

**EMPANELMENT OF FIRMS/ INSTITUTIONS / NGO'S /INDIVIDUALS
FOR CONSTRUCTION OF ARTIFICIAL RAIN WATER RECHARGING
STRUCTURES IN PUNJAB**



DSWC | Department of Soil & Water
Conservation, Punjab

DEPARTMENT OF SOIL AND WATER CONSERVATION, PUNJAB

O/o Chief Conservator of Soils, Punjab

SCO: 50-51, Sector: 17-E, Chandigarh

Tel Nos: 0172-2704857, 2716158

Email: dswcpunjab@gmail.com Website: <http://dswcpunjab.gov.in>

Form Fee: 1000/-**Earnest Money Deposit: 50,000/-****Bid Document No : DSWC/RWH-R/.....****Issued To :****Dated :****DISCLAIMER****Kindly Note:**

1. This document is not transferable
2. Though adequate care has been taken for preparation of this document, the bidder shall satisfy himself that the document is complete in all respects. Intimation of any discrepancy shall be given to this office immediately. If no intimation is received from any bidder within five days from the date of issue of the bid document, it shall be considered that bid document is complete in all respects and has been received by the bidder.
3. The Department of Soil and Water Conservation, Punjab(DSWC) reserves the right to modify, amend or supplement this bid document keeping in view the necessity in implementation of the scheme.
4. While the bid has been prepared in good faith, neither DSWC nor their employees or advisors make any representation, warranty, express or implied or accept any responsibility or liability, whatsoever, in respect of any statements or omissions herein, or the accuracy, completeness or reliability of information, and shall incur no liability under any law, statute, rules or regulations as to the accuracy, reliability and completeness of this bid document, even if any loss or damage is caused by any act or omission on their part.
5. The decision of Chief Conservator of Soils, Punjab shall be final in case of any dispute arising out of interpretation of the bid document.
6. In case of any clarification required regarding this tender, please contact O/o Chief Conservator of Soils, Punjab.

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CHAPTER – I

INSTRUCTIONS TO

BIDDERS

Government of Punjab

DEPARTMENT OF SOIL AND WATER CONSERVATION, PUNJAB

O/o Chief Conservator of Soils, Punjab

SCO 50-51, Sector 17-E, Chandigarh-160017.

Phone: 0172-2704857, 2716158, 2777094. Fax: 0172-2725330.

Website: <http://dswcpunjab.gov.in>, E-mail: dswcpunjab@gmail.com

Notice Inviting Tender, No.– DSWC/RWH/3-2019

The Department of Soil and Water Conservation Punjab implements number of schemes/ projects for water conservation and management in the state. In pursuance of this objective, Chief Conservator of Soils, Punjab invites bidders for work as per following :

Name of the Work	Fee Details	Schedule Details
Empanelment of Firms for Surveying, Planning, Designing, Executing and commissioning of Rain Water Harvesting-cum-Recharging Projects with material etc complete in all respects with 2 year maintenance anywhere in Punjab state.	<ul style="list-style-type: none"> ▪ Form Fee: ₹ 1000.00 ▪ Earnest Money Deposit: ₹ 0.50 lakh 	<ul style="list-style-type: none"> ▪ Date from which Bid document shall be provided to the bidders 23.7.2019 3.00 AM The empanelment shall remain open throughout the year, subject to meeting of terms and conditions by firms

Any clarifications/amendments/corrigenda etc., to NIT will only be available on our website: <http://dswcpunjab.gov.in>. Therefore bidders are advised to keep visiting our website.

Dated: 16.7.2019

Chief Conservator of Soils, Punjab

1. Submission of Bid: Bids should be submitted in sealed envelopes in two Parts separately, i.e. "Technical bid" and "Financial bid". Both the parts should be further sealed in an envelope super-scribing NIT No and name of work, due date for opening, bidders name & address. The tender duly filled in may be sent to O/o Chief Conservator of Soils, Punjab either by post or hand at Technical Branch O/o Chief Conservator of Soils, Punjab after ensuring that due entries are made in the register kept at the counter.
2. It should not be handed over to any employee of the department. No tender shall be accepted later than the time schedule specified above.
3. The empanelment shall be open throughout the year, and interested can submit documents at O/o Chief Conservator of Soils, Punjab. The empanelment shall however be carried out subject to meeting requisite criteria as provided in this bid document.
4. The Earnest Money Deposit shall have to be submitted vide Cheque or Demand Draft in favour of Chief Conservator of Soils, Punjab payable at Chandigarh.
5. The bids without requisite fee and documents shall be rejected
6. Technical bid is enclosed as Part - I. Supporting Documentary proof is required to be submitted for each of claim made by bidder
7. Financial Bid is enclosed as Part – II. Supporting Documents are documents are required to be submitted

Part-'I'

Technical Bid: In this bid, the bidder should submit

S.No.	Particulars (Documentary Proof Required to be submitted)
General Qualification Criteria	
a.	Proof of Nature of Firm (Individual/Partnership/Joint Venture/Consortium/Pvt Ltd//Ltd/Public sector) Registration Certificate of the firm/contractor as the case may be
b.	Permanent Account Number (PAN) of Bidder
c.	Registration under Goods and Service Tax (GST) by bidder
d.	Income tax returns for last three financial years.
Technical Qualification Criteria	
e.	Bidder should have completed undertaken Artificial Rain water Harvesting work amounting to Rs 15.00 lakh under during last 3 years.
f.	List of Statement of works completed/ in hand along with the value of unfinished work during last 3 years clearly stating completed/in hand projects.
g.	Proof of List of works executed and/or in progress with agreement cost. Copies of supply orders, completion certificates issued by their clients. Certificates signed by concerned office under whom the works were undertaken needs to be attached.
h.	List of plant, machinery and tools in possession –owned and leased
i.	Technical staff available on permanent and temporary basis with bidder
j.	Statutory Undertaking by Bidder (Annexure – 'A')

Part – 'II'

Financial Bid: In this bid, the bidder should submit

S.No.	Particulars (Documentary Proof Required to be submitted)
General Qualification Criteria	
a.	Designs for Rain water Recharging Structures for different aquifer depth and soil strata
b.	Rates for Each Particular Design
c.	Item wise Rate of each component
d.	Photographs of Structures already installed by bidder -10 nos

Annexure – 'A'

Statutory Declaration by Bidder (On Non Judicial Paper)

We, the undersigned, declare that:

- 1 I/We have examined and have no reservations to the Bidding Documents, including Addenda issued in accordance with Instruction to Bidders (ITB) and Empanelment Terms;
- 2 I/We offer to execute in conformity with the bidding Documents the following Work/s: Construction of Rooftop Rainwater Harvesting/Recharging Structures at Various Locations in Punjab State including with a Defect Liability Period of Two Years.
- 3 I/We understand that the scope of work involves surveying, planning, designing, execution, commissioning and maintenance of rain water recharging structures.
- 4 I/We understand that works can be implemented through Government schemes or by individual citizens at their own level.
- 5 I/We will follow rain water recharging guidelines/instructions issued by Central Ground Water Board from time to time.
- 6 I/We will conform to designs of rain water harvesting/recharging structures and rates finalized by department and shall offer and install material as per approved specifications only.
- 7 I/We shall submit monthly report of all rain water recharging structures installed anywhere, across the state to the department within first seven days of next month.
- 8 I/We understand that all our works are open to scrutiny by department during execution and after commissioning.
- 9 I/We shall install rain water recharging structures only where water quality is absolutely fit for direct injection into ground water.
- 10 I/We will take undertaking from each of our customer as per specimen (Annexure –B) of this bid document.
- 11 We shall abide by all terms, conditions and instructions as circulated by Department or Government from time to time
- 12 That I/we have not been debarred/blacklisted by Govt/Semi Govt/Corporation anywhere in country.

