CHAPTER 2 CONTENTS OF THE PROJECT

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2.1 Basic Concept of the Project

2.1.1 Objective of the Project

The Yemeni Ministry of Education declared nine-year basic education to be compulsory education in September 1993, and since then it has strived to construct facilities, train teaching personnel and develop curriculums, etc. As a result of these efforts, the enrolment rate increased from 68% in 1990 to 74% in 2000 and the number of students increased by 210,000 from 2,190,000 to 2,400,000 over the same period.

However, because the population of Yemen continues to grow at a high rate (3.4% in 2001), issues still remain such as shortage of school facilities, biased distribution of teachers, and imperfections in the education system, etc. Accordingly, international agencies such as the World Bank, UNESCO and KfW/GTZ continue to offer assistance to the education sector. The Ministry of Education compiled the Second Five Year Education Plan (draft) as part of the Five Year National Development Plan in 2002, and in this it aims to raise the overall enrolment rate from 61.4% in 2001 to 69.3% by 2006 and the enrollment for girls rate from 43.9% to 55.0% over the same period.

In particular, concerning improvement of the enrolment rate for girls, in addition to securing the understanding of parents, a number of surveys (ESCWA 1999 and others) have reported the following measures to be effective: 1) establishing girls class or girls schools, 2) increasing numbers of female teachers, 3) providing girls' toilets, and 4) installing fences around schools, etc. International agencies and other donors are also supporting the construction of standard classrooms and toilets primarily in poverty districts where the literacy rate among girls is low.

During the site survey too, cases of chronic classroom shortages, temporary classrooms with no roofing, rented classrooms, and outdoor lessons were numerously observed at the surveyed schools. It was also observed that although girl students account for half of all students in lower grades, most drop out and leave only a few behind by the time they reach intermediate and higher grades.

The Project aims to improve these situations and achieve the above goals raised by the Government of Yemen by providing needed classrooms and teaching materials and thus improving overall school enrolment rates and in particular for girls to improve enrolment and reduce dropout at basic schools conducting basic education for the first nine grades in Taiz Governorate and Ibb Governorate.

2.1.2 Selection and Current Condition of Survey Target Schools

(1) Selection of Survey Target Schools

In talks held with the Yemeni Ministry of Education (MOE), a revised request list of 82 schools, including the originally requested 26 schools (200 classrooms) consisting of 43 schools in Taiz Governorate and 39 schools in Ibb Governorate, was presented. In consideration of the consultant's survey schedule, investigation of around 40 sites was judged to be feasible and, in discussions held with in charge for planning from both Governorate Education Offices, the survey target schools were revised down.

Among the criteria used to select sites, the following were examined: 1) closeness of sites to main roads, 2) already leveled on sites, 3) existence of no cliffs or wadis, etc. A prioritized list of 20 sites in each Governorate was compiled and agreed on in the minutes of meetings.

With respect to these 40 target sites, the consultant surveyed access, site, and school operating conditions and presented these findings to MOE as the Site Survey Report upon completion of the study. The survey findings for each site are given in the appendices.

(2) Features of the Study Target Schools

As a result of the site survey, the following points were confirmed as the features of the surveyed schools.

1) School operating conditions

① Varied grade composition by schools

Some of the surveyed schools were based on the former primary education system (six grades), while others catered to five grades, after which the older children go to neighboring schools. Some schools were combined with secondary schools (10^{th}-12^{th} grades), while other schools consisted of just higher grades (7^{th}-9^{th} grades) and secondary schools. As a result of shortages of classrooms and teachers, a wide variety of operating conditions coexist and actual school operations do not conform to the basic education system of nine grades.

Therefore, it is necessary to construct basic education schools that provide nine years of education continuously.

② Numerous dropout students

Although the number of student attending school is increasing, there are many dropouts and school leavers, and on average only around 40% of students complete the full nine years of basic education. At the surveyed schools too, it was commonly found that although first grade students exceed capacity by two or three times, only around one-quarter of the capacity level remain by the time of the ninth grade. In particular, in upper grade classes, girls frequently account for only a handful of the total number of students.

Accordingly, it is necessary to correspond the number of classrooms based on the grade-by-grade numbers of students, which are subject to large fluctuations.

③ Shortage in the absolute number of classrooms

In rural areas, temporary classrooms and outdoor lessons (under trees or beside shade of school walls, etc.) can be frequently seen because construction of new classrooms is never able to keep pace with needs. Many of temporary classrooms built by parents are made from concrete blocks, however, these frequently have no roofs due to lack of funds. Also, roof slabs are in danger of collapsing in some classrooms.

Therefore, preserving those classrooms that can renovate by peoples to sustained use, priority shall be given to constructing as many of permanent classrooms as possible.

④ Small classrooms and without furniture

The standard classroom size prescribed by MOE and World Bank is 1 m2 per student. However, many of the schools constructed under the Social Fund for Development (SFD) and Public Works Project (PWP) have classroom sizes of 20 m2 or less. Moreover, no schools have classrooms sufficiently equipped with furniture, and almost half the students sit on the floor in lower grades or small groups congregate around limited numbers of desks in intermediate grades.

Accordingly, it is necessary to prepare classrooms in which the fixed capacity can sit down and learn in appropriate space.

⑤ Two-story school buildings

The Project areas are located in a mountainous region and have numerous slopes. Many of the surveyed schools here are located on limited space and consist of schoolyards (used for morning assembly) enclosed by the school buildings. Almost all schools constructed after 1990s, including even one-story buildings, prepared staircases and can be extended into two-story buildings. However, only one school was observed where two-story extension had actually been carried out.

Therefore, in order to effectively utilize limited space, two-story school buildings or buildings capable of extension are generally provided.

⑥ Situation of girls' schools

Surveyed girls' schools were only located in city areas, however, coeducation schools in rural areas were found to either provide girls classrooms or implement 'double shifts' with lessons for girls carried out in the afternoon. At two schools, the number of girl students outnumbered the number of boys. The reasons given for this situation were, 1) the schools teach separated girls' classes in the afternoon, and 2) there are many female teachers who born locally.

Accordingly, establishment of independent girls' schools in rural areas as requested shall be conditional on there being a certain number of girl students (around 300 for 9 grades) and female teachers accounting for half the prescribed number of teaching staff (around 8 staffs).

Schools that do not fulfill these criteria shall be coeducational with the phased implementation of the following kind of countermeasures considered appropriate: 1) adoption of separate classrooms for girls and boys in higher grades, and 2) adoption of 'double shift' lessons with schools becoming girls' schools in the afternoon.

(3) Conditions of Existing Equipment

① Standard furniture and teaching materials

Classrooms at the surveyed schools are not equipped with desks and chairs, also little usage of furniture in temporary classrooms and outdoor classes. Principal's rooms are combined with teachers' rooms in many cases, and desks, chairs and simple bookshelves are placed in half space of the classrooms. There are no documents or instruments, and only a few schools have student registers and account books. Also, many schools have a surplus of the old or previous year's textbooks.

Teaching materials consist of charts, many of which are hung from the walls of principal rooms or rolled up and kept in shelves. Reasons given for the infrequent usage of such materials were that, 1) they couldn't be hung up because classrooms have no hooks, and 2) it is troublesome to carry them at each lesson. However, some of the schools are very enthusiastic and have classroom walls covered with charts and works made by students.

② Additional request for basic laboratories and basic laboratory equipment

MOE requested additional items for the construction of basic laboratories and supply of basic laboratory equipment. MOE intends to provide each school with basic laboratories and basic laboratory equipment in a phased program for spread and strengthens science education. One of the standard designs for schools buildings by MOE includes the type where one laboratory (capable of partitioning into two small classrooms) is provided with three classrooms type. The equipment list was also additionally presented with include 1,430 basic education items.

In the site surveys, some laboratories were observed (at IB-01 school, outskirts of Ibb, Sana'a City), but many of these were not in use due to absence of equipment. On the other hand, there was one school (IB-14) that had a large amount of laboratory equipment, which arrived two months earlier, but could not use it.
Accordingly, prior to supplying basic laboratory equipment, it is necessary to hurry up with the preparation of curriculums and textbooks and the training of science teachers (laboratory assistants).

2.2 Basic Design of the Requested Japanese Assistance

2.2.1 Design Policy

The Project, which surveyed 40 schools conducting 9 years basic education in the Governorates of Taiz and Ibb located in the central highlands of Yemen, intends to construct shortage facilities and supply education furniture and materials.
In selection of project target schools and implementing the facilities planning, basic design shall be carried out in accordance with the following concept. (Selection of 30 schools will be discussed on 2.2.1 Selection of Project Target School)

(1) Design Concept Regarding Natural Conditions

The surveyed area, situated over the western hills and central mountains of Yemen, lies at an altitude ranging from 1,500 m to 3,500 m and consists of steep precipices and wadis. The cities of Taiz and Ibb have both developed at the foot of mountains. Meanwhile, in rural villages located on ridge-tops or slopes, buildings of between 2-6 stories stone house are built on cramped land with terraced firms in surroundings. The climate varies according to altitude, but annual average temperature is generally between 15-25 ℃, sunlight is strong, and annual average rainfall is around 1,000 mm with light showers occurring during the rainy season between April and October.
In 1984 at Damar, which 50 km to the north form Ibb, M6 (magnitude 6) earthquake occurred and this resulted in the destruction of 47% of buildings with 3,000 fatalities and casualties. Earthquakes on this scale occur once every 20-30 years, while 64 small-scale earthquakes were observed in 2001, most frequently in Ibb, Taiz and bay of Aden.

As the design concept for facilities in consideration of these natural conditions, fittings shall be provided at openings to open and close dealing changeable mountain weather conditions, and waterproof roofs shall be planned for rainfall. Concerning earthquakes, plans need to take the minimum required seismic coefficient into account.

(2) Design Concept Regarding Social Conditions

In historical terms, the surveyed area is located along the Caravan Route, which traverses the Arabian Peninsula to leads for the Port of Aden, and there is a unique traditional culture from the local masonry architecture. The inhabitants of rural villages build their homes on slopes or ridges in order to avoid contact with outsiders, and they make a living by farming terraced fields. In recent years, many local inhabitants have moved to the cities or neighboring oil rich countries to make a living, and the area suffers from slow economic development. The roads are steep narrow path and the means of transportation is only by donkey or four-wheel-drive vehicle. It is heavy burden for housewives and girls to draw water from wells situated on low-lying land (wadis).

In consideration of these conditions, architectural specifications that harmonize with the surrounding landscape shall be adopted and the planning and layout of classrooms and toilets shall take local customs into account. Moreover, plans shall be designed to improve the currently low school enrolment rate of girls, while at the same time giving consideration to the traditional social roles of males and females in Yemen.

(3) Concept Regarding Utilization of Local Operators

Local construction companies in the two Governorates are small and medium enterprises registered as Grade-2 or Grade-3 operators. At these companies, one or a number of engineers use between 10 and 30 laborers to generally construct houses or shops, etc. Medium-scale or larger construction works are contracted out to Grade-1 construction companies based in the capital Sana'a, and overseas construction companies selected via international tender undertake larger projects.

The Project facilities here are designed according to standard specifications of MOE and they can be constructed with the execution technology of local construction operators. Moreover, since the Project entails simultaneous construction at numerous sites located over a wide area, it is necessary to control and setup that enables work to be executed with standard technology and quality levels throughout the whole works.

(4) Concept Regarding Maintenance Capacity of the Implementing Agency

The Project implementing agency is the Ministry of Education (MOE), while the Governorate Education Office (GEO) is responsible to carry out supervision and guidance for school operation. District Education Office (DEO), which is responsible for the maintenance of each school facility, appoints maintenance staff in charge to go round school by school. Also, parent's councils (PC) have been organized at each school and help in raising funds for constructing and renting classrooms needed to make up for shortages. However, due to tightening of fiscal policy and decentralization from 2001, the burden of facilities maintenance is gradually being transferred to the parent's councils and community peoples.

In consideration of these conditions, by using local materials and adopting sturdy and simple facilities, design that does not require any particular technology or cost for maintenance shall be aimed for.

(5) Concept Regarding the 9 Years Basic School and the Grade of Facilities

As descried before, there are varied grade compositions of surveyed schools; some schools are up to 6 grades only. Since 9 years basic education is declared to be compulsory education, in this Project it is to be planned schools that provide to study 9 years continuously as a basic education.

The Project shall give top priority to preparation of classrooms needed to make up for shortages based on the current number of students, and the number of managed rooms required for school operation shall also be kept to the absolute minimum. The

local building generally consists of stonewalls and reinforced concrete flat roofs, and since such design is sturdy and long lasting and requires the minimum degree of maintenance, the same specifications shall be adopted in the Project.

The grades of overall facilities and fittings shall be in accordance with the standard design specifications adopted by the Planning Department of MOE and the World Bank. Regarding education materials, the minimum required items used in basic science education should be selected.

(6) Concept Regarding Works Schedule

The surveyed sites are widely scattered over Taiz Governorate and Ibb Governorate. Annual rainfall in this area is around 1,000 mm and works will be affected by the rainy season from May to September (squalls). Since access to some of the sites is along unpaved roads and wadis river bottoms, it is necessary to show due care regarding material transportation during the rainy season. Furthermore, because numerous other factors such as Ramadan (September-October, 2003) and the after-meal custom of chewing Qat may reduce operating efficiency, careful attention will need to be paid to the overall works schedule.

2.2.2 Basic Plan

2.2.2.1 Selection of Project Target Schools

(1) Criteria for Selection

As was mentioned earlier, a list of 40 schools was presented as the survey target schools from the Yemeni side, and these were surveyed and narrowed down to the Project target schools according to the following criteria.

In particular, since the surveyed area is a mountainous region, judgment criteria concerning location conditions differ between the Yemen side and Japan side. However, since basic design cannot be advanced on sites that do not satisfy the following three points, the Yemen side was told during the site surveys that such sites would not be studied nor planned in the Project.

① At sites where it is not possible to gain access by works vehicles, in this case schedule management cannot be carried out during the works period.
② At sites where site land has not been prepared flat and the site area is unclear, in this case layout planning cannot be carried out.
③ Land use rights have been transferred to local governments as school site land, and there are no site revisions in future.

Based on the data obtained for each school and site surveying conducted during the study period, and using the selection criteria agreed on in the Minutes, examination

was carried out on the appropriateness and urgency of classroom development. Concerning land use rights, except sites where classrooms will be built on existing school sites, those required for new sites were obtained during the Basic Design Study.

Table 2-1 Criteria for Selection of Project Target Schools (Attached to Minutes)

	Item	Contents
Site conditions	①Shape of the site	Construction is possible; the site is prepared and to be flat with appropriate size.
	②Land use permission	In the case of both existing sites and new sites, land use rights have been transferred as school land.
	③Access by works vehicles	Access roads that enable passage by works vehicles of 5 t or so even in the rainy season are prepared.
	④Removal of facilities and replacement classrooms	When facilities need to be removed, removal is possible and the school is able to provide replacement classrooms.
	⑤No overlapping with other assistance	The work does not overlap with construction plans of other donors, international agencies and the Ministry of Education, etc.
	⑥No problems in terms of disasters and civil safety	The target area is not in danger of natural disasters such as landslides and flashfloods and has no civil peace problems related to racial clashes and so on. Education situation
Educational Situations	⑦Necessity of classrooms	There are many temporary or rented classrooms and outdoor lessons, and the shortage of permanent classrooms with respect to the current number of students is startling.
	⑧ Future necessity of classrooms	The surrounding population is adequate number and forecast that the number of students will increase and enrolment rate will improve in the future.
	⑨ Sufficiency of teaching staff and budget	The school has teaching staff and a maintenance budget, and no major additional budget is required as a result of school building construction.
	⑩ Other	Priority is given to schools that are striving to improve the quality of education.

Survey results of the selected 40 sites are listed on next pages. After examination of surveyed sites conditions, there were deleted inadequate sites and excluded for selecting Planed Target School.

