Ministry of Education, Culture, Science and Sports
Mongolia

PREPARATORY SURVEY REPORT
ON
THE PROJECT FOR
THE IMPROVEMENT OF FACILITIES FOR PRIMARY AND SECONDARY EDUCATION
IN ULAANBAATAR CITY
IN MONGOLIA

JANUARY 2018

JAPAN INTERNATIONAL COOPERATION AGENCY (JICA)

CONSORTIUM
MATSUDA CONSULTANTS INTERNATIONAL CO., LTD.
KOEI RESEARCH & CONSULTING INC.

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Preface

Japan International Cooperation Agency (JICA) decided to conduct the preparatory survey and entrust the survey to the Consortium of Matsuda Consultants International Co., Ltd. and KOEI Research & Consulting Inc.

The survey team held a series of discussions with the officials concerned of the Government of Mongolia, and conducted field investigations. As a result of further studies in Japan, the present report was finalized.

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

Finally, I wish to express my sincere appreciation to the officials concerned of the Government of Mongolia for their close cooperation contributed to the survey team.

January, 2018

Akiko Kumagai

Director General
Human Development Department
Japan International Cooperation Agency

Summary

1. Outline of the Country

Mongolia is an inland country in the central East Asia, landlocked between Russia to the north and China to the south. The land area is 1,564,100 km^2 (about four times as large as Japan), and the total population is 3.121 million (National Statistical Office, 2016). Occupying the western part of the country, the Altai and Khangai Mountain ranges reaching 4,000 m above sea level trend to the central and eastern plateaus at an elevation of 1,000 to 1,500 m. The southern part of Mongolia is bounded by the Gobi Desert. The steppes comprise 70% of the land area. The climate is typically continental, arid throughout the year, which is prone to extreme temperature variations in terms of the daily and yearly ranges.

With the collapse of the Soviet Union, Mongolia became a democratized and liberalized country in 1990. The country managed the serious economic crisis afterwards with support from the international community. Throughout the 2000s, it sustains robust economic growth with increased agricultural and livestock production, and rising mineral resource prices in the world market which have boomed foreign investments. During the global economic and financial crisis in 2008, the country decelerated its real GDP to -1.3%. In 2011, it achieved the real growth at 17.3%, showing a remarkable resilience. However, because of the discriminatory investment policy adopted against a backdrop of emerging resource nationalism, foreign direct investment has plummeted. This led to low GDP growth at 2.3% in 2015, and -1.56% in 2016, coupled with a slump in resource prices and China's growth moderation. The government revenue has also decreased substantially as a result of the recession. Mongolia is now in very harsh fiscal and economic conditions.

Sector-specific GDP shares are 13.6% in the primary industry, 34.1% in the secondary industry, and 52.3% in the tertiary industry[1]. Mongolian economy is underpinned by the agriculture and stock raising sectors which account for 30% of employment. The mining sector also plays a prime role, accounting for 16.7% of GDP by itself and 70.8% of total exports. In terms of Mongolia's foreign economic relations, China is by far the dominant trading partner, accounting for 79% of exports and 32% of imports. The country also continues to maintain a strong relation with Russia.

2. Background and Outline of the Requested Assistance

Mongolia has achieved 99.3% of the enrollment rate in five-year primary education and 96.9% in nine-year compulsory schooling which completes four-year lower secondary education. In the capital Ulaanbaatar city (hereinafter referred to as "UBC"), however, provision of educational facilities has not kept up with an increase in school-aged population resulting from a rising birth rate as well as a growing number of students accelerated by the influx of rural migrants. This has compelled as many as 31 schools to run their classes in three shifts a day, equivalent to nearly a quarter of all public schools as of the 2016/17 academic year. More students need to commute a long distance beyond

[1] NSO Statistical Yearbook, 2015

their original education districts where there are no schools available for them. These circumstances have seriously undermined the educational environments.

To address the above problems, the Government of Mongolia (hereinafter referred to as "GOM") has set out one of the objectives in its Mongolia Sustainable Development Vision 2030 approved in 2016 to "improve the general education system to the international benchmark levels and ensure impartation of quality education." It envisages a broad-based coverage of school infrastructure, while also aiming at "creating a healthy, safe and student-friendly environment at all levels of education." In the Government Action Program for 2016-2020, which is a mid-term implementation guide, also intends to "eliminate three-shifts in schools" and "create a healthy, safe and student-friendly environment in terms of social, psychological and infrastructural services at all levels of education."

Notably, Mongolia has worked towards fulfilling rights of children with disabilities (hereinafter referred to as "CWD") to access to education after "Inclusive Education Program of Children with Disabilities" was approved in 2003. As a part of this effort, the Law on the Rights of Persons with Disabilities enacted in 2016 stipulates reasonable accommodations for CWD to be included in educational settings. Furthermore, in response to growing social needs for disability-related accommodations, the country is sought to create relevant model facilities. At the same time, to prepare against potentially increasing earthquake hazards in UBC, GOM has revised the Disaster Protection Law reinforcing disaster prevention schemes, while also updating seismic design criteria on buildings and assessing earthquake resistance in existing schools. Apart from these government-led risk reduction, schools are expected to have pivotal functions in preparing against disasters to safeguard local people and communities. GOM also enacted the National Green Development Policy in 2014 which sets out the Green Growth strategy. This is applied to modeling of energy-efficient, and environmentally friendly educational facilities or "Green Schools" where environmental considerations are an integral component of school construction.

Under these circumstances, GOM is elaborating on architectural requirements and a standard design (Model Blueprint) to ensure the quality and efficiency in educational facilities. Its initiatives to increase access to education include a shift towards integrating kindergartens and primary schools that are likely to have the greatest supply and demand gap in enrollment over the coming years. Another is a concession approach[2] to project financing involving the private sector. However, due to a decline in funding of aid agencies as Mongolia achieves economic growth, financial resources are insufficient to absorb an increase in students exceeding 10,000 per year. With a curtailed budget since 2017 due to economic slowdown, GOM has suspended all the new investment projects.

Accordingly, GOM requested the Government of Japan for grant aid to construct and improve primary and secondary schools in UBC.

[2] According to "Law on Concession", "concession" means "an exclusive right to possess, operate, create and renovate state and local own property assets for the purpose of rendering basic social and infrastructure services on the basis of an agreement". In general, it means the method of improving social structures by promoting private capital and know-how, granting an exclusive right on the public assets for the purpose and the period defined in an agreement. In Mongolia, some types of concession agreements are prescribed on the low besides "build-operate-transfer" approach, and mainly "build-transfer" approach, which does not include granting the right of operation, has been used for school constructions.

3. Summary of the Study Results and Contents of the Project

Upon request from GOM, Japan International Cooperation Agency (JICA) sent a preparatory survey team from November to December 2016 to Mongolia. It collected and reviewed an array of evidence supporting the needs and relevance of the requested school construction, including the context in which the request was made, current conditions and problems in primary and secondary education, and national education policies. In discussion with the Mongolian government officials concerned, the survey team endorsed the project's key objective to "create quality model schools for future projects," considering multifunctional roles of schools perceived in recent years. From January through April 2017, the survey team reviewed with the Mongolian side on the components and physical capacities of the requested facilities and components in accordance with the agreed objective. It surveyed conditions of the proposed and existing sites where the facilities and equipment may be provided, and also investigated similar facilities. With the topographical and geological surveying over the proposed sites, the survey team identified various preconditions to be met for implementation of the Project. Subsequently, it analyzed the findings in Japan and prepared an outline design of the Project.

1) Target sites, components and scale of the proposed assistance

With universal design approach to "making a user-friendly environment," the Project is tasked with creating model facilities for Mongolia's future school construction projects, incorporating disability-related accommodations, disaster preparedness, and environmental friendliness. The target locations (urban-center or rural-suburbs) and suitable architectural strategies (new construction or expansion) are organized into four categories each representing unique needs and conditions. Based on findings in the Field Study on requested ten sites, the target sites were chosen from each category, where they were projected to have the largest enrollment demands among others anticipating sufficient prospective students. The Project decided on school capacities at each target location so as to accommodate a standard class structure comprising a 12-grade system. Then, four kinds of classroom distribution were planned so that they would have enough space for two-shift schooling, ranging from 23 (new construction-center) to 8 classrooms (expansion-suburbs).

The components compound the most needed facilities and equipment required for the curriculum, considering the priorities discussed by both parties and a standard suit of items in GOM-funded recent primary and secondary schools. The Project eliminated those requested items that were less frequently equipped or used, and uncertain whether indispensable in implementing the curriculum. Where possible, rooms will be used to meet multiple purposes so that the facility configuration will be on a reasonably modest scale. Educational equipment will be also provided with minimum sets needed to implement the current curriculum. It was chosen from locally purchasable items to make replacement and maintenance easier. Apart from these, both parties agreed to include a soft component into the Project so that the completed schools would be fully used as intended models.

2) Outline design of the proposed facilities and equipment

The Project has incorporated universal design[3] into its facility planning as a shared and generic principle that should be applied to new school construction projects. The planning deliberated on a set of reasonable accommodations, each adjusted to the site conditions, with particular focuses on accessibility for persons with disabilities, including children, disaster preparedness, and environmental friendliness. All floor levels will be connected with a gently sloping ramp aligned with international standards, and they will allow facility users to circulate at the center of building, accessible to various facility functions. Including the existing buildings, the target schools are designed to have access-free[4] floors at all levels and barrier-free[5] access in newly constructed areas. On the ground floor, furthermore, a CWD-accessible classroom and a wheelchair-accessible multifunctional toilet will be provided. The Project will also provide Child Development Center that is one of the standard accommodations for CWD prescribed in Mongolia, as the space in which a social worker is stationed.

In terms of risk-mitigating measures against natural disasters, it is ensured that buildings are earthquake resistant, according to structural analysis to meet the same or stricter requirements imposed by Mongolia's seismic code currently under revision. These buildings also will be equipped with an alarm system, fire-extinguishing installations, and emergency evacuation devices aligned with Mongolia's the latest disaster- and fire- prevention codes.

Rooms in the target facilities were distributed in accordance with facility components and design specifications in the similar school projects recently undertaken by GOM, while also considering how various existing rooms were being used. The number and capacity of classrooms were determined according to the curriculum and school administration planned in the target schools. The buildings will be a plane structure with either side- or middle- corridors, depending on the angle of direction. Their simplified, rectangle shapes were designed to satisfy workability and thermal efficiency. An underground space to prevent frost heaving will be made usable for educational activities and other purposes to be fulfilled without natural light. The buildings basically compound four floor levels, including basements. The sites in suburbs will construct two floored buildings to suit their surrounding environments.

As for equipment, an essential set of educational tools and devices will be supplied to implement the current curriculum, which the Project has decided on their specifications and quantities to meet prescribed learning, after reviewing how the existing instruments are used in regular experiments and exercises and maintained. Basic equipment to assist CWD's learning will be supplied, excluding such devices that are difficult to maintain in Mongolia.

Planned facilities, furniture, and equipment are summarized below.

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[3] Concept to ensure the user-friendly design, regardless of age, sex, or disabilities.

[4] "Access-free" denotes the conditions in which all socially vulnerable and/or physically disabled individuals, including wheelchair users and the elderly, can access to all floor levels by themselves.

[5] "Barrier-free" denotes the conditions that do not impede use or activities by socially vulnerable and/or physically disabled individuals, including wheelchair users and the elderly.

Table 1 Key Components of the Proposed Facilities

Facility content		Site/Schools	A-1 No. 75 School	A-2 No. 7 Khoroo	B-1 No. 53 School	B-2 No. 109 School
		District	Khan Uul	Chingeltei	Bayanzürkh	Nalaikh
		Floors	an underground floor and three above-ground floors	two underground floors and two above-ground floors	an underground floor and three above-ground floors	an underground floor and two above-ground floors
Classroom building	General Classroom (36 students) (Included CWD-accessible Classroom)		23 rooms (3 rooms)	18 rooms (2 rooms)	12 rooms (3 rooms)	8 rooms (2 rooms)
	Multipurpose Room		2 rooms	1 room	1 room	1 room
	ICT Laboratory		1 room each			
	Child Development Center		1 room each			
	Library (reading room / bookshelves)		1 room (36 seats)	1 room (36 seats)	1 room (18 seats)	1 room (18 seats)
	Craft room 1, 2		1 room each	1 room each	-	1 room each
	Flexible Space (multipurpose space)		1 room	3 rooms	2 rooms	1 room
	Director/ Deputy Director's Room, Secretary's Room, Accountant/Treasury Room		1 room each	1 room each	-	-
	Teacher's Room		1 room (32 seats)	1 room (26 seats)	1 room (16 seats)	1 room (14 seats)
	Training Manager's Room /Space		3 rooms	2 rooms	1 room	2 rooms
	Medical Room・Guard Room		1 room each			
	Staff Room		1 room each for male and female staff			
	Kitchen / Cafeteria		63 seats	54 seats	-	-
	Pantry		-	-	1 room	1 room
	Auditorium (Art Hall)		1 room (150-people capacity)	1 room (150-people capacity)	-	-
	Lavatory (for male and female students)		4 rooms each	4 rooms each	4 rooms each	3 rooms each
	Lavatory (multifunctional, wheelchair-accessible)		4 rooms	4 rooms	4 rooms	3 rooms
	Lavatory (for male and female teachers)		1 room each	1 room each	1 room each	-
Gymnasium			1 (large)	1 (large)	1 (small)	-
Facility	Boiler Room		-	equipped	-	equipped
	Power Generator Room		equipped	-	equipped	equipped
	Total Floor Areas (㎡)		6,301.57	5,058,90	3,356.64	2,631.888
	Total Floor Areas (㎡)		17,348.99			

Table 2　Overview of School Furniture

Category	Main Furniture	Usage・Rooms	Qty.
Furniture for Classroom	Students' desk/chair (36 sets), Teacher's desk/chair (1 set), Glass white board (2), locker (6), Wheelchair-accessible desks (10)	General Classroom (36 students)	2,755
	Lab table (6), Stool (36), Lab table/chair for teacher (2 sets), Glass white board, Teacher's desk, Stool, Steel bookshelf (12)	Multipurpose Room (36 students) Preparation room and warehouse for above	295
	PC table (18), PC Chair (36), Teacher's desk/chair (1 set), Glass white board (1), Printer table (1), Steel bookshelf (10) Open rack (2)	ICT Laboratory (36 students) Preparation room and warehouse for above	241
	Craft table (3), Stool (18), Teacher's work table/chair (2 sets), Glass white board (1), Teacher's desk (1), Steel bookshelf (4)	Craft room 1 (18 students), Preparation room for above	87
	Trapezoid table/stool (18 sets), Teacher's desk/chair (2 sets), Glass white board, Steel bookshelf (4)	Craft room 2 (18 students), Preparation room for above	25
Furniture for Library	Reading table (20), reading chair (120), Teacher's desk/chair (2 sets), Open rack (15), bookshelf (74)	Library・bookshelves	237
Furniture for Child Development Center	Director's desk/chair (1 set), Trapezoid table (12), Stool (12), locker, Glass white board, Steel bookshelf (2), Movable white board (5), Movable partition (4), Cushion chair (2)	Child Development Center (shared for Social Worker's Room)	160
Furniture for Auditorium (Art Hall)	Stacking chair (150), PC desk/chair for PC (2 sets), Open rack (6)	Auditorium (Art Hall), mixer room and warehouse for above	316
Furniture for Gymnasium	Locker (13), Teacher's desk/chair (1 set), Wooden bench (10)	Preparation room for Gymnasium, locker room	24
Furniture for Cafeteria	Dining table (52), Stacking chair (117), Office desk/chair (1 set), Wooden bench, lockers	Cafeteria, Kitchen, Kitchen Staff Room	175
Furniture for Medical Room	Doctor's desk/chair (1), Stool (2), lockers, Steel bookshelf, Examination bed	Medical Room	24
Furniture for Management	Director's/manager's/office desk/chair (5 sets), Guest chair (4), Meeting chair w/6 chairs (2 sets), Steel bookshelf (11), Glass white board (4), Wooden bench	Director/ Deputy Director's Room, Secretary's Room, Accountant/Treasury Room	54
	Manager's desk/chair (7 sets), Meeting chair w/6 chairs (7 sets), Guest chair (14), Steel bookshelf (66), Glass white board (15), locker (39), Teacher's desk/chair (89 sets), Printer table (4),	Training Manager's Room Teacher's Room	241
	Open rack (28), Wooden bench (9), Office desk/chair (4 sets), locker (4)	Others	45

Table 3 Overview of Educational Equipment

Category	Main Equipment	Subject・Room name	Qty.
Equipment for Primary Education	Abacus, Geometric block models, Measurement set, Scales set, Maps, Mongolian language CD audio	Primary classes (Math・Mongolian language・Human environment)	13
Equipment for Physical education	Hurdle, Basketball/ Volleyball/ Futsal Balls, Gymnastics mat, Table tennis set・Badminton set	Gymnasium (Physical education and health)	18
Equipment for Science experiments	[Physics Lab. equipment] Mass with hanger / Spring / Pulley /Inclined plate set/ Magnet set, Cart for dynamic experiments, Oscilloscope [Chemistry Lab. equipment] Molecular model, Thermometer, glass tools, Centrifuge [Biology Lab. equipment] Compound microscope, dissecting kit, Immersion specimen, anatomical model of human body, Various specimens	Multipurpose Room (Science)	71
Equipment for Craft room	[Sewing machine materials] Electric sewing machine, Steam iron, Shears for sewing, Embroidery frame, Crochet hook set for knitting [Metalworking machine] Metal cutting saw, Pliers, Vise, Metal lathe, Grinder, Soldering iron [Woodworking machine] Plane / Chisel /Saw / Wooden hammer / Hammer, Tape measure, Thicknesser (Planer), Wood lathe, Electric drill	Craft room 1, 2 (Technology)	41
Equipment for music	Smart board, Morin khuur, Yatga, Shanz, Khuuchir, Flute, Keyboard harmonica	Auditorium (Art Hall) (music)	13
Equipment for ICT	Desk top computer, Printer	ICT Laboratory (Information)	3
Equipment for Medical Room	Weight scale, Height measuring scale, Sphygmomanometer, Spirometer	Medical Room	5
Equipment for children with special needs	Book holder, Desktop electronic magnifier for reading assistance, Triangle Cushion	Child Development Center (education for CWD)	4
Common Equipment	Projector, Screen	Each subject class	4

4. Implementation Schedule and Project Cost Estimation

When the Project is implemented with a Japanese grant aid, it requires 5.5 months for the detailed design, 3 months for a tender process, and 23 months for construction work, including a preparatory period before the construction starts and a test and handover period upon facility completion. Procurement of equipment and furniture will be completed in the construction period, which includes a period from the start to handover. GOM's share of costs for implementing the Project is roughly 47.73 million yen.

5. Project Evaluation

The Project will construct schools representing models of quality educational settings, while also alleviating a shortage of facilities. It will directly benefit about 6,900 students and 400 teachers and school staff who will be using the constructed primary and secondary schools. They will ultimately contribute to achieving quality learning environments widely across Mongolia, when they are used to encourage such good practices in other schools.

In UBC targeted by the Project, educational settings are seriously deteriorating because of a population increase and concentration. The number of students increased by 38,000 in three years (in public schools from 2014/15 to 2016/17). Of all the UBC-based public schools, 24% (31 schools) are compelled to run their classes in three shifts, which calls for urgent solutions.

GOM has set out one of its overall policy objectives in "improving the general education system to the international benchmark leveks," while also prioritizing a broad-based school coverage which should be achievable with "creating a healthy, safe, and student-friendly environment at all levels of education." The Project is thus consistent with what GOM is working for. Furthermore, Japan has articulated to "assist Mongolia's self-supporting efforts for poverty reduction through sustainable economic growth." The Project is consistent with such Japanese assistance policy that endorses delivering more positive results from Japan's past and ongoing assistance in Mongolia's education sector.

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

- In the target schools and district, the number of classrooms usable continuously increases from 35 (a baseline in 2016) to 96 (+61 classrooms, in three years after the project completion in 2023).
- In the target schools and district, the number of students learning in classrooms usable continuously increases from 2,383 (in 2016) to 6,912 (+4,529 students, in 2023).

In addition, the following qualitative effects are expected through the implementation of the Project.

- Awareness of issues on "persons/children with disabilities", "disaster preparedness" and "environmental friendliness" will be increased among school directors, teachers and community members, by incorporating considerations to those issues into their school facilities.

In light of the above, the Project is highly relevant and considered effective.

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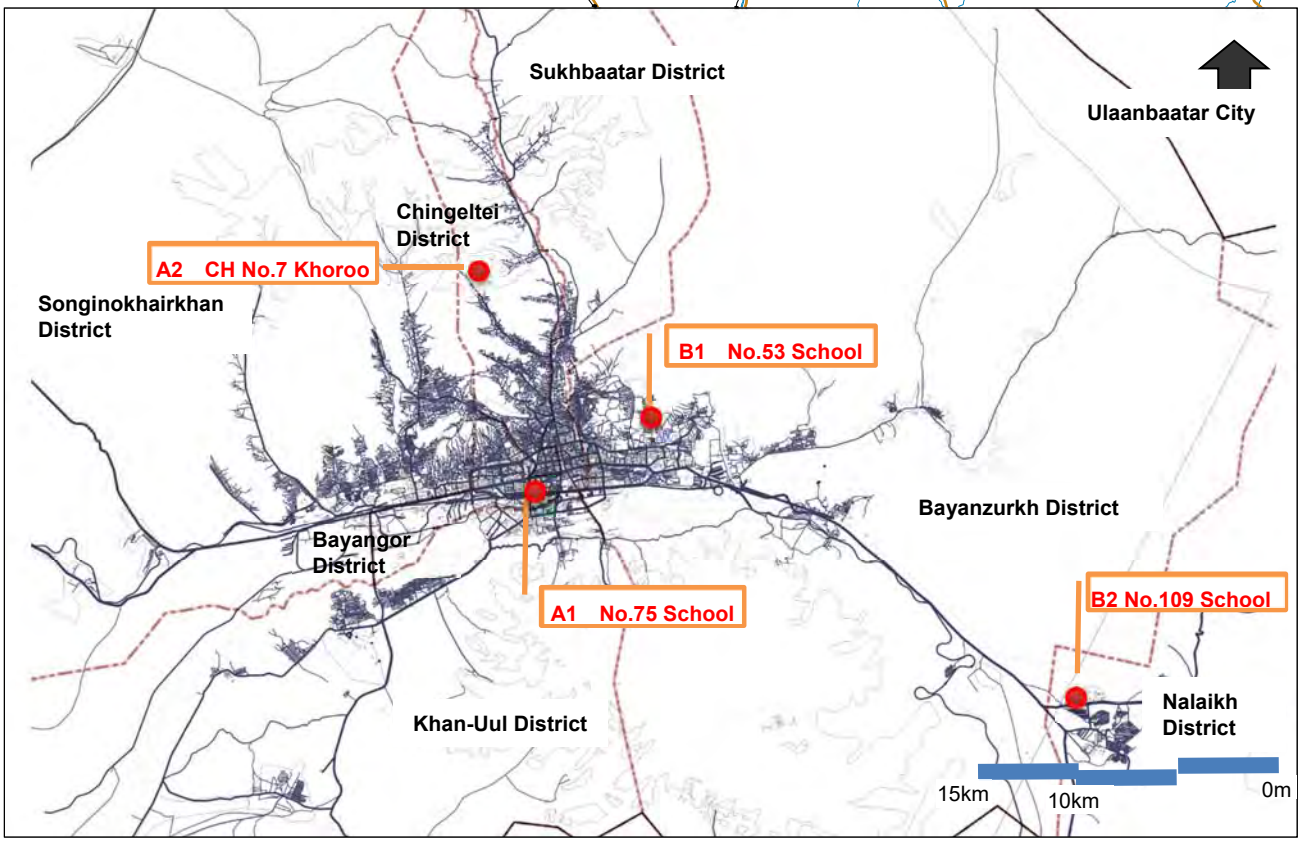
Appendices

LOCATION MAP



PERSPECTIVE

Birds-eye view of No. 75 School, Khan-Uul District (A-1)

Birds-eye view of No. 7 Khoroo, Chingeltei District (A-2)

Figures and Tables

Abbreviations

AEP	Aclyric Emulsion Paint
A/P	Authorization to Pay
B/A	Banking Arrangement
CB	Concrete Block
CD	Compact Disk
CWD	Children with Disabilities
EIA	Environmental Impact Assessment
EMDC	Emergency Management Department of the Capital City
E/N	Exchange of Notes
EPS	Expanded polystyrene
G/A	Grant Agreement
GDP	Gross Domestic Products
GL	Ground Level
GIS	Geographical Information System
GOM	Government of Mongolia
ICT	Information and Communication Technology
JICA	Japan International Cooperation Agency
JIS	Japan Industrial Standards
LAN	Local Area Network
LED	Light Emitting Diode
MCUD	Ministry of Construction and Urban Development
MECSS	Ministry of Education, Culture, Science and Sports
MEDG	Ministry of Environment and Green Development
MOF	Ministry of Finance
MPR	Multi-purpose room
NEMA	National Emergency Management Agency
PB	Plaster Board
PBX	Private Branch Exchange
PC	Personal Computer
P/Q	Pre-Qualification
PVC	Polyvinyl Chloride
RC	Reinforced Concrete
UBC	Ulaanbaatar City Education Department
UBC-ED	Ulaanbaatar City
WMO	World Meteorological Orgainzation
WS	Workshop
XPS	Extruded polystyrene

Chapter 1 Background of the Project

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1-1 Background of the Project

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Another is a concession approach to project financing involving the private sector. However, due to a decline in funding of aid agencies as Mongolia achieves economic growth, financial resources are insufficient to absorb an increase in students exceeding 10,000 per year. With a curtailed budget since 2017 due to economic slowdown, GOM has suspended all the new investment projects.

Accordingly, GOM requested the Government of Japan for grant aid to construct and improve primary and secondary schools in UBC. Upon request from GOM, Japan International Cooperation Agency (JICA) sent a preparatory survey team from November to December 2016 to Mongolia. It collected and reviewed an array of evidence supporting the needs and relevance of the requested school construction, including the context in which the request was made, current conditions and problems in primary and secondary education, and national education policies. In discussion with the Mongolian government officials concerned, the survey team endorsed the project's basic policy to "create quality model schools for future projects," considering multifunctional roles of schools perceived in recent years. Subsequently, provisionally requested 28 sites were narrowed down to 10, and then finalized as follows:

- Facility construction: 10 sites in UBC
  Expansion of existing schools (6 sites), Renovation and relocation of existing schools (2 sites), and new construction (2 sites)
- First priority: General classrooms, teachers' room, toilet and washroom, cloaks, ICT classroom, science laboratory, gymnasium, kitchen, medical room, rooms for various staff members, and library
- Second priority: Cafeteria, special classroom, craft rooms for technology/home economics, vocational training room, auditorium (art hall), art room, and playroom for 1st-grade students

• Procurement of furniture and equipment for educational and administrative areas to be equipped in the above facilities

1-2 Natural Conditions

(1) Topography and geographical features

Located in the inland Eurasian Continent, Mongolia is landlocked between two large countries, China and Russia. At the average altitude of 1,580 m, the country has 1,564,100 km^2 of the land area (four times as large as Japan) where the plateaus extend 2,392 km from east to west, and 1,259 km from north to south. Topographically, Mongolia rises in altitude from east to west. The northwestern part is peaked with the 4,000-meter-class Altai and Khangai Mountains, while the eastern part is a plateau at an elevation of 1,000 to 1,500 m. The steppes cover 70% of the national territory, which are divided equally into three zones from the north: forest steppe, steppe, and desert steppe. To the southward is the Gobi Desert at an average altitude of 1,000 m.

UBC, the area targeted by the Project, is located in the northeastern part of the country where the

forest steppe of 1,351 m above sea level predominates. Central UBC is a basin extending from east to west along the upper Tuul River branching from the Selenga River. In southern UBC, the Bogd Khan Mountain peaks 2,391 m. The rest of the city is surrounded by 2,000-meter hills and mountain ranges at the southern west end of the Hentiyn Mountains. The built-up areas in UBC are mostly situated in flat terrace surface on the right bank of the Tuul River, northern hillsides, and the bordering foot hills. Urban peripheries around UBC continue to roll on the left bank of the Tuul River and also into hilly lands in the north, west, and east.

(2) Climate conditions

Mongolia has a continental climate, situated in a middle-latitude high-pressure range. The altitude is high, and the climate is typically extremely cold and arid, and wide in the daily and annual temperature ranges. The average monthly temperature is 22.7℃ at minimum and 26.4℃ at maximum. Whereas the temperature in summer can exceed 30℃, winter extremes drop as low as -35 to -40℃.

The annual rainfall remains 200 to 300 mm, which is concentrated in summer from June to August. The country has four seasons which include about six months of severe winter lasting from late October through early April. The winter is the most arid time of the year, with little snow and moderate wind. Spring lasts less than two months from early April to the end of June, marked with drastic changes in temperature and a fluctuation in weather. Wind gust exceeding 15 m per second as well as sand and snow storm are often observed. In about two months from late June to the end of August, the temperature rises, and yet because of low humidity, the dry air makes summer moderate. Rainfall concentrates in this period, albeit little in the amount. Intense rain, however, occurs occasionally with lightning and hailstorm. The subsequent period less than two months between September and October are autumn, start snowing. The temperature sharply drops as low as below zero even in the daytime in late October, followed by a seasonal shift to winter.

Table 1-1 Meteorological Data in UBC

	Jan	Feb	Mar	Apr	May	June	July	Aug	Sep	Oct	Nov	Dec	Annual
Average maximum temperature ℃	-15.6	-11.4	-2	8.3	16.8	21.6	22.7	21.5	15.6	6.8	-4.4	-13.7	5.5
Average temperature ℃	-24.6	-20.6	-9.8	0.3	8.9	14.6	16.6	14.7	7.3	-1.1	-13.2	-21.9	-2.4
Average minimum temperature ℃	-26.5	-21.4	-15.4	-5.8	2.7	8.3	11.2	9.3	2.2	-6	-16.2	-23.8	-7.0
Precipitation	1.1	1.7	2.7	8.3	13.4	41.7	57.6	51.6	26.2	6.4	3.2	2.5	216.4
Average number of rainy days	0	0	1	2	4	5	10	8	3	2	1	0	36
Average number of snowy days	1	1	1	0	0	0	0	0	0	0	1	1	5
Relative humidity %	73	66	61	42	40	44	54	49	43	48	57	75	54.3

Source: WMO Climate Normals (1961-1990)

(3) Natural disasters

Although none of the target sites have ever experienced building damage caused by natural disasters, potential risks in UBC include intense rainfall resulting in floods, gales, sand and snow storms, lightning, and earthquakes. Flood damage is getting more serious partly because of poor infrastructure and haphazard urban sprawling in unsafe areas such as riverfronts and hilly ranges. In fact, UBC has floods almost every year, and the major floods have been recorded nearly every decade.

Table 1-2 Major Natural Disasters in UBC

Date of occurrence	Type of natural disaster	Description
2009.6.17	Flood	A flood caused by intense rain with hail, which affected more than 3,000 people in the UBC-based ger area, including 26 deaths and 130 households losing their residences.
2003.7.18	Flash flood	Intense rain of 56 mm in 40 minutes inundated more than 300 buildings, 93 building collapse, and 15 deaths in UBC and multiple provinces.
1994.8.10	Flash flood	Three UBC districts had 5 deaths, serious damage on residences, roads, bridges and other infrastructure, and inundation in the business districts.
1983.8.03	Flood	Intense rain of 44 mm in 19 minutes caused 130 deaths.

Source: Asian Disaster Reduction Center, and other references

Although earthquake damage has not occurred in UBC, Mongolia, especially in its western part, experienced four inland earthquakes of magnitude 8.0 or equivalent, and 13 earthquakes of magnitude 7.0 or larger, recorded exclusively in the 20th century. Areas around UBC are less prone to seismic activities compared with the western area. After 2003, however, UBC and surrounding areas have an increasing number of earthquakes, where felt earthquakes occurred a few times. These areas have identified some faults, and it is revealed that they are highly likely to induce a 7.0 magnitude earthquake or equivalent, though in several thousand years of recurrence intervals.

(4) Geological features and subsoil

Soils in areas around UBC are composed of Palaeozoic metamorphic rocks, Devonian and Carboniferous terrigenous sediments made of sandstones and mudstones, and granites intruding into these bodies. Foothills and riversides are distributed with newly deposited clay and gravel sediments. Except for the Tuul River and the basins of the branch rivers, the UBC terrane deeper than about 3 m is typically clayey sand or sandy clay mixed with gravel, showing N-value between 30 and 40. At the depth of 8 to 15 m or more, the N-value exceeds 50, revealing stable and firm subsoil conditions.

The Field Study commissioned a soil condition survey (boring, a standard penetration test, and sampling) to a local agency, carried out in seven locations including the four target sites. The survey was based on the following procedures:

- Survey components: Boring (a depth of 10 m, 2 to 4 points in each site) a standard penetration test (at a 1.0 m interval), undisturbed soil sampling (GL-1.0 m and at a 2.0 m interval), and physical properties test of soil samples (particle size distribution, specific gravity, moisture content, Atterberg scale, and triple compression stress test)
- In the two sites where no piped sewerage is provided, a permeability test was additionally

conducted to assess the soil that would treat waste water with a septic tank and seepage pit.

The survey findings indicate that the target bearing layers in the four sites are all as firm and dense as having 250 to 500 kPa of the likely bearing capacities of soil. Specific findings are as summarized below. Some appropriate measures should be studied in A-1 site with a high groundwater level and B-2 site where a layer deeper than 4 m from the surface is found to be permafrost.

Table 1-3 Findings of the Subsurface Survey

Site	A-1 No. 75 School	A-2 CH No. 7 Khoroo	B-1 No. 53 School	B-2 No. 109 School
Location	Located on a terrace surface on the right bank of the Tuul River. Area with apartment buildings in the south of the urban center, increasingly developed for residential use	Located at the end of ger area extending along the valley stretching northward from the basin	Located at the eastern end of the downtown where ger area and an apartment complex coexist in the business area	Area about 35 km away to the southeast from the urban center, whose geographic location and economy are isolated from the city
Topography (construction area)	Altitude: 1,285 m Difference in altitude: 0.6 m	Altitude: 14,87.2-1,496.8 m Sloping to the southeast	Altitude 1,318.5-1,320 m Foothill in the north of the Tuul River	Altitude 1,485.14-1,485.85 m
Soil properties in the target bearing layer	Yellowish brown, gravelly soil mixed with sand	Yellow, gravelly soil mixed with clay and sand	Yellowish brown, silty and sandy soil mixed with gravel	Light yellow to Yellowish brown, silty and sandy soil mixed with gravel
Groundwater level	3.6－3.8 m ＋1.0-1.5 m in summer	10 m or deeper	10 m or deeper	10 m or deeper
Seismic intensity scale	ZONE 8	ZONE 7	ZONE 8	ZONE 7
Expected bearing capacity of soil	500kPa	450kPa	250kPa-400kPa	500kPa
Base freezing depth*	GL-3.8m	GL-3.5m	GL-3.1m	Permafrost (4 m or deeper)
Permeability	-	0.116 cm/sec	-	0.007.cm/sec

* The calculated freezing depth to determine the depth of building foundation is a value adjusted to a set of conditions provided. For instance, for a building with a basement, the coefficient varying from 0.4 to 0.8 is multiplied, depending on the room temperature.

1-3 Environmental and Social Considerations

(1) Impact of the project implementation on natural and social environments

The Project intends to construct school facilities on the premises of the existing schools or on lots prepared for new schools. They have variations in geographical features or surrounding conditions, and yet because no large trees exist thereon, they do not require a large-scale reformation of land and vegetation to implement the Project. The planned facilities are complied with environmental requirements prescribed in Mongolia, incorporating the following considerations to avoid likely adverse impacts on the natural environment as much as possible.

- A facility layout on a sloped site will be tailored to the local topographic conditions so as to minimize excavation and land development.
- Successive ditches will be laid to release rainwater off the premises so as to prevent soil runoff and land erosion.
- In the target site where a piped sewerage system is unavailable, a conventional sewage collection (suctioned by a vacuum truck) will be replaced with a system permeating water treated in a septic tank into the soil.
- In the target sites where no hot water for heating is supplied, a high-efficiency coal boiler will be used. This is concluded from findings of a comparative study on the initial and running costs, easiness of maintenance work, and other factors.

In terms of social environment, the Project is unlikely to involve resettlement of the existing dwellings and alternations of the living environment for local residents, because the construction sites are located on the premises of the existing schools or a vacant lot. An adverse impact is thus unlikely to arise on nearby communities. Furthermore, in the target schools situated in built-up areas, a facility layout will elaborate on provision of enough space between buildings to minimize potential obstruction of sunlight and wind hazard on surrounding residential areas. At the same time, it is planned to prevent construction noise and a deteriorated safety in the dwelling environment as much as possible by locating appropriate delivery routes and temporary structures during construction.

In light of the above, the Project is categorized into a "project having a minimal or virtually no impact on the environment and society."

(2) System and Procedures Related to Environmental Impact Assessment

Mongolia's Environmental Impact Assessment (hereinafter referred to as "EIA") is prescribed in the Law on Environmental Protection (enacted in 1995 and revised in 2012). It is required for any projects that are likely to have adverse effects on the environment. More specifically, the Law on Environmental Impact Assessment (enacted in 1998, and revised in 2002) defines the four major assessment schemes, namely, (1) Strategic Environmental Assessment, (2) Environmental Baseline Assessment, (3) Cumulative Impact Assessment, and (4) Environmental Impact Assessment. Of these schemes, Ministry of Environment and Green Development (MEGD) or a provincial environmental department undertakes the General Evaluation on (4) to screen a relatively small-scale project that is likely to involve minor impacts applicable to the Annex to the said Law. On the other hand, a relatively large-scale project that is likely to involve significant impacts undergoes scoping based on the General Evaluation outcomes. The project implementer is obliged to commission an MEGD-registered environmental consultancy to perform the Detailed Evaluation[6].

The Project is not applicable to the activities indicated in the Annex. Nevertheless, as a result of a

[6]The General Evaluation is equivalent to Initial Environmental Examination (IEE), and the Detailed Evaluation, to Environmental Impact Assessment (EIA).

preliminary discussion with the UBC Environmental Department in charge of environmental screening of the Project, it was noted that the intended plan should be approved after verifying that it would involve no major adverse impacts, with relevant evidence in Environment Baseline Assessment. To respond to this, it was agreed with UBC Educational Department (hereinafter referred to as "UBC-ED"), the implementing agency for the Project, that it would perform the Environment Baseline Assessment after brief project description is finalized, which is required to apply for environmental screening of UBC Environmental Department for a development project.

To request the environmental screening of UBC Environmental Department, an Environmental Baseline Assessment report and the below documents need to be submitted. The screening of UBS Environmental Department takes 14 working days[7] on average.

- Company name, type of business, and a copy of corporate register (which are abridged as the Project is implemented by UBC- ED)
- Project outline and schematic drawings
- A copy of land ownership, location map, and layout plan
- Request from UBC-ED to perform an environmental social consideration screening
- Written agreement of the district governor on the intended construction

The Environmental Baseline Assessment appraises five major factors related to the environmental and social aspects (air, water quality, the nature of soil, vegetation, and socio-economic study). If necessary, other relevant environmental issues (noise and vibration) are appraised, depending on the conditions on and around the project site. Since 2014, furthermore, any likely impacts identified in the Strategic Environmental Assessment need clear indication of potential differences arising from a particular influence in a short term, a medium- and long-term, and at regular intervals (impacts generated by the existing facilities and operational patterns). The said Assessment entails approximately two months, as reported by a local environment consultant.

(3) Implementation Schedule of Environmental Baseline Assessment

The Environmental Baseline Assessment for the Project will be carried out under the management of the implementing agency, namely, UBC-ED. With an assessment report and the above-mentioned accompanying documents, a request for environmental screening of this development project will be made to UBC Environmental Department. The said Assessment will be conducted to obtain approval of the proposed plan, followed by a project briefing, in a period after the target sites are determined and before a tender is announced. When the project approval is subject to supplementary obligations requiring environmental and social considerations, they must be fulfilled prior to a tender notice, or adopted in tender documents.

[7] World Bank (2017) "Doing Business"

Chapter 2 Contents of the Project

Chapter 2. Contents of the Project

2-1 Basic Concept of the Project

(1) Overall Goals and Project Objectives

In Mongolia, the enrollment rate in five-year primary education has reached 99.3%. The country has also achieved 96.9% (2016/17) of the enrollment rate in nine-year compulsory schooling which completes lower secondary education. In UBC, however, provision of educational facilities has not kept up with an increase in school-aged population resulting from a rising birth rate as well as a growing number of students accelerated by the influx of rural migrants. This has compelled classes to be run in three shifts and students to commute a long distance beyond their original school districts. These circumstances have seriously undermined the educational environments.

To address the above problems, GOM has set out one of the objectives in its Mongolia Sustainable Development Vision 2030 approved in 2016 to "improve the general education system to the international benchmark levels and ensure impartation of quality education." In terms of educational infrastructure, it envisages a broad-based coverage of schools, while also aiming at "creating a healthy, safe and student-friendly environment at all levels of education."

On the other hand, GOM enacted the State Law on the Rights of Persons with Disabilities in February 2016. One of the "reasonable accommodations" stipulates "provision of education to children with disabilities (CWD) in a well-adjusted environment." Similarly, the Government Action Program 2016-2020 intends to "create conditions for CWD to study together with their mates." In the domain of disaster preparedness, furthermore, Mongolia has been developing risk-mitigating schemes to disable disaster-caused damage to grow, for instance, through revising the Disaster Protection Law, imposing more strict seismic design criteria on buildings, and designating local emergency shelters. Consistent with these efforts, GOM encourages reconstruction of school buildings where a safety concern prevails.

In the light of the above, the Project for Improvement of Primary and Secondary Education Facilities in Ulaanbaatar City (hereinafter referred to as "the Project") is intended to achieve a twofold aim. It supports the above-mentioned GOM objectives through mitigating a shortage of educational facilities resulting from a population increase, targeting the most needed UBC districts. The Project will then construct quality schools that will serve as models to be replicated by Mongolia in its projects undertaken in the future. Such schools are ultimately envisioned to address social needs related to cross-cutting challenges growing in the country.

(2) Outline of the Project

Among UBC-based 10 sites/schools requested by GOM to achieve the above objectives, the Project targets four sites (including two involving school building expansion and two providing new school buildings) to build quality schools on the ground that they are suitable for presenting model facilities,

with sufficient enrollment demand projected over the coming years. Incorporating universal design principles, these schools will take into account of CWD, disaster preparedness, and environmental friendliness to serve as enabling models for GOM to replicate in its own school construction projects. In addition, an essential suite of furniture and educational equipment will be supplied, which accommodates the above-said functional considerations. Visual aids will be also prepared and distributed in a form of booklet, highlighting key tips and know-how gained in design and implementation phases. They will be made available for those people who are involved in academic institutions, local communities, and school construction projects. The Project will disseminate those knowledge assets for local stakeholders in seminars and on other relevant occasions, and therefore work toward qualitative improvement of school infrastructure in Mongolia.

The Project is planned to construct model schools in the four target sites, procure furniture and educational equipment essential to school operations, and pursue publicity activities upon facility completion, as a part of soft component.