Seal and Signature:

Name.....

Signed in the capacity of.....

Annexure – 'B'

Specimen of Declaration to be taken by Empanelled Firm from each Individual/Institute/Organization etc wherein Rainwater Recharging Structure has been installed.

I/We (Name of Individual/Institute/Organization) have installed Rainwater Recharging Structure at (Address) for an area covering sq meters, which has been installed by (Name of Firm) and declare as under:

1. I/we shall ensure that area from where rainwater is being recharged into ground is cleaned at regular intervals so that no contaminants/debris is being put in to ground aquifers.
2. I/We shall ensure that only water fit for recharge is being recharged into ground water aquifer.
3. I/We shall take all precautionary measure in order to check recharge of contaminated water into ground.
4. I/We fully understand that punitive action can be taken against me/us by competent authorities, in case recharge structure is found to be contaminating ground water.
5. I/We shall ensure proper working and maintenance of recharging structure and shall follow maintenance schedule/manual provided by vendor.
6. I/We will abide by all instructions and guidelines available on <http://cgwb.gov.in>. (Central Ground Water Board portal) for artificial ground water recharging

Signature of Customer

Countersigned by Vendor.....

CHAPTER – II

EMPANEMENT -TERMS

3.1. Period of Empanelment

- Individual/Partnership/Joint Venture/Consortium/Pvt Ltd//Ltd/Public sector will be empanelled for Construction of Rain Water Harvesting-cum-Recharging structures for a period of 2 years.

3.2 Scope of Work

- The empanelled firms can implement rain water harvesting-cum-recharging work either awarded by Government departments or by individuals, institutes organizations etc.
- Mainly rooftop rain water harvesting/recharging projects shall be implemented by empanelled firms for individuals/private institutes or organizations. State Govt departments can however ask the empanelled firms to execute recharging works at other sites wherein water quality is determined as fit for recharge.
- The empanelment shall be valid in jurisdiction of Punjab state

3.3 Publicity

- The department will advertise list of empanelled firms for rain water recharging in leading newspapers and on web and other media encouraging citizens to execute work through approved firms.

3.4 Design of Structure

- Central Ground Water Board has approved a number of designs/specifications for rain water harvesting-cum-recharging, which shall have to be followed .
- Site specific changes such as length of conduits, size of chambers etc can be made, justification of which has to be duly recorded
- The depth of borewell shall have to be determined according to pre and post monsoon water level.
- Recharge structure or storage tank should not be located close to a source of contamination, such as a septic tank etc.
- A storage tank must be located on a lower level than the roof to ensure that it fills completely.
- A rainwater system must include installation of an overflow pipe which empties into a non-flooding area. Excess water may also be used for recharging the aquifer through dug well or abandoned hand pump or tubewell etc.
- Storage/Filtration tanks should be accessible for cleaning.
- The inlet into the Storage tank should be screened in such way that these can be cleaned regularly.

- Cost benefit ratio must be kept in mind while designing any rain water recharging structure.
- Approved designs of Central Ground Water Board are annexed with document for reference; however each participating bidder shall have to submit its design/s along with this bid which should be in accordance with designs of Central Ground Water Board.

3.5 Provision of Water flow Meter

- Water flow meter to measure the volume of water being recharged has to be installed at each rain water recharging site.
- The water flow meter of only approved specification by department shall be installed by empanelled firms

3.6 Adherence to Norms

- The empanelled firms shall adhere to norms/ instructions of Central Ground Water Board and as provided in this bid document.
- The empanelled firms shall execute works as per rain water harvesting-cum-recharging structures designs approved by department
- The empanelled firms shall implement rain water recharging work at rates approved by the department, which are valid for a period of one year from date of empanelment. The rates shall be reviewed after one year.
- The empanelled firms shall offer and install material as per approved specifications only both in case of Government and Private work.
- The officers/officials of department shall carry out random checks of rain water harvesting and recharging structures during installation and after installation.

3.7 Taxes, Levies Duties etc

- The rates submitted by bidders shall have to be inclusive of all Central and State Govt taxes, GST, duties, cess etc.
- The empanelled firm shall have to pass on benefit to end consumer in case of lowering of any tax, duty, cess etc by Government however no escalation of rate within a period of one year from date of empanelment shall be allowed under any circumstances.

3.8 Agreement and Performance Guarantee

- The firm whose bid is accepted shall have to sign a formal agreement with the department.

- The empanelled firm shall have to submit a performance guarantee of 2.5 lakh in form of cash through Demand Draft or Bank Guarantee in favour of Chief Conservator of Soils, Punjab.
- The performance guarantee shall be revoked and empanelment terminated in case of breach of conditions of this bid document or any instructions/guidelines issued by concerned authorities of Centre/State authorities.

3.9 Operation and Maintenance

- The firm executing the work will ensure that work has been carried out in a professional manner
- The firm shall monitor each of work implemented at regular intervals.
- The firm executing the work shall provide free service for 2 years in case of any manufacturing/installation defect.

3.10 Submission of Reports

- Each firm shall have to submit on monthly basis the list of rain water harvesting structures installed with GPS coordinates.
- Quarterly report on working of rain water recharging units installed by particular firms shall have to be submitted.
- The bidder shall have to inform local sub-divisional office of department before or during execution of recharging project and shall incorporate any technical advice given by department in structure.
- Photographs of completed works may also be submitted at quarterly intervals

3.11 Maintenance Manual

- The firm executing the work shall prepare and distribute a maintenance manual printed in both English and Punjabi language to all citizens/departments/institutes etc, wherein rain water recharging structures have been installed.
- The manual should contain maintenance schedule, precautions and other operation related issues of recharging structures.

CHAPTER –III

IMPLEMENTATION OF ARTIFICIAL RECHARGE SCHEMES

3.1 Guidelines on Artificial Recharging

Central Ground Water Board has published a 'Manual on Artificial Recharge of Ground Water', providing detailed guidelines on investigative techniques for selection of sites, planning and design of artificial recharge structures, monitoring and economic evaluation of artificial recharge schemes. The set of guidelines and instructions brought out by Central Ground Water Board for ground water recharge are:

1. Manual on Artificial Recharge of Ground Water (1994).
2. National Perspective Plan for Recharge to Ground Water by Utilizing Surplus Monsoon Runoff (1996)
3. Guide on Artificial Recharge to Ground Water (1998)
4. Guide on Artificial Recharge to Ground Water (2000) 5) Master Plan for Artificial Recharge to Ground Water (2002).
5. Manual on Artificial Recharge of Ground Water (2007)

The empanelled vendor shall have to follow all instructions/guidelines of Central Ground Water Board for installation of recharging structures

3.2 Water Source for Recharging

Availability of source water is one of the basic prerequisites for taking up any artificial recharge scheme. The source water available for artificial recharge could be of the following types:

- i) In-situ precipitation on the roof area.
- ii) Nearby stream/ spring / aquifer system.
- iii) Surface water (canal) supplies from reservoirs.

The physical, chemical and biological quality of the recharge water affects the planning and selection of recharge method. Physical quality of recharge water refers to the type and amount of suspended solids, temperature, and the amount of entrapped air whereas chemical quality refers to type and concentration of dissolved solids and gases. Biological quality refers to type and concentration of living organisms. Under certain conditions, any or all of these characteristics can diminish recharge rates. The following must be adhered to while executing recharging project

Physical: Where suspended solid loads in recharge water are high, subsurface application techniques, including deep pits, shafts, and wells, are prone to failure. Unless pretreatment measures are provided, subsurface techniques should not be considered when the source water is turbid because clogging of injection wells is particularly troublesome.

