ESTIMATE OF PHE SERVICES

FOR

PROPOSED AFFORDABLE GROUP HOUSING AT SECTOR-88A, GURUGRAM, HARYANA

ON 6.5 Acres

(LICENSE NO.77 OF 2021, DATED 24.04.2021)

M/S GCC INFRA

PROJECT REPORT/ESTIMATE FOR PROVIDING WATER SUPPLY, SEWERAGE, STORM WATER DRAINAGE, ROADS, STREET LIGHTING AND HORTICULTURE IN RESPECT OF 6.5 ACRE AFFORDABLE GROUP HOUSING COLONY, SECTOR 88A, GURUGRAM.

Index

REPORT

The Haryana Government has prepared a master plan for development of Residential/Industrial urban estate at Gurugram. M/s GCC Infra has decided to develop a part of the area in the master plan and named this part as 6.5 acres Affordable Group Housing Colony. The Scheme is located in Sector-88A Gurugram. License has already been granted under DTCP license No. 77 of 2021 Dated 24.04.2021. The Brief details of the scheme are as under: -

WATER SUPPLY

1. Source

The source of water supply in this area bore well as the underground water is potable and fit for human consumption. Moreover, water is available at reasonable depth. The average yield of tube well with 40-45 ft strainers will be about 30000 litre per hour. The recharging of underground water table in this belt is stated to be good. The number of tube wells required for the above area has been worked out and the tube wells will be bored in tune with growth of demand to avoid obsolesce of the tube wells. The ultimate requirement of tube wells includes provisions of 10% stand by.

2. Design

The scheme has been designed for approved population of approx. 1122 persons. The rate of water supply per head per day taken as 155 litres as per HUDA norms. In addition to above necessary provision of water for commercial, electric substation, parks etc. have been taken into account for calculating the maximum quantity of water requirement.

3. Pump chambers and Pumping Machinery

It is proposed to install pumping set as described with standby of equal capacity and to equip each tube well with an electrically driven set ejecto type or submersible pump capable for delivering of 30000 litre per hour. It is also proposed to equip fifty percent of pumping sets with standby generating set has also been provided in case of any electricity failure. Generator will be provided separately or added to the capacity of main generator.

4. Under Ground Storage

Provision has been made for 550KL capacity in two compartments, which caters for the domestic as well as for firefighting requirement. The water for domestic water compartment shall overflow the fire compartment so that the water in the fie compartment also remains fresh.

5. Boosting Station

The Boosting station are being planned near underground storage tank catering to the above requirement.

6. Distribution System

The distribution system for this development has been designed to supply @155 litre per head per day @ 3 times the average rate of flow on Hazen William formula. Necessary provision for laying for laying CI/DI pipes conforming to relevant IS standards along with valves and specials has been made in the project. The minimum terminal head at any point will be more than 65 meters so that it can serve all the floors.

7. Rising mains

Rising mains from HUDA water main or sector road to water works have also been proposed and provision has been made in the estimate.

8. Sewerage Scheme

The sewer lines have been designed for 3 times average DWF in relation to the water supply demand assuming that 75% of the domestic water supply shall find its way into the proposed sewer. SW/RCC pipe sewers have been proposed and designed to run half full. The sewers have been designed on 0.77 M per second minimum velocity i.e. self-cleansing velocity. Necessary provision for laying s. w./RCC pipes manholes etc. has been made in this estimate.

Along with S.T.P of capacity 555KLD. Treated Sewerage will be used for flushing purposes and Horticulture purpose. This over flow will be discharged into HUDA Sewerage.

9. Storm water Drainage

The storm water drainage in being designed to carry 6.25 mm rainfall per hour for intramural and 3.125mm rainfall intensity for extramural sewers. Also, suitable provision are contemplated in our scheme to ensure better recharging of underground water table in the area R.C.C. Hume pipes drain with minimum 400mm dia. is proposed in this area.

10. Roads

The roads in the colony have been planned as minimum 6 M wide. The following specifications have been adopted which are reproduced below.

The Specifications of 6M wide roads

i. 200mm GSB
ii. 250mm stone aggregate
iii. 50mm thick B.M
iv. 25mm MSS

11. Street Lighting

The provision has been made on lump sum basis.

12. Horticulture

The usual provision of road side plantation of tree guards has been made for all roads. The parks shall be developed by providing lawns etc.

13. Specifications

The work will be carried out in accordance with the standard specifications of P.H. department as laid down by HUDA & Haryana Government.

14. Rates

Estimate for providing services in this pocket has been prepared on the recent market rates.

15. Cost

The total cost of the development in this project including various P.H. and B & R services works out to, Rs 539.99 Lacs including 3% contingencies & P.E. charges and 49% departmental administrative, unforeseen and escalation charges.

The cost per gross acre for the proposal works out to be Rs. 83.07 Lacs which covers the provision of services like water supply, sewerage storm water drainage, roads, street lighting and plantation including maintenance thereof for ten years.

FOR ----------

(Authorized Signatory)

1. DESIGN CALCULATION

I. Design Calculation:

i)	Domestic Water Requirement		
	a) No. of Dwelling units		936Nos.
	and population @5 person per plot		4680Persons
	Domestic water requirement 4680 person @ 155 LPD		**725400 LPD**
ii)	Infra-structural facilities		
	a) Commercial -1		5000 LPD
	b) Commercial -2		2000 LPD
	c) Commercial -3		3000 LPD
		Total =	**10000 LPD**
iii)	Area Under Parks/green space		4000 sq.m
			1 acre
	Therefore, daily water requirement		@25000 litres/Acre
			1 X 25000
			25000 Litres
iv)	Area under roads out of 6.5 Acres		1.42 Acre
	Therefore, daily water requirements for Sweeping of Roads		5000 X 1.42
			7500 KL
a.	For Domestic Use (i+ii)		735400LPD
b.	Under parks & roads (iii+iv)		32500 LPD
c.	Assuming domestic requirement for flushing as 33% of total domestic requirement, then daily water requirement for flushing = .33 X (735400) potable (drinking)		242682 LPD
d.	Total requirement of portable water (735400-242682)		492718 LPD

II. BOREWELLS:

Approx. discharge of borewells @30 KL /hr. and working 16 hrs/day.

a)	Total water demand	= 492.8
b)	Number of borewells 492.8/16/30	= 1.02667 nos.
c)	Add 10% as standby	= .102 nos.
	Total	**= 1.05 nos.**
		= Say=2 no.

Since the entire water to the proposed development is to be supplied by HUDA from its scheme and it is yet to come-up, it is proposed to install 3 numbers of bore-wells (2 working + 1 standby). 1 Standby is for both low rise and high-rise apartments.

Since the entire water to the proposed development is to be supplied by HUDA from its scheme and it is yet to come-up, it is proposed to install overall 3 numbers of bore-wells (2 working + 1 standby) for entire project.

III. PUMPING MACHINERY FOR BOREWELLS:

a) Gross working head = 40.00 mts.
b) Average fall in S.L. = 3.05 mts.
c) Depression Head = 6.10 mts.
d) Friction loss in main = 3.05 mts.
Total = 52.20 mts.
= Say=60.0 mts

HP = 30000 x 60 x 1/60 x 60 x 75 x 0.6 = 11.11
= 12.50 BHP

IV. U.G. TANK: (DOMESTIC & FIREFIGHTING TANK)

a) Daily demand (domestic) = 492.8 KLD
b) Capacity of underground = 0.5X492.8 = 246.4 KLD
Say= 250 KLD

Therefore, it is proposed to construct underground tank of 125 KL in two compartments for Domestic purposes. Also, a fire storage of 300 KL fire storage in two equal compartments of 150K each is proposed to be constructed as per NBC-2016.

V. BOOSTING MACHINERY (FOR DRINKING WATER SUPPLY)

i) Total Water Demand = 492.8 KLD

ii) Pumping per hour @8 hours pumping/day = 61.6 KLH
= 1026.667 LPM

Considering 2 pumps are working so capacity of each pump = 513.33 LPM
Say
=550 LPM

iii) Gross working head:

Suction lift = 5.00 meter
Frictional loss in = 10.00 meter

iv) Clear head required = 65.00 meter
Total = 80.00 meter
Say = 80.00 meter

v) Motor HP = 550 x 80 / 60 x 75 x 0.65 = 20.05 HP
Say = 20.0 HP

It is proposed to provide 3 nos. of pumping sets (2 Working+1 Standby) of 550 lpm discharge at 80 mtr. Head for entire complex.

VI. U.G. TANK: (FLUSHING WATER)

i) Daily requirement for flushing at S.T.P. = 242.7 KLD
ii) Add for cleaning of roads and irrigation = 32,5 KLD
Total (i+ii) = 275.2 KLD
Half day capacity = 275.2/2 = 137.6 KLD
Say = 150 KLD

VII. BOOSTING MACHINERY (FOR FLUSHING WATER SUPPLY)

i) Total Water Demand = 242.7 KLD

ii) Pumping per hour @8 hours pumping/day = 30.33 KLH
= 505.63 LPM

Considering 1 pumps are working so capacity of each pump = 505.63 LPM
Say = 550 LPM

iii) Gross working head:

Suction lift = 5.00 meter
Frictional loss in = 10.00 meter

iv) Clear head required = 65.00 meter
Total = 80.00 meter
Say = 80.00 meter

v) Motor HP = 550 x 80 / 60 x 75 x 0.65 = 20.05 HP
Say = 20.0 HP

It is proposed to provide 2 nos. of pumping sets (1 Working+1 Standby) of 550 lpm discharge at 80 mtr. Head for entire complex.