2-2 Outline Design of the Japanese Assistance

2-2-1 Design Policy

(1) Basic policy

1) Concept of the Project

The Project is intended to develop facility models conducive to quality school construction undertaken by GOM in the future. Because social backgrounds and environmental conditions vary from district to district in UBC, school facilities are needed for different reasons. The present conditions of available public utilities and premises also have specific constraints, and fit into particular construction strategies and facility capacities. The Project has put a range of UBC's school construction needs into four types organized in a matrix, depending on the suitable architectural strategy (new construction or expansion) and applicable location (urban or suburbs). Accordingly, quality model schools will be built to represent these specific types.

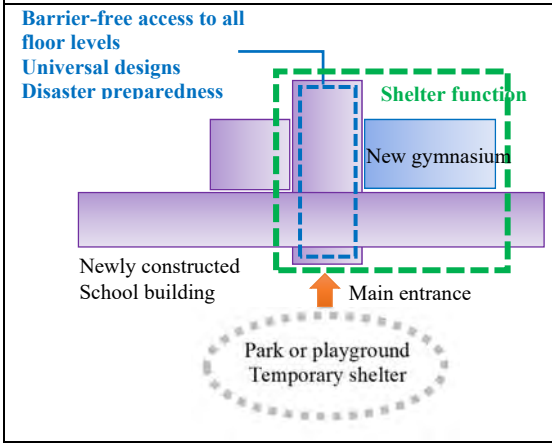
A "quality school" herein means a model facility incorporating "universal design" principles that enable all individuals to use easily and safely, regardless of their disabilities, age, or sex. It also accommodates growing social needs which school functions are to meet for achieving sustainable development of a country, namely, inclusive education, disaster preparedness, and environmental friendliness.

Table 2-1 describes features and functions of the four model types as well as key functional considerations to be integrated in the Project.

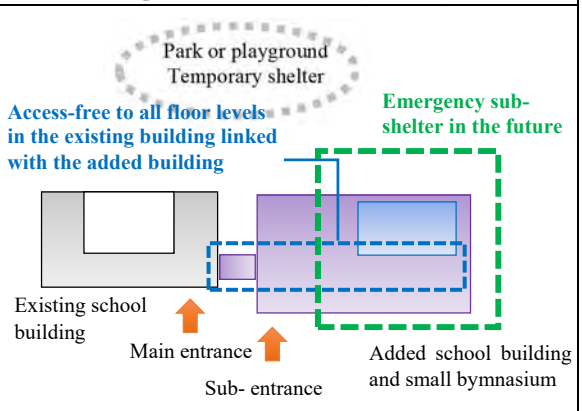
Table 2-1 Models of School Construction

Model		A: Newly constructed schools incorporating universal design principles with due consideration to inclusive education and disaster preparedness		B: Schools with extended buildings having access-free floors at all levels, including the existing buildings, which serve as a future sub-center to prepare against disasters	
		A-1: Core school in the local communities located in an urban center	A-2: Newly established school with a standard capacity and functions	B-1: Large-scale expansion equipped with ancillary functions	B-2: Relatively small-scale expansion to provide more classrooms
Location		Urban center/Built-up area	Suburbs/rural	Urban center/Built-up area	Suburb/rural
Infrastructure		Available	Unavailable	Available	Unavailable
Needs		Overcrowded facilities resulting from classroom shortage	Shortage of primary and secondary school facilities	Overcrowded facilities resulting from classroom shortage	Shortage of secondary school facilities
Type of work		New construction		Expansion	
Component		A complete suite of components		Classrooms＋ancillary functions＋the existing buildings, being connected on each floor level	
Nominal capacity		920	720	480	320
considerations	Universal design	Barrier-free, accessible floors at all levels		Barrier-free in the extended areas and access-free at all levels to the existing buildings[8]	
	Inclusive setting	Enhanced functions of and expanded activities in Child Development Center, together with provision of relevant learning equipment			
	Disaster preparedness	Communal center or future sub-center for disaster protection			

Newly constructed school model (A-1, A-2)



Expanded school model (B-1, B-2)



2) Survey sites

The target survey sites were nominated in the following process, consulted with UBC-ED during the Field Survey.

- Site investigations were conducted according to a list of 10 priority sites (dated December 8, 2016) proposed during the Field Survey 1. The survey team requested to replace three sites that were obviously not eligible, and this was recorded it in the Technical Notes. It was agreed in the Minutes of Discussions that an updated list would be submitted due on January 15, 2017.

[8] "Access-free" denotes the condition in which all facility users, including wheelchair users, are accessible by themselves. Unlike "barrier-free," however, it does not mean that all physical barriers are eliminated to use a facility.

- The updated list was submitted, dated on January 25. It excluded the above three sites, together with a rebuilding site in an urban center. Because urban schools would continue to face rebuilding needs, it was agreed, as a result of discussion, that the urban rebuilding site would be put back by switching with other site.
- Dated on January 31, the final list was submitted, reflecting the results of the above-mentioned discussions.

Ten sites were initially requested to construct four new schools and expand six existing schools. The former includes the existing schools that involve relocation to a new site and reconstruction on the original site. New construction would thus take place on two vacant sites. The following table indicates survey sites confirmed eventually. Note that the orders of schools represent priorities proposed by Mongolia.

Table 2-2 List of Schools Nominated for the Survey Targets

Priority	District	Khoroo/School	Remarks
1	Chingeltei	No. 7 Khoroo	A lot is available, together with the adjacent kindergarten.
2	Khan-Uul	No. 75 School	The existing school buildings will be demolished entirely for reconstruction.
3	S.Khairkhan	No. 32 Khoroo	Located in the west end of UBC, no school exists in this khoroo.
4	Chingeltei	No. 57 School	A large school surrounded by ger areas
5	Khan-Uul	No. 59 School	Relocation to a new lot. The existing premises will locate a kindergarten, as originally intended.
6	Bayanzurkh	No. 53 School	A district comprising gers and apartments, located in the east end of urban area
7	S.Khairkhan	No. 42 School	Location surrounded by ger areas. The existing building complex comprises double story and single story structures.
8	Khan-Uul	No. 118 School	Newly established school in the Japanese grant aid project (Phase IV). An increasingly populated area
9	Chingeltei	No. 61 School	Newly established school in the Japanese grant aid project (Phase III). A gymnasium building is being constructed.
10	Nalaikh	No. 109 School	The primary school will be upgraded to a general education school that fully enrolls up to Grade 12.

3) Grouping of survey sites

In accordance with the project concept, the nominated 10 sites are grouped into the same work types, either new construction or expansion. They are further divided into two locational features. The Project works on making models corresponding to these four categories (new construction-urban/center, new construction-rural/suburbs, expansion-urban/center, and expansion-rural/suburbs). Described more precisely, functional attributes of each model school are as provided below.

A-1: A newly established school incorporating universal design principles with a focus on inclusive education and disaster preparedness. Located in an urban center, A-1 model functions as a pivotal

facility in the community.

A-2: A newly established school incorporating universal design principles with a focus on inclusive education and disaster preparedness. Located in suburbs or suburban rural area, A-2 model demonstrates broader applicability in terms of the facility capacity and functions.

B-1: Including the existing school buildings, all floors are made access-free to function as a future sub-center preparing against disasters. Located in an urban center, B-1 model involves relatively large-scale expansion equipped with ancillary functions.

B-2: Including the existing school buildings, all floors are made access-free to function as a future sub-center preparing against disasters. Located in suburbs or suburban rural area, B-2 model involves building expansion on a modest scale chiefly to add more classrooms.

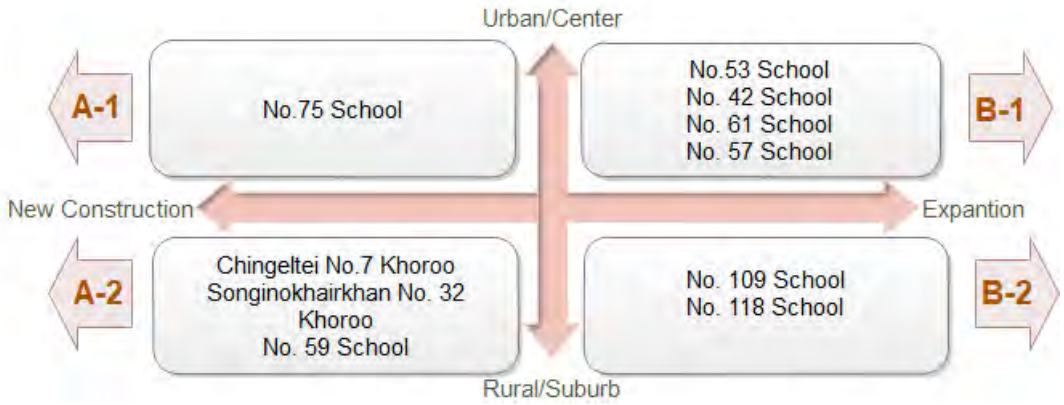


Figure 2-1 Types of the Requested Sites

(2) Selection of the Target Sites and Determination of the Scope of Assistance

1) Screening and selection of the target sites

The target sites are the top priority schools selected from each model group set out above. The order of priority has been determined with screening outcomes pursuant to selection requirements and priority criteria which were discussed and agreed on the survey sites.

Table 2-3 Assessment of Site Suitability and Priority Criteria

【Minimum requirements for selection of sites: a requested site is eliminated if unable to meet any of the conditions】
a Sufficient number of enrollment can be expected to fulfill with the planned capacity of the model;
b Sufficient size of land is secured for the construction of the buildings set for the model;
c Land or a part of land is not registered as natural reserves, disaster-prone area, or inadequate area in the UBC's master plan;
d Any kind of resettlement or expropriation of agricultural land will not be required;
e Site is free from special condition, such as permafrost soil which needs particular design for building

construction; f School officials have a positive view to accept CWD (children with disabilities) in their school and to offer their school as an emergency assembly point; and g There is no hindrance to accepting CWD in the surrounding environment.
【Criteria for putting priority of sites】 a The site where the bigger effect is expected by the Project; b The site where its characteristics such as location and required number of classrooms fits more appropriately to the model; c The site where few obstacles for construction are expected; d The site where school officials have higher motivation to accept CWD in their school and to offer their school to utilize for emergency; and e The site where favorable infrastructure is equipped to accepting CWD, such as adequate road network in the vicinity.

Selection requirements from “b” to “e” evaluate the site conditions, and “f” and “g” are to assess considerations to CWD and disaster preparedness. Findings of the on-site survey revealed that the following sites required further examination if they satisfy the above requirements.

- Chingeltei No. 7 Khoroo (new establishment): The premises are inclined from 12% to 13% across the entire property, which will require land development on a considerable scale in order to construct facilities thereon. The space is sufficiently large.
- No.61 School (expansion): A lot must be cleared by demolishing the in-situ single-story school building that was initially established. A sewage tank is located in the north of the existing school building, and a driveway will be needed for a vacuum truck of suction service.

Having said the above, it does not mean that facility construction is unfeasible on these sites. With more detailed studies, the construction is deemed feasible. Regarding the right of land use, the existing schools have submitted copies of the agreements with UBC Land Management Office. New construction sites and the sites requiring enlarged premises have also submitted copies of the governor’s order to enter into an agreement on the land use.

2) Projection of Facility-User Demand

Enrollment demand related to the selection requirement “a” is projected according to the number of students in the future based on two kinds of calculation, namely, (1) projecting a growth of school-aged population in specifically demarcated school districts served by the existing schools, or (2) projecting the number of prospective students according to the number of currently enrolled students (2016/17), whichever is smaller. The projected year is three years after the project completion (when JICA’s ex-post evaluation is scheduled). Following the procedural flow and a set of assumptions, the number of necessary classrooms is calculated according to the estimated number of students and the existing facilities available. The resulting estimates will be used for evaluation of the enrollment demand.

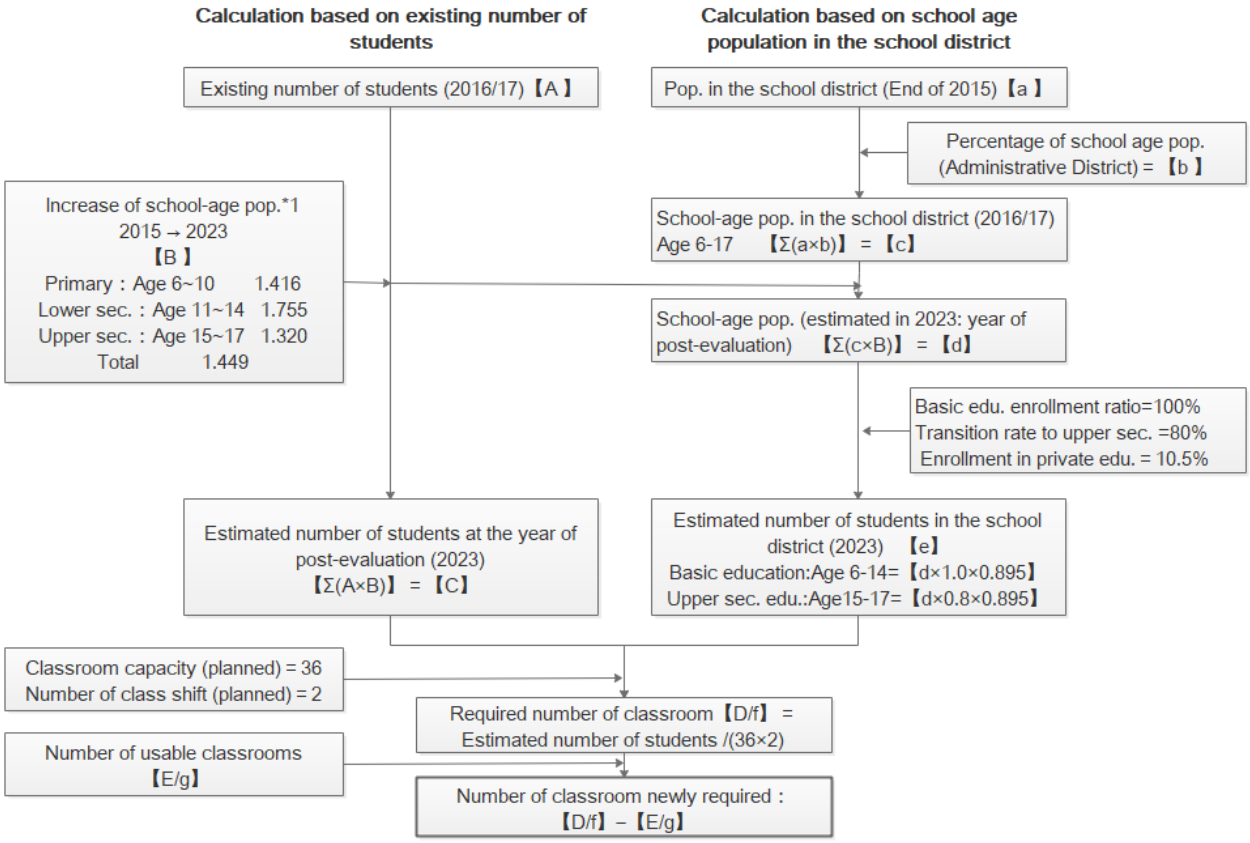


Figure 2-2 Flow of Enrollment Demand Projection and Calculation of Classroom Shortage

[1] Projection of Enrollment Demand

- Estimate based on the number of school-aged population in their school districts: The number of primary students to be enrolled in the target year (2023/24) is projected based on the population of the primary-school-age group in the district served by the school in the said year (where a population in the served district drawn from khoroo-based population data as of the start of 2016 is multiplied by the proportion of school-aged population drawn from district-based data). This takes into account of a population increase in the said district (Table 2-4).
- Estimate based on the number of students in the existing schools: The number of students in the target year (2023/24) is projected based on the number of currently enrolled students (2016/17), taking into account of an increase in the school-aged population[9] (Table 2-5).

[2] Calculation of Classroom Shortage

The number of classrooms needed to accommodate the number of students projected in [1] is obtained under the following calculation conditions.

- Number of class shifts: Existing general education schools are all run in two or three shifts. Given that the government policy envisions to achieve schooling in less than two shifts, classrooms are supposed to accommodate two shifts in the target schools.

[9] NSO Number of population on medium fertility decline assumption 2010-2040, Ulaanbaatar city

- Per-class capacity: A classroom capacity will be 36 students, considering a typical number of students prescribed by the Building Standards for Educational Facilities (30 students for the first grade, and 35 for other grades) as well as the current capacities in UBC (34.7 students per classroom on average in public schools, and 37.1 students per classroom on average in the surveyed schools).

In the existing schools, the number of classrooms in shortage is estimated by offsetting classrooms that are considered usable. Where the existing classrooms are available, the shortage is calculated according to the following conditions.

- It is considered unsuitable, if any of the general classrooms currently in use are when (1) they do not meet the requirements, such that the floor area and width are smaller than a standard classroom or that they do not have an access from a corridor, and when (2) the competent authority has prohibited the use of the classroom due to its deterioration or other reasons. Otherwise, the existing classrooms will continue to be used.
- When having a size identical to the general classrooms, special classrooms other than those typically provided in the existing schools (craft rooms for Technology/Home Economics, and computer rooms) may be used compatibly with regular classrooms. For the sake of impartial appraisal of all the requested schools, those special classrooms are counted as the existing general classrooms due to their compatibility.

The resulting calculation is shown in Table 2-4 and Table 2-5.

Table 2-4 Classrooms Calculation Based on School-Aged Population in the School Districts

Category	Priority order	District	School/site	Khoroo District	Popula-tion 2015*	(Y2015) Number of children of the age (estimate) 6-10	11-14	15-17	No.of Sch.-age Children (Y2023) increase in population 6-10 1.416	11-14 1.755	15-17 1.320	Adjusted private sch. & promot.	Y2023 Number of CRs Required (2-shift, 36 students/classroom)	Existing	Shortage
Schools in the List of 10 candidate															
New Construction	1	CH	Khoroo No. 7	CH-7 ,etc.	7,278	627	362	294	888	635	389	1,642	23	0	23
	2	KU	No. 75 school	KU-2 ,etc.	12,737	1,169	624	475	1,655	1,095	627	2,914	41	0	41
	3	SO	Khoroo No. 32	SO-32 ,etc.	8,227	736	421	334	1,042	738	440	1,910	15	0	15
	5	KU	No. 59 school	KU-14	4,710	421	241	191	597	423	252	1,093	16	6	10
Expansion	4	CH	No.57 School	CH-11	6,040	518	300	244	734	526	322	1,359	19	23	-4
	6	BZ	No.53 School	BZ-16 , etc.	15,539	1,358	766	624	1,924	1,344	824	3,516	49	30	19
	7	SO	No.42 School	SO-2 , etc.	17,665	1,580	903	716	2,237	1,585	946	4,101	57	28	29
	8	CH	No.61 School	CH-11 part	11,753	1,008	583	475	1,428	1,023	627	2,644	37	18	19
	9	KU	No.118 School	KU-8 , etc.	11,996	1,104	590	448	1,563	1,035	592	2,752	39	16	23
	10	NA	No.109 School	NA-03 , etc.	12,221	1,160	726	569	1,642	1,274	751	3,151	44	6	38

*CH:Chingeltei, KU:Khan-Uul, SO:Songinokhairkhan, BZ:Bayanzurkh, NA:Nalaikh

- The estimate based on the school-aged population projects the number of students considering the present rates of entrance into next level schooling, namely, 80% of students going onto upper secondary schools, and 10.5% to private institutions (the rates in the entire UBC, 2016/17).
- Areas served by a given school are not strictly demarcated by an administrative district (khoroo), and therefore the served population is divided proportionally based on the shares reported in an interview to estimate the rate of population increase in the served areas.
- Because No. 109 School in Nalaikh is a primary school, the number of lower and upper secondary school students is tentatively estimated based on the proportion of its students in the total primary-student population in Nalaikh.

■ While some candidate sites expect a future population increase associated with city development projects, the progresses of these projects and the resulting population increase are unpredictable, subject to various socio-economic conditions. A potential population increase resulting from these projects, excluding those already being implemented, is therefore not reflected in the projection of enrollment demand.

Table 2-5 Classrooms Calculation Based on Currently Enrolled Students

Category	Priority order	District	School/site	Number of students (AY2016-17)				Number of Students (AY2023-24)				No. of classrms required (AY2023-24)			CR shortage calculated by school-age pop..
				Total	Primary	Lower Sec.	Upper Sec.	Total	Primary 1.416	Lower Sec. 1.755	Upper Sec. 1.32	Total	Existing CRs	Shortage	
Schools in the List of 10 candidate															
New Construction	1	CH	No. 7 Khoroo	New site											23
	2	KU	No. 75 School	1287	650	342	295	1910	920	600	389	27	0	27	41
	3	SO	No. 32 Khoroo	New site											15
	5	KU	No.59 School	730	417	236	77	1106	590	414	102	16	6	10	10
Expansion	4	CH	No.57 School	1341	669	438	234	2025	947	769	309	29	23	6	-4
	6	BZ	No.53 School	1991	1081	567	343	2979	1531	995	453	42	29	13	19
	7	SO	No.42 School	1963	1183	563	217	2950	1675	988	286	41	28	13	29
	8	KU	No.118 School	1115	647	270	198	1651	916	474	261	23	16	7	19
	9	CH	No.61 School	958	376	404	178	1476	532	709	235	21	18	3	23
	10	NA	No.109 School	654	392	203	58	989	555	357	77	14	6	8	38

※ District names are as abbreviated in the above table. AY: Academic Year

3) Determination of Capacity to Demonstrate Model Facilities

To make a design of the model schools broadly applicable, standard capacities (the number of classrooms) are set out as below to accommodate a class structure comprising a 12-grade system (five years of primary education, four years of lower secondary education, and three years of upper secondary education). Then, they are distributed to each model. It is assumed that the newly constructed schools will accommodate all grades and classes from G1 to G12 in two shifts, and that expanded schools will accommodate primary or lower-secondary classes in two shifts.

Table 2-6 Calculation of Model School Capacity

	Model	Planned no. of classrooms	Prospective no. of classes	Prospective class structure	Nominal capacity [10] (students)
New construction	A-1	23	45	G1-G9 4 classes each＋G10-G12 3 classes each	920
	A-2	18	36	G1-G12 3 classes each	720
Expansion	B-1	12	23	G1-G5 3 classes each＋G6-G9 2 classes each	480
	B-2	8	15	G1-G5 3 classes each	320

4) Scope of Assistance (Target Sites)

As a result of the above estimation, it turned out that, in more than half the requested sites, the estimated number of necessary classrooms (the number of classrooms in shortage) falls short of the

[10] In Mongolia, a school capacity is generally indicated with a nominal number of students, where 40 students are enrolled per classroom. In the Phase-IV grant aid project, for instance, a newly constructed school with 16 classrooms is authorized to enroll up to 640 students.

number of classrooms planned in each model school, in either the foregoing two demand projections. In other words, they are unlikely to have adequate demand relative to the planned capacities (18 classrooms or more in the new schools and 8 classrooms or more in the expanded schools). These sites do not meet the condition “a” in the minimum requirements for suitable sites in Table 2-3, and are thus disqualified and excluded from the Project’s targets. The remaining sites are placed in the order of schools with more serious classroom deficiency.

Table 2-7 Selected Target Sites

	Model	Site	No. of classrooms in shortage	Priority	Applicable facility type
New construction	A-1	No.75 School	27	1	A1-23CR
	A-2	Chingeltei (CH) No.7 Khoroo	23	2	A2-18CR
Expansion	B-1	No. 53 School	13	3	B1-12CR
		No. 42 School	13	4	-
	B-2	No. 109 School	8	4	B2-8CR

Given the demonstrative purpose of the models, duplicating the same type of model is less beneficial. Therefore, the target sites are selected so as to represent different models, each having the highest priority pertinent to its type. The planned capacities (the number of classrooms) are as initially set out for each model school.

(3) Strategies for Project Components

1) Facility Components

Facility components were not initially specified in the request. The survey team examined components provided and used in other schools and those constructed by GOM after the previous Japanese grant aid project was completed. The survey team then put forward a tentative plan and discussed with Mongolian stakeholders to go through the proposed components. Both sides reviewed by distributing them either to new construction sites or expansion sites. The priority components in each category were eventually agreed as in the table below.

Table 2-8 Requested Components and Priorities

	Priority	Component	New construction (Type A1 and A2)	Expansion (Type B1 and B2)
Core components	A-1: Facilities included in the previous Japanese grant aid project which were deemed necessary and beneficial	・General Classroom	A	A
		・Teacher's Room	A	A
		・Lavatory/washstand	A	A
		・Cloakroom	Cancelled	Cancelled
		・ICT Laboratory (Computer Room)	A	A
		・Science Laboratory	A (Multipurpose Room)	－
		・Gymnasium	A	－/A (Type B1)
	A-2：Facilities provided after the completion of the previous Japanese grant aid project and also included in the similar projects	・Kitchen	A	A (Pantry only)
		・Medical Room	A	－
		・Staff Room	A Training Manager's Room	A Training Manager' Room
		・Library	A	－
	A-3: Essential furniture and equipment	・Furniture and equipment in the above facilities	A	A
Ancillary components	B:Generally provided and used in the existing schools	・Dining Hall (Cafeteria)	B	B (when unavailable in the existing target schools)
		・Craft room (Wood/Metal work, Sewing)	B	－
	C: Further analysis is required	・Auditorium (Art Hall)	C	－
		・Art Room	C	－
	D: Less frequently used in the existing schools, and not included in the curriculum	・Vocational Training Room	D	－
		・Playroom for 1st grade students	D	－

Reviews on the components and principles underlying facility planning are as follows.

Priority A1-A3: Core Components

The core components are all provided and used well in the majority of existing schools. Compared with the preceding Japanese grant aid project in Phase IV (hereinafter referred to as "the Phase-IV project") committed to provision of the maximum allowable sites and classrooms to mitigate overcrowded learning environment, the target sites in the Project will have a larger floor area per classroom. Nonetheless, the Building Standards for Educational Facilities require all these core components to be provided in schools. The Project will thus supply the components within the essential scope of assistance, depending on the required functions.

- General classrooms: Instead of cloakrooms which obstruct circulation during shift changes, coats will be kept in the classrooms.
- Teacher's room: The existing schools often separate a resting area in their teacher's rooms from

a working space to prepare teaching materials[11] and lesson plans. They have a variety of layout options. The Project will provide a room available for a working space and resting area.

- Lavatory and washstands: Including multifunctional toilets, these facilities are provided on all floors separately for male and female students and teachers.
- ICT laboratory: While the ICT laboratory is used in lower secondary education and above, it will be made available for extracurricular activities.
- Science laboratory: Considering the current practices in the existing schools, a laboratory with a complete set of specifications is not necessarily an urgent need. The multipurpose room will be provided to allow a flexible use.
- Gymnasium: In the existing schools, the gymnasium is often used jointly by several classes. Extracurricular activities are also carried out frequently, while local community activities take place on weekends. The gymnasium is considered an important component used to shelter people evacuated from natural disasters, which is one of the Project's thematic objectives. A standard gymnasium will be provided to meet the student capacity.
- Kitchen (Pantry): Kitchen will serve school meals for primary students and light meals for teachers and staff as well as secondary students. It will be designed to meet functions in a minimum essential space.
- Medical room: Each school assigns a school doctor. A consultation area and work space will be located to maintain work efficiency.
- Library: A space will consist of a reading room compatible with a study area and a small storeroom for books.
- Other offices for teachers and staff: Individually assigned rooms are needed, namely, the director's room, deputy director/secretary's room, accountant/treasury room, training manager's room, and technical staff room.
- Social worker's room: This room will have extended functions as "Child Development Center." It will be provided to develop potential abilities and talents of each student, offering opportunities for CWD and other students alike to receive face-to-face teaching and review their day-to-day lessons.
- It was agreed that the Project would review an essential suite of furniture needed for newly constructed schools to function, and also that components of student furniture would be procured in consideration to inclusion of students with special needs.

Priority B: Additional Components

- Craft rooms for Technology/Home Economics: Mostly provided in the existing schools, they are

[11] The office is generally called the "Teacher Development Center" equipped with personal computers. Some schools allocate a studio for learning material development and a photocopying room. The office is used in a variety of ways.

used on a regular basis. Because a suite of equipment is installed, the room is not compatible with other learning purposes. Workshops will be provided exclusively for these two subjects.

- Dining hall (cafeteria): This facility will be available for teachers and staff as well as secondary students who are not served with school meals. A kiosk is sometimes annexed to a cafeteria. The cafeteria is needed on a daily basis especially where the school is located away from settlement.

Priority C: Additional Components

- Auditorium (art hall): Auditoriums in the existing schools are used regularly for a venue to run various school events and extracurricular activities. On weekends, they are often used for practicing and presenting performance related to artistic subjects. The auditorium constructed in the Project will be available for music lessons using acoustic instruments and voice as well as dance lessons.
- Art room: Not many schools are equipped with a room dedicated for arts and crafts, or design techniques. The multipurpose room will be provided alternatively.

Priority D: Additional Components

- Vocational training room: Although technical and vocational training was once carried out previously at the upper secondary level, it is no longer included in the curriculum. The vocational training room is not equipped in the existing schools. A need for this facility is not justifiable.
- Playroom for the first-grade students: When 6-years old children started to enroll, various types of classrooms for such age group were prepared, renovated with a set of furniture and play tools. Few schools have such space now allocated for 6-years old students. It is not considered essential, given the present situation.

2) Equipment Components

Likewise, equipment components were not specified in the request of GOM. It was agreed in a meeting during the Field Survey 1 that a list of requested equipment would be submitted by January 15, 2017. The list, which was submitted on January 18, included items indicated with unknown quantities or duplication. Therefore, the team of Field Survey 2 had meetings separately with relevant officials to check the priorities of items and update the preliminary list of components. The priorities were checked in accordance with the pre-agreed criteria for elimination and priority rating. As a rule, those items applicable to the elimination criteria were left out from the list.

Table 2-9 Criteria for Shortlisting and Sequencing the Requested Equipment

【Criteria for exclusion】
a Equipment being used less frequently and/or less effectively in the existing schools:
b Equipment which can be substituted with alternative or existing devices and appliances:
c Equipment requiring specialized skills for operations and maintenance:

d	Equipment requiring consumable supplies not procurable in the domestic market: and
e	Consumables such as chemicals and reagents, stationaries, and books

【Criteria for prioritization】

f	Equipment being indispensable for implementing the relevant curriculum and actually used frequently in teaching and learning:
g	Equipment which is commonly used in the similar facilities and their effectiveness has been confirmed: and
h	Equipment of which operation and maintenance no special skill is required

Table 2-10 Requested Equipment and Priorities

Prio-rity	Category	Quant-ity	New con-struction	Extension	Major items requested
A	Equipment for primary classes	12	A	A	Math (Abacus, block model, scale set, measurement set), Mongolian language (CD audio system) Human environment (zoological and botanical maps, geographic map, world geographic map), Common (Wall-mounted chessboard, chess table, checker)
	Mathematics	7			
	Mongolian language	1			
	Human environment	2		〃	
	Common equipment	2		〃	
	Equipment for secondary classes				
A	Physical education tools	23	A	A	Track and field tools, basketball, volleyball, table tennis set, badminton, wall bar, and gymnastics mat
B	Mongolian language	3	B	〃	Wall map, CD audio system
B	Foreign language	2	B	〃	Wall map, CD audio system
B	Physics Lab. equipment	34	B	〃	Experimental apparatus for dynamics, pulley set, tester, optical stand, oscilloscope, magnet set, fume food, transformer, etc.
B	Chemistry Lab. equipment	40	B	〃	Fume hood, glass tools, molecular model, pH meter, thermometer, centrifuge, electronic balance, etc.
B	Biology Lab. equipment	20	B	-	Compound microscope, various thermometers, dissecting kit, anatomical model of human body, etc.
A	Equipment for technical exercises	50	A	〃	Sewing (sewing machine, iron, crochet hook set, shears for sewing, etc.), metal work (metal cutting saw, Vernier caliper, pliers, metallic files, voltammeter), wood work (work table, planer, chisel set, drill press, jig saw, milling machine), art (wood chisel, clay scraper spatula, easel, portable drawing board)
	Sewing	8			
	Metal work	17			
	Wood work	21			
	Art	4			
A	Music instruments	13	A	A	Morin khuur, shanz, Khuurchir, flute, electronic keyboard, etc.
A	ICT equipment	6	A	A	Computer, laser printer, projector, etc.
B	Kitchen utensils	19	B	B	Steam oven, electric cooker, water heater, refrigerator, freezer, service cart, exhaust hood, rice cooker, etc.
B	Medical Room equipment	4	B	B	Disinfection trolley, weight scale, height measuring scale, Sphygmomanometer
A	Equipment for children with special needs	7	A	A	Mat, cushion, white board, partition, book stand, etc.
A	Furniture to be included in the project components	-	○	○	To be included in a construction work portion
	Total	229			

Requested components covered across ranging subjects taught in primary and secondary education. Tools and apparatuses requested for chemical experiments (including reagents) were approximately 250 items, other educational equipment, 330 items, kitchen utensils, 40 items, which added up to more than 600 items. In the past Japanese grant aid projects, educational equipment supply was funded by Mongolia for all items used other than in general classrooms, including in the added and new school buildings. In the Project, on the other hand, the intended schools should demonstrate prospective models in Mongolia, exemplifying a universal design strategy holistically, together with their equipment and furniture components. Thus, equipment will be in the scope of assistance, as long as the requested items on the list are essential to their curriculum implementation and functioning of school facilities.

It should be noted that additional components were requested in the course of consultation, namely, 31 items used in biological experiments, medical room, and inclusive education. They are all standard instruments used regularly in day-to-day classes and facility operations. Because no particular problems are identified regarding maintenance of those items, they will be included in the agreed list of requested equipment to be procured. The table below summarizes the requested equipment by category, marked with the priorities.

(4) Universal design and other considerations

The Project intends to construct quality primary and secondary school facilities that will serve as replicable models in the future. The models incorporate universal design as a shared and generic principle that underpins new school construction projects. In other words, it will be elaborated to provide a user-friendly and comfortable environment for all individuals coming to the school, regardless of their disabilities. Apart from this, the Project will place added values in design components of the target schools to meet their unique conditions. This will be achieved through which educational facilities accommodate growing social needs. In particular, the school design will give considerations to CWD (inclusive education) and disaster prevention which are promoted in Japanese technical cooperation projects. Environmental considerations will be also taken into account as a top priority issue addressed both by UBC and GOM.

The target sites will need to integrate specific considerations according to their facility components to be provided. The above-said functional considerations should be exemplified in the models to take an up-to-date design initiative, so that the schools remain leading prototypes when they are completed. Components to prepare against disasters will be also provided, depending on locational functions of the target schools, whether they are in an urban center or suburbs and suburban rural area. Universal design principles, however, will be applied as consistently as possible across the target sites. A site-specific design strategy will be developed in light of the table below.

Table 2-11 Considerations Given to Facility Design

【Key elements: Considerations applicable to all target schools】	
1. Essential considerations pursuant to seven universal design principles	・ Classrooms and common space designed to offer flexible layout options. ・ Guide signs that are legible for all users ・ Enhanced safety clear of level differences, surface irregularities, and blind spots ・ Classroom furniture selected to fit students' physiques and use of wheelchairs
2. Essential considerations required to meet reasonable accommodations for CWD	・ Accessibility to the key functions or barrier-free design ・ Space available for personalized care provision according to types and degrees of disabilities ・ Basic learning aid tools suited for visual and hearing impairments ・ Braille display and other tactile guides
3. Essential safety considerations to buildings	・ Conformity to the latest seismic code and fire prevention standards ・ Allocation of safe evacuation routes
4. Essential environmental considerations	・ High insulation efficiency ・ Use of energy-saving and resource-saving equipment and materials ・ Practice of green planning in and outside the buildings
【Additional elements: Considerations subject to locational conditions】	
5. Considerations to facility functions to serve as a temporary shelter and disaster protection sub-center	・ Allocation of evacuation routes and exits, and entrance immediately leading to outside ・ Installation of stockpile warehouse
6. Considerations to a focal point to disseminate disaster prevention education in the local communities	・ Accessible facilities for local residents to take part in disaster prevention education and other activities ・ Permanent location to display information related to disaster prevention

(5) Measures to cope with natural environmental conditions

1) Measures against climate conditions

UBC is located on the plateau at roughly 1,300 m above sea level in the inland Eurasian Continent, featured by a typical continental climate. It is a rigorous climate where the minimum temperature falls below -30℃ in winter, whereas the maximum temperature exceeds 30℃ in summer. The daily temperature difference is as large as 15 to 20℃ on average. The annual rainfall remains about 270 mm, which is concentrated in summer. It often involves intense rain. Wind gust occurs throughout a year, which is unique to the continental climate, causing spouts and dust storms. The design solutions to these climate conditions are prepared in accordance with the following principles.

- A heating system with an adequate capacity will be installed to prepare against weather conditions marked by intense cold in winter. Ensuring that external insulation is thoroughly furnished, the facilities will be designed to increase insulation efficiency in the entire buildings with well-insulated windows that are often a thermal flaw.
- Surface exposure to the outside air should be reduced by lowering the building volume to the possible extent. Buildings will be designed to avoid a space that allows snowdrifts when snowing.
- Windows and doors should be sufficiently airtight and wind-resistant against wind gust and dust storms.
- Buildings should be arranged so that classrooms face either south or east and west, ensuring all

rooms have as much daylight as possible.

2) Measures against natural disasters

Natural disaster risks in UBC include floods caused by intense rainfall, gales, and lightning. Although none of the target sites have ever experienced flood damage, drainage ditches should be sufficiently provided to release rain water off the premises in the sloping sites. To prevent damage from wind gusts, due consideration should be given to specifications and anchoring of external wall fittings. Lightning protection will be provided on the rooftops of buildings.

Over the 20th century, Mongolia experienced four inland earthquakes of magnitude 8.0 or equivalent. The major seismic zone is concentrated in the western part of the country. Areas around UBC are less susceptible to seismic activities compared with the western area. However, UBS area roughly in the range of 200 km is surrounded by four faults, including the one found recently. It is revealed that they are highly likely to induce a 7.0 magnitude earthquake or equivalent, though in several thousand years of recurrence intervals. Notably from 2009 and onwards, unfelt earthquakes have sharply increased in the areas around UBC where an earthquake equivalent to 4 in a seismic intensity was registered in the city.

In line with "disaster preparedness" that is one of the Project's thematic focuses, particularly in relation to earthquake protection, it is envisioned that the constructed schools will play leading roles to be assumed in a local disaster prevention strategy. Necessary considerations will be reflected in the planning of the Project. With National Emergency Management Agency (NEMA) as a focal point, GOM has been committed to disaster-risk mitigation. In UBC, the Emergency Management Department of the Capital City (EMDC) is taking initiatives in planning of disaster prevention in local communities and academic facilities, designating emergency evacuation areas and temporary shelters as per such planning, and holding evacuation drills. Considering these backgrounds, the Project will design the facilities in accordance with the following principles.

- Mongolia is currently updating seismic code for buildings. The Project will basically apply the revised code. Where it is not released in a timely manner, the Japanese building code will be applied to ensure required seismic performance (the base shear coefficient will be set at 0.12 in place of 0.08 that corresponds to the previous code).
- Due attention should be paid to strengthening nonstructural materials against earthquakes which constitute buildings (materials used for windows and doors, ceiling, installed machines and equipment, pipes, and so on).
- Shelter functions will be equipped in the target schools to be available for the public in the event of disaster.
  - Ensuring access to the Gymnasium used for an evacuation area
  - Providing a storage of disaster relief (EMDC will procure the supplies to be stockpiled)
  - Securing essential lifeline utilities (reserve water, heating source, electricity, and so on.)

3) Measures against topographic and soil conditions

Of the four target sites, a sloping site with a gradient of 1 in 8 to 1 in 6 (No. 7 Khoroo in Chingeltei District) and a moderately sloping site up to 5% (No. 109 School in Nalaikh District) will locate the facilities to suit the present topographic conditions to the possible extent and determine the floor levels of the buildings, while considering the directions of the intended building and surrounding facilities.

Furthermore, the foundation level will be lower than the freezing depth (roughly 3.0 m) to prevent frost heave caused by soil freezing. The resulting underground space will be fully used for the machine room or the special classroom. In all sites, the bearing ground deeper than 3.0 m has mostly gravelly soil or a fairly solid sandy clay layer mixed with gravel.

(6) Measures against social and economic conditions

1) Measures to cope with social conditions

In 2016, GOM released "Sustainable Development Vision 2030" to put forward its development policy ahead of other countries, which is aligned with the Sustainable Development Goals (SDGs) set out by the United Nations in that year. One of the educational objectives stipulates that the state ensures to provide opportunities for lifelong learning beyond schooling. Furthermore, it envisages school functions should live up to diverse values in partnership with local communities. The Project is intended to integrate three thematic considerations, namely, "inclusion of children with special needs," "disaster preparedness," and "environment." They are likely to become increasingly relevant needs in Mongolia as it achieves national development. The mainstreaming efforts on these issues have just started, albeit little by little, across the society. With the above-mentioned vision, it is imperative that the facilities planned in the Project resist becoming outdated after their completion. They should be conducive to Mongolia's future strategy beyond the scope of current issues.

2) Measures to cope with economic conditions

As its economic conditions are rapidly declining in the recent years, Mongolia is in a complete reversal from its earlier upswing until 2014, now experiencing such a severe slump that even a financial failure is likely. The construction sector is one of the leading industries that had driven the country's growth. With the two-digit inflation rate, soaring prices of construction materials prolonged over time and doubled construction costs. While the price hike has been slowed down at present, financial risks continue to surface. This has led the Ministry of Education, Culture, Science and Sports (MECSS) to temporarily suspend financing new projects. Despite the turnaround of resource prices and other positive effects, the unstable economic conditions will probably prevail over the medium term. In particular, fluctuations in the exchange rate of local currency will substantially affect the Project. To hedge this risk, cost estimates in foreign currency unit should use stable key currency. Likewise, the Project's outline design will elaborate on safeguards, such as reserving a contingency

fund and finding reliable supply sources of goods. Furthermore, there will be a careful follow-up of GOM's budgetary procedures to ensure that financial resources are allocated to execute the Project.

(7) Measures to cope with construction-related requirements

1) Approvals and licenses, architectural codes and standards

The planned facilities will be allowed to start the construction after the authorities' review on regulating design components, which is pursued in accordance with a building permit procedure in Mongolia. Furthermore, the occupancy will be authorized when the planned facilities pass inspections conducted during construction and upon completion. The review is undertaken according to item-based requirements prescribed for educational facilities and ranging standards such as general provisions for public buildings, regulations for structures and disaster mitigation, requirements for utility connections, including water supply and heating systems. On the other hand, some administrative control is based on the regulations currently under revision or rules of former Soviet Union. Therefore, the Project must liaise closely with relevant authorities in both design and construction phases to check if detailed design components are acceptable. To proceed with designing, a local consultant, who is familiar with building standards and a reviewing process in Mongolia, should be assigned to play an enabling role in coordinating with related agencies. The Project's implementation schedule, moreover, should include a period necessary for obtaining applicable permits and licenses. The table below shows stepwise procedures required during the Project implementation. Review in a detailed design phase will take approximately four months.

