

No.W-11034/58/2008-DWS-II  
Government of India  
Ministry of Rural Development  
Department of Drinking Water Supply

9<sup>th</sup> Floor, Paryavaran Bhawan,  
CGO Complex, Lodhi Road,  
New Delhi-110 003

Dated: 8.6.2010

To

Principal Secretaries / Secretaries  
in charge of Rural Water Supply in States.

**Subject:** Terafil water purification plant for 'JALMANI' programme -reg.

Madam / Sir,

I am directed to forward herewith a copy of up-to-date brochure of Terafil water purification technology, terms & conditions for transfer of technology to Govt. Departments free of charges and to provide entrepreneurs on payment of token technology fee and engineering drawings of 1,000 LPD Terafil water purification plant for ' JALMANI' Programme, received from Design & Rural Technology Department, IMMT(CSIR), Bhubaneswar, for necessary action at your end.

Yours faithfully,



Encl: As above.

(P.N. Ashtamoorthy)

Under Secretary to the Government of India.

*Copy to TIDNIC) for hosting on web site*

*O/C*

*Adl. Binopal Sankar Heastone  
including 2 RWS Ws. in  
States*

*35 letters in  
time for by SP*

*PM. 8/6/10*



**Institute of Minerals and Materials Technology**  
(Council of Scientific and Industrial Research)  
Bhubaneswar-751013, Orissa, India

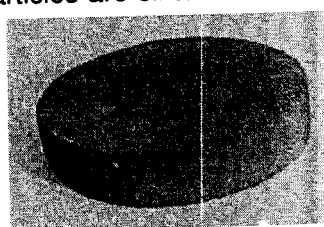
May 2010

## TERAFIL™ WATER FILTER

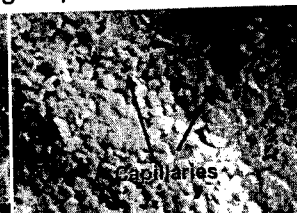
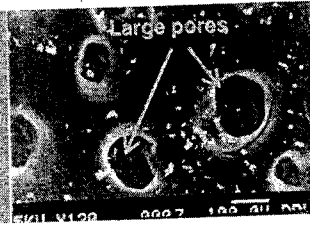
**T**ERAFIL WATER FILTER is a low cost device to filter impure water into clean drinking water. The filter is developed to cater the needs for clean drinking water, especially when the water is rich in sediments, suspended particles, iron and certain micro-organisms causing water borne diseases. It is most suitable for areas where water from both surface & ground water sources like dug wells, ponds, tube wells and rivers is used for drinking purpose. TERAFIL has been developed at the Institute of Minerals and Materials Technology (IMMT), (formerly known as Regional Research Laboratory), Council of Scientific and Industrial Research, Bhubaneswar-751013 after long years of research and trials. The filter is already in use by thousands of households in the state of Orissa, Karnataka, Meghalaya & few other states in various forms. TERAFIL water filtration discs are prepared under license and training from IMMT.

### FEATURES OF TECHNOLOGY:

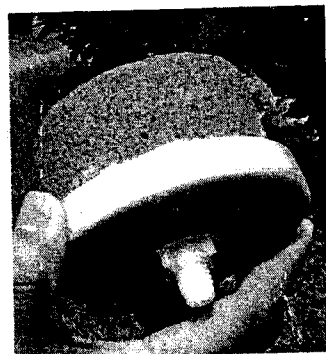
TERAFIL™ is a burnt red clay (terracotta) porous media used for filtration and treatment of water for drinking. It is made from a mixture of red clay (silt clay), river sand and wood saw dust without using any chemicals. The dough of the mixture is sintered at high temperature in a low cost coal / wood fired furnace to make the terracotta disc porous. During sintering process, the wood particles are burnt and clay particles are sintered around the sand particles leaving elliptical / circular large size pores in between. These pores are not connected with each other, unlike white ceramic filter candles, but separated by very thin clay walls which are semi-permeable in nature. The thin clay walls contain large numbers of ultra-fine capillary openings. A set of pores are connected by these ultra-fine capillaries only. Average diameter of the capillary openings is in sub-micron size. During filtration process, water flows from one pore to another pore through the capillary openings by pressure of raw water over the Terafil disc. The pores inside the Terafil disc always work like micro-reservoirs of filtered water. Since opening of the capillaries are in sub-micron, almost all suspended particles & microbes etc. cannot enter into the capillaries; hence sediments & impurities are deposited on top of the Terafil disc during filtration. Therefore the core of Terafil disc is never clogged unlike white ceramic candle during filtration. The Terafil is activated during sintering process and the clay is negatively charged.



