

**PREPARATORY SURVEY REPORT  
ON  
THE PROJECT FOR THE DEVELOPMENT  
OF JAPAN-MYANMAR AUNG SAN  
VOCATIONAL TRAINING INSTITUTE  
IN  
THE REPUBLIC OF THE UNION OF MYANMAR**

**MAY 2019**

**JAPAN INTERNATIONAL COOPERATION AGENCY (JICA)**

**MATSUDA CONSULTANTS INTERNATIONAL CO., LTD.**

**YAMASHITA SEKKEI INC.**

**PADECO CO., LTD.**

**INTEM CONSULTING, INC.**

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## **PREFACE**

Japan International Cooperation Agency (JICA) decided to conduct this preparatory survey and has entrusted it to the Consortium of Matsuda Consultants International Co., Ltd., Yamashita Sekkei Inc., PADECO Co., Ltd., and INTEM Consulting, Inc.

The survey team held a series of discussions with officials concerned in the Government of the Republic of the Union of Myanmar 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 enhancement of friendly relations between our two countries.

Finally, I wish to express my sincere appreciation to the officials concerned of the Government of the Republic of the Union of Myanmar for their close cooperation extended to the survey team.

May 2019

Jun Sakuma

Director General

Human Development Department

Japan International Cooperation Agency

## SUMMARY

### 1. Outline of the Country

The Republic of the Union of Myanmar (hereinafter referred to as ‘Myanmar’) is located along the western side of the Indochina Peninsula on the Bay of Bengal and Andaman Sea and is bordered by India and Bangladesh to its west, Thailand and Laos to its east, and China to its north and northeast. Myanmar is an ethnically diverse nation with eight major national ethnic races, and the Burma form more than 60% of the population. The land area is approximately 680,000 square kilometres (about 1.8 times that of Japan), the population is about 51.41 million (as of 2014), and the capital city is Naypyidaw. Myanmar is classified as a tropical or subtropical zone and has a varied temperature and rainfall pattern across the country.

Since 1962, economic distress had increased owing to the socialist regime and closed economic policy, and on December 1987, Myanmar was recognized as the Least Developed Country (LDC) by the United Nations. In 1988, the Myanmar government announced that it would change to a liberal economic system, and the economy began to grow in 1992. However, economic growth remained sluggish because of the Asian currency crisis of 1997 and the global recession in 2008. After the general election of 2010, Ms. Aung San Suu Kyi, who had been under house arrest, was released, and the military regime ended in March 2011. Then, Mr. Thein Sein was inaugurated, and the transition to a civilian government was implemented. At the general election on the 8th of November 2015, the National League for Democracy (NLD), headed by Ms. Aung San Suu Kyi, achieved a great victory, and the NLD government was launched.

Myanmar rapidly implemented democratisation, economic liberalisation, and trade environmental improvement and has maintained a high GDP growth rate of 5.6 to 8.4% after the transition to liberal democracy since 2011. Over these 10 years, the labour population transitioned from the primary sector to the secondary and tertiary sectors. The GDP ratios of the primary, secondary, and tertiary sectors were 23.7%, 36.2%, and 40.1%, respectively, in 2017, while they were 40.3%, 22.7%, and 37.1%, respectively, in 2008. The key economic indicators of Myanmar in 2016/17 are as follows: a nominal GDP of USD 68.3 billion; GDP per capita of USD 1,307; GDP growth rate of 6.3%, and inflation rate of 7.0%.<sup>1</sup> With its abundant natural resources, fertile land, labour power, and geopolitical advantage as a node of ASEAN countries India and China, Myanmar is expected to sustain stable economic growth of around 7% in the medium and long term.

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<sup>1</sup> <https://www.mofa.go.jp/region/asia-paci/myanmar/data.html>

## **2. Background and Outline of the Project**

Although Myanmar has achieved steady economic growth as described above, the significant shortage of skilled workers in industry is clearly indicated in the ‘Industrial Policy, 2016’, varied economic analyses, and interviews in this Survey, which is likely to impede its economic growth in the future. The report, ‘12 points of Economic Policy of Myanmar, July 2016’, highlighted human resource development and employment creation through higher education and Technical and Vocational Education and Training (TVET) as priority policies. The ‘National Education Strategic Plan (NESP), February 2017’ also defines TVET as a priority component and mentions a skilled workforce development policy and expansion of employment opportunities based on access expansion, educational improvement, and strengthening of providers’ management capacity. In Myanmar, TVET institutions such as Government Technical High Schools (GTHSs) and Government Technical Institutes (GTIs) are supposed to play leading roles in educating and training practical skilled workers. However, the business community and society criticize that their quality of education and training is low and that the content and methods don’t reflect the demands of private firms.

To consider solutions to this situation, the Japan International Cooperation Agency (JICA) conducted the ‘Data Collection Survey on the Education Sector in Myanmar’ in 2013 to determine the position and current situation of TVET in the education sector and the ‘Myanmar Data Collection Survey on Technical and Vocational Education and Training’ in 2016 to collect detailed information, analyse the situation, and propose solutions. Subsequently, JICA provided Japanese experts to government agencies and developed a technical cooperation project, referred to as the ‘Project for Quality Improvement in the TVET Program’, along with a grant project to establish a TVET institute.

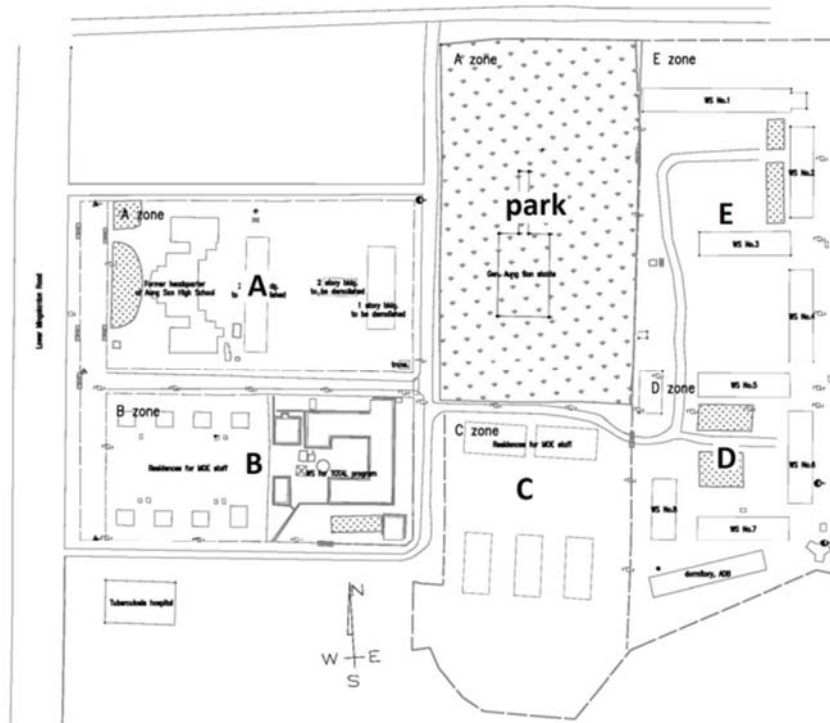
With this background, this Project set its overall goal to contribute to human resource development and employment creation reflecting the demands of the business community and labour market in Myanmar. Its project objective was to establish the Japan-Myanmar Aung San Vocational Training Institute (JMASVTI) and provide quality education and training on the premises of the former Aung-San Technical High School in the suburbs of Yangon, based on an automotive technology course and an electrical engineering course. The grant project targets the construction of facilities and procurement of equipment for JMASVTI.

## **3. Summary of the Survey Results and Content of the Project**

JICA conducted a first survey from 25 March to 7 April, 2018 to confirm the request of the Myanmar side and the conditions for implementation of the Project. After JICA confirmed the survey results and discussed policy for the Project, it conducted a second survey from 20 May to 9 June to discuss the development of the outline design with the

Department of Technical and Vocational Education and Training (DTVET) of the Ministry of Education (MOE).

The Project site is for the former Aung San Government Technical High School which established in 1950s and divided into zones A to E and Bogyoke Aung San Memorial Park. There remain buildings of the school.



**Figure 1 Project Site**

In zone A, a main building of the former technical high school remained and was evaluated for its heritage value. And in western half of zone B, eight families of MOE staff live. The survey team explained that the structure of main building is considered to be decrepit and unsafe, and expected to be demolished. In addition, the eight residences are also demolished in terms of the future productive land use. DTVET agreed to demolish these buildings through discussions with the survey team.

However, members of Yangon Regional Assembly and the community expressed against the demolition of the main building. MOE had discussions with the stakeholders and the both parties agreed to demolish the building with conditions of reconstruction of boundary walls, conservation of emblems decorated on the facade of the building, conservation of a statue of Bogyoke Aung San in the park and entrance design to harmonize a statue of Bogyoke Aung San in front of the main building. As a result of the series of discussions, educational blocks including workshops are decided to be constructed in zone A and western

half of zone B in the Project. Moreover, both sides agreed that student hostels are constructed in zone C and buildings which is located in the construction area.

The park is accessible for the third parties such as citizens and respected as some kind of sanctuary because a statue of Bogyoke Aung San is set on a throne and platform. The park is controlled under MOE, namely the newly established institute, in consultation with the community and stakeholders. Several community events take place customarily in the park, which is not allowed to be developed and used at the institute's own judgement.

Since unexploded ordnance (UXO) has been found during a past construction project funded by a Japanese grant in Insein Township, where the project site is located, UXO detection is necessary to ensure the safety of construction in this Project. Since it is required that the UXO detection is finished by April 2019 to start the construction from the beginning of 2020, DTVET has made effort to allocate the budget of the detection work. However, DTVET failed the budget allocation due to confusion by change of national budgetary system<sup>2</sup> and negotiated in vain with the Ministry of Planning and Finance for supplementary budget finally. Therefore, DTVET requested Japanese side for assistance to UXO detection work.

Upon the request, JICA decided that priority facility components such as workshops is set in zone A for phase 1 and the UXO detection in zone A is conducted by the Japanese budget, in consideration of failure of a budget allocation due to confusion by change of national budgetary system. According to lessons learned in the past projects, the survey team decided that the survey shall be conducted by a Japanese detection company and metal detectors. MOE contracted with the detection company and discussed with related ministries for their consensus for importation and usage of metal detectors. The UXO detection in zone B and C for phase 2, are scheduled to be conducted by the Myanmar's budget by April 2020 and MOE has applied the budget.

In the eastern half of zone B, a welding workshop is running by a French energy giant, TOTAL's cooperation, workshops and a dormitory are running by a project financed by ADB in zone D and the above-mentioned cooperation project is planning workshops in zone E.

Based on the above-mentioned consensus of land use, the survey team developed an outline design of facilities and equipment, estimated the draft budget of the Project, and organized a draft report. JICA conducted the third survey from March 10 to 16 to explain the outline design and implementation conditions to DTVET, as follows.

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<sup>2</sup> While a budget year used to begin in April, it begins in October since FY 2018/19.

## **1) Proposed target component and scale**

This Project aims to build the facilities and procure the equipment to establish a GTI which has an automotive technology course and an electrical engineering course. The number of students in each course is set as 40, while the total number of students of the institute is calculated as 240, as GTI has three grades.

The main facility components are workshops for practical training and classrooms where students learn basic knowledge. The design of the workshop corresponds to the content of the practical training by the above-mentioned technical cooperation project. A computer room, drawing room, science laboratory, library, administration offices, dining hall, and assembly hall are also included in the Project, since they are standard components in other GTIs. Since hostels are also a standard component of GTIs established recently, JMASVTI includes hostels to attract excellent students from the countryside.

Training equipment for the two courses and the equipment necessary for the operation of JMASVTI are planned. The specifications and quantity of training equipment correspond to the practical training offered by the above-mentioned technical cooperation project.

## **2) Outline design of facilities**

A main elongated two-story building (buildings A and B) housing educational functions including electrical workshops and administration functions is set in zones A and B, along the main road in a north-south direction, so that the building attracts public attention and can be accessed easily. An automobile workshop (building C) is set away from buildings A and B, since the workshop produces noise, vibrations, and exhaust gas. It is designed as a single-story building in an east-west direction to maximise the remaining unoccupied land for the future extension plan. For this purpose, underground pipes and conduits shall not be installed in this space. A covered canteen is set between these buildings to link both functions and provides a space for student and staff interaction. In zone C, a quiet area away from the main road which faces the park, two-story hostels (buildings D and E) are established for girls and boys.

Buildings are designed as two-story reinforced concrete (RC) superstructures in principle, and shallow foundations are employed for the structure design, in consideration of the scale and classification of the buildings, local materials, and methods and restrictions caused by UXO detection.

A gable roof with a gentle pitch covered with a steel roofing sheet is employed in principle, along with high side windows on the roof ridge to lighten an upper-floor middle corridor. Sun control by screen blocks is installed on both facades of buildings A, B, D, and E to prevent rain blowing in, burglaries, and a view from outside. Tile-finished floors and



masonry walls are employed in principle, and suspended ceilings are applied for upper-floor and air-conditioned rooms.

Since the estimated power demand for the Project with other activities on the project site exceeds the current transformer's capacity, a new transformer is installed. In this Project, power outlets corresponding to the training equipment layout and LED lighting system, emergency power generators, telephone and LAN network, fire alarm system, and lightning protection system are planned.

Water from the city water network along the main road is supplied by water towers through gravity to toilets, hostel showers, workshops, laboratory sinks, kitchen sinks, and fire hoses. Wastewater is treated in compliance with the discharge guideline of authorities and discharged to the city drainage network. Some rooms are equipped with air-conditioners, while some are equipped with ceiling fans.

Basic furniture such as desks, chairs, shelves, and beds for the hostels are planned. The facility outline is shown in Table 1, and the furniture outline is shown in Table 2.

**Table 1 Description of Buildings**

	Structural system No. of stories	Rooms	Floor area (m <sup>2</sup> )	Construction phase
Building A	Reinforced concrete two-stories	Electrical engineering workshops, classrooms, computer room, drawing room, principal's room, vice principal's room, trainers' room, administration office	2,953	phase 1
Building B	Reinforced concrete two-stories	Classrooms, library, chemical laboratory, meeting rooms, trainers' room, assembly hall	2,020	phase 2
Building C	Reinforced concrete single-story	Automotive technology workshops	1,848	phase 1
Building D	Reinforced concrete two-stories	40-student female hostels, shower room, washing space	678	phase 2
Building E	Reinforced concrete two-stories	40-student male hostels, shower room, washing space	1,146	phase 2
Building F	Steel single-story	240-seat canteen, catering service space	654	phase 2
Building G	Reinforced concrete single-story	Guard house	20	phase 2
Building H	Reinforced concrete single-story	Power receiving room, generator room, outdoor transformer	143	phase 1
Building I	Reinforced concrete	Water tower for zones A and B, water reservoir tank, outdoor firefighting water tank	69	phase 1

Building J	Steel frame	Water tower for zone C, water reservoir tank, outdoor firefighting water tank	79	phase 2
Building K	Reinforced concrete single-story	Blower room	10	phase 2
		Total floor area of phase 1	5,013	
		Total floor area of phase 2	4,607	
Total			9,620	

**Table 2 Furniture Outline**

Rooms	Items
Classrooms, computer room, drawing room	Desks and chairs for students, desks and chairs for teachers, podiums, classroom stages, blackboards
Chemistry laboratory	Laboratory benches, stools, classroom stages, blackboards
Teachers' rooms, administration office	Desks and chairs, filing cabinets
Principal's room, Vice-principal's room	Desks and chairs, sofa set, filing cabinets
Meeting rooms	Meeting desks and chairs
Library	Carrel desks and chairs, book shelves, reception desk and chair
Locker rooms	Lockers
Assembly hall	Stacking chairs
Canteen	Dining desks and chairs
Hostels	Beds, desks, and chairs

### 3) Outline design of equipment

The equipment plan is developed appropriately in consideration of industrial trends and the needs of the day of workers in Myanmar, training curriculum corresponding to the demands, the use frequency of equipment, cost-benefit performance, maintenance and management costs, ease of maintenance, and procurement routes of replacement parts and consumables.

The equipment is delivered to the newly constructed buildings in principle, but some are delivered to renovated workshops for the technical cooperation project in advance. In terms of the equipment plan, its detailed design is coordinated with building services.

The quantity of equipment is planned under the condition that automobile training and science experiments are carried out by 20-student units and electrical training and common subjects by 40-student units. The quantity is set depending on the purpose: a demonstration, group activity, or individual practice. For group activities, a car is intended for four students in automobile service training, practical equipment is for two students in electrical work practice, and demonstration equipment is for 20 students (or two for 40 students).

Since the technical cooperation project procures equipment for their TOT program, the equipment list of this Project is checked against the list of the technical cooperation project to avoid overlap between the two lists. The outline of the equipment is shown in Table 3.

**Table 3 Outline of equipment**

Category	Equipment Name	Purpose of use	Qty
Automotive Engineering	6-cylinder engine model	Disassembly and assembly of gasoline engine	11
	Diesel engine model	Disassembly and assembly of diesel engine	11
	Gasoline engine trainer	Disassembly and assembly and operation test of gasoline engine	2
	Diesel engine trainer	Disassembly and assembly and operation test of diesel engine	5
	Cut-away model, gasoline engine	Observation of internal structure of gasoline engine	1
	Cut-away model, engine with chassis	Observation of operation of the engine, transmission, and powertrain	1
	Cut-away model, automatic transmission	Observation of automatic transmission internal structure	1
	Lighting and electric ignition system trainer	Car lighting system and ignition system training	1
	Car air conditioning system trainer	Car air conditioning system training	1
	On-board diagnostics scan tool type A	Vehicle failure diagnosis	6
	Buried-type car lift	Transmission and drive maintenance	1
	Hot water high pressure washer	Removal of grease and dust adhering to the vehicle	1
	Tire changer	Removal of tire wheel for replacement or repair	1
	Wheel balancer	Balance measurement for tire fitting	1
	Leader bench	Alignment for vehicle frame deformation	1
	Headlight tester	Adjustment for low beams and high beams of headlights	1
	Combination tester	Inspection for side slip, braking, and speed	1
	Exhaust gas tester	Analysis of substances contained in exhaust gas	1
Forklift	Transportation of heavy goods such as parts and materials	1	
Electrical engineering	Programmable logic controller practice set	Electronic control training	40
	Inverter training system		2
	Servo training system		21
General	Projector (Small)	Projection of teaching materials, documents in lectures, and exercises and playing VTR during events in the assembly hall	8
	Projector (Large)		1
	Screen (Large)		1
	Audiovisual equipment	Public address and audio in the assembly hall	1
	Physical experiment equipment set	Physical experiments	1

## **4. Implementation Schedule and Project Cost Estimation**

The period is estimated as 6.5 months for the detailed design work and 3.5 months for the bidding procedures. The construction period is estimated as 17.0 months for phase 1 and 15.5 months for phase 2 in consideration of the scale, location, and work conditions based on climate and local construction customs. In addition, it is required to be scheduled so that foundation work is finished prior to the rainy seasons for both phases; the overlapping period of both phases is estimated as 3.5 months. As a result of the study, the total construction period is estimated as 29.0 months. Procurement of equipment can be completed during this construction period.

The draft project cost borne by the Myanmar side is estimated as 571.8 million MMK (41.6 million JPY).

## **5. Project Evaluation**

### **1) Relevance**

The relevance of the Project is justified as described below:

- The Project will directly benefit the 240 students and 50 to 60 staff of the newly established JMASVTI, while the automotive, power, and construction industries of Myanmar which employ the graduates of JMASVTI will receive indirect benefits from the Project.
- The Project Objective is to establish a TVET institute to provide quality education and training, and its Overall Goal is to contribute to human resource development and employment creation, reflecting the demands of the business community and labour market in Myanmar. Myanmar industry is growing rapidly but facing a serious shortage of skilled workers. A supply of practical skilled workers responding to industry needs is necessary for stable economic growth in the future. This Project contributes directly to solving this social problem, and its urgency is substantially justified.
- The ‘Comprehensive Education Sector Review’ in 2012, ‘12-Point Economic Policy of Myanmar’ in 2016, and ‘National Education Strategic Plan for 2016 to 2020’ in 2017 were issued with policies concerning TVET to boost the economy, industry, and society. This Project is justified by contributing directly to such policies.
- The Government of Japan issued Japan’s Projected Economic Cooperation to Myanmar in April 2012, consisting of the following three columns:
  - I. Assistance for improvement of people’s livelihoods (including assistance for ethnic minorities and people living under the poverty line);

II. Assistance for capacity building and institutional development to sustain economy and society (including assistance for promotion of democratisation);

III. Assistance for development of infrastructure and related systems necessary for sustainable economic development.

This Project corresponds to item II. In addition, it also corresponds to the second sector, ‘enrichment of education widely received by the people and job creation in line with industrial policies’, among nine important sectors of the Japan-Myanmar Cooperation Program issued in 2016. Thus, this Project complies with Japanese policies of assistance to Myanmar, and its appropriateness is justified substantially.

## 2) Effectiveness

The expected quantitative effects of implementation of the Project are as follows.

### Quantitative Effect

**Table 4 Expected Quantative Effect**

Indicator	Course	Baseline (2018)	Target (2025)
Cumulative number of students enrolled in new JMASVTI courses *1	Automotive Technology	0	200
	Electrical Engineering	0	200
Cumulative number of graduates from new JMASVTI courses *2	Automotive Technology	0	78
	Electrical Engineering	0	78

\*1 This quotative effect targets the cumulative number of students who use the facility and equipment by this Project in the courses of automotive technology and electrical engineering, from the first enrollement in December 2019 until the sixth enrollment in December 2024. The number of enrollemnt for the first and second year is set as 40, who will use the facility and equipment since May 2021 and the number of enrollment since the third year is set as 80.

\*2 The cumulative number of graduates in December 2024 is calculated as 160 and is estimated by assumed dropout ratio. The dropout ratio is assumed as one for 40 students who enroll for the first and second year and two for 80 students who enroll since the third year, according to a data of five dropouts for 200 students in Industrial Training Centre Sinda of Ministry of Industry (refer to ‘Myanmar Data Collection Survey on Technical and Vocational Education and Training, 2016, JICA’)

### Qualitative Effect

- The Project will create better training circumstances than other major GTIs in terms of facilities and equipment, and the quality of knowledge and attitudes towards jobs learned by JMASVTI students will be improved.
- Girls will be encouraged to enrol at JMASVTI because the number of toilets and lockers are set based on a girls’ ratio of 40%, which is larger than the current ratio.

As stated above, the Project is justified to be highly relevant and effective.

