

Part II

Survey Results of Phase II

- 1. Existing Water Quality Analysis Data
- 2. Result of Solid Waste Quantity and Quality Survey (Phase II)
- 3. Result of Time and Motion Survey
- 4. Result of Market Survey on Recyclable Waste
- 5. Household Behavior and Attitude Survey on SWM
- 6. Flood Analysis and Study

**1. Existing Water Quality Analysis
Data**

1. EXISTING WATER QUALITY ANALYSIS DATA

Various water quality studies were conducted in the Kathmandu Valley especially on Bagmati River and its tributaries, and these studies extend from the periodical/ continuous base monitoring to spot base surveys for specific themes such as thesis and research works.

Among the existing studies of water quality for Bagmati River system, summarized results of the periodical monitoring and spot survey covering widely river system are shown in Tables A.8-1 to 6 focusing on BOD as typical indicator of water pollution. The topics implied from the tables are enumerated below, although some data are considered to be less reliable.

- The water quality of the river system is in general polluted except the samples taken at uppermost locations. The water quality is highly polluted in urban area especially within the Ring Road.
- It can be understood that the water quality in wet season is better due to dilution effect than that in dry season, although some data do not indicate this situation.
- The water quality had been already worse and polluted before closure of Gokarna LFS (2000) and commencement of river dumping according to the existing data. This implies that the domestic and/or industrial waste water are bigger contributors rather than the waste dumping.

Table 1-1 Analysis of Bagmati River Water (BOD) (1993-1998)

Unit: mg/L

No.	Location	1993						1994			1995			1996	1997			1998	
		Feb	Mar	May	June	Aug	Nov	Feb	May	Sep	Feb	May	Sep	Sep	Mar	Aug	Dec	June	Dec
1	Sundarijal	4.5	2.0	1.6	2.0	1.5	2.4	1.1	1.1	-	3.1	7.2	4.8	-	13.2	-	7.2	-	6.3
2	Gokarna	2.4	1.2	3.0	4.8	4.5	3.4	3.9	5.4	-	7.5	120.0	3.6	-	120.0	-	7.8	-	33.0
3	Jorpati	8.0	6.9	3.0	5.7	3.0	5.4	3.9	6.3	-	3.6	130.0	39.0	-	140.0	-	24.0	-	60.0
4	Gaurighat	22.2	10.2	6.0	7.8	4.2	5.4	23.4	11.1	-	42.6	150.0	15.0	-	180.0	-	45.0	-	45.0
5	Sinamangal	18.5	10.2	9.0	9.6	7.2	6.0	21.6	8.9	-	18.9	140.0	21.0	-	170.0	-	45.0	-	39.0
6	Min Bhawan	18.3	7.8	14.5	12.6	5.4	9.0	37.8	-	-	57.0	110.0	36.0	-	210.0	-	45.0	-	48.0
7	Sankhamol	9.8	8.4	7.2	6.0	6.0	9.0	7.8	-	-	7.8	170.0	15.0	-	190.0	-	24.0	-	27.0
8	Thapathali	19.6	12.3	12.0	9.0	7.2	9.6	13.2	-	-	17.1	160.0	18.0	-	130.0	-	42.0	-	-
9	Pachali	21.4	37.8	13.5	10.2	9.0	8.4	54.0	-	-	30.6	230.0	36.0	-	190.0	-	66.0	-	54.0
10	Balkhu Khol	21.6	30.6	32.5	6.6	-	-	-	-	-	40.2	-	42.0	-	200.0	-	54.0	-	84.0
11	Sundarighat	20.3	43.8	42.0	19.2	12.6	13.8	16.0	-	-	52.8	180.0	51.0	-	230.0	-	39.0	-	54.0
12	Khokana	20.0	-	12.0	9.0	12.6	8.4	30.6	-	-	13.8	190.0	36.0	-	-	-	-	-	-

Source: Department of Hydrology and Meteorology

Table 1-2 Analysis of Bishnumati River Water (BOD) (1993-1998)

Unit: mg/L

No.	Location	1993						1994			1995			1997			1998	
		Jan	Mar	May	June	Aug	Nov	Feb	June	Sep	Feb	June	Sep	Apr	Aug	Dec	June	Dec
1	Sibapuri	4.9	5.0	3.2	1.7	1.8	5.1	5.6	-	-	6.1	9.0	5.7	220.0	-	-	-	-
2	Vishnupalika	4.0	3.4	2.0	1.1	1.6	1.6	2.4	-	-	3.6	7.8	2.1	20.0	-	-	-	-
3	Budhanilkantha	6.5	4.4	4.5	1.9	3.6	3.4	6.3	-	-	3.7	10.8	7.8	60.0	-	-	-	-
4	Gongabu	4.8	4.2	4.2	3.6	4.0	4.5	-	-	-	8.1	110.0	21.0	-	-	-	-	-
5	Balaju New Bus Park	15.2	3.3	6.0	3.0	4.8	4.8	4.2	-	-	5.4	150.0	33.0	40.0	-	-	-	-
6	Balaju Bridge	18.1	3.0	7.8	5.7	8.4	10.8	7.8	-	-	-	130.0	21.0	10.0	-	-	-	-
7	Soba Bhagbati	13.3	6.3	13.8	21.6	4.8	13.2	12.6	-	-	7.8	100.0	81.0	30.0	-	-	-	-
8	Kankeswaree	24.2	25.8	18.0	13.2	7.2	15.6	18.6	-	-	24.6	130.0	9.0	30.0	-	-	-	-
9	Hiumat	27.4	114.1	31.5	12.6	9.0	24.0	69.6	-	-	31.8	90.0	24.0	30.0	-	-	-	-
10	Tekudovan	24.0	135.8	52.5	20.4	10.2	63.0	69.0	-	-	27.0	110.0	30.0	10.0	-	-	-	-
11	Shangla Khola	7.7	6.3	3.6	5.1	4.2	5.4	2.0	-	-	-	150.0	18.0	-	-	-	-	-

Source: Department of Hydrology and Meteorology

Table 1-3 Analysis of Dhobi River Water (BOD) (1993-1998)

Unit: mg/L

No.	Location	1993						1994			1995			1997		1998	
		Feb	Mar	May	July	Aug	Dec	Feb	May	Sep	Feb	June	Sep	Apr	Aug	Jan	Dec
1	Dhumbarahi Chabahil	36.0	25.8	13.8	22.2	-	21.0	16.5	25.5	-	7.2	50.0	39.0	140.0	-	150.0	-
2	Sano GaucharanSiphal	13.8	12.0	14.4	15.0	-	18.0	16.2	18.0	-	18.6	35.0	42.0	80.0	-	150.0	-
3	Maitidevi	40.0	17.6	31.2	42.0	-	48.0	55.8	19.5	-	30.0	35.0	39.0	70.0	-	186.0	-
4	Bijulibajar	38.2	98.0	35.1	31.5	-	61.8	74.4	13.5	-	34.8	35.0	24.0	106.0	-	222.0	-

Source: Department of Hydrology and Meteorology

Table 1-4 Analysis of Manohara River Water (BOD) (1993-1998)

Unit: mg/L

No.	Location	1993						1994			1995			1997		1998	
		Feb	Mar	May	July	Aug	Dec	Feb	May	Sep	Feb	June	Sep	Apr	Aug	Jan	Dec
1	Jadibuti Kendra	9.3	7.5	3.6	3.0	-	7.8	4.8	16.8	-	7.5	55.0	27.0	20.0	-	132.0	-
2	Balkumari Bridge	6.0	98.0	4.8	3.9	-	4.8	3.6	8.4	-	8.1	50.0	27.0	50.0	-	96.0	-

Source: Department of Hydrology and Meteorology

Table 1-5 Analysis of Hanumante River Water (BOD) (1993-1998)

Unit: mg/L

No.	Location	1993						1994			1995			1997		1998	
		Feb	Mar	May	July	Aug	Dec	Feb	May	Sep	Feb	June	Sep	Apr	Aug	Jan	Dec
1	Thimi	10.0	96.0	6.0	7.8	-	62.4	33.0	11.3	-	8.4	60.0	33.0	196.0	-	174.0	-
2	Balkot Kausaltar	7.2	31.0	7.8	9.6	-	13.8	15.0	21.0	-	10.8	55.0	39.0	170.0	-	138.0	-

Source: Department of Hydrology and Meteorology

Table 1-6 Water Quality Analysis of the Kathmandu Valley

Unit: mg/L

No.	Location		1999			2000		2001
	River/Khola	Location	May	July	Oct	Aug	Nov	Feb
1	Hanumante Khola	Just before its confluence with Manohara Khola, about 120 m North of the Imadol	34.0	6.4	4.0	17.0	118.0	127.0
2	Manohara Khola	Just upstream of its confluence with Hanumante Khola, about 120 m North of the	22.0	1.8	2.0	15.0	29.0	32.0
3	Bagmati River-G	Temple.	6.0	1.1	3.0	3.0	13.0	12.0
4	Bagmati River-UGB	About 200 m upstream of the Gorkana bridge.	30.0	4.8	4.0	12.0	18.0	19.0
5	Bagmati River-DGB	bridge.	28.0	5.4	4.0	14.0	24.0	36.0
6	Bagmati River-PD	Just downstream of Pashupati Dam, near the bridge of the Ring Road.	105.0	18.2	10.0	20.0	72.0	147.0
7	Bagmati River-MB	About 500 m South of the Bagmati bridge at the Min Bhawan.	108.0	21.5	9.0	47.0	79.0	219.0
8	Bagmati River-S	Just downstream of its confluence with Manohara Khola, near Sankhamul.	48.0	15.8	9.0	32.0	106.0	189.0
9	Dhobi Khola	Just before its confluence with Bagmati River at Naya Baneswor.	82.0	13.7	20.0	42.0	123.0	150.0
10	Bagmati River	Just downstream of its confluence with Bagmati River.	58.0	16.3	14.0	30.0	75.0	81.0
11	Tukucha Khola	Near Blue star Hotel. Before its confluence with Bagmati River.	63.0	22.9	42.0	51.0	148.0	302.0
12	Bagmati River-DTK	Just downstream of its confluence with Tukucha Khola.	82.0	23.2	16.0	48.0	82.0	165.0
13	Bishnumati Khola-URF	Upstream side, just North of the Ring Road.	30.0	5.7	3.0	10.0	10.0	31.0
14	Bishnumati Khola-UK	Upstream side at Kalimati, North of the Bishnumati Bridge.	63.0	11.3	7.0	40.0	70.0	187.0
15	Bagmati River-DTK	Sundarighat near Tribhuvan University gate at Kirtipur, downstream of the confluence of Bagmati River with Bishnumati Khola.	105.0	12.4	13.0	55.0	66.0	204.0
16	Nkhu Khola	Just before its confluence with Bagmati River.	12.0	6.5	2.0	6.0	2.0	14.0
17	Bagmati River-K	At Khokana, few kilometers South of Chobhar and near the Leprosy Hospital.	28.0	11.2	4.0	20.0	74.0	198.0

Source: ADB, 2000 "Urban Water Supply Reforms in the Kathmandu Valley, Wastewater Management Plan Assessment -Volume II-"

The following tables are the data of leachate quality analysis at Gokarna LFS obtained under its operation phase. These data implies that organic pollution and electric conductivity (alkalinity) are highly observed regarding leachate of anaerobic type LFS. Whereas, the detection of heavy metals are comparatively low.

Table 1-7 Leachate Quality Analyzed in 1988 at Gokarna LFS

Parameters/Date	June 28	Aug 4	Aug 12	Aug 18	Aug 25	Sep 1
pH	7.32	7.49	7.56	7.69	7.77	7.64
BOD5 (ppm)	9400	5866	3800	4500	3150	3300
COD (ppm)	13305	9000	5518	6140	4399	4528
Ammonia-N (ppm)	513	408	500	538	500	450
Conductivity (us/cm)	12830	10280	8860	10690	9430	9440
Chloride (ppm)	2079	11286	4357	3267	2970	2921

Source: SWMRMC

**Table 1-8 Leachate Quality Analyzed in
December 1988 at Gokarna LFS**

Parameters	Unit	Value
pH	-	7.10
Conductivity	µs/cm	10,050
Volatile Solids	mg/l	2,923
Phosphate	mg/l	3
Dissolved Chloride	mg/l as Cl	845
Sulphate	mg/l	CND
Ammonia	mg/l	343
Nitrate-N	mg/l	CND
Nitrite-N	mg/l	CND
Potassium (K)	mg/l	1,110
Magnesium (Mg)	mg/l	166.4
Calcium (Ca)	mg/l	512
Manganese (Mn)	mg/l	5.4
Iron (Fe)	mg/l	30.7
Nickel (Ni)	mg/l	3.7
Copper (Cu)	mg/l	0.1
Zinc (Zn)	mg/l	0.31
Cadmium (Cd)	mg/l	0.3
Lead (Pb)	mg/l	0.1
Mercury (Hg)	mg/l	0.0003
Chromium (Cr)	mg/l	0.6

CND: Cannot analyzed due to high color

Source: SWMRMC

**Table 1-9 Leachate Quality Analyzed in
December 1996 at Gokarna LFS**

Parameters	Unit	Value
pH	-	6.75
Electrical Conductivity	µ mhos/cm	13,500
Colour (Chromacity Unit)	Chromacity Unit	273
Turbidity	NTU	640
Total Suspended Solids	mg/l	1144
Total Dissolved Solids	mg/l	30,036
BOD	mg/l	3,500
COD	mg/l	45,500
Total Alkalinity as CaCo3	mg/l	8798
Total Acidity as alkali consumption	mg/l	19.71
Total Hardness as CaCo3	mg/l	9,500
Dissolved Oxygen	mg/l	-
Chloride	mg/l	24,046
Phosphate	mg/l	0.76
Total Phosphorous	mg/l	0.80
Ammonia-N	mg/l	808.0
Nitrite-N	mg/l	0.980
Nitrate-N	mg/l	2.73
Organic-N	mg/l	534
Calcium	mg/l	2,700
Magnesium	mg/l	656.1
Sodium	mg/l	618.25
Potassium	mg/l	1625.0
Iron	mg/l	323.11
Manganese	mg/l	39.74
Lead	mg/l	0.32
Copper	mg/l	0.07
Nickel	mg/l	0.55
Chromium	mg/l	0.38
Zinc	mg/l	0.26
Cadmium	mg/l	0.03

Source: SWMRMC

2. Result of Solid Waste Quantity and Quality Survey (Phase II)

2. RESULT OF SOLID WASTE QUANTITY AND QUALITY SURVEY (PHASE II)

1 Objectives

The objectives of the Solid Waste Quantity and Quality Survey (the Survey) are:

- To grasp and understand the current conditions on quantity and quality of solid waste generated and collected in five municipalities within the Kathmandu Valley, namely KMC, LSMC, BK, MTM and KRM, and
- To provide information to help examining the essential characteristics and factors for formulating the Action Plan on SWM, such as unit generation ratio and collection rate of waste.

Average waste generation and bulk density at household in the Survey was modified in the narrative by the JICA Study Team in the course of formulating the Draft Action Plan.

2 Methodology

(1) Sampling for the Survey

Sample survey was carried out at household level, commercial places and streets in all of five municipalities on one weekday and on one weekend day. The amount of the samples for the survey is presented in Table 2.1.

Table 2-1 Sample Amount of the Survey

Sampling Place		KMC		LSMC		BKM		MTM		KRM	
		Qnt'y	Qlt'y	Qnt'y	Qlt'y	Qnt'y	Qlt'y	Qnt'y	Qlt'y	Qnt'y	Qlt'y
Household	High Income (HI)	10	1	5	1	3		1		1	
	Middle Income (MI)	20	1	10	1	6	1	3	1	3	1
	Low Income (LI)	10	1	5	1	3		1		1	
Sub-total		40	3	20	3	12	1	5	1	5	1
Commercial	Restaurant/Hotel	5	1	2	1	1		1		1	
	Market	5	1	2	1	1	1	1	1	1	1
	Office	5	1	2	1	1		1		1	
Sub-total		15	3	6	3	3	1	3	1	3	1
Street		5	1	2	1	1	-	-	-	-	-
Sub-total		60	7	28	7	16	2	8	2	8	2
TOTAL		120									
GRAND TOTAL		240 (twice; one weekday and one weekend day)									

Source: JICA Study Team

The Survey also conducted at four SWM-related facilities, namely Balkhu (Bagmati river dumping site), Teku transfer station, Bhaktapur final disposal site (Hanumante river dumping site), and Bhaktapur composting facility. The field work was done for two days at each facility. All of field works were carried out from March to April in 2004.

(2) Survey Methods

1) Solid Waste Quantity

After confirming the targets as sample households and other commercial centers, the targets were requested to keep their day's waste using provided plastic bags on designated week day and weekend day for sample collection. The targets were also asked to discard the waste on one day before the designated day. The bags of waste were collected and directly weighed. The volume of collected waste was also measured.

2) Solid Waste Quality

In order to have an accurate data of solid waste quality, mixed mass of sample waste was piled up conically and cut it to divide in four equal parts. Two opposite parts were mixed again and piled to form another groups, whereas other two parts were discarded. This process was repeated till the sample size was approximately 5 kg. The samples processed in this way were measured for the determination of its weight and volume, and then separated into 10 items by hand; i.e. paper, garbage, textile, wood, plastic, rubber or leather, metal, glass, ceramics, and others. Wet and dried physical compositions were measured on all items.

Water content and bulk density of the waste were also calculated.

3) Survey at Four SWM-related Facilities

Total waste transferred or disposed by truck, tractor, tri-cycle etc. at four SWM-related facilities were measured by the truck scale rented from the central laboratory of DOR. Total number of transportation was counted by type of vehicle. The vehicles were weighed with- and without-condition of the solid waste for two days at each site. The volume of wastes of each vehicle was estimated by ocular measurement taking into account the existing records of the municipalities and direct measurement of the vehicle bodies. The quantity of the daily generation was directly calculated on the basis of weight and volume measurement and counting the total number of trips of each type of vehicle. Bulk density is calculated by dividing the total mass by volume.

3 Summarized Results of the Survey

3.1 Solid Waste Quantity

(1) KMC

1) Household Waste

Table 3-1 Average Waste Generation and Bulk Density (KMC, Household)

Income Level	Weekday			Weekend day		
	Waste generation per person weight (g)	Waste generation per person volume (l)	Bulk density (g/l)	Waste generation per person weight (g)	Waste generation per person volume (l)	Bulk density (g/l)
HI	288	1.0	299	216	1.0	225
MI	200	0.8	249	203	0.9	235
LI	112	0.6	195	171	0.7	255
Average	200	0.8	246	198	0.83	238

Source: JICA Study Team

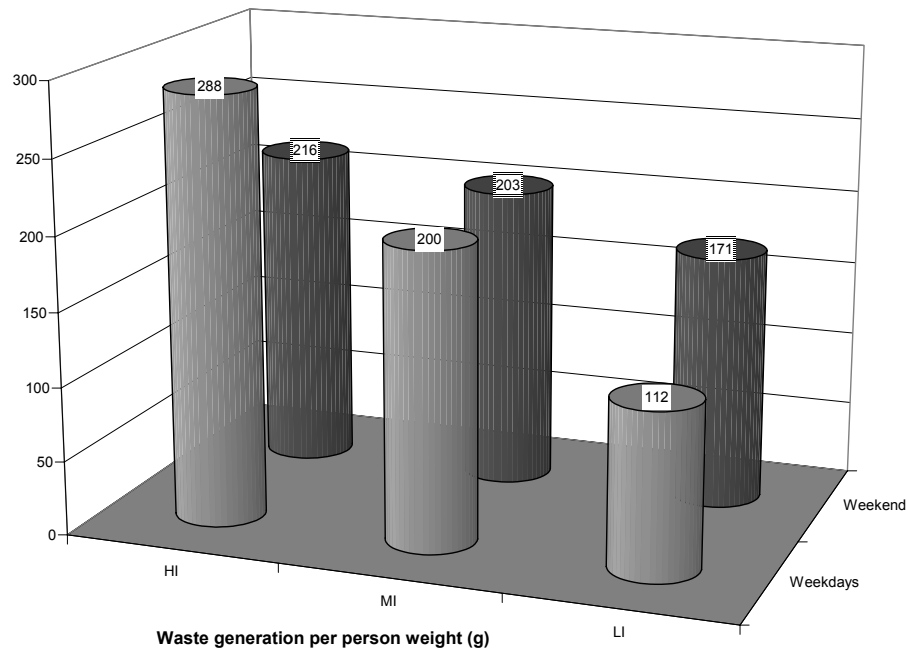


Figure 3-1 Comparison between Weekday and Weekend Day Waste Generation

Source: JICA Study Team

2) Commercial Waste

Table 3-2 Commercial Waste Generation and Bulk Density (KMC)

Source of waste generation	Weekday			Weekend day		
	Waste generation per Unit weight (g)	Waste generation per Unit volume (l)	Bulk density (g/l)	Waste generation per Unit weight (g)	Waste generation per Unit volume (l)	Bulk density (g/l)
Hotel/restaurants	32,280	106	440	38,575	128	477
Market	2275	8	312	3537	7	476
Office	2450	9	396	950	4	265

Source: JICA Study Team

3) Street Waste

The streets where waste samples were collected consisted of main highway and side roads in residential area and commercial area. Each sample was collected for approximately 100m length of street. Street waste of weekend could not be collected because of sudden Nepal Bandh. Average waste generation is calculated to be 22,340 g with volume of 58 L and bulk density of 380 g/L per 100 m length of street.

- (2) LSMC
1) Household Waste

Table 3-3 Average Waste Generation and Bulk Density (LSMC, Household)

Income Level	Weekday			Weekend day		
	Waste generation per person weight (g)	Waste generation per person volume (l)	Bulk density (g/l)	Waste generation per person weight (g)	Waste generation per person volume (l)	Bulk density (g/l)
HI	236	1.1	254	248	1.5	168
MI	201	1.0	228	193	1	189
LI	121	0.7	170	175	1	162
Average	190	0.95	220	202	1.1	177

Source: JICA Study Team

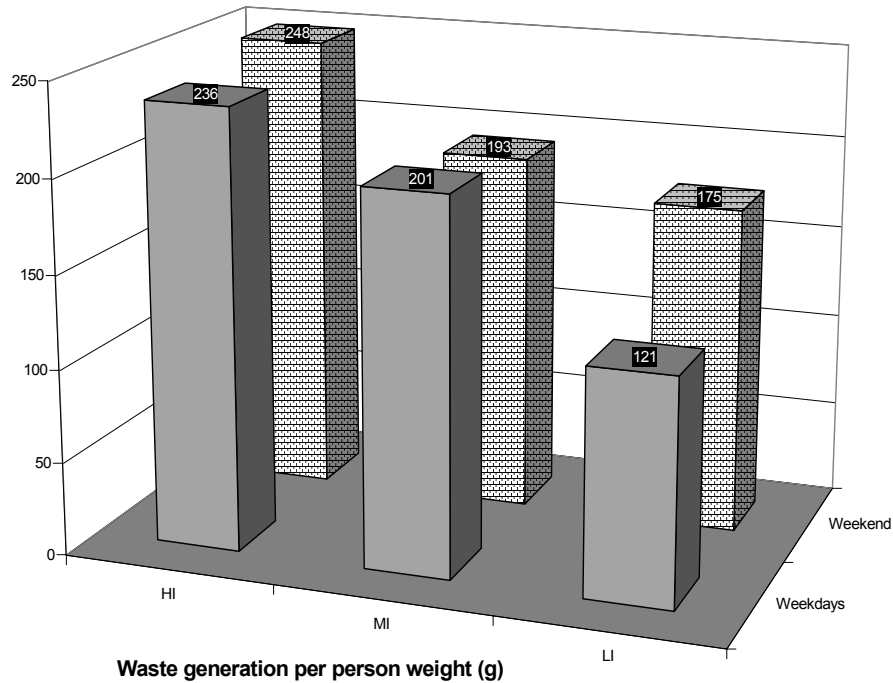


Figure 3-2 Comparison between Weekday and Weekend Day Waste Generation

Source: JICA Study Team

- 2) Commercial Waste

Table 3-4 Commercial Waste Generation and Bulk Density (LSMC)

Source of waste generation	Weekday			Weekend day		
	Waste generation per Unit weight (g)	Waste generation per Unit volume (l)	Bulk density (g/l)	Waste generation per Unit weight (g)	Waste generation per Unit volume (l)	Bulk density (g/l)
Hotel/restaurants	3975	21	139	6675	27	396
Market	1275	7.75	164	1225	7.25	170
Office	550	4	137	1100	4.5	244

Source: JICA Study Team

3) Street Waste

The streets where waste samples were collected consisted of the side roads in residential area and commercial area. Each sample was collected for approximately 100m length of street. Street waste of weekend could not be collected because of sudden Nepal Bandh. Average waste generation is calculated to be 20,977 g with volume of 97 L and bulk density of 217 g/L per 100 m length of street.

(3) BKM, KRM, and MTM

1) Household Waste

Table 3-5 Average Household Waste Generation and Bulk Density (BKM, KRM, MTM)

Generation Point	Waste generation weight (g/person)		Waste generation volume (L/person)		Bulk density (g/liter)	
	Week day	Weekend	Week day	Weekend	Week day	Weekend
BKM	144	135	0.7	0.6	207	193
KRM	119	112	0.5	0.71	244	236
MTM	177	192	1	0.9	230	301

Remark: The data collected from all income levels are averaged by each municipality. Two households belonging to HI level in BKM did not keep samples.

Source: JICA Study Team

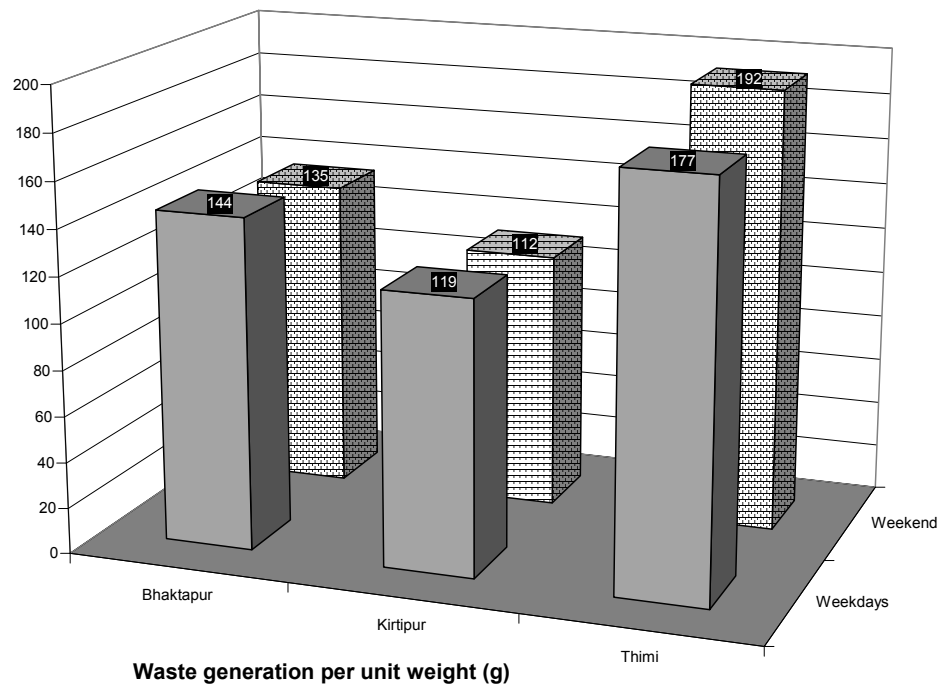


Figure 3-3 Comparison between Weekday and Weekend Day Waste Generation

Source: JICA Study Team

2) Commercial Waste

**Table 3-6 Commercial Waste Generation and Bulk Density
(BKM, KRM, MTM)**

Generation Point		Waste generation weight (g/unit)		Waste generation volume (L/unit)		Bulk density (g/L)	
		Week day	Weekend	Week day	Weekend	Week day	Weekend
BKM	Hotel & Restaurant	600	300	2.5	1	240	300
	Office	1600	1450	6	9	267	161
	Market	1350	550	4	2	338	275
KRM	Hotel / Restaurant	3450	8150	18	20	191	407
	Office	2000	650	9	3.5	222	185
	Market	800	800	5	5	160	160
MTM	Office	2500	400	7	1.5	357	267

Remark: Waste samples from hotel/restaurant and market in MTM were not available.

Source: JICA Study Team

3) Street Waste

The street where a waste sample was collected consisted of the side road in residential and commercial area. The sample was collected for approximately 100 m length of street. Waste generation is calculated to be 3,500 g with volume of 18 L and bulk density of 194 g/L per 100 m length of street in week end, whereas 2,650 g in weight 15 L in volume and the bulk density of 177 g/L is calculated for weekend.

3.2 Solid Waste Quality

(1) KMC

1) Household Waste

Table 3-7 Composition of Household Waste (KMC)

HH Type	Waste Components by % of weight									
	Garbage	Paper	Textile	Wood/Leave	Plastic	Rubber/Leather	Metal	Glass	Ceramics	Others
Weekday										
HI	71	15	0	1	5	7	1	0	0	0
MI	79	9	0	0	12	0	0	0	0	0
LI	67	11	8	8	6	0	0	0	0	0
Average	72.3	11.7	2.6	3	7.7	2.3	0.4	0	0	0
Weekend										
HI	74	7	2	5	12	0	0	0	0	0
MI	70	9	1	0	16	0	0	0	0	0
LI	69	8	2	0	15	0	0	0	3	0
Average	71	8	1.8	1.8	14.4	0	0	0	1	0
Average (both days)	71.6	9.8	2.2	2.4	11	1.1	0.2	0	0.5	0

Source: JICA Study Team

Table 3-8 Moisture Content of Household Waste (KMC)

HH Type	Moisture Content of each component of solid waste in %									
	Garbage	Paper	Textile	Wood/ Leave	Plastic	Rubber/ Leather	Metal	Glass	Ceramics	Others
Weekday										
HI	71	57	-	80	40	17	-	-	-	-
MI	55	58	50	-	19	-	-	-	-	-
LI	54	67	1	1	40	-	-	-	-	-
Average	60	60	25	40	33	17	-	-	-	-
Weekend										
HI	65	50	50	67	43	-	-	-	-	-
MI	74	27	40	-	46	-	-	50	-	-
LI	60	75	33	-	29	-	-	-	-	-
Average	66	50	41	67	39	-	-	50	-	-

Source: JICA Study Team

2) Commercial Waste

Table 3-9 Composition of Commercial Waste (KMC)

Source type	Waste Components by % of weight									
	Garbage	Paper	Textile	Wood/ Leave	Plastic	Rubber/ Leather	Metal	Glass	Ceramics	Others
Weekday										
Hotel/Restaurant	31	29	0	0	20	0	5	14	1	0
Market	90	0	0	0	2	0	0	0	0	8
Office	50	21	0	0	4	1	1	24	0	0
Average	57	17	0	0	9	1	2	13	1	3
Weekend										
Hotel/Restaurant	75	11	0	0	5	0	7	3	0	0
Market	91	0	0	0	2	0	0	0	0	7
Office	22	48	0	0	18	0	0	0	0	12
Average	63	20	0	0	8	0	2	1	0	6
Average (both days)	60	18.5	0	0	8.5	0.5	2	7	0.5	4.5

Source: JICA Study Team

Table 3-10 Moisture Content of Commercial Waste (KMC)

Type	Moisture Content of each component of solid waste in %									
	Garbage	Paper	Textile	Wood/ Leave	Plastic	Rubber/ Leather	Metal	Glass	Ceramics	Others
Weekday										
Hotel restaurant	72	72	-	-	68	-	0	8	0	-
Market	79	-	-	-	50	-	-	-	-	38
Office	71	52	-	-	56	-	-	8	-	-
Average	74	62	-	-	58	-	0	8	0	38
Weekend										
Hotel restaurant	87	50	-	-	33	-	0	0	-	-
Market	73	-	-	-	67	-	-	-	-	22
Office	87	31	-	-	17	-	-	-	-	25
Average	82	40	-	-	39	-	-	-	-	23

Source: JICA Study Team

3) Street Waste

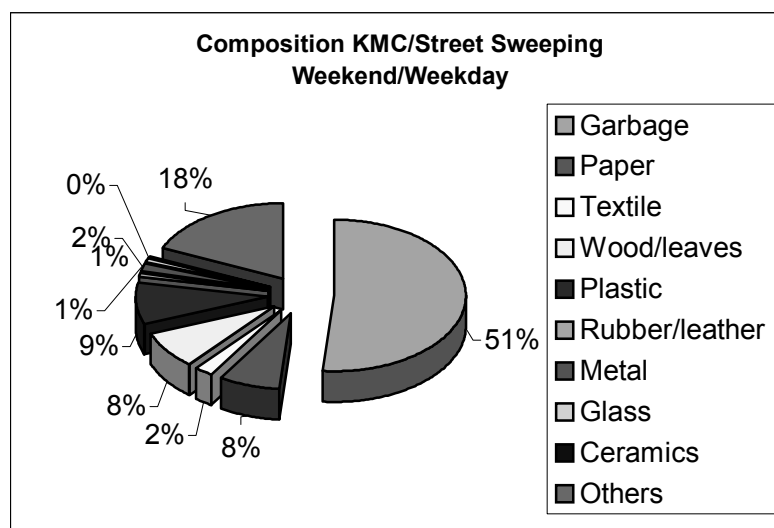


Figure 3-4 Composition of Street Waste (KMC)

Source: JICA Study Team

(2) LSMC

1) Household Waste

Table 3-11 Composition of Household Waste (LSMC)

HH type	Waste Components by % of weight									
	Garbage	Paper	Textile	Wood/Leave	Plastic	Rubber/Leather	Metal	Glass	Ceramics	Others
Weekday										
HI	73	9	0	0	12	0	3	3	0	0
MI	76	5	5	4	10	0	0	0	0	0
LI	58	5	2	20	15	0	0	0	0	0
Average	69	6	3	12	12	0	2	2	0	0
Weekend										
HI	56	15	0	0	30	0	0	0	0	0
MI	76	4	0	10	4	0	1	5	1	0
LI	60	8	2	10	15	0	1	4	0	0
Average	64	9	1	7	16	0	1	3	0	0
Average (both days)	67	8	2	10	14	0	2	4	1	0

Source: JICA Study Team

Table 3-12 Moisture Content of Household Waste (LSMC)

HH type	Moisture Content of each component of solid waste in %									
	Garbage	Paper	Textile	Wood/Leave	Plastic	Rubber/Leather	Metal	Glass	Ceramics	Others
Weekday										
HI	63	67	-	-	25	-	0	0	-	-
MI	65	20	40	50	11	-	-	-	-	-
LI	54	67	50	33	22	-	-	-	-	-
Average	61	51	45	42	29	-	0	0	-	-
Weekend										
HI	57	40	-	-	20	-	-	-	-	-
MI	65	67	-	38	33	-	0	0	0	-
LI	63	67	67	-	-	25	-	0	0	-
Average	62	58	67	38	27	25	0	0	0	-

Source: JICA Study Team

2) Commercial Waste

Table 3-13 Composition of Commercial Waste (LSMC)

Source type	Waste Components by % of weight									
	Garbage	Paper	Textile	Wood/Leave	Plastic	Rubber/Leather	Metal	Glass	Ceramics	Others
Weekday										
Hotel/Restaurant	77	10	0	0	13	0	0	0	0	0
Market	Very small sample, Data not available									
Office	0	73	0	0	18	9	0	0	0	0
Average	39	42	0	0	22	5	0	0	0	0
Weekend										
Hotel/Restaurant	42	21	4	0	11	0	1	20	2	0
Market	Very small sample, Data not available									
Office	69	5	14	3	9	0	0	0	0	0
Average	56	13	8	2	10	0	1	10	1	0
Average (both days)	48	28	4	1	16	3	1	5	1	0

Source: JICA Study Team

Table 3-14 Moisture Content of Commercial Waste (LSMC)

Type	Moisture Content of each component of solid waste in %									
	Garbage	Paper	Textile	Wood/Leave	Plastic	Rubber/Leather	Metal	Glass	Ceramics	Others
Weekday										
Hotel restaurant	83	63	-	-	40	-	-	-	-	-
Market	Sample not available									
Office	-	25	-	-	50	0	-	-	-	-
Average	83	44	-	-	45	-	-	-	-	-
Weekend										
Hotel restaurant	71	54	43	-	5	-	0	0	-	-
Market	Sample not available									
Office	47	10	33	17	50	-	-	-	-	-
Average	59	37	38	9	28	-	-	-	-	-

Source: JICA Study Team

3) Street Waste

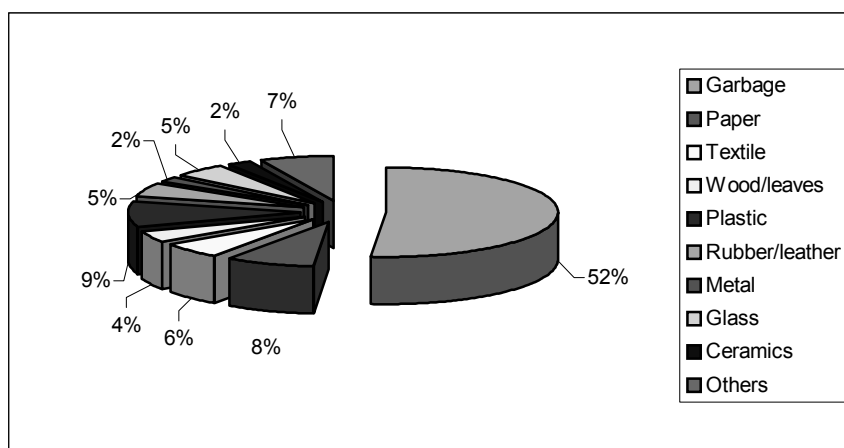


Figure 3-5 Composition of Street Waste (LSMC)

Source: JICA Study Team

(3) BKM

Table 3-15 Composition of Household & Commercial Waste (BKM)

Source	Waste Components by % of weight									
	Garbage	Paper	Textile	Wood/Leave	Plastic	Rubber/Leather	Metal	Glass	Ceramics	Others
Weekday										
HH	84	6	1	1	7	0	0	0	0	0
Commercial	41	19	1	9	3	10	10	6	0	0
Weekend										
HH	90	3	0	3	4	0	0	0	0	0
Commercial	28	28	0	9	33	0	2	0	0	0

Source: JICA Study Team

Table 3-16 Moisture Content of Household & Commercial Waste (BKM)

Source	Moisture Content of each component of solid waste in %									
	Garbage	Paper	Textile	Wood/Leave	Plastic	Rubber/Leather	Metal	Glass	Ceramics	Others
Weekday										
Household	43	50	50	50	60	-	-	-	-	-
Commercial	64	31	50	50	50	0	0	0	-	-
Weekend										
Household	43	50	-	30	67	-	-	-	-	-
Commercial	46	15	0	50	20	-	-	-	-	-

Source: JICA Study Team

(4) KRM

Table 3-17 Composition of Household & Commercial Waste (KRM)

Source	Waste Components by % of weight									
	Garbage	Paper	Textile	Wood/ Leave	Plastic	Rubber/ Leather	Metal	Glass	Ceramics	Others
Weekday										
HH	87	3	3	0	7	0	0	0	0	0
Commercial	74	6	1	7	9	0	1	2	0	0
Weekend										
HH	77	3	6	3	10	0	0	0	0	0
Commercial	87	9	0	0	4	0	0	1	0	0

Source: JICA Study Team

Table 3-18 Moisture Content of Household & Commercial Waste (KRM)

Type	Moisture Content of each component of solid waste in %									
	Garbage	Paper	Textile	Wood/ Leave	Plastic	Rubber/ Leather	Metal	Glass	Ceramics	Others
Weekday										
Household	62	50	50	-	0	-	-	-	-	-
Commercial	68	38	50	44	27	-	0	-	-	-
Average	65	44	50	44	14	-	0	-	-	-
Weekend										
Household	71	50	50	50	33	-	-	-	-	-
Commercial	78	26	-	-	29	-	-	-	-	-
Average	75	38	50	50	31	-	-	-	-	-

Source: JICA Study Team

(5) MTM

Table 3-19 Composition of Household & Commercial Waste (MTM)

Type	Moisture Content of each component of solid waste in %									
	Garbage	Paper	Textile	Wood/ Leave	Plastic	Rubber/ Leather	Metal	Glass	Ceramics	Others
Weekday										
Household	74	1	0	0	4	0	0	1	0	0
Commercial	Waste not available									
Weekend										
Household	94	1	0	0	4	0	0	1	0	0
Commercial	Waste not available									

Source: JICA Study Team

Table 3-20 Moisture Content of Household & Commercial Waste (MTM)

Type	Moisture Content of each component of solid waste in %									
	Garbage	Paper	Textile	Wood/ Leave	Plastic	Rubber/ Leather	Metal	Glass	Ceramics	Others
Weekday										
Household	39	52	40	75	50	-	-	20	-	-
Commercial	Waste not available									
Average	39	52	40	75	50	-	-	20	-	-
Weekend										
Household	59	40	-	-	17	-	-	0	-	-
Commercial	Waste not available									
Average	59	40	-	-	17	-	-	0	-	-

Source: JICA Study Team

3.3 Survey at SWM-related Facilities

(1) Balkhu (Bagmati River Dumping Site)

Table 3-21 Quantity of Waste Disposal at Balkhu

Item	Weight of KMC waste (kg)	Weight of LSMC waste (kg)	Weight of total waste disposed (kg)
1st survey	299,791	97,300	397,091
2nd survey	275,650	100,356	376,006
Average	287,720	98,828	386,548

Source: JICA Study Team

Table 3-22 Average Bulk Density of Waste Disposed of at Balkhu (kg/m³)

Item	Average Bulk Density Truck (Private)	Average Bulk Density Truck (Municipality)	Average Bulk Density Tractor (Private)	Average Bulk Density Tractor (Municipality)	Average Bulk Density Rikshaw (Private)	Average Trucks	Average Tractor
1st survey	821	411	750	724	-	616	737
2nd survey	1,075	1,138	-	578	788	1,106	578
Average	948	774	750	651	100	861	657

Source: JICA Study Team

(2) Teku Transfer Station

Table 3-23 Quantity of Waste Coming in & Going out at Teku

Item	Waste coming in (kg)	Waste going out (kg)	Waste surplus (kg)
1st survey	124,660	152,400	27,740
2nd survey	125,220	139,000	13,780
Average	124940	145700	20760

Source: JICA Study Team

Table 3-24 Bulk Density of Waste at Teku (kg/m³)

Item	Average Bulk Density Truck (Private)	Average Bulk Density Truck (Municipality)	Average Bulk Density Tractor (Private)	Average Bulk Density Tractor (Municipality)	Average Bulk Density Rikshaw (Private)	Average Trucks	Average Tractors
Coming in							
1st survey	404	303	1,034	440	172	354	737
2nd survey	318	367	1,128	539	367	343	834
Average	361	335	1,081	489	269	348	785
Going out							
1st survey	-	498	-	-	-	498	-
2nd survey	-	495	-	-	-	495	-
Average	-	496	-	-	-	496	-

Source: JICA Study Team

(3) Bhaktapur Final Disposal Site (Hanumante River Dumping Site)

Table 3-25 Quantity of Waste Disposal at Hanumante

Item	Weight of solid waste (kg)	Average bulk density (kg/m ³)
1st survey	25,480	580
2nd survey	25,300	532
Average	25,390	556

Source: JICA Study Team

(4) Bhaktapur Composting Facility

Table 3-26 Quantity of Waste Received at Composting Facility

Item	Weight of solid waste (kg)	Average bulk density (kg/m ³)
1st survey	5,600	662
2nd survey	5,750	680
Average	5,675	671

Source: JICA Study Team

3. *Result of Time and Motion Survey*

3. RESULT OF TIME AND MOTION SURVEY

1. Kathmandu Metropolitan City

Table 1-1 The Route Description and Vehicle Type of the Time and Motion Survey at KMC

Route	Route Description	Vehicle Type
1	Tankeswor-Chhauni- Dally-Sundarighat	Mini Truck Vehicle no 3756
	Sundarighat-Dally	
	Dally-Bijayaswori-Dumping Site	
	Dumping Site - Teku Garage	
2	Garage - Tripureswor-Maitighar-Babarmahal- Baneswor-Maitighar-Tripureswor- -Dumping Site	Multi Compactor Vehicle no 4476
	Teku-KMC Garage	
	Garage-Tripureswor-Maitighar-Minbhawan-Koteswor-Sinamanagal-Airport-Koteswor-M aitighar-Dumping Site	
	Dumping Site - Teku Garage	
3	Garage - Pipalbot-Baudha- Sundarighat	Triper Vehicle no 2793
	Sundarighat-Baudha	
	Tusal- Sundarighat	
	Sundarighat - Garage	
4	Gargae - Ratanpark-Biswojyoti-Jaya Nepal- Simrik Marg-Royal Shinghe Hotel-Durbar Hotel- Sherpa Hotel-IJ Plaza-Jamal-Norboling Resturant- Dumping Site	Triper Vehicle no 1090
	Dumping Site-Garage	
5	Sorakhutte-Nayabazar-Balaju-Baisdhara-Balaju-Balkhu- Dumping Site	Triper Vehicle no 4134
	Dumping-Balaju	
	Balaju-Baish Dhara- Nepaltar-Baispass- Dumping Site	
	Dumping-Garage	
6	Gargae - Khasi Bazar-Kalanki-Dumping Site	Mini Truck Vehicle no 3255
	Dumping-Soltee Mode	
	Soltee Mode - Sundari Ghat	
	Sundari Ghat-Garage	
7	Garage - Kuleswor-Dumping Site	Riksaw Vehicle no 25
	Dumping-Kuleswor	
	Kuleswor - Dumping	
	Dumping -Kuleswor	
	Kuleswor - Dumping	
	Dumping -Kuleswor	
8	Garage - Teku- Jamal-Royal Palace-Gairidhara-Baluwatar-Gairidhara-Sundarighat	Mini Truck Vehicle no 3354
	Sundarighat-Kuleswor-Kalimati	
	Kalimati-Jamal-Nirajan-Biswojyoti-Tindhara-Lain Chaur-Lajimpat-Nagpokhari-Dilli Bazar- Sundarighat	
	Sundarighat-Kalimati-Garrage	
9	Garage - Teku- Jamal-Royal Palace-Gairidhara-Baluwatar-Gairidhara-Sundarighat	Triper Vehicle no 4129
	Sundarighat-Kuleswor-Kalimati	
	Kalimati-Jamal-Nirajan-Biswojyoti-Tindhara-Lain Chaur-Lajimpat-Nagpokhari-Dilli Bazar- Sundarighat	
	Sundarighat-Kalimati-Garrage	

Route	Route Description	Vehicle Type
10	Garage - Sundhara- New Road-Bir Hospital- Rani	Triper vehicle no 4128
	Pokhari-Asan-Kamaladi-Bagbazar-Ratnapar- Exhibition Road- Sundhara- Sundarighat	
	Sundarighat-Kalimati- Tripureswor	
	Tripureswor- Sundhara- Mahakal- Bhadrakali- Finance Ministry- Kamaladi- Sundarighat ighat-Kalimati-Garrage	
11	Garage – Bhagwan Pau- Bhawan Pau- Teku Dumping Site	Tractor Vehicle no 541
	Dumping Site -Kankeswori	
	Kankeswori- Chagal-Dallu- Bijayswori-Teku Dumping Site	
	Teku –Dllu	
	Dallu- Bhagwan Pau-Chhauni- Teku Dumping Site	
Teku –Garage		
12	Garage – Soltee Mode- Kalimati- Dumping Site	Riksaw Vehicle no 3
	Dumping Site -Kalimati	
	Kalimati-Teku Dumping Site	
	Teku –Kalimati	
	Kalimati- Teku Dumping Site	
Teku –Garage		

Source: JICA Study Team

Table 1-2 The Results of the Time and Motion Survey at KMC

Route	Average Collection/ Dumping Time (minutes)	Total Distance Travel (km)	Average Speed of Vehicle (km/hour)	Average Speed of vehicle including collection and dumping	Return Distance (km)	Average Speed on Return (km/hr)
1	49.90	11.90	18.50	5.80	6.00	21.80
2	3.80	8.60	13.60	5.00	5.40	20.30
3	15.80	18.30	8.00	9.50	10.40	21.20
4	4.90	11.30	31.50	23.80	6.00	24.00
5	4.80	11.30	11.50	5.10		
6	7.25	4.50	10.50	0.00	4.80	17.17
7	14.83	1.20	5.67	1.12		
8	5.34	16.15	14.92	6.60	4.80	18.81
9	5.86	7.40	12.80	4.64	6.00	20.00
10	6.45	11.95	18.36	6.45	6.40	23.60
11	5.47	5.87	9.34	4.15	5.70	12.99
12	1.93	2.20	4.81	1.72	2.57	11.75

Note: The field survey was conducted on April 12, 14 and 15, 2004.

Source: JICA Study Team

2. Lalitpur Sub-Metropolitan City

Table 2-1 The Route Description and Vehicle Type of the Time and Motion Survey at LSMC

Route	Route Description	Vehicle Type
1	Garage- Mangal Bazar-Mapal-Gahabal-Natole-Balkhu- Sundarighat	Triper (Eicher-10. 6 G) Vehicle no 791.
	Sundari Ghat-Ringroad-Ekantkuna-Jawalakhel- Lagankhel	
	Lagankhel-Lagankhel-Prayagpokhari-Balkhu-Sundarighat	
	Sundarighat-Ringroad-Ekantkuna-Jawalakhel- Pulchoke-Patandhoka	
	Nagbahal-Kanibahal-Balkhu-Sundari Ghat	
	Sunadrai Ghat-Ekantkuna-Satdobato-Sichahit	
	Sichahiti-Kanibahal- Balkhu- Sundari Ghat	
Sundarighat-Ekantkuna-Satdobato-Gwarko- LSMC Garage.		
2	Garage- Mahapal-Balkhu-Bhimsensthan-Adarskanya-Thalyacha-Sundarighat	Tripper (199 B) Vehicle NO 803
	Sundarighat-Ringroad-Sanepa-Bagdole- Pulchok-HariharBhawan-Krishnagalli	
	Krishnagalli-Patan Buspark-Shankhamul-Setuganesh-Kumbheswor-Sundarighat	
	Sundarighat-Ringroad-Sanepa-Jawalakhel- Pulchoke-Patandhoka-Ashok Hall	
	Ashok Hall-Chandi Bidhyalaya-Swati Narayan-Sundari Ghat	
Sunadrai Ghat- Bagdole-Ekantkuna-Jawalakhel-Gwarko-Garage		
3	Mangalbazar- Haungal-Ibab-Tangal-Sundarighat	Tripper (10.60 G) Vehicle no
	Sundarighat-Ringroad-Bhanimandal-Jawalkhel-Lagankhel-Loksi.	
	Loksi-Loksi-Sundarighat	
	Sundarighat-Ringroad- Bhanimandal-Jawalkhel-Lagankhel-Thatitol	
	Thatitol-Prayagpokhari-Prayagpokhari-Thaina-Sundari Ghat	
Sunadrai Ghat-Ringroad-Jawalkhel-Garage		
4	Garage- Mahapal-Balkhu-Bhimsensthan-Adarskanya-Thalyacha-Sundarighat	Tripper
	Sundarighat-Ringroad-Sanepa-Bagdole- Pulchok-HariharBhawan-Krishnagalli.	
	Krishnagalli-Patan Buspark-Shankhamul-Setuganesh-Kumbheswor-Sundarighat	
	Sundarighat-Ringroad-Sanepa-Jawalakhel- Pulchoke-Patandhoka-Ashok Hall	
	Ashok Hall-Chandi Bidhyalaya-Swati Narayan-Sundari Ghat	
Sunadrai Ghat- Bagdole-Ekantkuna-Jawalakhel-Gwarko-Garage		
5	Garage- Balkhu-Sundarighat	Super Placer Vehicle no 349
	Sundarighat-Mahalaxmi.	
	Mahalaxmi-Sundarighat	
	Sundarighat-Dhalaut Industry	
	Dhalaut Industry-Mahalaxmi-Sundari Ghat	
	Sunadrai Ghat-Balkhu	
	Balkhu-Sundari Ghat	
	Sunadrai Ghat-Kupandole	
	Kupandole-Sundari Ghat	
Sunadrai Ghat-Lagankhel		
6	Garage- Pulchoke-Harihar Bhawan-Kupandole-Harihar	Triper Vehicle no 3354.
	Bhawan-Pulchoke-Sundarighat	
	Sundarighat-T Dhoka	
	T Dhoka-Nagal-Khawali-Nagal-Sundarighat	
	Sundarighat-Ihiti	
Ihiti-Machhendra Dev-Ichapo-Ikhalakhu-Mahapal-Sundari Ghat		
Sunadrai Ghat-Garage		

Source: JICA Study Team

Table 2-2 The Results of the Time and Motion Survey at LSMC

Route	Average Collection/ Dumping Time (minutes)	Total Distance Travel (km)	Average Speed of Vehicle (km/hour)	Average Speed of vehicle including collection and dumping	Return Distance (km)	Average Speed on Return (km/hr)
1	5.30	7.00	8.80	4.00	7.10	22.40
2	8.99	7.22	9.64	2.59	6.70	18.27
3	7.19	7.65	11.98	8.24	7.00	19.34
4	14.7	3.80	12.80	3.70	2.80	12.00
5	3.30	3.12	7.96	6.97	5.11	24.26
6	3.85	6.37	14.15	5.12	5.47	13.72

Note: The field survey was conducted on April 16 and 19, 2004.

