MADHAV INSTITUTE OF TECHNOLOGY AND SCIENCE GWALIOR

(A govt. Aided Autonomous Institute under RGPV, Bhopal (M.P) Established in 1957)

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BACHELOR of TECHNOLOGY
In
CIVIL ENGINEERING

2018-2022

ON

"OVERHEAD WATER TANK"

Submitted By–

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(A Govt. Aided UGC Autonomous & NAAC Accredited Institute Affiliated to R.G.P.V. Bhopal)

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CERTIFICATE

This is reference to the ongoing internship of Mr. NAMAN CHHAPARIYA at PHE Morar (Gwalior),

From 18 Jan 2022 to 20 May 2022

Subject: WATER TANK CONSTRUCTION

We found sincere, hardworking, and technically sound and result oriented. He worked well as a part of the team during his tenure. We take this opportunity to thank him and wish him all the best for his future.

As a part of his institute grading we would like to grade him Excellent during these course of month.

For Public Health Engineering Department

Assistant Engineer
Public Health Engg. Deptt
Authorized signatory

MADHAV INSTITUTE OF TECHNOLOGY & SCIENCE, GWALIOR – 474005
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When it comes to properly acknowledging someone's support and assistance, it may be a challenging undertaking, chiefly when the support offered is so wholehearted and unwavering.

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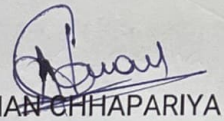
Also, I would like to thank **Dr. M.K. Trivedi**, Head of Civil Engineering Department, MITS Gwalior, and all other academics and staff members of MITS Gwalior's Civil Engineering Department for their unwavering support throughout the project.

I am really grateful to **Dr. R. K. Pandit**, Director of MITS Gwalior, for establishing an outstanding institutional environment and for giving all facilities and assistance in the preparation of my dissertation.

I take great pleasure for my institute **PUBLIC HEALTH ENGINEERING DEPARTMENT, MORAR ,Gwalior (M.P)** for providing the opportunities.

The environment of Institute has been valuable experience for me. It has provided an opportunity to learn at our own pace in discipline of interest. I would like to thank all those who helped me during different stages of completion of this project.



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ABSTRACT

All The requirement of world are depend on water ,according to the some reportsGround water level is depleted day by day and need of water is increasing day by day ,The vision of phe department to provide pure drinking water facilities and maintain them to provide pure drinking water free of any anamalities as improved portable water supply and sanitation facilities and services are critical to enhance public health and improve human development outcomes, more so for rural household.

The overhead water tank are constructed by the phe department which have the capacity according to their size of upper dome which may be 2.5 lakh litre but not at Least 50,000 litre ,and they are made up of Reinforced cement concrete in which mostly m30 mixture is used Before taking up the design, the most suitable type of staging of tanks and correct estimation of loads including statically equilibrium of structure particularly in regards to overturning of overhanging members are made.

In this project by performing the analysis of rcc over head water tank, deflection shape due to hydrostatic pressure and stresses, etc. are analysed.

ABSTRACT IN HINDI

कुछ रिपोर्टों के अनुसार, दुनिया की सभी आवश्यकताएँ पानी पर निर्भर हैं

भूजल का स्तर दिन-ब-दिन कम होता जा रहा है और पानी की जरूरत दिन-ब-दिन बढ़ती जा रही है

दिन, शुद्ध पेयजल सुविधाएं प्रदान करने के लिए पीएचई विभाग की दृष्टि और उन्हें किसी भी विसंगतियों से मुक्त शुद्ध पेयजल प्रदान करने के लिए बनाए रखने के लिए बेहतर पोर्टेबल जल आपूर्ति और स्वच्छता सुविधाएं और सेवाएं सार्वजनिक स्वास्थ्य को बढ़ाने और मानव विकास परिणामों में सुधार के लिए महत्वपूर्ण हैं, और भी बहुत कुछ के लिए ग्रामीण परिवार।

ओवरहेड पानी की टंकी का निर्माण पीएचई विभाग द्वारा किया जाता है जिसकी क्षमता उनके ऊपरी गुंबद के आकार के अनुसार होती है जो 2.5 लाख लीटर हो सकती है लेकिन नहीं

कम से कम 50,000 लीटर, और वे प्रबलित सीमेंट कंक्रीट से बने होते हैं जिसमें ज्यादातर एम 30 मिश्रण का उपयोग डिजाइन को लेने से पहले किया जाता है, टैंकों के मंचन का सबसे उपयुक्त प्रकार और भार का सही