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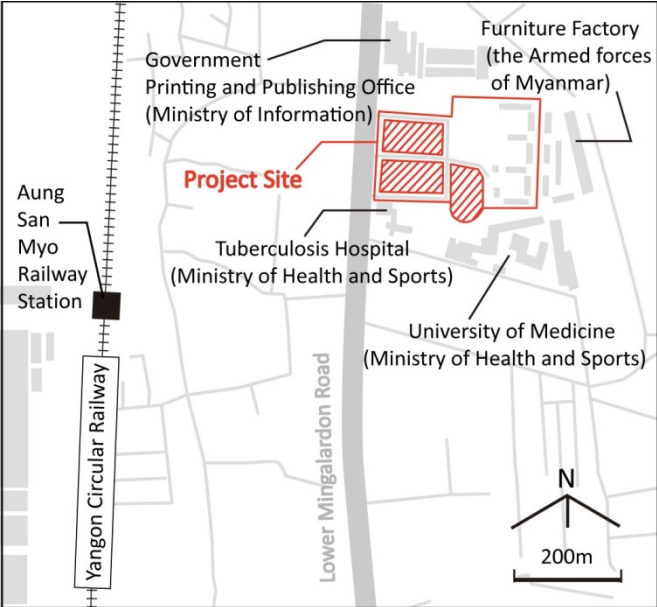
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## ABBREVIATIONS

A/P	Authorization to Pay
ADB	Asia Development Bank
ASEAN	Association of Southeast Asian Nations
AVR	Automatic Voltage Regulator
B/A	Banking Arrangement
CAD	Computer-Aided Design
CATV	Common/Community Antenna Television
CB	Concrete Block
CESR	Comprehensive Education Sector Review
DTVET	Department of Technical and Vocational Education and Training
E/N	Exchange of Notes
EFA	Education for All
G/A	Grant Agreement
GDP	Gross Domestic Product
GIS	Geographical Information System
GIZ	Gesellschaft für Internationale Zusammenarbeit
GL	Ground Level
GTI	Government Technical Institute
ICT	Information and Communication Technology
ILO	International Labour Organization
IP	Internet Protocol
IT	Information Technology
ITC	Industrial Training Centre
JETRO	Japan External Trade Organization
JICA	Japan International Cooperation Agency
JIS	Japan Industrial Standard
JMAVTI	Japan-Myanmar Aung San Vocational Training Institute
KfW	Kreditanstalt für Wiederaufbau
KOICA	Korea International Cooperation Agency
LAN	Local Area Network
LED	Light-Emitting Diode
M/D	Minutes of Discussions
MFSD	Myanmar Fire Service Department
MNQF	Myanmar National Qualification Framework
MOPF	Ministry of Planning and Finance
NAQAC	National Accreditation and Qualification Assurance
NEP	National Electrification Plan
NESP	National Education Strategic Plan
NGO	Non-Governmental Organization
NSS	National Skills Standards
NSSA	National Skills Standards Authority
OECD	Organisation for Economic Co-operation and Development
OJT	On-the-job Training
P/Q	Pre-Qualification

PBX	Private Branch Exchange
PC	Personal Computer
PLC	Programmable Logic Controller
PMR	Project Monitoring Report
PPE	Personal Protective Equipment
PVC	Polyvinyl Chloride
RC	Reinforced Concrete
SDC	Swiss Agency for Development and Cooperation
SDGs	Sustainable Development Goals
SMVTI	Singapore-Myanmar Vocational Training Institute
STC	Skills Training Centre
TOT	Training of Trainers
TPTC	Technical Promotion Training Centre
TVET	Technical and Vocational Education and Training
UXO	Unexploded Ordnance
UNFPA	United Nations Population Fund
VAT	Value-added Tax
YCDC	Yangon City Development Committee
YESC	Yangon Electricity Supply Corporation

## **Chapter 1 Background of the Project**

# Chapter 1 Background of the Project

## 1.1 Background of the Project

Myanmar rapidly implemented democratisation, economic liberalisation, and trade environmental improvement and has maintained a high GDP growth rate of 5.6 to 8.4% after the transition to liberal democracy since 2011. Over these 10 years, the labour population transitioned from the primary sector to the secondary and tertiary sectors. The GDP ratios of the primary, secondary, and tertiary sectors were 23.7%, 36.2%, and 40.1%, respectively, in 2017, while they were 40.3%, 22.7%, and 37.1%, respectively, in 2008. The key economic indicators of Myanmar in 2016/17 are as follows: a nominal GDP of USD 68.3 billion; GDP per capita of USD 1,307; GDP growth rate of 6.3%, and inflation rate of 7.0 %.<sup>3</sup> With its abundant natural resources, fertile land, labour power, and geopolitical advantage as a node of ASEAN countries India and China, Myanmar is expected to sustain stable economic growth of around 7% in the medium and long term.

Although Myanmar has achieved steady economic growth as described above, the significant shortage of skilled workers in industry is clearly indicated in the ‘Industrial Policy, 2016’, varied economic analyses, and interviews in this Survey, which is likely to impede its economic growth in the future. The report, ‘12 points of Economic Policy of Myanmar, July 2016’, highlighted human resource development and employment creation through higher education and Technical and Vocational Education and Training (TVET) as priority policies. The ‘National Education Strategic Plan (NESP), February 2017’ also defines TVET as a priority component and mentions a skilled workforce development policy and expansion of employment opportunities based on access expansion, educational improvement, and strengthening of providers’ management capacity. In Myanmar, TVET institutions such as Government Technical High Schools (GTHSs) and Government Technical Institutes (GTIs) are supposed to play leading roles in educating and training practical skilled workers. However, the business community and society criticize that their quality of education and training is low and that the content and methods don’t reflect the demands of private firms.

To consider solutions to this situation, the Japan International Cooperation Agency (JICA) conducted the ‘Data Collection Survey on the Education Sector in Myanmar’ in 2013 to determine the position and current situation of TVET in the education sector and the ‘Myanmar Data Collection Survey on Technical and Vocational Education and Training’ in 2016 to collect detailed information, analyse the situation, and propose solutions. Subsequently, JICA provided Japanese experts to government agencies and developed a

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<sup>3</sup> <https://www.mofa.go.jp/region/asia-paci/myanmar/data.html>

technical cooperation project, referred to as the ‘Project for Quality Improvement in the TVET Program’, along with a grant project to establish a TVET institute.

## **1.2 Environmental and Social Consideration**

### **(1) Myanmar Regulation of Environmental and Social Considerations**

The Myanmar government enforced the Environmental Conservation Law in March 2012, and the procedures related to the Environmental Impact Assessment (EIA) were approved by the Diet. In December 2015, the Ministry of Environmental Conservation and Forestry (MOECAF) issued a notice on the procedure of the EIA and operates evaluations based on the National Environmental Quality (Emission) Guidelines. Currently the Environment Conservation Department (ECD) of the Ministry of Natural Resources and Environmental Conservation (MONREC) is responsible for the EIA.

This notice prescribes the classification of a report and flowchart of the procedures and penalties. An applicant shall submit basic information such as a plan outline to ECD in advance. The notice follows the International Finance Corporation (IFC) Environment, Health, and Safety (EHS) guidelines.

### **(2) Environmental and social consideration procedures for this Project**

MONREC notified MOE on 27 June, 2018 that an EIA report is not required for this Project, but an Environment Management Plan (EMP) is required for approval of MONREC. In this preparatory survey, the EMP was prepared, and MOE must submit this EMP to MONREC for approval.



## **Chapter 2 Outline Design of Japanese Assistance**

## Chapter 2 Outline Design of Japanese Assistance

### 2.1 Basic Concept of the Project

The Project set its overall goal to contribute to human resource development and employment creation reflecting the demands of the business community and labour market in Myanmar. Its project objective was to establish the Japan-Myanmar Aung San Vocational Training Institute (JMASVTI) and provide quality education and training on the premises of the former Aung-San Technical High School in the suburbs of Yangon, based on an automotive technology course and an electrical engineering course. The grant project targets the construction of facilities and procurement of equipment for JMASVTI.

### 2.2 Outline Design of the Japanese Grant Assistance

#### 2.2.1 Design Policy

This Project aims to build facilities and procure equipment to establish a three-grade GTI which has an automotive technology course and an electrical engineering course. Like other GTIs, JMASVTI has 40-student classes for each course, and the total number of students is calculated as 240. Since JMASVTI is expected to add another two courses to become a four-course GTI in the future, the basic components such as classrooms and sanitary fixtures are planned in consideration of this future expansion.

#### (1) Policy of Project Components

Since the Myanmar side didn't request clear facility components, the Japanese side proposed the facility components of the Project through a survey of situations and usage of other GTI facilities and training institutions by other donors, discussion with the Japanese technical cooperation team, and analysis of the curriculum. As a result of discussion between both sides, the facility components list as shown in the following table.

**Table 2-1 Facility components list**

Section	Component	No. of rooms	Description
Training	Automotive Technology Workshop	-	Workshops are core components of the training institute, and multiple workshops are necessary per subject.
	Electrical Engineering Workshop	-	Workshops are core components of the training institute, and three workshops are necessary for measurement, control, and electrical work practice.
	Classroom	6	Classrooms are also core components of the training institute. The number of rooms corresponds to the number of classes.

	Computer room	1	A computer room is a necessary component for learning CAD and acquiring computer skills essential today.
	Drawing room	1	A drawing room is a necessary component for learning drawing techniques, a basic skill of engineers. In the GTI, drawing is learned in the first year, while CAD is learned after the second year.
	Library	1	A library is a standard component of GTIs and necessary to provide reference books and a space for students to study by themselves.
	Chemical laboratory	1	Chemistry and physics lessons in the 1st grade of GTI and physics experiments can take place in classrooms, but chemical experiments require laboratories because of the usage of dangerous chemical agents.
Non-training	Principal room, Vice-principal room	2	These are necessary independent rooms, as principals have opportunities to welcome guests and hold confidential meetings.
	Administration room	1	This serves as the reception and accounting area of the institutes. The floor area is decided by the number of staff and the archives space.
	Dispensary	1	Since there is the possibility of injury from practical training, first aid is necessary. Medical staff will not be stationed.
	Trainers' rooms	2	A trainers' room is necessary for each department to prepare lessons, organize documents, and take a break.
	Counselling room	1	A counselling room is required separately for placement and advising of students.
	Large meeting room	1	Meeting rooms are necessary for various staff meetings, guest receptions, and small-scale events, etc.
	Small meeting room	2	
Assembly hall	1	An assembly hall where all students can gather is necessary for various events as shown in Table 2-5.	
Canteen	-	A canteen is necessary for lunch for commuting students and staff and breakfast and supper for hostel students.	
Hostel	-	Hostels are becoming standard components of GTIs established recently and are included in the Project to attract excellent students from the countryside.	

## (2) Outline Design of Equipment Scope

The equipment list is developed through discussion with the executing agency and experts of the technical cooperation team. Each item is classified into the following categories based on its priority.

- Category A: Equipment indispensable for practical training;
- Category B: Although it is necessary for practical training, further consideration is necessary;
- Category C: Equipment which can be procured by the Myanmar side or was cancelled during the discussions.

In the analysis in Japan, the validity of the items of equipment was verified based on the survey results of vocational training plans, industrial trends, and labour demand. An item which doesn't meet at least one of the criteria shown below is excluded from the Project:

- i. Consistency with JMASVTI curriculum by the technical cooperation project;
- ii. Relevance to human resources needs in the labour market;
- iii. Consistency between the number of students and requested quantity;
- iv. Consistency with the maintenance and management system and budgetary measures in the current or future situation;
- v. Consistency with the technical level of workforces (excessive high-performance equipment is excluded);
- vi. Whether the Myanmar side can procure consumables, spare parts, and equipment that can be maintained within its budget (avoiding obstacles to sustainability);
- vii. Equipment that doesn't have a short life;
- viii. Equipment necessary for procurement by the grant project because the quantity of equipment procured by the technical cooperation project is insufficient;
- ix. Equipment necessary for facility use and preferable to include in cooperation;
- x. Equipment not specialized for use in the administrative management section.

The quantity of equipment is planned under the condition that automobile training and science experiments are carried out by 20-student units and electrical training and common subjects by 40-student units. The quantity is set depending on the purpose: a demonstration, group activity, or individual practice. For group activities, a car is intended for four students in automobile service training, practical equipment is for two students in electrical work practice, and demonstration equipment is for 20 students (or two for 40 students).

Since the technical cooperation project procures equipment for their TOT program, the equipment list of this Project is checked against the list of the technical cooperation project to avoid overlap between the two lists.

### **(3) Policy on Natural Environmental Conditions**

In Yangon City, where the project site is located, half the year, from May to October, is the rainy season, and the annual rainfall is also large at 2,680 mm. Since the project site is inclined gently with a slope of 1/100, and clay soil has poor water permeability, the project site is likely to be flooded during heavy showers. For this reason, the floor level is set to reduce the risk of flooding, and stormwater drainage is designed. In the construction program, excavation and foundation work is planned to avoid the rainy season.

The average monthly maximum temperature of Yangon exceeds 30 degrees C, which is an extremely hot climate. In terms of facility design, it is first required to reduce absorption of heat from sunlight and heat insulation of the roof and outer skin. Shade from sunlight at

low angles in the morning and evening are considered, from the viewpoint of energy saving. The indoor light environment is designed appropriately for training in indirect light as much as possible. In addition, warm indoor air is exhausted using natural ventilation in rooms without air conditioning.

Cyclones are the most significant natural disasters in Myanmar and cause the most serious damage to people's lives. Nargis in May 2008 brought huge damage to the Ayeyarwady Region and Yangon Region, with over 100,000 estimated deaths. Cyclones land in Myanmar once every several years. In Myanmar, large rivers such as the Ayeyarwady River flow north and south of the country, and much damage caused by flooding is reported in areas close to rivers. The project site is also two km from the Ayeyarwady River, and it has a high risk of flooding.

In addition, the Sagaing fault running north and south of Myanmar is a strike-slip active fault in a lateral direction, and many earthquakes of M7.0 or more have occurred in the past. Yangon is also located in the west, close to the fault, and an M6-class earthquake occurred in January 2018. Based on the risks of these natural disasters, the buildings are designed with appropriate wind load and seismic load.

#### **(4) Policy on Social and Economic Conditions**

Given that Insein Township, where the project site is located, was a battlefield during the Second World War, the independence war against the UK, and the subsequent civil war, there is a possibility that unexploded ordnance (UXO) from bombing is buried in the ground. Even during the construction project by Japanese ODA in the same township, UXO was discovered during the construction period, causing a suspension of the work. In this Project, UXO shall be detected prior to the start of construction to ensure the smooth implementation of the Project. Since it is required that the UXO detection is finished by April 2019 to start the construction from the beginning of 2020, DTVET has made effort to allocate the budget of the detection work, but failed. Therefore priority facility components such as workshops is set in zone A for phase 1 and the UXO detection in zone A has been conducted by the Japanese budget for detailed design. The UXO detection in zone B and C for phase 2, are scheduled to be conducted by the Myanmar's budget by April 2020. The appropriate method of UXO detection is metal detection, but the work requires alternate exploration and excavation because the detectable distance is limited. For this reason, there is a limit to the range of detection, and a shallow foundation is employed in the building design.

To promote girls' enrolment from the viewpoint of gender balance, MOE sets the ratio of boys and girls to 6:4. The ratio of GTI students by sex in Yangon city is roughly 8:2, but the ratio is 9:1 or less for mechanical engineering departments. In this Project, MOE sets a challenging target with the advantage of good training circumstances in an urban area. The number of toilets and lockers are established based on this target ratio, but the number of

boys' toilets, urinals, washbasins, and lockers shall be set with margins considering deviation from the actual situation.

In addition, from the viewpoint of barrier-free facilities for students and staff in wheelchairs, a ramp between the external walkway level and ground floor; an elevator for the two-story buildings A and B; and a wheelchair booth in toilets are designed. In the hostels, toilet and shower booths for wheelchairs are planned, along with bedroom furniture arrangements for wheelchair-using students.

#### **(5) Policy on Construction and Procurement Conditions**

To control rapid development in Yangon, the Yangon City Development Committee (YCDC) enforces building permit approval. Although the project site is outside the urban area of Yangon, this Project requires a building permit. In the review of building permits, YCDC refers not only to the Myanmar National Building Code (MNBC 2016), which entered into force in October 2018, but also items which are not mentioned in MNBC. Thus, an applicant must have a preparatory meeting with YCDC prior to application. In addition, an applicant is required to obtain approval of the plan by the fire department in advance.

In Yangon City, the biggest city in Myanmar, it is not difficult to secure human resources such as skilled workers and engineers or to procure tools, equipment, and materials for construction work.

#### **(6) Policy concerning Utilization of Local Construction Companies and Consultants**

Two thousand companies have joined the Myanmar Construction Entrepreneurs Association (MCEA), which was established in 1996. Especially in Yangon, the largest city in Myanmar, big projects such as redevelopment around central Yangon station are proceeding; the construction market is booming, and there are abundant numbers of construction companies of a high technical level. However, since the contractors list in Myanmar's registration system is not disclosed, when choosing a subcontractor, it is necessary to judge its capacity individually based on experience in business and number of engineers and skilled workers, temporary materials, and machinery.

Since there are many local consultants providing various technical services, the Project will be implemented in cooperation with them.

#### **(7) Policy on Operation and Maintenance**

The policy is to reduce utility costs, heat insulation, sun-shading, ridge ventilation, and ceiling fans so that an appropriate indoor environment can be maintained without using air conditioning even in hot climate conditions. LED lighting is mainly employed to reduce the charge and replacement costs of bulbs. In addition, wastewater treatment plants in compliance with YCDC's requirement are employed, and a lower-maintenance product shall be selected.

As a technical cooperation project is in operation, basic maintenance and repair methods of equipment will be taught. For this reason, initial instruction will be conducted to avoid an unnecessary cost burden caused by false operation of the equipment by trainers and mistakes in orders of parts and consumables. Basic maintenance and repair of assumed minor troubles shall be included in initial instruction to help trainers understand.

#### **(8) Policy on Grade Setting of Facilities and Equipment**

This Project, in collaboration with the technical cooperation project, aims to convey Japan's technical capabilities and manufacturing spirit to the Myanmar people and establish an ideal TVET institute. The grade of facilities shall be appropriate for this purpose.

The grade for the equipment specifications is set in consideration of frequency of use, durability, availability, maintenance and management costs of local agents, and competitiveness in bidding.

#### **(9) Policies on Construction and Procurement Methods and Construction Period**

The technical cooperation project will start practical training in temporary workshops on the premises so that this Project is completed as scheduled. Thus, the Project is required to be implemented in a timely manner, and it is necessary to formulate a realistic schedule considering risk factors and the list of issues, deadlines, and expenses to be assumed by the Myanmar and Japanese sides. It is also important to monitor issues of both parties during the bidding period.

In principle, the construction methods and materials are procured locally, and a reinforced concrete (RC) structure is employed, because steel frame construction has few advantages over RC. Secondary members such as roof trusses and inner walls are made using a dry construction method that is light weight for the soil conditions and time-saving in the rainy season.

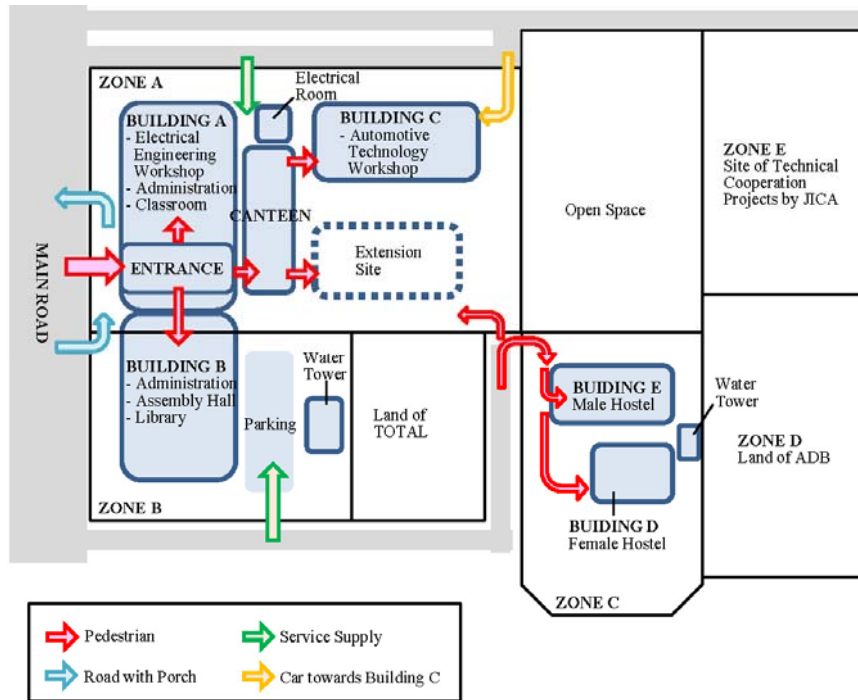
### **2.2.2 Basic Plan**

#### **(1) Block Plan and Facility Structure**

##### **■ Block Plan**

A main elongated two-story building (buildings A and B) housing educational functions including electrical workshops and administration functions is set in zones A and B, along the main road in a north-south direction, so that the building attracts public attention and can be accessed easily. An automobile workshop (building C) is set away from buildings A and B, since the workshop produces noise, vibrations, and exhaust gas. It is designed as a single-story building in an east-west direction to maximise the remaining unoccupied land for the

future extension plan. For this purpose, underground pipes and conduits shall not be installed in this space. A covered canteen is set between these buildings to link both functions and be positioned as a space for student and staff interaction. In zone C, a quiet area away from the main road which faces the park, two-story hostels (buildings D and E) are established for girls and boys. Services such as water supply, power supply, wastewater treatment, and garbage collection are located facing pathways to provide easy access for maintenance and supervision.



**Figure 2-1 Block plan and flow**

■ **Flow Plan**

The main approach for students, staff, and guests to the entrance of building A is from the main road. Each building in zone A is connected by a covered corridor for rainy days. Students can gain easy access from zone A and via the southern road of zone B. The service approach to the canteen and the flow of cars for the automotive technology workshop is from the northern road of zone A.

Zones A and B form one block, united by the existing pathway between the two zones. The other pathways remain to enable access by service cars. Most parking lots are located between the main building and main road, while some are located behind the building in zone B.



## (2) Building Plan

### ■ Buildings A and B

Currently, eight families of MOE staff occupy zone B, and their relocation, demolition of their residences and UXO detection will be completed by April 2020. Afterward, the construction of phase 2 will start. To reduce the risk of suspension of construction, the main building is divided into two buildings in zones A and B. Essential components for training activities such as electrical engineering workshops, classrooms, a computer room, a drawing room, and trainers' rooms are housed in building A. Relatively low priority components such as an assembly hall, library, and meeting rooms are housed in building B. An elevator is installed in building B from the viewpoint of universal design.

The buildings are two-story or single-story based on soil bearing capacity, foundation and structure style, and a middle corridor plan employed to save on floor area.