Source: JICA Study Team

3. Bhaktapur Municipality

Table 3-1 The Route Description and Vehicle Type of the Time and Motion Survey at BKM

Route	Route Description	Vehicle Type
1	Garage- Durbar Square-Kashana-Mahakali-Deokocha-Yache-Lalache-Compost Plant-Gomadi-Pasikhel Dumping Site	Pick Up Van Vehicle no 880
	Dumping Site-Durbar Square.	
2	Garage- Durbar Square-Kashana-Mahakali-Deokocha-Yache-Lalache-Compost Plant-Gomadi-Pasikhel Dumping Site	Pick Up Van Vehicle no 880
	Dumping Site-Durbar Square	
3	Garage- Durbar Square-Deocho-Bans Gopal-Hanumapati-Buspark-Npuckhu-Kahumachi -Itache-Sallaghari- China Highway- Hukumpoithi- Industrial Area-Cancer Hospital- Dudha Patti- Sidha Pokhari-Old Buspark- Sallaghari Dumping Site	Pick Up Van Vehicle no 873
	Dumping Site-Durbar Square .	
4	Garage- Durbar Square-Dudhapati-Sidhapokhar-Old Bushpark- Ganesh Primaru-Vawarcho-Dudhpati -Dukche-Bansgopal- Hanumanpati- allaghari Dumping Site	Pick Up Van Vehicle no 873
	Dumping Site-Durbar Square .	

Source: JICA Study Team

Table 3-2 The Results of the Time and Motion Survey at BKM

Route	Average Collection/ Dumping Time (minutes)	Total Distance Travel (km)	Average Speed of Vehicle (km/hour)	Average Speed of vehicle including collection and dumping	Return Distance (km)	Average Speed on Return (km/hr)
1	9.67	6.90	11.71	5.48	0.70	2.33
2	7.69	5.20	13.31	3.98	0.60	2.00
3	3.13	15.90	16.87	8.67	1.10	3.67
4	1.77	4.30	9.94	4.58	1.10	3.67

Note: The field survey was conducted on April 20, 2004.

Source: JICA Study Team

4. Kirtipur Municipality

Table 4-1 The Route Description and Vehicle Type of the Time and Motion Survey at KRM

Route	Route Discription	Vehicle Type
1	Gargae - Nayabazar-Sundar Bazar- Panga-Sundarighat	Tractor Vehicle no 1037
	Sundarighat-Panga-Nayabazar	

Source: JICA Study Team

Table 4-2 The Results of the Time and Motion Survey at KRM

Route	Average Collection/ Dumping Time (minutes)	Total Distance Travel (km)	Average Speed of Vehicle (km/hour)	Average Speed of vehicle including collection and dumping	Return Distance (km)	Average Speed on Return (km/hr)
1	5.16	5.10	9.43	4.66	2.80	9.33

Note: The field survey was conducted on April 19, 2004.

Source: JICA Study Team

4. *Result of Market Survey on Recyclable Waste*

4. RESULT OF MARKET SURVEY ON RECYCLABLE WASTE

1. Recycling Waste Survey

The JICA Study Team carried out Marketing Survey on Recyclable Materials basically three municipalities of the Kathmandu Valley- KMC, LSMC and BKM. Remaining two municipalities- MTM and KRM do not have recyclable material recovery and Kabadi Shop. One of the reasons for this can be presumed that whatever little recyclable material is generated is collected by cycled hawkers, and restaurants and major recyclable waste generating sources have direct link with Kabadi Shops (scrap dealer shops) in KMC/LSMC.

Waste picker survey was carried out at three main waste dumping sites at KMC, LSMC and BKM (about 15 waste pickers). 17 Nos. of small to main wholesaler Kabadi shops, 3 NGOs, a private sector, 2 recycling industries, Nepal Recyclable Producers Association and a Contractor appointed by DDC to collect scrap tax of the Recyclable Materials being exported outside the Kathmandu Valley were surveyed with structured questionnaire.

2. Amount of Trade of Recyclable Waste

It is general situation that one of the limitations of carrying out the study in underdeveloped country like Nepal is lack of reliable database. In absence of this, many information are to be acquired as verbal assurance out of rich past experience in the field of the informant. In this context, data collected on total recyclable waste of different types collected and exported out of the Kathmandu Valley is also based on information given by main (wholesale) supplier, president of NEREPA and information given by KMC, and is presented graphically in Figure 2-1.

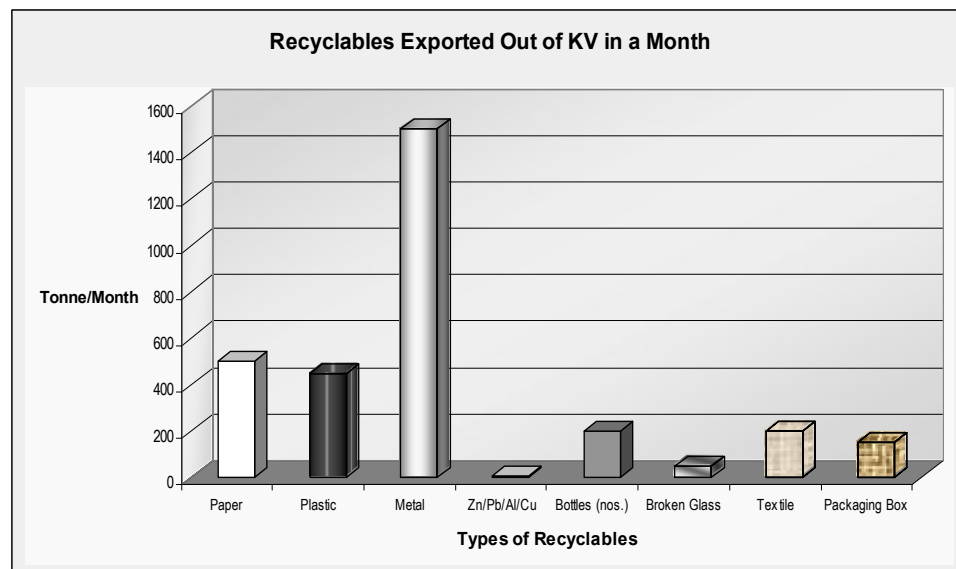


Figure 2-1 Recyclables Exported out of the Kathmandu Valley in a Month

Source: JICA Study Team

Information given by the wholesaler in plastic recyclable about total collected and recycled is as presented in following Figure 2-2.

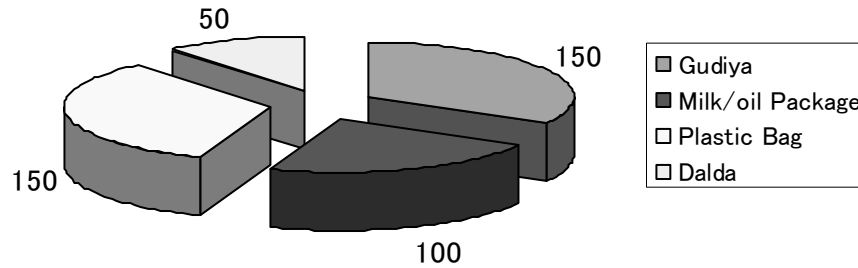


Figure 2-2 Types Plastic Product Collected Tonne Per Month in the Kathmandu Valley

Note: Gudiya- type of thick plastics (polystyrene), Dalda- high density polythene plastics
Source: JICA Study Team

A previous Study (R.C. Bhattarai, 2003) shows that out of the total collected waste materials, the bulk is exported outside the Kathmandu Valley and some are utilized within the valley for reuse and recycling. Following Figure 2-3 shows the share of export and reuse within the Kathmandu Valley. It shows that of the total value of waste materials collected informally, 16% is reused in the valley and 84% is exported outside of the valley.

The Study also shows that about Rs 371 millions is annually contributed by the informal sector to the national income from waste materials in the Kathmandu Valley.

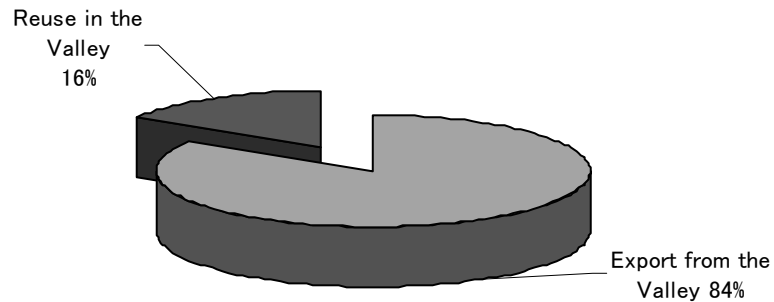


Figure 2-3 Type of Plastic Product Collected Ton Per Month in the Kathmandu Valley

Source: JICA Study Team

BOX. Plastics Identification Code / Recycled Products
(Plastic Industry Association in USA)

Code 1 (PET): Polyethylene Terephthalate- Non food bottles, T-shirts, carpet, containers

Code 2 (HDPE): High Density Polyethylene- Compost & recycling bins

Code 3 (V): Polyvinyl Chloride- Drain pipes, detergent bottles, ducting cables, hoses

Code 4 (LDPE): Low Density Polyethylene- Recycled shopping bags

Code 5 (PP): Polypropylene- Plastic storage boxes, auto-parts, batteries, carpets

Code 6 (PS): Polystyrene- Insulation board, office equipments, reusable cafeteria trays

Code 7 (OTHER): All other resins and mixes of plastics- Generally not recycled.

**5. *Household Behavior and Attitude
Survey on SWM***

5. HOUSEHOLD BEHAVIOR AND ATTITUDE SURVEY ON SWM

1. Introduction

1.1 Objectives

The objectives of the Household Behavior and Attitude Survey on SWM (hereafter are herewith:

- To identify the current practices and attitudes regarding SWM among the local residents and the local establishments in five municipalities, namely Kathmandu Metropolitan (KMC), Lalitpur-Sub Metropolitan City (LSMC), Bhaktapur Municipality (BKM), Madhyapur Thimi Municipality (MTM) and Kirtipur Municipality (KRM).
- To provide information to help formulating strategies and Action Plan for effective SWM.

1.2 Methods

Survey site and sample design: The five Municipalities were categorized into two groups i.e. Group A (KMC & LSMC) and Group B (BKM, MTM and KRM). The above two groups were categorized into 2 to 6 subgroups based upon the population density, economy, settlement patterns as well as land use patterns of the municipalities. The total interviewed household (HHs) samples were 765. Out of 765 households, 330, 160, 126, 75 and 75 HHs were from KMC, LSMC, BKM, MTM and KRM respectively. Table 2-1 summarizes the sample frame and sample size of the survey.

Table 2-1 Sample Frame and Sample Size of the Study

S.N	Sample Area of the Survey	Selected Ward Nos.	Demography				HHs in selected wards	Sample Size (HH)
			HH (no.)	Popln (no.)	Area (ha)	Density per ha		
1	Kathmandu Metropolitan City (KMC)							
	(I): Kathmandu Core (Total 14 wards)	W# 21, 23, 28	23,873	116,885	275	425	5,304	52
	(II): Kathmandu Central (Total 6 wards)	W# 33	22,760	99,502	719	138	5,064	49
	(III): Kathmandu North (Total 5 wards)	W# 2, 29	30,903	133,969	1,280	105	8,777	67
	(IV): Kathmandu West (Total 3 wards)	W# 14, 15	21,723	96,650	952	102	15,294	47
	(V): Kathmandu East (Total 7 wards)	W# 6, 8, 10, 35	52,896	224,840	1,860	121	25,817	115
	TOTAL KMC (35 wards)	12 wards	152,155	671,846	5,086	132	60,256	330
2	Lalitpur Sub-Metropolitan City (LSMC)							
	(I): Lalitpur Core (Total 7 wards)	W#18, 20	7,800	38,940	102	380	2,734	36
	(II): Lalitpur Extension (Total 15 wards)	W# 1, 3, 13	27,196	124,051	1,187	105	5,456	124
	TOTAL LsMC (22 wards)	5 wards	34,996	162,991	1,289	126	8,190	160
3	Bhaktapur Municipality (BKM)							
	(I): Bhaktapur Core (Total 6 wards)	W# 7, 13	3,479	20,598			1,233	35
	(II): Bhaktapur South (Total 4 wards)	W# 5	3,000	19,096			744	31
	(II): Bhaktapur North (Total 3 wards)	W# 10	2,976	16,386			713	31
	(II): Bhaktapur East (Total 4 wards)	W# 2, 4	2,678	16,463			1,589	28
	TOTAL Bhaktapur (17 wards)	6 wards	12,133	72,543			4,279	125

S.N	Sample Area of the Survey	Selected Ward Nos.	Demography				HHs in selected wards	Sample Size (HH)
			HH (no.)	Popln (no.)	Area (ha)	Density per ha		
4	Madhyapur Thimi Municipality (MTM)							
	(I): Thimi Core (Total 4 wards)	W# 7	1,598	8,585			509	20
	(II): Thimi Sub Core (Total 3 wards)	W# 1, 2, 3	799	4,692			799	30
	(II): Thimi Fringe (Total 10 wards)	W# 13	7,953	39,166			620	25
	TOTAL Thimi (17 wards)	5 wards	10,350	52,443			1,928	75
5	Kirtipur Municipality (KRM)							
	(I): Kirtipur Core (Total 5 wards)	W# 9	1,803	8,470			474	24
	(II): Kirtipur Fringe (Total 14 wards)	W# 3, 14	7,684	32,365			1775	51
	TOTAL Kirtipur (19 wards)	5 wards	9,487	40,835			2,199	75
GRAND TOTAL		23 wards	219,121	1,000,658			76,852	765

Source: JICA Study Team

Questionnaire: A set of structured questionnaire provided by the JICA Study Team was thoroughly discussed and modified, when found necessary. Subsequently, it was translated into Nepali language. The questions for the HH survey focused on existing practice and attitude, and were broadly grouped into following aspects:

- i. General household characteristics
- ii. Waste disposal and management practices at household level
- iii. Existing waste collection services at community/ward level
- iv. Existing situation of waste reduction and recycling
- v. Public awareness and community involvement towards Solid Waste Management

Date collection and Analysis: The survey was conducted from 5th April and completed on 28th April 2004 in the five municipalities. The study team consisted of Team Leader, Data Analyst, Survey Facilitators, Quality Controllers and Enumerators/ Social Surveyors. To solicit the quality data from the sampled households, qualified and experienced field staff and enumerators were recruited from local people living in each municipality. Only female enumerators were recruited for the HH survey. With due considerations to the local culture and extensive involvement of women in managing household waste, it was felt that only the female enumerators can establish effective communications with the respondents.

All the HH survey questionnaires were thoroughly checked for any errors before entering the data in SPSS (Statistical Package for Social Science: The SPSS software has been using world wise for statistical data analysis) programmed database to analysis efficiently and was monitored by a senior statistician. The entered data in digital form were also cross-checked to minimize the human errors.

QUESTIONNAIRE FOR INDIVIDUAL HOUSEHOLD

A. INTRODUCTION

Date of Survey:

- A.1 Name of House-Head.....
A.2 Location
A.3 Name of interviewee A.4 Age/ Sex
A.5 Relationship to House-Head... A.6 Ethnicity/ Caste
A.7 Name of surveyor..... A.8 Signature of Surveyor.....

1. General Questions of Your Household

1.1 Please provide the following information.

- (i) Total number of family members in the household using the same kitchen..... []
Adult...[] Children (Below 17 years)...[] Male...[] Female...[]
(ii) Number of families with “separate kitchen” in your house...[]

1.2 Which does your house have access to?

- [] 1. Motarable main road
[] 2. Lane
[] 3. Footpath

1.3 What does your house have?

- [] 1. Open compound/ backyard [] 5. No compound/backyard
[] 2. Closed compound/backyard [] 6. Farming/ kitchen garden
[] 3. Common courtyard [] 7. Trees, shrubs, flower plants
[] 4. Free spaces left around premises

1.4 Did your household migrate from other districts to *Kathmandu, Lalitpur, Bhaktapur, Thimi & Kirtipur*?

- [] 1. Yes, we migrated during our generation
[] 2. Yes, we migrated during my parents' generation
[] 3. Yes, we migrated during my grand parents' generation
[] 4. No
[] 5. Do not know

1.5 How long have you and your family lived in this community?

- [] 1. Less than 1 year
[] 2. Less than 5 years
[] 3. Less than 10 years
[] 4. Less than 20 years
[] 5. More than 21 years

1.6 In what household income categories do you think you belong to?

- [] 1. Low (HH income less than Rs 6000/month)
[] 2. Lower Middle (HH income between Rs 6000 to 13,000/month)
[] 3. Higher Middle (HH income between Rs 13,000 to 22,000/month)
[] 4. Higher (HH income more than Rs 22,000/month)

1.7 How much is the total expenditure per month on average?

Amount of money: _____ NRs/ month

1.8 Please specify the priority for your daily life regarding the improvement of the following aspects? (Fill all three priorities)

1. Water supply
2. Drainage/Sewerage
3. Waste collection/Disposal
4. Air pollution
5. Electricity supply
6. Public Transportation / Traffic jam
7. Access road to my house
8. Noise pollution
9. Others (please specify _____)

Answer: Priority

1st (_____)

2nd (_____)

3rd (_____)

1.9 Do you know what has been done so far for Solid Waste Management in Nepal?

- [] 1. Do not know about it
[] 2. Partially know about it
[] 3. Yes, I know about it

2. QUESTIONS ON WASTE DISPOSAL PRACTICE OF YOUR HOUSE

2.1 How much solid waste does your house generate each day/each week/ each month?

- [] 1. Weight in kg
- [] 2. Volume in cm³.....
- [] 3. Others (please specify _____)

2.2 Who mainly handles wastes at home?

- [] 1. A male member of the family
[] 2. A female member of the family
[] 3. House Keeper / Servant / Maid
[] 4. Others (please specify _____)

2.3 Who takes the waste out?

- [] 1. A male adult member of the family
[] 2. A female adult member of the family
[] 3. House Keeper / Servant / Maid
[] 4. Children
[] 5. Others (please specify _____)

2.4 How do you dispose of waste generated from your house?

- [] 1. Put outside of the house or into the moving container for door- to-door collection services
If yes, go to question no. – 2.5
- [] 2. Put into municipal or communal waste bins/containers
If yes, go to question no. – 2.5
- [] 3. Put at the municipality disposal site
If yes, go to question no. – 2.6 & 2.7
- [] 4. Open dumping outside of the house (including roads, farmlands, and vacant lands)

- [] 5. Open combustion / burning
[] 6. Bury in our backyard
[] 7. Composting (producing fertilizer from waste)
[] 8. Give for recycling
[] 9. Use for animal feeding (please specify such as dogs, goats, cow, water buffalo, pigs etc)
[] 10. Other (please specify _____)
- 2.5 **(Only for those chose 1-3 in Q. 2-4)** Do you know where the collected waste is disposed?
[] 1. Yes
[] 2. No
- 2.6 **(Only for those chose 4 "Open dumping" in Q. 2-4)** Where do you dispose of your waste by open dumping?
[] 1. On roads
[] 2. On farmlands
[] 3. On banks of stream / river or in stream / river.
[] 4. On vacant land
[] 5. Others (please specify _____)
- 2.7 **(Only for those who chose 4 "Open dumping" in Q. 2-4)** Why do you dispose of your waste by open dumping?
1. Long practice among our family and neighbors
2. No door to door collection services available
3. Far from the specified collection site
4. No specified container available
5. Other (please specify _____)
- | |
|------------------|
| Answer: Priority |
| 1st (_____) |
| 2nd (_____) |
| 3rd (_____) |
- 2.8 How often do you dispose of waste generated from your house?
[] 1. As soon as wastes arise
[] 2. Once daily
[] 3. Once every 2 or 3 days
[] 4. Less frequently
- 2.9 Where do you store the waste?
[] 1. Kitchen
[] 2. Store room
[] 3. Backyard
[] 4. Others (please specify _____)
- 2.10 If you are requested to carry your waste to a specified collection point, would you cooperate to do so?
[] 1. Yes, if it is located within 25m distance (30 seconds to walk)
[] 2. Yes, if it is located within 50m distance (1 minute to walk)
[] 3. No, I do not prefer the collection system mentioned above anyway.
[] 4. We have been already doing.
[] 5. Others (please specify _____)

- 2.11 What type of container do you use for carrying waste to a collection point or for placing the waste outside of your house? (Choose one or more)
- 1. Plastic bag
 - 2. Paper bag
 - 3. Metal/plastic/wood waste bin or container/bucket
 - 4. Box
 - 5. Basket
 - 6. None – place directly If “None, place directly”, got to Q. 2- 13
 - 7. Others (please specify _____)
- 2.12 (**Only those who chose 1-5 & 7 in Q. 2-11**) Why do you use it? (Choose one or more)
- 1. It is clean after collection work
 - 2. It prevents foul odors
 - 3. It is easy handling
 - 4. It keeps away pests such as flies
 - 5. It is cheap or easy to get
 - 6. Others (please specify _____)
- 2.13 (**Only those who chose “None-place directly” in Q. 2-11**) If you are requested to use some containers for carrying your waste to a collection point or for placing the waste outside of your house, would you cooperate to do so?
- 1. Yes, if plastic bag is requested to use.
 - 2. Yes, if paper bag is requested to use.
 - 3. Yes, if metal/plastic/wood waste bin or container/bucket is requested to use.
 - 4. Yes, if box is requested to use.
 - 5. Yes, if basket is requested to use.
 - 6. No, I do not prefer the collection system mentioned above anyway.
 - 7. Others (please specify _____)
- 2.14 Do you have garden wastes (fallen leaves and branches or grass and weeds)?
- 1. Yes
 - 2. No - **If no, go to question no. – 3.1**
- 2.15 How do you dispose of your garden wastes generally?
- 1. Dispose it together with other wastes outside of the house or into the moving container for the door to door collection
 - 2. Dispose it at the specified collection site
 - 3. Open dumping
 - 4. Open combustion/burning
 - 5. Bury in the backyard
 - 6. Composting (producing fertilizer from waste)
 - 7. Give for composting
 - 8. Use for animal feeding (please specify animals such as dogs, goats, cow, water buffalo, pigs etc. _____)
 - 9. Others (please specify _____)

3. Questions on Waste Collection Services in Your Toile

Here we would like to know about the present situation of waste collection services in your area.

3.1 Are there waste collection services in your area?

1. Yes
 2. No **If "No", go to Q3-15.**

3.2 Do you use these services?

1. Yes
 2. No (If no, please specify reasons) **If no, go to question no. – 4.1**

3.3 How is waste collected in your area?

1. Collection workers or sweepers or moving containers collect wastes from door to door
 2. We carry wastes to the specified collection site
 3. We directly carry wastes to a collection container/ truck / vehicle.
 4. Others (please specify _____)
 5. Do not know

3.4 **(Only for those who chose 1 in Q. 3-3)** Who provides door-to-door collection service?

1. Municipality 3. NGOs/ CBOs
 2. Private company 4. Do not know

3.5 **(Only for those who chose 1 in Q. 3-3)** What time is your waste normally collected?

1. 7:00-9:59
 2. 10:00-12:59
 3. 13:00-15:59
 4. 16:00-18:59
 5. Others (please specify _____)
 6. Do not know

3.6 **(Only for those who chose 2 or 3 in Q. 3-3)** How far do you have to walk to reach this point?

1. 1-25 m 4. 100-250 m
 2. 26-50 m 5. Over 250 m
 3. 51-100 m

3.7 How often is your waste collected?

1. Daily 5. Less than once per week
 2. More than four times per week 6. Irregular
 3. Two to three times per week 7. I do not know
 4. Once a week

3.8 Is the waste collection service done at a fixed time on the collection day?

1. Yes
 2. No
 3. I do not know

3.9 Have you ever paid for the waste collection and sweeping services?

- [] 1. Yes
- [] 2. No **If “No”, go to Q3-12**
- 3.10 **(Only those who chose 1 “Yes” in Q. 3-9)**, How much do you pay for the waste collection and sweeping services per month?
- Answer: (1) Only waste collection service Rs _____
- (2) Only sweeping the roads Rs _____
- (3) Both waste collection and sweeping roads Rs _____
- 3.11 **(Only those who chose 1 “Yes” in Q. 3-9)**, Do you pay these fees directly to the service providers (municipality/collection company/ NGOs/ CBOs) or through your community?
- [] 1. Directly (by myself)
- [] 2. Through the community/community organization
- [] 3. Do not know
- 3.12 Are you satisfied with the collection service?
- [] 1. Very satisfied **If yes, go to question no. – 4.1**
- [] 2. Somewhat satisfied **If yes, go to question no. – 3.13& 3.14**
- [] 3. Less than satisfied / somewhat dissatisfied **If yes, go to question no. – 3.13& 3.14**
- [] 4. Not satisfied at all **If yes, go to question no. – 3.13& 3.14**
- 3.13 **(Only those who chose 2, 3 or 4 in Q. 3-12)** What are the reasons? (Choose one or more)
- [] 1. Waste collection / sweeping is not properly done
- [] 2. Waste collection / sweeping frequency is too low
- [] 3. Waste collection / sweeping is irregular
- [] 4. Waste collection time is too early or too late or irregular
- [] 5. Behavior of waste collection workers is bad
- [] 6. (ask people who are paying fees) Waste collection / sweeping fee is expensive
- [] 7. Waste collection point is too far away
- [] 8. Other (please specify _____)
- 3.14 **(Only those who chose 2, 3 or 4 in Q. 3-12)** Have you ever complained about the waste collection service to the service providers or held meetings on this matter within the community in the last three years?
- [] 1. Yes
- [] 2. No
- 3.15 **(Only for those who chose “No” in question Q. 3-1)** Do you want to receive a waste collection service?
- [] 1. Yes
- [] 2. No

4. Questions on Recycling and Waste Reduction

Here we would like to know about your opinions on recycling.

- 4.1 Do you know that some of waste items such as paper, plastics, metal and textile can be recovered and used as resources?

- [] 1. Yes
[] 2. No

4.2 Do you separate your waste into categories?

- [] 1. Yes
[] 2. No **If no, go to question no. – 4.4**

4.3 (**Only for those who chose “Yes” in Q. 4-2**) How many categories and what type of waste do you segregate?

- [] 1. Two..... () ()
[] 2. Three..... ()()()
[] 3. More than three.()

4.4 Recycling of waste is most effective if the waste can be sorted into different categories by the household. If the service providers such as Municipality, private companies, NGO/CBO introduce a separate waste collection system, you will be requested to separate your wastes into a number of categories, for example, i) recyclable waste such as metals, glass, plastics, paper and ii) other wastes. Are you willing to cooperate with this type of system?

- [] 1. Very much willing to cooperate **go to question no. – 4.5 & 4.6**
[] 2. Somewhat willing to cooperate **go to question no. – 4.5 & 4.6**
[] 3. Less willing to cooperate / somewhat unwilling to cooperate
 go to question no. – 4.7
[] 4. Not willing to cooperate at all **go to question no. – 4.7**
[] 5. We have been already doing **go to question no. – 4.5 & 4.6**

4.5 (**Only who chose either 1 or 2 and 5 in Q. 4-4**) What do you think about recycling? (Choose one or more)

- [] 1. Recycling would reduce the amount of waste going to landfill
[] 2. Recycling would help to protect the environment
[] 3. Recycling would allow you to earn some money
[] 4. Recycling would help to utilize our resources effectively
[] 5. Others (please specify _____)

4.6 (**Only who chose either 1 or 2 and 5 in Q. 4-4**) How many categories would you be willing to separate your wastes into?

- [] 1. Two
[] 2. Three
[] 3. More than three

4.7 (**Only those who chose 3 or 4 in Q. 4-4**) What are the reasons? (Choose one or more)

- [] 1. It is inconvenient and difficult
[] 2. It will take much time
[] 3. Needs for the recycling system is not clear
[] 4. Benefits of the recycling system is not clear
[] 5. There may be poor contribution form household members
[] 6. No space inside the house to keep the separated wastes
[] 7. Others (please specify _____)

- 4.8 Is there someone who comes around to collect or buy your reusable or recyclable materials?
 1. Yes
 2. No **If "No", go to Q4-10.**

- 4.9 Which materials do they collect or buy from you?
 1. Glass 8. Plastic
 2. Cardboard 9. Textiles (e.g. clothes)
 3. Paper 10. Leather, rubber
 4. Metal can 11. Wood/Timber
 5. Other metal 12. Tyres
 6. Kitchen waste 13. Others (Please specify _____)
 7. Garden waste

- 4.10 Do you take your recyclable materials to shops for refund or sale?
 1. Yes
 2. No **If "No", go to Q4-13.**

- 4.11 Which materials do you return or sell to shops?
 1. Glass 8. Plastic
 2. Cardboard 9. Textiles (e.g. clothes)
 3. Paper 10. Leather, rubber
 4. Metal can 11. Wood/Timber
 5. Other metal 12. Tyres
 6. Kitchen waste 13. Others (Please specify _____)
 7. Garden waste

- 4.12 (**Only for those chose "Yes" in either Q. 4-8 or Q. 4-10**) Now we would like to ask you about up to major three materials collected from you or returned / sold to shops.
 (1) How much of these materials are collected from you or returned / sold to shops?
 (2) How much do you sell these for? (NRs. / kg or item) Put 0 if given for free.
 (3) How often are these materials collected / taken for recycling? (Choose from (a) 2-3 times/week, (b) once a week, (c) once very other week, (d) once a month (e) once every 6 months, (f) once a year (g) irregular, and (f) do not know)

Type of materials	(1) Quantity		(2) Price		(3)
	Amount	Unit/month	NRs.	Unit	Frequency
1					
2					
3					

- 4.13 Do you know what is "compost" produced from municipal waste and food wastes and garden wastes (fallen leaves, cut trees or grasses)?
 1. Yes
 2. No

4.14 Have you ever been taught how to make compost?

- 1. Yes, by municipality
- 2. Yes, by private companies
- 3. Yes, by NGO/CBO
- 4. Yes, by others (please specify _____)
- 5. No

4.15 Have you ever made compost by using kitchen and/or garden waste?

- 1. Yes
- 2. No ***If "No", go to Q4-18***

4-16 (***Only those who chose "Yes" in Q. 4-15***) What method do you adopt for composting?

- 1. Open space/organic field
- 2. Containers/composing bin
- 3. Others (please specify _____)

4.17 (i) (***Only those who chose "Yes" in Q. 4-15***) how much of these wastes do you compost per month?

- | | | |
|----------------|--------------------------|-------------------|
| Kitchen wastes | <input type="checkbox"/> | 1. Less than half |
| | <input type="checkbox"/> | 2. Half |
| | <input type="checkbox"/> | 3. More than half |
| | <input type="checkbox"/> | 4. All |
| Garden wastes | <input type="checkbox"/> | 1. Less than half |
| | <input type="checkbox"/> | 2. Half |
| | <input type="checkbox"/> | 3. More than half |
| | <input type="checkbox"/> | 4. All |

(ii) How much compost do you produce per month?

Answer _____.

(iii) What do you do with it? 1. Sell
 2. Own use

(iv) If you sell it, how much do you sell it for?

Answer _____ NRs./kg.

(v) If you sell it, who do you sell it to?

- 1. Neighbors
- 2. Farmers
- 3. NGO/CBO
- 4. Private company
- 5. Other (Please specify)

- 4.18 Are you willing to make compost from food waste and/or garden waste?
- 1. Yes
 - 2. Yes, if the training is provided.
 - 3. Yes, if the compost bin/container is provided free of charge.
 - 4. Yes, if the compost produced is purchased by any organizations
 - 5. No
 - 6. We have been already doing

- 4.19 (**Only those who chose "No" in Q. 4-18**) What are the reasons?
- 1. It seems to be inconvenient and difficult
 - 2. It seems to take much time (We are too busy to do)
 - 3. It seems to take much money (We cannot afford)
 - 4. Needs for composing is not clear
 - 5. Benefits of composing is not clear
 - 6. No farmland/kitchen garden for using compost available
 - 7. Others (please specify _____)

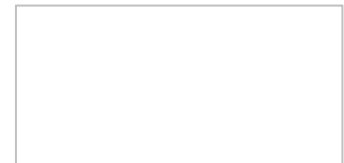
5. Public Involvement/ Community Participation & Public Awareness

- 5.1 Please tell us the disposal practice of your community people, and not yours. What are the most common methods to dispose of the waste in your community?

- 1. Picked up by waste collection service
- 2. Burnt
- 3. Thrown in the open spaces or rivers **go to question no. – 5.3**
- 4. Just dumped on the yard / in the garden **go to question no. – 5.3**
- 5. Buried on the yard / in the garden
- 6. Others

- 5.2 Who should be responsible for managing the waste discharged by residents?

- 1. Government/Ministry of Local Development
- 2. Municipality
- 3. Sweepers
- 4. Yourselves
- 5. Our Communities/ CBOs
- 6. Private companies
- 7. NGOs
- 8. Do not know
- 9. Other (please specify _____)



- 5.3 (**Only those who chose 3 or 4 in Q. 5-1**) Do you take any actions?

- 1. Yes
- 2. No **If "No", go to Q 5-6.**

5.4 **(Only those who chose “Yes” in Q. 5-3)** What activities do you or your family members take initiatives?

1. Trying not produce household waste as far as possible
2. Reducing waste by composting
3. Reducing waste by recycling/reusing
4. Disposing of waste in the fixed place on fixed time
5. Disposing of organic waste and inorganic waste separately
6. Paying fees for disposal collection services
7. Cleaning the neighborhood **go to question no. – 5.5**
8. Other (please specify _____)

Answer: Priority

1st (_____)

2nd (_____)

3rd (_____)

5.5 **(Only those who chose 7” Cleaning the neighborhood” in Q. 5-4)** How often does anyone in your family or your servant clean the side of the road or adjacent public area in front of your premises?

- [] 1. Almost everyday
[] 2. Sometimes
[] 3. Do not know

5.6 Solid waste management costs a lot of money. What do you think about if you are requested to pay for the waste collection services?

- [] 1. We are willing to pay if services are available. **go to question no. – 5.5 & 5.8**
[] 2. We have already paid. **go to question no. – 5.10**
[] 3. We are not willing to pay. **go to question no. – 5.9**
[] 4. Others (please specify _____)

5.7 **(Only for those chose 1 in Q. 5-6)** To which service providers do you want to pay for waste collection?

- [] 1. Any service providers including municipality, private companies, NGOs/ CBOs
[] 2. Municipality
[] 3. Private company
[] 4. NGOs/ CBOs
[] 5. Others (please specify _____)

5.8 **(Only for those chose 1 in Q. 5-6)** How much is the largest amount of money that your household would be willing to pay?

- [] 1. Less than 10 Rs per month
[] 2. 11-30 Rs per month
[] 3. 31-50 Rs per month
[] 4. 51-100 Rs per month
[] 5. 101-150 Rs per month
[] 6. More than 150 Rs per month
[] 7. Do not know

5.9 **(Only for those chose 3 in Q. 5-6)** What are the reasons for not willing to pay?

1. It is the duty of the Ministry/ Government
2. It is the duty of the Municipality
3. It is the duty of the sweepers
4. Income is very low and could not afford
5. Good services could not be expected
6. Our waste was collected / disposed and we do not have any problem from the waste
7. We and our neighbors have not paid for a long time.
8. Do not know
9. Others (please specify _____)

Answer: Priority

1st (_____)

2nd (_____)

3rd (_____)

5.10 Are there any community-based organizations (CBOs), clubs and groups to manage waste in your community?

[] 1. Yes

[] 2. No

[] 3. Do not know

If "No", go to Q 5-13

If "not know", go to Q 5-13

5.11 **(Only those who chose "Yes" in Q. 5-10)** What types of activities are CBOs involved in?

1. Waste collection
2. Composting
3. Recycling
4. Public Education/Campaign
5. Cleaning
6. Discussion meetings regarding proper waste handling and discharge
7. Do not know
8. Others (please specify _____)

Answer: Priority

1st (_____)

2nd (_____)

3rd (_____)

5.12 Have you ever participated in or contribute to these CBOs' activities?

[] 1. Yes, we have participated in/contribute to _____

[] 2. No

5.13 Have you ever been taught or informed methods of proper waste handling and discharge?

[] 1. Yes

[] 2. No *If "No", go to Q 5-15*

5.14 **(Only those who chose "Yes" in Q. 5-13)** Who taught these to you? (Choose one or more)

[] 1. Family members

[] 2. Community people / Neighbors

[] 3. School

[] 4. Municipality

[] 5. Central government

[] 6. NGOs (please specify _____)

[] 7. Donor agencies (please specify _____)

[] 8. TV program

[] 9. Radio program

[] 10. Newspaper and magazine,

[] 11. Pamphlet, booklet, posters

[] 12. Others (please specify _____)

5.15 Has anyone in this household including children, received any environmental and health education such as the health and environmental impacts caused by solid waste?

- [] 1. Yes
[] 2. No **if no go to question no. – 5.5**

5.16 (**Only those who chose "Yes" in Q5-15**) Where did this information come from? (Choose one or more)

- [] 1. Family members
[] 2. School
[] 3. Medical worker / center / hospital
[] 4. Community organization / NGO (please specify _____)
[] 5. Newspaper
[] 6. Radio program
[] 7. TV program
[] 8. Municipality
[] 9. Ministry of Local Development
[] 10. Others (please specify _____)

5.17 Do you think community-based Solid Waste Management activities such as collecting wastes, cleaning the community, mass campaign for raising awareness of people, education program/training on solid waste management for maintaining the cleaner city and environment are necessary?

- [] 1. Very necessary
[] 2. Somewhat necessary
[] 3. Not very necessary
[] 4. Not necessary at all

5.18 If you have a chance, are you willing to participate in these activities?

1. Yes, we are willing to participate in any activities related to solid waste management.
2. Yes, we are willing to participate in collecting wastes in our community
3. Yes, we are willing to participate in cleaning our community
4. Yes, we are willing to participate in mass campaign for raising awareness of people
5. Yes, we are willing to participate in education program/training on solid waste management
6. Yes, we are willing to participate in reducing wastes/composting.
7. No, we are not willing to participate in any activities
8. Others (please specify _____)

Answer: Priority
1st (_____)
2nd (_____)
3rd (_____)

Thank you very much for your cooperation.

*****End*****

2. Result of Questionnaire Survey

SECTION 1: GENERAL HOUSEHOLD CHARACTERISTICS

Table 1.1: Household Structure of Municipalities

Particulars	Municipalities										Total
	KMC		LSMC		BKM		MTM		KRM		
	#	%	#	%	#	%	#	%	#	%	
Sample HH nos.	331		162		126		74		75		768
Size of Family	5.15		5.48		7.12		6.91		5.79		
Sex Ratio	100%										
	Male	48%	49%	49%	52%	49%					
	Female	52%	51%	51%	48%	51%					
Adult Ratio	100%										
	Adult	70%	70%	69%	69%	69%					
	Children	30%	30%	31%	31%	31%					

Comments:

- 1 BKM and MTM has the largest family size approaching 7 members per household
- 2 The average family size for KMC, LSMC and KRM has been recorded as 5.15, 5.48 and 5.79 respectively.
- 3 With the exception of MTM, there are more female members in a family. Thus SWM program should be focussed on women.
- 4 Children (age below 17 years) constitute almost one third of a family in all municipalities

Table 1.2: Access to Houses

Particulars	Municipalities										Total
	KMC		LSMC		BKM		MTM		KRM		
	#	%	#	%	#	%	#	%	#	%	
Sample HH nos.	331	100%	162	100%	126	100%	74	100%	75	100%	768
Motable (main road)	93	28%	55	34%	28	22%	22	30%	28	37%	
Lane (motorable)	141	43%	69	43%	47	37%	32	43%	36	48%	
Footpath (pedestrian)	97	29%	38	23%	51	40%	20	27%	11	15%	

Comments:

- 1 Most houses in municipalities (around 40%) could be accessed only through narrow motorable lanes. This figure is highest for KRM at 48% and lowest for BKM at 37%
- 2 On the other hand KRM has the lowest percentage of HHs (15%) access through footpath and BKM has the highest at 40%. For others footpath access is in the range of 23-29%.
- 3 Facility of motorable main road access varies as shown in the table, with BKM being lowest and KRM being the highest.

Table 1.3: Open Space with the House.

Particulars	Municipalities										Total
	KMC		LSMC		BKM		MTM		KRM		
	#	%	#	%	#	%	#	%	#	%	
Sample HH nos.	331	100%	162	100%	126	100%	74	100%	75	100%	768
Open compound/backyard	49	15%	42	26%	0	0%	4	5%	2	3%	97
Closed compound/backyard	126	38%	53	33%	7	6%	2	3%	9	12%	197
Common courtyard	68	21%	8	5%	56	44%	43	58%	17	23%	192
Free spaces left around premises	4	1%	3	2%	1	1%	8	11%	2	3%	18
No compound / backyard	74	22%	51	31%	39	31%	6	8%	44	59%	214
Family / Kitchen garden	5	2%	1	1%	22	17%	8	11%	1	1%	37
Trees, Shrubs, Flower plants	5	2%	4	2%	1	1%	3	4%	0	0%	13

Comments:

- 1 A significant number of HHs have no open spaces. This figure varies with 22% in KMC and 31% for LSMC and BKM.
- 2 In MTM very few houses (8%) have open spaces but a large no. of them (58%) avail common courtyard.
- 3 Houses having closed compound and backyard is most prevalent in KMC and LSMC.
- 4 Very few houses (almost negligible at 1-2%) in KMC, LSMC and KRM have family or kitchen garden. But a significant no. of HHs in Bhakatapur (17%) and MTM (11%) have kitchen gardens.

Table 1.4: Migration Characteristics

Particulars	Municipalities										Total
	KMC		LSMC		BKM		MTM		KRM		
	#	%	#	%	#	%	#	%	#	%	
Sample HH nos.	331	100%	162	100%	126	100%	74	100%	75	100%	768
Migration Level											
Local - Indiginous	154	47%	102	63%	118	94%	71	96%	52	69%	497
Migrated - Total	177	53%	60	37%	8	6%	3	4%	23	31%	271
Period of Migration											
During our generation	119	36%	38	23%	7	6%	2	3%	14	19%	180
During my parents	46	14%	16	10%	1	1%	0	0%	7	9%	70
During my grand parents	12	4%	6	4%	0	0%	1	1%	2	3%	21

Comments:

- 1 The highest number of migrant households were recorded at KMC (53%) to be followed by LSMC (37%) and KRM (31%). In BKM and MTM migrant households are negligible (6% and 4% respectively).
- 2 Most of migrated households were found to have migrated recently i.e. in their own generation.
- 3 Very few migrated households have migrated two generations before.

Table 1.5: Period of Settlement in Community

Particulars	Municipalities										Total
	KMC		LSMC		BKM		MTM		KRM		
	#	%	#	%	#	%	#	%	#	%	
Respondent Sample HHs	177	100%	60	100%	8	100%	3	100%	23	100%	294
Sample HHs	331	53%	162	37%	126	6%	74	4%	75	31%	768
Less than 1 year	11	6%	2	3%	2	25%	0	0%	1	4%	16
Less than 5 years	9	5%	4	7%	1	13%	0	0%	1	4%	15
Less than 10 years	61	34%	20	33%	5	63%	2	67%	6	26%	104
Less than 20 years	58	33%	17	28%	0	0%	0	0%	6	26%	81
More than 21 years	38	21%	17	28%	0	0%	1	33%	9	39%	78

Comments:

- 1 A majority of migrant HHs in all the five municipalities have been living in the community since last 10 years or even before.
- 2 In KMC and LSMC, one third of migrated HHs (34% and 33% resp.) have been living in this community since 5 to 10 years. This figure is exceptionally high for BKM (63%) and MTM (67%).
- 3 In case of BKM, a sizable 25% HHs have been found to be in this community for less than a year.
- 4 For the case of LSMC, MTM and KRM almost a third of migrated HHs have been living in this community for more than twenty years. KMC recorded three quarter of this figure and there were no migrated HHs in BKM some 20 years ago.

Table 1.6: Income Categories of HHs Covered by Survey

Particulars	Municipalities										Total
	KMC		LSMC		BKM		MTM		KRM		
	#	%	#	%	#	%	#	%	#	%	
Sample HH nos.	331	100%	162	100%	126	100%	74	100%	75	100%	768
Low (less than 6000/- per month)	83	25%	43	27%	65	52%	41	55%	18	24%	250
Lower Middle (6000/- to 13,000/- pm)	169	51%	81	50%	51	40%	24	32%	46	61%	371
Higher Middle (13000/- to 22000/- pm)	66	20%	35	22%	9	7%	7	9%	10	13%	127
Higher (more than 22000/- per month)	13	4%	3	2%	1	1%	2	3%	1	1%	20

Comments:

- 1 The household income structure of KMC and LSMC are almost similar with around 50% belonging to Lower Middle Income Group followed by a quarter of HHs having less than NRs. 6000 per month income.
- 2 The household income structure of KRM is also similar to KMC and LSMC, but more % of Lower Middle Groups have been found at the expense of lesser Middle Income Group (income Nrs. 13,000 -22,000 pm).
- 3 BKM and MTM are different from other municipalities as Low Income Groups constitute almost 50% of HHs.

Remarks:

- 1 It is to be noted that the present survey with small sample size and sort of purposive sampling may not reflect the actual income structure.

Table 1.7: Ranking of HH Services & Utilities for Improvements.

Particulars	Municipalities										Total
	KMC		LSMC		BKM		MTM		KRM		
	Rank	%	#	%	#	%	#	%	#	%	
Sample HH nos.	331	100%	162	100%	126	100%	74	100%	75	100%	768
Water Supply	1	48%	1	47%	1	46%	2	30%	1	35%	
Drainage/ sewerage	3	12%	2	20%	2	14%	3	10%	2	25%	
Waste collection	2	19%	3	13%	3	13%	1	35%	3	20%	
Air Pollution	4	9%	4	10%	4	12%	3	10%	7	1%	
Electricity Supply		0%		1%	7	4%		0%	5	4%	
Public transportation	7	2%	7	2%		0%	5	5%	4	6%	
Access road to my house	5	6%	5	5%	6	5%	6	3%	4	6%	
Noise pollution	6	4%	6	3%	5	6%	4	7%	6	2%	
Others		0%		0%		0%		0%		0%	

Comments:

1 SWM has been considered as top priority in MTM municipality, to be followed by KMC where it is ranked next to water supply. For other three municipalities it is ranked third and next to water supply and drainage/sewerage.

SECTION 2: WASTE DISPOSAL AND MANAGEMENT

Table 2.1 Methods Adopted by HHs for Waste disposal

Particulars	Municipalities										Total
	KMC		LSMC		BKM		MTM		KRM		
	#	%	#	%	#	%	#	%	#	%	
Sample HH nos.	331	128%	162	109%	126	115%	74	147%	75	133%	768
Dispose of waste by door to door collection service	214	65%	91	56%	50	40%	8	11%	42	56%	405
Dispose of waste by putting into Municipal or Communal Container	65	20%	54	33%	5	4%	5	7%	2	3%	131
Dispose of waste at Municipality's designated disposal site	25	8%	11	7%	63	50%	13	18%	1	1%	113
Dispose of waste by open dumping out side the house	18	5%	3	2%	7	6%	44	59%	17	23%	89
Dispose of waste by open combustion	37	11%	4	2%	2	2%	16	22%	26	35%	85
Dispose of waste by burrying in the ground	3	1%	1	1%	2	2%	5	7%	4	5%	15
Dispose of waste by Composting	30	9%	9	6%	15	12%	17	23%	8	11%	79
Dispose of waste by giving it for recycling	20	6%	1	1%	0	0%	1	1%	0	0%	22
Dispose of waste by using as animal feed	11	3%	2	1%	1	1%	0	0%	0	0%	14
Dispose of waste by Other means	0	0%		0%	0	0%	0	0%	0	0%	

Comments:

- As indicated by more than 50% of the sample households, disposal of waste by door to door collection service is the most prevalent practice adopted in KMC, LSMC and KRM. However in case of BKM only 50% and in MTM only 18% households follow this practice. A majority (50%) HHs in BKM dispose of their waste at Municipality's designated disposal sites and 59% HHs of MTM just dump their waste at open places outside their house.
- In case of KMC, 20% HHs have also indicated that they dispose by putting their waste in Municipal or Communal containers located in the vicinity. Around 11% HHs do open combustion and around 8% are also engaged in making compost.
- In case of LSMC, 33% HHs have indicated that they dispose by putting their waste in Municipal or Communal containers located in the vicinity. Around 7% HHs use Municipality's designated disposal sites and 6% HHs have also adopted composting.
- Combustion and Composting is a popular practice in MTM (adopted by 22% and 23% respectively).
- Composting is practiced by 9%, 6%, 12% and 11% HHs in KMC, LSMC, BKM and MTM municipalities

Remarks:

1 Considering more than one answers sought from the respondent, the summation of responses exceeds 100%.

Table 2.2 Family Members responsible for Waste Related Activities

Discription of Family member	Municipalities										Total
	KMC		LSMC		BKM		MTM		KRM		
	Handle by	Taken out	Handle by	Taken out	Handle by	Taken out	Handle by	Taken out	Handle by	Taken out	
Sample HH nos.	331		162		126		74		75		768
Male Adult member	5%	6%	2%	2%	0%	1%	0%	0%	4%	3%	
Female Adult member	66%	54%	69%	29%	81%	79%	80%	55%	67%	65%	
House Keeper/servant	6%	7%	7%	9%	0%	0%	3%	0%	0%	0%	
Children of the family	23%	3%	22%	4%	19%	0%	18%	3%	29%	1%	
Any of the members	0%	31%	0%	56%	0%	20%	0%	42%	0%	31%	
Total	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	

Comments:

- Female members are exclusively responsible for Handling Wastes and Taking it out for disposal. In case of LSMC though, females are less involved as other members of the family do it most of the times.
- Female members are sometimes helped by other members of the family for taking out the waste for disposal.
- Children of the family are also considerably involved in handling wastes.

