

APPENDIX 5

REHABILITATION OF ORPHANAGES

(JROH NAGUNA & NIRMALA)

UNDER JAPAN'S NON-PROJECT TYPE GRANT AID

**APPENDIX-5 REHABILITATION OF ORPHANAGES  
(JROH NAGUNA & NIRMALA)  
UNDER JAPAN’S NON-PROJECT TYPE GRANT AID**

**Table of Contents**

	<i>Page</i>
CHAPTER 1 DESIGN AND ESTIMATED CONSTRUCTION COSTS .....	A5-1
1.1 DESIGN CONDITIONS .....	A5-1
1.1.1 Purpose and Overview of the Project .....	A5-1
1.1.2 Location of the Site .....	A5-2
1.1.3 Facility Names and Classification of New Construction and Repairs .....	A5-2
1.1.4 Building Damage and Repair Methods .....	A5-3
1.1.5 Building Equipment and Electricity Plans .....	A5-9
1.1.6 Plan for Repairs to Existing Buildings .....	A5-13
1.1.7 Design Principles for Newly Constructed Buildings .....	A5-14
1.1.8 Site Conditions .....	A5-22
1.1.9 Structure Plan .....	A5-23
1.2 NATURAL CONDITIONS .....	A5-28
1.2.1 Topography .....	A5-28
1.2.2 Weather .....	A5-30
1.2.3 Termite Control .....	A5-30
1.3 DESIGN STANDARDS .....	A5-30
1.3.1 Applied Regulation and Standards .....	A5-30
1.4 DESIGN DRAWINGS .....	A5-31
1.4.1 Basic Policy for Drafting Design Drawing .....	A5-31
1.5 ESTIMATION OF CONSTRUCTION COSTS .....	A5-36
1.5.1 Basic Policy for Rough Estimation of Construction Costs .....	A5-36
1.5.2 Overview of Rough Construction Costs .....	A5-37
1.5.3 Appropriateness of Rough Construction Costs .....	A5-37
1.5.4 Overview of Costs by Facility .....	A5-38
 CHAPTER 2 PREPARATION OF TECHNICAL REPORT .....	 A5-39
2.1 TENDERING CONDITIONS .....	A5-39
2.1.1 Source of Fund .....	A5-39
2.1.2 Mode of Tender .....	A5-39
2.2 TECHNICAL REPORT .....	A5-39

## **List of Table**

	<i>Page</i>
Table 1.1.1 Classification of New Construction and Repairs for Each Facility in the Orphanages .....	A5-3
Table 1.1.2 Classification of Repairs by Facility at Jroh Naguna Orphanage .....	A5-6
Table 1.1.3 Classification of Repairs by Facility at Nirmala Orphanage .....	A5-8
Table 1.1.4 Buildings and Facilities for New Construction.....	A5-15
Table 1.1.5 Outline of the Plan of Nirmala Orphanage Administration Building and Education Building .....	A5-20
Table 1.1.6 Outline of the Plan of Jroh Naguna Orphanage Orphanage Vocational Training Building.....	A5-21
Table 1.1.7 Outline of the Plan of Jroh Naguna Orphanage Auditorium .....	A5-22
Table 1.1.8 Structural Overview .....	A5-23
Table 1.1.9 Live Load Summary.....	A5-26
Table 1.1.10 Material LIST .....	A5-28
Table 1.2.1 Overview of Survey Data .....	A5-28
Table 1.4.1 List of Drawings .....	A5-32
Table 1.5.1 Overview of Construction Costs.....	A5-37
Table 1.5.2 Cost Overview per Unit Area .....	A5-38
Table 1.5.3 Overview of Cost by Facility at Nirmala Orphanage .....	A5-38
Table 1.5.4 Overview of Cost by Facility at Jroh Naguna Orphanage.....	A5-38

## **List of Figure**

	<i>Page</i>
Figure 1.1.1 Site Plan of Jroh Naguna and Nirmala Orphanages .....	A5-1
Figure 1.1.2 Location of Jroh Naguna and Nirmala Orphanages .....	A5-2
Figure 1.1.3 Site Plan and Rehabilitation plan for Jroh Naguna Orphanage .....	A5-4
Figure 1.1.4 Site Plan and Rehabilitation Plan for Nirmala Orphanage .....	A5-5
Figure 1.1.5 Site Plan and Rehabilitation Plan for Nirmala Orphanage .....	A5-7
Figure 1.1.6 Nirmala Orphanage Water Supply Plan.....	A5-10
Figure 1.1.7 Nirmala Orphanage Power System Diagram.....	A5-12
Figure 1.1.8 Condition of Lighting Fixture in Nirmala Orphanage.....	A5-13
Figure 1.1.9 Damage Condition of Nirmala Orphanage.....	A5-16
Figure 1.1.10 Damage Condition of Jroh Naguna Orphanage Auditorium .....	A5-17
Figure 1.1.11 Damage Condition of Jroh Naguna Orphanage Vocational Training Building.....	A5-18
Figure 1.1.12 Figure of Nirmala Orphanage Administration Building and Education Building .....	A5-20
Figure 1.1.13 Figure of Jroh Naguna Orphanage Vocational Training Building.....	A5-21

Figure 1.1.14 Figure of Jroh Naguna Orphanage Auditorium .....	A5-22
Figure 1.1.15 Earthquake Zones in Indonesia .....	A5-25

# CHAPTER 1 DESIGN AND ESTIMATED CONSTRUCTION COSTS

## 1.1 DESIGN CONDITIONS

### 1.1.1 Purpose and Overview of the Project

The province-run Jroh Naguna orphanage and the city-run Nirmala orphanage, located approximately 3 km east of central Banda Aceh in the Sumatra province of Indonesia were severely damaged as a result of the Sumatran earthquake. As seen in Figure 1.1.1, the sites included not only boarding facilities, but also mosques, administration buildings, education rooms, kitchens and dining rooms, guest houses, and numerous other facilities related to the orphanages. Most were one-story buildings and some require complete reconstruction as a result of severe damage. The damage conditions of each facility are shown in Figures 1.1.9 through 1.1.9~1.1.11 The walls of many buildings were cracked as a result of the pressure from the tsunami, and fixtures such as the windows and doors of buildings were particularly heavily damaged. Some buildings are structurally unsafe as a result of large cracks in the pillars and beams, which are the major supports of the buildings. Many rooms in these buildings are unusable, and life these days continues under strained conditions at the orphanages. Given the current conditions, this project aims to reconstruct and rehabilitate the orphanages, which play such a vital societal role. The goals are to ensure the safety of the sites, restore their normal function, improve the poor facility environment, employ disaster countermeasures, and expand the capacity of the facilities to meet the increased number of orphans and facility-related personnel.

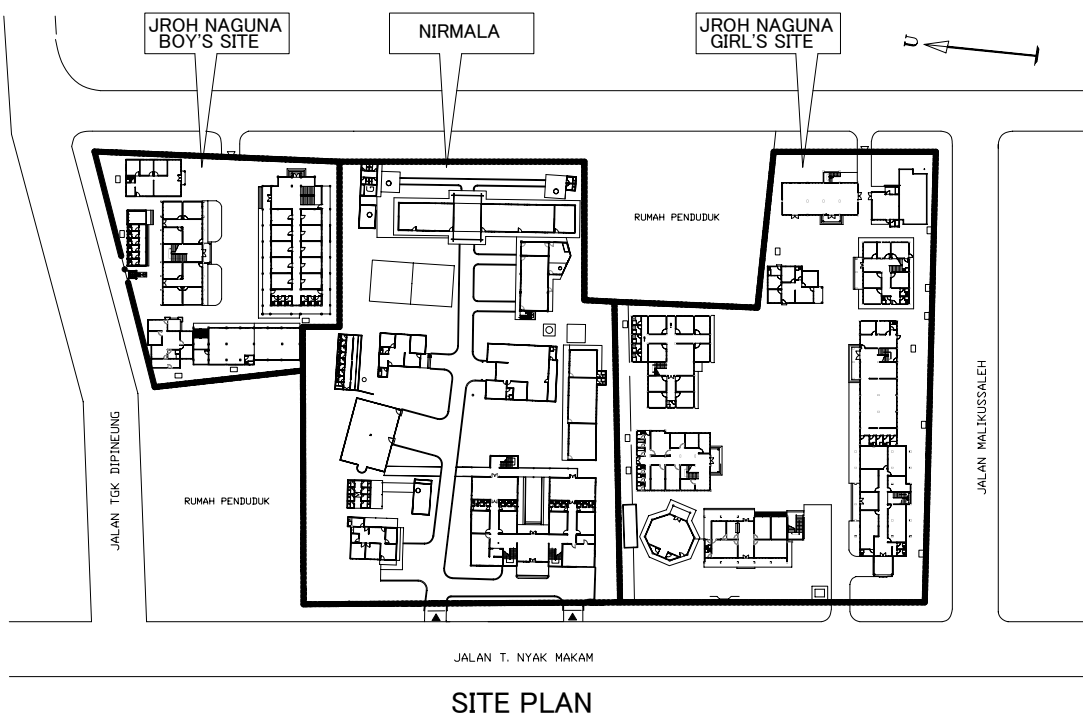


Figure 1.1.1 Site Plan of Jroh Naguna and Nirmala Orphanages

### 1.1.2 Location of the Site



Figure 1.1.2 Location of Jroh Naguna and Nirmala Orphanages

### 1.1.3 Facility Names and Classification of New Construction and Repairs

Table 1.1.1 shows the classification of new construction and repairs for existing buildings in the orphanages. In terms of the procedure for surveying the site, after a survey of the framework of buildings was conducted, if it was determined that a building does not have structural damage that would prevent safe use on an ongoing basis, the finishing materials, fixtures, and electrical equipment would be repaired. If the damage was severe and structural safety cannot be guaranteed, the existing building would be cleared off and new construction would be planned for that site. The administrative building in the Nirmala orphanage suffered a great deal of damage and is slated for new construction. However, the other facilities at that orphanage will be repaired. The boarding house, workshop, and auditorium at the Jroh Naguna orphanage will mainly be rebuilt, while other facilities at that orphanage will undergo repairs.

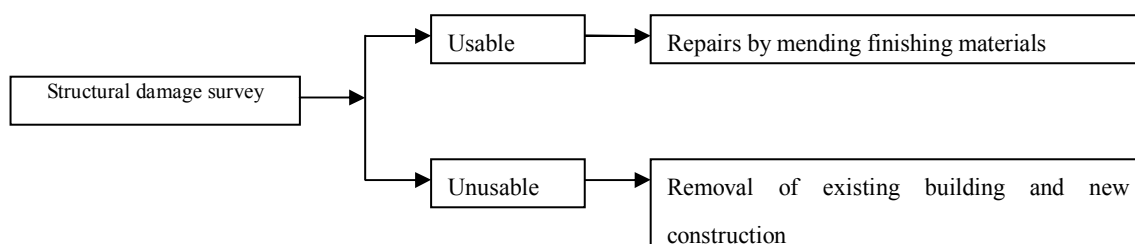


Table 1.1.1 Classification of New Construction and Repairs for Each Facility in the Orphanages

No.	Nirmala orphanage				Jroh Naguna orphanage		
Mark	Facility name	New Construction	Repairs	Mark	Facility name	New Construction	Repairs
A	Office and Education room	●		A.C	Office and Hostel of Main-I		○
B	Women's Hostel/ Office & Education Room		○	B	Auditorium		○
C	Men's Hostel		○	D	Mosque		○
D	Mess Room		○	E-1	Hostel of Girl-1		○
E	Men's Hostel-2		○	E-2	Hostel of Girl-2		○
F	Toilet-4		○	F	Office House		○
G	Toilet-3		○	G.I	Kitchen and Mess Room-1		○
H	Guest House		○	H	Hostel of Main-2		○
I	Toilet-2		○	J	Education Room		○
J	Mosque		○	K.L	Workshop and Boarding House	●	
K	Corridor	●		M	Polyclinic		○
L	Well		○	N	Boarding House and Auditorium	●	
M	Toilet-1		○	Q	Kitchen and Mess Room-2		○
N	Office		○				

#### 1.1.4 Building Damage and Repair Methods

The height of the tsunami waves was approximately 2 meters above ground at the boys' hostels of the Nirmala and Jroh Naguna orphanages, and approximately 1.7 meters at the girls' hostel of the Jroh Naguna orphanage. The most striking damage due to the tsunami was the cracks in the major structural components of the buildings and deformation and separation of the concrete due to subsidence in the foundations of the buildings. In addition, finishing materials were also greatly damaged, including damage to outside structures such as walls and gates, damage to the walls on the first floor of buildings, damage to and rusting of fixtures, deformation, damage to, and rusting of

steel sheet roofing, fallen and damaged interior walls and ceilings and adhesion of dirt. Beds, furniture, and other living supplies also suffered extensive damage. Figures 1.1.3 and 1.1.4, in the next section, show the location of each facility and the plan for its restoration. The main restoration items are repainting of walls, replacement and repainting of ceilings, replacement and painting of part of the roofing materials, replacement and repainting of fixtures, replacement of the flooring, replacement of toilets, and replacement of light fixtures.

(1) Facility layout and overview of plans for repairs to Jroh Naguna orphanage

Site plan and rehabilitation plan for Jroh Naguna orphanage are shown in Figure 1.1.3.

