Water-Conscious Building Standards at SRM University-AP

SRM University–AP builds and fits out its buildings to use as little water as practical. Washrooms, taps and kitchens are specified with water-saving fixtures: all 4,059 taps on campus (100 per cent) are low-flow, and 457 of the 486 washrooms (94 per cent) have dual-flush toilets. Water is delivered through hydro-pneumatic pressure systems with no overhead tanks, domestic and flush water run in separate pipelines, 11 rainwater harvesting systems with a combined capacity of 22 m^3 collect roof and run-off water, and wastewater is treated for reuse.

1. Water-Saving Fixture Standards

The university's fixture specification sets a maximum water use for each type of fitting. These are the standards applied when buildings are fitted out.

Fixture	Specification
Toilets	Dual flush: full flush 8 litres, half flush 4 litres
Urinals	Sensor-operated, 0.25 gallon (about 0.95 litre) per flush
Bathroom faucets	0.5 gallon (about 1.9 litres) per minute
Showerheads	2 gallons (about 7.6 litres) per minute
Dishwashing machines	13 litres (3.5 gallons) per wash, with a lower-use option of 2 litres (0.54 gallon) per wash
Flow-limiting fittings	Faucet aerators, pressure regulators, high-pressure jet sprays, pre-rinse sprays and a push-action sink fixture

Toilets and urinals

Toilets are fitted with dual-flush systems that offer a full flush of 8 litres and a half flush of 4 litres. The half flush therefore uses 50 per cent less water than the full flush. The campus audit notes that flush tanks are generally 8 to 10 litres, so every half flush saves 4 to 6 litres compared with a conventional single-flush cistern. Urinals are sensor-based and specified at 0.25 gallon per flush, about 0.95 litre. The sensor flushes the urinal only after use.



Figure 1. Dual-flush plate with separate half half and full flush buttons



Figure 2. Dual-flush toilet

Taps, showers and kitchen fittings

Bathroom faucets are specified at 0.5 gallon per minute, about 1.9 litres per minute, and showerheads at 2 gallons per minute, about 7.6 litres per minute. The specification also lists faucet aerators, pressure regulators, high-pressure jet sprays, pre-rinse sprays and a push-action sink fixture, all which limit flow or shut the water off automatically. Dishwashing machines are specified at 13 litres (3.5 gallons) per wash, with a second, lower-use specification of 2 litres (0.54 gallon) per wash.



Figure 3. Bathroom faucet



Figure 4. Showerhead



Figure 5. Faucet aerator



Figure 6. Faucet aerator (mesh type)



Figure 7. Pressure regulator



Figure 8. High-pressure jet spray



Figure 9. Hose reel with spray nozzle



Figure 10. Pre-rinse spray



Figure 11. Push-action sink

2. How Widely the Standards Are Applied

The standards apply across all the university's main buildings. The university has 486 washrooms in six blocks, of which 240 are male and 246 are female washrooms. Dual-flush toilets are installed in 457 of the 486 washrooms, which is 94 per cent. Every washroom in Homi J Bhabha, Vikram Sarabhai, X-Lab, CV Raman and JC Bose is dual-flush; SR Block has 91 dual-flush washrooms out of 120, which is about 76 per cent.

Block	No. of Washrooms	No. of Dual-flush washrooms
Homi J Bhabha	48	48
Vikram Sarabhai	72	72
X-Lab	24	24
SR Block	120	91
CV Raman Block	192	192
JC Bose Block	30	30
Total	**486**	**457**

For taps, the figures are complete. All 4,059 taps in the campus are fitted with low-flow fixtures, so no conventional tap remains in the count.

3. Efficient Water Distribution

Water consumption is also controlled through the way water is delivered. Raw water, with a supply of 300 kilolitres a day, is drawn from the Krishna River (through CRDA) into an underground cement tank, treated in the campus water treatment plants, and used for utensil cleaning, bathing and cloth washing. Drinking water is produced separately in a reverse-osmosis plant and offered through hot and normal water dispensers.

All water pumping runs on hydro-pneumatic systems, and each pump has a standby unit controlled by a pressure controller with a variable frequency drive. The campus has no overhead tanks, which removes the overflow and leakage losses that overhead storage tends to cause and reduces maintenance. Storage tanks are cleaned once a month, and wastewater from the water treatment tanks, including the tank serving the Annapurna Mess, is directed to the sewage treatment plant or the garden.