Capacity of S.T.P. = 0.75 x 740 = 555 KLD
Say = 555 KLD

VIII. PUMPS FOR FIRE PROTECTION:

S. No.	Parameters	Location	Pump Sets		
			Jockey	Main	Diesel
1.	Water Tank block	Pump Room			
a)	Discharge in lpm		180	2280	2280
b)	Head in meters		110	110	110
c)	HP		15.0	100	100
d)	Quantity in nos.		2	2	2

IX. CAPACITY OF DG SETS

S. No.	Equipment	Qty	HP	Total HP
1.	Borewell	3	15.00	45.00
2.	Fire Jockey	2	15.00	30.00
3.	Booster Pump		20.00	20.00
5.	Lighting			8.00
			Total	**103.00**

KVA = 103.00x .746 x 1.50 = 115.257KVA = **SAY 125 KVA**

It is proposed to add 125 KVA capacity for above said machinery to the main D.G. set for high rise apartments.

FINAL ABSTRACT OF COST

Amount in Rs. Lacs

SUB WORK NO. I	WATER SUPPLY SCHEME	353.13
SUB WORK NO. II	SEWERAGE SCHEME	112.40
SUB WORK NO. III	STORM WATER DRAINAGE	66.22
SUB WORK NO. IV	ROAD	150.05
SUB WORK NO. V	STREET LIGHTING	24.94
SUB WORK NO. VI	HORTICULTURE	17.88
SUB WORK NO. VII	MTC. CHARGES INCLUDING RE-SURFACING OF ROADS AFTER 1ST 5 YRS AND 2ND YRS OF MTC AS PER HUDA)	194.05
	TOTAL	**918.67**

For _____

Authorised Signatory

SUB WORK NO. 1:
WATER SUPPLY (SUMMARY)

			Amount in Rs.
1	SUB HEAD NO. 01	Head Works	Rs72,89,825.00
2	SUB HEAD NO. 02	Pumping Machinery	Rs88,85,913.00
3	SUB HEAD NO. 03	Rising Main	Rs75,500.00
4	SUB HEAD NO. 04	Distribution System	Rs10,50,725.00
5	SUB HEAD NO. 05	Fire Fighting	Rs34,04,195.00
6	SUB HEAD NO. 06	Irrigation System	Rs23,03,585.00
		TOTAL	**Rs2,30,09,743.00**
		Add 3% contingencies & PH charges	Rs6,90,292.29
		TOTAL	**Rs2,37,00,035.29**
		Add 49% departmental charges	**Rs1,16,13,017.29**
		TOTAL	**Rs3,53,13,052.58**

Say Rs3,53,13,052.58

(Cost to final abstract of cost)

SUB WORK NO. 1:
HEAD NO. 01
Water Supply
Head Work

		Amount(Rs.)
1	Boring and installing 200mm i/d tubewell with reverse/direct rotary rig complete with pipe strainer to a depth of about 250m 2 Nos. @ Rs. 800,000/- each.	Rs16,00,000.00
2	Constructing pump chambers as per standar design of PWD PH/HUDA of size 1.5M X1.55 M X1.5M 1No. L.S.	Rs1,00,000.00
3	Constructing of boosting chambers of suitable size along with underground tank of capacity 740 KL pumping machinery and generating set etc. complete in all respect.	
	Details of boosting Station	
i)	Construction of boosting chamber	Rs5,00,000.00
ii)	U.G. tank 700 KL capacity incl. 250KL, 300KL and 150 KL for domestic, fire fighting and flushing water respectivelyin two compartment @ Rs.3500/- (250+300+150)=700	Rs24,50,000.00
4	Provision for carriage for materials	Rs1,00,000.00
	Total	**Rs47,50,000.00**
	Add 3% Contingencies & P.E. Charges	Rs1,42,500.00
	Total	Rs48,92,500.00
6	Add 49% departmental price escalation, unforeseen charges	Rs23,97,325.00
	Grand Total	Rs72,89,825.00
	TOTAL	**Rs72,89,825.00**

(C.O. cost to final abstract of cost S.W. No. 1)

MATERIAL STATEMENT OF BOREWELL RAISING MAINS:

S. No.	Name of Line From	Name of Line To	Dia (mm)	Length (mtr) 100mm	Length (mtr) 80mm
1	BW-1	X1	100	0	65
2	BW-2	X1	100	0	100
3	X1	X2	80	50	0
4	X2	U.G.T	100	12	0
	Total			**62**	**165**

SUB WORK NO. 1:

SUB HEAD NO. 02
PUMPING MACHINARY

		Amount
1	Providing and installing electricity driven electro or submersible pumping set capable of delivering about 30 KL/Hr of water against a total head of 60m complete with motor and other accessories	
	2 No. @ 200,000/-	Rs4,00,000.00
2	Provision for diesel engine Genset stand by arrangements for tube wells of capacity 125 KVA @ 750000/-	Rs7,50,000.00
3	Provision for cheap pressure type chlorination plant complete. 1 No. @ 100000/-	Rs1,00,000.00
4	Provision for making foundations and erection of pumping machinery 1 No. (L.S.)	Rs2,00,000.00
5	Provision for pipes, valve and specials inside the pump chamber (L.S.)	Rs2,00,000.00
6	Provisions for electric services connection including transformer, electric fitting for tubewells chambers complete. (L.S.)	Rs25,00,000.00
7	Providing and installing centrifugal boosting pumping sets, capable of delivering 5500 LPM water at 80 M head complete in all respects domesting & flushing (3x20 H.P. + 2 X 20 H.P.) (2 WORKING + 1 STAND BY) for Domestic and (1 Working +1 Standby) for flushing 2 sets @ 150000/- Each	Rs3,00,000.00
8	Providing and fixing pumping sets of following capacity for fire protection	Rs40,000.00
i)	180 LPM at 110 M Head 1 No. 7.5 H.P. Jockey Pump	Rs1,00,000.00
ii)	2280 LPM at 110M Head 1 No. 100 H.P.	Rs3,00,000.00
iii)	2280 LPM at 110M Head 1 No. 100 H.P.	Rs3,00,000.00
iv)	2280 LPM at 110 M Head 1 No. Diesel Pump 120 B.H.P.	Rs5,00,000.00
9	Provisions for carriage for material and other unforeseen items (L.S.)	Rs1,00,000.00
	TOTAL	**Rs57,90,000.00**
	Add 3% Contingencies & P.E. Charges	**Rs1,73,700.00**
	TOTAL	**Rs59,63,700.00**
	Add 49% departmental, escalation, unforeseen charges.	**Rs29,22,213.00**
	Grand Total	**Rs88,85,913.00**
	Say	**Rs88,85,913.00**

(C.O. cost to final abstract of cost S.W. No. 1)

SUB WORK NO. 1:
SUB HEAD NO. 03
Water Supply
Rising Main from HUDA

		Amount in Rs.
1	Providing, laying, jointing and testing CI/GI pipe lines including cost of excavation etc. complete in all respects.	
	C.I./G.I. pipe 100mm dia 30m @Rs. 625/- M	Rs12,500.00
2	Providing and fixing sluice valve including cost of surface boxes and masonary chambers etc. complete in all respects.	
	100mm i/d 2 nos. @Rs. 6000/- each	Rs12,000.00
3	Providing and fixing indicating plates for sluice valve – 2 Nos. @Rs. 500/- each	Rs1,000.00 Rs. 1,000.00
4	Provision for carriage for materials and other unforeseen items (L/S)	Rs50,000.00
	TOTAL	**Rs75,500.00**

(C.O. cost to final abstract of cost S.W. No. 1)

SUB WORK NO. 1:
HEAD NO. 04
Water Supply
Distribution Rising Main System

		Amount in Rs.
1	Providing, laying,jointing and testing K9 and D.I. Pipes including cost of excavation complete as per specifications.	
	100 mm I/d 299Mtr @ Rs. 1105/-mtr.	330395.00
	150 mm I/d 10Mtr @ Rs. 1575/-mtr.	15750.00
2	Providing and fixing Sluice valve including cost brick masonry chambers complete in all respect.	
	100mm i/d 8 Nos. @ Rs. 12000 Each.	96000.00
	150mm i/d 1 Nos. @ Rs. 15000 Each.	15000.00
3	Providing and fixing air valve and scour valves including cost brick masonry chamber.	
	2 Nos. & Rs. 10000/- Each	20000.00
4	Providing and fixing indicator plates for sluice valve, air valve etc.	
	10 Nos. & Rs. 1000/- Each	10000.00
5	Providing and carriage of material L.S.	100000.00
6	Providing for rising main from tubewells to U.G. tank	
	100 mm dia i/d 15 mtrs @ Rs. 1250/- mtr	18750.00
7	Providing for rising main from HUDA water to U.G. tank	
	150 mm dia i/d 50 mtrs @ Rs. 1575/- mtr	78750.00
	Total	**684645.00**
	Add 3% Contingencies and P.E. charges	20539.35
	Total	**705184.35**
	Add 49% Escalation, departmental, uniforeseen charges	345540.33
	Grand Total	**1050724.68**
	Say	**Rs10,50,725.00**

