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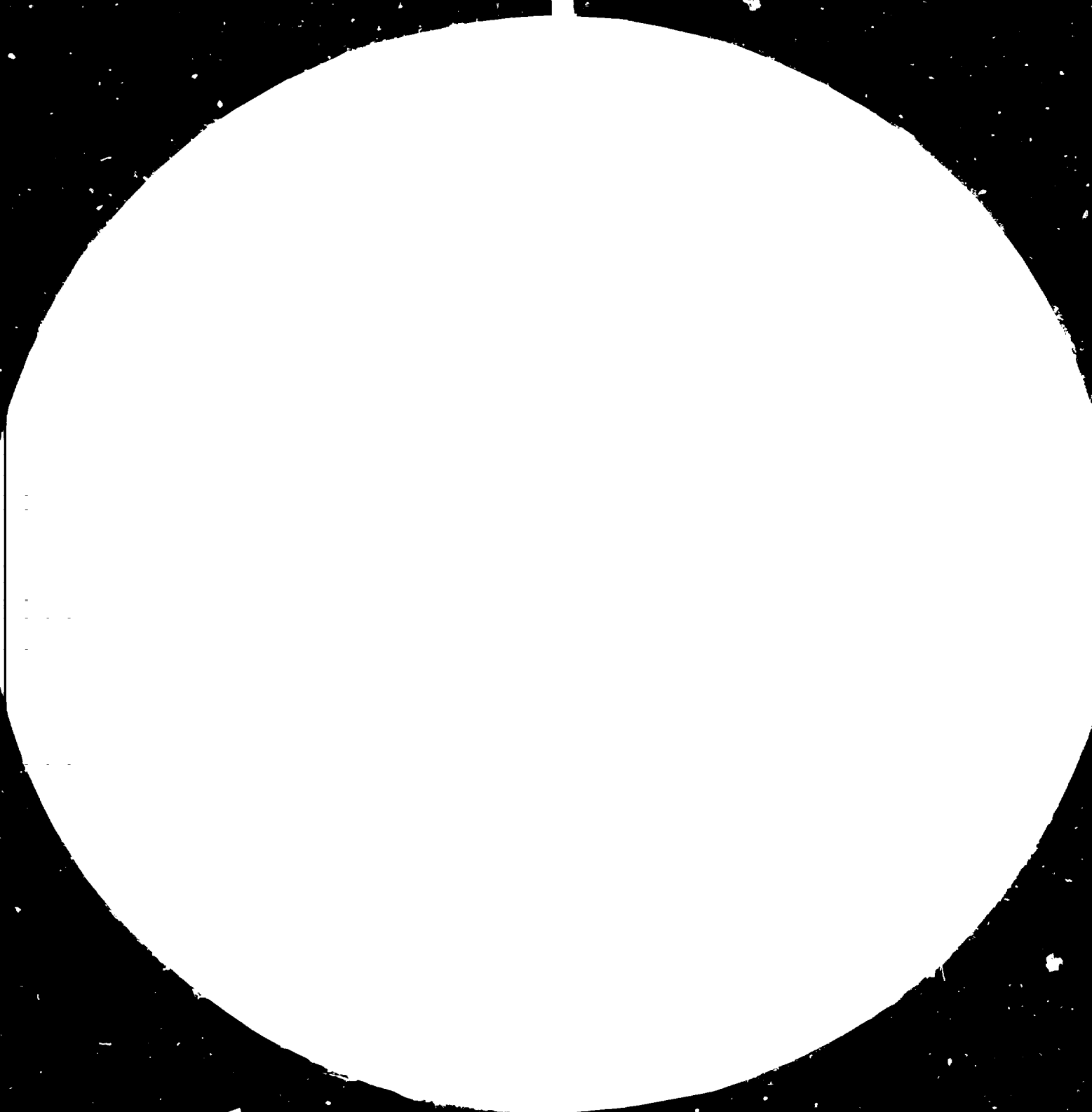

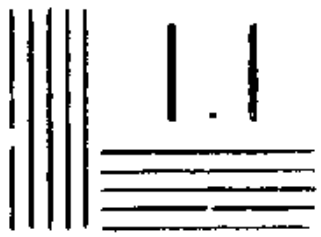

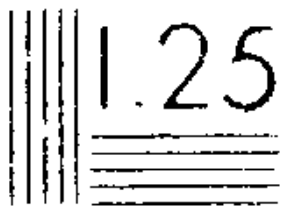

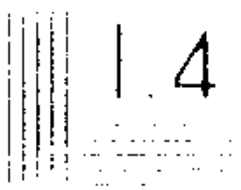

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YEMEN ARAB REPUBLIC

THE CONSTRUCTION INDUSTRY
A SURVEY AND IDENTIFICATION REPORT*

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WORLD BANK/UNIDO
CO-OPERATIVE PROGRAMME

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July 1981

*This report was prepared for the Government of the Yemen Arab Republic.

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PREFACE

The following report on the construction industry in the Yemen Arab Republic (YAR) was prepared by the staff and consultants of the World Bank/UNIDO Co-operative Programme (CP), which is located in the offices of the United Nations Industrial Development Organization (UNIDO), Vienna International Centre, Vienna, Austria. The study was requested by the Government of the Yemen Arab Republic, commissioned by the Least Developed Countries Section of UNIDO, and supported in part by the Urban Development Department of the World Bank.

The report was written by Derek Miles (consultant and mission leader) and Lloyd Thorson (staff member of the World Bank/UNIDO Co-operative Programme). Other contributors and members of the field mission were Warren Barkley (consultant engineer), Sarkis Garabedian (consultant engineer), and Salah Shehata (consultant architect). Of special assistance in the field were B. Kulkarni and M. Al-Tayeb (Ministry of Public Works, Sana'a), and in the final review of the report, Luis Vera (Urban Development Department, World Bank).

The basic field work was carried out in the YAR in December 1980, at which time public and private sector persons and entities were interviewed. The terms of reference for the field mission are attached at Annex 1. The UNDP field office and the Ministry of Public Works in Sana'a were the principal co-ordinating agencies in the YAR. In writing this report the authors have made substantial use of other research done by the World Bank/UNIDO Co-operative Programme in the field of construction materials in the YAR over the past three years.

This document is one in a series of seven papers prepared by the CP dealing with various aspects of the construction industry in the YAR. The subjects covered are stone quarrying and cutting, marble quarrying, the manufacture of ceramic wall and floor tiles, asbestos cement products, glass manufacture, the manufacture of concrete poles and pipes, and finally this general review of the construction industry in all of its aspects. It is also the latest in a series of six reports on the construction industry prepared by the CP for several developing countries, namely Swaziland (1978), Burundi (1979), Liberia (1979), Madagascar (1980), Sudan (1981), and the Yemen Arab Republic (1981).

CURRENCY EQUIVALENTS

Currency Unit:	Yemeni Rial (YR) YR 1 = 100 Fils
Currency Equivalent:[1/]	YR 1 = US$ 0.22 US$ 1 = YR 4.50
Fiscal Year:	July 1 - June 30 (through 1980) January 1 - December 31 (from 1981)

ABBREVIATIONS

AYE	Association of Yemeni Engineers
BCEOM	Bureau Central pour les Equipments d'Outre Mer
CDB	Co-operative Development Bank
CP	World Bank/UNIDO Co-operative Programme
CPO	Central Planning Organization
CYDA	Confederation of Yemeni Development Associations
GDP	Gross Domestic Product
GFCF	Gross Fixed Capital Formation
GNP	Gross National Product
HA	Highway Authority
HCB	Housing Credit Bank
IBY	Industrial Bank of Yemen
IDA	International Development Association
LDA	Local Development Association
MOE	Ministry of Education
MPW	Ministry of Public Works
MSALY	Ministry of Social Affairs, Labour and Youth
NWSA	National Water and Sewerage Authority
PIU/MOE	Project Implementation Unit, Ministry of Education
RWSD	Rural Water Supply Department
SPC	Supreme Purchasing Committee
UNDP	United Nations Development Programme
UNIDO	United Nations Industrial Development Organization
USAID	United States Agency for International Development
VTC	Vocational Training Centre
WHO	World Health Organization

1/ No par value for the Yemeni Rial has yet been declared to the IMF. Exchange transactions are effected at the Central Bank rate which has been pegged to the US dollar since February 1973.

YAR	Yemen Arab Republic
YEMROC	National Company for Industrial and Construction Materials
YGEC	Yemen General Electricity Corporation

SUMMARY

i. The construction industry reflects the fulfillment of a basic human need and is also of crucial economic importance since it impinges on all other sectors in a national economy. An increasing number of developing countries are becoming conscious of the importance of local construction industries in the context of overall economic planning and are looking for ways to strengthen them. In response, a number of international organizations have embarked on programmes of financial and technical assistance specifically aimed at strengthening this sector.

ii. The objective of this present study is to identify areas of financial and technical assistance which will enhance the performance of the local construction industry in the Yemen Arab Republic (YAR), moderate cost increases in the medium term and improve the prospects for timely execution of vital development projects. This is particularly important in view of the likelihood of there being a very substantial construction component in the forthcoming Second Five Year Development Plan (1981-1986).

iii. The YAR has an estimated population (mid 1980) of 5.9 million and an area of 195,000 sq. km. Political consolidation of the country has come rapidly since the 1962 revolution and the long civil war that lasted until mid 1970, although it is still classified as one of the world's least developed nations according to accepted indicators of social development. Economic performance has been impressive with an average 10 per cent annual growth of GDP over the past decade, fuelled by an unprecedented growth in remittances from Yemeni workers in Saudi Arabia and the Gulf States.

iv. The YAR has an established and unique building heritage, and the rich, characteristic and uniform style of the traditional Yemeni architecture and townscape is justly admired. However, it did not prove possible for the local construction industry to cope with the explosive growth in demand for modern forms of construction over the past decade. Although local firms were able to secure a share of the expanding workload, many of them encountered severe operational problems due to their inexperience in organizing large projects coupled with the impact of inflation on fixed price contracts. Many projects fell seriously behind schedule and were withdrawn from local firms and re-awarded to foreign contractors. The construction boom resulted in shortages of skilled labour. The inadequacies of local sources of building materials and components has meant that the local content in construction projects undertaken by foreign firms is very low. Inadequate design and project management capacity has been a further bottleneck, with undue dependence on foreign consultants coupled with a lack of any agreed national system of codes, standards or specifications. The result is that construction projects are often over-designed or otherwise inappropriate to local needs and priorities.

v. The Mission proposes measures of rationalization and assistance to the construction industry under four main headings as follows:

Construction Materials and Standards

1. Improve technical and managerial methods of local manufacturers of construction materials.

2. Set up an autonomous Yemen Bureau of Construction Standards within the Ministry of Public Works (MPW) to develop and publish codes and standards appropriate to local needs and to inspect and monitor materials and components.

3. Utilize the new MPW buildings and highways laboratories for practical research and development on local materials and components, as well as for providing a testing service for both public and private sector projects on a fully remunerative basis.

4. Provide technical assistance to speed up geological exploration, evaluation and exploitation of mineral resources that can be used in the manufacture of construction materials, e.g. marble, clays, gypsum, pumice, perlite; channel assistance through the Geological Survey and the National Company for Industrial and Construction Materials (YEMROC).

5. Establish new building materials industries where feasible, using locally available raw materials, e.g. mechanized stone quarrying and cutting (for low-cost production of natural stone), marble slabs and tiles, pre-cast concrete products such as poles, pipes and kerbs, lime products, gypsum plaster and wallboards, ceramic wall and floor tiles, vitrified clay pipes, ceramic sanitary ware, plate glass, and pumice and perlite for use in manufacturing lightweight concrete.

Design and Project Management

6. Strengthen and develop the MPW Technical Section as an autonomous Yemen Consulting Bureau responsible generally for the design and project management of all public sector projects.

7. Phase out gradually the Highway Authority's force account construction activities and upgrade the Authority into a planning, supervisory and maintenance group.

8. Develop and publish through the MPW procurement guidelines and nationally agreed conditions of contract appropriate to conditions in the YAR.

9. Classify local, foreign and joint venture contractors according to managerial, technical and financial capacity.

10. Formulate preventive maintenance schedules for all new projects, particularly those with a significant mechanical/electrical component.

Performance of Local Contractors

11. Assist in the promotion of a Contractors Association to act as a focus for local firms involved in the construction process.

12. Direct technical support to promising local firms structured so as to enhance their capability and encourage self-reliance.

13. Reserve lower categories of projects for bidding by local contractors and medium categories for either local contractors or joint ventures.

14. Include price escalation clauses, based upon a recognized construction cost index, on all but short term contracts. The MPW should prepare a price adjustment formula and publish quarterly cost variations.

15. Prepare clearer and more simple bid documents so that they can be readily understood by local contractors.

16. Minimize post-contract design changes, but ensure that any alterations are properly covered by variation orders so that the contractor is properly remunerated.

17. Ensure smoother and prompter settlement of progress payments on public sector contracts by simplifying procedures and by establishing a proper settlement office.

18. Establish, through specialized courses, construction management training, possibly supplemented with an on-the-job extension service.

19. Devise measures to provide a steadier workload for local contractors, including subdivision of large projects as specific training contracts with appropriate financial allocations to cover the costs of splitting work as well as training and other assistance.

20. Establish equipment pools in the major construction centres for equipment rental, provision of operators and master mechanics, and technical know-how related to maintenance.

Education, Training and Professional Standards

21. Offer technical assistance to the Association of Engineers to help it to develop into a comprehensive professional institution.

22. Assist the proposed Faculty of Engineering at the University of Sana'a to provide courses that are fully appropriate to local needs, including postgraduate training for returning graduates from foreign universities.

23. Expand technical, craft and vocational training facilities to overcome the continuing severe shortage of skilled personnel.

vi. The Mission proposes the establishment of a semi-autonomous Construction Industry Development Unit within the Ministry of Public Works to co-ordinate with other government agencies and to ensure an active and concerted approach to the implementation of the above recommendations. The cost of staffing and equipping such a unit to function over a five year period is estimated at US$ 1.8 million (see Annex 21). The Ministry of Public Works should be responsible for follow-up of the recommendations of the Mission.

vii. The Mission concludes that the Government should be encouraged to implement directly and/or facilitate the implementation of the above-listed recommendations. In-depth studies of individual aspects should be commissioned as required.

I. INTRODUCTION

1. The construction industry impinges on all other sectors in a national economy, and the substantial share of costs attributable to construction activities in overall investment in the range of economic and social facilities for which governments are responsible is a matter of increasing concern. Thus no nation can afford to ignore the constraints on the effective performance of its construction industry if it seeks to turn economic plans into reality, and attention must be given to their alleviation or removal. Furthermore, the industry is of social as well as economic significance. It is universally recognized as an important source of employment in developing countries, particularly for the urban poor. It provides opportunities for the transition of rural migrants from a situation of unemployment or underemployment to employment for wages in urban life (often, for Yemenis, after a spell of wage earning employment in a neighbouring country). Also, it constitutes an opportunity for import substitution in developing countries once indigenous firms are able to make inroads on what has traditionally been the domain of foreign companies.

2. In recognition of the above, the governments of a number of developing countries have adopted policies aimed at strengthening their local construction industries. International organizations have responded by offering programmes of financial and technical assistance to this sector. Examples of financial assistance are the provision of loans to contractors through the facilities of local development banks, the financing of materials testing and research laboratories, and the financing of projects for the local production of building materials. Examples of technical assistance are training and education in the building trades, recommendations for modifying existing government procedures and institutions, and research into building technology and design suited to local conditions.

3. The Yemen Arab Republic (YAR) has requested UNIDO and the World Bank to explore ways to assist in the development of its local construction industry. The country has an established and unique building heritage, reflected in the craft skills of many of the local contractors who specialize in traditional forms of construction. However, few local firms have been able to adapt and develop their commercial, managerial and technical skills sufficiently rapidly to cope with the explosive growth in demand for construction over the last decade. The industry has encountered severe problems, due mainly to its inexperience in organizing large projects compounded by the impact of inflation on fixed price contracts. Many projects have fallen behind schedule and have been withdrawn from local firms and re-awarded to foreign contractors. The shortages of skilled labour and the inadequacies of local sources of building materials and components mean that the local content in construction projects undertaken by foreign firms is very low - only 15 per cent in some cases.1/ Design and general project management capacity are further bottlenecks, with undue dependence on foreign consultants. These constraints, coupled with the lack of any agreed national system of codes, standards or specifications, result in construction projects being over-designed or otherwise inappropriate to local needs and priorities.

1/ Yemen Arab Republic, Development of a Traditional Economy, World Bank Country Study (Washington, World Bank, 1979).

4. Political consolidation of the country has come rapidly since the 1962 revolution and the long civil war that lasted until mid 1970. Over the past decade tribal divisions have been blurred and impressive strides have been taken towards establishing the organizational framework of a modern government. Economic performance has also been impressive, with an average 10 per cent annual growth of GDP. A feature has been the unprecedented growth of remittances from Yemeni workers in Saudi Arabia and the Gulf States. About 330,000 of the YAR's 5.3 million inhabitants lived abroad in 1975, but this figure rose to between 650,000 and 700,000 by 1978. Remittances from these workers grew from about US$ 40 million in 1969/70 to about US$ 1 billion in 1976/77. 1/ As a consequence, per capita GNP has more than doubled since 1969/70 to a level of about US$ 410 in 1977/78. Whilst reliable data on income distribution are not available, there are at least indications that recent income gains have been widely distributed, thanks to the impact of remittances on family groups in the rural areas.

5. Despite the encouraging progress over the past decade, the economy remains fragile with as much as 40 per cent of GNP representing income earned abroad, mostly workers' remittances. Domestic production levels are still very low and the social infrastructure remains very underdeveloped. Therefore the country still justifies classification as one of the world's least developed nations according to accepted indicators of social development.

Table 1

Indicators of Social Development

Employment in agriculture	- 1979	76 %
Adult illiteracy	- 1977	87 %
Primary school enrollment	- 1977	26 %
Population per physician	- 1978/79	13,000 persons
Life expectancy at birth	- 1978	39 years
Access to safe water	- 1977	4 % of dwellings
Access to electricity (urban only)	- 1977	57 %

Source: World Bank

6. The continuing need for heavy infrastructural investment will be reflected in an increasing demand for construction projects of various kinds, and the cost structure and efficiency of the industry must therefore be a matter of prime concern to the Government. Likely trends in demand are discussed in more detail in chapter 4, but an indication of likely growth in value added, employment and productivity appears in Table 2 overleaf.

7. In the report that follows, the "construction industry" is defined as that sector of the economy which engages in the production of buildings and civil works of all types, including designers, contractors, direct labour organizations, manufacturers, and suppliers of building materials and the planning, administrative and regulatory agencies associated with construction. The aim of the report is to describe the industry as it exists in the Yemen Arab Republic, to identify the most serious constraints and opportunities for improving cost-effectiveness and general performance and to propose financial and technical assistance that would make the maximum positive impact in helping the industry as a whole to contribute more effectively to evolving national needs.

1/ Yemen Arab Republic, Urban Sector Report (Washington, World Bank, 1979).

Table 2

Construction Industry

Projected Growth in Value Added, Employment and Productivity

(constant 1975 prices)

	Value Added (YR million)	Employment ('000)	Productivity (YR '000)	Growth Rates Assumed: Value Added	Growth Rates Assumed: Productivity
1975	202	48.7	4.1		
				30.0	4.0
1980	750	148.6	5.0		
				6.0	1.5
1985 (low growth)	1,004	185.9	5.4		
				10.0	2.0
1985 (likely growth)	1,208	215.7	5.6		

Source: World Bank

II. DESCRIPTION OF THE CONSTRUCTION INDUSTRY

A. The Public Sector

8. Prior to the 1962 revolution and during the civil war that extended up to 1970, all public sector construction was the direct responsibility of the Ministry of Public Works (MPW). This included the construction of a limited number of state buildings and the maintenance and repair of public buildings generally. As the situation stabilized, the Government and people of the YAR embarked on the pressing task of bringing the country out of its historical isolation and general social, economic, educational, industrial and agricultural underdevelopment. Concerted economic and social development is never easy to achieve, and in the circumstances the physical achievements over the past decade are remarkable.

9. Before the revolution in 1962 the only paved road in the country was the one connecting Sana'a with Hodeidah. There was no electricity, water, sewerage or other municipal services, no schools (other than the traditional "kuttab" religious schools for boys only), and no hospitals or health clinics. The economic and commercial system was equally underdeveloped. Foreign banks began operating in the YAR only in 1972. Even now many Yemenis are reluctant to put their money into banks. Land and property speculation are a more popular form of investment than are bank savings accounts or the financing of commercial activities or productive enterprise.

10. Thus the Government was faced with the massive task of developing from scratch a national infrastructure and civil administration. It therefore invited a number of international, bilateral, religious and humanitarian organizations to assist in the socio-economic development of the country. The funds that became available for construction rapidly outpaced the limited resources of the technical and administrative staffs of the MPW.

11. As a result of the understandable concern for the achievement of physical results and the frustration at the limited implementation capacity of the MPW, various ministries and public agencies became directly involved in the design and commissioning of construction projects by establishing their own technical departments, engaging foreign consultants, supervising tendering procedures and generally managing projects. Similarly, bilateral agencies began carrying out many projects with a minimum of Government involvement. With Government encouragement, the Local Development Associations (LDAs) began grass roots development activities at the village and provincial level, constructing schools, water supply systems, health centres and feeder roads.

12. As a result of a growing awareness of the need for an efficient institutional arrangement for planning, the Government established the Central Planning Organization (CPO) in 1972. In spite of the experience gained from the first Three Year Development Plan (1973-1976) and the much improved Five Year Plan (1976/77-1980/81), planning and implementation capacity in the YAR remain severely limited. Construction activities in both the public sector and the parallel semi-official sector lack co-ordination and clarity in overall organization. The efforts of the small Yemeni and foreign staff of the CPO during the short time since its inception are commendable. The continuing deficiency in dependable basic statistics (which is only now gradually being ameliorated) make planning and forecasting difficult. There is a continuing shortage of qualified personnel in most public services, and this is reflected in the disarray of the construction industry in both the public and private sectors.

13. Following the revolution, and especially since the national conciliation in 1970, Government institutions have been expanded and modern administrative procedures have been progressively introduced. The first development programme and the subsequent Five Year Plan were significant improvements over the situation that existed before. However, being so very recent and alien to the traditions of the people, it will require time and persistent efforts on the part of the Government for co-ordinated national planning to be accepted as a rational framework for overall development.

14. The Mission identified the following public sector organizations as being directly involved in the construction industry:

Central Planning Organization (CPO): Instrumental in allocating foreign and local financial resources; also acts as the Government executing agency for certain construction projects.

Ministry of Public Works (MPW): Design and supervision of construction and periodic maintenance of public buildings, most rural water supply systems, and highways and ports through the Highway Authority and Ports Authority respectively.

Ministry of Economy: Construction of industrial estates; licensing of industrial projects including those for the production of building materials; encourages housing development through the Housing Credit Bank (HCB).

Ministry of Education (MOE): Implementation of a booming school construction programme through its Project Implementation Unit (PIU/MOE) (see Annex 3).

Ministry of Power and Water: Construction of national grid and city power supply networks and the water supply and sewerage systems in the major cities of Sana'a, Hodeidah, Taiz, Ibb and Dhamar, through the Yemen General Electricity Corporation (YGEC) and the National Water Supply and Sewerage Authority (NWSA).

Ministry of Municipalities and Housing: Municipal development sch and, more recently, low cost housing.

Ministry of Religious Endowments ("Wakf"): Investments of religious endowments in construction of housing, office buildings and commercial centres.

Ministry of Health: Construction of hospitals, health centres, infirmaries and related buildings.

Ministry of Social Affairs and Labour: Construction of youth centres, stadiums, low cost housing and social service buildings.

Ministry of the Interior: Construction of office buildings, police stations, security posts and related buildings.

Ministry of Communications: Construction of radio and TV stations, telephone exchanges, and cable and wireless links.

Ministry of Agriculture: Construction of irrigation systems, land reclamation, water wells for agricultural purposes, rural water supply systems, slaughterhouses and meat markets.

Petroleum and Mineral Resources Corporation: Licensing of all mineral exploitation, including minerals used as construction materials; controls National Company for Industrial and Construction Materials (YEMROC) (see Annex 4).

15. There is thus a multiplicity of public institutions which have an impact on construction demand. Unfortunately their efforts are largely uncoordinated, and sometimes even undocumented, with the result that details of projects implemented and amounts spent are unavailable or unreliable.

16. The following table shows the funds allocated in the Government annual budgets under Section 4 as development expenditures (these are in addition to current expenditure and external assistance):

Table 3

Allocation of Development Expenditures

Budget Year	YR million
1972/73	57
1973/74	139
1974/75	185
1975/76	340
1976/77	463
1977/78	not available
1978/79	1,007
1979/80	1,272

These funds are allocated to the various ministries on the basis of project lists submitted by them, but the requests submitted inevitably exceed the Government's estimate of funds available; therefore the ministries concerned are required to restructure their activities according to the funds made available to them. Even more than in most developing countries, budgetary operations in the YAR remain a novel and somewhat tentative exercise. Irrespective of standing instructions to the contrary, reallocations between headings within the budget, budget overruns and new allocations to the budget are common. These stem from changes in Government priorities, faulty estimates, inflation and approval of additional projects for which foreign co-financing is obtained after the start of the financial year. It is intended that financial discipline should become progressively tighter as more experience is gained in budget preparation and management and better data become available for more realistic planning.

17. The funds actually disbursed by the Ministry of Finance under Section 4 in the last two years were as follows:

Table 4

Development Expenditures Disbursements 1978/80

	1978/79 (12 months) (YR million)	1979/80 (11 months) (YR million)
Construction and related activities		
Studies and designs	16.0	9.3
Buildings	281.2	3[illegible].7
Construction	133.2	143.6
Mechanical items and equipment	85.0	162.2
	395.4	648.8
Other		
Wages, operational and general expenses, transport, lands	230.4	164.2
	625.8	813.0

Source: Central Planning Organization. Does not include amounts disbursed under bilateral or international loans, grants or credits.

18. The procedure followed in implementing projects varies from ministry to ministry and also from year to year. Therefore comparison and analysis are virtually impossible.1/ Depending on the source of funds - national, bilateral, international or any combination of them - or the complexity of a project, the design, tendering and supervision of construction may be entrusted to foreign consultants, the MPW, a specific ministry's technical department, or to a government or national organization or authority.

19. A special element that further affects public sector construction activities in the YAR is the direct involvement of foreign agencies. Because of the vast need for basic services and the lack of sufficient government personnel to administer available assistance funds, it has been found necessary to authorize some bilateral and joint agencies (e.g. Saudi Arabia, United Arab Emirates, Iraq and Arab Fund) to operate directly with a minimum of YAR Government supervision or control. Some agencies have their own offices in the YAR that directly finance, plan, tender and manage the construction of schools, health centres, mosques, highways, water supplies and general development projects. The contribution of these agencies to the improvement of the living conditions of the rural poor has been substantial, both as a source of employment during construction and subsequently in the form of improved public services. However, detailed information on the extent of their contributions, numbers and location of projects was not available (although the CPO is in the process of documenting its activities). As the country's development needs become better defined, it will be necessary to regulate the activities of these agencies in order to maximize the benefits of their contributions.

1/ Annex 5 includes excerpts from instructions regarding the implementation of the transitional budget for the second half of 1980, due to the change to a calendar fiscal year from January 1981.

The Ministry of Public Works (MPW)

20. Despite the proliferation of government ministries and agencies involved in construction, the MPW remains the central government's main executive branch responsible for public construction, building works and roads. It is effectively the parent ministry responsible for controlling and co-ordinating the activities of specialist construction agencies. In 1972 its construction department became the present Highway Authority (HA), which relates to the MPW only through the person of the Minister who is also Chairman of the HA. In 1973 the National Water and Sewerage Authority (NWSA) evolved from a WHO/UNDP project for pre-investment studies, for which the MPW was the Government co-ordinating agency. NWSA was later made responsible to the Ministry of Municipalities and more recently to the newly formed Ministry of Electricity, Water and Sewerage. Functions of the present Ministry of Municipalities and Housing were also originally fulfilled by the MPW. The MPW continues to be the focal point for government planning and decision-making in technical matters.

The MPW Technical Department

21. The MPW Technical Department is responsible for the design of building projects undertaken by the MPW and various other government ministries and departments. Design documents are limited in most cases to major architectural drawings and drawings of reinforced concrete works. Electrical, sanitary, carpentry and finishing works are merely described in written notes in the contract documents, and no detailed drawings are available.

22. In December 1980 the technical staff was comprised of:

12 engineers (Yemeni)
1 engineer (expatriate)
2 technical assistants (Yemeni)
1 engineering assistant (Yemeni)

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Inevitably the output both as to quantity and quality of work has been limited by the number of staff and their professional qualifications and experience, although the number of buildings designed is substantial (see Annex 6).

23. In addition to design, the Technical Department is responsible for the preparation of tender documents, the evaluation of tenders, the execution of contracts, supervision of construction, and certification of contractors' invoices for interim and final payments. It is not surprising therefore that the Department has had to be somewhat ruthless in defining and limiting its priorities with the result that:

- work is limited to buildings only,
- contract and working drawings are limited to a bare minimum,
- a uniform, but inadequate and seriously outdated, set of tender documents is applied to all contracts,
- technical specifications are general and no variations are introduced to suit specific needs,
- bidders are required to make their own quantity takeoffs from the limited drawings and take full responsibility for them, i.e. bid a lump sum (unit prices are included only for application to eventual changes in scope of work),

- regular supervision of the contractor's work is lacking, and
- quality control of work in progress is fragmentary and ineffective.

24. The number of staff and facilities accorded to the Technical Department is thus effectively unrelated to the number of building contracts they are required to manage, and their limited resources are spread so thinly that they are unable to provide a fully satisfactory service to any of their clients. This lends to general criticism of performance, understandable but often unfair, which in turn adversely affects the morale of the already overworked staff. Another adverse result is the dispersion of resources as other ministries and government or semi-public bodies establish their own technical departments or engage foreign consultants.

25. The Mission were told that recently-graduated Yemeni engineers are reluctant to join the Technical Department of the MPW, both because of its general unpopularity and because of its uncompetitive salary scales.1/ It would appear that the dispersion of the small number of qualified Yemeni engineers and specialists to a wide range of ministries is a highly inefficient way of employing this scarce national resource.

26. The Mission concluded that a basic reorganization of the Technical Department of the MPW is called for. It was repeatedly pointed out to the Mission that the Government wants the MPW to be its major adviser in technical matters. To do this the Ministry will have to be provided with the necessary personnel and facilities. The Mission therefore recommends that the present Technical Department be developed into a general public sector consulting authority, with a title such as "The Yemen Consulting Bureau". Its services should be available to all ministries and public bodies on a fee basis, i.e. either a fixed percentage of project cost or as a negotiated sum, and it should be authorized to recruit staff to suit its anticipated workload. The Central Government should bear a proportion of the overall expenses in compensation for general national-level planning and consultancy services, research work and feasibility studies, for which a specific fee cannot be negotiated. The technical officers now emerging in other departments should be transferred, along with their duties, to this central consulting authority. The authority would also prepare up-to-date standard tender and contract conditions and be a central pool for storage and exchange of experience and information on a national level. In addition to the activities of the present Technical Department, the new authority might gradually evolve to take over the provision of technical input to other relevant government services, e.g. co-ordinated city planning, housing for lower and middle-income groups, rural water supply projects and public health projects.

The MPW Rural Water Supply Department

27. The MPW Rural Water Supply Department (RWSD) was established to strengthen and co-ordinate efforts to bring supplies of potable water to remote towns and villages, and to channel all the various government and bilateral aid contributions to projects for the construction or improvement of water supply, and recently sanitation, in rural areas. Its services are considered as contributing to basic health improvement. Therefore many of its proposed projects are approved without strict feasibility studies or analysis of priorities but rather in response to vocalized popular demand. The RWSD works closely with the Local Development

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1/ Certain specialized public sector agencies have been authorized to pay higher salaries and provide better working conditions.

Associations (LDAs) and the Confederation of Yemen Development Associations (CYDA) in their water supply extension programmes on a project by project basis. The RWSD is assisted by a WHO/UNDP technical unit which designs and prepares drawings, specifications and supply lists for rural projects. The staffing consists of a Project Manager, Design Engineer and Mechanical Engineer, plus a number of United Nations volunteers and expatriate engineers (not currently up to authorized strength due to recruitment difficulties). A further problem is the difficulty in recruiting sufficient local staff as counterparts to benefit from training opportunities.

28. In its efforts to satisfy the numerous requests for water supply projects, the RWSD operates on force account with its own drilling rigs, but it also tenders out well drilling work to private, local and foreign contractors. It has its own pump erection and maintenance crews, workshops and stores taken over from an earlier USAID project. Some of the pipes and pumping equipment are obtained through foreign assistance, and the remainder are purchased from local merchants. Some bilateral aid agencies carry out projects directly or through contractors of their own selection with only a nominal involvement of the RWSD.

29. As a result of the proliferation of organizations and agencies involved in the work of the RWSD, it was not possible to ascertain the actual number of projects implemented, or even obtain a clear picture of the funds invested. However, the following figures were obtained from a report under preparation by the WHO/UNDP unit:

Table 5

Projects Designed and Implemented by WHO/UNDP

	1976	1977	1978	1979	Up to August 1980
Designed	32	42	74	89	126
Implemented	25	43	63	40	25
Wells drilled	19	11	19	28	25
Population served	82,000	99,000	122,000	58,000	72,000

30. The Mission concluded that, in their enthusiasm to cater for a basic need with an immediate positive impact, the Government, LDAs and international and bilateral agencies are operating in an unco-ordinated manner. Furthermore, there are clear risks in continuing with uncontrolled drilling. Large sums are being invested on water resources with scant hydrogeological information on the probable long term yield of these resources. Further well drilling, in the mountainous areas of the country in particular, should be limited until such time as a comprehensible hydrogeological survey of the country is carried out to determine the quantities that may safely be extracted. In Sana'a, for example, a 20 m drop in the water table has been reported, although full exploitation started only in 1978. The Government is aware of the dangers and recently decided to disallow the importation of drilling rigs in view of the large number (estimated to be over one thousand) already in the country. Thus there is an urgent need for co-ordination of decision making to ensure efficient use of local and foreign contributions.

The Highway Authority

31. The Highway Authority (HA) was established in 1973 as part of a joint IDA/Kuwait Fund (315-YAR) operation to assist in financing a highway project. It operates as an autonomous Government agency with its own capital, budget, income and salary scales, under a board of directors composed of government officials and chaired by the Minister of Public Works. The HA was initially responsible for the design, construction and maintenance of the highway and road network on a contractual basis for the Government and local authorities. It has over time become merely a public sector contracting agency submitting tenders and competing in the construction and maintenance of roads like any private subcontractor. At the same time it subcontracts local and foreign contractors and engages in renting out equipment and plant. Its involvement in design has been negligible.

32. It was the original intention that all road construction activities should be channelled through the HA. However, the extremely rapid growth of demand for roads, coupled with an increasing availability of resources to meet that demand, has made such an aim impractical. Consequently the HA has rightly concentrated on major projects. The LDAs have executed a large programme of feeder road construction, in most instances without consultation with the HA. Bilateral aid organizations have also been directly involved in the planning and construction of new highways.

33. Since its inception in 1973, the HA has assumed several discrete functions:

Highways financed by the Central Government: These projects are financed directly from Central Government funds included in the MPW budget. The HA itself prepares designs and cost estimates and carries out construction, sometimes on force account but usually by subcontracting to local (or recently Chinese) contractors.

Highways with international financing (e.g. IDA, Arab Fund): Here the HA acts as the Government's executing agency throughout all the project management stages of identification, design and implementation. The designs and tender documents are prepared by international consulting firms, acceptable to the financing agencies, under contract to the HA. The projects are advertised for international tender and the work is awarded to the lowest satisfactory bidder. Local firms can, but rarely do, participate, due to their lack of technical and managerial resources. Supervision of construction is also undertaken by foreign consultant firms under contract to the HA, and they monitor progress and certify payments on behalf of the Government. In one recent instance, the Taiz-Turda road, the bids received from responsive, qualified contractors were found to be in excess of the available funds. In agreement with the funding agencies, the Government required the HA to carry out the work on "force account". To prevent any conflict of interest, the supervising consultant was engaged by the Central Planning Organization.

Highways with bilateral financing (e.g. the Abu Dhabi Fund): Some bilateral financing agencies have their own executing agencies. These agencies engage consultants to carry out the necessary designs, prepare tender documents and supervise construction. In such cases, the HA bids on the projects as an independent contractor under the same terms and conditions as the other bidders (no preference is currently given to bids from local sources). An example is the Sana'a-Marib highway financed by the Abu Dhabi Fund, where the HA bid was the second lowest, the lowest being that of Al-Khourafi of Kuwait.

34. Since the establishment of CYDA, attempts have been made to formalize the HA's relations with the LDAs. It has been suggested that the activities of the LDAs should be limited to roads of less than 30 km in length. It has also been proposed that the HA should be made responsible for the maintenance of roads constructed by the LDAs. But the HA has been reluctant to take over this latter task since, in its opinion, most of these roads are not properly aligned and constructed. Thus, there would be a need for basic reconstruction to upgrade them before regular maintenance procedures could be successfully implemented. When asked, the HA also carries out cost estimates of roads built, or planned to be built, by the LDAs, in order to determine the cost share of the Central Government.

35. The HA typically suffers from a deficiency of suitably qualified staff, and is often under pressure to proceed without the necessary advance preparation or organization. Here an important factor is the generally low level of compensation in the public sector. The HA, which operates as a parastatal, is able to offer somewhat better conditions of service than apply to regular civil servants, but these remain considerably inferior to salary levels in the private sector.

36. The first IDA/Kuwait Fund highway project was followed in 1976 by a second project (558-YAR) for US$ 14 million to construct 63 km of bitumen road and provide technical assistance to the HA. A third highway project, approved in 1978, is currently being implemented, co-financed by IDA (US$ 11.5 million) (794-YAR) and OPEC (US$ 8.7 million)(loan number 114P-1979). In this latest project the main emphasis is on the introduction of effective highway maintenance practices including the provision of maintenance equipment and workshops, HA staff training in operation and maintenance of equipment, and direct staffing of related key positions.

37. The main operational sections in the HA are the Construction Department and the Maintenance Department. The Construction Department is responsible for inter-urban highways and street works for the municipalities on a "force account" basis. This Department prepares designs and submits a preliminary cost estimate that includes estimates for labour, materials, depreciation of equipment, a 20 per cent contingency item and a 10 per cent head office overhead. The necessary funds are then allocated from the State budget for the MPW. The HA draws on these funds as construction work progresses, but it is unable to plan its work effectively because the Ministry of Finance seldom allocates the full amounts estimated to be necessary.

38. The income of the HA resulting from its construction of new road and street works in recent years was reported to the Mission as follows:

Budget Year	Income
1976-1977	YR 62,500,000
1977-1978	YR 73,600,000
1978-1979	YR 66,600,000
1979-1980	YR 59,000,000

For the 12 month period from July 1980, the HA estimates it will carry out works valued at approximately YR 60 million, of which YR 15 million is for the city of Sana'a.

39. The Construction Department has an overall workforce of around 800 and works from its head office in Sana'a with a resident engineer responsible for each specific project. Reporting to the Chairman (the Minister of Public Works) are a General Manager, Chief Engineer, Design Engineer, Mechanical Engineer and Construction Engineer (all Yemeni nationals). They are at present assisted by 8 expatriate engineers from India, Pakistan and the Philippines.

40. The Construction Department has a large pool of plant and equipment accumulated over the last 8 years (see Annex 7), and this is sometimes made available for hire when not in use by the Department.

41. The current highway construction activities in which the HA is involved are summarized in the following table:

Table 6

Construction Activities at December 1980

Finance	Road	Length km	Finish	Cost Estimate YR million	Design	Supervision	Construction
YAR Government	Sana'a-Jihanaa	30	Asphalt	50	SWECO/HA	HA	HA
	Arhab - Hazm	112	Gravel	70	SWECO/HA	HA	HA
	Mansouria - Raimia	30	Gravel	Not available	HA	HA	HA
Saudi Dev.	Dharan - El Jainoub	79	Asphalt	253	Wilson + Morrow		Furlanis
Saudi Dev.	Hodeidah - Jizan	204	Asphalt	389	Wilson + Morrow		Saru Whan (Korean)
Libya	Mafraq - Mokha		Asphalt	60	Interonte/Gibb		China R + B
YAR/China	Amran - Hajja	80	Asphalt	220	China Road and Bridge Engineering Company		

Source: Highway Authority

42. The HA Maintenance Department is responsible for the maintenance of approximately 1,200 km of asphalt roads and 775 km of gravel surfaced roads, the latter mostly in Hodeidah, Taiz and Ibb Governorates. Maintenance costs are charged to the Government and are calculated to cover direct materials, labour and fuel costs, equipment depreciation plus a 10 per cent overhead to cover HA headquarters expenses. The yearly costs reported to the Mission, as billed to the Government, are as follows:

Budget Year	Maintenance Cost
1976-1977	YR 14,261,266
1977-1978	YR 13,016,921
1978-1979	YR 23,835,625
1979-1980	YR 25,758,968
July-October 1980	YR 6,690,476

43. The Chief Maintenance Engineer, an expatriate, and his Yemeni counterpart are based in the Sana'a head office, and the three branches are run by maintenance engineers, each with a secretary, stores, a bookkeeper and assistant supervisors. The overall number of maintenance personnel is about 400, fluctuating seasonally, and annual payrolls generally range from YR 550,000 to YR 600,000.

44. The Department has the following major equipment at its disposal:

Bulldozers, D-65 to D-8	8
Graders	8
Rollers, y, 8 -d 12+	9
Service vehicles	14
Mobile asphalt kettles	4
Asphalt distributors	3
Loaders	8
Dump trucks	13
Water tankers	6

It can also borrow equipment from the Construction Department as necessary.

45. In summary, the HA is involved in many phases of highway development - preliminary studies, designs, contract administration, actual construction and maintenance. This vast range of responsibilities, coupled with a limited stock of managerial and technical resources, has rendered its effectiveness in all aspects unsatisfactory. Senior staff are overworked, both due to their limited number and absence of clarity of purpose and objectives. The administration of day-to-day operations consumes their efforts and thereby inhibits any serious long term planning and deprives them of the opportunities to contribute dependable advice as an input to the government decision-making process. The HA and staff are thus exposed to often unfair, albeit inevitable, criticism that further reduces their morale. Furthermore, the establishment of the HA as a "force account" operation has constrained the development of local contractors in this sector. The Mission therefore suggests that the HA's construction activities should be gradually phased out and the authority upgraded into a planning, supervisory and maintenance operation. The equipment available within the HA should partly be transferred to the Maintenance Department, whose duties are bound to increase significantly as the highway network extends, and the remainder sold or made available for hire to local contractors.

B. Governorates and Local Development Associations

46. The administrative system in the YAR is decentralized, and considerable authority is devolved to the Governors, who both co-ordinate the activities of central departments at local level and have funds (and limited technical staff) with which to commission development activities on their own account. Another important factor with special impact on the construction industry is the system of Local Development Associations (LDAs), recently further formalized and given more consistent government support by the establishment of the Confederation of Yemen Development Associations (CYDA). Self-help and co-operation on a local level is a historic characteristic of Yemeni communities, developed as a result of geographic isolation imposed on them by the mountainous terrain and through centuries of neglect by uninterested central autocracies. These factors have engendered a self-reliant approach among rural people and an appreciation of the need to adopt some form of co-operation for the sake of survival in a difficult environment. The activities of the LDAs, financed in approximately equal parts by local taxes, contributions of the local population, and allocations from the Central Government, are a dynamic element in rural development and form a vital link in the Government's strategy to meet basic human needs.

47. Prior to the advent of the LDAs in the early 1970s, the only access to many rural communities was by rough paths which could only be traversed on foot or by using pack animals. Now, with some technical assistance and heavy equipment from the LDAs, plus locally organized volunteer labour, many of these communities have constructed access roads suitable for four wheel drive vehicles. Whereas a visit to the nearest town used to require a full day, now it may be accomplished in a few hours, and locally grown agricultural produce can be marketed readily. Once these communities had roads, they were then able to transport building materials and build schools, clinics, and water and electric systems.

48. In 1972 there were only 28 LDAs, and now the number has increased to 191. There is great variation among LDAs, but many have achieved remarkable success in assisting rural communities to attain an improved standard of living. The Government is aware of the valuable contribution made by the LDAs to rural development and plans, through CYDA, to continue supporting this system and gradually expand their technical, administrative and financial services.

49. The Mission were impressed by the positive contribution made by the LDAs to the nation-building efforts of the people, and the dedication and sense of pride of elected officers who make a real contribution to direct participation in decision-making at the local community level. The projects carried out by the LDAs have been (ranked by priority) feeder secondary roads, water supplies, schools and health centres, and mosques. The following table showing the financial progress of the LDAs is a good indication of their dynamism:

Table 7

LDA Income and Expenditure, 1975-1978

	1975-1976	1976-1977	1977-1978
Number of LDAs	114	118	134
Expenditure (YR million)	37.2	55.8	100.7
Income (YR million)	56.2	89.9	141.7

Source: CYDA Magazine, No. 3/4 of 1980

50. For the two financial years 1976-1977 and 1977-1978 the following achievements were reported[1]:

Roads	8,206 km	
School buildings	486	
Water supply projects	746	(includes some very minor projects)
Health projects	31	

51. As primary community needs are satisfied, albeit at a basic level, and the funds allocated to the LDAs increase, it will be advisable to organize, control and monitor their activities more closely in order to reduce wastage that was perhaps inevitable during implementation of primary projects. The subsequent stages should be based on carefully thought out and better conceived and designed projects. These may include such activities as broadening the feeder roads, adding bridges and culverts, introducing retaining walls, and improving surfacing. In the case of water supply, projects could include a second well to guarantee permanence of supply, house connections and improved storage. In order to establish the above, some measure of central control will be necessary, probably guided by the CYDA.