Table 2-2 Results of Site Survey (Taiz)

No.	District	School Name	Type of Site	certificate of Site Use	Topography of Site	Road Access to Site from main rd.	Existing Building or Obstruction	Classroom in use	Classroom enable to use	Fence and Gate	Water Supply	Po Su
TZ-01	Demnah Khadeer	Al Ihsan School – Damnah Khadeer	New	Individual	Almost Flat	**Fair** (9.0km from paved main road)	_____	25	18	none	Well water (0.5km from site)	0.2km f
TZ-02	Demnah Khaeer	Algeed Alsaiid Girls School	Existing	Government	Flat	**Good** (0.1km from paved main road)	3buildings	7	5	2m(H),CB wall around site and steel gate	Well water (0.5km from site)	7km fr
TZ-03	At Taiziyah	Tareq Ibn Ziyad Al Buraihi School	New	Government	Almost Flat	**Good** (Beside paved main road)	_____	11	2	none	Piped water (beside site)	3km fr
TZ-04	Saber	Ouqba Ben Nafa'a School for Girls	Existing	Community	Almost Flat	**Fair** (Besidepaved main road)	2buildings	14	6	none	Piped water will be supplied 2002	1km fr
TZ-05	Maweyah	Alnahada Badeyah School	New	Government	Almost Flat	**Good** (0.8km from main road)	_____	9	6	none	Well water (0.2km from site)	20km f
TZ-06	At Taiziyah	Khaled Ibn Al Waleed School Al Ag'ood	Existing	Government	Almost Flat	**Good** (Beside paved main road)	3 building	7	0	none	Well water (0.3km from site)	5km fr gene Avai
TZ-07	Haifan	Al Ma'asarah Al Aghaber School	New	_____	Mountainous	**Bad** (1km from paved main road)	_____	0	0	_____	_____	___
TZ-08	Jabel Habashi	Al Wafa Maylat School	New	Individual	Inclined Gently	**Fair** (1.5km from paved main road)	_____	9	9	none	Well water (0.2km from site)	7km fr
TZ-09	Jabel Habashi	Othman Bin Afa'an School	Existing	Individual	Flat	**Fair** (3km from paved main road)	2 building	9	2	none	Well water (0.5km from site)	3km fr
TZ-10	Al Misrakh	Juba(Jeba) Girls School	New	N/A	Inclined Gently	**Fair** (1km from paved main road)	_____	12	12	none	Piped water (0.1km from site)	1km fr
TZ-11	Al Maafer - Jabel Hebshi	Khaled Ibn Al Walid School Al Afairah Hafan	Existing	Government	Almost Flat	**Fair** (13km from paved main road)	2 building	6	6	none	Well water (2km from site)	4km fr
TZ-12	aber Al-Mawade	Khaled Ibn Al Walid - Al Dabab	Existing	Individual	Flat	**Good** (beside main road)	4 building	12	6	2m(H),CB wall around site and steel gate	Well water (0.5km from site)	13km f
TZ-13	Jabel Habashi	Maud Bin Jabal – Al Gherrama	Existing	Government	Almost Flat	**Good** (0.5km from paved main road)	6 Building	21	14	2m(H),CB wall around site and steel gate	Well water (2km from site)	Exis
TZ-14	Maafer -Jabel He	Al Wahdah - Nawayha	New	Government	Almost Flat	**Fair** (10km from paved main road)	_____	12	5	none	Well water (0.5km from site)	10km f
TZ-15	At Taiziyah	Al Kifah Girls School – Al Ramadah	New	Individual	Flat	**Good** (0.05km from paved main road)	_____	21	10	none	Piped water (beside site)	Availab si
TZ-16	Saalah	Al Fawz School	Existing	Government	inclined	**Fair** (0.05km from paved main road)	4 building	11	11	2m(H),CB wall around site and steel gate	Piped water Existing	Exis
TZ-17	Saber	Al Fath Al Uzlah School	New	Individual	Flat	**Fair** (0.4km from paved main road)	_____	10	7	none	Well water (0.6km from site)	10km f
TZ-18	Al Maafer	Ammar Bin Yaser	Existing	Government	Flat	**Good** (beside paved main road)	6 Building	11	3	none	Piped water (0.02km from site)	0.3km f
TZ-19	At Taiziyah	Al Nnour Alajound Girls School	New	Individual	Almost Flat	**Fair** (20m from gravel main road)	_____	8	8	none	Well water (0.15km from site)	5km fr
TZ-20	Jabel Habashi	Ahmed Bin Alwan	New	Individual	Inclined	**Fair** (4km from paved main road)	_____	6	6	0.5m(H),stone wall over 40m and steel gate	Piped water (beside site)	Exis

Table 2-3 Results of Site Survey (IBB)

No.	District	School Name	Type of Site	certificate of Site Use	Topography of Site	Road Access to Site from main rd.	Existing Building or Obstruction	Classroom in use	Classroom enable to use	Fence and Gate	Water Supply	Power Supply	Land Forming, demolishing
IB-01	Ibb	Anas Bin Malfek Al Sadm School - Al Saddm	Existing	Governorate	Inclined Gently	Good (Beside paved main road)	2 Building	8	0	2.0m(H),CB wall around site and steel gate	Well Water (3.0km from site)	Power Supply will be available 2,3 month later	No Need
IB-02	Al Radhama	Al - Najid Al - Ahmar	New	Governorate	Inclined Gently	Good (0.2km from paved main road)	1Building deteriorated	0	0	none	River water (0.2km from site) and Well water 0.8km from site)	(0.2km from site)	Need 3 building, Cut 2m
IB-03	Ba'adan	Al Fatesh School - Souk Al Khamis	Existing	Governorate	Flat	Fair (7km from Gravel main road)	6 Building	13	13	none	Well Water Existing	(0.01km from site)	3 Building
IB-04	De Alsufal	Al Noor School	New	_____	Too Small	Bad (20km from paved main road)	_____	18	12	_____	_____	_____	_____
IB-05	Yarim	26 September School	New	Individual	Almost Flat	Good (Beside Paved main road)	none	3	0	none	Piped Water Existing	Power Supply Existing	No Need
IB-06	AR Alamas	Al-Diya School - Bait Yahya Aubad	Existing	Governorate	Inclined Gently	Good (Beside paved main road)	3 Building	8	0	none	Piped Water Available (Within site)	Power Supply Available (Within site)	No Need
IB-07	Ibb	Ad Daqiqah School Bilad Shar	New	_____	Too Small and Steap	Bad (8km from paved main road)	_____	9	0	_____	_____	_____	_____
IB-08	Al Mukhadir	Al Ikhiass School - Sahaban	New	Governorate	Flat	Fair (7km from paved main road)	_____	7	2	none	Piped water (0.05km from site)	(0.2km from site)	No Need
IB-09	Ibb	Al Qaryaat School - City of Ibb	Existing	Governorate	Flat	Good (0.2km from paved main road)	5 Building	19	18	0.4m(H),stone wall around site	Piped Water Existing	Power Supply Existing	No Need
IB-10	Al Mukhadir	Osama Bin Zalid School	Existing	Governorate	Flat	Good (0.3km from paved main road)	1 Building	5	0	none	Piped Water Available (Within site)	(0.3km from site)	Need 3 building
IB-11	Jiblah	Salah-Uddin School - Ath Thawabi	_____	_____	_____	Bad too far	_____	_____	_____	_____	_____	_____	_____
IB-12	shear	Omar Bin Al-Khatab	New	Individual	Flat	Bad (18km from paved main road)	_____	9	9	2.0m(H),stone wall around site and steel gate	Piped Water Existing	Existing	No Need
IB-13	Al Nadirah	Wadi Bana School	New	Governorate	Flat	Fair (Beside paved main rd.) 2 river crossing	_____	8	8	0.6m(H),stone wall around site and steel gate	Piped Water Available (beside site)	Power Supply Available (beside site)	Need Change drainage line
IB-14	Al Qafr	Alshahied Aliryant Girls School	Existing	Community	Almost Flat	Fair (20km from paved main road)	4 Building	14	12	0.6m(H),stone wall around site and steel gate	Piped Water Existing	Power Supply Available (Within site)	No Need
IB-15	Hubaish	Al Nour Fadhai School	Existing	Community	Almost Flat	Fair (17km from paved main road)	2 Building	5	0	1.8m(H),CB wall around site and steel gate	Well Water (1.5km from site)	(17km from site)	No Need
IB-16	As Saiyani	Al Imam Al Shokhany	Existing	Governorate	Almost Flat	Fair (3km from paved main road)	6 Building	13	2	none	Well Water (5km from site)	Geberator	No Need
IB-17	As Saprah	Mugam'ah Al Wehdah School	New	Individual	Inclined Gently	Good (Beside gravel main road)	2 Building	5	5	none	Piped Water Available (beside site)	(1.5km from site)	No Need
IB-18	Ash Sud'ah	Al Aeman School - Thafar	Existing (Expanded)	Individual	Flat	Good (800m from paved main road)	3 Building	5	5	2.0m(H),CB wall Front side and steel gate	Piped Water Existing	(800m to site)	No Need
IB-19	Ibb	Al Thagah Al Ra'ccyah School	New	Individual	step	Good (1Km from paved main road)	2 Building	10	4	2.0m(H),CB wall around site	Piped Water Existing	Existing	Need
IB-20	Ibb	Saba'a Dafdaf Girls School	New	Community	Almost Flat	Fair (2.0km from paved main road)	4 Building	9	1	none	Rain water (Apr.-Sep.) otherwise Lorry supply from Ibb	supplied by generator	No Need

Table 2-4 Results of School Survey in TAIZ

		No. of Classrooms					No. of Classes										No. of Students										Shift (No. of classes)			No. of Teachers by Experience						population							
		Owned	Rented	Temporary	Outside	Total	G1	G2	G3	G4	G5	G6	G7	G8	G9	Total	G1	G2	G3	G4	G5	G6	G7	G8	G9	Total	1 Shift	2 Shift	total	Less than 5 years	6 to 10 years	More than 11 years	headmaster	total	female	Total	No. of families	children 15 - 18 years		children 6 - 14 years		children 0 - 5 years	
																																					boys	girls	boys	girls	boys	girls
TZ-1	Mixed	2	0	0	0	2	0	0	0	0	0	0	1	0	1	2																											
	Male only	3	0	0	6	9	2	2	1	1	1	1	0	1	0	9	85	66	50	65	63	51	43	43	50	516																	
	Female only	4	0	0	3	7	1	1	1	1	1	1	0	1	0	7	74	58	46	54	42	46	13	16	10	359																	
	total	9	0	0	9	18	3	3	2	2	2	2	1	2	1	18	159	124	96	119	105	97	56	59	60	875	18	0	18	2	30	0	inc.	32	0	4,824	679	324	328	6,838	569	466	565
TZ-2	Mixed	3	0	0	6	9	1	1	1	1	1	1	1	1	1	9																											
	Male only	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	44	22	42	19	30	34	32	19	18	260																	
	Female only	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	39	18	27	16	27	27	10	8	8	180																	
	total	3	0	0	6	9	1	1	1	1	1	1	1	1	1	9	83	40	69	35	57	61	42	27	26	440	9	0	9	2	14	6	inc.	22	N.A.	1,660	243	77	86	243	209	184	165
TZ-3	Mixed	6	0	4	5	15	1	1	1	1	1	1	1	1	1	9																											
	Male only	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	58	60	46	41	40	30	28	35	49	387																	
	Female only	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	15	17	4	4	4	4	6	3	8	65																	
	total	6	0	4	5	15	1	1	1	1	1	1	1	1	1	9	73	77	50	45	44	34	34	38	57	452	15	0	15	4	20	5	inc.	29	N.A.	3,433	547	222	184	550	418	468	472
TZ-4	Mixed	8	0	3	0	11	0	0	0	0	1	1	1	1	1	5																											
	Male only	0	0	2	3	5	1	1	1	1	0	0	0	0	0	4	50	45	45	46	37	44	38	34	35	374																	
	Female only	0	0	2	5	7	3	2	1	1	0	0	0	0	0	7	135	75	35	32	25	15	14	13	15	359																	
	total	8	0	7	8	23	4	3	2	2	1	1	1	1	1	16	185	120	80	78	62	59	52	47	50	733	23	0	23	10	17	4	1	32	0	7,174	900	438	496	560	640	641	787
TZ-5	Mixed	6	0	3	2	11	2	1	1	1	1	1	1	1	1	10																											
	Male only	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	66	58	49	43	32	15	21	13	12	309																	
	Female only	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	58	45	35	26	16	7	0	1	1	189																	
	total	6	0	3	2	11	2	1	1	1	1	1	1	1	1	10	124	103	84	69	48	22	21	14	13	498	9	0	9	3	7	4	inc.	14	N.A.	4,824	679	324	328	683	569	466	565
TZ-6	Mixed	5	0	0	6	11	1	1	1	1	1	1	1	1	1	9																											
	Male only	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	52	42	33	29	38	32	31	32	49	338																	
	Female only	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	46	41	44	17	0	12	16	14	16	206																	
	total	5	0	0	6	11	1	1	1	1	1	1	1	1	1	9	98	83	77	46	38	44	47	46	65	544	9	0	9	3	11	8	inc.	22	1	4,124	622	222	218	304	305	357	408
TZ-8	Mixed	6	11	0	2	19	5	3	2	3	2	2	1	1	1	20																											
	Male only	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	110	110	60	120	110	137	60	57	30	794																	
	Female only	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	190	115	70	160	180	110	20	18	10	873																	
	total	6	11	0	2	19	5	3	2	3	2	2	1	1	1	20	300	225	130	280	290	247	80	75	40	1667	19	9	28	16	37	4	NA	4	NA	4,644	647	377	363	478	622	640	615
TZ-9	Mixed	3	0	1	5	9	1	1	1	1	1	1	1	1	1	9																											
	Male only	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	55	48	32	42	32	29	34	30	45	347																	
	Female only	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	57	36	35	50	18	21	9	10	0	236																	
	total	3	0	1	5	9	1	1	1	1	1	1	1	1	1	9	112	84	67	92	50	50	43	40	45	583	9	0	9	13	9	2	inc.	24	N.A.	2,248	376	195	124	396	295	334	273
TZ-10	Mixed	13	0	0	4	17	3	3	3	3	3	3	3	3	3	27																											
	Male only	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	96	65	69	64	65	74	72	76	74	655																	
	Female only	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	82	50	65	52	50	31	44	46	50	470																	
	total	13	0	0	4	17	3	3	3	3	3	3	3	3	3	27	178	115	134	116	115	105	116	122	124	1125	6	3	9	6	22	7	inc.	35	18	4,630	709	323	360	640	753	443	393

Table 2-5 Results of School Survey in IBB

		No. of Classrooms					No. of Classes										No. of Students										Shift (No. of classes)			No. of Teachers by Experience						Area Population							
		Owned	Rented	Temporary	Outside	Total	G1	G2	G3	G4	G5	G6	G7	G8	G9	Total	G1	G2	G3	G4	G5	G6	G7	G8	G9	Total	1 Shift	2 Shift	total	Less than 5 years	6 to 10 years	More than 11 years	headmaster	total	female	Total	No. of families	children 15 - 18 years		children 6 - 14 years		children 0 - 5 years	
																																						boys	girls	boys	girls	boys	girls
IB-1 (Inc. division)	Mixed	8	0	0	2	10	1	1	2	1	1	1	1	1	1	10																											
	Male only	0	0	6	0	6	1	1	1	1	1	1	0	0	0	6	58	49	62	56	71	44	89	28	52	509	11	5	16	7	23	1	Inc	31	0	1,075	6,879	3,336	3,416	NA	NA	NA	NA
	Female only	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	40	37	29	16	28	8	51	0	7	216																
	total	8	0	6	2	16	2	2	3	2	2	2	1	1	1	16	98	86	91	72	99	52	140	28	59	725																
IB-2	Mixed	3	0	0	3	6	2	1	1	1	1	1	0	0	0	7																											
	Male only	3	0	0	3	6	0	0	0	0	0	0	0	0	0	0	29	20	24	20	18	28	0	0	0	139	13	0	13	0	10	0	Inc	10	0	4,531	649	346	261	630	660	715	789
	Female only	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	27	15	26	13	11	15	0	0	0	107																
	total	6	0	0	6	12	2	1	1	1	1	1	0	0	0	7	56	35	50	33	29	43	0	0	0	246																
IB-2 (Division)	Mixed	2	0	0	4	6	1	1	1	1	1	1	0	0	0	6																											
	Male only	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	68	52	61	61	47	66	0	0	0	355	6	0	6	0	4	0	Inc	4	0	4,056	668	244	244	493	461	511	475
	Female only	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	71	43	56	36	36	41	0	0	0	283																
	total	2	0	0	4	6	1	1	1	1	1	1	0	0	0	6	139	95	117	97	83	107	0	0	0	638																
IB-3	Mixed	7	7	8	0	22	3	3	3	3	3	3	3	3	2	26																											
	Male only	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	95	90	102	90	86	98	85	81	70	797	20	7	27	2	31	0	1	34	0	5,400	800	710	484	920	630	986	690
	Female only	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	80	75	58	50	45	38	35	35	21	437																
	total	7	7	8	0	22	3	3	3	3	3	3	3	3	2	26	175	165	160	140	131	136	120	116	91	1,234																
IB-4	Mixed	12	3	4	4	23	0	0	0	2	2	2	1	1	1	9																											
	Male only	0	0	0	0	0	2	2	2	0	0	0	0	0	0	6	84	79	82	80	63	59	39	26	32	544	21	0	21	11	13	17	2	43	0	6,110	564	1,359	765	784	694	792	900
	Female only	0	0	0	0	0	1	1	1	0	0	0	0	0	0	3	95	68	54	45	37	33	23	16	14	385																
	total	12	3	4	4	23	3	3	3	2	2	2	1	1	1	18	179	147	136	125	100	92	62	42	46	929																
IB-5	Mixed	0	3	0	0	3	2	2	2	2	2	1	na	na	na	11																											
	Male only	0	0	0	4	4	0	0	0	0	0	0	na	na	na	0	98	100	60	59	68	63	na	na	na	448	6	6	12	0	6	3	1	10	0	14,451	1,918	1,755	1,684	2,021	1,971	2,585	2,427
	Female only	0	0	0	0	0	0	0	0	0	0	0	na	na	na	0	79	58	54	50	60	59	na	na	na	360																
	total	0	3	0	4	7	2	2	2	2	2	1	na	na	na	11	177	158	114	109	128	122	47	37	49	808																
IB-6	Mixed	6	0	0	0	6	1	1	1	1	1	1	na	na	na	6																											
	Male only	0	0	0	0	0	0	0	0	0	0	0	na	na	na	0	53	36	43	30	11	37	na	na	na	210	6	0	6	2	3	1	Inc	6	0	2,755	227	224	176	242	191	281	341
	Female only	0	0	0	0	0	0	0	0	0	0	0	na	na	na	0	21	18	15	10	31	6	na	na	na	101																
	total	6	0	0	0	6	1	1	1	1	1	1	na	na	na	6	74	54	58	40	42	43	na	na	na	311																
IB-7	Mixed	6	0	0	6	12	2	2	2	1	1	1	1	1	1	12																											
	Male only	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	35	51	49	46	29	28	21	29	23	311	12	0	12	0	16	0	2	18	0	2,770	179	134	134	141	217	126	204
	Female only	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	37	43	24	16	23	13	13	9	7	185																
	total	6	0	0	6	12	2	2	2	1	1	1	1	1	1	12	72	94	73	62	52	41	34	38	30	496																
IB-8	Mixed	4	0	1	2	7	2	1	1	1	1	1	0	0	0	7																											
	Male only	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	49	44	71	51	34	36	0	0	0	285	7	0	7	0	7	3	Inc	10	0	3,121	471	175	193	384	414	514	535
	Female only	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	57	36	40	18	21	11	0	0	0	183																
	total	4	0	1	2	7	2	1	1	1	1	1	0	0	0	7	106	80	111	69	55	47	0	0	0	468																

