

National Fisheries Authority
Madang Urban Level Local Government
Papua New Guinea

**PREPARATORY SURVEY REPORT
ON
THE PROJECT FOR REHABILITATION OF
MADANG TOWN MARKET
IN
THE INDEPENDENT STATE OF
PAPUA NEW GUINEA**

OCTOBER 2013

**JAPAN INTERNATIONAL COOPERATION AGENCY (JICA)
OAFIC CO., LTD.**

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PREFACE

Japan International Cooperation Agency (JICA) decided to conduct the preparatory survey and entrust the survey to OAFIC Co., Ltd.

The survey team held a series of discussions with officials concerned of the Government of the Independent State of Papua New Guinea, and conducted a field investigation. As a result of further studies in Japan, the present report was finalized.

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

Finally, I wish to express my sincere appreciation to the officials concerned of the Government of the Independent State of Papua New Guinea for their close cooperation extended to the survey team.

October, 2013

Teruyoshi Kumashiro
Director General,
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SUMMARY

Summary

The Independent State of Papua New Guinea (hereinafter referred to as “Papua New Guinea”) has the total population of approximately 7.167 million (source: the World Bank, as of FY2012) and its national land area is 463,000 km². Papua New Guinea is located at a distance of 160km north from Australia and situated in south latitude 0 ~ 14 degree and east longitude 141 ~ 160 degree across the South Pacific, and consists of the eastern half of New Guinea Island, while the western half is the territory of Indonesia, called Irian Jaya, and more than 700 islands of varying sizes. The Madang Province, the target area of the Project, is located in the central part and the north side of New Guinea Island along Bismarck Sea and its shoreline is stretching out from the northwest to the southeast and the straight line is approximately 310 km long. The land area is 29,000 km² with the width of approximately 150 km between the shoreline and inland. The total population of the Madang Province is 487,000 (source: population census, FY2011). GNI of Papua New Guinea in 2010 was approximately US\$ 9.3 billion (source: the World Bank) and US\$ 1,300 per person, and its economic growth was 8.0% (source: the World Bank). The ratios of primary, secondary and tertiary sectors of industry in GDP account for 27.9%, 38.5% and 33.6% respectively (source: estimated values for 2012 by the Japan Institute for Overseas Investment). The economy of Papua New Guinea is noted for the double-structure of self-supporting economy in rural areas and monetized economy in the urban areas. The key export products include gold, copper, petroleum palm oil and timber, and especially key minerals account for approximately 80% of the export amount. The key counterparties of export are Australia, Japan, the Philippines, China, Germany, etc. and the key counterparties of import are Australia, USA, Singapore, Japan, China, etc. Economic activities enhanced by the export division has led to the constant positive results since 2003 in response to the rise in production and pricing of mineral and non-mineral products as well as stable climate conditions. Strong demand for export, with synergetic effect by the reduction in import and fiscal tightening by the Government, resulted in the stabilized exchange rates, drop in inflation rate and increase in foreign-exchange reserves, as well as the increase of employment and the growths in the private sector across the country. In addition, the outlook for 2014 includes liquefied natural gas production and it is anticipated that this should lead to the further growth of the economy.

Papua New Guinea has asserted “the strategic initiatives are undertaken to shift dependency on the mineral/energy sector and convert to the agricultural and fishery sector” in “Vision 2050” (a long-term development strategy). In addition, Papua New Guinea set a goal “to provide more opportunities of market entries in order to increase profitability of rural residents through commercial activities“ for rural development in “Mid-term Development Strategy 2011-2015”. Other goals are also set in “National Plan of Agricultural Development 2007-2016” to achieve the better productivity, while focusing on marketplaces

and distribution. Those goals are “improvement of food safety, nutrition, household economy and employment for rural residents”, “more business opportunities for people engaged in agriculture” and “promotion of efficient distribution system” for food, vegetables and fruits. Also, “facilitation of market access” is deemed as the important issue for policy of the artisanal coastal fishery development in “Ten-Year Plan of Fishery Development”, the long-term development plan of fishery sector.

In Papua New Guinea, the agriculture, forestry and fishery sector is key in its industry as it contributes to 27.9% of GDP (FY2012), but the activities in rural areas mostly focus on self-supporting and artisanal production, and the extra production are sold as commercial products at the local markets in order to gain valuable cash. The Madang Town Market functions as retail markets of agricultural and fishery products for Madang residents and simultaneously as a key place for those people who come to sell many local products from inlands, isolated islands or Highland district in order to gain cash. However, the existing facilities of the Madang Town Market are deteriorated overall, that is, noticeable damages to roofs, downspouts and sales tables and the lack of space in the market buildings as well as incomplete flooring even with roof furnished. The standby rubbish bays are also deteriorated and the capacity is smaller than the actual quantity of the rubbish. As a result, a large amount of rubbish is left on the ground accompanied with the unhygienic environment causing odor nuisance. Since most parts of the Market are unpaved, mud after rain causes poor mobility and unhygienic conditions to a considerable extent, and also the fundamental infrastructure for market functionality is inadequate under the present situation; specifically, cut-off of water supply and inadequate drainage channels. The lagoon shore, close by the Market, provides a marketplace for fresh fish, where insulated fish boxes are used, but the freshness is difficult to be maintained properly under the conditions of open-air stalls, and also ice in the boxes melts out and the water is discharged, causing another unhygienic condition. These instances signify that many issues reside in the Madang Town Market.

Under these circumstances, to enhance the efficiency of the Madang Town Market and a jetty, the Government of Papua New Guinea has requested the grant aid cooperation from the Japanese government for 1) reconstruction and buildout of the existing market, 2) construction of a jetty, and 3) construction of ice making plant. The full deliberation of the eligibility for the grant aid cooperation required: 1) information concerning the retail sales volumes to determine appropriate functions and scales of facilities, 2) land to be secured for the requested Site as well as the need of temporary relocation and its alternative site for users due to reconstruction of the existing market, and 3) data of natural conditions. However, the required information was not available and the requester’s framework and capability for implementation were not clarified. Therefore, Japan International Cooperation Agency (hereinafter referred to as “JICA”) conducted the preparatory survey (Phase 1) in March, 2013 to confirm the necessity, adequacy and urgency of the Project to be implemented under

grant aid assistance in the fisheries sector through clarification of the said unclear points followed by scrutiny of the request, and deliberate the appropriate scope and scale. This preparatory survey also examined the possibility and adequacy of the further investigation for the outline design as well as collected and analyzed the relevant information during the course of the survey. The findings for the said unclear points were as follows:

- Issues concerning the deterioration and insanitation of the facilities were identified, and the market infrastructure requires improvement.
- In view of natural conditions at the lagoon and advantages for fishery people, a jetty and a bridge should be excluded, but the seawall, where provides approaches for outboard motor boats, requires reconstruction.
- The additional land proximate to the existing market will be also included in the planned Site for construction.
- Operations Management Body under Madang Urban Level Local Government will be responsible for the management of the Market.

The necessity, adequacy and urgency of the requested Project were fully scrutinized, as well as the appropriate contents and scope as a project for grant aid assistance in the fisheries sector, based on the results from the preparatory survey (Phase 1). Subsequently, the preparatory survey (Phase 2) was conducted for the outline design of the required facilities and equipment as the schedule shown below:

| | |
|---|-----------------------------------|
| Outline Design Study | : 19, January – 16 February, 2013 |
| Explanation of the Draft Outline Design | : 25, July – 3, August, 2013 |

From the field survey and analysis, the survey team identified and examined the background and the details of the Project, natural conditions, operation and management planning, plus conditions of building construction and material procurement. The results led to the conclusion that the Project intends to provide the high quality of services to meet the needs of retailers and local residents through the establishment of such environments that facilitate hygienic and efficient distribution of agricultural and fishery products in the Madang Town Market, where provides workplaces to agricultural and fishery villagers around the Project target site for their living as well as marketplaces to local people for their daily necessities. With this intention, the Project set a goal to contribute to the continuous economic growth of this region, and aims to provide reconstruction of and repairs to facilities related to market, sanitation, exteriors and ice storage/sales facilities as well as car park and a seawall in the existing Market site and its buildout site. The Japanese assistance, by means of grand aid cooperation will provide construction of Market Buildings, Administration Building, Ice Storage/Sales Facilities, Market Toilets, Standby Rubbish Bays, Exteriors, Car Park and Seawall and the outline design was developed as the summary below.

| Facilities | Details/Scale |
|------------------------------|---|
| Market Buildings | Retail sections for vegetables, fruits, clothes, crafts, etc. consist of 523 table sales and floor sales units allocated in six buildings. The total floor area is 2,899 m ² . Structure: Reinforced concrete foundation, steel frame and single story building |
| Fresh Fish Retail Section | Fresh Fish Retail Section consists of 30 box sales units allocated in one building. The total floor area is 127 m ² . Structure: Reinforced concrete foundation, steel frame and single story building |
| Ice Storage/Sales Facilities | Ice Sales Office and Ice Sales Room are allocated in one building, containing 1 unit of chest freezer, 1 unit of ice crusher and 1 unit of ice scale. The total floor area is 30 m ² . Structure: Reinforced concrete foundation, concrete block structure and single story building |
| Administration Building | Market Supervisor Office, Accountant Office, Staff Room, Storage Room, Hallway/Pantry, Retailers' Storage, Multifunction Space and Exterior Connecting Passageway are allocated in one building. The total floor area is 153 m ² . Structure: Reinforced concrete foundation, concrete block structure and single story building |
| Market Toilets | Women and Gentlemen Toilet, Admission Counter, Accessible Toilet and Administrative Staff Toilet are allocated in one building. The total floor area is 136 m ² . Structure: Reinforced concrete foundation, concrete block structure and single story building |
| Gatehouse | Retailers' Gate, Main Gate and Lagoon Gate are allocated in three respective buildings. The total floor area is 45 m ² . Structure: Reinforced concrete foundation, steel frame and single story building |
| Exteriors | Unloading Space (61 m ²), Standby Rubbish Bays (103 m ²), rainwater drainage, septic tank, infiltration inlet, etc., and concrete pavement (662 m ²) for roads and Car Park, etc. and interlocking pavement (3,636 m ²) on the premises |
| Seawall | Embankment-type of vertical concrete seawall (extension: 76m), apron and wave return wall, including stair-shaped part and nine mooring rings |

When implementing this Project by means of grant aid cooperation under the Japanese Government, it requires a total implementation period 18.5 months consisting of approximately 3.5 months for the details design and the tender documents approval process, approximately for 3.0 months for the subsequent tendering and contracting process and 12.0 months for approval of design drawings, construction work, inspection, etc. The Project cost borne by the Papua New Guinea side is estimated to be 1,060,800 PGK (approximately JPY 45.2 million).

Subsequent to the implementation of this Project, the annual cost incurred for operation and maintenance of the Madang Town Market is estimated to be approximately 368,340 PGK, while the annual revenues from usages fees of facilities are estimated to be approximately 441,528 PGK. On the other hand, in relation with the maintenance costs, the replacement costs of facilities and equipment (air conditioner, for example) will be required in addition to repair costs including building painting, and reserve fund for those maintenance costs and strategic planning of maintenance are necessary. In response to that, if the fund of 32,000 PGK (approximately 44% of the annual total profit of 73,188 PGK) is possibly reserved from the profits, the fund for the mid and long-term maintenance cost can be secured and the financial soundness will be ensured for operation and maintenance of the Madang Town Market.

With regard to the propriety for implementing the Project, the following matters are expected.

- ① The beneficiaries by this Project are local people such as artisanal fishermen, retailers, etc. including poverty society of which population is considerably large.
- ② Operation and maintenance of the facilities and equipment under this Project are feasible by human resources and techniques available in Papua New Guinea without any special advanced technology.
- ③ This Project contributes to the achievement of objectives set forth in “Mid-term Development Strategy 2011-2015” of Papua New Guinea.
- ④ The profitability of the operation in this Project is to the extent that facilitates operation and maintenance of the facilities and equipment under the Project.
- ⑤ Though negative impact arises from the social and environmental aspect, which is relocation of the relevant parties to the temporary places during the construction period, adequate measures are taken to mitigate those impacts.
- ⑥ This Project is feasible under the system of Japanese grant aid cooperation.

With regard to the effectiveness for implementing the Project, the following effects are expected.

The following quantitative effects are expected:

- ① The current ratio of retailers who can conduct business in the facility of the Madang Town Market provided with both flooring and roof is approximately 34%. This ratio is expected to increase up to approximately 80%.
- ② The annual quantity of tap water sales within the Madang Town Market is expected to be 60 tons, while the current sales are none.
- ③ The annual quantity of ice sales within the Madang Town Market is expected to be 15 tons, while the current sales are none.
- ④ The current number of the sales units per 100 m² of the floor area is approximately 15.6. It is expected to increase up to approximately 17.9.

- ⑤ In the case that three truck-style PMVs simultaneously arrive at the Madang Town Market during the rush hours in the morning, the current waiting time for unloading the sales products is approximately 1 hour. It is expected to be reduced to 0.5 hours.
- ⑥ The annual frequency of toilet usage in the Madang Town Market will be 70,000 times, while the current usage is none.

The following qualitative effects are expected:

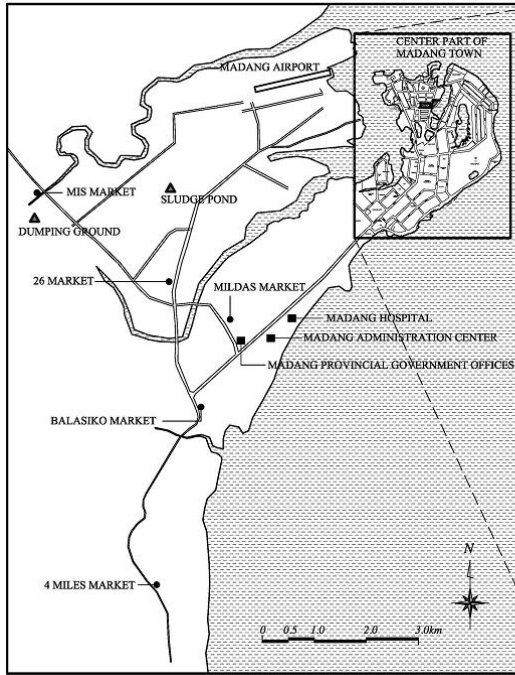
- ① The hygienic conditions in the Madang Town Market are expected to be improved through appropriate surveillance of rubbish disposal enhanced by Standby Rubbish Bays, mud prevention by pavement on the premises, better drainage system, etc.
- ② The environment for users is expected to be improved through separate access to the Madang Town Market, evening-out of bumps, better buying flow promoted by soft zoning, etc.
- ③ Food safety is expected to be improved for approximately 110,000 residents in the Madang Province who are main users of the Madang Town Market.
- ④ The evaluation (satisfaction) of users (retailers and customers) is expected to rise on the rehabilitation of the Madang Town Market.
- ⑤ In connection with the operation and maintenance of the Madang Town Market, the operation and maintenance of facilities and equipment and fee collection and accounting will be conducted through leveraging the established basic rules of operation and maintenance as well as the methods for charges, accounting and financing.

In consideration of the points listed above, it is deemed proper to implement the Japanese Assistance of this Project by means of Japanese grant aid cooperation.

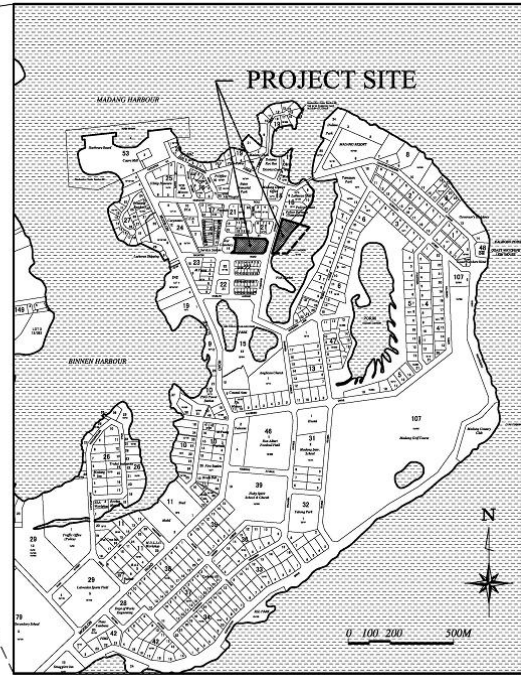
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Location Map



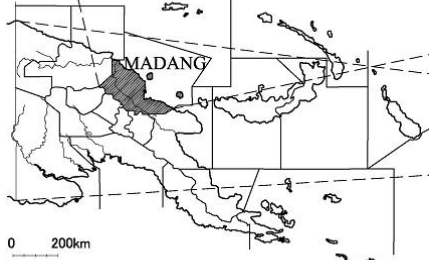
MAP OF MADANG TOWN



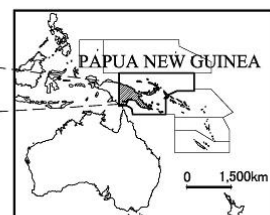
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MAP OF MADANG PROVINCE



MAP OF PAPUA NEW GUINEA



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PERSPECTIVE VIEW

Perspective

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Abbreviations

| Abbreviation | Formal Name |
|---------------------|----------------------------------|
| ADB | Asian Development Bank |
| EIA | Environmental Impact Assessment |
| EPA | Environmental Permit Application |
| EU | European Union |
| GDP | Gross Domestic Product |
| GPS | Global Positioning System |
| LLG | Local Level Government |
| NFA | National Fisheries Authority |
| NGO | Non-Governmental Organizations |
| PGK | Papua New Guinea Kina |
| PMV | Public Motor Vehicle |
| PNG | Papua New Guinea |
| RC | Reinforced Concrete |
| RCB | Reinforced Concrete Block |
| US\$ | United States Dollars |

Chapter 1 Background of the Project

Chapter 1 Background of the Project

1-1 Background

In Papua New Guinea, the agriculture and fishery sector is the key industry that contributes to 27.9% of GDP (2012). However, the activities in rural areas mostly focus on self-supporting and artisanal production, and the extra production are sold as commercial products at the local markets in order to gain valuable cash. 85% of residents in rural districts are engaged in this type of self-supporting fishery activities. The Madang Town Market, which is located in the center of Madang Town, Madang Province, functions as retail markets of agricultural and fishery products for Madang residents and simultaneously as a key place for agricultural and fishery people to gain cash income. Those people are from inlands or isolated islands, or Highland district, and bring many local products there for sales. However, the existing facilities of the Madang Town Market are deteriorated overall, that is, noticeable damages to roofs, downspouts and sales tables and the lack of space in the market buildings as well as incomplete flooring even with roof furnished. The standby rubbish bays are also deteriorated and the capacity is smaller than the actual quantity of the rubbish. As a result, a large amount of rubbish is left on the ground accompanied with the unhygienic environment causing odor nuisance. Since most parts of the Market are unpaved, mud after rain causes poor mobility and unhygienic conditions to a considerable extent, and also the fundamental infrastructure for market functionality is inadequate under the present situation; specifically, cut-off of water supply and inadequate drainage channels. The lagoon shore, close by the Market, provides a marketplace for fresh fish, where insulated fish boxes are used, but the freshness is difficult to be maintained properly under the conditions of open-air stalls, and also ice in the boxes melts out and the water is discharged, causing another unhygienic condition. These instances signify that many issues reside in the Madang Town Market.

Under these circumstances, to enhance the efficiency of the Madang Town Market and a jetty, the Government of Papua New Guinea has requested the grant aid cooperation from the Japanese government for 1) reconstruction and buildout of the existing market, 2) construction of a jetty, 3) construction of ice making plant. The full deliberation of the eligibility for the grant aid cooperation required: 1) information concerning the retail sales volumes to determine appropriate functions and scales of facilities, 2) the necessity of land to be secured for the relevant site requested as well as temporary relocation and its alternative site for users due to reconstruction of the existing market, and 3) data of natural conditions. However, the required information was not available and the requester's framework and capability for implementation were not clarified. Therefore, Japan International Cooperation Agency (hereinafter referred to as "JICA") conducted the preparatory survey (Phase 1) in March, 2013 to confirm the necessity, adequacy and urgency of the Project to be implemented under grant aid assistance in the fisheries sector through clarification of the said unclear aspects followed by scrutiny of the

request, and deliberate the appropriate scope and scale. This preparatory survey also examined the possibility and adequacy of the further investigation for the outline design as well as collected and analyzed the relevant information during the course of the survey. As a result, the said unclear aspects were clarified as follows:

- Issues concerning the deterioration and insanitation of the facilities were identified, and the market infrastructure requires improvement.
- In view of natural conditions at the lagoon and advantages for fishery people, a jetty and a bridge should be excluded, but the seawall, where provides approaches for outboard motor boats, requires reconstruction.
- The planned Site for construction newly requires additional land proximate to the existing market site.
- Operations Management Body under Madang Urban Level Local Government is supposed to be responsible for the management of the Market.

The necessity, adequacy and urgency of the requested Project were fully scrutinized, as well as the appropriate contents and scope as a project for grant aid assistance in the fisheries sector, based on the results from the preparatory survey (Phase 1). Subsequently, the preparatory survey (Phase 2) was determined to be conducted for the outline design of the required facilities and equipment.

The followings were confirmed through the field survey and Table 1-1 accordingly shows the components of the Project.

- ① Sales building for fowls: The products sold in the Madang Town Market and neighboring areas include fresh vegetables, fresh fish, processed food, betel nuts and tobacco, and most of them are food for human beings. Particularly, fowls have often been causes of pollution such as virus infection, etc. Under those environments, many retailers have complained about potential insanitation due to the concurrent retail sales with fowls. In view of such circumstances and complete food safety of retail products, the Papua New Guinea side found it as an opportunity to improve the Madang Town Market from a perspective of sanitation, and designed a policy to transfer the retail section for fowls to Mildas Market and started making negotiation with the relevant retailers. Therefore, the sales building for fowls was excluded from the Japanese assistance for this Project.
- ② Ice making plant building: Ice is constantly used for fresh fish retail sales at the lagoon shore proximate to the Madang Town Market, and the shortage of ice was identified, but the amount of shortage was 300kg per week that is not large. On the other hand, since Madang Fisheries Cooperative that makes ice especially for the fishery purpose is located far away from the commercial district, they are capable of making the far larger amount of extra ice and providing transportation for the delivery. The Papua New Guinea side considered such situation and consequently adopted a mechanism to transfer ice from there to the Madang Town Market in order to leverage their ice making facility and simultaneously supply ice to cover the shortage. As a result, the ice making plant building,

including ice making machine, in the request was excluded from the Japanese assistance for this Project and alternatively ice storage/sales facilities including a chest freezer and an ice crusher were added to the request.

Table 1-1 Component of Project

| | Requested item | Description | Priority given by preparatory survey (phase 1) | Priority given by preparatory survey (phase 2) | Notes |
|----|------------------------------|---|--|--|--|
| 1 | Market building | Table sales type, single story building | A | A | |
| 2 | Market building | Floor sales type, single story building | A | A | |
| 3 | Fresh fish retail building | Box sales type, single story building | A | A | |
| | Sales building for fowls | | B | C | |
| 4 | Public toilets building | Market toilets/public toilets | A | A | Need of public toilets to be examined |
| 5 | Kiosk | | A | A | |
| 6 | Administration building | | A | A | |
| 7 | Retailers' storage | | A | A | |
| 8 | Gatehouse | Fee collection of market usage | A | A | |
| 9 | Multifunctional space | | B | B | For display of local specialties |
| | Ice making plant facility | | B | C | Including ice making machine |
| 10 | Ice storage/sales facilities | | - | B | [Additional item] Including chest freezer and ice crusher |
| 11 | Pavement on the premises | Interlocking pavement | A | A | |
| 12 | Market car park | Concrete pavement | A | A | |
| 13 | Incidental facilities | Lounge, drainage, standby rubbish bay, | A | A | |

| | | | | | |
|----|---------------------------|-------------|---|---|---------------------|
| | | septic tank | | | |
| 14 | Loading Space | | A | A | |
| 15 | Seawall | | A | A | |
| 16 | Emergency power generator | | B | B | Need to be examined |

Notes)

A: Prioritized

B: Need to be examined

C: Excluded from the Japanese assistance

*It should be noted that any item specified as C at the preparatory survey (phase 1) is not listed.

In addition, with regard to circumstances surrounding the Project, the following two changes were made according to the comparison of the situations between the preparatory surveys (phase 1 and phase 2), but no material impact on the Project is expected to arise due to these changes.

- ① Temporary relocation destination: The candidates for relocation destination during the preparatory survey (phase 1) were retail markets around Madang Town, including Mildas Market, Balasiko Market, 4-Miles Market and Mis Market. However, through the discussion at the stakeholders meetings during the preparatory survey (phase 2), many participants opposed to other markets than Mildas Market, for they were located too far away as the relocation destination. Botanic Garden or Bates Oval, where are dormant lands close to the Madang Town Market were presented as new candidates. The deliberation resulted in securing the same size of the retail area as the Madang Town Market in Bates Oval and fence will be placed. Simultaneously, Mildas Market will be rehabilitated, including ground repair as a relocation site for retailers preferring the existing market.
- ② Road closure: At the stage of the preparatory survey (phase 1), Yamauan Road, which is located in between main market facilities for vegetables, etc. and fresh fish retail sections at the lagoon shore, was considered to be blocked for pedestrians' safety. Accordingly, test closure was conducted at Yamauan Road at the stage of the preparatory survey (phase 2), and the commercial stakeholders opposed due to traffic congestion, etc. Madang Urban Level Local Government reviewed those opposing opinions and determined to withdraw the road closure plan and alternatively to place Hump, etc. for pedestrians' safety. Key facilities for vegetables are totally close for Sundays, but fresh fish retail sections are likely to be open for Sundays. Therefore, no impact on market functionality is expected to arise due to the withdrawal of the road closure, because it is preferable to place respective fences for both sites, etc.

1-2 Natural Conditions

The Independent State of Papua New has the total population of approximately 7.167 million (source: the World Bank, as of FY2012) and its national land area is 463,000 km². Papua New Guinea is located 160km north from Australia and situated in south latitude 0 ~ 14 degree and east longitude 141 ~ 160 degree across the South Pacific, and consists of the eastern half of New Guinea Island, while the western half is the territory of Indonesia, called Irian Jaya, and more than 700 islands of varying sizes.

The Madang Province, the target site of the Project, is located in the central part and the north side of New Guinea Island along Bismarck Sea and its shoreline is stretching out from the northwest to the southeast and the straight line is approximately 310 km long. The land area is 29,000 km² with the width of approximately 150km between the shoreline and inland. The total population of the Madang Province is 487,000 (source: population census, 2011). The annual average of rainfall is approximately 3,487 mm, the average highest and lowest temperatures are 31.0°C and 24.1°C respectively, and the average of humidity through a year is approximately 74%. The difference in temperatures is smaller than that in inland, as it faces the ocean.

1-3 Environmental and Social Considerations

(1) JICA's Environmental and Social Considerations Category

The Project will not cause any serious negative impact from the environmental and social aspects, but while it is implemented, the negative impacts listed below are anticipated. Therefore, this Project is identified as “Category B”, according to criteria set forth in JICA's Environmental and Social Considerations Guidelines.

(2) Anticipated Negative Impacts

Negative impacts on the following aspects of both environmental and social factors are anticipated through the implementation of the Project.

- ① The closure of the Market during the construction will require the retailers to be relocated temporarily, and this may cause some financial impact on them.
- ② During the temporary relocation as described above, any dispute with the existing retailers may arise at relocation sites.
- ③ Accompanied with the construction of the Market, the demolition of the existing Market will produce dusts and construction waste. Water may also be polluted by oil dripped from heavy mechanical facilities used for seawall construction
- ④ The construction work of the Market may cause noise and vibration nuisance in neighboring

areas.

- ⑤ Asbestos is not identified in composition of any material. However, any accident may occur to workers during the construction work.
- ⑥ Food waste from dead stock and inorganic garbage (i.e. bottles, cans and papers), as well as waste disposal with odor nuisance, are anticipated at the planned Market.
- ⑦ Water pollution at the lagoons close by is anticipated due to sewage from the toilets and drainage at the planned Market.
- ⑧ After the implementation of the Project, the traffic will be controlled on the road in front of the Market, during certain time slots, and this may cause the users some impact.

(3) Mitigation Measures for the Predicted Negative Impacts

To mitigate the predicted negative impacts on the environmental and social aspects, the following measures are planned.

- ① The mitigating measures for the impacts on retailers caused by temporary relocation follow. Madang Urban Level Local Government held several stakeholders meetings and gave hearings for retailers' opinions on temporary relocation. As a result, Bates Oval and the Mildas Market were selected for the relocation destination. The outline of this relocation plan specifies that the relocation period is about 18 months, adequate space is secured to accommodate all of the applicable retailers primarily in Bates Oval, and Mildas Market is the secondary relocation destination. Fence placement, public water supply and standby rubbish bays will be provided at Bates Oval, and repairs to public toilets and public water supply, etc. will be provided at Mildas Market. Those preparatory services to accept the relocation will be complete prior to the construction of the Market, and relocation shall be realized simultaneously with its closure.
- ② There are no existing retailers at Bates Oval, but some at Mildas Market. Therefore, any dispute may arise with them, but such conflict can be controlled, because the primary relocation destination is Bates Oval and Mildas Market is a public market under operation of Madang Urban Level Local Government that provides oversight and coordination.
- ③ According to the plans of Madang Urban Level Local Government concerning construction waste produced by the demolition of the existing Market (including corrugated iron sheet roofs, timber, steel frames and concrete blocks), corrugated iron sheet roofs, timber and steel frames will be reused for temporary relocation and sold for recycled resources, and concrete blocks will be reused by Madang Urban Level Local Government to lay the foundation, etc. These plans will realize almost zero construction waste. The potential water pollution caused by the seawall construction will be prevented through placement of oil fences, full maintenance of heavy mechanical facilities to prevent oil drippings and mandatory awareness programs for workers concerning water pollution.
- ④ The mitigation measure for noise and vibration nuisance restricts construction hours to daytime as well as prohibits any construction work at 8 pm or later. This will control any impact on residents in the areas surrounding the Site. In addition, commercial facilities

mainly surround the existing Market, where construction work is planned, and only a few residences reside within a radius of 200 meters and all of them are located 150 to 200m away. Therefore, impacts on the residences will be limited.

- ⑤ Any accident may occur to workers during the construction work, but it will be prevented through sufficient safety programs concerning heavy mechanical facilities usage and traffic operation for vehicles.
- ⑥ Organic waste that accompanies the operation of the new Market will be traditionally transported on a daily basis by truck to the designated waste treatment plant under Madang Urban Level Local Government. This plant was checked and the life span was demonstrated to last for next 20 years, and no waste issue is expected to arise. This traditional waste process will prevent odor nuisance.
- ⑦ The mitigation measures for water pollution follow. A septic tank with double chambers will be provided at the planned Market for sewage from toilets and general wastewater from the Market and effluent disposal will be ultimately delivered to absorption wells. Toilets and a septic tank will be located at the further back side of the Market, where keeps approximately 150m away from the lagoon. A dedicated treatment tank will also be provided to drainage for the fresh fish retail sections. Only rainwater will be drained into the lagoon. These mitigation measures will eliminate almost all impacts on water at the lagoon.
- ⑧ Convenience and safety of traffic on the front road of the Market will be ensured for the Market users through placement of Hump that facilitates traffic control during certain hours and deceleration of vehicles as well as placement of pedestrian crossings. Any traffic control for certain hours will be notified to the relevant residents.

(4) Procedure of Environmental Impact Assessment

The followings are the procedures of the environmental impact assessment set by the Government of Papua New Guinea:

- ① Department of Environment & Conservation (hereinafter referred to as “DEC”) is designated for environmental authorization in Papua New Guinea and Environment Act is a law that relates to environment and was enacted in 2000. This Act requires to obtain the relevant Environmental Permit and to conduct appropriate environmental impact assessment as specified according to development plans prior to construction. Environment Prescribed Activities Regulation 2002 categorizes environmental impacts into three Levels; Level 1 is the least impact and Level 3 is the largest impact on the environment and Level 2 is further divided into Level 2A and Level 2B. Any development within the range between Level 2 and Level 3 is required to apply for environment authorization. Any development identified as Level 2A indicates less negative impact on the environmental and social aspects than Level 2B.
- ② While any development identified as Level 3 is required to conduct Environmental Impact Assessment (EIA), any development identified either as Level 2B or Level 2A is

required to create an outline of Environment Permit Application (EPA). These procedures to issue environment permits are to register the applicable development into DEC at its planning stage to examine the direction of EIA report or EPA reporting, and the master report will be created once certain details of development are specified (creating design drawings, etc.).

