

**Cambodian Mine Action Centre (CMAC)  
Kingdom of Cambodia**

**Preparatory Survey  
on the Project for the Construction of  
Training Complex and Outreach Facility of  
Cambodian Mine Action Centre**

**Final Report**

**November 2022**

**Japan International Cooperation Agency (JICA)**

**Oriental Consultants Global Co., Ltd. (OCG)**

**Japan International Cooperation System (JICS)**

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## Preface

Japan International Cooperation Agency (JICA) decided to conduct the preparatory survey and entrust the survey to the Joint Venture of Oriental Consultants Global Co., Ltd. (OCG) and Japan International Cooperation System (JICS).

The study team held a series of discussions with the officials concerned of the Government of Cambodia, and conducted field investigations. 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 the enhancement of friendly relations between our two countries.

Finally, I wish to express my sincere appreciation to the officials concerned of the Government of Cambodia for their close cooperation extended to the study team.

November, 2022

MASUDA Junko  
Director General,  
Governance and Peacebuilding Department  
Japan International Cooperation Agency

# Summary

## 1. Overview of the Country

The Kingdom of Cambodia (hereinafter referred to as “Cambodia”) is a constitutional monarchy located in the southwestern part of the Indochina Peninsula that gained independence from France in 1953. It has a land area of 181,035 km<sup>2</sup> (almost half of Japan) and borders Thailand, Vietnam and Laos. The Mekong River flows north-south on the eastern side of the central plain, and Tonle Sap Lake lies on the western side of the central plain. The population is approximately 15.3 million (2019 Cambodia Census).

It has a tropical monsoon climate, with a dry season from November to April and a rainy season from May to October.

Cambodia's economy grew rapidly in the 2000s and has continued to grow steadily since the 2010s. Per capita GDP was 301 US dollars in 2000, but increased to 1,544 US dollars in 2020, about five times in 20 years (World Bank). In July 2016, the World Bank rated Cambodia as a "lower middle-income country." The Cambodian government aims to become an upper middle-income country by 2030 and a high-income country by 2050, and continuous economic growth is expected in the future. Cambodia's economy is supported by the garment industry, construction industry, tourism and agriculture. Comparing 2010 and 2020, the ratio of agriculture, forestry and fisheries to GDP fell from 33.9% to 22.8%, while other industries including construction increased from 21.9% to 34.7%, which is a significant increase. The tourism industry, which is a major industry, is in a difficult situation as the number of overseas tourists, which was about 6 million in 2019, has plummeted to about 200,000 due to the COVID-19 pandemic.

## 2. Background and Outline of the Project

The Royal Government of Cambodia (hereinafter referred to as "RGC") has successfully implemented the national development plan “Rectangular Strategy” for Growth, Employment, Equity, and Efficiency for the last three phases, committed to work on the fourth phase (2018-2023). In addition, Cambodia is obliged to complete the removal of domestic anti-personnel landmines by 2025 as a party to the Ottawa Treaty (prohibition of anti-personnel landmines). However, unexploded ordnance (UXO) and anti-tank mines that have not been removed are expected to remain even after the deadline, thus mine action activity will still be necessary after 2025. Furthermore, the National Mine Action Strategy 2018-2025 developed by Cambodian Mine Action and Victim Assistance Authority (CMAA) advocates the promotion of international cooperation in the field of mine action. Reconstruction is being carried out amid the large number of landmine-contaminated countries where landmines and UXO are likely to remain after 2025. The policy is to provide the knowledge of Cambodia's mine action to other conflict-affected countries.

The Technical Institute of Mine Action (hereinafter referred to as "TIMA"), is responsible for training and development of not only Cambodian Mine Action Centre (hereinafter referred to as “CMAC”) staff, but also to the Royal Government Forces (RGF), police, NGOs, etc. involved in mine action in Cambodia, widely used as a place for technical training for countries contaminated by landmines and UXO, and has provided technical guidance by inviting people involved in mine action in Colombia, Laos, Angola, and Iraq to Cambodia. The high technical level of mine action of CMAC is unparalleled globally, and the importance of trainings conducted in TIMA is high both in Cambodia and abroad. However, at present, the facilities are seriously deteriorated, and there is a lack of facilities and equipment that can provide appropriate training both on-site and online to participants from home and abroad.

In addition, CMAC has an Outreach Facility (hereinafter referred to as "OF") which disseminates the history of Cambodia from the civil war to its reconstruction & development including the role of mine action. The facility is not only important for promoting understanding of landmine problems to general visitors and students, but also for people involved in mine action domestically and abroad to recover from the civil war. It is expected to be a place to deepen the understanding of the history of mine action, but at present, the exhibition space has not been prepared to effectively display the exhibits, not sufficiently functioning the above purpose for visitors and others.

The Project for the Construction of Training Complex and OF of Cambodian Mine Action Centre (hereinafter referred to as “the Project”) promotes technical guidance to other landmine and UXO-contaminated countries through the new construction that will replace the dilapidated facilities of TIMA and OF, further widely disseminate the history and achievements of Cambodia's mine action both domestically and internationally. Since 1998, JICA has been promoting mine action in Cambodia through grant aid and technical cooperation focusing on provision of equipment to CMAC and continuously strengthening CMAC's organizational capacity. With over 20 years of support from Japan for mine action, CMAC has grown into one of the world's leading organizations in mine action. Based on the support from the GOJ so far, this project is one of the important steps for CMAC to further improve the quality of mine action in Cambodia and South-South cooperation with other landmine and UXO-contaminated countries.

### **3. Overview and Results of Survey, Project Contents**

The RGC requested the expansion of TIMA and OF as follows.

TIMA facilities: Classroom building, EOD (Explosive Ordnance Disposal) classroom building, conference hall building, exhibition room, female accommodation facility, male accommodation facility, gym, canteen, MDD (Mine Detection Dog) office, breeding kennel, training kennel, main office building, instructor’s housing facility and classroom toilets.

TIMA equipment: Training-related equipment for each building.

OF facilities: Indoor exhibition facility, outdoor exhibition facility and classroom building.

OF equipment: Equipment for exhibition and training.

Based on the above request, the Japan International Cooperation Agency (hereinafter referred to as “JICA”) decided to dispatch a study team to Cambodia from January 18 to March 1, 2022 to conduct a preparatory survey. The study team held discussions with Cambodian government officials and conducted field surveys to the target sites in Kampong Chhnang and Siem Reap. The team then returned to Japan and compiled the survey results in the Draft Final Report on the preparatory survey. The team returned to Cambodia from August 14 to August 20, 2022 to explain and discuss about the report. Based on the discussions, this Final Report was compiled.

The outline of this project, which was compiled based on discussions with RGC, is as follows.

#### **3-1. Design Policy**

##### **(1) Design Policy for the Facilities**

###### **1) TIMA**

- Efficient floor planning by focusing on the functions of training and accommodation, to secure maximum capacity.
- Well-designed layout with good connection to existing facilities for trainees and instructors.
- Efficient site and section planning regarding earthwork and drainage work considering the ground level difference and access from the western and existing internal roads.
- Well-insulated energy-and-cost saving building with natural lighting and natural ventilation, to keep an educational and living space comfortable.

###### **2) OF**

- The building is designed to blend with the surrounding landscape and its exterior shape to entice visitors into the museum.

- Since the exhibition area will be used by an unspecified number of visitors, it will be planned with Universal Design in mind, including floor and signage plans that are easy for anyone to understand.
- Building materials are to be locally sourced and the building is designed for easy maintenance and low running costs.
- The building is to be designed to minimize heat load in consideration of the local climate. The 1F is designed with natural lighting and ventilation.

## **(2) Design Policy for Structure**

- The building is planned to have sufficient durability and strength to maintain its functions against natural disasters such as wind and rain. As the OF is built on weak ground, pile foundations should be used after careful consideration of construction period, cost, and building safety.

## **(3) Design Policy for Mechanical and Electrical**

- Design for safety, reliability, maintainability, and economical installation of energy-efficient equipment, and install products that are easy to operate. In addition, the design will be consistent and uniform to ensure that equipment can be easily maintained, visitors, trainees, trainers, and staff are comfortable, and the type and quality of equipment and systems are standardized. Furthermore, the design documents will be easy to tender, and the design will be economical in construction and operation.

## **(4) Design Policy for Exhibition (OF)**

### **1) The plan must integrate sufficient safety measures**

- For the installation of fixtures, measures must be planned to fasten them to the floor and walls and support them from the ceiling so that they will not fall over or otherwise move in any unintended manner. In addition, to prevent any theft of articles on display, install boundaries and covers.
- Make sure that the floor will be free of any uneven surfaces or other obstacles to provide universal access. Also, set up rest areas. Make sure that the entire exhibition rooms will have enough light throughout (not too dark for people to watch their steps).

### **2) The plan must be considerate of the museum's operation after its opening**

- Select materials that can be procured locally with ease and adopt such specifications that will allow for continuous exhibition switching. As for the video software, also consider adopting such specifications that will allow CMAC to implement updates on their own with ease.

### **3) Design spaces that utilize the building's architecture**

- Create impressive exhibition spaces that take full advantage of the positive features of the museum's architecture, including its 7m story height, void with approximately 14m diameter and overall building design that is congruous with the surrounding outdoor areas.

## **(5) Design Policy for Equipment**

### **1) TIMA**

- The equipment necessary for online training (attend & provide) will be selected.
- The equipment suitable for training of GIS software will be selected.
- The equipment necessary for preparation of training material will be selected.

- The specifications of the model available in local market will be prioritized to facilitate the maintenance.
- To reduce maintenance cost, the laser projector with lamp that has long life will be selected.
- Based on current IT network of CMAC, the server to archive the training material is installed in HQ, where TIMA accesses remotely. (The cost for access and the related device (if any), is to be borne by CMAC.).
- Repair will be outsourced. The equipment which needs frequent part replacement will not be included. Therefore, the spare parts will not be provided.
- The consumables necessary for initial operation will be provided (toner).

## 2) OF

- The equipment necessary for online training (attend & provide) will be selected.
- The equipment will be selected based on the management and operation structure expected at the time of completion of works.
- The specifications of the model available in local market will be prioritized to facilitate the maintenance.
- To reduce the maintenance cost, the laser projector with lamp that has long life will be selected.
- Regarding the projector used in the exhibition, DLP that has unnoticeable pixels will be selected; it is widely used in museums in Japan.
- To avoid troubles caused by network instability, the electronic equipment in the exhibition area will be designed as a stand-alone.
- Exhibition contents such as video, programming, graphic panel, a part of model/diorama will be borne by CMAC.
- Based on current IT network of CMAC, the server to archive the training material is installed in HQ, where OF accesses remotely. (The cost for access and the related device (if any), is to be borne by CMAC).
- Repair will be outsourced. The equipment which needs frequent part replacement will not be included. Therefore, the spare parts will not be provided.
- The consumables necessary for initial operation will be provided (toner).

### 3-2. Content, Scale

**Table 1 List of TIMA's New Facility**

Building Name	Number of Building	Floor Number	Key Rooms	Floor Area (m <sup>2</sup> )
①Classrooms	1	2	10 Classrooms (30 seats/room)	1,196
②Conference Hall	1	1	Hall (300 seats), VIP Room, Restrooms	628
③Accommodation/Female	1	1	15 Bedrooms (6 beds/room), Lounge,	950
④Accommodation/Male	1	1	Laundry Room, Shower Room, Restrooms	950
⑤Canteen	1	1	Dining Space, Kitchen, Restrooms	411
⑥Restrooms for Classrooms	1	1	Restrooms	88
⑦Dynamo & Electrical Room	1	1	Dynamo and Electrical Room	44
Total				4,267

Source: JICA Study Team

**Table 2 Rooms List of Indoor Exhibition Facility**

Room Name	Area (m <sup>2</sup> )	Function
<b>GF</b>		
Exhibition room	1,814	The entire exhibition is divided into 8 sections *For details, see " <b>Table 2-14</b> List of Exhibits" below.
Preparation room/ Backyard	102	Prepare works for the next special exhibition and replace or repair damaged exhibits in the permanent collection. Perform graphic repairs, etc. Also, store spare parts for exhibition-related items such as elevating vehicles and lighting fixtures.
Special Exhibition Room	120	It will function as a place for CMAC-related facilities, NPOs, etc. to present their activities, for artists to exhibit their works, and for the latest technology and information related to landmine clearance, etc. Exhibits will be changed several times a year to ensure repeat visitors and play a PR role.
Theatre Room	120	The exhibition will provide an overview of the historical background of Cambodia and CMAC's activities, such as landmine clearance, through a video (expected to be about 10 minutes). The exhibition will be a place where tourists and young people can easily understand the exhibits.
Briefing Room	75	The space will be used as a place to hold lectures in advance and to store luggage when school classes come to the facility. It is also envisioned to be used as one of the space for facility-wide events.
Loading Entrance (Truck Yard)		Entrance/exit for bringing in large works and valuable exhibits. (Separate from visitor flow lines).
Corridors, Toilets, Machine room, etc.	378	
GF sub-total	2,590	
<b>1F</b>		
Conference hall	235	It will be a place to promote educational outreach activities by inviting domestic and foreign officials and others for training and lectures. The maximum seating capacity is 240 for training using desks.
Meeting room	110	Meeting space primarily for use by museum staff
Multipurpose room, Office	340	Used for multiple purposes, including preparation of materials and publicity materials. Administrative workspace for museum staff.
Storage	135	Mainly houses and stores documents and paper materials.
Corridors, Toilets, Machine room, etc.	378	
1F sub-total	1,198	
<b>Total</b>	<b>3,788</b>	

Source: JICA Study Team



**Table 3 Exhibition List**

No	Description	Qty	Size			Remarks																						
			W	D	H																							
1	<p>About Cambodia, before war</p> <p>This section provides the general information about Cambodia from the following three perspectives, "culture and civilization", "geographical features and resources" and "prosperity". The information includes how people lived in the 70s in Cambodia so that visitors, who visit Cambodia for the first time, can easily understand the context.</p>																											
2	<p>War History</p> <p>This section focuses on the war taking place in the 60s and 70s. It explains the background about why and how the war took place and why many landmines and UXOs/ERWs were left in Cambodia. The explanation includes the overview of where and what kind of landmines and bombs were used. The maps are used for this explanation.</p>																											
	<table border="1"> <tr> <td>Khmer Rouge</td> <td>Stage</td> <td></td> <td>1</td> <td></td> <td></td> <td>450</td> <td>Railing</td> </tr> </table>	Khmer Rouge	Stage		1			450	Railing																			
Khmer Rouge	Stage		1			450	Railing																					
3	<p>War Legacy and destruction</p> <p>The section shows how the war gave a huge impact on the Cambodian society. Pictures are mainly used in this section to show the impact of war. Visitors will understand how the Cambodian society and infrastructures were damaged by the war.</p>																											
4	<p>Mine demining site</p> <p>This section explains how items are used and found on the ground. The explanation focuses on each scene including how it is used, how it is found, and how it is exploded.</p>																											
	<table border="1"> <tr> <td>Contamination maps, survey information, site sketches, survey tools</td> <td>Furniture</td> <td>Table</td> <td>1</td> <td></td> <td></td> <td></td> <td></td> </tr> </table>	Contamination maps, survey information, site sketches, survey tools	Furniture	Table	1																							
Contamination maps, survey information, site sketches, survey tools	Furniture	Table	1																									
5	<p>Displays</p> <p>This section shows the actual items including anti-personnel mines, anti-tank mines, UXOs and others with explanations. The explanations facilitate the understanding among visitors on how the items are designed, how they function and how they affect human body.</p>																											
	<table border="1"> <tr> <td>Air-dropped Scene [Void]</td> <td>Stage</td> <td></td> <td>1</td> <td>5000φ</td> <td>500</td> <td></td> <td></td> </tr> </table>	Air-dropped Scene [Void]	Stage		1	5000φ	500																					
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6	<p>About CMAC and Mine Action</p> <p>This section provides information about CMAC as an organization and how CMAC works on the ground, including the technics that are used in the field. Visitors will understand the history and organization of CMAC as well as how the safe land is produced by the CMAC's work. In this corner, the activities of CMAC's international contributions (Laos, Colombia, Angola, Iraq, etc.) to promote the removal of landmines and UXO will also be introduced.</p>																											
7	<p>Stories and voices of victims and participants of peace building</p> <p>This section introduces videos about the victims of landmines and other disasters. Videos that are developed based on the interviews will enable visitors to deepen the understanding of what happened to the people on the ground during the conflict.</p>																											
	<table border="1"> <tr> <td rowspan="2">Stories and Voices</td> <td rowspan="2">Furniture</td> <td>Table</td> <td>2</td> <td>900φ</td> <td>700</td> <td>Ready-made</td> </tr> <tr> <td>Chair</td> <td>2</td> <td></td> <td></td> <td>Ready-made</td> </tr> </table>	Stories and Voices	Furniture	Table	2	900φ	700	Ready-made	Chair	2			Ready-made															
Stories and Voices	Furniture			Table	2	900φ	700	Ready-made																				
		Chair	2			Ready-made																						
8	<p>Looking to the Future</p> <p>This section provides the opportunity where visitors feel hopeful about the future of the world without landmines and UXOs.</p>																											
	<table border="1"> <tr> <td rowspan="3">Visitors Comment Board</td> <td>Board</td> <td></td> <td>1</td> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td rowspan="2">Furniture</td> <td>Table</td> <td>2</td> <td>1500</td> <td>900</td> <td>700</td> <td>Ready-made</td> </tr> <tr> <td>Chair</td> <td></td> <td>8</td> <td></td> <td></td> <td></td> <td>Ready-made</td> </tr> </table>	Visitors Comment Board	Board		1					Furniture	Table	2	1500	900	700	Ready-made	Chair		8				Ready-made					
Visitors Comment Board	Board			1																								
	Furniture		Table	2	1500	900	700	Ready-made																				
		Chair		8				Ready-made																				
9	<p>Preparation room for exhibition</p> <p>This space is used to repair and prepare for the replacement of graphic panels and other items in the Permanent Exhibition Room as well as to prepare for the special exhibitions and temporary storage of packing materials. This room is located close to the Temporary Exhibition Room and Backyard, while ensuring a carry-in route from the outside.</p>																											
	<table border="1"> <tr> <td rowspan="2"></td> <td rowspan="2">Furniture</td> <td>Table</td> <td>2</td> <td>1800</td> <td>900</td> <td>700</td> <td>Ready-made</td> </tr> <tr> <td>Chair</td> <td>2</td> <td></td> <td></td> <td></td> <td>Ready-made</td> </tr> </table>		Furniture	Table	2	1800	900	700	Ready-made	Chair	2				Ready-made													
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No	Description	Qty	Size			Remarks
			W	D	H	
10	<p>Temporary exhibition room</p> <p>This room is used for temporary exhibition which is held about four times a year in cooperation with similar facilities such as Peace Museum and artists who produce works on themes related to peace in the Temporary Exhibition Room. Furthermore, it plays a role in raising the level of satisfaction of repeat visitors and disseminating activities in Cambodia and overseas.</p>				35.3m	
11	<p>Theater room</p> <p>The room provides the introduction of Cambodian geographical features, history and mine action with a 15-minute video. The use of dynamic visuals will be designed to make the museum's exhibits more interesting to tourists visiting Cambodia for the first time, as well as to the younger generation in the country.</p>					
		Video (Hardware)	1			Screen
		Furniture	Chair	35		Ready-made

Source: JICA Study Team

**Table 4 List of Equipment**

No.	Equipment Name	Specifications	Objective	TIMA	OF	Total Q'ty	Technical Level		Difficulty of Acquisition of Consumables
							Operation	Maintenance	
1	Projector Set A	Projector, Screen etc.	TIMA: Lecture in classroom OF: Briefing to visitors in group such as schools	7set	1set	8set	Low	Low	N/A
2	WEB Conference System A	Projector, Screen, Camera, Microphone, Speaker etc.	TIMA: Teleconference	1set	0set	1set	Low	Low	N/A
3	WEB Conference System B	Interactive Board, Screen, Camera, Microphone, Speaker etc.	TIMA: Online classroom and teleconference OF: Teleconference	2unit	1unit	1set	Low	Low	N/A
4	Copier	Print·Scan·Copy, White Black, Color, with Cabinet	TIMA: Print, scan and copy of training materials and administration documents OF: Print, scan and copy for training and administration	2set	1set	3set	Low	Middle	Easy (local)
5	PA System	Type A: Projector, Screen, Monitor, Microphone, Speaker, Mixer, Amplifier, Switcher, Rack etc. Type B: Portable Speaker, Microphone etc.	TIMA: Plenary gathering OF: Plenary gathering	1set	1set	1set	Middle	Middle	N/A

No.	Equipment Name	Specifications	Objective	TIMA	OF	Total Q'ty	Technical Level		Difficulty of Acquisition of Consumables
							Operation	Maintenance	
6	PC A	Laptop	TIMA: Manager in charge of training and administration OF: Manager in charge of training and administration	29set	9set	38set	Low	Low	N/A
7	PC B	Desktop etc.	TIMA: Staff in charge of training and administration OF: Staff in charge of training and administration	10set	8set	18set	Low	Low	N/A
8	PC C	Workstation etc.	TIMA: ArcGIS software training (installed in the computer room)	25set	0set	25set	Low	Low	N/A
9	File Server	Server, LTO, Rack etc.	TIMA: Archive of training materials	HQ 1set		1set	Middle	Middle	N/A
10	Aerial Work Platform	4m height	OF: Maintenance and display works in area with height	0set	1set	1set	Low	Middle	Easy (local)
11	Showcase	Glass & Steel, Frameless, Acrylic Resin Baking Finishing	OF: Display of models or real objects	0set	1set	1set	Low	Low	N/A
12	Display Monitor	70-75inches	OF: Video for display	0set	2set	2set	Low	Low	N/A
13	Model A	Scene of setting a landmine in battlefield, Military battlefield scene including child soldier, Scene of house burning together with war victims, Site, CMAC staff mannequin with uniform and tool	OF: Display	0set	1set	1set	Low	Low	N/A
14	Model B	Diorama, Mannequins, Speaker etc.	OF: Display	0set	1set	1set	Low	Low	N/A
15	Touch Panel A	20-22inches	OF: Search of anti-personnel landmines, anti-tank landmines (display)	0set	3set	3set	Low	Low	N/A
16	Touch Panel B	32inches	OF: Interactive Q&A (no of quiz: 5), with animation	0set	2set	2set	Low	Low	N/A
17	Touch Panel C	32inches	OF: Watching the video by selection	0set	2set	2set	Low	Low	N/A
18	Projector Set B	Projector, Screen in air	OF: Projection of video	0set	1set	1set	Low	Low	N/A
19	Projector Set C	Projector 3D, Glasses, Speaker, Media Player etc.	OF: Theater	0set	1set	1set	Middle	Middle	N/A

Source: JICA Study Team

### 3-3. Implementation Period and Project Cost

The construction period required to implement the Project depends on construction constraints due to construction scale and weather conditions, and on-site construction.

Considering the circumstances, it takes 4.5 months for Detailed Design, 3.5 months for bidding, and 19.0 months for facility construction and equipment procurement, which concludes to 27.0 months in total. The project cost to be borne by the Cambodian government is estimated to be 204 million JPY.

## 4. Project Evaluation

### 4-1. Relevance

The relevance of this project as Grant aid project is verified by two main reasons below.

- RGC received the delegation of authority to CMAC, which was established by the United Nations Transitional Authority in Cambodia (UNTAC) in 1992 and proceeded with the removal of land mines. In National Strategic Development Plan (NSDP) 2019-2023, to promote agriculture and rural development, it is clearly stated to remove landmines and UXO to secure agricultural land for poor households, positioning it as one of the priority policies and activities. Of the 8 goals of National Monitoring Strategic Plan (NMSP) 2018-2025, Goal 1 states "Release all known landmine contaminated areas by 2025" and activities for that purpose are planned. Furthermore, there is unique goals in Cambodia Goal18 (Demining, removing Explosive Remnants of War (ERW) and victim assistance monitored by CMAC and CMAA. The National Mine Action Strategy 2018-2025 advocates the promotion of international cooperation in the field of mine action, and while there are many landmine-contaminated countries with a high chance of having landmines and UXO to remain even after 2025, Cambodia has achieved reconstruction to provide other conflict-affected countries with the knowledge of mine action. By constructing a training complex and outreach facility for CMAC, this project can contribute to supporting activities of landmines and UXO removal that match the development strategy of Cambodia.
- Since 1998, the Government of Japan has been improving equipment for CMAC through 7 Grant-aid projects and has been continuously strengthening CMAC's capacity with technical cooperation since 1999. One of the priorities of Country Assistance Policy of the Government of Japan (July, 2017) is "strengthening of governance" including supporting landmines and UXO measuring. Grant aid project is currently implemented to provide landmines removal machines and brush cutter machines to Laos and Columbia. In addition, in the ongoing technical cooperation project in Laos "UXO Lao Implementation Capacity Development Project Contributing to Poverty Reduction" (2019-2024) and third-country training with Colombia "Mine Action" (2017-2023), CMAC acted as a resource where knowledge and technology are shared, and South-South cooperation is being developed led by CMAC. In these projects, CMAC provides training of control machine utilize facility of CMAC and minefields in Cambodia. The aim of this project is to construct and training complex and OF of CMAC and adapt Country Assistance Policy of the Government of Japan.

## 4-2. Effectiveness

The effectiveness of this project is mentioned below.

### (1) Quantitative effect

**Table 5 Quantitative effect**

Name of index	Standard Value (2020)	Target Value (2028) [3 years after project completion]
Capacity of trainees in training rooms in TIMA (person)	Approx. 120	Approx.420
Number of trainees per year in TIMA (person)	602 (Average from 2011 to 2021)	Approx. 1,260
Number of training course per year in TIMA (number)	26	Approx.50
Capacity of trainees staying at accommodation in TIMA (person)	80	Male Dormitory 170 Female Dormitory 90 Total 260
Number of visitors of OF per year (person).	15,891 (Actual value for 2019. In 2020 it was closed due COVID-19)	Approx. 50,000

Source: JICA Study Team

### (2) Qualitative effect

- Improving the quality of education and training by improving the facility's environment, promoting demining activities in Cambodia and overseas, promoting understanding of landmine issues, and promoting awareness and PR activities

# Contents

Preface  
 Summary  
 Contents  
 Location Map  
 Perspective Drawing  
 List of Figures  
 List of Tables  
 List of Abbreviations

	page
<b>Chapter 1 Background of the Project.....</b>	<b>1-1</b>
1-1 Background and Outline of the Japan’s Grant Aid.....	1-1
1-2 Environmental and Social Considerations.....	1-1
1-2-1 Environmental Impact Assessment (EIA) .....	1-1
1-2-2 EIA procedure flow in Cambodia .....	1-2
1-2-3 EPC costs required for this project (to be borne by the Cambodian side).....	1-3
1-3 Points to Note in Implementing Grant Aid Projects in Recipient Countries .....	1-3
1-4 Others .....	1-3
<b>Chapter 2 Contents of the Project.....</b>	<b>2-1</b>
2-1 Basic Concept of the Project .....	2-1
2-1-1 Objective of the Project .....	2-1
2-1-2 Outline of the Project.....	2-1
2-2 Outline Design of the Japanese Assistance .....	2-2
2-2-1 Design Policy.....	2-2
2-2-2 Basic Plan (Construction Plan / Equipment Plan) .....	2-7
2-2-3 Outline Design Drawing .....	2-46
2-2-4 Implementation Plan .....	2-71
2-3 Security Plan.....	2-80
2-4 Obligations of Recipient Country.....	2-81
2-4-1 Embankment work at the project site (before bidding).....	2-81
2-4-2 Installation of infrastructure to the project site (during the construction period) .....	2-81
2-4-3 Cost to hire EIA consultant to get EPC (before bidding) .....	2-81
2-4-4 Exterior work at the project site (during the construction period and/or after completion) .....	2-81
2-4-5 Construction of outdoor exhibition facility at OF project site .....	2-81
2-4-6 VPN Installation (Contract) (by the commencement of installation works of equipment) .....	2-81
2-4-7 Exhibition Plan .....	2-81
2-4-8 Wheelchair (after the completion of the works and before opening of OF) .....	2-82
2-4-9 Personnel (by the commencement of the operation training) .....	2-82
2-4-10 Cost for maintenance of equipment (after the completion of the works) .....	2-82
2-5 Project Operation Plan.....	2-82
2-5-1 Facility .....	2-82
2-5-2 Equipment.....	2-82
2-6 Project Cost Estimation .....	2-82
2-6-1 Initial Cost Estimation .....	2-82
2-6-2 Operation and Maintenance Cost.....	2-84
<b>Chapter 3 Project Evaluation .....</b>	<b>3-1</b>
3-1 Preconditions .....	3-1
3-2 Necessary Inputs by Recipient Country .....	3-1
3-3 Important Assumptions .....	3-1

3-4	Project Evaluation .....	3-2
3-4-1	Relevance.....	3-2
3-4-2	Effectiveness.....	3-3

## **Appendices**

Appendix 1: Study Team Members

Appendix 2: Survey Schedule

Appendix 3: Cambodian Officials List

Appendix 4: Minutes of Discussion (M/D)

Appendix 5: Technical Note (T/N)

Appendix 6: Minutes of Discussion (M/D) (Explanation on Draft Preparatory Survey Report)

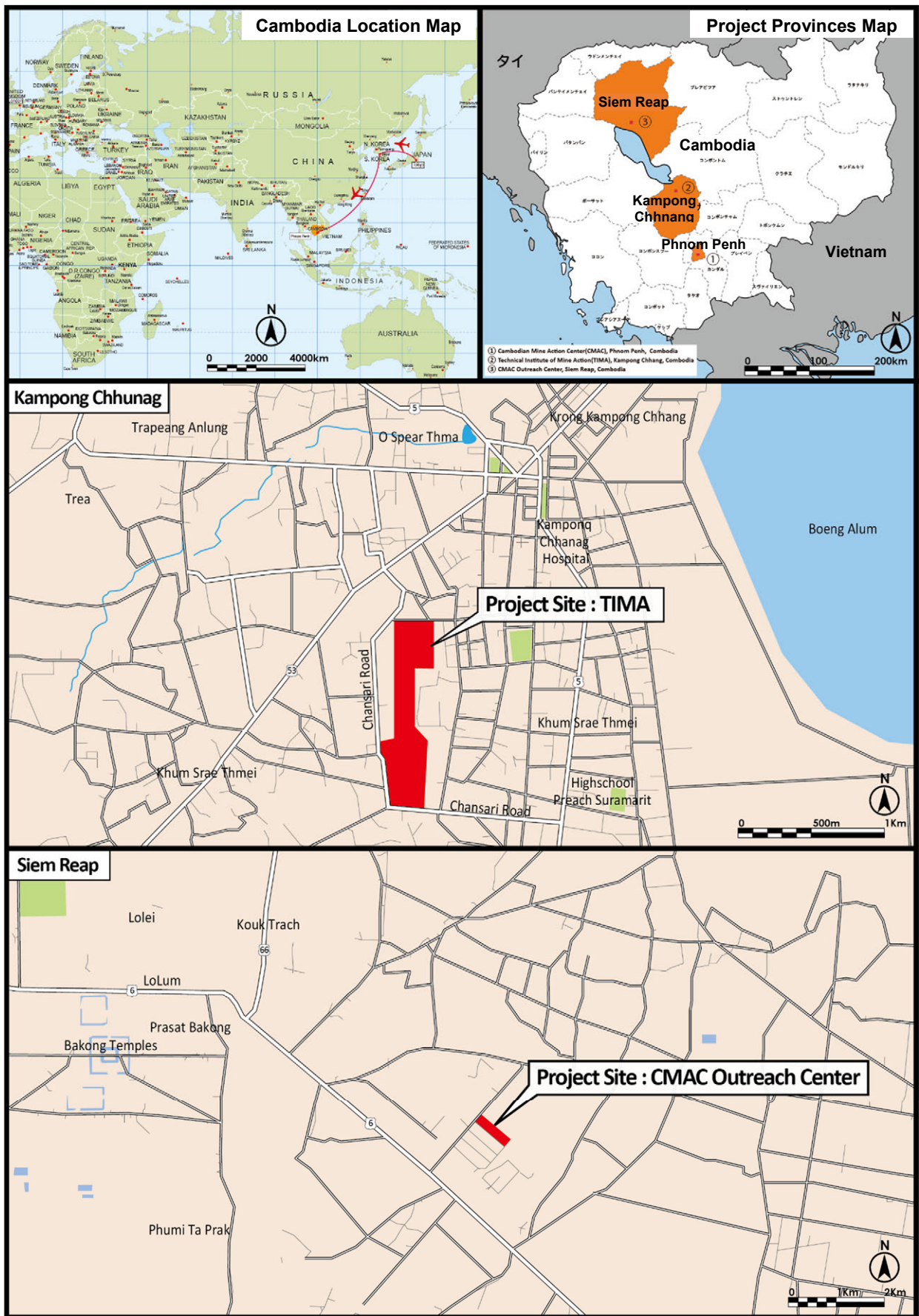
Appendix 7-1: Land Registration (Kampong Chhnang)

Appendix 7-2: Land Registration (Siem Reap)

Appendix 8-1: Boring Locations and Log (TIMA)

Appendix 8-2: Boring Locations and Log (OF)

Appendix 9: New Wells Location, Results of Pumping Test and Water Quality Survey

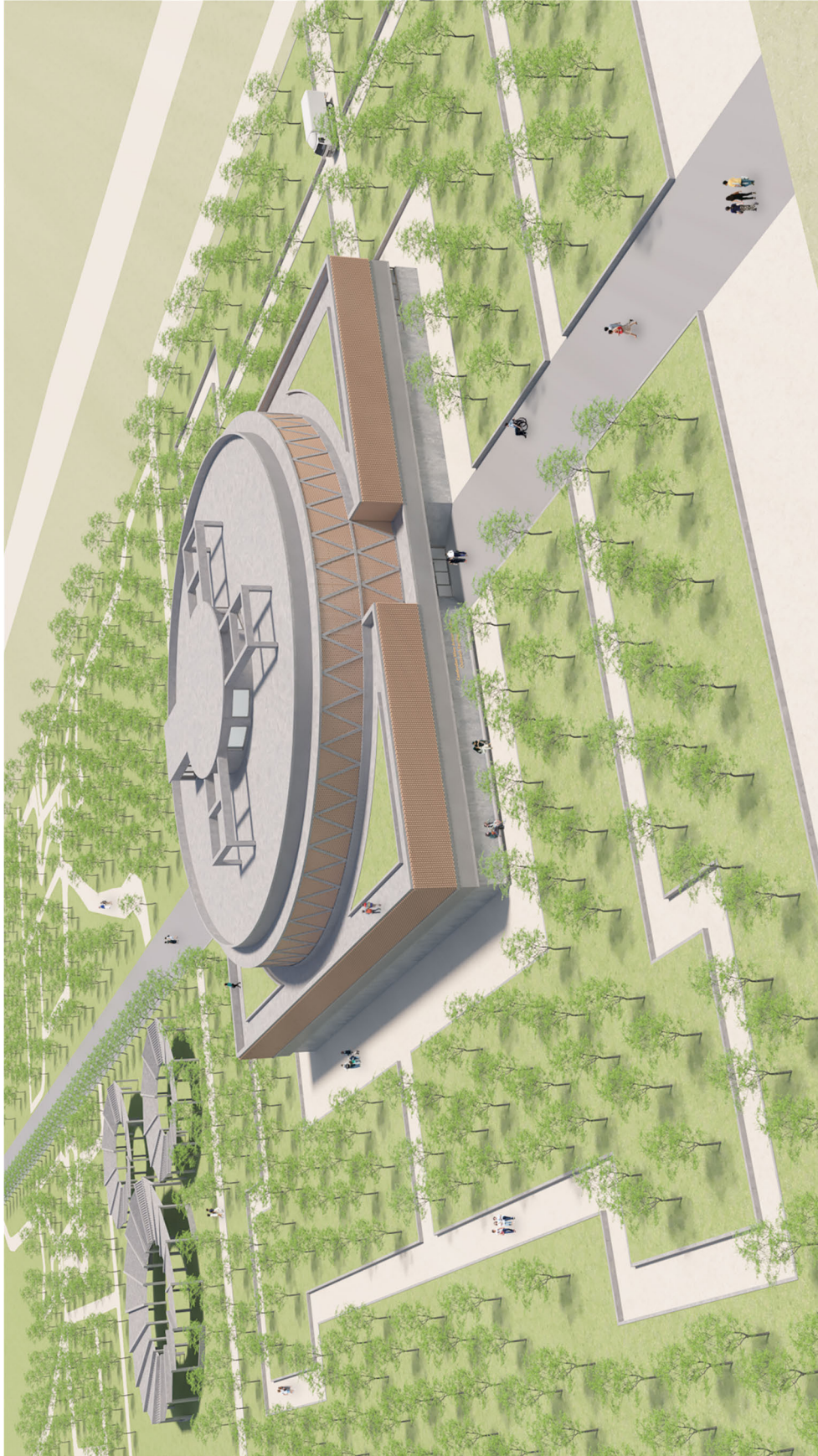


**Figure 1 Location Map**





**Figure 2** Perspective Drawing of TIMA



**Figure 3** Perspective Drawing of Outreach Facility (OF)

## List of Figures

	page
Figure 1-1	EIA Procedure Flow ..... 1-2
Figure 2-1	TIMA Zoning Plan..... 2-8
Figure 2-2	TIMA New Facility’s Layout Plan ..... 2-9
Figure 2-3	Classroom Building Layout Plan ..... 2-10
Figure 2-4	Classroom Building Ground Floor Plan ..... 2-10
Figure 2-5	Conference Hall Ground Floor Plan ..... 2-11
Figure 2-6	Conference Hall Sectional Plan ..... 2-12
Figure 2-7	Accommodation for Male Ground Floor Plan ..... 2-12
Figure 2-8	Canteen Ground Floor Plan ..... 2-13
Figure 2-9	Restrooms Ground Floor Plan ..... 2-14
Figure 2-10	Dynamo & Electrical Room GF Plan ..... 2-14
Figure 2-11	Site Layout Plan of OF ..... 2-15
Figure 2-12	OF floor plan: indoor exhibition (GF) ..... 2-17
Figure 2-13	OF floor plan: indoor exhibition (1F) ..... 2-18
Figure 2-14	3D Image of OF ..... 2-18
Figure 2-15	Exhibition layout..... 2-38
Figure 2-16	Exhibit system concept ..... 2-39
Figure 2-17	Concept of the main model (diorama) and model exhibition stage (table)..... 2-39
Figure 2-18	Layout of TIMA..... 2-46
Figure 2-19	Floor Plan of TIMA Classroom Building (GFL)..... 2-47
Figure 2-20	Floor Plan of TIMA Classroom Building (1FL, RFL)..... 2-48
Figure 2-21	Section of TIMA Classroom Building..... 2-49
Figure 2-22	Elevation of TIMA Classroom Building..... 2-50
Figure 2-23	Floor Plan of TIMA Conference Hall..... 2-51
Figure 2-24	Section of TIMA Conference Hall..... 2-52
Figure 2-25	Elevation of TIMA Conference Hall ..... 2-53
Figure 2-26	Floor Plan of TIMA Accommodation for Female (GFL)..... 2-54
Figure 2-27	Section of TIMA Accommodation for Female..... 2-55
Figure 2-28	Elevation of TIMA Accommodation for Female..... 2-56
Figure 2-29	Floor Plan of TIMA Accommodation for Male (GFL)..... 2-57
Figure 2-30	Section of TIMA Accommodation for Male ..... 2-58
Figure 2-31	Elevation of TIMA Accommodation for Male ..... 2-59
Figure 2-32	Floor Plan of TIMA Canteen (GFL)..... 2-60
Figure 2-33	Section of TIMA Canteen..... 2-61
Figure 2-34	Elevation of TIMA Canteen ..... 2-62
Figure 2-35	Floor Plan and Section of TIMA Restrooms for Classrooms ..... 2-63
Figure 2-36	Elevation of TIMA Restrooms for Classrooms ..... 2-64
Figure 2-37	Floor Plan, Section and Elevation of TIMA Dynamo & Electrical Room ..... 2-65
Figure 2-38	Layout of OF..... 2-66
Figure 2-39	Floor Plan of OF (GFL, 1FL) ..... 2-67
Figure 2-40	Floor Plan of OF (RFL, R-top) ..... 2-68
Figure 2-41	Section of OF ..... 2-69
Figure 2-42	Elevation of OF..... 2-70

## List of Tables

	page
Table 1-1	EIA Classification in Prakas No. 021 ..... 1-2
Table 1-2	Cost Variation of EIA Consulting Service..... 1-3
Table 2-1	List of TIMA’s New Facility ..... 2-1
Table 2-2	Rooms List of Indoor Exhibition Facility ..... 2-1
Table 2-3	List of TIMA’s New Facility ..... 2-9
Table 2-4	Rooms List of Indoor Exhibition Facility ..... 2-16
Table 2-5	Foundation of Each Building ..... 2-20
Table 2-6	Exterior Finish Materials and the Selection Reasons..... 2-23
Table 2-7	Interior Finish Materials and the Selection Reasons..... 2-23
Table 2-8	Exterior finishing materials and the reasons for selection ..... 2-23
Table 2-9	Interior finishing materials and the reasons for selection ..... 2-24
Table 2-10	Electricity Demand List ..... 2-25
Table 2-11	Lighting Level Design Criteria ..... 2-26
Table 2-12	Design Criteria for Ventilation ..... 2-27
Table 2-13	Assumed Power Load Capacity ..... 2-28
Table 2-14	Lighting Level Design Criteria ..... 2-28
Table 2-15	Design Criteria for Ventilation ..... 2-31
Table 2-16	Elevator (Wheelchair Accessible)..... 2-31
Table 2-17	Exhibition list..... 2-32
Table 2-18	Selection Policy on Equipment and its Quantity ..... 2-41
Table 2-19	Procurement List of Equipment ..... 2-44
Table 2-20	Tax Exemption Procedure ..... 2-72
Table 2-21	Scope of Work (Facility) ..... 2-72
Table 2-22	Scope of Work (Equipment) ..... 2-73
Table 2-23	Staffing Plan for Detailed Design and Bid ..... 2-74
Table 2-24	Staffing Plan for Construction and Procurement Supervision ..... 2-75
Table 2-25	Construction Supervision by Japanese Side ..... 2-76
Table 2-26	Procurement Source of Main Materials ..... 2-77
Table 2-27	Procurement Plan of the Equipment ..... 2-78
Table 2-28	Operation Training Plan..... 2-79
Table 2-29	Implementation Schedule ..... 2-80
Table 2-30	Project Cost Breakdown (to be borne by Cambodia) ..... 2-82
Table 2-31	Criteria ..... 2-84
Table 2-32	Electricity Tariffs (EDC: Electric du Cambodia Tariff 11KV Power Rate)..... 2-84
Table 2-33	Monthly Electricity Charge ..... 2-84
Table 2-34	Annual Electricity Charge ..... 2-84
Table 2-35	Criteria ..... 2-84
Table 2-36	Electricity Tariffs, Power Supply Company (EDC: Electric du CAMBODIA TARRIF 11KV Power Rate)..... 2-84
Table 2-37	Monthly Electricity Charge ..... 2-84
Table 2-38	Annual Electricity Charge ..... 2-85
Table 2-39	Telephone and Telecommunication..... 2-85
Table 2-40	Water Supply Charge..... 2-85
Table 2-41	TIMA Diesel Generator Fuel Charge ..... 2-85
Table 2-42	OF Diesel Generator Fuel Charge..... 2-86
Table 2-43	Maintenance Cost for Septic Tank..... 2-86
Table 2-44	Maintenance Cost for Wastewater Treatment Facility ..... 2-86
Table 2-45	Maintenance Cost for Sand Filtration System ..... 2-86
Table 2-46	TIMA facility maintenance costs (annual) ..... 2-86
Table 2-47	OF facility maintenance costs (annual)..... 2-87

Table 2-48	Operation and Maintenance Cost of CMAC (Annual) .....	2-87
Table 2-49	Revenue and expenses of OF .....	2-88
Table 2-50	Admission fee .....	2-88
Table 2-51	Number of Visitors of Outreach Facility (National).....	2-88
Table 2-52	Number of visitors of museum (2018).....	2-89
Table 2-53	Operation and Maintenance Cost (Annual) .....	2-89
Table 2-54	Revenue Estimation .....	2-89
Table 3-1	Quantitative effect.....	3-3

## List of Abbreviations

1FL	First Floor Level (2 <sup>nd</sup> Floor in Japan)
AC	Air Conditioner
AEP	Acrylic Emulsion Paint
AIJ	Architectural Institute of Japan
B/A	Banking Arrangement
BOD	Biochemical Oxygen Demand
CDC	Council of Development of Cambodia
CMAA	Cambodian Mine Action and Victim Assistance Authority
CMAC	Cambodian Mine Action Centre
COD	Chemical Oxygen Demand
COVID-19	Coronavirus disease
DC	Dog Center
DLP	Digital Light Processing
DU	Demining Unit
EBA	Everything But Arms
EDC	Electricite du Cambodge
EDD	Explosive Detection Dog
EIA	Environmental Impact Assessment
EOD	Explosive Ordnance Disposal
EP	Emulsion Paint
EPC	Environmental Protection Contract
EPNRM	Environmental Protection and Natural Resource Management
EU	European Union
FEIA	Full Environment Impact Assessment
FRP	Fiberglass Reinforced Plastics
FSA	Japan Fire Service Act
G/A	Grant Agreement
GDCE	General Department of Custom and Excise
GDP	Gross Domestic Product
GDT	General Department of Taxation
GFL	Ground Floor Level (1 <sup>st</sup> Floor in Japan)
GIS	Geographic Information System
GPS	Global Positioning System
HQ	Headquarter
IEC	International Electrical Code
IEIA	Initial Environment Impact Assessment
IMCCD	International Mine Clearance and Community Development Supporters
IT	Information Technology
JICA	Japan International Cooperation Agency
JIS	Japanese Industrial Standards

KC	Kampong Chhnang
KHR	Cambodian Riel
LAN	Local Area Network
LED	Light Emitting Diode
MAG	Mine Advisory Group
MDD	Mine Detection Dog
MEF	Ministry of Economy and Finance
NGO	Non-governmental Organization
NMSP	National Monitoring Strategic Plan
NPO	Non-Profit Organization
NSDP	National Strategic Development Plan
OF	Outreach Facility
PA	Public Address (System)
PC	Personal Computer
PH	Potential of Hydrogen
PHC pile	Pretensioned spun High strength Concrete pile
R&D	Research and Development
RGC	The Royal Government of Cambodia
RGF	Royal Government Forces
SD	Steel Deformed bar
SDGs	Sustainable Development Goals
SPD	Surge Protective Device
SR	Siem Reap
SS	Steel Structure
STK	Steel Tube Kozo
TIMA	Technical Institute of Mine Action
TSS	Total Suspended Solids
UNDP	United Nations Development Programme
UNTAC	United Nations Transitional Authority in Cambodia
USD	United States Dollar
UXO	Unexploded Ordnance
VAT	Value Added Tax
VPN	Virtual private network

# **Chapter 1 Background of the Project**

## **1-1 Background and Outline of the Japan's Grant Aid**

The Royal Government of Cambodia (hereinafter referred to as "RGC") has successfully implemented the national development plan "Rectangular Strategy" for Growth, Employment, Equity, and Efficiency for the last three phases, committed to work on the fourth phase (2018-2023). In addition, Cambodia is obliged to complete the removal of domestic anti-personnel landmines by 2025 as a party to the Ottawa Treaty (prohibition of anti-personnel landmines). However, unexploded ordnance (UXO) and anti-tank mines that have not been removed are expected to remain even after the deadline, thus mine action activity will still be necessary after 2025. Furthermore, the National Mine Action Strategy 2018-2025 developed by Cambodian Mine Action and Victim Assistance Authority (CMAA) advocates the promotion of international cooperation in the field of mine action. Reconstruction is being carried out amid the large number of landmine-contaminated countries where landmines and UXO are likely to remain after 2025. The policy is to provide the knowledge of Cambodia's mine action to other conflict-affected countries.

The Technical Institute of Mine Action (hereinafter referred to as "TIMA"), is responsible for training and development of not only Cambodian Mine Action Centre (hereinafter referred to as "CMAC") staff, but also to the Royal Government Forces (RGF), police, NGOs, etc. involved in mine action in Cambodia, widely used as a place for technical training for countries contaminated by landmines and UXO, and has provided technical guidance by inviting people involved in mine action in Colombia, Laos, Angola, and Iraq to Cambodia. The high technical level of mine action of CMAC is unparalleled globally, and the importance of trainings conducted in TIMA is high both in Cambodia and abroad. However, at present, the facilities are seriously deteriorated, and there is a lack of facilities and equipment that can provide appropriate training both on-site and online to participants from home and abroad.

In addition, CMAC has an Outreach Facility (hereinafter referred to as "OF") which disseminates the history of Cambodia from the civil war to its reconstruction & development including the role of mine action. The facility is not only important for promoting understanding of landmine problems to general visitors and students, but also for people involved in mine action domestically and abroad to recover from the civil war. It is expected to be a place to deepen the understanding of the history of mine action, but at present, the exhibition space has not been prepared to effectively display the exhibits, not sufficiently functioning the above purpose for visitors and others.

The Project for Construction of Training Complex and OF of Cambodian Mine Action Centre (hereinafter referred to as "the Project") promotes technical guidance to other landmine and UXO-contaminated countries through the new construction that will replace the dilapidated facilities of TIMA and OF, further widely disseminate the history and achievements of Cambodia's mine action both domestically and internationally. Since 1998, JICA has been promoting mine action in Cambodia through grant aid and technical cooperation focusing on provision of equipment to CMAC and continuously strengthening CMAC's organizational capacity. With over 20 years of support from Japan for mine action, CMAC has grown into one of the world's leading organizations in mine action. Based on the support from the GOJ so far, this project is one of the important steps for CMAC to further improve the quality of mine action in Cambodia and South-South cooperation with other landmine and UXO-contaminated countries.

## **1-2 Environmental and Social Considerations**

### **1-2-1 Environmental Impact Assessment (EIA)**

This project is likely to have minimal or no adverse impact on the environment or society as specified in the JICA Guidelines for Environmental and Social Consideration (April 2010), hence classified as Category C and there is no further environmental impact assessment necessary following JICA's regulation. However, what remains is for the Cambodian side to perform for the necessary environment-related permit application in accordance with the country's regulations.



The main legal requirements for EIA in Cambodia are Chapter III of the Law on Environmental Protection and Natural Resource Management (EPNRM) 1996 and EIA Sub-Decree on Environmental Impact Assessment 1999.

In addition, the Ministry of Environment (MOE) has issued Prakas No. 021 on February 3, 2020 on the classification of environmental impact assessment for development projects. Prakas No. 021 unprecedentedly aims to classify which project is subject to FEIA (Full Environment Impact Assessment), IEIA (Initial Environment Impact Assessment), or the new EPC (Environmental Protection Contract) based on the nature and scale of the project. This Prakas applies to all development projects including existing and ongoing projects of individual/private companies, joint ventures, public companies or government ministries.

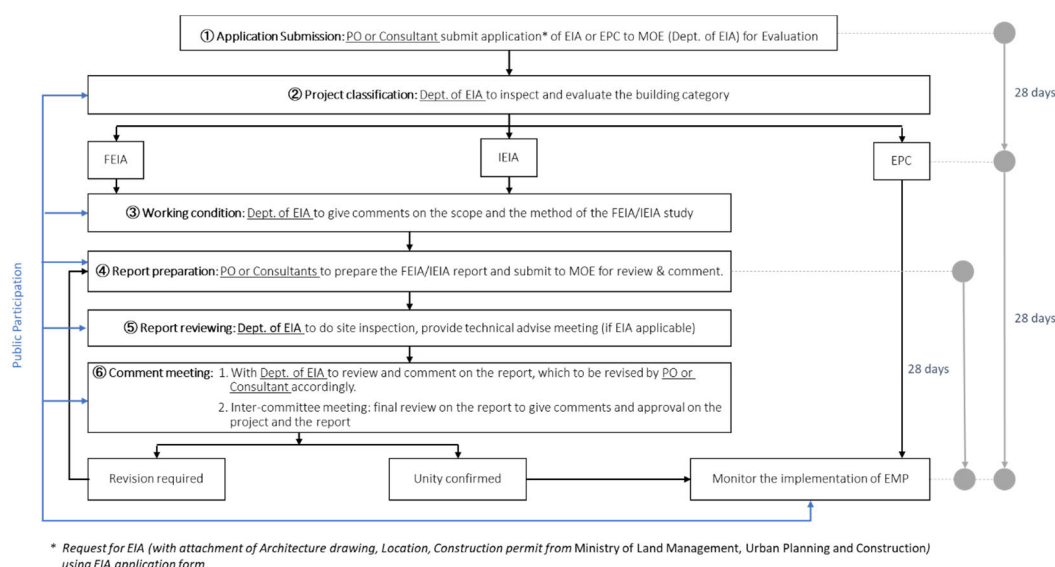
**Table 1-1 EIA Classification in Prakas No. 021**

Type of Project	FEIA	IEIA	EPC
Infrastructure Sector	Construction area more than 45,000 m <sup>2</sup>	Construction area between 15,000 m <sup>2</sup> to 45,000 m <sup>2</sup>	Construction area between 3,000 m <sup>2</sup> to 15,000 m <sup>2</sup>

Source: Department of Environment, Cambodia

### 1-2-2 EIA procedure flow in Cambodia

The EIA procedures according to the Department of Environment are shown below.



Source: Department of Environment, Cambodia

**Figure 1-1 EIA Procedure Flow**

During the survey related to EIA, the followings were confirmed.

- Obtained the evidence (Land Registration belonging to CMAC) for both sites (see Appendix 6).
- Resettlement (including irregular residents) and compensation for privately-owned buildings and crops were not required.
- Environment Protection Contract (EPC) is legally required for this project.

The EIA application process requires the submission of an application form, architectural drawings, site information, and a construction permit issued by the Ministry of Land Management, Urban Planning and Construction. Applications must be submitted before or during construction. The timeline shown in Figure 1-1 is best-case scenario. In the current situation affected by COVID-19 pandemic, it takes about 3 months to receive EPC approval from Ministry of Environment.

### 1-2-3 EPC costs required for this project (to be borne by the Cambodian side)

Following interviews with CMAC regarding the acquisition of EPC, it was confirmed that it would be difficult to do this on their own and that the support of an EIA consultant would be necessary. The variation of EIA consultancy costs is summarized in Table 1-2.

**Table 1-2 Cost Variation of EIA Consulting Service**

No	Name/ Company	Contact Info	Cost	Remarks
1	Ms. Morakat Sao Sambat	+855 12 488 378 (Mobile / Telegram)	\$16,200 incl. VAT \$17,820 (assumed)	Quotation has breakdown
2	PPIC	Mr. Sokky +855 99 331 494 (Telegram)	\$30,000 incl. VAT \$33,000 (assumed)	Received through Telegram app
3	Sustinat Green	Mr. Som Piseth, CEO +855 92 369 594 sompiseth@sustinatgreen.com	incl. VAT \$17,710	Quotation has breakdown
4	GIGB	info@gigbcambodia.com +855 23 500 32 46 +855 12 588 877	N/A	No response through phone nor email
5	SAWAC Consultant	+855 23 991 074 sawaccd@gmail.com Mr. Saroeum Uch +855 12 893 941 (Mobile/ Telegram)	\$28,000 incl. VAT \$30,800	No response through phone nor email, but received via Telegram app

Source: JICA Study Team

EPC Application Fee: The application fee for a total floor area of 3,000-15,000 m<sup>2</sup> is 5,000,000 Riel, which is about 1,250 USD (1USD = 4,000 Riel). (It is necessary to confirm individually before contracting whether this application fee is included in the EIA consultant fee.)

### 1-3 Points to Note in Implementing Grant Aid Projects in Recipient Countries

The following was confirmed in the survey related to environmental and social considerations.

- Land Registrations of both Project sites have been acquired (see Appendix 7-1 and 7-2).
- Resettlement, including unregistered residents, and compensation for privately-owned buildings and land are not required.
- It is legally required to obtain an Environment Protection Contract (EPC).

### 1-4 Others

The Project will expand the facilities of TIMA and OF, which hold the training function of CMAC. The Project aims to provide an adequate educational and training environment for personnel engaged in mine action in Cambodia and other countries, which will promote understanding and enlightenment regarding landmine issues among domestic and foreign visitors, thereby contributing to the promotion of landmine removal and UXO countermeasures in Cambodia and abroad. In addition to this grant aid project alone, CMAC will provide resources that will contribute to strengthening the capacity of the world's mine and UXO agencies after 2026 through the technical cooperation project "Project for Strengthening the Organization of the Cambodia Mine Action Centre." In order to maintain and strengthen the capacity of the institution, we expect cooperation with the technical cooperation project to produce highly satisfactory results.

## Chapter 2 Contents of the Project

### 2-1 Basic Concept of the Project

#### 2-1-1 Objective of the Project

One of the overall objectives of the Project is to complete the removal of anti-personnel landmines in Cambodia by 2025, and to continue the removal of all landmines and UXO after that. In Kampong Chhnang and Siem Reap provinces, the Project will expand the facilities of TIMA and OF, which hold the training function of CMAC. The goal is to promote understanding and enlightenment regarding landmine issues, and thereby contribute to the realization of a sustainable society through the promotion of mine action and countermeasures against UXO in Cambodia and abroad.

#### 2-1-2 Outline of the Project

In order to achieve the above objectives, the Project will provide training to the military, police, NGOs, etc. involved in mine action in Cambodia. The following facilities will be constructed and equipment will be procured in order to conduct trainings to provide knowledge on actions against landmines and UXO.

#### 1) Facility

**Table 2-1 List of TIMA's New Facility**

Building Name	Number of Building	Floor Number	Key Rooms	Floor Area (m <sup>2</sup> )
①Classrooms	1	2	10 Classrooms(30 seats/room)	1,196
②Conference Hall	1	1	Hall (300 seats), VIP Room, Restrooms	628
③Accommodation/Female	1	1	15 Bedrooms (6 beds/room), Lounge,	950
④Accommodation/Male	1	1	Laundry Room, Shower Room, Restrooms	950
⑤Canteen	1	1	Dining Space, Kitchen, Restrooms	411
⑥Restrooms for Classrooms	1	1	Restrooms	88
⑦Dynamo & Electrical Room	1	1	Dynamo and Electrical Room	44
Total				4,267

Source: JICA Study Team

**Table 2-2 Rooms List of Indoor Exhibition Facility**

Room Name	Area (m <sup>2</sup> )	Function
<b>GF</b>		
Exhibition room	1,814	The entire exhibition is divided into 8 sections *For details, see "Table 2-14 List of Exhibits" below.
Preparation room/ Backyard	102	Prepare works for the next special exhibition and replace or repair damaged exhibits in the permanent collection. Perform graphic repairs, etc. Also, store spare parts for exhibition-related items such as elevating vehicles and lighting fixtures.
Special Exhibition Room	120	It will function as a place for CMAC-related facilities, NPOs, etc. to present their activities, for artists to exhibit their works, and for the latest technology and information related to landmine clearance, etc. Exhibits will be changed several times a year to ensure repeat visitors and play a PR role.
Theatre Room	120	The exhibition will provide an overview of the historical background of Cambodia and CMAC's activities, such as landmine clearance, through a video (expected to be about 10 minutes). The exhibition will be a place where tourists and young people can easily understand the exhibits.

Room Name	Area (m <sup>2</sup> )	Function
Briefing Room	75	The space will be used as a place to hold lectures in advance and to store luggage when school classes come to the facility. It is also envisioned to be used as one of the space for facility-wide events.
Loading Entrance (Truck Yard)		Entrance/exit for bringing in large works and valuable exhibits. (Separate from visitor flow lines).
Corridors, Toilets, Machine room, etc.	378	
GF sub-total	2,590	
<b>1F</b>		
Conference hall	235	It will be a place to promote educational outreach activities by inviting domestic and foreign officials and others for training and lectures. The maximum seating capacity is 240 for training using desks.
Meeting room	110	Meeting space primarily for use by museum staff
Multipurpose room, Office	340	Used for multiple purposes, including preparation of materials and publicity materials. Administrative workspace for museum staff.
Storage	135	Mainly houses and stores documents and paper materials.
Corridors, Toilets, Machine room, etc.	378	
1F sub-total	1,198	
<b>Total</b>	<b>3,788</b>	

Source: JICA Study Team

## 2) Equipment

- TIMA facility: WEB meeting system, PA system (1 set), etc.
- OF facility: WEB meeting system, PA system (1 set), aerial work platform (1 set), exhibit display case (1 set), exhibit model (2 sets), etc.

## 2-2 Outline Design of the Japanese Assistance

### 2-2-1 Design Policy

#### (1) Design policy for the Facilities

##### 1) General

###### a) TIMA

- Efficient floor planning by focusing on the functions of training and accommodation, to secure maximum capacity.
- Well-designed layout with good connection to existing facilities for trainees and instructors.
- Efficient site and section planning regarding earthwork and drainage work considering the ground level difference and access from the western and existing internal roads.
- Well-insulated energy-and-cost saving building with natural lighting and natural ventilation, to keep an educational and living space comfortable.

###### b) OF

- The building is designed to blend with the surrounding landscape and its exterior shape to entice visitors into the museum.

- Since the exhibition area will be used by an unspecified number of visitors, it will be planned with Universal Design in mind, including floor and signage plans that are easy for anyone to understand.
- Building materials are to be locally sourced and the building is designed for easy maintenance and low running costs.
- The building is to be designed to minimize heat load in consideration of the local climate. The 1F is designed with natural lighting and ventilation.

## **2) Basic Policies for building capacity**

### **a) TIMA**

- Selection of function, grouping of facility, and efficient building design are required to secure the necessary scale and volume of facilities that meet CMAC's requirements within the limited project budget. In a functional aspect, minimized new construction plan are proposed to CMAC with the possibility of renovation work for existing classrooms, which are currently used as accommodation. After reviewing the detailed requirements, setting priorities, discussing with CMAC about the use and capacity of each facility, compact yet functional classrooms and accommodation can be achieved.

### **b) OF**

- The café and store, which were originally intended as part of the indoor exhibition facility, will be removed from the plans for this facility because CMAC has decided to renovate and improve the existing facility.
- The indoor exhibition facility will include a conference (training) hall in addition to the exhibition rooms and administrative offices and will be located on the 1F of the building (the exhibition rooms will be on the GF).

## **3) Basic Policies for room layout planning**

### **a) TIMA**

- The layout of facility put ground level difference, site planar shape, access to roads, and connection with existing facilities into consideration.
- By planning a new entrance and access road to the site's zoning, the zoning area become clearer, and security is improved with a separate traffic flow.
- Layout of classrooms and accommodation rooms facing east-west reduces the impact of direct sunlight.
- Open corridors in the Classroom Building and Accommodations are useful for daylight and natural ventilation.
- Future equipment upgrade is considered for the Dynamo & Electrical Room.

### **b) OF**

- By locating the various exhibition rooms on the GF and storage, administrative office, training rooms on the 1F, zoning will be clearly separated for general visitors and CMAC staff with doors at the boundaries to prevent general visitors from entering,
- In order to clarify the flow, exhibit rooms should be planned with a single stroke line of flow.
- The rest area is to be located in the middle of the total length due to the long length of the exhibition walls.
- Two emergency evacuation flow lines are to be located through the back yard to the outside.

- The loading entrance should be located for direct vehicular access from the southwest side road, and the floor plan should be such that loads can be carried directly to the preparation room and back yard.
- Two backyards will be provided for maintenance of the building and exhibits, as well as for storage of exhibits and equipment.
- Two toilets will be provided on the GF and one on the 1F, and multipurpose toilets will be provided in all locations to accommodate a variety of visitors.
- The stairs to the 1F will be provided in two locations to allow for two-directional evacuation in the event of an emergency.

#### **4) Basic policies for elevation and sectional planning**

##### **a) TIMA**

- Big eaves on the south side and a part of the north side will decrease solar radiation and keep indoor comfort, while serving as a roof that allows for a natural ventilation even during rain.
- Roof material of Classroom Building is reinforced concrete slab with exterior insulation. An elevated water storage tank will be installed on this roof. Other than Dynamo & Electrical Room, the rest of the buildings are designed with sloped roofs with interior insulation to improve heat insulation capacities and noise barrier performance when it rains as well.
- As a flood countermeasure during rainy season, the GF level setting of all new facilities is 600 mm above the ground level. Considering Universal Design, a ramp is installed where there is level difference.

##### **b) OF**

- The GF level is set at 2 meters above the ground level, and a 50-meter-long approach walkway is planned from the parking lot level to the OF (5% slope), in accordance with CMAC's strong request for visibility from a distance and respect for the facility's symbolic nature.
- The GF height is set as 7 m and the ceiling height 5 m in consideration of the exhibition plan. The 1FL is set as 5.1m in height to accommodate the functions of the OF's administrative offices, storage, and training rooms, as well as the strong request from CMAC which values the significance of numbers in the local context.
- The elevation will follow the strong request from CMAC, with a mine-shaped cylindrical form on top of a square base.

#### **(2) Design policy for Structure**

- The building is planned to have sufficient durability and strength to maintain its functions against natural disasters such as wind and rain. As the OF is built on weak ground, pile foundations should be used after careful consideration of construction period, cost, and building safety.

#### **(3) Design policy for Mechanical and Electrical**

- Design for safety, reliability, maintainability, and economical installation of energy-efficient equipment, and install products that are easy to operate. In addition, the design will be consistent and uniform to ensure that equipment can be easily maintained, visitors, trainees, trainers, and staff are comfortable, and the type and quality of equipment and systems are standardized. Furthermore, the design documents will be easy to tender, and the design will be economical in construction and operation.

## **1) Mechanical system**

- Based on the site survey results and the site layout, specific mechanical system will be planned to satisfy the mechanical system and equipment required for the TIMA and OF.
- As there is no public water main in the OF, well water is lifted up from newly drilled wells, then filtered by sand filtration equipment, and used to water closets, urinals, and hand washes. The public main water at the front of TIMA will be connected with incoming pipe to TIMA and water will be supplied to each building.
- There is an open culvert along the perimeter of OF, to which wastewater from the buildings will be discharged into. Since the discharge from the open culvert is likely to flow to Lake Tonlé Sap, wastewater treatment facility to purify the sewage and wastewater will be installed. In addition, the septic tank in TIMA will be a combination of a septic tank with infiltration tank, as in the existing building.
- In Cambodia, there are no laws and regulations on fire fighting and disaster prevention equipment like the Fire Service Law in Japan. Therefore, necessary fire extinguishing equipment should be selected and determined through the consent of the local fire department in charge of the Project.
- The OF will be equipped with air conditioning, taking into consideration the number of visitors. As there is a lot of agricultural land and vacant lot in the vicinity of OF, dust and sand enter the building as can be seen in the existing building. In order to maintain a good indoor environment for trainees, trainers, and staff, TIMA will have air conditioning in Classrooms and Conference Halls.
- Ventilation system will be provided in the Restrooms, Storage Rooms, and Kitchens of the OF and TIMA.
- Applicable Codes and Standards: Japanese Industrial Standards (JIS) Japan, Japan Fire Service Act (FSA)

## **2) Electrical system**

- Based on the site survey results and the site layout, specific electrical systems will be planned to satisfy the electrical requirements for TIMA and Outreach Facilities. TIMA will have High-Tension Power from Power Transmission Line running along the road facing the Project Site, and Low-Voltage Power will receive from Transformer provided in the Site. In addition, one set of Emergency Generator System will be provided for each facility.
- For communication line, an underground pipe will be provided in the site for CMAC to connect Dedicated Line and Internet Line to the Site.
- Applicable Codes and Standards: International Electrical Code (IEC), Japanese Industrial Standards (JIS), Japan Fire Service Act (FSA)
- Generator yard will be planned as an outdoor infrastructure.

## **(4) Design Policy for Exhibition (OF)**

### **1) The plan must integrate sufficient safety measures**

- For the installation of fixtures, measures must be planned to fasten them to the floor and walls and support them from the ceiling so that they will not fall over or otherwise move in any unintended manner. In addition, to prevent any theft of articles on display, install boundaries and covers.
- Make sure that the floor will be free of any uneven surfaces or other obstacles to provide universal access. Also, set up rest areas. Make sure that the entire exhibition rooms will have enough light throughout (not too dark for people to watch their steps).

**2) The plan must be considerate of the museum's operation after its opening**

- Select materials that can be procured locally with ease and adopt such specifications that will allow for continuous exhibition switching. As for the video software, also consider adopting such specifications that will allow CMAC to implement updates on their own with ease.

**3) Design spaces that utilize the building's architecture**

- Create impressive exhibition spaces that take full advantage of the positive features of the museum's architecture, including its 7m story height, void with approximately 14m diameter and overall building design that is congruous with the surrounding outdoor areas.

**(5) Design policy for Equipment**

**1) TIMA**

- The equipment necessary for online training (attend & provide) will be selected.
- The equipment suitable for training of GIS software will be selected.
- The equipment necessary for preparation of training material will be selected.
- The specifications of the model available in local market will be prioritized to facilitate the maintenance.
- To reduce maintenance cost, the laser projector with lamp that has long life will be selected.
- Based on current IT network of CMAC, the server to archive the training material is installed in HQ, where TIMA accesses remotely. (The cost for access and the related device (if any), is to be borne by CMAC.).
- Repair will be outsourced. The equipment which needs frequent part replacement will not be included. Therefore, the spare parts will not be provided.
- The consumables necessary for initial operation will be provided (toner).

**2) OF**

- The equipment necessary for online training (attend & provide) will be selected.
- The equipment will be selected based on the management and operation structure expected at the time of completion of works.
- The specifications of the model available in local market will be prioritized to facilitate the maintenance.
- To reduce the maintenance cost, the laser projector with lamp that has long life will be selected.
- Regarding the projector used in the exhibition, DLP that has unnoticeable pixels will be selected; it is widely used in museums in Japan.
- To avoid troubles caused by network instability, the electronic equipment in the exhibition area will be designed as a stand-alone.
- Exhibition contents such as video, programming, graphic panel, a part of model/diorama will be borne by CMAC.
- Based on current IT network of CMAC, the server to archive the training material is installed in HQ, where OF accesses remotely. (The cost for access and the related device (if any), is to be borne by CMAC).
- Repair will be outsourced. The equipment which needs frequent part replacement will not be included. Therefore, the spare parts will not be provided.
- The consumables necessary for initial operation will be provided (toner).



### **3) Procurement circumstances and policy on local company**

- There are local companies or agents which deal the equipment related to IT, office, and maintenance machine, although they are not made locally. Local procurement has advantage in terms of after-sales services and price. Therefore, plan local procurement.
- PA system is not familiar to the local companies; therefore, plan procurement in Japan.
- Local procurement of the showcases for OF was initially planned. However, the quality is uncertain, or only the wooden made (not steel) is available even though they have good quality. For this reason, plan procurement in Japan or third countries.
- Regarding the touch panel or display monitor, although those with a large screen are available in local market for signage use, those with a small screen will be difficult to be purchased locally. Therefore, local procurement as well as procurement from Japan are planned.
- Local IT companies do not have experience in DLP projector which is used for exhibition. Therefore, plan procurement in Japan.
- The models for exhibition are planned to be procured in Japan for quality assurance.

### **4) Policy on the grade of equipment**

- The equipment for TIMA is composed of general apparatus used for training, preparation and archiving of training material, and equipment for online training, ArcGIS course which will be newly introduced. The equipment will help to improve the educational environment for the people engaged in mine action in Cambodia and other countries. Most of the equipment for TIMA is of standard grade and available in local market.
- The equipment for OF is composed of general apparatus to be used for training, management and exhibition. The grade of the equipment for training and management is standard, the same as TIMA. However, the level of the equipment for exhibition is planned to be the same as that for the museums in Japan in order to attract national or international visitors.

### **(6) Design policy for gender and Universal Design**

- At TIMA, the dormitory will be separated into male and female buildings with design consideration given to the safety of women. Moreover, as the facilities to be constructed at both sites will be used by many trainees and visitors from Japan and overseas, wheelchair-accessible restrooms will be installed, and the GF will be directly accessible by a slope. In addition, OF used by many visitors will have elevator access from the GF to the 1F.

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

### **(1) Basic plan for facility**

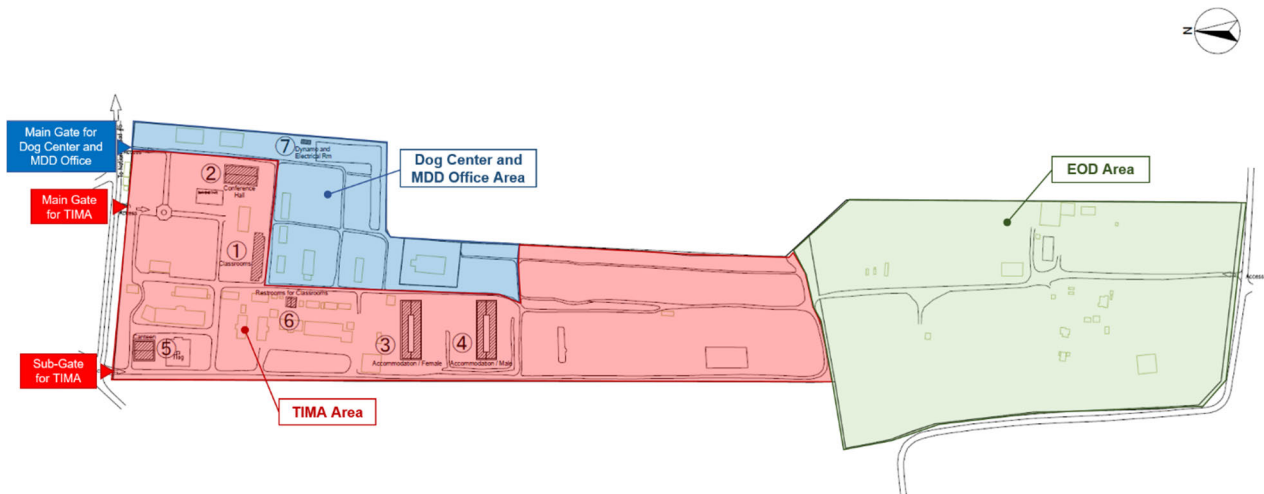
#### **1) TIMA**

##### **a) Project site**

TIMA is an educational training institute composed from many dispersed buildings. More than 60 buildings varied greatly in size currently exist on the entire site. The existing premise is a double-fronted lot, facing to public roads on the north and on the south. The site is a rectangular shape about 1,250m by 300m, long and slender in the north-south direction. There are entrance gates on the north side and an internal road is crossing whole TIMA site from north to south. There is a gate on the south side as well, but it is not used as a gateway.