IB-9	Mixed	21	0	0	0	21	0	0	0	0	0	0	0	0	0	0											16	18	34	20	25	14	Inc	59	NA	2,770	179	134	134	141	217	126	204
	Male only	0	0	0	0	0	2	2	2	2	2	2	2	2	0	16	125	165	158	184	113	126	97	0	0	968															
	Female only	0	0	0	0	0	2	2	2	2	2	2	2	2	2	18	114	174	117	151	144	124	135	88	95	1,142															
	total	21	0	0	0	21	4	4	4	4	4	4	4	4	2	34	239	339	275	335	257	250	232	88	95	2,110															
IB-10	Mixed	0	3	0	5	8	2	2	2	1	1	0	0	0	0	8											8	0	8	NA	NA	NA	NA	11	0	3,681	456	318	371	516	664	643	884
	Male only	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	40	40	45	27	17	0	0	0	0	169															
	Female only	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	80	60	35	23	13	0	0	0	0	211															
	total	0	3	0	5	8	2	2	2	1	1	0	0	0	0	8	120	100	80	50	30	0	0	0	0	380															
IB-12	Mixed	7	0	0	0	7	1	1	1	1	1	1	1	0	0	7											9	0	9	2	10	0	1	13	0	1,881	264	191	138	220	144	270	293
	Male only	2	0	0	0	2	0	0	0	0	0	0	0	1	1	2	35	24	21	19	25	16	21	17	12	190															
	Female only	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	35	23	23	20	17	7	5	0	0	130															
	total	9	0	0	0	9	1	1	1	1	1	1	1	1	1	9	70	47	44	39	42	23	26	17	12	320															
IB-13	Mixed	10	0	0	0	10	2	2	2	2	2	1	0	0	0	11											10	0	10	0	17	6	Inc	23	14	41,270	4,732	2,117	1,556	3,050	3,258	2,371	2,322
	Male only	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	85	70	65	65	60	70	0	0	0	415															
	Female only	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	45	40	40	30	40	25	0	0	0	220															
	total	10	0	0	0	10	2	2	2	2	2	1	0	0	0	11	130	110	105	95	100	95	0	0	0	635															
IB-14	Mixed	9	0	0	0	9	1	1	1	1	1	1	1	1	1	9											14	0	14	5	25	0	Inc	30	13	3,205	183	157	92	107	95	NA	NA
	Male only	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	17	10	8	15	11	20	36	25	32	174															
	Female only	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	10	14	15	10	15	14	21	19	24	142															
	total	9	0	0	0	9	1	1	1	1	1	1	1	1	1	9	27	24	23	25	26	34	57	44	56	316															
IB-15	Mixed	5	2	0	1	8	1	1	2	1	1	1	1	1	1	10											4	6	10	5	7	0	Inc	12	NA	NA	NA	2,633	2,728	5,361	NA	NA	NA
	Male only	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	33	31	41	27	24	19	39	22	31	267															
	Female only	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	23	28	32	27	21	18	10	5	2	166															
	total	5	2	0	1	8	1	1	2	1	1	1	1	1	1	10	56	59	73	54	45	37	49	27	33	433															
IB-16	Mixed	12	0	0	12	24	1	1	1	1	1	1	1	1	1	9											12	12	24	14	27	1	Inc	42	29	5,004	803	383	420	795	806	784	817
	Male only	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	74	77	75	105	83	72	56	55	54	651															
	Female only	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	78	70	74	76	105	80	78	58	71	690															
	total	12	0	0	12	24	1	1	1	1	1	1	1	1	1	9	152	147	149	181	188	152	134	113	125	1,341															
IB-17	Mixed	6	0	3	0	9	0	0	0	0	0	0	1	1	1	3											6	0	6	5	3	0	1	9	NA	3,850	427	256	336	334	419	306	401
	Male only	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	27	28	39	94															
	Female only	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	2	2	6															
	total	6	0	3	0	9	0	0	0	0	0	0	1	1	1	3	0	0	0	0	0	0	29	30	41	100															
IB-18	Mixed	6	0	3	0	9	1	1	1	1	1	1	1	1	1	9											9	0	9	0	7	7	Inc	14	NA	5,450	NA	NA	NA	NA	NA	NA	NA
	Male only	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	40	30	45	40	50	30	40	30	25	330															
	Female only	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	12	12	8	15	10	15	7	8	3	90															
	total	6	0	3	0	9	1	1	1	1	1	1	1	1	1	9	52	42	53	55	60	45	47	38	28	420															
IB-19	Mixed	6	0	3	0	9	2	2	3	1	1	1	1	1	1	13											13	0	13	2	15	0	1	18	NA	6,350	679	157	172	292	196	160	150
	Male only	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	40	34	58	28	25	15	19	15	0	234															
	Female only	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	35	33	61	21	16	6	1	0	0	173															
	total	6	0	3	0	9	2	2	3	1	1	1	1	1	1	13	75	67	119	49	41	21	20	15	0	407															
7(IB-20)	Mixed	0	7	3	0	10	0	0	0	0	0	1	1	1	1	4											14	0	14	5	3	0	1	9	NA	4,470	475	152	186	775	678	820	866
	Male only	0	0	0	0	0	1	1	1	1	1	0	0	0	0	5	34	31	34	23	35	27	23	24	22	253															
	Female only	0	0	0	0	0	1	1	1	1	1	0	0	0	0	5	28	38	44	37	30	9	6	8	2	202															
	total	0	7	3	0	10	2	2	2	2	2	1	1	1	1	14	62	69	78	60	65	36	29	32	24	455															

The procedure for determining the standard plan of each school, from selection of the schools doe survey through to calculation of, is as indicated in the following flow.

Table 2-6 Flows for Calculating the Number of Classrooms

1. Selection of School for Survey

- ○ Upon discussing the selection criteria, the Yemeni side selected 40 schools for survey from the new request list (82 schools), and these were agreed on in the Minutes as a prioritized list.

2. Selection of Project target schools

- ○ Upon surveying the 40 schools and carrying out careful examination based on the selection criteria agreed on in the Minutes, 10 schools were omitted and the remaining 30 were selected as the Project target schools.

3. Calculation of necessary number of classrooms

(1) Make classroom capacity 40 students

- ○ Divide the number of students (boys, girls, total) in each grade by the classroom capacity of 40 students.
- ○ Since population growth and increases in the number of students differ according to area and schools, do not count these factors.
- ○ Assume 69 to be the maximum number of students per classroom, and calculate anything over 70 as two or more classrooms.
- ○ Concerning the number of teachers, assign one per classroom for G1-G3 and two for each of seven subjects for G4-G9 (17 in total); then subtract the existing number to obtain the number of teachers needs.

(2) Implementation of 9 year basic education

- ○ Provide one classroom each for higher grades (G-7 to G-9) even if the number of students is unknown.
- ○ In the above case, a lot of lower grade students, provide 9 classrooms as the absolute minimum.

(3) Examination of the number of students in amalgamated schools

- ○ At combined schools, utilize existing classrooms at branch schools for the lower grade classes (G1-G3). Because traveling to school is difficult for lower grade students if the branch school is 2 km or more apart.

(4) Examination of girls' schools and coeducation schools

- ○ Even in the case of requests for girls' schools, if the numbers of girl students are small (90% of capacity), calculate in terms of coeducation. Convert into girls' schools after girl students and teachers have been supplemented in the future.

(5) Examination of 'double shift' lessons

- ○ The School where double shift system is currently implemented but there are constrains of site space or number of teachers, calculate according to this system. Simplify to single shift in the case of small schools.

4. Calculation of the number of Project classrooms

- ○ {Required Nos. of classrooms} – {Nos. of classrooms continued to be used} = {Nos. of Project classrooms}
- ○ Classrooms that can be used continuously refer to permanent structure classrooms without any risk and danger.

5. Application of standard plan

- ○ At the 27 schools, have no management room, add one classroom for this space. 3 schools shall be provided furniture only for existing management room.
- ○ In cases where the total classrooms are an odd number, round off and use one of the existing classrooms.
- ○ In the above, round up schools with double shift, but round off in the case of large-scale double shift schools.

(2) Selection of Project target schools

In accordance with the flow procedure, from the 40 schools investigated in the site survey, 9 inaccessible schools and 1 school with few students and low urgency (IB-18) (10 schools in total) were excluded.

Table 2-7 Schools Excluded from the Project Target Schools

School Code		Reason for Excluded
1)	TZ-07	The final access road is a steep hill and has numerous high-risk spots.
2)	TZ-11	The access road runs along wadis for 2 km and passage is difficult in the rainy season.
3)	IB-04	The site is approximately 1 hour away from the nearest main road; also land on the site has not been prepared.
4)	IB-07	The access road is narrow and difficult to pass; also the site prepared along the roadside is cramped and dangerous.
5)	IB-11	The site cannot be reached even after driving for more than an hour from the nearest main road.
6)	IB-12	A site that will be impassable in the rainy season also was encountered after running 35 km along an unpaved road.
7)	IB-14	2 hours from main road, also access road is difficult to pass because very steep and rocky just before the site.
8)	IB-15	The final access road has rock outcrops and it is difficult for works vehicles to pass.
9)	IB-18	Since six existing classrooms can continue to be used and there are only three necessary classrooms in terms of calculation, the urgency level is low.
10)	IB-20	The final access road is steep, narrow and both difficult and dangerous for the passage of works vehicles.

IB-3 school has a long climb to the site and presents little difficult in the transportation of materials, however, because the existing number of classrooms is small with respect to the number of students and teachers, it was deemed to be a high urgency case and was included in the Project target schools.

As a result, the number of Project target schools works out as 18 schools in Taiz Governorate and 12 schools in Ibb Governorate, making 30 schools in all.

Table 2-8 Project Target Schools

	TAIZ Governorate	IBB Governorate	Sub-total
Schools for Survey	20 schools	20 schools	40 Schools
Excluded Schools: Poor Access	2 schools: TZ-07, TZ-11	7 schools: IB-04, IB-07, IB-11, IB-12, IB-14, IB-15, IB-20	9 schools
Excluded School: Small Scale (3 rooms)	—	1 school（IB-18）	1 school
Result: Schools for Planning	18 schools	12 schools	30 school

(3) Calculation of necessary number of classrooms

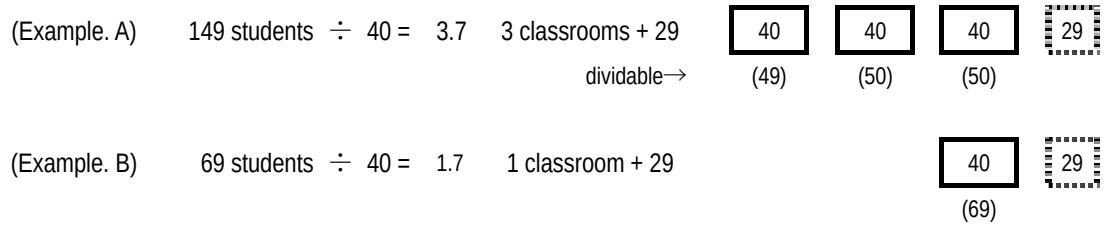
[(1) Calculation by classroom capacity 40 students]

Divide the number of students in each grade by the classroom capacity of 40 in order to obtain the required number of classrooms. Concerning odd sums, assume 69 to be the maximum number of students per classroom, and calculate anything over 70 as two or more classrooms. Concerning the basis for this, when three sets of classroom

furniture are shifted from other classroom to make 23 sets and three students can sit at each set, the maximum classroom capacity works out as 69 students.

Based on the existing number of students per grade, the following nine classrooms, mostly in lower grades, will hold 69 students.

- ○ Taiz Governorate: G-2 (2 classrooms), G-3 (2 classrooms), G-4 (2 classrooms)
- ○ Ibb Governorate: G-1 (1 classroom), G-2 (1 classroom), G-4 (1 classroom)



In the case where the number of students in the same grade is 70, there will be two classrooms holding classes of 35 students each. Since each school refuses entry to around 50 students every year due to the shortage of classrooms, it is desirable to accept additional enrolments and utilize classes with 40 students. Concerning empty seats in G4-G9 class, school administrators can encourage early leavers to resume studies or they can accept students from overcrowded neighboring schools. Even now, schools adjust the number of students with neighboring schools because of the shortage of classrooms.

[(2) Implementation of nine-year basic education]

Placing the emphasis on encouraging more students to graduate throughout 9-year basic education, classrooms shall be provided for higher-grade classes (G7-G9). Even if small numbers of students or currently cater to just six grades in school, one classroom each shall be provided for such grades. However, since the number of students in lower classes is huge number compare with upper classes, classroom shall be deducted and the minimum requirement of 9 classrooms shall be provided. Deducted number shall be used existing classroom, because it takes 3 to 5 years to upgrade students to higher grade.

[(3) Examination of the number of students in amalgamated schools]

If schools with large numbers of students in the lower grades are combined, these lower grade classes will become even larger in general. Fundamentally, branch schools are established around village in order to be minimizing the access for lower students around 2 km. However, in cases of combining with branch schools separated by around 2 km, it is difficult for lower grade students to travel to school. MOE has recommendation that each school to be constructed every 4 km apart, meaning about 2km access to school.

To avoid this case, some of the classrooms at branch schools shall be utilized for the lower grade students in order to preserve their access.

[(4) Examination of girls' schools and coeducation schools]

To construction of girl's school buildings have been requested from 14 schools of the 30 project target schools. But at 5 schools where the number of girl students (especially higher grade students) and teachers was few at the time of the survey, the number of classrooms is calculated assuming coeducation facilities. These schools can be converted into independent girls' schools in the future, however, until then it will be necessary to secure female teachers and training local girl students as future teaching personnel.

Table 2-9 Examinations of Coeducation and Girls' Schools

	TAIZ Governorate	IBB Governorate	Sub-total
Request for Coeducation Schools	7 Schools	9 Schools	16 Schools
Request for Girl's Schools	11 Schools	3 Schools	14 Schools
Plan for coeducation, since girl students are few	3 Schools: TZ-02, TZ-05, TZ-11	2 Schools: IB-13, IB-20	5 Schools
Results: Girls School or Girls School Building	8 Schools: TZ-01, TZ-04, TZ-08, TZ-10, TZ-14, TZ-15, TZ-19, TZ-20	1 School: IB-09	9 Schools

As a result, 9 schools of the 30 schools shall be for girls or shall have school buildings for girls; calculation of classrooms shall be applied from the number of girl students per grade. As for the remaining 21 schools, these shall be coeducation; calculation of classrooms shall be applied from the combined number of boy and girl students.

[(5) Examination of double shift lessons]

Double shift lessons are currently carried out at 10 schools of the 30 survey schools. This double shift lessons are divided according to sex (boys and girls) and class (lower and higher). At the schools implementing double shift lessons and possessing sufficient teachers, there were no requests for conversion to single shift lessons. However, some schools plan to introduce double shift lessons with afternoon classes devoted to girl students (specially higher grade) in future.

In calculation of the number of classrooms, shifting from single shift to double shift lessons can halve the number of classrooms. However, more teachers are needed because teachers of morning classes do not also teach in the afternoon. In rural areas, living quarters and other arrangements for receiving teaching personnel are not in place, and it is thus difficult and time consuming to increase teaching personnel. Therefore in the plan, the changing from single shift lessons to double shift lessons shall not be adopted.