- ③ Regulator of DEC responsible for environmental authorization inspected the Project Site during the field survey as part of this Survey. Regulator assumed that this Project would be applicable to either Level 2A or 2B but likely to be Level 2A, because it does not include construction of a jetty.

Chapter 2 Contents of the Project

Chapter 2 Contents of the Project

2-1 Basic Concept of the Project

The Madang Town Market to be rehabilitated is flourished with trees and grass, which provides the mild environment to users against the strong sunlight of the subtropical climate, while the founding parts of the destructed buildings remain, which causes unevenness of the ground. In addition, the existing sales buildings are deteriorated overall, that is, noticeable damages to roofs, downspouts and sales tables and the lack of space in the market buildings as well as incomplete flooring even with roof furnished. The standby rubbish bays are also deteriorated and the capacity is smaller than the actual quantity of the rubbish. As a result, a large amount of rubbish is left on the ground accompanied with the unhygienic environment with odor nuisance. Since most parts of the Market are unpaved, mud after rain causes poor mobility and unhygienic conditions to a considerable extent, and also the fundamental infrastructure for market functionality is inadequate under the present situation; specifically, cut-off of water supply and inadequate drainage channels. The lagoon shore, close by the Market, provides a marketplace for fresh fish, where insulated fish boxes are used but the freshness is difficult to be maintained properly under the conditions of open-air stalls, and also ice in the boxes melts out and the water is discharged, causing another unhygienic condition. These instances signify that many issues reside in the Madang Town Market.

The Project intends to provide the high quality of services to meet the needs of retailers and local residents through the establishment of such environments that facilitate hygienic and efficient distribution of agricultural and fishery products in the Madang Town Market, where provides workplaces to agricultural and fishery villagers around the Project target site for their living as well as marketplaces to local people for their daily necessities. With this intention, the Project set a goal to contribute to the continuous economic growth of this region. Therefore, the Project aims to provide reconstruction of and repairs to facilities related to market, sanitation, exteriors and ice storage/sales facilities as well as car park and a seawall in the existing Market site and its buildout site, and this leads to the solutions of the issues. The Project Site is located in Madang Town, Madang Province.

To achieve the said goal, the Project plans to maintain the operation of the facilities such as market, sanitation, exteriors and ice storage/sales facilities, car park, a seawall, etc. through reconstruction of and repairs to them. The expectative effects will include but not limited to decrease in the ratio of retailers in the open air or on the bare ground, increase in usage of the sanitary facilities, maximization of the space-efficiency and growth of ice sale volumes. In this context, the Japanese assistance, by means of grant aid cooperation, will implement the construction of Market Buildings, Administration Buildings, Ice Storage/Sales Facilities, Market Toilets, Standby Rubbish Bays, Exterior Facilities, Car park and Seawall.

2-2 Outline Design of the Japanese Assistance

2-2-1 Design Policy

2-2-1-1 Design Policy

(1) Basic Policy

In preparing the Outline Design of the Japanese Assistance for this Project, the followings have been defined as the elements comprised in this basic policy:

- ① To improve work environments and enhance the market functionality for conformity with the current utilization of the Madang Town Market.
- ② To improve the work environments with the intention of better sales environments; specifically elimination of the direct sunlight, mud and unhygienic conditions, and more utilization of sanitation facilities
- ③ To enhance market functionality with the intention of more area-efficiency and realization of ice sales service within the Site.
- ④ To reflect the results from natural climate surveys around the Project Site
- ⑤ To consider simple maintenance and cost-effective operation

(2) Policy related to natural conditions

Even in Papua New Guinea, Madang is the region rich in nature and symbolized with the color of green originated from trees, and the relevant personnel are highly aware of the environmental preservation. Besides the basic design in harmony with natural conditions and landscape, the followings will be applied to the policy under the Project:

- ① Anti-rust arrangement should be noted because the Project Site is located along the shore and is exposed to sea breezes.
- ② The facilities design should incorporate utilization of natural ventilation and sunlight as well as sun shades for direct sunlight, because the Project Site is under subtropical conditions (i.e. high temperature, abundant rainfall and high humidity).
- ③ Wastewater from sanitation facilities, including toilets, should be treated by means of effluent disposal to absorption wells in order to prevent pollution at the lagoon.
- ④ Rainwater in the Site should be smoothly flowed into the lagoon by its natural slopes.

Table 2-1 below shows the values of natural conditions related to the facilities design, based on results from the natural condition survey, etc.

Table 2-1 Values Related to Natural Conditions for Facilities Design

| Factor | Value | Sources |
|---------------|---|--|
| Temperature | Max.: 33°C, Min: 22°C | Statistics between 1997 and 2011 |
| Humidity | Average: 74% | Statistics between 2002 and 2011 |
| Rainfall | Monthly max.: 700mm | Statistics between 2002 and 2011 |
| Wind pressure | Wind velocity: 28m/sec. | Value fixed for the Madang region by the national authority |
| Seismic load | Horizontal seismic coefficient: 0.2 (Architectural Structure: Rahmen frame) 0.3 (Architectural Structure: masonry construction) | Standard values for Zone 2 is applied to the Madang region, according to the classifications for seismic loads set by the national authority |

(3) Policy related to socio-economic conditions

The policy related to socio-economic conditions with respect to the Project shall be as follows:

- ① Because sales activities in the Market are the main source of cash incomes for retailers, the layout should maximize space to provide the largest possible number of retail sections.
- ② The implementation plan should minimize any impact on their sales activities.
- ③ Charges for use of the Market should be evaluated reasonably to prevent any financial constraints for retailers.
- ④ Charges for storage and ice should be evaluated based on the funding for the maintenance costs of the relevant facilities that should be raised from the profit, but users' views should also be deliberated.

(4) Policy related to construction and material procurement

1) Design criteria

Based on the following circumstances, the facility design under the Project shall be compliant with the criteria shown in Table 2-2 below.

- ① Since the Project Site is located within the areas specified for probable earthquakes, structural analysis for seismic force should be taken into account. Although the structural criteria in Papua New Guinea are similar to those in Japan, the inspection under the Japanese criteria include differential movement, rigidity and eccentricity, which are more advantageous, and therefore it is deemed appropriate to adopt Japanese criteria.
- ② Although either British or Japanese criteria are, in general, adopted for marine architecture in Papua New Guinea, it is deemed appropriate to adopt Japanese criteria which provide more specifics than British ones.
- ③ Papua New Guinea provides the appropriate criteria for the rest.

Table 2-2 Design Criteria for Facilities Design

| Area | Applicable Criteria (Country Name) |
|-------------------------------|---|
| Architecture | Building Regulation (Papua New Guinea) |
| Structure | Building Standards Law (Japan) and Structural Engineering Standards by Architectural Institute of Japan |
| Facility | Public Health Act and Fire Services Act (Papua New Guinea) |
| Marine architecture (seawall) | Guideline for Facility Design of Fishery Harbor and Fishing Grounds (Japan) |

2) Procedure for construction permits

Permissions for construction work shall be authorized by Madang Urban Level Local Government. Permissions shall be granted through the deliberation of the Building Board of Madang Urban Level Local Government. The timeframes between application and approval require three weeks to one month.

3) Procurement of construction materials

- ① It is primary that any material and/or equipment available in Papua New Guinea should be procured locally.
- ② For any material or equipment of which type or amount is minimal even though it is available in Papua New Guinea, its procurement should be determined through comparison analysis of Japan, Papua New Guinea and its surrounding countries.

(5) Policy related to use of local construction companies

The execution scheme shall be developed by adopting the specifications and construction methods generally acceptable in Papua New Guinea, if possible, so that local construction companies can properly participate in this Project.

(6) Policy related to operation, management and administration

1) Operation and maintenance

- ① The Market will be operated and maintained through maximizing the credit of the Madang Urban Level Local Government in long-standing market operation, but partial changes in the number of operational staff members and the operational framework will be deliberated in connection with the management of additional operation for Ice Sales Facilities/Market Toilets in the Market, enhancement of the security system and appropriate budget control for maintenance,.
- ② The independent profitability should be noted for the continuous operation of the Madang Town Market.

2) Soft Component

In view of the fact that the following bottlenecks and/or conditions exist, the implementation of Soft Component is considered with regard to the operation, maintenance and management of the planned Madang Town Market.

- ① The Papua New Guinea side made a request for Soft Component in association with the operation, maintenance and management of the planned Madang Town Market.
- ② The charging system for the Market usage requires improvement and certain operational guidance and support are necessary to realize an appropriate collection and accounting system.
- ③ The sufficient surveillance over rubbish disposal is not in place and certain operational guidance and support are necessary with respect to the enforcement of the relevant rules.
- ④ The introduction of Soft Component shall maximize the human resources, including local consultants, and intend to transfer the relevant expertise locally.

(7) Policy related to setting the grade of facilities and equipment

The policy related to setting the grade of facilities and equipment is as follows:

- ① A simple view focused on mobility should be noted for setting the grade of facilities and equipment under the Japanese assistance for this Project
- ② Grade setting of the said facilities should refer to the similar existing facilities in Papua New Guinea and require the comprehensive examination, including safety, durability, simplicity of maintenance and economics.
- ③ The standard grades, which are generally used across Papua New Guinea, should be applied to structures and specifications of the said facilities and equipment.
- ④ As the Project target is a retail market where is widely open to the public and accessed by a wide range of users, the design should incorporate accessibility for users with wheelchairs.

(8) Policy related to the construction method, procurement method and construction period

The policy related to the construction method, procurement method and construction period is as follows:

- ① The simplest possible plan should be developed to eliminate any special techniques or construction methods in order to enable local construction.
- ② General construction equipment assumed to be used for the Project should be primarily procured locally since it is available in Papua New Guinea.
- ③ Based on the climate conditions, that is, abundant rain, the dry construction method should be adopted for the building structure where possible, and the construction period should be minimized.
- ④ Based on the restricted transport method that commodities are transported mainly by sea, the construction schedule should allow time for shipment of procured materials and equipment.

2-2-1-2 Calculation of Size Requirements

(1) Present situation at the Madang Town Market

Table 2-3 below shows the data of daily and weekly transitions aggregated from the baseline survey of retailers for fresh fish, fowl and other commodities (including betel nuts and tobacco) at the Market and the lagoon close by. The survey identified that the number of retailers within the Market exceeded 620 in daytime on Friday and Saturday during the given period (weekly average is approximately 523 people). Even on Monday, with the least number of retailers, more than 340 retailers were active. The number of insulated fish boxes for fresh fish sales reached the peak of 30. While retail sections for vegetables, etc. at the Market are close for Sundays, those for fish are often open for Sundays and the data aggregated on Sunday, February 10 shows that the numbers of boxes were 6 at 9:00 am, 17 at 12:00 noon and 18 at 15:00.

Table 2-3 Weekly and Daily Transitions in the Numbers of Retailers in the Madang Town Markets (February, 2013)

| Date | Time | Weather *1) | South open-air retail section | Sales bldg. 7 | West open-air retail | Sales bldg. 4 | Sales bldg. 5 | Sales bldg. 6 | retail section | Northeast open-air retail section | Sales bldg. 1 | Sales bldg. 2 | Sales bldg. 8 | Sales bldg. 8 retail section | Southeast open-air retail section | Front side of building | Market site total | No. of insulated fish boxes | No. of fowl baskets | Other products | Lagoon shore total | Grand total | |
|----------------|------|-------------|-------------------------------|---------------|----------------------|---------------|---------------|---------------|----------------|-----------------------------------|---------------|---------------|---------------|------------------------------|-----------------------------------|------------------------|-------------------|-----------------------------|---------------------|----------------|--------------------|-------------|--|
| Retail Section | | | Open | Off-Floor | Open | Roof Floor | Roof Floor | Roof Floor | Open | Roof Floor | Off-Floor | Roof Floor | Off-Floor | Open | Off-Floor | | | | | | | | |
| Mon. Feb. 4 | 9 | | | | | | | | | | | | | | | | | | | | | | |
| | 12 | S | 35 | 75 | 46 | 0 | 20 | 38 | 33 | 22 | 3 | 0 | 0 | 18 | 13 | 303 | 28 | 11 | 118 | 157 | 460 | | |
| | 15 | S | 38 | 82 | 55 | 0 | 25 | 45 | 37 | 24 | 3 | 0 | 0 | 20 | 15 | 344 | 30 | 11 | 125 | 166 | 510 | | |
| Tue. Feb. 5 | 9 | S | 39 | 102 | 56 | 0 | 20 | 34 | 23 | 14 | 4 | 2 | 2 | 22 | 12 | 328 | 13 | 8 | 54 | 75 | 403 | | |
| | 12 | S | 45 | 132 | 106 | 1 | 36 | 56 | 36 | 28 | 5 | 5 | 5 | 34 | 16 | 500 | 11 | 9 | 78 | 98 | 598 | | |
| | 15 | S | 16 | 105 | 62 | 3 | 18 | 22 | 26 | 26 | 5 | 4 | 4 | 32 | 18 | 337 | 13 | 6 | 79 | 98 | 435 | | |
| Wed. Feb. 6 | 9 | S | 42 | 103 | 84 | 4 | 31 | 36 | 16 | 22 | 3 | 1 | 1 | 12 | 15 | 369 | 16 | 5 | 54 | 75 | 444 | | |
| | 12 | S | 64 | 124 | 132 | 6 | 33 | 56 | 38 | 28 | 4 | 2 | 2 | 26 | 26 | 539 | 22 | 11 | 82 | 115 | 654 | | |
| | 15 | R | 21 | 107 | 48 | 5 | 33 | 47 | 35 | 25 | 3 | 1 | 1 | 22 | 19 | 366 | 15 | 6 | 78 | 99 | 465 | | |
| Thu. Feb. 7 | 9 | R | 37 | 89 | 49 | 2 | 25 | 55 | 34 | 21 | 8 | 6 | 6 | 21 | 14 | 361 | 3 | 9 | 41 | 53 | 414 | | |
| | 12 | S | 48 | 117 | 105 | 8 | 34 | 62 | 45 | 29 | 8 | 2 | 2 | 28 | 22 | 508 | 6 | 12 | 78 | 96 | 604 | | |
| | 15 | S | 31 | 96 | 82 | 6 | 40 | 59 | 54 | 22 | 8 | 2 | 2 | 23 | 22 | 445 | 9 | 10 | 76 | 95 | 540 | | |
| Fri. Feb. 8 | 9 | S | 40 | 91 | 69 | 4 | 31 | 54 | 26 | 16 | 8 | 0 | 0 | 22 | 7 | 368 | 9 | 11 | 42 | 62 | 430 | | |
| | 12 | S | 73 | 142 | 156 | 5 | 42 | 67 | 53 | 22 | 10 | 2 | 2 | 30 | 18 | 620 | 15 | 9 | 73 | 97 | 717 | | |
| | 15 | S | 72 | 108 | 126 | 5 | 44 | 58 | 48 | 20 | 10 | 2 | 2 | 26 | 22 | 541 | 14 | 3 | 84 | 101 | 642 | | |
| Sat. Feb. 9 | 9 | S | 39 | 82 | 65 | 2 | 28 | 56 | 36 | 17 | 9 | 0 | 0 | 24 | 5 | 363 | 14 | 5 | 29 | 48 | 411 | | |
| | 12 | S | 72 | 116 | 182 | 11 | 38 | 61 | 68 | 24 | 9 | 1 | 1 | 26 | 18 | 626 | 14 | 11 | 74 | 99 | 725 | | |
| | 15 | S | 54 | 89 | 97 | 4 | 36 | 54 | 53 | 22 | 4 | 1 | 1 | 23 | 15 | 452 | 8 | 3 | 95 | 106 | 558 | | |

| | | | | | | | | | | | | | | | | | | | | | | | |
|-------------------------------------|--|--|-----|-----|-----|----|-----|-----|-----|-----|----|----|-----|-----|------|-------|------|--|--|--|--|--|--|
| Weekly total of peak numbers | | | 340 | 713 | 736 | 31 | 208 | 347 | 277 | 155 | 39 | 12 | 164 | 115 | 3137 | Ratio | | | | | | | |
| Total of off-floor sales retailers | | | | 713 | | 31 | | | | 155 | 39 | 12 | | | 115 | 1065 | 33.9 | | | | | | |
| Total of under-roof sales retailers | | | | 713 | | 31 | 208 | 347 | | 155 | 39 | 12 | | | | 1505 | 48.0 | | | | | | |

*1) S: Sunny, R: Rain

Note: See Figure 2-1 for the layout of retail sales sections.

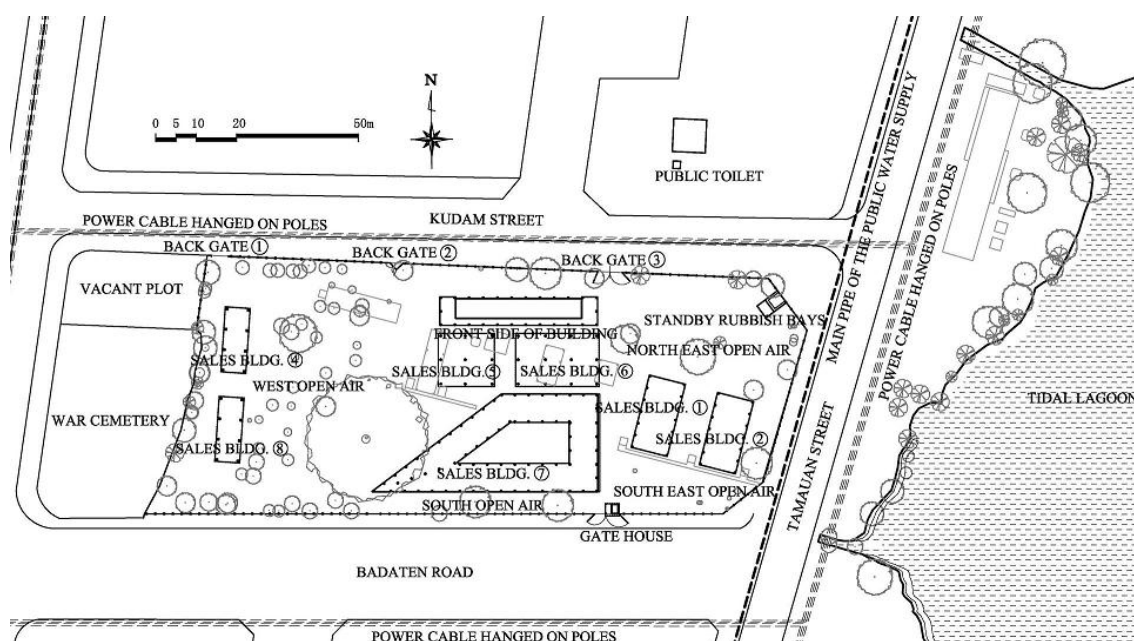


Figure 2-1 Layout of Retail Sales Sections in the Madang Town Market

Table 2-4 below shows the results aggregated from retailers' responses to the questionnaire conducted in the Madang Town Market in the course of the baseline survey.

Table 2-4 Summaries of Retailers' Responses to the Questionnaire Conducted in the Madang Town Market

| | |
|-------------------------------------|---|
| Period | Monday, February 4 to Saturday, February 9, 2013 |
| No. of Respondents | 210 |
| Gender | Male: 39 (19%), Female: 171 (81%) |
| Residences of respondents | Madang District: 81 (38%), Sumkar District: 14 (7%), Bogia District: 12 (6%), Rai Coast District: 35 (17%), Usino Bundi District: 7 (3%), Middle Ramu District: 3 (1%), any other district outside of Madang Province: 58 (28%) |
| Sales Start time | 6:00-7:00: 12 (6%), 7:00-8:00: 27 (13%), 8:00-9:00: 133 (63%), 9:00-10:00: 27 (13%), 10:00-11:00: 7 (3%), 11:00 or later: 4 (2%) |
| Sales Finish time | 15:00 or earlier: 13 (6%), 15:00-16:00: 49 (24%), 16:00-17:00: 114 (54%), 17:00-18:00: 34 (16%) |
| Transportation | Bus: 25 (12%), PMV: 165 (78%), Personal car: 2 (1%), Boat: 27 (9%) |
| Products (multiple answers allowed) | Grain: 126, vegetables: 79, fruits: 112, fresh fish: 27 |
| Sales | Less than 50 Kina: 29 (14%), 50-100 Kina: 72 (34%), 100-150 Kina: 49 |

| | | |
|---|---|--|
| amount/day | (23%), 150-200 Kina: 23 (11%), N/A: 37 (18%), Weighted averages: approx. 94 Kina | |
| Sales area | 1 m ² : 32 (15%), 2 m ² : 132 (63%), 2 m ² or larger: 25 (12%), N/A: 21 (10%) | |
| Total sales quantity by shipment area | Madang District: Total 2.75t (32%) | 2t: taros, sweet potatoes, yams, bananas, coconuts, etc. 0.5t: peanuts, papayas, mangoes, etc. 0.25t: cucumbers, tomatoes, watermelons, aibika, etc. |
| Grand total: 8.65 tons/day | Sumkar District: Total 0.45t (5%) | 0.25t: taros, yams, sagos, bananas, coconuts, etc. 0.1t: peanuts, papayas, mangoes, etc. 0.1t: gingers, tomatoes, aibika, leaf vegetables, etc. |
| | Bogia District: Total 0.85t (10%) | 0.5t: taros, sweet potatoes, yams, bananas, coconuts, etc. 0.25t: peanuts, papayas, mangoes, etc. 0.1t: cucumbers, watermelons, aibika, leaf vegetables, etc. |
| | Rai Coast District: Total 1.85t (21%) | 1t: taros, sweet potatoes, yams, coconuts, etc. 0.1t: peanuts, papayas, mangoes, etc. 0.25t: gingers, aibika, etc. 0.5t: cucumbers, bananas, pawpaw, leaf vegetables, etc. |
| | Usino Bundi District: Total 0.60t (7%) | 0.25t: sweet potatoes, coconuts, etc. 0.1t: peanuts, papayas, mangoes, etc. 0.25t: gingers, leaf vegetables, etc. |
| | Middle Ramu District: Total 0.45t (5%) | 0.25t: taros, sweet potatoes, onions, etc. 0.1t: peanuts, papayas, mangoes, etc. 0.1t: cabbages, carrots, aibika, etc. |
| | Highland area: Total 1.70t (20%) | 1t: potatoes, sweet potatoes, carrots, onions, etc. 0.5t: broccolis, cabbages, cauliflowers, tomatoes, eggplants, beans, etc. 0.1t: gingers, garlics, citrus fruits, etc. 0.1t: cucumbers, eggplants, leeks, etc. |
| | Sources of cash | Only from sales activities at the Market: 185 (88%) |
| Dead stock | 0%: 6 (3%), 1-9%: 126 (60%), 10-19%: 21 (10%), 20-29%: 17 (8%), 30-39%: 9 (4%), 40-49%: 11 (5%), 50% or more: 20 (10%). The weighted average: 15% | |
| Frequency of public toilets usage (per day) | 1: 204 (97%), More than 1: 3 (1.5%), None: 3 (1.5%) | |
| Relationships with fisheries (multiple answers allowed) | Any relationship: 96 (46%), no relationship: 114 (54%); Details: Family members engaged in fisheries: 31(15%) Family members engaged in fish retailing: 24% (11%) For self-supporting purpose: 31 (15%) | |

| | Relatives engaged in fisheries: 6 (3%) Relatives engaged in fish retailing: 4 (2%) | | | | |
|------------------------------|--|-----------|-------------|-------------|------------------|
| Voices from retailers | Very satisfied | Satisfied | Fair | Unsatisfied | Very unsatisfied |
| Products display | 1 (0.5%) | 10 (5%) | 117 (56%) | 7 (3.5%) | 73 (35%) |
| Direct sunlight | 2 (1%) | 1 (0.5%) | 125 (59.5%) | 15 (7%) | 67 (32%) |
| Temperature | 2 (1%) | 1 (0.5%) | 127 (60.5%) | 18 (8.5%) | 62 (29.5%) |
| Floor condition | 1 (0.5%) | 0 (0%) | 97 (46%) | 23 (11%) | 89 (42.5%) |
| Odor nuisance | 1 (0.5%) | 1 (0.5%) | 125 (59.5%) | 18 (8.5%) | 65 (31%) |
| Sanitation | 0 (0%) | 0 (0%) | 125 (59.5%) | 20 (9.5%) | 65 (31%) |
| Rainwater drainage | 0 (0%) | 0 (0%) | 84 (40%) | 14 (6.5%) | 112 (53.5%) |
| Waste disposal | 0 (0%) | 1 (0.5%) | 78 (37%) | 19 (9%) | 112 (53.5%) |
| Summary of the answers above | Issues for 50-60% of retailers: Floor, drainage and waste Issues for 40% of retailers: Display, sunlight, temperature, odor nuisance and sanitation | | | | |

The results of the questionnaire to retailers show that most of retailers start by 10:00 am after the Market opens at 7:00 and close around 15:00. 80% of retailers are female and they use public toilets out of the Market that are to be relocated. The daily quantity of products including vegetables and fruits is more than 8 tons and the sales amount of each retailer per day mostly falls between 50 and 150 Kinas. Even among retailers of vegetables, 46% of them have family members or relatives who are related to fisheries at any rate.

Table 3-5 shows the results from the questionnaires to customers in the Madang Town Market conducted as part of the baseline survey. It is found that many of them are not satisfied with the present situation of the Madang Town Market for direct sunlight, unpaved areas, insanitation, odor nuisance, inadequate drainage system, insufficient rubbish disposal, inefficient product zoning, etc.

Table 2-5 Summaries of Customers' Responses to the Questionnaire Conducted in the Madang Town Market

| | |
|---------------------------|---|
| Period | Monday, February 4 to Saturday, February 9, 2013 |
| No. of Respondents | 205 |
| Gender | Male: 81(40%), Female: 124 (60%) |
| Residences of respondents | Madang District: 129 (63%), Sumkar District: 7 (4%), Bogia District: 12 (6%), Rai Coast District: 10 (5%), Usino Bundi District: 5 (2%), Middle Ramu District: 9 (4%), other districts than Madang Province: 33 (16%) |

| | | | | | |
|---|--|-----------|-----------|-------------|------------------|
| No. of visits per week | 1 day: 97 (47%), 2 days: 44 (22%), 3 days: 25 (12%), 4 days: 14(7%), 5 days: 6 (3%), 6days: 19 (9%) | | | | |
| Transportation | Bus: 113 (55%), PMV: 34 (17%), Personal Car: 17 (8%), Boat: 23 (11%), Walk: 18 (9%) | | | | |
| Intensity | The Madang Town Market is the main marketplace for daily food: 191 (93%), Any other than the Madang Town Markets: 14(7%) | | | | |
| Frequency of public toilets usage (per day) | Once a day: 79 (39%), Return home without using: 126 (61%) | | | | |
| Voices from customers about the present situation | Very satisfied | Satisfied | Fair | Unsatisfied | Very unsatisfied |
| Visibility of products | 8 (4%) | 24 (12%) | 94 (46%) | 13 (6%) | 66 (32%) |
| Product zoning | 1 (0.5%) | 2 (1.0%) | 82 (40%) | 46 (22.5%) | 74 (36%) |
| Bumps of floors between buildings | 2 (1.0%) | 2(1.0%) | 108 (53%) | 44 (21%) | 49 (24%) |
| Visibility of product prices | 0 (0%) | 0 (0%) | 118 (58%) | 35 (17%) | 52 (25%) |
| Sanitation | 0 (0%) | 0(0%) | 126 (61%) | 24 (12%) | 55 (27%) |
| Hygienic conditions in the Market | 2 (1.0%) | 10 (5%) | 122 (59%) | 24 (12%) | 47 (23%) |
| Rain shelter | 0 (0%) | 5 (2%) | 125(61%) | 32 (16%) | 43 (21%) |
| Sun shelter | 0 (0%) | 0 (0%) | 106 (51%) | 34 (17%) | 65 (32%) |
| Odor nuisance | 0 (0%) | 0 (0%) | 86 (42%) | 35 (17%) | 84 (41%) |
| Pavement on the premises | 0 (0%) | 9 (4%) | 112 (55%) | 28 (14%) | 56 (27%) |
| Drainage for rainwater, etc. | 0 (0%) | 0 (0%) | 91 (45%) | 58 (28%) | 56 (27%) |
| Rubbish disposal | 0 (0%) | 0 (0%) | 98 (48%) | 66 (32%) | 41 (20%) |
| Safety in surrounding roads | 0 (0%) | 0 (0%) | 101 (49%) | 39 (19%) | 65 (32%) |

(2) Number of retail sections (excluding fresh fish retailers)

1) Calculation policy

① The required size will be calculated, reflected on the result of the survey for the transitions

in the numbers of retailers that was conducted as part of the baseline survey.

- ② The specifications of retail sections will be designed according to the existing forms and address any insufficiency requiring improvement.
- ③ The present usage style (i.e. co-existence of table sales sections and floor sales sections) should be noted.

2) Present situation of retailers' usage and scope of work

As shown in Table 2-6 below, any significant transition in monthly usage is not identified, except for December and January that surround a new-year season.

Table 2-6 Monthly Amounts of the Madang Town Market Usage Fees (2011)

(Unit: 1,000 PGK)

| Month | Jan. | Feb. | Mar. | Apr. | May | June | July | Aug. | Sep. | Oct. | Nov. | Dec. |
|--------|------|------|------|------|-----|------|------|------|------|------|------|------|
| Amount | 24 | 25 | 27 | 31 | 29 | 29 | 30 | 30 | 24 | 29 | 29 | 21 |

Source: Madang Urban Level Local Government

As shown in Table 2-3, less retailers use the Market in the first half of week, but more retailers as the weekend comes closer. During daytime, after 12:00 noon to 15:00 or around then, the number of retailers reaches its peak. The baseline survey conducted in February 2013, as part of this Survey, resulted in the minimum number of 344 retailers on Monday and the maximum number of 626 retailers on Saturday used the Market during peak hours of respective days. The weekly average number of retailers during peak hours of respective days is approximately 523 (Formula: $(344 + 500 + 539 + 508 + 620 + 626) \text{ retailers} \div 6 \text{ days} = 3,137 \text{ retailers} \div 6 \text{ days} = 522.8$). It should be noted that the numbers of retailers during peak hours counted on the preparatory survey (Phase 1) for the Project (period: a week of March, 2013) were 413 on Tuesday at minimum and 583 on Saturday at maximum, and the weekly average number of retailers during peak hours of respective days was approximately 513 (Formula: $3,070 \text{ retailers} \div 6 \text{ days} = 512.7$), which indicates no significant variance, compared with the results from the survey in 2013. Consequently, no material variance is expected to arise in the numbers of retailers at the Madang Town Market on a year-over-year basis. In addition, the average value of 523 resulted from the said baseline survey covers the maximum numbers of all days, except for Friday (620) and Saturday (626), when the Market is the most crowded and the number of retailers reaches its daily peak.

Along with the situation above, the estimation of 523 retailers is considered appropriate for the new work environment provided with roof and flooring, because the areas that are allowed to construct roofed facilities are limited in the Project Site. However, in this case, since 100 retailers are assumed to exceed the capacity during peak hours on weekends, the environment should be improved to allow them to use paved space at least.

(3) Number of retail sections for fresh fish

Fresh fish is stored in and sold from insulated fish boxes, and ice, at any rate, is used for every box. For most cases, fresh fish is transported by outboard motor boats and sales activities are conducted individually by households. Some households use multiple insulated fish boxes, which is very particular. For issues residing in the work environment, including sanitation for wastewater from insulated fish boxes and sunshades for them, it is also particular that the improvement should be required for each box, not for each household. As a result, the number of retail sections for fresh fish should be calculated based on the number of insulated fish boxes even though the number of households is around 20.

As shown in Table 2-3, the baseline survey conducted in February, 2013, as part of this Survey, resulted in 9 boxes on Thursday at minimum and 30 boxes on Monday at maximum during peak hours of respective days. It should be noted that the numbers of insulated fish boxes during peak hours counted on the preparatory survey (Phase 1) for the Project (period: a week of March, 2012) were 13 boxes on Tuesday at minimum and 28 boxes on Friday at maximum, and no significant variance was identified, compared with the results from the survey in 2013. The current issues in retail sections for fresh fish are the risks of lowering the freshness due to roofless sales and insanitation due to drips from insulated fish boxes. Based on those backgrounds, it is considered essential that all of 30 insulated fish boxes counted at those two surveys above should be stored in roofed facilities and a drainage system for drips should be provided for box sales sections.