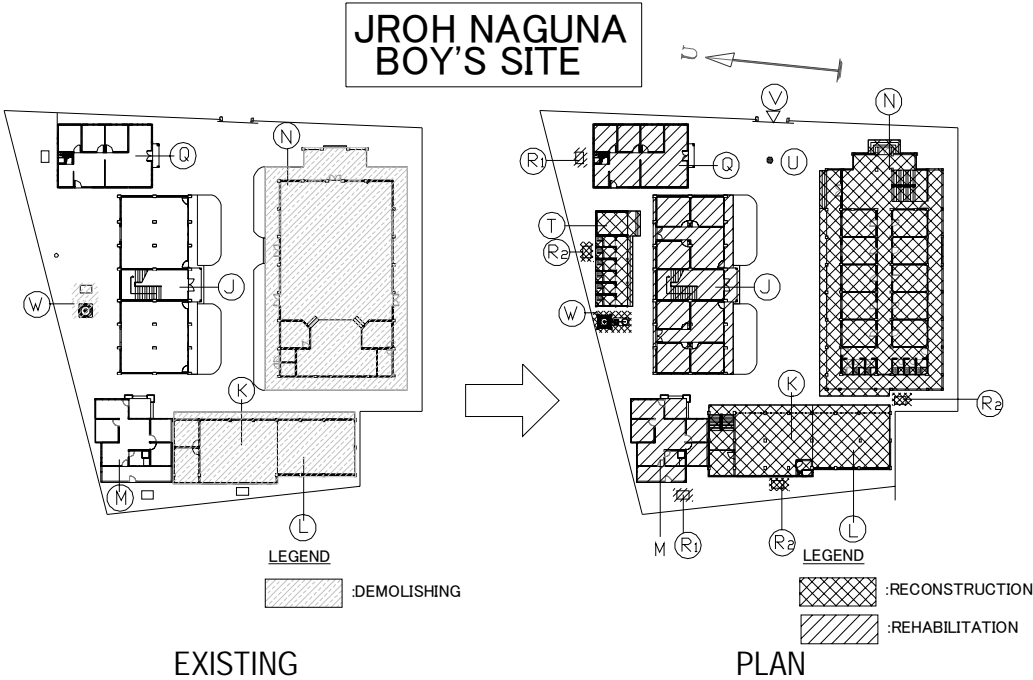


Figure 1.1.3 Site Plan and Rehabilitation Plan for Jroh Naguna Orphanage



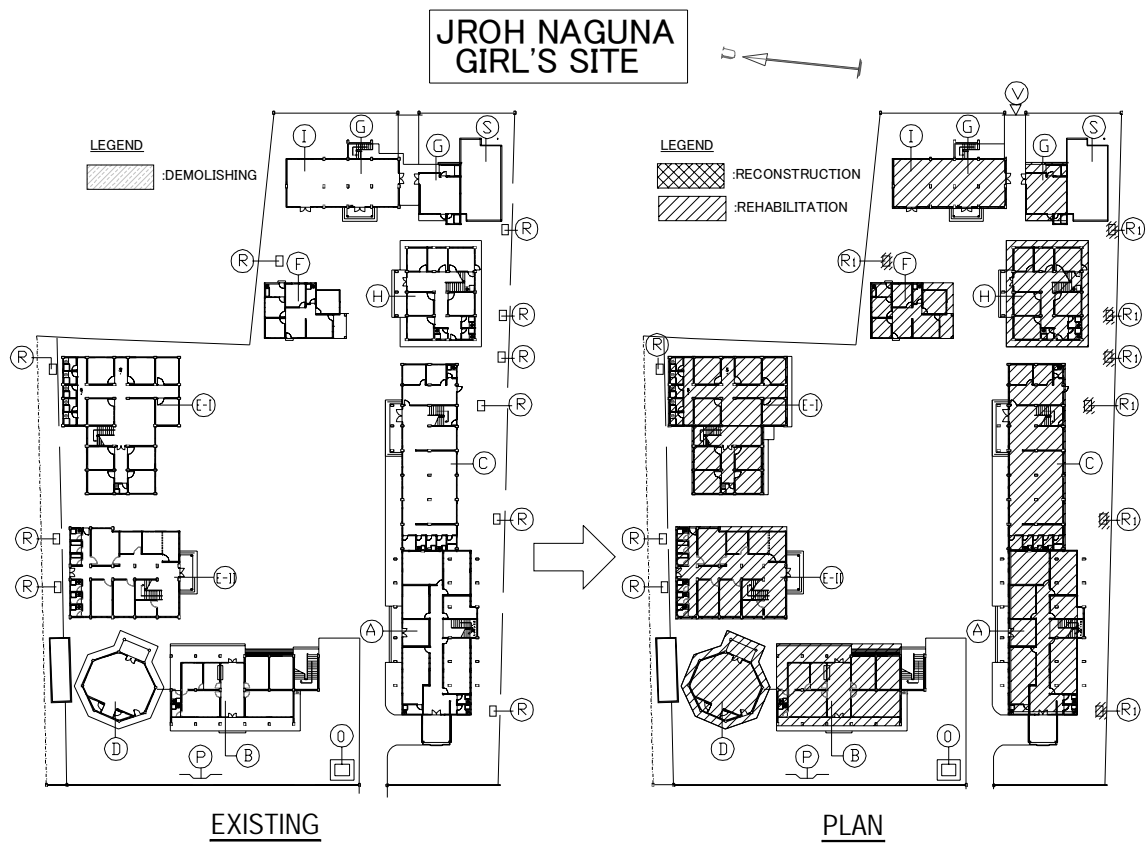


Figure 1.1.4 Site Plan and Rehabilitation Plan for Jroh Naguna Orphanage

Table 1.1.2 Classification of Repairs by Facility at Jroh Naguna Orphanage

Symbol	Facility name		Repair classification (○: Usable X: Unusable ▲: Overall repairs □: Partial repairs)									
			Structure	Exterior walls	Interior walls	Indoor flooring	Halls Stairs	Ceilings	Roofs	Fixtures	Light fixtures	Plumbing fixtures
A/C	Office and Hostel (Boy)1	2 <sup>nd</sup> fl	○	▲	▲	△	△	▲	△	△	△	△
		1 <sup>st</sup> fl		▲	▲	▲	▲	▲		△	△	△
B	Auditorium	2 <sup>nd</sup> fl	○	▲	▲	△	▲	▲	△	△	▲	○
		1 <sup>st</sup> fl		▲	▲	△	N/A	▲		△	▲	○
D	Mosque		○	▲	▲	▲	N/A	▲	▲	△	○	N/A
E-I	Hostel (Girl)1	2 <sup>nd</sup> fl	○	▲	▲	△	△	▲	○	△	△	△
		1 <sup>st</sup> fl		▲	▲	△	△	▲		△	△	○
E-II	Hostel(Girl)2	2 <sup>nd</sup> fl	○	▲	▲	△	○	▲	▲	△	○	○
		1 <sup>st</sup> fl		▲	▲	△	○	▲		△	○	○
F	Office House		○	▲	▲	▲	N/A	△	○	△	○	△
G/I	Kitchen and Mess Room1	2 <sup>nd</sup> fl	○	▲	▲	○	△	▲	△	△	△	○
		1 <sup>st</sup> fl		▲	▲	△	△	▲		△	△	○
H	Hostel(Boy)2	2 <sup>nd</sup> fl	○	▲	▲	△	○	△	△	△	△	○
		1 <sup>st</sup> fl		▲	▲	△	○	△		△	△	○
J	Education Room	2 <sup>nd</sup> fl	○	▲	▲	○	△	▲	△	△	▲	○
		1 <sup>st</sup> fl		▲	▲	▲	△	▲		△	▲	○
K/L	Workshop and Boarding House		X	New construction, due to major damage to structure frame.								
M	Polyclinic		○	▲	▲	▲	N/A	▲	▲	△	○	○
N	Auditorium		X	New construction, due to major damage to structure frame.								
Q	Kitchen and Mess Room2		○	▲	▲	▲	N/A	▲	○	△	○	△
T	Toilet		X	New construction, due to tsunami damage.								

In addition to the repairs listed in Table 1.1.2, other repair work performed will include the following described repairs to the roads inside the premises, restoration of walls and gates, and repairs to water supply facilities.

- ◆ Roads inside premises: Since the corridor connecting the boys' hostel was severely damaged, repairs will be made using interlocking block material.
- ◆ Grounds work: The roads in vacant land other than the roads inside the premises of the boys' hostel will be repaired with gravel.

- ◆ Walls and gates: Walls on the perimeter of the facilities collapsed due to the tsunami, and will therefore be rebuilt.
- ◆ Water supply facilities: Saltwater damage due to the tsunami rendered the existing well unusable. Therefore, new water supply facilities will be installed.

(2) Facility layout and overview of repair plans at Nirmala orphanage

Site plan and rehabilitation plan for Nirmala orphanage is shown in Figure 1.1.5.

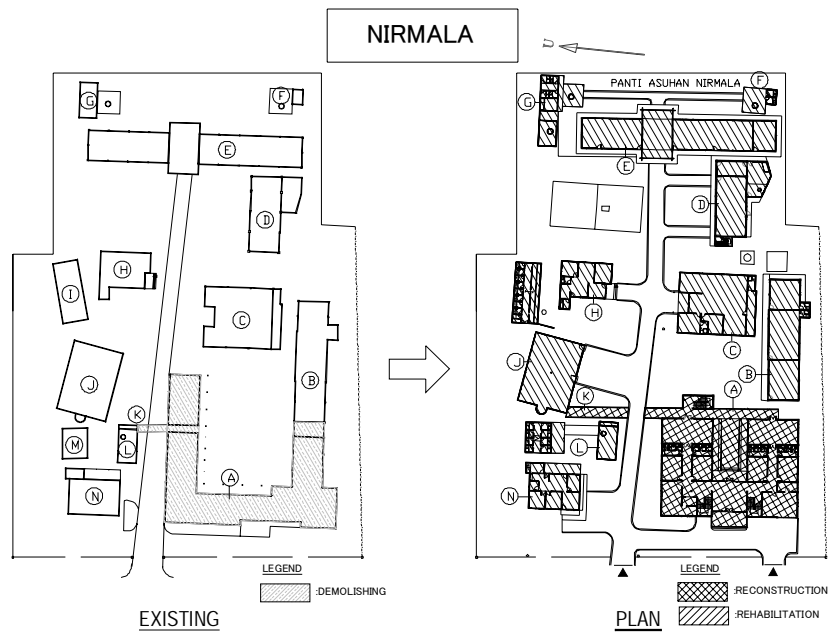


Figure 1.1.5 Site Plan and Rehabilitation Plan for Nirmala Orphanage

Table 1.1.3 Classification of Repairs by Facility at Nirmala Orphanage

Symbol	Facility name		Repair classification (○: Usable X: Unusable ▲: Overall repairs □: Partial repairs)									
			Structure	Exterior walls	Interior walls	Indoor flooring	Halls Stairs	Ceiling material	Roofing material	Fixtures	Light fixtures	Plumbing fixtures
A	Office and Education Room	2 <sup>nd</sup> fl	X	New construction, due to major damage to structure frame. Plan is for replacing the content of the existing facility and adding a third floor along with a multipurpose room which will also function as an evacuation area.								
		1 <sup>st</sup> fl										
B	Hostel (Girl)		○	▲	▲	△	N/A	△	▲	○	▲	▲
C	Hostel (Boy)1		○	▲	▲	▲	N/A	▲	▲	▲	▲	▲
D	Mess Room	2 <sup>nd</sup> fl	○	▲	▲	▲	△	▲	▲	▲	▲	○
		1 <sup>st</sup> fl		▲	▲	▲	△	▲		▲	▲	○
E	Hostel (Boy)2		○	▲	▲	▲	△	▲	▲	▲	▲	N/A
F	Toilet 4		○	▲	▲	▲	N/A	▲	▲	▲	▲	▲
G	Toilet 3		○	▲	▲	▲	N/A	▲	▲	▲	▲	▲
H	Guest House		○	▲	▲	○	N/A	▲	○	△	▲	○
I	Toilet 2		○	▲	▲	▲	N/A	▲	▲	▲	▲	▲
J	Mosque		○	▲	▲	○	N/A	▲	▲	▲	▲	N/A
K	Corridor		X	New construction, due to tsunami damage								
L	Well Facility		○	▲	▲	▲	N/A	N/A	N/A	N/A	N/A	N/A
M	Toilet 1		○	▲	▲	▲	N/A	▲	▲	▲	▲	▲
N	Office		○	▲	▲	○	▲	▲	▲	○	○	▲

In addition to the repairs listed in Table 1.1.3, other repair work performed will include the following described repairs to the roads inside the premises, restoration of walls and gates, and repairs to the water supply facilities.

- ◆ Roads inside premises: Since the corridor connecting the facilities was severely damaged, repairs will be made using interlocking block material.
- ◆ Grounds work: Repair work in vacant land other than the roads inside the premises will be made using sod.
- ◆ Walls and gates: Walls on the perimeter of the facilities collapsed due to the tsunami, and will therefore be rebuilt. To make the gates more convenient, two additional gates will be built along the road on the western side of the facility.
- ◆ Water supply facilities: Salt damage due to the tsunami rendered the existing well unusable. Therefore, new water supply facilities will be installed.
- ◆ Other: The volleyball court will be repaired.