**b) Site layout plan: zoning plan**

CMAC has made a future plan to restructure TIMA’s zoning, clearly sectionalize the area of TIMA, DCC, and EOD. 3 entrance gates facing the northern road: one as TIMA’s main gate, one for DCC’s main gate and another one as a sub-gate for Canteen have been planned. The existing main access gate on the northwest will be used as the main entrance for this project, connecting Accommodations, Canteen and Classrooms for trainees, and existing facilities in TIMA.



Source: JICA Study Team

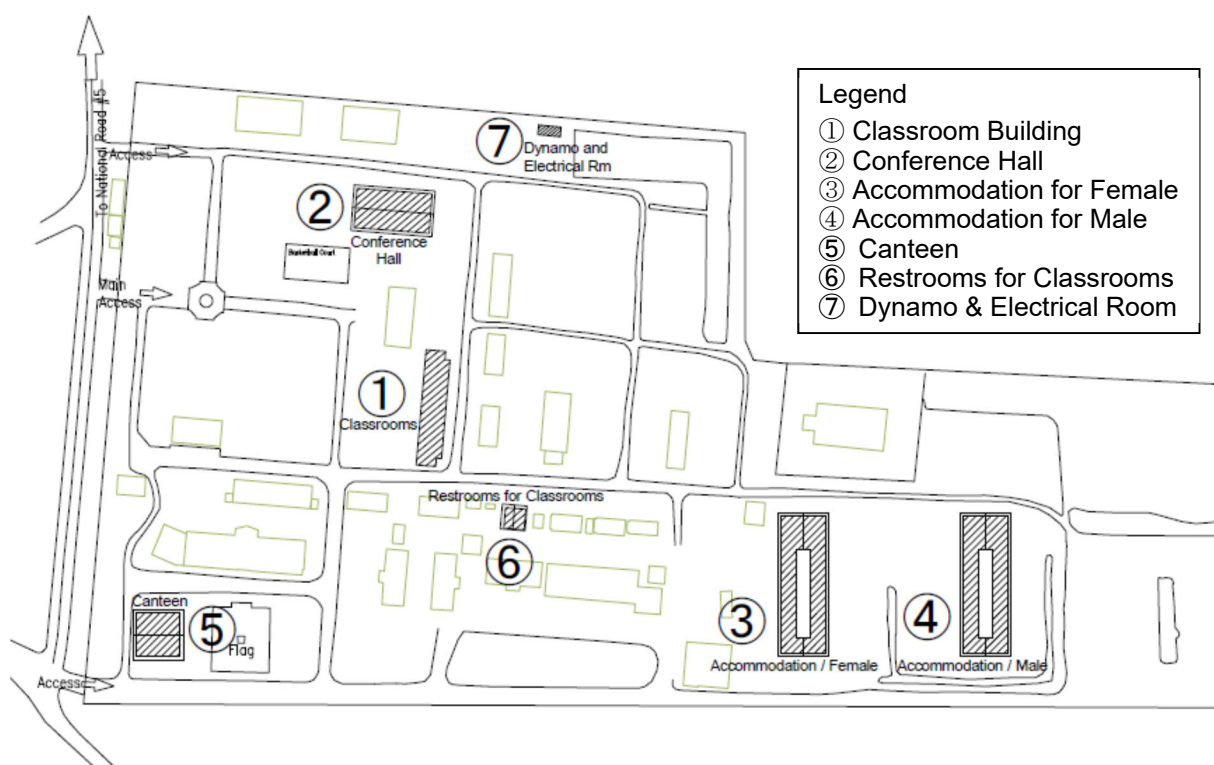
**Figure 2-1 TIMA Zoning Plan**

**c) Site layout plan: new facility’s location**

Initially, 14 new building design prioritized by CMAC had been started. However, as the said priority has been narrowed down following the range of accomplishable performance goals and objectives of the project, 7 facilities are to be constructed in this project.

Classroom Building, Conference Hall, Accommodation for Female, Accommodation for Male, Canteen and Restrooms for Classrooms are located at TIMA area (red area above), and Dynamo & Electrical Room is located at DC & MDD area (blue area above) close to the existing generator room.

The new facility’s layout is shown in the figure below:



Source: JICA Study Team

**Figure 2-2 TIMA New Facility's Layout Plan**

**d) Architectural planning**

The following is the design description for each facility.

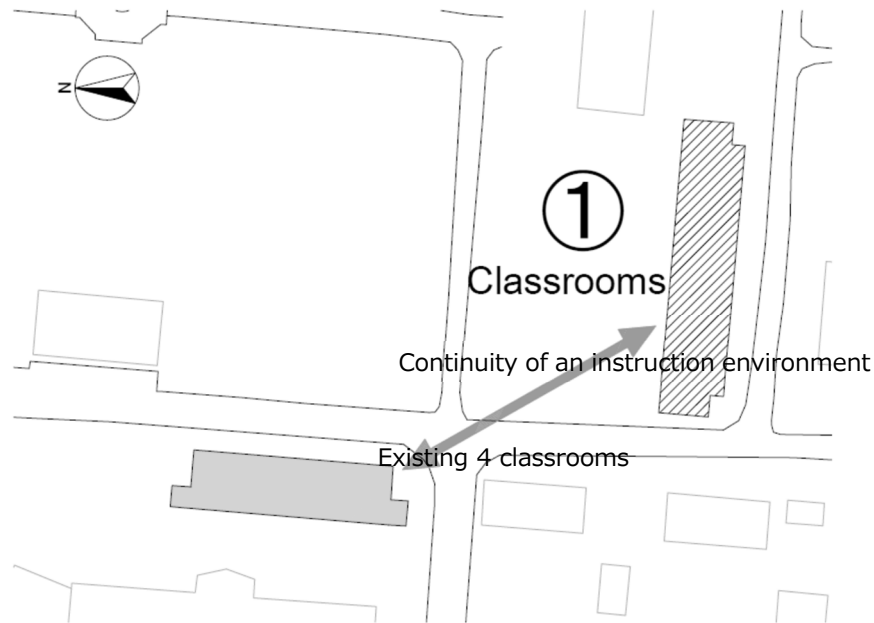
**Table 2-3 List of TIMA's New Facility**

Building Name	Number of Building	Floor Number	Key Rooms	Floor Area (m <sup>2</sup> )
①Classrooms	1	2	10 Classrooms(30 seats/room)	1,196
②Conference Hall	1	1	Hall (300 seats), VIP Room, Restrooms	628
③Accommodation/Female	1	1	15 Bedrooms (6 beds/room), Lounge,	950
④Accommodation/Male	1	1	Laundry Room, Shower Room, Restrooms	950
⑤Canteen	1	1	Dining Space, Kitchen, Restrooms	411
⑥Restrooms for Classrooms	1	1	Restrooms	88
⑦Dynamo & Electrical Room	1	1	Dynamo and Electrical Room	44
Total				4,267

Source: JICA Study Team

**1. Classroom Building**

A new classroom building is placed on the opposite side of an internal road of the existing classroom building, giving importance to functional continuity as a training facility. The room is the same size as the existing ones, 9.2 m × 9.2 m. While the existing classroom building elongates in north-south direction, the new classrooms are placed following an east-west axis, to reduce the impact of direct sunlight, while allowing daylighting and natural ventilation. One classroom can accommodate up to 30 people. The building has 5 classrooms per floor, totalling to 10 classrooms for the two-story building, as the surrounding area already has many existing buildings.

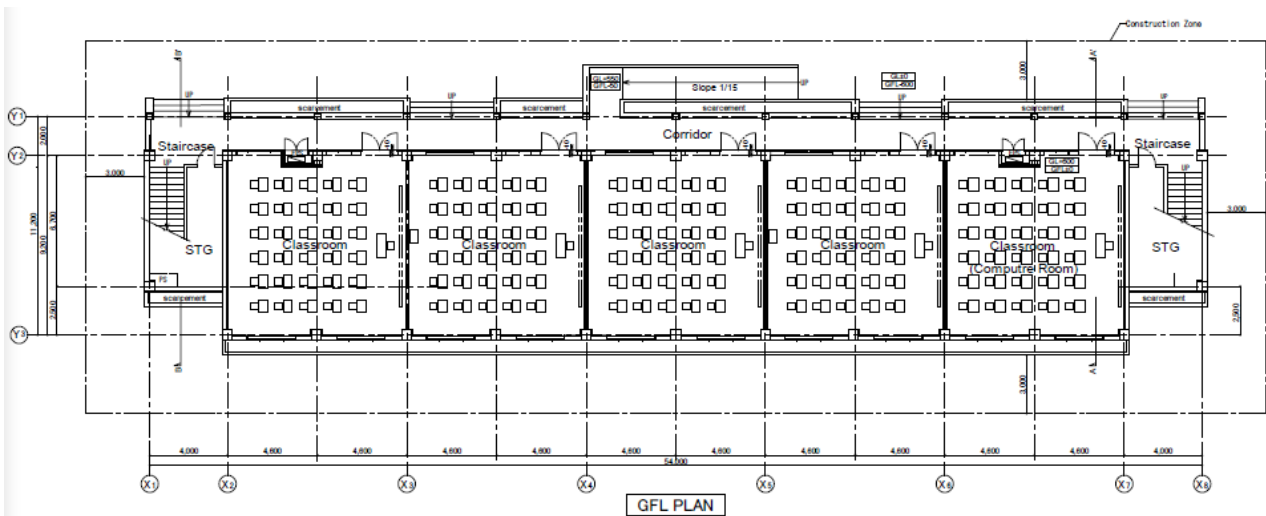


Source: JICA Study Team

**Figure 2-3 Classroom Building Layout Plan**

One of the 10 classrooms is used as a computer room with dedicated desks and chairs, equipment and raised floor.

A ramped entrance with preferred angle of 1/15 will be installed as an easy access to the GF for trainees with physical disability. The GF is 600 mm higher than the ground level for flood countermeasures and 4 stairs with handrails will be installed.



Source: JICA Study Team

**Figure 2-4 Classroom Building Ground Floor Plan**

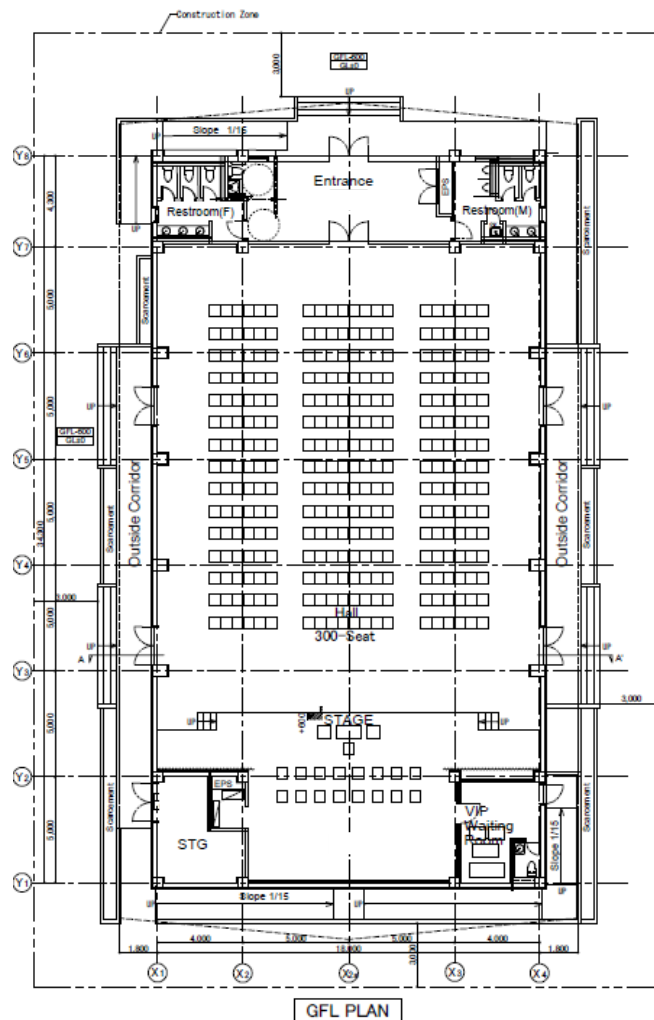
## 2. Conference Hall

As many as 300 trainees can be received in TIMA, but all trainees cannot gather under one roof due to the lack of venue designed for a large group, thus a convention facility having a capacity of 300 persons is planned. All chairs in the assembly hall are movable to various layout - school, theatre, U-shaped, hollow square-shaped, island, even face-to-face adjustable to fit gathering size and purpose, as needed. A VIP waiting room and restrooms are installed as well. In consideration of instructors and speakers with physical disability, a ramped access to the VIP waiting room is provided.

A small room with a view to the stage and hall has equipment to adjust sound and lighting is installed at the stage side. A storage that can keep about half of the foldable chairs can be accessed from outside corridor under the eaves.

The reason why size of building is larger compared to the initial design on Technical Notes is because while the building capacity is the same, the stage depth and the distance between the stage to the audience seat have been expanded to adjust to the local practice and standard of conference hall, following CMAC’s request.

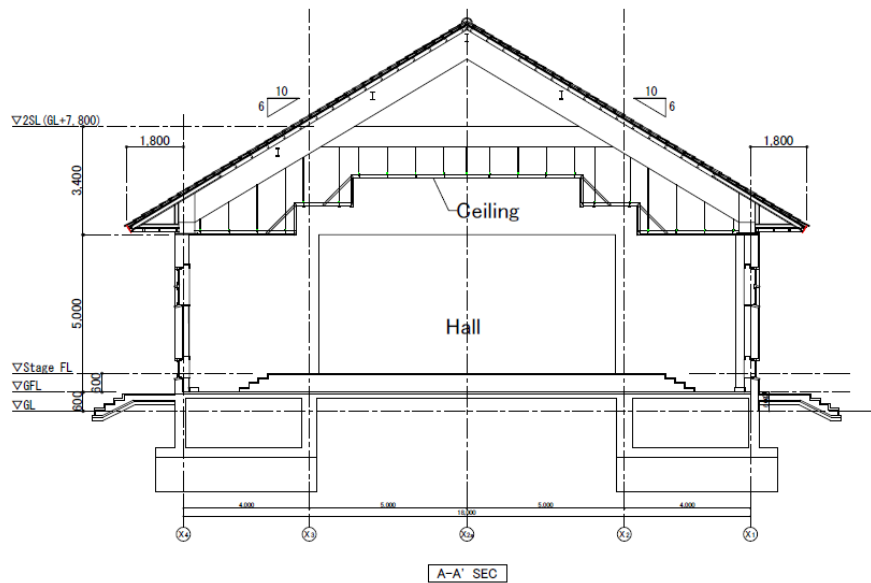
Regarding the Hall’s frequency of use, CMAC expects regular use for training as well as for project meeting, workshop, opening and closing, large lecture for public (medical awareness, HR policies), war history, movies of war and post clearance development, public audience, visits from high school student and universities, etc.



Source: JICA Study Team

**Figure 2-5 Conference Hall Ground Floor Plan**

Sectional design of the hall adopts stepped-ceiling shape to honour the local tradition, in harmony with CMAC’s request.



Source: JICA Study Team

**Figure 2-6 Conference Hall Sectional Plan**

### 3. Accommodation for Female and 4. Accommodation for Male

For trainees, gender-based accommodation facilities are planned. The floor planning is about the same: a room of 7 m × 7 m that allows for six beds, with each building has 15 rooms and capacity for 90 people. The room next to the main entrance is designed as lounge for trainees during their free time. As a space for chatting, two communication spaces are installed near the main and the sub entrance. Laundry room, shower room and restroom are located around the east sub entrance. Two of the 15 bedrooms, 1 shower room and restroom all located nearby, can be accessed by wheelchair - barrier-free. Washing machines and dryer machines will be provided in the laundry room considering the many users at the same time.

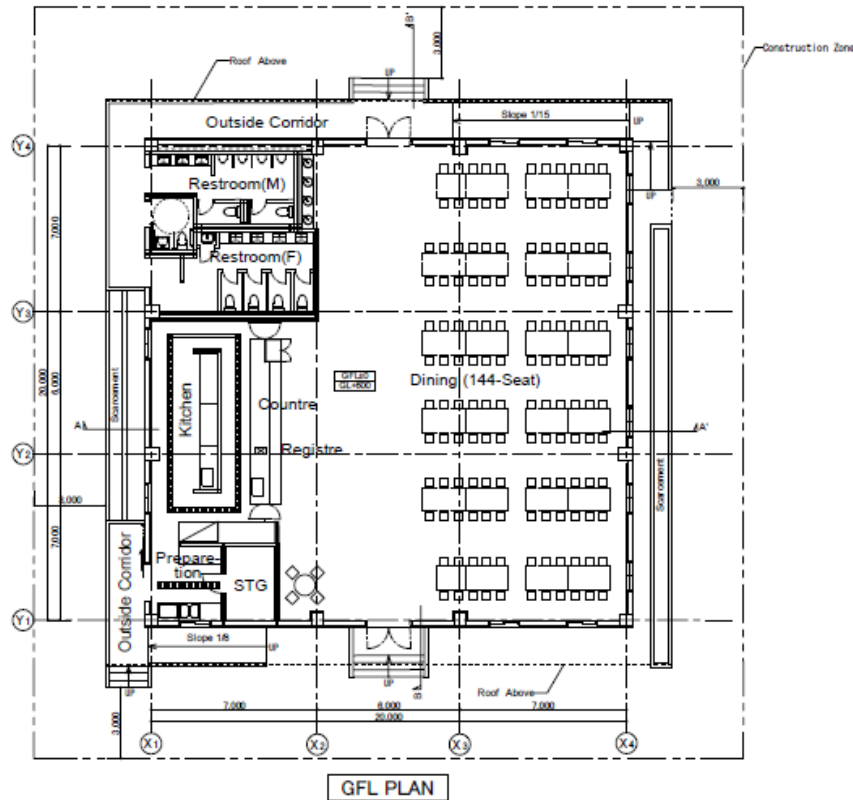


Source: JICA Study Team

**Figure 2-7 Accommodation for Male Ground Floor Plan**

## 5. Canteen

To be placed near the existing gate on the northwest, a canteen with 144-seats dining hall can be used in two shift system for about 300 trainees. Public guests can enter from the northern door near the gate, and trainees can mainly use the southern door near Classrooms and Accommodations. As an infection prevention, a hand-wash station will be installed near the entrance for public guests. A service entrance for food is placed facing an existing parking area with a slope for trolley.



Source: JICA Study Team

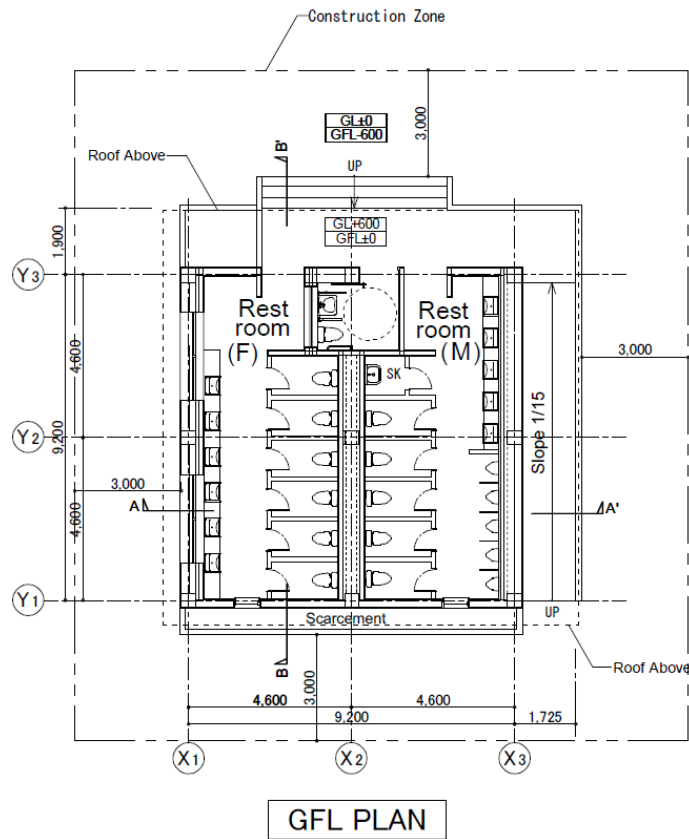
**Figure 2-8 Canteen Ground Floor Plan**

CMAC does not plan any outsourcing operation, hence guests will pay at a cash register at the counter.

## 6. Restrooms for Classrooms

Restrooms for Classrooms is a separate building from Classroom Building upon request from CMAC.

All new restrooms installed at TIMA adopt economical natural ventilation with high louvers. With due considerations to seniors and the people with disabilities, accessible restrooms with handrails are installed and an access way from outside corridor under the eaves is designed for weather protections.

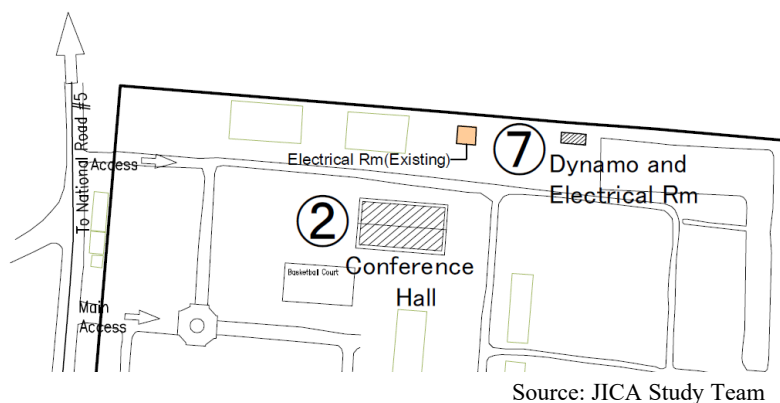


Source: JICA Study Team

**Figure 2-9 Restrooms Ground Floor Plan**

### 7. Dynamo & Electrical Room

To distribute electricity to the new facilities, an electrical room will be built where a distribution switchboard panel will be placed. A dynamo-electric generator for back-up is located next to the electrical room. This Dynamo & Electrical Room is located near the existing dynamo room, but its location would not be an obstacle for the future site plan.



**Figure 2-10 Dynamo & Electrical Room GF Plan**

#### e) Outdoor Planning

A range of 3 meters from each new building will be set as the construction site, and the exterior will be developed within that range.



## 2) OF

### a) Project site

The rectangular land is approximately 11.6 hectares in area, with the short side bordering the front road at approximately 145 m and the long side at approximately 800 m. While the existing Peace Museum (with the DU4 office of CMAC on the upper floor) is located on the front roadside (northwest side) of the site and the outdoor exhibition area is located behind it (southeast side), the remaining 70% of the land is a lower ground level and is currently used as rat training field and detection training field.

CMAC had already prepared its own overall layout plan and strongly requested that the proposed layout be followed. Therefore, the indoor exhibition facility planned for this project will be in this lower area.

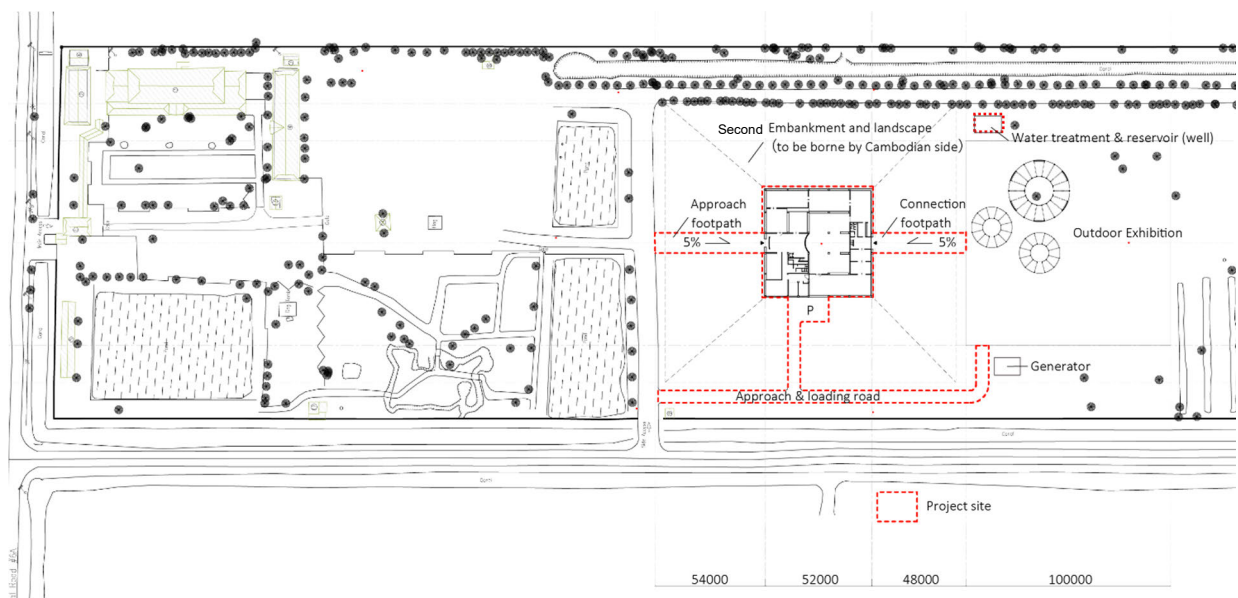
The construction of facilities in the low areas will be done after the G/A, after having appropriate first embankment work carried out at CMAC's expense. During the construction of the first embankment work by CMAC, supervision by a local civil engineer hired by the Japanese consultant is planned to be implemented.

### b) Site Layout Plan

On the GF of the indoor exhibition facility is the exhibition (museum) space. On the 1FL, various rooms mainly for training and administrative functions are located. This is planned to clearly separate the general visitors' area from the conference (training) and administrative areas.

On the southeast site behind the indoor exhibition facility, the outdoor exhibition space and experience area, which will be constructed by CMAC, will be located to allow a natural flow line from the indoor exhibition facility.

In the future, the experience area and other facilities will be expanded on the vacant southeast site.



Source: JICA Study Team

Figure 2-11 Site Layout Plan of OF

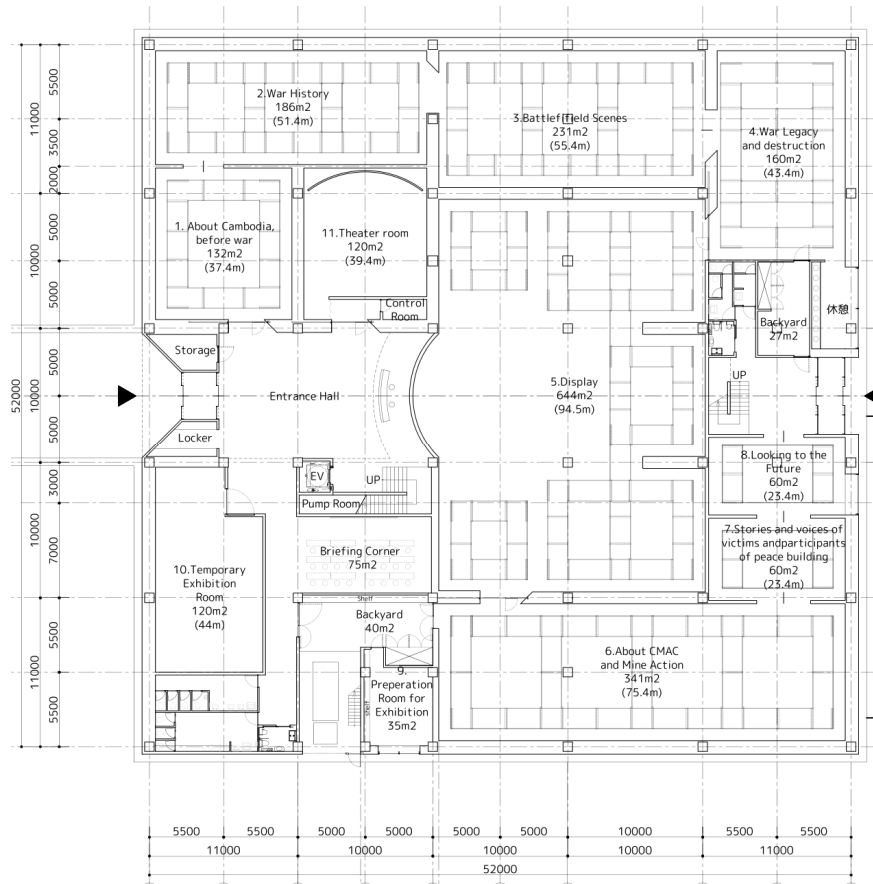
c) **Architectural Planning**

The rooms of the indoor exhibition facility are shown in the table below.

**Table 2-4 Rooms List of Indoor Exhibition Facility**

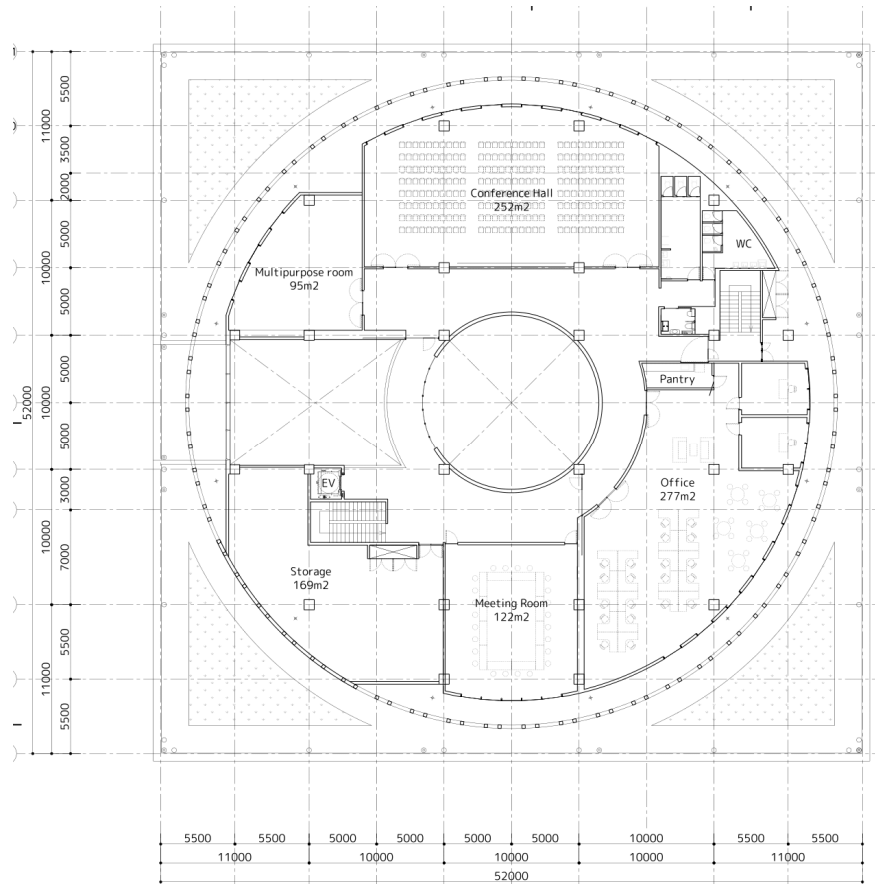
Room Name	Area (m <sup>2</sup> )	Function
<b>GF</b>		
Exhibition room	1,814	The entire exhibition is divided into 8 sections *For details, see "Table 2-14 List of Exhibits" below.
Preparation room/ Backyard	102	Prepare works for the next special exhibition and replace or repair damaged exhibits in the permanent collection. Perform graphic repairs, etc. Also, store spare parts for exhibition-related items such as elevating vehicles and lighting fixtures.
Special Exhibition Room	120	It will function as a place for CMAC-related facilities, NPOs, etc. to present their activities, for artists to exhibit their works, and for the latest technology and information related to landmine clearance, etc. Exhibits will be changed several times a year to ensure repeat visitors and play a PR role.
Theatre Room	120	The exhibition will provide an overview of the historical background of Cambodia and CMAC's activities, such as landmine clearance, through a video (expected to be about 10 minutes). The exhibition will be a place where tourists and young people can easily understand the exhibits.
Briefing Room	75	The space will be used as a place to hold lectures in advance and to store luggage when school classes come to the facility. It is also envisioned to be used as one of the space for facility-wide events.
Loading Entrance (Truck Yard)		Entrance/exit for bringing in large works and valuable exhibits. (Separate from visitor flow lines).
Corridors, Toilets, Machine room, etc.	378	
GF sub-total	2,590	
<b>1F</b>		
Conference hall	235	It will be a place to promote educational outreach activities by inviting domestic and foreign officials and others for training and lectures. The maximum seating capacity is 240 for training using desks.
Meeting room	110	Meeting space primarily for use by museum staff
Multipurpose room, Office	340	Used for multiple purposes, including preparation of materials and publicity materials. Administrative workspace for museum staff.
Storage	135	Mainly houses and stores documents and paper materials.
Corridors, Toilets, Machine room, etc.	378	
1F sub-total	1,198	
<b>Total</b>	<b>3,788</b>	

Source: JICA Study Team



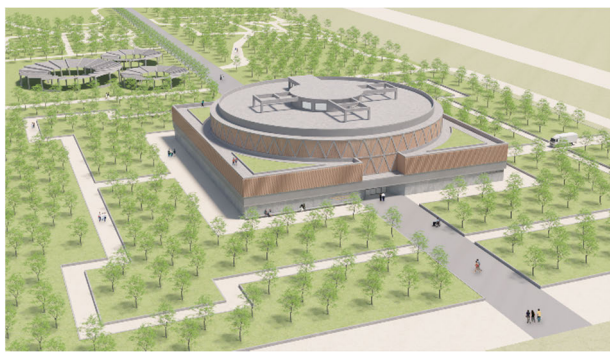
Source: JICA Study Team

**Figure 2-12 OF floor plan: indoor exhibition (GF)**



Source: JICA Study Team

**Figure 2-13 OF floor plan: indoor exhibition (1F)**



**Exterior image of the building**



**Interior image (Entrance Hall)**

Source: JICA Study Team

**Figure 2-14 3D Image of OF**

**d) Outdoor Planning**

The outdoor planning around the building includes the second embankment (soil provided by CMAC) that is from the GL level to the level near the first floor of the building, the approach walkway that accesses the building from the GL level, and the connection road from the building to the outdoor exhibition area. Sidewalks and service access roads used for carrying in luggage and maintenance of facilities and outdoor exhibition areas will be constructed. (See **Figure 2-11**)

Planting around the building and maintenance of walking paths, etc. will be carried out by CMAC.

## (2) Structural Planning

### 1) TIMA

#### a) Geology

The soil type is silty sand with crushed stone with N-value of 2 up to GL-1.5m, silty sand with gravel with N-value of 3 to 8 from GL-1.5m to -2.7m, clay with N-value of 8 to 12 from GL-2.7m to -6.8m, hard silt with N value of 32 to 59 from GL-6.8m to -10.0m, and hard clay and mudstone layers with N-values of 100 or higher are distributed at depths deeper than GL-10.0m. See Appendix 7-1: Boring Log (TIMA).

#### b) Construction method and materials used

Since the buildings of TIMA facilities are mainly one-story buildings, even the tallest buildings are two-story, the type of structure will be mainly reinforced concrete, which is common in the local area, with brick walls.

#### c) Structural design policy

As there are no specific structural safety standards in Cambodia, the AIJ (Architectural Institute of Japan) and JIS (Japanese Industrial Standards) are followed.

- Concrete Strength

Concrete slab on grade	21N/mm <sup>2</sup>
Foundation, columns, beams, slabs, staircase	24N/mm <sup>2</sup>
Brick	15N/mm <sup>2</sup>

- Reinforcing bar strength

D10~D16	SD295 (295N/mm <sup>2</sup> )
D19~D25	SD345 (345 N/mm <sup>2</sup> )
D29 or higher	SD390 (390N/mm <sup>2</sup> )

- Steel

Rolled materials, plates, cold-formed materials	SS400 (235N/mm <sup>2</sup> )
Steel pipe	STK400 (235N/mm <sup>2</sup> )
High strength bolt	M16 ~ M22 (F10T) 900N/mm <sup>2</sup>
Anchor bolt	Φ16 ~ 24 (SNR400B) 235N/mm <sup>2</sup>

- Material weight

Concrete	24kN/m <sup>3</sup>
Brick	18kN/m <sup>3</sup>
Steel frame	78.5kN/m <sup>3</sup>

- Dead load

Water proofing sheet	0.10kN/m <sup>2</sup>
Heat insulating material	0.05kN/m <sup>2</sup>
Purlin material	0.10kN/m <sup>2</sup>
Ceiling material	0.15kN/m <sup>2</sup>
Floor finishes	0.60kN/m <sup>2</sup>

- Live load for slab & beam, for framing, for earthquakes
 

Steel Roof	for slab & beams 950 kNm <sup>2</sup> , for framing 100 kNm <sup>2</sup> , for earthquakes 100 kNm <sup>2</sup>
RC Roof	for slab & beams 950 kNm <sup>2</sup> , for framing 650 kNm <sup>2</sup> , for earthquakes 300 kNm <sup>2</sup>
Classroom	for slab & beams 2300 kNm <sup>2</sup> , for framing 2100kNm <sup>2</sup> , for earthquakes 1100 kNm <sup>2</sup>
Office	for slab & beams 2900 kNm <sup>2</sup> , for framing 1800kNm <sup>2</sup> , for earthquakes 800 kNm <sup>2</sup>
Hall	for slab & beams 3500 kNm <sup>2</sup> , for framing 3200kNm <sup>2</sup> , for earthquakes 2100kNm <sup>2</sup>
Warehouse	for slab & beams 3900 kNm <sup>2</sup> , for framing 2900kNm <sup>2</sup> , for earthquakes 2000 kNm <sup>2</sup>
Dormitory	for slab & beams 1800 kNm <sup>2</sup> , for framing 1300kNm <sup>2</sup> , for earthquakes 600 kNm <sup>2</sup>
Machine room	for slab & beams 5000 kNm <sup>2</sup> , for framing 4000kN m <sup>2</sup> , for earthquakes 3000 kNm <sup>2</sup>

#### d) Structural type

The main structure is an RC rigid-frame structure, and both internal and external walls are planned in brick or concrete block masonry. The roof is planned to be steel framed as well as RC slab, depending on the type of building.

The existing ground level is generally gently sloping from south to north and from west to east, and the difference in elevation is approximately 4.5 m across the site, but the scale of the facility construction is small in relation to the site area, so there will be little impact at each proposed construction site. However, as the average ground level is 0.9m lower than the surrounding area where the male and female accommodation buildings are to be constructed, this area will require a 100m × 130m of embankment. This has been agreed as construction work to be borne by CMAC.

#### e) Planning of foundations

The result of the geological survey shows that the site is generally in good ground conditions where the required bearing capacity can be expected. The foundation type is based on solid foundations, with a plan to safely support the building using a combination of independent footing. Basically, the mat foundation is a double slab, and the foundation and the GFL are structural slabs.

**Table 2-5 Foundation of Each Building**

Building Name	Floor Number	Foundation Type	Support Layer GL-(m)	N Value	Design bearing capacity (kN/m <sup>2</sup> )	Underground Beam (m)
①Classrooms	2	solid	1.4	4	40	1,800
②Conference Hall	1	solid	2.0	6	60	2,400
③Accommodation/Female	1	solid	1.0	5	50	1,400
④Accommodation/Male	1	solid, independent foundation	1.0	10	100	1,400
⑤Canteen	1	solid	1.4	4	40	1,800
⑥Restrooms for Classrooms	1	solid	1.0	3	30	1,200
⑦Dynamo & Electrical Room	1	solid	0.8	3	30	1,200

Source: JICA Study Team

## f) Materials used

The concrete specification used for the structural frame is planned to have a compressive strength of 24 N/mm<sup>2</sup>, which is strong enough to cope on site. Rebar is planned to be made from deformed steel bars (equivalent to SD390) and round steel bars (equivalent to SR235), which are standard materials on site.

## 2) OF

### a) Geology

Soil type is clayey layer with sand with N-values of 6-10 up to GL-3.5m; clayey layer with N-values of 16-18 from GL-3.5m to -7.5m; sandy clay layer with N-values of 15-21 from GL-7.5m to -14.5m; and GL-14.5m to -17.0m is a clayey sand layer with N-values of 21 to 44, GL-17.0m to -25.0m is a hard clay layer with sand with N-values of 15 to 23, GL-25.0m to -31.5m is a hard sandy silt layer with N-values of 16 to 63 and the depth below GL-31.5m is hard clayey sand and sandy clay layers with N-values of 60 and above. The depth below GL-31.5m is covered by hard clayey sand and sandy clay layers with N-values of 60 and above. See Appendix 7-2: Boring Log (OF)

### b) Construction method and materials used

As the proposed building is a two-storey building (one storey in the tower), the type of construction shall be reinforced concrete, which is common in the area. As the building must be airtight, the perimeter and other walls are to be constructed of brickwork and light steel partitions. The roof will be RC with a flat roof and a pit in the basement for pipes. Some rooms are used for heavy objects such as exhibits, and sufficient floor slabs and beam rigidity are to be provided to prevent floor deformation and floor vibrations.

### c) Structural design policy

As there are no specific structural safety standards in Cambodia, the AIJ (Architectural Institute of Japan) and JIS (Japanese Industrial Standards) should be followed.

- Concrete Strength

Concrete slab on grade	21N/mm <sup>2</sup>
Foundation, columns, beams, slabs, staircase	30N/mm <sup>2</sup>
Brick	15N/mm <sup>2</sup>
- Reinforcing bar strength

D10~D16	SD295 (295N/mm <sup>2</sup> )
D19~D25	SD345 (345 N/mm <sup>2</sup> )
D29 or higher	SD390 (390N/mm <sup>2</sup> )
- Steel

Rolled materials, plates, cold-formed materials	SS400 (235N/mm <sup>2</sup> )
Steel pipe	STK400 (235N/mm <sup>2</sup> )
High strength bolt	M16 ~ M20 (F10T) 900N/mm <sup>2</sup>
Anchor bolt	Φ16~24 (SNR400B) 235N/mm <sup>2</sup>
- Material weight

Concrete	30kN/m <sup>3</sup>
Brick	18kN/m <sup>3</sup>
Steel frame	78.5kN/m <sup>3</sup>

- Dead load
 

Water proofing sheet	0.10kN/m <sup>2</sup>
Heat insulating material	0.05kN/m <sup>2</sup>
Purlin material	0.10kN/m <sup>2</sup>
Ceiling material	0.15kN/m <sup>2</sup>
Floor finishes	0.60kN/m <sup>2</sup>
- Live load
 

RC Roof	for slab & beams 950 kNm <sup>2</sup> , for framing 650 kNm <sup>2</sup> , for earthquakes 300 kNm <sup>2</sup>
Hall	for slab & beams 3500 kNm <sup>2</sup> , for framing 3200kNm <sup>2</sup> , for earthquakes 2100 kNm <sup>2</sup>
Machine room	for slab & beams 5000 kNm <sup>2</sup> , for framing 4000kNm <sup>2</sup> , for earthquakes 3000 kNm <sup>2</sup>

**d) Structural type.**

The main structure is a RC rigid-frame structure and the walls are planned in brickwork for both interior and exterior walls.

**e) Planning of foundations**

The result of the geological survey indicates that the Siem Reap site has a sandy clayey soil type, and the foundation type for the OF will be pile foundation.

**f) Materials used**

The indoor exhibition facility is raised by 2.0 m above the GF level as a symbol of the project. As the current ground level is 1.5m lower than the ground level, the plan is to reduce the amount of backfill as much as possible by making a total pit under the GF. The foundation types envisaged are columnar improvement piles, precast pile using the press-in method (PHC piles) and cast-in-place concrete piles. For precast piles, circular and round piles are available on site and can be procured locally. Columnar improvement piles and cast-in-place concrete piles will be procured from third countries. The best foundation construction method is selected based on economic comparisons and workability of each construction method. The concrete specification for the structural frame is 30 N/mm<sup>2</sup> of compressive strength, which is sufficient to be used locally. Standard local materials such as deformed steel bars (equivalent to SD390) and round steel bars (equivalent to SR235) are used for the steel bars.

**(3) Building Material Planning**

Finishing materials for each part of the building shall be selected in consideration of local climate, required functions, construction period, construction cost, and ease of maintenance.

**1) TIMA**

**a) Exterior Finishing Material**

The following table shows the plan for the main exterior finishing materials and the reasons for their selection.



**Table 2-6 Exterior Finish Materials and the Selection Reasons**

Part	Finishing Materials	Reasons for Selection
Roof	Sloped Concrete Roof: Modified Asphalt Sheet Waterproofing torch method, Concrete Over layer Steel Trowel t80 w/Steel Mesh 5φ150×150 Sloped Metal Roof: Hot-dip 55% aluminium-zinc alloy coated folded steel sheet t=0.6, Polyester Colour Factory Finish Tiled Roof: Local Roof Tile	Commonly used materials and methods, easy to procure, construct and maintain on site
Wall	Multi-layers Acrylic Wall Coating for Glossy Textured Finish	ditto
Doors and Windows	Anodic Oxidation Coatings on Aluminium	Commonly used materials on site, satisfactory in performance and durability

Source: JICA Study Team

**b) Interior Finishing Material**

The following table shows a plan for the main interior finishing materials and the reasons for the selection.

**Table 2-7 Interior Finish Materials and the Selection Reasons**

Room	Floor	Wall	Ceiling	Selection Reasons
Classrooms	Porcelain Tile 300 × 300 (nonslip)	Acrylic Resin Emulsion Paint	Decorated Rockwool Acoustic Board	Commonly used materials and methods, easy to procure, construct and maintain on site
Conference Hall	Porcelain Tile 600 × 600 (nonslip)	Perforated plaster Board	Perforated Plaster Board	Commonly used materials and methods, considering acoustic regarding wall and ceiling materials
Accommodation Room	Porcelain Tile 300 × 300 (nonslip)	Acrylic Resin Emulsion Paint	Decorated Rockwool Acoustic Board	Commonly used materials and methods, easy to procure, construct and maintain on site
Dining Hall	ditto	ditto	ditto	ditto
Restrooms	ditto	Ceramic Tile 200 × 400	Direct Roof Panel	ditto

Source: JICA Study Team

**2) OF****a) Exterior Finishing Materials**

The table below shows the plans for the main exterior finishing materials and the reasons for their selection.

**Table 2-8 Exterior finishing materials and the reasons for selection**

Part	Finishing Materials	Reasons for Selection
Roof	RC flat roof: Asphalt sheet waterproofing Adhesion method, heat insulator + protective concrete finish (partly rooftop greening)	For waterproofing, this method will be used because it is a common local material and construction method, easy to install and maintain.  The greening is to insulate the roof of the GF floor and to mitigate the rise in temperature on the 1F due to reflected heat. The greening is also intended to provide a good scenery from the office and training spaces on the 1F.
Wall	Patterned brick walls + mortar washout finish +	Minimize maintenance costs by avoiding painted finishes

Part	Finishing Materials	Reasons for Selection
	local stone (some borders finished with fair-faced concrete and coated with water repellent)	that need to be repainted every few years. Also, building maintenance will be facilitated by using materials and construction methods that are common in the area.
Door & Window	Steel doors, aluminium windows	Because the materials are commonly available locally and their performance and durability is generally good.

Source: JICA Study Team

## b) Interior Finishing Materials

The table below shows the main interior finishing materials and the reasons for their selection.

**Table 2-9 Interior finishing materials and the reasons for selection**

Room Name	Floor	Wall	Ceiling	Reasons for Selection
Exhibition room	Porcelain tile t18	Plywood t12*2+GB-Rt12.5+Putty treatment of cheesecloth +EP	Grid ceiling (lower end GFL+5000)	To make the exhibition wall flexible for all kinds of exhibitions
Entrance Hall	Porcelain tile t18	Fair-faced RC (column section), Fair-faced RC + EP, Brick + EP	Rock wool sound-absorbing board t9	Because the materials and construction methods are commonly available locally and are easy to install and maintain.
Briefing Rooms	Porcelain tile t18	Mortar trowel finish + EP	Plasterboard t9.5+ Rock wool sound-absorbing board t9	Ditto
Theatre Room	Carpet tile t8 (for heavy walking)	Mortar trowel finish + EP/Plywood t15 + glass wool board with glass cloth laminate t50 + Perforated fibre reinforced cement board t6+EP (black colour)	Plasterboard t9.5+ Rock wool sound-absorbing board t9 (black colour)	To be finished in consideration of visual and acoustic effects
Conference Room	terracotta tile t18	Mortar trowel finish + EP	System ceiling Rock wool sound-absorbing board	Because the materials and construction methods are commonly available locally and are easy to install and maintain.
Office	terracotta tile t18	Mortar trowel finish + EP	System ceiling Rock wool sound-absorbing board	ditto
Toilet	Porcelain tile t18	ceramic tile	Plasterboard t9.5+ calcium silicate board t6+EP	ditto

Source: JICA Study Team

## (4) MEP Planning

### 1) TIMA

#### a) Electrical Systems

##### [Power Receiving Equipment]

The expected electricity demand is calculated based on the load capacities in Table 2-10.

Therefore, transformer capacity is assumed to be 200 kVA.

Since the new buildings will require a new transformer (200 kVA), it will be installed (to be borne by CMAC) on a Power Pole in the northeast part of the building, after consultation with the power supply company. Stepped-down power line will be led-in at the new Electrical Room and supplied to each building through underground cables via low-voltage Power Distribution Board.

- Lead-in Voltage: 3 $\phi$ 4W, 400/230V, 50Hz

**Table 2-10 Electricity Demand List**

TIMA Buildings	Load Density (VA/m <sup>2</sup> )	Floor Area (m <sup>2</sup> )	Load Capacity (KVA)
Classrooms	60	1,196	75
Conference Hall	80	628	50
Accommodation for Female	30	950	35
Accommodation for Male	30	950	35
Canteen	120	411	50
Restroom for Classrooms		88	6
Demand Rate			60%
Total (Max. Electricity Demand)			151

Source: JICA Study Team

#### [Emergency Diesel Generator Set]

Emergency Diesel Generator will be provided as a backup power source in the event of power failure.

- Air-cooled Outdoor Packaged type
- Capacity: 3-Phase, 4-Wire, 400/230V 50Hz, 200KVA

#### [Low Voltage Power Supply Trunk Line]

- Main line cable sizes will be set to satisfy the appropriate voltage drop and allowable current according to the capacity of the equipment to be connected.

Power distribution system will be as follows.

- Power distribution/trunk line: 3 $\phi$ 4W, 400V/230V
- Single-phase load: 1 $\phi$ 2W, 230V
- Power load: 3 $\phi$ 3W, 400V

#### [Lighting and Receptacles]

Lighting fixtures will be planned mainly using LED lamps, taking maintenance, and running costs into consideration.

Illuminance standard (general illuminance) will be determined with reference to the average illuminance of International Standards and JIS Standards, and taking into account the current illuminance of the existing building.

Lighting switches are in each room, with separate flashing circuits to allow flashing in each necessary sub-compartment. Exit lights will be provided in evacuation routes and at Entrances and Exits. Receptacles and Sockets will be provided where necessary.

**Table 2-11 Lighting Level Design Criteria**

<b>Class Rms, Offices, Admin.Rms, Staff Rms.</b>	500lux
<b>Conference Hall</b>	500lux
<b>Accommodation</b>	500lux
<b>Canteen</b>	500lux
<b>Corridor, Stairs</b>	200lux
<b>Toilets, Storage</b>	150lux
<b>Mech. And Elec Rms</b>	150lux

Source: JICA Study Team

**[Telephone and Telecommunication]**

Empty pipes and conduit will be laid in each building to allow for telephone and telecommunications wiring. Telephone system in the buildings is to be borne by CMAC.

**[LAN (Local Area Network)]**

Telecommunication will use the existing Internet network. Wired LAN will be provided in Classrooms and Conference Halls only.

The supply of servers, modems, and firewalls is not included in this project.

**[Fire Detection and Alarm]**

Automatic Fire Alarm and Detection System will be installed for early detection, notification and evacuation of fires.

Since Cambodia's own Fire Protection Standards for buildings have not yet been developed, Fire Detection and Alarm System will be referred to and comply with Japan's Fire Service Law.

**b) Mechanical System**

**[Water Supply System]**

In the north area of TIMA (TIMA Area, Dog Centre and MDD Office Area), a City Water Main is accessible from the front road of TIMA. CMAC and the water supply company already discussed, and the water will be branched into TIMA using 50 mm pipe from the northwest of the TIMA Site. The estimated daily water consumption of the TIMA will be expected to 24.2 m<sup>3</sup>/day.

For the water supply system, an Elevated Water Tank will be installed on the roof of the building to keep the water pressure constant by gravity. The capacity of the Water Reservoir Tank will be sufficient for the daily water consumption of the TIMA, and Elevated Water Tank will be capable of supplying water for 2 to 3 hours of the maximum instantaneous hourly water supply rate.

**[Sewage and Wastewater Drainage System]**

Restroom for each building constructed in TIMA will have a septic tank and a sedimentation tank near the building to treat sewage and miscellaneous wastewater for underground seepage treatment. In this project, sewage and miscellaneous wastewater in the new building will be combined, and piping and Sewage Catch Basin will be installed to the septic tank with sedimentation tank provided outside the building.

**[Plumbing Fixtures]**

Plumbing fixtures will be provided in the Toilets, Shower Rooms, Laundry Rooms, and Kitchens in the TIMA. In addition, water faucets (with faucet posts) for cleaning will be provided near Water Reservoir Tank and Septic Tank.

## [Fire Fighting System]

In Cambodia, there is no law on fire fighting and disaster prevention equipment like Fire Service Law in Japan. Therefore, necessary firefighting system and equipment will be selected and determined through the consent of the local fire department in charge of the project.

## c) Air Conditioning and Ventilation System

### [Air Conditioning System]

Since the climate in Cambodia is warm throughout the year, Air Conditioner will be provided in the Classroom Building where students work for long hours, and in Conference Hall which is used for meetings and ceremonies. In other rooms, cycle fans (ceiling fans), which are also used in the existing buildings, will be provided.

Air-Cooled Heat Pump Type Packaged Air Conditioner will be provided, taking into consideration the time usage zone and air conditioning heat load. In addition, considering the ideas and requests of CMAC, an indoor unit of Ceiling-Mounted Cassette Type (4-Way Blowout Type) will be provided for the indoor units in the classrooms, and an indoor unit of Ceiling Concealed Duct Type will be provided in the Conference Hall to enhance the design. VIP waiting room in conference building will be provided with indoor unit of Wall Mounted Type.

### [Ventilation System]

The appropriate ventilation system will be planned considering the applications and characteristics of the building and its various rooms. Ventilation Air Change Rate will be as follows:

**Table 2-12 Design Criteria for Ventilation**

Room	Type	Air Change	Note
<b>Classroom Building</b>			
Storage	Mechanical, Exhaust Fans	5 times/hour	For air exchange
<b>Conference Hall Building</b>			
Multi-purpose toilet, VIP toilet	Mechanical, Exhaust Fans	10 times/hour	To remove odours (men's and women's restrooms are naturally ventilated)
<b>Female Accommodation</b>			
Shower Room	Mechanical, Exhaust Fans	5 times/hour	For dehumidification
Laundry Room	Mechanical, Exhaust Fans	5 times/hour	Moisture and hot air removal from dryers
Storage	Mechanical, Exhaust Fans	5 times/hour	For air exchange
<b>Male Accommodation</b>			
Shower Room	Mechanical, Exhaust Fans	5 times/hour	For dehumidification
Laundry Room	Mechanical, Exhaust Fans	5 times/hour	Moisture and hot air removal from dryers
Storage	Mechanical, Exhaust Fans	5 times/hour	For air exchange
<b>Canteen</b>			
Kitchen	Mechanical, Exhaust Fans	40 times/hour	Emitted gas and moisture removal
Pantry	Mechanical, Exhaust Fans	5 times/hour	For dehumidification
Male Toilet, Female Toilet, Multi-Purpose Toilet	Mechanical, Exhaust Fans	10 times/hour	To remove odours
<b>Restrooms for Classroom</b>			
Multi-purpose toilet	Mechanical, Exhaust Fans	10 times/hour	To remove odours (men's and women's restrooms are naturally ventilated)
<b>Dynamo and Electrical Room</b>			
Dynamo Room	Natural Ventilation		
Electrical Room	Natural Ventilation		

Source: Building Mechanical System Design Standards, Ministry of Land, Infrastructure, Transport and Tourism, Japan

## 2) OF

### a) Electrical Systems

#### [Substation System]

Assumed load capacity will be calculated according to Table 2-10 with a transformer capacity of 300 kVA.

A new 300 kVA transformer will be installed (to be borne by CMAC) and Power Lead-In Board will be provided in the Electrical Room of the OF.

Power led in will be distributed from the Distribution Board to Power Control Board and Lighting Board and will be supplied to each fixtures (lighting fixtures, power receptacles, etc.).

- Lead-In Power: 3φ4 W, 400/230V 50 Hz

**Table 2-13 Assumed Power Load Capacity**

Load	Load Density (VA/m <sup>2</sup> )	Floor Area (m <sup>2</sup> )	Load Capacity (KVA)
Lighting and Receptacles	40	3,790	150
AC Equipment	50	3,790	200
Plumbing Equipment	-	-	10
Demand Factor			70%
Total (Max. Electricity Demand)			252

Source: JICA Study Team

#### [Emergency Diesel Generator Set]

As a result of discussions with the local fire department regarding the size and structure of the OF, Indoor Fire Hydrant System was requested, and therefore will be provided.

Emergency Diesel Generator Set will be provided as a back-up power for the Indoor Hydrant Pumps and in the event of power failure.

- Type: Air-cooled, Outdoor-Mounted Package Type
- Capacity: 3-Phase, 4-Wire, 400/230V 50Hz, 250KVA

#### [Lighting and Receptacles]

Lighting fixtures will be planned mainly using LED lamps, taking maintenance and running costs into consideration.

Illuminance standard (general illuminance) will be determined with reference to the average illuminance of International Standards and JIS Standards, and also taking into account the current illuminance of the existing building.

Lighting switches are in each room, with separate flashing circuits to allow flashing in each necessary sub-compartment. Exit lights will be provided in evacuation routes and at Entrances and Exits. Receptacles and Sockets will be provided where necessary.

**Table 2-14 Lighting Level Design Criteria**

Training Rms, Offices, Admin.Rms, Staff Rms.	500lux
Conference Rms.	500lux
Corridor, Stairs	200lux
Toilets, Storage	150lux
Mech. And Elec Rms	150lux

Source: JICA Study Team

### **[Telephone and Telecommunication]**

Telephone lines will be provided into the building and therefore, only empty Pipes and or Conduit will be provided to allow wiring to each room.

Telephone system and equipment is not included in this project.

### **[LAN (Local Area Network)]**

Empty pipes will be laid in planned buildings and facility to allow optical cable installation for LAN.

Access point for Wi-Fi connection for visitors will be provided.

Servers, modems, and firewalls are not included in this project.

### **[Public Address System]**

Amplifier for both emergency and normal operations will be provided in office on the 1F, and loudspeakers will be installed in all necessary locations.

### **[CCTV System]**

To monitor the situation in the museum, surveillance CCTV cameras will be provided in the exhibition rooms, corridors and entrance. The CCTV System will have a monitoring system to with displays to be installed in the office on 1F.

### **[Fire Detection and Alarm]**

Automatic fire alarm and detection system will be planned for early detection, notification, and evacuation of fires.

Since Cambodia's own Fire Protection Standards for buildings have not yet been developed, Fire Detection and Alarm System will be referred to and comply with Japan's Fire Service Law.

### **[Lightning Protection System.]**

In accordance with Lightning Protection Standards, buildings are to be provided with lightning protection system with lightning rods and grounding conductor.

In addition, SPDs (Surge Protective Device) will be provided in each Electrical Panel and Boards to protect induced lightning surge via AC power supply, and to avoid damage to computers and other electronic equipment.

## **b) Mechanical system**

### **[Water Supply System]**

Not only there is no water main on the road in front of the OF nor on the side road, but also there is no plans to provide them. Therefore, two wells have been bored at the OF site to lift-up well water which will be filtered by sand filtration equipment and supplied to the buildings within OF as water for water closets, urinals and hand wash.

Daily water consumption of OF is estimated as 11.2 m<sup>3</sup>/day.

Lifted well water will be stored in a raw water tank. The stored well water is filtered by sand filtration equipment and chlorine sterilization, and stored in a Reservoir Tank, and the pressurized by Hydro-Pneumatic Water Supply Unit to supply water to Toilets and other facilities in OF.

Hydro-Pneumatic Water Supply System will be used for the domestic water supply system. The method is advantageous in terms of building structure and equipment maintenance (fewer cleanings) because there is no need to provide Elevated Water Tank on the roof. The disadvantage is that water cannot be supplied if the hydro-Pneumatic Water Supply Unit is out of order.

### **[Sewage and Wastewater Drainage System]**

OF is not served with a public sewer system, therefore an independent septic tank will be provided.

Sewage and wastewater from the building will be combined inside the building to discharge, and piping and catch basins will be installed to Wastewater Treatment Facility to be provided outside the building.

Treated water by Wastewater Treatment Facility will be discharged into the culvert installed around the perimeter of the OF. In Cambodia, the Ministry of Environment has provided the regulations regarding the quality of wastewater discharged into rivers, so a merged septic tank system in this Project will be planned and designed in accordance with the Ministry's effluent quality standards.

- Regarding the rainwater drainage on the roof, considering that OF site is an area with many squalls, the rainwater gutter will be designed by calculating the maximum capacity of gutter required for the rainfall intensity per hour (mm/hr) flowing to the gutter. Wastewater Treatment Facility.
- Daily Treated Water Volume: 20.0 m<sup>3</sup>/day
- Effluent water quality standards: BOD5 80mg/L, COD 100mg/L, TSS 80mg/L, PH 5-9, etc.

### **[Plumbing Fixtures]**

Plumbing fixtures will be provided in toilets and kitchenette in the buildings of OF. In addition, water faucets (with faucet post) for cleaning will be provided near the Wastewater Treatment Facility, raw water tank and water reservoir tank.

### **[Fire Fighting System]**

In Cambodia, there is no fire regulation like Fire Service Law in Japan. However, because of discussions with the Fire Department that has jurisdiction over OF, that buildings and facilities with a building area exceeding 3,000 m<sup>2</sup> must provide Indoor Hose Reel System (Indoor Hydrant System). In addition, the amount of water required for fire extinguishing is estimated in the capacity of the Reservoir Water Tank, assuming that the water tank would be used in combination with the Reservoir Water Tank instead of having a separate Fire Fighting Tank.

## **c) Air Conditioning and ventilation system**

### **[Air Conditioning System]**

Due to the nature of the OF as an exhibition facility, provision of windows will allow sunlight to enter the building, affecting the exhibits and the space they occupy.

Therefore, provision of windows will be restricted, and air conditioning is required to maintain the indoor environment since air change is not possible.

Air-cooled heat-pump type packaged Air Conditioner will be provided in the booths of GF Exhibition Rooms and the office room, meeting room etc on 1F, taking into consideration the time zone of usage and the Air Conditioning heat load distributions.

The type of Indoor Unit will be a Ceiling-Mounted Cassette Type (4-way blowout type). Outdoor Unit of Air-Cooled Heat Pump Type Packaged Air Conditioner will be installed inside the brick screen block wall for sun shading around the perimeter of the rooms on 1F to reduce the load from solar radiation. In addition, the exhaust air from the occupied room and toilet will be blown inside the perimeter to increase the thermal efficiency of the outdoor unit.

### **[Ventilation System]**

Considering the applications and characteristics of the building and its various rooms, ventilation air change rate will be as follows:



**Table 2-15 Design Criteria for Ventilation**

Room	Type	Air Change	Note
Exhibition Room	Mechanical, Supply Air Fan	1.0 -1.5 times/hour	Positive pressure is to be maintained in Exhibition Room while adjusting the air balance of the exhaust air.
Storage	Mechanical, Exhaust Fan	5 times/hour	-
Toilet	Mechanical, Exhaust Fan	10 times/hour	To eliminate odours.
Electrical Room	Mechanical, Exhaust Fan	10 times/hour	To remove heat load from electrical equipment.
Dynamo Room	Mechanical, Exhaust Fan	25 – 30 times/hour	For combustion air supply and heat load from equipment.

Source: Building Mechanical System Design Standards, Ministry of Land, Infrastructure, Transport and Tourism, Japan

**[Elevator]**

Visitor elevator will be provided in OF that connects GF to 1F, wheelchair accessible.

**Table 2-16 Elevator (Wheelchair Accessible)**

<b>Elevator Car Internal Size</b>	1600 × 1500
<b>Rated Speed</b>	60m/min
<b>Capacity</b>	14 Passengers
<b>Loading Capacity</b>	1,000 kg

Source: JICA Study Team

**(5) Exhibition Plan (OF)**

As the information sharing process with CMAC is in progress concerning each of the exhibition rooms located on the 1F of the museum based on the exhibition item list below, an exhibition layout diagrams will be prepared, and basic design drawings will be created accordingly. In addition, since CMAC has agreed to cover the cost of exhibition content production (graphics, models, video software, etc.), a realistic proposal will be put together while being considerate of what the acceptable overall cost amount might be. The itemized list of the tasks being planned for this exhibition project is as follows:

- Floor finish
- Exhibition walls
- Ceiling-suspension grids + illumination wiring ducts
- Illumination equipment (spotlights for the items on display)
- Article display system (stage, boundaries, wall-side showcases) → See **Figure 2-16** below.
- Models (dioramas), model display stage (platform) → See **Figure 2-17** below.
- Video hardware (including audio equipment)
- Showcases (for both articles and models)

**Table 2-17 Exhibition list**

No	Description	Qty	Size			Remarks	Responsibility			
			W	D	H		CMAC	Architecture	Equipment	
	Ticket counter									
	Receptionist and information counter									
1	<p>About Cambodia, before war</p> <p>This section provides the general information about Cambodia from the following three perspectives, "culture and civilization", "geographical features and resources" and "prosperity". The information includes how people lived in the 70s in Cambodia so that visitors, who visit Cambodia for the first time, can easily understand the context.</p>									
1	Title	Graphic banner	Sign	1	900		1200		✓	
2	Explanation of Theme 1	Graphic	Text+ Picture	1	1200	75	2500		✓	
3	Cambodia's culture and civilization	Graphic	Text+ Picture	1				Creative chronology	✓	
4	Cambodia's natural resources	Graphic	Text+ Picture	1					✓	
		Graphic	Map	1	2500		2500		✓	
5	Cambodia's prosperity	Graphic	Text+ Picture	1					✓	
6	Key Infrastructure	Graphic	Text+ Picture	1					✓	
2	<p>War History</p> <p>This section focuses on the war taking place in the 60s and 70s. It explains the background about why and how the war took place and why many landmines and UXOs/ERWs were left in Cambodia. The explanation includes the overview of where and what kind of landmines and bombs were used. The maps are used for this explanation.</p>									
1	Title	Graphic banner	Sign	1	900		1200		✓	
2	Explanation of Theme 2	Graphic	Text+ Picture	1	1200	75	2500		✓	
3	War chronology War stories	Graphic	Text+ Picture	1				Creative chronology	✓	
		Video	Hardware	1			70'	Monitor		
	Software		1				Video Purchase +Editing	✓		
* Moved from Room 3										
4	Scene of setting a land mine in battlefield Explanation of Scene	Graphic	Text	3					✓	
		Model (small-scale)		2	900	900	300	① Scene of setting a land mine on a battlefield		✓
								② Military battlefield scene include child soldiers		✓
		Showcase		2	1100	1100	750+450			✓
5	War victims in battlefields (villagers during a battle)	Graphic	Text+ Picture	1+4					✓	
		Model (small-scale)		1	900	900	300	③ Houses burned scene, including war victims		✓
		Showcase		1	1100	1100	750+450			✓

No	Description			Qty	Size			Remarks	Responsibility			
					W	D	H		CMAC	Architecture	Equipment	
6	Khmer Rouge	Graphic	Text+ Picture	1+1	1200	70	2500		✓			
		Graphic	Text+ Picture	2+2	1500	70	2500		✓			
		Graphic banner	Picture	2	1500				✓			
		Model		1	3500	1750		2 mannequins only	✓			
		Graphic banner	Picture	1	3000		2500	Model scene graphic	✓			
		Showcase		1			450	Railing		✓		
7	Items of evidence	Graphic	Text+ Picture	1+4					✓			
		Materials	Original	4					✓			
		Showcase		2	1200	700	750+350				✓	
8	Landmine contamination map	Graphic	Map	1					✓			
9	ERW/Bombs contamination map	Graphic	Map	1					✓			
10	Cluster Munition map	Graphic	Map	1					✓			
11	Chemical bombs map	Graphic	Map	1					✓			
3	War Legacy and destruction			<p>The section shows how the war gave a huge impact on the Cambodian society. Pictures are mainly used in this section to show the impact of war. Visitors will understand how the Cambodian society and infrastructures were damaged by the war.</p>								
1	Title	Graphic banner	Sign	1	900		1200			✓		
2	Explanation of Theme 3	Graphic	Text+ Picture	1+1	1200	100	2500			✓		
3	Victims	Graphic	Text+ Picture+ Chart	1+6+1	6000	100	2500			✓		
4	Economy	Graphic	Text+ Picture+ Chart	1+4+2	6000	100	2500			✓		
5	Villages, schools, houses, pagodas etc.	Graphic	Text+ Picture	1+6	6000	100	2500			✓		
6	Key infrastructure	Graphic	Text+ Picture	1+4	6000	100	2500			✓		
		Model		1						✓		
		Showcase		1	1500	800	750+450					✓
		Model		1				e.g. Cambodia-Japanese bridge		✓		
		Showcase		1	1500	800	750+450					✓
		Video	Hardware	1			120-150'		Projector			
1							Screen				✓	
1						TBC	Slide show on screen	✓				

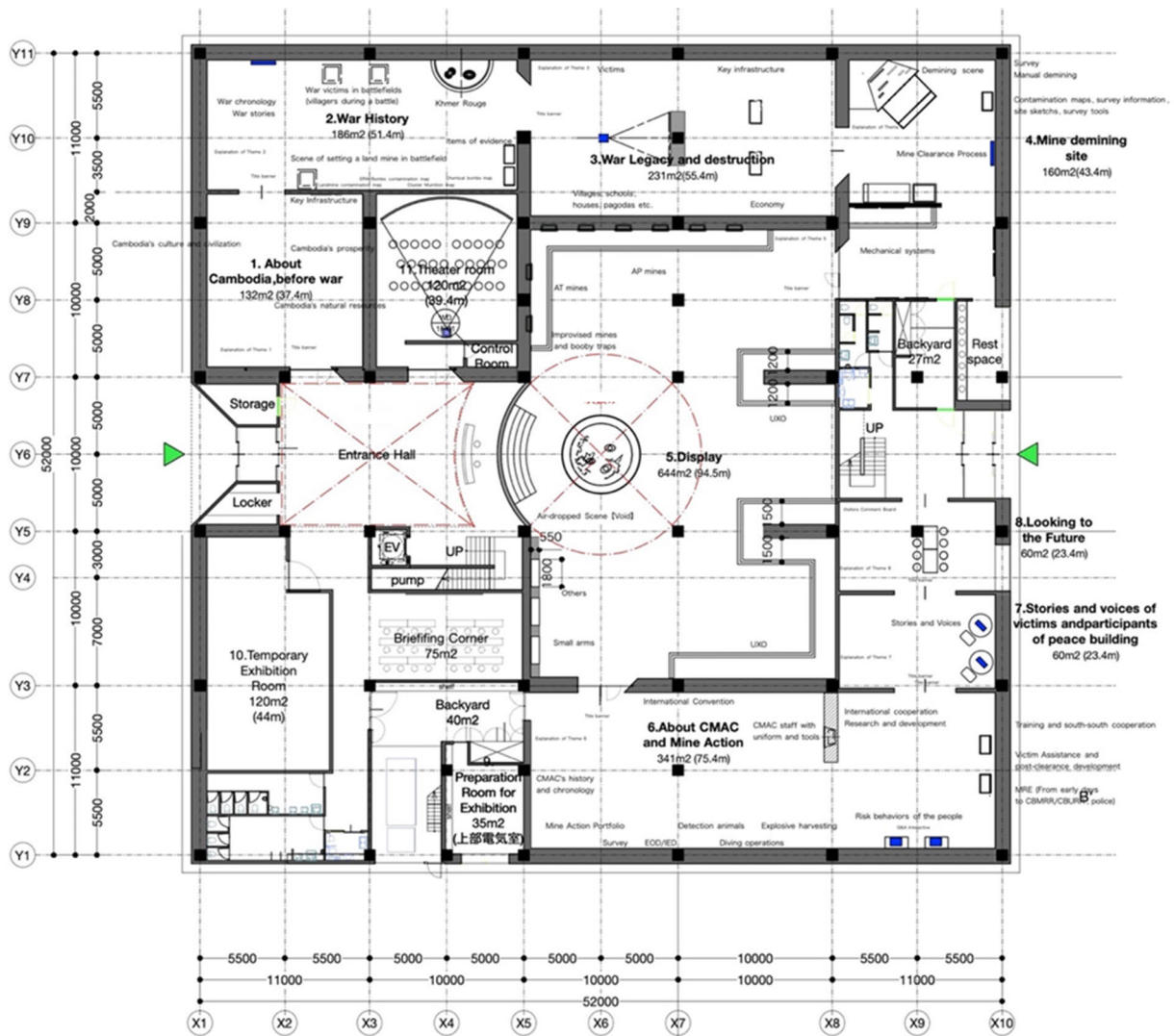
No	Description	Qty	Size			Remarks	Responsibility					
			W	D	H		CMAC	Architecture	Equipment			
4 Mine demining site												
This section explains how items are used and found on the ground. The explanation focuses on each scene including how it is used, how it is found, and how it is exploded.												
1	Title	Graphic banner	Sign	1	900		1200		✓			
2	Explanation of Theme 4	Graphic	Text+ Picture	1	1200	70	2500		✓			
Moved from Room 3												
3	Demining scene	Graphic	Picture (Cut-out Panels)			Demining accident scene (Looking into the scene from a hole/ Perspective)			✓			
Moved from Room 6												
4	Contamination maps, survey information, site sketches, survey tools	Graphic	Text	4					✓			
		Materials	Original	10					✓			
		Showcase		1	1200	700	750+350				✓	
		Materials	Original					Contamination maps and site sketches	✓			
		Furniture	Table	1							✓	
		Model		1	900	700	250	Site				✓
		Showcase		1	1100	900	750+450					✓
5	Mine Clearance Process	Graphic	Text+ Picture	4+10					✓			
		Video	Hardware	1	70'			Monitor			✓	
			Software	1				CG+ Live-action	✓			
6	Survey	Graphic	Text+ Picture	4+6					✓			
7	Manual demining	Graphic	Text+ Picture+ Illustration	4+6+2					✓			
8	Mechanical systems	Graphic	Text+ Picture	4+6					✓			
		Materials	Original	2					✓			
5 Displays												
This section shows the actual items including anti-personnel mines, anti-tank mines, UXOs and others with explanations. The explanations facilitate the understanding among visitors on how the items are designed, how they function and how they affect human body.												
1	Title	Graphic banner	Sign	1	900		1200		✓			
2	Explanation of Theme 5	Graphic	Text+ Picture	1	1200	70	2500		✓			
3	AP mines	Graphic	Text	1					✓			
		Materials	Original	10					✓			
		Graphic	Text+ Chart	40→10						✓		
		Retrieval device	Hardware	1	20 or 22'			Touch panel				✓
			Software						✓			

No	Description			Qty	Size			Remarks	Responsibility			
					W	D	H		CMAC	Architecture	Equipment	
4	AT mines	Graphic	Text	1					✓			
		Materials	Original	5					✓			
		Graphic	Text+ Chart	5					✓			
		Retrieval device	Hardware		1	20 or 22'			Touch panel			✓
Software								✓				
5	Improvised mines and booby traps	Graphic	Text	1					✓			
		Materials	Original	5					✓			
		Graphic	Text+ Chart	5					✓			
6	UXO	Graphic	Text	1					✓			
		Materials	Original	10					✓			
		Graphic	Text+ Chart						✓			
		Retrieval device	Hardware		1	20 or 22'			Touch panel			✓
			Software							✓		
7	Air-dropped Scene [Void]	Model		1	4000φ			Diorama of actual scene on the floor / 4 mannequins			✓	
		Video	Hardware					Directional speaker			✓	
			Software						Screams, footsteps (escaping through the grass), bomb sounds	✓		
	Stage		1	5000φ		500			✓			
	Explanation of Scene Air-dropped bombs Cluster munitions Chemical bombs	Graphic	Text	1					✓			
		Materials	Original	1					✓			
		Materials	Original						✓			
		Materials	Original						✓			
8	Small arms	Graphic	Text	1					✓			
		Materials	Original	3					✓			
		Graphic	Text+ Chart						✓			
9	Others	Graphic	Text						✓			
		Materials	Original						✓			
6 About CMAC and Mine Action												
<p>This section provides information about CMAC as an organization and how CMAC works on the ground, including the technics that are used in the field. Visitors will understand the history and organization of CMAC as well as how the safe land is produced by the CMAC's work. In this corner, the activities of CMAC's international contributions (Laos, Colombia, Angola, Iraq, etc.) to promote the removal of landmines and UXO will also be introduced.</p>												
1	Title	Graphic banner	Sign	1	900		1200			✓		
2	Explanation of Theme 3	Graphic	Text+ Picture	1	1200	70	2500			✓		
3	CMAC's history and chronology	Graphic	Text+ Picture	4+ 10						✓		

No	Description			Qty	Size			Remarks	Responsibility		
					W	D	H		CMAC	Architecture	Equipment
4	Mine Action Portfolio	Graphic	Text+ Picture	4+10					✓		
5	International Convention	Graphic	Text+ Picture	2+6					✓		
6	Detection animals	Graphic	Text+ Picture	4+6					✓		
7	EOD/IED	Graphic	Text+ Picture	4+6					✓		
8	Diving operations	Graphic	Text+ Picture	4+6					✓		
9	Explosive harvesting	Graphic	Text+ Picture	4+6					✓		
10	Risk behaviours of the people: using bombs as a bell improvised fishing tools, scrap metals, blacksmiths	Graphic	Text	4					✓		
		Materials	Original	4					✓		
		Video	Hardware	2				Touch panel			✓
			Software	1				Q&A Interactive Animation	✓		
11	MRE (From early days to CBMRR/CBURR, police)	Graphic	Text+ Picture	4+10					✓		
12	Victim Assistance and post-clearance development (artificial limbs, social and economic development)	Graphic	Text+ Picture	4+10					✓		
		Materials	Original						✓		
		Showcase		1	1200	700	750+350				✓
13	Training and south-south cooperation (internal training, training RCAF, police, etc.)	Graphic	Text+ Picture	4+10					✓		
		Materials	Original								
		Showcase		1	1200	700	750+350				✓
14	Research and development	Graphic	Text+ Picture	4+10					✓		
15	International cooperation	Graphic	Text+ Picture	4+10					✓		
16	Others	Model (Mannequin or Torso)		1				CMAC staff with uniform and tools	✓		✓
7 Stories and voices of victims and participants of peace building This section introduces videos about the victims of landmines and other disasters. Videos that are developed based on the interviews will enable visitors to deepen the understanding of what happened to the people on the ground during the conflict.											
1	Title	Graphic banner	Sign	1	900		1200		✓		
2	Explanation of Theme 7	Graphic	Text+ Picture	1	1200	70	2500		✓		

No	Description			Qty	Size			Remarks	Responsibility		
					W	D	H		CMAC	Architecture	Equipment
3	Stories and Voices	Video	Hardware	2	32'			Select by touch panel			✓
			Software	1				Interview+ Editing	✓		
	Furniture	Table	2	900φ	700	Ready-made		✓			
		Chair	2			Ready-made		✓			
8	Looking to the Future This section provides the opportunity where visitors feel hopeful about the future of the world without landmines and UXOs.										
1	Title	Graphic banner	Sign	1	1200				✓		
2	Explanation of Theme 8	Graphic	Text+ Picture	1	1200	70	2500		✓		
3	Visitors Comment Board	Board		1						✓	
		Furniture	Table	2	1500	900	700	Ready-made		✓	
	Chair		8				Ready-made		✓		
9	Preparation room for exhibition This space is used to repair and prepare for the replacement of graphic panels and other items in the Permanent Exhibition Room as well as to prepare for the special exhibitions and temporary storage of packing materials. This room is located close to the Temporary Exhibition Room and Backyard, while ensuring a carry-in route from the outside.										
		Furniture	Table	2	1800	900	700	Ready-made		✓	
			Chair	2				Ready-made		✓	
10	Temporary exhibition room This room is used for temporary exhibition which is held about four times a year in cooperation with similar facilities such as Peace Museum and artists who produce works on themes related to peace in the Temporary Exhibition Room. Furthermore, it plays a role in raising the level of satisfaction of repeat visitors and disseminating activities in Cambodia and overseas.										
	Picture rail						35.3m			✓	
11	Theatre room The room provides the introduction of Cambodian geographical features, history and mine action with a 15-minute video. The use of dynamic visuals will be designed to make the museum's exhibits more interesting to tourists visiting Cambodia for the first time, as well as to the younger generation in the country.										
		Video	Hardware	1				Projector			✓
				1				Screen		✓	
			Software	1				3-D video	✓		
		Furniture	Chair	35				Ready-made		✓	
12	Outdoor Exhibition										
	Original	Materials	Original	10-15					✓		
		Graphic							✓		
	Demonstration area										
	Experience area							Visitor can have experience with uniform and tools			
	Briefing room										
	Storage (Warehouse)										
	Backyard										

Source: JICA Study Team



Source: JICA Study Team

**Figure 2-15 Exhibition layout**

**Basic policy**

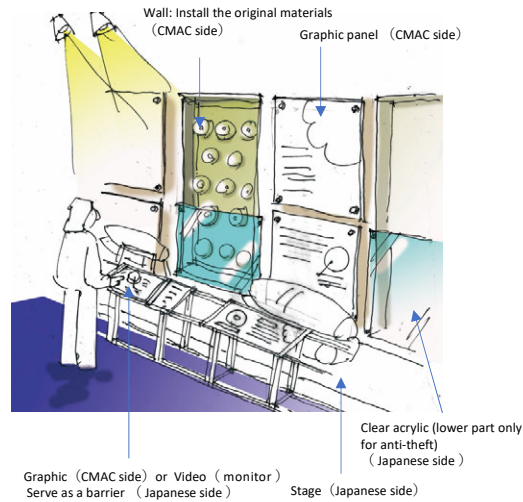
1. Exhibit all items bare, excluding paper-based and other fragile materials
  - \* As for the mines and other UXO that will be on display, install acrylic covers over some of them for safety and theft prevention measures.
2. Updatable exhibition system
 

The system must allow the staff to switch materials on display.
3. Install stands displaying detailed explanatory information (graphics, videos, etc.) in front.
 