Table 2.3 Places of Open Waste Dumping

Unit: # & % of sample HHs practicing open space dumping

Particulars	Municipalities										Total
	KMC		LSMC		BKM		MTM		KRM		
	#	%	#	%	#	%	#	%	#	%	
Respondent Sample HHs	18	100%	3	100%	7	100%	44	100%	17	100%	89
Sample HHs	331	5%	162	2%	126	6%	74	59%	75	23%	768
On Road	7	39%	0	0%	4	57%	2	5%	1	6%	13
On farmland	0	0%	0	0%	0	0%	3	7%	4	24%	7
On bank of stream/river	1	6%	1	33%	1	14%	10	23%	6	35%	19
On Vacant Land	10	56%	2	67%	2	29%	29	66%	6	35%	47

Comments:

- 1 In KMC, LSMC and MTM, an overwhelming majority of HHs (around 60%) practicing 'Open Space Dumping' dispose of their waste on vacant land. In case of BKM, roads are commonly used. KMC
- 2 In LSMC, MTM and KRM, a large number of HHs dispose waste on bank of stream rivers. This practice is also found in KMC and BKM but in smaller numbers.
- 3 A significant large number of HHs in KRM followed by MTM use farmland as disposal sites.

Table 2.4 Frequency of HH Waste Disposal

Unit: # & % of sample HHs

Particulars	Municipalities										Total
	KMC		LSMC		BKM		MTM		KRM		
	#	%	#	%	#	%	#	%	#	%	
Sample HH nos.	331	100%	162	100%	126	100%	74	100%	75	100%	768
As soon as wastes arise	17	5%	3	2%	22	17%	3	4%	3	4%	48
Once Daily	214	65%	84	52%	87	69%	35	47%	25	33%	445
Once every 2 or 3 Days	96	29%	67	41%	16	13%	35	47%	43	57%	257
Less frequent	4	1%	8	5%	1	1%	1	1%	4	5%	18

Comments:

- 1 Disposing waste with the frequency of once daily is the most common practice followed in municipalities. However, in the case of KRM, an overwhelming majority do it once every two or three
- 2 Majority of HHs in KMC (65%) and LSMC (52%) have been disposing waste once daily and around 29% and 41% HHs respectively do it once every 2 or 3 days.
- 3 In case of BKM, around 17% HHs dispose waste as soon as it arises and 13% HHs once every 2 or 3 days, but 69% do it daily. In MTM, equal % (47%) of HHs do it once daily or once 2 or 3 days.

Table 2.5 Storage of waste in the house

Unit: # & % of sample HHs

Particulars	Municipalities										Total
	KMC		LSMC		BKM		MTM		KRM		
	#	%	#	%	#	%	#	%	#	%	
Sample HH nos.	331	100%	162	100%	126	100%	74	100%	75	100%	768
Kitchen	80	24%	20	12%	80	63%	10	14%	12	16%	202
Store room	2	1%	0	0%	3	2%	0	0%	0	0%	5
Backyard	146	44%	92	57%	31	25%	62	84%	62	83%	393
No Specific Place	103	31%	50	31%	12	10%	2	3%	1	1%	161
Others		0%		0%	0	0%	0	0%	0	0%	7

Comments:

- 1 Place of waste storage varies from municipality to municipality
- 2 The nature of the place of waste storage is almost same in KMC & LSMC where the majority of HHs use backyard and the remaining HHs use kitchen and other places for storing the waste.
- 3 Similarly, the nature of the place of waste storage is same in MTM and KRM where majority % of HH almost 84% using backyard and remaining HHs using kitchen.
- 4 In case of BKM, the nature of the place waste storage is completely different from other municipalities. A significant % of HHs (63%) use kitchen followed by 25% of HHs using the backyard and 10% have no specific place.

Table 2.6 Type of Container Used for Carrying Waste to Collection Point

Unit: # & % of sample HHs

Particulars	Municipalities										Total
	KMC		LSMC		BKM		MTM		KRM		
	#	%	#	%	#	%	#	%	#	%	
Sample HH nos.	331	100%	162	100%	126	100%	74	100%	75	100%	768
Plastic bag	250	76%	128	79%	42	33%	44	59%	48	64%	533
Paper bag	4	1%	0	0%	1	1%	1	1%	0	0%	6
Metal/plastic/wood bin	24	7%	7	4%	2	2%	2	3%	15	20%	52
Box	24	7%	12	7%	6	5%	5	7%	3	4%	50
Basket	15	5%	14	9%	75	60%	19	26%	8	11%	143
None	11	3%	0	0%	0	0%	3	4%	0	0%	14
Others	3	1%	1	1%	0	0%	0	0%	1	1%	5

Comments:

- 1 Plastic Bag is the most common container used for carrying waste to collection points in all municipalities except BKM. In case of BKM Baskets are used by majority 60% of the HHs.
- 2 Baskets are also used to a lesser extent in MTM (26%) followed by KRM (11%), LSMC (9%) and KMC (5%).
- 3 Metal/plastic/wood made bins are used by a large number of HHs (20%) in KRM, followed by 7% in KMC and 4% in LSMC.
- 4 Box is used by some HHs (7%) in KMC, LSMC and MTM as well as 5% in BKM and 4% in KRM.
- 5 A very few % of HHs in all the municipalities also use paper bag.

Table 2.7 Disposal of Garden Waste

Unit: # & % of sample HHs that generates garden waste

Particulars	Municipalities										Total
	KMC		LSMC		BKM		MTM		KRM		
	#	%	#	%	#	%	#	%	#	%	
Sample HH nos	331	27%	162	31%	126	17%	74	23%	75	23%	768
Respondent HH nos.	91	152%	50	110%	21	90%	17	135%	17	106%	196
Together with other waste in moving container for DD collections	44	48%	12	24%	6	29%	0	0%	3	18%	65
Specific collection Site	4	4%	3	6%	0	0%	0	0%	2	12%	9
Open Dumping	4	4%	5	10%	1	5%	3	18%	1	6%	14
Open Combustion	39	43%	17	34%	3	14%	7	41%	10	59%	76
Bury in the backyard	9	10%	7	14%	2	10%	4	24%	0	0%	22
Composting	34	37%	21	42%	11	52%	9	53%	4	24%	79
Giving for composting	0	0%	1	2%	0	0%	0	0%	1	6%	2
Using for animal feeding	4	4%	1	2%	2	10%	0	0%	0	0%	7
Other	0	0%	0	0%	0	0%	0	0%	0	0%	89

Comments:

- 1 A majority of HHs in LSMC (42%), BKM (52%) and MTM (53%) use garden wastes for composting. In KMC and KRM also 37% HHs and 24% HHs respectively follow the practice of composting.
- 2 In KMC, a large majority of HHs (48%) dispose garden waste with other wastes in moving container or follow the practice of open combustion (43%). A few of them (10%) bury garden waste in the backyard.
- 3 In LSMC, a large number of HHs (24%) dispose garden waste with other wastes in moving container but even larger (34%) follow the practice of open combustion. A few of them (14%) bury garden waste in the backyard or dump outside. Almost similar trend is observed in BKM and a mix of above trends in MTM and KRM.

Remarks:

- 1 Considering more than one answer sought from the respondent, the summation of responses exceeds 100%.
- 2 The % of respondent HHs that generates garden waste ranges between 31% in LSMC to 17% in BKM. In KMC they constitute 27% and for MTM and KRM they account for 23%.

SECTION 3: EXISTING WASTE COLLECTION SERVICES

Table 3.1 Availability and use of waste collection service

Unit: # & % of sample HHs

Particulars	Municipalities										Total
	KMC		LSMC		BKM		MTM		KRM		
	#	%	#	%	#	%	#	%	#	%	
Sample HH nos.	331	100%	162	100%	126	100%	74	100%	75	100%	768
Service available and used	295	89%	155	96%	119	94%	26	35%	42	56%	637
Service available and not used	13	4%	6	4%	2	2%	0	0%	6	8%	27
Service not available but required	7	2%	1	1%	5	4%	47	64%	23	31%	83
Service neither available nor required	16	5%	0	0%	0	0%	1	1%	4	5%	21

Comments:

- 1 An overwhelming large majority of HHs in KMC, LSMC and BKM avail waste collection services. Among the newly established municipalities, only 35% HHs in MTM and 56% in KRM avail the services. But in both cases a large number of HHs have expressed their need to have such services.
- 2 Very few HHs (almost negligible at 0-5%) in all municipalities are not interested for the services.

Table 3.2 Mode of Waste Collection

Unit: # & % of sample HHs that avail waste collection services

Particulars	Municipalities										Total
	KMC		LSMC		BKM		MTM		KRM		
	#	%	#	%	#	%	#	%	#	%	
Respondent Sample HH nos. & %	295	100%	155	100%	119	100%	26	100%	43	100%	638
Sample HHs and % of respondent	331	89%	162	96%	126	94%	74	35%	75	57%	768
Door to door collection	227	77%	94	61%	52	44%	8	31%	41	95%	
Carrying to specific site	33	11%	10	6%	63	53%	14	54%	1	2%	
Carrying to container /truck	34	12%	51	33%	4	3%	4	15%	0	0%	
Do not know/others	1	0%	0	0%	0	0%	0	0%	1	2%	

Comments:

- 1 Among the HHs availing waste services, almost all the respondent HHs in KRM (98%) followed by a large majority of 77% and 66% in KMC and LSMC have door to door collection service. available to them.
- 2 The HHs in BKM - 53% & in MTM - 52% are reported carrying the waste at the specific site.
- 3 33% of HHs of LSMC, 12% of KMC and 15% of MTM are disposing the waste through container/truck.

Table 3.3 Service Providers of Door to Door Collection and Their Timing

Unit: # & % of sample HHs that avail door to door collection services

Particulars	Municipalities										Total
	KMC		LSMC		BKM		MTM		KRM		
	#	%	#	%	#	%	#	%	#	%	
Respondent Sample HH nos. & %	227	100%	94	100%	52	100%	8	100%	41	100%	422
Sample HHs and % of respondent	331	69%	162	58%	126	41%	74	11%	75	55%	768
Service Provider											
Municipality	145	64%	18	19%	52	100%	8	100%	7	17%	
Private company	29	13%	5	5%	0	0%	0	0%	4	10%	
NGO/CBO	43	19%	69	73%	0	0%	0	0%	30	73%	
Do not know	10	4%	2	2%	0	0%	0	0%	0	0%	
Respondent Sample HH nos. & %	#	%	#	%	#	%	#	%	#	%	
	227	100%	94	100%	52	100%	8	100%	41	100%	
Timing											
7:00 - 9:59	175	77%	69	73%	48	92%	8	100%	15	37%	
10:00-12:59	20	9%	16	17%	2	4%	0	0%	12	29%	
13:00 - 15 :59	9	4%	0	0%	1	2%	0	0%	1	2%	
16:00 - 18 : 59	1	0%	0	0%	0	0%	0	0%	0	0%	
Other	22	10%	9	10%	1	2%	0	0%	13	32%	
Do not know	0	0%	0	0%	0	0%	0	0%	0	0%	

Comments:

- 1 Majority HHs (37% to 100%) in all municipalities reported collection of waste in the morning at 7: to 9.59 AM, followed between 10 AM to 1 PM.
- 3 A few % of the HHs in all municipalities reported collection of waste in other times.

Table 3.4 Distance Travelled for Waste Disposal

Unit: # & % of sample HHs that carry waste to collection point by themselves

Particulars	Municipalities										Total
	KMC		LSMC		BKM		MTM		KRM		
	#	%	#	%	#	%	#	%	#	%	
Respondent Sample HH nos. & %	67	100%	61	100%	67	100%	18	100%	1	100%	214
Sample HHs and % of respondent	331	20%	162	38%	126	53%	74	24%	75	1%	768
1 - 25 m	40	60%	38	62%	38	57%	6	33%	1	100%	
26 - 50 m	10	15%	23	38%	28	42%	8	44%	0	0%	
51 - 100m	5	7%	0	0%	1	1%	1	6%	0	0%	
100 - 250 m	11	16%	0	0%	0	0%	3	17%	0	0%	
Over 250 m	1	1%	0	0%	0	0%	0	0%	0	0%	

Comments:

- 1 A large majority of HHs in KMC, LSMC and BKM that avail door to door services have to walk less than 25m for disposing the waste to collection point. This figure is 100% for KRM.
- 2 In case of KMC around 15% walk 26-50m and 16% walk for 100-250m in doing so.
- 3 For LSMC, BKM and MTM around 40% walk for 26-50m.

Table 3.5 Frequency of Waste Collection Service

Unit: # & % of sample HHs that avail waste collection services

Particulars	Municipalities										Total
	KMC		LSMC		BKM		MTM		KRM		
	#	%	#	%	#	%	#	%	#	%	
Respondent Sample HH nos. & %	295	100%	155	100%	119	100%	26	100%	42	100%	637
Sample HHs and % of respondent	331	89%	162	96%	126	94%	74	35%	75	56%	768
Daily	193	65%	72	46%	112	94%	11	42%	7	17%	
More 4 times / week	54	18%	20	13%	1	1%	9	35%	4	10%	
2 or 3 times / week	30	10%	50	32%	0	0%	5	19%	13	31%	
1 / week	2	1%	2	1%	2	2%	0	0%	0	0%	
less than 1 /week	3	1%	2	1%	1	1%	0	0%	1	2%	
Irregular	11	4%	8	5%	3	3%	1	4%	17	40%	
I do not know	2	1%	1	1%	0	0%	0	0%	0	0%	

Comments:

- 1 Almost all the HHs (94%) of BKM reported that their wastes are collected on daily basis. In case of KMC, LSMC and MTM 65%, 46% and 42% reported daily frequency of waste collection services
- 2 The frequency of waste collection in KRM was reported irregular (40% HHs) and less frequent.
- 3 In case of KMC, 18% HHs have more than 4 times per week and for 10%, 2 or 3 times a week.
- 4 In case of LSMC, 13% HHs have more than 4 times per week and for 32%, 2 or 3 times a week.
- 5 Except KRM, very few HHs reported irregular waste collection frequency.

Table 3.6 Paid for Waste Collection Services

Unit: # & % of sample HHs

Particulars	Municipalities										Total
	KMC		LSMC		BKM		MTM		KRM		
	#	%	#	%	#	%	#	%	#	%	
Sample HH nos.	331	100%	162	100%	126	100%	74	100%	75	100%	768
Yes	218	66%	87	54%	72	57%	2	3%	43	57%	422
No	113	34%	75	46%	54	43%	72	97%	32	43%	346

Comments:

- 1 Almost all the HHs (97%) of MTM reported not paying the waste collection services charge
- 2 In other four municipalities, 54% to 66% HHs are paying the service charge.

Table 3.7 Amount of Payment for Waste Collection and sweeping Services

Particulars	Municipalities										Total
	KMC		LSMC		BKM		MTM		KRM		
	#	%	#	%	#	%	#	%	#	%	
Respondent Sample HH nos. & %	218	0%	87	0%	72	0%	2	0%	43	0%	422
Type of Service	Avg. Amt.		Avg. Amt.		Avg. Amt.		Avg. Amt.		Avg. Amt.		
Waste collection service charge paid	93.4		79.5		25.9		12.5		46.4		
Sweeping the road charge	12.0		0.0		0.0		0.0		0.0		
Both collection and sweeping charge	77.9		0.0		28.6		0.0		0.0		

Comments:

- 1 Almost all the HHs of LSMC, MTM & KRM reported paying NRs. 79.5, 12.5 & 46.4 /HH/Monthin average against the waste collection charge
- 2 Only 60% of HHs of BKM & 92% of HHs of KMC reported paying NRs. 25.9 & 93.4 repectively
- 3 Out of these five municipalities, HHs of the KMC are paying more charge than others
- 4 Almost all the HHs of all the municipalities reported not paying the road sweeping charge separately
- 5 But 40% of HHs of Bhatapur are paying the road sweeping charge along with the waste collection charge ie combined charge,
- 6 HHs of the four municipalities except BKM reported not paying the collection & sweeping charge in combined

Table 3.8 Mode of payment

Particulars	Municipalities										Total
	KMC		LSMC		BKM		MTM		KRM		
	#	%	#	%	#	%	#	%	#	%	
Respondent Sample HH nos. & %	218	100%	87	100%	72	100%	2	100%	43	100%	422
Modality of Payment											
my Self	179	82%	81	93%	68	94%	2	100%	42	98%	
through community	20	9%	5	6%	1	1%	0	0%	1	2%	
others	19	9%	1	1%	3	4%	0	0%	0	0%	

Comments:

- 1 Almost all the respondent HHs of all the municipalities reported paying the service charge themselves
- 2 Negligible % (0-9) of HHs are paying the service charge through community and others

SECTION 4: WASTE REDUCTION AND RECYCLING

Table 4.1: Knowledge and Practice on Waste Separation

Particulars	Municipalities										Total
	KMC		LSMC		BKM		MTM		KRM		
	#	%	#	%	#	%	#	%	#	%	
Sample HH nos. and % sum	331	100%	162	100%	126	100%	74	100%	75	100%	768
Have knowledge & practice seperation	215	65%	89	55%	70	56%	23	31%	20	27%	
Have knowledge but do not practice separation	65	20%	41	25%	16	13%	29	39%	14	19%	
Do not have knowlede but do practice separation	30	9%	4	2%	15	12%	1	1%	17	23%	
Neither have knowledge nor practice separation	21	6%	28	17%	25	20%	21	28%	24	32%	

Comments:

- 1 A majority of HHs in KMC (65%), LSMC (55%) and BKM (56%) are having both the knowledge and practice of waste separation. In case of MTM, this figure is limited to 31% only. But, a majority of HHs in MTM 39% have knowledge but do not practice. Similarly, significant no. of HHs (32%) in KRM and MTM (28%) have neither knowledge nor practice of waste separation.
- 2 In KMC very few HHs (6%) reported not having knowledge and practice, but 20% HHs do not practice separation despite having knowledge of it.

Table 4.2: Extent of Waste Seperation

Particulars	Municipalities										Total
	KMC		LSMC		BKM		MTM		KRM		
	#	%	#	%	#	%	#	%	#	%	
Sample Respondent HHs nos. and % sum	245	100%	93	100%	85	100%	24	100%	37	100%	484
Two	149	61%	65	70%	61	72%	17	71%	30	81%	330
Three	62	25%	24	26%	17	20%	6	25%	6	16%	119
More than three	34	14%	4	4%	7	8%	1	4%	1	3%	47

Comments:

- 1 Of the total HHs, majority of HHs of in all municipalities separate waste into two categories. Some HHs also separate waste into three and more than three categories.

Table 4.3: Willingness to Cooperate for Recycling

Unit: # & % of sample HHs that do not practice source separation

Particulars	Municipalities										Total
	KMC		LSMC		BKM		MTM		KRM		
	#	%	#	%	#	%	#	%	#	%	
Respondent Sample HH nos. & % sum	86	100%	69	100%	41	100%	50	100%	38	100%	
Sample HHs nos. and % of respondent	331	26%	162	43%	126	33%	74	68%	75	51%	768
Very much	45	52%	32	46%	25	61%	8	16%	18	47%	
Somewhat	27	31%	28	41%	5	12%	32	64%	13	34%	
Less willing	7	8%	7	10%	8	20%	7	14%	2	5%	
Not willing	7	8%	2	3%	3	7%	3	6%	5	13%	

Comments:

- 1 A majority of HHs in all municipalities except MTM are very much interested to cooperate for recycling. The figure varies from 46-61% . In MTM, 64% HHs are somewhat interested.
- 2 Only upto 20% HHs in all the five municipalities expressed their unwillingness to cooperate for recycling.

Table 4.4: Perception on Waste Recycling by Non Practitioner but Willing Households

Unit: # & % of sample HHs that are quite willing to practice waste separation in Table 4.3

Particulars	Municipalities										Total
	KMC		LSMC		BKM		MTM		KRM		
	#	%	#	%	#	%	#	%	#	%	
Respondent Sample HH nos.	72		60		30		40		31		
Sample HHs nos. and % of respondent	331	22%	162	37%	126	24%	74	54%	75	41%	768
Reduces waste production	53	74%	52	87%	28	93%	24	60%	18	58%	
Reduces environmental pollution	51	71%	52	87%	11	37%	21	53%	27	87%	
Provides income generating opportunities	26	36%	8	13%	4	13%	2	5%	10	32%	
Provides opportunity for effective resource utilization	25	35%	3	5%	1	3%	8	20%	2	6%	
Others	2	3%	0		0		0		1		
	157	218%	115	192%	44	147%	55	138%	58	184%	

Comments:

- 1 A large majority of respondents in all the five municipalities felt that waste separation helps reduce waste production and reduces environmental pollution.

Remarks: Summation of responses exceeds 100% due to the multiple answers.

Table 4.5: Reasons for Unwillingness to Waste Separation

Unit: # & % of less willing and unwilling respondent in Table 4.3

Particulars	Municipalities										Total
	KMC		LSMC		BKM		MTM		KRM		
	#	%	#	%	#	%	#	%	#	%	
Respondent Sample HH nos.	14		9	192%	11	147%	10	138%	7	184%	51
Sample HHs nos. and % of respondent	331	4%	162	6%	126	9%	74	14%	75	9%	768
It is inconvenient and difficult	7	50%	3	33%	9	82%	7	70%	6	86%	
It takes much time	5	36%	6	67%	1	9%	2	20%	6	86%	
Needs for recycling system is not clear	0	0%	1	11%	5	45%	1	10%	0	0%	
Benefits of recycling system is not clear	0	0%	0	0%	5	45%	2	20%	0	0%	
No space inside the house to keep the seperated waste	9	64%	6	67%	3	27%	1	10%	1	14%	

Comments:

- 1 The majority of HHs in KMC (64%) & LSMC (67%) cited lack of space inside the house as reason for their unwillingness. Equal no. of HHs in LSMC (67%) reported that it takes much time and 33% found it inconvenient. In case of KMC, half of respondents found it inconvenient and around one third thought it
- 2 A large no. of respondents in BKM, MTM and KRM also found waste separation as too inconvenient. A significant number of them in BKM (45%) and MTM (10-20%) were not clear on needs and benefit of waste separation.

Table 4.6: Preferred Extent of Waste Separation

Unit: # & % of sample HHs that are quite willing to practice waste separation in Table 4.3

Particulars	Municipalities										Total
	KMC		LSMC		BKM		MTM		KRM		
	#	%	#	%	#	%	#	%	#	%	
Sample HH nos. and % sum	72	100%	60	100%	30	100%	40	100%	31	100%	233
Two	31	43%	33	55%	10	33%	30	75%	22	71%	
Three	29	40%	19	32%	12	40%	10	25%	9	29%	
More than three	12	17%	8	13%	8	27%	0%	0%	0%	0%	

Comments:

- 1 Majority of respondent HHs in KMC (43%), LSMC (55%), MTM (75%), and KRM (71%) prefer seperation of waste into two categories. But a significant numbers of them (25% to 40%) in those four municipalities also prefer three categories. Few of the HHs in KMC and LSMC prefer more than three categories.
- 2 In case of BKM, 33%, 40% and 27% respondents preferred two, three and more than three respectively.

Table 4.7: Disposal/Income Generated through Recyclable Materials

Unit: # & % of sample HHs

Particulars	Municipalities										Total
	KMC		LSMC		BKM		MTM		KRM		
	#	%	#	%	#	%	#	%	#	%	
Sample HH nos.	331	100%	162	100%	126	100%	74	100%	75	100%	768
Mode of Disposal											
Collected/Sold at Households' Doorstep	205	62%	79	49%	72	57%	13	18%	13	17%	376
Sold at Households' Doorstep	1	0%	1	1%			1	1%	1	1%	4
Returned/Sold at Market	123	37%	82	51%	48	38%	18	24%	45	60%	313
None of above	3	1%	1	1%	6	5%	43	58%	17	23%	70

Comments:

- 1 Majority of HHs of KMC (62%) & BKM (57%) fall in the category of collected/sold at Households' doorstep. In LSMC 49% belong to this category.
- 2 On the other hand, the majority of HHs of LSMC & KRM fall in the category of returned /sold at market. 37% of KMC, 38% of BKM and 24% of MTM also fall into this category.
- 3 But, for the majority of HHs (58%) in MTM the mode of disposal is different from that presented in the table.

Table 4.8: Recyclable Material Collected or Sold

Unit: # of responses

Particulars	Municipalities										Total
	KMC		LSMC		BKM		MTM		KRM		
	Collect ed/Bou ght at Home	Return/ Sold at Shop	Collect ed/Bou ght at Home	Return/ Sold at Shop	Collect ed/Bou ght at Home	Return/ Sold at Shop	Collect ed/Bou ght at Home	Return/ Sold at Shop	Collect ed/Bou ght at Home	Return/ Sold at Shop	
Sample HH nos.	331		162		126		74		75		768
Glass	318	159	155	69	114	53	25	8	56	13	
Paper	318	138	158	66	103	41	24	6	53	10	
Tin	153	22	65	6	71	9	9	2	26	1	
Metal	88	18	28	4	19	4	7	2	11	0	
Kitchen waste	0	0	56	0	27	0	17	0	313	0	
Garden waste	3	1	0	0	0	0	0	0	3	0	
Plastic	209	36	87	5	17	1	5	1	3	0	
Rubber	38	13	5	0	0	0	3	0	46	0	
Wood	2	1	0	0	0	0	0	0	2	0	
Tyres	9	0	3	0	0	0	0	0	12	0	
Others	38	31	5	1	1	0	1	0	45	0	

Comments:

- 1 The major items collected for sell are glass and paper in all municipalities whereas kitchen waste is reported as the major item in KRM. In KMC and LSMC , large number of repondents also mentioned tin and plastic.

Table 4.9: Linkage between Practice of Source Separation and Composting (Q4.2/4.15)

Unit: # & % of sample HHs

Particular	Municipalities										Total
	KMC		LSMC		BKM		MTM		KRM		
	#	%	#	%	#	%	#	%	#	%	
Sample HH nos.	331	100%	162	100%	126	100%	74	100%	75	100%	768
Practice both- Waste Seperation and Composting	46	14%	34	21%	23	18%	11	15%	6	8%	
Practice Waste Seperation but not Composting	199	60%	59	36%	62	49%	13	18%	31	41%	
Do not practice Waste Seperation but do Composting	9	3%	6	4%	12	10%	8	11%	7	9%	
Neither practice Waste Seperation nor do Composting	77	23%	63	39%	29	23%	42	57%	31	41%	

Comments:

- 1 A large number of HHs in KMC (60%), BKM (49%) and KRM (41%) practice waste separation but are not engaged in composting. In LSMC and MTM only 36% and 18% HHs respectively belong to this
- 2 On the other hand, 39% of HHs in LSMC, 57% of HHs in MTM and 41% HHs in KRM neither practice waste separation nor do composting. In KMC and BKM 23% belong to this group.

Table 4.10: Knowledge and Practice on Composting (Q4.13/4.15)

Unit: # & % of sample HHs

Particulars	Municipalities										Total
	KMC		LSMC		BKM		MTM		KRM		
	#	%	#	%	#	%	#	%	#	%	
Sample HH nos. & % sum	331	100%	162	100%	126	100%	74	100%	75	100%	768
Have knowledge (heard of) & make compost	40	12%	39	24%	34	27%	18	24%	11	15%	
Do not have knowlede but do make compost	15	5%	1	1%	1	1%	1	1%	2	3%	
Have knowledge but do not make compost	152	46%	86	53%	68	54%	31	42%	32	43%	
Neither have knowledge nor make compost	124	37%	36	22%	23	18%	24	32%	30	40%	

Comments:

- 1 Majority of HHs of all the municipalities have knowledge but do not make compost, the figure varies from 42-54% in which lowest figure in MTM at 42% and highest figure in BKM at 54%.
- 2 On the other hand, 32-40% of the HHs of the KMC, MTM & KRM neither have knowledge and nor make compost. 24-27% of HHs of the LSMC, BKM, and MTM have knowledge and make composting.
- 3 Negligible % of HHs of all the municipalities do not have knowledge and do make compost.

Table 4.11: Source of Knowledge on Compost Making

Unit: # & % of sample HHs that have knowledge of Compost Making

Particulars	Municipalities										Total
	KMC		LSMC		BKM		MTM		KRM		
	#	%	#	%	#	%	#	%	#	%	
Respondent Sample HH nos. & % sum	192	100%	125	100%	102	100%	49	100%	43	100%	511
Sample HHs nos. and % of respondent	331	58%	162	77%	126	81%	74	66%	75	57%	768
Municipality	0	0%	5	4%	3	3%	10	20%	0	0%	
Private Company	1	1%	1	1%	0	0%	5	10%	0	0%	
NGO/CBO	3	2%	16	13%	2	2%	17	35%	0	0%	
Others	17	9%	14	11%	2	2%	3	6%	0	0%	
None of above/ by oneself	171	89%	89	71%	95	93%	14	29%	43	100%	

Comments:

- 1 A large majority of HHs in KMC (58%), LSMC (77%), BKM (81%), MTM (66%) and KRM (57%) reported to have knowledge in composting. Out of them, an overwhelming respondents had received the knowledge on their own.
- 2 The involvement of NGO/CBO is not appreciable except for MTM (35%). In MTM, municipality also seems to be active in disseminating knowledge. But in other municipality the agencies have not been involved in this activity as such.

Table 4.12: Methods adopted for Making Compost

Unit: # & % of sample HHs that have experience with Compost Making

Particulars	Municipalities										Total
	KMC		LSMC		BKM		MTM		KRM		
	#	%	#	%	#	%	#	%	#	%	
Respondent Sample HH nos. & %	55	100%	40	100%	35	100%	19	100%	13	100%	162
Sample HHs nos. and % of respondent	331	17%	162	25%	126	28%	74	26%	75	17%	768
Open space/ organic field	39	71%	24	60%	32	91%	10	53%	12	92%	115
Containers/composting bin	13	24%	15	38%	3	9%	9	47%	1	8%	40
Others	3	5%	1	3%	0	0%	0	0%	0	0%	4

Comments:

- 1 The HHs that reported to have experience in compost making accounted for 17% in KMC, 25% in LSMC, 28% in BKM, 26% in MTM and 17% in KRM. Out of them, an overwhelming respondents practice composting in open space or organic fields.
- 2 Some HHs also do composting in containers and compost bins. Their number is significant in KMC, LSMC and MTM.

Table 4.13: Willingness to make Compost

Unit: # & % of sample HHs that do not have experience with Compost Making

Particulars	Municipalities										Total
	KMC		LSMC		BKM		MTM		KRM		
	#	%	#	%	#	%	#	%	#	%	
Respondent Sample HH nos. & %	276	100%	122	100%	91	100%	55	100%	62	100%	606
Sample HHs nos. and % of respondent	331	83%	162	75%	126	72%	74	74%	75	83%	768
Willing	41	15%	12	10%	5	5%	3	5%	1	2%	82
Willing, if training is provided	72	26%	62	51%	14	15%	33	60%	10	16%	204
Willing, if compost making box is provided free	9	3%	10	8%	2	2%	4	7%	0	0%	25
Willing, if assured of buyer (organization)	9	3%	0	0%	2	2%	3	5%	0	0%	14
Not Willing	145	53%	38	31%	68	75%	12	22%	51	82%	316

Comments:

- 1 Among the sample HHs that do not have experience with compost making, a majority of them in KMC (53%), BKM (75%) and KRM (82%) asserted that they are not willing at all in any condition.
- 2 In LSMC and MTM, training was considered as a condition for doing composting by majority of HHs.

Table 4.14: Reasons for Unwilling to make Compost

Unit: # & % of sample HHs that are Not Willing in Table 4.13

Particulars	Municipalities										Total
	KMC		LSMC		BKM		MTM		KRM		
	#	%	#	%	#	%	#	%	#	%	
Respondent Sample HH nos. & %	145	100%	38	100%	68	100%	12	100%	51	100%	314
Sample HHs nos. and % of respondent	331	44%	162	23%	126	54%	74	16%	75	68%	768
It is inconvenient and difficult	13	9%	2	5%	15	22%	3	25%	4	8%	
It takes much time as we have no time	36	25%	5	13%	8	12%	3	25%	10	20%	
It takes much money as we cannot afford	7	5%	5	13%	10	15%	2	17%	12	24%	
Needs for composting is not clear	19	13%	6	16%	20	29%	3	25%	7	14%	
Benefits of composting is not clear	10	7%	5	13%	2	3%	1	8%	8	16%	
No space is available	60	41%	13	34%	12	18%	0	0%	7	14%	
Others (please specify)	0	0%	2	5%	1	1%	0	0%	3	6%	

Comments:

- 1 Unavailability of space was cited as the main reason for unwillingness to composting in KMC and LSMC.
- 2 A large number of respondents in BKM and MTM were not clear on the need for composting.
- 3 Other reasons, as shown in the table were also cited by some HHs.

Table 4.15: Assessment of Composting

Particulars	Unit: # & % of respondents that make compost & as shown										
	Municipalities										
	KMC		LSMC		BKM		MTM		KRM		Total
	#	%	#	%	#	%	#	%	#	%	
Respondent Sample HH nos. & % sum	55		40		35		19		13		162
Sample HHs nos. and % of respondent	331	17%	162	25%	126	28%	74	26%	75	17%	768
A. Kitchen Waste											
Less than half	13	24%	5	13%	0	0%	3	16%	0	0%	21
Half	13	24%	14	35%	18	51%	11	58%	6	46%	61
More than half	13	24%	3	8%	9	26%	4	21%	2	15%	31
All	12	22%	11	28%	8	23%	1	5%	5	38%	37
	51	93%	33	83%	35	100%	19	100%	13	100%	
B. Garden Waste											
Less than half	10	18%	5	13%	0	0%	4	21%	1	8%	20
Half	6	11%	6	15%	5	14%	3	16%	3	23%	23
More than half	11	20%	3	8%	2	6%	2	11%	2	15%	20
All	13	24%	7	18%	5	14%	0	0%	2	15%	27
Total	40	73%	21	53%	12	34%	9	47%	8	62%	90
C. Amount of Waste											
Minimum	0.50		0.50		2.00		0.50		2.00		
Maximum	15.00		6.00		20.00		10.00		10.00		
Mean	3.93		1.99		6.66		2.92		5.31		
Std. Deviation	2.78		1.28		4.60		2.01		3.07		
D. Proportion of sell/own use											
Sell	1	2%	0	0%	0	0%	0	0%	0	0%	
Ownuse	51	98%	38	100%	35	100%	19	100%	13	100%	
Total	52	100%	38	100%	35	100%	19	100%	13	100%	
E. Selling Rate											
Total	NA	0	NA	0	NA	0	NA	0	NA	0	
E. Customers of Compost											
Total	0	0	0	0	0	0	0	0	0	0	

Comments:

- 1 Majority of HHs in all the municipalities making compost of almost half of the kitchen waste, this figure varies from 24-58% with lowest figure in KMC and highest figure in MTM.
- 2 In the case of garden waste, views of HHs differ from municipality to municipality.
- 3 Almost all of the HHs in all municipalities do not sell the compost.

Remarks: Summation of responses exceeds 100% due to the multiple answers.

SECTION 5. PUBLIC AWARENESS AND COMMUNITY INVOLVEMENT

Table 5.1: Awareness on SWM in Nepal

Level of Awareness	Unit: # & % of sample HHs										
	Municipalities										
	KMC		LSMC		BKM		MTM		KRM		Total
	#	%	#	%	#	%	#	%	#	%	
Sample HH nos. & % sum	331	100%	162	100%	126	100%	74	100%	75	100%	768
Not Aware	147	44%	52	32%	13	10%	5	7%	28	37%	245
Partially Aware	149	45%	80	49%	27	21%	51	69%	26	35%	333
Aware	35	11%	30	19%	86	68%	18	24%	21	28%	190

Comments:

- 1 Awareness level on SWM in BKM is high or more than the other municipalities
- 2 KMC has the Lowest awareness level on SWM (11%) followed by LSMC (19%), MTM (24%) and KRM (28%)
- 3 A majority of HHs in KMC and LSMC however reported partial awareness. In MTM 69% were reported in this category.

Table 5.2: Mode of Waste Disposal in the Community

Mode of Waste Disposal	Municipalities										Total
	KMC		LSMC		BKM		MTM		KRM		
	#	%	#	%	#	%	#	%	#	%	
Sample HH nos.	331		162		126		74		75		768
(1) Waste collected by Collector	300	91%	159	98%	120	95%	28	38%	47	63%	654
(2) Waste is Burnt	95	29%	25	15%	6	5%	35	47%	43	57%	204
(3) Waste thrown in the open space	51	15%	9	6%	15	12%	50	68%	24	32%	149
(4) Waste dumped on the vicinity of the house/yard	23	7%	2	1%	15	12%	25	34%	21	28%	86
(5) Waste buried in the yard/garden near the house	22	7%	8	5%	1	1%	16	22%	5	7%	52
(6) Others	12	4%	2	1%	2	2%	0	0%	1	1%	17
Total	503	152%	205	127%	159	126%	154	208%	141	188%	1162
sum of (3) & (4)	74	22%	11	7%	30	24%	75	101%	45	60%	

Comments:

- 1 The most common mode of waste disposal in the communities of KMC (91%), LSMC (98%), BKM (95%) and KRM (63%) was in the form of waste collected by Collector from house to house. In KRM, burning was also common (57%). Burning of waste was reported practiced by significant number of HHs in KMC (29%), LSMC (15%) and MTM (47%) as well.
- 2 Throwing waste in open space and dumping in the vicinity is quite prevalent in MTM and KRM

Remarks:

- 1 Summation of responses exceeds 100% due to multiple answers.

Table 5.3: Perception on Responsibility for Waste Management

Actor and Institutions	Municipalities										Total
	KMC		LSMC		BKM		MTM		KRM		
	#	%	#	%	#	%	#	%	#	%	
Sample HH nos. & % sum	331	100%	162	100%	126	100%	74	100%	75	100%	768
Government	36	11%	7	4%	4	3%	2	3%	8	11%	57
Municipality	105	32%	33	20%	60	48%	24	32%	55	73%	277
Sweepers	7	2%	0	0%	15	12%	1	1%	0	0%	23
Yourselves	147	44%	109	67%	35	28%	34	46%	5	7%	330
Pvt. Company.	28	8%	7	4%	11	9%	13	18%	7	9%	66
NGO	0	0%	1	1%	0	0%	0	0%	0	0%	1
Do not know	7	2%	5	3%	0	0%	0	0%	0	0%	12
Others	1	0%	0	0%	1	1%	0	0%	0	0%	2

Comments:

- 1 A majority of HHs in KMC (44%), LSMC (67%) and MTM (46%) perceived that they are themselves responsible for SWM. But majority of HHs in BKM (48%) and KRM (73%) wanted Municipality to be responsible for it.
- 2 Few HHs in all the municipalities considered Government or Private Company as the responsible body for SWM.
- 3 NGOs were not considered responsible for SWM in all the municipalities.

Table 5.4: Household Initiatives towards Waste Management

Initiatives	Municipalities										Total
	KMC		LSMC		BKM		MTM		KRM		
	#	%	#	%	#	%	#	%	#	%	
Respondent Sample HH nos. & % sum	65	100%	11	100%	3	100%	1	100%	6	100%	86
Sample HHs nos. and % of respondent	331	20%	162	7%	126	2%	74	1%	75	8%	768
Reducing Waste Generation	14	22%	2	18%	2	67%	0%	0%	3	50%	21
Making Compost	6	9%	0	0%	0	0%	0	0%	2	33%	8
Using Recycle and Reuse	1	2%	1	9%	0	0%	0	0%	0	0%	2
Disposing waste at designated place and time	20	31%	3	27%	0	0%	0	0%	0	0%	23
Practicing Waste Separation	6	9%	0	0%	0	0%	1	100%	0	0%	7
Paying service charge to collector/sweeper	4	6%	4	36%	0	0%	0	0%	1	17%	9
Cleaning Neighbours	11	17%	1	9%	1	33%	0	0%	0	0%	13
Others	3	5%	0	0%	0	0%	0	0%	0	0%	3

Comments:

- 1 It was reported in table 5.3 that 22%, 7%, 24%, 100% and 60% of sample HHs in KMC, LSMC, Bhaktapu, MTM and KRM respectively indicated that open dumping in various forms was being practiced in the community. But only 20%, 7%, 2%, 1% and 8% respectively.
- 2 It is to be noted that except KMC, very few respondents in other four municipalities have taken any initiative.

Table 5.5: Frequency of Cleaning the Neighborhood

Unit: # & % of sample HHs who Cleans neighbourhood (table 5.4)

Frequency of Cleaning	Municipalities										Total
	KMC		LSMC		BKM		MTM		KRM		
	#	%	#	%	#	%	#	%	#	%	
Respondent Sample HH nos. & % sum	11	100%	1	100%	1	100%	0	0%	0	0%	13
Sample HHs nos. and % of respondent	331	3%	162	1%	126	1%	74	0%	75	0%	768
Almost every day	2	18%	1	100%	0	0%	0	0%	0	0%	3
Not Frequently	9	82%	0	0%	1	100%	0	0%	0	0%	10

Comments:

1 A negligible small % of sample HHs in KMC (3%), LSMC (1%) and BKM (1%) clean their neighbourhood, and that too not frequently (LSMC reported almost daily). This was reported zero for MTM and KRM.

Remarks: The validity of this table could be questioned on the ground of very few responses.

Table 5.6: Willingness to Pay for SWM Services

Unit: # & % of sample HHs

Level of Willingness	Municipalities										Total
	KMC		LSMC		BKM		MTM		KRM		
	#	%	#	%	#	%	#	%	#	%	
Sample HH nos. & % sum	331	100%	162	100%	126	100%	74	100%	75	100%	768
Willing to pay if service is available	95	29%	66	41%	46	37%	69	93%	28	37%	
We have already paid	220	66%	88	54%	70	56%	3	4%	42	56%	
We are not willing to pay	16	5%	8	5%	10	8%	2	3%	5	7%	

Comments:

1 A majority of HHs in KMC (66%), LSMC (54%), BKM (56%) and KRM (56%) reported already paying for SWM services. Besides, a significant % of HHs that do not pay now, expressed their willingness to pay provided service is available.

2 A small % of HHs (3-8%) in all municipalities declined to pay for the services.

Table 5.7: Preference of Willing Households for payments to the recipient Service Provider

Unit: # & % of sample HHs that are willing to pay (table 5.6)

Service Providers	Municipalities										Total
	KMC		LSMC		BKM		MTM		KRM		
	#	%	#	%	#	%	#	%	#	%	
Respondent Sample HH nos. & % sum	95	100%	66	100%	46	100%	69	100%	28	100%	304
Sample HHs nos. and % of respondent	331	29%	162	41%	126	37%	74	93%	75	37%	768
Concerned Service Provider	94	99%	66	100%	44	96%	64	93%	28	100%	296
Municipality	1	1%	0	0%	2	4%	4	6%	0	0%	7
Private Company	0	0%	0	0%	0	0%	0	0%	0	0%	0
NGOs/CBOs	0	0%	0	0%	0	0%	1	1%	0	0%	1
Others	0	0%	0	0%	0	0%	0	0%	0	0%	0

Comments:

1 Almost all the respondents of all the municipalities prefer any service provider whereas only negligible % HHs prefers municipality. This figure varies from 0-6%.

Table 5.8: Affordability to SWM Service Charge

Unit: # & % of sample HHs that are willing to pay (table 5.6)

Range of Payments	Municipalities										Total
	KMC		LSMC		BKM		MTM		KRM		
	#	%	#	%	#	%	#	%	#	%	
Respondent Sample HH nos. & % sum	95	100%	66	100%	46	100%	69	100%	28	100%	304
Sample HHs nos. and % of respondent	331	29%	162	41%	126	37%	74	93%	75	37%	768
Less than Rs 10	14	15%	14	21%	18	39%	13	19%	1	4%	60
11 - 30 per month	37	39%	15	23%	23	50%	44	64%	8	29%	127
31 - 50 per month	23	24%	23	35%	5	11%	11	16%	16	57%	78
51 - 100 per month	15	16%	10	15%	0	0%	1	1%	2	7%	28
101 - 150 per month	3	3%	3	5%	0	0%	0	0%	1	4%	7
more than 150 per month	3	3%	1	2%	0	0%	0	0%	0	0%	4

Comments:

1 The respondents included 29%, 41%, 37%, 93% and 37% of the sample HHs of five municipalities

2 A majority of respondent HHs of KMC (39%), BKM (50%) and MTM (64%) indicated to pay upto NRs. 30 per month against SWM service charges. Around 23% of LSMC and 29% of KRM also reported the same.

3 A majority of respondent HHs of LSMC (35%) and KRM (57%) indicated to pay between NRs. 31 to 50 per month against SWM service charges. Around 24% of KMC, 11% of BKM and 16% of MTM also reported the same.

4 Around 16% of KMC and 15% of LSMC could pay between Nrs. 51-100. Some HHs in these municipalities could go even higher, but in other three municipalities HHs would not like to pay above NRs. 50 per month.

5 A significant number of respondent HHs in KMC (15%), LSMC (21%), BKM (39%) and MTM (19%) would prefer to pay only less than Nrs. 10 per month.

Table 5.9: Reason for Unwillingness to Pay

Unit: # & % of sample HHs that are not willing to pay (table 5.6)

Reasons for Unwillingness to Pay	Municipalities										
	KMC		LSMC		BKM		MTM		KRM		Total
	#	%	#	%	#	%	#	%	#	%	
Respondent Sample HH nos. & % sum	16	100%	8	100%	10	100%	2	100%	5	100%	37
Sample HHs nos. and % of respondent	331	5%	162	5%	126	8%	74	3%	75	7%	768
It is duty of the Ministry/Government	4	25%	0%	0%	0%	0%	0%	0%	0%	0%	4
It is duty of the Municipality	8	50%	0%	0%	6	60%	1	50%	2	40%	17
Duty of the sweeper		0%	0%	0%	0%	0%	1	50%	0%	0%	1
Could not afford	1	6%	1	13%	2	20%	0%	0%	0%	0%	4
Good service could not be expected	0	0%	1	13%	0%	0%	0%	0%	0%	0%	1
We have no problem from the waste	1	6%	5	63%	1	10%	0%	0%	3	60%	10
We have not paid for a long time		0%	0%	0%	0%	0%	0%	0%	0%	0%	
Do not know		0%	0%	0%	0%	0%	0%	0%	0%	0%	
Others	2	13%	1	13%	1	10%	0%	0%	0%	0%	4

Comments:

- 1 It was reported in table 5.7 that a few of sample HHs; 5% in KMC & LSMC, nearly 8% in BKM & KRM along with 3% in MTM declined to pay for SWM service. The reasons for unwillingness to pay is described above.
- 2 A majority of respondents in KMC (50%), BKM (60%) and MTM (50%) were of the view that SWM is the duty of municipality, and hence they should not be asked to pay any additional charges for SWM services. About 40% respondents in KRM also thought the same.
- 3 A majority of respondents in LSMC (63%) and KRM (60%) were of the opinion that they had no problems with solid waste, hence why to pay. Around 6% in KMC and 10% in BKM also thought the same.
- 4 A significant % of respondents in KMC (25%) opined that Ministry/Government should take care of SWM without levying any additional charges

Table 5.10: Activities of CBO's in the Community

Unit: # & % of sample HHs that know about CBOs activities

Activities	Municipalities										
	KMC		LSMC		BKM		MTM		KRM		Total
	#	%	#	%	#	%	#	%	#	%	
Respondent Sample HH nos. & % sum	268	100%	157	100%	117	100%	26	100%	49	100%	617
Sample HHs nos. and % of respondent	331	81%	162	97%	126	93%	74	35%	75	65%	768
Waste Collection	261	97%	152	97%	113	97%	21	81%	44	90%	591
Composting		0%	1	1%	1	1%	4	15%	0%	0%	6
Recycling	2	1%	0%	0%	0%	0%	0%	0%	0%	0%	2
Public Educaiton/ Campaign	1	0%	1	1%	1	1%	1	4%	0%	0%	4
Cleaning	3	1%	2	1%	1	1%	0%	0%	5	10%	11
Discussion meeting	1	0%	0%	0%	0%	0%	0%	0%	0%	0%	1
Do not know	0	0%	1	1%	1	1%	0	0%	0	0%	2

Comments:

- 1 A large majority of sample HHs in KMC (81%), LSMC (97%) and BKM (93%) followed by KRM (65%) and MTM (35%) reported being aware of involvement and activities of CBOs/NGOs in the field of SWM in their municipalities. But almost all of them took notice of CBOs/NGOs involvement in door to door waste collection activities. Except for MTM (15%) and KRM (10%) respondents are not informed of CBOs involvement in other activities like composting, education campaign, recycling etc.
- 2 It follows that NGOs/CBOs has lot to do to make their activities being felt in other aspects of SWM too.

Table 5.11: Participation in CBO's Activities

Unit: # & % of sample HHs

Particulars	Municipalities										
	KMC		LSMC		BKM		MTM		KRM		Total
	#	%	#	%	#	%	#	%	#	%	
Sample HH nos.	331	100%	162	100%	126	100%	74	100%	75	100%	768
Participated/Cooperated in CBO Activities	82	25%	80	49%	47	37%	12	16%	12	16%	233
Not Participated/Cooperated in CBO Activities	249	75%	82	51%	79	63%	62	84%	63	84%	535
Participated in Training	69	10%	49	14%	38	14%	39	23%	6	4%	201
Enviroment & Health Education	282	41%	143	40%	105	39%	56	33%	69	46%	655
Total	682	151%	354	154%	269	153%	169	156%	150	150%	1624

Comments:

- 1 A majority of sample HHs were reported not to have participated in CBOs activities, but significant % of respondents in LSMC (49%) and BKM (37%) have either participated or cooperated in CBOs activities. In case of KMC (25%), MTM (16%) and KRM (16%) participation could be considered as low.

Table 5.12: Source of Training/Information on SWM

Unit: # & % of sample HHs exposed to appropriate information on SWM

Sources	Municipalities										Total
	KMC		LSMC		BKM		MTM		KRM		
	#	%	#	%	#	%	#	%	#	%	
Respondent Sample HH nos. & % sum	131	100%	91	100%	79	100%	70	100%	12	100%	218
Sample HHs nos. and % of respondent	331	40%	162	56%	126	63%	74	95%	75	16%	768
by Family Members	29	22%	7	8%	1	1%	8	11%	0	0%	45
by Community people/Neighbour	9	7%	9	10%	2	3%	3	4%	2	17%	25
by school	16	12%	8	9%	19	24%	10	14%	2	17%	55
by Municipality	4	3%	10	11%	14	18%	9	13%	0	0%	37
Central Government	0	0%	0	0%	0	0%	0	0%	0	0%	0
by NGO	10	8%	15	16%	5	6%	18	26%	1	8%	49
by donor agencies	3	2%	0	0%	1	1%	2	3%	1	8%	7
by TV program	36	27%	23	25%	16	20%	7	10%	3	25%	85
by radio program	13	10%	9	10%	12	15%	1	1%	2	17%	37
by Newspaper/Magazine	7	5%	8	9%	4	5%	12	17%	1	8%	32
by Pamphlet/Booklet/Poster	3	2%	1	1%	5	6%	0	0%	0	0%	9
by Others	1	1%	1	1%	0	0%	0	0%	0	0%	2

Comments:

- The % sample HHs that reported exposed to information on SWM were 40%, 56%, 63%, 95% and 16% respect.
- Most of the respondent HHs of KMC (27%), LSMC (25%) and KRM (25%) have been informed about SWM through TV programs. But this figure is 10% and 20% for the case of BKM and MTM respect.
- The other important source of information has been identified as school (BKM) or NGO (MTM). In case of KMC a large % of respondents (22%) got information through family members. Other sources like neighbour, municipality, radio programs, newspaper etc. were also cited in all the municipalities.