1/ Source: Al Ta'awon, a co-operative movement in YAR .

52. The YAR Government and CYDA are jointly planning the preparation of a Rural Development Support Project to strengthen the operations of the LDAs by providing a channel for financing through the Co-operative Development Bank (CDB). At the time of writing this report, CYDA was considering appointing a project preparation team to prepare a proposal to be submitted for consideration by the World Bank. As the team would inevitably have limited experience in project preparation, the Government planned to recruit a suitable firm of consultants to assist in the preparation. The consultants should be required to prove themselves capable of engineering, supervising and administering the various levels of infrastructure required to serve the needs of the community. They should also be required to develop a portfolio of standard designs and specifications with bills of quantities for water and electric supply systems, drainage schemes, schools, clinics and service roads.

53. The LDAs, with Government, CYDA and CDB assistance, have greatly improved the living standards of rural communities, and if they are provided with access to appropriate levels of technology and long range financing, living conditions in the rural areas should improve. As a result, urban drift ought to be moderated if not halted. The Mission believes that a strategy of underpinning, but not undermining, the LDA structure is vital to the continuing stability and progressive development of the YAR.

C. Foreign Contractors and Joint Ventures

54. Foreign contractors only started to move into the YAR during the 1970s, and their operations are generally limited to the larger public sector projects. However, Chinese workers have sometimes undertaken minor works such as tile paving in the central network of roads in Sana'a. The Chinese have also undertaken the construction of houses and repair works for the private sector.

55. In view of the lack of reliable data on the resources and operations of private construction enterprises, the Mission conducted 52 interviews (see Annex 8) as follows:

5 international contractors
2 joint ventures
41 local contractors
4 manufacturers of building materials.

The responses may not themselves be entirely reliable, but it is believed that the overall picture is reasonably accurate.

56. Most of the foreign contractors working in the YAR operate on a project by project basis, and their operations are directed either from the head office in their home country or from a branch office elsewhere in the region. Projects are usually managed and supervised by expatriate personnel, and equipment and construction materials are often purchased directly by their head office abroad. Apart from the Chinese work forces, who have successfully employed labour-intensive techniques, most foreign contractors use modern construction techniques and sophisticated construction equipment, and rely heavily on imported building materials and components.

57. There are currently about 15 foreign contractors active in the YAR, mainly from Europe and the Middle East. However, Korean contractors have recently been successful in obtaining some major contracts including the completion of the large new Central Bank building in Sana'a. Although the quality and speed of construction achieved by foreign contractors is usually acceptable, it appears that bids are sometimes excessively high (even bearing in mind the high cost of labour and other resources in the YAR), and that insufficient attention is given to the transfer of skills to local people at all levels. Some companies retain local Yemeni agents, but these individuals are usually general merchants who lack technical expertise, and their managerial role is limited to contacting clients and seeking invitations to tender. Although some Yemeni citizens have obtained useful on-the-job training in craft skills and as plant operators, the Mission maintains that it would have been preferable that foreign contractors be required to make a more formal commitment to the transfer of skills as a contribution to a general apprenticeship scheme.

58. The activities and approach of the Chinese work forces differ markedly from those of the foreign companies, but they can also be viewed as "foreign contractors" since they are now bidding in competition with the private sector for general building, public housing, and public works contracts. They have been remarkably successful in competition, largely because their bids are low, they complete their work on schedule, and the quality is acceptable.

59. The People's Republic of China sent an initial work force to the YAR in the late 1950s to design and construct a road from Sana'a to Hodeidah. The rocky and sharply undulating terrain over which the road had to pass constituted a major challenge. The work was completed, using labour-intensive techniques, in 1962 and is still rightly admired as a remarkable engineering achievement. The Chinese have continued to contribute to the highway programme, including the major link from Sana'a to Sadah and a road from Amran to Haijah, which is now being extended to the coast road. As a result of their favourable record, the Chinese work forces are now being invited to bid for a variety of projects in competition with other foreign and local contractors.

60. The Chinese work forces appear to be highly motivated to complete projects on schedule and to acceptable quality standards. This is true in spite of the fact that they pay much lower wages to their nationals than the YR 70-80 per day demanded by Yemenis. However, it is clear that their bids do not realistically reflect their overall cost structure. Chinese work forces normally receive two salaries, one in the country where they actually work, and a second salary which is received by their families in China. They do not pay taxes nor contribute to social security benefits. Furthermore, they have very little time off. The Chinese work forces have no counterpart Yemeni nationals. This is unfortunate as the latter could gain much from the transfer of skills available within the Chinese work forces, which are undoubtedly of a high order.

61. The largest and most active joint venture construction business is Saeed Kalpataru, which was set up jointly in 1977 by an Indian construction company and a Yemeni entrepreneur and has already completed a number of university buildings, offices, factories and residential buildings. It should be understood that the joint ventures operating currently in the YAR, although they serve a purpose, are not of the conventional kind where two or more companies join forces, each contributing technology, equipment and financing. The predominant technical and managerial contribution is made by the foreign partner, while the Yemeni partner has the necessary funds and credit to qualify as a bidder on public and private sector projects. Thus the actual transfer of technology and managerial skills is limited.

62. There are few local contractors with sufficient financial, managerial and technical resources to compete currently with foreign contractors on large or technologically complex projects. These resources can only be improved and augmented gradually; therefore the alternative strategies available are: (1) to set up a national construction company to compete for large projects1/ or (2) to accept that there will be a continuing need to rely on foreign companies (hopefully diminishing as local firms increase their capacity), at the same time taking measures to encourage these firms to offer reasonable prices and contribute to the general national development. Since the idea of forming a national construction company has not been accepted by the Government, the Mission recommends measures to encourage better service from foreign firms by:

1. Diminishing contractual risks so that bidders will reduce the "risk factor" in their profit margins and offer keener prices. Measures could include clearer drawings and contract documents, reducing the number of alterations due to changes in requirements, expediting decisions on queries and variations, allowing price adjustments based upon an agreed index of construction costs, facilitating the issue of tax exemptions, visas and work permits and ensuring that contract payments against interim and final certificates are made promptly in accordance with the conditions of contract. It may be argued that these measures are unnecessary since the contractor always covers himself with excessive profit margins. On the other hand such profit margins often realistically reflect costs imposed artificially by cumbersome and unhelpful procedures. They could and would be reduced if the bidders were more confident.

2. Requiring that foreign contractors contribute directly to the development process through counterpart and apprenticeship training schemes. Joint ventures might also receive direct encouragement providing there were formal procedures for the transfer of technical, managerial and commercial skills.

D. Local Contractors

63. The YAR is a country with a rich and unique building heritage, which is reflected in the technical skills of local building contractors who specialize in traditional technologies using stone, burnt clay bricks, mud bricks and gypsum. Before 1962 these traditional technologies predominated, and local contractors enjoyed a monopoly in a steady but limited market. At that time there were no foreign contractors working in the YAR apart from the Chinese work force which was engaged in the construction of the Sana'a - Hodeidah road. During the succeeding 8 years of civil war, public sector construction activity was almost halted, except for a limited amount of school and hospital building in the main cities of Sana'a, Taiz and Hodeidah. The traditional builders experienced a diminution of demand, ran down their limited stocks of tools and equipment, and allowed their labour forces to become dispersed. They were thus ill-prepared to compete for the many new development projects that became available in the drive to modernize the country in the early 1970s after the civil war had been concluded. Financing came from a variety of sources, including the World Bank and UNDP and a number of Western and Arab countries.

1/ B. Kulkarni, The Yemen National Construction Company, Concept Paper (Ministry of Public Works, 1978).

64. With the rapid expansion of construction works - both in size and quantity - few Yemeni contractors could cope with the complexities and new building techniques that were demanded. They found themselves unable to complete work to a fixed cost within a limited contract period. Many projects fell seriously behind schedule and were withdrawn from local firms and re-awarded to foreign contractors. With the excess of development activity, little attention was given to the needs of local contractors, particularly in respect to upgrading their capacity and competitiveness. The Government therefore became understandably reluctant to award contracts (particularly for major projects) to local contractors, and many left the contracting industry to engage in more rewarding forms of commercial activity. There have been cases where prominent local contractors have been removed from major construction jobs and replaced by foreign companies. Those local contractors who managed to stay active have often either employed foreign experts to work for them or deliberately limited themselves to small and simple projects, which they can manage successfully.

65. One problem in particular is that many of the so-called skilled workers in the construction industry in the YAR perform below internationally accepted levels of quality and productivity. Plumbers, carpenters, electricians and plasterers are generally inadequate due to poor training. There are hundreds of small Yemeni contractors working in their villages on houses or buildings such as schools. Most of the prototype schools in the rural areas were in fact built by these local contractors. However at the present time there are few who can be relied upon to construct a major project on time and to acceptable standards.

66. There are some local companies that show considerable promise and would need only limited assistance to become, in due course, fully competitive with foreign contractors on all but the largest and most complex building projects. These firms are usually managed by an engineer or at least by a manager with substantial practical technical experience, and have a full range of equipment, experienced supervisors and skilled labour. Although there are a number of capable local building contractors, the picture in civil engineering, road construction and general public works is less happy. Even with outside assistance, a 5-10 year time scale would be realistic for the development of fully capable local firms in these more specialized and technically demanding areas.

67. Although there is no established system for the registration of contractors, some Government agencies have their own registration lists. The MPW for example has prepared a list of 55 local contractors (see Annex 9). The Project Implementation Unit/IDA Education Project under the MOE has also set up a system of classification for its own purposes based on the following criteria:

Table 8

Basis of Classification of Local Contractors by PIU/MOE

	Classification Base	First Class	Second Class	Third Class
1.	Volume of work (YR million)	20-50	5-20	less than 5
2.	Quality of work	good	acceptable	poor
3.	Completion	prompt	prompt	some delays
4.	Financial capability to finance work in progress from own resources for at least 3 months	fully capable	average	not usually possible

68. The Mission interviewed 41 local contractors (see Annex 8) in order to obtain a general picture of typical resources, capacities and problems. The annual workload of these contractors ranged from YR 2 million to YR 40 million, and the largest among them employed up to 1,000 people (mostly casual labour). The main difficulties perceived by these firms were as follows:

1. Bid documents prepared by the MPW and some aid agencies are not complete. Mechanical and electrical drawings and specifications are inadequate, and fully detailed bills of quantities are seldom available. In addition, the conditions of contract are frequently ambiguous and difficult to understand. Most bid documents are prepared in English, which creates a language problem. Also, time periods for studying the contract documents are often so short that the contractor is unable to prepare a fully detailed estimate.

2. Most of the materials used in construction are imported (varies from 65 per cent to 80 per cent not including prefabricated construction 1/), which creates additional difficulties for local firms in ordering and purchasing with adequate lead time. Handling and clearance in the ports is a further source of delay and difficulty. Custom duties for imported building materials are high, ranging from 30 per cent to 70 per cent. These bear particularly heavily on the local contractors, who are unable to demand remittance of tax on the contracts they undertake.

3. Transportation between the port of Hodiedah and other cities is very costly. For example, hire of a 6-ton truck from Hodiedah to Sana'a costs almost YR 2,000. This can and does lead to enormous cost increases, stemming directly from transportation expenses. In 1976 the PIU/MOE estimated cost additions of 10 per cent for transport from Hodeidah to Sana'a and 120 per cent additional for goods transported from Hodeidah to Beida. New and better roads will, of course, eventually lead to somewhat lower costs at the final destination.

4. The operational cost of vehicles, plant and equipment is high due to the mountainous terrain, high wage rates for mechanics, drivers and operators and delays in the delivery of spare parts. The wide range of suppliers from many different countries is a factor in the generally inadequate agency and service facilities.

5. Payments to contractors are often delayed for 2 to 4 months after they have been certified due to prolonged processing procedures in Government offices. Contractors' payment certificates are first checked by the supervising agency, but every certificate must also be examined and approved by the CPO and the Ministry of Finance before it can be honoured. These cumbersome procedures result in excessive calls upon a contractor's liquid reserves to fund work in progress and encourage contractors to restrict the commitment of resources to their sites, resulting eventually in delays to the construction schedule and additional overheads for the contractor.

1/ Source: PIU/MOE, based on comparative study of many projects under construction.

6. Commercial banks rarely offer full lending and guarantee facilities to local contractors, and letters of guarantee, performance bonds and loans have to be fully covered by liquid reserves in a bank account or with full collateral backed by land or property.

7. One of the most crucial problems facing local contractors is a lack of effective management skills, particularly in the areas of estimating, costing, programming and general contract administration. Many of the contractors interviewed expressed a readiness to take advantage of technical assistance for construction management training if this were made available.

8. Skilled manpower is in short supply at all levels, ranging from engineers to technicians to supervisors, foremen and craftsmen. Site supervision is often ineffective, so that work is of barely acceptable quality and productivity levels are poor. According to the PIU/MOE, transporting skilled labor from Sana'a to construction sites in Saada, Haja or Beida, can add about 30 per cent to the cost of labor.

9. Since clients (especially Government and aid agencies) are aware of the inexperience of Yemeni contractors and their low levels of supervisory skill and capital, they are understandably reluctant to award sizeable construction projects to them. This reluctance, coupled with the competition from foreign contractors, makes it very difficult for local firms to secure a stable workload and gain the experience they need to gradually improve their levels of performance.

69. There is an urgent need to improve the levels of efficiency and performance of local contr ors, not only to moderate the escalation in housing and infrastructure costs but also in view of the substantial proportionate share of costs attributable to construction activities in investment and development programmes affecting other sectors of the economy. In order to upgrade the capacity and standards of performance of local contractors, the Mission concludes that attention should be given to four main aspects:

1. Provision of a reasonably continuous workload, so that it becomes worthwhile for the contractor to invest in physical resources and build up his technical and managerial skills.

2. Financial assistance, at least to the extent of ensuring that the client makes payments promptly on certified work in accordance with the terms and conditions of the contract.

3. Deliberate risk reduction by simplified or less rigorous contract conditions, or by making available materials or specialised plant and equipment to the contractor so that he can devote more attention to the physical planning and organisation of work on the site.

4. Direct advice and assistance through training, possibly supplemented by an on-the-job advisory service on an extension basis.

E. Consultants

70. Most of the design and supervision work on major projects is carried out by foreign consultants who are registered with the CPO and selected on the basis of technical evaluation (sometimes restricted in the case of bilaterally-funded projects). Fees are discussed, and if within range then negotiations for contract are entered into. Some of these firms have permanent offices or representation in the YAR, but others only establish a presence when working on a particular project. There are a few Yemeni engineers and architects in private practice, but they mostly concentrate on simple building projects for private clients. The PIU/MOE and Technical Department of the Ministry of Public Works (see paras. 21-26) provide reasonable consultancy services to other government departments, but not on the fee-charging basis that would be necessary to fund a fully effective professional service. There is a definite need for an improved local source of technical consultancy expertise to assist the Government in planning and decision-making, and to regulate the activities of foreign consultants and ensure that their design and supervision procedures are fully appropriate to general strategies for national development as well as providing efficient solutions on individual projects. To this end, the Mission proposes that the Government should strengthen and develop the MPW Technical Section as an autonomous Yemen Consulting Bureau responsible directly to the Minister of Public Works. This bureau should also assume responsibility for registering, setting guidelines for, and supervising the work of foreign and local consultants.

71. The Government is aware that, in spite of the rise in the number of Yemeni graduate engineers and architects, the need for the services of foreign consultant firms and individuals will inevitably persist for some years to come. This, however, is no reason for neglecting to provide opportunities for local engineers to gain experience from such consultants so that they will be able, in turn, to make their own increasing contribution to the achievement of the nations's development objectives. A frequent regret expressed by UN and bilateral agency advisers has been the lack of enthusiasm or initiative shown on the part of their Yemeni counterparts. It would, however, be wrong to use this as an excuse for adopting a defeatist attitude. In the Mission's opinion, the Government should require its consultants to make a more conscious effort to provide positive work experience and training for local engineers and architects, so that the status and contribution of the profession becomes steadily more relevant to local needs.

F. Professional Associations

72. The organization of the engineering and allied technical professions is in its infancy in the YAR, and problems and constraints include:

1. The small number of graduate engineers (about 200 in the whole country).

2. The quality of training received in many cases is low, both due to weaknesses in their basic schooling in the YAR and the doubtful academic standards of some of the foreign universities attended.

3. There has been a general lack of appreciation of the services that engineers and architects can bring to the improvement of the traditional construction methods to ensure a more efficient use of available resources.

4. The urgent pressure to implement the relatively large and complex development projects demanded by both the public and private sectors has resulted in these projects being designed and executed by foreign consultants and contractors, thus limiting opportunities for training and improvement of Yemeni engineers.

5. The scarcity of Yemeni citizens with university education has caused some engineers to be appointed to managerial posts of a purely administrative nature. One finds that the specialised and wide-ranging skills of engineers and other technically-based professionals are often grossly undervalued in comparison with those of managers, administrators and graduates in various soft disciplines.

6. Lastly, but of major significance, is the disparity resulting from the relatively low salaries paid to national engineers as compared to expatriates and also the divergencies in salaries among the different state organizations.

73. After several abortive attempts, the Association of Yemeni Engineers (AYE) was formally instituted at the First Constitutional Congress held in Sana'a on 2 March 1980, during which an Executive Board was elected. The Basic Law of the AYE was then issued to regulate its activities. The objectives and duties of the AYE are included in Article 5 of the Basic Law reproduced hereunder, as translated from the original Arabic text:

"As a result of the rise in the number of Yemeni engineers in the Yemen Arab Republic, and the conviction of the important role that these engineers must play in the economic development field and the importance of ensuring their effective participation in overcoming the factors leading to underdevelopment, the Association aims at unifying the efforts of Yemeni engineers in order to carry out the following duties:

1. Effective participation in strengthening the foundations of an independent and self-sufficient national economy through participation in the design and construction of various vital development projects, whether at the overall national, social and economic level, or within the scope of Local Development Associations. This shall be provided through the Association's specialised consulting and construction offices. The Association shall also organize lectures and conferences in various fields.

2. Work at providing the broadest facilities and conditions to allow the members to exercise their technical activities and provide them with social insurances (guarantees).

3. Effective participation in organizing productive and developmental activities and monitoring designs in order to adopt engineering specifications suitable to the conditions and characteristics of the country."

74. Conditions for membership in the Association are Yemeni citizenship and a B.Sc. or equivalent degree in engineering or a related profession, including architects and civil, mechanical, electrical, mining, chemical and other engineers to be specified in the By-Laws (not yet published), but with the exception of agricultural engineers. Provision has been made to accept honorary members of Yemeni citizenship as advisory consultants to facilitate and support the activities of the Association. These include senior civil servants who, although not holding a formal degree, have gained sufficient compensating practical engineering experience as a result of their official responsibilities.

75. By November 1980 the Executive Board had established an AYE office in Sana'a and invited all qualified engineers to apply for registration with the Association by submitting copies of their academic credentials. The Mission was informed that, by the end of November 1980, some 150 engineers had been registered, and it was expected that the number would rise to 200 by early 1981. Disaggregated membership figures by the various disciplines were not available, although the number of civil engineers and architects in the country qualified for membership was estimated to be about 50. The establishment of the Association is a positive step towards organizing the profession and providing a forum for its members. The Mission was impressed by the serious approach of the elected officers and officials of the Association.

76. The Mission has identified the AYE as an institution which should be actively supported. There is an urgent need to provide local engineers with opportunities to gain organized, practical postgraduate experience and access to relevant data, information and expertise, so that they can gradually take on enhanced responsibilities and make a full contribution to national development. Thus, the Mission recommends that the Government should:

1. Consult AYE fully in the evaluation of degrees and professional credentials. The AYE should eventually develop into a corporate body with full jurisdiction over the granting of the title "graduate engineer" (Muhandes Mujaz).1/ Eventually the AYE should only offer full corporate membership to those who can demonstrate practical professional competence (through designs, calculations, an interview and examination) after, say, 3 - 5 years postgraduate experience.

2. Require foreign consultants and contractors to employ a minimum proportion of Yemeni engineers on an agreed counterpart basis.

3. Introduce more attractive salary scales, incentives and faster promotion for engineers in public service.

4. Gradually introduce a requirement for engineer's or architect's drawings in applications for building licences.

77. In view of the early stage of development of the AYE and the inevitable inexperience (and pressure from other duties) that limits the activities of its honorary officers, the Mission suggests that technical assistance should be sought by the Government on behalf of the AYE to:

1. Prepare and issue criteria and recommendations for postgraduate in-service training and a code of professional conduct.

2. Establish internal administrative rules and regulations.

3. Formulate a list of accredited educational institutions.

4. Assist in producing a programme of relevant professional activities including training courses, lectures, papers and perhaps a technical journal.

G. Evolution of Construction Costs

78. Construction costs have risen steeply in recent years.2/ No systematic and agreed record of building costs is available, although the PIU/MOE periodically issues analyses of costs of building materials and labour, the most recent having been published in October 1980 with cost escalation projections to 1983. In 1979 the MPW started to collect data with a view to issuing a "Builders Price Book" to assist in estimating and controlling costs.

1/ In Yemen, artisans such as car mechanics, master blacksmiths, plumbers and similar professionals are traditionally called "Muhandes", i.e. engineers.

2/ See Annex 10 for data on construction cost trend 1975-79 and typical labour and material cost increases.

The latest issue of this volume, dated May 1980, contains valuable information on basic rates for labor, plant and materials (see Annex 11), typical productivity levels (see Annex 12) and a schedule of typical rates for finished items of building work (see Annex 13). All of this information covers prices as at April 1979 and April 1980. Inevitably some of the data is speculative, since construction costs are highly sensitive to specifications, standards and inspection, all of which are highly variable in the YAR. A set of uniform standards and specifications, backed up by thorough quality control, is a prerequisite to the compilation of fully reliable cost data.

79. Another crucial factor is the imperfect operation of the market for construction materials in the YAR. For example, it is stated that the price range for certain construction materials at any given time can fluctuate by as much as 20 per cent, and wage rates vary according to the supply/demand situation as well.

80. Productivity data is based on observations, discussions with local contractors and a reconciliation of standard output figures with operating conditions in the YAR. The schedule of rates allows for a 30 per cent increment to cover materials, labour, plant and other direct expenditures.

81. Thus a very commendable and comprehensive, albeit tentative, start has been made in the analysis and recording of construction cost information, and the Mission recommends that the MPW should encourage the use of the "Builders Price Book", both by its contractors and within the MPW itself, as a basic document for cost comparison and cost control. This should lead to a publication of current unit cost figures on a regular basis.

The MPW Building Cost Index

82. Arising from its other work on building costs, the MPW has made initial calculations for the establishment of a "Building Cost Index", with weights assigned to major cost factors based on an analysis of a wide range of public sector building projects, specifications and costs over a five year period. The first annual calculation was as follows, showing an escalation in costs of over 30 per cent between April 1979 and April 1980:

Table 9

MPW Building Cost Index

(Base = April 1979)

No.	Item	Weight	Cost April '79 (YR)	Cost April '80 (YR)	Per Cent increase (decrease)	Weighted Percentage
(1)	(2)	(3)	(4)	(5)	(6) $\frac{(5)-(4)x100}{(4)}$	(7) (6) x (3)
1	Stone	0.12	650	1,300	100.00	12.00
2	Bricks/blocks	0.03	300	340	13.33	0.40
3	Aggregate	0.05	260	300	15.38	0.77
4	Sand	0.06	250	280	12.00	0.72
5	Cement	0.13	640	798	24.69	3.21
6	M. Steel rods	0.07	3,500	2,940	(16.00)	(1.12)
7	Timber	0.11	1,425	2,131	49.54	5.45
8	Tiles	0.01	180	240	33.33	0.33
9	Skilled labor	0.28	200	240	20.00	5.60
10	Unskilled labor	0.09	60	80	33.33	3.00
		0.95				30.36

83. According to NWSA, PIU/MOE, and MPW, the increase was about 23-25 per cent between April 1980 and April 1981.

H. Architectural Style

84. The rich style of architecture in the YAR is currently in transition, reflecting the introduction of new materials to supplement and modify traditional materials and methods. Hand-dressed stone is still the most common material on the plateau, but mechanical methods of quarrying and cutting are gradually being introduced because of the current high cost of labor. Traditionally, bricks are still made by hand, but mechanized brick factories using the latest automatic firing and handling equipment are beginning to offer competitive products. Reinforced concrete is now widely used as a structural frame, but it is often clad in stone to simulate the traditional style. Structural steel is hardly ever used, apart from certain workshops and commercial buildings.

85. In parts of Sana'a, Hodeidah and Taiz, the expanded use of concrete blocks, which are relatively cheap to produce, has effected a departure from the traditional Yemeni architectural style. The Mission believes that such departures should be discouraged. Before issuing building permits, the municipal authorities should ascertain minimum adherence to traditional architectural forms.

86. Some of the features of architectural design in the YAR are as follows:

Mass: Massive stone walls, usually about 50 cm thick, have the merit of heat insulation and storage. In the mountainous areas, the temperature drops sharply during the night, and the heat stored in the walls during the day is gradually radiated into the rooms. Thus massive wall construction offers an advantage over modern skeletal construction, namely a comfortable indoor climate during both day and night without any need for artifical heating or cooling. Even when reinforced concrete frame structures are employed, it is preferable to employ massive stone cladding to provide thermal insulation. The high initial cost of natural stone is often outweighed by a long-term saving of fuel and a comfortable living environment. Structural masonry walls are also highly durable and make effective use of local materials. The potential limit for structural masonry is about six storeys since higher structures require very thick walls at ground floor level. The top three storeys are often built of brick because it is light, relatively cheap, and does not detract from the general appearance.

Surface: The external surface of traditional buildings is flat, reflecting the structural nature of the wall and the lack of materials strong enough in tension to form cantilevers. Elevations often vary from floor to floor, because stone is used to give strength to walls in the lower storeys with several storeys of brick above. Windows are often large on the upper floors and may be surrounded with intricate plaster decorations. In contradistinction to the prevailing trend in Western architecture, purely decorative features are still very popular among both architects and clients in the YAR. Therefore,individual buildings vary and present more subtle and less rigidly geometrical outlines than are common in contemporary architecture elsewhere.

Volume: The overall form of the building enclosed by the external surfaces is seldom of the rectilinear "box type". The shapes of the sometimes large traditional buildings are usually broken down into more complex masses by juxtaposition of at least two separate rectilineal forms. Unless this technique is followed in designing modern buildings, the latter tend to dwarf the surrounding traditional structures. Another feature is the strong vertical emphasis in the massing of traditional buildings.

Symmetry: The most obvious feature of both traditional and modern Yemeni architecture is the use of arched openings rather than rectangular ones, leading to greater symmetry. These arched openings usually contain the characteristic carved gypsum "quamaria". The centre line of an arch is more clearly apparent than that of a rectangle, and this is frequently emphasized by bringing the surrounding decoration to a point at the apex. The symmetry may be extended to a series of openings by flanking a central one with a pair of similar openings.

General Townscape: A feature of the typical Yemeni townscape is the strong vertical emphasis, resulting from the preference for expansion of dwelling units by adding storeys rather than extending construction at ground level. As in most Arab countries, owners prefer to protect and define their plots with high solid screen walls. The older parts of Sana'a and other cities present a unique and highly attractive appearance, with richly ornamented stone and brick buildings usually of 6 to 8 storeys, with some as high as 10 storeys. In addition to height, another characteristic of Yemeni construction is the rectangular plan shape of the buildings and their clear-cut cubic form. This is caused by the lack of a central internal courtyard, and by the custom of extending buildings upwards. Thus, flat roofs are characteristic and dome roofs are usually seen only on mosques.

Since prior to the revolution Yemen was effectively cut off from the outside world, the country developed a particularly rich, characteristic and uniform building style. In the Mission's view, the preservation of this tradition and style, even when using new technology, is of prime importance. In keeping with tradition, vertical lines and large, massive rectangular architecture appear appropriate even today. Similarly the facings constructed of natural stone and burnt brick are still suitable. Window character (arched openings) can be retained in the design of new buildings. Traditional motifs and ornaments can also give architectural character to modern public buildings, although direct copies are neither necessary nor desirable. Large new buildings need not be obtrusive, and the Central Bank building is a good example of a new structure which provides an acceptable addition to the townscape of Sana'a. The Mission therefore recommends that committees be set up within the MPW or relevant local authorities to review proposed building designs in sensitive areas, in order to retain the distinctive character of the present townscape.

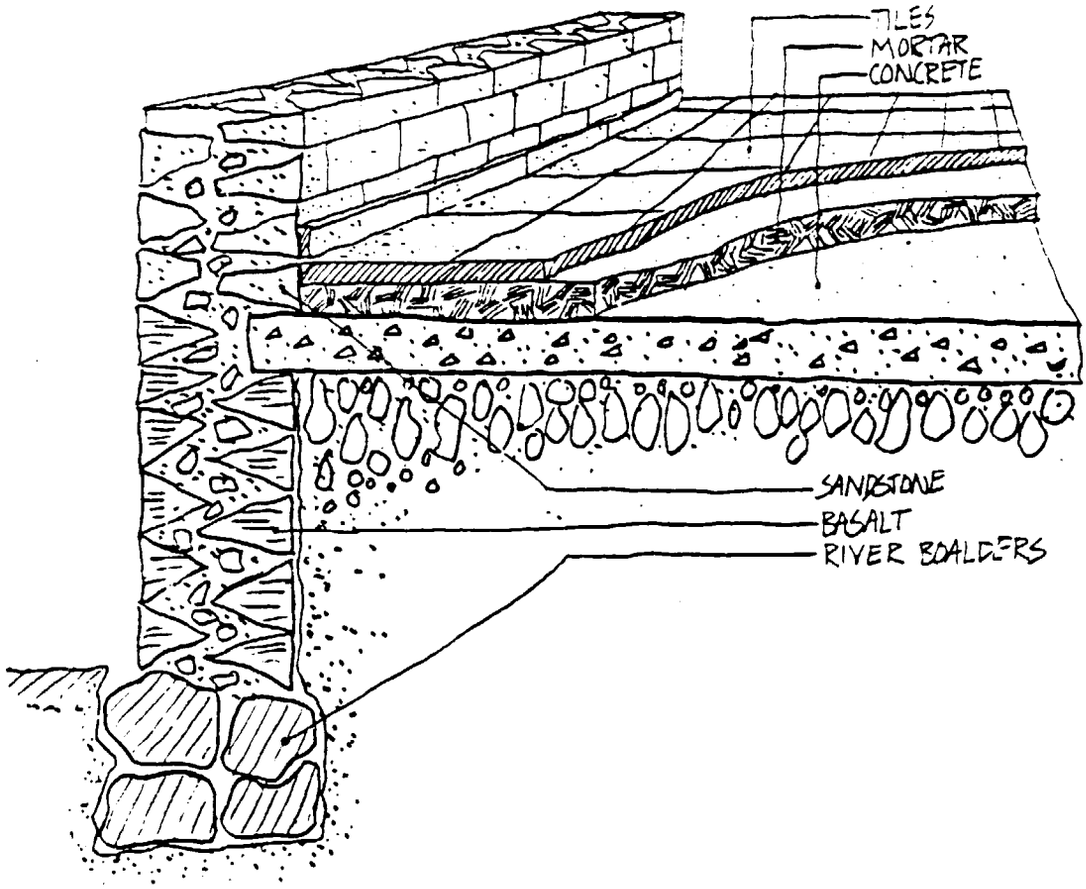
I. Building Design

Traditional and Contemporary Designs

87. The traditional and contemporary designs that are generally current in the YAR have the following main features:

Foundations: As the load-bearing capacity of local soil is, in general, good, the traditional foundation system based on basalt or river boulder footings and concrete floor slabs is considered to be appropriate and economical. However, foundations appear sometimes to be unnecessarily deep, and might be reduced if soil investigations were undertaken to determine bearing capacity. The following sketch shows a typical section of foundation, wall and ground floor:

Typical Section of Foundation, Wall and Ground Floor



Structural Systems: Traditionally, load-bearing walls are of natural stone or brick and attest to the high (but at present expensive) skills of Yemeni stone cutters and masons. These walls permit intermediate floors and roofs to span about 3 meters. Floors are usually of timber beams with transverse branches covered with mud and/or floor tiles. Newer buildings have reinforced concrete slab floors. Contemporary buildings in the Hodeidah area are commonly of reinforced concrete frame construction with hollow concrete block walls. Reinforced concrete is, however, of less reliable quality than stone. Cement and reinforced steel

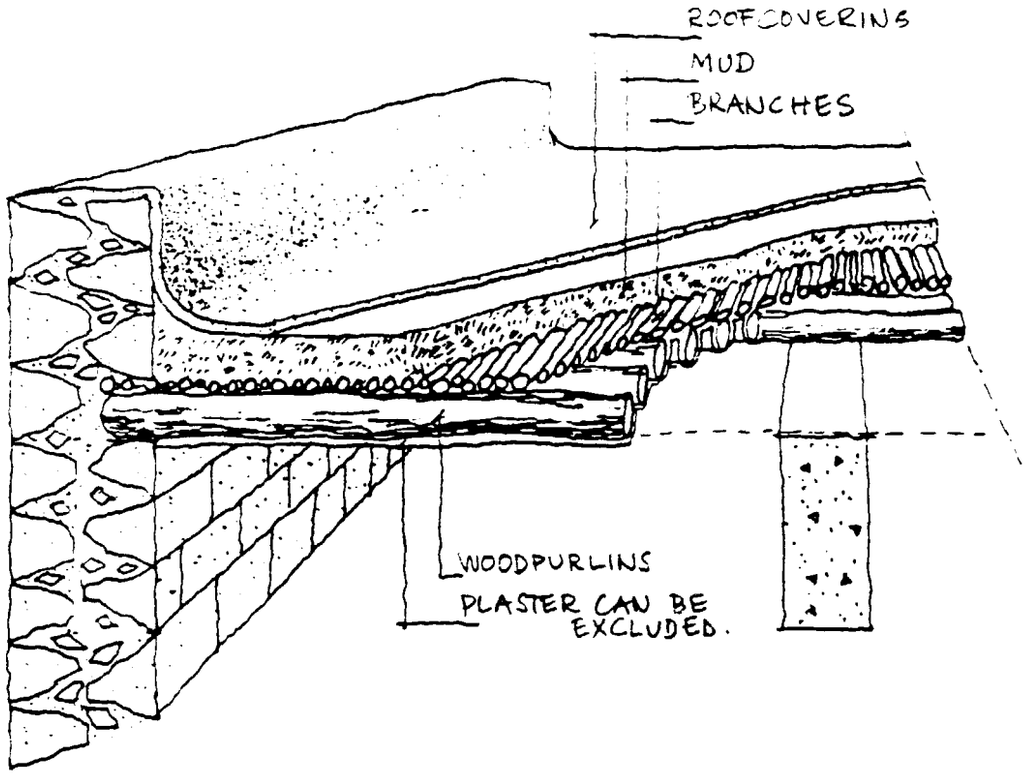
are mostly imported,and the execution is often of poor quality for such reasons as lack of training, poor shuttering timber, inferior aggregates, polluted water, inadequate compaction, and poorly maintained concrete mixers. Except on large projects, concrete quality is rarely inspected by a qualified technician or engineer, and facilities for concrete testing are not available.

Wall Finishes: Walls of natural stone or fairfaced brickwork do not need external finish and do not require maintenance. Walls of hollow block, on the other hand, are generally plastered and require regular maintenance. The internal face of stone walls is quite rough as the stones are generally uncut; it is normally finished with a thin layer of gypsum plaster which covers the irregularities. This surface requires maintenance and repair and a more resistant finish would be desirable.

Floors: Floors generally are covered with cement floor tiles. The tiles currently used are of rather poor quality and bad workmanship but could be improved with better production methods. They often give the appearance of being dirty even when new.

Roofs: Almost all buildings in the YAR have flat roofs. The traditional roof covering material is lime plaster, but modern buildings may use such materials as asphalt and terrazo tiles. Both new and traditional roofs have a tendency to leak, due to the lack of a waterproof membrane, insufficient slopes, bad workmanship and bad maintenance. Despite their need for regular maintenance the traditional heavy roofs provide good thermal conditions. They reflect 60 to 80 per cent of solar radiation if plastered with lime. In principle, the ideal roof for YAR would be a heavy, sloping, waterproof construction employing local materials, which suggests that dome and vault construction could be an alternative form. However, the dome and vault is contrary to tradition, which sees the flat roof used as a working area, and it does not allow for vertical expansion. The following sketch shows the traditional flat roof construction:

Typical Flat Roof Construction



Modern Design

88. Some modern techniques have already been introduced in the YAR. Examples are:

- University of Sana'a Housing for Professors - precast concrete panels
- University Student Boarding Accommodation - prefabricated elements
- Al-Hamdy Housing Project, Sana'a - concrete tunnel form system

There is potential for additional use of modern systems of construction, particularly in projects where time is of the essence, and the Mission finds that the following five systems could have merit in certain specialised applications:

- Cast in situ concrete
- Prefabricated systems using light elements
- Prefabricated panel systems
- Lightweight concrete systems, such as tong
- Tunnel form systems

89. A brief evaluation of the five approaches is given in the following table:

Table 10

Comparative Merits of Modern Designs

System	Investment cost	Production time	Level of Technology
Cast in situ concrete.	Comparatively low; mixing plant, mobile cranes, mixer trucks, (ca. US$ 1 million).	Prompt start up, but rate of production limited by plant capacity.	Well-understood, but requires skilled labour.
Prefabricated, using light elements.	Mixing plant, casting yard, mobile cranes, trucks. (ca. US$ 3 million).	Prompt start up and rapid production.	Relatively simple, but capital-intensive.
Prefabricated panels.	Specialised factory, lifting and transport equipment. (ca. US$ 6 million).	Start up 1 to 2 years after commencing factory construction.	Capital-intensive, both in production and erection.
Lightweight concrete (blocks and panels).	US$ 20 million ca. for factory producing 300 m^3 per day.	Start up about 2 years after commencing factory construction.	Capital-intensive, both in production and erection.
Tunnel form.	Comparatively low. Forms plus equipment for cast in situ construction (ca.US$ 1.5 million)	Very rapid if site management is competent.	Capital-intensive.

90. A specific evaluation based upon comparative cost estimates would have to be made in the case of any particular proposed project.

Climatic Design

91. One aspect of design which has been accorded insufficient attention in the YAR is that of the need to adapt designs, technologies and locations to suit local climatic conditions. With assistance from UNDP Project YEM/73/006, MPW has issued a document "Climatic Design in Yemen" (see Annex 14 for extract), which contains design recommendations for the four main climatic regions: the Tihama, Midlands, Highlands and Eastern Desert. The document also includes the Mahoney tables for the main cities and diagrams displaying the variations of the solar azimuth and altitude and charts with vertical angle tables according to the time of year and the latitude. If these guidelines are understood and followed by local architects, buildings will provide an increased degree of comfort for the occupants without the need for artificial heating or cooling. Any future building code should take full account of these practical recommendations for proper climatic design.

J. Construction Technologies

92. In the urban areas construction is often carried out using modern techniques. The relatively high wages and reduced productivity in recent years have led contractors to make extensive investments in labor-saving plant and machinery.

Quarries

93. The large quarries that produce 300 or more cubic metres of aggregate per day are equipped with modern plant such as track-mounted pneumatic drills, Caterpillar D-8 bulldozers and 977 loaders. This equipment is normally operated by Yemeni labor, although maintenance and repairs are sometimes the responsibility of expatriates. In the small quarries producing 50 cubic metres per day or less, the technology level depends upon the equipment available, but is generally more labor-intensive.

Excavation, Earth Movement and Trenching

94. The major construction companies in the YAR are well-supplied with the best available heavy equipment. Most of this is less than five years old and dates from the period 1974-75 when foreign contractors started to compete seriously for major projects. Some of the larger local contractors are prepared to hire out surplus plant when it is not needed on their own jobs. In the rural areas there is still considerable hand labor used for grading and drainage projects in the villages. When these projects are too extensive for the villagers to implement on a self-help basis, the local LDA is often able to obtain heavy equipment. In the public sector, the Highway Authority (which itself operates the Komatsu agency) is well-equipped for road construction, and is also able to supply equipment for local development projects. There is no substantial local assembly or parts manufacturing industry, and it is unlikely that there will be a sufficient market for this in the foreseeable future.

Reinforced Concrete

95. The major construction companies engaged in projects requiring a large volume of concrete generally erect on-site automatic batching plants and bulk cement silos. Concrete is transferred to the work-place by mixer truck, dumper or concrete pump. Most of these plants can produce fifty cubic metres or more of concrete per hour. The cement is delivered in 20-ton bulk transporters, thereby reducing the unit cost of cement by at least 10 per cent compared to the bagged product. These plants usually produce quality concrete of the bearing strength specified, and testing facilities are available on large projects.

96. There are also independent transit mix concrete companies in Sana'a and Hodeidah. These companies have large batching concrete plants and 5 to 7 m^3 mixer trucks for delivery to the client's site. In Sana'a this is a relatively new enterprise and has so far achieved only limited acceptability among the medium and small size contractors. The Sana'a Ready Mix Concrete Company is capable of mixing and delivering 500 m^3 of concrete per eight hour day, but to date has developed a market of only about 200 m^3 per day. In areas such as Sana'a where labor is in short supply and wages high, the attractions of ready-mix concrete are likely to lead to an increasing market penetration.

97. On smaller sites concrete is still mixed in 1/4 m^3 drum mixers with batching by volume. Quality concrete of specified strength can be produced by this method providing the operation is properly supervised. In some of the more remote areas, concrete is still mixed by hand. The development of the methods and procedures for the placing and compaction of concrete have progressed in step with the progress achieved in concrete production. The large companies engaged in the construction of high rise buildings employ tower cranes with skips for lifting and placing concrete or, if working on high-volume low-rise structures, hydraulic mobile cranes. The medium-size contractors generally confine their projects to 3 to 4 storey structures and hire mobile cranes for placing concrete and lifting of heavy loads. The small contractors are usually involved in residential or 1 to 2 storey commercial buildings and often have electric hoists for placing concrete and raising materials. In the rural areas, where structures are seldom more than one storey the concrete is usually placed by hand. Both large and small contractors generally have mechanical vibrators for compacting the placed concrete, and the quality of work is broadly acceptable.

98. All reinforcing steel is currently imported, although plans for a small rolling mill are under consideration in the YAR. Most of the structures designed by local engineers use the readily available mild steel. Many of the foreign engineered projects are designed for high tensile steel, which is justified providing quality control procedures are adequate. As an illustration of potential savings, approximately 40 per cent less high tensile steel is required to obtain the same structural capacity as concrete reinforced with mild steel, and reduced labor and shipping costs can also be offset against the higher unit cost.

Most contractors set up a reinforcement fabrication yard on the site, as there are no specialist steel stock-holders who will cut, bend, fabricate and deliver reinforcement cages. The bigger projects have electric or hydraulic cutters and benders which are essential for fabrication of tensile steel. On the smaller jobs using mild steel, cutting and bending is generally done manually using hand tools and simple equipment.

Stone and Brick Masonry and Plastering

99. Due to the shortage of skilled masons and generally low productivity, most major projects have eliminated stone as a load-bearing material, although it remains popular as a facing to reinforced concrete frame structures. On a few of the new projects there is a limited amount of brick used for architectural effect. The exterior walls of high income housing are usually constructed in stone masonry, and this work is executed with great skill by local masons. The architectural appearance of the houses is most appealing, but the cost of labor and material is high and only well-to-do clients can afford mass stone masonry. Thus projects which would appreciably reduce the cost of stone cutting and preparation would be generally welcomed.[1/] On major projects plastering is occasionally sub-contracted to local firms. Some of the local plasterers are highly skilled, but their levels of productivity are generally low and there would be advantages in vocational training and apprenticeship programmes aimed at improving both the skill and the tempo of this work.

Mechanical and Electrical Installations

100. All complex mechanical and electrical equipment is imported. The advanced technology of installing and commissioning this equipment requires the services of qualified engineers and highly skilled technicians. Such skills cannot now be found in the YAR, and expatriate technicians must be employed. Even after commissioning, expatriate advice is often required to set up operational and maintenance schedules. Obviously more effort is required to give on-the-job training to Yemeni nationals to take over these responsibilities. In medium and small jobs, the installations are less complex, and many components can be procured from local merchants, although only PVC conduit is currently manufactured in the YAR. A general contractor normally employs a specialized sub-contractor for the installation, and the latter is usually able to work with local designs and materials. Nevertheless, local contractors will require specialized training coupled with sound on-the-job experience (perhaps abroad) before they can compete effectively with foreign specialist firms on more advanced projects.

K. Materials Standards, Testing and Research

101. Until recently facilities for materials testing and research were limited to temporary site laboratories set up by consultants and/or contractors on large projects and to laboratories

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[1/] See page 57 for a mechanized stone quarrying and cutting project prepared and promoted by the World Bank/UNIDO Co-operative Programme.

at technical and trade schools. However, the MPW has now set up small, but well-equipped, building and highways laboratories in Sana'a, with a view to improving inspection and therefore quality standards on Government projects. Currently most buildings in the YAR are over-designed, but it is understandable that designers should use excessive factors of safety to cover uncertainty regarding eventual quality standards. If agreed standards can be introduced, backed up by strict supervision and thorough testing, it will be possible to achieve acceptable buildings designed to more modest factors of safety and thereby obtain significant savings in direct resource costs. The MPW laboratory could also eventually make a useful contribution by conducting basic practical research to upgrade and increase the utilisation of local materials and components. The testing service should be self-financing by charging realistic fees for the work performed on both public and private sector projects.