*Terafil water filtration disc*



*SEM Pictures of Terafil disc*

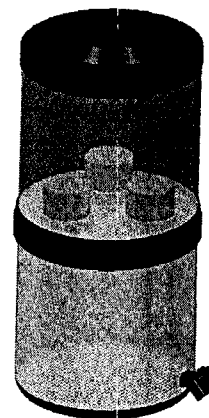


*TERAFIL disc fitted with holder*

Soluble iron and some heavy metals present in raw water are also removed by ion-exchange and/or adsorption process. The soluble iron is always precipitated on the top surface of the Terafil. These impurities / sediments are cleaned from the top surface of Terafil periodically. In this way iron rich or high turbid raw water can be filtered and treated to get clean drinking water. Nearly 99% of turbidity, 95-100% of micro-organisms, 90-95% of soluble iron, colour, bad odour etc. is effectively removed from the raw water by filtration through the Terafil disc. Pathogen free product water can be obtained from ground water by filtration through Terafil disc, while mild chlorination (0.01 gm/ liter product water) is necessary for surface water. Rate of filtration is dependant upon turbidity and pressure of raw water as well as diameter of Terafil disc inside the filter. The filtrates clog the top surface of the Terafil over time during use and hence reduce the flow rate.

Therefore scrubbing or cleaning the top surface of the Terafil disc with a soft nylon brush or coir or similar abrasive materials or by water jet is necessary to remove the sediments and open the new pores for rejuvenation of filtration process. However quality of filtered water is not altered during entire life of Terafil although thickness of the Terafil is reduced by scrubbing its top surface during the filtration process. The Terafil can be made in any shape; but circular disc shape is more preferable in respect of high strength, long operational life, simple production, easy fixing with container or holder, high rate of filtration, and easy operation & maintenance.

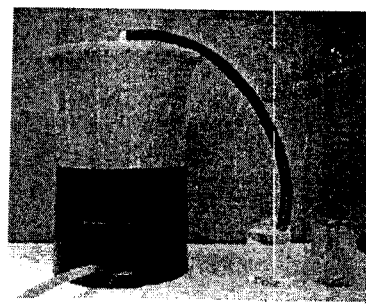
Terafil is prepared in shape of solid disc of 50 mm thickness and 100 & 220 mm diameter to obtain maximum benefits. Average rate of filtration is 13ml/hr per unit area (cm<sup>2</sup>) of top surface of Terafil disc with raw water having 50 NTU turbidity and 250mm water head. Rate of filtration increases many folds with increase of water pressure. Average turbidity of the product water is in the range of 0.5 to 3 NTU, irrespective of high turbid raw water is used. Similarly iron content of the product water is always within permissible limit of BIS even when high iron content (15ppm) raw water is filtered. pH of product water is also improved during filtration of acidic water. Therefore the Terafil water filter is well suitable for treatment of both surface & ground water with affordable cost and without significant maintenance for a long period. Moreover the filtrates/ sediments collected after filtration does not contaminate the water sources. Electricity is not required for operation of both domestic and community Terafil water purification systems.



*Domestic Terafil filter*

**QUALITY OF TREATED (PRODUCT) WATER:**

- Turbidity : Within BIS limit
- Iron : Within BIS limit
- Micro-organisms : Within BIS limit for ground water. (For surface water: 0.01gm bleaching powder per liter of product water is sufficient to make complete pathogen free)
- Increase of pH : 1.0
- Color & odor : Significantly removed
- Rate of filtration : 1 to 10,000 liters /hr depending upon type & capacity of filter.



*On-line Terafil water filter*

**QUALITY OF RAW WATER CAN BE TREATED:**

- Source : Surface and ground water
- Turbidity : Up to 500 NTU
- Iron : Up to 15 ppm

**CAPACITY OF TERAFIL WATER FILTERS:**

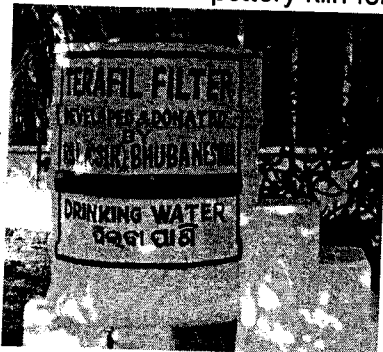
- Rate of filtration : 1 to 10,000 liters /hr at present
- Domestic Terafil water filter: 20 & 30 liter sizes with 1 to 4 lit/hr rate of filtration.
- Community gravity flow Terafil water filter : 1,000, 3,000, 10,000, 30,000, 50,000, 80,000, 1,00,000 liter per day.
- On-line pressure flow Terafil water filter : 60 to 10,000 liter per hour