**Table 2-2 Rooms in building A**

Room	QTY	Area per room (m <sup>2</sup> )	Remark
Classrooms	4	344	Accommodate 40 students and 2.15 m <sup>2</sup> per student (floor area 86 m <sup>2</sup> /room), equipped with students' desks, chairs, teacher's platform and desk
Computer Room	1	127	Accommodates 40 students for computer practice; equipped with students' desks, chairs, teacher's platform and desk, and a raised floor for flexible wiring of power and LAN
Drawing Room	1	127	Accommodates 40 students for drawing practice, equipped with drawing desks, teacher's platform and desk
Principal's Office	1	44	Office space and reception space with a toilet
Vice-principal's Office	1	44	
Meeting Room	1	43	Accommodates 12 seats for visitors and academic meetings
Administration Office	1	42	For administration staff and reception, facing the entrance hall
Control Room	1	10	MDF, PBX, router, and fire alarm are installed.
Printing Room	1	22	For printing and binding teaching materials and examination papers
Trainers' Rooms	2	88	For trainers' preparation work Accommodate 10 people, equipped with desks, chairs, filing cabinets, and shelves
First Aid Room	1	14	Provides first aid for wounds and a bed for the indisposed, without medical personnel
Locker Rooms (Electrical Engineering)	2	46	Accommodate 120 students, equipped with lockers
Control Workshop	1	126	Accommodates 40 students, equipped with power outlets

Measurement Workshop	1	127	Accommodates 40 students, equipped with power outlets
Electrical Workshop	1	255	Accommodates 40 students, equipped with 20 work boards 2 m or more apart, with a path width of 1.5 m between them
Common	-	1496	Entrance hall, corridor, toilets, storage, staircase room, etc.
Total Floor Area	2,953 m <sup>2</sup>		

**Table 2-3 Rooms in building B**

Room	QTY	Area per room (m <sup>2</sup> )	Remark
Classrooms	2	172	Refer to the same item in Table 2-3
Chemical Laboratory	1	101	Accommodates 20 students for experiment practice. Four groups of five students practice around experiment benches. Equipped with benches for students and a teacher with chemically resistant tabletops, water supplies, and drainage.
Library	1	127	Accommodates 40 seats which can house the total number of students in a class
Large Meeting Room	1	124	Accommodates 48 seats which can house all staff of the institute, used for visitors and management meetings
Meeting Room	2	84	For visitors and small meetings
Trainers' Room	1	85	Refer to the same item in Table 2-3
Assembly Hall	1	400	Accommodates about 270 seats, used for multi-purpose events as shown in Table 2-4
Counselling Room	1	27	For placement and advising of students
Common	-	900	Entrance hall, corridor, toilets, storage, staircase room, etc.
Total Floor Area	2,020 m <sup>2</sup>		

### ■ Relevance of Assembly Hall

From the perspective of the activities and purpose of GTI, the purpose and frequency of use of the assembly hall is considered, as shown in the following table.

**Table 2-4 Assembly hall purpose and frequency of use**

	Activity	Target	No. of people	Frequency of use	Use period	Remarks
1	Enrollment	First graders	250	Once a year	Each December	80 new students (future maximum) + staff (30) + students' parents/relatives (150)
2	Graduation ceremony	graduating third graders	250	Once a year	Each January to February	
3	All school meetings	all students and staff	270	Monthly	Monthly	Internal by the principal, etc.
				Monthly	To be Advised	At the time of visits by VIP officials such as MOE officials

4	Seminars	all students and staff	270	Once a year	To be advised	Special seminar by professional external lecturers (e.g. invitations of external lecturers such as police officials)
5	Special lectures by external instructors	all students and staff	270	Multiple times per semester	To be advised	More specialized lectures that contribute to advancement, employment, and improvement ability
6	Appreciation society for teachers	all students and staff	270	Once a year	2nd semester latter half	Teachers appreciation parties by students (general events)
7	Donation events	all students and staff	270	Once a year	Warso: Each June to July Ka Htane: Each October	Invitation of monks from neighboring temples, etc. (general events)
8	Sports events (indoor competitions)	all students and staff	270	A few times a year	To be Advised	Indoor sports
9	Physical exercise and sports	all students and staff	270	At any time	Each June to October	Especially used as a daily exercise space for students during the rainy season
10	Conducting speech contests, debates, etc.	eligible person	Eligible person	A few times a year	To be advised	Used for speech competitions and debate competitions in Burmese/English
11	Venue for various written examinations	eligible person	Eligible person	A few times a year	To be advised	Used as a venue for various exams and events for students and staff (e.g. for enhancement as a hub: essay contests, etc.)
			Eligible person	Once a year	To be advised	Used as a venue for various practical tests and events conducted by JMASVTI and MOE (for enhancement as a hub)
12	Exhibition of JMASVTI introduction materials	external stakeholders	Eligible person	At any time	At any time	Exhibition on JMASVTI's history and activities (for enhancement as a hub)

## ■ Building C

Building C is a single-story, independent automotive technology workshop. Column spacing is set to 4.8 m to allow cars to enter directly from the covered corridor which is used as a car wash. In addition, the ceiling height is set to allow the operation of a car lift.

**Table 2-5 Rooms in building C**

Room	QTY	Area per room (m <sup>2</sup> )	Remark
Equipment	1	232	Accommodates five groups of four students, equipped with five cars for practice
Car Lift	1	228	Accommodates five groups of four students, equipped with five cars for practice
General Workshop	1	193	Accommodates 40 students, equipped with hand-wash basins
Inspection Lane	1	88	For one car to move back and forth for inspection
Welding Booth	1	62	Equipped with five electric welding booths and five gas welding booths
Painting Booth	1	48	For practical training on car body painting
Frame Repair	1	46	For practical training on adjustment of vehicle body frame, provides space for one car
Sheet Metal Work	1	78	For practical training on sheet metal works
Locker Room	2	40	Accommodate 120 students, equipped with lockers
Common	-	833	Foyer, corridor, toilets, storage, pilotis, etc.
Total Floor Area	1,848 m <sup>2</sup>		

■ **Student Hostels (Buildings D, E)**

An 80-boy hostel and 40-girl hostel are designed as two-story buildings in zone C. Both have a middle corridor plan with side bedrooms. Each bedroom has two beds, desks, and chairs.

**Table 2-6 Rooms in building D**

Room	QTY	Area per room (m <sup>2</sup> )	Remark
Bedroom	20	230	2-bed room, equipped with desks and chairs The floor area is 11.3 m <sup>2</sup> per room and 5.65 m <sup>2</sup> per person.
Lounge	1	10	For family and guests to visit the students
Common	-	427	Corridor, toilets, shower room, storage, balcony, staircase, etc.
Total Floor Area	678 m <sup>2</sup>		

**Table 2-7 Rooms in building E**

Room	QTY	Area per room (m <sup>2</sup> )	Remark
Bedroom	40	461	Refer to Table 2-6
Lounge	1	10	
Common	-	664	

Total Floor Area	1,146 m <sup>2</sup>
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■ **Building F (Canteen)**

A covered canteen is developed between buildings A and C, accommodating 240 seats which corresponds to the number of students. The canteen serves not only lunch but also breakfast and supper for hostel students. Meals are provided by external catering companies.

**Table 2-8 Rooms in building F**

Room	QTY	Area per room (m <sup>2</sup> )	Remark
Canteen	1	591	A 240-seat canteen
Catering Service Space	1	63	Equipped with power supply, drainage, and worktables
Total Floor Area	654 m <sup>2</sup>		

■ **Other affiliated facilities**

**Table 2-9 Affiliated facilities**

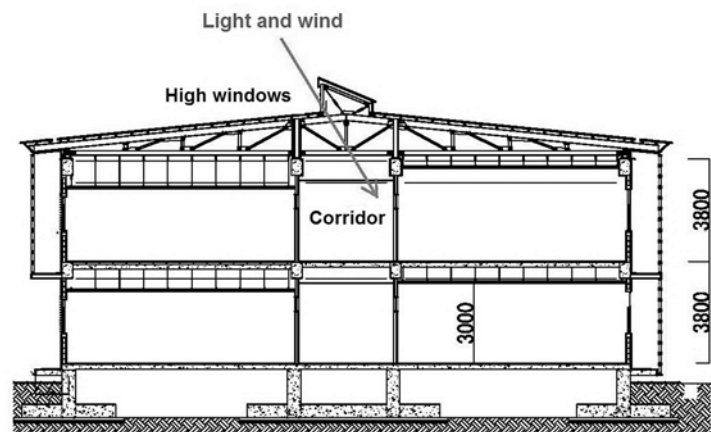
Room	Area per room(m <sup>2</sup> )	Remark
Water Tower	148	A pump room, reservoir tank, and elevated tank space
Electrical Room	143	For switchboards and a generator
Guard Room	20	A guardman to be stationed to monitor the entries to the institute
Blower Room	10	For a wastewater treatment plant in zone C
Total Floor Area	321 m <sup>2</sup>	

**(3) Section Design**

The ground floor level is set at least 30 cm higher than the surrounding ground level to minimize the effect of flooding on the building.

■ **Buildings A and B**

The floor height is about 3.8 m, and the ceiling height is about 3 m. Daylight and ventilation flows through high windows on the monitor roof to the middle corridor. The ceiling panel of the corridor is permeable to allow



airflow and daylight. Suspended ceilings are applied for upper-floor rooms and air-conditioned rooms.

#### ■ **Building C**

The height of the bottom of a roof truss is 4.4 m in consideration of the car lift's movement. A ceiling is not installed, and daylight and ventilation flow into the workshop through high side windows on the roof.

#### ■ **Building D and E**

The floor height is about 3.6 m, and the ceiling height is about 3 m. Daylight and ventilation flow through high windows on the ridge of the roof to the middle corridor. The ceiling panel of the corridor is permeable to allow airflow and daylight. Ground-floor rooms have no ceilings.

### **(4) Structural plan**

#### ■ **Ground conditions of project site and foundation structural plan**

Based on the results of the geological survey, a long-term allowable soil bearing capacity of 10 ton/m<sup>2</sup> or more is confirmed in zones A and B at a depth of 1.5 m to 2.0 m from the present ground level. For zone C, the long-term allowable soil bearing capacity is five ton/m<sup>2</sup>. Considering the UXO survey, a shallow foundation is employed, and the bottom level of the foundation is shallower than 1.5 m's depth from the present ground level, in principle.

#### ■ **Structural System**

Strip foundations or mat foundations are employed depending on the soil bearing conditions and the building's weight. A rigid frame system of reinforced concrete and steel frame roofing are employed.

#### ■ **Structural Load**

The design load is set as below, considering the local weather and geographical and building applications.

□ **Dead load:** Dead loads are calculated by each building material's weight.

□ **Live load:** According to Japanese Building Standards, the live loads of floor slabs for the main rooms are as follows.

- General classroom: 2,300 N/m<sup>2</sup>
- Electrical engineering workshops: 4,900 N/m<sup>2</sup>
- Automotive technology workshop: 7,900 N/m<sup>2</sup>
- Trainers' room, office, corridor, etc.: 2,900 N/m<sup>2</sup>
- Library/Archive, etc.: 7,800 N/m<sup>2</sup>
- Assembly hall: 3,500 N/m<sup>2</sup>

□ **Seismic load:** According to the seismic map of Myanmar, the project site is in the 'Strong zone', and its ground motion acceleration is 0.21 G to 0.30 G. The calculation is based on the seismic area coefficient Z=0.8.

□ **Wind Load (Yangon):** Since Yangon has a record wind speed of 100 mph (3second gust), the standard wind speed V<sub>o</sub> of the Japanese Building Standards is set between 30 m/s and 34 m/s, and the ground surface roughness is classified as III for the calculation.

■ **Materials**

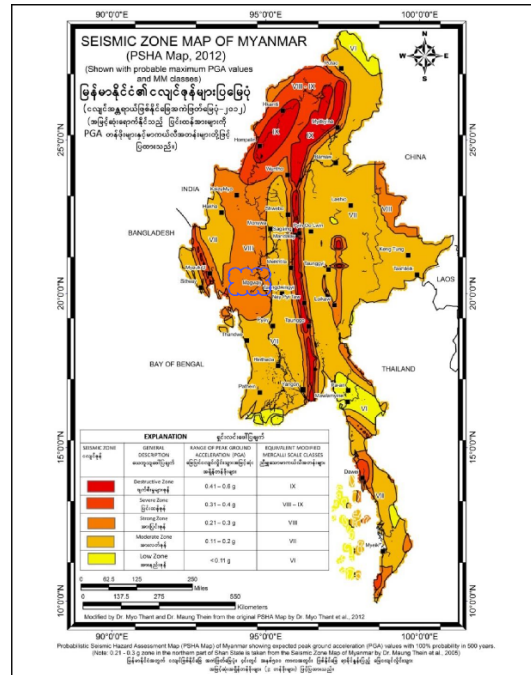
Structural material shall be calculated as the following strength conforming to JIS.

- Concrete: Design Standard Strength F<sub>c</sub>=24N/mm<sup>2</sup>
- Reinforcement: Yield strength 345N/mm<sup>2</sup> and 295 N/mm<sup>2</sup>
- Steel frame: Yield strength 325 N/mm<sup>2</sup> and 235 N/mm<sup>2</sup>

(5) **Electrical Design**

■ **Power Receiving and Transformer**

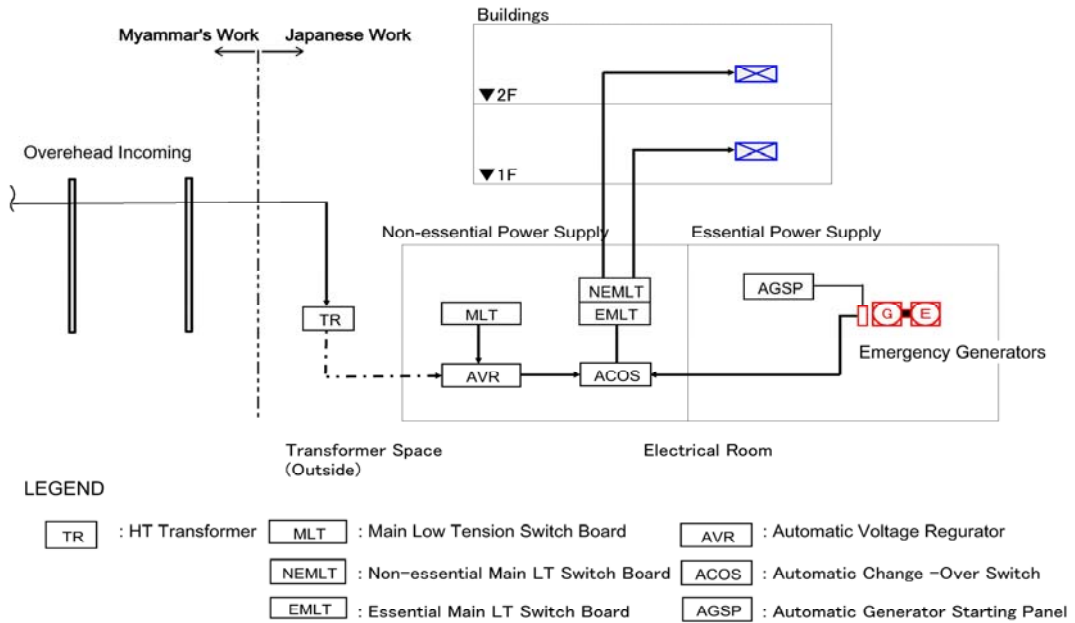
A current 315-kVA transformer receives 6.6kV and supplies 230/400 V electricity to the training activities by TOTAL, ADB, JICA, and residents in zones A to E. The current power usage is assumed to be around 200 kVA, and there is not enough surplus capacity for this Project. Since Yangon city authorities plan to shift the power supply system to 11kV or more, the current transformer needs to be replaced with one corresponding to 11kV, at any rate, in



**Figure 2-2 Seismic map of Myanmar**  
Source: MyoThnat, etc. 2012

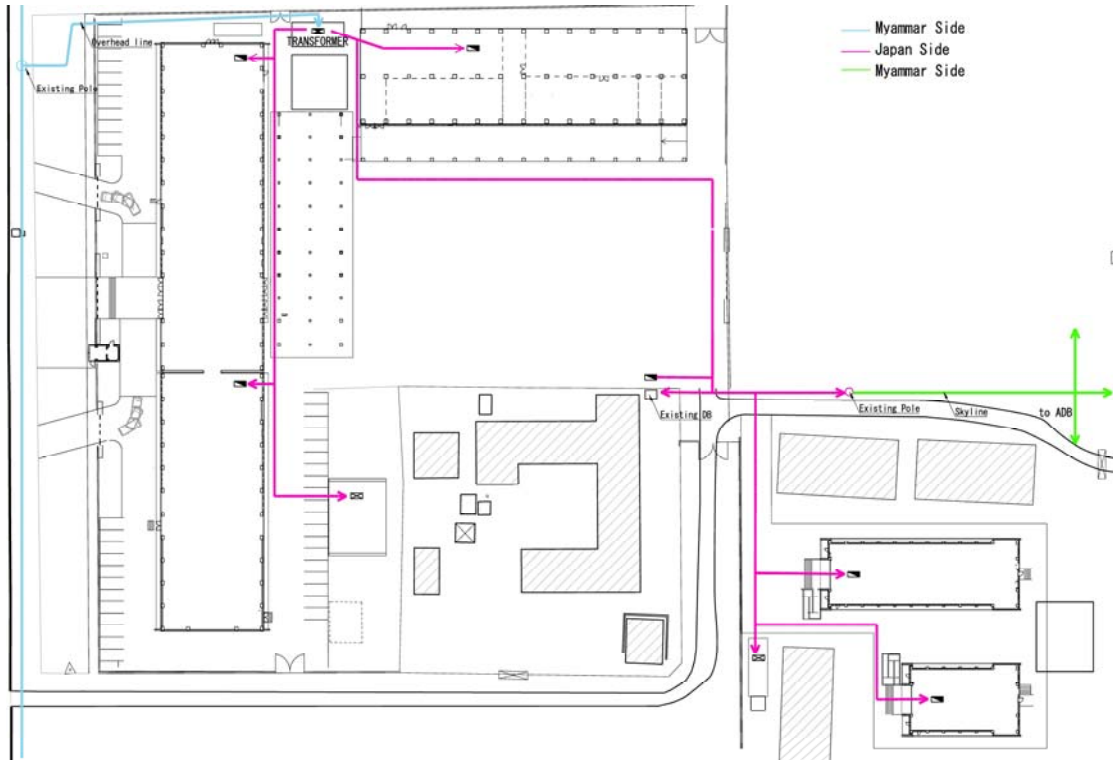
the future. For this reason, a 1,000-kVA transformer is newly installed for the total power demand to cover future expansion and other training institute on the same premises.

A distribution line from the Danyingon substation is laid on the Lower Mingalardon road. In this outline design, the distribution voltage is assumed as 33kV and the Myanmar side will extend an aerial cable to the planned transformer from the north side of the project site. The specifications of the transformer are decided based on YESC standards.



**Figure 2-3 Power distribution diagram**





**Figure 2-4 Power supply system master layout**

■ **Emergency power supply**

Since frequent power failures occur in the neighbourhood, an emergency power supply is required for the essential facilities shown in the following table. In consideration of the educational environment, the generator shall be selected from among low-exhaust gas and noise products.

**Table 2-10 Generator power supply load**

Supply target facilities and equipment	Load
Principal's office, vice principal's office, administration office, trainers' rooms, meeting rooms, computer rooms, workshops	Some of the outlets
Building services	Pumps, fire alarm equipment

■ **Power Distribution System**

The power is supplied from a main distribution board (MDB) in an electrical room (building H) to each distribution board by underground cables. A branch outdoor board is set up in the middle of the route from MDB to zone C, which supplies power to the hostels, ADB workshops, and hostels in zone D, JICA workshops in zone E, and TOTAL welding workshops.

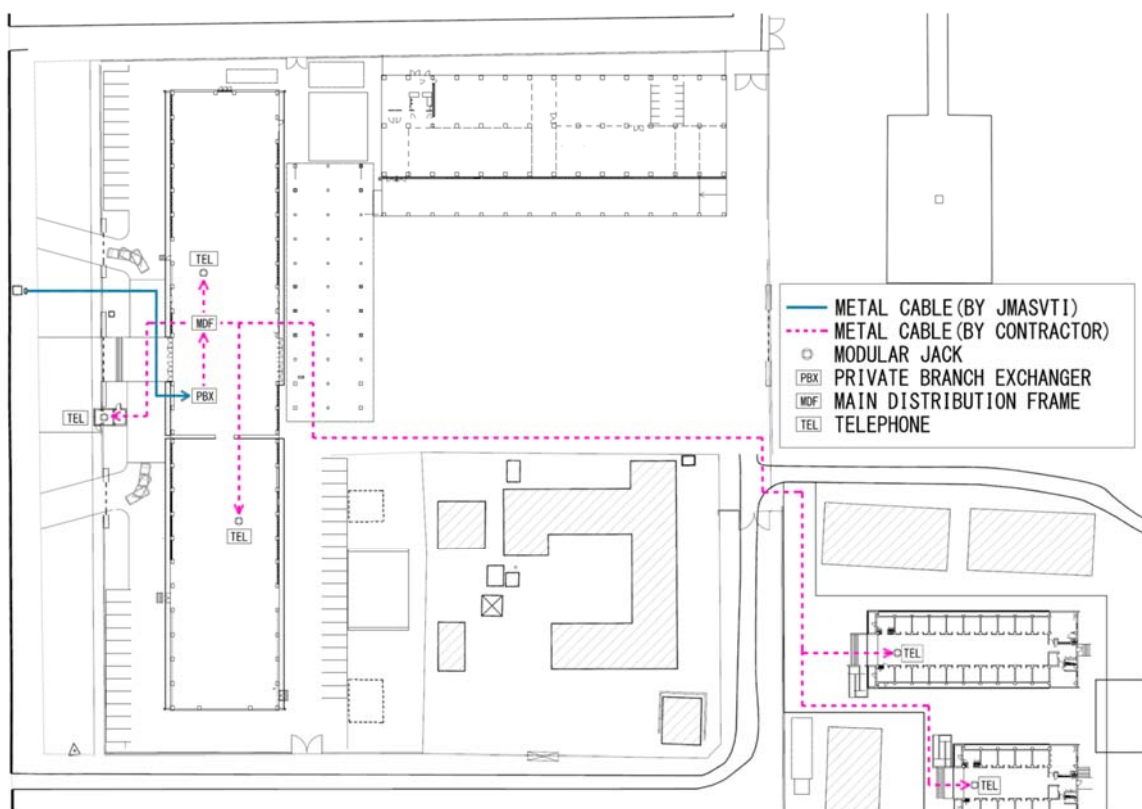
## ■ Lighting and Power Outlets

Sub distribution boards are installed by appropriate area of each building and floor with optimized circuit configuration. Wiring is designed for lighting fixtures and power outlets.

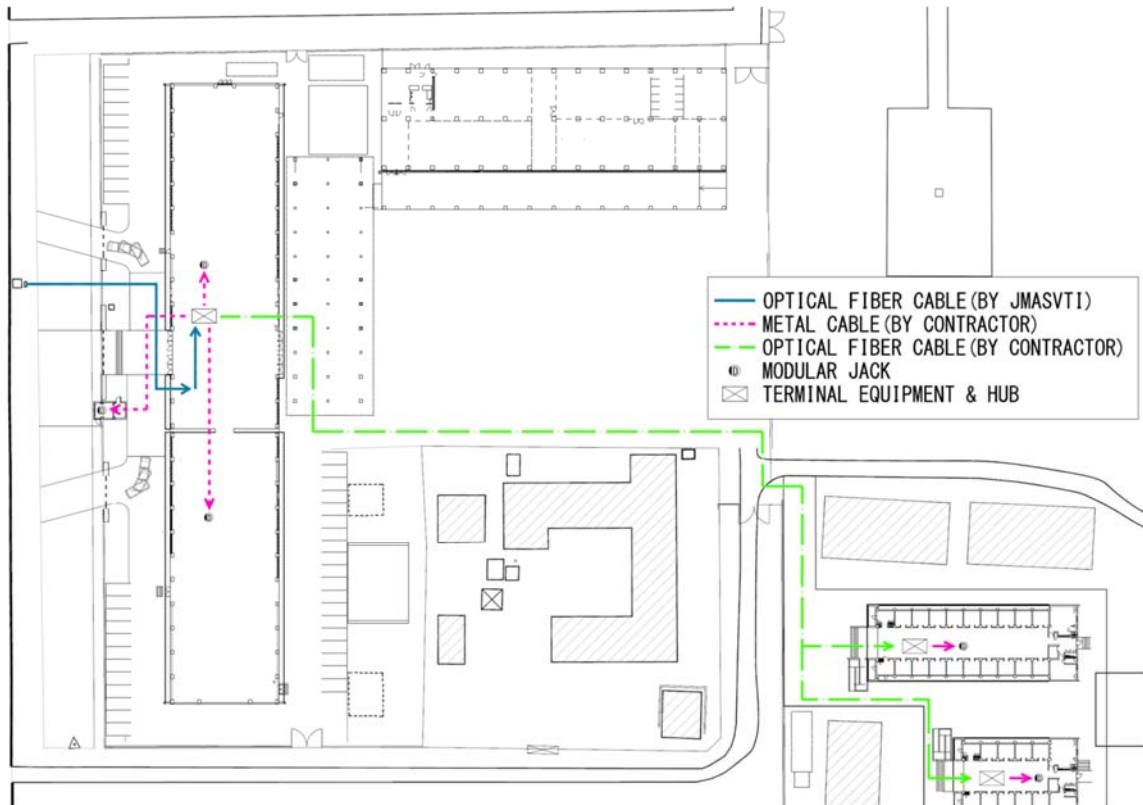
- General lighting: Lighting fixtures are selected among LED light products in principle and laid with reference to JIS illuminance standards.
- Emergency lighting: Wall-mounted emergency lighting with built-in batteries are installed in each room.
- Power outlet: Appropriate types of power outlets are designed in consideration of training equipment layout and activities, and each outlet is equipped with ground electrodes.