As a result of the calculation, 3 schools to be switched to single shift lessons of the said 10 schools. At other 7 schools retained double shift due to the shortage of site land and/or teachers.

Table 2-10 Elimination of Double Shift Lessons

	TAIZ Governorate	IBB Governorate	Sub-total
Current double shift Schools	4 Schools	6 School	10 Schools
Schools, adopt single shift	2 Schools: TZ-10, TZ-12	1 School: IB-08	3 Schools
Schools, continue double shift (target number of students: 500)	2 Schools: TZ-08, TZ-16	5Schools: IB-01, IB-03, IB-05, IB-09, IB-16	7 Schools

(4) Calculation of the Number of Project Classrooms

The number of Project classrooms is calculated by deducting the number of classrooms that can continue to be used from the number of classrooms that are required. Usable classrooms refer to classrooms that have a roof, have no dangerous exposed steel-bars, etc., and can continue to be used by carrying out simple renovation (a fresh coat of paint, etc.).

Many of the temporary classrooms observed were still under construction. These classrooms are built by local inhabitants and have concrete block walls but no roofs. In the Project, it is considered that these classrooms can be used to accommodate future increases in the number of students if the community peoples complete the roofs. Therefore, in planning the layout of classrooms, since even inadequate school buildings can be utilized if the community peoples carry out renovation work, the utmost effort was made to avoid destroying existing school buildings.

(5) Application of Standard Plan

Based on the calculated number of Project classrooms, the 2-story standard type was adopted using the following procedure (please refer 2.2.3 (3) Floor Plan).

- At the 27 schools that require administration rooms (principal room /staff room /storage & preparation), one more classroom fro this space shall be added.
- Since buildings have 2-stories and even numbers, in cases where the number of classrooms is an odd number, the figure shall be rounded down and one existing room utilized.

Applying the standard type and continuing to use some existing classrooms, it is possible to construct lacking classrooms at more schools. Standard type school buildings having 3 classroom in flat or 6 classrooms in 2-stories are also constructed in projects by MOE or World Bank in rural areas.
In rural areas, rather than constructing classrooms in restricted school based on expected increases of student numbers in future, it is more economical to provide the existing shortage in classrooms.

The final Project schools are as indicated in the following table. Examination sheets for each school are shown in the appendices.

Table 2-11 List of Final Project Target Schools

A: TAIZ Governorate

Code No.	Directorate	School Name	School Type			Shift
			Coeducation	Girls School	Separated Site	
TZ-01	Demnah Khadeer	Al Ihsan School	-	○	○	-
TZ-02	Demnah Khaeer	A School for Girls in Ad -Demnah Al Badw	○	-	-	-
TZ-03	At Taiziyah	Tareq Ibn Ziyad Al Buraihi School	○	-	-	-
TZ-04	Saber	Ouqba Ben Nafa'a School for Girls	-	○	○	-
TZ-05	Maweyah	Alnahada Badeyah School	○	-	-	-
TZ-06	At Taiziyah	Khaled Ibn Al Waleed School Al Ag'ood	○	-	-	-
TZ-08	Jabel Habashi	Al Wafa Maylat School for Girls	-	○	○	W-W
TZ-09	Jabel Habashi	Othman Bin Afa'an School	○	-	○	-
TZ-10	Al Misrakh	Juba (Jeba) Girls School	-	○	○	W-S
TZ-12	Saber Al-Mawadem	Khaled Ibn Al Walid-Al Dabab	○	-	-	W-S
TZ-13	Jabel Habashi	Muad Bin Jabal- Al Gherrama	○	-	-	-
TZ-14	Al Maafer -Jabel Hebshi	Al Wahdah – Nawayha	-	○*	-	-
TZ-15	At Taiziyah	Al Kifah Girls School - Al Ramadah	-	○	○	-
TZ-16	Saalah	Al Fawz School	○	-	-	W-W
TZ-17	Saber	Al Fath Al Uzlah School	○	-	-	-
TZ-18	Al Maafer	Ammar Bin Yaser	○	-	-	-
TZ-19	At Taiziyah	An Nnour Alajoud Girls School	-	○	○	-
TZ-20	Jabel Habashi	Ahmed Bin Alwan	-	○	-	-

B: IBB Governorate

Code No.	Directorate	School Name	Coeducation	Girls School	Separated Site	Shift
IB-01	Ibb	Hard Najd Al Sadm School - Al Sadm	○	-	-	W-W
IB-02	Al Radhama	Al-Najd Al-Ahmar	○	-	○	-
IB-03	Ba'adan	Al Fatesh School - Souk Al Khamis	○	-	-	W-W
IB-05	Yarim	26 September School	○	-	○	W-W
IB-06	AR Alamas	Al-Diya School - Bait Yahya Aubadi	○	-	-	-
IB-08	Al Mukhadir	Al Ikhlass School - Sahaban	○	-	-	W-S
IB-09	Ibb	Al Qaryaat School	-	○	○	W-W
IB-10	Al Mukhadir	Al Usama Bin Zaid School	○	-	-	-
IB-13	Al Nadirah	Wadi Bana School	○	-	-	-
IB-16	As Saiyani	Al Imam Al Shokhany School	○	-	-	W-W
IB-17	As Saprah	Mugam'ah Al Wehdah School	○	-	-	-
IB-19	Ibb	Al Ra'eeyah School	○	-	○	-

Note: W-W indicates current double shift schools that will remain as double shift schools after the Project)

2.2.2.2 Contents and Scale of Project Facilities

(1) Examination of the Request Contents

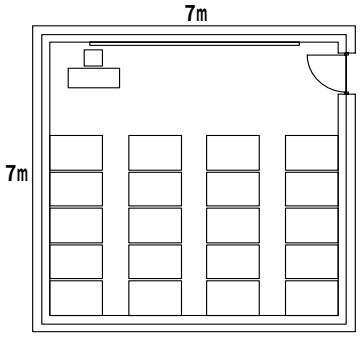
Facilities contained in the request are the classrooms, principal rooms, staff rooms, storerooms, multi-purpose rooms (basic laboratories in additional request), and toilets. In the Project, the facilities described below shall be provided at the 30 schools with the aim of improving the appropriate school environment.

1) Classrooms

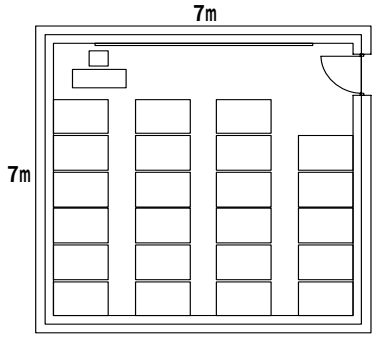
The area of classrooms is planned on a basic grid of 7 m x 7 m = 49 m2 based on layout of standard furniture by MOE (fixed desks and chairs for two students each). Inner dimensions of this rooms are almost equivalent to the area of 40~48 m2 prescribed by MOE as the standard for classes of 40 students in the fourth through sixth grades.

In general classroom planning, the classroom area and capacity of students are varied between primary school and junior school since these children have different physiques and behavior patterns. However, in the current situation in Yemen, since there is a high dropout rate and the number of students in each grade fluctuates and deviates from the set capacity, there is a strong possibility that different classrooms will be used by different grades each year. Therefore, classroom size shall be unified at 7 m x 7 m and flexible design shall be adopted that enables the number of students held by each classroom to be adjusted by moving the classroom furniture around.

◆ Classroom and Furniture Layout



General classroom
(capacity 40 students)
(2 students per table/chair 20 set)



Increased capacity classroom
(46-69 students)
(2-3 students per table/chair 23 set)

2) Administration rooms

Since the scale of schools in the Project is on the whole small, one room of standard classroom size shall be set aside and partitioned using furniture and shelves in order to fulfill the following functions.

[Principal space]

In view of the importance of the principal in school operation, principal rooms

shall be provided at all schools except for those that already have rooms that can continue to be used.

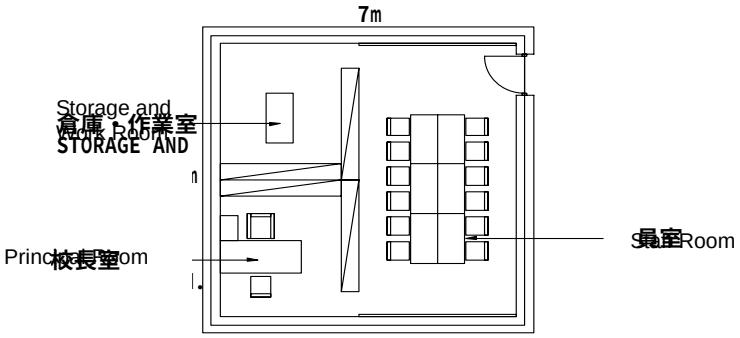
[Staff space]

The staff room is the place where teachers prepare lessons, keep student registers after classes, and hold staff meetings. Accordingly, the staff room is an important place in order for the teaching staff to smoothly advance each day's lessons. Staff rooms shall be equipped with common meeting desks and chairs as well as document shelves.

[Storage/work space]

Space shall be provided for storing textbooks, operating documents and basic teaching materials. Currently, the only storage space consists of simple document shelves in principal offices. Separation of space will be used 9 cabinets that one for each grade in order to store teaching materials or textbooks. The workroom will be provided with working table with chairs. In this space, school secretary will make registration and operation clerical work, or teachers will prepare teaching materials and other activities.

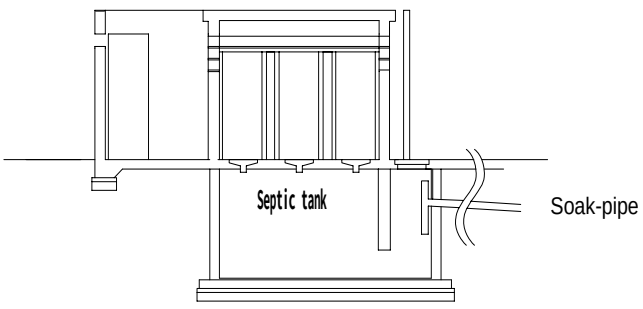
◆ Administration room layout



3) Toilets

Any of surveyed schools possessed toilet facilities. Even when toilet facilities do exist, these consist of a single booth for the teaching staff, but have no plumbing, and odor is bad due to poor ventilation. Toilet facility is seriously needed for girls' students, this shortage is one of the factors to push down of girls school enrolments. In the plan, simple septic tank with soak-pipe will be provided and separately planned for boys and girls toilet.

◆ Toilet



2.2.2.3 Building Plan

(1) Site Utilization and Facilities Layout Plan

Since site conditions are different at each school, the optimum site utilization and facilities layout plan shall be designed based around the following basic items upon giving careful consideration to the terrain, surrounding environment and existing facilities layout, etc. on each site.

- When constructing facilities on existing school sites avoid demolishing existing buildings as much as possible and position the new buildings in such a way to harmonize with the classrooms that can continue to be used.
- Adopt site utilization plans that make it possible to build extensions in the future.
- Position school buildings along the east-west axis in order to avoid morning and evening sunlight into classrooms, and place corridors on the south side in order to stop sunlight directly shining into classrooms during daytime hours.
- In order to effectively incorporate natural ventilation, give a broad open layout to school buildings on the south side (corridor side) and secure ample space between existing facilities and neighboring land.
- In cases where site land is sloping, basically adopt facility layouts that fit with the terrain; and in cases where site preparation works are needed, adopt layouts that keep the workload to a minimum and ensure that safety is secured.

(2) Building Plan

1) Basic Concept of Building Plan

Concerning the survey target schools, in order to give priority to the provision of lacking classrooms and carry out construction at low cost, incorporate the following points into the building plan:

- Set aside one standard classroom as the administration room, and flexibly utilize this by dividing it into the principal room, staff room and storage/work room by partitioning with furniture.
- In order to keep construction cost to a minimum, adopt six rooms (five classrooms and one administrative room) as the minimum school scale, and adopt 2-story buildings in order to make effective use of small site space.
- Since buildings are 2-story structures, plan even numbers of inhabited rooms. Leaving aside one classroom for administrative use, this means that the standard number of classrooms will be 5, 7, 9 and 11.
- Adopt single-side corridor in classroom blocks and design buildings either as straight line types (S type) or L-shaped types (L type) according to site layout.

- Concerning parts of existing school buildings that can continue to be used, recommended to the Yemeni Government and each school that light renovation works consisting of repainting, etc. be carried out at the local expense in order to prepare overall school environments.
- Particularly at school buildings for girls, clearly show outer boundary walls and gates recommend that these be installed as part of the Yemeni side works.

2) Standard Building Types

The scale of classroom buildings was determined based on the number of classrooms, which is calculated by subtracting the number of classrooms that can continue to be used from the necessary number of classrooms, itself computed based on the number of students in each grade. Standard buildings in the Project shall range in size from 5 to 15 classrooms. In order to efficiently implement construction of classroom buildings, designs shall be planned in accordance with the standard types shown in the next table.

In the table, S refers to straight-line type and L refers to L-shaped type designs selected according to site space and relationship with existing facilities. Out of the 30 Project target schools, 18 schools (60%) are the type consisting of 9 classrooms.

Table 2-12 Standards Types of Facilities

Building Type	Number of Room	Building Are(m^2)	Floor Area(m^2)	Number of Site	Total Floor Area(m^2)
5S	6	220.50	441.00	2	882.0
5L	6	220.50	441.00	1	441.0
7S	8	283.50	567.00	4	2268.0
9S	10	346.50	693.00	13	9009.0
9L	10	346.50	693.00	5	3465.0
11S	12	409.50	819.00	1	819.0
11L	12	409.50	819.00	1	819.0
13L	14	472.50	945.00	2	1890.0
15L	16	567.00	1,134.00	1	1134.0
Sub-total	94	—	—	30	20727.0

Note 1: Number of Room includes Classrooms and one Admin. Office.
Note 2: S shows Straight-type building and L shows L-shape building.

3) Toilet Facilities

The proposed MOE standard for installing toilet booths for 9-classroom type is 9 male booths and 11 female booths (20 booths in total). However, such figures are considered to be very high for rural areas without water supply for maintain unlike city schools. Therefore, the number of booths shall be calculated according to the following ratio based on 1/4 of the above standard. When extending facilities on existing site land, the number of booths shall be planned to include the existing number of students. Moreover, since boys' urinals are not used in Yemen, Arabian type closets shall be installed inside both boys' booths and girls' booths.

Table 2-13 Number of Students per Toilet Booth

Students	For Boys	For Girls	Sub-total
～300	2	2	4
～600	3	3	6
～900	4	4	8
900～	5	5	10

Boys' and girls' toilets shall be designed with separate water receiving tanks, septic tanks and soak-pipes. It is desirable to locate each set of toilets on opposite sides of sites, however, problems arise concerning the length of water supply piping and difficulty in securing water makeup routes by water trucks and donkeys. Accordingly, boys' and girls' toilets shall be positioned in straight lines, however, if schools make strong requests, it shall be possible to separate toilets on opposite sides.

Table 2-14 Planned Toilet Types and Quantities

Type (booth)	No. of Building	Floor Area (m^2)	Construction Floor Area (m^2)	Sub-total of Floor Area (m^2)	Sub-total of Const. Floor Area (m^2)
4	5	10	20	50	100
6A	13	15	25	195	325
6B	8	15	25	120	200
8	1	20	30	20	30
10	3	25	35	75	105
Sub-total	30	—	—	460	760

Note: Type A and B differs number of booth for Boys and Girls.

Concerning toilet plumbing, locally widespread galvanized water tanks shall be installed alongside toilets, and toilet users shall flush water with small buckets from taps and carry this to toilets for flushing. The same method shall also be adopted at sites with village water supply in order to save and minimize water use. Connection of water supply pipe from existing or future line, the connection works to the water tank shall be by Yemeni side.

Septic system, which is widespread in the local area, shall be adopted as the method of toilet treatment. The same method shall also be adopted at the 15 sites that possess no water supply facilities, and thorough guidance shall be provided to users to make sure they flush toilets (1 liter units) after use. If water supply is not sufficient, sludge will not decompose because bacteria will not propagate, and periodic sludge removal will be necessary, and trap water will dry up then lead to the generation of odor.

4) Size of Facilities

Based on the above examination, the scale of each school facility will be as follows.