**COST OF PRODUCT WATER : Rs.2/- per ton of filtered water**  
(Considering cost of plant & excluding cost of raw water)

**SPACE FOR INSTALLATION OF COMMUNITY TERAFIL WATER FILTERS : 1 to 300 m<sup>2</sup> for installation of 1,000 to 1, 00,000 lit/day capacities.**

### **CAPACITY BUILDING :**

Terafil water filtration disc can be manufactured by small and micro-entrepreneurs, like tiny, cottage, small scale industries and Self Help Groups in any place of the country without any prerequisite conditions. However, raw materials such as red clay (clay used by potters), river sand and wood saw dust should be available in the locality. The Terafil production unit requires one 5 hp Atta Chaki (Pulverizer) for grinding red clay, Manual / motorized sieves, mixing machine, hand tools for moulding green Terafil, RCC platforms(60 ft X 40 ft ) for sun drying of Terafil, 'Queen' coal/wood fired pottery kiln for sintering of Terafil, and 30ft X 20ft size shed. 3 phase 5 KW power



*Community Terafil water filter(1000 lit/day capacity)*

is necessary for operations of the machines. Trained manpower without any specific expertise can produce Terafil water filtration disc. Local masons and sanitary marts can install the community Terafil water filters using ferro-cement chambers or masonry/RCC structures. Domestic Terafil water filters can be made with the chambers made with terracotta, food grade plastic, metallic and ferro-cement etc.

### **MAINTENANCE OF TERAFIL WATER FILTER :**

The sediment deposits on the top surface of the Terafil discs are to be cleaned once in a week or as and when required, by mild scrubbing with an ordinary plastic

scrubber or coir or water sprayer followed by a rinse with cold water. The Terafil discs in domestic or community filters are easy to dismantle / reassemble the by a person of ordinary skill. Always ensure that the Terafil discs are fitted rigidly on the base of top container with rubber washers in proper places and not damaged in domestic filters. The height of the Terafil discs will reduce over a period of time due to scrubbing but shall remain active till 10 mm above the plastic holder. Care should be taken not to drop the filter/Terafil discs as it may cause accidental break/crack. During first use of a new filter, fill the filter with water repeatedly during first two days and drain out the filtered water. Consume the filtered water for drinking from third day onwards.



*Iron sludge on Terafil discs*

### **SELF TEST :**

The transparent colour of the filtered water in the lower container is indicative of proper working of the filter. However the user is advised to ensure that water of about half inch height always stands at the bottom of the top container in empty condition (in case of Terafil fitted with holder is used) of domestic filter. Failing of these, the filter discs are to be checked for crack/loose mounting.



*Terafil water purification plant (30,000 Lit/day capacity)*

### **TECHNOLOGY TRANSFER :**

#### **Technology fee for licensing manufacture of Terafil disc:**

Rs.15, 000/- one time payment for DIC registered micro and small entrepreneurs.

Rs.60, 000/- one time payment for other entrepreneurs.

10.3% service tax extra.