They can be added and moved around freely in the future.

Such stands will also serve as boundaries to ensure visitor safety and also prevent them from touching the articles on display.





Source: JICA Study Team

**Figure 2-16 Exhibit system concept**

Concept of Diorama: Upon encountering the history of past wars in the graphics of exhibition rooms 1 and 2 and to raise awareness of future peace in exhibition rooms 6-8, the visitors will be able to view the first half of the exhibition rooms in a symbolic diorama exhibition placed in the center of the exhibition room.

Scene Idea

\*Determine the detailed scene after discussion with CMAC

Bombing from the sky (actual display)  
Surrounding (foot) grass (visible from 360 degrees)

Mannequins: 4 units (including children)

- Soldier
- A mother flees with her child
- An old man pointing to the sky while looking back
- A boy holding his head and following his mother

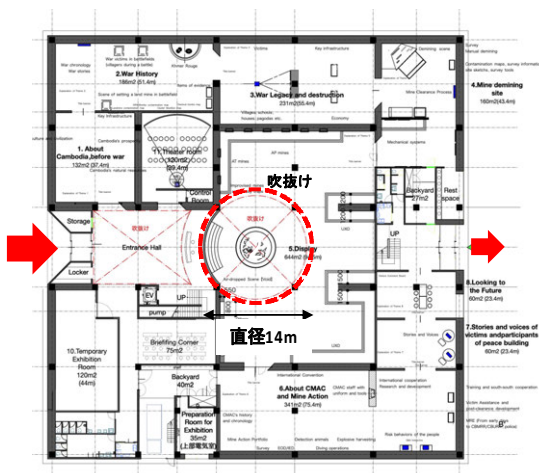
Directional speaker (Hardware: Japanese side)  
Bombing, Screaming,  
Footsteps running through the grass

Air strike (Original materials/ hanging) (CMAC side)

Diorama mannequin (Japanese side)

Diorama stage (Japanese side)

Explanation graphic (CMAC side)



Source: JICA Study Team

**Figure 2-17 Concept of the main model (diorama) and model exhibition stage (table)**

## **(6) Equipment Planning**

### **1) Study on the Requested Equipment**

Considering that the existing equipment that are in good condition will continue to be used in the new buildings, CMAC requested the equipment necessary for training and preparation of training material and the exhibition equipment to be used in OF, through the discussion with the study team. All requested equipment contributes to achieve the project objective; however, budget limitation allows only to target the equipment with high priority.

The original request and the planned equipment to be procured under the project are compared in the table below.

Table 2-18 Selection Policy on Equipment and its Quantity

No	Equipment	Unit	Request /Plan	Q'ty	Breakdown of the Quantity													Priority at the time of request	Reason for Modification							
					HQ	TIMA						OF														
						Classroom (new)	Advanced EOD Classroom (new)	Conference Hall (new)	Male Accommodation (new)	Female Accommodation (new)	Gym (new)	MDD Office (new)	Main Office (existing-new)	DC logistics / medical (existing)	Reception-Information Center (new)	Exhibition Room (new)	Conference Hall (new)			Meeting Room (new)	Office (new)	Classroom (new)				
1	Projector Set (general)	Set	Request	24		14	3					1													A except 5 sets for OF Classroom: B	Because of budget limitation, the assistance to EOD, MDD management and the classroom construction in OF was excluded.
2	Web Conference System (projector)	Set	Request Plan	1		7							1												A	-
3	Web Conference System (interactive board)	Set	Request Plan	3		1							1												A	-
4	Copier	Set	Request Plan	5								1	3												A	Because of budget limitation, the assistance to MDD management was excluded. In addition, the quantity was reduced to minimum requirement for TIMA management.
5	Printer	Set	Request Plan	3									1												A	The printers were supposed to be used by directors for confidentiality issue. However, because of budget limitation, they use the copiers, asking for solution to setting or management in use.

No	Equipment	Unit	Request /Plan	Q'ty	Breakdown of the Quantity												Reason for Modification						
					TIMA																		
					HQ	OF			TIMA														
					Classroom (new)	Office (new)	Meeting Room (new)	Conference Hall (new)	Exhibition Room (new)	Reception - Information Center (new)	DC logistics / medical (existing)	Main Office (existing - new)	MDD Office (new)	Gym (new)	Female Accommodation (new)	Male Accommodation (new)	Conference Hall (new)	Advanced EOD Classroom (new)	Classroom (new)	Server Room	Priority at the time of request		
6	PA System	Set	Request Plan	4 4																		A	-
7	PC (laptop)	Set	Request Plan	52 38		11					1	35	5									A	Because of budget limitation, the assistance to MDD and DC management and preparation of training material in DC was excluded. Six units purchased under technical cooperation were also considered.
8	PC (desktop)	Set	Request Plan	34 18							2	10	14									A	Because of budget limitation, the assistance to MDD and DC management was excluded.
9	PC (workstation)	Set	Request Plan	25 25																25	25	A	-
10	Digital Video Camera	Set	Request Plan	3 0																		A	Because of budget limitation, the video or photo to be used to prepare training materials will be taken by private smart phone of trainers.
11	Gym Equipment	Set	Request Plan	1 0											1							A	Because of budget limitation, the assistance to build the physical strength was excluded.

No	Equipment	Unit	Request /Plan	Q'ty	Breakdown of the Quantity														Priority at the time of request	Reason for Modification			
					HQ		TIMA						OF										
					Server Room	Classroom (new)	Advanced EOD Classroom (new)	Conference Hall (new)	Male Accommodation (new)	Female Accommodation (new)	Gym (new)	MDD Office (new)	Main Office (existing·new)	DC logistics / medical (existing)	Reception·Information Center (new)	Exhibition Room (new)	Conference Hall (new)	Meeting Room (new)	Office (new)	Classroom (new)			
12	TV	Set	Request Plan	2 0					1	1												A	Because of budget limitation, the equipment for enhancing the communication among trainees was excluded.
13	File Server	Set	Request Plan	1 1	1 1																	A	-
14	Aerial Work Platform	Set	Request Plan	0 1												1							The ceiling of OF is high. To maintain the air-conditioning or lights and display works easily and safely, make the maintenance easy, this equipment was added.
15	Showcase	Set	Request Plan	1 1												1 1						A	-
16	Display Monitor (including touch panel)	Set	Request Plan	1 1												1 1						A	-
17	Model	Set	Request Plan	1 1												1 1						A	-
18	Projector Set (exhibition)	Set	Request Plan	1 1												1 1						A	-

Source: JICA Study Team

## 2) Planned Equipment

The table below shows the equipment list to be procured, which considers the modification above. To ensure repair and acquisition of consumables, local procurement is prioritized. An operation training will be provided under the project for the equipment unfamiliar to CMAC or which use is different among the models.

**Table 2-19 Procurement List of Equipment**

No.	Equipment Name	Specifications	Objective	TIMA	OF	Total Q'ty	Technical Level		Difficulty of Acquisition of Consumables	Corresponding No of Table "Selection Policy on Equipment and its Quantity"
							Operation	Maintenance		
1	Projector Set A	Projector, Screen etc.	TIMA: Lecture in classroom OF: Briefing to visitors in group such as schools	7set	1set	8set	Low	Low	N/A	1
2	WEB Conference System A	Projector, Screen, Camera, Microphone, Speaker etc.	TIMA: Teleconference	1set	0set	1set	Low	Low	N/A	2
3	WEB Conference System B	Interactive Board, Screen, Camera, Microphone, Speaker etc.	TIMA: Online classroom and teleconference OF: Teleconference	2unit	1unit	1set	Low	Low	N/A	3
4	Copier	Print • Scan • Copy, White Black, Color, with Cabinet	TIMA: Print, scan and copy of training materials and administration documents OF: Print, scan and copy for training and administration	2set	1set	3set	Low	Middle	Easy (local)	4
5	PA System	Type A: Projector, Screen, Monitor, Microphone, Speaker, Mixer, Amplifier, Switcher, Rack etc. Type B: Portable Speaker, Microphone etc.	TIMA: Plenary gathering OF: Plenary gathering	1set	1set	1set	Middle	Middle	N/A	6
6	PC A	Laptop	TIMA: Manager in charge of training and administration OF: Manager in charge of training and administration	29set	9set	38set	Low	Low	N/A	7
7	PC B	Desktop etc.	TIMA: Staff in charge of training and administration OF: Staff in charge of training and administration	10set	8set	18set	Low	Low	N/A	8

No.	Equipment Name	Specifications	Objective	TIMA	OF	Total Q'ty	Technical Level		Difficulty of Acquisition of Consumables	Corresponding No of Table "Selection of Policy on Equipment and its Quantity"
							Operation	Maintenance		
8	PC C	Workstation etc.	TIMA: ArcGIS software training (installed in the computer room)	25set	0set	25set	Low	Low	N/A	9
9	File Server	Server, LTO, Rack etc.	TIMA: Archive of training materials	HQ 1set		1set	Middle	Middle	N/A	13
10	Aerial Work Platform	4m height	OF: Maintenance and display works in area with height	0set	1set	1set	Low	Middle	Easy (local)	14
11	Showcase	Glass & Steel, Frameless, Acrylic Resin Baking Finishing	OF: Display of models or real objects	0set	1set	1set	Low	Low	N/A	15
12	Display Monitor	70-75inches	OF: Video for display	0set	2set	2set	Low	Low	N/A	16
13	Model A	Scene of setting a landmine in battlefield, Military battlefield scene including child soldier, Scene of house burning together with war victims, Site, C/MAC staff mannequin with uniform and tool	OF: Display	0set	1set	1set	Low	Low	N/A	17
14	Model B	Diorama, Mannequins, Speaker etc.	OF: Display	0set	1set	1set	Low	Low	N/A	17
15	Touch Panel A	20-22inches	OF: Search of anti-personnel landmines, anti-tank landmines (display)	0set	3set	3set	Low	Low	N/A	16
16	Touch Panel B	32inches	OF: Interactive Q& A (no of quiz: 5), with animation	0set	2set	2set	Low	Low	N/A	16
17	Touch Panel C	32inches	OF: Watching the video by selection	0set	2set	2set	Low	Low	N/A	16
18	Projector Set B	Projector, Screen in air	OF: Projection of video	0set	1set	1set	Low	Low	N/A	18
19	Projector Set C	Projector 3D, Glasses, Speaker, Media Player etc.	OF: Theater	0set	1set	1set	Middle	Middle	N/A	18

Source: JICA Study Team

2-2-3 Outline Design Drawing

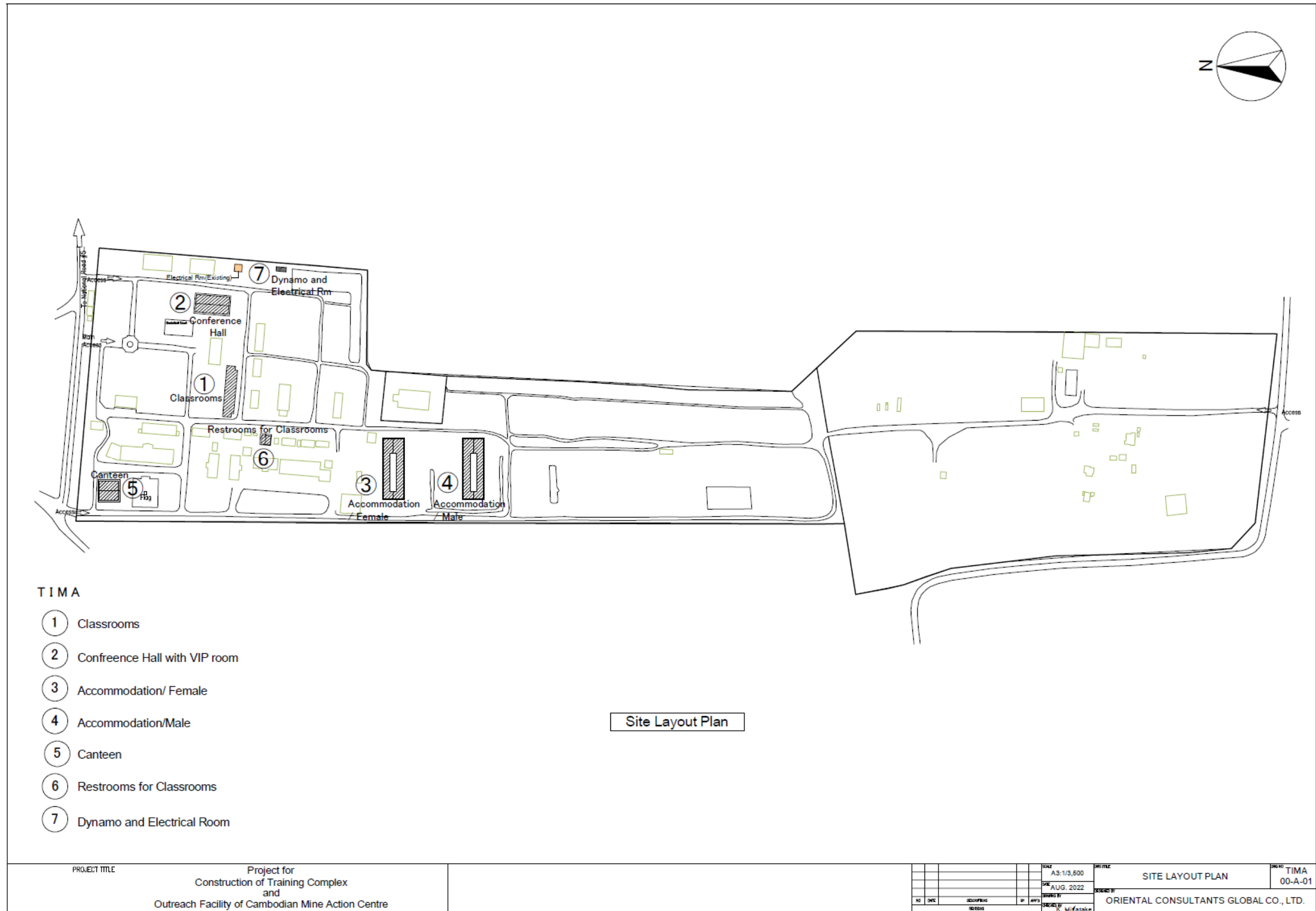


Figure 2-18 Layout of TIFA

Source: JICA Study Team



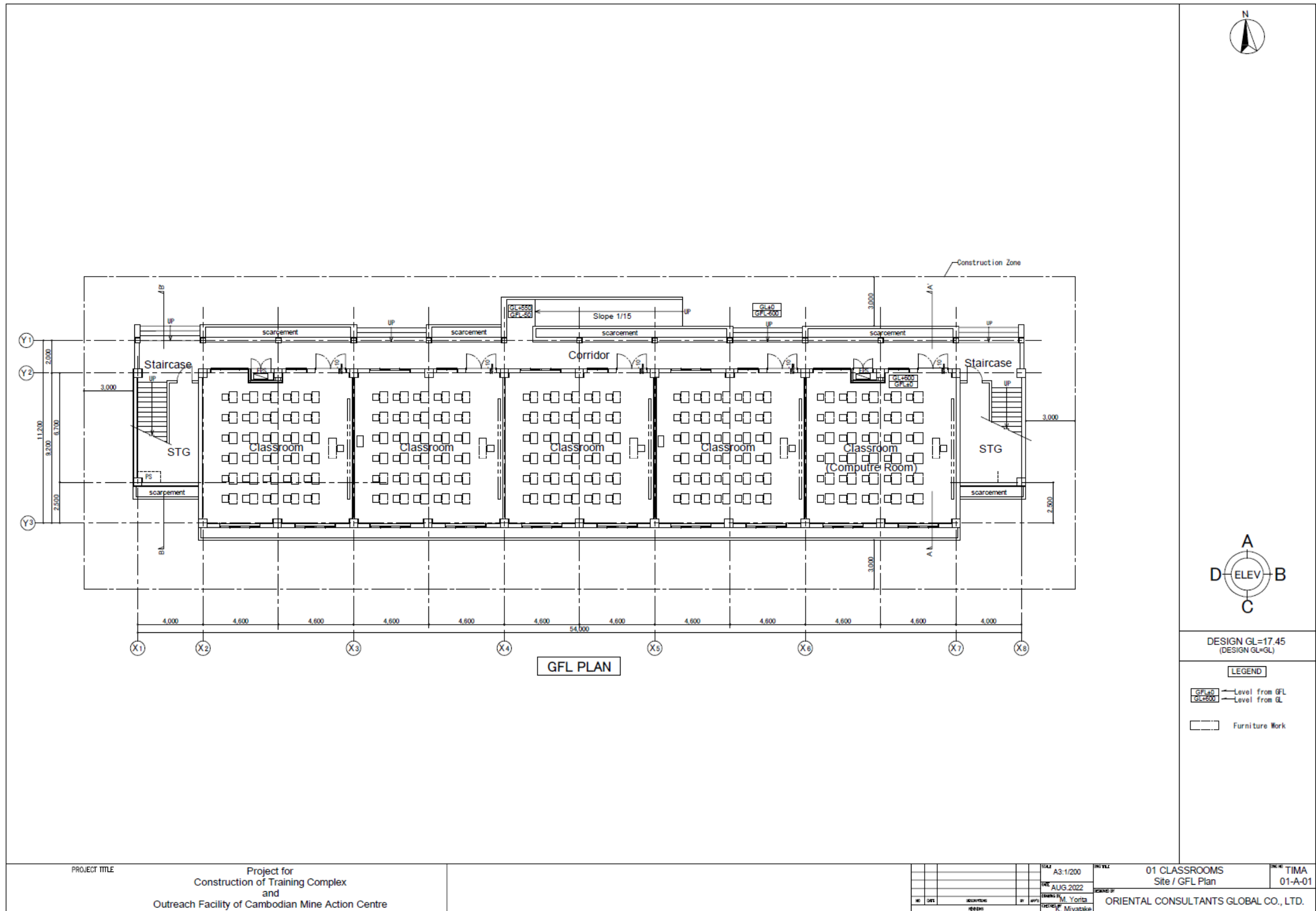


Figure 2-19 Floor Plan of TIMA Classroom Building (GFL)

Source: JICA Study Team

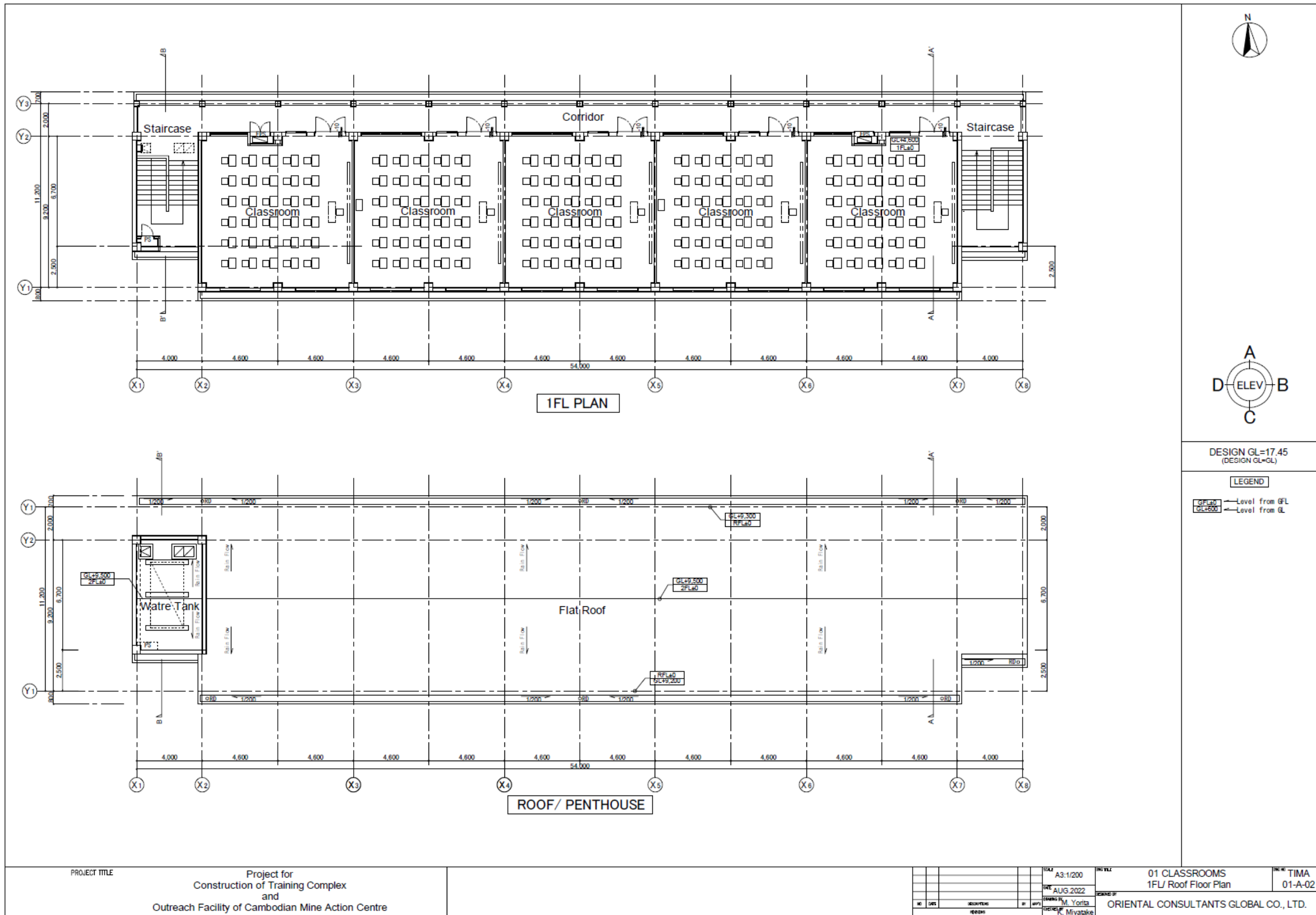


Figure 2-20 Floor Plan of TIMA Classroom Building (1FL, RFL)

Source: JICA Study Team

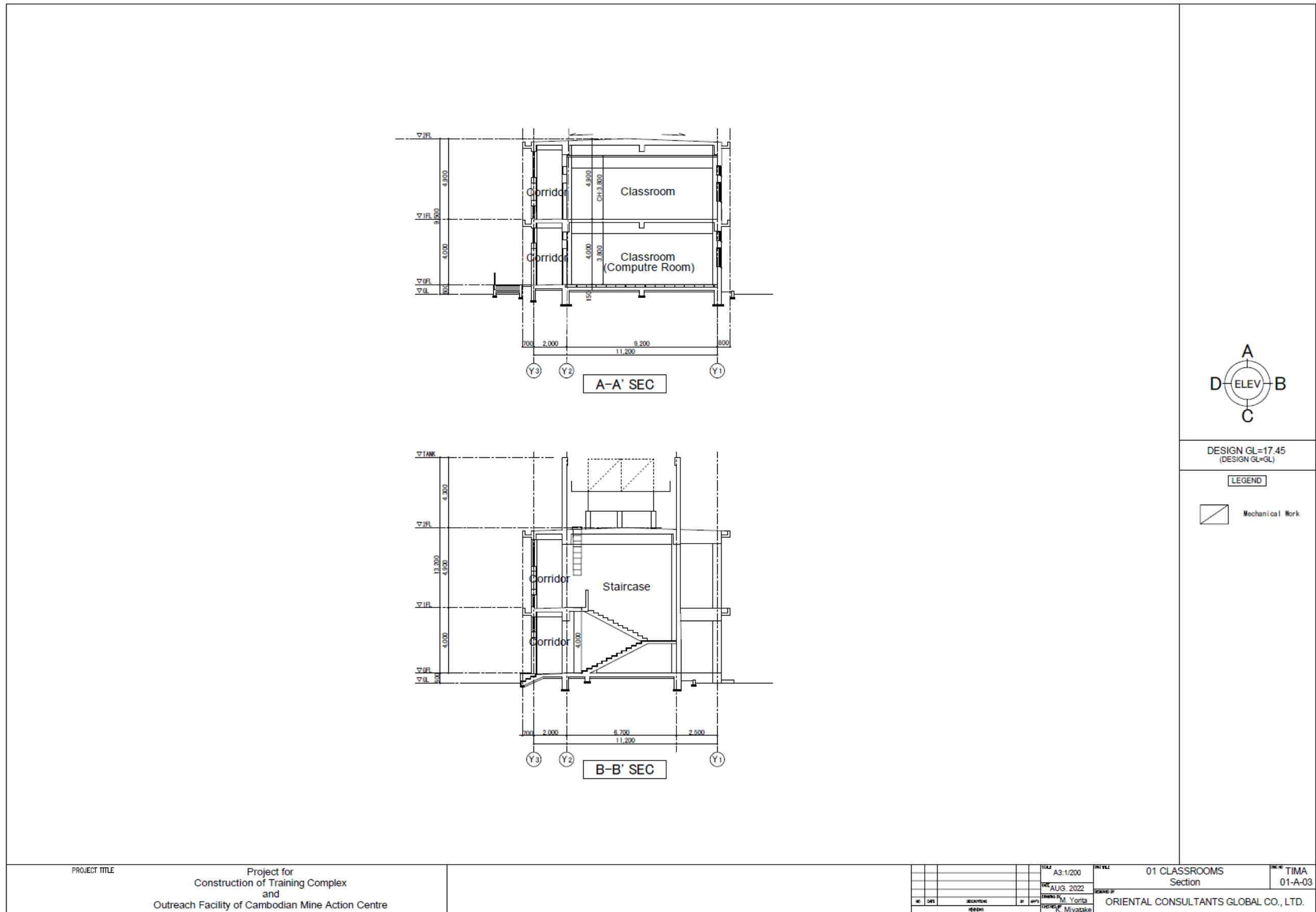


Figure 2-21 Section of TIMA Classroom Building

Source: JICA Study Team

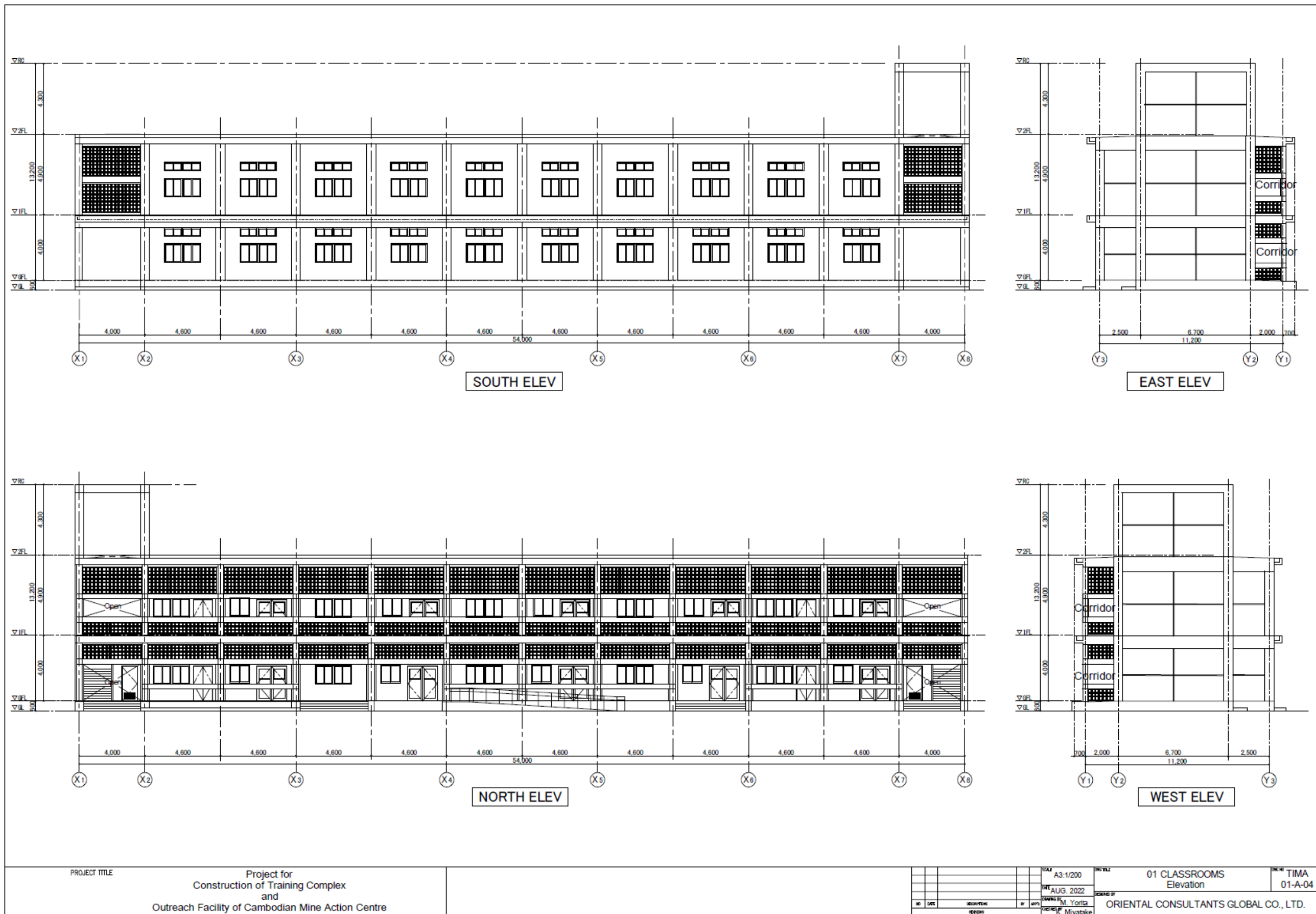


Figure 2-22 Elevation of TIMA Classroom Building

Source: JICA Study Team

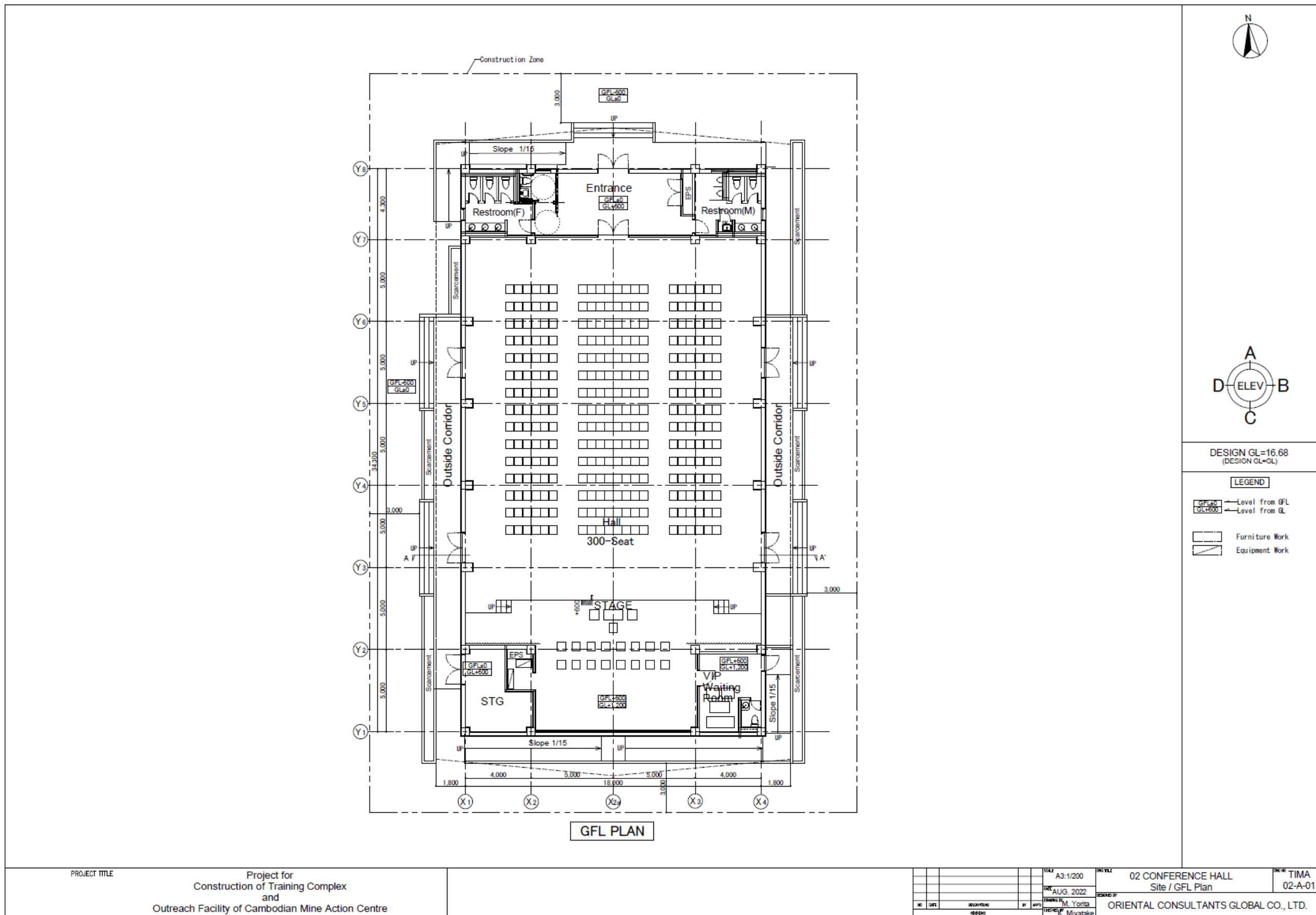


Figure 2-23 Floor Plan of TIMA Conference Hall

Source: JICA Study Team

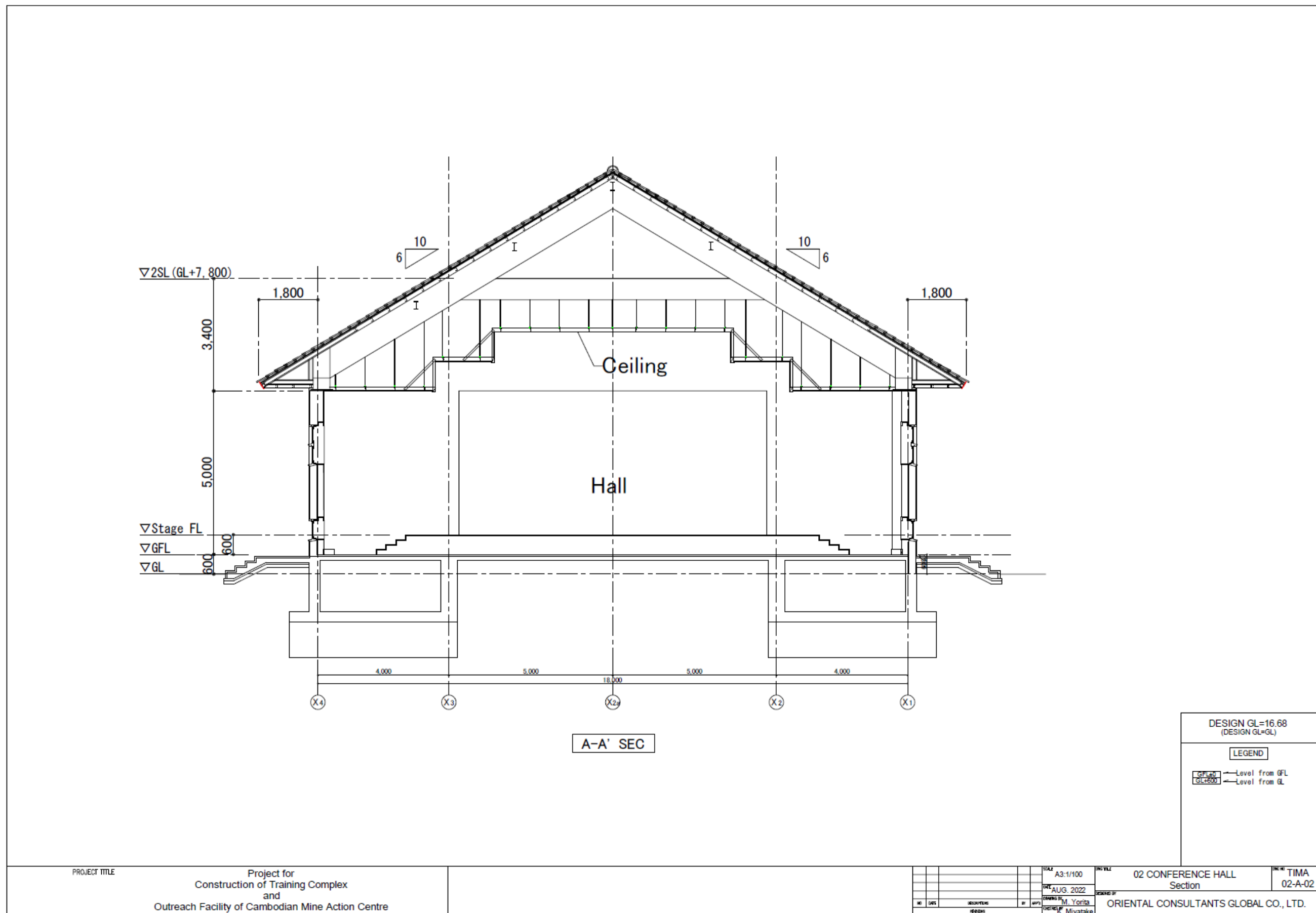
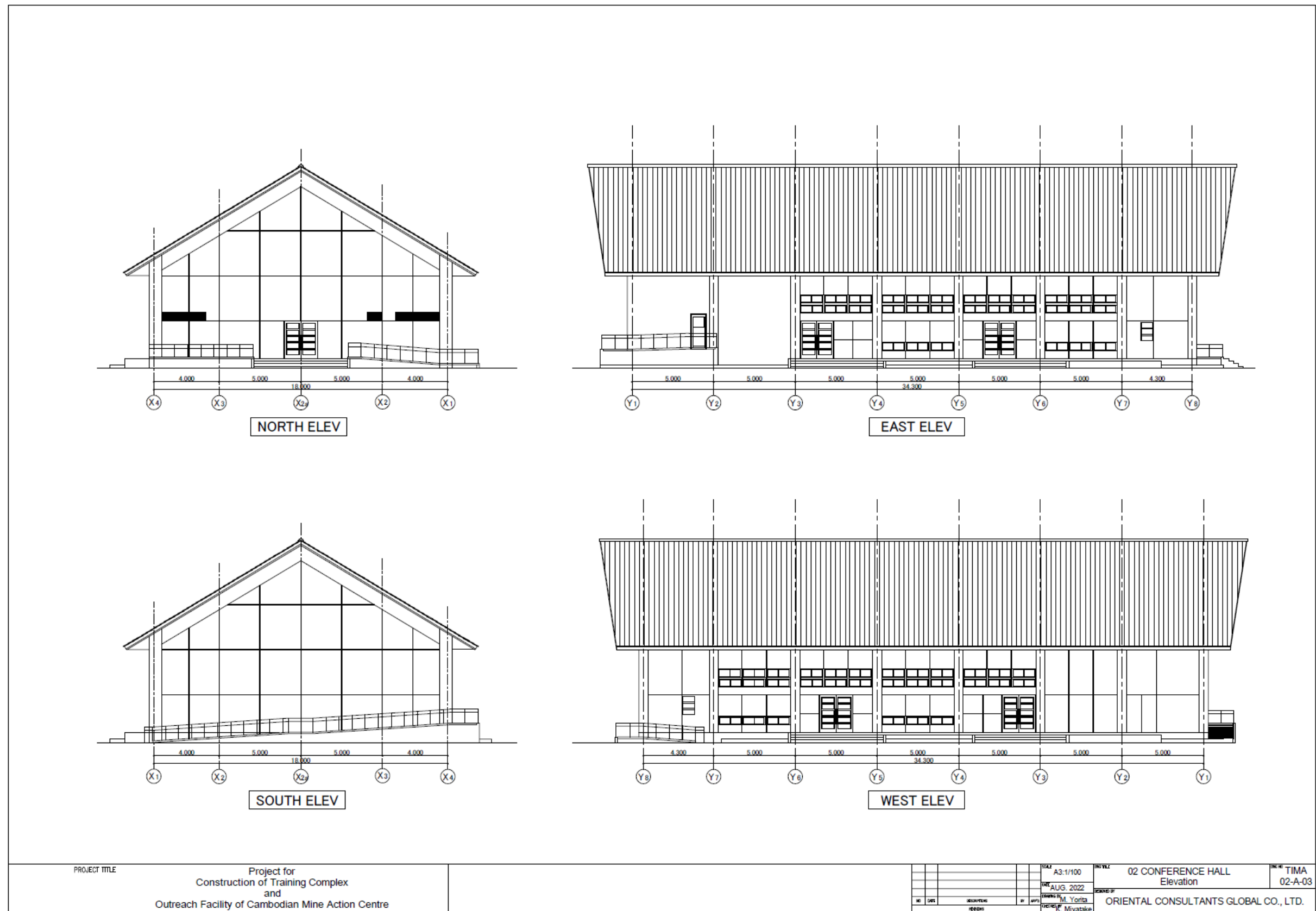


Figure 2-24 Section of TIMA Conference Hall

Source: JICA Study Team



Source: JICA Study Team

Figure 2-25 Elevation of TIMA Conference Hall

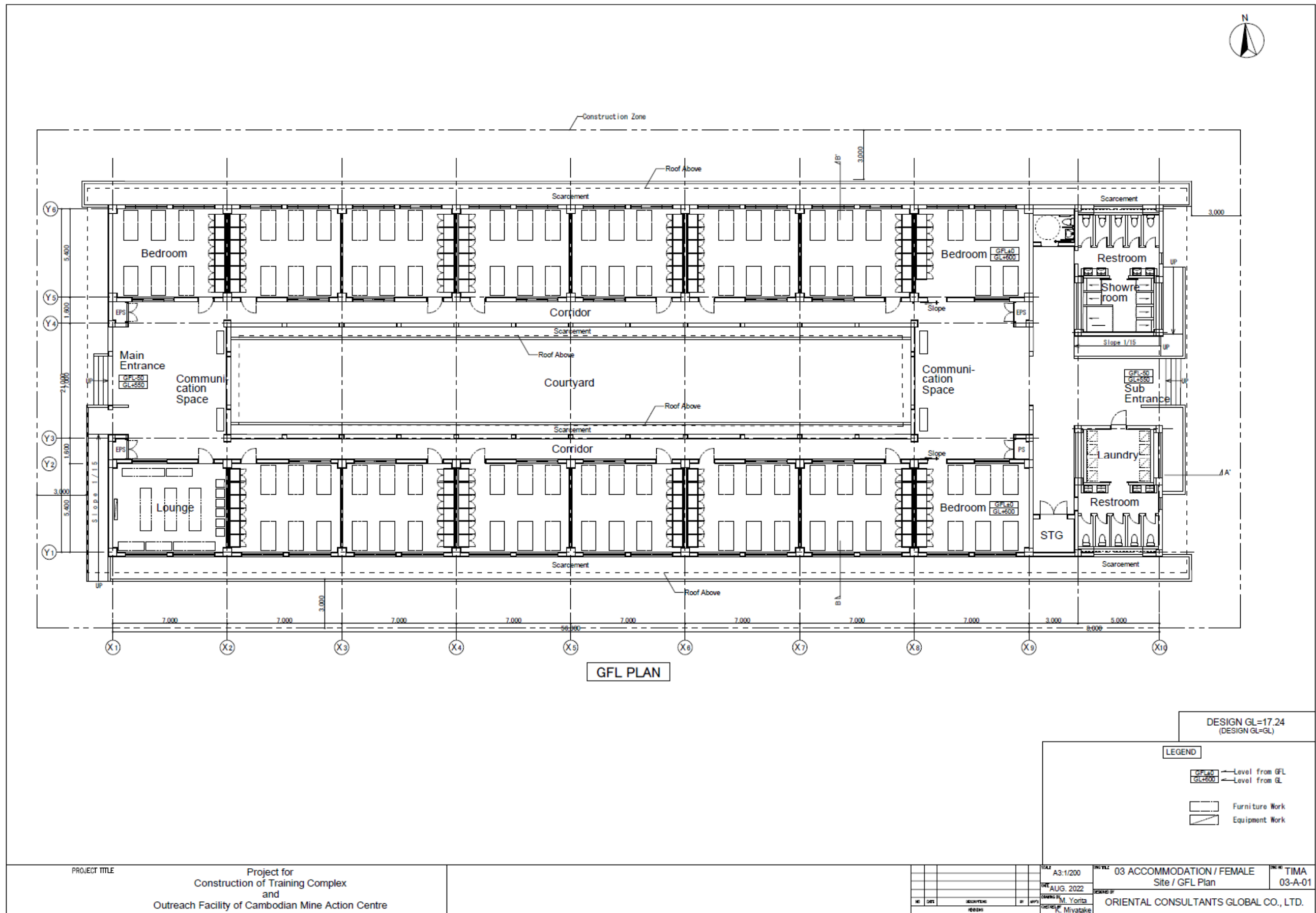
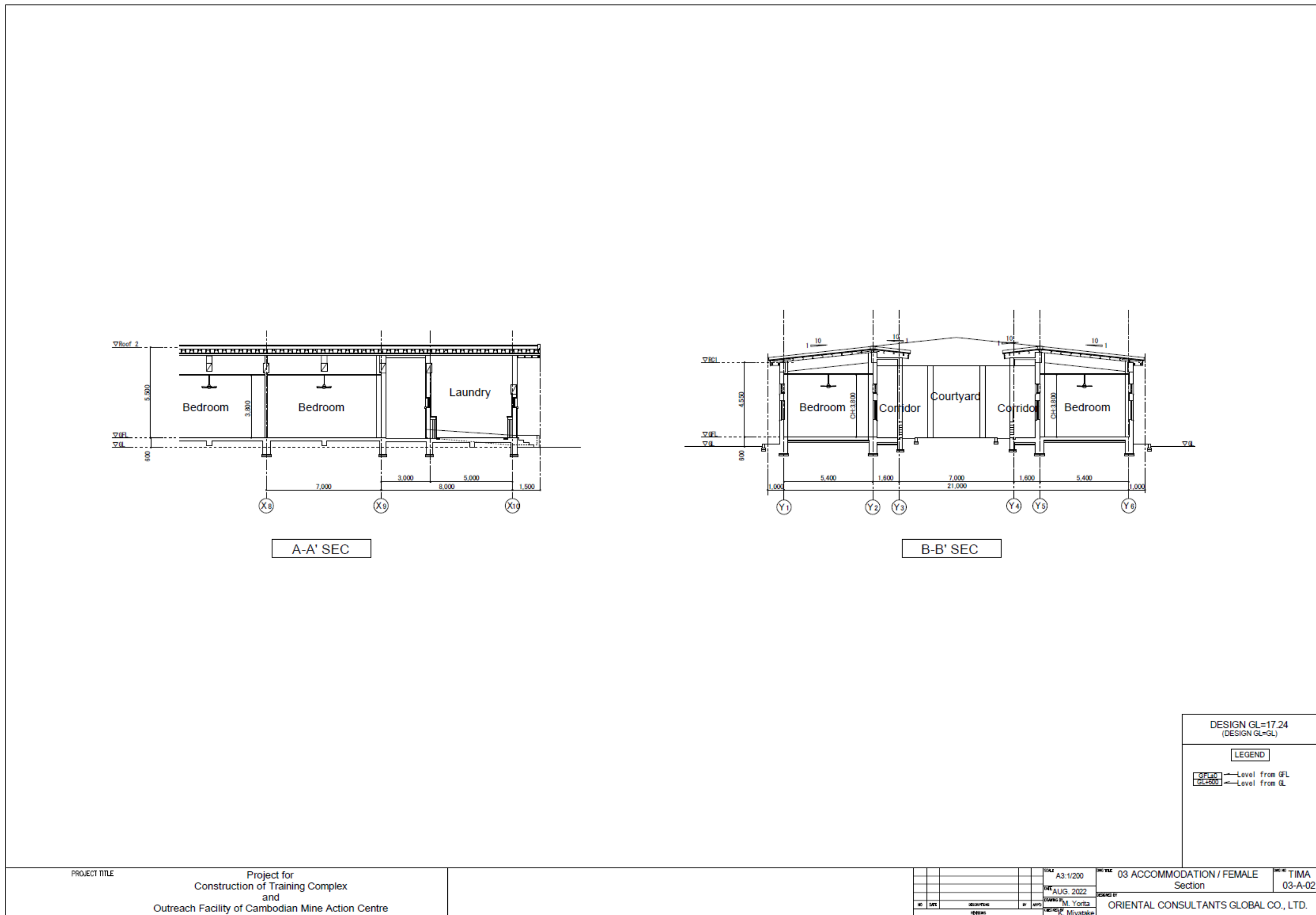


Figure 2-26 Floor Plan of TIMA Accommodation for Female (GFL)

Source: JICA Study Team





Source: JICA Study Team

Figure 2-27 Section of TIMA Accommodation for Female

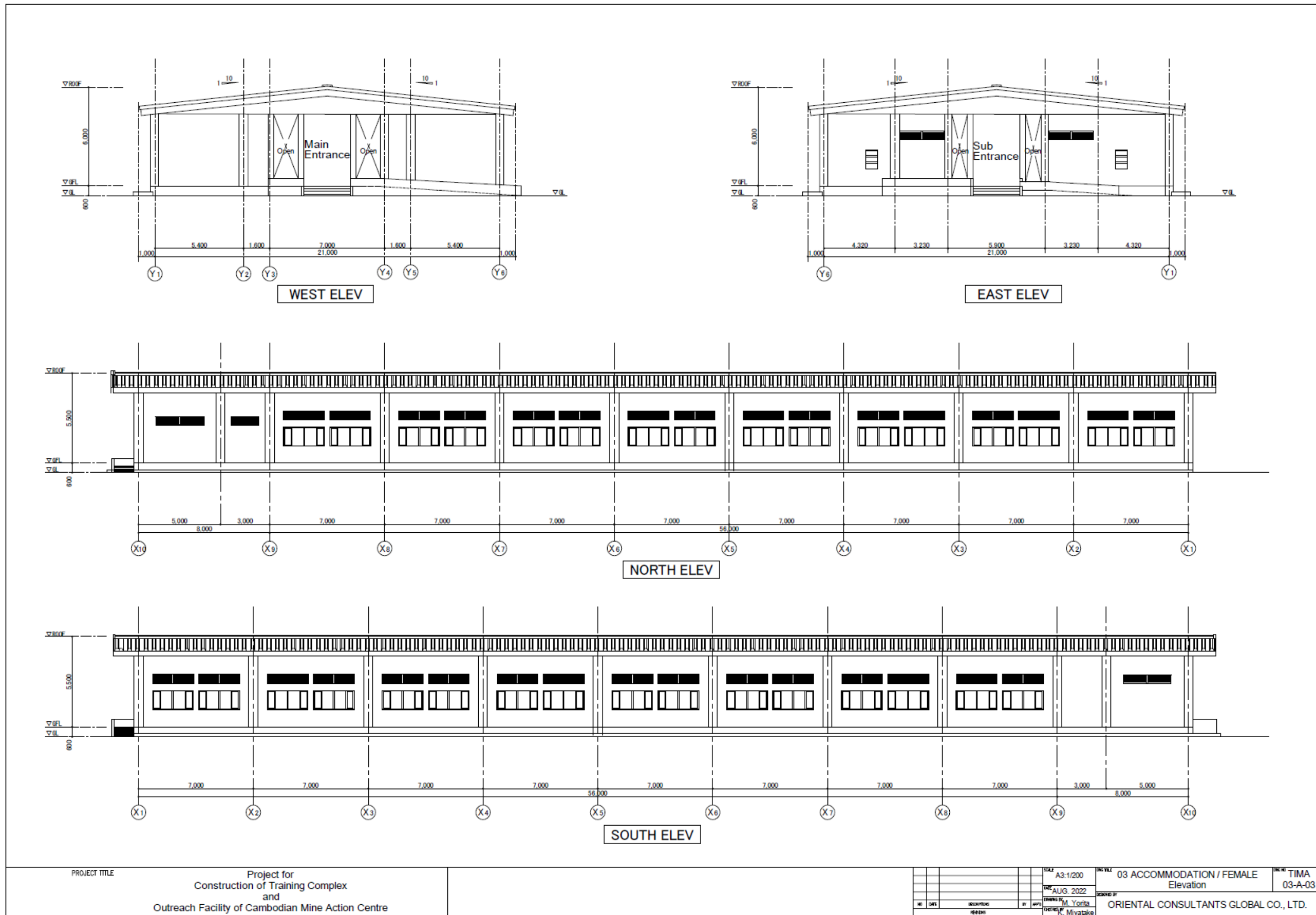


Figure 2-28 Elevation of TIMA Accommodation for Female

Source: JICA Study Team



DESIGN GL=17.05  
(DESIGN GL=GL)

LEGEND	
	Level from GFL
	Level from GL
	Furniture Work
	Equipment Work

PROJECT TITLE  
Project for  
Construction of Training Complex  
and  
Outreach Facility of Cambodian Mine Action Centre

SCALE A3:1/200	NO. 04 ACCOMMODATION / MALE Site / GFL Plan	TIMA 04-A-01
DATE AUG. 2022	DRAWN BY M. Yorita	
NO. 04	REVISION	CHECKED BY K. Miyatake
ORIENTAL CONSULTANTS GLOBAL CO., LTD.		

Source: JICA Study Team

Figure 2-29 Floor Plan of TIMA Accommodation for Male (GFL)

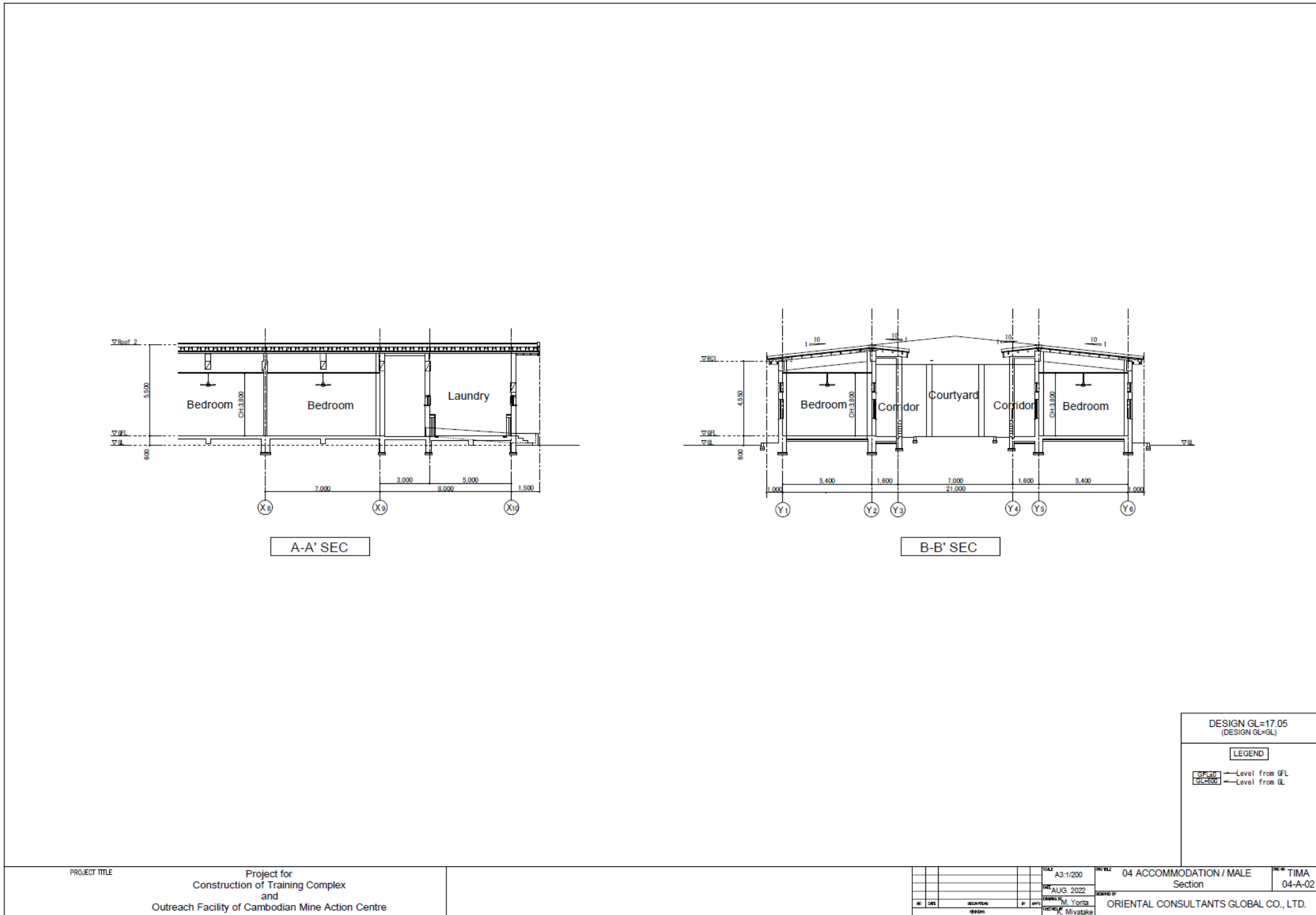


Figure 2-30 Section of TIMA Accommodation for Male

Source: JICA Study Team

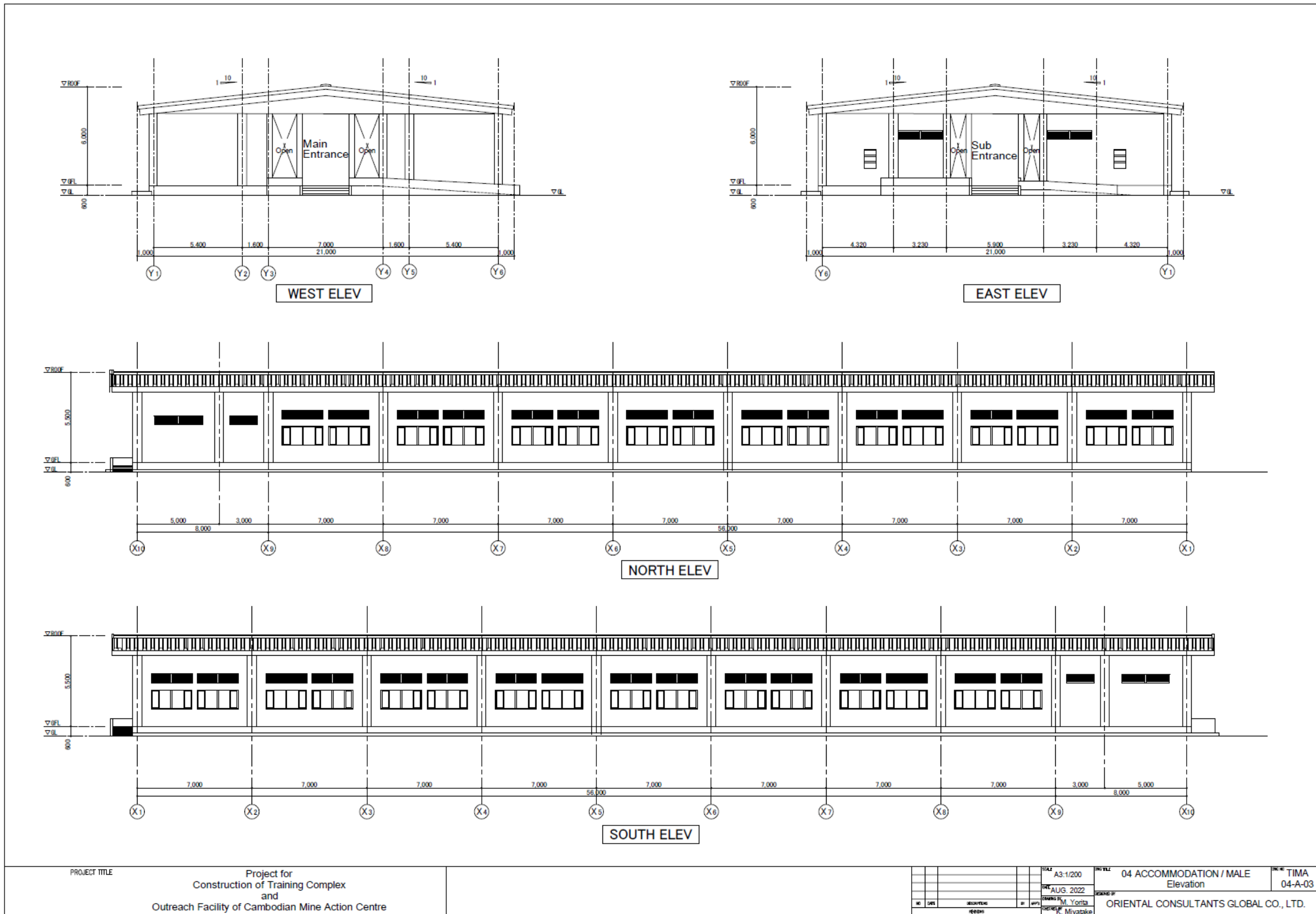


Figure 2-31 Elevation of TIMA Accommodation for Male

Source: JICA Study Team

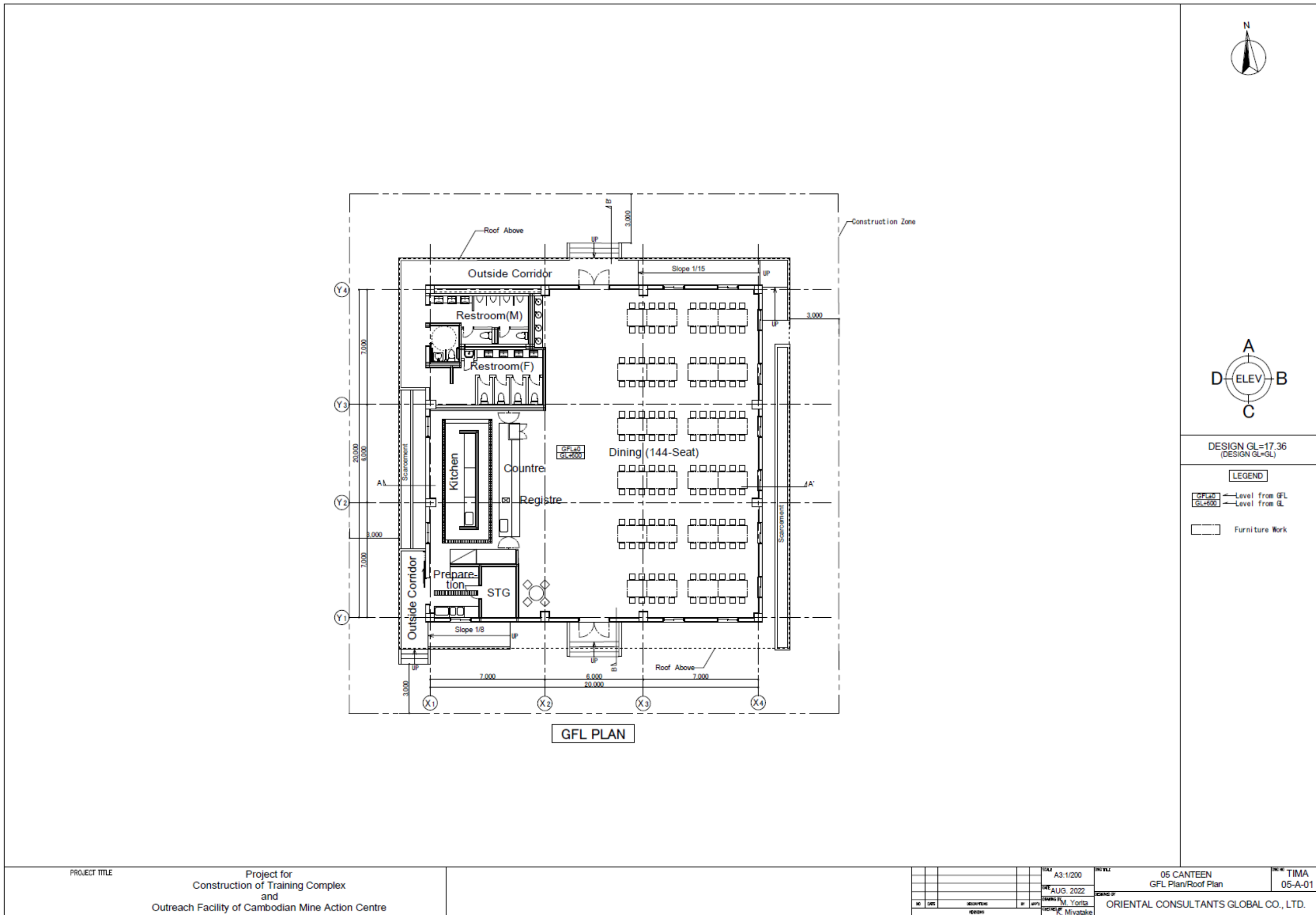


Figure 2-32 Floor Plan of TIMA Canteen (GFL)