## ■ Telephone and LAN System

Telephone and LAN outlets are installed for rooms in consideration of the activities and requirements of the institute. While the Myanmar side establishes a telephone and LAN network by contracting with each provider at his own cost, the Japanese side is building a room for a communication system with server racks and a power supply and is installing the main wiring in buildings and underground optical cables between buildings.



**Figure 2-5 Telephone system master layout**



**Figure 2-6 LAN system master layout**

■ **Fire Alarm System**

Manual emergency bells are installed for training departments, and smoke detectors, automatic bells, and manual bells are installed for hostels according to the guidance of the Myanmar Fire Service Department (MFSD).

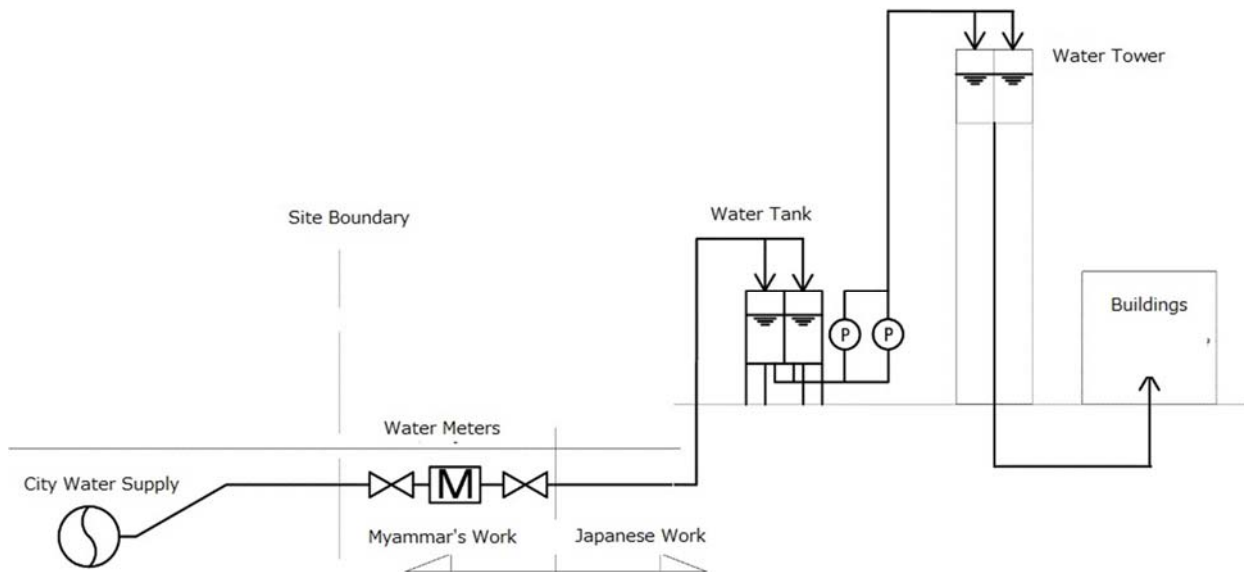
■ **Lightning Protection System**

In reference to JIS and guidance by the Tokyo Fire Department, a lightning protection system is installed for buildings A and B, where computers are used, and building C, where students practice using oil.

**(6) Mechanical Utilities**

■ **Water Supply System**

Water is drawn from the city water network along the main road, and the water is supplied from elevated water tanks installed in zones B and C. For each water tower, two water pump units are operated alternately.



**Figure 2-7 Diagram of water supply**

**Table 2-11 Water demand for zones A, B**

Targets	Estimated number of persons	Unit water supply [L/person/day]	Daily water volume [L/day]
Staff	30	45.5	1,365
Students	120	45.5	5,460
Visitors	20	13.7	274
Hostel students	120	45.5	5,460
<b>Total</b>	<b>290</b>		<b>12,559[L/day]=2,760[gal/d]</b>

\*1 1[gal] ≒ 4.55[L]

\*2 The unit water supply volume is based on MNBC.

**Table 2-12 Water demand for zone C**

Targets	Estimated number of persons	Unit water supply [L/person/day]	Daily water volume [L/day]
Staff	2	136.5	273
hostel students	120	91.0	10,920
<b>Total</b>	<b>122</b>		<b>11,193[L/day]=2,460[gal/d]</b>

\*1 1[gal] ≒ 4.55[L]

\*2 The unit water supply volume is based on MNBC.

The capacity of water tanks is calculated as 1.5 days' demand of the institute, and two tanks are connected in consideration of maintenance. The capacity of elevated tanks is calculated as the maximum hourly demand, and a two-tank system is employed in consideration of maintenance. Since bottled water and water servers are widely used for drinking water, a water purification system is not applied in this Project.

**Table 2-13 Calculation of tank capacities**

zones A and B	Reservoir tank	$12,559L \times 1.5 < 20(10 + 10) m^3$
	Elevated tank	$12,559L/day \div 6 h/day \times 2 < 5(2.5 + 2.5) m^3$
zone C	Reservoir tank	$11,193L \times 1.5 < 18(9 + 9) m^3$
	Elevated tank	$11,193L/day \div 8h/day \times 2 < 3(1.5 + 1.5) m^3$

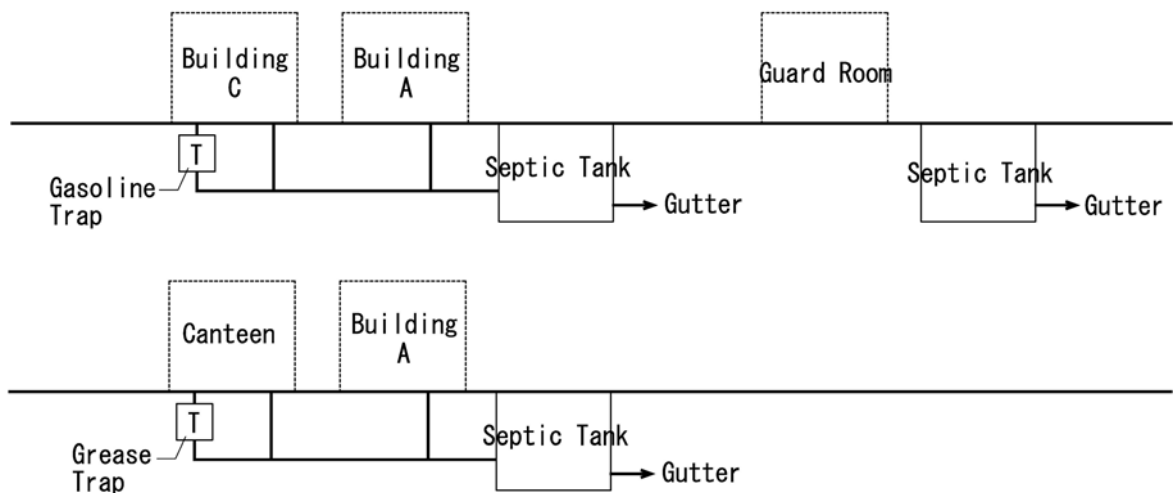
■ **Wastewater Treatment System**

Since there is no public wastewater treatment system, YCDC and MNBC require a wastewater treatment plant which meets the standards as shown in the following table. The treated water is discharged to the gutter along the main road.

**Table 2-14 Discharge water quality standard**

Item	Reference value [mg/L]
Biochemical Oxygen Demand (BOD)	Less than 20
Chemical oxygen demand (COD)	Less than 60
Suspended solids (SS)	Less than 30

A gasoline trap is installed in the wastewater system of the automotive technology workshop. The capacity of a trap is calculated on the condition that one car is washed every day and that the trap is cleaned every 90 days. In addition, a grease trap is installed in the drainage of the canteen.



**Figure 2-8 Water Drain Diagram**

- **Hot water System: No installation of a hot water supply system in this Project**

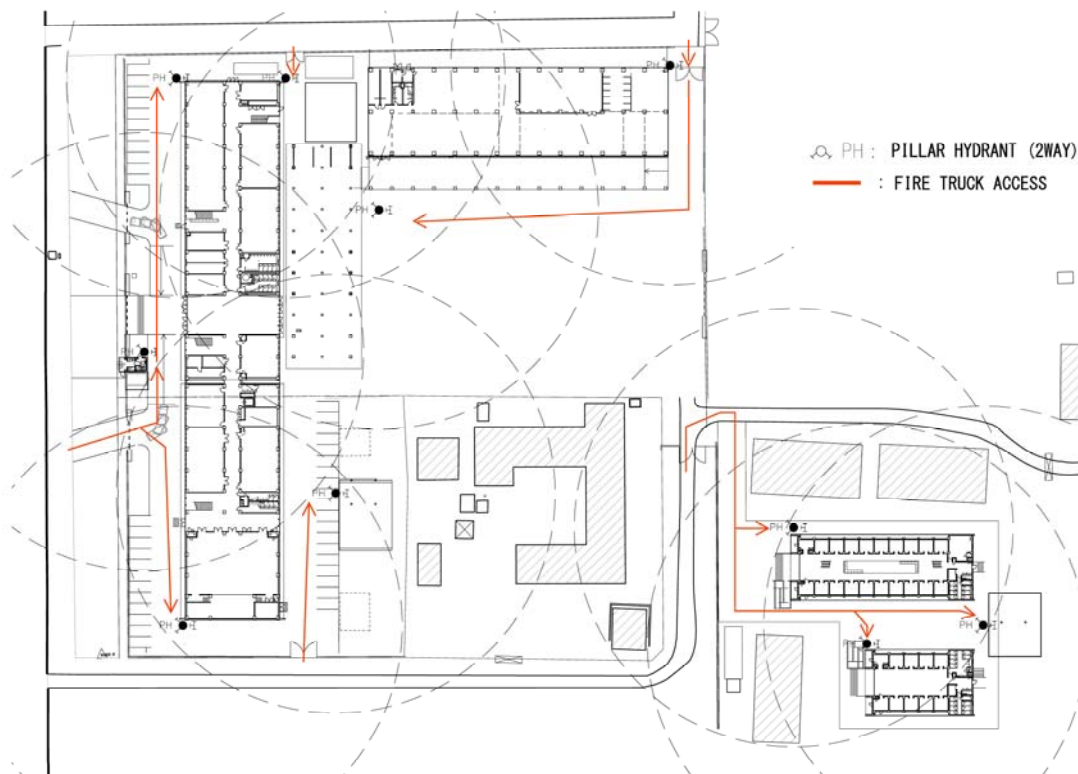
- **Sanitary Fixtures**

Western-style toilet bowls and hand sprays are employed for toilets. The number of sanitary fixtures is calculated with reference to the Japanese design guideline<sup>4</sup> with service level 1 ‘excellent’ and added surplus in case of failure.

- **Fuel Gas Supply: No installation of a fuel gas supply system in this Project**

- **Fire Alarm equipment**

According to the guidance of MFSD, indoor fire hydrants, outdoor fire hydrants, and fire extinguishers are installed. The fire extinguishing pump is a combination of electric motor and fuel engine. For fire extinguisher tanks, two 15,000-gal (68.3 m<sup>3</sup>) panel-type tanks, totalling 30,000 gal (136.4 m<sup>3</sup>), are installed.



**Figure 2-9 Outdoors fire hydrant master layout**

- **Air Conditioning, Mechanical Ventilation**

In consideration of maintenance and renewal, a package of air conditioning equipment (a set of outdoor and indoor equipment) is employed for administrative offices and other rooms,

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<sup>4</sup> Japan Air Conditioning and Hygiene Engineering Association

as shown in the following table. The ceiling cassette-type is for general use, the floor type is for a high ceiling assembly hall, and the wall-mounted type is for narrow control rooms. Ceiling fans are installed for rooms without air conditioners.

An exhaust mechanical ventilation fan is installed in rooms with moisture, odours, and chemical substances, as shown in the following table.

**Table 2-15 Rooms equipped with air conditioners, etc.**

Type of equipment	Rooms
Air Conditioner	Principal's office, vice principal's office, administration office, meeting room, electrical engineering workshop, library, assembly hall, first aid room, control room
Ceiling fan	Classroom, chemical laboratory, locker room, automotive technology workshop, hostel bedrooms, washing room, guard room
Mechanical ventilation	Printing room, first aid room, storage of chemical laboratory, assembly hall, automotive technology workshop, washing room, shower room, toilets

■ **Kitchen equipment: No installation of kitchen equipment in this Project**

**(7) Construction Materials**

Structural and finishing material shall be procured locally in principle to reduce construction costs and period and to ensure easy maintenance. Material shall be selected corresponding to the local climate among durable and easy maintenance options to reduce maintenance costs. The major exterior finishes by building elements are as shown in the following table.

**Table 2-16 Major materials of exterior finishes**

Element	Materials	Advantages
Pitched roof	Corrugated steel roofing sheet	Common locally, workability
Flat roof	Bituminous membrane waterproofing, waterproofing mortar	Durability, waterproofing
Exterior Wall	Concrete blocks, mortar, and paint	Common locally, workability
	Corrugated steel sheet	Light-weight, workability
	Screen concrete blocks	Common locally, workability
External Fitting	Aluminium windows	Durability, waterproofing
	Steel doors	Burglar protection, durability

The major interior finishes by room and building elements are as shown in the following table.

**Table 2-17 Major materials of interior finishes**

	Room	Materials	Advantages
Floor	General room, corridor	Tile	Hygiene, durability, aesthetic appearance
	Computer room	Raised floor	Flexibility of wiring and modification
	Workshop	Resinous coating	Hygiene, durability
	Assembly hall	Wooden flooring	Sound- and shock-absorbing, aesthetic appearance
	Entrance hall	Stone	Aesthetic appearance
	Service	Dust-proof coating	Maintenance
Wall	General room, corridor, workshop	Mortar on concrete blocks or gypsum board + paint	Hygiene, durability, aesthetic appearance
	WC, shower, washing room	Tile	Hygiene, durability
	Assembly hall, lounge	Wooden material	Sound absorbing, Aesthetic Appearance
	Entrance hall	Large-sized fibre cement board	Aesthetic appearance
Ceiling	General	Grid system ceiling	Sound-absorbing, workability
	Upper-floor corridor, entrance hall	Expanded metal	Permeability, durability
	Upper-floor bedrooms, canteen	Gypsum board + paint	Aesthetic appearance
	Ground-floor corridor, service	Paint on concrete	Durability

### 2.2.3 Basic Plan of Equipment

The procured equipment by this Project is used for practical training and lectures of JMASVTI, installed in the facilities by this Project and adjusted with water and power services in the detailed design.

#### (1) Equipment Plan

Since this Project aims to establish a GTI that provides quality education and practical training and to contribute to human resource development and employment creation reflecting the demands of the Myanmar business community and labour market, the Project design shall be consistent with Myanmar's industrial trends, human resources needs, and practical curriculum. The equipment plan is developed through an analysis of the trainer's skill level, frequency of use, cost effectiveness, cost and ease of maintenance, and procurement of consumables and spare parts.



The equipment list is finalized by priority, selection criteria, and the following check points:

- Are the necessity and relevance of this item justified?
- Is re-examination of this item required based on frequency of use and cost effectiveness?
- Can other equipment act as substitutes for this item?
- Can the Myanmar side allocate a budget to procure this item in the future?
- Can competition be secured during the bidding?

In addition, the specifications of the equipment are examined and set from the viewpoint of the JMASVTI trainer's skill level, frequency of use, cost effectiveness, maintenance management, and competitiveness of bidding.

The calculation of the quantity of equipment and equipment specifications are decided according to the following policies. The quantity of equipment is decided by reducing the amount of equipment procured by the technical cooperation project.

#### ■ **Automotive Technology**

Practical training is conducted with 20 students, divided into units of four, in principle, and the number of students in the unit can be changed based on the contents of the exercise. The numbers of tools and measuring instruments used individually match the number of students. Several items of equipment and cut models form a set to be used by multiple groups together. The equipment specifications shall be for general automobile maintenance and don't require excessive high performance.

#### ■ **Electrical Engineering**

Practical training is conducted with 40 students, and the students exercise in pairs or individually. The number of measuring instruments required for all grades simultaneously are decided as required. The equipment specifications shall allow for the basic practical training of electrical engineering such as electronic measurement technology, sequence control, electrical equipment, and maintenance techniques.

#### ■ **Other Equipment**

Computer and drafting exercises are done individually. The number of laboratory benches and equipment are planned for 20 students. In addition, projectors, screens, printers, and whiteboards are planned based on the scale of the rooms and the frequency of use to allow for the operation of the institute.

Based on the above considerations, the following equipment list was formulated.

**Table 2-18 Equipment list**

No.	Equipment Name	Qty	unit
1	Valve spring compressor	11	sets
2	Automobile mechanics tool sets	30	sets
3	Socket wrench set	11	sets
4	Gear bearing puller	2	sets
5	Oil filter wrench	2	sets
6	Waste oil drainer	2	sets
7	ATF changer	1	set
8	Cord reel (mobile)	9	sets
9	Cord reel (fixed)	5	sets
10	Hand grease gun	4	sets
11	Rigid rack two-leg set	4	sets
12	Quick battery charger	2	sets
13	Booster cable	2	sets
14	Strut spring compressor	5	sets
15	Cross wrench set	10	sets
16	Impact wrench	6	sets
17	Scraper set	5	sets
18	Snap ring pliers	10	sets
19	Sliding hammer	5	sets
20	Slide hammer-type puller	5	sets
21	Clutch alignment tool set	2	sets
22	Universal joint bearing press with adapter	1	set
23	Tie-rod end and ball joint puller	5	sets
24	Front-bearing hub tool	1	set
25	Hold-down spring and return spring tool	5	sets
26	Caliper piston removal tool	5	sets
27	Service creeper, steel frame type	5	sets
28	Garage lamp	5	sets
29	Solder-less terminal kit	11	sets
30	Soldering irons	20	sets
31	Tire repair set, tubeless tire	20	sets
32	Tube repair set	1	set
33	Cleaning pan	20	sets
34	Air blow gun	10	sets
35	Air hose	5	sets
36	Paint spray with container	5	sets
37	Double-action sander	5	sets
38	Polisher	5	sets
39	Protective tool for painting	21	sets
40	Arc welding machine	5	sets
41	Gas welding and cutting machine	5	sets
42	Fume collector	5	sets
43	Helmet for welding	5	sets
44	2-cylinder engine model	11	sets
45	4-cylinder engine model	9	sets
46	6-cylinder engine model	11	sets
47	Diesel engine model	11	sets
48	Gasoline engine trainer	2	sets
49	Diesel engine trainer	5	sets
50	Transmission with clutch	9	sets
51	Automatic transmission	9	sets

52	Differential	9	sets
53	Drive shaft	9	sets
54	Rear axle	11	sets
55	Starter motor	18	sets
56	Alternator	18	sets
57	Cut-away model, planetary gear	1	set
58	Cut-away model, torque convertor	1	set
59	Cut-away model, turbo charger	1	set
60	Cut-away model, gasoline engine	1	set
61	Cut-away model, engine with chassis	1	set
62	Cut-away model, automatic transmission	1	set
63	Cut-away model, CVT	1	set
64	Lighting and electric ignition system trainer	1	set
65	Car air conditioning system trainer	1	set
66	Car air conditioning maintenance tool	1	set
67	On-board diagnostics scan tool type A	6	sets
68	Vise	5	sets
69	Hacksaw	20	sets
70	Taps and dies set	4	sets
71	Hydraulic press	1	set
72	Bench grinder	2	sets
73	Drilling machine	2	sets
74	Electric drill	4	sets
75	Iron work file set	19	sets
76	Flat chisel	19	sets
77	Center punch	19	sets
78	Magnetic base	20	sets
79	Surface plate	10	sets
80	V-blocks	19	sets
81	Vernier caliper	10	sets
82	Digital vernier caliper	6	sets
83	Micrometer set	20	sets
84	Dial gauge	20	sets
85	Cylinder gauge	20	sets
86	Thickness gauge	20	sets
87	Straight-edge tool	10	sets
88	Compression gauge	5	sets
89	Engine oil pressure gauge	5	sets
90	Timing light	5	sets
91	Digital tester	20	sets
92	Analog tester	20	sets
93	Battery coolant tester	5	sets
94	Tire gauge	5	sets
95	Radiator cap tester	5	sets
96	Preset-type torque wrench set	6	sets
97	Digital-type torque wrench	6	sets
98	A-plate-type torque wrench set	10	sets
99	Turning radius gauge	5	sets
100	Camber, caster, kingpin gauge	5	sets
101	DC power supply	6	sets
102	Thermometer	100	sets
103	Buried-type car lift	6	sets
104	Garage jack	4	sets
105	Work bench (small)	9	sets

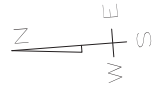
106	Work bench (large)	2	sets
107	Engine lifter	2	sets
108	Air hose reel	10	sets
109	Hot water high-pressure washer	1	set
110	Tire changer	1	set
111	Wheel balancer	1	set
112	Wheel weight set	10	sets
113	Balance weight tool	1	set
114	Leader bench	1	set
115	Headlight tester	1	set
116	Combination tester	1	set
117	Exhaust gas tester	1	set
118	Opacimeter	1	set
119	Steel cabinet	4	sets
120	Parts rack	10	sets
121	Sink	1	set
122	Forklift	1	set
123	Analog tester	21	sets
124	Digital tester	21	sets
125	DC power supply	10	sets
126	Multimeter	10	sets
127	Oscilloscope	10	sets
128	Function generator	10	sets
129	IC trainer set	10	sets
130	Bread board	21	sets
131	Crocodile clip	12	sets
132	Watt meter	4	sets
133	Voltage transformer for measurement	7	sets
134	Megger insulation tester	4	sets
135	Test-phase shifter	4	sets
136	Current transformer	4	sets
137	Voltage transformer	4	sets
138	Electroscope	10	sets
139	Clamp meter	4	sets
140	Miniature plier	10	sets
141	Miniature cutter	10	sets
142	Motor (1-phase)	19	sets
143	Motor (3-phase)	4	sets
144	Motor (3-phase) for Star-delta	4	sets
145	Magnetic contactor	21	sets
146	AUX contactor unit	21	sets
147	Thermal relay	21	sets
148	Earth leakage breaker	21	sets
149	Laptop computer	40	sets
150	Printer	2	sets
151	Programmable logic controller practice set	40	sets
152	Push-button	21	sets
153	Lamp (red)	21	sets
154	Tool set	40	sets
155	Trainer for sensors	21	sets
156	Trainer for pneumatic system	42	sets
157	Inverter training system	2	sets
158	Servo training system	2	sets
159	Electric drill	6	sets