102. The need for a nationally-accepted system of standards for building materials is urgent, and is a prerequisite to the orderly and effective development of the local materials industry. The Mission therefore recommends that the Government should seek technical assistance to set up an autonomous Yemen Bureau of Construction Standards within the MPW to develop and publish codes and standards appropriate to local needs, and to inspect and monitor materials and components to ensure that they comply with specified standards. It should be noted that some valuable initial work on standards has been carried out by Mr. B. Kulkarni, UNDP Project Manager at the MPW.

L. Plant, Tools and Equipment

Plant and Heavy Equipment

103. Apart from a single enterprising local entrepreneur (with practical overseas experience in the American and British motor industries), who manufactures his own range of small stone cutting machinery and concrete mixers in Sana'a, all construction equipment is imported. Since it comes from a variety of sources in a wide range of countries, down-time and the cost of repairs and maintenance are serious problems. There are few reliable service agencies, and qualified mechanics are at a premium. Thus the operation and maintenance of plant, vehicles and equipment is a source of continuous difficulty and expense to contractors in the YAR. Ultimately these costs are reflected in higher bids and higher costs to the clients.

104. Foreign contractors rarely purchase plant on the local market but usually import their own equipment according to specialized needs. They usually operate their own maintenance facilities, and on completion the equipment is either re-exported or sold locally, in which case a proportion of the previously rebated import duty on Government contracts is charged to the contractor. Local contractors are less self-sufficient than are foreign contractors, but the larger firms seem to be reasonably well-equipped. Smaller contractors usually own their own transport vehicles, such as tippers and pick-ups, as well as concrete mixers and other lighter plant items.

105. One way to encourage the standardization of plant and equipment would be to restrict import licenses to companies with reliable service agencies and training programmes. Use of technologically complex equipment should be discouraged until trained technicians are available to cope with specialized demands.

106. A further policy option would be to encourage the growth of a plant hire industry and this could be done through direct financing and/or import duty rebates. Under this system contractors could hire plant with operators at reasonable daily, weekly or monthly rates. In the public sector, the Highways Authority already owns many items of heavy construction equipment, and some of these are available for hire by the private sector under certain conditions. This equipment fleet could form the nucleus of a heavy equipment plant pool for general hire, if the Government chose this path to encourage local contractors to participate more fully in public works contracting. However, it should be remembered that the efficient operation of a plant hire activity demands an agressive, and sometimes ruthless, entrepreneurial approach, and the Government may prefer to encourage the private sector to manage such an operation under general rules and guidelines designed to serve the national interest.

Small Hand Tools and Light Power Equipment

107. Foreign contractors understand the importance of importing appropriate small hand tools and power equipment, and they are permitted to do so duty-free on most Government contracts. High quality hand tools and simple manually-operated power equipment enable skilled and semi-skilled labor to achieve dramatic increases in unit productivity. Most of the joint venture contractors interviewed are also aware of the savings in both time and money that can be realized by limited investment in good quality hand and power tools.

108. Although most of this equipment is available in the local market, the price excludes most medium and small contractors. This partly reflects reaction to a highly fluctuating workload. It also reflects inexperience and failure to appreciate possible reduction in labor costs due to increased productivity. Thus local contractors often purchase poor quality tools on the basis of low purchase price, leading to low output levels and inferior workmanship.

109. Stone cutters, as an example, could benefit from the introduction of pneumatic hammers and high speed hand-held saws with carbide tip blades. It is quite likely that the introduction of this simple and comparatively inexpensive equipment could lead to a doubling of current levels of output per man day.

110. Possibly some small hand and power tools could be manufactured locally, providing they were sufficiently basic and rugged. With advice and assistance from the Industrial Bank of Yemen (IBY), a local entrepreneur is now assembling and marketing simple power equipment for stone cutting and small concrete mixers.

M. Financing, Bonds and Insurance

111. Most of the local contractors rely on personal and family funds to finance their activities. Commercial banks are generally reluctant to grant loan or overdraft facilities unless these are fully covered by collateral and/or firm financial guarantees. Up to 1975 the Yemen Bank for Reconstruction and Development provided loans, bonds and guarantees to local contractors comparatively freely. But subsequent experience of default and bad debts has since led to a much more cautious policy. Loans are available at interest rates of 13-17 per cent, but only if the borrower can provide acceptable collateral in the form of land, buildings or machinery. Guarantees are normally issued only against full cash backing. The larger and more professional local contractors carry full insurance coverage, but many of the smaller contractors prefer to carry their own risks.

112. The Mission did not find finance to be a particular problem for Yemeni contractors. Most seem to have access to liquidity or can raise capital by using land and property holdings as collateral. Therefore any scheme for providing finance to contractors is not a recommendation of the Mission at this time.

113. On the other hand contractors in the YAR are often confronted with serious cash flow problems due to unpredictable administrative delays in honouring certified payments on public sector projects. Without substantial working capital reserves, most contractors have great difficulty in coping with this problem. Therefore, a major recommendation of the Mission is that the Government revise the existing system in order to assure prompt settlement of payments. For this purpose a solution might be to set up a special Contractors' Settlement Bureau within the Yemen Bank for Reconstruction and Development or the Central Bank to be funded by project payments from the budget of the contracting ministry or authority. The complaint regarding progress payment was widespread among contractors that were interviewed by the Mission.

N. Repairs and Maintenance of Works

114. An aspect of the construction industry that has received insufficient attention is the need to make realistic provision for repairs and maintenance of construction and associated works. Maintenance is a problem in all developing countries, and the YAR is no exception. Plumbing and electrical installations are examples of the facilities that often break down. The need for funds for maintenance, either within the original project or in annual budgets, is too often overlooked or played down. Therefore, the Mission recommends that preventive maintenance schedules be formulated for all new projects, particularly those with a significant mechanical/ electrical component, along the lines of the maintenance procedures included in the Third World Bank Highway Project. Technical assistance should be given for developing repair and preventive maintenance schedules, and training in this subject should be stressed.

III. LEGAL AND ADMINISTRATIVE FRAMEWORK

A. General Legal Framework

115. The legal system which applies in the YAR is the Sharia, which is based on the Koran and its interpretation by religious leaders. While the Koran provides detailed rules covering the family and inheritance, the Sharia establishes principles which regulate business dealings and differ markedly from Western legal concepts. Two examples are the ban on usury, whereby interest on loans is prohibited, and the absence of any limited duration of legal responsibility. The Sharia is unchangeable and cannot be modified by legislation, but this statement is only valid insofar as it lays down specific provisions. Since this is not the case in the business field, new commercial laws and regulations can be created without conflicting with religious principles.

116. In general, six different legal forms of doing business can be distinguished:

- full commercial license with general registration or representative office for a variety of activities
- limited registration, valid for one specific contract or activity only (applicable to foreign contractors)
- joint venture between foreign and local partners
- a local branch or agency representing a foreign company
- a company set up under Yemeni law as a local legal entity
- informal unlicensed trading by Yemeni citizens operating small-scale businesses, usually as sole traders.

117. Although the first five forms of doing business are all available to foreign firms, the latter may enjoy certain advantages if there is some Yemeni participation in the enterprise. Even more advantages may be obtained if a limited liability company is formed with a local shareholding. The advantages include, apart from a limitation on the liability for equity funding of the company, tax exemptions and preferential treatment in bidding on certain internationally-funded contracts. It should be noted that a representative office may not directly contract for its own account, whereas a branch office may trade independently of the parent company.

B. Contract Legislation and Procedures

118. The diversity of public authorities involved in construction, sources of funds and nature of projects, as well as the lack of nationally-adopted conditions of contract, together with the wide variety of foreign consultants of different backgrounds, all have resulted in the application of a variety of tendering and contracting procedures and conditions. Although procedures may be similar in general approach (i.e. public tendering and award to the lowest bidder), they nevertheless constitute an unnecessary burden on the limited number of officials available to administer them. They are also a source of confusion and difficulty to contractors, and this is eventually reflected in higher bids and higher costs to the client. The closest approach to national conditions of contract and specifications are documents applied by the MPW to building works contracts (see Annex 15) and a separate set used by the PIU/MOE (see Annex 16). For projects open to international tender, where in most cases there is foreign co-financing, contract documents are generally prepared by foreign consultancy firms using internationally accepted standards, sometimes modified to reflect local conditions.

119. From a legal standpoint, the ruling language for all contracts is Arabic. However, most of the contracts prepared by foreign consultants are in English, and this is a source of considerable difficulty for many local contractors.

120. All government or other public sector-financed purchases, including construction services, supplies, equipment and consulting services, are subject to public tender in accordance with Law No. 3 of 1975. The law was revised in Leadership Council Decree No. 23, dated 1 February 1977, by the creation of a Supreme Purchasing Committee (SPC) to decide upon contracts exceeding YR 300,000 in value. (The decree, as translated from the Arabic original, is attached at Annex 17). According to this decree, public purchases are classified as follows:

1. Less than YR 10,000: For approval by a committee formed by the relevant Minister and headed by a Deputy Minister or officials of equivalent authority in the governorates.

2. From YR 10,000 to YR 300,000: For approval by a committee chaired by the relevant Minister or by an official authorized to act on his behalf.

3. Above YR 300,000: For approval by the committee in (2) above, subject to final decision by the Supreme Purchasing Committee.

Contracts exceeding YR 45 million are further scrutinized by a Development Committee (including the Deputy Prime Minister for Economic Affairs and the Ministers of Public Works, Communications, Development, and Economy) and are subject to approval by the Cabinet.

121. The SPC has issued a directive to all Ministries, Government authorities and Boards, outlining tendering and tender evaluation procedures to be followed in cases where the contract cost exceeds YR 300,000 (see Annex 18). These directives are normally followed, although certain exceptions occur in cases of urgency or where special national or regional considerations apply. In cases involving foreign aid funds, the provisions of the aid agreements are implemented in addition to the standard SPC procedures.

122. The SPC scrutinized the responses to 549 invitations to tender issued between May 1977 and August 1980, ranging from the printing of schoolbooks to the purchase of vehicles, equipment and machinery, and the majority (389) referred to construction as indicated in the following table of quarterly approvals:

Table 11

SPC Tender Approvals May 1977 - August 1980

Period		Total	Of Which Construction	Construction by Value (YR million)
1977	May-June (2 months)	11	9	
	July-Sept	19	12	
	Oct-Dec	12	5	not available
		42	26	
1978	Jan-March	42	21	
	April-June	40	25	
	July-Sept	24	15	
	Oct-Dec	43	26	
		149	87	
1979	Jan-March	84	50	255
	April-June	71	52	175
	July-Sept	32	31	120
	Oct-Dec	33	27	115
		220	160	665
1980	Jan-March	84	72	265
	April-June	39	32	115
	July-Aug (2 months)	15	12	50
		138	116	430
		549	389	

Source: SPC Secretariat

123. Thus the SPC has had to scrutinize a large number of tenders for a wide variety of purchases, many of which require a high level of technical expertise if they are to be effectively evaluated. Their problems in evaluating construction tenders are made more difficult by the conflicting provisions of the various contract conditions applied by different public sector clients.

124. In all government contracts or contracts with government authorities in the YAR, the laws of the YAR prevail. However, in internationally financed contracts there is usually provision for international arbitration. The same is true in the case of FIDIC (Federation Internationale des Ingenieurs-Conseils) contracts, which are sometimes used. All contracts are also subject to the contractor, as employer, performing in accordance with the labour law outlined in Section 3C below. Negotiated contracts are possible, although they are used only in exceptional cases. In general the regulations are binding on both partners; therefore no contradictory agreements may be entered into between the parties if the tender regulations contain specific provisions. In particular, no contractor can expect to be protected if a specific provision is deemed to be contrary to the national interest or to the principles of the Sharia.

125. Contractual payment conditions differ according to type of contract, most of which contain only limited provision for reimbursement of cost increases to the contractor. Although monthly progress payments are usually provided for, in practice payments may be delayed for months or, in exceptional cases, years. Interim certificates are normally issued according to monthly progress made, although payments are sometimes made on a percentage basis at various stages of completion. The main cause for delay stems from the required approval of various Ministries for every stage of payment. This is a frequent source difficulty, and many of the less well financed local contractors complain that a significant proportion of scarce managerial time must be diverted to ensuring that payments are processed within a reasonable period. Retention money is withheld from interim payments, and this normally amounts to 10 per cent of certified work value reduced to 5 per cent after a certificate of completion is issued. The balance is released at the end of the maintenance period, but may be released earlier if the contractor is able to offer a suitable compensating guarantee. The maintenance period is normally 12 months from the date the client takes delivery, but there has been a recent trend towards reducing the period to 6 months on building contracts. This is in response to complaints by contractors regarding the length of time required to secure final payment from clients. Specific tender regulations indicate whether a mobilization or other advance payment applies, but advances of up to 25 per cent are often allowed against a letter of guarantee.

126. In addition to the bid bond, which normally costs between 1 and 2 per cent of contract value, the contractor must provide a guarantee equal to the amount of any advance payment made and also a performance bond or performance guarantee which normally amounts to between 5 and 10 per cent of the contract value. Normally the guarantee must be provided by a bank doing business in the YAR; therefore a foreign contractor needs to secure a counter-guarantee from a bank in his own country. In general the wording of the guarantee is specified by the client, and the guarantee is payable on first demand. Reservations of any kind are rarely acceptable.

127. According to British law, penalties on the one hand have to be distinguished from liquidated damages on the other. In the case of penalties, the daily rate for damages provided for in the contract can be claimed by the client, whereas with liquidated damages the amount of the liability is limited to compensation for the amount of proven damages suffered by the client. The distinction between penalties and liquidated damages is therefore very important to both client and contractor. Unfortunately in most of the tender regulations neither the term penalty nor the term liquidated damages is used, and the nearest translation is "fine" or "delay fine". From the legal point of view, the meaning of the terms "fine" or "delay fine" is approximately the same as that of "penalty" in British law; therefore the amount of the "fine" is the daily rate provided for in the contract multiplied by the number of days by which completion has been delayed. There is no necessity for the client to prove that he has actually suffered consequent damages or loss.

128. Both contractors and clients would benefit from the availability of concise and clear contract documents issued under the law for application to all public sector contracts. The Mission therefore recommends the preparation of the following documents:

a. Tendering Regulations: These are the procedures to be followed in submitting bids for the purchase of supplies, equipment and consultancy services. They should specify, inter alia, the form and distribution of notices, minimum effective periods for preparation and submission of bids, bid security requirements, form and content of tenders, periods for which bids must be left open for acceptance, procedures for evaluation of bids and award of contracts, and authorities and methods for granting approvals and ratifications. Various procedures should be specified for different categories of contracts as regards amount and scope.

b. Conditions of Contract: These should set out the responsibilities of the client (first party) and the contractor (second party), i.e. terms of payment, commencement, completion and maintenance provisions, variations, extra work, price adjustments, and termination.

c. Technical Specifications: These should include standard specifications of materials used in construction, and separate specifications relating to construction techniques, methods of measurement, etc.

129. It is important that these documents be issued formally under a law stating clearly the extent of their application and the authority empowered to make amendments thereto. They should be published in both Arabic and English and made easily and freely available. Annexes should be issued for various standard forms to suit special needs. It should be noted that some useful preliminary work on these aspects has already been carried out by Mr. B. Kulkarni, UNDP Project Manager at the MPW.

C. Labour Laws, Safety Procedures and Accident Prevention

130. The first labour law in the YAR was issued in the form of a Presidential Decree (Law No. 5 of 15 October 1970) (see Annex 19). This Law states the employment rights of Yemeni workers including working hours, minimum wages and overtime payments, and also covers employment contracts and accrued compensation rights for employees reaching 60 years of age or having completed 15 years of service. Foreign labour may be employed only after receiving a permit from the Ministry of Social Affairs, Labour and Youth (MSALY). The Law also covers health and safety regulations, and requires every employer to take the necessary precautions to ensure the protection of his work force from engaging in dangerous practices and using faulty equipment and materials.

131. Health or accident insurance is not mandatory for those who employ less than 5 persons, but it may be arranged by the employer and recovered by a proportional deduction from the employee's wages. It should be noted that legislation for full national insurance is currently under study. If an employer engages more than 50 labourers, he must arrange for medical treatment to be available at least 3 days per week, and he should inform the labour office in the MSALY of the name of the doctor he has appointed and the details of the service. Table No. 1 of the Law covers rights to compensation for industrial accidents.

132. The Law also determines the means of settling industrial disputes, and provides for the right of groups of workers to associate in trade unions and syndicates. There is a syndicate for transport labour, and it is expected that other syndicates, including one for building workers, will be set up in the near future. The Mission suggests that encouragement be given to the formation of a syndicate for construction workers.

133. Although the Law specifies minimum wages and conditions of service for labourers, inspection and enforcement of its provisions are sporadic due to lack of staff. There are at present only 16 labour inspectors to cover all industries throughout the YAR. Their remit is confined to the private sector, and their responsibilities include the monitoring of:

- Minimum wage legislation
- Health insurance
- Safety procedures
- Protection of machinery
- Ventilation and atmospheric pollution
- Investigation of injuries and industrial accidents
- Supervision of training programmes
- Regulations for the provision of workers' housing

134. Any serious breaches of the Labour Law can be brought to the attention of the Labour Committee, which has the power of a court of law. The MSALY realizes the need for additional staffing, and aims to recruit a further 34 labour inspectors bringing the total to 50 by the end of 1981. The Mission supports the proposal to increase the number of labour inspectors because the Law, although generally adequate, is not correctly and properly enforced.

135. Foreign labour requires a work permit issued by the MSALY. Prior to obtaining a work permit, an expatriate must first secure a temporary residence permit and certification from his prospective employer that his skill is not available in the YAR. Temporary residence permits for an expatriate and his dependants are granted if the applicant fills a specific post for which no local candidate is available. A temporary residence permit is usually granted for a period of one year, but may be renewed annually providing a satisfactory case is made. Procedures for the granting of residence permits have been tightened in recent years. In the opinion of the Mission, the opposite should prevail, i.e. procedures should be relaxed because it is indisputable that the YAR needs foreign expertise for development at this time.

IV. DEMAND FOR BUILDINGS AND CIVIL WORKS

A. Initial Three Year Development Plan 1973/76

136. The initial Three Year Development Plan introduced in 1972 aimed at increasing the gross national product through development of agriculture, industry, traditional crafts and the construction of roads to connect the main urban areas, and at improving per capita income. It therefore focussed on strengthening the economic infrastructure, particularly roads, ports, communications and the physical basis for government administrative agencies. During this Plan period mean annual growth in the various economic sectors was as follows:

Table 12

Annual Growth in Various Sectors 1973-1976

Sector	Annual Percentage
Agriculture	5.0
Industry	8.6
Construction	5.5
Transport	8.0
Trade	10.4
Finance and Banking	35.4
Services	7.1

Source: Report on the Economic and Social Situation in the YAR, CPO, September 1980.

137. The comparatively low growth in the construction sector was perhaps surprising in view of the intention to focus on infrastructure development. Difficulties in implementation were attributed to:

1. Weakness of the basic structure of the economy;
2. Weakness of the local construction industry and its consequent inability to execute the development plans;
3. Lack of qualified and trained Yemeni labour;
4. Weakness of the administrative framework of the government agencies; and
5. Lack of financing within the country and resulting reliance on foreign sources.

B. First Five Year Development Plan 1976/81

138. The Three Year Plan 1973/76 had been effectively no more than a collection of individual projects, but the experience gained by the CPO during its implementation period was essential in the formulation of the First Five Year Plan. The CPO provided the global framework of the Plan and co-ordinated the sector programmes of individual ministries and other government agencies. The Plan envisaged a GDP growth at constant prices of 8.2 per cent per annum, with industry, transport and trade as the leading sectors. The investment targets of the Plan were particularly ambitious and envisaged an increase in gross fixed capital formation (GFCF) from YR 773 million in 1975/76 to YR 5,536 million in 1980/81, an annual growth rate equivalent to 48.3 per cent. The overall GFCF for the Plan period was expected to amount to a little under YR 16 billion, of which construction would account for 67.5 per cent or more than YR 10 billion, as shown in the following table.

Table 13

First Five Year Plan 1976/81

Expected Share of Construction in Gross Fixed Capital Formation [1/]

(YR millions at 1975/76 prices)

Sector	Civil Engineering Works		Buildings		Total Construction		Sector GFCF
	YR	%	YR	%	YR	%	YR
Agriculture	1,255	55	57	3	1,312	58	2,276
Industry	413	12	815	23	1,228	35	3,545
Construction			15	3	15	3	451
Commerce			379	60	379	60	628
Transport and Communications	4,440	89	10	1	4,450	90	4,925
Finance			15	16	15	16	93
Housing			2,085	100	2,085	100	2,090
Services	50	3	1,247	64	1,297	67	1,963
	6,158	38.6	4,623	28.9	10,781	67.5	15,971

Source: CPO, Five Year Plan 1976/81, p. 215.

139. Over 60 per cent of total investment was to be spent on projects related to infrastructure and other service sectors, reflecting the inadequacy of the YAR's physical infrastructure and the Government's desire to strengthen it. The largest share was allotted to transport and communications, mainly roads, representing 31 per cent of all investments and 41 per cent of the share of construction in GFCF. YR 2.1 billion were to be invested in housing and YR 2 billion in public buildings, such as schools, hospitals and offices. About one third of the total investment (YR 5.4 billion) was to be carried out by the Central Government, with further shares of rather less than a third by public and mixed enterprises (YR 4.9 billion) and the private sector (YR 4.5 billion), with the remaining YR 1.1 billion being carried out by co-operatives (including LDAs).

1/ In interpreting it should be kept in mind that the percentages may be unduly high as they may include items not usually considered as normal construction materials. This applies in particular in the case of the categories "Transport and Communications" and "Services". During the course of a 3 1/2 week field mission it was not possible to verify in Government records the factors included in each category.

140. Although precise figures are not available, it is clear that construction demand was well in excess of that expected in the first year or so of the Plan, although there are indications that it has tailed off recently. The annual growth rates of GDP related to the construction sector in 1976/77, 1977/78 and 1978/79 were 61 per cent, 20 per cent and 10 per cent respectively, compared to a Plan target of 14 per cent per annum. GFCF at constant 1975/76 prices is estimated to have grown by about 87 per cent in 1976/77 and a further 14 per cent in 1977/78. The overall investment ratio was about 23 per cent of GNP in 1977/78. The bulk of investment was in fact undertaken by the private sector in the first two years of the Plan, with residential buildings accounting for over 40 per cent of GFCF, as shown in the following table.

Table 14

Gross Fixed Capital Formation

	1975/76	1976/77	1977/78	Annual Average Increase (%) Actual 76/77 - 77/78	Annual Average Increase (%) Plan Target 76/77 - 80/81
	(YR million, 1975/76 prices)				
Private Sector	519	1,142	1,208	53	30
Public Sector	254	305	444	32	70
Total GFCF	773	1,447	1,652	46	48
Housing	286	590	716	58	32
Transport	232	471	492	46	50
Industry	61	209	189	75	86
Agriculture	106	76	157	22	52
Other	88	101	98	6	-

Source: Yemen Arab Republic - Economic Memorandum, World Bank, Report Number 2856-YAR, October 23, 1980

141. It was inevitable that such an ambitious Plan would be difficult to implement effectively, and some of the specific problems experienced so far have been:

1. Lack of qualified local labour;
2. Weakness in the government administrative framework;
3. Inexperience within government agencies;
4. Lack of co-ordination between government agencies;
5. Lack of co-ordination between government and bilateral aid agencies;
6. Pronounced increase in the cost of building materials, labour and land, which were reflected in enhanced general implementation costs;
7. Lack of experienced Yemeni contractors able to execute the projects;
8. Difficulties in acquiring sites for the various projects; and
9. Lack of funds for financing development projects.

142. It is now recognized that a crucial constraint has been the lack of organized and reliable contracting firms, capable of executing these ambitious development plans. The absence of experienced management and lack of finance, equipment, material resources and technical manpower has resulted in fragmented and unstable firms. The Government has consequently experienced great difficulty in obtaining reasonable prices for its development works. Projects have often been delayed, and the quality of work has been below the accepted standard. Foreign contractors are understandably not interested in the smaller projects (i.e. less than YR 10 to 15 million); therefore the Government has had no choice but to rely on local contractors for the execution of many of its smaller but crucial projects. The Government relies entirely on foreign contractors for the execution of major and specialized projects.

143. The Government recognizes that the present heavy reliance on foreign consulting firms and contractors is essential, but considers development of national capacity to be desirable, given the key importance of the building and construction sector. Consequently it is essential for the country to develop adequate national capacities for physical and regional planning, engineering and architectural consultancy, and construction. The absence as yet of an adequate national capacity for these purposes has, inter alia, produced a situation in which different consultants are following different standards and procedures in respect to the country's building and construction projects. There is a need to develop standardized contractual agreements and work procedures, uniform standards for construction, including the use of local materials, and standard building specifications. The necessary institutional capability in this respect will need to be built up in the Ministry of Public Works. The Five Year Plan in fact foresaw the establishment of a Centre for Engineering Studies and Designs and the formation of a National Contracting Company. The former proposal is effectively endorsed by the Mission in its suggestion for a Yemen Consulting Bureau. The latter proposal has been dropped in accordance with the Government's expressed desire to work with and through the private sector.

C. Second Five Year Development Plan 1981/86

144. At the time of the Mission detailed preparation of the Second Five Year Plan had not yet started and it was impossible to obtain even tentative official projections upon which forecasts of demand could be based. The only paper that was available 1/ outlined the possible scope of objectives for the Second Plan Period, but it must be emphasized that these are neither firm nor quantified and must therefore be treated with considerable reserve. These draft objectives are as follows:2/

1. Completion of the basic infrastructure. Despite the impressive development projects and efforts through the Three Year Development Plan and the First Five Year Development Plan, the YAR has only 2,000 km of asphalted roads in the main network of roads in the country and over 2,000 km of unpaved roads. The country needs to develop its ports, power, water supply, urban planning, airports, government administrative capabilities, education and training and communications.

1/ Report on the Economic and Social Situation in the YAR (CPO, 1980).

2/ Translated from the original Arabic.

2. Rural development projects shall be one of the main concerns of the Second Five Year Development Plan.

3. Concentration on production projects through active participation of all sectors and government incentives.

4. Discovery and utilization of natural resources.

5. Food security programme, through establishing agricultural policies based on relative assets of production and stable policies with countries on which the YAR relies for food products.

6. Completion of the developing of administrative capabilities through training programmes and incentives at the Central Government and Governorate levels.

7. Development of the taxation system. The YAR relies heavily on foreign sources to finance its development projects. A better taxation system has to be developed to increase the local fiscal resources available for this purpose.

D. Forecasts of Demand

145. The implementation of the Second Five Year Plan will place further heavy demands on the country's limited institutional capacities in the construction industry sector. Any forecast of the contribution of the construction industry sector to the Plan would be wholly speculative at this stage, but if the previous Plan is taken as an indicator, the annual contribution will be of the order of 5 to 6 per cent of GDP. In the absence of official projections the only approach to the quantification of demand available to the Mission is to make a very tentative calculation based upon projections made for the Government in connection with proposals to expand local cement production.1/ If cement consumption is taken as the indicator for demand (and it certainly is true that cement consumption in the YAR is rapidly increasing due to the present economic growth of the country), the relevant data are as follows:

Population growth: The projected population of the YAR is 6.64 million in 1986 and 9.01 million in 2000.

GDP growth: The First Five Year Plan was based on a GDP growth rate of 8.2 per cent, while the actual growth rate between 1969/70 and 1975/76 was 8.5 per cent. The corresponding figures for the construction sector were 14.4 per cent and 8 per cent respectively.

Cement demand: The consultants forecast annual growth rates in cement consumption of 11 per cent for the period 1978-86 and 4 per cent for the period 1986-2000 (equivalent to an average growth rate of about 6 per cent per year for the overall period 1978-2000).

146. In order to forecast the future likely levels of demand for construction of various kinds, it is necessary to accept a level of construction output in a given base year and then disaggregate the overall sector demand according to the main types of projects. This methodology is itself far from perfect, and the statistics available to the Mission cannot be accorded a high level of reliability. Thus the suggested forecasts should be treated with severe reservations, and are

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1/ Feasibility Study for a Cement Plant in the Yemen Arab Republic, Part 3 (BCEOM, 1978).

only presented by the Mission in the absence of more acceptable data and in the hope that they will provide a starting point for others who will be able to refine the information, assumptions and methodology as better statistics become available.

147. Using Table 14, the total GFCF for 1977/78 (the latest available figure) was YR 1,652 million 1/, of which YR 716 million related to housing. Thus GFCF (other than housing) was YR 936 million. In order to obtain an estimate of the proportion of this latter figure relating to construction, it is necessary to calculate a conversion factor. Suitable data for the calculation of such a factor are given in Table 13.

	Total Construction (YR million)	Sector GFCF (YR million)
Expected GFCF 1976/81	10,781	15,971
Less Housing	2,085	2,090
GFCF (other than housing)	8,696	13,881

Thus construction (other than housing) as a proportion of GFCF (other than housing) for the YAR represents:

$$\frac{8,696}{13,881} \times 100 = 62.6 \text{ per cent}$$

148. It should be noted that the conversion factor has been calculated to exclude housing in view of the special nature of the sector, the extreme difficulty in obtaining hard data on its performance (partly because so much of it is accounted for by the informal sector), and the remarkable growth it has enjoyed in the first three years of the Plan period. The construction shares stated in Table 13 should also be treated with reservation as some (e.g. agriculture - 58%, transport/communications - 90%) appear somewhat high. If this is the case, the conversion factor will also, of course, lead to an overestimate of the share of construction. Applying the calculated conversion factor to the figure for GFCF (other than housing) in 1977/78 we obtain:

Construction (other than housing) for 1977/78	= YR 936 million x 62.6%	= YR 586 million
Add Housing		YR 716 million
Total Construction Sector 1977/78		YR 1,302 million

149. An estimate of the shares of the various types of construction (other than housing) in the YAR is as follows:

1/ This and all succeeding figures in this section are in 1975/76 prices.

Table 15

Shares of Various Types of Construction in the YAR

	Type of construction	Approximate Percentage by Volume
1.	Offices, institutional buildings, laboratories and such works	28
2.	Schools, university buildings	16
3.	Factory buildings, industrial structures, storage, accommodation	14
4.	Hospitals, dispensaries, clinics and other facilities	9
5.	Airports and aviation works	7
6.	Other construction works including port development, irrigation schemes, highway construction	26
		100

Source: B. Kulkarni, The Yemen National Construction Company, Concept Paper (MPW, 1978).

150. Using these figures and combining 5. and 6. into a single category "public works" as 33% (an underestimate in the view of the Mission) and the forecast demand for cement, and making the (somewhat heroic) assumption that the demand for construction of all types will grow in line with forecast cement consumption, it is possible to produce very tentative projections of construction demand up to the year 1990. All forecasts are based on 1975/76 prices and take 1977/78 as a base year. The projections for 1978/79 and 1979/80 are followed by one for the latter half of 1980, and calendar year projections from thereon up to the year 1990 as per Table 16.

Table 16

Forecast of Construction Demand to 1990

(in YR million at 1975/76 prices)

Year	Housing	Construction (other than housing)					Sub-total	Total Construction
		Offices	Education	Industry	Health	Public Works		
1977/78	716	164	94	82	53	193	586	1,302
1978/79	795	182	104	91	59	214	650	1,445
1979/80	882	203	115	101	66	237	722	1,604
1980 (2nd half) (half year)	465	110	59	51	34	127	381	846
1981	1,033	244	131	113	75	282	845	1,878
1982	1,147	271	146	125	83	313	938	2,085
1983	1,273	301	162	139	92	347	1,041	2,314
1984	1,413	334	180	154	103	385	1,156	2,569
1985	1,569	370	200	171	114	428	1,283	2,852
1986	1,741	410	222	190	127	475	1,424	3,165
1987	1,810	428	230	197	132	494	1,481	3,291
1988	1,883	446	239	205	137	513	1,540	3,423
1989	1,958	464	249	213	142	534	1,602	3,560
1990	2,036	482	259	222	148	555	1,666	3,702

The forecasts are shown graphically in Annex 20.

V. BUILDING MATERIALS

A. Traditional and Modern Materials

151. The construction industry is currently suffering a mild recession compared to the busy 1975-79 period, so that most building materials are no longer in short supply. However, the heavy reliance on imports is a continuing problem as materials comprise 60 to 70 per cent of construction costs in the modern sector.

152. There are many proposals for increasing local production of basic materials, which if successfully implemented would provide for an increasing proportion of domestic requirements plus, in some cases, a surplus for export. The Government is urging the private sector to be a major investor in the expansion programmes. Most of the existing production plants are financed from local private sources, sometimes with foreign participation. The only major building materials industry in which the Government is involved is cement.

153. There are two distinct "building regions" having traditional building materials and methods. These are the interior mountain area and the Tihama plain along the Red Sea. Improvement in communications is however gradually reducing the differences. Cement blocks and reinforced concrete are becoming more widespread everywhere.

154. The traditional materials for the mountain area are natural stone, burnt clay bricks, mud bricks, timber and branches, and gypsum. Natural stone is used for foundations and exterior walls, and this is particularly important because of its excellent thermal insulation qualities in an area of temperature extremes between night and day. Burnt bricks are used for exterior walls. Mud bricks are used for interior walls and for internal lining of exterior walls. Timber is used for roofing, doors and window frames, while branches are used as filler material between timbers. Gypsum is used as plaster for walls, ceilings, and floors, as well as for decorative arches over windows and doors.

155. The traditional materials for the coastal region are burnt clay bricks and mud bricks, while natural stone, which is so commonly seen in other parts of the country, is generally missing.

156. Materials that have been introduced in recent times are hollow cement blocks for walls, reinforced concrete slabs to replace traditional roofing and flooring materials, reinforcing rods and structural steel,and terazzo and cement floor tiles. Steel and the better quality tiles are imported. Wood, once obtained from Yemen's now depleted forests, is mostly imported . The manufacture of doors and windows is done locally in small workshops. Notable examples of the usage of modern materials in the Sana'a area are:

Hamdi housing project - pre-cast concrete tunnels

Sana'a University housing - pre-cast concrete panels and imported steel structures

Ramada Hotel - imported steel structures and prefabricated panels.

B. Quarrying and Stone Cutting

157. Natural stone is extremely durable, and is used both as a load-bearing medium in buildings up to five stories and as a facing to reinforced concrete frame structures. Yemeni craftsmen are highly skilled in hand cutting and preparation of stones and in building with stone, so that stone-faced buildings are attractive and popular. In fact, these buildings account for the fame of Yemeni architecture. Quarries are dispersed throughout the country, and most are small or medium sized enterprises. The stones are usually roughed out at the quarries, finishing normally being done by hand at or near the building site.

158. The recent escalation in the cost of labour and thus in the cost of cutting and dressing the stone is reducing its usage and causing the introduction of substitute materials. The introduction of electric saws to cut the stone and thus reduce the labour factor has not met with unqualified success, because the resulting flat and even surface is far less attractive than a rough hewn surface.

159. Statistics on stone production and demand are sparse and often contradictory. It is generally believed that stone accounts for 50 per cent of the total demand for external wall materials, especially in the highlands. In the view of the Mission, the figures in the following table give a fair picture of the current market share.

Table 17

Demand for Building Stone 1980

	Built-up Area (square metres)	Total Requirements for External Wall Materials (metric tons) 1/	Estimated Market Share of Stone for External Walls (metric tons) 1/
Sana'a	500,000	350,000	120,000 (35%)
Hodeidah	290,000	200,000	20,000 (10%)
Total	790,000	550,000	140,000

1/ Expressed in terms of standard stone (dimensions 400 mm x 200 mm), it is estimated that one cubic metre equals 60 stones and weighs 2.5 tons.

Source: Appraisal of Industrial Opportunities in the Industrial Sector, CPO, May 1977.

160. The varieties of stone in common use are:

Basalt: A hard black stone used in foundation walls and footings.

Volcanic Stone: Black or grey lava, popular for decorative use in facades around windows, arches and corners.

Sandstone and Tuffite: Available in the highlands in a wide range of colours (yellow, red, green, grey), and used for load-bearing walls.

Limestone: A hard, heavy stone used mainly for foundations and infrequently for walls.

161. The usual shape of a cut stone block is cubical with sides roughly 20-25 cm long. The type and precision of cut varies widely from region to region according to the wealth of the inhabitants and the nature of the stone available. To reduce costs, it is common to limit the more precise and time consuming work to the main façade.

162. Stone floor tiles are produced in small workshops but are of variable and generally unsatisfactory quality. These products are traditional in the YAR and are produced in sizes varying from 40 cm square to 60 cm square. They are generally rough cut and uneven, with a thickness up to 25-30 cm at the centre. A recommendation is that simple mechanization of these production facilities could produce a more uniform and acceptable product which could be thinner and therefore less expensive to handle and distribute.

163. The Central Laboratory of the Ministry of Public Works has undertaken limited research on the relative suitability of local stones and has, in particular, identified certain types that lose a significant degree of strength when wet. The Mission recommends that this research be encouraged and that the standards for stone proposed by the MPW be published and generally adopted.

164. A major central mechanized project for the production of simulated hand-cut stone facing slabs is currently being investigated by the National Company for Industrial and Construction Materials (YEMROC), a state-owned enterprise, with the assistance of the World Bank/UNIDO Co-operative Programme (CP) for possible financing by international lending institutions. The project was identified by a CP mission that visited the YAR in 1979 to investigate possibilities for the local production of building materials. The project envisaged provides for a production capacity of 70 m^3 of stone strips and blocks per day at an investment cost of about US$ 17 million. The project would include some capacity to produce polished slabs for facings where limestone is the material used. The technical attributes of the project were developed by the Austrian University of Mining and Metallurgy under contract to the World Bank/ UNIDO Co-operative Programme in Vienna.[1/]

165. The main argument for this project is that it aims to produce an attractive, acceptable stone at reduced cost through the large-scale introduction of labour-saving techniques and equipment. While it is true that natural stone is in danger of being superseded by other materials as a result of disproportionate price inflation in recent years, the cost and market acceptability of the product that will result from this application of new production techniques still needs investigation. The possible site in the Sana'a area will also require an hydrogeological survey to ensure that a sufficient water source is available. A more general point affecting the attractiveness of a capital-intensive process is the possible surplus of unskilled labour in the mid-1980s, and this factor should be carefully investigated during the project appraisal.

166. Whether or not the proposed central mechanized project is implemented, the existing industry will continue to have an important role as a dispersed provider of materials and as a generator of relatively well-paid employment opportunities to a skilled, but highly specialized, group of individuals. The Mission therefore recommends

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1/ F. Schüssler, Study on a Stone Cutting Project (World Bank/UNIDO Co-operative Programme, Vienna, 1979) and E. Lechner and F. Schüssler, Preparation of a Feasibility Study on a Mechanized Stone Cutting Project (World Bank/UNIDO Co-operative Programme, Vienna, 1980).

that steps be taken to encourage limited mechanization of stone cutting among small and medium sized enterprises at the same time that the major project mentioned above is undergoing evaluation. The heavy demand for stone that is acceptable in appearance and reasonable in cost would support both ideas. Stone cutting and finishing could both be undertaken at smaller quarries using a compressor and pneumatic tools, thereby reducing unnecessary transportation and increasing rural employment opportunities. The softer tuffite could be finished with simple electrically-powered hand tools.

Marble

167. There are a number of known marble deposits in the YAR, and reserves are estimated to be relatively significant. However, domestic marble is not exploited, and the little that is used in special construction is imported, mainly from Italy. Speculation has existed for a very long time that Yemen's marble deposits could be profitably utilized for slab and terrazzo tile production, not only for the limited local market but also for export to Saudi Arabia, the Gulf states and other regional markets.

168. Given the state of scientific knowledge of the country's mineral resources, the best known marble deposit seems to be the one at Wadi Maksab at the gateway to the mountains between the port of Mokka and Taiz. At the request of the National Company for Industrial and Construction Materials (YEMROC) this deposit was investigated by the geologists employed by the World Bank/UNIDO Co-operative Programme in April 1979. Here the marble strata form the slopes of a deep, steep-sided valley and are about 250 metres thick. The predominantly light grey marble is shot through with basalt dikes and there are numerous faults. The extent to which the faults are superficial or run deep could not be determined by the team and, subsequent to the expedition, it was recommended to YEMROC that substantial digging be done to determine the subsurface condition of the marble and thus the possibility of winning large slabs. To the knowledge of the Mission members nothing but very superficial investigations have ever been done at this location. The Mission therefore recommends that more serious work be undertaken to establish the possible viability of a marble quarrying operation at Wadi Maksab.

169. At the same time the Co-operative Programme's 1979 field mission visited a marble outcrop at Shiban, some 30 km south east of Taiz. The deposit there is 80 metres thick over a length of about one kilometre, white in colour, and appears to be of better quality than that at Wadi Maksab. Reserves were estimated at 40 million tons by Russian geologists in 1964. A project for the production of terrazzo tiles from a quarry at Shiban was elaborated by the World Bank/UNIDO Co-operative Programme after the 1979 investigation. This project provides for the production of 350 m2 of terrazzo tiles per day at a total investment of YR 16.3 million (US$ 3.6 million equivalent).1/ Presumably the question of land ownership, which is a delicate and complex question in the YAR, has prevented YEMROC from taking serious interest in this project, although it would appear to merit consideration.

1/ F. Schüssler, Feasibility Study of Marble Production (World Bank/UNIDO Co-operative Programme, Vienna, 1979).

C. Mud as a Construction Material

170. Mud is perhaps the oldest material ever used by mankind for construction purposes. It was used by the ancient Egyptians and Assyrians in housing construction, and where it is still available its usage continues. It is probably the least expensive building material known and has excellent thermal qualities. However, the usage of mud as a construction material has decreased simply because it is outmoded and because the techniques for using it have been forgotten. People are no longer knowledgable about its good qualities and are even prejudiced against its use.

171. The ancient Egyptians were aware of the potential for mud and knowing its properties made expansion joints in the walls of their cities. The fortified city walls of Saada and Sana'a in the YAR used corrugated mud walls in order to allow for expansion and contraction. To protect mud walls, the ancient Egyptians faced them with stone blocks, for example the pyramid of Dahshour in Egypt. To create a bond within the mud walls, long pieces of timber or other materials of plant origin (palm branches, reeds and bamboo) were used. This material was put along the length of the wall and vertically at intervals to reinforce and to prevent cracks. Some examples are the walls of Karnak and some of the buildings of the new dynasties of ancient Egypt. The "Nubian vault" is an example of an ancient technique that has not been forgotten and which deserves attention in the YAR even though it is not among the traditional building forms (see Annex 22 for description).

172. There are many descriptions as to how the ancients went about making mud bricks. The fact is that the system of manufacture and the techniques of building with mud bricks have not changed in 5,000 years, and in some instances the system and techniques have deteriorated because modern generations are not aware of certain refinements that were introduced by the ancients. The manufacture of mud bricks is illustrated in the 18th dynasty Rakhmarah tomb in Egypt. A shallow basin is depicted where water is mixed with soil, made into a paste, and left in the basin to ferment. Blocks made from the paste were then laid on the ground in rows to dry. Wooden moulds in which the paste was formed into blocks have been found in the Al Lahoun area from the 12th dynasty of the Middle Kingdom.

173. As far as basic ingredients are concerned, first came the soil, in which the percentage of silt and sand varied according to the nature of the area. In some samples one finds materials of plant origin such as straw mixed with the soil and left in the paste for a couple of days to ferment. During this period, materials of plant origin produce an adhesive substance which helps create a mechanical bond between the soil and the plant material. In other instances dung was added to the soil to create the same effect, because dung contains elements of plant origin that produce a chemical reaction creating a stronger block. In other instances traces of bone were found. Possibly these were already in the soil from which the bricks were made, or they may have been purposely added to create a stronger block. In general, research on this subject has never been completed, and more attention should be given to it because this type of material could suit the needs of many developing nations. 1/

1/ The descriptions of ancient techniques are taken from Dr. Ing. Mohammed Hammad, Building Construction and Architecture, Cairo, 1964.

174. Mud used in its natural form requires extensive maintenance. Every year it is necessary to add a layer of mud plaster to the exterior surface where exposed to rain action. Much research has been done on development of this material to make it more resistant to rain, for example by adding cement or asphalt. When combined with a more durable material, or used with burnt bricks or stone as an exterior facade or as a filler for hollow cement blocks, it can be considered a suitable material for low cost housing. The important attributes to consider are that it is readily available and that it provides the desired thermal qualities in an area where temperature extremes exist.

175. The introduction of modern building techniques should not be reason to reject traditional materials such as mud bricks, which in many instances are found to be cheaper and more suitable for the environment. What is needed is more research into developing mud products in order to make them more durable, and in this respect the Mission recommends continued research into appropriate applications in the YAR along with some public relations work to convince the public that it can be an acceptable material.

176. Mud mixed with either cement or asphalt is more durable than mud in its simple state and requires far less maintenance. It is now used as interior wall lining in many residential buildings in the YAR. Usually it is plastered with gypsum. The PIU has used mud as a filler for hollow concrete blocks in school construction in the Tihama area because of its thermal qualities. Mud is not widely used in the Sana'a area because of the widespread usage of stone in that area. However, there is no reason why mud used in combination with hollow concrete blocks would not be suitable for the Sana'a area as well.

D. Fired Clay Building Materials

Burnt Clay Bricks and Hollow Blocks

177. At present there are three mechanized brick plants in production and another under construction. The four plants are located in the following towns: Sana'a, Al-Mansuriya, Haiz and Mabar. In addition to these mechanized plants, there are a substantial number of small-scale scattered artisanal producers (the annual production in the Sana'a area alone is estimated at 5 million bricks). The quality of the bricks manufactured by these small-scale plants is highly variable, but could be improved if practical advice and assistance were made available. Here the Mission definitely recommends that action be taken to provide technical assistance to artisan brick makers.