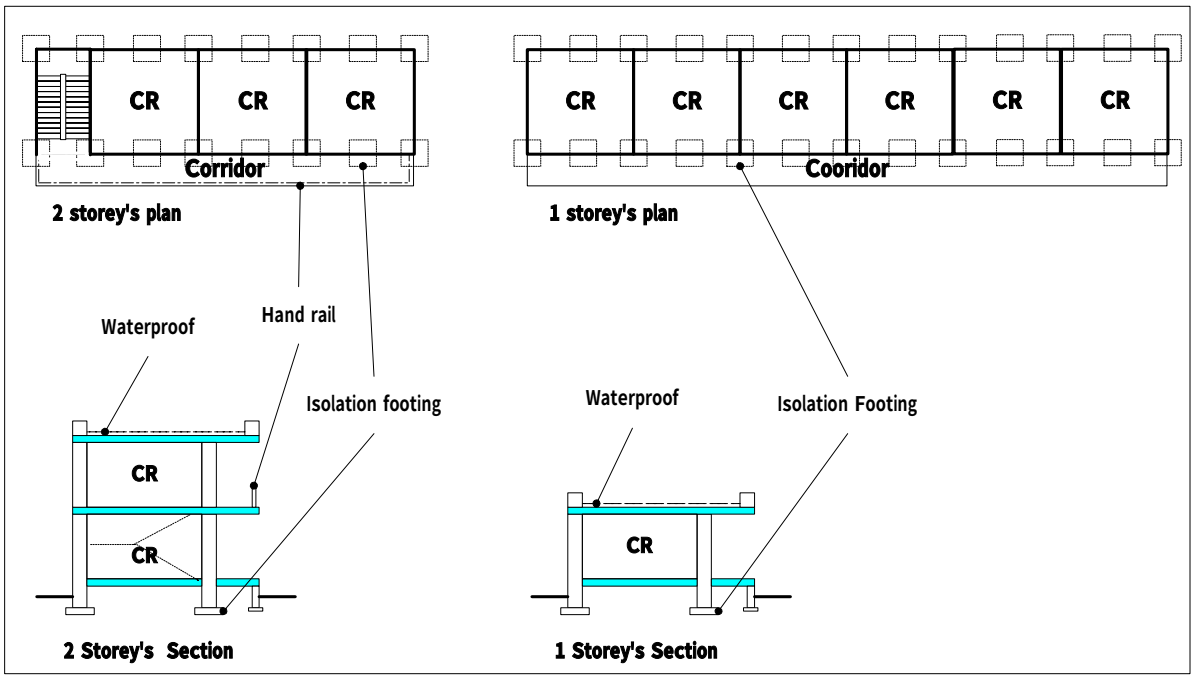
Table 2-15 Type and Floor Area of Project Facilities

No.	Code No.	School Name	School Building (㎡)			Toilet Building (㎡)		
			Type	Building Area	Floor Area	Type	Floor Area	Const. Area
1	TZ-01	Al Ihsan School – Damnah Khaeer	9S	346.5	693.0	6A	15	25
2	TZ-02	A School in Ad-Demnah Al Badw	5S	220.5	441.0	6B	15	25
3	TZ-03	Tareq Ibn Ziyad Al Buraihi School	9S	346.5	693.0	6B	15	25
4	TZ-04	Ouqba Ben Nafa'a School for Girls	9S	346.5	693.0	6A	15	25
5	TZ-05	Alnahada Badeyah School	7S	283.5	567.0	4	10	20
6	TZ-06	Khaled Ibn Al Waleed School Al Ag'ood	11L	409.5	819.0	6B	15	25
7	TZ-08	Al Wafa Maylat School for Girls	9L	346.5	693.0	6A	15	25
8	TZ-09	Othman Bin Afa'an School	7S	283.5	567.0	4	10	20
9	TZ-10	Juba (Jeba) Girls School	9L	346.5	693.0	6A	15	25
10	TZ-12	Khaled Ibn Al Walid-Al Dabab	5S	220.5	441.0	4	10	20
11	TZ-13	Muad Bin Jabal- Al Gherrama	9S	346.5	693.0	10	25	35
12	TZ-14	Al Wahdah – Nawayha	9S	346.5	693.0	10	25	35
13	TZ-15	Al Kifah Girls School - Al Ramadah	9S	346.5	693.0	6A	15	25
14	TZ-16	Al Fawz School	5L	220.5	441.0	4	10	20
15	TZ-17	Al Fath Al Uzlah School	9S	346.5	693.0	6B	15	25
16	TZ-18	Ammar Bin Yaser	13L	472.5	945.0	8	20	30
17	TZ-19	An Nnour Alajoud Girls School	9L	346.5	693.0	6A	15	25
18	TZ-20	Ahmed Bin Alwan	9S	346.5	693.0	10	25	35
Sub-total(TAIZ)					1,1844.0		285.0	465.0
1	IB-01	Hard Najd Al Sadm School	9S	346.5	693.0	6B	15	25
2	IB-02	Al-Najd Al-Ahmar	9S	346.5	693.0	6B	15	25
3	IB-03	Al Fatesh School - Souk Al Khamis	9L	346.5	693.0	6B	15	25
4	IB-05	26 September School	11S	409.5	819.0	6B	15	25
5	IB-06	Al-Diya School - Bait Yahya Aubadi	7S	283.5	567.0	6B	15	25
6	IB-08	Al Ikhlass School – Sahaban	9S	346.5	693.0	6B	15	25
7	IB-09	Al Qaryaat School - City of Ibb	13L	472.5	945.0	6A	15	25
8	IB-10	Al Usama Bin Zaid School	9S	346.5	693.0	6B	15	25
9	IB-13	Wadi Bana School	9S	346.5	693.0	6B	15	25
10	IB-16	Al Imam Al Shokhany School	15L	567.0	1,134.0	6B	15	25
11	IB-17	Mugam'ah Al Wehdah School	9L	346.5	693.0	6B	15	25
12	IB-19	Al Ra'eeyah School - City of Ibb	7S	283.5	567.0	4	10	20
Sub-total(IBB)					8,883.0		175.0	295.0
Total					20,727.0		460.0	760.0

(3) Floor Plan

The Project area is an earthquake risk zone. Therefore, in consideration of seismic resistance, RC frame with flat roof structures that are commonplace in Yemen shall be adopted. Based on this structural frame, cost comparison for a six-classroom school between the case of a two-story building and a one-story building is shown in the following drawing. It works out that the two-story building involves less work and is more economical.

Figure 2-1 Comparison of Cost Between a Two-Story and One-story School (Six Classrooms)



In terms of the volume of concrete, the one-story building has a slightly smaller frame size, however, if this is viewed as the same in both cases, the two-story option entails a smaller works quantity and is more economical as shown in the following table. Moreover, the target area is located in mountains and includes many rocky slopes, however, in the case of two-story buildings, the building area is roughly half that of one-story buildings and structures are less prone to alterations in the ground or slopes.

Table 2-16 Comparison of Construction Volume Between Double and Single Story

	Double Story	Single Story	Volume Reduction
Grading and excavation volume	3.5 Grids	6.0 Grids	－ 2.5 Grids
Number of Footings	16 Footings	26 Footings	－10 Footings
Slab for Floor/Roof	10.5 Grids	12 Grids	－1.5 Grids
Roof water-proofing area	3.5 Grids	6 Grids	－2.5 Grids

Accordingly, in the case of RC frame structure buildings with roofs, since two-story structures are more economical if there are six or more classrooms, two-story structures shall be adopted as the basic facilities design.

(4) Structural Plan

1) Design Concept

In Yemen, related legislation or criteria concerning structural design is not provided. Designers usually apply the British Standard (BS) or the Uniform Building Code (UBC), and assistance donors use their own domestic standards when designing facilities in assistance projects. Therefore, the following standards shall be applied to the design of these facilities.

- Japan Building Standard Law and execution case studies
- Structural regulations of buildings (Japan Architectural Center)
- Reinforced Concrete Structural Calculation Criteria (the Architectural Institute of Japan)
- Architectural Basic Structural Criteria (the Architectural Institute of Japan)
- Uniform Building Code (UBC)

2) Anti-seismic Design

Yemen is located at the southern tip of the Arabian Peninsula and is subject to seismic and volcanic activity. In December 1982, magnitude 6.0 earthquakes in Dammar (50km north from Ibb) resulted in 2,500 fatalities and the collapse of 25,045 houses (46.1% of all houses in the Governorate), 79 schools and 651 mosques. After this was followed by after-shocks for a few days, another earthquake of magnitude 4.6 occurred in Al-Udain in Ibb Governorate and caused the deaths of another 26 people. Also, earthquake damage was reported in Sadda (200km north from sana'a) in 1992 and Hays (70km west from Ibb) in 1993.

As is indicated in the following table, the number of earthquakes observed in 2000 was 859, of which 62 were of magnitude M4~5.

Table 2-17 Frequency and Strength (Richter Scale) of Earthquakes in Yemen, 2000

	Domestic					International		Total
Richter Scale	1 or less	1～2	2～3	3～4	4～5	> 5	5 or more	
No. of Event	173	203	226	160	62	22	13	859

Note: The Richter Scale is almost equivalent to the magnitude standard.
The overseas quakes here mainly occurred in the Gulf of Aden and the Red Sea.
Source: Statistical Yearbook 2000, MOPD

In the case where earthquakes of around M6 occur, horizontal acceleration of the epicenter becomes 54 cm/s2, which is equivalent to level 4 on the Japanese scale of seismic intensity and 0.2 is adopted as the coefficient of first-floor seismic horizontal shearing force. In the project are, M6 occurs every 20-30 years a half of in Japan, therefore 0.1 shall be adopted as the coefficient in this project. Here, 1/10 of the dead weight of the building is added as seismic horizontal force on the first floor.

LogA0 = -2.1 + 0.8 M – 0.027 M2 (from Gutemberg-Richter: BSSA46, p105)

A0: maximum acceleration at the epicenter (cm/s2)

M: magnitude (M = 6)

OgA0 = 1.728

A0 = 54 cm/s2

In the case where seismic horizontal force of 0.1 is taken into account, one D16 bar each is added to the top and bottom of the second floor slab beam alongside of external wall, the pillar section is generally decided by the vertical load, and there is no need for reinforcement.

3) Soil Condition and Foundation Plan

Soil on the surveyed sites consists of gravelly soil or silty sand, and from first impressions it appears that seismic bearing capacity in the range of 10~20 t/m2 can be expected.

Table 2-18 Geological Conditions and Estimated Ground Bearing Force

Geological Conditions	Conditions	Estimated Value
Rock, soft rock, eroded rock, gravelly soil, very hard clay, consolidated sand	Good	20t/m² or more
Gravelly soil, sandy soil, gravel mixed with clay, hard clay	Normal	20～10t/m²
Silty sand, clayey sand, slightly hard clay	Weak	10～5t/m²
Clayey soil, organic soil, soft clay, loose clay	Poor	5t/m² or less

Soil bearing capacity as estimated by visual inspection at each site is as follows.

Table 2-19 Assumed Soil Bearing Capacity at Each Site

School Code	Assumed bearing capacity (t/m²)	Soil conditions	School Code	Assumed bearing capacity (t/m²)	Soil conditions
TZ-01	10	Gravelly soil, rock (Reclamation)	IB-01	10	Sandy Silt (Trench)
TZ-02	20	Silt mixed with rock	IB-02	20	Gravel, Rock
TZ-03	20	Silt mixed with rock	IB-03	20	Sandy Silt
TZ-04	15	Gravel, Rock	IB-05	15	Sandy Silt (Farm)
TZ-05	20	Gravel, Rock (Reclamation)	IB-06	20	Gravel, Rock
TZ-06	20	Silt with Gravel	IB-08	20	Gravel, Rock (Reclamation)
TZ-08	20	Gravel, Rock	IB-09	15	Sandy Silt (Farm)
TZ-09	10	Silty Sand (Farm)	IB-10	15	Sandy Silt
TZ-10	20	Gravel, Rock	IB-13	20	Gravel, Rock
TZ-12	15	Silty Sand (Farm)	IB-16	20	Gravel, Rock
TZ-13	20	Gravel, Rock	IB-17	20	Gravel, Rock
TZ-14	15	Silty Sand (Farm)	IB-19	15	Sandy Silt (Farm)
TZ-15	10	Silty Sand (water)			
TZ-16	10	Silty Sand (town)			
TZ-17	20	Gravel, Rock (Reclamation)	Note: Marked site shows Soil Bearing Test for confirmation		
TZ-18	15	Silt with Gravel			
TZ-19	15	Silt with Gravel			
TZ-20	10	Gravel, Rock (Reclamation)			

In the Project, isolated footings shall be adopted, however, judging from the reaction force at the point of support of the Project facilities, the size of foundations shall be designed according to soil bearing capacity as shown in the following table.

Table 2-20 Size of Footing (reaction force: N = 33 t)

Soil Bearing Capacity	Size of Footing
20.0 t/m²	1.25m × 1.25m
15.0 t/m²	1.50m × 1.50m
12.5 t/m²	1.65m × 1.65m
10.0 t/m²	1.80m × 1.80m

4) Structural Materials and Design Load

The most commonly adopted local materials shall be adopted for structures. That is reinforced concrete structures, stone masonry for external walls, and concrete blocks (CB) for partition walls. From the floor plan, structural modules of 7 m x 7 m shall be adopted, and dividing these into 3.5 structural spans shall disperse slab weight.

Table 2-21 Design Loads (N/mm²)

	Dead Load	Live Load	Sub-total
Roof	3,750	600	4,350
Classroom	3,850	2,100	5,950
Corridor	4,100	1,300	5,400
Stair	9,050	1,300	10,350

The salt content of coarse aggregate, fine aggregate (less than 0.04% NaCl) and water for concrete (less than 200ppm) shall be checked, and anti-corrosive shall be used if concentration is more.

Table 2-22 Materials Used in Reinforced Concrete

	Contents
Design standard strength	21 N/mm²
Cement	Ordinary Portland Cement
Ad-Mixture	Do not use in cases of on-site mixing
Coarse Aggregate	Crushed Stone
Fine Aggregate	River Sand, mountain sand
Steel Bar (Decorative)	D-10～D-16 ASTEM Grade-40 (equivalent) D-19～D-25 ASTEM Grade-60 (equivalent)

(5) Equipment Plan

1) Plumbing Equipment

In the current situation, 10 out of the 30 target schools receive water from local supply systems, and extension is possible at another five sites. As for the remaining 15 sites, water is carried from lowland community wells by water truck or donkey.

Table 2-23 Availability of Water Supply

	Taiz	Ibb	Total
Already connected	3	7	10
Possible to Connect *	1	4	5
Community Well	14	1	15
Total	18	12	30

Note: * water supply pine lines along the site.

At schools in rural area, since water supply volume is unstable even when local supply systems exist, water shall be supplemented in receiving tanks (galvanized sheet steel, roughly 1 ton), and the deficiency shall be carried in and made up. Moreover, since many schools have no water receiving tanks or toilets, locally commonplace water receiving tanks shall be installed for toilet use in the Project.

Table 2-24 Size of Water Receiving Tanks (Galvanized Sheet Steel)

No. of Toilet Booth	Size of Water Tank	Capacity (ton)
2	φ1.0m × 0.8mL	0.6
3	φ1.0m × 1.2mL	0.9
4	φ1.0m × 1.6mL	1.2
5	φ1.0m × 2.0mL	1.5

Utilization of rainwater tanks was observed some houses at high altitude sites, however no schools. These are not used in low-lying areas (altitude less than 2,000m approx.) because rainfall is small. Rainwater usage can be anticipated at some of the Project sites, however, since children may drink this, it will not plan of this project.

Since there are no sewerage facilities in the target area, rainwater is drained naturally, and toilet sewage and miscellaneous wastewater from hand washing is percolated into local-type percolation drains via simple purification tanks installed underneath toilets. Even at schools not connected to local water supply systems, sewage is treated in the same way by manually flushing with around 1 liter of water after use. Since bacteria decomposition does not progress much at schools where the amount of flush water is small, schools shall provide guidance to ensure that toilet users always flush after use.

2) Electric Equipment

Idle piping and lighting and socket equipment could be seen at most of the schools, however, hardly any schools actually received electricity supply. Double-shift lessons are adopted and adult classes (literacy education) are held in the afternoon when classrooms are idle. Since classrooms are not used at nighttime, schools do not use lighting even if they do have lighting installations.

School equipment that requires electricity consists of loudspeakers used for announcing morning assemblies and the start of lessons and radio cassettes for playing English study tapes. Loudspeakers use car batteries, and radio cassettes use dry cell batteries.

Table 2-25 Situations of Connection of Electricity

	Taiz	Ibb	Total
Already connected	3	4	7
Possible to Connect *	1	6	7
Very far to Elec. Main	14	2	16
Total	18	12	30

Note: * shows the sites that can be connected have overhead lines

In future, when lighting becomes necessary for implementing literacy education in evening, community people shall fit wiring in necessary classroom. In the Project, however, electric equipment shall be not planned from the scope of cooperation.

(6) Construction Materials Plan

When selecting construction materials, locally established general materials and finishing methods shall be adopted and the basic concept shall be to realize facilities that are easy to maintain. Moreover, materials that comply with standard design of the Ministry of Construction Planning Bureau, World Bank and other donors shall be adopted.

Comparison with local methods is as indicated below.