Table 5.13: Source of Family Members' Environmental and Health Education

Unit: # of sample HHs whose family members are exposed to env. Health education

Sources	Municipalities										Total
	KMC		LSMC		BKM		MTM		KRM		
	#	%	#	%	#	%	#	%	#	%	
Respondent Sample HH nos. & % sum	282		143		105		56		69		
Sample HHs nos. and % of respondent	331	85%	162	88%	126	83%	74	76%	75	92%	768
From other family member	71	25%	35	24%	2	2%	5	9%	7	10%	120
From school	180	64%	92	64%	91	87%	41	73%	47	68%	451
From Medical worker/ health center/hospital	12	4%	0	0%	6	6%	0	0%	4	6%	22
From CBOs/NGOs	18	6%	11	8%	4	4%	10	18%	4	6%	47
From Print Media (newspapers etc.)	121	43%	67	47%	23	22%	5	9%	31	45%	247
From radio program	142	50%	62	43%	63	60%	16	29%	21	30%	304
From TV program	219	78%	83	58%	81	77%	28	50%	57	83%	468
From Municipality	6	2%	13	9%	8	8%	4	7%	1	1%	32
From HMG/MLD	0	0%	0	0%	0	0%	0	0%	0	0%	0
From Others	9	3%	2	1%	0	0%	4	7%	15	22%	30
	778	276%	365	255%	278	265%	113	202%	187	271%	1721

Comments:

- The % sample HHs that reported their family members being exposed to environmental health education were 85%, 88%, 83%, 76% and 92% respectively.
- School and TV programs were reported to be the main source of learning for all municipalities. Radio and print media was also an important source. In case of KMC and LSMC family members were also helpful in disseminating information. Importance of other sources varied municipality to municipality, as shown in table. So far NGOs/CBOs or Municipality have not been instrumental in disseminating informations.

Remarks:

- Summation of responses exceeds 100% due to the multiple answers.

Table 5.14: Perception on Participatory SWM Programs

Unit: # & % of sample HHs

Particulars	Municipalities										Total
	KMC		LSMC		BKM		MTM		KRM		
	#	%	#	%	#	%	#	%	#	%	
Sample HH nos.	331	100%	162	100%	126	100%	74	100%	75	100%	768
Is very necessary	298	90%	160	99%	109	87%	45	61%	62	83%	
Is some what necessary	30	9%	2	1%	10	8%	25	34%	13	17%	
Is Not very necessary	2	1%	0	0%	3	2%	2	3%	0	0%	
Is Not necessary at all	1	0%	0	0%	4	3%	2	3%	0	0%	

Comments:

- An overwhelming large majority of sample HHs have voted for participatory SWM programs in all municipalities.

Table 5.15: Willingness for Participation in Preferred SWM Activity

Unit: # & % of sample HHs

Scope of Participation	Municipalities										Total
	KMC		LSMC		BKM		MTM		KRM		
	#	%	#	%	#	%	#	%	#	%	
Sample HH nos.	331	100%	162	100%	126	100%	74	100%	75	100%	768
First Priority Responses											
Any activity related to SWM	56	17%	111	69%	27	21%	35	47%	20	27%	249
Collecting Waste in our Community	15	5%	9	6%	13	10%	13	18%	21	28%	71
Cleaning our Community	53	16%	7	4%	24	19%	1	1%	18	24%	103
Campaign for raising Awareness of People	116	35%	17	10%	28	22%	8	11%	9	12%	178
Education program on SWM	46	14%	6	4%	24	19%	6	8%	4	5%	86
Reducing Waste/Composting	15	5%	4	2%	1	1%	6	8%	1	1%	27
Not Willing	30	9%	8	5%	9	7%	5	7%	2	3%	54

Comments:

- 1 A few of the sample HHs in KMC (9%), LSMC (5%), BKM and MTM 7% and KRM (3%) expressed unwillingness to participate in any SWM related activities. The rest have expressed varied interests.
- 2 In case of KMC and BKM, awareness raising followed by any activity related to SWM, cleaning community, education program and collecting waste have been identified as preferred activities in descending order.
- 3 In case of LSMC and MTM, majority preferred any activity related to SWM followed by raising awareness or collecting waste and education program as well as composting. HHs in KRM also wanted to be engaged in similar activities but with varied interests.

SECTION 6: ANALYSIS OF BEHAVIOUR AND ATTITUDE

6-I: Open Dumping Practices (refer Q2.7)

It was found in Table 2.1 (Q2.4) that a large proportion of sample HHs (59% and 23% respectively) in MTM and KRM follow open dumping practice. This figure was reported 5%, 2% and 6% for KMC, LSMC and BKM respectively. It is to be noted that both MTM and KRM are the newly established municipalities and the other three are the old ones. Does the institutional set up i.e. being municipality or VDC affect the open dumping practices? There could be other determinants as well. The following section attempts to identify major determining factor for this behaviour.

Table 6_I.1: Reasons for Open Waste Dumping Practices (Q2.7)

Unit: # & % of sample HHs practicing open space dumping

Particulars	Municipalities										Total
	KMC		LSMC		BKM		MTM		KRM		
	#	%	#	%	#	%	#	%	#	%	
Respondent Sample HHs	18	100%	3	100%	7	100%	44	100%	17	100%	89
Sample HHs	331	5%	162	2%	126	6%	74	59%	75	23%	768
Long practice among our family	6	33%	2	67%	1	14%	24	55%	2	12%	
No door to door collection service	8	44%		0%	5	71%	11	25%	12	71%	
Far from specific collection site	1	6%	1	33%		0%	1	2%	2	12%	
No specified container available	2	11%		0%	1	14%	8	18%	1	6%	
Other	1	6%	0	0%	0	0%	0	0%	0	0%	

Comments:

- 1 In the case of KMC, respondents reported that unavailability of door to door collection services (44%) and long practice (33%) are the major two factors for following open space dumping practice. Some respondent (11%) attributed unavailability of specified container.
- 2 In the case of LSMC, majority of respondents (67%) cited long practice of the family followed by being their house far from collection site and other reasons for following open space dumping.
- 3 Similar to the case of KMC, an overwhelming majority of respondents (71% HHs) in BKM and KRM cited unavailability of door to door collection services as the major factor.
- 4 In the case of MTM, Long practice (55%) followed by absence of door to door service (25% HHs) and container (18% HHs) were the determining factor.

Table 6_I.2: Availability of "open space with the house" wrt practitioner of "open space dumping" (Q1.3/Q2.4)

Unit: # & % of sample HHs practicing open space dumping

Particulars	Municipalities										Total
	KMC		LSMC		BKM		MTM		KRM		
	#	%	#	%	#	%	#	%	#	%	
Respondent Sample HHs	18	100%	3	33%	7	100%	44	93%	17	100%	89
Open compound/backyard	6	33%	1	33%	0	0%	2	5%	0	0%	
Closed compound/backyard	3	17%	1	33%	0	0%	1	2%	2	12%	
Common courtyard	6	33%	0	0%	3	43%	25	57%	2	12%	
Free spaces left around premises	0	0%	0	0%	0	0%	4	9%	0	0%	
No compound/backyard	3	17%	0	0%	2	29%	5	11%	13	76%	
Family /Kitchen garden	0	0%	0	0%	2	29%	6	14%	0	0%	
Trees, Shrubs, Flower plants	0	0%	1	33%	0	0%	1	2%	0	0%	

Comments:

- 1 In case of KMC and LSMC, there seems to exist positive correlation between open space dumping and availability of open compound or backyard to dump them.
- 2 In KMC, BKM and MTM, a large majority of respondents have common courtyard.
- 3 In case of KRM, there seems to exist a strong positive correlation between open space dumping and unavailability of compound or backyard. Thereby forcing respondents to dump outside in the open.

Table 6_I.3: Migration Characteristics and Settlements with respect to practitioner of "open space dumping" (Q1.3/Q2.4)

Unit: # & % of sample HHs practicing open space dumping

Migration Characteristics	Municipalities										Total
	KMC		LSMC		BKM		MTM		KRM		
	#	%	#	%	#	%	#	%	#	%	
Sample HH nos.	18	100%	3	100%	7	100%	44	100%	17	100%	89
Migration Level											
Local - Indigenous	8	44%	3	100%	5	71%	41	93%	10	59%	
Migrated - Total	10	56%	0	0%	2	29%	3	7%	7	41%	
Period of Migration											
During our generation	7	70%	0	0%	2	100%	2	67%	3	43%	
During my parents	2	20%	0	0%	0	0%	0	0%	4	57%	
During my grand parents	1	10%	0	0%	0	0%	1	33%	0	0%	
Length of Settlement											
Less than 1 year	1	10%	0	0%	2	100%	0	0%	0	0%	
Less than 10 years	5	50%	0	0%	0	0%	2	67%	1	14%	
Less than 20 years	3	30%	0	0%	0	0%	0	0%	2	29%	
More than 21 years	1	10%	0	0%	0	0%	1	33%	4	57%	

Comments:

- 1 In case of KMC and KRM, it seems that open space dumping is followed by both the indigenous and migrated HHs alike (with minor variation).
- 2 In case of LSMC, BKM and MTM, an overwhelming majority of respondent HHs are indigenous. But in BKM, 29% of them are also migrated HHs.
- 3 Most of the migrated HHs came in their own generation. But in KRM, a large % of them (57%) came in parents' generation.
- 4 A large proportion of migrated respondent HHs have been in the community for less than 10 years in KMC and MTM. But in KRM, a majority (57%) have been living for more than 21 years.

Table 6_I.4: Knowledge about SWM in Nepal wrt practitioner of "open space dumping" (Q1.9/Q2.4)

Unit: # & % of sample HHs practicing open space dumping

Particular	Municipalities										Total
	KMC		LSMC		BKM		MTM		KRM		
	#	%	#	%	#	%	#	%	#	%	
Sample HH nos.	18	100%	3	100%	7	100%	44	100%	17	100%	89
Do not know	10	56%	0	0%	1	14%	5	11%	7	41%	
Partially know about it	6	33%	2	67%	3	43%	35	80%	5	29%	
Yes I know about it	2	11%	1	33%	3	43%	4	9%	5	29%	

Comments:

- 1 In KMC and MTM very few respondent HHs know about SWM in Nepal. In case of other three municipalities only about one third of them (29-43%) are aware of SWM.

Table 6_I.5: Views on responsibility of managing the waste by practitioner of "open space dumping" (Q5.2/Q2.4)

Unit: # & % of sample HHs practicing open space dumping

Particular	Municipalities										Total
	KMC		LSMC		BKM		MTM		KRM		
	#	%	#	%	#	%	#	%	#	%	
Sample HH nos.	11	100%	1	100%	7	100%	31	100%	13	100%	63
Government	2	18%	0	0%	0	0%	2	6%	2	15%	
Municipality	6	55%	1	100%	3	43%	10	32%	9	69%	
Sweepers	1	9%	0	0%	2	29%	1	3%	0	0%	
Yourselves	2	18%	0	0%	1	14%	13	42%	0	0%	
Pvt. Company.	0	0%	0	0%	1	14%	5	16%	2	15%	
Total											

Comments:

- 1 A large number of respondent thought that Municipalities are responsible for waste management. But 42% of HHs in MTM felt that they are themselves responsible for it.

Table 6_I.6: Participation in CBO activities by practitioner of "open space dumping" (Q5.12/Q2.4)

Unit: # & % of sample HHs practicing open space dumping

Particular	Municipalities										Total
	KMC		LSMC		BKM		MTM		KRM		
	#	%	#	%	#	%	#	%	#	%	
Sample HH nos.	18	100%	3	100%	7	100%	44	100%	17	100%	89
Yes	0	0%	0	0%	1	14%	1	2%	2	12%	
No	18	100%	3	100%	6	86%	43	98%	15	88%	

Comments:

- 1 As expected, very few to none of the respondents that practice open space dumping responded to have participated in CBOs activities.

Table 6_I.7: Training received on proper waste handling/discharge by practitioner of "open space dumping" (5.13/Q2.4)

Unit: # & % of sample HHs practicing open space dumping

Particular	Municipalities										Total
	KMC		LSMC		BKM		MTM		KRM		
	#	%	#	%	#	%	#	%	#	%	
Sample HH nos.	18	100%	3	100%	7	100%	44	100%	17	100%	89
Yes	2	11%	1	33%	1	14%	13	30%	1	6%	
No	16	89%	2	67%	6	86%	31	70%	16	94%	

Comments:

1 It is surprising to note that 11%, 33%, 14%, 30% and 6% respondent HHs of respective municipalities have had received training on waste handling, yet they practice open space dumping.

Table 6_I.8: Education received on environment and health by any family member (Q5.15/Q2.4)

Unit: # & % of sample HHs practicing open space dumping

Particular	Municipalities										Total
	KMC		LSMC		BKM		MTM		KRM		
	#	%	#	%	#	%	#	%	#	%	
Sample HH nos.	18	100%	3	100%	7	100%	44	100%	17	100%	89
Yes	15	83%	3	100%	4	57%	27	61%	17	100%	
No	3	17%	0	0%	3	43%	17	39%	0	0%	

Comments:

1 It is even more surprising to note that 83%, 100%, 57%, 61% and 100% respondent HHs of respective municipalities have had their family members received education on environment and health.

Major Determinants related to the Behaviour of Open Space Dumping:

- 1 It may be concluded that open space dumping practice is quite prevalent in the newly established municipalities of MTM and KRM. This figure was reported 5%, 2% and 6% for KMC, LSMC and BKM respectively.
- 2 An overwhelming large proportion of indigenous HHs in LSMC, BKM and MTM were found involved in open dumping. But in case of KMC and KRM, locals and migrated alike were involved. Most of such migrant HHs had migrated recently (own and parents generations).
- 3 Respondents reported that unavailability of door to door collection services and long practice or habit are the two major factors for following open space dumping. Some respondents attributed unavailability of specified container or they being located far away.
- 4 There seems to exist positive correlation between open space dumping and availability of open compound or backyard to dump them. But in KRM, the practitioner do not have open compound or backyard, thereby forcing them to dump outside their houses.
- 5 In KMC and MTM very few respondent HHs know about SWM in Nepal. In case of other three municipalities only about one third of them (29-43%) are aware of SWM. In all five municipalities, very few respondents had participated in CBO activities or had received training on proper waste handling. However, in many cases at least a member was educated on environment and health.
- 6 A large number of respondent opined that Municipalities are responsible for waste management, but a majority in MTM and some HHs in KMC and BKM felt that they are themselves responsible for it.

6-II: Behaviour and Attitude wrt Payment of Waste Collection Services

It was found in Table 3.6 that a large proportion of sample HHs in KMC (34%), LSMC (46%), BKM (43%), MTM (97%), and KRM (43%) do not pay for waste collection service charge. In order to ascertain the determining factors towards this attitude and behaviour, multi-facet enquiry into various aspects has been undertaken. In this connection, attempts have also been made to explore the attitude and behaviour of HHs that do pay service charge so that a comparative evaluation of determining factors be made and positive aspects are taken up in the proposed action plan.

Table 6_II.1: Use of Available Waste Collection Services and Payments (ref Q3.2/3.9)

Unit: # & % of sample HHs

Particular	Municipalities										Total
	KMC		LSMC		BKM		MTM		KRM		
	#	%	#	%	#	%	#	%	#	%	
Sample HH nos.	331	100%	162	100%	126	100%	74	100%	75	100%	768
Have used the services and paid for it	218	66%	87	54%	72	57%	2	3%	43	57%	
Have used the services but not paid for it	77	23%	68	42%	47	37%	24	32%	0	0%	
Have not used the services but paid for it	0	0%	0	0%	0	0%	0	0%	0	0%	
Neither used the services nor paid for it	36	11%	7	4%	7	6%	48	65%	32	43%	

Comments:

1 It is evident from the above table that 11% HHs in KMC, 4% in LSMC, 6% in BKM, 65% in MTM and 43% in KRM do not pay because they have not used the services. The rest of 23%, 42%, 37% and 32% HHs in the four municipalities, do not pay despite availing the service.

Table 6_II.2: HH Income Categories of Payee/Non Payee Households (refer Q1.6/3.9)

A: Payee HHS												Unit: # & % of sample HHS that pay for waste collection services											
HH Income Categories	Municipalities											Total											
	KMC		LSMC		BKM		MTM		KRM														
	#	%	#	%	#	%	#	%	#	%													
Respondent Sample HHS	218	100%	87	100%	72	100%	2	100%	43	100%	422												
Sample HHS	331	66%	162	54%	126	57%	74	3%	75	57%	768												
low (less than 6000/-per month)	39	18%	19	22%	32	44%	1	50%	5	12%													
Lower Middle(between 6000/- to 13,000/- per	111	51%	42	48%	32	44%	0	0%	32	74%													
Middle (13000/- to 22000/- per month)	58	27%	24	28%	8	11%	0	0%	5	12%													
High (more then 22000/- per month)	10	5%	2	2%	0	0%	1	50%	1	2%													
B: Non Payee HHS												Unit: # & % of sample HHS that do not pay for waste collection services											
HH Income Categories	Municipalities											Total											
	KMC		LSMC		BKM		MTM		KRM														
	#	%	#	%	#	%	#	%	#	%													
Respondent Sample HHS	113	100%	75	100%	54	100%	72	100%	32	100%	346												
Sample HHS	331	34%	162	46%	126	43%	74	97%	75	43%	768												
low (less than 6000/-per month)	44	39%	24	32%	33	61%	40	56%	13	41%	154												
Lower Middle(between 6000/- to 13,000/- per	58	51%	39	52%	19	35%	24	33%	14	44%	154												
Middle (13000/- to 22000/- per month)	8	7%	11	15%	1	2%	7	10%	5	16%	32												
High (more then 22000/- per month)	3	3%	1	1%	1	2%	1	1%	0	0%	6												
C: Payee HHS in Each Income Category												Unit: # of sample HHS in each category and % of payee HHS in each category											
HH Income Categories	Municipalities											Total											
	KMC		LSMC		BKM		MTM		KRM														
	#	%	#	%	#	%	#	%	#	%													
Sample HHS	331	66%	162	54%	126	57%	74	3%	75	57%	768												
low (less than 6000/-per month)	83	47%	43	44%	65	49%	41	2%	18	28%	154												
Lower Middle(between 6000/- to 13,000/- per	169	66%	81	52%	51	63%	24	0%	46	70%	154												
Middle (13000/- to 22000/- per month)	66	88%	35	69%	9	89%	7	0%	10	50%	32												
High (more then 22000/- per month)	13	77%	3	67%	1	0%	2	50%	1	100%	6												
D: Non Payee HHS in Each Income Category												Unit: # of sample HHS in each category and % of non payee HHS in each category											
HH Income Categories	Municipalities											Total											
	KMC		LSMC		BKM		MTM		KRM														
	#	%	#	%	#	%	#	%	#	%													
Sample HHS	331	34%	162	46%	126	43%	74	97%	75	43%	768												
low (less than 6000/-per month)	83	53%	43	56%	65	51%	41	98%	18	72%	154												
Lower Middle(between 6000/- to 13,000/- per	169	34%	81	48%	51	37%	24	100%	46	30%	154												
Middle (13000/- to 22000/- per month)	66	12%	35	31%	9	11%	7	100%	10	50%	32												
High (more then 22000/- per month)	13	23%	3	33%	1	100%	2	50%	1	0%	6												

Comments:

- 1 In case of KMC, a large proportion of Middle Income Group (88%) followed by 77% of High, 66% of LMIG and 47% of Low income group pay for the service, indicating a positive linkage between household income and payment. Less % of High as compared to Middle could be attributed to non availability of the service in that area. Similar trend was noted for LSMC and BKM as well.
- 2 In case of KRM, as expected all High (100%), Lower Middle (70%) and Low (28%) pay for the service - indicating positive linkage between income and payment but data showing 50% for Middle income group is difficult to explain.
- 3 MTM is excluded from analysis due to low frequency of the response (few respondents).

Table 6_II.3: Mode of Waste Collection among Payee/Non Payee Households (refer Q3.3/3.9)

A: Payee Households												Unit: # & % of sample HHS that pay for waste collection services											
Particular	Municipalities											Total											
	KMC		LSMC		BKM		MTM		KRM														
	#	%	#	%	#	%	#	%	#	%													
Respondent Sample HHS	218	100%	87	100%	72	100%	2	100%	43	100%	422												
Door to door collection	208	95%	85	98%	37	51%	1	50%	41	95%	373												
Carrying to specific site	5	2%	1	1%	33	46%	0	0%	1	2%	40												
Carrying to container /truck	5	2%	1	1%	2	3%	0	0%	0	0%	8												
Others	0	0%	0	0%	0	0%	1	50%	1	2%	8												
B: Non Payee Households												Unit: # & % of respondent HHS that have used the service but not paid for it											
Particular	Municipalities											Total											
	KMC		LSMC		BKM		MTM		KRM														
	#	%	#	%	#	%	#	%	#	%													
Respondent Sample HHS	77	101%	68	100%	47	100%	24	100%	0	0%	216												
Door to door collection	18	23%	9	13%	14	30%	7	29%	0	0%													
Carrying to specific site	29	38%	9	13%	31	66%	13	54%	0	0%													
Carrying to container /truck	30	39%	50	74%	2	4%	4	17%	0	0%													
Others	1	1%	0	0%	0	0%	0	0%	0	0%													

Comments:

- 1 It is evident from the above tables that a large % of respondent HHS that pay for the services uses door to door collection services for waste disposal. In case of non payee HHS in four municipalities, the service charge might have been paid by the houseowners, as it is difficult to conceptualize that how can they manage without paying at all to the service providers.
- 2 For other mode of disposal, that most of the non payee HHS adopt, it is apparent that they are not forced to pay to the municipality (service providers).

Table No 6_II.4 (3.9) Level of Satisfaction with Collection Services (Q3.12/3.12)

Unit: # & % of sample HHs that pay for waste collection services

Particulars	Municipalities										Total
	KMC		LSMC		BKM		MTM		KRM		
	#	%	#	%	#	%	#	%	#	%	
Respondent Sample HH nos. & %	218	100%	87	100%	72	100%	2	100%	43	100%	422
Sample HHs and % of respondent	331	66%	162	54%	126	57%	74	3%	75	57%	768
Level of satisfaction											
Very Satisfied	146	67%	60	69%	54	75%	1	50%	4	9%	
Somewhat satisfied	56	26%	23	26%	13	18%	1	50%	34	79%	
Less than satisfied	14	6%	4	5%	3	4%	0	0%	5	12%	
Not satisfied at all	2	1%	0	0%	2	3%	0	0%	0	0%	

Comments:

1 Majority of payee Hhs in KMC (67%), LSMC (69%), BKM (75%) and MTM (50%) are very satisfied with the door to door collection service. But in case of KRM only 9% expressed the same and majority (79%) reported somewhat satisfied.

Table 6_II.5: Reasons for Less Satisfaction

Unit: # & % of sample HHs that are not fully satisfied with waste collection services

Particulars	Municipalities										Total
	KMC		LSMC		BKM		MTM		KRM		
	#	%	#	%	#	%	#	%	#	%	
Respondent Sample HH nos. & %	72	100%	27	100%	18	100%	1	100%	39	100%	157
Sample HHs and % of respondent	331	22%	162	17%	126	14%	74	1%	75	52%	768
Reasons											
Waste coll. & swpg. not properly done	35	49%	5	19%	7	39%	1	100%	12	31%	
Waste coll. & swpg. frequency is too low	12	17%	1	4%	3	17%	0	0%	8	21%	
Waste coll. & swpg. Irregular	8	11%	9	33%	5	28%	0	0%	9	23%	
Waste coll. & swpg. Too late, early or irregular	6	8%	6	22%	3	17%	0	0%	7	18%	
Waste coll. & swpg. behaviours is bad	5	7%	3	11%	0	0%	0	0%	1	3%	
Waste coll. & swpg. fee expensive	6	8%	3	11%	0	0%	0	0%	2	5%	
Other	0	0%	0	0%	0	0%	0	0%	0	0%	

Comments:

1 Among the payee Hhs that expressed dissatisfaction with the service, a majority of respondents in KMC, LSMC, BKM and KRM blamed irregularity, inefficiency and inadequacy of waste collection and sweeping services.
2 All the HHs of MTM Municipality reported waste collection and sweeping not done properly, but only one response questioned the validity of the interpretation.
3 Timing of waste collection and sweeping bothered a significant % of respondents in KMC (8%), LSMC (22%), BKM (17%) and KRM (18%). Other problems like bad behaviour, expensive fee was cited by a number of respondents, particularly in KMC, LSMC and KRM.

Table 6_II.6: Perception on Responsibilities of Waste Collection refer Q5.2/3.9)

Unit: % of sample respondent HHs by each agency

Particulars	Municipalities										Total
	KMC		LSMC		BKM		MTM		KRM		
	Payee HHs	Non Payee	Payee HHs	Non Payee	Payee HHs	Non Payee	Payee HHs	Non Payee	Payee HHs	Non Payee	
Respondent Sample HH nos.	218	113	87	75	72	54	2	72	43	32	768
Respondent HHs %	66%	34%	54%	46%	57%	43%	3%	97%	57%	43%	
Government	10%	13%	3%	5%	1%	6%	0%	3%	12%	9%	
Municipality	31%	34%	18%	23%	50%	44%	0%	33%	67%	81%	
Sweepers	3%	1%	0%	0%	8%	17%	0%	1%	0%	0%	
Yourselves	46%	42%	69%	65%	33%	20%	50%	46%	12%	0%	
Pvt. Company.	9%	8%	5%	4%	7%	11%	50%	17%	9%	9%	
NGO	0%	0%	0%	1%	0%	0%	0%	0%	0%	0%	
Do not know	2%	3%	5%	1%	0%	0%	0%	0%	0%	0%	
Others	0%	0%	0%	0%	0%	2%	0%	0%	0%	0%	
	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	

Comments:

1 In table 5.4, a majority of sampled HHs in KMC (44%), LSMC (67%) and MTM (46%) perceived that they are themselves responsible for SWM. But majority of HHs in BKM (48%) and KRM (73%) wanted Municipality to be responsible for it. Disaggregating the above data by payee/non payee HHs, it is concluded that overall trend of response remains the same except for MTM, where payee HHs prefer private company as their second choice as compared to Municipality by the non payee HHs.

Table 6_II.7: Willingness to Pay for Improved Waste Collection Services by Income Categories of Non Payee Households (Q1.6/5.6)

Unit: % of sample HHs in each category that do not pay for waste collection services

HH Income Categories	Municipalities										Total
	KMC		LSMC		BKM		MTM		KRM		
	Willing to pay	Not willing	Willing to pay	Not willing	Willing to pay	Not willing	Willing to pay	Not willing	Willing to pay	Not willing	
Respondent Sample HHs nos.	113		75		54		72		32		346
Respondents sample Hhs % sum	84%	16%	88%	12%	83%	17%	96%	4%	88%	13%	
low (less than 6000/-per month)	84%	16%	83%	17%	76%	24%	98%	3%	85%	15%	
Lower Middle(between 6000/- to 13,000/- per	84%	16%	90%	10%	95%	5%	92%	8%	86%	14%	
Middle (13000/- to 22000/- per month)	75%	25%	91%	9%	100%	0%	100%	0%	100%	0%	
High (more then 22000/- per month)	100%	0%	100%	0%	100%	0%	100%	0%	0%	0%	

Comments:

- 1 An overwhelming large % of respondent HHs that presently do not pay for waste collection services have in fact expressed their willingness to pay for the improved services.
- 2 As expected, higher % of low income respondents of LSMC (17%), BKM (24%) and KRM (15%) were among the non willing respondents. But in case of KMC, a significant % of non willing respondents (25%) belonged to Middle Income Group, followed by equal % of Low and Lower Middle groups (along with KRM).

Major Determinants related to non payments for Waste Collection Services:

- 1 It was discussed in Table 3.2 that door to door collection service is availed by a large majority of Hhs in KMC, LSMC and KRM. It was found that most of the users of this service pay for it.
- 2 A significant proportion of the 23%, 42%, 37% and 32% sample HHs in KMC, LSMC, BKM and MTM that reported not paying despite availing the service infact were dependent on the municipal service i.e. carrying waste to certain point or container truck. This way they are not compelled to pay for it directly. Such Hhs constituted 77%, 87%, 70% and 71% of them respectively. Rest of 23%, 13%, 30% and 29% respectively were using the door to door services and not paying for it.
- 3 It was also observed that there exist a positive linkage between HH income group and Payee Hhs, but interestingly in KMC more of Middle Income Group were unwilling to pay for improved services than the lower strata groups. Overall, an overwhelming large majority of respondents in all the five municipalities expressed their willingness to pay for improved solid waste collection services.

6-III: Behaviour and Attitude wrt Composting (Q4.15, 4.18)

It was found in Table 4.9 that 28% sample Hhs of BKM, 25-26% Hhs of MTM and LSMC followed by 17% sample HHs of KMC and KRM do composting. The rest of Hhs, particularly in KMC and LSMC cited unavailability of space as the major factor for not making compost (refer table 4.13). An effort has been made below to cross check the linkage between availability of space and composting. Other aspects pertaining to attitude and behaviour towards composting have been analyzed in detail in section 4 of this chapter.

Table 6_III.1: Availability of "open space with the house" wrt practitioner of "Composting" (Q1.3/Q4.15)

Unit: # of sample HHs

Particulars	Municipalities										Total
	KMC		LSMC		BKM		MTM		KRM		
	Make Compost	Do not make	Make Compost	Do not make	Make Compost	Do not make	Make Compost	Do not make	Make Compost	Do not make	
Respondent Sample HHs nos.	55	276	40	122	35	91	19	55	13	62	768
Respondent HHs %	17%	83%	25%	75%	28%	72%	26%	74%	17%	83%	
Open compound/backyard	5%	17%	35%	23%	0%	0%	5%	5%	0%	0%	
Closed compound/backyard	62%	33%	45%	29%	9%	4%	0%	4%	15%	3%	
Common courtyard	13%	22%	3%	6%	40%	46%	21%	71%	15%	11%	
Free spaces left around premises	4%	1%	5%	1%	3%	0%	21%	7%	0%	24%	
No compound/backyard	9%	25%	8%	39%	17%	36%	11%	7%	62%	3%	
Family /Kitchen garden	5%	1%	3%	0%	29%	13%	26%	5%	8%	58%	
Trees, Shrubs, Flower plants	2%	1%	3%	2%	3%	0%	16%	0%	0%	0%	
Total	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	

Comments:

- 1 It was found in Table 1.3, that 22% sample HHs in KMC, 31% in LSMC and BKM, 8% in MTM and 59% in KRM did not have had any compound or backyard in their houses.
- 2 Disaggregating table 1.3 data in terms of HHs that do and do not engaged in composting, it is observed that in case of KMC, LSMC and BKM, lesser % of composting Hhs do not have compound/backyard. Somehow this reflects that having compound/backyard do help or encourage composting in urban area.
- 3 In case of MTM and KRM, no linkage could be established between HHs having space around their house and composting. This implies that in these two municipalities composting is done mostly on agricultural fields.

Table 6_III.2: Availability of "open space with the house" wrt willingness to "Composting" (Q1.3/Q4.18)

Unit: # of sample HHs that do not practice composting

Particulars	Municipalities										Total
	KMC		LSMC		BKM		MTM		KRM		
	Willing to Compost	Not Willing	Willing to Compost	Not Willing	Willing to Compost	Not Willing	Willing to Compost	Not Willing	Willing to Compost	Not Willing	
Respondent Sample HHs nos.	276		122		91		55		62		606
Respondents sample Hhs %	47%	53%	69%	31%	25%	75%	80%	20%	18%	82%	
Open compound/backyard	19%	14%	27%	13%	0%	0%	2%	18%	0%	4%	
Closed compound/backyard	28%	39%	31%	24%	9%	3%	5%	0%	9%	12%	
Common courtyard	27%	18%	5%	8%	48%	46%	70%	82%	9%	27%	
Free spaces left around premises	1%	1%	1%	0%	0%	0%	7%	0%	9%	2%	
No compound/backyard	24%	26%	35%	50%	30%	38%	9%	0%	73%	55%	
Family /Kitchen garden	0%	1%	0%	0%	13%	13%	7%	0%	0%	0%	
Trees, Shrubs, Flower plants	2%	1%	1%	5%	0%	0%	0%	0%	0%	0%	
Total	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	

Comments:

- 1 The data of table 1.3 has been disaggregated in terms of willing and unwilling Hhs on composting. It is observed that they are almost equally divided in KMC (47:53), but more Hhs are willing in LSMC (69%) and MTM (80%). On the other hand, less Hhs are willing to make compost in BKM (25%) and KRM (18%).
- 2 In KMC availability of space do not seem to be a determining factor, but in case of LSMC and MTM it seems to have encouraged a few to be willing. But 9% respondent of MTM highlights the fact that Hhs could be willing without having any space (compound/backyard) as well.
- 3 In BKM and KRM, it is well established that open space in the house is not the only determining factor for being willing to composting.

Table 6_III.3: Perception on Responsibilities of Waste Collection wrt practitioner of "Composting" (refer Q5.2/4.15)

Unit: # or % of sample HHs

Particulars	Municipalities										Total
	KMC		LSMC		BKM		MTM		KRM		
	Make Compost	Do not make	Make Compost	Do not make	Make Compost	Do not make	Make Compost	Do not make	Make Compost	Do not make	
Respondent Sample HHs nos.	55	276	40	122	35	91	19	55	13	62	768
Respondent Hhs %	17%	83%	25%	75%	28%	72%	26%	74%	17%	83%	
Government Municipality	7%	12%	0%	9%	3%	3%	0%	4%	23%	8%	
Sweepers	18%	34%	15%	22%	46%	48%	26%	35%	62%	76%	
Yourselves	2%	2%	0%	0%	3%	15%	0%	2%	0%	0%	
Pvt. Company.	53%	43%	75%	65%	34%	25%	47%	45%	8%	6%	
NGO	20%	6%	5%	4%	11%	8%	26%	15%	8%	10%	
Do not know	0%	0%	0%	1%	0%	0%	0%	0%	0%	0%	
Others	0%	3%	5%	2%	0%	0%	0%	0%	0%	0%	
Total	100%	100%	100%	103%	100%	100%	100%	100%	100%	100%	

Comments:

- 1 In KMC, Hhs that do composting favour private sector more than municipality, but a majority of 53% want to depend on themselves. Similar trends are observed in MTM but BKM markedly favours municipality.
- 2 In LSMC, respondent Hhs seems to be less dependent on other agency and overwhelmingly want to rely on themselves. Contrary to that respondents of KRM excessively want municipality and government to be responsible.

6-IV: Behaviour and Attitude wrt Participation in Community SWM Activities (Q5.12,5.18)

It was found in Table 5.12 that participation of the sample HHs in community based SWM activities was relatively low for KMC (25%), MTM (16%), and KRM (16%). The figures for LSMC (49%) and BKM (37%) were though better, but less than fifty percent. Considering the important role of CBOs/NGOs in the SWM activities, it is desired that various factors of behaviour and attitude, leading to participation in community based activities be analyzed in the context of proposed SWM action plan. In the tables below Active HHs refer to respondents that have participated in SWM activities.

Table 6_IV.1: Migration Characteristics of Active/Passive Participant Households in CBOs Activities

Migration Characteristics	Municipalities										Total
	KMC		LSMC		BKM		MTM		KRM		
	Active HHS	Passive HHS	Active HHS	Passive HHS	Active HHS	Passive HHS	Active HHS	Passive HHS	Active HHS	Passive HHS	
Respondent Sample HHS nos.	82	249	80	82	47	79	12	62	12	63	768
Respondent HHS %	25%	75%	49%	51%	37%	63%	16%	84%	16%	84%	
During our generation	28%	39%	30%	17%	4%	6%	0%	3%	25%	17%	
During my parents	9%	16%	9%	11%	0%	1%	0%	0%	17%	8%	
During my grand parents	9%	2%	3%	5%	0%	0%	0%	2%	0%	3%	
Migrated (Total)	45%	56%	41%	33%	4%	8%	0%	5%	42%	29%	
No, Local - Indiginous	55%	44%	59%	67%	96%	92%	100%	95%	58%	71%	
Do not know	0%	0%	3%	0%	0%	1%	8%	2%	0%	2%	
Total	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	

Comments:

- 1 In KMC, indiginous local population was found more active in CBOs activities, constituting 55% of sample HHS. Among the migrants, the first generation (28%) were more active than second or third generation migrants 99% each), however more of first and second generation migrants remained inactive (39% & 16% respectively)
- 2 Similar trends were observed in LSMC and KRM, but with the difference that indiginous population also constituted overwhelming majority amongst the passive Hhs.
- 3 In case of BKM and MTM, migrant HHS are almost out of the picture.

Table 6_IV.2: Awareness on SWM in Nepal of Active/Passive Participant Households in CBOs Activities

Migration Characteristics	Municipalities										Total
	KMC		LSMC		BKM		MTM		KRM		
	Active HHS	Passive HHS	Active HHS	Passive HHS	Active HHS	Passive HHS	Active HHS	Passive HHS	Active HHS	Passive HHS	
Respondent Sample HHS nos.	82	249	80	82	47	79	12	62	12	63	768
Respondent HHS %	25%	75%	49%	51%	37%	63%	16%	84%	16%	84%	
Not Awared	33%	48%	35%	29%	0%	16%	0%	8%	25%	40%	
Partially Awared	56%	41%	43%	56%	15%	25%	50%	73%	67%	29%	
Awared	11%	10%	23%	15%	85%	58%	50%	19%	8%	32%	

Comments:

- 1 In KMC, LSMC and KRM around one third or one quarter active HHS reported unawared of SWM activities in Nepal. In BKM and MTM, none reported unawared.
- 2 Considering that a majority of respondents, whether active or passive, are only partially awared or unawared of SWM, it is imperative that appropriate awareness campaign be initiated in the action plan.
- 3 Based on above data, it can be concluded that level of awareness is not the sufficient condition for participation in CBOs activities.

Table 6_IV.3: Perception on Responsibility for Waste Managemen of Active/Passive Participant Households in CBOs Activities

Actor and Institutions	Municipalities										Total
	KMC		LSMC		BKM		MTM		KRM		
	Active HHS	Passive HHS	Active HHS	Passive HHS	Active HHS	Passive HHS	Active HHS	Passive HHS	Active HHS	Passive HHS	
Respondent Sample HHS nos.	82	249	80	82	47	79	12	62	12	63	768
Respondent HHS %	25%	75%	49%	51%	37%	63%	16%	84%	16%	84%	
Government	6%	12%	4%	5%	4%	3%	0%	3%	17%	10%	
Municipality	28%	33%	15%	26%	49%	47%	0%	39%	50%	78%	
Sweepers	0%	3%	0%	0%	4%	16%	0%	2%	0%	0%	
Yourselves	60%	39%	75%	60%	26%	29%	67%	42%	17%	5%	
Pvt. Company.	5%	10%	4%	5%	17%	4%	33%	15%	17%	8%	
NGO	0%	0%	1%	0%	0%	0%	0%	0%	0%	0%	
Do not know	1%	2%	1%	5%	0%	0%	0%	0%	0%	0%	
Others	0%	0%	0%	0%	0%	1%	0%	0%	0%	0%	

Comments:

- 1 In KMC and LSMC, majority of both the active and passive HHS want to depend on themselves. Others preferred Municipality more than Government or private companies. Role of NGO was not considered at all.
- 2 In BKM and KRM, Municipality was considered as the responsible agency by both the majority of active and passive HHS. Among the rest of active HHS, equal preference were given to Government, Private Company and Yourself in KRM, whereas depending on themselves and private sector was given prominence in BKM.
- 3 The active HHS in MTM just wanted to depend on themselves and the private companies.

Table 6_IV.4: Perception on Participatory SWM Programs by Active/Passive respondent Households

Particulars	Municipalities										Total
	KMC		LSMC		BKM		MTM		KRM		
	Active HHS	Passive HHS	Active HHS	Passive HHS	Active HHS	Passive HHS	Active HHS	Passive HHS	Active HHS	Passive HHS	
Respondent Sample HHS nos.	82	249	80	82	47	79	12	62	12	63	768
Respondent HHS %	25%	75%	49%	51%	37%	63%	16%	84%	16%	84%	
Very necessary	88%	91%	100%	98%	100%	78%	92%	55%	92%	81%	
Some what necessary	12%	8%	0%	2%	0%	13%	8%	39%	8%	19%	
Not very necessary	0%	1%	0%	0%	0%	4%	0%	3%	0%	0%	
Not necessary at all	0%	0%	0%	0%	0%	5%	0%	3%	0%	0%	

Comments:

- 1 An overwhelming majority of active HHS supported the concept of participatory SWM program. Except for MTM and BKM, none of the HHS, even the passive ones, could oppose it.

Table 6_IV.5: Willingness for Participation in Preferred SWM Activity by Active/Passive Households (Q5.3/5.18)

Particulars	Municipalities										Total
	KMC		LSMC		BKM		MTM		KRM		
	Active HHS	Passive HHS	Active HHS	Passive HHS	Active HHS	Passive HHS	Active HHS	Passive HHS	Active HHS	Passive HHS	
Respondent Sample HHS nos.	82	249	80	82	47	79	12	62	12	63	768
Respondent HHS %	25%	75%	49%	51%	37%	63%	16%	84%	16%	84%	
First Priority Responses											
Any activity related to SWM	22%	15%	86%	51%	15%	25%	42%	48%	42%	24%	
Collecting Waste in our Community	9%	3%	4%	7%	17%	6%	33%	15%	17%	30%	
Cleaning our Community	17%	16%	0%	9%	23%	16%	0%	2%	25%	24%	
Campaign for raising Awareness of People	39%	34%	4%	17%	26%	20%	8%	11%	17%	11%	
Education program on SWM	11%	15%	3%	5%	15%	22%	0%	10%	0%	6%	
Reducing Waste/Composting	1%	6%	3%	2%	2%	0%	17%	6%	0%	2%	
Not Willing	1%	11%	1%	9%	2%	10%	0%	8%	0%	3%	
Others	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	

Comments:

- 1 A large number of respondents in all the municipalities have expressed willingness to participate in any activities related to SWM. In this regard the response in LSMC had been exclusive. Except for BKM and MTM, more of active HHS than passive ones have shared willingness for any activity.
- 2 The active HHS in KMC, BKM and KRM have shown marked inclinations towards raising awareness, cleaning community and collecting waste as compared to their passive counterparts. In case of MTM, collecting waste and composting are preferred.

Table 6_IV.6: Willingness for Participation in Preferred SWM Activity by Migration Characteristics (Q1.4/5.18)

Particulars	Municipalities										Total
	KMC		LSMC		BKM		MTM		KRM		
	Migrated HHS	Non Migrated	Migrated HHS	Non Migrated	Migrated HHS	Non Migrated	Migrated HHS	Non Migrated	Migrated HHS	Non Migrated	
Respondent Sample HHS nos.	177	153	60	102	8	118	3	71	23	52	768
Respondent HHS %	54%	46%	37%	63%	6%	94%	4%	96%	31%	69%	
First Priority Responses											
Any activity related to SWM	14%	20%	72%	67%	25%	21%	0%	49%	70%	8%	
Collecting Waste in our Community	5%	5%	7%	5%	13%	10%	67%	15%	0%	40%	
Cleaning our Community	15%	17%	5%	4%	0%	20%	33%	0%	4%	33%	
Campaign for raising Awareness of People	35%	35%	3%	15%	38%	21%	0%	11%	17%	10%	
Education program on SWM	19%	8%	7%	2%	13%	19%	0%	8%	4%	6%	
Reducing Waste/Composting	4%	5%	5%	1%	0%	1%	0%	8%	4%	0%	
Not Willing	8%	9%	2%	7%	13%	7%	0%	7%	0%	4%	

Comments:

- 1 Fewer migrant HHS than indigenous ones in LSMC, MTM and KRM have expressed unwillingness to participation in SWM activities. It is opposite for BKM and is equally divided in KMC.
- 2 The migrant HHS in KMC and BKM have shown marked inclinations towards raising awareness and collecting waste as compared to their passive counterparts. In case of MTM, collecting waste and cleaning are exclusively marked by migrants.
- 3 In LSMC and KRM, an overwhelming % of migrant HHS are willing to participate in any SWM related activity.

Table 6_IV.7: Willingness for Participation in Preferred SWM Activity wrt Awareness on SWM in Nepal (Q1.9/5.18)

Unit: # or % of Sample HHs

Particulars	Municipalities										Total
	KMC		LSMC		BKM		MTM		KRM		
	Awared & Partial awared	Not Awared at all	Awared & Partial awared	Not Awared at all	Awared & Partial awared	Not Awared at all	Awared & Partial awared	Not Awared at all	Awared & Partial awared	Not Awared at all	
Respondent Sample HHs nos.	184	147	110	52	113	13	69	5	47	28	768
Respondent HHs %	56%	44%	68%	32%	90%	10%	93%	7%	63%	37%	
First Priority Responses											
Any activity related to SWM	21%	12%	65%	75%	20%	31%	48%	40%	23%	32%	
Collecting Waste in our Community	4%	5%	6%	4%	12%	0%	19%	0%	32%	21%	
Cleaning our Community	14%	19%	5%	4%	20%	8%	1%	0%	21%	29%	
Campaign for raising Awareness of People	38%	32%	12%	8%	24%	8%	10%	20%	15%	7%	
Education program on SWM	11%	17%	4%	4%	18%	31%	9%	0%	4%	7%	
Reducing Waste/Composting	3%	6%	4%	0%	1%	0%	7%	20%	2%	0%	
Not Willing	10%	8%	5%	6%	5%	23%	6%	20%	2%	4%	

Comments:

- 1 Almost equal % of awared and unwared sample HHs in KMC and LSMC (5%) have expressed unwillingness to participate in any SWM related activities. For the rest of municipalities, unwared constitute majority in this aspect.
- 2 In KMC, unwared HHs have preferred raising awareness, education program and cleaning the community as prominent activities. Around 21% & 12% awared and unwared HHs respectively would do any related SWM activities.
- 3 In LSMC, a large % of both the awared and unwared would do any activity. They have also given prominence to raising awareness, among others.
- 4 In case of BKM, awared HHs attach importance to raising awareness (24%) followed almost equally by education program, cleaning and collecting waste as well as any related activity. Unwared ones have preferred education program more than others.
- 5 A majority of awared HHs in MTM (48%) would engage in any activity, but some of them would focus on collecting waste, raising awareness, education program and composting. Similar view points have been expressed by awared ones in KRM, but with varying frequency.

6. *Flood Analysis and Study*

6. FLOOD ANALYSIS AND STUDY

1. Introduction

The Sisdol short-term Landfill site (S/T-LFS) is located at the right bank of Kolpu Khola. Since there are no available data and information regarding the flood conditions of the river which may cause the adverse effects on the LFS, the flood discharge and flood water level at the outlet point of Sisdol site is preliminarily examined hereinafter.

On the other hand, the Bagmati River dumping is intruding the river cross section which may obstruct the flood flowing of the river. The available information is also consolidated in this appendix in order to grasp the flood situation at the dumping site.

2. Flood Analysis of Kolpu Khola

2.1 The Catchment Area

Sisdol S/T-LFS is located in Ward 4 of Okharpauwa VDC, and the catchment area of Kolpu Khola at the site is approximately 28 km². The catchment area is situated on the northwest of the Kathmandu Valley between 27°45' to 27°49' north latitude and 85°13'30" to 85°17'30" east longitude, being spread over Okharpauwa VDC of Nuwakot DDC and Jitpurphed VDC of Kathmandu DDC. Agricultural land use is predominant including terrace cultivation, and many small forest plots are scattered within the catchment. Uppermost areas are covered by dense forest such as the Nagarjun Reserved Forest and Shivapuri Watershed and Wildlife Reserve.

Kolpu Khola at Sisdol S/T-LFS has a number of small tributaries with large tributaries such as Kule Khola, Kaule Khola, Khani Khola and Thulo Khola. The elevation of uppermost boundary of watershed is about 2,100-2,300 m while that of riverbed near the site is about 1,110-1,120 m. The average longitude gradient of the river is considerably high reaching about 13.6% up to the site.

2.2 Flood Analysis

There are no available data on hydrological conditions of Kolpu Khola. Therefore, the rational approach is employed which is the most widely used method to examine the flood discharge of different return periods in case of the absence of the existing data. The flood analysis includes the following steps:

- Rainfall analysis
- Runoff analysis
- Flood water level analysis

(1) Rainfall Analysis

There is one rainfall gauging station within the catchment; namely Kakani station showing the detail in Table 2-1. The daily (24 hours) rainfall data of Kakani is available and collected from 1971 to 2000 with some years non-available.

Table 2-1 Kakani Rainfall Station

No. & Name	Latitude	Longitude	Elevation (m)	Established	Data collected	Mean annual rainfall (mm)
Kakani No. 1007	27°48' (N)	85°15' (E)	2,064	Jan. 1962	1972-1990 1995-2000 (25 years)	2,894

Source: Climatological Records of Nepal, Department of Hydrology and Meteorology

Based on the maximum daily (24 hours) rainfall of each year, frequency analysis was carried out for estimation of the probable maximum daily rainfall. Gumbel method was applied for estimation since it projected higher probable rainfall than others such as Iwai method and logarithmic normal distribution method, meaning tendency to the safer side. The result for different return period is presented in Table 2-2.

Table 2-2 Probable Maximum Daily Rainfall (Kakani)

Return period (year)	2	5	10	25	50	100
Estimated rainfall	113	136	151	170	184	198

Unit: mm/day

Source: JICA Study Team

Based on the above result, the rainfall intensity curves by specific return period were established by Monobe's equation as follows which is generally applied in mountainous catchment.

$$R_t = \frac{R_{24}}{24} \left(\frac{24}{t} \right)^{\frac{2}{3}}$$

where, R_t : Rainfall intensity in t hours (mm/hr)

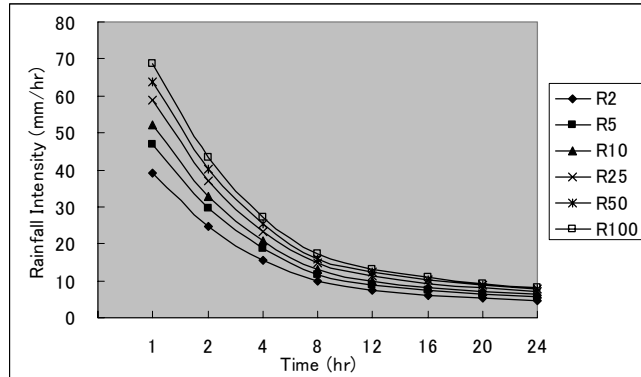
R_{24} : Daily rainfall (mm)

t : Time of flood concentration (hr)

The rainfall intensity duration table with corresponding figure is shown in Table 2-3.

