MINISTRY OF AGRIOULTURE AND FISHERIES
THE SULTANATE OF OMAN

BASIC DESIGN STUDY REPORT
ON
PROJECT FOR THE CONSTRUCTION OF QUALITY CONTROL CENTER
IN
THE SULTANATE OF OMAN

MARCH 2000

JAPAN INTERNATIONAL COOPERATION AGENCY

KYOKUYO CO., LTD.
SYSTEM SCIENCE CONSULTANTS INC.

PREFACE

In response to a request from the Government of the Sultanate of Oman, the Government of Japan decided to conduct a basic design study on the Project for Construction of Quality Control Center and entrusted the study to the Japan International Cooperation Agency (JICA).

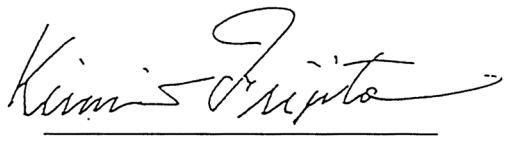
JICA sent to Oman a study team from September 24 to October 14, 1999.

The team held discussions with the officials concerned of the Government of Oman, and conducted a field study at the study area. After the team returned to Japan, further studies were made. Then, a mission was sent to Oman in order to discuss a draft basic design, and as this result, the present report was finalized.

I hope that this report will contribute to the promotion of the project and to the enhancement of friendly relations between our two countries.

I wish to express my sincere appreciation to the officials concerned of the Government of the Sultanate of Oman for their close cooperation extended to the teams.

March, 2000



Kimio Fujita
President
Japan International Cooperation Agency

March, 2000

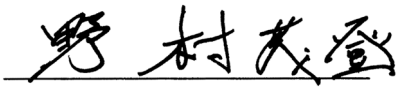
LETTER OF TRANSMITTAL

We are pleased to submit to you the basic design study report on the Project for Construction of Quality Control Center in the Sultanate of Oman.

This study was conducted by Kyokuyo Co., Ltd. and System Science Consultants Inc. , under a contract to JICA, during the period from August 30, 1999 to March 31, 2000. In conducting the study, we have examined the feasibility and rationale of the project with due consideration to the present situation of Oman and formulated the most appropriate basic design for the project under Japan s grant aid scheme.

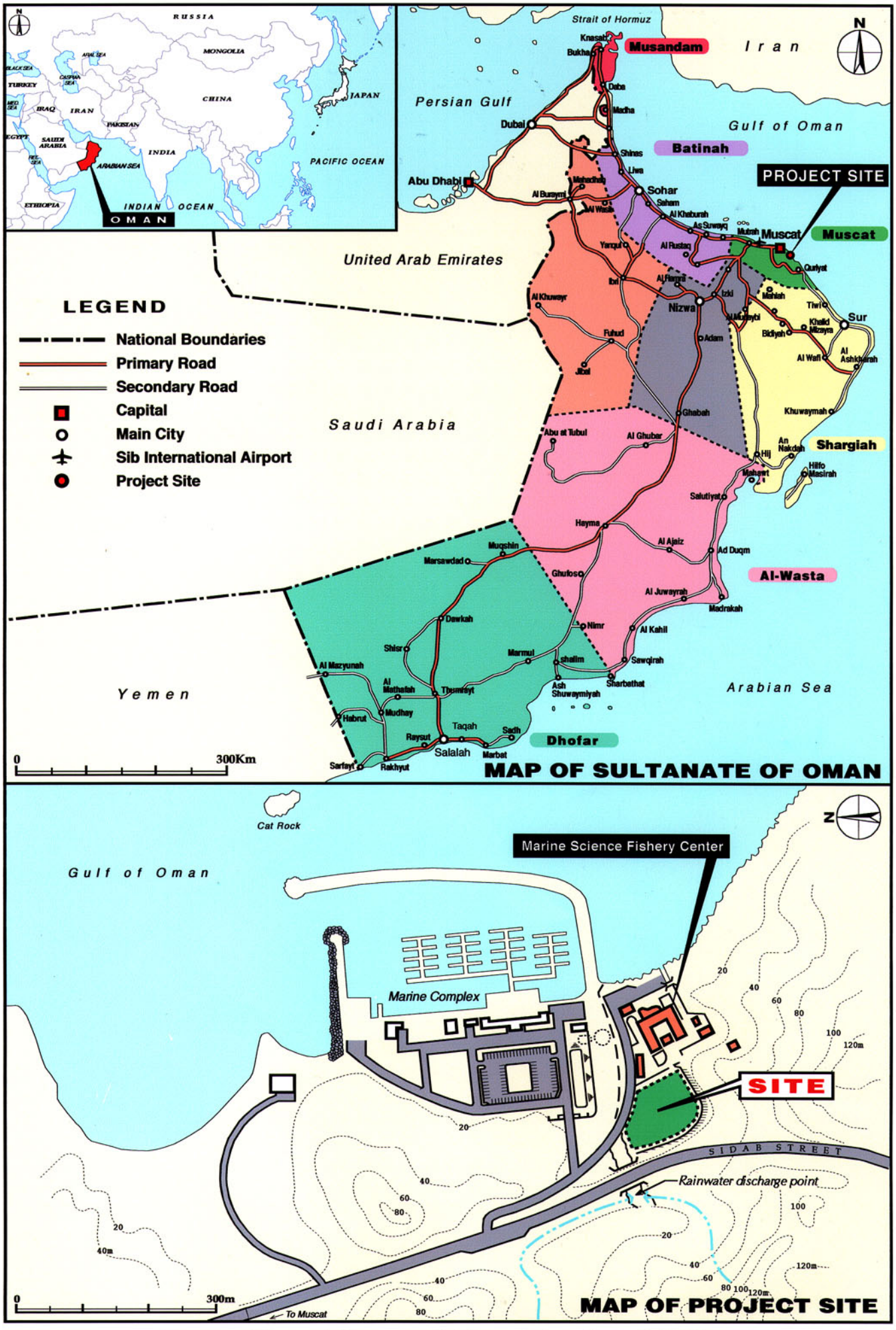
Finally, we hope that this report will contribute to further promotion of the project.

Very truly yours,



Shigeto NOMURA
Project manager,
Basic design study team on
the Project for the Construction of Quality Control Center

Joint Venture of
Kyokuyo Co., Ltd. and
System Science Consultants Inc.



Location Map of the Project Site


PERSPECTIVE
RROJECT FOR CONSTRUCTION OF QUALITY CONTROL CENTER
IN THE SULTANATE OF OMAN

List of Abbreviations

AAS	Atomic Absorption Spectrophotometer
AOAC	Association of Analytical Chemist
CPUE	Catch Per Unit of Effort
EEZ	Exclusive Economic Zone
EU	European Union
FAO	Food and Agriculture Organization
GC	Gas Chromatography
GCC	Gulf Cooperation Council
GPS	Global Positioning System
HACCP	Hazard Analysis and Critical Control Point
HPLC	High Performance Liquid Chromatography
MSFC	Marine Science and Fisheries Center
OAJC	Omani-American Joint Commission
QCC	Quality Control Center
RC	Reinforced Concrete
UV	Ultra Violet
WID	Women In Development

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Appendix II

Chapter 1 Background of the Request

Chapter 1 Background of the Request

1.1 Background

The fisheries of the Sultanate of Oman (henceforth referred to as Oman) is mainly comprised of artisanal fisheries conducted along the 1,700km coastline that borders the Indian Ocean and Arabian Sea. Approximately 120,000 tons of yellowfin, spanish mackerel, and grouper are landed annually (1997), of which about 40,000 tons are exported.

Policies have been pursued that aimed at promoting the fisheries industry such as the Fisheries Promotion Fund established in 1978. Subsequently, the fisheries industry now comprises 20 percent of the total volume of non-petroleum export products. It has diversified, created employment, helped develop fishing villages, and has served as a means of earning foreign currency. Although the fish production, distribution, and processing facilities have developed rapidly over a short period of time, there has been a tendency to ignore the importance of storing the fish catch in ice, due to the close proximity of the fishing grounds to the landing site and the custom of consuming mainly fried fish. As a result, despite the expanded scope of fish marketing activities, the awareness of fishermen and distributors regarding fish freshness has not evolved and the same fish handling methods of the past continue to be used; and quality and hygiene management issues remain unresolved.

In recent years, the quality standard for food products in the international market have become exceedingly stricter. A ten-year fisheries development plan was launched by the government in 1991 and the goals of improving the quality and sanitation standards for fishery products were prioritized. In 1997, QC regulations on exported fishery products were announced and a fishery processing factory which adopted the HACCP standards was built. However, a quality control institution capable of conducting tests and analyses or a QC management system based on these standards remain undeveloped.

Consequently, the EU prohibited the import of processed fishery products from Oman as of April 1998 on the grounds that the fishery products did not meet the EU hygiene standards. This decision had a drastic impact on fish processing factories handling mainly high grade fish for export such as tuna, etc., as well as on the lives and economic welfare of the coastal fishermen.

Therefore, improving the quality control system for fishery products as well as an inspection system for fish processing factories, establishing quality control capabilities in accordance with international quality control and hygiene management standards became urgent issues, in conjunction with creating a quality control facility for fishery products equipped with adequate testing equipment to cope with the

anticipated volume and number of test items. Additionally, a comprehensive quality control management system encompassing the entire fisheries process from fish production to marketing was required in conjunction with as a base of operations for the education, training, and supervision of fishermen and fish processors.

Against this background, the government of Oman prepared a plan to build a Quality Control Centre for Fishery Products (henceforth referred to as QCC) equipped with testing, analyses, supervision, training, and educational functions in quality control management of fishery products and submitted a request to the Japanese government for grant aid cooperation for the construction of the facility and provision of needed equipment.

Based on this request, the Japanese government decided to implement a basic design study for the required facility and equipment through the auspices of the Japan Cooperation Agency (henceforth referred to as JICA) in September 1999.

1.2 Summary of the Requested Facility and Equipment

The following were requested by the Oman government.

(1) Proposed project site

Adjacent to the MSFC in Arubustan district in Muscat City.

(2) Requested facility and equipment

1) Facility: Quality control building, exhibition building, training, building, others
   a) Quality control building: test/analysis room, researcher room, storage, etc.
   b) Exhibition building; Office, exhibition room, lecture hall, meeting room
   c) Training building: Training room, storage
   d) Others: Garage, guardhouse

2) Equipment: QC equipment, educational/training equipment, others
   a) Quality control equipment: Chemistry test, biology test, bacteriology tests, analytical instruments, etc.
   b) Educational/training equipment: Simulator, FRP boat, and loading equipment
   c) Others: Vehicles

Chapter 2 Content of the Project

Chapter 2 Content of the Project

2.1 Objective of the Project

The coastline of Oman which stretches approximately 1,700km has traditionally been inhabited by coastal fishing villages engaged in artisanal fisheries. The government has adopted a major policy to diversify its industries and to promote balanced regional development; and the promotion of the fisheries has become a priority target within this policy.

The short-term objective of the Project is to fully utilize the newly established QCC and its equipment and to quickly establish a quality control system for fishery products based on HACCP standards, the internationally adopted quality control standards. In the area of fishery product exports, the aim is to reestablish trust in Oman's fishery products as quickly as possible by satisfying international quality control and hygiene standards.

The long-term objective is to support a quality control and hygiene management system that is needed to supply a good source of protein both domestically and overseas, to establish a comprehensive system at each stage of the fisheries process - from fish production to processing and distribution, and to achieve a sustainable quality control and hygiene management system for the entire fisheries industry.

Presently, under a follow-up evaluation of the Japanese government technical assistance project, "Oman Fisheries Training Plan", in Oman, quality control technicians are being fostered at the MFSC and the aim is to improve the quality control capabilities of the local researchers. The MFSC is a research institute which specializes in overall fisheries resources and its basic activities and functions differ from those of the QCC. However, the effectiveness of the activities of both centers can be raised if a management system that will effectively utilize the activities and differing characteristics of both centers is realized. Simultaneously, establishing comprehensive guidance and supervision in quality control and hygiene management within the branch offices of the Ministry of Agriculture and Fisheries will contribute to establishing a quality control and hygiene management system over a wide area.

In order to achieve this, the Ministry of Agriculture and Fisheries must establish a quality control and hygiene management system utilizing the QCC as a base, for the existing MSFC and the activities of each branch of the ministry located throughout the country, in order to improve quality control and hygiene management nationwide.

Based on the above, the basic objective of the Project is to establish the QCC and to provide facilities and equipment to conduct tests/analyses, education, training, supervision, and guidance activities.

In addition, the Project will assist in providing facilities and equipment in accordance with the Oman government policy to improve the quality control and hygiene management system of fishery products that is the focus of Oman's ten-year development plan for fisheries.

The relevancy and anticipated impact of the Center following the commencement of its operations is shown in the diagram below.

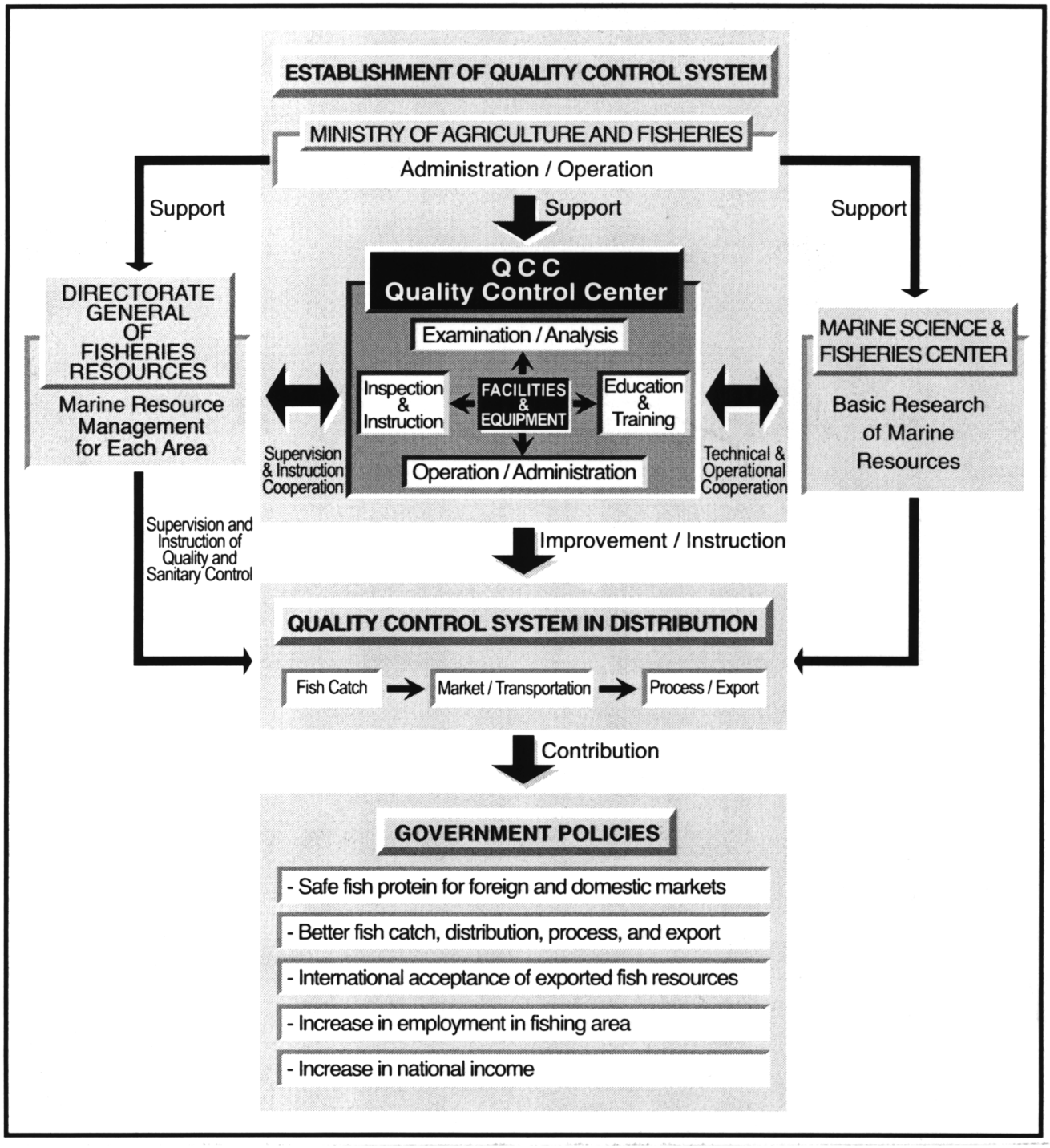


Fig. 2.1: Project Activities Flow

2.2 Basic Structure of the Project

(1) Basic Improvements

The focus will be on the effective use of the facilities and equipment that will be provided by the Project and to cope with the operations and maintenance plan of the Oman government in its efforts to establish a quality control system, immediate issues which QCC must confront, and the mutual and efficient sharing of the existing equipment and facilities of the MSFC.

Due to the lack of a quality control center with central management functions in Oman, the Project will enable the center to address the immediate needs of the processing factories producing fishery products for export and all other items that are extraneous to the demands for quality control management will be excluded from the content of the Project. The QCC will be comprised of the four departments of Examination and Analysis, Inspection and Guidance, Training, and Administration. It will be operated by quality control staff members transferred from the adjacently located MSFC and the Ministry of Agriculture and Fisheries.

The QCC will be responsible for the quality control management that encompasses the entire fisheries process from fish production to marketing and to address the high demand for educational and training activities in this area. The Project will provide the facilities and equipment required for these activities.

(2) Review of the content and scope of cooperation of the requested facilities

Quality control regulations for fishery products were established in Oman in 1997. Under these regulations, the quality control of fishery products was conducted by the quality control section of the Bureau of Fisheries Resources under the jurisdiction of the Ministry of Agriculture and Fisheries which was responsible for inspecting and supervising processing factories and issuing export licenses. But the facilities and equipment to conduct tests under a quality control system were nonexistent. The EU prohibited the import of processed fishery products from Oman as of April 1998 on the grounds of an inadequate quality control and hygiene management system in Oman. In the face of this restriction, the Ministry of Agriculture and Fisheries provisionally transferred the quality control section to the MSFC, a research center equipped with testing/analysis equipment, in order to commence tests and analyses in accordance with EU standards. From 1998 to the present, the MSFC has conducted scientific tests and analyses of samples and products of fish processors throughout the country partially assisted with technical cooperation from JICA. Simultaneously, quality control inspectors were employed and measures to improve hygiene conditions were implemented by the processing factories; and with the combined effort of the MSFC and the Ministry of Agriculture and Fisheries in

implementing supervisory and guidance activities, four factories were issued licenses to export their products to the EU in July 1999.

Although the MFSC has been provisionally designated as center for quality control inspections, it is the only institute that is presently engaged in conducting quality control tests and analyses. Following the start of the QCC, the MFSC staff members from the quality control section will be transferred to the QCC. Consequently, in reviewing the content of the equipment and the technical level of the staff members, the activities of the MSFC will be used as a point of reference and a careful examination will be conducted to establish appropriate Project content.

1) Needs Assessment

a) Need for a QCC

In order to receive export licenses for fishery products, the quality control tests of fishery products is presently provisionally conducted at the MFSC utilizing its equipment and facilities. However, the MFSC was established as a research center and its equipment and facilities were not installed specifically for the purpose of quality control management. In terms of space, each room is fully used and there are no empty rooms. As a result, the only room which can be shared is the lecture hall.

However, the two centers are located adjacent to each other and although the basic research facilities of the MFSC and the practical test/analysis facilities of the QCC differ, mutual cooperation in terms of operation and in fostering and securing efficient lab personnel will be emphasized.

b) Scope of Improvements

QCC will be responsible for fulfilling an autonomous role in improving quality control and hygiene management of the entire fisheries process from fish production to marketing. However, the tests and analysis work will mainly have to be dependent on MFSC staff members for the time being. When the need to expand the content of the tests arises in future, the range of the improvements that will be made will be within the scope of the operations and management plan that the Oman government will be able to effectively implement. The Project will focus on the foremost issue confronting QCC, which is to enable it to conduct tests on quality control and hygiene to enable fishery products to be exported to industrialized nations such as the EU and to provide equipment and facilities that are in accordance with the technical skills of the operating staff members.

The specific content and quantity of the equipment and facilities provided by the Project will be based on the volume of tests and analyses that will be

conducted according to HACCP standards and the content of the educational and training activities. In addition, if the demand for certain test items are notably low, despite the fact that it is listed in the quality control regulations for exported fishery products compiled by the Oman government, it will not be included in the list of equipment and facilities that will be provided by the Project. If the demand for these tests rises in future, it will be the responsibility of the Oman government to take the measures required to meet the demand.

c) Level of Improvement

The regional infrastructure of the project site has grown rapidly from the 1980s to the 1990s in conjunction with an appropriate legal system. Hence in view of these latest improvements in the infrastructure, excessive improvements will not be implemented under the Project.

The content of the facilities and equipment that will be provided for QCC will adequately reflect the characteristics of the operations and maintenance conditions of facilities and equipment of other institutions in Muscat City with laboratory functions.

The Central Laboratory of the Ministry of Commerce and Industry has been in operation since 1985 and utilizes a LAN computer system and has accumulated data on collecting examination fees per test item. In order to determine the scope of the facilities and equipment and the level of improvements required for the operating system of the QCC, this institution should be fully utilized as a point of reference.

In principle, it is the responsibility of the Oman side to implement a self-supporting operations and maintenance system in order to enable the Center to achieve sustained development of its operations.

2) Facility Plan

- The size and structure of the rooms in the scope and content of the facility plan will be in accordance with what is required to improving quality control management of fishery products and the scope of the test items will be limited to fishery products.
- The MFSC is fundamentally a research institute and the layout and space of its facilities are limited and difficult to utilize for practical examinations. The QCC will enable functional quality control tests of fishery products and zoning will be adopted for efficient data management and educational and training activities.

- The standard of improvements will be equivalent to those at other existing and similar facilities and the facility will meet the latest standards and regulations. Exorbitant improvements that will financially affect the budget will not be included.
- Facilities and rooms that are not directly related to improving quality control and hygiene management of fishery products will not be included in the Project. However, educational and training rooms that are considered appropriate for a quality control center, as well as sanitation area will be included in the Project.

3) Equipment Plan

- In the area of equipment procurement, local companies will be selected based on a review of their operations. In view of the details of equipment performance and standards that must be reviewed, the equipment will be selected and procured in Japan. However, in principle, equipment which requires local maintenance and afterservice will be procured locally.
- The request for a FRP boat, GPS, fish detector, and navigational training simulator, required attachments, and other fish production support equipment will not be included in this Project since it is not directly related QCC functions and the objective of the Project. However, educational and training equipment needed to improve the awareness of quality control by fishermen and others such as audio visual equipment and other simple quality control and hygiene related equipment will be provided to support training activities in this area.
- A camera and other editing and data management equipment for use within the QCC will be provided, but the equipment will be selected to allow shared use for educational and training activities and overall efficiency in the use of the equipment will be considered in the selection.

4) Items requested by the Oman side and items deliberated and confirmed

The following is a final list of items that will be provided by the Project based on discussions with the Oman side.

(Facility)

Content of the Request	Improvement (Yes/No)	Consideration Criteria
[Examination & Analysis Dept.]		
- Sample preparation room	O	- Appropriate equipment & facilities to match function of room
- Organoleptic room	O	- Ditto
- Physical property lab.	O	- Ditto
- Microbiology lab.	O	- Ditto
- Sample stock room	O	- To accommodate sample volume
- Data management room	O	- Centralize data management
[Education & Training Dept.]		
- Lecture hall	O	- Essential education/training room contents and improvements
- Library	O	- Essential to the training needs
[Inspection/Guidance Dept.]		
- Inspector/instructor room	O	- Number of personnel
[Administration Dept.]		
- Director/Secretary office	O	- Room size to local standards
- Office/staff room	O	- Number of personnel
- Documentation room	O	- Data management
[Excluded from the Project]		
- Auditorium	X	- Education/Training room to be used.
- Simulator	X	- Cope by education/training programme
- Navigational training	X	- Ditto
[New Facility not requested]		
- Reception	O	- For management of samples received
- Ante room	O	- For hygienic preservation of samples
- Locker room	O	- For hygienic/sanitary condition
- Permit office	O	- For management of issuance of permits

Remarks: O=Yes, X=No

(Equipment)

Content of the Request	Improvement (Yes/No)	Consideration Criteria
[Examination & Analysis Dept.]		
- Sample preparation equipment	O	- Sample preparation from reception to each lab.
- Examination & analysis equipment	O	- Equipment for analysis items and content
- Cold storage	O	- Sample amount
- Data management equipment	O	- Basic equipment needed for data management
[Education & Training Dept.]		
- Education & Training equipment	O	- Audio visual /practical training equipment
[Inspection/Guidance Dept.]		
- Guidance equipment	O	- Guidance related equipment
[Administration Dept.]		
- Sample management equipment	O	- Basic equipment for sample data management
[Excluded from the Project]		
- Navigational equipment simulator	X	- Low priority to QC (not urgent)
- Navigational equipment	X	- Ditto
- Fishing boat	X	- Ditto
- Motor vehicle	X	- Ditto

Remarks: O=Yes, X=No

(3) Facility and Equipment Plan

1) Basic policy on facilities and equipment

The prerequisites are fish handling, fishing boat repair, landing facilities, inspection of processing factories, improving the quality control system for exported products, and establishing quality control capabilities that meet international quality control and hygiene management standards.

Presently, the provisional base of operations for quality control management is the MSFC where a three-year follow up project for the Japanese technical cooperation project, “Fisheries Training Project”, has been implemented since 1999 (slated to be completed in March 2000). The technology for quality control examination and analyses has also being included in this project. However, it is difficult for the MSFC to conduct the task of quality control examinations. In addition, there are presently 42 processing factories which will eventually apply for export licenses and a surge in the number of tests and examination items is anticipated in the future. The QCC will be established to handle this increase.

2) Basic Policy of the Facility Design

a) Function and Content

The center will be equipped to conduct quality control tests and analyses in accordance with the international standards for fishery products. The QCC will be comprised of the four departments of Examination and Analysis, Inspection and Guidance, Training, and Administration and will be operated in accordance with the Oman government plan on QCC operations In order to enable the center to fulfill these functions, it will have the following minimum functions.

i) Examination/Analysis

The most optimum line of movement will be created for the examination and analysis room in accordance with the flow of tests. In addition, a separate sanitation zone is planned.

ii) Inspection/Guidance

A workroom for the inspection and guidance department will be created for the staff members who will be visiting fish landing sites, processing factories, etc. to provide inspection and guidance in overseeing The test data and required test items needed for inspection and guidance activities will be shared with the testing/analysis department. In addition, the workroom will be conveniently located to enable interviews of fishermen, distributors, and fish processors.

iii) Education/Training

In order to improve the overall quality of fishery products, comprehensive quality control measures must be taken during fish harvesting, landing, and at each stage of fish distribution. A multi-purpose education and training room will be installed to conduct educational and training sessions in quality control for fishermen, distributors, and processors. In addition to the staff members of the training and examination departments, the educational and training sessions will also be carried out by MSFC researchers.

A training room equipped with audio-visual equipment as well as sink facilities for simple handling of fishery products will be installed in the training room in order to enable practical training sessions as well as lectures.

iv) Administration

The data obtained from the quality tests must be compiled, categorized, and stored according each test item. In addition, the QCC will be responsible for issuing test certifications. A room will be provided for data management purposes. Another room will be provided to effectively assist the management, operations, and maintenance of the entire QCC.

b) Optimize Facility Function

i) The procedures for each examination will be reviewed and the facilities will enable the most effective implementation of quality examinations.

ii) An efficient line of movement that will connect the facility to the adjacently located MSFC will be created and emphasis will be placed on establishing a sanitation zone.

iii) The facility will be take into consideration local design standards, renovation standards of the MSFC, and the special characteristics of the location.

iv) While minimizing the heating and cooling needs of the corridors and hallways, the heating and cooling units will be conveniently located in the facility.

v) An effective line of movement between the facility and the adjacent MFSC is planned.

c) Facility Size

The number of rooms and their size will be calculated according to the "Collection of Information on Architectural Design" published by the Architectural Institute of Japan.

d) Facility Fixtures

Fixtures, furniture, etc. that are directly related to the overall function of testing fish quality will be included in the scope of this Project. However, the

furniture, utensils, and fixtures for the administrative, training, and staff rooms will be provided by the Oman side.

e) Security Safe Conditions around the Facility

The installation of rainwater discharge conduits, securing the safety of the site from the surrounding sloping areas, installing fencing around the site, entrance gate, etc. will be the responsibility of the Oman side.

3) Basic policy on equipment procurement

a) Division of tasks between the MSFC and QCC and emphasis on the joint use of equipment

As mentioned earlier, the MSFC is an oceanographic and fisheries research institute, and the QCC is responsible for the testing, analyses, supervision, guidance, education, and training activities in quality control of fishery products. Although a segment of the testing and analysis equipment (HPLC, AAS, etc.) can be shared by the two institutes, equipment at the MSFC is basically used for independent research activities and in practical terms, the shared use of equipment is difficult. However, easy-to-handle test equipment and spare parts will be selected; and in view of the fact that equipment at the MSFC will be used as substitute equipment during emergencies, equipment that can be shared will be selected.

b) Locally Procured Equipment

The analysis of data and output from the atomic absorption spectrophotometer, high performance liquid chromatography, and other computerized precision equipment, requires detailed maintenance and swift action in the event of a breakdown. Such equipment which requires periodic maintenance will be procured locally. Several of the government testing institutions (Central Laboratory of the Ministry of Commerce and Industry and the Laboratory of the Ministry of Water Resources) and private companies have these types of equipment. As a result, there are several suppliers who sell and carry out maintenance work on these types of equipment. Three suppliers have provided the MSFC with such equipment and have established a good service record.

c) Policy on Equipment Selection

The type, grade, and number of equipment that will be provided under the Project will be selected according to the following conditions.

i) The testing equipment will be capable of analyzing the officially required test items set forth in the quality control regulations for exported fishery products (1998 new edition published by the Ministry of Agriculture and Fisheries) and other test items required in general quality control.

ii) Equipment that will enable staff members to take samplings, simple tests at landing sites, and storage and transport of samples will be selected for the supervision and guidance department.

iii) Equipment for the education and training department will include audiovisual equipment, and other equipment used in training sessions.

iv) Test data management equipment will initially be limited to basic equipment and the Oman side will be responsible for providing software and other upgrade equipment in gradual stages.

v) Test operations during the start of the Center's operations and equipment essential to begin test activities (instruments, reagents, etc) will be provided by the Project, but subsequent supplements and renewals will be provided by the Oman side.

vi) The grade of the equipment will be based on specifications that reflect analytical needs.

vii) Equipment suited to the present technical levels of the technicians will be selected.

viii) Equipment that require complex service and maintenance will be procured locally from suppliers with service technicians.

2.3 Basic Design

2.3.1 Design Policy

(1) Establishing Design Policy

1) Policy on Natural Conditions and Surrounding Environment

- The Project site is located adjacent to the coast and the rear is made up of a slope and rocky mountains. It is intensely hot and desert dust storms are brought in by the seasonal winds. The basic structure, structural heating and cooling, light and ventilation have been adequately considered for the space that has been allocated.
- The design will take into consideration maximum wind velocity, temperature, etc. In addition, construction material that is able to withstand salt damage will be selected as much as possible.
- A functional design that will take into consideration local construction methods and harmonization with the surrounding environment will be adopted.

- Design and construction methods with minimal impact on the environment will be used.

2) Policy on Construction Conditions

Due to the rapid infrastructure improvements that began in the 1970s, construction companies and relevant industries have developed locally and construction equipment and materials can be procured easily. However, the majority of the workers are Indians, Pakistanis, and Sri Lankans and the industry is dependent on foreign labor. Subsequently, utilizing a design where the construction methods are familiar and understood by local building companies will ensure safe, quality work, as well as adherence to the work schedule. Therefore, local construction methods will be emphasized in the project design and building methods for the Project.

3) Policy on the use of Local Contractors, Equipment and Materials

Due to the availability of locally manufactured standardized equipment and materials which are suited to the local climate, concrete and other major materials can be procured locally. However, the majority of the facility equipment is dependent on foreign imports and as in the labor situation, and it is difficult to procure a large amount of equipment and materials of uniform quality. For example, varieties of cast items such as sliding door sashes, glass, and processed manufacturing methods are limited. As a result, equipment and materials that are widespread locally, where consumables and spare parts can be procured, and equipment and materials which can be processed and repaired locally will be given priority. Based on these conditions, the equipment and materials will be reviewed for material, durability, cost, etc., in conjunction with the capabilities of local manufacturing methods, and installation technology.

4) Policy on the management and maintenance capabilities of the implementing body

The staff members in charge of the maintenance and management of the equipment and the technical level of the service companies will be taken into consideration; and the Oman side will be able to adequately maintain and manage the content and scope of the equipment which will be provided by the Project.

5) Policy on the grade of the facilities and equipment

The facilities and equipment which are adequately suited to the operating capabilities of the local staff and are easy to maintain will be selected. The focus will be to select equipment with the minimum required functions which can be used for the

Center's activities. Sophisticated and automated equipment will be avoided and equipment which can be repaired locally will be selected.

6) Policy on execution period

The main structure will be RC rigid frame which is the most commonly used local form of construction and the outside walls will be RC. In order to shorten the installation period of the equipment and the finishing work, a segment of the walls partitioning the rooms will be built using the dry method , etc. and methods that will shorten the execution period while ensuring durability and quality will be adopted.

7) Policy on obtaining Permits for Construction Works

A construction permit must be obtained prior to the start of construction work on the facility in accordance with the legal standards. The permit can be obtained in Muscat city which is responsible for all basic matters pertaining to construction work in accordance with the Building Regulation for Muscat: 1992. In addition to the construction permit, the Project facility must undergo a sanitation inspection by the Health Engineering Dept., Muscat Municipality and a fire prevention inspection by the Fire Department which is under the jurisdiction of the Police Department.

The Planning Department of the Ministry of Agriculture and Fisheries which is the implementing body of the Project will be responsible for obtaining these permits and submitting the applications to the Muscat municipal offices and related institutions.

(2) Review of the Design Conditions

The Project will be based on the following design conditions.

1) Earthquake Magnitude

Oman is located in the eastern end of the Arabian Peninsula which has very few earthquakes. There is no record of past earthquakes at the Project site located in the Muscat region and therefore, earthquake magnitude was not considered in the design of the Project facility.

2) Wind Load

The average wind velocity is moderate and usually averages 3 to 5m/sec. The maximum wind velocity recorded in the past 20 years by Shibu International Airport in Muscat city was 34m/sec (May 1981). Therefore, the design wind velocity was set at 35.0m/sec.

3) Design Standards

Most of the facilities and equipment will be imported items and therefore, locally applied material design standards, as well as those of Japanese standards will be applied. Local standards for concrete and other materials that are commonly used in Oman will be utilized.

The structural design will utilize the Japanese structural stress analysis method to calculate the structural members suited to local conditions.

Japanese, International and local standards will be applied for the design of the mechanical and electrical components.

In addition, local regulations will be given priority since fire prevention laws and sanitation regulations are directly related to daily maintenance and operations.

4) Establishing the Area of Each Room

The area of the average office room will be based on the basic area per person as set forth in the Collection of Information on Architectural Design, Architectural Institute of Japan and the value of other similar facilities such as the MSFC. The area of the rooms will enable the activities of each department in the Center to be comfortably carried out.

The per capita area of each room in the facility is as follows.

Table 2.1: Standard Area of Each Room

Room Utilized by	Standard for Area per person (*Reference area)	Area of MSFC (Room Area)	(Allowable Design Area)	Rooms for the Project
Manager	13 - 18.0 m^2	Approx. 20.0 m^2	Approx. 13 - 18.0 m^2	Director's room
Office staff	4.5 - 7.0 m^2	5.0 - 8.0 m^2	Approx. 4.5 - 7.0 m^2	Administration/ Supervision room
QC staff	5.5 - 9.0 m^2	7.0 - 12.0 m^2	Approx. 7.0 - 9.0 m^2	Data management room
Training staff	3.6 - 4.5 m^2	5.0 - 7.0 m^2	Approx. 4.0 - 5.0 m^2	Education/Training room (Practical training use)

Source: Standard for area per worker taken from the Architectural Design Data, Architectural Institute of Japan.

Note: *The reference area reflects the work area needed for one person and it does not include the area for reception, storage, copier, etc. The area of the MSFC is the existing room area. The testing room will be about 1.2 times larger than the recommended area for general office space, based on examples of other similar local facilities. The area of the training room is equivalent to the area for one person in a high school training room in Japan, in accordance with Collection of Information on Architectural Design.

(3) Layout of the Equipment

The layout of the equipment will be based on the following basic conditions.

- Equipment requiring ventilation will be located on the window side.

- Instruments and reagents which must be stored in an area where there is minimal temperature fluctuations will placed near the entrance in order to ensure easy restocking.
- A line of movement between the central testing table and the side testing table will be calculated to avoid duplication.
- The washing space and the preparation room will be placed in a separate support area.
- The layout of the testing rooms and the lines of movement will be in accordance with HACCP standards.

(Example: Layout of the examination/analysis room)

The basic area of the examination/analysis room is shown in the layout below, which is the basic layout for equipment installation. The size and space will be set according to the line of movement and the content of the equipment in each examination room.

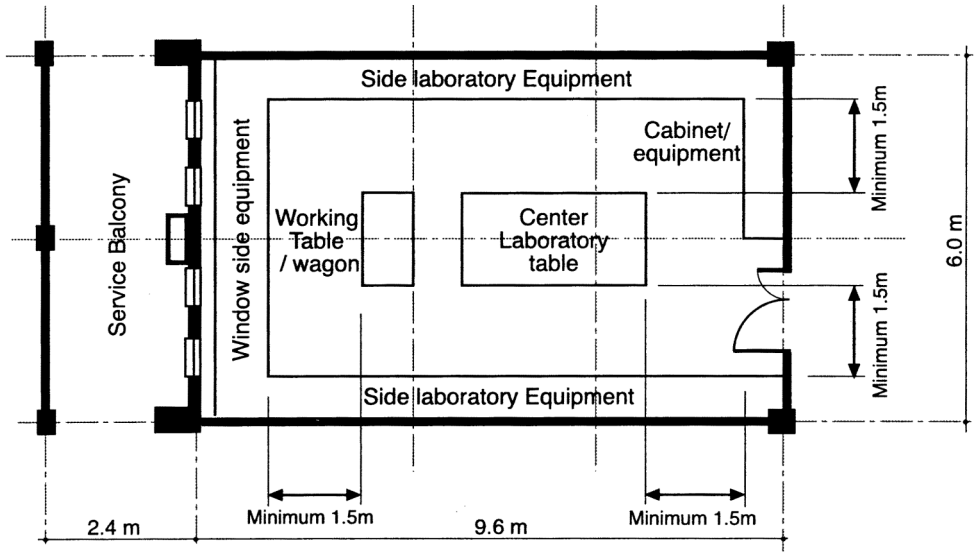


Fig. 2.2 Basic Concept on the Layout of the Laboratories

2.3.2 Basic Plan

(1) Facility Layout Plan

1) Basic Concept of the Layout Plan

The surrounding conditions of the Project site, adequate size to ensure the effective use of the site, differences between high and low areas, easy motor vehicle access from the road to the site, and climatic conditions will be factored into the layout plan.