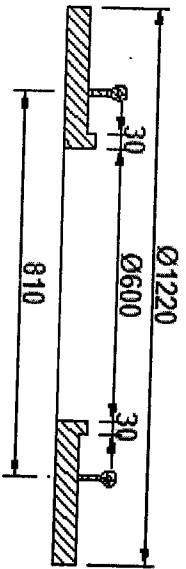
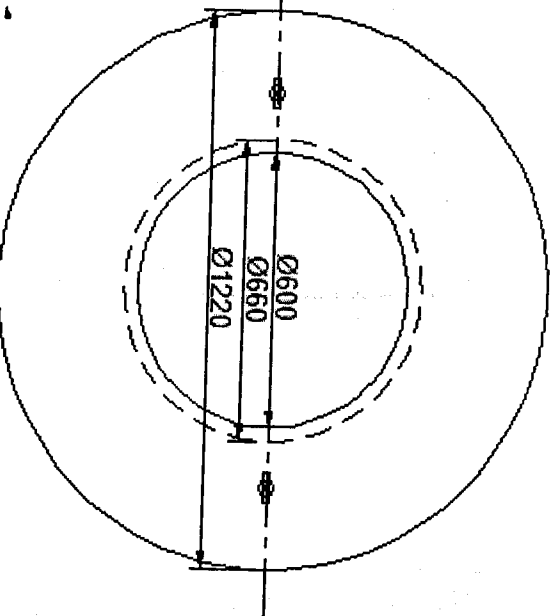
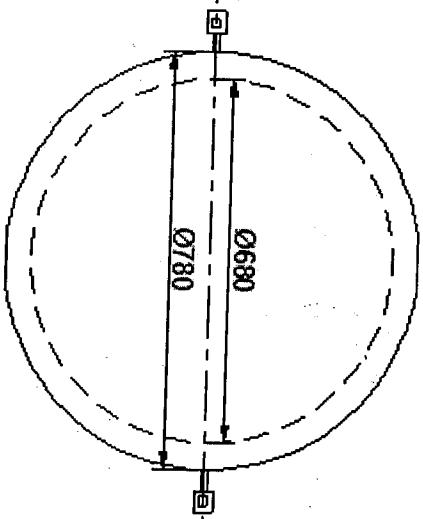
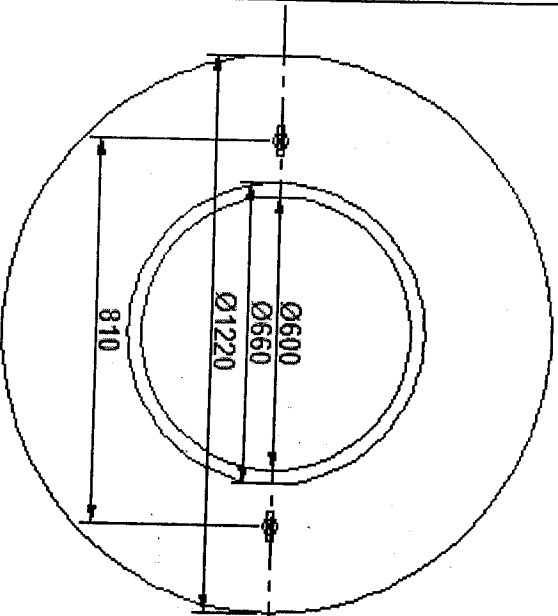
*For further details / trade enquiries please contact:*

*Director / S. Khuntia, Head, Design & Rural Technology,*

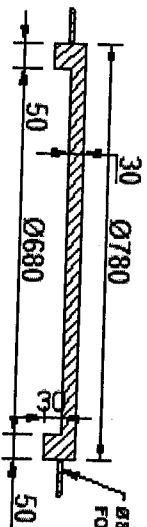
*Institute of Minerals and Materials Technology, P.O. RRL, Bhubaneswar – 751013, India.*

*Tel (off) : 0674 2581635-39,(Ext.-522 & 307), Fax: 0674 2581637, 2581160*

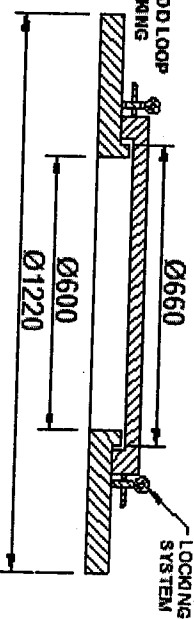
*Email- khuntias@gmail.com, khuntias@yahoo.com, skhuntia@immt.res.in*



**TOP PLATE**



**LID**



**ASSEMBLY OF LID WITH TOP PLATE**

# TOP LID ARRANGEMENT

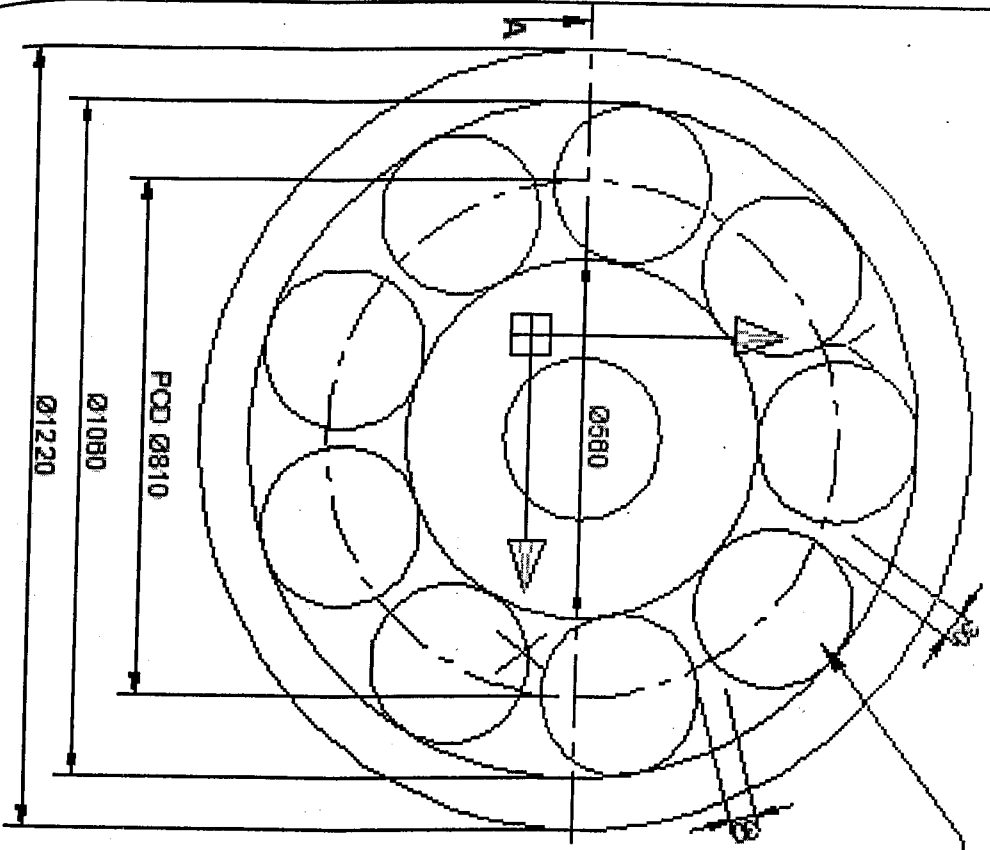
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DESIGN & RURAL TECHNOLOGY DEPT.		DGN	S. KHUNTIA
INMUL, BHUBANESWAR (CSIR)		DRN	S. WAGAITRA
DETAIL OF LOCKING ARRANGEMENT OF LID		CHD	S. KHUNTIA
M/M		STD	13
		APD	S. KHUNTIA
		S. SCALE	NTS
		SHEET NO.: 2 OF 3	