Chemical: Toxic substances in excess of established health standards must not be present in the recharge water unless they can be removed by pre-treatment or chemically decomposed

by a suitable land or aquifer treatment system. If artificial recharge is for drinking purpose, then the source water must conform to the drinking water standards in vogue

Biological: Growth of algae and bacteria during recharge can cause clogging of infiltration surfaces and may lead to the production of gases that further hinder recharge efforts. If treated water is to be used for direct recharge, secondary treatment should be followed by chemical clarification (coagulation-flocculation-clarification). The water is then allowed to pass through adequate filter beds. The filtration is followed by tertiary treatment involving air tripping, granular activated carbon treatment, reverse osmosis and disinfection, in that order. In case it is not possible to ensure the desired quality standard from the treatment, such source(s) may be avoided for recharging the ground water.

3.3 Soil Hydrological Properties

Information of hydrological properties of soil are important before designing any recharging project. The available water and rate of infiltration shall help in proper designing of structure. The infiltration rates for various types of soil are

S. No	Class	Rates / hr in		Remarks
		Inches	Millimeters	
1	Very Low	Below 0.1	Below 2.5	Highly clayey soils
2	Low	0.1 - 0.5	2.5 - 12.5	Shallow soils, clay soils, soils low in organic matter
3	Medium	0.5 - 1.0	12.5 - 25.0	Sandy loams, silt loams
4	High	Above 1.0	Above 25.0	Deep sands, well aggregated soil

3.4 Estimation of Sub-surface Storage Capacity of Aquifers

The scope for artificial recharge in an area is basically governed by the thickness of unsaturated material available above the water table in the unconfined aquifer. Depth to water level, therefore, provides the reference level to calculate the volume of unsaturated material available for recharge. Depth to water level recorded during post-monsoon period is used for the purpose as areas where the natural recharge is not enough to compensate the ground water withdrawal, can be easily identified using the water level data. The average water levels for a period of at least 5 years is to be used in order to nullify the effects of variation in rainfall. After assessing the subsurface storage space, the actual requirement of source water is to be estimated. Based on the experience gained from field experiments, the average recharge efficiency of the individual structure is to be specified (say 60-90%). To arrive at the total volume of actual source water required at the surface, the volume of water

required for artificial recharge is calculated by multiplying the volume of subsurface storage space with the reciprocal of recharge efficiency of the structure proposed.

3.5 Computation of Peak Flow from Roof

Rainfall Intensity mm/hr for 20 min	50 (min.)	100 (min.)	150 (min.)	200(min.)
Roof top area sq m	Peak flow in litres/s (lps)			
20	0.28	0.56	0.83	1.11
30	0.42	0.83	1.25	1.67
40	0.56	1.11	1.67	2.22
50	0.69	1.39	2.08	2.78
60	0.83	1.67	2.50	3.33
70	0.97	1.94	2.92	3.89
80	1.11	2.22	3.33	4.44
100	1.39	2.78	4.17	5.55
200	2.78	5.56	8.33	11.11
500	6.95	13.89	20.83	27.78
1000	13.92	27.78	41.67	55.55

3.6 Data Sheet for Designing Rainwater Harvesting System

	Type of buildings	
a.	Residential	
b.	Commercial	
c.	Industrial	
d.	Park	
e.	Open Area	
	Layout plan of the building	
a.	Roof top area	
b.	Paved area	
c.	Open area	
	Water Availability	
a.	Rainfall (Data on daily basis for two years)	
b.	Rain fall intensity	
c.	Number of rainy days	
d.	Height of roof	
	Water withdrawal	
a.	Number of tube wells	
b.	Discharge	
c.	Number of hrs operated per day	
	Quality of source water:	
	Number and locations	
a.	Tube wells	
b.	Bore wells	

c.	Hand pumps	
	Type of roof:	
a.	Flat roof	
b.	Sloping roof	
c.	Rainwater disposal system	
d.	Drain pipes	
	i. Up to ground	
	ii. Above ground	
e.	If Sloping roof	
	i. Gutters	
	ii. Size of gutter	
	Type of drain pipes	
a.	G1	
b.	Cement	
c.	PVC	
d.	Others	
	Hydro geological settings	
a.	Depth to water level	
b.	Geological formation water bearing strata and water bearing formation	
c.	Type of soil	
d.	Depth of clay bands/clay	
e.	Depth of tube wells	
f.	Present discharge of tube wells	
g.	Assembly chart of tube wells	
h.	Hydraulic conductivity	
i.	Specific yield of aquifer	
j.	Storage capacity of aquifer	
k.	Ground water flow pattern	
l.	Thickness of soil cover	
m.	Infiltration rate of	
	i. Soil	
	ii. Aquifer	
	Any other information such as:	
a.	Problems due to submergence area and location	
b.	Rainwater coming from adjoining area	
c.	Lack of storm water drains	
d.	Decline/failure of tube wells	
e.	Tube wells started giving saline or bad quality of water.	

3.8 Type of Rain Water Harvesting/ Recharging Structures

The bidders shall have to submit designs and rates for following type of structures

1. **Water Harvesting for Reuse only:** Such structures shall be constructed for harvesting of rain water and reuse. Appropriate storage and reuse facilities shall have to be provided in design along with rates as per water availability
2. **Water Harvesting-cum- Recharging Structures:** These structures shall have provision for storing and reuse of water plus structure for recharging of water. Appropriate storage plus reuse facilities and recharging infrastructure shall have to be provided in design along with rates as per water availability.
3. **Ground Water Recharging Structures:** These structures shall have provision for ground recharge of water. Appropriate designs and rates as per soil strata of major regions of state shall have to be provided.
4. **Any other type of Structure Design:** In case the participating bidder, desires to submit any other design for water harvesting or recharging for purpose stated than above, he is welcome to submit such designs.

The cost models to be submitted must adhere to cost norms as approved by department. In case of any Non Schedule Items justification of rates must be submitted alongwith.

CHAPTER –IV

REFERENCE DESIGNS OF STRUCTURES BY CENTREAL GROUND WATER BOARD

Technical design of Roof Top Rain Water Harvesting and Artificial Recharge to Ground Water

A. Trench without Recharge well

Roof Top Area (Sq. m)	Highest Rainfall intensity (mtr/ hourly)	Run-off Coefficient	Runoff/hr (cu. m)	Annual Runoff (cu. m)	Size of recharge Structure (mtr)
a	b	c	$d(a \times b \times c)$	$e(a \times 0.54 \times c)$	$L \times B \times H$
100	0.025	0.8	2.0	43.20	1.2X1.2X1.4
200	0.025	0.8	4.0	86.40	1.8X1.5X1.5
300	0.025	0.8	6.0	129.6	2.4X1.8X1.4
400	0.025	0.8	8.0	172.8	2.7X2.1X1.4
500	0.025	0.8	10.0	216	3.3X2.1X1.5

Note: Normal rainfall in Delhi: 611 mm,

Normal monsoon rainfall: 540 mm

Points to be taken into consideration for implementation of the above structures:

1. Valid for buildings without basements (Cellar) and for areas for alluvial formation where ground water level is more than 5 meter upto 15 meter below ground level. Buildings with basements should adopt rain water harvesting through storage tank.
2. Only the rain water from the roof top area has to be diverted to recharge structure through connection of down pipe.
3. Before the onset of the monsoon all the catchment area (roof top) considered for recharge is to be cleaned. The recharge structures are to be in operation during the monsoon season only so as to avoid any contamination.
4. A mesh should be provided at the roof so that leaves or any other solid waste/debris is prevented from entering the pit. By-pass arrangement be provided before the collection chamber to reject the first showers.
5. The depth of the inlet pipe should be within 10 cm below ground level for easy overflow through outlet pipe that has to be connected to storm water drain.
6. Based on site condition length and breadth of the recharge chamber may be altered keeping its volumetric capacity the same.
7. RCC slab thickness and reinforcement shall be dependent on structural loads. Access manhole frame and covers to be provided.
8. Filter media of 1.0 meter thick will be in three layers comprising of 0.4 meter thick layer of boulders (5-20cm) at the bottom, 0.3 meter thick layer of gravels (5-10cm) in the middle and 0.3 meter thick layer of coarse sand (1.5-2.0mm) at the top so that the silt content that will come with runoff will be deposited on the top and can easily be removed.
9. A 10 cm thick layer of pea gravels will be provided over the coarse sand layer of the filter media.