(C.O. cost to final abstract of cost S.W. No. 1)

MATERIAL STATEMENT OF WATER SUPPLY DISTRIBUTION SYSTEM

Line		Dia	Length	Pipe Length(M)					Valve				
From	To	(mm)	(m)	150	100	80	65	50	150	100	80	65	50
U.G.T	W1	150	7	7	0	0	0	0	1				
W1	W1a	100	4	0	4	0	0	0		1			
W1a	SHOP	50	2	0	0	0	0	2					1
W1a	W2	100	22	0	21.5	0	0	0		1			
W2	W3	100	11	0	10.5	0	0	0					
W3	T-5	65	17	0	0	0	17	0				1	
W3	W4	100	32	0	32	0	0	0		1			
W4	T-6	65	17	0	0	0	17	0				1	
W4	W5	100	35	0	35	0	0	0		1			
W5	T-7	65	20	0	0	0	20	0				1	
W5	T-8	100	15	0	15	0	0	0		1			
W2	W6	100	7	0	6.5	0	0	0					
W6	T-3	65	11	0	0	0	11	0				1	
W6	W7	65	28	0	0	0	28	0					
W7	T-4	65	6	0	0	0	6	0				1	
W1	W8	100	23	0	22.5	0	0	0		1			
W8	W9	100	29	0	28.5	0	0	0					
W9	W10	100	35	0	34.5	0	0	0					
W10	SHOP	50	2	0	0	0	0	2					1
W10	W11	100	40	0	40	0	0	0		1			
W11	W12	100	15	0	14.5	0	0	0					
W12	T-2	65	10	0	0	0	10	0				1	
W12	W13	100	34	0	34	0	0	0		1			
W13	T-1	65	10	0	0	0	10	0				1	
USHING WATER SUPPLY													
S.T.P.	F1	100	9	0	9	0	0	0		1			
F1	F2	80	23	0	0	23	0	0			1		
F2	F3	80	12	0	0	12	0	0					
F3	T-7	50	19	0	0	0	0	19					1
F3	T-8	80	15	0	0	15	0	0			1		
F2	F4	50	24	0	0	0	0	23.5					1
F4	T-6	80	17	0	0	17	0	0			1		
F4	F5	50	32	0	0	0	0	32					1
F5	T-5	80	17	0	0	17	0	0			1		
F5	F6	80	12	0	0	11.5	0	0					
F6	F7	50	6	0	0	0	0	6					1
F7	T-3	80	10	0	0	10	0	0			1		
F7	F8	50	28	0	0	0	0	28					1
F8	T-4	80	7	0	0	6.5	0	0			1		
F6	F9	80	22	0	0	21.5	0	0					

Line		Dia	Length	Pipe Length(M)					Valve				
From	To	(mm)	(m)	150	100	80	65	50	150	100	80	65	50
F9	SHOP	80	2	0	0	2	0	0					
F9	F10	50	26	0	0	0	0	26					1
F10	F11	80	28.5	0	0	28.5	0	0			1		
F11	F12	80	34.5	0	0	34.5	0	0					
F12	SHOP	50	2	0	0	0	0	2					1
F12	F13	80	40.6	0	0	40.6	0	0			1		
F13	F14	80	15.5	0	0	15.5	0	0					
F14	T-2	50	10	0	0	0	0	10					1
F14	F15	80	34	0	0	34	0	0			1		
F15	T-1	50	10	0	0	0	0	10					1
Total				**7.0**	**307.5**	**288.1**	**119.0**	**160.5**	**1**	**9**	**9**	**7**	**11**
Say				**7.0**	**308.0**	**288.0**	**119.0**	**161.0**	**1.0**	**9.0**	**9.0**	**7.0**	**11.0**

SUB WORK NO. 1:
SUB HEAD NO. 05
Water Supply
Fire Fighting

		Amount in Rs.
1	Providing, laying, jointing and testing MS pipe lines including fittings, cost of excavation etc. complete in all respects.	
a)	150mm M.S. Pipe line 1082m @ Rs. 1575/- M	Rs17,04,150.00
b)	80mm M.S. Pipe line 97m @ Rs. 1000/- M	Rs97,000.00
2	Providing and fixing valve including cost of surface boxes and masonary chambers etc. complete in all respects.	
a)	150mm dia 5 nos. @ Rs. 15000/- Each	Rs75,000.00
3	Providing and fixing fire hydrants with accessories 22 Nos. @ Rs. 10000/- Each.	Rs2,20,000.00
4	Provision for carriage for materials (L.S.)	Rs1,00,000.00
5	Provision and fixing indicating plates 22 Nos. @ Rs.1000/- Each	Rs22,000.00
	TOTAL	**Rs22,18,150.00**
	Add 3% Contingencies and P.E. charges	66544.50
	Total	**2284694.50**
	Add 49% Escalation, departmental, uniforeseen charges	1119500.31
	Grand Total	**3404194.81**
	TOTAL	**Rs34,04,195.00**

(Cost to final abstract of cost S.W. No. 1)

MATERIAL STATEMENT OF FIRE FIGHTING SYSTEM:

Line		Dia	Length	Pipe Length	
From	To	(mm)	(m)	150	80
PUMP	1	150	19.0	13.0	0.0
1	2	150	4.0	24.0	0.0
2	YH-1	80	3.0	0.0	3.0
2	3	150	43.0	43.0	0.0
3	YH-2	80	3.0	0.0	3.0
3	4	150	45.0	45.0	0.0
4	YH-3	80	3.0	0.0	3.0
4	5	150	36.0	36.0	0.0
5	YH-4	80	3.0	0.0	3.0
5	6	150	46.0	46.0	0.0
6	YH-5	80	3.0	0.0	3.0
6	7	150	45.0	45.0	0.0
7	YH-6	80	3.0	0.0	3.0
7	8	150	45.0	45.0	0.0
8	YH-7	80	3.0	0.0	3.0
8	9	150	35.0	35.0	0.0
9	YH-8	80	3.0	0.0	3.0
1	10	150	30.0	30.0	0.0
10	YH-9	80	3.0	0.0	3.0
10	11	150	45.0	45.0	0.0
11	YH-10	80	3.0	0.0	3.0
11	12	150	45.0	45.0	0.0
12	YH-11	80	3.0	0.0	3.0
12	13	150	20.0	14.0	0.0
13	YH-12	80	3.0	19.0	3.0
13	14	150	45.0	45.0	0.0
14	YH-13	80	3.0	0.0	3.0
14	9	150	45.0	45.0	0.0
9	YH-8	80	3.0	42.0	3.0
1	15	150	27.0	27.0	0.0
15	16	150	5.0	9.0	0.0
16	YH-14	80	3.0	0.0	3.0
16	17	150	30.0	30.0	0.0
17	YH-15	80	10.0	0.0	10.0
17	18	150	53.0	40.0	0.0
18	YH-16	80	10.0	0.0	10.0
18	19	150	41.0	42.0	0.0
19	YH-17	80	3.0	3.0	3.0
19	20	150	45.0	45.0	0.0

20	YH-18	80	3.0	45.0	3.0
15	21	150	43.0	43.0	0.0
21	YH-19	80	3.0	0.0	3.0
21	22	150	40.0	40.0	0.0
22	YH-20	80	3.0	0.0	3.0
22	20	150	45.0	45.0	0.0
22	22A	150	10.0	10.0	0.0
22A	23	150	23.0	23.0	0.0
23	YH-21	80	10.0	0.0	10.0
23	24	150	45.0	45.0	0.0
24	YH-22	80	10.0	0.0	10.0
24	17A	150	18.0	18.0	0.0
Total				**1082.0**	**97.0**

SUB HEAD NO. 06
Water Supply
Irrigation System

1	Providing, laying, jointing and testing GI class B Pipe / DI K9 pipe line conforming to IS:4985 specification including cost of excavation etc. complete in all respect.	
a)	100 mm dia 995m @ Rs.1000/- M	Rs9,95,000.00
2	Providing and fixing sluice valve including cost of surface boxes and masonry chambers etc. complete in all respect.	Rs1,00,000.00
a)	100 mm dia 6 Nos. @ Rs.12000/- M	Rs72,000.00
3	Providing and fixing 25mm dia, irrigation hydrant valve complete in all respect.	Rs1,00,000.00
a)	28 Nos. @ Rs.1000/- Each	Rs28,000.00
4	Providing and fixing indieating plates	
	6 Nos. @ Rs.1000/- Each	Rs6,000.00
5	Providing and carriage of material and other unforseen items.(L.S.)	Rs1,00,000.00
6	Providing for cutting of road and making good its original condition. (L.S.)	Rs1,00,000.00
	TOTAL	**Rs15,01,000.00**
	Add 3% Contingencies and P.E. charges	45030.00
	Total	**1546030.00**
	Add 49% Escalation, departmental, uniforeseen charges	757554.70
	Grand Total	**2303584.70**
	Say	**Rs23,03,585.00**

(C.O. cost to final abstract of cost S.W. No. 1)