Source: JICA Study Team

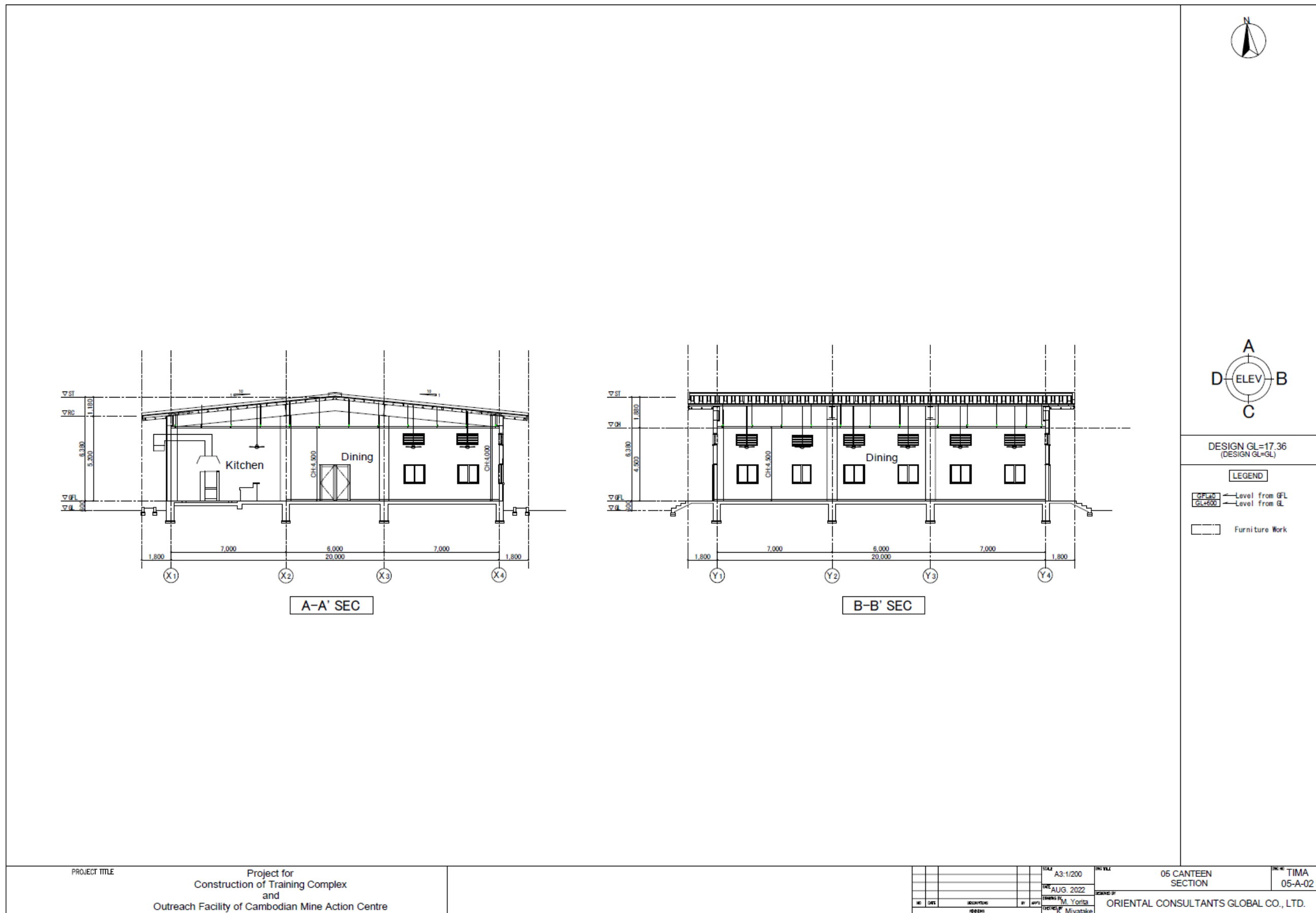
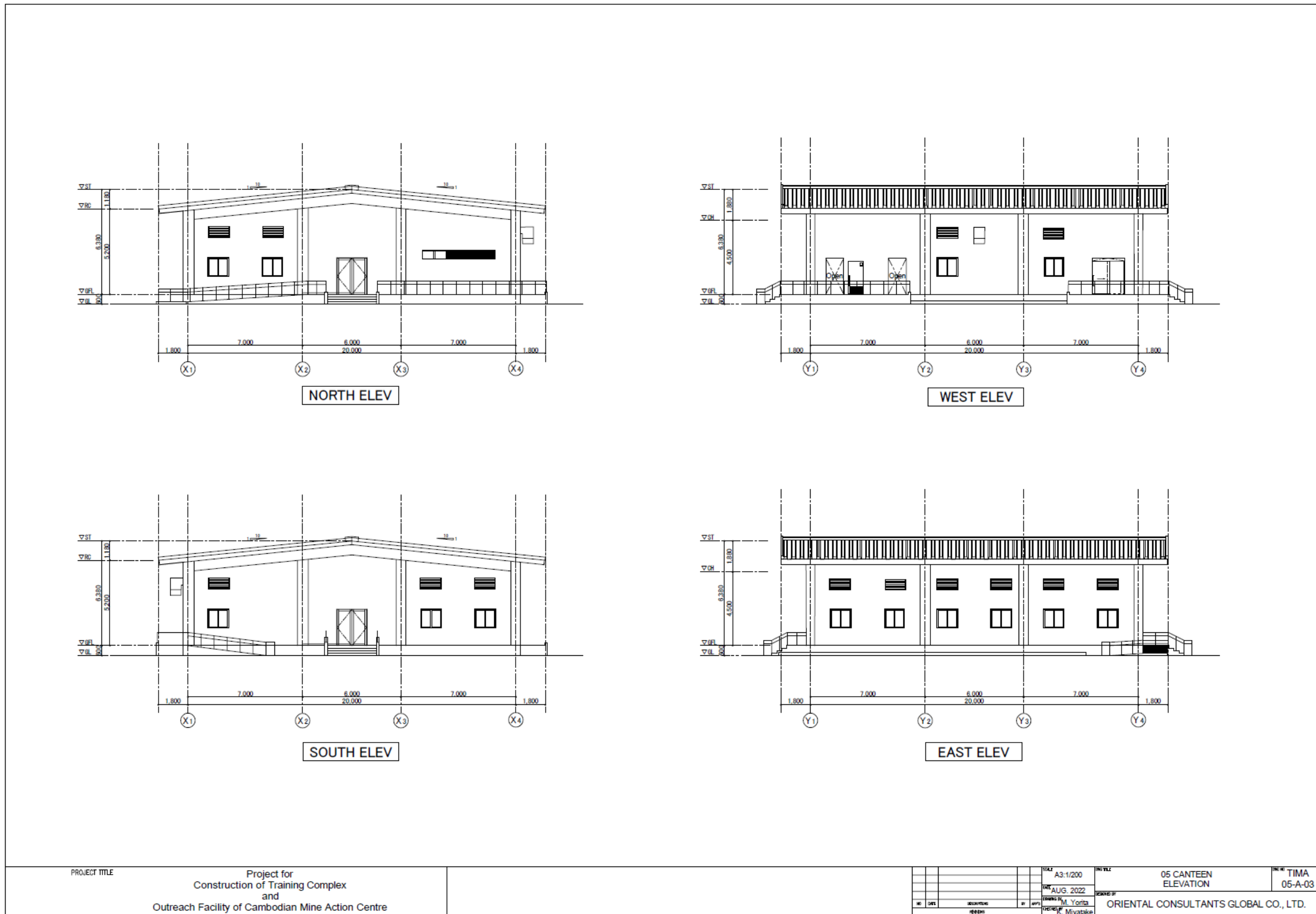


Figure 2-33 Section of TIMA Canteen

Source: JICA Study Team



Source: JICA Study Team

Figure 2-34 Elevation of TIMA Canteen



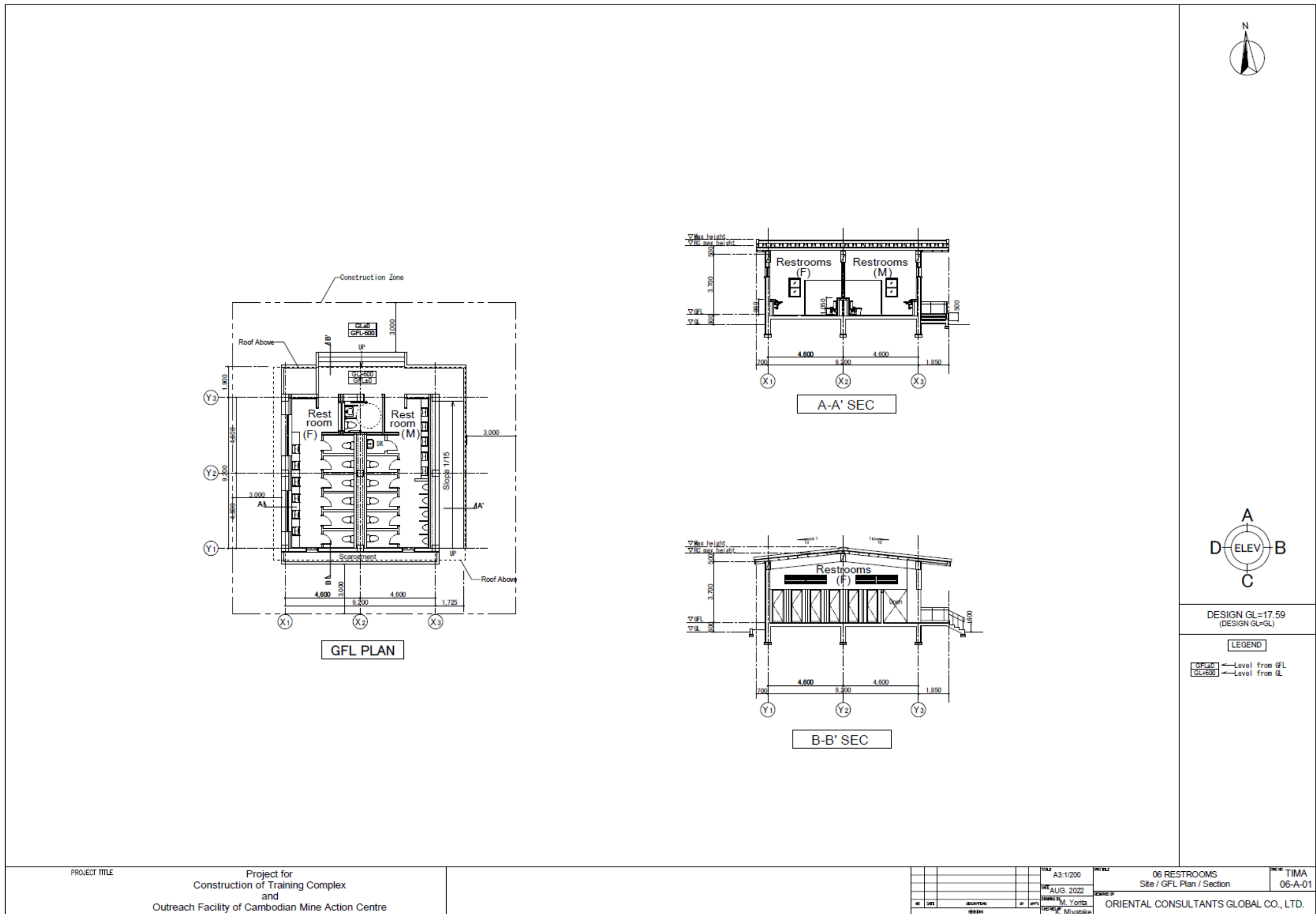


Figure 2-35 Floor Plan and Section of TIMA Restrooms for Classrooms

Source: JICA Study Team



Figure 2-36 Elevation of TIMA Restrooms for Classrooms

Source: JICA Study Team

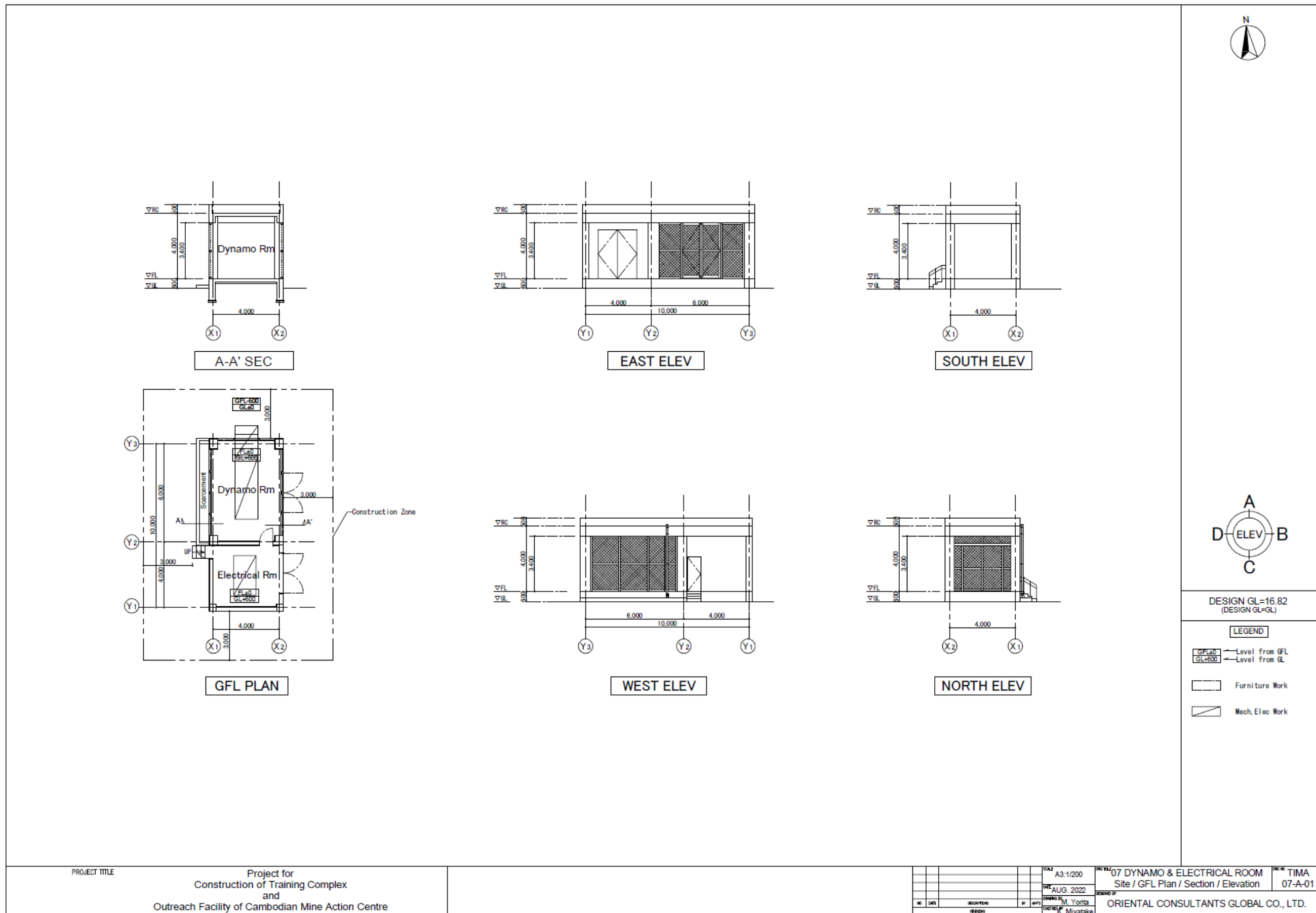


Figure 2-37 Floor Plan, Section and Elevation of TIMA Dynamo & Electrical Room

Source: JICA Study Team

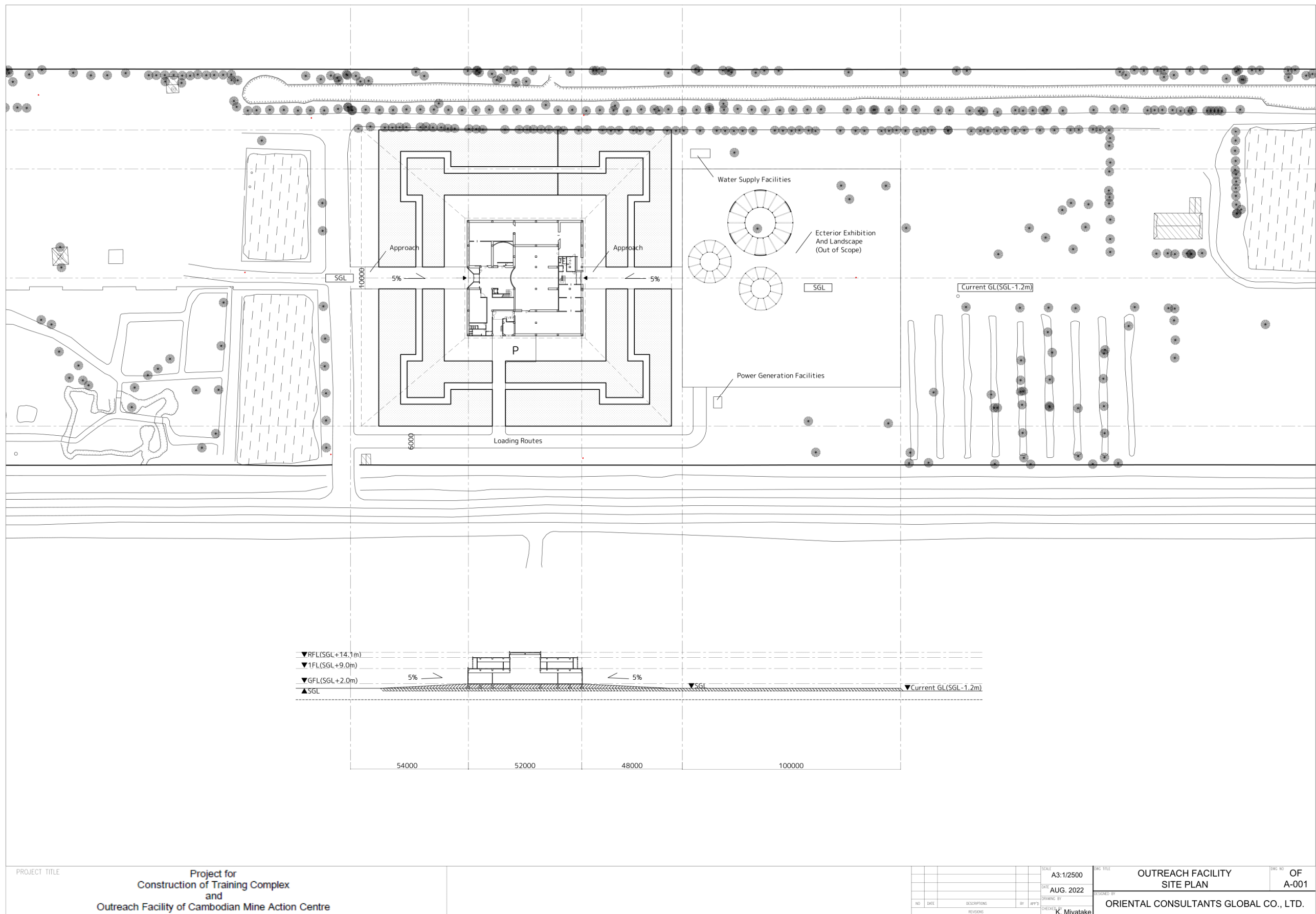


Figure 2-38 Layout of OF

Source: JICA Study Team

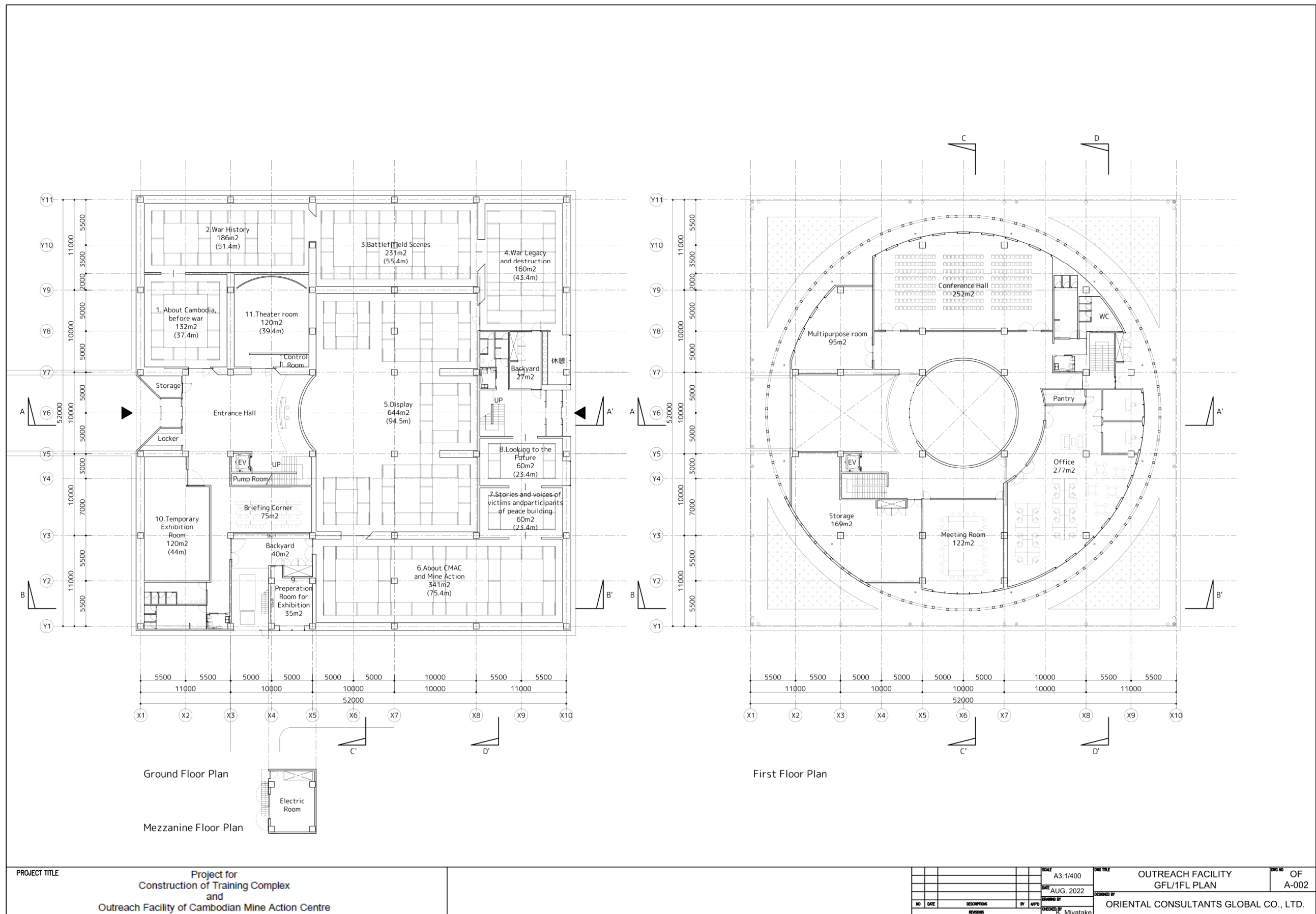


Figure 2-39 Floor Plan of OF (GFL, 1FL)

Source: JICA Study Team

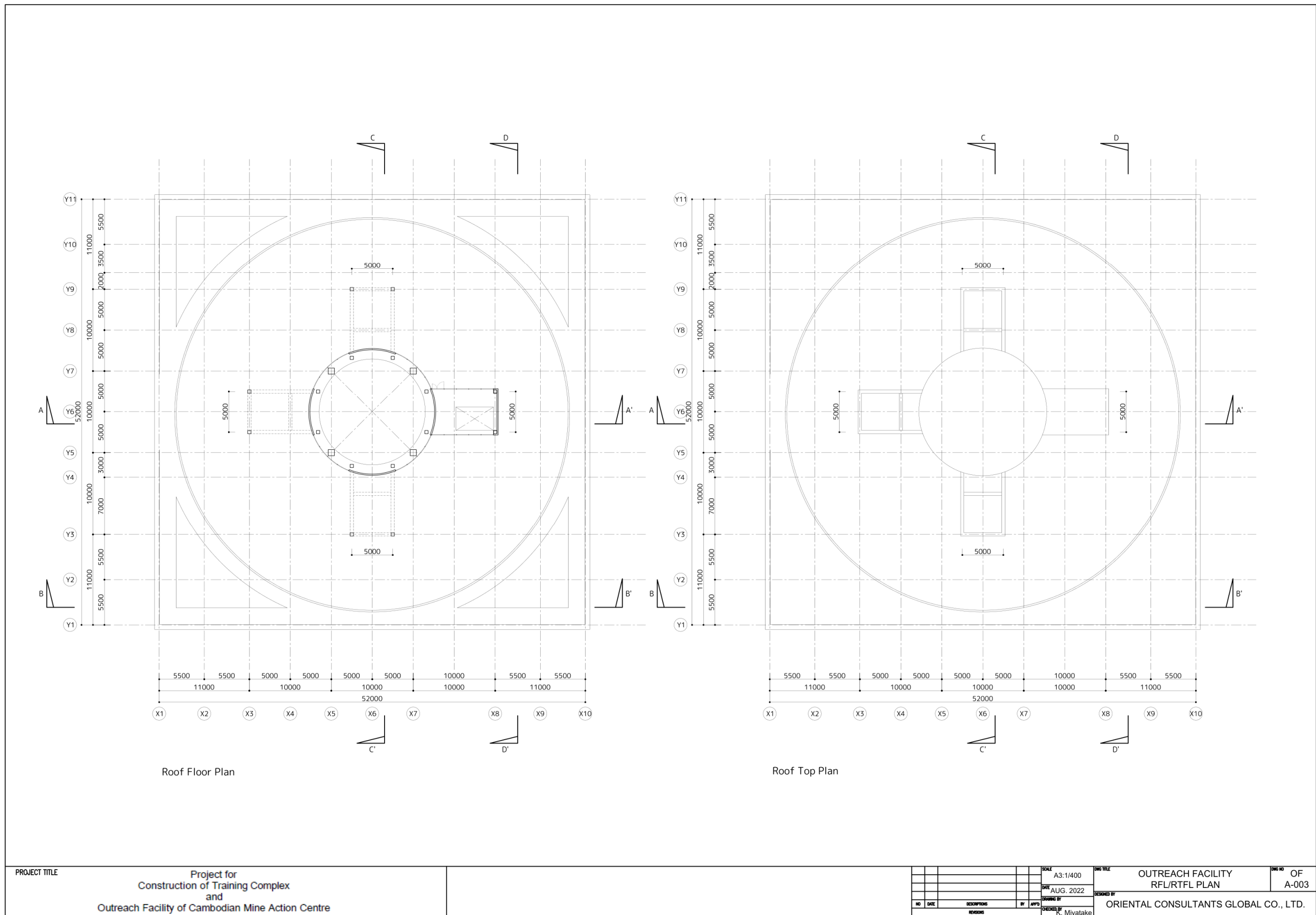
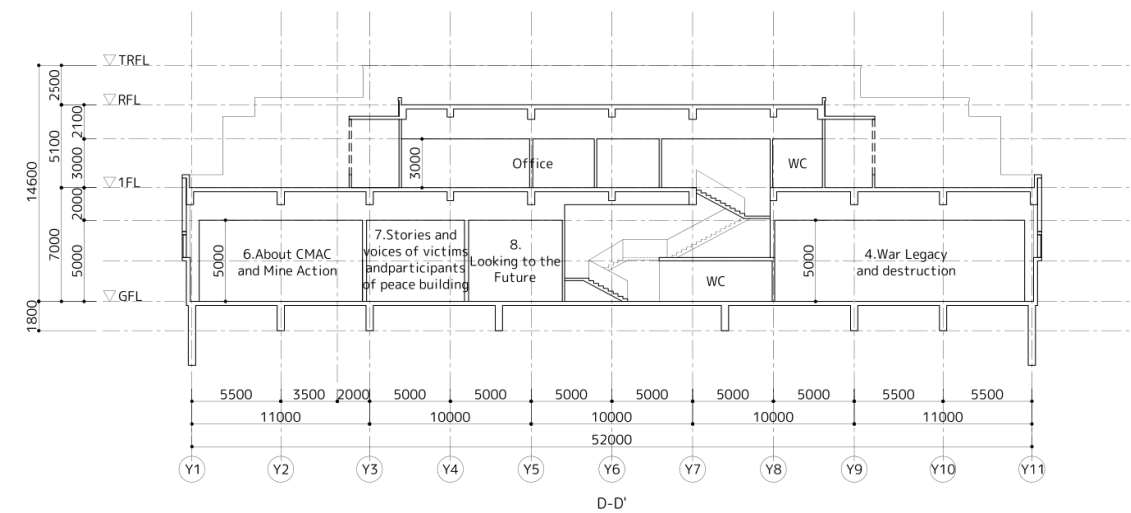
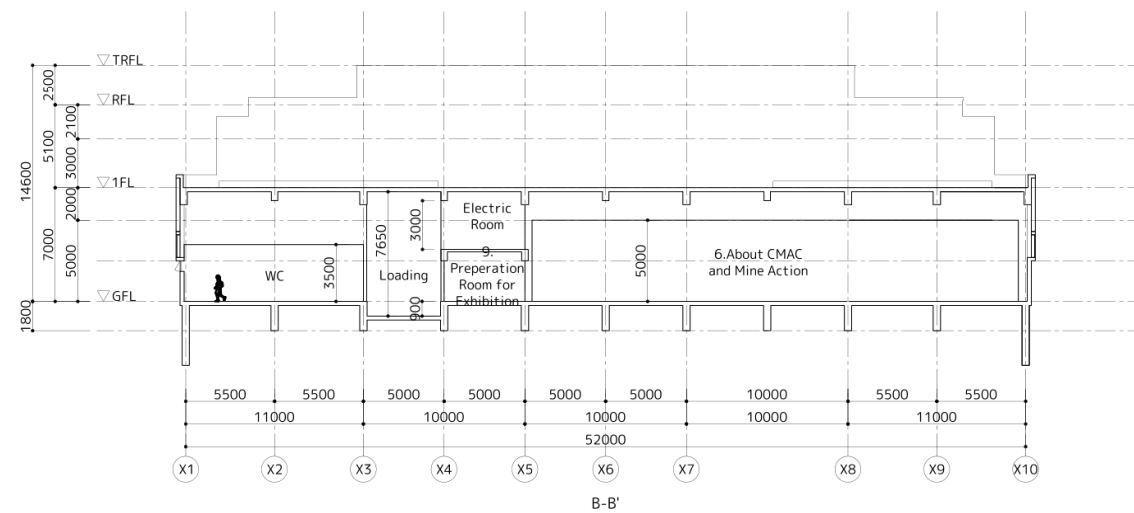
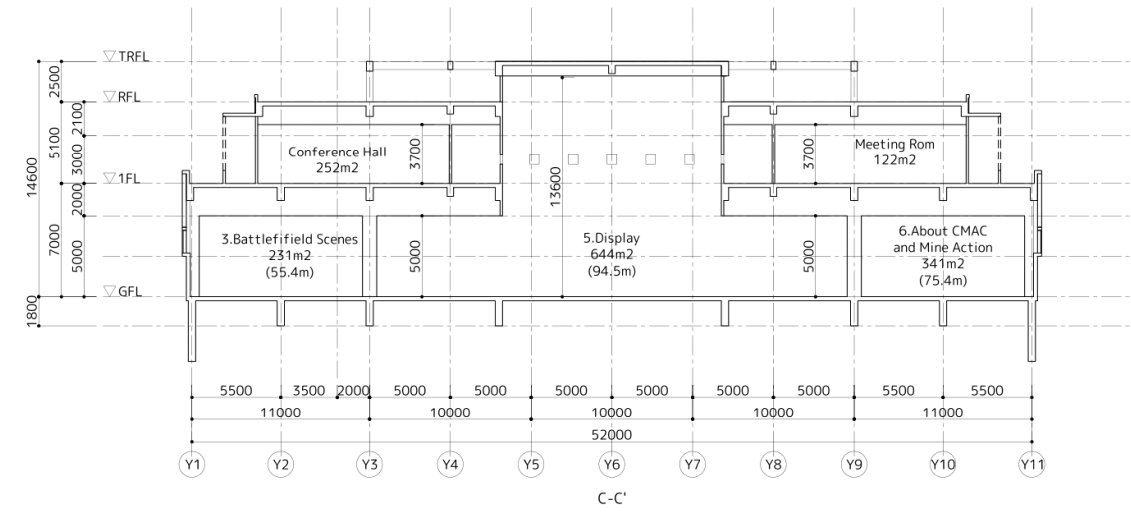
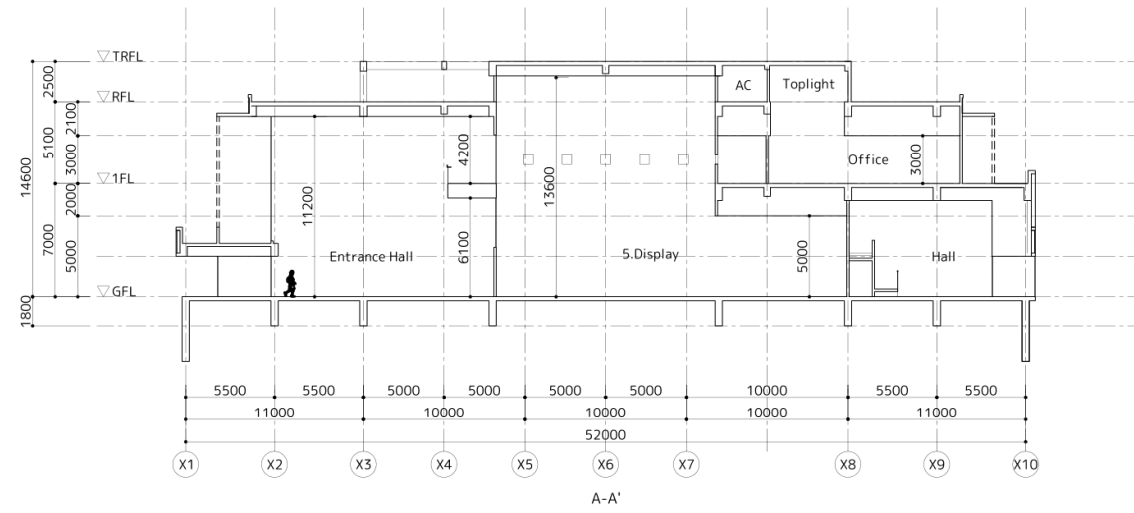


Figure 2-40 Floor Plan of OF (RFL, R-top)

Source: JICA Study Team



PROJECT TITLE  
 Project for  
 Construction of Training Complex  
 and  
 Outreach Facility of Cambodian Mine Action Centre

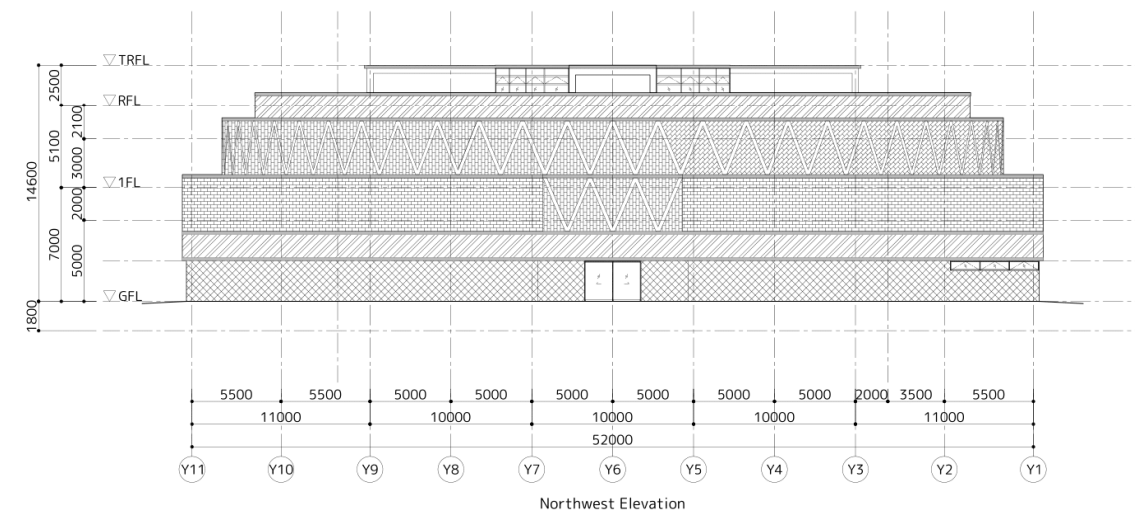
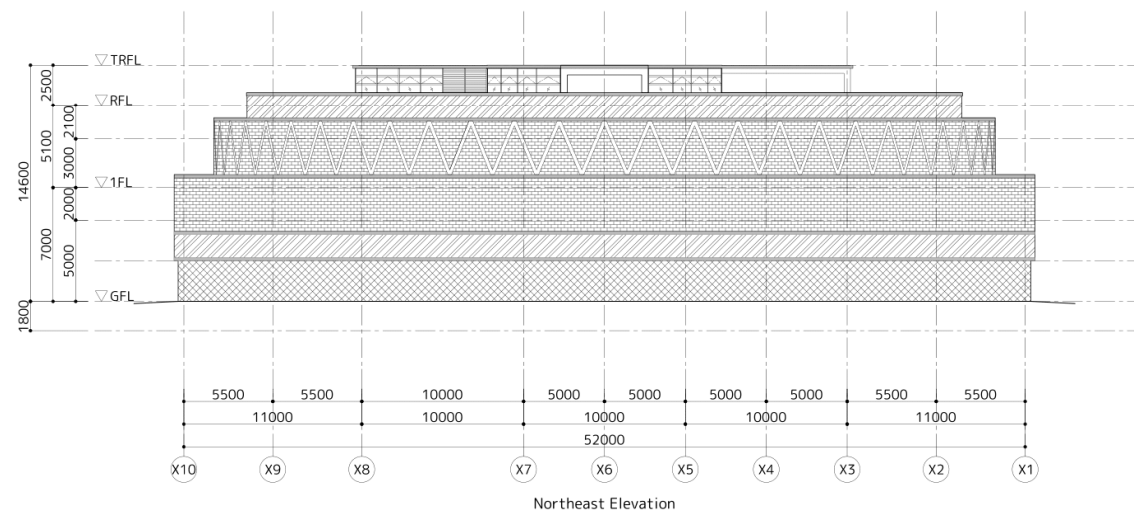
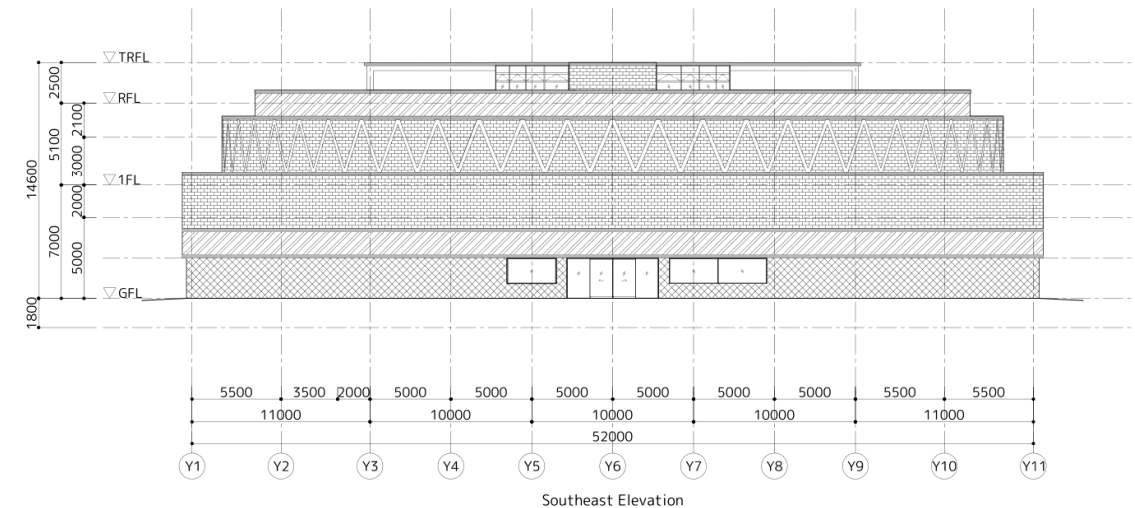
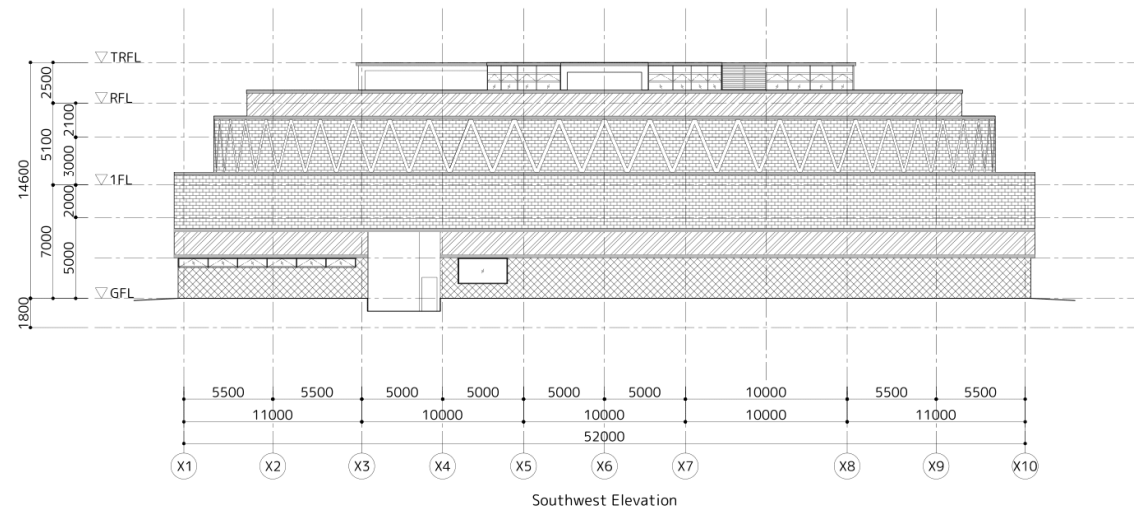
NO	DATE	DESCRIPTION	BY	APPD	CHECKED BY

SCALE  
 A3:1/400  
 DATE  
 AUG. 2022  
 DESIGNED BY  
 DRAWN BY  
 CHECKED BY  
 K. Miyatake

DWG TITLE  
 OUTREACH FACILITY  
 SECTION  
 DWG NO  
 OF  
 A-004  
 DESIGNED BY  
 ORIENTAL CONSULTANTS GLOBAL CO., LTD.

Figure 2-41 Section of OF

Source: JICA Study Team



FL/BL	
[Pattern]	DW01 Stone
[Pattern]	DW02 Mortar (washout finish)
[Pattern]	DW03 RC Border
[Pattern]	DW04 Patterned Brick
[Pattern]	DW05 Brick Screen
[Pattern]	DW06 Patterned Brick Screen

PROJECT TITLE  
 Project for  
 Construction of Training Complex  
 and  
 Outreach Facility of Cambodian Mine Action Centre

SCALE	A3:1/400	DWG TITLE	OUTREACH FACILITY ELEVATION	DWG NO	OF A-005
DATE	AUG. 2022	DESIGNED BY	ORIENTAL CONSULTANTS GLOBAL CO., LTD.		
NO	DATE	DESCRIPTION	BY	APPD	CHECKED
		REVISIONS			K. Miyatake

Figure 2-42 Elevation of OF

Source: JICA Study Team



## **2-2-4 Implementation Plan**

### **(1) Implementation Policy**

#### **1) Construction Policy**

Both construction sites in Kampong Chhnang and in Siem Reap are located within CMAC's site, thus considerations towards the neighbourhood is not particularly necessary.

In September, which is during the rainy season, preparation work including constructing temporary buildings, installing temporary barricades, surveying, loading piling machine, procuring pile materials, will be conducted. In October, which is the last month of the rainy season, piling work in OF site and excavation work in TIMA site will start.

At the OF site, the main frame construction work is difficult, and the quantity is high, thus it is necessary to thoroughly plan the number of workers and engineers, and to procure sufficient formwork support. After the civil work and finishing work of the exhibition area at the GF are completed, installation work of exhibition equipment will be conducted. It is crucial to ensure completion within the scheduled construction period.

At the TIMA site, a total of 7 buildings will be constructed, but the scale and difficulty level are not high. It is necessary to start the construction of each building in order, and to plan just enough number of workers, engineers and machineries. The considered construction period is 15 months for all the buildings, but partial completion is worth considering.

#### **2) Procurement Policy**

The main construction materials can be procured in Cambodia. In addition to local products, building materials from neighbouring countries are widely available in the local market. There is no problem with local procurement of cement, aggregates, reinforcing bars and formwork materials, including imported products. Ready-mixed concrete is also available.

Interior and exterior finishing materials such as tiles, paints, aluminium fixtures, lighting fixtures for equipment construction, switches, ceiling fans, electric wires, cables, plumbing materials, sanitary fixtures, pumps, and water tanks are widely available.

### **(2) Implementation Conditions**

#### **1) Construction**

Concerns regarding construction are as follows.

- (General) Measures for pouring concrete in hot weather needs to be confirmed.
- (TIMA) Support strength of the direct support ground needs to be confirmed.
- (OF) Number of workers needs to be planned.
- (OF) Sufficient temporary scaffolding materials need to be procured.
- (OF) Sufficient number of formworks supports needs to be procured.
- (OF) Accurate decorative bricks needs to be procured.
- (OF) Exposed formwork needs to be considered.

#### **2) Procurement: Tax Exemption**

The tax exemption procedure in the table below has been confirmed to CMAC.

Considering that CMAC has lots of experiences in exemption of customs duties and that no trouble has been observed until now, smooth operation is expected. However, CMAC is unfamiliar with the

procedure of VAT exemption of locally purchased products and other fiscal levies, and thus it should be noted that the necessary documents for exemption shall be submitted well in advance.

**Table 2-20 Tax Exemption Procedure**

Item	How to Exempt	Rate	Procedure
Corporate Tax	Exempt (advanced: no payment)	20%	Japanese contractor applies for Tax Exemption to GDT (General Department of Taxation) through CMAC, then GDT forward it to MEF (Ministry of Economy and Finance) after the internal approval in GDT, and then GDT issues the Letter of Tax Exemption. Duration: It takes approx. 5 months from application to issuance of the Letter of Tax Exemption by GDT.
Income Tax	Exempt (advanced: no payment)	Depending on income	Japanese contractor applies for Tax Exemption to GDT through CMAC, then GDT forwards it to MEF after the internal approval in GDT, and then GDT issues the Letter of Tax Exemption. Duration: It takes approx. 5 months from application to issuance of the Letter of Tax Exemption by GDT.
VAT (locally purchased products)	Exempt (advanced: no payment or reimbursed after payment)	10%	Japanese contractor applies for Tax Exemption to GDT through CMAC, then GDT forwards it to MEF after the internal approval in GDT, and then GDT issues the Letter of Tax Exemption. Duration: It takes approx. 6 months from application to issuance of the Letter of Tax Exemption by GDT.  It is also possible to follow the refund procedure to GDT based on Prakas No. 576 and No.577 for the VAT which is paid before the issuance of Letter of Tax Exemption. However it should be noted that Japanese contractor shall be registered in Cambodia to benefit from the refund.
VAT (imported products)	Exempt (advanced: no payment)	10%	The same procedure as customs duty.
Customs Duties (imported products)	Exempt (advanced: no payment)	Depending on items	(Step 1) Japanese contractor submits Master List of all material and equipment to be imported to CMAC, then CMAC submits it to CDC (Council of Development of Cambodia) for approval.  (Step 2) After approval of CDC, CMAC requests GDCE (General Department of Custom and Excise) to issue Letter of Tax Exemption to the Japanese contractor, together with shipping documents (B/L, invoice, and packing list).  (Step 3) After the issuance of GDCE letter, CMAC applies to GDT for exemption.

Source: JICA Study Team

### (3) Scope of Works

#### 1) Construction

Below is the cost to be borne by CMAC.

**Table 2-21 Scope of Work (Facility)**

Item	Japan	Cambodia
Construction of TIMA (classroom building, conference hall building, female accommodation building, male accommodation building, cafeteria building, restrooms for classroom building, dynamo & electrical room building)	○	

Item	Japan	Cambodia
OF facilities (indoor exhibition facility, generator equipment facility, approaching walkway, services access road)	○	
Embankment (TIMA: 0+0.9m, OF: 0+1.2m+1.7m)		○
Electric lead-in for TIMA and OF		○
TIMA water supply lead-in		○
TIMA's tree felling and felled roots		○
TIMA site's rainwater side drainage improvement		○
Landscape of TIMA and OF		○
Installation of additional gates for OF		○
Maintenance of sidewalks in OF		○
Maintenance of parking lots for OF		○
OF outdoor exhibition facility		○
Production and installation of exhibition content for OF		○
Furniture for OF (office, manager office, deputy manager office only)		○
Equipment for OF (wheelchairs)		○
Bank charges for B/A		○
EIA consulting service fee		○

Source: JICA Study Team

## 2) Procurement and Installation

**Table 2-22 Scope of Work (Equipment)**

Item	Japan	Cambodia
Procurement of Equipment	○	
Transportation to the site in Cambodia	○	
Exemption of taxes imposed by Cambodian Government		○
VPN Contract (including the equipment, if any)		○
Contents of Exhibition (OF)		○
Wheelchair (OF)		○
Preparation of site (existing building)		○
Preparation of site (new building constructed under the project)	○	
Installation (equipment which needs installation)	○	
Operation Training (equipment which needs operation training)	○	△ (The cost related to trainees shall be borne by Cambodian side.)
Operation and Maintenance Cost		○

Source: JICA Study Team

#### (4) Consultant Supervision

##### 1) Detailed Design and Bid

The staffing plan for detailed design and bidding is as follows.

**Table 2-23 Staffing Plan for Detailed Design and Bid**

Japanese Expert		Grade	Home Man-Month (M/M)	Field Man-Month (M/M)	Field Trips (times)	Total Man-Month (M/M)
1. Detailed Design						
TIMA Facility	Team Leader (both TIMA and OF)	2	2.00	0.50	1	2.50
	Architect 1	3	2.00	0.50	1	2.50
	Architect 2	4	1.50	0.00	0	1.50
	Structural Engineer 1	3	1.50	0.50	1	2.00
	Electrical Engineer 1	3	1.50	0.50	1	2.00
	Plumbing & Mechanical Engineer 1	3	1.50	0.50	1	2.00
	Quantity Surveyor 1	3	1.50	0.33	1	1.83
OF Facility	Architect 3	3	2.00	0.00	0	2.00
	Architect 4	4	2.00	0.00	0	2.00
	Structural Engineer 2	3	1.50	0.00	0	1.50
	Electrical Engineer 2	3	1.70	0.00	0	1.70
	Plumbing & Mechanical Engineer 2	3	1.50	0.00	0	1.50
	Exhibition Expert 1	3	1.50	0.33	1	1.83
	Exhibition Expert 2	4	1.50		0	1.50
Equipment	Quantity Surveyor 2	3	1.50	0.00	0	1.50
	Equipment Planner (both TIMA and OF)	3	0.35	0.33	1	0.68
	Procurement Expert (both TIMA and OF)	3	0.50	0.00	0	0.50
Sub-total of 1. Detailed Design			25.55	3.49	8.00	29.04
2. Bid-Related Work 1						
TIMA & OF	Team Leader (both TIMA and OF)	2	0.50	0.50	1	1.00
	Architect 1	3	0.50	0.00	0	0.50
	Structural Engineer 1	3	0.50	0.00	0	0.50
	Electrical Engineer 1	3	0.50	0.00	0	0.50
	Plumbing & Mechanical Engineer 1	3	0.50	0.00	0	0.50
	Quantity Surveyor 1	3	0.50	0.00	0	0.50
	Exhibition Expert 1	3	0.50	0.50	1	1.00
	Bid and Contract Documents Expert (Architecture) 1 (both TIMA and OF)	4	0.25	0.00	0	0.25
Equipment	Equipment Planner (both TIMA and OF)	3	0.35	0.33	1	0.68
Sub-total of 2. Bid-Related Work 1			4.10	1.33	3	5.43
3. Bid-Related Work 2						
TIMA & OF	Team Leader (both TIMA and OF)	2	0.25	0.33	1	0.58
	Architect 1	3	0.25	0.33	1	0.58
Equipment	Equipment Planner (both TIMA and OF)	3	0.25	0.00	0	0.25
Sub-total of 3. Bid-Related Work 2			0.75	0.66	2	1.41
Total (1+2+3)			30.40	5.48	13	35.88

Source: JICA Study Team

## 2) Construction Supervision

The staffing plan for construction supervision is as follows.

**Table 2-24 Staffing Plan for Construction and Procurement Supervision**

Japanese Expert		Grade	Home Man-Month (M/M)	Field Man-Month (M/M)	Field Trips (times)	Total Man-Month (M/M)	
1. Construction Supervision							
Japanese Engineer	TIMA & OF	Resident Construction Supervisor 1	3	-	19.00	3	19.00
		Project Manager/ Construction Supervisor 2 (Architecture)	2	-	1.50	3	1.50
		Construction Supervisor 3 (Architecture)	3	-	1.33	3	1.33
		Construction Supervisor 4 (Structure)	3	-	0.50	1	0.50
		Construction Supervisor 5 (Electrical)	3	-	1.00	2	1.00
		Construction Supervisor 6 (Mechanical and Plumbing)	3	-	1.00	2	1.00
		Construction Supervisor 7 (Exhibition)	3	-	1.00	2	1.00
Local Engineer	TIMA & OF	Construction Supervisor 8 (Architecture 1) TIMA	-	-	15.00	-	15.00
		Construction Supervisor 9 (Architecture 2) OF	-	-	22.00	-	22.00
		Construction Supervisor 10 (Electrical 1) TIMA	-	-	11.00	-	11.00
		Construction Supervisor 11 (Electrical 2) OF	-	-	17.00	-	17.00
		Construction Supervisor 12 (Mechanical and Plumbing 1) TIMA	-	-	11.00	-	11.00
		Construction Supervisor 13 (Mechanical and Plumbing 2) OF	-	-	17.00	-	17.00
		Office Manager	-	-	19.00	-	19.00
		Driver (included in rental car fee)	-	-	15.00	-	15.00
Total			-	-	137.33	16	137.33
2. Procurement Supervision							
Japanese Engineer	Equipment	Inspector (confirmation/ verification of shop drawing, onsite inspection)	3	0.90	-	1	0.90
		Procurement Manager	3	-	0.73	0	0.73
Total			0.90	0.73	1	1.63	

Source: JICA Study Team

## 3) Construction Supervision by Contractor

Structure of construction supervision by the Japanese side is as shown below.

**Table 2-25 Construction Supervision by Japanese Side**

Position	Grade	Field Trips (times)	Period (M/M)	Remarks (Work in Charge)
Resident Construction Supervisor 1	3	3	19.00	Site management
Project Manager/ Construction Supervisor 2 (Architecture)	2	3	1.50	Construction drawing review, construction management work, defect inspection
Construction Supervisor 3 (Architecture)	3	3	1.33	Construction drawing review
Construction Supervisor 4 (Structure)	3	1	0.50	Construction drawing review
Construction Supervisor 5 (Electrical)	3	2	1.00	Electrical work
Construction Supervisor 6 (Mechanical and Plumbing)	3	2	1.00	Mechanical and plumbing work
Construction Supervisor 7 (Exhibition)	3	2	1.00	Exhibition work
Total		16	25.33	

Source: JICA Study Team

### (5) Quality Control Plan

Basically, the quality control plan is made according to the standard specifications for public building work, but particular attention is necessary for the following items.

#### 1) General

- Quality, design strength and delivery timing of concrete materials
- Measures for pouring concrete in hot weather
- Quality of reinforcing bars

#### 2) OF Site

- Concrete material quality control: (1) Design standard strength (Fc) 30N/mm<sup>2</sup>, (2) Structural strength correction value (S) 6N/mm<sup>2</sup> (corresponding to hot concrete), (3) Mixed control strength (Fm) (1) + (2) = 36N/mm<sup>2</sup>
- Pile material quality and piling construction accuracy
- Accuracy of construction drawing of exposed formwork and concrete casting design
- Quality of decorative bricks
- Accuracy of construction drawing of decorative bricks
- Quality of waterproof material, inspection and water leakage test

#### 3) TIMA Site

- Concrete material quality control: (1) Design standard strength (Fc) 24N/mm<sup>2</sup>, (2) Structural strength correction value (S) 6N/mm<sup>2</sup> (corresponding to hot concrete), (3) Mixed control strength (Fm) (1) + (2) = 30N/mm<sup>2</sup>
- Strength of supporting ground
- Steel frame construction and frictional joints

### (6) Procurement Plan

Some of the required main construction materials locally produced, but since many are imported from neighbouring countries (mainly Vietnam and Thailand), cooperation from related ministries and agencies, and clarification of tax exemption procedures are essential. There is no problem with local procurement of cement, reinforcing bars, and formwork materials, including imported products. There is a ready-mixed

concrete manufacturing plant near the Project sites. Interior and exterior materials such as tiles, paints, aluminium products, lighting, switches, ceiling fans, electric wires, cables, piping materials, sanitary equipment, pumps, water tanks, and switchboards are either locally produced products or imported products area widely available in the local market.

**Table 2-26 Procurement Source of Main Materials**

Material	Procurement Source			Country of Origin
	Local	Japan	Third Country	
River sand	○			
Mountain sand	○			
Gravel	○			
Sandstone	○			
Marble	○		○	Thailand
Granite	○		○	Vietnam, Thailand
Cement	○		○	Vietnam, Thailand
Burned brick	○		○	Vietnam, Thailand
ALC block	○		○	Vietnam, Thailand
Concrete	○			
PC pile, RC pile	○		○	Vietnam
Reinforcing bar (round steel)	○		○	Vietnam, Thailand
Deformed bar	○		○	Vietnam, Thailand
Iron pipe	○		○	Vietnam, Thailand
Stainless pipe	○		○	Vietnam, Thailand
Steel materials (H steel, etc.)	○		○	Vietnam, Thailand
Steel angle	○		○	Vietnam, Thailand
High strength bolt	○	○	○	Vietnam, Thailand
Lightweight C-shaped steel (lip channel steel)	○		○	Vietnam, Thailand
Lightweight steel base (wall, ceiling base)	○		○	Vietnam, Thailand
Steel plate	○		○	Vietnam, Thailand
Welding rods	○		○	Vietnam, Thailand
Mechanical fittings	○		○	Vietnam, Thailand
Veneer plywood	○		○	Vietnam, Thailand
Gypsum board	○		○	Vietnam, Thailand
Ceiling sound absorbing board	○		○	Vietnam, Thailand
Aluminium sash window	○		○	Vietnam, Thailand
Glass	○		○	Vietnam, Thailand
Steel door	○		○	Vietnam, Thailand
Paint	○		○	Vietnam, Thailand
Ceramic tile	○		○	Indonesia, Thailand, Italy
Stone tile	○		○	Vietnam, Thailand
Vinyl tile	○		○	Vietnam, Thailand
Floor sheet	○		○	Vietnam, Thailand
Carpet	○		○	Vietnam, Thailand
Flooring	○		○	Vietnam, Thailand

Material	Procurement Source			Country of Origin
	Local	Japan	Third Country	
Wall vinyl cloth	○		○	Vietnam, Thailand
Curtain	○		○	Vietnam, Thailand
Blind	○		○	Vietnam, Thailand
Mirror	○		○	Vietnam, Thailand
Galvalume roof steel plate	○		○	Vietnam, Thailand
Roof drain	○		○	Vietnam, Thailand
Interlocking paver	○		○	Vietnam, Thailand
Gutter grating	○		○	Vietnam, Thailand
Asphalt material	○		○	Vietnam, Thailand
Tarpaulin	○		○	Malaysia, Vietnam, Singapore, Thailand
Manhole cover	○		○	Vietnam, Thailand
Switchboards	○		○	Vietnam, Thailand
Electric wire/cable	○		○	Vietnam, Thailand
Outlets, switches	○		○	Vietnam, Thailand
Lighting	○		○	Vietnam, Thailand
Air conditioner	○		○	Vietnam, Thailand
FRP panel tank	○		○	Vietnam, Thailand
Pumps	○		○	Vietnam, Thailand
Combined septic tank	○		○	Vietnam, Thailand
Elevator	○		○	Vietnam, Thailand
Sanitary appliances	○		○	Vietnam, Thailand
Piping material	○		○	Vietnam, Thailand
Nameplate	○		○	Vietnam, Thailand

Source: JICA Study Team

To ensure ease of repair and maintenance of the equipment, local purchase is prioritized. However, regarding the equipment which is not widely handled in the local market, procurement in Japan or third countries is also considered. Warranty will be set for 1 year after the installation (Warranty of the equipment whose installation work is not provided by Japanese side will be 1 year after the receipt.).

**Table 2-27 Procurement Plan of the Equipment**

Type of Equipment	Supplier		
	Cambodia	Japan	Third Countries
IT equipment, administration equipment, maintenance equipment	○		
PA system		○	
Showcase		○	○ (Germany)*
Display monitor, touch panel	△ (depending on the specifications)	○	
DLP projector		○	
Model		○	

\* Regarding the showcase, the Japanese manufacturer who address international market is limited. Therefore, German manufacturer with business in Japanese market is also considered.

Source: JICA Study Team



In case of local procurement, materials/ equipment will be transported by land from the local warehouse in Phnom Penh to TIMA site (Kampong Chhnang) or OF (Siem Reap). The road conditions are good and there are no problems with land transportation. In the case of procurement from Japan or a third country, materials/ equipment will be transported by sea from major international ports by container and landed at Phnom Penh Port or Sihanoukville Port. After customs clearance, they will be transported by land to TIMA (Kampong Chhnang) or OF (Siem Reap) and devanned at the site. It is assumed that a total of 3 months is required for shipping until arrival at sites.

### (7) Operational Guidance Plan

Operation training will be provided for unfamiliar equipment/model for CMAC. Immediately after the completion of installation, operation training will be done using the equipment or referring to the manual or block diagram. The detail is shown in the table below.

**Table 2-28 Operation Training Plan**

No	Equipment Name	Installation	Operation Training						
			No of Days			Contents	No of trainees		
			HQ	TIMA	OF		HQ	TIMA	OF
1	Projector Set A	Required	0.0	0.5	0.5	Operation, maintenance	0	31	7
2	WEB Conference System A	Required	0.0	1.0	0.0	Operation, connection, maintenance	0	15	0
3	WEB Conference System B	Required	0.0	1.0	1.0	Operation, connection	0	31	7
4	Copier	Required	0.0	0.5	0.5	Operation, connection	0	15	7
5	PA System	Required	0.0	1.0	1.0	Operation, connection, maintenance	0	4	8
6	PC A								
7	PC B								
8	PC C	Required							
9	File Server	Required	1.0	0.0	0.0	Operation, configuration	3	0	0
10	Aerial Work Platform		0.0	0.0	1.0	Operation, maintenance	0	0	10
11	Showcase	Required	0.0	0.0	0.0				
12	Display Monitor	Required	0.0	0.5	0.0	Operation, programming	0	0	7
13	Model A	Required	0.0	0.0	0.0				
14	Model B	Required	0.0	0.0	0.5	Operation, programming	0	0	7
15	Touch Panel A	Required	0.0	0.0	0.0				
16	Touch Panel B	Required	0.0	0.0	0.0				
17	Touch Panel C	Required	0.0	0.0	0.0				
18	Projector Set B	Required	0.0	0.5	0.0	Operation, programming, maintenance	0	0	7
19	Projector Set C	Required	0.0	1.0	0.0	Operation, connection, programming, maintenance	0	0	7

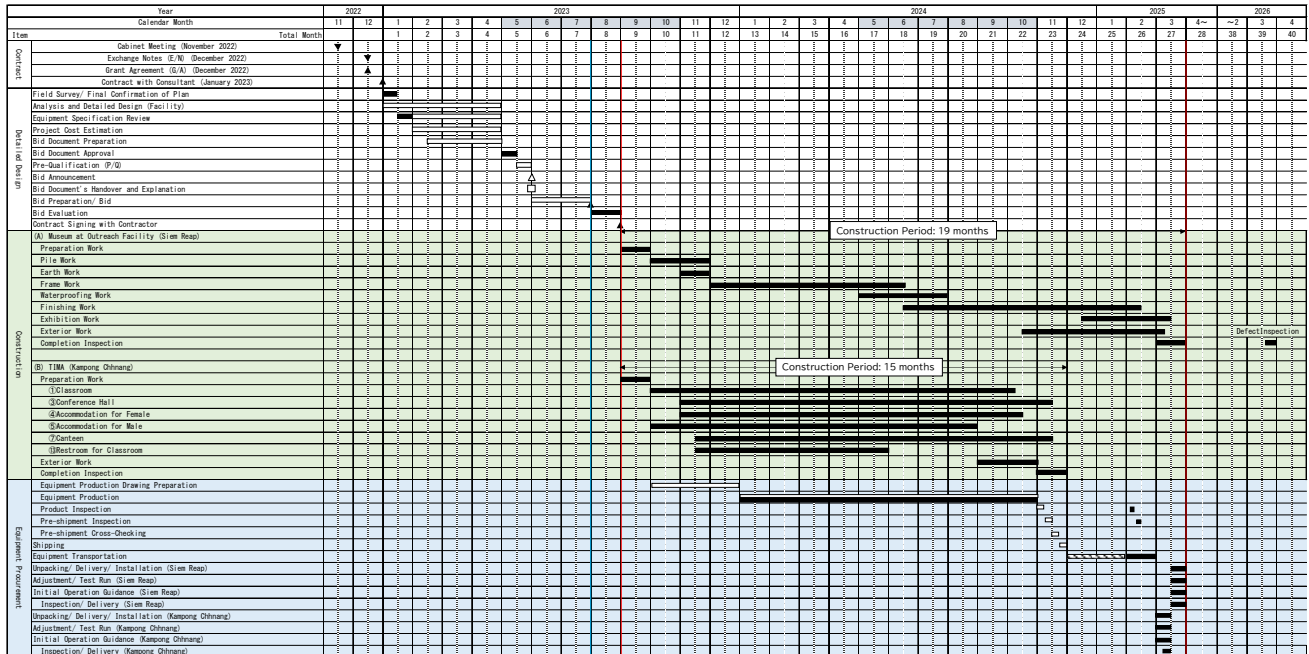
Source: JICA Study Team

## (8) Implementation Schedule

Upon the implementation of this Project as a grant aid project, an E/N between the governments of both countries and a G/A between the executing agency and JICA will be concluded after the cabinet approval of GOJ. After that, contract for consultancy services will be concluded based on the E/N and G/A, followed by Detailed Design and Bidding. Afterwards, contract for building construction and equipment procurement will be concluded.

It takes 4.5 months for Detailed Design (field survey to approval of bid documents) and 3.5 months for Bidding (publication of PQ to contract signing). Building construction and equipment procurement is within 1 package, but due to the differences in the construction scale of each site, implementation will take 15 months for TIMA in Kampong Chhnang and 19 months for OF in Siem Reap.

The project implementation schedule (draft) is as follows, assuming the cabinet meeting will be in November 2022.



Source: JICA Study Team

Table 2-29 Implementation Schedule

### 2-3 Security Plan

Both construction sites in Kampong Chhnang and in Siem Reap are located within CMAC's site, thus considerations towards the neighbourhood are not particularly necessary. Safety plan needs to be considered based on JICA safety guidelines, paying attention particularly to the following safety measures.

- Setting up of temporary barricades around the building construction sites
- Limitation of speed of construction vehicles within CMAC site.
- Safety of temporary external scaffolding (12m height or more)
- Workers' work during hot weather
- Countermeasures against dust during the dry season
- (OF site) Safety of formwork support (approximately 7m height)
- (OF site) Safety of internal scaffolding (approximately 7m height)

## **2-4 Obligations of Recipient Country**

The obligation for this project is as described in the previous section "2.4.3 Construction Classification / Procurement and Installation Classification. The following is an overview of the Cambodian share of the project.

### **2-4-1 Embankment work at the project site (before bidding)**

In TIMA site and OF site where the land is low from the surrounding ground and roads, CMAC will need to perform appropriate embankment work prior to the start of the building construction work. In addition, CMAC will need to prepare the soil to be used for the embankment work, although the embankment work itself will be carried out by the Japanese side.

### **2-4-2 Installation of infrastructure to the project site (during the construction period)**

CMAC needs to have the appropriate construction work performed on the CMAC side for the installation of water supply line and the increased electric supply line at the TIMA site and the installation of the increased electric supply line at the OF site.

### **2-4-3 Cost to hire EIA consultant to get EPC (before bidding)**

As obtaining EPC (Environment Protection Contract) is required by law, CMAC needs the support from an EIA Consultant to obtain EPC.

### **2-4-4 Exterior work at the project site (during the construction period and/or after completion)**

TIMA site, as well as the construction of a parking lot for visitors at the OF and a pedestrian path from the parking lot to the approach road constructed on the Japanese side, will need to be done by CMAC in parallel with the construction by the Japanese side.

At the OF site, landscape work around the indoor exhibition facility will be carried out by the Cambodian side as soon as the exterior work by the Japanese side is completed.

### **2-4-5 Construction of outdoor exhibition facility at OF project site**

The outdoor exhibition facility was originally included in the scope of this project but was eventually removed. Therefore, it will be constructed in parallel with the Project by CMAC side.

### **2-4-6 VPN Installation (Contract) (by the commencement of installation works of equipment)**

The server to archive the training material will be installed in HQ based on the CMAC policy for smooth maintenance. Therefore, it is necessary to ensure access to the HQ server from TIMA or OF. Currently TIMA and OF use the dedicated line; however, since CMAC must pay the relocation fee every time, VPN service is considered. It is required to enter into a contract with VPN service and install the device if any, before starting the server installation in HQ.

### **2-4-7 Exhibition Plan**

Provision of materials, production, and installation of exhibition items (graphics, video software, models, etc.) (e.g., provision of photos and manuscripts; supply of literature based upon which illustrations, drawings, and models will be created; materials necessary to produce the video software, installation of items into the video software, adjustment). These tasks must be executed after the construction work completion before the museum opening.

- Supervision over the exhibition items as specified above
- Tasks related to articles that will be exhibited: article selection and display, and production of exhibition
- accessories and fixtures as needed
- On-site operation until the museum opening

#### 2-4-8 Wheelchair (after the completion of the works and before opening of OF)

To ensure accessibility it is desirable to prepare wheelchair by the opening of OF. Initially wheelchair was included in the equipment list. However, it became the item to be provided by CMAC due to its easy obtainability in local market.

#### 2-4-9 Personnel (by the commencement of the operation training)

To enhance TIMA and OF, the number of trainers and assistant staff shall be increased. In TIMA, ArcGIS course will be newly provided, and therefore, qualified trainers shall be ensured. In OF it is also necessary to deploy the well-trained staff for appropriate operation.

#### 2-4-10 Cost for maintenance of equipment (after the completion of the works)

It is required to ensure the budget for ArcGIS annual license fee from 2nd year and equipment repair, as well as consumables such as toner or oil.

### 2-5 Project Operation Plan

#### 2-5-1 Facility

TIMA and OF will be provided with a variety of electrical and mechanical equipment. Therefore, periodic inspections of the electrical substation and In-House Power Generator Equipment, cleaning of the Reservoir Water Tank, Elevated Water Tank, sludge withdrawal from Septic Tank and Wastewater Treatment Facility, and cleaning of the filters of the Air-Cooled Heat Pump Type AC will be required.

Since the maintenance of Wastewater Treatment Facility and Sand Filtration Systems may be outsourced to outside contractor, these outsourcing expenses should be included in the budget for maintenance and operation.

#### 2-5-2 Equipment

Special care or technical knowledge in using or maintenance is not required except 3D theatre using the model different from ordinary projector and PA system which has synchronized function of several equipment. The equipment can be used longer if the repair or adjustment is properly outsourced. In OF, there is no spare equipment. Therefore, in case of defect, prompt action is necessary not to disappoint the visitors. To strengthen the organizational capability, it is important that OF reports to HQ immediately after finding any defect. HQ is also expected to check the equipment status and registration list regularly.

### 2-6 Project Cost Estimation

#### 2-6-1 Initial Cost Estimation

Below is the cost estimated to be borne by the Government of Cambodia.

**Table 2-30 Project Cost Breakdown (to be borne by Cambodia)**

No	Item	Specification	Amount (USD)	Remarks
<b>A</b>	<b>Administration</b>			
1	Banking charge for B/A		18,400	0.1% of Construction Cost
2	EIA Consultant		20,000	
<b>Sub-total of A. Administration</b>			<b>34,726</b>	
<b>B</b>	<b>TIMA (Kampong Chhnang)</b>			
3	Embankment(0+0.9m)	100m × 130m × 0.9 (Good quality soil) Carry in the site only	46,800	

No	Item	Specification	Amount (USD)	Remarks
4	Electrical System	500KVA Transformer (Electrical pole)	19,000	Transformer will be provided by EDC
5	Water system	20mm	1,100	
6	Water system	50mm	1,000	Northern side
7	Tree logging		10,000	
8	Site drainage system		10,000	
9	Equipment	VPN	10,000	Surrounding building except Toilet and Electrical building.
<b>Sub-total of B. TIMA (Kampong Chhnang)</b>			<b>97,900</b>	
<b>C</b>	<b>OF (Siem Reap)</b>			
10	Embankment (0+1.2m)	125m × 250m × 1.2 (Good quality soil) compacted each 300mm depth	262,500	
11	Embankment (+1.2m-+1.7m)	100m × 100m × 1.7 (Good quality soil) Carry in the site only	49,600	
12	Electrical System	630KVA Transformer (Electrical pole)	19,000	Transformer will be provided by EDC
13	Additional Gate	Steel structure	5,000	
14	Sidewalk	Interlocking block	40,000	Out of Japanese project area
15	Parking for visitors	Gravel pavement	125,000	
16	Landscape	Tree & grass	22,080	
17	Outdoor Facility		494,000	Due to scope-cut from the Project
18	Exhibition contents	Graphic	75,500	
		Installation cost	34,602	
19	Equipment (Local Procurement Use existing material, manufactured by CMAC and/or Local Company)	Contents for Display Monitor 2-3	0	
		Contents for Projector 3-6	0	
		Contents for Display Monitor 4-5	50,000	
		Touch Panel for searching Program 5-3, 5-4, 5-6	9,000	
		Touch Panel for Quiz Program 6-10	3,000	
		Touch Panel for Interview Contents & Programming 7-3	3,000	
		Contents for Theatre	104,000	
		2 sets of Model or Graphic	39,000	
		Model 2-6	0	
		<b>Sub-total of Equipment</b>	<b>208,000</b>	
20	Furniture		34,206	Office Manager room and Deputy Manager room
21	Other	Wheelchair	4,000	For visitors
<b>Sub-total of C. OF (Siem Reap)</b>			<b>1,373,488</b>	
<b>Total (A+B+C)</b>		<b>(USD)</b>	<b>1,509,788</b>	
		<b>(JPY) 1 = 135.24</b>	<b>204,183,729</b>	

Source: JICA Study Team

## 2-6-2 Operation and Maintenance Cost

### (1) Operation and Maintenance Cost

Operation and Maintenance Cost (including utility) of each facility is estimated as follows.

#### 1) Electricity Charge

##### a) TIMA

**Table 2-31 Criteria**

Max Demand Power	77 kW	$151\text{kVA} \times 0.85 (\text{Power Factor})$ $\times 0.6 (\text{Demand Rate}) = 77\text{kW}$
Load Factor	0.3	

Source: JICA Study Team

**Table 2-32 Electricity Tariffs  
(EDC: Electric du Cambodia Tariff 11KV Power Rate)**

Basic Rate	- KHR/kw
Metered Rate	720 KHR/kwh

Source: JICA Study Team

**Table 2-33 Monthly Electricity Charge**

Basic Rate	-
Metered Rate	$77\text{kW} \times 720 \text{ hours/month} \times 0.3 \times 720 \text{ KHR/kWh} = 11,975,040 \text{ KHR/month}$
Total	$11,975,040 \text{ KHR/month} \Rightarrow 11,975,000 \text{ KHR/month}$

Source: JICA Study Team

**Table 2-34 Annual Electricity Charge**

$11,975,000 \text{ KHR/month} \times 12 \text{ month/year} = 143,700,000 \text{ KHR/year}$
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Source: JICA Study Team

##### b) OF

**Table 2-35 Criteria**

Max Demand Power	128 kW	$252\text{kVA} \times 0.85 (\text{Power Factor})$ $\times 0.6 (\text{Demand Rate}) = 128\text{kW}$
Load Factor	0.3	

Source: JICA Study Team

**Table 2-36 Electricity Tariffs, Power Supply Company  
(EDC: Electric du CAMBODIA TARRIF 11KV Power Rate)**

Basic Rate	- KHR/kw
Metered Rate	720 KHR/kWh

Source: JICA Study Team

**Table 2-37 Monthly Electricity Charge**

Basic Rate	-
Metered Rate	$128\text{kW} \times 720 \text{ hour/month} \times 0.3 \times 720 \text{ KHR/kWh} = 19,906,560 \text{ KHR/month}$
Total	$19,906,560 \text{ KHR/month} \Rightarrow 19,907,000 \text{ KHR/month}$

**Table 2-38 Annual Electricity Charge**

19,907,000 KHR/month	×	12 month/year	=	238,884,000 KHR/year
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Source: JICA Study Team

**2) Telephone and Telecommunication Charge****Table 2-39 Telephone and Telecommunication**

100Mbps Consumption	250,000 KHR/month	
Annual Telephone and Telecommunication Charge	250,000 KHR/month × 12months =	3,000,000 KHR /year

Source: JICA Study Team

**3) Water Supply Charge****a) TIMA****Table 2-40 Water Supply Charge**

Maximum Daily Water Consumption	
Maximum Daily Water Consumption	24.2 m <sup>3</sup> /day
Fee Tariff and Schedule	
Water rate: 1500 Riel/m <sup>3</sup> .	0.375 USD/m <sup>3</sup>
Annual Water Bill	
24.2m <sup>3</sup> /hour × 360 day/year × 0.7 × 0.375 USD/m <sup>3</sup> =	2,286.90 USD/year

Source: JICA Study Team

**b) OF**

No charge since Well Water will be utilized.