160	Projector	3	sets
161	Screen	3	sets
162	Wiring practice board	21	sets
163	Pipe vendor	21	sets
164	Torch burner	21	sets
165	Line wire	11	sets
166	Electric works tool set	42	sets
167	Spirit level	42	sets
168	Earth tester	6	sets
169	Pipe thread cutter	21	sets
170	Pipe vise	21	sets
171	Electric works practice kit	4	sets
172	Work table	40	sets
173	Stool	120	sets
174	Chair	6	sets
175	Desktop PC	42	sets
176	Server	1	set
177	Switching hub	2	sets
178	Black and white printer	2	sets
179	Color printer	1	set
180	Large format printer	1	set
181	Projector (Small)	9	sets
182	Screen (Small)	9	sets
183	Projector (Large)	1	set
184	Screen (Large)	1	set
185	Audiovisual equipment	1	set
186	Drawing table	42	sets
187	First aid kit	1	set
188	Chemical experiment equipment set	1	set
189	Chemical experiment table for teacher	1	set
190	Chemical experiment table for student	4	sets
191	Physical experiment equipment set	1	set
192	Movable whiteboard	9	sets
193	Kitchen equipment	1	set

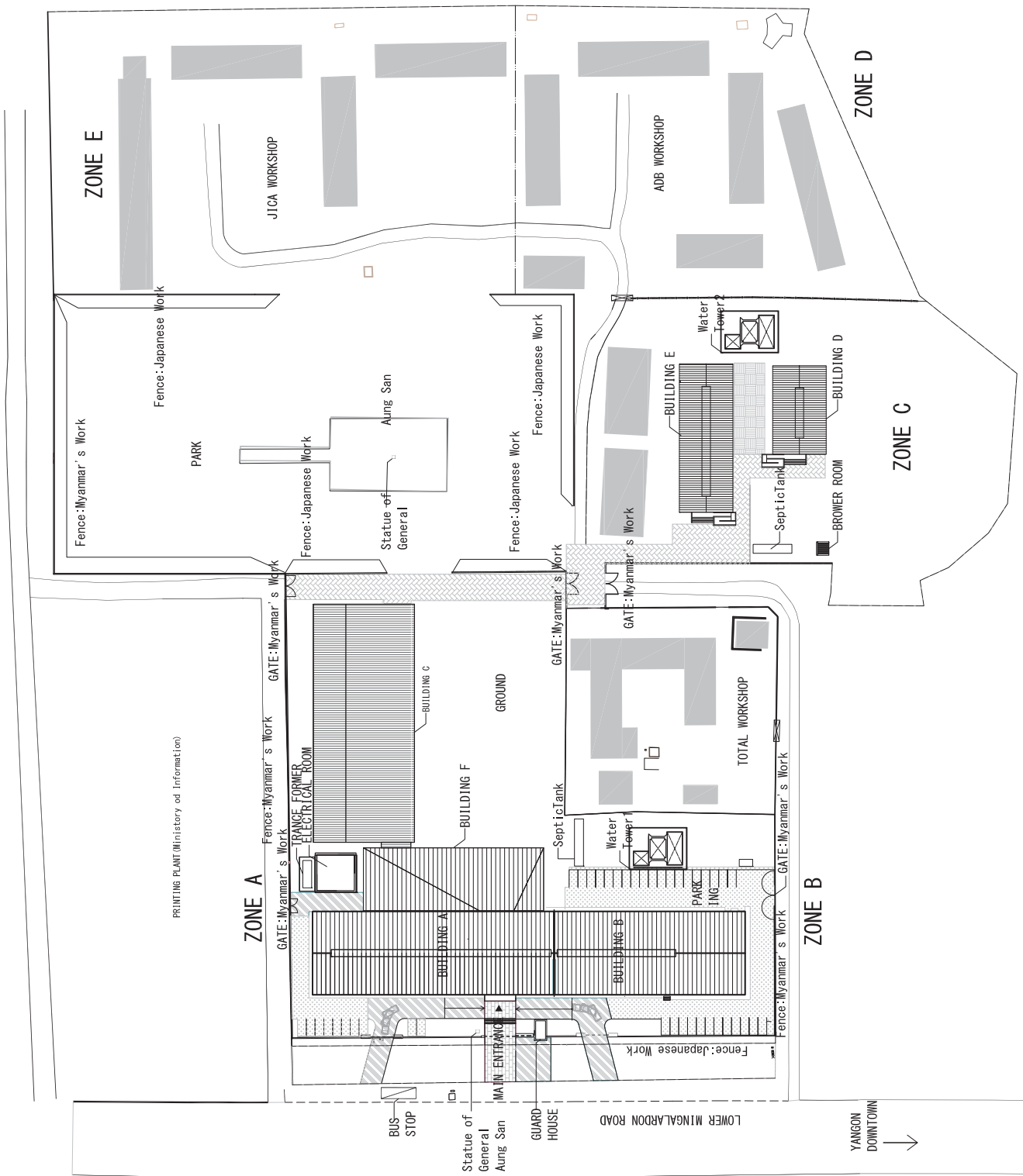
## 2.2.4 Outline Design Drawings

**Table 2-19 Description of buildings**

	Structural system No. of stories	Rooms	Total floor area (m <sup>2</sup> )	Construction period
Building A	Reinforced concrete two-stories	Electrical engineering workshops, classrooms, computer room, drawing room, principal's room, vice principal's room, trainers' room, administration office	2,953	phase 1
Building B	Reinforced concrete two-stories	Classrooms, library, chemical laboratory, meeting rooms, trainers' room, assembly hall	2,020	phase 2
Building C	Reinforced concrete single-story	Automotive technology workshops	1,848	phase 1
Building D	Reinforced concrete two-stories	40-student female hostel, shower room, washing space	678	phase 2
Building E	Reinforced concrete two-stories	40-student male hostel, shower room, washing space	1,146	phase 2
Building F	Steel single-story	240-seat canteen, catering service space	654	phase 2
Building G	Reinforced concrete single-story	Guard house	20	phase 2
Building H	Reinforced concrete single-story	Power-receiving room, generator room, outdoor transformer	143	phase 1
Building I	Reinforced concrete	Water tower for zones A and B, water reservoir tank, outdoor firefighting water tank	69	phase 1
Building J	Steel frame	Water tower for zone C, water reservoir tank, outdoor firefighting water tank	79	phase 2
Building K	Reinforced concrete single-story	Blower room	10	phase 2
		Total floor area of phase 1	5,013	
		Total floor area of phase 2	4,607	
<b>Total</b>			<b>9,620</b>	



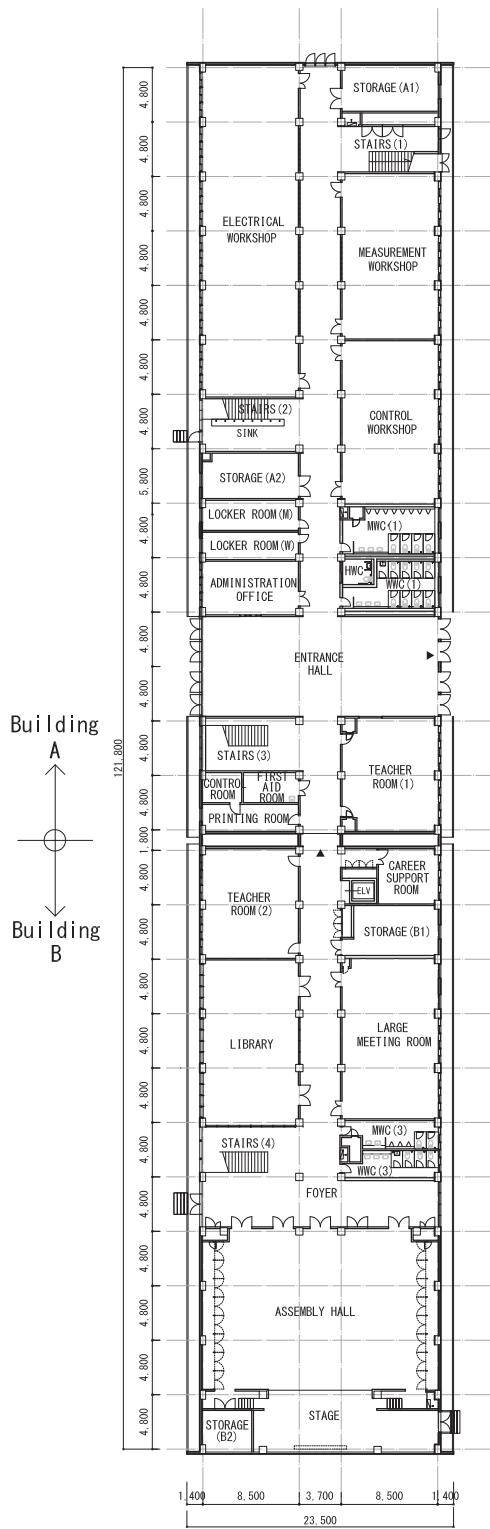
Furniture  
Factory  
(Ministry  
of Defence)



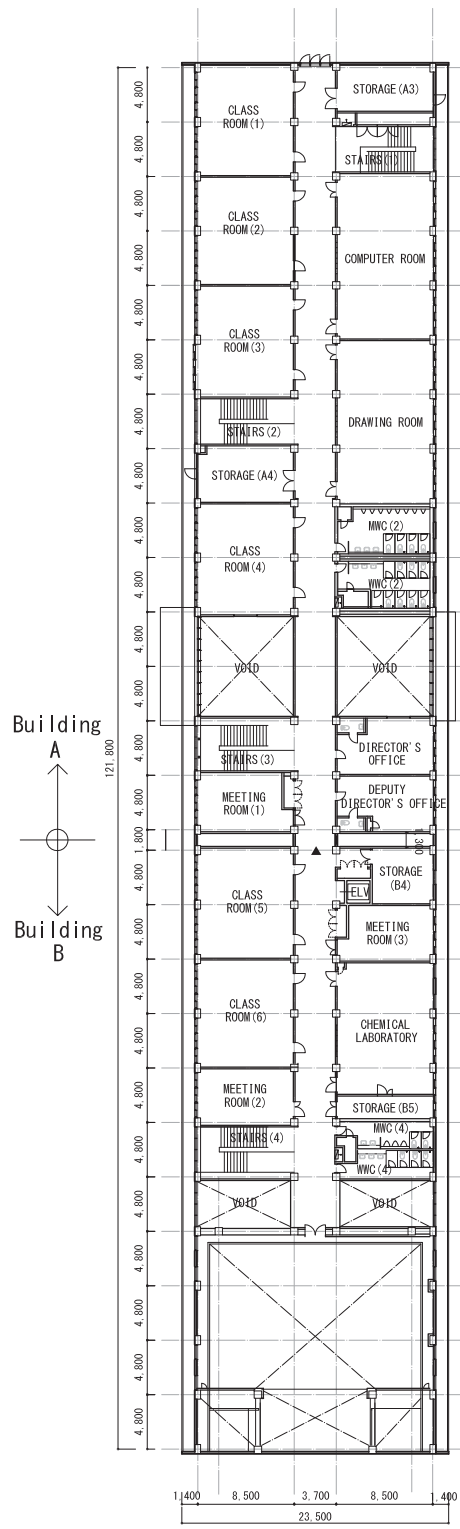
PRINTING PLANT (Ministry of Information)