Table 2-12 Procedural Flow Related to Building Permit and Licenses

<table>
<tr><th></th><th>Item</th><th>Application addressed to</th><th>Application period</th><th>Number of days required</th></tr>
<tr><td>1</td><td>Acquisition of sites (permit lawful land acquisition)</td><td>UBC Land Management Department</td><td rowspan="2">In an outline design phase</td><td>*1 day</td></tr>
<tr><td>2</td><td>Proposal of construction project (appraisal and approval of the planned components and basic design)</td><td>UBC Urban Planning Department</td><td>*14 days</td></tr>
<tr><td>3</td><td>Requests for connection with utility services (water supply, sewerage, heating, and communication)</td><td>Applicable public utilities</td><td rowspan="5">Preliminary consultation in an outline design phase and review in a detailed design phase</td><td>*14 days</td></tr>
<tr><td>4</td><td>Request for a project screening (a soil survey, utility connection, a building layout and landscaping plan)</td><td>Qualified consultants and agencies</td><td>Until tender documents are prepared</td></tr>
<tr><td>5</td><td>Request for administrative guidance on fire and disaster prevention</td><td>NEMA (*the project less than 3000 m^3 receives municipal guidance)</td><td>*1 day</td></tr>
<tr><td>6</td><td>Request for verification (screening of (1) through (5) above and the detailed design)</td><td>Construction Development Center</td><td>*7 days</td></tr>
<tr><td>7</td><td>Application for a notice to proceed the construction work (filed with a license of contractor)</td><td>UBC Urban Planning Department</td><td>At the commencement of construction</td><td>**10 days</td></tr>
</table>

8	Completion inspection during construction and upon final completion	General Agency for Specialized Inspection	During and upon completion of construction	*14 days
9	Handover of the buildings	Urban Planning Department	After the final inspection	-
10	Registration (assignment of address and indication in GIS)	Urban Planning Department	After the handover	-
11	Submission of related documentation	National Data Center		-
12	Property registration	General Authority for State Registration		14 days

Source: *World Bank (2017), "Doing Business"
**GTS Advocates "The Revised Construction Law of Mongolia: the changes and its implications"
Prepared by the Survey Team based on the documents provided by UBC Urban Planning Department and the findings in the Field Survey

2) Local conditions of construction and procurement

With Mongolia's a rapid economic growth peaked in 2011, the construction industry has achieved considerable development. Accordingly, conditions of construction and procurement in recent years have remarkably changed, which have negated the influence of former Soviet Union. The country now commonly uses many of the previously imported materials and construction methods that were not much localized. Some kinds of highly functional industrial products are manufactured on a full scale in Mongolia, excelling conventional counterpart products in terms of supply capacity and cost effectiveness. Considering the most recent circumstances in the above-mentioned construction sector, various factors will be compared broadly, such as functional performance, workability, stability of supply, costs, and price fluctuations. The optimal specifications and construction methods will be planned according to the underlying principles below so that local construction companies will be able to replicate them in school construction projects in the future.

- Structures will be built with cast-in-situ concrete frames using ready-mixed concrete which is sufficiently procurable and technically workable in place of precast concrete (PC) products supplied in limited quantities.
- Anticipating that GOM will embark on identical construction projects in the future, local products should be used (including locally procurable import goods), wherever possible. Materials and specifications will be determined with overall economic rationality in terms of the qualities, prices and supply chain.
- Materials and specifications for external elements such as roofs and walls will be elaborated to determine construction methods that do not require much labor and time, as they need to be finished during summer.
- Locally manufactured construction materials will be transported by truck from UBC areas. Import products will be primarily transported by rail via Zamyn-Uud bordering with China. Regardless of time zones, the major roads in and around UBC are so chronically congested that number plate restrictions are enforced. Rail transport is also likely to cause materials left unshipped or delayed because of inadequate transloading capacity. Procurement planning must therefore cope with such risks by affording sufficient time for scheduled transport of procured

materials.

(8) Policy for deployment of local companies

1) Construction companies

The Construction Law of Mongolia was revised in 2016, requiring a licensing (a business permit) system in which construction works are grouped in five stages according to the technical difficulties. Companies licensed by the Ministry of Construction and Urban Development (MCUD) are about 4,500 across the country, of which 3,700 are based in UBC (as of May 2016). However, those operating business with their office buildings are less than half the said number. The major public works and large-scale construction projects in the private sector are mostly engaged by large and medium construction companies, including foreign affiliates. These entities do not have problems in the quality of their work, construction management system, and capacities to supply materials and labor. Of the technically qualified large- or medium-sized companies, those experienced similar educational facility construction will be assessed, together with locally available construction know-how and supply network, so as to enable smooth work execution.

2) Consultants

Registered architectural design firms located in UBC are 535 (as of May 2016), of which some offices are specialized in structures and building services. Many of these firms have engaged in numerous projects in the wake of construction boom in recent years. A partnership with local consultant is indispensable for coordination with relevant authorities to have a building permit and phased inspections and preparing preliminary drawings pursuant to the local architectural code and designated format. A local consulting agency will be therefore selected from those experienced in the similar services, which are chiefly appraised in terms of their technical capability and competency in service delivery. The main responsibility assigned on the local consultant includes designs of building structures and installations that are key elements in a technical screening undertaken by a relevant authority.

(9) Operation and maintenance strategy

General education schools in Mongolia are operated and maintained under supervision and guidance of the Provincial Education and Culture Department (equivalent to the Education Department in UBC). Approximately 70% of their operating expenses account for the personnel cost and social security[12], and therefore, the budget for facility maintenance is limited. To reduce the costs of facility maintenance in the target schools, the Project will chiefly adopt work methods and materials that are solid and durable, while requiring no specialized skills in sustaining their constructed facilities.

[12] A written response to the questionnaire prepared by the survey team

(10) Grade selection for the requested facilities and equipment

Quality grades of the planned facilities should be in accordance with requirements for standard educational facilities in Mongolia. The grades will be determined to ensure those facilities are durable, equipped with necessary functions, considering relative functionality, economic efficiency, and maintainability of the components and specifications in standard school buildings constructed in the preceding grant aid projects or in those funded by GOM. Note, however, that quality grades of insulation specifications should be determined separately for external walls, roofs, and windows and doors, so as to distribute efficient insulation systems across the buildings, because they directly influence key structural performances.

The requested furniture and equipment, furthermore, include essential components typically supplied in the existing schools. Their quality grades will be thus identical to or higher than those equipped in the Phase-IV project conforming to standard furniture and equipment procured by UBC-ED.

(11) Policy for construction and procurement methods and work schedule

Construction projects in Mongolia are largely restrained during winter. In general, excavation should be initiated in the beginning or middle of April, when frozen soil starts thawing. Heating installation work, on the other hand, should complete (structural work, exterior work, and heating installation) so as to start heat supply in mid-October at latest. Therefore, the major construction projects are concentrated in a peak period lasting six months of summer season. It is sometimes unavoidable that a shortage of labor and materials compels workers to work on a holiday and on a 24-hours basis. The Project will schedule such critical work components as structures and exteriors in accordance with the following strategies.

- Each of the four target sites located across UBC (a total floor area exceeding 17,000 m^2) constitute a work lot where the construction rotates to deploy machinery and labor efficiently among them.
- All target sites will complete underground structural work and land development in the first year, followed by the aboveground work in the next year, so that a sufficient work period (six months) is spent to complete structural and exterior works on the ground.
- Work sequence and components in each year will be planned to distribute the work volume evenly over the entire work period.
- A work period will be determined so as to afford a relevant timespan required for obtaining various permits and licenses prior to and during construction and for procurement of materials and equipment. In particular, the Project must ensure that the target sites will be able to start and complete a critical stage of service connections to public utilities within the scheduled time frame.

2-2-2 Basic Plan

In line with design components and specifications in typical school buildings funded by the Phase-IV project and GOM, basic plans of the intended facilities and equipment will be developed to integrate improvements reflecting the findings in the Field Survey on how the constructed facilities are being used and maintained. The basic facility planning, furthermore, will be in accordance with applicable requirements for educational facilities prescribed in Mongolia, while also incorporating administrative guidance and outcomes of consultations with relevant local stakeholders during in the Field Survey.

(1) Site planning and facility layout

Considering the in-situ facilities and buried infrastructure on each target site, facility layout on the premises will be planned in accordance with the following principles as well as the provisional basic plan confirmed under the presence of local stakeholders during the Field Survey.

- To ensure a daylight distribution in classrooms, side corridors will be located in the target sites where the buildings are elongated in an east-west axis to meet the conditions of the premises and existing facilities. Otherwise, the buildings will be a plan type locating middle corridors so that its architectural layout can be as simple and efficient as possible.
- The facilities will be configured to make the largest possible open space available for a playground. Where expanded, school buildings should be located at adequate intervals, considering shadow that may affect the existing buildings.
- Essential external facilities should have the following functions. Where school buildings are expanded, only those in shortage may be provided, after the currently available structures are reviewed.
  - An access driveway, sidewalk (a gradient of less than 1 in 15), and a parking lot to receive CWD. A driveway will be constructed from the entry point on the premises to a drop-off porch.
  - To prepare against rainfall in the rainy season, drain ditches will be provided to sufficiently discharge incoming rainwater down from the upper land surface on a sloping site.
  - Chingeltei No. 7 Khoroo is inclined about 12% to 15% across the entire premises. The building area will be therefore developed onto a flat land with an enough margin. A slope coverage will be placed with standard local PC blocks over the applicable section around the sloping margin. Steeply sloping sections on the premises, if any, will be provided with retaining walls, as required.
  - In the target sites installing a water supply tank (for water supply), septic tank (for sewer), boiler facility, and power generator room, a line of flow should allow vehicles to access for periodical supply delivery and maintenance work.

(2) Architectural planning

1) Basic layout

While varied in site conditions and building capacities, the four target schools are deliberately planned in line with the consistent project concept. Accordingly, in a plane configuration of the buildings, classroom buildings, a gymnasium, and ancillary facilities are linked one another with a conjunctive space called a “node.” The node includes a ramp located centrally in the planned school building. A space in the vertical direction will be connected with the space on the same floor level by means of a barrier-free nodal point (which is practically shaped in a "belt"). Another alternative solution for barrier-free access in the vertical direction is generally a lift going up and down in a closed shaft. In many cases, a lift in a building with a few floors can transport a limited number of users. As oppose to this, ramps enable a lot more people to access. Although the ramps entail the initial cost, no additional costs will be required thereafter. They are also available for emergency evacuation, while a stream of people and their safety are being ensured.

A schematic facility layout in each target site is as shown in the figure below. Various plan options are available, depending on where a node and other facility spaces are linked.

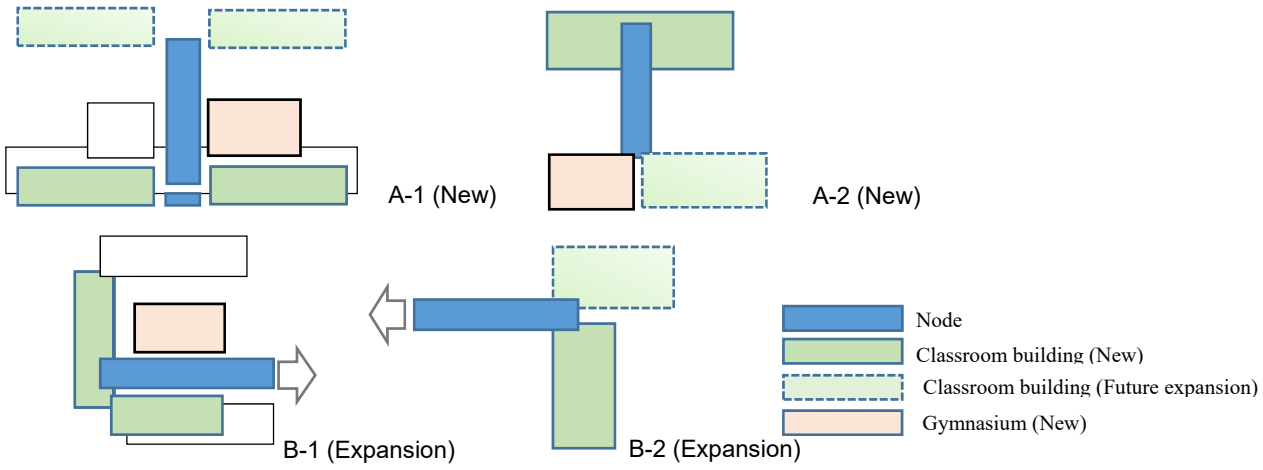


Figure 2-3 Schematic Facility Layout

2) Floor planning

Floor planning for the facilities will be developed as follows.

Classroom building

Floor planning for a classroom building will constitute a simple layout situating side- or middle-corridors. Where the buildings are elongated in an east-west axis, side corridors will be located so that classrooms do not face north, and can exploit the maximum daylight in the summer. Otherwise, classrooms will be located in a north-south axis along each side of the corridors so that they can all obtain at least three hours of daylight exposure. With respect to other aspects, a classroom building will be planned in accordance with the following principles.

- Because the foundation level should be deeper than the freezing depth, an underground space

will be efficiently used to locate the machine room, storage, special classrooms for technical subjects (including craft rooms), and a lobby where natural daylight is inessential.

- A plan should be a simple rectangle without irregularities to increase insulation efficiency over the entire building by minimizing a surface area per inner volume. This will enhance both workability and cost efficiency in the construction process at the same time.
- Each floor will equip a classroom adjusted to accommodate CWD and a multifunctional toilet (wheelchair-accessible unit). The below accommodations will be incorporated, apart from regular arrangements provided for general classrooms.
  - Sliding doors will be installed in place of hinged ones. A wheelchair-accessible desks will be provided for each room.
- Integral to universal design, ramps accessible to all floor levels will be located with the prescribed gradient (less than 1 in 12). Double handrails will be provided on both sides to enable self-propelled wheelchair users to go up and down the ramps. Flooring material should be non-slip vinyl sheeting. Braille printed navigation labels will be attached at the end of handrails.
- Corners in a lobby, stairs and corridors where many users circulate will use round columns to mitigate the impact of hitting against each other and to keep a clear line of vision.
- Surplus spaces being left free after allocating necessary space to the Project compornents will be utilized as a flexible (multipurpose) space which can be utilized upon a school's own needs and originality. Generally, they have a space approximately half of the general classroom, and can be used as a classroom for small group of students, a space for extra-curricular activities and/or self-learning after classes.

■ General Classrooms

Compared with a conventional standard classroom size in Mongolia (6 m x 9 m, a 40-people capacity), a classroom capacity in recent MECSS projects is generally kept about 28 to 36 students, while the space is one size larger than the above-said classroom. Also, lockers are generally equipped in the classrooms to place coats instead of cloak rooms. The Project will provide student furniture to accommodate 36 seats per classroom to absorb a prospective increase in enrolled students for the time being. A longitudinal span will require 4.0 m, which equates a classroom size of 8.0 m x 7.6 m, so that the prescribed area (1.6 m^2 or more per student) is obtained. This will attain a 30-people capacity with an area size of 2.0 m^2 per student which MECSS intends to standardize in the future. Entrance doors in classrooms will have alcoves sculpted inward from the corridor walls to reduce protruding sections, when opened. Washstands will be equipped in the classrooms in accordance with their standard specifications.

■ Special Classrooms

Subjects requiring rooms other than general classrooms are ICT, technology, physical education,

music, arts/crafts, and physics/chemistry/biology. Room components in each model school are planned for these subjects on the condition that the current curriculum will continue to be implemented. They are at the same time designed to allow (1) arrangements in an efficient and compact manner, and (2) flexible layout options capable of accommodating future alternations. The planning has involved the analysis of how special classrooms are currently used for each subject in the target schools of different facility types. Where compatible, these rooms will be used as much as possible for other than their original purposes.

Table 2-13 Curriculum-Based Distribution of Special Rooms

Facility model	Education	Grade	Provisional number of classes	Standard total class hours per week					
				ICT	Technology/Home Economics	Arts/ Crafts	Physical Education	Music	Physics/ Chemistry/Biology
A-1	Primary	G1-G5	5×4CL	0	40	40	40	36	0
	Lower secondary	G6-G9	4×4CL	16	32	16	32	16	84
	Upper secondary	G10-G12	3×3CL	9	18	0	18	0	54
		Total hours of classes		25	90	56	90	52	138
		Planned no. of classrooms		**1**	**2**	**(MP)**	**1**	**1**	**(2)**
A-2	Primary	G1-G5	5×3CL		30	30	30	30	0
	Lower secondary	G6-G9	4×3CL	12	24	12	24	12	63
	Upper secondary	G10-G12	3×3CL	9	18	0	18	0	54
		Total hours of classes		21	72	42	72	42	117
		Planned no. of classrooms		**1**	**2**	**(MP)**	**1**	**1**	**(1)**
B-1	Primary	G1-G5	5×3CL	0	30	30	30	27	0
	Lower secondary	G6-G9	4×2CL	8	16	8	16	8	42
		Total hours of classes		8	46	38	46	35	42
		Planned no. of classrooms		**1**	**(Existing)**	**(MP)**	**1**	**(Existing)**	**(1)**
B-2	Primary	G1-G5	5×3CL	0	30	30	30	27	0
	Lower secondary	G6-G9	4×2CL	8	16	8	16	8	42
	Upper secondary	G10-G12	3×2CL	6	12	0	12	0	36
		Total hours of classes		0	30	30	30	27	78
		Planned no. of classrooms		**1**	**2**	**(MP)**	**(Existing)**	**(Existing)**	**(1)**

* Upper secondary education has a selective system which offers such elective subjects as science (physics/chemistry/biology), design and technology, and ICT (8 hours per week). After the curriculum created under the preceding government was once abolished. Now the curriculum is taught as it was before. A new curriculum is not yet decided. The above-calculated distribution is estimated only on core subjects.

* Weekly class hours (lessons) are 70 lessons, where 7 lessons ×5 days×2 shifts.

* (MP) refers to use of Multipurpose Rooms. (Existing) refers to use of the existing rooms.

* B-2 model shows on a room distribution in the entire facility, as the existing buildings and an expanded section will function in an integrated manner.

In the light of the analysis, special classrooms will be planned in accordance with the above table

and the following principles.

- ICT Laboratory and craft rooms (Technology and Home Economics) will have dedicated spaces, as they need to place machinery and equipment. These rooms will allow shared use with arts and crafts or design-related electives offered at the upper secondary level.
- While ICT is not included in the primary education curriculum, the room is often used for extracurricular activities. It will be provided on each site, including expanded schools.
- Artistic subjects, including arts and crafts, can be taught in general classrooms. Practical exercises, however, will take place in the multipurpose room and the auditorium (art hall). In particular, music lessons should pay due consideration to sound exposure, and therefore lessons other than classroom lectures should be carried out in the auditorium (art hall). In particular, music lessons should pay due consideration to sound exposure, and therefore lessons other than classroom lectures should be carried out in the auditorium (art hall[13]).
- Apart from what is indicated in ther above table, science laborartory may be used in the primary education ("Human and Environment" and "Human and Nature"). Experimental teaching will take place in the multippurpose room.
- The multipurpose room will be provided as a workshop for shared use, teaching such subjects as science experiments, arts and craft.

■ Teachers and staff rooms

Teachers and staff rooms will have necessary room components, floor areas, and specifications, after an overall teacher allocation is determined, which should match a class structure and planned capacity (number of classes) in the constructed/expanded schools. Table 2-14 briefly shows a distribution of teachers. The detailed allocation plan will be described in "2-4-1 Operational Plan." Rooms in newly constructed schools (A-1 and A-2) will accommodate all the teachers and staff members planned. In expanded schools (B-1 and B-2), minimum essential rooms will be provided, as per a capacity of the existing Teacher's Room, to accommodate teachers required to run classes in the added buildings and staff members who will work there (indicated in bold frames).

- Expanded areas will chiefly accommodate the primary classes. Assuming that classes will be run in two shifts, a space for teachers and a primary-level training manager, should be large enough to accommodate those required to teach at least half the number of classes.
- Teacher's Room will have a flexible design that allows the space to be partitioned with furniture. It consists of a working space for a training manager, changing area for teachers, their working spaces, meeting room, and resting area.
- Those positions requiring individual offices are the director (including the secretary's room), social worker, and accountant/treasurer. In the Project, a social worker should be stationed in the

[13] No. 109 School planned to construct a B-2 type facility has no Art Hall. Alternatively, the existing music room is available.

Child Development Center at all times. The director's room, secretary's room, accountant/ treasurer room will be provided separately. Not many public schools allocate the deputy director, accounting for 10%. Nonetheless, an upper-secondary-level training manager often assumes the position in lieu, and therefore the deputy director's room will be located.

- Nearly all the schools assign their school doctors who take medical care of students regularly. Including the expanded schools, the medical room will be provided with a space for medical consultation and other duties.
- Resting room for supporting staff, technical staff room (electrician and plumber), and an en-suite room (shared for maintenance storage) will be provided on each site.

Table 2-14 Planned Allocation of Teachers and Staff

	Position	Allocation in the existing schools			Planned allocation (Total)				Allocation in the expanded schools	
	Site	A-1	B-1	B-2	A-1	A-2	B-1	B-2	B-1	B-2
Administrators	Director	1	1	1	1	1	1	1	-	-
	Training manager	3	3	1	3	2	3	2	1	1
	Social worker	2	2	1	1	1	1	1	1	1
Teachers	Primary teacher	21	29	15	23	18	38	13	16	16
	Lower secondary teacher	32	30	-	32	24	56	24	-	-
	Upper secondary teacher	21	25	-	18	18	42	12	-	-
	Subtotal of teachers	74	84	15	73	60	136	49	16	16
Staff	Accountant	1	1	1	1	1	1	1	-	-
	Treasurer	1	1	1	1	1	1	1	-	-
	Registrar and document management	1	1	1	1	1	1	1	-	-
	Librarian	1	1	1	1	1	1	1	1	1
	School doctor	1	1	1	1	1	1	1	1	1
	Plumber/electrician/wood work staff	4	2	2	2	2	2	2		
	Cleaning and other services	8	3	9	9	7	10	6		
	Security guard	4	3	4	5	4	7	3		
	Boiler operation	-	-	3		3		3	-	-

■ Library

The library consists of a reading space and a closed stack book storeroom where a librarian stations. The stack will have a book capacity up to 10,000. Available for group learning, the reading space will seat more than a class capacity of 36 students in the new schools.

■ Cafeteria/Pantry

The cafeteria serves free light meals for primary students, and paid lunch for secondary students, teachers and staff working in consecutive shifts. It is sometimes annexed to a kiosk that sells drinks, snacks, and stationaries. A-1 and A-2 (new construction) will be equipped with the kitchen and dining hall (cafeteria) to serve quick lunch, according to the number of teachers and staff. The pantry will be also equipped to distribute school meals for primary students. B-1 and B-2 will be provided only with

the panty, as the existing kitchens are available. The cafeteria will have a space to accommodate the number of users in accordance with the Building Standards for Educational Facilities.

■ Auditorium (Art Hall)

The Auditorium should be large enough to seat all students of a given grade (up to four classes, totaling 150 students), during events, meeting, and lessons. In line with the curriculum, this facility will be used for practices of music and dance as well as extracurricular activities. Sound-absorbing materials and forms will be applied to the interior to maintain the proper acoustic environment in the room. Doors should be sufficiently airtight for acoustic separation from general classrooms. To enable shading during projecting movies or on other occasions, a suitable structure will be installed to hang shades and blackout curtains (to be purchased by the Mongolian side). A simplified stage will be located at the one side of the Hall, equipped with electric outlets to meet various purposes in a flexible manner.

■ Lavatory

In accordance with the Building Standards for Educational Facilities, student toilets (for male and female) and wheelchair-accessible multifunctional toilets will be provided on all floor levels. Closet bowls are a Western type, while urinals are floor mount type. A slop sink will be equipped for a cleaning purpose. Where the lavatory is primarily used by lower grade students (generally on the first floor), the components should be accessible for users with different physiques by (1) installing small closet bowls, and (2) adjusting the height of wash-hand basins and (3) adjusting the height of booths and pull-handles.

Furthermore, newly constructed A-1 and A-2 schools will be provided with a multifunctional toilet for teachers and visitors on the second floor where the administration area will be located. It will be made available for the public, when the gymnasium and other school facilities are used for shelters in the event of disaster.

■ Corridors and common space

In A-1 and B-1 schools locating side corridors, the center-to-center distance between columns requires 2.8 m (to provide an effective width of 2.2 m or more) as in the Phase-IV project. In A-1 and B-1 schools locating middle corridors, the above-said distance requires 3.8 m, according to the similar facilities. Staircases will be located at the both ends of a corridor so that an emergency evacuation route should not exceed 60 m in total, including a central ramp. In particular, the centrally located ramp is intended to link spaces under which students assemble. Therefore, nodal points in corridors are designed to distribute enough natural light, while also situating a spacious lobby.

Gymnasium

The gymnasium requires specifically designed spans and floor height. Athletic exercises are likely to disturb the learning environment in classrooms. For these reasons, it will be structured separately

from a classroom building, constituting a semi-basement built under the entire floor so as to use the underground space efficiently. As an essential ancillary space, locker rooms will be provided each for male and female students on the second floor (first floor above the ground). Located as per the architectural code, an emergency staircase (1.5 m in width) should be directly accessible to the outside. The capacity is planned according to the applicable requirement in the Building Standards for Educational Facilities to accommodate a standard size of basketball court occupying 18 m x 32 m (in an arena). The gymnasium in A-1 and A-2 school will be used for a shelter in the event of disaster, and so a disaster relief storage will be built, using a sloping section.

Boiler House

The boiler house will be located in an annexed building on the target sites installing an independent boiler. The minimum essential space will be allocated for necessary installations, together with the boiler operator's room operating on a 24-hour basis.

Generator House

In the target sites where water is supplied with a booster pump (three sites excluding No. 53 School, B-1), an emergency generator is required by the Fire Department for sending water to indoor hydrants. Apart from this, a power generator will be provided with a capacity necessary for luminaries in common spaces occupied in an emergency situation.

Floor areas of the planned rooms

In light of the above planning, room components and the corresponding floor areas are as indicated in the table below on a model basis.

Table 2-15 Room Components and Floor Areas by Facility Type

Room name	Site/Model type	A-1 B1＋3F		A-2 B2＋2F		B-1 B1＋3F		B-2 B1＋2F		Remarks
		Q'ty	Area (m^2)	Q'ty	Area (m^2)	Q'ty	Area (m^2)	Q'ty	Area (m^2)	
Classroom	General Classroom	20	1,216.00	16	972.80	9	547.20	6	364.80	60. 8 m^2 per room, 1.69 m^2 per room
	CWD-accessible Classroom	3	182.40	2	121.60	3	182.40	2	121.60	Same as above, one classroom per floor
	Flexible(multipurpose) Space	1	30.40	3	84.85	2	60.80	1	30.40	30.4 m^2 per room
Special Classroom	Multipurpose Room	2	182.40	1	91.20	1	91.20	1	91.20	Including a preparation room and storage
	ICT Laboratory	1	91.20	1	91.20	1	91.20	1	91.20	Storage and a sever room included in B-1
	Craft room (Technology/ HE)	2	152.00	2	174.80	-		2	121.60	Including a preparation room and storage
Child Development Center		1	60.80	1	60.80	1	60.80	1	60.80	Shared with a Social Worker's Room
Teacher's Room	(Training Manager's Room)	1	60.80	1	30.40	1	15.20	1	15.20	
	(Teacher's Room)	1	161.20	1	98.40	1	53.20	1	76.00	Excluding 15% of the special subject teachers

Room name	Site/Model type	A-1 B1＋3F		A-2 B2＋2F		B-1 B1＋3F		B-2 B1＋2F		Remarks
		Q'ty	Area (m^2)	Q'ty	Area (m^2)	Q'ty	Area (m^2)	Q'ty	Area (m^2)	
Administration	Director's Room	1	39.90	1	22.80	-		-		
	Secretary's Room	1	13.70	1	15.20	-		-		
	Deputy Director's Rm.	1	30.40	1	22.80	-		-		
	Accountant/Treasurer	1	25.27	1	25.27	-		-		
	Medical Room	1	15.20	1	15.20	1	15.20	1	15.20	
	Staff Room	3	24.20	2	15.20	2	15.20	1	7.20	
	Server Room	1	5.13	1	5.13					
	Guard Room	1	10.85	1	8.00	1	6.52	1	8.00	
Cafeteria	Kitchen	1	94.85	1	87.00	-		-		Including a pantry and food storage
	Pantry	-		-		1	30.40	1	30.40	
	Cafeteria	1	91.20	1	76.00	-		-		
Library	Reading space	1	76.00	1	85.75	1	30.40	1	45.60	36 seats in the newly constructed schools
	Bookshelves/ Librarian's room	1	45.60	1	44.10	1	30.40	1	30.40	
Auditrium(Art Hall)			218.00	1	228.00	-		-		1.45-1.52 m^2 per person (a 150-people capacity)
Toilet (for students)		8	243.20	6	167.10	8	222.80	6	167.10	
Toilet (multifunctional)		4	22.19	3	15.30	4	20.40	3	15.30	
Toilet (for teachers)		2	24.85	2	30.40	-		-		
Machine Room/Electric Room		1	91.20	1	121.60	1	77.06	1	60.80	
Emergency Storage		1	67.20	1	35.35	1	41.60	1	21.88	
Gymnasium	Arena	1	603.10	1	576.00	1	319.80			
	Changing Room/Lavatory	2	45.60	2	56.56					
	Machine Room	1	25.19	1	9.48					
	Teacher's Room including storage	1	30.40	-						
Stars, corridors			2,294.14		1,587.11		1,444.86		1,159.70	
Boiler Room					70.00				84.00	
Power Generator Room			27.00		13.50				13.50	
Total			6,301.57		5,058.90		3,356.64		2,631.88	Grand total of 4 sites:17,348.99

3) Section planning

Classroom building

The classroom building will use an underground space derived from preventing frost heaving. Where feasible within a limited work period, the building will be multistoried with an underground floor and three above-ground floors to lower the construction cost per classroom. In Chingeltei No.7 Khoroo on a sloping site, however, the gymnasium will be located in the second basement floor. With a fewer floors, therefore, it will be structured to have a basement floor and two above-ground floors. Similarly, No. 109 School whose existing classroom building is two-storied will have an added structure that locates an underground floor and two above-ground floors.

- A floor height is 3.3 m as per the Building Standards for Educational Facilities. The first-floor level will be equal to DGL plus 1.75 m to prevent the structure from inundation caused by intense rain and frost damage by snowfall. This height is also required to obtain natural light in a

basement through clerestory windows. The floor height of basement is 3.45 m from the ceiling to have the depth of foundation level necessary for frost heave prevention and the space for water tank installation. The exposed foundation will be poured with rubble concrete from the foundation bottom up to the suitable height so that the said bottom is kept deeper than 3 m of freezing depth common to UBC.

- The height of windows will be just under the beams in the longitudinal direction to distribute as much natural light as possible into the classrooms. While the same window height should be kept at classrooms and corridors, south-facing classrooms will have wider windows to let in optimal daylighting and collect heat.
- Windows in classrooms along corridors should have a higher waist height than the eye level so that students can concentrate on their lessons without being disturbed by the glance of people walking the corridor. The illuminance level should be kept constant in the classrooms with daylight distributed from the corridor.
- The depth in the outer beams should be large enough, while reducing the width. The beams should be designed to avoid a dominant exposure to the rooms. Moreover, the beam depth in the longitudinal direction will be constant for the sake of efficient construction work. On the other hand, beams in the span direction will be as wide as columns. Minimization of beam depth will provide enough under-beam height (2.7 m).
- Planning requirements vary site to site, depending on the local conditions, connection between the existing and added buildings, and compass directions. The Project thus prepares two kinds of floor plans which adopt either side- or middle- corridors. In a middle-corridor building, a drainage slope is laid from the central ridge towards each side of the external walls along the classrooms. In a side-corridor building, on the other hand, a drainage slope is laid from the one side ridge at the external walls along the classrooms towards the corridors.

Gymnasium building

The gymnasium requires a floor to ceiling height of 7 m or above, as generally applied in the existing schools, whereas the floor height at the lower elevation should be 7.2 m. As in the classroom buildings, the resulting underground space will constitute a semi-basement where windows above the ground should allow natural light to reach inside. The floor level of arena should be 1.7 m deeper than the ground plane, as in the classroom buildings. The ground height will be planned on a site basis to minimize the depth of excavation according to the foundation. A difference in levels between the gymnasium and the classrooms, if any, will be redressed with a node (conjunction space).

Node (conjunction space)

A node is a key section constituting a common space in a facility where the Project's thematic considerations are exemplified to meet the needs of CWD and prepare against natural disasters. A ramp with a slope of 1 in 12 connecting the lowest to top floor levels will enable students with physical

disabilities (wheelchair users) to have self-assisted access and mobility, while also providing a viable means of emergency escape to outside. In the expanded schools, furthermore, upper and lower floor levels in the existing buildings will be accessed freely via a node connected with the added buildings. Due consideration should be given to ramps constituting the main building structure, equipped with double handrails, so that persons with physical disabilities and small children can use them with minimum physical effort.

Design of specifications for roofs, external walls, and insulation

To be connected with a central heating network in UBC, thermal insulation performance requires a coefficient of heat transmission of 0.4 or below for sections exposed to the external air. Increased insulation performance is also crucial to reduce the running cost. The Project will apply the following specifications for roofs, external walls, floors, windows and doors to be better insulated than those designed in the Phase-IV project. External insulation will be installed with a continuous insulating envelop all around the buildings to minimize a thermal bridge.

- A roofing system is flat roofs sealed with insulating materials over cast-in-situ concrete slab. A waterproofing measure is standing seam metal roofing suitable for leakage prevention on a low slope. This application entails less time and labor in installation work, while also workable in a dry process, regardless of outside temperature.
- Instead of using increasingly high-priced bricks, external walls will apply a rapidly establishing external insulation system in Mongolia, which has become a common local standard (XPS or EPS insulating material is attached with fixing anchors over the outer surface of walls, on which mesh sheets are covered and finished with special mortar and coating). Room-facing surface of the walls enveloped with insulation layers will be structured with shock-resistant and durable solid concrete blocks.
- Windows will be insulated sash windows with PVC frames that are increasingly available in recent years. Glasses will be multi-layered and have low emissivity to maintain high insulation performance. A small vent opening will allow natural ventilation during summer and help additional ventilation in a heating period. Windows on the lowest floors will be equipped with steel grilles to guard against a burglary.

With these material components applied, high insulation performance is achieved where U-value of standard external wall specification is 0.221 W/m^2K, standard roof specification, 0.176 W/m^2K, and window specification, 1.435 W/m^2K to 1.225 W/m^2K[14].

[14] For instance, these values meet environmental performance requirements for Public-Private Partnership projects (coefficients of heat transmission requiring 0.25 W/m^2K for walls, 0.18 W/m^2K for roofs, and 1.5 W/m^2K for windows), while also mostly exceeding performance values designed in the Phase-IV project.

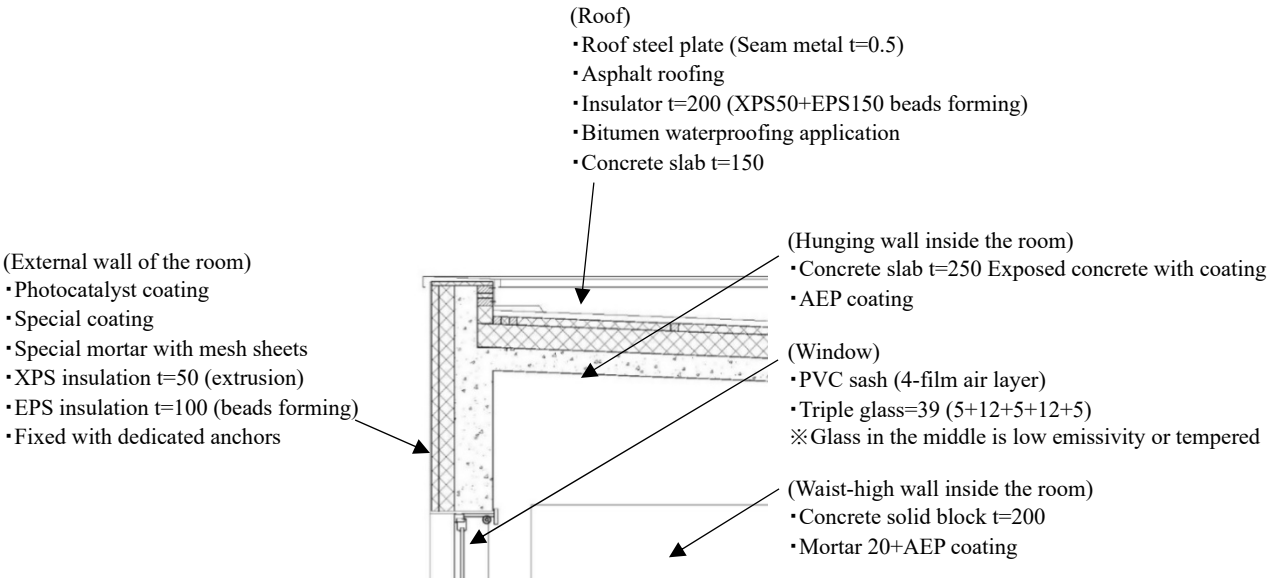


Figure 2-4 Insulation Specifications for Roof and External Wall

4) Structural planning

Structural system

- Main structure:

The most common type of building in Mongolia will be applied, which is cast-in-situ RC frame structures constructed with columns and beams. The cross-sections of structures will have the members aligned with a benchmark section and allow streamlined work execution to the possible extent, because the structure work must be completed in a limited summer period.

- Foundation system:

Findings in the geotechnical survey on the target sites reveal that soil below more than 2.0 m from the ground surface is mostly as solid as more than 200 kN/m^2 in a bearing capacity (sand-mixed grave layer or gravel-mixed sandy cray layer). A long-term bearing capacity of the soil for foundation design has been set as 200 kN/m^2, and RC independent footing tied with foundation beams, which allows the most efficient design, will be employed for the foundation system. The foundation bed should be as deep as 3.00 m below the ground surface to prevent frost heaving.

- Floor structure:

Instead of PC floor slab, common cast-in-situ RC slab will be used. The lowest floor level will be finished with slab on grade. Other sections will be finished with structural slab, including roof slab.

- Basement wall:

To allow a more straightforward and flexible construction method while achieving high water resistance, cast-in-situ RC structural walls will be built in the basement, instead of PC block basement masonry walls.

Structural standards

Architectural code in Mongolia will be observed in the structural design, and where necessary, Japanese standards (Architectural Institute of Japan) will be also consulted.

- Live load (Normative reference in structural analysis of frames):
  - Roof 0.65 kN/m^2
  - Classroom and Teacher's Room 2.10 kN/m^2
  - Lavatory 1.30 kN/m^2
  - Corridor, lobby, and stairs 3.20kN/m^2
- Wind load:

While the prescribed value is 35 kgf/m^2 (terrain category II), the applicable wind load will be decided on the basis of the seismic force that is greater than horizontal force.

- Snow load:

While the prescribed value is 50 kgf/m^2 (terrain category II), the snow load will be decided on the basis of long-term load (fixed load plus live load) that is greater in terms of vertical load.

- Seismic force:

The target sites are located in the zones prone to 6 to 8 on the MSK seismic intensity scale (equivalent to 4 to 5 on the Japan Meteorological Agency's seismic intensity scale). Mongolia is currently up-dating zoning of UBC for the application of seismic intensity scale. The modified zones are likely to predict one scale higher seismic intensity than before.

To respond to this revision, the structural design in the Project will apply the base shear coefficient of 0.12, instead of 0.08 used to meet the previous requirement.

Structural materials

Structural materials are planned as follows in accordance with Mongolian standards.

- Concrete: Ready-mixed concrete (Standard product in Mongolia)

  Design strength

  - Main structures including foundation, columns, and beams : M300 (Fc=24N/mm^2)
  - Other sections : M250 (Fc=20N/mm^2)

  Ensuring nominal strength (procured ready-mixed concrete)

  - Main structures including foundation, columns, and beams : M400 (Ensuring Fm or above→Fc=24N/mm^2+8N/mm^2)
  - Sections other than the structure : M300 (Fc=20 N/mm^2+4N/mm^2)
- Rebars and steel: Round steel and deformed bars imported from Japan or Russia or produced in

Mongolia (JIS products)

- Rebars D13 or less : SD295A Yield strength 295MPa
- Rebars D16 or above : SD345 Yield strength 345MPa
- Steel (mold steel) : SS400 Yield strength 235Mpa

5) Building services planning

Building services in the planned facilities should be provided in accordance with architectural code in Mongolia and administrative guidance of relevant authorities. It must be also ensured that the room environments are set up to meet severe climate conditions, equipped with user-friendly equipment and devices incorporating universal design principles. No specialized skills or additional costs should be required for maintenance of those components, while giving due consideration to disaster preparedness and environment. In light of these underlying requirements, the required installations are planned as follows.

Electric installations

- Trunk power system:

Low-voltage power (3-phase/4-wire, 380/220V 50Hz) will be drawn to a lead-in switch box set up on the premises and supplied with buried cables to a main distribution panel in the basement machine room. Where the sites require overhead transmission, the Japanese assistance will cover power connection for the section after lead-in poles. Where they require buried cables, it will cover a section after a lead-in switcher. In the buildings, distribution panels will be installed on each floor level to supply power to various loads. For systems and devices related to heating, water and hot water supply, and ventilation, a distribution circuit will be equipped with automatic voltage regulars (AVR) to prevent irregular voltage fluctuations leading functional failures and damage of connected devices.

As a rule, trunk lines in the buildings will be distributed with installed cable racks. Underground sections outside the buildings will install PVC conduits to distribute electricity.

A power receiving capacity on each site is as planned below, according to the expected load capacity there.

- No. 75 School (A-1) : 23 classrooms 160 KVA
- CH No. 7 Khoroo (A-2) : 18 classrooms 160 KVA
- No. 53 School (B-1) : 12 classrooms 100 KVA
- No. 109 School (B-2) : 8 classrooms 100KVA

- Lighting system:

Locally available LED lights will be installed in accordance with room functions. Open-type appliances are provided, wherever possible. ICT laboratory and library will be provided with louver luminaries for anti-glare protection. The gymnasium will install both high-bay and wall-mounted

lighting fixtures. Illuminance in the key spaces should exceed the following standards.

- General Classroom, Special Classroom :300 Lx
- Teacher's Room, Gymnasium :200 Lx
- Gymnasium :350 Lx
- Corridor, Lobby, Lavatory :100 Lx

CWD-accessible classroom will have at least 500 Lx of illuminance to accommodate students with visual impairment. Lighting circuit over the front row, which is adjacent to a whiteboard lighting fixture, should be separated for flexible switching control.

- Electric outlets:

Three outlets will be provided per general classroom. Other rooms will be equipped with outlets suitable for the expected loads. Special classrooms should be able to use experimental equipment and machine tools as required by the curriculum, and therefore will be provided with necessary number of outlets for group-work experiments.

- Automatic fire alarm system:

In compliance with building safety standards, an automatic fire alarm system will be installed with smoke detectors (thermal sensor in kitchen: actuating or low temperature detector) and alarm bells. The detectors will be set up across the areas other than lavatory and the boiler room. An indicator panel will be placed in a room on the first floor where a security guard is stationed. Alarm bells will be installed in corridors, as required, to reach 20 m in the effective coverage.