(4) Ice Sales Facilities

As shown in Table 2-7, the results from the questionnaire to fish retailer show that the average usage of ice per insulated fish box is 7.9kg. This value is approximate to the value of 10kg specified by a fish retailer as the estimated usage of ice per insulated fish box at the stakeholders meetings. Fish retailers purchase ice mostly from J&Z Kaibar located in front of retail sections (20m away), where general consumers purchase ice as well. This sometimes results in sold-out of ice and driving fish retailers to go all the way to Butchery Supermarket (600m away). The answer of “irregularly from Butchery” shown in Table 2-7 represents this situation, and the ratio of the probability is estimated to be approximately 37.5%.

On the other hand, based on the maximum number of insulated fish boxes per day shown in Table 2-3, the ice usage per week will be calculated as follows:

$$7.9\text{kg/box} \times (30 + 13 + 22 + 9 + 15 + 14) \text{ boxes/day} = 813.7\text{kg/week}$$

Then, the unavailability of ice per week is estimated as follows:

$$813.7\text{kg/week} \times 0.375 = 305.14\text{kg/week}$$

The Project will sell ice to cover the estimated unavailable amount of ice in order to facilitate fish retailers to stay and conduct their business at retail sections, and simultaneously note the prevention of any impacts on the exiting ice sales vendors.

Ice blocks sold at the Madang Town Market are transported from Madang Fisheries Cooperative, and the weight per block is 16.5kg. Consequently, the required amount per week as calculated above will be equivalent to 18 to 19 ice blocks ($305.14\text{kg} \div 16.5\text{kg} = 18.5$ ice blocks). Those ice blocks are stored without any process in order to prevent them from melting quickly, and cut into smaller pieces for sales and each piece is optionally crashed upon request. A refrigerated vehicle owned by Madang Fisheries Cooperative is used for the transportation. The frequency of the transportation is planned to be once week for the purposes of effective transportation and saving the high cost (the cost of chilling cargo is high).

Currently, 18 ice blocks at maximum are stored in a chest freezer with a capacity of 600ℓ used in the Madang Fisheries Cooperative. Therefore, the Project will transport 18 ice blocks every week and store them in the chest freezer with a capacity of 600ℓ for sales.

Madang Fisheries Cooperative owns 5 units of chest freezers with a capacity of 600ℓ and 1 unit of an ice crusher, but an ice storage room is not available and two units of those ice freezers are used for ice storage and the remaining 3 units are used for freezing and storing fish. The ice crusher is used for crashing ice for sales. Therefore, it is not practical to transfer any of those to the Madang Town Market. As a result, Ice Sales Facilities under the Project should include 1 unit of chest freezer with a capacity of 600ℓ, 1 unit of ice crusher, and 1 unit of scale for ice.

Table 2-7 Amount of Ice Used by Fresh Fish Retailers

| | Location | Species, box size | Amount of ice purchase | Ice sales | No. of visits/ week |
|---|---------------|------------------------|------------------------|---|---------------------|
| 1 | Bilbil Island | Demersal fish, large | 1 package (3kg) | Mainly from J&Z and irregularly from Butchery | 3 days |
| 2 | Panai Island | Yellow fin tuna, large | 3 packages (9kg) | Mainly from J&Z and irregularly from Butchery | 6 days |
| 3 | Biliau Island | Yellow fin tuna, large | 4 packages (12kg) | Mainly from J&Z and irregularly from Butchery | 6 days |
| 4 | Riwo Island | Yellow fin tuna, large | 3-4 packages (9-12kg) | J&Z | 6 days |
| 5 | Riwo Island | Demersal fish, small | 1 package (3kg) | J&Z | 6 days |
| 6 | Riwo Island | Demersal fish, medium | 3-5 packages (9-15kg) | J&Z | 6 days |
| 7 | Riwo Island | Coral fish, small | 1 package (3kg) | J&Z | 6 days |
| 8 | Kananam | Pelagic fish, small | 1 package (3kg) | J&Z | 6 days |

| | Village | | | | |
|----|---------------|---|--|--|--------|
| 9 | Riwo Island | Yellow fin tuna, medium | 2 packages (6kg) | J&Z | 5 days |
| 10 | Riwo Island | Yellow fin tuna, medium | 1 package (3kg) | J&Z | 6 days |
| 11 | Siar Island | Yellow fin tuna, swordfish, large | 2-3 packages (6-9kg) | Mainly from J&Z and irregularly from Butchery | 6 days |
| 12 | Siar Island | Yellow fin tuna, large | 5 packages (15kg) | J&Z | 6 days |
| 13 | Malmal Island | Pelagic fish, medium | 2 packages (6kg) | J&Z | 6 days |
| 14 | Pig Island | Yellow fin tuna, large | 5 packages (15kg) | J&Z | 6 days |
| 15 | Pig Island | Coral fish, swordfish, large | 5 packages (15kg) | Mainly from J&Z and irregularly from Butchery | 6 days |
| 16 | Siar Island | Coral fish, demersal fish, spiny lobster, medium ² | 1 package (3kg) | Mainly from J&Z and irregularly from Butchery | 6 days |
| | | | 2.5-2.75 packages Average 2.63 packages (7.9kg) | All retailers purchase ice mainly from J&Z and 37.5% irregularly from Butchery | |

Table 2-8 Ice Sales Facilities and Sales Amount around the Madang Town Market

| | Name | Business type | Ice type | Unit Price | Sales amount | Distance from Retail sections |
|---|----------|------------------|----------------|---|---|-------------------------------|
| 1 | J&Z | Kaibar (canteen) | Frozen package | 3PGK/3kg/ package | 390kg / day | 20m |
| 2 | Best Buy | Super-market | Frozen package | 3PGK/3kg/ package Counter sales is not available. | 450kg / day, specialized on bulk order | 100m |
| 3 | Butchery | Super-market | Cube | 4.5PGK/2.4kg /package | 480kg / day | 600m |
| 4 | Redscar | Kaibar (canteen) | Frozen package | 5PGK/3kg /package | 150kg / day | 2.3km |
| 5 | Rooks | Marina | Cube | 3PGK/2kg | 200kg / day | 2.9km |

| | | | | | | |
|---|--|------------------|---|------------------------|-------------------------------------|-------|
| | | | | /package | | |
| 6 | Niewguini | Bar | Cube | 3PGK/2.5kg /package | 75g / day | 3.0km |
| 7 | Madang Fisheries Cooperativ e | Co- operative | Ice block, members: 1PGK/kg Non-members: 1.4PGK/kg | | 430kg/ day available for sale | 3.2km |

Notes: The total quantity includes the sales for any other purpose than fisheries.

(5) Offices for Administration Building and Ice Sales Facilities

Based on the following perspectives, the standard values for office areas are calculated:

- ① Building Regulation in Papua New Guinea provides regulations for the lowest limit of height to ceiling, etc. for office construction, but not for areas. Therefore, to determine criteria, comparison analysis was performed among those values that are 1) scales of the similar local facilities, 2) preferred values in Compilation of Building Plans by Architectural Institute of Japan and 3) the area criteria for new public buildings regulated by Ministry of Land, Infrastructure, Transport and Tourism of Japan.
- ② In Papua New Guinea, the scales are approximately 18 to 25 m² large for most of business offices for senior management, such as Market Supervisor. Based on those scales of the similar local facilities, the floor area value is set to the range between 18 and 20 m², which are the higher values of the criteria for a managing director class.
- ③ Referential values of offices for engineering roles will be applied to the accounting office where professional services are provided. An accountant often works with a cash collector frequently handling a large amount of petty cash and the capacity is set to accommodate two persons. However, because it is not always that those two persons stay in the office at the same time, the area value is set to the range between 12 and 14 m² (=6.2 to 7 m² x 2 persons), which are the lower values of the specified criteria.
- ④ The capacity of Ice Sales Office is to accommodate two persons, but one of them often works at Ice Sales Room. Therefore, the area value is set to the range between 12 and 14 m², the lower values, as well as Accountant Office in the Administration Building.
- ⑤ Staff room is used by twelve members for a break, staff meetings, etc. and by security officers on the night shift. The area values should be set, focused on the most important purpose that four security officers stay there overnight. 10 m² per person is the minimum standard value of the room for night duty under the said area criteria in ① 3); therefore, the area value is set to the range between 19 and 20 m² (10 m²/person + additional 3 persons x 3.3 m²).

Table 2-9 below shows the formula to calculate the values above. Along with the layout design in the 2-2-2-2 Architectural Plan, the floor areas will ultimately be fixed within the ranges.

Table 2-9 Floor Area Values for Offices

| Office for: | Capacity | Specified values | Preferred values from Compilation of Building Plans by Architectural Institute of Japan | Preferred values from Area criteria for new public buildings by Ministry of Land, Infrastructure, Transport and Tourism of Japan |
|---------------------------|----------|------------------------|---|--|
| Market Supervisor | 1 | 18 ~ 20 m ² | Managing Director: 13 to 18 m ² /person | Managing Director class: 21.8 m ² / person |
| Accountants and Ice sales | 2 | 12 ~ 14 m ² | Engineering roles: 7 ~ 10 m ² / person | Engineering roles: 6.2 m ² / person |
| Staff room | 4 | 19 ~ 20 m ² | N/A | Night duty room: 10 + 3 persons x 3.3 m ² |

(6) Retailers' Storage

Many retailers leave unsold products under sales tables in the Market. Under present situation, the quantity of those left products is approximately 30 m³/day. This behavior is implicitly permitted and leads to theft during nighttime, as no charge incurs and the potential risk attributes to those retailers. 80% of left products are root vegetables, etc. of which retail prices are low, but those retailers who sell products of which prices are higher, including tomatoes and highland vegetables, are strongly requesting for any storage room within the Market even though some charges incur. According to the field survey, approximately 20% of the overall left products are highland vegetables. In view of this background, the target scale for area calculation of Retailers' Storage is set to 6 m³ (=30 m³ × 20%).

The area of Retailers' Storage is calculated to be approximately 12 m² (=6 m³ ÷ 0.5m in height), and applied by 0.64 (area occupied by goods ÷ area of storage capability) that is a ratio of area charging efficiency, as specified in Compilation of Building Plans by Architectural Institute of Japan. Then the required area is calculated to be approximately 19 m² (=12.0 ÷ 0.64). It should be noted that Retailers' Storage is built within the Administration Building, not as a separate facility, from aspects of cost-efficiency and advantages in operation and maintenance.

(7) Market Toilets

Both of "Market Toilets" and "public toilets" presented in the requests mean a toilet facility for public use. Market Toilets are public toilets that are located within the Market and public toilets are public toilets that are located outside of the Market. Therefore, public toilets will be also used by general users irrelevant to the Market. No Market Toilets are currently available (not provided). On the other hand, the existing public toilets are located at the north side of the

Madang Town Market, across the road, and had been closed during a certain period. However, in December 2011, the maintenance of a septic tank and the buildout of an infiltration inlet were implemented and, presently, many residents in the Town use them. Based on these backgrounds, the Japanese assistance for this Project will be applied only to the Market Toilets because they are closely related to the Market utilization.

It is assumed that the Market Toilets will be mainly used by retailers and by the limited number of general customers as they stay in the Market only for a short time. The number of sanitary fixtures and the scale of a septic tank are regulated under Public Health Act of Papua New Guinea, and Inspector of Health is responsible for surveillance over compliance with this Act. The discussion with Inspector of Health in charge of Madang Town concerning the scale of sanitation facility led to the conclusion that it was appropriate to incorporate the points listed below. Table 2-10 shows the criteria for sanitary fixtures installment and Table 2-11 shows the number of sanitary fixtures in the Market Toilets.

- ① The rank applied to the number of users within the range between “600 or more and less than 1,000” will be reviewed for the number of sanitary fixtures to be installed in the Market Toilets.
- ② Those retailers who come from distant areas including highland to the Market are strongly requesting for a shower facility and it is also considered essential from the sanitation perspective of the Market. Therefore, 1 unit of shower is provided in Gentlemen and Women Toilets respectively.
- ③ 1 unit of Accessible Toilet will be provided for the customers visiting the Market with wheelchairs
- ④ 1 unit of sink for cleaning will be provided in Gentlemen and Women Toilets respectively for the purpose of appropriate facility maintenance.
- ⑤ To minimize construction of an infiltration inlet for sewage, 1 unit of Administrative Staff Toilet will be provided in the Market Toilets instead of Administration Building.
- ⑥ The scale of a septic tank will be compliant with Public Health Act of Papua New Guinea, and the capacity will at least be the value that is calculated for those facilities used only in daytime, such as schools.

Capacity of a septic tank : 19.35 m^3 or more

$$=1,350(\ell) + 30(\ell) \times \text{No. of users} = 1,350(\ell) + 30(\ell) \times 600 \text{ people} = 19,350\ell$$

Table 2-10 Criteria for the Numbers of Sanitary Fixtures in Public Facilities under Public Health Act of Papua New Guinea

| No. of facility users | No. of stools for gentlemen | No. of urinals for gentlemen | No. of stools for women |
|-------------------------------|-----------------------------|------------------------------|-------------------------|
| Less than 200 | 1 | 1 | 2 |
| 200 or more and less than 400 | 1 | 2 | 3 |
| 400 or more and less than 600 | 2 | 2 | 4 |

| | | | |
|---------------------------------|---|---|---|
| 600 for more less than 1,000 | 2 | 3 | 5 |
| No. to be added per 1,000 users | 1 | 1 | 2 |

Notes: The criterion for the number of hand basins are 1 unit or more for 500 users.

Table 2-11 No. of Sanitary Fixtures in Market Toilets

| Category | Stool | Urinal | Hand basin | Shower | Cleaning sink |
|-----------------------------|-------|--------|------------|--------|---------------|
| Gentlemen Toilets | 2 | 3 | 2 | 1 | 1 |
| Women Toilets | 5 | - | 3 | 1 | 1 |
| Accessible Toilet | 1 | - | 1 | - | - |
| Administrative Staff Toilet | 1 | - | 1 | - | - |

(8) Kiosk

There are some kaibars (canteen-cum-deli) around the existing Madang Town Market, but kiosks are often set up and sell light meals and soft drinks for the Market users. A kiosk was included in the Project for the similar purpose, but many issues accompany the operation, including tenant selection and maintenance. Sufficient discussion with the stakeholders in Papua New Guinea resulted in excluding the kiosk from the Japanese assistance for this Project.

(9) Seawall

1) Current status of seawall

Currently, public wastewater at the south side of the Site is drained through culvert across the road into the lagoon shore, the front side of the Site, and the stair-shaped seawall made of mortar masonry is built to prevent and protect the shore from erosion due to the wastewater. The seawall of several tens meters long is stretching out to both south and north sides of the drainage and naturally along with the curvy shoreline. Even though deterioration to certain extent is identified (i.e. inside of some mortar masonry is eroded at the terminal points of the seawall), the remaining parts are functioning well as a seawall and plants including mangroves are firmly rooted to the seawall as time has elapsed since its construction. The current seawall also functions as a hub of transportation routes that provides approaches for banana boats (small-sized outboard motor boats) of people from fishing villages and isolated inlands around the Madang Province upon their visits to the Market. As well as a gateway to the land for people, it is used for landing of fresh fish contained in insulated fish boxes and vegetables, and loading daily commodities. Those banana boats moor for comparatively a long time at the current seawall, and natural plants work as mooring ropes. Many of those fishing villagers are retailers that bring and sell fresh fish captured on their own or agricultural products at the lagoon shore or the current Market, and will be beneficiaries of the Project.

2) Policy related to Seawall design

The policy related to Seawall design shall be as follows:

- ① It should be noted that erosion is prevented at the lagoon shore and banana boats are approachable.
- ② It should be noted that natural environment is well preserved and the scope of the new construction is minimized by prioritizing the utilization of the existing seawall.

3) Scope of Seawall construction

The form of the planned Seawall would be similar sectional form to the existing seawall and familiar with and useful to users. The specifications and structures will be planned with either precast concrete or cast-in-situ concrete in line with results from natural condition survey such as the height and width of Seawall correlated to the water depth. The scope of Seawall construction will be reviewed based on a plan to utilize and extend the existing seawall at the north.

2-2-2 Basic Plan (Construction Plan / Equipment Plan)

2-2-2-1 Site and Facilities Layout Plan

The Project Site as shown in Figure 2-2 below is divided into two lots by Yamauan Road, one is the west side of the Site surrounded by a fence and the other one is the east side of the Site located at the lagoon shore. The site areas of the west and east sides are approximately 8,985 m² and approximately 2,787 m² respectively, 11,772 m² in total. The whole Site is geographically sloping down to the eastern lagoon, which is shallow and almost flat, and comparatively many trees grow thick therein, including large trees called Malmal with a diameter of several 10 meters long. The facilities layout plan of the Project will utilize the said geographical slope and avoid deforesting the existing larger trees.

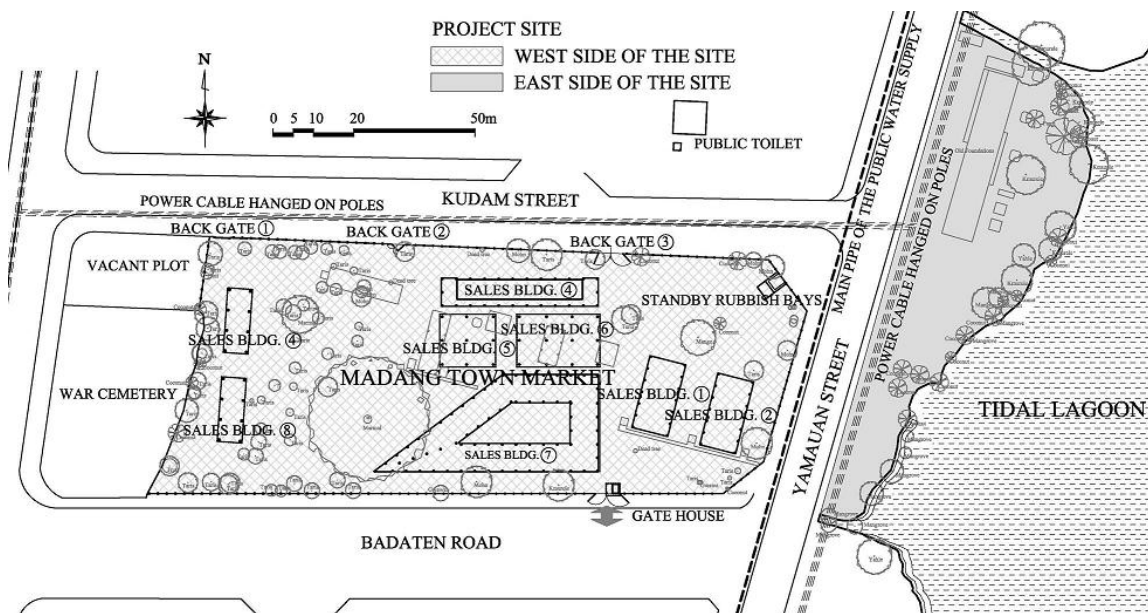


Figure 2-2 Current Madang Town Market and Project Site

It is significant to incorporate traffic flows for users into the facilities layout plan. Under the present situation, most of users are centralized into Main Gate at the south side of the Site for entry. The width of the road at the south side is 20m or wider, which allows cars to park, and due to the position where the existing Market is located within the whole Madang Town, it is assumed that the current location of Main Gate was deemed the most accessible point for users. Main Gate functions as the access to the Market for both retailers and customers, and a great number of goods are unloaded from many trucks on the road alongside. Constant flows of people and products produce the extremely congested situation. Since the said unloading work is performed beyond the fence at the Market, it is presently excluded from the supervision of the Market operation body. Unloading Space is planned to be secured on the premises by the Papua New Guinea side and will be under the relevant supervision after the implementation of

the Project. For conformity with the said situation and solutions for the issues, access to the Market should be separate for products/retailers and customers, and the layout should be practically in line with the relevant facilities.

Zoning by product is helpful for customers who visit markets, but it is not particularly applied to the existing Madang Town Market. It will be convenient for customers when they visit the Market if appropriate zoning produce a traffic flow that leads them to buy lightweight vegetables first and heavyweight products including root vegetables last or before exit. However, since many retailers bring several different products including vegetables, root vegetables and fruits, “Soft Zoning” is practical for the mixture of those products. In reference with sales methods by product, it is appropriate to sell vegetables mainly on the table and root vegetables on the floor. Table 2-12 below shows the zoning plan of the Madang Town Market.

Table 2-12 Madang Town Market Zoning Plan

| Zoning | Product | Sales method |
|--------|---|--------------|
| Zone ① | Vegetables/fruits: Leaf vegetables, tomatoes, cabbages, rambutans, etc. | Table sales |
| Zone ② | Root vegetables/fruits: tubers, coconuts, bananas, peanuts, etc. | Floor sales |
| Zone ③ | Crafts : handicrafts, bags, clothes, etc. | Table sales |
| Zone ④ | Fresh fish, etc. | Box sales |

Based on the preceding plan, the framework of the facilities layout plan will be as follows:

- ① As shown in Table 2-12 above, the target products for Zone ① ~ ③ are sold within the existing Madang Town Market, while fresh fish, etc. for Zone ④ is sold outside. Zone ① ~ ③ (Market Buildings) will be located at the west side and Zone ④ (Fresh Fish Retail Building) at the east side of the Site, because the lagoon is the gateway for fresh fish and its retailers. In addition, the Ice Sales Facilities are located proximately to Fresh Fish Retail Building at the east side.
- ② The layout of Market Buildings will be developed in order to avoid existing trees in view of zoning and producing appropriate traffic flows for buying activities.
- ③ Main Gate will be located around the existing cash collection area and dedicated to customers. Lagoon Gate will be located on Yamauan Road at the west side of the Site, in view of access between west and east sides of the Site.
- ④ The road layout in the Site will be adequately developed, and Unloading Space and Gatehouse for retailers will be located therewith.
- ⑤ Market Toilets will be located the furthest west possible at the west side of the Site where the land is geographically elevated.
- ⑥ Administration Building will be located at the appropriate position to the traffic flow between facilities at the west side of the Site.

- ⑦ To reflect the natural conditions (i.e. strong sunlight and abundant rainfall), Passageways will be provided to connect facilities in the Market, if appropriate.
- ⑧ Car Park for administrative staff will be located near Administration Building and for the Market will be in vacant space at the east side of the Site.
- ⑨ The areas surround the preserved trees will be appropriately districted in order to be open to further placement of greenways, instead of pavement.

Figure 2-3 shows the zoning layout plan of the Madang Town.

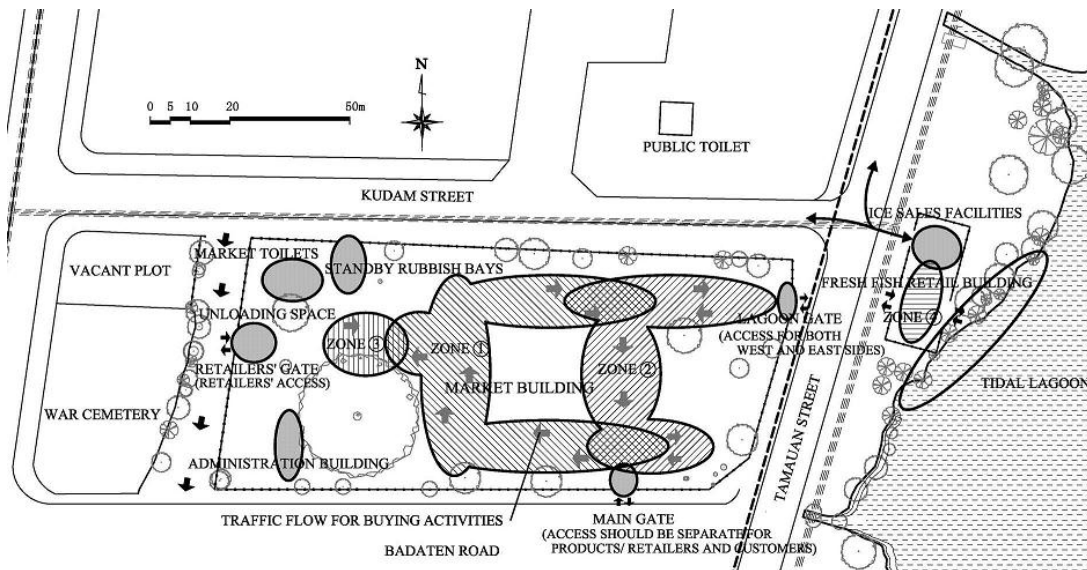


Figure 2-3 Madang Town Market Zoning Plan

2-2-2-2 Architectural Plan

(1) Floor plan

1) Market Buildings

The layout and floor plan of Market facilities will be initiated while preserving larger trees, in line with Site and Facilities Layout Plan. A middle corridor type is considered appropriate for Passageways in order to produce a clear traffic flow for buying activities in the Market and utilize the natural sunlight and wind for interior lighting, air conditioning and ventilation. Where all retail sections are combined into one larger area, the less benefits from the sunlight and natural ventilation would be awarded, compared with the said middle corridor type, and the more cost-consuming would be the maintenance due to electric lighting and ventilation. It should be noted that key sales buildings at the existing Madang Town Market are designed with cloister architecture. Therefore, in relation with Market Buildings, the Project will adopt the middle corridor type and the architecture only with roofs and columns to make the facilities open, and enable to accommodate approximately 523 retailers as described in 2-1-2 (1).

It is the one of goals of the Project to achieve sanitation improvement for handling fresh food, and it is highly necessary to provide tables for sales. However, the necessity of sales tables is determined subject to product types, and for some products (e.g. root vegetables, etc.), as listed in Zone ② of Table 2-12, it is more appropriate to be displayed on the floor covered with a sheet or equivalent (currently most of those products are displayed directly on the ground). As a result, sales tables will not to be provided in Zone ②,

During the field survey, hearings for retailers (626 retailers at the peak) were conducted with regard to preferred sales methods as well as the size calculation of retail section. Table 2-13 shows the results from those hearings subject to 582 retailers, out of 626, who sell fresh food including vegetables, fruits and root vegetables and are applicable to Zone ① and ②. 359 retailers preferred a table sales section, while 223 retailers preferred a floor sales section.

Table 2-13 Results from Sales Method Preference Research of Retailers for Food

| Sales section | Sales method | Product | No. of Retailers | Preference | | Notes |
|-----------------------------------|---------------------|---|------------------|------------|-------|--------------------|
| | | | | Table | Floor | |
| Sales building ① | Table sales section | Vegetables, fruits, etc. | 14 | 14 | 0 | |
| | Floor sales section | Vegetables, root vegetables, fruits, etc. | 10 | 6 | 4 | |
| Sales building ② | Floor sales section | Vegetables, root vegetables, fruits, etc. | 9 | 0 | 9 | |
| Sales building ⑤ | Floor sales section | Vegetables, root vegetables, fruits, etc. | 38 | 11 | 27 | |
| Sales building ⑥ | Floor sales section | Peanuts, fruits, etc. | 61 | 26 | 35 | |
| Sales building ⑦ | Table sales section | Vegetables, fruits, etc. | 83 | 83 | 0 | |
| | Floor sales section | Peanuts, root vegetables, fruits, etc. | 33 | 4 | 29 | |
| Northeast open-air retail section | Table sales section | Peanuts, frozen dessert, groceries, etc. | 29 | 29 | 0 | Plastic bags, etc. |
| | Floor sales section | Root vegetables, vegetables, etc. | 39 | 39 | 0 | |
| Southeast open-air retail section | Table sales section | Peanuts, frozen dessert, groceries, etc. | 5 | 5 | 0 | |
| | Floor sales section | Root vegetables, vegetables, etc. | 21 | 5 | 16 | |
| Front side of | Floor sales | Root vegetables, | 18 | 11 | 7 | |

| | | | | | | |
|-------------------------------|---------------------|---|-----|-----|-----|--------------------|
| building | section | vegetables, etc. | | | | |
| South open-air retail section | Floor sales section | Coconuts, fruits, etc. | 72 | 49 | 23 | |
| West open-air retail section | Table sales section | Groceries, eggs, frozen dessert, etc. | 27 | 27 | 0 | Plastic bags, soap |
| | Floor sales section | Vegetables, root vegetables, fruits, etc. | 123 | 50 | 73 | |
| Total | | | 582 | 359 | 223 | |

On the other hand, all of the remaining 44 retailers, who sell crafts and are applicable to Zone ③ prefer table sales section as shown in Table 2-14 below.

Table 2-14 Results from Sales Method Preference Research of Retailers for Crafts etc.

| Sales section | Sales method | Product | No. of Retailers | Preference | | Notes |
|------------------------------|---------------------|-------------------------------|------------------|------------|-------|-------------------------|
| | | | | Table | Floor | |
| West open-air retail section | Floor sales section | Clothes, crafts, etc. | 24 | 24 | 0 | 7 using clothes-hangers |
| | Table sales section | Plastic baskets, crafts, etc. | 2 | 2 | 0 | |
| | Clothes-hanger | Clothes | 6 | 6 | 0 | |
| Sales buildings ④ | Table sales section | Crafts, etc. | 7 | 7 | 0 | |
| | Clothes-hanger | Clothes, crafts, etc. | 4 | 4 | 0 | |
| Sales buildings ⑧ | Table sales section | Crafts, etc. | 1 | 1 | 0 | |
| | | | 44 | 44 | 0 | |

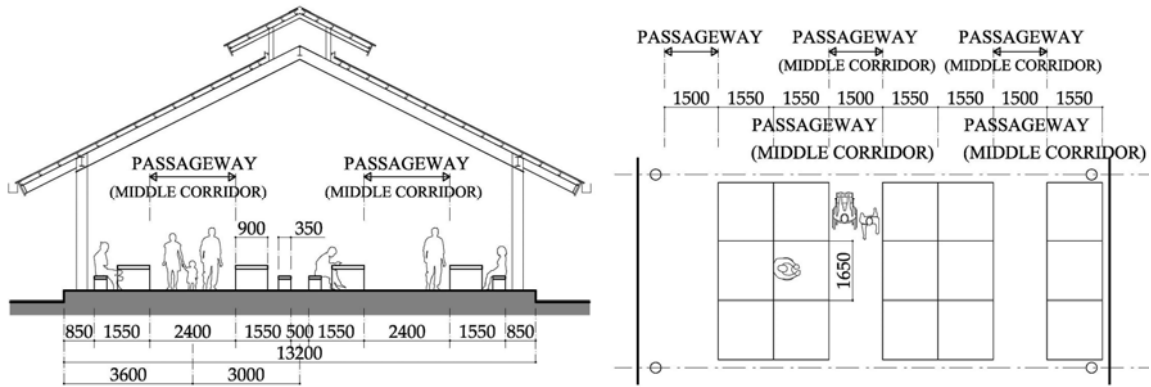
Based on the results shown in Table 2-13 and Table 2-14 (i.e. structure ratio of retailers and preference ratio of sales methods), scales are calculated for sales sections by Zone and the values are shown in Table 2-15 below. The value for each scale was calculated by multiplying 523, which is the assumed number of retailers for size calculation, by the structure ratio of retailers by Zone when the survey was conducted.

Table 2-15 Values from Scale Calculation of Retail Section by Zone in Market Buildings

| Sales method | Zone | Product | No. of retailers | Ratio | No. of retailers assumed for scale calculation | |
|---------------------|--------|---|------------------|-------|--|-----|
| Table sales section | Zone ① | Vegetables, fruits, etc. | 359 | 57% | 298 | 335 |
| | Zone ③ | Clothes, crafts, etc. | 44 | 7% | 37 | |
| Floor sales section | Zone ② | Vegetables, root vegetables, fruits, etc. | 223 | 36% | 188 | 188 |
| | | | 626 | 100% | 523 | 523 |

The results from size calculation for sales sections show that the average area per retailer of sales table in table sales sections was 1.28 m² and that of individual retail unit in floor sales sections is 2.55 m². In reference with these values, the area of sales table per unit is set to approximately 1 m², in line with the sales building ⑦ of the existing Market, and the dimensions will be 1.12m in width x 0.9m in depth. The area of individual retail unit in table sales sections will be approximately 1.74 m², including a chair. On the other hand, the area of individual retail unit in floor sales sections is set to approximately 2.55 m² equivalent to the present size, and the dimensions will be 1.65m in width x 1.55m in depth.

The planning of Market Buildings should incorporate the shared areas including Passageway that produces a traffic flow for customers. In the sales building ⑦, a key facility of the existing Market, chairs and tables are fixed, and the passageway runs in the middle of the table sales section and its width is 2,400 mm, which is practical. Accordingly, the width of Passageway in the new Market will be 2,400 mm and two middle-corridor-type Passageways will be placed in parallel. On the other hand, in the floor sales section of the existing Madang Town Market, the widths of passageways vary and some are too narrow to facilitate buying activities due to unclear zoning of sales sections. It is deemed necessary that zoning of sales sections and Passageways should be explicitly planned, also from the viewpoint of fair usage of the Market. Therefore, the layout should be designed to secure Passageways of at least 1,500 mm in width in the floor sales section for the accessibility of customers with wheelchairs. 1,500 mm is considered adequate for one passer and one wheelchair to pass side by side.