अनुमान जिसमें संरचना का स्थिर संतुलन विशेष रूप से पलटने के संबंध में होता है लटके हुए सदस्य बनाए जाते हैं।

इस परियोजना में आरसीसी ओवर हेड वाटर टैंक का विश्लेषण करके, हाइड्रोस्टेटिक दबाव और तनाव आदि के कारण विक्षेपण आकार का विश्लेषण किया जाता है।

ABBREVIATION

CPHEEO	Central Public Health and Environmental Engineering Organisation
CU. M	Cubic Meter
DN	Diameter Nominal
ESR	Elevated Surface Reservoir
FTK	Field Test Kit
GI	Galvanised Iron
GSR	Ground Service Reservoir
HDPE	High Density Poly Ethylene
HH	Household
ISI	Indian Standards Institute
MLD	Million Litres per Day
PHED	Public Health Engineering Department

PVC	Poly Vinyl Chloride
Mg/l	Milligram per litre
M	meter
MS	Mild Steel
MT	Metric Ton
NTU	Nephelometric Turbidity Unit
RCC	Reinforced cement concrete
r.mt.	Running metre
TMT	Thermo Mechanically Treated

INDEX

S NO.	TOPIC	PG NO.
1.	INTRODUCTION	9-10
2.	CLASSIFICATION OF OF WATER TANK	11-13
3.	FOUNDATION	14-17
4.	COLUMN	18-20
5.	BRACING SYSTEM	21-23
6.	DOME	24-26
6.	CONICAL WALL	27-28
7.	STAIRCASE	29-30
8.	SUMP WELL	31-36
9.	MISCELLANEOUS	37-41
10.	SITE VISIT PLAN IMAGES	42-48
11.	CONCLUSION	49
12.	REFRENCES	50
13.	PLAGRISM REPORT	51
14.	THANK YOU	

CHAPTER I
INTRODUCTION

1.1 General

Water Supply in India is now previewed as community based demand driven system, under which it is essential to enhance capacity of local community residing in villages and small towns to develop and manage their own water supply systems and for the increasing need of water in rural and urban areas public health engineering department are doing a great job by providing the overhead water tanks by which water is supplied to the homes through the underground water supply chain. The district level administer of the public health engineering department undertakes field investigation, survey,data collection, preparation, execution and maintenance of schemes. OVERHEAD WATER TANKS is container for storing water and any other liquid. The main objectives in any design of water tank are to provide safe drinkable water after storing for long time, optimizing cost, strength, service life and performance during special situations like earthquakes.

PHE department made an RCC overhead water tanks are supported on staging and are generally used in water distribution system and overhead water tank are made of minimum capacity of 50000 litre and maximum capacity of overhead water tank is dependent on the maximum size of bottom dome ,cylindrical wall and upper dome mainly we can say that as large as we can afford to build example like ghatigaon (located in Gwalior district of MADHYA PRADEH of latitude and longitude of 77.83 and 25.98 respectively) water tank have capacity of 2.5 lakh litre which stand at the height of 15 m from the ground level and in the future this

water tank provide water to the population of 5641 (according to the census of 2011) of which 2978 are males and 2663 are females, but the main problem in overhead water tank is cracking.

The risk of cracking due to overall temperature and shrinkage effects may be minimized by limiting the changes in moisture content and temperature to which the structure as a whole is subjected. Cracks can be prevented by avoiding the use of thick timber shuttering which prevent the easy escape of heat of hydration from the concrete mass. The risk of cracking can also be minimized by reducing the restraints on the free expansion or contraction of the structure. For long walls or slabs foundation or below the ground level, restraints can be minimized by founding the structure on a flat layer of concrete with interposition of sliding layer of some material to break the bond and facilitate movement

However, it should be recognized that common and more serious causes of leakage in practice, other than cracking, are defects such as segregation and honey combing and in particular all joints are potential source of leakage.

Design of liquid retaining structure has to be based on the avoidance of cracking in the concrete having regard to its tensile strength. It has to be ensured in its design that concrete does not crack on its water face. Cracking may also result from the restraint to shrinkage free expansion and contraction of concrete due to temperature and shrinkage and swelling due to moisture effects. Correct placing of reinforcement, use of small sized bars and use of deformed bars lead to a diffused distribution of cracks.