### **1.1.5 Building Equipment and Electricity Plans**

#### (1) Water supply facilities

##### 1) Current conditions in the city of Aceh

Restoration of the structural function of the buildings as well as the function of the equipment and electricity are both important parts of the plan. The extent of damage is great, impairing the function of not only the area covered by this plan, but also of the entire region impacted by the disaster. Although the waterworks department of the city of Aceh is currently carrying out restorative work, running water is still turbid in Nirmala, Jroh Naguna, and the surrounding areas and is therefore not yet being used. Consequently, these areas are dependent on city and other water tank trucks for their supply of water. Due to lagging advancements in the restoration of city water, the Aceh Province Resource Agency is conducting drilling exploration of deep wells. In addition, Switzerland is constructing a deep well for drinking water inside the premises of the Jroh Naguna girls' hostel. This well is 160 meters in depth and this type of well is a conventional method of water supply in Indonesia. The well constructed under this plan must also be around the same depth. According to the provincial government, there is a plan to conduct an analysis on the water quality of the water from this new well in the future. For water to be used in toilets, water from the existing shallow well can be used. The shallow well is approximately 3 meters deep and contains salt, making it unsuitable for drinking water. Water is supplied to the facilities in the orphanage from the shallow well via pumps and other methods.

##### 2) Water supply planning under this plan

As mentioned in section 1) above, city water remains unusable at this time. Consequently, appropriate water supply equipment must be installed in each facility.

- ◆ In the boys' hostel at the Jroh Naguna orphanage, repairs will be made to the elevated water tank, pump, and other water supply facilities to provide water. However, it is expected that contamination of running and well water has clogged the faucets with mud, and that they will need to be replaced.
- ◆ As for the well at the girls' hostel at the Jroh Naguna orphanage, a deep well of 160 meters is currently under construction by another donor (Switzerland). As a result, repair work to the well is outside the scope of this plan. Also, as with the boys' hostel at the Jroh Naguna orphanage, it is expected that contamination of running and well water has clogged the faucets with mud, and that they will need to be replaced.
- ◆ Since the existing water supply facilities at the Nirmala orphanage are unusable, a deep well will be drilled in the vacant land next to the existing dinning room water will be supplied via water supply facilities including an elevated tank and a pump which will also be installed. Also, as with the boys' hostel at the Jroh Naguna orphanage, it is expected that contamination of running and well water has clogged the faucets with mud, and that they will need to be

replaced.

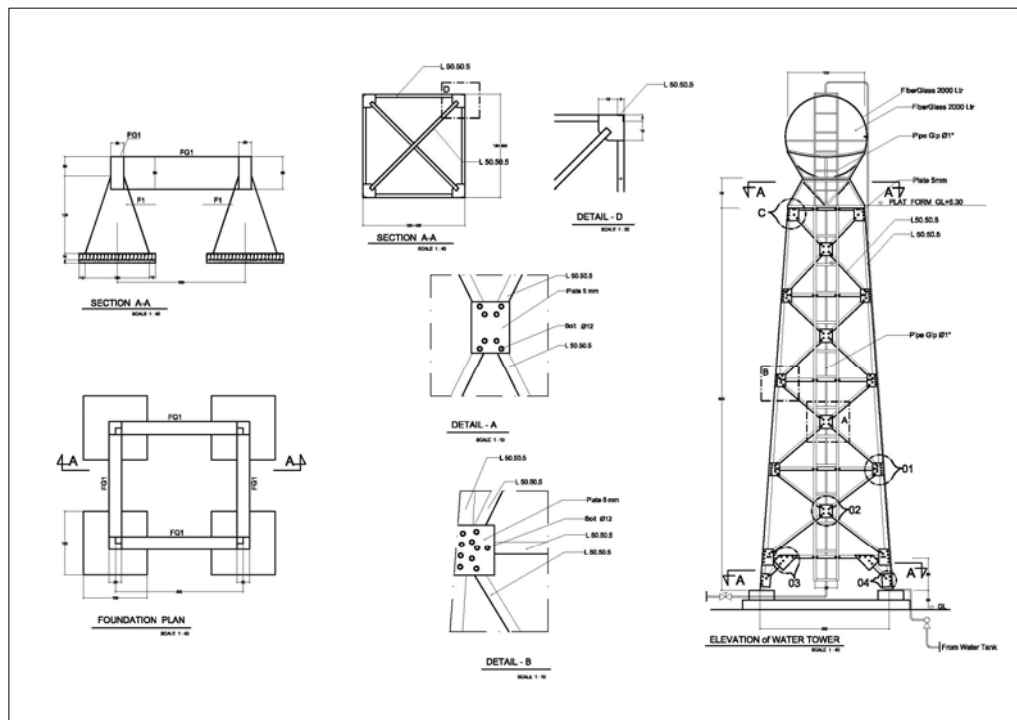
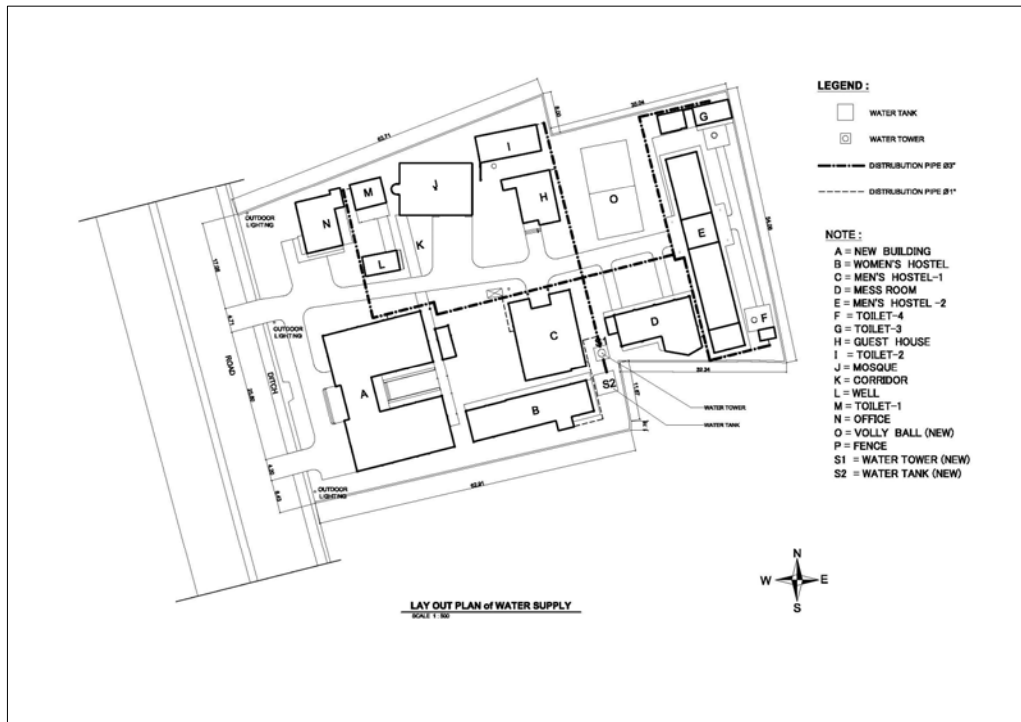


Figure 1.1.6 Nirmala Orphanage Water Supply Plan

(2) Electrical facility planning under this plan

Tsunami damage has also resulted in impaired function of the electricity-related facilities at this site. In particular, power line retracting mechanisms and lighting fixtures have been greatly damaged. The goal of this plan is to restore function to the level it was before the damage, and therefore the

plans for electrical equipment at each facility are as shown below. However, as for the power lines, electricity is to be received via a utility pole, as is the case with the existing facilities, and the plan will be to arrange to have PLN (Indonesia's state-run power company) pull and position the power lines when the application is made.

1) Jroh Naguna orphanage

Power will be received at the girls' hostel from the west side of the building and at the boys' hostel (whose front gate is at the opposite side of the girls' hostel) from the right side as seen facing the building. Therefore, the plan for the boys' hostel is to receive power at a utility pole on the south side. Since nearly all of the light fixtures in the facility were damaged, they will need to be replaced. In particular, damage on the first floor is extensive, and most light fixtures are unusable as a result of deterioration of parts because of rust, both from age and from the tsunami. The spread of rust will lead to damage such as electrical leaks and earth fault accidents, and therefore necessitates immediate replacement of these parts. In addition, some light fixtures have fallen from the ceilings as a result of vibration from the earthquakes. When the light fixtures fell from the ceilings it exerted an excessive amount of strain on the cables and contact points resulting in damage to the insulating coating on both the cables and the fixtures. As a result, these parts also require immediate replacement.

2) Nirmala orphanage

Due to the positional relationship between the existing utility pole and the facility, the plan is to receive power from a utility pole on the west side of the building. Power will be distributed throughout the facility by overhead wiring. The wiring will come from the utility pole on the west side and then be received at a utility pole located within the premises. A distribution board with a watt-hour meter will be installed, and power will be distributed to the buildings from the second side via an underground distribution system. Regarding the connection point with the local power supply, in principle the contractor ordering the work makes an application up to the distribution board to PLN, and must carry out any procedures necessary for receiving power. The vendor will bear any costs associated with receiving power, such as the cable and watt-hour meter obtained from PLN.

As is the case with the Jroh Naguna orphanage, lighting fixtures here have also been damaged to the extent that most of them in the facility need to be replaced. In particular, the damage on the first floor is extensive, and most of the light fixtures are unusable as a result of deterioration of parts because of rust, both from age and from the tsunami. The spread of rust will lead to damage such as electrical leaks and earth fault accidents, and therefore necessitates immediate replacement of these parts. In addition, some light fixtures have fallen from the ceilings as a result of vibration from the earthquakes. When the light fixtures fell from the ceilings it exerted an excessive amount of strain on the cables and contact points resulting in damage to the insulating coating on cables and fixtures.

As a result, these parts also require immediate replacement (see photos below).

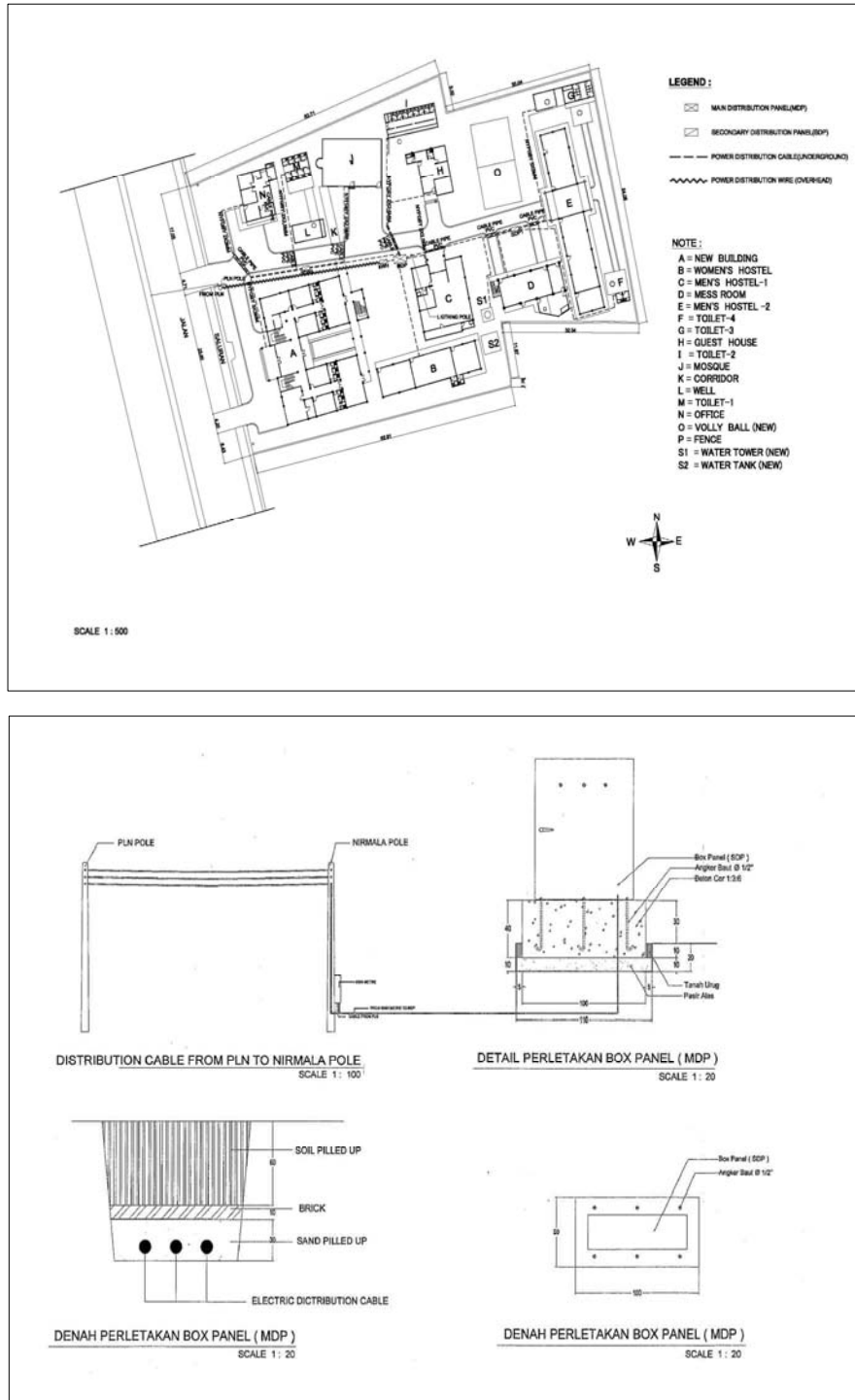


Figure-1.1.7 Nirmla Orphanage Power System Diagram





Lighting fixtures in sleeping rooms and kitchen  
(the screws holding the fixtures in place have dropped out and the fixtures are hanging by their cables)

Figure 1.1.8 Condition of Lighting Fixture in Nirmala Orphanage

### 1.1.6 Plan for Repairs to Existing Buildings

Among the facilities that were damaged by the tsunami, some had only minor structural damage and with repairs can once again become usable buildings. For these buildings, the plan is to make repairs using the methods described below. Construction materials similar to the existing finishing materials will be chosen, with consideration given to economical efficiency and marketability.