Width of passageway in table sales section Width of passageway in floor sales section

Figure 2-4 Width of Passageway by Sale Section

In addition to the viewpoints as aforementioned, Figure 2-5 shows the floor plan of Market Buildings, incorporating the Site conditions, positions of existing trees, traffic flows for buying activities, etc., while Table 2-16 below shows the details of floor areas and the numbers of individual sales units. This floor plan is developed with two basic modules (one is $1 \text{ m}^2 \times 4$ units for table sales sections and the other one is $2.55 \text{ m}^2 \times 3$ units for floor sales sections) as shown in Figure 2-5, aligned with the positions of both Passageways in sales sections and columns for roofs, as shown in Figure 2-4, and is intended to prevent space inefficiency. Market Buildings consist of six buildings from ① to ⑥ and adequate space is allocated into those six buildings based on the Zoning plan in order to accommodate the total numbers of retail units shown in Table 2-15.

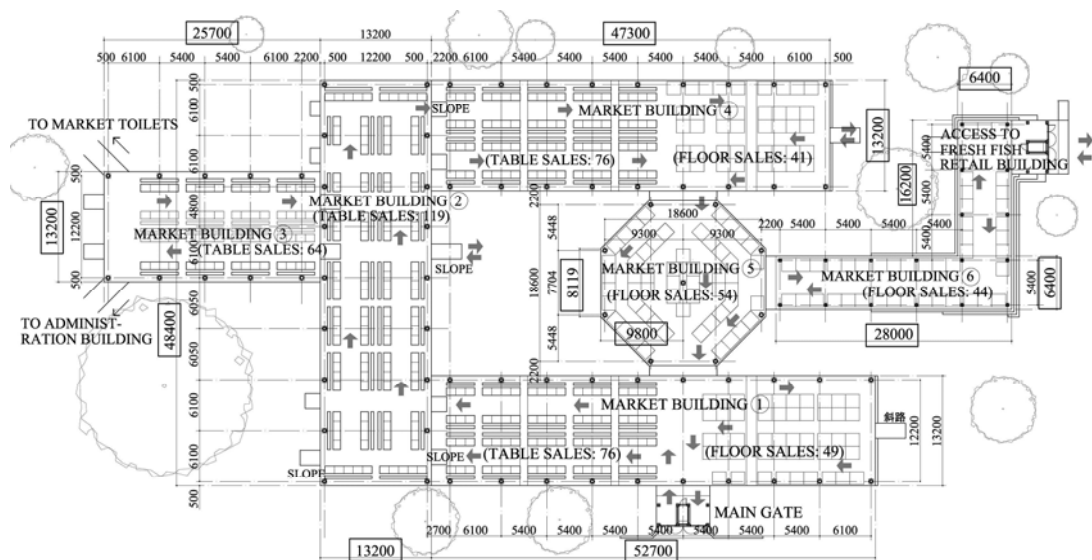


Figure 2-5 Floor Plans of Market Buildings

Table 2-16 Areas of Sales Units and Floor Area by Market Building

| Market Building | Floor area (m ²) | Formula (m x m) | No. of table sales section | No. of floor sales section | No. of sales section per floor area of 100m ² (No. of sales section ÷ floor area x 100) |
|-----------------|------------------------------|---------------------|----------------------------|----------------------------|--|
| ① | 695.64 | 52.7 x 13.2 | 76 | 49 | 18.0 |
| ② | 638.88 | 13.2 x 48.4 | 119 | 0 | 18.6 |
| ③ | 339.24 | 25.7 x 13.2 | 64 | 0 | 18.9 |
| ④ | 624.36 | 47.3 x 13.2 | 76 | 41 | 18.7 |
| ⑤ | 318.26 | 8.119 x 9.8 x 4 | 0 | 54 | 17.0 |
| ⑥ | 282.88 | (28.0 + 16.2) x 6.4 | 0 | 44 | 15.6 |
| Total | 2,899.26 | — | 335 | 188 | Average: 17.9 |

Table 2-16 shows the No. of sales section per floor area of 100m² of each Market Building, and the average across Market Buildings is 17.9. On the other hand, in the sales building ⑦, a key sales building of the existing Madang Town Market, 83 retailers are allocated in the table sales section and 33 retailers in the floor sales section, 116 in total, even during peak hours, this value is 15.6 (= 116 sales sections ÷ 743m² x 100). Therefore, the space efficiency is expected to be enhanced in the new Market.

2) Fresh Fish Retail Building/Ice Sales Facilities

From the perspectives of food freshness maintenance and sanitation, insulated fish boxes are used for fresh fish retail sales. Therefore, Fresh Fish Retail Building will be provided with boards that are laid on the floor to place insulated fish boxes on the top of them (box sales section), and the structure will be widely open only with roofs and columns, similar to that of Market Buildings. A wide variety of insulated fish boxes are currently used for fresh fish retail sales at the lagoon shore and dimensions of the largest box are 450 mm in width x 1,050 mm in length. Therefore, the depth of box sale sections will be 1,100 mm and Passageway under the roof for customers will be located at its front side. In addition, drainage of 100 mm wide will be introduced for melting water flowed out of those boxes. As described in 2-1-2 (3), the number of insulated fish boxes is 30. Figure 2-6 below shows the layout to secure space for the sales units with insulated fish boxes and Passageway. The fresh fish retailers sell products, presently backed by the lagoon and facing open space towards the land. Unlike Market Buildings, Passageway does not run in between box sales units, and the familiar layout with users is to place box sales units, back to back with one another, as shown in Figure 2-6, which allows retailers to sell products facing open space. For its floor plan, as well as that of Market Buildings, aligned with positions of roofs and its supporting columns, 4 units x 900mm in width will be reviewed as a basic module for box sales sections and columns will be placed in between box sales sections without causing customers any inefficiency for their buying activities.

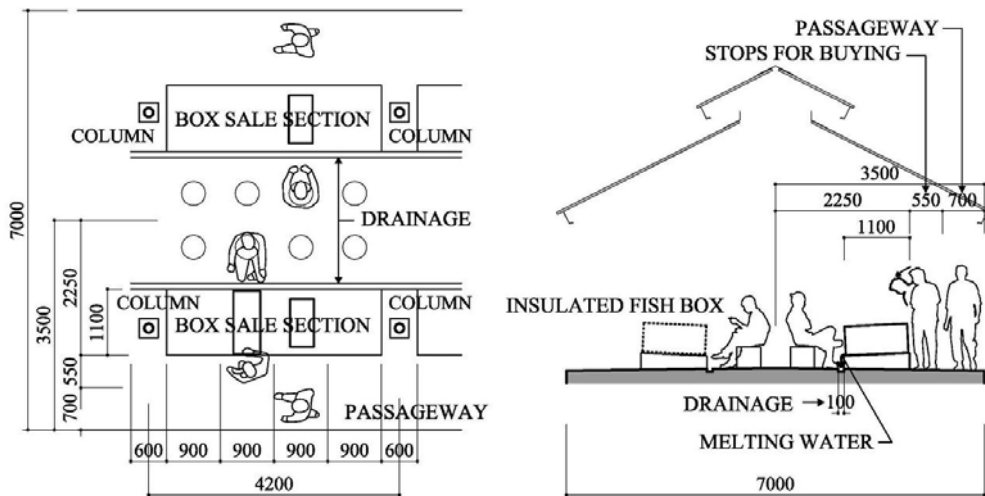


Figure 2-6 Positions of Retail Sales Unit and Passageway

Because the main purpose of Ice Sales Facilities is to supply ice to fresh fish retailers, they will be located proximate to Fresh Fish Retail Building. 1 unit of chest freezer with flat dimensions of approximately 800 mm in width x 1,800 mm will reside in Ice Sale Room to store ice blocks and to sell them to fresh fish retailers. In addition, as an ice block is crashed by an ice crusher and the pieces are weighed for sales, certain space should be incorporated to accommodate 1 unit each of ice crusher and scale as well as space to perform ice crashing service. 1 unit of sink will also be provided therewith for tap water and fresh fish processing and slicing. With the consideration of the said space, the floor plan will be shown in Figure 2-7 below.

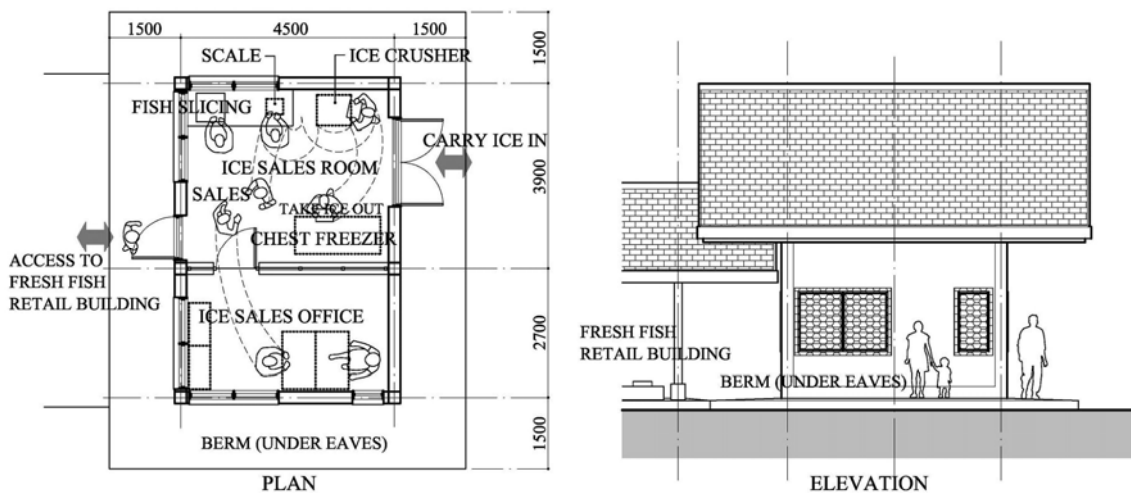


Figure 2-7 Floor Plans for Ice Storage/Sales Facilities

The length between columns of Ice Sales Office next to Ice Sales Room is planned to be 4.5m, which is consistent with the length of Ice Sales Room, in order to fit within the relevant area criteria that are between 12 and 14 m² calculated in Table 2-9. Under the eaves over Ice Sales Facilities, a berm (passage under eaves) will be placed and assumed to function as a shelter for

those users who visit the areas surrounding Seawall and other facilities in case of sudden showers.

Figure 2-8 and Table 2-17 below show the overall floor plan and the floor areas of Fresh Fish Retail Building and Ice Sales Facilities, respectively.

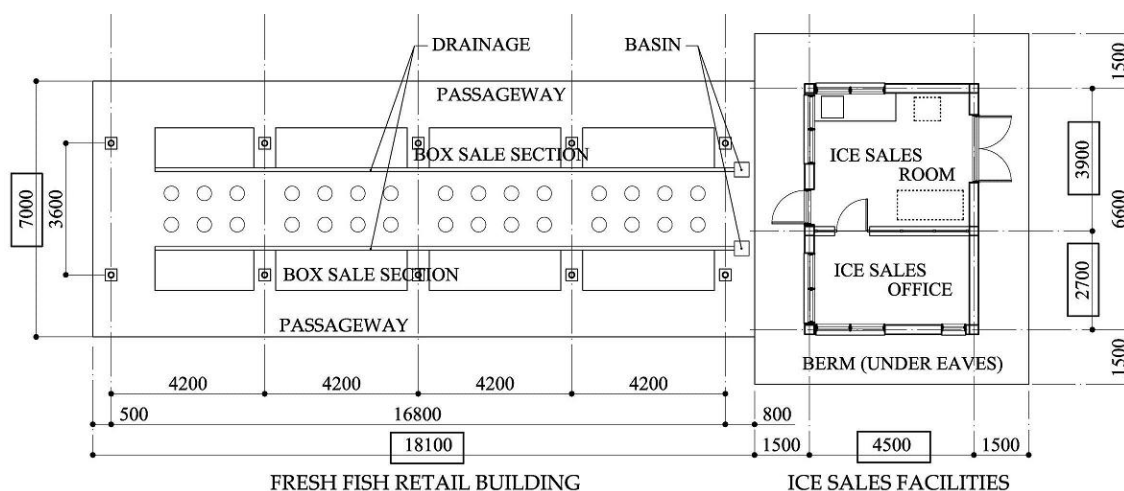


Figure 2-8 Overall Floor Plans of Fresh Fish Retail Building and Ice Sales Facilities

Table 2-17 Floor Areas of Fresh Fish Retail Building and Ice Sales Facilities

| Facility | Room Name | Floor area (m ²) | Formula (m x m) |
|------------------------------|------------------|------------------------------|-----------------|
| Fresh Fish Retail Building | — | 126.7 | 18.1 x 7.0 |
| Ice Storage/Sales Facilities | Ice Sales Room | 17.55 | 4.5 x 3.9 |
| | Ice Sales Office | 12.15 | 4.5 x 2.7 |
| Total | | 29.70 | — |

The area of the berm for Ice Storage/Sales Facilities (passage under eaves) will be 42.3m² (7.5 m x 9.6m - 29.7m²).

3) Administration Building

Administration Building is a facility where administrative services are conducted for operation of the Madang Town Market. The dimensions between columns for Market Supervisor Office and Accountant Office and Administrative Staff Room will be 5.4m, resulting from review of the layout based on the area criteria calculated in Table 2-9, and the floor plan will be designed

as follows:

- ① Exterior Connecting Passageway will be placed to connect Administration Building and Market Buildings that allows the Market users to move under roof and avoid rain. The width of 1.5m is secured as the effective width in view of accessibility for users with wheelchairs.
- ② Exterior Connecting Passageway will be located in front and outside of Administration Building, and lead staff and the Market users to Administration Building. Entrance to each Office or Room in Administration Building will be provided along with it, except for Accountant Office from a perspective of security, where the services are apt to handle cash and direct access from the outside is not appropriate.
- ③ Access exclusive to administrative staff will be provided at the road side on the premises and they can travel between offices through Hallway. Pantry will be placed at a corner of Hallway for the staff and guests.
- ④ Market Supervisor Office will be located close to Market Buildings and Retailers' Gates in order to provide Market Supervisor better view of the situation in the Market.
- ⑤ As indicated in 2-1-2 (6), Retailers' Storage will be located aligned with the Administration Building.
- ⑥ Storage Room for small facility supplies (one-wheel cart, cleaning kit including brooms, etc.) will be provided.
- ⑦ Multifunctional Space will be located at the outside of Administration Building and under its roof. A wall will be built behind it and 2 units of tables of 1 m² will be provided, for the purpose of displaying local specialties, and they will face Market Buildings, where users gather.

The floor plan and floor areas of Administration Building are shown in Figure 2-9 and Table 2-18 respectively.

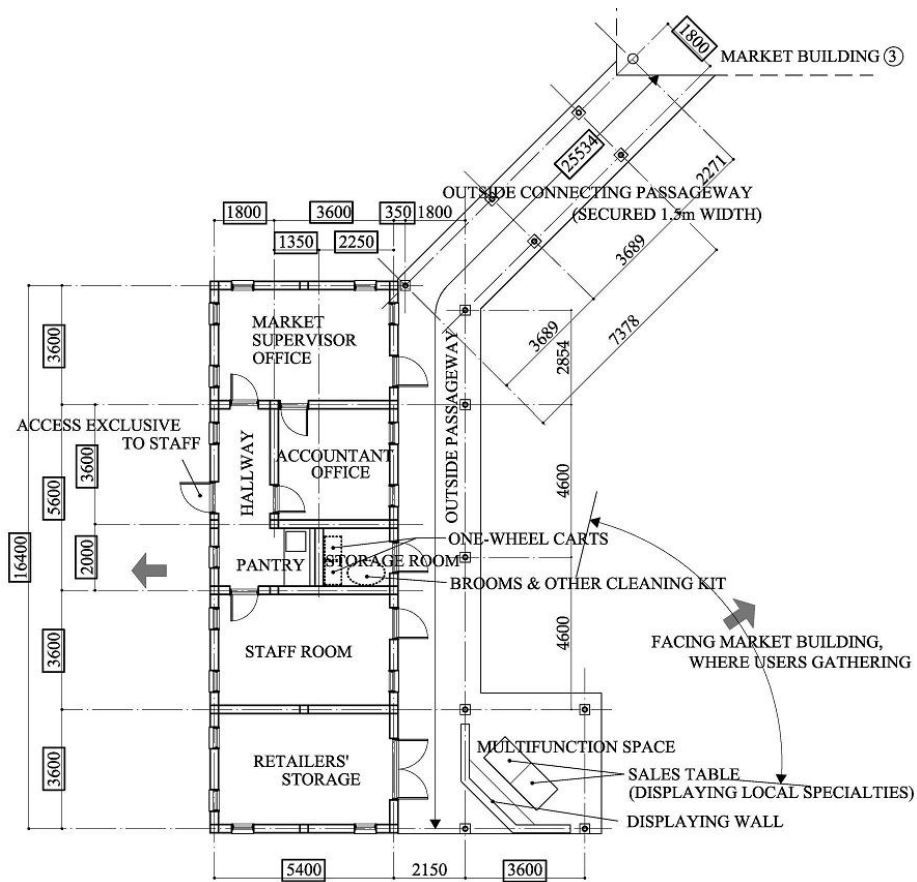


Figure 2-9 Floor Plan of Administration Building

Table 2-18 Floor Areas of Administration Building

| Office/Room | Floor area (m ²) | Formula |
|--------------------------------|------------------------------|---------------------------|
| Market Supervisor Office | 19.44 | 5.4 x 3.6 |
| Accountant Office | 12.96 | 3.6 x 3.6 |
| Staff Room | 19.44 | 5.4 x 3.6 |
| Storage Room | 4.50 | 2.25 x 2.0 |
| Hallway/Pantry | 12.78 | 1.8 x 5.6 + 1.35 x 2.0 |
| Retailers' Storage | 19.44 | 5.4 x 3.6 |
| Multifunction Space | 12.96 | 3.6 x 3.6 |
| Exterior Connecting Passageway | 51.69 | 1.8 x 25.53 + 0.35 x 16.4 |
| Total | 153.21 | |

4) Market Toilets

Based on the size calculated for Market Toilets as described in 2-1-2 (7), the plan will be as

follows:

- ① Exterior Connecting Passageway will be provided to connect Market Toilets and Market Buildings that allow the Market users to move under roof and avoid rain. The width of 1.5m is secured as the effective width in view of accessibility for users with wheelchairs.
- ② The interior layout will allocate individual booths for stools, showers and cleaning sinks in Gentlemen Toilets and Women Toilets in accordance with the numbers of sanitary fixtures as shown in Table 2-11, and space will be secured to allow users to move behind even when hand basins and urinals are occupied.
- ③ Admission Counter will be located at the entrance of Gentlemen/Women Toilets to assist a fee collector in collecting usage fees from users and the form will be one rectangular unit, to function as a counter and entrances for Gentlemen/Women Toilets.
- ④ Accessible Toilet will be designed, referring to Compilation of Building Plans by Architectural Institute of Japan and be built in a separate building in view of appropriate structure for accessibility.
- ⑤ Administrative Staff Toilet will be located next to Administration Building and at the side of the separate building where Accessible Toilet is built in, and the dimensions between columns will be consistent with those in Accessible Toilets
- ⑥ Water Station with taps and a sink will be attached to the preceding separate building in order to supply water to retailers. It is efficient to locate it next to Market Toilets for benefits from centralization of fee collection services and plumbing and sanitary equipment devices. It will be structured only with columns and roof without any wall for easier access.

The floor plan and floor areas of Market Toilets are shown in Figure 2-10 and Table 2-19 respectively.

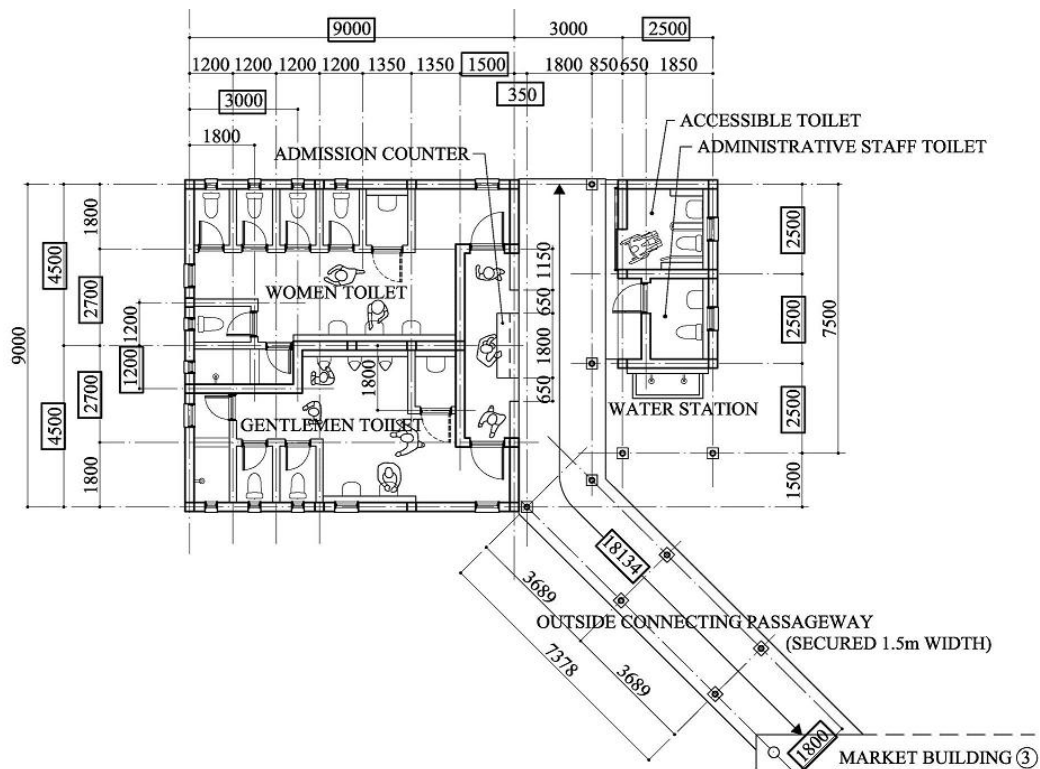


Figure 2-10 Floor Plans of Market Toilets

Table 2-19 Floor Areas of Market Toilets

| Room | Floor area (m ²) | Formula (m x m) |
|--------------------------------|------------------------------|--|
| Women Toilets | 40.05 | $9.0 \times 4.5 + 3.0 \times 1.2 - 1.5 \times 2.7$ |
| Gentlemen Toilets | 32.85 | $9.0 \times 4.5 - 3.0 \times 1.2 - 1.5 \times 2.7$ |
| Admission Counter | 8.10 | 1.5×5.4 |
| Accessible Toilet | 6.25 | 2.5×2.5 |
| Administrative Staff Toilet | 6.25 | 2.5×2.5 |
| Water Station | 6.25 | 2.5×2.5 |
| Exterior Connecting passageway | 35.78 | $1.8 \times 18.13 + 0.35 \times 9.0$ |
| Total | 135.53 | — |

5) Gatehouse and Unloading space

Under the present situation at the existing Madang Town Market, the area surrounding Main Gate is always congested with retailers to pay admission fees and customers for entry. Due to this congestion, other entrances are located than Main Gate and this leads to failure in fee collection from retailers. The area is also used by retailers to unload products from trucks and line up for entry, which aggravates the congestion. The sidewalk around Main Gate is open-air and the environment becomes inconvenient when it rains. Reviews on those issues identify the

following factors to be incorporated into the planning of Gatehouse and Unloading Space.

- ① A traffic flow of retailers for unloading and entry will be isolated from that of customers for entry, and Road and Sidewalk will be constructed on the premises in order to enable retailers to park their trucks and perform unloading work in the Market, in place of the public road.
- ② Retailers' Gate will be located close to Unloading Space and Sidewalk for unloading can also function as Waiting Area for retailers until the Market opens. Sidewalk will be built with a simple structured roof as shown in Figure 2-11 below.

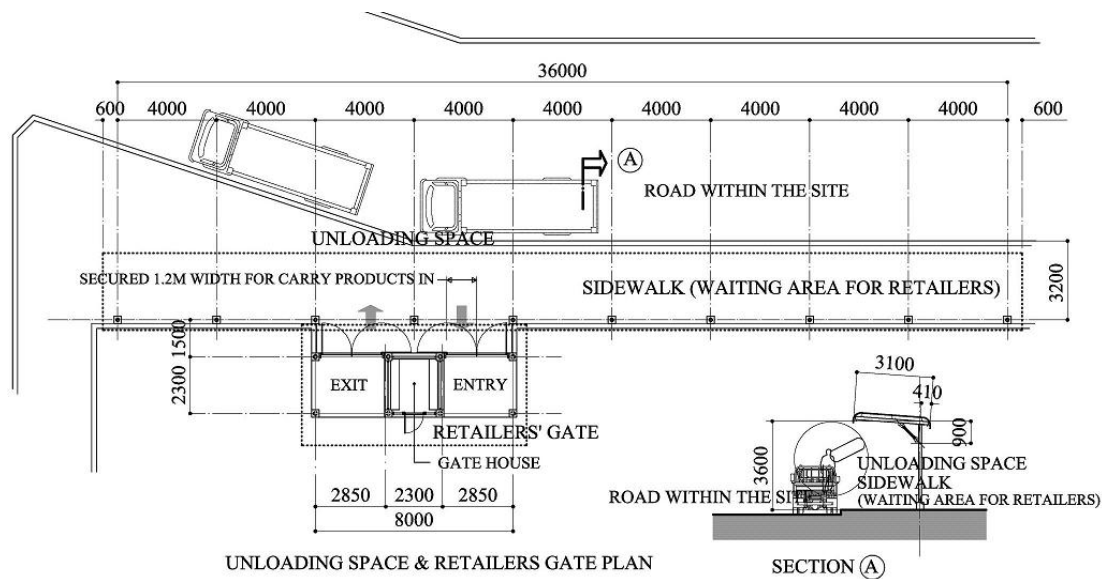


Figure 2-11 Plans for Unloading Space and Retailers' Gate

- ③ Other than Retailers' Gate, new Main Gate will be located at the existing fee collection facility as a gateway for customers, separately from retailers' access.
- ④ Lagoon Gate will be located at the northeast end of the west side of the Site for retailers landing from the lagoon as well as easier access to the east side of the Site.
- ⑤ Gatehouse will be located in the center between two passages that are one-way for entry and exit respectively in order to prevent congestion with users.
- ⑥ The appearance of Gatehouse roof will be designed to be more noticeable than other facilities in order to mark it as the entrance of the Market.

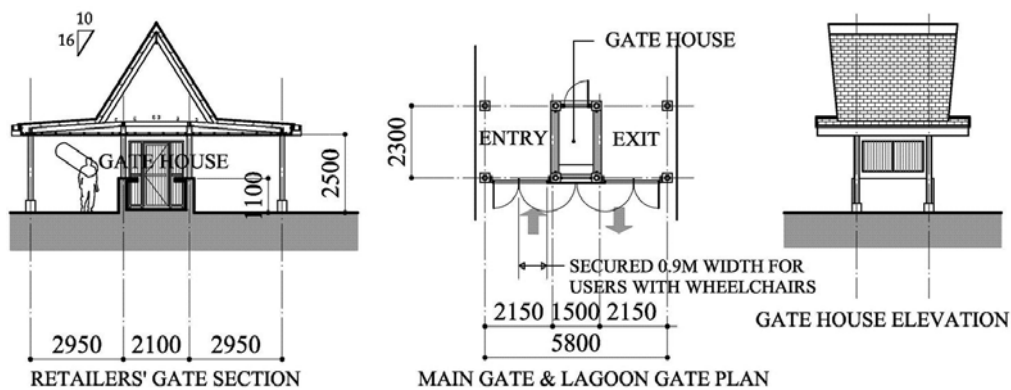


Figure 2-12 Gatehouse Plan

6) Standby Rubbish Bays

The daily quantity of rubbish at the Madang Town Market is about 10 ~ 12m³. The capacity of the existing standby rubbish bays is approximately 6m³ and, as a result, the exceeding rubbish is piled up at certain places in the Market. This situation causes unhygienic environments in the Market as well as inefficiency when conveying the rubbish out of the Market due to dispersed rubbish collection. The existing standby rubbish bays are elevated to approximately 1m higher than the floor in order to facilitate to throw rubbish directly into a truck. This form is appropriate but may cause danger in rubbish disposal since the slope between the ground and the floors of the standby rubbish bays are steep and slippery. These existing issues will be noted to plan new Standby Rubbish Bays and the following items will be deliberated.

- ① The capacity of Standby Rubbish Bays will be approximately 12 ~ 13m³ to accommodate the current daily quantity of the rubbish at the Market.
- ② Following the existing standby rubbish bays, the floors of new Standby Rubbish Bays will be elevated to 1.0 m higher than the ground and the slope will be inclined appropriately to carry the rubbish to the bay safely.
- ③ Parking space for a rubbish truck will be secured to enable to cast away rubbish on the premises.
- ④ A wall as high as Standby Rubbish Bays will be built, surrounding the whole area, in order to prevent rubbish from being scattered.
- ⑤ The said parking space for a rubbish truck will also be used for a sanitary (vacuum) truck to maintain a septic tank and an infiltration inlet, and a gate for the access will be built.

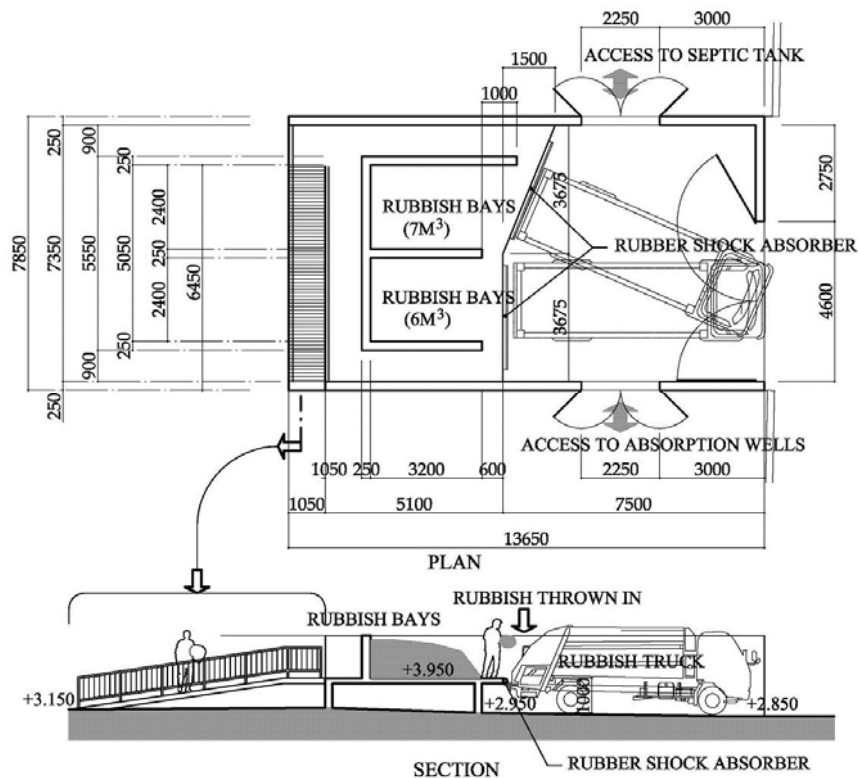


Figure 2-13 Standby Rubbish Bays Plan

7) Exterior Facilities

The geographical feature forms a flat land that shallowly slopes down from both west and east sides of the Site to the lagoon. At the west side of the Site, the difference of the ground levels between east and west ends is approximately 1m. The roads surrounding the Site are similarly sloping down, and any land development is not required to change the present geographical conditions. The framework of Exterior Facilities will incorporate the following factors:

- ① The natural landscape should be well preserved by certain methods to avoid cutting the existing trees and provide greenways around the larger trees, etc.
- ② Interlocking Pavement will primarily be applied, except for greenways and facilities areas.
- ③ Drainage will be located appropriately to ensure that rainwater flows into the lagoon consistent with the natural slope of the present geographical feature of the Project Site,
- ④ The form and finish height, etc. of Exterior Facilities will be designed to prevent rainwater from flooding into the Project Site. However, the geographical feature at the east side of the Site partially impedes the prevention of rainwater from the shoulder of the proximate road.

Figure 2-14 shows the plan of Exterior Facilities.