4. Plumbing Network: Separate Domestic and Flush Lines

The campus plumbing is laid out phase by phase on plumbing drawings that show every water line, treatment plant and block connection. Domestic water and flush water run in separate pipelines to the hostel towers, the admin and academic blocks and the gardens, so flushing and garden demand are served separately from the domestic supply. The plumbing drawings for Phase 1, Phase 2 and Phase 3 are provided separately.

Phase 1 pipe sizes and lengths

In Phase 1 the domestic line is 110 mm, and the flush line is 90 mm. Both run from the Utility building to the head valves of each building group over the same lengths, and a garden flush line is laid in addition.

Run from Utility	Domestic line (110 mm)	Flush line (90 mm)
To Tower-3 head valves	180 m	180 m
To Tower-4 and Tower-5 head valves	275 m	275 m
To Admin and Academic head valves	200 m	200 m
Garden flush line	-	275 m
Total	**655 m**	**930 m**

Water lines marked on the Phase 1 drawing

- **Admin, Academic and Canteen** domestic water line.
- **Boys hostel (T1, T2, T3)** domestic water line, and **girls hostel (T4, T5)** domestic water line.
- **PT plant to Utility** raw water line, and **WTP-3 to Utility** final water line.
- **T4 to Canteen** domestic water line.
- **Flush water line** serving the hostels, academic and admin blocks and the garden.

Treatment units and lines on the Phase 1, 2 and 3 drawings

Phase	Treatment units marked	Water lines marked
Phase 1	WTP-1, STP-1, 1500 LPH RO and 3000 LPH RO plants, WTP-3 with collection tank	Domestic lines to the admin, academic, canteen and hostel blocks, flush line, PT plant raw water line to Utility, WTP-3 final water line
Phase 2 and 3	WTP-2 with 4000 LPH RO plant, WTP-4, STP-2, collection tank	Raw water line to Vedavathi hostel, STP water line, domestic water lines to Ganga, Sarvepalli Radhakrishnan Block, C.V. Raman Block, food court and kiosks, PT plant to WTP-2 raw water line

The Phase 2 and 3 drawings also mark separate domestic (D) and flush (F) connection points for the blocks, for example SR-D and SR-F at the SR Block, G-D and G-F at Ganga hostel, and CV-D and CV-F at the C.V. Raman Block.

5. Rainwater Harvesting and Run-off Management

Rainwater is treated as a resource in building design. The campus has 11 rainwater harvesting systems with a combined capacity of 22 m^3. Roofs are arranged to collect rainwater, which passes through a piping system to harvesting pits close to each

building, where it recharges groundwater. Run-off from common areas and roads is collected and routed to a nearby water body, and some paved areas are laid with grass joints that let rain soak into the ground (Figure 14). The audit team appreciated the efforts of the management in harvesting rainwater in almost all buildings.