Table 2-26 Comparison of Local and Planned Materials

	Local Method	Planned Method	Comments
<OUTSIDE> Roof	Flat Roof with Asphalt Water –Proofing	Ditto	Ordinal and familiar as a local practice, more durable compared to Mortar Water proofing.
External Wall	Faced Field Rock, CB + mortar paint	Faced Field Rock CB + mortar paint	Ordinal and familiar as a local practice, less wall crack and washable
Doors and Windows	Wooden, Steel, Aluminum	Steel	Ordinal and familiar for houses, wood is scarce, aluminum cost more.
<INSIDE> Floor	Mortar Trowel, Terrazzo Tiles	Mortar Trowel Terrazzo Tiles	Mortal trowel is ordinary in local and low cost, but crack happens easily.
Wall	Mortar Paint	Mortar Paint	Ordinal and familiar as a local practice
Ceiling	Concrete + paint, Mortal paint	Concrete + paint	Ordinary in local, depends on shuttering materials

2.2.2.4 Equipment and Materials Plan

In the official request, 19 items of furniture and 18 items of equipment and materials were included. Taking additionally requested equipment and materials into account, the following plan shall be adopted as the basic concept.

- Furniture, equipment and materials for use in basic education (G1-G9) shall be adopted.
- Priority shall be given to simple equipment and materials that existing teaching staff is able to use.
- Minimum required quantities should be set in accordance with the number of students and curriculums.
- Priority shall be given to equipment and materials that can be procured locally.

(1) Facility Furniture

The Planning Department of MOE uses standard furniture, and the World Bank and KfW/GTZ also adopt furniture according to this standard. In the Project too, corresponding specifications shall be adopted and the plan shall take into account compatibility with existing furniture and convenience of repairs. This furniture is made at plants in Aden and Hoddeida.

Classroom furniture (for classes of 40 students) shall consist of the furniture for students (two persons), furniture for teachers (desk and chair) and blackboards. Dimensions of furniture for students shall be provided 2 sizes (small for G1-G6, large for G4-G9) based on the physiques of students, and small sizes shall be adopted in one-third of number of classrooms. Classroom furniture is also lacking in existing classrooms, but new furniture in the Project shall only be procured for the facilities constructed in the Project.

Administration rooms, which consist of the principal space, staff space and workspace, shall be provided with desks, chairs and shelves. Three of the 30 Project target schools have existing rooms that can still be used; accordingly, new administration rooms will not be provided here. However, the same furniture for administration shall be procured for these three schools too, in order to ensure efficient school operation.

Table 2-27 List of Project Furniture and Equipment

	Furniture	For 1 Classroom (297 rooms)	For 1 School (30 schools)	Remarks
Classroom furniture	Student desks and chairs	20 sets	—	2 students, combined desk and chair: 1200 (W) x 830 (D)
	Teacher desk and chair	1 set	—	Desk: 1200 (W) x 600 (D) Chair: 440 (W) x 500 (D)
	Blackboard	1 unit	—	3000(W)×1200(H)
Administration room furniture	Principal desk and chair	—	1 set	Desk: 1800 (W) x 800 (D) Chair: 600 (W) x 500 (D) Chair: 600 (W) x 500 (D) 2 sets
	Staff desk and chair	—	6 sets	Desk: 1200 (W) x 600 (D) Chair: 440 (W) x 500 (D) 2 sets
	Teaching materials cabinet	—	9 sets	900(W)×400(D)
	Teaching materials work desk	—	1 set	Desk: 1200 (W) x 600 (D) Chair: 440 (W) x 500 (D) 2 sets
	Notice board	—	2 units	2400(W)×900(H)

(2) Education Materials

Requested education materials include a lot of charts as shown in the next table, and types of materials are small with respect to the number of subjects. The surveyed schools have nothing apart from some old charts. These charts are usually stored in principal rooms or storerooms, and many of the schools have no materials in the classrooms.

Locally procurable education materials shall be selected. The Teaching Materials Preparation Department of the Ministry of Education prints textbooks and charts; therefore, maps of Yemen, administrative maps, Arabian language and music materials shall be procured in Yemen and thus omitted from the Project items.

Table 2-28 Requested Equipment and Materials and Standard Curriculums (per classroom)

Requested Materials	Subject to use	Requested Number	Notes
1 Geographical map of Yemen	Social study	1	Standard Curriculum: G1～G6 1Subject: 50min./week Arabic: 9 units Mathematics: 5 units Arts & Crafts: 2～3 units Social study: 2～4 units Science: 3 units Physical training: 2 units Islam: 6～4 units Others
2 Political map of Yemen	Social study	1	
3 Chart of Arabic numbers	Arabic	1	
4 Chart of Arabic letters	Arabic	1	
5 Charts showing basic words	Arabic	4	
6 Balance scales & set of weights	Science	1	
7 Plastic measures to teach volume, etc.	Science･Math	6	
8 Set squares, wooden, 45 & 60 degree.	Science･Math	2	
9 Protractors for chalk	Science･Math	2	
10 Globe of world - Political	General	1	
11 Globe of world - Geographical	General	1	
12 Yemeni musical instruments	General	1	
13 Magnetic wallboard	General	1	
14 Magnetic shapes	General	1	
15 Basic wind-speed kit	General	1	
16 Magnifying glass	General	1	
17 Sets of Arabic letters on plastic	General	10	
18 Sets of Arabic numbers on plastic	General	10	

When selecting education materials, including substitute items for additionally requested basic laboratory equipment, selection was made primarily based on science and math subjects. The requested quantity was one set for all classrooms, however, in the Project one set for each school has been set assuming the method whereby teachers borrow materials from storage as needed.

Table 2-29 Planned Teaching Materials — (for every one School)

	Name of Equipment	Subject	Related study	Qty
1	Map of The World	Social Study	Study of geographical world	1
2	Globe	Social Study	Study of geographical world	1
3	Blackboard Drawing Set	Math	Study of angel, figure, shape	1
4	Balance – Double Pan	Science･Math	Study of weight (solid)	1
5	Set of Beaker (Plastic)	Science･Math	Study of volume (fluid)	1
6	Thermometer – Wall type	Science	Study of air temperature	1
7	Magnetic Compass	Science	Study of geographical direction	1
8	Magnet Set	Science	Study of magnetic field and force	1
9	Wall Clock Model	Science	Study of time and timing device	1
10	Set of Mirror	Science	Study of light and reflections	1
11	Magnifier	Science	Study and observe micro object	1
12	Set of Science Charts	Science	Study of body and science	1

(3) Additionally Requested Equipment and Materials (Laboratory Equipment)

The additionally requested basic laboratory equipment and materials were 1,430 items in total and were mainly intended for use in high school education. Upon carrying out selection according to the criteria of, 1) avoiding overlapping, 2) applying to basic education, and 3) avoiding maintenance difficulties, 57 items are considered as targets.

Table 2-30 Items of Basic Laboratory Equipment (Additional Request)

	Requested Quantity	Considered Quantity
Physics	1281 items	27 items
Biology	64 items	11 items
General Science	85 items	19 items
Total	1430 items	57 items

Meanwhile, in the site surveys, it was found that even at those schools in the urban part of Taiz that possess laboratories, basic laboratory equipment is hardly used at all. It is thought first necessary to provide training to science teachers and laboratory assistant (who allocates every science laboratory as MOE regulations) how to instruct experiments for student's especially local city and rural area too.
Therefore, these items were removed from the scope of cooperation in the Project.

2.2.3 Basic Design Drawing

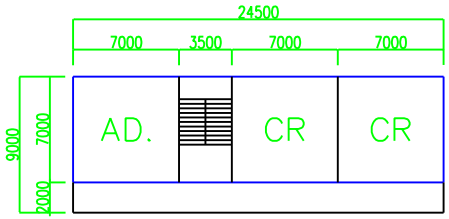
1. Standard Plan 1
2. Standard Plan 2
3. Standard Plan 3
4. Typical Plan —Type 9L
5. Typical Elevation – Type 9L
6. Typical Plan – Type 9S
7. Typical Elevation – Type 9S
8. Toilet Plan
9. Furniture Layout Plan

Table 2-31 List of Building Type and Floor Area

No.	Code No.	SCHOOL NAME	CLASSROOM BLDG. (㎡)					TOILET BLG. (㎡)	
			Type	No. of Class -rooms	No. of Admi. room	Building Area	Floor Area	Type	Floor Area
1	TZ-01	Al Ihsan School – Damnah Khaeer	9S	9	1	346.5	693.0	6A	25
2	TZ-02	A School in Ad-Demnah Al Badw	5S	5	1	220.5	441.0	6B	25
3	TZ-03	Tareq Ibn Ziyad Al Buraihi School	9S	9	1	346.5	693.0	6B	25
4	TZ-04	Ouqba Ben Nafa'a School for Girls	9S	9	1	346.5	693.0	6A	25
5	TZ-05	Alnahada Badeyah School	7S	7	1	283.5	567.0	4	20
6	TZ-06	Khaled Ibn Al Waleed School Al Ag'ood	11L	11	1	409.5	819.0	6B	25
7	TZ-08	Al Wafa Maylat School for Girls	9L	9	1	346.5	693.0	6A	25
8	TZ-09	Othman Bin Afa'an School	7S	7	1	283.5	567.0	4	20
9	TZ-10	Juba (Jeba) Girls School	9L	9	1	346.5	693.0	6A	25
10	TZ-12	Khaled Ibn Al Walid-Al Dabab	5S	6	0	220.5	441.0	4	20
11	TZ-13	Muad Bin Jabal- Al Gherrama	9S	9	1	346.5	693.0	10	35
12	TZ-14	Al Wahdah – Nawayha	9S	9	1	346.5	693.0	10	35
13	TZ-15	Al Kifah Girls School - Al Ramadah	9S	9	1	346.5	693.0	6A	25
14	TZ-16	Al Fawz School	5L	6	0	220.5	441.0	4	20
15	TZ-17	Al Fath Al Uzlah School	9S	9	1	346.5	693.0	6B	25
16	TZ-18	Ammar Bin Yaser	13L	13	1	472.5	945.0	8	30
17	TZ-19	An Nnour Alajoud Girls School	9L	9	1	346.5	693.0	6A	25
18	TZ-20	Ahmed Bin Alwan	9S	9	1	346.5	693.0	10	35
Sub-total: Taiz Governorate				154	16	5922.0	1,1844.0		465.0
1	IB-01	Hard Najd Al Sadm School - Al Sadm	9S	9	1	346.5	693.0	6B	25
2	IB-02	Al-Najd Al-Ahmar	9S	9	1	346.5	693.0	6B	25
3	IB-03	Al Fatesh School - Souk Al Khamis	9L	9	1	346.5	693.0	6B	25
4	IB-05	26 September School	11S	11	1	409.5	819.0	6B	25
5	IB-06	Al-Diya School - Bait Yahya Aubadi	7S	7	1	283.5	567.0	6B	25
6	IB-08	Al Ikhlass School – Sahaban	9S	9	1	346.5	693.0	6B	25
7	IB-09	Al Qaryaat School - City of Ibb	13L	13	1	472.5	945.0	6A	25
8	IB-10	Al Usama Bin Zaid School	9S	9	1	346.5	693.0	6B	25
9	IB-13	Wadi Bana School	9S	9	1	346.5	693.0	6B	25
10	IB-16	Al Imam Al Shokhany School	15L	15	1	567.0	1,134.0	6B	25
11	IB-17	Mugam'ah Al Wehdah School - As Subrah	9L	9	1	346.5	693.0	6B	25
12	IB-19	Al Ra'eeyah School - City of Ibb	7S	8	0	283.5	567.0	4	20
Sub-total: Ibb Governorate				117	11	4441.5	8,883.0		295.0
TOTAL				271	27	10363.5	20,727.0		760.0

5S

	sqm
CLASS RM.	245.0
ADMI.	49.0
CORRIDOR	98.0
STAIR	49.0
TOTAL	441.0



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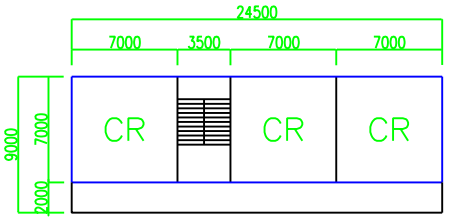

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5L

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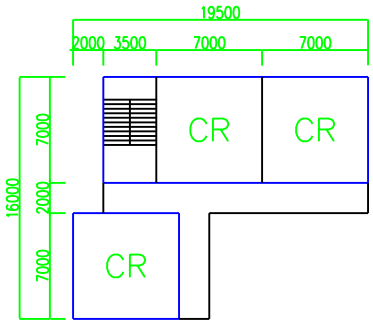
STAIR	49.0
TOTAL	441.0



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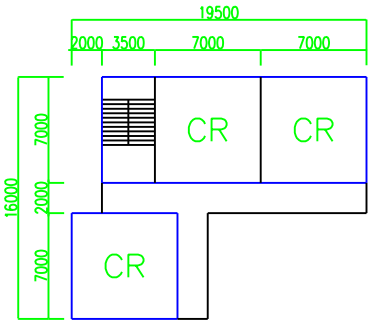

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7S

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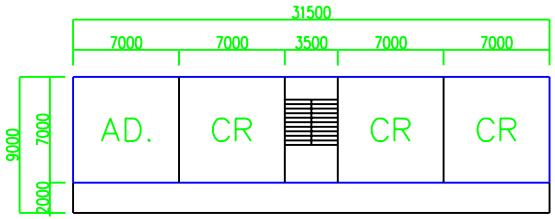
CORRIDOR	126.0
STAIR	49.0
TOTAL	567.0



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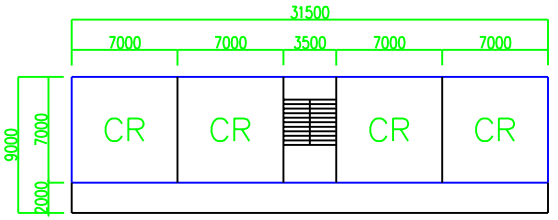

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9S

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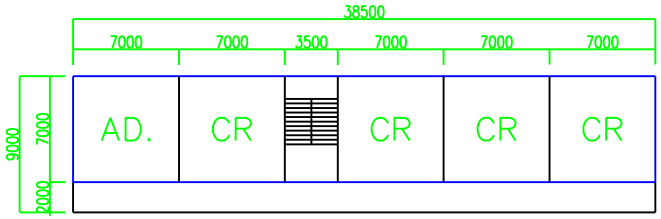
ADMI.	49.0
CORRIDOR	154.0
STAIR	49.0
TOTAL	693.0



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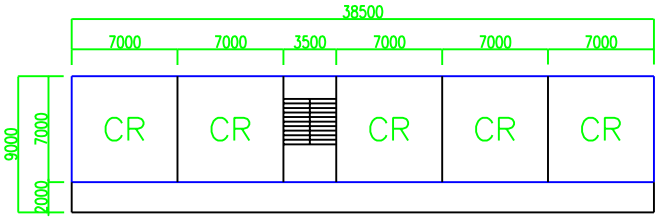

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Model plan-1

9L

	sqm
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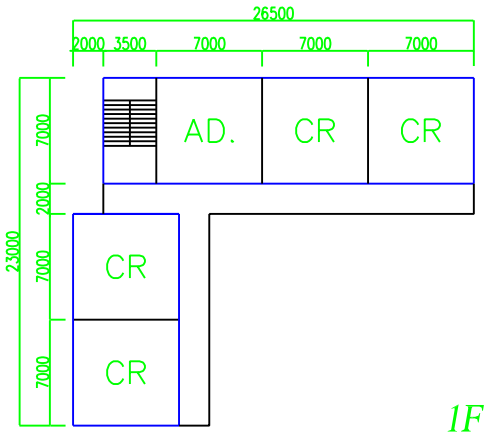
ADMI.	49.0
CORRIDOR	154.0
STAIR	49.0
TOTAL	693.0



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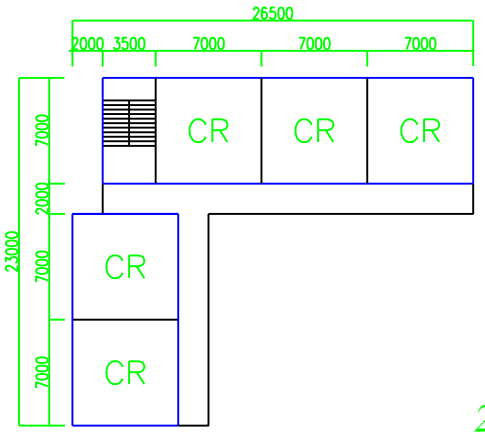

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11S

	sqm
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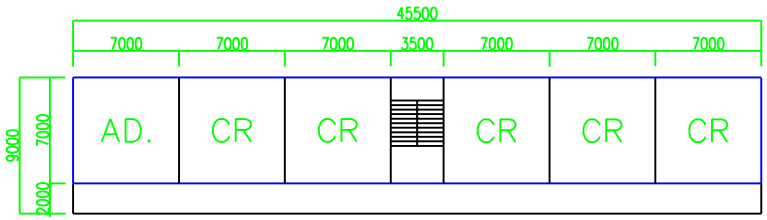
ADMI.	49.0
CORRIDOR	182.0
STAIR	49.0
TOTAL	819.0