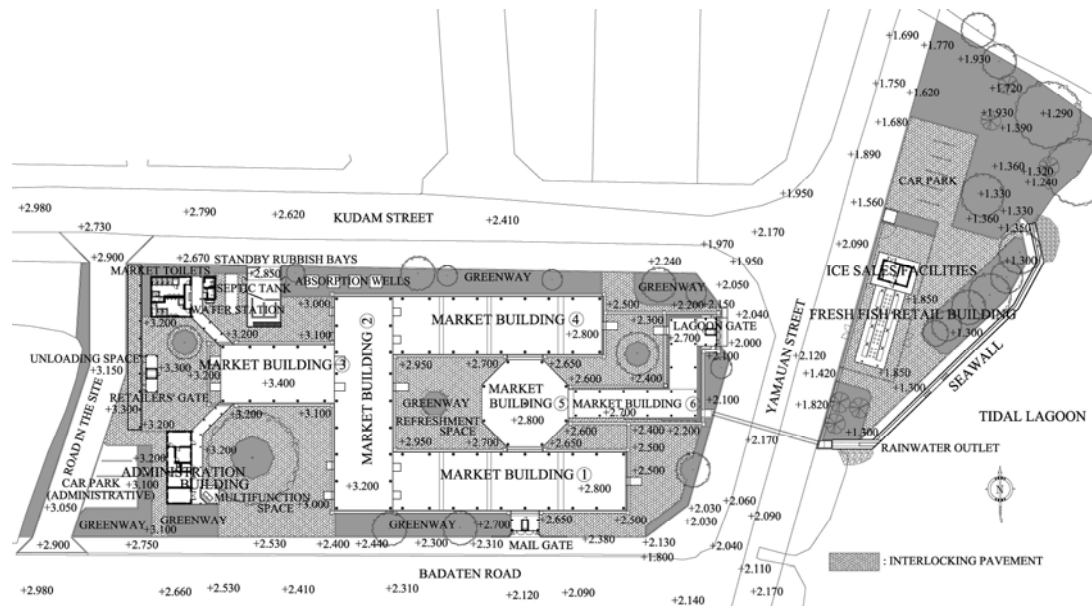


Figure 2-14 Exterior Facilities Plan

8) Car Park

Car Park is not currently available at the Madang Town Market, but many Market users use PMVs (Public Motor Vehicles) as their transportation and the majority of them are parked on the front road at the south side of the Market only for a short time. That front road also acts as public car park for stores in the surrounding areas. Approximately 60 units are parked on the both sides of the road during the peak hours, and the present environment meets the demand of users including the said tenants. On the other hand, car park is not available for retailers who stay in the Market for a long time. According to the results from the questionnaire conducted during the field survey, 1% of retailers use a private car as their transportation and the number of the vehicles requiring car park for a long time will be calculated to 5 or 6 units ($= 523$ (average number of retailers) $\times 1\%$). Therefore, Car Park with a capacity of 6 units will be constructed at the north side of the lagoon shore in the east side of the Site. With reference to the Market administration, another Car Park with a capacity of 4 units will be constructed close to Administration Building in the Market Site to accommodate vehicles for the chairman of the Market Board, Market Supervisor, administrative and operational use and guest or for any other purpose.

9) Seawall

The east side of the Site in the Project Site directly faces the lagoon and its shoreline is approximately 130m in length. Seawall will be constructed along with this shoreline as follows, based on the basic policy and the scope described in the 2-1-2 (9):

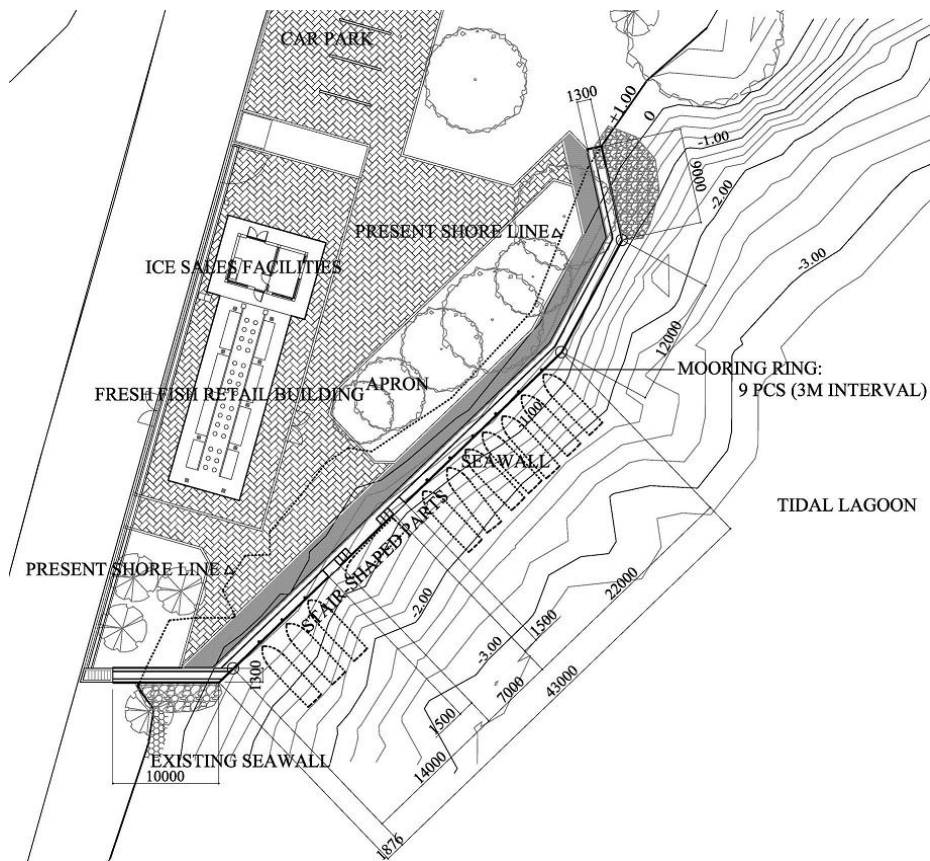


Figure 2-15 Floor Plan of Seawall

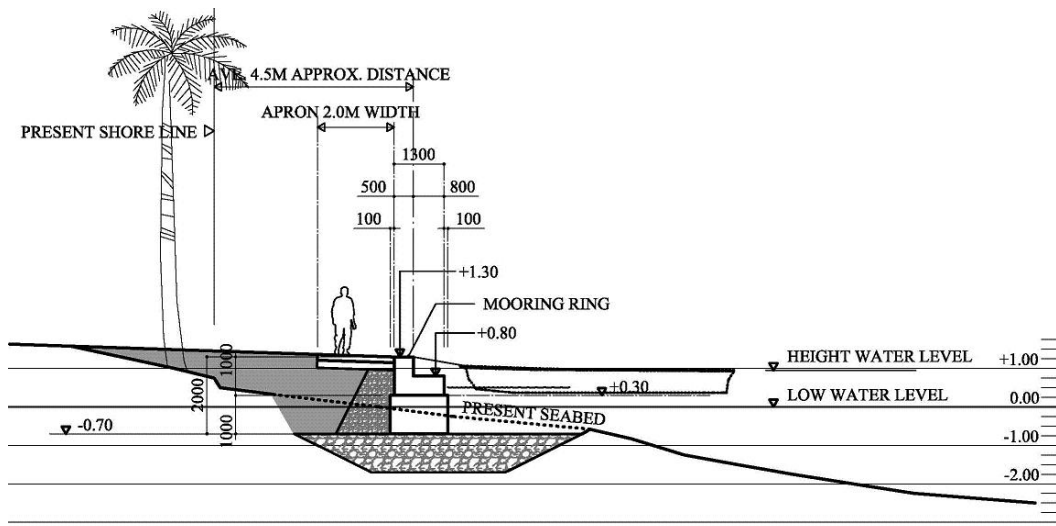


Figure 2-16 Sectional Plan of Seawall

- ① As shown in Figure 2-15, Seawall applicable to construction will be mainly for the area where land facilities are built. From the north side of the existing seawall, it will be extended to approximately 60m in length towards the northeast direction along with contour lines from the seabed and the terminals of Seawall will be connected with land through space between the existing trees.

- ② As shown in Figure 2-16, Seawall will be constructed 4.5 m on average away from the shore in order to preserve the ecology of the existing trees.
- ③ At present, the shoreline of the lagoon provides approach and mooring for banana boats, and mooring rings for banana boats will be placed at the upper parts of Seawall, because the same manner of usage is anticipated after the completion of construction. The number of the mooring rings will be 9, equivalent to the number of the existing trees along Seawall that are currently used for mooring.

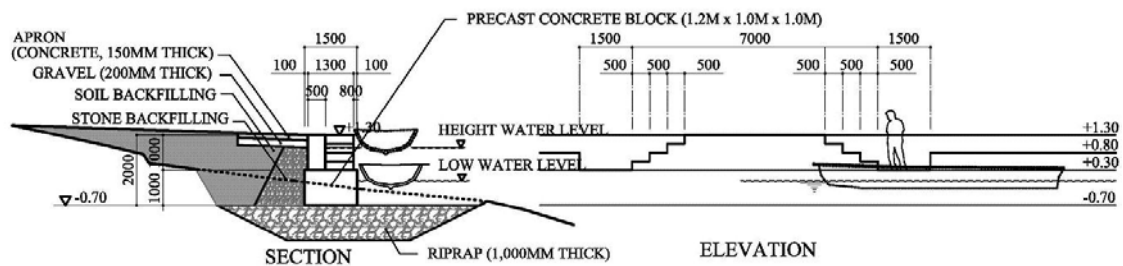


Figure 2-17 Plan of Stair-shaped Parts at Seawall

- ④ Seawall will be structured with placing precast concrete blocks on the ground which is riprapped in the given width and depth and being capped with L-shaped concrete superstructure.
- ⑤ As shown in Figure 2-17, some parts of Seawall will be stair-shaped in order to facilitate approach and landing even during hours when tide is low. As shown in Figure 2-15, the said stair-shaped parts will be positioned in where is close to Fresh Fish Retail Building.
- ⑥ An apron of 2m in width will be allowed to protect the stone backfilling provided behind the embankment of Seawall.

(2) Sectional plan

- ① The finish heights of Exterior Facilities (pavement/foundation) and the floor heights of Facilities will be set aligned with the natural slope of the construction sites. The floor levels of Facilities should be elevated higher than the finish heights of the pavement and the foundation in the surrounding areas in order to prevent rainwater from flooding into Facilities. The floor levels will be designed as shown in Figure 2-18 and Table 2-20, based on the positions of Facilities correlated with the finish heights of the pavement and the foundation. It should be noted that the numeric values of the heights will indicate the heights (in meters) from Permanent Survey Mark applied in Papua New Guinea.

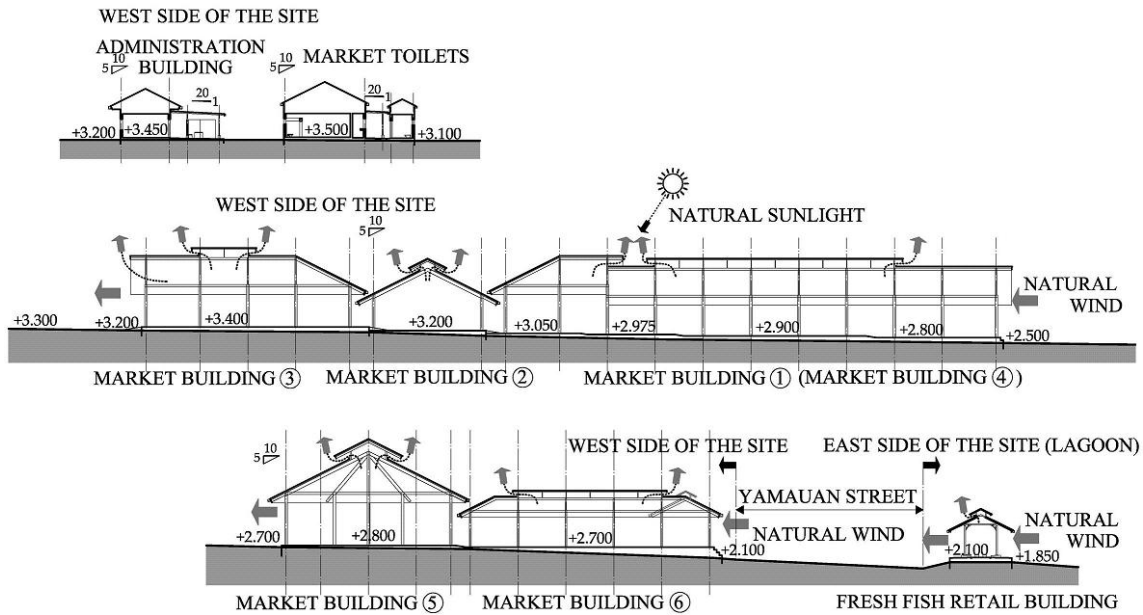


Figure 2-18 Overall Sectional Plans

Table 2-20 Heights of Floors in Market Buildings

| Market Buildings | Finish height of surrounding Exterior Facilities | Floor level |
|------------------------------|--|--------------------|
| Administration Building | + 3.200m | + 3.450m |
| Market Toilets | + 3.200 ~ + 3.100m | + 3.500m |
| Market Building ① | + 2.950 ~ + 2.500m | + 3.050 ~ + 2.800m |
| Market Building ② | + 3.100 ~ + 2.950m | + 3.200m |
| Market Building ③ | + 3.200 ~ + 3.100m | + 3.400m |
| Market Building ④ | + 2.950 ~ + 2.500m | + 3.050 ~ + 2.800m |
| Market Building ⑤ | + 2.700 ~ + 2.600m | + 2.800m |
| Market Building ⑥ | + 2.600 ~ + 2.100m | + 2.700m |
| Fresh Fish Retail Building | + 1.850m | + 2.100m |
| Ice Storage/Sales Facilities | + 1.850m | + 2.200m |

- ② The height up to the eaves of the roof will be approximately 2.5m. The central part of the roof will be elevated higher to prevent radiant heat from being transmitted to the lower part of the building and a monitor roof will be built as a vent on the top of the roof to emit the warm air caused by the radiant heating through natural ventilation.
- ③ The lighting and ventilation in Market Buildings will be provided through the utilization of natural wind and sunlight.

- ④ The eaves of the roofs over Market Buildings will be horizontally overlapped to certain extent in order to enable passers to move under the eaves.
- ⑤ For the preceding ② and ③, there will be certain space between the eaves, which allows for rainwater falling down on windy days, but the advantages will be prioritized and these assumed raindrops should be accepted.
- ⑥ The floors of Market Buildings should be sloping down from its center to the sides for water drainage.
- ⑦ The slopes with 1/12 gradient will be placed to even the gaps between floor levels in Market Buildings to provide access for wheelchairs. In addition, 1,500 mm or wider will be secured for the widths of Passageways in view of accessibility for users with wheelchairs.
- ⑧ Jalousie windows will be applied to let breezes in, and this will result in facilitating the effective air conditioning as well as preventing a rise in human body temperature.
- ⑨ Rooms where require air conditioners will be embedded with insulation materials in its attics in order to enhance insulation effectiveness and prevent the heat from being transmitted from outside for the purpose of power saving.
- ⑩ According to Building Regulation in Papua New Guinea, the height to the ceiling will be 2,700 mm for all Offices in Administration Building and the same height will be applied to Storage and Retailers' Storage. However, the height of 2,400 mm will be applied to Hallway and Pantry in order to install a ventilating duct in the attic.
- ⑪ For Ice Sales Room in Ice Storage/Sales Facilities where fresh fish is expected to be handled, the height to its ceiling will be 3,200 mm compliant with "PNG Standards for Fish & Fishery Products 2009" regulated by National Fishery Authority (NFA), and the same height will be applied to Ice Sales Office.
- ⑫ The floor of Fresh Fish Retail Building should be sloping down from its center to the sides for water drainage. In addition, the height of the board to place insulated fish boxes on will be elevated up to 250 mm from the floor level in order to provide customers clear view of boxes, and it will be inclined to water drainage (toward the center).
- ⑬ For Market Toilets, the height to the ceiling will be 2,700 mm. The height of partitioning walls between toilet booths will be 2,100 mm from the floor level and the upper parts of the walls will be open for the purpose of ventilation.
- ⑭ Vent blocks will be applied partially to the exterior wall of Market Toilets for ventilation by natural breezes.
- ⑮ Small jalousie windows will be applied to all booths respectively in Market Toilets for lighting by the sunlight and ventilation by natural breeze.

(3) Structural plan

1) Bearing capacity of soil for design

Table 2-21 below shows the bearing capacities of the soil for the foundation design.

Table 2-21 Bearing Capacity of Soil for Design

| Site | Long-term bearing capacity of soil for design | Basis |
|-----------|---|---------------------------------------|
| West side | 40kPa (4t/m ²) | Results from geological investigation |
| East side | 40kPa (4t/m ²) | Results from geological investigation |

2) Foundation form

According to the results from the geological investigation, the soil at 2 to 3 meters down from the surface is composed of sandy pebbles and old washed-up coral pieces and they are evenly mixed, and since all Facilities subject to the Project will be a single story building, the foundation level will be around 1m deep from the surface for direct foundation.

3) Structural form

Based on the values of the bearing capacities of the soil for design, it is not appropriate that structures with reinforced concrete, etc. apply to the upper framework, because they are heavily loaded. Since retail market, as a key facility, is planned to be structured only with columns and roofs and the construction sites are located in the shore area, a steel frame structure will apply to the upper parts of Market Buildings and Fresh Fish Retail Building, coated with anti-salt corrosion. The general standards in Papua New Guinea will be applied to the other facilities including the Administration Building and Market Toilets. Table 2-22 below shows the structural form of each Facility.

Table 2-22 Structural Forms of Facilities

| Facility | Foundation | Foundation beam | Floor | Column | Beam | Roof-board |
|---|----------------|-----------------|-------|-------------------------------|-------------|-------------------------------|
| Market Buildings, Fresh Fish Retail Building, Gatehouse | Individual RC* | RC | RC | Steel frame | Steel frame | Steel frame purlin |
| Administration Building, Market Toilets, Ice Storage/Sales Facilities | Continuous RC | | RC | RCB* wall with RC lintel beam | | Steel frame truss with purlin |
| Standby Rubbish Bays | Continuous RC | | RC | RCB wall with RC lintel beam | | - |

*Notes: RC and RCB stand for “reinforced concrete” and “reinforced concrete block” respectively.

4) Design Load

- ① Dead load will be calculated based on finish and structural materials for the Project.
- ② Live load will be specified after the practices of the Project are appropriately evaluated.

5) Applicable materials

- ① The design criteria of concrete compressive strength will be 25 (N/mm²) for key structures and 20 (N/mm²) for others to deliberate seismic resistance and durability for the construction.
- ② Any reinforced concrete and steel frame to satisfy the standards provided in AS (Australia), NZS (New Zealand), ASTM (USA), BS (England) and JIS (Japan) will be acceptable.
- ③ Concrete blocks shall be compliant with “PNGS 1004 – Code of Practice for Reinforced Masonry Structures” provided in Papua New Guinea.

(4) Facility plan

1) Electric facilities

① Power supply and transformation/Transmission cabling

- Power will be supplied from the main public power cable hanged on poles along with Kudam Road at the north part in the west side of the Site.
- An electric pole will be built at the north side of Market Toilets to draw primary power source and buried conduit will be placed to transmit the power to the power distribution board in Administration Building.
- Primary power sourcing and cabling to the power board shall be allocated to Papua New Guinea, while the electric pole and the power board shall be allocated to Japan.

② Lighting equipment

For selection of lighting equipment, any criterion or value of illuminance is not specified in Building Regulation in Papua New Guinea, although the structural regulations are provided for opening parts, etc. in order to utilize sunlight. The lighting equipment in the existing Market is only three fluorescent lights, of which total brightness is 40W, for the security purpose. The Project is not founded on the hypothesis that the facilities are used during night, excluding Administration Building, Administrative Staff Toilet, and Ice Storage/Sales Facilities. Therefore, the lighting equipment will be provided as follows:

- Since power consumption by lighting equipment directly affects the running costs, the design standard of illuminance will be the lowest possible without causing any practical issue. The lighting equipment will be minimal.
- The standard of illuminance for Administration Building and Ice Storage/Sales Facilities will be specified as follows:

| | |
|---|------------------------|
| Market Supervisor Office, Accountant Office, Staff Room | : Approx. 200~300 (1x) |
| Hallway/Pantry | : Approx. 50~100 (1x) |
| Storage, Retailers' Storage | : Approx. 30~50 (1x) |
| Ice Sales Room, Ice Sales Office | : Approx. 200~300 (1x) |
- For other facilities, although no standard of illuminance is provided, the following lighting equipment will be applied:

| | |
|--------------------------|---|
| Market Buildings ①②④⑥ | : 100W or equivalent x 2 units (For security) |
| Market Buildings ③⑤, and | : 75W or equivalent x 1 unit (For security) |

Fresh Fish Retail Building

Market Toilets: : 75W or equivalent x 1 unit (Supplementary lighting for cloudy weather)
Gentlemen/Women

Market Toilets: : 60W or equivalent x 1 unit (Supplementary lighting for cloudy weather)
Accessible toilet

Market Toilets: : 60W or equivalent x 1 unit (Supplementary lighting for cloudy weather and night)
Administrative Staff Toilet

Gatehouse: Admission Booth : 20 to 25W or equivalent x (For security)
and Staff Room 1 unit

- Fluorescent lamps will be used for the interior lighting in the facilities
- The exterior lighting equipment for the security purpose will be provided by placing 250w lights at 4 spots and 2 spots in the west side and east side respectively of the Site.

③ Socket outlet

1 or 2 sockets will be provided in each Office/Room in Administration Building and Ice Storage/Sales Facilities.

④ Others

- Telephone cabling will be conducted in Administrative Staff Room in Administration Building at the west side of the Site, as well as in Ice Storage/Sales Facilities at the east side.
- Any cabling and/or communication device, if required for the telephone cabling, will be covered by Papua New Guinea.
- As all the facilities for the Project are one story and low layer types, the risk of the rolling of the thunder is scarce. Then, lightning arrester equipment will not be provided.

⑤ Emergency power generator

Power outage occasionally occurs due to failure of the thermal power generator, according to the results from hearing for a power company. However, the outage is not frequent or constant and it requires only a short time until a failed generator is switched to the alternative one. In addition, any electric device that is greatly impacted due to the outage is not included in the Project. Therefore, emergency power generator is excluded from the Japanese assistance for this Project

2) Mechanical facilities

① Water supply system

- The main pipe of the public water supply is placed at the west side of Yamauan Road, which divides the Site into two sides, east and west, and the piping from there to a water meter in the Site will be conducted as part of construction by Papua New Guinea and the water supply system from the meter will be established as part of the Japanese assistance for this Project.
- The direct water supply system will be adopted and plumbing will be in place to supply water to the specified water stations. The daily water demand by facility is estimated and

shown in Table 2-23 below.

Table 2-23 Daily Water Demand Estimation

| Daily water usage estimation by item | |
|---|---|
| Toilets: 600 persons x 30ℓ = | 18.00 m ³ |
| Hand basins: 600 persons x 6ℓ = | 3.60 m ³ |
| Showers: 523 persons x 1/30 x 1 time x 12ℓ/min. x 10 min. = | 2.09 m ³ |
| Tap water: 523 persons x 1/10 x 1time x 5ℓ = | 0.26 m ³ |
| <u>Water for administrative staff:</u> | |
| <u>16 persons (Market: 14 persons + Ice Sales: 2 persons) x 20ℓ =</u> | <u>0.32 m³</u> |
| Total | 25 m³ ← 24.27 m³ |

② Sanitation facilities

- Number of sanitary fixtures

| Facility | Room | Fixture type |
|------------------------------|-----------------|--|
| Administration Building | Pantry | 1 unit of water tap, 1 unit of sink |
| Market Toilets | Gentlemen/Women | 3 units of urinals, 9 units of stools, 7 |
| | Toilets | units of hand basins, 2 units of showers |
| Water Station | | 2 units of water taps, 1 unit of sink (on-site construction) |
| Standby Rubbish Bays | Rubbish bays | 1 unit of water tap (with lock and for cleaning) |
| West side of the Site | On the premises | 3 units of water taps (with lock and for cleaning/plants) |
| Ice Storage/Sales Facilities | Ice Sales Room | 1 unit of water tap, 1 unit of sink (on-site construction) |

③ Drainage system

- Sewage from toilets will be drained into a septic tank that is constructed on-site and the effluent treated by the septic tank will be infiltrated into the ground through an infiltration inlet.
- Wastewater other than sewage will be infiltrated into the ground through an infiltration inlet.
- Melting water in Fresh Fish Retail Building will be infiltrated ultimately into the ground through an infiltration inlet via drainage system followed by grease trap and subsoil drainage system.
- Rainwater from the rooftop will be drained into drainage or a catch basin via downspouts. It will be directly discharged into the sea (lagoon) via the catch basin followed by the subsoil drainage system. In order to prevent any waste or rubbish from being discharged

into the sea, a water discharge net will be attached to the ultimate tank.

3) Air conditioning and ventilating appliance

- A distributed air conditioning system will be applied to air conditioning that allows independent control in each room, and air conditioning devices will be provided in following rooms:

Administration Building: Market Supervisor Office, Accountant Office and Administrative Staff Room

Ice storage/sales facilities: Ice sales office

- Mechanical ventilation facilities will be provided in the following rooms:

Administration Building: Pantry (ceiling fan)

Market Toilets: Gentlemen Toilets, Women Toilets, Accessible Toilet and Administrative Staff Toilet (wall fan)

Ice Storage/Sales Facilities: Ice Sales Room (wall fan)

(5) Construction materials plan

Construction materials should be selected from certain perspectives including smooth procurement of accessories and availability of spare parts in Papua New Guinea for further maintenance, general methods if possible, simple maintenance and high durability. The following points should be noted for key construction materials.

1) Exterior finish materials

① Roof

- Since the construction sites are located in the shore area, asphalt shingle roofs should be applied to roofs for key facilities that are resistant to salt corrosion and harmonized with natural landscapes.
- Corrugated iron sheets made from galvalume will be applied to roofs for Unloading Space/Waiting Area for retailers, of which structure is planned to be simple.

② Columns and beams in Market Buildings and Fresh Fish Retail Building

As walls are not placed in Market Buildings and Fresh Fish Retail Building, the steel frames will be exposed. They will be coated with hot dip galvanizing for anti-salt corrosion.

③ Exterior walls

Finish coating materials for exterior walls should be widely available in Papua New Guinea in order to facilitate further maintenance.

④ Doors and windows

- From the perspective of weather resistance, aluminum sash will be applied to the exterior doors and windows as they are exposed to the air.
- Robust steel doors will be used for Standby Rubbish Bays, etc.

⑤ Exterior Facilities

- Interlocking pavement that is locally general will be applied to paving for premises and Car

Park.

- Concrete pavement will be applied to the roads on the premises.

Table 2-24 Exterior Finish Materials

| Part | Material | Selection criteria |
|-----------------|--|---|
| Roof | Asphalt shingle roof | Salt-corrosion-resistance, good appearance, simple construction and high durability |
| | Corrugated iron sheets made from galvalume | Better salt-corrosion-resistance, simple construction and more reasonable pricing |
| Ext. wall | Concrete block + mortar + coating | Local availability and simpler maintenance |
| Door and window | Aluminum doors /windows | Weather- resistance and simpler maintenance |
| | Steel doors | Robustness. Applied to Standby Rubbish Bays and Accessible Toilets |
| Ext. | Interlocking pavement | Local availability and simpler maintenance |
| | Concrete pavement | Robustness and high resistance |

*Note: Ext. stands for “Exterior”

2) Interior finish materials

① Floor

- Fair-faced concrete coated with permeable water repellent agent will be applied to floors at the following facilities:

Market Buildings, Passageways, Gatehouse, Storage and Retailers’ Storage in Administration Building, Multifunctional Space, Fresh Fish Retail Building, and Ice Storage/Sales Facilities.

- For easier cleaning and maintenance, tile flooring will be applied to floors at the followings:

Administration Building: Market Supervisor Office, Accountant Office, Administrative Staff Room and Hallway/Pantry

Ice Storage/Sales facilities: Ice Sales Office

- Tile flooring will be applied to all rooms in the Market Toilets in order to enable floor washing.

② Interior wall

- Mortar coated with finish materials will be applied to general parts in Administration Building and general parts of rooms in Ice Storage/Sales Facilities.

- Tiling will be applied to interior walls of all rooms in Market Toilets, as well as the floor, in order to enable wall washing.

③ Ceiling

- In Market Buildings, Passageways, Multifunctional Space, and Fresh Fish Retail Building, ceiling will be not placed and the back sides of roofs will be exposed:

- For easier cleaning and maintenance, inorganic calcium silicate board with coating will be applied to Gatehouse, Storage and Retailers' Storage in Administration Building, rooms in Market Toilets, Ice Sale Room in Ice Storage/Sales Facilities.
- Ceiling grid system that covers rock wool insulation board on the top of lightweight T bar-shaped steel frame will be applied to Market Supervisor Office, Accountant Office, Administrative Staff Room and Hallway/Pantry in Administration Building, and Ice Storage/Sales Facilities.

④ Doors and windows

- Wood will be applied for general interior doors and windows.

Table 2-25 Interior Finish Materials

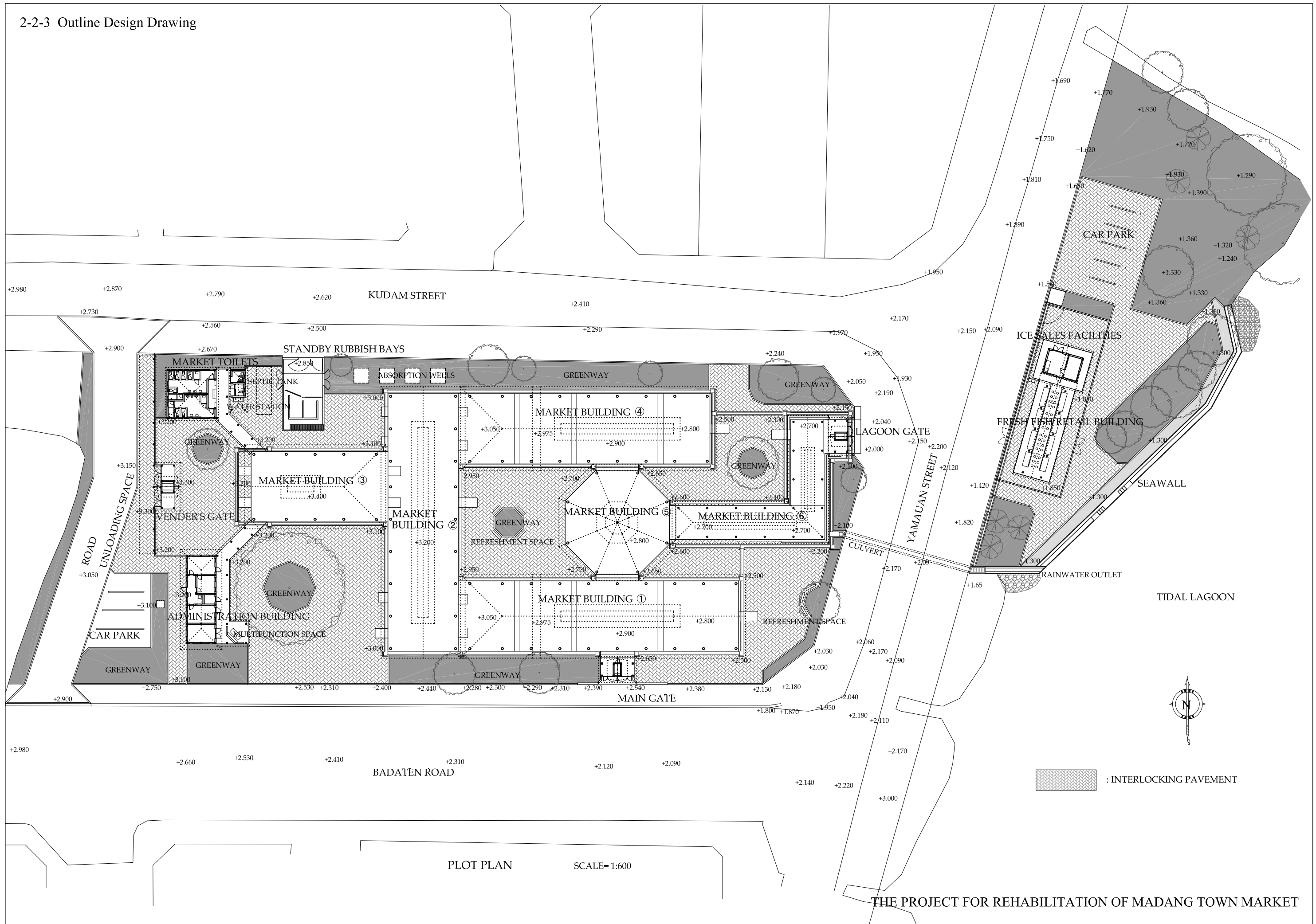
| Part | Material | Selection criteria |
|-----------------|---|--|
| Floor | Fair-faced concrete coated with permeable water repellent agent | Dust-resistance and further enhancement of durability |
| | Ceramic tile | Durability and simple cleaning (floor washing) |
| Int. Wall | Coating | Local availability, reasonable pricing and simpler maintenance |
| | Ceramic tile | Durability and simple cleaning (floor washing) |
| Ceiling | Calcium silicate board + coating | More stain- resistance, simpler maintenance and water resistance |
| | Rock wool insulation board | Local availability and simpler maintenance |
| Door and window | Wooden door | Local availability and simpler maintenance |

*Note: Int. stands for "Interior"

3) Facility equipment

Life cycles of facility equipment and devices will be around 7 years for most cases, comparatively shorter than construction materials. Therefore, facility equipment should be selected from manufactures from third countries that have already been used in Papua New Guinea or from Japan in order to facilitate further maintenance, including renewal, after the completion and delivery of the relevant facility equipment while ensuring required quality.