10. Prior to monsoon season the top most sand layer in the pit may be scrapped and replaces with the fresh and cleaned coarse sand.

11. Recharge chambers shall be checked and cleaned at 7 days interval or more frequently during rainy season.

B. Trench with Recharge well

Roof Area (sq. m)	Top (Sq. m)	Highest Rainfall intensity (mtr/ hourly)	Run-off Coefficient	Runoff/hr (cu. m)	Annual Runoff (cu. m)	Size of recharge Structure (mtr)
a	b	c	d	$a \times b \times c$	$a \times 0.54 \times c$	$L \times B \times H$
100	0.025	0.8	2.0	43.20	1.0X0.5X0.5	
200	0.025	0.8	4.0	86.40	1.0X1.0X1.0	
300	0.025	0.8	6.0	129.6	1.0X1.0X1.0	
400	0.025	0.8	8.0	172.8	1.0X1.0X1.0	
500	0.025	0.8	10.0	216	2.0X1.5X1.0	

Points to be taken into consideration for implementation of the above structures:

1. Valid for all buildings and for both alluvial and hard rock formation where ground water level is more than 15 meter below ground level.
2. Only the rain water from the roof top area has to be diverted to recharge structure through connection of down pipe.
3. Before the onset of the monsoon all the catchment area (roof top) considered for recharge is to be cleaned. The recharge structures are to be in operation during the monsoon season only so as to avoid any contamination.
4. A mesh should be provided at the roof so that leaves or any other solid waste/debris is prevented from entering the pit. By-pass arrangement be provided before the collection chamber to reject the first showers.
5. The depth of the inlet pipe should be within 10 cm below ground level for easy overflow through outlet pipe that has to be connected to storm water drain.
6. Based on site condition length and breadth of the recharge chamber may be altered keeping its volumetric capacity the same.
7. RCC slab thickness and reinforcement shall be dependent on structural loads. Access manhole frame and covers to be provided.
8. Filter media of 1.0 meter thick will be in three layers comprising of 0.4 meter thick layer of boulders (5-20cm) at the bottom, 0.3 meter thick layer of gravels (5-10cm) in the middle and 0.3 meter thick layer of coarse sand (1.5-2.0mm) at the top so that the silt content that will come with runoff will be deposited on the top and can easily be removed.
9. A 10 cm thick layer of pea gravels will be provided over the coarse sand layer of the filter media.

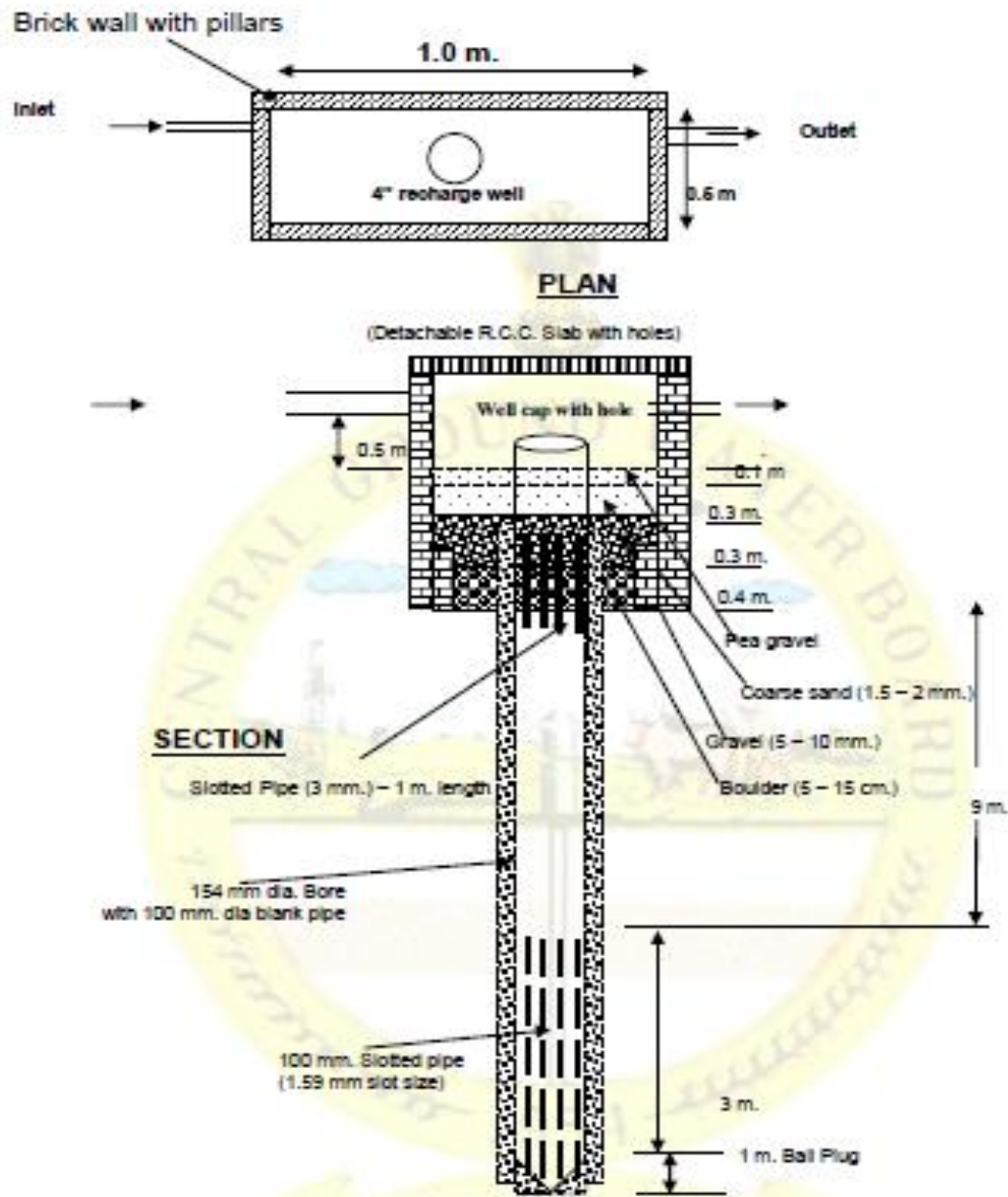
10. Prior to monsoon season the top most sand layer in the pit may be scrapped and replaces with the fresh and cleaned coarse sand.
11. Recharge chambers shall be checked and cleaned at 7 days interval or more frequently during rainy season.
12. Depth of the recharge wells should be kept 2to 3 meter above post monsoon water level and the slotted pipe must be placed against the granular (Sandy or Fracture) zone.
13. On non-acceptance of water by the recharge well, the same may be cleaned using air compressor.

Remarks:

1. Proper & timely maintenance is the key factor for the success of Artificial Recharge.
2. Permission to install various Artificial Recharge structures and Recharge wells is governed by the prevailing rules and laws in the area.