**4) Sewage and Wastewater Charges****a) TIMA**

Not required. Since Septic Tank with Seepage Tank will be provided.

**b) OF**

Not required. Merged Septic Tank will be provided.

**5) Diesel Generator Fuel Charge****a) TIMA****Table 2-41 TIMA Diesel Generator Fuel Charge**

Generator	200KVA × 1Unit, 3 phase, 4W, 415V 50HZ (Diesel Engine Fuel)	
	Fuel Consumption (75% Load)	35.0 ℓ/hour
Consumption Assumed	Monthly Operating Time (5 hour/day) × 10 day	50 hour/month
Diesel Fuel Rate		4,000 KHR/ℓ
Annual Fuel Charge	35 litter/hour × 50 hour/day × 12 month/year × 4,000 KHR/ℓ= 84,000,000KHR/year	

Source: JICA Study Team

b) OF

**Table 2-42 OF Diesel Generator Fuel Charge**

Generator	250KVA × 1unit, 3phase, 4W, 415V 50HZ (Diesel Engine Fuel)	
	Fuel Consumption (75% Load)	40.0 ℓ/hour
Consumption Assumed	Monthly Operating Time (5 hour/day) × 10 day	50 hour/month
Diesel Fuel Rate		4,000 KHR/ℓ
Annual Fuel Charge	40 litter/hour × 50 hour/day × 12month/year × 4,000 KHR/ℓ= 96,000,000KHR/year	

Source: JICA Study Team

6) Maintenance Cost for Septic Tank (TIMA)

**Table 2-43 Maintenance Cost for Septic Tank**

Management fee (sludge transfer): 100 USD/month × 4 location	400 USD/month
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Source: JICA Study Team

7) Maintenance Cost for Wastewater Treatment Facility (OF)

**Table 2-44 Maintenance Cost for Wastewater Treatment Facility**

Management fee (sludge transfer, purchase of consumables)	800 USD/month
Repair costs (pumps, blowers, etc.)	300 USD/month

Source: JICA Study Team

8) Maintenance Cost for Sand Filtration System (OF)

**Table 2-45 Maintenance Cost for Sand Filtration System**

Filter maintenance fee (about once a year)	500 USD/year
Chemical (sodium hypochlorite): 20 kg × 2 bags	120 USD/year

Source: JICA Study Team

9) Repair Expenses

**Table 2-46 TIMA facility maintenance costs (annual)**

Equipment	Monthly Repair Expense (USD)				Annual Repair Cost (USD/year)
	Replacement Parts	Consumables	Inspection	Total	
Lighting Equipment	200	600	100	900	10,800 USD/year
AC Equipment	100	100	100	300	3,600 USD/ year
Plumbing Equipment	200	200	500	9000	10,800 USD/ year
Interior & Exterior Repair	20 USD/m <sup>2</sup> /year×5,000 m <sup>2</sup> =				100,000 USD/ year
Total					125,200 USD/ year

Source: JICA Study Team



**Table 2-47 OF facility maintenance costs (annual)**

Equipment	Monthly Repair Expense (USD)				Annual Repair Cost (USD/year)
	Replacement Parts	Consumables	Inspection	Total	
Lighting Equipment	200	600	100	900	10,800 USD/year
AC Equipment	300	200	200	700	8,400 USD/year
Plumbing Equipment	300	200	500	1,000	12,000 USD/year
Interior & Exterior Repair	20 USD/m <sup>2</sup> /year×6,000 m <sup>2</sup> =				120,000 USD/year
Total					151,200 USD/year

Source: JICA Study Team

## (2) Equipment

The cost required for maintenance of the equipment is calculated as follows.

- Purchase of consumables (toner, etc.): USD 12,000/year (TIMA: USD 8,000/year, OF: USD 4,000/year)
- Equipment repair: USD 59,000 (5 years after delivery) (TIMA: USD 28,000/5 years, OF: USD 31,000/5 years)
- VPN expenses (communication costs): USD 10,000/year (whole organization)
- ArcGIS license fee: USD 4,000/year (TIMA)
- Theater inspection fee: USD 13,000/year (OF)

The expected life of electronic equipment will be 4-5 years. However, projector lamp lasts longer than the estimated life. It is also possible to use the equipment beyond the life. Regarding PCs, it is better to consider the renewal at the end of the expected life since the PCs may run slow after the expected life.

## (3) Maintenance plan

### 1) TIMA

Operation and maintenance cost of TIMA is summarized below. Personnel expenses are not included because the existence building maintenance staff are expected to manage new facility. Annual total cost of Operation and maintenance cost is about 0.19 million USD which is approximately 1% of annual total budget of CMAC. Considering the budget of CMAC, it will managed new facility properly.

**Table 2-48 Operation and Maintenance Cost of CMAC (Annual)**

(Unit: USD)

Name	Cost
Electricity	35,974
Sewage and Wastewater	2,287
Fuel for generator	21,029
Septic Tank	4,800
Facility Repair	125,200
Consumables	8,000
Equipment Repair	5,600
ArcGIS License	4,000
Total	206,889

Source: JICA Study Team

## 2) OF

Financial analysis for sustainable OF maintenance is done below. Revenue and expense of OF is needed for financial analysis. Revenues includes total admission fee (admission fee× number of visitors). Expenses consists of maintenance cost including personnel, and water and electricity cost.

**Table 2-49 Revenue and expenses of OF**

Revenue	Expenses
Total admission fee (admission fee × number of visitors)	Maintenance cost <ul style="list-style-type: none"> <li>• personnel</li> <li>• water and electricity cost</li> <li>etc.,</li> </ul>

Source: JICA Study Team

The admission fee is considered similar to those of famous museum around Siem Reap and Phnom Penh as summarized in the table below. Most of the admission fee are 5 USD and 10 USD, and some are free for Cambodian citizens. Therefore, 5 USD and 10 USD will be adopted as the admission fee calculated in the financial analysis.

**Table 2-50 Admission fee**

No.	Name of Facility (Place)	Admission fee (Cambodian citizens)	Remarks
1	Angkor Wat (Siem Reap)	37 USD (free)	Enter multiple facilities. 3-day free pass (62 USD)
2	Cambodia Land Mine Museum (Siem Reap)	5 USD (2.5 USD)	NGO manage museum for landmines.
3	Cultural Village (Siem Reap)	15 USD (5 USD)	Khmer culture introduction.
4	National Museum (Phnom Penh)	10 USD (free)	Exhibiting cultural property from all over the country
5	Tuol Sleng Museum (Phnom Penh)	5 USD (free)	Exhibiting Khmer rouge era
6	Killing Field (Phnom Penh)	3 USD (free)	Exhibiting Khmer rouge era
7	Existing Outreach Facility (Siem Reap)	12 USD (1 USD)	Existing Outreach Facility

Source: JICA Study Team

The number of visitors is predicted based on (1) the number of visitors to existing facilities and (2) the capacity of facilities.

The number of visitors of the existing Outreach Facility is summarized below. In 2018 and 2019, it was around 15,000 visitors, with people from Japan being the highest number followed by local, China, Australia, and USA. Other includes visitors from Columbia, Iraq, Laos which were expected to visit after CMAC training. If the number of visitors is expected to triple with the new facility, it will be about 45,000.

**Table 2-51 Number of Visitors of Outreach Facility (National)**

Year	Cambodia	Japan	China	Australia	USA	Europe	Korea	Thailand	Others	Total
2017	2,514	279	-	45	6	23	-	8	88	<b>2,963</b>
2018	1,142	13,348	25	78	61	86	13	9	145	<b>14,907</b>
2019	946	13,851	116	185	13	86	52	14	628	<b>15,891</b>
2020	405	177	492	1	32	16	3	-	73	<b>1,199</b>
<b>Total</b>	<b>5,007</b>	<b>27,655</b>	<b>633</b>	<b>309</b>	<b>112</b>	<b>211</b>	<b>68</b>	<b>31</b>	<b>934</b>	<b>34,960</b>

※In 2017, counted between July and December.

※In 2020, counted between January and March.

Source: CMAC

Considering the capacity of OF, if 40 persons per group are to visit, spending 1.5 hours per group, 4 groups per day, or 160 visitors, may be accommodated per day. Based on this number, 48,000 visitors are expected annually.

From these two aspects, the number of visitors is expected about 50,000. The table below shows the number of visitors of neighbouring and famous museum in Cambodia.

**Table 2-52 Number of visitors of museum (2018)**

No	Name of museum (place)	Number of visitors (Cambodian)
1	Angkor Wat (Siem Reap)	2,590,819 people (N/A)
2	National Museum (Phnom Penh)	209,201 people (102,507)
3	Tuol Sleng Museum (Phnom Penh)	421,024 people (55,719)
4	Killing Field (Phnom Penh)	197,980 people (51,123)
5	Existing OF (Siem Reap)	13,765 people (1,142)

Source: JICA Study Team

The maintenance cost of OF is shown below. Personnel expenses are calculated at 300 USD per person which is the minimum wage of public official in Cambodia. The number of staff is expected to be 15 people.

**Table 2-53 Operation and Maintenance Cost (Annual)**

(Unit: USD)

Name	Cost
Personnel cost	54,000
Electricity	59,802
Fuel for generator	2,403
Wastewater Treatment Facility	13,200
Sand Filtration System	620
Facility Repair	151,200
Consumables	4,000
Equipment Repair	6,200
ArcGIS License	13,000
<b>Total</b>	<b>304,425</b>

Source: JICA Study Team

A financial analysis was conducted based on the above-mentioned assumptions of number of visitors and maintenance costs. Plan A has an entrance fee of 12 USD, Plan B 5 USD, and Plan C 10 USD. As a result, plans A and C are expected to generate a profit of about 290,000 USD and about 190,000 USD, and the entrance fee will be sufficient to cover the maintenance and management costs of the facility. In Plan A, the minimum number of visitors at which the break-even point (maintenance and management costs can be raised) is about 25,000.

**Table 2-54 Revenue Estimation**

(Unit: USD)

	Plan A	Plan B	Plan C
Revenue	600,000	250,000	500,000
Cost	304,425	304,425	304,425
Profit	295,575	-54,425	195,575
Break-even point of visitors	25,369	60,885	30,443

Source: JICA Study Team

For the OF to operate sustainably, it is necessary to (1) secure a certain number of visitors and (2) secure income other than admission fees. Possible measures for (1) include cooperation with travel agencies (incorporating visits to OF in group tours), improving recognition by listing OF in travel guidebooks, and encouraging word of mouth through SNS. As for (2), there are shops that sell souvenirs, etc., and cafés and restaurants.

Since the entrance fee for foreign visitors to the existing OF (Peace Museum) is USD 12, if the same entrance fee is collected, the target number of foreign visitors of 50,000 will be achieved, and the revenue will be as shown in the above table under Plan A.

Approximately 15,000 people have visited the existing OF annually, but more than 90% of those visitors are from overseas. Considering that OF will be renewed in the future, the new airport will operate, and that the site is located on the road connecting the new airport and Angkor Wat, it is considered to be a feasibly achievable figure.

## **Chapter 3 Project Evaluation**

### **3-1 Preconditions**

To implement this project, it is a prerequisite that the following items be implemented without delay by the Cambodian side.

- Preparation of construction site (removal of obstacles, trees, etc. that hinder the implementation of this project, embankment work on low land at TIMA site and OF, embankment, including the provision of soil for raising the height of the indoor exhibition facility building at OF)
- Water supply pipeline and increased electrical capacity at TIMA, and electrical draw and increase to the proposed construction site at OF.
- Construction of storm drainage ditches and landscaping around the building at TIMA.
- Development of parking lots for visitors, sidewalks, outdoor exhibition facilities, and landscaping at OF.
- Production and installation of exhibition contents at OF
- Licenses and other fees required for online training at TIMA
- Necessary measures for import customs clearance of materials and equipment to be used in the Project
- Tax exemption measures for customs duties, domestic taxes, and other taxes on the procurement of goods and services related to the implementation of the Project

### **3-2 Necessary Inputs by Recipient Country**

To achieve and maintain the effectiveness of this project, the Cambodian side should address the following inputs.

- Assignment of lecturers necessary to provide appropriate training and drills at TIMA.
- Appropriate number of trainees shall participate in the training, and the appropriate program management, including the preparation of teaching materials, to ensure the quality of the training, at TIMA and OF.
- Operational and administrative budget, including personnel costs for instructors to conduct training and maintenance costs for facilities and equipment, shall be secured.
- Construction of a maintenance management system for facilities, exhibitions, and equipment of TIMA and OF, and implementation of appropriate maintenance management

### **3-3 Important Assumptions**

The external conditions for manifesting and maintaining the effects of this project are as follows.

- Country risk (e.g., change of policy, deterioration of security) and natural disaster will not call off or delay this project.
- Procurement of necessary materials and equipment will be carried out according to plan without unexpected price hikes due to economic conditions
- Organization structure of CMAC will not dramatically changed and each planned training will be implemented.
- The number of tourists does not decrease significantly due any infectious diseases, and the expected number of tourists visits OF.

### 3-4 Project Evaluation

#### 3-4-1 Relevance

The relevance of this project as Grant aid project is verified by two main reasons below.

- RGC received the delegation of authority to CMAC, which was established by the United Nations Transitional Authority in Cambodia (UNTAC) in 1992 and proceeded with the removal of land mines. In National Strategic Development Plan (NSDP) 2019-2023, to promote agriculture and rural development, it is clearly stated to remove landmines and UXO to secure agricultural land for poor households, positioning it as one of the priority policies and activities. Of the 8 goals of National Monitoring Strategic Plan (NMSP) 2018-2025, Goal 1 states “Release all known landmine contaminated areas by 2025” and activities for that purpose are planned. Furthermore, there is unique goals in Cambodia Goal18 (Demining, removing Explosive Remnants of War (ERW) and victim assistance monitored by CMAC and CMAA. The National Mine Action Strategy 2018-2025 advocates the promotion of international cooperation in the field of mine action, and while there are many landmine-contaminated countries with a high chance of having landmines and UXO to remain even after 2025, Cambodia has achieved reconstruction to provide other conflict-affected countries with the knowledge of mine action. By constructing a training complex and outreach facility for CMAC, this project can contribute to supporting activities of landmines and UXO removal that match the development strategy of Cambodia.
- Since 1998, the Government of Japan has been improving equipment for CMAC through 7 Grant-aid projects and has been continuously strengthening CMAC's capacity with technical cooperation since 1999. One of the priorities of Country Assistance Policy of the Government of Japan (July, 2017) is “strengthening of governance” including supporting landmines and UXO measuring. Grant aid project is currently implemented to provide landmines removal machines and brush cutter machines to Laos and Columbia. In addition, in the ongoing technical cooperation project in Laos "UXO Lao Implementation Capacity Development Project Contributing to Poverty Reduction" (2019-2024) and third-country training with Colombia "Mine Action" (2017-2023), CMAC acted as a resource where knowledge and technology are shared, and South-South cooperation is being developed led by CMAC. In these projects, CMAC provides training of control machine utilize facility of CMAC and minefields in Cambodia. The aim of this project is to construct and training complex and OF of CMAC and adapt Country Assistance Policy of the Government of Japan.

### 3-4-2 Effectiveness

The effectiveness of this project is mentioned below.

#### 1) Quantitative effect

**Table 3-1 Quantitative effect**

Name of index	Standard Value (2020)	Target Value (2028) [3 years after project completion]
Capacity of trainees in training rooms in TIMA (person)	Approx. 120	Approx.420
Number of trainees per year in TIMA (person)	602 (Average from 2011 to 2021)	Approx. 1,260
Number of training course per year in TIMA (number)	26	Approx.50
Capacity of trainees staying at accommodation in TIMA (person)	80	Male Dormitory 170 Female Dormitory 90 Total 260
Number of visitors of OF per year (person).	15,891 (Actual value for 2019. In 2020 it was closed due COVID-19)	Approx. 50,000

Source: JICA Study Team

#### 2) Qualitative effect

- Improving the quality of education and training by improving the facility's environment, promoting demining activities in Cambodia and overseas, promoting understanding of landmine issues, and promoting awareness and PR activities

# Appendices:

Appendix 1: Study Team Members

Appendix 2: Survey Schedule

Appendix 3: Cambodian Officials` List

Appendix 4: Minutes of Discussion (M/D)

Appendix 5: Technical Note (T/N)

Appendix 6: Minutes of Discussion (M/D)

(Explanation on Draft Preparatory Survey Report)

Appendix 7-1: Land Registration (Kampong Chhnang)

Appendix 7-2: Land Registration (Siem Reap)

Appendix 8-1: Boring Locations and Log (TIMA)

Appendix 8-2: Boring Locations and Log (OF)

Appendix 9: New Wells Location, Results of Pumping Test and Water Quality Survey



## **Appendix 1: Study Team Members**

## Appendix 1: Study Team Members

The names and affiliations of the study team members are as follows.

**Table 1 Study Team Member Name and Affiliation (First Field Survey)**

Name	Work in charge	Affiliation
KOMUKAI Eri	Team Leader	JICA Senior Advisor
NUMATA Shuichi	Implementation Management (Architecture)	JICA Senior Advisor
KANAYAMA Hiroki	Planning Management	JICA Office for Peacebuilding
MIYATAKE Kazuhiro	PM / Architectural Plan / Operation and Maintenance Plan 1	Oriental Consultants Global Co., Ltd.
NISHIMURA Toyoto	DPM / Operation and Maintenance Plan 2	Oriental Consultants Global Co., Ltd.
YORITA Masako	Architectural Design	Oriental Consultants Global Co., Ltd.
SAWANOBORI Kino	Exhibition Plan	Oriental Consultants Global Co., Ltd. (Reinforce: individual consultant)
TOMITA Mitsugu	Construction Plan/Cost Estimate	Oriental Consultants Global Co., Ltd.
YASUDA Masahiro	Site Situation Survey 1/Training/Procurement Plan	Japan International Cooperation System (Reinforce: individual consultant)
NATA DJAJA Puji	Site Survey 2/Environmental and Social Considerations	Oriental Consultants Global Co., Ltd.
SATO Hideaki	Equipment Plan	Oriental Consultants Global Co., Ltd. (Reinforce: System Planning Corporation)
TANAKA (AKIYAMA) Yukiko	Equipment Plan/Cost Estimate	Japan International Cooperation System
YOSUA Natasia	Operational Coordination / Assist in Construction Plan / Assist in Cost Estimation	Oriental Consultants Global Co., Ltd.

Source: JICA Study Team

**Table 2 Study Team Member Name and Affiliation (Second Field Survey)**

Name	Work in charge	Affiliation
KOMUKAI Eri	Team Leader	JICA Senior Advisor
SUGAYA Ayumi	Planning Management	JICA Office for Peacebuilding
MIYATAKE Kazuhiro	PM / Architectural Plan / Operation and Maintenance Plan 1	Oriental Consultants Global Co., Ltd.
NISHIMURA Toyoto	DPM / Operation and Maintenance Plan 2	Oriental Consultants Global Co., Ltd.
YORITA Masako	Architectural Design	Oriental Consultants Global Co., Ltd.
YASUDA Masahiro	Site Situation Survey 1/Training/Procurement Plan	Japan International Cooperation System (Reinforce: individual consultant)
TANAKA (AKIYAMA) Yukiko	Equipment Plan/Cost Estimate	Japan International Cooperation System
YOSUA Natasia	Operational Coordination / Assist in Construction Plan / Assist in Cost Estimation	Oriental Consultants Global Co., Ltd.

Source: JICA Study Team

## **Appendix 2: Survey Schedule**

## Appendix 2: Survey Schedule

The first field survey was from January 18, 2022 to March 1, 2022, but due to number limitation of people on site and infected team members caused by COVID-19, the schedule for each team member was adjusted as follows.

**Table 1 First Field Survey Period of Each Study Team Member**

Name	Work in charge	Local travel period
KOMUKAI Eri	Team Leader	January 20, 2022 to January 29, 2022
NUMATA Shuichi	Implementation Management (Architecture)	January 20, 2022 to January 29, 2022
KANAYAMA Hiroki	Planning Management (up to March,2022)	January 20, 2022 to January 29, 2022
MIYATAKE Kazuhiro	PM/ Architectural Plan / Operation and Maintenance Plan 1	January 18, 2022 to February 19, 2022
NISHIMURA Toyoto	DPM / Operation and Maintenance Plan 2	February 4, 2022 to March 8, 2022
YORITA Masako	Architectural Design	January 18, 2022 to February 19, 2022
SAWANOBORI Kino	Exhibition Plan	January 18, 2022 to February 19, 2022
TOMITA Mitsugu	Construction Plan/Cost Estimate	February 4, 2022 to March 5, 2022
YASUDA Masahiro	Site Situation Survey 1/Training/Procurement Plan	Residing in Phnom Penh
NATA DJAJA Puji	Site Survey 2/Environmental and Social Considerations	January 18, 2022 to February 15, 2022
SATO Hideaki	Equipment Plan	February 4, 2022 to March 1, 2022
TANAKA (AKIYAMA) Yukiko	Equipment Plan/Cost Estimate	January 18, 2022 to February 19, 2022
YOSUA Natasia	Operational Coordination / Assist in Construction Plan / Assist in Cost Estimation	February 13, 2022 to March 1, 2022

Source: JICA Study Team

The first field survey schedule is as follows.

**Table 2 First Field Survey Schedule**

Schedule	Itinerary	Location
Tue,Jun,18th	(5 people) From Narita, via Incheon, to Phnom Penh	Tokyo→Phnom Penh
Wed,Jun,19th	JICA office briefing, CMAC courtesy call, Inception explanation and discussion	Phnom Penh
Thu,Jun,20th	Hearings from related ministries and agencies	Phnom Penh
Fri,Jun,21st	Consultation with CMAC (confirmation of request details, etc.)	Phnom Penh
Sat,Jun,22nd	Transfer from Phnom Penh to Kampong Chhnang, TIMA site visit	Phnom Penh → Kampong Chhnang
Sun,Jun,23rd	Transfer from Kampong Chhnang to Siem Reap	Kampong Chhnang → Siem Reap
Mon,Jun,24th	Outreach facility site visit, transfer from Siem Reap to Phnom Penh	Siem Reap → Phnom Penh
Tue,Jun,25th - Thu,Jun,27th	Consultation with CMAC (M/D plan review/draft)	Phnom Penh
Fri,Jun,28th	Discussion with CMAC (M/D discussion/signing)	Phnom Penh
Sat,Jun,29th - Sun,Jun,18th	In-group meeting, data sorting	Phnom Penh
Mon,Jun,31th	(4 people) Move from Phnom Penh to Kampong Chhnang, discussion and hearing with TIMA (2 people) Exhibition planning survey, equipment planning survey	(4 people) Phnom Penh → Kampong Chhnang (2 people) Phnom Penh

Schedule	Itinerary	Location
Tue, Feb, 1st	(4 people) Facility planning/operation/maintenance planning/survey, site status/training/procurement plan survey, subcontracted survey preparation, environmental and social considerations/survey (2 people) Exhibit planning survey, equipment planning survey	(4 people) Kampong Chunang (2 people) Phnom Penh
Wed, Feb, 2nd	(4 people) Transfer from Kampong Chhnang to Siem Reap (2 people) Transfer from Phnom Penh to Siem Reap	(4 people) Kampong Chhnang → Siem Reap (2 people) Phnom Penh → Siem Reap
Thu, Feb, 3rd	Facility plan review, exhibition plan survey, site situation survey/training/procurement plan survey, equipment plan survey	Siem Reap
Fri, Feb, 4th	(4 people) Battambang minefield inspection (2 people) Exhibit planning survey, equipment planning survey (2 people) From Narita, via Incheon, to Phnom Penh	(4 people) Battambang (2 people) Siem Reap (2 people) From Narita, via Incheon, to Phnom Penh
Sat, Feb, 5th	(6 people) Facility plan review, exhibition plan survey, site situation survey/training/procurement plan survey, equipment plan survey (2 people) Transfer from Phnom Penh to Siem Reap	(6 people) Siem Reap (2 people) Phnom Penh → Siem Reap
Sun, Feb, 6th	In-group meeting, data sorting	Siem Reap
Mon, Feb, 7th - Tue, Feb, 8th	Facility plan review, exhibition plan survey, site condition survey/training/procurement plan survey, equipment plan survey, operation/maintenance plan survey, facility plan review, construction/procurement plan survey	Siem Reap
Wed, Feb, 9th	(6 pax) Transfer from Siem Reap to Kampong Chhnang (2 people) Operation/maintenance plan survey, construction/procurement plan survey	(6 people) Siem Reap → Kampong Chhnang (2 people) Siem Reap
Thu, Feb, 10th	(6 people) Facility plan review, exhibition plan review, procurement-related survey, equipment plan review (2 people) Transfer from Siem Reap to Kampong Chhnang	(6 people) Kampong Chunang (2 people) Siem Reap → Kampong Chhnang
Fri, Feb, 11th	(6 people) Facility plan study, operation/maintenance plan study, exhibition plan study, procurement-related study, equipment plan study, construction/procurement plan study (2 persons) Transfer from Kampong Chhnang to Phnom Penh	(6 people) Kampong Chunang (2 people) Kampong Chhnang → Phnom Penh
Sat, Feb, 12th	(6 people) Transfer from Kampong Chhnang to Phnom Penh (2 people) Examination of outline design plan	(6 people) Kampong Chhnang → Phnom Penh (2 people) Phnom Penh
Sun, Feb, 13th	(8 people) In-group meeting, data sorting (1 person) From Narita, via Incheon, to Phnom Penh	(8 people) Phnom Penh (1 person) Tokyo → Phnom Penh
Mon, Feb, 14th	Examination/explanation/discussion of outline design proposal, discussion of technical notes	Phnom Penh
Tue, Feb, 15th	(1 person) Departure from Phnom Penh, via Incheon, arrival at Narita	(8 people) Phnom Penh (1 person) Phnom Penh → Tokyo
Wed, Feb, 16th - Thu, Feb, 17th	Examination/explanation/discussion of outline design proposal, discussion of technical notes	Phnom Penh
Fri, Feb, 18th	Discussion and signing of technical notes	Phnom Penh
Sat, Feb, 19th	(4 passengers) From Phnom Penh, via Incheon, to Narita (4 people) Operation/maintenance planning survey, construction/procurement related survey, facility planning survey	(4 people) Phnom Penh → Tokyo (4 people) Phnom Penh
Sun, Feb, 20th	In-group meeting, data sorting	Phnom Penh

Schedule	Itinerary	Location
Mon, Feb, 21st	Operation/maintenance planning survey, construction/procurement related survey, facility planning survey	Kampong Chhnang
Tue, Feb, 22nd - Thu, Feb, 24th	Operation/maintenance planning survey, construction/procurement related survey, facility planning survey	Phnom Penh
Fri, Feb, 25th	Submission and agreement of provisional plan and equipment plan	Phnom Penh
Sat, Feb, 26th - Mon, Feb, 28th	In-group meeting, data sorting	Phnom Penh
Tue, Mar, 1st	(2 people) From Phnom Penh, via Incheon, to Narita (2 people) Waiting at the hotel due to the new coronavirus infection	(2 people) Phnom Penh → Tokyo (2 people) Phnom Penh
Wed, Mar, 2nd - Fri, Mar, 4th	(2 people) Self-quarantine at the hotel due to the new coronavirus infection	Phnom Penh
Sat, Mar, 5th	(1 person) Departure from Phnom Penh, via Incheon, arrival at Narita (1 person) Waiting at the hotel due to the new coronavirus infection	(1 person) Phnom Penh → Tokyo (1 person) Phnom Penh
Sun, Mar, 6th - Mon, Mar, 7th	(1 person) Self-quarantine at the hotel due to the new coronavirus infection	Phnom Penh
Tue, Mar, 8th	(1 person) From Phnom Penh, via Incheon, to Narita	(1 person) Phnom Penh → Tokyo

Source: JICA Study Team

The second field survey was from August 14, 2022 to August 20, 2022, but since a member was infected with COVID-19, the schedule for each team member was adjusted as follows.

**Table 3 Second Field Survey Period of Each Study Team Member**

Name	Work in charge	Local travel period
KOMUKAI Eri	Team Leader	August 15, 2022 to August 20, 2022
SUGAYA Ayumi	Planning Management (up to March, 2022)	August 15, 2022 to August 20, 2022
MIYATAKE Kazuhiro	PM/ Architectural Plan / Operation and Maintenance Plan 1	August 14, 2022 to August 20, 2022
NISHIMURA Toyoto	DPM / Operation and Maintenance Plan 2	August 14, 2022 to August 20, 2022
YORITA Masako	Architectural Design	August 14, 2022 to August 20, 2022
YASUDA Masahiro	Site Situation Survey 1/Training/Procurement Plan	Residing in Phnom Penh
TANAKA (AKIYAMA) Yukiko	Equipment Plan/Cost Estimate	August 15, 2022 to August 28, 2022
YOSUA Natasia	Operational Coordination / Assist in Construction Plan / Assist in Cost Estimation	August 14, 2022 to August 20, 2022

Source: JICA Study Team

The second field survey schedule is as follows.

**Table 4 Second Field Survey Schedule**

Schedule	Itinerary	Location
Sun, Aug, 14th	(4 people) From Narita, via Incheon, to Phnom Penh	Tokyo → Phnom Penh
Mon, Aug, 15th	CMAC courtesy call, Draft Final Report's explanation and discussion (1 person) From Narita, via Incheon, to Phnom Penh	Phnom Penh Tokyo → Phnom Penh
Tue, Aug, 16th	Discussion on Minutes of Discussion (M/D)	Phnom Penh
Wed, Aug, 17th	Discussion with CMAC regarding Outreach Facility's exhibition plan, facility, etc. Additional market survey.	Phnom Penh, Siem Reap
Thu, Aug, 18th	Discussion with CMAC regarding facility, equipment, etc. Additional market survey.	Phnom Penh
Fri, Aug, 19th	M/D signing, additional market survey. (3 people) Leaving Phnom Penh	Phnom Penh
Sat, Aug, 20th	(3 people) From Phnom Penh, via Incheon, to Narita (1 person) From Phnom Penh to Vientiane	(3 people) Phnom Penh → Tokyo (1 person) Phnom Penh → Vientiane
Sun, Aug, 21st- Sat, Aug, 27th	(1 person) Self-quarantine at the hotel due to the new coronavirus infection	Phnom Penh
Sun, Aug, 28th	(1 person) From Phnom Penh, via Incheon, to Narita	(1 person) Phnom Penh → Tokyo

Source: JICA Study Team

## **Appendix 3: Cambodian Officials List**



## Appendix 3: Cambodian Officials List

The list of CMAC members is as follows.

**Table 1 CMAC Officials List**

<b>Name</b>	<b>Affiliation</b>	<b>Position</b>
H. E. Mr. Heng Ratana	Cambodian Mine Action Centre (CMAC)	Delegate of the Royal Government in Charge as Director General (DG)
Mr. Oum Phumro	Cambodian Mine Action Centre (CMAC)	Deputy Director General (DDG)
Mr. Ek Bolin	Cambodian Mine Action Centre (CMAC)	Senior Director
Mr. Leng Chreang	Cambodian Mine Action Centre (CMAC)	Senior Director
Mr. Rath Pottana	Cambodian Mine Action Centre (CMAC)	Senior Director of Planning/ Operation
Mr. Phat Phearak	Cambodian Mine Action Centre (CMAC)	Director of Cabinet and Administration
Mr. Oum Sopheavy	Cambodian Mine Action Centre (CMAC)	Director of Project Management and International Cooperation
Mr. Muon Veasna	Cambodian Mine Action Centre (CMAC)	Director of Finance
Mr. Heng Kra	Cambodian Mine Action Centre (CMAC)	Director of Support
Mr. Say Seiha	Cambodian Mine Action Centre (CMAC)	Architect
H. E. Mr. Mong Sokunthearath	Cambodian Mine Action Centre (CMAC)	Director of Technical Institute of Mine Action (TIMA)
Ms. Oum Socheath	Cambodian Mine Action Centre (CMAC)	Permanent Deputy Director of Technical Institute of Mine Action (TIMA)

Source: JICA Study Team

## **Appendix 4: Minutes of Discussion (M/D)**

**Minutes of Discussions**  
**on the Preparatory Survey for the Project for**  
**Construction of Training Complex and Outreach Facility of**  
**Cambodian Mine Action Centre**

In response to the verbal request from Prime Minister of the Kingdom of Cambodia to Ambassador of Japan to the Kingdom of Cambodia on 23<sup>rd</sup> July 2021 as well as based on the several preliminary discussions between the Royal Government of Cambodia (hereinafter referred to as “Cambodia”) and Japan International Cooperation Agency (hereinafter referred to as “JICA”) , JICA dispatched the Preparatory Survey Team for the Outline Design (hereinafter referred to as “the Team”) of the Project for Construction of Training Complex and Outreach Facility of Cambodian Mine Action Centre (hereinafter referred to as “the Project”) to Cambodia. The Team held a series of discussions with the officials of Cambodia and conducted a field survey. In the course of the discussions, both sides have confirmed the main items described in the attached sheets.

Phnom Penh, 28<sup>th</sup> January 2022

Ms. KOMUKAI ERI

Leader

Preparatory Survey Team

Japan International Cooperation Agency

Japan

H. E. Mr. HENG RATANA

Delegate of the Royal Government

in charge as Director General

Cambodian Mine Action Centre (CMAC)

Kingdom of Cambodia

## ATTACHMENT

### 1. Objective of the Project

The objective of the Project is to improve education/training environment for mine action related staff not only within the Cambodian Mine Action Centre (hereinafter referred to as “CMAC”) but also other related institutions both in Cambodia and in other mine-affected countries, and to promote understanding on mine-related issues and peacebuilding and to preserve skills and experiences that CMAC has stored to date by constructing and improving existing functions of Technical Institute of Mine Action (hereinafter referred to as “TIMA”) and Outreach Facility<sup>1</sup>, thereby contributing to realization of a mine-free world and sustainable society as well as poverty reduction.

### 2. Title of the Preparatory Survey

Both sides confirmed the title of the Preparatory Survey as “Preparatory Survey for the Project for Construction of Training Complex and Outreach Facility of Cambodian Mine Action Centre”.

### 3. Project site

Both sides confirmed that the sites of the Project are in Kampong Chhnang and Siem Reap, which are shown in Annex 1.

### 4. Responsible authority for the Project

Both sides confirmed the authorities responsible for the Project are as follows:

CMAC will be the executing agency for the Project (hereinafter referred to as “the Executing Agency”). The Executing Agency shall coordinate with all the relevant authorities to ensure smooth implementation of the Project and ensure that the undertakings for the Project shall be managed by relevant authorities properly and on time. The organization charts are shown in Annex 2.

### 5. Items requested by the Royal Government of Cambodia

5-1. As a result of discussions, both sides confirmed that the items requested by the Royal Government of Cambodia are as shown in Annex 3.

5-2. JICA will assess the feasibility of the above requested items through the survey

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<sup>1</sup> This Outreach Facility is currently referred to as “Peace Museum of Mine Action”.



and will report the findings to the Government of Japan. Depending upon the results of assessment, the scope of items described in Annex 3 is subject to change in consultation with the Cambodian side. The final scope of the Project will be decided by the Government of Japan.

5-3. The Royal Government of Cambodia shall submit an official request to the Government of Japan through a diplomatic channel before the appraisal of the Project, which is scheduled in April, 2022.

## 6. Procedures and Basic Principles of Japanese Grant

6-1. The Cambodian side agreed that the procedures and basic principles of Japanese Grant (hereinafter referred to as “the Grant”) as described in Annex 4 shall be applied to the Project.

As for the monitoring of the implementation of the Project, JICA requires Cambodian side to submit the Project Monitoring Report, the form of which is attached as Annex 5.

6-2. The Cambodian side agreed to take the necessary measures, as described in Annex 6, for smooth implementation of the Project. The contents of the Annex 6 will be elaborated and refined during the Preparatory Survey and be agreed in the mission dispatched for explanation of the Draft Preparatory Survey Report.

The contents of Annex 6 will be updated as the Preparatory Survey progresses, and eventually, will be used as an attachment to the Grant Agreement.

## 7. Schedule of the Survey

7-1. The Team will proceed with further survey in Cambodia until 1<sup>st</sup> March 2022.

7-2. An official request to the Government of Japan will be submitted in April, 2022.

7-3. JICA will prepare a draft Preparatory Survey Report in English and dispatch a mission to Cambodia in order to explain its contents around August, 2022.

7-4. If the contents of the draft Preparatory Survey Report is accepted and the undertakings for the Project are fully agreed by the Cambodian side, JICA will finalize the Preparatory Survey Report and send it to Cambodia around November, 2022.

7-5. The above schedule is tentative and subject to change.

## 8. Environmental and Social Considerations

8-1. The Cambodian side confirmed to give due environmental and social considerations before and during implementation, and after completion of the

Project, in accordance with the JICA Guidelines for Environmental and Social Considerations (April, 2010).

8-2. The Project is categorized as “C” from the following considerations:

Not located in a sensitive area, nor has it sensitive characteristics, nor falls it into sensitive sectors under the Guidelines, and its potential adverse impacts on the environment are not likely to be significant.

## 9. Other Relevant Issues

### 9-1 Gender Mainstreaming

Both sides confirmed that following gender elements shall be duly reflected in the scope of Preparatory Survey.

- (a) Collection of information and gender disaggregated data for assessment of gender needs.
- (b) Examination of gender-responsive measures based on the assessment, such as:
  - ✓ Facility design that reflects gender-specific needs.
  - ✓ Selection of equipment that reflects gender-specific needs and ensure usability by women.

9-2 Both parties agreed upon the items requested by the Cambodian side with the prioritization for facilities as in Annex 3.

9-3 Both parties reaffirmed the importance of the Project speeding up as much as possible.

9-4 JICA explained the need of undertakings to be implemented by the Cambodian side throughout the Project as in Annex 6, and CMAC expressed their intention to take necessary budgetary measures.

9-5 JICA requested CMAC to elaborate the future use plan subsequent to 2025 both for TIMA and Outreach facility, in order to measure appropriateness of the Project.

9-6 Regarding TIMA, both sides shared understanding that the current environment of classroom facilities does not meet training requirements, particularly in terms of space and density, and confirmed the importance of securing space enough for implementing effective and smooth trainings.

9-7 Both parties agreed to keep existing buildings in TIMA, which can be strengthened or renovated outside the scope of the Project, for future use, taking space management in TIMA and quality assurance of strengthened or renovated buildings into account.

9-8. The Cambodian side agreed to secure sufficient budget for site preparation including embankment in site area for Outreach facility.

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Annex 1 Project Site

Annex 2 Organization Chart

Annex-3 Items Requested by Cambodia

Annex 4 Japanese Grant

Annex 5 Project Monitoring Report (template)

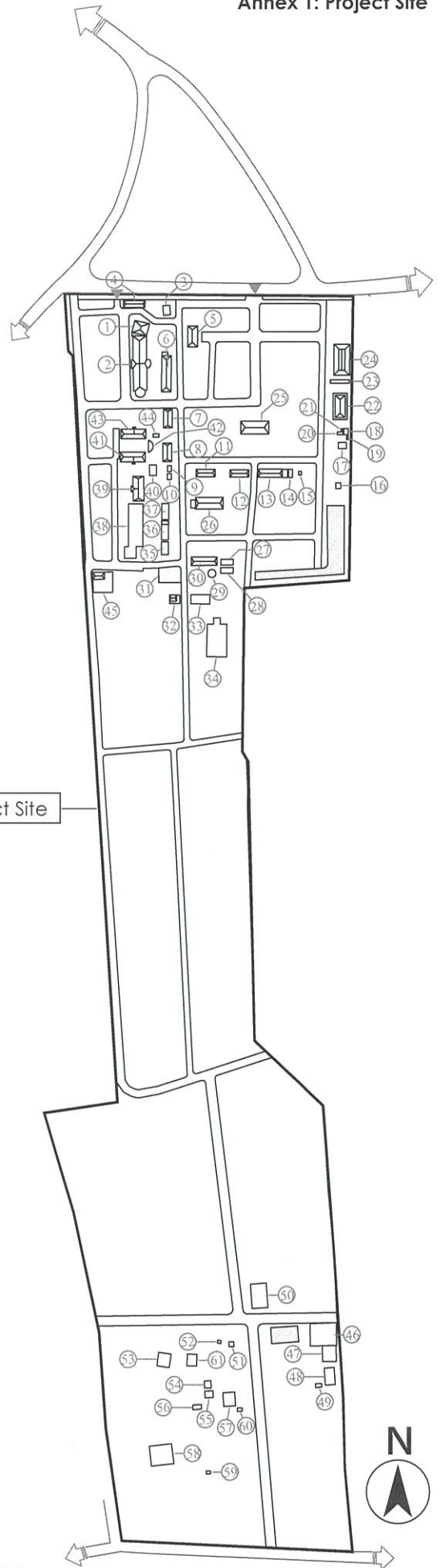
Annex 6 Major Undertakings to be taken by the Royal Government of Cambodia

SK (2)

# TIMA Site Plan

1. Exhibition Room
2. Office Building
3. Security Guard Building
4. Car parking
5. Conference Building
6. School Building
7. Accommodation Building (A)
8. Accommodation Building (B)
9. Toilet Room
10. Concrete Water Tank with Roofing
11. Accommodation Building (C)
12. Accommodation Building (D)
13. Canteen
14. Concrete Water Tank with Roofing
15. Water Tank Basin
16. Warehouse for UXO
17. Generator Room
18. Toilet Rooms
19. Septic Tank
20. Concrete Water Tank with Roofing
21. Water Tank Basin
22. Dog Breeding Building
23. Dog Training Hall
24. Caring Pregnancy Dog Building
25. Dog Center Office
26. MDD Training Center and Management of Dog Program
27. Dog Food Storage building
28. Water Cleaning Building for Dog
29. Dog Training Pool with Roofing with Round Shape
30. Dog Kennels
31. Dog Cemetery Hall
32. Carousel Building
33. Dog Training Space
34. Dog Training Anti-Covid -19 Building
35. Dog Kennels & Dog Handle (1)
36. Dog Kennels & Dog Handle with Pool (2)
37. Dog Kennels & Dog Handle (3)
38. Warehouse Building
39. Office Building for Warehouse
40. Dining Hall with Roofing for Warehouse Staffs
41. Accommodations Building for Warehouse Staffs
42. Toilet Room
43. Accommodations Building for EOD Staffs
44. Car Parking with Roofing
45. CMAC Salvage Dive Unit Building
46. Applied Technology Training Center Building
47. Accommodations made by Container
48. Training Pool for CMAC Salvage Dive
49. Toilet Room
50. Building Construction by USA
51. Assembly Point
52. Flammable Material Room
53. Cutting Place
54. ADA Materials Building
55. Generator Room
56. UXO Storage Room
57. Steam / Cast / Drill Building
58. Warehouse for Exploded Materials
59. Flammable Material Room
60. Toilet Room
61. Command or Control Place

Project Site



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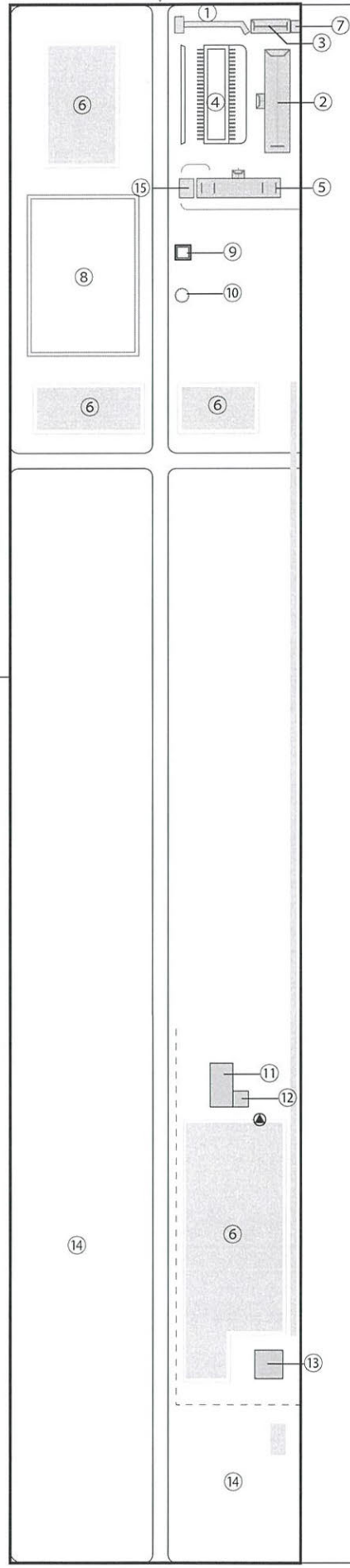


# Outreach Facility Site Plan

Annex 1: Project Site

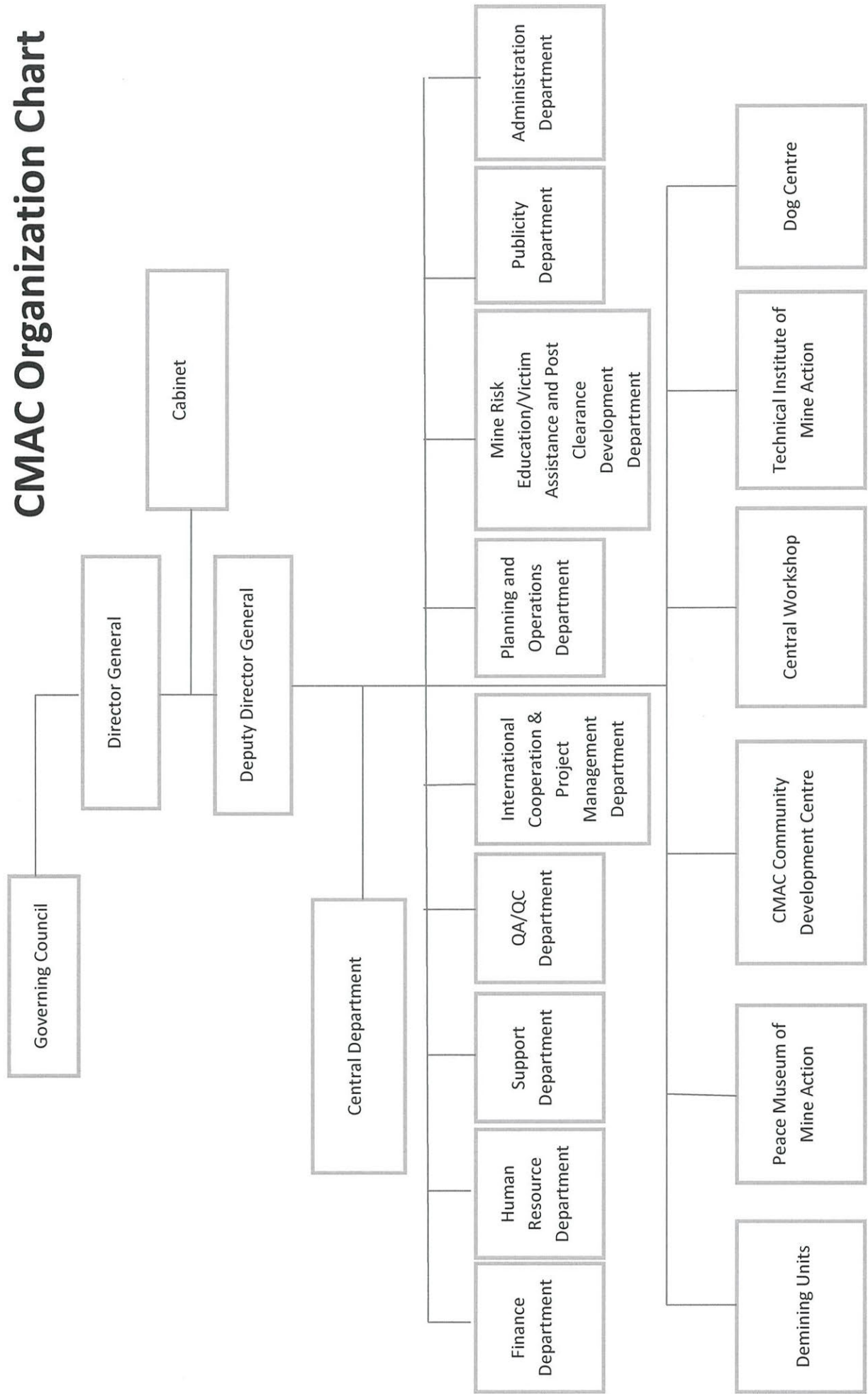
1. Entrance corridor to the museum
2. Exhibition area & DU4 Office
3. Office & presentation room
4. Outdoor exhibition area
5. Accomodation
6. Water reservoir
7. Toilet
8. Artificial MIne/ UXO field
9. Buddha statue
10. Flag pole
11. Pavillion/ Dining
12. Kitchen
13. UXO Storage
14. Training area
15. Security building

Project Site



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# CMAC Organization Chart



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**List of Requested Facilities**

**TIMA**

Category	Priority: A		Priority: B		Priority: C
	Classrooms	Conference hall	Exhibition hall	VIP room	
Training	Classrooms	Conference hall	Exhibition hall	VIP room	Workshop
	Discussion room	Accommodation	TV room and recreation space for Gym	Laundry space	Office building for explosive harvesting
Training dormitories	Discussion room	Accommodation	TV room and recreation space for Gym	Laundry space	Ammunition neutralization building
	Canteen				Accommodation for VIP
MDD training center	MDD office	Kennel			Indoor training building
Administration	Office room	Meeting room	Instructor's house	Infrastructures	
Infrastructure	Infrastructures				

**Outreach Facility**

Category	Priority: A		Priority: B		Priority: C
	Exhibition room	Conference hall	Meeting room	Multipurpose room	
Museum	Exhibition room	Conference hall	Meeting room	Multipurpose room	Souvenir shop
	Storage	Out-of-door exhibition space			
Training			Classrooms		
Training dormitories					Accommodation for VIP
					Accommodation
					Canteen
					Instructors' house
Administration	Office room				
Infrastructure	Infrastructures				

Note: Furniture included

List of Requested Equipment

Site	Equipment Name
TIMA	Projector Set
	Video Conference System
	Copier/scanner/printer
	PA System
	PC
	Digital Camera
	Gym Workout Machine
HQ	Server etc.
Outreach Facility	Projector Set
	Display Monitor
	Diorama
	Showcase
	PC
	Digital Camera
	Video Conference System
	Wheel Chair
	Copier/scanner/printer

## JAPANESE GRANT

The Japanese Grant is non-reimbursable fund provided to a recipient country (hereinafter referred to as “the Recipient”) to purchase the products and/or services (engineering services and transportation of the products, etc.) for its economic and social development in accordance with the relevant laws and regulations of Japan. Followings are the basic features of the project grants operated by JICA (hereinafter referred to as “Project Grants”).

### 1. Procedures of Project Grants

Project Grants are conducted through following procedures (See “PROCEDURES OF JAPANESE GRANT” for details):

(1) Preparation

- The Preparatory Survey (hereinafter referred to as “the Survey”) conducted by JICA

(2) Appraisal

- Appraisal by the government of Japan (hereinafter referred to as “GOJ”) and JICA, and Approval by the Japanese Cabinet

(3) Implementation

Exchange of Notes

- The Notes exchanged between the GOJ and the government of the Recipient

Grant Agreement (hereinafter referred to as “the G/A”)

- Agreement concluded between JICA and the Recipient

Banking Arrangement (hereinafter referred to as “the B/A”)

- Opening of bank account by the Recipient in a bank in Japan (hereinafter referred to as "the Bank") to receive the grant

Construction works/procurement

- Implementation of the project (hereinafter referred to as “the Project”) on the basis of the G/A

(4) Ex-post Monitoring and Evaluation

- Monitoring and evaluation at post-implementation stage

### 2. Preparatory Survey

(1) Contents of the Survey

The aim of the Survey is to provide basic documents necessary for the appraisal of the the Project made by the GOJ and JICA. The contents of the Survey are as follows:

- Confirmation of the background, objectives, and benefits of the Project and also institutional capacity of

E/K



relevant agencies of the Recipient necessary for the implementation of the Project.

- Evaluation of the feasibility of the Project to be implemented under the Japanese Grant from a technical, financial, social and economic point of view.
- Confirmation of items agreed between both parties concerning the basic concept of the Project.
- Preparation of an outline design of the Project.
- Estimation of costs of the Project.
- Confirmation of Environmental and Social Considerations

The contents of the original request by the Recipient are not necessarily approved in their initial form. The Outline Design of the Project is confirmed based on the guidelines of the Japanese Grant.

JICA requests the Recipient to take measures necessary to achieve its self-reliance in the implementation of the Project. Such measures must be guaranteed even though they may fall outside of the jurisdiction of the executing agency of the Project. Therefore, the contents of the Project are confirmed by all relevant organizations of the Recipient based on the Minutes of Discussions.

#### (2) Selection of Consultants

For smooth implementation of the Survey, JICA contracts with (a) consulting firm(s). JICA selects (a) firm(s) based on proposals submitted by interested firms.

#### (3) Result of the Survey

JICA reviews the report on the results of the Survey and recommends the GOJ to appraise the implementation of the Project after confirming the feasibility of the Project.


### 3. Basic Principles of Project Grants

#### (1) Implementation Stage

##### 1) The E/N and the G/A

After the Project is approved by the Cabinet of Japan, the Exchange of Notes (hereinafter referred to as “the E/N”) will be signed between the GOJ and the Government of the Recipient to make a pledge for assistance, which is followed by the conclusion of the G/A between JICA and the Recipient to define the necessary articles, in accordance with the E/N, to implement the Project, such as conditions of disbursement, responsibilities of the Recipient, and procurement conditions. The terms and conditions generally applicable to the Japanese Grant are stipulated in the “General Terms and Conditions for Japanese Grant (January 2016).”

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2) Banking Arrangements (B/A) (See “Financial Flow of Japanese Grant (A/P Type)” for details)

a) The Recipient shall open an account or shall cause its designated authority to open an account under the name of the Recipient in the Bank, in principle. JICA will disburse the Japanese Grant in Japanese yen for the Recipient to cover the obligations incurred by the Recipient under the verified contracts.

b) The Japanese Grant will be disbursed when payment requests are submitted by the Bank to JICA under an Authorization to Pay (A/P) issued by the Recipient.

3) Procurement Procedure

The products and/or services necessary for the implementation of the Project shall be procured in accordance with JICA’s procurement guidelines as stipulated in the G/A.

4) Selection of Consultants

In order to maintain technical consistency, the consulting firm(s) which conducted the Survey will be recommended by JICA to the Recipient to continue to work on the Project’s implementation after the E/N and G/A.

5) Eligible source country

In using the Japanese Grant disbursed by JICA for the purchase of products and/or services, the eligible source countries of such products and/or services shall be Japan and/or the Recipient. The Japanese Grant may be used for the purchase of the products and/or services of a third country as eligible, if necessary, taking into account the quality, competitiveness and economic rationality of products and/or services necessary for achieving the objective of the Project. However, the prime contractors, namely, constructing and procurement firms, and the prime consulting firm, which enter into contracts with the Recipient, are limited to "Japanese nationals", in principle.

6) Contracts and Concurrence by JICA

The Recipient will conclude contracts denominated in Japanese yen with Japanese nationals. Those contracts shall be concurred by JICA in order to be verified as eligible for using the Japanese Grant.

7) Monitoring

The Recipient is required to take their initiative to carefully monitor the progress of the Project in order to ensure its smooth implementation as part of their responsibility in the G/A, and to regularly report to JICA about its status by using the Project Monitoring Report (PMR).

8) Safety Measures

The Recipient must ensure that the safety is highly observed during the implementation of the Project.

9) Construction Quality Control Meeting

Construction Quality Control Meeting (hereinafter referred to as the “Meeting”) will be held for quality assurance and smooth implementation of the Works at each stage of the Works. The member of the Meeting will be composed by the

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Recipient (or executing agency), the Consultant, the Contractor and JICA. The functions of the Meeting are as followings:

- a) Sharing information on the objective, concept and conditions of design from the Contractor, before start of construction.
- b) Discussing the issues affecting the Works such as modification of the design, test, inspection, safety control and the Client's obligation, during of construction.

(2) Ex-post Monitoring and Evaluation Stage

1) After the project completion, JICA will continue to keep in close contact with the Recipient in order to monitor that the outputs of the Project is used and maintained properly to attain its expected outcomes.

2) In principle, JICA will conduct ex-post evaluation of the Project after three years from the completion. It is required for the Recipient to furnish any necessary information as JICA may reasonably request.

(3) Others

1) Environmental and Social Considerations

The Recipient shall carefully consider environmental and social impacts by the Project and must comply with the environmental regulations of the Recipient and JICA Guidelines for Environmental and Social Considerations (April, 2010).

2) Major undertakings to be taken by the Government of the Recipient

For the smooth and proper implementation of the Project, the Recipient is required to undertake necessary measures including land acquisition, and bear an advising commission of the A/P and payment commissions paid to the Bank as agreed with the GOJ and/or JICA. The Government of the Recipient shall ensure that customs duties, internal taxes and other fiscal levies which may be imposed in the Recipient with respect to the purchase of the Products and/or the Services be exempted or be borne by its designated authority without using the Grant and its accrued interest, since the grant fund comes from the Japanese taxpayers.

3) Proper Use

The Recipient is required to maintain and use properly and effectively the products and/or services under the Project (including the facilities constructed and the equipment purchased), to assign staff necessary for this operation and maintenance and to bear all the expenses other than those covered by the Japanese Grant.

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#### 4) Export and Re-export

The products purchased under the Japanese Grant should not be exported or re-exported from the Recipient.

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PROCEDURES OF JAPANESE GRANT

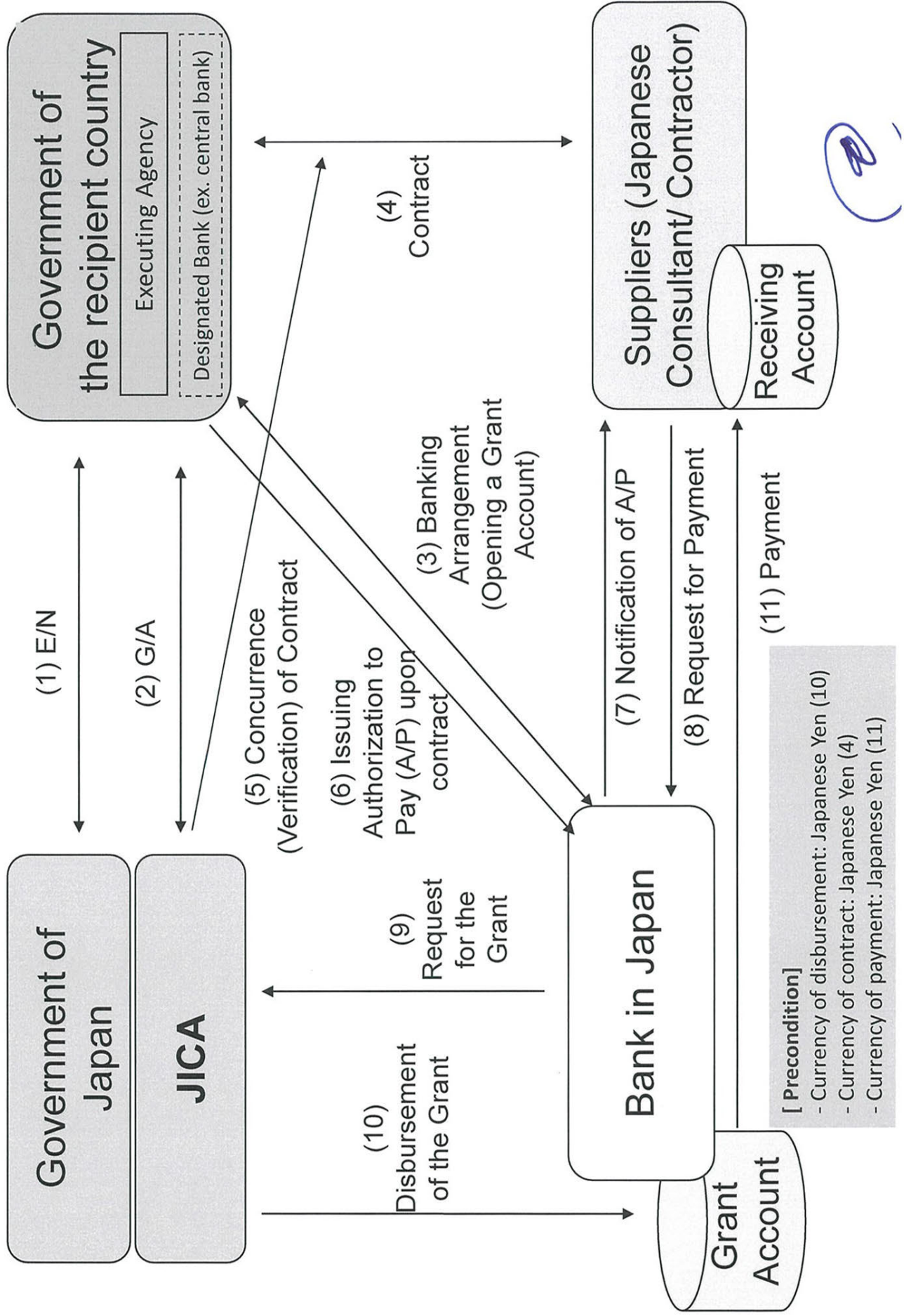
Stage	Procedures	Remarks	Recipient Government	Japanese Government	JICA	Consultants	Contractors	Agent Bank
Official Request	Request for grants through diplomatic channel	Request shall be submitted before appraisal stage.	x	x				
1. Preparation	(1) Preparatory Survey Preparation of outline design and cost estimate		x		x	x		
2. Appraisal	(2) Preparatory Survey Explanation of draft outline design, including cost estimate, undertakings, etc.		x		x	x		
	(3) Agreement on conditions for implementation	Conditions will be explained with the draft notes (E/N) and Grant Agreement (G/A) which will be signed before approval by Japanese government.	x	x (E/N)	x (G/A)			
	(4) Approval by the Japanese cabinet			x				
3. Implementation	(5) Exchange of Notes (E/N)		x	x				
	(6) Signing of Grant Agreement (G/A)		x		x			
	(7) Banking Arrangement (B/A)	Need to be informed to JICA	x					x
	(8) Contracting with consultant and issuance of Authorization to Pay (A/P)	Concurrence by JICA is required	x			x		x
	(9) Detail design (D/D)		x			x		
	(10) Preparation of bidding documents	Concurrence by JICA is required	x			x		
	(11) Bidding	Concurrence by JICA is required	x			x	x	
	(12) Contracting with contractor/supplier and issuance of A/P	Concurrence by JICA is required	x				x	x
	(13) Construction works/procurement	Concurrence by JICA is required for major modification of design and amendment of contracts.	x			x	x	
	(14) Completion certificate		x			x	x	
4. Ex-post monitoring & evaluation	(15) Ex-post monitoring	To be implemented generally after 1, 3, 10 years of completion, subject to change	x		x			
	(16) Ex-post evaluation	To be implemented basically after 3 years of completion	x		x			

notes:

1. Project Monitoring Report and Report for Project Completion shall be submitted to JICA as agreed in the G/A.

2. Concurrence by JICA is required for allocation of grant for remaining amount and/or contingencies as agreed in the G/A.

# Financial Flow of Japanese Grant (A/P Type)



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**Project Monitoring Report**  
**on**  
**Project Name**  
**Grant Agreement No. XXXXXXXX**  
20XX, Month

**Organizational Information**

<b>Signer of the G/A (Recipient)</b>	<p>_____ Person in Charge (Designation)</p> <p>Contacts      _____                     Address:                     Phone/FAX:                     Email:</p>
<b>Executing Agency</b>	<p>_____ Person in Charge (Designation)</p> <p>Contacts      _____                     Address:                     Phone/FAX:                     Email:</p>
<b>Line Ministry</b>	<p>_____ Person in Charge (Designation)</p> <p>Contacts      _____                     Address:                     Phone/FAX:                     Email:</p>

**General Information:**

<b>Project Title</b>	
<b>E/N</b>	Signed date: Duration:
<b>G/A</b>	Signed date: Duration:
<b>Source of Finance</b>	Government of Japan: Not exceeding JPY _____ mil. Government of (_____): _____


**1: Project Description**

**1-1 Project Objective**

--

**1-2 Project Rationale**

- Higher-level objectives to which the project contributes (national/regional/sectoral policies and strategies)
- Situation of the target groups to which the project addresses

--

**1-3 Indicators for measurement of "Effectiveness"**

Quantitative indicators to measure the attainment of project objectives		
Indicators	Original (Yr )	Target (Yr )
Qualitative indicators to measure the attainment of project objectives		

**2: Details of the Project**

**2-1 Location**

Components	Original <i>(proposed in the outline design)</i>	Actual
1.		

**2-2 Scope of the work**

Components	Original* <i>(proposed in the outline design)</i>	Actual*
1.		

Reasons for modification of scope (if any).

(PMR)
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zk (R)

**2-3 Implementation Schedule**

Items	Original		Actual
	<i>(proposed in the outline design)</i>	<i>(at the time of signing the Grant Agreement)</i>	

Reasons for any changes of the schedule, and their effects on the project (if any)

**2-4 Obligations by the Recipient**

**2-4-1 Progress of Specific Obligations**

See Attachment 2.

**2-4-2 Activities**

See Attachment 3.

**2-4-3 Report on RD**

See Attachment 11.

**2-5 Project Cost**

**2-5-1 Cost borne by the Grant(Confidential until the Bidding)**

Components			Cost (Million Yen)	
	Original <i>(proposed in the outline design)</i>	Actual <i>(in case of any modification)</i>	Original <sup>1),2)</sup> <i>(proposed in the outline design)</i>	Actual
	1.			
Total				

Note: 1) Date of estimation:

2) Exchange rate: 1 US Dollar = Yen

**2-5-2 Cost borne by the Recipient**

Components			Cost (1,000 Taka)	
	Original <i>(proposed in the outline design)</i>	Actual <i>(in case of any modification)</i>	Original <sup>1),2)</sup> <i>(proposed in the outline design)</i>	Actual
	1.			

zk (2)

- Note: 1) Date of estimation:  
2) Exchange rate: 1 US Dollar =

Reasons for the remarkable gaps between the original and actual cost, and the countermeasures (if any)

(PMR)

**2-6 Executing Agency**

- Organization's role, financial position, capacity, cost recovery etc,
- Organization Chart including the unit in charge of the implementation and number of employees.

**Original** (at the time of outline design)

name:

role:

financial situation:

institutional and organizational arrangement (organogram):

human resources (number and ability of staff):

**Actual** (PMR)

**2-7 Environmental and Social Impacts**

- The results of environmental monitoring based on Attachment 5 (in accordance with Schedule 4 of the Grant Agreement).
- The results of social monitoring based on in Attachment 5 (in accordance with Schedule 4 of the Grant Agreement).
- Disclosed information related to results of environmental and social monitoring to local stakeholders (whenever applicable).

**3: Operation and Maintenance (O&M)**

**3-1 Physical Arrangement**

- Plan for O&M (number and skills of the staff in the responsible division or section, availability of manuals and guidelines, availability of spareparts, etc.)

**Original** (at the time of outline design)

**Actual** (PMR)

**3-2 Budgetary Arrangement**

- Required O&M cost and actual budget allocation for O&M

**Original** (at the time of outline design)

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Actual (PMR)

**4: Potential Risks and Mitigation Measures**

- Potential risks which may affect the project implementation, attainment of objectives, sustainability
- Mitigation measures corresponding to the potential risks

**Assessment of Potential Risks (at the time of outline design)**

Potential Risks	Assessment
1. (Description of Risk)	Probability: High/Moderate/Low
	Impact: High/Moderate/Low
	Analysis of Probability and Impact:
	Mitigation Measures:
	Action required during the implementation stage:
	Contingency Plan (if applicable):
2. (Description of Risk)	Probability: High/Moderate/Low
	Impact: High/Moderate/Low
	Analysis of Probability and Impact:
	Mitigation Measures:
	Action required during the implementation stage:
	Contingency Plan (if applicable):
3. (Description of Risk)	Probability: High/Moderate/Low
	Impact: High/Moderate/Low
	Analysis of Probability and Impact:
	Mitigation Measures:
	Action required during the implementation stage:

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	Contingency Plan (if applicable):
Actual Situation and Countermeasures (PMR)	

**5: Evaluation and Monitoring Plan (after the work completion)**

**5-1 Overall evaluation**

Please describe your overall evaluation on the project.

**5-2 Lessons Learnt and Recommendations**

Please raise any lessons learned from the project experience, which might be valuable for the future assistance or similar type of projects, as well as any recommendations, which might be beneficial for better realization of the project effect, impact and assurance of sustainability.

**5-3 Monitoring Plan of the Indicators for Post-Evaluation**

Please describe monitoring methods, section(s)/department(s) in charge of monitoring, frequency, the term to monitor the indicators stipulated in 1-3.

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Attachment

1. Project Location Map
  2. Specific obligations of the Recipient which will not be funded with the Grant
  3. Monthly Report submitted by the Consultant
- Appendix - Photocopy of Contractor's Progress Report (if any)
- Consultant Member List
  - Contractor's Main Staff List
4. Check list for the Contract (including Record of Amendment of the Contract/Agreement and Schedule of Payment)
  5. Environmental Monitoring Form / Social Monitoring Form
  6. Monitoring sheet on price of specified materials (Quarterly)
  7. Report on Proportion of Procurement (Recipient Country, Japan and Third Countries) (PMR (final) only)
  8. Pictures (by JPEG style by CD-R) (PMR (final) only)
  9. Equipment List (PMR (final) only)
  10. Drawing (PMR (final) only)
  11. Report on RD (After project)

Monitoring sheet on price of specified materials

1. Initial Conditions (Confirmed)

Items of Specified Materials	Initial Volume A	Initial Unit Price (¥) B	Initial total Price C=A×B	1% of Contract Price D	Condition of payment	
					Price (Decreased) E=C-D	Price (Increased) F=C+D
Item 1	●●t	●	●	●	●	●
Item 2	●●t	●	●			
Item 3						
Item 4						
Item 5						

2. Monitoring of the Unit Price of Specified Materials

(1) Method of Monitoring : ●●

(2) Result of the Monitoring Survey on Unit Price for each specified materials

Items of Specified Materials	1st month, 2015	2nd month, 2015	3rd month, 2015	4th	5th	6th
Item 1	●	●	●			
Item 2						
Item 3						
Item 4						
Item 5						

(3) Summary of Discussion with Contractor (if necessary)

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Report on Proportion of Procurement (Recipient Country, Japan and Third Countries)  
 (Actual Expenditure by Construction and Equipment each)

	Domestic Procurement (Recipient Country) A	Foreign Procurement (Japan) B	Foreign Procurement (Third Countries) C	Total D
Construction Cost	(A/D%)	(B/D%)	(C/D%)	
Direct Construction	(A/D%)	(B/D%)	(C/D%)	
Cost others	(A/D%)	(B/D%)	(C/D%)	
Equipment Cost	(A/D%)	(B/D%)	(C/D%)	
Design and Supervision Cost	(A/D%)	(B/D%)	(C/D%)	
Total	(A/D%)	(B/D%)	(C/D%)	

37

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Annex 6

Major Undertakings to be taken by the Royal Government of Cambodia

**1. Specific obligations of the Royal Government of Cambodia which will not be funded with the Grant**

**(1) Before the Bidding**

NO	Items	Deadline	In charge	Estimated Cost	Ref.
1	To sign the banking arrangement (B/A) with a bank in Japan (the Agent Bank) to open bank account for the Grant	within 1 month after the signing of the G/A			
2	To issue A/P to the Agent Bank for the payment to the consultant	within 1 month after the signing of the contract(s)			
3	To bear the following commissions to the Agent Bank for the banking services based upon B/A				
	1) Advising commission of A/P	within 1 month after the signing of the contract(s)			
	2) Payment commission for A/P	every payment			
4	To secure and clear the following lands 1) project sites for TIMA and Outreach facility 2) temporary construction yard and stock yard near the Project area 3) borrow pit and disposal site near the Project area	before notice of the bidding documents			
5	To obtain the planning, zoning, building permit	before notice of the bidding documents			
6	To clear, level and reclaim the following sites 1) existing facilities 2) leveling and reclaiming the sites by banking for TIMA and Outreach facility 3) Removal of unnecessary existing trees.	before notice of the bidding documents			
7	To submit Project Monitoring Report (with the result of Detailed Design)	before preparation of the bidding documents			

(B/A: Banking Arrangement, A/P: Authorization to pay, N/A: Not Applicable)

## (2) During the Project Implementation

NO	Items	Deadline	In charge	Estimated Cost	Ref.
1	To issue A/P to the Agent Bank for the payment to the supplier and the contractor	within 1 month after the signing of the contract(s)			
2	To bear the following commissions to the Agent Bank for the banking services based upon the B/A				
	1) Advising commission of A/P	within 1 month after the signing of the contract(s)			
	2) Payment commission for A/P	every payment			
3	To ensure prompt unloading and customs clearance at ports of disembarkation in the country of the Recipient and to assist the Supplier(s) with internal transportation therein	during the Project			
4	To accord Japanese physical persons and/or physical persons of third countries whose services may be required in connection with the supply of the products and the services such facilities as may be necessary for their entry into the country of the Recipient and stay therein for the performance of their work	during the Project			
5	To ensure that customs duties, internal taxes and other fiscal levies which may be imposed in the country of the Recipient with respect to the purchase of the products and/or the services be exempted; Such customs duties, internal taxes and other fiscal levies mentioned above include VAT, commercial tax, income tax and corporate tax of Japanese nationals, resident tax, fuel tax, but not limited, which may be imposed in the recipient country with respect to the supply of the products and services under the verified contract	during the Project			
6	To bear all the expenses, other than those covered by the Grant, necessary for the implementation of the Project	during the Project			
7	To notify JICA promptly of any incident or accident, which has, or is likely to have, a significant adverse effect on the environment, the affected communities, the public or workers.	during the construction			
8	To submit Project Monitoring Report	every month			
	To submit Project Monitoring Report (final) (including as-built drawings, equipment list, photographs, etc.)	within 1 month after issuance of Certificate of Completion for the works under the contract(s)			
9	To submit a report concerning completion of the Project	within 6 months after completion of the Project			
10	To construct access roads	3 months before completion of the construction			
	1) Outside the site				
11	To provide facilities for distribution of electricity, water supply and drainage and other incidental facilities necessary for the implementation of the Project outside the site(s)				
	1) Electricity The distributing line to the site	before start of the construction			
	2) Water Supply The city water distribution main to the site	before start of the construction			

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	3) Drainage The city drainage main ( for storm, sewer and others ) to the site	6 months before completion of the construction			
	4) Telecommunications Proper speed of communication line to the site	6 months before completion of the construction			
12	To provide equipment, furniture, facilities necessary for the implementation of the Project in the site(s)	before start of the construction			
13	To take necessary measures for general security and safety of the Project site	during the construction			
14	To provide the contents of the exhibition	On or before the installation work of the equipment related to the exhibition			

### (3) After the Project

NO	Items	Deadline	In charge	Estimated Cost	Ref.
1	To maintain and use properly and effectively the facilities constructed and equipment provided under the Grant Aid 1) Allocation of maintenance cost 2) Operation and maintenance structure 3) Routine check/Periodic inspection	After completion of the construction			
2	To bear all the expenses, other than those covered by the Grant, necessary for operation.	After completion of the construction			

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2. Other obligations of the Royal Government of Cambodia funded with the Grant

NO	Items	Deadline	Amount (Million Japanese Yen)*
1	To construct buildings within TIMA and Outreach facility and to procure necessary equipment which is in line with the fuctions of those facilities	/	/
2	To implement detailed design, bidding support and construction supervision(Consulting Service)		
3	Contingencies		
	Total		XXX

\*The Amount is provisional. This is subject to the approval of the Government of Japan.