The Oman side will be responsible for securing the safety of the sloping area surrounding the site and installing rainwater and wastewater conduits at the site. Based

on the conditions explained above, the basic concept pertaining to the layout plan is summarized below.

- The south and west sides of the site are sloping areas, the MSFC will be located adjacent to the facility on the east side, and the access road will be located on the north side. The site will face the ocean from the north to the east sides of the site. The surrounding conditions of the site will be adequately considered in the layout plan.
- Based on the results of the survey study of the site and its surrounding areas, the building will be located at a safe distance from the slope on the south and west sides of the site.
- There is a moderate incline from the south side of the site to the north side where the access road is located and there is a difference of about 1.5m to 2.5m in ground height and the main entrance will take this factor into consideration.
- An uninterrupted line of movement will be created from the entrance for motor vehicles from the access road to the site, the connection with the adjacently located MSFC, the Center building, and the service route to the area surrounding the building.

2) Layout plan

The main entrance will be located in an area with minimal height difference between the access road and the north side of the site. The QCC building will be located in the center of the site and motor vehicles will be able to drive around the building. The parking lot will be located on the west side and the pump house, machine house, and holding tanks will be located on the east side of the site. The zoning within the site and the line of movement is shown in the figure below.

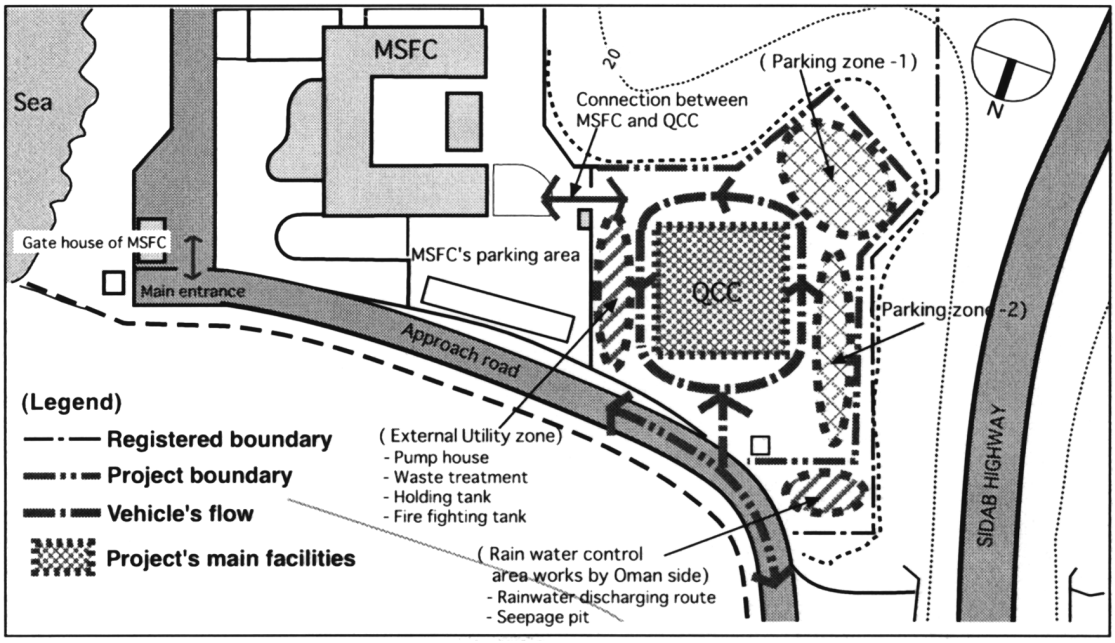


Fig 2.3: Outline of Zoning and Major Flow on Site

(2) Architectural Plan

1) Basic Concept

The major functions of the QCC are largely divided into the following four departments of 1) examination and analysis 2) inspection and guidance, 3) education and training, and 4) administration. The rooms will have the space needed to enable the functions of each section to be carried out and to accommodate the number of staff members that will be allocated to each section.

The quality testing needs of fishery products and the system of operations and personnel planned by the Oman side for the QCC have been considered in the layout of equipment and the functions of each room. Based on a review of the scope required for the facilities (floor area), it is difficult to construct a one-storied building because of the parking lot and facility space which is also planned within the site. But in order to effectively fulfill the functions of an examination center and to minimize the line of movement connecting the different departments, a two-storied building will be built.

The inspection/guidance, education/training, and administrative departments will be located on the first floor to facilitate the movement of visitors and the delivery of samples. The analysis and other departments will be clearly demarcated by the sanitation zone in order to prevent contamination of the examination process stemming from the line of movement from the other departments. The sanitation zone will have a hand-washing and checking area at the entrance.

The sample preparation room for carrying out the preliminary work prior to transferring the samples to the examination laboratories will be located on the first floor and the examination laboratories will be located on the second floor.

The zoning and line of movement planned for the building is shown in the figure in the following page.

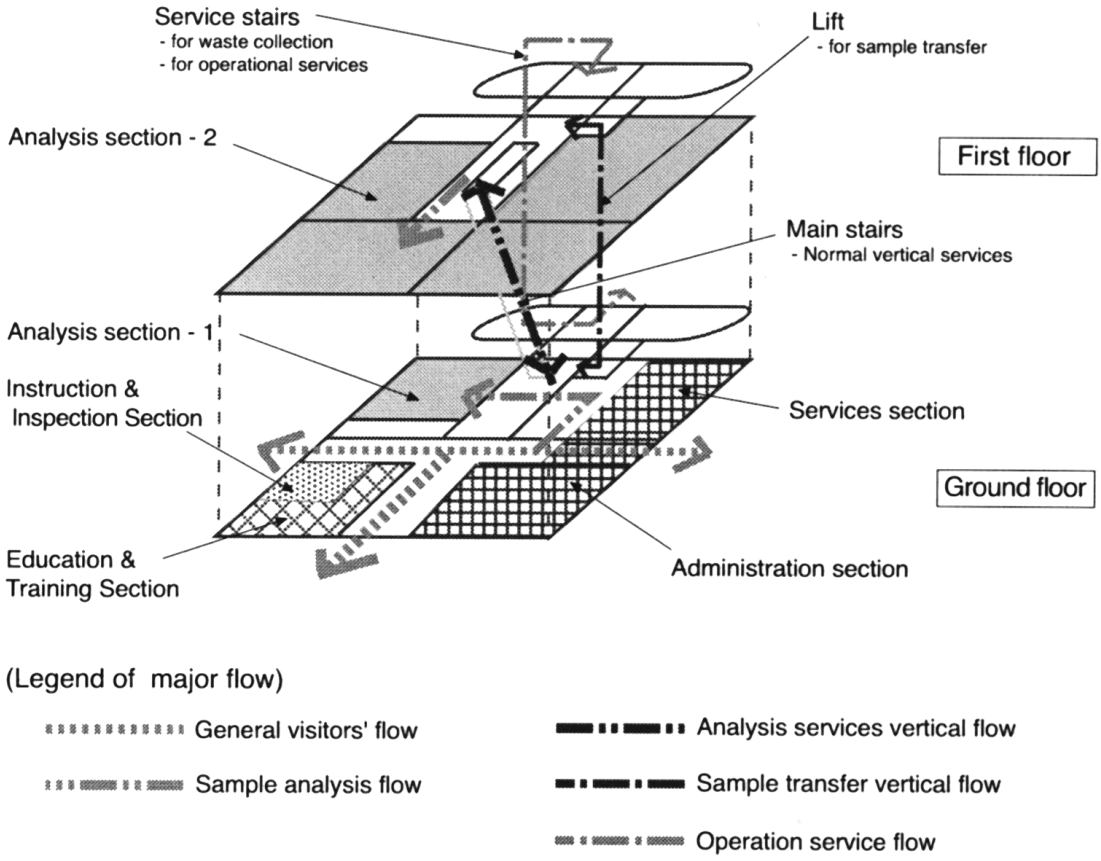


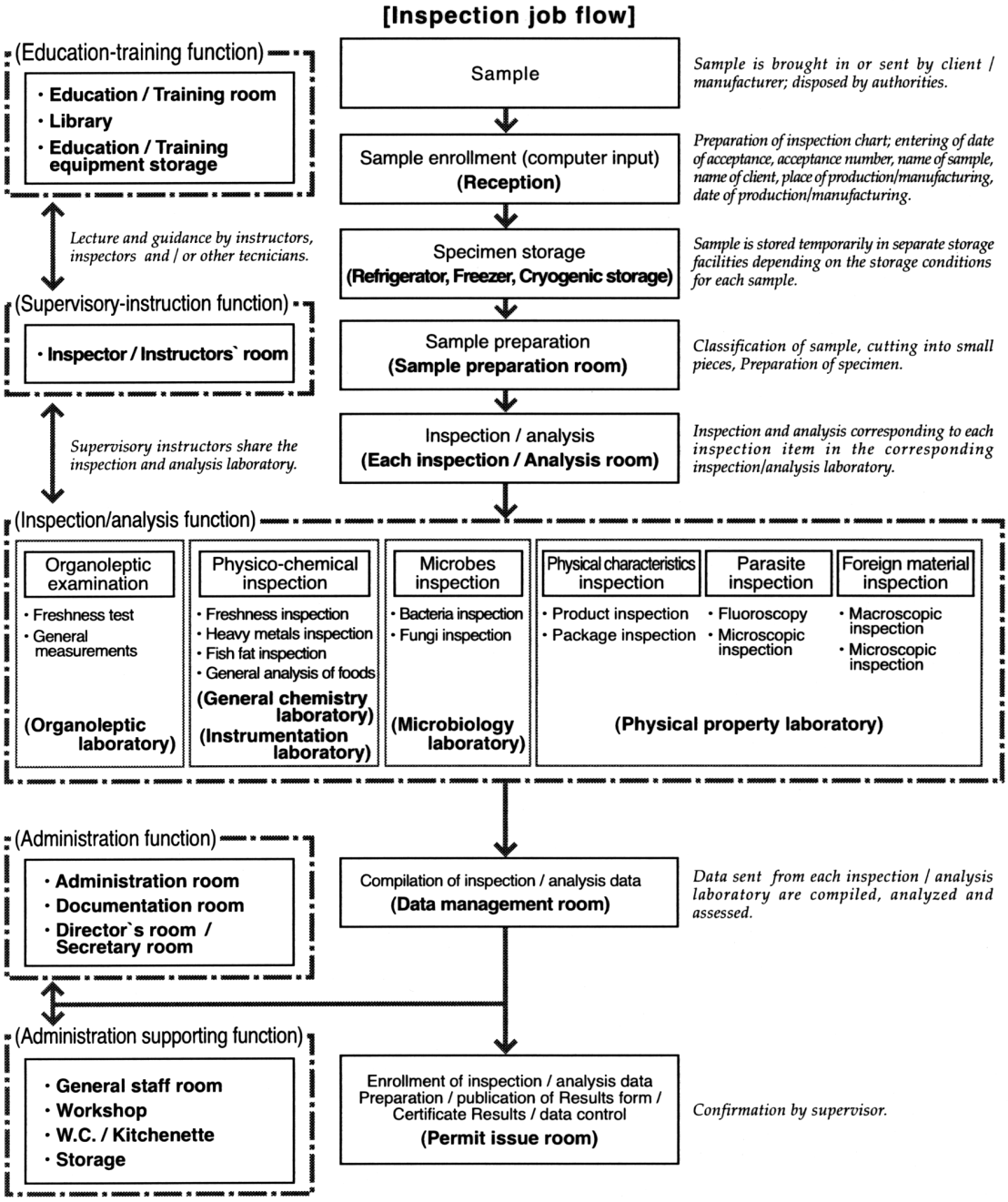
Fig 2.4: Zoning and Line of Movement in the Center building

2) Functions of the Project Facilities

Based on the design policy, the functions of each department within the QCC has been planned to ensure the effective utilization of the Center and smooth coordination between departments.

The flow of the examination process which includes delivery of test samples, the implementation of the examinations, the issuance of licenses and permits, and coordinated functions between each laboratory has been planned as shown in following page.

Analysis Flow and Relation of the Rooms



3) Ground plan

Based on the functional flow chart shown above, each room will be categorized according to department and the conditions for each room are summarized below.

a) Examination and Analysis Department

This department will be comprised of examination rooms that will be responsible for implementing the analysis items and the sample data managing room. The examination rooms will be of adequate size and space to accommodate the work/content of each test and to enable the equipment to be arranged according to the examination procedure. The sample data managing room will be of sufficient space and size to accommodate the required number of staff members and their assistants to implement the work comfortably. In addition, fixed partitions will be avoided so that the room can be used flexibly and to enable the room layout to be changed according to work periods. The examination and analysis department will be placed in the sanitation zone and it will be separated from the line of movement for ordinary visitors.

i) Examination and Analysis Room on the First Floor

The test samples will be received and registered at the first floor and stored temporarily in the cold storage or freezer. It will then be transferred to the sample preparation room and prepared for examinations according to the analysis items. In addition, the sensory test which does not require precise analysis, but which must be carried out quickly will be carried out in the sample preparation room on the first floor.

- Sample preparation room: The fishery samples will be appropriately divided and the equipment needed to prepare the test samples will be installed in this room. A booth will be installed where the work of registering the samples will be carried out since a list of each sample must be compiled. In addition, a storage room will be created to store trays used to separate the samples and transport carts. A grease trap will be placed in the drainage to prevent the oil and waste from the prepared fish samples from flowing into the storage tank.
- Organoleptic laboratory: Although the sensory test is a simple examination to ascertain fish freshness, the analysis items are numerous and the data must be quickly recorded. Therefore, a booth will be created to carry out the examinations.

ii) Examination and Analysis Room on the Second Floor

Test samples will be transferred from the preparation room on the first floor to the specialized examination and analysis laboratories on the second floor. The samples will be transported either manually or by dumb waiter.

General chemistry and instrumentation laboratory: Freshness test, heavy metals, fish fat, and general food analyses are the major analysis items that will be conducted. Specialized analytical instruments will be placed in a separate instrument analysis room. In addition, a separate corner will be created to accommodate the draft chamber and instruments will be washed using distilled water in order to keep them separated from the general analysis zone.

- Microbiology laboratory: Microbial and specific bacterial examinations are the major items of analysis that will be carried out. This lab will be located in the sanitation zone and in order to prevent bacterial contamination from the outside, an ante-room will be created at the entrance. As in the case of the general chemistry room where microbial examinations are carried out, the task of dividing the samples, sterilizing instruments, washing activities, clean bench work, etc. will be separated from the general analysis work.
- Physical property laboratory: The packing conditions, the presence of parasites, foreign substances, etc. are some of the analysis items that will be conducted. The facility will be comprised of one room since specialized testing is not required. However, due to the need to carry out visual tests, sufficient lighting will be installed in the corner where visual tests will be conducted.
- Data management room: The task of recording the test results by staff members will be carried out, in addition to information exchange, adjusting the test work, etc. The data will be put into the computer and the records will be stored in this room. In order to assign individual staff members their own working space, a low partition will be installed that will enable the space to be modified according to the testing needs and changes in personnel. Therefore, concrete walls, blocks, and other fixed partitions will not be utilized. The space and furniture layout which is planned will accommodate the 12 staff members of the examination/analysis department.
- Equipment storage: A storage room will be created to stock operational parts, reagents, etc. Wooden shelves will be installed for easy storage and management.

b) Inspection and Guidance Department

The inspection and guidance department will be responsible for overseeing the fish catch, landing, and processing stages; and in addition to the QCC duties, the main task will be to visit each site to provide guidance services.

Since the department will have numerous opportunities to provide guidance to fishermen and processors at the QCC, the supervisory staff room will be conveniently located in the educational and training zone on the first floor for general visitors.

- Inspectors/Instructors room: In accordance with the Oman personnel plan, space that will accommodate three staff members, in addition to a meeting area of several people will be created. In addition, it will be located adjacent to the training room, which will accommodate a large number of fishermen.

c) Education and Training Department

The aim of this department is to carry out educational and training activities in quality control for fishermen and private companies. The activities will not only include lectures, but actual training sessions given by staff members from the examination and analysis, inspection and guidance, and administrative departments will be provided. The training room will be located on the first floor near the main entrance for easy access by visitors.

- Education/Training room: One basic training unit in Oman is comprised of six persons in accordance with the standards and training methods of the vocational training schools in the United States and Europe. The training room at the QCC will contain a sink that will accommodate 12 persons (two units) simultaneously in accordance with the training program. In addition, desks and chairs from the adjacent storage room will be arranged to seat 24 people for lectures. The audiovisual equipment will be stored in the adjacent storage room.
- Library: The library will enable the staff members to make full use of quality management data and to obtain the latest information. It will be located next to the training room and the supervisory staff room. This library will contain a comprehensive selection of data and reference on quality control since a large library and reference room is located in the adjacent MSFC building. A reading space for six people will be created.

d) Administration Department

The administration department will be responsible for receiving and registering the samples for the examination and analysis department. It will also be responsible for issuing certification of the examinations and analyses that have been completed and to manage the test data. Its role will be to support the other departments and it will carry out a wide range of administrative tasks. The department will be located on the first floor near the entrance in order to attend to general visitors efficiently and to receive examination samples. Since

the department will be staffed by a minimum number of personnel whose duties will be shared, the main room will be located in one zone and the layout will enable operations to be carried out efficiently.

- Director's room: The director's office will be connected to the secretary's office. The area will include adequate work space and room to accommodate several guests.
- Licenses/Permits issue room: Activities will be mainly to review the test data in order to issue licenses and permits. It will be located next to the director's office and adequate space to accommodate meetings with examination personnel from each department, periodic discussions about test results, and work space for the QC supervisor will be allocated.
- Reception (receiving samples): The major task will be to record the test samples and contact the staff members of the sample preparation room to transfer the samples to the examination department. Space to accommodate two staff members, equipment for handling sample data, analysis equipment, communication equipment, etc. will be created.
- Documentation room: Data following receipt of the examination sample and the results of the examinations and analyses, as well as data on permits issued by the QCC will be compiled and stored here. The office which will receive the samples and each examination room will be connected by LAN in future and wiring and connections will be included in the basic design of the facility.
- Administration room: Accounting and supplementary compilation of sample data will be carried out here. It will be located across from the library and reference room to enable the administrative staff members to manage the library and the library and reference staff members to assist in the general office work.
- Secretary's room: The secretary's office will function in conjunction with the administrative office. A glass connecting door will be installed between the two offices to enable the two areas to be allocated in the administrative zone.

e) Administrative Support Section

This section will be placed under the administration department and it will be responsible for assisting the day-to-day operations of the QCC. It will contain the maintenance staff room, locker room, washing and cleaning room, workers' room, hot water supply, restrooms, storage, etc.

- Workshop: A full-time technician will be recruited and the room will be located to enable efficient management of the core systems of each facility. Maintenance work will include not only tasks within the QCC building, but the

periodic draining of the sewage tank. It will be located in an area which will enable waste matter to be collected by outside parties.

- Locker room: It is recommended that staff members change into lab coats due to possible damage and soiling of clothing by chemicals and examination samples. Twelve lockers for both men and women will be installed and each locker area will have one sink for washing and one mirror.
- Cleaning room: The QCC must be kept in a constant state of cleanliness. A room to store clothing shared by the staff and cleaning materials and utensils will be created. In addition, a separate entrance will be installed in the room to allow easy and convenient access.
- General staff room: A resting and changing area for the cleaning and maintenance workers will be created next to the washing and cleaning room.
- Kitchenette: A hot water supply room will be installed on the first and second floors.
- Lavatories: Women and men's lavatories will be installed on the first floor and separate lavatories will be installed on the second floor in the sanitation zone. All the lavatories will have two booths. The interior of the restroom will conform to local custom.

f) Others

Service space on the first and second floors and balcony: Service balconies will be installed on the first floor of the building (east and west sides) and in the same area on the second floor. Service space to accommodate the gas tanks that will supply the examination rooms and the outdoor unit (condenser) of the heating and cooling units will be created. The service space will be located on the roof or under the balcony and it will contain shade to protect the walls of the building and the outdoor heating and cooling units from direct sunlight. The balcony on the second floor will also serve as an emergency exit.

- Pump house: The pump house will be of RC rigid frame with hollow concrete block walls and RC roof slab. A fire fighting tank of 3 ton capacity with 2 pumps will be located inside. One pump will be electricity driven while the other will be driven by a diesel engine.
- Parking lot: Due to the intense heat, the parking lots are usually covered by a louver with the exception of parking lots that are used for a short period of time at a shopping center. Parking space will be created on both the southwest and west areas of the Project site and a louver will be installed in the parking area on the southwestern side (for 10 cars). The parking space on the east side will be for visitors and a louver will not be installed.

- Guardhouse: The QCC guardhouse will not have bunks and it will be able to accommodate two security guards who will be responsible for the night security of the QCC.
- Machine House: Neutralizing equipment will be installed in the Machine House. A holding tank to contain the neutralized waste discharge from chemical laboratory will be located underground.
- Garbage Stock Area: This area will be located adjacent to the machine house and enclosed on 3 sides by hollow concrete block walls.

4) Determining the area of the Project facility rooms

In accordance with section 2.3.1, (2), 4) " Establishing the Area of Each Room", the room areas of the planned facility are shown in the tables in the following pages.

Design Criteria for Each Room

(Floor)	Room Name	Design Criteria／Purpose of Use	Design Conditions			
			Floor Areas m2	Room Size m x m	Persons per Room	Floor Area for One Person m2
(Ground Floor)						
Public	Entrance Porch	for adjusting floor level and ground level	18.00	6X3		
	Ante Room - 1	to avoid the cooling loss	18.00	6X3		
	Hall	to serve also as display space	129.60	(6X9)+(25.2X3)		
	Corridor - 1	to follow the width of similar facilities	28.80	2.4X12		
	Corridor - 2	ditto	12.96	7.2x1.8		
Admini-	Reception	standard area：approx. 4～7m2／person	10.80	3.6X3	2	5.4
stration	Administration office	ditto	21.60	3.6X6	4	5.4
	Secretary R.	standard area：approx.10m2／person (including waiting area)	11.76	2.8x4.2	1	11.8
	Director's R.	standard area：approx.15m2／person	15.12	3.6X4.2	1	15.1
	Permit issue R.	standard area：approx. 4～7m2／person	21.60	3.6X6	4	5.4
	Documentation R.	ditto	21.60	3.6X6	3	7.2
	Service R.	space for photocopy and office appliances	9.60	2.4X4		
	Document St.	storage for office supplies and documents	4.80	2.4X2		
Supervising	Inspector & Instructor's R.	standard area：approx. 4～7m2／person	25.20	(3x3.6)+(2.4x6)	4	6.3
Education	Library	reference area for approx. 6 persons	21.60	3.6X6	6	3.6
/Training	Education/Training R.	standard area：approx. 4～5m2／person（experimental)	57.60	9.6X6	12	4.8
	E/T Equipment St.	equipment storage for Education & Training room	14.40	2.4X6		
Service	Locker (Women)	12 lockers (30cm wide each)	7.20	3.6X2	12	
	Locker (Men)	ditto	7.20	3.6X2	12	
	General Staff R.	rest and luggage apace for 3-4 persons	10.80	3.6X3	4	2.7
	Cleaning R.	space for washer, basin, cabinets	10.80	3.6X3		
	Workshop	permanent maintenance staff space	11.70	3.9X3	1	11.7
	Electrical panel R.	electrical distribution and control panel space	10.80	4.5X2.4		
	Service St.	supplies / equipment for administration	4.80	2.2x3		
	Kichenette	hot-water service for ground floor area	7.20	2.4X3		
	Lavatory (Women)	women's lavatory : 2 booths	9.90	3.3x3		
	Lavatory (Men)	men's lavatory : 2 booths and 1 stall	15.00	5.0x3		
Sanitary	Sanitary Area - 1	to follow the standard of similar facilities	84.00	6.0X14		
	Ante R. -2	to avoid the cooling loss	18.00	6.0X3		
	Sanitary ante R.	space for washing hand and dressing	10.80	3.6X3		
Analysis	Sample preparation R.	subject to efficient equipment layout	57.60	9.6X6		
	Oprganoleptic Lab.	ditto	57.60	9.6X6		
	Sample stock R.-1	temporary sample stock cold room	21.60	3.6X6		
	Sample stock R.-2	ditto (very low stock use)	10.80	3.6X3		
	Equipment St. & Fish scrap stock St.	storage for sample trays, trolleys, etc./ Fish scrap stock space	14.40	2.4X6		
Utility	Generator R.	to be set up for emergency generator size	17.03	(1.5X1.5x3.14/2) +4.5X3		
	Stairs	to follow the local standards: 90cm wide	53.03			
	Sample Lift	for conveying sample loaded trolleys: 120cm tall	10.80	3.6X3		
	Service yards	space for condensing unit, gas cylinders, etc.	144.00	(54X2)+36		
Others	Pump house	space for water reservoir, pressure pump	32.00	4x8		
	Guard house	security guard box, case without nap area	6.00	room size：3x2	2	3.0

Design Criteria for Each Room

(Floor)	Room Name	Design Criteria／Purpose of Use	Design Conditions			
			Floor Areas m2	Room Size m x m	Persons per Room	Floor Area for One Person m2
(First floor)						
Public	Sanitary Area - 2	to follow the standard of similar facilities	108.00	6.0x18		
	Ante R. -3	to avoid the cooling loss	18.00	6.0x3		
	Corridor - 3	to follow the width of similar facilities	21.60	12.0x1.8		
Analysis	Physical property Lab.	subject to efficient equipment layout	57.60	9.6x6		
	Instrumentation Lab.	ditto	57.60	9.6x6		
	General chemistry Lab.	ditto	201.60	(15.6x12) +(2.4x6)		
	Safety clean corner	to follow the standard measurements of similar facilities				
	Washing corner	ditto				
	Microbiology Lab.	subject to efficient equipment layout	187.20	(9.6x18) +(2.4x6)		
	Ante R.	to follow the international standard				
	Safety clean corner	to follow the standard measurements of similar facilities				
	Sterilization corner	to follow the international standard				
	Sample treatment	to follow the standard measurements of similar facilities				
	Washing corner	ditto				
	Data management R.	subject to efficient equipment layout: approx. 7~10m2/person	120.60	(9.6x12-3x3) +(2.4x6)	12	10.1
Service	Analysis support St.	storage for tools, spare parts, documents, etc.	22.68	5.4x4.2		
	Kichenette	hot-water service for first floor area	3.30	2.2x1.5		
	Lavatory (Women)	women's lavatory : 2 booths	8.43	(2.4x4.2) -(1.1x1.5)		
	Lavatory (Men)	men's lavatory : 2 booths and 1 stall	8.43	(2.4x4.2) -(1.1x1.5)		
	Cleaning R.	for general cleaning of first floor	7.56	1.8x4.2		
	Service St.	storage for maintenance supplies and other materials	17.03	(1.5X1.5x3.14/2) +4.5X3		
Utility	Cooling unit R.	air-conditioning unit space	10.80	3.6x3		
	Stairs	to follow the local standards: 90cm wide	53.03			
	Sample Lift	for conveying sample loaded trolleys: 120cm tall	10.80	3.6X3		
	Service balcony -1	space for condensing unit, piping, emergency escape	43.20	2.4x18		
	Service balcony -2	ditto	43.20	2.4x18		
	Condensing unit Space	space for condensing unit	10.80	3.6X3		

5) Built-in Furniture

The following items of furniture have been selected as essential items for the facility. Equipment and furniture vital to the examination and training activities that will be provided by the Project are listed below.

Outline of the built-in furniture

		CONTENTS								
		Perimeter side contour for Piping & Wiring	Reception counter	Book shelves	Locker for Inspector	Locker for service staffs	Working table	Sink & service contour	Hanging cabinet	Wooden shelves
	Approx. w x D x H / Room	1500x750x750	Depth: 600	Depth: 350 x Height: 2200	Depth; 500 for 12 persons	Depth; 500 for 6 persons	Depth; 600	Depth; 600	Depth; 400	Depth; 400~600
(Ground floor)										
Administration	Reception		○				○			
	Document St.									○
	Service St.									○
	Cleaning R.									○
Education &	Library			○						
Training	Education/Training R.						○	○		
	E/T. Equipment St.									○
Analysis	Sample preparation R.	○								
	Equipment St.									○
	Organoleptic Laboratory	○								
Service	Locker(Men)				○					
	Locker(Women)				○					
	General staff R.					○				
	Workshop						○			○
	Kitchenette							○	○	
Others	Guard house					○				
	Service tool St.									○
(First floor)										
Analysis	Physical property test R.	○								
	Instrumentation Laboratory	○								
	General chemistry Laboratory	○								
	Microbiology Laboratory	○								
	Data management R.	○								
	Analysis support St.									○
Others	Kitchenette							○	○	
	Service St.									○
	Cleaning tool R.									○

Remarks： Analysis & training equipment are not included in this table.

6) Cross Sectional Plan

The surrounding environment of the Project site, the supporting ground conditions, the ceiling height of the rooms, the wiring, and facilities that will be installed above the ceilings will be comprehensively reviewed. Due to the intense sunlight and high temperatures, a cross sectional plan that will moderate the effect of direct sunlight on the south, east, and west sides of the building is planned.

a) Ground Design and the First Floor

Based on the results of the boring test, the approach way to the south and north sides will be moderately inclined. Although the Project site is about 150m from the sea, the sea level is about 9m to 11m. The underground water level is low and will not affect the basic structure. The site follows an incline and the raised ground level is about 1.5m on the south and about 3.0m on the north sides of the site. Land durability under the raised ground level has a hardness of about 30t/m2 and the direct structural method of replacing a portion of the raised land with rubble concrete will be adopted and piling will not be used. In view of the ground level of the site, the planned GL will be about 10.3m above sea level in order to secure a connecting line of movement to the adjacent MSFC. The first floor will be about 0.5m higher than the GL.

b) Structural Framing System

A two-storied structure made of reinforced concrete rigid frame is planned. In accordance with similar local structures, the ceiling height of the major rooms on the first and second floors will be about 3.0m. Lighting equipment, cooling and heating units, electrical wiring, water and drainage pipes, etc. will be installed behind the ceilings. Subsequently, the measurement under the bridge will adequately enable the installation of these facilities within the structural height of the building.

c) Exterior Wall

In order to escape the intense heat, the corridor with exterior wall is traditionally employed in the construction method. The cross-sectional plan will also incorporate this method and a balcony will be installed on the east and west exterior walls of the building. The creation of this space will enable sunlight to be filtered out and it will alleviate the adiabatic specifications of the windows and exterior wall surface. In addition, this space will also accommodate the condensers for the heating and cooling units, the gas tanks for the examination laboratories, facility pipes, will serve as an emergency escape way, as well as other functions. The south external wall will be created

as a structurally separate block for the stair room, storage, and machine room which will be located about 3.0m away from the external wall of the main structure. This will alleviate the sunlight in the rooms facing the south side. The north side is unaffected by sunlight and therefore, the external walls will be made of reinforced concrete and balconies will not be installed.

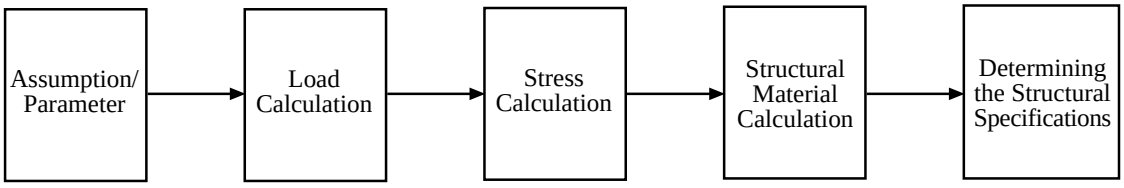
d) Energy Conservation based on Local Specifications

The required illumination intensity of the testing and analysis rooms is about 1,000LX and the other rooms will require an illumination intensity of about 150LX to 500LX. Natural sunlight will be utilized as much as possible and energy conservation will be aimed for during the day. The amount of light in the south, east and west sides greatly differ according to changes in sunlight direction and height. As a result, a high window will be installed on the north side for greater illumination and thereby enabling natural sunlight into the general chemistry testing room with the largest room area and the hallway of sanitation zones on the first and second floors. In addition, the roof of this high window will be extended to accommodate the external heating and cooling unit as well as fresh air from the high side louver.

The MSFC has also installed a high window for natural sunlight and this appears to be a commonly adopted local construction feature.

7) Structural Plan

The structural design of the Project is based on the design flow of the Architectural Institute of Japan (AIJ). A structural design based on the ground support capacity, wind load, and the lack of horizontal tremors obtained from the survey on natural conditions will be prepared. The process which will be followed in preparing the structural design is shown in the flow below.



a) Structural Framing

i) Structure of the Foundation

The foundation will be about 1.5m from the ground surface and it will be direct foundation. The soffit of the foundation or the supporting layer of sandy or rocky layer will be replaced by rubble concrete. The long-term soil bearing capacity assumed for the design is R_a=30.0t/m^2.

ii) Upper Structure

The upper structure of the building will be made of RC rigid frame structure. In order to ensure durability against weather conditions, the external walls will be of RC. The other walls will be made of concrete blocks or light steel partitions. The stair case on the south side of the building will be considered as part of the main structure.

b) Load Calculation

i) Wind load design

The design wind velocity has been set at V_o=35m/sec based on the past data on maximum wind velocity. The wind load, P, is based on the criteria set by the AIJ and the calculation is shown below.

$P = c \cdot q \cdot A \cdot I$

c: wind velocity coefficient

A: wind pressure area

I: importance factor (l=1.0)

q: velocity pressure ($q=1/2 \cdot \rho \cdot V^2$, $V=V_o (H/10)^{1/10}$, $\rho=1/8$)

ρ: Air density

H: Height of building

ii) Design Load

The design floor load of each room has been set to cope with the facility's use. The design floor load will be about 300kg/m^2 for the first floor, which will contain the administration office, and training room, whereas the design load of the second floor, which will bear the equipment load will be set at about 400kg/m^2. The stairs to the roof will be waterproof and the design load of the roof will be about 300kg/m^2 since an external ventilation unit will be installed.

(3) Utility Plan

The utilities and facilities required for the QCC are electricity, water and drainage sanitation facilities, ventilation, interphone, refrigerator, fire prevention, telephone, communication facilities within the facility, and emergency power facilities. A summary of these items are given below.

1) Electricity

a) Power Generator

A transformer of about 1,000Amp has been installed in the space for transformer of the adjacent MSFC and about 600 to700KVA of electricity is

supplied. Since this capacity is insufficient to meet the electricity needs of the QCC, a 5000KVA transformer will be installed. The installation work of connecting the transformer at QCC to the main artery of the substation will be the responsibility of the Oman side. The high-voltage underground cable of the substation to the QCC transformer is 11,000V. The voltage will be decreased to 415/240V, 50HZ that will feed into the main distribution panel in the electricity room to supply electricity throughout the center.

The electricity supply system in the Muscat municipal area, which surrounds the Project site, is good and there are very few power outages and electricity supply is stable with few fluctuations. Subsequently, the backup power system will be limited to providing emergency electricity to the cold storage facility for samples; and an emergency power generator for the entire center will not be installed. A separate UPS will be provided for the computer and analysis equipment for emergencies. A summary of the electricity load volume is given below.

Major electricity load zone	Area	Lighting outlet	Loading of examination equipment	Electricity load of ventilation
Administrative zone	550m^2	30KVA	3KVA	50KVA
Examination zone	1,100m^2	60KVA	85KVA	150KVA
Others	350m^2	10KVA	2KVA	10KVA
(Total)	2,000m^2	100KVA	90KVA	210KVA
			*Total:	400KVA

Based on the results above, the required volume of electricity for the Center is 400 to 450KVA. The electricity single line diagram is shown in the following page.

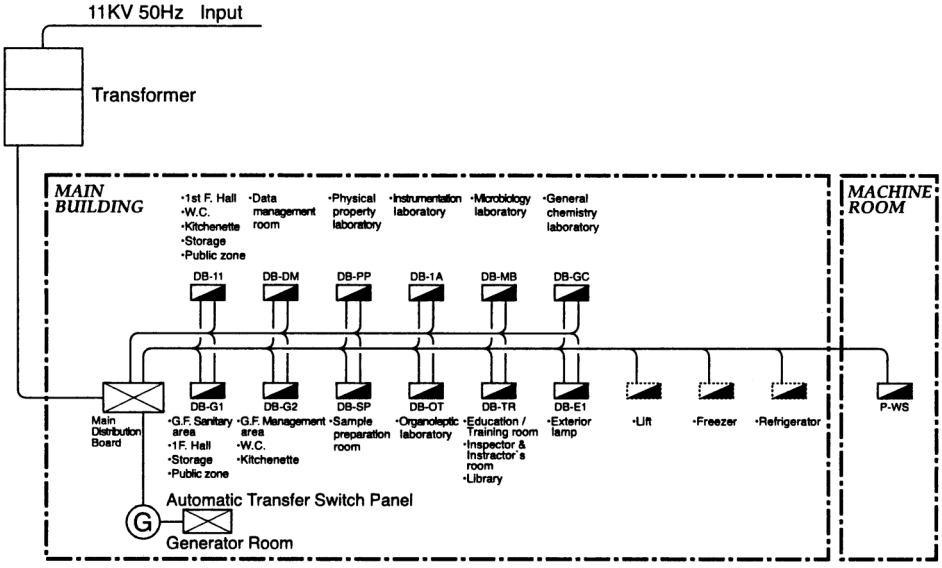


Fig 2.5: Electric Single Line Diagram

b) Main Facility

Electricity will be distributed to each distribution panel, electric power panel, and the manual switch panel for equipment via the main electricity panel at the Center. A separate distribution panel will be installed in each examination and analysis laboratory. This will insure that each examination and analysis laboratory will remain unaffected by electricity outages in the other zones. A diagram of the main facility is shown below.