178. The production capacity of the four main mechanized plants is shown in the following table:

Table 18

Brick Manufacturers in the YAR

Company	Annual Production of Clay Products (metric tons)	or	Standard Bricks (million)
The Yemen Brick Manufacturing Co., Sana'a	25,000		8
The National Company for Red Brick and By-products, Al-Mansuriya	32,000		10
The Red Brick Factory, Haiz	32,000		10
The Al-Ansy Factory (proposed), Mabar	48,000		15

Source: Mission interviews

179. The Yemen Brick Manufacturing Company, Sana'a has Czechoslovakian equipment, which appears generally adequate, although it is likely to require considerable maintenance. The plant is presently suffering from serious quality control problems. The curing sheds and kilns are well engineered, but the bricks are very soft and develop multiple surface cracks. These bricks cannot be used in load-bearing walls. The problem appears to stem from the poor quality of the raw material, and it will be necessary to investigate whether a different mix (possibly more sand) could result in a more satisfactory product or whether material should be won from a more suitable source. A contributory factor could be unsatisfactory air drying due to the very dry climate in Sana'a.

180. The National Company for Red Brick and By-products, Al-Mansuriya has equipment of excellent quality imported from the Federal Republic of Germany. The curing sheds are fully enclosed with automatic fans which extract surplus heat from the kilns. The kilns are of advanced design including overhead firing. Loading and unloading of the kilns is completely mechanized. When this plant first went into production the bricks were of excellent quality and sufficiently strong to be used in load-bearing walls. However, due to inadequate materials research and testing at the feasibility study stage, the raw materials had to be brought in from more than 40 km. The plant later switched to a clay deposit closer to the site, but this material has not proved satisfactory inasmuch as bricks frequently develop surface cracks after firing. At this time the plant is planning to go back to the original source for the clay material. The plant has an integral diesel power generating plant and therefore should not suffer shut-downs due to electricity failure. When in full production it should be able to supply the requirements for a complete line of clay products to serve Hodeidah and the surrounding area.

181. The Red Brick Factory, Haiz has good quality Italian-manufactured equipment. The curing sheds are fully enclosed with automatic fan dryers. The kilns are overhead-fired and of very large capacity. The movement of the air dried products to the kilns is only semi-automated, and the pallets that are placed in the kilns have to be hand-loaded and moved by mechanical trucks, a procedure that slows down overall production. The pulverizing and mixing machinery is suitable for a great variety of products, and the production of clay pipe should be feasible. Currently the plant is producing bricks and hollow clay blocks.

182. The proposed Al-Ansy factory at Mabar has had machinery in storage for over a year awaiting a final decision on location. There remains a question as to the quality of the available raw material. The capacity of this proposed plant is 50 per cent greater than the Al-Mansuriya and Haiz factories.

183. The products manufactured at the two factories in the Tehama plain are likely to have an appreciable crushing strength and therefore potential as load-bearing walling products. They could also be used as facings without exterior plastering. This would necessitate additional attention to quality control, testing and sorting to ensure that the products meet an acceptable standard. If this could be achieved it is likely that an improved market penetration could be secured since the additional labour cost involved in laying bricks would be counterbalanced by the saving in plastering cost on concrete block walls and/or the cost of erecting a reinforced concrete frame. The problem is partly one of marketing, but also one of setting standards for load-bearing clay brick and block walls so that architects and engineers can be persuaded to incorporate such products in their designs. Insulation could be improved by incorporating urethane in the cavity between the facing brick outer skin and the concrete block inner skin. Proper attention to the setting of standards is obviously recommended by the Mission.

Clay Pipes and Roofing Tiles

184. Vitrified clay pipes could be a useful product for sewerage purposes in parts of the Tehama plain where concrete pipes are subject to deterioration from salt attack. However, vitrified pipes are comparatively fragile and therefore subject to breakage if transported over difficult roads or mishandled during the laying process. The Mission therefore does not recommend a centralized large-scale production plant. On the other hand, vitrified clay pipe could provide a useful diversification for the clay brick and block factories at Mansuriya and Haiz. Pipes could be manufactured up to 15 cm diameter for use in house sewer connections and as agricultural drains. Where the costs of transport are significant, clay pipe is unlikely to be competitive with the PVC pipes produced at the factory at Taiz. Clay pipes could also be usefully promoted as a village-scale industry for strictly local use.

185. Pitched roofs have not so far been incorporated in buildings in the YAR, and it is therefore doubtful that there would be a market for conventional clay roofing tiles. A further factor is that timber for trusses, purlins, etc. would have to be imported. However, it would be possible to improve the waterproofing of flat reinforced concrete roofs by laying flat tiles on top of a waterproof membrane. These tiles could later be removed if the owner wished to add a further storey or they could remain as floor tiles. A further possibility would be to manufacture shaped hollow tile blocks as infill between inverted reinforced concrete "T" beams. The Red Brick Factory, Haiz has already started pilot production of this product.

Ceramic Ware

186. All of the glazed wall and floor tiles now used in the YAR are imported; otherwise locally made cement tiles of generally poor quality are used as a substitute. If sanitary ware manufacture could be integrated with ceramic wall and floor tile production, overheads would be reduced and the overall operation rendered more competitive than it now appears to be. Siting is a crucial problem, but a recent geological survey suggests that a suitable clay is available in the coastal region between Al-Mansuriya and Hodeidah. This is an excellent location for general distribution, and there is also an abundant supply of water which is a major economic factor in tile production. In order to ensure market acceptability, a sufficient variety of patterns and styles would have to be made available to satisfy a full range of architectural specifications.

187. There exist a number of studies on the manufacture and marketing of ceramic clay products in the YAR. Some may be found in the files of the Industrial Bank of Yemen (IBY). Particularly noteworthy is a report and pre-feasibility study on the production of ceramic tiles prepared by the World Bank/UNIDO Co-operative Programme as part of a general survey of construction materials in early 1979.1/ This report recommends and the Mission endorses the idea to establish a plant to produce 150,000 square metres each of wall and floor tiles in the Tehama plain, although the exact location must be determined by thorough exploration for suitable clays. The total investment cost is estimated at about US$ 11.5 million. The report points out that recent technological developments have made it possible to reduce the labour content and to utilize a wider range of clays quality-wise for this industry. Both of these developments would be important in the implementation of such a project in the YAR.

E. Timber and Timber Products

188. The YAR has no remaining forest areas, and timber of acceptable quality is wholly imported. It is therefore not competitive as a structural medium and its use is generally confined to applications where substitution is difficult, such as doors, frames and shuttering for concrete. The woodworking industry in the YAR is presently based on numerous small workshops using imported sawn timber. A possible recommendation in this area would be factory production of standard wooden fitments to achieve savings in labour and materials. The high cost of timber joinery is a factor in the increasing popularity of aluminium window frames and metal furniture, and there is likely to be increasing scope for re-usable steel formwork systems in reinforced concrete production.

F. Gypsum

189. "Goss" is a soft white plaster consisting of calcined gypsum, and its traditional use is as a mortar in stone and brickwork walls in the mountain areas where rainfall is light to moderate. The material is also used internally as a plaster, sometimes carved for decoration or moulded to form a narrow shelf. The most characteristic use of the product is in the intricate perforated plaster carved screens or "quamaria". These screens are decorated with stained glass (or sometimes now coloured plastic) and are built-in above doors and windows. The plaster quamaria is surmounted by a protective semi-circular arch and continues to provide a distinctive and attractive feature in contemporary Yemeni architecture. Goss is occasionally used for decorative external plastering (and more frequently as a window surround) but it is unsatisfactory for this purpose as the surface requires annual renewal by the application of a whitewash to repair erosion by rain.

190. Gypsum is the raw material for producing "goss" and it is currently produced in small-scale operations of limited efficiency and under working conditions that are unhealthy and sometimes dangerous. These small-scale operations are mainly located around Sana'a and Taiz. Gypsum is also mined for use in the cement manufacturing plant at Bajil. Following extraction, the rock gypsum is trucked for calcination in crude clamp kilns approximately 2.5 m in diameter and 3 m deep with a basalt lining 60-70 cm thick. The flow of fuel oil from a barrel is controlled by a valve, and it is gravity-fed to a system of preheated parallel perforated tubes at the bottom of the gypsum bed. Calcination

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1/ Ian Knizek, Report on Fired Clay Building Materials (World Bank/UNIDO Co-operative Programme, Vienna, 1979).

time is 4-5 hours, and oil consumption is 200 litres for each 30-ton firing. Unfortunately, the firing is usually very uneven and only about 20 per cent of the material is burnt at temperatures ranging between 130° and 170° C, which is required for proper calcination. No attempt is made to select and segregate the properly calcined material, and the complete firing is mixed and ground between rotating millstones to produce the "goss", which is either sold "ex-works" or delivered to the client's site in the manufacturer's truck. Total current production for the small kilns in the Sana'a and Taiz areas is estimated to be of the order of 10,000 to 15,000 tons per annum, and an additional output of about 9,000 tons per annum takes place in the Al-Salif district to supply the Bajil cement factory.

191. Gypsum reserves of varying quality are believed to be around 20-25 million tons, although no systematic mapping of known deposits has been done. The reserves are favourably distributed, large reserves being located conveniently close to the regional centres of Sana'a, Taiz and Hodeidah (Al-Salif district). The best quality raw gypsum is found in three main deposits in the Al-Salif district 74 km from Hodeidah. A team of geologists from the Austrian University for Mining and Metallurgy, under contract to the World Bank/UNIDO Co-operative Programme, investigated the gypsum deposits at Al-Gheras and Al-Salif in April 1979 and outlined the basic steps required to improve and further develop the industry.1/ Mineralogical and chemical analyses of samples were carried out at the University.

192. Apart from its direct use in building, the general market for gypsum is likely to grow considerably since requirements for the cement plant at Bajil will increase in line with cement production and demand will also be created by the new cement plant at Amran. A further demand will stem from the agricultural sector and for paint manufacture.

193. There are two approaches that could be followed to increase overall output of gypsum and gypsum products, and both have been described by the Austrian geological team based on their April 1979 investigations.2/

i) Establishment of a new medium/large scale manufacturing unit using modern equipment and techniques;

ii) Improvement and upgrading of production methods of existing small-scale producers, including financial and technical advice on the introduction of small-scale manufacturing of gypsum products using appropriate technologies.

This is not a stark either/or choice since, even if a major unit is built, the smaller units have a degree of commercial flexibility which should be encouraged, as well as providing useful dispersed employment opportunities and contributing to meeting a full range of consumer choice in type, quality and price.

1/ W.J. Schmidt, Progress Report on Gypsum (World Bank/UNIDO Co-operative Programme, Vienna, 1979) and Final Report on Gypsum (World Bank/UNIDO Co-operative Programme. Vienna, 1980).

2/ W.J. Schmidt, op. cit.

i) Potential for Large-scale Manufacture

A pre-feasibility study would be required to precisely locate the most suitable site for gypsum mining (probably at Al-Salif) and determine the method of extraction, investigate the market potential for gypsum products of various kinds and decide upon a desirable level of output and capacity. One possible product for factory production would be prefabricated gypsum wall boards, ceiling boards and covings for offices, public buildings and residential properties. However, it is doubtful whether such a relatively fragile material would be accepted without considerable education and modification of current practices, and unacceptable wastage could occur due to damage in transit. Nevertheless, the Mission recommends that studies to promote this industry be carried out.

ii) Upgrading of Existing Production Techniques

There is a clear need to upgrade production techniques, productivity, safety procedures and quality control as well as to examine the potential market for finished gypsum products. The strategy to achieve change should be based on a mixture of encouragement and regulation. Regulation could be achieved by the introduction of a more formal system of licensing for gypsum extraction by the authorities, and this could be linked to appropriate safety regulations and the adoption by the licensee of approved extraction techniques. Much technical assistance to the existing small producers is required, including the demonstration of new types of equipment, and the Mission recommends that priority be given to this work.

G. Cement and Cement Based Products

Cement

194. Cement is the basic material used for modern construction in the YAR. It is mainly used in mortar and for structural elements of reinforced concrete, hollow blocks, floor tiles and various screen elements. The estimated cement consumption for 1980 was about 900,000 tons of which only 80,000 tons were locally produced at the plant at Bajil. The importation of cement results in a major foreign currency expenditure and in 1980 cost about YR 249.2 million (US$ 55.4 million equivalent).1/ The Government rightly places high priority on measures to increase local cement production and thereby reduce dependence on foreign supplies.

1/ 1980 price c.i.f. Hodeidah YR 305 per ton according to Ministry of Supply and Trade.

195. Bajil Cement Plant, a public sector enterprise, is the only cement plant currently operating in the YAR at a production level of 50,000 tons annually. The equipment is of USSR origin and has been in constant use since 1973. At present the plant management is encountering problems in producing cement that meets international standards. The Government is building an extension to the existing plant which would increase the capacity to 250,000 tons at a cost of YR 258 million (US$ 57.3 million equivalent). The extension is scheduled for completion by the end of 1982.

196. Amran Cement Project: Construction at a site 48 km north-west of Sana'a was started in November 1980 by IHI of Japan, and the plant is projected to start producing cement at the end of 1982. The production capacity is estimated to be 500,000 tons annually. The total cost will be in excess of the originally estimated YR 500 million (US$ 111.1 million equivalent). Consideration is being given to a later doubling of capacity to 1 million tons per annum.

197. Mafraq Cement Project: The CPO in 1978 employed the French firm of BCEOM (Bureau Central pour les Equipments d'Outre Mer) to undertake a feasibility study for a 500,000 tons annual capacity plant to be located west of Taiz. It is being considered for inclusion in the next five-year plan.

198. All cement plants in the YAR are public sector companies responsible to the Ministry of Economy, which also regulates cement imports. If the annual capacity of the Bajil plant is expanded to 250,000 tons, the Amran production increased to 1 million tons and the Mafraq plant built, the YAR could become a major supplier of cement in the region. Even if the proposed plant at Mafraq is not built, Bajil and Amran should have sufficient production capacity to meet all local demands.

Precast Concrete Products

199. The most readily-available precast products in the YAR are concrete blocks, most of which are produced in the standard size of 20 x 20 x 40 cm. There are large automated concrete block plants in Sana'a and Taiz producing blocks of adequate dimension and strength. However, they are operating at only 20 to 25 per cent of capacity due to fierce price competition from the many small entrepreneurs who have been attracted into the industry. Throughout the country there are numerous small yards with two to five workers producing from 300 to 600 standard blocks per day. The quality and bearing capacity of these blocks is uncontrolled and often inadequate for structural use. In many yards the casting moulds are badly worn, the vibrating and compaction equipment is inadequately maintained, the raw materials are of variable quality and often the cement content is reduced to save costs. Additionally, curing procedures are sometimes inadequate. As a result many of the blocks are unsuitable for installation in load-bearing walls.

200. On small and medium-size projects there are no inspection procedures to restrict the use of blocks of poor quality to non-structural applications. As with other building materials, there is an urgent need for nationally-agreed standards backed up by effective inspection procedures and these are strong recommendations of the Mission. If the blocks from the small yards were tested periodically and the forms and equipment checked, a uniform quality satisfactory for bearing walls could be assured. In general there are advantages in encouraging the small entrepreneurs to upgrade their production techniques, as they provide investment and employment opportunities as well as ensure a free market and so restrict the tendency to oligopoly control of prices.

201. In assessing the comparative merits of concrete blocks, a factor that should be considered is the consumption of water during mixing and curing. In Sana'a in particular the water table has dropped alarmingly in the last two years and any water intensive manufacturing process should be carefully reviewed. It is at least important that supplies to block manufacturers should be based on fully realistic price structures and properly metered, to ensure that the ultimate price structure reflects a fair comparison with natural stone and brick.

202. Assistance and advice could also be given on diversification into new product lines, such as precast concrete lintels and sills. Lintels and sills are currently either poured in place or precast on site. There would be a useful market for a series of standardized precast products if quality could be assured. Once facing bricks have been accepted for use in exterior walls of cavity construction, a market will develop for 10 x 20 x 40 cm concrete back-up blocks. These blocks could also be used for erection of interior partitions, providingthey are uniform in size and meet load bearing requirements. A further potential market would be precast stairway items (separate or combined rise and tread finished with mosaic) but full precast stairways would only be justified for mass production housing projects and are unlikely to be viable. There will also be a growing market for a wide range of somewhat more sophisticated precast products, providing always that quality standards are acceptable. There is currently some dispersed production of items such as paving slabs, kerbs, inspection chamber covers and even concrete pipes (not pressure pipes) but, due to the lack of a regular system of inspection or quality control, the products are highly variable. Other possible products are fencing posts, rails and balustrades, sanitary fittings and septic tanks. If hollow clay tile flooring/roofing is developed, there would be a potential market for precast 'T'-beams.

203. In view of the continuing large national programme of water and sewerage projects, there would appear to be potential for local concrete pressure pipe production. At the request of the Ministry of Municipalities and Housing, the World Bank/UNIDO Co-operative Programme in December 1980 conducted a survey of the market for pipe and other concrete products, which could support the setting up of a manufacturing plant. The resulting feasibility study for a concrete products plant[1/] provided the market data, capital costs, operating information and costs, and profitability projections for a 24,000 cubic metre (60,000 tons) per year plant. The proposed location is in the Sana'a

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1/ Yemen Arab Republic, Feasibility Study for a Concrete Products Plant (World Bank/UNIDO Co-operative Programme, Vienna, 1981).

area, which provides the main market for construction materials. The estimated capital cost is YR 40.5 million (US$ 9.0 million equivalent) at 1981 prices including working capital.

204. The project as presented proposed the manufacture of the following products:

	Tons per year
1. Small concrete pipes for sewerage (200-500 mm diameter)	4,800
2. Large reinforced concrete pipes (600-2,500 mm diameter)	28,800
3. Poles for electricity lines and lighting	7,200
4. Cable blocks	4,800
5. Pre-fabricated forms (slabs, kerbs, etc.)	14,400
Total	60,000

205. The projected average selling price is YR 542 per ton (US$ 120 equivalent). The financial discounted rate of return on the project over the initial 15 years operating period is 19.7 per cent. Return to the equity investor is estimated at 22 per cent after taxes. The economic rate of return of the project is difficult to quantify as most of these products, or of alternative materials, have not yet been introduced in the YAR. However, the construction programmes of the Government, its agencies and of the private sector will require large amounts of specialized concrete products, which the existing plants in the YAR are not equipped to produce, and which would be extremely expensive to import. The economic rate of return might therefore approach 19.7 per cent. The Mission endorses this project as one of certain benefit to the country.

Ready-Mix Concrete

206. There are at present two plants in Sana'a offering ready-mix concrete for general sale (including delivery to the client's site): Mohamed K. Own, and Abdel Madeq.

207. In addition, foreign contractors such as Sogex and Kharafi sometimes erect batching and ready-mix concrete facilities for their own use when undertaking large individual projects. A ready-mix concrete plant would appear to be a feasible project for Taiz, where the demand for building continues to be very strong (although the hilly terrain and narrow streets would inflate trucking costs).

208. In the Hodeidah area a number of foreign contractors have temporarily used ready-mix concrete on large individual projects, but no permanent facility has been erected. There would appear to be potential for a combined ready-mix concrete/precasting works at the Highways Authority yard at km 16 east of Hodeidah, which was originally set up by the USSR team which built the Hodeidah-Taiz highway.

Asbestos Cement

209. Asbestos cement sheet finds application in roofing for industrial construction and rural and low cost housing, where it can substitute for mud or tin. Asbestos cement pipes are used in water distribution and sewerage systems and are imported by the YAR for this purpose. Asbestos cement products are not manufactured in the YAR but are being imported in increasing amounts. Data from the Foreign Trade Department showed imports valued at YR 11.3 million (US$ 2.5 million equivalent) for the year 1977/78.

210. A project for the local production of asbestos cement sheets and pipes was proposed by the World Bank/UNIDO Co-operative Programme in the course of a survey of building materials in 1979.1/ This project provides for the annual production of 28,000 tons of sheet and 25,000 tons of pipe. The total cost of the investment including working capital is estimated at YR 120.7 million (US$ 26.8 million equivalent). The financial discounted rate of return on the project was estimated at 19.3 per cent. However, priority has not been attached to this project because of the necessity of importing the principal raw materials, namely asbestos fibres as well as cement.

Cement and Mosaic Floor Tiles

211. Plain cement tiles are currently used in low and middle income housing. The local product is of variable quality, but usually poor. These tiles are also used in roofing and street islands in Sana'a.

212. Local mosaic tile production is disorganised and dispersed, usually on a small-scale, and the tiles are generally of poor quality with the result that higher-quality imported tiles from China, Italy, Japan and Pakistan have dominated the market. The usual dimensions of tiles are 20 cm x 20 cm x 2.5 cm and marble chips and coloured cement are used. The local tiles do not take polish, their wearing quality is unsatisfactory and the compressive strength and dimensional tolerances are unacceptable to most customers. A further factor is that local tile producers do not produce special corner or skirting tiles.

213. The Mission recommends that the local tile factories be assisted to upgrade both production techniques and quality of product. Some of the specific factors that need attention are:

- Need to grade aggregate according to size of tile;
- Need to match chips, not merely rely on the use of coloured cement;
- Possible need to import special marble chips if suitable local items cannot be located to ensure high quality products;
- Need to manufacture special tiles to provide a full coordinated range;
- Need to grind flat after laying and polish to ensure even surface and provide dirt resistance;

1/ M. Osman, Pre-feasibility Study for an Asbestos Cement Products Project (World Bank/UNIDO Co-operative Programme, Vienna, 1979).

- Need to use a sealer and renew every 1 to 2 years (perhaps a suitable sealer could be manufactured at a local paint factory);
- The local cement factory should be encouraged to produce occasional batches of white cement (obtained by burning clinker differently with additional gypsum) which, although of lower strength, would produce more attractive tiles.

The Potential for Soil-Cement in Low-Cost Housing

214. Soil-cement blocks have potential for use in low-cost housing, particularly in rural areas (perhaps through an LDA project). A simple hand press, such as the CINVA-RAM, can produce blocks of acceptable quality for self-help type projects. There are reputed to be three plants in the Sana'a area utilizing CINVA-RAM hand presses. Their use could be spread to the villages through organized demonstration processes. The Mission suggests this be initiated, particularly in the Tehama, where soil cement could be used as a walling material for the characteristic thatched huts and houses. A generous roof overhang is advisable to protect this le. durable walling material.

H. Lime Industry

215. Lime is a constituent of mortar and when mixed with gypsum makes a limewash paint. It is a chemical additive in water treatment, in iron, steel and paper manufacturing, tanning and the sugar industry. In agriculture it is used to neutralize soil of high acidity.

216. Limestone is abundant in the YAR, and lime is readily available although the production methods are highly dispersed and very primitive. The manufacturing procedure for lime involves placing limestone blocks in a kiln and then burning by blowing liquid fuel oil from below. In the YAR this method leads to technical problems including:

- The limestone is not burnt uniformly;
- Some stones are overburnt; and
- Fuel is wasted due to lack of control and inefficient combustion.

Thus the quality of lime is generally inadequate, and lime is imported whenever quality is important. There would be considerable benefits to be gained from upgrading lime manufacture in the YAR.

217. There would be potential for two mechanized lime production projects, attached to the Bajil and Amran cement factories respectively. Each would employ a vertical kiln with a daily capacity of 50-80 tons (approximately 20,000 tons per annum). The former project would supply the Tihama area and the latter the region around Sana'a. In addition there would appear to be scope for providng limited advice and assistance to the present producers on an extension service basis, particularly in

areas where external road access is difficult. The Mission suggests that priority be attached to this type of technical assistance.

I. Sand and Aggregates

Sand

218. Although sand is abundant in the YAR, a considerable proportion of the resource is not of the quality required for use as an ingredient in concrete, mortar or plaster. For example, in the Sana'a area much of the sand has an excessive amount of silt and loam which is particularly detrimental to concrete quality. Some of the loam can be removed by vibration and sieving, but washing (a comparatively expensive process) is required for its complete elimination. The equipment to wash 500 to 600 cubic metres of sand per day would cost US$ 75,000 plus another US$ 15,000 for a water recycling plant. Since the design strength requirement for most of the concrete used currently in the YAR is of the order of 2,500 to 3,000 PSI, the quality and grading of sand has not been a serious problem as the strength could be brought up to an acceptable level by increasing the cement content. As the testing facilities at the MPW laboratory develop, all sand pits should be required to submit samples for testing and grading so that concrete and asphalt mixes can be properly designed. Any pit showing a continuing excess of detrimental ingredients should be restricted to the supply of sand for non-structural uses.

Crushed Rock

219. As-dug aggregates suitable for concrete works are available in the vicinity of Taiz, but elsewhere the main source of aggregates is by mechanical crushing of rocks found in the immediate vicinity. The Industrial Bank of Yemen (IBY) reports involvement (sometimes in loan financing but in other cases purely in the provision of technical advice) in 20 aggregate crushing projects in recent years. Quarry owners normally purchase modern crushing plants from firms such as W.H. Baxter (11 total in YAR), B.H.S., Parker or Caterpillar. There was over-investment in the industry at the end of the construction boom in 1978, resulting in over-capacity. However, there have been recent signs of rising demand, reflecting the commencement of several large projects.

220. In the rural areas there are many small (often portable) locally-owned and operated rock crushing operations, which should be encouraged to improve their production methods as they effectively serve the limited requirements of the local market. Many of these crushers are outmoded and badly worn, to the extent that the aggregate cannot be properly graded for more sophisticated uses. However, the product is quite satisfactory for use in typical rural building projects which do not require high-strength concrete. Much of the aggregate used in LDA projects is produced almost adjacent to the sites by portable plants capable of crushing approximately 25 to 30 cubic metres per day. Although the daily output of such plants is strictly limited, the operators often stockpile several days or weeks production, in order to supply the full project needs on LDA rural road projects.

221. The IBY already provides technical advice and limited loan finance to assist the smaller-scale aggregate producers and the UNDP small-scale project fund is available to underwrite this important activity. The Mission recommends that these efforts be further encouraged to boost rural employment opportunities and improve the availability of this basic building material.

Pumice and Perlite

222. The YAR has useful but unexploited reserves of pumice and perlite which could be used as light-weight aggregates in concrete production. They can also be used as insulating material in modern construction. The construction materials mission to the YAR organized by the World Bank/UNIDO Co-operative Programme in April 1979, found evidence of pumice and perlite in the vicinity of Djebel Issa near Dhamar, but the extent to which such volcanic rocks might be available in exploitable quantities is not yet known. Topographic and geologic mapping, sampling, laboratory analysis and drilling are all necessary and recommended in order to determine the feasibility of production of light-weight aggregates in this area.

J. Structural Steel and Reinforcing Rods

223. All structural steel is imported and is so expensive that it is rarely competitive as a building material, except in specialized commercial and industrial structures. The corrosive, salty atmosphere close by the Red Sea makes the use of untreated steel structures in the Tihama inadvisable.

224. In view of the growing popularity of reinforced concrete frame structures, there is a growing demand for reinforcing bars. Several studies have been made of the feasibility of setting up a steel rolling mill, most recently by the German firm Ofenbaugesellschaft Berg of Cologne. The suggested annual capacity would be 250,000 tons, which is much in excess of local needs. However, the proposed location is only 30 km from the new port of Mokka, so it is possible that any surplus production could be exported to other states in the region. The geological report identified ore of high quality, suitable for the manufacture of high tensile reinforcing rod.

K. Ironmongery and Fittings

225. Iron used to be smelted in Sa'ada, but this industry has disappeared and the YAR now depends on imported iron and steel. However, a proposal to build a steel rolling mill is currently under consideration. The traditional forging methods still survive, but locally-produced hinges, nails, latches, door handles and door knockers are increasingly being replaced by imported items. Action should be taken to upgrade the standards and production techniques of the more promising local producers before the traditional skills are lost.

226. Even if the proposed steel rolling mill is not built, the hardware market should be evaluated to determine the potential demand for items which could be produced in local factories from sheet metal stampings. If the products were of acceptable quality, a limited export market might also be secured. Initially, production would be limited to hinges, hasps, brackets, straps and other items which can be manufactured by stamping without major investment in specialized facilities. If the steel mill project is implemented and locally produced high-quality cold rolled sheet steel becomes available, production of metal cabinets, shelving and furniture would also be feasible.

L. Glass

227. Considerable interest in glass projects has been reported by foreign plant suppliers and investors and by local entrepreneurs. There are deposits of the principal raw material, silica sand, at several locations. An extensive occurrence at Saadah, in the northern part of the country bordering Saudi Arabia, was found to be suitable for glass manufacture and other industrial uses, but it is relatively inaccessible at the present time.

228. The significance of another deposit of glass sand, at Al Jirah (Thagban), near Sana'a was recognized by a World Bank/UNIDO Co-operative Programme mission during a survey of building materials in 1979. Samples of the sand were subsequently analysed by the University of Mining and Metallurgy at Leoben, Austria. They showed outstanding physical and chemical characteristics, with a high silica content and very small amounts of iron, heavy metals and other impurities. A glass-making trial in Germany confirmed the suitability of the sand for flint as well as coloured container glass and also for window glass. This sand deposit is located near a suitable factory site with access to a main road, power supply and underground water. The CP commissioned a more extensive survey of the deposit in May 1981 including topographic mapping and analysis of additional samples. The conclusion was that the deposit could support a bottle glass project of some 15,000 tons annually, but that there is not sufficient high quality sand to support a flat glass plant as well.1/

229. A consultant employed by the World Bank/UNIDO Co-operative Programme in July 1981 reported on the consumption of flat glass by the building industry in the YAR, which is of the order of 6,000 to 7,000 tons per year.2/ Production of sheet glass is more complex and capital intensive than bottle glass and is generally undertaken by large plants, such as the modern float glass units with a capacity of 150,000 tons or more of saleable glass per year.

1/ F. Schüssler, G. Hirner, A. Mayer and W. Pistora, Yemen Arab Republic, The Silica Sand Deposit at Thagban, Geological Survey and Analysis of Samples (World Bank/UNIDO Co-operative Programme, Vienna, 1981).

2/ L. Königson, Yemen Arab Republic, Feasibility Study for a Hollow Glass Manufacturing Project (World Bank/UNIDO Co-operative Programme, Vienna, 1981).

Under favourable conditions plants of 30,000 or even 15,000 tons per year may be viable, but the YAR is likely to take several years to reach this level. It is recommended that a further market survey be made in 1983 in order to review the timing for a viable flat glass project. Implementation of a glass container project, such as the one developed by the Co-operative Programme 1/, would in the meantime help to acquire expertise in glass technology which would aid the subsequent establishment of the more demanding flat glass operation.

M. Paint

230. Paint is produced in the YAR in only one plant at present. A particular problem facing paint manufacture in the YAR is the need to meet two distinct climatic conditions: the predominantly dry heat of the highlands and the salty, moist heat near the coast.

231. The National Paint and Chemicals Company has a modern plant at Taiz. Pilot production started in 1972, and by 1976 the firm was producing paint in accordance with international specifications. The single shift capacity of the existing plant is 120,000 gallons per month, and current production is 60,000 gallons per month which the owners believe to be about 60 per cent of the local market. The company employs a qualified paint technologist, has a small research and testing laboratory and has devised special paint to meet the exacting standards required for hospital use. The firm complains of unfair competition due to price under-cutting by retailers of inferior foreign paints, and has conducted comparative scrub tests, which show that their product is much more durable and better fitted for the severe climatic conditions that affect painted surfaces in the YAR. Once again the lack of a Government Bureau of Standards inhibits local manufacturers from gaining market recognition for a quality product. Partly to obtain access to a reputable and accepted trademark, the company recently concluded a licensing agreement with ICI to produce that company's well-known Dulux line of paints from January 1981. This required certain changes in equipment and manufacturing techniques, but ICI was generally impressed with the standards and expertise of the local company. ICI specialists will also advise on marketing and general management techniques and will appoint the YAR firm as import agent for specialised lines for which there is insufficient demand to justify local production.

232. A second, but smaller, paint factory in the Taiz area is reported to have concluded a licensing agreement with Crown paints, another UK-based company.

N. PVC and Other Plastic Products

233. The National Company for Sponge and Plastics Industry Limited, Taiz, produces high quality rigid PVC water and sewer pipe from 20 mm to 200 mm

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1/ L. Königson, op. cit.

diameter, together with a limited supply of the most popular fittings. The water pipes are produced to specification DIN 8062, and prices per standard length of six metres (as at November 1980) ranged from YR 14 for 20 mm OD (wall thickness 1.5 mm/pressure class 16 kg/cm^2) to YR 664 for 200 mm OD (wall thickness 9.6 mm/pressure class 10 kg/cm^2). The sewer pipes are to specification DIN 19534 and cost YR 120, YR 224 and YR 318 per standard length of six metres for the three outside diameters of 110 mm, 160 mm and 200 mm respectively. The pipes are available in 6 and 9 metre lengths with plain ends or one end expanded, and integral joints are available at extra cost. It should be noted that the prices quoted include delivery charges, and discounts are given on bulk purchases. The plant has advanced equipment, appears well-managed, produces products of high quality, and has already developed a small but growing export business. The company also produces electric conduit, and is actively considering other opportunities for diversification.

234. Fibreglass water storage and septic tanks are manufactured in Sana'a by Saeed Ralpa-Jaru Industries, Ltd., a YAR-Indian joint venture (see Annex 8, Interview 51). PVC ceiling tiles and plumbing fixtures are also being produced in Sana'a by YEFCO (see Annex 8, Interview 52), but production is only on a pilot basis,and the quality of the finished products is not yet acceptable.

O. Projects to Introduce New Building Materials

235. It is true that a greater variety of walling materials would be generally welcomed by architects in the YAR as widening the scope of design possibilities. The desire for increased variety of surface texture is indicated by the fact that facing bricks have been imported from the United Kingdom for certain specialized purposes. The Mission recommends that the authorities responsible for licensing new projects closely examine the following two.

Sand-Lime Bricks

236. The Government has received at least one proposal to erect a factory for sand-lime brick. A proposal to erect a plant to produce 9,600 m^3 of sand-lime bricks per annum (along with the manufacture of 33,000 tons of lime) was submitted to the Government by the Krupp Group and Generale Impianti together with a local sponsor in April 1979. The investment cost was estimated at YR 252.5 million (US$ 56.1 million equivalent). The project has not been implemented mainly because of doubts regarding the market for the product. On cost grounds it is unlikely that sand-lime bricks could compete with concrete blocks unless they are accepted for facing at a premium price.

Reconstituted Stone

237. A project to produce reconstituted stone was presented to the Government by Norcem International and a local sponsor about three years ago. The proposal is to produce standard reconstituted textured and coloured load bearing blocks based on natural coloured aggregate. A plant to produce 6.5 million blocks annually would have cost YR 33.8 million (US$ 7.5 million equivalent) in 1979. The claimed advantage of this product is 50 per cent reduction in the main frame of a house. The project has been delayed apparently because of uncertainties regarding the market.

P. Distribution of Building Materials

238. Important contributors to the high delivered cost of building materials are the cost of handling, warehousing, transport and delivery. By the time a given material has reached its final destination its cost may be double or triple the cif value in Hodeidah, the port of entry. In addition there is an understandable and, in the view of the Mission at least sometimes justified, view on the part of independent contractors that excessive profit margins are exacted by merchants taking advantage of restricted competition. Reliable disaggregated figures for the cost of distribution were not available, but it was clear that the high cost of buying and running trucks and other road vehicles in the mountainous terrain of the YAR is a major cost factor. Fuel and labour are particularly expensive. Most imported building materials are shipped to Hodeidah and then hauled in heavy trucks to Sana'a or Taiz for redistribution unless the ultimate destination is in the Tihama. The only return load that is normally available is roughcut stone from the quarries in the highlands, which makes only a marginal contribution to overall running costs. There are no railways in the YAR and the construction of a railway system would not be economically feasible in view of the mountainous terrain. Therefore road transport will continue to be the sole means of distribution.

239. Unless a local source of oil is located or the labour costs for drivers and mechanics declines, it is likely that the cost of truck operation will at least keep pace with the general level of inflation. Thus the cost of distribution from central plants should be fully taken into account in feasibility studies relating to new investment in building materials production. Where a choice of site is available, the inference should be that the mean distance between producer and user should be minimized, thereby reducing overall haulage costs. Where there is a choice between centralized and dispersed production using small-scale factories and basic technologies, the latter is to be preferred as it will ensure that many more potential users will have access to the products at reasonable cost.

Q. Recommendations regarding Building Materials

240. In summarizing the foregoing sections, there are many recommendations to make regarding the local production of building materials. In the YAR this field of activity is in its infancy, and given the mineral resources of the country there is much that can be done, both by the public and the private sectors. While small and medium scale operations in the private sector should b encouraged for such activities as gypsum production, rock crushing, and the making of concrete blocks, for example, there are other industries such as mechanized stone quarrying and cutting, marble production, diversified concrete products and the manufacture of ceramic tiles that would require substantial investments and possibly the participation of the public sector in joint ventures.

241. The National Company for Industrial and Construction Materials (YEMROC) was purportedly created by the Government to invest in building materials industries as well as to grant licenses for the exploitation of the YAR's mineral resources. (See Annex4). Whether or not YEMROC succeeds in implementing projects on its own is yet to be seen, but the mechanized stone quarry project supported by UNIDO and the World Bank will be a good test of YEMROC's intentions as well as its managerial capability. In any case the Mission recommends support for YEMROC as it grows into a viable public corporation with the goal of putting the country's mineral resources to productive use. Such support would probably take the form of technical and managerial assistance.

242. Information on the mineral resources of the YAR is scarce and incomplete. Geological surveys of the most important mineral deposits must be carried out in order to determine the quality and quantity of the material on which industries can be based. There have been a number of superficial investigations over the years, mostly financed by bilateral aid, but little effort has been made to coordinate this work and put it to practical use. General surveys have rarely been followed by detailed work. This would be a principal recommendation of the Mission. Other recommendations may be grouped as follows for consideration by the Government:

1. Encourage the establishment of standards including laboratory testing to provide for lower cost, better quality and greater safety in respect to all building materials.
2. Provide technical assistance to upgrade the current technologies for the production of lime, gypsum, burnt clay bricks, cement and mosaic tiles, and concrete blocks, and for the practical usage of mud and soil cement blocks as building materials.
3. Implement projects to lower the cost of natural stone and thus assure the continued usage of this fundamental and popular building material.
4. Base new industries on known deposits of marble, pumice, perlite, gypsum, and sand for glass production.
5. Introduce the manufacture of new products such as ceramic tiles, concrete pipes and poles, sand lime bricks and reconstituted stone where supported by thorough studies of the market and technical feasibility.
6. Encourage the usage of low cost materials for low cost housing, such as reinforced mud and soil cement blocks.

VI. MANPOWER, EDUCATION AND TRAINING

A. Labour Availability and Employment

243. According to the 1975 census, the resident population was around 5.2 million and the migrant population (both short and long term) 1.2 million. The total recorded potential labour force was around 1.4 million, of whom almost 20 per cent were working abroad. Of the remaining 1.1 million domestic workers, the bulk (90 per cent) were employed in the private sector, primarily on traditional activities.

Table 19

Summary of Labour Force Deployment (1975)
('000)

		Number	%
Domestic Employment		1,060	75
Public sector	31		2
Private sector	1,029		73
Modern	53		4
Traditional	976		69
Employment Abroad		263	19
Total Employment		1,323	94
Unemployed		80	6
Total Labour Force		1,403	100

Source: 1975 census

The majority of workers (78 per cent) were employed in agriculture, 12 per cent in trade and services, 5 per cent in construction, and the remaining 5 per cent in all other sectors combined.

244. Firm information on employment trends from 1975 onwards is not available, but an estimate based on trends in value added and productivity is as follows:

Table 20

Domestic Employment Trend 1975 - 1985
('000)

	Construction Employment	Total Employment	Construction As Per Cent of Total
1975	48.7	1,059.9	4.6
1980	148.6	1,331.3	11.2
1985	215.7	1,543.6	14.0

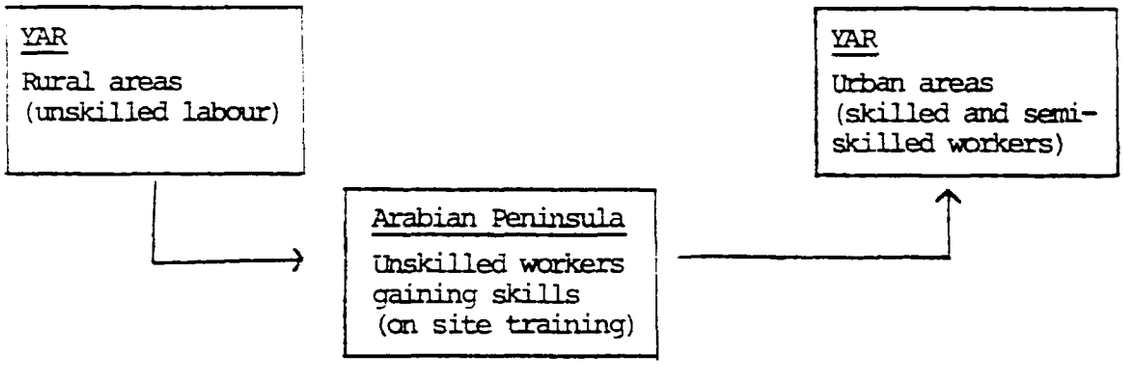
Source: Manpower Development in the Yemen Arab Republic (World Bank, 1980).

245. Thus the growth of construction industry employment appears to have been dramatic, both in terms of absolute numbers and as a proportion of total employment. This goes some way to explain the remarkable rises in wage levels and the tendency of contractors to seek to reduce the labour content in their operations by investing in mechanical plant and other labour saving equipment. Although manpower shortages in the construction industry affected both skilled and unskilled workers during the years of peak growth, the contractors interviewed by the Mission reported that there is now no problem in recruiting unskilled workers. The recent World Bank Manpower Mission (Manpower Development in YAR, World Bank report number 3181-YAR, October 1980) reached the same conclusion as a result of "fairly consistent responses from many agencies of the public and private sectors in Sana'a, Taiz, Hodeidah and locations along the road that, by and large, 'there is no problem in finding unskilled workers' ... If this impression is correct, then increases in wage levels should level off and would actually drop in real terms." The Manpower Mission, however, enters the caveat that "this is a difficult prediction to make in view of the linkage of the Yemeni labour market with those of surrounding countries."

246. Labour migration from the YAR to other parts of the Arabian peninsula has taken place over the past 25 years at least. However, in recent years the intense demand for labour in neighbouring oil producing countries has translated into highly attractive wages that caused large numbers of Yemenis to cross the border, primarily into Saudi Arabia but also to other parts of the peninsula. By 1975 Yemeni migrant workers accounted for almost 20 per cent of the total Yemeni work force and remitted an estimated YR 1.7 billion (US$ 375 million) to the Yemeni economy. These remittances increased dramatically to YR 6.5 billion (US$ 1.4 billion) in 1979.

247. Yemenis abroad may be divided into two broad categories: long term emigrants and short term migrants. Information about the first group is sparse, although it is known that they are scattered widely in Africa, Asia, Europe and America. Although some of these emigrants return either to augment the local labour force or to stimulate employment by investing in local industry, it is the second, and much larger, group of short term migrants that have a substantial effect on the manpower situation and on manpower planning in the YAR. They work primarily in the Arabian Peninsula and mostly in Saudi Arabia, and even their numbers are in dispute since the border between the YAR and Saudi Arabia is, to a large extent, effectively "open". "Unofficial" travel is easy and frequently goes unrecorded. It is generally believed that the greatest number of Yemeni migrant workers are of rural origin and unskilled. Many work on construction projects, and it is very likely that the number of Yemeni construction workers in neighbouring countries is in fact larger than the construction work force inside the YAR. Some of them intend to continue to work abroad, returning home only to visit their families and spend their accumulated savings. Others aim to obtain experience and skills and to reach a specific "savings target" before returning to settle in the YAR, perhaps working as skilled or semi-skilled construction workers and purchasing a house and consumer durables with their savings. A significant number put their skills and savings to use by starting small businesses, such as repair shops, workshops and small building firms. Thus many of the short term migrant workers are effectively subjecting themselves to a form of conversion process as indicated in the following diagram:

Movement of Migrant Yemeni Workers To and From the Arabian Peninsula



248. Future trends in migration are difficult to predict, making manpower planning for the construction sector hazardous. A further substantial rise in outward migration, accompanied by an internal construction boom, would result in a return to acute shortages of skilled labour and (less severe) shortages even of unskilled labour. At the other extreme, an unexpected change in priorities, policies or technology in the neighbouring countries, leading to a large number of returning workers coming suddenly onto the labour market, probably accompanied by a concomitant slump in construction demand, could result in serious and potentially disruptive unemployment. Fortunately neither of these extremes represents a likely scenario, and the Mission endorses the view of the Manpower Report that "barring unforeseen and sudden changes in the pace of development in Saudi Arabia and the Gulf, the demand for Yemeni labour in the peninsula is not likely to increase significantly." The Manpower Report forecasts continuing shortages of skilled workers at all levels, but a surplus of as many as 191,500 unskilled workers in 1985. If this latter forecast proves to be correct, the recent emphasis on investment in labour-saving equipment of all kinds requires re-examination. A more appropriate emphasis would be on kinds of investment that de-skill productive processes, coupled of course with a renewed emphasis on relevant education and training.

249. Information on employment of expatriate workers is scattered and incomplete, but the Manpower Mission calculated a total of 17,000 expatriates in 1979/80, of whom 10,000 were in the private sector and 6,000 and 1,000 in the public and mixed sectors respectively. The overall figure is probably an underestimate and does not include expatriate experts attached to technical assistance programmes of the various aid donors operating in the YAR. It is likely that at least 5,000 expatriates are employed in the construction industry, almost all with specialist managerial, technical or craft skills.

B. Education and Training

250. The repressive feudal rule that lasted until 1962 kept the country backward in all fields, but especially in education, where no facilities were available except the traditional religious "kuttab" schools. Little progress could be made during the protracted civil war period that lasted until 1970. Even now adult illiteracy is as high as 87 per cent and primary school enrollment only 26 per cent (1977 figures). According to the 1975 CPO Manpower Survey only about 20,000 out of the total resident labour force of 1.1 million had attended primary school. However, the progress of the education system over the past decade has been remarkable, and it now encompasses close to 4,000 schools in a 6:3:3 structure with a total enrollment (primary, preparatory and secondary) exceeding 360,000 students.