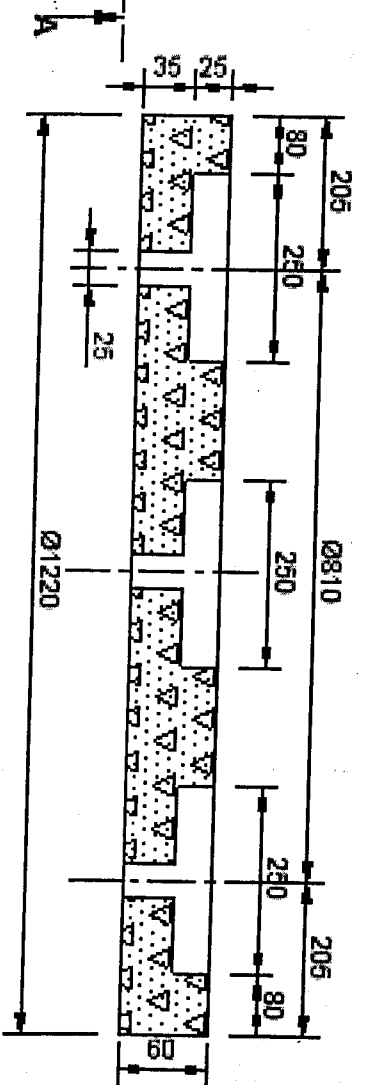
**TERMS OF CONDITIONS FOR TRANSFER OF TECHNOLOGY OF  
TERAFIL WATER FILTER TO GOVERNMENT DEPARTMENTS AND ORGANIZATIONS**

01. IMMT-Bhubaneswar can transfer the technology (licensing) of Terafil filtration media (disc) and designs of community filter (1,000 LPD) to Govt. departments & organizations free of charges under CSIR guidelines and agreement. The licensee is not transferable and the Govt. departments & organizations can not transfer the know-how of Terafil disc & community filter to any other party. The required agreement for transfer of technology should be carried out by the authorized officer / engineer of the departments / organizations.
02. The Govt. departments / organization can also depute or nominate private entrepreneurs to IMMT-Bhubaneswar for transfer of technology of Terafil water filtration media (disc) & community Terafil water filter, who will manufacture Terafil disc in the respective states. The said department / organizations may procure Terafil disc and carryout construction of community Terafil water filter through these licensees. The private entrepreneurs (licensees) will have to pay the required charges of IMMT for transfer of technology of Terafil water filtration media (disc) & community Terafil water filter and make agreement with IMMT as per CSIR guideline for the same. The private entrepreneurs, registered as micro & small scale industries & SHGs by District Industrial Centre (DIC) of the respective states, will pay one time technology fee @ Rs. 15,000/- plus 10.30% service tax for transfer of technology of Terafil disc, & Rs. 5,000/- plus service tax towards transfer of technology of community Terafil water filter. For other private entrepreneurs, the technology fees are Rs. 60,000/- & Rs. 20,000/- plus service tax respectively.
03. IMMT-Bhubaneswar can render training on details of Terafil technology, operation & maintenance etc to the senior officers & field engineers of the Govt. departments for a period of three days at IMMT – Bhubaneswar on payment of Rs. 50,000/- (Rupees Fifty thousands only) towards training charges to IMMT. Expenditure for travel, local transport, lodging & boarding etc of the trainees will be born by the Govt. department / trainees.
04. The Govt. departments / organizations will make due publicity and mention a label or plate bearing the inscription **TERAFIL water purification plant, developed by IMMT (CSIR), Bhubaneswar** on each plant to be installed by them or their associates in different places of the country.
05. The Govt. departments / organizations will acknowledge and publicize the Terafil technology of IMMT (CSIR), Bhubaneswar in drinking water programme. The Govt. departments / organizations will also inform IMMT regarding production/ installation and use of Terafil water filters time to time for official records.
06. IMMT-Bhubaneswar can render technical supports to the Govt. departments for designing higher capacity plant on consultancy basis if necessary. The consultancy charges can be decided by discussion between IMMT & the Govt. departments.
07. The Govt. departments / organizations will bear appropriate TA/DA and local hospitality & transport of scientists & staff of IMMT during supervision, monitoring etc for production / installation & use of Terafil water filters in their states, if required by the Govt. departments / organizations.
08. IMMT-Bhubaneswar will provide necessary engineering drawings for construction and operation of "Queen" coal/wood fired low cost pottery kiln for sintering of Terafil disc.