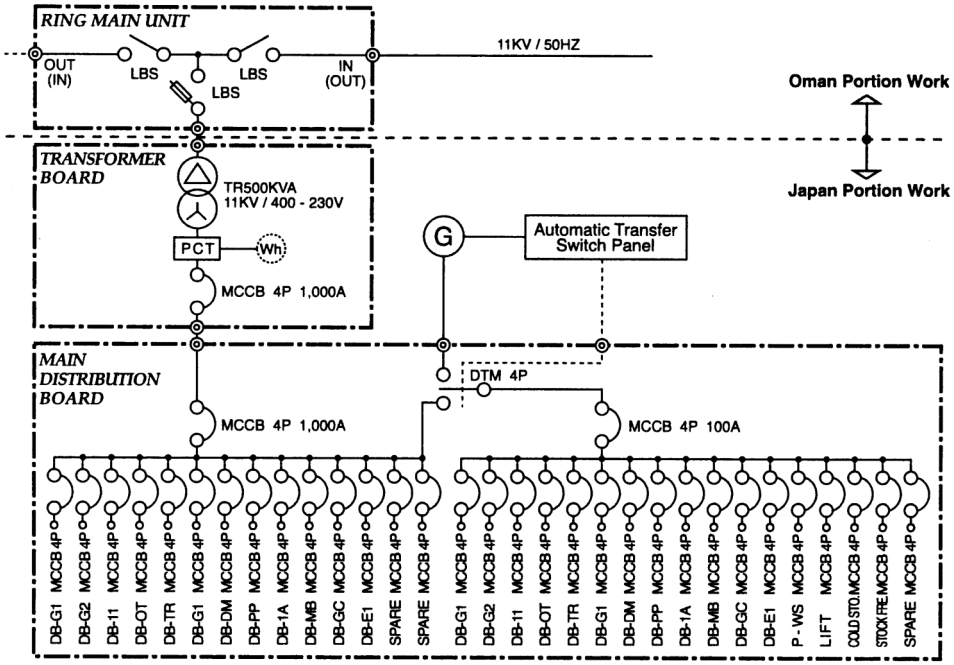


Fig 2.6: Electric Main Line Diagram

c) Power Supply

Electricity to each pump, heating equipment, ventilation, and examination and analysis equipment will be supplied by each distribution and electric panel.

d) Electrical Socket

Electricity will be supplied to each room through regular electrical sockets and special sockets for the examination and analysis equipment in each laboratory. The regular sockets will be the BS types that are commonly used locally. Some equipment from Japan which are not modified for the local voltage in Oman will use Japanese sockets in order to prevent damages stemming from the higher local voltage.

e) Lighting Fixture

In conjunction with the lighting specifications of similar local facilities, florescent lighting will be installed. The lighting fixtures in the offices, maintenance room, and sanitation zone will be the ceiling lamps with louver.

The lighting fixtures in the examination and analysis laboratories will be the ceiling lamps with acrylic covers. The lighting in the other rooms will be fixtures that can be easily replaced and maintained.

The illumination standards will incorporate the Japanese standard for the laboratories; the local standards used by other similar facilities, and the HACCAP standards.

Room/Standard	Japanese Standard	Similar Facility in Oman	HACCP Standard	Standard set in this Project
Inspection/ Analysis	1,000LX (Table top)	Approx. 500-1,000LX (Table top)	More than 1,000LX (Table top)	1,000LX (Table top)
Office/ Administration	700LX (Table top)	Approx. 300-700LX (Table top)	Approx. 500LX (Table top)	700LX (Table top)
Assistant/ Training Room	200LX (Floor level)	200LX (Floor level)	No standard	200LX (Floor level)
Toilet/Storage	150LX (Floor level)	150LX (Floor level)	No standard	150LX (Floor level)
Hall/Corridor	150LX (Floor level)	150LX (Floor level)	No standard	150LX (Floor level)

A battery operated emergency lighting will be installed in the administrative office, training room, laboratories, emergency passageway, hall, and stairs and emergency exit lighting will be installed in the emergency exit. Illumination intensity and installation criteria will be in accordance with the national fire prevention standards.

Outside lighting will be installed for illumination at night.

f) Emergency Power Generator

The electricity supply of the area is stable and although an emergency power generator will be installed, blackouts are not anticipated to seriously affect the functions of the QCC.

The emergency power generator will provide a backup system for the refrigerator, freezer, and chest freezer used to store examination samples. Its capacity will be approx. 75KVA and it will utilize an engine-operated generator with an automatic on/off circuit. It will have a maximum operating capacity of three hours and a fuel tank with adequate capacity will be installed. It will be installed according to local fire prevention regulations.

In addition, the installation of a starter control relay will be considered in order to ensure the safety of the electricity system in the laboratories by slightly slowing down the starter process and avoiding fluctuations in electrical load pressure following a power outage.

g) Telephone Facilities

A telephone distribution system with 30 extension lines will be installed. It will also have interphone functions for communication within the Center. The installation of telephone lines is the responsibility of the Oman side.

h) LAN Cable

The LAN cable will be installed to major rooms for a LAN system to be utilized by the Oman side in future.

i) Broadcasting Facilities

Speakers will be installed in the ceiling of major rooms, the hall, and corridors. An amplifier will be installed in the administrative office to enable general announcements and emergency instructions to be broadcast.

j) TV Cable

A TV circuit cable will be installed from the roof to the administrative office and training room. A TV antenna will not be installed.

k) Automatic Fire Detector

Detectors (heat, smoke) will be installed in the rooms. The main fire warning panel is located in the entrance hall and the sub-warning panel is located in the Guard House. Detailed specifications will be in accordance with local fire prevention regulations.

2) Water Supply/ Drainage

a) Water Supply

City water supply pipes have been installed along the roads running along the Project site. There are no problems with the water quality and supply conditions. The city water supply pipe will supply water to the elevated water tank on the roof without pumping. This elevated water tank will have a capacity of 50% of one day use requirement of QCC.

b) Hot Water Supply

A reservoir type water heater will be installed in each laboratory to provide hot water. An electric water heater will be installed in the hot water supply rooms on each floor.

c) Drainage Facility

As a municipal sewage system is not available at the Project site, the sewage disposal system commonly used locally employing a holding tank will

be installed. Wastewater from the restrooms will pass through the screen pit before discharge into a holding tank. A screen will be installed in the drainage of the sample preparation room to recover dismembered parts of fish samples. A grease trap will also be installed to filter out fat where it will be disposed of in the holding tank. Wastewater from the laundry and hot water supply rooms will flow into the holding tank without undergoing a preliminary disposal procedure.

In addition, wastewater from the laboratories, which can be neutralized, will pass through a special wastewater channel to the neutralization disposal tank and directly into the holding tank. The waste water in the holding tank will be collected several times a week by a third party consigned by the Center. The collected wastewater will be transported to the municipal sewage plant to be processed and recycled as irrigation water.

d) Special Wastewater from the Laboratories

Wastewater containing heavy metals, poisons, and powerful chemicals must be stored in special containers. Wastewater, which falls into this category at the Center, will be disposed of according to local standards and regulations. QCC should appoint a person to be responsible to stock and handle these wastewater.

Special wastewater, which is stored in special containers, will be collected by a third party specializing in this work.

A flow chart showing the wastewater disposal system described in sections 3 and 4 is given below.

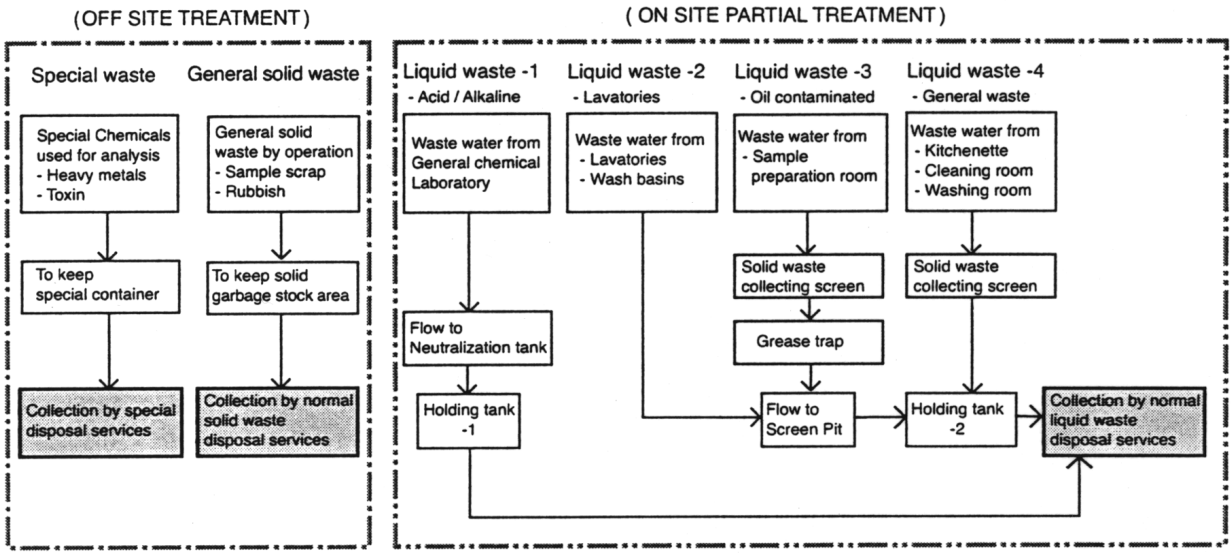


Fig 2.7: Flow Chart on Waste Water Disposal Plan

e) Gas Facility

Conduits for propane gas will be installed for use at the lab tables in the sample preparation and laboratories. Gas used in the testing samples (helium, argon, nitrogen, hydrogen) will be supplied to the analysis equipment room. The propane gas tanks will be installed on the second floor service space for easy replacement and they will be stored according to local fire prevention regulations.

f) Emergency Shower Facility

An emergency shower and eye washer will be installed near the entrance of the general chemistry laboratory since chemicals and heat tests will be conducted. In the event of an accident, washing can be swiftly carried out.

3) Ventilation

a) Cooling and Heating Facilities

In accordance with the local practice of similar facilities, the entire building will be air-conditioned. A central cooling system will not be adopted in order to curtail maintenance and operating costs and as a countermeasure against partial breakdowns. A separate cooling system for each room or zone will be adopted. Due to the widespread use of air conditioners, the heat exchange system will utilize an electric heat pump for easy operation. The selected equipment will have specifications that will suit the local temperature and humidity conditions and it will be able to withstand salt damage since the Center is located near the coast.

b) Ventilation

An efficient ventilation plan will be adopted since it will greatly effect the air conditioning load. In principle, the ventilation frequency will be in accordance with the Japanese ventilation standard. In addition, due to the periodic sand storms from the desert, the ventilation opening will be devised to remove the sand.

4) Fire Extinguisher

a) Fire Hydrant

Due to the adequate pressure of the city water supply, a 30m indoor fire hydrant hose reel that is directly connected to the water supply will be installed on each floor.

b) Fire Extinguisher

Compact fire extinguishers will be placed in the rooms utilizing heat and in the emergency passageway. The type and location will be in accordance with local fire prevention laws.

5) Special Facilities

a) Refrigeration and freezer facilities

i) Freezer

One normal type of prefabricated freezer (internal temperature of -20 degrees) for storing samples will be installed. The machinery will be installed in the service space outside the building.

ii) Cold Storage

One normal type of prefabricated cold storage unit (internal temperature of +5 degrees) for storing samples will be installed. The machinery will be installed in the service space outside the building.

iii) Chest Freezer

An ordinary chest freezer which will supplement the freezer and refrigerator and have a capacity to adequately store samples will be provided.

b) Dumb Waiter

The examination samples will be prepared for testing by the sample preparation room on the first floor. It will then be placed in a labelled tray and transported to the testing and analysis room on the second floor. The tray will be placed in a wagon and transported to the second floor by a dumb waiter specifically for cargo only.

The dumb waiter will have a height of 1.2m, a load capacity of 150kg, and a speed of 0.2m/second.

(4) Outside Facilities

A parking area, water supply tank, pump house, machine house, holding tank, plant and shrubbery area, and other outside facilities will be provided. These external facilities will be in accordance with the local construction laws, sanitation standards, and fire prevention regulations.

In accordance with the fire prevention regulations, an asphalt-paved or interlocking block approach way for the fire truck will be created. Although rainwater conduits will be installed around the site by the Oman side, the conduits within the site will be included in the Project. Due to the minimal volume of rainwater, a grating for

collecting water will be installed along the approach way and a seepage pit will be installed to enable seepage.

The wall, gate, shrubbery, and the rainwater conduits outside the site will be installed by the Oman side.

(5) Construction Materials

All construction materials and equipment will be procured in Oman if there is no problem in the quality and delivery of the materials and equipment. The finishing work for each area will be as follows.

a) Exterior Finish

In accordance with the specifications that will be based on the design standards of Oman (Muscat city construction standards, etc.), the specifications will include protection from salt damage and heat and will harmonize with the surrounding environment.

b) Interior Finish

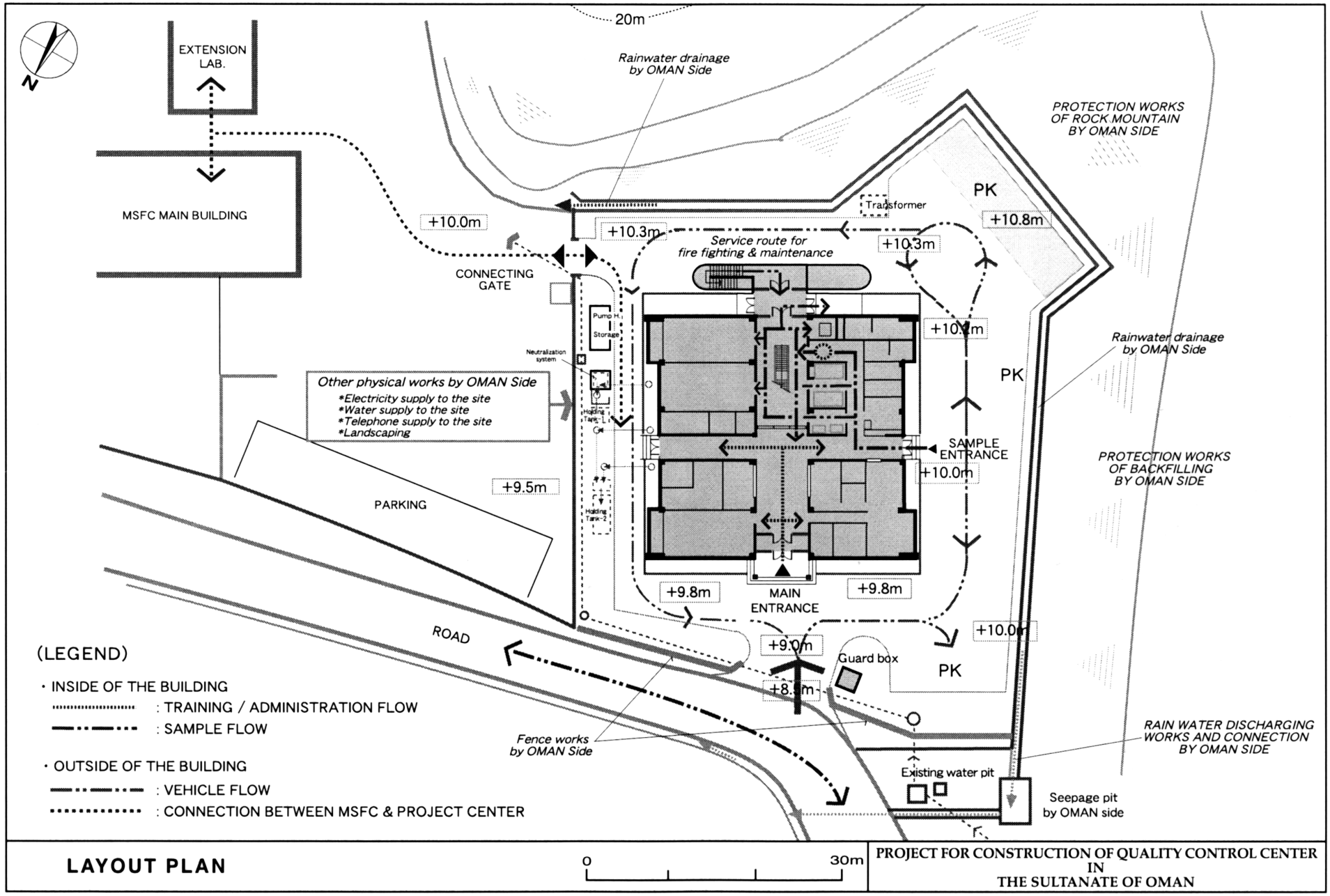
The internal finish will be in accordance with those of similar local facilities. The specifications will consider such factors as the use of water and chemicals in the laboratories. The major finishing work is given below.

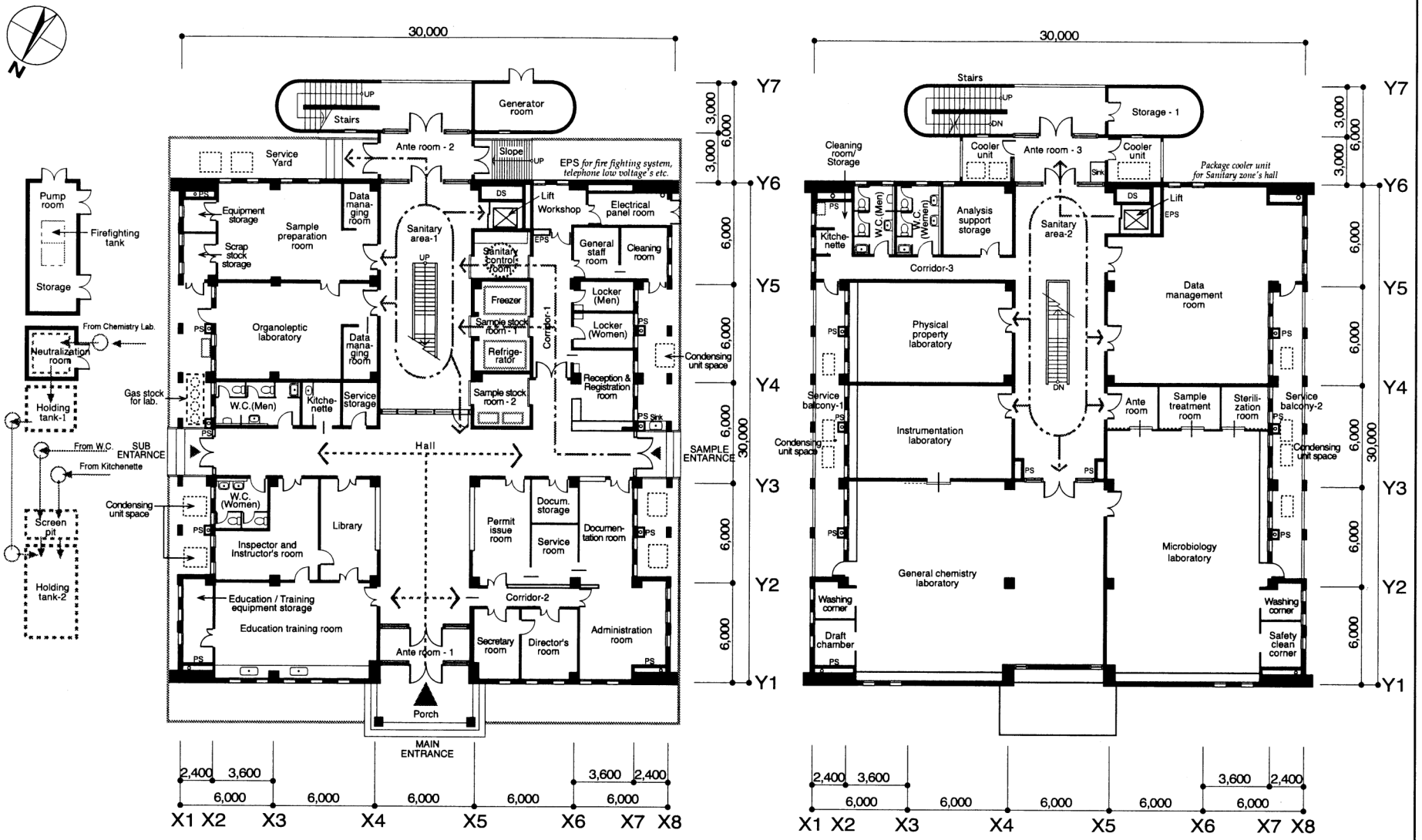
Table 2.4: Finishing Specifications

Part of Building	Main specification	Remarks
1. Exterior Finish		
- Roof	- Water proof with insulation : asphalt water proofing covered with tiles	- Common method
- Exterior wall	- Paint on RC	- Common method
	- Paint on mortar travel finish on hollow concrete block	- Common method
	- Paint on hollow ventilation block	- Common method
- Window	- Aluminium/wood	- Common method
2. Interior Finish		
- Floor	- Plastic sheet or ceramic tile	- Common method
	- Terrazzo or stone	- Common method
	- Ceramic tile	- Common method
- Wall	- Paint on mortar travel finish on hollow concrete block	- Common method
	- Paint on plastered board on light steel frame	- Common method
- Ceiling	- Acoustic board	- Common method
	- Water proof system ceiling	- Common method

(6) Basic Design

Diagrams of the basic design of the Project are given in the following pages.


N
EXTENSION LAB.
MSFC MAIN BUILDING
20m
Rainwater drainage by OMAN Side
PROTECTION WORKS OF ROCK MOUNTAIN BY OMAN SIDE
Transformer
PK
+10.8m
+10.0m
+10.3m
Service route for fire fighting & maintenance
+10.3m
CONNECTING GATE
Pump H
Storage
Neutralization system
+10.3m
Rainwater drainage by OMAN Side
PK
Other physical works by OMAN Side
*Electricity supply to the site
*Water supply to the site
*Telephone supply to the site
*Landscaping
Holding Tank-1
Oil
Oil
Holding Tank-2
SAMPLE ENTRANCE
+10.0m
PROTECTION WORKS OF BACKFILLING BY OMAN SIDE
+9.5m
PARKING
+9.8m
MAIN ENTRANCE
+9.8m
ROAD
+10.0m
+9.0m
Guard box
PK
+8.5m
Fence works by OMAN Side
RAIN WATER DISCHARGING WORKS AND CONNECTION BY OMAN SIDE
Existing water pit
Seepage pit by OMAN side
(LEGEND)
・INSIDE OF THE BUILDING
: TRAINING / ADMINISTRATION FLOW
: SAMPLE FLOW
・OUTSIDE OF THE BUILDING
: VEHICLE FLOW
: CONNECTION BETWEEN MSFC & PROJECT CENTER
LAYOUT PLAN
0
30m
PROJECT FOR CONSTRUCTION OF QUALITY CONTROL CENTER IN THE SULTANATE OF OMAN



GROUND FLOOR PLAN

FIRST FLOOR PLAN

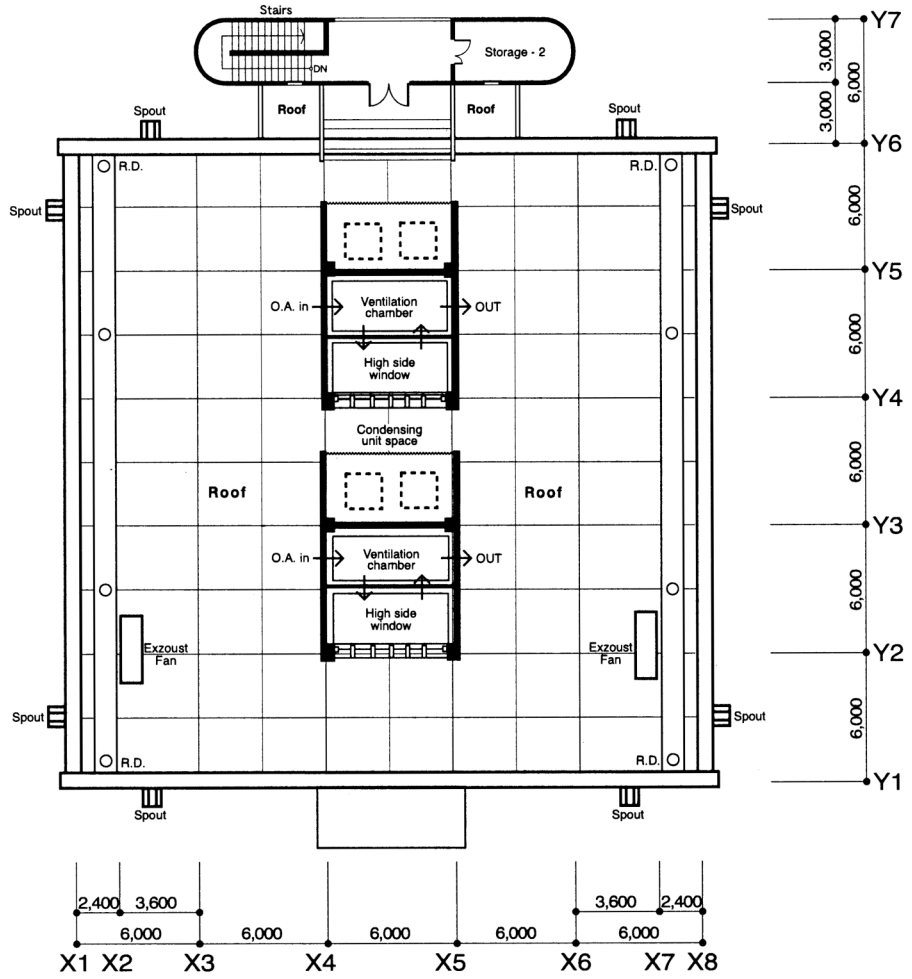
: SAMPLE FLOW

: ADMINISTRATION FLOW

FLOOR PLAN - 1

0 10 20 30m

PROJECT FOR CONSTRUCTION OF QUALITY CONTROL CENTER IN THE SULTANATE OF OMAN

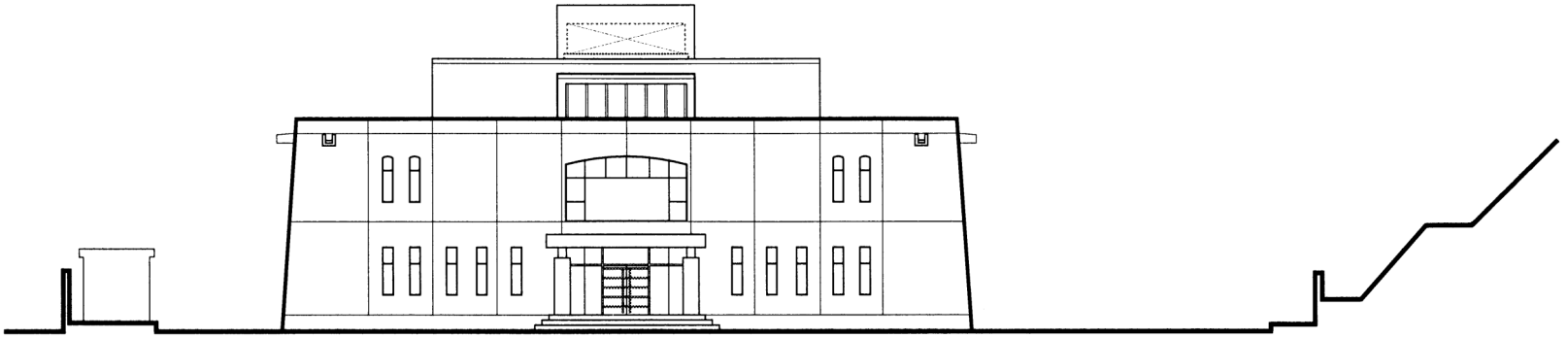


ROOF FLOOR PLAN

FLOOR PLAN - 2

0 10 20 30m

PROJECT FOR CONSTRUCTION OF QUALITY CONTROL CENTER IN THE SULTANATE OF OMAN



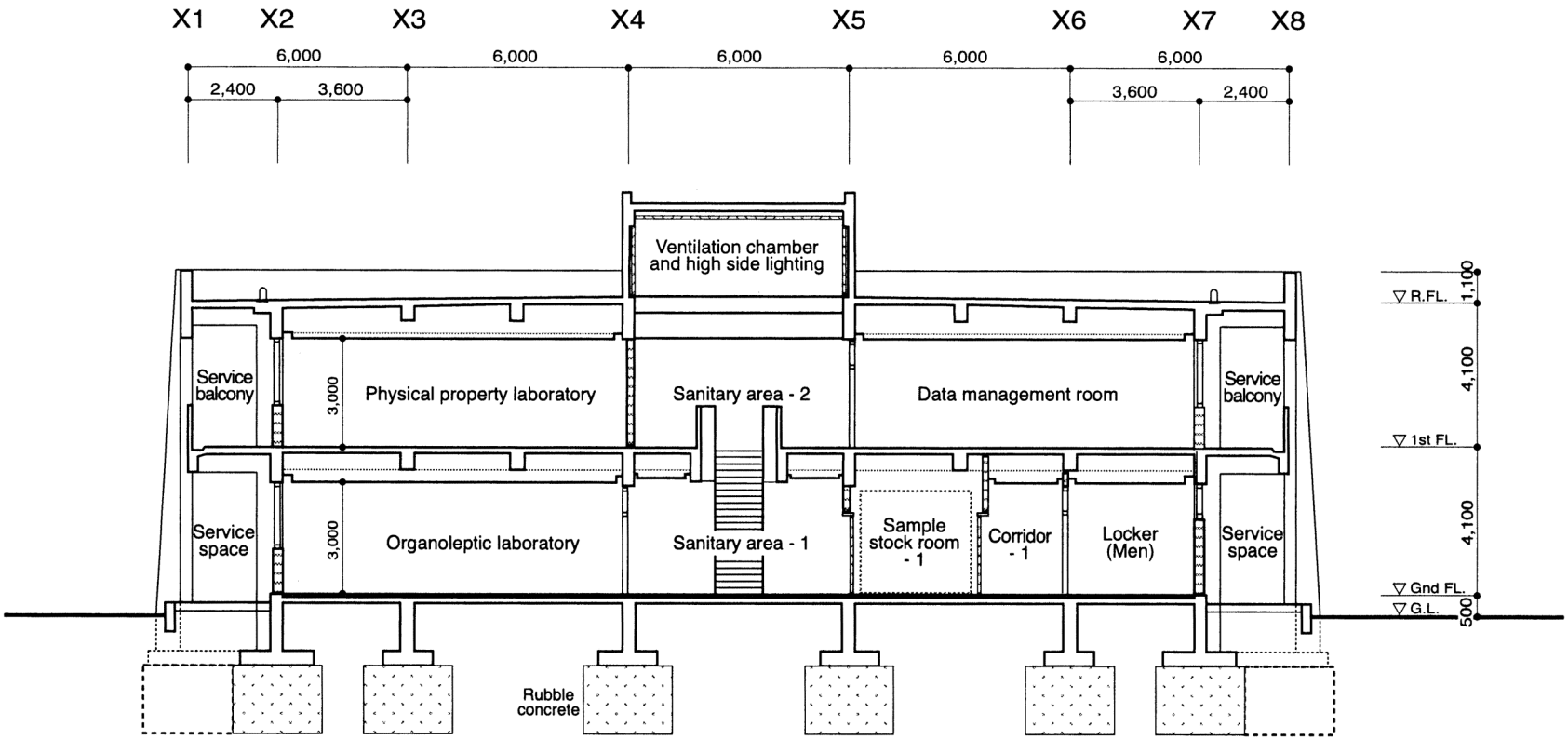
NORTH ELEVATION

WEST ELEVATION

ELEVATION

0 10 20 30m

PROJECT FOR CONSTRUCTION OF QUALITY CONTROL CENTER
IN
THE SULTANATE OF OMAN

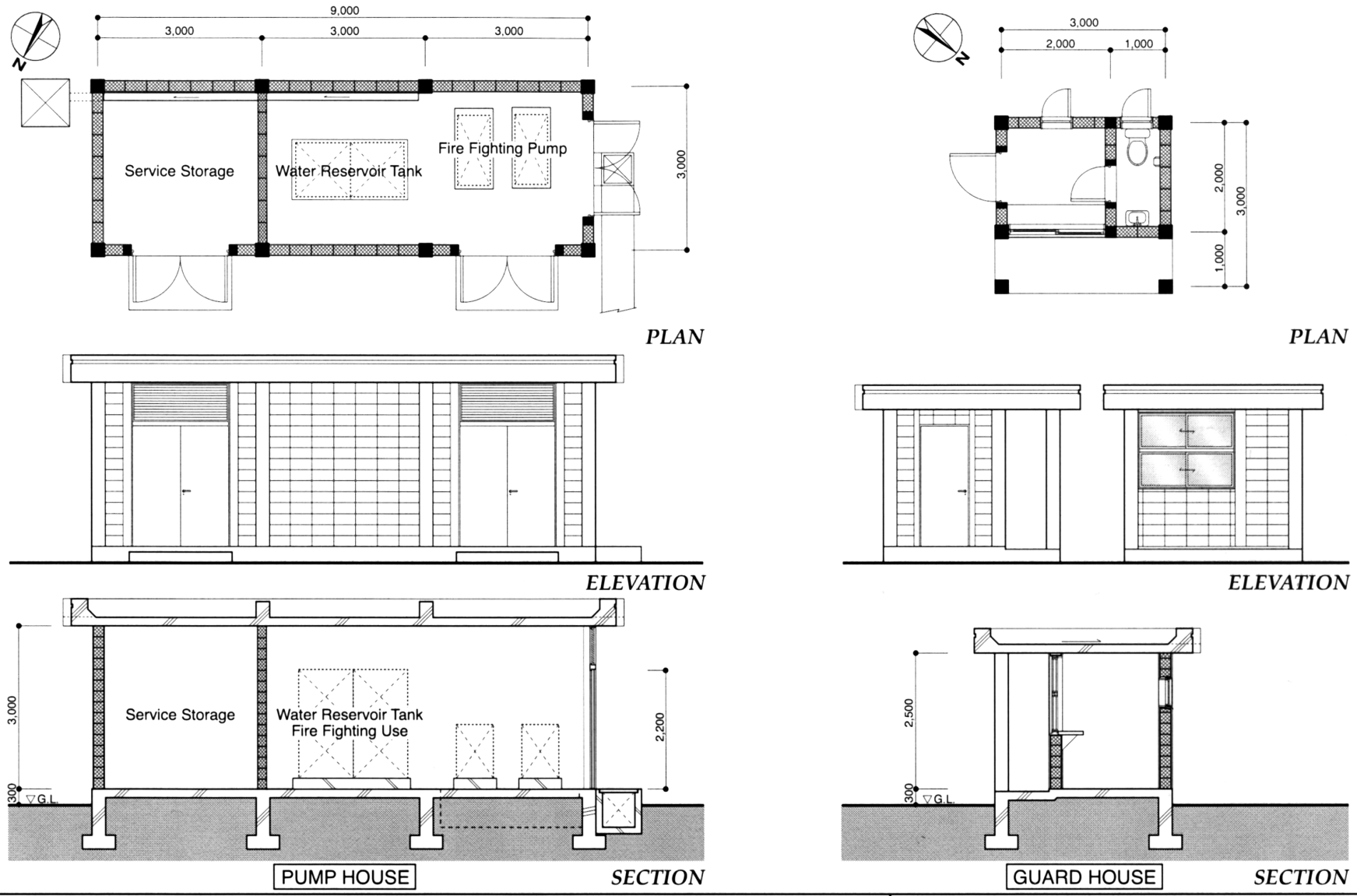


EAST - WEST SECTION

SECTION

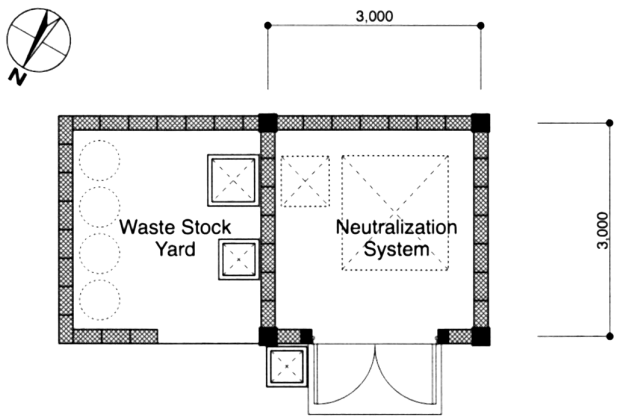
0 5 10 15m

PROJECT FOR CONSTRUCTION OF QUALITY CONTROL CENTER IN THE SULTANATE OF OMAN

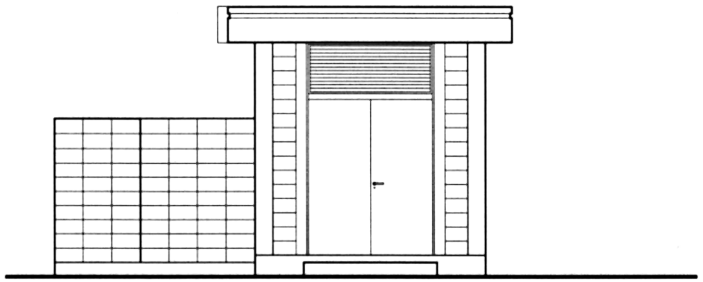


PUMP HOUSE/GUARD HOUSE PLAN · ELEVATION · SECTION 0 5m

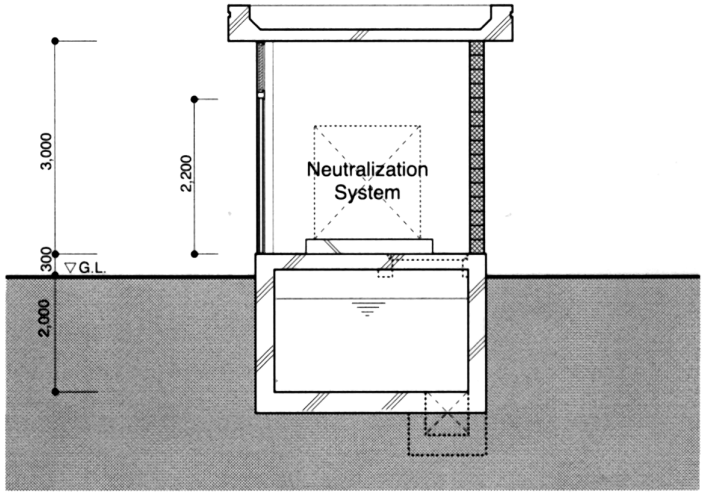
PROJECT FOR CONSTRUCTION OF QUALITY CONTROL CENTER
IN
THE SULTANATE OF OMAN



PLAN



ELEVATION

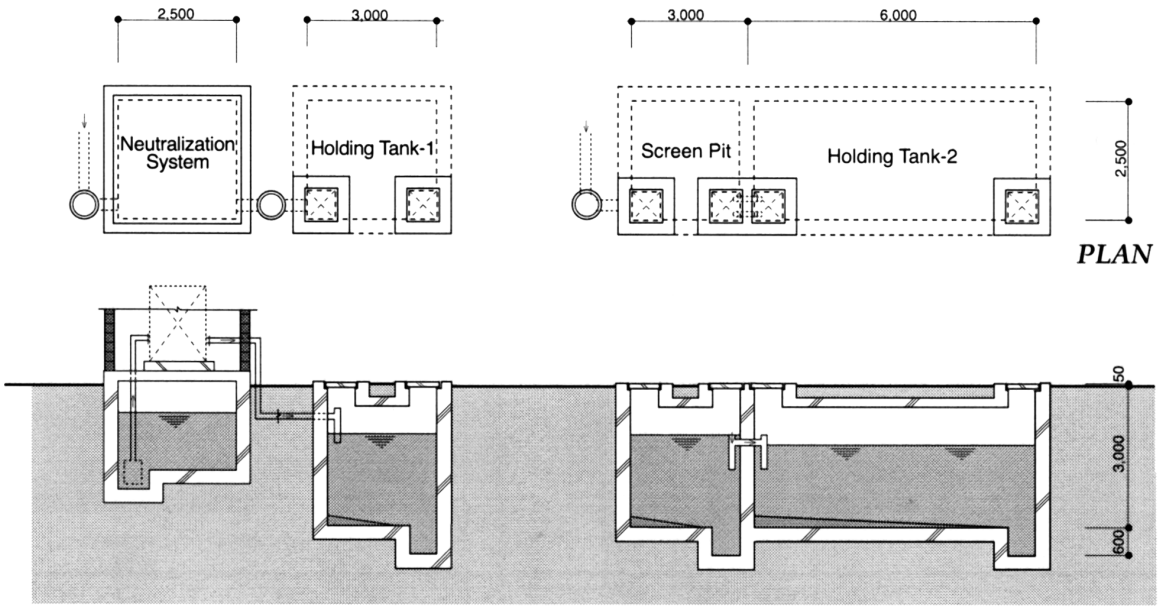


SECTION

EQUIPMENT STORAGE **PLAN • ELEVATION • SECTION**

0 5m

PROJECT FOR CONSTRUCTION OF QUALITY CONTROL CENTER IN THE SULTANATE OF OMAN



PLAN

SECTION

SEPTIC TANK/HOLDING TANK PLAN · SECTION

0 5m

PROJECT FOR CONSTRUCTION OF QUALITY CONTROL CENTER IN THE SULTANATE OF OMAN

(7) Equipment Plan

The equipment for the QCC is divided into the four categories of examination/analysis, educational/training, inspection/guidance and administration equipment. The Project will provide examination/analysis and educational/training equipment. The administration equipment should be provided by Oman side.