- ◆ After the cracks in the exterior and interior walls are repaired, the walls will be painted. The portion of the walls with cracks will be removed, along with their mortar base, and the holes filled in with new mortar. To get rid of already deteriorated paint and the salt adhering to the surface as a result of the tsunami, a wire brush will be used to scrape off the deteriorated surface. Then, the walls will be washed, dried thoroughly, and recoated with plaster (adhesive process), and painted. Since the quality of the final paint job is, to a large extent, determined by the quality of the underlying base, this process will be carried out with great care.
- ◆ For the floors of the rooms, the repair work involves replacing the damaged tile. Since the existing underlying mortar base under the tiles is thin, both the tiles and the underlying mortar will be removed. After putting down a new mortar base, new tiles will be put in place.
- ◆ The damaged parts of the ceiling will be completely removed and replaced with materials similar to the existing ceiling. However, cement asbestos material will not be used as it is a health hazard. Basically, hooks will not be replaced. Only the ceiling material itself will be replaced and painted. The parts of the ceiling that can be repaired only by painting will be handled in the same way as with the wall repairs. A wire brush will be used to scrape off the deteriorated surface paint and then the ceiling will be primed and painted.
- ◆ The method for repairing the roofing material will vary according to the type of materials used in the existing roofing. For facilities with steel sheet roofing (galvanized iron roofing) that

exhibit severe rusting and are leaking, the entire roof will be replaced. Since facilities with tiled roofs have comparatively minor damage, only the damaged parts will be replaced.

- ◆ Repair work on fixtures (doors and windows) will depend on the extent of damage. The work is divided into the following categories: glass replacement only, frame repainting, frame usable but door or window itself is replaced with a new one, and complete replacement including frame. Mounting hardware, knobs, and metal fixtures such as locks have been exposed to salt due to the tsunami and may rust. Therefore, these parts will be thoroughly washed and any fixtures that have already begun to rust will be replaced.
- ◆ For repairs to toilets, only the plumbing fixtures which were severely damaged will be replaced. Repair on pipes that show no signs of damage will be limited to cleaning.
- ◆ For lighting fixtures, lighting fixtures and hooks that show extensive damage will be replaced, and repairs will be made to any broken indoor wiring. However, since the outlets and switches are usable, the existing ones will be kept and used.
- ◆ Faucets and indoor pipes that are part of the water supply equipment only suffered minor damage, and as a result are almost usable. The damaged faucets shall be repaired.

### **1.1.7 Design Principles for Newly-Constructed Buildings**

#### **(1) Background on existing buildings and basic principles**

The orphanage facilities discussed here are included in the scope of this urgent rehabilitation and reconstruction plan. Approximately 60 years, the city-run Nirmala orphanage was built in the center of the site. Then, about 20 years ago, Aceh province constructed a girls' hostel on the south side and a boys' hostel on the northeast side of the Nirmala orphanage. These together were established as the province-run Jroh Naguna orphanage. In 1997 nearly all of the facilities in the Jroh Naguna orphanage (province-run) were rebuilt. In contrast, many of the buildings in the Nirmala orphanage (city-run) have not been rebuilt and have aged over time. It is easy to understand why small-scale buildings were damaged by the tsunami, but even comparatively large steel-reinforced concrete buildings suffered major structural damage due to the tsunami. This is mainly due to a decline in the ultimate lateral strength over time due to aging of the buildings and poor quality original construction. As described in section 1.1.7-(2) and following, the foundation and pillars, which are the major supports of the buildings, along with the beams and walls have been seriously damaged, and are beyond partial repair in some places. In particular, damage such as cracks in the major structural components of aged concrete buildings is not the type of damage that can be reinforced, and it is easy to imagine that many other structurally damaged areas exist in places that cannot be visually confirmed, such as subsidence of the foundation and finishing materials. Even if partial reinforcements were made, stress would be concentrated in areas that cannot be reinforced, according to the principles of degradation, and it would be impossible to ensure the structural safety of the buildings. Furthermore, even if the issue of durability was set aside and reinforcements could

be made, a provisional calculation of repair costs has shown that since repairs are needed building-wide, the costs amount to somewhere between 60% and 70% of what it would cost for new construction. Given these results and considering the life expectancy of the buildings after repairs are complete, it is likely that repairs are not the most economical method of handling these types of damage. Accordingly, buildings that have suffered significant damage, as described above, will be identified as dangerous structures and removed, followed by new construction. The buildings and facilities earmarked for new construction are as shown below as shown Table 1.1.4.

Table 1.1.4 Buildings and Facilities for New Construction

Reason for new construction	Nirmala orphanage	Jroh Naguna orphanage
Damage to structural frame	<ul style="list-style-type: none"> <li>●Administrative building</li> <li>●education room</li> </ul>	<ul style="list-style-type: none"> <li>●Auditorium</li> <li>●Vocational training building</li> </ul>
Collapsed or was rendered non-functional due to pressure from the tsunami	<ul style="list-style-type: none"> <li>●Corridor connecting facilities</li> <li>●Walls and gates</li> <li>●Water supply facilities</li> </ul>	<ul style="list-style-type: none"> <li>●Toilet</li> <li>●Walls and gates</li> <li>●Water supply facilities</li> </ul>

(2) Damage conditions of each facility

A survey of the tsunami damage conditions showed that the facilities listed below were particularly impacted by damage and that they require new construction (removal of the existing facility and new construction). The damage conditions of each facility are also given.

1) Nirmala orphanage administration building and education room

One of the buildings with the most significant aging was the administration building, comprising an office, a store, an education room, and a boarding house. The images below show the severe structural damage suffered by the front of the building, where the force of the tsunami was greatest as shown Figure 1.1.9.

- ◆ This facility is an aged building several decades old and already had problems in terms of structural strength due to aging.
- ◆ Large cracks (10 mm wide by 30 cm long) appeared at the junction of the two pillars and the beam at the front entrance, and the reinforcing steel is deformed.
- ◆ The pillars and walls on which the roof rests have numerous cracks.
- ◆ The foundation on the back patio side has subsided causing visible structural distortion.
- ◆ Distortion has caused windows and fixtures to break and/or change shape, and these parts are irreparable.
- ◆ There is damage throughout the building, including the foundation, and the safety of this building most likely cannot be ensured by performing repair work alone.



Figure 1.1.9 Damage Condition of Nirjala Orphanage

The doors and windows of the centrally-located boys' hostel are severely damaged. This building is one of the oldest (60 years old) and the floor is not of a sufficient height since it is the same as the ground outside. It floods regularly during heavy rainfalls.

## 2) Jroh Naguna orphanage auditorium

- ◆ The pillars, which are main structural supports, exhibit both deformation and damage. The 18 main pillars in the center (north side), running the length of the building, are approximately 5 meters high. Six of those are separated from the beam above them by 8 cm and 12 cm, creating a structurally dangerous condition.
- ◆ The junctions between the roof beam and pillars near the front entrance have cracks in 4 parts. Among them, at 2 points, the coated concrete has come off and fallen, revealing the deformed reinforcing steel.
- ◆ The roof trusses are deformed as a result of strain on the building and the roofing material has come off and fallen significantly.
- ◆ The walls have countless diagonal cracks.
- ◆ Strain on the building has resulted in damage to and deformation of the windows and other fixtures, making these parts irreparable.
- ◆ There is damage throughout the building, including the foundation, and the safety of this

building most likely cannot be ensured by performing repair work alone as shown Figure 1.1.10.



Figure 1.1.10 Damage Condition of Jroh Naguna Orphanage Auditorium

### 3) Jroh Naguna orphanage vocational training building

- ◆ Subsidence of the foundation has triggered structural deformation.
- ◆ The beam, a major structural component, has numerous diagonal cracks significantly impairing its strength.
- ◆ The walls have countless diagonal cracks.
- ◆ The ceilings are sagging severely.
- ◆ Strain on the building has resulted in damage to and deformation of the windows and other fixtures, making these parts irreparable.
- ◆ There is damage throughout the building, including the foundation, and the safety of this building most likely cannot be ensured by performing repair work alone as shown Figure 1.1.11.





Figure 1.1.11 Damage Condition of Jroh Naguna Orphanage Vocational Training Building

#### 4) Other facilities at Jroh Naguna orphanage

- ◆ The exterior toilet and shower house at the boys' hostel site collapsed and were washed away in the tsunami.
- ◆ The wall on the west boundary of the boys' hostel site was completely destroyed.

#### (3) Basic principles in the construction plan

The plans for reconstructing the existing buildings were decided upon after deliberation with officials from the Indonesian government. The procedure included an exchange of opinions with the orphanage administrators who were directly involved in the facilities, a survey of both the requests and the actual facility usage conditions, and then a draft of a proposal. Then, design plans proceeded in compliance with the orphanage construction standards and regulations of the Indonesian Ministry of Social Affairs, the overseeing organization. The acceptance of additional orphans and facility-related personnel was a request from the Indonesian Ministry of Social Affairs. Approval of the final draft has been received from the Indonesian Ministry of Social Affairs in Jakarta and the Aceh city Ministry of Social Affairs. The following is the layout plan for the newly-constructed facilities, a floor plan, and a discussion of things to keep in mind regarding the design scale.

(4) Building layout plans

The layout plan of the facilities, which takes into consideration the convenience and coordination with surrounding buildings, is not a very different layout from that which existed before the tsunami damage.

(5) Floor plan and basic principles in determining the scale of construction

1) Basic plan

In this urgent rehabilitation and reconstruction plan, one of the basic principles is to restore the facilities to the state they were in before they were damaged. Accordingly, when planning for the newly-constructed buildings the facility content and required rooms will, in principle, follow the scale of the existing facility and there are no particular plans for buildings with new functions.

2) Measures to expand the scale of accommodations

The plan has basically been formulated at the same scale as the existing facilities, however, according to the Ministry of Social Affairs, the number of orphans at the Nirmala orphanage increased by 50 children and at the Jroh Naguna orphanage by 100 children in order to cope with the increase of number of orphans after the disaster. Along with an expected increase in these numbers is a plan to expand the scale of accommodations and the facility-related personnel, accordingly. Given this situation, the plan includes a boarding house as a measure to accept those people and an increase in the number of toilets. The boarding house (hostel rooms) will be built for four people per room in order to ensure a relatively comfortable living and learning space. The rooms will be large enough (approximately 15 m<sup>2</sup>) to allow for a comfortable arrangement of bunk beds, study desks (for each person), and closets (for each person).

3) Evacuation and disaster countermeasures

When planning for reconstruction in disaster affected areas, implementing a floor plan that takes into account disaster planning is important as it contributes to the peace of mind of not only those who use the facility but also the neighboring citizens. Most of the buildings in the existing facility are one-story buildings and do not provide a place to evacuate to in case of a tidal wave or flooding. This plan considers the fact that most of the tsunami damage was concentrated in the first floor and the fact that restoration of the existing facility scale will not ensure sufficient evacuation space. It allows for three-story buildings for both the administrative and education buildings in the Nirmala orphanage, as part of the disaster countermeasures, the space of which can be used during disasters as evacuation areas. These spaces will be used as meeting rooms, auditoriums, and gymnasiums during normal times. Another improvement over the current utilization types is an expansion of the common spaces (corridors, stairs, lobby, etc.) so that they can be used as evacuation routes during disasters.

4) Design overview of each facility

① Nirmala orphanage administration building and education building

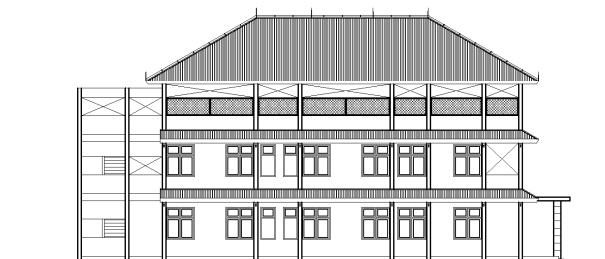
Table 1.1.5 shows outline of the plan of Nirmala orphanage administration building and education building.