□□□



HOLE OF Ø 250MM FOR TERAFL DISC

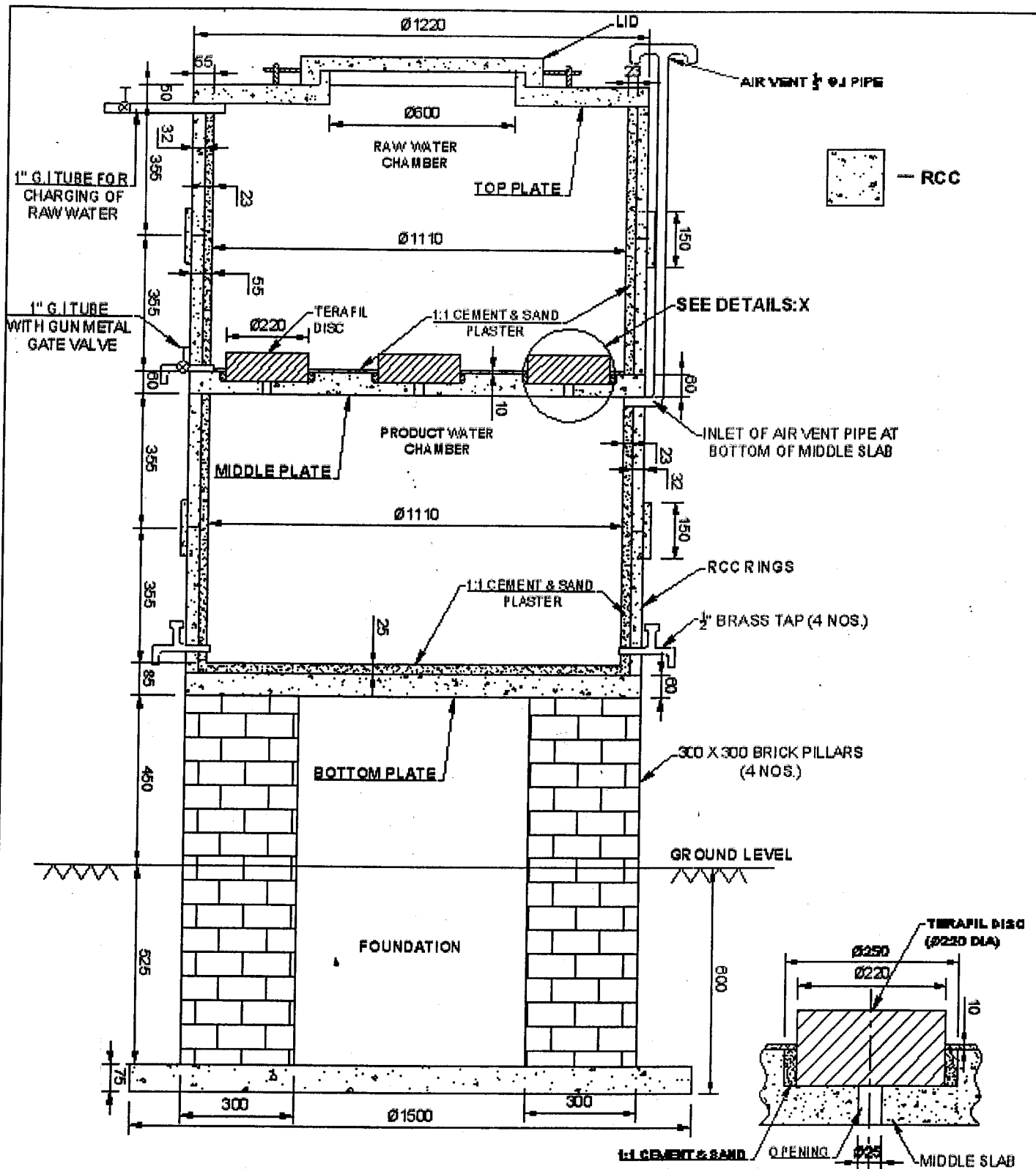


VIEW AT A-A

**TERAFL FIXING**  
 PITCH = 280 (CENTER DISTANCE BETWEEN A PAIR OF TERAFL DISC)  
 NOS. OF TERAFL DISC = 09, AT CENTER = 01  
 TERAFL DISC : DIAMETER = 220 MM, THICKNESS = 50 MM

**MIDDLE PLATE**

ALL DIMENSIONS ARE IN MM		DESIGN & RURAL TECHNOLOGY DEPT.	DEN SKHUNTA	NAME	SKEN
FIXING OF TERAFL DISC WITH MIDDLE PLATE		DANU BHEEMESWAR (CSE)	IRN SWAGATIKA		
			CHD SKHUNTA		
			STD IS		
			APD SKHUNTA		
			SCALE	N/S	
			SHEET NO. - 3 OF 3		



**STAND ALONE TERAFIL WATER PURIFICATION PLANT**

**CAPACITY : 1000 LITER PER DAY**

(NO. OF TERAFIL DISCS : TEN NOS., 220 MM DIAMETER EACH)

ALL DIMENSIONS ARE IN MM		NAME	SIGN
DESIGN & RURAL TECHNOLOGY DEPT. GOVT. ENGINEERING (CSE)	DGN	SEKUNTIA	
	DRN	FWAGATKA	
	CHD	SEKUNTIA	
	STD	LS	
STAND ALONE TERAFIL WATER FILTER PLANT	APD	SEKUNTIA	
	SCALE	NTS	
		SHEET NO:- 1 OF 3	



**INSTITUTE OF MINERALS AND MATERIALS TECHNOLOGY**  
(Council of Scientific & Industrial Research), Bhubaneswar-751013

**TERMS AND CONDITIONS FOR TRANSFER OF  
TECHNOLOGY OF TERAFIL WATER PURIFICATION MEDIA (DISC) FOR PRODUCTION & MARKETING**

**One time fee for transfer of Technology of Terafil filtration media (disc) :**

1. For SSI, tiny, micro industries & SHGs, and NGOs having proven track record in dealing with supply with drinking water (Govt proof necessary) = Rs.15,000/- plus 10.30% service tax.
2. For others = Rs. 60,000/- plus 10.30% service tax.

**One time fee for transfer of technology of Community Terafil water filter (1,000 LPD) :**

1. For SSI, tiny, micro industries & SHGs = Rs. 5,000/- plus 10.30% service tax.
2. For others = Rs. 20,000/- plus 10.30% service tax.