Table 2-3 Probable Maximum Daily Rainfall (Kakani)

Probable Maximum Daily Rainfall at Return Periods						
Year	2	5	10	25	50	100
Rainfall (mm)	113	136	151	170	184	198
Rainfall Intensity in t hours at Each Return Period (mm/hr)						
t (hour)	R ₂	R ₅	R ₁₀	R ₂₅	R ₅₀	R ₁₀₀
1	39.1	47.0	52.3	58.9	63.9	68.7
2	24.6	29.6	32.9	37.1	40.2	43.3
4	15.5	18.7	20.7	23.4	25.3	27.3
8	9.8	11.8	13.1	14.7	16.0	17.2
12	7.5	9.0	10.0	11.2	12.2	13.1
16	6.2	7.4	8.2	9.3	10.1	10.8
20	5.3	6.4	7.1	8.0	8.7	9.3
24	4.7	5.7	6.3	7.1	7.7	8.3



Source: JICA Study Team

(2) Runoff Analysis

A rational formula was employed for calculation of the flood discharge volume from the catchment at the outlet point of Sisdol short-term LFS.

$$Q_p = \frac{1}{3.6} f \cdot r \cdot A$$

where, Q_p : Maximum flood discharge in m^3/s

f : Dimensionless runoff coefficient (=0.6)

r : Average rainfall intensity within the time of flood concentration in mm/hr

A : Catchment area in km^2 (=28.3 km^2 , measured on 1:25,000 scaled topo map)

The average rainfall intensity “r” was calculated, based on the time of flood concentration at the LFS point derived from Kraven formula using the measured parameters on 1:25,000 scaled topo map.

The result of probable flood discharge volume in each return period at Sisdol LFS point is shown in Table 2-4.

Table 2-4 Flood Discharge Volume of Kolpu Khola Estimated at Sisdol Point

Return period (year)	2	5	10	25	50	100
Probable flood discharge volume	263	316	352	396	430	462

Source: JICA Study Team

(3) Flood Water Level Analysis

Flood water level was calculated by Manning’s mean velocity formula in the river cross section of Kolpu Khola at the outlet point of Sisdol LFS (single cross section case).

$$U = \frac{Q}{A} = \frac{1}{n} R^{\frac{2}{3}} I^{\frac{1}{2}}$$

- where, U : Mean velocity
 Q : Discharge
 A : Cross-sectional area
 n : Manning's coefficient of roughness (= 0.05)
 R : Hydraulic radius
 I : Longitude gradient of drainage (=1/50 for Kolpu Khola at the outlet point of Sisdol S/T-LFS)

The rating curve at Sisdol S/T-LFS derived by the above formula is presented in Figure 2-1, with the estimated probable flood discharge and critical points to be assessed.

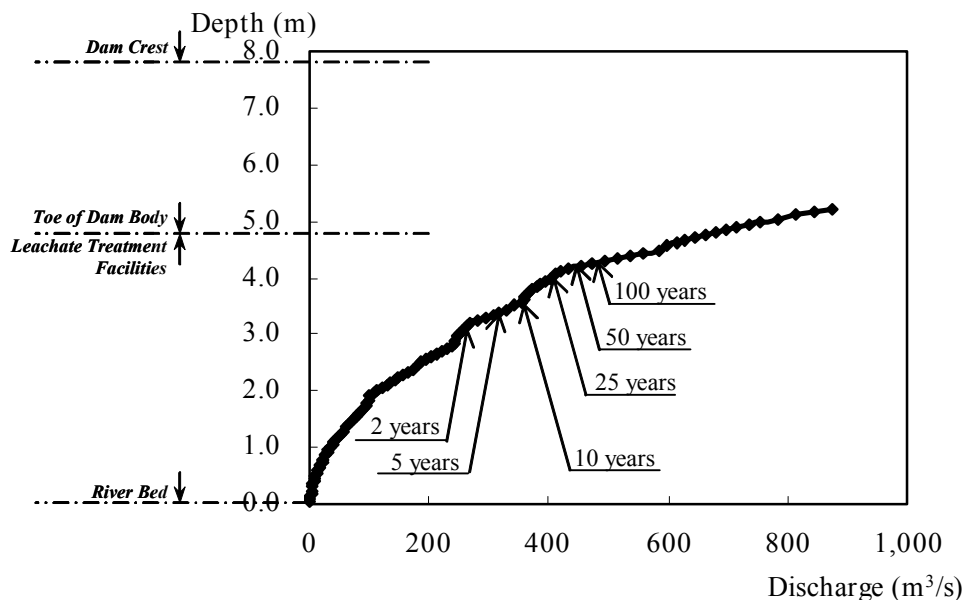


Figure 2-1 Rating Curve of Kolpu Khola at Sisdol Site

Remark: Dam crest level indicated in the above is on as built base as of May, 2004.

Source: JICA Study Team

2.3 Conclusion and Suggestion

Based on the analysis hereinbefore, the following can be preliminarily concluded regarding the probable effect on Sisdol short-term LFS by the flood of Kolpu Khola.

- The paddy field on the left bank can be considered to provide retarding function when flood comes. Therefore, the flood level even of return period 100 years will not exceed the crest of storage dam.
- The flood level of return period 10 years may reach up to about 1.5 m below the toe of storage dam, and difference of elevation between flood level and toe of dam may be less than 1 m in case of return period of 25 or 50 years.

- Sisdol S/T-LFS facilities will not be directly damaged by any probable flood of Kolpu Khola. However, the leachate treatment system will be installed on the river terrace at the same elevation of the toe of storage dam. Therefore, river training work along the section of leachate treatment system is suggestive as river bank protection, since bank collapse may bring about destructive damage to the treatment facilities when 10 % or more probability flood comes.

3 Flood Study of Bagmati River

3.1 Available Information for Understanding Flood Condition

In order to grasp the flood situation at the dumping site of Bagmati River, some local people along the river were interviewed, and the major findings are summarized below:

- The water level of the river does not exceed the top surface of dumped waste, except the flood occurrence.
- When we have heavy rain in wet season, the flood level at dumping site comes just below the surface of the existing road along with the right bank of the Bagmati River. It can be assumed that the flood level is above the top surface of waste over 1 or 2 m. According to the local people, the flood probability of this type can be observed once in a year or two years.
- A big flood sometime happened in the last two decades, whose flood level reached just below the pedestrian bridge crossing over the dumping site. (River water could be scooped directly by bucket on the pedestrian bridge when big floods came, according to the local people.) It is said that the probability of big flood is 2 to 4 times in last two decades.
- Even when the big flood comes, the water level mostly falls back to the normal one within 2 to 3 days.

The depth of river water of Bagmati is observed from 1991 at Khokana gauging station located about 6 km downstream from the pedestrian bridge, as shown in Table 3-1. Table 3-2 shows the data simulated by other study on flood discharge for different return periods at Chobhar. Based on these information and dumping site condition, it can be assumed that the occurrence of inundation of the top surface of dumped garbage by flood would be observed on 50%-probability basis at least in case of about 2 m-high dumping from the elevation of original river area, although the flood level is dependent on site-specific conditions of river regime such as cross section, longitudinal gradient, toughness of wetted perimeter, etc.

Table 3-1 Maximum Water Depth by Year Recorded at Kokana

	Unit: m					
Year	1991	1992	1993	1994	1995	1996
Max. depth	2.99	2.85	4.39	3.85	3.4	3.55
Highest water level (EL)	1,257.99	1,257.85	1,259.39	1,258.85	1,258.40	1,258.55
Year	1997	1998	1999	2000	2001	2002
Max. depth	4.03	4.49	4.00	3.71	3.11	1.34
Highest water level (EL)	1,259.03	1,259.49	1,259.00	1,258.71	1,258.11	1,256.34

Source: Department of Hydrology and Meteorology

Table 3-2 Probable Flood Discharge Volume Estimated in Other Study at Chobhar

	Unit: m ³ /s				
Return period (year)	2	5	10	25	50
Estimated probable flood discharge volume	408	624	787	1012	1175

Source: Report of High Powered Committee for Implementation and Monitoring of Bagmati Area Sewerage Construction /Rehabilitation Project, June 1998

3.2 Conclusion

Waste dumping in Bagmati River is intruding the river cross section, meaning that the flowing area of channel is being reduced. The above studies and findings somewhat indicate that the river dumping may affect discharge capacity and obstruct the flood flow comparing with the original river regime, and subsequently a risk of flood damage around the site and its upper reach may be increasing along the dumping continuity. However, it is unavailable to quantitatively estimate the discharge capacity obstruction and the contribution toward risk increment, due to the limited data and information. When the necessity of precise prospect of causality among dumping activities, obstruction of flood flowing and flood damage risk is recognized, the further studies and analysis should be carried out including field surveys and investigation.

Part III

Pilot Projects

Pilot Project A

- A-1 Public-Private-Partnership (PPP) Municipal Solid Waste Management Operational Handbook
- A-2 As-built Drawings for Improvement Work at Teku Transfer Station

Pilot Project B

- B-1 Result of Market Survey on Compost Product
- B-2 Result of Data Collection at Bhaktapur Composting Facility
- B-3 Suggested Layout and Specification for Large-Scale Composting Facility
- B-4 Result of Analysis of Compost Quality
- B-5 Training Manual for Trainers on Home Composting
- B-6 User Manual for Home Compost Bin (“How to Use Home Compost Bin”)
- B-7 Practice of Medium-Scale Vermi-Composting in KMC
- B-8 Manual for Medium Scale Vermi-Composting

Pilot Project C

- C-1 Practice of Evaluation of Potential Landfill Sites at Bungamati
- C-2 Practice of Scoping and TOR for EIA on Banchare Danda

Landfill Site in Okharpauwa

- C-3 Practice of Scoping and TOR for EIA on Pharsidol North Landfill Site in Bungamati
- C-4 Practice of EIA at Taikabu Landfill Site
- C-5 Detailed Design and As-built Drawings for Improvement Work at Sisdol Short-term Landfill
- C-6 Operation Manual for Sisdol Short-term Landfill
- C-7 Environmental Monitoring at Sisdol Landfill Site

Pilot Project E

- E-1 Result of Solid Waste Quantity and Quality Survey (I)
- E-2 Result of Solid Waste Quantity and Quality Survey (II)
- E-3 User Manual for Solid Waste Database Management System

PILOT PROJECT A

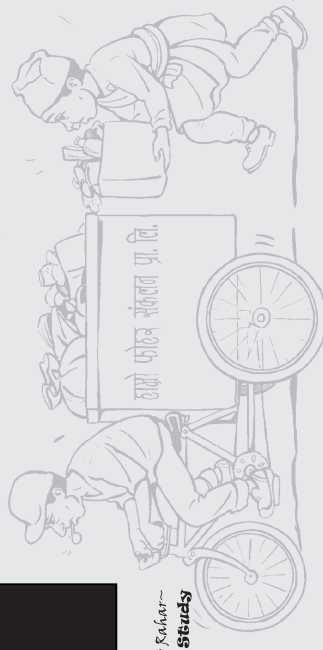
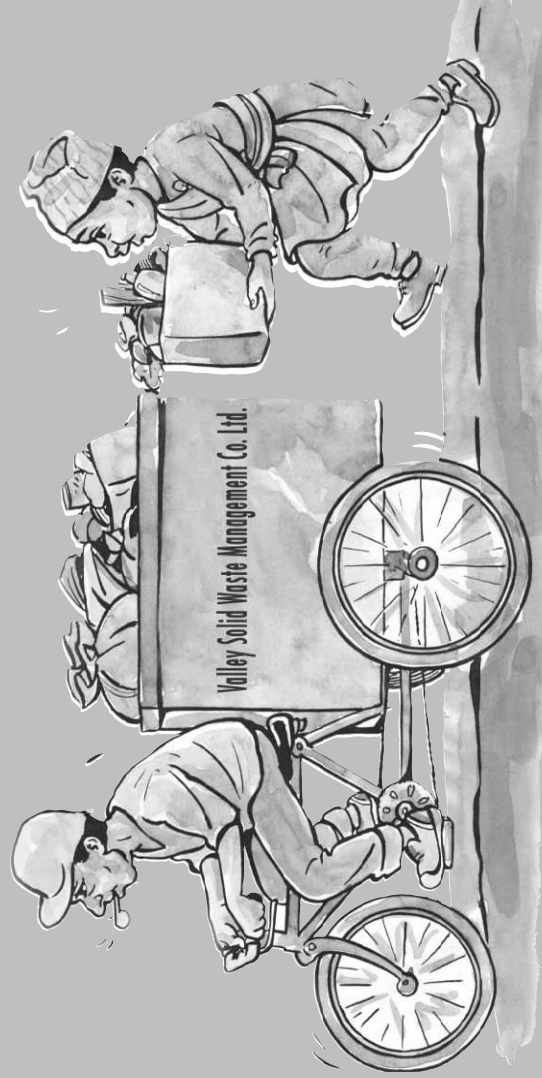
IMPROVEMENT OF

COLLECTION AND TRANSPORTATION

Pilot Project A-1

***Public-Private-Partnership (PPP)
Municipal Solid Waste Management
Operational Handbook***

Public Private Partnership (PPP) Municipal Solid Waste Management Operational Handbook



Public Private Partnership (PPP) Municipal Solid Waste Management Operational Handbook

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Introduction to Public Private Partnership in Solid Waste Management (SWM)

For municipalities in Nepal, Solid Waste Management (SWM) has always been a top priority issue. Cleanliness of public places and safe disposal of wastes are essential for the protection of public health and municipal environment.

The Local Self-Governance Act, 2055 (1999) has made the local governments (for example the municipalities) responsible for management of solid waste related activities. The same Act and the related Rules allow the municipalities to involve the non-governmental organizations and the user committees in solid waste management. The participation of the private sector has been stipulated in the Act, but the procedure of involvement is not clear and adequate.

In the past, many municipalities tried to implement the partnership approach, and some of them are relatively successful. As a result, substantial level of awareness has been created among the municipalities in this regard. But, at the same time, the poor understanding of partnership approach and the procurement processes have caused the failure of the program. So, with a view to address this gap, this 'Operational Handbook' has been developed. The Handbook expects to enhance the private sector partnership management capacity of the municipal staff in solid waste management. Also, the Handbook shows how the Public-Private-Partnership in Solid Waste Management can be structured.

- Objectives
- Terms and Key Concepts
- Necessary Institutional Arrangements

A. Objectives

The major objective of the Handbook is to provide a step-by-step procedure for Public Private Partnership (PPP) in the delivery of municipal services in solid waste management. It aims to:

- Provide practical tips for planning, procurement, and implementation of municipal solid waste management through private partnership arrangement;

Stage 4: Implementation of Partnership Project in SWM

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- Serve as a procedural guideline for private sector involvement in municipal solid waste management; and
- Serve as resource material for capacity enhancement of the municipal staff and the private sector service providers in solid waste management.

B. Terms and Key Concepts

i) Solid Waste Management (SWM)

Solid Waste could be described as non-liquid (not sludge or semisolid) refusals from household; non-hazardous solid waste from industrial and commercial establishments; refusal from market, public places and street cleaning. The following are the sources of municipal solid wastes.

MUNICIPAL SOLID WASTE	Domestic waste	Household waste - kitchen, house cleaning, old papers, packing, bottles, crockery wares, furnishing materials, garden trimmings, etc.
	Commercial waste	Waste generated at business premises, shops, offices, markets, departmental stores (paper, packing material, spoiled, and discarded goods), organic and inorganic, chemically reactive and hazardous waste.
	Institutional waste	Schools, colleges, hospitals, large hotels and restaurants, vegetable markets, fruits, fish, etc, community halls, religious places etc.
INDUSTRIAL SOLID WASTE	Industrial / trade waste	Waste generated from industrial manufacturing establishments, breweries, leather industries, carpet factories, chemical industries, and food processing industry, repair and maintenance shops.
MEDICAL SOLID WASTE	Medical waste	All wastes generated by health care institutions, related research facilities and laboratories. Any waste generated during diagnosis, treatment, or immunization of human beings or animals or in research activities thereto or in the production or biological testing.
OTHER SOLID WASTE	Agricultural waste	Wastes produced from agricultural activities and processes, cottage dairies, chicken farms, livestock rearing and forests.
	Construction waste	Wastes generated as a result of construction activities or from demolition or reconstruction of buildings and facilities. It consists of earth, brickbat, stones, sand, wood, packing materials, etc.
	Waste – offal, dead animals, etc.	Offal wastes generated from slaughterhouses, food, packing institutions, cold storage premises, etc.

(Source: The Study on Solid Waste Management for the Kathmandu Valley, Interim Report (1), JICA, June 2004.)

The SWM service, being a public goods, is nonexclusive and non-rivalled in nature and because the benefits derived from it are consumed or enjoyed by all in the community. By and large, whatever may result from any kind of partnership, the municipality assumes the ultimate responsibility and accountability of the solid waste management services.

ii) Products/Services in SWM

Solid Waste Management (SWM) is mainly a municipality's responsibility. Municipalities take the responsibility for financing the SWM services. Often, private sector and the community associations (user groups, CBOs, NGOs) are involved in providing the services and collecting the fees for such services.

By unbundling the various SWM services, different opportunities and combinations of options to the municipalities for service delivery through private sector partnership emerge. Municipalities, by assessing the capital market and institutional capacity of the private sector, can engage appropriate service providers in different components of SWM. They can award them the contract for main components or even the whole package of services. An example of unbundling of the services is shown below:

Main Components	Sub-components
Primary Waste Collection	Source to Collection Point/Place (Street Sweeping)
	Source to Containers
	Source to Transfer Station
	Source to Landfill Site
Waste Transportation and Management	Containers to Transfer Station
	Containers to Landfill Site
	Transfer Station to Landfill Site
SWM Facilities Management	Transfer Station Management
	Landfill Site Management
	Waste Processing Facility Management

iii) Partnership

A contractual agreement between a municipality and a service provider(s) to deliver the SWM services by sharing the responsibility, risk and return could be considered as partnership.

Partnership is simply one of the means available to the municipalities to address the deficiency of municipal services. This partnership should not be viewed as a substitute for existing direct service delivery system or an alternative to improve the efficiency and accountability of service delivery by the municipalities. In fact, it is intended to provide greater flexibility and options to municipalities in addressing solid waste management requirements.

Not limiting the scope of partnership to the registered private commercial institutions, the non-governmental social organizations may also be considered as partners for SWM service delivery. The partners in provision are:



■ **Private Sector Partner**

This type of partnership satisfies the need for SWM services, where large-scale capital investments and skilled management are required. The private sector generally has the greater capacity to enhance service delivery covering large area or through more complex partnership arrangements.

■ **CBO or NGO**

Partnership arrangements with CBOs and NGOs can be beneficial for empowerment of civil society at the local level. Direct involvement of communities helps make better solid waste management especially in low-income communities. Enhancing institutional capacity of CBOs and NGOs would be essential for their matured participation in service delivery.

iv) Various Forms of Public-Private-Partnership arrangements

The arrangements of Public Private Partnerships in solid waste management should vary with the degree of complexities involved in SWM. Generally, the level of risks allocated between the partners, the amount of expertise required on the part of each partner to negotiate contracts and the potential implications for fee payers determine the form of partnership arrangement.

The following are the most possible and widely used arrangements of partnership between the municipality and the private sector entities, which may be adopted for solid waste management.

■ **Service contract**

Private sector (or service provider) receives fee from the municipality to manage a particular or all tasks of solid waste management service. Service contracts are usually short-term (one to three years), and more feasibly applicable to CBOs, NGOs and small private contractors for street cleaning and household collection of wastes.

■ **Franchise contract**

Under franchise contract, the municipality grants a private service provider an exclusive right to provide specific type of service within a specified area. In solid waste management, franchise is often adopted. The private operator is given the right to deliver a service, for example, door-to-door collection, where the private operator is confined to a specific area and exercises monopoly for a fixed period. Franchise is usually given for a period of one to two years.

Private operator pays some fee to the municipality for the franchise arrangement. The revenue for making such payment is generated by collecting the fees from customer in the specified area. Franchise arrangement consists of commercial risk of non-payment by the beneficiaries. In franchise, the municipality is ultimately responsible and accountable for setting performance standard and its achievement.

■ **Management contract**

A service provider can be made responsible for the overall management of solid waste, but without the responsibility for financing the operation, maintenance, repair, or capital costs of the service. In this arrangement, three to five years is considered the most suitable duration of contractual arrangement. Management contracts generally specify the payment of a fixed fee against the performance of assigned services. Management responsibility of the operation of transfer station, landfill site, vehicle fleets, container services including waste collection from collection point to the transfer station and transportation of wastes to the landfill site could be done under the management contract.

■ **Lease**

The municipality provides its assets (facilities) on lease to the contractor to perform specified SWM services. The service provider (contractor) is responsible for operating, repairing, and maintaining the assets. The service provider usually collects the fees from service users and pays the rent to the municipality for using its assets and facilities. Because of this, the service provider may bear the responsibilities for collecting tariffs from the service users and assume the collection risk of transactions. However, in case of solid waste management, the municipality pays the agreed amount (tipping fee) to run the specified services, if the private sector does not find the commercial option of value added services (e.g. landfill site with value added service of compost plants) to recover the service costs.

Service providers do not invest new capitals and, or replace the leased assets and facilities under normal circumstances. Leases are typical for eight to fifteen years. Leasing of municipality owned land for the establishment of a composting plant or leasing of waste transportation vehicles could be typical examples of lease contracts. Generally, municipality provides its assets on leases for municipal service delivery under Build-Operate-Transfer (BOT) arrangement.

■ **Concession**

Under this arrangement, the SWM service provider enjoys the highest level of freedom to run the services. It assumes the whole or partial responsibility for the management, operation, repair, maintenance, replacement, design construction and financing of all or some components. In consonant to this, the service provider bears all management, operation and financial risks; and pays concession fee to the municipality. However, the municipality still remains the owner of the assets in operation, under construction or those to be constructed which are transferred to the municipality at the end of the concession period. Usually concession arrangement is contracted for longer periods of 15 to 25 years. The contracts such as BOT (Build-Operate-Transfer) and BOOT (Build-Own-Operate-Transfer) fall under this arrangement.

This arrangement is suitable for the development of new service infrastructure such as the establishment of transfer station, landfill site, compost plant, which municipality alone cannot fund. As mentioned earlier, unless the service provider generates adequate financial resource through charging the service fees from the users, particularly big business houses, commercial establishments, industries and if possible from households for collecting, transporting and disposing the waste, it is difficult to meet the financial obligations to run the



services. Hence, again the municipality has to finance for the service fees instead of users for service delivery.

Service contract is considered the simplest contractual arrangement with the private sector, and subsequently management contract, lease and concession arrangements become more complex and expensive which demand for strengthening the partnership related technical and management skills of the municipality.

The following matrix shows the possible partnership arrangements in the delivery of the SWM services

Feasible Partnership	SWM Products / Services					
	Primary Collection (Sweeping)	Collection Point Management	Container Management	Transportation	Transfer Station Management	Landfill Site Management
Feasible Transaction						
Service Contract	▲	▲	○	▲	○	○
Franchise Contract	▲	▲	○	▲	○	○
Management Contract	▲	▲	▲	▲	■	○
Lease Arrangement	○	■	■	■	▲	▲
Concession Arrangement						
Feasible Partner	▲	▲	○	○	○	○
Communities / CBOs / NGOs	▲	▲	▲	▲	○	○
Small Companies	▲	▲	▲	▲	■	○
Large Companies	▲	▲	▲	▲	▲	▲

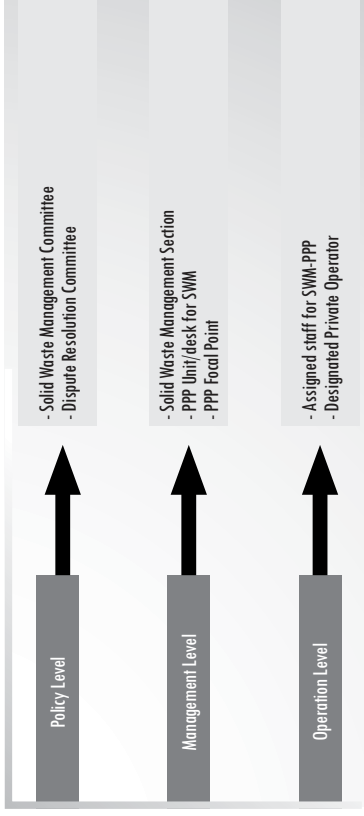
Legend:

- ▲ Feasible transaction
- Semi-feasible transaction
- Non-feasible transaction

C. Necessary Institutional Arrangements

Municipality has the primary responsibility for ensuring that the solid waste collection service performs in accordance with the provisions in a PPP contractual agreement. For this purpose, the municipality should define the following institutional and management framework:

- 1) Involvement of Solid Waste Management /Environment Committee; and
- 2) Establishment of PPP unit/ desk in the municipal organizational frame



i) Solid Waste Management Committee

Existing Solid Waste Management Committee /Environment Committee within the municipal structure should be responsible for preparing policy frame work and strategy for implementing SWM services in partnership arrangement. It should also be responsible for the following:

- To decide how SWM service delivery will be implemented within their SWM Action Plan framework (through PPP arrangement and/or municipality on their own);
- To monitor the implementation of the S WM Action Plan and Annual SWM Work plan (including PPP in SWM related Work plan); and
- To evaluate and monitor SWM service delivery performance and make respective reporting.

ii) PPP unit/ desk

Municipality should establish a PPP unit/ desk for SWM service under the coordination of a PPP focal person. The PPP unit/ desk and the focal person should be responsible for the following:

- Identification of SWM services for partnership
- Identification of appropriate mode of partnership
- Search for partners
- Initiation of bids
- Selection of bids
- Development of contract
- Enforcement of contract
- Monitoring, evaluation and reporting



Planning for Public Private Partnership in SWM

Public-Private Partnership (PPP) in solid waste management (SWM) is only a possible opportunity - not a panacea in improving municipal SWM. In situations in which existing service delivery is too costly or inadequate, private sector should be examined as a means of enhancing efficiency and mobilizing private investment. In this regard, PPP in SWM service delivery option should be considered in the context of SWM Action Plan.

Step 1: Preparation of SWM Action Plan

Step 2: Approval of SWM Action Plan and Annual Work Plan

Step 3: Conducting a Pre-feasibility Study



Step 1: Preparation of SWM Action Plan

Municipality should prepare a SWM Action Plan based on the long-term municipal development plan, which should clearly set the strategic direction and approaches to involve private service provider in SWM service delivery.

Based on the SWM Action Plan, for each fiscal year, the municipality should develop Annual SWM Work Plans which should, among other activities, clearly specify the level and intensity for involving private service providers. The Annual Work Plan should also set out the resource mobilization strategy for SWM and mechanism for service delivery (including the activities that the municipality requires to carry out on its own and the activities with partnership arrangement). Basically, it should determine where and how the SWM services are to be delivered with the partners.

SWM Annual Work Plan should include the following steps:

- Identification of the SWM products/services that could be delivered by partners;
- Activities for involving partners in SWM services;
- Choice of partner for the products/services delivery; and
- Timeline for planning/preparing/implementing PPP project

Identification of the SWM products/services for partnership arrangement

Most SWM activities can be delivered through private sector involvement. Since the nature and importance of a specific community or area might differ from one another, the

municipality should focus on those activities, which are most inefficiently performed if implemented on its own.

Solid Waste Management products/services for partnership arrangement should be identified on the following basis:

- Which SWM services could facilitate utmost participation of local and community people and the use of their skills?
- Which SWM products/services could expect viable cost recovery?
- Which SWM products/services the community and local people would be willing to pay for the products/services?
- Which SWM products/services identified for partnership arrangement would facilitate the transition of municipalities' role from implementation to supervision/ monitoring?
- Which SWM products/services would enhance and expose capacity building opportunities to the partners (municipality as well as the private operator)?

The most successful method of SWM in one ward might not be equally successful in another ward where there is a different set of local conditions. The success depends on various factors. Therefore, the municipality should conduct an assessment study to identify feasible SWM products/service for PPP through the following steps:

i) Collection of information

The first step in the identification of SWM products/service for partnership arrangement is the collection of information of the existing situation in a particular ward or/and community. This involves:

General information

- Settlement and nature of the ward/community/focused area;
- Number of households in the ward/community/focused area;
- Income, education and awareness level of the community;
- General notion about the waste management; and
- Strength and weakness

Solid waste related information

- Sources of waste generation;
- Waste quantity, density, and composition;
- Method of collection including transfer facility and disposal options;
- Transport distance and road condition;
- Cost incurred (per month or unit cost per cubic meter of garbage);
- Human resources employed; and
- Technology applied

SWM service providers' information

- Local clubs and other community based organizations involved in SWM activities; and
- Strength and weakness

ii) Analysis of information

The second step involves the analysis of the information to:

- define the problems regarding the adequacy of existing services and constraints to service improvement;
- assess the need and demand for services;
- assess the capacity of the local SWM service providers in terms of skills, experience, and access to credit and human resources;
- involve public in building consensus to the solution of the problems;
- develop strategy for private sector involvement in SWM and determine the services in which private operators could be involved.

iii) Defining the objective

Mere SWM service improvement through private sector involvement should not be the objective of the partnership arrangement. The municipality should aim at sustainable and cost-effective SWM service. Such arrangement should facilitate win-win relationship with the private operator. Based on the principle that the arrangement is mutually beneficial.

Strategic direction for involving partners in SWM services

The choice to use Private Partners in solid waste management is entirely the municipality's decision. The municipality should decide, based on the community needs and the municipal capacity, to undertake such arrangements. The municipality's decision should be based on the existing situation and strategic direction to involve partners in SWM. The following could be some of the guiding factors:

- a) The engagement of the private sector in SWM service provision does not relieve the municipality of its responsibilities. The municipality will remain the regulator of SWM services and have the ultimate responsibility.
- b) The municipality ensures that the partnership arrangement is made accountable to the end-users in terms of cost and safe environment.
- c) The municipality promotes 3R's concept (reduce, re-cycle and re-use) in PPP arrangements.
- d) The municipality adopts the principle that the "polluters pay" for cost recovery of the services. This principle is used also for positive re-enforcement in changing the behavior of the service users.
- e) The municipality encourages community participation wherever possible.
- f) The municipality sets SWM service delivery standards jointly with the partners and enforce the quality of delivery within the frame of the set standards.
- g) The municipality promotes competitive environment among the private parties based on the beneficiary outreach, service standards, and distribution of responsibilities, risks and returns.
- h) The municipality strengthens its organizational capacity for PPP arrangement in SWM. It encourages capacity enhancement of the partners as well.

Choice of partner

The municipality should choose whether to involve private sector, and/or a CBO/NGO as its partner for SWM. The decision will depend on the need of the municipality, ward/community's demand for services, and management and technical capabilities required for the services.

PPP Plan for implementation

Planned activities for implementing PPP arrangements should be incorporated in the Annual SWM Work Plan. This PPP Plan should clearly indicate the activities that need to be accomplished for the PPP arrangement along with the time frame and assigned responsibility. Solid Waste Management Committee should submit the SWM Action Plan and the Annual SWM Work Plan to the Municipal Board for approval.

Step 2: Approval of SWM Action Plan and Annual Work Plan

As part of planning process for PPP in SWM, the Municipal Board should consider which services could best be provided directly by the municipality and which services could be delivered through private sector's involvement. Thus, SWM Action Plan and Annual SWM workplan should be submitted to the Municipality Board for approval. The Board's decision then should be the Annual SWM Work Plan of the municipality.

Step 3: Conducting A Pre-Feasibility Study

The conduction of the pre-feasibility study or review is the third step, which should provide fairly clear picture about the planned PPP activities so that it serves as a preliminary basis for partnership arrangement. Once the Municipal Board decides on potential SWM partnership projects and budget, the municipality can do a pre-feasibility study of the possible partnership arrangement. The study should lead to a report covering major aspects of the proposed partnership arrangement. A checklist for contents of a pre-feasibility report is given in the box below. For simple and small size partnership arrangement in SWM services (e.g. street sweeping and door-to-door collection), each relevant topic may be covered in a short paragraph.

The amount of detail under each heading in a report will depend on the size and complexity of the PPP. For complex partnership arrangements, municipality will conduct detail feasibility study. Such study should include:

- general information about the partnership project;
- technical and financial viability;
- social impact and environmental sustainability;

- probable risks and benefits for the municipality , residents and other key stakeholders; and
- institutional arrangement, capability requirement and skill enhancement.

Checklist for such feasibility study is given in **Annex I**.

Checklist of contents of pre-feasibility study

1. Objectives to be achieved by the SWM project
2. Beneficiaries (ward, community or focused area)
3. Alternative ways to meet project objectives
4. Choice of PPP model
5. Description of preferred partnership
6. Technical analysis
7. Financial analysis (cost, income and required investment, source of fund, return on investment. etc)
8. Benefits (quantifiable and non-quantifiable)
9. Risks in the project and method of handling
10. Impact on the environment
11. Overall project viability in qualitative terms

Note: Each point should be considered but not all needs to be included for small and simple PPP in SWM.

As per the Clause 113 of the Local Self-Governance Act (LSGA) 1999, it is the responsibility of the municipality to conduct the pre-feasibility study before publishing notice to request for proposals. In case, the municipality lacks the capacity for conducting such a study, according to the provision in Rule 72 of local Self Governance Regulation (LSGR) 2000, the municipality could undertake such study through consultancy services. The pre-feasibility study and /or feasibility study should be released as a public document, so that all interested potential partners can review and add creative and cost effective ideas for partnership arrangement.

Procurement of partnership is crucial in any PPP arrangement. Procurement process should be able to achieve "value of money" for the municipality, partners and ultimately the beneficiaries. Existing procurement legislation and regulations are focused only on the civil works construction and purchase of equipment and services. The essential difference between the conventional procurement and partnership procurement is that in the former, the municipality purchases assets and services from partners so that it can deliver municipal service itself. In case of partnership project, partner delivers municipal service, which involves delegation of responsibility. Such delegation creates higher level of risks to both the municipality and the partner. Thus, while procuring partnership arrangement for SWM, risks implication needs to be carefully analyzed.

Stage 2

Procuring Public Private Partnerships

Procurement of PPP for SWM services delivery process involves a series of activities beginning from identification of the appropriate procurement process to make invitation for bidding and evaluation of bid document. The following are the steps that need to be followed for Partnership Procurement:

- Step 1: Identifying Procurement Process
- Step 2: Preparation of Partnership Procurement Documents
- Step 3: Pre-qualification of the Partners
- Step 4: Invitation for Bidding (Request for Proposal)
- Step 5: Organizing Bidders' Meeting
- Step 6: Opening and Examination of the Bid Document
- Step 7: Evaluation of Bid Document and Selection of Partner

Step 1: Identifying Procurement Process

Partnership procurement for the SWM services should be conducted through a competitive bidding process by following the Clause 117 of LSG Act (1999) and Chapter 5 of LSG Financial Rules (revised 2005).

However, it may not be feasible to apply such competitive procurement process in all partnership arrangements. Possible combination of partnership arrangement and appropriate procurement process are presented in the following matrix:

Procurement Process	Partnership Arrangement					
	Concession Arrangement	Lease Contract	Management Contract	Franchise Contract	Service Contract	Negotiation and MOU
Formal Competitive Tendering	✓	✓	✓	✓	✓	✓
Competitive Negotiation						
Competitive Solicitation						
Users Committees, CBOs/NGOs						

Formal Competitive Tendering

Formal Competitive Tendering process of partnership procurement is applicable for BOT, BOOT and concession arrangements. It can also be used for the management and service contract if the transaction is of very high monetary value.

The municipality can also use this procurement process for leasing of high value assets (facilities, capitals). The development, management and operation of a sanitary landfill site, transfer station; or leasing of already existed SWM facilities or plants (waste processing plants, vehicles, etc.); or awarding of certain geographical service coverage for the whole SWM package on a franchise basis are appropriately liable for this bidding process.

Competitive Negotiation

Competitive negotiation is a simple version of competitive bidding process. This process allows the municipality more flexibility to procure the arrangements, which are less complex, less risky, and have moderate capital value. The municipality selects a preferred bidder and enters into contract negotiation after a formal bid evaluation.

This procurement process is suitable for leased and management contractual arrangements. The leasing of the SWM facilities such as composting equipment, plants, vehicles and land in a single package or in the form of various components; and management contract of waste collection, transportation and operation facilities can be considered under this procurement process.

Competitive Solicitation

Competitive solicitation applies to those partnership arrangements that have the shortest duration, lowest monetary value and risk, and less complexity. A competitive solicitation requires proposals from two or more potential partners.

Service contract and franchise contract of primary collection, sweepers' contract, waste collection and transportation; or supply of transportation, automobile and other parts (in small amounts) are the best-suited components of SWM for this type of procurement.

Users Committee, CBOs and NGOs.

The municipality can procure solid waste management services through or arrange jointly with users groups, CBOs and NGOs. A joint partnership can be formed by defining the terms and conditions of services. Cross subsidy, cost sharing, and users' contribution are the resource sharing modalities that can be used in this type of arrangement. With better understanding of the service requirements and by devising appropriate contract mechanisms, the community can be made responsible for the development, management and operation of

the services. The municipality needs to provide technical and management support closely if the partners lack such capacity to manage the services.

Primary collection, source separation, household disposal, waste transportation to transfer stations, awareness campaign, conflict resolution in transfer stations and landfill sites are the areas where the users groups, CBOs and NGOs can be effective.

Step 2: Preparation of Partnership Procurement Documents

The PPP unit/desk's foremost task would be to prepare documents for partnership procurement. A clear and qualitative purchase document is a pre-requisite for successful partnership arrangement.

The PPP Unit/desk of the municipality should prepare the following documents before publishing public notice for bidding:

- Form for Bidding
- Procurement conditions
- Contract conditions
- Scope and specification of service
- Agreement document
- Performance monitoring modality
- Provisions of bank guarantee
- Schedule of prices

Step 3: Pre-Qualification of the Partners

Generally, prior to making invitation for bidding, pre-qualification exercise is initiated. Pre-qualification is designed to identify which potential bidders are clearly suitable as service providers for SWM. It is also conducted to exclude unsuitable bidder from the actual bidding process, thus simplifying the process. The municipality should develop pre-qualification criteria before the commencement of the process.

The criteria for pre-qualification might include the following:

Some criteria for prequalification

- Specific experience in the fields of SWM sector
- Past successful performance in similar project
- Capabilities with respect to management of labor and equipment operation
- Financial capabilities to carryout the project
- Proof of absence of illegal record history

If the PPP unit/desk feels it necessary (depending on the nature and complexity of the project), the municipality should seek expression of interest from the potential partners. The following would be the steps in the pre-qualification process:

- 1) Invitation for pre-qualification;
- 2) Evaluation and announcement of the result of pre-qualification; and
- 3) Appeal process.

For pre-qualification of the potential partners, the municipality will follow the process as per the Rule 58 in the LSGR, 2000.

Step 4: Invitation for Bidding (Request for Proposal)

The municipality will invite the potential partners (i.e. those who have been pre-qualified) to submit proposal for SWM service delivery. The notice should be published in both the local and national newspapers, which should mention the following information about the proposed partnership project:

- Objective, scope and job specification of the project (Terms of Reference);
- Date and time for submission of the bid document;
- Place where the bidding form would be available and where it needs to be submitted; and
- Fee for bidding form.

The municipality should provide bidding form to the partners upon their request. Often such forms are sold to the potential partners. The bidding form should include a variety of sequential steps necessary for partnership procurement, namely:

- Letter of invitation,
- Introduction to bidders covering background,
- Scope of work,
- Contents of bid document,
- Process of submission and evaluation of bids,
- Details of proposal preparation and submission of bid,
- Description of bidders and their commitment to the SWM project,
- Possible risk foreseen by the bidder in the project and possible measures for mitigation,
- Factors determining positive environment for the project,
- Agreement for technical proposal and financial proposal,
- Pre-qualification criteria (if the municipality feels necessary),
- Details about award of contract,
- Signing of Agreement, and
- Time frame for taking up the work.

Note: Sample Terms of Reference (TOR) for Solid waste collection project is given in **Annex 2.**

Step 5: Organizing Bidders' Meeting

The municipality could call for bidders' meeting after the publication of the bidding notice. The time and location of the bidders' meeting should be advertised in the bid document or by a separate letter to the bidders. The municipality should call the meeting for the following reasons:

- To amend or modify the bid document.
- To provide sufficient information and clarify any confusion in the clauses of the bid document.
- To address any serious comments in the bid document.
- To extend the submission date of the bid document.

Step 6: Opening and Examination of the Bid Document

Bid document should be open only at the time, date and location specified in the bid invitation notice or at the time, date and location specified by any extension of the deadline for submission of the bid. The procedure for opening the bid document should be according to the Rule 63 of the LSGR, 2000. While in the process, the municipality should adopt the following steps:

- Appoint a competent staff with authority to accept or not to accept the bid document;
- Open bid document even though the bidders or their representatives are not present. The bid may be opened in the presence of at least two representatives from the governmental offices;
- Announce the name, and address of each bidder and prepare a record (Muchulka) of this announcement together with the name of all persons (bidders in person or the representatives) present at the time of opening; and
- Sign and get the meeting minute signed by all those present at the opening of the bid.

After opening the bid, no information should be disclosed to any bidder or their representatives until the successful bidder has been notified the award of the agreement.

At the time of opening, all the bids received by the deadline of submission should be examined to determine the responsiveness of each bid to the bid document. Bids not responsive should be rejected and should be recorded. Such examination could be done against the following criteria:

- Acknowledgment of receipt of the bid (date and time) on the envelope with the municipal stamp;
- Pre-qualification of the bidder (if pre-qualification exercise had been initiated);
- Document sealed;
- Document submitted in the form sold by the municipality;
- Completeness of the document;
- Currency in the bid;
- The bid bond;
- Arithmetic errors; and
- Authorized signatures.

Step 7: Evaluation of Bid Document and Selection of Partner

Partnership procurement team should also conduct evaluation of the bid document. For SWM service bidding, two envelope system (one sealed technical envelope and the other financial envelope) is recommended. The evaluation team first evaluates the technical proposal. Any bid that does not meet the technical requirements is rejected, and the financial envelope from such bidder is not opened.

The satisfactory bids may be ranked according to their technical merits. The financial proposals of the satisfactory bidders are then opened. The bidder offering the lowest (reasonable) price for the service is invited for negotiation.

Technical Evaluation

The following factors should be considered in the technical evaluation:

- Proposed technical details of all the components of the project (How the services would be provided);
- Proposed working procedure and description of every step of the project (understanding of the work requirement);
- Human resources, materials, equipment and facilities required to perform each step of the project;
- Owners' experience in providing similar operational services like sweeping, collection of garbage, transportation etc.;
- Evidence that the firm is capable of commencing service provision when required.
- Cost estimate of the components of the project and estimated value of assets owned by the bidder;
- Procurement plans and proposed procurement methods, procurement schedule and budget, and reasons for selecting the proposed procurement schedule;
- Project implementation process pursued by the municipality and plans and schedule for partner consultation; and
- Project implementation schedule including an analysis of the expected problem in service delivery

The municipality should perform technical evaluation of bidding document within the frame of Sub-rules 10 to 18 of the Rule 72 in LSGR, 2000.

Financial Evaluation

The financial proposal of the technically successful bidders should be evaluated using the present value method of financial discount. Rastra Bank's daily rate should be considered as a basis for calculating the discount rate for the financial evaluation.

The following factors should be considered in the financial evaluation:

- Finance required to put the project into operation. Normally, it could be classified into three broad categories:

Fixed Assets	Land, building, equipment, vehicles
Working Capital	Cost of project operation and maintenance until revenue starts coming in
Pre-operating cost	Expenses incurred in preparing project study, registration etc.

- Source financing includes analysis of partners investment required, loan (if any), and cost of money, terms, risks and expected rate of return.
- A cost-benefit analysis should cover the comparative analysis of the expected cost and benefits of the project over the expected duration of the project (financial analysis and projections).
- Financial feasibility study should also cover financial evaluation to examine the effectiveness of the project.

Besides, the financial evaluation should also be made on the following basis:

- The financial flows used in the bids document should be consistent with the technical details defined in the bid documents.
- The financial flows of all bids should be evaluated over the same time period specified in the bid document.
- Tariff assumption should be in consistent with those in the bid document.
- The implementation schedule of the project should be in consistent with the cash flows contained in the financial analysis.
- Debt service, financing arrangements, interest and amortization of debt should be properly indicated and accounted for in financial analysis.

Bid Evaluation Report

The municipality should then prepare a bid evaluation report, which should at least contain the following information:

- process and procedure followed in evaluating the bids;
- the criteria for bid evaluation;
- list of bidders that submitted bids including list of bidders pre-qualified as potential service providers;
- list of bids that were rejected and reasons for rejection;
- comparative analysis of the evaluated bids and their ranking;
- recommended successful bidder; and
- the proposed schedule for contract negotiations.

Rejection of Bidding Process

The municipality may reject all the bids and/or initiate the process of re-bidding, if it feels necessary. In such case, it should provide justification of rejection. The following could be the common grounds for rejection:

3 Stage

Preparation and Award of Partnership contract



- None of the bids submitted were responsive to the bid documents;
- There was lack of competition;
- Requests were made by the bidders for rejection.

However, the municipality should clearly spell out the retention of right to reject all bids in the bid notice itself. The municipality should not incur any liability to any bidder because of its decision to reject a bidding process.

Notification of the Bid Evaluation Result

The municipality should notify all the bidders about the result of bid evaluation. At this stage, the municipality should:

- Set deadline for concluding the negotiations and reserve the right to begin negotiation with other bidders, if the negotiation with the first ranked bidder can not satisfactorily be concluded;
- Notify in writing all bidders of the result of the bid evaluation and proposed contract negotiations; and
- Publish the result of the bids and proposed contract negotiations in widely circulated newspaper and municipal bulletin board.

Appeal Process

Unsuccessful bidders will have the opportunity to appeal the result of the bidding process.

The municipality should make the following factors clear in the appeal process:

- Appeal process should be to provide a mechanism for review of the bidding process.
- It should be limited to a review of the fairness of bidding process. It should not be considered as a “second chance” to win.
- Invite the first-place bidder for contract negotiations.
- The process should be the reviewing of unsuccessful bidder’s bid submission against the municipal bid evaluation criteria. Any data submitted after the closing date should not be considered.

Since the municipality is ultimately responsible for the delivery of solid waste management services, the obligation does not end by just involving the private sector. It should be considered as one of the alternatives for effective and efficient delivery of solid waste service. Involvement of private sector in SWM demands for an agreement between the municipality and the private service provider, which could facilitate the following:

- Distribution of responsibility;
- Distribution of Risk; and
- Distribution of Reward.

Thus, the municipality should prepare/develop contractual agreement on each of the solid waste management product addressing all the three important elements of a partnership.

This section provides a guideline for preparing the contractual agreement specifically for solid waste collection service (which includes door to door collection, street and public place sweeping and transportation of garbage to the transfer station) of the municipal solid waste. Generally, service contract and/or franchise contract are considered as feasible arrangement for partner involvement.

The municipality should prepare contract document and invite the first-place bidders for contract negotiations. Aspects that need to be covered in a contractual agreement are:

- Item 1: The parties to the agreement
- Item 2: The objective and scope of agreement
- Item 3: The objectives and scope of the financial requirements
- Item 4: The duration of agreement and the scope for renegotiation or early termination of agreement
- Item 5: The right and responsibilities of the private sector
- Item 6: The rights and responsibilities of the municipality
- Item 7: Regulatory requirement and consents
- Item 8: Identification and management of key risks
- Item 9: Performance measurement and monitoring
- Item 10: Payment
- Item 11: Consents on ownership and use of assets
- Item 12: Dispute resolution and arbitration



Item 1: The Parties to the Agreement

This section of the agreement should describe the roles and responsibilities of the concerned parties. Usually in solid waste collection partnership, the municipality is the grantor, and the contractor/franchise is the private service provider (also include CBO/NGO).

The following points should be clearly mentioned in the section:

- Authority and legal standing of the grantor,
- Legal identification of the service provider (joint venture, partnership or micro enterprise or community organizations), and
- Regulatory provision.

Item 2: The Objective and Scope of Agreement

For collection of solid waste, the agreement could be structured either as

- **Service contract:** Where the service provider provides the collection service in the specified area(s) for periodic fees paid by the municipality, or as
- **Franchise:** Where the service provider gets monopoly rights for a specified period to deliver collection service in specified areas and charges waste generators directly for the service.

This section should clearly mention the

- description of areas for solid waste collection;
- operational responsibilities of the service provider and target beneficiaries; and
- specific obligation of service provider to the solid waste collection service.

Item 3: The Objectives and Scope of the Financial Requirements

In this section, financial arrangements should be mentioned. For solid waste collection through service contract, municipality levies and collects revenue. In franchise, the service provider is given authority to collect service fees directly from the waste generator. The basis for service fee could be either based on negotiation between the generator and the service provider, or the municipality may set the tariff based on the ability and willingness of the generator to pay. Provision of subsidization and royalty could also be included in the provision.

Item 4: Duration of Agreement and Scope for Renegotiation or Early Termination of Agreement

The following points should be considered to fix the duration of agreement:

- Duration should be long enough for the service providers to repay the loans taken to purchase equipment for the work;

- There should be a provision for the municipality to be able to vary the duration of the agreement;

- The agreement should contain adequate provision for adjustment of contract duration as a result of unavoidable delays; and
- It should contain the possibilities of early termination of the contract

Important points that need to be addressed for agreement renegotiation are:

- Expansion of the scope of service; and
- Procedures for renegotiation.

Item 5: The Rights and Responsibilities of the Private Sector

The following will be the rights and responsibilities of the private service providers:

- Quality of the solid waste management service;
- Clientele attitude;
- Reasonable price; and
- Business plan and management.

Item 6: The Rights and Responsibilities of the Municipality

The following will be the rights and responsibilities of the municipality:

- Maintaining the service standard;
- Protection of public interest;
- Regulation and monitoring of services;
- Create environment to enable the private operator; and
- Showing accountability to the public.

Item 7: Regulatory Requirement and Consents

Regulatory issues should be clearly stated in the agreement. They include:

- Regulatory power of municipality in a specific issue like tariff setting, monitoring the agreement etc.
- Funding of regulatory activities---who should bear the cost of regulatory inspection, hearing and other regulatory services.
- Procedures of regulating the agreement should balance with the need of cost effective service, enhancement of efficiency in operation, enhancement of investment and acceptance of reasonable rate of return.

Item 8: Identification and Management of Key Risks

It is difficult but necessary to assess and allocate the risk involved in the project. Careful drafting of the agreement is necessary to reduce risk to the both parties in service contract and franchise agreement in solid waste collection services.