Material Statement of Garden Irrigation pipes

Line		Dia	Length	Pipe Length		Valve	
From	To	(mm)	(m)	90	25	90	25
S.T.P	G1	90	9.0	9	0	1	
G1	G2	90	27.0	27	0		
G2	G3	90	8.0	8	0		
G3	GH-1	25	3.5	0	3.5		1
G3	G4	90	20.0	20	0	1	
G4	GH-2	25	11.0	0	11		1
G4	GH-3	25	39.0	0	39		1
G2	G5	90	25.5	25.5	0	1	
G5	GH-4	25	1.0	0	1		1
G5	G6	90	23.0	23	0	1	
G6	G7	90	9.0	9	0		
G7	GH-5	25	1.0	0	1		1
G7	G8	90	43.5	43.5	0	1	
G8	GH-6	25	1.0	0	1		1
G8	G9	90	30.0	30	0	1	
G9	GH-7	25	6.5	0	6.5		1
G9	G10	90	30.0	30	0	1	
G10	GH-8	25	6.5	0	6.5		1
G10	G11	90	9.0	9	0	1	
G1	G12	90	25.0	25	0		
G12	G13	90	25.0	25	0		
G13	GH-9	25	1.0	0	1		1
G13	G14	90	41.0	41	0	1	
G14	GH-10	25	1.0	0	1		1
G14	G15	90	30.0	30	0	1	
G15	GH-11	25	1.0	0	1		1
G15	G16	90	30.0	30	0	1	
G16	GH-12	25	1.0	0	1		1
G16	G17	90	16.5	16.5	0	1	
G17	G18	90	30.1	30.1	0		
G18	GH-13	25	1.0	0	1		1
G18	G6	90	18.5	18.5	0	1	
G12	G19	90	7.5	7.5	0		
G19	GH-14	25	1.0	0	1		1
G19	G20	90	7.0	7	0	1	
G20	G21	90	23.0	23	0		
G21	GH-15	25	1.0	0	1		1
G21	G22	90	30.0	30	0	1	
G22	GH-16	25	1.0	0	1		1
G22	G23	90	58.0	58	0	1	
G23	GH-17	25	3.0	0	3		1
G23	G24	90	30.0	30	0	1	
G24	GH-18	25	3.0	0	3		1
G24	G25	90	30.0	30	0	1	

G25	GH-19	25	3.0	0	3		1
G25	G11	90	35.5	35.5	0	1	
G20	G26	90	24.5	24.5	0		
G26	G27	90	3.0	3	0		
G27	GH-20	25	1.0	0	1		1
G27	G28	90	30.0	30	0	1	
G28	GH-21	25	1.0	0	1		1
G28	G29	90	32.0	32	0	1	
G29	GH-22	25	1.0	0	1		1
G29	G30	90	30.0	30	0	1	
G30	GH-23	25	1.0	0	1		1
G30	G31	90	30.0	30	0	1	
G31	GH-24	25	1.0	0	1		1
G31	G32	90	25.0	25	0	1	
G26	G33	90	31.0	31	0		
G33	GH-25	25	1.0	0	1		1
G33	G34	90	30.0	30	0	1	
G34	GH-26	25	1.0	0	1		1
G34	G35	90	41.0	41	0	1	
G35	GH-27	25	5.5	0	5.5		1
G35	G36	90	36.0	36	0	1	
G36	GH-28	25	5.5	0	5.5		1
G36	G32	90	11.0	11	0	1	
Total				**994.6**	**129.5**	**118**	**53**
Say				**995**	**130**	**118**	**53**

SUB WORK NO. II:
Sewerage Scheme

Amount in Rs.

1	Providing, lowering,, cutting salt stoneware pipes and specials into trenches including cost of excavation, bed concrete, cost of manholes complete. In all respect.	
	200 mm i/d	
i)	Av. Depth upto 2.00 m-560m @ 1250/- per M	Rs7,00,000.00
ii)	Av. Depth upto 3.00 m-89m @ 1500/- per M	Rs1,33,500.00
	250 mm i/d	Rs62,300.00
i)	Av. Depth upto 3.00 m-66m @ 1800/- per M	Rs1,18,800.00
	66m @Rs. 900/- M	Rs59,400.00
2	Provision for vent shafts as per P.H. requirement at suitable places (L.S.)	Rs2,00,000.00
3	Provision for making connection with HUDA main sewer line (L.S.)	Rs1,00,000.00
4	Provision for temporary timbering etc.	Rs1,00,000.00
5	Provision of S.T.P. 550 KLD capacity storage for treated sewage and other arrangement.	Rs55,50,000.00
6	Provision for carriage of material etc. and other unforeseen L/S/	Rs2,00,000.00
7	Provision for cutting of road and making good to its original condition. (L.S.)	Rs1,00,000.00
	TOTAL	**Rs73,24,000.00**
	Add 3% contingencies & PH charges	Rs2,19,720.00
	TOTAL	**Rs75,43,720.00**
	Add 49% departmental charges	Rs36,96,422.80
	TOTAL	**Rs1,12,40,142.80**

Say **Rs1,12,40,142.80**

(Cost to final abstract of cost)

Material Statement for Sewerage Pipes

S.No.	Line No.		Length(m)	Pipe Dia	Av Depth	200mm dia		250mm dia		300mm dia		400mm dia	
	From	To			(m)	0 to 2 m	2 to 6 m	0 to 2 m	2 to 6 m	0 to 2 m	2 to 6 m	0 to 2 m	2 to 6 m
1	S1	S2	33	200	1.01	33	0	0	0	0	0	0	0
2	S2	S3	21	200	1.20	21	0	0	0	0	0	0	0
3	S3	S4	15	200	1.32	15	0	0	0	0	0	0	0
4	S4	S5	13	200	1.42	13	0	0	0	0	0	0	0
5	S5	S6	15	200	1.52	15	0	0	0	0	0	0	0
6	S12	S13	27	200	0.99	27	0	0	0	0	0	0	0
7	S13	S14	25	200	1.17	25	0	0	0	0	0	0	0
8	S14	S15	22	200	1.33	22	0	0	0	0	0	0	0
9	S15	S16	20	200	1.48	20	0	0	0	0	0	0	0
10	S16	S17	21	200	1.62	21	0	0	0	0	0	0	0
11	S17	S18	24	200	1.78	24	0	0	0	0	0	0	0
12	S18	S6	16	200	1.91	16	0	0	0	0	0	0	0
13	S6	S7	34	200	2.09	0	34	0	0	0	0	0	0
14	S7	S8	10	200	2.24	0	10	0	0	0	0	0	0
15	S19	S20	16	200	0.96	16	0	0	0	0	0	0	0
16	S20	S21	13	200	1.06	13	0	0	0	0	0	0	0
17	S21	S22	36	200	1.22	36	0	0	0	0	0	0	0
18	S28	S29	27	200	0.99	27	0	0	0	0	0	0	0
19	S29	S30	26	200	1.18	26	0	0	0	0	0	0	0
20	S30	S22	24	200	1.35	24	0	0	0	0	0	0	0
21	S22	S23	14	200	1.48	14	0	0	0	0	0	0	0
22	S23	S24	23	200	1.61	23	0	0	0	0	0	0	0
23	S24	S25	26	200	1.78	26	0	0	0	0	0	0	0
24	S25	S26	21	200	1.94	21	0	0	0	0	0	0	0
25	S26	S27	22	200	2.09	0	22	0	0	0	0	0	0
26	S27	S8	23	200	2.24	0	23	0	0	0	0	0	0
27	S8	S9	20	250	2.37	0	0	0	20	0	0	0	0
28	S9	S10	17	250	2.47	0	0	0	17	0	0	0	0
29	S31	S32	8	200	0.93	8	0	0	0	0	0	0	0
30	S32	S33	22	200	1.03	22	0	0	0	0	0	0	0
31	S33	S10	15	200	1.16	15	0	0	0	0	0	0	0
32	S10	S11	27	250	2.58	0	0	0	27	0	0	0	0
33	S34	S35	21	200	0.87	21	0	0	0	0	0	0	0
34	S35	S11	16	200	1.00	16	0	0	0	0	0	0	0
35	S11	S.T.P	2	250	2.65	0	0	0	2	0	0	0	0
	Total					560	89	0	66	0	0	0	0
	Say					**560**	**89**	**0**	**66**	**0**	**0**	**0**	**0**

SUB WORK NO. III:
Storm Water Scheme
R.C.C. Main Pipe Drain

		Amount in Rs.
1	Providing, laying, RCC pipes drain class NP-3 with cement joints manholes, excavation etc. complete in all respects.	
	400 mm i/d	
	Av. Depth upto 2.0 M - 606 M @ 2500/-Per M	Rs15,15,000.00
2	Provision for road gullies with 300 mm dia & pipe connection (L.S.)	Rs4,00,000.00
3	Provision for lighting watching and temporary diversions of traffic.	Rs2,00,000.00
4	Provision for cutting of roads and carriage of materials etc. and other unforeseen items L.S.	Rs1,00,000.00
5	Provision for Rcharge pit (RWH) 3 Nos. @ 600000/- Each	Rs18,00,000.00
6	Provision for connection with HUDA on master S.W.D. line (L.S.)	Rs1,00,000.00
7	Provision for timbering & shoring (L.S.)	Rs1,00,000.00
8	Provision temporary disposal arrangement till HUDA services are provided	Rs1,00,000.00
	TOTAL	**Rs43,15,000.00**
	Add 3% contingencies & PH charges	Rs1,29,450.00
	TOTAL	**Rs44,44,450.00**
	Add 49% departmental charges	Rs21,77,780.50
	TOTAL	**Rs66,22,230.50**