The technology fee must be deposited in form of bank draft, drawn in favor **DIRECTOR, IMMT, BHUBANESWAR -751013, payable at Bhubaneswar** before execution of agreement for transfer of technology to any licensee as per CSIR guidelines.

Technology Transfer Documents (TTD) and one day training on production, operation and maintenance of Terafil filtration media (disc) will be rendered to the party by the undersigned at IMMT, Bhubaneswar after execution of the agreement on a non-judicial stamp paper worth of Rs.100/- as per CSIR guidelines.

TTD of community water filter contains engineering drawings of the plant and maintenance schedule.

The agreement for transfer of Technology will be made by Dr. G. V. Rao, Scientist-G & Head, Business Development Division of IMMT, Bhubaneswar after receipt of full amount of technology fee in form of bank draft or in cash in IMMT. Therefore you are requested to arrange following documents and deposit the technology fee and contact Dr. G. V. Rao scientist-G & Head, Business Development Division of IMMT, Bhubaneswar under intimation to the undersigned. The broacher of Terafil water filter is attached for your reference.

**Documents necessary for AGREEMENT for transfer of technology:**

1. Attested copy of industry registration certificate (Necessary for SSI, micro, cottage industry and SHGs), registered by DIC, Industry dept of local Government.
2. One-time technology fee in form of bank draft, drawn in favor of **DIRECTOR, IMMT, BHUBANESWAR**, payable at Bhubaneswar.
3. Non-judicial stamp paper of Rs.100/- for each technology transfer.
4. Office seal of your industry or company.
5. One witness for execution of agreement.