- Emergency lighting and exit route lamps:

As required by the Fire Department, battery-powered emergency lighting and exit route lamps will be provided in staircases and entrances.

- Communication system and electrical appliances :

An public-address system will be installed to deliver administrative messages and guide emergency evacuation. Loudspeakers will be provided in classrooms, cafeteria, library, gymnasium, and corridors. An amplifier will be controlled in the training manager's room. A set of mobile acoustic devices (such as amplifier, mixer, and CD/DVD player) will be placed in the auditorium (art hall).

- School bell:

Apart from the above, a school bell system will be installed to indicate the lesson hours. Electromagnetic bells are installed in corridors on each floor, which is operated in the guard room.

- Security monitoring system:

Provided with an identical specification in similar facilities, a split-screen monitor will be set up in the guard room to keep watch over gates and around the buildings on the premises.

- Communication system:

In UBC, high-speed optical communication systems are being installed in schools. The Project will draw optical cables in a terminal board in the server room, connecting to LAN to provide a communication system with Internet and IP telephones. Connection with a service line and sever installation should be funded and executed by the Mongolian side. The Project's construction work will include piping and cabling related to a switching hub, wireless access point, media convertor. LAN outlets will be provided in classrooms, administrators' rooms, and ICT laboratory.

- Master antenna television system:

CATV lines or antenna signal lines will be drawn into the server room to connect via a distributor where TV sets are located (director's room, teacher's room, CWD-accessible room, Child Development Center, and a lobby on the first floor). The Project's construction work will include piping and wire distribution for a section between the distributor and wall-mounted TV terminals.

- Lightning protection device:

In accordance with the Fire Department guidance, roof-conductor type lightning protection will be set up on the main building. An earth electrode will be installed to connect with a lightning rod.

Water supply and drainage system, and sanitary fuxtures

- Water supply system:

In two target sites where the municipal water supply is available (A-1 and B-1), service pipes will be branched from the existing water main on the premises. Otherwise, new service pipes will be connected from the boundary of the premises via a water meter pit all the way to the basement machine room. Pipes outside the buildings are placed in trenches, where possible, in parallel to heating hot water pipes. Alternatively, a supply pipe and return pipe will be installed for service connection, enabling circulation at all times to prevent freezing.

Table 2-16 Calculation of Water Tank Capacity

Site (Facility type)		User	Basic unit of water consumption		Volume of water consumption		Water tank capacity (m^3)
			Planned no. of users	L/person per day	(L/day)	(m^3/day)	
No. 75 School	A-1	Students	1,651	35	57,785	64.9	Disaster relief 100 users x 7 days x50l =35 m^3
		Teachers and staff	102	70	7,140		
CH No. 7 Khoroo	A-2	Students	1,296	35	45,360	51.3 (x0.5=25.7)	25.7+8.00 (for fire extinguishing) 34 m^3
		Teachers and staff	85	70	5,950		
No. 109 School	B-2	Students	576	35	20,160	23.3	23.3+8.00 (for fire extinguishing) 32 m^3
		Teachers and staff	45*	70	3,150		

* The number of teachers is estimated according to the capacity of the current teacher's room. The number of staff, on the other hand, is full-time workers assigned in the added building.

No. 75 School (A-1): To serve as a pivotal public facility to shelter people from natural disasters, the machine room will allocate a water storage tank to supply water with a booster pump to the points

served. The tank capacity should be enough for 100 people to sustain their living for one week (except for drinking water).

No. 53 School (B-1): Water will be supplied to the points served, with a direct pressure distribution system connected to the municipal water, via a water meter and pressure-reducing valve.

CH No. 7 Khoroo (A-2): A well in an adjacent kindergarten is available. By rehabilitating a well pump and pipes, water is sent to a receiving tank installed in the machine room. Water is then supplied with a booster pump to the points served. The tank capacity should be enough to contain water required for half a day.

No. 109 School (B-2): A water truck will be used. Water will be supplied with a booster pump from a receiving tank in the machine room to the points served. A water intake is provided in an external wall to feed water to the receiving tank. The tank capacity should be enough to contain water volume to be consumed in a day.

In A-2 and B-2 sites where the municipal water is unavailable, 8 m^3 out of water volume contained in a receiving tank will be saved for fire extinguishing.

- Hot water supply system:

In A-1, A-2, and B-1 sites where water service pipes are heat-retaining, a temperature of supplied water is kept reasonably warm so that it causes no trouble for ordinary use. Thus, hot water will not be supplied to regular faucets, although one of the wash-hand basins in a common space in the lavatory and a washstand in the medical room will be supplied with hot water with a storage-type electric water heater. In B-2 where a water truck will be deployed, a storage-type water heater will be provided to supply temperature-adjusted hot water to all faucets. The kitchen, pantry, and showers will be installed each with tankless electric water heaters for hot-water supply.

- Drainage system:

Waste water will be discharged to a combined sewer in the buildings. In A-1 and B-1 sites connected with a piped sewerage system, waste water generated in the buildings will be drained to the existing sewage system on the premises. The existing B-1 site will be connected to the sewer pit located on the premises. In A-1 site, where the buildings will be rebuilt entirely, a final pit will be provided to connect to the piped sewerage system in-situ.

In A-2 and B-2 sites unconnected with the piped sewerage system, a septic tank will be installed on the premises to make treated water absorbed into the soil. The septic tank should have an enough capacity to treat the estimated volume of sewer water. At the same time, it should be installed deep enough to allow a decomposing process in the severe winter, which water temperature in the tank must be kept at least 4℃. Biological chips will be put into the tank to keep bacteria alive in low temperature. Septic water will be soaked into the soil in an unfrozen layer via a seepage pit or pipe installed below the freezing depth.

- Plumbing fixtures:

Toilet bowls and washstands must meet the quantities stipulated separately for boys and girls in the Building Standards for Educational Facilities. Plumbing fixtures will be provided according to the facility types (number of classrooms), as indicated in the table below. In addition, all classrooms will be equipped with wash-hand basins. In the target sites installed with the boiler room, a wash-hand basin will be equipped in the boiler operator's room. For students, closet bowls are a Western style, while urinals are floor mount type. Toilet bowls for teachers will be a Western style. These components should be designed to enable all users with different physiques to use without restraints. Based on a layout of the planned toilet fixtures, appropriate specifications should be decided for likely users. The fixtures will be adjusted to their sitting height of closet bowls and height of washstands and booths, together with a suitable design of urinals.

Table 2-17 Planned Distribution of Plumbing Fixtures

Facility/Fixtures		A-1 (23CR) Planned number of students: 828	A-2 (18CR) Planned number of students: 648	B-1 (12CR) Planned number of students:432	B-2 (8CR) Planned number of students:288	Installation requirement
Lavatory for students		4 blocks each for male/female	Same as left	Same as left	3 blocks each for male/female	Number of toilet bowls Female 1 bowl per 30 users Male 1 bowl per 40 users Washing faucet 1 faucet per 30 users
	Closet bowl	Female 24 Male 11	Female 20 Male 10	23 for male, 11 for male	17 for female, 8 for male	
	Urinal	Male 19	Male 16	20 for male	15 for male	
	Washing faucet	Female 15 Male 15	Female 15 Male 15	Female 16 Male 16	Female 12 Male 12	
	Slop sink	6	6	8	6	
Multifunctional toilet		4	4	4	3	
Toilet for teachers		One block each for male/female	One block each for male/female	Shared use with students	Shared use with students	
	Closet bowl	Female 2 Male 1	Female 2 Male 1	Female 1 Male 1	Female 1 Male 1	
	Urinal	Male 2	Male 2	-	-	
	Washstand	Female 1 Male 1	Female 1 Male 1	-	-	

- Fire extinguishing facility:

Indoor hydrants will be installed in corridors and the gymnasium in an adequate quantity across the entire building, each covering a 20-meter radius of a fire-prone area. No. 53 School (B-1) will supply water with a direct pressure distribution system connected to the municipal water. The three sites provided with water receiving tanks will send water with booster pumps. Furthermore, No. 75 School (A-1) and No. 53 School (B-1) will install a water intake point exclusively used for a fire-fighting vehicle. It will be situated in a check pit where a branch pipe is connected with the municipal water main.

A fire extinguisher will be equipped in shared corridors per 50 m^2. The machine room and the electric room, partitioned from each other, will be also supplied with a dedicated fire extinguisher. Inert gas extinguisher will be suitable for the electric room equipped with mechanical installations.

- Kitchen equipment:

The new school sites will locate the kitchen to serve primary students with school meals twice a day as well as lunch in an adjacent cafeteria. In the expansion sites, the pantry will be provided for a temporary placement of school meals prepared in the kitchen, subsequently distributed to students learning in the added buildings.

The kitchen will be provided as part of the construction work, including typical kitchen unit (sink, cooking table, racks, heating apparatus, and refrigerator). All heat sources are electricity.

It should be noted that many schools outsource their cafeteria services private firms, including school meals. Accordingly, measurement of electricity and water consumption and a locking system and security management of the building should be carried out separately from the school operations.

Air conditioning and ventilation system

- Heating system

Heating will be provided with the most common hot-water radiator system in Mongolia, which will cover the entire buildings, except for the boiler room.

In A-1 and B-1 sites where district heating is available, source hot water will be branched from the existing or newly provided hot water pipe to the basement machine room. It will be then sent to the above-building sections with a circulation pump. When the existing pipe is not enough to supply additional hot water required in newly constructed buildings, the Mongolian side will rehabilitate pipes or connect new service pipes. It is a heat provider who installs branch pipes, and the Mongolian side will bear such expenses. The Japanese side will execute works needed for a section from the branch points.

Where district heating is unavailable, an independent boiler will be installed in the building to supply heat source. A high-efficiency coal boiler will be provided in conformity to local standards. A dust removal filter must be equipped so that combustion exhaust gas meets the environmental requirements in Mongolia. The boiler will be accommodated in a dedicated building, together with the boiler operator's room.

- Ventilation system

Ventilation scheme: In accordance with the Building Standards for Educational Facilities, a forced ventilation system will be installed, which aerates at least once in an hour. When heating system is used in winter, windows will be closed tightly, while running the forced ventilation system. In other periods, the buildings will be naturally ventilated with vents to lower the maintenance cost. Ventilation systems in lavatories on each floor level will be isolated to release air directly outside with exhaust fans.

Forced ventilation system: Fresh air will be taken into the basement machine room through an inlet vent. Air once heated in the machine room will be re-heated in a blower unit with built-in hot water coils, and then distributed to rooms. Ducts will be hung in corridor areas. On the classroom floors, ducts will be placed between the floor slab and the false ceiling. Classrooms will be provided with

air supply vents connected to ducts. Exhaust air will be sent from classrooms to corridors and eventually lavatories to be discharged with an exhaust fan equipped there. A kitchen, pantry, and multipurpose rooms will have natural supply and forced exhaust of air with their on-site exhaust fans, while the boiler room will have forced supply and natural exhaust of air with its on-site supply ventilating fan.

Furthermore, a temperature in a building will be kept constant by circulating rising warm air down the lowest floor.

Stand-by generators

As advised by the UBC Fire Department, an emergency power generator should be provided to run a booster pump that sends water to indoor hydrants. In addition, stand-by generators will be supplied as below to meet the lifeline necessity in the event of disaster.

No. 75 School (A-1): To serve as a local evacuation center for protection against disasters, the school will be equipped with a power generator with a minimum supply capacity of 80KVA, which is essential to sustain a week of evacuees' living in the gymnasium in the first-floor basement and common spaces on the first and second floors.

CH No. 7 Khoroo (A-2) and No. 109 School (B-2): A power generator will be installed with a supply capacity necessary to operate a water supply pump unit, a circulation pump and a boiler power source, both needed for heating, and essential luminaires in common spaces.

No. 53 School (B-1) is directly connected with a water main, and therefore is not required to install an emergency power generator. Because the school is located in the central area of UBC where electric power supply is stable, an stand-by generator will not be provided.

6) Planning of construction materials

Specifications of structural elements will be planned reflecting a comparative analysis of those used in other similar facilities (GOM-funded standard school buildings and facilities designed in the past Japanese grant aid projects) as well as requirements and work methods generally applied in Mongolia. As indicated in the table below, they are designed to meet the standard quality grade required for a school building, rigidity, durability, workability, and thermal efficiency.

Table 2-18 Construction Methods and Specifications by Structural Elements

Element	Applicable specifications and construction method	Standards applied to similar facilities in Mongolia	Rationales for application
Main structure			
Footings/foundation beam	RC	Same as left	Compliant with Mongolian standards
Columns/beams	RC	RC, brick masonry, PC	Highly resistant to earthquake and good workability
Roof/floors	RC	PC floor slab, RC	Constant availability, design flexibility. Highly workable for local workers

Element		Applicable specifications and construction method	Standards applied to similar facilities in Mongolia	Rationales for application
Exterior				
Roof		Insulation (XPS50+EPS150= 200 mm) +asphalt roofing sheet＋galvalume steel sheet /standing seam metal roofing	Insulation(100mm)+ protective concrete coating +asphalt waterproofing (Protective layers with PC blocks were placed in the phase III project)	Dry construction is feasible, regardless of the outside temperature. Fewer work steps. Cost effective. Continuous insulation layers across roofs and walls enhance insulation.
Coping		Ready-made aluminum coping w=500mm	Same as left	Ready-made product, suitable for keeping heat insulation's continuity at the edges of roof and parapets.
Walls		External insulation (Insulator XPS50+EPS100mm)+ special painting with mesh sheets+ coating+Photocatalyst paint	External insulation (Insulator 100 mm)+dressed brick masonry+mortar plastering	Broadly applicable specifications whose work is simple and established reduce overall costs.
Windows (General)		PVC sash (four-film air layer) ＋triple-glazing including Low-e or tempered glass, steel insulation door	PVC sash＋double-glazing, double wooden sash, steel insulation door	Excellent air-tightness, insulation efficiency, and durability. Easy maintenance. Better-quality glass insulator will increase insulation efficiency over windows that usually cause a thermal flaw.
Window (Gymnasium)		Same as above	Glass block window	Enables natural ventilation in summer, suitable for natural lighting, high thermal insulation performance
Interior				
Floor	General section	Continuous vinyl sheeting (t=2.5 mm)	Same as left, wooden strip flooring, terrazzo floor (Continuous vinyl sheeting in the Phase III project)	Locally marketed product is 2-mm thick, and is worn out soon. Highly durable specification should be applied.
	Stairs, ramps	Non-slip continuous vinyl sheeting (t=2.5, 4.2 mm)	Same as above	Used in the Phase-IV project. User-friendly material and safe in walking on. User satisfaction is high.
	Entrance lobby	Porcelain tile	Same as left (Continuous vinyl sheeting in the Phase III project)	Used in the Phase-IV project. Excellent abrasion resistance .Easy to clean.
	Toilet	Porcelain tile	Same as left	Compliant with Mongolian standards
	Gymnasium	Continuous linoleum sheet (t=3.2 mm)	Wooden strip flooring, (Continuous vinyl sheeting)	Excellent abrasion resistance and good workability
Walls	General section	Solid CB wall＋bedding mortar＋painting	Brick wall＋bedding mortar ＋painting (calcium silicate board in the Phase III project)	CB walls are featured by a stable price and good workability. The standard specifications in Mongolia will be applied. Solid CB will enable more rigid anchoring and better acoustic and thermal insulation performance.
	Toilet	Porcelain tile (waist-high wall)	Same as left	Compliant with Mongolian standards
Ceiling	General section	Cast-in-situ concrete coating +painting	Bedding mortar and board＋ painting (PC floor slab＋ mortar washed bedding in the Phase III project)	Surface finish with cast-in-situ concrete with minimum backing coat.
	Corridor Part of lobby	Lightweight steel sub-ceiling ＋gypsum ceiling board		Easy to check piping in a ceiling space
Windows and doors		PVC window＋PVC door	Wooden window and door, PVC window and door	PVC is used for all windows, which is high in insulation efficiency and free of deformation.

CB: Concrete block

Phase-III project: The Project for Improvement of Primary Education Facilities (Phase III)

PVC: Polyvinyl chloride (rigid plastic)

Phase-IV project: The Project for Improvement of Primary Education Facilities (Phase IV)

PC: Precast concrete

(3) Furniture planning

The Project will supply minimum essential furniture and fittings to operate the schools and implement their curricula. The components will be decided according to those provided in GOM-funded similar school buildings. Sizes and other specifications of student furniture will take into account of age-based physical differences and CWD, particularly wheelchair users, who should be able to attend their classes comfortably without the need for adaptation. In addition, furniture, such as shelves, that is likely to fall down with an earthquake will be anchored at the upper sections to prevent physical damage.

Furniture specifications should be similar arrangements in identical facilities. Items and quantities of furniture specific to the intended facilities and rooms are as described below.

- General Classrooms:

General classrooms will be provided with sets of single seater desk and chair for all grades which offer various layout options for different learning settings and to meet personal needs of students flexibly. Items will be selected from height-adjustable, light-weight, and durable products. In the classroom, a glass whiteboard will be set up in the front, suitable for ranging purposes and equipped with durability. For instance, it can be alternatively used as a projector screen. At the both ends of the board, rigid felt boards will be placed to post notices (a part of the construction work). Back of the classroom will be equipped with personal storage comprising six sets of three-wide, two-tier lockers to hang coats of 36 students. They have doors and are lockable, and yet they are not enough to be allocated on a student-by-student basis, because classes are currently run in two shifts.

- CWD-accessible Classroom:

Wheelchair-accessible desks will be provided for CWD students to attend their classes.

- Flexible space (multipurpose space):

Furniture will not be supplied not to disrupt flexible and unique usage of the space by the target schools.

- Child Development Center:

Trapezoid tables and upholstered round stools will be supplied so as to offer various layout options for children exercising their creative imagination. A shelf, a set of table and chair for social worker, and a guest chair will be allocated.

- Multipurpose Room:

Work tables (each seats six stools) will be provided for such ranging purposes as science experiments, art, craft, design, and group works. A wide table and chair will be also provided to teachers for demonstrative teaching. An en-suite room for equipment storage and preparation will be supplied with equipment racks (open-type and/or with door), work desk, teacher’s chair. A board will be the same type as in the general classrooms.

- Craft Rooms (Technology/Home Economics):

In general, sewing and wood / metal works are provided. Tools and equipment are mostly small-size pieces handled on tables. Easily movable multipurpose work tables and stools will be provided for shared use with arts, crafts, and design lessons. The preparation room will allocate equipment racks, work desk, and teacher's chair. A board will be the same type as in the general classrooms.

- ICT Laboratory:

A two-seater PC desk for student (to place LCD and compact PC for 18 students as a unit covering half a class, and two units will be supplied), 18 chairs, and a set of teacher's desk and chair, and a printer table. A glass whiteboard will be set up and used compatibly as a projector screen.

- Library:

A reading space will be large enough to accommodate a class (or half a class in the expanded schools) at one time, which will locate six sets of six-seater reading table and chairs (three sets in the expanded schools) and open bookshelves. Stacks include open bookshelves and those with doors. An office desk and chair will be allocated for a librarian.

- Teacher's Room:

The room will consist of a working area and a meeting space where work desks with chairs and a six-seater meeting table with six chairs will be provided. The quantity is determined to accommodate teachers using them at one time (the planned number of teachers deducted by those working in their individually assigned rooms and preparation rooms, then multiplying a half). Equipment racks and lockers for coats and personal belongings will be provided to meet the capacity of newly constructed buildings.

- Administrative offices and staff rooms:

Director's room, deputy director's room, and training manager's room will be equipped each with a set of administrator's desk and high-backed chair, a cabinet, and two guest chairs. In addition, director's room and deputy director's room will allocate a meeting table and six chairs each. Accountant/treasurer room and secretary's room will be equipped each with a set of work desk and chair for the staff, together with file cabinets, where necessary. medical room will be provided with a set of work desk and chair, medical and resting couch, medical stool, and cabinet.

- Cafeteria:

To constitute a moderate seating layout, small cafe tables and plastic chairs will be provided to meet the capacity of cafeteria area.

- Auditorium(art hall):

Interlocking, stackable pipe chairs will be provided for 150 units.

- Gymnasium:

The preparation room including equipment storage will be provided with a set of office desk and chair, a three-wide two-tier locker, and equipment racks. In addition, a locker room will place a wooden bench and two-tier wardrobe lockers.

In light of the above planning, types, items, and quantities of furniture and fittings are as listed in Table 2-19.

Table 2-19 List of Furniture

Room title	Components provided per room Numbers in parentheses indicate quantity	Q'ty by site (number of set)			
		A-1	A-2	B-1	B-2
General classroom	Students' desk/chair(36 sets), Teacher's desk/chair(1 set), Glass white board(2), 2-tier/3 wide locker(6)	20	16	9	6
CWD-accessible classroom	Ditto+Wheelchair-accessible desk(1)	3	2	3	2
Director/Deputy director's room	Director's desk/chair(1 set), Guest chair(2), Meeting chair w/6 chairs(1 set), Steel shelves(2), Glass white board(1)	2	2	-	-
Accountant's room	Manager's desk/chair(2), Steel shelves(6), Glass white board(2)	1	1	-	-
Secretary room	Office desk/chair(1 set), Steel shelves(1), Wooden bench(1)	1	1	-	-
Server room	Open rack(1)	1	1		1
Training manager's room	Manager's desk/chair(3 sets), Guest chair(6), Steel shelves(12),Glass white board(3), 2-tier/1-wide locker(3), Meeting table w/ 6 chairs(1 set)	1			
Training manager's space (per person)	Manager's desk/chair(1 set), Guest chair(2), Steel shelves(3-4),Glass white board(1), 2-tier/1-wide locker(1)		2	1	1
Teachers' room/space	Teacher's desk/chair (32/26/16/15 sets), 2-tier locker(for 64/52/32/30 persons), Meeting table w/6 chairs(2/2/1/1 set), Glass white board(2), Printer table(1), Steel shelves(18/12/8/6)	1	1	1	1
Medical room	Doctor's desk/chair(1 set), Stool(2), 2-tier locker(1), Steel shelf(1), Examination bed(1)	1	1	1	1
Child development center	Social worker's desk/chair(1 set), Trapezoid table(12), Stool(12), 2-tier locker(1), Glass white board(1),Steel shelves(2), Movable white board(5), Movable partition(4), Cushion chair(2)	1	1	1	1
Staff room	Wooden bench(1), 2-tier/3-wide locker(1)	2	2	2	1
Cafeteria	Dining table(28/24), Stacking chair(63/54)	1	1		
Kitchen staff room	Office desk/chair(1 set), Wooden bench(1), 2-tier/3-wide locker(1)	1	1		
Guard room	Office desk/chair(1 set)	1	1	1	1
ICT laboratory	Teacher's desk/chair(1 set), PC table(18), PC Chair(36), Glass white board(1), Printer table(1)	1	1	1	1
Server/prep. Room	Teacher's desk/chair(1 set), Steel shelves(2), Open rack(2)			1	
Store for ICT lab.	Steel shelves(8)			1	
Multipurpose room	Lab table for teacher/chair(1 set), Lab table(6), Stool(36), Glass white board(1)	2	1	1	1
Preparation for MPR	Lab table for teacher/chair(1 set), Teacher's desk(1), Steel shelves(4), Stool(1)	2	1	1	1
Store for MPR	Steel shelves(8))	2	1	1	1
Craft room-1 (Technical)	Craft table(3), Stool(18), Teacher's work table/chair(1 set), Glass white board(1)	1	1		1

Room title	Components provided per room Numbers in parentheses indicate quantity	Q'ty by site (number of set)			
		A-1	A-2	B-1	B-2
Preparation for Craft room -1	Teacher's work table/chair(1 set), Teacher's desk(1), Steel shelves(4), Stool(1)	1	1		1
Craft room-2 (Home Economics)	Trapezoid table(18), Stool(18), Teacher's desk/chair(1 set), Glass white board(1)	1	1		1
Preparation for Craft room-2	Teacher's desk/chair(1), Steel shelves(4)	1	1		1
Auditorium(Art Hall)	Stacking chair(150), PC desk/chairs(2 sets), Open rack(6)	1	1		
Preparation for gym	2-tier locker(1), Teacher's desk/chair(1 set), Wooden bench(1)	1			
Changing room	2-tier/3-wide locker(3), Wooden bench(2)	1	1		
Library	Reading table(8/6/3/3), reading chair(48/36/18/18), Open rack(5/4/3/3)	1	1	1	1
Archive	Teacher's desk/chair(2 sets), Double-sided shelves(16/14/14/14)	1	1	1	1
Storage for emergency supplies	Open rack(10/5/5/5)	1	1	1	1
Entrance lobby	Wooden bench(6/4)	1	1		

Numbers in parentheses denote respective facility types in order of A-1, A-2, B-1, and B-2 from the left.

(4) Equipment plan

Irrelevant equipment was excluded from the request components in line with the elimination criteria, after reviewed individually with officials concerned (subject teaching officers in UBC Teacher Development Center). The basic equipment plan was carefully considered what was discussed with the Mongolian side, and was decided to include the equipment as arranged below.

- Kitchen appliances to be connected with building services will be part of the construction work.
- Furniture, such as equipment racks, is excluded from the requested equipment components and purchased with the project budget allocated for furniture and fittings.
- Wall bars in the gymnasium and a basketball goal will be fixed or mounted, and therefore will be a part of the facility components.
- Duplicated equipment is eliminated.
- A quantity of items per room is decided on the basis of the following rules.
  - Equipment used for demonstrative purposes will be supplied one set.
  - Assuming that a class has 36 students, equipment used by two students will be supplied 18 sets, while equipment used by a group of four students will be supplied 9 sets.
  - General experiments will be conducted in a group of six students, and six sets will be provided.
- Distribution of equipment to each target site depends on whether the schools have relevant rooms requiring the items. The number of classes in each grade will be set out on a site basis to estimate the number of classrooms required. The equipment will be distributed accordingly.
  - In the expanded schools, the equipment available in the existing buildings will be excluded.
  - Equipment for primary education will take into account of the grade-specific needs, and will be

supplied in quantities for half the number of classrooms.

- Projectors and some of other devices will be categorized in a group of the project equipment provided for shared use (COM-) across the school.
- Specifications of the equipment should be decided in accordance with items procured in the recently built similar facilities in Mongolia.
- The Project will review local suppliers' capacities and maintainability of the intended equipment to make final adjustment to the scope of procurement.
- Table 2-20 shows items planned for specific subjects and rooms as well as quantities distributed to each target site.

Table 2-20 List of Educational Equipment

Subject	ID	Item Name	Quantity	Quantity by Facility Type				
			Per CR	A-1	A-2	B-1	B-2	Total
Equipment for Primary Classes								
Mathematics	PRM- 01	Abacus for demonstrating	1	5	4	4	4	17
	PRM- 02	Geometric block models set	18	90	72	72	72	306
	PRM- 03	Measurement set for students	18	90	72	72	72	306
	PRM- 04	Time teaching set	1	5	4	4	4	17
	PRM- 05	Abacus for students	18	90	72	72	72	306
	PRM- 06	Scales set for teacher	1	5	4	4	4	17
Mongolian Lang.	PRM- 07	CD Audio system	1	5	4	4	4	17
Human Environment	PRM- 08	Zoological and Botanical Map of Mongolia	1	5	4	4	4	17
	PRM- 09	World Geographic Map	1	5	4	4	4	17
Common	PRM- 10	Chess set for demonstrating	1	5	4	4	4	17
	PRM- 11	Checker set for demonstrating	1	5	4	4	4	17
	PRM- 12	Chess set for students	9	45	36	36	36	153
	PRM- 13	Checker set for students	9	45	36	36	36	153
Equipment for Secondary Classes								
Physical Education Tools	GYM- 01	Hurdle	20	20	20	20		60
	GYM- 02	Traffic cone	1	1	1	1		3
	GYM- 03	Basketball balls (Size 7)	9	9	9	9		27
	GYM- 04	Basketball balls (Size 6)	9	9	9	9		27
	GYM-	Basket ball goal set	To be included in the building work					
	GYM- 05	Movable scoreboard	1	1	1	1		3
	GYM- 06	Volleyball Balls	18	18	18	18		54
	GYM- 07	Volley ball pole set (1pair)	1	1	1	1		3
	GYM- 08	Volley ball net	1	1	1	1		3
	GYM- 09	Gymnastics mat	6	6	6	6		18
	GYM- 10	Ropes for tug-of-war	1	1	1	1		3
	GYM- 11	CD Audio system	1	1	1	1		3
	GYM-	Wall Bars	To be included in the building work					
	GYM- 12	Football Balls	18	18	18	18		54
	GYM- 13	Table tennis set	2	2	2	2		6
	GYM- 14	Table tennis racket	8	8	8	8		24
	GYM- 15	Badminton Shuttle	18	18	18	18		54
	GYM- 16	Badminton racket set (1pair)	18	18	18	18		54
	GYM- 17	Badminton pole setset (1pair)	1	1	1	1		3
	GYM- 18	Badminton net	1	1	1	1		3
Mongolian Lang.	MGL- 01	CD Audio system	1	1	1	1	1	4
Foreign Lang.	FLG- 02	CD Audio system	1	1	1	1	1	4

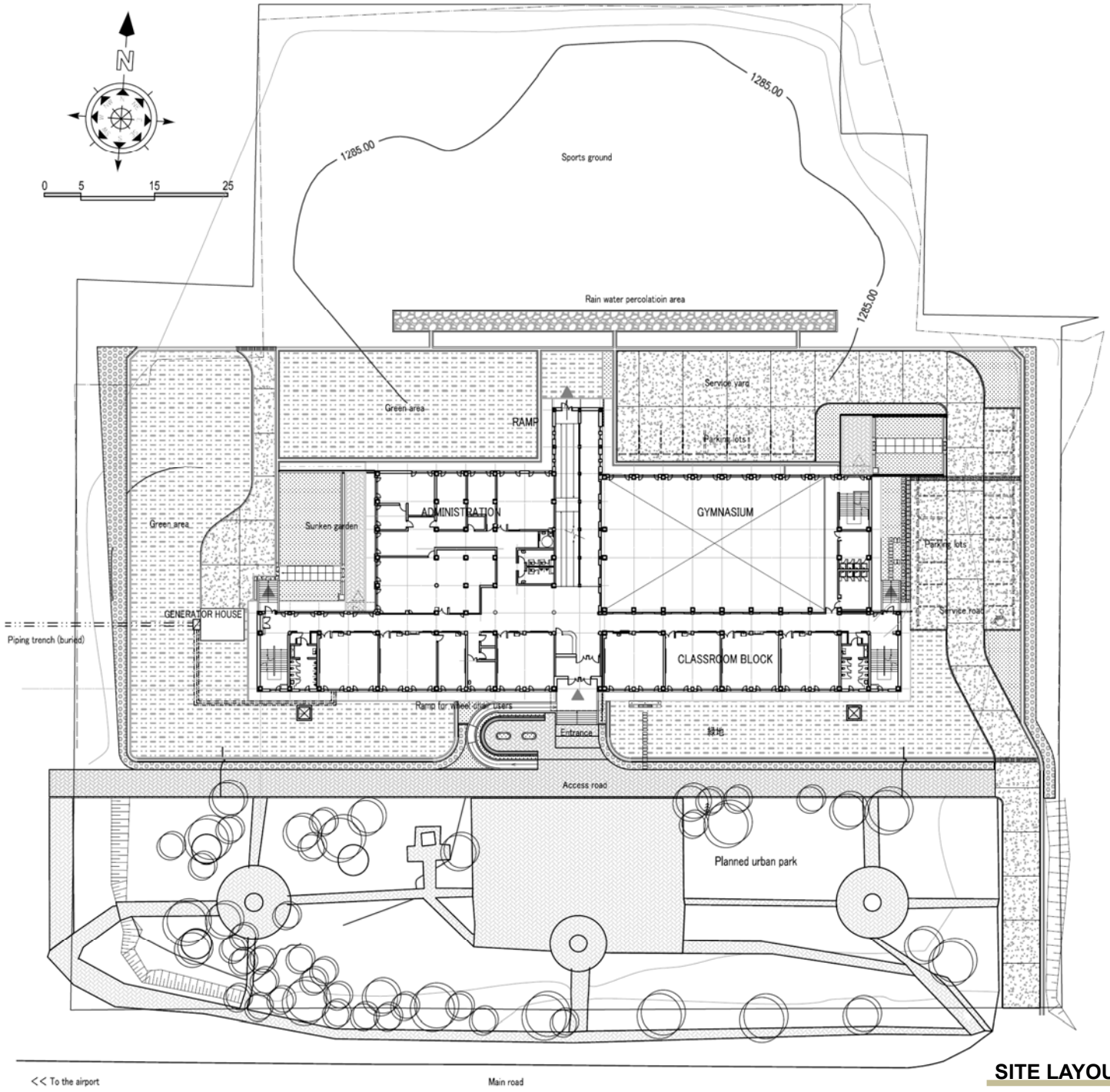
Subject	ID	Item Name	Quantity	Quantity by Facility Type				
			Per CR	A-1	A-2	B-1	B-2	Total
Physics Lab. Equipment	PHY- 01	Experimental apparatus for dynamics	6	6	6	6	6	24
	PHY- 02	Pulley set	6	6	6	6	6	24
	PHY- 03	Mass with hanger	6	6	6	6	6	24
	PHY- 04	Inclined plane set for dynamics experiment	6	6	6	6	6	24
	PHY- 05	Spring set	6	6	6	6	6	24
	PHY- 06	Photovoltaic experiment set	6	6	6	6	6	24
	PHY- 07	Hand generator	6	6	6	6	6	24
	PHY- 08	Air column resonance apparatus	1	1	1	1	1	4
	PHY- 09	Light for learning three primary colors of light	6	6	6	6	6	24
	PHY- 10	Optical experiment set	1	1	1	1	1	4
	PHY- 11	DC low voltage power supply	6	6	6	6	6	24
	PHY- 12	Digital multi-meter	6	6	6	6	6	24
	PHY- 13	Slide rheostat	6	6	6	6	6	24
	PHY- 14	Leads and crocodile clip	6	6	6	6	6	24
	PHY- 15	Oscilloscope	1	1	1	1	1	4
	PHY- 16	Magnet set	6	6	6	6	6	24
Chemistry Lab. Equipment	CHE-	Fume hood (Lab Ductless Fume Hood)	To be included in the building work					
	CHE- 01	Burette	12	12	12	12	12	48
	CHE- 02	Retort stand set	12	12	12	12	12	48
	CHE- 03	Watch glass	36	36	36	36	36	144
	CHE- 04	Molecular model set	6	6	6	6	6	24
	CHE- 05	Bulb pipette with teat	36	36	36	36	36	144
	CHE- 06	Measuring pipettel	36	36	36	36	36	144
	CHE- 07	Digital pH meter	12	12	12	12	12	48
	CHE- 08	Thermometer	12	12	12	12	12	48
	CHE- 09	Crucible Tongues	12	12	12	12	12	48
	CHE- 10	Crucible with lid	12	12	12	12	12	48
	CHE- 11	Mortar set	12	12	12	12	12	48
	CHE- 12	Evaporating basin	12	12	12	12	12	48
	CHE- 13	Drying chamber	1	1	1	1	1	4
	CHE- 14	Test tube set	1	1	1	1	1	4
	CHE- 15	Volumetric flask, 100ml	6	6	6	6	6	24
	CHE- 16	Volumetric flask, 500ml	6	6	6	6	6	24
	CHE- 17	Volumetric flask, 1000ml	6	6	6	6	6	24
	CHE- 18	Measuring cylinder, 10 ml	6	6	6	6	6	24
	CHE- 19	Measuring cylinder, 50 ml	6	6	6	6	6	24
	CHE- 20	Measuring cylinder, 100 ml	6	6	6	6	6	24
	CHE- 21	Measuring cylinder, 500 ml	6	6	6	6	6	24
	CHE- 22	Centrifuge	1	1	1	1	1	4
	CHE- 23	Beaker, 50ml	12	12	12	12	12	48
	CHE- 24	Beaker, 100ml	12	12	12	12	12	48
	CHE- 25	Beaker, 250ml	12	12	12	12	12	48
	CHE- 26	Beaker, 500ml	12	12	12	12	12	48
	CHE- 27	Conical beaker, 500ml	12	12	12	12	12	48
	CHE- 28	Desiccator	1	1	1	1	1	4
	CHE- 29	Electronic balance	1	1	1	1	1	4
	CHE- 30	Conical flask (Erlenmeyer flask), 100ml	12	12	12	12	12	48
	CHE- 31	Conical flask (Erlenmeyer flask), 300ml	12	12	12	12	12	48
	CHE- 32	Funnel, caliber 75mm	12	12	12	12	12	48
	CHE- 33	Funnel, caliber 120mm	12	12	12	12	12	48
Biology	BIO- 01	Compound microscope	18	18	18	18	18	72

Subject	ID	Item Name	Quantity	Quantity by Facility Type				
			Per CR	A-1	A-2	B-1	B-2	Total
Lab. Equipment	BIO- 02	Hand lens	18	18	18	18	18	72
	BIO- 03	Water distiller	1	1	1	1	1	4
	BIO- 04	Water bath	1	1	1	1	1	4
	BIO- 05	Various thermometers	6	6	6	6	6	24
	BIO- 06	Dissecting kit	12	12	12	12	12	48
	BIO- 07	Petri dish	36	36	36	36	36	144
	BIO- 08	Syringes set	36	36	36	36	36	144
	BIO- 09	Immersion specimen	1	1	1	1	1	4
	BIO- 10	Anatomical model of human body	1	1	1	1	1	4
	BIO- 11	Human skeleton	1	1	1	1	1	4
	BIO- 12	Prepared slide set	1	1	1	1	1	4
	BIO- 13	Various specimens	1	1	1	1	1	4
	BIO- 14	Skeletal of vertebrate	1	1	1	1	1	4
	BIO- 15	DNA model	1	1	1	1	1	4
	BIO- 16	Human brain and head models	1	1	1	1	1	4
	BIO- 17	Human eye model	1	1	1	1	1	4
	BIO- 18	Human ear model	1	1	1	1	1	4
	BIO- 19	Human teeth model	1	1	1	1	1	4
	BIO- 20	Human heart model	1	1	1	1	1	4
	BIO- 21	Lung model with larynx	1	1	1	1	1	4
Equipment for Technical Exercises								
Sewing	WTE- 01	Electric sewing machine	9	9	9		9	27
	WTE- 02	Over locker sewing machine	1	1	1		1	3
	WTE- 03	Steam iron	2	2	2		2	6
	WTE- 04	Ironing board	2	2	2		2	6
	WTE- 05	Shears for sewing	18	18	18		18	54
	WTE- 06	Crochet hook set for knitting	18	18	18		18	54
	WTE- 07	Embroidery frame	18	18	18		18	54
Metal Work	MET- 01	Metal cutting saw	18	18	18		18	54
	MET- 02	Vernier calliper	9	9	9		9	27
	MET- 03	Metallic file	9	9	9		9	27
	MET- 04	Cold chisel for metalwork	9	9	9		9	27
	MET- 05	Center punch	9	9	9		9	27
	MET- 06	Pliers	9	9	9		9	27
	MET- 07	End Cutting Nippers	9	9	9		9	27
	MET- 08	Longnose pliers	9	9	9		9	27
	MET- 09	Vise	12	12	12		12	36
	MET- 10	Soldering iron	9	9	9		9	27
	MET- 11	Digital multi tester	3	3	3		3	9
	MET- 12	Metal lathe	1	1	1		1	3
	MET- 13	Grinder	1	1	1		1	3
	MET- 14	Compressor airbrush set	1	1	1		1	3
Wood Work	WOD- 01	Plane	9	9	9		9	27
	WOD- 02	Chisel set	9	9	9		9	27
	WOD- 03	Saw for woodwork	9	9	9		9	27
	WOD- 04	Wooden hammer	9	9	9		9	27
	WOD- 05	Clamp	6	6	6		6	18
	WOD- 06	Small axe	6	6	6		6	18
	WOD- 07	Cross slot screwdriver	9	9	9		9	27
	WOD- 08	Tape measure	6	6	6		6	18
	WOD- 09	Hammer	9	9	9		9	27
	WOD- 10	Thicknesser (Planer)	1	1	1		1	3
	WOD- 11	Drill press	1	1	1		1	3

Subject	ID	Item Name	Quantity	Quantity by Facility Type				
			Per CR	A-1	A-2	B-1	B-2	Total
	WOD- 12	Wood lathe	1	1	1		1	3
	WOD- 13	Scroll saw	1	1	1		1	3
	WOD- 14	Hammer drill	1	1	1		1	3
	WOD- 15	Electric drill	1	1	1		1	3
	WOD- 16	Power planer	1	1	1		1	3
	WOD- 17	Orbit sander	1	1	1		1	3
	WOD- 18	Jig saw	1	1	1		1	3
	WOD- 19	Milling machine (Router)	1	1	1		1	3
	WOD- 20	Electric circular saw	1	1	1		1	3
Art	ART- 01	Wood chisel	36	36	36			72
	ART- 02	Clay scraper spatula	36	36	36			72
	ART- 03	Easel	36	36	36			72
	ART- 04	Portable drawing board	36	36	36			72
Music Instruments	MUS- 01	Smart board for music	1	1	1			2
	MUS- 02	Stereo system	1	1	1			2
	MUS- 03	Morin khuur	9	9	9			18
	MUS- 04	Yatga 120cm	6	6	6			12
	MUS- 05	Yatga 180cm	6	6	6			12
	MUS- 06	Shanz 110cm	3	3	3			6
	MUS- 07	Shanz 140cm	3	3	3			6
	MUS- 08	Khuuchir	2	2	2			4
	MUS- 09	Flute (Bamboo)	1	1	1			2
	MUS- 10	Flute (Iron)	1	1	1			2
	MUS- 11	Yoochin	3	3	3			6
	MUS- 12	Electronic keyboard	1	1	1			2
	MUS- 13	Keyboard harmonica	36	36	36			72
ICT Equipment	ICT- 01	Desk top computer	37, 19	37	37	19	37	130
	ICT- 02	Complex type printer, monochrome	1	1	1	1	1	4
	ICT- 03	Switching hub 24 ports	1	1	1	1	1	4
Kitchen Utensils	KIT-		To be included in the building work					
Medical Room Equipment	DOC- 01	UV lam disinfection trolley	1	1	1	1	1	4
	DOC- 02	Weight scale	1	1	1	1	1	4
	DOC- 03	Height measuring scale	1	1	1	1	1	4
	DOC- 04	Sphygmomanometer	1	1	1	1	1	4
	DOC- 05	Spirometer	1	1	1	1	1	4
Equipment for CWD	CWD- 01	Book stand (book holder)	5	5	5	5	5	20
	CWD- 02	Desktop magnifier for reading assistance	5	5	5	5	5	20
	CWD-	Partition wall	To be included in the furniture work					
	CWD-	White board small	Ditto					
	CWD-	Cushion Chair	Ditto					
	CWD- 03	Triangle Cushion	2	2	2	2	2	8
	CWD- 02	Mat	2	2	2	2	2	8
Common	COM- 01	Projector 1 (fixed)	2	2	2	2	2	8
	COM- 02	Projector 2 (fixed)	1	1	1			2
	COM- 03	Screen	1	1	1			2
	COM- 04	Sound equipment	To be included in the building work					
	COM- 05	Portable projector (Portable)	2	2	2	2	2	8