The equipment which is most urgently needed for examination/analysis and training activities will be selected; it will be in keeping with the technical capabilities of the staff members.

The quantity/volume of equipment that will be provided will reflect the volume of work that will be handled by the Center.

Examination/analysis equipment will be selected according to the technical level and skills of the staff members who will be operating the equipment. However, equipment requiring initial supervision/training on its operation, technical support, and detailed after service will be procured in Oman.

1) Examination/Analysis Equipment

The testing and analysis system will focus on fishery products that are currently in distribution in Oman and the content of the tests will be in accordance with Export Marine Products Quality Control Regulations, and the analysis items will be those required for quality control of fishery products.

a) Test samples: Fresh fish, frozen and refrigerated processed products, fish fat, powder, salted and dried products

b) Review of the analysis items and equipment: The items required by the Export Marine Products Quality Control Regulations will be studied to determine their priority and only examination and analysis equipment that has been found to be presently essential will be provided by the Project.

These items are shown in Table 2.9 and according to the Japanese consultant company, these items can be largely divided into the following three groups of which i) and ii) will be targeted by the Project.

i) Analysis items that will be implemented from the start in accordance with Export Marine Products Quality Control Regulations
ii) Analysis items that are essential for quality control, although they are not specified by the Export Marine Products Quality Control Regulations
iii) Analysis items that will be not be considered under the Project due to their low priority or technical skills of the staff members

The majority of the fishery products in Oman are first stage-processed products that are frozen, chilled, salted or dried; and with the exception of a segment of the products, additives (preservatives, fungicides, quality

improvement agents) are not used. Presently, mixed agricultural/meat/fishery products are not manufactured. Therefore, examinations to ascertain residual pesticides, radiation, or livestock drug products are not required.

c) Review of examination/analysis methods and equipment: Equipment requiring specialized methods will not be provided as the examination/analysis methods which will be utilized will be in accordance with official methods stipulated for each analysis item.

- Physiochemical tests: Atomic absorption method, liquid chromatograph, gas chromatograph, titration method, colorimeter, fluorescent analysis method, ultraviolet ray spectrum, etc.
- Bacterial tests: Culture test (including bacterial count), microscopy
- Property of matter tests: Measuring length, weight, temperature, color, meat elasticity test, general measurements of canned products (degree of vacuum, test on seam).
- Organoleptic test: To check freshness and condition of products (appearance, shape, color, taste).

d) Review of the number of samples and equipment:

The export of fishery products from Oman to the EU is a priority issue and presently, four factories have been issued licenses to export their fishery products. The objective of the QCC is to increase this number to 20 factories within one to two years.

According to the quality control regulations on exported fishery products, factories without quality control facilities must submit their products to an inspection by a public testing institution once every three months (four times a year). With the establishment of the QCC, this requirement will be met.

Due to the technical and economic difficulties for private factories to maintain their own inspection/testing facilities, the inspections will be carried out by a public examination/inspection institution.

According to data provided by the Oman side (see item 13), the annual volume of major tests and inspections which will be required in the near future for the estimated 20 factories is shown in the table below. The minimum number of equipment provided by the Project will adequately handle this volume of work (one unit of major equipment will be provided).

Taking account of the 5,840 specimens / year for testing and assuming a 200 day/ year QCC operation, number of specimens to be tested per day is about 30. Especially for histamine and heavy metal analysis, the estimated

number of specimen per day is about 3~4 for each test. Considering the number of specimen to be tested, the equipment required for QCC was determined.

Table 2.8: Estimated Number of Samples

Item	No. of specimens/ batch	Number of specimens/year
Histamine	9	9 × 4 times × 20 plants = 720 specimens
Heavy metals (mercury, cadmium)	8	8 × 4 times × 20 plants = 640 specimens
Volatile basic nitrogen (VBN)	3	3 × 4 times × 20 plants = 240 specimens
Trimethyl amine nitrogen TMA-N	3	3 × 4 times × 20 plants = 240 specimens
Bacteria (general viable bacterial count/7 kinds such as coliform)	5 × 7	5 × 7 × 4 times × 20 plants = 2,800 specimens
K-value	3	3 × 4 times × 20 plants = 240 specimens
General analysis of foods (water content, crude protein, crude fat, ash)	3 × 4	3 × 4 × 4 times × 20 plants = 960 specimens
Total		5,840 specimens

It is envisaged that with improved technical capabilities of the QCC staff and the efficient operations of the Center, the Center will be able to cope with all 42 factories that may be designated as an export factory with nominal increased of instruments, reagents, and staff members.

2) Examination and Analysis Item in the Project

The following table indicates the scope of the examination and analysis items for the Project. Equipment for analysis items marked by O and Δ will be considered by the Project.

Table 2.9: QC Quality inspection of fish products – Items for analysis

(Note)

O: Analysis items that will be implemented by the QCC from its initial start that are specified in the Export Marine Products Quality Control Regulations

Δ: Items not stipulated in the regulations, but which will be implemented from the initial start due to the need for quality control inspection and analysis.

X: Items that are stipulated in the regulations, but which will not be implemented due to the technical capabilities required and the low priority level of the item.

Items for Inspection/Analysis	Presence or absence of implementation
I. Organoleptic examination	
Freshness inspection by organic evaluation	O
II. Physicochemical examination	
1. Freshness inspection	
Total volatile basic nitrogen (TVB-N)	O
Histamine	O
Trimethyl amine	O
K-value	Δ
Ammonia	Δ
2. Heavy metals inspection	
Total mercury	O
Organic mercury	Δ
Lead	X
Cadmium	X
3. Food additives inspection	
1) Preservatives	
Sorbic acid	X
Benzoic acid	X
Boric acid and its salts	X
2) Bleaching agents	
Sulfur dioxide and its salts	Δ
3) Coloring agents, antiseptic agents	
Nitrates	X
4) Antioxidants	
Erithorbic acid	X
EDTA salts	X
5) Quality enhancers	
Phosphates	X
6) Polysaccharides	
Sorbitol & others	X
4. Fish toxin/Shell toxin inspection	
Muscle paralytic properties, etc.	X
Ciguatoxin	X
5.Fish fat inspection	
Acid value, peroxide value	Δ
Thiobarbiturate value (TRA).	Δ
Fatty acid composition	X

Items for Inspection/Analysis	Presence or absence of implementation
6. General analysis of foods	
Water content, crude protein, crude fat, ash	Δ
Vitamins	X
III. Microbial inspection	
1. Bacterial inspection	
General viable bacterial count	O
Coliform	O
Escherichia coli	O
Salmonella	O
Staphylococcus aureus	O
Vibrio parahaemolyticus	Δ
Clostridium botulinum	X
Clostridia welchii	Δ
2. Fungal inspection	
Fungi	X
IV.Physical properties inspection	
1. Fish products inspection	
Length, weight, product temperature	Δ
Color measurement, gel strength measurement	Δ
2. Packing container inspection	
Degree of vacuum test (bag, can, etc.)	Δ
3. Quality inspection	
Inspection for seasoning liquid, density, etc.	Δ
V. Parasite inspection	
Inspection for anisakis and others	O
VI. Inspection for contamination	
Inspection for hair, insects, and others	O
VII. Radioactivity inspection	X
VIII. Inspection for fungicide (Agricultural chemicals)	X
IX. Inspection for residual medicine (Agricultural chemicals)	X
X. Inspection for residual livestock medicines	X

In addition to the items shown in the table above, inspection items (59) for drinking water are specified. The examinations for these items will be performed by the Ministry of Electricity/Water Supply.

3) Educational and Training Equipment

a) Targeted Audience

Fishermen, fish distributors, processors from the private sector, as well government quality control supervisors are targeted by the training department. Therefore, the educational and training methods that will be utilized will differ and the method that is the most suited to the targeted audience will be utilized. Specifically, audiovisual equipment and simple practical training sessions will be carried out.

Lectures using audio visual equipment on how to handle fish products in order to maintain fish freshness on board the fishing vessel and practical sessions demonstrating how different handling methods affect fish freshness will be implemented with the aim of raising the awareness of fishermen on fish freshness. There are approximately 26,000 fishermen and it is an impossible task to educate all fishermen within a short period of time. Therefore, representatives from each of the six provinces will be invited to participated in the training sessions and they will form a core group which will carry out extension activities for fishermen within their respective provinces.

Practical training sessions for fish distributors (including fish transporters) will provide information on means of transporting fishery products from the landing sites to the fish processing factories and will show examples of measures that are employed to maintain fish freshness in industrialized countries.

Educational activities for fish processors will aim to promote and establish HACCP quality control standards. These activities will target factory managers and quality control personnel.

In addition, educational and training activities for the staff members of the six divisions of the Directorate General of Fisheries Resources aimed at improving the supervisory methods in quality control at the fish landing sites will be conducted.

b) Lecturers

The educational and training courses will mainly be conducted by QCC staff members, but specialists from the university (National Sultan Qaboos

University) and lecturers from the MSFC and other ministries will be invited as guest lecturers.

This type of educational/training activity was originally conducted as seminars by the MFSC staff members three to four times a year. In addition, JICA experts are also conducting technical supervision in quality control at the MFSC and the training skills of the staff members have improved.

In addition, the regional educational activities sponsored by the Laboratory of the Ministry of Water Resources are conducted two to three times annually. The MSFC staff personnel have also participated in these activities as lecturers and are experienced as seminar lecturers.

c) Equipment

Audiovisual equipment such as camera, video, television, OHP, etc. are the main items of equipment that will be utilized in the educational and training activities targeting the private sector. Simple thermometers and other instruments will be utilized in the practical training sessions. Equipment and facilities at the MSFC will be utilized if such equipment and facilities are lacking at the QCC.

The training room will be able to accommodate a maximum of 24 people (4 units of 6 people). Therefore, educational and training equipment which can accommodate this number will be provided.

d) Concrete Educational/Training Plan

The basic plan will be in accordance with the table on “QCC educational and training plan”, but the details are still under review by the Oman side.

e) Impact anticipated from QCC education/training

The QCC will be equipped with specialized equipment and facilities from its initial commencement and a systematic educational/training program by full-time staff members is possible. Therefore, it is anticipated that a concrete quality control system will gradually become established among the fishermen, distributors, and processors.

A comprehensive quality control system will be created not only for the private sector, but will help improve the skills and knowledge of relevant government officers as well.

Fisheries products in Oman are anticipated to improve, stabilize and achieve international competitiveness. The entire fisheries industry will be promoted and will become an important source of employment in Oman for the younger generation.

Table 2.10: Education and training program in QCC

Activity item	Contents of activity	Person involved	Schedule (year)												Responsible person, Remarks
			Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov	Dec.	
1. Education and training of civilians related to this program															
(1) Education and training for maintaining freshness															
a. Education on handling method of fish products on fishing boat, and for sanitation	Education on pretreatment method of fish products and on preservation method of fish products on fishing boat is conducted using audio-visual equipment.	Fishermen		◎	◎	◎	◎	◎	◎	◎	◎	◎	◎		Person responsible for the education and training in QCC
b. Education on handling method of fish products at landing site, and education on sanitation	Lectures on actual examples performed in advanced countries, exercise on treatment methods, and experiments on freshness are performed	Distributors such as consignee	◎		◎		◎		◎		◎				"
c. Education on handling method of fish products in distribution, and education on sanitation	Lectures on actual examples in advanced countries, and instruction on the comparison of freshness according to a difference in preserved temperature, time dependent changes in freshness, and methods of storage and transportation.	Distributors such as consignee		◎		◎		◎		◎		◎			"
(2) Education and training for staffs in quality control division															
a. Establishment of quality control system in processing plant	For thorough understanding of the significance of quality control, lectures are given using photographs, videos, and other appropriate measures.	Plant administrators/ managers	○											○	The cooperation of quality control specialists in QCC with processing plant.
b. Lectures on the quality control system based on HACCP in processing plant	Education and training on quality control method in processing plant are conducted based mainly on HACCP using videos, photographs ,drawings, and text books	Quality control staffs			●		●		●		●		●		"
c. Microbial inspection method based on HACCP	Reeducation for basic knowledge and application of quality control is conducted based mainly on HACCP using videos, photographs, drawings, and text books	Quality control staffs		●		●		●		●		●			"
2. Education and training for quality control staffs in Ministry of Agriculture and Fisheries															
a. Knowledge concerning quality control at landing site based on HACCCP	Lectures on the instruction method concerning quality control with HACCCP system for fishing boats at the landing site, market, processing plant, and others	Local staffs of Ministry of Agriculture and Fisheries	●												Professor of QABOOS University, the expert in food processing, cooperation of responsible staff in QCC education and training with MSFC.
b. Lectures and exercise on the organoleptic examination of fish products	Education and training on realization of the difference in freshness depending on the treatment method utilized after fishing or preservation conditions are conducted by studying theory and performing exercises covering areas such as determination of K-value														
c. Lecture on topics concerning quality control items	Studying information on quality control issued by international organizations such as WHO, FAO, and others														

Legend: ○: 1 day/course
◎: 2 days/course
●: 4 days/course

For promotion, the exhibition of panels and photographs, printing of pamphlets, and lectures are performed whenever necessary.

4) Basic system pertaining to the examination/analysis equipment

As explained earlier, the basic workflow of the system that will be implemented at the Center is: a) receive and register examination samples, b) store samples, c) prepare sample for examination/analysis, d) examine/analyze samples, e) collect and analyze examination/analysis data, and register and manage examination results/data.

The examination and analysis process will be comprised of: i) organoleptic examination of fish freshness, ii) physiochemical examinations to determine fish freshness, the presence of heavy metals, and general food analysis (water, fat and oil, protein, ash, etc.), examination on fish fat, iii) microbial examination, iv) examination on physical characteristics (length, weight, elasticity, color, etc.), v) parasite, and vi) foreign material examination (insects, sand, etc.).

The Project will provide equipment with general functions that will be initially required to implement the examinations and analyses of the samples (i.e. equipment of the same capacity and function used by the Japan Frozen Food Inspection Association or the Japan Food Environment Inspection Association). Specific examples of the examination and analysis work is given below.

a) Receive and Register Examination Samples

The management and storage of all examination and analysis data produced by the QCC will be computerized. The samples will be received and processed by the sample receiving room where the sample name, name of the producer (manufacturer), date received, number, analysis items, etc. will be recorded.

b) Data Storage

Samples which have been initially registered and recorded will be stored in the sample storage room until they are examined and analyzed. They will be kept in the freezer (under -20^{o}C), cold storage (0-10 ^{o}C), or in low temperature (-85 ^{o}C). Samples that are analyzed and examined immediately after they have been received will not undergo this process.

c) Preparing the Sample

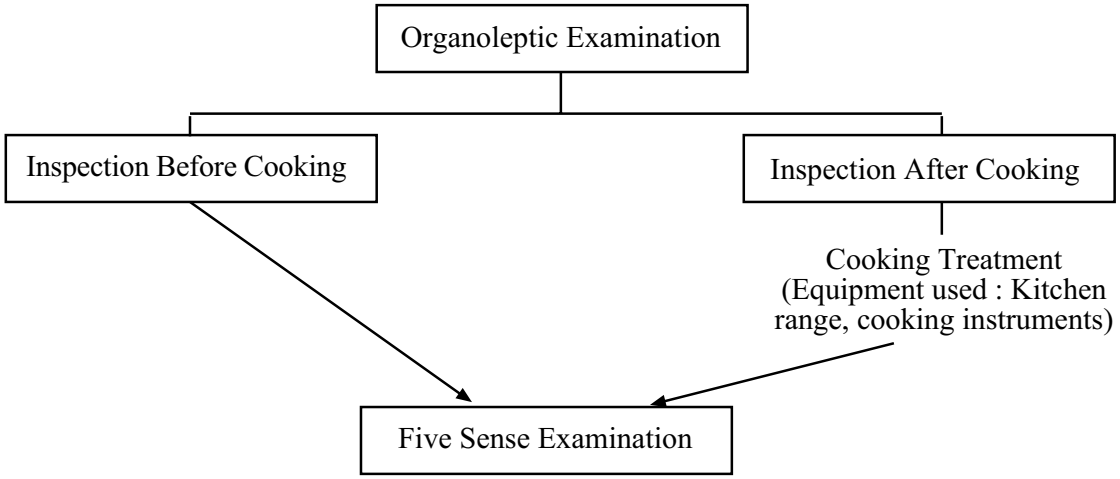
If the sample requires detailed cutting prior to examination and analysis, it will be prepared in the sample preparation room in order to avoid soiling the surrounding area.

d) Examination and Analysis

Samples which have been prepared will be under go analyses in the six categories of organoleptic, physiochemical, bacterial, physical property, parasite, and foreign material examinations.

☆ Organoleptic examination

The organoleptic examination is comprised of cooking or inspecting the sample in its raw form based on the five senses. This examination will be carried out by the examination staff member and by other QCC staff members (including MSFC members) who have acute abilities of the five senses.



(Color, odor, elasticity, taste, etc. are inspected utilizing the five senses. Assessment standards are based on the Export Marine Products Quality Control Regulation)

☆ Physiochemical Examinations

The physiochemical examinations will be conducted in the chemistry laboratory which is comprised of the general chemistry laboratory and the analysis equipment room.

Pre-treatment of the sample, reagent preparation, fish fat examination, general analysis of foods (water, fat, protein, ash, etc.) will be conducted in the general chemistry laboratory and measurements of histamine, mercury, and other minute measurements (units of 1 millionth per parts) will be carried out in the instrumentation laboratory.

☆ Histamine Examination

The examination for histamine is the most representative of the fish freshness tests that are conducted and a high performance liquid chromatography is used carry out the measurements. Pre-treatment of the sample and reagent preparation will be

conducted in the general chemistry laboratory and analyses will be carried out in the instrumentation laboratory.

Inspection flow	Major apparatus to be used
Sample ↓ Sample preparation ↓ Homogenization ↓ Filtration ↓ Heating ↓ Shaking ↓ Evaporation to dryness ↓ Filtration ↓ Filling up to the mark ↓ Determination	(Preparation of reagent solutions) Balance (electronic balance) Homogenizer Filter Water bath Shaker Rotary evaporator Membrane filter High performance liquid chromatography For this inspection and analysis, reagents and glassware (flasks, beakers, pipettes, and others) are used.

☆ Trimethylamine Examination

The trimethylamine examination is an index used in fish freshness examinations. As in the case of the histamine examination, pre-treatment of the sample and reagent preparation will be conducted in the general chemistry laboratory and the analyses will be carried out in the instrumentation laboratory.

Inspection flow	Major apparatus to be used
Sample ↓ Sample preparation ↓ Homogenization ↓ Filtration ↓ Heating ↓ Shaking ↓ Centrifugation ↓ Filtration ↓ Filling up to the mark ↓ Determination	(Preparation of reagent solutions) Balance Homogenizer Filter Water bath Shaker High speed cooling centrifuge Filter Gas chromatography For this inspection and analysis, reagents and glassware (flasks, beakers, pipettes, and others) are used.

☆ Total Mercury Examination

Inspection of total mercury is conducted and used as an index for the quality control of fishes, particularly of tuna. Reagent preparation and sample pretreatment are conducted in the general chemistry laboratory, and the analysis will be carried out in the instrumentation laboratory.

Inspection flow	Major apparatus to be used
Sample ↓ Preparation of sample solution (specimen) ↓ Heating ↓ Cooling ↓ Heating ↓ Cooling ↓ Heating ↓ Cooling ↓ Filling up to the mark ↓ Determination	 Balance, hot plate, electric furnace Addition of reagents Mantle heater Reflux condenser Addition of reagents Reflux condenser Addition of reagents Atomic absorption spectrophotometer For this inspection and analysis, reagents and glassware (flasks, beakers, pipettes, and others) are used.

* Occasionally an inspection of methyl mercury is requested depending on the country to export. This inspection is determined by gas chromatography.

☆ Examination of fish fat

In this country there is only one fish meal plant. Therefore, quality inspection of fish fat produced in this plant is necessary. Inspection items are acid value (AV), which is the representative index, peroxide value (POV), and thiobarbiturate value (TBA). Inspection and analysis are conducted at a normal laboratory suitable for chemical analysis.

As requested, the fatty acid composition of fish fat is included as an analysis item.

Inspection item	Major apparatus to be used
AV, POV, TBA	Titration apparatus
Fatty acid composition	Reflux condenser, chromatograph tube, water bath, hot plate, rotary evaporator, gas chromatograph

For this inspection and analysis, reagents and glassware (flasks, beakers, pipettes, and others) are used.

☆ General Analysis of Foods

Labeling that includes a heat value indication (calories) may be required for fishery products in addition to labeling on product quality by the buyers, and consumers in the export country. It is also a basic analysis item in food examinations. The analysis will be conducted in the general chemistry laboratory.

Inspection item	Apparatus to be used
Water content	Moisture meter (Infrared heating system)
Fat and oil	Soxhlet fat extracting apparatus
Protein	Kjehldahl nitrogen determination apparatus
Ash	Electric furnace
Water activity (Preservation inspection of dried products)	Water activity determination apparatus

For these inspections and analyses, reagents and glassware (flasks, beakers, pipettes, and others) are used.

☆ Bacterial Examinations

The sanitary examination of foods and related products are usually based on bacterial examinations. This examination is also used in determining the sanitary conditions of facilities, equipment, and the environment, in addition to food. It is carried out in the bacterial laboratory and careful measures will be taken to protect the laboratory from outside bacterial contamination.

A part of the sample is collected and the number of colonies that form following cultivation under certain conditions is counted and the number of bacteria originally present in the sample is calculated.

Fish products are usually tested for six kinds of bacteria (general bacteria, colitis germs, salmonella, staphylococcus, colitis vibrio) and canned foods or products sealed in polyethylene bags are analyzed for anaerobic bacteria. However, clostridium botulinum will be excluded as an analysis item.

Inspection flow	Major apparatus to be used
Sample ↓ Preparation of diluted sample (specimen) ↓ Collection of diluted sample ↓ Mixing with culture media ↓ Cooling and coagulation ↓ Cultivation ↓ Colony counting ↓ Calculating number of bacteria ↓ If necessary, an identification test is conducted	Sterilization of apparatus Balance, machine for cutting samples into small pieces, mortars and pestles, homogenizer, diluted sample injection apparatus, hot plate, dry sterilization oven, autoclave Incubator (shaking type is used depending on the type of bacteria) Colony counter Microscope For this inspection and analysis, reagents and glassware (flasks, beakers, pipettes, and others) are used.

☆ Physical Characteristics Examination

The physical characteristics test will examine the length, weight, elasticity, and color of the fishery product and it will be conducted in the physical inspection laboratory.

(1) Elasticity will be measured using a rheometer by measuring the length of the plunger which is inserted into the sample. The elasticity of paste fishery products in Japan are measured using this method.

(2) The color is measured using a color difference meter. The brightness or degree of red or blue color intensity is converted into numerical values. Objective values can be used in the color assessment of fillet products.

☆ Parasite and Foreign Material Examinations

These examinations will be conducted in the physical inspection laboratory. The parasite examination will be conducted on fish fillet products. The sample is placed on a semi-transparent board and a fluorescent light is lighted from below and the presence of parasites is detected. This is called the candling method and a box-like apparatus is used. A microscope is also used to enlarge the image when necessary.

The foreign materials examination is based on macroscopic observation, but a microscope is utilized to detect minute particles.

5) Equipment Specifications and Quantity

a) Equipment Specifications

The specifications of the equipment will be in accordance with the technical skills of the QCC staff members and with the basic system of examination/analysis of fishery products that will be implemented by the Center. In addition, the specifications which will prevent the high climatic temperatures from affecting the examination and analyses will be considered.

b) Quantity of Equipment

The number of samples that is initially anticipated is 5,840 samples annually. Subsequently, a minimum of one unit of major analysis equipment will be required. However, several units will be provided for equipment that will be utilized simultaneously under separate conditions.

c) Facilities of the Examination Laboratory

i) The laboratory table will synchronize with the layout of the required equipment. In order to enable the tasks to be performed smoothly, storage space for analytical instruments will be installed in the most convenient areas. The laboratory table in the chemistry laboratory will be of durable make to withstand the use of chemicals and reagents, but in view of the costs, it will be within the range to withstand the tasks of the other laboratories.

ii) Sink

A hard plastic sink that will withstand the use of chemicals will be installed in the chemistry laboratory and ordinary stainless steel sinks will be installed in the other laboratories.

iii) Shelves (for reagents, instruments)

Chemical reagents and instruments are all imported items in Oman and therefore, they are difficult to replace or supplement. As a result, replacements are ordered once or twice a year in large increments and storage space is planned.

iv) Cold Storage and Freezer

Cold storage and freezer facilities will be included due to the high climatic temperatures and to handle the extensive volume of large fish samples (tuna, mackerel, grouper, etc.). The cold storage facility will also accommodate reagents and solvents.

Glassware, reagents, culture media are required to ensure the efficient operation of the QCC at its commencement. Procurement of these supplies in Oman generally takes considerable time. Therefore, a three-month supply of

examination and analysis supplies will be provided due to the trial operations of the equipment following their installation.

v) Store for Heavy Metal and Toxin

Heavy metals and toxins should be kept in special containers and stored in appropriate cabinet located in a designated stock area. The QCC assigned person responsible for these waste chemicals should ensure that the Oman's local regulations regarding handling and disposal of these waste chemicals are met.

During the final implementation stages of the Project, gas instruments, reagents, culture, etc. will be needed for the trial operation of the equipment after their installation, in order to ensure trouble-free operation of the equipment and the Center. The Project will provide a three-month supply of these instruments and supplies since it takes more than six months for local suppliers to procure.

(8) Summary of Equipment Specifications and Layout of Major Equipment

A summary of equipment specifications and a layout of the major equipment are shown below.

Specification of Equipment

① Equipment for Examination/Analysis

Instrumentation Micro-analysis Lab.

No.	Item	Number	Description	Remarks
1	Atomic absorption spectrophotometer (AAS)	1	4 or 6 Lamp turret, Flame auto-sampler, Flame controller, Gas pressure controller, Compressor, Burner head, Fume duct system, Hallow cathode lamp (Hg, Pb, Cd), Quarts cell 2, PC & software	
2	Fluorescence spectrophotometer	1	Measuring wavelength ; 200 ~ 800 nm, Wave length range less than ±3nm, PC & software	
3	Gas chromatography (GC)	1	FID, ECD, Autosampler, Zero-air generator or air compressor, Columns (Glass column for Methyl mercury, columns for Fatty acid analysis), PC & software	
4	High performance liquid chromatography (HPLC)	1	Quaternary pump, Degasser, Variable wavelength UV/VIS detector, Fluorescence detector, Thermostated column compartment, Autosampler, Columns for (Histamine, K-value, DMA, TMA), PC & software	
5	Ultra violet spectrophotometer	1	UV/Vis type, Measuring wave length;200~1000nm, PC & software	
6	Uninterruptible Power System (UPS)	2	3 kVA for AAS and GC	
7	Uninterruptible Power System (UPS)	1	5 kVA for HPLC	
8	Water ultra-pure purifiers	1	For AAS & HPLC use, Purity : more than 18MΩ · cm, Capacity : 0.5 liter/min.	
9	Refrigerator for reagent	1	Capacity ; 160 liter, +2~14℃	
10	Laboratory work table	2	W1200×D750×H900mm,Top;Non asbestos material	
11	Laboratory work table	2	W1800×D750×H900mm,Top;Non asbestos material	
12	Laboratory corner table (Flat type)	2	W 950×D950×H900mm,Top;Non asbestos material	
13	Laboratory corner table (Flat type)	1	W 900×D950×H900mm,Top;Non asbestos material	
14	Laboratory side table (Flat type)	2	W1500×D750×H900mm,Top;Non asbestos material	
15	Laboratory side table (Flat type)	5	W1800×D750×H900mm,Top;Non asbestos material	
16	Sink (One basin)	1	W 600×D750×H900mm, Basin;Plastic material Three mouthed faucet×1	
17	Laboratory chair	4	Standard type	
18	Cabinet for apparatus	1	W 900×D500/400×H900mm, Glazed sliding door	

General Chemistry Lab.

No.	Item	Number	Description	Remarks
1	Automatic mortar	1	Diameter ; 150 mm	
2	Potential difference auto-titration system	1	Measuring range:pH 0.00~14.00, Potential differece: 0~± 2000mV, Electric current value:~±200 μA, Titration software, Recording unit, Electrode set	
3	Blender	1	Capacity;1.2 liter, Glass made cup	
4	Cool aspirator	1	Temperature range:+5~35℃, Water capacity:more than 10L	
5	Cool water circulator	1	Water temperature;−5 ~+20 ℃, Water capacity ;16~25L	
6	Cooler (Immersion type)	1	Using temperature range:−20 ~+35 ℃Cooling capacity ; 200 kcal/h, Length of cooling coil: 1000mm	
7	Electric homogenizer	1	Glass cylinder,Approx. φ33×L226mm, With loose clearance rod	
8	Electronic balance	2	Weighing capacity ; 0.01mg/42g, 0.1mg/210g 2 ranges	
9	Electronic balance	2	Weighing capacity ; 0.001g/310g	
10	Electronic balance	2	Weighing capacity ; 0.01g/3000g	
11	Heating mantle	1	For Flask use, Capacity ; 500 ml	
12	Heating mantle	3	For Flask use, Capacity ; 1000 ml	
13	Heating mantle	1	For Beaker use, Capacity ; 1000 ml	
14	High-speed refrigerated centrifuge	1	22,000rpm, Maximum capacity:3,000ml, with rotor (50 ml×6), Micro computer control	
15	Dryer for apparatus	1	Capacity;300 liter, Temperature:30~70℃, With timer	
16	Kjeldahr nitrogen determination system	1	Decomposition unit (6 tubes), Distillation unit, Auto titration unit, Auto-recording unit	
17	Magnetic stirrer	2	Stirring capacity ; 50 ~2000 ml, Size:190×180mm or φ150mm	
18	Magnetic stirrer with hot plate	2	Stirring capacity ; 100 ~3000 ml, Size:180~190×150~185mm	
19	Meat chopper	1	500W type	
20	Mill	1	Handyl type, Capacity ; 125 ml	

No.	Item	Number	Description	Remarks
21	Muffle furnace	1	Inner capacity;7.5 liter, Using temperature:100～1100 ℃, Micro computer controlled	
22	Oil bath	1	Capacity ; 5.2 liter, Over heat protection type	
23	pH meter	1	Glass electrode, Digital type, Measuring:pH 0～14, Minimum range:0.2pH	
24	Rotary evaporator	2	Vertical type, Refrigerated water circulation unit, Vacuum pump unit, Flask capacity:1000ml, Water bath:4～7L	
25	Salt analyzer	1	Electronic titration type, Measuring range:0.00～99.99%, Minimum measuring:0.02%	
26	Test tube shaker	2	Shaking table: ϕ 60～70mm	
27	Shaker	1	Vertical/Horizental shaking type, With separating funnel holder (4)	
28	Soxhlet extraction system	1	4 extraction units, Extraction unit capacity:180ml, Solvent cylinder capacity:150ml, Extracting type:Soxhlet/Heat/High temperature/Continuing	
29	Stirrer (Propeller type)	1	Medium density type, Maximum tolk:4～6kg-cm	
30	Stirrer (Propeller type)	1	Low density type, Maximum tolk:1.5～3kg-cm	
31	Water activity measuring system	1	Electric resistance type, Measuring range:0.05～0.98Aw, Acuracy:0.01Aw	
32	Moisture meter	1	Infrared lamp type, Measuring range:0～100%, Sample wight:5～70g, Measuring temperature and time controlled	
33	Water bath	2	Capacity ; 3.7 liter, Temperature:Room temperature: +5℃～95℃	
34	Water bath	1	Capacity ; 7 liter, Temperature:Room temperature: +5℃～95℃	
35	Incubator	1	Capacity;70liter, Temperature range:Room temperature: + 5℃ ～ 70℃	
36	Hot plate	1	600×400mm. Maximum temperature: + 450℃	
37	Water purifier system	1	Capacity ; Distilled water : 10 liter/h, Ion exchanged water : 1.2 liter/min.	
38	Ultrasonic cleaner	1	Tank capacity ; 5.7 liter	
39	Ultrasonic pipette washer	1	Running water ; 1 ～ 3 liter/min.	
40	Laboratory instruments washer	1	2 direction water injection type, Water temperature controlled, With pure water suppry unit	
41	Hume hood	1	W1500×D750×H2350mm, With duct and exhaust fan	
42	Heavy metal eliminator	1	40 ～ 50 liter / Batch, Correspond to Hg, Cd. Pb. etc,	
43	pH adjustment system for waste water from chemistry lab.	1	Autocontrol system, Capacity of holding tank ; maximum 3000liter	
44	Refrigerator for solvent	1	Capacity ; 500liter, +2 ～14℃	
45	Refrigerator for reagent	1	Capacity ; 500 liter, + 2 ～14℃	
46	Freezer for reagent	1	Capacity ; 300 liter, −15 ～−30℃	
47	Refrigerator for sample	1	Capacity ; 400liter, −5 ～+10℃	
48	Freezer for sample	1	Capacity ; 400liter, −20℃	
49	Chemical balance table	2	W 900×D600×H900mm	
50	Laboratory work table	2	W900×D750×H900mm,Top;Non asbestos material	
51	Laboratory work table	2	W1800×D900×H900mm,Top;Non asbestos material	
52	Laboratory center table (Flat type)	2	W3600×D1500×H900mm, Top ; Non asbestos material, Sink×1, Table socket×1, Gas cock×2	
53	Laboratory side table (Flat type)	4	W1500×D750×H900mm,Top;Non asbestos material	
54	Laboratory side table (Flat type, small sink)	2	W1800×D750×H900mm, Top ; Non asbestos material, Goose necked faucet×1	
55	Laboratory side table (Flat type)	3	W1500×D750×H900mm,Top;Non asbestos material	
56	Sink (One basin)	1	W1800×D750×H900mm, Basin ; Plastic material Normal faucet and Hot water faucet	
57	Laboratory chair	4	Standard type	
58	Cabinet for reagents	1	W1800×D750/400×H1800mm,Grazed slide door	
59	Cabinet for apparatus	2	W1800×D500/400×H1800mm,Grazed slide door	

Microbiology Lab.

