



CHARUSAT
CHAROTAR UNIVERSITY OF SCIENCE AND TECHNOLOGY

Rain Water Harvesting
At
CHARUSAT CAMPUS

Prepared by

Dr. Hiteshri Shastri,
Associate Professor

M. S. Patel Department of Civil Engineering,
CSPIT, CHARUSAT

December 2019

Water Harvesting Potential of CHARUSAT Campus

CHARUSAT Campus is located in Anand District of the Gujarat State. The district of Anand is located at 72.93° E longitude and 22.57°N latitude in Anand district of Gujarat at an elevation of about 39m above mean sea level. The district has a moderate climate and receives less rainfall during southwest monsoon (June-September) and retreating no rainfall in Northeast monsoon (December-January). Average annual rainfall ranges between 750-785mm. References of www.imd.gov.in site (Indian Meteorological Department) Average annual rainfall of Anand district is taken as 773.6 mm.

Total amount of water that is received from rainfall over an area is called the rainwater legacy of that area. The amount that can be effectively harvested is called the water harvesting potential. The formula for calculation for harvesting potential or volume of water received or runoff produced or harvesting capacity is given as:-

Harvesting potential or Volume of water Received (m^3)

= Area of Catchment (m^2) x Depth of rainfall (m) x Runoff/Recharge coefficient

Runoff coefficient for any catchment is the ratio of the volume of water that runs off a surface to the volume of rainfall that falls on the surface. Runoff coefficient accounts for losses due to spillage, leakage, infiltration, catchment surface wetting and evaporation, which will all contribute to reducing the amount of runoff. Runoff coefficient varies from 0.05 to 1.0. In present report, runoff coefficient and recharge coefficient for buildup area is taken 0.9 respectively as the rooftop area is totally impervious. The runoff coefficient and recharge coefficient for green areas is taken as 0.3 and 0.5 respectively.

CHARUSAT campus practices rain water harvesting through surface water detention and ground water recharge. The water harvesting potential of the campus is estimated as 43% from its total fresh water legacy. Annexure 1 presents the calculation of the water harvesting potential of the campus. Annexure 2 includes the campus map depicting the buildup-green areas on the campus in reference to the computed water harvesting potential.

Annexure 1		
CAMPUS LAND ALLOCATION		
Sr. No.	Institute / Department	Ground Floor Built up Area (Sq. Meters)
1	Central Administrative Building	2105
2	DEPSTAR (Building - 2)	3017.36
3	EE/EC (Building - 1)	4151.91
4	ME/CL (Building - 3)	4577.19
5	RPCP	4124.45
6	PDPIAS	4040.86
7	IIIM	3136
8	CMPICA	3076.99
9	ARIP	1748.61
10	MTIN	1815.73
11	WORKSHOP	1325
13	KKGGH - 1	1000
14	JCPGGH - 2	1150
15	Charusat Girls' Hostel - 3	1448.57
16	Charusat Girls' Hostel - 4	2210.00
17	Dining Hall - 1	392
18	TAPAS ANNAPURNA	740.34
19	Canteen and Gymnasium	537
20	Animal House	64.00
21	Shade for Lunch (Near Canteen)	304.70
22	Open Air Theater (Technology Zone)	2800.00
24	Main Parking Shades (Technology Zone)	2436.00
25	Parking (Main Entrance)	235.00
26	Parking (RPCP)	766.00
27	Parking (CSPIT)	250.00
28	Parking (PDPIAS)	5224.00
29	Parking (Healthcare Zone)	676.00
30	Shade for Lunch (Behind CE/IT building)	98.00
31	Shade for Lunch (Beside EE/EC building)	98.00
32	Shade for Lunch (Behind PDPIAS building)	77.10
33	Shade for Lunch (Behind IIIM building)	77.10
34	Herbal Garden	2150.00
35	HT Electrical Room	62.00
36	Main Gate (E.C.C)	77.00
37	Overhead Tank & Water Work Change room	237.00
38	Campus Roads	17235.00
39	Campus Stage-1 (Technology Zone)	189.00

40	Campus Stage-2 (Healthcare Zone)	285.00
41	SANTRAM XEROX CENTER	30.66
42	STUDENTS STORE	66.61
43	ATM (AXIS BANK)	10.00
44	K.D.C.C BANK	26.48
45	SHREEJI XEROX	20.00
46	CANTEEN(SHREEJI)	537.00
47	MESS(JCP - PAPYLON)	550.00
48	AMUL PARLOUR	11.61
49	ICE BERG	76.65
50	NES CAFÉ	22.23
51	GIRLS HOSTEL STORE	13.38
52	KRISHNA CHAT	58.10
53	DANNY'S COFFEE BAR	70.10
54	TEA POST	72.93
55	LALABHAI SEVSAL	72.93
56	AMUL PARLOUR(HEALTH CARE ZONE)	11.61
57	SOVENIOUR SHOP	100.00
58	Main Sports GROUND	21978.00
59	DRINKING AREA NEAR CANTEEN	9.29
60	SPORTS GROUND TOILET	20.32
61	Campus Stage-3 (IIIM- Technology Zone)	310.00
62	STAFF QUARTERS - 1	1195.42
66	HT ROOM 2(STAFF QUARTERS)	71.00
67	Hospital Building-H.T Room	584.00
68	Hospital Building-HVAC Plant	1276.00
69	Hospital Building-STP Tank	790.00
70	Hospital Building-Under Ground Sump	788.00
71	Hospital Building-Ward	5000.00
72	Hospital Building-Main Diagnostic	6000.00
73	Roads	17235.00
	TOTAL BUILTUP	130945.23
74	Campus Lake (Surface area)	12140.6
	Depth of Campus Lake (m)	2.5
	TOTAL LAND ACQUISITION(120 ACRE)	485623.00
	TOTAL GREEN COVER	342537.17

Particular	Volume in (cubic m)
Annual fresh water volume received on campus through rainfall (cubic m)	$485623 \times 0.7736 = 375677.95$
Surface Runoff generated from Built up area (cubic m)	$130945.23 \times 0.7736 \times 0.9 = 91169.31$
Surface Runoff generated from Green Cover area (cubic m)	$342537.17 \times 0.7736 \times 0.3 = 79496.03$
TOTAL surface runoff from campus	$91169.31 + 79496.03 = 170665.33$
TOTAL water stored in campus lake (cubic m)	$79496.03 \times 2.5 = 30351.50$
Total Ground water Recharge from Green Cover	$342537.17 \times 0.7736 \times 0.5 = 132493.37$
Total Rain water Harvested on Campus	$30351.50 + 132493.3774 = 162844.88$
Percentage rain water harvested on campus	$(162844.88 / 375677.95)100 = \mathbf{43\%}$

Runoff Coefficient for Parks and pastures	0.05–0.30
Runoff Coefficient for Paved and Built-up Areas	0.9
Annual Rainfall of Anand District (mm)	773.6
Annual Rainfall of Anand District (m)	0.7736

H. K. Shastri

Dr. Hiteshri Shastri,
PhD (Water Resources, IIT Bombay)
Associate Professor, Civil Engineering