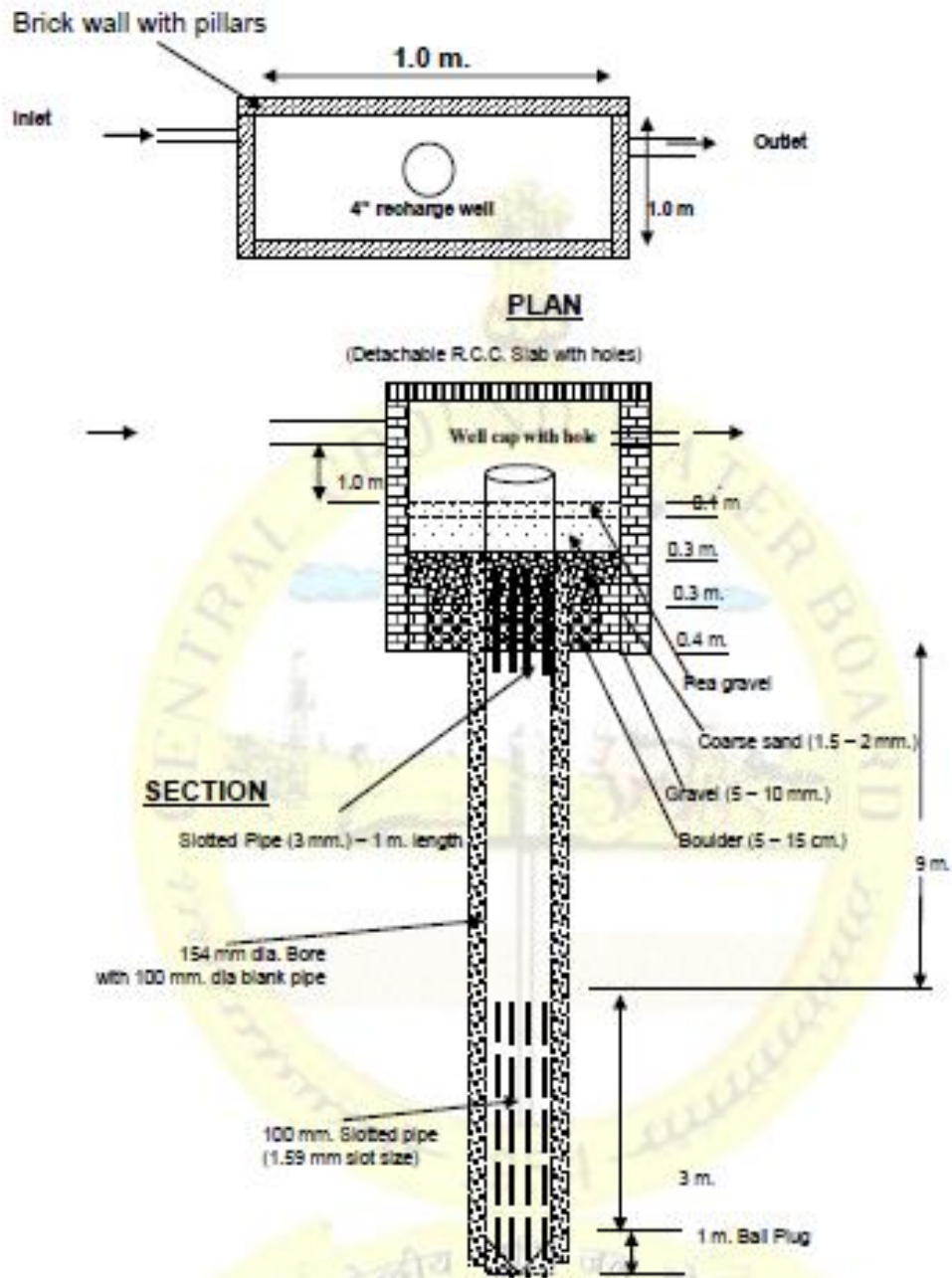
Trench with Recharge well
(Roof top area upto 100 sq. m)



Note:

1. Based on post monsoon depth to water level, the recharge well depth will change and should be kept 2 to 3 meter above post monsoon water level.
2. The design is indicative; the actual design depends on site condition.

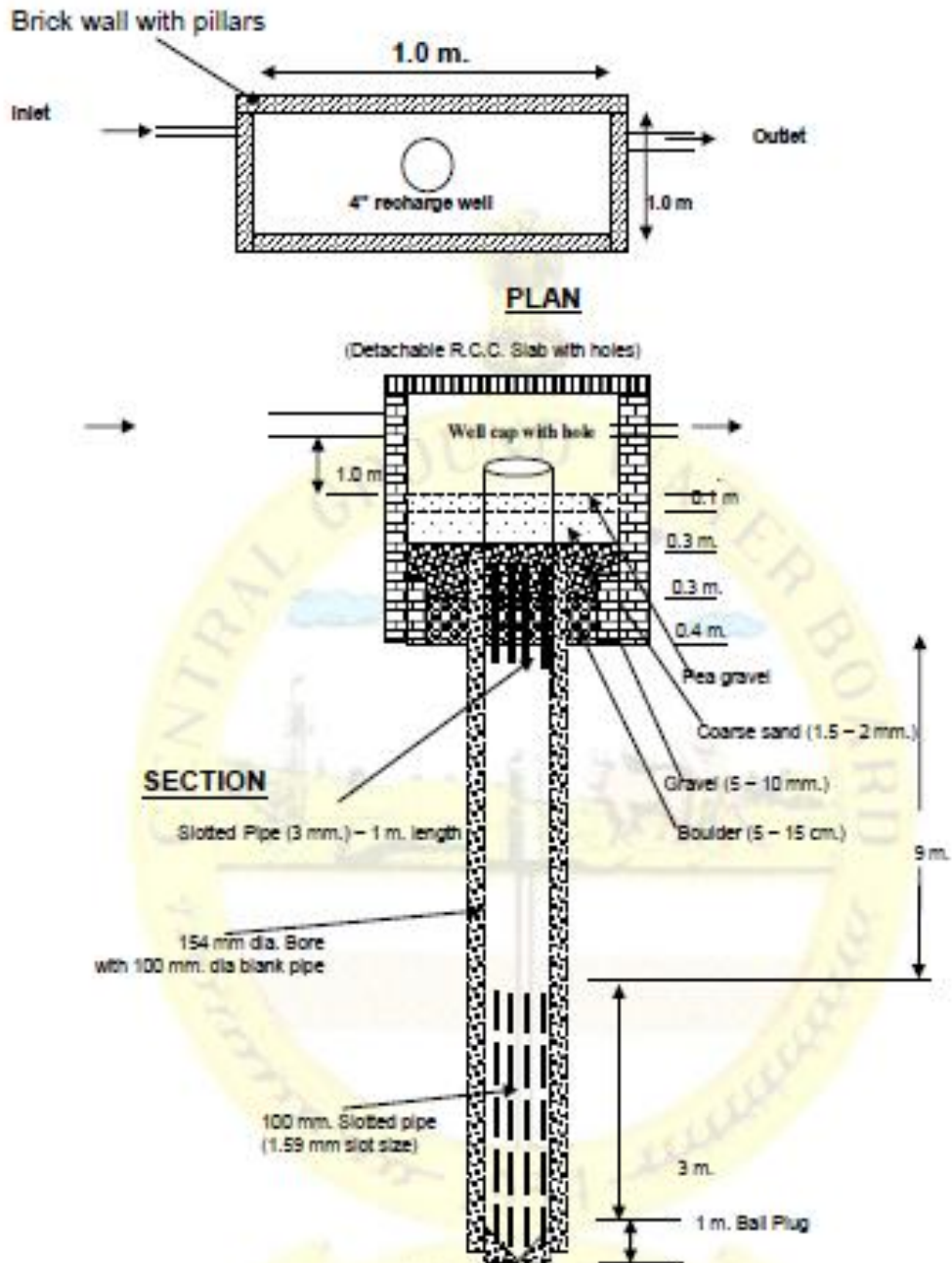
Trench with Recharge well
(Roof top area 100-200 sq. m)



Note:

1. Based on post monsoon depth to water level, the recharge well depth will change and should be kept 2 to 3 meter above post monsoon water level.
2. The design is indicative; the actual design depends on site condition.