No.	Item	Number	Description	Remarks
1	Autoclave	1	Capacity;20 liter, Steam sterilizing system, Temperature range:105～123℃, With basket	
2	Autoclave	1	Capacity;50 liter, Steam sterilizing system, Temperature range:105～128℃, With basket	
3	Blender	1	Capacity;1.2 liter, Glass made cup	
4	Colony counter	1	Loupe:2×, Maximum diameter of petri dish:125～150mm	
5	Dilution fluid pouring system	1	Standard type, Pouring quantity setting system, Pouring capacity: Maximum 1500g	
6	Electronic balance	1	Weighing capacity ; 0.01mg/42g, 0.1mg/210g 2 ranges	
7	Electronic balance	1	Weighing capacity ; 0.01g/3000g	
8	Electronic balance	1	Weighing capacity ; 0.001g/310g	
9	Homogenizer (Stomacher)	1	Capacity:400ml, With timer	
10	Hot air sterilizer	1	Capacity;100liter,Temperature range:+40～260℃, Automatic controlled	
11	Hot air sterilizer	1	Capacity;160liter,Temperature range:+40～260℃, Automatic controlled	
12	Hot plate	1	600×400mm. Temperature; +50～250℃	
13	Incubator	3	Capacity;160liter, Temperature range:Room temperature: +5℃ ～70℃	
14	Magnetic stirrer	1	Stirring capacity ; 100 ～2000 ml, Size:170×150mm	
15	Magnetic stirrer with hot plate	1	Stirring capacity ; 100 ～3000 ml, Size:180～190×150～185mm	
16	Microscope (Stereo type)	1	10×Zooming, With light permeation system, Angled lens	
17	Microscope	1	3 Mirror cylinder, With photograph system, Object lens:2×,4×,10×,20×,40×,100×(Oil immersion)	
18	pH meter	1	Glass electrode, Digital type, Measuring: pH 0～14, Minimum range: 0.2pH	
19	Refrigerated centrifuge	1	Table top type, 6000rpm, Capacity;1000 ml, with rotor (Angled and Swing)	
20	Thermo-stable water bath	1	Capacity ; 30 liter	
21	Thermo-stable water bath	1	Capacity ; 40 liter	
22	Thermo-stable water bath (Shaking type)	1	Capacity ; 13～15 liter	
23	Thermo-stable water bath (Shaking type)	1	Capacity ; 27～30 liter	
24	Test tube mixer	2	Shaking table: ϕ 60～70mm	
25	Freeze dryer	1	Cold trap:Temperature-45～-75℃,Dehydration 0.5～2L, Capacity 4～12L, Vacuum pump	
26	Automatic SPC colony counter	1	ATP detector system, Biochemical luminescence method	
27	Instrument dryer	1	Capacity:160liter, Temperature:40～70℃、With stand	
28	Ultrasonic pipette washer	1	Rinsing water ; 1 ～ 3 liter/min.	
29	Laboratory instruments washer	1	2 direction water injection type, Water temperature controlled	
30	Clean bench	1	W 1300～1400×D760～900×H1860～2010mm, Water supply & drainage, Air circulating system, Gas burner, Dust collecting efficiency:99.99%(more than 0.3 μ m)	
31	Refrigerator for culture media	1	Capacity;300 liter, Temperature: +0 ～10℃	
32	Freezer for reagent	1	Capacity ; 300 liter, －15～－30℃	
33	Refrigerator for sample	1	Capacity ; 400 liter, －5 ～10℃	
34	Freezer for sample	1	Capacity ; 400 liter, －20℃	
35	Deep freezer for sample	1	Capacity ; 100 liter, －85℃	
36	Laboratory work table (Stainless steel)	2	W 900×D750×H900mm, With low shelf	
37	Laboratory work table (Stainless steel)	1	W1500×D750×H900mm, With low shelf	
38	Laboratory work table (Stainless steel)	1	W1800×D750×H900mm, With low shelf	
39	Laboratory center table (Flat type)	2	W3600×D1500×H900mm, Top ; Melamine resin , Sink×1, Table socket×1, Gas cock×2	
40	Laboratory side table (Flat type)	2	W 900×D750×H900mm, Top;Melamine resin	

No.	Item	Number	Description	Remarks
41	Laboratory side table (Flat type)	2	W1500×D750×H900mm, Top;Melamine resin	
42	Laboratory side table (Flat type)	1	W1800×D750×H900mm, Top ; Melamine resin Goose necked faucet×1	
43	Laboratory side table (Flat type)	4	W1800×D750×H900mm, Top ; Melamine resin	
44	Sink (One basin)	1	W1800×D750×H900mm, Basin;1130mm, Normal faucet and Hot water faucet	
45	Sink (One basin)	1	W1800×D750×H900mm, Basin;1730mm Normal faucet and Hot water faucet	
46	Laboratory chair	4	Standard	
47	Cabinet for reagent	1	W 900×D750/400×H1800mm,Grazed slide door	
48	Cabinet for apparatus	1	W1800×D500/400×H1800mm,Grazed slide door	

Physical property test Lab.

No.	Item	Number	Description	Remarks
1	Colorimeter	1	Double beam fiber system, Measuring range:400～700nm, Halogen lamp	
2	Electronic balance	1	Weighing capacity ; 0.01g/3000g	
3	Electronic balance	1	Weighing capacity ; 0.001g/310g	
4	Fish length measuring unit	1	Maximum measuring length; 200cm	
5	Candling equipment for parasite checking	1	W600×D300×H150mm, Fluorescent light 20W×2	
6	Microscope (Stereo type)	1	10×Zooming, With light permeation system, Angled lens	
7	Electric drill	1	Handy type, 13mm type	
8	Rheometer	1	Food measuring type,Plunger;3kinds,Recording system	
9	Thermometer	2	Food measuring type, Digital type, Temperature:-40～+240℃	
10	Incubator	1	Capacity;160liter, Temperature range:Room temperature: +5℃ ～ 80℃	
11	Tapping bar	1	Canned food testing instrument	
12	Vacuum can tester	1	—Ditto—	
13	Pressure can tester	1	—Ditto—	
14	Electric can opener	1	—Ditto—	
15	Fret saw / Fret saw blade	1set	—Ditto—	
16	Vernier micrometer	1	—Ditto—	
17	Micrometer	1	—Ditto—	
18	Center thermometer	1	For Low temperature (+50～100℃)	
19	Center thermometer	1	For High temperature (+80～130℃)	
20	Refract meter	1	Sugar meter : Measuring range: 0～32%	
21	—Ditto—	1	Sugar meter : Measuring range: 28～62%	
22	—Ditto—	1	Salt meter : Measuring range: 0～10%	
23	Vacuum packing machine	1	Chamber:20L, Sealing length:max. 50mm	
24	Refrigerator for sample	1	Capacity ; 400 liter, −5 ～+10℃	
25	Freezer for sample	1	Capacity ; 400 liter, −20℃	
26	Laboratory work table	1	W 900×D750×H900mm, Top ; Melamine resin	
27	Laboratory work table	1	W2400×D900×H900mm, Top ; Melamine resin	
28	Laboratory corner table (Flat type)	2	W 950×D950×H900mm, Top ; Melamine resin	
29	Laboratory side table (Flat type)	4	W1500×D750×H900mm, Top ; Melamine resin	
30	Laboratory side table (Flat type)	3	W1800×D750×H900mm, Top ; Melamine resin	
31	Sink (One basin)	1	W 900×D750×H900mm, Basin ; Stainless steel Normal faucet and Hot water faucet	
32	Laboratory chair	3	Standard	
33	Cabinet for reagent	1	W900×D750/400×H1800mm, Grazed slide door	
34	Cabinet for apparatus	1	W900×D500/400×H1800mm, Grazed slide door	

Organoleptic Lab.

No.	Item	Number	Description	Remarks
1	Electronic balance	1	Weighing capacity ; 0.01g/3000g	
2	Electronic balance	1	Weighing capacity ; 0.001g/310g	
3	Thermometer	2	Food measuring type, Digital type, Temperature: -40～+240℃	
4	Micro-wave oven	1	Capacity:20L, Max. 1700W	
5	Cooking range	1 set	Gas burner 4, Heater 1, Electric oven 1	
6	Refrigerator for sample	1	Capacity ; 400 liter, −5 ～+10℃	
7	Freezer for sample	1	Capacity ; 400 liter, −20℃	
8	Laboratory work table (Stainless steel)	2	W 900×D750×H900mm, With low shelf	
9	Laboratory work table (Stainless steel)	1	W1500×D750×H900mm, With low shelf	
10	Laboratory work table (Stainless steel)	1	W1800×D750×H900mm, With low shelf	
11	Laboratory side table (Flat type)	2	W1500×D750×H900mm, Top ; Melamine resin	
12	Laboratory side table (Flat type)	1	W1800×D750×H900mm, Top ; Melamine resin	
13	Sink (One basin)	1	W1500×D750×H900mm, Basin ; Stainless steel Normal faucet and Hot water faucet	
14	Laboratory chair	6	Standard	
15	Cabinet for instrument	1	W 900×D 500/400×H1800mm, Sliding glazed door	

Sample preparation Room

No.	Item	Number	Description	Remarks
1	Automatic flake ice making machine	1	120 kg type, Maximum stock ; 25～30 kg	
2	Band saw	1	Small type, Wheel diameter:26～30cm	
3	Meat chopper	1	1000W type	
4	Electronic balance	1	Weighing capacity ; 0.01g/3000g	
5	Electronic platform scale	1	Maximum weighing ; 32 kg	
6	Freezer/Refrigerator for sample	1	Capacity;Refrigerator 700L(0～+10℃), Freezer 300L (−20℃)	
7	Freezer for keeping of sample waste	1	Capacity ; 400 liter, −20℃	
8	Laboratory work table (Stainless steel)	3	W1500×D750×H900mm, With low shelf	
9	Laboratory work table (Stainless steel)	2	W1800×D750×H900mm, With low shelf	
10	Sink (One basin)	1	W1800×D750×H900mm, Basin ; Stainless steel Normal faucet and Hot water faucet	
11	Shelf for apparatus	1	W 1500×D600×H1800mm, Stainless steel	
12	Cabinet for instrument	1	W 1500×D600×H1800mm, Sliding grazed door	

Sample storage Room

No.	Item	Number	Description	Remarks
1	Deep freezer for sample	2	Capacity ; 500 liter, −85℃	

Data managing Room

No.	Item	Number	Description	Remarks
1	Personal computer	5	Pentium Ⅲ, Memory:64MB, Hard disk:5～6GB, CRT monitor	
2	Printer	3	Leaser type, Printing speed:8pages/miniuts (600dpi),	

Training Room

No.	Item	Number	Description	Remarks
1	Camera	1	With Zooming Lens (28～80mm, F3.5～5.6), With case	
2	Slide Projector	1	Film:35mm,APS24mm,Half size type film, With halogen lamp	
3	Stand for slide projector	1	W 600×D450×H750mm	
4	Video Camera Recorder	1	3.5 Liquid crystal monitor, Mini disc, 680000 pic-cel, 10×optical zooming	
5	Video Deck	1	Multi type, VHS/Digital double deck	
6	Television Set with stand	1	34 inch type	
7	OA Board	1	With Screen, W1745×H833mm	
8	Laser Pointer	1	Out put:1mV, Form of beam:Dot irradiation, Reaching distance:30～300m	
9	OHP	1	Halogen lamp, A4 type, Focus length:210～340mm	
10	Laboratory work table (Stainless steel)	1	W1800×D750×H900mm, With low shelf	
11	Table for trainee	12	W1500×D500×H750mm	
12	Chair for trainee	24		
13	Desk for lecturer	1	W 900×D600×H750mm	
14	Chair for lecturer	1		
15	Cabinet for instrument	2	W900×D500/400×H1800mm, Sliding glazed door	

Inspector/Instructor's Room

No.	Item	Number	Description	Remarks
1	Thermometer	3	Food measuring type, Digital type, Temperature:-40～+240℃	
2	Electric drill	3	Handy type, 13mm type	

② Apparatus

No.	Item	Number	Description	Remarks
1	Alcohol Lamp	2	Standard type, Capacity:120ml	
2	Cover Glass	1Box	For microscopic examination, 18×24mm (100 pieces)	
3	Clamp Support Platform	4	For Attachiment to support Rod, ϕ 125mm	
4	Clamp Holder	10	Square type, Grip rod up to 12 mm	
5	Ring Support	2	Open type, ϕ 50mm	
6	Ring Support	2	Open type, ϕ 72mm	
7	Clamp for joint	10	For 15/35	
8	Clamp for joint	10	For 24/40	
9	Clamp Suspension	2	Standard type, For rod ϕ 12mm	
10	Clamp Versatile, Vinyl-coated jaw	4	3-prong grip, Maximum open diameter; 100mm	
11	Clamp Funnel Support	5	For attachiment to support tod, Metal	
12	Conrage Glass Stick (Stirring Stick)	20	Standard type	
13	Flask Erlenmeyer	10	Narrow mouth, Capacity ; 50 ml	
14	Flask Erlenmeyer	10	Narrow mouth, Capacity ; 100 ml	
15	Flask Erlenmeyer	20	Narrow mouth, Capacity ; 300 ml	
16	Flask Erlenmeyer	30	Narrow mouth, Capacity ; 500 ml	
17	Test Tube with Plastic Screw Cap	20	ϕ ; 10mm、Length ; 100mm	
18	Test Tube with Rim	300	ϕ ; 16.5mm、Length ; 165mm	
19	Test Tube Stand	10	For ϕ 25 tubes	
20	Test Tube Stand	3	For ϕ 40 tubes	
21	Automatic Buret Set	1	With glass stopcock, Flat ground connection on reservor, Capacity ; 10 ml	
22	Petri Dish	220	ϕ ; 90mm、Outer depth ; 22mm	
23	Reagent Bottle (Narrow mouth)	5	With stopper, Capacity ; 250 ml	
24	Reagent Bottle (Narrow mouth)	5	With stopper, Capacity ; 500 ml	
25	Reagent Bottle (Narrow mouth)	2	With stopper, Capacity ; 1,000 ml	
26	Cylicone Plug	200	For Medium sized Test Tube	
27	Support Jack	2	250×250 mm	
28	Distiling glass apparatuses (Vapor still)	1	Glass apparatus set	
29	Support Base with Rod	5	Flat base, Large size	
30	Spoid	5	Silicon made、For 2g	
31	Spoid	5	Silicon made、For 5g	
32	Slide Glass	1	For microscopic examination 76×26mm (100pieces)	
33	Safety Ring	6	Outer ϕ ; 96mm	
34	Safety Ring	6	Outer ϕ ; 106mm	
35	Dahram Tube	100	ϕ 6mm, L30mm	
36	Desiccator Shelbler	2	Glass made, Inner Plate ϕ ; 240mm	
37	Tong	1	For Beaker	
38	Tong	2	For Melting Pot	
39	Mortar	2	With Rod, ϕ ; 110mm	
40	Dropping Bottle (Amber)	2	With valve and pipette, Capacity ; 50 ml	
41	Platinum Wire & Holder	2	Standard type	
42	Beaker	5	Capacity ; 50 ml	
43	Beaker	15	Capacity ; 100 ml	
44	Beaker	10	Capacity ; 300 ml	
45	Beaker	20	Capacity ; 500 ml	
46	Beaker	20	Capacity ; 1,000 ml	
47	Pipette Volumetric	5	Capacity ; 1 ml	
48	Pipette Volumetric	5	Capacity ; 5 ml	
49	Pipette Volumetric	5	Capacity ; 10 ml	
50	Pipette Measuring	5	Capacity ; 1 ml	
51	Pipette Measuring	5	Capacity ; 5 ml	
52	Pipette Measuring	5	Capacity ; 10 ml	
53	Pipette Measuring	5	Capacity ; 20 ml	
54	Pipette Measuring Large Opening	10	Capacity ; 1 ml	
55	Pipette Measuring Large Opening	10	Capacity ; 2 ml	
56	Pipette Measuring Large Opening	10	Capacity ; 5 ml	
57	Pipette Measuring Large Opening	5	Capacity ; 10 ml	

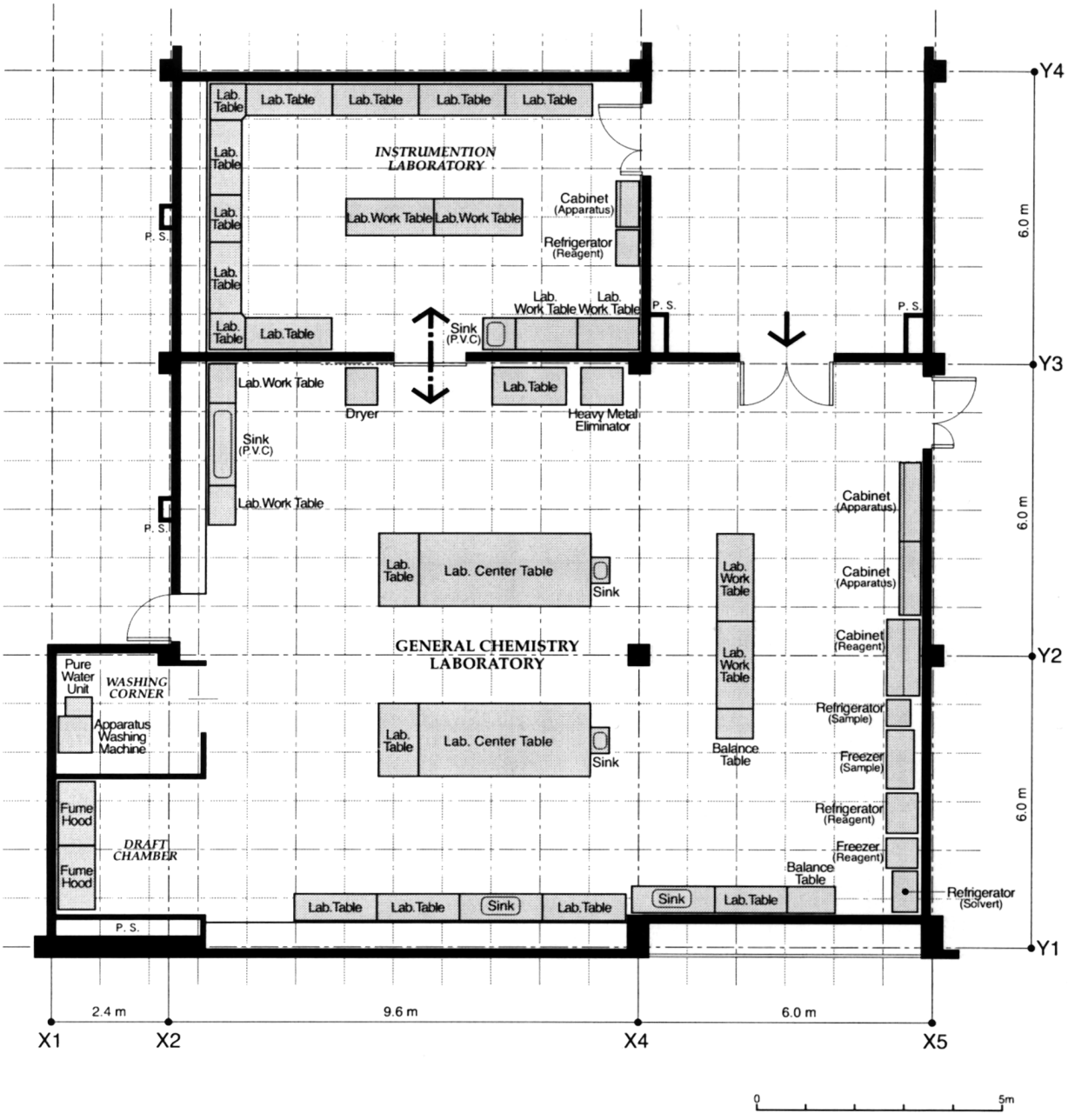
No.	Item	Number	Description	Remarks
58	Pipette Controller	5	Capacity ; 1～ 5 ml	
59	Pipette Controller	2	Capacity ; 5～20 ml	
60	Buret (Clear)	2	Capacity ; 10 ml	
61	Buret Holder	2	Double type	
62	Micro diffusion analysis apparatus	1	Conway's unit	
63	Flask Short Neck (Kjeldahl type)	5	Capacity ; 500 ml	
64	Flask Short Neck (Rouond bottom)	5	Capacity ; 500 ml	
65	Flask Short Neck (Rouond bottom)	5	Capacity ; 1,000 ml	
66	Separating Funnel	5	Capacity ; 500 ml	
67	Separating Funnel	5	Capacity ; 1,000 ml	
68	Gas Burner Bunsen	1	Standard type, For Propan gas	
69	Dispenser	1	Didpensing Range ; 10～50ml、Divisions ; 1ml, With glass bottle	
70	Plastic rack for Homogenizer's bag	1	Standard type, For microbiology examaination	
71	Micro Sylinge	3	Capacity ; 10 μl	
72	Micro Sylinge	3	Capacity ; 25 μl	
73	Micro Sylinge	3	Capacity ; 50 μl	
74	Scalpel	2	Standard type	
75	Graduated Cylinder	3	Capacity ; 100 ml	
76	Graduated Cylinder	10	Capacity ; 300 ml	
77	Graduated Cylinder	5	Capacity ; 500 ml	
78	Graduated Cylinder	5	Capacity ; 1,000 ml	
79	Volumetric Flask	10	Capacity ; 10 ml	
80	Volumetric Flask	5	Capacity ; 20 ml	
81	Volumetric Flask	5	Capacity ; 50 ml	
82	Volumetric Flask	10	Capacity ; 100 ml	
83	Volumetric Flask	5	Capacity ; 500 ml	
84	Volumetric Flask	5	Capacity ; 1,000 ml	
85	Sterilizing Can	2	65×80×200mm	
86	Sterilizing Can	3	65×80×400mm	
87	Spoon	6	Laboratory use, Length ; 180mm	
88	Funnel	10	ϕ ; 45 mm	
89	Funnel	25	ϕ ; 75 mm	
90	Filter paper	2 Boxes	No.2 type, ϕ ; 150mm (100sheets)	
91	SPC testing paper	2 Boxes	Standard type (100sheets)	
92	Coliform organism testing paper	2 Boxes	Standard type (100sheets)	
93	PT Pouch	2 Boxes	For anaerobe testing	
94	Sealer	1	For PT-Poubh sealing	
95	Drying Shelf for apparatus	2	Rack type	
96	Sterilizing Locker	1	Wideth ; 900×500mm、Sterilizing of Laboratory	
97	Auto Sterilizer for Hand Fingers	1	Alcohol spray method, Wall putting type	
98	Eye Washer	1	Standard type	
99	Respirator	5	Medium/Small size、With Gas Absorbing Can	
100	Respirator	5	Large/Medium size、With Gas Absorbing Can	
101	Protective Glasses	5	Standard type	
102	Protective Glasses Rack	1	Standard type, For 5 sets glasses	
103	Laboratory Wagon	5	Standard type	

③ Reagent for Chemical Analysis

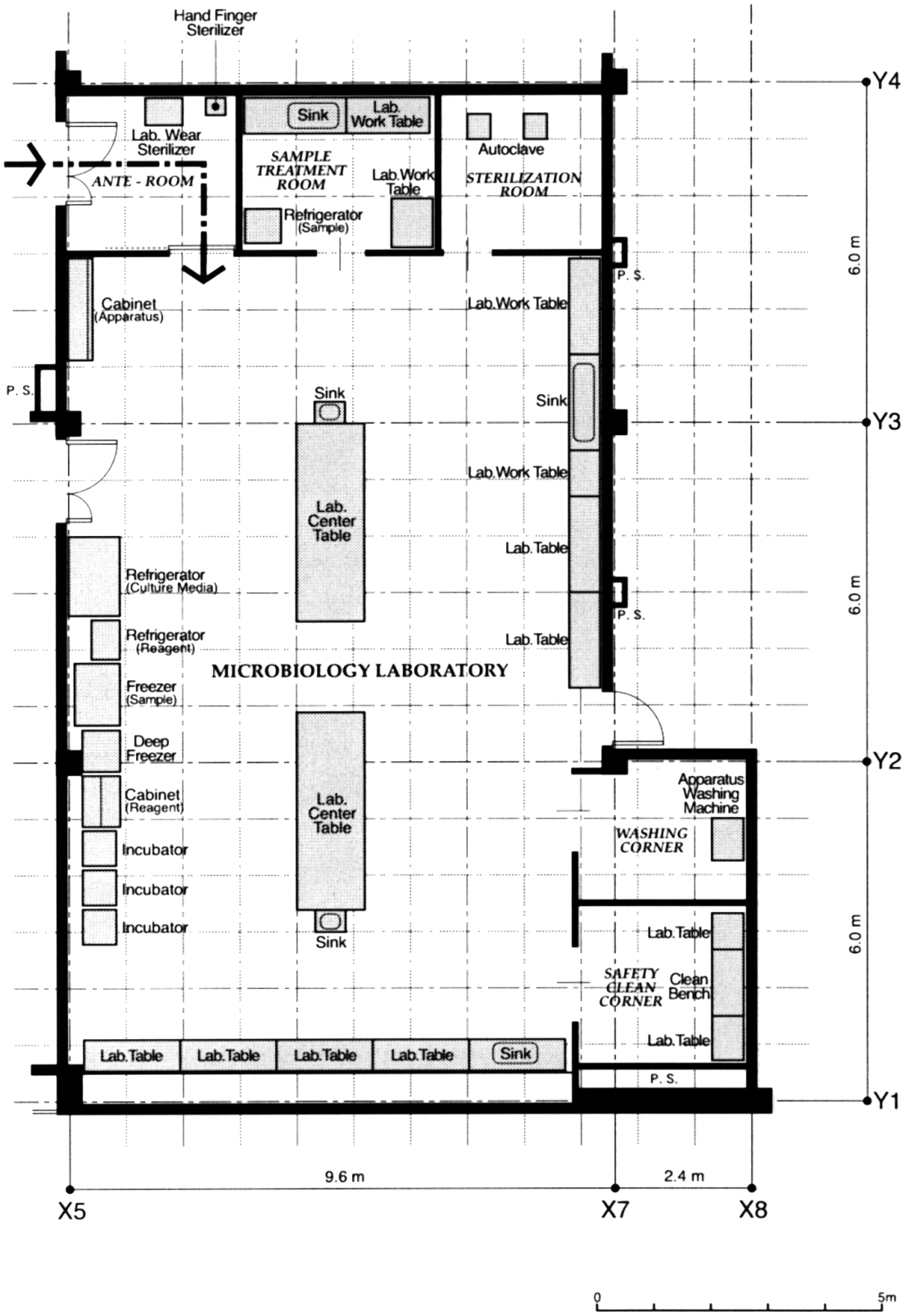
No.	Item	Number	Description	Remarks
1	1,6-Diaminohexane Dihydrochloride	25g×2	First grade	
2	DL-Histidine	10g×2	First grade	
3	DL-Proline	1g×2	First grade	
4	L-Cysteine Monohydrochliride monohydrate	5g×2	Special Grade	
5	Adenosine 3',5'-Monophosphate	500 ml×1	Biochemical Analysis	
6	Adenosine 5'-Triphosphate	100 mg×2	Biochemical Analysis	
7	Adenosine 5'-Diphosphate	5g×1	Biochemical Analysis	
8	Inosine (HxR)	1g×2	First grade	
9	Inosine 5'-Monophosphate (IMP)	1g×2	Biochemical Analysis	
10	Ethylene-diamine-tetraacetic Acid	50g×1	First grade	
11	Ammonium chloride	500 g×1	First grade	
12	Hydroxylamine Hydrochloride Hydroxyammonium Chloride	500g×1	AAS Analysis	
13	Cadmium Standard Solution Cd 100mg/l	100 ml×2		
14	Citric Acid Monohydrate	500g×1	Special Grade	
15	Sodium Acetate Trihydrate	500g×2	Special Grade	
16	Sodium Oxalate Solution 0.5mol/l (1/10N)	500 ml×2	Volumetrical Analysis	
17	Oxalic Acid Solution 0.5mol/l (1N)	500 ml×2	Volumetrical Analysis	
18	Ammonium hydroxide	500 ml×2	Harmful Metal Analysis	
19	Potassium Hydroxide solution 1mol 1N	500g×1	Special Grade	
20	Sodium Hydroxide solution 5mol 5N	500g×2	Volumetrical Analysis	
21	Dansyl Chloride	5g×5	Biochemical Analysis	
22	Thymol Blue Ethanol (50) Solution 0.1w/v%	500 ml×1	Neutralize Titration	
23	Buffer Solution Standard Phosphate Equimolal pH; 6.86	500 ml×2	Neutral Phosphate pH Standard Solution	
24	Trimethylamine Standard Solution	(2ml×5)×2		
25	Lead Standard Solution Pb 100mg/l	100 ml×2		
26	Histamine Dichloride	1g×3	Special Grade	
27	Urea	25g×2	Special Grade	
28	Histamine	5g×5	Special Grade	
29	Hypoxanthine (Hx)	25g×1	First Grade	
30	Phenolphthalein Ethanol Solution 1.0w/v%	500 ml×1	Neutralize Titration	
31	Bromocresol Green Ethanol (50) Solution 0.04w/v%	500 ml×1	Neutralize Titration	
32	Bromophenol Blue Ethanol(50) Solution 0.1w/v%	500 ml×1	Neutralize Titration	
33	Methyl Orange Solution 0.1w/v%	500 ml×1	Neutralize Titration	
34	Methyl Red Solution 0.04w/v%	100 ml×1	Indication	
35	0.5mol/l Iodine Solution (1N)	500 ml×1	Volumetrical Analysis	
36	Sodium Sulfate, Anhydrous, 99.9 %	50g×1	Special Grade	
37	Potassium Phosphate Monobasic	500g×1	First Grade	
38	Potassium Phosphate Dibasic	500g×1	First Grade	
39	Phosphate pH Standard Solution pH; 7.41	500 ml×2	Neutral Phosphate pH Standard Solution	

④ Culture Media for Microbiological Analyhsis

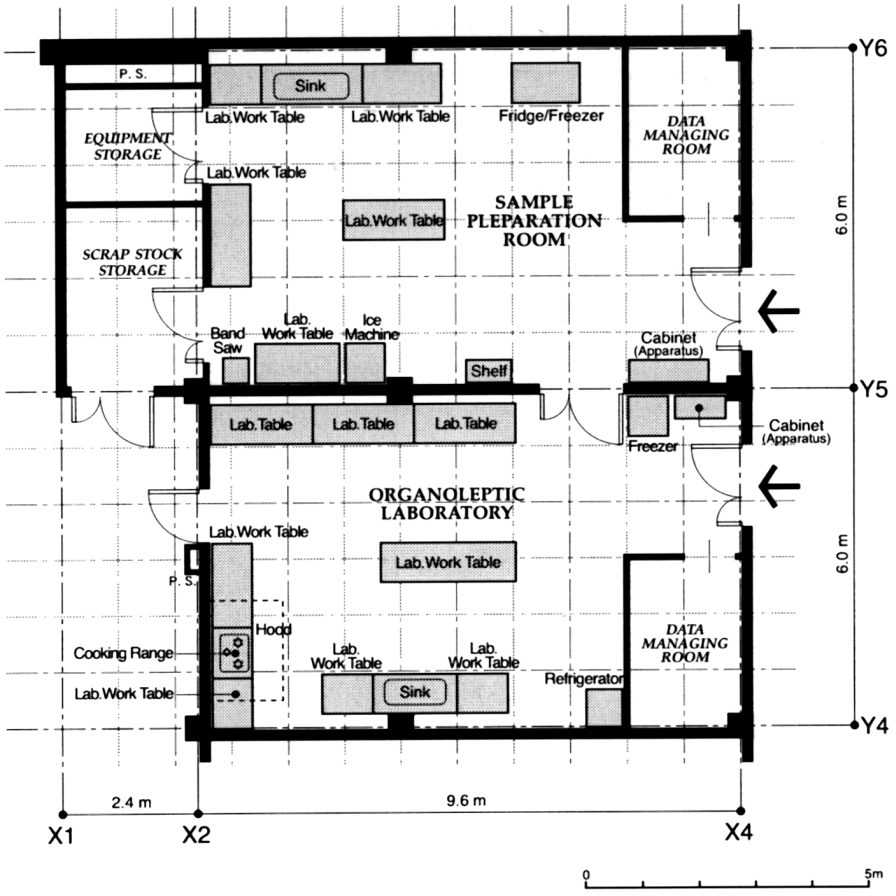
No.	Item	Number	Description	Remarks
1	CW Agar Base with KM	100g×2	Welsh	
2	DHL Agar	300g×3	Salmonella	
3	EC Broth	100g×3	Eschelichia coli.	
4	EEM Broth	100g×3	Salmonella	
5	EMB Agar	300g×3	Eschelichia coli.	
6	NGKG Agar Base	300g×1	Seleus	
7	TCBS Agar	300g×3	Vibrio parahemoryticus/ Preparation of culture media	
8	TSI Agar	100g×3	Vibrio parahemoryticus	
9	Clostridia Count Agar	300g×1	Clostridia	
10	Selenite Cystine Broth Base	100g×4	Salmonella	
11	Desoxycholate	300g×3	Coliform organisms	
12	Modified Handford Agar	300g×2	Welsh	
13	Polymixine B	1g×2	Vibrio parahemoryticus	
14	Mannitol Salt Agar	300g×3	Staphylococcus aureus	
15	Standard Method Agar	300g×5	SPC(Standard Plate Count)	



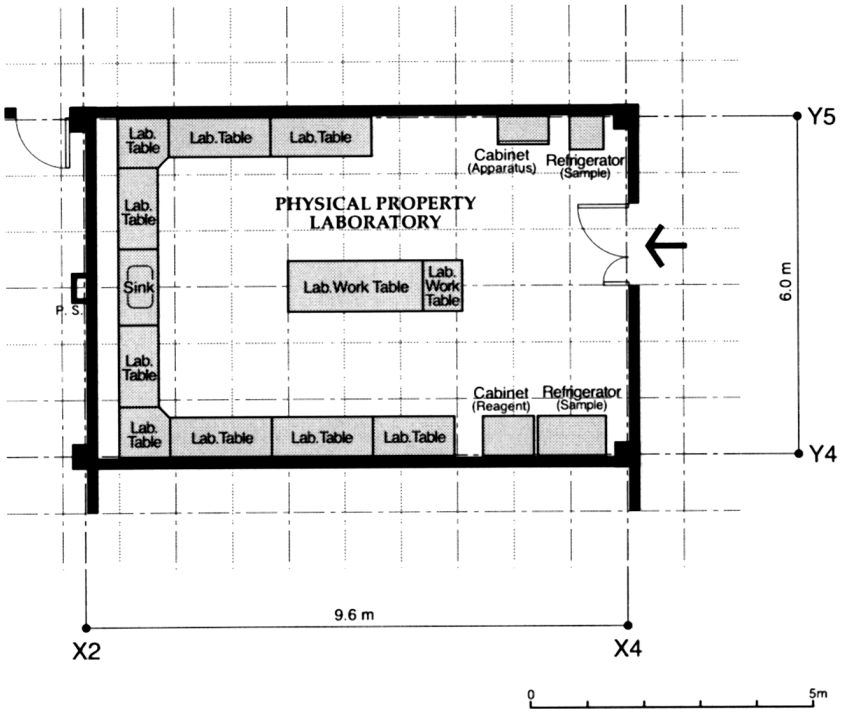
LAYOUT PLAN OF CHEMISTRY LABORATORY



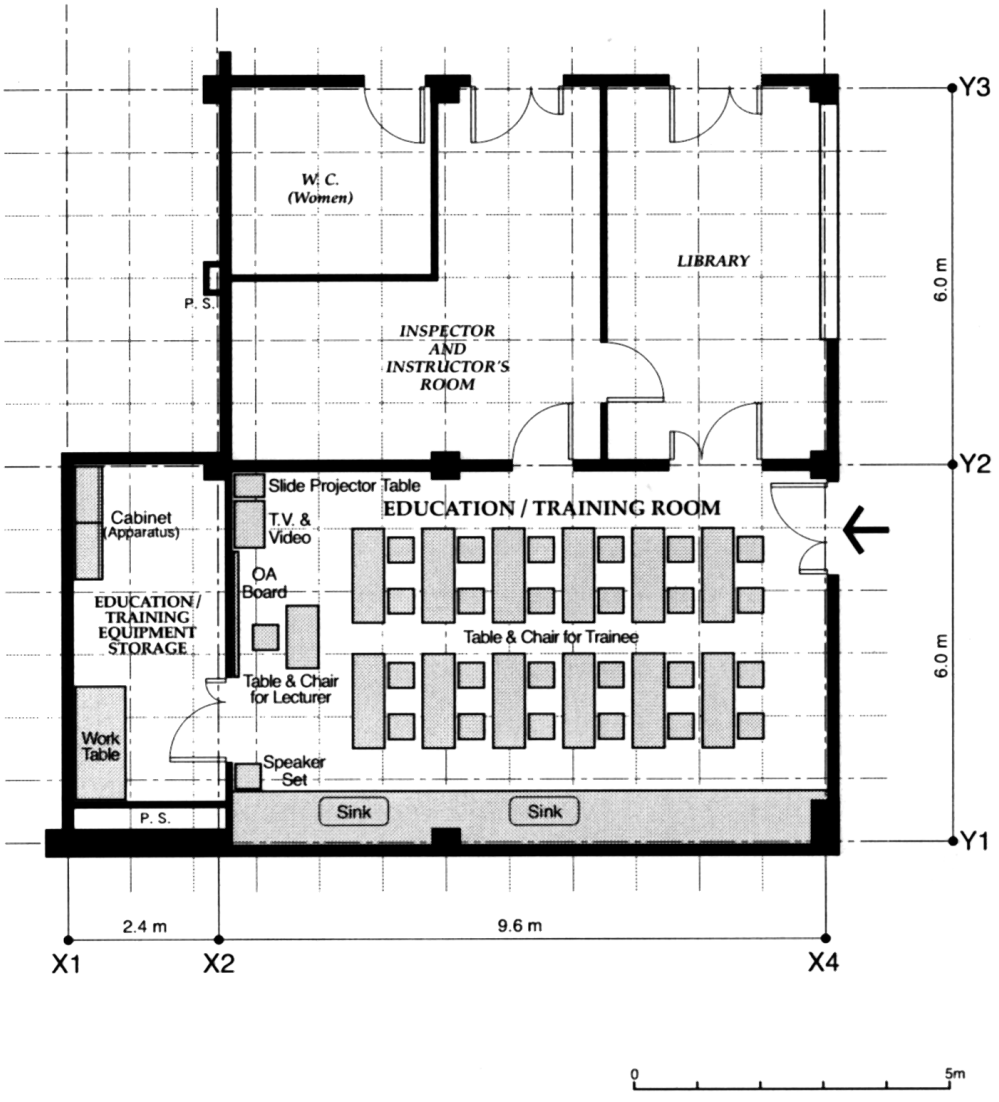
LAYOUT PLAN OF MICROBIOLOGY LABORATORY



LAYOUT PLAN OF ORGANOLEPTIC LABORATORY & SAMPLE PLEPARATION ROOM



LAYOUT PLAN OF PHYSICAL PROPERTY LABORATORY



LAYOUT PLAN OF EDUCATION / TRAINING ROOM

2.4 Project Implementation

2.4.1 Organization

The QCC will be placed under the jurisdiction of the Directorate General of Fisheries Resources, Ministry of Agriculture and Fisheries and the Directorate General will have the authority to administer the QCC and to oversee fisheries administration.