Figure 12. Campus walkway with a pit cover beside a planted bed

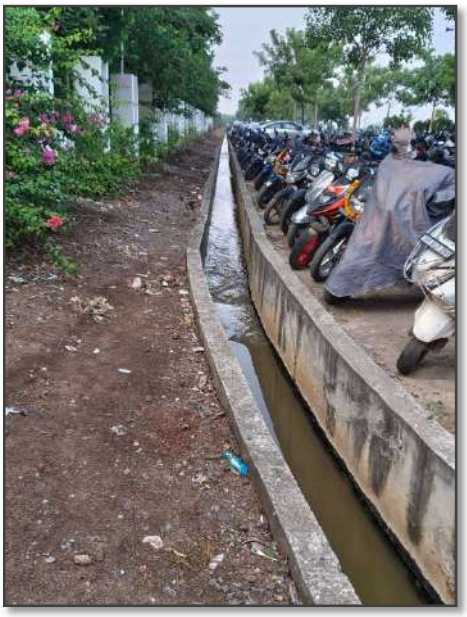
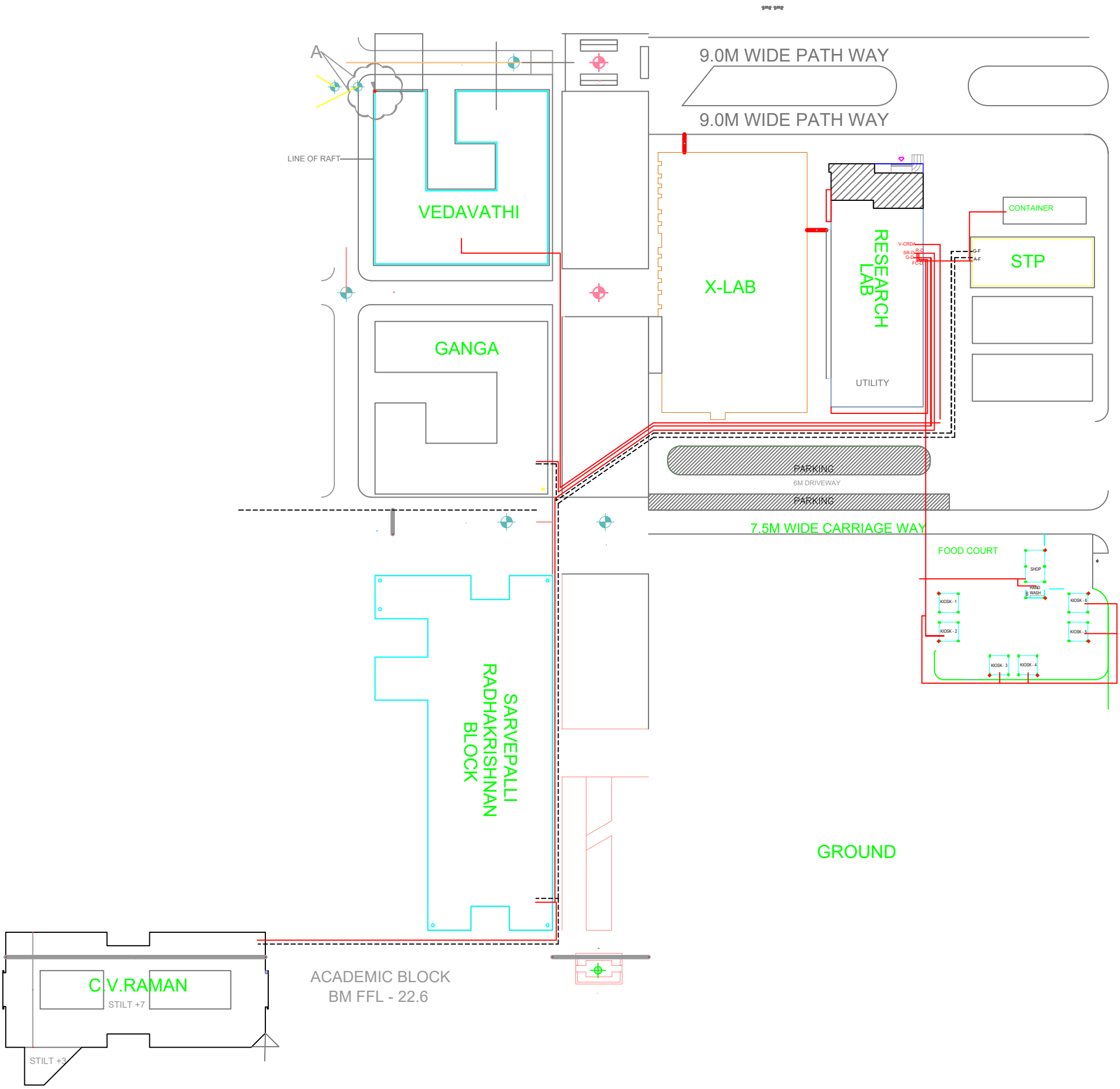