The risks that need to be analyzed and allocated in waste collection agreement in SWM services are:

Risks	Issues
	<ul style="list-style-type: none"> — Sufficient financial capacity to pay the claims against the contractor/franchise during operational phase — Control measures (sanction and penalty) for non-compliance with standards and regulation relating — Response to improvements in productivity
Operational Risks	<ul style="list-style-type: none"> — Non-performance of the contractor/franchise and/or the municipality due to circumstance beyond control — Definition of benchmarks or criteria for monitoring operation more effectively — Municipal guarantee for the availability of the agreed facilities and charges, for example truck for transfer of the collected garbage to transfer station, the tipping fee for waste delivery to transfer station etc. — Handling complaints — Continuation of service and provision in case of default by the contractor /franchise
Financial Risks	<ul style="list-style-type: none"> — Proper record of investment and expenditure on operation and maintenance — Reliability of cash flow — Acceptable tariff and quality of service to the public — Municipal support for the financial arrangement of the contractor /franchise. For example Short term debt or equity acquiring facility for financing the project — Guarantee of minimum rate of return or minimum tariff revenue — Assurance of a monopoly for the franchise in the designated area — Coverage to compensate for a shortfall in revenue due to non-payment by the users — Distribution of franchise fee to the municipality if it exceeds the agreed level of return — Provisions for reviewing the tariff rate if debt servicing found insufficient
Regulatory Risks	<ul style="list-style-type: none"> — Role and power of the municipality/regulating agency — Limit to the power of discretion of the municipality/regulating agency — Procedures for appeal against or arbitration with the municipality/regulating agency — Compensation for accommodating changes in regulation
Political risk	<ul style="list-style-type: none"> — Political stability

Item 9: Performance Measurement and Monitoring

The agreement for waste collection should specify the scope of services, the outputs and the quality of such outputs required from the contractor/franchise. The municipality should specify the broad regulatory frame within which the contractor/franchise needs to function. Based on this frames the performance of the contractor/franchise should be monitored.

This section of the agreement should clearly spell out the following:

- Definition of performance target/standard, and
- Information that the contractor/franchise should submit to the municipality.

The information could be: financial and technical data on waste collection works (i.e, waste quantity) such as data on number and condition of physical assets, productivity of workers, vehicle audited cost information, and reporting requirement at the end of the agreement period.

Item 10: Payment

Payment form should be defined and agreed by both parties in advance in writing in agreement.

Item 11: Consents on Ownership and Use of Assets

The role and responsibility in connection with consents should be clearly identified in the agreement. The contractor/franchise may need the following consents to provide solid waste collection service efficiently:

- Capital mobilization,
- Labor,
- Equipment for collection,
- Environmental consents, and
- Legal consents.

It should be noted that the duration of the validity of such consents should be clearly mentioned. Validity of such consents should be sufficient to minimize the risk from adverse modification of these consents during the course of agreement.

Item 12: Dispute Resolution and Arbitration

The mechanism for resolving dispute should be stated in the agreement. The responsibility for resolving dispute should rest with both parties to the agreement. The legal framework governing the dispute resolution process and responsibility for undertaking work during the disputed period needs to be clearly stated in this section of agreement.

Note: Prototype contract agreement for solid waste collection is given in Annex 3.

Implementation of Partnership Project in SWM

Private operator should provide SWM services according to the agreed contractual agreement. The municipality should ensure that the Private contractors/franchisees are performing as per the agreement condition. This will demand for some basis about how to measure/evaluate that the service provider is in line with the agreement. For the purpose, the municipality should ensure the following:

- Step 1: Formation of Monitoring and Evaluation Team
- Step 2: Development of Performance Standard and Criteria for Measurement
- Step 3: Conduct Periodic Progress, Monitoring, Review and Evaluations of the Project
- Step 4: Reporting of the Progress
- Step 5: Establish Dispute Resolution Mechanisms

Step 1: Formation of Monitoring and Evaluation Team

The municipality should form a team for monitoring and evaluation for each of the SWM project implemented by the private operator. Such team should comprise of a municipal staff, representative of the private operator, and preferably a third party. Based on the reporting conducted by the private operator on a quarterly basis, the Monitoring and Evaluation Team will discuss pertinent issues regarding operation. In addition, the Team could be convened to deal with any contingency that arises within the project.

Solid Waste Management Committee should be made responsible for monitoring and evaluation of the SWM service project. The major function of the Solid Waste Management Committee in relation to monitoring and evaluation would be the following:

- Develop performance standard and criteria for measurement.
- Conduct periodic progress monitoring, review and evaluation of the project.

Step 2: Development of Performance Standard and Criteria for Measurement

Since the municipality is responsible for SWM service delivery, partnership arrangement is considered an alternative option for service delivery. The municipality should regularly monitor the performance of the service provider (contractor/franchise in case of solid waste collection service) to ensure that adequate services are being delivered at appropriate price to the beneficiaries. Thus, the municipality should develop a set of clear and unambiguous performance standards against which actual performance can be monitored.

Performance standards should be developed at the very beginning. Later, it should be included in the bid document and contractual agreement.

A set of performance indicators should be included in the contractual agreement. Such performance indicator should:

- show the performance monitoring against overall target, and year-by-year target of the project; and
- be in a simple format that should facilitate regular comparison of actual performance against the target.

Benchmarking and criteria for performance measurement in solid waste management service

A minimum target level performance should be specified and agreed upon for solid waste management service. Penalties or certain kind of punishment should also be specified in case of failure to achieve the targeted level.

Consideration in selection of performance indicators

- The performance indicators should be such that they could be measured objectively.
- The time and cost of performance monitoring should be minimum possible.
- The frequency of the performance measurement exercise and the time period over which the indicators are to be achieved need to be specified.
- The success of performance monitoring process depends on the capacity of the municipality and the partner. To monitor the achievement, the indicators should be simple.

The supervision, evaluation and monitoring of solid waste management services will be done by a committee formed in accordance with the Rule 139 of LSGR, 2000.

Step 3: Conduct Periodic Progress Monitoring, Review and Evaluations of the Project

PPP committee for monitoring and evaluation should conduct monitoring, review and evaluation of the progress made in SWM. In doing this, the municipality may adopt the following steps:

- Study contractual agreement document;
- Review data/information against performance indicators;
- Make site observation;
- Discuss with the beneficiaries;
- Discuss with the private service providers;
- Discuss with the PPP unit for SWM in the municipality; and
- Discuss with the relevant personnel from the civil society.

For conducting the *progress evaluations review and monitoring*, the municipality could use the sample format shown in Annex 5 to determine the status.

Step 4: Reporting of the Progress

The municipality should prepare progress-monitoring report based on the site observation and discussion with the stakeholders. The municipality should also get written reports from the Contractor/franchise on the progress made in collection of solid waste against the set performance target within the stipulated time and frequency. Such reports should include the following:

- Annual target and progress made;
- Problem experienced during the project implementation with causes and impacts;
- Possible solution to the problems and efforts that are made to solve the problem;
- Positive and negative experience during the implementation of the project;
- Corrective action for the next year plan;
- Plan for the next year; and
- Other relevant facts and figures.

Step 5: Establish Dispute Resolution Mechanisms

The responsibility for resolving dispute should rest with both parties to the agreement. Therefore, the municipality should jointly (i.e. with the private partner) specify the mechanism for resolving disputes. Procedures for resolving disputes between the parties of the partnership arrangement should be based on methods that are clear, low-cost, timely and effective. This will reduce the risk of unresolved disputes.

The dispute in partnership arrangement should be resolved following the four-step rule given below:

1	The affected partner raises disputed issue to show other partner (the municipality and the private service provider) clearly expressing the problem and its effect.
2	Partners jointly discover the root cause of the dispute. For this, both the parties should be ready to listen to so that they understand the problem.
3	Identify possible options for resolution.
4	Develop agreements based on objective standards. Normally, for an option to provide a win-win solution, it must meet objective standards such as being workable, equitable for both partners, fair, legal, ethical, within cost, and capable of being implemented.

Solid waste management contractual agreement should clearly provide:

- Mechanism that aims to minimize the incidence of disputes;
- Method of dispute resolution that aims to minimize the incident protracted and court litigation (for example, conciliation, mediation, or arbitration);
- Sorts of disputes that may (or must) be resolved; and
- Safeguarding the continuity of solid waste collection services during the time of dispute.

Stages in resolution of dispute

1	Negotiation	Where both the partners to the agreement come to a discussion table for win-win solution to the dispute.
2	Mediation	Where a mediator or a committee is formed for dispute settlement.
3	Appeal at the court	Where disputed matters are presented before the court for legal decision.

Checklist for Feasibility Study

Municipality should conduct project feasibility study of the selected SWM project for partnership arrangement. The viability assessment report should provide fairly detail information about the project so that it serves as a basis for partnership arrangement.

The feasibility study should highlight the following:

- The status in terms of technical and financial feasibility of the selected SWM projects;
- A broad frame for development of PPP arrangement;
- A strong basis for transparent and meaningful investment for the partners;
- A basis for the municipality and the partners to evaluate the achievement of SWM service delivery; and
- Suggestion for appropriate form of partnership.

A feasibility study should cover the following:

1. General information

- Detail analysis of existing SWM service delivery in the focused ward, community or area.
- Analysis of the strength and problem areas of the SWM service in the present situation.

2. Technical feasibility study

Technical feasibility study is a technical description of all the relevant components of the SWM project.

The following descriptions of the selected products/services are sought in this analysis:

- Technical analysis of all the components of the project;
 - Working procedure and description of every step of the project
 - Human resources, materials, equipment and facilities required to perform each step of the project
 - Capacity of the project
- Cost estimate of the components of the project
- A procurement plan and proposed procurement methods, procurement schedule and budget, and reasons for selecting the proposed procurement schedule
- Project implementation process pursued by the municipality and plans and schedule for partner consultation
- Project implementation schedule including an analysis of the expected problem in service delivery

3. Financial feasibility study

The following are the fundamental objectives of financial study of the selected SWM projects:

- Quantify the assumptions on the level of SWM activity;

- Provide and maintain available funds to support planned activities at the minimum cost possible;
- Determine optimum mixes of resources (HR, materials and facilities) and ensure adequate return on partner's investment; and
- Provide the desired financial result of operation and estimated financial condition.

The financial feasibility study should provide detail information on the following:

- Finance required to put the project into operation. Normally, it could be classified into three broad categories:
 - *Fixed Assets*: land, building, equipment, vehicles;
 - *Working Capital initially*: cost of project operation and maintenance until revenue starts coming in; and
 - *Pre-operating cost*: expenses incurred in preparing project study, registration etc.
- Source financing including the analysis of partners' investment required, loan (if any), cost of money, terms, risks and expected rate of return;
- A cost benefit analysis covering the comparative analysis of the expected cost and benefits of the project over the expected duration of the project; and
- Financial feasibility study also covering financial evaluation to examine the ability of the project.

4. Social impact and environmental sustainability analysis should cover

- A description of the beneficiaries of the project including willingness and ability to pay for the service;
- Identification of the potential private service providers, their possible issues and methods/ ways to address the issues;
- Social assessment identifying both expected positive and negative impacts on various areas of the ward and community including the municipality; and
- Environmental impact, including the measures for mitigation if any adverse impact is expected.

5. Risks and benefits analysis

- Identification of the major risks that might arise while implementing the SWM services, to the municipality and the partners;
- Proposition of methods for mitigation and distribution of those risk.

6. Institutional and contractual analysis

- Assessment of managing capacity of municipality to undertake the proposed partnership project. Generally the municipalities require enhancing their capacity to perform the following:
 - Conduct the partnership procurement;
 - Carryout contract negotiation;
 - Make agreement and performance monitoring; and
 - Develop plan for capacity/skill enhancement if necessary.
- Recommendation of the form of partnership (private sector or CBO/NGO etc.), and
- Proposal for contractual arrangement, its duration, and reasons for proposing the arrangement.

Terms of Reference for Municipal SWM Service through PPP

1.0 Background

Municipal solid waste management is an essential public service for public health and environment protection. Cleaning public places and safe disposal of waste is the major responsibility of the municipality. Article 96 (c) 7 of the Local Self-Governance Act, 2055 BS and policy statement in article 3 (f) of the same Act have authorized the municipalities to encourage the private sector to participate in the task of providing basic urban services for sustainable development.

Kirtipur Municipality has decided to implement solid waste management services involving private operator. The municipality expects the following outcome as a result of involving the private operator in solid waste management:

- a) upgrading of knowledge and skills;
- b) improvement in equipment use;
- c) rationalization of operation and maintenance;
- d) increase in accountability towards the users; and
- e) Regular performance monitoring .

Thus, the municipality requests proposal from the interested private operators for solid waste management services. The private operators shall submit Business Plan (Technical and Financial) as mentioned in Point 8 of this TOR. The selected operator will be considered a municipal partner for solid waste management service in the specified area. The partnership arrangement will be based on equitable distribution of the responsibility, risks and reward incorporated in the operation of the solid waste service.



3.0 Tasks

The solid waste management service will include the following tasks:

- **Task 1:** Implementation of solid waste education program at household level through community mobilization, in order to reduce the domestic refusal at the source.
- **Task 2:** Provide the users (especially women), the techniques of preparing compost at household level and ensure the utilization of knowledge;
- **Task 3:** Sweeping of the street and public places (Temples, Pati and Parks), cleaning of public drainage and removing the posters from the wall in the public places;
- **Task 4:** Collecting the garbage and refusals from the street sweeping and public place cleaning, cleaning of public drainage, removed postures and door-to-door collection of domestic refusal; and
- **Task 5:** Transporting of the collected garbage and refusals to the ... (specified place) or to the prescribed Transfer Station

4.0 Scope of work

The following will be the scope of work for the above mentioned tasks:

- A. Provide solid waste education to no. of household in Kirtipur municipality ward no. to area.
- B. Cleaning and sweeping of the street and public places (Temples, Pati and Parks), cleaning of public drainage and removing the posters from the wall in the public places in Kirtipur municipality ward no., tole from area.
- C. Collecting tonnes of garbage and refusals per year from street sweeping and public place cleaning, cleaning of public drainags, removing posters and door-to-door collection of domestic refusal in Kirtipur municipality ward no., tole from area, and safely transport to the (specified place) or to the prescribed Transfer Station.

2.0 Objective

The objective of this project is to provide necessary power and responsibility to the private service provider, to operate municipal solid waste management service in the specified area.



6.0 Estimation of budget and participation of users

Private operator shall submit their financial proposal considering the following provisions for budget and users participation:

- A. For tasks 1 and 2, municipality will provide program implementation cost (including remuneration, stationeries).
- B. For operating cost of the tasks 3, 4, and 5, private operator shall collect service fee from users. For the purpose, private operator shall propose tariff rate not exceeding upper ceiling of Rupees per household.
- C. Private Operator should deposit performance bond equivalent to the amount Rs. (in word rupees only) to the Municipality.

7.0 Staff and workers

Private operator shall employ and manage staff and workers necessary for the above mentioned tasks. In order to implement the task effectively, the following staffs and workers shall be employed or hired:

- a) **Solid waste manager:** Experienced in solid waste management works
- b) **Supervisor:** Experienced in managing sweepers
- c) **Workers:** Experienced in sweeping and drainage cleaning
- d) **Driver, Loaders** etc

Number, duration, salary and remuneration for the staff and workforce shall be clearly mentioned in the Business Plan.

8.0 Checklist for business plan

Private Operator should submit business plan for the project mentioned above. Two envelopes, one with technical plan and the other with financial plan, should be submitted to the municipality. Checklist for technical plan and format for financial plan are given below:

A. Technical Proposal

The following point should be clearly elaborated in the technical proposal for municipal solid waste management service:

- a) Analysis of present situation in solid waste management, which should include:
 - Description of solid waste management works by the municipality and private operators
 - Analysis of strength and weakness of the existing work

b) Description of every component of the proposed project:

- Working process and description of every step
- Listing and description of assets, machinery, equipments and tools demanded by each step
- Capacity of the project/plant

c) Cost estimation for each component of the proposed project.

d) Description of capability of the private operator to implement the project, which should include:

- Capacity of the vehicles and other equipment that would be used in solid waste management project (existing no. and type or to be purchased)
 - Procurement plan for machinery, equipment and tools
 - Experience in repair and maintenance of machinery, equipment and tools
 - Staff and workers necessary and available (number and type or to be hired/employed).
- e) Understanding of the work (solid waste management service)
 - f) Proprietor's experience in solid waste management work.
 - g) Experience of the major staff and workers in planning, designing, operation and implementation of solid waste management work.
 - h) Proof of the organization in operation for at least three years.
 - i) Proprietor's capacity to manage and deal with the labour union and the proof of providing fair wage to the workers.
 - j) Financial statement of the past three years.
 - k) Record of payment of tax and other government revenues of the past three years.
 - l) Description of possible hindrance in the solid waste work and measures that need to be taken to overcome it.

B. Financial Plan

The following is the format for financial plan for the project;

B.1. Project Highlight

1. Name of the project
2. Location and address
3. Proprietor
4. Annual capacity of the project
5. Human resource requirement
 - Staff
 - Workers
6. Investment:
 - a) Fixed assets
 - b) Initial operating capital
 - c) Working capital

7. Financing:

- a) Owners' own fund (Equity)
- b) Loan from bank/financial institute
- c) Personal borrowings

8. Annual income (in the first year)

9. Financial analysis
- a) Break-even point analysis
 - b) Pay back period
 - c) Return in investment
 - d) Internal rate of return

B.2. Investment in Fixed Capital

1. Land and land development
2. Building/shed and its construction
3. Machinery, equipment and tools
4. Electrification
5. Furniture and fixture
6. Pre-operation cost
7. Total investment in fixed assets

B.3. Annual operating expenses

1. Annual fixed cost
 - Depreciation of
 - Building/shed
 - Machinery, equipment and tools
 - Electrification
 - Furniture
 - Insurance
 - Interest on loan
 - Administrative expenses
 - Expenses on utilities
 - Electricity
 - Water
 - Salary of staff
 - Other fixed expenses
2. Annual variable costs
 - Wages for workers
 - Raw materials
 - Fuel
 - Repair and maintenance
3. Total annual operating expenses (1 + 2)

B.4. Estimation of Annual Depreciation

Depreciation	Rate	Total Amount	Year					
			1	2	3	4	5	
Building/shed								
Machinery & equipment								
Furniture								
Electrification								
Others								
Total								

B.5. Estimation of Annual Expenses

Particular	Year				
	1	2	3	4	5
- Raw materials					
- Workers					
- Staff					
- Fuel					
- Repair and maintenance					
- Administrative expenses					
- Rent of the building					
- Insurance					
- Others					
Operational expenses					
- Interest					
- Depreciation					
- Others					
Total Annual Expenses					

B.6 Annual Income Estimation

Particular	Year				
	1	2	3	4	5
- Collection of service fee					
- Income from program					
-					
- Sales of scrap (plastic)					
- Other incomes					
Total Annual Income					

B.7 Profit and Loss Statement

Description	Year				
	1	2	3	4	5
1. Annual Income					
Less:					
2. Annual Operating Cost					
3. Gross Profit					
Less:					
4. Depreciation					
5. Profit					
Less:					
6. Interest					
7. Less Other Expenses					
8. Net Profit/Loss					
9. Cumulative/Undistributed Profit/Loss					

B.8 Operating/Working Requirement

Description	Year				
	1	2	3	4	5
- Raw material (for months)					
- Salary (..... months)					
- Wages (for months)					
- Fuel (for months)					
- Adm. exp. (for months)					
- Repair and Maintenance					
Total Operating/Working Capital required					

B.9 Balance Sheet

Description	Year				
	1	2	3	4	5
1. Assets					
- Current Assets including Cash Balance					
- Cumulative Cash Flow Balance					
- Fixed Assets (after depreciation)					
Total Assets					
2. Liabilities					
- Loan					
- Owners Investment (Equity)					
- Cumulative Profit					
Total Liabilities					

B.10 Return on Investment

Value	Year				
	1	2	3	4	5
Investment in Fixed Assets (IFA)					
- Gross Operating Profit					
- Less Interest and Depreciation					
- Net Profit (NP)					
Return on Fixed Investment (NP / IFA × 100)					

Sample Contractual Agreement BetweenMunicipality and for Municipal SMW

This Contract is made on 2005 between
..... Municipality, herein after referred to as “*Municipality*” and(Name of the
Private Partner).....hereinafter referred to as “*Private Partner*” on other part.

WHEREAS the *Municipality* wishes to share its responsibility with the private service
provider in municipal solid waste management, by obtaining private partnership arrangement,
in franchise modality to implement the ‘solid waste collection’ service;

AND

WHEREAS, the *Private Partner* is willing and has accepted to undertake the responsibility
to provide such ‘Municipal Solid Waste Management’ service;

NOW, THEREFORE, both the parties hereby agree to it as follows:

Section I (One) DEFINITIONS

1.1 Objective of the Contract

The objective of this franchise contract is to provide necessary power and responsibility to the
private service provider, to operate the municipal solid waste management service in the
specified area.

1.2 Definitions

1.2.1 “..... Municipality” (*Municipality*) means an organization formed under the
article of Local Self Governance Act, 2055, situated at Devdhokha, ward
No. of Municipality, Kathmandu district.

1.2.2 “.....(Name of the Private Partner).....” (*Private Partner*) means an organization
registered under Organization Registration Act, 2034 / Company Act 2022, with
registration no., PAN No., and situated at
Municipality in ward No. of district.



1.2.3 “Municipal Solid Waste Management” means the following urban solid waste
management related services:

- A. Sweeping of the street and public place (Temples, Pati and Parks), cleaning of public
drainage and removal of posters from the wall in the public places;
 - B. Collecting the garbage and refusals from the street sweeping and public place
cleaning, cleaning of public drainage, removal of posters and door-to-door collection
of domestic refusal; and
 - C. Transporting of the collected garbage and refusals to the (specified place)
..... or to the prescribed Transfer Station;
- 1.2.4 “Users” means household owners, offices and organizations, and businessman dwelling
area from to
....., where the private partner
has agreed to provide Municipal Solid Waste Management service.

Section II (Two)

Specific terms and conditions

2.1 Both the parties to the agreement (the *Municipality* and the *Private Partner*) are
aware and understand all the process of partnership procurement (project feasibility/
business plan-technical and financial; all the document, records and proposals submitted
by the bidders) and agree the stage-wise decisions in the procurement as an integral
part of this partnership contractual agreement.

2.2 Responsibilities of the Municipality

2.2.1 *Municipality* shall approve the service of *Private Partner* for Municipal Solid Waste
Management in Municipality Ward No., to
..... tole from area.

2.2.2 *Municipality* shall specify the garbage collection points for the users after the primary
(Door-to-door collection has been done) and place (specific place or transfer station as
described in Annex 1.) for safe transportation of the collected garbage.

2.2.3 *Municipality* shall make necessary arrangement to prohibit dumping domestic waste
and the collected garbage in the place other than the one specified in Annex 1.

2.3 Responsibility of the Private Partner

2.3.1 *Private Partner* shall deliver municipal solid waste management service in the area
approved by the *Municipality* as mentioned in Article 2.2.1



2.3.2 **Private Partner** shall perform the sweeping of the street and public places in the area as mentioned in article 2.2.1 within 8:00 PM to 6:00 AM, or at the time specified by the **Municipality**.

2.3.3 **Private Partner** shall manage the equipment and other necessary facilities for the municipal solid waste management service and mobilize at least No. of labour as mentioned in the proposal.

2.3.4 **Private Partner** shall safely transport the collected garbage to the transfer station as mentioned in Article 1.2.3 or to the place specified by the **Municipality** within 7:00 AM.

2.3.5 At least once in every month, **Private Partner** shall remove the mud and grasses from the street and public places in the area as mentioned in Article 2.2.1.

2.3.6 In case of arrival of important guest, national festivals and/or in special occasion **Private Partner** shall sweep and clean the public places in the area as mentioned in Article 2.2.1 at any time, if **Municipality** demands for.

2.3.7 Further to the above-mentioned responsibilities, **Private Partner** shall implement municipal solid waste management service in accordance with the directives of the specified Review and Monitoring Committee.

2.4 **Management of Service Fee**

2.4.1 Tariff for the Solid Waste Management services for the area mentioned in Article 2.2.1 shall be set jointly by the **Municipality** and the **Private Partner**. Tariff for Solid Waste Management services shall be as shown in Annex 2.

2.4.2 **Private Partner** shall collect the service fee as specified in Annex 2 from the users for delivering Solid Waste management service. The **Private Partner** shall maintain a separate book of account for service charge collection. The statement of service charge should be submitted to the **Municipality** within 15 days of the next month.

In case of difficulty in collecting the service fee, the municipality shall support the **Private Partner** by freezing the urban service to the defaulter.

2.4.3 For modification of service charge, the **Municipality** and the **Private Partner** shall finalize it by discussion.

2.4.4 For recording of service charge account, the **Private Partner** should use three copy receipt papers. The first copy of the receipt should be given to the user against the payment of service fee. The second copy (first carbon copy) should be submitted to the **Municipality** along with the statement of service charge and the third copy (second carbon copy) should be kept in the record.

2.4.5 The service charge account should be audited every year. For such audit **Private Partner** should appoint a competent auditor. **Private Partner** should submit the audit report to the **Municipality**.

2.4.6 **Private Partner** should deposit performance bond equivalent to Rs.

..... (in word rupees only) to the **Municipality**.

2.4.7 **Private Partner** shall have responsibility to pay any HMG tax and local taxes.

2.5 **Duration of the Contract**

Duration of this agreement shall be years from the date of signing the contractual agreement paper. Thereafter, it could be extended in the understanding of both the parties to the agreement.

Provisional period for such contract shall be three months.

2.6 **Performance Standard for Collection of Solid Waste**

Municipality and the **Private Partner** shall jointly set the performance standard for Municipal Solid Waste Management service mentioned in Article 1.2.3. Both the parties to the agreement agree to work for achieving the performance standard mentioned in Annex 3 of this agreement.

2.7 **Activities Planning**

Based on the performance standard mentioned in Article 2.6, **Private Partner** shall submit activities plan (Annex 4) to the **Municipality**. The activities plan should indicate the following:

- Detail activities;
- Responsible persons; and
- Time frame,

The performance standard mentioned in Article 2.6 and the Activities Plan shall serve as a guideline for the agreed Municipal Solid Waste Management service.

Section III (Three)

GENERAL TERMS AND CONDITIONS

3.1 **Ownership of Solid Waste**

The **Private Partner** shall have the ownership of the collected waste and shall be liable to the waste collection till it is safely transported to the specified place or to the transfer station.

After the waste had been transferred to the specified place or the transfer station, **Municipality** shall have ownership of that waste.

3.2 **Review and Monitoring of the Solid Waste Collection Service**

Solid Waste Management Review Committee, hereinafter referred to as "**Review Committee**" shall review and monitor the progress of solid waste collection every days/weeks. Representatives from the following (No.) organizations shall be the members of the **Review Committee**.

- Coordinator, representative 1 No.
- Member, representative 1 No.
- Member, representative 1 No.

The **Review Committee** and the parties to the agreement shall jointly set the process for progress review and monitoring (Annex 5). Progress review and monitoring of the Solid Waste Management service shall be based on the following information:

- Financial statement and work progress report submitted by the **Private Partner**;
- Observation of the project site by the **Review Committee**; and
- Interview with the users and the stakeholders.

3.3 **Submission of Progress Report**

3.3.1 **Review Committee** shall submit a copy of report on progress review and monitoring of the Solid Waste Management Service to the **Municipality** and a copy to the **Private Partner** for necessary action.

3.3.2 Every quarter **Private Partner** shall submit progress report on Solid Waste Management Service to the **Municipality**, which should include the following information:

- a) Quarterly/yearly target and description of the work progress;
- b) Statement of income and expenditure
- c) Problems encountered and steps taken to solve the problems during implementation of solid waste collection service;
- d) Description of positive and negative experiences;
- e) Activities planning for the next quarter;
- f) Corrective action necessary; and
- g) Others, if any.

3.4 **Failure to Act as per Terms and Conditions of the Agreement**

3.4.1 For any reason, if the **Private Partner** does not accomplish the responsibilities as mentioned in Article 2.3 and **Review Committee** proves it with sufficient proof, **Municipality** can cancel the agreement and reassign the work to a third party. For this purpose, **Municipality** should notify the **Private Partner** with 15 days notice. Expenses incurred for such action will be liability of the **Private Partner**.

3.4.2. For any specific reason, if any party to the agreement (either the **Municipality** or the **Private Partner**) notifies the other party for cancellation of the agreement, with 3 (three) month prior notice, the agreement shall be cancelled.

3.4.3 For any reason or situation other than the mentioned in Sub-Articles 3.4.1 and 3.4.1, if **Municipality** cancels the agreement, **Municipality** should pay **Private Partner** the amount equivalent to the losses due to such action.

3.5 **Failure on Work Completion**

3.5.1 If **Private Partners** do not perform the Solid Waste Management Service in the area mentioned in Article 2.2.1 within the specified time, the **Municipality** can notify the **Private Partner** for performance within 24 hours. If the **Private Partner** fails to do

so, the **Municipality** can make arrangement for the same. For such action, the **Private Partner** shall be made liable for the amount of expenses incurred.

In case of Natural disaster or situation beyond the control the above-mentioned sub-Article 3.5.1 shall not apply.

3.5.2 If the **Private Partner**'s service delivery is not found to be at the level of the prescribed performance standard, the **Private Partner** shall improve its performance to the level, within the time duration fixed by the **Review Committee**. The **Municipality** shall act according to the **Review Committee**'s decision for necessary corrective action. If the **Private Partner** fails to do so. Expenses incurred for such action will be reimbursed from the **Private Partner**.

3.6 **Responsibility for Loss and Damage**

3.6.1 In case of loss or damage due to **Private Partner** or its staff or representative, the **Private Partner** shall bear the responsibility. **Municipality** shall not be responsible for such loss or damage.

3.6.2 In case of the loss or damage due to natural disaster the **Private Partner** shall timely report the **Review Committee** in written form describing the nature of loss or damage and its cause. The **Review Committee** shall decide for distribution of such loss or damage after a detail analysis based on the report.

3.7 **Delegation of Work Responsibility**

- a) Without prior approval from the **Municipality** the **Private Partner** shall not furnish any work of contractual agreement by using a third party.
- b) Similarly, **Municipality** shall not assign or enter into contract with any third party during the contract period for the same work.

3.8 **Labour Security**

The **Private Partner** shall provide dress, gloves, masks and boots to all the staff according to the prescribed rules of the **Municipality**. This dress is mandatory to all the staff during the working period. The dress shall be always clean.

3.9 **Strikes**

Solid Waste Management is considered as a basic service and is directly related to public health. This partnership agreement is a commitment of the local government and the private service provider for efficient and regularity in service delivery. Thus, both the parties to the agreement (the **Municipality** and the **Private Partner**) understand and agree not to go into strike at any circumstance.

3.10 **Notice for Prosecution (Punishment)**

If any person(s) or organization(s) is disturbing the solid waste management activities, the **Private Partner** can request them to refrain from disturbing and/or can give a notice for legal

Sample Format for Progress Monitoring, Review and Monitoring of the Solid Waste Collection Operation

action and/or punishment. But for taking any kind of legal action and/or punishing such person or organization, *Municipality* shall be informed in writing.

Action taken by the *Municipality* in this respect shall be informed to the *Private Partner*.

3.11 Dispute and Complaint Handling

3.11.1 All complaints and suggestions of the users regarding solid waste management services shall be put forward by the *Private Partner*. Such record should be submitted to the *Municipality*.

3.11.2 If any one party to the agreement is dissatisfied with the quality of the service delivery or the accomplishment of the responsibilities and, as a result, dispute arises, the following steps shall be taken to resolve the dispute:

- a) *Municipality* and the *Private Partner* shall come to the negotiation table to arrive at the resolving point.
- b) If unable to arrive at the resolving point at the negotiation table, *Municipality* and *Private Partner* shall nominate one mediator each, and the nominated mediator shall select another mediator to form a three member mediation team to resolve the dispute. Such mediation team shall resolve the dispute within 15 days either by voting or by consensus. Both the parties shall share the cost incurred in such mediation.
- c) If the parties to the dispute are not satisfied with the mediation team's decision, the dispute shall be settled through the court of law.

Authorized Signature for
Municipality

Signature:

Office Stamp

Name:

Designation:

Date:

Authorized Signature for
Private Partner

Signature:

Office Stamp

Name:

Designation:

Date:

Performance measures	What is measured	How it is measured	Where it is measured	How often it is measured	By whom it is measured	Basis for sanction
Cleanliness of service area	Existence of litter					
	Existence of clandestine waste pile					
	Waste in drains					
	Improperly placed waste bins					
Safe disposal of collected waste	Regularity and frequency in collection service					
	Number of collection points and competency in collection services					
Customer satisfaction	Waste quantity delivered at transfer station					
	Clandestine dumping					
Workers productivity	Percentage about cleanliness of areas					
	Willingness to pay					
Customer dissatisfaction	Willingness to participate in collection requirements					
	Complaint about improperly placed waste bins, damage of waste bins, uncollected wastes, rude behavior by the collector etc.					
Workers productivity	No. of workers in service					
	Waste quantity per worker each shift					
	Absenteeism					

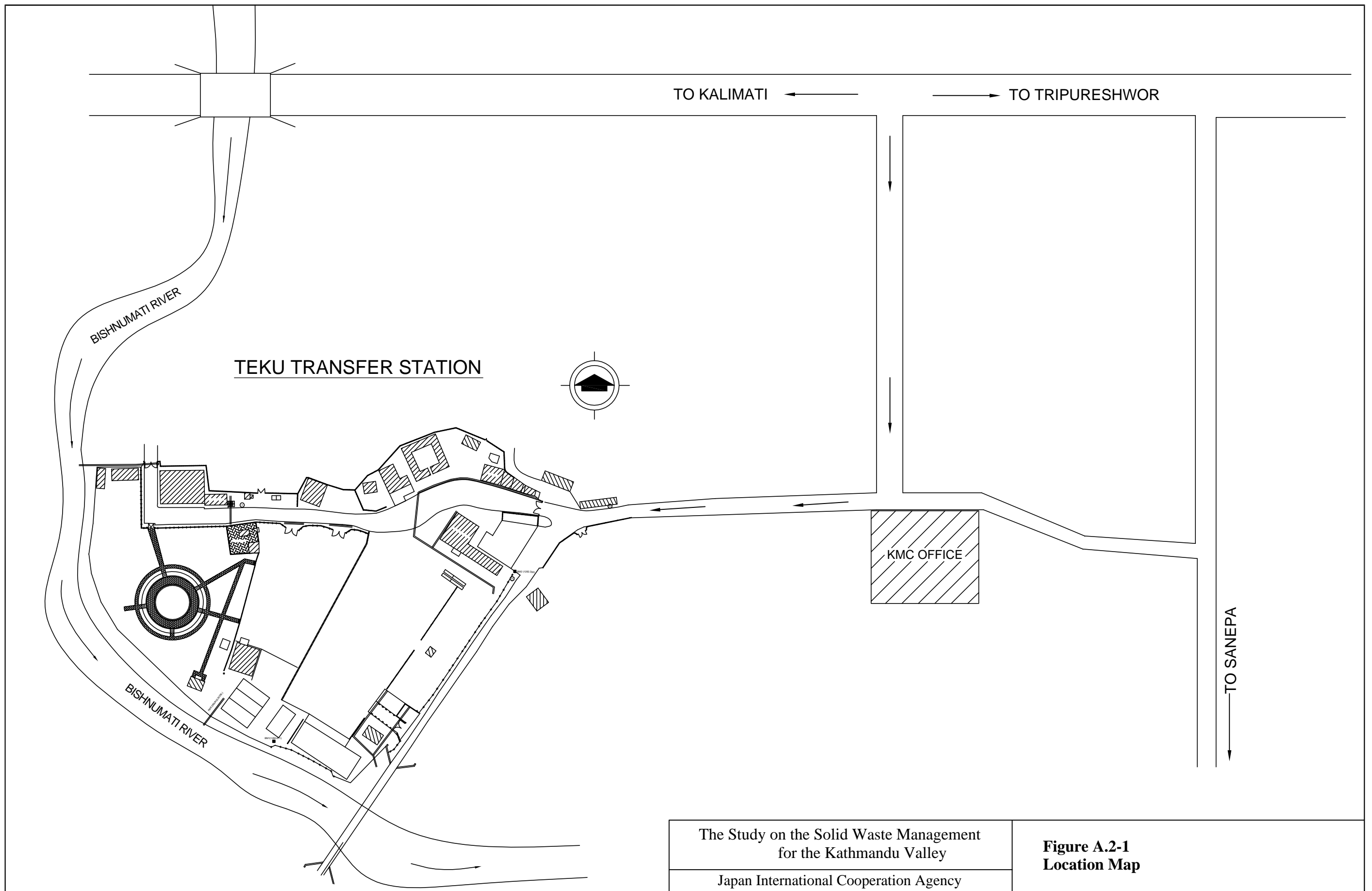
Performance measures	What is measured	How it is measured	Where it is measured	How often it is measured	By whom it is measured	Basis for sanction
Vehicle productivity	No. of vehicles in service Waste quantity per vehicle each shift and per day					
Environmental controls	Leakage from waste in vehicles Control of litter from vehicles Use of gloves, masks, uniforms					
Occupational health and safety controls	Tools on vehicles to load loose waste and size and weight of lifted load Annual medical check-up Regular payment of taxes Payment to the workers					
Finance						

Pilot Project A-2

***As-built Drawings
for Improvement Work
at Teku Transfer Station***

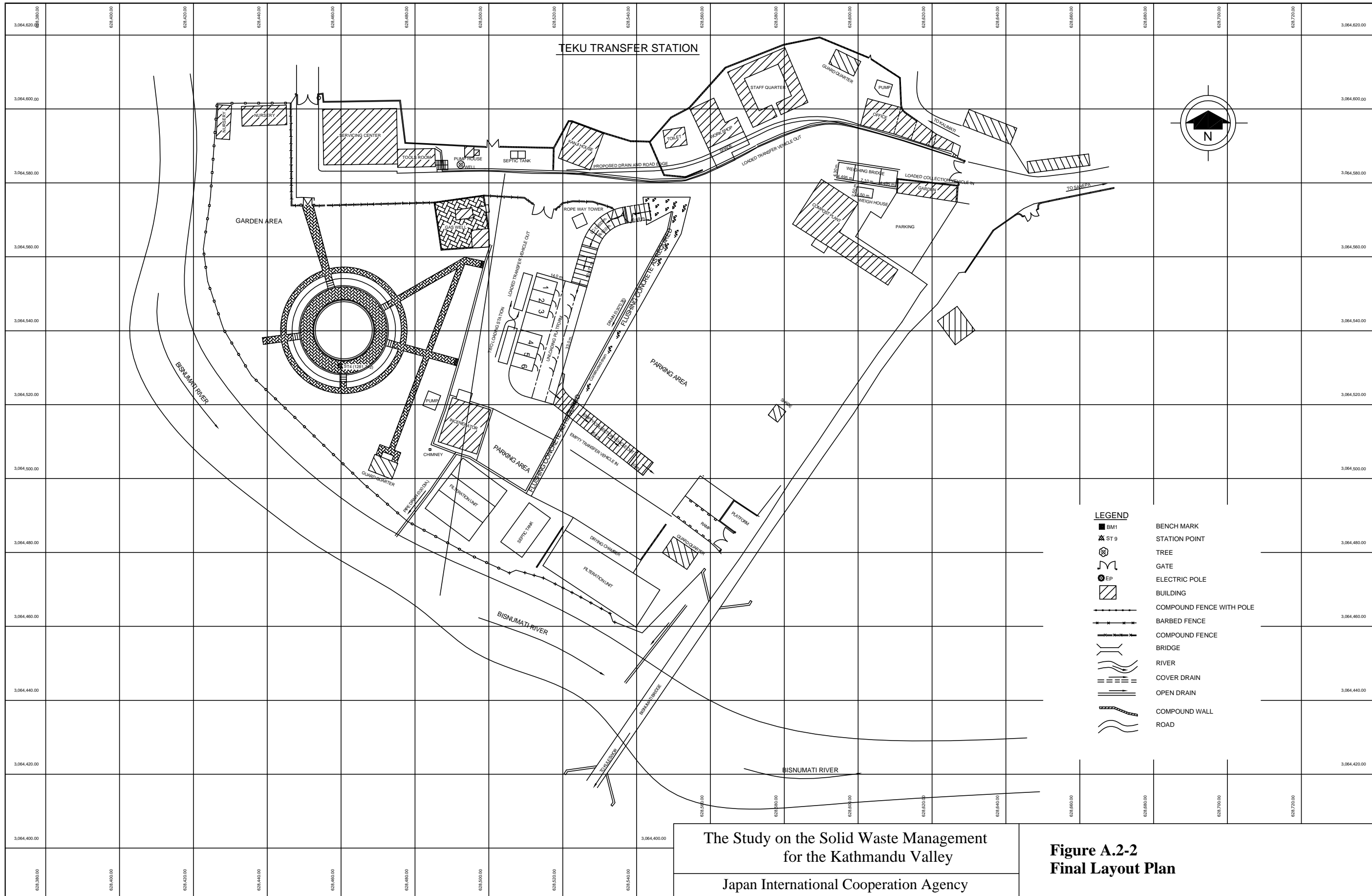
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3	A.2-3A	Plan and Profile
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7	A.2-6	Foundation Details Grid BB & GG
8	A.2-7	Foundation Details Grid AA
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<i>Drainage</i>		
32	A.2-24	Drainage Layout Improvement Plan
33	A.2-25	Drainage Improvement Section Detail
34	A.2-26	Drainage Improvement Drain Cover
35	A.2-27	Traffic Circulation and Vehicle Parking



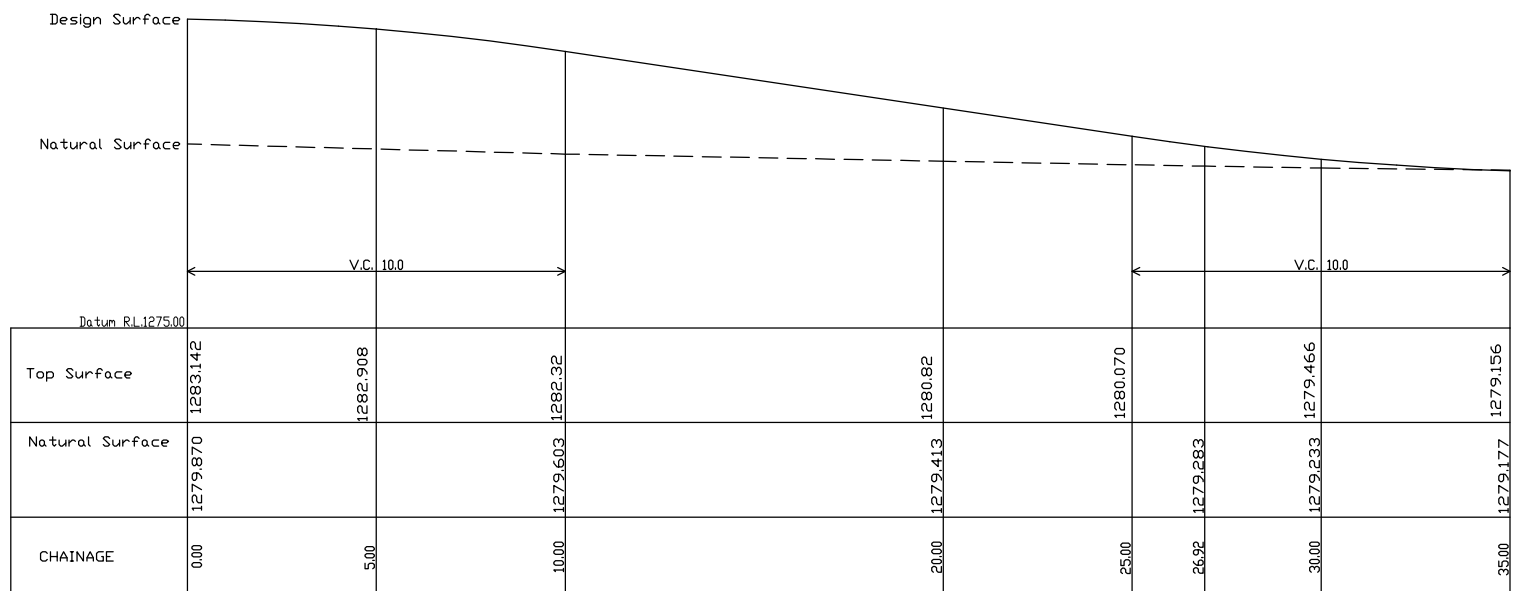
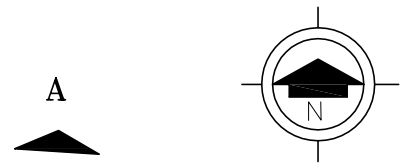
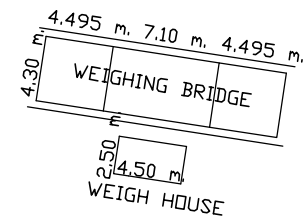
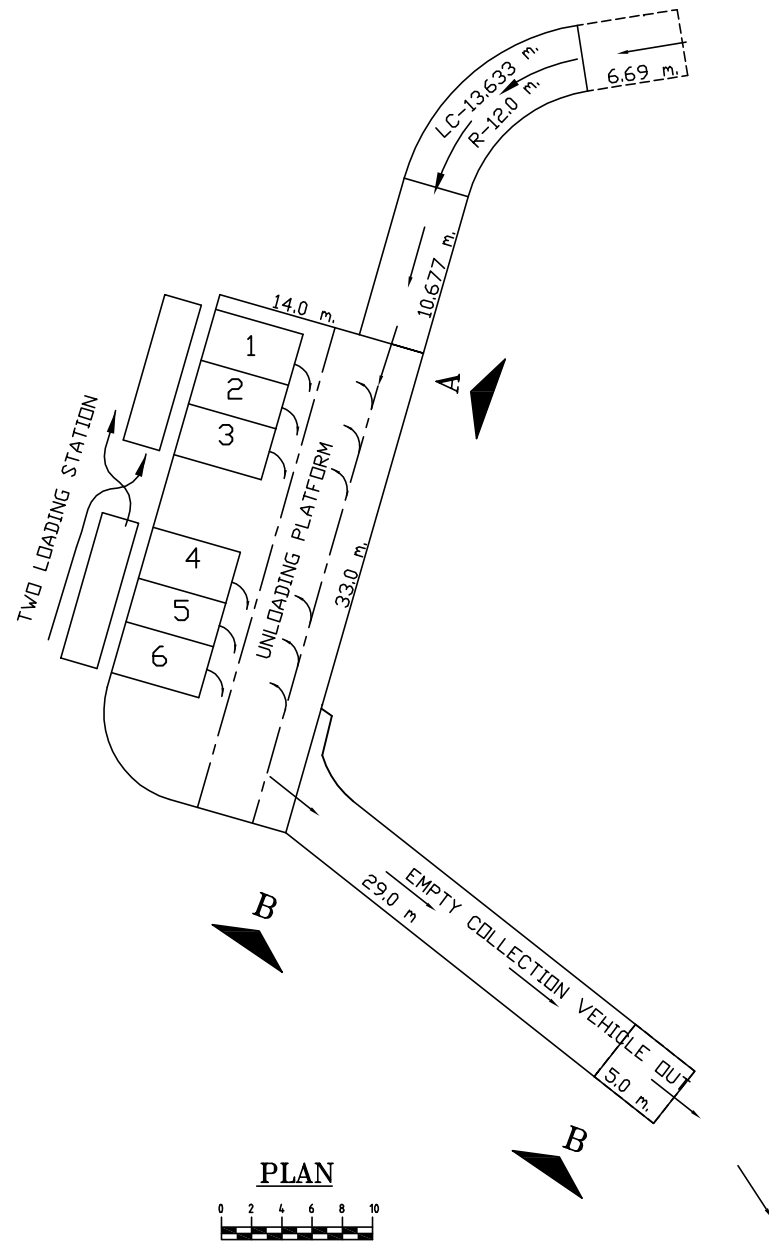
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Figure A.2-1
Location Map



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Figure A.2-2
Final Layout Plan



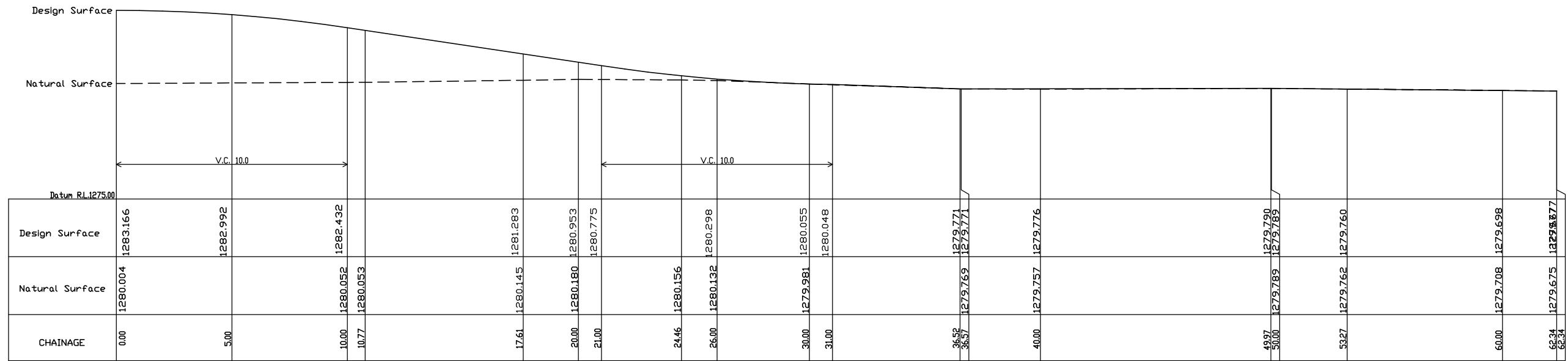
LONGITUDINAL SECTION B-B



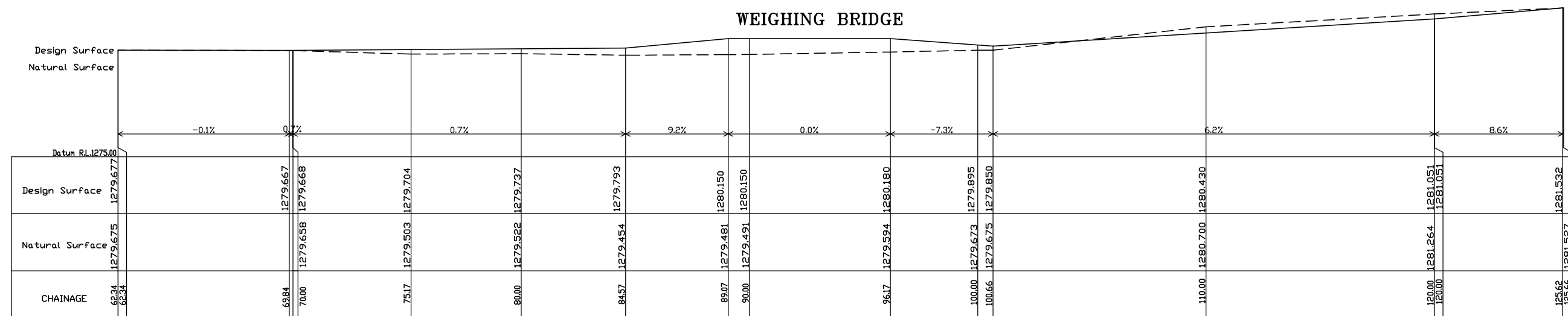
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Figure A.2-3A
Plan and Profile