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## **Appendix 5: Technical Note (T/N)**

**Technical Note (T/N)**  
**on the Preparatory Survey on Project for Construction of**  
**Training Complex and Outreach Facility of Cambodian Mine Action Center**  
**(CMAC)**

In addition to the discussion held by the officials of the Government of Cambodia and the Preparatory Survey Team (hereinafter referred to as “the Team”) for the Outline Design of the Construction of Training Complex and Outreach Facility of Cambodian Mine Action Center (hereinafter referred to as “the Project”) dispatched by Japan International Cooperation Agency (hereinafter referred to as “JICA”) which Minutes of Discussion (hereinafter referred to as “M/D”) was signed on 28<sup>th</sup> January 2022, CMAC and the Team have confirmed the technical matters described in the attached sheets. M/D prevails over T/N.

Phnom Penh, Cambodia,

February 2022



H.E.Mr. Heng Ratana  
Delegate of the Royal Government  
in charge as Director General  
Cambodian Mine Action Centre (CMAC)  
Kingdom of Cambodia



Mr. Kazuhiro MIYATAKE  
Chief Consultant  
JICA Preparatory Survey Team  
Japan

## 1. Project Site

Project area:

- (1) The Team explained the Project Area inside the CMAC compound in Kampong Chhnang (Technical Institute of Mine Action (hereinafter referred to as “TIMA”)) and in Siem Reap (Outreach Facility (hereinafter referred to as “OF”)), which is required for the construction of the buildings and facility implemented by the Project, as indicated in **Annex 1-1** and **1-2**. CMAC agreed.
- (2) The Team explained that the levelling and embankment of the existing ground level in Kampong Chhnang and in Siem Reap sites would be conducted by CMAC after signing the Grant Agreement (G/A) and before the tender period. For OF in Siem Reap, after the ground level for the planned facility is levelled at an appropriate height (the same level as the surrounding area of the existing Peace Museum of Mine Action building), appropriate rolling compaction and embankment to additional 2 m height are to be conducted in the 100 m x 100 m range area including the Indoor Facility area. CMAC agreed.

## 2. Building Layout and Floor Plans

The Team conducted site survey and interview with the CMAC based on the drawings which were prepared and submitted. The drawings are presented in **Annex 1-1** to **2-2**.

CMAC confirmed the drawings and agreed to proceed for the further works based on those.

**Table 1 Outline of Buildings in Technical Institute of Mine Action (TIMA)**

No	Building	Structure	Story	Floor Area		Approximate Total Floor Area (m <sup>2</sup> )
					(m <sup>2</sup> )	
1	Classrooms	RC	3	GF	582	1,747
				1F	582	
				2F	582	
2	Advanced EOD classrooms	RC	1	GF	309	309
3	Conference Hall including VIP room	RC	1	GF	432	432
4	Accommodation for Female with TV Room, including Laundry Space and	RC	1	GF	931	931

	Bathrooms					
5	Accommodation for Male with TV Room, including Laundry Space and Bathrooms	RC	2	GF	906	1,812
				1F	906	
6	Recreation space for Gym	S	1	GF	225	225
7	Canteen	S	1	GF	400	400
8	MDD Office	RC	1	GF	400	400
9	Breeding Kennel	S	1	GF	360	360
10	Training Kennel	S	1	GF	396	396
11	Main office building with meeting room	RC	2	GF	790	1,580
				1F	790	
12	Instructor's House	RC	1	GF	560	560
13	Restrooms for Classrooms	RC	1	GF	85	85
14	Restrooms for Advanced EOD Classrooms	RC	1	GF	63	63
<b>Total Area of TIMA Buildings (m<sup>2</sup>)</b>						<b>9,301</b>

- (1) The classroom building was divided into two buildings, one for 15 regular classes and one for 3 advanced classes.
- (2) The Exhibition hall mentioned in the list of Minutes of Discussion was changed to Priority B. It will be included in the planning only if the budget is available.
- (3) Training Kennel No.2 is set as Priority B. It will be included in the planning only if the budget is available.

**Table 2 Outline of Facilities in Outreach Facility (OF)**

No	Description	Floor Area (m <sup>2</sup> )		Total Floor Area (m <sup>2</sup> )
		GF	1F	
<b>1. Indoor Facility</b>				
<b>1-1. Exhibition Rooms</b>				
1	About Cambodia (Before War)	130		130
2	War History	185		185
3	Battlefield Scenes (Simulations)	230		230



4	War Legacy and Destruction	160		140
5	Displays	644		644
6	About CMAC and Mine Action	340		340
7	Stories and Voices of Victims and Participants of Peace Building	60		60
8	Looking to the Future	60		60
9	Preparation Room for Exhibition	40		40
10	Temporary Exhibition Room	100		100
11	Theater Room	120		120
<b>1-2. Others</b>				
1	Briefing Room	128		128
2	Lobby (Stairs, EV, etc.)	288		283
3	Backyard	55		80
4	Conference Hall		242	242
5	Meeting Room		120	120
6	Multipurpose Room, Office Space		360	360
7	Toilets	80	80	160
8	Storage (Warehouse)		100	100
<b>Total Area of OF Indoor Facility (m<sup>2</sup>)</b>		<b>2,620</b>	<b>902</b>	<b>3,522</b>
<b>2. Outdoor Facility</b>				
12	Roofed Exhibition Facility	2,500		2,500
	Others (Demonstration Area, Experience Area, Walkway)	7,500		7,500
<b>Total Area of OF Outdoor Facility (m<sup>2</sup>)</b>		<b>10,000</b>		<b>10,000</b>
<b>Total Area of OF Facilities (m<sup>2</sup>)</b>				<b>13,522</b>

- (1) Regarding the floor height of OF Indoor Facility, considering the appropriate ceiling height of the exhibition facility, as well as natural ventilation and natural lighting, CMAC and the Team agreed to set the floor height of 7 m for GF and 5.1 m for 1F.
- (2) Regarding the site plan, CMAC requested to build the museum on the low land, thus embankment is required. Regarding the floor level of GF, CMAC requested to raise it by 2 m. The Team explained that in case it causes an over budget, other functions might have to be reduced. CMAC agreed.
- (3) Classroom building is set as Priority B. It will be included in the planning only if the budget is available.

(4) Development of the Demonstration Area and Experience Area will be conducted by CMAC.

### 3. Exhibition Plan

The Team conducted a site survey and interview with CMAC about their vision on the exhibition plan. The zoning plan, a part of the section plan, and the necessity of the story for the exhibition were confirmed. They are shown in **Annex 2-2 and 3**. The exhibition contents planning will be determined after further discussions.

### 4. Outline of Electrical and Mechanical work

CMAC confirmed the outline of the electrical and mechanical facilities to be applied.

#### 4.1. Electric Power Supply

The power supplies for TIMA and OF come from 11kV high voltage and Electricite du Cambodge (EDC) distribution line, respectively. Diesel generator is also planned as a back-up emergency power supply in consideration with power outage.

**Table 3 Design Capacity**

Equipment	TIMA	OF
Demand Power	500 kVA	630 kVA
Generator Capacity	Not required	200 kVA
UPS Capacity (for server backup)	Not required	100 kVA

#### 4.2. Information and Communications

The extension telephone system is to be provided to TIMA and OF, and will be connected to the existing building telephone exchanger. LAN system is to be provided to TIMA and OF, and will be connected to the existing system. Fire alarm equipment which is based on the Japanese Fire Service Act is to be provided. CCTV, broadcast equipment and television receiver will also be provided.

#### 4.3. Water Supply

Water supply in TIMA is to be provided with water reservoir tank, elevated tank and lift-up pump. Water in elevated tank is to be distributed to the new buildings. Backside area of TIMA is to be supplied with water from the water reservoir tank, elevated tank and lift-up pump.

Water supply pipeline does not reach OF. Well water is to be provided with newly

bored hole and lift-up well pump. If deemed necessary based on the water quality survey, water will be treated with filtration system after lifted water filled the water tank. Treated water will be distributed to the new buildings.

Water reservoir tank capacity is 100% of daily water consumption. Water demand is based on the International Plumbing Code (IPC) and water consumption can be calculated as shown in the table below.

**Table 4 Daily Water Consumption and Water Tank Capacity**

Facility	Number of Occupancies (people)	Daily Consumption per Person	Daily Consumption (L)	Water Reservoir Tank Capacity (L)
OF	20	60 L/ officer	1,200	11,200
	200	50 L/ visitor	10,000	
TIMA	300	100 L/ student	30,000	33,600
	20	60 L/ instructor	1,200	
	40	60 L/ officer	2,400	

Note: Number of Occupancies is tentative.

Hot water is to be supplied to showers in bathrooms in the accommodations in TIMA.

#### 4.4. Drainage / Sewage

A septic tank and a sedimentation tank in TIMA are to be provided in each building.

A wastewater treatment facility is to be provided in OF. Treated water and rainwater will be discharged to rainwater channel. The treated water quality shall be within the tolerance limits based on the effluent standard for pollution sources discharging wastewater to public areas or sewer featured in Sub-Decree on Water Pollution Control by the Ministry of Environment (April 1999), under the column of “Public water area and sewer” as shown in **Annex 4**.

#### 4.5. Air Conditioning and Ventilation

Air conditioning system is to be provided with packaged air conditioner, ceiling fan and propeller fan. Rooms with air conditioning system are shown below.

**Table 5 Air Conditioning and Ventilation Requirements**

<b>Facility</b>	<b>Room Name</b>	<b>Air Conditioning</b>	<b>Ventilation</b>
TIMA	Office room, meeting room, classrooms, conference hall, etc.	Required	Required
	Dormitory, water closet, storage, gym	Not required	Required
OF	Indoor Facility, office room, meeting room, conference hall, etc.	Required	Required
	Water closet, storage	Not required	Required

Temperature condition for calculation of air conditioning capacity is as shown below. For the average maximum and minimum temperatures in Kampong Chhnang (2015 to 2019) and Siem Reap (2016 to 2019), refer to the following table.

**Table 6 Temperature Conditions in Kampong Chhnang and Siem Reap**

<b>Area</b>	<b>Maximum Temperature</b>	<b>Minimum Temperature</b>
Kampong Chhnang (average from 2015 to 2019)	36.6°C	21.8°C
Siem Reap (average from 2016 to 2019)	36.3°C	22.0°C

Note: Data from June 2019 onwards is not available.

Source: Ministry of Water Resources and Meteorology

**Table 7 Temperature Condition for Planning (Target Value)**

<b>Season</b>	<b>Temperature</b>
Summer	26.0°C
Winter	26.0°C

Note: Humidity is tentative.

## **5. Connection to Infrastructures**

### **5.1. Electric Power and Information & communication**

The power supply source for TIMA is the existing power line of 11kV from EDC, and for OF is the existing power supply line of 230V from EDC. A new transformer in the electrical building is to be provided in TIMA. Telephone and internet cables are connected to the existing buildings.

### **5.2. Water Supply and Drainage or Sewage**

The water supply source for TIMA is the water pipe supplied by city water, and for OF



is a deep well drilled under the Project. Water supply source and amount are to be discussed.

Drainage that fulfills the effluent quality standard is to be discharged to inland surface water. However, discharged drainage water at TIMA will seep through the sedimentation tank.

## **6. Result of Geological Survey**

Boring survey and Standard Penetration Test (SPT) in TIMA were carried out at 11 points to a depth of 16 meters below the current ground level. Whereas in OF, boring survey and SPT were carried out at 8 points to a depth of 40 meters.

The foundation and structural consideration will be studied following the results of the geotechnical investigation, upon receiving the report from the local contractor.

## **7. Equipment Plan**

CMAC and the Team confirmed the priority of equipment to be procured under the Project as shown in **Annex 5**. The Team will prepare the final equipment list according to the priority considering the equipment cost and the Project budget, and discuss with CMAC.

## **8. Other relevant issues**

- (1) Both parties agreed to continue detailed discussions to consider effective use of the available budget for developing the facilities, exhibitions, equipment in TIMA and OF. The Team explained that if the cost estimate shows that items in Priority A exceed the budget, the Team will discuss with CMAC and possibly remove some items (facility and equipment). CMAC agreed.
- (2) The Team requested the submission of copies of evidential/ supporting documents of the landownership in Kampong Chhnang and Siem Reap no later than end of February 2022. CMAC acknowledged the request.
- (3) The Team explained that the building approval of the Project would be applied and obtained by CMAC's undertaking before tender period, prior to the expected date of the public announcement of the tender, and that the following arrangements and documentations should be conducted by CMAC. CMAC acknowledged the explanation.
  - a. Carry out the technical review of the design documents prepared by the Team by contracting registered architects and engineers in Cambodia.



- b. When applicable, prepare the Environment Protection Contract and provide Environmental Management Plan to the Ministry of Environment.
- c. Carry out the preparation of documents required for the application incorporating results of a and b.

(End of Notes)

Annex 1-1: Site Plan of TIMA

Annex 1-2: Site Plan of OF

Annex 2-1: Floor Plans of TIMA Buildings

Annex 2-2: Floor Plans and Elevation Plan of OF Facilities

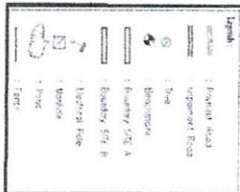
Annex 3: Exhibition Plan of OF

Annex 4: Effluent standard for pollution sources discharging wastewater to public areas or sewer

Annex 5: Equipment list of TIMA and OF

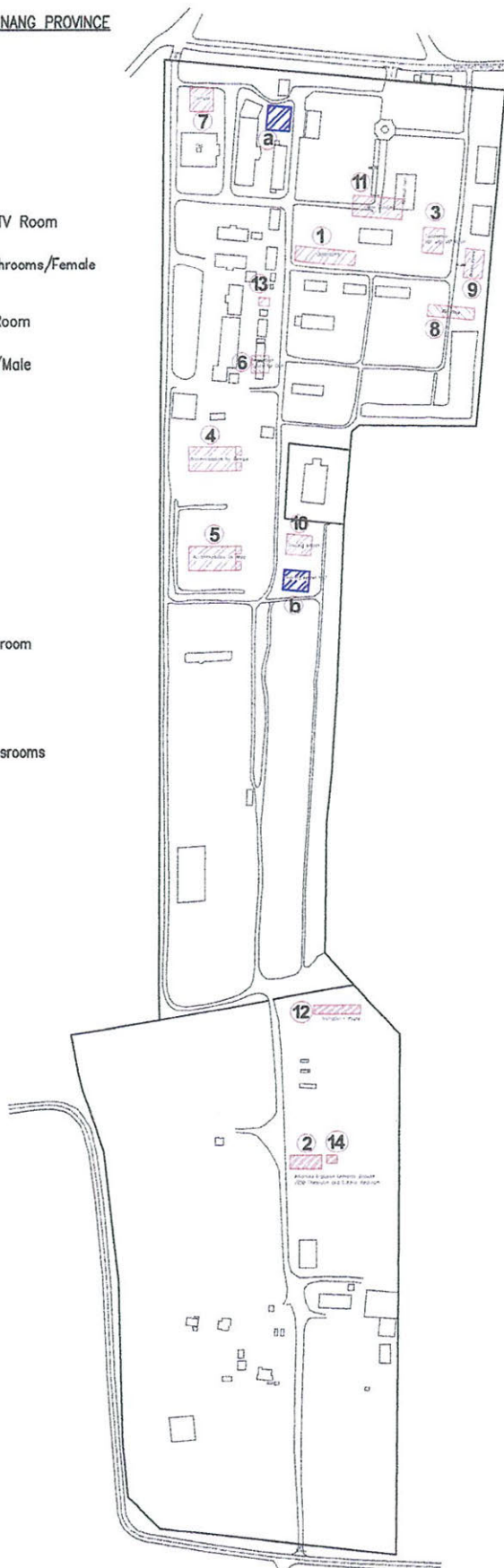
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# Annex 1-1. Site Plan of TIMA



## TIMA MASTER PLAN AT KAMPONG CHHNANG PROVINCE

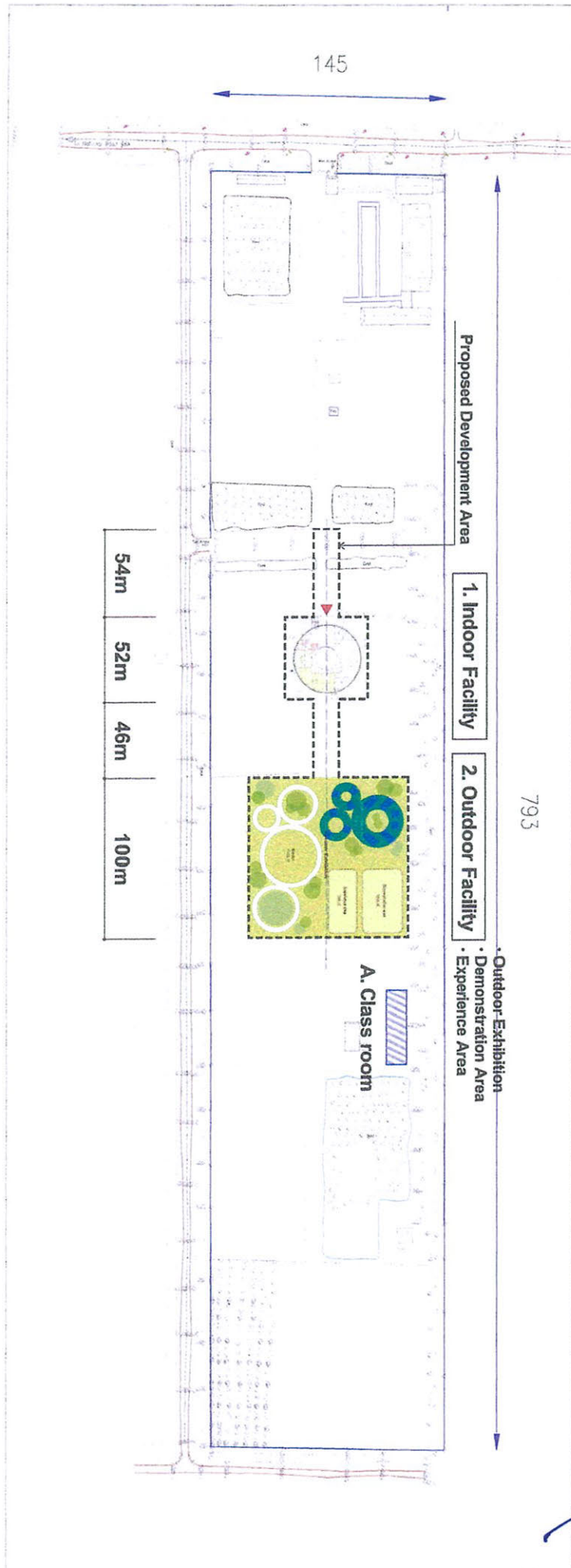
1. Classroom
2. Advanced EOD Classrooms
3. Conference Hall with VIP room
- a. Exhibition mill
4. Accommodation/ Female with TV Room  
Including Laundry space and bathrooms/Female
5. Accommodation/Male with TV Room  
Laundry space and bathrooms/Male
6. Recreation space for GYM
7. Canteen
8. MDD Office
9. Breeding Kennel
10. Training Kennel
- b. Training Kennel No.2
11. Main Office Building with meeting room
12. Instructor's House
13. Restrooms for Classrooms
14. Restrooms for Advanced EOD Classrooms



<p>ES CONSULTING 100, Street 10, Kampong Chhnang, Kampong Chhnang Province, Cambodia Tel: +855 93 282 784</p>	
<p><b>NOTES:</b></p> <ul style="list-style-type: none"> <li>This drawing shall not be used for construction unless certified.</li> <li>Contractor to verify all dimensions of existing works on site before commencing work.</li> <li>Do not scale drawings, use written dimension only.</li> <li>This drawing is to be used in conjunction with the specifications and dimensions in the tender.</li> </ul>	
REVISION	DATE
A	
B	
C	
D	
E	
<p>PROJECT: TIMA MASTER PLAN</p> <p>DESIGNED BY: [Name]</p> <p>CHECKED BY: [Name]</p> <p>APPROVED BY: [Name]</p>	
<p>DATE: 2019/01/13</p> <p>SCALE: 1:400</p>	

*[Handwritten signatures and initials]*

# Annex 1-2. Site Plan of OF



	Proposed Road
	Residential Road
	Type
	Boundary
	Boundary 50%
	Boundary 25%
	Boundary 10%
	Field
	1:200

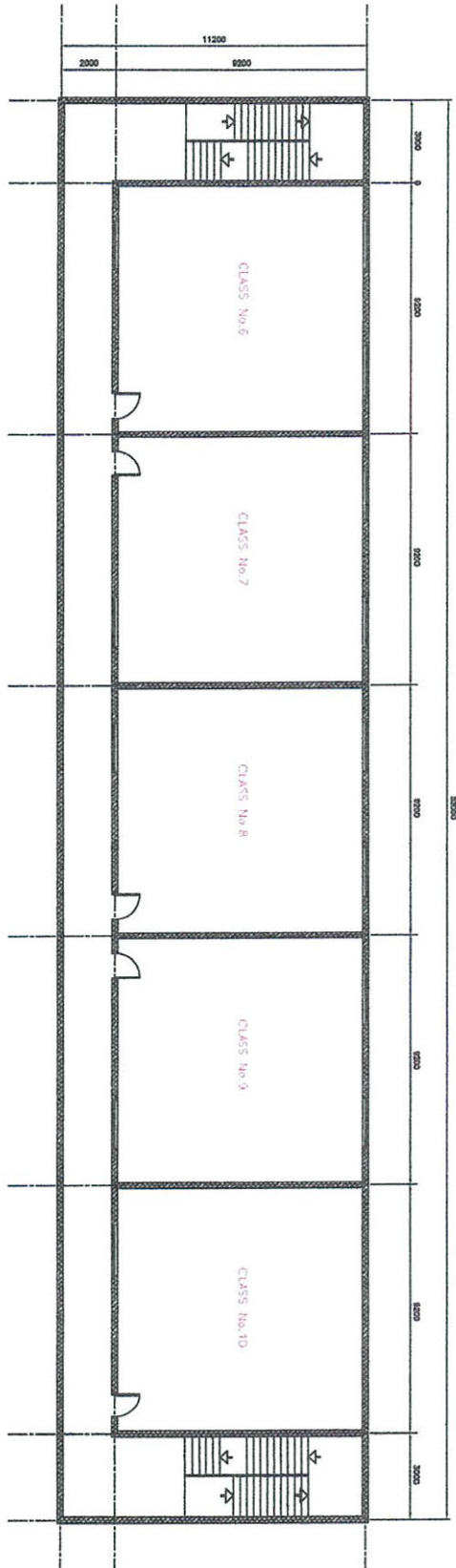
REVISIONS	<ul style="list-style-type: none"> <li>- This drawing shall not be used for construction unless certified.</li> <li>- Do not scale drawings, use a metric dimension only.</li> <li>- Do not scale drawings, use a metric dimension only.</li> <li>- Do not scale drawings, use a metric dimension only.</li> <li>- Do not scale drawings, use a metric dimension only.</li> <li>- All dimensions in millimeter.</li> </ul>
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REVISION	DATE	PROJECT	DRAWING NO
A			501
B			
C			
D			
E			
DRAWING NAME: ONTOHAP		CHEKED BY:	PAPER SIZE: A1
DRAWN BY:		APPROVED BY:	SCALE: 1:200

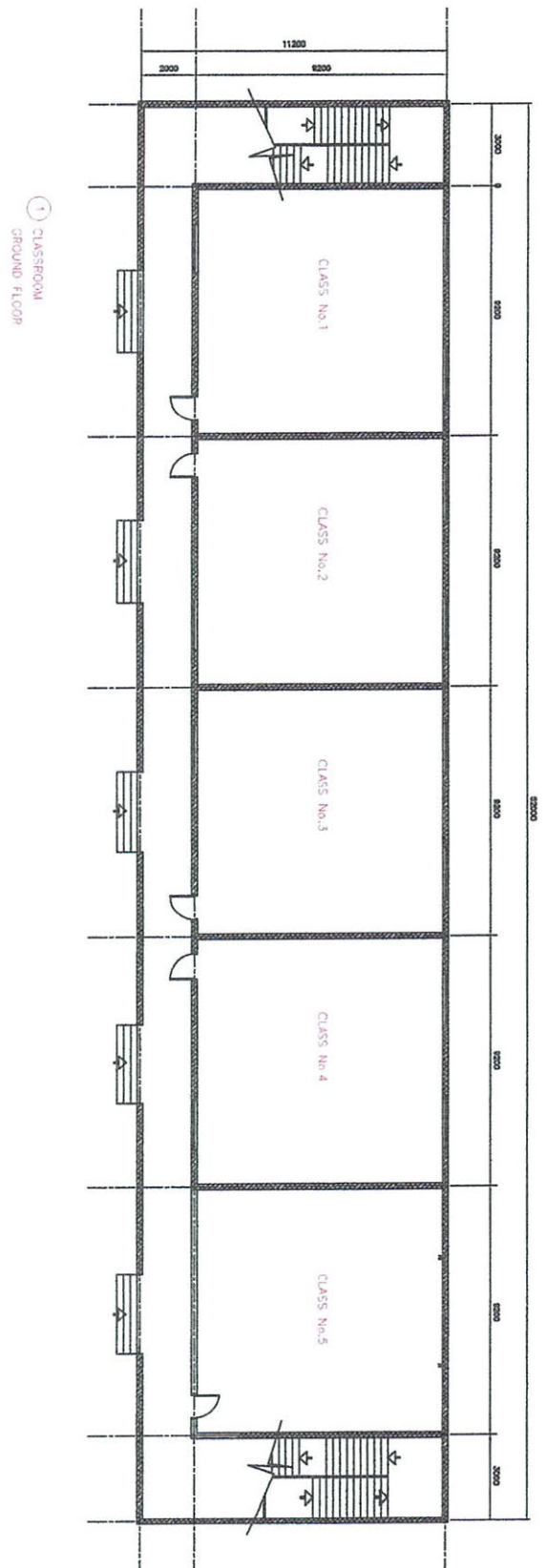
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# Annex 2-1. Floor Plan of TIMA Buildings

## 1. Classrooms (First Floor)

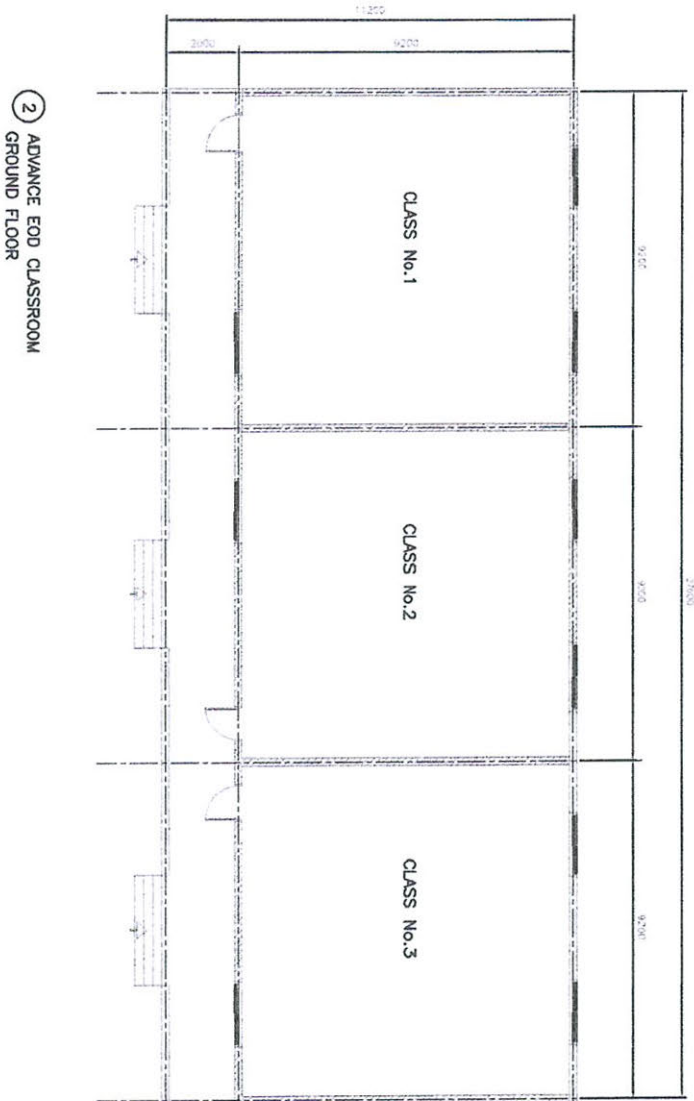


## 1. Classrooms (Ground Floor)

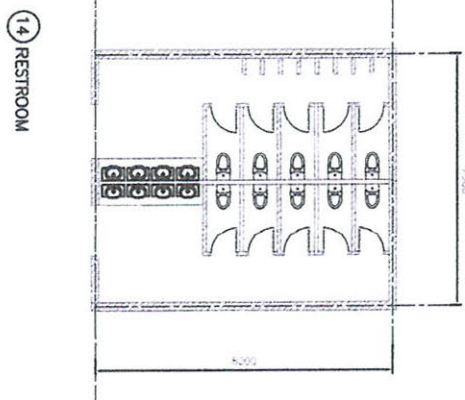


*[Handwritten signature]* *[Handwritten mark]*

2. Advanced EOD Classrooms

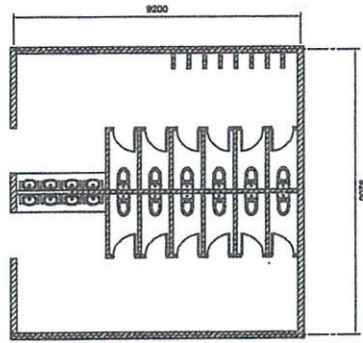


14. Restrooms for Advanced EOD Classrooms

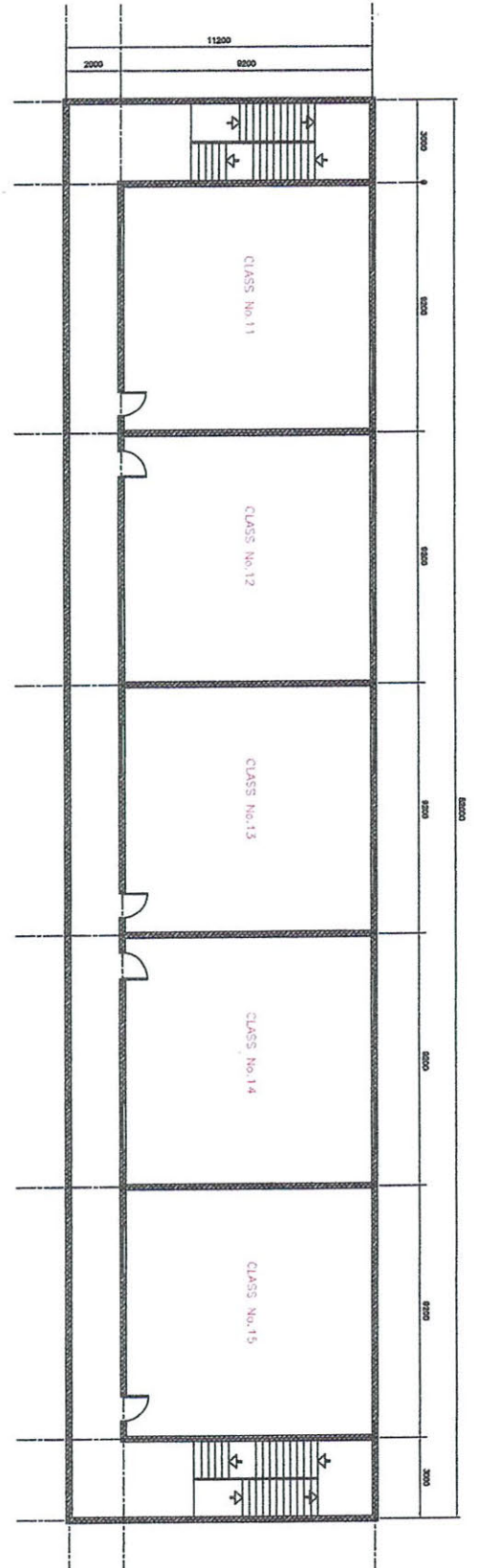


# Annex 2-1. Floor Plan of TIMA Buildings

## 13. Restrooms for Classrooms

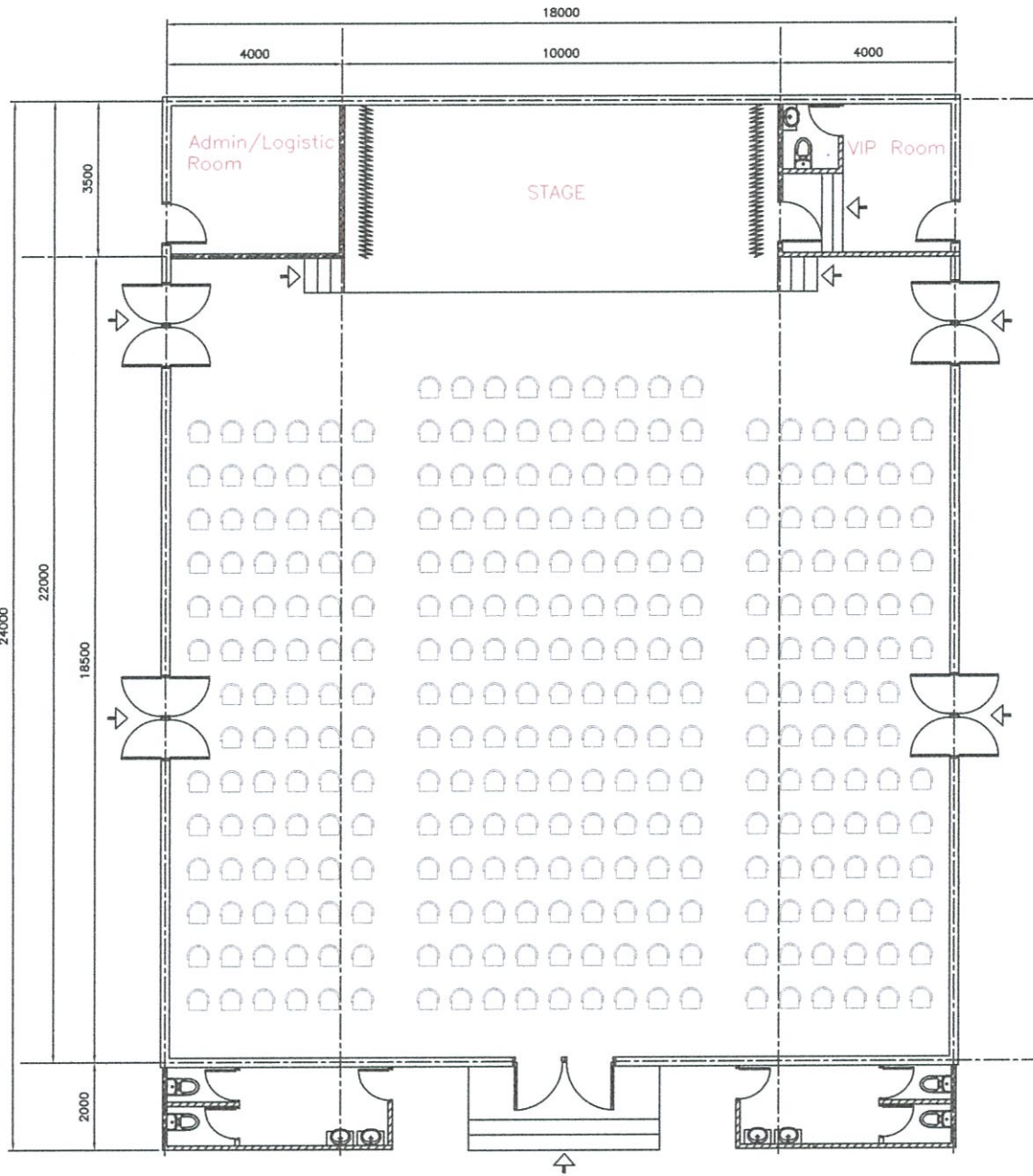


## 1. Classrooms (Second Floor)



*[Handwritten signature]* *[Handwritten initials]*

3. Conference Hall



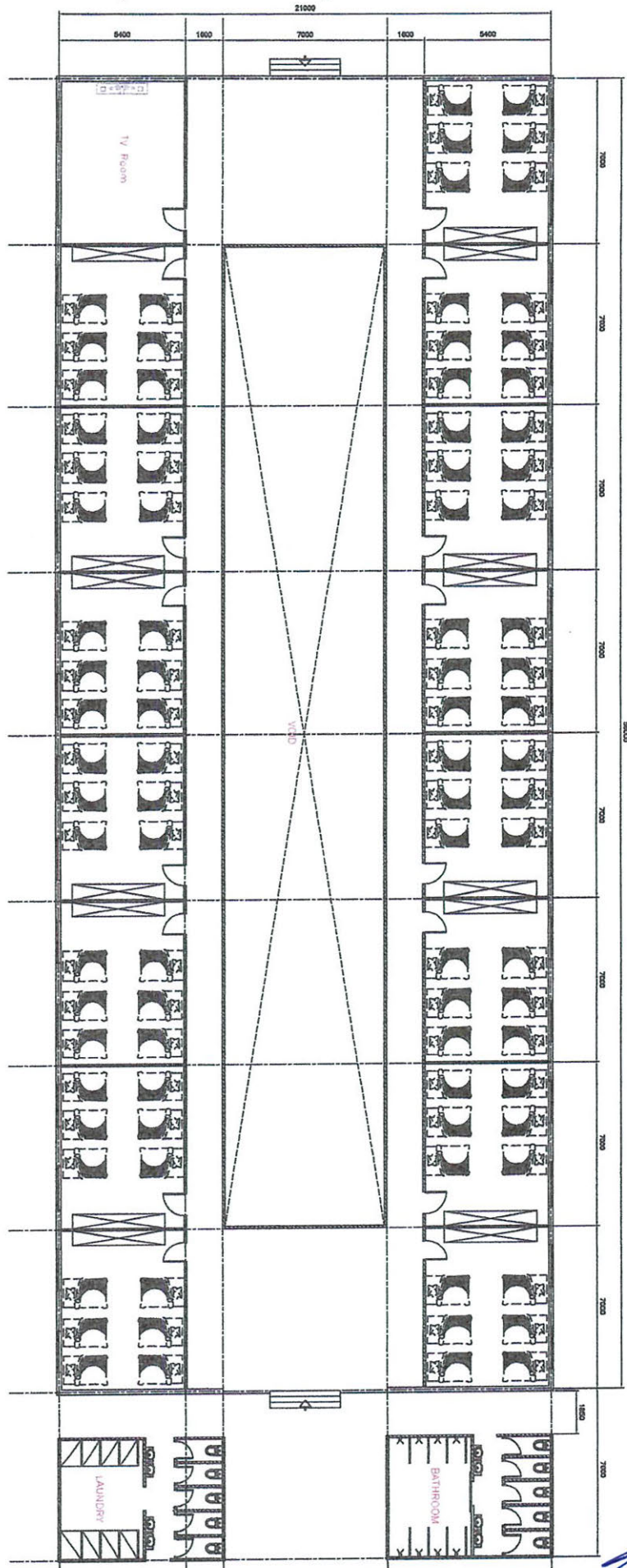
3 CONFERENCE HALL WITH VIP ROOMS

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# Annex 2-1. Floor Plan of TIMA Buildings

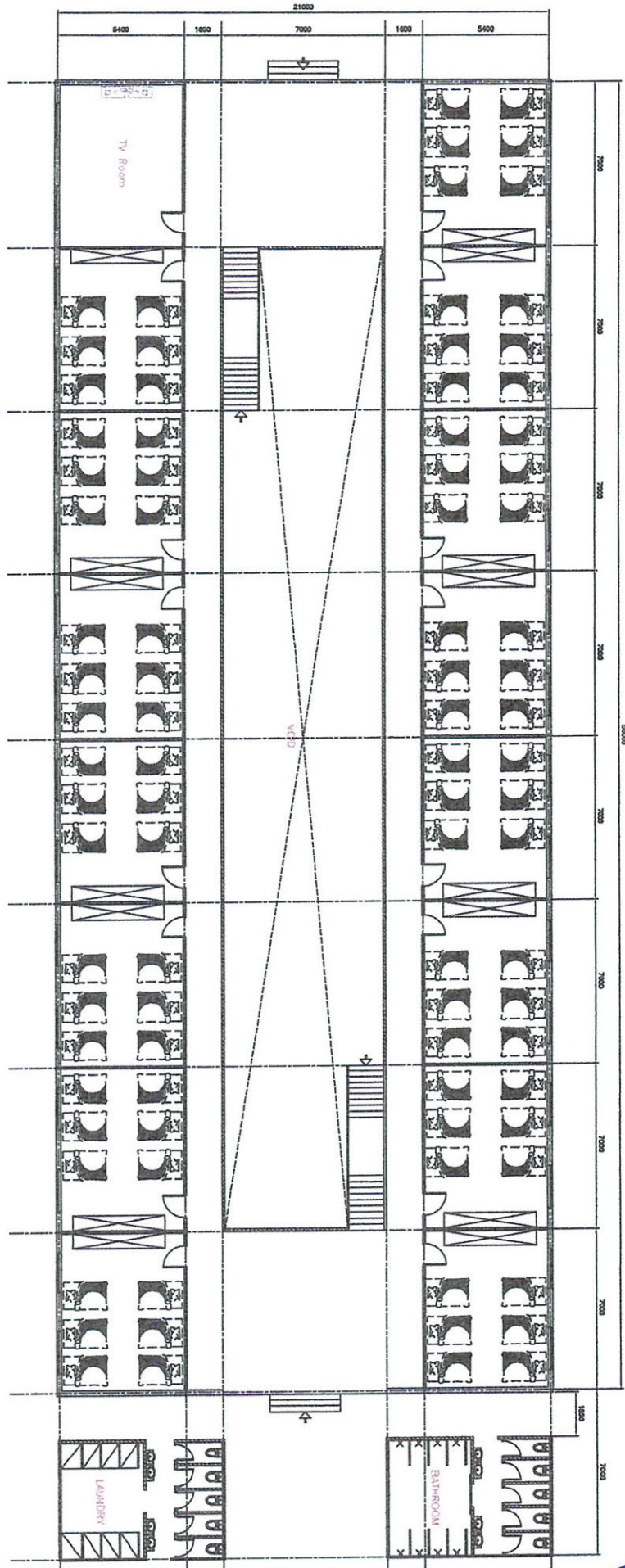
## 4. Accommodation for Female (Ground Floor)



*[Handwritten signature and mark]*

# Annex 2-1. Floor Plan of TIMA Buildings

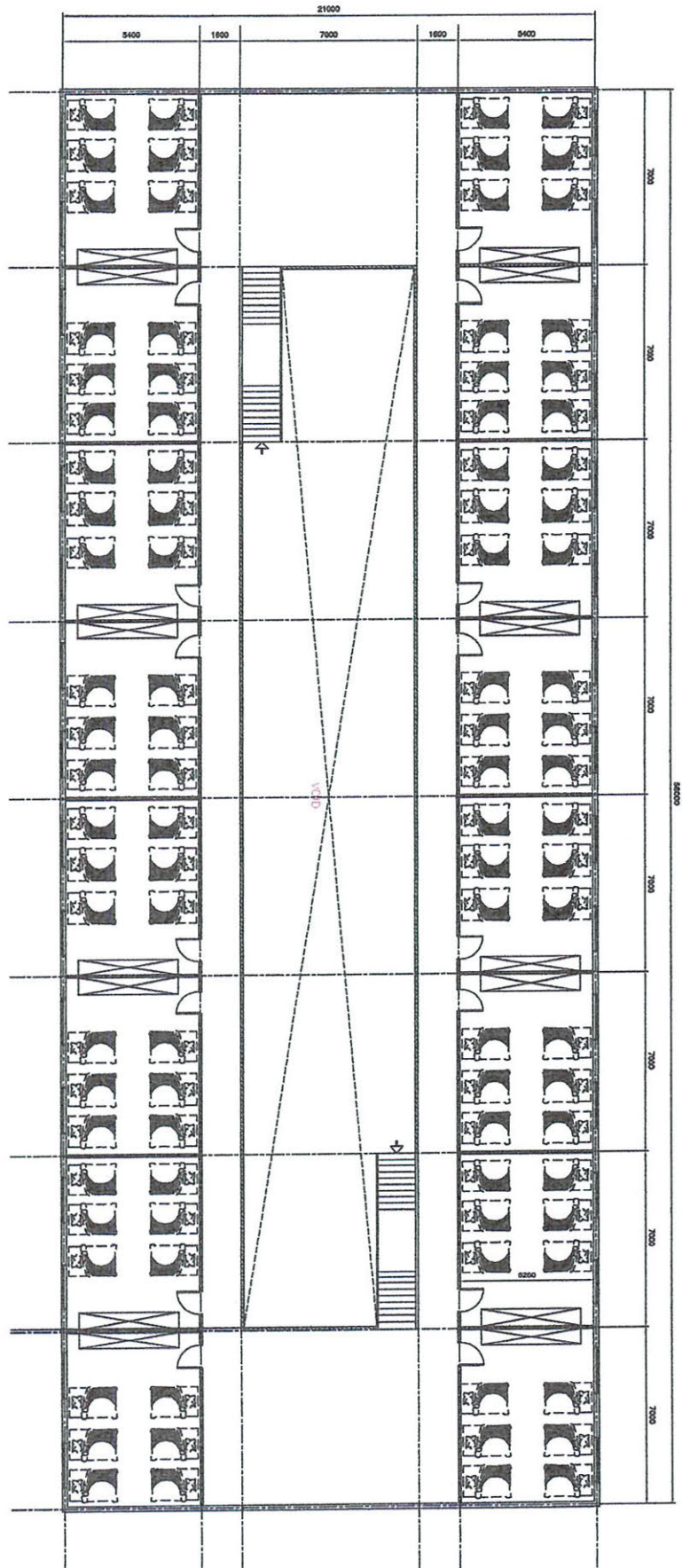
## 5. Accommodation for Male (Ground Floor)



*[Handwritten signature]*  
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# Annex 2-1. Floor Plan of TIMA Buildings

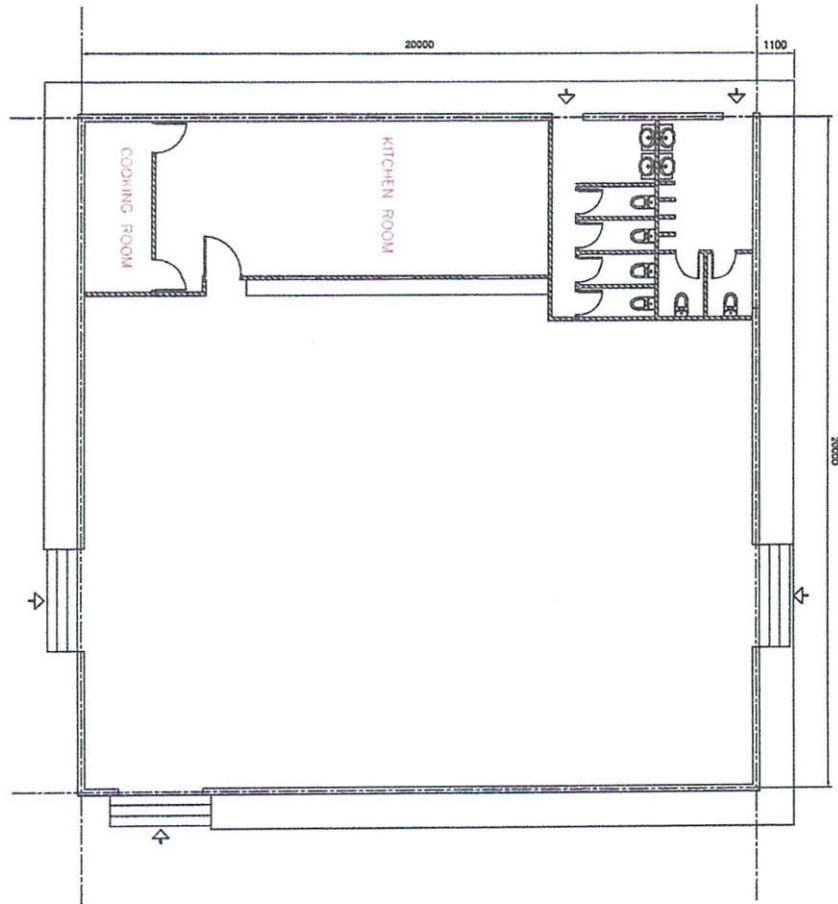
## 5. Accommodation for Male (First Floor)



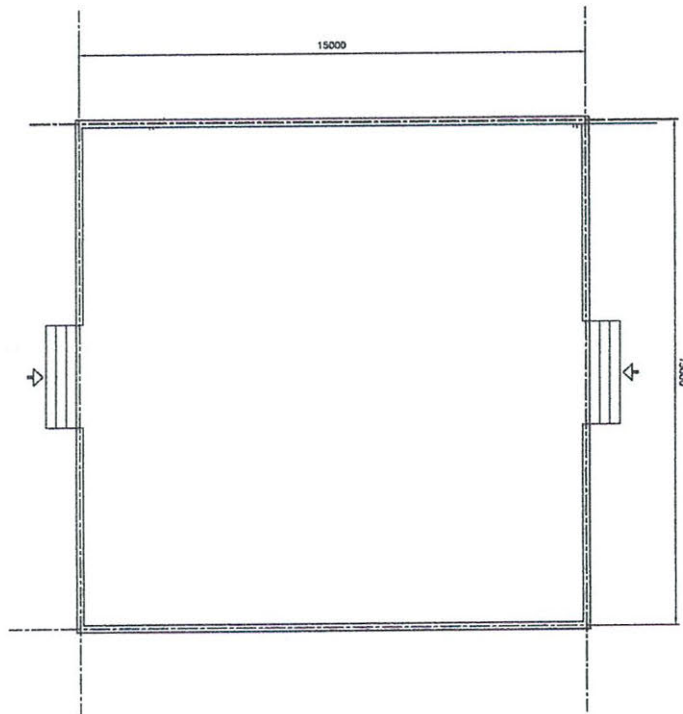
Handwritten annotations in the bottom right corner, including a blue arrow pointing upwards and a circled blue number '2'.

# Annex 2-1. Floor Plan of TIMA Buildings

## 7. Canteen



## 6. Recreation Space for Gym

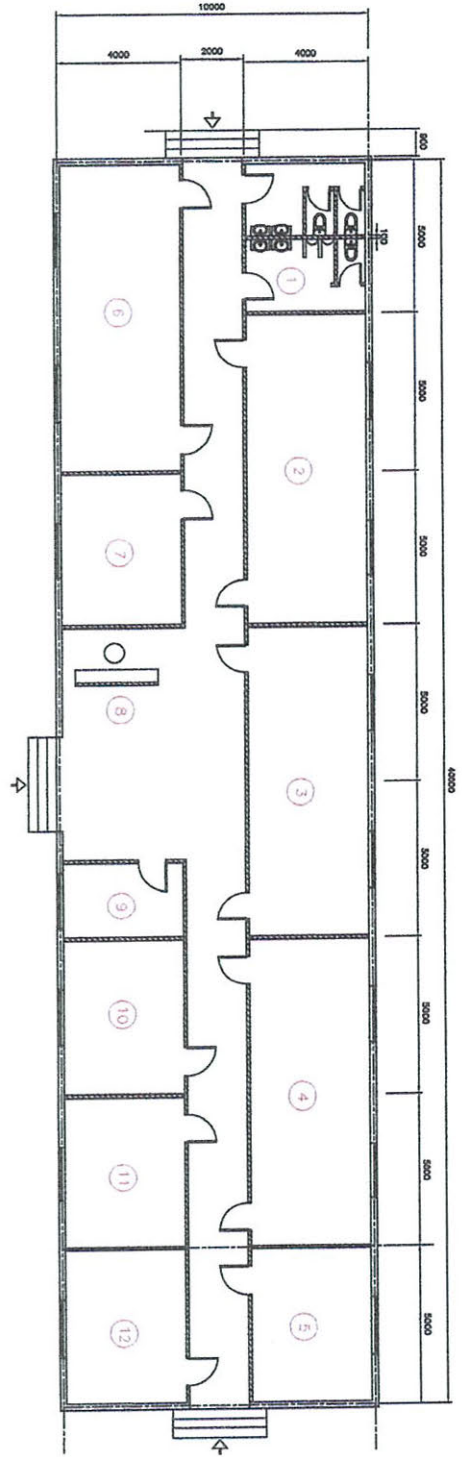


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# Annex 2-1. Floor Plan of TIMA Buildings

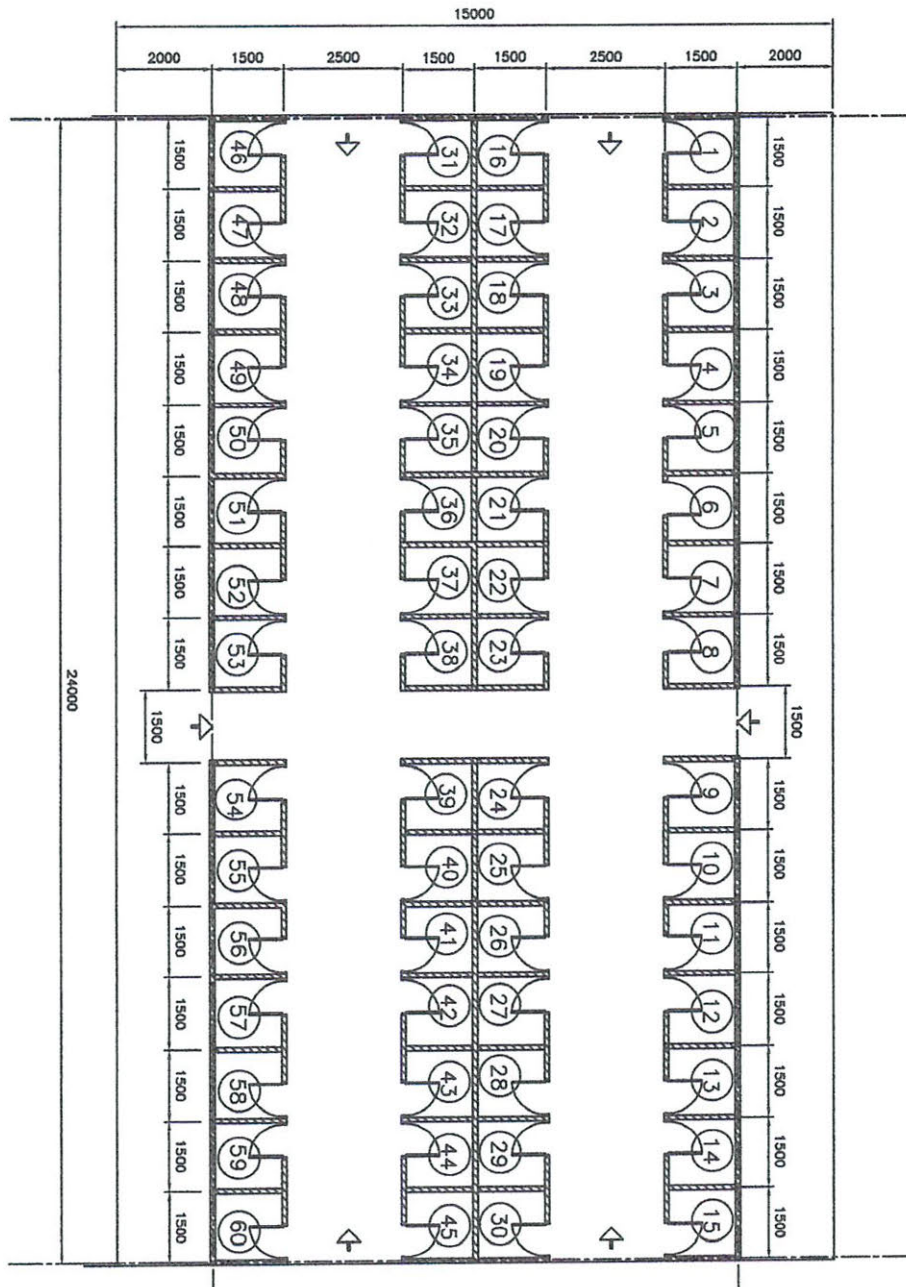
- MDD OFFICE
- 1. Rest Room
  - 2. Dog Training Office
  - 3. Meeting Room
  - 4. DC Manager
  - 5. Support Office
  - 6. Operation Office
  - 7. Breeding Office
  - 8. Receptionist Counter
  - 9. Waiting Room
  - 10. DC Deputy
  - 11. Administration/IT Office
  - 12. Finance Office

## 8. MDD Office



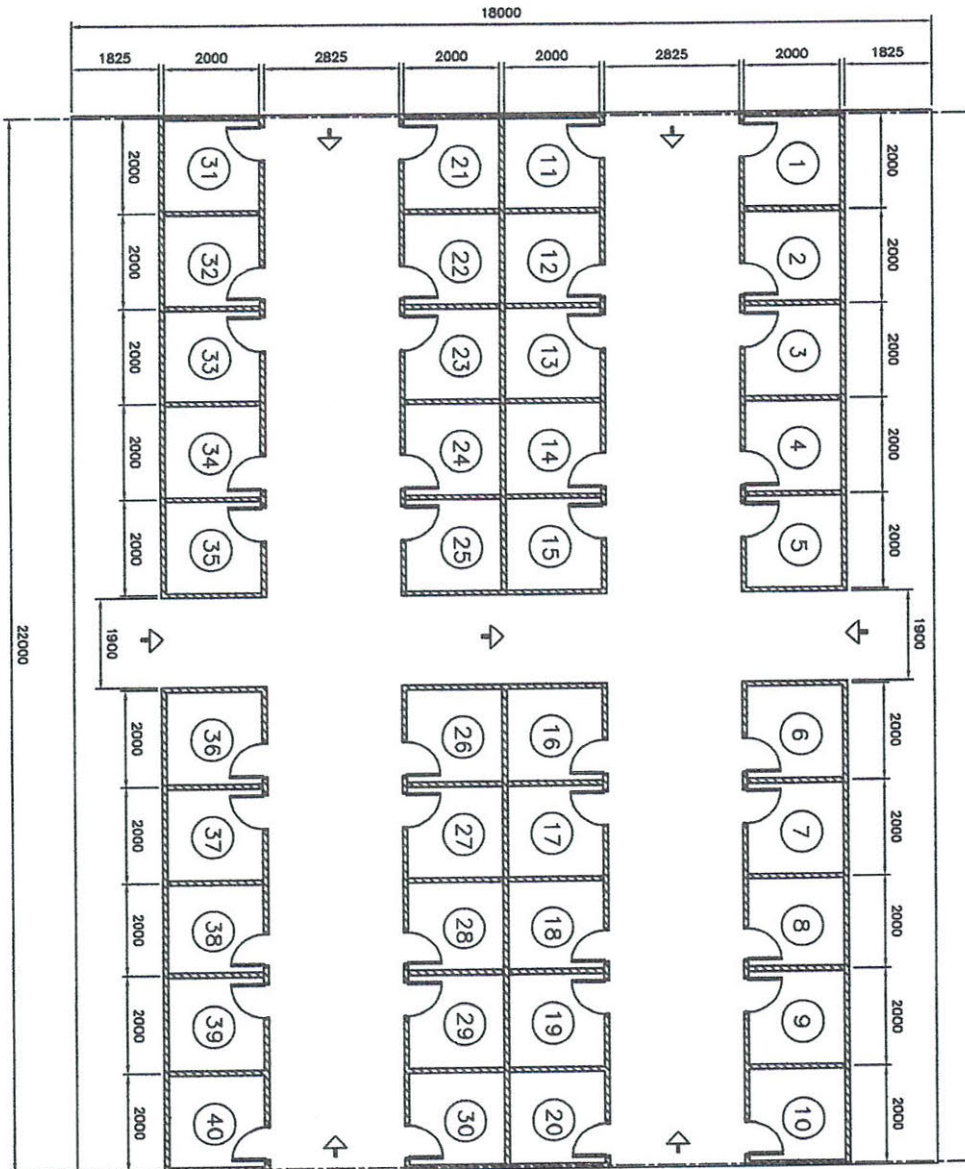
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9. Breeding Kennel



Handwritten signature and a circular stamp.

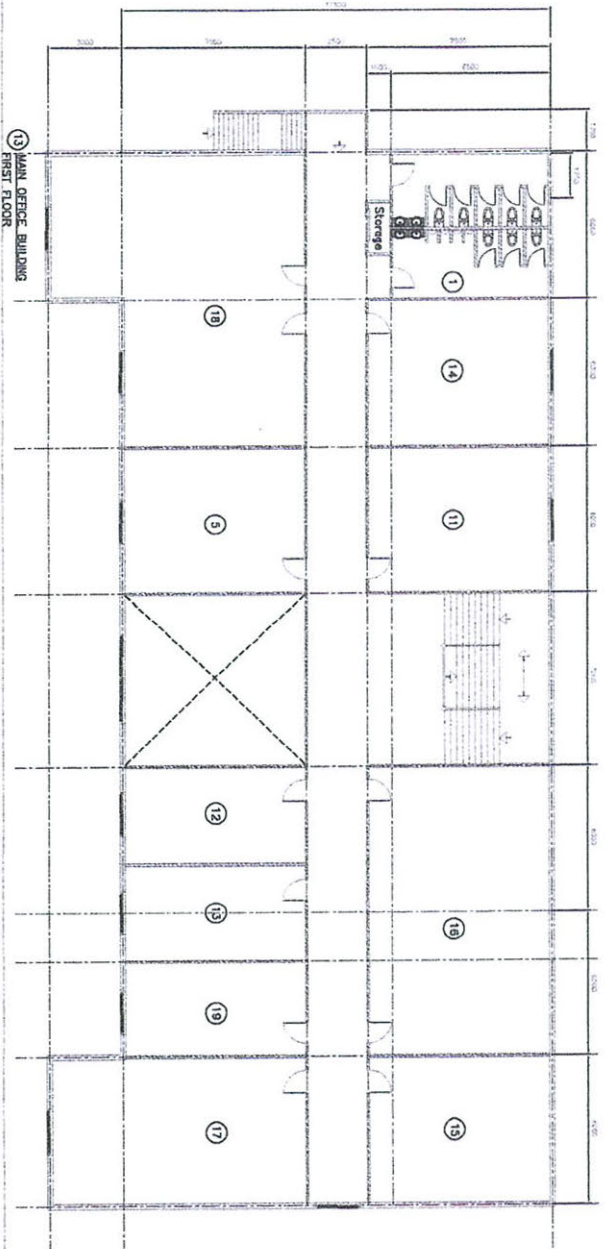
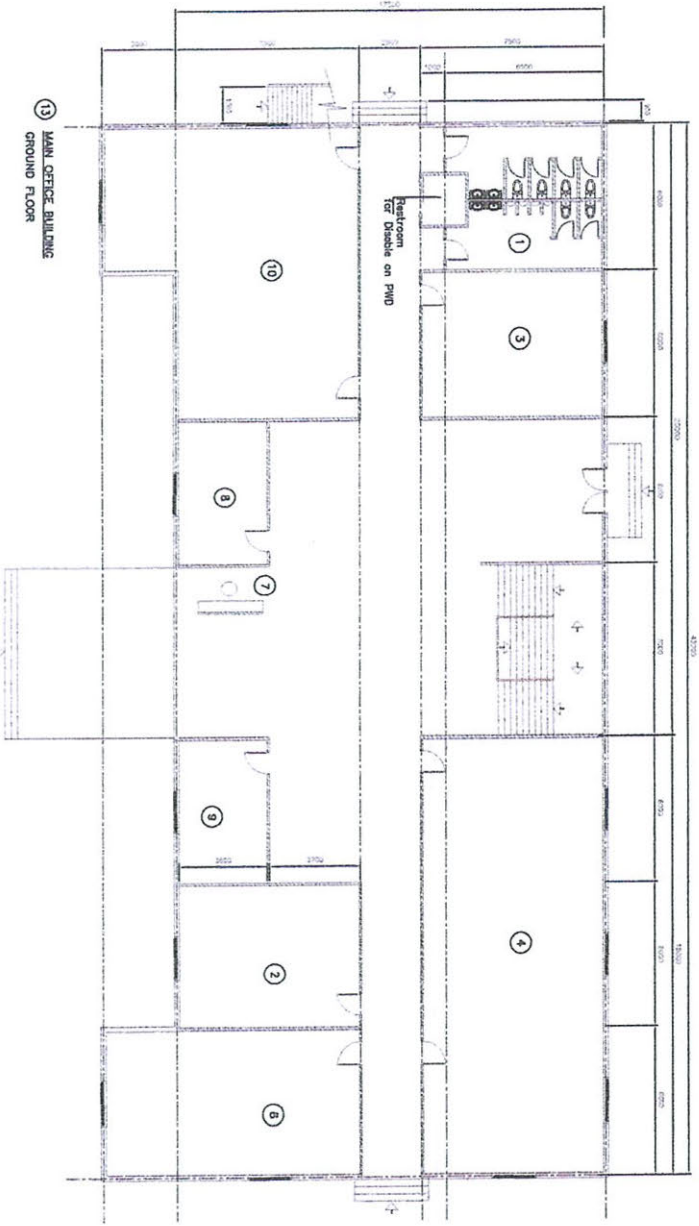
10. Training Kennel



# Annex 2-1. Floor Plan of TIMA Buildings

## 11. Main Office Building with Meeting Room

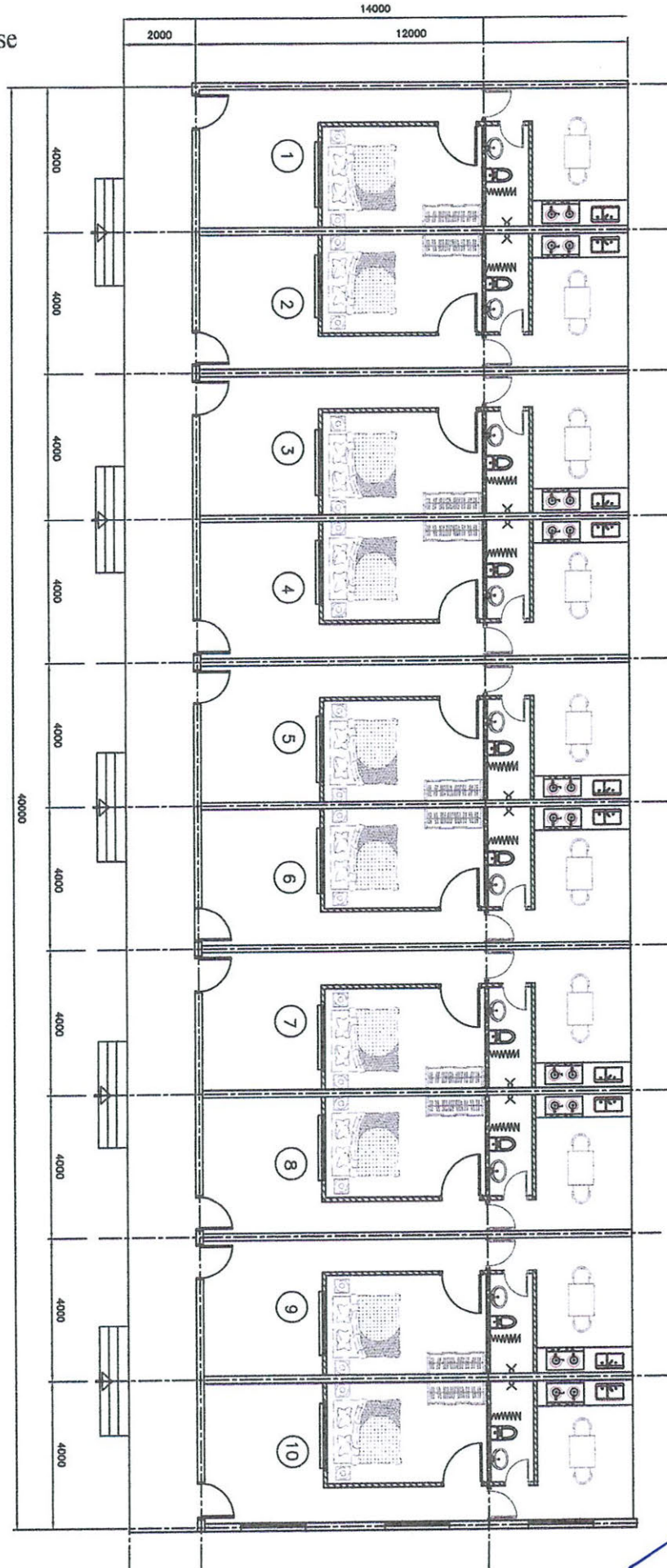
- MAIN OFFICE BUILDING**
- 1 Rest Room
  - 2 Student Affairs Office
  - 3 Research & Administration Office
  - 4 Main Meeting Room (50 people)
  - 5 Department of Foreign Language
  - 6 Internal & International Education Affairs Office
  - 7 Reception Center
  - 8 Waiting Room
  - 9 Speech/IT Room
  - 10 Department of Education Research & Language Use/Service
  - 11 Center Counsel Office
  - 12 Book Manager Office Rm.1
  - 13 Deputy Manager Office Rm.2
  - 14 Accounting & Finance Office
  - 15 Internal QA Office
  - 16 Department ERM
  - 17 Executive Meeting Room
  - 18 HRM Manager Office
  - 19 Planning Research & Dissemination Office



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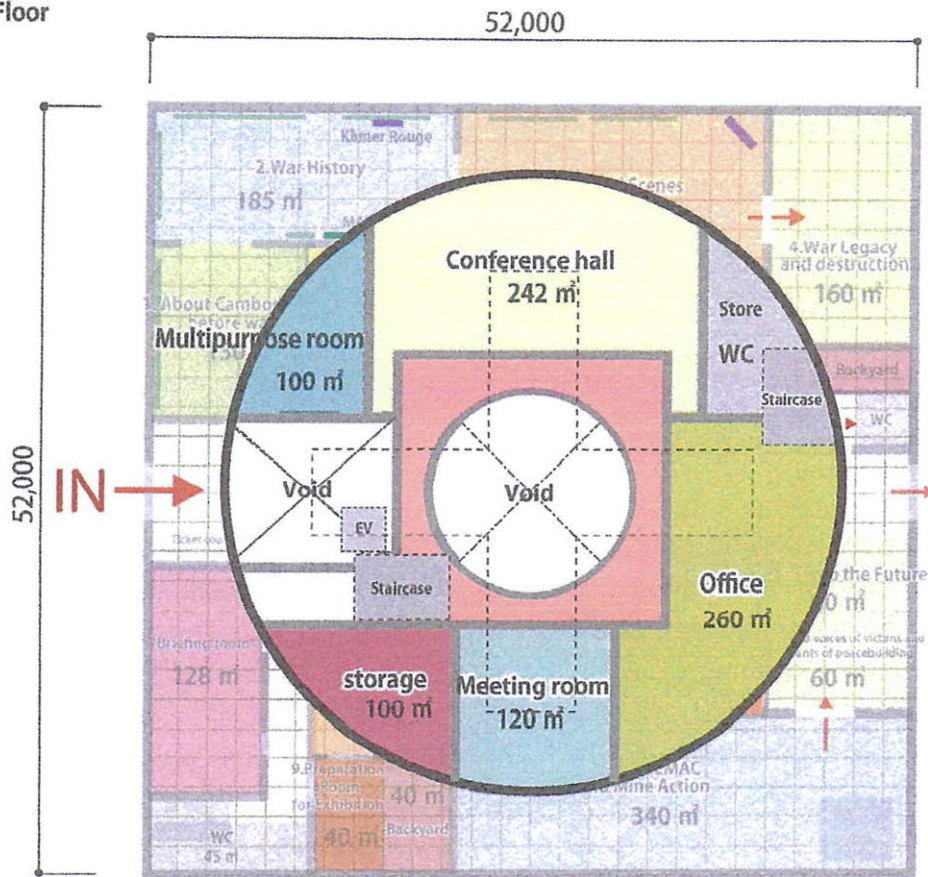
12. Instructor's House



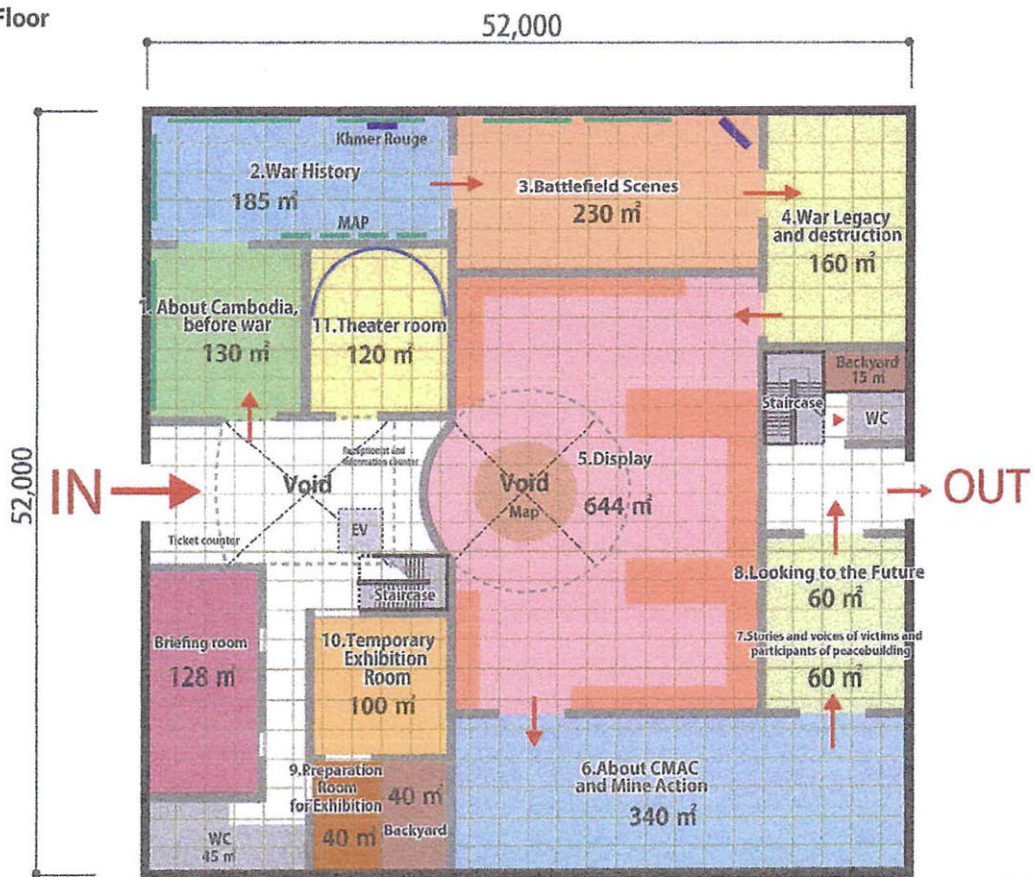
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Annex 2-2. Floor Plans and Elevation Plan of OF Facilities

1st Floor



Ground Floor

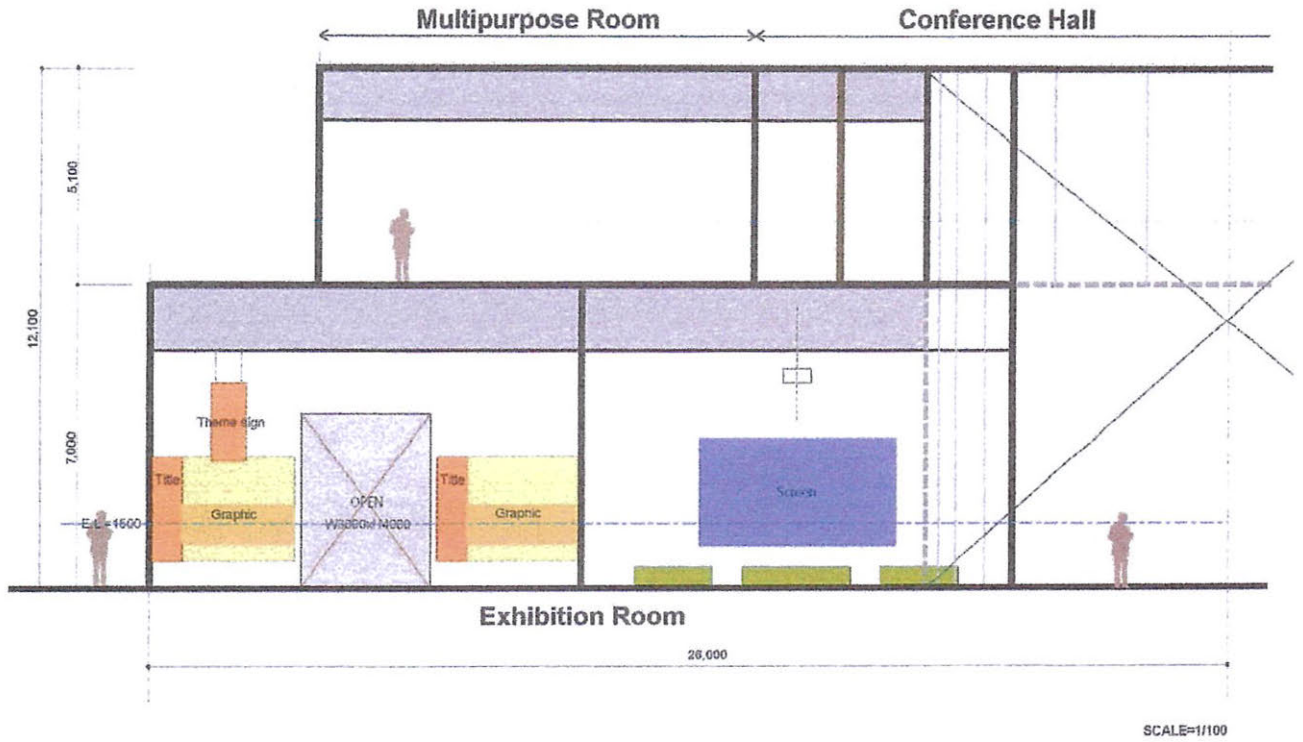


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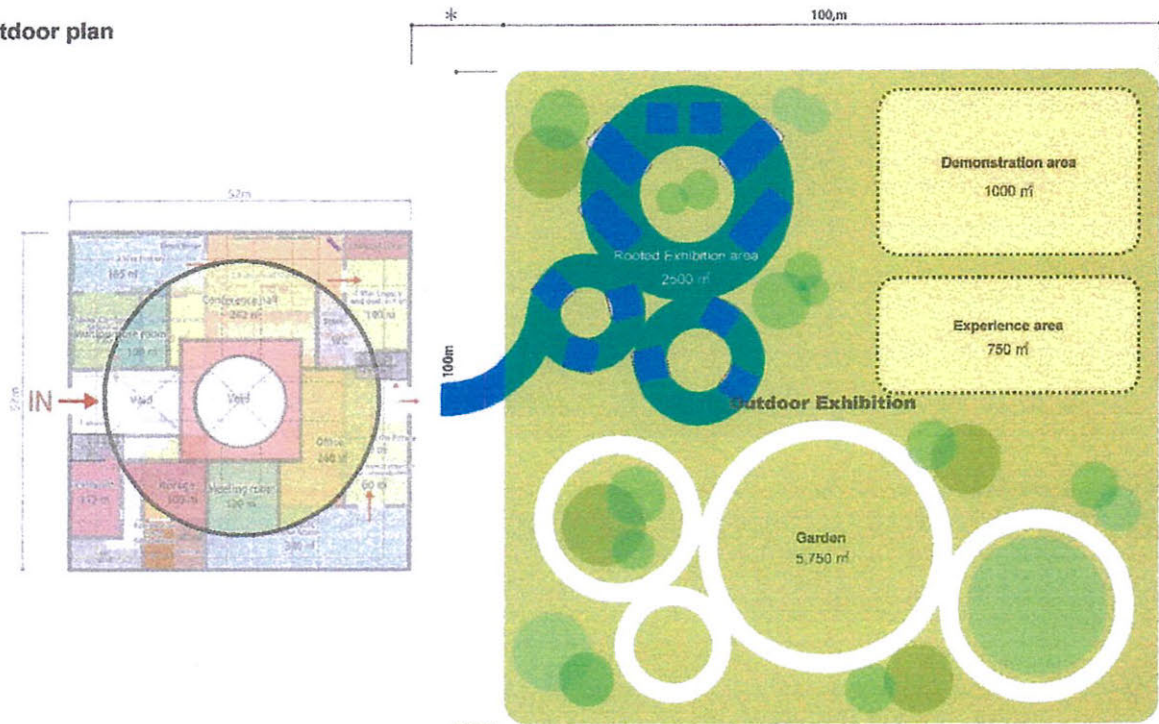
Annex 2-2. Floor Plans and Elevation Plan of OF Facilities

ELEVATION STUDY

2022.02.16



Outdoor plan



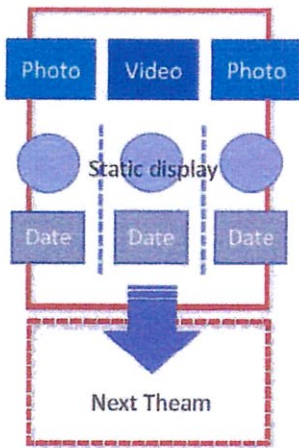
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Annex 3. Exhibition Plan of OF

MUSEUM Display Method

More professional ◀ Main Target ▶ Foreigners, Students

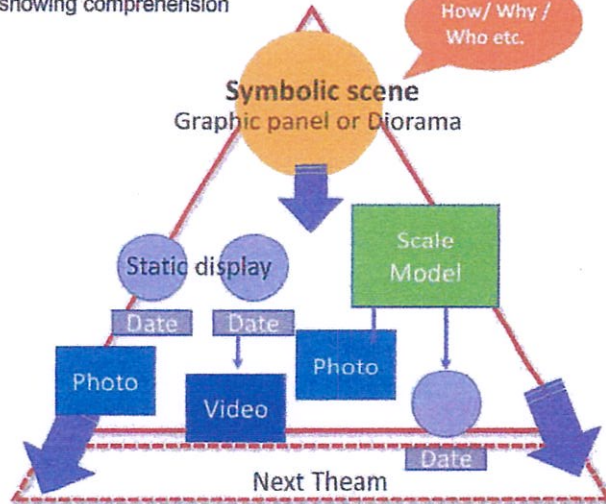
**Specificical Data**



- Same rhythm
- Not interested

**Story**

Diagram showing comprehension

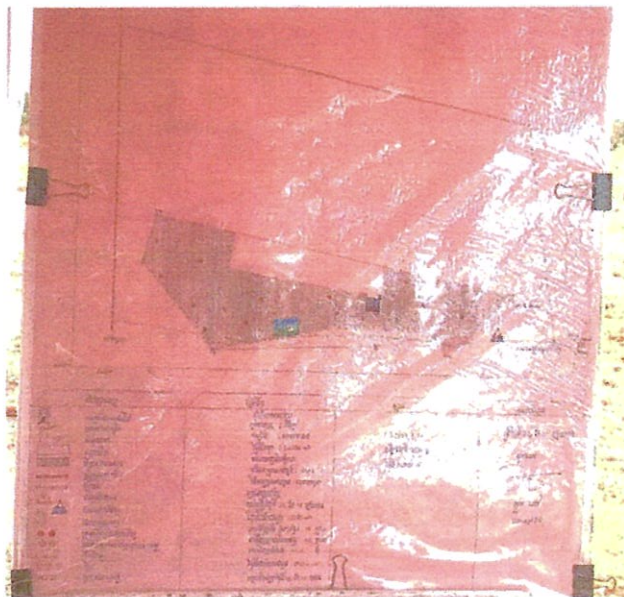


- Unique
- Worth a visit
- Easy to imagine

**[Reference]** One of the demining sites of Battambang

**The field map shows**

- How scale the field
- Date of start – Date of finish
- How many people and dogs work
- What kind of landmines and unexploded ordnance were found etc.