LOWER MINGALARDON ROAD  
YANGON DOWNTOWN

SITE PLAN 1/1500



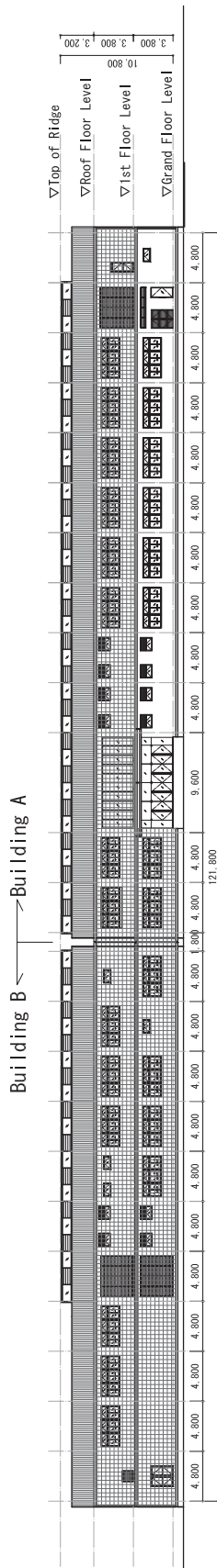
Ground Floor Plan



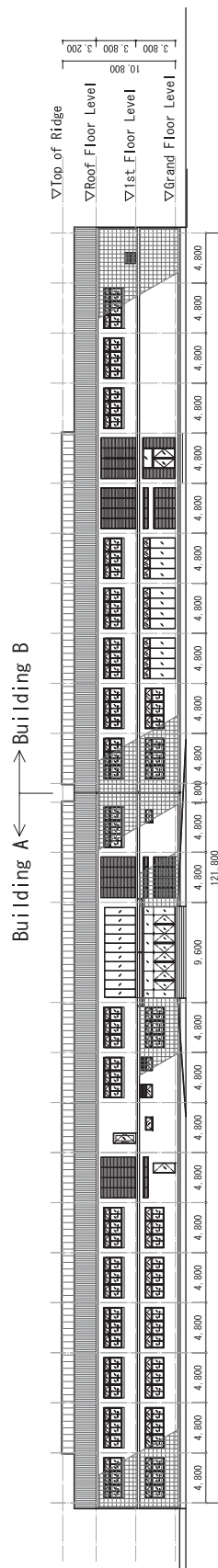
1st Floor Plan



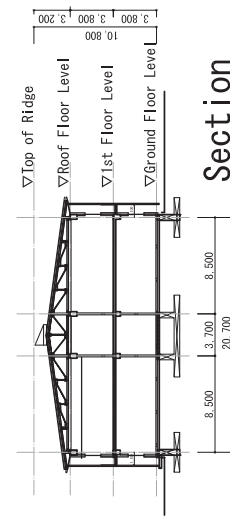




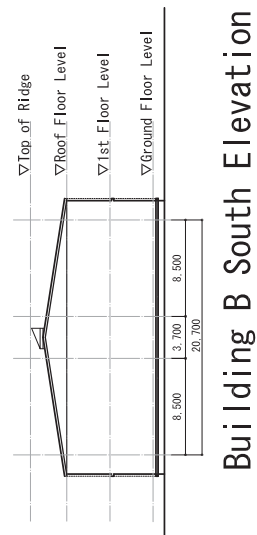
Building A - B East Elevation



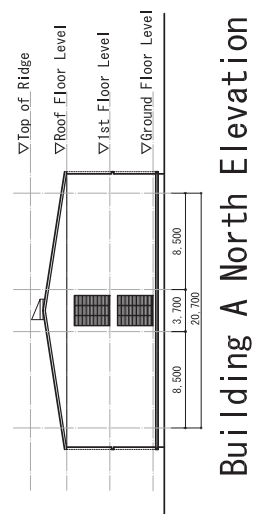
Building A - B West Elevation



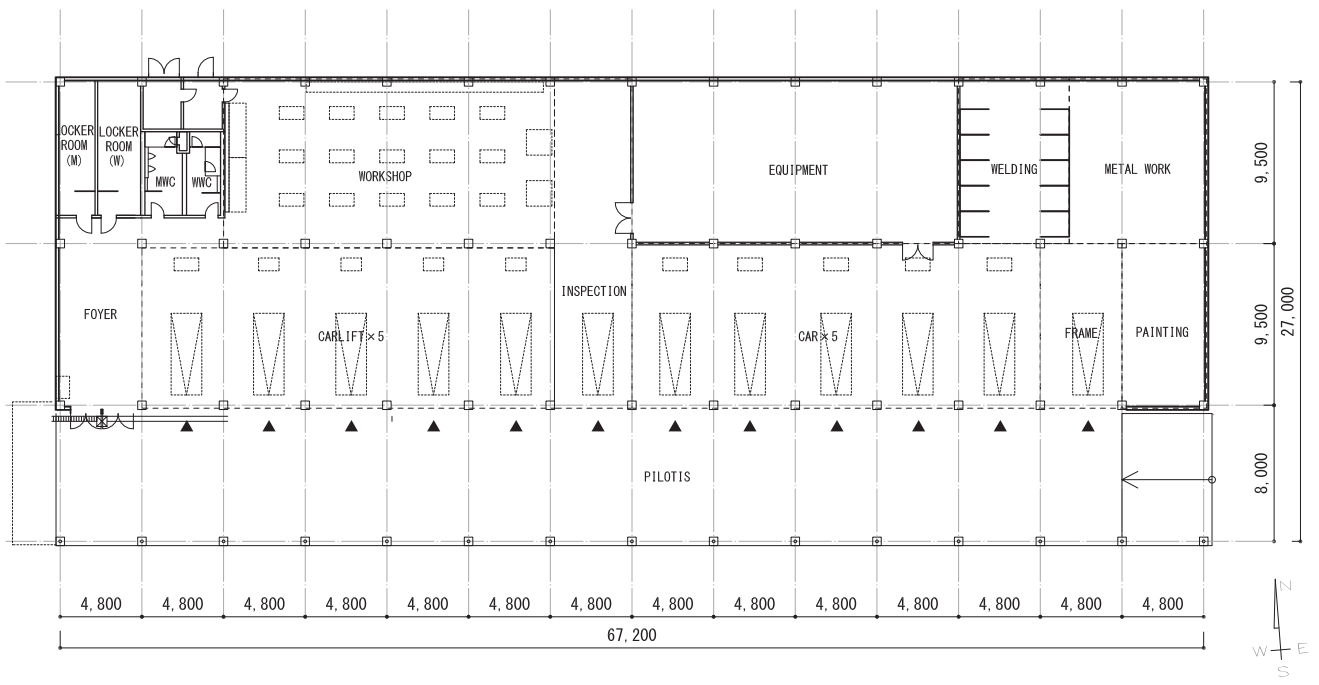
Section



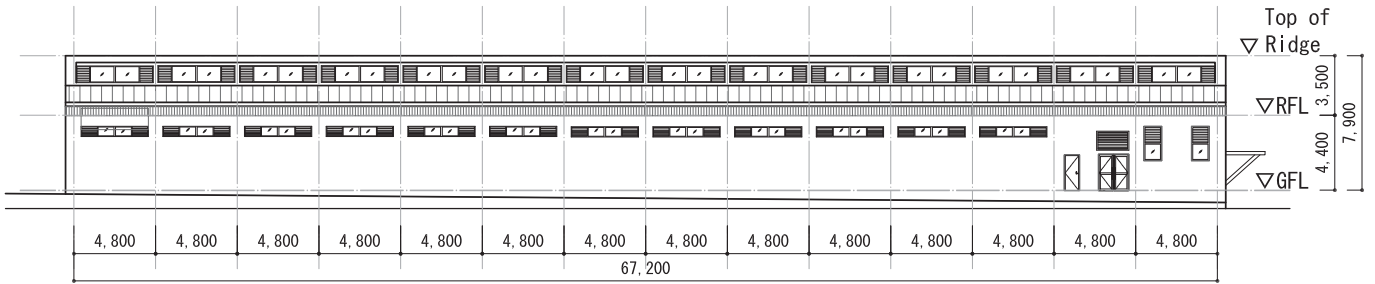
Building B South Elevation



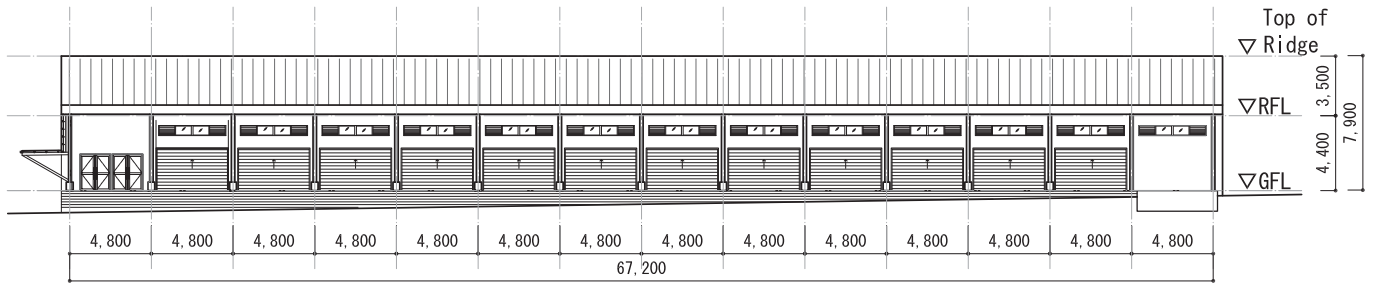
Building A North Elevation



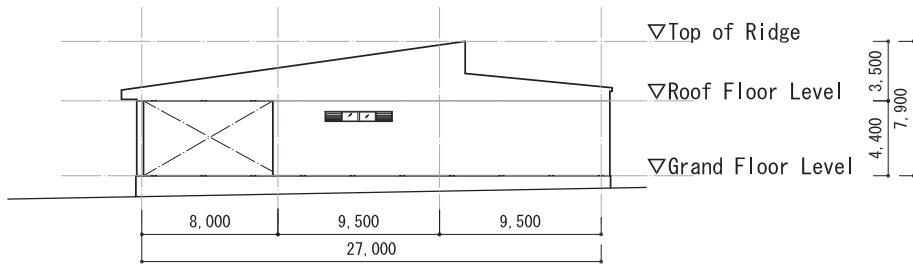
Ground Floor Plan



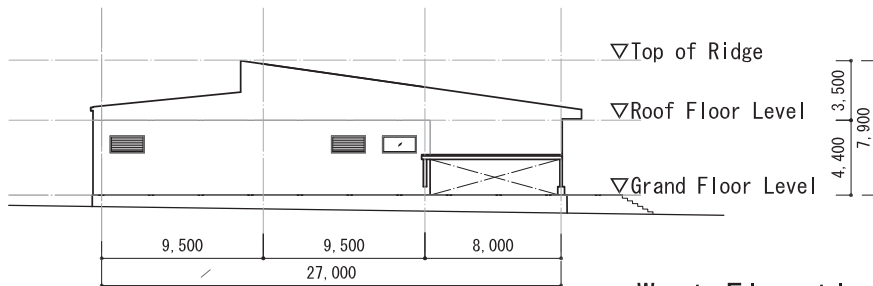
North Elevation



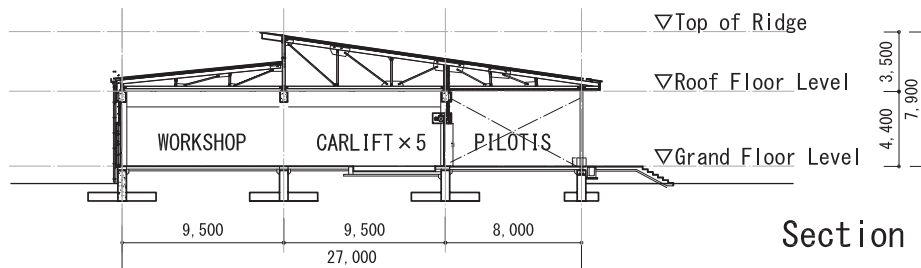
South Elevation



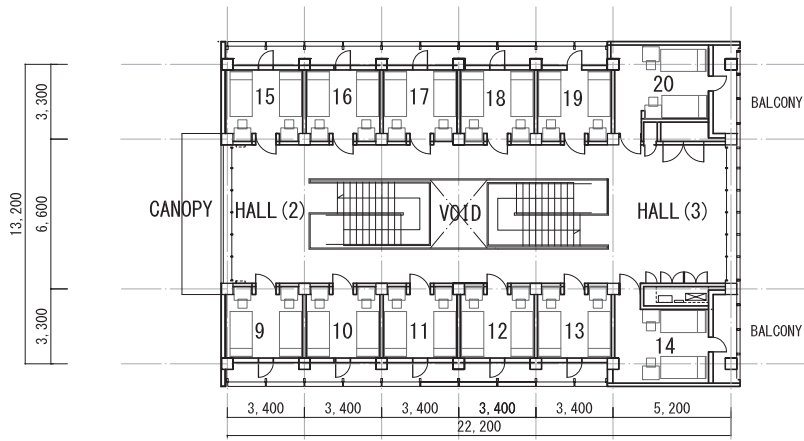
East Elevation



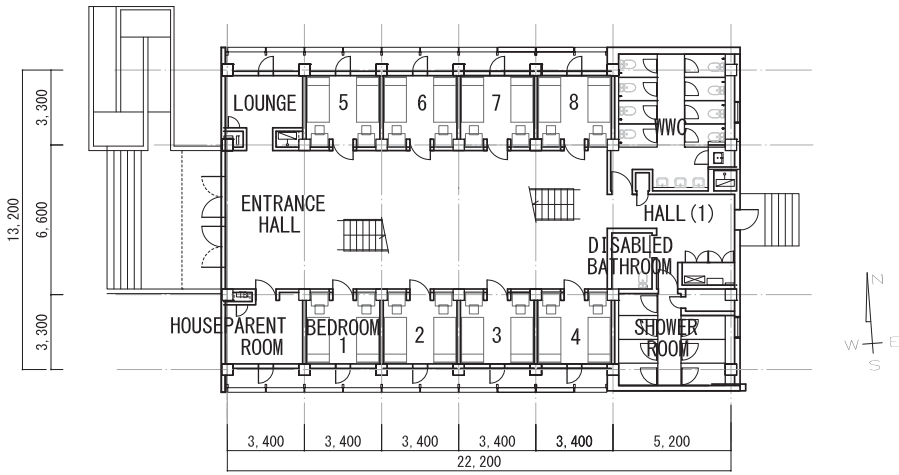
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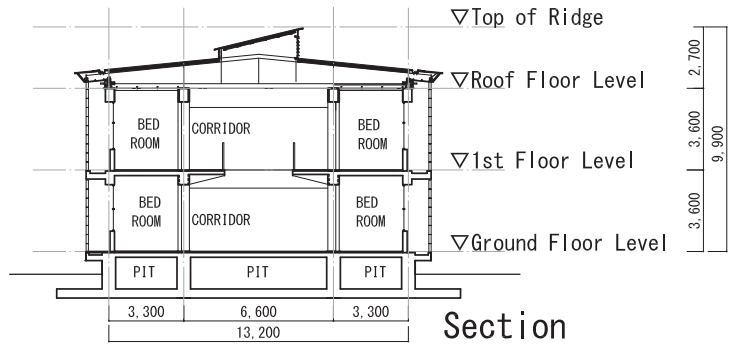
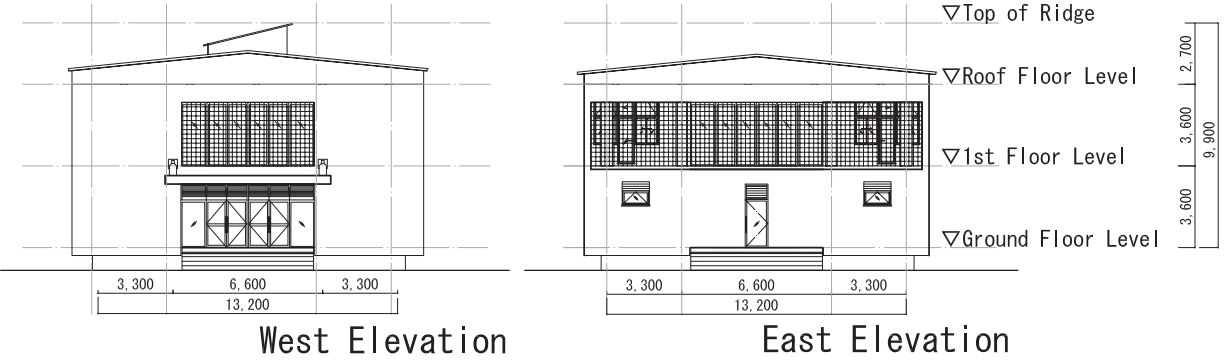
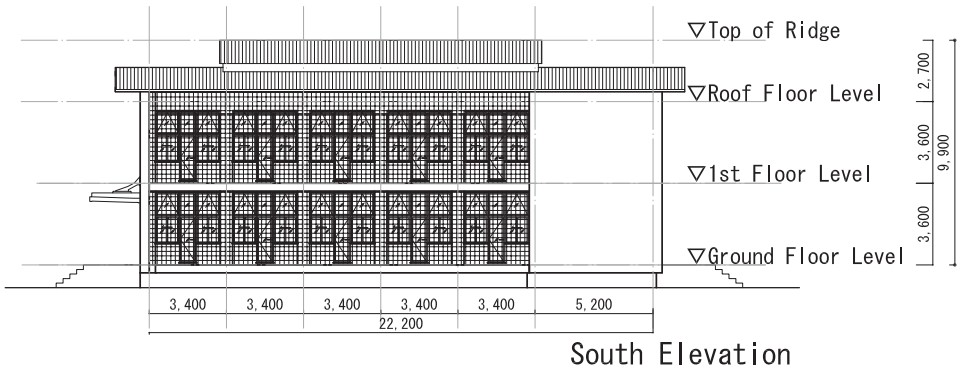
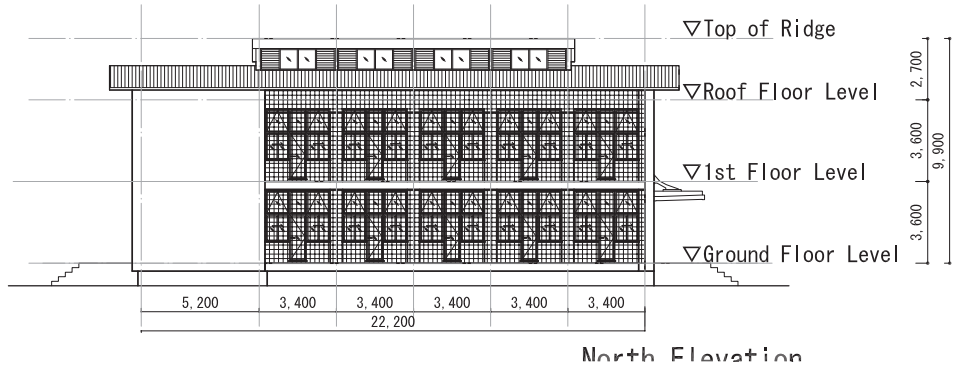
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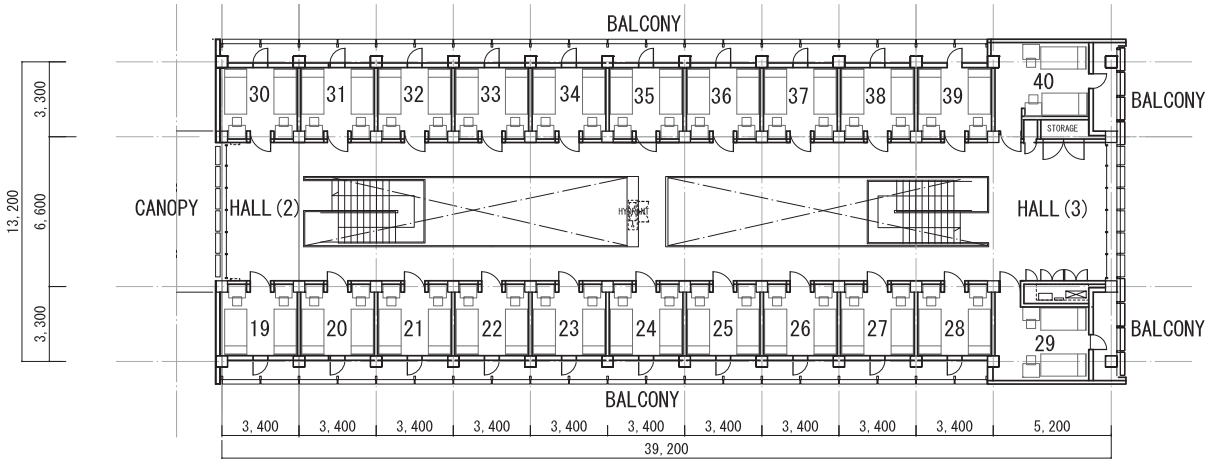


1st Floor Plan

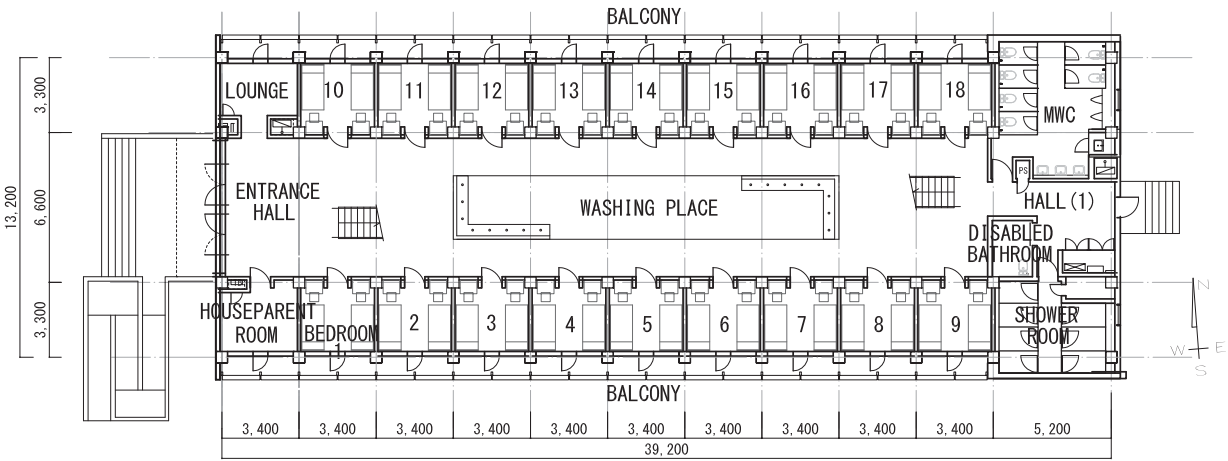


Ground Floor Plan

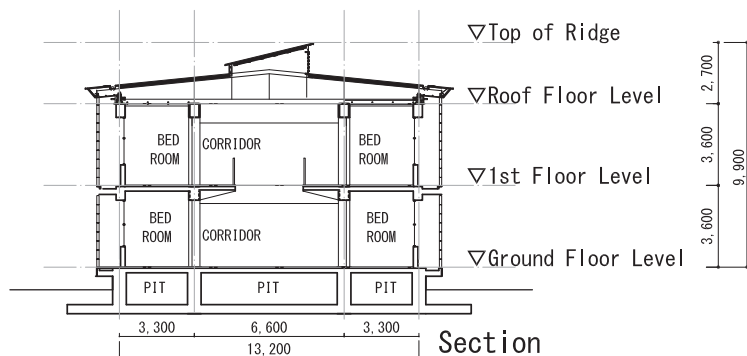
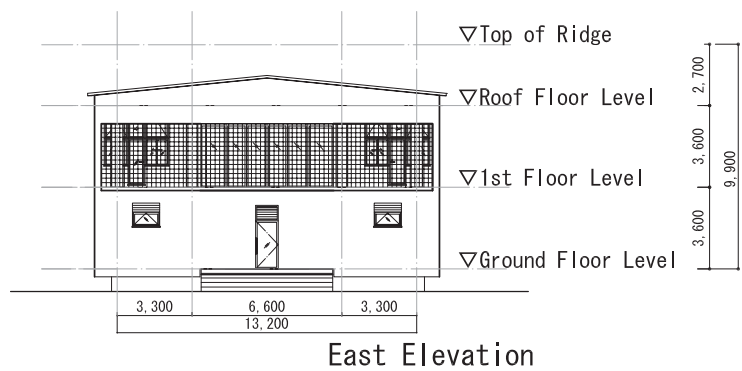
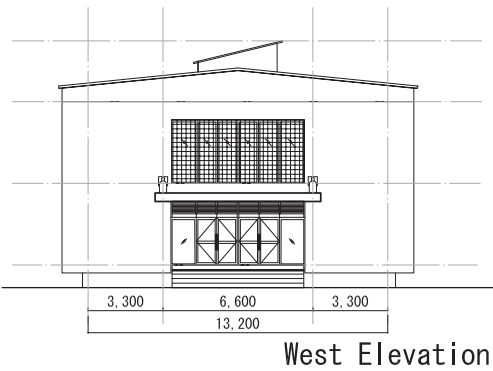
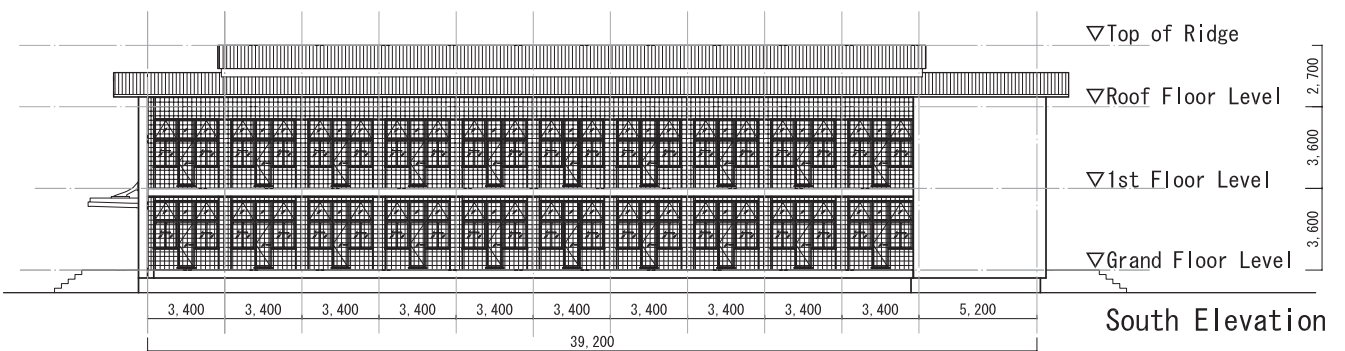
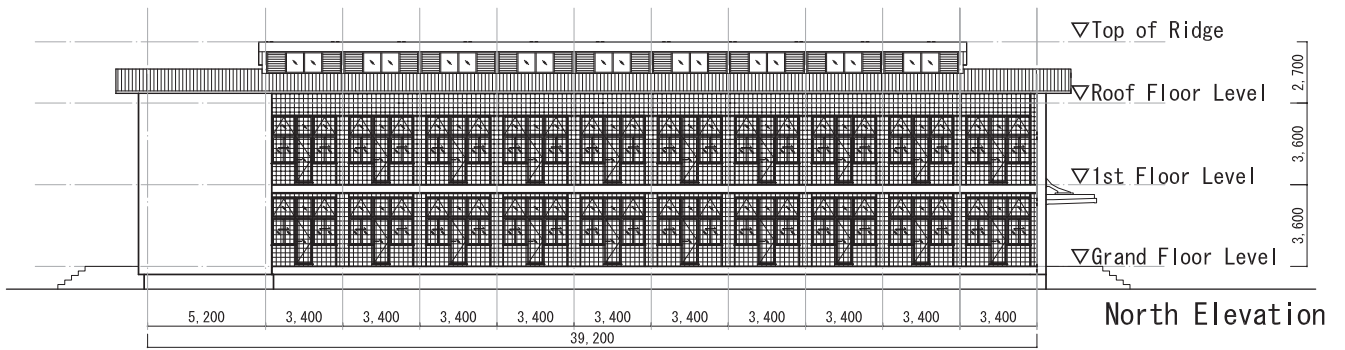


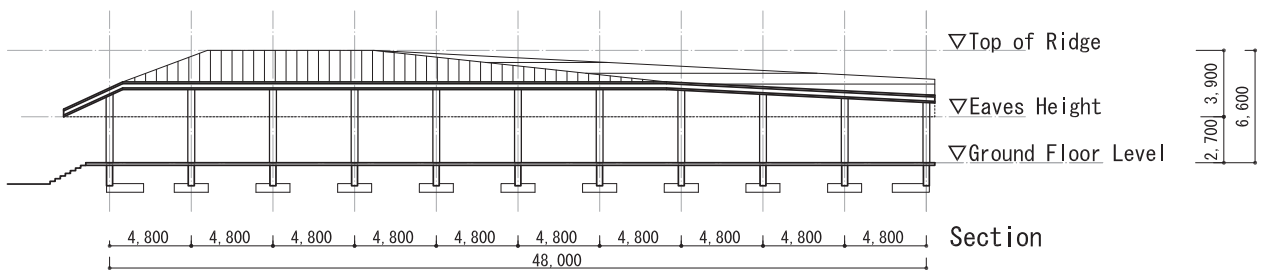
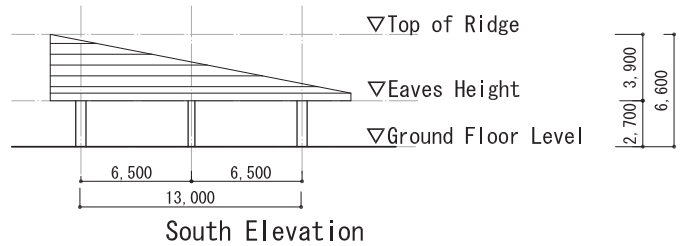
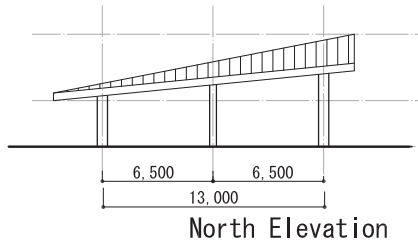
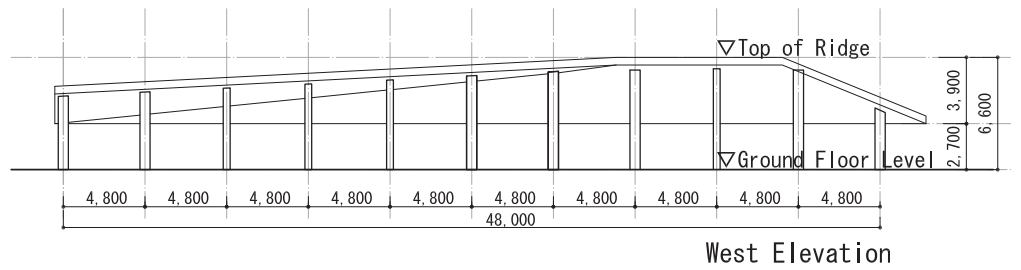
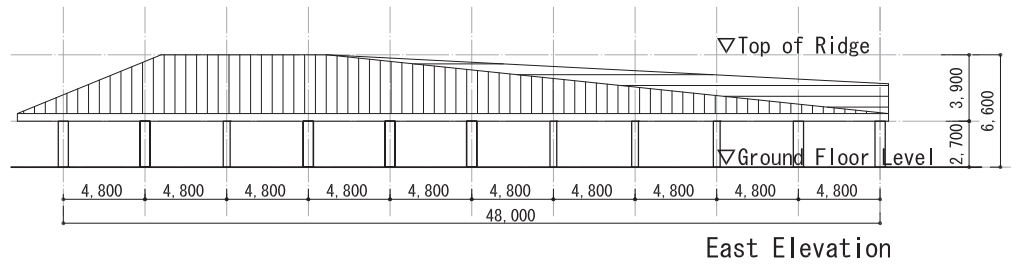
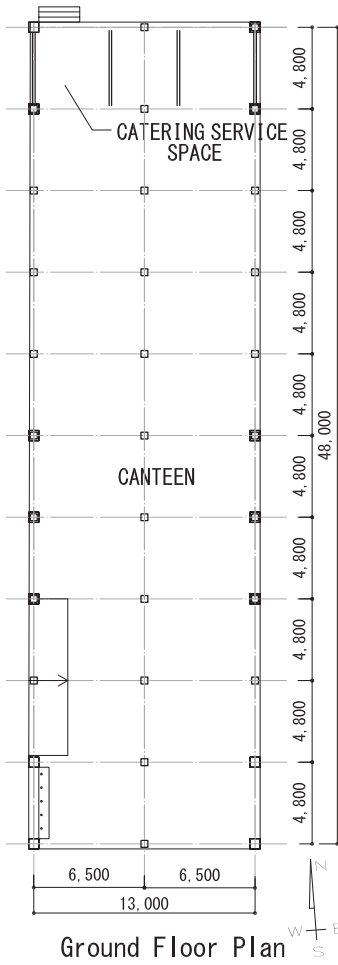


1st Floor Plan



Ground Floor Plan







## **2.2.5 Implementation Plan**

### **2.2.5.1 Implementation Policy**

#### **(1) Basic Conditions for the Project Implementation**

After this Project is approved by the Cabinet of Japan, an Exchange of Notes (E/N) will be signed by the governments of Japan and Myanmar with respect to its implementation. In accordance with the E/N, a Grant Agreement (G/A) will be signed by the government of Myanmar (GOM) and Japan International Cooperation Agency (JICA). The Project is then implemented pursuant to the Japanese Grant Aid scheme. Subsequently, GOM will sign a consulting agreement for the Project with a consortium of Japanese consultant companies (hereinafter referred to as ‘the Consultant’) which will prepare detailed designs of the intended facilities and equipment. Upon completion of the detailed design drawings and bidding documents, competitive bidding will be carried out, calling for pre-qualified Japanese companies. A successful bidder (hereinafter referred to as ‘the Contractor’) and GOM will enter into a contract for construction work and equipment procurement (hereinafter referred to as ‘the Contract’), which shall be fulfilled as agreed therein.

#### **(2) Project Implementation Structure**

##### **■ Implementation Structure of the Myanmar side**

The Project is under the jurisdiction of MOE, with the Department of Technical and Vocational Education and Training (DTVET), which coordinate and implement the Project. MOE is the main body concluding both the Consulting Agreement and Contract with qualified Japanese companies, using due process to open a bank account and make payments. It also needs to allocate the budget required to fulfil obligations on the Myanmar side. DTVET is also in charge of executing the work to be undertaken by the Myanmar side, acquiring applicable permits and licenses, clearing site conditions, and handling technical matters related to project implementation. DTVET shall closely work with relevant departments and agencies to pursue its assigned tasks in a timely manner.

##### **■ Japan International Cooperation Agency (JICA)**

JICA will conclude the G/A with MOE, which represents the government of Myanmar, and oversee the Project to be executed properly and as scheduled in accordance with a Japanese Grant Aid scheme.