LONGITUDINAL SECTION A-A

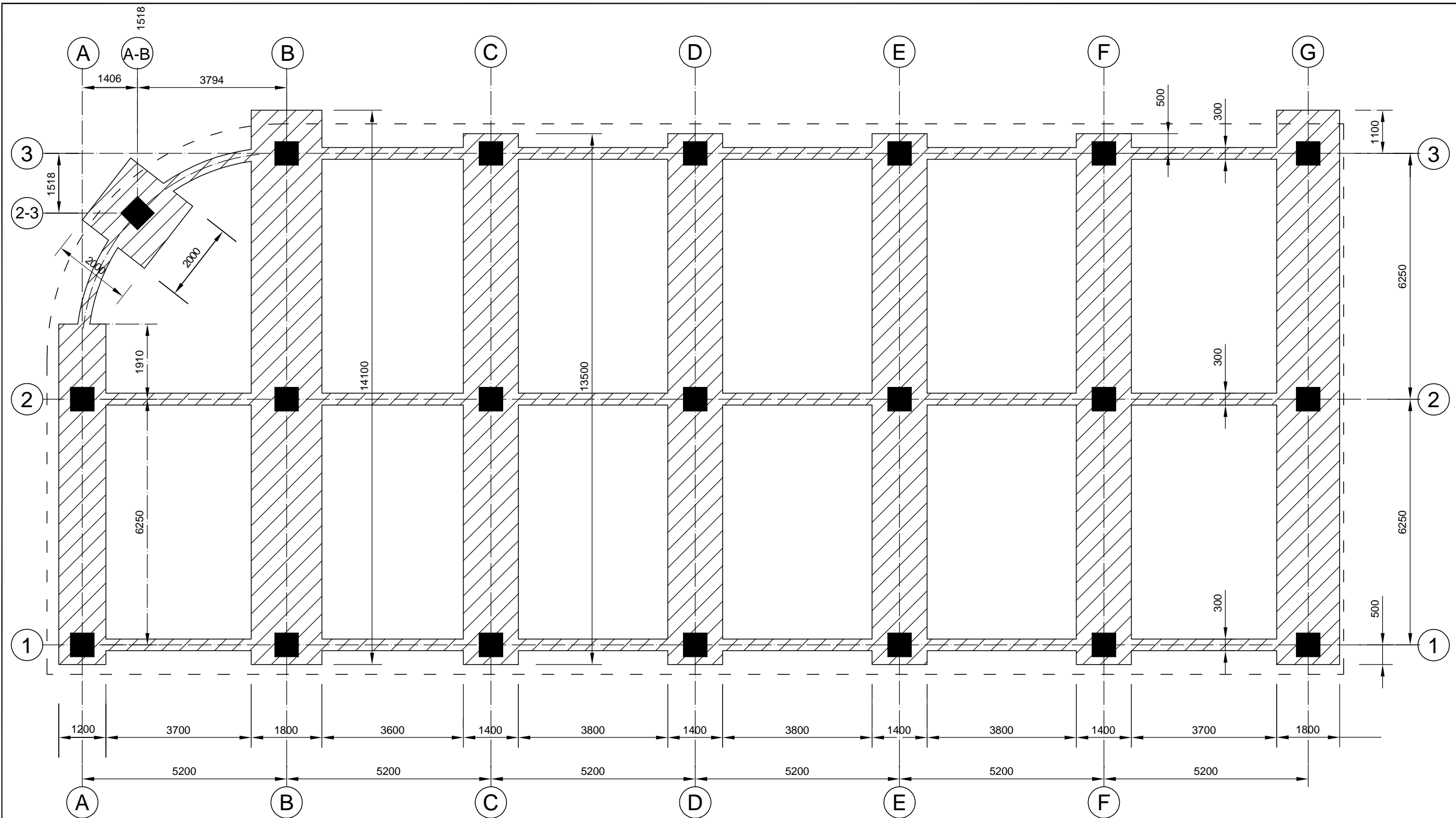


LONGITUDINAL SECTION A-A

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Figure A.2-3B
Plan and Profile



CO-ORDINATES OF GRID D

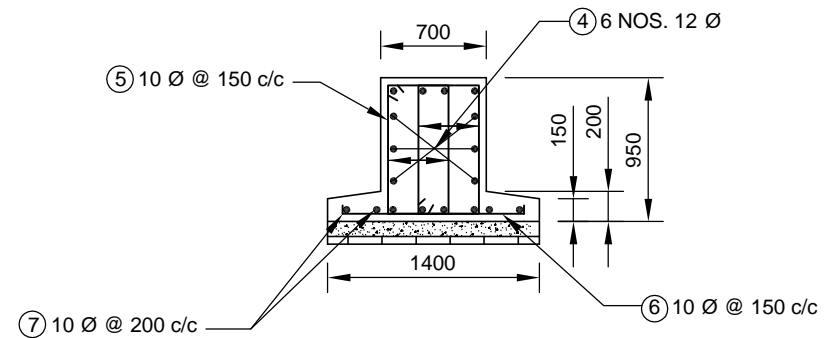
S. No.	Column No.	Easting	Northing
1	D1	628521.251	3064536.154
2	D2	628515.243	3064537.877
3	D3	628209.235	3064539.600

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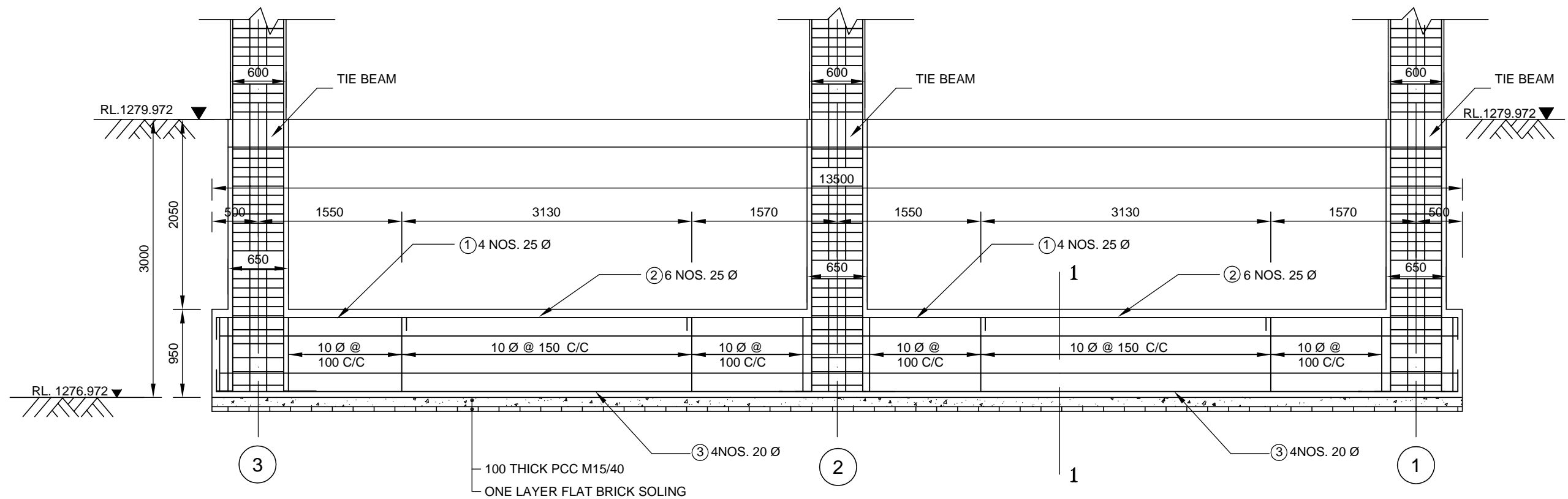
**Figure A.2-4
Trench Plan
Unloading Platform**

BAR BENDING SCHEDULE

S. No.	Bar Mark	Bar Shape	Dia (mm)	No. of Bars	Length of each bar (m)	Total Length (m)	Unit Weight (kg/m)	Total Weight (kgs)	Remarks
1	1		25	4	15.65	62.60	3.852	241.135	
2	2		25	4	3.48	13.92	3.852	53.62	
3	3		20	4	15.15	60.6	2.465	149.379	
4	4		12	6	13.566	81.396	0.888	72.28	
5	5		10	111	5.4	599.40	0.62	371.63	
6	6		10	90	1.38	124.20	0.62	77.004	
7	7		10	6 (3*2)	13.53	81.18	0.62	50.33	
Sub Total								1015.378	
Grand Total for Grid CC,DD,EE & FF								4061.512	



SECTION 1-1



GRID CC, DD, EE & FF

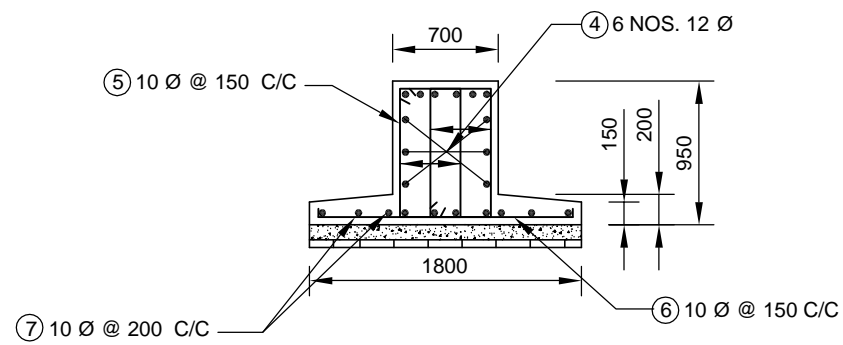
- NOTES:-
- The minimum clear cover to any reinforcement shall be 75mm.
 - Concrete should be of grade M25/20 having characteristic strength 25N/mm².
 - Rebars should be thermex TMT having characteristic strength 500N/mm².

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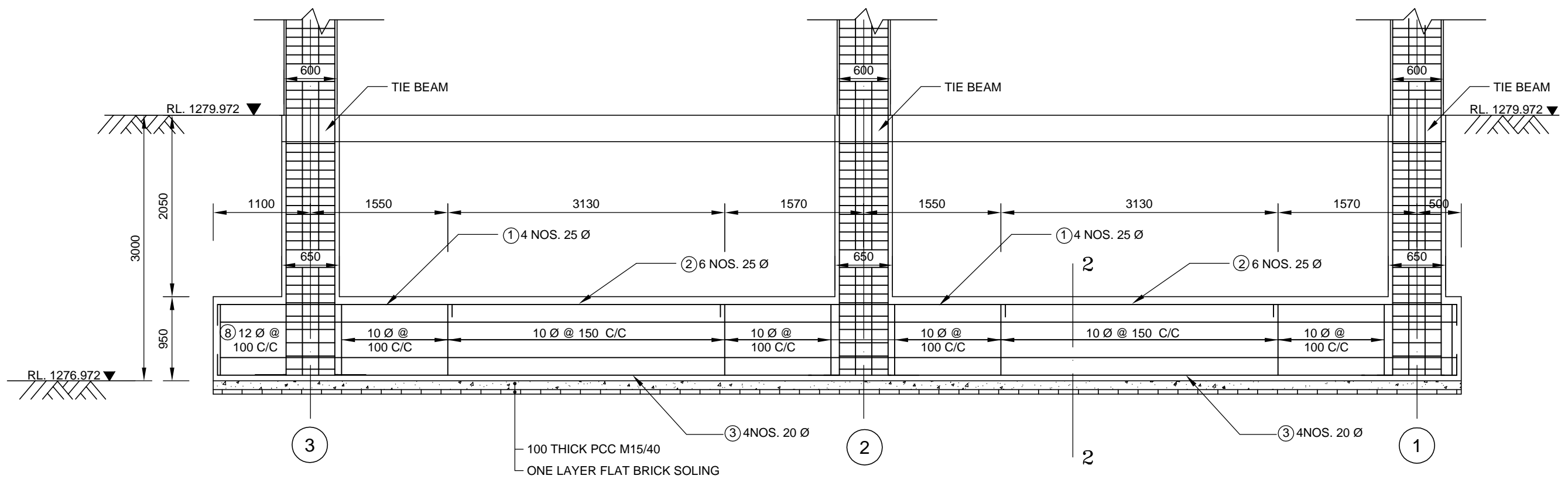
Figure A.2-5
Foundation Details Grid CC,DD,EE & FF
Unloading Platform

BAR BENDING SCHEDULE

S. No.	Bar Mark	Bar Shape	Dia (mm)	No. of Bars	Length of each bar (m)	Total Length (m)	Unit Weight (kg/m)	Total Weight (kgs)	Remarks
1	1	400 13950 400	25	4	16.25	65	3.852	250.38	
2	2	225 3030 225	25	4	3.48	13.92	3.852	53.62	
3	3	400 13950 400	20	4	15.75	63	2.465	155.295	
4	4	108 13950 108	12	6	14.766	88.596	0.888	78.673	
5	5	100 850 400	10	108	5.4	583.20	0.62	361.584	
6	6	90 1650 90	10	94	1.88	176.72	0.62	109.566	
7	7	90 13950 90	10	6	14.13	84.78	0.62	52.564	
8	8	100 850 400	12	24	5.40	129.60	0.888	115.085	
Sub Total								1176.767	
Grand Total for BB & GG								2353.534	



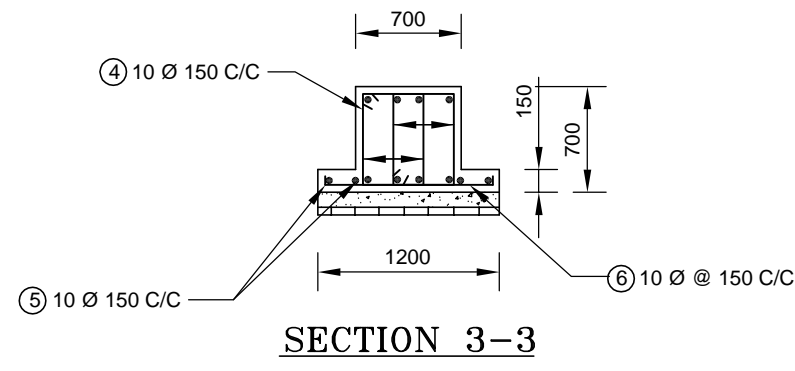
SECTION 2-2



GRID BB&GG

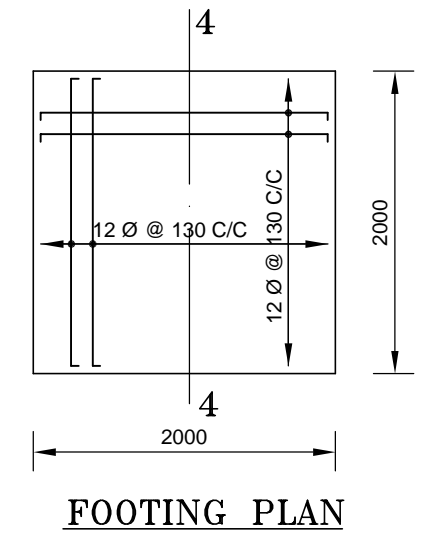
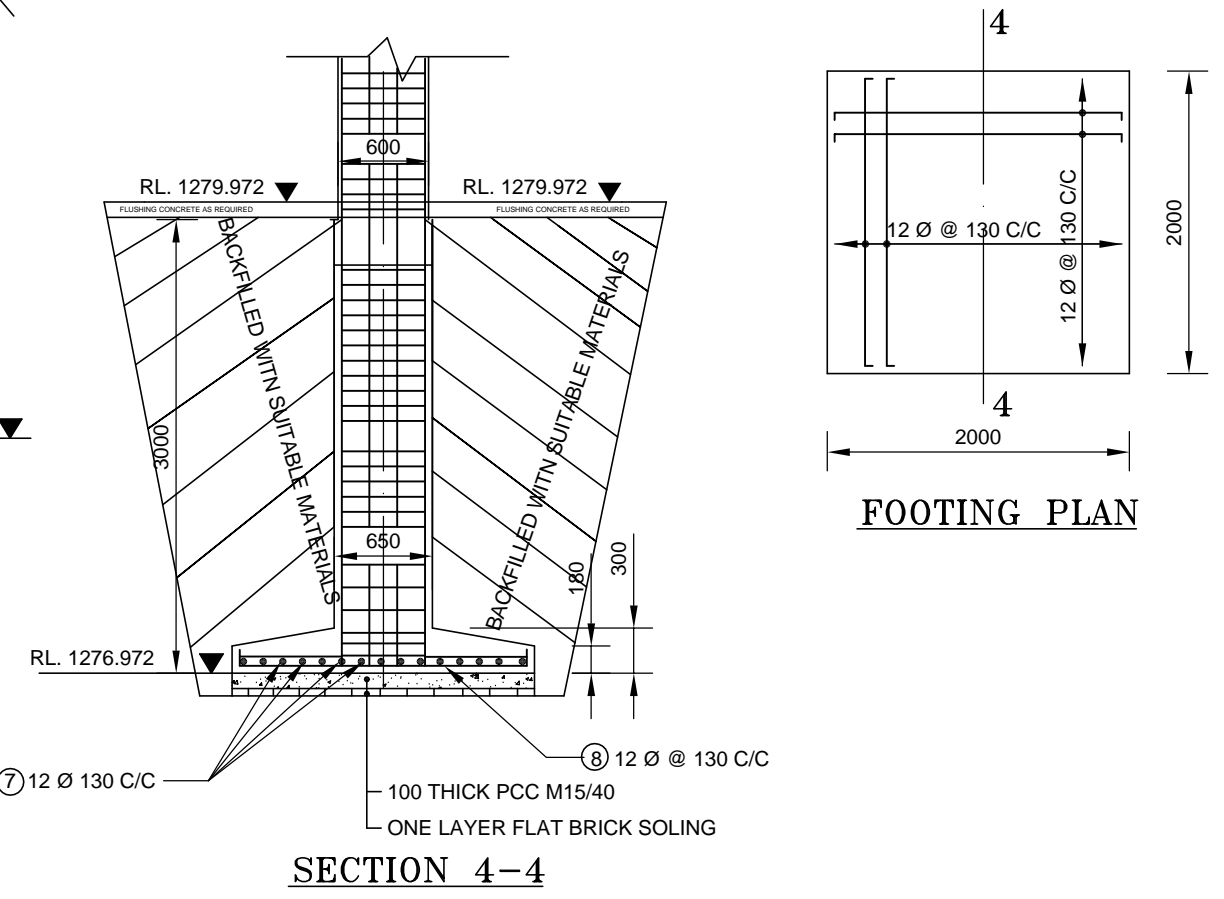
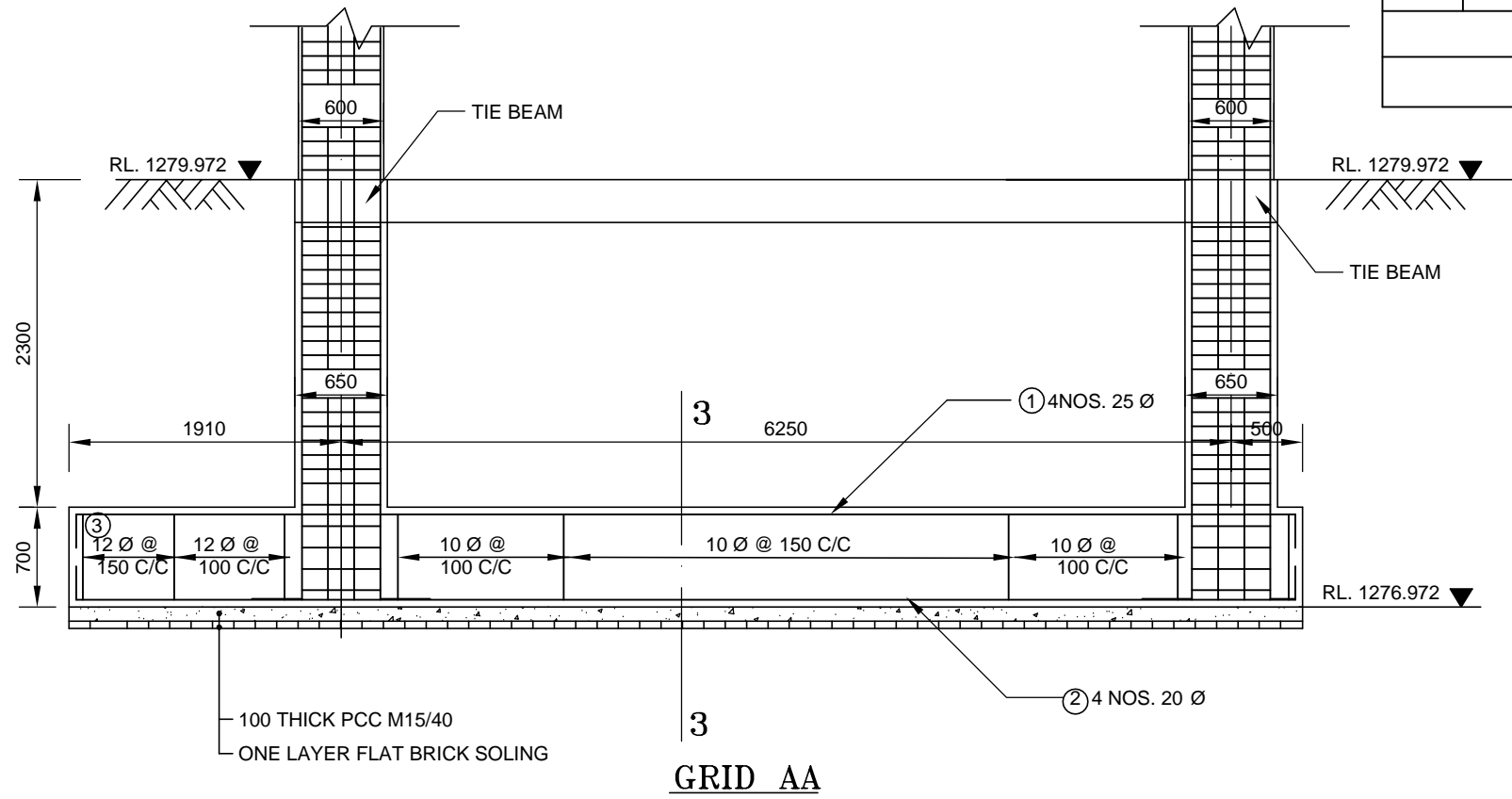
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Figure A.2-6
Foundation Details Grid BB & GG
Unloading Platform



BAR BENDING SCHEDULE

S. No.	Bar Mark	Bar Shape	Dia (mm)	No. of Bars	Length of each bar (m)	Total Length (m)	Unit Weight (kg/m)	Total Weight (kgs)	Remarks
1	1		25	4	9.11	36.44	3.852	140.367	
2	2		20	4	9.11	36.44	2.465	89.825	
3	3		12	14	4.48	62.72	0.888	55.695	
4	4		10	54	4.40	237.60	0.62	147.312	
5	5		10	4	8.69	34.76	0.62	21.551	
6	6		10	58	1.23	71.34	0.62	44.231	
7	7		12	16	2.066	33.056	0.888	29.354	
8	8		12	16	2.066	33.056	0.888	29.354	
Sub Total							557.689		
Grand Total for Grid AA & Footing							557.689		



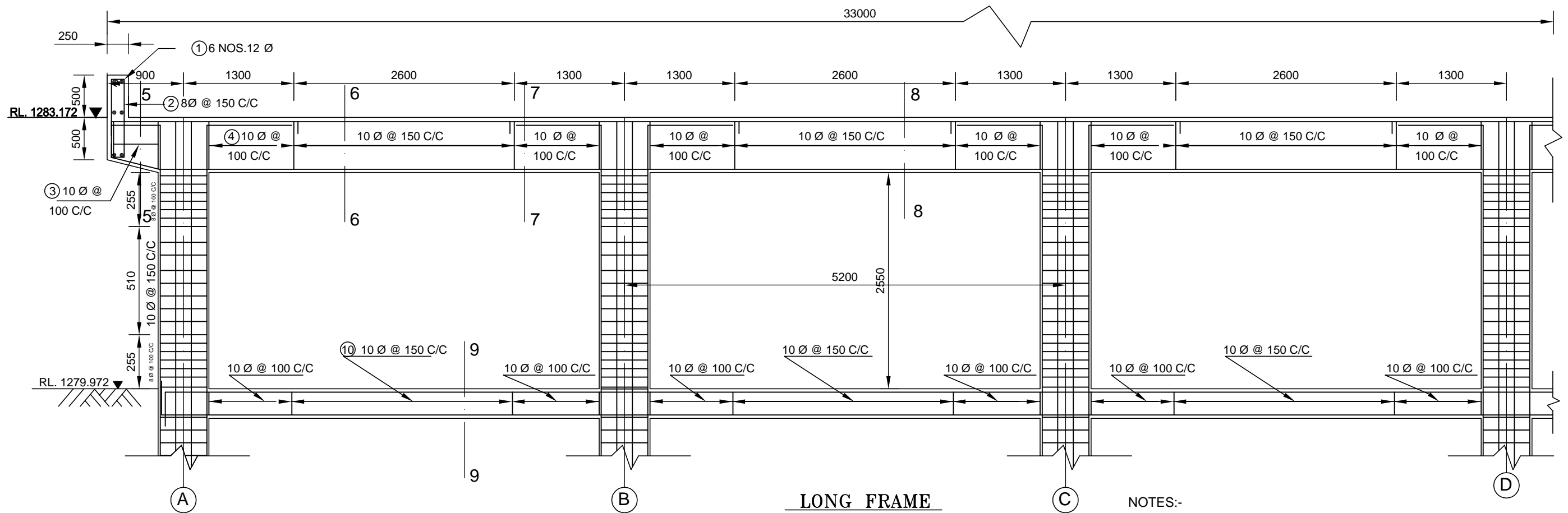
- NOTES:-
- The minimum clear cover to any reinforcement is 75 mm.
 - Concrete is of grade M25/20 having characteristic strength 25 N/mm².
 - Rebars is thermex TMT having characteristic strength 500 N/mm².
 - Minimum 3 nos. of stirrups are provided within isolated foundation.
 - Lap length of column bars is 60*diameter of bars and is according to Earthquake code of Nepal.

BAR BENDING SCHEDULE

S. No.	Bar Mark	Bar Shape	Dia (mm)	No. of Bars	Length of each bar (m)	Total Length (m)	Unit Weight (kg/m)	Total Weight (kgs)	Remarks
1	4		10	661	3.36	2220.96	0.62	1376.99	(235*2)+191
2	5		25	2*3	37.92	227.52	3.852	876.407	
			25	2*3	32.18	193.08	3.852	743.744	
			25	2*2*3	2.66	31.92	3.852	122.956	
3	6		20	4*3	33.28	399.36	2.465	984.422	
			20	4	28.08	112.32	2.465	276.87	
4	7		8	594	1.36	807.84	0.395	319.097	
5	8		20	30	2.96	88.80	2.465	218.89	
6	9		16	34	2.90	98.6	1.578	155.591	
	Extra		25	12	4.925	59.10	3.852	227.653	

BAR BENDING SCHEDULE

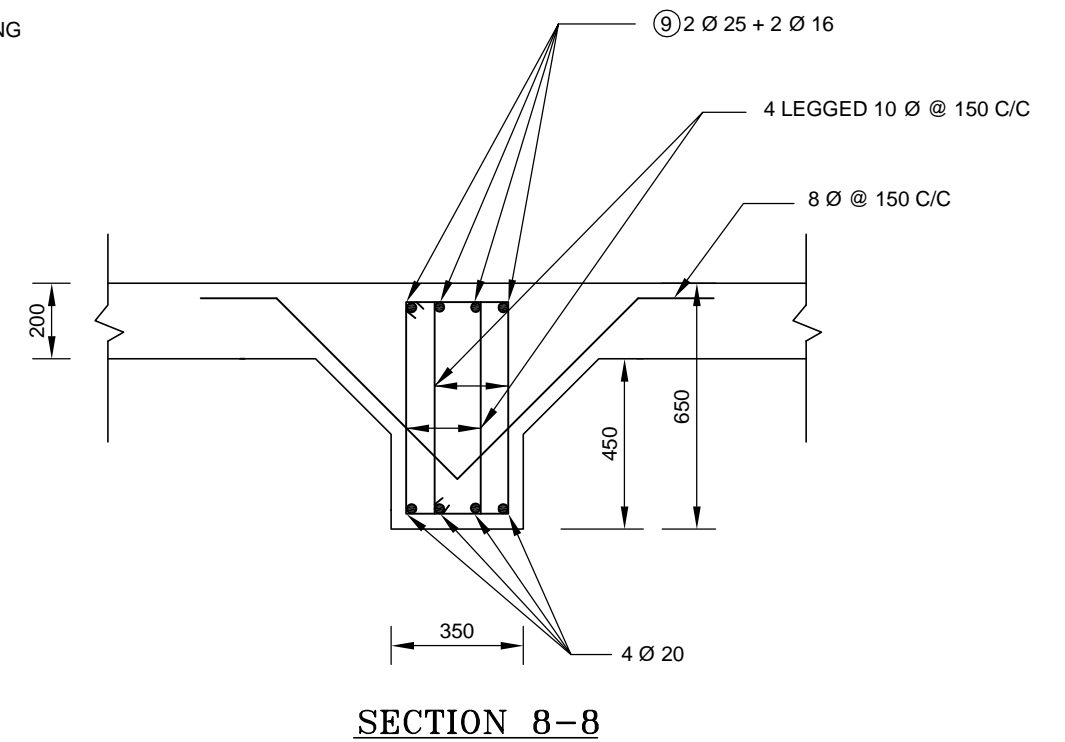
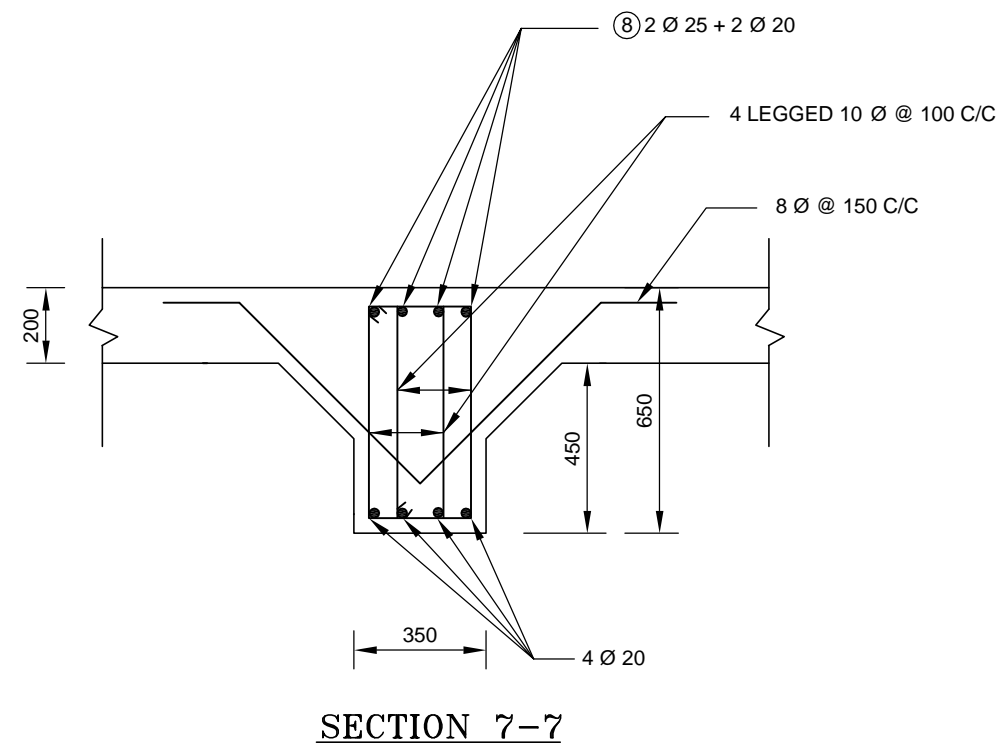
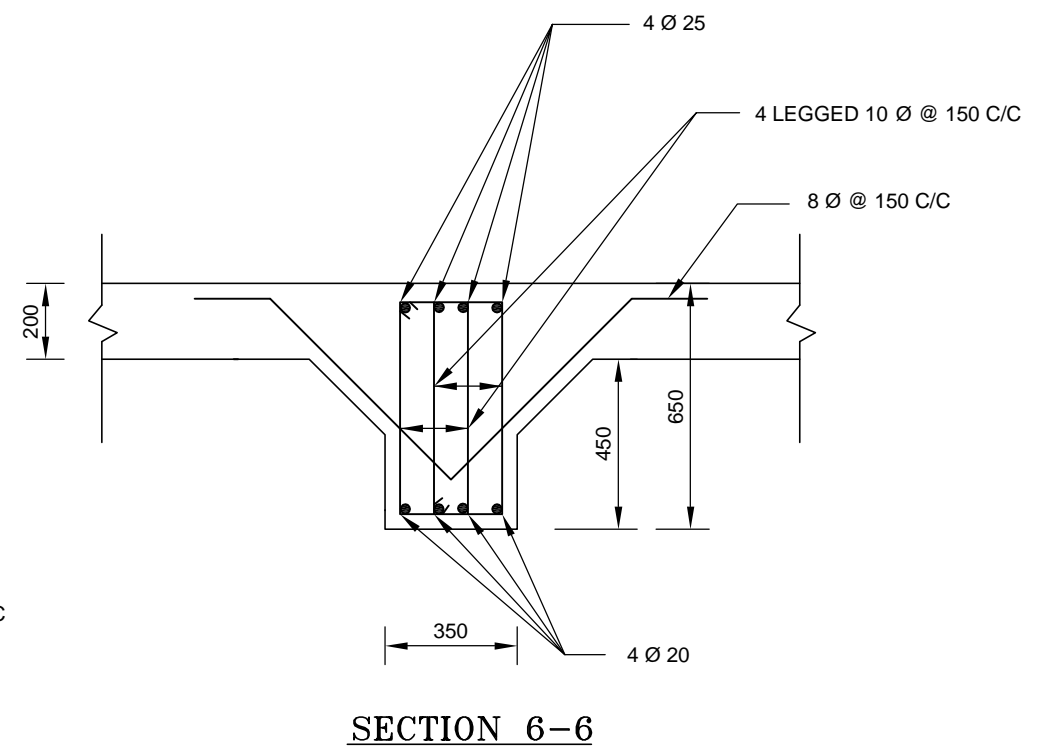
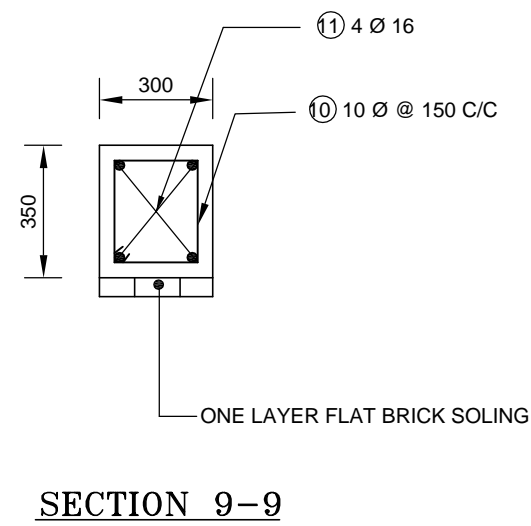
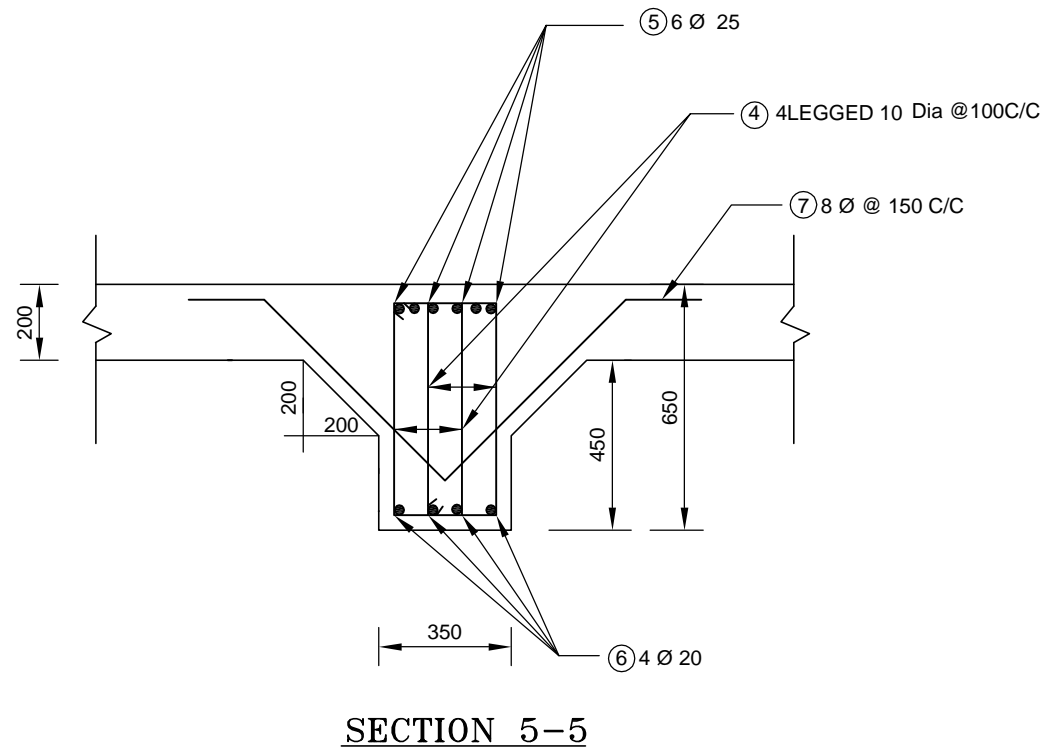
S. No.	Bar Mark	Bar Shape	Dia (mm)	No. of Bars	Length of each bar (m)	Total Length (m)	Unit Weight (kg/m)	Total Weight (kgs)	Remarks
7	10		10	343	1.04	356.72	0.62	221.17	
8	11		16	4*3	94.30	1131.6	1.578	1785.665	
Sub Total								7032.585	
Grand Total								7032.585	



NOTES:-
1.SAME AS DRAWING NO.7.

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Figure A.2-8A
Typical Long Frame
Unloading Platform



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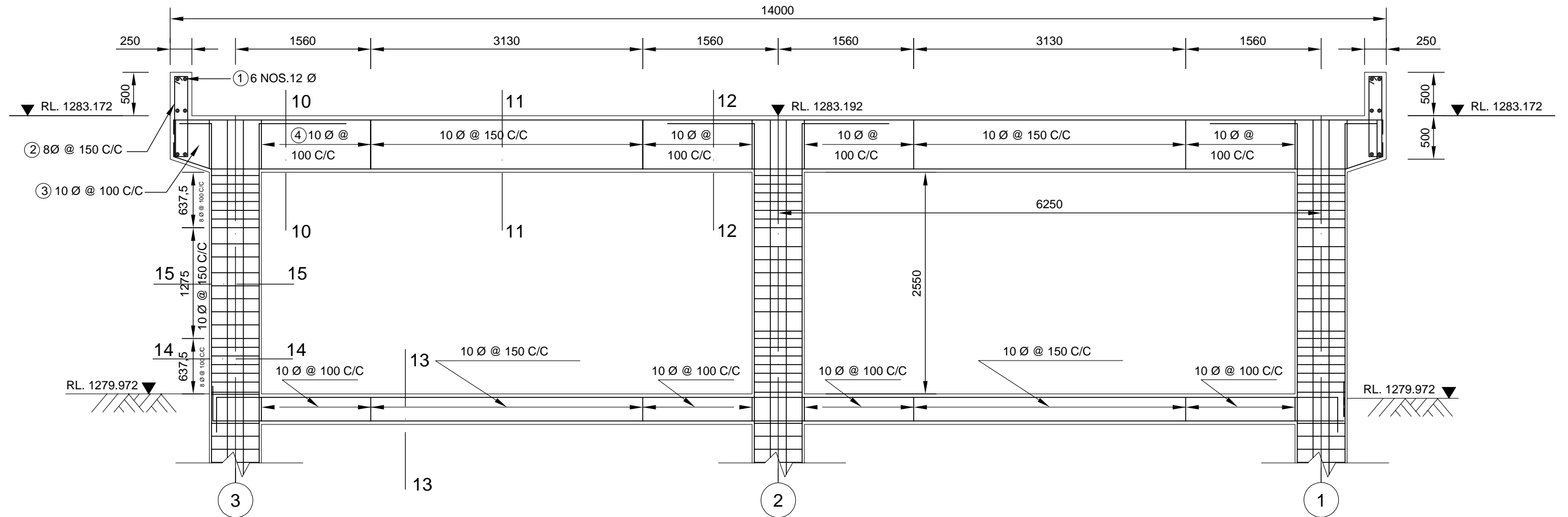
Figure A.2-8B
Typical Long Frame Section Detail
Unloading Platform

BAR BENDING SCHEDULE

S. No.	Bar Mark	Bar Shape	Dia (mm)	No. of Bars	Length of each bar (m)	Total Length (m)	Unit Weight (kg/m)	Total Weight (kgs)	Remarks
1	1		12	3	79.182	237.546	0.888	210.941	COVERS WHOLE PLATFORM
2	2		12	3	81.017	243.222	0.888	215.981	
3	3		8	535	2.300	1230.50	0.395	486.048	
4	4		10	102	3.360	342.72	0.620	212.486	
5	5		25	2*3*6	5.020	120.48	3.852	464.089	
6	6		8	78*6	1.360	636.48	0.395	251.409	
7	7		25	4*6	14.235	341.64	3.852	1315.997	
8	8		25	2*6	14.240	185.04	3.852	109.705	
Sub total								3869.725	

BAR BENDING SCHEDULE

S. No.	Bar Mark	Bar Shape	Dia (mm)	No. of Bars	Length of each bar (m)	Total Length (m)	Unit Weight (kg/m)	Total Weight (kgs)	Remarks	
9	9		25	2*2*6	3.48	83.52	3.852	321.719		
10	10		10	94*7	1.08	710.64	.62	440.597		
11	11		16	4*7	13.70	383.64	1.578	605.321		
12	12		25	12*21	7.6	1915.20	3.852	7377.35		
13	13		8	53*21*2	3.92	4362.96	0.395	1723.369		
14	14		8	53*21*2	3.92	4362.96	0.395	1723.369		
Sub Total								12397.601		
Grand Total for Grid CC,DD,EE & FF								16267.326		

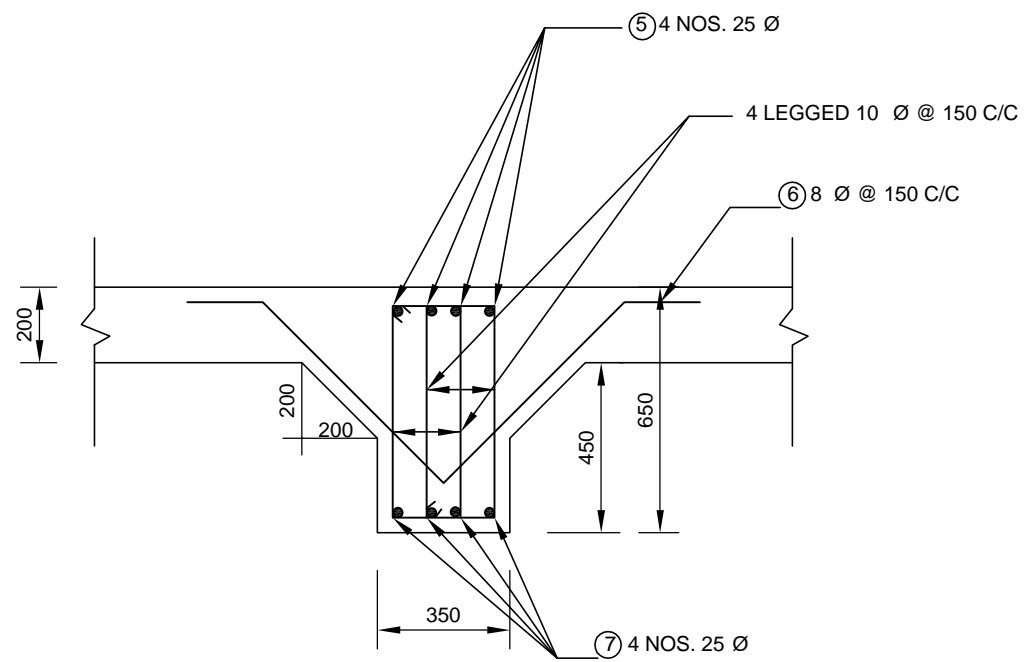


FRAME CC,DD,EE & FF

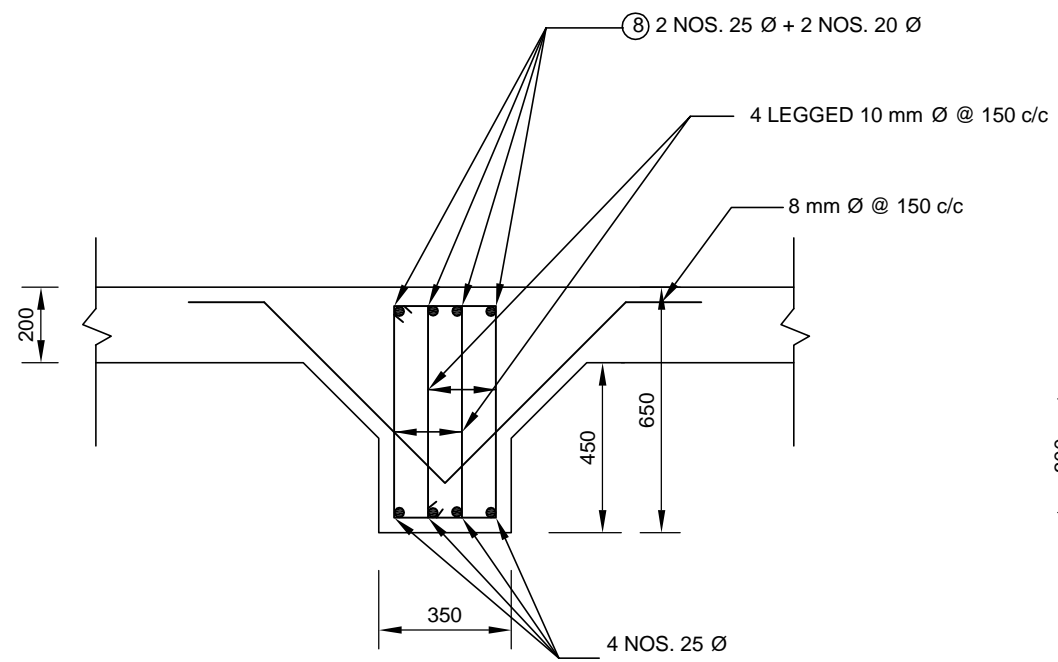
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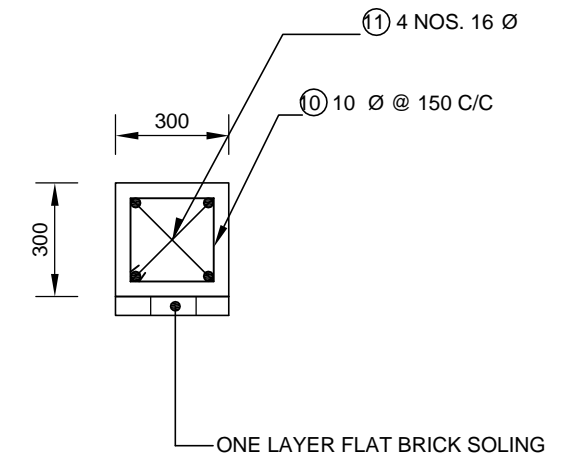
Figure A.2-9A
Typical Short Frame
Unloading Platform



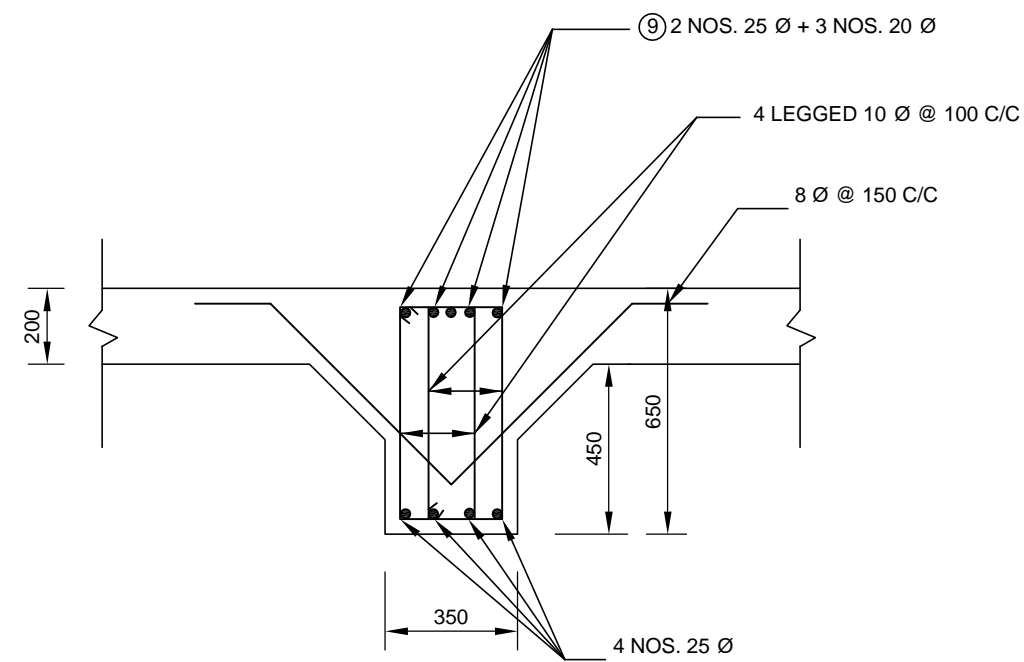
SECTION 10-10



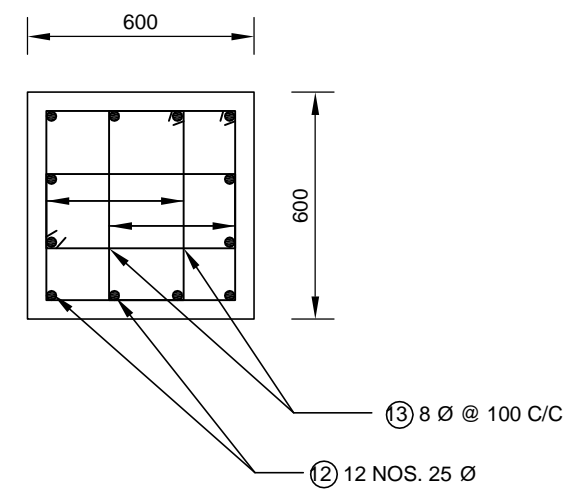
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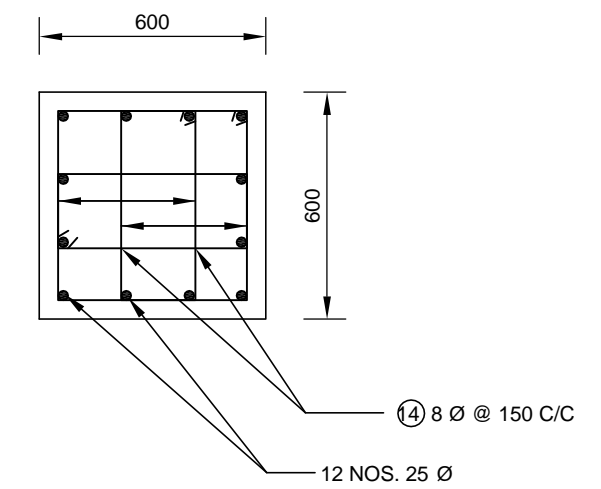
SECTION 13-13