251. The University of Sana'a was established in 1970, and its five faculties currently have around 4,200 registered students. Both a faculty of engineering and of health sciences are being planned for the near future. In addition, a significant number of Yemenis study in neighbouring countries or seek higher education abroad either on scholarship or at their own expense.

252. The most serious problem facing the formal education system is the shortage of adequately trained teaching staff and administrators. For teachers, the system relies heavily on expatriates, mainly from Egypt, whose number has increased considerably in the past few years. On the other hand, the authorities have made some progress in training qualified Yemeni teachers. Despite these difficulties, the progress made so far is encouraging and education will undoubtedly remain one of the priority areas for the YAR in the next decade and beyond.

253. The formal training system includes technical secondary schools, teacher training institutes, vocational training centres, district training centres and literacy programmes. A further component consists of in-service training (training of employees by the employing authority to meet its needs for special technical and managerial skills) which is conducted through both out-of-country and in-country arrangements. In 1981 a further four vocational training centres will come into operation in addition to the existing centre at Sana'a, with an anticipated output of 140 skilled tradesmen from two-year day courses at Sana'a and about 300 from part-time evening courses at Sana'a, Taiz and Hodeidah. By 1982/83 the annual output is expected to reach about 800 in various craft courses, about half of which are allied to the construction industry. Although district training centres only commenced operations in 1979/80, over 3,000 people are already involved in a variety of programmes including literacy, craft and vocational topics. In addition, the MOE's own literacy programme had over 10,400 students in 1979/80.

254. On-the-job training has not been documented, although it makes a useful contribution in the more progressive of the productive enterprises. Too frequently, however, on-the-job training is not planned, organized or supervised specifically as a training activity, with the result that the training is over-specific and sporadic in its general contribution.

255. There is a limited amount of off-the-job training in centres set up to serve the needs of particular employers. The most relevant of these to the construction industry is the Vocational Training Centre (VTC) of the Highway Authority. This Centre was first established in Taiz in 1971 but only commenced operations in December 1974. In 1978 the HA took over the Centre directly as part of its new training division, financed under the Third IDA Highway Project. This training division is comprised of a central administrative unit, the VTC for classroom work, and training production units for mechanical and road maintenance work, all estimated to cost US$ 4.24 million for a three-year programme to train some 227 existing employees, 417 new employees and 13 Yemeni instructors. The training will include the occupations of road maintenance supervisors and foremen, equipment operators and drivers, petrol and diesel engine mechanics, machinists, welders, storekeepers and accountants.

256. The recommendations made in this area by the Mission are the following. Firstly the Mission supports proposals for a Faculty of Engineering at Sana'a University that would design courses related to the construction industry as it exists in the YAR. The Faculty could provide post-graduate training for returning Yemeni graduates from foreign universities to provide familiarity with local conditions and requirements.

257. Because the severe shortage of skilled personnel at all levels is likely to persist, the Mission would urge the Government to support the expansion and upgrading of technical training facilities. The Technical Secondary Schools at Sana'a and Taiz and the Vocational Training Centres at these and other locations should be continually improved. Vocational day release and evening courses should be made available at training centres throughout the country in order to upgrade the skills of Yemeni artisans. Specific courses should be arranged for plant operators and maintenance personnel. General apprenticeship and trade testing schemes for skilled construction personnel should be developed. Finally, the Government should award medium and large public sector contracts only to contractors operating an approved apprentice training programme.

VII. HOUSING AND URBAN INFRASTRUCTURE

258. Housing conditions in the YAR are generally satisfactory in comparison with many other developing countries, since traditional materials and workmanship are of good quality and space standards are acceptable. However, there are increasing signs of pressure in the urban areas, such as squatter settlements on the outskirts of the main cities. The provision of housing that can be afforded by the lower income groups is a serious problem facing the new Ministry of Municipalities and Housing.

259. Land prices, in Sana'a in particular, have risen substantially in recent years, and land for building is now barely affordable, without subsidy, by the lowest income group. The main source of land for new, low income development has so far been Government land in the hills east of the city, where the price is approximately YR 100 per square metre. The middle and higher income groups have mostly settled on the northern and western outskirts of Sana'a and are paying from YR 200 to YR 500 per square metre.

260. In Hodeidah it is particularly difficult for the lower income group to purchase land and register it so as to obtain a firm title. Even though most of the land enclosed within the city belongs to the Government, it is very difficult for individuals to secure undisputed tenure. In 1977 as many as 70 per cent of all households in Hodeidah were squatting on Government land. Many households obtain a certificate acknowledging temporary squatting rights, but they can be displaced by the Government at any time without compensation. This insecure tenure inevitably discourages investment in permanent construction, and is an increasingly significant factor in the growing slum problem in the Hodeidah area.

261. In Taiz and other cities, the informal land allocation process works more effectively, but registration procedures are cumbersome, expensive and sometimes ineffective. It is difficult to obtain undisputed title, which is necessary to secure loan financing for building.

A. Housing Construction Costs

262. Until very recently, the YAR building tradition provided an economical and owner-initiated means of matching housing supply to demand. However, the generally high rates of inflation in recent years have been reflected in dramatically increased building costs. From 1975 to 1980, the cost per square metre for traditional housing in the major cities rose from less than YR 1,000 to over YR 3,000. The cost of labour has risen by as much as 600 per cent in areas where there are large commercial and industrial construction projects. This, plus increased profit margins demanded by contractors to cover increased overheads (and to take advantage of the favourable supply/demand situation), and reduced productivity due to erratic supply of materials, has caused a rate of inflation in housing construction costs that, if anything, has outpaced the general inflation rate. 1/ Graphs illustrating the escalation are contained in Annex 10.

1/ Analysis and Escalation of Cost of Building Materials and Labor in the Yemen Arab Republic (PIU/MOE, updated annually).

B. Housing Materials and Technology

263. Traditional wall-bearing building bricks and natural stone are still used, and the technology is labour intensive. Reinforced concrete skeleton and concrete blocks are produced locally, the concrete blocks being used for both internal and external walls. In traditional houses, roofs and intermediate floors are supported by timber beams with wooden-branch cross supports and covered with mud. However, due to the severe shortage of local timber, reinforced concrete flat slab construction is becoming more common. Burnt clay bricks have always been manufactured in small kilns located throughout the country. In recent times large-scale production has started using modern technology, and bricks thus manufactured can constitute a load-bearing medium in middle income housing. The Government is rightly concerned to develop the local building materials industry as a means of increasing supplies and lowering construction costs. Whilst it is prepared to participate in joint ventures, it generally prefers that the private sector should take a leading role in investment and management of commercial enterprises.

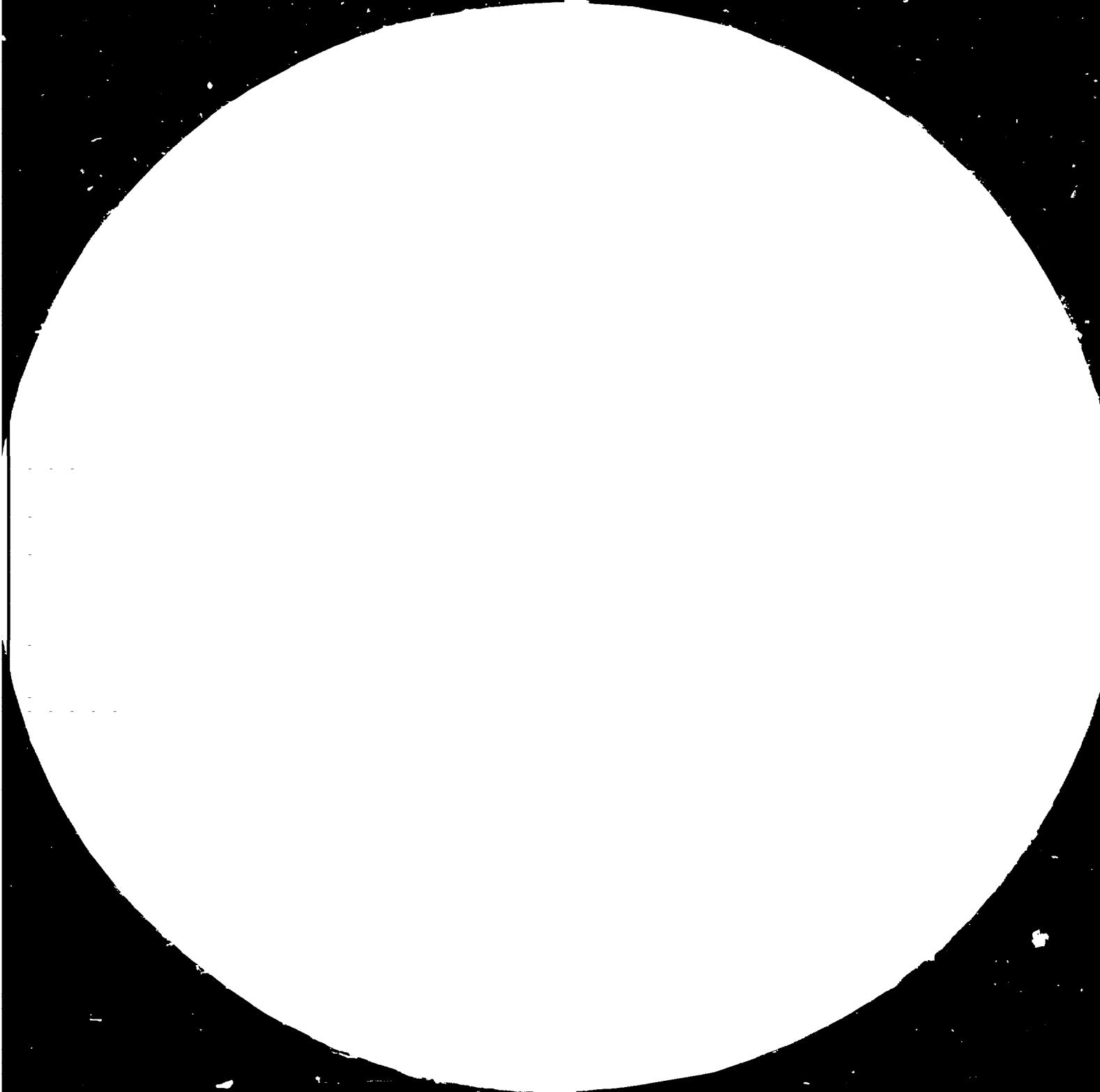
264. Another way in which the Government has attempted to reduce housing construction costs is by replacing traditional building methods outright with imported products and technologies. But these experiments have not been an unqualified success, as for example in the 2,000 unit Hamdi housing project outside Sana'a started by a Spanish contracting firm. Here the cost per dwelling unit had been estimated at about US$ 15,000 but if and when completed the cost will probably be closer to US$ 50,000 per unit. The form system used on this project was designed to reduce the time required for construction, which should have been reflected in reduced unit costs. However the project was mismanaged and the technology used was not appropriate to local conditions. Therefore, when the project was approximately 40 per cent complete, the contractor abandoned the project leaving the form system and equipment. Negotiations are in process for completing the project with another contractor.

265. There are, on the other hand, successful examples of the use of new technologies. Housing units at Sana'a University were constructed using steel skeletons and pre-cast concrete panels, and these have proved to be cost saving techniques. The cost came to about YR 1,040 per square metre for accommodation for 2,000 students and YR 2,000 per square metre for 154 professors' apartments.

C. Housing Institutions

266. As previously stated, there is an increasing shortage of low income housing in both the public and private sectors, and this is reflected in the comparatively small, but growing, squatter settlements on the outskirts of major cities. For the period 1980-1985 the Government estimates that over 4,000 units will be required annually for families earning less than YR 2,000 per month, merely to keep pace with newcomers. When the newly established Ministry of Municipalities and Housing becomes fully functional, it will be the authority responsible for co-ordinating Government policies in the housing field, and low income housing is likely to be the main priority.

267. The Housing Credit Bank (HCB) was established by Law No. 86 of 1977, with an initial capital of YR 100 million, 70 per cent from the Government and 30 per cent from private sector investors. The HCB is a corporation with financial and administrative independence. However, the Ministry of Economy is responsible for the overall supervision of the HCB. At the time of writing this report, the HCB had only opened a head office in temporary premises in Sana'a. However it was to be relocated in its own premises shortly and will eventually establish branch offices in every governorate.

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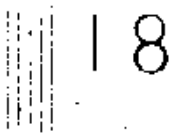
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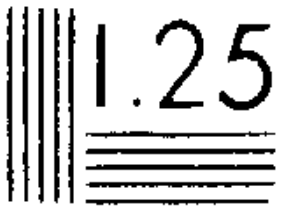
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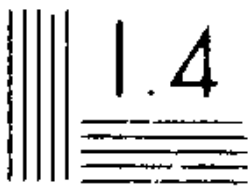
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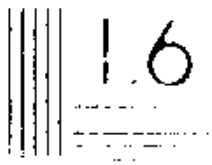
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268. The Government intends that the HCB should take full responsibility for the construction of public sector housing projects. The HCB aims to consolidate the construction of residential buildings, provide medium and long term loans for both the public and private sectors, assist in organizing housing co-operative societies, and monitor all housing development undertaken by the Government. The public sector and Government employees are to have first priority on commitments from the HCB. The HCB intends to recruit a staff of architects, engineers and technicians to review plans and specifications and offer technical advice and assistance to future borrowers. It already has a professional staff of 34. The HCB has been charged with completing the 2,000 unit Hamdi project referred to in the foregoing. It recently concluded its first agreement with a Co-operative Housing Committee to provide technical assistance and financing for a 350 residential unit project in Sana'a. Providing the HCB receives appropriate Government support, it should be able to make a useful and effective contribution to housing in the YAR.

D. Low Income Housing

269. The Government is understandably reluctant, in view of other pressing priorities, to commit a high proportion of scarce public funds to the construction of housing for rental on a massive scale. Thus, most of the poorer families in both urban and rural areas must continue to depend heavily on the informal sector. The Mission foresees several concessions the Government might consider to reduce the cost of housing for these lower income groups. Firstly, measures could be taken to provide a steady supply of basic materials at reasonable prices. Examples might be bulk purchasing or special manufacturing facilities set up for the purpose. Secondly, it might be possible to make suitable basic plans and equipment available at favourable rates to self-help groups and labour-only housing contractors. Thirdly, Government technical facilities could be used to design and develop a limited range of basic houses, making maximum use of cheap local materials and using levels of technology that are well understood. The Government could also encourage "self-help" site-and-service programmes by underwriting long term variable rate interest (or reduced interest) loans to those households unable economically to qualify for conventional financing, placing housing within the reach of many more Yemeni families.

270. There will be growing scope for public sector rental housing, and careful consideration should be given to the type of technology to be employed and the desirable scale of individual projects. There are apparent economic attractions in large scale projects, although these can prove ephemeral as in the case quoted above. The Mission suggests herein an alternative approach, which would have the advantage of enabling local contractors to participate more fully and thereby gain experience; this would be to deliberately break down large projects into a series of smaller contracts. For example, a 300 house estate could be the subject of a general infrastructure contract plus 6 separate house building contracts covering 50 houses each. The infrastructure contract might be let to a foreign firm if no local contractor was thought suitable, but the six housing contracts would then all be within the scope of local firms. They could be helped further by the client making a separate contract with a merchant to supply major imported materials (cement, reinforcing bar, sanitary and electrical fittings, etc.), thereby reducing the contractor's working capital requirements and securing for the client the benefit of bulk purchasing and keener prices. The projects could be funded as training projects with a technical/management contractor support unit to provide formal training and an on-site advisory service. It must be appreciated that occasional failures will occur, despite careful initial screening of the local firms to concentrate assistance on those with most promise. As an additional incentive it could be arranged that, should a contractor fail to achieve target output levels, all or

part of his contract would be redistributed to those contractors who were achieving the best current performance levels. Bidding procedures could be simplified on these "training contracts", either by negotiation on the basis of estimated rates or calling bids based on plus or minus percentage variations on guide rates and prices.

VIII. CONCLUSIONS AND RECOMMENDATIONS

271. The Mission's conclusions and recommendations are set out under main headings as follows:

A. Construction Materials and Standards
B. Design and Project Management
C. Performance of Local Contractors
D. Education, Training and Professional Standards
E. Implementation

A. Construction Materials and Standards

272. In view of the continuing heavy reliance on imports (60-70 per cent of materials costs on modern forms of construction) the Mission recommends that the Government should seek technical and financial assistance to upgrade the technical and managerial standards of local manufacturers of materials and components. Subject to technological and economic feasibility, in general the Mission favors a strategy of encouraging dispersed production in smaller units so as to increase product choice and reduce delivered costs through enhanced competition and lower transport charges. The Mission identified the following priorities for development of the local construction materials industry:

Quarrying and stone cutting:	(a) Review of all aspects of the proposed large scale mechanized project and proceed with implementation if warranted;
	(b) Encourage limited mechanization of small and medium size enterprises;
	(c) Encourage exploitation of marble deposits, which are at present not used.
Sand and aggregates:	(a) Provide technical assistance to small-scale aggregate producers;
	(b) Study the prospects for exploiting pumice and perlite as lightweight aggregates.
Pre-cast concrete products:	(a) Develop further the project for the production of concrete pipes and poles and other structural pre-cast items;
	(b) Assist concrete block producers to diversify into specialist pre-cast products including stairway items, paving slabs, kerbs, inspection covers, fencing posts, etc.
Lime industry:	(a) Study the potential for mechanized lime production at Bajil and Amran cement plants;
	(b) Assist in upgrading production methods of small-scale producers.
Gypsum:	(a) Study the potential for large-scale manufacture in the Salif area; extraction method, market potential and desirable levels of output and capacity;
	(b) Upgrade the production techniques of small-scale producers in the Sana'a area, including safety procedures and quality control.

Burnt clay products:	(a) Promote the marketing of high quality bricks as a facing and load-bearing product;
	(b) Upgrade the production techniques and quality control of small-scale manufacturers;
	(c) Study the market possibilities for associated products such as hollow blocks, vitrified clay pipes and ceramic sanitary ware;
	(d) Develop further the project for the manufacture of ceramic wall and floor tiles.
Glass:	Study the potential for plate glass manufacture utilizing known quality glass sand deposits.
Low-cost building materials:	(a) Propagate techniques that will encourage the usage of mud as a basic construction material;
	(b) Promote the usage of soil cement blocks through demonstration and technical assistance.

273. There is an urgent need to formulate and agree on national standards for building materials, mechanical and other components since varying specifications discourage local manufacturers and will eventually lead to unnecessarily high repair and maintenance costs. Thus the Mission recommends that the Government seek technical assistance to set up an autonomous Yemen Bureau of Construction Standards within the MPW to develop and publish codes and standards appropriate to local needs and to inspect and monitor materials and components in order to ensure that they comply with specified standards.

274. Until recently no facilities for building research were available in the YAR, but the Mission recommends that the new MPW building and highways laboratories be utilized for practical research and development to upgrade and increase the utilization of local materials and components. The laboratories should also provide a testing service for both public and private sector projects on a fully remunerative basis.

275. The Mission recommends that the Government seek technical assistance in the field of geological exploration in order to speed up the acquisition of detailed knowledge regarding mineral resources that can be used in the production of construction materials. The Geological Survey attached to the Yemen Petroleum and Mineral Resources Authority would be the logical vehicle for this assistance, as would be the National Company for Industrial and Construction Materials (YEMROC). The latter should also receive assistance to increase its project implementation and management capability if it is to successfully promote and participate in productive enterprises.

B. Design and Project Management

276. The MPW Technical Section should be strengthened and developed as an autonomous Yemen Consulting Bureau responsible generally for design and project management of all public sector projects and reporting directly to the Minister of Public Works. It is envisaged that the Bureau would also assume responsibility for registering, setting guidelines for and supervising the work of foreign and local consultants. The Mission further recommends that the Government should seek specialized training in practical project management techniques for engineers and administrators in the proposed Bureau and other public sector agencies responsible for commissioning construction work.

277. The Mission suggests that the Highway Authority's force account construction activities should be phased out gradually and the Authority upgraded into a planning, supervisory and maintenance authority. The equipment that would then be available could partly be transferred to the Authority's Maintenance Department - the duties of which are bound to increase significantly as the highway network extends - and the remainder sold or made available for hire to local contractors for use in road building contracts.

278. The Government should seek technical assistance to enable the MPW to develop and publish nationally-agreed conditions of contract appropriate to conditions in the YAR.

279. The Government should seek technical assistance to set up procedures for the classification of local, foreign and joint venture contractors according to managerial, technical and financial capacity. Separate regional lists should be formulated for smaller jobs. Prequalification procedures would cover larger and more specialized projects.

280. Preventive maintenance schedules should be formulated for all new projects, particularly those with a significant mechanical/electrical component, on the lines of the road maintenance procedures included in the Third World Bank Highway Project. Work would include the development of repair and preventive maintenance schedules, setting up workshop units and the formulation and presentation of suitable training courses.

C. Performance of Local Contractors

A first step towards improving the performance of local contractors is to encourage a more serious approach by enabling them to contribute to the formulation of policies affecting the industry as a whole. To this end they should be helped by the proposed Construction Industry Development Unit to promote a Contractors' Association to act as a focus for firms involved in the construction process, improve the general standing of contractors and provide an entity with which the Government could negotiate standard conditions of contract, training opportunities and specific measures to assist local firms. It is envisaged that building and civil engineering contractors would be full members of the Association, while electrical and mechanical sub-contractors would be invited to participate as associate members.

282. Direct technical support to the local industry could be helpful, providing a cautious and careful approach is adopted. The objective would be the promotion of more capable local firms, and the implementing agency would require the skill and sensitivity to meet and overcome the problem of an over-individualistic approach in which the typical owner of a one-man firm is unwilling to share decision making with his management colleagues and subordinates. It is essential that the Government should support the local industry but not attempt detailed control, thereby making it subservient and over-dependent.

283. One possibility would be for an existing institution, such as the Industrial Bank of Yemen (IBY), to take a minority shareholding (perhaps with voting control for a specified period) in a limited number of companies in return for comprehensive managerial, administrative, financial and technical support. In each case it would be necessary to quantify the support required and set target dates by which time supported firms would be capable of full self-reliance. It must be recognized that the IBY, as at present constituted and staffed, would probably not be able to provide substantial support of the specialist nature required. The principles and preferred methods of operation of contractor support agencies (e.g. the Kenya National Construction Corporation Ltd.) are currently imperfectly understood, and a thorough preparatory study and the recruitment of additional qualified specialist staff would be essential prerequisites if this possibility were to be pursued. Another approach would be to establish two or three construction companies (to allow for competition) to help the Government in the implementation of its ambitious development projects. These companies would be privately owned by shareholders with Government participation. They would initially have to be run mainly be expatriates either through a general management contract or individual recruitment, but on-the-job counterpart training and formal training through fellowships abroad should be planned to enable Yemeni staff to gradually take over the management of the enterprises.

284. The Mission favours the reservation of lower categories of projects for bidding by local contractors and medium categories for either local contractors or joint ventures (providing that the Yemeni partner is fully involved in the management of the firm and not just a sleeping partner). The Mission recommends that the draft MPW Index of Construction Costs should be refined, utilizing the assistance and experience of the PIU/MOE, and established as a basis for price escalation clauses on all but short term jobs. Bid documents (plans, drawings and specifications), whether prepared by the MPW or consultants, should be simplified and clarified so that they can be readily understood by local contractors. It is also important to minimize variations after the contract has been signed and to ensure that any alterations are properly covered by variation orders so that the contractor is properly remunerated.

285. The provision of direct financing to cover fixed and working capital requirements is of lower priority in the YAR than in most developing countries, since a substantial proportion of local contractors appear to have access to liquid funds or can raise capital by using land and property holdings as collateral. There are other promising firms which would benefit from financial assistance, but the risks inherent in schemes for the provision of contractors' finance should not be underestimated, and any proposal of this kind would have to be thoroughly prepared and operated with caution.

286. The Mission was, however, concerned at the unpredictable administrative delays in honouring certified interim and final payments on public sector projects, which can result in a sudden cash flow crisis unless the contractor has massive working capital reserves. The Mission therefore recommends that the Government consider measures to assure the smoother and prompter settlement of progress payments through a special Contractors' Settlement Bureau within, for example, the Yemen Bank for Reconstruction and Development or the Central Bank and funded by project payments from the budget of the sponsoring ministry or authority. This proposal would also circumvent the present cumbersome procedure whereby each ministry has to transfer unspent funds to the Ministry of Finance at the end of each financial year, which often leaves ongoing projects unfunded for several months until the new budget has been agreed. In summary, the payment chain should be drastically simplified so that certificates can be honoured by the client without delay.

287. Many of the problems faced by local contractors can be traced to inadequate construction management procedures, including an inadequate appreciation of contractual risks at the tendering stage and poor operational performance. Thus the Mission recommends practical technical and managerial assistance to local contractors both through specialized training courses and (possibly) an on-the-job extension service. The Mission was unable to identify a suitable existing institution to undertake these tasks and consequently proposes that they should be allocated as a part of the responsibilities of the proposed Construction Industry Development Unit. As an incentive, preference on Government contracts might be given to contractors who obtain a certificate of attendance at management training courses organized by the proposed Construction Industry Development Unit (see Annex 21 for description of proposed Unit).

288. Local contractors could also be helped to gain experience by the subdivision of large projects as specific training contracts with appropriate financial allocations to cover the costs of splitting work as well as training and other assistance. Contractors are more likely to improve their operational performance if they can be assured of a reasonably steady workload, although it is equally important not to overload contractors, so the agency responsible should monitor volume. A further possibility is serial tendering for smaller standard jobs.

289. Even though many contractors can afford to have their own equipment, the lack of operators and improper maintenance frequently cause equipment to be left idle, which in turn creates bottlenecks and results in higher costs. Then there are the smaller contractors for whom the acquisition of heavy equipment is impractical. An economical approach to this problem, an approach that would at the same time be an alternative to individual ownership, would be to set up equipment pools in the major construction centres. Equipment would be available at the pool for rental to local contractors at reasonable cost. The pool would include operators, master mechanics for maintenance work, and an inventory of spare parts for periodic overhaul. It could provide operational know-how and maintenance even to those contractors who can afford to purchase equipment on their own. Such an equipment pool could possibly be sponsored by a contractors' association as a co-operative endeavour, or by a distinct company with shares taken up by the contractors themselves.

D. Education, Training and Professional Standards

290. Technical assistance should be offered to the Association of Engineers to help it develop into a professional institution. It should eventually monitor professional training in the YAR and offer full corporate membership only to those who can demonstrate practical professional competence (through designs, calculations, interview and examination) after, say, three to five years of postgraduate experience. The Association could also be helped to develop as a forum for the discussion and publication of standards, data, information and papers of professional interest.

291. The Mission strongly supports the proposals for a Faculty of Engineering at the University of Sana'a, which will provide an opportunity to design courses that are fully appropriate to local needs. The Faculty could also provide postgraduate training for returning Yemeni graduates from foreign universities to ensure that they are fully able to cope with local conditions and responsibilities.

292. The Mission concluded that the severe shortage of skilled personnel at all levels is likely to persist and will act as a serious constraint on the performance of the industry. Thus the Government should seek substantial technical and financial support to expand and upgrade technical training facilities. The Technical Secondary Schools at Sana'a and Taiz and the Vocational Training Centres at these and other locations should be continually developed and fully utilized. To upgrade the skills of Yemeni artisans, vocational day release and evening courses should be expanded in vocational training centres and district training centres throughout the YAR. Specific courses should be arranged for plant operators and maintenance personnel. General apprenticeship and trade testing schemes for skilled construction personnel should be developed, and medium and large public sector contracts should only be awarded to contractors operating an approved apprentice training programme.

E. Implementation of the Recommendations

293. The aforementioned recommendations can obviously not be carried out without concerted effort and formalized supervision. The assignment of special responsibilities is therefore mandatory. With the approval of the Government, the MPW should be named as the Government co-ordinating agency for follow-up of the implementation of the recommendations of the Mission.

294. The implementation of the recommendations is unlikely to be achieved if the responsibilities are devolved and dispersed among a variety of ministries, authorities, units and institutions. The Mission therefore recommends the establishment of a Construction Industry Development Unit with specific objectives and full authority to carry out its duties (see Annex 21). The Project Director should report directly to the Minister of Public Works, but should also be empowered to work directly with other ministries and public sector agencies as necessary. An indication of possible responsibilities and costs is included in Annex 21, but detailed terms of reference and a project budget would have to be drawn up in accordance with the Government's decisions regarding priorities.

TERMS OF REFERENCE

Immediate Objectives

The study will describe the construction industry, identify the main problem areas and make recommendations regarding policies and programmes to improve the performance of the sector. It will identify technical assistance activities in respect to preparation of projects for industrial plants for the local production of building materials. From UNIDO's point of view, the work of the building materials specialist attached to the Mission is likely to produce the greatest number of ideas for follow-up technical assistance in relation to the establishment of new industries.

Regarding local contractors, the study will evaluate their capacity, assess their needs in terms of skilled and unskilled manpower and financial and technical assistance, and make suggestions regarding the improvement of their performance.

Project Outputs

The project will result in an in-depth analysis of the construction industry. It will provide background data on construction activities in both housing and civil works. It will identify the needs for building materials and especially those that can be produced in the country on an economic scale. Special emphasis will be placed on devising means to help improve capacities and skills in the local contracting agencies to enable them to assume a more effective role in the construction sector. Above all the study will produce concrete recommendations for financial and technical assistance to strengthen and develop the construction industry in the Yemen Arab Republic.

The study will focus, inter alia, on:

(a) An examination of past development and present capacity of the domestic construction industry and estimates of future demand, especially with regard to projects contained in the Five Year Plan.

(b) A breakdown of the work performed by public, private and foreign contractors in respect to housing, public works, and building materials production.

(c) Relevant Government policies: incentives available and required; investment code; contractor registration; practices of awarding bids and contracts; financial aspects; administrative and institutional arrangements; design standards; legal framework.

(d) An assessment of the present availability of construction materials and future requirements, especially with regard to the projects to be undertaken according to the country's economic plan; identification of those materials that can be manufactured on an economic scale; substitution of costly imported materials by improving locally available materials; introduction of new materials to lower costs of construction.

(e) Assessment of the status of local contracting agencies and their growth possibilities; an indication of the volume of work they can undertake with their present means; improvements in the financing of contractors; contract procedures, bonds, guarantees, securities, payments, loans and advances, credit facilities.

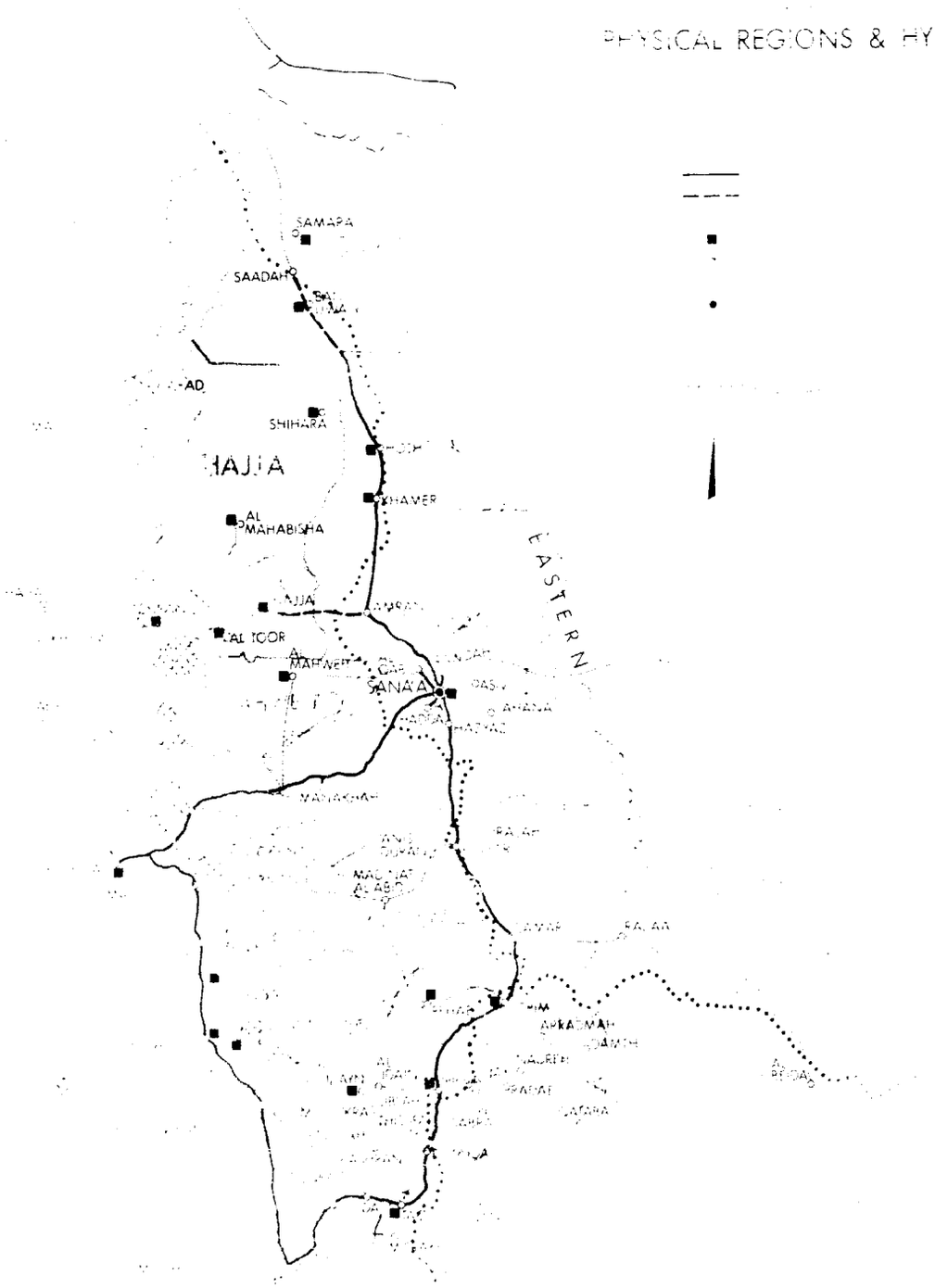
(f) Assessment of the availability and needs of equipment used in the construction industry; recommendations regarding the means of providing these.

(g) Assessment of the skilled and unskilled labour force presently available and required; labour laws and practices; wages, hours of work and related questions.

(h) A survey of the existing facilities for training of workers, technicians and managers; evaluation of existing training courses and suggestions for their improvement.

Annex 2

PHYSICAL REGIONS & HYDROGRAPHY



Annex 3

The Project Implementation Unit/Ministry of Education (PIU/MOE)

The PIU/MOE was established in 1974 to execute IDA-financed education projects. Pilot programmes were initiated for construction of schools and educational facilities using local contractors and local materials such as various kinds of stones and cement blocks. PIU succeeded in building schools at between YR 600 and YR 1,000/sq. m, which was less than a quarter of the then prevailing construction cost. PIU also prepared the first set of the general standard specifications and the first general conditions of contract for buildings in the YAR, under which several hundred primary and preparatory schools were built throughout the country based on PIU prototype designs. These prototype designs took account of climatic and topographic variations, the availability of construction materials and possibilities for expansion. Cost-saving was a priority. Accommodation for teachers was also provided for prototypes in rural areas. Over one thousand of these prototype schools were built and became one of the features of the Yemen villages. Local contractors from the villages carried out the building work. Many other government projects were executed by the PIU, particularly Sana'a University professors' housing (YR 23.2 million) where modern building techniques were used (pre-cast concrete) and foreign contractors were employed due to the limited time allowed for completion of the project. Yemeni traditional architectural features were maintained in the building, including coloured glass windows and other decorative features. Another example was the Student Boarding Accommodation for the University (cost YR 7.3 million). Due to the severe budgetary and time limitations, prefabricated elements were used and foreign contractors were in charge of execution. Other buildings executed by PIU for the University were the Cafeteria, Central Library, General Stores and University Guest House. Many other buildings were executed by PIU for other Government agencies like the new Central Planning Organization office building (YR 3.1 million), and the new office building for the MOE (YR 5.5 million). The PIU was originally established under the first education project agreement credit 421/YAR between YAR and IDA. Its prime responsibilities were the execution of IDA financed education projects, but eventually it developed into a general government technical consulting bureau.

Annex 4

The National Company for Industrial and Construction Materials (YEMROC)

The company was established under Presidential Decree dated 1 October 1978 (Law No. 12 of 1978) with a capital of YR 20 million represented by 200,000 indivisible shares of YR 100 nominal value each and allotted as follows:

No. of Shares	Per cent	Shareholder
102,000	51	YAR Government
70,000	35	Arab Mining Company (Jordan)
14,000	7	Industrial Bank of Yemen
14,000	7	Housing Credit Bank
200,000	100	

The Articles of Association provide for founder shareholders to initially pay 25 per cent of the subscription price, and the balance is payable within 5 years. The aims and purposes of the company are, inter alia, to "mine, exploit, produce and market industrial minerals and raw materials and to carry out all other activities related thereto. Such minerals will include limestone, marble, various types of sands, feldspar, gypsum, tuffstone and all types of stone used as building materials."

The company is currently considering project possibilities in three main areas:

- Factory production of building stone
- Gypsum production
- Marble quarrying and tile cutting.

Annex 5

Excerpts from

"Regulations for the Implementation of

the General State Budget

and Ancillary Budgets

and the Budgets of the Economic Sector"

Issued by the Ministry of Finance under

No. 97 on 29 July 1980

Section Four: Development Expenditures

Art. 45:

It is not permitted to enter a contract or commence the execution of any new work or project under Section Four - Development Expenditures - except after approval of the Control Planning Organization and notification to the Ministry of Finance by a copy of the project (draft) of contracts relative to these projects prior to the completion (finalization) of the contract. If the contract provides for advance payments, the proportion should not exceed 25 per cent. Each party (department) must notify the Central Planning Organization of the funds expended every three months. Consideration should be given when contracting to the provisions of Law No. 3 of 1975 relative to regulating Government purchases and stores, the laws revising it and the administrative regulations thereof. The state of the relative funds (allocated in the budget) should be made available to the committees authorized to decide upon them whenever a project (draft) of a contract is submitted. Such committees may not approve a contract for any project for which a fund is not allocated in the budget of the respective party.

Art. 46:

It is permissible to enter into contracts for periods exceeding the financial period (of the budget) in respect of works or projects indicated under Section Four where the implementation will extend beyond the financial period, with due regard to the provisions of the previous article, subject that actual expenditures do not exceed allocations of the general budget for the period July-December 1978.

Art. 49:

It is permissible to reallocate the funds of Section Four - Development Expenditures - among different parties (departments, ministries) within the total limit of funds, when proposed by the Central Planning Organization and the Ministry of Finance, by a decision of the Council of Ministers.

Annex 6

List of Public Buildings Designed by MPW Technical Department 1977-80

	YR
1977	
1. CYDA headquarters	3,000,000
2. Fourth Wakf building	14,000,000
3. Commercial and housing unit	5,000,000
4. Criminal investigations (2,200 m^2)	5,000,000
5. Dhrafi stadium	8,000,000
1978	
1. Courthouse, Amran (400 m^2)	2,350,000
2. Department of taxes (880 m^2)	4,000,000
3. Department of Duties (880 m^2)	3,700,000
4. Water closets, public	2,000,000
5. Police station (435 m^2)	1,500,000
6. Plates workshop (177 m^2)	420,000
7. Kindergarden (780 m^2)	1,530,000
8. Ministry of Information, 3rd floor	1,250,000
9. Radio broadcasting station	3,800,000
10. Bank (2,250 m^2)	5,540,000
11. Courthouse (Ibb)	3,000,000
12. Security Department, Ibb	5,430,000
13. Customs stores	1,760,000
14. Customs inspectorate	2,130,000
1979	
1. Customs building, Taiz	2,740,000
2. Consumer's association	3,000,000
3. Health centre (1,050 m^2)	3,650,000
4. Infirmary (490 m^2)	1,470,000
5. Tourist exhibition	1,700,000
6. Doctors' residence (492 m^2)	1,475,000
7. Tax office	2,160,000
8. Data office	7,550,000
9. Transportation office	680,000
10. Lands office	4,170,000

	YR
11. Police station	1,317,000
12. Training camp	15,000,000
13. Agricultural office	1,700,000
14. Generators' building - radio	2,120,000
15. Records building	4,750,000
16. Airport post-office building	1,100,000
17. Comptroller's office	1,320,000
1980	
1. Transport office building	1,970,000
2. Transport office building	720,000
3. Hospital annexes	1,800,000
4. Government house	8,700,000
5. Central drug warehouses	5,350,000

Annex 7

Highway Authority Construction Department

Pool of Plant

In May 1980, the following were reported to be in working order or "repairable":

Dozers (Komatsu and Cat)	45
Track shovels	10
Wheel loaders	22
Back hoe	2
Motor graders	27
Road rollers	37
Hand vibrating rollers	3
Plate vibrator	1
Air compressors	23
Generating sets (185-250 kva)	9
Welding sets	1
Concrete mixers	3
Chipping spreader	2
Asphalt distributors	13
Asphalt heaters	6
Crushing and screening plant	4
Mobile crushing and screening plant	1
Crusher	1
Mobile cranes (7-16+)	5
Mobile servicing unit or workshop	5
Water tankers	19
Fuel tanker	1
Dump trucks (12 and 16 ton)	24
Dump trucks (8 tons)	12
Dump trucks (1.5 ton)	13
Lorry (5 ton)	1
Trailers	6
Various buses, service vehicles, 2-wheel and 4-wheel cars	

Annex 8

YAR - Local Construction Industry
Summaries of Interviews with Contractors and Producers of Building Materials

	Date Established	Annual Value of Work (YR million)
A. International Contractors		
1. Cable Export	1929	75
2. Imsay - ETS	1958	220
3. Joannou and Paraskevaides Ltd.	1961	420
4. Jungwood Development Co. Ltd.	1957	2,580
5. Wimpey Offshore Construction Co. Inc.	1920	50 (in YAR)
B. Joint Ventures		
6. Rashed Construction Co.	1979	23 million Dirahams
7. Saeed Kalpataru Construction Co.	1977	440 million Dirahams
C. Local Contractors - rated "First-Class" by PIU-MOE (or other clients)		
8. Saleh Forhan Al-Hachdy	1970	20
9. El-Asbahi Office for Building Contracting	1935	20
10. Mohamed Abdullah Al-Asbahi	1970	40
11. Abdul Malik Al Asbahi	1973	40
12. Mohhamed Hassouna	1978	20
13. Al Mounsoub	1965	6-7
14. Mohammed Kassim Own	1975	30
15. Shamsan Own and Sons	1940	10
16. Ahmed Shamsan Own	1970	30
17. Red Sea Contracting and Construction Company	1973	10-15
18. Saif Smaeel Saied	1958	10
19. Yemeni Tadamin Company for Contracting and Engineering	1969	15

	Date Established	Annual Value of Work (YR million)
D. Local Contractors - rated "Second Class" by PIU-MOE		
20. Yaseen Abdullah Al Ademi	1977	5
21. Saleh Ali Al Garady	1971	6
22. Gaber Al-Hamadani	1974	6
23. Al Towaiti National Construction and Engineering Corporation	1977	25
24. Hezzam Abdullah Al Towaiti	1973	6
25. Abdul Kadeir Al Yademi	1977	3
26. Engineering Office for Contracting and Engineering	1975	10
27. Gaar Allah Ferdan	1975	10
28. Abdul Bari Al Khamry and Mohamed Haiel Osman	1974	5
29. Mansour Ali Mohamed and Ahmed Osman Kassim	1975	4
30. Abdulla Raweh	1975	20
31. Abdullah Osman Soliman	1975	5
E. Local Contractors - rated "Third-Class" by PIU-MOE (or other clients)		
32. Kaied Ahmed and Abdulla Hassan	1978	2
33. Abdul Wasee Ahmed Al Asbahi	1974	2
34. Ali Kaied Abdullah Al Asbahi	1978	2.5
35. Mohamed Ahmed Galib Al Asbahi	1976	4
36. Mohamed Saleh Al Baari	1979	2
37. Ali Hamood Al-Khawlani	1979	1.5
38. Abdulla Al Kibssi	1976	3
39. Mohamed Ali Al Odeel	1978	4.5
40. Farwan Office for Contracting	1977	3
41. Taha Thabit Haiedr	1967	3
42. Mohamed Saief Hidara	1978	3
43. Yehia Amer Kaied	1977	3
44. Mohamed Kaied and Omar Ahmed Abad	1977	2
45. Amein Yassien Khalib	1979	2
46. Fath Hatem Mosleh	1977	2.5
47. Nasher Engineering Office	1979	2
48. Union Contracting Company	1956	2

	Date Established	Annual Value of Work (YR Million)
F. Producers of Building Materials		
49. Abdul Malik Mujahid Crushers	1963	9
50. Moein Industrial Establishment	1979	1.2
51. Saeed Ralpa - Jaru Industries Ltd.	1979	15 (projected)
52. Yefoo	1979	Not available

Cable Export

Interview 1

Address:	P.O. Box 30, 88500 Mirecourt, France.
Description:	International contractor.
Established:	1929.
Nationality:	French.
Manager:	Jacques Cable (French).
Management Staff:	25.
Skilled Labour:	75.
Unskilled Labour:	150.
Labour Availability:	Difficulty in obtaining skilled labour.
Equipment:	Concrete mixers, cranes and trucks.
Value of Work:	US$ 17,000,000.
Type of Work:	Pre-fabricated buildings.
Typical Contracts:	Public buildings.
Financial:	Credit and financing through Bank Kolb, Credit Commercial de France, Epinal.
Problems:	Locating acceptable housing for expatriates. Foreign operators are not licensed to drive motor cranes on public streets. Delays of up to 45 days on payments against certified accounts.
Remarks:	-

Interview 2

EASAY - ETS

Address:	23, Avenue Ashonomie, Brussels, Belgium.
Description:	International contractor.
Established:	1958.
Nationality:	Belgium.
Manager:	J.M. Garcez (Belgian).
Management Staff:	83 (architects, engineers, supervisors and accountants).
Skilled Labour:	60.
Unskilled Labour:	150.
Labour Availability:	Difficulty in attracting foreign workers to come to YAR.
Equipment:	Full range of equipment required for precasting and erecting multi-storey buildings.
Value of Work:	US$ 51 million.
Type of Work:	Precast and in situ reinforced concrete structure.
Typical Contracts:	Multi-storey high rise apartments, hospitals, schools.
Financial:	Capital assets US$ 880 million. No problems with credit or bonds.
Problems:	Lack of new projects.
Remarks:	Large international construction company specializing in prefabricated and precast concrete structures.