Say Rs66,22,230.50

(Cost to final abstract of cost)

Material Statement for Storm water Drainage System

S.No.	Line No.		Length(m)	Pipe Dia	Av Depth	400mm dia	450mm dia
	From	To			(m)	0 to 2 m	0 to 2 m
1.	D1	D2	33	400	0.95	33	0
2.	D2	D3	21	400	1.02	21	0
3.	D3	D4	15	400	1.08	15	0
4.	D4	D5	15	400	1.12	15	0
5.	D5	D6	15	400	1.16	15	0
6.	D15	D16	20	400	0.93	20	0
7.	D16	D17	29	400	1.00	29	0
8.	D17	D6	18	400	1.07	18	0
9.	D6	D7	16	400	1.21	16	0
10.	D7	D8	24	400	1.26	24	0
11.	D8	D9	21	400	1.33	21	0
12.	D9	R.W-1	2	400	1.36	2	0
13.	D9	D10	20	400	1.39	20	0
14.	D10	D11	22	400	1.45	22	0
15.	D11	D12	26	400	1.51	26	0
16.	D12	D13	26	400	1.59	26	0
17.	D13	D14	32	400	1.67	32	0
18.	D18	D19	29	400	0.94	29	0
19.	D19	D20	21	400	1.01	21	0
20.	D20	D21	32	400	1.09	32	0
21.	D21	D22	25	400	1.17	25	0
22.	D23	D24	29	400	0.94	29	0
23.	D24	D25	21	400	1.01	21	0
24.	D25	D26	9	400	1.06	9	0
25.	D26	R.W.-2	8	400	1.08	8	0
26.	D26	D22	37	400	1.12	37	0
27.	D22	D14	29	400	1.25	29	0
28.	D14	R.W.-3	7	400	1.73	7	0
29.	R.W.-3	O.FLOW	4	400	0.91	4	0
	Total					**606**	**0**

SUB WORK NO. IV.

Road Work **ROAD WORK**

Item No.	Description of Item	Unit	Qty.	Rtae (Rs.)	**Amount in Rs.**
1	Site Clearance				
1.1	Clearig and grubbing road land including uprooting rank, vegetation, grass, bushes, shrubs, saplings and trees girth upto 300 mm, removal of stumps of trees cut earlier and disposal of unserviceable materials and stacking of serviceable materials to be used or auctioned, upto a lead of l000mm including removal and disposal of top soil not exceeding 150 mm thickness by manual means in areas of light jungle as per drawings and Clause 201 of Morth Specifications.	Hectare	2.63	50000	Rs1,31,500.00
2	**Earth Works**				
2.1	Provision for leveling + earth filling as per site condition approximate	Acre	3.65	150000	Rs5,47,500.00
3	**Provision for**				
i)	200 mm GSB				
ii)	250 mm thick stonr aggaregate				
iii)	50 mm thick B.M.				
iv)	20 mm thick MSS				
		Sqm	5805	1200	Rs69,66,000.00
4	**Miscellaneous Items**				
4.1	Construction of cement concrete Kerb and Channels as specifications	Meter	1920	600	Rs11,52,000.00
4.2	Construction of Foothpath as per Specifications for approach to each block.			L.S.	Rs5,00,000.00
4.3	Provision for metalling of commercial L.S 50 SQM	Sqm	50	600	Rs30,000.00
4.4	Providing and fixixng guide maps at selected locations (L.S.)			L.S.	Rs50,000.00
4.5	Provision for plot indicators (L.S.)			L.S.	Rs1,00,000.00
4.6	Provision for demarcating burgies(L.S.)			L.S.	Rs1,00,000.00
4.7	Provision for traffic light arrangement			L.S.	Rs1,00,000.00
4.8	Provision for carriage of material (L.S.)			L.S.	Rs1,00,000.00
	TOTAL				**Rs97,77,000.00**
	Add 3% contingencies & PH charges				Rs2,93,310.00
	TOTAL				**Rs1,00,70,310.00**
	Add 49% departmental charges				Rs49,34,451.90
	TOTAL				**Rs1,50,04,761.90**

Say Rs1,50,04,761.90

(Cost to final abstract of cost)

ROAD CALCULATION

S.NO.	Road no.	Length	Width	Total Area	
1.	Road-1	133.00	6.00	798.00	
2	Road-2	90.00	6.00	540.00	
3	Road-3	201.00	6.00	1206.00	
4	Road-4	109.00	6.00	654.00	
5	Road-5	101.00	6.00	606.00	
6	Road-6	170.00	6.00	1020.00	
7	Road-7	68.00	6.00	408.00	
	Total	**872.00**		**5232.00**	
	Add 10% of curves			523.2	
	Total			5755.20	
	Say			5755	**m**
Add extra at entry and exit and miscellaneous				50	**sqm**
Say				**5805**	**sqm**
Total length of road=960				**960**	**m**
Length of C.C. kerb channels = 960X2 =				**1920**	**m**

SUB WORK NO. V:
Street Lighting

		Amount in Rs.
1	Providing street lighting on internal roads as per standard specifications in 6.5 Acres area @ Rs. 250000/- Per Acre	Rs16,25,000.00
	Add 3% contingencies & PH charges	Rs48,750.00
	TOTAL	**Rs16,73,750.00**
	Add 49% departmental charges	Rs8,20,137.50
	TOTAL	**Rs24,93,887.50**

Say Rs24,93,887.50

(Cost to final abstract of cost)

SUB WORK NO. VI:

SUB HEBD NO. 01

Plantation & Road Side Trees

		Amount in Rs.
1	Development of Lawn Areas: a) Trenching of ordinary soil upto depth of 60cm including removal and stacking of serviceable material And disposing at a lead of 50m/ and making up the trenched area to proper level by filling with earth mixed with manure including cost of improved earth and manure.	975000.00
	b) Rough dressing of turfed Area	
	c) Grassing with "Doob grass" i/c Watering and maintenance of Lawns for 30 days till the grass forms B thick Lawn, free from weeds And fit mowing in rows 7.5 cm apart in either direction including provision for hedges and barbed wire around park. Approx 6.5 Acres organized green @Rs. 150000/-	
2	Providing and Planting or trees with tree guards on roads at 6 m intervals Length of roads = 872 M Total Road Length = 872 M No. of trees @ 6M c/c = 872 x2/12 =145.33 Say = 146 Trees COST OF THE TREE Excavation = Rs. 60/- Manure = Rs. 90/- Tree Plant = Rs. 150/- Tree Guard = Rs. 1000/- Total = Rs. 200.00 Total = Rs. 1300X146.00	189800
	TOTAL	**1164800**
	Add 3% contingencies & PH charges	34944
	TOTAL	**1199744**
	Add 49% departmental charges	587874.56
	TOTAL	**1787618.56**

Say 1787618.56

(Cost to final abstract of cost)

SUB WORK NO. VII :

Maintenance Charges & Resurfacing of Roads

		Amount in Rs.
1	a) Provision for maintenance charges for water supply, sewerage, storm water drainage, roads, street light, horticulture etc. complete including operation and establishment charges as per HUDA norms after completion and resurfacing of roads after 10 years. 6.5 acre @ Rs. 7.50 lacs per acre	Rs48,75,000.00
2	Provision for resurfacing of roads after Ist 5 years of maintenance i.e. 100 mm thick B.M. & 25 mm thick premix carpet with seal coat with mechanical paver. 5755 sqm. @ Rs.600/-Per Sqm.	Rs34,53,000.00
3	Resurfacing of roads after 10 years of maintenance by providing 25 mm thick premix carpet with seal coat with mechanical paver. 5755 sqm. @ Rs.750/-Per Sqm.	Rs43,16,250.00
	Total	**Rs1,26,44,250.00**
	Add 3% contingencies & PH charges	Rs3,79,327.50
	TOTAL	**Rs1,30,23,577.50**
	Add 49% departmental charges	Rs63,81,552.98
	TOTAL	**Rs1,94,05,130.48**

Say Rs1,94,05,130.48

(Cost to final abstract of cost)