2-2-3 Outline Design Drawings

A-1	No. 75 School	A1-01	Layout plan
	(Khan-Uul District)	A1-02	BF plan
		A1-03	1F plan
		A1-04	2F plan
		A1-05	3F plan
		A1-06	Elevation and section
A-2	Chingeltei No. 7 Khoroo	A2-01	Layout plan
	(Chingeltei District)	A2-02	B2F plan
		A2-03	BF plan
		A2-04	1F plan
		A2-05	2F plan
		A2-06	Elevation and section
B-1	No. 53 School	B1-01	Layout plan
	(Bayanzurkh District)	B1-02	BF/ 1F plan
		B1-03	2F/ 3F plan
		B1-04	Elevation and section
B-2	No. 109 School	B2-01	Layout plan
	(Nalaikh District)	B2-02	BF plan
		B2-03	1F plan
		B2-04	2F plan
		B2-05	Elevation and section
-	Ancillary buildings	C-01	Boiler house / Generator house
-	Detail plan of classroom	C-02	General / CWD accessible classroom



Rain water drainage, w=300, d=300~500

Ditto, with grating cover, w=600

Ditto, PC cover 600X600

RC retaining wall H=2~3m

PC curbstone W150XH200XL1000

Gravel pavement (t=150)

Rain water percolation area, gravel h=500

Retaining blocks

Interlocking block (t=80) pavement

Green area

Concrete pavement (M400) t=150

PC paving block 300X600

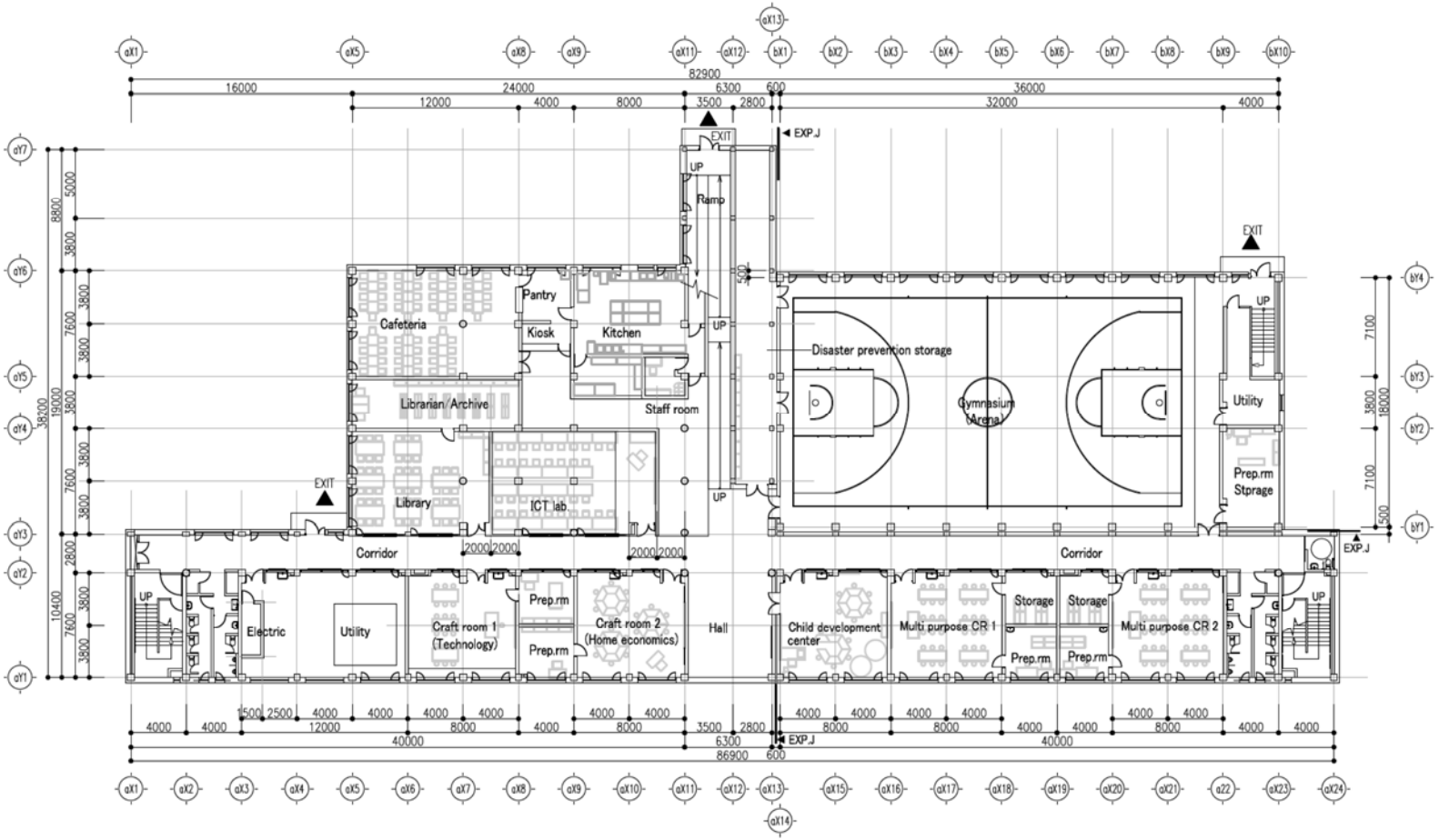
Rainrater catch pit 1000X1000X1500

Drain distribution pit

Piping trench (d=2.5m)

SITE LAYOUT PLAN S=1:800 **A1-01**

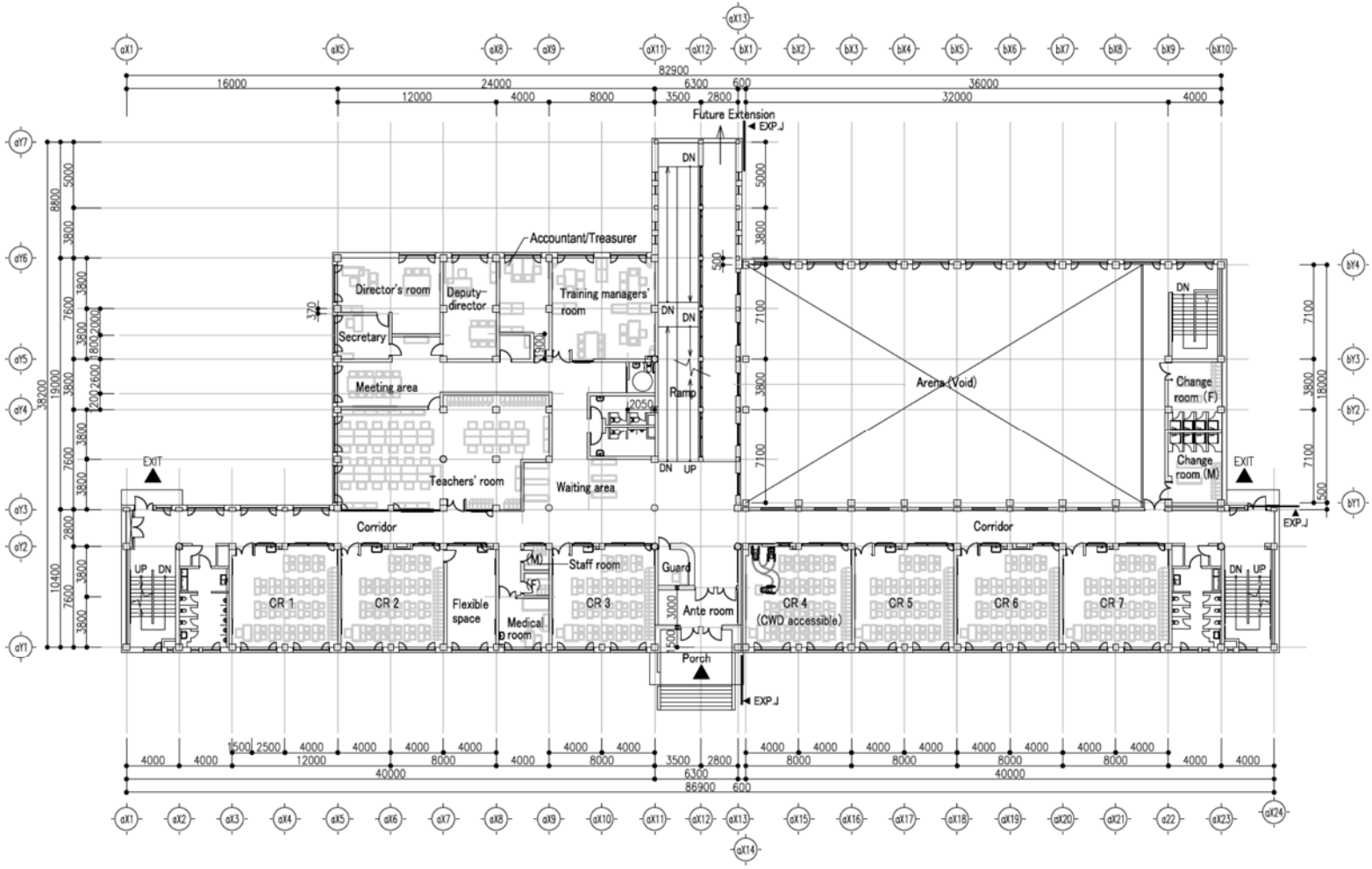
No. 75 School (Khan-Uul)



BF PLAN S=1:500

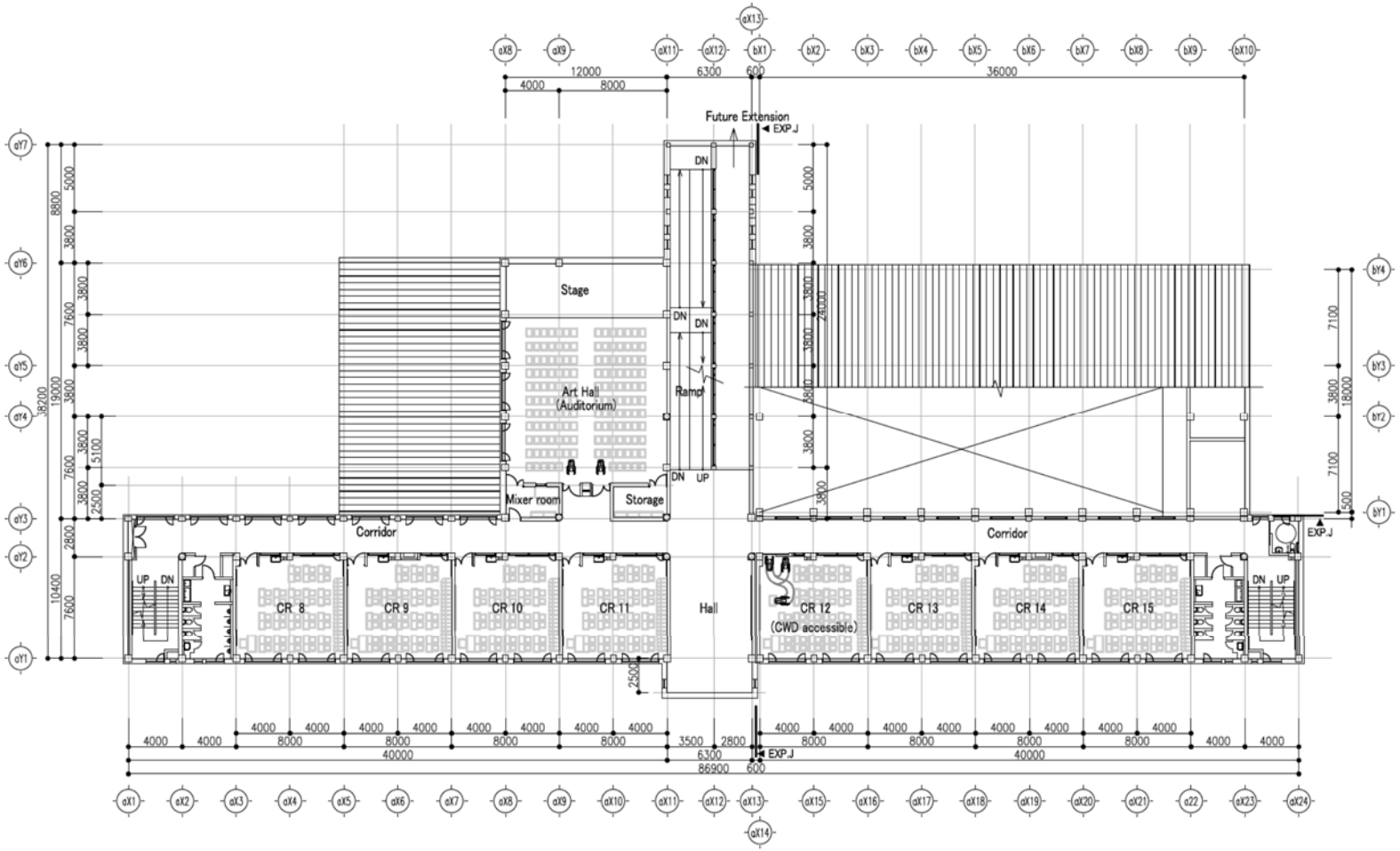
A1-02

No. 75 School (Khan-Uul)



1F PLAN S=1:500 **A1-03**

No. 75 School (Khan-Uul)



2F PLAN S=1:500

A1-04

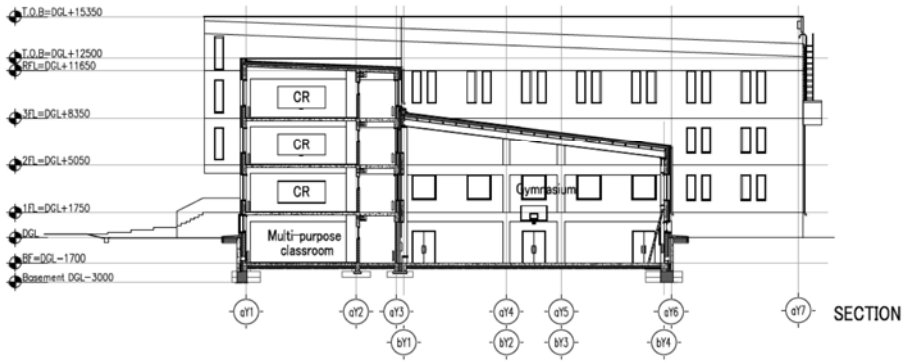
No. 75 School (Khan-Uul)

ELEVATION/SECTION S=1:500 **A1-05**

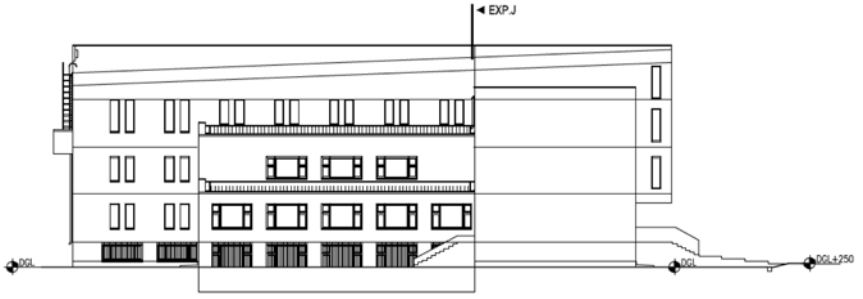
No. 75 School (Khan-Uul)

SOUTH ELEVETION

NORTH ELEVATION



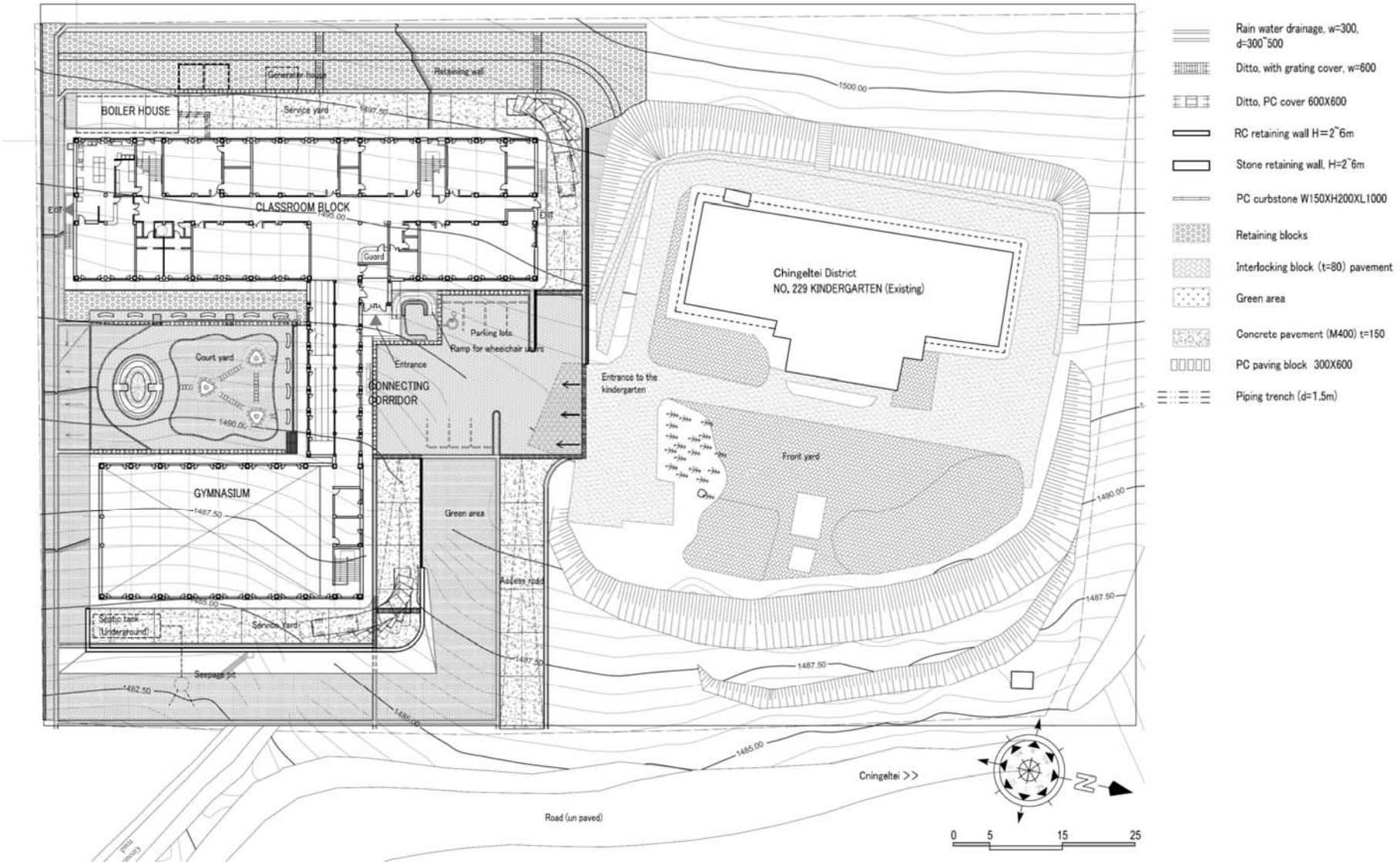
SECTION



WEST ELEVATION

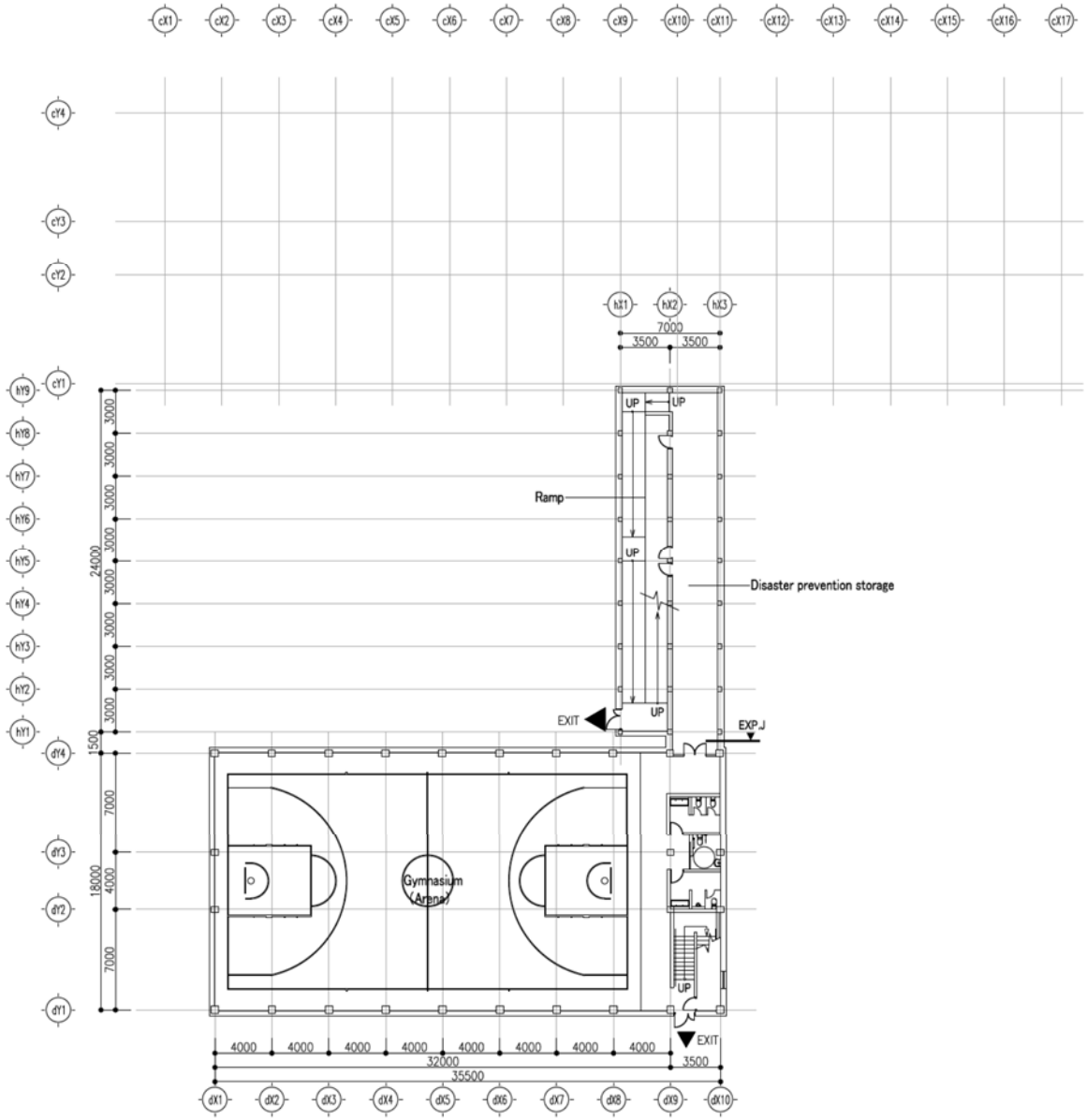
ELEVATION/SECTION S=1:500 **A1-06**

No. 75 School (Khan-Uul)



SITE LAYOUT PLAN S=1:800 **A2-01**

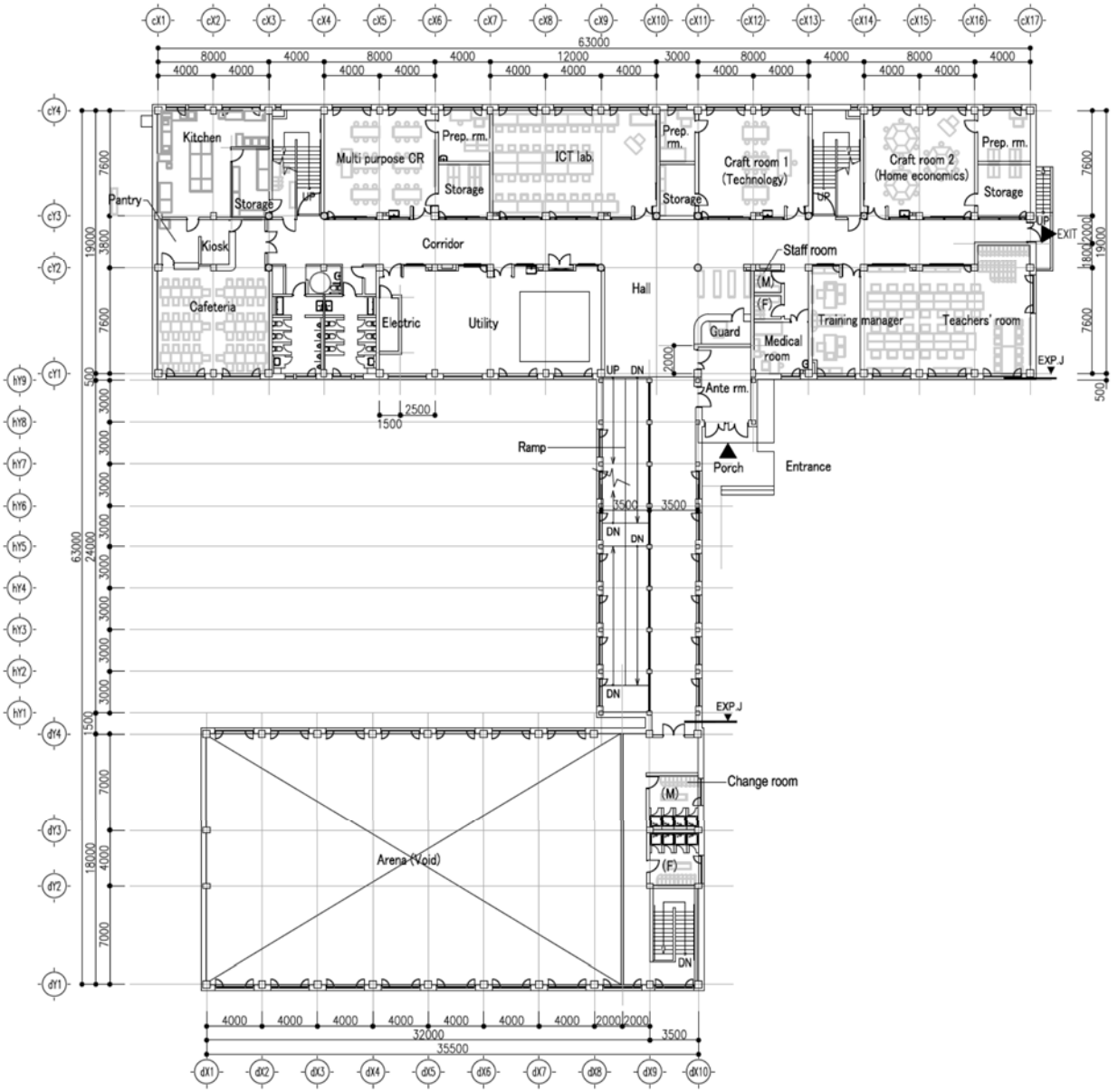
Chingeltei 7th Khoroo



B2F PLAN S=1:800

A2-02

Chingeltei 7th Khoroo



B1F PLAN S=1:500

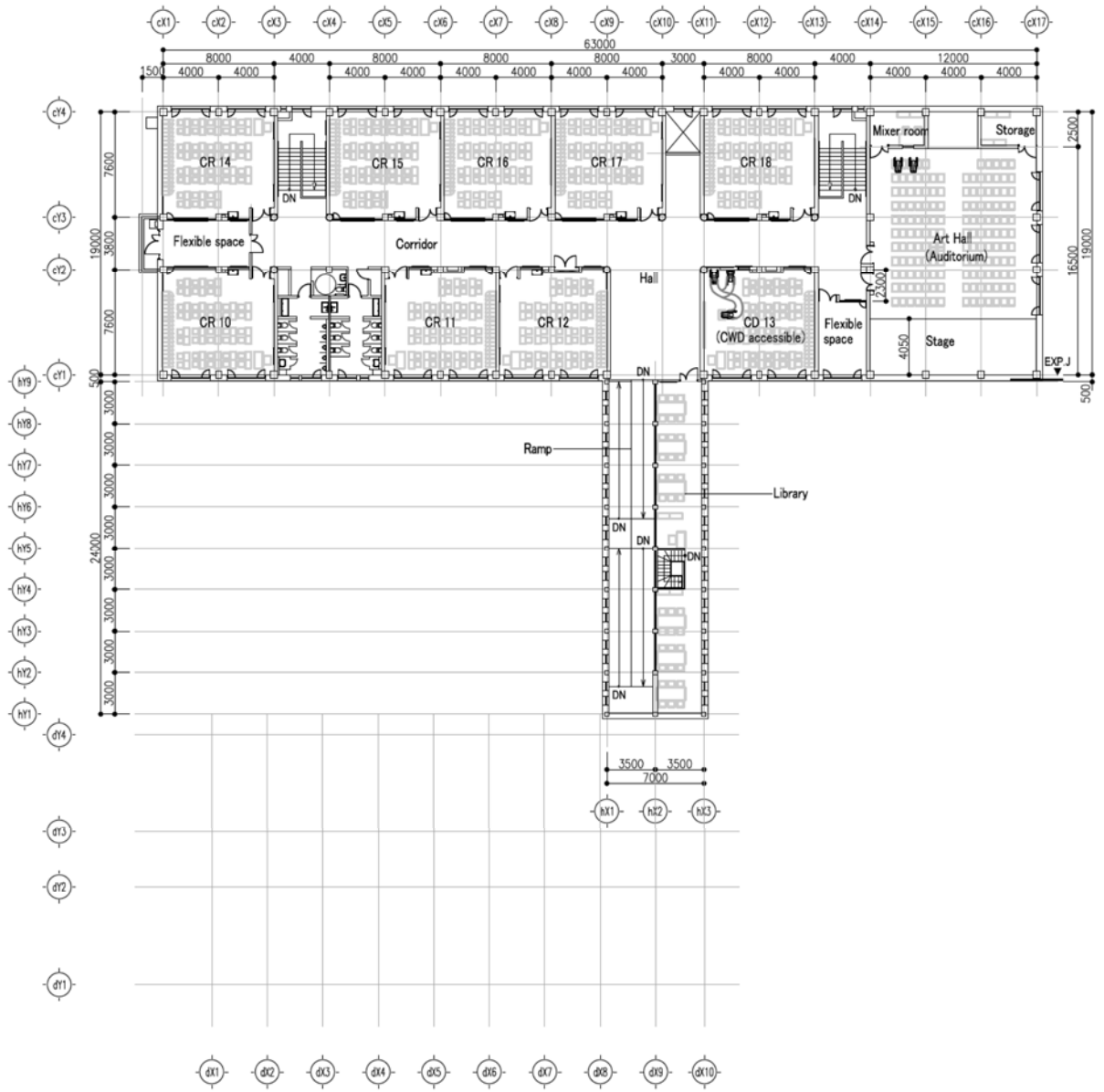
A2-03

Chingeltei 7th Khoroo

1F PLAN S=1:500

A2-04

Chingeltei 7th Khoroo

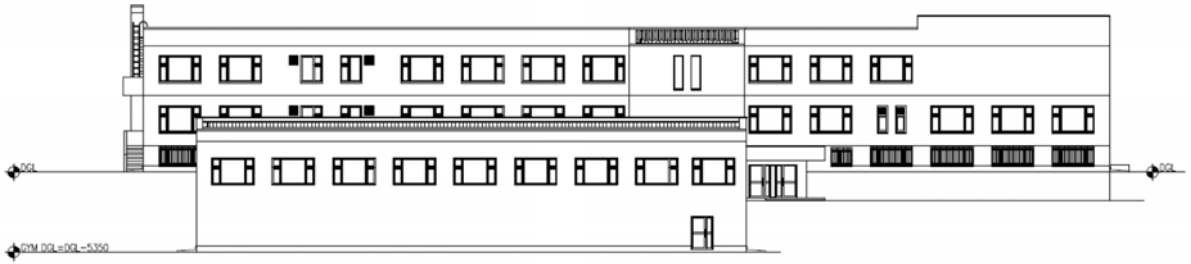


2F PLAN S=1:500

A2-05

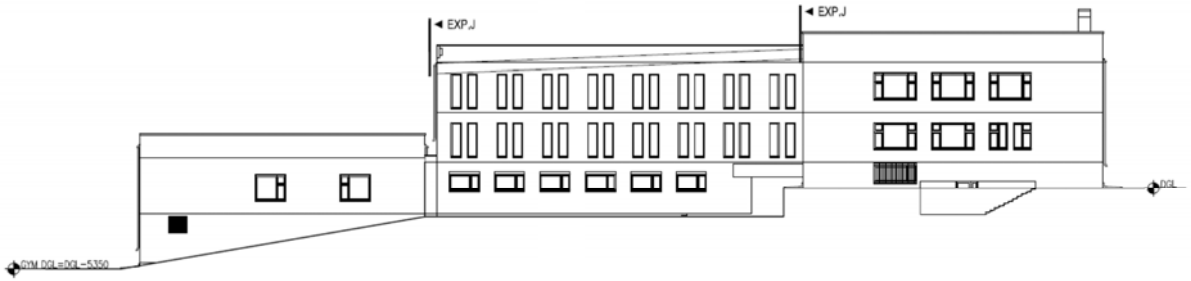
Chingeltei 7th Khoroo

東立面図

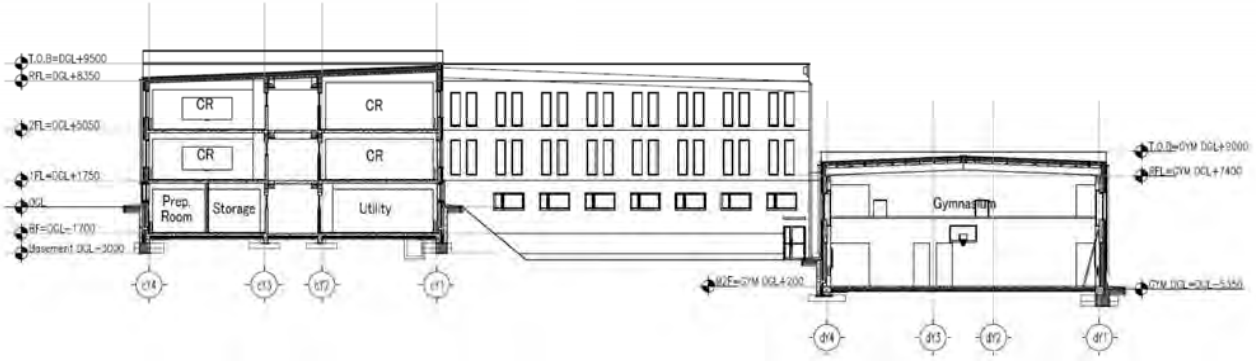


WEST ELEVATION

NORTH ELEVATION

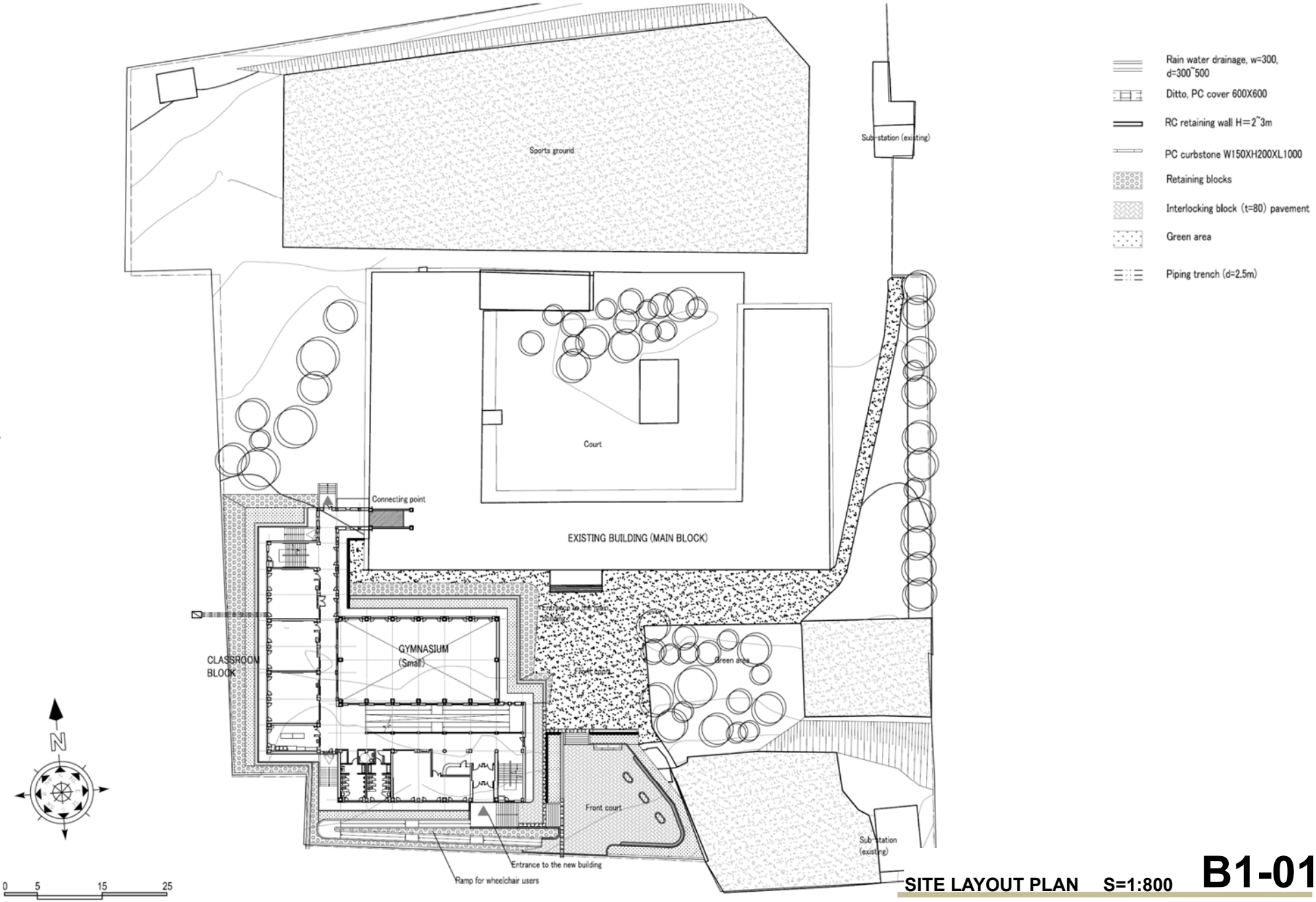


SECTION



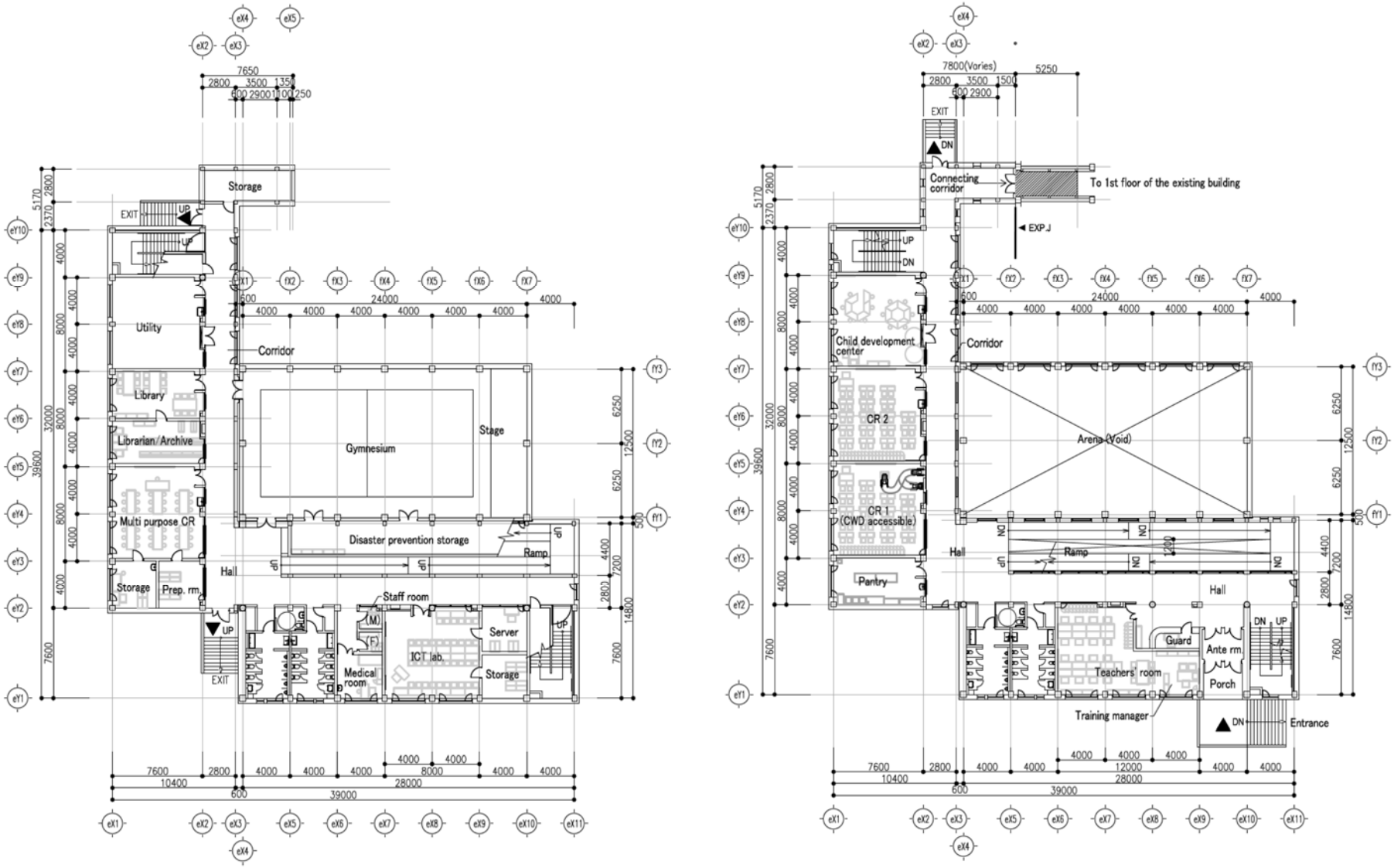
ELEVATION/SECTION S=1:500 **A2-06**

Chingeltei 7th Khoroo



SITE LAYOUT PLAN S=1:800 **B1-01**

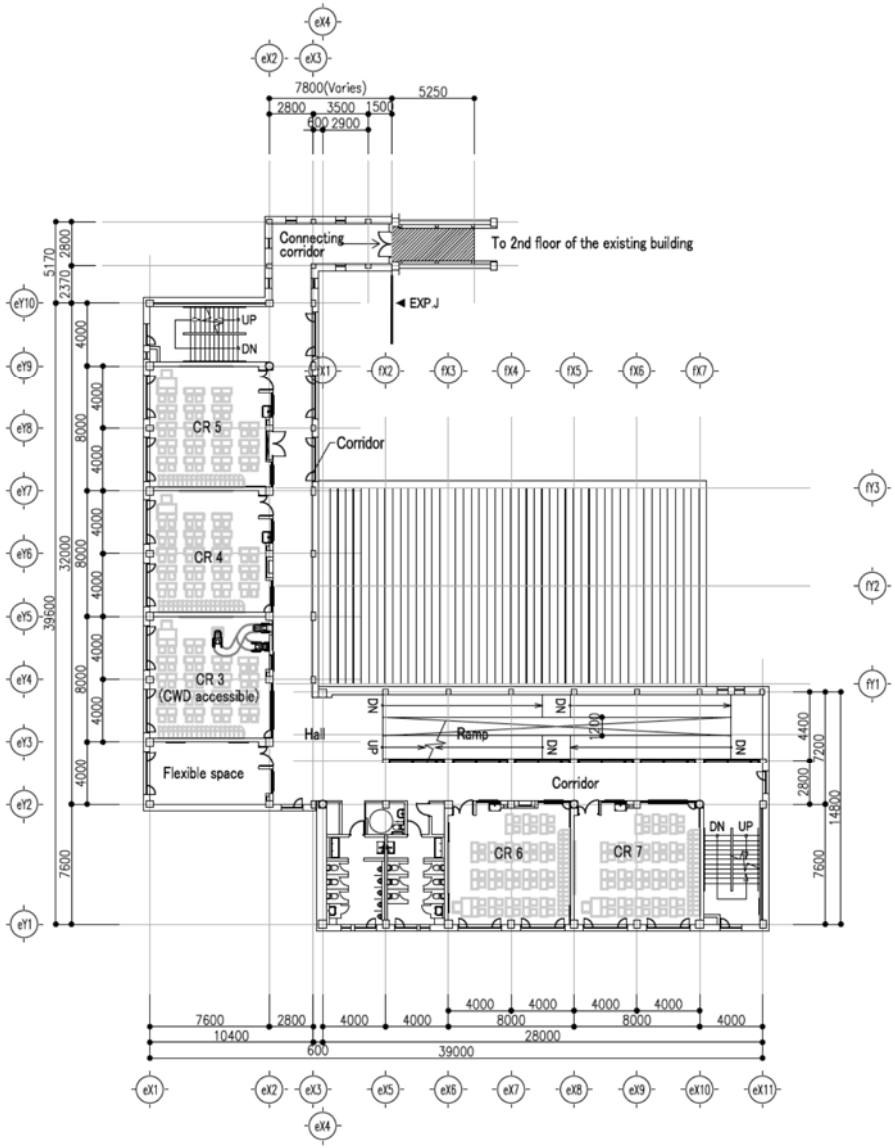
No. 53 School (Bayanzurkh)