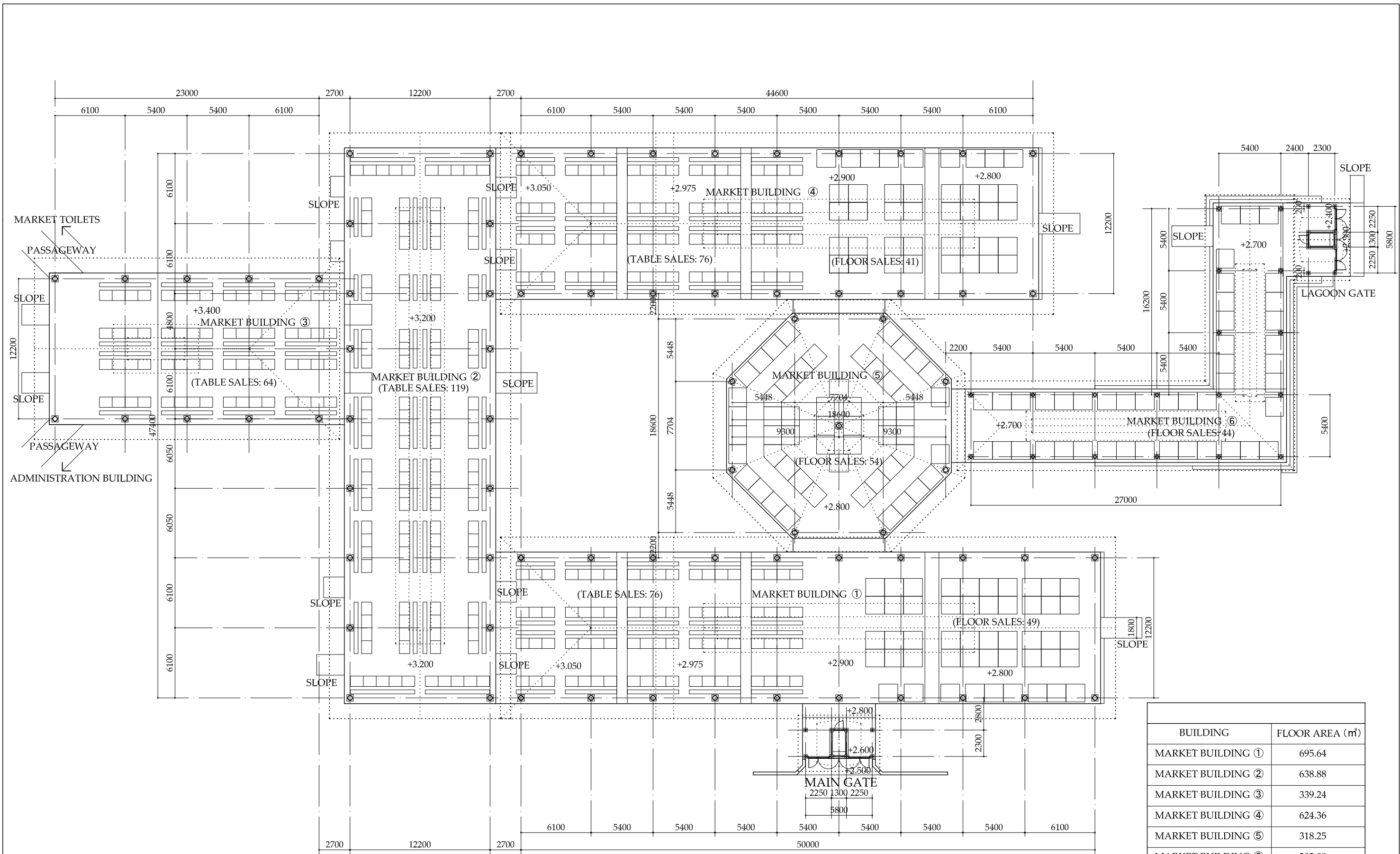
2-2-3 Outline Design Drawing



PLOT PLAN

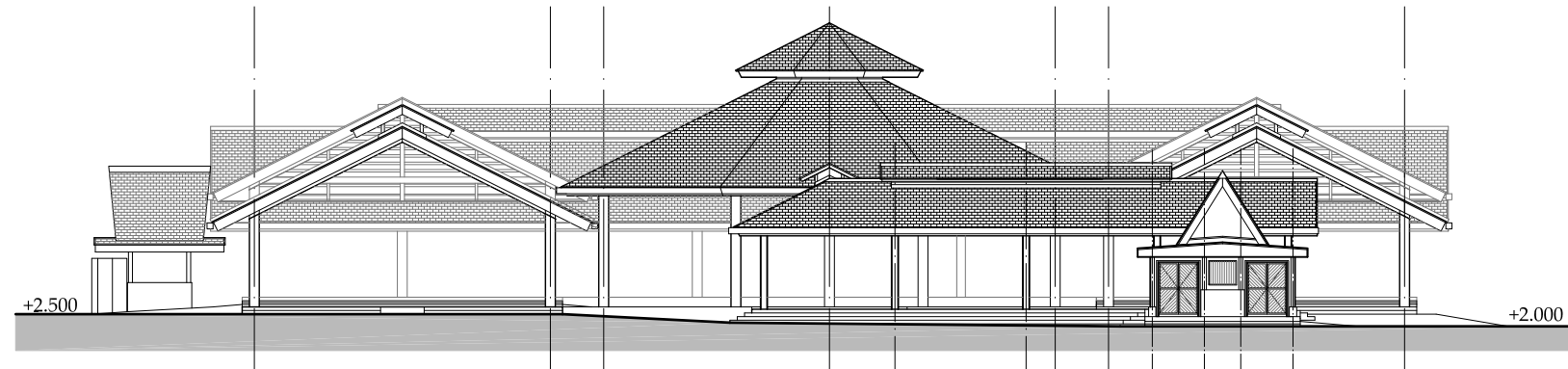
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THE PROJECT FOR REHABILITATION OF MADANG TOWN MARKET

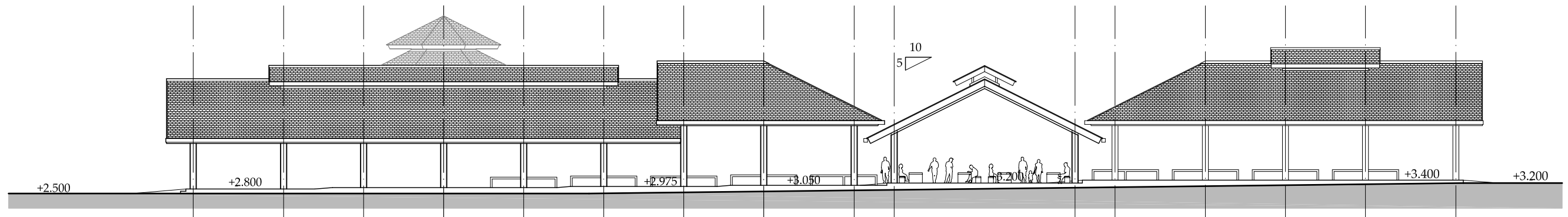


FLOOR PLAN/ MARKET BUILDINGS, MAIN GATE & LAGOON GATE SCALE= 1:300

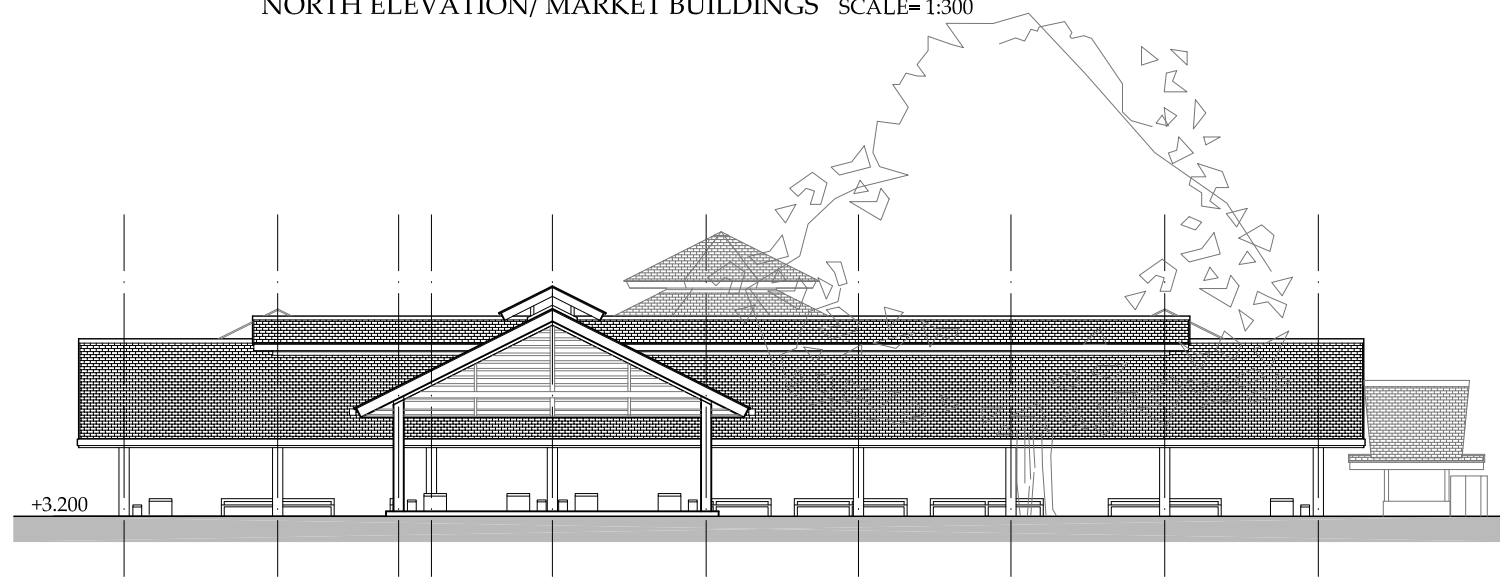
| BUILDING | FLOOR AREA (m ²) |
|-------------------|------------------------------|
| MARKET BUILDING ① | 695.64 |
| MARKET BUILDING ② | 638.88 |
| MARKET BUILDING ③ | 339.24 |
| MARKET BUILDING ④ | 624.36 |
| MARKET BUILDING ⑤ | 318.25 |
| MARKET BUILDING ⑥ | 282.88 |
| MAIN GATE | 13.34 |
| LAGOON GATE | 13.34 |



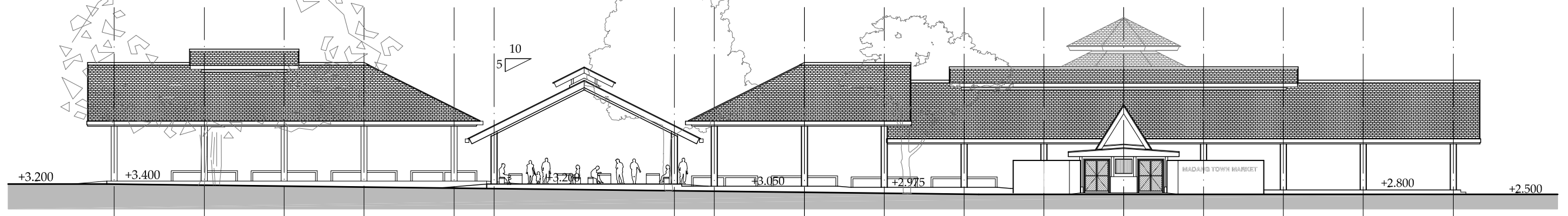
EAST ELEVATION/ MARKET BUILDINGS SCALE= 1:300



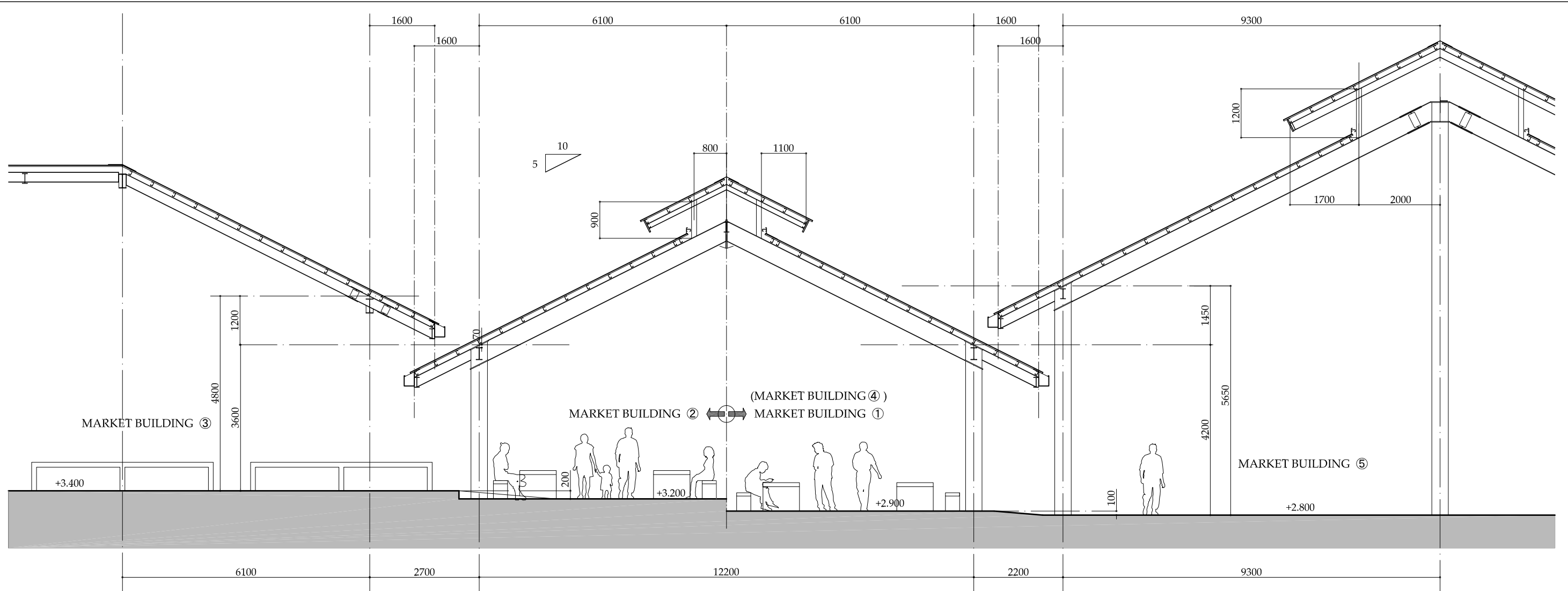
NORTH ELEVATION/ MARKET BUILDINGS SCALE= 1:300



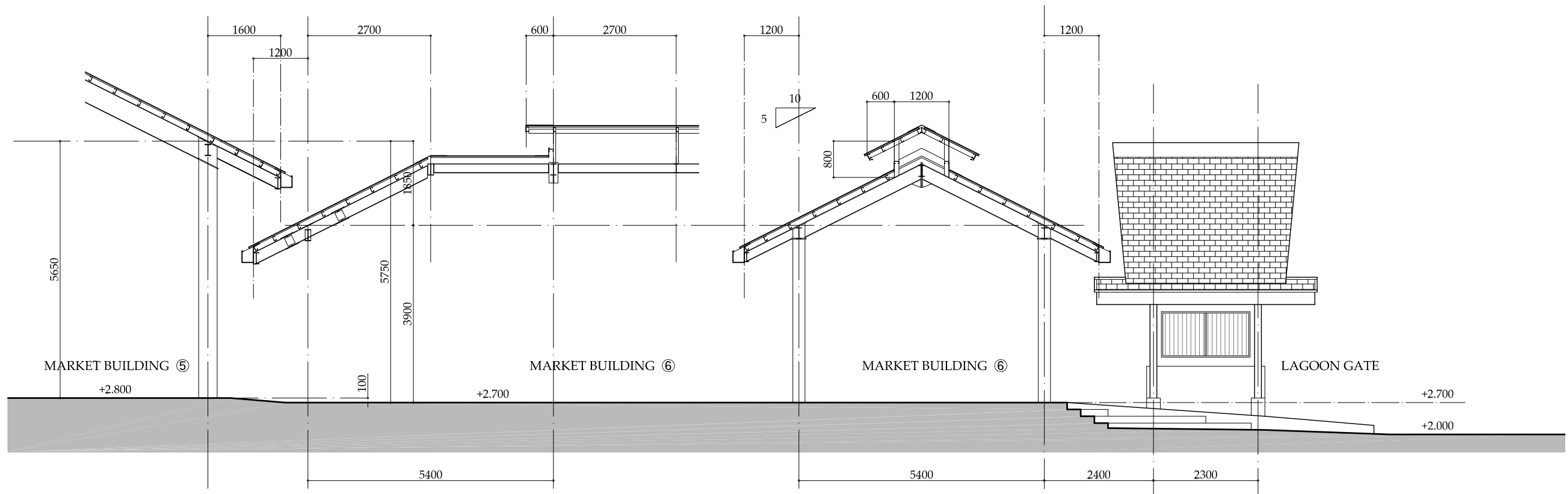
WEST ELEVATION/ MARKET BUILDINGS SCALE= 1:300



SOUTH ELEVATION/ MARKET BUILDINGS SCALE= 1:300

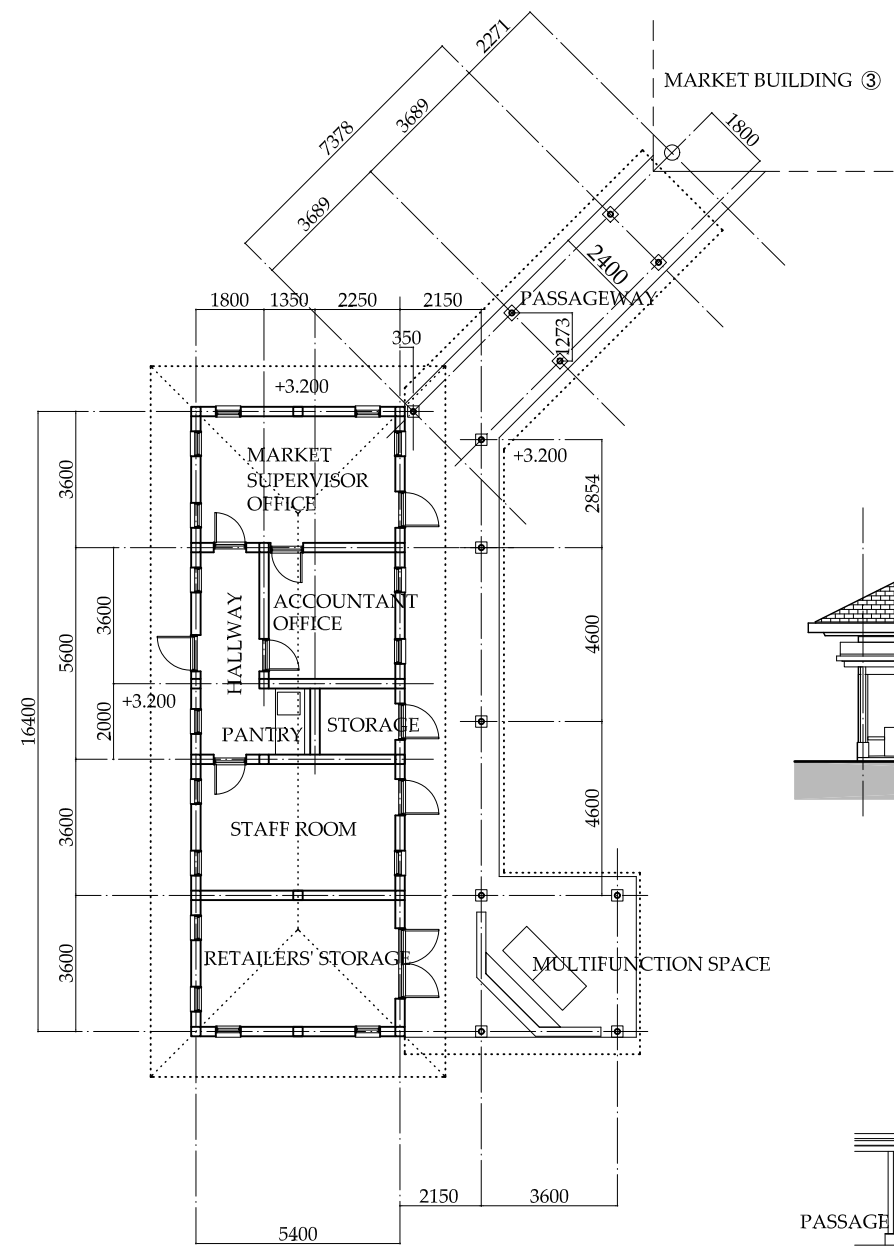


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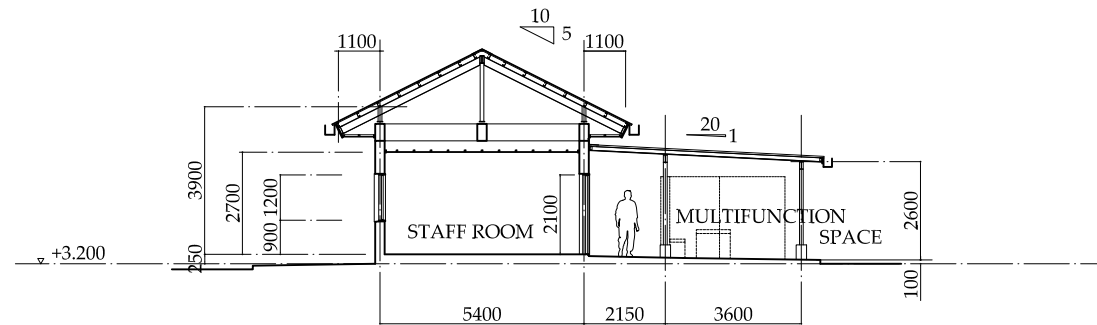


SECTION/ MARKET BUILDINGS SCALE= 1:100

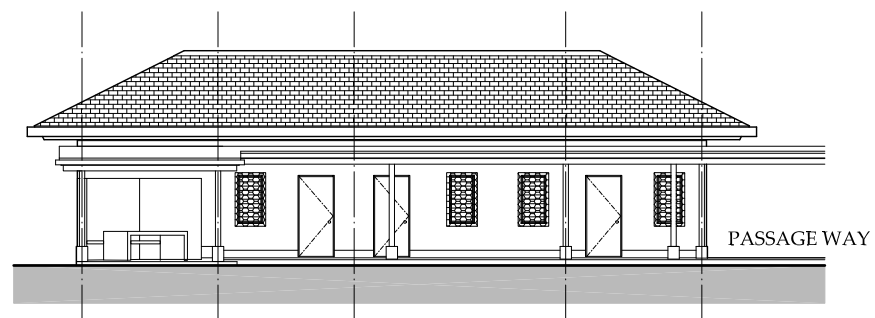
THE PROJECT FOR REHABILITATION OF MADANG TOWN MARKET



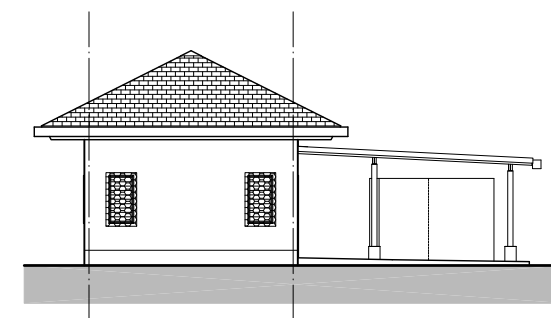
FLOOR PLAN SCALE= 1:200



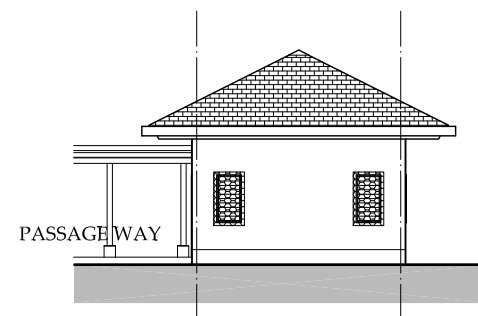
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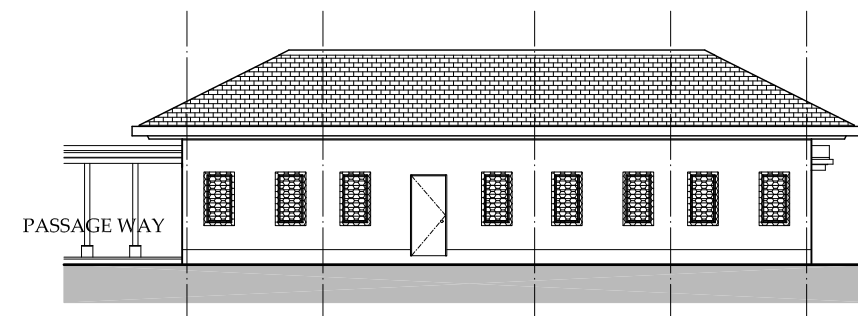
EAST ELEVATION SCALE= 1:200



SOUTH ELEVATION SCALE= 1:200

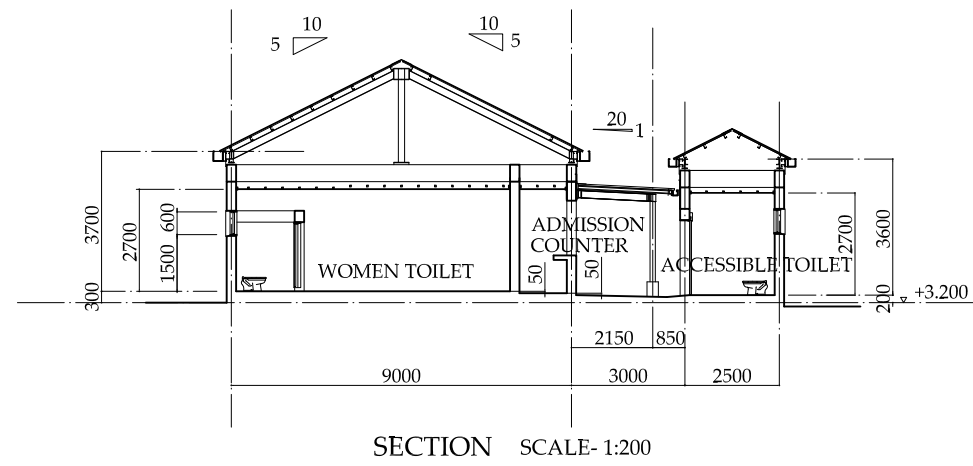


NORTH ELEVATION SCALE= 1:200

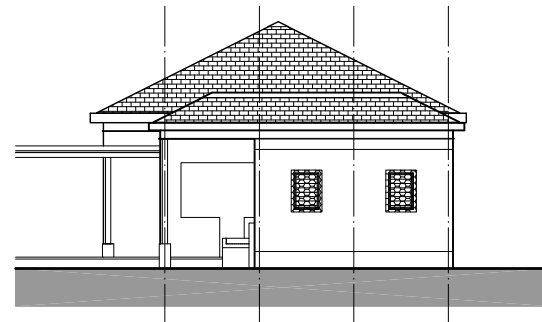


WEST ELEVATION SCALE= 1:200

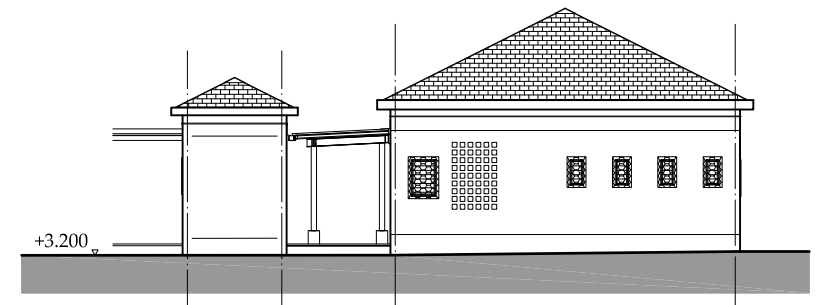
FLOOR PLAN, ELEVATIONS & SECTION/ ADMINISTRATION BUILDING



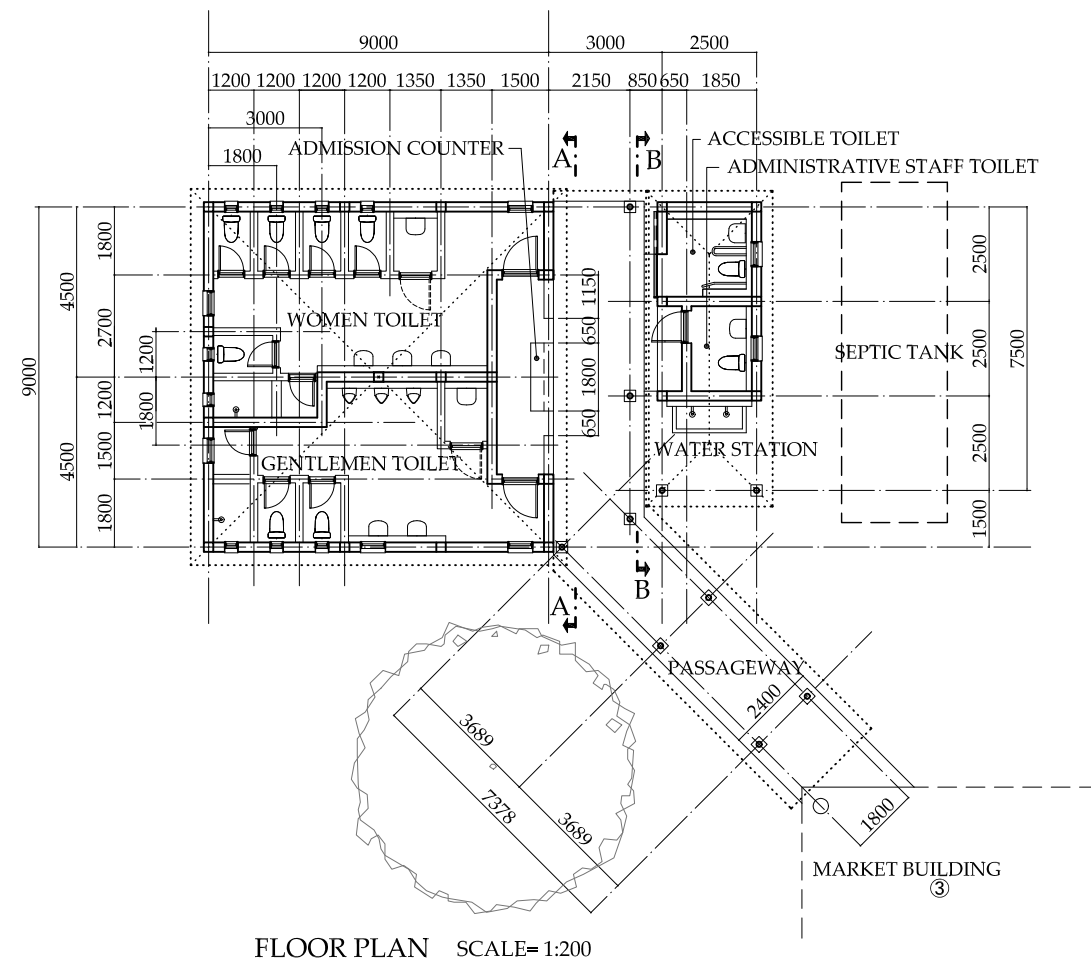
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EAST ELEVATION SCALE= 1:200