Design Chart Showing Sewerage Details

S.No.	Line No.		Length(m)	Population			Sewage flow @ 108 LPCD(lpd)	Peak Flow(lpd)	Peak Flow(lps)	Pipe Size(mm)	Slope 1 in	Velocity(m/s)	Capacity of pipe(lps)	Fall (m)	Ground Level(m)		Invert Level(m)		q/Q	va/v	Actual velocity(va)	d/D	Depth(m)	
	From	To		Self	Prev.	Total									Start	End	Start	End					Start	End
1.	**S1**	**S2**	**33.0**	**225.0**	**0.0**	**225.0**	**24300.0**	**72900**	**0.84**	**200**	**145**	**0.75**	**11.81**	**0.23**	**100.0**	**100.0**	**99.10**	**98.87**	**0.036**	**0.449**	**0.337**	**0.122**	**0.900**	**1.128**
2.	**S2**	**S3**	**21.0**	**225.0**	**225.0**	**450.0**	**48600.0**	**145800**	**1.69**	**200**	**145**	**0.75**	**11.81**	**0.14**	**100.0**	**100.0**	**98.87**	**98.73**	**0.071**	**0.561**	**0.421**	**0.175**	**1.128**	**1.272**
3.	**S3**	**S4**	**15.0**	**225.0**	**450.0**	**675.0**	**72900.0**	**218700**	**2.53**	**200**	**145**	**0.75**	**11.81**	**0.10**	**100.0**	**100.0**	**98.73**	**98.62**	**0.107**	**0.643**	**0.483**	**0.218**	**1.272**	**1.376**
4.	**S4**	**S5**	**13.0**	**0.0**	**675.0**	**675.0**	**72900.0**	**218700**	**2.53**	**200**	**145**	**0.75**	**11.81**	**0.09**	**100.0**	**100.0**	**98.62**	**98.53**	**0.107**	**0.643**	**0.483**	**0.218**	**1.376**	**1.466**
5.	**S5**	**S6**	**15.0**	**225.0**	**675.0**	**900.0**	**97200.0**	**291600**	**3.38**	**200**	**145**	**0.75**	**11.81**	**0.10**	**100.0**	**100.0**	**98.53**	**98.43**	**0.143**	**0.697**	**0.524**	**0.251**	**1.466**	**1.569**
6.	S12	S13	27.0	305.0	0.0	305.0	32940.0	98820	1.14	200	145	0.75	11.81	0.19	100.0	100.0	99.10	98.91	0.048	0.487	0.366	0.140	0.900	1.086
7.	S13	S14	25.0	305.0	305.0	610.0	65880.0	197640	2.29	200	145	0.75	11.81	0.17	100.0	100.0	98.91	98.74	0.097	0.628	0.472	0.208	1.086	1.259
8.	S14	S15	22.0	0.0	610.0	610.0	65880.0	197640	2.29	200	145	0.75	11.81	0.15	100.0	100.0	98.74	98.59	0.097	0.628	0.472	0.208	1.259	1.410
9.	S15	S16	20.0	305.0	610.0	915.0	98820.0	296460	3.43	200	145	0.75	11.81	0.14	100.0	100.0	98.59	98.45	0.145	0.700	0.526	0.253	1.410	1.548
10.	S16	S17	21.0	0.0	915.0	915.0	98820.0	296460	3.43	200	145	0.75	11.81	0.14	100.0	100.0	98.45	98.31	0.145	0.700	0.526	0.253	1.548	1.693
11.	S17	S18	24.0	305.0	915.0	1220.0	131760.0	395280	4.58	200	145	0.75	11.81	0.17	100.0	100.0	98.31	98.14	0.194	0.773	0.581	0.298	1.693	1.859
12.	S18	S6	16.0	305.0	1220.0	1525.0	164700.0	494100	5.72	200	145	0.75	11.81	0.11	100.0	100.0	98.14	98.03	0.242	0.817	0.614	0.333	1.859	1.969
13.	**S6**	**S7**	**34.0**	**0.0**	**2425.0**	**2425.0**	**261900.0**	**785700**	**9.09**	**200**	**145**	**0.75**	**11.81**	**0.23**	**100.0**	**100.0**	**98.03**	**97.80**	**0.385**	**0.931**	**0.699**	**0.430**	**1.969**	**2.203**
14.	**S7**	**S8**	**10.0**	**0.0**	**2425.0**	**2425.0**	**261900.0**	**785700**	**9.09**	**200**	**145**	**0.75**	**11.81**	**0.07**	**100.0**	**100.0**	**97.80**	**97.73**	**0.385**	**0.931**	**0.699**	**0.430**	**2.203**	**2.272**
15.	S19	S20	16.0	225.0	0.0	225.0	24300.0	72900	0.84	200	145	0.75	11.81	0.11	100.0	100.0	99.10	98.99	0.036	0.449	0.337	0.122	0.900	1.010
16.	S20	S21	13.0	0.0	225.0	225.0	24300.0	72900	0.84	200	145	0.75	11.81	0.09	100.0	100.0	98.99	98.90	0.036	0.449	0.337	0.122	1.010	1.100
17.	S21	S22	36.0	225.0	225.0	450.0	48600.0	145800	1.69	200	145	0.75	11.81	0.25	100.0	100.0	98.90	98.65	0.071	0.561	0.421	0.175	1.100	1.348
18.	S28	S29	27.0	225.0	0.0	225.0	24300.0	72900	0.84	200	145	0.75	11.81	0.19	100.0	100.0	99.10	98.91	0.036	0.449	0.337	0.122	0.900	1.086
19.	S29	S30	26.0	225.0	225.0	450.0	48600.0	145800	1.69	200	145	0.75	11.81	0.18	100.0	100.0	98.91	98.73	0.071	0.561	0.421	0.175	1.086	1.266
20.	S30	S22	24.0	0.0	450.0	450.0	48600.0	145800	1.69	200	145	0.75	11.81	0.17	100.0	100.0	98.73	98.57	0.071	0.561	0.421	0.175	1.266	1.431
21.	S22	S23	14.0	225.0	900.0	1125.0	121500.0	364500	4.22	200	145	0.75	11.81	0.10	100.0	100.0	98.57	98.47	0.179	0.751	0.564	0.284	1.431	1.528
22.	S23	S24	23.0	0.0	1125.0	1125.0	121500.0	364500	4.22	200	145	0.75	11.81	0.16	100.0	100.0	98.47	98.31	0.179	0.751	0.564	0.284	1.528	1.686
23.	S24	S25	26.0	0.0	1125.0	1125.0	121500.0	364500	4.22	200	145	0.75	11.81	0.18	100.0	100.0	98.31	98.13	0.179	0.751	0.564	0.284	1.686	1.866
24.	S25	S26	21.0	0.0	1125.0	1125.0	121500.0	364500	4.22	200	145	0.75	11.81	0.14	100.0	100.0	98.13	97.99	0.179	0.751	0.564	0.284	1.866	2.010
25.	S26	S27	22.0	0.0	1125.0	1125.0	121500.0	364500	4.22	200	145	0.75	11.81	0.15	100.0	100.0	97.99	97.84	0.179	0.751	0.564	0.284	2.010	2.162
26.	S27	S8	23.0	0.0	1125.0	1125.0	121500.0	364500	4.22	200	145	0.75	11.81	0.16	100.0	100.0	97.84	97.68	0.179	0.751	0.564	0.284	2.162	2.321
27.	**S8**	**S9**	**20.0**	**225.0**	**3550.0**	**3775.0**	**407700.0**	**1223100**	**14.16**	**250**	**195**	**0.75**	**18.46**	**0.10**	**100.0**	**100.0**	**97.68**	**97.58**	**0.383**	**0.930**	**0.699**	**0.428**	**2.321**	**2.423**
28.	**S9**	**S10**	**17.0**	**0.0**	**3775.0**	**3775.0**	**407700.0**	**1223100**	**14.16**	**250**	**195**	**0.75**	**18.46**	**0.09**	**100.0**	**100.0**	**97.58**	**97.49**	**0.383**	**0.930**	**0.699**	**0.428**	**2.423**	**2.510**
29.	S31	S32	8.0	305.0	0.0	305.0	32940.0	98820	1.14	200	145	0.75	11.81	0.06	100.0	100.0	99.10	99.04	0.048	0.487	0.366	0.140	0.900	0.955
30.	S32	S33	22.0	305.0	305.0	610.0	65880.0	197640	2.29	200	145	0.75	11.81	0.15	100.0	100.0	99.04	98.89	0.097	0.628	0.472	0.208	0.955	1.107
31.	S33	S10	15.0	305.0	610.0	915.0	98820.0	296460	3.43	200	145	0.75	11.81	0.10	100.0	100.0	98.89	98.79	0.145	0.700	0.526	0.253	1.107	1.210
32.	**S10**	**S11**	**27.0**	**0.0**	**4690.0**	**4690.0**	**506520.0**	**1519560**	**17.59**	**250**	**195**	**0.75**	**18.46**	**0.14**	**100.0**	**100.0**	**97.49**	**97.35**	**0.476**	**0.986**	**0.741**	**0.485**	**2.510**	**2.649**
33.	S34	S35	21.0	34.0	0.0	34.0	3672.0	11016	0.13	200	145	0.75	11.81	0.14	100.0	100.0	99.20	99.06	0.005	0.350	0.263	0.076	0.800	0.945
34.	S35	S11	16.0	34.0	34.0	68.0	7344.0	22032	0.26	200	145	0.75	11.81	0.11	100.0	100.0	99.06	98.94	0.011	0.369	0.277	0.085	0.945	1.055
35.	**S11**	**S.T.P**	**2.0**	**0.0**	**4758.0**	**4758.0**	**513864.0**	**1541592**	**17.84**	**250**	**195**	**0.75**	**18.46**	**0.01**	**100.0**	**100.0**	**97.35**	**97.34**	**0.483**	**0.990**	**0.744**	**0.490**	**2.649**	**2.659**

Design of Surface drainage system (PIPE DRAIN)