CLASSIFICATION OF WATERTANK

In general, water tanks can be classified under three heads:

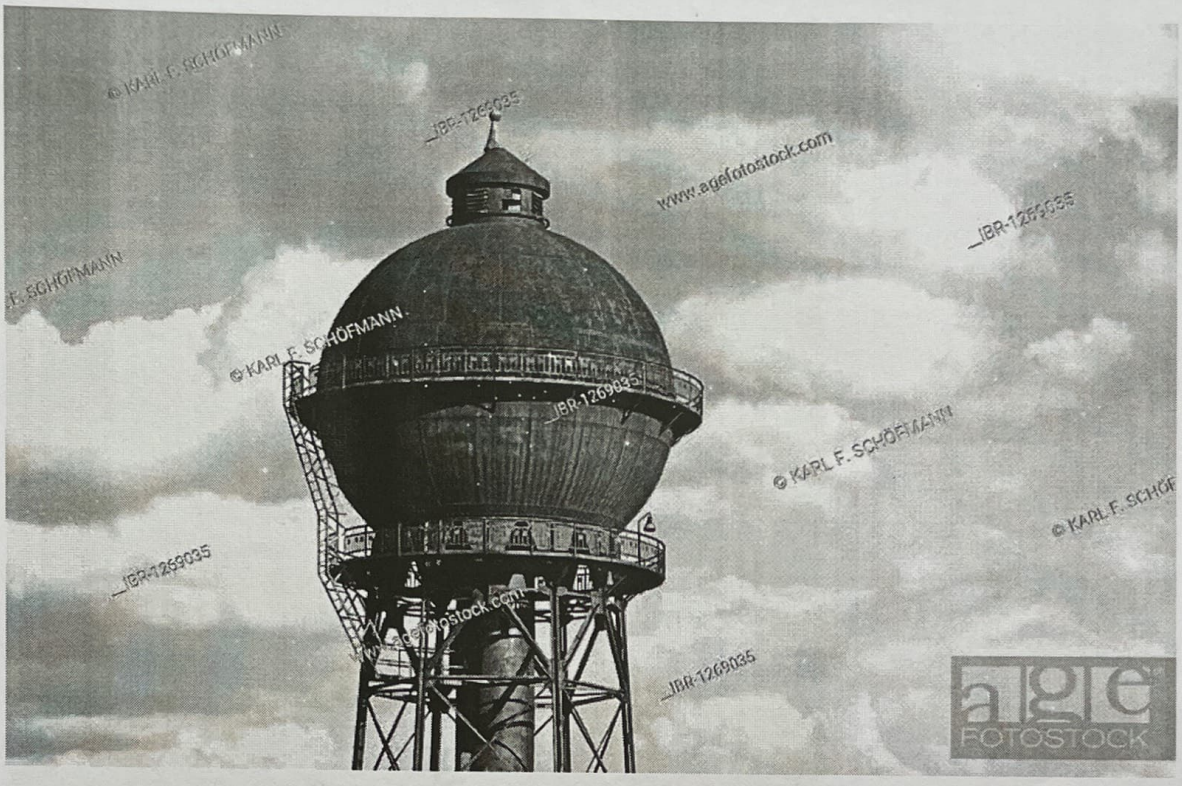
a) tanks resting on ground

b) elevated tanks supported on staging,

c) underground tanks.