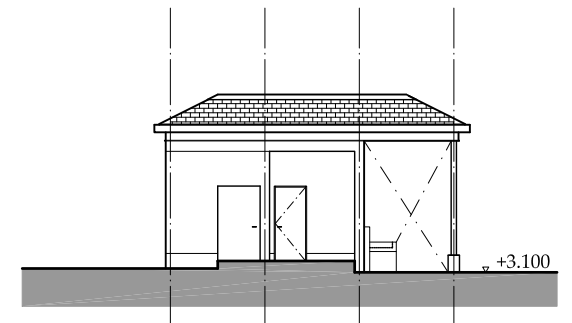
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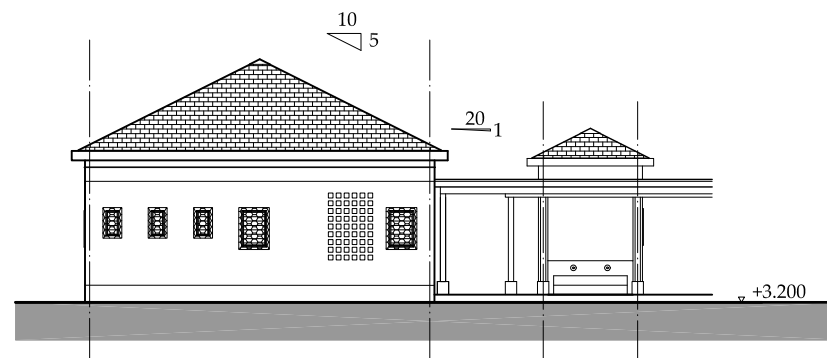
FLOOR PLAN SCALE= 1:200



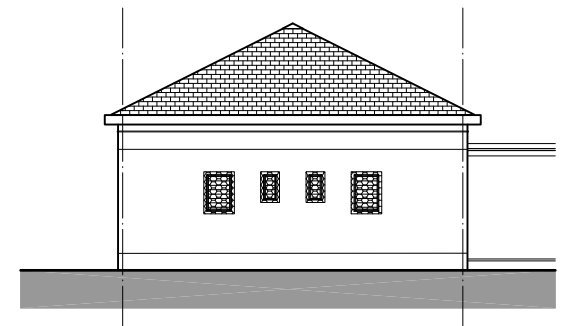
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ELEVATION B - B SCALE= 1:200

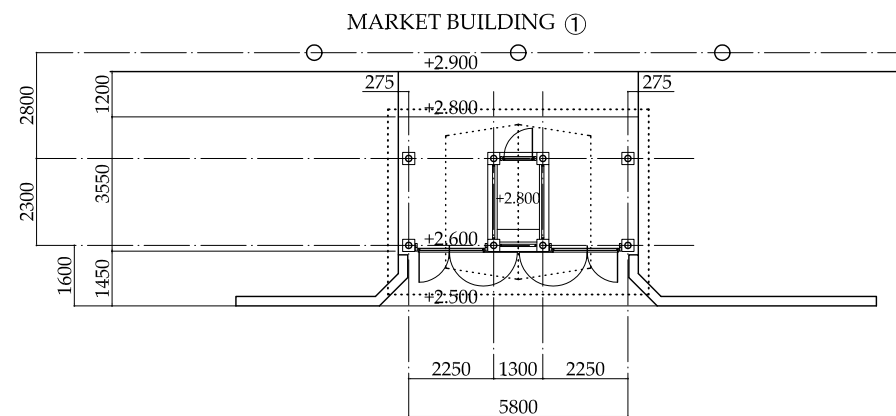
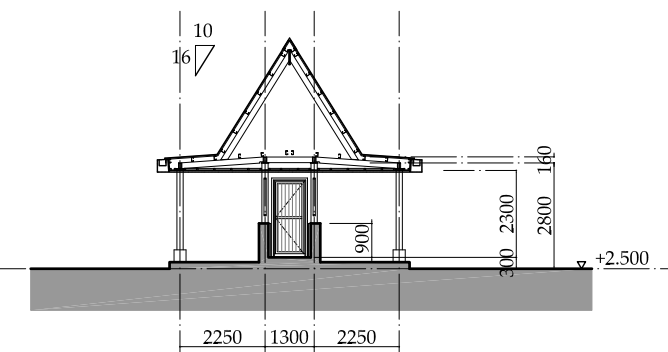
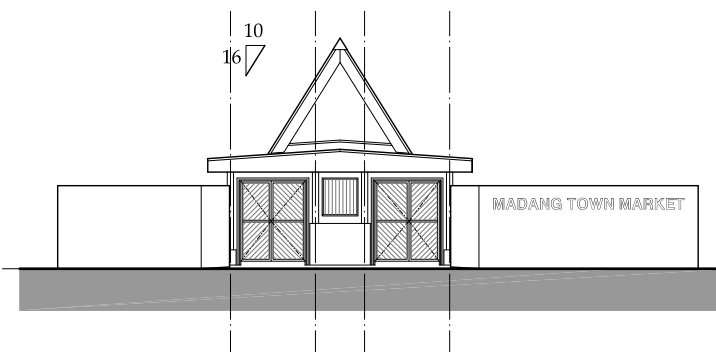
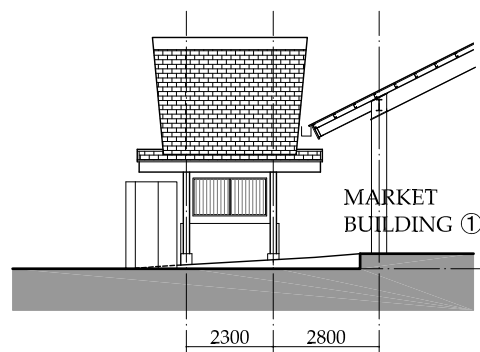
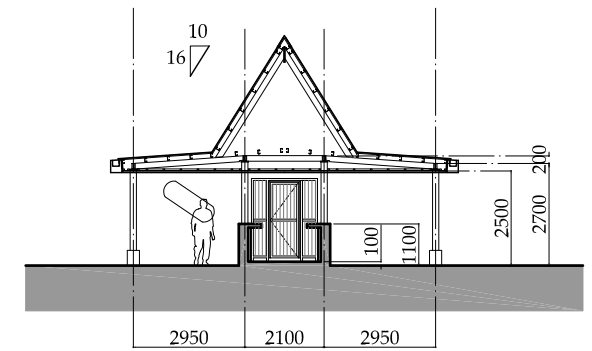
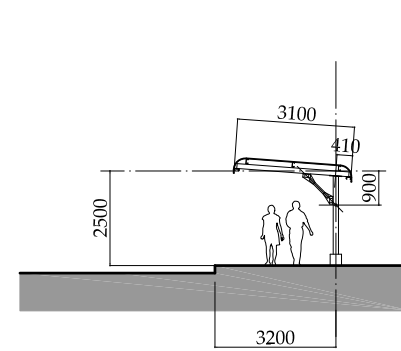
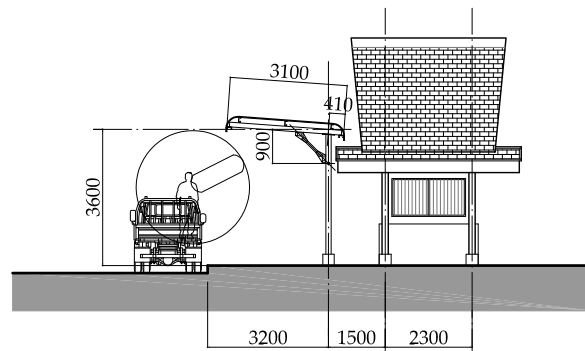
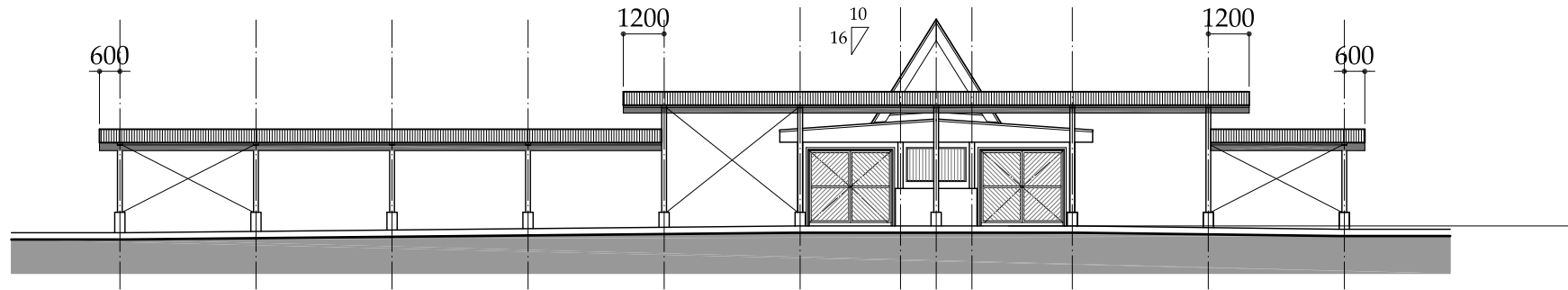
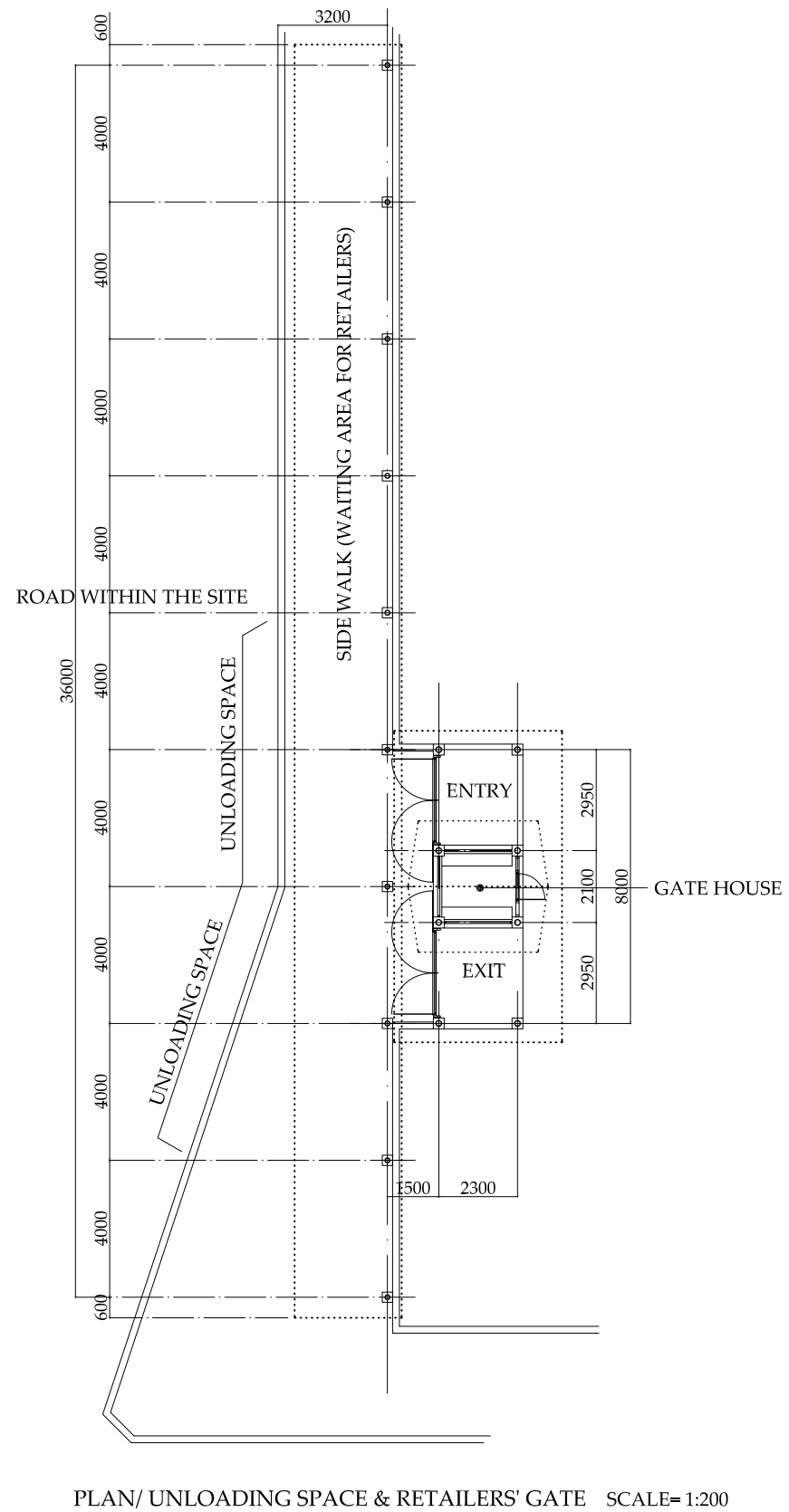


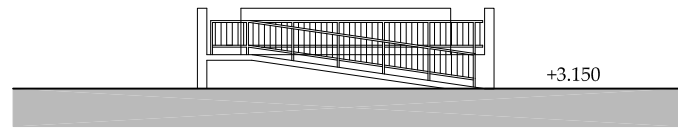
SOUTH ELEVATION SCALE= 1:200



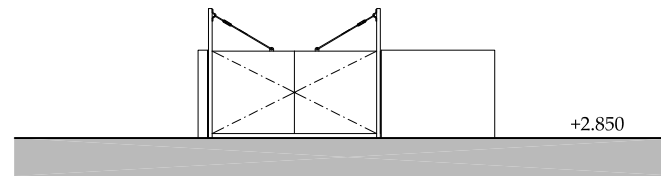
WEST ELEVATION SCALE= 1:200

FLOOR PLAN, ELEVATIONS & SECTION/ MARKET TOILET

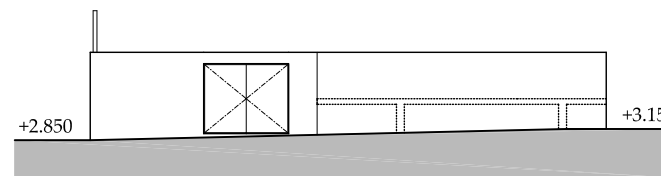




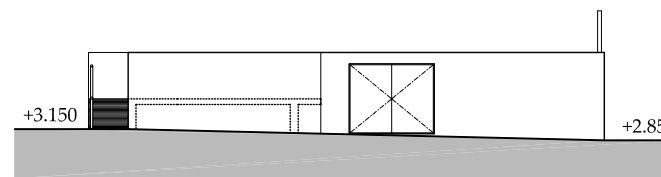
SOUTH ELEVATION SCALE= 1:200



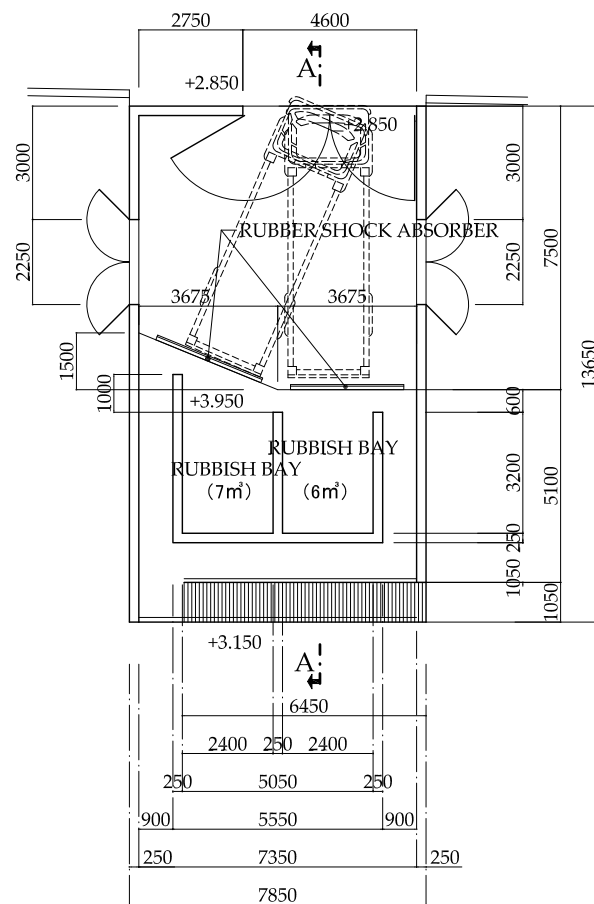
NORTH ELEVATION SCALE= 1:200



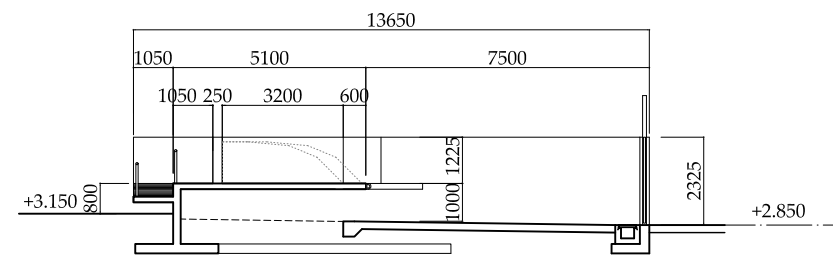
WEST ELEVATION SCALE= 1:200



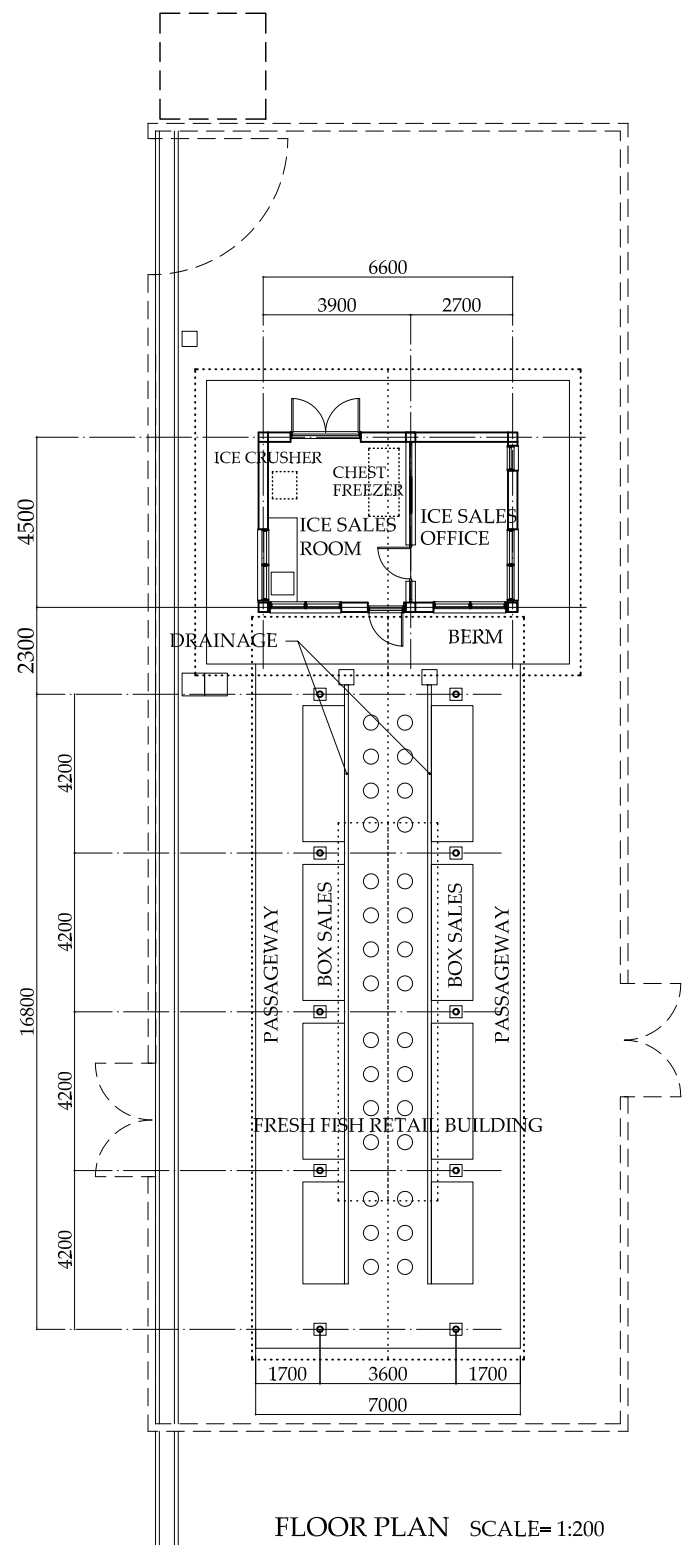
EAST ELEVATION SCALE= 1:200



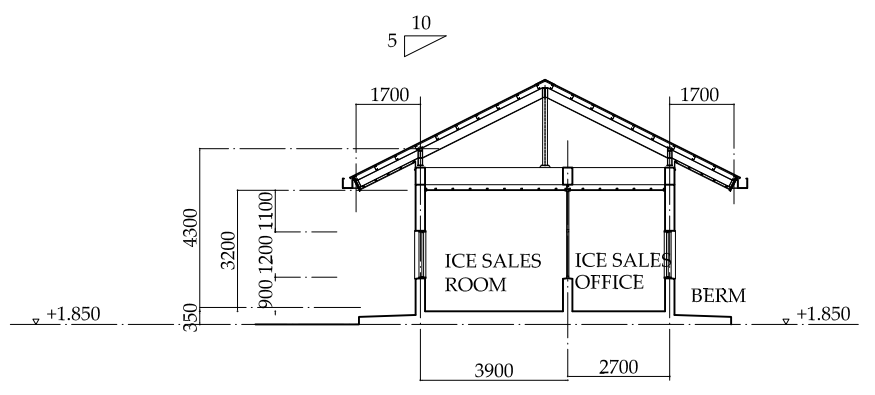
PLAN/ STANDBY RUBBISH BAYS SCALE= 1:200



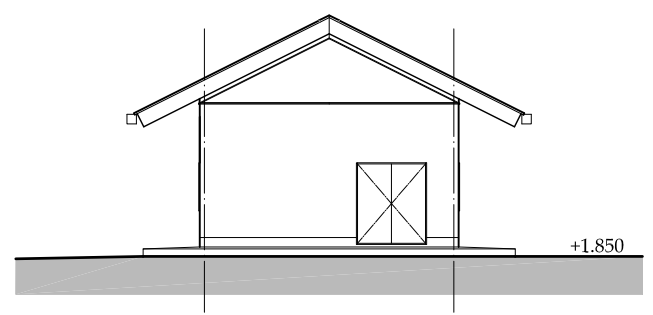
SECTION A - A SCALE= 1:200



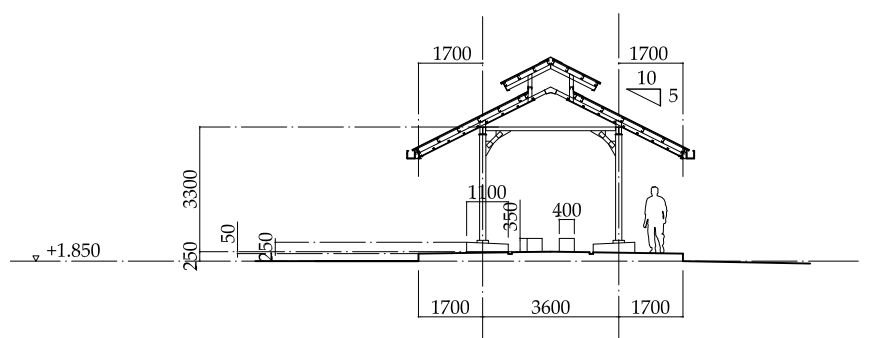
FLOOR PLAN SCALE=1:200



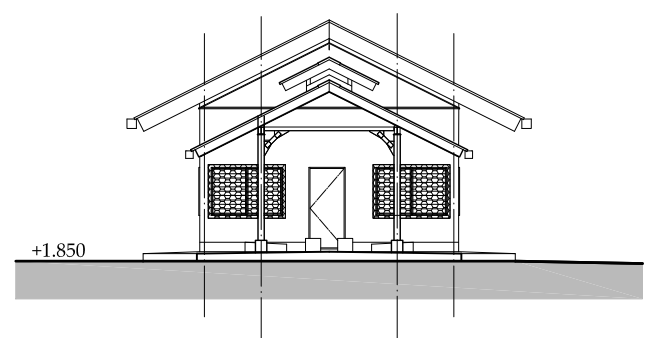
SECTION/ ICE SALES FACILITIES SCALE=1:200



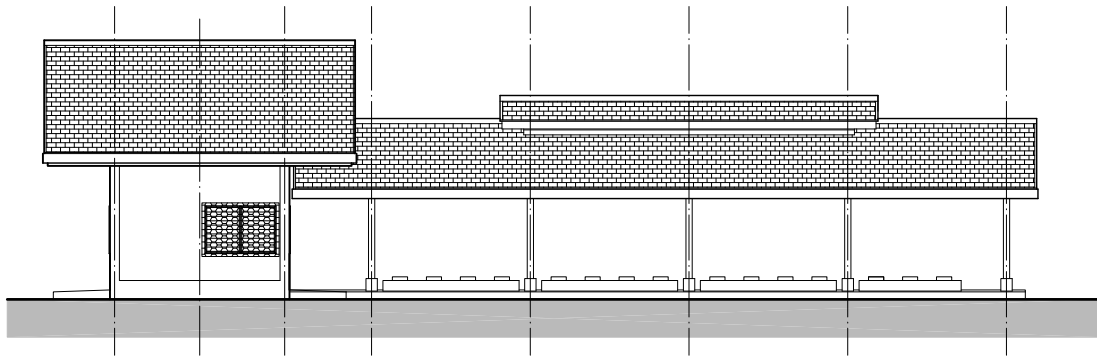
NORTH ELEVATION SCALE=1:200



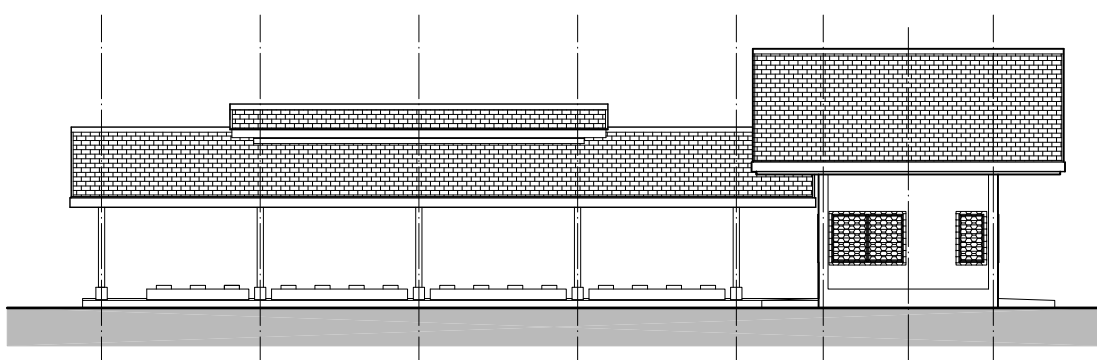
SECTION/ FRESH FISH RETAIL BUILDING SCALE=1:200



SOUTH ELEVATION SCALE=1:200

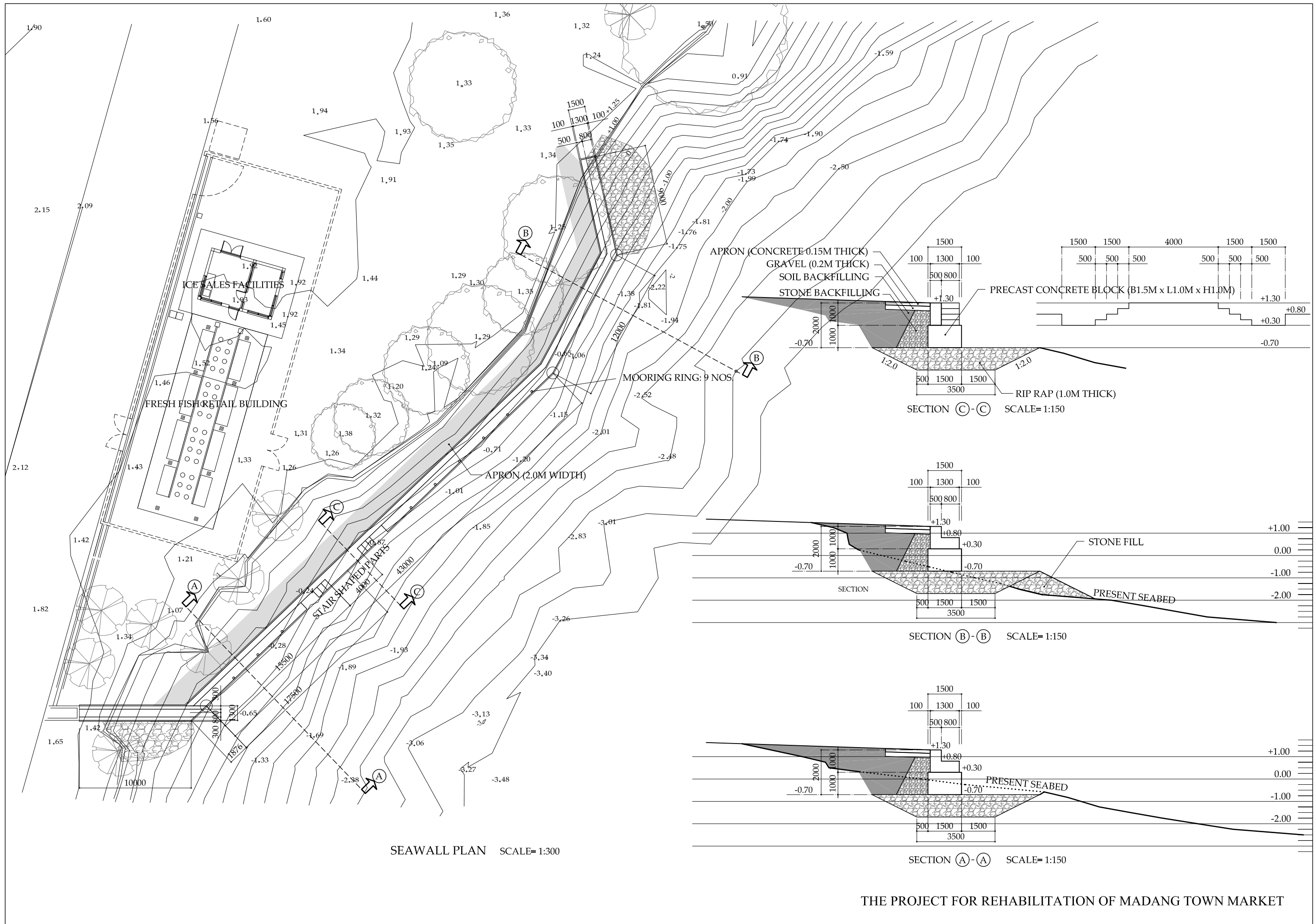


WEST ELEVATION SCALE=1:200



EAST ELEVATION SCALE=1:200

FLOOR PLAN, ELEVATIONS & SECTIONS/
FRESH FISH RETAIL BUILDING & ICE SALES FACILITIES



SEAWALL PLAN SCALE= 1:300

SECTION (A)-(A) SCALE= 1:150

SECTION (B)-(B) SCALE= 1:150

SECTION (C)-(C) SCALE= 1:150

2-2-4 Implementation Plan

2-2-4-1 Implementation Policy

The construction work for this Project will be carried out in compliance with the following basic implementation policy:

- ① It should be noted that the construction work is restricted to be complete by the predetermined timeframe subject to the Japanese Assistance by means of Japanese grant aid cooperation. Therefore, the plans concerning methodology, material and equipment procurement, schedule and quality control should be fully developed, and the construction work should be implemented under the appropriate construction supervision.
- ② The existing facilities and natural environments in surrounding areas should be secured.
- ③ Communication with stakeholders in the recipient country should be adequate for mutual understanding at every phase of the construction work in order to prevent any inconsistency concerning procedures.
- ④ Security should be ensured for any stakeholder or personnel engaged in this Project from the perspective of public safety.
- ⑤ Practices, traditions and culture in Papua New Guinea should be deliberated on the implementation of construction work and labor management.
- ⑥ The levels of local building techniques and labor force reach to certain standards. Therefore, local constructors should be maximized to implement the construction work
- ⑦ In the soft components activities the local consultants, who are practically familiar with organizational management, including fundamental rules of market operation and maintenance, and accounting/financing, will be appointed.