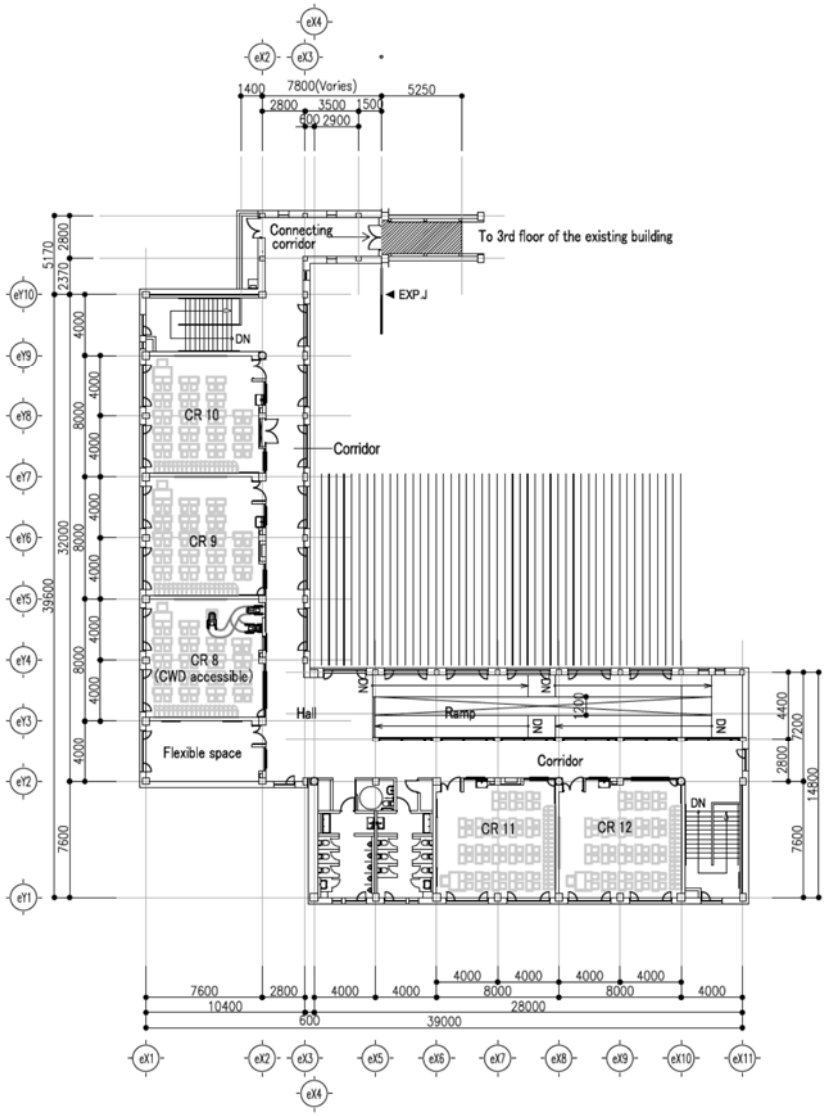


BF/1F PLAN S=1:500

B1-02

No. 53 School (Bayanzurkh)



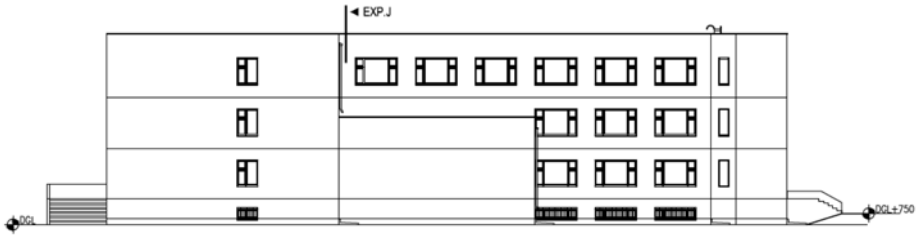


2F/3F PLAN S=1:500

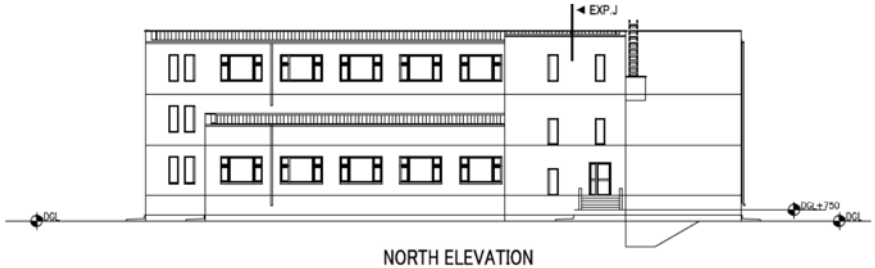
B1-03

No. 53 School (Bayanzurkh)

SOUTH ELEVATION

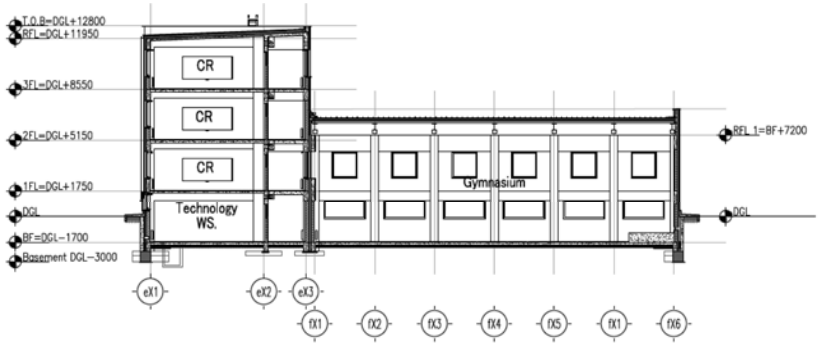


EAST ELEVATION



NORTH ELEVATION

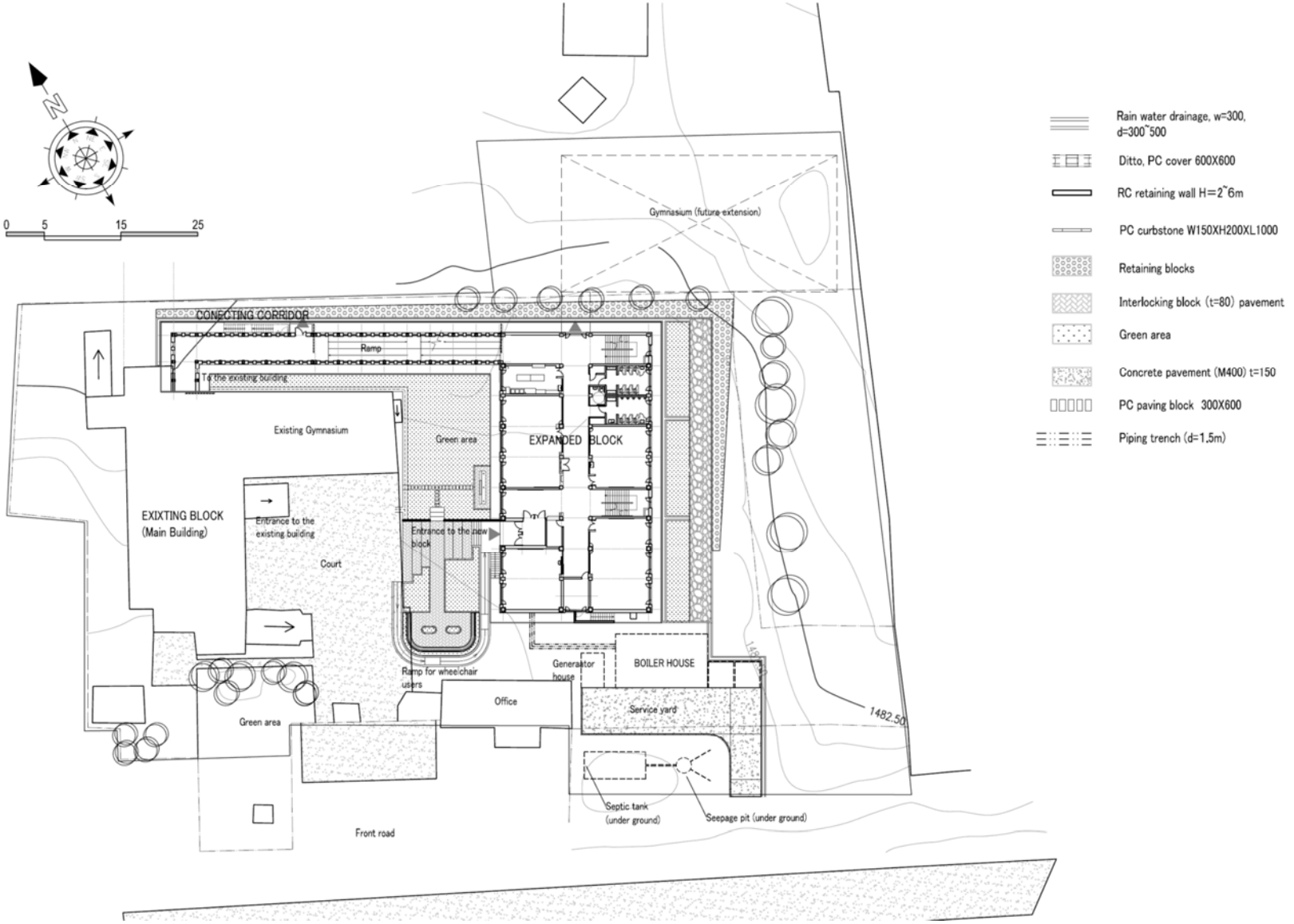
WEST ELEVATION



SECTION

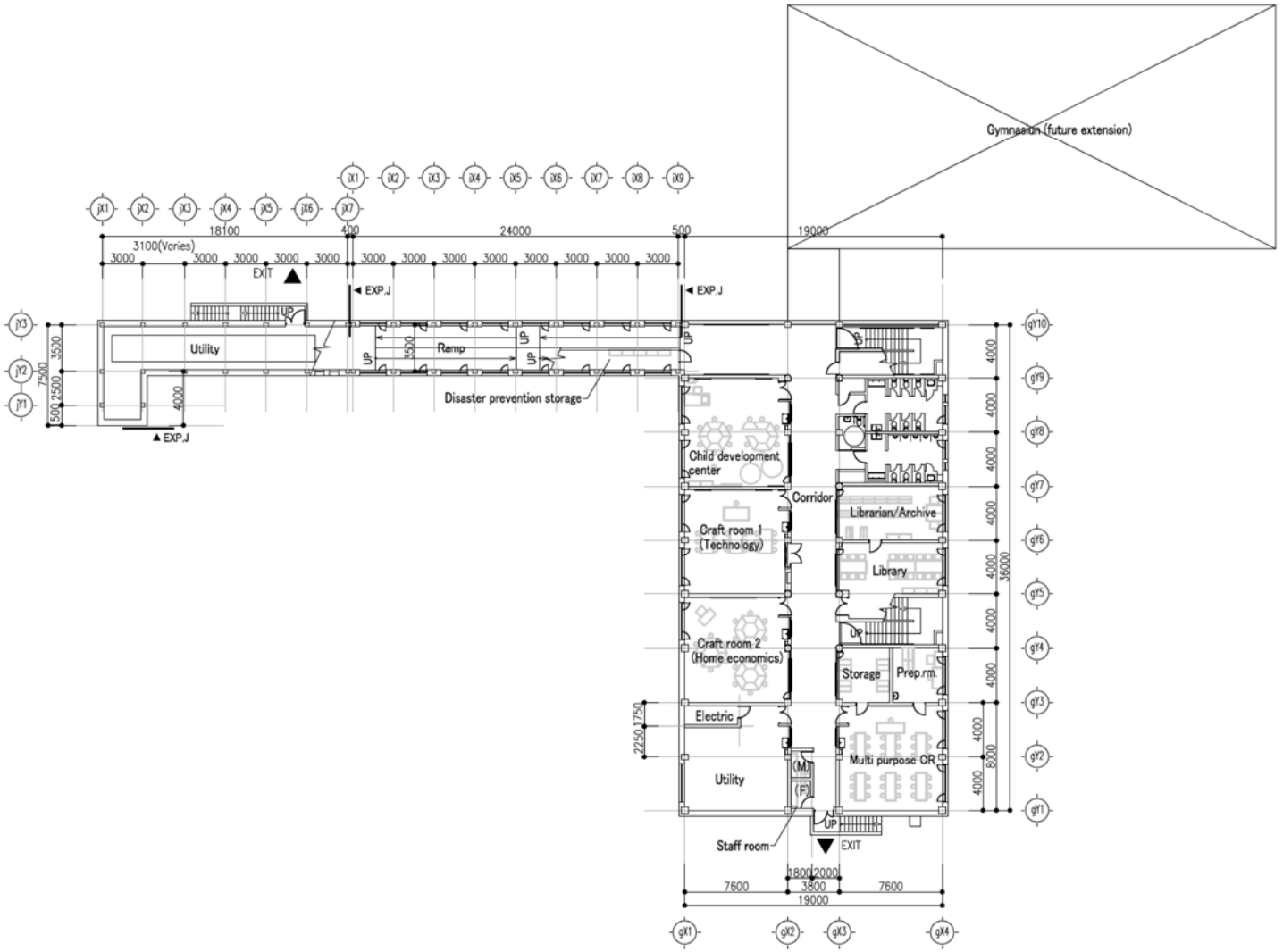
ELEVATION/SECTION S=1:500 **B1-04**

No. 53 School (Bayanzurkh)



SITE LAYOUT PLAN S=1:500 **B2-01**

No. 109 School (Nalaikh)

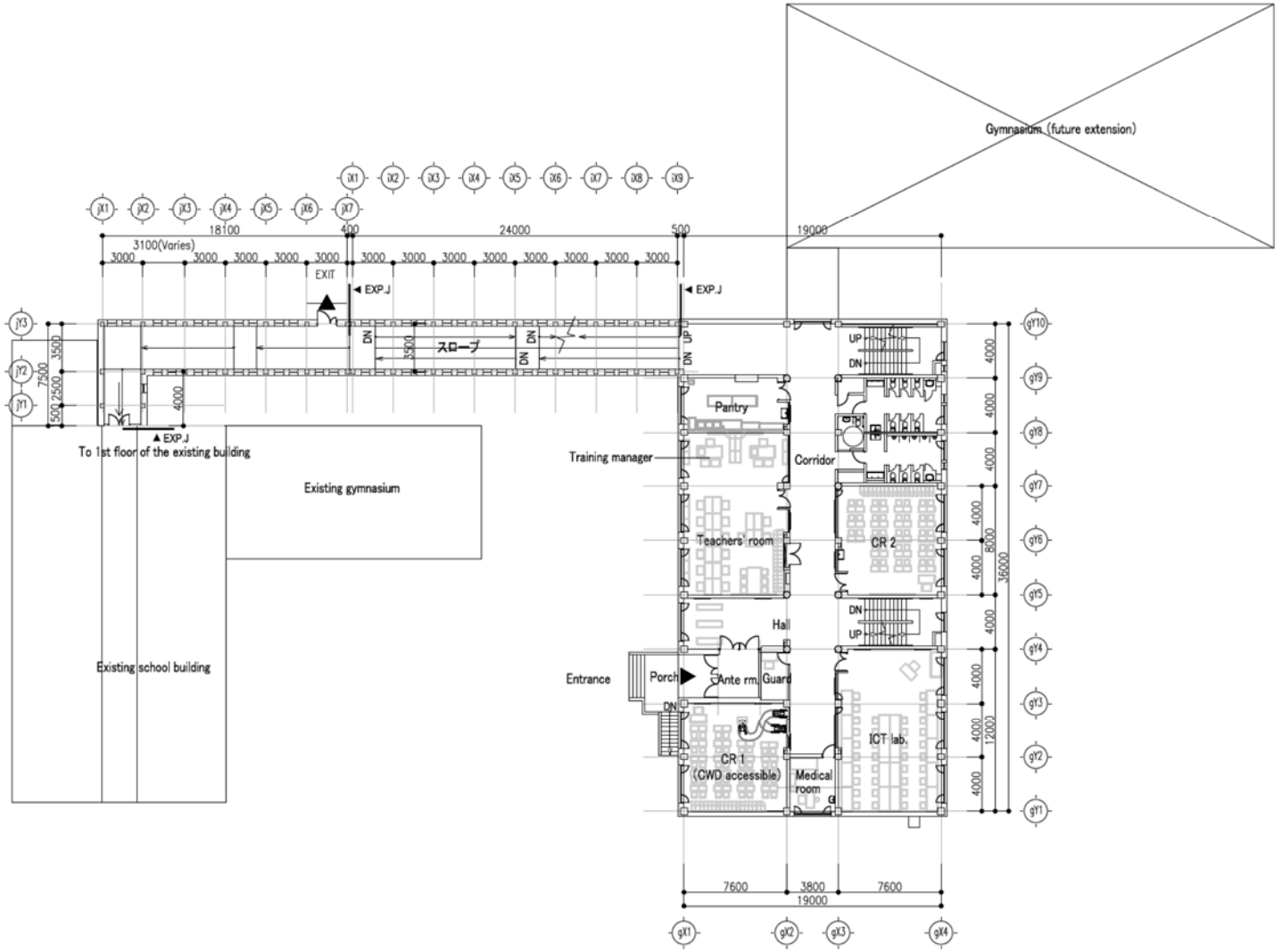


77

BF PLAN S=1:500

B2-02

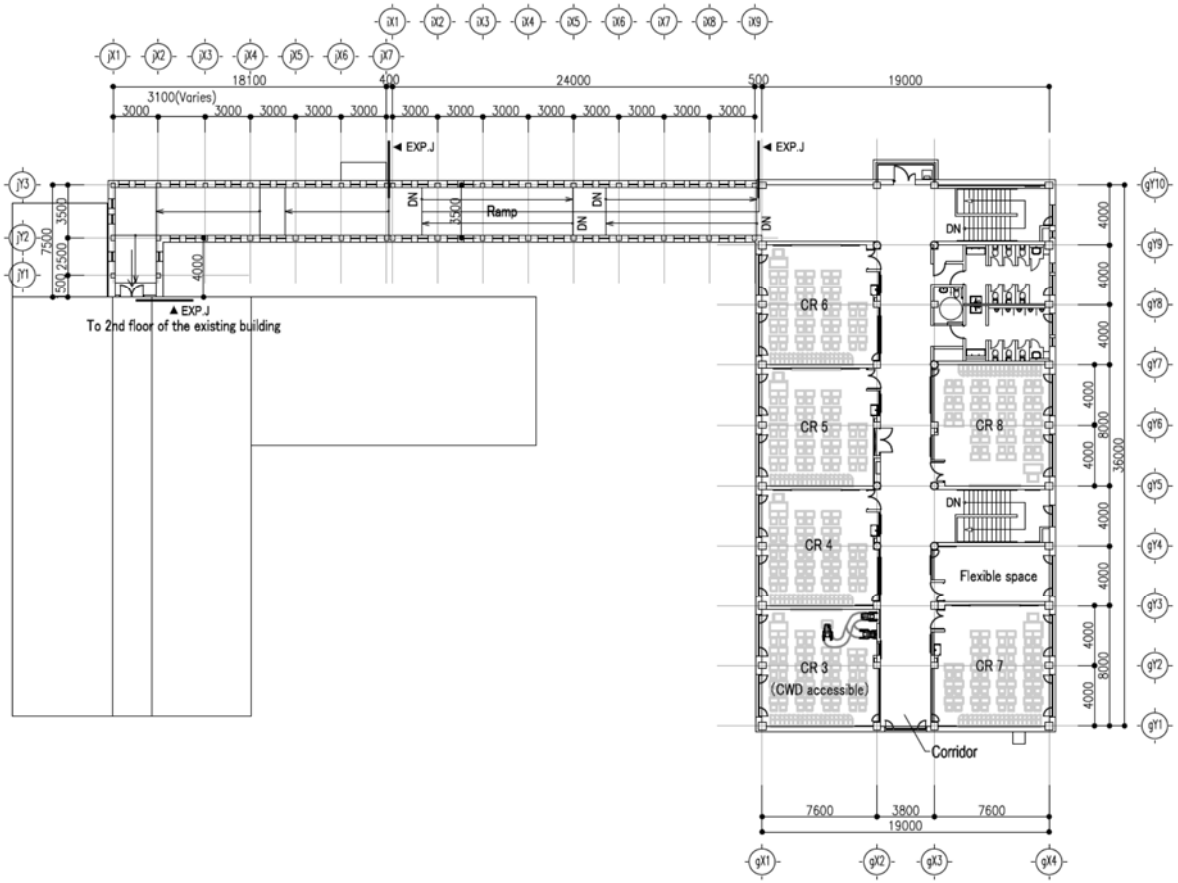
No. 109 School (Nalaikh)



1F PLAN S=1:500

B2-03

No. 109 School (Nalaikh)



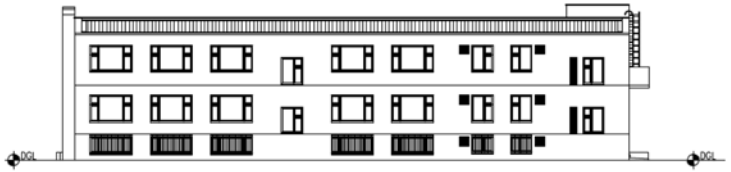
2F PLAN S=1:500

B2-04

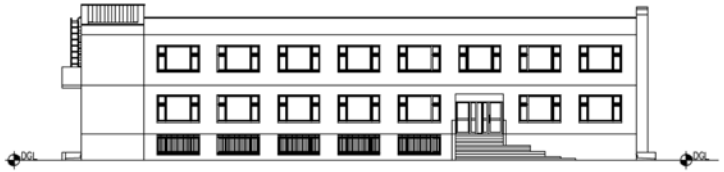
No. 109 School (Nalaikh)

SOUTH ELEVATION

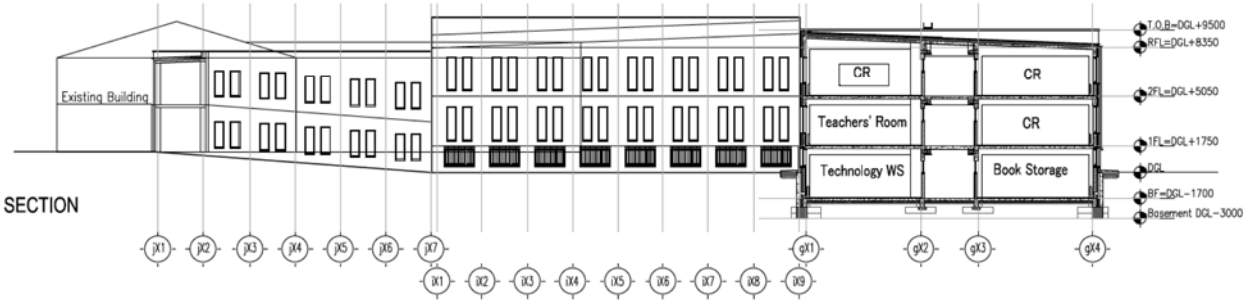
NORTH ELEVATION



EAST ELEVATION



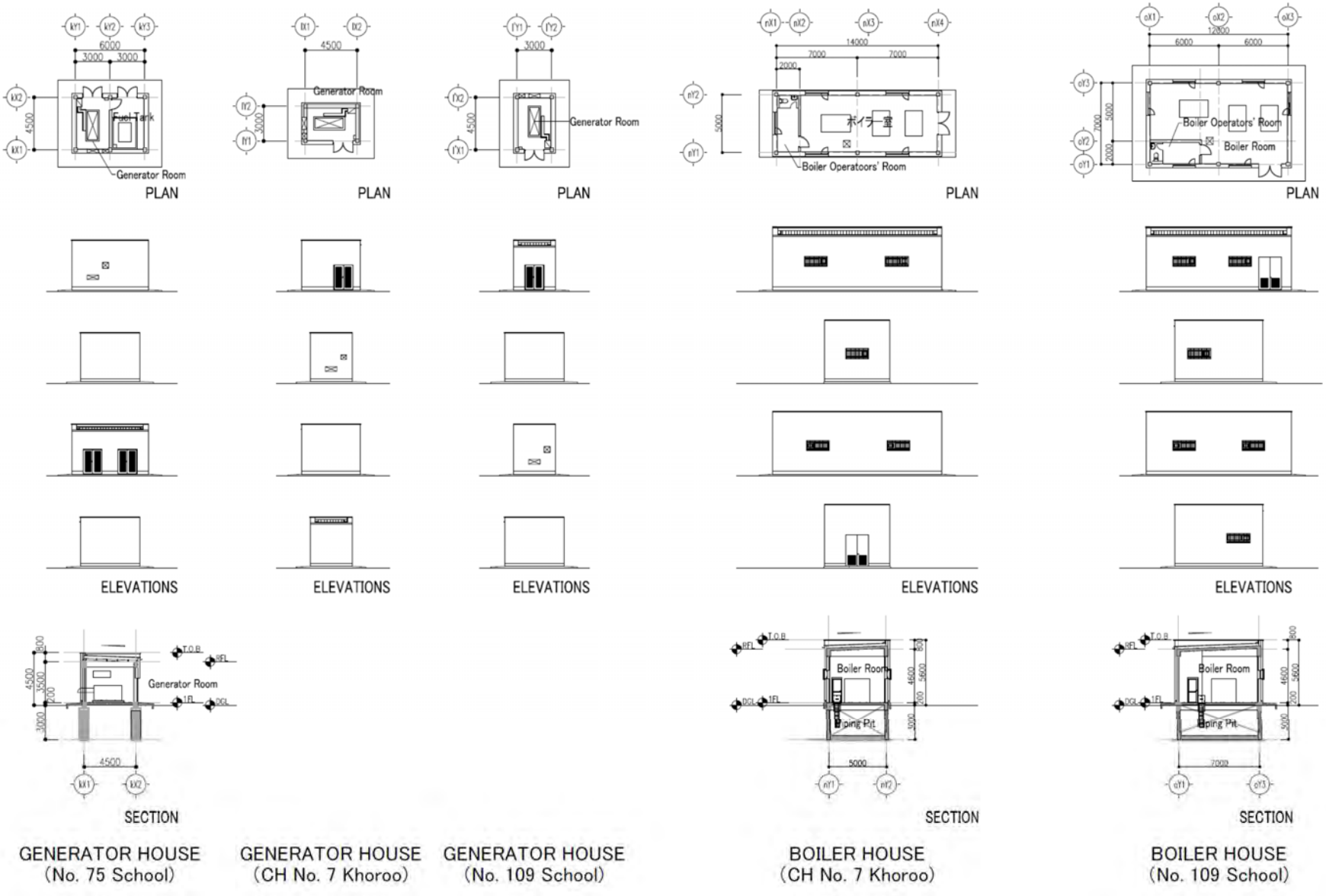
WEST ELEVATION



SECTION

ELEVATION/SECTION S=1:500 **B2-05**

No. 109 School (Nalaikh)



GENERATOR HOUSE (No. 75 School)

GENERATOR HOUSE (CH No. 7 Khoroo)

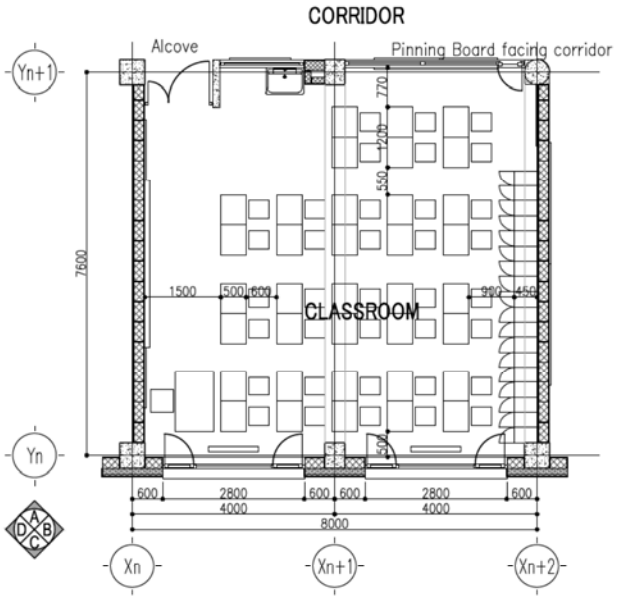
GENERATOR HOUSE (No. 109 School)

BOILER HOUSE (CH No. 7 Khoroo)

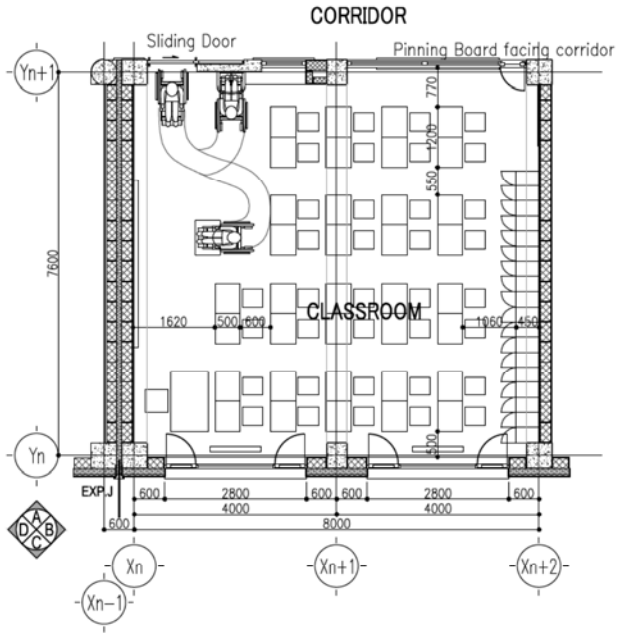
BOILER HOUSE (No. 109 School)

ANCELLARY BUILDINGS S=1:500 **C-01**

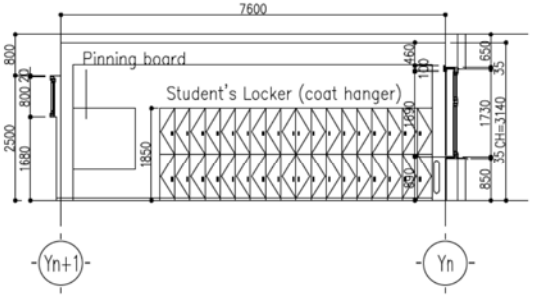
All Sites



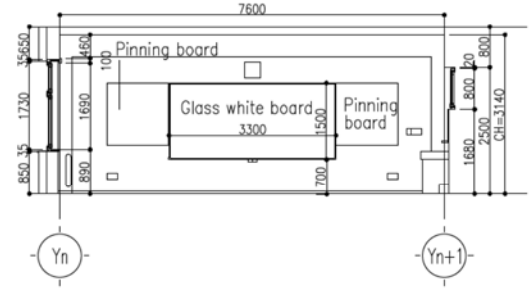
GENERAL CLASSROOM PLAN



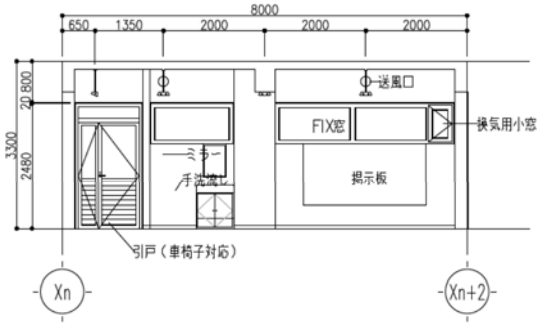
CWD ACCESSIBLE CLASSROOM PLAN



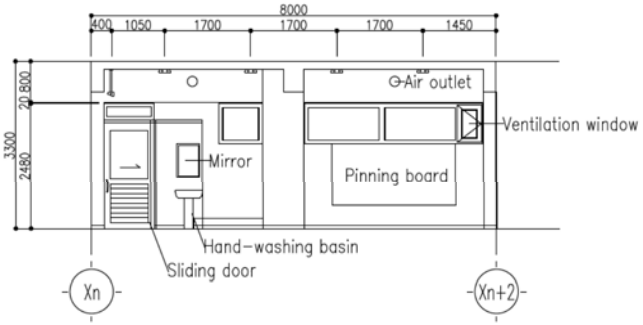
INTERIOR ELLEVATION B



INTERIOR ELLEVATION D



INTERIOR ELEVATION A



INTERIOR ELEVATION A

CLASSROOM PLAN S S=1:150 **C-02**

All Sites

2-2-4 Implementation Plan / Procurement Plan

2-2-4-1 Implementation Policy / Procurement Policy

(1) Guiding Principles for the Project Implementation

After the Project is approved by the Cabinet of Japan, an Exchange of Notes (E/N) will be signed between the governments of both countries with regards to its implementation. And in accordance with the E/N, a Grant Agreement (G/A) will be signed between GOM and JICA (Japan International Cooperation Agency). The Project is then implemented pursuant to the Japanese grant aid scheme. Subsequently, GOM will sign a consulting agreement for the Project (hereinafter referred to as "the Consulting Agreement") with a Japanese consultant company which will prepare detailed designs of the intended facilities and equipment (hereinafter referred to as "the Consultant"). Upon completion of the detailed design drawings and tender documents, a competitive tender will be carried out, calling for pre-qualified Japanese companies. A successful tenderer (hereinafter referred to as "the Contractor") and GOM will enter into a contract for facility construction and equipment procurement (hereinafter collectively referred to as "the Contract"), which shall be fulfilled as agreed therein. Note that, on general principle, contracts for facility construction and equipment procurement should be separately concluded. However, given the quantities and components of equipment planned in the Project, it is less likely that Japanese companies would make their bids for a competitive tender. Therefore, it is deemed appropriate that construction and procurement services will be tendered in a package in this Project.

(2) Project Implementation Structure

Implementation Structure of the Mongolian side

The Project is under the jurisdiction of the Ministry of Education, Culture, Science and Sports (MECSS), with Department of Finance and Investment serving as a focal point to supervise Ulaanbaatar City Education Department (UBC-ED) that is the implementing agency, coordinate and facilitate the entire project process. MECSS is a main body to conclude the Consulting Agreement and the Contract each with the qualified Japanese companies, taking due procedures to open a bank account and make payments. It also needs to earmark budgets required for fulfilling obligations of the Mongolian side. Under the supervision of MECSS, on the other hand, UBC-ED is in charge of executing the works to be undertaken by the Mongolian side, acquiring applicable permits and licenses, clearing site conditions, and handling technical matters relating to the project implementation. UBC-ED should closely work with relevant departments and agencies (Specialized Inspection Agency of Ulaanbaatar City, Urban Planning Department, water supply and sewerage authority, and heating authority) to pursue its assigned tasks in a timely manner. Note that the Ministry of Finance (MOF) will be the responsible body to sign the E/N and G/A of the Project.

Japan International Cooperation Agency (JICA)

Japan International Cooperation Agency (JICA) will conclude the G/A with MOF, which represents GOM 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 intended facilities and equipment and supervise the construction work and procurement described in this Report, pursuant to the Consulting Agreement signed by MECSS. The Consultant will also prepare tender documents and assist a tender process and conclusion of the Contract. In order to deliver these services efficiently, the Consultant should develop a close and cooperative relationship with the relevant departments in MESCC and UBC-ED implementing the Project. It will send a supervising engineer in Mongolia throughout the period of facilities construction and equipment procurement.

Contractor

Selected in a competitive tender, the Contractor should complete its works and services pursuant to the Contract signed by MECSS within an agreed execution period. In executing the construction work and equipment procurement, the Contractor must create locally viable work flows of construction and procurement specific to the designed capacity and components.

Implementation Framework

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

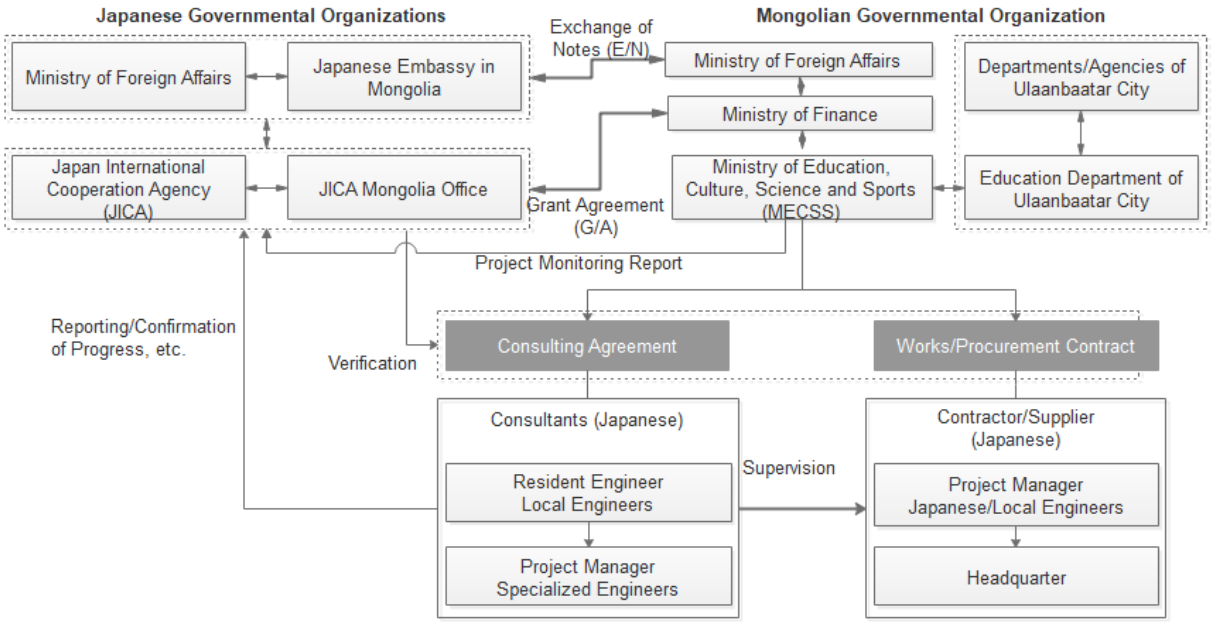


Figure 2-5 Project Implementation Structure

(3) Principal Basic Policy for Construction Work and Procurement

Although all situated in UBC, the target sites vary in their locational conditions, available utilities, and features of adjacent areas. The Project is intended to exemplify models reflecting architectural elaboration that meets all those unique conditions. It is of vital importance to plan the optimal construction work and procurement for each target site, deliberating on interconnection with the existing buildings, slopes, compass directions of the premises, and other site-specific conditions. At the same time, multiple challenges should be accomplished concurrently on all target sites, for instance, deployment of efficient and flexible work schedules, labor, and materials and other resources. Quality of the work done and safety control on these sites should be also kept consistent. The intended construction work and procurement must be therefore organized to fully align with what should be achieved on all the target sites. For the sake of cost reduction and efficient work execution, it is crucial to schedule the reasonable construction process with manpower and time afforded to work with a constraint of the long-lasting severe winter. Key strategies underlying the above-mentioned construction work and procurement will be as follows.

- Work together with qualified local companies and engineers and create a locally viable construction management mechanism to implement the Project in a streamlined and locally suitable manner without remedying work, while achieving the required quality at the same time.
- Ensure to apply a coherent scheme in controlling the quality, work process, and safety to maintain the acceptable and efficient work executed on the multiple sites in parallel.
- Prepare detailed construction and procurement plans prior to the commencement of work and carry out them as scheduled to cope with a time constraint arising from local climate conditions.
- Implement the Project in such a way to gain good understandings and cooperation of key stakeholders in the schools, local communities, and related UBC departments, and create a close liaison with specialized agencies of UBC to obtain applicable permits and licenses.

2-2-4-2 Implementation Conditions

(1) Situations in the Construction and Supply Industries and the Local Features

1) Construction companies and labor situations

Rapid economic growth in UBC from the late 2000's to the early 2010's had led to an upsurge of construction demand. In response to this, the construction industry has achieved considerable development in every respect, such as experiences, financial capacities, and technical abilities. In particular, construction of high-rise apartments had been robust, thanks to business expansion of foreign-affiliated companies, including China and Korea. High-rise buildings and large complex facilities had been constructed all across UBC, where major construction companies had put their effort in capital investment in their plants and machinery to expand the business. Then, the economy

has slowed down after it hit a high in 2011. More recently, construction projects are often left suspended half way through. Nonetheless, top-ranking construction companies have sustained their work capacities and technical abilities. Their work performance is kept consistent in terms of controlling quality of work, safety, and construction schedule control. With the expanded business capacity, they can apparently afford to supply construction materials, machinery, and labor (including skilled and general workers), and therefore have no particular concerns with respect to procurement of such resources.

Mongolian companies will be encouraged to take part in the Project, wherever possible, not only for the smooth implementation, but also for future replication of the demonstrative facility models in the country.

2) Conditions Related to Construction Materials and Procurement

Mongolia has promoted domestic production of key construction materials, after going through its earlier economic growth. Apart from conventional domestic products such as sand, crushed stones, cement, lumber, rebars, and bricks, the country has launched full-scale industrial manufacturing of ranging products, including PVC fixtures, thermal insulators, aluminum fixtures, glass, and furniture. Similarly, the supply system for ready-mixed concrete has been established, which is now broadly used. In terms of the prices, it is projected that they are unlikely to surge for the time being. In practice, the country has apparently a surplus supply capacity.