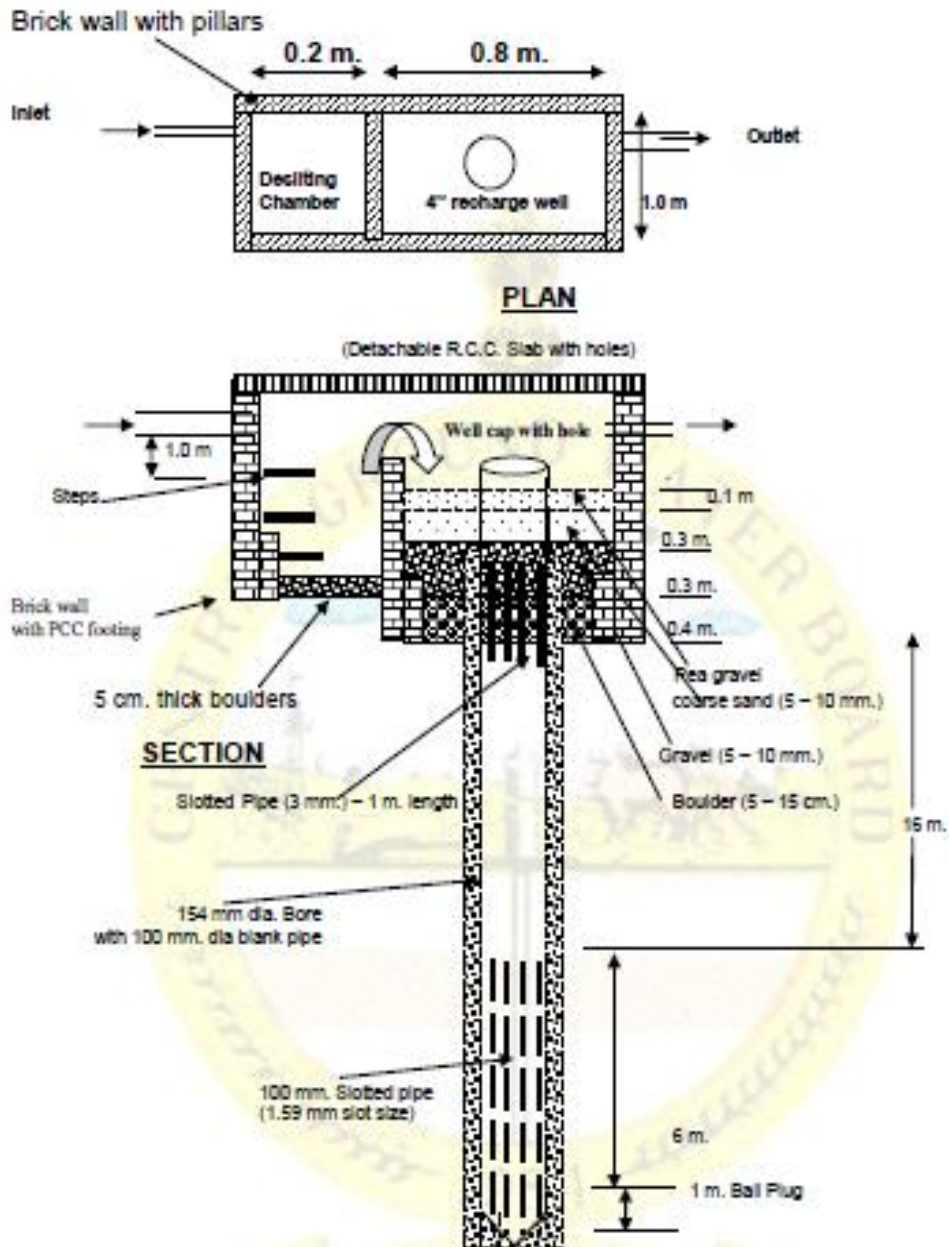
Trench with Recharge well
(Roof top area 200-300 sq. m)



Note:

1. Based on post monsoon depth to water level, the recharge well depth will change and should be kept 2 to 3 meter above post monsoon water level.
2. The design is indicative; the actual design depends on site condition

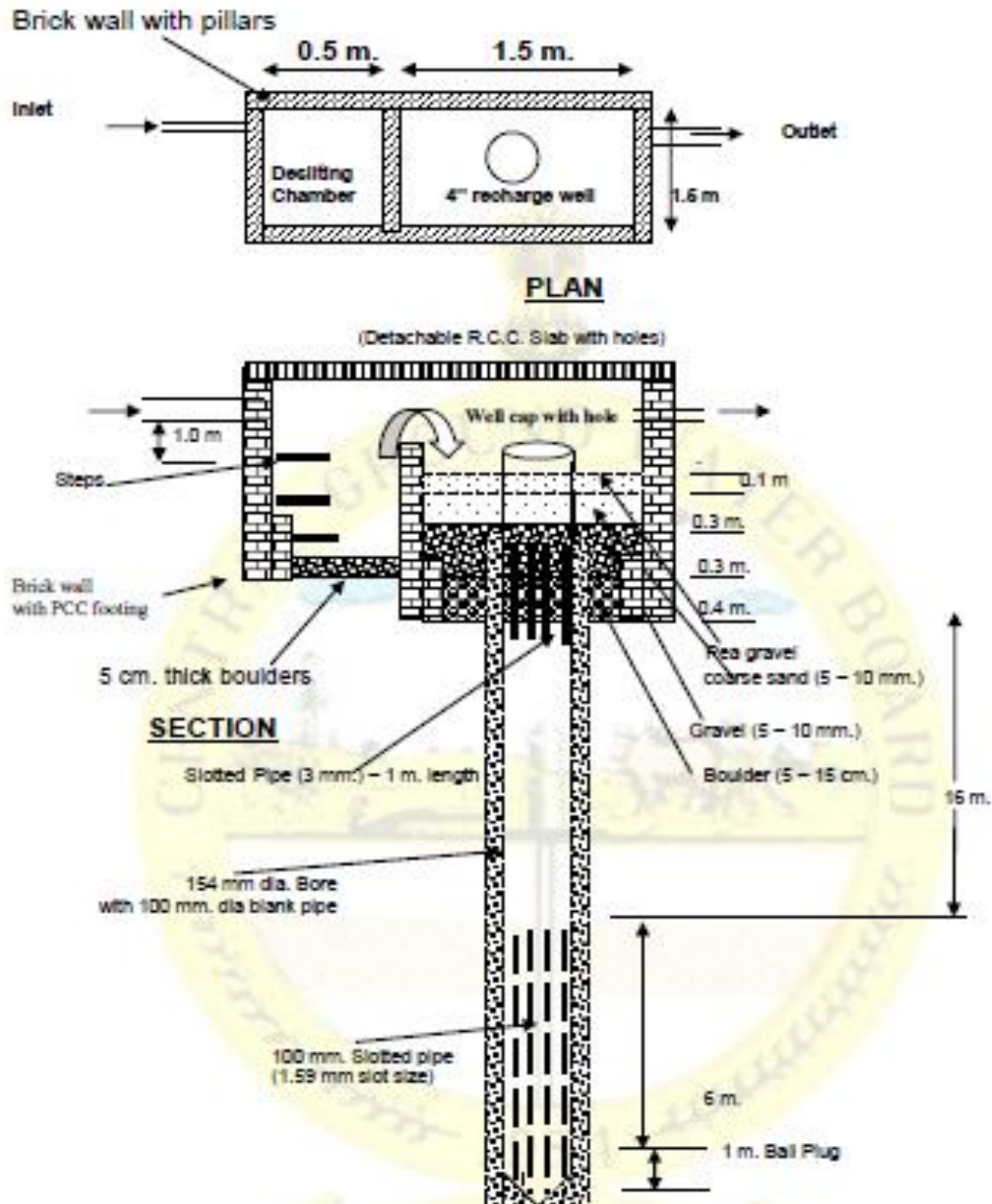
Trench with Recharge well & De-silting Chamber
(Roof top area 300-400 sq. m)