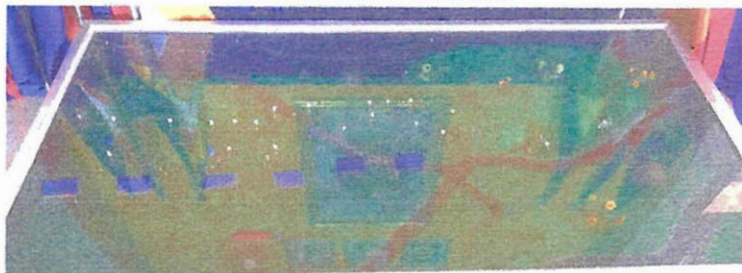
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### Annex 3. Exhibition Plan of OF

#### **【Reference】 One of the demining sites of Battambang**

- The field map shows**
- How scale the field
  - Date of start – Date of finish
  - How many people and dogs work
  - What kind of landmines and unexploded ordnance were found etc.

#### **Overall the field model**



Reference photo

#### **【Reference】 One of the demining sites of Battambang**

- The field map shows**
- How scale the field
  - Date of start – Date of finish
  - How many people and dogs work
  - What kind of landmines and unexploded ordnance were found etc.



 2 

### Annex 3. Exhibition Plan of OF

#### **【Reference】 One of the demining sites of Battambang**

##### **The field map shows**

- How scale the field
- Date of start – Date of finish
- How many people and dogs work
- What kind of landmines and unexploded ordnance were found etc.

Actual item



Caption (Text)

Actual item




Caption (Text)

**Effluent standard for pollution sources discharging wastewater to public water areas or sewer access**

No	Parameters	Unit	Allowable limits for pollutant substance discharging to	
			Protected public water area	Public water area and sewer
1	Temperature	°C	< 45	< 45
2	pH		6 – 9	5 - 9
3	BOD5 ( 5 days at 200 C )	mg/l	< 30	< 80
4	COD	mg/l	< 50	< 100
5	Total Suspended Solids	mg/l	< 50	< 80
6	Total Dissolved Solids	mg/l	< 1000	< 2000
7	Grease and Oil	mg/l	< 5.0	< 15
8	Detergents	mg/l	< 5.0	< 15
9	Phenols	mg/l	< 0.1	< 1.2
10	Nitrate (NO3 )	mg/l	< 10	< 20
11	Chlorine ( free )	mg/l	< 1.0	< 2.0
12	Chloride ( ion )	mg/l	< 500	< 700
13	Sulphate ( as SO4 )	mg/l	< 300	< 500
14	Sulphide ( as Sulphur )	mg/l	< 0.2	< 1.0
15	Phosphate ( PO4 )	mg/l	< 3.0	< 6.0
16	Cyanide ( CN )	mg/l	< 0.2	< 1.5
17	Barium ( Ba )	mg/l	< 4.0	< 7.0
18	Arsenic ( As )	mg/l	< 0.10	< 1.0
19	Tin ( Sn )	mg/l	< 2.0	< 8.0
20	Iron ( Fe )	mg/l	< 1.0	< 20
21	Boron ( B )	mg/l	< 1.0	< 5.0
22	Manganese ( Mn )	mg/l	< 1.0	< 5.0
23	Cadmium ( Cd )	mg/l	< 0.1	< 0.5
24	Chromium ( Cr )+3	mg/l	< 0.2	< 1.0
25	Chromium ( Cr )+6	mg/l	< 0.05	< 0.5
26	Copper ( Cu )	mg/l	< 0.2	< 1.0
27	Lead ( Pb )	mg/l	< 0.1	< 1.0
28	Mercury (Hg )	mg/l	< 0.002	< 0.05
29	Nickel ( Ni )	mg/l	< 0.2	< 1.0
30	Selenium ( Se )	mg/l	< 0.05	< 0.5
31	Silver ( Ag )	mg/l	< 0.1	< 0.5
32	Zinc ( Zn )	mg/l	< 1.0	< 3.0
33	Molybdenum ( Mo )	mg/l	< 0.1	< 1.0
34	Ammonia ( NH3 )	mg/l	< 5.0	< 7.0
35	DO	mg/l	> 2.0	> 1.0
36	Polychlorinated Biphenyl	mg/l	< 0.003	< 0.003

37	Calcium	mg/l	< 150	< 200
38	Magnesium	mg/l	< 150	< 200
39	Carbon tetrachloride	mg/l	< 3	< 3
40	Hexachloro benzene	mg/l	< 2	< 2
41	DTT	mg/l	< 1.3	< 1.3
42	Endrin	mg/l	< 0.01	< 0.01
43	Dieldrin	mg/l	< 0.01	< 0.01
44	Aldrin	mg/l	< 0.01	< 0.01
45	Isodrin	mg/l	< 0.01	< 0.01
46	Perchloro ethylene	mg/l	< 2.5	< 2.5
47	Hexachloro butadiene	mg/l	< 3	< 3
48	Chloroform	mg/l	< 1	< 1
49	1,2 Dichloro ethylene	mg/l	< 2.5	< 2.5
50	Trichloro ethylene	mg/l	< 1	< 1
51	Trichloro benzene	mg/l	< 2	< 2
52	Hexaxhloro cyclohexene	mg/l	< 2	< 2

Remark: The Ministry of Environment and the Ministry of Agriculture, Forestry and Fishery shall collaborate to set up the standard of pesticides which discharged from pollution sources.

 pagetop  close





Annex 5. Equipment List of TIMA and OF

Equipment Name	Unit	Site										Total	Priority				
		HQ	TIMA					Outreach Facility									
Projector Set	set	-	14	3	1	-	-	1	-	-	1	1	-	-	5	22	A
Web Conference System Type A (Projector)	set	-	-	-	-	-	-	-	1	-	-	-	-	-	-	5	B
Web Conference System Type B (Interactive Board)	set	-	1	-	-	-	-	-	1	-	-	-	1	-	-	3	A
Copier/scanner/printer	unit	-	-	-	-	-	-	1	3	-	-	-	-	-	-	5	A
Printer	unit	-	-	-	-	-	-	1	1	-	-	-	-	-	-	3	A
PA System	set	-	-	-	1	-	-	-	1	-	-	1	1	-	-	4	A
PC Type A (General Purpose, Laptop)	unit	-	-	-	-	-	-	5	35	1	-	1	9	-	-	50	A
PC Type B (General Purpose, Desktop)	unit	-	-	-	-	-	-	-	-	-	-	-	2	-	-	2	B
PC Type C (Computer Lab Room, Desktop)	unit	-	25	-	-	-	-	14	10	2	-	1	7	-	-	34	A
Digital Video Camera	unit	-	-	-	-	-	-	-	-	2	-	-	-	-	-	25	A
Gym Workout Machine	set	-	-	-	-	-	-	1	-	-	-	-	1	-	-	3	A
Television Monitor	unit	-	-	-	-	-	1	-	-	-	-	-	-	-	-	1	A
Server etc.	set	1	-	-	-	-	-	-	-	-	-	-	-	-	-	2	A
Display Monitor Set	set	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	A
Diorama Set	set	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	A
Display Case	set	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	A
Wheel Chair	unit	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	A

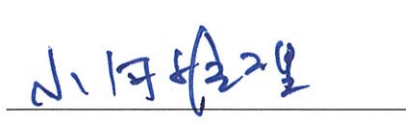
**Appendix 6: Minutes of Discussion (M/D)  
(Explanation on Draft Preparatory Survey Report)**

**Minutes of Discussions**  
**on the Preparatory Survey for the Project for**  
**Construction of Training Complex and Outreach Facility of**  
**Cambodian Mine Action Centre**  
**(Explanation on Draft Preparatory Survey Report)**

With reference to the minutes of discussions signed between Cambodian Mine Action Centre (CMAC) and the Japan International Cooperation Agency (hereinafter referred to as "JICA") on 19<sup>th</sup> August 2022 and in response to the request from the Royal Government of Cambodia (hereinafter referred to as "Cambodia") dated 13<sup>th</sup> May 2022, JICA dispatched the Preparatory Survey Team (hereinafter referred to as "the Team") for the explanation of Draft Preparatory Survey Report (hereinafter referred to as "the Draft Report") for the Project for Construction of Training Complex and Outreach Facility of Cambodian Mine Action Centre (hereinafter referred to as "the Project").

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

Phnom Penh, 19<sup>th</sup> August 2022



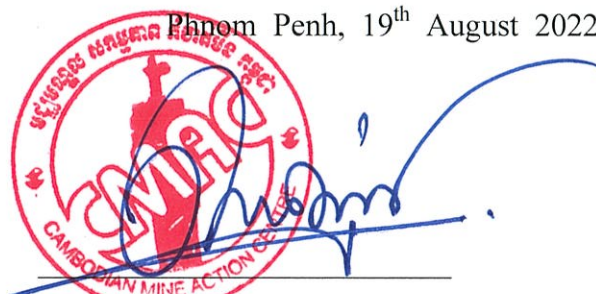
Ms. KOMUKAI ERI

Leader

Preparatory Survey Team

Japan International Cooperation Agency

Japan



H. E. Mr. HENG RATANA

Delegate of the Royal Government  
in charge as Director General

Cambodian Mine Action Centre

Kingdom of Cambodia

## ATTACHEMENT

### 1. Objective of the Project

The objective of the Project is to improve education/training environment for mine action related staff not only within the Cambodian Mine Action Centre (hereinafter referred to as “CMAC”) but also other related institutions both in Cambodia and in other mine-affected countries, and to promote understanding on mine-related issues and peacebuilding and to preserve skills and experiences that CMAC has stored to date by constructing and improving existing functions of Technical Institute of Mine Action (hereinafter referred to as “TIMA”) and Outreach Facility<sup>1</sup>, thereby contributing to realization of a mine-free world and sustainable society as well as poverty reduction.

### 2. Title of the Preparatory Survey

Both sides confirmed the title of the Preparatory Survey as “the Preparatory Survey for the Project for Construction of Training Complex and Outreach Facility of Cambodian Mine Action Centre”.

### 3. Project site

Both sides confirmed that the sites of the Project are in Kampong Chhnang and Siem Reap, which is shown in Annex 1.

### 4. Responsible authority for the Project

Both sides confirmed the authorities responsible for the Project are as follows: CMAC will be the executing agency for the Project (hereinafter referred to as “the Executing Agency”). The Executing Agency shall coordinate with all the relevant authorities to ensure smooth implementation of the Project and ensure that the undertakings for the Project shall be taken care by relevant authorities properly and on time. The organization charts are shown in Annex 2.

### 5. Contents of the Draft Report

After the explanation of the contents of the Draft Report by the Team, the Cambodia side agreed to its contents. JICA will finalize the Preparatory Survey Report based on the confirmed items. The report will be sent to the Cambodia side around November.

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<sup>1</sup> This Outreach Facility is currently referred to as “Peace Museum of Mine Action”.

6. Cost estimate

Both sides confirmed that the cost estimate including the contingency explained by the Team is provisional and will be examined further by the Government of Japan for its approval. The contingency would cover the additional cost against natural disaster, unexpected natural conditions, etc.

7. Confidentiality of the cost estimate and technical specifications

Both sides confirmed that the cost estimate and technical specifications of the Project should never be disclosed to any third parties until all the contracts under the Project are concluded.

8. Procedures and Basic Principles of Japanese Grant

The Cambodia side agreed that the procedures and basic principles of Japanese Grant (hereinafter referred to as “the Grant”) as described in Annex 3 shall be applied to the Project. In addition, the Cambodia side agreed to take necessary measures according to the procedures.

9. Timeline for the project implementation

The Team explained to the Cambodia side that the expected timeline for the project implementation is as attached in Annex 4.

10. Expected outcomes and indicators

Both sides agreed that key indicators for expected outcomes are as follows. The Cambodia side will be responsible for the achievement of agreed key indicators targeted in year 2028 and shall monitor the progress for Ex-Post Evaluation based on those indicators.

[Quantitative indicators]

Indicators	Standard Value (2020)	Target Value (2028) 【3 years after project completion】
Capacity of trainees in training rooms in TIMA (person)	Approx. 120	Approx. 420
Number of trainees per year in TIMA (person)	602 (Average between 2011 to 2021)	Approx. 1260
Number of training course in TIMA (number)	26	Approx. 50

Capacity of trainees staying at accommodations in TIMA (person)	80	Male Dormitory 90 + 80 Female Dormitory 90 Total 260
Number of visitors of Outreach Facility per year (person)	15,891 (Actual value for 2019. In 2020 it was closed due to COVID-19)	Approx. 50,000

[Qualitative indicators]

Improving the quality of education and training by improving the facility's environment, promoting demining activities in Cambodia and overseas, promoting understanding of landmine issues, and promoting awareness and PR activities

11. Ex-Post Evaluation

JICA will conduct ex-post evaluation after three (3) years from the project completion, in principle, with respect to six evaluation criteria (Relevance, Coherence, Effectiveness, Efficiency, Impact, Sustainability). The result of the evaluation will be publicized. The Cambodia side is required to provide necessary support for the data collection.

12. Undertakings of the Project

Both sides confirmed the undertakings of the Project as described in Annex 5. With regard to exemption of customs duties, internal taxes and other fiscal levies as stipulated in 1-(2)-5 of Annex 5, both sides confirmed that such customs duties, internal taxes and other fiscal levies, which shall be clarified in the bid documents by CMAC during the implementation stage of the Project.

The Cambodia side assured to take the necessary measures and coordination including allocation of the necessary budget which are preconditions of implementation of the Project. It is further agreed that the costs are indicative, i.e. at Outline Design level. More accurate costs will be calculated at the Detailed Design stage.

Both sides also confirmed that the Annex 5 will be used as an attachment of G/A.

As shown in Annex 5, Both sides confirmed that CMAC shall take necessary measures to ensure and maintain the security of the Project site and the persons related to the implementation of the Project, in cooperation with relevant authorities such as police.

13. Monitoring during the implementation

The Project will be monitored by the Executing Agency and reported to JICA by using the form of Project Monitoring Report (PMR) attached as Annex 6. The timing of submission of the PMR is described in Annex 5.

14. Project completion

Both sides confirmed that the project completes when all the facilities constructed and equipment procured by the Grant are in operation. The completion of the Project will be reported to JICA promptly by the Executing Agency, but in any event not later than six months after completion of the Project.

15. Items and measures to be considered for the smooth implementation of the Project

Both sides confirmed the items and measures to be considered for the smooth implementation of the Project as follows:

- (a) As described in Annex 5, CMAC will clear, level and reclaim the sites by banking for TIMA and Outreach facility and remove unnecessary existing trees before the Bid Announcement ( approximately end of May 2023). Budget for this process must be properly ensured by CMAC.
- (b) Outreach Facility will be made open to the public within two months from the completion of the project.
- (c) In order to follow the above mentioned timeline, CMAC will proceed with preparation for the contents of the Outreach Facility and staff training with support of JICA Technical Cooperation and other resources.

16. Environmental and Social Considerations

16-1 General Issues

16-1-1 Environmental Guidelines and Environmental Category

The Team explained that ‘JICA Guidelines for Environmental and Social Considerations (April 2010)’ (hereinafter referred to as “the Guidelines”) is applicable for the Project. The Project is categorized as C because the Project is likely to have minimal adverse impact on the environment under the Guidelines.

17. Other Relevant Issues

17-1 Disclosure of Information

Both sides confirmed that the Preparatory Survey Report from which project cost is excluded will be disclosed to the public after completion of the Preparatory Survey. The comprehensive report including the project cost will be disclosed to

the public after all the contracts under the Project are concluded.

#### 17-2 Gender Mainstreaming

Both sides confirmed that gender mainstreaming should be duly practiced for the Project implementation as the project is categorized as GIS (Gender Integrated Project). In particular, both sides agreed on the following gender elements to be integrated into the Project.

- (a) Facility design that reflects gender-specific needs
- (b) Separate buildings for male accommodation and female accommodation at TIMA, with consideration for women's safety

Annex 1 Project Site

Annex 2 Organization Chart

Annex 3 Japanese Grant

Annex 4 Project Implementation Schedule

Annex 5 Major Undertakings to be taken by the Government of Cambodia

Annex 6 Project Monitoring Report (template)



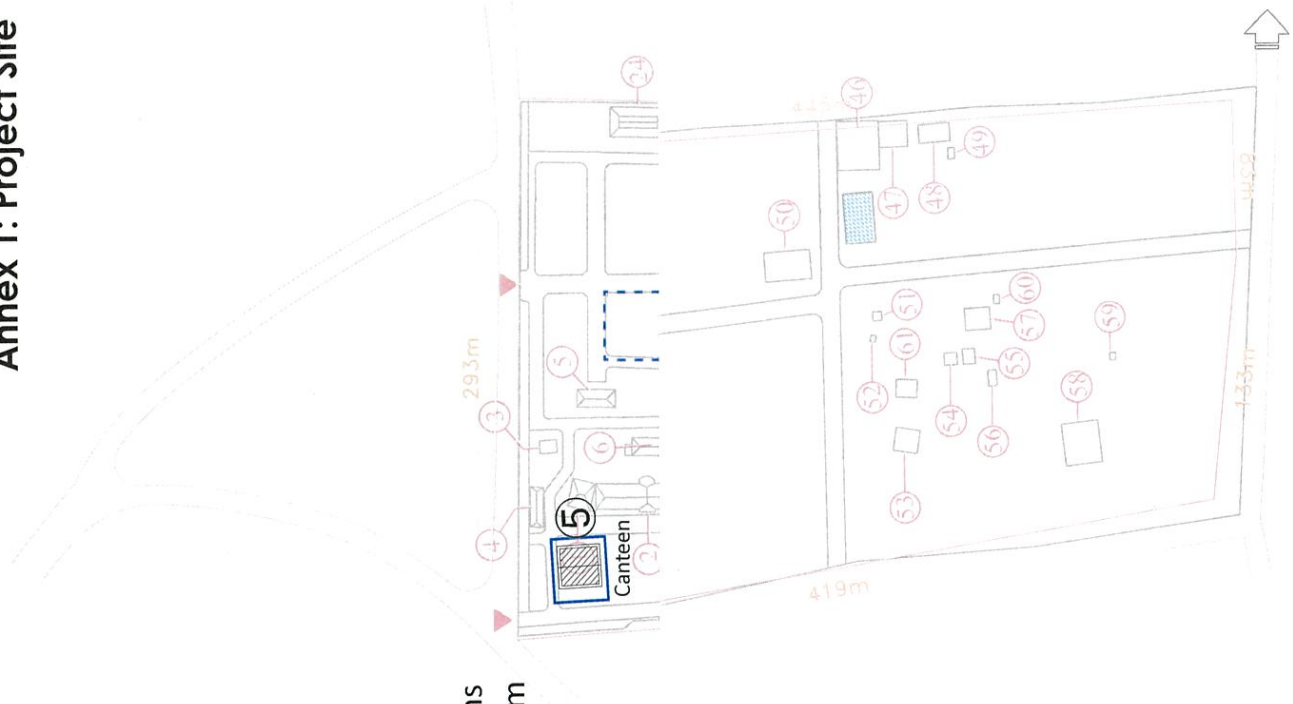
# TIMA Site Plan

## Existing buildings:

1. Exhibition Room
2. Office Building
3. Security Guard Building
4. Car parking
5. Conference Building
6. School Building
7. Accommodation Building (A)
8. Accommodation Building (B)
9. Toilet Room
10. Concrete Water Tank with Roofing
11. Accommodation Building (C)
12. Accommodation Building (D)
48. Training Pool for CMAC Salvage Dive
49. Toilet Room
50. Building Construction by USA
51. Assembly Point
52. Flammable Material Room
53. Cutting Place
54. ADA Materials Building
55. Generator Room
56. UXO Storage Room
57. Steam / Cast / Drill Building
58. Warehouse for Exploded Materials
59. Flammable Material Room
60. Toilet Room
61. Command or Control Place

## New buildings:

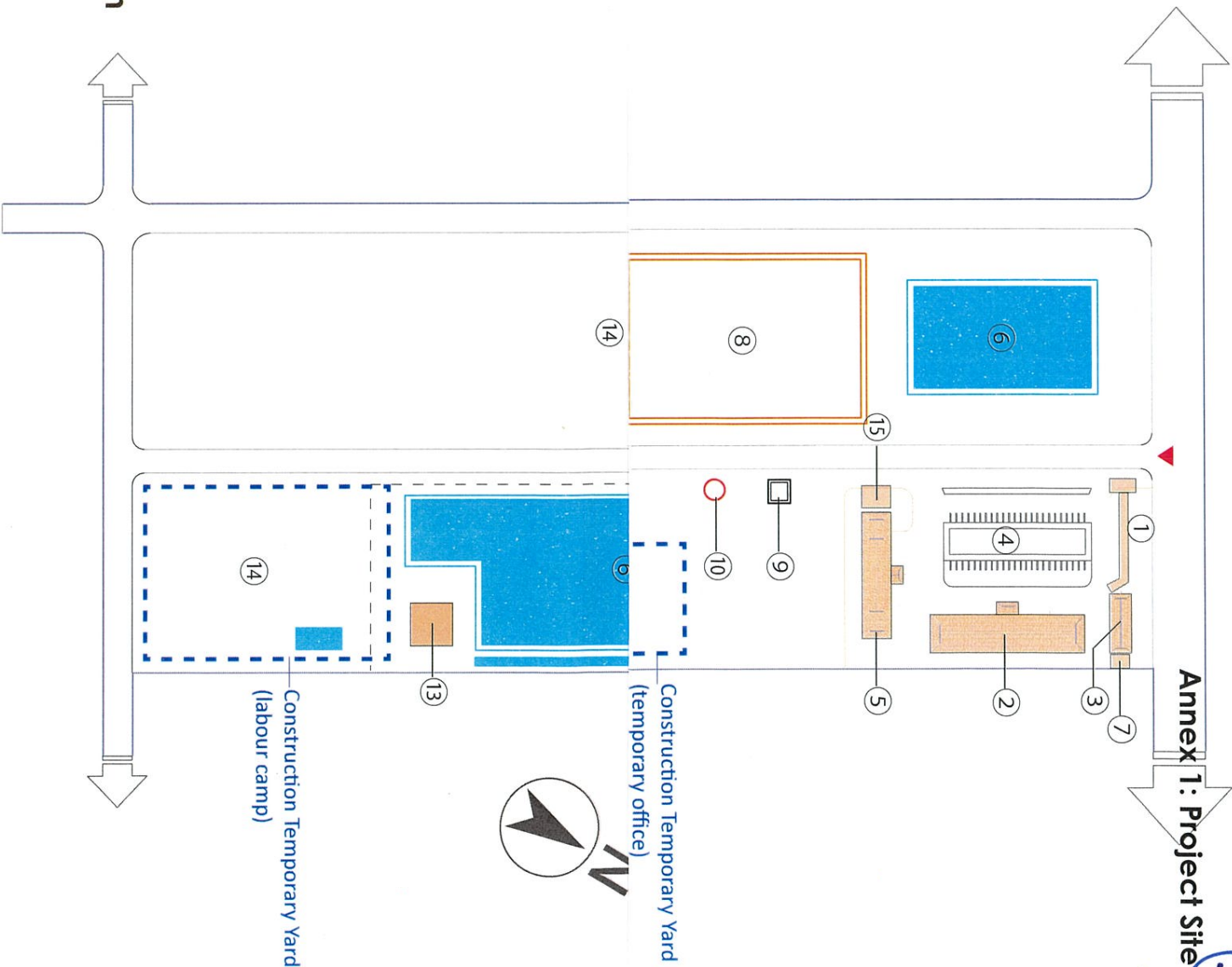
1. Classrooms
2. Conference Hall
3. Female Dormitory
4. Male Dormitory
5. Canteen
6. Restrooms for Classrooms
7. Dynamo & Electrical room



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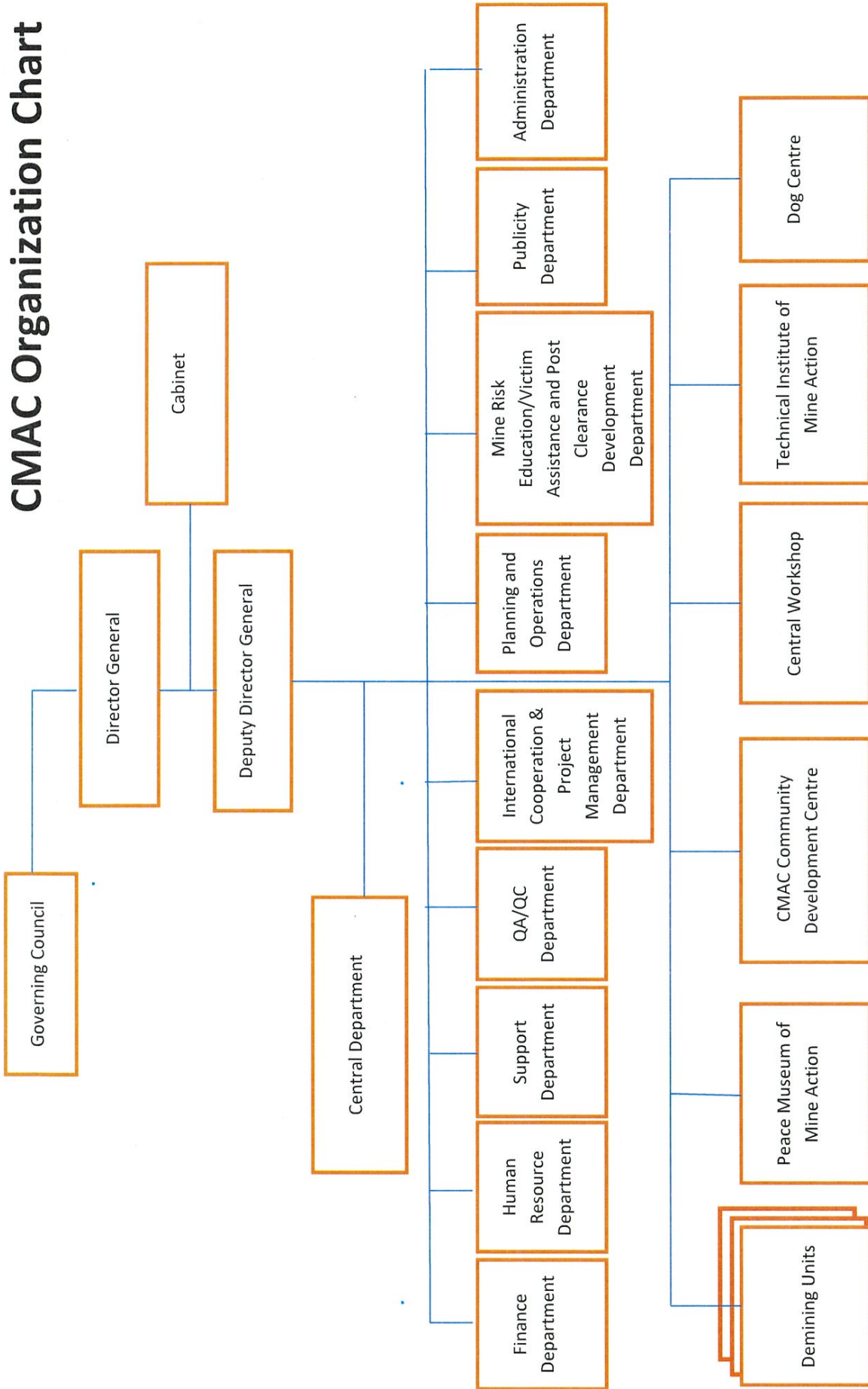
# Outreach Facility Site Plan

- i. Entrance corridor to the museum
2. Exhibition area & DU4 Office
3. Office & presentation room
4. Outdoor exhibition area
5. Accommodation
6. Water reservoir
7. Toilet
8. Artificial Mlne/ UXO field
9. Buddha statue
10. Flag pole
11. Pavillion/ Dining



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# CMAC Organization Chart



Annex 2

273

## JAPANESE GRANT

The Japanese Grant is non-reimbursable fund provided to a recipient country (hereinafter referred to as “the Recipient”) to purchase the products and/or services (engineering services and transportation of the products, etc.) for its economic and social development in accordance with the relevant laws and regulations of Japan. Followings are the basic features of the project grants operated by JICA (hereinafter referred to as “Project Grants”).

### 1. Procedures of Project Grants

Project Grants are conducted through following procedures (See “PROCEDURES OF JAPANESE GRANT” for details):

(1) Preparation

- The Preparatory Survey (hereinafter referred to as “the Survey”) conducted by JICA

(2) Appraisal

- Appraisal by the government of Japan (hereinafter referred to as “GOJ”) and JICA, and Approval by the Japanese Cabinet

(3) Implementation

Exchange of Notes

- The Notes exchanged between the GOJ and the government of the Recipient

Grant Agreement (hereinafter referred to as “the G/A”)

- Agreement concluded between JICA and the Recipient

Banking Arrangement (hereinafter referred to as “the B/A”)

- Opening of bank account by the Recipient in a bank in Japan (hereinafter referred to as "the Bank") to receive the grant

Construction works/procurement

- Implementation of the project (hereinafter referred to as “the Project”) on the basis of the G/A

(4) Ex-post Monitoring and Evaluation

- Monitoring and evaluation at post-implementation stage

### 2. Preparatory Survey

(1) Contents of the Survey

The aim of the Survey is to provide basic documents necessary for the appraisal of the the Project made by the GOJ and JICA. The contents of the Survey are as follows:

- Confirmation of the background, objectives, and benefits of the Project and also institutional capacity of relevant agencies of the Recipient necessary for the implementation of the Project.

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- Evaluation of the feasibility of the Project to be implemented under the Japanese Grant from a technical, financial, social and economic point of view.
- Confirmation of items agreed between both parties concerning the basic concept of the Project.
- Preparation of an outline design of the Project.
- Estimation of costs of the Project.
- Confirmation of Environmental and Social Considerations

The contents of the original request by the Recipient are not necessarily approved in their initial form. The Outline Design of the Project is confirmed based on the guidelines of the Japanese Grant.

JICA requests the Recipient to take measures necessary to achieve its self-reliance in the implementation of the Project. Such measures must be guaranteed even though they may fall outside of the jurisdiction of the executing agency of the Project. Therefore, the contents of the Project are confirmed by all relevant organizations of the Recipient based on the Minutes of Discussions.

## (2) Selection of Consultants

For smooth implementation of the Survey, JICA contracts with (a) consulting firm(s). JICA selects (a) firm(s) based on proposals submitted by interested firms.

## (3) Result of the Survey

JICA reviews the report on the results of the Survey and recommends the GOJ to appraise the implementation of the Project after confirming the feasibility of the Project.

## 3. Basic Principles of Project Grants

### (1) Implementation Stage

#### 1) The E/N and the G/A

After the Project is approved by the Cabinet of Japan, the Exchange of Notes (hereinafter referred to as “the E/N”) will be signed between the GOJ and the Government of the Recipient to make a pledge for assistance, which is followed by the conclusion of the G/A between JICA and the Recipient to define the necessary articles, in accordance with the E/N, to implement the Project, such as conditions of disbursement, responsibilities of the Recipient, and procurement conditions. The terms and conditions generally applicable to the Japanese Grant are stipulated in the “General Terms and Conditions for Japanese Grant (January 2016).”

#### 2) Banking Arrangements (B/A) (See “Financial Flow of Japanese Grant (A/P Type)” for details)

- a) The Recipient shall open an account or shall cause its designated authority to open an account under the name of the Recipient in the Bank, in principle. JICA will disburse the Japanese Grant in Japanese yen for the Recipient to cover the obligations incurred by the Recipient under the verified contracts.

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b) The Japanese Grant will be disbursed when payment requests are submitted by the Bank to JICA under an Authorization to Pay (A/P) issued by the Recipient.

### 3) Procurement Procedure

The products and/or services necessary for the implementation of the Project shall be procured in accordance with JICA's procurement guidelines as stipulated in the G/A.

### 4) Selection of Consultants

In order to maintain technical consistency, the consulting firm(s) which conducted the Survey will be recommended by JICA to the Recipient to continue to work on the Project's implementation after the E/N and G/A.

### 5) Eligible source country

In using the Japanese Grant disbursed by JICA for the purchase of products and/or services, the eligible source countries of such products and/or services shall be Japan and/or the Recipient. The Japanese Grant may be used for the purchase of the products and/or services of a third country as eligible, if necessary, taking into account the quality, competitiveness and economic rationality of products and/or services necessary for achieving the objective of the Project. However, the prime contractors, namely, constructing and procurement firms, and the prime consulting firm, which enter into contracts with the Recipient, are limited to "Japanese nationals", in principle.

### 6) Contracts and Concurrence by JICA

The Recipient will conclude contracts denominated in Japanese yen with Japanese nationals. Those contracts shall be concurred by JICA in order to be verified as eligible for using the Japanese Grant.

### 7) Monitoring

The Recipient is required to take their initiative to carefully monitor the progress of the Project in order to ensure its smooth implementation as part of their responsibility in the G/A, and to regularly report to JICA about its status by using the Project Monitoring Report (PMR).

### 8) Safety Measures

The Recipient must ensure that the safety is highly observed during the implementation of the Project.

### 9) Construction Quality Control Meeting

Construction Quality Control Meeting (hereinafter referred to as the "Meeting") will be held for quality assurance and smooth implementation of the Works at each stage of the Works. The member of the Meeting will be composed by the Recipient (or executing agency), the Consultant, the Contractor and JICA. The functions of the Meeting are as followings:

- a) Sharing information on the objective, concept and conditions of design from the Contractor, before start of construction.

- b) Discussing the issues affecting the Works such as modification of the design, test, inspection, safety control and the Client's obligation, during of construction.

(2) Ex-post Monitoring and Evaluation Stage

- 1) After the project completion, JICA will continue to keep in close contact with the Recipient in order to monitor that the outputs of the Project is used and maintained properly to attain its expected outcomes.
- 2) In principle, JICA will conduct ex-post evaluation of the Project after three years from the completion. It is required for the Recipient to furnish any necessary information as JICA may reasonably request.

(3) Others

1) Environmental and Social Considerations

The Recipient shall carefully consider environmental and social impacts by the Project and must comply with the environmental regulations of the Recipient and JICA Guidelines for Environmental and Social Considerations (April, 2010).

2) Major undertakings to be taken by the Government of the Recipient

For the smooth and proper implementation of the Project, the Recipient is required to undertake necessary measures including land acquisition, and bear an advising commission of the A/P and payment commissions paid to the Bank as agreed with the GOJ and/or JICA. The Government of the Recipient shall ensure that customs duties, internal taxes and other fiscal levies which may be imposed in the Recipient with respect to the purchase of the Products and/or the Services be exempted or be borne by its designated authority without using the Grant and its accrued interest, since the grant fund comes from the Japanese taxpayers.

3) Measures to ensure more efficient implementation of the Grant

- i) In the event that the E/N and the G/A concerning a project cannot be signed by the end of the following Japanese fiscal year of the cabinet decision concerned by the GOJ, the authorities concerned of the two Governments will discuss the cancellation of the project.
- ii) In the event that the period, specified in the G/A, during which the grant is available expires before the completion of the disbursement, the authorities concerned of the GO J will thoroughly review the status, situation and perspective of the implementation of the project concerned before extending the said period. The authorities concerned of the two Governments will discuss the termination of the project including a refund, unless there are concrete prospects for its completion.
- iii) Regardless of the period mentioned in ii) above, the authorities concerned of the two Governments will, in the event that five years have passed since the cabinet decision concerned by the GOJ before the completion of the

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disbursement, except as otherwise confirmed between them, discuss the termination of a project including a refund, unless there are concrete prospects for its completion.

4) Proper Use

The Recipient is required to maintain and use properly and effectively the products and/or services under the Project (including the facilities constructed and the equipment purchased), to assign staff necessary for this operation and maintenance and to bear all the expenses other than those covered by the Japanese Grant.

5) Export and Re-export

The products purchased under the Japanese Grant should not be exported or re-exported from the Recipient.

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Project Implementation Schedule



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## Annex 5

## Major Undertakings to be taken by the Royal Government of Cambodia

**1. Specific obligations of the Royal Government of Cambodia which will not be funded with the Grant****(1) Before the Bidding**

NO	Items	Deadline	In charge	Estimated Cost	Ref.
1	To sign the banking arrangement (B/A) with a bank in Japan (the Agent Bank) to open bank account for the Grant	within 1 month after the signing of the G/A	National Bank of Cambodia	N/A	
2	To issue A/P to the Agent Bank for the payment to the consultant	within 1 month after the signing of the contract(s)	National Bank of Cambodia	N/A	
3	To bear the following commissions to the Agent Bank for the banking services based upon B/A				
	1) Advising commission of A/P	within 1 month after the signing of the contract(s)	National Bank of Cambodia	USD 100	
	2) Payment commission for A/P	every payment	National Bank of Cambodia	USD 2,200	
4	To secure and clear the following lands 1) project sites for TIMA and Outreach facility 2) temporary construction yard and stock yard near the Project area 3) borrow pit and disposal site near the Project area	before notice of the bidding documents	CMAC	N/A	
5	To obtain the planning, zoning, building permit	before notice of the bidding documents	CMAC	N/A	
6	To clear, level and reclaim the following sites 1) existing facilities 2) leveling and reclaiming the sites by banking for TIMA and Outreach facility 3) Removal of unnecessary existing trees.	before notice of the bidding documents	CMAC	USD359,900	
7	To submit Project Monitoring Report (with the result of Detailed Design)	before preparation of the bidding documents	CMAC	N/A	

(B/A: Banking Arrangement, A/P: Authorization to pay, N/A: Not Applicable)

## (2) During the Project Implementation

NO	Items	Deadline	In charge	Estimated Cost	Ref.
1	To issue A/P to the Agent Bank for the payment to the supplier and the contractor	within 1 month after the signing of the contract(s)	National Bank of Cambodia	N/A	
2	To bear the following commissions to the Agent Bank for the banking services based upon the B/A				
	1) Advising commission of A/P	within 1 month after the signing of the contract(s)	National Bank of Cambodia	USD 100	
	2) Payment commission for A/P	every payment	National Bank of Cambodia	USD 16,000	
3	To ensure prompt unloading and customs clearance at ports of disembarkation in the country of the Recipient and to assist the Supplier(s) with internal transportation therein	during the Project	MEF	N/A	
4	To accord Japanese physical persons and/or physical persons of third countries whose services may be required in connection with the supply of the products and the services such facilities as may be necessary for their entry into the country of the Recipient and stay therein for the performance of their work	during the Project	MEF	N/A	
5	To ensure that customs duties, internal taxes and other fiscal levies which may be imposed in the country of the Recipient with respect to the purchase of the products and/or the services be exempted; Such customs duties, internal taxes and other fiscal levies mentioned above include VAT, commercial tax, income tax and corporate tax of Japanese nationals, resident tax, fuel tax, but not limited, which may be imposed in the recipient country with respect to the supply of the products and services under the verified contract	during the Project	MEF	N/A	
6	To bear all the expenses, other than those covered by the Grant, necessary for the implementation of the Project	during the Project	CMAC	N/A	
7	To notify JICA promptly of any incident or accident, which has, or is likely to have, a significant adverse effect on the environment, the affected communities, the public or workers.	During the construction	CMAC	N/A	
8	To submit Project Monitoring Report	every month	CMAC	N/A	M/D
	To submit Project Monitoring Report (final) (including as-built drawings, equipment list, photographs, etc.)	within 1 month after issuance of Certificate of Completion for the works under the contract(s)	CMAC	N/A	
9	To submit a report concerning completion of the Project	within 6 months after completion of the Project	CMAC	N/A	
10	To construct access roads	3 months before completion of the construction	CMAC	N/A	
	1) Outside the site				
11	To approve EPC (Environment Protection Contract)	Before or during the construction	CMAC	USD20,000	

12	To provide facilities for distribution of electricity, water supply and drainage and other incidental facilities necessary for the implementation of the Project outside the site(s)				
	1) Electricity The distributing line to the site	before start of the construction	CMAC	USD38,000	
	2) Water Supply The city water distribution main to the site	before start of the construction	CMAC	USD1,100	
	3) Drainage The city drainage main ( for storm, sewer and others ) to the site	6 months before completion of the construction	CMAC	USD10,000	
	4) Telecommunications Proper speed of communication line to the site	6 months before completion of the construction	CMAC	N/A	
13	To provide facility necessary for the implementation of the Project in the site(s)	At the same time of completion of the construction	CMAC	USD 499,000	
14	To provide equipment, furniture necessary for the implementation of the Project in the site(s)	Immediately after completion of the construction	CMAC	USD 44,206	
15	To provide planting, landscape, parking and gate necessary for the implementation of the Project in the site(s)	Before and after completion of the construction	CMAC	USD 202,080	
16	To take necessary measures for general security and safety of the Project site	during the construction	CMAC	N/A	
17	To provide the contents of the exhibition	On or before the installation work of the equipment related to the exhibition	CMAC	USD 318,102	

### (3) After the Project

NO	Items	Deadline	In charge	Estimated Cost	Ref.
1	To maintain and use properly and effectively the facilities constructed and equipment provided under the Grant Aid 1) Allocation of maintenance cost 2) Operation and maintenance structure 3) Routine check/Periodic inspection	After completion of the construction	CMAC	N/A	
2	To bear all the expenses, other than those covered by the Grant, necessary for operation.	After completion of the construction	CMAC	N/A	
3	Wheelchair for OF	After completion of the construction	CMAC	USD4,000	

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2. Other obligations of the Royal Government of Cambodia funded with the Grant

NO	Items	Deadline	Amount (Million Japanese Yen)*
1	To construct buildings within TIMA and Outreach facility and to procure necessary equipment which is in line with the functions of those facilities	/	/
2	To implement detailed design, bidding support and construction supervision(Consulting Service)		
3	Contingencies		
Total			XXX

\*The Amount is provisional. This is subject to the approval of the Government of Japan.

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**Project Monitoring Report**  
**on**  
**Project Name**  
**Grant Agreement No. XXXXXXXX**  
 20XX, Month

**Organizational Information**

<b>Signer of the G/A (Recipient)</b>	_____ Person in Charge (Designation)  Contacts      _____ Address: Phone/FAX: Email:
<b>Executing Agency</b>	_____ Person in Charge (Designation)  Contacts      _____ Address: Phone/FAX: Email:
<b>Line Ministry</b>	_____ Person in Charge (Designation)  Contacts      _____ Address: Phone/FAX: Email:

**General Information:**

<b>Project Title</b>	
<b>E/N</b>	Signed date: Duration:
<b>G/A</b>	Signed date: Duration:
<b>Source of Finance</b>	Government of Japan: Not exceeding JPY _____ mil. Government of (_____): _____

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<b>1: Project Description</b>	
-------------------------------	--

**1-1 Project Objective**

--

**1-2 Project Rationale**

- Higher-level objectives to which the project contributes (national/regional/sectoral policies and strategies)
- Situation of the target groups to which the project addresses

--

**1-3 Indicators for measurement of "Effectiveness"**

Quantitative indicators to measure the attainment of project objectives		
Indicators	Original (Yr )	Target (Yr )
Qualitative indicators to measure the attainment of project objectives		

<b>2: Details of the Project</b>
----------------------------------

**2-1 Location**

Components	Original <i>(proposed in the outline design)</i>	Actual
1.		

**2-2 Scope of the work**

Components	Original* <i>(proposed in the outline design)</i>	Actual*
1.		

Reasons for modification of scope (if any).

(PMR)
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**2-3 Implementation Schedule**

Items	Original		Actual
	<i>(proposed in the outline design)</i>	<i>(at the time of signing the Grant Agreement)</i>	

Reasons for any changes of the schedule, and their effects on the project (if any)

--

**2-4 Obligations by the Recipient**

**2-4-1 Progress of Specific Obligations**

See Attachment 2.

**2-4-2 Activities**

See Attachment 3.

**2-4-3 Report on RD**

See Attachment 11.

**2-5 Project Cost**

**2-5-1 Cost borne by the Grant(Confidential until the Bidding)**

Components			Cost (Million Yen)	
	Original <i>(proposed in the outline design)</i>	Actual <i>(in case of any modification)</i>	Original <sup>1),2)</sup> <i>(proposed in the outline design)</i>	Actual
	1.			
Total				

Note: 1) Date of estimation:

2) Exchange rate: 1 US Dollar = Yen

**2-5-2 Cost borne by the Recipient**

Components			Cost (1,000 Taka)	
	Original <i>(proposed in the outline design)</i>	Actual <i>(in case of any modification)</i>	Original <sup>1),2)</sup> <i>(proposed in the outline design)</i>	Actual
	1.			



- Note: 1) Date of estimation:  
2) Exchange rate: 1 US Dollar =

Reasons for the remarkable gaps between the original and actual cost, and the countermeasures (if any)

(PMR)

**2-6 Executing Agency**

- Organization's role, financial position, capacity, cost recovery etc,
- Organization Chart including the unit in charge of the implementation and number of employees.

**Original** (at the time of outline design)

name:

role:

financial situation:

institutional and organizational arrangement (organogram):

human resources (number and ability of staff):

**Actual** (PMR)

**2-7 Environmental and Social Impacts**

- The results of environmental monitoring based on Attachment 5 (in accordance with Schedule 4 of the Grant Agreement).
- The results of social monitoring based on in Attachment 5 (in accordance with Schedule 4 of the Grant Agreement).
- Disclosed information related to results of environmental and social monitoring to local stakeholders (whenever applicable).

**3: Operation and Maintenance (O&M)**

**3-1 Physical Arrangement**

- Plan for O&M (number and skills of the staff in the responsible division or section, availability of manuals and guidelines, availability of spareparts, etc.)

**Original** (at the time of outline design)

**Actual** (PMR)

**3-2 Budgetary Arrangement**

- Required O&M cost and actual budget allocation for O&M

**Original** (at the time of outline design)

SK @

Actual (PMR)

**4: Potential Risks and Mitigation Measures**

- Potential risks which may affect the project implementation, attainment of objectives, sustainability
- Mitigation measures corresponding to the potential risks

**Assessment of Potential Risks** (at the time of outline design)

Potential Risks	Assessment
1. (Description of Risk)	Probability: High/Moderate/Low
	Impact: High/Moderate/Low
	Analysis of Probability and Impact:
	Mitigation Measures:
	Action required during the implementation stage:
2. (Description of Risk)	Probability: High/Moderate/Low
	Impact: High/Moderate/Low
	Analysis of Probability and Impact:
	Mitigation Measures:
	Action required during the implementation stage:
3. (Description of Risk)	Probability: High/Moderate/Low
	Impact: High/Moderate/Low
	Analysis of Probability and Impact:
	Mitigation Measures:
	Action required during the implementation stage:

	Contingency Plan (if applicable):
<b>Actual Situation and Countermeasures</b>	
(PMR)	

**5: Evaluation and Monitoring Plan (after the work completion)**

**5-1 Overall evaluation**

Please describe your overall evaluation on the project.

--

**5-2 Lessons Learnt and Recommendations**

Please raise any lessons learned from the project experience, which might be valuable for the future assistance or similar type of projects, as well as any recommendations, which might be beneficial for better realization of the project effect, impact and assurance of sustainability.

--

**5-3 Monitoring Plan of the Indicators for Post-Evaluation**

Please describe monitoring methods, section(s)/department(s) in charge of monitoring, frequency, the term to monitor the indicators stipulated in 1-3.

--

SK@

Attachment

1. Project Location Map
  2. Specific obligations of the Recipient which will not be funded with the Grant
  3. Monthly Report submitted by the Consultant
- Appendix - Photocopy of Contractor's Progress Report (if any)
- Consultant Member List
  - Contractor's Main Staff List
4. Check list for the Contract (including Record of Amendment of the Contract/Agreement and Schedule of Payment)
  5. Environmental Monitoring Form / Social Monitoring Form
  6. Monitoring sheet on price of specified materials (Quarterly)
  7. Report on Proportion of Procurement (Recipient Country, Japan and Third Countries) (PMR (final) only)
  8. Pictures (by JPEG style by CD-R) (PMR (final) only)
  9. Equipment List (PMR (final) only)
  10. Drawing (PMR (final) only)
  11. Report on RD (After project)

Monitoring sheet on price of specified materials

1. Initial Conditions (Confirmed)

Items of Specified Materials	Initial Volume A	Initial Unit Price (¥) B	Initial total Price C=A×B	1% of Contract Price D	Condition of payment	
					Price (Decreased) E=C-D	Price (Increased) F=C+D
1 Item 1	●●t	●	●	●	●	●
2 Item 2	●●t	●	●	●		
3 Item 3						
4 Item 4						
5 Item 5						

2. Monitoring of the Unit Price of Specified Materials

(1) Method of Monitoring : ●●

(2) Result of the Monitoring Survey on Unit Price for each specified materials

Items of Specified Materials	1st month, 2015	2nd month, 2015	3rd month, 2015	4th	5th	6th
1 Item 1	●	●	●			
2 Item 2						
3 Item 3						
4 Item 4						
5 Item 5						

(3) Summary of Discussion with Contractor (if necessary)

.  
. .  
.

Report on Proportion of Procurement (Recipient Country, Japan and Third Countries)  
 (Actual Expenditure by Construction and Equipment each)

	Domestic Procurement (Recipient Country) A	Foreign Procurement (Japan) B	Foreign Procurement (Third Countries) C	Total D
Construction Cost	(A/D%)	(B/D%)	(C/D%)	
Direct Construction Cost	(A/D%)	(B/D%)	(C/D%)	
others	(A/D%)	(B/D%)	(C/D%)	
Equipment Cost	(A/D%)	(B/D%)	(C/D%)	
Design and Supervision Cost	(A/D%)	(B/D%)	(C/D%)	
Total	(A/D%)	(B/D%)	(C/D%)	

**Appendix 7-1: Land Registration  
(Kampong Chhnang)**

**Kingdom of Cambodia  
Nation, Religion, King**

**Council of Ministers**  
No. 1164 SCNRV

Phnom Penh, 17 October 1996

**Co-Ministers in Charge of the Council of Ministers  
To  
Your Excellency Board of Directors of Cambodian Mine Action Center  
And the Minister of Ministry of Information**

**Subject:** Case concerning the request for the land plot of the former Svay Chrum Airport in the town of Kampong Chhnang for establishing the CMAC's training center.

**Reference:** - Letter No.217/01/96 MS.MK dated 06-08-1996 of the Cambodian Mine Action Center  
- Letter No. 60 SCN dated 25-07-1996 of the Kampong Chhnang Provincial Hall  
- Approving remark of the first Samdech Prime Minister dated 06-08-1996  
- Approving remark of the second Samdech Prime Minister dated 13-08-1996

Pursuant to the above-mentioned subject and reference, the Council of Ministers would like to inform Your Excellency that the Royal Government of Cambodia has agreed to provide the land plot of the former Svay Chrum Airport located in the town of Kampong Chhnang province for the Cambodian Mine Action Center (CMAC) for establishing the training center. Therefore, please be kindly informed and implement as appropriate.

For Co-Ministers in Charge of the Council of Ministers  
**Secretary of State**  
(Stamp and Signature)

**Som Manit                      Nouv Kanun**

cc:

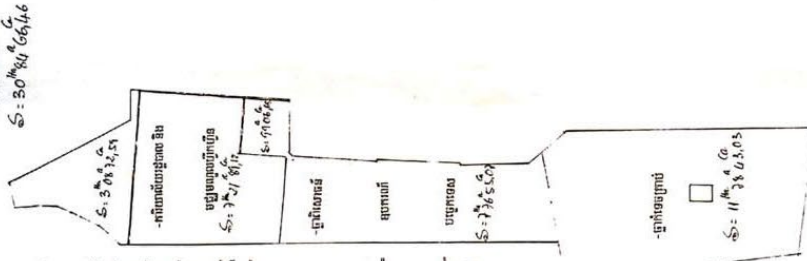
- Ministry of Interior
- Kampong Chhnang Provincial Hall
- Cabinet of the first Samdech Prime Minister
- Cabinet of the second Samdech Prime Minister
- Central Point
- Archive



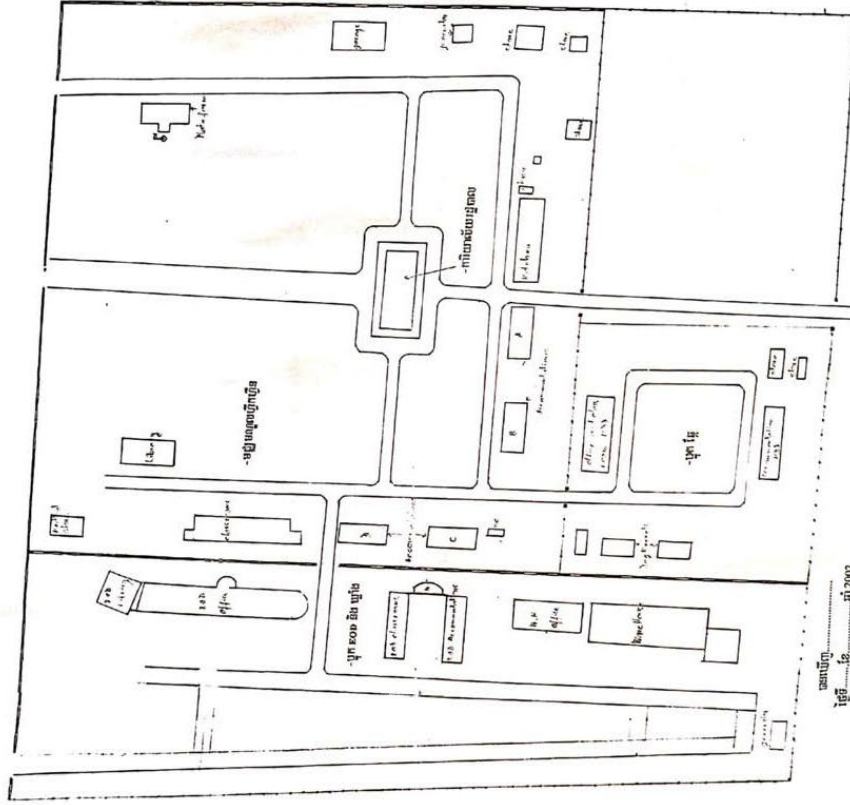
**Location Map**  
 The CMAC's training center in  
 Kampong Chhnang province  
 Scale: 1:12.500



**Overall Map**  
 The land plot of CMAC's  
 training center in Kampong  
 Chhnang province  
 Scale: 1:5.000



**Total Map**  
 Administrative office and the  
 training center in Kampong  
 Chhnang province  
 Scale: 1:1.000



Measured and drawn by  
 Technical Team of Office of Cadaster and Geography  
 11 January 2001  
 Head of Office  
 (Signature)

**Appendix 7-2: Land Registration  
(Siem Reap)**

**Kingdom of Cambodia**  
**Nation, Religion, King**  
 ព្រះ រាជ កិរិយា

**Land Ownership Transfer Certificate**

My name is Sao Chi Laphoan Sex Female Age 25 years old, holding the ID No. 18420 Dated 27-07-1999 Name of wife/husband \_\_\_\_\_ Address No. \_\_\_\_\_ Village/Group 7 District/Sangkat Boeung Kok Town/Khan Toul Kork Province/City Phnom Penh.

Has consented to transfer ownership of a plot of land to:

Name Heng Ratana Sex Male Age 42 years old, holding the ID No. 933614 dated 30-04-2009 Name of wife/husband \_\_\_\_\_ Address No. \_\_\_\_\_ Village/Group Kork Chombok Commune/Sangkat Choam Chao Town/Khan Dangkor Province/City Phnom Penh.

The land has \_\_\_\_\_ width \_\_\_\_\_ length, or 120000m<sup>2</sup> square located village/group Trol Paing Thnol Commune/Sangkat Kantraing Town/Khan Prasat Bakorn Province/City Siem Reap and bordered north to \_\_\_\_\_ south to CMAC Road east to CMAC Road west to to CMAC Road.

In this land transfer, the witnesses are: - 1<sup>st</sup> Name: Sao Seng Age \_\_\_\_\_  
 - 2<sup>nd</sup> Name: Om Phumro Age \_\_\_\_\_

Siem Reap, Day \_\_\_\_\_ Month \_\_\_\_\_ Year 200 \_\_\_\_\_

Receiver	Witness	Giver
	1 <sup>st</sup>	2 <sup>nd</sup>
(Thumbprint) Heng Ratana	(Thumbprint) Om Phumro	(Thumbprint) Sao Chi Laphoan

[CMAC Stamp]

No.04/11 K.K.N.  
 Seen and certified that  
 the signature on the right truly belongs to  
 Village Chief of Tropaing Thnol.  
 District Kantraing, 04 February 2011.

Commune Chief  
 (Stamp and signature)  
 Kheam Chhang

Seen and certified that  
 The giver and the receiver have  
 consented and printed thumbs  
 in front of us.

Village Tropaing Thnol, 3 February 2011

Village Chief  
 (Signature)  
 Soeun Chun

**Kingdom of Cambodia  
Nation, Religion, King**

**Land Certificate**

We Seoun Chun Village Chief Tropaing Thnol Commune Kantraing Town Prasat  
Bakorng Province Siem Reap.

**To**  
**Kantraing Commune Chief**

**Objective:** Request for land certificate CMAC of Name Heng Ratana Sex Male Age 42 years old.  
and name of husband or wife \_\_\_\_\_ Age \_\_\_\_\_ years old, holding ID No. 933614  
dated 30 April 2009 Address No. \_\_\_\_\_ Group \_\_\_\_\_ Village Kork Chombok  
Commune Choam Chao Town Dangkor Province Phnom Penh City.

**This land is demarcated:**

- North to \_\_\_\_\_ South to CMAC Road
- East to CMAC Road West to CMAC Road

In accordance with the objective mentioned above, please Commune Chief kindly check and facilitate for us.

We are committed to complying with any duty and other orders stipulated by the authority.

**In certifying this land, there are witnesses:**

- 1<sup>st</sup> Name Sao Seng Sex \_\_\_\_\_ Age \_\_\_\_\_ years old Address Village \_\_\_\_\_
- 2<sup>nd</sup> Name Om Phumro Sex \_\_\_\_\_ Age \_\_\_\_\_ years old Address Village \_\_\_\_\_

Thumb-print of witnesses  
2011  
1<sup>st</sup> (Thumbprint) \_\_\_\_\_  
2<sup>nd</sup> (Thumbprint) \_\_\_\_\_  
Sao Seng \_\_\_\_\_ Om Phumro \_\_\_\_\_

Kantraing, 03 February

Thumbprint of Applicant  
[CMAC Stamp]  
Heng Ratana (Thumbprint)

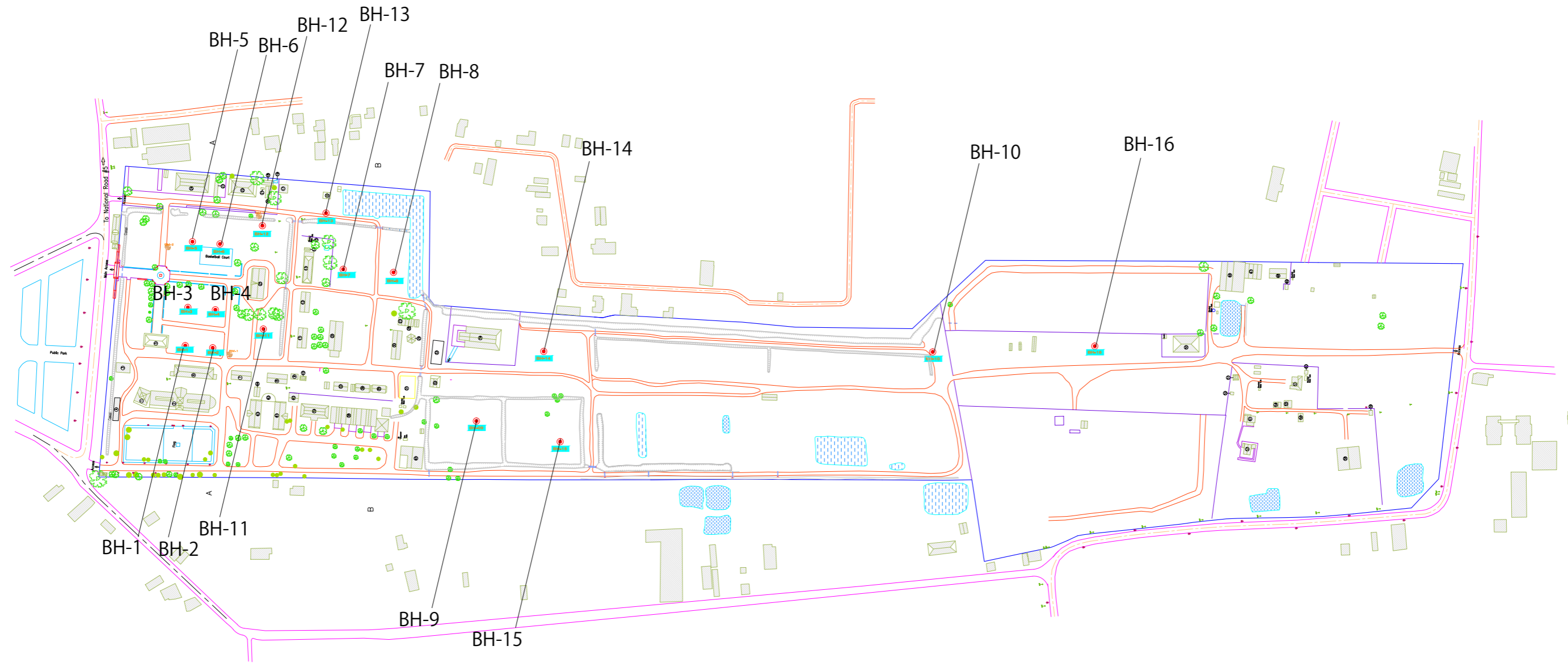
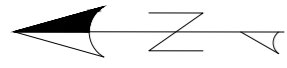
No.04/11 K.K.N.  
Seen and certified that  
the signature on the right truly belongs to  
Name Seoun Chun, Village Chief of Tropaing Thnol.  
Dated 04 February 2011.

No.189/11 K.P.C.  
Seen and certified that the land size  
as certified above truly belongs  
Name Heng Ratana and Name \_\_\_\_\_  
Dated 3 February 2011.