Interview 3

Jouannou and Paraskevaides, Ltd.

Address:	Al-Qaser Street, Sana'a.
Description:	International contractor.
Established:	1961.
Nationality:	Cyprus.
Manager:	Stelios Chr. Joannou.
Management Staff:	320 management, engineering and supervising staff.
Skilled Labour:	1,200.
Unskilled Labour:	9,000.
Labour Availability:	No problems.
Equipment:	Full range of all types of heavy equipment and vehicles.
Value of Work:	US$ 93 million.
Type of Work:	General construction, buildings and roads.
Typical Contracts:	Housing projects, schools, roads, bridges for public sector. Hotels for private clients.
Financial:	Current assets £ 43.8 million.
Problems:	Locating suitable housing for management staff. Slow payments from clients.
Remarks:	International company presently working in YAR, Saudi Arabia, Libya, Iraq, Cyprus and Greece.

Jungwood Development Co. Ltd. Interview 4

Address:	2-10, 1-KA, Do-Dong, Yong San-Ku, Seoul, Korea.
Description:	Korean registered company No. 3439.
Established:	1957
Nationality:	Korean
Manager:	Gong Howang (Korean).
Management Staff:	61
Skilled Labour:	150.
Unskilled Labour:	200.
Labour Availability:	Has to bring skilled labour from Korea.
Equipment:	Full range of equipment required for general construction projects.
Value of Work:	US$ 573,000,000.
Type of Work:	Commercial and residential buildings, roads, bridges and power plants.
Typical contracts:	Power plants and factories.
Financial:	Assets US$ 194,000,000. Has no problems securing bank guarantees or credit.
Problems:	Lack of new contracts.
Remarks:	Has been involved in a number of major projects in Saudi Arabia.

Interview 5

Wimpey Offshore Construction Co. Inc.

Address:	P.O. Box 375, Sana'a.
Description:	Subsidiary of international contractor.
Established:	1920 (parent company).
Nationality:	United Kingdom.
Manager:	G.R. Lightbody.
Management Staff:	8 (2 engineers, 5 supervisors, 1 accountant).
Skilled Labour:	220. (Mostly Indian).
Unskilled Labour:	100.
Labour Availability:	Unable to recruit skilled labour locally. Recruits in India.
Equipment:	Ready mix concrete plant, 2 cranes, 1 loader, 6 heavy trucks, 3 pickups.
Value of Work:	£ 5 million in YAR.
Type of Work:	Constructing a hospital, 48 flats and 7 houses.
Financial:	Project being funded jointly by YAR and Netherlands Governments.
Problems:	Expediting payments for the requisitions. As both governments have to agree, delays of up to 4 months sometimes occur. Recurrent delays due to Ministries failing to expedite documents for importing material, tax exemption and permits for Indian workers.
Remarks:	Generally well-organized and managed project, although approximately 30 days behind schedule due to delays in delivery of imported materials.

Interview 6

Rashed Construction Co.

Address:	Al-Qasnr - Al Ghumeri St. P.O. Box 1221 Sana'a.
Description:	Joint venture.
Established:	1979.
Nationality:	YAR/Indian.
Manager:	M. Abdel-Gabar Rashed (YAR).
Management Staff:	13.
Skilled Labour:	137.
Unskilled Labour:	200.
Labour Availability:	Adequate.
Equipment:	Ready mix concrete plant, arc welder, concrete block machine, electric hoist, wood working machinery, fork lift, mobile crane and 16 vehicles.
Value of Work:	23,000,000 Dirahams.
Type of Work:	Commercial and residential buildings, schools and hotels.
Typical Contracts:	Commercial and residential construction.
Financial:	Information not available.
Problems:	No escalation clauses in government contracts, which creates difficulty due to rapid inflation in the cost of labour and materials.
Remarks:	Have an excellent reputation.

Interview 7

Saeed Kalpataru Construction Co.

Address:	P.O. Box 920, Sana'a.
Description:	Joint venture.
Established:	1977.
Nationality:	YAR/Indian.
Manager:	Mofatraj P. Munot (Indian).
Management Staff:	17.
Skilled Labour:	50.
Unskilled Labour:	250.
Labour Availability:	Available mostly from India.
Equipment:	Full range required for general building construction.
Value of Work:	440,000,000 Dirahams.
Type of Work:	General building construction, hospitals, offices, and schools mostly for public sector.
Typical Contracts:	Sana'a University, Hayel Office Building residential complex, Sana'a and factory in Taiz.
Financial:	Have credit with Bank de l'Indo-Chine et de Suez.
Problems:	Lack of new contracts.
Remarks:	Capable of constructing large buildings on schedule.

Interview 3

Saleh Forhaan Al-Hachdy

Address:	Sana'a.
Description:	General building construction.
Established:	1970.
Nationality:	YAR.
Manager:	Saleh Forhan Al-Hachdy.
Management Staff:	6 (1 engineer, 5 supervisors).
Skilled Labour:	40.
Unskilled Labour:	200.
Labour Availability:	Problems in recruiting capable skilled craftsmen.
Equipment:	1 mechanical loader, 1 crane, 3 heavy trucks, 5 pickups.
Value of Work:	YR 20 million.
Type of Work:	General building construction, for public and private sectors.
Typical Contracts:	One public sector project and two private sector buildings currently under construction.
Financial:	Capital YR 2 million. No problems encountered in obtaining bonds or credit.
Problems:	Current lack of contracts. Government contracts make no allowance for price escalation.
Remarks:	Rated as a First Class contractor by Project Implementation Unit, Ministry of Education.

Interview 9

El-Asbahi Office for Building Contracting

Address:	P.O. Box 3582, Hodeidah.
Description:	Family business started by father of current owner/manager.
Established:	1935 (current owner/manager joined firm in 1970).
Nationality:	YAR.
Manager:	Aly Saeed Alasbahey, B.Sc. (accounting).
Management Staff:	25.
Skilled Labour:	100 (some permanent staff employed for 30-40 years) (YR 130 daily wage).
Unskilled Labour:	700 average (600-1,000) - mostly daily labourers. (YR 60-70 daily wage).
Labour Availability:	Now no problem - although was tight up to 1978.
Equipment:	1 mechanical shovel, 11 concrete mixers, 4 electric hoists, 6 tipper trucks.
Value of Work:	YR 20 million (average) - 70 per cent private clients/30 per cent public sector.
Type of Work:	General building construction within Hodeidah Governorate.
Typical Contracts:	Red brick factory at Mansuria - YR 3 million Hodeidah hospital - (7,300 sq. m. 1973) - YR 4 million Customs building; Hodeidah harbour - YR 4.5 million Tax office - YR 4 million Swimming pool and recreation facility - YR 3.5 million School at Hodeidah - YR 2 million.
Financial:	Father started as labourer in Aden, rose to foreman, became a sub-contractor and later moved to Saudi Arabia, where he became a building contractor specialising in the construction of large houses for private clients, and finally moved to the YAR after the Revolution. The equity is wholly family-owned. Has current account with Yemen Bank, and is able to

negotiate credit/loan facilities up to YR 1-1 1/2 million. The Bank also offers Performances Bond Facilities. Foreign exchange for imports is not a problem since apart from a large concrete mixer, most plant and materials are bought on the local market. No insurance carried. Employees have not so far suffered any serious industrial accident, but contractor stated that he would provide some financial compensation in such a circumstance. Suppliers make credit up to 3-4 months available, but contractor usually pays cash or within 2 weeks to keep goodwill. Clients usually pay promptly but where delays do occur he is usually able to deal with the difficulties quickly, thanks to good relations with his clients and their representatives. Mobilisation payments of 20 per cent are available, but he seldom takes advantage of them, as he would have to pay a fee to secure an appropriate bank guarantee.

Problems:

Unfair competition from foreign contractors who are able to obtain tax exemption on imported supplies and make excessive use of foreign labour. Foreign companies recover their overheads on large projects and are thereby able to compete unfairly with local contractors on nearby jobs by basing their bids on marginal costs only.

Remarks:

This company is generally accepted as one of the most progressive contractors in the Hodeidah area, and many of its projects are completed ahead of schedule. An architect is employed to provide a "design and build" package deal to private clients. The company also enjoys a good reputation for training employees on the job, and about 200 employees leave each year to start their own small business, often as sub-contractors to Mr. Alasbahey. He employs about 50 separate sub-contractors (averaging 7 employees each) on specialised tasks such as tiling, stone cutting, electrical and plumbing work. Mr. Alasbahey makes a point of visiting all his sites daily so that problems can be dealt with promptly. Somewhat unusually, Mr. Alasbahey is not tempted to diversify into different businesses or undertake dispersed contracts, but prefers to concentrate his commercial activities to ensure full control and maximize performance.

Interview 10

Mohamed Abdullah Al-Asbahi

Address:	P.O. Box 76, Sana'a.
Description:	Sole proprietor
Established:	1970.
Nationality:	Yemen Arab Republic.
Manager:	Mohamed Abdullah Al-Asbahi.
Management Staff:	10 (2 engineers, 7 supervisors, 1 accountant).
Skilled Labour:	100.
Unskilled Labour:	400.
Labour Availability:	No problems.
Equipment:	10 concrete mixers, 12 heavy trucks, 5 pickups, 3 cranes, 2 loaders, 1 bulldozer.
Value of Work:	YR 40 million.
Type of Work:	General building construction.
Typical Contracts:	Office buildings, hospitals, schools for public works.
Financial:	Equity capital YR 5,000,000. No problems in securing bonds or credit.
Problems:	Lack of new contracts.
Remarks:	Rated as a First Class contractor by Project Implementation Unit, Ministry of Education. Good reputation generally among clients.

Interview 11

Abdul Malik Al Asbahi

Address:	Kiada Street, Sana'a.
Description:	Sole Proprietor.
Establishment:	1973.
Nationality:	Yemen Arab Republic.
Manager:	Abdul Malik Al Asbahi.
Management Staff:	10 (2 engineers - 8 supervisors).
Skilled Labour:	120.
Unskilled Labour:	500.
Labour Availability:	No problem.
Equipment:	15 cement mixers, 12 heavy trucks, 8 pickups, 3 cranes, 1 tractor, 2 compactors, 2 generators.
Value of Work:	YR 40 million.
Type of Work:	General construction projects.
Typical Contracts:	Mostly public works.
Financial:	Equity capital YR 5,000,000. No problems in securing bonding or credit.
Problems:	Bid documents for Government projects are not clear. Difficult to get spare parts for equipment. Unable to hire competent engineers and technicians.
Remarks:	Rated as First Class contractor by Project Implementation Unit, Ministry of Education.

Interview 12

Mohhamed Hassoura

Address:	P.O. Box 141, Sana'a.
Description:	Sole proprietor.
Established:	1978.
Nationality:	YAR (Naturalised citizen).
Manager:	Mohhamed Hassoura.
Management Staff:	20.
Skilled Labour:	50.
Unskilled Labour:	100-200 (varies).
Labour Availability:	Some difficulty in recruiting skilled labour.
Equipment:	1 mechanical shovel, 4 concrete mixers, 2 electric hoists, 6 tipper trucks, 3 pick-ups.
Value of Work:	YR 20 million.
Type of Work:	General building contracts in Sana'a area, mostly for public sector.
Typical Contracts.	Department of Statistics (CPO) - YR 12 million Vocational Training Centre, Dhamar - YR 4.5 million Mosque for Sana'a University - YR 3 million Educational Materials Centre - YR 2.5 million Tourist Authority Building - YR 2 million
Financial:	Has account with Bank de l'Indochine et de Suez, who provide bonds, guarantees and occasional loan facilities. Has insurance cover for equipment and employer's liability. Sometimes imports specialised items directly (e.g. sanitary ware and lighting equipment). Local suppliers offer 1-2 months credit. Mobilisation payments of 20-25 per cent available against guarantees. No major problems in delayed progress payments by clients.
Problems:	Some discontinuity in workload, but not a serious problem.

Interview 12

Remarks:

The owner obtained a B.Sc. in civil engineering at Cairo University in 1962, and has worked in the YAR since 1966. He has rapidly obtained an excellent reputation as a technically-qualified contractor who completes work on time and to good quality standards. Mr. Hassouna stated that he is quite confident that he can continue to compete on equal terms with foreign contractors.

Interview 13

Al Mounsoub

Address:	P.O. Box 4777, Taiz.
Description:	Sole proprietor (previously worked as contractor in Aden and Saudi Arabia).
Established:	1965.
Nationality:	YAR.
Manager:	Al Mounsoub.
Management Staff:	7 (manager, 2 accountants, 4 supervisors).
Skilled Labour:	28.
Unskilled Labour:	50-60 (varies).
Labour Availability:	No problem at present. Used to be more difficult.
Equipment:	Stone crusher (not currently in use), block-making workshop, 8 concrete mixers, 3 tipper trucks, 4 pickups.
Value of Work:	YR 6-7 million.
Type of Work:	Buildings for both public and private sectors.
Typical Contracts:	Rural school - YR 2.2 million. Dwelling house - YR 1.0 million (for private client).
Financial:	Equity wholly-owned by proprietor. Has bank account (currently overdrawn). Performance bonds available from Bank. No insurance cover. All purchases made locally. Suppliers allow credit up to one month. Mobilisation advances of 20 per cent have been granted by both public sector (subject to bank guarantee) and private clients (no guarantee). Progress payments from public sector can be seriously delayed (up to 3 months). Payment experience with private clients has been good.

Interview 13

Problems: Lack of work. Preference given to foreign contractors. Government jobs are advertised, but no encouragement given to local contractors. Slow payments from public sector clients waste management time and create cash flow problems. Local prices of materials are high. Merchants tend to favour foreign contractors, who are able to secure bulk discounts.

Remarks: Finance is not a problem, since land and property is available as collateral. Owner makes own estimates (with outside assistance if necessary). Owner was in favour of an Association of local contractors, and would welcome availability of management training.

Interview 14

Mohammed Kassim Own

Address:	Kassar Street, Sana'a.
Description:	General contractor and supplier of ready mixed concrete.
Established:	1975.
Nationality:	YAR.
Manager:	Mohammed Kassim Own.
Management Staff:	10 (1 engineer, 8 supervisors, 1 accountant).
Skilled Labour:	40.
Unskilled Labour:	200.
Labour Availability:	No problem.
Equipment:	1 ready-mix concrete plant, 3 transit mix trucks, 3 cranes, 6 heavy trucks, 4 pickups, woodworking workshop.
Value of Work:	YR 30 million.
Type of Work:	General construction.
Typical Contracts:	Public works projects.
Financial:	Capital YR 10 million.
Problems:	Lack of future projects to follow up current work programme.
Remarks:	Rated as a First Class contractor by Project Implementation Unit, Ministry of Education.

Interview 15

Shamsan Own and Sons

Address:	P.O. Box 4972, Taiz.
Description:	Family business with another branch (of similar size) in Hodeidah.
Established:	1940.
Nationality:	YAR.
Manager:	Mr. Mohammed Shamsan.
Management Staff:	4 currently (manager, accountant, 2 clerks).
Skilled Labour:	16 currently (max. 50 previously).
Unskilled Labour:	40 currently (max. 300 previously).
Labour Availability:	No problem.
Equipment:	Rock crusher, 2 mechanical shovels, 6 concrete mixers, 4 tipper trucks, 2 pick-ups. (Can hire other plant, including excavators, in Taiz area).
Value of Work:	10 million YR in 1980 (YR 15 million in 1979).
Type of Work:	General building construction, mostly for public sector.
Typical Contracts:	Military compound - YR 9 million Taiz Tech. Training School (1) - YR 7 million Taiz Tech. Training School (2) - YR 4 million Foundation work for Electricity Corporation - YR 4.5 million Officers' club - YR 1.8 million Military HQ - YR 1 million
Financial:	Equity wholly family-owned. Account with Yemen Bank can obtain loans using land/property as collateral. Some materials, equipment directly imported, but usually buys locally. Can obtain performance bonds from bank. Has insurance cover for materials and employer's liability cover for permanent employees. Suppliers allow credit periods up to 1-4 months, but sometimes pays cash to obtain discounts. No mobilisation payments. Significant delays (up to 2 months) have been experienced in the receipt of progress payments.

Interview 15

Problems:	Current lack of contracts. Slow payments by public sector clients. Fixed price contracts with no provision for reimbursement of price increases on labour/materials.
Remarks:	A contractor with a good reputation locally. Usually completes work within the contract period, except where payments from the client are delayed (about 20 per cent of contracts). The manager stated that he was in favour of an Association of Local Contractors, and would welcome technical and management assistance training.

Interview 16

Ahmed Shamsan Own

Address:	Sana'a Street, Hodeidah.
Description:	General contractor (family-owned).
Established:	1970.
Nationality:	YAR.
Manager:	Al Saieed Abdullah Abd Al-Wakeel.
Management Staff:	8 (1 engineer, 6 supervisors, 1 accountant).
Skilled Labour:	60.
Unskilled Labour:	300.
Labour Availability:	No problem.
Equipment:	1 rock crusher, 1 mechanical loader, 1 dozer, 2 mobile cranes, 10 concrete mixers, 9 heavy trucks, 5 pick-ups.
Value of Work:	YR 30 million.
Type of Work:	Commercial buildings, mainly for private sector.
Typical Contracts:	Office buildings and manufacturing facilities.
Financial:	Capital YR 3 million. Full line of credit available from the Yemen Bank and the Arab Bank.
Problems:	Insufficient work at present time. Problems have also been encountered in collecting progress payments.
Remarks:	Rated as a First Class contractor by Project Implementation Unit, Ministry of Education.

Interview 17

Red Sea Contracting and Construction Company

Address:	P.O. Box 3337, Hodeidah.
Description:	Contracting arm of Thabet Bros. Group. Other group companies include Hodeidah Shipping and Transport Co., Tehama Trading Co. (agents for vehicles and construction equipment), Yemen Dairy and Juice, Yemen Cold Store, Thabet Bros. (Import/Export agency) and General Insurance Company.
Established:	1973.
Nationality:	YAR.
Manager:	Mr. Sayed Abdul Thabet (Director). Mr. Ahamed Morshid (Manager).
Management Staff:	13 (including 6 engineers).
Skilled Labour:	40 permanent (daily wage YR 150 upwards).
Unskilled Labour:	70 currently (up to 200) (daily wage YR 50 upwards).
Labour Availability:	No problem, except for finishing carpenters.
Equipment:	3 D6 dozers, 3 mechanical loaders, 3 rollers, 2 graders, 4 mobile cranes, 3 water bowsers, 2 compressors, 1 low loader, 1 diesel generator, 2 welding machines, 12 dump trucks, 6 tipper trucks.
Value of Work:	YR 10-15 million.
Type of Work:	Marine and general public works contractors.
Typical Contracts:	Hodeidah Port Berth No. 4 - YR 12 million. Salif Port Jetty No. 3 - YR 3 million. Foundations for cement site at Salif. - YR 2.5 million Ras Hab Katbadhib Port - Pontoon Jetty. Hodeidah Port transit sheds and prefabricated housing. Water reservoir at Mocca. Dairy and Juice factory and Cold Store for other group companies.

Interview 17

Financial:	Strong financial position since backed by Group. Accounts with Yemen Bank and Bank de l'Indochine et de Suez. Finance, bonds and guarantees are not a problem. Can supply materials from associated factory in Dubai. Normally pay cash local suppliers, but sometimes obtain credit from external suppliers. Mobilisation payments of 15 per cent on Port job. Private clients settle progress payments promptly, but delays up to 2-3 months on Government jobs.
Problems:	None. Can even bring in foreign specialist workers (welders, etc.) as necessary.
Remarks:	Company has considerable technical, financial and physical resources, and has a good reputation for prompt completion of work. For example, the YR 12 million Berth No. 4 at Hodeidah Port was completed in less than a year.

Interview 13

Saif Smaeel Saied

Address:	P.O. Box 4093, Taiz.
Description:	Sole proprietor.
Established:	1958.
Nationality:	YAR.
Manager:	Saif Smaeel Saied.
Management:	5 currently (previously 20 when workload higher).
Skilled Labour:	60 currently (previously 200 when workload higher).
Unskilled Labour:	40 currently (previously 100 when workload higher).
Labour Availability:	No problem currently.
Equipment:	2 concrete mixers, 2 tipper trucks (can hire other plant as needed).
Value of Work:	10 million YR in 1980 (15 million YR in 1979, 20 million YR in 1978).
Type of Work:	General building construction and sewerage works.
Typical Contracts:	Municipality building (1978) - YR 1.5 million. House for private client - YR 0.3 million. (14 separate contracts during 1980).
Financial:	Has account with Bank de l'Indochine et de Suez and can obtain loans using land/buildings as collateral. Can also obtain bonds/guarantees, but bank requires 100 per cent financial backing which depletes working capital. Does not currently carry insurance since a claim in the previous year was not satisfactorily settled. Sometimes imports directly, but usually buys from local suppliers. Suppliers used to allow generous credit terms, but now require cash or maximum 20 days credit. Does

Interview 13

not obtain mobilisation advances, in view of cost of obtaining guarantees. Good payment experience with Municipality and private clients, but Government slower.

Problems: Lack of work. Indian, Chinese and other foreign contractors compete unfairly due to lower labour costs. According to Mr. Saied, foreign skilled workers receive a daily wage of YR 45 (Yemenis YR 200-250) and unskilled workers YR 15 (Yemenis YR 70). He believes foreign contractors should be required to hire more local people.

Remarks: Mr. Saied, stated that he was in favour of Contractor's Association and would welcome technical and management assistance (local or foreign). In the opinion of the interviewer, stated turnover and skilled labour force figures are somewhat inflated.

Interview 13

Yemeni Tadamin Company for Contracting and Engineering

Address:	Zubiri Street, Sana'a.
Description:	General building contractor.
Established:	1969.
Nationality:	YAR.
Manager:	Abdul Rahman Ali Al-Ademi.
Management Staff:	4 (1 engineer, 3 supervisors).
Skilled Labour:	40.
Unskilled Labour:	120.
Labour Availability:	Difficult to recruit skilled craftsmen.
Equipment:	1 excavator, 1 mechanical loader, 7 concrete mixers, 3 heavy trucks, 3 pick-ups.
Value of Work:	YR 15 million.
Type of Work:	Reinforced concrete and stone buildings.
Typical Contracts:	Two private sector office buildings.
Financial:	Equity capital YR 3 million. Has good credit rating with Yemen Bank.
Problems:	Severe shortage of qualified skilled workers.
Remarks:	Rated as a First Class contractor by Project Implementation Unit, Ministry of Education.

Interview 20

Yaseen Abdullah Al Ademi

Address:	Sana'a.
Description:	Sole proprietor.
Established:	1977.
Nationality:	YAR.
Manager:	Mr. Yaseen Abdullah Al Ademi.
Management Staff:	2 (1 engineer and 1 supervisor).
Skilled Labour:	20.
Unskilled Labour:	100.
Labour Availability:	No problem.
Equipment:	3 concrete mixers; 4 vibrators; 2 generating sets; 3 tipper trucks; 2 pick-ups.
Value of Work:	YR 3 million.
Type of Work:	General works and subcontracting works.
Typical Contracts:	No information.
Financial:	Equity capital YR 1 million. Account with Yemen Bank, which covers general banking needs. Has general insurance cover. Mobilisation advances 20 per cent. Progress payments monthly.
Problems:	See main report for problems generally applicable to construction industry in YAR.
Remarks:	Rated as a Third Class contractor by Project Implementation Unit, Ministry of Education.

Interview 21

Saleh Ali Al Garady

Address:	Sana'a - near Kuwait Hospital.
Description:	Sole proprietor.
Established:	1971.
Nationality:	YAR.
Manager:	Mr. Saleh Ali Al Garady.
Management Staff:	3 (1 engineer and 2 supervisors).
Skilled Labour:	20-30
Unskilled Labour:	30-100
Labour Availability:	No problem.
Equipment:	1 crane; 3 concrete mixers; 2 generating sets; 2 tipper trucks; 4 pick-ups.
Value of Work:	YR 6 million.
Type of Work:	General contracting and subcontracting.
Typical Contracts:	No information.
Financial:	Equity capital YR 1.6 million. Account with Yemen Bank, which covers general banking needs. Has general insurance cover. Mobilisation advances 20 per cent. Progress payments monthly.
Problems:	See main report for problems generally applicable to construction industry in YAR.
Remarks:	Rated as a Third Class contractor by Project Implementation Unit, Ministry of Education.

Interview 22

Gaber Al-Hamadani

Address:	Sana'a.
Description:	Sole proprietor.
Established:	1974.
Nationality:	YAR.
Manager:	Mr. Gaber Al-Hamadani.
Management Staff:	3 supervisors.
Skilled Labour:	20.
Unskilled Labour:	100.
Labour Availability:	No problem.
Equipment:	1 crane; 3 concrete mixers; 2 vibrators; 2 tipper trucks; 4 pick-ups.
Value of Work:	YR 6 million.
Type of Work:	General Contractor.
Typical Contracts:	No information.
Financial:	Capital YR 1.5 million. Account with Yemen Bank, which covers general banking needs. Has general insurance cover. Mobilisation advances 20 per cent. Progress payments monthly.
Problems:	See main report for problems generally applicable to construction industry in YAR.
Remarks:	Rated as a Third Class contractor by Project Implementation Unit, Ministry of Education.

Interview 23

Al Towaiti National Construction and Engineering Corporation

Address:	Kiada St., Sana'a.
Description:	General contractor.
Established:	1977.
Nationality:	YAR.
Manager:	Hamood Kaied Al Towaiti.
Management Staff:	12 (2 engineers, 10 supervisors).
Skilled Labour:	80.
Unskilled Labour:	120.
Labour Availability:	No problem.
Equipment:	3 mobile cranes, 2 loaders, 2 bulldozers, 13 concrete mixers, 10 heavy trucks, 3 pick-ups.
Value of Work:	YR 25 million.
Type of Work:	General building construction, mainly for private sector.
Typical Contracts:	Residential housing.
Financial:	Equity capital YR 8,513,000. Credit available from Yemen Bank.
Problems:	Current lack of projects.
Remarks:	Rated as a Second Class contractor by Project Implementation Unit, Ministry of Education. Has good reputation for completing work on schedule.

Interview 24

Hezzam Abdullah Al Towaiti

Address:	Sana'a - Sho'ob.
Description:	Sole proprietor.
Established:	1973.
Nationality:	YAR.
Manager:	Mr. Hezzam Abdullah Al Towaiti.
Management Staff:	4 (1 engineer and 3 supervisors).
Skilled Labour:	20.
Unskilled Labour:	100.
Labour Availability:	No problem.
Equipment:	1 crane; 3 concrete mixers; 2 vibrators; 5 generating sets; 3 tipper trucks; 2 pick-ups.
Value of Work:	YR 6 million.
Type of Work:	Contractor and subcontractor specialising in stone work.
Typical Contracts:	No information.
Financial:	Equity capital YR 5 million. Account with Yemen Bank, which covers general banking needs. Has general insurance cover. Mobilisation advances 20 per cent. Progress payments monthly.
Problems:	See main report for problems generally applicable to construction industry in YAR.
Remarks:	Rated as a Third Class contractor by Project Implementation Unit, Ministry of Education.

Interview 25

Abdul Kadeir Al Yademi

Address:	Taiz - Gamal Street, Sana'a.
Description:	Sole proprietor.
Established:	1977.
Nationality:	YAR.
Manager:	Mr. Abdul Kadeir Al-Yademi.
Management Staff:	2 supervisors.
Skilled Labour:	10.
Unskilled Labour:	50.
Labour Availability:	No problem.
Equipment:	4 cranes; 2 concrete mixers; 1 vibrator; 1 tipper truck; 4 pick-ups.
Value of Work:	YR 3 million.
Type of Work:	General contracting works.
Typical Contracts:	No information.
Financial:	Capital YR 300,000. Account with Yemen Bank, which covers general banking needs. Has general insurance cover. Mobilisation advances 20 per cent. Progress payments monthly.
Problems:	See main report for problems generally applicable to construction industry in YAR.
Remarks:	Rated as a Third Class contractor by Project Implementation Unit, Ministry of Education.

Interview 26

Engineering Office for Contracting and Engineering

Address:	Sana'a Street, Hodeidah.
Description:	Family business.
Established:	1975.
Nationality:	YAR.
Manager:	Mr. Mohamed Redmaan Mohamed.
Management Staff:	4 (2 engineers and 2 supervisors).
Skilled Labour:	16.
Unskilled Labour:	100.
Labour Availability:	No problem.
Equipment:	2 concrete mixers; 1 vibrator; 4 generators; 3 tipper trucks; 7 pick-ups.
Value of Work:	YR 10 million.
Type of Work:	General contractor.
Typical Contracts:	No information.
Financial:	Equity capital YR 6 million. Account with Yemen Bank, which covers general banking needs. Has general insurance cover. Mobilisation advances 20 per cent. Progress payments monthly.
Problems:	See main report for problems generally applicable to construction industry in YAR.
Remarks:	Rated as a Third Class contractor by Project Implementation Unit, Ministry of Education.

Interview 27

Gaar Allah Ferdan

Address:	Sada'a.
Description:	Sole proprietor.
Established:	1975.
Nationality:	YAR.
Manager:	Gaar Allah Ferdan.
Management Staff:	5 supervisors.
Skilled Labour:	20.
Unskilled Labour:	60.
Labour Availability:	Available when needed.
Equipment:	3 mobile cranes, 1 loader, 3 concrete mixers, 8 heavy trucks, 5 pick-ups.
Value of Work:	YR 10 million.
Type of Work:	Reinforced concrete frame and stone buildings, particularly private residential accommodation.
Typical Contracts:	Office building. Four large residences for private clients.
Financial:	Equity capital YR 3 million. No problems in obtaining loans.
Problems:	Insufficient work at present. Many of the small projects are now going to the foreign contractors.
Remarks:	Rated as a Second Class contractor by Project Implementation Unit, Ministry of Education.

Interview 28

Abdul Bari Al Khamry and Mohamed Haiel Osman

Address:	Hadda Street, Sana'a.
Description:	Partnership.
Established:	1974.
Nationality:	YAR.
Manager:	Mr. Abdul Bari Al Khamry.
Management Staff:	5 supervisors.
Skilled Labour:	25.
Unskilled Labour:	80.
Labour Availability:	No problem.
Equipment:	1 mechanical loader; 1 crane; 1 c[illegible]tor; 2 generator sets; 4 concrete mixers, 3 vibrators; 4 tipper trucks; 3 pick-ups.
Value of Work:	YR 5 million.
Type of Work:	General building construction.
Typical Contracts:	No information.
Financial:	Equity capital YR 2 million. Account with Yemen Bank, which covers foreign exchange needs and provides performance bonds. The contractor has general insurance cover. Mobilisation payments of 20 per cent are available, and progress payments are made monthly.
Problems:	See main report for problems generally applicable to construction industry in YAR.
Remarks:	Rated as a Third Class contractor by Project Implementation Unit, Ministry of Education.

Interview 29

Mansour Ali Mohamed and Ahmed Osman Kassim

Address:	Sana'a - Al Kaa'a.
Description:	Partnership.
Established:	1975.
Nationality:	YAR.
Manager:	Mr. Mansour Ali Mohamed Al Asbahi.
Management Staff:	2 supervisors.
Skilled Labour:	16.
Unskilled Labour:	20.
Labour Availability:	No problem.
Equipment:	4 cranes; 8 concrete mixers; 6 vibrators; 5 generating sets; 8 tipper trucks; 6 pick-ups.
Value of Work:	YR 4 million.
Type of Work:	General work and subcontracting.
Typical Contracts:	No information.
Financial:	Equity capital YR 1 million. Account with Yemen Bank which covers general banking needs. Has general insurance cover. Mobilisation advances 20 per cent. Progress payments monthly.
Problems:	See main report for problems generally applicable to construction industry in YAR.
Remarks:	Rated as a Third Class contractor by Project Implementation Unit, Ministry of Education.

Interview 30

Abdulla Raweh

Address:	Sana'a Gamal Street, Sana'a.
Description:	Sole proprietor.
Established:	1975.
Nationality:	YAR.
Manager:	Mr. Abdulla Raweh.
Management Staff:	8 (1 engineer and 7 supervisors).
Skilled Labour:	30.
Unskilled Labour:	140.
Labour Availability:	No problem.
Equipment:	1 rock crusher; 1 mechanical loader; 3 generating sets; 7 concrete mixers; 6 vibrators; 8 tipper trucks; 4 pick-ups.
Value of Work:	YR 20 million.
Type of Work:	General public works contractor.
Typical Contracts:	No information.
Financial:	Equity capital YR 4 million. Accounts with Yemen Bank and Arab Bank, which covers foreign exchange needs and provides performance bonds. Contractor has general insurance cover. Mobilisation advances of 20 per cent are available, and progress payments are made monthly.
Problems:	See main report for problems generally applicable to construction industry in YAR.
Remarks:	Rated as a Third Class contractor by Project Implementation Unit, Ministry of Education.

Interview 31

Abdullah Osman Soliman

Address:	Sana'a - Beer Al Shaaief.
Description:	Sole proprietor.
Established:	1975.
Nationality:	YAR.
Manager:	Mr. Abdullah Osman Soliman.
Management Staff:	3 (1 engineer and 2 supervisors).
Skilled Labour:	34.
Unskilled Labour:	80.
Labour Availability:	No problem.
Equipment:	1 crane; 2 concrete mixers; 3 vibrators; 2 tipper trucks; 3 pick-ups.
Value of Work:	YR 5 million.
Type of Work:	General contractor and subcontractor specialising in stone work.
Typical Contracts:	No information.
Financial:	Equity capital YR 1 million. Account with Yemen Bank, which covers general banking needs. Has general insurance cover. Mobilisation advances 20 per cent. Progress payments monthly.
Problems:	See main report for problems generally applicable to construction industry in YAR.
Remarks:	Rated as a Third Class contractor by Project Implementation Unit, Ministry of Education.

Interview 32

Kaied Ahmed and Abdulla Hassan

Address:	Sana'a.
Description:	Partnership.
Established:	1978.
Nationality:	YAR.
Manager:	Mr. Kaied Ahmed.
Management Staff:	2 supervisors.
Skilled Labour:	5.
Unskilled Labour:	30.
Labour Availability:	No problems.
Equipment:	1 concrete mixer; 2 tipper trucks; 3 pick-ups.
Value of Work:	YR 2 million.
Type of Work:	Small contracting and subcontracting work.
Typical Contracts:	No information.
Financial:	Equity capital YR 1 million. Account with Yemen Bank which covers general banking needs. No insurance cover. Contract payment arrangements vary.
Problems:	See main report for problems generally applicable to construction industry in YAR.
Remarks:	Rated as a Third Class contractor by Project Implementation Unit, Ministry of Education.

Interview 33

Abdul Wasee Ahmed Al Asbahi

Address:	Bostaan Al Sahtaan, Sana'a.
Description:	Sole proprietor.
Established:	1974.
Nationality:	YAR.
Manager:	Mr. Abdul Wasee Ahmed Al Asbahi.
Management Staff:	3 supervisors.
Skilled Labour:	10.
Unskilled Labour:	30.
Labour Availability:	No problem.
Equipment:	2 concrete mixers; 2 vibrators; 1 tipper truck; 1 pick-up.
Value of Work:	YR 2 million.
Type of Work:	Small and subcontracting work.
Typical Contracts:	No information.
Financial:	Equity capital YR 400,000. Account with Arab Bank which covers general banking needs. No insurance cover. Mobilisation advances 20 per cent. Progress payments monthly.
Problems:	See main report for problems generally applicable to construction industry in YAR.
Remarks:	Rated as a Third Class contractor by Project Implementation Unit, Ministry of Education.

Interview 34

Ali Kaied Abdullah Al Asbahi

Address:	P.O. Box 4952, Taiz.
Description:	Sole proprietor.
Established:	1978.
Nationality:	YAR.
Manager:	Mr. Ali Kaied Abdullah.
Management Staff:	2 (1 engineer and 1 supervisor).
Skilled Labour:	6.
Unskilled Labour:	9.
Labour Availability:	No problem.
Equipment:	1 concrete mixer; 1 vibrator; 1 generating set; 1 tipper truck; 1 pick-up.
Value of Work:	YR 2.5 million.
Type of Work:	Small and subcontracting work.
Typical Contracts:	No information.
Financial:	Equity capital YR 2 million. Account with Yemen Bank which covers general banking needs. No insurance cover. Contract payment arrangements vary.
Problems:	See main report for problems generally applicable to construction industry in YAR.
Remarks	Rated as a Third Class contractor by Project Implementation Unit, Ministry of Education.

Interview 35

Mohamed Ahmed Galib Al Asbahi

Address:	Hodeidah - Gamal Street.
Description:	Sole proprietor.
Established:	1976.
Nationality:	YAR.
Manager:	Mr. Mohamed Ahmed Galib Al Asbahi.
Management Staff:	4 supervisors.
Skilled Labour:	27.
Unskilled Labour:	50.
Labour Availability:	No problem.
Equipment:	2 cranes; 3 concrete mixers; 2 vibrators; 2 generating sets; 6 tipper trucks; 4 pick-ups.
Value of Work:	YR 4 million.
Type of Work:	General contracting work.
Typical Contracts:	No information.
Financial:	Equity capital YR 2 million. Account with Yemen Bank which covers general banking needs. No insurance cover. Contract payment arrangements vary.
Problems:	See main report for problems generally applicable to construction industry in YAR.
Remarks:	Rated as a Third Class contractor by Project Implementation Unit, Ministry of Education.

Interview 36

Mohamed Saleh Al Baari

Address:	P.O. Box 53, Sana'a.
Description:	Sole proprietor.
Established:	1979.
Nationality:	YAR.
Manager:	Mr. Mohamed Saleh Al Baari.
Management Staff:	2 supervisors.
Skilled Labour:	5.
Unskilled Labour:	25.
Labour Availability:	No problem.
Equipment:	2 concrete mixers; 1 tipper truck; 2 pick-ups.
Value of Work:	YR 2 million.
Type of Work:	Small contracting work and subcontracting work.
Typical Contracts:	No information.
Financial:	Equity capital YR 400,000. Account with Yemen Bank which covers general banking needs. No insurance cover. Contract payment arrangements vary.
Problems:	See main report for problems generally applicable to construction industry in YAR.
Remarks:	Rated as a Third Class contractor by Project Implementation Unit, Ministry of Education.

Interview 37

Ali Hamood Al-Khawlani

Address:	Sana'a
Description:	Sole proprietor.
Established:	1979.
Nationality:	YAR.
Manager:	Mr. Ali Hamood Al-Khawlani.
Management Staff:	2 supervisors.
Skilled Labour:	8.
Unskilled Labour:	15.
Labour Availability:	No problem.
Equipment:	1 tipper truck; 1 pick-up.
Value of Work:	YR 1.5 million.
Type of Work:	Subcontracting work.
Typical Contracts:	No information.
Financial:	Equity capital YR 1 million. Account with Yemen Bank, which covers general banking needs. No insurance cover. Contract payment arrangements vary.
Problems:	See main report for problems generally applicable to construction industry in YAR.
Remarks:	Rated as a Third Class contractor by Project Implementation Unit, Ministry of Education.

Interview 38

Abdulla Al Kibssi

Address:	Agricultural Street, Sana'a.
Description:	Sole proprietor.
Established:	1976.
Nationality:	YAR.
Manager:	Mr. Abdulla Al Kibssi.
Management Staff:	4 supervisors.
Skilled Labour:	20.
Unskilled Labour:	40.
Labour Availability:	No problem.
Equipment:	1 mechanical loader; 3 concrete mixers; 2 vibrators; 1 generating set; 3 tipper trucks; 2 pick-ups.
Value of Work:	YR 3 million.
Type of Work:	General and subcontracting work.
Typical Contracts:	No information.
Financial:	Equity capital YR 500,000. Account with Yemen Bank which covers general banking needs. No insurance cover. Contract payment arrangements vary.
Problems:	See main report for problems generally applicable to construction industry in YAR.
Remarks:	Rated as a Third Class contractor by Project Implementation Unit, Ministry of Education.

Interview 39

Mohamed Ali Al Odeel

Address:	P.O. Box 2132, Sana'a.
Description:	Sole proprietor.
Established:	1978.
Nationality:	YAR.
Manager:	Mr. Mohamed Ali Al Odeel.
Management Staff:	2 supervisors.
Skilled Labour:	18.
Unskilled Labour:	30.
Labour Availability:	No problems.
Equipment:	2 concrete mixers: 2 vibrators; 2 generating sets: 1 tipper truck; 2 pick-ups.
Value of Work:	YR 4.5 million.
Type of Work:	Small contracting jobs and subcontracting work.
Typical Contracts:	No information.
Financial:	Equity capital YR 4.5 million. Account with Yemen Bank which covers general banking needs. Has general insurance cover. Mobilisation advances 20 per cent. Progress payments monthly.
Problems:	See main report for problems generally applicable to construction industry in YAR.
Remarks:	Rated as a Third Class contractor by Project Implementation Unit, Ministry of Education.

Interview 40

Farwan Office for Contracting

Address:	Ring Road Street, Sana'a.
Description:	Family business.
Established:	1977.
Nationality:	YAR.
Manager:	Mr. Mohamed Ali Farwan.
Management Staff:	3 (1 engineer and 2 supervisors).
Skilled Labour:	5.
Unskilled Labour:	20.
Labour Availability:	No problem.
Equipment:	1 mechanical loader; 4 concrete mixers; 10 vibrators; 4 generating sets: 3 tipper trucks; 2 pick-ups.
Value of Work:	YR 3 million.
Type of Work:	General and subcontracting work.
Typical Contracts:	No information.
Financial:	Equity capital YR 2 million. Account with Yemen Bank which covers general banking needs. No insurance cover. Contract payment arrangements vary.
Problems:	See main report for problems generally applicable to construction industry in YAR.
Remarks:	Rated as a Third Class constructor by Project Implementation Unit, Ministry of Education.

Interview 41

Taha Thabit Haiedr

Address:	Sana'a - Bab Al-Sharai.
Description:	Sole proprietor.
Established:	1967.
Nationality:	YAR.
Manager:	Mr. Taha Thabit Haiedr.
Management Staff:	2 supervisors.
Skilled Labour:	20.
Unskilled Labour:	40.
Labour Availability:	No problem.
Equipment:	1 crusher; 1 concrete mixer; 1 vibrator; 1 tipper truck; 1 pick-up.
Value of Work:	YR 3 million.
Type of Work:	General contractor.
Typical Contracts:	No information.
Financial:	Equity capital YR 1.4 million. Account with Yemen Bank which covers general banking needs. No insurance cover. Contract payment arrangements vary.
Problems:	See main report for problems generally applicable to construction industry in YAR.
Remarks:	Rated as a Third Class contractor by Project Implementation Unit, Ministry of Education.

Interview 42

Mohamed Saief Hidara

Address:	P.O. Box 4352, Taiz.
Description:	Sole proprietor.
Established:	1978.
Nationality:	YAR.
Manager:	Mr. Mohamed Saief Hidara.
Management Staff:	3 supervisors.
Skilled Labour:	10.
Unskilled Labour:	25.
Labour Availability:	No problem.
Equipment:	2 crushers; 4 concrete mixers; 5 tipper trucks; 6 pick-ups.
Value of Work:	YR 3 million.
Type of Work:	General contractor specialising in tiling.
Typical Contracts:	No information.
Financial:	Equity capital YR 1 million. Account with Yemen Bank which covers general banking needs. No insurance cover. Contract payment arrangements vary.
Problems:	See main report for problems generally applicable to construction industry in YAR.
Remarks:	Rated as a Third Class contractor by Project Implementation Unit, Ministry of Education.

Interview 43

Yehia Amer Kaied

Address:	Sana'a.
Description:	Sole proprietor.
Established:	1977.
Nationality:	YAR.
Manager:	Mr. Mohamed Amer Kaied.
Management Staff:	1 supervisor.
Skilled Labour:	5.
Unskilled Labour:	20.
Labour Availability:	No problem.
Equipment:	1 concrete mixer; 1 vibrator; 1 tipper truck; 1 pick-up.
Value of Work:	YR 3 million.
Type of Work:	Small contracting and subcontracting works.
Typical Contracts:	No information.
Financial:	Equity capital YR 1 million. Account with Yemen Bank which covers general banking needs. No insurance cover. Contract payment arrangements vary.
Problems:	See main report for problems generally applicable to construction industry in YAR.
Remarks:	Rated as a Third Class contractor by Project Implementation Unit, Ministry of Education.

Interview 44

Mohamed Kaied and Omar Ahmed Abad

Address:	Bab Al-Salam, Sana'a.
Description:	Partnership.
Established:	1977.
Nationality:	YAR.
Manager:	Mr. Mohamed Kaied.
Management Staff:	1 engineer.
Skilled Labour:	5.
Unskilled Labour:	20.
Labour Availability:	No problem.
Equipment:	3 concrete mixers; 1 generating set; 2 tipper trucks; 2 pick-ups.
Value of Work:	YR 2 million.
Type of Work:	Small and subcontracting work.
Typical Contracts:	No information.
Financial:	Equity capital YR 500,000. Account with Yemen Bank which covers general banking needs. No insurance cover. Contract payment arrangements vary.
Problems:	See main report for problems generally applicable to construction industry in YAR.
Remarks:	Rated as a Third Class contractor by Project Implementation Unit, Ministry of Education.