Table 1.1.5 Outline of Plan of Nirmala Orphanage Administration Building and Education Building

	Existing facility		New construction plan		Plan overview
Floor space (m <sup>2</sup> )	438.0(m <sup>2</sup> )		602.4(m <sup>2</sup> )		
Cumulative floor space (m <sup>2</sup> )	438.0(m <sup>2</sup> )		1459.0(m <sup>2</sup> )		
Eave height (m)	3.80(m)		9.80(m)		
Floors	One-story		Three-story		
Construction	Reinforced steel concrete frame Block construction		Reinforced steel concrete construction		
Room name	1 <sup>st</sup> floor	<ul style="list-style-type: none"> <li>• Office</li> <li>• Storage</li> <li>• Classroom</li> <li>• Hostel</li> <li>• Other common space</li> </ul>	1 <sup>st</sup> floor	<ul style="list-style-type: none"> <li>• Office</li> <li>• Storage</li> <li>• Classroom</li> <li>• Hostel</li> <li>• Other common space</li> </ul>	
	2 <sup>nd</sup> floor	N/A	2 <sup>nd</sup> floor	<ul style="list-style-type: none"> <li>• Hostel</li> </ul>	
	3 <sup>rd</sup> floor		3 <sup>rd</sup> floor	<ul style="list-style-type: none"> <li>• Multi-purpose room (meetings, evacuation area)</li> </ul>	



**FRONT ELEVATION**



**LEFT ELEVATION**

Figure 1.1.12 Figure of Nirmala Orphanage Administration Building and Education Building



② Jroh Naguna orphanage vocational training building

Table 1.1.6 shows outline of the plan of Jroh Naguna orphanage vocational training building.

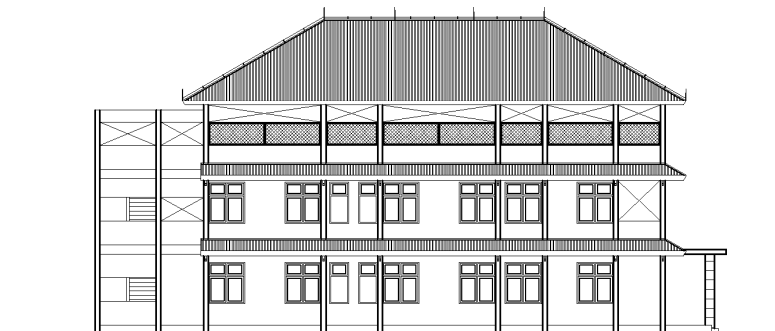
Table 1.1.6 Outline of Plan of Jroh Naguna Orphanage Orphanage Vocational Training Building

	Existing facility		New construction plan		Plan overview
Floor space (m <sup>2</sup> )	169.0(m <sup>2</sup> )		217.4(m <sup>2</sup> )		
Cumulative floor space (m <sup>2</sup> )	169.0(m <sup>2</sup> )		434.8(m <sup>2</sup> )		
Eave height (m)	3.80(m)		7.70(m)		
Floors	One-story		Two-story		
Construction	Reinforced steel concrete frame Block construction		Reinforced steel concrete construction		
Room name	1 <sup>st</sup> floor	<ul style="list-style-type: none"> <li>• Training room</li> <li>• Storage</li> <li>• Other common space</li> </ul>	1 <sup>st</sup> floor	<ul style="list-style-type: none"> <li>• Training room</li> <li>• Storage</li> <li>• Hostel</li> <li>• Other common space</li> </ul>	
	2 <sup>nd</sup> floor	N/A	2 <sup>nd</sup> floor	<ul style="list-style-type: none"> <li>• Hostel</li> </ul>	

Figure 1.1.13 shows figure of Jroh Naguna orphanage vocational training building.



**FRONT ELEVATION**



**LEFT ELEVATION**

Figure 1.1.13 Figure of Jroh Naguna Orphanage Vocational Training Building

③ Jroh Naguna orphanage auditorium

Table 1.1.7 shows outline of the plan of Jroh Naguna orphanage auditorium.

Table 1.1.7 Outline of Plan of Jroh Naguna Orphanage Auditorium

	Existing facility		New construction plan		Plan overview
Floor space (m <sup>2</sup> )	388.0(m <sup>2</sup> )		398.0(m <sup>2</sup> )		The layout is the same as the existing facility. To accommodate additional orphans, the first floor will have a hostel and the second floor will have an auditorium.
Cumulative floor space (m <sup>2</sup> )	388.0(m <sup>2</sup> )		796.0(m <sup>2</sup> )		
Eave height (m)	4.40(m)		8.50(m)		
Floors	One-story		Two-story		
Construction	Reinforced steel concrete frame Block construction		Reinforced steel concrete construction		
Room name	1 <sup>st</sup> floor	<ul style="list-style-type: none"> <li>• Auditorium</li> <li>• Storage</li> <li>• Other common space</li> </ul>	1 <sup>st</sup> floor	<ul style="list-style-type: none"> <li>• Hostel</li> <li>• Other common space</li> </ul>	
	2 <sup>nd</sup> floor	N/A	2 <sup>nd</sup> floor	<ul style="list-style-type: none"> <li>• Auditorium</li> <li>• Other common space</li> </ul>	

Figure 1.1.14 shows outline of the plan of Jroh Naguna orphanage auditorium.



Figure 1.1.14 Figure of Jroh Naguna Orphanage Auditorium

**1.1.8 Site Conditions**

(1) Site Overview

This facility is located in Nyak Makan (Kampom Pineung), approximately 3 kilometers east of central Banda Aceh. The Jroh Naguna and Nirmala orphanages are located on the same 100 by 180 meter block of land, held by the city. Most of the block is occupied by the orphanages, but there are also private premises on part of the block. The city-run Nirmala orphanage was established in the center of the site about 60 years ago. Then, about 20 years ago, Aceh province constructed girls' and boys' hostels on the south and northeast sides of the block, respectively, comprising the province-run Jroh Naguna. The site is approximately 10 cm higher than the surrounding roads and most of it is a flat and almost rectangular in shape, but the ground plane on which the province-run Jroh Naguna orphanage was constructed is about 20 cm higher than that of the previously constructed Nirmala orphanage. In terms of planning for land utilization, this region is both at

present and will in the future be used for both public facilities and residences.

(2) Conditions in the surrounding area

The site is fronting on four sides by roads. The entrance to the facility is on the west side and faces a 4-lane road about 25 m in width, making for generally good access conditions. Therefore, this plan will allow for the construction of entrances to the east side. The surrounding area is included in the area designated for urbanization and therefore has many different schools such as an elementary school, as well as public facilities. Also, the back side of the facility is surrounded by residences. In general, the elevation of the surrounding land is low, at nearly the same level as the high-tide water level. In terms of the surrounding environment, most has also been severely impacted by the tsunami and the majority of buildings in the area are now under repair. As for roads and bridges in the area, some railings and other parts have been destroyed, but they have retained their original shape and do not obstruct the passing of vehicles.

(3) Nearby environment and environmental impact

This plan is to build a new three-story orphanage, but the usage conditions of the site and the facility content will not generate any sunshine or noise-related problems. Furthermore, the site does not contain anything that needs to be protected from an environmental standpoint and regulations in Indonesia about sunshine and noise-related problems are not yet established.

(4) Obstructions

Within the planned site there are no obstructions such as underground pipes, nor are there any overhead obstructions such as power transmission lines. There are no obstructions to the restoration work.

**1.1.9 Structural Plan**

(1) Structural Overview

Table 1.1.8 shows Structural overview

Table 1.1.8 Structural Overview

Facility name		Jroh Naguna orphanage		Nirmala orphanage
		Auditorium	Vocational training area	Administration building / Education building
Use		Hostel and meeting room	Workroom/workshop Hostel	Office / hostel / education room and meeting room
Work type		New construction	New construction	New construction
Building scale	Floor space (m <sup>2</sup> )	398.0(m <sup>2</sup> )	217.4(m <sup>2</sup> )	602.4(m <sup>2</sup> )
	Cumulative floor space (m <sup>2</sup> )	796.0(m <sup>2</sup> )	434.8(m <sup>2</sup> )	1459.0(m <sup>2</sup> )
	Floors	2 above ground	2 above ground	3 above ground
	Eave height (m)	8.50(m)	7.70(m)	9.80(m)
	Building height (m)	11.03(m)	11.45(m)	13.30(m)

	1 <sup>st</sup> floor story height	4.00(m)	4.17(m)	3.40(m)	
	2 <sup>nd</sup> floor story height	4.50(m)	3.53(m)	3.20(m)	
	3 <sup>rd</sup> floor story height	—	—	3.20(m)	
Structural overview	Structure type		Reinforced steel concrete frame and wooden truss roof	Reinforced steel concrete frame and wooden truss roof	Reinforced steel concrete frame and wooden truss roof
	Structure style	X direction	Rigid-framed structure	Rigid-framed structure	Rigid-framed structure
		Y direction	Rigid-framed structure	Rigid-framed structure	Rigid-framed structure
	Foundation type		Spread footing	Spread footing	Spread footing
Plans for expansion		None	None	None	

## (2) Basic policy for structural design

### 1) Drawing up the structure type and structure shape

One aspect of the basic policy concerning this emergency restoration project and reconstruction assistance project is restoring the facility to its pre-disaster state and implementing a structural design that is capable of withstanding earthquakes. Various types of structures are feasible, among them (1) steel frame construction, (2) reinforced concrete construction, (3) steel frame reinforced concrete construction, and (4) block construction. Of these, (4) block construction does not offer good resistance to earthquakes, while (3) steel frame reinforced concrete construction is not economical on the scale of two- or three-story buildings. (1) Steel frame construction has toughness, and is flexible enough to be able to follow an intricate design that involves curves. Another benefit is that processes can be shortened, but in general, this construction is not economical, and it requires special technology in the plant, such as machining technology, welding technology and bolt joining technology, making quality monitoring difficult. Upkeep control expenses also tend to mount up, as the building has to be repainted once every few years. Additionally, in a building such as the present one, that involves numerous openings such as windows and doors, diagonal beams and braces cannot be shared in many cases, and although this does not detract from the ability to withstand earthquakes, it results in significant deformation of the building in relation to the horizontal force when an earthquake occurs. With (2) reinforced concrete construction, on the other hand, there is a problem in that a longer construction period is required than with steel frame construction. In terms of the building situation in Indonesia, however, construction materials can be acquired easily and economically, and this type of construction is widely used in the region. Moreover, this type of construction is the most appropriate to the scale of the new building to be built at the facility, and also offers adequate resistance to earthquakes, so it was decided to use a rigid-frame structure with a reinforced concrete construction for this project.

### 2) Basic policy of the structural design relating to load in the event of an earthquake

The project area is close to the sea, and most of the buildings in the surrounding area, including this facility itself, were destroyed by the earthquake and the tsunami, but it is impossible to design

buildings capable of withstanding a tsunami that is so large it can completely demolish building structures. Basically, the structural design policy relating to load in the event of an earthquake was formulated as described below, in view of the fact that this emergency restoration aid is aimed at restoring the current state, and that new earthquake standards based on the survey of damages being promoted by the local Earthquake Committee and on earthquake engineering have not yet been put in place.

① Coefficient for calculating horizontal load in the event of an earthquake

The design standards of Indonesia were used to calculate the horizontal load acting on a building in the event of an earthquake, and the calculation was made using the following equation.

◆ Horizontal load (H) = building weight (W) x earthquake coefficient (Cd)

• Earthquake coefficient (Cd) = C x I x K

• Basic coefficient (C) = 0.09 (Zone 2)

(Because Banda Aceh City is in Zone 2 of the Indonesian earthquake zones, the basic coefficient is 0.09. The earthquakes zones range from 1 to 6, and values ranging from 0.13 to 0.00 are used for the basic coefficient, based on the firmness of the ground and the period of a particular building. This value is approximately half that of the earthquake standards used in Japan, but Aceh City is classified in the large-earthquake zone in Indonesia.)

• Importance coefficient (I) = 1.0

• Structure coefficient (K) = 1.0 or 2.5

If the structure is a rigid-frame structure, 1.0 is used, and if it is a diagonal-bracing structure, 2.5 is used. Consequently, the earthquake coefficient (Cd) will be  $0.09 \times 1.0 \times 1.0 = 0.09$ . The product of this value and the building weight is the horizontal load that acts on the building if an earthquake occurs.

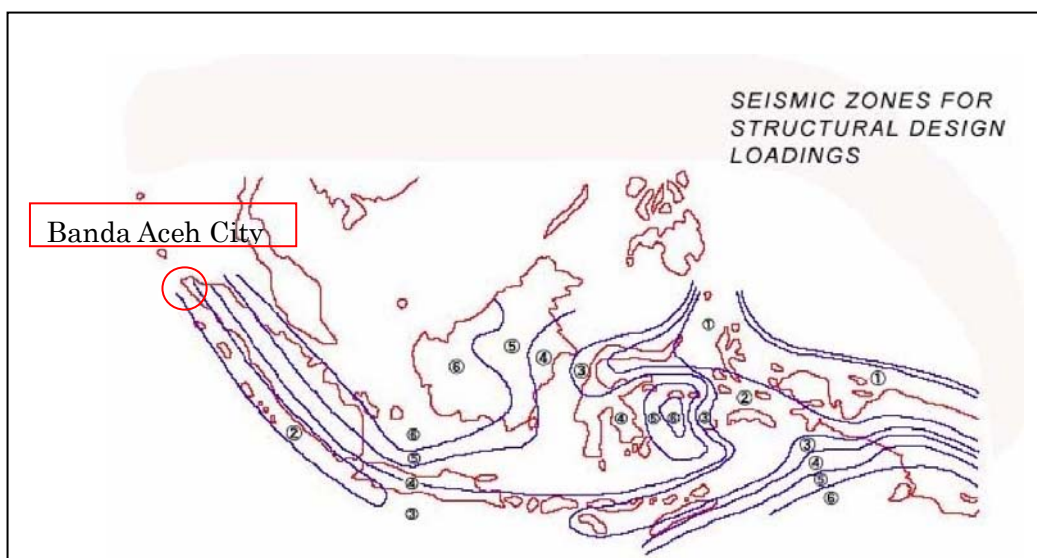


Figure 1.1.15 Earthquake Zones in Indonesia

② Additional margin of horizontal load if an earthquake occurs

When designing a new building to be built in an area where disaster has struck in the form of an earthquake and tsunami, in view of the fact that buildings designed based on the existing standards were destroyed, the point at issue is what degree of standards for earthquake resistance are necessary. In terms of this issue, at the current stage, given that no new earthquake resistance design standards have yet been provided, it is difficult to set this degree because there is no theoretical proof of how much additional horizontal load would provide a safe margin. Additionally, the destruction may have been caused by a number of factors, such as the ground sinking, buildings not having enough structural resistance, buildings being old and having deteriorated, and construction being defective, and thus it cannot be stated conclusively that the existing design standards are inadequate. Moreover, one characteristic of design standards is that they cannot be set by any one individual designer, but rather are not applied until provided by official authorities. Against that background, with respect to the earthquake-resistant design of the new buildings to be built in this project, the values calculated for the existing Indonesian design standards were used to calculate the horizontal load generated when an earthquake occurs, and measures such as including an addition margin of horizontal load beyond the necessary amount, for safety purposes, were not used.