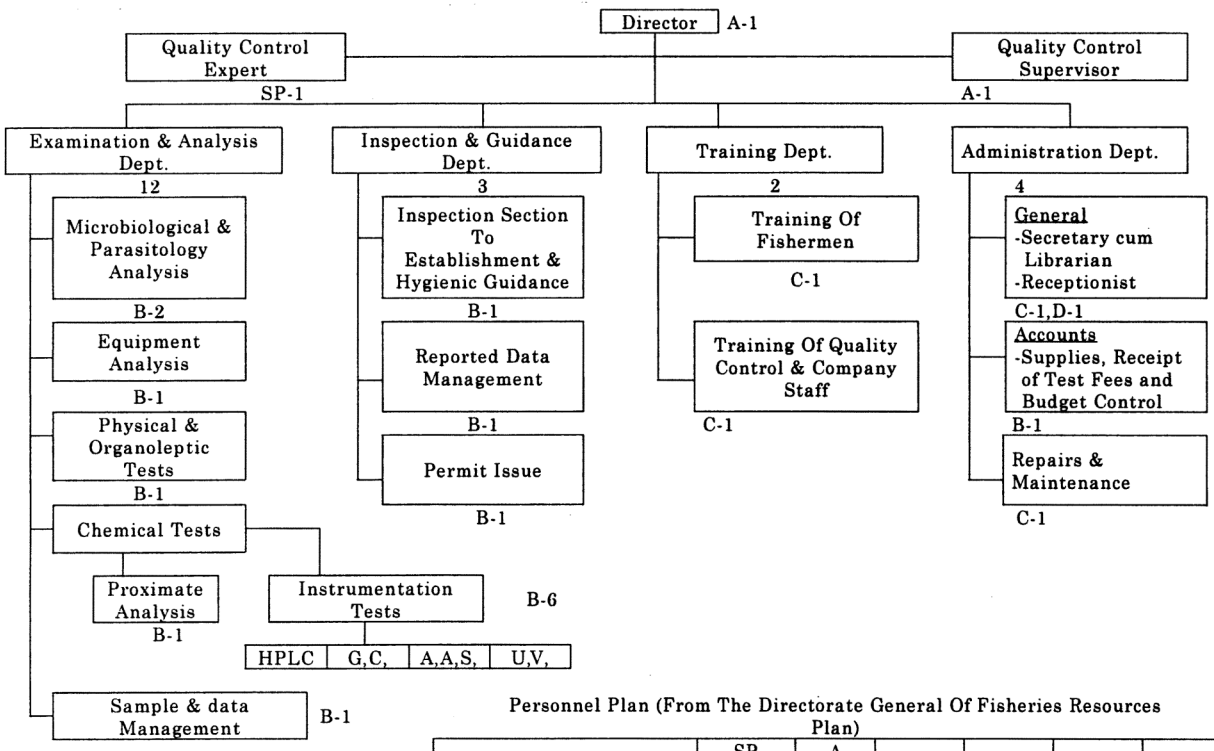
The QCC will be comprised of the four departments of examination/analysis, inspection/guidance, training, and administration and it is the first institution in Oman equipped with quality control facilities and equipment for fishery products. The Center will have the authority and responsibility to oversee the quality control of fishery products while simultaneously implementing education and training activities of fisheries related personnel with the aim of improving the level of quality control.

The specific task of the QCC is to conduct stipulated examinations and analyses of export fishery products and to issue Health Certificates. It is responsible for supplying safe fishery products domestically and to expand the fisheries industry. In order to achieve these goals, the objective of the QCC is to establish a system of quality control management based on the HACCP method that is stipulated by industrialized nations.

A similar institution, the MSFC, is currently in operation, but it is an oceanographic and fishery resource research institute. Subsequently, the tasks that are performed by the MSFC differ from those of the QCC.

An organizational chart of the Directorate General of Fisheries Resources and the QCC is given in the following page.

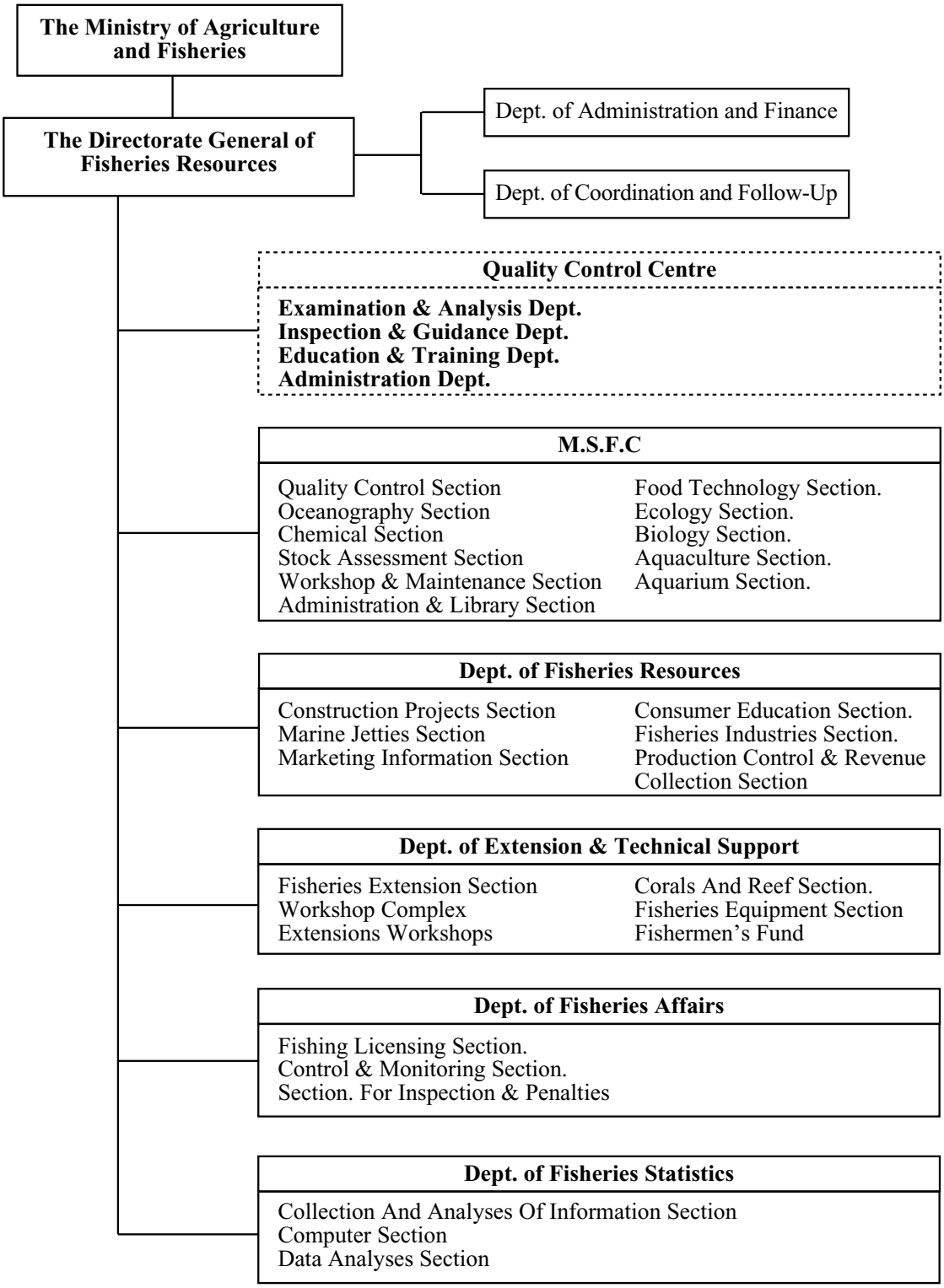
Fig 2.6: The Organization Chart of the Quality Control Center



Personnel Plan (From The Directorate General Of Fisheries Resources Plan)

Occupation Class	SP class	A class	B class	C class	D class	Total
Director		1				1
Quality Control Supervisor		1				1
Quality Control Expert	1					1
Examination & Analysis Dept.			12			12
Inspection & Guidance Dept.			3			3
Training Dept				2		2
Administration Dept.			1	2	1	4
Total	1	2	16	4	1	24

Fig 2.7: The Organization Chart of the Directorate General of Fisheries Resources



2.4.2 Budgetary Measures

The Ministry of Agriculture and Fisheries will be responsible for the operations and maintenance of the QCC. Of the operations and maintenance budget, the salaries of the staff will be provided by the ministry and the remaining costs will be covered by revenue generated from inspection fees. If the revenue generated from inspection fees is inadequate to cover the costs, the Fisheries Research Fund will be utilized.

The estimated operations and maintenance cost of the Center for the first fiscal year (2001) is 333,520 rials as shown in Table 2.11. Revenue generated from inspection fees is estimated at 57,184 rials and if 75,936 rials are supplemented from the Fisheries Research Fund, funds to cover the costs will be secured with the exception of salaries.

Following the second fiscal year, the number of officially licensed export factories is expected to gradually increase from the original 20, thereby raising the amount of revenue generated from inspection fees to cover costs other than salaries and removing the need for supplement funding from the Fisheries Research Fund.

Table 2.11: Revenue and Expenditures of QCC for the First Fiscal Year

Revenue	(Unit: RO)	Expenditure	(Unit: RO)	**MSFC**
Budget of MAF* Salary	200,400	Salary	200,400 (60 %)	302,086 (81 %)
Inspection Fee	57,184	Consumables	22,800	14,963
FRF**	75,936	Maintenance	14,400	13,713
		Insurance	8,000	
		Miscellaneous	4,520	9,000
		Others	20,000	33,976
		Initial Purchases	63,400	
Total	333,520	Total	333,520	373,738

*MAF: Ministry of Agriculture and Fisheries **FRF:Fisheries Research Fund

Summary of the Fisheries Research Fund

The Fisheries Research fund is comprised of subscription funds from both the public and private sectors. In 1991 the Department of Administration and Finance was established within the Ministry of Agriculture and Fisheries and the funds were distributed for project proposals that were submitted, reviewed, and passed by a review committee. The fund totalled 2 million rials.

- Objective of the Fund

The Fisheries Research Fund was established by Act 51/91. The aim of the fund is to implement fishery research projects that will contribute to the development of the fisheries industry in Oman. The research projects are in the following fields.

a) Research in resource evaluation and estimation of sustainable fishery production volume in terms of biological, economical, and environmental context
b) Economic, sociological, environmental research to develop maximum profit generating methods and programs based on sustained fishery production
c) Environmental research in terms of the relationship between fish culture, fishing labor, and processing
d) Research project on monitoring the maximum profit generating method of fishery resources and development of a management system

- The following organizations have qualified to receive funding.
  a) Ministry of Agriculture and Fisheries
  b) Sultan Qaboos University
  c) Ministry of Finance (Economic Department)
  d) Oman Fisheries Company
- The following four MSFC related projects have received funding.
  a) Artificial reef project
  b) Quality control related project
  c) Fish culture project
  d) Fishing gear development project

2.4.3 Technical Level of Staff Members

(1) Personnel Plan

QCC Organization and Staff Members

The number of staff members are listed as follows.

Director, Vice-Director, Quality Control Supervisor	3 persons
Examination/Analysis Department	12 persons
Inspection/Guidance Department	3 persons
Training Department	2 persons
Administration Department	4 persons
Total	24 persons

The accounting assistant, janitorial personnel, security guard, and other supplementary personnel have not been included in the above. Each department is anticipated to recruit one to two assistants to handle the increase in the quantity of test samples and analysis items in future. However, the present personnel plan which was prepared by the Oman side and which will be implemented following the completion of the Project, has been concluded as appropriate in view of QCC's present role and number of tasks.

Capabilities of the Staff Members

The staff members of the QCC will be transferred from the MSFC. Presently, the MFSC has 62 staff members and their academic qualifications are as follows.

Ph.D	3 persons
Masters degree	11 persons
Four-year University	21 persons
Vocational school	2 persons
High School	8 persons
Others	17 persons

(Note) Others: Overseas vocational schools and universities

Of the QCC supplementary staff members for the examination department, eight members are currently participating as counterparts in the JICA project. These members have the technical skills to operate high performance liquid chromatography, atomic absorption spectrophotometer, gas chromatography, etc. If these members were to transfer to the QCC and further their experience in quality control analysis, they will be qualified to foster and supervise the next generation of technicians.

If this project is implemented, they will be required to undergo basic training at the MSFC in order to contribute to the sustained operations of the QCC. The academic qualifications of these eight personnel is shown as follows.

University graduate	6 persons
Vocational school	1 person
Others1	1 person

Of the 14 staff members who will be transferring from the MSFC to the QCC, 10 members have specialized knowledge and are also involved in administrative work. Their experience and knowledge will contribute greatly to the supervision and improvements of QCC’s administrative tasks in the quality control of fishery products.

Chapter 3 Project Plan

Chapter 3 Project Plan

3.1 Implementation Plan

3.1.1 Implementation Policy

(1) Project Implementation Structure

The Project implementing body on the Oman side is the Department of Fisheries Resources under the jurisdiction of the Ministry of Agriculture and Fisheries. Following the signing of the E/N between the governments of Oman and Japan, a Japanese consultant company will sign a contract with the Oman government regarding the Project implementation design and management of the construction work. In addition, a contract will be signed between the Oman government and a Japanese construction company to execute the construction work and to procure and install the equipment and materials. The construction company will be placed under the supervision of the Japanese consultant company. After the construction work has been completed, the newly created Quality Control Center (QCC) will be the body responsible for operating and maintaining the project facilities.

(2) Implementation Policy

1) Construction Conditions

a) Labor

The stipulated working hours in Oman is generally 8 hours a day, 48 hours per week. During Ramadan, the working hours are curtailed to 6 hours a day, 36 hours per week in observance of the Islamic fasting month. Weekday overtime wages are 25 percent of the basic wage and wages for working on holidays are 35 percent higher than the basic wage. In addition, paid holidays, holidays for holy visits, etc. are stipulated.

The Oman government is promoting employment for Oman citizens and technical training (Omanization) and more than 15 percent of the total number of employees at each company, including construction companies, must be Oman citizens. Furthermore, the companies are required to pay a designated amount (110 rials/year) for each foreign employee to the government as a labor training tax for Oman citizens.

However, much of the construction labor is dependent on Indian, Pakistani, Sri Lankan, and other third country workers. The technical level of the labor is comparatively high and without this foreign labor, construction work cannot be carried out. Subsequently, in order to encourage long-term employment of their foreign employees, the construction companies have set up retirement funds, transportation benefits to the worker's home country, commuting allowance,

company housing, and other benefits which have become an established practice. As a result, although the technical standards of the labor is high, labor cost is also comparatively higher than neighboring countries.

b) Construction Resources

Ready-mix concrete is generally used in the capital area of Muscat and there is an established quality control system based on local specifications. In particular, facilities such as the chilled water facilities, etc. have been built using driven concrete capable of withstanding the fierce heat of the country and a production supply of raw concrete to meet the constant demand is available.

Secondary concrete products such as precast concrete, concrete blocks, Hume pipe, etc. are manufactured by ready-mix concrete companies or related firms in accordance with demand and general products can be procured at construction material stores in the city.

The volume of reinforced concrete and steel materials produced domestically is limited and construction materials, including facility materials are largely imported from the UAE, Turkey, and Europe. Quality standards for construction materials have been established and high quality materials can be procured and no problems are foreseen in terms of supply volume.

c) Construction Machinery

A great number of large-scale civil engineering and construction works have been implemented in the Muscat region since the 1970s. Nearly all the large local construction companies or their subsidiaries possess their own construction machinery and it is possible to procure general heavy machinery.

2) Establishing the Execution Policy on Construction Work

This Project will be implemented under the grant aid scheme of the Japanese government and local construction conditions will be taken into consideration. The following policy will be followed in executing the construction work.

a) The project implementing body in Oman, the Japanese consultant company, and the construction company will carry out a sufficient exchange of opinions and will maintain close communication with each other in order to ensure the continuous execution of the construction work.
b) The construction plan will be prepared taking into consideration the conditions pertaining to the procurement of construction workers, materials and equipment since the labor force and materials are largely sourced from

overseas. The work schedule will be flexibly managed in order to cope with local conditions and to ensure the continuous progress of the construction work.

c) The work of constructing the facilities and installing the equipment will be carried out simultaneously in the final stages of the work schedule. Therefore, work schedule and allocation of management personnel will be prepared to ensure the uninterrupted progress of both works.

d) Adequate storage measures will be taken to protect the construction equipment and materials from salt air damage as the Project site is adjacent to the coast.

e) The scope of responsibility for utility services such as electricity, water supply, drainage, etc. will be clearly defined, in order to ensure that the construction work progresses efficiently and without interruption.

f) Preventive measures against accidents that may occur during the temporary storage of equipment and materials, their transport, and installation will be taken.

3.1.2 Considerations to be Taken during Construction

The following considerations will be taken when the construction work is executed.

1) Measures against the fierce heat: The local practice is to carry out work such as driving concrete etc. during the relatively cool evening or midnight hours. Such local practices against the fierce heat will be actively adopted when implementing the construction work of the Project.

2) Strictly adherence to the work period based on meticulous management of the work process: Orders that follow the plan and procedure of the work schedule, confirmed execution diagrams, and coordinated implementation will be emphasized. A manager in charge of equipment works will be allocated at the Project site from the preparation stage, in order to avoid errors or returns in the case of altered repair work. An on-site system which will enable sufficient review of the facilities and the execution of the construction work will be set up.

3) Taking into consideration local practices: The work schedule will take into account local customs such as the Ramadan period and Ramadan-related holidays which lower real work efficiency.

4) Work schedule that includes equipment installation and finishing work: The work schedule will enable timely adjustments between the equipment installation and finishing work as these two areas of the construction work will be emphasized.

5) Enabling major construction work to remain unaffected by the provisional work: Due to the limited area of the Project site, it is difficult to create a large provisional work yard. Storage area for equipment and materials and a provisional office will be allocated in an area where they will not directly affect the progress of the main construction work.
6) Environmental considerations: Measures will be taken to prevent the outflow of dirt and sand to the adjacent areas during the construction work and to minimize the impact on the environment as much as possible.

3.1.3 Scope of Works

The work on the Project will be divided between the Japanese and Oman sides. The scope of works is shown in the table below.

Table 3.1: Scope of Work

Scope of Work	Japan	Oman
1. Securing and clearing the land		**O**
2. Build an anti-collapse protection wall and rain water drainage channel at the south side of the site and the east side of the inclined area		**O**
3. Installation of utility facilities at the site		
• Installation and connection of needed electricity from the main system to the transformer of the project facilities, installation of the meter, etc. and on/off safety device		**O**
• Move the existing water supply channel, connect the water supply, including the water gauge, install the water gauge		**O**
• Install telephone lines, including the telephone distribution board		**O**
• Installation work of the equipment in the facilities	**O**	
4. Landscaping in the site, install wall, gate		**O**
5. Planned construction work of the facilities at the site	**O**	
6. Electrical facilities, water supply/drainage sanitation facility, air conditioning equipment	**O**	
7. Equipment		
• Procurement and installation of equipment	**O**	
• Trial operation of the equipment, instruction on the use of the equipment	**O**	
8. Import, Customs procedures		
• Transport to Muscat and domestic transport	**O**	
• Tariff exemptions and Customs		**O**
9. Licenses, filing in of applications required to carry out construction work		**O**
10. Payment of B/A commissions to a foreign exchange bank in Japan		**O**
11. Arrangement for the stay and immigration procedures of Japanese nationals going in/out of Oman in conjunction with Project-related work		**O**
12. Responsibility for all the expenses related to the construction of facilities, transport, installation, and setting of equipment and materials that are not included in the grant aid project		**O**
13. Fulfill the procedures/paperwork required to enable the strict adherence of the construction schedule		**O**

3.1.4 Project Supervision Plan

The basic policy regarding supervision of the Project and the factors which have been taken into consideration are summarized below.

1. The consultant company will closely coordinate their work with the Project implementing body, the Department of Fisheries Resources, to ensure the uneventful transport and installation of equipment/materials as well as construction work. In particular, the construction work on the wall on the south and west sides of the Project site and the work of installing the utilities must be coordinated with the construction work which will be carried out by the Japanese side. The timing of these construction works is important and the implementation schedule and specifications must be thoroughly discussed between the two sides.
2. Prior to the start of the construction work, the execution plan and shop drawings submitted by the construction company must be thoroughly reviewed and the appropriateness of the temporary work plan, work process, quality of the planned materials, and the construction method must be reviewed.
3. On completion of the construction work and prior to the transfer of the facility to the Oman side, the constructed facilities and the specifications of the equipment will be inspected. Repairs that are required will be pinpointed at this time.
4. An architect will be assigned to the construction site to supervise the construction work throughout the construction period; and the facility and equipment technician will be sent to the Project site as needed.

3.1.5 Equipment and Materials Procurement Plan

(1) Construction Related Equipment and Materials

All construction related equipment and materials, including imported items, that are required in the Project will be procured as much as possible in Oman. In particular, equipment and materials that will affect the implementation schedule of the Project will be procured in Oman, with the exception of items that are more advantageous to purchase in Japan in terms of cost.

(2) Equipment and Materials

The selection of equipment and materials require a detailed review and discussion of quality and specifications; and selecting and procuring the equipment and materials can be more appropriately carried out in Japan. Therefore, in order to ensure the uneventful procurement of Project equipment and materials, it is considered appropriate that the procurement is basically carried out in Japan.

However, equipment which requires a maintenance contract with a local supplier, such as diluted gas, pharmaceuticals, etc. which are used in tests and must be periodically restocked and general equipment will mainly be procured locally.

3.1.6 Implementing Schedule

When a project is implemented as a Japanese government grant aid project, the two countries must sign an E/N. The signing of the E/N will be followed by preparation of the implementation design, the tender documents, tendering and signing of the construction work and equipment procurement contract, the construction work, equipment procurement, installation, completion, and turnover.

(1) Implementation Design

A detailed implementation design will be drawn up based on the basic design study report and tender documents will be prepared. It will take approximately 3.0 months for this process to be completed after the signing of the E/N. All the licenses/permits and drawings that are required to carry out the construction work will be prepared during this time period.

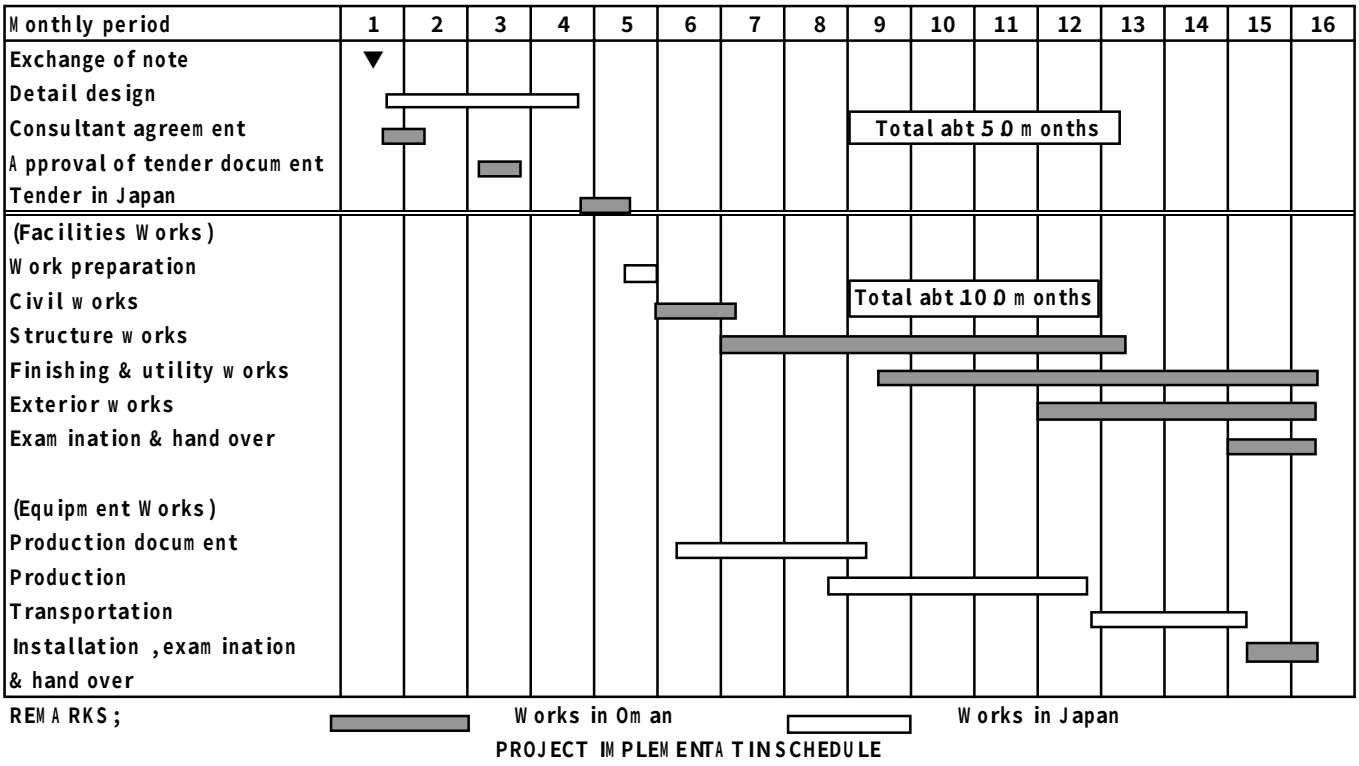
(2) Tendering

Following the completion of the implementation design, potential candidates will be publicly invited to participate in the tender for the construction work and equipment procurement. The candidates' qualifications to participate in the tendering are reviewed before being passed. Based on the results of this review, the candidates are then invited to the tendering by the implementing agency and tendering is carried out in the presence of relevant witnesses. This is followed by a signing of the tender contract. The process of publicly announcing the tendering, the explanation and submittal of drawings and diagrams will take about one month and an added one month will be required for from the time the drawings are submitted to the signing of the construction contract.

(3) Construction Work and Equipment and Procurement/Installation

Following the signing of the construction contract, the construction work and equipment provision and installation are executed with the approval of the Japanese government. The entire process from the time the E/N is signed until the consultant's contract is completed is expected to take 15.0 months and the construction work is expected to be completed in 10 months from its start. The Project implementation schedule is shown below.

Table 3.2: Project Implementation Schedule



3.1.7 Obligation of the Oman Government

The Department of Fisheries Affairs, which is the implementing body of the Project on the Oman side and other relevant bodies will be responsible for implementing the following work within the designated time frame indicated below in order to implement the Project.

(1) Obtaining all licenses/permits pertaining to construction work: To be completed prior to handing over the tender drawings

(2) Carrying out the banking arrangements and Authorization to Pay (A/P): The banking arrangements will be immediately following the signing of the E/N and the A/P will be issued following the signing of the contracts with the consultant and construction companies.

(3) Construct a protective wall on the south and west sides of the Project site and rainwater drainage facility: To be completed prior to the start of the construction work

(4) Work of moving the existing water supply pipe at the site: To be completed prior to the start of the construction work

(5) Supply the infrastructure at the planned facilities: To be completed prior to the start of the construction work

(6) Wall, gate, landscaping within the site: To be completed prior to the start of operations

(7) Install office equipment for the administrative section, furniture, accessories, fixtures: To be completed prior to the start of operations

(8) Obtain all Customs clearance and domestic tariff exemptions in Oman for all equipment and materials that will be procured as well as for payment of services rendered for the Project by the construction company

(9) Make arrangements for the stay and immigration procedures of Japanese nationals engaged in the Project

(10) Ensure that the implementation schedule of the construction work is strictly followed.

(11) Take budgetary, employment of staff, operational, and other specific measures needed to operate the project's facilities after the Project has been implemented.

(12) Promptly procure all other equipment and materials that are not included in the grant aid cooperation.

3.2 Project Cost for the Oman Side

The estimated cost of the Project for the Oman side if the project is implemented as a Japanese government grant aid project is about 138,000 rials (about 39 million yen). A breakdown of this cost is shown below.

Table 3.3: Project Cost for Oman Side

Unit: RO

	Items	Cost
1)	Protection works against the slopes of backfilling along the highway and rock mountain around the site, and the works of rainwater discharge route	45,700
2)	Infrastructure related works of electricity, potable water, telephone	37,800
3)	Fence, gate and landscaping	15,000
4)	Equipment, tools, furniture that are excluded in this Project	30,500
5)	Other miscellaneous	9,000
	Total	138,000

Method of Calculation

The estimation of the costs have been calculated using the following conditions.

- Period of Calculation: October 1999
- Exchange Rate: US$1.00 = 110.8 Yen
  US$1.00 = 0.388 RO
  1 RO = 285.57 Yen
- Implementation Period: The detail design, construction work, and equipment procurement periods are given in the Project Implementation Schedule.
- Others: The Project will be implemented in accordance with the grant aid system of the Japanese government.

3.3 Operation and Maintenance Plan

The operations and maintenance costs of the Project are shown below.

(1) Operations and Maintenance System

1) Personnel Plan

The director of the Center will be responsible for overseeing QCC when the Project is implemented and a total number of 24 staff members will be recruited. The organizational chart of the center is shown in Fig 2.6.

There will be four departments, examination/analysis, inspection/guidance, training, and administration, under the overall management of the director and vice-director. The allocation of staff members to each section is shown in the table below. In addition to two personnel who will be newly recruited, 14

members from relevant departments of the Ministry of Agriculture and Fisheries and 8 members from the MSFC will be transferred to the facility.

Of the personnel who will be transferred from the MSFC, six will placed in the examination/analysis department and their transfer is not anticipated to cause undue loss to the MSFC.

Four members other than these staff members will also be hired as assistants.

Table 3.4: QCC Staff Personnel

Sort of Occupation	Class	Number of Staff	Home Office
Director	A	1	MAF*1
Quality Control Supervisor	A	1	New employment
Quality Control Expert	SP	1	New employment
Examination & Analysis personnel	B	12	MAF (DGFR*2) 3 persons MAF (DGAAWF*3) 3 persons MSFC 6 persons
Inspection & Guidance personnel	B	3	MAF (DGFR) 2 persons MSFC 1 person
Training personnel	C	2	MAF(DGFR) 1 person MSFC 1 person
Administration staff	B C D	1 2 1	MAF (DGPR*4) MAF (DGPR) MAF(DGPR)
Worker		4	New employment

*1 MAF Ministry of Agriculture and Fisheries
*2 DGFR Directorate General of Fisheries Resources
*3 DGAAWF Directorate General of Animal Wealth & Fisheries
*4 DGPR Directorate General of Planning & Projects

2) Facilities that are easy to repair and service will be maintained by the repair and service section of the department. However, the Project will also be providing facilities and equipment that require specialized technical knowledge as well as spare parts. This type of equipment will be procured locally and a maintenance contract will be signed with an outside party.

(2) Maintenance and Operational Costs

1) Budgetary Measure

Salaries of the staff members which are part of the QCC maintenance and operational costs will be allocated by the Ministry of Agriculture and Fisheries. The staff members are categorized into five levels ranging from SP and A to D. There will be one SP ranking staff member, two class A members, 16 class B members, four class C members, and one class D member for a total of 24 staff members and four assistants.

Salaries for the first year have been estimated at 200,400 rials (see Table 3.7) and this amount is expected to increase only with the combined salaries of

the newly recruited personnel (37,200 rials). If there remains a shortage even after inspection fees are appropriated for the maintenance and operations budget, there are plans to allocate funds from the Fisheries Research Fund.

2) Revenue from Testing Fees

According to the regulations pertaining to the QC management of exported fishery products, companies which do not have their own examination facilities must undergo a designated inspection once every three months.

Inspection fees will be collected and this revenue will be an important component in the operations and maintenance of the QCC.

Presently, there are four factories which have been approved for exporting fishery products and there are plans to increase this number to 20 factories in the first fiscal year (2001), gradually increasing the number thereafter.

The amount of the fees is still under review, but according to the data obtained earlier, they are estimated as follows.

Table 3.5: Inspection Fee

(Unit: Rial Oman)

Inspection item		Inspection fee (for 1 specimen)
Histamine		15
Heavy metals		15
Total volatile basic nitrogen VBN		9
Trimethyl amine nitrogen TMA-N		9
Bacteria	Salmonella, Vibrio parahaemolyticus	10
	Others	4
Total mercury		25.5
K-value		35.1
General analysis	Crude protein, crude fat	8
	Ash	5
	Moisture	2

When the revenue generated from the inspection fees are calculated according to this plan, a total of 57,184 rials will be generated from 5,840 items for analysis from about 20 factories (see Table 3.6). Based on this figure, the estimated operations and maintenance cost of the center is shown in Table 3.7.

Table 3.6. Calculation of Revenue Generated From Testing Fees

(Inspection fee unit: Rial Oman)

		Number of specimens per sample	Inspection fee per specimen	First year (20 plants)	
				Number of specimens	Inspection Revenue
Histamine		9	15	720	10,800
Heavy metals		5	15	400	6,000
TVB-N		3	9	240	2,160
TMA-N		3	9	240	2,160
Bacteria	Salmonella, Vibrio parahaemolyticus	5	10	800	8,000
	Others	5	4	2,000	8,000
Total mercury		3	25.5	240	6,120
K-value		3	35.1	240	8,424
General analysis	Protein, fat	3	8	480	3,840
	Ash	3	5	240	1,200
	Water content	3	2	240	480
Total				5,840	57,184

(3) Review of the Operations, Maintenance, and Management Costs

1) Fund Allocation

The Ministry of Agriculture and Fisheries is responsible to allocate the operation, maintenance and management budget of QCC. Out of these, the fixed cost such as salaries and consumables, would be borne by the Ministry whereas the temporary expenditure will be covered by the project subsidy of the Fisheries Research Fund.

The total operations, maintenance, and management costs for the first fiscal year is estimated at 333,520 rials, out of which 63,400 rials is needed for purchase of office appliances and vehicles. However, the operations and maintenance costs will greatly decrease from the following fiscal year due to the drop in purchasing costs.

Revenue generated from the inspection fees is expected to rise with increase in the number of factories.

Therefore the operation, maintenance and management cost of QCC will be sufficiently covered. The projected QCC operations and maintenance costs for the first fiscal year is shown in the following table.

2) Operation Staff Allocation

Initial operation staff of QCC will be transferred from the Ministry of Agriculture and Fisheries and MSFC. Also, recruitment of new personnel with appropriate technical abilities will be in line with the planned expansion of operation.

MSFC's human and technical cooperation will be shared with the QCC for the foreseeable future and as such, operation of QCC in terms of number and technical level of staff will not encounter any problem.

As explained above, there are no impediments either economically, technically, or in terms of management in the operations and maintenance of the facilities and equipment planned by the Project; and the conditions that will ensure its effectiveness have been met.

Table 3.7: Projected QCC Operations and Maintenance Costs for the First Fiscal Year

In the initial year (2001)
Unit R.O.

Expense item	Itemization	QCC (the year 2001)	MSFC the year 1999
Salary	A class= 2x800x12	19,200	
	B class=16x650x12	124,800	
	C class= 4x500x12	24,000	
	D class= 1x400x12	4,800	
	SP	18,000	
	Worker=4x200x12	9,600	
Sub Total		200,400	302,086
Consumables:	Electricity	3,600	
	Fuel/Oil/Lubricants	6,000	
	Water	1,200	
	Printing/Stationery	3,000	
	Field Trip Allowances	9.000	
Sub Total		22,800	14,963
Maintenance	Equipment	10,000	
	Transport	2,400	
	Buildings	2,000	
Sub Total		14,400	13,713
Chemical waste facility		20,000	
Insurance		8,000	
Miscellaneous		4,520	9,000
Initial Purchases	Vehicles	54,000	
	Office Equipment	4,000	
	Other Equipment	5,400	
Sub Total		63,400	
Others			33,976
Total of Expenditure		333,520 (Approx.101 million yen)	373,738 (Approx. 113 million yen)
Inspection Fee Incomes		57,184	
Fisheries Research Fund		75,936	
Deduction		200,400	373,738

Chapter 4 Project Evaluation and Recommendation

Chapter 4 Project Evaluation and Recommendation

4.1 Appropriateness of the Corroborative Data and Examinations and Beneficial Effects

Due to the Oman government's policy to actively promote its fisheries industry, fish production, distribution, and fish processing factories have developed rapidly over a short period of time. In contrast, the coastal artisanal fisheries industry which produces much of the fish landing volume have continued to rely on traditional handling methods that ignore the importance of ice storage. As a result, problems prevail in the area of quality control and hygiene management. This has been compounded by stricter international quality control regulations for fishery products; and a system of quality control for fishery products have lagged in Oman.

These circumstances resulted in a ban on the export of Oman's fishery products in April 1998 when Oman's fishery products were unable to meet EU hygiene standards. This ban seriously affected the fish processing factories which were mainly dependent on exporting high grade fish such as yellowfin, spanish mackerel, and grouper, and consequently, greatly impacted the economic livelihood of the coastal fishermen. Presently, some of the processing factories have resumed exporting to the EU.

Until recently, facilities and equipment needed to implement a system of quality control management for fishery products were nonexistent in Oman, but with the implementation of this Project, a base of operations to conduct quality control management from fish production, processing, to the marketing stages will be created.

The following benefits are anticipated when the Project is implemented.

(1) Benefits Stemming from Project Implementation

The following benefits are anticipated when the Project is implemented.

1) Direct Benefits

a) Base of operations for quality control and hygiene management

A center equipped with facilities and equipment to conduct quality control activities for fishery products does not exist in Oman. QCC, which will be comprised of the four departments of examination/analysis, inspection/guidance, training, and administration, will establish a comprehensive system of quality control and hygiene management at each stage of the fisheries process - from fish production to processing and distribution. The implementation of this Project will create a center for activities that will establish such a system which is also in accordance with

Oman government policies. It is anticipated to promote the entire fisheries industry.

b) Economic stability for fisheries related personnel through the promotion of exports

If the export of fishery products is resumed through QCC activities, increased profits for the fisheries and fish processing industries are anticipated. If quality control and hygiene management for fishery products are recognized as safe, the development of new export markets is anticipated and increased profits and economic stability are expected for those employed by the fish processing factories (about 4,000 including families), fishermen (about 26,000 including families), and fisheries related personnel (distributors, market laborers, and their families).

c) Benefits derived from education and training

The QCC will be implementing training activities and seminars to improve the awareness of fishermen, distributors, and processors on the issue of quality control and hygiene management, in addition to the tasks of conducting tests and analyses of fishery product samples. A decrease in the loss of fishery products due to deteriorated fish quality at each stage of the process is expected from these activities. Therefore, all personnel engaged in the fisheries industry will be the beneficiaries of this project.

2) Indirect Benefits

a) Creation of regional employment

The export of fishery products will be promoted with the implementation of the project. Improved economic conditions for fishermen due to a rise in income stemming from the exportation of high-priced, high-grade fish; and the development of fish processing factories and the entire fisheries industry are expected to create regional employment.

b) Moderating effect on urban population growth

The export value of fishery products comprises about 20 percent of the total export value of non-petroleum products (1996 Ministry of Agriculture and Fishery statistics) and fisheries has become an important industry in the Oman economy. Coastal fisheries is carried out along the 1700km coastline and an active fisheries industry contributes to an enlarged economy for a widespread regional society. Therefore, this is expected to alleviate the outflow of the regional population to the urban areas.

c) Guaranteed source of protein

Oman is a nation of fish consumers. Due to an improved road infrastructure, fishery products are transported inland and sold as fresh fish. Although the fish is mainly consumed as fried fish, there is a demand for fresh fish. The implementation of this project will play a major role in guaranteeing a safe source of protein for the Oman people since it aims to improve fish freshness and hygiene management for all stages of fish distribution.

(2) Appropriateness of the Project as a Japanese Grant-Aid Project

- The Project was prepared based on the concept of the Oman government's five-year economic development plan. It is in accordance with the 10-year fisheries development plan (1991-2000) which aims to develop the fisheries sector, diversify the economy by expanding employment, and promote the importance of quality control management in order to achieve regional development.
- The management and maintenance of the Project will be carried out by the Ministry of Agriculture and Fisheries which will be responsible for budgetary measures, the staff personnel plan, and technical cooperation.
- The revenue generated from the collection of test fees will be utilized to supplement the cost of equipment, reagents, and other maintenance costs of the facilities and will not be implemented for profit-making purposes.