S.No.	Line No.		Length	Catchment Area(Acre)			Discharge @1/4 cusec/ acre	Pipe Dia	Slope	Velocity(m/s)	Capacity of pipe (cusecs)	Fall(m)	Ground Level(mm)		Invert Level(mm)		Depth(m)	
	From	To	(m)	Self	Progg.	Total		(mm)	1 in				Start	End	Start	End	Start	End
1.	**D1**	**D2**	**33.0**	**0.35**	**0**	**0.35**	**0.088**	**400**	**350**	**2.91**	**3.933**	**0.094**	**100.0**	**100.0**	**99.10**	**99.01**	**0.900**	**0.994**
2.	**D2**	**D3**	**21.0**	**0.22**	**0.35233**	**0.58**	**0.144**	**400**	**350**	**2.91**	**3.933**	**0.060**	**100.0**	**100.0**	**99.01**	**98.95**	**0.994**	**1.054**
3.	**D3**	**D4**	**15.0**	**0.16**	**0.57653**	**0.74**	**0.184**	**400**	**350**	**2.91**	**3.933**	**0.043**	**100.0**	**100.0**	**98.95**	**98.90**	**1.054**	**1.097**
4.	**D4**	**D5**	**15.0**	**0.16**	**0.73668**	**0.90**	**0.224**	**400**	**350**	**2.91**	**3.933**	**0.043**	**100.0**	**100.0**	**98.90**	**98.86**	**1.097**	**1.140**
5.	**D5**	**D6**	**15.0**	**0.16**	**0.89683**	**1.06**	**0.264**	**400**	**350**	**2.91**	**3.933**	**0.043**	**100.0**	**100.0**	**98.86**	**98.82**	**1.140**	**1.183**
6.	D15	D16	20.0	0.21	0	0.21	0.053	400	350	2.91	3.933	0.057	100.0	100.0	99.10	99.04	0.900	0.957
7.	D16	D17	29.0	0.31	0.21353	0.52	0.131	400	350	2.91	3.933	0.083	100.0	100.0	99.04	98.96	0.957	1.040
8.	D17	D6	18.0	0.19	0.52315	0.72	0.179	400	350	2.91	3.933	0.051	100.0	100.0	98.96	98.91	1.040	1.091
9.	**D6**	**D7**	**16.0**	**0.17**	**1.77231**	**1.94**	**0.486**	**400**	**350**	**2.91**	**3.933**	**0.046**	**100.0**	**100.0**	**98.82**	**98.77**	**1.183**	**1.229**
10.	**D7**	**D8**	**24.0**	**0.26**	**1.94314**	**2.20**	**0.550**	**400**	**350**	**2.91**	**3.933**	**0.069**	**100.0**	**100.0**	**98.77**	**98.70**	**1.229**	**1.297**
11.	**D8**	**D9**	**21.0**	**0.22**	**2.19937**	**2.42**	**0.606**	**400**	**350**	**2.91**	**3.933**	**0.060**	**100.0**	**100.0**	**98.70**	**98.64**	**1.297**	**1.357**
12.	**D9**	**R.W-1**	**2.0**	**0.02**	**2.42358**	**2.44**	**0.611**	**400**	**350**	**2.91**	**3.933**	**0.006**	**100.0**	**100.0**	**98.64**	**98.64**	**1.357**	**1.363**
13.	**D9**	**D10**	**20.0**	**0.21**	**2.42358**	**2.64**	**0.659**	**400**	**350**	**2.91**	**3.933**	**0.057**	**100.0**	**100.0**	**98.64**	**98.59**	**1.357**	**1.414**
14.	**D10**	**D11**	**22.0**	**0.23**	**2.63711**	**2.87**	**0.718**	**400**	**350**	**2.91**	**3.933**	**0.063**	**100.0**	**100.0**	**98.59**	**98.52**	**1.414**	**1.477**
15.	**D11**	**D12**	**26.0**	**0.28**	**2.872**	**3.15**	**0.787**	**400**	**350**	**2.91**	**3.933**	**0.074**	**100.0**	**100.0**	**98.52**	**98.45**	**1.477**	**1.551**
16.	**D12**	**D13**	**26.0**	**0.28**	**3.14959**	**3.43**	**0.857**	**400**	**350**	**2.91**	**3.933**	**0.074**	**100.0**	**100.0**	**98.45**	**98.37**	**1.551**	**1.626**
17.	**D13**	**D14**	**32.0**	**0.34**	**3.42718**	**3.77**	**0.942**	**400**	**350**	**2.91**	**3.933**	**0.091**	**100.0**	**100.0**	**98.37**	**98.28**	**1.626**	**1.717**
18.	D18	D19	29.0	0.31	0	0.31	0.077	400	350	2.91	3.933	0.083	100.0	100.0	99.10	99.02	0.900	0.983
19.	D19	D20	21.0	0.22	0.30962	0.53	0.133	400	350	2.91	3.933	0.060	100.0	100.0	99.02	98.96	0.983	1.043
20.	D20	D21	32.0	0.34	0.53383	0.88	0.219	400	350	2.91	3.933	0.091	100.0	100.0	98.96	98.87	1.043	1.134
21.	D21	D22	25.0	0.27	0.87548	1.14	0.286	400	350	2.91	3.933	0.071	100.0	100.0	98.87	98.79	1.134	1.206
22.	D23	D24	29.0	0.31	0	0.31	0.077	400	350	2.91	3.933	0.083	100.0	100.0	99.10	99.02	0.900	0.983
23.	D24	D25	21.0	0.22	0.30962	0.53	0.133	400	350	2.91	3.933	0.060	100.0	100.0	99.02	98.96	0.983	1.043
24.	D25	D26	9.0	0.10	0.53383	0.63	0.157	400	350	2.91	3.933	0.026	100.0	100.0	98.96	98.93	1.043	1.069
25.	D26	R.W.-2	8.0	0.09	0.62992	0.72	0.179	400	350	2.91	3.933	0.023	100.0	100.0	98.93	98.91	1.069	1.091
26.	D26	D22	37.0	0.40	0.62992	1.02	0.256	400	350	2.91	3.933	0.106	100.0	100.0	98.93	98.83	1.069	1.174
27.	D22	D14	29.0	0.31	2.16734	2.48	0.619	400	350	2.91	3.933	0.083	100.0	100.0	98.79	98.71	1.206	1.289
28.	**D14**	**R.W.-3**	**7.0**	**0.07**	**6.24579**	**6.32**	**1.580**	**400**	**350**	**2.91**	**3.933**	**0.020**	**100.0**	**100.0**	**98.28**	**98.26**	**1.717**	**1.737**
29.	**R.W.-3**	**O.FLOW**	**4.0**	**0.04**	**6.32053**	**6.36**	**1.591**	**400**	**350**	**2.91**	**3.933**	**0.011**	**100.0**	**100.0**	**99.10**	**99.09**	**0.900**	**0.911**

Fire Hydrant Chart High Rise Part

Line		Dia	Length
From	To	(mm)	(m)
PUMP	1	150	19
1	2	150	4
2	YH-1	80	3
2	3	150	43
3	YH-2	80	3
3	4	150	45
4	YH-3	80	3
4	5	150	36
5	YH-4	80	3
5	6	150	46
6	YH-5	80	3
6	7	150	45
7	YH-6	80	3
7	8	150	45
8	YH-7	80	3
8	9	150	35
9	YH-8	80	3
1	10	150	30
10	YH-9	80	3
10	11	150	45
11	YH-10	80	3
11	12	150	45
12	YH-11	80	3
12	13	150	20
13	YH-12	80	3
13	14	150	45
14	YH-13	80	3
14	9	150	45
9	YH-8	80	3
1	15	150	27
15	16	150	5
16	YH-14	80	3
16	17	150	30
17	YH-15	80	10
17	18	150	53
18	YH-16	80	10
18	19	150	41
19	YH-17	80	3
19	20	150	45
20	YH-18	80	3
15	21	150	43
21	YH-19	80	3
21	22	150	40
22	YH-20	80	3
22	20	150	45
22	22A	150	10
22A	23	150	23
23	YH-21	80	10
23	24	150	45
24	YH-22	80	10
24	17A	150	18