3) Specifying the foundation type

The foundation form can be done in two ways: one is to use a direct foundation, in which the vertical load is supported by the surface area of the foundation, and the other is to use a pile foundation in which concrete piles and steel pipe piles, or PC piles, are driven into the ground and the load is supported by the hard ground at the base of the piles and the frictional force underground. Taking safety into consideration, the pile foundation method will be used, based on the results of a ground survey involving a study of the natural conditions that will be described later.

4) Design load

Design loads are categorized as follows: (1) fixed loads, (2) live loads, and (3) short-term horizontal force (earthquake load / wind load). The first type, the fixed load, is imposed by the actual weight of the building skeleton and the finishing materials. The second type, the live load, is determined based on the applications of the building. The project facility is a fisheries facility, but it will be subject to the load imposed by equipment and materials such as ice-making devices and freezers, so the types of live load noted below were used, with reference to the standards of the Architectural Institute of Japan. Table 1.1.9 shows Live load summary.

Table 1.1.9 Live Load Summary

Purpose	Designed members	
	Binding beam and floor design load	Structural frame and foundation design load
Hostel	230(kg/m <sup>2</sup> )	210(kg/m <sup>2</sup> )
Auditorium	230(kg/m <sup>2</sup> )	330(kg/m <sup>2</sup> )

Stairs and corridors	230(kg/m <sup>2</sup> )	330(kg/m <sup>2</sup> )
Roof	0(kg/m <sup>2</sup> )	0(kg/m <sup>2</sup> )

According to the standards of the Architectural Institute of Japan, considering that the live load for the design of the structure skeleton (pillars and girders) and the foundation will be more widely dispersed than the load for the design of the beams and floor, the load is reduced. Moreover, for this project, the roof is galvanized sheet iron roofing, and the facility will not be used as an open square, so the live load was not taken into consideration. For the third type of load, the short-term horizontal force (earthquake load / wind load), there are two types of load, one induced by earthquakes and one by wind, but that induced by earthquakes is clearly larger, so the horizontal force when an earthquake occurs was used. An earthquake and wind acting simultaneously would result in a redundant design, so this was not used.

5) Wind load

According to meteorological data for the local area, the wind load is relatively small. Since the basic velocity is around 35 m/sec, we compared the load guidelines with those of the Architectural Institute of Japan and converted the basic velocity into the wind pressure, arriving at a basic wind force of 78.5 kg/m<sup>2</sup>. This is about half the wind load of Japan (basic velocity = 60 m/sec), so it can be judged that this load does not govern the structural design.

6) Stress analysis

The calculation of the stress used to design principal structural components such as the pillars and girders, and the vertical load used to design the foundation, was done using either SAP2000 or STAAD PRO 2000, both of which are 3D structural analysis programs commonly used in Indonesia.

7) Cross-section design and load combinations

The cross-section was calculated using not the allowable stress method, but rather an ultimate stress method similar to the design standards of France. With this method, an extra margin is added to the actual load ahead of time using a coefficient, and then the design stress of the structure is calculated, and the cross-section is decided based on the ultimate proof stress of the concrete and reinforcements. The load combinations used to calculate the design stress of the structure are as noted below.

①  $M_u = 1.2 \text{ fixed load} + 1.6 \text{ live load}$

②  $M_u = 1.05 \text{ fixed load} + 1.05 \times (0.9 \times \text{live load}) + 1.05 \text{ earthquake load}$

8) Improvements to structure shape

In structural framing for reinforced concrete construction in Indonesia, when the roof is constructed of wood or steel frame, although a girder is placed on the pillar heads of the upper-most floor in the

long direction, reinforced concrete beams are not placed on the short direction. Consequently, the pillars on the upper-most floor are cantilevered making this type of construction weak with respect to horizontal force. To compensate for this weakness, this plan will include reinforced concrete beams in both directions, for a frame that is not disproportionate with respect to horizontal force during earthquakes.

9) **Materials used**

Materials were selected that are marketable in the area near Aceh City in Indonesia, and that are easily accessible. In light of the fact that we would be using an appropriate design strength balanced with the building scale, we did not use high-strength or other special concrete or reinforcements. Table 1.1.10 shows Material list.

Table 1.1.10 Material List

Strength of concrete used	For structural frame design	For floor concrete, concrete sub-slab
	K250 (250kg/cm <sup>2</sup> )	K200 (200kg/cm <sup>2</sup> )
Reinforcing steel used	Deformed reinforcing bar	Round steel bar
	BJD 32 Strength at yield point (3200kg/cm <sup>2</sup> )	BJTP24 (2400kg/cm <sup>2</sup> ) Strength at yield point (2400kg/cm <sup>2</sup> )

**1.2 NATURAL CONDITIONS**

**1.2.1 Topography**

(1) **Ground survey**

A ground survey is required to carry out a basic design for newly-constructed buildings. However, survey data from a previous survey on the orphanage premises were obtained and were sufficient for understanding the conditions of the ground. Therefore, a new ground survey has not been conducted. Below is an outline of data from the previous survey. Table 1.2.1 shows Overview of survey data.

Table 1.2.1 Overview of Survey Data

Survey method	A “Dutch dual-cone penetration tests” was conducted to a depth of 20 m from the ground level.
Survey positions	Inside the premises of the boys’ hostel at the Jroh Naguna orphanage.
Groundwater level	Around 1.5 m below the ground surface.
Strata	The main part of the bed is peat, but there is a viscous stratum including trace amounts of clay 3.0 m and deeper below the ground level.
Bearing ground	From the ground surface down about 2.0 m, the ground is extremely soft. However, around 2.6 m deep, the cone resistance (penetration resistance value) suddenly increased. Therefore, this bearing stratum will not present a problem for the design.



(2) Foundation design policy

Since the scale of the designed buildings is from two to three stories in height, and the vertical load is not very great, and since there is a good quality bearing stratum in the vicinity of 2.6 m below ground level, a direct base form will be employed, rather than pilings. However, since a bearing stratum of 2.6 m below the ground level is fairly deep for a direct base and since the ground-water level is around 1.5 below the ground level, the bottom level of the base will be established near 1.6 m below the ground level. The space between 1.6 m and 2.6 m below ground level will be raised using inexpensive non-reinforced concrete in consideration of economics and practicality.

(3) Investigation of the allowable bearing capacity of the soil

When designing the size of the foundation, it is necessary to set the allowable bearing capacity of the soil. The allowable bearing capacity of the soil was calculated based on the “Architectural Foundation Structure Design Guidelines” published by the Architectural Institute of Japan and the “Soil Survey Methods” of the Soil Society of Japan.

The following equation was used to calculate the long-term allowable bearing capacity of the soil (qa):

$$q_a = (\alpha \times C \times N_c + \beta \times \gamma_1 \times B \times N_r + \gamma_2 \times D_f \times N_q) / 3 \quad \text{Formula 1}$$

- ◆ For viscous stratum, the relationship between cone penetration resistance (qc) and unconfined compressive strength (qu) is

$$q_c = 5 \times q_u \quad \text{therefore} \quad q_u = q_c / 5 = 24.6 / 5 = 4.9 \text{ kg/cm}^2$$

- ◆ The relationship between unconfined compressive strength (qu) and adhesion (C) is  $C = q_u / 2 = 4.9 / 2 = 2.5 \text{ kg/cm}^2 \rightarrow 25.0 \text{ ton/m}^2$

Conditions

- ◆  $q_c = 24.6 \text{ kg/cm}^2$  (cone penetration resistance value; according to survey data, around 2.6 m below the ground level)
  - ◆  $D_f = -2.6 \text{ m}$  (base setting depth; 2.6 m below ground level)
  - ◆  $\gamma_1 = \gamma_2 = 0.7 \text{ ton/m}^3$  (unit weight of the ground; since the base bottom is lower than the ground-water level, a value less the water pressure value)
  - ◆  $\alpha = 1.3$  (index according to base shape; 1.3 in the case of a square base)
  - ◆  $\beta = 0.4$  (index according to base shape; 0.4 in the case of a square base)
  - ◆  $B = 2.0 \text{ m}$  (minimum width of the base)
  - ◆  $N_c = 5.3$
  - ◆  $N_r = 0.0$
  - ◆  $N_q = 3.0$
- } The index according to soil texture; in the case of a viscous stratum, a coefficient set with an internal friction angle  $\phi = 0^\circ$

When the above-listed descriptions were used in Formula 1 and calculated, the result was that the long-term allowable bearing capacity (qa) of the planned site is as follows:

$$(1.3 \times 25 \times 5.3 + 0.4 \times 0.7 \times 2 \times 0.0 + 0.7 \times 2.6 \times 3.0) = \underline{\underline{59.2 \text{ ton/m}^2}}$$

(4) Establishing the design bearing capacity

The design bearing capacity that will be used in the designs of facilities must be set based on the results of the calculations from section (3) above. Given the scale of the buildings to be newly-constructed in this plan (reinforced concrete construction: two- to three- stories), 15 to 30 ton/m<sup>2</sup> is sufficient for long-term allowing bearing capacity.

### 1.2.2 Weather

Given the tropical monsoon weather of Indonesia, designs will be made in accordance with the principles listed below:

- ① Since there are many sudden downpours in this region, a steep pitch is used for the roofs (about 30°) to avoid water leaks. In addition, eaves will be installed above openings such as the entrance and windows to prevent wind and rain from blowing into them.
- ② Wind velocity is relatively weak (approx. half that of Japan's), and therefore the overhang of eaves will not be reinforced.
- ③ Since this region is subject to high temperatures and humidity, the stories of the building will be tall (3.2 to 3.5 m) to make the airspace inside rooms as large as possible and ensure good ventilation.
- ④ In order to ensure good water drainage inside the premises block paving will be used for roads inside the site.
- ⑤ Other than the above, easily-damaged gutters and downspouts will not be used in order to facilitate maintenance and operations.

### 1.2.3 Termite Control

Since both the temperature and the humidity in Indonesia are high, damage due to termites is a frequent occurrence. However, since the facilities are built using reinforced concrete construction, no particular termite-repellant measures are taken.

## 1.3 DESIGN STANDARDS

### 1.3.1 Applied Regulations and Standards

The regulations and standards noted below were applied.

- (1) Architectural design standards of Indonesia
  - Tata Cara Perhitungan Struktur beton untuk Bangunan Gedung SNI 03-2847-2002
  - Tada Cara Perencanaan Kethanan Gempa untuk Bangunan Gedung SNI 03-1726-2003
  - Pedoman Perencanaan Pembebanan untuk Rumah dan Gedung

SKBI-1.3.53.1987, UDC; 624.042

- Pedoman Perencanaan Ketahanan Gempa untuk Rumah dan Gedung  
SKBI-1.3.53.1987, UDC;699.841
- Petunjuk Perencanaan Beton Burtulang dan Struktur Dinding Burtulang untuk Rumah dan Gedung  
SKBI-2.3.53.1987, UDC;693.55;6, 693.25

(2) Other standards

- Structure Calculation Guidelines published by the Architectural Institute of Japan
- Reinforced Concrete Structure Calculation Guidelines published by the Architectural Institute of Japan
- Load Guidelines published by the Architectural Institute of Japan
- Architectural Foundation Structure Design Guidelines published by the Architectural Institute of Japan
- Soil Survey Methods published by the Soil Society of Japan

## **1.4 DESIGN DRAWINGS**

### **1.4.1 Basic Policy for Drafting Design Drawings**

Based on the results of the Field survey, design drawings were created to serve the purposes of bidding, calculation of construction costs, and the actual construction. The basic principles used in creating the designs were classified into (1) buildings slated for repairs and auxiliary facilities/equipment and (2) newly-constructed buildings. As for the buildings that will be repaired, design plans that explain the overall design of existing buildings will be created with respect to each facility (e.g. floor plans, elevations, cross-sections, fixture drawings, and equipment-related drawings), and all of the parts requiring repair will be indicated. For the newly-constructed buildings, all necessary design drawings, finishing drawings, structural drawings, and equipment drawings will be created. A list of drawings for each facility is attached as reference and the newly-created drawings are as follows as shown Table 1.4.1 List of Drawings.