In view of the above, the implementation of the Project is anticipated to contribute to the development of a balanced regional society and promotion of the entire fisheries industry ; and it is also appropriate in terms of the technical capabilities of the staff members and budgetary measures by the Oman side which ensure the sustained operations of the Project. Therefore, the Project has been judged as appropriate as a Japanese grant-aid project.

4.2 Technical Cooperation and Liaison with Other Donors

The technical assistance project, "Oman Fisheries Training Project", and the follow-up project for training activities in quality control management and fish processing ended in March 2000. The technical staff members who have been trained and fostered in conducting examinations and analyses are capable of utilizing the analytical equipment. However, the Oman side is requesting technical supervision to efficiently operate the facilities and equipment during the period prior to and shortly after the Center's commencement since the QCC is the country's first center for quality control management of fishery products. Therefore, sending an expert with the

technical supervisory experience in quality control facilities will contribute to the uninterrupted start of the Center's operations.

Further, providing technical support following the start of the Center's operations, including the training of QCC trainees to ensure sustained and uninterrupted operations, will greatly contribute to raising the effectiveness of the Project.

4.3 Issues

This Project meets the priority needs of the country's fisheries sector and will not only benefit the population engaged in the fisheries sector, but the entire country; therefore, it has been concluded that the implementation of this Project is greatly significant. The following items should be considered by the Oman side to ensure that the facilities and equipment are utilized effectively following the implementation of the Project.

(1) Fostering inspectors

Of the 42 fish processing factories located throughout the country at the start of the Project, 20 are scheduled to be the target of export inspections. However, in conjunction with improvements made by the factories and the development of the fisheries industry in future, the work volume of the QCC is anticipated to increase. In order to cope with this expected increase, activities to foster inspectors with specialized knowledge and technical skills should be continually conducted.

(2) Supplementing equipment and consumables

As explained earlier, the Project will provide a minimum quantity of reagents for the tests, fixtures, and consumables in order to support the initial stages of the Center's operations. Consequently, it will be necessary to periodically restock the required equipment and consumables in conjunction with the increased volume of tests and test items after the Center has started its operations.

(3) Establishing a quality control system which includes the six branches of the Ministry of Agriculture and Fisheries

In order to reform and develop the entire fisheries industry of Oman, it is important to establish a national system of quality control management which utilizes the QCC as the focal institution for quality control and hygiene management of fishery products. One quality control personnel has been designated at each of the six branches of the Ministry of Agriculture and Fisheries. It is appropriate to utilize these key personnel to conduct on-site inspections and guidance for fishermen. In order to

accomplish this, QCC should periodically implement quality control guidance and training activities suited to the conditions of each landing site under the jurisdiction of the branch officer. In addition, simple testing equipment, etc. required to conduct on-site inspections should be provided and a national quality control system should be established as quickly as possible.

(4) Securing operation and maintenance costs

The Ministry of Agriculture and Fisheries will be responsible for securing the operations and maintenance budget of the QCC. In addition, when the operations of the Center have become established, a segment of the revenue generated from inspection fees will be used to cover the maintenance costs of the equipment.

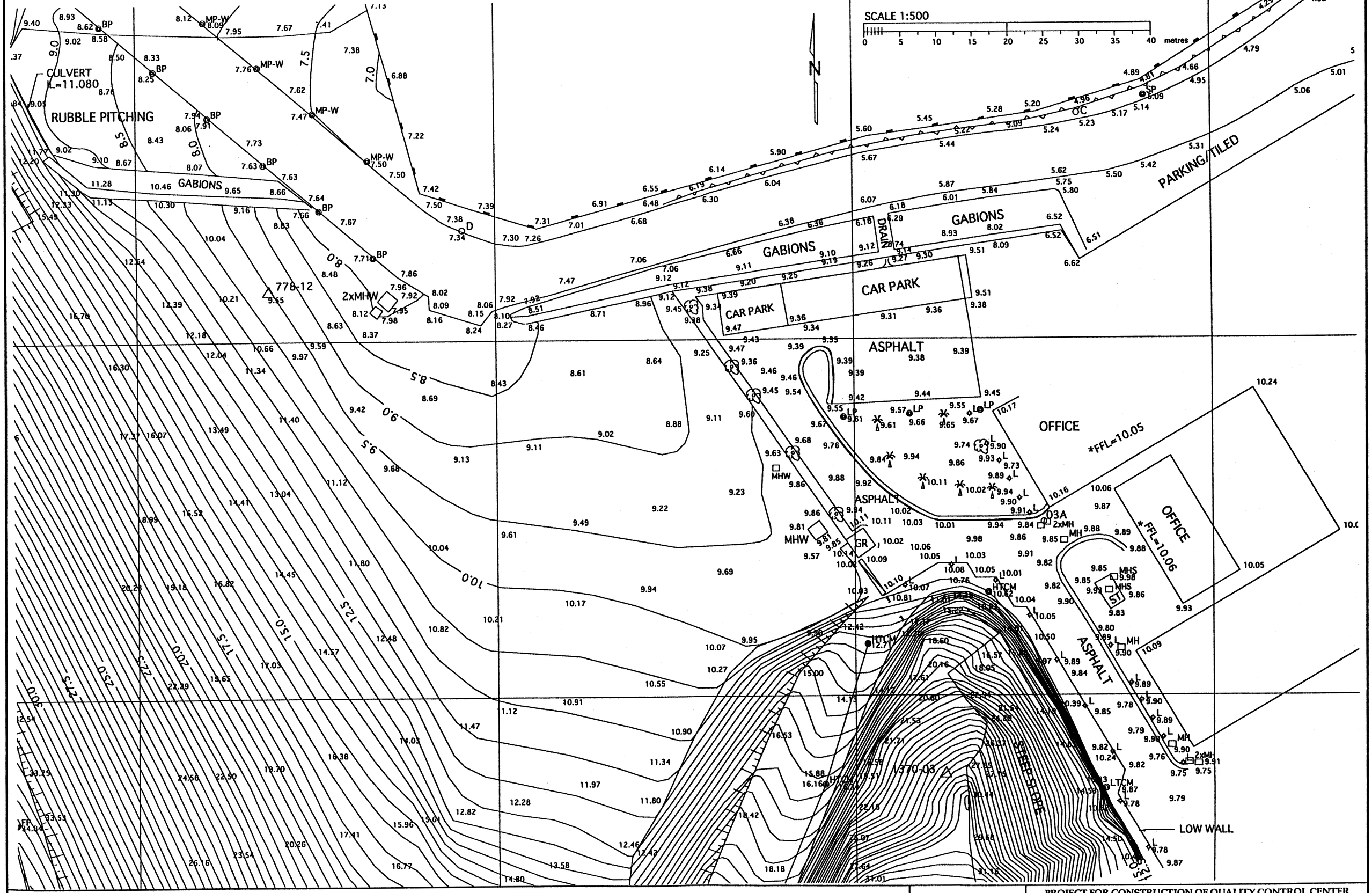
The inspection fee system of the Central Laboratory of the Ministry of Commerce and Industry will be used as a point of reference and a system of collecting inspection fees according to each test item should be established quickly.

It is important that a quality control and hygiene management system that includes each of the branches of the Ministry of Agriculture and Fisheries, in addition to the QCC, is swiftly established in order to ensure the effective operation of the Center. Additionally, the Ministry of Agriculture and Fisheries should be responsible for procuring the budget needed to actively implement such a system.

(5) Effective use and reform of the existing facilities

There are many regional market facilities located along the Oman coastline which are not effectively utilized because of the lack of tap water and light facilities. If such improvements are installed and the existing facilities are effectively utilized, improved fish quality for all stages, from fish production at the landing sites to distribution, can be maintained.

Appendix I

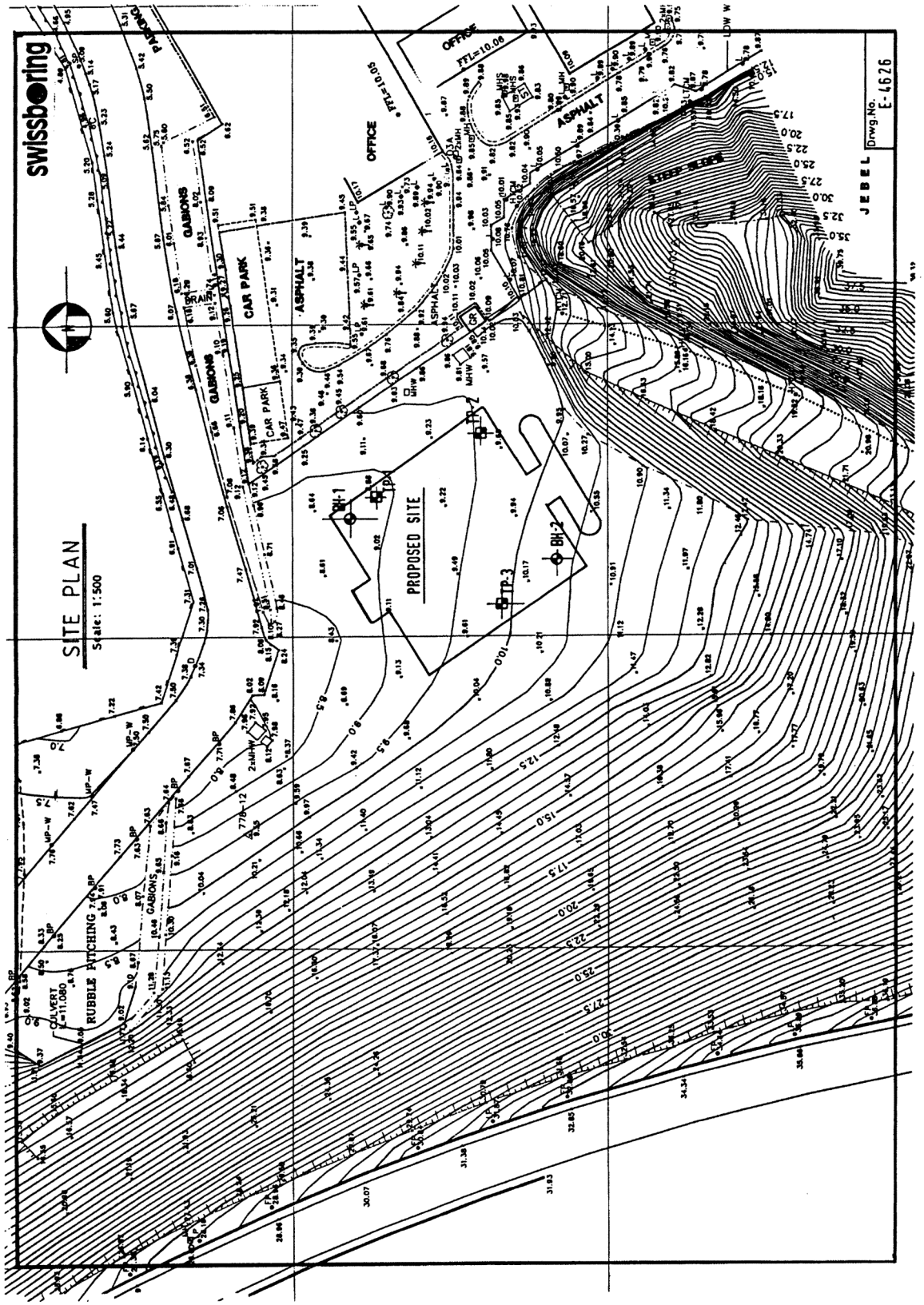


Topographic Survey Map

S = 1 : 500

PROJECT FOR CONSTRUCTION OF QUALITY CONTROL CENTER IN THE SULTANATE OF OMAN

Appendix I-2 Site Borehole Location Map



RECORD OF BOREHOLE

CLIENT	:	MINISTRY OF AGRICULTURE & FISHERIES	JOB No	:	E - 1201
CONSULTANT	:	KYOKUYO CO. LTD.	BH. No	:	BH - 1
PROJECT	:	PROPOSED QUALITY CONTROL CENTRE AT AL BUSTAN	SHEET No.	:	1 of 2

DRILL DATE	: 06.10.99 - 08.10.99	RIG	: SR-60	REF. LEVEL	: 8.85m
DRILL METHOD	: ROTARY	CASING DIA.	: HW	G.W.T	: 6.80m
DRILL FLUID	: MUD / WATER	CASING DEPTH	: 4.00m	ORIENTATION	: VERTICAL

SCALE 1:50	DEPTH	THICKNESS	LEGEND	VISUAL DESCRIPTION	CORE DIA.	CORE RUN	CORE RECOVERY	CORE R.Q.D.	SPT "N" VALUES	SPT NUMBER OF BLOWS	SAMPLES UD	SAMPLES D	SAMPLES WATER RETURN	REMARKS
0.00	m	m			mm	m	%	%	20 40 60	15 cm / 15 cm / 15 cm			%	
1.0				MADE GROUND										
2.0		2.50							23	7 9 14		■		
3.0	2.50								46 >50	16 34 12		■		
4.0				Brownish grey, dense to very dense, silty, fine to coarse SAND & GRAVEL with occasional sub angular cobbles.					>50	35 45 5/2cm		■		
5.0		3.90		- Grading into weakly cemented to well cemented.					>50	25 50/12cm		■		
6.0						6.00			>50	32 50/10cm		■		
7.0	6.40				79	7.00	50	0		50/12cm		■	85	GWT
8.0				Fragmented, brownish grey to grey, moderately weak to moderately strong PERIDOTITE, joints infilled with talc & chloride.	79	7.6	85	0						
9.0		4.80			79	8.75	100	0						
10.0					79	10.0	100	0						

REMARKS

SWISSBORING OVERSEAS CORPN. LTD.

RECORD OF BOREHOLE

CLIENT	:	MINISTRY OF AGRICULTURE & FISHERIES	JOB No	:	E - 1201
CONSULTANT	:	KYOKUYO CO. LTD.	BH. No	:	BH - 1
PROJECT	:	PROPOSED QUALITY CONTROL CENTRE AT AL BUSTAN	SHEET No.	:	2 of 2

DRILL DATE	: 06.10.99 - 08.10.99	RIG	: SR-60	REF. LEVEL	: 8.85m
DRILL METHOD	: ROTARY	CASING DIA.	: HW	G.W.T	: 6.80m
DRILL FLUID	: MUD / WATER	CASING DEPTH	: 4.00m	ORIENTATION	: VERTICAL

SCALE 1:50	DEPTH	THICKNESS	LEGEND	VISUAL DESCRIPTION	CORE DIA.	CORE RUN	CORE RECOVERY	CORE R.Q.D.	SPT "N" VALUES 20	SPT "N" VALUES 40	SPT "N" VALUES 60	SPT NUMBER OF BLOWS 15 cm	SPT NUMBER OF BLOWS 15 cm	SPT NUMBER OF BLOWS 15 cm	SAMPLES UD	SAMPLES D	SAMPLES WATER RETURN	REMARKS
10.00	m	m			mm	m	%	%									%	
11.0		4.80		As above	79	11.0	90	0										
	11.2																	
12.0				Fragmented to very blocky, dark grey to black, moderately strong	79	12.0	85	0										
13.0				PERIDOTITE, joints infilled with talc & chloride.	79	13.0	90	10										
14.0		3.80			79		100	40										
15.0	15.0					15.0												
16.0				END OF BOREHOLE														
17.0																		
18.0																		
19.0																	NIL	
20.0																		

REMARKS

SWISSBORING OVERSEAS CORPN. LTD.

RECORD OF BOREHOLE

CLIENT : MINISTRY OF AGRICULTURE & FISHERIES
CONSULTANT : KYOKUYO CO. LTD.
PROJECT : PROPOSED QUALITY CONTROL CENTRE AT AL BUSTAN

JOB No : E - 1201
BH. No : BH - 2
SHEET No. : 1 of 1

DRILL DATE : 08.10.99 - 09.10.99
DRILL METHOD : ROTARY
DRILL FLUID : MUD / WATER
RIG : SR-60
CASING DIA. : HW
CASING DEPTH : 2.00m
REF. LEVEL : 10.48m
G.W.T : 7.70m
ORIENTATION : VERTICAL

SCALE 1:50	DEPTH	THICKNESS	LEGEND	VISUAL DESCRIPTION	CORE DIA.	CORE RUN	CORE RECOVERY	CORE R.Q.D.	SPT "N" VALUES	SPT NUMBER OF BLOWS	SAMPLES UD	SAMPLES D	SAMPLES WATER RETURN	REMARKS
0.00	m	m			mm	m	%	%	20 40 60	15 cm / 15 cm / 15 cm			%	
1.0		1.50		MADE GROUND									75	
	1.50								23	7 9 14				
2.0	1.90	0.40		Brownish grey, dense to very dense, silty, fine to coarse SAND & GRAVEL with occasional sub angular cobbles.		2.00			>50	50/6cm				
3.0				Fragmented to very blocky, brownish grey, moderately weak to moderately strong PERIDOTITE, joints infilled with talc & chloride.	79	3.00	100	20					NIL	
4.0					79	4.00	100	35						
5.0		4.20			79		100	25						
6.0	6.10					5.20								
					79	5.70	100	10						
7.0				Fragmented to very blocky, dark grey to black, moderately strong PERIDOTITE, joints infilled with talc & chloride.	79	6.80	100	25					85	
8.0					79	7.70	100	20						GWT
9.0		3.90			79	8.70	100	35						
10.0	10.0				79	10.0	100	40						

REMARKS END OF BOREHOLE

SWISSBORING OVERSEAS CORPN. LTD.

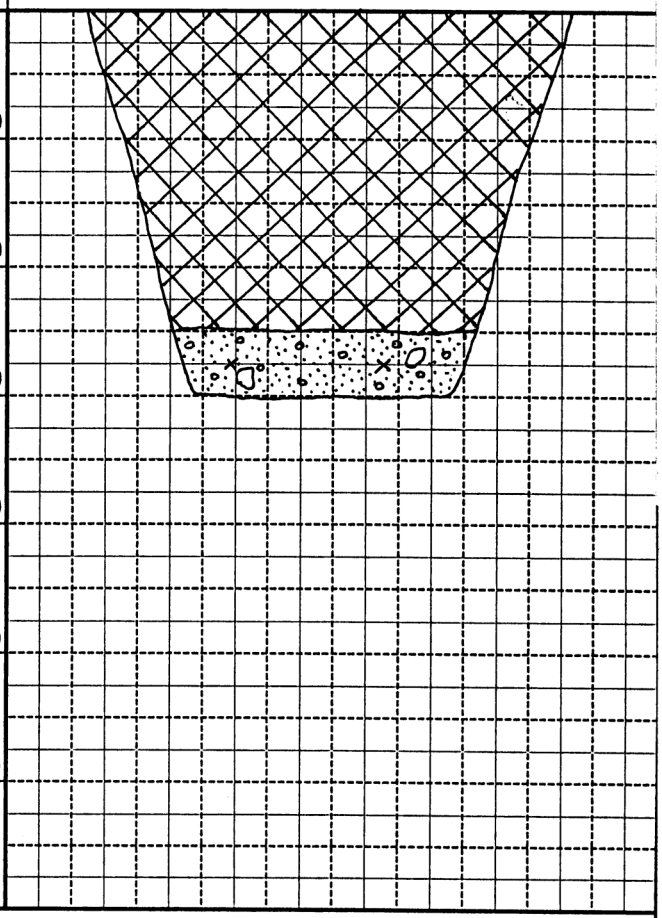
RECORD OF TRIAL PIT

CLIENT : **MINISTRY OF AGRICULTURE & FISHERIES** JOB No.: E - 1201

CONSULTANT : KYOKUYO CO. LTD. TP No. : TP - 1

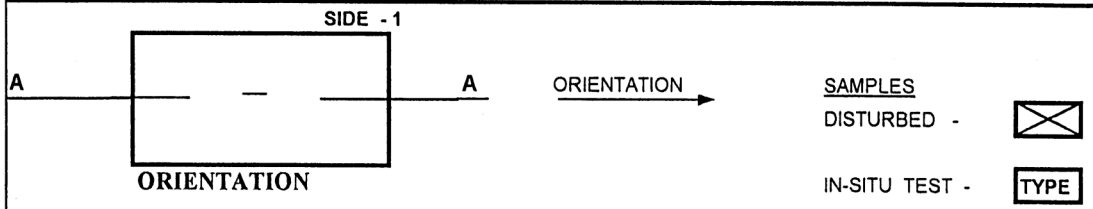
PROJECT : PROPOSED QUALITY CONTROL CENTRE AT AL BUSTAN

Executed on : 09.10.1999 **Ref Level : 9.02m** **Scale** : 1:50 **GWT** : NIL

VISUAL DESCRIPTION	DEPTH (m)	LONG SECTION A - A
0.00 - 2.50m **MADE GROUND** [Brownish grey, loose, slightly silty, sandy, GRAVEL with angular cobbles & boulders] **2.50 - 3.00m** Brownish grey, dense to very dense, silty, fine to coarse **SAND & GRAVEL** with occasional sub angular cobbles.	1.00 2.00 3.00 4.00 5.00 6.00 7.00	

REMARKS :

TYPE OF EXCAVATION : MECHANICAL



SWISSBORING OVERSEAS CORPN. LTD. OMAN

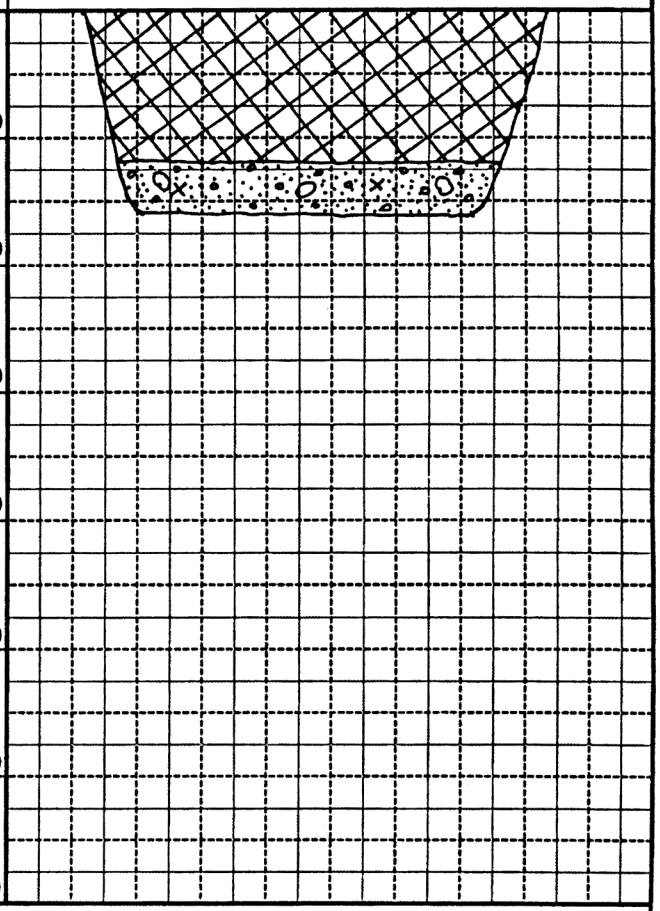
RECORD OF TRIAL PIT

CLIENT : **MINISTRY OF AGRICULTURE & FISHERIES** JOB No.: E - 1201

CONSULTANT : KYOKUYO CO. LTD. TP No. : TP - 2

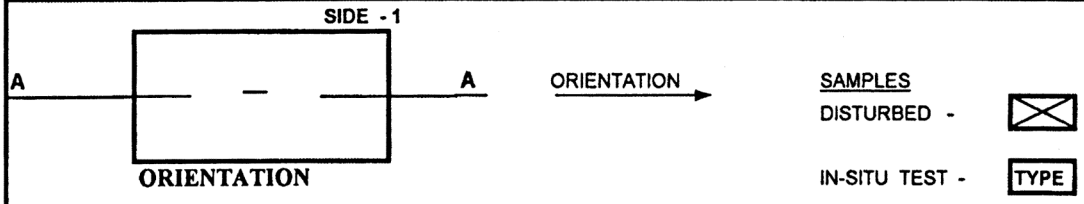
PROJECT : PROPOSED QUALITY CONTROL CENTRE AT AL BUSTAN

Executed on : 09.10.1999 Ref Level : 9.79m Scale : 1:50 GWT : NIL

VISUAL DESCRIPTION	DEPTH (m)	LONG SECTION A - A
0.00 - 1.20m MADE GROUND [Brownish grey, loose, slightly silty, sandy, GRAVEL with angular cobbles & boulders]	1.00	
1.20 - 1.60m Brownish grey, dense to very dense, silty, fine to coarse SAND & GRAVEL with occasional sub angular cobbles. Refusal at bottom of pit.	2.00 3.00 4.00 5.00 6.00 7.00	

REMARKS :

TYPE OF EXCAVATION : MECHANICAL



SWISSBORING OVERSEAS CORPN. LTD. OMAN

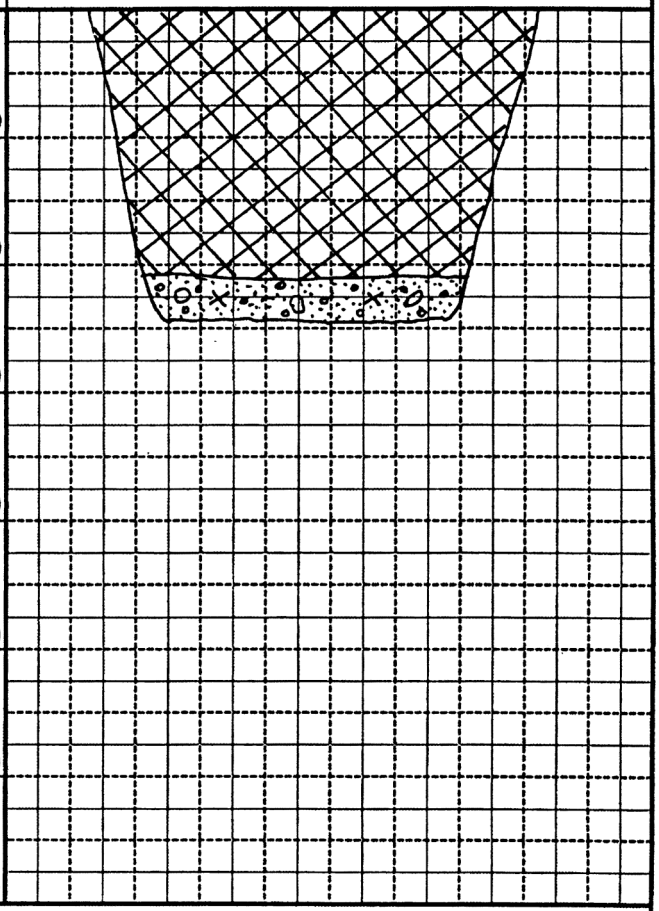
RECORD OF TRIAL PIT

CLIENT : **MINISTRY OF AGRICULTURE & FISHERIES** JOB No.: E - 1201

CONSULTANT : KYOKUYO CO. LTD. TP No. : TP - 3

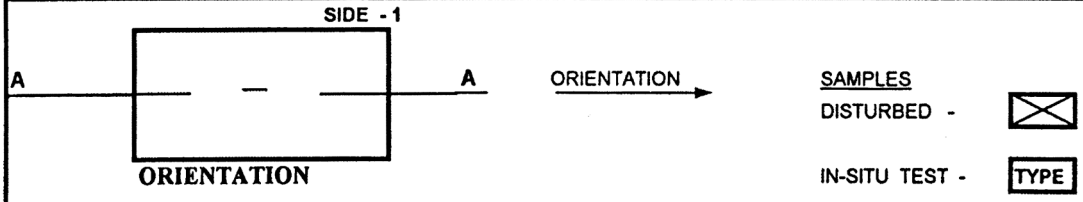
PROJECT : PROPOSED QUALITY CONTROL CENTRE AT AL BUSTAN

Executed on : 09.10.1999 Ref Level : 10.09m Scale : 1:50 GWT : NIL

VISUAL DESCRIPTION	DEPTH (m)	LONG SECTION A - A
0.00 - 2.10m **MADE GROUND** [Brownish grey, loose, slightly silty, sandy, GRAVEL with angular cobbles & boulders]	1.00 2.00	
2.10 - 2.40m Brownish grey, dense to very dense, silty, fine to coarse **SAND & GRAVEL** with occasional sub angular cobbles. Refusal at bottom of pit.	3.00 4.00 5.00 6.00 7.00	

REMARKS :

TYPE OF EXCAVATION : MECHANICAL



SWISSBORING OVERSEAS CORPN. LTD. OMAN

swissboring سويس بورنج

JOB NO.: E - 1201

IN-SITU DRY DENSITY

In-situ dry density tests were carried out in accordance with BS-1377 (1990), "Methods of Test for Soils for Civil Engineering Purpose". The results are given below :

Location	Depth (m)	In-situ dry density (kg/m^3)	Moisture Content %
TP - 1	1.00	1.984	3.7
TP - 1	2.00	1898	4.4
TP - 2	1.00	1921	4.2
TP - 2	1.50	1898	4.2
TP - 3	1.00	1910	3.5
TP - 3	2.00	1805	7.1

Swissboring

LABORATORY TEST SUMMARY SHEET

PROJECT : **PROPOSED QUALITY CONTROL CENTRE AT AL BUSTAN**

JOB No. E - 1201

LAB TESTING BY : **AL TURKI LABORATORIES DIVISION**

SAMPLE DETAILS				CLASSIFICATION TESTS												SHEAR STRENGTH			UCS		COMPACTION			CBR		CHEMICAL ANALYSES				
BH / TP NO.	DEPTH (m)	TYPE	DESCRIPTION	GROUP SYMBOL	0.425 (%)	PI (%)	PL (%)	LL (%)	MC (%)	Bulk Density Mg/m3	CLAY (%)	SILT (%)	SAND (%)	GRAVEL (%)	SG	TYPE	C C' KN/m2	Deg.	DRY Density Mg/m3	strength MN/m2	TYPE	opt. W (%)	MAX.DRY DENSITY Mg/m3	TEST W (%)	CBR (%)	SO_4 mg/l	Cl (%)	pH	Gypsum (%)	Anhydrite (%)
TP - 1	0.50	BULK	Silty,sandy GRAVEL		27.0				3.5	1.770		13.0	35.0	52.0	2.73															
TP - 1	1.00	BULK	Slightly silty,sandy GRAVEL		12.0				3.7	1.860		4.0	23.0	73.0	2.89											137	0.036	9.30		
TP - 1	2.00	BULK	Slightly silty,sandy GRAVEL		10.0				4.4	1.790		4.0	22.0	74.0	2.79															
TP - 1	3.00	BULK	Slightly silty,sandy GRAVEL		10.0				5.3	1.720		4.0	24.0	72.0	2.94											35	0.016	9.20		
TP - 2	1.00	BULK	Slightly silty,sandy GRAVEL		17.0				4.2	1.820		7.0	26.0	67.0	2.72															
TP - 2	1.60	BULK	Slightly silty,sandy GRAVEL		12.0				4.2	1.720		4.0	23.0	73.0	2.65											56	0.023	9.10		
TP - 3	1.00	BULK	Slightly silty,sandy GRAVEL		18.0				3.5	1.880		7.0	28.0	65.0	2.65															
TP - 3	2.00	BULK	Slightly silty,sandy GRAVEL		15.0				7.1	1.680		5.0	32.0	63.0	2.70											37	0.018	9.30		
TP - 3	2.40	BULK	Slightly silty,sandy GRAVEL		17.0				8.2	1.630		6.00	30.0	64.0	2.76											141	0.029	9.4		
BH - 1	8.75-8.90	ROCK	Moderately weak PERIDOTITE						1.1	2.620					2.86				2.590	9.36										
BH - 1	14.0-14.2	ROCK	Strong PERIDOTITE						0.2	2.670					2.82				2.660	83.19										
BH -2	5.70-5.85	ROCK	Moderately strong PERIDOTITE						1.3	2.530					2.81				2.500	13.54										
BH - 1	6.80		WATER																						73.0	*300	9.70		
BH - 2	7.70		WATER																						75	*320	9.7		

REMARKS : * Chloride content of ground water in mg/l

S Standard Compaction
H Heavy Compaction
V Vibratory

UU Unconsolidation Undrained
UU Ditto with pwp measurement
CD Consolidated drained
CD Ditto pwp measured
UCS Unconfined compression test

CU Consolidated Undrained
CU' Ditto with pwp measurement
V Vane Shear
S Sher Box

mv and cv given for a loading increment of 100 KN/M2 above assumed effective overburden pressure

FR Frost Susceptibility
PH Acidity
SI Sulphate
SG Sp. Gravity
Cl Chloride

PI Plastic Index
PL Plastic Limit
LL Liquid Limit
MC Moisture Content

Appendix II

〔Appendix II〕

1 Member List of the Survey Team

2 Survey Schedule

3 List of Parties Concerned in the Sultanate of Oman

4 Minutes of Discussion

5 References

1 Member List of the Survey Team

1-1 Survey Team for Basic Design Study

Team Leader	Mr. KAWADA Kazunori	Grant Aid Division, Bureau of Economic Cooperation, Ministry of Foreign Affairs
Technical Advisor	Mr. OGASAWARA Shoichi	Office of Overseas Fisheries Cooperation, Fisheries Agency
Coordinator	Mr. IMAMURA Makoto	Fourth Project Management Division, Grant Aid Management Department, Japan International Cooperation Agency
Project Manager/ Fisheries Quality Control Facility Planning	Mr. NOMURA Shigeto	Kyokuyo Co., Ltd. Division of Fisheries Consultant
Equipment Planning I	Mr. SIRATORI Yoshinobu	Kyokuyo Co., Ltd. Division of Fisheries Consultant
Architect Planning/ Natural Condition Sirvey	Mr. WATANABE Masahiko	System Science Consultants Inc. Design & Engineering Department
Construction Planning/ Cost Estimation	Mr. HAYAHARA Akihiro	System Science Consultants Inc. Design & Engineering Department

1-2 Survey Team for Explanation of the Outline of Basic Design

Team Leader	Mr. ISHIKAWA Katsutoshi	Grant Aid Division, Bureau of Economic Cooperation, Ministry of Foreign Affairs
Technical Advisor	Mr. MATSUO Tatsutoshi	Office of Overseas Fisheries Cooperation, Fisheries Agency
Coordinator	Mr. IMAMURA Makoto	Fourth Project Management Division, Grant Aid Management Department, Japan International Cooperation Agency
Project Manager/ Fisheries Quality Control Facility Planning	Mr. NOMURA Shigeto	Kyokuyo Co., Ltd. Division of Fisheries Consultant
Equipment Planning I	Mr. SIRATORI Yoshinobu	Kyokuyo Co., Ltd. Division of Fisheries Consultant
Architect Planning/ Natural Condition Sirvey	Mr. WATANABE Masahiko	System Science Consultants Inc. Design & Engineering Department

2 Survey Schedule

2-1 Survey Schedule for Basic Design Study

Official member	Consultant member
Leader : Grant Aid Division, Bureau of Economic Cooperation, Ministry of Foreign Affairs Mr. Kzunori KAWADA Technical Advisor: Office of Overseas Fisheries Cooperation, Fisheries Agency Mr. Shoichi OGASAWARA Coordinator: Fourth Project Management Division, Grant Aid Management Department(JICA) Mr. Makoto IMAMURA	Project Manager : Mr. NOMURA Shigeto Equipment Planner : Mr. SHIRATORI Yoshinobu Architect Planner : Mr. WATANABE Masahiko Construction Planner : Mr. HAYAHARA Akihiro

No.	Date	Movement	Stay	Schedule		Stay	No.
1	9/24 (Fri.)	Tokyo → Muscat	Muscat	Dep.: Tokyo 11:00 (JL717) via Bangkok Arv. : Muscat 21:10 (GF 153)	Dep.: Tokyo 11:00 (TG641) via Bangkok Arv. : Muscat 21:10 (GF 153)	Muscat	1
2	9/25 (Sat.)	Muscat	Muscat	AM: Courtesy call to Japanese Embassy PM: Courtesy call to the Ministry of Agriculture & Fisheries.	Same with Official Members	Muscat	2
3	9/26 (Sun.)	Muscat	Muscat	AM: Visit to with Marine Science and Fisheries Centre. Site Survey PM: Discussion	Submission of the questionnaire. Explanation of Inception report and etc.	Muscat	3
4	9/27 (Mon .)	Muscat	Muscat	Discussion	Same with Official Members.	Muscat	4
5	9/28 (Tue.)	Muscat	Muscat	Discussion	Same with Official Members. / Geo-technical investigation and topographical survey. Study equipment	Muscat	5
6	9/29 (Wed.)	Muscat	Muscat	Signature on the Minutes of Meeting. Report to the Embassy of Japan .	Same with Official Members. / --Ditto--	Muscat	6
7	9/30 (Thu.)	Muscat →Bangkok	In Airplan e	Site Survey(Rustaq) Movement Dep.: Muscat 23:15 (TG 508) via Bangkok to Tokyo	Same with Official Members.	Muscat	7
8	10/1 (Fri.)	Bangkok → Tokyo		Arv.: Tokyo 19:00(TG 640)	Meeting in Consultant Member	Muscat	8
9	10/2 (Sat.)				Hearing for study from MSFC, City Planner and Local Consultant.	Muscat	9
10	10/3 (Sun.)				Studies of Regulation concerned and collection of data Studies of facilities and equipment.	Muscat	10
11	10/4 (Mon .)				Studies of fisheries facilities (fishing boats, landing market, processing plants and etc) in Muscat and Sohar.	Muscat Sohar	11
12	10/5 (Tue.)				Discussion with Marine Science and Fisheries Centre Survey the Project Sight. Studies of quality control equipment.	Muscat	12
13	10/6 (Wed.)				Studies of maintenance, management and administration. Check the specification of quality control equipment.	Muscat	13
14	10/7 (Thu.)				Each Consultant member studies their respective subjects .	Muscat	14
15	10/8 (Fri.)				Meeting in Consultant members and data check.	Muscat	15
16	10/9 (Sat.)				Supplementary studies of design for facilities and equipment .	Muscat	16
17	10/10 (Sun.)				Studies of draft plan of construction of facilities.	Muscat	17
18	10/11 (Mon .)				Confirmation of specification of equipment and materials for construction of facilities. Confirmation of the results of topographical survey.	Muscat	18
19	10/12 (Tue.)				Meeting for confirmation with Directrate General of Fisheries Resources about the results of studies, consideration and analysis.	Muscat	19
20	10/13 (Wed.)				Meeting for confirmation with Directrate General of Fisheries Resources about draft specification and design of the Project facilities. Report to Japanese Embassy.	Muscat	20
21	10/14 (Thu.)				Meeting in the study team. Movement Dep.: Muscat 23:15 (TG 508) (via Bangkok)	In Airplan e	21
22	10/15 (Fri.)				Dep.: Bangkok 10:50 (TG 640) Arv.: Tokyo 19:00		22

2-2 Basic Study for Explanation of the Outline of Basic Design

No. Of Date	Date		Schedule		Stay
			Officials	Consultants	
			Mr. Katsutoshi ISHIKAWA Mr. Tatsushi MATUO Mr. Makoto IMAMURA	Mr. Shigeto NOMURA Mr. Yoshinobu SHIRATORI Mr. Masahiko WATANABE	
1	14JAN	Fri	Narita→Bangkok(JL717 11:00→15:15) Bangkok→Muscat(GF153 18:00→21:30)		Muscat
2	15JAN	Sat	AM: Courtesy Call to the Embassy of Japan PM: Courtesy Call to the Ministry of Agriculture and Fisheries		Muscat
3	16JAN	Sun	Discussion		Muscat
4	17JAN	Mon	Discussion		Muscat
5	18JAN	Tue	Discussion		Muscat
6	19JAN	Wed	PM: Signature on the Minutes of Meetings Report to the Embassy of Japan Survey		Muscat
7	20JAN	Thu	Muscat→(TG508 23:59→)	Survey	Muscat
8	21JAN	Fri	→Bangkok(TG508→10:10) Bangkok→Narita (TG640 11:20→19:00)	Survey	Muscat/ In plane
9	22JAN	Sat		Survey	Muscat
10	23JAN	Sun		Survey	Muscat
11	24JAN	Mon		Survey PM: Report to the Embassy of Japan Muscat→Dubai (WY123 18:00→19:00) Dubai→ (CX73022:25→)	In plane
12	25JAN	Tue		→Hong Kong(CX730→12:05) Hong Kong→ Narita(JL732 15:10→19:55)	

3 List of Parties Concerned in the Sultanate of Oman

Embassy of Japan in the Sultanate of Oman

Mr. Zenji Kaminaga	Ambassador of Japan
Mr. Yoshimasa Iwata	Minister- Counselor

The Sultanate of Oman Government

Ministry of Agriculture and Fisheries

Dr. Ahmed Bin Khalfan Bin Mohammed Al-Rawahy	Minister

Directorate General of Fisheries Resources

Dr. Mohammed Redha Hassan	Director General
Mr. Hassan Al-Nabhani	Manager of Directorate General of Planning & Projects
Mr. AL-Moharami Zayeed	Assistant Manager of Directorate General of Planning & Projects
Mr. Tajalsir Hassan	
Mr. K.R. Asokan	Architect of Directorate General of Planning & Projects
Mr. V.K. Shah	Civil Engineer of Directorate General of Planning & Projects
Mr. Abdallah Al-Hadaby	Deputy of Director General

Marine Fisheries Scientific Center

Dr. Abdullah Mohammed Asagheer Omezzine	Director
Ms. Nashwa Ali Al-Mazrooei	Assistant Director for Fisheries Research
Mr. Abdullah Talib Moh'd Al Mawaly	Research Specialist
Mr. Azis Hamed Al-Khaitri	Quality Control Section
Mr. Adil Mohammed Al-Qasmi	Research Specialist
Ms. Sabra Al-Mugheiry	Research Assistant for Seafood Technology Section and Quality Control
Mr. Walter Mark Monteiro	Coordinator of Department of Administration and Finance

Sohar Branch

Mr. Al Gheilani Hamad	Manager of Fisheries Department
Mr. Al Ajimi Ali	Supervisor

Ministry of Foreign Affairs

H.E. Amb Awadh bin Badr bin Marce Al Shanfari	Chief of Economic and Technical Cooperation Dept.