Note:

1. Based on post monsoon depth to water level, the recharge well depth will change and should be kept 2 to 3 meter above post monsoon water level.
2. The design is indicative; the actual design depends on site condition

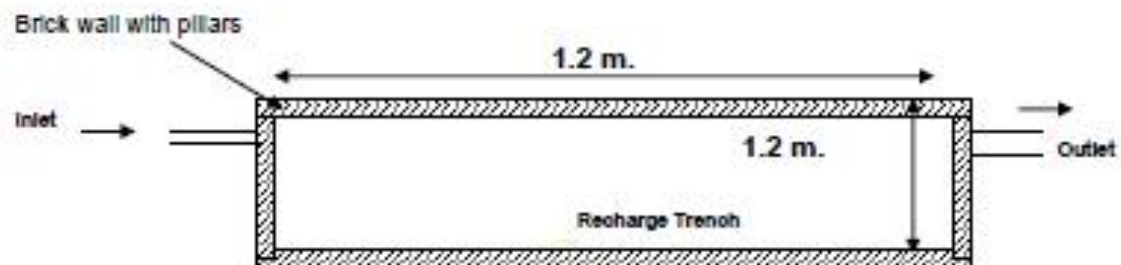
Trench with Recharge well & De-silting Chamber
(Roof top area 400-500 sq. m)



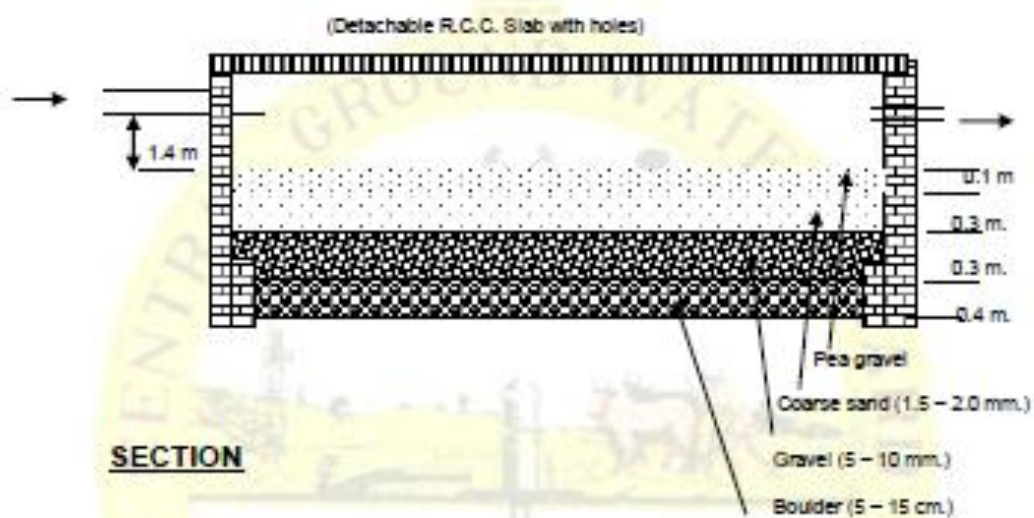
Note:

1. Based on post monsoon depth to water level, the recharge well depth will change and should be kept 2 to 3 meter above post monsoon water level.
2. The design is indicative; the actual design depends on site condition

Recharge Trench (Roof Top area upto 100 sq. m.)



PLAN



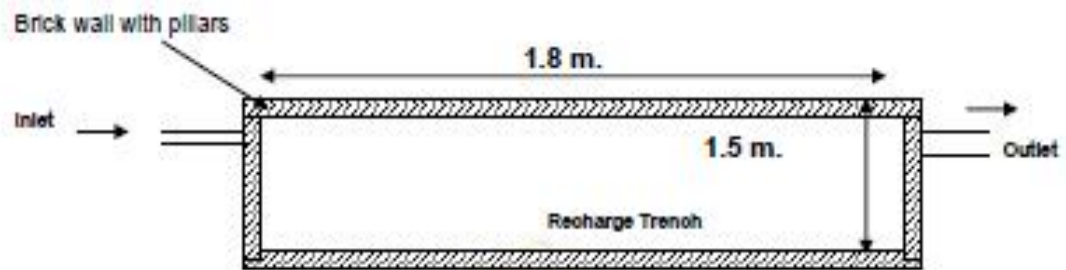
SECTION

(All the dimensions are inner)

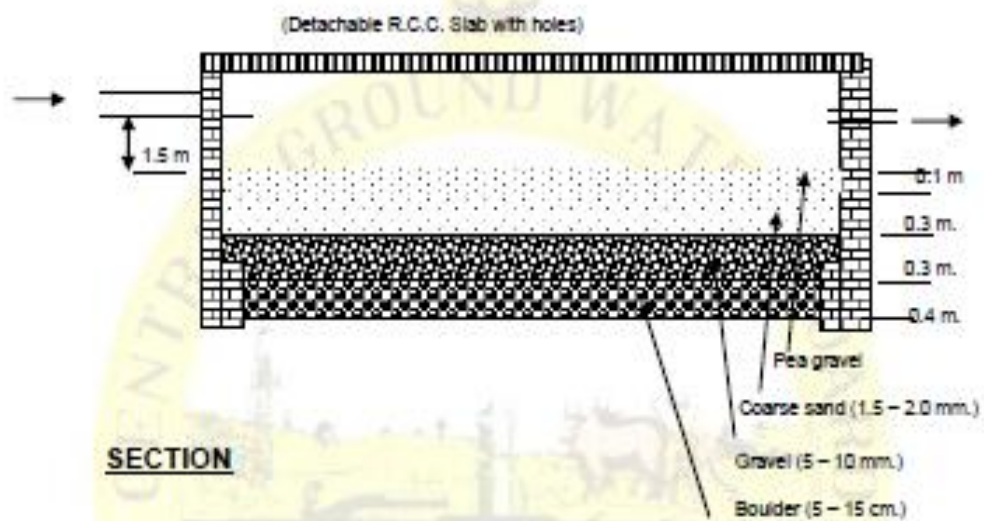
Note:

1. The design is indicative; the actual design depends on site condition

Recharge Trench (Roof Top area 100-200 sq. m.)



PLAN



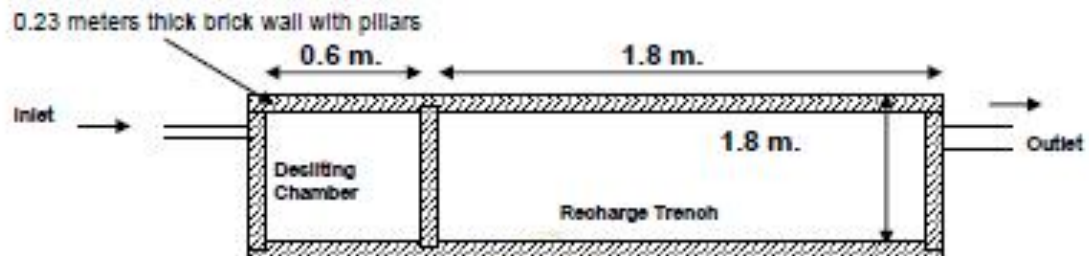
SECTION

(All the dimensions are inner)