Table 1.4.1 List of Drawings

REHABILITATION & RECONSTRUCTION OF JROH NAGUNA ORPHANAGES (STATE)  
DRAWING LIST OF RECONSTRUCTION (1)

No.	Dwg. No.	Building Name	Title	No.	Dwg. No.	Building Name	Title
01	00	SITE PLAN	TABLE OF THE WORKS	40	K/L-36	WORKSHOP AND BOARDING HOUSE	FRAME ELEVATION LINE 4
02	01	SITE PLAN	PROPOSED SITE PLAN	41	K/L-37		REINFORCEMENT OF 1ST FLOOR SLAB PLAN
03	02	SITE PLAN	EXISTING SITE PLAN	42	K/L-38		SECTION A-A
				43	K/L-39		ELECTRICITY PLAN 1ST FLOOR
04	K/L-00	WORKSHOP AND BOARDING HOUSE	FINISHING SCHEDULE	44	K/L-40		ELECTRICITY 2ND FLOOR
05	K/L-01		1st FLOOR PLAN	45	K/L-41		SEPTICTANK PLAN, SECTION I-I 2-2
06	K/L-02		2nd FLOOR PLAN	46	K/L-42		PENETRATION PLAN, CONTROL BOX, SECTION
07	K/L-03		FRONT SIDE VIEW	47	K/L-43		DEMOLISHING BUILDING(Existing)
08	K/L-04		RIGHT & LEFT SIDE VIEW				
09	K/L-05		BACK SIDE VIEW	48	N-00	BOARDING HOUSE AND AUDITORIUM	FINISHING SCHEDULE
10	K/L-06		SECTION A-A	49	N-01		1ST FLOOR PLAN
11	K/L-07		SECTION B-B	50	N-02		2ND FLOOR PLAN
12	K/L-08		ROOF PLAN	51	N-03		FRONT SIDE VIEW
13	K/L-09		SKELETON ROOF. K1	52	N-04		RIGHT SIDE VIEW
14	K/L-10		SKELETON ROOF. K2	53	N-05		LEFT SIDE VIEW
15	K/L-11		BATH ROOM PLAN	54	N-06		BACK SIDE VIEW
16	K/L-12		STAIRS PLAN	55	N-07		SECTION A-A
17	K/L-13		DETAIL A. B	56	N-08		SECTION B-B
18	K/L-14		CEILING PLAN	57	N-09		SECTION C-C
19	K/L-15		FITTING-1	58	N-10		ROOF PLAN
20	K/L-16		FITTING-2	59	N-11		SKELETON ROOF K1
21	K/L-17		FOUNDATION PLAN	60	N-12		SKELETON ROOF 1/2 K1
22	K/L-18		SECTION A-A, B-B	61	N-13		SKELETON ROOF K2
23	K/L-19		FRAMING ELEVATION FOR FOUNDATION	62	N-14		SKELETON ROOF 1/2 K2
24	K/L-20		FOUNDATION PLAN, SECTION A-A	63	N-15		CEILING PLAN
25	K/L-21		KEY PLAN OF FRAME-1	64	N-16		SECTION DETAIL P
26	K/L-22		KEY PLAN OF FRAME-2	65	N-17		BATH ROOM/TOILET-1
27	K/L-23		MEMBER LIST FOR BEAM AND COLUMN	66	N-18		BATH ROOM/TOILET-2
28	K/L-24		FRAME ELEVATION LINE A	67	N-19		STAIRS
29	K/L-25		FRAME ELEVATION LINE B&C	68	N-20		STAIRS HANDRAIL
30	K/L-26		FRAME ELEVATION LINE D	69	N-21		FLOOR LOCATION OF FITTING
31	K/L-27		FRAME ELEVATION LINE E&F	70	N-22		FITTINGS-1
32	K/L-28		FRAME ELEVATION LINE G&H	71	N-23		FITTINGS-2
33	K/L-29		FRAME ELEVATION LINE 1	72	N-24		FITTINGS-3
34	K/L-30		FRAME ELEVATION LINE 1	73	N-25		FITTINGS-4
35	K/L-31		FRAME ELEVATION LINE 2	74	N-26		FOUNDATION PLAN
36	K/L-32		FRAME ELEVATION LINE 2	75	N-27		FOUNDATION
37	K/L-33		FRAME ELEVATION LINE 3	76	N-28		FOUNDATION
38	K/L-34		FRAME ELEVATION LINE 3	77	N-29		FOUNDATION
39	K/L-35		FRAME ELEVATION LINE 5	78	N-30		FOUNDATION

REHABILITATION & RECONSTRUCTION OF JROH NAGUNA ORPHANAGES (STATE)  
DRAWING LIST OF RECONSTRUCTION (2)

No.	Dwg. No.	Building Name	Title	No.	Dwg. No.	Building Name	Title
79	N-31	BOARDING HOUSE AND AUDITORIUM	FOUNDATION	112	T-00	TOILET	FINISHING SCHEDULE
80	N-32		FOUNDATION	113	T-01		PLAN & ELEVATION
81	N-33		FOUNDATION	114	T-02		ELEVATION & SECTION
82	N-34		FOUNDATION	115	T-03		FITTINGS
83	N-35		KEY PLAN OF 1st FLOOR BEAM	116	T-04		DETAIL OF ROOF, ELECTRICTY
84	N-36		KEY PLAN OF 2nf FLOOR BEAM	117	T-05		DETAIL & SECTION
85	N-37		KEY PLAN OF ROOF BEAM	118	T-06		DETAIL OF FOUNDATION
86	N-38		BEAM AND COLUMN TABLE	119	T-07		STRUCTURE-1
87	N-39		FRAMING ELEVATION LINE A&H	120	T-08		STRUCTURE-2
88	N-40		FRAMING ELEVATION LINE A	121	T-09		STRUCTURE-3
89	N-41		FRAMING ELEVATION LINE H	122	T-10		PLUMBING, SEPTIC TANK
90	N-42		FRAMING ELEVATION LINE B&G	123	T-11		PENETRATION
91	N-43		FRAMING ELEVATION LINE B				
92	N-44		FRAMING ELEVATION LINE G	124	U-01	PROPOSED SITE	PAVING BLOCK PLAN
93	N-45		FRAMING ELEVATION LINE C&F	125	U-02		WATER PLAN
94	N-46		FRAMING ELEVATION LINE D&E	126	U-03		CLEAN WATER INSTALLAION
95	N-47		FRAMING ELEVATION LINE D&E	127	U-04		DIRTY WATER INSTALLAION
96	N-48		FRAMING ELEVATION LINE 1	128	U-05		CONTROL BOX
97	N-49		FRAMING ELEVATION LINE 2	129	U-06		WATER TOWER VIEW
98	N-50		FRAMING ELEVATION LINE 3	130	U-07		WATER TOWER SECTION & DETAIL
99	N-51		FRAMING ELEVATION LINE 4,5,6&7	131	U-08		FINISHING SCHEDULE
100	N-52		FRAMING ELEVATION LINE 8	132	U-09		FENCE & GATE PLAN
101	N-53		FRAMING ELEVATION LINE 9	133	U-10		FENCE & GATE TYPE A
102	N-54		FRAMING ELEVATION LINE 10	134	U-11		FENCE & GATE STRUCTURAL FRAMING TYPE A
103	N-55		REINFORCEMENT OF 2nd FLOOR SLAB	135	U-12		FENCE & GATE TYPE B
104	N-56		SECTION OF 2nd FLOOR SLAB	136	U-13		FENCE & GATE TYPE C
105	N-57		ELECTRICITY PLAN 1ST FLOOR	137	U-14		FENCE & GATE TYPE D
106	N-58		ELECTRICITY PLAN 2ND FLOOR	138	U-15		FENCE & GATE STRUCTURAL FRAMING TYPE B~D
107	N-59		ELECTRIC EQUIPMENT-1	139	U-16		FENCE & GATE GATE PLAN & ELEVATION
108	N-60		ELECTRIC EQUIPMENT-2				
109	N-61		SEPTICTANK				
110	N-62		PENETRATION				
111	N-63		DEMOLISHING BUILDING(Existing)				

REHABILITATION & RECONSTRUCTION OF JROH NAGUNA ORPHANAGES (STATE)  
DRAWING LIST OF REHABILITATION

No.	Dwg. No.	Building Name	Title	No.	Dwg. No.	Building Name	Title
01	A/C-01	OFFICE AND HOSTEL OF MAN-I	1st. and 2nd. Floor PLAN	35	G/I-01	KITCHEN AND MESS ROOM I	1st. and 2nd. Floor PLAN
02	A/C-02	OFFICE AND HOSTEL OF MAN-I	ELEVATION	36	G/I-02	KITCHEN AND MESS ROOM I	FRONT SIDE VIEW
03	A/C-03	OFFICE AND HOSTEL OF MAN-I	SECTION	37	G/I-03	KITCHEN AND MESS ROOM I	LEFT AND RIGHT SIDE VIEW
04	A/C-04	OFFICE AND HOSTEL OF MAN-I	DETAIL OF TERASS A	38	G/I-04	KITCHEN AND MESS ROOM I	BACK SIDE VIEW
05	A/C-05	OFFICE AND HOSTEL OF MAN-I	LOCATION OF FITTINGS	39	G/I-05	KITCHEN AND MESS ROOM I	SECTION
06	A/C-06	OFFICE AND HOSTEL OF MAN-I	FITTINGS SCHEDULE	40	G/I-06	KITCHEN AND MESS ROOM I	FITTINGS SCHEDULE
07	A/C-07	OFFICE AND HOSTEL OF MAN-I	LIGTHING				
				41	H-01	HOSTEL OF MAN-II	1st. and 2nd. Floor PLAN
08	B-01	AUDITORIUM	1st. Floor PLAN	42	H-02	HOSTEL OF MAN-II	FRONT AND BACK SIDE VIEW
09	B-02	AUDITORIUM	2nd. Floor PLAN	43	H-03	HOSTEL OF MAN-II	LEFT AND RIGHT SIDE VIEW
10	B-03	AUDITORIUM	FRONT AND BACK SIDE VIEW	44	H-04	HOSTEL OF MAN-II	SECTION
11	B-04	AUDITORIUM	LEFT AND RIGHT SIDE VIEW	45	H-05	HOSTEL OF MAN-II	FITTINGS SCHEDULE
12	B-05	AUDITORIUM	SECTION				
13	B-06	AUDITORIUM	FITTINGS SCHEDULE	46	J-01	EDUCATION ROOM	1st and 2nd FLOOR PLAN AFTER REHABILITATION
14	B-07	AUDITORIUM	2nd FLOOR LIGHT FIXTUERS PLAN	47	J-02	EDUCATION ROOM	1st FLOOR PLAN BEFORE REHABILITATION
15	B-08	AUDITORIUM	2nd Floor LIGTH FIXTURES SECTION	48	J-03	EDUCATION ROOM	FRONT VIEW AFTER AND BEFORE
				49	J-04	EDUCATION ROOM	BACK AND SIDE VIEW AFTER AND BEFORE
16	D-01	MUSHALLA	PLAN ,FRONT AND RIGTH SIDE VIEW	50	J-05	EDUCATION ROOM	SECTION
17	D-02	MUSHALLA	LEFT AND BACK SIDE VIEW. SECTION	51	J-06	EDUCATION ROOM	FITTINGS SCHEDULE
18	D-03	MUSHALLA	FITTING SCHEDULE	52	J-07	EDUCATION ROOM	STRUCTURAL REINFORCEMENT-1
				53	J-08	EDUCATION ROOM	STRUCTURAL REINFORCEMENT-2
19	E-I-01	HOSTEL OF GIRL-I	1st. Floor PLAN	54	J-09	EDUCATION ROOM	STRUCTURAL REINFORCEMENT-3
20	E-I-02	HOSTEL OF GIRL-I	2nd. Floor PLAN	55	J-10	EDUCATION ROOM	LIGHTING FIXTURE PLAN
21	E-I-03	HOSTEL OF GIRL-I	FRONT AND BACK SIDE VIEW				
22	E-I-04	HOSTEL OF GIRL-I	LEFT AND RIGHT SIDE VIEW	56	M-01	POLYCLINIC	1st FLOOR PLAN AFETER AND BEFORE
23	E-I-05	HOSTEL OF GIRL-I	SECTION	57	M-02	POLYCLINIC	FRONT AND RIGTH SIDE VIEW AFTER AND BEFORE
24	E-I-06	HOSTEL OF GIRL-I	FITTINGS SCHEDULE	58	M-03	POLYCLINIC	BACK VIEW AND SECTION AFTER AND BEFORE
				59	M-04	POLYCLINIC	FITTINGS SCHEDULE
25	E-II-01	HOSTEL OF GIRL-II	1st. Floor PLAN				
26	E-II-02	HOSTEL OF GIRL-II	2nd. Floor PLAN	60	Q-01	KITCHEN AND MESS ROOM II	PLAN AND ELEVATION
27	E-II-03	HOSTEL OF GIRL-II	FRONT AND BACK SIDE VIEW	61	Q-02	KITCHEN AND MESS ROOM II	SECTION
28	E-II-04	HOSTEL OF GIRL-II	LEFT SIDE VIEW	62	Q-03	KITCHEN AND MESS ROOM II	FITTINGS SCHEDULE
29	E-II-05	HOSTEL OF GIRL-II	RIGHT SIDE VIEW				
30	E-II-06	HOSTEL OF GIRL-II	SECTION				
31	E-II-07	HOSTEL OF GIRL-II	FITTINGS SCHEDULE				
32	F-01	OFFICER HOUSE	PLAN AND FRONT & BACK VIEW				
33	F-02	OFFICER HOUSE	LEFT & RIGTH VIEW AND SECTION				
34	F-03	OFFICER HOUSE	FITTINGS SCHEDULE				