**Dr. G. V. RAo : Tel (O) : 0674-2581635-39, Extn : 472, E.Mail: [gvrao@immt.res.in](mailto:gvrao@immt.res.in)**

With regards

S. Khuntia  
Scientist-G & Head,  
Design & Rural Technology Dept  
IMMT (CSIR), Bhubaneswar  
[khuntias@gmail.com](mailto:khuntias@gmail.com), [khuntias@yahoo.com](mailto:khuntias@yahoo.com), [khuntias@immt.res.in](mailto:khuntias@immt.res.in)

**Office of the Chief Engineer**  
**Panchayath Raj Engineering Department**  
 Karnataka Slum Clearance Board Building  
 Resildar Street, Sheshadripuram  
 Bangalore - 560 020



Ph : 23460448

ಮುಖ್ಯ ಇಂಜಿನಿಯರ್‌ರವರ ಕಛೇರಿ  
 ಪಂಚಾಯತ್ ರಾಜ್ ಇಂಜಿನಿಯರಿಂಗ್ ಇಲಾಖೆ  
 ಕರ್ನಾಟಕ ಸ್ಲಂ ಕ್ಲಿರೇನ್ಸ್ ಬೋಡ್ ಕಟ್ಟಡ  
 ರೆಸಿಡೆನ್ಸ್ ಸ್ಟ್ರೀಟ್, ಶೇಷಾದ್ರಿಪುರಂ  
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No. CE/PRED/ARWS-1/TA-1/AE-6/ 02.1 /2010-11 Dt: 03-04-2010

To,  
 S.Khuntia  
 Scientist-G & Head  
 D&RT Dept, IMMT (CSIR),  
 Bhubaneswar-751013

Sir,

Sub: IMPLEMENTATION OF COMMUNITY TERRAFIL  
 PROGRAMME IN KARNATAKA

There are 59203 habitations in 30 Districts of Karnataka State. Out of which, there is drinking water quality problem in 21008 Habitations. Out of 21008 Water Quality Affected Habitations 3072 Habitations of 12 Districts are affected by excess Iron i.e. ranges from 1 to 9 ppm. The Quality Affected Districts are (1) Bangalore(Rural), (2) Bangalore(Urban), (3) Ramanagara (4) Chickmagalur (5) Chitradurga (6) Dakshina Kannada (7) Dharwad (8) Kodagu (9) Mysore (10) Shimoga (11) Udupi (12) Uttara Kannada.

It was approved in the S.L.E.C. dated 1/3/2008 to install Community Terrafil Units in the Quality Affected 3072 Habitations so that 10 LPCD of potable water could be supplied to the villagers. The Govt has approved to implement the Terrafil Technology on 27/3/2008. The Terrafil Technology was transferred from IMMT to Government of Karnataka on 12/11/2008 and Training Programme was held at IMMT from 11/11/2008 to 14/11/2008 for the officials of Rural Development & Panchayat Raj Department. The details of the Community Terrafil units of 5000 litres capacity to be installed in the iron affected habitations are as follows:-

- The capacity of Community Terrafil unit is 5000 litres (Raw water – 2500 litre & Pure water – 2500 litre).
- The container made up of any one of the following material:- 1) LLDPE, 2) GRP, 3) RCC, 4) M.S. consisting upper tank (Raw water) – 2500 litres capacity and lower tank (Pure Water) – 2500 Litres capacity.
- The rate of filtration of 22 cms Dia and 5 cms thick Terrafil disc is 13 ml/hr/unit area (cm<sup>2</sup>) hence, approximately 30 Nos. of Terrafil disc will be fixed in each unit so as to collect 5000 liters of potable water per day.
- It is proposed to install 1 unit per 250 souls and 10 LPCD of potable water will be supplied for drinking purpose. Totally 59750 kilolitres of portable water will be supplied per day.
- It is proposed to construct 11,950 units for 3072 habitations at an estimated cost of Rs.55,000/- per unit.

Tenders were awarded to the Licensees of IMMT during August 2009 and the Project is under implementation.

M/s. Sree Sai Water Treatment Pvt. Ltd., Hindupur and M/s. Farmland Rain Water Harvesting Systems, Chickmagalur are already Manufacturing Terrafil Discs in large scale at Hindupur of A.P. and Chickmagalur in Karnataka respectively. The Quality of Terrafil Discs manufactured by these Licensees was tested at I.M.M.T. and certified that the Terrafil Discs are suitable for water purification. The implementation of this Project will be completed by the end of June 2010.

Yours Faithfully,



Chief Engineer

Panchayat Raj Engineering Department,  
Bangalore