Besides the above-said local products, materials used in the Project for finishing and utility installations may be imported from China, Russia, Korea, and Japan, via suppliers. Typical materials applied to local construction methods are available constantly in the domestic market. Generally speaking, no particular concern has been identified in procurable product lines, quality, and quantity supplied. In a large-scale project requiring a massive quantity of goods, the contractor places an order directly to foreign manufacturers or suppliers, as required. This entails time to complete a procurement process from ordering to delivery. Most of the import products are supplied by rail via Zamyn-Uud bordering with China. The time required for transloading from a freight train to a truck must be include in the Project's schedule.

(2) Other conditions

In Mongolia, a building inspection system, which is inherited from the Socialist period, is applicable to all construction projects. They must start with acquisition of a building permit, subsequently undergoing stepwise inspections by UBC and General Agency for Specialized Inspection that authorize the next work stage. The checks chiefly start with a notice to commence, interim inspections for excavation, structural work, and finishing, application filing and inspection related to public utilities, all of which are required in a construction phase. They are then followed by a completion inspection, and finally an occupancy certificate. Work execution, if it should be pursued as scheduled, must avoid remedying work ordered during the above-said inspections. To do so, an

engineer, who is familiar with local situations, will be deployed and assigned in design and construction phases for close consultations with departments concerned. The construction work schedule should afford the time required for the mandatory inspections and issuance of permit and licenses.

2-2-4-3 Scope of Works

To implement the Project with a Japanese grant aid, the Japanese side and the Mongolian side share their responsibilities as follows. Note that typical sharing of responsibilities in a Japanese grant aid project are as described in the next chapter.

1) Works to be undertaken by the Japanese Side

- Facility construction (four target sites, comprising 61 Classrooms in total, Gymnasiums, Auditoriums, Lavatories, Teacher's Rooms, administrators' rooms, Libraries, ICT Laboratories, Craft rooms, Special Classrooms, Cafeterias, and other ancillary facilities)
  - Installation works for building services in the above facilities on the premises, namely, cold/hot water supply, sewage/drainage, emergency, ventilation, heating, electricity and communication systems
- Procurement and installation of school furniture and fittings in the above facilities
- Equipment procurement
  - Essential educational equipment (to be used in classrooms, laboratory experiments, and practical exercises)

2) Works to be undertaken by the Mongolian Side

- Acquire sites required for facility construction
- Prepare the site conditions (demolition of the existing structures and buried obstacles, and leveling of ground)
- Connection with service pipes and cables for electric power, heating source, water supply and sewerage, and communication, where available.
- Provision of external facilities, such as gates and fences, parking lots, planting of trees, and pavement that are not included in the works undertaken by the Japanese side.
- Procurement of furniture, fittings, fixtures, stationaries, and consumables that are not included in the works undertaken by the Japanese side.

2-2-4-4 Consultant's Supervision

(1) Basic Policy for Supervision of Construction Work and Procurement

Fully understanding a Japanese grant aid scheme and the key concept underlying the outline design, the Consultant must deliver specified services in a stepwise manner from a detailed design, tender, supervision of construction work and procurement, and handover of the completed facilities. In supervising construction work and procurement of equipment, the Consultant should keep a close contact with the related government agencies in both countries to make necessary reports. It should also provide timely and relevant advice to the construction personnel so that they complete the facilities and equipment installation without delay, meeting the quality prescribed in the contract documents. Particular attentions should be paid to the following matters.

- The Consultant should prepare a supervision plan which articulates quality requirements and key work components to oversee efficiently and effectively multiple sites located across the urban periphery. It will make site visits at regular intervals to supervise the works.
- With a view to its objectives, the Project should give careful considerations to users of the completed facilities as well as good quality. Therefore, those who are involved in the construction work must be fully informed of purposeful designed components and quality requirements they must meet. The Consultant makes sure that these matters are mutually understood to have the work smoothly executed, avoiding remedying work.
- For timely facility completion, the construction work should be launched punctually, while excavation and underground structural work should be finished within the predetermined timeframe (before the first winter). At the same, structural work, exterior work, and heating system installation must be completed before the next winter. The Consultant must closely liaise with relevant agencies to facilitate the Recipient's work execution and permit issuance without delay. It must also monitor the work progress on a regular basis, including allocation of labor and materials, and take immediate actions, if any problem arises.

(2) Work Supervision Structure and Responsibilities

In order to supervise adequately the work being executed on the multiple sites in parallel, the Consultant will assign a resident engineer of Japanese national to Mongolia at all stages of the construction and procurement. The following tasks should be fulfilled.

- Review the plans associated with construction, schedule, construction materials and machinery, furniture and equipment procurement, quality control, and safety measures. Give relevant guidance and advice to the Contractor, and make necessary coordination.
- Verify and approve the drawings, working drawings, and samples submitted by the Contractor.
- Understand the entire work schedule of the intended construction and procurement and monitor the progress of works site by site. Give guidance to the Contractor, where necessary, and report

the work progress to the related organizations in Mongolia and Japan.

- Check the quality and workmanship of the work done, and give guidance and advice to the Contractor.
- Make technical arrangements and monitor the progress related to the work being executed by the Mongolian side.
- Support approval of payments and processing of prescribed procedures upon completion of the services.
- Check the specifications, components, and quantities of the equipment to be procured and carry out the necessary inspections.
- Carry out a completion inspection, take part in the handover of the completed facilities and procured equipment, and check the Contractor's guidances on operations and maintenance.

The supervision of construction work and procurement intended in the Project entails a wide range of additional tasks to be accomplished in a timely manner. They include site-based arrangement of equipment supply, and contact and coordination with relevant Mongolian organizations including building inspectors/testing agencies. Therefore, the eligible resident engineer must have a working knowledge of installations and equipment as well as architectural expertise, while also is familiar with a Japanese grant aid scheme. Furthermore, a local architectural engineer will be employed to assist the resident engineer.

The Consultant should also create a backup system by which the technical staff in specialized areas are assigned under the project leader. Such system is intended to supervise and manage the entire project cycle, act as a coordinating focal point to liaise with relevant Japanese organizations, and support the resident engineer. The Consultant will dispatch an engineer temporarily to join key testing and inspections and provide architectural advice pertinent to the construction progress, when the work is at the critical points requiring supervision.

2-2-4-5 Quality Control Plan

The planned facilities will consist of low-rise buildings with two or three floors above the ground and a basement, mainly structured with RC frames. Quality control of the facilities will be chiefly focused on the following points: structural works (rebars and concrete works), external insulation works (with EPS/XPS boards), aluminum and/or PVC sash and roofing work that significantly affect key performance of durability, thermal insulation, and waterproofness), and building services (heating system, etc.) essential to functioning of the facilities. The quality of construction materials will be ensured in accordance with the next table. Note that testing methods and material standards will refer to requirements certified by the building inspectors/testing agencies in Mongolia, and to Japanese standards, where necessary.

Table 2-21 Quality Control Items

Item	Method
Ground	・ After foundation excavation, visually check the soil conditions at the bottom of bedding, and cross-check them with the test results. ・ Check also if freezing depth and soil freezing have caused any effects on the foundation.
Rebar	・ Check the material quality with the product testing report submitted by the manufacturers at each delivery. Conduct a tensile strength test at a certified laboratory once for different types of bars.
Steel beam	・ Conduct shop inspections twice, including a test of custom-made steel frame components against the full-size drawings and a product test.
Concrete (ingredients)	・ Check concrete materials (cement, aggregate, and water) regarding the prescribed quality, based on the material test data submitted by the source concrete plant when mix proportion is planned.
Concrete (ready-mixed concrete)	・ Determin concrete mix according to trial mixing. ・ Check by verifying slumps, temperature, air content, and chlorides content of fresh concrete when delivered to the sites. ・ Conduct a compressive strength test with sample pieces (three each checked for first-week and fourth-week strength) taken during casting (per 150 m^3-casting and per cast portion) to check the compressive strength. ・ Pay due attention to climate conditions involving a large temperature difference, particularly high summer daytime temperature and low temperature in spring and fall (April-May and September-October). Take appropriate measures, where necessary, such as sheet curing and insulated curing.
Bar arrangement inspection	・ Prior to casting of concrete, conduct a bar arrangement inspection in the presence of the Consultant and the Contractor to check the quantity, position, accuracy, length of joints and anchorages, and placement of spacers.
Insulation work	・ Check working drawings carefully to ensure no thermal bridge which might cause condensation will be generated. Clearly identify points that require cautions, which should be double-checked by more than one persons qualified for such checking (a resident engineer, a project manager of the Contractor, etc.) throughout construction and procurement stages.
Roofing work	・ Prepare a detailed work manual for metal roofing work. Make the procedures clear especially to work on coping to parapets, flushing, drains and expansion joints, which are more prone to water leakage, based on confirmation of work methods established by well examined details during the design stage.
Piping work	・ Provide thermal wrap with pipes of installations outside the buildings which are prone to freezing and frost heave. Check any malfunction or failure with test operations, desirably in winter.

It should be noted that working procedure plan must be prepared for key work items. They describe the schedule, specifications, materials, sequences, test methods, and required quality, which must be checked and approved by the Consultant.

2-2-4-6 Procurement Plan

1) Construction materials and machinery

Materials necessary for the Project's facility construction are generally used in local construction projects, except for roof covering (steel sheet). Other than Mongolian products, a variety of import goods are marketed regularly, supplied from China, Russia, Korea, and Japan. Most of the procurable products have no problems in term of their variety, quality, and availability.

In Mongolia, a contractor directly places order to foreign manufacturers or suppliers, when it requires bulk purchasing of materials in much larger quantities than the usual. The Project will import from Japan or a third country such materials that are not sufficiently available in the market in UBC. For some of the local products with poor quality, the best source options will be decided, including import goods, after making a broader comparison. The table below indicates items, specifications, and sources of major construction materials and equipment.

Table 2-22 Supply Source of Key Construction Materials and Equipment

Item	Source of supply			Remarks: Prospective third countries that are eligible sources are China and Russia.
	Mongolia	Japan	Third country	
Construction materials				
Sand and gravel	○			Procure granitic river sand or crushed sand from crushing plants operated by subcontractors or suppliers. Make sure the quality is maintained as they are supplied from different supply sources.
Cement	○			Procure Mongolian products from suppliers in UBC
Concrete	○			Several plants are available in UBC. No problem identified in the availability and quality.
Re-bars and steel frames	○		△	Procure Mongolian products, wherever possible. At the same time, an alternative source should be planned in third countries.
Concrete blocks	○			Procure from manufacturers in UBC or subcontractors.
Roofing steel panel sheet		○		Locally marketed products are limited in terms of variety and availability. Quality low-slope roofing products are not procurable in Mongolia.
Form board (plywood)		○		Import Japanese products directly, as they excel in price, quality and availability.
Lumber (board)	○			Procure in UBC both for temporary construction and finishing works
Wood fixtures and furniture	○			Procure from suppliers and plants in UBC that have a comparative advantage in their prices and supply capacities.
Steel fixtures and fittings	○			
PVC fixtures and glass	○			Procure mass-produced and established products from suppliers in UBC
Flooring (continuous sheet)		○		Better to import a Japanese product that is advantageous in the quality and price.
Ceiling material (decorative PB)	○			Procure import products from suppliers in UBC.
Waterproofing material	○			Procure common import products from local suppliers.
Porcelain/ceramic tiles	○			Procure locally marketed products.
Paint	○			Procure locally marketed import products from suppliers in UBC.
Insulation material	○			Procure polyethylene foam boards produced in Mongolia.
Installation materials and components				
Pipes and metal fittings	○			Procure locally marketed products directly from suppliers or subcontractors in UBC.

Item	Source of supply			Remarks:
	Mongolia	Japan	Third country	
Plumbing fixtures	○		○	Procure locally marketed products directly from suppliers or subcontractors in UBC. Procure directly from Japan or China instead of those products marketed in Mongolia that do not meet the acceptable quality and performance.
Mechanical equipment	○	○	○	
Electric wires and cables	○		○	
Luminaires	○		○	
Distribution panel	○		○	
Communication and emergency system	○		○	

2) Equipment

The equipment to be procured in the Project is grouped in (1) prevalent teaching tools used for different subjects, devices and apparatus for laboratory experiments and practical exercises, and (2) non subject-specific, multipurpose computer devices and audio-visual appliances. They are all basic items used in the existing schools, requiring no specialized skills in the maintenance. Except for some items produced in Mongolia, such as wall charts, they will be procured from China, Korea, Europe, or Japan. While Chinese products have comparative advantages in terms of prices and availability, many products do not meet the quality requirement. The intended equipment will be purchased via manufacturers' agents in Mongolia, which will be ordered in small lots. Otherwise, the eligible supply source will be decided according to types of equipment.

Table 2-23 Supply Source of Equipment

Item	Product of Mongolia	Product of Japan	Product of third country	Remarks
Printed materials including wall charts and multimedia teaching materials	○			Procure from local suppliers designated by UBC-ED.
Physical education apparatus, music instruments	○			Procure local or Chinese products via manufacturers' agents in Mongolia.
Experiment and practical exercise equipment	○			Procure Japanese or third-country products available from manufacturers' agents in Mongolia.
ICT devices, audio-visual appliances	○			Procure Japanese or third-country products available from manufacturers' agents in Mongolia
Other school equipment	○			Procure local or Chinese products via manufacturers' agents in Mongolia.

2-2-4-7 Operational Guidance Plan

The equipment to be procured in the Project is locally available and commonly used in Mongolian schools. However, teachers in the general education schools may not be familiar with some of the provided experiment tools. Therefore, when laboratory equipment is handed over, the school staff in charge of equipment will be taught by technicians of the local manufacturers' agents about basic

handling and maintenance scheme (day-to-day inspection, cleaning, adjustment, and minor repairs).

2-2-4-8 Soft Component Plan

The Project has a twofold aim. Firstly, it builds up model schools in Mongolia, incorporating universal design principles. Secondly, it is intended to contribute to qualitative improvement of teaching and learning environments through which the architectural essence embodied in the models, namely, due consideration to CWD, disaster preparedness, and environmental friendliness, is passed onto to other schools broadly. To these ends, the Project should gain greater publicity of the models upon completion, whereby people involved in school construction in Mongolia can learn about them at first hand. Therefore, soft component of the Project will assist delivering seminars or workshops, including site tours to the completed facilities, inviting people related to school education and construction. A PR material (booklet) will be also created and distributed, highlighting practical application of universal design to the constructed facilities.

Furthermore, the models will put more values in terms of energy conservation that lowers the maintenance cost during which the school buildings are heated. This will be attempted by the optimal energy-saving operations, showing numerated difference in cost reduction. Soft component on energy management will assist establishing the most efficient heating scheme, based on actual operations.

2-2-4-9 Implementation Schedule

When the Project is implemented with a Japanese grant aid, the following steps will be taken after the E/N and G/A are signed between the Government of Japan and the Government of Mongolia.

Detailed Design and Cost Estimation (approximately 5.5 months)

The Consultant will conclude the Consulting Agreement with MECSS, and prepare detailed design drawings and tender documents in accordance with the outline design proposed herein. The Consultant will also estimate detailed costs and obtain approval from JICA. The Field Survey team will have meetings with relevant agencies in Mongolia, when the detailed design is started (upon signing of the Consulting Agreement) and completed (at the outset of cost estimation), as well as at the completion of their services of this stage upon approval of the final deliverable. This will entail roughly 5.5 months.

Tender (Approximately 3.0 months)

Upon approval of tender documents by MECSS, the Consultant will make a tender notice in Japan on behalf of the said ministry and prequalify (P/Q) tenderers. Prequalified Japanese contractors will make competitive bids under the presence of responsible officers. A contract will be awarded to the tenderer indicating the lowest price, when the proposed tender is evaluated appropriate. The successful tenderer will sign the Contract with MECSS. A period from a notice of P/Q and conclusion

of the Contract will require approximately 3.0 months.

Construction and Procurement (Approximately 23.0 months)

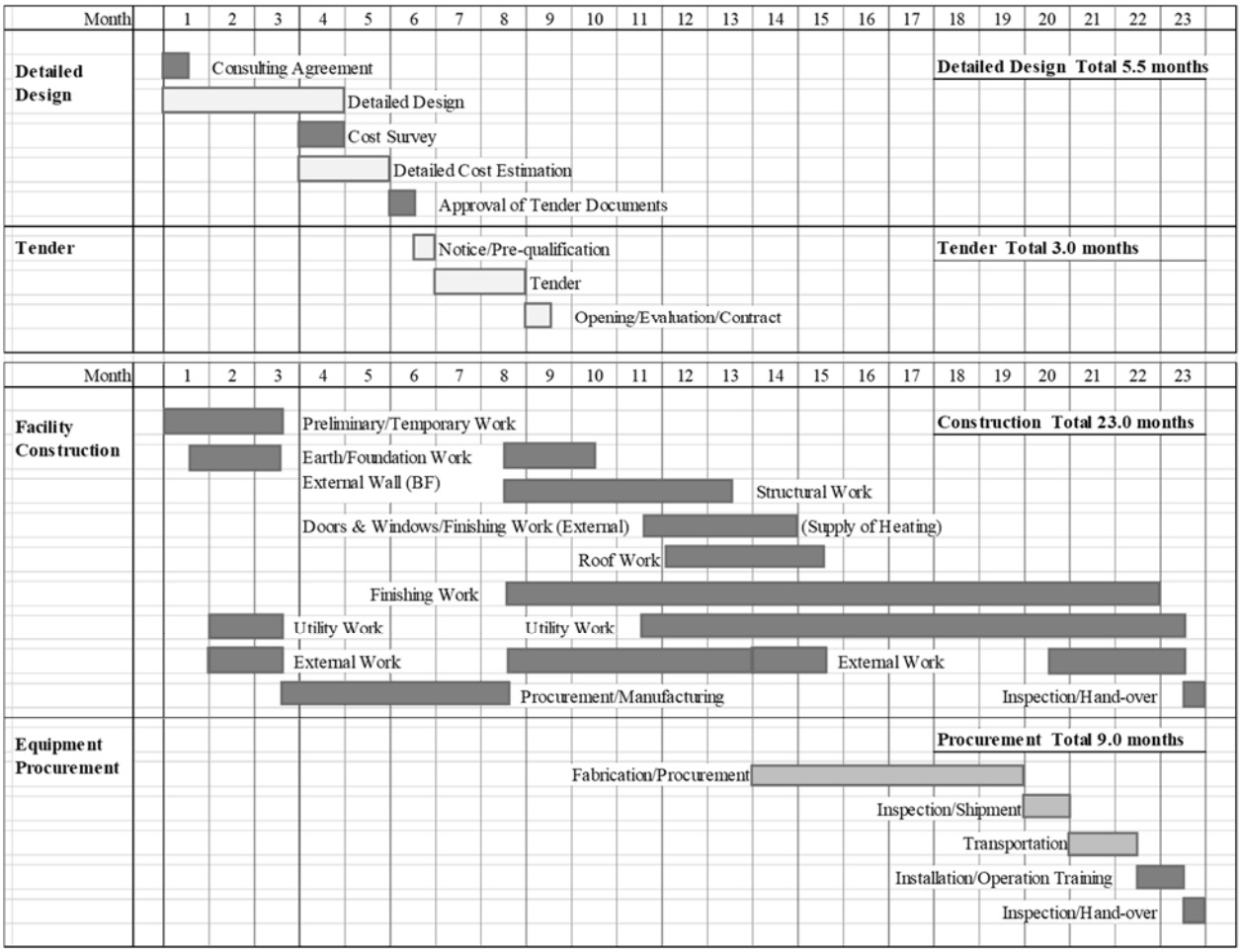
The Contractor will commence the work after signing the Contract, sending the necessary personnel to Mongolia. The Contractor will give due consideration to local climate conditions that disrupt exterior work, when an average temperature falls below zero in the harshest period of winter (November through March). At the same time, the Contractor should afford some time in the construction phase to go through inspections and permit issuance prescribed by the Mongolian authorities. Considering site-specific conditions and planned scales, it will entail 23 months for each target site (of which five months in the first year recess the work during the winter) to construct the intended facilities with a basement and two or three floors above the ground. Key work procedures are as benchmarked below.

- The main building construction will be started on all four target sites at the same time, after minimum essential preparation is completed before a preliminary work.
- In the project year when the work started, CH No. 7 Khoroo (A-2) requiring extensive site preparation, will complete rough land development up to the ground level and provisional slope protection. Other target sites will complete the foundation work of the school buildings.
- On the sites where the same local subcontractor is assigned, a building with a larger work quantity should be started first, while construction of other buildings will proceed consecutively deploying machinery and workers on a rotating basis.
- Upon completion of structural work above the ground level, the exterior work will be started immediately, while installing a heating system at the same time. The heating system should be operable in mid-October in the second project year.
- After the above steps, interior finishing and utility installation will be mainly carried out to complete the entire work.

Note that the equipment planned in the Project does not include large-sized or unusual components that require the time for installation. They will be able to complete procurement during facility construction.

The above-mentioned implementation schedule is charted out in the next table. It is expected to take 31.5 months from the conclusion of G/A to the completion of construction work.

Table 2-24 Project Implementation Schedule



2-3 Obrigations of the Recipient Country

As agreed in the Field Survey, the following undertakings are assumed by the Mongolian side to implement the Project.

Table 2-25 Obligations of GOM

Items	In charge	Timing or deadline
【Before posting a tender notice】		
1 To open Bank Account (Banking Arrangement: B/A).	MOF/MECSS	Within a month after G/A is signed
2 To issue Authorization to Pay (A/P) to a bank (the Agent Bank) in Japan to make payments to the Consultant.	MOF/MECSS	Within a month after the Consulting Agreement
3 To bear the following commissions to a bank in Japan for banking services based upon the B/A: 1) Advising commission of A/P 2) Payment commission for A/P	MOF/MECSS	1): Within a month after the Agreement is signed 2): On every payment made
4 To implement the baseline survey on environment and compile a report by entrusting to a registered consulting firm.	UBC-ED	Before a tender notice
5 To submit an application(s) for the initial screening for EIA and obtain a permit for a development project (Prerequisite must be cleared, if any).	UBC-ED	Before a tender notice
6 To obtain official certificate authorizing the land use right over the entire site area.	UBC-ED	Within a month after G/A is signed
7 To acquire and clear the following land lots: 1） Building area of each project site 2） Temporary construction yard and stock yard in the vicinity of each project site	UBC-ED	Before a tender notice
8 1） To obtain official permission for demolishing and remove the existing buildings and any obstacles (including fence, playing equipment, curves, and paving) specified in the bidding documents. 2） To provide necessary learinng facilities for the students during construction of new school buildings.	UBC-ED	Before a tender notice
9 To relocate the existing utility lines such as water, sewerage, heating and power line so as not to hinder the construction.	UBC-ED	Before a tender notice
10 To obtain approval of the schematic plan which includes information on utility connection, building layout plan, and landscaping plan, and disaster prevention plan.	UBC-ED	Within a month after G/A is signed
11 To obtain a building permit.	UBC-ED	Before a tender notice
12 To submit a Project Monitoring Report (in a detailed design phase).	MECSS/ UBC-ED	Before a tender notice
【During the project implementation】		
1 To issue A/P to a bank in Japan to make payment to the Contractor (Supplier).	MOF/MECSS	Within a month the Contract is signed

Items	In charge	Timing or deadline
2 To bear the following commissions to a bank in Japan for banking services based upon the B/A: 3) Advising commission of A/P 4) Payment commission for A/P	MOF/MECSS	1): Within a month after the Contract is signed 2): On every payment made
3 To ensure prompt customs clearance and to assist the Supplier with internal transportation in the recipient country.	MECSS	In construction and procurement phases
4 To accommodate Japanese nationals and/or physical persons of third countries whose services may be required in connection with the supply of the products and the services such facilities as may be necessary for their entry in the recipient country and stay therein for the performance of their work.	MECSS	In construction and procurement phases
5 To ensure that customs duties, internal taxes and other fiscal levies which may be imposed in the recipient country with respect to the purchase of the products and/or the services be exempted: 1) Import tax: be exempted by filing application to MOF for every import 2) VAT: be exempted by purchasing with the registration number through E-Voucher system 3) Income tax of Japanese nationals: be exempted based on the description of E/N	MOF/MECSS	In construction and procurement phases
6 To bear all expenses, other than those covered by the Grant, necessary for the implementation of the Project.	MECSS/ UBC-ED	Throughout the project implementation phase
7 To submit a Project Monitoring Report.	MECSS/ UBC-ED	Every two months throughout the project implementation phase
8 To submit a Project Completion Report.	MECSS/ UBC-ED	Within six months after the project completion
9 To provide and connect facilities for available public utilities distributed on site: 1) Electricity: Distributing line connected to the site (in all four target schools) 2) Heating system: Distributing line connected to the site (A1 No. 75 School and B1 No. 53 School in case new connection is required) 3) Water supply: Municipal water main branched to the site (A1 No. 75 School and B1 No. 53 School in case new connection is required) 4) Drainage: Municipal drainage main branched to the site(A1 No. 75 School and B1 No. 53 School in case new connection is required) 5) Communication: Fiber-optic cable connected to the site (in all four target schools)	UBC-ED	 3 months before completion of the construction 10 months before completion of the construction 3 months before completion of the construction (same as above) (same as above)

Items	In charge	Timing or deadline
10 To provide following facilities and equipment not covered by the Grant Aid. 1) General furniture (a set of reception furniture, etc.) 2) Outer walls, fences, and gates 3) Fixtures, fittings, and fabrics	UBC-ED	After completion of the construction
11 To take necessary safety measure during construction.	UBC-ED	In construction and procurement phases
12 To obtain an occupancy certificate and have the properties registered.	UBC-ED	After handover
13 To carry out activities included in the Project's soft component with an assistance of the consultant.	MECSS UBC-ED	Before and after handover and during first operation season of heating

【After the Project is completed】

1 To maintain and use properly and effectively the facilities constructed and equipment provided with the Grant Aid: 1) Allocation of teachers and administrative staff 2) Allocation of maintenance expenses 3) Establishment of operation and maintenance scheme 4) Regular inspection and checkups	MECSS UBC-ED	After completion of the construction and procurement

UBC-ED and MECSS, which will fulfill their obligatory undertakings in the Project, have experiences in school construction funded with Japanese grant aid, and have executed similar undertakings. Therefore, the above-described obligations will not present any particular problems.

Of the above obligations, specific work components are indicated in Table 2-26.

Furthermore, the target sites will require planting of trees around the buildings to protect the soil and prevent dust.

Table 2-26 Site-Specific Obligations of GOM

	Works to be completed prior to the commencement of construction				
	Demolition, removal, and relocation of obstacles		Cutting and uprooting trees	Site clearance	**Remarks**
	Removal	Relocation			
A1 No. 75 School	Brick-masonry school buildings, pavement, curbstones, and other exterior and buried structures located in the construction area	None	None	Back filling, compaction, and leveling in the construction area	Waste disposal is complied with the environmental requirements of UBC. In-situ building foundation should be removed as well.
A2 Chingeltei No. 7 Khoroo	None	None	None	None	Land development of the premises will be pursued by the Japanese side.
B1 No. 53 School	Concrete pavement, curbstones, and steel fence	Various buried pipes	Yes	Back filling, compaction, and leveling in the construction area	－

B2	No. 109 School	Sewer tank, playing equipment, steel fence, and wood barricade		Overhead cables and poles	None	None	—
		Works to be completed after the commencement of construction					
		Service connection of utilities					External facility improvement
		Electricity	Heating	Water supply	Sewerage	Communication*	
A1	No. 75 School	New service connection	Recovery of the existing service pipe	Recovery of the existing service pipe	Recovery of the existing system	New service connection	Planting of trees around the buildings
A2	Chingeltei No. 7 Khoroo	New service connection	—	—	—	New service connection	Installation of outer fences and gates Planting of trees around the buildings
B1	No. 53 School	New service connection	Branching out from the existing pipe	Branching out from the existing pipe	Connection with the existing pipe	New service connection	Planting of trees around the buildings
B2	No. 109 School	Connection with the existing SS	—	—	—	New service connection	Planting of trees around the buildings

SS: Substation * Service connection of optical cables

*1 The Mongolian side must complete a service application and connection of cables and pipes for electricity and heating supply before they are required temporarily for construction.

*2 The scope of work is defined as below, regarding connection of utilities.

・Electricity: For buried service cables, the Mongolian side will draw them up to an lead-in panel installed on the premises. The Japanese side will be responsible for internal wiring. For overhead service cables, the Mongolian side will connect them with power service poles installed by the Japanese side. Where a high-tension service is provided, the Mongolian side will install a substation.

・Heating: The Mongolian side will branch out the existing service main on the premises, and the Japanese side will undertake the rest of piping work. The Japanese side will provide an inspection pit in the branch point.

・Water supply: The Japanese side will undertake any works associated with water supply connectable with the existing water pipes. Otherwise, the Japanese side will provide an inspection pit on the premises, and the Mongolian side will branch out the water main and connect the pipe to the pit.

・Sewerage: The Japanese side will undertake any works associated with a sewer system connectable with a sewer pit. Otherwise, the Japanese side will provide a final pit on the premises, and the Mongolian side will branch out the sewer main and connect the pipe to the pit.

・Communication: The Japanese side will undertake conduit work and work inside the buildings for the section after a hand hole provided on the premises. The Mongolian side, on the other hand, will connect service wires on the premises, and distribute and connect cables to PBX provided in the buildings.

・After the Project's outline design is officially finalized, locations and specifications of service connections will be determined utility by utility, technically elaborating a plan prepared by a registered design firm and approved by the Urban Planning Department. The scope of work described herein is tentatively planned according to various conditions.

2-4 Project Operation Plan

2-4-1 Operation Plan

The expanded or newly constructed facilities in the Project will be operated and maintained by the target schools under the supervision of UBC-ED and local District Education Divisions. Under the MECSS guidelines, these schools will be responsible for employing teachers, preparing and filing the budget proposals, developing educational programs and activity plans carried out in the provided facilities.

Other than teachers, the target schools allocate staff who engage either in administration and facility maintenance. Furthermore, the School Board is organized, consisting of the Director, community representatives, parents, and chief teaching staff. It discusses and decides on key issues related to school management such as an administration plan and budget. The School Board also cooperates with the school in addressing various matters, including improvement and maintenance of the facilities. Similarly, the facilities constructed by the Project will be operated and maintained jointly by teachers, other staff, and the School Board, with a leadership of the Director.

In public schools in UBC, teachers and other school staff are typically distributed as below.

- The Director and training managers at the primary and secondary levels are assigned managerial positions pursuing academic affairs pertinent to their own responsibilities.
- At the primary level, homeroom teachers teach students in their assigned classes. However, some subjects, such as physical education, music, and English, are instructed by teachers dedicated to all the lessons specified in the primary and secondary curricula.
- At the secondary level, teachers are distributed on a subject basis. In the public schools in UBC, the number of teachers is assigned approximately twice the number of classes on average.
- Administration staff is allocated in accordance with the school capacity and ongoing operations, namely, an accountant, treasury, registrar, social worker, school doctor, librarian, and teaching assistants. Typical facility management staff include a security guard, cleaners, and technical staff for heating, electricity, and plumbing.
- Cafeteria services, including school meals, are often outsourced. The kitchen workers are then not counted in the school staff in this plan.

In light of the above, additional teachers and other staff required to operate and maintain the intended facilities are planned as below.

- Primary school teachers: Homeroom teachers will be assigned for the number of planned classes. New teachers will be distributed to make up for homeroom teachers in shortage. In new schools, three subject-specific teachers (music, physical education, and English) will be allocated, apart from the homeroom teachers.

- Secondary school teachers: Teachers will be assigned as many as in the typical schools (the number of classes x two teachers). New teachers in the existing schools will be assigned to meet a shortfall arising from expanding their facilities.
- School staff: New schools need new staff members assigned in all sections. According to a typical personnel distribution in the public schools in UBC, regular staff are four management positions (the Director, training managers in primary and secondary schools, and social worker), other five positions (accountant, treasury, registrar, librarian, and school doctor), two maintenance technicians (plumbing and electricity), security guard, and cleaners (to be calculated based on the average number of workers/classes in the public schools in UBC). In the existing schools, a security guard and cleaners will be newly hired to satisfy a currently short-handed workforce. In those schools installed with separate boilers, three boiler operators (work in three shifts) will be hired on a seasonal basis, when heating is needed.

Table 2-27 Teachers and Supporting Staff to Be Distributed for the Project

	[School name] A-1 No. 75 School A-2 CH No. 7 Khoroo B-1 No. 53 School B-2 No. 109 School	Average distribution in UBC-based public schools		Distribution of teachers and supporting staff							Number of additional teachers and staff required (b-a)				
		Per school (persons)	Per class (Persons)	Current distribution: a			Planned distribution: b								
				A-1	B-1	B-2	A-1	A-2	B-1	B-2	A-1	A-2	B-1	B-2	Total
Managerial	Director	0.96		1	1	1	1	1	1	1	-	1	-	-	1
	Training M.	2.56		3	3	1	3	2	3	2	-	2	-	1	3
	Social worker	1.28		2	1	1	2	1	1	1	-	1	-	-	1
Teacher	Primary	24.44	1.03	21	29	15	23	18	38	18	2	18	9	3	142
	Lower second.	28.63	1.99	32	30	-	32	24	56	16	-	24	26	16	
	Upper second.	17.48	2.06	21	25	-	18	18	42	12	-3	18	17	12	
	Subtotal	70.56	1.51	74	84	15	73	60	136	46	-1	60	52	31	
Staff	Accountant	1.05		1	1	1	1	1	1	1	-	1	-	-	1
	Treasury	1.08		1	1	1	1	1	1	1	-	1	-	-	3
	Registrar	0.95		1	1	1	1	1	1	1	-	1	-	-	
	Librarian	1.05		1	1	1	1	1	1	1	-	1	-	-	
	School doctor	1.04		1	1	1	1	1	1	1	-	1	-	-	1
	Plumber	1.27		4	2	2	4	2	2	2	-	2	-	-	2
	Electrician	0.69													
	Carpenter	0.46													
	Cleaner・Other services	9.47	0.20	8	3	9	9	7	10	6	1	7	7	-3	20
	Security guard	5.39	0.12	4	3	4	5	4	7	3	1	4	4	-1	
	Boiler operator	0.40		-	-	3	0	3	0	3	-	3	-	-	3

According to the calculation (Table 2-27), the planned facilities will additionally require 142 teachers and 35 staff members (5 managerial positions and 30 other staff members). Some of the additionally required teachers will be assigned by relocating in-service teachers in nearby schools

from which their students will leave to transfer.

The number of teachers in general education schools in UBC is 11,084 in 2016/2017 (of which 9,243 teachers serve for public schools). In the public schools, it continues to increase by 3.3% (287 teachers) on annual average after 2012/13, when the number of students started to increase. The teacher-to-student ratio is increasing, because the number of teachers is not kept up with an increase in enrolled students. However, the said ratio is reported 22.6 students per teacher in 2016/17, which is supposedly adequate[15]. Since 2009/2010, on the other hand, more than 5,000 people have graduated annually from higher academic institutions across the country, majoring in education or completing teacher training courses. In 2016, new graduates counted 5,508, implying that employment of new teachers is unlikely to pose a problem in a quantitative respect. It is therefore deemed that teachers will be readily available to meet the needs associated with the project implementation.

2-4-2 Maintenance Plan

Daily maintenance of the school facilities is pursued by teachers and staff as guided by the Director. Technical staff employed in the schools will engage in operations and maintenance of furniture, heating and electric systems, and other building services. The School Board, comprising parents and community representatives, will support improvement and maintenance of the school facilities. The planned facilities will require no specialized techniques for the maintenance work. Nonetheless, in order to keep them in good conditions in the long run, it is necessary to clean and check them on a daily basis and make appropriate repairs where they are worn, damaged, or deteriorated due to aging.

- Regular cleaning: Students will pursue day-to-day cleaning, as instructed by teachers. Cleaners will clean administrative and common spaces. The school buildings must be thoroughly cleaned at each end of academic year.
- Routine repairs of the facilities: The planned facilities are designed to minimize the maintenance cost, using maintenance-free materials and finishing. With regular checkups and proper daily management, the facilities will require no repairs for several years after handover. After that, they will need some regular repairs, such as repainting (at a 10-year interval), and checkups and adjustments of fittings (once a year).
- Maintenance of the building services: It is critical for building services to take precautions before requiring repairs of breakdowns and replacement of parts, managing daily operations and regular checkups. The planned facilities will be mostly made up of typical components broadly operated in Mongolia, with no complicated systems involved. However, a reliable maintenance mechanism must be created where technical staff conduct daily checkups, minor repairs, and part replacement.

[15] UBC Education Statistics 2016-2017, and other sources

- Maintenance of external facilities: Besides daily cleaning around the buildings, pits must be checked and cleaned twice a year. Trees on slopes must be properly maintained to stabilize the soil.

Ordinary budgets for the school facility maintenance are appropriated in accordance with budget proposal made by schools. In the fiscal year of 2017, operating budget for general school education in UBC is 184,369 million Tg. (roughly 8.48 billion yen). On average, 819 million Tg. is allocated per school (roughly 38 million yen in FY 2017), and yet more than 70% of this budget account for personnel cost and social security expense. The maintenance (ordinary repair) cost, on the other hand, remains 8.7 million Tg. (roughly 400,000 yen in FY 2017). This is not enough to keep the aged facilities, and has necessitated many schools to rely on donation from parents and graduates to cover the maintenance costs. For appropriate, long-term maintenance of the constructed facilities, it is essential that adequate government budget will be earmarked and sustained to allow ordinary repairs, when needed. As for facility extension and major renovation, the project budget must be requested by a school, and allocated in accordance with an annual investment plan prepared by UBC-ED.

2-5 Project Cost Estimation

2-5-1 Initial Cost Estimation

(1) Costs Borne by Japanese Side (omitted)

(2) Costs Borne by Mongolian Side

Table 2-28 Costs Borne by Mongolia

Item	Estimated cost (million Tg.)	(million yen)
Demolition and removal of obstacles, and relocation of structures (including the existing buildings)	442.33	20.35
Site clearance and leveling	34.25	1.58
Connection with utility services	303.89	13.98
Provision of external facilities (gates and fences)	192.41	8.85
Application and commission fees for a preliminary appraisal of EIA	14.00	0.64
Fees of B/A and payment transfer	50.75	2.33
Total	1,037.63	47.73

(3) Condition of Estimation

- Estimated as of : February 2017

Currency exchange rate: US$ 1=JPY 113.97=MNT 2,460.10 (MNT: Mongolian New Tughrik), JPY 1= MNT 11.00 MNT 1 =JPY 0.046

- Construction and procurement period: Periods required for a detailed design and construction work are as shown in the implementation schedule.
- Other: The Project is implemented in accordance with a grant aid scheme of the Government of Japan.

2-5-2 Operation and Maintenance Costs

Costs required for operations and maintenance of the planned facilities are estimated as below.

(1) Operation costs

1) Personnel cost

Implementation of the Project will entail employment of five managerial staff members, 142 teachers, and 30 general staff members in the four target schools. Of these sites, No. 75 School (A-1) will rebuild the existing school building, which involves no substantial capacity expansion. The present personnel distribution will mostly suffice the school administration. When the new school in No. 7 Khoroo in Chingeltei (A-2) is opened, it will have students in its school district transferred from nearby schools. It is presumed that some teachers required in the new school will be relocated from those existing schools. On the other hand, two expanded schools should employ only as many teachers as required to cover additionally enrolled students within their current school districts. The personnel cost needed for such additional teacher allocation is estimated as below.

Table 2-29 Estimated Costs for Additional Teacher and Staff Allocation

Job title	Salary scale	Annual basis	Additional staff required in the constructed school facilities					Additional costs
		(million Tg.)	A-1	A-2	B-1	B-2	Total	(million Tg/yr)
Director	TUBD-7	11.0	-	1	-	-	1	11.0
Training manager	TUBD-6	10.7	-	2	-	1	3	32.1
Social worker	TUBD-4	9.2	-	1	-	-	1	9.2
Teacher	TUBD-4	9.2	-1	60	52	31	142	1,306.4
Accountant	TY-8	9.5	-	1	-	-	1	9.5
Registrar, Treasurer Librarian	TY-4	7.1	-	3	-	-	3	21.3
School doctor	TY-6	8.5	-	1	-	-	1	8.5
Technical staff	TY-3	6.8	-	2	-	-	2	13.6
Other service	TY-1	6.3	2	14	11	-4	23	144.9
Total			1	85	63	28	177	1,556.5

2) Operating Costs for Facilities

Costs required for running the facilities are estimated on the following conditions.

- Water supply costs: Water tariffs are calculated in the target sites (A-1 and B-1) where the municipal water is available. Water charge is calculated where a water supply truck is deployed (B-2). The site using a well (A-2) will entail no cost. These charges are calculated on a metered or as-used basis for expected water consumption. The annual water consumption is estimated separately for students as well as teachers and staff. The former is based on the number of days classes are run, which is 175 days (35 weeks x 5 days). For the latter, the annual water consumption is based on the number of days classes are run plus additional 25 days, which totals 200 days. It also assumes that a student consumes 35 liters per day and that a teacher or a staff member consumes 70 liters per day. The resulting calculation is shown in Table 2-30.
- Sewer cost: Sewer rates are calculated for the target sites where a piped sewer system is available (A-1 and B-1). Otherwise, suction service charges for deployment of a vacuum truck are calculated, as needed for maintenance of their septic tanks (twice a year). Sewer and waste water is disposed in a combined sewer, and therefore it is supposed that the discharge volume equals the water supply volume. The resulting calculation is shown in Table 2-30.

Table 2-30 Estimated Water Supply and Sewerage Costs

	Name of school/site		No. of users	Water consumption		Water supply and sewerage rate	Charges of water supply truck	Maintenance cost for septic tank*	Total (1,000 Tg. per year)
				day・L	year・m^3				
A-1	No. 75 School	Student	1,656	57,960	10,143				
		Teacher/staff	102	7,140	1,428	25,243	-	-	25,243
A-2	CH No. 7 Khoroo	Student	1,296	45,360	7,938				
		Teacher/staff	85	5,950	1,190	-	-	770	770
B-1	No. 53 School	Student	864	30,240	5,292				
		Teacher/staff	63	4,410	882	13,667	-	-	13,667
B-2	No. 109 School	Student	576	20,160	3,528				
		Teacher/staff	28	1,960	392	-	86,240	1,000	87,240
	Total					38,910	86,240	1,770	126,920

* Desludging will be scheduled twice a year (50 m3).

Unit rate of municipal utility service		Unit rate of private utility service	
Water supply	1,100 Tg/m^3	Water supply truck (No. 109 School)	22,000 Tg/m^3
Sewerage	850 Tg/m^3	Water supply truck (CH No. 7 Khoroo)	8,350 Tg/m^3
Basic charge	32,080 Tg/month	Vacuum truck (No. 109 School)	10,000Tg/m^3
	(Service pipe diameter 50 mm)	Vacuum truck (CH No.7 Khoroo)	7,700 Tg/ m^3
	(VAT exclusive)		

- Heating costs: In the target sites where a district heating system is available (A-1 and B-1), meters will be installed to pay heating tariff per amount of heat used on an as-used basis (Tg./Gcal). Where separate boilers are provided (A-2 and B-2), the heating cost is calculated based on the price of fuel (coal) for boiler operations. The heating period is eight months in winter, assuming

the boilers will be run on a 24-hour basis, including closed days. Note that the Project will design highly insulated, energy-efficient building structures to save energy consumption, enabling heating operations to absorb load fluctuation flexibly. The maintenance cost is thus estimated on the assumption that heat consumption will achieve a 15% reduction. The estimated costs are shown in Table 2-31.