REHABILITATION and RECONSTRUCTION of NIRMALA ORPHANAGE (MUNICIPALITY)  
DRAWING LIST OF RECONSTRUCTION

No.	Dwg.No.	Building Name	Title	No.	Dwg.No.	Building Name	Title
01	00	SITE LAYOUT PLAN	TABLE OF THE WORKS	40	A-32	NEW BUILDING	FITTING-2
02	01		PROPOSED SITE PLAN	41	A-33		FITTING-3
03	02		EXISTING SITE PLAN	42	A-34		FITTING-4
04	03		EXTERIOR WORK	43	A-35		PLUMBING PLAN-1
05	04		DRAINAGE DETAIL	44	A-36		PLUMBING PLAN-2
06	05		PAVING SECTION	45	A-37		SEWERAGE INST . PLAN-1
07	06		ELECTRICAL SITE PLAN	46	A-38		SEWERAGE INST . PLAN-2
08	07		WATER SUPPLY SITE PLAN	47	A-39		DETAIL SEPTIC TANK
				48	A-40		DETAIL SOAKAWAY
09	A-01	NEW BUILDING	FLOOR PLAN-1	49	A-41		DETAIL OF TOILET-1
10	A-02		FLOOR PLAN-2	50	A-42		DETAIL OF TOILET-2
11	A-03		ELEVATION-1	51	A-43		DETAIL of LIGHTNING
12	A-04		ELEVATION-2	52	A-44		DEMOLISHING BUILDING(Existing)
13	A-05		SECTION				
14	A-06		FOUNDATION PLAN				
15	A-07		DETAIL FOUNDATION-1				
16	A-08		DETAIL FOUNDATION-2	53	S-01	WATER TOWER	PLAN & ELEVATION
17	A-09		DETAIL FOUNDATION-3	54	S-02		DETAIL-1
18	A-10		DETAIL FOUNDATION-4	55	S-03		DETAIL-2
19	A-11		TIE BEAM	56	S-04		WATER TANK
20	A-12		GIRDER PLAN-1				
21	A-13		GIRDER PLAN-2				
22	A-14		FRAME-1				
23	A-15		FRAME-2				
24	A-16		COLUMN & GIRDER TABLES				
25	A-17		SLAB REINFORCEMENT-1				
26	A-18		SLAB REINFORCEMENT-2				
27	A-19		SLAB REINFORCEMENT-3				
28	A-20		STAIR				
29	A-21		TIMBER TRUSS PLAN				
30	A-22		DETAIL TRUSS-1				
31	A-23		DETAIL TRUSS-2				
32	A-24		CEILING PLAN-1				
33	A-25		CEILING PLAN-2				
34	A-26		CEILING SECTION				
35	A-27		ELECTRICAL LAMP-1				
36	A-28		ELECTRICAL LAMP-2				
37	A-29		FITTING SCHEDULE-1				
38	A-30		FITTING SCHEDULE-2				
39	A-31		FITTING-1				

REHABILITATION and RECONSTRUCTION of NIRMALA ORPHANAGE (MUNICIPALITY)  
DRAWING LIST OF REHABILITATION

No.	Dwg. No.	Building Name	Title	No.	Dwg. No.	Building Name	Title
57	B-01	WOMEN'S HOSTEL-1	FLOOR PLAN	87	I-01	TOILET-2	FLOOR AND CEILING PLAN
58	B-02		FRONT AND BACK ELEVATION	88	I-02		ELEVATION AND SECTION
59	B-03		LEFT AND RIGHT ELEVATION	89	I-03		LIGHTING PLAN
60	B-04		CEILING PLAN				
61	B-05		LIGHTING PLAN	90	J-01	MOSQUE	FLOOR PLAN
				91	J-02		ELEVATION
				92	J-03		SECTION
62	C-01	MEN'S HOSTEL-1	FLOOR PLAN	93	J-04		CEILING PLAN
63	C-02		FRONT AND BACK ELEVATION	94	J-05		LIGHTING PLAN
64	C-03		LEFT AND RIGHT ELEVATION				
65	C-04		SECTION	95	K-01	CORRIDOR	FLOOR, ELEVATION AND ELECTRICAL
66	C-05		CEILING PLAN				
67	C-06		FITTING SCHEDULE	96	L-01	WELL	PLAN, ELEVATION, AND SECTION
68	C-07		LIGHTING PLAN				
				97	M-01	TOILET-1	FLOOR, ELEVATION AND CEILING PLAN
69	D-01	MESS ROOM	1st FLOOR PLAN	98	M-02		ELEVATION AND SECTION
70	D-02		2nd FLOOR PLAN	99	M-03		LIGHTING PLAN
71	D-03		FRONT AND BACK ELEVATION				
72	D-04		LEFT AND RIGHT ELEVATION	100	N-01	OFFICE	FLOOR PLAN
73	D-05		SECTION	101	N-02		ELEVATION
74	D-06		LIGHTING PLAN	102	N-03		SECTION
75	E-01	MEN'S HOSTEL-2	FLOOR PLAN	103	O-01	VALLEY BALL	VALLEY BALL PLAN
76	E-02		ELEVATION				
77	E-03		SECTION				
78	E-04		LIGHTING PLAN				
79	F-01	TOILET-4	PLAN, ELEVATION, AND SECTION				
80	G-01	TOILET-3	FLOOR AND CEILING PLAN				
81	G-02		ELEVATION AND SECTION				
82	G-03		LIGHTING PLAN				
83	H-01	GUEST HOUSE	FLOOR PLAN AND ELEVATION				
84	H-02		ELEVATION				
85	H-03		FITTING SCHEDULE				
86	H-04		CEILING PLAN				

## 1.5 ESTIMATION OF CONSTRUCTION COSTS

### 1.5.1 Basic Policy for Rough Estimation of Construction Costs

The rough construction costs were estimated using the volume of construction calculated based on the design drawings and specifications that were drafted and the unit prices for construction in the Aceh region of Indonesia. For the unit prices for construction and labor, the principal unit prices described in Indonesia's official standard construction unit prices (noted below) were used, and then indirect costs were added in. Costs such as transportation costs are included in the indirect costs, and comprise approximately 15 to 20% of the principal unit prices. Construction unit prices that could not be obtained from the principal unit prices were calculated by taking the standard measure used in Indonesia for the ratio of work that can be accomplished in a certain unit period of time and calculating the complex unit prices.



- PENETAPAN HARGA SATUAN BAHAN BANGUNAN DAN JAYA PPASCA BENCANA
- KUBUTUHAN PEMERINTAH PROVINVE NANGGRE ACHE DARUSSALAM TAHUN 2005 NOMOR ;050.205/082/2005. TANGGAL 27 MEI 2005.  
(2005 edition of the Aceh Province Official Standard Construction Unit Prices)

### 1.5.2 Overview of Rough Construction Costs

The Table 1.5.1 shows the results of the rough estimate of construction costs.

Table 1.5.1 Overview of Construction Costs

Facility name	Work classification	Overview of work costs (in Japanese yen) Unit: 1000 yen		
		Breakdown		Total
Nirmala orphanage	New construction cost	35,810	51,800	106,419
	Repair cost	15,990		
Jroh Naguna orphanage	New construction cost	42,994	54,619	
	Repair cost	11,625		

### 1.5.3 Appropriateness of Rough Construction Costs

It is difficult to verify the appropriateness of costs necessary for repair construction, so the appropriateness of the costs was verified by calculating the construction costs per unit area for a newly constructed building. The results showed that the rough construction costs per unit area for a newly constructed building would be approximately 29,000 yen/ m<sup>2</sup>. The average unit price for new construction of a reinforced concrete structure in Aceh Province in Indonesia is between 2,500,000 Rp/ m<sup>2</sup> and 3,000,000 Rp/m<sup>2</sup> (approximately 31,500 yen/ m<sup>2</sup>). Thus, the estimate of the rough construction costs involved in the project is deemed to be appropriate.

Table 1.5.2 Cost Overview per Unit Area

Total dimensions (m2) of newly-constructed buildings	New construction cost total Unit: 1000 yen	Cost overview per unit area (Unit: yen/m2)
2,735.0	78,805	29,000

#### 1.5.4 Overview of Costs by Facility

Table 1.5.3 Overview of Costs by Facility at Nirmala Orphanage

Symbol	Building or facility name	Class	Scale	Rp. (Indonesian currency)	Yen (in Japanese yen)
A	Office and Education room	New construction	RC • 3-story	2,826,545,000	35,614,500
B	Women's Hostel/ Office & Education Room	Repair	RC • 1-story	47,001,000	592,200
C	Men's Hostel	Repair	RC • 1-story	88,721,000	1,117,900
D	Mess Room	Repair	RC • 2-story	45,965,000	579,200
E	Men's Hostel-2	Repair	RC • 1-story	127,921,000	1,611,800
F	Toilet-4	Repair	RC • 1-story	14,517,000	182,900
G	Toilet-3	Repair	RC • 1-story	47,027,000	592,500
H	Guest House	Repair	RC • 1-story	7,902,000	99,600
I	Toilet-2	Repair	RC • 1-story	62,373,000	785,900
J	Mosque	Repair	RC • 1-story	51,555,000	649,600
K	Corridor	New construction	RC • 1-story	15,491,000	195,200
L	Well	Repair	RC • 1-story	6,594,000	83,100
M	Toilet-1	Repair	RC • 1-story	47,793,000	602,200
N	Office	Repair	RC • 1-story	32,959,000	415,300
	Total outdoor work	Repair	—	688,698,000	8,677,500
Total				4,111,062,000	51,799,400

Table 1.5.4 Overview of Costs by Facility at Jroh Naguna Orphanage

Symbol	Building or facility name	Classification	Scale	Rp. (Indonesian currency)	Yen (in Japanese yen)
A.C	Office and Hostel of Main-I	Repairs	RC • 2-story	119,764,894	1,508,900
B	Auditorium	Repairs	RC • 2-story	116,278,420	1,465,100
D	Mosque	Repairs	RC • 1 story	44,411,306	559,500
E-1	Hostel of Girl-1	Repairs	RC • 2-story	84,065,247	1,059,200
E-2	Hostel of Girl-2	Repairs	RC • 2-story	67,802,250	854,300
F	Office House	Repairs	RC • 1 story	32,395,341	408,100
G,I	Kitchen and Mess Room-1	Repairs	RC • 1 story	31,982,896	402,900
H	Hostel of Main-2	Repairs	RC • 2-story	50,493,700	636,200
J	Education Room	Repairs	RC • 2-story	106,683,873	1,344,200
K,L	Workshop and Boarding House	New construction	RC • 2-story	1,096,531,232	13,816,200
M	Polyclinic	repairs	RC • 1 story	19,939,536	251,200
N	Boarding House and Auditorium	New construction	RC • 2 story	2,176,289,723	27,421,200
T	Toilet	New construction	RC • 1 story	139,400,105	1,756,400
Q	Kitchen and Mess Room-2	repairs	RC • 1 story	12,369,896	155,800
	All outside work	New construction and repairs	—	236,502,086	2,979,800
Total				4,334,910,000	54,619,000

## **CHAPTER 2 PREPARATION OF TECHNICAL REPORT**

### **2.1 TENDER CONDITION**

#### **2.1.1 Source of Funds**

The Government of Indonesia has received from the Government of Japan a Grant Aid amounting to Fourteen Billion Six Hundred Million Japanese Yen (Yen 14,600,000,000) as per Exchanged Note dated on January 17, 2005, for the purchase of products and services necessary for the execution of Program by the Government of Indonesia for Efforts to cope with the Damages caused by the Great Earthquake of the Coast of Sumatra, and by the Indian Ocean Tsunami Disaster which includes the Project.

Under this program, the Japan International Cooperation System (JICS) acts as an implementing agency for and on behalf of the Government of Indonesia in accordance with the Exchange of Notes.

#### **2.1.2 Mode of Tender**

The Contractor for construction will be procured through international competitive bidding which will be executed by JICS.

The contract is presumed to be unit price contract with bill of quantities.

### **2.2 TECHNICAL REPORT**

The tender documents will comprise three (3) volumes as listed up here under:

(1) VOLUME I	Section 1	Invitation for Bids
	Section 2	Instructions to Bidders
	Section 3	Bid Data
	Section 4	Bill of Quantities
	Section 5	Forms, Annexes and Enclosures
	Section 6	Conditions of Contract
	Part I:	General Conditions of Contract
Part II:	Conditions of Particular Application	
Part III:	Appendix to Bid	
(2) VOLUME II	Section 7	Technical Specifications
(3) VOLUME III	Section 8	Drawings

Technical report was prepared. Composition of the report is same as that of the Project: RECOVERY OF WATER SUPPLY SYSTEM IN BANDA ACEH CITY. JICA Study Team has produced Volumes II: Technical Specifications and III: Drawings as Technical Report.