SECTION 12-12



SECTION 14-14

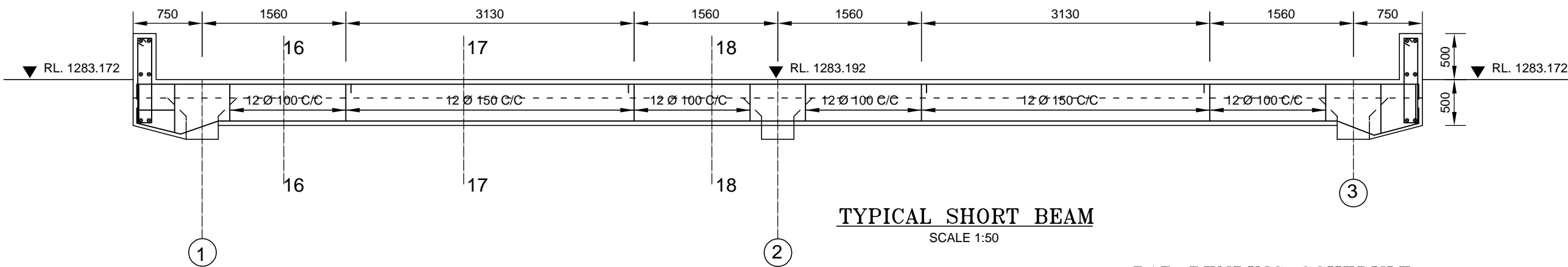
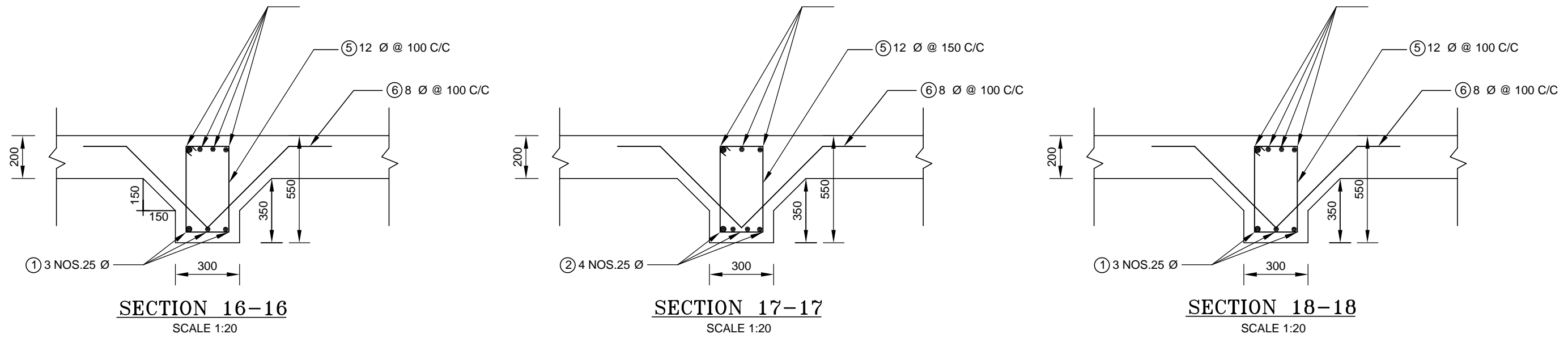


SECTION 15-15

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Figure A.2-9B
Typical Short Frame Section Detail
Unloading Platform



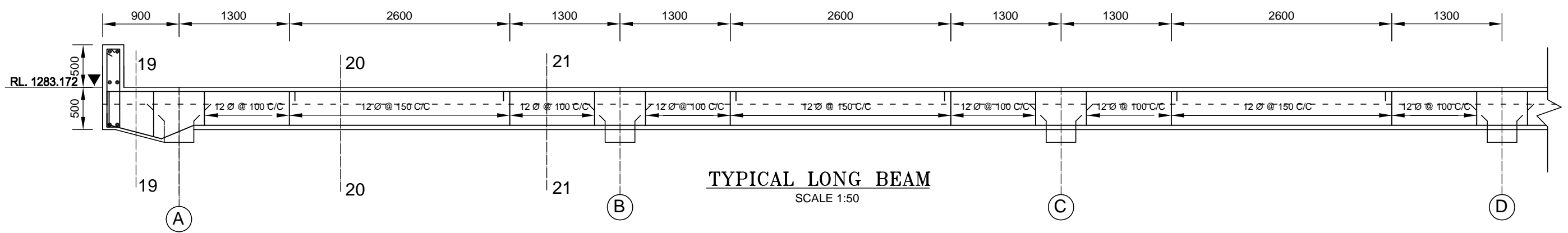
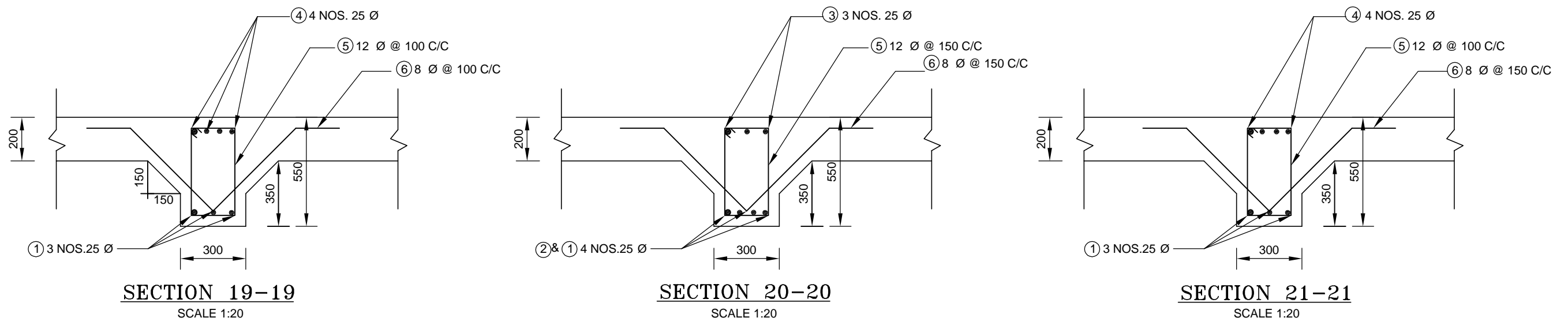
TYPICAL SHORT BEAM
SCALE 1:50

BAR BENDING SCHEDULE

S. No.	Bar Mark	Bar Shape	Dia (mm)	No. of Bars	Length of each bar (m)	Total Length (m)	Unit Weight (kg/m)	Total Weight (kgs)	Remarks
1	1		25	3	14.35	43.05	3.852	165.829	
2	2		25	2	3.58	7.16	3.852	27.580	
3	3		25	3	14.35	43.05	3.852	165.830	
4	4		25	2	3.57	7.14	3.852	27.500	
5	5		12	32	1.40	44.80	0.888	39.780	
6	6		8	46	1.472	67.712	0.395	26.746	
Sub Total								467.017	
Grand Total for all secondary beams								2802.102	

NOTES:-

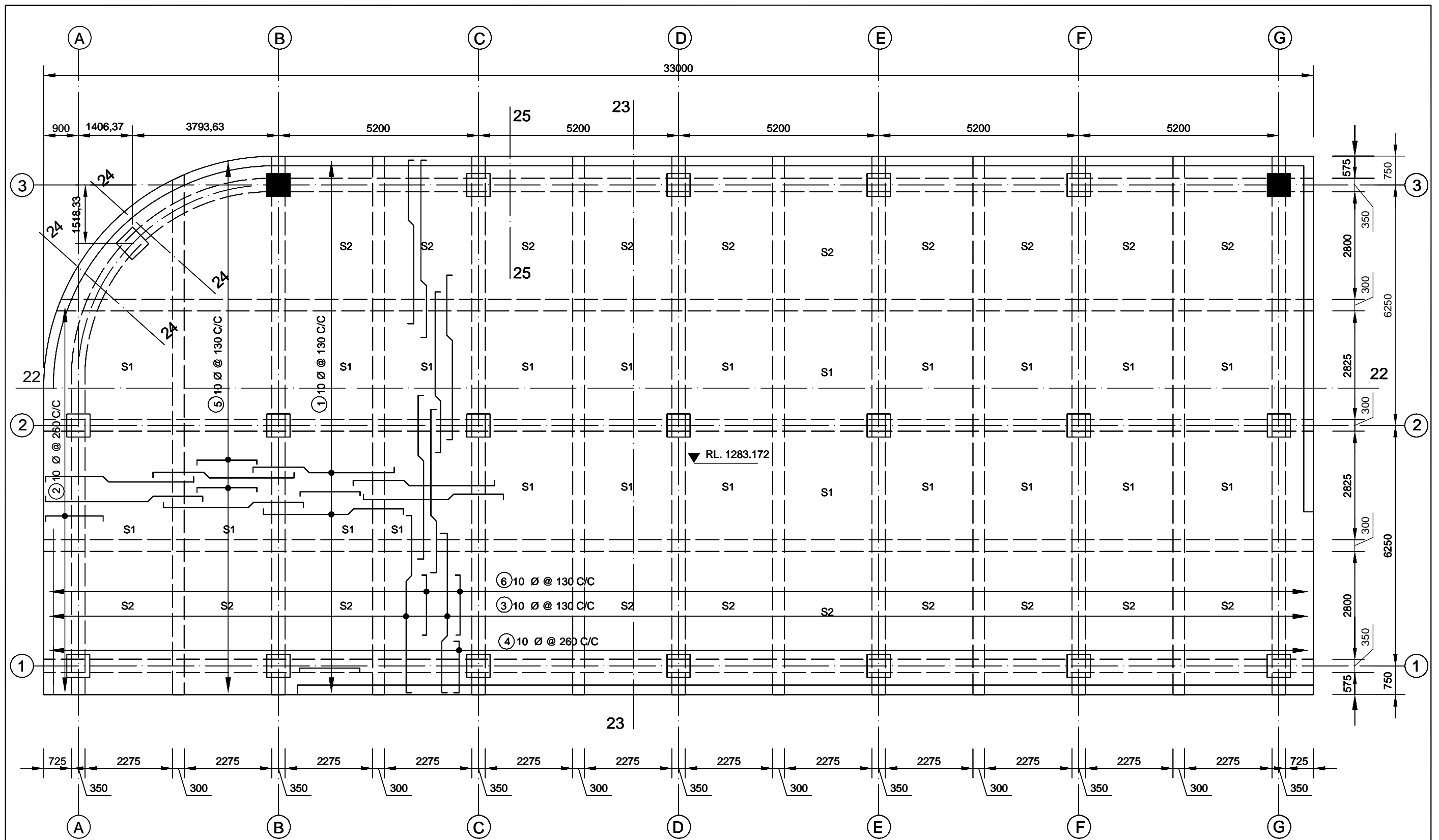
- The minimum clear cover to any reinforcement shall be 40mm.
- Increased cover thickness of 50mm shall be provided for top bar.
- Concrete should be of grade M25/20 having characteristic strength 25N/mm².
- Rebars should be thermex TMT having characteristic strength 500N/mm².
- From seismic consideration hooks of stirrup should be 10*diameter of bars.
- Lap length of bars of beams should be 60*diameter of bars. The position and location of laps should be according to Earthquake code of Nepal.



BAR BENDING SCHEDULE

S. No.	Bar Mark	Bar Shape	Dia (mm)	No. of Bars	Length of each bar (m)	Total Length (m)	Unit Weight (kg/m)	Total Weight (kgs)	Remarks
1	1		25	3	37.85	113.55	3.852	437.395	
2	2		25	7	3.05	21.35	3.852	82.240	
3	3		25	3	37.85	113.55	3.852	437.395	
4	4		25	7	3.05	21.35	3.852	82.240	
6	5		12	249 *1	1.40	348.60	0.888	309.557	
7	6		8	167	1.472	245.824	0.395	97.100	
Sub Total								1445.927	
Grand Total for Two Secondary beams								2891.854	

NOTES:-
1. SAME AS SPECIFIED IN DRAWING NO.7



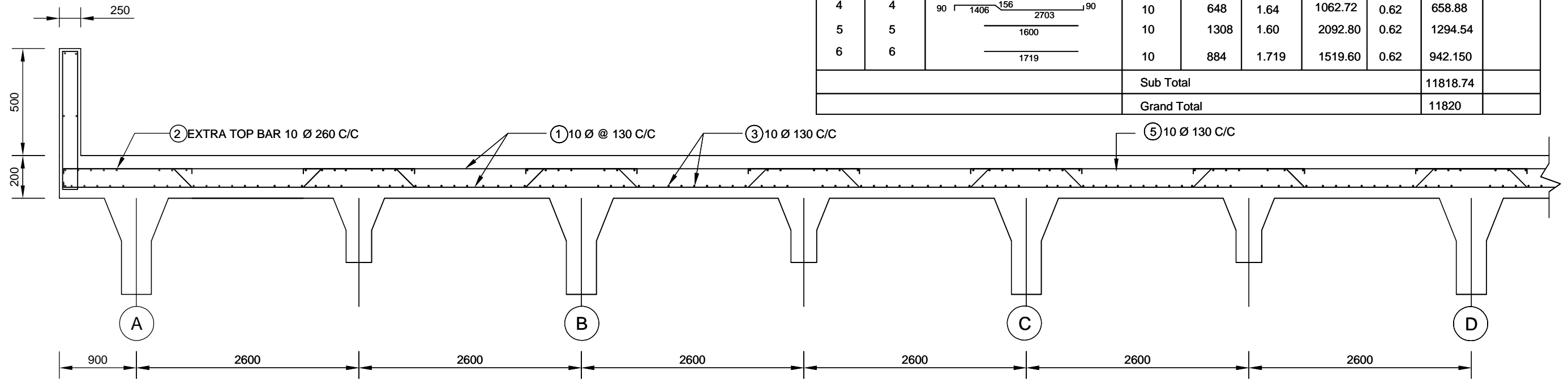
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Figure A.2-12A
Slab Reinforcement Plan
Unloading Platform

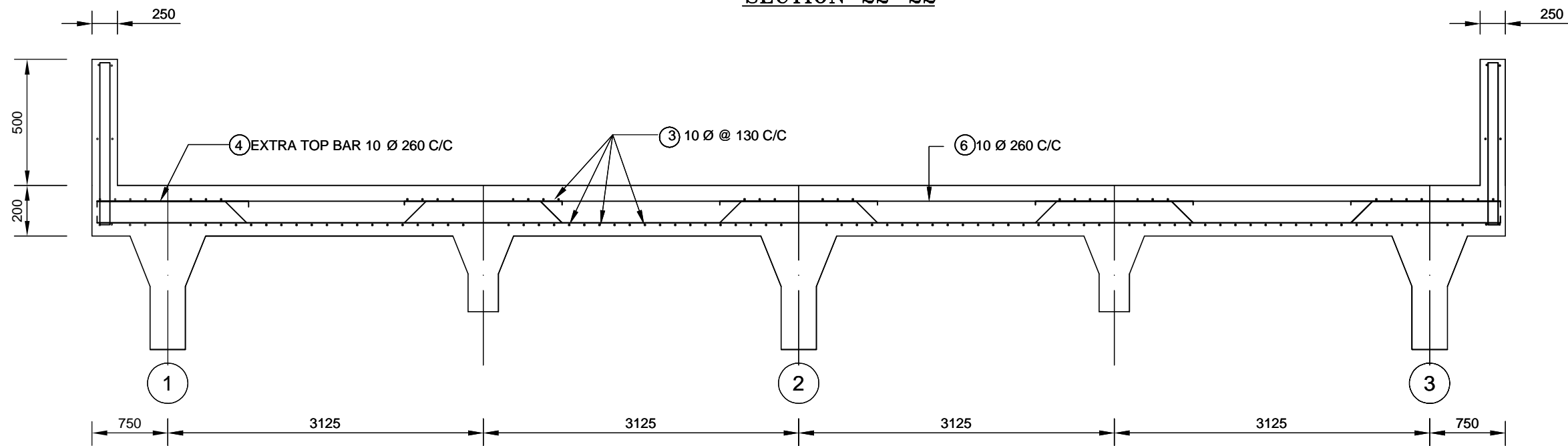
NOTES:-

1.SAME AS SPECIFIED IN DRAWING NO.7.

1	1	90 1170 156 1970 90	10	2108	3.476	7327.408	0.62	4542.99
2	2	90 1760 90	10	378	1.94	733.32	0.62	454.65
3	3	90 1406 156 2703 90	10	1426	4.44	6331.44	0.62	3925.50
4	4	90 1406 156 2703 90	10	648	1.64	1062.72	0.62	658.88
5	5	1600	10	1308	1.60	2092.80	0.62	1294.54
6	6	1719	10	884	1.719	1519.60	0.62	942.150
Sub Total								11818.74
Grand Total								11820



SECTION 22-22

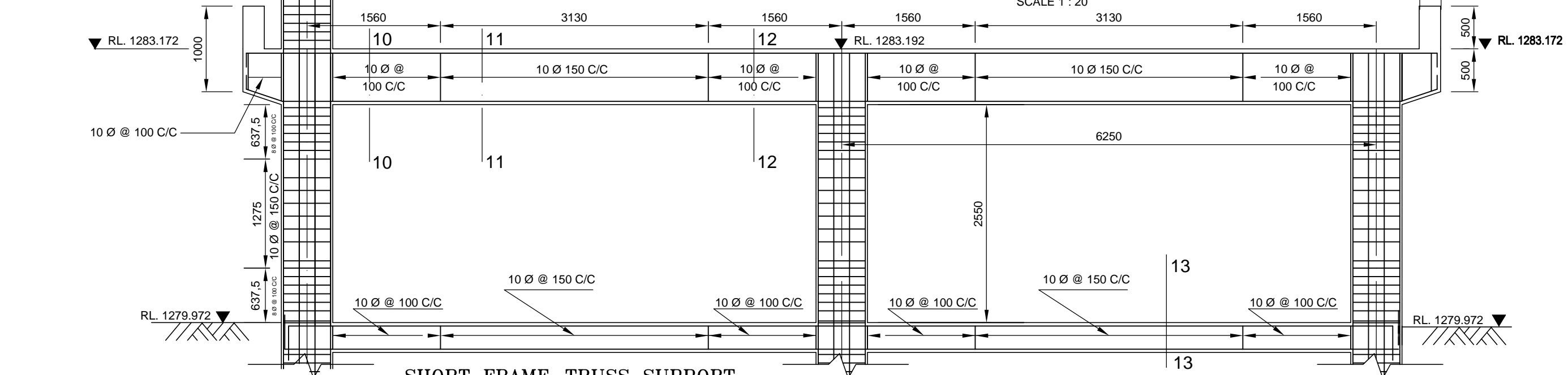
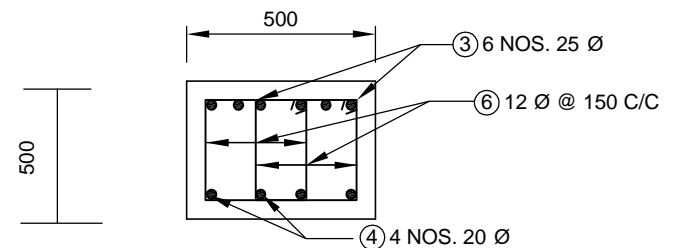
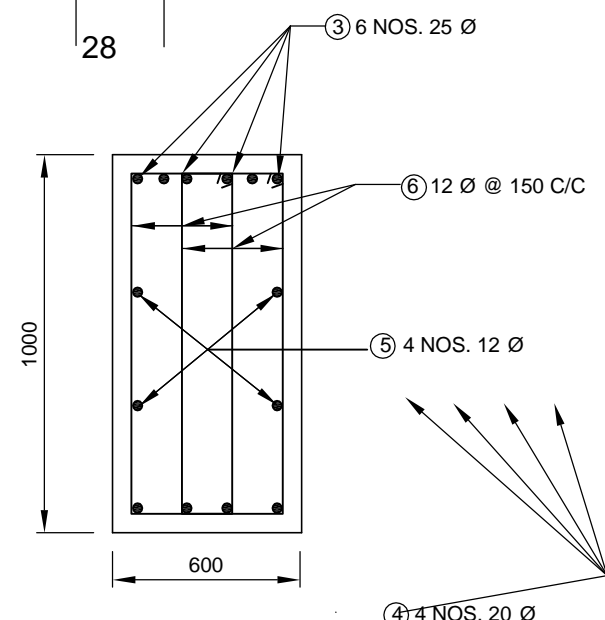
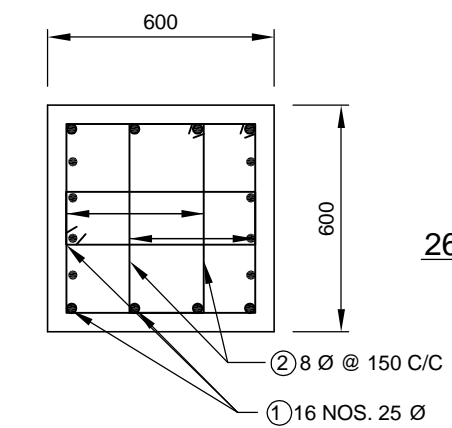
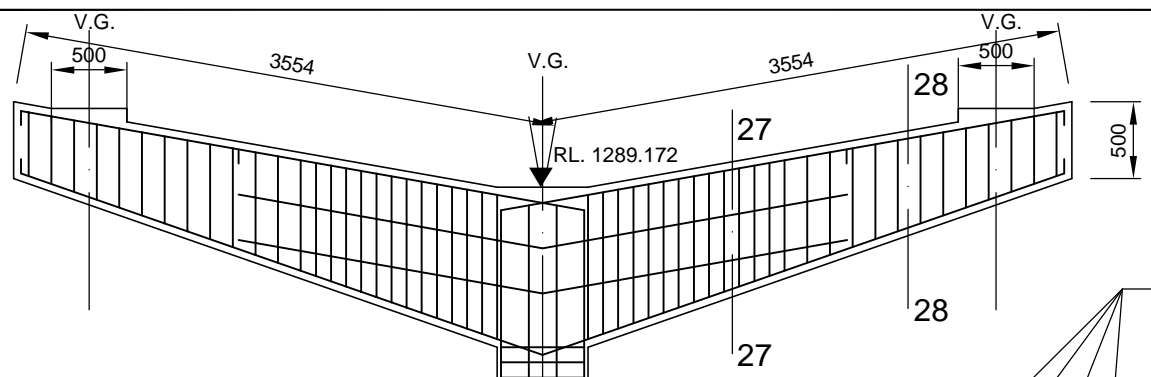


SECTION 23-23

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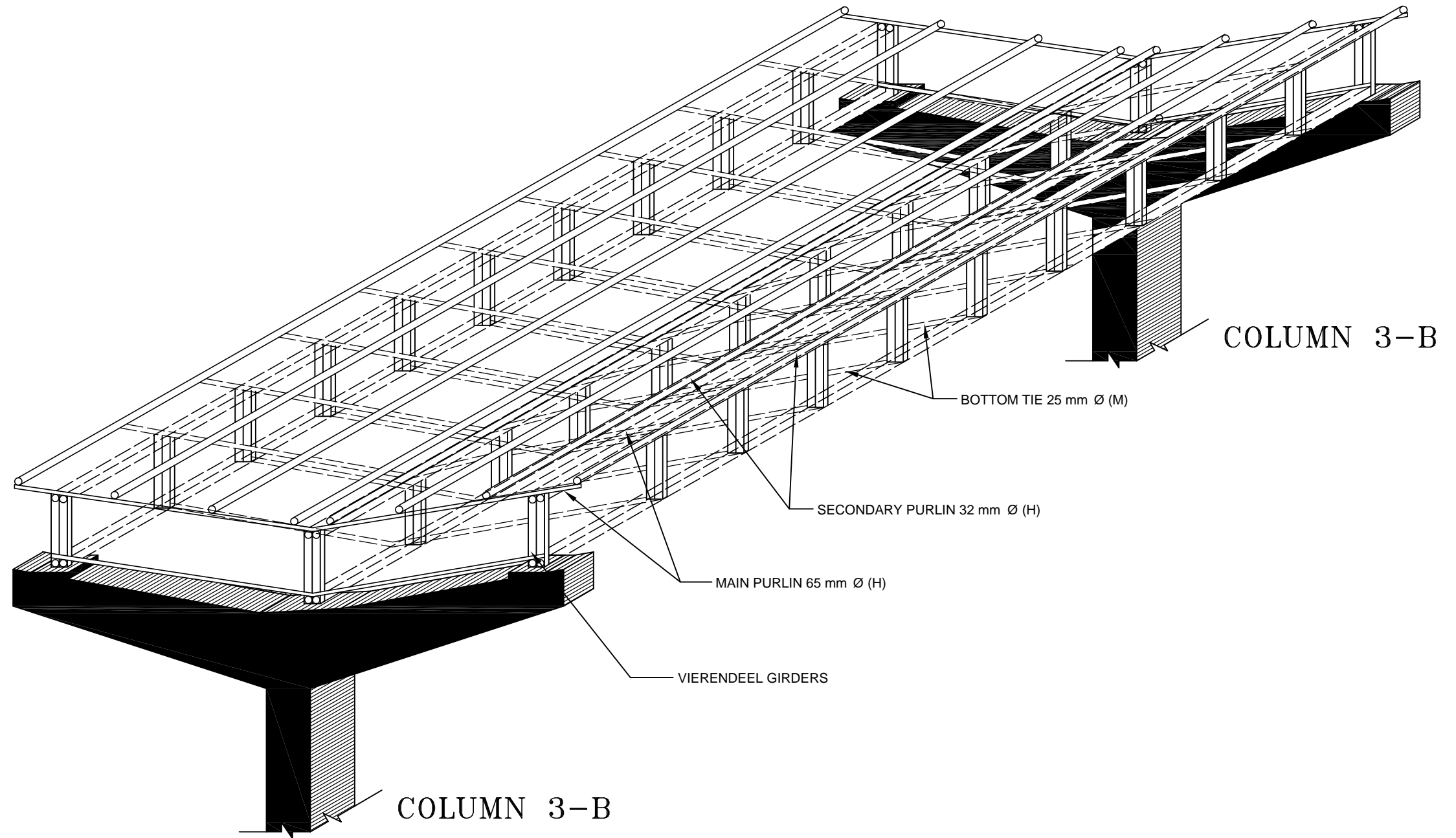
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Figure A.2-12B
Slab Section Detail
Unloading Platform



BAR BENDING SCHEDULE

S. No.	Bar Mark	Bar Shape	Dia (mm)	No. of Bars	Length of each bar (m)	Total Length (m)	Unit Weight (kg/m)	Total Weight (kgs)	Remarks
1	1		25	4	6.89	27.56	3.852	106.16	DRG. NO. 11A,16A VERTICAL
2	2		8	43	3.12	134.16	0.395	52.99	
3	2		8	43	1.44	61.92	0.395	55.42	
4	3		25	12	10.165	121.98	3.852	469.86	
5	4		20	4	7.666	30.664	2.465	75.59	
6	5		12	4	4.082	16.328	0.888	14.50	
7	6		12	54	2.54	137.16	0.888	121.80	
8	6		12	46	1.27	58.42	0.888	51.87	
Sub Total								948.19	
Grand Total for Grid B & G								1900.00	



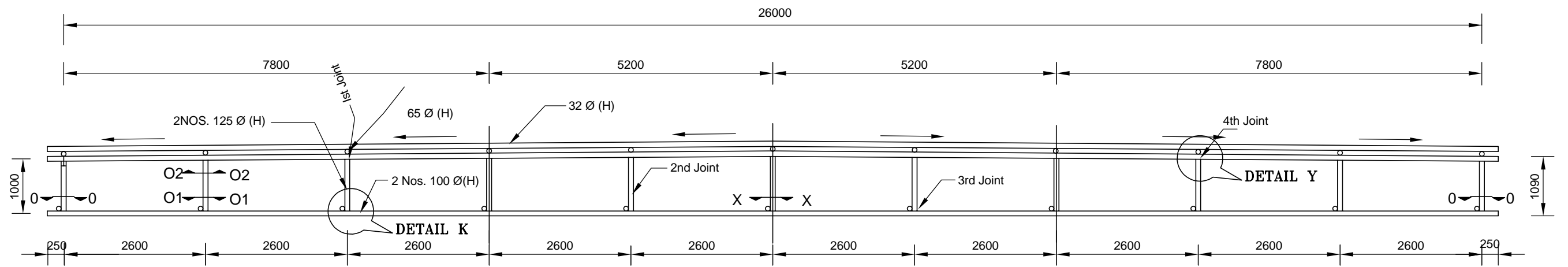
NOTES:-

1. DIAMETER OF PIPE INDICATES FOR NOMINAL BORE.
2. YIELD STRENGTH OF STRUCTURAL STEEL TUBE SHOULD BE 300M PA.
3. BOLTS USED FOR CONECTION OF JOINT OF VIERENDEEL GIRDERS SHOULD BE HIGH STRENGTH FRICTION GRIP BOLT.

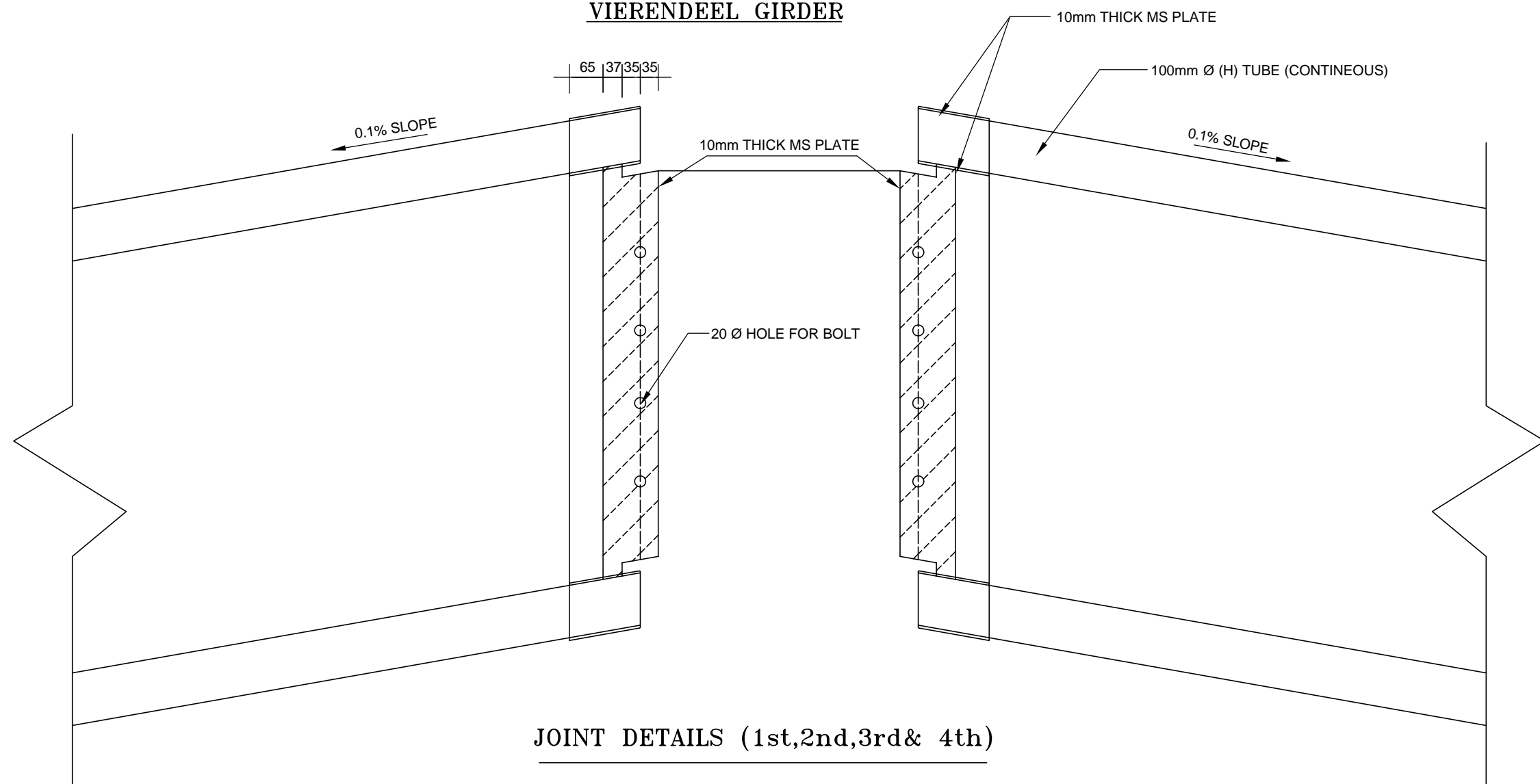
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Figure A.2-14
Isometric View of Vierendeel Girder
Unloading Platform



VIERENDEEL GIRDER

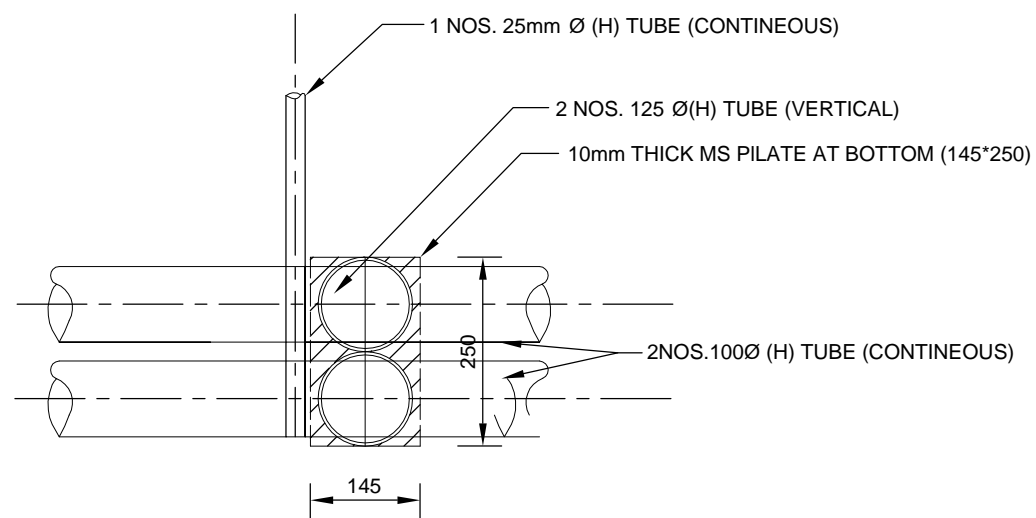


JOINT DETAILS (1st,2nd,3rd& 4th)

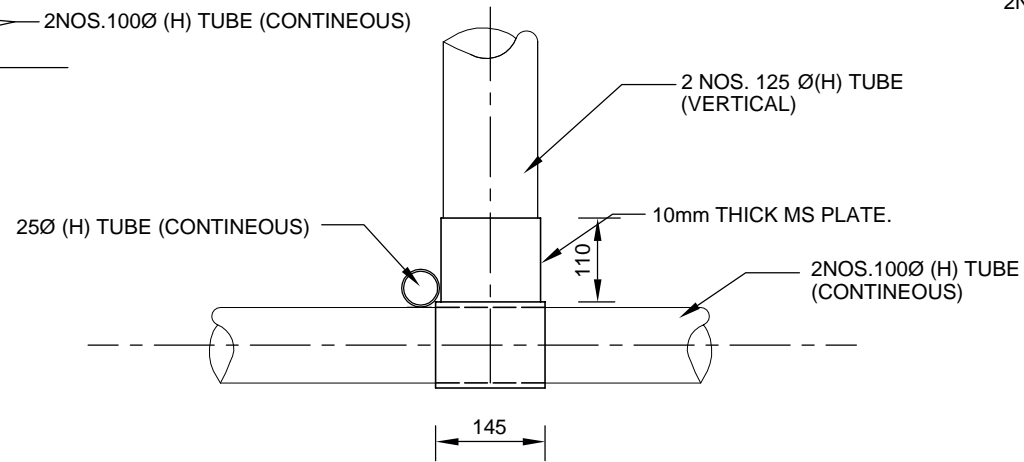
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Figure A.2-15A
Vierendeel Girder Detail
Unloading Platform



PLAN AT 01 -01



DETAIL AT K VIEW

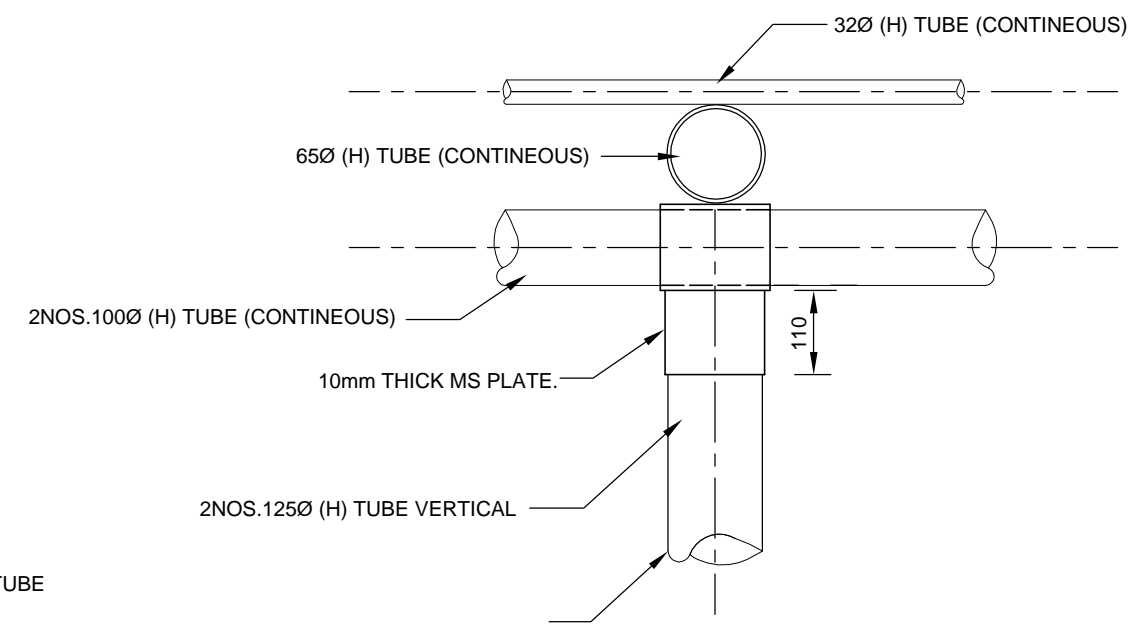
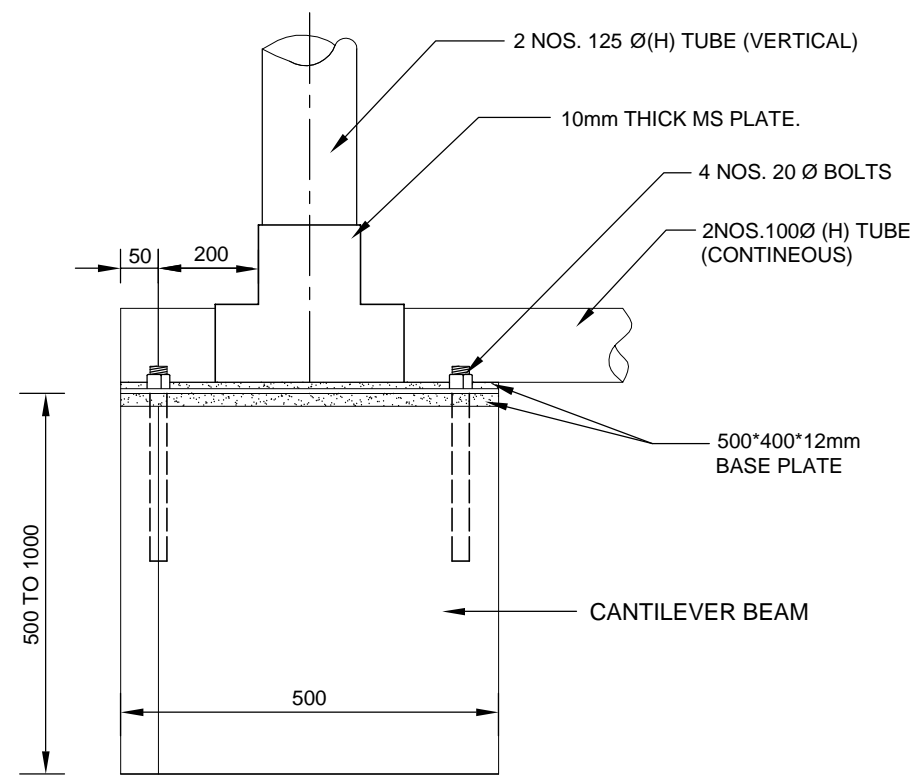
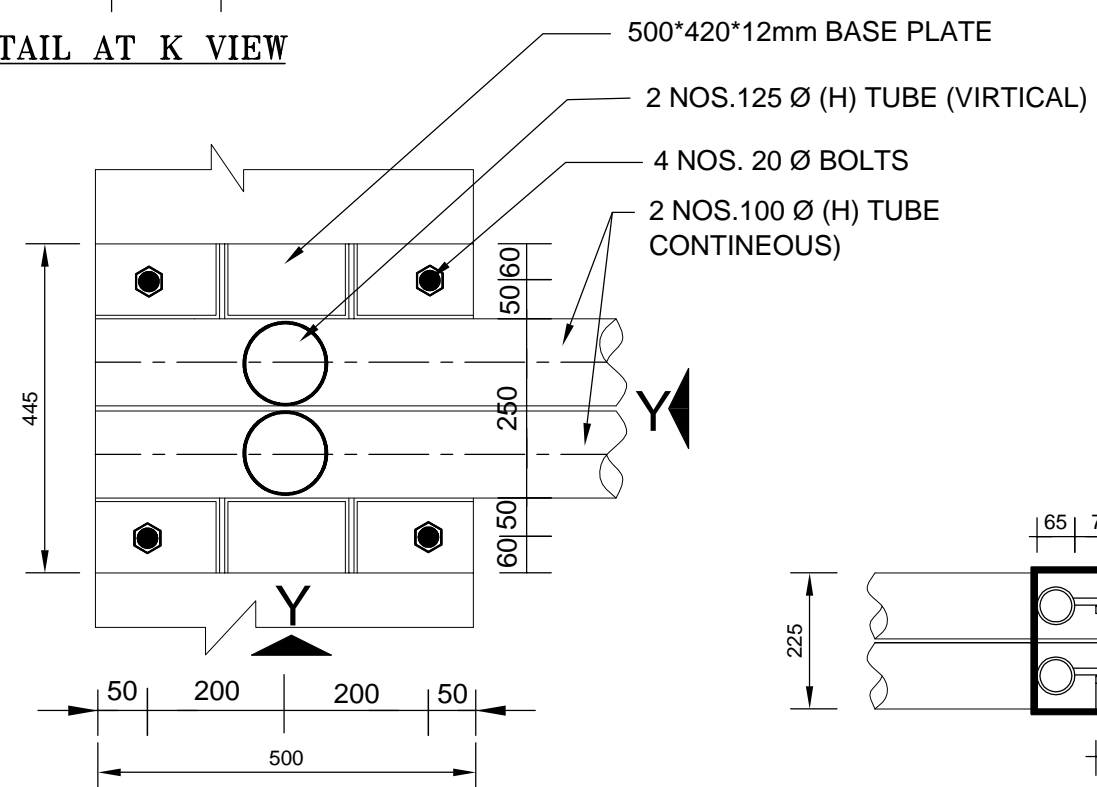


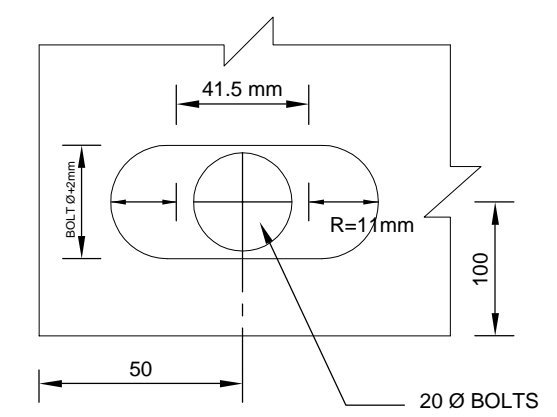
PLATE IN ELEVATION Y VIEW



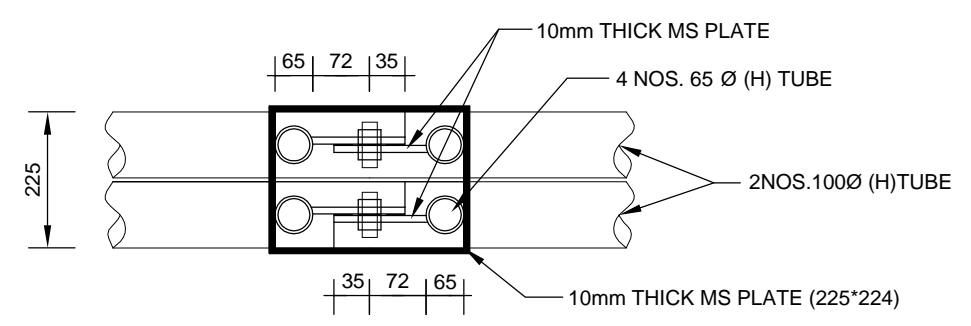
FIXED SUPPORT



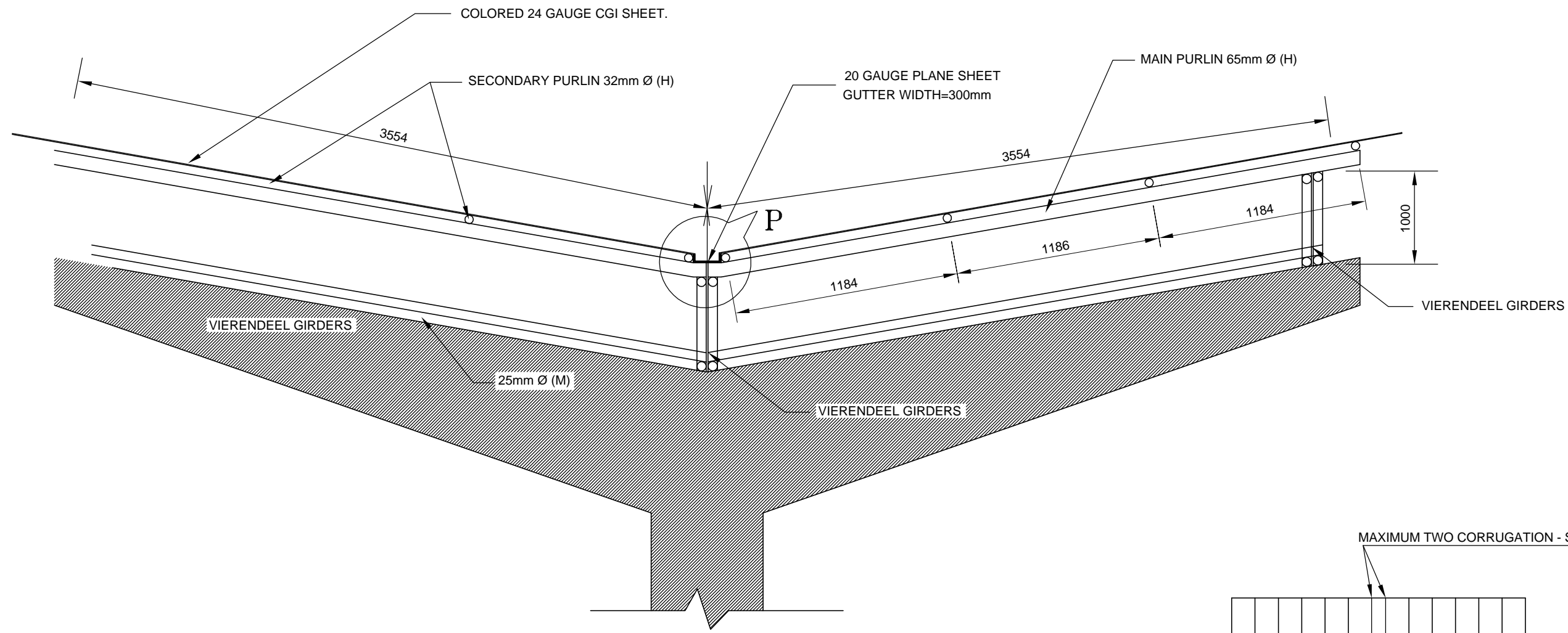
PLAN AT 0-0



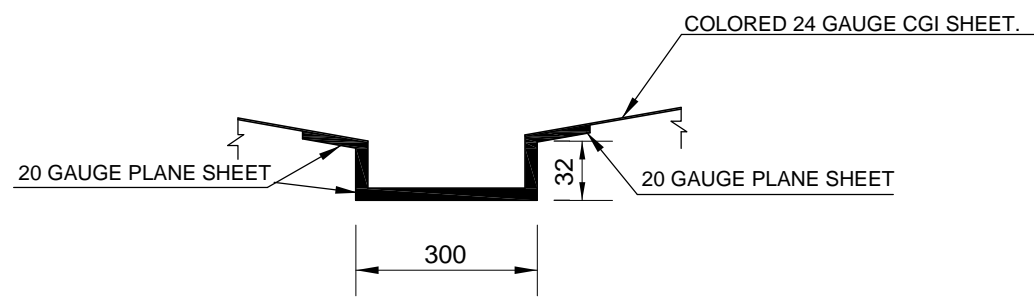
SLOTTED HOLE AT MOVABLE SUPPORT



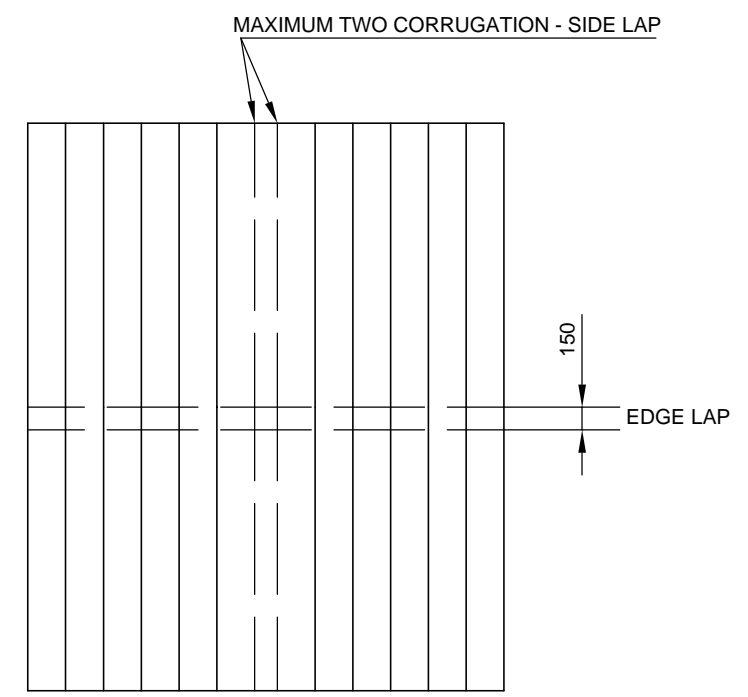
JOINT PLAN AT X-X



ROOF CROSS SECTION



DETAIL AT-P ROOF RIDGE
NOT TO SCALE



LAPPING OF CGI SHEET
NOT TO SCALE

- 2. YIELD STRENGTH OF STRUCTURAL STEEL TUBE SHOULD BE 300M PA.
- 3. BOLTS USED FOR CONECTION OF JOINT OF VIERENDEEL GIRDERS SHOULD BE
- 4. THE END LAP FOR C.G.I. SHEET TO BE PROVIDED SHALL BE 150MM.
- 5. THE SIDE LAP TO BE PROVIDED FOR C.G.I. SHEET SHALL BE MINIMUM TWO CORRUGATIONS.