Commune Chief of Kantraing  
(Stamp and signature)  
Kearm Chang

Village Chief of Tropaing Thnol  
(Signature)  
Soeun Chun

## **Appendix 8-1: Boring Locations and Log (TIMA)**



- Legends :**
- : Pavment Road
  - : unpavment Road
  - : Tree
  - : Benchmark
  - : Building
  - : Contour Line
  - : Electrical Pole
  - : Manhole
  - : Pond
  - : Fence
  - : Canal
  - 10.00 : Spot Elevation
  - BH : Soil Bore log

- LandMark Legends :**
- |                                       |                                                        |                                                   |                                       |
|---------------------------------------|--------------------------------------------------------|---------------------------------------------------|---------------------------------------|
| 1 : Exhibition Room                   | 19 : Septic Tank                                       | 36 : Dog staying and Dog Handle with Pool(2)      | 54 : ADA material Bld                 |
| 2 : Office Bld                        | 20 : Concrete Water Tank with Roofing                  | 37 : Dog staying and dog Handle (3)               | 55 : Generator Room                   |
| 3 : Security Guard Bld                | 21 : Water Tank Basin                                  | 38 : Warehouse Bld                                | 56 : UXO Storage room                 |
| 4 : Car Parking                       | 22 : Dog Breeding Bld                                  | 39 : Office Bld for warehouse                     | 57 : Steam/Cast/Drill Bld             |
| 5 : Conference Bld                    | 23 : Dog Training Hall                                 | 40 : Dining Hall with Roofing for warehouse staff | 58 : Warehouse for exploded materials |
| 6 : School Bld                        | 24 : Caring Pregnancy Bld                              | 41 : Accommodation Bld for Warehouse staff        | 59 : Flammable material Room          |
| 7 : Accommodation Bld (A)             | 25 : Dog Center Office                                 | 42 : Toilet Room                                  | 60 : Toilet Room                      |
| 8 : Accommodation Bld(B)              | 26 : MDD Training Center and Management of Dog Program | 43 : Accommodation for EDO staff                  | 61 : Command and control place        |
| 9 : Toilet Room                       | 27 : Dog Food Storage Bld                              | 44 : Car park with Roofing                        |                                       |
| 10 : Concrete Water Tank with Roofing | 28 : Water Cleaning Bld for Dog                        | 45 : CMAC salvage Dive Unid Bld                   |                                       |
| 11 : Accommodation Bld (C)            | 29 : Dog Training Pool with Roofing                    | 46 : Applied Technology Training Center Bld       |                                       |
| 12 : Accommodation Bld (D)            | 30 : Dog Staying Bld                                   | 47 : Accommodation made by Container              |                                       |
| 13 : Dining Bld                       | 31 : Dog Cemetery Hall                                 | 48 : Training Pool for CMAC Salvage Dive          |                                       |
| 14 : Concrete Water Tank With Roofing | 32 : Carousel Bld                                      | 49 : Toilet Room                                  |                                       |
| 15 : Warehouse for Keep UXO           | 33 : Dog Training Space                                | 50 : Building Construction by USA                 |                                       |
| 16 : Generator Room                   | 34 : Dog Training anti covid Bld                       | 51 : Assembly Point                               |                                       |
| 17 : Toilet Room                      | 35 : Dog staying and dog handle (1)                    | 52 : Flammable Material Room                      |                                       |
|                                       |                                                        | 53 : Cutting Place                                |                                       |



#20 Street 606 Boeung Kok II  
Toulkuk Phnom Penh, Cambodia  
Tel: (+855) 023 882 704

**REMARKS**

- This drawing shall not be used for construction unless certified.
- Contractor to verify all dimensions of existing works on site before commencing any work or preparing shop drawings.
- Do not scale drawings, use written dimension only.
- This drawing is to be read in conjunction with the specifications and condition of contract.
- All dimensions in millimeter

REVISION	DATE
A	
B	
C	
D	
E	

**PROJECT:**  
Preparatory Survey On Project for Construction of Training Complex and Outreach Facility of Cambodia Mine Action Center, Kampong Chhang

**DRAWING NAME:**  
BORE LOG LOCATION PLAN

**DRAWN BY:** CAM.E.S  
**SURVEY BY:** CAM.E.S  
**CHECKED BY:**  
**APPROVED BY:**

**DATE:** 14/03/2022  
**PAPER SIZE:** A1  
**SCALE:** 1/2000

# BORING LOG


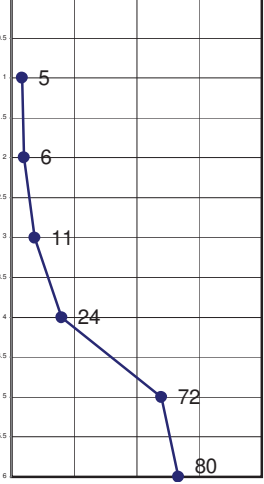





PROJECT NAME: PREPARATORY SURVEY PROJECT OF TRAINING COMPLEX AND OUTREACH FACILITY OF CAMBODIA MINE ACTION CENTER						BH-1							
PROJECT SITE : LOCATED KAMPONG CHNANG PROVINCE, KINGDOM OF CAMBODIA						Date Started: 04/02/2022							
E=1353596.459 N=463049.827 Z=17.1883			EQUIPMENT : WASH BORING METHOD			Date finished: 04/02/2022							
Depth	Samples	Sample Type	DESCRIPTION OF STRATA	Depth & Thick	Legend	FIELD TESTING						Recovery ratio	
						Pocket Test	Vane Test	Depth testing	S P T				
m	No			m.	kPa	kPa	m.	Blows / 150mm			N- value (Blows / 300mm)	mm.	
1	1	D	Brown very loose Silty SAND	(2.50)				1.00 to 1.45	1	1	2		
2	2	D				2.00 to 2.45	1	1	1				
3	3	D	Brown stiff SILT	(5.50)		85		3.00 to 3.45	2	6	8		
4	4	D				100		4.00 to 4.45	2	4	6		
5	5	D				175		5.00 to 5.45	5	5	7		
6	6	D				140		6.00 to 6.45	4	6	6		
7	7	D				150		7.00 to 7.45	4	6	8		
8	8	D				>300		8.00 to 8.45	7	14	12		
9	9	D	Brown very stiff Lean CLAY	(1.00)		>300		9.00 to 9.45	14	31	32		
10	10	D	Yellow very hard Lean CLAY	(2.00)		>300		10.00 to 10.45	20	40	45		
11	11	D				>300		11.00 to 11.45	Nvalue>100blows				
12			Yellow brown white highly weathered CLAYSTONE	(2.00)				11.00 to 12.00	Advanced core 1000mm			RQD= 0% TCR= 97%	
13										12.00 to 13.00	Advanced core 1000mm		
14			Borehole Ends 13.00m	13.00									
15													
16													
17													
18													
19													
20													

LEGEND: D - Disturbed Sample  
U - Undisturbed Sample

Water Level: >13.00m

# BORING LOG

PROJECT NAME: PREPARATORY SURVEY PROJECT OF TRAINING COMPLEX AND OUTREACH FACILITY OF CAMBODIA MINE ACTION CENTER		<b>BH-9</b>
PROJECT SITE : LOCATED KAMPONG CHNANG PROVINCE, KINGDOM OF CAMBODIA		Date Started: 16/02/2022
E=1353322.278 N=462978.755 Z=17.0049	EQUIPMENT : WASH BORING METHOD	Date finished: 16/02/2022

Depth	Samples	Sample Type	DESCRIPTION OF STRATA	Depth & Thick	Legend	FIELD TESTING						Recovery ratio			
						Pocket Test	Vane Test	Depth testing	S P T				N- value (Blows / 300mm)		
									N <sub>0</sub>	N <sub>1</sub>	N <sub>2</sub>				
m	No			m.		kPa	kPa	m.	Blows / 150mm			mm.			
1	1	D	Brown medium stiff Fat CLAY	(3.00)			20	1.00 to 1.45	2	2	3				
2	2	D					25	2.00 to 2.45	2	3	3				
3							70	3.00 to 3.45	3	4	7				
4	3	D	Yellow white stiff Sandy SILT	(1.00)		150		4.00 to 4.45	7	10	14				
5	4	D	Yellow white very stiff Sandy SILT	(1.00)				5.00 to 5.45	15	33	39				
6	5	D	Brown very dense Silty SAND	(1.00)		>300		6.00 to 6.45	16	35	45				
7	6	D	Brown very hard Lean CLAY	(1.00)											
8			Yellow brown completely weathered CLAYSTONE	(2.00)				7.00 to 8.00	Advanced core 1000mm				RQD= 0% TCR= 94%		
9										8.00 to 9.00	Advanced core 1000mm			RQD= 0% TCR= 63%	
10			Borehole Ends 9.00m												
11															
12															
13															
14															
15															
16															
17															
18															
19															
20															



PROJECT NAME: PREPARATORY SURVEY PROJECT OF TRAINING COMPLEX AND OUTREACH FACILITY OF CAMBODIA MINE ACTION CENTER	<b>BH-11</b>
PROJECT SITE : LOCATED KAMPONG CHNANG PROVINCE, KINGDOM OF CAMBODIA	Date Started: 17/02/2022
E=1353522.945 N=463065.4439 Z=16.7838	Date finished: 17/02/2022
EQUIPMENT : WASH BORING METHOD	

Depth	Samples	Sample Type	DESCRIPTION OF STRATA	Depth & Thick	Legend	FIELD TESTING							Recovery ratio
						Pocket Test	Vane Test	Depth testing	S P T			N- value (Blows / 300mm)	
									N <sub>0</sub>	N <sub>1</sub>	N <sub>2</sub>		
m	No			m.		kPa	kPa	m.	Blows / 150mm			mm.	
1	1	D	Brown very loose Silty SAND with gravel	(2.00)				1.00 to 1.45	1	1	1		
2		2.00 to 2.45		1		2	6						
3	2	D	Red brown loose Silty SAND with gravel	(0.70)									
4		2.70 to 3.00	35			3.00 to 3.45	5	4	4				
5	3	D	Yellow stiff Fat CLAY	(4.10)									
6	4	D				4.00 to 4.45	50	3	6	6			
7	5	D				5.00 to 5.45	50	3	4	8			
8	6	D				6.00 to 6.45	50	4	6	6			
9	7	D				7.00 to 7.45	200	8	14	18			
10	8	D				8.00 to 8.45	290	9	18	27			
11	9	D				9.00 to 9.45	>300	12	26	33			
12	10	D	10.00 to 10.45	>300	Nvalue>100blows								
13	11	D	Yellow very hard Sandy Silty CLAY	(2.00)				11.00 to 11.45	Nvalue>100blows				
14		12.00 to 12.00				>300							
15			Yellow brown highly weathered CLAYSTONE	(2.00)				12.00 to 13.00	Advanced core 1000mm			RQD= 0% TCR= 42%	
16						13.00 to 14.00	Advanced core 1000mm			RQD= 16% TCR= 60%			
17			Borehole Ends 14.00m										
18													
19													
20													

# BORING LOG

PROJECT NAME: PREPARATORY SURVEY PROJECT OF TRAINING COMPLEX AND OUTREACH FACILITY OF CAMBODIA MINE ACTION CENTER	<b>BH-12</b>
PROJECT SITE : LOCATED KAMPONG CHNANG PROVINCE, KINGDOM OF CAMBODIA	Date Started: 01/04/2022
E=1353523.816 N=463162.7456	Date finished: 01/04/2022
EQUIPMENT : WASH BORING METHOD	

Depth	Samples	Sample Type	DESCRIPTION OF STRATA	Depth & Thick	Legend	FIELD TESTING						Recovery ratio	
						Pocket Test	Vane Test	Depth testing	S P T				
									N <sub>0</sub>	N <sub>1</sub>	N <sub>2</sub>		N- value (Blows / 300mm)
m	No			m.		kPa	kPa	m.	Blows / 150mm			mm.	
1	1	D	Light brown very loose Clayey SAND with gravel	(2.00)				1.00 to 1.45	2	1	1		
2		2.00		35		2.00 to 2.45	2	4	4				
3	2	D	Light brown stiff Lean CLAY	(4.00)		60	3.00 to 3.45	3	7	7			
4	3	D				95	4.00 to 4.45	3	6	9			
5	4	D				65	5.00 to 5.45	3	4	6			
6	5	D				45	6.00 to 6.45	2	3	4			
7	6	D				(1.00)	110	7.00 to 7.45	3	7	10		
8	7	D				Yellow very stiff Lean CLAY	(2.00)		130	8.00 to 8.45	7		10
9	8	D	>300	9.00 to 9.45	7				20	35			
10	9	D	>300	10.00 to 10.45	25				45	50			
11	10	D	Yellow white very hard Lean CLAY	(5.00)		>300	11.00 to 11.45	Nvalue>100blows					
12	11	D				>300	12.00 to 12.45	Nvalue>100blows					
13	12	D				>300	13.00 to 13.45	Nvalue>100blows					
14	13	D				>300	14.00 to 14.45	Nvalue>100blows					
15	14	D				>300	14.00 to 14.45	Nvalue>100blows					
16			Yellow light brown completely weathering CLAYSTONE	(1.00)									
17			Borehole Ends 15.00m	15.00			14.00 to 15.00	Advanced core 1000mm			RQD= 0%		TCR= 60%
18													
19													
20													
21													

PROJECT NAME: PREPARATORY SURVEY PROJECT OF TRAINING COMPLEX AND OUTREACH FACILITY OF CAMBODIA MINE ACTION CENTER							BH-13									
PROJECT SITE : LOCATED KAMPONG CHNANG PROVINCE, KINGDOM OF CAMBODIA							Date Started: 04/04/2022									
E=1353463.894 N=463174.6833				EQUIPMENT : WASH BORING METHOD			Date finished: 04/04/2022									
Depth	Samples	Sample Type	DESCRIPTION OF STRATA	Depth & Thick	Legend	FIELD TESTING							Recovery ratio			
						Pocket Test	Vane Test	Depth testing	S P T			N- value (Blows / 300mm)				
m	No			m.		kPa	kPa	m.	Blows / 150mm				mm.			
									0	50	100	150	200			
1	1	D	Light red very loose Silty SAND	(3.00)				1.00 to 1.45	3	2	1			3		
2	2	D				2.00 to 2.45	3	2	2			4				
3						90	3.00 to 3.45	8	7	7			14			
4	3	D	Light red brown stiff Lean CLAY	(1.70)		65		4.00 to 4.45	3	5	5			10		
5	4	D				110	5.00 to 5.45	8	8	10			18			
6	5	D	Yellow white very stiff Lean CLAY	(4.30)		135		6.00 to 6.45	7	10	11			21		
7	6	D				100	7.00 to 7.45	5	7	9			16			
8	7	D				185	8.00 to 8.45	8	12	17			29			
9	8	D				200	9.00 to 9.45	8	12	20			32			
10	9	D				145	10.00 to 10.45	5	11	12			23			
11	10	D	Yellow hard Lean CLAY	(2.00)		>300		11.00 to 11.45	15	24	25			49		
12	11	D				>300	12.00 to 12.45	13	22	26			48			
13	12	D	Yellow white very hard Lean CLAY	(2.00)												
14																
15																
16			Yellow light brown highly weathered CLAYSTONE	(2.00)				13.00 to 14.00	Advanced core 1000mm			RQD= 42%	TCR= 74%			
17										14.00 to 15.00	Advanced core 1000mm			RQD= 20%	TCR= 78%	
18			Borehole Ends 15.00m													
19																
20																

LEGEND: D - Disturbed Sample  
U - Undisturbed Sample

Water Level: >15.00m

Sheet No 1

# BORING LOG

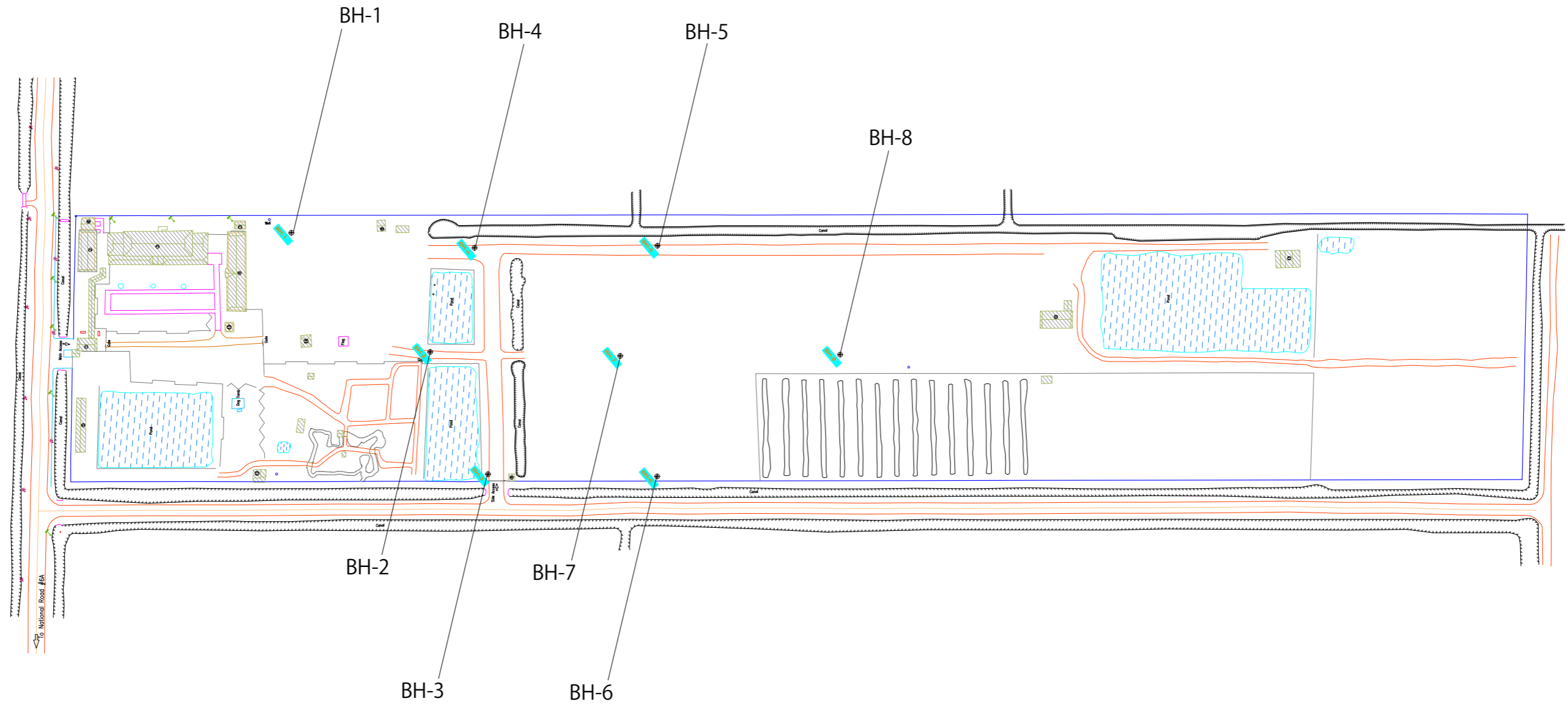
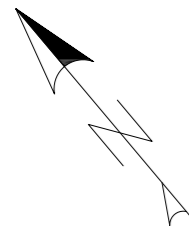
PROJECT NAME: PREPARATORY SURVEY PROJECT OF TRAINING COMPLEX AND OUTREACH FACILITY OF CAMBODIA MINE ACTION CENTER							BH-15									
PROJECT SITE : LOCATED KAMPONG CHNANG PROVINCE, KINGDOM OF CAMBODIA							Date Started: 06/04/2022									
E=1353243.382 N=462959.2835				EQUIPMENT : WASH BORING METHOD			Date finished: 06/04/2022									
Depth	Samples	Sample Type	DESCRIPTION OF STRATA	Depth & Thick	Legend	FIELD TESTING						Recovery ratio				
						Pocket Test	Vane Test	Depth testing	S P T							
m	No			m.		kPa	kPa	m.	Blows / 150mm			N- value (Blows / 300mm)	mm.			
									0	50	100	150	200			
1	1	D	Light red loose Clayey SAND with gravel	(2.00)				1.00 to 1.45	5	5	5	10				
2				2.00		40	2.00 to 2.45	2	3	6	9					
3	2	D	Yellow stiff SILT	(2.00)		65		3.00 to 3.45	2	4	6	10				
4	3	D		4.00		180	4.00 to 4.45	5	15	13	28					
5	4	D		5.00		160	5.00 to 5.45	8	10	15	25					
6	5	D	Yellow very stiff SILT	(2.00)		290		6.00 to 6.45	9	15	30	45				
7	6	D		6.00												
8			Yellow white hard SILT	(1.00)												
9				7.00												
10			Yellow light brown completely weathering CLAYSTONE	(2.00)				7.00 to 8.00	Advanced core 1000mm			RQD= 0%	TCR= 15%			
11				8.00						8.00 to 9.00	Advanced core 1000mm			RQD= 0%	TCR= 18%	
12			Borehole Ends 9.00m	9.00												
13																
14																
15																
16																
17																
18																
19																
20																

LEGEND: D - Disturbed Sample  
U - Undisturbed Sample

Water Level: >9.00m

Sheet No 1

## **Appendix 8-2: Boring Locations and Log (OF)**



Legends :		LandMark Lengends :	
	: Pavment Road	①	: Entrance
	: unpavment Road	②	: Briefing Room
	: Tree	③	: Main Exhibition Hall
	: Benchmark	④	: Storage
	: Building	⑤	: Toll Souvenir
	: Contour Line	⑥	: Rest Room
	: Electrical Pole	⑦	: Rest Area
	: Manhole	⑧	: Canteen
	: Pond	⑨	: Guard House
	: Fence	⑩	: Rest Area
	: Canal	⑪	: Warehouse for Exploded Material
	: Spot Elevation	⑫	: Accommodation Bld
	: Soil Bore log	⑬	: Guard House

Name	Grid North	Grid East	Elevation
BM1	1473101.564	396708.407	16.204
BM2	1473111.149	396579.943	16.347
BM3	1473024.927	396677.013	16.330

Notes :  
 - Ordnance Survey National Grid Coordinated have been established from BM017C  
 - All Levels relate to the ordnance survey datum for MRC Control Station



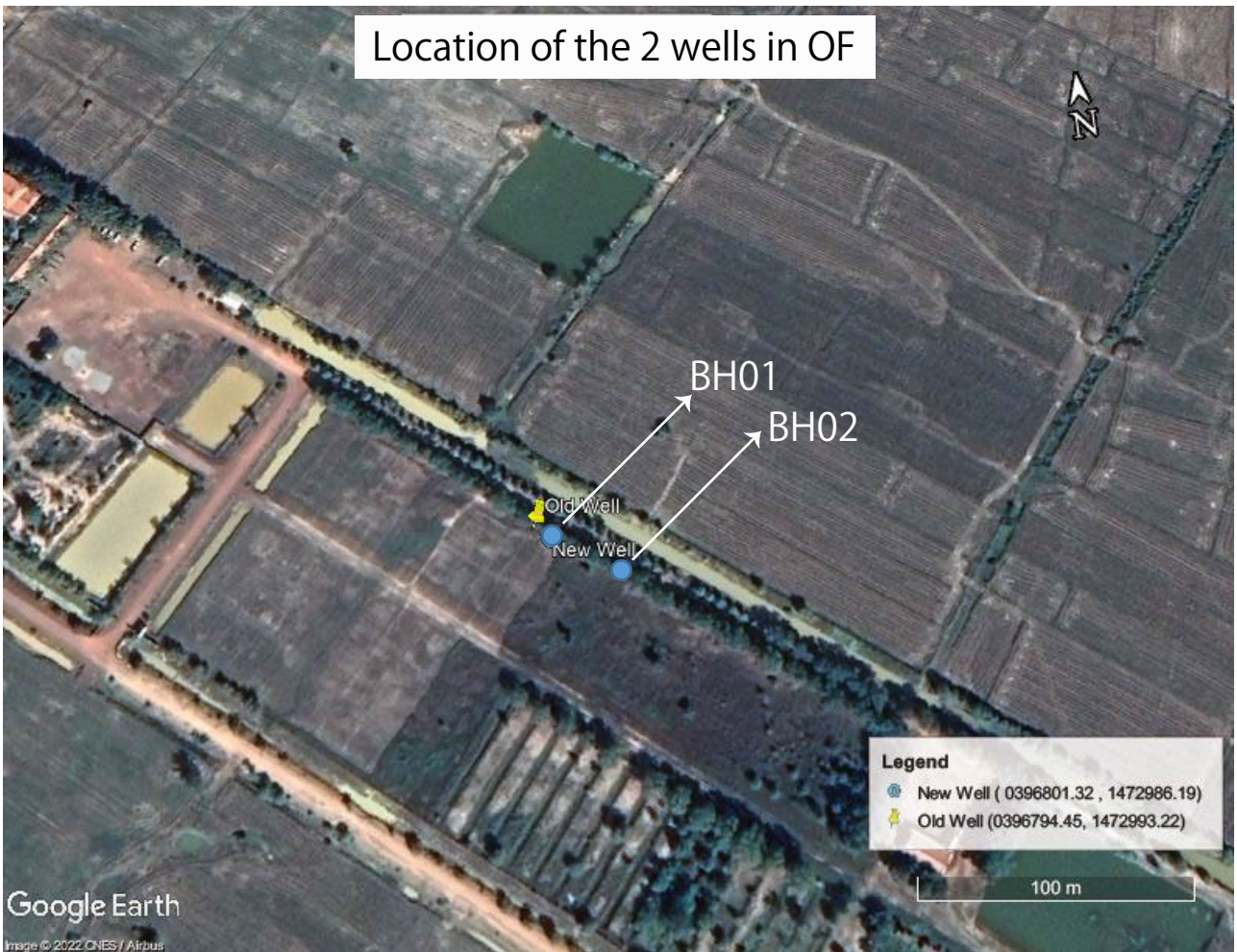
 #20 Street 606 Boeung Kok II Toukok Phnom Penh, Cambodia Tel: (+855) 023 882 704	REMARKS	REVISION	DATE	PROJECT:	DRAWN BY:	DRAWING NO:		
	- This drawing shall not be used for construction unless certified. - Contractor to verify all dimensions of existing works on site before commencing any work or preparing shop drawings. - Do not scale drawings, use written dimension only. - This drawing is to be read in conjunction with the specifications and condition of contract. - All dimensions in millimeter	A			Preparatory Survey On Project for Construction of Training Complex and Outreach Facility of Cambodia Mine Action Center, Siem Reap	CAM.E.S	SP01	
		B				14/03/2022		
		C				DRAWING NAME:	CHECKED BY:	PAPER SIZE:
		D				BOREHOLE LOCATION	APPROVED BY:	A1
E				SCALE:			1/1250	

PROJECT NAME: TRAINING COMPLEX AND OUTREACH FACILITY OF CAMBODIA MINE ACTION CENT		<b>BH-7</b>
PROJECT SITE : LOCATED SIEM REAP PROVINCE, KINGDOM OF CAMBODIA		Date Started: 21/02/2022
N=1380553.620 E=370233.359 Z=19.728m	EQUIPMENT : WASH BORING METHOD	Date finished: 22/02/2022

Depth	Samples	Sample Type	DESCRIPTION OF STRATA	Depth & Thick	Legend	FIELD TESTING						Recovery ratio			
						Pocket Test	Vane Test	Depth testing	S P T						
									N <sub>0</sub>	N <sub>1</sub>	N <sub>2</sub>		N- value (Blows / 300mm)		
m	No			m.	kPa	kPa	m.	Blows / 150mm			mm.				
1	1	D	Brown medium stiff Lean CLAY with sand	(3.50)		25		1.00 to 1.45	1	2	2				
2	2	35					2.00 to 2.45	2	2	4					
3	3	50					3.00 to 3.45	3	3	5					
4	4	D	Brown very stiff Sandy Lean CLAY	(4.00)		90		4.00 to 4.45	3	5	9				
5	5	145					5.00 to 5.45	6	10	13					
6	6	90					6.00 to 6.45	6	10	10					
7	7	D	Brown hard Sandy Lean CLAY	(5.50)		95		7.00 to 7.45	5	9	13				
8	8	200					8.00 to 8.45	7	14	17					
9	9	205					9.00 to 9.45	7	15	17					
10	10	D	White grey very stiff Lean CLAY with sand	(3.00)		145		10.00 to 10.45	10	10	13				
11	11	180					11.00 to 11.45	10	13	15					
12	12	240					12.00 to 12.45	9	17	20					
13	13	D	Brown white hard Lean CLAY with sand	(4.00)		115		13.00 to 13.45	6	9	9				
14	14	165					14.00 to 14.45	7	9	17					
15	15	180					15.00 to 15.45	8	10	18					
16	16	D	White grey brown very dense Clayey SAND	(2.00)		145		16.00 to 16.45	9	14	19				
17	17	160					17.00 to 17.45	8	16	21					
18	18	245					18.00 to 18.45	11	21	34					
19	19	D	Brown white very hard Sandy SILT	(3.00)		270		19.00 to 19.45	14	24	37				
20	20	>300					20.00 to 20.45	24	38	47					
21	21	>300					21.00 to 21.45	19	30	41					
22	22	D	White grey brown hard Sandy SILT	(4.50)				22.00 to 22.45	13	30	39				
23	23						23.00 to 23.45	15	30	37					
24	24	300					24.00 to 24.45	14	20	31					
25	25	D	White grey very dense Clayey SAND	(6.00)		160		25.00 to 25.45	13	19	28				
26	26	175					26.00 to 26.45	8	10	15					
27	27	>300					27.00 to 27.45	9	10	17					
28	28	D	Borehole Ends 35.50m	(35.50)		>300		28.00 to 28.45	16	25	30				
29	29	>300					29.00 to 29.45	8	17	30					
30	30						30.00 to 30.45	N>100							
31	31	D	Borehole Ends 35.50m	(35.50)				31.00 to 31.45	N>100						
32	32	D								32.00 to 32.45	N>100				
33	33	D								33.00 to 33.45	N>100				
34	34	D								34.00 to 34.45	N>100				
35	35	D								35.00 to 35.45	N>100				
36			Borehole Ends 35.50m	(35.50)											
37															
38															
39															
40															

**Appendix 9: New Wells Location,  
Results of Pumping Test and Water Quality Survey**





**KINGDOM OF CAMBODIA**  
Nation Religion King

5/8/2022

**Oriental Consultant Global Co., Ltd**  
**Preparatory Survey on Project for**  
**Construction of Training Complex and**  
**Outreach Facility of Cambodian Mine**  
**Action Center**

**REPORT**

**WATER WELL DRILLING**  
**PROJECT IN CMAC SIEM**  
**REAP**

Reported by: Seng Eam Hor

**SAFE WATER SUPPLY TEAM**

## 1. Introduction

SAFE WATER SUPPLY TEAM has the SUB-CONSULTING AGREEMENT for the geophysical prospecting Survey, Drilling work and pumping test for Preparatory Survey on Project for Construction of Training Complex and Outreach Facility of Cambodian Mine Action Center from ORIENTAL CONSULTANT GLOBAL CO., LTD on April 22, 2022. The location of the project area is at Peace Museum of Mine Action in Trapeang Thum Commune, Prasat Bakong District Siem Reap Province. The drilling work was carried out for 90 days from May 5 to August 5, 2022. After the contract was amendment on 8 July, 2022, there are three holes drilled on the location of CMAC's land area and they are near to the survey point OC2 that was selected for well point. The three wells have code number, OC2BH0, OCBH1 and OCBH2. One of the three was unsuccessful well.

The report consists of the drilling work with installation of PVC casing and screen pipe, gravel pack, sanitary seal, soil back fill, well development, cement grouting, pumping test, water sample collection, water quality test, and construction of projection box.

Drilling methodology applied is a direct rotary circulation with drag bit in unconsolidated material layers and DTD hammer bit in consolidated formation. The process of drilling has main activities are initial drilling hole of 145mm size as pilot holes, first, second and third reaming of 190mm, 270mm, 300mm. The drilling depth of the three holes has 80m, 82m and the deepest 120m.

## 2. Location

There are locations of the survey point and the three borehole points and named are: OC2 (396794, 1472989) and, OC2BH0 (396801, 1472994), OC2BH1 (396810, 1472988) and OC2BH2 (396832, 1472965) in the Peace Museum of Mine Action's land area (see figure1 below).



Figure 1: The location points are yellow pin OC2 is the survey point, the green square OC2BH0 is unsuccessful hole, the blue circles are the water wells

## 3. Result of the drilling

On the location of CMAC's land area, the three holes were drilled where are near to the survey point OC2 that was selected for well point. All information of the well drilling recorded and

summarized to show on table 1 as well code, well diameter, drilling depth, length of PCV casing pipe and perforated pipe, water yield was estimated by air left, water yield by pumping, static water level, dynamic water level, dawn down level, recovery level, pumping test time, recovery time and pump setting (see table 1).

Table 1: well data

Table 1: Result of Water Well Drillings																
Well Number	Well diameter	Drilling Depth	Well Depth	PVC Casing	Screen	Total casing & screen	By air lift Yield	Step Draw down	Static Water Level	Dynamic water level	Draw down	Recovery level	Average discharge by pumping	Time of pumping	Time of recovery	Pump Setting
	(mm)	(m)	(m)	(m)	(m)	(m)	(m³/h)		(m)	(m)	(m)	(m)	(m³/h)	hour	hour	(m)
OC2HB0	300-270-190-145	80														
OC2HB1	300-190-270-175-145	120	68	34	34	68	0.75	3.00	14.80	50.46	35.66	26.93	0.26	7.00	9.00	58.0
OC2HB2	300-190-270-300	82	68	34	34	68	1.50	5.00	8.15	43.13	34.98	9.85	0.79	24.00	24.00	58.0

- OC2BH0 is the unsuccessful well that has depth of 120m. It wasn't installed any well material, the protected PVC casing damaged and stuck in the holes, abandoned.
- OC2 BH1 is the well has been completed construction as mentioned in the contract condition, but it hasn't enough water yield, drilling deep 120m, well deep 68m
- OC2BH2 is the last well has completed and more water yield than the OC2BH1

In detail see Appendix 1: well geology and casing program

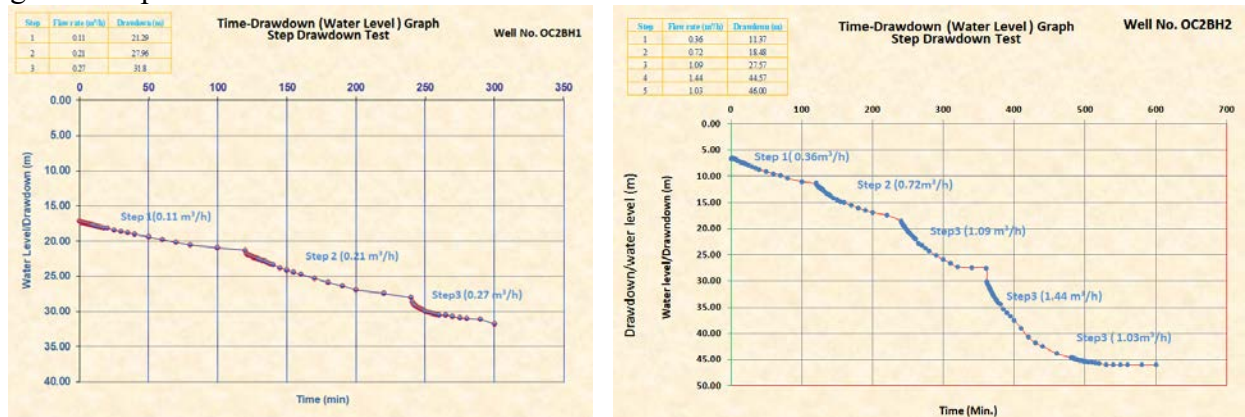
### 2.1.1. Pumping test and water yield

As mention on the table 1, the pumping test methods are the constant rate, step drawdown and recovery test. The pumping test duration are: 7 hours and 24 hours for the constant rate, 9 hours and 24 hours for recovery and stepdrawdown 3 steps for 5 hours and 5 step for 10 hours of OC2BH1 and OC2BH2 respectively.

(Appendix 2: pumping worksheet). A submersible pump of 1 Hp Skill pump model and piezometer were installed. The activities was started as shown on the datasheets and reported by group telegram for the real time and intermittent time. The result of the pumping and analysis are the following:

#### 2.1.1.1. Graphic of time drawdown and water level of the drawn down

Figure1: Step drawn down OC2BH1 & OC2BH2



2.1.1.2.Graphic of time drawdown and water level of constant rate and recovery

Figure 2: Constant rate and recovery OC2BH1 &OC2BH2



OC2BH1: The static water level is 14.80m in the time of doing pump test, dynamic water level is 50.46m and recovery is 26.93m after running of 7 hours of the pumping test and 9 hours for recovery and the average yield 0.26m<sup>3</sup>/hours

OC2BH2: The static water level is 8.15m, in the time of doing pump test, dynamic water level is 43.13 m and recovery is 9.85m after running of 24 hours of the pumping test and 24 hours for recovery and the average yield 0.79 m<sup>3</sup>/h.

**2.1.2. Water quality**

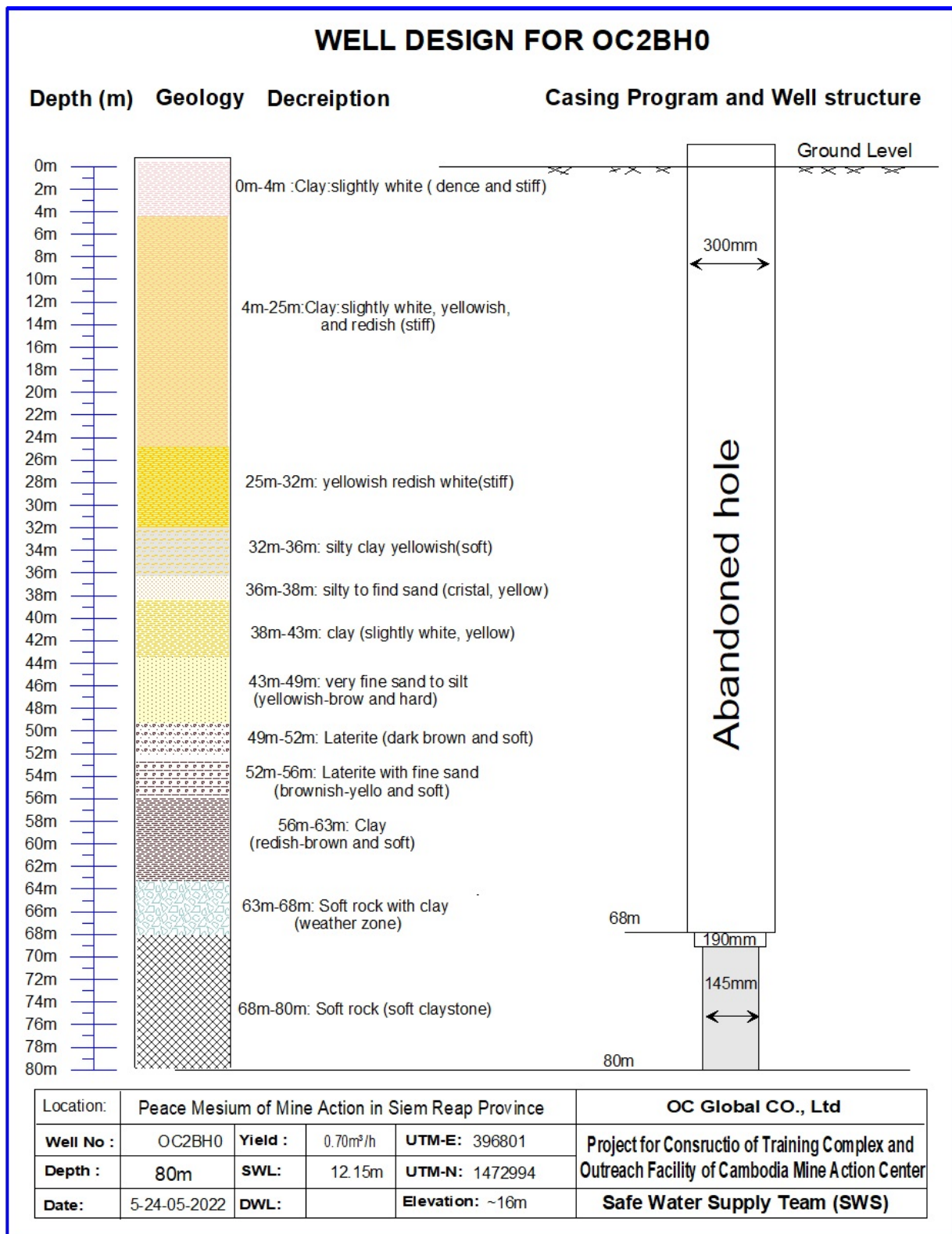
Water samples of Water quality of OC2BH1 and OC2BH2 have collected and checked for microbiological analysis and physico-chemical analysis in the lab of Research And Innovation Center. The Result of the OC2BH1 on June 27, 2022 and the OC2BH2 on August 5, 2022 for the microbiological analysis showed that the water has contaminated some coliform bacteria and fecal coliform, but E.coli has no found. whereas all chemical parameters has no exceed the standard of drinking water of the Cambodian national guideline (see appendix 3).

**4. Conclusion**

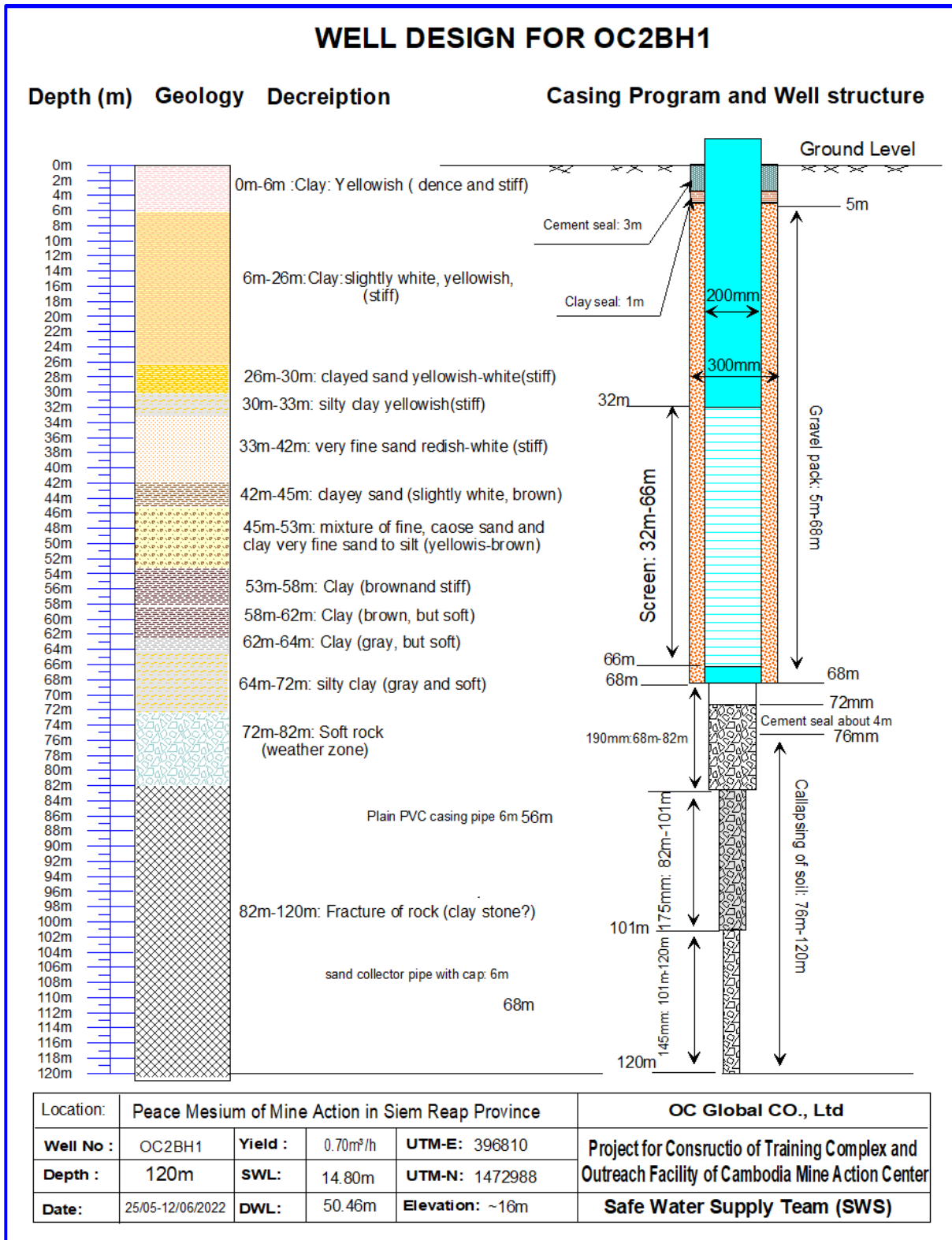
Aquifers of the water wells have found in unconsolidated material (fine sand mixture of soils materials in Alluvial Holocene Era of Quaternary, but not have in sedimentary rocks). Based on geological structure and hydrological data from the water well (soil sample collection, pumping test data, existing wells), the groundwater potential is low. The wells have production water less than one cubicmeter per hours. Due to the water quality result, Turbidity and microbiological shall retest.

Appendix I Well Geology and Program

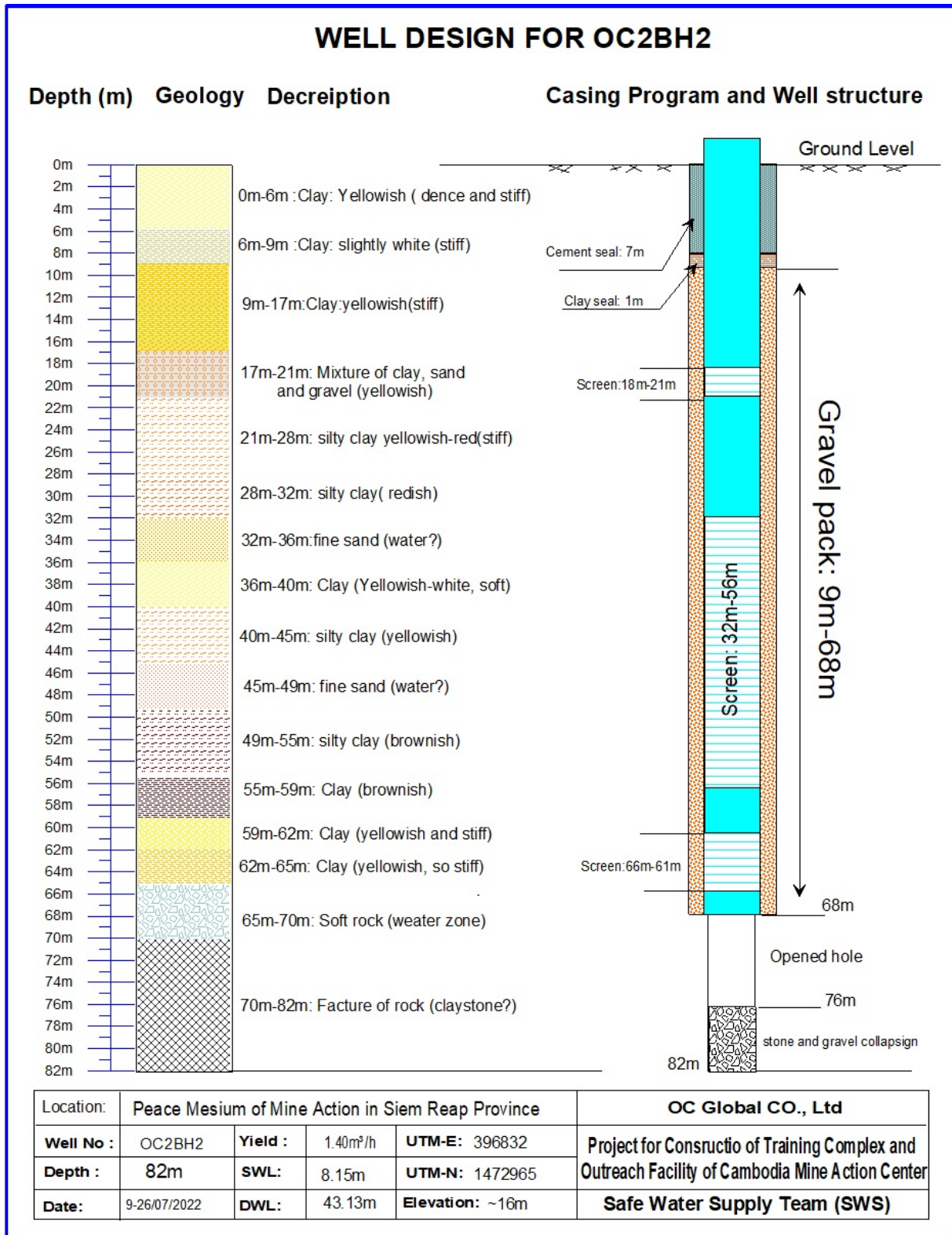
1- OC2BH0



2- OC2BH1



3- OC2BH2





Appendix II Pumping test data sheet

1- OC2BH1

CONSTANT RATE TEST			
Well number	Pumping Well: OC02BH01	Map zone	UTM WGS 84 P48
Project	Project for Construction of Training Complex	E :	396820
Company	OC Global., Ltd	N :	1472965
Village	Koun Sat?	Village No.	17090901?
Commune	Trapeang Thom	District	Prasat Bakong
Province	Seim Reap	Date:	20-Jun-22

Pump type	Skill Pump (Italy)		
Horse power	1.0		Hp
Suction pipe size	75		mm
Well size	200		mm
Well depth	68		m.
Screen interval	(34m): 32m-66m		
Static water level (the elevated pipe: 0.5m):	14.8		m.
Dynamic water level	50.46		m.
Drawdown	35.66		m.
Pump setting depth	58.00		m.
Average pumping rate	0.7		m <sup>3</sup> /Hr.
Recovery	26.93		m.

Clock Time	Time since pump start, t	Time since pump stop, t'	Water level (m.)	Flow rate (m <sup>3</sup> /hr)	Clock Time	Recovery		
	(Min.)	(Min.)				Accumulated time (min.)	Recovery time (min.)	Water level (m.)
6:00:00 AM	0.00	0	14.8		1:00:00 AM	420	0	50.46
	1	1	15.14	0.26		421	1	48.95
	2	1	15.40	0.26		422	1	48.91
	3	1	15.53	0.26		423	1	48.84
	4	1	15.70	0.26		424	1	48.76
	5	1	15.80	0.26		425	1	48.70
	6	1	16.04	0.26		426	1	48.62
	7	1	16.20	0.26		427	1	48.56
	8	1	16.35	0.26		428	1	48.50
	9	1	16.50	0.26		429	1	48.42
	10	1	16.62	0.26		430	1	48.37
	12	2	16.97	0.26		432	2	48.23
	14	2	17.25	0.26		434	2	48.10
	16	2	17.54	0.26		436	2	47.98
	18	2	17.82	0.26		438	2	47.84
	20	2	18.10	0.26		440	2	47.71
	25	5	18.94	0.26		445	5	47.42
	30	5	20.13	0.26		450	5	47.12
	35	5	21.06	0.26		455	5	46.80
	40	5	21.78	0.26		460	5	46.52
	50	10	23.17	0.26		470	10	45.2
7:00:00 AM	60	10	24.44	0.26	2:00:00 AM	480	10	45.4
	70	10	25.87	0.26		490	10	44.36
7:20:00 AM	80	10	26.80	0.26		500	10	43.30
7:40:00 AM	100	20	29.04	0.26		520	20	42.40
8:00:00 AM	120	20	31.60	0.26	3:00:00 AM	540	20	40.70
8:30:00 AM	150	30	34.10	0.26		560	20	40.34
9:00:00 AM	180	30	39.40	0.26		580	20	39.81
10:00:00 AM	240	60	42.44	0.26	4:00:00 AM	600	20	38.93
11:00:00 AM	300	60	44.80	0.26		620	20	38.14
12:00:00 PM	360	60	49.79	0.21		640	20	37.5
1:00:00 PM	420	60	50.46	0.17	5:00:00 AM	660	20	34.70
					6:00:00 AM	720	60	33.32
					7:00:00 AM	780	60	31.44
					8:00:00 AM	840	60	29.25
					9:00:00 AM	900	60	27.31
					10:00:00 AM	960	60	26.93

FIVE STEP DRAW DOWN TESTS													
Well number of Pumping Well : OC02BH02								Map zone:		UTM WGS84 P48			
Village: Koun Sat								E :		396820			
Commune: Trapeang Thom								N :		1472965			
District: Prasat Bakong								Date: 15/6/2022					
Province: Seim Reap								Time: 9:00 AM - 3:50PM					
Static Water Level:								17.15 m					
Clock Time	STEP	Step/Flow rate (m <sup>3</sup> /h)	Time since			Water	STEP	Clock Time	Step/Flow rate (m <sup>3</sup> /h)	Time since			Water
			pump start, t	pump start, t	pump stop, t'	level				pump start, t	pump start, t	pump stop, t'	level
			(Hour)	(Min.)	(Min.)	(m.)				(Hour)	(Min.)	(Min.)	(m.)
0.00		0.00	0.00	0	0	17.15					240		
9:00:00 PM	I	0.12	0.02	1	1	17.30	III	3:00:00PM	0.36	4.02	1	241	28.70
		0.12	0.03	1	2	17.37			0.36	4.03	1	242	28.96
		0.12	0.05	1	3	17.40			0.36	4.05	1	243	29.15
		0.12	0.07	1	4	17.45			0.36	4.07	1	244	29.31
		0.12	0.08	1	5	17.50			0.36	4.08	1	245	29.42
		0.12	0.10	1	6	17.53			0.36	4.10	1	246	29.55
		0.12	0.12	1	7	17.58			0.36	4.12	1	247	29.60
		0.12	0.13	1	8	17.63			0.36	4.13	1	248	29.71
		0.12	0.15	1	9	17.68			0.36	4.15	1	249	29.85
		0.12	0.17	1	10	17.74			0.27	4.17	1	250	30.04
		0.12	0.20	2	12	17.85			0.27	4.20	2	252	30.13
		0.12	0.23	2	14	17.92			0.27	4.23	2	254	30.18
		0.12	0.27	2	16	18.05			0.27	4.27	2	256	30.35
		0.12	0.30	2	18	18.11			0.27	4.30	2	258	30.42
		0.12	0.33	2	20	18.18			0.27	4.33	2	260	30.49
		0.12	0.42	5	25	18.40			0.15	4.42	5	265	30.55
		0.12	0.50	5	30	18.62			0.15	4.50	5	270	30.70
		0.12	0.58	5	35	18.81			0.15	4.58	5	275	30.86
		0.10	0.67	5	40	19.05			0.15	4.67	5	280	31.00
		0.10	0.83	10	50	19.40			0.15	4.83	10	290	31.10
	0.10	1.00	10	60	19.80		4:00:00 AM	0.09	5.00	10	300	31.80	
	0.10	1.17	10	70	20.21								
	0.10	1.33	10	80	20.52								
	0.10	1.67	20	100	20.91								
11:00:00 AM		0.09	2.00	20	120	21.29		5:00:00 PM					
	II	0.24	2.02	1	121	21.85	IV						
		0.24	2.03	1	122	21.97							
		0.24	2.05	1	123	22.04							
		0.24	2.07	1	124	22.09							
		0.24	2.08	1	125	22.20							
		0.24	2.10	1	126	22.28							
		0.24	2.12	1	127	22.36							
		0.24	2.13	1	128	22.44							
		0.24	2.15	1	129	22.51							
		0.24	2.17	1	130	22.57							
		0.24	2.20	2	132	22.78							
		0.24	2.23	2	134	22.90							
		0.24	2.27	2	136	23.05							
		0.24	2.30	2	138	23.23							
		0.20	2.33	2	140	23.37							
		0.20	2.42	5	145	23.82							
		0.20	2.50	5	150	24.14							
		0.20	2.58	5	155	24.40							
		0.20	2.67	5	160	24.74							
		0.20	2.83	10	170	25.34							
	0.20	3.00	10	180	25.88								
	0.20	3.17	10	190	26.38								
	0.15	3.33	10	200	26.93								
	0.15	3.67	20	220	27.41								
1:00:00 PM		0.15	4.00	20	240	27.96		6:30:00 PM					

## - OC2BH2

Well number	Pumping Well: OC02BH02	Map zone	UTM WGS 84 P48
Project	Project for Construction of Training Complex	E :	396832
Company	OC Global., Ltd	N :	1472965
Village	Koun Sat?	Village No.	17090901?
Commune	Trapeang Thom	District	Prasat Bakong
Province	Seim Reap	Date:	29- 31 July 2022

Pump type	Skill Pump (Italy)	
Horse power	1.0	Hp
Suction pipe size	75	mm
Well size	200	mm
Well depth	68	m.
Screen interval	(34m): 18m-21m, 32m-56m and 61m-66m	
Static water level (the elevated pipe: 0.5m):	8.15	m.
Dynamic water level	43.13	m.
Drawdown	34.98	m.
Pump setting depth	58.00	m.
Average pumping rate	0.79	m3/Hr.
Recovery	9.85	m.

Clock Time	Time since pump start, t	Time since pump stop, t'	Water level (m.)	Flow rate (m3/hr)	Clock Time	Recovery		Water level (m.)
	(Min.)	(Min.)				Accumulated time (min.)	Recovery time (min.)	
11:00:00 AM	0.00	0	8.15		11:00:00 AM	1440	0	43.13
	1	1	10.59	0.79		1441	1	42.2
	2	1	10.86	0.79		1442	1	41.93
	3	1	11.14	0.79		1443	1	41.61
	4	1	11.42	0.79		1444	1	41.32
	5	1	11.69	0.79		1445	1	41.08
	6	1	11.89	0.79		1446	1	40.8
	7	1	12.04	0.79		1447	1	40.53
	8	1	12.16	0.79		1448	1	40.29
	9	1	12.30	0.79		1449	1	40.04
	10	1	12.44	0.79		1450	1	39.8
	15	5	13.16	0.79		1455	5	38.75
	20	5	13.60	0.79		1460	5	37.86
	25	5	14.07	0.79		1465	5	37.05
	30	5	14.52	0.79		1470	5	36.36
	40	10	15.27	0.79		1480	10	35.04
	50	10	15.91	0.79		1490	10	34.1
12:00:00 AM	60	10	16.51	0.79	12:00:00 AM	1500	10	33.05
	80	20	17.58	0.79		1520	20	31.35
	100	20	18.54	0.79		1540	20	29.87
1:00:00 PM	120	20	19.27	0.79	1:00:00 PM	1560	20	29.65
	140	20	19.96	0.79		1580	20	27.57
	160	20	20.65	0.79		1600	20	26.6
2:00:00 PM	180	20	21.10	0.79	2:00:00 PM	1620	20	25.46
	200	20	21.57	0.79		1640	20	24.63
	220	20	22.00	0.79		1660	20	24.08
3:00:00 PM	240	20	25.3	0.79	3:00:00 PM	1680	20	23.34
	260	20	27.69	0.79		1700	20	22.7
	280	20	28.45	0.79		1720	20	21.72
4:00:00 PM	300	20	29.47	0.79	4:00:00 PM	1740	20	21.31
	320	20	31.02	0.79		1760	20	20.95
	340	20	32.54	0.79		1780	20	20.54
5:00:00 PM	360	20	34.03	0.79	5:00:00 PM	1800	20	20.23
6:00:00 PM	420	60	35.69	0.79	6:00:00 PM	1860	60	18.32
7:00:00 PM	480	60	36.84	0.79	7:00:00 PM	1920	60	18.13
8:00:00 PM	540	60	37.65	0.79	8:00:00 PM	1980	60	17.42
9:00:00 PM	600	60	38.38	0.79	9:00:00 PM	2040	60	16.81
10:00:00 PM	660	60	38.9	0.79	10:00:00 PM	2100	60	16.18
11:00:00 PM	720	60	39.38	0.79	11:00:00 PM	2160	60	15.64
12:00:00 AM	780	60	39.81	0.79	12:00:00 AM	2220	60	15.18
1:00:00 AM	840	60	40.18	0.79	1:00:00 AM	2280	60	14.70
2:00:00 AM	900	60	40.38	0.79	2:00:00 AM	2340	60	13.65
3:00:00 AM	960	60	40.55	0.79	3:00:00 AM	2400	60	13.10
4:00:00 AM	1020	60	40.74	0.79	4:00:00 AM	2460	60	12.84
5:00:00 AM	1080	60	40.99	0.79	5:00:00 AM	2520	60	12.45
6:00:00 AM	1140	60	41.29	0.79	6:00:00 AM	2580	60	11.88
7:00:00 AM	1200	60	41.40	0.79	7:00:00 AM	2640	60	11.34
8:00:00 AM	1260	60	41.47	0.79	8:00:00 AM	2700	60	10.80
9:00:00 AM	1320	60	42.41	0.79	9:00:00 AM	2760	60	10.63
10:00:00 AM	1380	60	43.00	0.79	10:00:00 AM	2820	60	10.21
11:00:00 AM	1440	60	43.13	0.79	11:00:00 AM	2880	60	9.85

SAFE WATER SUPPLY TEAM (SWS)/water well construction CMAC/ August 2022

FIVE STEP DRAW DOWN TESTS													
Well number of Pumping Well : OC02BH02										Map zone:		UTM WGS84 P48	
Village: Koun Sat										E :		396832	
Commune: Trapeang Thom										N :		1472965	
District: Prasat Bakong										Date: 28/07/2022			
Province: Seim Reap										Time: 8:30 AM - 6:30PM			
Static Water Level:										6.64 m			
Clock Time	STEP	Step/Flow rate (m <sup>3</sup> /h)	Time since			Water level (m.)	STEP	Clock Time	Step/Flow rate (m <sup>3</sup> /h)	Time since			Water level (m.)
			pump start, t (Hour)	pump start, t (Min.)	pump stop, t' (Min.)					pump start, t (Hour)	pump start, t (Min.)	pump stop, t' (Min.)	
0.00		0.00	0.00	0	0	6.64						360	
8:30:00 PM	I	0.36	0.02	1	1	6.50	IV	2:31:00PM	1.56	6.02	1	361	30.15
		0.36	0.03	1	2	6.55			1.50	6.03	1	362	30.58
		0.36	0.05	1	3	6.60			1.44	6.05	1	363	30.85
		0.36	0.07	1	4	6.65			1.44	6.07	1	364	31.12
		0.33	0.08	1	5	6.68			1.44	6.08	1	365	31.42
		0.36	0.10	1	6	6.77			1.44	6.10	1	366	31.70
		0.36	0.12	1	7	6.87			1.44	6.12	1	367	31.95
		0.39	0.13	1	8	7.00			1.44	6.13	1	368	32.22
		0.39	0.15	1	9	7.07			1.44	6.15	1	369	32.46
		0.36	0.17	1	10	7.10			1.44	6.17	1	370	32.70
		0.36	0.20	2	12	7.18			1.44	6.20	2	372	33.15
		0.39	0.23	2	14	7.29			1.44	6.23	2	374	33.57
		0.36	0.27	2	16	7.37			1.44	6.27	2	376	33.91
		0.36	0.30	2	18	7.49			1.44	6.30	2	378	34.28
		0.36	0.33	2	20	7.59			1.44	6.33	2	380	34.44
		0.33	0.42	5	25	7.85			1.44	6.42	5	385	35.37
		0.36	0.50	5	30	8.20			1.44	6.50	5	390	36.00
		0.36	0.58	5	35	8.49			1.38	6.58	5	395	36.66
		0.36	0.67	5	40	8.70			1.44	6.67	5	400	37.47
		0.36	0.83	10	50	9.14			1.44	6.83	10	410	39.08
	0.36	1.00	10	60	9.48		1.44	7.00	10	420	40.71		
	0.36	1.17	10	70	9.74		1.44	7.17	10	430	41.78		
	0.36	1.33	10	80	10.40		1.38	7.33	10	440	42.44		
	0.36	1.67	20	100	11.00		1.44	7.67	20	460	43.84		
10:30:00 AM	II	0.36	2.00	20	120	11.37	V	4:30:00 PM	1.26	8.00	20	480	44.57
		0.72	2.02	1	121	11.71			1.20	8.02	1	481	44.63
		0.72	2.03	1	122	11.83			1.08	8.03	1	482	44.67
		0.72	2.05	1	123	11.95			1.08	8.05	1	483	44.70
		0.72	2.07	1	124	12.04			1.08	8.07	1	484	44.81
		0.72	2.08	1	125	12.15			1.08	8.08	1	485	44.85
		0.72	2.10	1	126	12.30			1.08	8.10	1	486	44.90
		0.72	2.12	1	127	12.40			1.08	8.12	1	487	44.94
		0.78	2.13	1	128	12.46			1.08	8.13	1	488	44.97
		0.78	2.15	1	129	12.54			1.08	8.15	1	489	45.00
		0.72	2.17	1	130	12.70			1.08	8.17	1	490	45.07
		0.72	2.20	2	132	13.00			1.08	8.20	2	492	45.14
		0.72	2.23	2	134	13.20			1.08	8.23	2	494	45.18
		0.72	2.27	2	136	13.38			1.08	8.27	2	496	45.21
		0.72	2.30	2	138	13.55			1.08	8.30	2	498	45.24
		0.72	2.33	2	140	13.72			1.08	8.33	2	500	45.32
		0.72	2.42	5	145	14.11			1.02	8.42	5	505	45.39
		0.72	2.50	5	150	14.49			1.02	8.50	5	510	45.45
		0.72	2.58	5	155	14.88			1.02	8.58	5	515	45.54
		0.72	2.67	5	160	15.04			0.96	8.67	5	520	45.72
	0.72	2.83	10	170	15.59		0.96	8.83	10	530	45.91		
	0.72	3.00	10	180	16.04		0.90	9.00	10	540	46.00		
	0.72	3.17	10	190	16.51		0.90	9.17	10	550	46.00		
	0.72	3.33	10	200	16.93		0.90	9.33	10	560	46.00		
	0.72	3.67	20	220	17.44		0.90	9.67	20	580	46.00		
12:30:00 PM	III	0.72	4.00	20	240	18.48		6:30:00 PM	0.90	10.00	20	600	46.00
		1.20	4.02	1	241	18.92							
		1.14	4.03	1	242	19.13							
		1.08	4.05	1	243	19.32							
		1.08	4.07	1	244	19.49							
		1.08	4.08	1	245	19.68							
		1.08	4.10	1	246	19.87							
		1.08	4.12	1	247	20.04							
		1.08	4.13	1	248	20.24							
		1.08	4.15	1	249	20.39							
		1.08	4.17	1	250	20.54							
		1.08	4.20	2	252	20.87							
		1.08	4.23	2	254	21.16							
		1.08	4.27	2	256	21.45							
		1.08	4.30	2	258	21.72							
		1.08	4.33	2	260	22.00							
		1.08	4.42	5	265	22.75							
		1.08	4.50	5	270	23.21							
		1.08	4.58	5	275	23.75							
		1.08	4.67	5	280	24.26							
	1.08	4.83	10	290	25.15								
	1.08	5.00	10	300	25.92								
	1.08	5.17	10	310	26.62								
	1.08	5.33	10	320	27.28								
	1.08	5.67	20	340	27.48								
2:30:00 AM		1.08	6.00	20	360	27.57							

Ref.: AS2022-597

### RESULT OF ANALYSIS

Organization / company	<b>Safe Water Supply Team</b> Tel.: 011 527211
Type of sample	Well water (Well No. OC3_CMAC) OC2BH1
Sample submitted date	23 June, 2022

N	Parameter	Standard of drinking water	Unit	Testing Result	Testing Method
1	Color	< 5	TCU	< 1.00	ISO 7887
2	Taste	Acceptable	-	Acceptable	ISO 13301
3	Odor	Acceptable	-	Acceptable	ISO 13301
4	Turbidity	< 5	NTU	38.0	ISO 7027
5	Temperature	N/A	°C	28.0*	Thermometer
6	Total dissolved solid (TDS)	< 800	mg/L	685	AOAC 973.40
7	Electric conductivity (EC)	N/A	μS/cm	1140	AOAC 973.40
8	Total suspended solids (TSS)	N/A	mg/L	40.0	ISO 11923
9	Total solid (TS)	N/A	mg/L	741	AOAC 935.29
10	pH	6.50 – 8.50	-	7.19	AOAC 973.41
11	Aluminum (Al)	< 0.2	mg/L	0.03	ISO 12020
12	Fluoride (F)	< 1.5	mg/L	1.10	ISO 17951
13	Antimony (Sb)	< 5	μg/L	Not detected (< 1)	ISO 17378
14	Silver (Ag)	N/A	μg/L	Not detected (< 5)	ISO 14911
15	Magnesium (Mg)	< 85	mg/L	6.75	AOAC 973.52
16	Ammonium (NH <sub>4</sub> )	< 1.5	mg/L	0.02	ISO 7150
17	Total hardness (CaCO <sub>3</sub> )	< 300	mg/L	120	AOAC 973.52
18	Total alkalinity (CaCO <sub>3</sub> )	N/A	mg/L	465	ISO 9963
19	Chloride (Cl)	< 250	mg/L	11.1	ISO 9297
20	Ammonia (NH <sub>3</sub> )	N/A	mg/L	< 0.01	AOAC 960.52
21	Arsenic (As)	< 50	μg/L	Not detected (< 2)	ISO 17378
22	Manganese (Mn)	< 0.1	mg/L	0.005	ISO 6333
23	Nitrate (NO <sub>3</sub> )	< 50	mg/L	0.34	ISO 13395
24	Total chlorine (Cl <sub>2</sub> )	0.2 – 0.5	mg/L	0.03	ISO 7393
25	Residual chlorine (Cl <sub>2</sub> )	N/A	mg/L	0.02	ISO 7393

26	Lead (Pb)	< 10	µg/L	Not detected (< 5)	ISO 8518
27	Barium (Ba)	< 0.7	mg/L	< 0.10	ISO 14911
28	Potassium (K)	N/A	mg/L	2.25	ISO 9964
29	Iron (Fe)	< 0.3	mg/L	0.10	ISO 6332
30	Nickel (Ni)	< 0.02	mg/L	Not detected (< 0.005)	ISO 110447
31	Nitrite (NO <sub>2</sub> )	< 3	mg/L	0.08	ISO 13395
32	Cyanide (CN)	< 0.07	mg/L	Not detected (< 0.01)	ISO 6703
33	Cadmium (Cd)	< 3	µg/L	Not detected (< 2)	ISO 5961
34	Mercury (Hg)	< 1	µg/L	Not detected (< 1)	ISO 12846
35	Chromium (Cr)	< 0.05	mg/L	Not detected (< 0.005)	ISO 9174
36	Selenium (Se)	< 10	µg/L	Not detected (< 5)	ISO 20280
37	Sulfate (SO <sub>4</sub> )	< 250	mg/L	22.5	ISO 22743
38	Copper (Cu)	< 1	mg/L	< 0.01	ISO 17381
39	Zinc (Zn)	< 3	mg/L	0.01	ISO 17381
40	Calcium (Ca)	< 120	mg/L	39.2	AOAC 973.52
41	Sodium (Na)	< 200	mg/L	6.89	ISO 9964
42	Dissolved silicate (SiO <sub>2</sub> )	N/A	mg/L	40.0	ISO 10136
43	Coliform bacteria	0	cfu/100 mL	$1.2 \times 10^3$	ISO 9308
44	Fecal coliform	0	cfu/100 mL	$7.5 \times 10^2$	ISO 9308
45	<i>E. coli</i>	0	cfu/100 mL	None found	ISO 9308

N/A: Not Available

\*: Derived measurement in-situ

Phnom Penh, 27 June, 2022

Head of Laboratory

  
 1235813213455  
 DR DAVIN UY

Ref.: AS2022-786

### RESULT OF ANALYSIS

Organization / company	Safe Water Supply Team Tel.: 011 527211
Type of sample	Well water (Well No. OC2_CMAC) OC2BH2
Sample submitted date	1 August, 2022

N	Parameter	Standard of drinking water	Unit	Testing Result	Testing Method
1	Color	< 5	TCU	< 1.00	ISO 7887
2	Taste	Acceptable	-	Acceptable	ISO 13301
3	Odor	Acceptable	-	Acceptable	ISO 13301
4	Turbidity	< 5	NTU	<b>8.50</b>	ISO 7027
5	Temperature	N/A	°C	28.0*	Thermometer
6	Total dissolved solid (TDS)	< 800	mg/L	668	AOAC 973.40
7	Electric conductivity (EC)	N/A	µS/cm	1110	AOAC 973.40
8	Total suspended solids (TSS)	N/A	mg/L	17.0	ISO 11923
9	Total solid (TS)	N/A	mg/L	750	AOAC 935.29
10	pH	6.50 – 8.50	-	7.91	AOAC 973.41
11	Aluminum (Al)	< 0.2	mg/L	0.02	ISO 12020
12	Fluoride (F)	< 1.5	mg/L	0.80	ISO 17951
13	Antimony (Sb)	< 5	µg/L	Not detected (< 1)	ISO 17378
14	Silver (Ag)	N/A	µg/L	Not detected (< 5)	ISO 14911
15	Magnesium (Mg)	< 85	mg/L	8.94	AOAC 973.52
16	Ammonium (NH <sub>4</sub> )	< 1.5	mg/L	0.05	ISO 7150
17	Total hardness (CaCO <sub>3</sub> )	< 300	mg/L	115	AOAC 973.52
18	Total alkalinity (CaCO <sub>3</sub> )	N/A	mg/L	490	ISO 9963
19	Chloride (Cl)	< 250	mg/L	8.60	ISO 9297
20	Ammonia (NH <sub>3</sub> )	N/A	mg/L	< 0.01	AOAC 960.52
21	Arsenic (As)	< 50	µg/L	Not detected (< 2)	ISO 17378
22	Manganese (Mn)	< 0.1	mg/L	0.004	ISO 6333
23	Nitrate (NO <sub>3</sub> )	< 50	mg/L	0.32	ISO 13395
24	Total chlorine (Cl <sub>2</sub> )	0.2 – 0.5	mg/L	0.02	ISO 7393
25	Residual chlorine (Cl <sub>2</sub> )	N/A	mg/L	0.01	ISO 7393

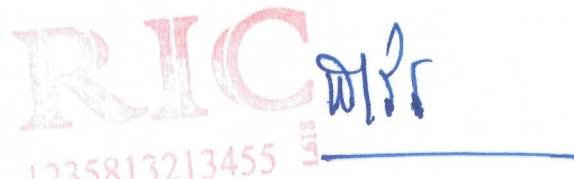
26	Lead (Pb)	< 10	µg/L	Not detected (< 5)	ISO 8518
27	Barium (Ba)	< 0.7	mg/L	< 0.10	ISO 14911
28	Potassium (K)	N/A	mg/L	1.85	ISO 9964
29	Iron (Fe)	< 0.3	mg/L	0.02	ISO 6332
30	Nickel (Ni)	< 0.02	mg/L	Not detected (< 0.005)	ISO 110447
31	Nitrite (NO <sub>2</sub> )	< 3	mg/L	0.03	ISO 13395
32	Cyanide (CN)	< 0.07	mg/L	Not detected (< 0.01)	ISO 6703
33	Cadmium (Cd)	< 3	µg/L	Not detected (< 2)	ISO 5961
34	Mercury (Hg)	< 1	µg/L	Not detected (< 1)	ISO 12846
35	Chromium (Cr)	< 0.05	mg/L	Not detected (< 0.005)	ISO 9174
36	Selenium (Se)	< 10	µg/L	Not detected (< 5)	ISO 20280
37	Sulfate (SO <sub>4</sub> )	< 250	mg/L	12.7	ISO 22743
38	Copper (Cu)	< 1	mg/L	0.02	ISO 17381
39	Zinc (Zn)	< 3	mg/L	0.01	ISO 17381
40	Calcium (Ca)	< 120	mg/L	32.3	AOAC 973.52
41	Sodium (Na)	< 200	mg/L	10.4	ISO 9964
42	Dissolved silicate (SiO <sub>2</sub> )	N/A	mg/L	12.0	ISO 10136
43	Coliform bacteria	0	cfu/100 mL	$2.0 \times 10^2$	ISO 9308
44	Fecal coliform	0	cfu/100 mL	$1.1 \times 10^2$	ISO 9308
45	<i>E. coli</i>	0	cfu/100 mL	None found	ISO 9308

N/A: Not Available

\*: Derived measurement in-situ

Phnom Penh, 5 August, 2022

Head of Laboratory


  
 DR DAVIN UY