DESIGN OF DOMESTIC WATER SUPPLY

Line		*DU*	*Population @5 persons per DU*	*Total daily demand @90/45 LPCD*	*Flow with 6 hrs pumping*	*Dia*	*Velocity*	*Length*	*Equivalent length*	*Friction*	*Total friction*	*Ground level(m)*		*HGL(m)*		*Head(m)*		*Valve*
From	*To*				*(lpm)*	*(mm)*	*(m/s)*	*(m)*	*for bends & tee(m)*	*loss in m/100m*	*loss in m*	*Start*	*End*	*Start*	*End*	*Start*	*End*	*as/line*
U.G.T	W1	1012	5060	455400	1265.00	150	1.19	**7.0**	8	0.85	0.07	100.00	100.00	170.00	169.93	70.00	69.93	1
W1	W1a	1012	5060	455400	1265.00	100	2.68	**4.0**	5	6.01	0.30	100.00	100.00	169.93	169.63	69.93	69.63	1
W1a	SHOP	1012	5060	455400	1265.00	50	10.73	**2.0**	2	168.51	3.37	100.00	100.00	169.63	166.26	69.63	66.26	1
W1a	W2	38	76	6840	47.50	100	0.10	**21.5**	26	0.02	0.00	100.00	100.00	169.93	169.93	69.93	69.93	1
W2	W3	974	4870	438300	1217.50	100	2.58	**10.5**	13	5.61	0.73	100.00	100.00	169.93	169.20	69.93	69.20	0
W3	T-5	974	4870	438300	1217.50	65	6.11	**17.0**	20	44.51	8.90	100.00	100.00	169.20	160.30	69.20	60.30	1
W3	W4	822	4110	369900	1027.50	100	2.18	**32.0**	38	4.12	1.57	100.00	100.00	169.20	167.63	69.20	67.63	0
W4	T-6	822	4110	369900	1027.50	65	5.16	**17.0**	20	32.74	6.55	100.00	100.00	167.63	161.08	67.63	61.08	1
W4	W5	710	3550	319500	887.50	100	1.88	**35.0**	42	3.16	1.33	100.00	100.00	167.63	166.30	67.63	66.30	1
W5	T-7	710	3550	319500	887.50	65	4.46	**20.0**	24	25.12	6.03	100.00	100.00	166.30	160.28	66.30	60.28	1
W5	T-8	598	2990	269100	747.50	100	1.59	**15.0**	18	2.32	0.42	100.00	100.00	166.30	165.89	66.30	65.89	0
W2	W6	486	2430	218700	607.50	100	1.29	**6.5**	8	1.59	0.13	100.00	100.00	169.93	169.80	69.93	69.80	0
W6	T-3	486	2430	218700	607.50	65	3.05	**11.0**	13	12.65	1.64	100.00	100.00	169.80	168.16	69.80	68.16	1
W6	W7	374	1870	168300	467.50	65	2.35	**28.0**	34	7.87	2.68	100.00	100.00	169.80	167.12	69.80	67.12	1
W7	T-4	374	1870	168300	467.50	65	2.35	**6.0**	7	7.87	0.55	100.00	100.00	167.12	166.57	67.12	66.57	1
W1	W8	262	1310	117900	327.50	100	0.69	**22.5**	27	0.52	0.14	100.00	100.00	169.93	169.79	69.93	69.79	0
W8	W9	262	1310	117900	327.50	100	0.69	**28.5**	34	0.52	0.18	100.00	100.00	169.79	169.61	69.79	69.61	1
W9	W10	262	1310	117900	327.50	100	0.69	**34.5**	41	0.52	0.21	100.00	100.00	169.61	169.40	69.61	69.40	0
W10	SHOP	38	76	6840	47.50	50	0.40	**2.0**	2	0.44	0.01	100.00	100.00	169.40	169.39	69.40	69.39	1
W10	W11	224	1120	100800	280.00	100	0.59	**40.0**	48	0.39	0.19	100.00	100.00	169.40	169.21	69.40	69.21	0
W11	W12	224	1120	100800	280.00	100	0.59	**14.5**	17	0.39	0.07	100.00	100.00	169.21	169.15	69.21	69.15	0
W12	T-2	224	1120	100800	280.00	65	1.41	**10.0**	12	3.11	0.37	100.00	100.00	169.15	168.77	69.15	68.77	1
W12	W13	112	560	50400	140.00	100	0.30	**34.0**	41	0.11	0.05	100.00	100.00	169.15	169.10	69.15	69.10	1
W13	T-1	112	560	50400	140.00	65	0.70	**10.0**	12	0.89	0.11	100.00	100.00	169.10	168.99	69.10	68.99	1

DESIGN OF FLUSHING WATER SUPPLY

S.T.P.	F1	1012	5060	227700	632.50	100	1.34	**9.0**	11	1.71	0.19	100.00	100.00	170.00	169.81	70.00	69.81	1
F1	F2	1012	5060	227700	632.50	80	2.10	**23.0**	28	5.01	1.40	100.00	100.00	169.81	168.41	69.81	68.41	1
F2	F3	1012	5060	227700	632.50	80	2.10	**11.5**	14	5.01	0.70	100.00	100.00	168.41	167.71	68.41	67.71	0
F3	T-7	1012	5060	227700	632.50	50	5.37	**19.0**	23	48.06	11.05	100.00	100.00	167.71	156.65	67.71	56.65	1
F3	T-8	900	4500	202500	562.50	80	1.86	**15.0**	18	4.05	0.73	100.00	100.00	167.71	166.98	67.71	66.98	0
F2	F4	788	3940	177300	492.50	50	4.18	**23.5**	28	30.56	8.56	100.00	100.00	168.41	159.85	68.41	59.85	1
F4	T-6	788	3940	177300	492.50	80	1.63	**17.0**	20	3.19	0.64	100.00	100.00	159.85	159.22	59.85	59.22	1
F4	F5	676	3380	152100	422.50	50	3.58	**32.0**	38	23.15	8.80	100.00	100.00	159.85	151.05	59.85	51.05	1
F5	T-5	676	3380	152100	422.50	80	1.40	**17.0**	20	2.41	0.48	100.00	100.00	151.05	150.57	51.05	50.57	0
F5	F6	524	2620	117900	327.50	80	1.09	**11.5**	14	1.52	0.21	100.00	100.00	151.05	150.84	51.05	50.84	0
F6	F7	524	2620	117900	327.50	50	2.78	**6.0**	7	14.60	1.02	100.00	100.00	150.84	149.82	50.84	49.82	1
F7	T-3	524	2620	117900	327.50	80	1.09	**10.0**	12	1.52	0.18	100.00	100.00	149.82	149.64	49.82	49.64	1
F7	F8	412	2060	92700	257.50	50	2.18	**28.0**	34	9.45	3.21	100.00	100.00	149.82	146.61	49.82	46.61	1
F8	T-4	412	2060	92700	257.50	80	0.85	**6.5**	8	0.99	0.08	100.00	100.00	146.61	146.53	46.61	46.53	0
F6	F9	300	1500	67500	187.50	80	0.62	**21.5**	26	0.55	0.14	100.00	100.00	150.84	150.70	50.84	50.70	1
F9	SHOP	38	190	8550	23.75	80	0.08	**2.0**	2	0.01	0.00	100.00	100.00	150.70	150.70	50.70	50.70	0
F9	F10	262	1310	58950	163.75	50	1.39	**26.0**	31	4.16	1.29	100.00	100.00	150.70	149.41	50.70	49.41	1
F10	F11	262	1310	58950	163.75	80	0.54	**28.5**	34	0.43	0.15	100.00	100.00	149.41	149.26	49.41	49.26	0
F11	F12	38	190	8550	23.75	80	0.08	**34.5**	41	0.01	0.01	100.00	100.00	149.26	149.25	49.26	49.25	0
F12	SHOP	224	1120	50400	140.00	50	1.19	**2.0**	2	3.14	0.06	100.00	100.00	149.26	149.20	49.26	49.20	1
F12	F13	224	1120	50400	140.00	80	0.46	**40.6**	49	0.33	0.16	100.00	100.00	149.20	149.04	49.20	49.04	1
F13	F14	224	1120	50400	140.00	80	0.46	**15.5**	19	0.33	0.06	100.00	100.00	149.04	148.97	49.04	48.97	1
F14	T-2	224	1120	50400	140.00	50	1.19	**10.0**	12	3.14	0.38	100.00	100.00	148.97	148.60	48.97	48.60	1
F14	F15	112	560	25200	70.00	80	0.23	**34.0**	41	0.09	0.04	100.00	100.00	148.97	148.94	48.97	48.94	1
F15	T-1	112	560	25200	70.00	50	0.59	**10.0**	12	0.89	0.11	100.00	100.00	148.94	148.83	48.94	48.83	1

garden hydrant

Fire Hydrant Chart High Rise Part

Line		*Dia(m)*	*Length(m)*
From	*To*		
S.T.P	G1	90	9.0
G1	G2	90	27.0
G2	G3	90	8.0
G3	**GH-1**	25	3.5
G3	G4	90	20.0
G4	**GH-2**	25	11.0
G4	**GH-3**	25	39.0
G2	G5	90	25.5
G5	**GH-4**	25	1.0
G5	G6	90	23.0
G6	G7	90	9.0
G7	**GH-5**	25	1.0
G7	G8	90	43.5
G8	**GH-6**	25	1.0
G8	G9	90	30.0
G9	**GH-7**	25	6.5
G9	G10	90	30.0
G10	**GH-8**	25	6.5
G10	G11	90	9.0
G1	G12	90	25.0
G12	G13	90	25.0
G13	**GH-9**	25	1.0
G13	G14	90	41.0
G14	**GH-10**	25	1.0
G14	G15	90	30.0
G15	**GH-11**	25	1.0
G15	G16	90	30.0
G16	**GH-12**	25	1.0
G16	G17	90	16.5
G17	G18	90	30.1
G18	**GH-13**	25	1.0
G18	G6	90	18.5
G12	G19	90	7.5
G19	**GH-14**	25	1.0
G19	G20	90	7.0
G20	G21	90	23.0
G21	**GH-15**	25	1.0
G21	G22	90	30.0
G22	**GH-16**	25	1.0

garden hydrant

G22	G23	90	58.0
G23	**GH-17**	25	3.0
G23	G24	90	30.0
G24	**GH-18**	25	3.0
G24	G25	90	30.0
G25	**GH-19**	25	3.0
G25	G11	90	35.5
G20	G26	90	24.5
G26	G27	90	3.0
G27	**GH-20**	25	1.0
G27	G28	90	30.0
G28	**GH-21**	25	1.0
G28	G29	90	32.0
G29	**GH-22**	25	1.0
G29	G30	90	30.0
G30	**GH-23**	25	1.0
G30	G31	90	30.0
G31	**GH-24**	25	1.0
G31	G32	90	25.0
G26	G33	90	31.0
G33	**GH-25**	25	1.0
G33	G34	90	30.0
G34	**GH-26**	25	1.0
G34	G35	90	41.0
G35	**GH-27**	25	5.5
G35	G36	90	36.0
G36	**GH-28**	25	5.5
G36	G32	90	11.0