Interview 46

Fath Hatem Mosleh

Address:	Sana'a
Description:	Sole proprietor.
Established:	1977.
Nationality:	YAR.
Manager:	Mr. Fath Hatem Mosleh.
Management Staff:	2 supervisors.
Skilled Labour:	20.
Unskilled Labour:	50.
Labour Availability:	No problem.
Equipment:	1 compactor; 4 concrete mixers; 5 vibrators; 2 tipper trucks; 2 pick-ups.
Value of Work:	YR 2.5 million.
Type of Work:	Small and subcontracting works.
Typical Contracts:	No information.
Financial:	Equity capital YR 2 million. Account with Yemen Bank which covers general banking needs. No insurance cover. Contract payment arrangements vary.
Problems:	See main report for problems generally applicable to construction industry in YAR.
Remarks:	Rated as a Third Class contractor by Project Implementation Unit, Ministry of Education.

Interview 45

Amein Yassien Khalib

Address:	Wadi Dhahr Street, Sana'a.
Description:	Sole proprietor.
Established:	1979.
Nationality:	YAR.
Manager:	Mr. Amein Yassien Khalib.
Management Staff:	3 (1 engineer and 2 supervisors).
Skilled Labour:	10.
Unskilled Labour:	30.
Labour Availability:	No problem.
Equipment:	1 concrete mixer; 1 tipper truck.
Value of Work:	YR 2 million.
Type of Work:	Small contracting and subcontracting works.
Typical Contracts:	No information.
Financial:	Equity capital YR 500,000. Account with Yemen Bank which covers general banking needs. No insurance cover. Contract payment arrangements vary.
Problems:	See main report for problems generally applicable to construction industry in YAR.
Remarks:	Rated as a Third Class contractor by Project Implementation Unit, Ministry of Education.

Interview 47

Nasher Engineering Office

Address:	P.O. Box 2254, Sana'a.
Description:	Family business.
Established:	1979.
Nationality:	YAR.
Manager:	Mr. Abdul Baki Nasher.
Management Staff:	1 engineer and 2 supervisors.
Skilled Labour:	15.
Unskilled Labour:	30.
Labour Availability:	No problem.
Equipment:	1 mechanical loader; 1 compactor; 1 concrete mixer; 1 generating set; 2 pick-ups.
Value of Work:	YR 2 million.
Type of Work:	General builder and surveying specialists.
Typical Contracts:	No information.
Financial:	Equity capital YR 1.5 million. Account with Yemen Bank which covers general banking needs. No insurance cover. Contract payment arrangements vary.
Problems:	See main report for problems generally applicable to construction industry in YAR.
Remarks:	Rated as a Third Class contractor by Project Implementation Unit, Ministry of Education.

Interview 48

Union Contracting Company

Address:	Al-Dabona Street Taiz.
Description:	General contractor.
Established:	1956.
Nationality:	YAR.
Manager:	Abdul Rakeed Saeed.
Management Staff:	23 (3 engineers, 3 supervisors, 10 foremen, 1 senior accountant and 6 clerks).
Skilled Labour:	100.
Unskilled Labour:	200.
Labour Availability:	Able to hire both skilled and unskilled labour as required.
Equipment:	1 motor grader, 1 bulldozer, 2 loaders, 1 large concrete mixer, 2 water bowsers, 10 heavy trucks, 3 pick-ups.
Value of Work:	YR 2 million.
Type of Work:	Airport runways and paving.
Typical Contracts:	Taxi ways and hardstanding at Taiz Airport.
Financial:	Equity capital YR 3 million. Has serious financial problems as a result of having failed to complete a major Public Works project.
Problems:	Due to the above failure, the company cannot currently bid for further public works projects. Government has impounded all equipment.
Remarks:	Was rated as a first class contractor by Project Implementation Unit, Ministry of Education. However, due to current problems this rating has been withdrawn.

Interview 40

Abdul Malik Mujahid Crushers

Address:	P.O. Box 337, Sana'a.
Description:	Rock crushing business.
Established:	1963.
Nationality:	YAR.
Manager:	Abdul Rahman Ahd Abdella (YAR).
Management Staff:	2 (1 engineer, 1 accountant).
Skilled Labour:	5.
Unskilled Labour:	24.
Labour Availability:	Experienced heavy equipment operators not readily available.
Equipment:	2 - 36 x 42 crushers, 1 crane. 3 - 200 KVA generators, 6 loaders, bulldozers, 1 service truck.
Value of Work:	YR 750,000 per month.
Type of Work:	Quarry and rock crusher.
Financial:	No problems.
Problems:	Have to maintain a very large inventory of spare parts, due to the long delays encountered in receiving overseas shipments.
Remarks:	The rock in the Sana'a area is unusually soft and can be ripped and bulldozed, so no explosives are required to extract rock from the quarry. All equipment was in excellent condition and both crushers were operating at full capacity.

Interview 30

Yoein Industrial Establishment

Address:	P.O. Box 1709, Sana'a.
Description:	Aluminum fabricator.
Established:	1979.
Nationality:	YAR.
Manager:	Abdul Ihanim Al Rub.
Management Staff:	2.
Skilled Labour:	7.
Unskilled Labour:	1.
Labour Availability:	No problem.
Equipment:	Pneumatic power tools and jigs imported from Italy.
Value of Work:	YR 100,000 per month.
Type of Work:	Fabricating aluminum window and door units.
Typical Contracts:	Units for single houses or small commercial buildings.
Financial:	No problems.
Problems:	Long delay in securing delivery of imported material.
Remarks:	Firm is quite new, and management appeared to lack experience necessary to ensure satisfactory levels of productivity and general maintenance of facilities. Work area is very confined, jigs in poor condition. It would be worthwhile to invest in pneumatic screwdrivers to take full advantage of power availability. General layout, however, was satisfactory. With limited technical assistance to improve methods and procedures, this could develop into a fully satisfactory productive enterprise.

Interview 31

Saeed Belpa - Jaru Industries Ltd.

Address:	P.O. Box 392, Sana'a.
Description:	Manufacturing and prefabrication of aluminium, fibreglass and timber products.
Established:	1979.
Nationality:	YAR/Indian joint venture.
Manager:	A. Sen Gupta (Indian).
Management Staff:	4.
Skilled Labour:	25 aluminium fabrication 30 fibreglass 55 woodworking.
Unskilled Labour:	None.
Labour Availability:	Recruits all labour from India.
Equipment:	In all operations the plant is equipped with the most advanced machinery available.
Value of Work:	Aluminium fabrication YR 500,000 per month. Fibreglass YR 5 million annually by end of 1981. Woodworking YR 3 to 5 million annually by end of 1981.
Type of Work:	1. Aluminium; prefabrication of first quality window and door units. 2. Fibreglass; moulding of water storage and septic tanks. Developing a line of sanitary fixtures. 3. Woodworking; fabricating window and door units. Developing a line of furniture.
Financial:	Hyel Saeed Aman Group is the YAR investor.
Problems:	Takes up to 6 months after order is placed before receiving delivery of imported material. No material available locally. YAR Government tries to force the company to hire local labour, but so far no suitable applicants have come forward to accept positions as trainees.
Remarks:	The company is well-organized, has excellent management and best available equipment and material. All products are of first quality.

Interview 32

YEFCO

Address:	Sana'a Industrial Estate, Sana'a.
Description:	Manufacturer of P.V.C. ceiling tile and plastic plumbing fixtures.
Established:	1979.
Nationality:	YAR/French joint venture.
Manager:	Faisal Shamson (YAR).
Management Staff:	3.
Skilled Labour:	8.
Unskilled Labour:	2.
Labour Availability:	No problem.
Equipment:	Manufacturing equipment supplied by French partner, Termatube.
Value of Work:	Not available.
Financial:	No information.
Problems:	The quality of the finished products was not satisfactory. Termatube, the supplier of the equipment, is in the process of modifying the machinery to improve the finish.
Remarks:	The sample fixtures brought from France appear satisfactory. If this quality can eventually be replicated locally, there should be a market for the products.

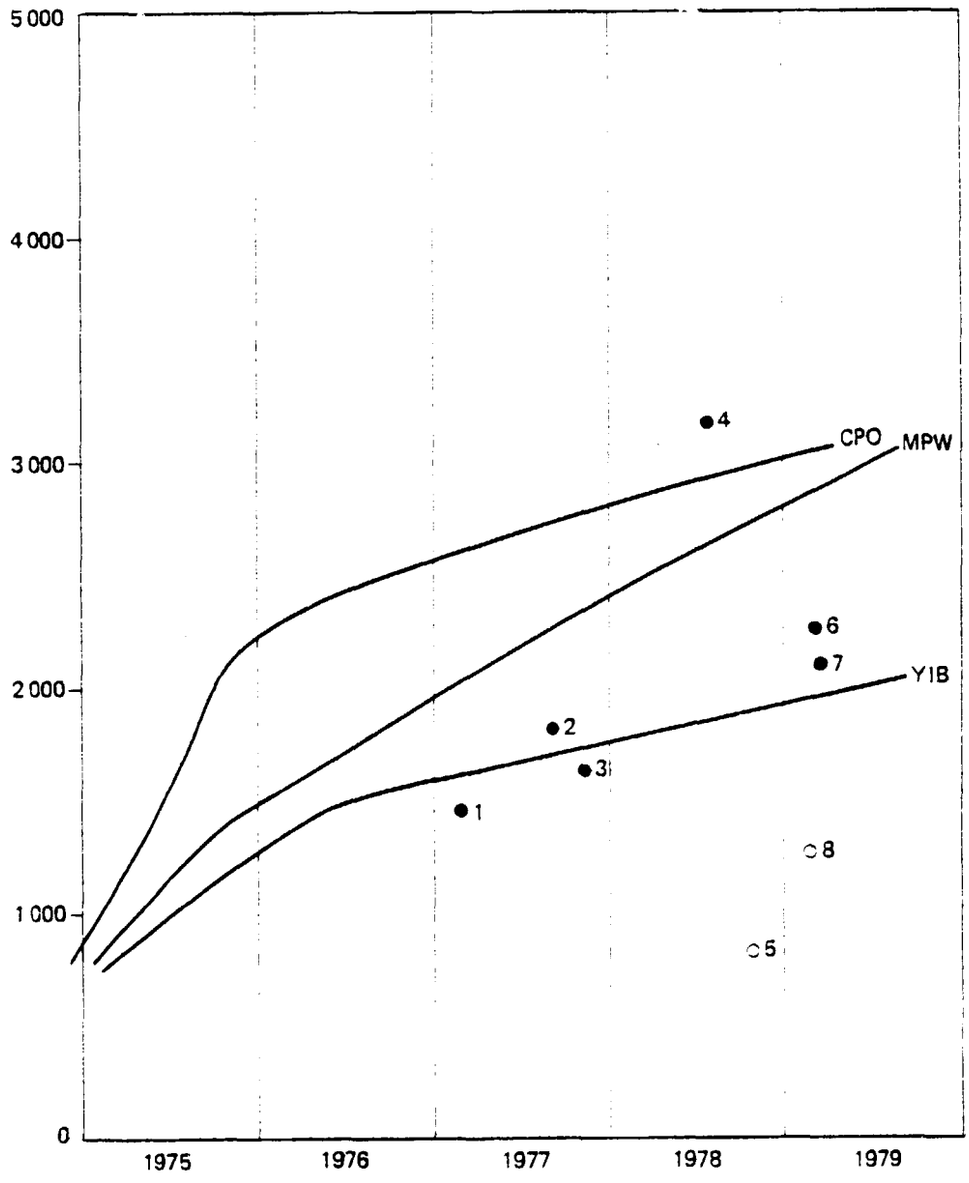
LOCAL YEMENI CONTRACTORS

1. Mohamed S. Hassounah
2. Abdel-Latif El-Rabia
3. Samirah G. Gamal
4. Abdalah M. El-Dimi
5. Mohamed A. El-Asbahi
6. Mohamed K. Own
7. Ahmed A. El-Dubai
8. Migahid A. Ra Gih
9. Abdalah O. Suliman
10. Gaber A. El-Hamadani
11. Ali S. El-Arasi
12. Mohamed S. Haidrah
13. Ahmed H. Al-Shakzah
14. Ahmed M. Al-Namrani
15. Mohamed H. Saad
16. National Institute for Construction and Development
17. Mohamed S. Taher
18. Nagi Y. Dain
19. Saleh A. El-Garadi
20. Mohamed S. El-Baagari
21. Ahmed G. Saad
22. Saleh S. Murshid
23. Yassin A. El-Adimi
24. Mohamed E. Abdel-Samad
25. Yassin S. El-Asbahi
26. Farwan Office for Contracting
27. Abdouh A. El-Asbahi
28. Mohamed A. El-Asbahi
29. Yihia M. Galab
30. Mohamed A. Shiban
31. Abdel-Migid M. Maktari
32. Abdouh A. Shagar and Mohamed Kaid
33. Mohamed O. Mohamed
34. Ahmed M. El-Zakary
35. Farouk A. El-Dubai
36. Amin Y. Galib
37. Ahmed M. Al-Samid
38. Abdalah S. El-Tuwaiti
39. Izi A. El-Barati
40. Mohamed M. El-Sanawy
41. Abdalah H. Awamis
42. Ahmed M. El-Mansoury
43. Abdel-Wahab El-Tuwaiti
44. Amin H. Ahmed and Partner
45. Abdel-Aziz El-Shawafi
46. Tuwaiti National Institute for Engineering and Contracting
47. Ahmed A. El-Asbahi
48. Ali A. El-Ariki and Brothers
49. Yassin Abdel-Malik
50. Ali A. Mufdil
51. Mohamed M. Mabkhouh
52. Ahmed A. El-Wardi
53. Technical Architectural Office
54. Ali A. Numan
55. Ahmed K. El-Sharagi

Source: MPW, November 1980

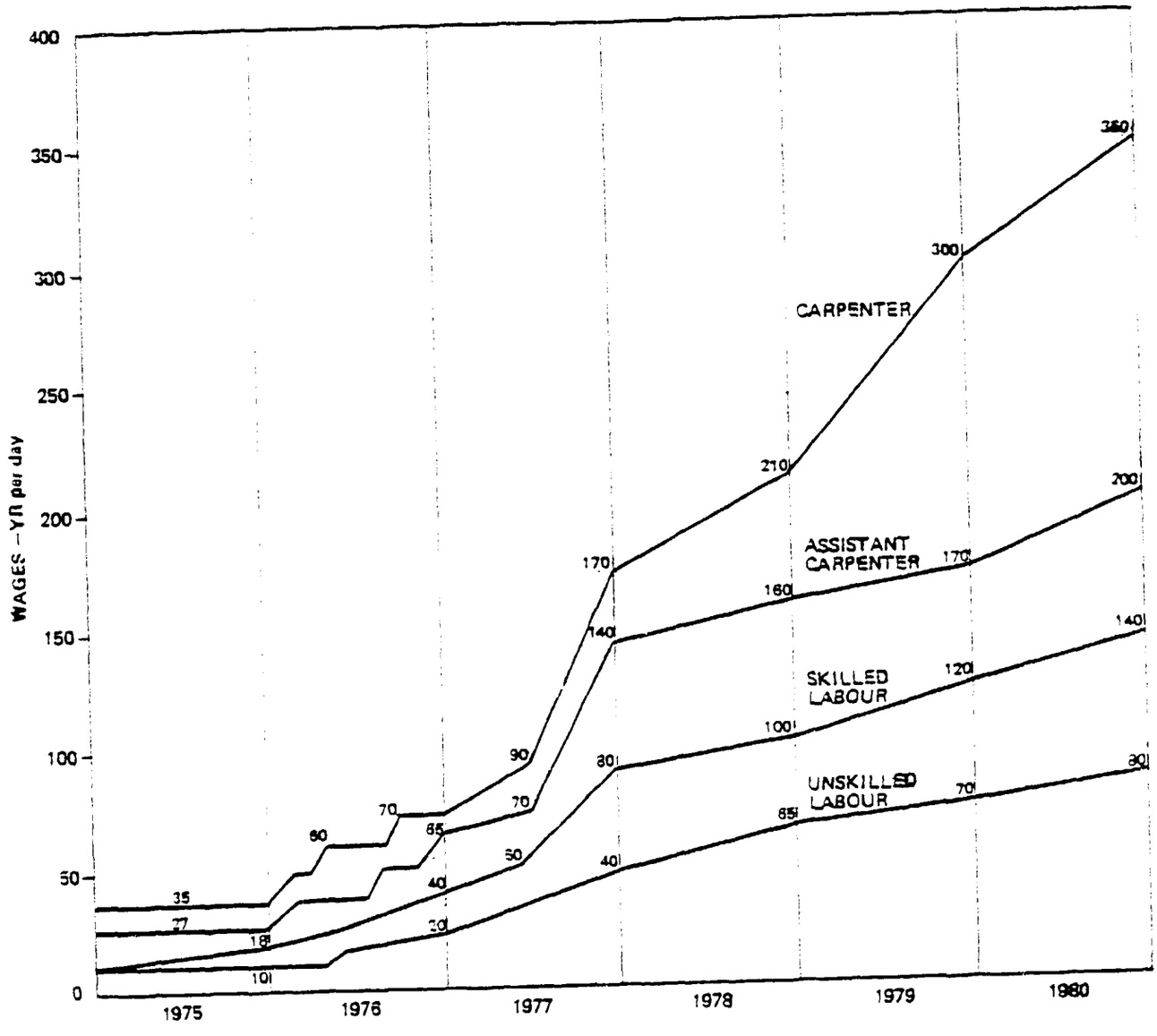
Table 1: Recent Construction Cost Trends (YR/square metre) Annex 10

Notes: Trend lines represent various estimates by Yemen Arab Republic Government sources. Dots represent actual bids (●), or estimates (○), of below average building costs: (1) Education project 1, (2) military housing (3) Al Hamdi New City, (4) large private building in Taiz, (5) an owner-built house in Hodeidah, (6) Professors' Housing Project (7) recent education project bid, (8) an owner-built house in Sana'a. In (5), the owner fabricated his own concrete blocks. In (3), the owner purchased concrete blocks at 3,700 YR/1,000 units, despite the fact that mud blocks were also available at YR/m² 1,200 YR/1,000.



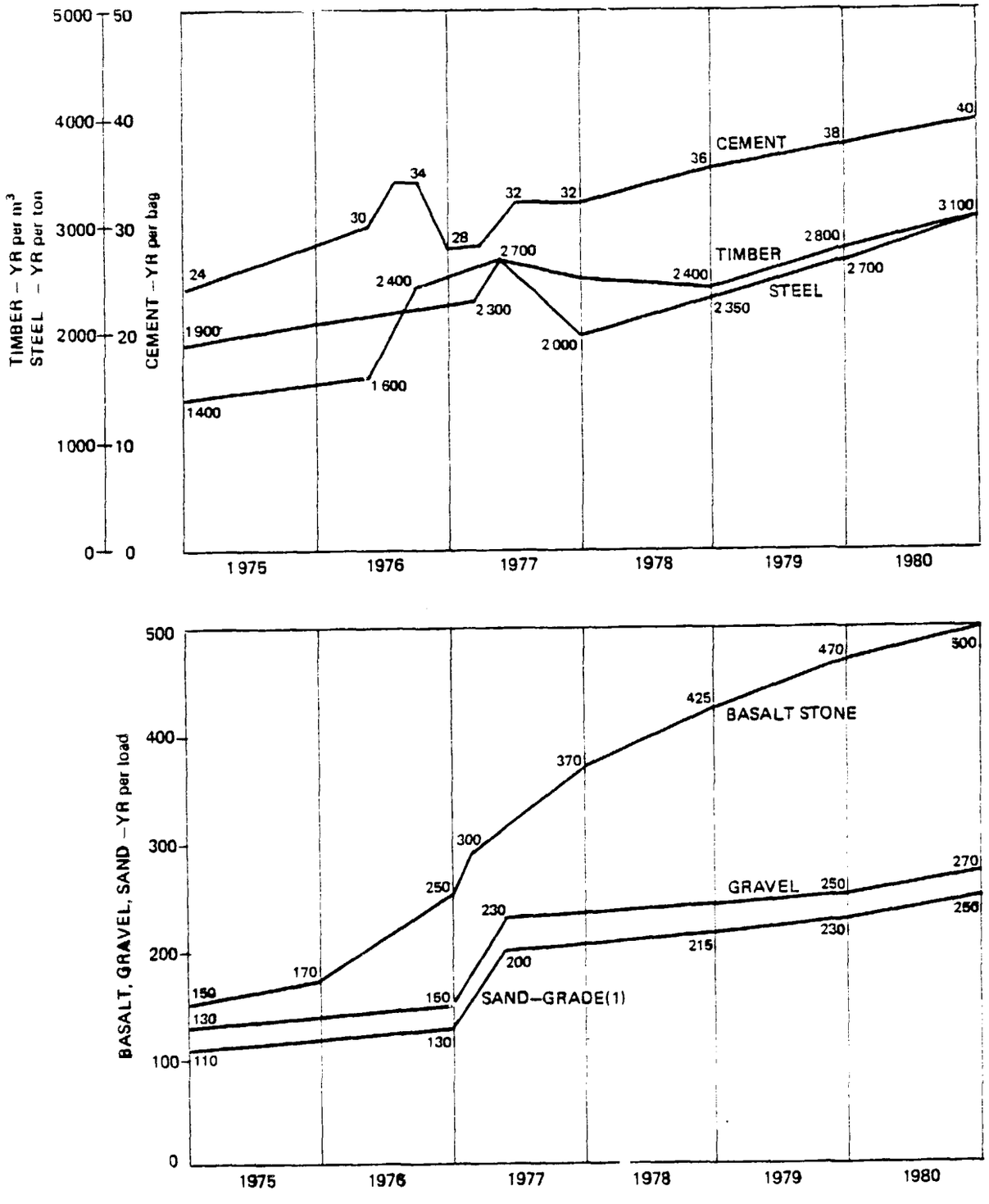
Source: Yemen Arab Republic, Urban Sector Report (World Bank, 1979).

Table 2: Examples of Labour Cost Escalation



Source: Analysis and Escalation of Cost of Building Materials and Labour in Yemen (PIU/MCE).

Table 3: Examples of Building Material Cost Increases



Source: Analysis and Escalation of Cost of Building Materials and Labour in Yemen (PIU/MOE).

BASIC RATES FOR LABOUR, PLANT AND MATERIALS IN THE YAR APRIL 1979 AND APRIL 1980

(EXTRACTED FROM BUILDERS PRICE BOOK, MPW, MAY 1980)

A. LABOUR

Category	Daily wages (YR)	
	April 1979	April 1980
1. Foreman	400	400
2. Craftsman	200	240
3. Semi skilled	160	180
4. Unskilled labour	60	80
5. Stone cutter (per stone)	6.5-10	7 - 10

B. PLANT AND EQUIPMENT

Item	Hourly charges (YR)	
	April 1979	April 1980
1. Dozen D8	268	620
2. Excavator	190	250
3. Crawler Tractor	95	250
4. Hydraulic Excavator 1/2 m^3	70	188
5. Grader	122	300
6. Wheel loader	170	285
7. 10t mobile crane	155	260
8. Roller 8/10 ton	48	185
9. Tipper 5 m^3	35	86
" 7 m^3	40	125
10. Concrete mixer (2 bag)	45	30
11. Water bowe (mobile)	36	70
12. Vibratory roller	30	150
" compactor	25	55
13. Compressor	65	65
14. Dump truck (1cu.m)	60	120

Note: Hourly changes include depreciation, operation and maintenance costs of equipment.

C. MATERIALS

Material	Unit	Rates (YR) April 1979	April 1980
1. Stone:			
a) Ghoum	m^3	68	108
b) Basalt	m^3	130	190
c) White sand stone	m^3	186	371
d) Red Stone	m^3	386	543
e) Green Stone	m^3	128	187
f) Habash	m^3	415	514
2. Bricks			
a) Burnt Bricks 16 x 16 x 5	1000	1200	1200
b) Factory bricks 25 x 12.5 x 6	1000		2888
20 x 10 x 6	1000		1100
3. Concrete Blocks			
a) Hollow Block 20 x 20 x 40	100	300-380	340-390
b) Hollow Block 15 x 20 x 40	100	280	325
c) Solid Blocks 20 x 20 x 40	100	440	525
15 x 20 x 40		420	400
10 x 12 x 25		130	270
10 x 10 x 20		120	220
4. Cement			
a) Portland Gray	Tonne	640	798
b) Portland White	Tonne	840	1418
5. Aggregates			
Up to 20 mm	m^3	87	100
Over 20 mm	m^3	90	90
6. Sand	m^3	71.4	80

Material	Unit	Rates (YR) April 1979	April 1980
7. TIMBER			
a) Plywoode 12 mm thick	m^3	30.3	41.7
b) Sections	m^3	1425	2131
c) Hardboards (3mm)	m^3	-	20
8. STEEL			
a) Rebars to 10 mm	Tonne	3000	3150
12 to 16 mm	"	3500	2940
Above 18 mm	"	3200	2940
b) Structural Sections	"	3500	3150
9. ROOFING MATERIALS			
a) C.I. sheets 31 b.w.g. (3' x 8')	No	25	29.5
b) Plain g.i. sheets 18 b.w.g. (3' x 8')	No	42	52.5
c) Roofing felt paper base 1^m x 20^m roll	Roll	80	80
d) Bitumen 80/100	Tonne	1300	4645
10. DOORS AND WINDOWS			
a) Panelled doors 40 mm thick complete	No	950	1228
b) Aluminium doors complete	No	1590-5000	1670-4925
c) Steel doors including fitting 1m x 2m	No	900	1350
2m x 3m	No	2000	2250
d) Wooden windows 1.2m x 1.2m	No	650	830
e) Aluminium windows including glazing	m^2	710	756
f) Steel windows 0.7 x 0.40	No	120	263
0.8 x 0.50	No	170	278
0.8 x 0.60	No	205	294

Material	Unit	Rates (YR) April 1979	April 1980
11. GLASS			
a) Plain, clear (2-5 mm)	m^2	115-140	123-147
b) Frosted, ribbed	m^2	140	53
12. GYPSUM QAMARIAS GLAZED			
single thickness			
30 cm radius	No	220	231
40 cm "	No	250	263
50 cm "	No	300	315
Above 60 cm rad.	No	450	473
13. FLOORING			
a) Terrazo tiles 2 x 20 x 20	100	180	240
b) Cement tiles 2 x 20 x 20	100	130	189
c) White ceramic tiles 4 x 15 x 15	100	115	105
d) Colored ceramic tiles 4 x 15 x 15	100	130	147
e) Marble slabs upto 30 mm thick	m^2	160	231
30 to 40 mm thick	m^2	180	252
f) P.V.C. Tiles	m^2	20	16
14. FINISHING			
a) Goss	Truck	210	473
b) Distemper (dry)	kg	4	4.7
c) Emulsion paint	litre	8	8.5
d) Oil-based paint	litre	10	10.5
e) Varnish, polish	litre	12	12.5
f) Lime	25kg bag	40	42
g) Celotex tiles	No	16	26

TYPICAL PRODUCTIVITY LEVELS IN YAR

(Extracted from Builders Price Book, MPW, May 1980)

A. LABOUR

Trade	Operation	Unit	Daily output
1. Mason	a) Stone masonry half cut	Sq.m.	4 to 6
	b) Stone masonry full cut	Sq.m.	4 to 6
	c) Brick masonry	Sq.m.	1-5 to 2-5
	d) Brick partitions 16cm. thick	Sq.m.	5 to 7
	e) Concrete	Cu.m.	4 to 6
	f) Concrete block masonry	Sq.m.	15 to 18
	g) Marble work	Sq.m.	1 to 2
	h) Stone Dressing	No.	20 to 40
	i) Concrete floors	Sq.m.	7 to 9
	j) Terrazo tile floors	Sq.m.	12 to 16
	k) Wall dados ceramic tiles	Sq.m.	4 to 16
	l) Pointing	Sq.m.	12 to 15
2. Carpenter	a) Timbering	Sq.m.	10 to 50
	b) Formwork	Cu.m.of concrete	1-5 to 4-5
	c) Fitting of doors and windows	Sq.m.	14 to 16
	d) Timber trusses	Cu.m.	10-12 to 10-15
	e) Ceiling panel and partitions	Sq.m.	10 to 12
	f) Roofing sheets	Sq.m.	12 to 15
3. Fitter	a) Reinforcement in r.c. work	kg	80 to 120
	b) Steel Trusses	Tonne	0.3 to 0.4
	c) Steel doors and grills	Sq.m.	3 to 4
	d) Fixing steel or aluminium windows	Sq.m.	8 to 12
	e) Roofing sheets and gutters	Sq.m.	12 to 15

	Trade	Operation	Unit	Daily Output
4.	Excavator	a) Earth excavation	Cu. m.	2 to 3
		b) Rock excavation	Cu. m.	0.5 to 1
		c) Back-filling	Cu. m.	4 to 6
5.	Glazier	a) Glazing windows	Sq. m.	5 to 6
6.	Plasterer	a) Plaster work	Sq. m.	12 to 18
		b) Goss work	Sq. m.	8 to 10
7.	Painter	a) Lime washing	Sq. m.	50 to 60
		b) Distempering	Sq. m.	16 to 20
		c) Painting	Sq. m.	20 to 30
		d) Varnishing and polishing	Sq. m.	12 to 16
8.	Rooster	Felt water-proofing	Sq. m.	100 to 120

B. Plant

	Item	Operation	Hourly Output (m^3)
1.	Dozer D 8	a) Excavation in soil	40 - 60
		b) Excavating and clearing boulders	25 - 35
		c) Levelling and topsoil clearance 30 cm	250 - 300
2.	Grader	Levelling and spreading	300 - 400
3.	Loader	General	40 - 50
4.	Compressor	Rock excavation to 30 cm depth with two jack hammers	5 - 7
5.	Concrete Mixer		
	a) 1 bag		3 - 4
	b) 2 bag		6 - 8

Annex 13

Schedule of Rates for Selected Items of Building Work in YAR

April 1979 and April 1980

(Extracted from Builders' Price Book, MPW, May 1980)

No.	Description	Unit	Rates (YR) April/79	April/80
1.	Earthwork			
1.01	Levelling to 20 cm depth	m^2	3.2	5.8
1.02	Trench excavation, including disposal up to 25 m	m^3	48	63
1.03	Trench excavation in rock, including disposal and stacking to 25 m	m^3	322	376
1.04	Plant excavation	m^3	23	37
1.05	Plant excavation in rock	m^3	96	143
1.06	Trench excavation (plant)	m^3	52	101
1.07	Close timbering in trenches up to 3 m depth	m^2	21	28
1.08	Close timbering for basement excavation up to 4 m	m^2	25	33
1.09	Back-filling and compaction in trenches	m^3	19	25
1.10	Back-filling and compaction in layers up to 70 cm	m^3	21	47
2.	Concretor			
2.01	Providing and laying concrete 1:4:8	m^3	509	626
2.02	Providing and laying concrete 1:2:4	m^3	619	764
2.03	Providing and laying concrete 1:1:5	m^3	694	859
2.04	Providing and laying concrete 1:1:2	m^3	863	1,069

No.	Description	Unit	Rates April/79	(YR) April/80
3.	Mason			
3.01	Ghoum stones in foundations	m^3	264	342
3.02	Black basalt stones in foundations and plinths, including pointing	m^2	942	1,658
3.03	Half-cut stone masonry in superstructure	m^3	1,413	2,181
3.04	Full-cut stone masonry in superstructure	m^3	1,690	2,525
3.05	Brick work in cement mortar 1:6	m^3	1,710	1,794
3.06	Brick work 16 cm thick in partitions in mud mortar	m^2	280	285
3.07	Hollow concrete block 20 cm thick	m^2	102-117	119-128
3.08	Solid concrete block 20 cm thick	m^2	147	152
3.09	Marble work 30 mm thick in stair treads and risers	m^2	384	565
3.10	Marble work 25 to 30 mm thick in wall lining	m^2	423	636
3.11	Marble work 40 mm thick in wall and pillar lining	m^2	519	669
3.12	Marble work 25 mm to 30 mm thick decorative in-lay on walls	m^2	845	1,137
4.	Concretor			
4.01	Reinforced concrete 1:2:4 including shuttering	m^3	1,132	1,499
4.02	Reinforced concrete 1:1:3 including shuttering	m^3	1,258	1,702
4.03	Reinforced concrete 1:1:2 including shuttering	m^3	1,430	1,912
4.04	Provide bend and fix mild steel	kg	6.3	7.1

No.	Description	Unit	Rates April/79	(YR) April/80
5.	Metalworker			
5.01	Structural steel sections, welded, bolted in trusses and frameworks, including hoisting, fixing in position and priming coat of red oxide	Ton	7,762	7,030
5.02	Provide and fix steel doors and frames	m^2	609	652
5.03	Provide and fix steel windows	m^2	942	1,385
5.04	Provide and fix anodised aluminium glazed doors complete	m^2	1,170	1,250
5.05	Provide and fix anodised aluminium windows complete	m^2	769	1,223
6.	Carpenter			
6.01	Timber in frames, false ceiling trusses, floors, roofs, etc.	m^3	3,900	5,296
6.02	Provide and fix panelled hardwood doors complete	m^2	785	944
6.03	Provide and fix plywood face doors complete	m^2	592	706
6.04	Provide, fix and glaze wooden windows complete	m^2	934	896
6.05	Glazing for 2 mm thick glass	m^2	122	75
	Glazing for 5 mm thick glass	m^2	152	137
	Glazing for 6 mm thick glass	m^2	152	137
6.06	Timber partitions including framing	m^2	228	272
6.07	Wall panelling including battens	m^2	131	150
7.	Floorer			
7.01	1:2:4 concrete floor float-finished			
	a) 30 mm thick	m^2	73	9
	b) 40 mm thick	m^2	99	121
7.02	Plaster skirting 15 mm thick in 1:3 cement mortar	m^2	85	107

No.	Description	Unit	Rates (MR) April/79	April/80
7.03	20 mm terrazo tiles on floors in 1:6 cement mortar	m^2	166	172
7.04	20 mm terrazo tiles on walls or in skirting on 1:3 mortar	m^2	191	224
7.05	8 mm ceramic tiles on floors in 1:4 cement mortar	m^2	188	214
7.06	4 mm ceramic tiles on walls or in skirting on 1:3 cement mortar	m^2	193	216
7.07	Marble stone flooring 30 mm thick laid on 1:4 cement mortar	m^2	309	470
7.08	Marble tiles 25 mm thick in risers and treads on 1:3 cement mortar	m^2	297	496
7.09	Provide and fix p.v.c. tile flooring on concrete floor surface	m^2	269	290
8.	Finishing			
8.01	12 mm cement plaster (1 coat)	m^2	38	47
8.02	20 mm cement plaster (2 coats)	m^2	46	57
8.03	6 mm cement plaster to underside of slab and ceilings	m^2	34	42
8.04	Goss plaster on stone walls	m^2	40	55
8.05	Goss plaster to underside of ceilings	m^2	46	60
8.06	Pointing to brick work with 1:3 cement mortar	m^2	31	39
8.07	White-wash with lime or goss to walls or ceilings	m^2	23	11
8.08	Painting two coats emulsion paint on walls or ceilings including preparation and primer	m^2	16	19
8.09	Painting two coats oil paint on walls or ceilings including preparation and primer	m^2	16	20
8.10	Finishing external walls with waterproof cement-based paint	m^2	19	23
8.11	Varnishing two coats on woodwork including preparation	m^2	31	37

No.	Description	Unit	Rates April/79	(NR) April/80
9.	Roofing			
9.01	Corrugated (316 w.g.) g.i. sheet roofing complete	m^2	89	98
9.02	Corrugated 6 mm asbestos cement sheet roofing complete	m^2	74	77
9.03	Provide and lay 1:2:4 concrete to slopes on structural roof slabs	m^3	619	764
9.04	Paint with 80% bitumen at rate of 1.7 kg/m^2	m^2	17	28
9.05	Provide and lay 20 mm cement concrete tiles complete	m^2	111	149
9.06	Four course bitumen felt water-proofing (two coats bitumen, one course felt and topping with sand/gravel)	m^2	53	60
9.07	Five course water-proofing treatment with two layers of bitumen felt on basement walls	m^2	85	96
9.08	Provide and fix 12 mm thick celotex tile ceiling complete	m^2	192	267
9.09	Provide and fix 3 mm hardboard ceiling complete	m^2	217	237

Extract from 'Climatic Design in Yemen'

(UNDP Project YEM/73/006 - Ministry of Public Works)

Introduction - Conditions in Yemen

With the introduction of new materials, methods and more complex building requirements there is a tendency to neglect the importance of climatic influences on building design.

As a result, much of what is being built today is climatically unsuitable. Buildings which could be comfortable all year round are cold in winter and hot in summer. Supplementary heating is necessary for buildings which could have been designed to be warm without it. Mechanical systems are being installed in buildings and operated at considerable expense which could have been designed to operate much more economically if climatic influences had been considered from an early stage.

Regional Climates

There are five major geographical regions in Yemen: Coastal Plain, Midlands, Highlands, Highlands Plateau, and Eastern Desert.

The climates in these five regions fall into three categories:

1. Hot Maritime Desert
2. Tropical Uplands
3. Hot-dry Desert

1. Hot Maritime Climate

This climate exists in the Tihama and the lower foothills adjoining it.

Temperature: High daytime temperature (to 38°C in the hot season, 21-26°C in cool season). There are two seasons, one very hot and the other cooler. Small diurnal range (9-12°C).

Humidity: High (50-90 per cent).

Precipitation: Very low.

Sky conditions: Cloudiness in the form of haze (resulting in glare).

Winds: Local, due to the heating and cooling of the land. Dust storms occur inland and on shore and offshore breezes alternate near the sea.

2. Tropical Uplands Climate

This climate occurs in the mountainous regions and plateaus above 900 m.

Temperature: Decreases with the altitude but at 1,300 m the mean maximum is from 24-13°C. At higher altitudes the temperature may drop below 4°C. Seasonal variations are small but become more pronounced with increasing distance from the equator. Large diurnal range (11-20°C).

Humidity: Varies (45-90 per cent).

Precipitation: Varies, but falls in heavy showers and is usually less than 1,000 mm per year.

Sky conditions: Normally clear or partly cloudy.

Winds: Variable, but predominantly NE/S and are deflected by local topography.

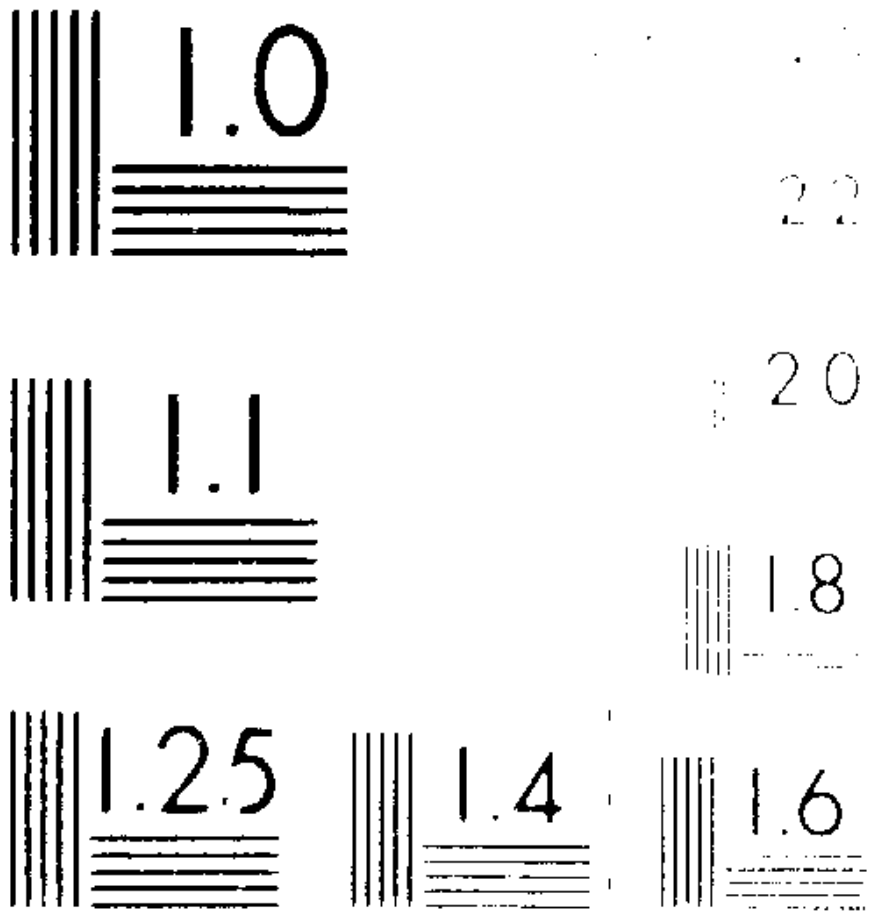
3. Hot-Dry Desert Climate

This occurs in the region of Yemen which borders the desert of the "Empty Quarter". The area is sparsely populated but includes the area around Marib and Harib.

Temperature: Very high daytime temperatures (mean Maximum 43-49°C in the hot season and 27-32°C in the cooler season). Night time mean minimum temperature 24-30°C. There are two seasons, one very hot and the other slightly cooler. Very large diurnal range (17-22°C).

Humidity: Variable, but low (10-55 per cent). Evaporation is rapid.

Precipitation: Very low (50-55 mm) but it may occur in storms accompanied by flash floods.


1.0
2.2
2.0
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1.8
1.25
1.4
1.6

Sky conditions: Usually very clear due to low humidity but a glaring haze can develop at certain times of the year.

Winds: Local, dusty, and hot, caused by the heating of the ground. Whirlwinds can develop.

Climatic Abstracts

1. Hodeidah (Hot Maritime Desert)

Temperatures are high throughout the year (mean monthly maximum: 29.3-36.9°C). The temperature drops only slightly during the night (mean monthly minimum: 20-29.1°C) resulting in a small diurnal range (5-9°C).

There are two seasons: A hot season from April through October and a cooler season from November through March. The hottest months are June, July and August. The coolest months are December, January and February.

Humidity is high, ranging from 50-90 per cent. The annual average is 63 per cent.

Rainfall is very low (100 mm per year).

A cooling breeze blows off the Red Sea during the day which provides needed air movement but this sometimes develops into a 60 km/hr. storm. The cooling effect of the Red Sea decreases inland where temperatures are greater and the humidity lower. Sandstorms from the east and storm winds off the sea are common.

In the cooler months it is possible to be out of doors for much of the day, but during the rest of the year only the cooler mornings and evenings are pleasant; conditions from mid-morning to late afternoon are extremely uncomfortable.

2. Taiz (Tropical Uplands)

Temperatures are moderate for most of the year (monthly mean maximum: 26.2-33.4°C. Temperature drops at night are significant (monthly mean minimum: 14.6-21°C) result in a large diurnal range (10-13°C). The hottest months are May, June and August. The coolest months are December, January and February.

Humidity is moderate, ranging from 30-60 per cent. The annual average is 46 per cent. Rainfall is considerable for Yemen. Regular rains occur from April through October totalling over 500 mm.

There are hot periods but in general the days and evenings throughout the year are comfortable. The cloud cover that accompanies the rains has a moderating effect on temperature during the hot months. Local winds lessen the effect of the humidity.

3. Sana'a (Tropical Uplands)

Temperatures are cooler the whole year round and less moderate than in Taiz (mean monthly maximum: 22.2-29.4°C). Temperature drops at night are very significant (monthly mean minimum: (2.2-11.2°C), resulting in a very large diurnal range (13-21°C). The hottest months are June and July. The coolest months are November, December and January, during which time the temperatures can drop below freezing (0°C).

Humidity is low to moderate, ranging from 10-70 per cent. The annual average is 33 per cent.

Rainfall is low (250 mm per year) but it falls with intensity in two seasons, the first from March to May and the second July through August.

Dry, dusty winds are a problem the whole year round, but especially during the long rainless period from September through February. Evenings are invariably cool during the warm months, a cooling breeze setting in shortly after sunset.

The sun is very intense almost all the year and has a considerable heating effect but shaded areas can become quite cold. During the rainy seasons the temperatures are moderated by cloud cover. Otherwise, the sky is clear and the air dry.

Design Recommendations

1. Tihama Region (Hot Maritime Climate)

Layout: Buildings should be oriented on an E-W to NE-SW axis to minimize exposure to the sun, and can be mutually shading. Non-inhabitable rooms such as stores and toilets can be located on E, SE, W, NW exposures because they provide insulation for inhabited rooms. There should be open spacing between buildings to allow for breezes, yet there should be protection from hot, dusty, off-desert winds. Slight deviations in orientation should be made to maximize the benefit of a cooling sea breeze (e.g. Hodeidah, Mocha). Rooms should be single banked to allow for air movement.

Openings: Openings should be large (40-80 per cent of N and S walls) while still providing protection from dusty winds. Openings in N walls will allow direct sun for only a short time of the year (June-July), the rest of the year they will receive only diffuse and reflected light. Openings in S walls allow direct sun to enter from July to May. This is desirable during the cooler months but should be controlled with fenestration during the hot months. Openings in W and NW walls should be avoided because these exposures experience a heat build-up from the direct sun. The E and NE walls receive an equal amount of direct sun but the heating effect is not great because it occurs in the cooler morning.

Rain Protection: Although rainfall is slight, it can occur as a torrential downpour. Ground drainage should be considered.

Roof and Wall Construction: High thermal capacity walls and roof are useful because they provide thermal storage during the cooler months, but they cannot be as effective as in a hot desert climate in maintaining a constant inside temperature because of the small diurnal range. Lightweight insulated walls and roof will provide shade and take advantage of cooling breezes during the very hot season. Ceiling heights of 3-4 m encourage air movement and allow hot air to rise.