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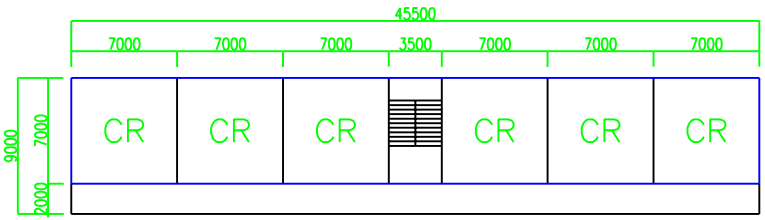

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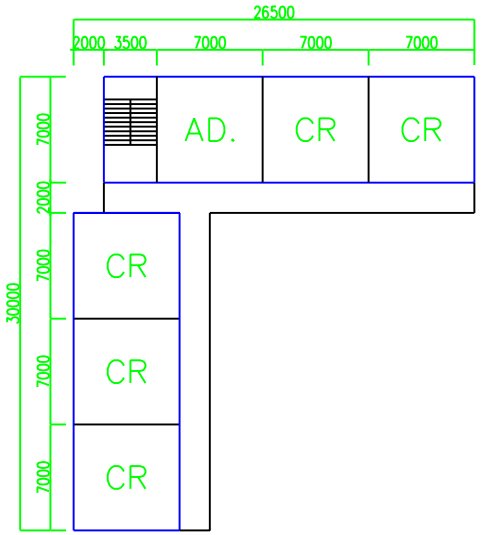
11L

	sqm
CLASS RM.	539.0
ADMI.	49.0
CORRIDOR	182.0
STAIR	49.0
TOTAL	819.0



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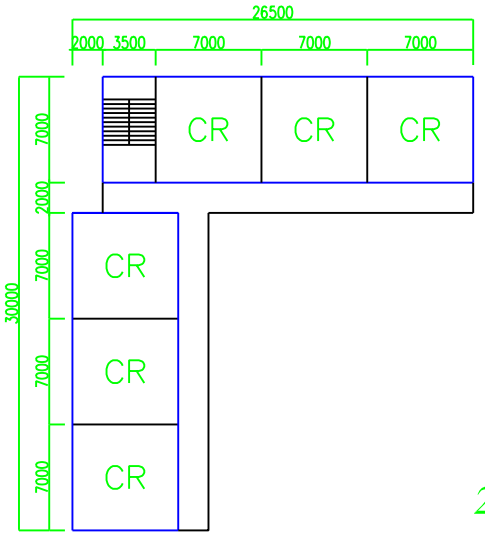


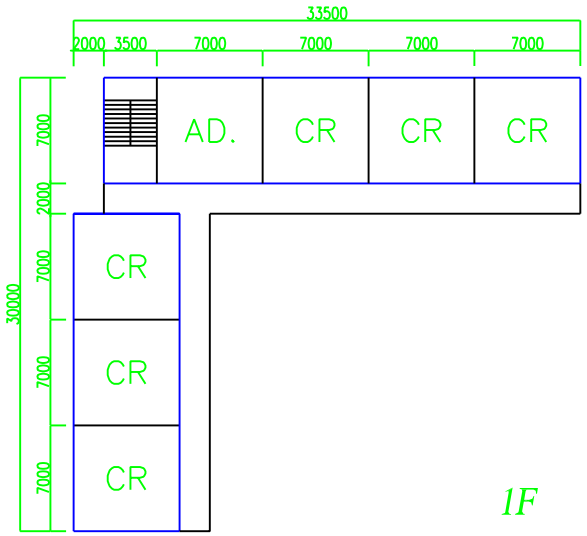
2F

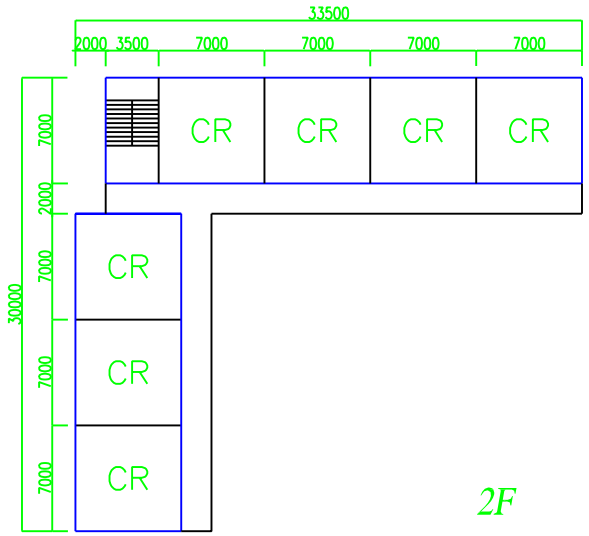
Model plan-2

The Project for Construction of Basic Schools in the Republic of Yemen

13L

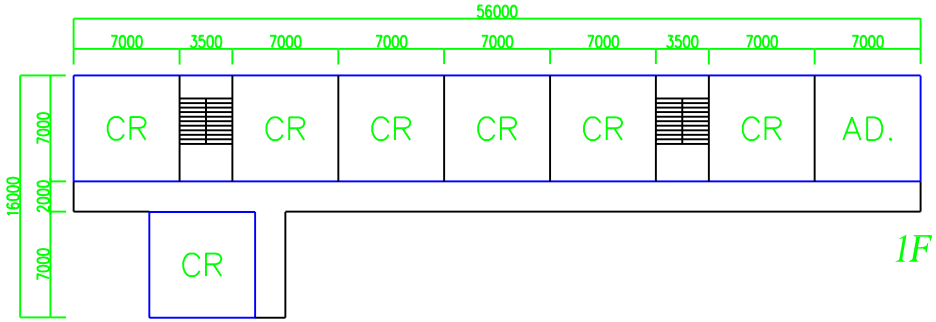
	sqm
CLASS RM.	637.0
ADMI.	49.0
CORRIDOR	210.0
STAIR	49.0
TOTAL	945.0

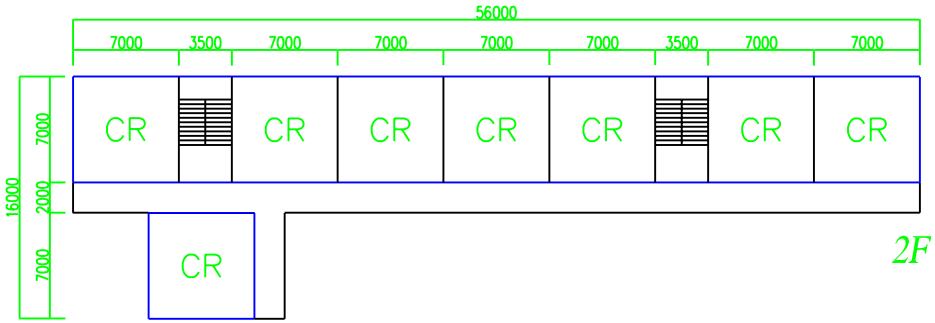




15L

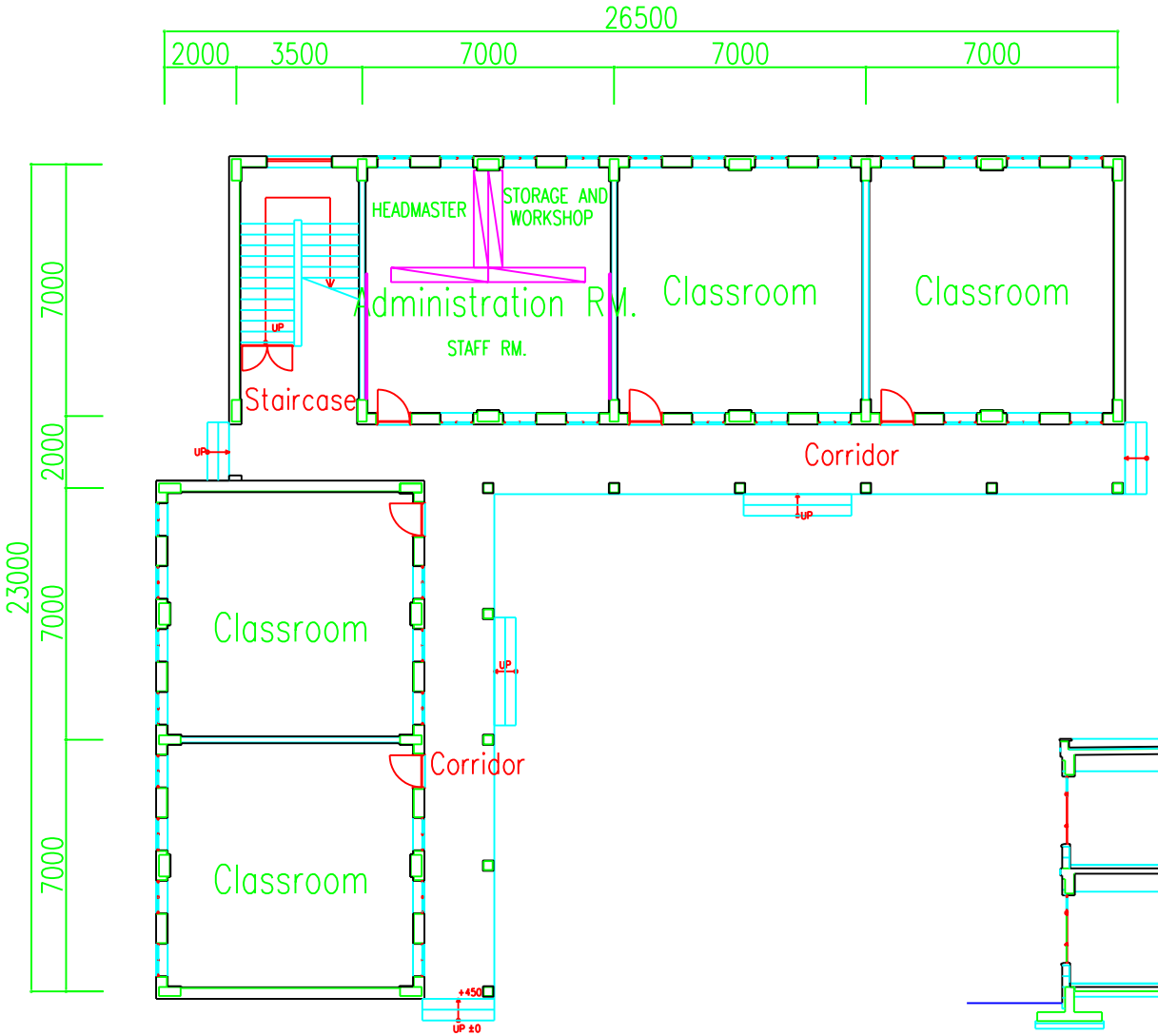
	sqm
CLASS RM.	735.0
ADMI.	49.0
CORRIDOR	252.0
STAIR	98.0
TOTAL	1134.0