From the shape point of view, water tanks may be of several types, such as

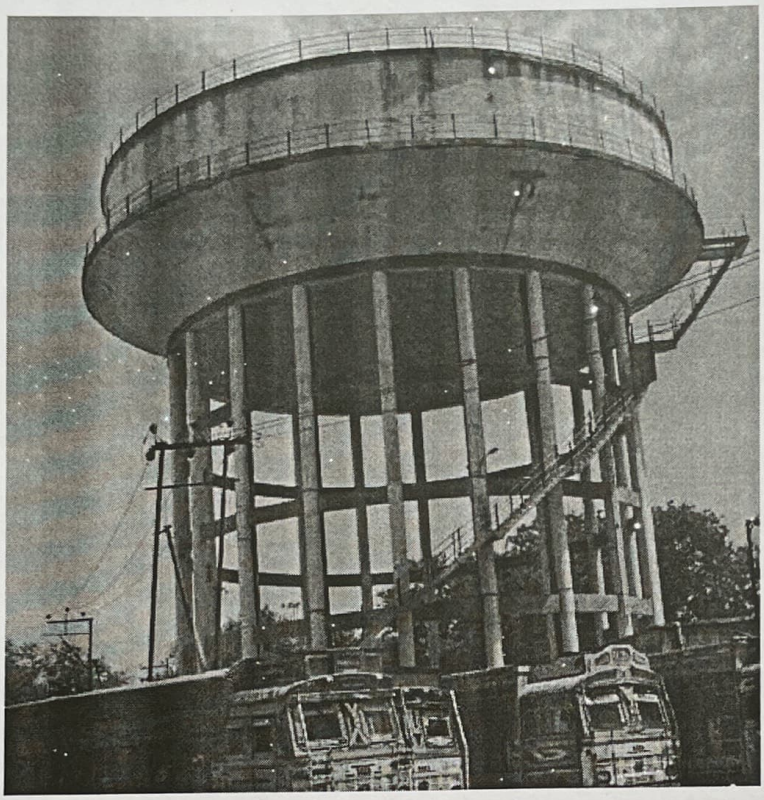
a)circulartanks



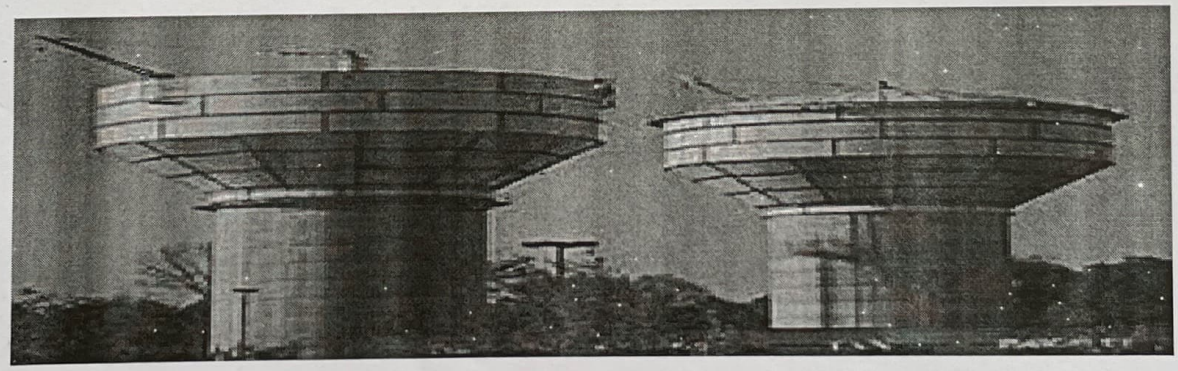
b) rectangular tanks

c) spherical tanks

d) Intze tanks



e) circular tanks with conical



Some of the figures of water tanks that are under construction –

CHAPTER III

FOUNDATION

Foundation of overhead water tank is the bedrock of all over the construction, In ghatigaon site there is an raft foundation used of height 2500 mm and width 2000 mm according to some data minimum depth of the excavation done by either mechanical or manual for the foundation is 1.5m in width or 10sqm on plan its includes dressing of sides and ramming of bottom and After the excavation process the pcc work is done by using grade of concrete m10 (1 cement :3 coarse sand : 6grade stone aggregate 20mm nominal size) and pcc work in ghatigaon site is 100mm thick and minimum pcc thickness is not less than 150 mm after that pcc work steel binding process is started by checking proper lapping and after pcc circular ring beam of raft foundation is constructed by using bars 4nos circular outside and 10mm diameter 150 c/c radial spacing at beam center also we should require to use cover block of min 75 mm to avoid corrosion of bar

In the ghatigaon site ring beam of cross section 400×650 is constructed by the use of 2 nos ×16 mm bars on each side and also external bars are 5nos×16mm bars and 10mm 2L @ C/C up to 1100 from center of support than 8mm 2L –STIRRUPS after the binding of top bars and bottom bars the process and for avoiding errors development length should be check (minimum 300mm) by 50D.

After the process of construction of ring beam along with foundation then the shuttering should be done by proper binding for avoiding cracks then

the process of concreting started in layer wise not exceeding maximum 300 mm and also along with vibrator for mixing by using m25 grade of concrete and before concreting process slump test should be done for checking the workability of concrete and minimum initial time of setting concrete is 30 minutes and final is 10 hours.

After the concreting process foundation ring beam should be cure by water curing process and minimum time for curing is 10 days and in some exceptional case curing time increases maximum upto 28 Days by using process of wet adhesion or formwork curing.