Table 2-31 Estimated Heating Costs

Site (Facility type)	Estimated heat consumption			Estimated coal consumption			Heating cost per year (1000 Tg.)	
	kWh/year	Gcal/year	Reduction by 15%	Kg/h	t/year	Reduction by 15%	District heating	Boiler
A-1 No. 75 School	2,999,619	2,580.93	2,193.79				66,826	-
A-2 CH No. 7 Khoroo	2,326,416	2,001.70		65	35,412	30,100	-	36,722
B-1 No. 53 School	1,987,088	1,709.73	1,453.27				44,268	-
B-2 No. 109 School	1,371,117	1,179.74		65	35,412	30,100	-	36,722
Total							111,094	73,444

- Electricity costs: Assuming that the constructed school buildings will be run in a typical manner, the minimum essential electric costs are calculated. The calculation is based on the conditions below, and the results are shown in Table 2-32.

Table 2-32 Estimated Electric Rates

Site (Facility type)		Electric consumption (kWh)				Annual electric cost (1000 Tg., VAT included)
		[General] Lighting, outlet, equipment	[Heating] Circulation pumps, boilers	[Always-on] Server, security, communication	TOTAL	
A-1 No. 75 School	/day	445.7	161.3	76.2		
	/year	89,144.8	39,030.7	27,827.6	156,003.1	22,051.0
A-2 CH No. 7 Khoroo	/day	427.4	196.2	74.6		
	/year	85,470.3	47,480.6	27,214.4	160,165.3	22,639.4
B-1 No. 53 School	/day	232.0	62.4	49.3		
	/year	46,404.4	15,089.2	17,987.2	79,480.8	11,234.6
B-2 No. 109 School	/day	194.9	61.8	41.4		
	/year	38,977.4	14,958.7	15,008.8	68,944.9	9,745.4
Total	/year	259,996.9	116,559.2	88,038.0	464,594.1	65,670.4

- The number of operating days is estimated 200 days in total, where the number of days classes are offered (35 weeks x 5 days=175 days) is added by 25 days required for administrative works. Note that an electric system for heating operations will run for eight consecutive months or 242 days per year.
- The schools will be open for 12.0 hours (7:30 to 19:30) operated in two shifts. It is assumed that general lighting installations will be used for six hours on a daily average.
- Electric charge for operating a cafeteria will not be included in the calculation since it is assumed to be outsourced to private operators.

- Electric rates will be charged with a measured rate system set for corporate customers: 128.5Tg/kWh

• Communication expenses: Fiber-optic communication services are offered by several providers. They are all charged with a monthly fixed rate system. The service rates range from 10 US dollars to 60 US dollars, depending on the subscribed transmission speed and optional services. It is assumed herein below that Mobicom is tentatively chosen for an Internet service provider.

- Fiber-optic high-speed Internet connection service: 96,000 Tg per month (for a service subscribed for at least a year)

Total of the four target schools: 4,608,000 Tg.

(2) Maintenance Costs

The table below indicates estimated maintenance costs required for the facilities and furniture provided in the Project. They are intended to cover ordinary maintenance works, such as repairing external walls and repainting steel and wood components inside and/or outside the buildings, mending finishing materials, repairing roof components, replacing broken metal fittings, used lightbulbs, and other parts of the installations, repairing broken equipment, and replacing broken furniture parts. Costs of a major renovation, which will be needed in the long run, must be disbursed from MECSS or UBC, using their project-specific budgets. As for the equipment, the Project will chiefly provide essential teaching and learning tools and appliances, which will entail no unusual maintenance expenses as far as they are used under the normal conditions. However, some of the equipment pieces require consumables and part replacement at regular intervals. The necessary maintenance expenses for such supplies are estimated for them accordingly.

Table 2-33 Estimated Maintenance Costs

Site name	Floor area m^2	Annual maintenance costs for: (1000Tg.)					
		Building	Building services	Furniture	Subtotal (Facility)	Equipment	Total
A-1 No. 75 School	6,301.57	8,255	9,578	7,141	24,974	2,308	27,282
A-2 CH No.7 Khoroo	5,058.90	6,627	7,690	5,923	20,240	2,308	22,548
B-1 No. 53 School	3,356.64	4,397	5,102	3,101	12,600	773	13,373
B-2 No. 109 School	2,631.88	3,448	4,000	3,420	10,868	1,018	11,886
Total		22,727	26,370	19,585	68,682	6,407	75,089

* Consulting with available data on building maintenance costs in Japan, probable ordinary costs are estimated as below, necessary for the maintenance of the intended facilities and their specifications.
- Building maintenance cost: Const of building work (655,000Tg./m^2)×0.2% =1,310 Tg./m^2
- Cost for installed system maintenance: Cost of building services work (190,000Tg./m^2)×0.8% =1,520 Tg./m^2
- Cost for furniture maintenance: Cost of furniture work (1,632 million Tg)×1.2% =39,000 Tg./classroom
(Unit price of building and building services works is set according to a typical direct construction cost incurred for schools funded by GOM.)

Table 2-34 Estimated Equipment Maintenance Costs

Name of equipment	Consumable	Quantity used per year	Unit price	No. 75 School (A-1)		CH No.7 Khoroo (A-2)		No. 53 School (B-1)		No. 109 School (B-2)		Total amount 1,000 Tg
			1000Tg	Q'ty	Amount	Q'ty	Amount	Q'ty	Amount	Q'ty	Amount	
Compound microscope	LED light	0.5	55.0	18.0	495.0	18.0	495.0	18.0	495.0	18.0	495.0	1,980.0
Electric sewing machine	Needle	1.0	7.6	9.0	68.4	9.0	68.4			9.0	68.4	205.2
Over locker sewing mach.	Needle	1.0	10.0	1.0	10.0	1.0	10.0		-	1.0	10.0	30.0
Metal cutting saw	Blade	0.5	13.0	18.0	117.0	18.0	117.0		-	18.0	117.0	351.0
Grinder	Grindstone	0.5	43.0	1.0	21.5	1.0	21.5		-	1.0	21.5	64.5
Scroll saw	Blade	1.0	16.3	1.0	16.3	1.0	16.3		-	1.0	16.3	48.9
Orbit sander	Abrasive paper	1.0	10.9	1.0	10.9	1.0	10.9		-	1.0	10.9	32.7
Morin khuur	String/horse hair	1.0	34.8	9.0	313.2	9.0	313.2		-		-	626.4
Yatga	String	1.0	81.5	9.0	733.5	9.0	733.5		-		-	1,467.0
Shanz	String	1.0	10.9	6.0	65.4	6.0	65.4		-		-	130.8
Khuuchir	String/horse hair	1.0	24.0	2.0	48.0	2.0	48.0		-		-	96.0
Yoochin	String	1.0	43.5	3.0	130.5	3.0	130.5		-		-	261.0
Complex type printer,	Toner	4.0	69.6	1.0	278.4	1.0	278.4	1.0	278.4	1.0	278.4	1,113.6
Total					2,308.1		2,308.1		773.4		1,017.5	6,407.1

(3) Total Costs for Operations and Maintenance

To wrap up the above calculations, additional operation and maintenance costs below will be incurred annually in association with the project implementation.

Table 2-35 Estimated Annual Operation and Maintenance Costs (million Tg.)

Item	Additional costs incurred by the project implementation [A]	Budget for general school education in UBC (for FY 2017) [B]	Percentage share of additional costs [A]/[B]	Rate of budget increase from FY 014-FY2017 (percentage on annual average)
Personnel cost	1,556.5	133,084.0	1.17%	3.7%
Water supply and sewerage cost	126.9	2,299.8	5.52%	11.0%
Heating cost	184.5	8,177.6	2.26%	
Electricity cost	65.7	2,291.4	2.87%	
Communication cost	4.6	568.8	0.81%	2.5%
Facility maintenance cost	68.7	1,955.9	3.84%	3.3%
Equipment maintenance cost	6.4			
Total of the above costs	2,013.3	148,377.5	1.36%	
Total operating budget for general school education		184,369.3	1.09%	6.3%

Operation expenses in Mongolian public schools, including the personnel expenses and maintenance costs, are funded by a special purpose transfer disbursed from the government budget, other state and municipal budgets, donation from parents and graduates, and own revenues of the schools. The government budget portion accounting for the most part of the operation expenses is

disbursed in accordance with proposals made on a school basis.

Operating budget for general school education in UBC, shown in the table below, amounts 184.4 billion Tg. (roughly 8.48 billion yen) in FY2017. On average, 1,410 million Tg. (64.7 million yen) is allocated per public school, or 882 thousand Tg. (40,000 yen) per pupil/student. 72% of this budget account for personnel cost, then 6.9% each for fixed expenses for facilities (electricity, heating, and supply/wastwater) and for lunch program to primary pupils. For maintenance of facilities and equipment only 1.1% of the budget is allocated. In total, it has been generally increasing, as the school systems are being expanded. The rate of such increase in the past three years comes up to 6.3% on annual average in spite of the tough economic and financial situation, with more distribution to the non-personnel expenditure.

The additional costs estimated above are equivalent to a 1.1% increase in terms of the total budgets allocated for general school education in UBC. This is an increase of 0.8% to 5.5% in terms of the operation and maintenance expenses for FY 2017. While there are varying increases in the above-estimated cost breakdowns, additional costs incurred by the Project will be sufficed by growing operating budgets. Note, however, that the number of public-school students is increasing by 7.4% annually on the average, which in turn has led to a decline in expenditures allocated per student (-0.9% per annum). Reliable financial resources for education should be secured to prepare against a probable mid-term economic downturn.

Table 2-36 Operating Budget for General School Education in UBC (million Tg.)

Item	2014 Actual	2015 Actual	2016 Actual	2017 Budget	Compo-sision	Annual increase
Total Expenditure	155,238.5	162,111.2	172,066.3	184,369.3	100.0%	6.3%
Personnel Expenditure	119,886.7	128,671.6	127,787.3	133,084.0	72.2%	3.7%
Wages, salaries & incentives	107,694.1	115,920.3	115,123.7	119,896.4	65.0%	3.8%
Social insurance employer contribution	12,192.6	12,751.2	12,663.6	13,187.7	7.2%	2.7%
Goods and Services	18,925.1	20,330.4	22,535.3	25,156.2	13.6%	11.0%
Fixed cost for use of building	9,701.7	10,032.5	12,088.4	12,768.8	6.9%	10.5%
Electricity	1,057.1	1,667.4	2,236.1	2,291.4	1.2%	38.9%
Heating	7,215.7	6,711.7	7,599.0	8,177.6	4.4%	4.4%
Water & drainage	1,428.9	1,653.4	2,253.4	2,299.8	1.2%	20.3%
Fixtures & maintenance	1,777.8	1,728.3	1,940.2	1,955.9	1.1%	3.3%
Fees & other charges	528.4	-	406.5	568.8	0.3%	
Other goods & services	6,917.3	8,569.6	8,100.2	9,862.6	5.3%	
Current Transfer	16,426.7	13,109.3	21,743.6	26,129.1	14.2%	19.7%
Subsidies to private institutions	-	-	6,691.6	7,736.2	4.2%	
One-time allowance for retirement	6,950.8	3,222.7	5,407.0	5,710.4	3.1%	
Rural benefits	300.4	-	43.9	47.4	0.0%	
Lunch program	9,175.5	9,886.6	9,601.2	12,635.1	6.9%	
Number of public general schools	114	119	123	131		5.0%
Number of students in private schools	171,191	180,335	197,660	209,056		7.4%
Budget per public school	1,361.7	1,362.3	1,398.9	1,407.4		1.1%
Budget per students in public schools (Tg)	906,814	898,945	870,516	881,914		-0.9%

Chapter 3 Project Evaluation

Chapter 3. Project Evaluation

3-1 Preconditions

To implement the Project, the following preconditions must be met by the Mongolian side.

1) Acquisition of permits, licenses, and approvals required for a facility construction project

A facility construction project in Mongolia entails a series of steps, including the Environmental Baseline Survey for environmental screening, approval of the schematic plan, assessment of technical matters involving relevant departments and agencies on public utilities, and applications for building permits. UBC-ED, the implementing agency, must obtain all the necessary documentations required based on the outline design and complete prescribed procedures on time in cooperation with relevant authorities.

2) Fulfillment of agreed undertakings of Mongolia

For timely implementation of the Project, the Mongolian side must ensure that its agreed responsibilities are fully undertaken without delay. It is of vital importance that UBC-ED will allocate necessary budget in each fiscal year and select local contractors to complete the agreed responsibilities within the specified time period by making a detailed implementation plan. In particular, the Mongolian side should carefully manage demolition of the in-situ buildings and relocation of buried pipes which are needed prior to the commencement of the construction, with due considerations to the temporary relocation of students learning in the existing facilities and a time constraint on construction work during the winter,

3-2 Necessary Inputs by the Recipient Country

Mongolia shall ensure that the following matters will be fulfilled to generate and sustain the outcomes of the Project.

1) Allocation of skilled teachers and staff

The Project-funded schools will need additional 177 teachers and staff employed and allocated for their proper operations. Immediate staff distribution upon facility completion will need planning of the personnel expenditures and recruiting a pool of members to be appointed in the schools. These staff members, including those already working at school, must have basic knowledge of special needs, disaster preparedness, and environmental consideration. They will also need to be masterful in operations and maintenance of the facilities built with the specific considerations. The Project thus includes the soft component to assist tutorial sessions and a short-term seminar, partnering with JICA's technical cooperation, namely, the Project for Strengthening Teachers' Ability and Reasonable Treatments for Children with Disabilities, which should develop capacities of school staff in the target

schools. The relevant Mongolian personnel must be participating in such learning opportunities.

2) Self-help efforts for quality school construction

For the sake of cost-effective use of available grant resources, the Project has focused on creating replicable model schools in the four sites with different locations and conditions. The priority issues in UBC's education sector, such as eliminating three-shift schooling, require a larger-scale amount of investment, where GOM should step up autonomous efforts to improve educational infrastructure. Furthermore, to obtain the maximum benefits from the Project, GOM must have an in-depth review on special needs, disaster preparedness, and environmental friendliness addressed in the Project's facility construction, and strive to ameliorate the quality of educational settings based on a variety of functions equipped. Continuous efforts to publicize the model schools will be necessary so that local school construction personnel can have chances to know about the good practices.

3-3 Important Assumptions

Mongolia has an unstable political situation in which the government changes one election after another, making coherency of the administration problematic. In fact, the new government started in July 2016 lost in the presidential election, and then a vote of non-confidence against the Cabinet was passed in September 2017. Consequently, MECSS, which is an administrative body for the Project, inevitably replaced its previous personnel, including the minister and the vice-minister, in line with the organizational restructuring. Political stability and continuity in working-level administrators are required for putting smooth implementation procedures forward.

Budget also needs to be allocated for timely fulfillment of responsibilities agreed by Mongolia. Economic and fiscal deterioration, if further worsened, will pose a substantial risk in implementing the Project. Furthermore, stable economic and fiscal situations are essential for GOM to carry on developing educational infrastructure, which underpin positive outcomes to prevail.

3-4 Project Evaluation

3-4-1 Relevance

The Project is relevant in terms of the following aspects.

- The Project will be beneficial to about 6,900 students and 400 teachers and staff who will be using in the primary and secondary schools constructed and improved by the Project. These schools will be known as quality models of educational settings that will be applied to GOM's future school construction projects. This will catalyze the attainment of quality learning environments in the target areas and across Mongolia, ultimately benefiting the general population in the country.

- Targeting UBC where educational environments are deteriorating due to population growth and concentration, the Project constructs replicable model schools in the four sites with different locational conditions and needs. An increase in the number of students reached 38,000 over three years (in public schools from 2014/15 to 2016/17), and this trend is projected to continue. Of all the UBC-based public schools, 24% (31 schools) are compelled to run their classes in three shifts, which calls for urgent solutions.
- In its long-term development guidelines known as the Sustainable Development Vision of Mongolia, GOM has set out one of its objectives to "improve the general education system to the international benchmark levels." It envisages a broad-based coverage of schools, while also aiming at "creating a healthy, safe, and user-friendly environment at all levels of education." The Project alleviates the deficiency of school facilities in the target areas, which simultaneously provides the quality models. It therefore serves to help Mongolia to achieve its overarching policy.
- Japan has articulated to "support Mongolia's self-supporting efforts on poverty reduction through sustainable economic growth." The specific priority areas of Japanese assistance for the country include: (1) sustainable development of the mining sector and enhancement of governance, (2) assistance for inclusive growth, and (3) enhancement of the capacity and function of UBC. The Project is a part of the assistance program to improve the basic social services envisioned in (2), and more broadly delivers positive outcomes Japan's past and ongoing assistance in Mongolia's basic education sector. Construction of model schools will facilitate Mongolia's self-supporting efforts to provide quality educational settings. The Project is thus consistent with the Japanese assistance policy for Mongolia.

3-4-2 Effectiveness

Quantitative Effect

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

Table 3-1 Expected Qualitative Effect

Indicator	Baseline (2016)	Target (2023) 【3 years after the project completion】
Number of classrooms usable continuously in the target schools/school district	35 classrooms (AY 2016/17)	96 classrooms (＋additional 61 classrooms) (AY 2023/24)
Number of pupils/students who are learning in classrooms usable continuously in the target schools/school district	2,383 students (AY 2016/17)	6,912 students (＋additional 4,529 students) (AY 2023/24)

Qualitative evaluation

In addition, the following qualitative effects are expected through the implementation of the Project.

- Awareness of issues on “persons/children with disabilities”, “disaster preparedness” and “environmental friendliness” will be increased among school directors, teachers and community members, by incorporating considerations to those issues into their school facilities.
- Higher level of awareness among people will contribute to materialize the following objectives..
    - Access of CWD to general schools will be expanded to enlarge better learning opportunities suitable for each pupil’s specific needs. Also reasonable accommodations for CWD are expected to be enhanced in other schools in the area.
    - Introduction of education on disaster prevention to schools will be facilitated and the central roll of schools for disaster preparedness will be recognized among the community members.
    - Merits and effectiveness of the energy saving operations of heating will be recognized.

In light of the above, the Project is highly relevant, and considered effective

Appendices

1. Member List of the Study Team

1-1 Field Study I (November 28 to December 15, 2016)

Ms. Chie Ezaki	Team Leader	Director, Basic Education Team 1, Basic Education Group, Human Development Department, JICA
Mr. Tomohiro Fukuo	Project Coordinator	Associate Expert, Basic Education Team 1, Basic Education Group, Human Development Department, JICA
Mr. Tomohiro Osawa	Chief Consultant/ Architectural Plnning	Matsuda Consultants International Co., Ltd.
Ms. Shoko Uehara	Education Planning/ Equipment Plnning 1	KOEI Research & Consulting Inc.
Mr. Tatsuji Tsuchiya	Asssistant Chief Consultant	Matsuda Consultants International Co., Ltd.
Mr. Toshiyuki Handa	Interpreter	Matsuda Consultants International Co., Ltd.

1-2 Field Survey II (January 30 to February 24, 2017)

Ms. Chie Ezaki	Team Leader	Director, Basic Education Team 1, Basic Education Group, Human Development Department, JICA
Mr. Tomohiro Fukuo	Project Coordinator	Associate Expert, Basic Education Team 1, Basic Education Group, Human Development Department, JICA
Mr. Tomohiro Osawa	Chief Consultant/ Architectural Plnning	Matsuda Consultants International Co., Ltd.
Ms. Shoko Uehara	Education Planning/ Equipment Plnning 1	KOEI Research & Consulting Inc.
Mr. Tatsuji Tsuchiya	Asssistant Chief Consultant/ Natural Condition/ Equipment Plnning 2	Matsuda Consultants International Co., Ltd.
Mr. Kaname Hyodo	Architectural Design/ Environmenttal and Social Considerations	Matsuda Consultants International Co., Ltd.
Mr. Naoto Nishiya	Construction Planning/ Cost Estimation	Matsuda Consultants International Co., Ltd.
Mr. Toshiyuki Handa	Interpreter	Matsuda Consultants International Co., Ltd.

1-3 Field Servey III (April 10 to April 26, 2017)

Mr. Tatsuji Tsuchiya	Asssistant Chief Consultant/ Natural Condition/ Equipment Plnning 2	Matsuda Consultants International Co., Ltd.
Mr. Masahiko Suzuki	Architectural Design 2/ Building Services Planning	Matsuda Consultants International Co., Ltd. (System Planning Corporation Ltd.)

1-4 Field Servey IV (August 30 to September 9, 2017)

Ms. Chie Ezaki	Team Leader	Director, Basic Education Team 1, Basic Education Group, Human Development Department, JICA
Ms. Mika Okamura	Project Coordinator	Associate Expert, Basic Education Team 1, Basic Education Group, Human Development Department, JICA
Mr. Tomohiro Osawa	Chief Consultant/ Architectural Plnning	Matsuda Consultants International Co., Ltd.
Mr. Naoto Nishiya	Construction Planning/ Cost Estimation	Matsuda Consultants International Co., Ltd.
Mr. Toshiyuki Handa	Interpreter	Matsuda Consultants International Co., Ltd.

2. Study Schedule

2-1 Field Survey I

Y2016			Officiall Members		Consultants		
			Team Leader	Project Coordinator	Chief Consultant/ Architectural Planning	Educational Pplanning/ Equipment Planning 1	Assistant Chief Consultant
1	28-Nov	M			・Tokyo→Seoul ・Seoul→UBC		
2	29-Nov	T			・Meeting with JICA Mongolia Office ・Visit to Similar Facility (No.125 School- Model School by FTI-CF, WB) ・Meeting with UBC-ED		
3	30-Nov	W	・Tokyo→UBC		・Collection of Facility Standards/Standard Drawings（MECSS） ・Meeting with START Team ・Seminar on PWD accessibility (JICA PWD TA)	・Collection of Data/Information on Education (MECSS)	・Tokyo→UBC
4	1-Dec	T	・Meeting with JICA Office, EOJ, Courtesy Call to MOF（ODA Policy Division） ・Meeting with MECSS (Survey policy, principals for assistance, explanation of ICR), Courtesy Call to Vice Minister				
5	2-Dec	F	・Coutesy Call to MOFA, Meeting with MECSS/UBC-ED (Requested Sites and Components) ・Visit to Requested Sites, Schools by Japan's Grant Aid, Schools by Gov't Budget)				
6	3-Dec	S	・Visit to No.28 School (START Pilot School) ・Meeting with JICA TA Projects（START, Disaster Prevention, PWD's Social Participation）				
7	4-Dec	S	・Team Meeting				
8	5-Dec	M	・Meeting with MECSS/UBC-ED（Discussion of M/D） ・Meeting with Director of Education Policy Dept. MECSS			Arrangement of Survey	・Technical Survey
9	6-Dec	T	・Reporting to JICA Mongolia Office, Meeting with ADB ・Courtesy Call to MECSS Secretary ・Signing of M/D with MECSS/UBC-ED				・Technical Survey
10	7-Dec	W	・UBC→Tokyo		・Survey on Facility Planning	・UBC Statisitical Div., Social Wellfare Div. , etc.	・Survey on Facility Planning
11	8-Dec	T			・Survey on Requested Sites, Similar Facilities (Bayanzurkh and Khan-Uul District)		
12	9-Dec	F			・Survey on Requested Sites, Similar Facilities (Chingeltei and Songinokhairkhan District)		
13	10-Dec	S			・Survey on Requested Sites, Similar Facilities (Sukhbaatar and Bayangol District)	・Drafting of Survey Results	
14	11-Dec	S			・Data Analysis	・UBC→ →Tokyo	
15	12-Dec	M			・Discussion on Facility Pkanning		・Env./Social Consideration
16	13-Dec	T			・Signing of Technical Notes with UBC-ED ・Data Collection		・Survey on Facility Planning
17	14-Dec	W			・Reporting to JICA Office, EOJ ・UBC→Seoul		・UBC→ →Tokyo
18	15-Dec	T			・Seoul→Tokyo		

Abbreviations:

MECSS=Ministry of Education, Culture, Science and Sports
UBC-ED=Ulaanbaatar City Education Department
JICA=Japan International Cooperation Agency
ADB=Asian Development Bank
START=he Project for Strengthening of Teachers' Ability and Reasonable Treatments for CWD
EOJ=Embassy of Japan
CC=Chief Consultant
M/D=Minutes of Discussions
FTI-CF=Fast Track Initiative Catalytic Fund
TA=Technical Assistance
WB=World Bank
PWD=Persons with Dieabilities
NEMA=National Emergency Management Agency

2-2 Field Survey II

Y2017			Official Members		Consultants				
			Team Leader	Project Coordi-nator	Chief Consultant/ Architectural Planning	Education Planning/ Equipment Planning 1	Architectural Design 1/ Environmental Considerations	Construction Planning/ Cost Estimation	Assistant Chief/ Natural Conditions/ Equipment Planning 2
1	30-Jan	M			・Tokyo →UBC				
2	31-Jan	T			・JICA Mongolia Office ・Meeting with MECSS/UBC-ED (ICR, Questionnair, Contents of the Request)				
3	1-Feb	W			・UBC relevant departments	・Survey at UBC-ED, MECSS	・UBC relevant departments	・Contractor Survey ・Cost Survey	・Tokyo →UBC
4	2-Feb	T			・Meeting w/EMDC ・MOF Tax Division	・Survey at MECSS (Statistics, Budget)	・Meeting w/EMDC (Fire Protection Div.	・Contractor Survey ・Tax Exemption Survey	・Local Consultant (Topo./Geo. Survey)
5	3-Feb	F			・Site Survey (No.109 School) ・Site Survey (No.53 School)				
6	4-Feb	S			・Similar Facilities (No.3 School, No.11 School, New ERA School, No.127 School) ・Survey on schools with elements of universal design				
7	5-Feb	S							
8	6-Feb	M			・Site Survey (Chingertei No.7 Khoroo) ・Site Survey (No.57 School, No.61 School)				
9	7-Feb	T			・Site Survey (No.75 School, No.59 School) ・Site Survey (No.118 School) with accessibility survey by PWD				
10	8-Feb	W			・Site Survey (Songinokhairkhan No.32 Khoroo) ・Site Survey (No.42 School, No.22 School) with accessibility survey by PWD				
11	9-Feb	T			・Meeting with UBC-ED (Equipment)	・Institute of Teachers Professional Develop.	・Survey on Local Consultants, Bldg. Regulations ・UBC-ED (Eco-school, Environmental Tech.)		←with CC ・Equipment Survey
12	10-Feb	F			・Meeting with MECSS Education Policy Dept. ・Data analysis	・Visit to APDC	・Facility Planning	・Building Cost Survey	・Equipment Planning
13	11-Feb	S			・Data analysis ・Meeting with Disaster Prevention TA Team		・Facility Planning ・Study Concept Model	・Market Survey ←with CC	・Facility Planning ←with CC
14	12-Feb	S							
15	13-Feb	M			・Meeting with UBC-ED (Result of Site Survey)	・National Univ. Educ. ・MECSS(Statistics)	・Facility Planning ・Study Concept Model	・Market Survey ・Building Cost Survey	・Facility Planning ・Local Consultant
16	14-Feb	T			・Other donors survey	・Organize data/info.	・Survey on Environmental Technology ・Survey on Building Services		・Sub-contract
17	15-Feb	W	・Tokyo →UBC		・Organize data/info.	・Survey on Teacher Training/Other donors	・Survey on Construction/Procurement Planning ・Meeting with UBC-ED (Facility Planning)		
18	16-Feb	T	・Courtesy Call to JICA、EOJ、MOF ・Meeting with MECSS(Secretary), UBC-ED			・MECS External Coop. Division	・Local Consultants ・Meeting with NEMA, UBC-ED	・Facility Planning	・Equipment Planning
19	17-Feb	F	・Meeting with MOF(Tax exemption) ・Meeting with UBC-ED (M/D)			・UBC-ED (Equipment for CWD) ・National Statistic Off.	←with CC ・Facility Planning ・Local Consultants	←with CC	・Meeting with UBC-ED Subject chief (Equipment Planing)
20	18-Feb	S	・Visit to School/Site (No.75 School、New ERA School、No.22 School, Chingertei No.7 Khoroo)				・Facility Planning	←with CC	・Equipment Planning
21	19-Feb	S							
22	20-Feb	M	・Meeting with UBC-ED (M/D) ・UBC Vice Mayor, Priv. School, MECCS (M/D)			・UBC-ED(Statistics) ・Equipment Survey	・Supplementary Site Survey (No.53 School, No.109 School)		・Meeting with Subject Chief (Equipment)
23	21-Feb	T	・MECSS/UBC-ED (Signing of M/D) ・Meeting with ADB, Reporting to JICA、EOJ			・UBC →Tokyo	・Survey on Construction Material/Market ・Meeting with ADB Project Team		・Meeting with Subject Chief (Equipment)
24	22-Feb	W	・UBC →Tokyo		・Documentation		・Survey on Construction Material/Furniture ・Suppl. Survey	・Collect Survey Sheets	・Equipment Survey
25	23-Feb	T			・Documentation ・Wrap-up Meeting		・Survey on Local Consultants ・Wrap-up Meeting with UBC-ED		・Supplier Survey
26	24-Feb	F			・UBC →Tokyo		・UBC →Tokyo		

Abbreviations:

MECSS=Ministry of Education, Culture, Science and Sports
UBC-ED=Ulaanbaatar City Education Department
JICA=Japan International Cooperation Agency
ADB=Asian Development Bank
EMDC=Emergency Management Department of the Capital City
EOJ=Embassy of Japan
CC=Chief Consultant
M/D=Minutes of Discussions
APDC=Association of Parents with Disabled Children
TA=Technical Assistance
PWD=Persons with Dieabilities
NEMA=National Emergency Management Agency

2-3 Field Survey III

	Y2007		Consultants	
			Assistant Chief Consultant/ Natural Conditions/Equipment Planning 2	Architectural Design 2/ Building Services Planning
1	10-Apr	M	・Tokyo→UBC	
2	11-Apr	T	・Meeting with JICA Mongolia Office, UBC-ED	
			・Meeting with Local Consultant, Survey on Construction Cost	・Survey on Local Suppliers of Mechanical Equipment
3	12-Apr	W	・Arrangement of Topographic/Geotechnical Survey (2 sites)	・Survey on Infrastructure at UBC relevant departments
			・Survey on Local Consultants/Cost Survey	・Site Survey (No.53 School)
4	13-Apr	T	・Arrangement of Topographic/Geotechnical Survey (2 sites)	・Survey on Infrastructure at UBC relevant departments
			・Survey on Construction/Procurement Conditions and Cost	and service providers
5	14-Apr	F	・Survey on Educational Equipment at Local Suppliers	・Site Survey (No.109 School)
6	15-Apr	S	・Survey on Construction/Procurement Conditions and Cost	・Site Survey (No.53 School)
7	16-Apr	S		
8	17-Apr	M	・Meeting with Subject Leaders on Educational Equipment	・Site Survey (Chingeltei No.7 Khoroo)
				・Survey on Similar Facilities (No.118 School)
9	18-Apr	T	・Meeting with Subject Leaders on Educational Equipment	・Survey on Similar Facilities (No.22/76 and New Era School)
			・Meeting with UBC Urban Development/Planning Dept.	
10	19-Apr	W	・Meeting with Subject Leaders on Educational Equipment	・Site Survey (No.75 School)
			・Survey on Construction/Procurement Conditions and Cost	・Survey on Similar Facilities (No.11 School)
11	20-Apr	T	・Meeting with EMDC, Construction Development Center	・Survey at EMDC, Fire Fighting Dept.
			・Survey on Educational Equipment at Local Suppliers	・Survey on Material Suppliers
12	21-Apr	F	・Meeting with EMDC (Fire Codes)	・Survey on relevant standards and regulations
			・Meeting with UBC-ED (Technical Notes)	・Survey on Infrastructure at UBC relevant departments
13	22-Apr	S	・Survey on Educational Equipment at Local Suppliers	・Survey on Procurement conditions in UBC
14	23-Apr	S		
15	24-Apr	M	・Collection of Buiiding Codes and Standards	・Survey on relevant standards and regulations
			・Survey on Educational Equipment at Local Suppliers	
16	25-Apr	T	・Reporting to JICA Mongolia Office, Meeting with Local Consultant	・Reporting to JICA Mongolia Office
			・Reporting to UBC-ED, Signing of Technical Notes	・Reporting to UBC-ED
17	26-Apr	W	・UBC→Tokyo	

2-4 Field Survey IV (Explanation of the Draft Report)

	Y2017		Official members		Consultants	
			Team Leader	Project Coordinator	Chief Consultant/ Architectural Planning	Construction Planning/ Cost Estimation
1	30-Aug	W	Abbreviation:			・Tokyo
			MECSS: Ministry of Education, Culture, Science and Sports			→UBC
2	31-Aug	T	UBC-ED: Ulaanbaatar City Education Department			・Meeting with MECSS/UBC-ED
			NEMA: National Emergency Management Agency			・Visit to JICA Mongolia Office
3	1-Sep	F	EMDC: Emergency Management Department of the Capital City			・Meeting with UBC-ED
			MCUD: Ministry of Construction and Urban Development			・Supplementary Survey on Construction
4	2-Sep	S			・Tokyo →UBC	・Supplementary Survey on Contructors/ Materials
5	3-Sep	S	・Tokyo→UBC		・Team Meeting	
6	4-Sep	M	・Meeting with MECSS/UBC-ED (Explanation of Draft Report, Discussion on M/D), Visit to JICA Mongolia Office			
			・Meeting with ADB			
7	5-Sep	T	・Courtesy Call to NEMA, MECSS (Acting Secretary), and MOF			
			・Visit to relevant schools (No. 113 School-START supported, No. 12 School -Japan's 4th Grant Aid)			
8	6-Sep	W	・Reporting to EOJ and JICA Mongolia Office			
			・Signing of M/D at MECSS		・Meeting with EMDC (Fire Dept.)	
9	7-Sep	T	・UBC→Tokyo		・Meeting with UBC Environmental Dept. and Unban Development/Planning Dept.	
					・Meeting with MCUD Construction Development Center	
10	8-Sep	F			・Wrap-up meeting with UBC-ED	
11	9-Sep	S			・UBC→Tokyo	

3. List of Parties Concerned in the Recipient Country

【Ministry of Finance】

Ms. Zorig Munkh-Orgil	Director, ODA Policy Division, Development Financing and Debt Management Department
Ms. Lkhagvaa Munkhtuya	Specialist, ODA Policy Division, Development Financing and Debt Management Department
Ms. Dulguun	Specialist (responsible for tax exemption)
Ms. Lkhagvasuren Undrakh	Specialist, Development Financing Department
Ms. Namkhajiantsan Enkhtsatsral	Specialist, Official Development Assistance Policy Division

【General Department of Taxation 】

Ms. Dulguun	Specialist (responsible for tax exemption)
Mr. Dorjsuren Enkhbayar	Head of Tax Inspection Division
Ms. N. Munkhdavaa	State Tax Inspector of Tax Inspection Division

【Ministry of Construction and Urban Development】

Mr. Battsagaan Enkhbold	Vice Director and Chief Engineer, Construction Development Center

【Ministry of Foreign Affairs】

Mr. Enkhbayar Enkhbat	Third Secretary, Department of Asia and Pacific
Mr. Byambaa Otgonbaatar	Attache, Department of Asia and Pacific

【National Emergency Management Agency】

Mr. G. Ariunbuyan	First deputy chief
Mr. J. Damdinsuren	Head of Professional Management and Coordination Division, Disaster Operation Department
Ms. N. Ananda	Officer, Policy Coordination and Cooperation Department
Mr. A. Enkhbat	Officer, Policy Coordination and Cooperation Department

【Ministry of Education, Culture, Science and Sports】

Mr. Yondon Otogonbayar	Vice minister for Education, Culture, Science and Sports
Ms. B. Bayarsaikhan	State Secretary
Mr. T. Gan-Erdene	Acting State Secretary
Mr. D. Batmagnai	Director General, Department of Finance and Economics
Ms. S. Nansalmaa	Finance and Investment Department
Mr. Dorjravdan Erdenechimeg	Director-general, Education Policy Department
Mr. J. Byambatsogt	Director of International Project/Program and External Cooperation Department
Mr. D. Gardi	Head of External Cooperation Division
Mr. Nasan Otgonbayar	Head of the Investment and Production Division
Mr. Erdenebaatar Erdenebulgan	Engineer of officer of Investment Planning and Regulatory
Mr. Amartuvshin	Specialist, Investment and Production Division
Mr. Bayarsaikhan	Specialist, Investment and Production Division
Ms. Altantsetseg	Specialist, Investment and Production Division

Ms. Urantugs	Specialist, Investment and Production Division
Ms. Uyanga	Specialist, External Cooperation Division
Mr. Ganbaatar	Specialist, Finance and Economics Department
Ms. S. Bolormaa	Head, Division of Basic and Secondary Education, Education Policy Department
Mr. U. Ganbold	Specialist in-charge of special needs education, Education Policy Department
Ms. N. Uran Tugs	Specialist, Production Division, Finance and Investment Department
Mr. L. Otgonjargal	Officer, Production Division, Finance and Investment Department
Mr. Z. Amgalanbaatar	Specialist, Int'l Project/Program and External Cooperation Department
Ms. Yura Altantuya	Officer, Department of Policy Implementation and Coordination (Statistics)

【Institute of Teacher's Professional Development】

Ms. O. Oyuntungalag	Deputy Director
Ms. Ch. Jargal	Specialist in-charge of special needs education

【Mongolian State University of Education】

Mr. Dashdorj Mandakh	Director, The Teacher's School
Ms. Batchuluun Bulgan	Deputy Director, The Teacher's School

【Ulaanbaatar City Administration】

Ms. Shijirbaatar Ankhmaa	Head of Social Development Projects-Deputy Governor
Ms. Boldbaatar Khaliun	Specialist of Foreign Relation Department

【Department of Education, Ulaanbaatar City】

Mr. Jigjidsuren Gantulga	Head
Mr. Jambal Enkhtur	Head of Finance and Investment Planning Department
Mr. Erdene Bayarmagnai	Officer of Construction and Investment Consulting engineer of Mongolia
Mr. Ganbold Amarsanaa	Officer of Technology, Arts and Special Needs Education
Mr. G. Menhbileg	Officer responsible database and statistics
Mr. J. Batbileg	Officer of Chemistry and Biology
Ms. Toivgoo Sarannemekh	Officer of Foreign Language
Mr. Badraa Purevjal	Officer of Physics and ICT
Ms. Shurentsetseg	Officer of Mongolian/World History and Social Studies
Ms. Batbold Enkhtaivan	Officer of Hygiene and Safety
Mr. Amgalan Gantulga	Officer of Physical Education
Ms. Olonnemekh	Officer of Music
Ms. Rentsen Ulziikhuu	Officer of Mongolian Language
Ms. Lhagvajav Urtnasan	Officer of Primary Education

【Urban Development and Master Planning Agency】

Mr. Shatarbat Urtnasan	Deputy Director, Urban Development and Master Planning Agency
Mr. Tserendash Tulga	Deputy Director

Mr. Sambuu Dalanjargal	Head of Urban Planning Department

【Environmental Agency of the Capital City】

Mr. Erkhembayar Battulga	Director
Ms. Batsukh Bolortuya	Head, Division of Environment and Natural Resources
Mr. Jargalsaikhan	Expert

【Emergency Management Department of the Capital City】

Mr. N. O. Nyamkhorloo	Deputy Director
Mr. N. Hyamkhorloo	Head, Division of Fire Fighting
Mr. Tegshbayar	Officer
Mr. Khishigbaatar Baljinnyam	Captain, Specialist of Earthquake and Explosives

【Water Supply and Sewerage Authority】

Mr. T.S. Tserendulam

【Ulaanbaatar District Heating Company】

Mr. B. Ochbayar

【Electricity Dietribution Network Company】

Mr. Davaatamir D. Dorj

【Senior Staff of the Schools Visited】

Ms. Maitsetseg	Teacher, Bayanzurkh Complex School (Branch)
Ms. Bazarkhand	Director, No. 120 School
Ms. Amarjargal	Instructional Manager, No. 120 School
Mr. Enkhbat	Director, No. 87 School
Ms. Gantulga	Instructional Manager, No. 87 School
Mr. Oktyabri	Director, No. 92 School
Mr. Bat-Ulzii	Director, No. 53 School
Ms. Munakhuu	Director, No. 28 School
Ms. Oyunbileg	Instructional Manager, No. 28 School
Ms. B. Amgalan	Director, No. 125 School
Mr. Bumaa	Director, No. 21 School
Ms. Ochgerel	Instructional Manager (Primary), No. 21 School
Ms. Tungalag	Director, No. 75 School
Mr. Otgonbaatar	Instructional Manager (Secondary), No. 75 School
Mr. Erdenebaatar	Deputy Director, No. 75 School
Mr. Ts. Munkhtur	Director, No. 63 School
Ms. Baigalmaa	Director, No. 118 School
Ms. Nergui	Instructional Manager (Primary), No. 59 School (Branch)
Mr. Naranbaatar	Director, No. 57 School
Ms. Oyunsuren	Instructional Manager (Primary), No. 57 School
Ms. Narangerel	Instructional Manager (Secondary), No. 57 School
Ms. Tsolmon	Instructional Manager (High), No. 57 School

Ms. Munkhchimeg	Director, No. 61 School
Ms. Tsetsegsuren	Director, No. 122 School
Mr. Davaadoo	Director, No. 42 School
(Field Survey 2)	
Ms. Dorj Tserendolgor	Director, No.109 School
Ms. Munkhzul	Instructional Manager, No.109 School
Ms. Erdenechimeg	Director, Kindergarden No.224 (Chingeltei 7th Khoroo)
Ms. Tserendulam	Instructional Manager, Uyunii-Undraa Complex School (school No.22)
Mr. Bold Amartuvshin	Director, New Era International Laboratory School

【Asian Development Bank】

Ms. Asako Maruyama	Education Specialist, Urban & Social Sectors Division, East Asia Department

【Embassy of USA in Mongolia】

Mr. Joshua A. Buck	Sergeant First Class, US. Army Civil Affairs
Mr. Eric T. Authement	Staff Sergeant, US. Army Civil Affairs

【START, The Project for Strengthening of Teachers' Ability and Reasonable Treatments for CWD】

Mr. Tetsuya Ishii	Director Consultant (Education), Consulting Division, KRI International Corp.

【Project for Promoting Social Participation of Persons with Disabilities in Ulaanbaatar】

Hisao Chiba	Chief Advisor

【Project for Strengthening the National Capacity of Earthquake Disaster Protection and Prevention in Mongolia】

Mr. Kiyotaka, Owada	Project Manager, Urban & Regional Development & Disaster Risk Management Department, Planning Division, Oriental Consulting Global

【Embassy of Japan in Mongolia】

Mr. Takenori Shimizu	Ambassador
Ms. Reiko Hozumi	Second Secretary,
Mr. Takashi Yokoyama	Second Secretary,

【JICA Mongolian Office】

Mr. Mutsumi Sato	Chief Representative
Ms. Hiromi Sawada	Senior Representative
Mr. Tomoaki Tanaka	Representative, (Education, Social Protection, Macroeconomics)
Ms. Kh. Tuvshin-od	Program Officer