Figure 13. Concrete channel that carries surface run-off beside the parking area

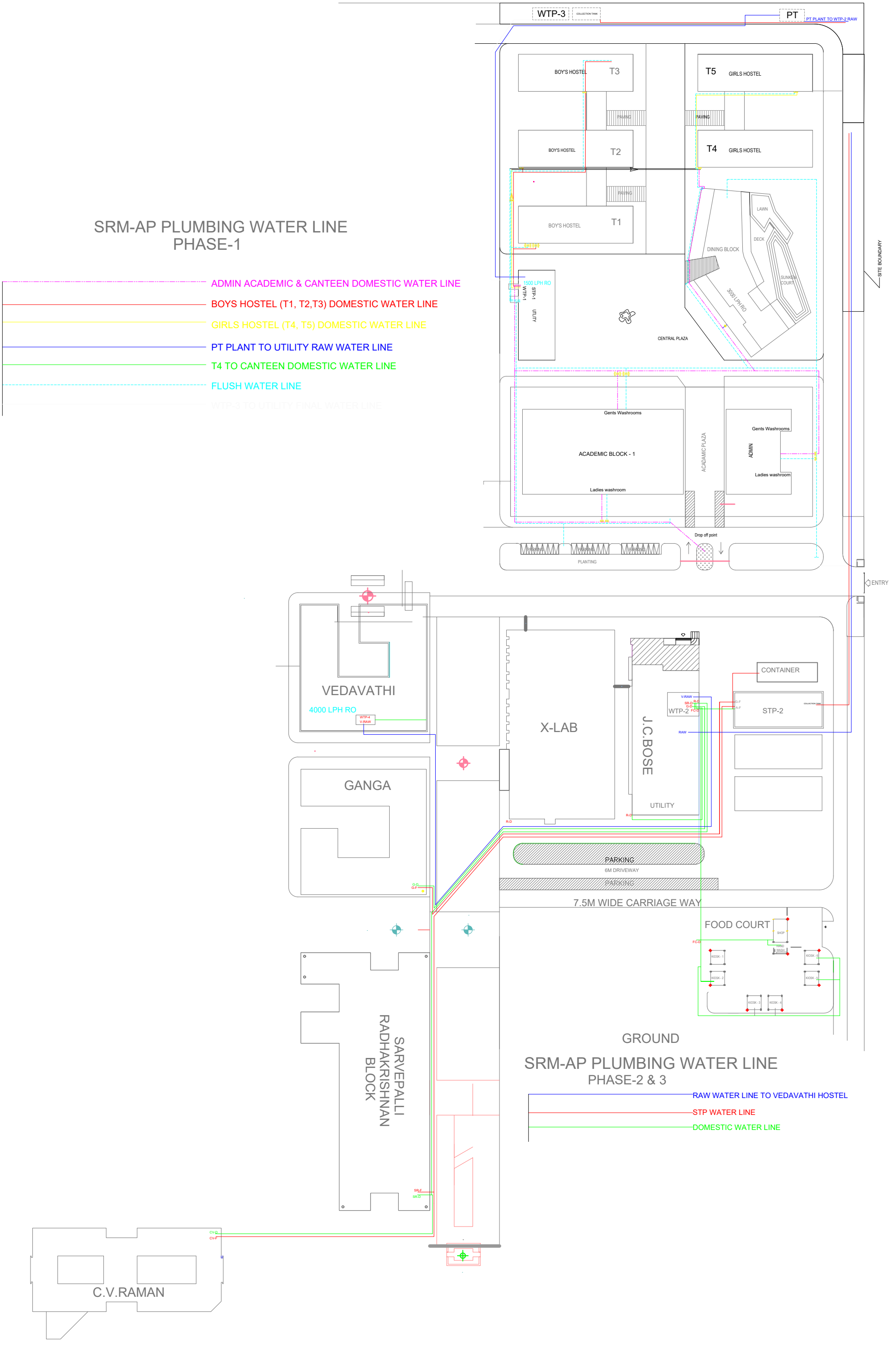


Figure 14. Rainwater collecting pit in the grass-paved area of the campus


A
9.0M WIDE PATH WAY
9.0M WIDE PATH WAY
LINE OF RAFT
VEDAVATHI
X-LAB
RESEARCH LAB
UTILITY
CONTAINER
STP
V-CRDA
SR-D
G-F
A-F
FCR
GANGA
PARKING
6M DRIVEWAY
PARKING
7.5M WIDE CARRIAGE WAY
FOOD COURT
SHOP
HAND WASH
KIOSK - 1
KIOSK - 2
KIOSK - 3
KIOSK - 4
KIOSK - 5
KIOSK - 6
SARVEPALLI RADHAKRISHNAN BLOCK
GROUND
C.V.RAMAN
STILT +7
STILT +3
ACADEMIC BLOCK
BM FFL - 22.6

SRM-AP PLUMBING WATER LINE
PHASE-1

- ADMIN ACADEMIC & CANTEEN DOMESTIC WATER LINE
- BOYS HOSTEL (T1, T2,T3) DOMESTIC WATER LINE
- GIRLS HOSTEL (T4, T5) DOMESTIC WATER LINE
- PT PLANT TO UTILITY RAW WATER LINE
- T4 TO CANTEEN DOMESTIC WATER LINE
- FLUSH WATER LINE
- WTP-3 TO UTILITY FINAL WATER LINE



GROUND

SRM-AP PLUMBING WATER LINE
PHASE-2 & 3

- RAW WATER LINE TO VEDAVATHI HOSTEL
- STP WATER LINE
- DOMESTIC WATER LINE

Utility to Tower-3 head valves- 180meters(Domestic)

Utility to Tower-3 head valves- 180meters(Flush)

Utility to Tower-4&5 head valves- 275meters(Domestic)

Utility to Tower-4&5 head valves- 275meters(Flush)

Utility to Admin & Academic head valves-200meters(Domestic)

Utility to Admin & Academic head valves-200meters(Flush)

Garden flush Line 275meters

Domestic line 110mm

Flush line 90mm

SRM-AP PLUMBING WATER LINE PHASE-1