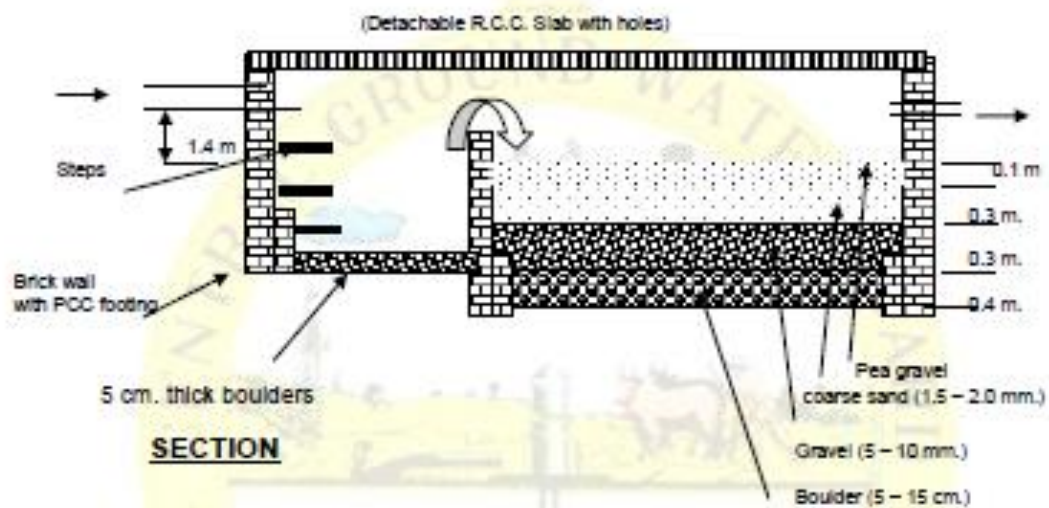
Note:

1. The design is indicative; the actual design depends on site condition

Recharge Trench with Desilting Chamber (Roof Top area 200-300 sq. m.)



PLAN



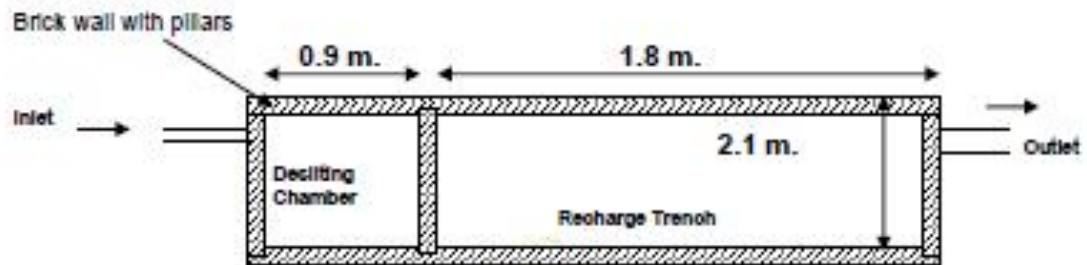
SECTION

(All the dimensions are inner)

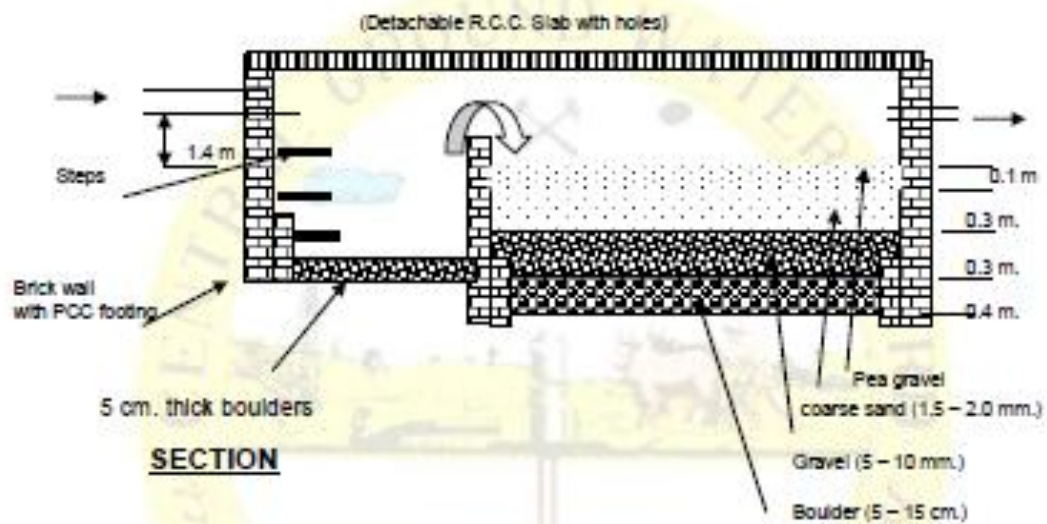
Note:

1. The design is indicative; the actual design depends on site condition

Recharge Trench with Desilting Chamber (Roof Top area 300-400 sq. m.)



PLAN



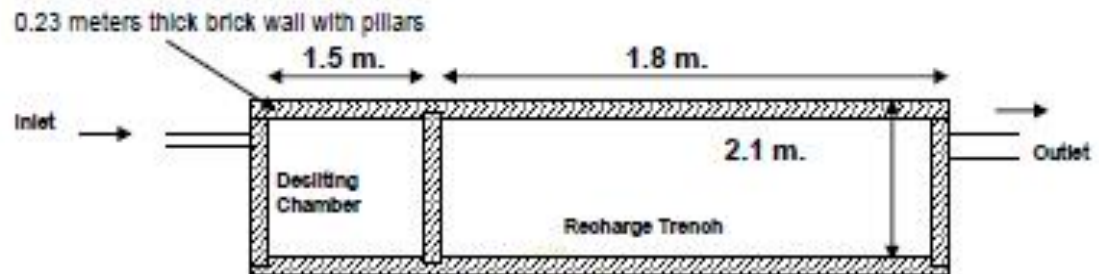
SECTION

(All the dimensions are inner)

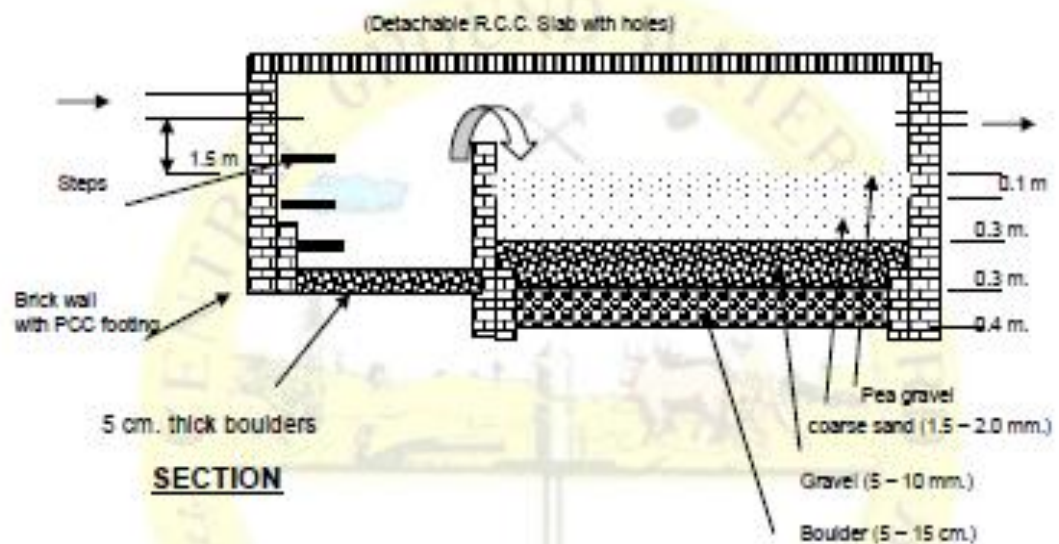
Note:

1. The design is indicative; the actual design depends on site condition.

Recharge Trench with Desilting Chamber (Roof Top area 400-500 sq. m.)



PLAN



(All the dimensions are inner)

Note:

1. The design is indicative; the actual design depends on site condition.