2. Midlands Region (Tropical Uplands Climate)

Layout: Planning should be compact because of the need for thermal storage (courtyard will work well by providing protected outdoor spaces). Buildings should be close together but arranged so as to not shade each other because the incoming sunlight is the source of heat, heating for the building. There should be space for outdoor sleeping. Outdoor spaces can be used in the evenings throughout the year.

Openings: Openings should be small (10-20 per cent of wall area), because of the need to conserve heat in the evenings and the cool winter months. Openings should have fenestration to exclude direct sun except in cool winter months.

Rain Protection: There should be permanent provision for rain protection (covered walkways, outdoor drainage) because rains are frequent and intense.

Roof and Wall Construction: Both roof and walls should be heavy and thick (walls 40 cm) to provide good insulation.

3. Highlands Plateau Region (Tropical Uplands Climate)

Layout: Planning should be compact because of the need for thermal storage (especially in cold months). Courtyards can provide outdoor spaces which are protected from dusty and drying winds during the day and cool breezes in the evening. There is no air movement requirement because of the low humidity and lower temperatures. Because the sun is the principal source on the SE, S, and SW exposures, circulation storage, and service functions can be accommodated on the N exposure. Rooms should be double banked if habitable. There should be space for outdoor sleeping. Mutual shading of buildings should be avoided.

Openings: Openings should be small (10-20 per cent of E, S, and W exposures) because of the need to contain heat in the evenings and cold winter months. Windows on the north exposure of living rooms should be avoided because they detract from heating effect of the sun in winter months. There is no need for air movement. Openings should maximize the penetration of direct sun during the cold winter months but should exclude sun during the warm months.

Rain Protection: Exterior drainage of rainwater should be provided.

Roof and Wall Construction: Both roof and walls should be heavy, thick (walls: 40-50 cm) construction to provide good insulation.

4. Eastern Desert Region (Hot Desert Climate)

Layout: Planning should be compact, enclosed, and inward-looking. Courtyards, colonnades, arcades, and narrow streets can provide maximum amounts of shading and coolness. Surfaces exposed to the sun should be minimal for this reason the bulk of the building should face NS (E-W axis). The worst orientation axis is NS because it receives the greatest heat load during the hot season. Non-inhabitable rooms such as stores and toilets if located on these exposures can provide protection for the other rooms.

Openings: Openings should be minimal during the day to exclude the sun and contain the cooler air from the night. During the night the openings should be large enough to provide ventilation and cooling for the interior. One solution satisfying both of these conditions would be shutters of high thermal capacity which could be opened at night but closed during the day. Openings should be located high on the wall to facilitate ventilation as well as to minimize ground glare and exclude dust.

Rain Protection: Siting and drainage should take into account the possibility of flash floods.

Roof and Wall Construction: Walls and roof, especially, should be heavy and thick (walls 50-60 cm) in order to utilize large diurnal temperature changes. A double roof with insulating airspace is ideal, but expensive. Dark, heat absorbing surfaces should be avoided. There should be shading of roofs and walls wherever possible as well as mutual shading of buildings.

Appendix: Elevations and Latitudes of Major Cities in Yemen

City	Elevation (m)	Latitude
Sana'a	2,200	15° 15'
Taiz	1,500	13° 30'
Hodeida	10	14° 45'
Dhamar	2,400	14° 30'
Ibb	2,000	14° 00'
Sa'ada	1,800	16° 00'
Hajja	1,700	15° 45'
Beit-Al-Fakih	175	14° 30'
Zabid	100	14° 15'
Marib	1,150	15° 30'
Al-Bayda	1,900	14° 00'
Rida	2,100	14° 30'
Yarim	2,200	14° 15'
Mocha	10	13° 15'

Annex 15

Extract from MPW "General Conditions of Contract"

For "Contracts without Quantities"

(Translated from Arabic by Mission)

Building Construction Contract for .....

Art. 1 Scope of Contract: Refers mainly to the rights of the Engineer to request changes.

Art. 2 Drawings and Specifications: Two sets of drawings are to be delivered to Contractor upon signature of Contract .....; other necessary drawings subsequently.

Art. 3 Progress of Work: Contractor to submit detailed written timetable and methods and procedures to complete work.

Art. 4 Setting Out: By Contractor, based on information provided by Engineer.

Art. 5 Materials and Workmanship: To conform to specifications. All Contractor's responsibility, except when stated otherwise.

Art. 6 Testing of Materials: As specified. Engineer may request other tests at owner's cost - unless results of these tests unacceptable, then cost borne by Contractor.

Art. 7 Photographs of Work: By Contractor to show work progress.

Art. 8 Engineer's Right to Visit and Inspect Work Sites: At reasonable hours.

Art. 9 Owner's Site Representative: Owner to assign full-time responsibility to supervise and inspect work as directed by the Engineer. Contractor to provide all assistance.

Art. 10 Daily Labour Reports: Covering numbers and category of workers.

Art. 11 Contractors to Employ Qualified Staff: The Contractor should nominate an authorized representative, acceptable to the Engineer, to supervise the work and carry out instructions of the owner's representative and Engineer. The Contractor should have an address in the YAR to receive notifications. The Contractor should set up a temporary office at site for his representative and staff, and assign sufficient staff as directed by the Engineer. The Contractor must abide by local labour laws. The Engineer may judge the suitability of staff, and request removal of unsatisfactory staff.

Art. 12 Assessment of Cost Variations: To be mutually agreed by Engineer and Contractor.

Art. 13 Quantities: It is the Contractor's sole responsibility to carry out work as shown on the drawings, irrespective of actual quantities.

Art. 14 Ownership of Materials and Equipment: All materials and equipment brought to the site become the property of the owner until the contract is completed or terminated.

Art. 15 Defects after Completion: The Contractor remains responsible during the maintenance period (or period of guarantee).

Art. 16 Subcontracting: No assignment of the contract, in whole or in part, except by written consent of the Engineer.

Art. 17 Damage to Persons or Property: The Contractor is responsible if any damage occurs as a result of carrying out the work.

Art. 18 Insurance: A list of different types of insurances; but not linked to Art. 17. Insurance should be with a Yemen representative of a firm approved by the Engineer.

Art. 19 Contract Period: The Contractor should complete the work during the specified period, except if extended or as per Art. 21.

Art. 20 Penalty Clause ("Non-completion Fine"): The Contractor, if late in completion, is to pay to the owner the sum stated in the attachment to the contract as liquidated damages ("loss") per week of delay, without it being necessary to prove that actual loss has occurred.

Art. 21 Delay and Postponement of Completion: The Engineer may postpone the deadline for completion for various reasons including exceptional climatic conditions, labour troubles, site congestion, etc.

Art. 22 Night and Overtime Work: Not permitted except with Engineer's approval.

Art. 23 Default or Bankruptcy of Contractor and Termination of Contract by Owner: Termination following 14 day's notice of cause of defect. Similarly upon bankruptcy or liquidation of a company, the contract may be terminated. Similarly in cases of bribery or collusion (but form of proof not clear).

Art. 24 Termination by Contractor: When payments delayed for 45 days and 7 day's written notice.

Art. 25: Skilled Labourers and Artisans: The Contractor should permit work not specified to be carried out by skilled labcurers and artisans selected by owner (meaning unclear).

Art. 26 Payment Certificates: The Engineer is to estimate and issue periodic payment certificates at predetermined intervals (usually monthly) which are to be settled within 30 days. Certificates should include work completed as determined by the Engineer plus a value of materials on site (usually 50 per cent). Retention money to be deducted (usually 10 per cent). Completion certificate to be issued by Engineer. This will be considered as a final statement that the contract is complete.

Art. 27 War Risks: Limited to wars or skirmishes, when the YAR Government is involved, that result in losses to either of the two parties. Both parties to agree on steps to be taken in such an eventuality.

Art. 28 Guarantee: The Contractor is to submit a guarantee from the bank or insurance company in an agreed form to guarantee the proper performance of the contract.

Art. 29 Arbitration: Disputes should first be submitted to the Engineer. If any party objects to the Engineer's decision, he should deliver notice within 20 days and request submission of the case to an Arbitrator mutually agreed upon ..... otherwise named by the court in accordance with the appropriate Commercial and Civil Law. The Arbitrator's decision is binding on both parties.

Art. 30 Claims: The Contractor is to deliver advance notice of any claim and submit justification within one month.

Annex 16

General Conditions of Contract
Prepared by PIU/IDA Education Project, MOE

In the absence of nationally-adopted general conditions for contracts in the YAR, PIU decided to prepare general contract conditions for its own use as well as for possible use by other government agencies and LDAs.

The general conditions of contract prepared by PIU have proved to be useful and practical considering the conditions in the YAR. Copies of the general contract conditions were forwarded to all Ministries.

Article No. 1: Definitions.

Article No. 2: Conditions of the contract which includes:

2.1 Evaluation of contractors:
Each Contractor has to fill in a special form indicating the nature of work executed in the YAR and elsewhere, permanent address, names of principals, number of staff, value of works at hand, annual output and description of equipment.

2.2 Purpose of the contract which includes:
Description of works and bid documents.

2.3 Method of presenting the bid.

2.4 Method of remuneration either based on measuring works completed, based on metric scale or number or weight or lump sum.

2.5 Insurance, a temporary insurance of 2 per cent of total sum of the bid is requested to be presented with the bid to be increased to 5 per cent after signing of contract. This bid bond will be kept with the project until the end of the maintenance period.

2.6 Companies, joint ventures and case of death of contractor.

2.7 Subcontractors and reassignment, names of subcontractors for specialized works to be included in the bid for approval by PIU. The contractor has no right to resign part or whole of the contract without the agreement of PIU.

2.8 Contractor's engineer and representatives on site.

2.9 Temporary offices on site for PIU engineers.

2.10 Provision of transportation of PIU engineers and site supervisors.

2.11 Water connections to site of works.

2.12 Government regulations and procedures in case of antiquities found on site.

2.13 Responsibilities of the contractor.

2.14 Workshop drawings.

2.15 Openings, ducts and pipes for specialized works.

2.16 Insurance against fire and theft.

2.17 The right for inspection and supervision.

2.18 Time schedule for execution of works.

2.19 Liquidated damages and penalties.

2.20 Termination of contract and execution of works on the contractor's account.

2.21 Quantities and prices.

2.22 Advance payments - 20 per cent advance payment to be dispersed to contractor as soon as he receives the site and upon presentation of a letter of guarantee.

2.23 Payments and deductions - 95 per cent of the value of work completed in each month is to be paid to contractor in the first week of the following month; the remaining 5 per cent could also be paid to contractor upon presentation of a letter of guarantee of its value valid to preliminary completion date. Additional advance payments are made to contractor on condition they do not exceed 50 per cent of materials stored on site.

2.24 Authority for variation orders.

(a) Foundations: If changes in foundation exceed 50 per cent of the contract sum, extension of contract period is possible.

(b) Superstructure: The project administration has the right to issue change orders with the same unit prices within 25 per cent of the contract sum. If change orders exceed this percentage, extension of contract period is possible.

2.25 Correction of errors.

2.26 Samples.

2.27 Differences between bills of quantities and drawings and specifications.

2.28 Alignment and levels.

2.29 Land under contractor's use.

2.30 Storage of materials subject to damage.

2.31 Rejection of plant or works.

2.32 Authority of project administration to change the site.

2.33 Preliminary completion.

2.34 Period of maintenance,... months.

2.35 Final completion.

Special conditions for import of materials: The contractor has to indicate in case of importing construction plant and building materials, the amounts allocated for this purpose and the country of origin.

Annex 17

Decree Establishing the Supreme Purchasing Committee

Yemen Arab Republic
Official Gazette No. 12
28 February 1977
(10 Rabi' Awal 1397H)

(Translated by Mission)

12th Year

Leadership Council Decree No. 23, 1977

Relative to a revision of certain provisions of Law No. 3, 1975, regulating Government purchases and stores.

The President of the Leadership Council

- having perused the permanent constitution
- and Declaration No. 1 of the Leadership Council of 1974,
- and the Constitutional Notice issued on 22 October 1975 regulating the constitutional affairs of the new transitional stage
- and Law No. 3, 1975, regulating Government purchases and stores
- and following the approval of the Council of Ministers and the council of Leadership

hereby issues the following Law:

Article 1 - Article No. 9 of Law No. 3, 1975 regulating Government purchases and stores is hereby revised as follows:

Article 9

A. Contracting (public tendering) procedures shall apply and their application shall be dealt with, in cases that do not exceed ten thousand rials, by a Committee formed for this purpose by the relevant Minister or any person authorized to act on his behalf. Such Committee shall be headed by the Deputy Minister responsible for the financial and administrative affairs or the Directors of Finance in the Governorates. It is mandatory that the Director of Financial Affairs and the Director of Purchases and an employee from the Ministry of Finance be members of the Committee, in addition to two officials from the relevant agency. The meetings of the Committee shall not be considered legal without the attendance of the Director of Financial Affairs.

B. Any purchases with a value above ten thousand rials up to threehundred thousand rials shall be dealt with by a committee headed by the Minister of the person authorized to act on his behalf.

C. For any purchases above threehundred thousand rials the tendering procedures shall be undertaken by the Committee referred to in the preceding paragraph subject to a final decision by a Supreme Purchasing Committee formed as follows:1/

1.	Minister of Public Works	Chairman
2.	Minister of Finance	Member
3.	Minister of Communications	Member
4.	Minister of Development	Member
5.	Director of Foreign Affairs at the Central Bank of Yemen	Member
6.	Minister in charge of the relevant authority or department or company	Member

The Supreme Purchasing Committee shall have a secretariat selected by said Committee.

Article 2

The provisions of the preceding article shall apply to all public sector agencies and mixed entities and government banks. The Council of Ministers shall designate the officials who shall exercise the authorities of the Deputy Minister in any of these entities.

Article 3

It shall be added to the beginning of Article 10 of Law No. 3 of 1975 under reference of the following text:

"With due consideration being given to paragraph C in the preceding article ..... etc."

The rest of the Article remaining unchanged.

1/ Membership composition has been slightly revised in this translation to reflect changes reported to this mission in November 1980.

Article 4

This Legislative Decree shall come into effect on the date of its issue and shall be published in the Official Gazette and it cancels all provisions (law decrees) in contradiction with it.

Issued at the Leadership Council
on 12 Sifr 1397 H
1 February 1977 M

Moh. Ahmed El-Juneid Vice Prime Minister for Financial and Economic Affairs. Minister of Finance	Abdula Aziz Abdulghani Member of the Leadership Council. Prime Minister.	Colonel Ibrahim Moh. El-Hamdi Chairman of the Leadership Council. Commander-in-Chief of the Armed Forces.

Annex 18

Supreme Purchasing Committee

Instructions to the Ministries, Authorities and Boards

(Translated by Mission)

1. The Supreme Committee was formed by virtue of the Leadership Council (literally "Republic") decree No. 23 dated 1 February 1977:

1. To regulate tendering activities for works or provision of services to a value in excess of YR 300,000.

2. All Government Ministries, Authorities and Boards are required to present any invitations to tender that exceed that amount in the manner laid down in Form No. 1 before forwarding them to the Supreme Committee. This submission should take place within one month from opening of tenders.

2. Invitation to tender and reception of tenders

Invitations to tender for the provision of works or supplies shall be made locally or on an international basis as appropriate. Notices shall be published in accordance with Form No. 2 or in a similar manner. The notices must be published sufficiently widely whether bids are sought locally or internationally. A copy of the notice shall be sent to the Supreme Committee by the department issuing the invitation.

For certain special technical works, the notice should be published in specialized magazines. A minimum period of thirty days must be allowed between the date of the notice to the date for receipt of tenders. Suppliers and contractors may also be invited to bid by direct communication.

3. Prior to the issue of invitations to tender for the provision of works or supplies, the requesting party should make available all technical information or specifications and include them in the bid documents as indicated in Form No. 3 for supply works and Form No. 3A for building works.

4. Suppliers and contractors should be notified that they are required to keep their tenders open for acceptance for a period of three months from the date of opening of tenders, and that they are not authorized to change their prices or conditions during this period.

5. Suppliers and contractors should submit a preliminary security with their tenders. They are further under the obligation to submit a bank guarantee certifying that the applicant shall commence work within one month from the date of acceptance of their tenders. Upon submission of the tenders to the Supreme Committee, the party inviting tenders should take this point into consideration.

6. The client party or "owner of the works" should maintain a record of tender (document) sales as per Form No. 4 which should be submitted to the Committee with the tenders. A record of receipt of tenders should also be kept on Form No. 5. The client party should appoint the (official) who shall sell the tender documents to potential bidders and receive the completed tenders and enter all the information in Forms Nos. 4 and 5 in his own handwriting.

The (official) who sells and receives the tenders should issue receipts to the contractors as per the form, and also fill in the data regarding the works as per the form and record the date of receipt of the tenders on the envelopes. These envelopes must be delivered to (the official) who is responsible for the opening of tender envelopes and he should sign for their receipt on Form No. 5.

7. The client party shall appoint (the official) who shall open the sealed tender envelopes at a fixed time and place in the presence of the tenderers and the owners tendering committee. It is a condition that the financial or administrative director should be present at the opening of the envelopes.

8. After ascertaining that the envelopes are properly sealed, the responsible (official) of the client party shall open them. It is not permitted to accept any tenders after the deadline for receipt of bids and any changes must be made on the tenders after opening them.

9. The (official) responsible for opening of the tenders shall sign all the tender documents and number them if they are not numbered. He must record all the papers of the tenders in a suitable place in these documents. Each tender must be numbered upon being opened in a sequential order of A and B, such that A represents the number and B represents the number of tenders that were received and opened for the specific (call for) tender.

10. The (official) responsible for opening the tenders must fill in Form No. 6 in his own handwriting and deliver these forms to the (official) responsible for the analysis with (evidence of) receipt on his part (shown) at the bottom of the form.

Analysis of Tenders

11. With respect to any tender, the following points must be reviewed:

a) Verification of the arithmetical calculations. Corrections shall be sent (in the form of a letter submitted to) the Supreme Committee. It is not permitted to carry out any corrections on the papers of the original tenders.

b) Verification that the tender abides by all the terms of the notice and tender documents.

c) Verify that the tenders are signed.

d) Verify that the tender includes the preliminary security in the required amount and is valid for the period indicated in the notice to tender.

12. The bookkeeper of the client party must examine the tenders and (counter)sign them.

13. Following the analysis, a comparison shall be made between the tenders as per Form No. 7, which shall be submitted to the Supreme Committee along with the remaining documents. The Financial or Administration Director shall review them prior to that (submission to the Supreme Committee).

14. The Committee of the owner of the request (client party) shall classify the tenders on a uniform basis and in a common currency to ensure a fair comparison.

15. On the basis of the technical specifications, prices and execution periods, the party owner of the works shall classify (rate) the tenders in order of acceptability as shown in Form No. 8 which shall be submitted to the Supreme Committee along with the other documents.

16. The three most favourable tenders shall be retained for detailed comparison indicating the following:

a) Previous experience.

b) (Agreement to complete the works) within the fixed timetable.

c) Financial standing of the bidder.

This comparison shall be prepared in accordance with Form No. 9 that shall be submitted to the Supreme Committee.

17. The tenders shall be analysed from the technical point of view (by) a technical expert or consultant, and in case of purchases, the following points shall be taken into consideration:

a) Efficiency, capacity and uniformity of the materials and equipment indicated in the tenders.

b) Availability of service and spare parts following sale (purchase).

c) Quality (excellence) of the offered goods on the basis of past experience.

d) Method of sampling, examination, planting (?) and acceptance of payment and responsibility ..... after operation.1/

e) Cost of shipment, insurance, compensations and expenses of the responsibility of storage up to reception by the party owner of the works.

f) Price adjustments and rates of increase.

In case of tenders for buildings and construction, the prices of items of works must be clarified (stated) and a detailed comparison made between the tenders.

What has been stated in this section is the basis according to which the classification of tenders referred to in Section 15 shall be carried out.

1/ Arabic text not clear.

Annex 19

Appendix VI: Yemen Arab Republic Labour Law 1970[1/]

Presidential Decree of Law No. (5) 1970

Regarding the Issuance of the Labour Law

Official Gazette dated 15 Sha'aban 1390, i.e. 15 October 1970

Chapter One

Definitions and General Regulations

Article 1

This law defines the rights and obligations of the workers and employers in the Arab Republic of Yemen and regulates the relations between them.

Article 2

In applying this law, the following definitions should be abided with.

1. By worker, it is meant any person, male or female, working for an employer or under his supervision directly or indirectly, against a wage regardless of its nature and in accordance with a written or verbal contract.

2. By apprentice, it is meant any worker learning a profession or trade, being an adult or under age and working under the supervision of the employer.

3. By employer it is meant any person physical or natural who employs one or several workers against a certain wage of whatever nature.

4. By wages it is meant .....

5. By juvenile (youth) it is meant any male or female who is not less than twelve years old nor is he over fifteen.

6.

7. By employee it is meant any person working under the supervision of an employer in accordance with a written or verbal contract, and the nature of his work is either administrative or mainly requires mental effort.

1/ This English translation was requested by the AT/CPO of Promo Services in Beirut, and has not been authorized by the Yemen Government. The original legal text has many ambiguities, so allowances should be made when reading the sometimes unclear English version. The document, imperfect as it stands, might still provide useful information which until now has been inaccessible to the non-Arabic reader.

Article 3

The provisions of this law are excluded from the following categories:

1. Government employees or workers excluding those whose status have not been defined in a cadre issued by the proper Government authorities.

2. Persons employed on temporary basis for a period of less than a month except when it pertains to industrial accidents.

3. Persons working in agriculture except those who are permanently employed by agricultural establishments.

4. Domestic Service. Their status might be later defined by the proper ministry.

Article 5

It is completely forbidden to employ children under twelve years of age, irrespective of the nature of the work required.

Chapter Three

Vocational Training and Employment of Women and Youth

Article 30

Considered as an apprentice is any person contracted to work for an employer with the intention of learning his profession.

Article 31

Any apprentice over sixteen years of age can conclude his training contract and determine in it his training period. The wage scale should be gradual in order to achieve in its final stages the minimum salary assigned for the workers in the specific category he is being trained in.

Article 32

The minister responsible for Industrial or Commercial establishment specified by his decree that he finds it necessary to train the Yemeni workers in the nature of their work and can compel those establishments to accept a number of workers for training under skilled labourers.

Article 33

The employer may break the contract with the apprentice if he has proof of his lack of capability or willingness to learn an assigned profession properly, the trainee may also terminate his employment by giving the other party at least one week's notice of his desire to cancel the contract.

Article 34

All conditions of the labour code apply to working women without discrimination falling in the same category without breaching the rules of the following articles.

Article 35

It is not permissible to have women work between the hours 6 p.m. and 6 a.m.

Article 36

It is not permissible to engage women in jobs injurious to the health or hard labour work or others, these being defined by decree of the minister concerned.

Article 37

A working woman can obtain a maternity leave of 70 days, this being the period before and after delivery. Therefore, it is not permissible to assign work to a working woman for 40 days following the delivery date.

Article 38

An amount equivalent to 70 per cent of her wages will be paid to the working woman for the maternity leave so granted.

Article 39

Every employer who employs a working woman or more should post on site a copy of the Women Labour Code.

Article 40

Youths under fifteen should not be asked to work between 6 p.m. and 6 a.m. nor should they be engaged in effective work for a period exceeding 6 hours a day.

Article 41

It is not permissible to ask youths to do any overtime work, irrespective of the circumstances.

Article 42

Every employer who employs a juvenile or more:

1. Should include in the labour register a copy of the laws governing the employment of juveniles;

2. should post in a prominent position a schedule of working and rest hours for juveniles;

3. should submit to the Social Welfare and Labour Authorities a list giving the name, nature of work, and the date of employment for each juvenile.

Chapter Four

Individual Labour Contract

Article 54

The employer is requested to grant each employee who has been in his employment for one year an annual leave of 21 days, and a one month for employees (in administrative jobs) with full pay. The worker cannot decline from taking his leave.

Article 55

Each worker is entitled to a leave with full pay on occasions and feasts as specified by a decree issued by the head of the Social Welfare and Labour Authorities, provided it does not exceed ten days per year.

Article 56

The employer has to keep a special record file for each worker, specifying his name, profession or job, age, address, date of employment, salary, bonusses, leave entitlement and anything related to his work.

Article 57

The worker will be granted one complete day of rest each week. Should circumstances of work necessitate his working on the weekly rest day or during his leave or on official occasions, the worker is entitled to extra wages.

Article 58

Any worker who during a year proves his sickness by presenting a sick report issued by the doctor concerned, is entitled to a pay equivalent to 80 per cent of his total salary for the first 90 days, which will be decreased to 70 per cent for the following 90 days. The employer will not be under any obligation to pay wages for days of sickness exceeding these limits.

Article 60

The employer should bear the expenses for the repatriation of the worker or the employee to the place where he was originally engaged should the worker or the employee submit such a request under the following conditions:

a. If the employer terminates the services of the worker or the employee for any of the reasons stipulated in article (50).

b. On the expiration date of the contract.

c. If the worker or the employee terminates his employment for any of the reasons reported in article (52).

d. Upon termination of the services of the worker or the employee after completing his paid sick leave entitlement and is still sick.

Article 62

The employer has no right to terminate the services of the worker or the employee during their absence on paid sick leave.

Article 63

The worker or the employee is entitled to a compensation for the services stipulated in article (51) of this Law, on the following conditions:

a. Upon termination of services of the worker or the employee.

b. If a woman relinquishes her services for reasons of marriage.

Minimum Scale of Wages

Article 84

1. The minimum scale for wages is the minimum salary payable to the worker or employee as per decree of the Wages Committee for any trade or branch thereof or profession or category of workers or employees.

4. The minimum scale of wages for juveniles, workers and employees on probation and training is determined on the basis of not less than one third of the agreed minimum wage of the same category.

Article 86

It is incumbent on the employers who are covered by the decrees of the Wage Determination Committee to post on the façade of their premises notices stating the minimum salaries as decreed by the Wage Determination Committee and to keep records of wages in accordance with the directions issued by the Head of Social Welfare and Labour Authorities and the Minister.

Working Hours

Article 88

It is forbidden to engage a worker in effective work for over 8 hours per day or 48 hours per week during the whole months of the year, except for the month of Ramadan Al Mubarak, whereby the effective working hours should not exceed 6 hours in any one day or 36 hours per week. The effective working hours do not include time devoted for prayer, rest and eating. It is possible to increase the daily working hours to 9 hours in certain categories of work or industries or jobs whereby the worker does not work on continuous stretch such as, official establishments, hotels, bars, restaurants and others. It is possible to reduce the daily working hours for certain categories of workers, or in some industries or in dangerous and injurious works. The categories of workers, industries, and the works referred to in this article will be determined by a decree issued by the minister concerned based on the suggestion of the Head of the establishment concerned.

Article 89

The daily working hours should include one or more intervals not less than one hour to be allotted for rest, prayer and eating. In factories where the work is carried on continual night and day shifts, the Minister establishes the system of rest intervals by decree.

Article 90

Friday is considered as a weekly day of rest fully paid. The employer, however, may after obtaining the approval from the Labour Authorities, replace this day by any other day provided the total working days per week would not exceed 6 days and provided this will enable the worker under any circumstances to attend to his religious obligations.

Article 91

The employer may not be bound by the provisions of the three aforesaid articles under the following conditions:

a. Annual inventories, preparation of budget, liquidation, closure of accounts, preparation for sale on reduced prices, preparation for new seasons, provided the number of days required for such preparations will not exceed thirty days per annum.

b. If work is required to prevent the occurrence of a dangerous accident or repair what has resulted therefrom or to avoid a sure loss in materials liable for deterioration.

c. If extra work is intended to meet an unusual pressure. In the two latter cases the Labour Authorities should be informed within 24 hours to assess the emergency and the period required to complete the work, and obtain a written approval thereto.

d. Feasts, seasons, other occasions and seasonal fluctuations which are determined by decree issued by the Minister. In any of the aforementioned conditions it is not permissible for the effective working hours to exceed 10 hours per day.

Chapter Seven

Precautions and Medical Services

Article 92

Every employer should take the necessary precautions for the protection of workers and their safety against dangers and diseases arising from the nature of the work or the equipments used. The employer should not charge the workers or deduct from their wages any amount to provide this protection.

Article 93

Every employer should adhere to the following rules:

a. The establishment should be kept in a hygienic condition, clean and free from unpleasant odours which emanate from the drains or from other sources.

b. The workshops in the establishment should be aerated, with enough space and room for breathing, in accordance with the norms and hygienic standards decreed by the Minister.

c. To execute the necessary preventive measures for the safeguard of workers from damages resulting from any gas, dust or smoke or of any refuse that may generate during the work.

d. Light and heating of the establishment during working hours to be in a satisfactory condition.

e. Install water closets and toilets within easy reach with an average of one W.C. for every fifteen persons or less and allocate separate W.C.'s and toilets for female workers should there be any.

f. Adequate potable water should be provided in convenient places.

g. Provision of adequate water for the easy use of workers.

Article 94

If the nature of the work exposes the worker to body injury, poisoning or illness, then the Minister will issue a decree with a view to regulating the safety of the work and the means the employers should institute for the safeguard of the workers. The employer or his representative should explain to the worker upon his engagement the dangers of his work and the precautionary measures which he should take.

Article 95

Every employer should take the necessary precautions against fire, the preparation of the technical means for its extinction and provide exits for escape which should be kept in good condition for use at any time.

Article 96

The employer should provide first aid facilities for the workers in accordance with the Standards approved by the Minister jointly with the Minister of Health. Should the number of his workers exceed 50 in one particular location or one town, or a sector with a rayon of 15 kilometers, then he should employ a nurse, well conversed with all first aid means on full time basis and should appoint a doctor to attend to them in a location assigned for this purpose.

If the number of workers increases to over one hundred under the conditions stated above, the employer would have to provide the workers with the means of treatment which may require the assistance of specialists capable of surgical operations. Should the number of workers be less than 50, the employer should then provide a first aid box, well kept, containing bandages, medicines and disinfectants as decreed by the Minister jointly with the Minister of Health in order to provide the workers with first aid assistance.

Article 97

Every employer should keep a medical file for each worker, containing the respective Labour Office and the name of the doctor appointed for the treatment and the the days fixed for the doctor's call to examine the workers and attend to them which should not be less than three visits per week.

Article 98

Every employer should keep a medical file for each worker, containing the results of the medical examination carried out upon his engagement, details of his sickness, the phases of treatment, the period of his absence from work and stating the kind of sickness whether normal, professional or industrial accident.

Article 99

Every employer should provide his workers with means of transportation from their residence or from an agreed upon pool to the place of work and ensure their return should their residence not be served with the usual regular means of transportation.

Chapter Eight

Industrial Accidents

Article 103

In the case of an industrial accident occurring during work, the employer is under obligation to pay all medical and treatment expenses, cost of medicines, plus transport charges of the injured to hospital or to the doctor, until complete recovery or confirmation of total disability or the completion of one year from the date of injury, whichever comes first.

Article 104

Should any temporary or permanent disability or deaths result from industrial accident, the employer should pay the injured worker or his dependents the compensation due. The estimation of the extent of the injury and its confirmation should be based on a doctor's certificate issued by the assigned medical committee.

Article 105

It is conditional that the compensation should not be less than the death compensation. In case of complete disability the compensation will be calculated in the light of its causes and circumstances in accordance with this chapter by the assigned Committee for determining compensations.

Article 106

If the injured worker is temporarily disabled, he is entitled to his full pay for the first month of his absence and to 75 per cent of his pay until complete recovery or until the expiry of one year from the date of his disability whichever comes first. And if it is medically confirmed that the temporary disability resulting from the accident turns into a permanent disability, the compensation will be paid to the injured in a lump sum in accordance with the rules of the following articles, and the employer has no right to deduct the amounts already paid by him to the injured worker during his period of temporary disability.

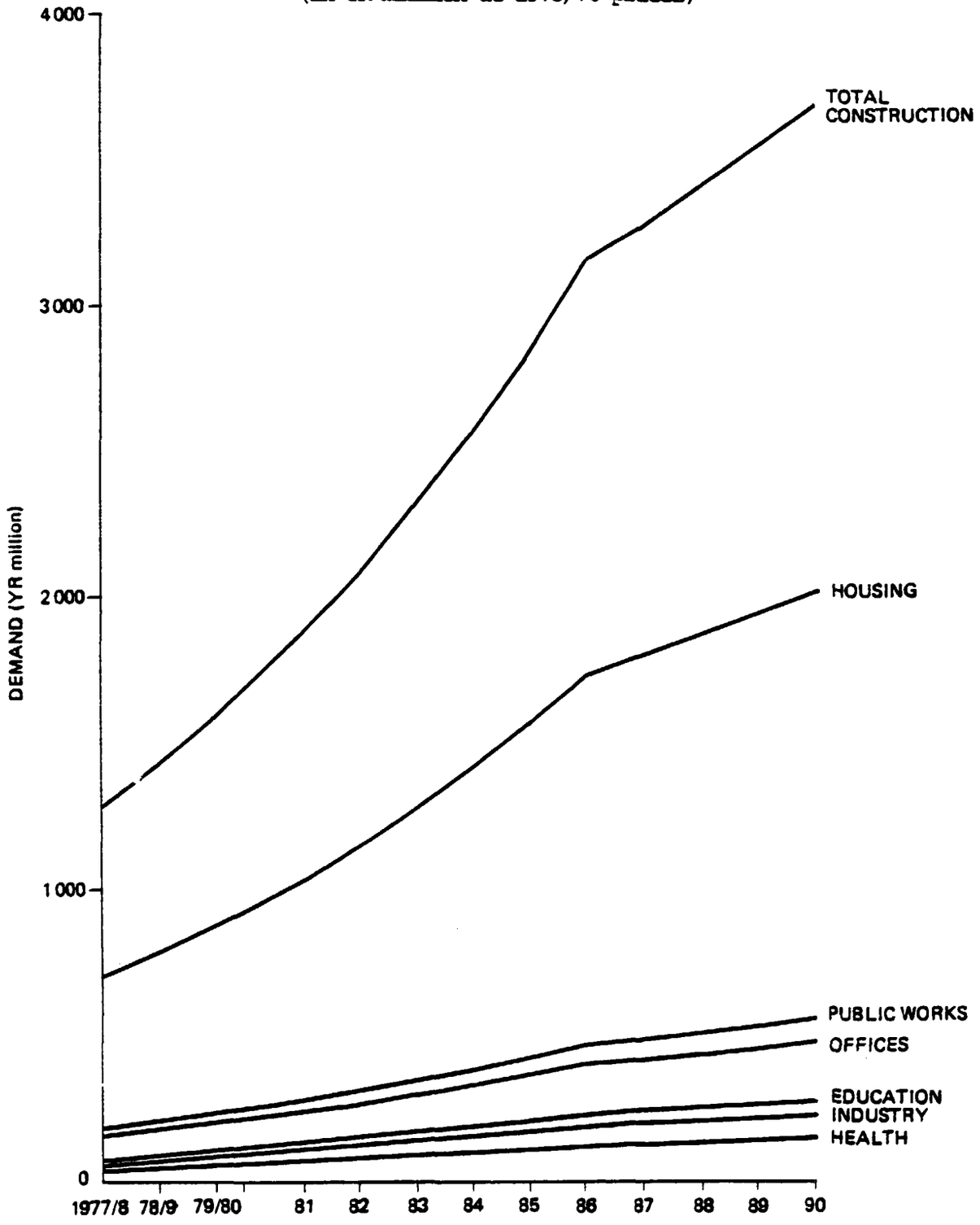
Article 109

If the injury results in a partial permanent disability, the compensation should be paid in accordance with the report submitted by the Compensation Committee concerned.

Annex 20

Forecast of Construction Demand to 1990

(in YR million at 1975/76 prices)



Annex 21

Mission Proposal for the Establishment of a Construction Industry Development Unit - Indication of Possible Responsibilities and Costs

Responsibilities

Comprehensive implementation and coordination of the recommendations proposed by the Mission including:

- Design and execution of the various plans and programmes needed to execute the recommendations.
- Establishing relations with the Ministry of Economy, the IBY and private investors and industrialists to promote and encourage indigenous production of building materials and components.
- Providing technical assistance in setting up the Yemen Bureau of Construction Standards, initiating practical building research activities and a testing and inspection service.
- Providing technical assistance in setting up the Yemen Consulting Bureau.
- Providing technical assistance to the MPW to improve and develop contract documents and conditions, bidding procedures and classification procedures for contractors.
- Preparation of comprehensive maintenance schedules and initiation of suitable training courses.
- Coordination with and assistance to the proposed Contractors' Association.
- Initiation and coordination of comprehensive measures to support and develop an effective and self-reliant local contracting industry, possibly including a formal contractor support institution.
- Coordination with and assistance to the Association of Engineers.
- Cooperation with the Ministry of Education in developing more comprehensive, relevant and effective education and training for construction personnel at all levels.

- Preparation of quarterly progress reports to Government and funding/technical assistance agencies.

Establishment and Costs

1. Project director

An architect or an engineer with at least twenty years of experience in construction, the last five years in construction management.

Duration 5 years (US$ 5 x 100,000)

2. Project engineer, with at least 15 years of experience in construction.

Duration 5 years (US$ 5 x 60,000)

3. Material testing engineer with at least 15 years of experience in material testing laboratories.

Duration 1 year (US$ 50,000)

4. Banking expert to help draw up plans in establishing the Contractors' Settlement Bureau.

Duration 1 year (US$ 50,000)

5. Construction equipment engineer with at least 15 years of experience in managing plant and equipment facilities.

Duration 2 years (US$ 2 x 50,000)

6. Procurement officer with at least 15 years of experience in procurement, preferably in equipment procurement.

Duration 5 years (US$ 5 x 60,000)

7. Accountant finance expert with at least 15 years of experience, who should be familiar with the practices and procedures of international organizations.

Duration 5 years (US$ 5 x 50,000)

8. Administrative officer with at least 10 years of experience.

Duration 5 years (US$ 5 x 25,000)

9. Short-term experts:

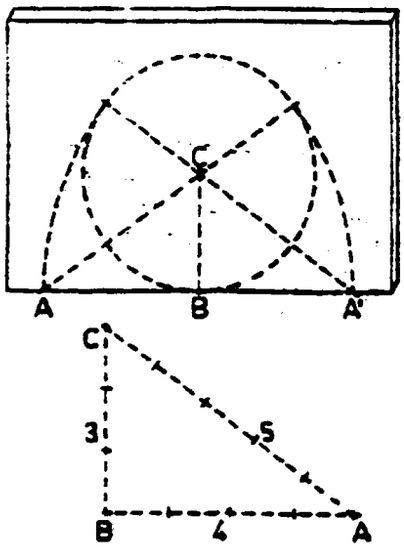
Duration 12 man/month (US$ 90,000)

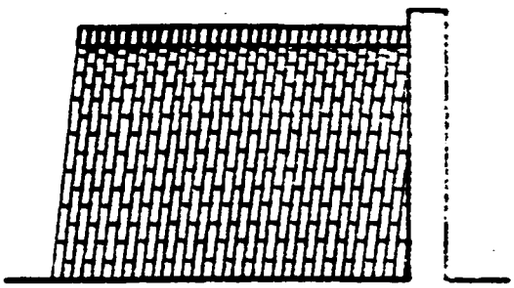
The Government should provide suitable office space, office equipment, supporting staff and transportation.

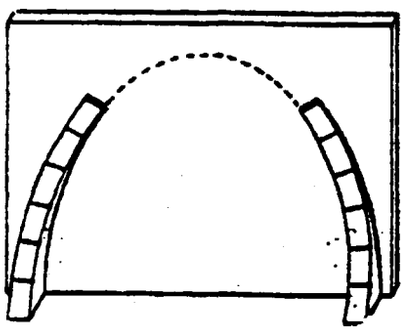
Cost of the PIU

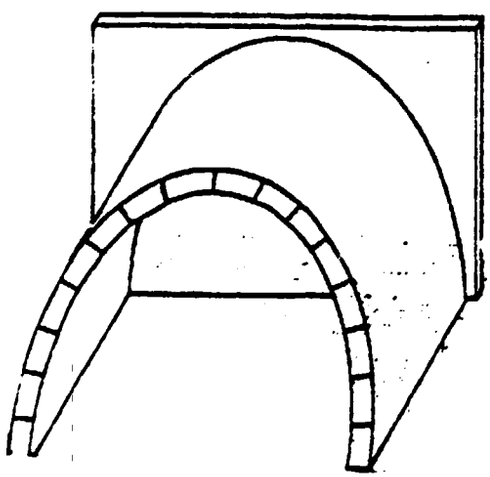
Expert salaries and other benefits	US$	1,765,000
Office equipment	US$	60,000
Total	US$	1,825,000

THE NUBIAN VAULT







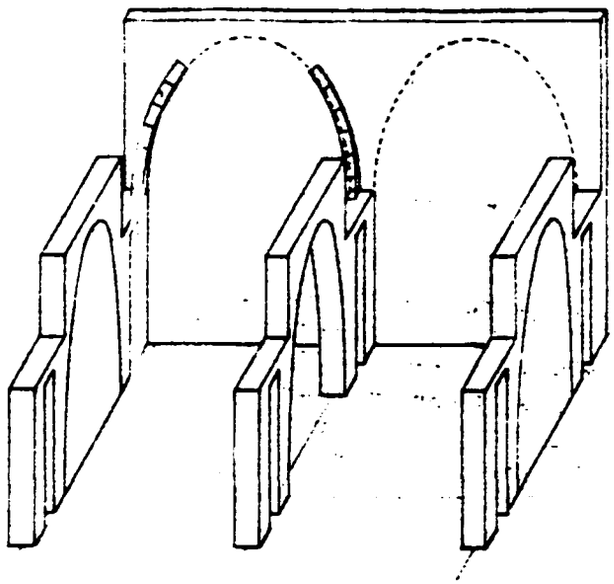


The geometry of this construction is based on the Egyptian triangle ABC. The curve is obtained by three compass strokes placing the centres successively at A, C and A^1.

The building of the vault without using any form is possible partially because of the adhesion between bricks and mortar, partially because of the placement of the layers of bricks leaning against a supporting gable-wall. The process of construction is shortly as follows:
a) A gable-wall of such thickness that provides sufficient stability is created. The geometrical curve can be marked on the gable-wall by using a piece of string as a primitive compass. Well-mixed clay mortar is plastered along the curve as an underlay for the first layers of bricks. Since the bricks lean against the supporting wall, the first layer will consist of only a few bricks;
b) Each of the following layers will have a larger number of bricks unti the top of the curve is reached.

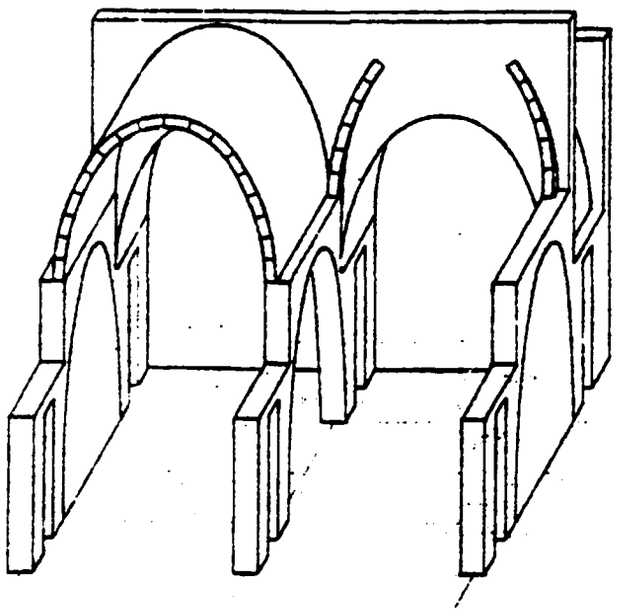
Normally, the span of this vault does rarely exceed three-four metres. However, the antique architecture shows examples of much larger spans, for instance, the Ctesiphon Palace in Iraq where the span is 27 metres.

Annex 22

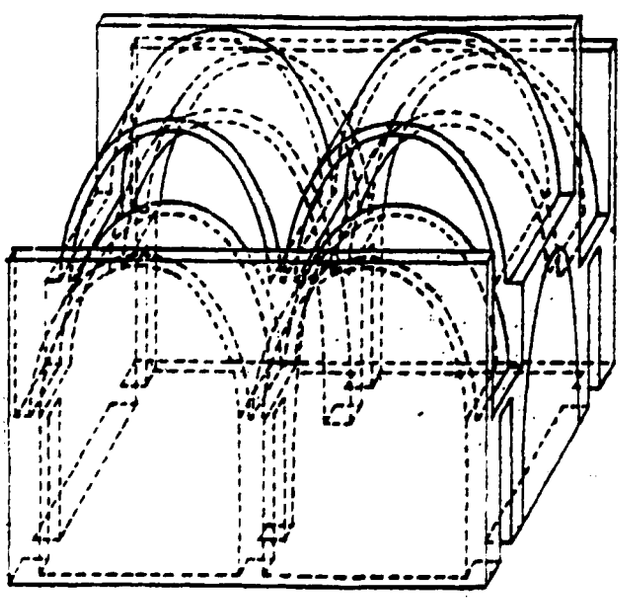


Erection of the structure:
Walls and the "Nubian" vault.

a) The supporting parallel walls and the gable-wall are laid in bricks (burned or unburned), stones, concrete blocks, etc. The geometry of the Nubian vault is marked on the gable-wall.



b) The vaults of the lower part of the building are erected. A supporting gable-wall for the vaults of the higher part of the building is built, supported by the lower vaults, and the same vault construction is repeated.



c) Finally, the second lower part of the building is covered by a vault construction following the same method, but in the opposite direction. The opening between the higher and the lower vaults can be closed by building a wall upon the lower vaults.