##### **■ Consultant**

The Consultant will prepare a detailed design of the facilities and equipment and supervise the construction work and equipment procurement described in this Report, pursuant to the Consulting Agreement signed by MOE. The Consultant will also prepare bidding documents and assist in the bidding process and conclusion of the Contract. The

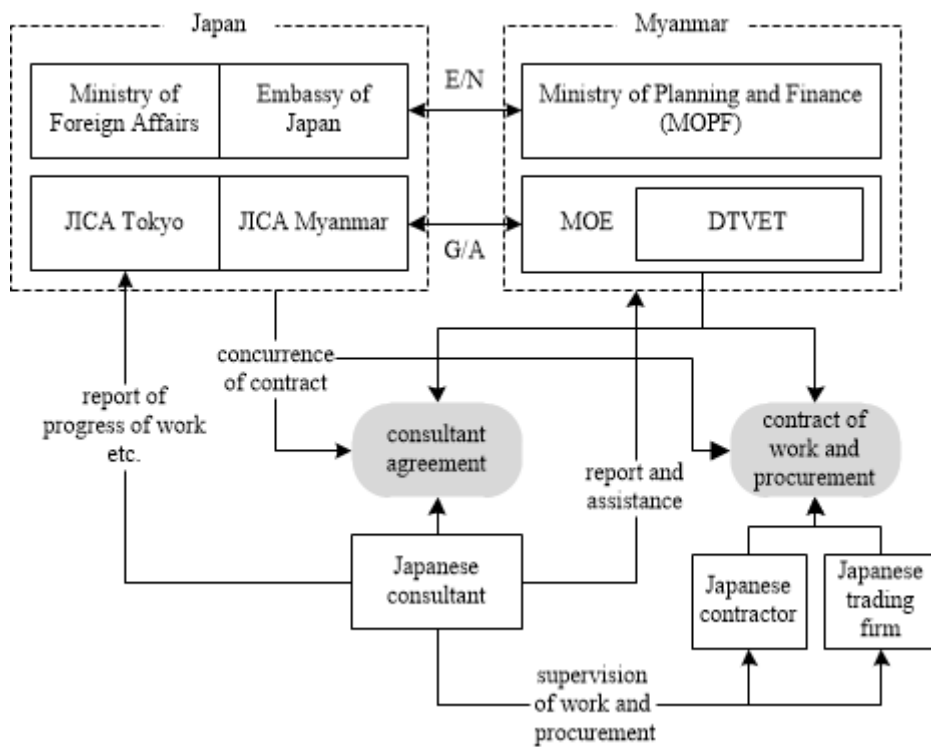
Consultant will report to JICA concerning the progress of the detailed design and the construction work, modification of the design, the methods and results of biddings, the conclusion and modification of the Contract, and the completion of the Project in a timely manner. The Consultant will assign a supervising engineer to the project site throughout the construction period.

■ **Contractor**

The Contractors to be selected through competitive bidding shall carry out the work and procurement pursuant to the Contract signed with MOE by the stated date. To carry out the construction work and equipment procurement, the Contractors shall establish the site work organization in consideration of the scale and contents of the Project.

■ **Implementation Framework**

The figure below shows a relationship among relevant actors involved in the implementation phase and the workflow to carry forward the Project.



**Figure 2-10 Project implementation framework**

**2.2.5.2 Implementation Conditions**

**(1) Tax Exemption**

The Ministry of Planning and Finance (MOPF) notified all ministries of the ‘MOPF Notification No. 38/2018’ in May 2018, and ‘MOPF Notice No. SaBa/BanDar – 2/1/295

(3048/2018)' in July 2018. With reference to these notices, contents of tax exemptions related to the Grant project are described as follows for each type of tax.

### ■ **Commercial Tax**

Myanmar's commercial tax corresponds to Value Added Tax (VAT) on foreign countries. Commercial tax on local procurement of goods and services to be used for the Project is supposed to be exempted. The Notification No. 38/2018 mentioned above stipulates that tax is exempted regardless of whether it is a primary or subcontract expense. However, since this notification has just been issued, it is difficult to guarantee that subcontractors will be exempt from commercial tax according to the new procedures.

To be exempt from commercial tax, it is necessary to submit the following documents through MOPF to obtain a certificate of the Internal Revenue Service (IRD).

- (a) Stated that the Project is implemented under Grant Aid;
  - (1) An explanation letter of company concerned
  - (2) A recommendation of ministry concerned
  - (3) Recommendations of the Budget Department for the Grant and Treasury Department for a loan, through MoPF, according to the recommendation of the line ministry
- (b) The contract signed between the main contractor and department concerned, for the main contractor
- (c) The contract signed with the main contractor and recommendation of the main contractor, for the sub-contractor
- (d) The comments of the Customs Department for import permits and custom duty exemptions
- (e) DACU's approval for procurement of vehicles, machinery, and equipment

### ■ **Customs Duty**

The Contractor prepares a master list of imported materials and equipment and submits them to the executing agency. The executing agency applies exemptions of customs duty and commercial taxes to the MOPF and applies for import permission to the Ministry of Commerce (MOC). When approved by MOPF, a letter of exemption will be issued to relevant ministries and customs. With the import permit from MOC and a letter of exemption from MOPF, customs clearance and tax exemptions can be made. For exemption of commercial tax for import, it is necessary to obtain an IRD certificate as well.

### ■ **Corporate Tax**

Main contractors have been exempted from corporate tax thus far. Pursuant to Notification No. 38/2018, subcontractors are also supposed to be exempt from corporate tax. However, since this notification has just been issued, it is difficult to guarantee that subcontractors will

be exempt from corporate tax according to the new procedures. To be exempt from corporate tax, it is necessary to obtain an IRD certificate through MOPF, and the necessary documents are the same as for item 1).

#### ■ **Personal Income Tax**

Only staff who are not Myanmar citizens and have only a single source of salary from working for the Grant Aid Project exclusively are exempt from paying personal income tax. To be exempt from personal income tax, it is necessary to submit the following documents through MOPF to obtain an IRD certificate.

- (a) Main or Sub Company's official letter recommending the staff of project (together with recommendations of concerned department and organization for main company, and recommendation of main company, concerned department, and organization for sub-company).
- (b) The main company's explanation letter mentions that the Project is implemented under Grant Aid.
- (c) Recommendations of the concerned ministry and Budget Department through MoPF mention that the Project is implemented under Grant Aid.

## **(2) Other Conditions for Construction**

The construction work of this Project is divided into two phases: Phase 1 is carried out in zone A, while phase 2 is carried out in zones B and C. There is a TOTAL welding workshop in the eastern half of zone B, a park on the north side of zone C, training workshops of a project funded by ADB in zone D, temporary workshops in zone E, and residences of MOE officials. Hence, there are multiple facilities in the construction area, and training activities and the lives of surrounding residents will continue during the construction period. In consideration of the safety of students and residents, the construction area compartment, circulation of construction vehicles, and commuter transportation shall be carefully planned. Especially during periods in which phase 1 and phase 2 overlap, careful safe measures such as additional guard assignment shall be provided to balance efficiency and safety of the work in consideration that the construction areas are dispersed.

Zones A, B, and C don't have enough temporary space for storage of materials, carpentry workshops, rebar works, offices, toilets, pathways of trucks, and heavy machinery. Some spaces in the park, pathways, or other zones shall be prepared for this purpose. The concerned parties shall discuss a solution.

The rainy season from May to October is a key factor of the work schedule. Earth work and foundation work shall be avoided during the rainy season, and temporary stormwater drainage during construction shall be designed to avoid flooding of the construction area.

Since the monthly average temperature exceeds 25 degrees throughout the year in Yangon, it is necessary to take measures for hot-weather concrete through increase in strength.

Although the security of Myanmar is relatively good, many cases of theft occur on construction sites, and a 24-hour guard is required to prevent materials theft.

### (3) Conditions for equipment procurement

Installation work of automobile lifts, projectors, screens, audiovisual equipment sets, and chemical experiment tables require careful coordination with the construction work. The Consultant, Contractor, and Supplier shall keep in close contact and manage the schedule of procurement and installation in consideration of the progress of the construction work.

#### 2.2.5.3 Scope of Work

For the work items in which both Myanmar and Japan cooperate, the scope of work for each country is described as shown in the following table.

**Table 2-20 Scope of work for specific work items**

Item	Myanmar Work	Japanese Work
Land preparation	Demolition of buildings, foundations, underground pits, other structures, trees, roots, plants, and boundary fence for the construction area	-
UXO	UXO detection for the construction area of phase 2, in zones B and C	UXO detection for the construction area of phase 1, in zone A *1
Power supply	Modification of contract capacity with YESC, Extension of 33kV cable from other substations, connection to the new transformer, demolition of the existing transformer, connected cables and poles	Installation of new transformer, power supply network after the transformer, connection to the existing network for other training institutes on the same premises
Water supply	Contract with water authority, extension piping from the main water pipe to the planned network	Water supply network to the planned facilities
Drainage	-	Installation of wastewater treatment plant, connection to the public drainage network
Telephone	Contract with telephone company, connection to PABX, installation of telephones	Installation of PABX, telephone network after PABX
Internet	Contract with internet provider, installation of communication devices such as a router and hubs	Installation of server cabinets and power, installation of conduits and outlets in buildings, installation of conduits and cables
Other furnishings	Furniture not provided by the Project, textbooks and reference books for the library; sheets, blankets, and pillows for hostels; cooking equipment, tableware, and cutlery	Basic furniture; shelves for the library; beds and mattresses; blackout curtains for the assembly hall; cooking tables

Landscape	Sports court and fence, if any, planting work	Pavement, pathways, outdoor lighting
Boundary fence	Boundary fences except for work by the Project	Boundary fences along the main road and gate, lower boundary wall of the park *2

\*1 Although UXO detection is supposed to be conducted by the Myanmar side, they failed to allocate the budget so as to complete this work by April 2019. Upon request of the Myanmar side, the Japanese side decided to conduct this work by the Japanese budget for detailed design.

\*2 Although construction of boundary fence is supposed to be done by the Myanmar side, the Japanese side decided to do this work by the Japanese budget because this work is one of agreements to demolish the main building of former technical high school as a result of the discussion with the community.

## 2.2.5.4 Consultant Supervision

### (1) Basic Policy for Supervision of Construction Work

Fully understanding a Japanese Grant Aid scheme and the content of the outline design, the Consultant delivers specified services in a stepwise manner from the detailed design and bidding to the supervision of construction work and handover of completed facilities. To supervise construction work, the Consultant keeps close contact with the related government agencies of both countries to make necessary reports. The Consultant also provides timely and relevant advice to the Contractor so that they complete the facilities without delay to fulfil the quality prescribed in the contract documents.

### (2) Supervisory System of Construction Work

The Consultant assigns a Japanese national resident engineer during the construction period. His or her role is to perform the following tasks:

- To examine the implementation plan, work schedule, procurement plan for construction materials, quality control plan, and safety measures and to provide instructions and advice to the Contractor when needed;
- To confirm the shop drawings, production drawings, and sample products submitted by the Contractor and to give approval to them;
- To monitor the progress of each work during the entire construction schedule and to advise the Contractor when needed;
- To give guidance to the Contractor, where necessary, and to report the work progress to the Client and JICA;
- To check the quality and workmanship of the work and to give guidance and advice to the Contractor;
- To make technical arrangements and monitor the progress related to Myanmar's work;
- To check the specifications, quality, dimensions, and quantity of the materials indicated in the contract documents and to give instructions and advice when needed;

- To confirm the safety management plan by the Contractor, check the safety measures on the project site, and provide instructions and advice when needed;
- To conduct inspections of the quality and workmanship of each work and provide advice to the Contractor when needed; also, to conduct inspections of milestone work regarding interim payments and the final inspection and issue the certificate approved by the Client.

The Consultant organizes a support system which consists of engineers under the control of a managing supervisor involved in Japan, to support the resident engineer. The Consultant dispatches engineers to join key inspections on the field and provide advice to the work depending on the work progress. The periods of inspection are as follows:

- Chief consultant: at the launch of the construction work, interim, and completion of inspections;
- Structural engineer: for confirmation of the soil conditions at the bottom of the bedding;
- Electrical engineer: at interim inspections when replacing or receiving power systems and transformers and at the completion inspection for electrical work;
- Mechanical engineer: at the interim and completion inspections for mechanical work.

### **(3) Supervisory System of Procurement Work**

The equipment is procured from Japan and Myanmar. In shipping in Japan, a third-party inspection agency conducts pre-shipment inspection of equipment at the shipping port. The Consultant confirms the inspection certificate by the inspection agency and issues an inspection report to the Client.

All the procured equipment is confirmed and handed over temporarily to the Client, witnessed by the responsible officer of JMASVTI, the Supplier, and the Consultant, after the installation, operation check, and instructions. The inspection is carried out for the specifications indicated in the contract, including model name, country of origin, manufacturer name, ODA sticker, and appearance check. The final inspection and handover are done in Naypyidaw. Supervision of procurement is implemented by the following personnel.

- Resident procurement supervision engineer (one person): Supervision during the whole period of installation work, operation check, and instructions;
- Inspection engineers (two persons): kick-off consultation, preparation for pre-shipment inspection, and confirmation of inspection certificate.

### 2.2.5.5 Quality Control Plan

To ensure the quality of materials and the accuracy of the fabrications on site, quality control is carried out through the technical specifications to describe the methods of tests and inspections. Especially, the structural materials which influence the durability and essential functions of the building and finishing materials which influence the grade of the building shall be emphasized. The quality control points are described as follows:

**Table 2-21 Quality control items**

Item	Method
Ground	<ul style="list-style-type: none"> <li>- The structural engineer visually confirms the soil conditions at the bottom of the bedding after the foundation excavation;</li> <li>- Also confirm the results of the plate load test for cross-check with the confirmation of the soil.</li> </ul>
Rebar	<ul style="list-style-type: none"> <li>- Check the material quality against the product test report by the manufacturers at each delivery.</li> <li>- Conduct a tensile strength test at a certified laboratory once for different types of bars.</li> </ul>
Structural steel member	<ul style="list-style-type: none"> <li>- Conduct shop inspections twice: 1. Pre-inspection of samples and shop drawings, 2. Product inspection.</li> </ul>
Cement, aggregate and water	<ul style="list-style-type: none"> <li>- Check the quality of cement, aggregate, and water against the material data provided by the manufacturer</li> </ul>
Concrete (ready-mixed)	<ul style="list-style-type: none"> <li>- Check the 28-day strength with a trial mixture, using the materials stored by the plant.</li> <li>- Set the required average strength as the design strength added with the strength correction value <math>6\text{N/mm}^2</math> for hot-season concrete.</li> <li>- Check the slump, temperature, and chloride content of fresh concrete when delivered on site.</li> <li>- Conduct a compressive strength test in a certified laboratory with sample pieces (three each for first-week and fourth-week strength) taken during casting to check the compressive strength.</li> <li>- Take necessary measures to avoid early drying and cracks: cooling of aggregate and water, control of mixing concrete, watering forms and concrete surface, covering concrete surface by plastic sheets and so on.</li> </ul>
Rebar arrangement	<ul style="list-style-type: none"> <li>- Conduct rebar arrangement inspections witnessed by the Consultant prior to casting of concrete.</li> <li>- Check the quantity, position, accuracy, length of joints and anchorages, and placement of spacers.</li> </ul>
Roofing work	<ul style="list-style-type: none"> <li>- Prepare a detailed work plan for metal roofing work, which clearly specifies the procedures, especially to work on a monitor roof (connection between roof and high side windows) and a valley gutter, which are prone to water leakage, according to the details developed in the design stage.</li> </ul>

The Contractor shall submit work plans to describe the schedule, specifications, materials, procedures, test methods, and required quality for check and approval by the Consultant.



## 2.2.5.6 Procurement Plan

### (1) Construction Material

In Myanmar, domestic construction materials are limited for sand, gravel, cement, ready-mixed concrete, timber, furniture, fittings, and so on; therefore, major materials are imported. In this Project, the major materials are assumed to be imported products or processed products of imported materials. Concerning imports from neighbouring countries such as Thailand, China, and Southeast Asia, various manufacturers' products are available on the market because both suppliers and contractors import them regularly. The supply sources and reference information of major construction materials are as shown in the following table.

**Table 2-22 Supply sources of major construction materials**

Material name	Procured locally		Third country	Japan	Reference information
	Domestic product	Imported product			
Construction materials					
Sand and gravel	✓				Granitic river sand and gravel are procured from the delta area near Yangon.
Cement	✓	✓			Local and imported EN products of class 32.5 and 42.5MPa are available.
Concrete	✓				Multiple plants are near the project site.
Concrete blocks	✓				To be procured by manufacturers and contractors in Yangon
Timber	✓	✓			Timber for temporary and finishing work are available in Yangon.
Steel products and rebars	✓	✓			ASTM products from Thailand, China, and Southeast Asia are available.
Metal roofing sheets	✓	✓			Products made from imported steel rolls are available.
Waterproof agent		✓			Imported membrane waterproofing are available, and imported one-component silicone sealants are mainly available.
Tile		✓			Imported products from Thailand, China, and the EU are available.
Gypsum, fibre cement, and mineral board		✓			Imported products from Thailand, Malaysia, and China are available.
Paint	✓	✓			-
Fittings		✓	✓		Wooden, steel, and aluminium doors and windows by local contractors are available.
Insulation materials					
Electrical materials		✓			These materials are procured directly from suppliers or contractors in Yangon.
Switch board	✓	✓			
Sanitary ware, faucets		✓			
Plumbing fixtures	✓	✓			

Mechanical equipment		✓			
Elevator		✓			Imported products including Japanese products are available.
Furniture					
Ready-made furniture	✓	✓			Imported furniture from Thailand, Malaysia, and China are available.
Manufactured furniture	✓				-

## (2) Equipment Procurement Plan

### ■ Procurement Scope

Versatile ICT equipment is procured in Myanmar and practical training equipment, including items in units and systems, workshop machinery, and tools are procured in Japan. However, in the case that Japanese manufacturers are few and block fair bidding, procurement is available, but eligible manufacturers shall have a local agent to dispatch a technician for the installation and after-sales service and have their headquarters in DAC or OECD member countries to secure the quality.

### ■ Procurement Period

Since training equipment indicated in ‘Advance procurement period’ for the 2nd grade of electrical engineering is essential and necessary as soon as possible in terms of training effect, they are procured by this Project prior to the completion of phase 1, and the Client will relocate them to the new workshops. Thus, the equipment will be delivered on three occasion: twice in phase 1 and once at the completion of phase 2. However, bidding for equipment procurement is not divided and conducted together with construction bidding.

**Table 2-23 Procurement schedule**

Period	Target facility	Procurement equipment
Advance procurement	Electric workshop (refurbished by technical cooperation project)	- Programmable logic controller practice set (20 sets)
		- Laptop computer (20 sets)
		- Printer (one set)
1st procurement	Building A (electrical workshop, administration, classroom)	Electrical engineering equipment (excluding above)
	Building C (automobile maintenance workshop)	Common equipment (except below)
2nd procurement	Building B (laboratory, administration, assembly hall, conference room)	Machinery for Automotive Engineering Department
	Canteen	

## ■ **Transportation of Equipment.**

Equipment procured in Japan is transported to the project site by sea and land. Marine transportation from the port in Japan to Yangon port is by regular container ship. Land transportation from Yangon port to the project site in Insein Township is by truck. The road conditions from Yangon Port to the project site are generally good.

### **2.2.5.7 Instruction and Training Plan**

Initial instruction will be carried out after installation work and an operation test by the supplier. Technicians of manufacturers or local agents will conduct initial instruction, while the supplier will manage the schedule and coordination. A training plan is not available in this Project.

### **2.2.5.8 Soft Component Plan**

Trainers will learn the usage and maintenance of each type of equipment based on the instruction described in Item 2.5.7. and be comprehensively upgraded for their skills by the technical cooperation project. Soft components are not considered necessary in this Project.

### **2.2.5.9 Implementation Schedule**

The Project is expected to be implemented through Japanese Grant Aid. After the conclusion of E/N and G/A between both governments, the Project will be carried out in three stages as shown below:

#### **(1) Detailed Design and Cost Estimation, 6.5 months**

The Consultant will enter into a consultant agreement with the executing agency and will prepare detailed design drawings and bidding documents based on this outline design. The Consultant will discuss with the executing agency at the beginning and at the end of the work and obtain approval of the bidding documents, including detailed drawings and equipment specifications. The period from the conclusion of the agreement to the end of the work is estimated to be around 6.5 months.

#### **(2) Bidding, 3.5 months**

After the approval of the bidding documents, the Consultant, on behalf of the executing agency, will conduct pre-qualification (P/Q) of bidders in Japan through public announcements and hold competitive bidding in the presence of the parties concerned, inviting qualified Japanese contractors. In the case that the content of the bidding is evaluated to be appropriate, the lowest bidder is awarded the contract with the executing agency. The period from the announcement of P/Q to the conclusion of the Contract is estimated to be around 3.5 months.

### **(3) Construction and Procurement, 29.0 months**

After conclusion of the Contracts, the Contractor will commence the construction work and equipment procurement. In consideration of the scale and specific conditions of the procurement of local material and local labour efficiency and importation procedures, the period for phase 1 is estimated to be 17.0 months. Phase 2 is estimated to be 15.5 months because the scale of phase 2 is similar to that of phase 1 and doesn't require preparation. For both phases, excavation and foundation work shall be conducted before May when the rainy season generally starts. As a result of the adjustment of the work schedule, both phases overlap each other by 3.5 months, and the whole schedule is 29.0 months.