2-2-4-2 Implementation Conditions

- ① Because the Project Site is located within the Madang Town, the numbers of vehicles and passers are comparatively larger, and the number of victims due to criminal cases is not small. Therefore:
 - It is essential that security during the construction period should be ensured by means of certain measures including strict prohibition of unauthorized access to the construction sites.
 - For areas surrounding the Project Site, certain measures should be in place such as prevention of dirt and dusts scattering as well as noise nuisance caused by the construction work.
 - Security measures should be in place for the Project Site and a temporary yard; specifically, security officers will be stationed in the Project Site for 24 hours a day.
 - In addition to the Project Site, secured environments should be ensured for Japanese staff (including their local office, accommodation and transportation).
- ② Environmental preservation measures including anti-water pollution should be in place for

sea areas that surround the marine construction sites.

- ③ Because the construction work is performed under tropic environments, it is important that the implementation plans should incorporate sanitation for and health of workers.
- ④ Most of construction materials and equipment will be procured and transported by sea, and any flaw of procurement may make an enormous impact on the construction schedule. Therefore, procurement plans should be fully deliberated and the materials and equipment should be systematically procured.

2-2-4-3 Scope of Works

When this Project is conducted under the Japanese Assistance by means of Japanese grant aid cooperation, the construction work will be allocated to Papua New Guinea and to Japan as shown in Table 2-26 below and consequent costs will also be borne respectively.

Table 2-26 Allocation of Construction Work

| Japan | Papua New Guinea |
|---|---|
| | To secure construction sites |
| | To obtain construction permissions |
| | To destruct and remove the existing facilities in the Site and to conduct site preparation work. To deforest specified trees within the Site. |
| | To secure space for temporary construction work yard, local office, etc. |
| To provide advisory on specific designs, bidding and construction inspection, Soft Component, etc. | |
| To provide any construction material or labor force required for construction implemented by Japan. <ul style="list-style-type: none"> • Building construction (Market Buildings, Administration Building, Market Toilets, Retailers' Gate, Main Gate, Lagoon Gate, Unloading Space, Standby Rubbish Bays, Exterior Facilities) • Electrical work (power supply, lighting equipment/socket outlet) Poles for primary power source, buried conduit, manholes • Mechanical work | To provide any construction material or labor force required for construction implemented by Papua New Guinea <ul style="list-style-type: none"> • To build exterior fence and gates, and place greenways. • Primary power source To implement primary power sourcing and transmission cables to the power board and to install a power meter. • Water supply from the main pipe To implement piping from the main pipe to the specified point and to install a water |

| | |
|---|--|
| (Water supply system, drainage system, sanitary fixtures, air-conditioners, ventilation facilities) Water supply system starting from a water meter • Civil engineering (Seawall) | meter. |
| | To procure office furniture required for facilities relevant to this Project. |
| | To ensure that the facilities be maintained and used properly and effectively for the implementation of the Project. |

2-2-4-4 Consultant Supervision

- ① For the Consultant Supervision of this Project, efforts should be made to ensure that construction work is conducted along with the predetermined schedule and in a consistent manner, while keeping a designated level of quality for satisfactory delivery in consideration of the construction carried out by Japanese Grant Aid.
- ② The consultant is responsible for examining prudently the details of the planned construction work, process planning, quality control planning and others based on the contents of this Project's design and thereby taking appropriate measures for construction supervision
- ③ Sufficient communication concerning construction work should be ensured among relevant parties that are relevant authorities in Papua New Guinea, Embassy of Japan in Papua New Guinea, JICA Papua New Guinea office, consultants and construction vendors.
- ④ Appropriate plans will be developed with respect to the procurement of materials and equipment, vehicles and office that are required for construction supervision, as well as various procedures, timeframes, and methods associated with quality control.
- ⑤ In connection with personnel planning, the skill level, labor allocations, head counts and organization will be examined prudently to ensure proper construction supervision.
- ⑥ Consultants should appoint a full-time on-site supervisor to achieve their construction supervision as well as dispatch the relevant technical staff with expertise on a spot basis, according to status of construction, in order to supervise the required inspection, guidance, coordination, etc. Figure 2-19 below shows the structure of construction supervision.

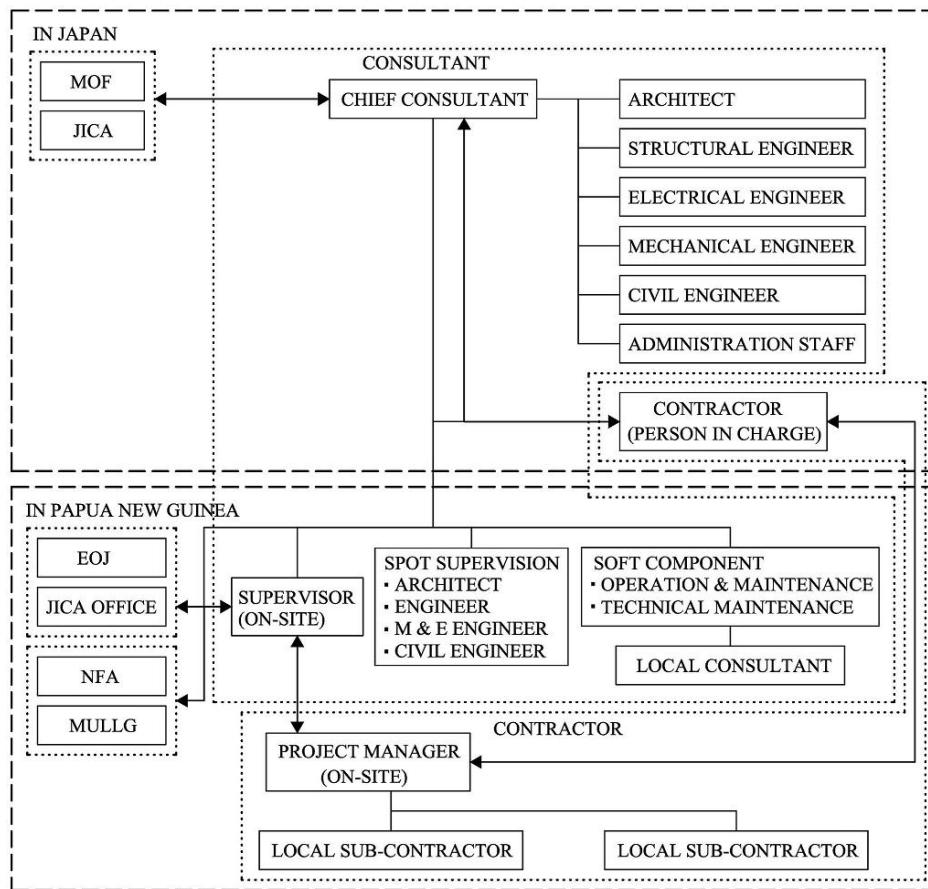


Figure 2-19 Construction Supervision Structure

2-2-4-5 Quality Control Plan

Quality control plan for this Project will be focused on the building structure that significantly relates to the basic performance of Facilities, including durability and safety, and quality should be controlled in line with the following rules:

- ① In connection with the conduct of key construction work, the relevant constructors should create a construction plan that outlines construction methods, schedule, quality control plans, etc. and obtain approvals from designated consultants prior to construction commencement.
- ② Quality of steel frame shall be checked primarily in line with a mill sheet. Product inspection of processed steel frame shall be conducted at manufacturers to check granularity of processing, as well as to inspect quality of welding joints through X ray or ultrasonic testing conducted by third parties.
- ③ Quality of cement will be assured by the relevant manufacturer's certificate that warrants the conduct of quality check.
- ④ Quality of concrete shall be checked by sampling manufacturing data for each casting.

2-2-4-6 Procurement Plan

1) Construction materials

Local procurement shall be primary because general construction materials are sufficiently available and procurable in Papua New Guinea except for special materials. Special materials means the materials that are: 1) not readily available in Papua New Guinea, 2) available through importing, but delivery date is hardly fixed due to import process, or 3) available but quality is not acceptable. Therefore, these materials should be procured from Japan or other neighbor countries. Table 2-27 below shows the procurement plan of construction materials.

Table 2-27 Procurement Plan of Construction Materials

| Construction material | Procured from: | | Basis |
|---|-----------------------|--------------------------|--|
| | Papua New Guinea | Japan or other countries | |
| Gravel, sand and cement | <input type="radio"/> | | Fully satisfactory to the required specification for the Project. |
| Concrete block | <input type="radio"/> | | Fully satisfactory to the required specification for the Project. |
| Material for formwork | <input type="radio"/> | | Fully satisfactory to the required specification for the Project. |
| Deformed bar | <input type="radio"/> | | Fully satisfactory to the required specification for the Project. |
| Steel frame | | <input type="radio"/> | The required specification for the Project is not satisfied locally. |
| Timber | <input type="radio"/> | | Fully satisfactory to the required specification for the Project. |
| Roof materials | <input type="radio"/> | | Fully satisfactory to the required specification for the Project. |
| Tile | <input type="radio"/> | | Fully satisfactory to the required specification for the Project. |
| Paint | <input type="radio"/> | | Fully satisfactory to the required specification for the Project. |
| Aluminum window | <input type="radio"/> | | Fully satisfactory to the required specification for the Project. |
| Steel door | | <input type="radio"/> | The required specification for the Project is not satisfied locally. |
| Lighting equipment | <input type="radio"/> | | Fully satisfactory to the required specification for the Project. |
| Plumbing and sanitary equipment devices | <input type="radio"/> | | Fully satisfactory to the required specification for the Project. |

| | | | |
|---|---|--|---|
| Air-conditioning/ ventilating appliance | ○ | | Fully satisfactory to the required specification for the Project. |
|---|---|--|---|

2) Equipment

Any equipment other than construction is not expected to be procured under the Japanese assistance for this Project.

2-2-4-7 Operation Guidance Plan

No trainings for initial and production operation will be planned for this Project.

2-2-4-8 Soft Component (Technical Assistance) Plan

Through discussion with the Government of Papua New Guinea, the following requests were raised:

- ① Assistance in developing adequate rules, accounting procedures and manuals required for appropriate operation and maintenance concerning retail markets for fresh fish and vegetables.
- ② Assistance in formalized and preventive/secured maintenance of retail market facilities.

(1) Necessity of Soft Component

Madang Urban Level Local Government has operated the Madang Town Market for years and has provided rules of market operation and usage even though they have not been stipulated, specifically enactment of “Ban on trading of betel nuts and tobacco inside the market” that was the far advanced rule at marketplaces in Papua New Guinea. On the other hand, some issues have arisen including lack/deterioration of market facilities to satisfy the actual operational scale, and lack of sanitation facilities and incomplete pavement on the premises. The Project will lead to the solutions for those issues and new approaches therewith will be adopted from the operational perspective as follows:

- ① The charging system of usage fees will be shifted to a charge on sales place from a charge on baggage of products in order to improve area-efficiency of retail sections.
- ② Public (pay) toilets will be introduced in the Market.
- ③ Ice sales services will be introduced (mainly) for fresh fish retail sales in the Market.
- ④ Surveillance over rubbish dumping, collection and disposal will be appropriately enhanced.
- ⑤ Financial management will be implemented in order to raise the fund from profits through market operation for further maintenance costs of the market operation.

Even with the credit of Madang Urban Level Local Government in long-standing market operation, the consideration on the following points resulted in the necessity of Soft Component

to commence operation and maintenance of the base services. Soft Component will address development of procedures and rules for operation and maintenance.

- ① New charging system will imply modification of voucher forms, accounting process, charging procedures, etc. It is essential to implement certain procedures including documentation of the relevant operational manuals and test operation in order to facilitate the introduction of the new system.
- ② Expertise in accounting and financial procedures will be required for most cases in order to realize financial management that raises the fund from profits through market operation and secures it for further maintenance costs of the market operation.
- ③ Although Madang Urban Level Local Government has conducted basic maintenance of facilities, a formalized framework of maintenance is not established (retention of maintenance data, for example).

Therefore, Soft Component will be implemented to address development of fundamental rules for operation and maintenance, charging methods, accounting and financing procedures, and technical instructions of facilities and equipment maintenance in order to assist in commencing operation and maintenance of the planned market facilities.

(2) Activities of Soft Component

Objective: To facilitate commencement of operation and maintenance in connection with the Madang Town Market facilities

Outcome :

1. To provide fundamental rules applied to operation and maintenance of market facilities.
2. To establish frameworks for collecting usage fees of market facilities and accounting as well as financing.
3. To transfer maintenance techniques of market facilities and equipment.

Activities :

- 1-1. To deliberate a framework for rules applied to market operation and usage.
- 1-2. To analyze issues residing in market operation and usage.
- 1-3. To run workshops involving the relevant organization for market operation and maintenance and retailers (or market users) and to discuss on operation and usage of the relevant facilities.
- 1-4. To draft rules applied to operation and usage of market facilities.
- 1-5. To walk through operation of the planned facilities based on the draft of operation and usage rules.
- 1-6. To evaluate and revise the draft of operation and usage rules.
- 2-1. To investigate the methods of collecting usage fees of market facilities and its accounting and financial procedures applied to similar market facilities.
- 2-2. To explore the optimum collecting and accounting methods of market usage fees.
- 2-3. To create proposals of collecting and accounting procedures of market

usage fees and financing procedures.

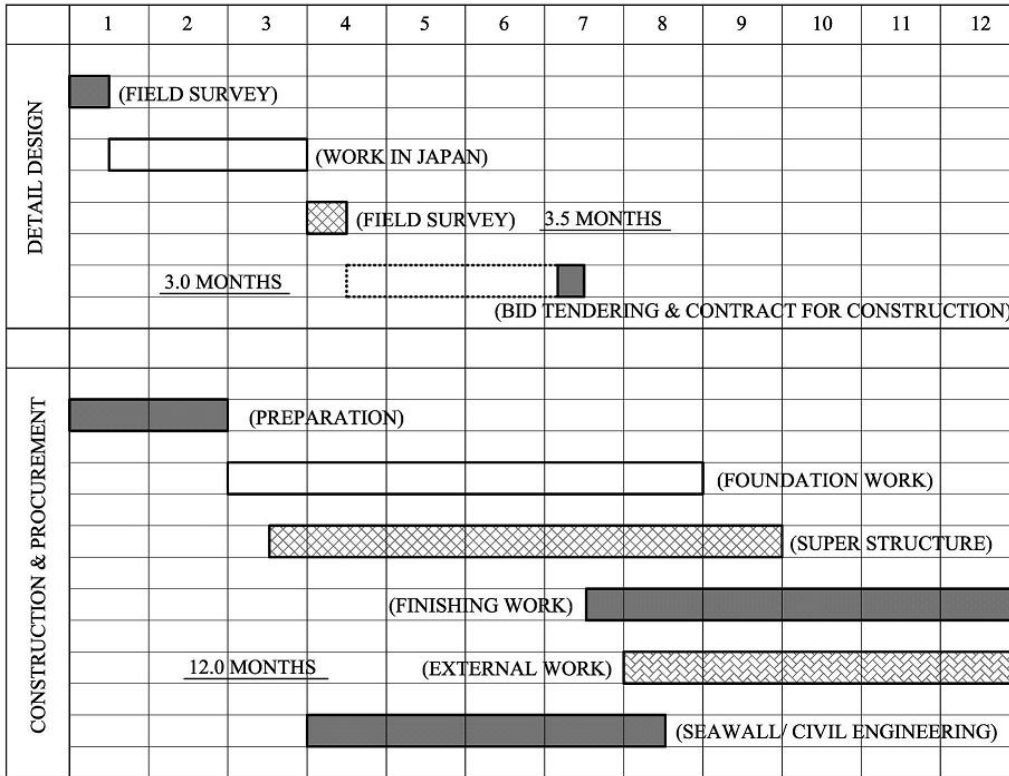
- 2-4. To walk through the collection and accounting services at the proximate markets based on the said proposals of collecting and accounting procedures of market usage fees and financing procedures, and to identify any issue, etc.
- 2-5. To evaluate facility operation based on the said proposals of collecting and accounting procedures of market usage fees and financing procedures, and to revise those proposals.
- 3-1. To create the initial maintenance notes of market facilities and equipment.
- 3-2. To provide methodology programs including systematic maintenance of key facilities and equipment, preventive and secured maintenance, and leveraging maintenance notes.
- 3-3. To provide a training program for information collection related to maintenance of key facilities and equipment.
- 3-4. To provide training programs to record and analyze maintenance notes of key facilities and equipment.
- 3-5. To create maintenance notes and financial plans of market facilities and equipment.

It should be noted that competent consultants are available in Papua New Guinea for Soft Component in connection with development of fundamental rules for operation and management as well as accounting and financing procedures. As a result, Japanese consultants will be appointed only at stages that deliberate operation and maintenance rules and frameworks of proposals for procedures related to fee collection and accounting and financing and conduct the comprehensive evaluation after the practical trainings, and local consultants will be appointed at the remaining stages. On the other hand, Japanese consultant who participated in this Survey will be appointed and dispatched for Soft Component concerning maintenance techniques, because either local consultant or NGO is not available who has the relevant experience or expertise.

2-2-4-9 Implementation Schedule

It is estimated that implementation of this Project will require 3.5 months for execution design to cover the specific designing of facilities and approval of tender documentation, 3.0 months for the subsequent bid tendering and awarding construction work, and 12 months for construction phases including approval of drawings, construction work and inspection. Table 2-28 below shows the implementation schedule of this Project.

Table 2-28 Implementation Schedule



2-3 Obligations of Recipient Country

- ① To secure land for this Project and to demolish and remove any remains including the existing facilities and foundations.
- ② To perform the legal procedures required under the laws of Papua New Guinea with respect to the possible environmental and social impact caused by this Project and to provide official notification and prior presentation to the relevant parties that may be affected.
- ③ To provide an alternative market site and relevant facilities for the Madang Town Market users during the construction work of this Project.
- ④ To obtain all required permits in Papua New Guinea with respect to execution, construction work and material procurement in connection with the conduct of this Project.
- ⑤ To execute the Banking Arrangement required for this Project and to issue the relevant Authorization to payment forms immediately.
- ⑥ To ensure Japanese or Japanese legal entities exempted from any tax or levy in Papua New Guinea, in connection with the conduct of any construction work, material and equipment procurement, or any service that relates to this Project.
- ⑦ To ensure prompt tax-free custom clearance for execution, construction work or material and equipment procurement that relates to this Project.
- ⑧ To grant Japanese personnel engaged in this Project entry and residence permits in Papua New Guinea as well as to ensure security for them during their residence.
- ⑨ To secure land for a temporary yard, a construction office and other facilities required for the construction work of this Project.
- ⑩ To establish measures to prohibit unauthorized access to the Project Site during the construction work of this Project.
- ⑪ To place the required fences and gates for this Project, and to provide the required services for this Project including placement of water pipes, electric wires and telephone cables.
- ⑫ To procure office supplies, telecommunication devices and furniture required for this Project.
- ⑬ To ensure that the facilities be maintained and used properly and effectively for the implementation of the Project.
- ⑭ To cover any other expense required for the execution of this Project but not allocated to the Japanese Government under the Japanese Grant Aid.

2-4 Project Operation Plan

The present organizational structure of the Madang Town Market consists of one Market Supervisor, three fee collectors, one security officer and one youth group of cleaning. As shown in Figure 2-20 below, one accountant, one fee collector (for Fresh Fish Retail Building/Car Park) and four security officers, and three fee collectors/cleaning staff for toilets will additionally be hired after the completion of the Market rehabilitation. This enhancement of human resources intends to complement accounting and financing services and security on the premises as well as to introduce the operation of Market Toilets. On the other hand, in regard to ice sales business, Madang Fisheries Cooperative will dispatch three workers responsible for the services.

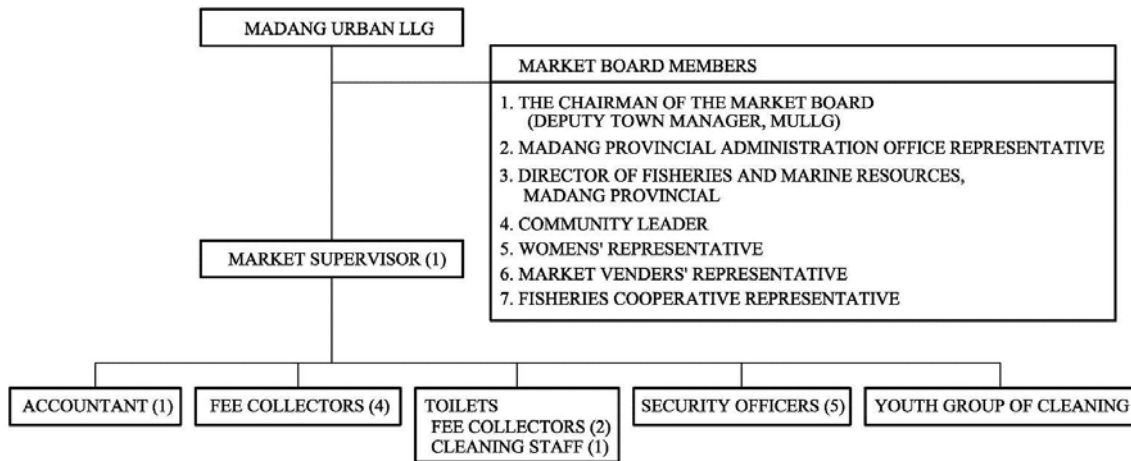


Figure 2-20 Organizational Structure of the Madang Town Market after Rehabilitation

2-5 Project Cost Estimation

2-5-1 Initial Cost Estimation

(1) Project Cost borne by Papua New Guinea side

The project cost borne by the Papua New Guinea side is estimated to be 1,060,800 PGK (Approx. JPY 45.2mil) as follows. This cost estimate is provisional and would be further examined by the Government of Japan for the approval of the Grant.

| | |
|---|------------------------------------|
| ① Environmental and social considerations | 173,600 PGK (Approx. JPY 7.4mil) |
| ② Removal of remains of existing buildings and obstacles, and deforesting | 600,000 PGK (Approx. JPY 25.5 mil) |
| ③ Placement of water pipes, electric wires and telephone cables | 23,000 PGK (Approx. JPY 1.0 mil) |
| ④ Placement of fences and gates | 220,000 PGK (Approx. JPY 9.4 mil) |
| ⑤ Procurement of office supplies and furniture | 23,000 PGK (Approx. JPY 1.0 mil) |
| ⑥ Bank charges | 21,200 PGK (Approx. JPY 0.9 mil) |

(2) Condition of Estimation

- ① Calculated at : February, 2013
- ② Exchange rate : 1US\$ =JPY 85.46
- ③ : Local currency 1 (PGK) =JPY 42.62
- ④ Timeframe for : See Table 2-28 “Implementation Schedule” for specific designing construction work and schedule.
and procurement
- ⑤ Others : Cost estimation shall be based on the framework of Japanese Grant Aid Assistance.

2-5-2 Operation and Maintenance Cost

Annual profits of approximately 73,188 PGK (441,528 PGK - 368,340 PGK) is estimated to be gained through operation of the Madang Town Market as shown in Table 2-29 below, but mid and long-term operation and maintenance costs as shown in Table 2-32 will incur and the fund should be raised to cover those costs.

Table 2-29 Estimated Revenues and Expenditures of the Madang Town Market
(Currency: PGK)

| Expense category | Annual amount | Notes |
|--------------------------|----------------|---|
| Revenues | | |
| Market usage | 350,000 | Estimated by Madang Urban Level Local Government for 2013 |
| Toilets usage | 70,000 | Estimated by Madang Urban Level Local Government for 2013 |
| Ice sales | 19,032 | 305kg/week x 52 weeks x 1.2 PGK/kg |
| Tap water sales | 2,496 | 240 buckets /week x 52 weeks x 0.2 PGK/bucket |
| Total | 441,528 | |
| Expenditures | | |
| Salaries and labor costs | 132,880 | See Table 2-30. |
| Overtime | 10,000 | 4 PGK/hour x 10 hours/day x 250 days/year |
| Power | 9,000 | 30 PGK/day x 300 days/year |
| Water | 30,000 | 100 PGK/day x 300 days/year, for toilets and cleaning |
| Ice purchase | 15,860 | 305kg/week x 52week x 1PGK/kg |
| Rubbish collection | 100,000 | Fuel for a truck 70,000 PGK, lease cost for alternative vehicle 30,000 (75 PGK/hour x 4 hours x 100 days) |
| Cleaning | 24,000 | Gratitude to volunteers 2,000 PGK/month x 12 months/year |
| Meetings | 9,600 | 6 persons x 200 PGK/meeting x (4 regular meetings/year + 4 irregular meetings/year) |
| Communication | 2,000 | |
| Education and training | 10,000 | e.g. Educational program to accountant, etc. |
| Expendables | 10,000 | Uniforms, cleaning kits, vouchers, etc. |
| Maintenance | 15,000 | Daily maintenance |
| Total | 368,340 | |
| Estimated annual profit | 73,188 | |

Table 2-30 Salaries and Labor Costs at the Madang Town Market after Rehabilitation
(Currency: PGK)

| Unit price (two weeks) | Role (number) | Formula | |
|---------------------------|--|------------------------------------|---------|
| 400 | Market Supervisor (1) | 1 person x 400 x 26/year | 10,400 |
| 300 | Accountant (1), fee collectors (4), toilets administrators (3), ice sales (1), 9 person in total | 9 persons x 300 x 26/year | 70,200 |
| 250 | Security officers (4) | 4 persons x 250 x 26/year | 26,000 |
| 3/hour | Security staff (1) hired from the professional security company | 1 person x 3 x 24 hours x 365/year | 26,280 |
| | | | 132,880 |

Table 2-31 Renewal Fund Required for Buildings/Facilities at the Madang Town Market

| Life cycle | Required amount | Details |
|------------|-----------------|--|
| 5-year | 83,000 PGK | Repair to coating on Administration Building and pavement on the premises, and replacement of chest freezers |
| 10-year | 65,000 PGK | Replacement of air-conditioning and ventilating appliance, and repair to roofs and downspouts |
| 15-year | 130,000 PGK | Repair to anti-rust coating on Market Buildings |

The preceding factors indicate that certain amount of maintenance costs regularly incur as shown in Table 2-31. It is deemed rational that some of the said estimated profits should be yearly reserved in order to ensure the fund for the maintenance costs. As shown in Table 2-32, the required amounts specified in Table 2-31 will be ensured through the annual reserve fund of 32,000 PGK (Approximately 44% of 73,188 PGK, estimated profits).

Table 2-32 Mid & Long -Term Maintenance Costs and the Reserve Funds (Currency: PGK)

| Expense category | 5 yrs | 10 yrs | 15 yrs | 20 yrs | 25 yrs | 30 yrs |
|---|---------|---------|---------|---------|---------|---------|
| Repair to finish coating and pavement, and chest freezers | 83,000 | 83,000 | 83,000 | 83,000 | 83,000 | 83,000 |
| Replacement of air-conditioning and ventilating appliance, and repair to roofs and downspouts | | 65,000 | | 65,000 | | 65,000 |
| Repair to anti-rust coating on Market Buildings | | | 130,000 | | | 130,000 |
| Required total maintenance costs | 83,000 | 148,000 | 213,000 | 148,000 | 83,000 | 278,000 |
| Term-end total reserve fund | 160,000 | 237,000 | 249,000 | 196,000 | 208,000 | 285,000 |
| Term-end balance of reserve fund | 77,000 | 89,000 | 36,000 | 48,000 | 125,000 | 7,000 |

Note: Term-end total reserve fund is calculated by adding 32,000 PGK, the annual amount of reserved fund, to the balance of the previous term.

Chapter 3 Project Evaluation

Chapter 3 Project Evaluation

3-1 Preconditions

The preconditions for the implementation of the Project require the Papua New Guinea side to carry out the following key processes:

- ① To obtain Environmental Permits, etc.
 - To provide prior notices and presentation to the stakeholders who are under influence of the temporary relocation during rehabilitation at the Market and to prepare the relocation sites.
 - To initiate EIA or EPA procedures
 - To obtain Environmental Permits from DEC
 - To obtain any permit required for construction work and material or equipment procurement
- ② To secure land for construction, etc.
 - To secure land for the Project Site
 - To demolish and remove the existing buildings and any obstacle
 - To secure land for a temporary yard, local offices, etc.
 - To prohibit unauthorized access to the Site
- ③ To establish measures to facilitate the progress of Project
 - To execute the Banking Arrangement and issue Authorization to payment
 - To grant entry and residence permits to Japanese personnel engaged in this Project and to ensure security during their stay
 - To ensure tax-free custom clearance required for any construction work or any material or equipment procurement
 - To ensure Japanese or Japanese legal entities exempted from any tax or levy in Papua New Guinea in connection with the conduct of any construction work or any material or equipment procurement for the Project
- ④ Construction work allocated to Papua New Guinea
 - To place water pipes, electric wires and telephone cables
 - To procure office devices and furniture
 - To build fences and gates

3-2 Necessary Inputs by Recipient Country

In order to realize and maintain the effectiveness of this Project, the Papua New Guinea side shall conduct the followings:

- ① Operation and maintenance
 - To secure the human resources as well as operation and maintenance costs required for the Project and to perform appropriate and effective operation and maintenance of the facilities and equipment
- ② To establish the framework for co-operation among the parties concerned

To establish the cooperative framework among Madang Urban Level Local Government, an executor, and NFA and Madang Provincial Administration, a regulator, in order to establish operational rules and create operation manuals and accounting procedures acceptable to public markets as well as in order to modify financial processes to secure the operation and maintenance costs

③ To follow up with effects of the Project

To conduct regular and continuous measurement for the effects of this Project in order to understand the precise results for the continuous progress of the Project

3-3 Important Assumptions

The followings are the important assumptions to realize and maintain the effectiveness by the Project.

- ① Any sudden or extreme drop in agricultural and fishery production due to climate conditions, etc. should not occur.
- ② Any excessive rise in commodities prices should not occur.

3-4 Project Evaluation

3-4-1 Relevance

Due to the following factors, it is considered proper to implement the Japanese Assistance by means of Japanese grant aid cooperation:

- ① The beneficiaries by this Project are local people such as artisanal fishermen, retailers, etc. including poverty society of which population is considerably large.
- ② Operation and maintenance of the facilities and equipment under this Project are feasible by human resources and techniques available in Papua New Guinea without any special advanced technology.
- ③ This Project contributes to the achievement of objectives set forth in “Mid-term Development Strategy 2011-2015” of Papua New Guinea.
- ④ The profitability of the operation in this Project is to the extent that facilitates operation and maintenance of the facilities and equipment under the Project.
- ⑤ Though negative impact arises from the social and environmental aspect, which is relocation of the relevant parties to the temporary places during the construction period, adequate measures are taken to mitigate those impacts.
- ⑥ This Project is feasible under the system of Japanese grant aid cooperation.

3-4-2 Effectiveness

The following effects are expected through the implementation of this Project:

1) Quantitative effects

| Indicator of Effect | Basis (2013) | Target (2018) |
|--|----------------|----------------------|
| Ratio of retailers who can conduct business in the facility of the Madang Town Market provided with both flooring and roof | Approx. 34% | Approx. 80% |
| Amount of annual tap water sales within the Market | 0 ton | Approx. 60 tons |
| Amount of annual ice sales within the Market | 0 ton | Approx. 15 tons |
| No of Sales unit per floor area of 100m ² in Market Buildings | Approx. 15.6 | Approx. 17.9 |
| Waiting time for unloading the sales products when three truck-style PMVs simultaneously arrive at the Madang Town Market during the rush hours in the morning | Approx. 1 hour | Approx. 0.5 hours |
| No. of annual Market Toilets usage | 0 | Approx. 70,000 times |

2) Qualitative Effects

- ① The hygienic conditions in the Madang Town Market are expected to be improved through appropriate surveillance of rubbish disposal enhanced by Standby Rubbish Bays, mud prevention by pavement on the premises, better drainage system, etc.
- ② The environment for users is expected to be improved through separate access to the Madang Town Market, evening-out of bumps, better buying flow promoted by soft zoning, etc.
- ③ Food safety is expected to be improved for approximately 110,000 residents in the Madang Province who are main users of the Madang Town Market.
- ④ The evaluation (satisfaction) of users (retailers and customers) is expected to rise on the rehabilitation of the Madang Town Market.
- ⑤ In connection with the operation and maintenance of the Madang Town Market, the operation and maintenance of facilities and equipment and fee collection and accounting will be conducted through leveraging the established basic rules of operation and maintenance as well as the methods for charges, accounting and financing.

In consideration of the points listed above, it is deemed proper to implement the Japanese Assistance of this Project by means of Japanese grant aid cooperation.