Ministry of Water Resources, Water Laboratory

Miss Amal Said	Chief of Data Section
Mr. Saleh Al-Maskery	Supervisor

Ministry of Regional Municipalities and Environment

Mr. Said Ali Alzidjzli	Director of Chemical Substances
Mr. Musallam Al-Jabri	Head of Marine Pollution and CAM
Mr. Salim Al-Suqri	Environmental Inspector
Mr. Nabil Habib Al-lawatiya	Environmental Inspector
Mr. Paul Sharples	Chief Inspector of Water and Water Pollution Control

Ministry of Housing

Mr. Al Farsi Saleh	Director of Survey Department
Mr. Abdulgader Al. Balushi	Surveyor
Mr. Adil Humed Al. Raishi	Surveyor

Royal Oman Police, Directorate General of Civil Defence

Mr. Khamis Sarim Al Harrasi	Inspector of Directorate General of Civil Defense
Mr. Nawaf Salim Dahman Al Nahdi	Inspector of Directorate General of Civil Defense

Ministry of Commerce and Industry, Central Laboratory

Eng. Yaqoob Bin Zuwaid Al-Hashmi	Director of Quality Control
Mr. Warith Al-Sulaimani	Electrical and Electronics Engineer
Mr.Ali EssaAl-Zadjali	Chief Inspector

Muscat Municipality

Mr. Munir Abdulwahab Ahmed Alhamdi	Director/Architect of Directorate of Building Permits Department
Mr. Slim H. Alkindi	Director of Health Engineering Department
Mr. Mohammad Hamdan Al Mamari	Directorate General of Technical Affairs Roads Directorate

Mattrah Municipality

Mr. Abdulhameed Alojaili	Manager of Health Section

JICA Technical Cooperation Staffs

Mr. Yasuhiko Saeki	Chief Adviser
Mr. Shingo Takahashi	Coordinator
Mr. Masao Tobari	Expert

Private Sector

Topographic and Soil Investigation Company

Mr. GUY Salerno	Swissboring Oversea Corporation Ltd.	Resident Manager

Fish Processing Factories

Mr. K. Surendranath	AL Arkan Trading Co., LLC	General Manager
Mr. Altafhusain H. Mangoli	AL Arkan Trading Co., LLC	Processing Manager

Mr. Said Ali Mohammed Al-Araimi	Oman Fisheries Co., Saog	Procurement Manager

Agents

Mr. Xavier D'Souza	Science & Technology Equipment LLC	Technical Sales & Service Engineer
Mr. Sunny Peter	Science & Technology Equipment LLC	Technical Sales & Service Engineer
Mr. Madhur Bhatnagar	Bishra Establishment LLC	Sales Consultant

MINUTES OF DISCUSSIONS
ON
THE BASIC DESIGN STUDY
ON
THE PROJECT
FOR
CONSTRUCTION OF QUALITY CONTROL CENTER
IN
THE SULTANATE OF OMAN

In response to a request from the Government of the Sultanate of Oman/the Ministry of Agriculture and Fisheries(hereinafter referred to as "the Government of Oman"), the Government of Japan decided to conduct a Basic Design Study on the project for Construction of Quality Control Center (hereinafter referred to as "the Project") and entrusted the study to the Japan International Cooperation Agency (hereinafter referred to as "JICA").

JICA sent to the Oman the basic design study team (hereinafter referred to as "the Team"), which is headed by Mr. Kazunori KAWADA, Grant Aid Division, Bureau of Economic Cooperation, Ministry of Foreign Affairs, and is scheduled to stay in the country from 24 September to 14 October, 1999.

The Team held discussions with the officials concerned of the Government of Oman and conducted a field survey at the study area.

In the course of discussions and field survey, both parties have confirmed the main items described on the attached sheets. The Team will proceed to further works and prepare the Basic Design Study Report.

Muscat, 29 September, 1999

Mr. Kazunori KAWADA
Leader
Basic Design Study Team
JICA

Dr. Moh'd Redha HASSAN
Director General
Directorate General of Fisheries Resources
Ministry of Agriculture and Fisheries

ATTACHMENT

1. **Objective**

The objective of the Project is to construct the Quality Control Center and to supply appropriate equipments in order to achieve the following targets.

(1) to improve the inspection abilities for fisheries quality control and to implement quality control policies imposed by the Government of Oman and importing countries for local and export markets.

(2) to train the inspectors for obtaining the proper skills for quality control.

(3) to train the employees engaged in the public and private fisheries institutions and the fishermen for improvement of quality control.

(4) to conduct research to support government policies in the field of quality control in face of prospective changes in sanitary conditions of fish.

2. **Project Site**

The site of the Project is located in Muscat city as shown in Annex-1 attached with the registration form prepared by the Oman side.

3. **Responsible and Implementing Agency**

The Responsible and Implementing Agency is the Ministry of Agriculture and Fisheries.

4. **Items requested by the Government of Oman**

After discussions with the Team, the items described in Annex-2 and 3 were finally requested by Oman side. JICA will assess the appropriateness of the request and will recommend to the Government of Japan for approval.

(1) The facility plan is listed in Annex-2.

(2) The equipment plan is listed in Annex-3.

5. **Japan's Grant Aid System**

5-1. Oman side has understood the Japan's Grant Aid Scheme explained by the Team, as described in Annex-4.

5-2. Subject to the Government of Oman's approval, Oman side will take the necessary measures, as described in Annex-5, for smooth implementation of the Project, as a condition for the Japanese Grant Aid to be implemented.

6. **Schedule of the Study**

6-1. The consultants will proceed to further works in Oman until 14 October.

6-2. JICA will prepare the draft report in English and dispatch a mission in order to explain its contents around January, 2000.

6-3. In case of that the contents of the report is accepted in principle by the Government of Oman, JICA will complete the final report and send it to the Government of Oman by March, 2000.

7. Other relevant issues

7-1. Oman side has agreed to allocate the enough budget to operate and maintain properly for the Project.

7-2. Both sides agreed that Oman side is responsible for the management, administration, finance and personnel matters for the Quality Control Center.

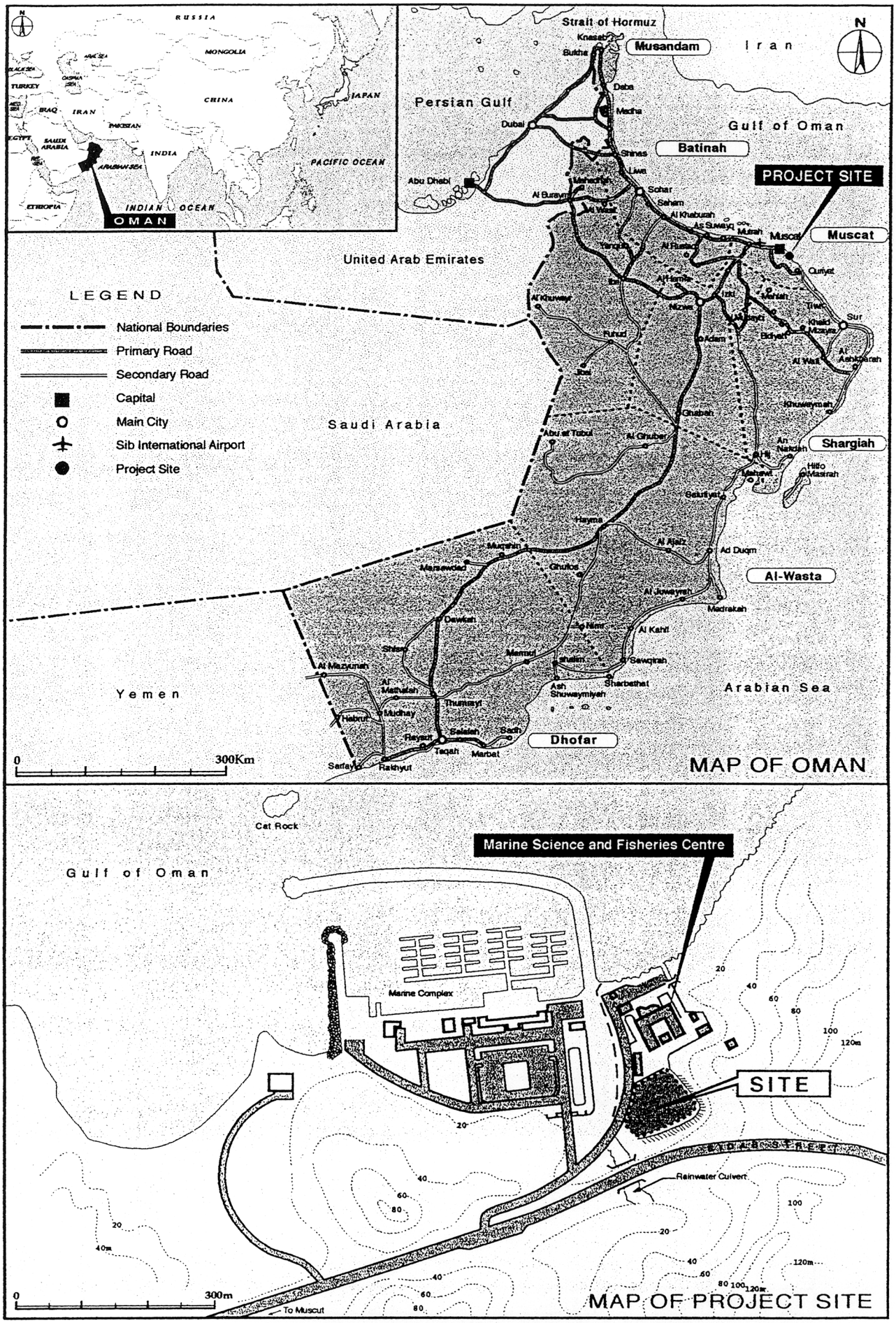
7-3. Oman side will make the organization plan as shown in Annex-6 to be precise and inform the plan to the Government of Japan before the next mission will be dispatched.

7-4. Both sides agreed that following matters are required to be executed by Oman side.

i) to carry out the necessary protection works against the slopes of backfilling along with the highway and rock mountains around the site.

ii) to set up the rain water discharging route for protection of the site.

7-5. Both sides agreed that vessels and the accessories, vehicles and navigation simulator will not be included in the Project.



Location Map of the Project Site

بسم الله الرحمن الرحيم

سلطنة عمان
وزارة الإسكان
مكتب الوزير

Sultanate of Oman
Ministry of Housing
Minister's Office

الرقم: و ح / ٤١ / ١٢٩
التاريخ : ١٧ صفر ١٤٢٠هـ
الموافق : ٢ يونيو ١٩٩٩م

المحترم

الفاضل / حسان بن أحمد النبهاني
رئيس مكتب الوزير
وزارة الزراعة والثروة السمكية

السلام عليكم ورحمة الله وبركاته وبعد ..

اشارة الى رسالتكم رقم ١٣٠٤ بتاريخ ١٧صفر ١٤٢٠هـ الموافق ٢/يونيو ١٩٩٩م بشأن رغبة وزارتكم بضم قطعة الارض المجاورة لمركز العلوم البحرية والسمكية بمنطقة البستان الى أرض المركز وتسجيلها بأسم وزارة الزراعة والثروة السمكية .

أود الافادة بأن هذه الوزارة وافقت على ضم الارض المشار إليها ودمجها مع أرض مركز العلوم البحرية والسمكية وعلى المختصين بوزارتكم الموقرة مراجعة المهندس مدير عام تخطيط المدن والمساحة لأنهاء باقي الاجراءات .

وتفضلوا بقبول فائق الاحترام ،،،

حمد بن محمد السليمي
رئيس مكتب الوزير

بسم الله الرحمن الرحيم

Sultanate of Oman
Ministry of Agriculture & Fisheries

سلطنة عمان
وزارة الزراعة والثروة السمكية

No. : MH/41/129
Date : 12.6.1991
Date : .....

الرقم :
التاريخ : .....
الموافق : .....

Mr. Hassan Bin Ahmed Al-Nabhani
The Head of the Minister's Office
Ministry of Agriculture and Fisheries

After compliments,

With reference to your letter number 1304 dated 2 June 1999, we would like to inform you our acceptance of your request for the inclusion of the area next to the Marine Science and Fisheries Centre in Al-Bustan to the Center and registration of the same in the name of the Ministry of Agriculture and Fisheries.

Accordingly, you can direct the concerned officials from your Ministry, to contact the Director General of Town Planning and Survey for completion of necessary procedures.

Thanking you
Best Regards

Hamad Bin Mohammed Al-Suleimy
The Head of the Minister's office
Ministry of Housing

28-9-1999

سلطنة عمان وزارة الزراعة والثروة السمكية المديرية العامة للثروة السمكية

ص . ب : ٤٦٧ - تليفون : ٦٩٦٣٠٠ - تلكس : ٥٥٠٣ أجريفش أو ان - فاكس : ٦٩٦٢٧١
P.O. Box 467 - Tel. : 696300 - Telex : 5503 AGRIFISH ON - Fax : 696271

(FACILITY PLAN)

Items to be considered as follows;

1. Building

(1) Examination & analysis section
- Chemical test laboratory
- Microbiological test laboratory
- Physical property test laboratory
- Organoleptical test laboratory
- Sample preparation laboratory
- Data management room

(2) Training section
- Training room
- Equipment storage

(3) Inspection & guidance section
- Inspector and instructor's room

(4) Administration section
- Administration room
- Reception
- Director's room

2. Utility

(1) Lighting fixture, Receptacle outlet

(2) Water supply, Sewage system and holding tank

(3) Air conditioning and ventilating system

(EQUIPMENT PLAN)

Items to be considered as follows;

1. Chemical test Laboratory

No.	Item
1	Atomic absorption sectrophotometer (AAS)
2	Fluorescence spectrophotometer
3	Gas chromatography (GC)
4	High performance liquid chromatography
5	Spectrophotometer
6	Ultra violet spectrophotometer
7	Analytical gas piping system
8	Automatic mortar
9	Auto-titration system
10	Blender
11	Conway's micro-difusion analysis apparatus
12	Cool aspirator
13	Cool water circulator
14	Distiling glass apparatus
15	Electric homogenizer
16	Electronic balance
17	Freezer
18	High-speed refrigerated centrifuge
19	Hume hood
20	Incubator (Thermo stable chamber)
21	Instruments dryer (Oven)
22	Kjeldahr nitrogen determination system
23	Laboratory instruments washer
24	Laboratory table, Chair, Sink, Cabinet
25	Magnetic stirrer
26	Meat chopper
27	Mill
28	Mixer
29	Muffle furnace
30	Oil bath
31	pH meter
32	Refrigerator
33	Rotary evapolator
34	Salt analyzer
35	Shaker
36	Soxhlet extraction system
37	Stirrer (Propeller type)
38	Titration glass apparatus
39	Ultrasonic cleaner
40	Water activity measuring system
41	Water bathe
42	Water purifier system
43	Water ultra-pure pulifier
	Waste water treatment system
1	Heavy metal eliminator
2	pH adjustment system

2. Microbiological test Laboratory

No.	Item
1	Autoclave
2	Blender
3	Clean bench
4	Colony counter
5	Dilution fluid pouring system
6	Electronic balance
7	Freezer
8	Homogenizer (Stomacher)
9	Hot air sterilizer
10	Hot plate
11	Incubator
12	Laboratory instruments washer
13	Laboratory table, Chair, Sink, Cabinet
14	Magnetic stirrer
15	Microscope
16	pH meter
17	Rack for homogenizing bag
18	Refrigerated centrifuge
19	Refrigerator
20	Test tube mixer
21	Thermo-stable water bath
22	Tissue homogenizer
23	Ultrasonic pipette washer

3. Physical property test Laboratoy

1	Cabinet for apparatus
2	Colorimeter
3	Electric dril
4	Electronic balance
5	Freezer
6	Laboratory table, Chair, Sink, Cabinet
7	Measuring unit
8	Refrigerator
9	Rheometer
10	Thermometer

4. Organoleptical test Laboratory

1	Canned food testing instrument
2	Cooking range
3	Cooking ware
4	Electronic balance
5	Freezer
6	Incubator
7	Laboratory table, Chair, Sink, Cabinet
8	Center thermometer
9	Cooking range

4. Organoleptical test Laboratory

No.	Item
10	Micro-wave oven
11	Refract meter
12	Refrigerator

5. Sample preparation Laboratory

No.	Item
1	Automatic flake ice making machine
2	Band saw
3	Electronic balance
4	Electronic platform scale
5	Freezer
6	Meat chopper
7	Refrigerator
8	Working table, Chair, Sink, Cabinet

6. Training Room

No.	Item
1	AV equipment
2	Lectur table and chair
3	White board

Japan's Grant Aid Program

1. Japan's Grant Aid Procedures

(1) The Japan's Grant Aid Program is executed by the following procedures.
Application (Request made by a recipient country)
Study (Preparatory Study / Basic Design Study conducted by JICA)
Appraisal & Approval (Appraisal by the Government of Japan and Approval by the Cabinet of Japan)
Determination of Implementation (Exchange of Notes between the both Governments)
Implementation (Implementation of the Project)

(2) Firstly, an application or a request for a project made by the recipient country is examined by the Government of Japan (the Ministry of Foreign Affairs) to see whether or not it is suitable for Japan's Grand Aid. If the request is deemed suitable, the Government of Japan entrusts a study on the request to JICA (Japan International Cooperation Agency).

Secondly, JICA conducts the Study (Basic Design Study), using a Japanese consulting firm. If the background and objective of the requested project are not clear, a Preparatory Study is conducted prior to a Basic Design Study.

Thirdly, the Government of Japan appraises the Project to see whether or not it is suitable for Japan's Grant Aid Program, based on the Basic Design Study Report prepared by JICA and the results are then submitted to the Cabinet for approval.

Fourthly, the Project approved by the Cabinet becomes official when pledged by the Exchange of Notes signed by the both Governments.

Finally, for the implementation of the Project, JICA assists the recipient country in preparing contracts and so on.

2. Contents of the Study

(1) Contents of the Study
The purpose of the Study (Preparatory Study/Basic Design Study) conducted on a project requested by JICA is to provide a basic document necessary for appraisal of the project by the Japanese Government. The contents of the Study are as follows:

a) to confirm background, objectives, benefits of the project and also institutional capacity of agencies concerned of the recipient country necessary

for project implementation,

b) to evaluate appropriateness of the Project for the Grant Aid Scheme from a technical, social and economical point of view,
c) to confirm items agreed on by the both parties concerning a basic concept of the project,
d) to prepare a basic design of the project,
e) to estimate cost involved in the project.

Final project components are subject to approval by the Government of Japan and therefore may differ from an original request.

Implementing the project, the Government of Japan requests the recipient country to take necessary measures involved which are itemized on Exchange of Notes.

(2) Selecting (a) Consulting Firm(s)

For smooth implementation of the study, JICA uses (a) consulting firm(s) registered. JICA selects (a) firm(s) through proposals submitted by firms which are interested. The firm(s) selected carry(ies) out a Basic Design Study and write(s) a report, based upon terms of reference made by JICA.

The consulting firm(s) used for the study is (are) recommended by JICA to a recipient country after Exchange of Notes, in order to maintain technical consistency.

(3) Status of a Preparatory Study in the Grant Aid Program

A Preparatory Study is conducted during the second step of a project formulation & preparation as mentioned above.

A result of the study will be utilized in Japan to decide if the Project is to be suitable for a Basic Design Study

Based on the result of the Basic Design Study, the Government would proceed to the stage of decision making process(appraisal and approval) .

It is important to notice that at the stage of Preparatory Study, no commitment is made by the Japanese side concerning the realization of the Project in the scheme of Grant Aid Program.

3. Japan's Grant Aid Scheme

(1) What is Grant Aid?

The Grant Aid Program provides a recipient country with non reimbursable funds needed to procure facilities, equipment and services for economic and social development of the country under the following principles in accordance with relevant laws and regulations of Japan. The Grant Aid is not in a form of donation or such.

(2) Exchange of Notes (E/N)

The Japan's Grant Aid is extended in accordance with the Exchange of Notes by both Governments, in which the objectives of the Project, period of execution, conditions and amount of the Grant etc. are confirmed.

(3) "The period of the Grant Aid" means one Japanese fiscal year which the Cabinet approves the Project for. Within the fiscal year, all procedure such as Exchange of Notes, concluding a contract with (a) consulting firm(s) and (a) contractor(s) and a final payment to them must be completed.

(4) Under the Grant, in principle, products and services of origins of Japan or the recipient country are to be purchased.
When the two Governments deem it necessary, the Grant may be used for the purchase of products or services of a third country origin.
However the prime contractors, namely, consulting, contractor and procurement firms, are limited to "Japanese nationals". (The term "Japanese nationals" means Japanese physical persons or Japanese juridical persons controlled by Japanese physical persons.)

(5) Necessity of the "Verification"
The Government of the recipient country or its designated authority will conclude into contracts in Japanese yen with Japanese nationals. Those contracts shall be verified by the Government of Japan. The "Verification" is deemed necessary to secure accountability to Japanese tax payers.

(6) Undertakings required to the Government of the recipient country
In the implementation of the Grant Aid, the recipient country is required to undertake necessary measures such as the following:

a) to secure land necessary for the sites of the project and to clear and level the land prior to commencement of the construction work,

b) to provide facilities for distribution of electricity, water supply and drainage and other incidental facilities in and around the sites,

c) to secure buildings prior to the installation work in case the Project is providing equipment,

d) to ensure all the expenses and prompt execution for unloading, customs clearance at the port of disembarkation and internal transportation of the products purchased under the Grant Aid,

e) to exempt Japanese nationals from customs duties, internal taxes and other fiscal levies which will be imposed in the recipient country with respect to

the supply of the products and services under the Verified Contracts,

f) to accord Japanese nationals whose services may be required in connection with the supply of the products and services under the Verified Contracts, such facilities as may be necessary for their entry into the recipient country and stay therein for the performance of their work.

(7) Proper Use

The recipient country is required to maintain and use facilities constructed and equipment purchased under the Grant Aid properly and effectively and to assign staff necessary for their operation and maintenance as well as to bear all expenses other than those to be borne by the Grant Aid.

(8) Re-export

The products purchased under the Grant Aid shall not be re-exported from the recipient country.

(9) Banking Arrangement (B/A)

a) The Government of the recipient country or its designated authority shall open an account in the name of the Government of the recipient country in a bank in Japan (hereinafter referred to as "the Bank"). The Government of Japan will execute the Grant Aid by making payments in Japanese yen to cover the obligations incurred by Government of the recipient country or its designated authority under the contracts verified.

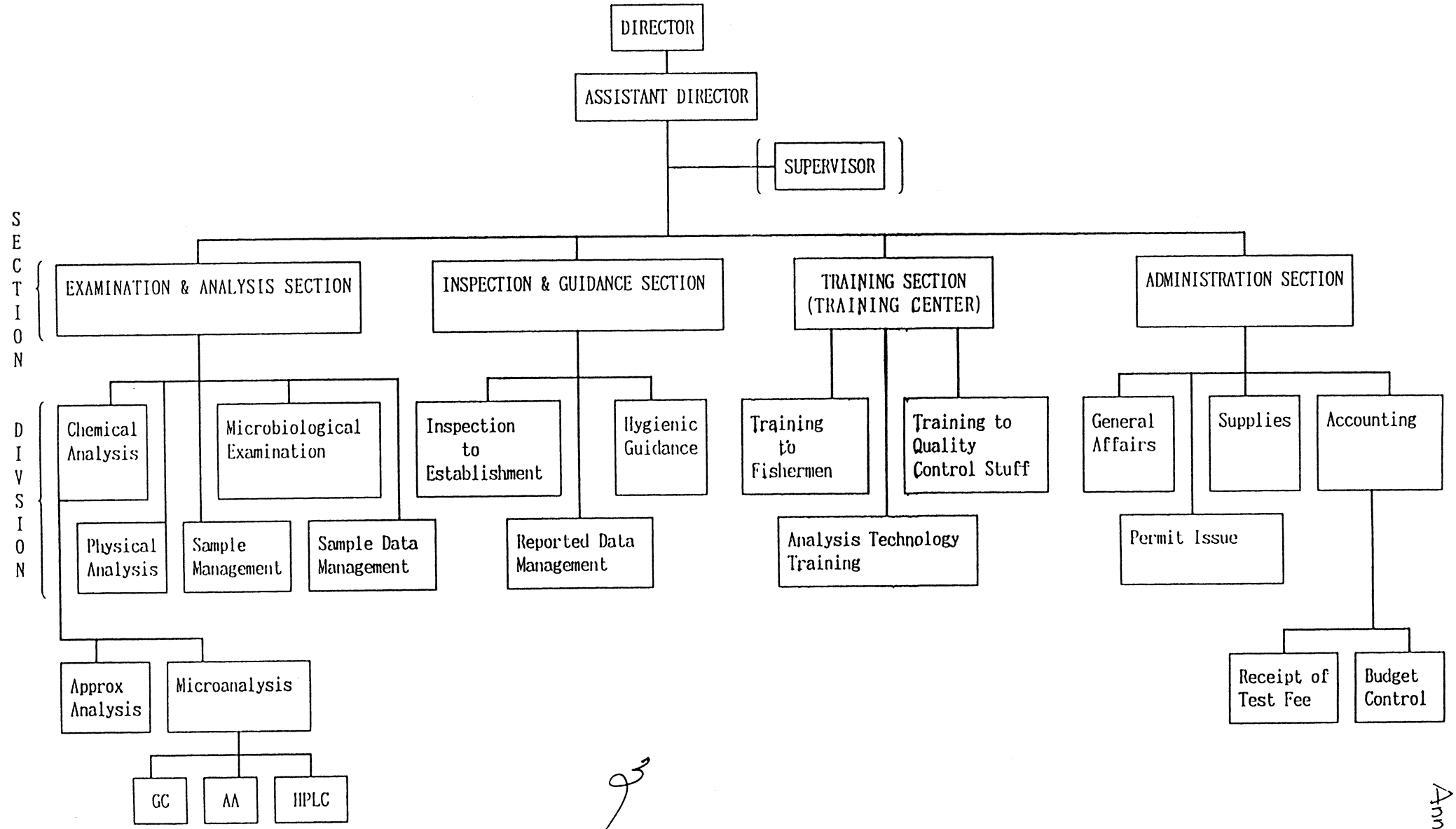
b) The payments will be made when payment requests are presented by the Bank to the Government of Japan under an Authorization to Pay issued by the Government of the recipient country or its designated authority.

Major Undertakings to be taken by Each Government

NO	Items	To be covered by Grant Aid	To be covered by Recipient side
1	To secure land		●
2	To clear, level and reclaim the site when needed		●
3	To construct gates and fences in and around the site		●
4	To construct the parking lot	●	
5	To construct roads		
	1) Within the site	●	
	2) Outside the site		●
6	To construct the building	●	
7	To provide facilities for the distribution of electricity, water supply, drainage and other incidental facilities		
	1)Electricity		
	a.The distributing line to the site		●
	b.The drop wiring and internal wiring within the site	●	
	c.The main circuit breaker and transformer	●	
	2)Water Supply		
	a.The city water distribution main to the site		●
	b.The supply system within the site (receiving and/or elevated tanks)	●	
	3)Drainage		
	a.The city drainage main (for storm, sewer and others) to the site		●
	b.The drainage system (for toilet sewer, ordinary waste, storm drainage and others) within the site	●	
	4)Gas Supply		
	a.The city gas main to the site		●
	b.The gas supply system within the site	●	
	5)Telephone System		
	a.The telephone trunk line to the main distribution frame / panel (MDF) of the building		●
	b.The MDF and the extension after the frame / panel	●	
	6)Furniture and Equipment		
	a.General furniture		●
	b.Project equipment	●	
8	To bear the following commissions to a bank of Japan for the banking services based upon the B/A		
	1) Advising commission of A/P		●
	2) Payment commission		●
9	To ensure prompt unloading and customs clearance at the port of disembarkation in recipient country		
	1) Marine(Air) transportation of the products from Japan to the recipient country	●	
	2) Tax exemption and customs clearance of the products at the port of disembarkation		●
	3) Internal transportation from the port of disembarkation to the project site	(●)	(●)

10	To accord Japanese nationals whose services may be required in connection with the supply of the products and the services under the verified contract such facilities as may be necessary for their entry into the recipient country and stay therein for the performance of their work		●
11	To exempt Japanese nationals from customs duties, internal taxes and other fiscal levies which may be imposed in the recipient country with respect to the supply of the products and services under the verified contract		●
12	To maintain and use properly and effectively the facilities constructed and equipment provided under the Grant Aid		●
13	To bear all the expenses, other than those to be borne by the Grant Aid, necessary for construction of the facilities as well as for the transportation and installation of the equipment		●

ORGANIZATION CHART OF
OMAN FISHERY PRODUCTS QUALITY CONTROL CENTRE



Annex-5

MINUTES OF DISCUSSIONS
ON
THE PROJECT
FOR
CONSTRUCTION OF QUALITY CONTROL CENTER
IN
THE SULTANATE OF OMAN

(CONSULTATION ON DRAFT REPORT)

In September 1999, the Japan International Cooperation Agency (JICA) dispatched a Basic Design Study Team on the project for Construction of Quality Control Center (hereinafter referred to as "the Project") to the Sultanate of Oman (hereinafter referred to as "Oman"), and through discussions, site surveys, and technical examination of the results in Japan, JICA prepared the draft report of the study.

In order to explain and to consult the Oman side on the components of the draft report, JICA sent to Oman the Draft Report Explanation Team (hereinafter referred to as "the Team"), which is headed by Mr. Katsutoshi ISHIKAWA, Grant Aid Division, Bureau of Economic Cooperation, Ministry of Foreign Affairs, from January 14 to January 24, 2000.

As a result of discussions, both sides have confirmed the main items described on the attached sheets.

Muscat, 19 January, 2000

Mr. Katsutoshi ISHIKAWA
Leader
Draft Report Explanation Team
JICA

Dr. Moh'd Redha HASSAN
Director General
Directorate General of Fisheries Resources
Ministry of Agriculture and Fisheries

ATTACHMENT

1. Components of the Draft Report

The Government of Oman/Ministry of Agriculture and Fisheries agrees and accepts in principal the components of the draft report explained by the Team.

2. Japan's Grant Aid System

Oman side understands the Japan's Grant Aid Scheme and the necessary measures to be taken by the Government of Oman/Ministry of Agriculture and Fisheries as explained by the Team and described in Annex 4 and 5 of the Minutes of Discussions signed by both parties on September 29, 1999.

3. Schedule of the Study

JICA will complete the final report in accordance with the confirmed items and send it to the Government of Oman/Ministry of Agriculture and Fisheries around March, 2000.

4. Other Relevant Issues

4-1. Oman side has agreed to allocate the enough budget to operate and maintain properly for the Project.

4-2. Both sides agreed that Oman side is responsible for the management, administration, finance and personnel matters for the Quality Control Center. Moreover, Oman side will inform Japanese side of the progress of these matters.

4-3. Both sides agreed that following matters are required to be executed by Oman side prior to the start of the construction works by Japanese side.

i) to carry out the necessary protection works against the slopes of backfilling along with the highway and rock mountains around the site.

ii) to set up the rain water discharging route for protection of the site.

4-4. The Ministry of Agriculture and Fisheries is responsible for coordination among the relevant authorities and taking necessary measures to implement the Project smoothly.

5 References

(1) Maps & Drawings

① Title: Marine Science and FisheriesCenter Drawings
Publisher: Ministry Of Agriculture And Fisheries
Issued in: September, 1999

② Title: Drawings of MSFC
Publisher: The Government Of The Sultanate Of Oman
Issued in: November ,1983

③ Title: Muscat City Maps, Scale 1:10,000 Al Wutayyah-1,2
Publisher: Ministry Of Commerce And Industry
Issued in: September, 1999

(2) Economics and Statistics

① Title: Central Bank Of Oman Annual Report 1998
Publisher: Central Bank Of Oman
Issued in: October, 1999

② Title: Annual Statistics Report For 1997
Publisher: Department Of Fisheries Statistics
Issued in: July, 1998

③ Title: Oil And The Transformation Of Oman
Publisher: Stacey International
Issued in: 1995

(3) Laws and Ordinances, Regulations

① Title: Ministerial Decision No.136/98 Issuing Quality Control Regulation For Omani Fishery Export
Publisher: Ministry Of Agriculture And Fisheries
Issued in: November, 1998

② Title: Quality Control Regulation For Omani Fisheries Exports Number:4/97
Publisher: Ministry Of Agriculture And Fisheries
Issued in: Unknown

③ Title: Law Of Marine Fishing And Conservation Of Live Marine Wealth
Publisher: Ministry Of Agriculture And Fisheries
Issued in: April, 1994

④ Title: Fire Safety Part-1, Part-2, Part-3

Publisher: Directorate General Of Civil Defense

Issued in: 1999

⑤ Title: Sultanate Of Oman, Oman Labor Law 1973

Publisher: Unknown

Issued in: October, 1999

(4) Facilities

① Title: Report On Soil Investigation For Alteration And Extension To Marine Science Center At Al Bustan

Publisher: Oman Drilling & Soil Technology Co. Llc

Issued in: October, 1999

② Title: Outlines of Factories in Muscat

Publisher: Hearing from freshly mixed concrete factories

Issued in: October, 1999

③ Title: Fire Safety Requirements, Part Five

Publisher: Directorate General Of Civil Defense

Issued in: December, 1999

④ Title: Fire Resisting Door Specifications

Publisher: Directorate General Of Civil Defense

Issued in: December, 1999

⑤ Title: Fire Station Unit Specifications

Publisher: Directorate General Of Civil Defense

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⑥ Title: Application For Environmental Permit

Publisher: Ministry Of Regional Municipalities & Environment

Issued in: 1999

⑦ Title: Construction Of Major Fishery Harbor At Quriyat With Extension And Fisheries Statistics Center(extract)

Publisher: Ministry Of Agriculture And Fisheries

Issued in: May, 1994

⑧ Title: Landing Facilities At Muttrah And Sidab (Capital Area)

Publisher: Ministry Of Agriculture And Fisheries

Issued in: February, 1993

⑨ Title: Process Flow Diagram Al Ansab Swage Treatment Plant (extract)
Publisher: Muscat City
Issued in: 1998

⑩ Title: System Configuration At Directorate General For Specification & Measurement
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(5) Materials

① Title: Omanian Standard No.2/1998 Aggregate From Natural Sources For Concrete
Publisher: Ministry Of Commerce And Industry
Issued in: October, 1999

② Title: Omanian Standard No.7 Ordinary Portland Cement OS 7/1979
Publisher: Ministry Of Commerce And Industry
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③ Title: Omanian Standard No.121 Ready-Mixed Concrete OS 121/1986
Publisher: Ministry Of Commerce And Industry
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(6) Others

① Title: Ten Year Fisheries Sector development Plan(1991-2000)
Publisher: Ministry Of Agriculture And Fisheries
Issued in: January, 1990

② Title: Omani Standards Catalogue 1998
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③ Title: Manual On Funding Of Fisheries Research Project (In Arabic)
Publisher: Fisheries Research Fund
Issued in: 1991