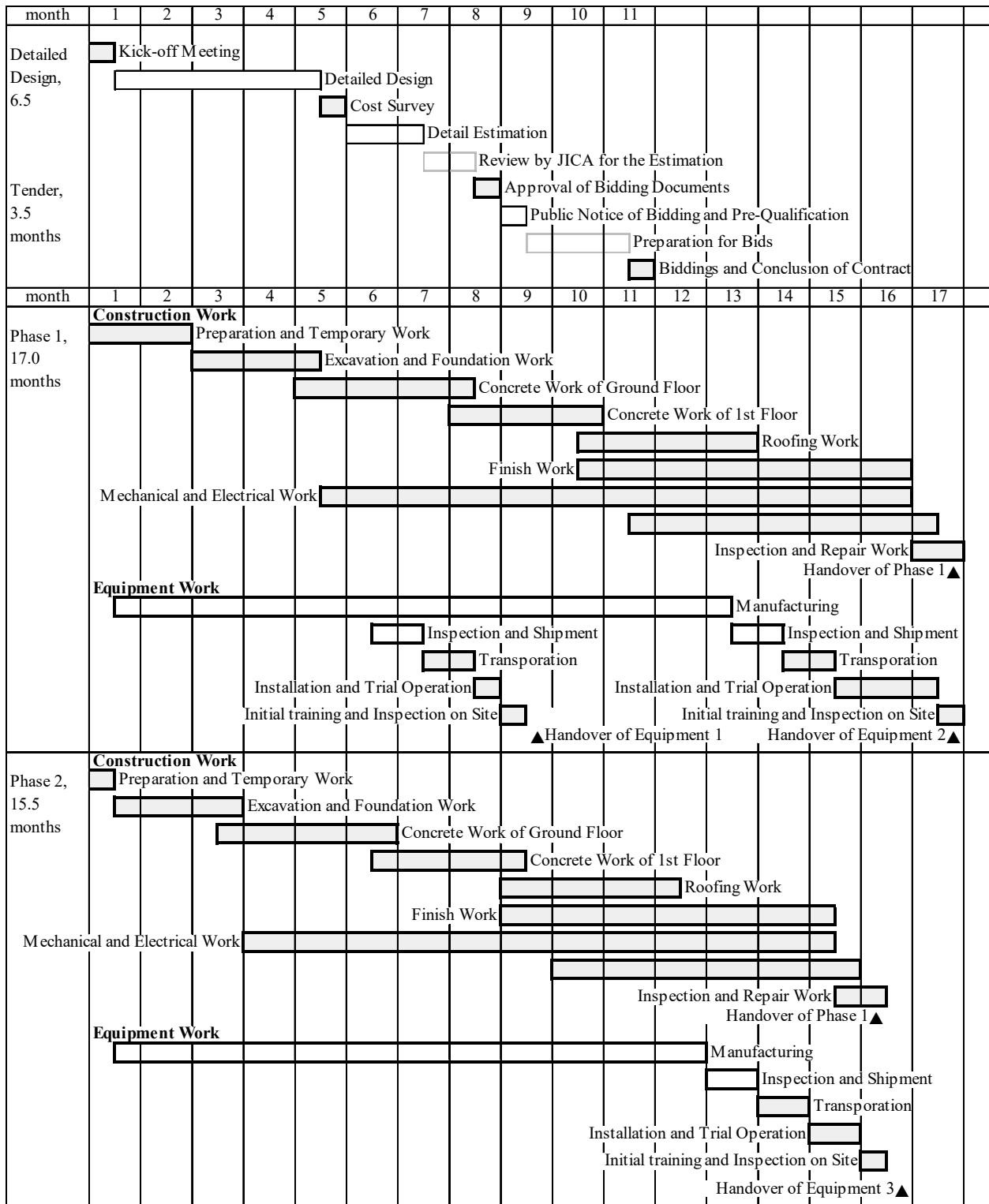


Figure 2-11 Implementation schedule

## 2.3 Obligations of the Recipient Country

Obligations of the Myanmar side for the implementation of the Project, as confirmed in the discussions of this survey, are listed as shown in the table below.

**Table 2-24 Obligation to be borne by the Myanmar side**

No	Items	Deadline	Organization in charge
<b>Before bidding</b>			
1	To open a bank account (B/A)	within 1 month of the signing of the G/A	DTVET
2	To issue authorization to pay (A/P) to a bank in Japan (the Agent Bank) for payments to Consultants	within 1 month of the signature of the contract	MFTB (Myanma Foreign Trade Bank)
3	To approve EMP and secure the necessary budget for implementation	before notice of the bidding documents	MONREC
4	To bear payment commissions	for each payment	DTVET
5	To secure and clear the following lands - former Aung San GTHS premises	before notice of the bidding documents	DTVET
6	To obtain the planning, zoning, building permits	before notice of the bidding documents	DTVET
7	To clear, level, and reclaim the following sites 1) removal of existing buildings and utilities of B and C zones for phase 2 of the Project 2) clearance of UXO buried in the ground of B and C zones for phase 2 of the Project	by the end of April 2020	DTVET
8	To submit Project Monitoring Reports (with the results of the Detailed Design)	before preparation of bidding documents	DTVET
<b>During the Project Implementation</b>			
1	To issue A/P to a bank in Japan for payments to Contractors	within 1 month of the signature of the contracts	MFTB
2	To bear the following commissions to a bank in Japan for banking services based upon the B/A		DTVET
	1) Advising commission of A/P	within 1 month of the signature of the contracts	
	2) Payment commission	for each payment	
3	To ensure prompt unloading and customs clearance at ports of disembarkation in the country of the Recipient and to assist the Contractors with internal transportation therein	during the Project	DTVET
4	To accord Japanese physical persons and/or physical persons of third countries whose services may be required in connection with the supply of products and 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	DTVET

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	during the Project	DTVET
6	To bear all the expenses, other than those covered by the Grant, necessary for the implementation of the Project	during the Project	DTVET
7	To submit Project Monitoring Reports	every month	DTVET
	To submit a Project Monitoring Report (final)	within one month of the certificate of completion	
8	To submit a report concerning completion of the Project	within six months of the completion of the Project	DTVET
9	To provide necessary power and water supply to the procured equipment and workshops and other incidental facilities necessary for the implementation of the Project		DTVET
	Electricity - Upgrading of the contract capacity with YESC - Extension of high-voltage cables to the new-installed transformer	6 months before completion of phase 1	
	Water Supply - Connection with the planned water supply network on the site	2 months before completion of phase 1	
	Furniture and Equipment - Furniture which are not provided by the Project - Stationaries and electrical appliances - Curtains, sheets, pillows, blankets - Textbooks and reference books - Telephones and internet devices	1 month before completion of construction	
10	To take necessary measures for safety construction - fences	1 month before completion of construction	DTVET
11	To relocate the bus stop and move power poles facing Lower Mingalodon road	3 months before completion of phase 1	DTVET
After the Project			
1	To maintain and use properly and effectively the facilities constructed and equipment provided under the Grant Aid - Allocation of maintenance costs - Operation and maintenance structure - Routine check/Periodic inspection	after completion of construction	DTVET

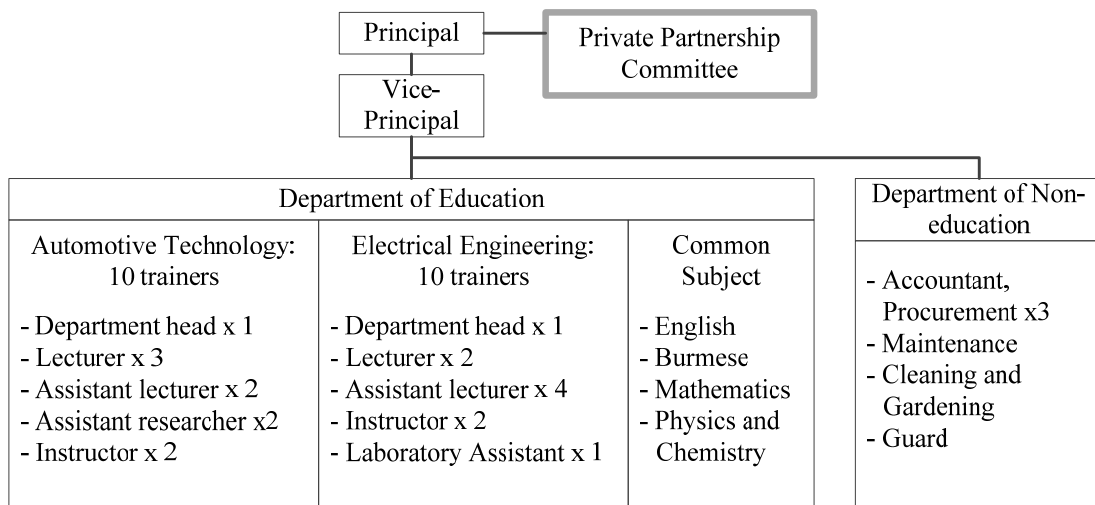
## 2.4 Project Operation and Maintenance Plan

### (1) Project Operation Plan

In the standard organizational structure of GTI, the education and non-education departments are established under the principal and vice-principal. The educational department is made up of trainers, laboratory technicians, instructors and technicians under a department head. JMASVTI has an automotive technology department and electrical engineering department and common subjects such as English, Burmese, mathematics, and science. Teachers of common subjects are part-time.

The principal has the authority to plan the employment of staff and requests to the Director General (DG) of DTVET for the staff employment plan. When the DG approves a request, he or she informs the staff and finance department, starts the process of employment and hiring of teachers and staff, and allocates the necessary budget.

JMASVTI aims to strengthen relationships with industry and establish a Public Private Partnership Committee (PPPC). The PPPC will facilitate employment assistance, an internship program, feedback from the industry on the contents of the curriculum, and so on.



**Figure 2-12 Organization of JMASVTI**

### (2) Maintenance Plan

#### ■ Maintenance of Facilities and Utilities

Various maintenance is required for the sustainable use of the facilities, as shown in Table 2-25. Maintenance personnel execute the work under management by the principal.



**Table 2-25 Maintenance of facilities and utilities**

Item	Maintenance	Responsible organization
Wastewater treatment plant and elevator	Periodical inspection	Special contractor
Firefighting service and generators	Annual operation check	School staff
Water tanks and stormwater network	Annual cleaning of tanks, gutters, and pits	School staff
Lighting fixtures	Replacement of bulbs	School staff
Door, windows, and furniture	Repairs	School staff

■ **Maintenance of Equipment**

A JMASVTI trainer has skills in minor repairs of equipment in his or her field based on initial instruction and the technical cooperation project. Failures which the trainer cannot repair shall be solved by an external contractor.

**2.5 Project Cost Estimation**

**2.5.1 Initial Cost Estimation**

**2.5.1.1 Costs Borne by the Japanese Side (omitted)**

**2.5.1.2 Costs Borne by the Myanmar Side**

**Table 2-26 Costs borne by the Myanmar side**

571.8 Million MMK

Item	million MMK
<b>Before Bidding</b>	
To bear charges for issuance of A/P and payment commissions for consultant agreements	16.3
To secure the land of zones B and C for phase 2, including the following activities: <ul style="list-style-type: none"> <li>- To relocate government staff to other residences;</li> <li>- To demolish existing buildings, structures, foundations, underground pits, trees, roots, and plants;</li> <li>- To conduct UXO detection of the planned foundation depth.</li> </ul>	186.5
<b>During Project Implementation</b>	
To bear charges for issuance of A/P for contracts	9.3
To bear payment commissions for contracts and consultant agreements	38.3
Electricity <ul style="list-style-type: none"> <li>- Upgrading of the contract capacity with YESC</li> <li>- Extension of high-voltage cables to the newly installed transformer</li> </ul>	100.0
Water Supply <ul style="list-style-type: none"> <li>- Connection with the planned water supply network on the site</li> </ul>	6.9

Other furnishings - Furniture which is not provided by the Project - Stationaries and electrical appliances - Curtains, sheets, pillows, blankets - Textbooks and reference books	-
To construct fences and gates and relocate power poles and the bus stop along the main road	214.5
<b>Total</b>	<b>571.8</b>

## ■ Conditions for Estimation

Currency exchange rate : 1MMK=0.072JPY  
(average from December 2018 to February 2019)

### 2.5.2 Operation and Maintenance Costs

The operation and maintenance costs for the facilities and equipment are estimated as below.

#### (1) Personnel Cost

The personnel cost is estimated at 193.3 million MMK based on the number of staff by classification and standard salary amounts.

#### (2) Utility Charges

The utility charges are estimated as shown in the following table.

**Table 2-27 Calculation of utility charge**

Item	Contents and Conditions of Estimation	Annual Cost (.000 MMK)
Water Supply	- The annual operation date is set as 210 days: training days are 190 (38 weeks by 5 days) plus 20 days for administration. - During the non-operation period, 155 days, 50% of hostel students stay. - The water charge is calculated by 0.4 MMK/gal for normal use.	515
Communication	- This charge is not included in this estimation because the telephone and internet utilities are not included in this Project.	NA
Power Supply	- The annual operation date is set as 210 days: training days are 190 (38 weeks by 5 days) plus 20 days for administration. - The working hours are 11, from 7:00 to 18:00. General lights work 5 hours per day, and security lights work 12 hours per day. - During the non-operation period, 155 days, 50% of hostel students stay. - Ceiling fans and air conditioners work 120 days per year. - Utilities concerning security work 120 days. - Consumption by other donors is included in this estimation. - The electricity charge is calculated by 50 MMK/kWh for normal use.	37,178

Fuel	- A diesel generator of 180 kVA works. - Power failures occur once every three days and continue for 1.5 hours. - The diesel price is 920 MML/L, and the consumption ratio is 47 L/hrs.	7,891
Total		45,584

### (3) Facilities Maintenance Cost

In this Project, wastewater treatment plants are installed based on YCDC instructions, and an elevator is installed from a barrier-free perspective. Regular inspections are indispensable for these facilities for sustainable use, and the maintenance costs are estimated as shown in the following table based on estimates by specialized companies.

**Table 2-28 Special utilities maintenance costs**

Item	Contents and Conditions of Estimation	Annual Cost (.000 MMK)
Wastewater treatment plant	- Periodical maintenance, inspection, and cleaning	21,316
Elevator	- Monthly maintenance and inspection and annual legal inspection	3,463
Sum		24,779

Maintenance items of the facilities include: repainting of the outer walls, steel, and timber members; partial repair of finishing materials; partial repair of the roof; replacement of damaged hardware; bulb replacement of light fixtures; repair of utility equipment; replacement of damaged furniture parts, and so on. The following table shows the supposed reference expenses for the maintenance of the facilities and furniture.

**Table 2-29 Calculation of repair and replacement costs**

Item	Annual Cost (.000 JPY)
Building	1,400
Building Services	2,350
Furniture	610
Sum	4,360 (=53,827,000 MMK)

Based on the reference concerning building maintenance in Japan, the current annual facilities maintenance costs may be calculated based on the following assumptions in consideration of the facility components:

- The facilities maintenance charge is assumed to be 0.2% of direct architectural cost.
- The utilities maintenance charge is assumed to be 1.0% of direct utilities cost.
- The furniture maintenance charge is assumed to be 1.5% of furniture cost.

#### (4) Equipment Maintenance Cost

To maintain the equipment, the costs of consumable and replacement parts and periodical maintenance are necessary, and the annual cost is estimated at 38,607 thousand MMK. The estimate of maintenance costs is as shown in the following table.

**Table 2-30 Calculation of equipment maintenance costs**

Equipment name	Q'ty	Consumables/Spare parts	Unit price (.000 MMK)	Amount (.000 MMK)	Basis for calculation per unit (supposition)
Garage lamp	5	Lamp	4	20	2,000MMK/pcs. Replacement twice/yr.
Soldering irons	20	Solder	200	4,000	100,000MMK/kg. Consumption of 2kg/yr.
Double-action sander	5	Sanding paper	36	180	4,000MMK/pcs. × 3 types. Replacement 3 times/yr.
Polisher	5	Buff	116	580	58,000MMK/pcs. Replacement twice/yr.
Arc welding machine	5	Welding rod	40	200	8,000MMK/kg. Consumption of 5 kg/yr.
Gas welding and cutting machine	5	Tip set	90	450	90,000MMK/set. Consumption of 1 set/yr.
		Oxygen gas	120	600	60,000MMK/unit. Consumption of 2 units/yr.
		Acetylene gas	460	2,300	240,000MMK/unit. Consumption of 2 units/yr.
Fume collector	5	Filter	100	500	50,000MMK/pcs. Replacement twice/yr.
Hacksaw	20	Saw blade	20	400	2,000MMK/pcs. Replacement 10 pcs./yr.
Bench grinder	2	Grinding wheel	24	48	6,000MMK/pcs. Consumption of 2 pcs./time and Replacement 4 times/yr.
Drilling machine	2	Drill bit	400	800	200,000MMK/set. Replacement twice/yr.
Electric drill	4	Drill bit	200	800	100,000MMK/set. Replacement twice/yr.
Buried-type car lift	6	Filter	50	300	50,000MMK/set. Replacement once/yr.
Hot water high-pressure washer	1	Hose	240	240	240,000MMK/pcs. Replacement once/yr.
Wheel balancer	1	Gasket set	200	200	200,000MMK/set. Replacement once/yr.
Exhaust gas tester	1	Spare parts set	500	500	500,000MMK/set. Replacement once/yr.
Opacimeter	1	Spare parts set	500	500	500,000MMKset. Replacement once/yr.
Forklift	1	Spare parts, annual maintenance	3,000	3,000	Constant replacement. Periodical maintenance once/yr.

Printer	2	Toner, etc.	2,100	4,200	700,000MMK/set. Replacement 3 times/yr.
Electric drill	6	Drill bit	200	1,200	100,000MMK/set. Replacement twice/yr.
Torch burner	21	Fuel	9	189	3,000MMK/unit. Consumption of 3 units/yr.
Black and white printer	2	Toner, etc.	800	1,600	200,000MMK/set. Replacement 4 times/yr.
Color printer	1	Toner, etc.	2,100	2,100	700,000MMK/set. Replacement 3 times/yr.
Large format printer	1	Ink, roll paper	2,600	2,600	650,000MMK/set. Replacement 4 times/yr.
Chemical experiment equipment set	1	Reagent	600	600	300,000MMK/set. Replacement twice/yr.
Movable whiteboard	9	Marker pen	1,200	10,800	10,000MMK/set (4 colours). Purchase 12 times/yr.
Sum				38,907	

## (5) Conclusion

Based on the above calculations for each item, the total annual amount necessary for the operation and maintenance of the facilities and equipment of this Project is 317.5 million MMK as shown in the following table. Compared with the average expenditure of GTIs in 2017/18 of 384 million MMK, the amount in this table is considered reasonable.

**Table 2-31 Maintenance Costs of the Project**

Item	Annual amount, million MMK
Personnel Cost	193.3
Utilities Charge	45.6
Facilities Maintenance Cost	78.6
Equipment Maintenance Cost	38.9
Total	356.1

## **Chapter 3 Project Evaluation**

## **Chapter 3 Project Evaluation**

### **3.1 Preconditions**

The preconditions of the implementation of the Project is that the obligations to be borne by the Myanmar side described in the minutes of the discussion in the survey and Clause 2.3 of this report are completed within the stated period. Especially, the following items are significant among them.

#### **(1) UXO detection in zones B and C**

Zones B and C, where phase 2 construction takes place, are supposed be cleared of UXO prior to the beginning of the 2020 rainy season. In advance, the following works shall be completed: the substitute residences are prepared; the residents relocate; the existing buildings and underground structures are demolished; and trees, roots, and fences are removed. A lot of concrete debris is generated during demolition, and it must be taken away from the project site. The relocation of the residents shall be carried out according to appropriate procedures based on the consensus of the residents.

#### **(2) Acquisition of the building permit**

A YCDC building permit is required in this Project, which the survey team discusses with YCDC and related authorities. The EMP in accordance with the MONREC guideline was completed and is available for the approval of MONREC. The executing agency is required to obtain the YCDC building permit for the Project by using the survey results and technical documents prepared by the Japanese consultant by August 2019.

#### **(3) Smooth implementation of the tax exemption**

Exemptions from commercial tax and income tax in the implementation of the Project are supposed in new procedures pursuant to ‘MOPF Notification No. 38/2018’ and ‘MOPF Notice No. SaBa/BanDar – 2/1/295 (3048/2018)’. Therefore, both parties receiving and applying are unfamiliar with these new procedures, and it is likely to take time. To ensure the smooth implementation of the tax exemption, the Contractors, Client, JICA, and Consultant need to understand each role, take prompt action, and closely communicate with each other.

### **3.2 Necessary Inputs by the Recipient Country**

The Myanmar side shall ensure the following to generate and sustain the outcomes of the Project.

### **(1) Assignment of ancillary staff**

JMASVTI trainers are already assigned and receiving training from the technical cooperation project; they are preparing to establish the institute with administration staff. The organization of the institute as described in Figure 2-12 is being formed, but common subject lecturers and ancillary staff such as maintenance staff of facilities and services, guards, and so on shall be employed until the handover of the Project.

### **(2) Firm allocation of maintenance budget**

The kinds and number of training equipment of this Project is more than other major GTI, and its maintenance requires more time, effort, and money than usual. For the building services, high-performance wastewater treatment plants and an elevator are installed, and the maintenance charge required is more than that of other major GTIs. In this context, firm allocation of a maintenance budget is required for the sustainable use of the facilities and the equipment after completion of the Project.

## **3.3 Important Assumptions**

Important assumptions to maintain the effectiveness of the Project are as follows:

- Trainers who receive training from the technical cooperation project will continue to work at JMASVTI and not transfer to the private sector;
- The policies concerning TVET such as the ‘Economic Policy of Myanmar, 2016’, ‘Comprehensive Education Sector Review’, and ‘National Education Strategic Plan, 2017’ will be continued, and the national budget for the TVET sector will be allocated sustainably;
- The consumables necessary for the use of the facilities and equipment will be provided and textbooks and software updated.

## **3.4 Project Evaluation**

### **3.4.1 Relevance**

The relevance of the Project is justified as described below:

- The Project will directly benefit the 240 students and 50 to 60 staff of the newly established JMASVTI, while the automotive, power, and construction industries of Myanmar which employ the graduates of JMASVTI will receive indirect benefits from the Project.
- The Project Objective is to establish a TVET institute to provide quality education and training, and its Overall Goal is to contribute to human resource development and



employment creation, reflecting the demands of the business community and labour market in Myanmar. Myanmar industry is growing rapidly but facing a serious shortage of skilled workers. A supply of practical skilled workers responding to industry needs is necessary for stable economic growth in the future. This Project contributes directly to solving this social problem, and its urgency is substantially justified.

- The ‘Comprehensive Education Sector Review’ in 2012, ‘12-Point Economic Policy of Myanmar’ in 2016, and ‘National Education Strategic Plan for 2016 to 2020’ in 2017 were issued with policies concerning TVET to boost the economy, industry, and society. This Project is justified by contributing directly to such policies.
- The Government of Japan issued Japan’s Projected Economic Cooperation to Myanmar in April 2012, consisting of the following three columns:
  - I. Assistance for improvement of people’s livelihoods (including assistance for ethnic minorities and people living under the poverty line);
  - II. Assistance for capacity building and institutional development to sustain economy and society (including assistance for promotion of democratisation);
  - III. Assistance for development of infrastructure and related systems necessary for sustainable economic development.
- This Project corresponds to the item II. In addition, this Project also corresponds to ‘2 Enrichment of education widely received by the people, and job creation in line with industrial policies’ among nine important sectors of Japan-Myanmar Cooperation Program is issued in 2016. Thus, this Project complies with the Japanese policies of assistance to Myanmar and its appropriateness is justified substantially.

### 3.4.2 Effectiveness

#### (1) Quantitative Effect

The expected quantitative effects of implementation of the Project are as follows.

**Table 3-1 Expected Quantative Effect**

Indicator	Course	Baseline (2018)	Target (2025)
Cumulative number of students enrolled in new JMASVTI courses *1	Automotive Technology	0	200
	Electrical Engineering	0	200
Cumulative number of graduates from new JMASVTI courses *2	Automotive Technology	0	78
	Electrical Engineering	0	78

\*1 This quotative effect targets the cumulative number of students who use the facility and equipment by this Project in the courses of automotive technology and electrical engineering, from the first enrollement in December 2019 until the sixth enrollment in December 2024. The number of enrollemnt for the first and second year is set as 40, who will use the facility and equipment since May 2021 and the number of enrollment since the third year is set as 80.

\*2 The cumulative number of graduates in December 2024 is calculated as 160 and is estimated by assumed dropout ratio. The dropout ratio is assumed as one for 40 students who enroll for the first and second year and two for 80 students who enroll since the third year, according to a data of five dropouts for 200 students in Industrial Training Centre Sinde of Ministry of Industry (refer to 'Myanmar Data Collection Survey on Technical and Vocational Education and Training, 2016, JICA')

## **(2) Qualitative Effect**

- The Project will create better training circumstances than other major GTIs in terms of facilities and equipment, and the quality of the knowledge and attitudes towards the jobs the students of JMASVTI shall learn will be improved.
- Girls will be encouraged to enrol in JMASVTI because the number of toilets and lockers are set based on a girls' ratio of 40% which is bigger than the current one.

As stated above, the Project is justified to be highly relevant and effective.