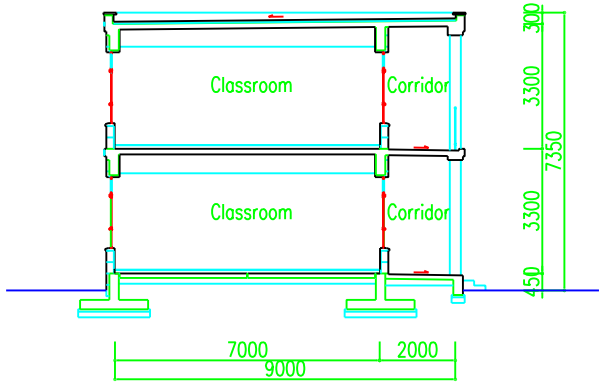


Model plan-3

TYPE 9L

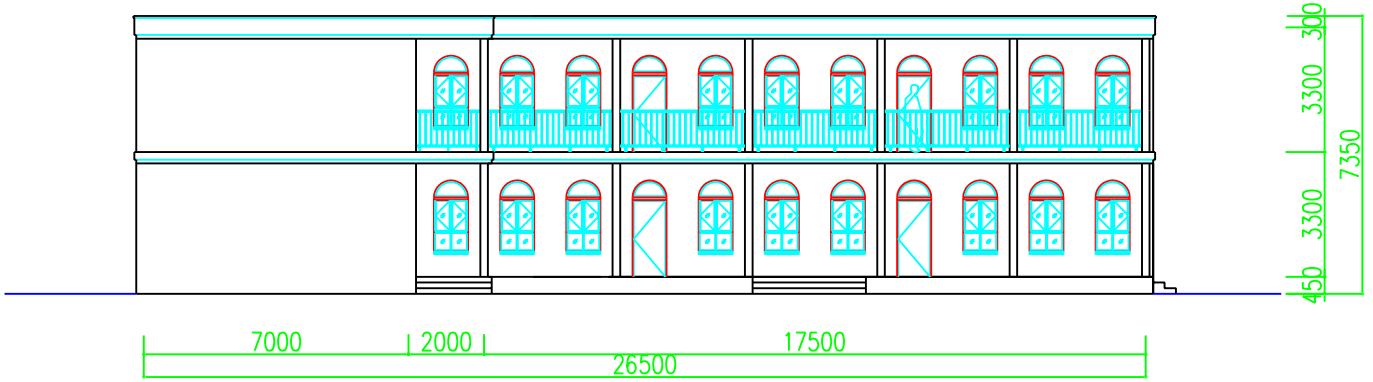


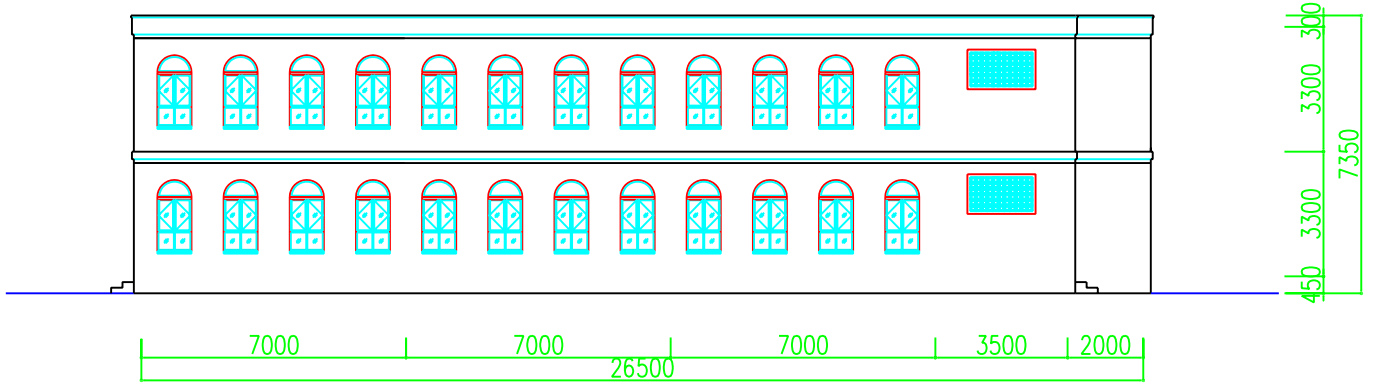
Typical Plan (9L) 1/200



Wall Section 1/200

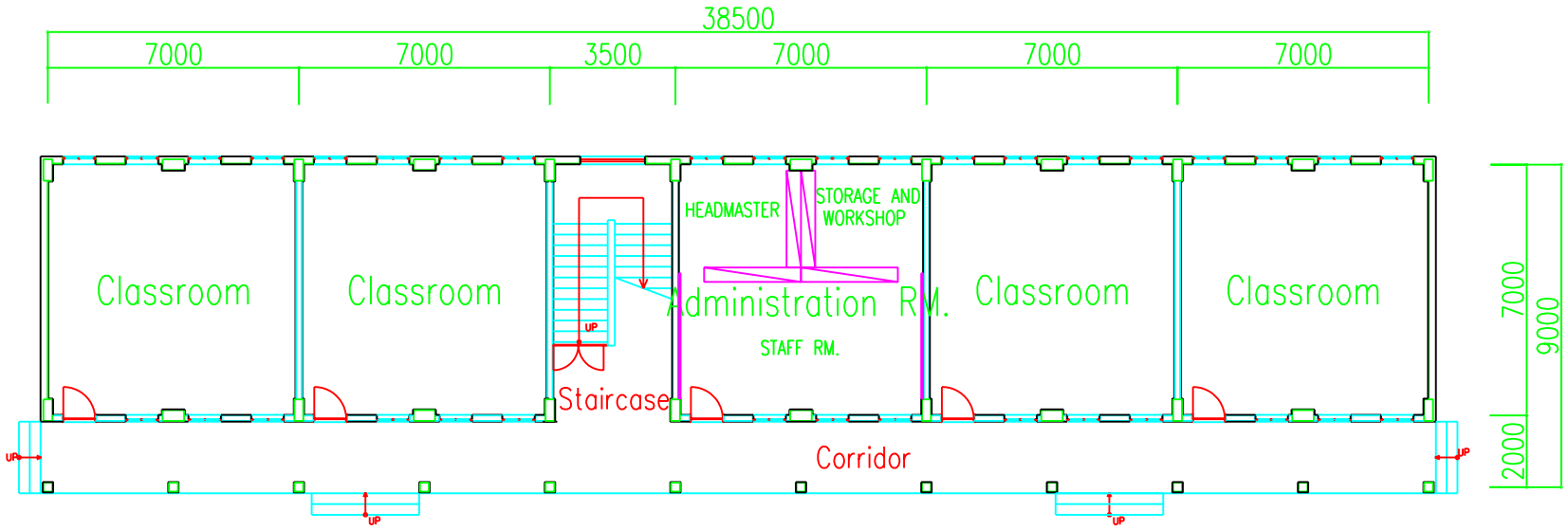
TYPE 9L



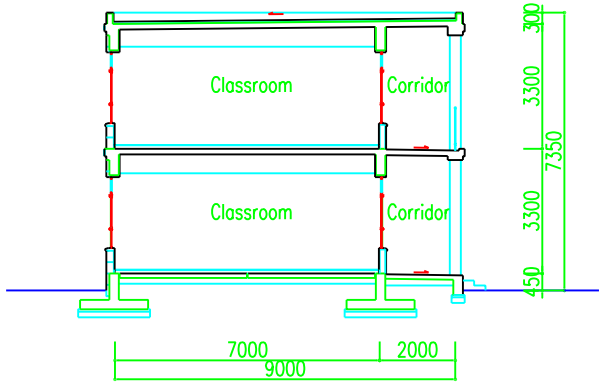


Typical Elevations (9L) 1/200

TYPE 9S

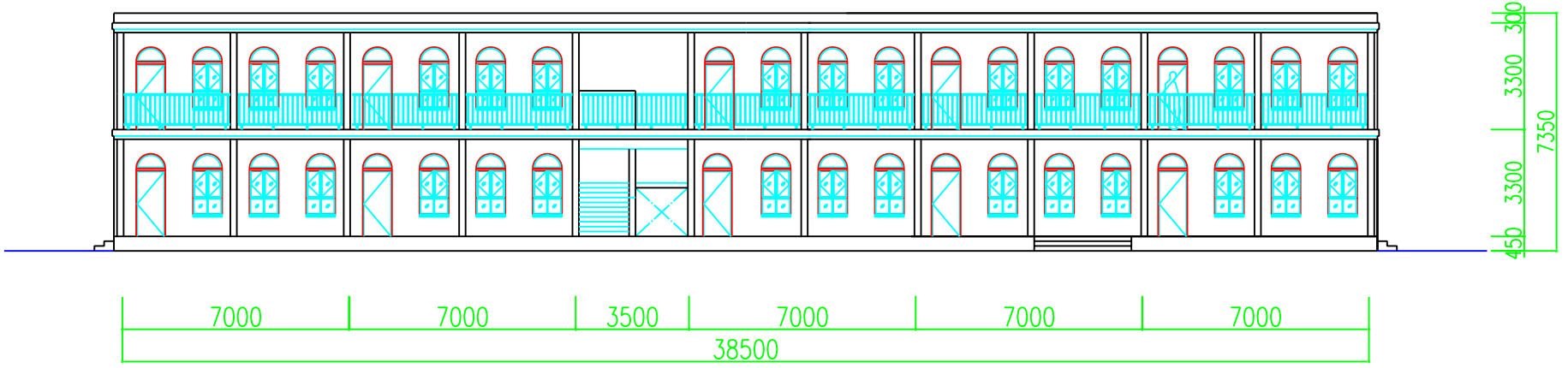


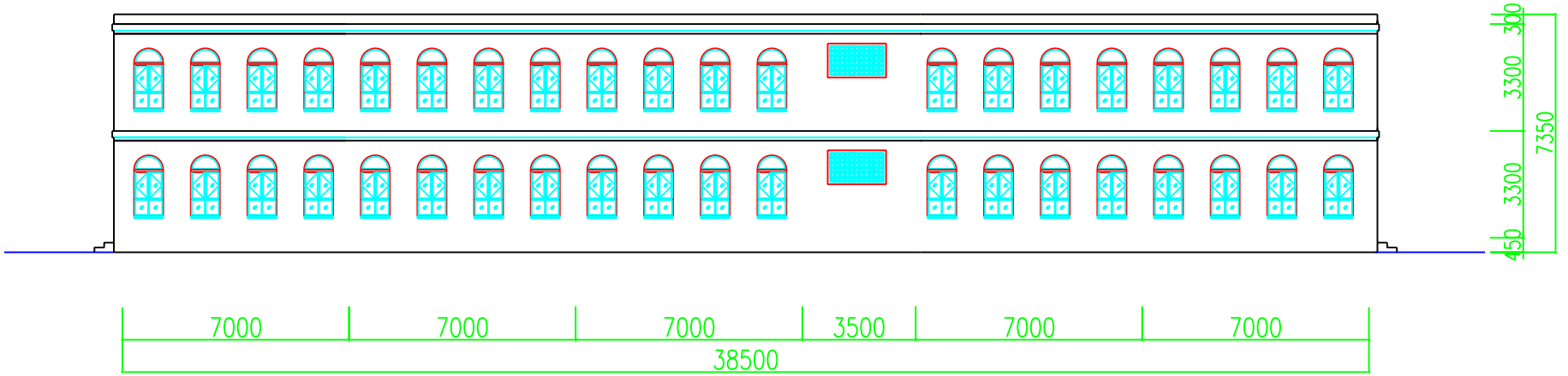
Typical Plan (9S) 1/200



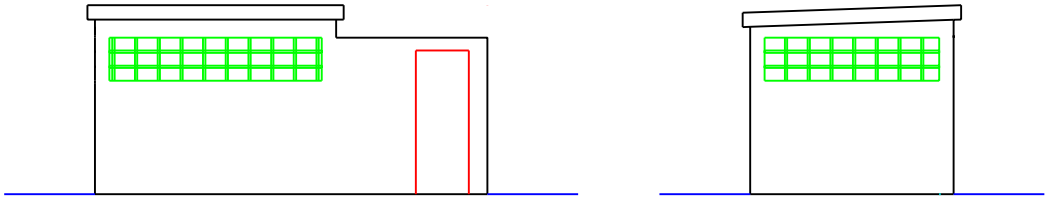
Wall Section 1/200

TYPE 9S

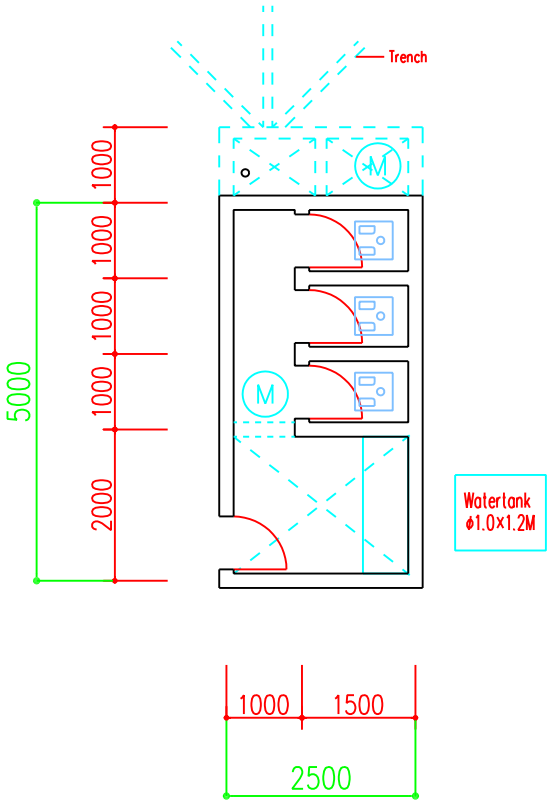




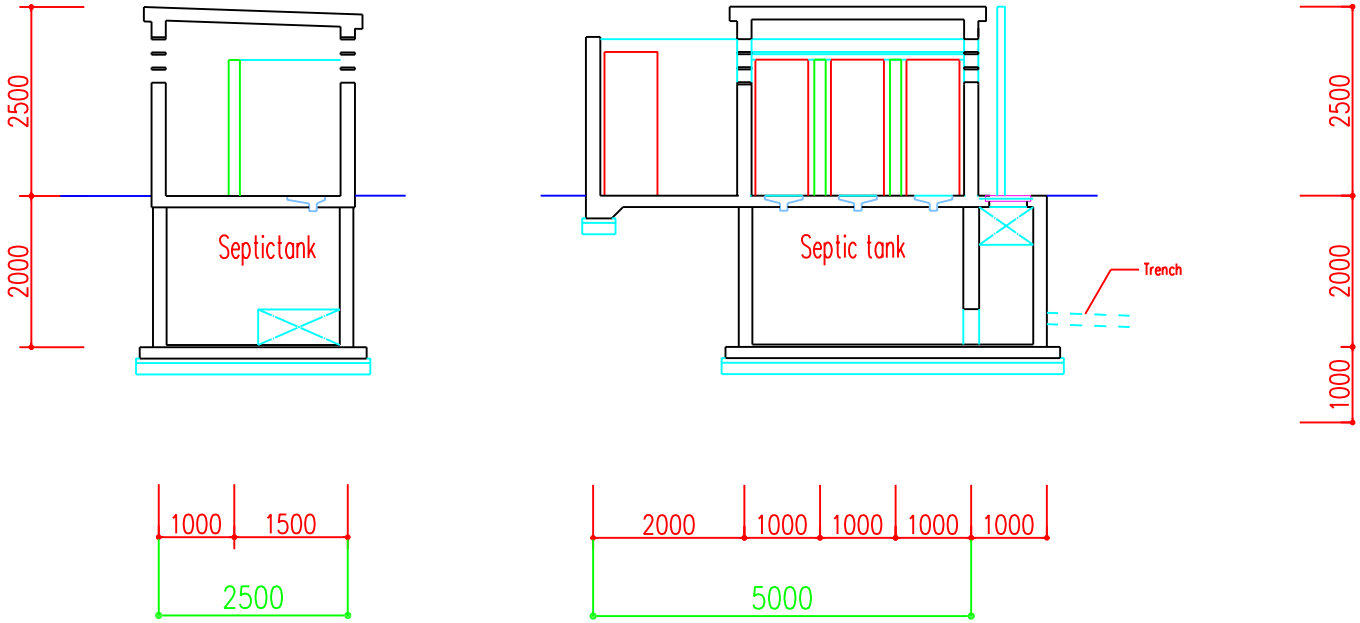
Typical Elevations (9S) 1/200



Elevations



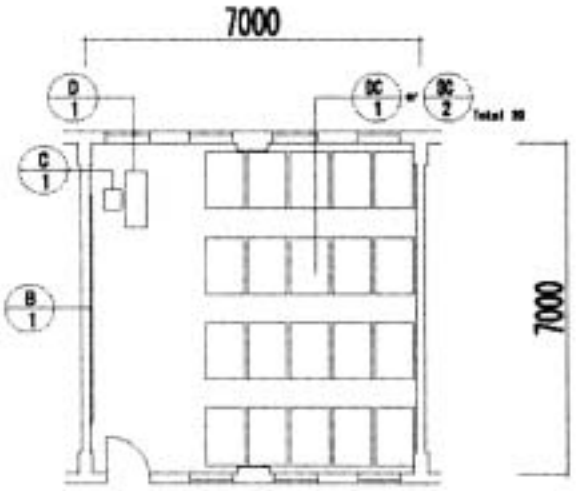
Plan



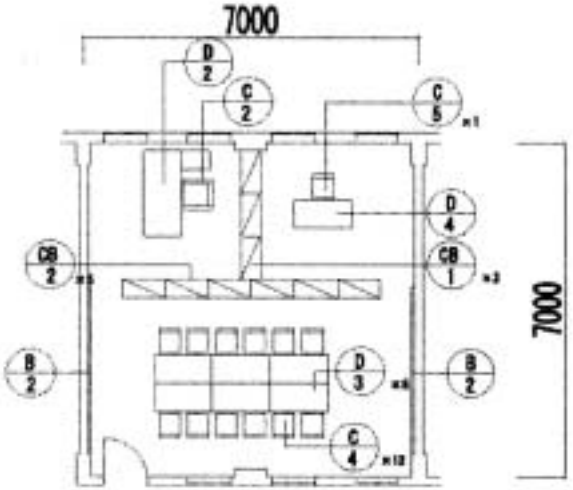
Sections

WC BLOCK (3C) 1/100

FURNITURE LAYOUT PLAN



Classroom 40 Seats



Administration RM.

					FURNITURE FOR CLASSROOM					FURNITURE FOR ADMINISTRATION								
No.	Code No.	TYPE OF SCHOOL	NUMBER OF CLASSROOM	ADMINISTRATION	DESK-BENCH SMALL	DESK-BENCH LARGE	DESK FOR TEACHER	CHAIR FOR TEACHER	BLACKBOARD	DESK FOR HEADMASTER	CHAIR FOR HEADMASTER	DESK FOR STAFFS	CHAIR FOR STAFFS	WORKSHOP DESK(ADMIN)	WORKSHOP CHAIR(ADMIN)	CABINET	CABINET WITH LOCKS	NOTICE BOARD
IBB GOVERNORATE					**DC-1**	**DC-2**	**D-1**	**C-1**	**B-1**	**D-2**	**C-2**	**D-3**	**C-4**	**D-4**	**C-5**	**CB-1**	**CB-2**	**B-2**
1	IB-01	9S	9	1	60	120	9	9	9	1	1	6	12	1	1	3	6	2
2	IB-02	9S	9	1	60	120	9	9	9	1	1	6	12	1	1	3	6	2
3	IB-03	9L	9	1	60	120	9	9	9	1	1	6	12	1	1	3	6	2
4	IB-05	11S	11	1	60	160	11	11	11	1	1	6	12	1	1	3	6	2
5	IB-06	7S	7	1	40	100	7	7	7	1	1	6	12	1	1	3	6	2
6	IB-08	9S	9	1	60	120	9	9	9	1	1	6	12	1	1	3	6	2
7	IB-09	13L	13	1	80	160	13	13	13	1	1	6	12	1	1	3	6	2
8	IB-10	9S	9	1	60	120	9	9	9	1	1	6	12	1	1	3	6	2
9	IB-13	9S	9	1	60	120	9	9	9	1	1	6	12	1	1	3	6	2
10	IB-16	15L	15	1	80	220	15	15	15	1	1	6	12	1	1	3	6	2
11	IB-17	9L	9	1	60	120	9	9	9	1	1	6	12	1	1	3	6	2
12	IB-19	7S	8	0	40	120	8	8	8	1	1	6	12	1	1	3	6	2
	Sub-total		117	11	720	1620	117	117	117	12	12	72	144	12	12	36	72	24
Taiz GOVERNORATE					**DC-1**	**DC-2**	**D-1**	**C-1**	**B-1**	**D-2**	**C-2**	**D-3**	**C-4**	**D-4**	**C-5**	**CB-1**	**B-2**	**B-2**
1	TZ-01	9S	9	1	60	120	9	9	9	1	1	6	12	1	1	3	6	2
2	TZ-02	5S	5	1	40	60	5	5	5	1	1	6	12	1	1	3	6	2
3	TZ-03	9S	9	1	60	120	9	9	9	1	1	6	12	1	1	3	6	2
4	TZ-04	9S	9	1	60	120	9	9	9	1	1	6	12	1	1	3	6	2
5	TZ-05	7S	7	1	40	100	7	7	7	1	1	6	12	1	1	3	6	2
6	TZ-06	11L	11	1	60	160	11	11	11	1	1	6	12	1	1	3	6	2
7	TZ-08	9L	9	1	60	120	9	9	9	1	1	6	12	1	1	3	6	2
8	TZ-09	7S	7	1	40	100	7	7	7	1	1	6	12	1	1	3	6	2
9	TZ-10	9L	9	1	60	120	9	9	9	1	1	6	12	1	1	3	6	2
10	TZ-12	5S	6	0	40	80	6	6	6	1	1	6	12	1	1	3	6	2
11	TZ-13	9S	9	1	60	120	9	9	9	1	1	6	12	1	1	3	6	2
12	TZ-14	9S	9	1	60	120	9	9	9	1	1	6	12	1	1	3	6	2
13	TZ-15	9S	9	1	60	120	9	9	9	1	1	6	12	1	1	3	6	2
14	TZ-16	5L	6	0	40	80	9	9	9	1	1	6	12	1	1	3	6	2
15	TZ-17	9S	9	1	60	120	6	6	6	1	1	6	12	1	1	3	6	2
16	TZ-18	13L	13	1	80	160	9	9	9	1	1	6	12	1	1	3	6	2
17	TZ-19	9L	9	1	60	120	13	13	13	1	1	6	12	1	1	3	6	2
18	TZ-20	9S	9	1	60	120	9	9	9	1	1	6	12	1	1	3	6	2
	Sub-total		154	16	1000	2080	154	154	154	18	18	108	216	18	18	54	108	36
	Total		271	27	1720	3700	271	271	271	30	30	180	360	30	30	90	180	60