NOTE- The minimum reinforcement in walls, floors and roofs in each of two directions at right angles shall have an area of 0.3 per cent of the concrete section in that direction for sections up to 100mm, thickness. For sections of thickness greater than 100mm, and less than 450mm the minimum reinforcement in each of the two directions shall be linearly reduced from 0.3 percent for 100mm thick section to 0.2 percent for 450mm, thick sections. For sections of thickness greater than 450mm, minimum reinforcement in each of the two directions shall be kept at.

DETERMINATION OF DIAMETER OF THE WATER TANK

Diameter=D=√ (Q * 0.004) / ((H - Fb) * 3.14)

Where Q = capacity of the water tank

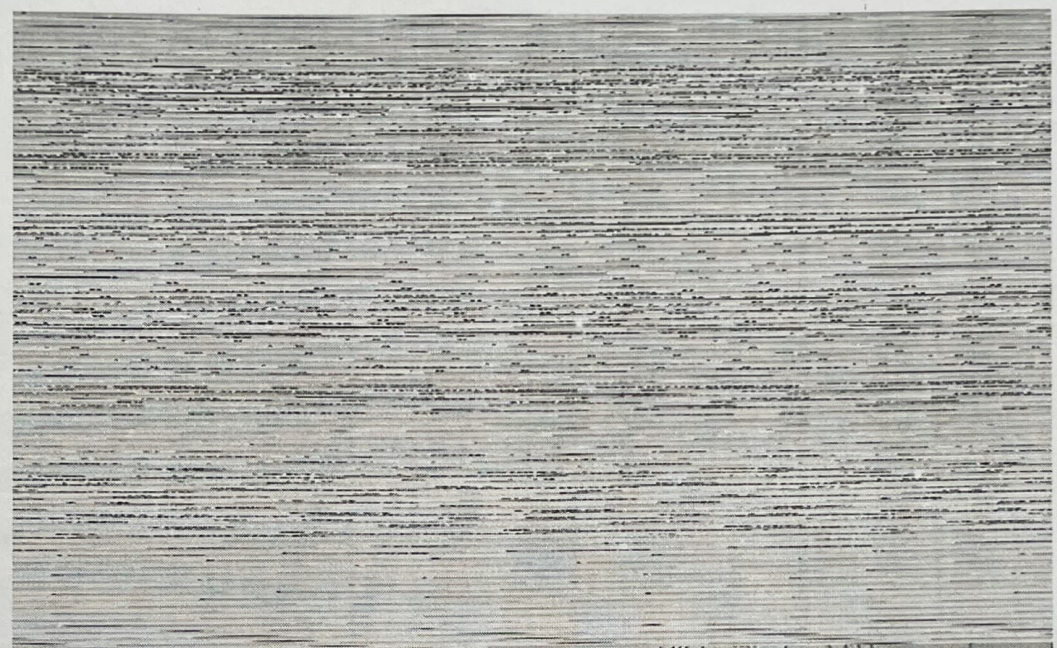
H = height of the water tank

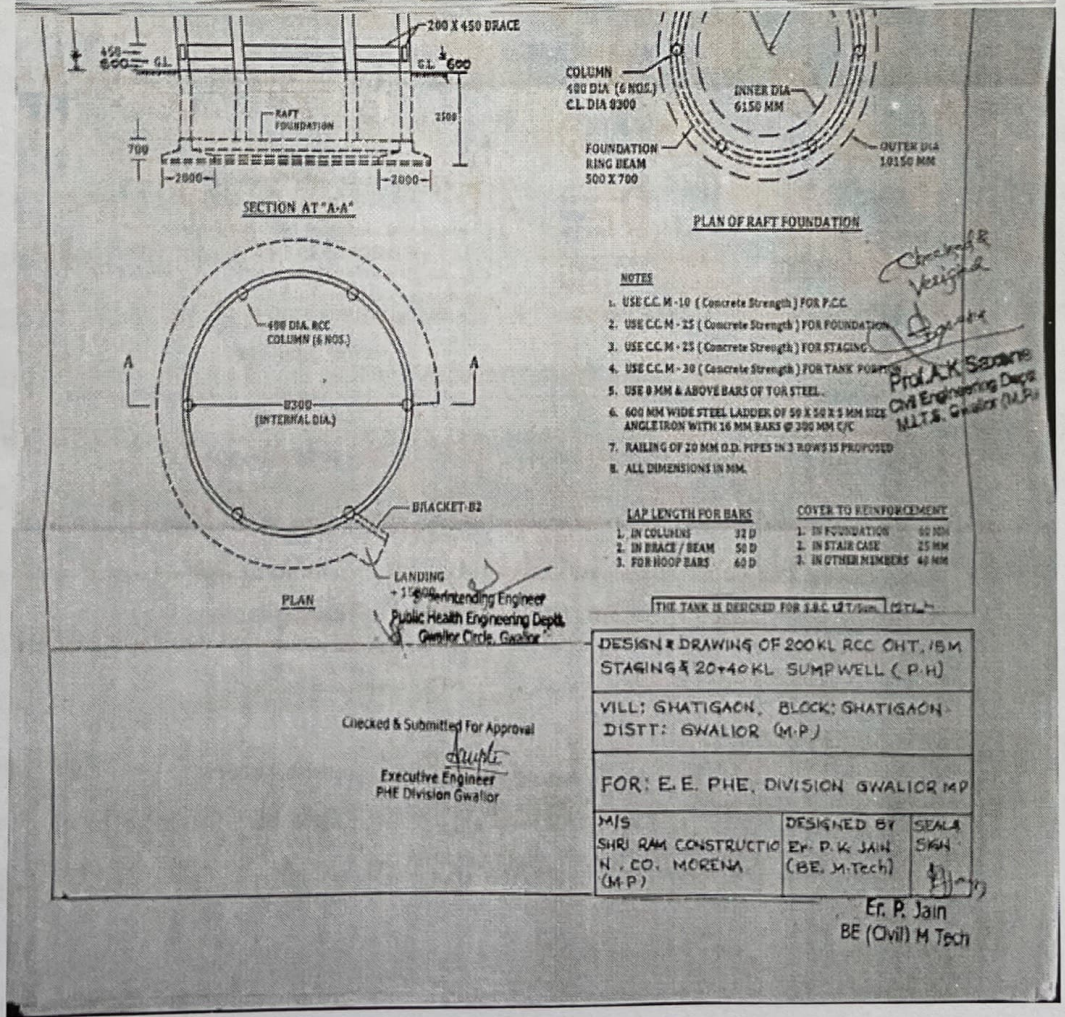
Fb = free board of the water.

IN THE GHATIGAON SITE INTERNAL DIAMETER OF OVERHEAD WATER

TANK IS 8300MM AROUND THE 200 MM THICK CONICAL WALL.

GHATIGAON SITE OVERHEAD WATERTANK DESIGN



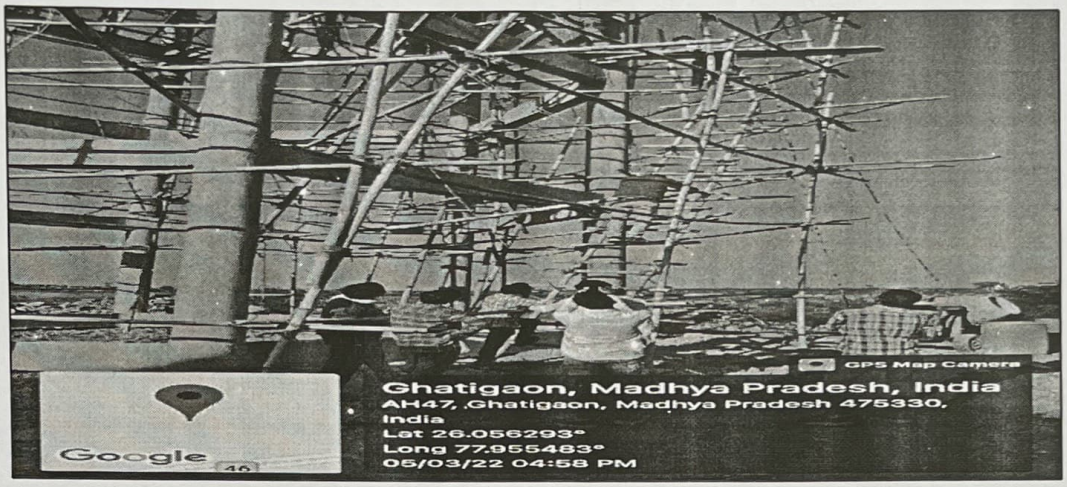


CHAPTER III

DESIGN OF COLUMN

These are to be designed for the total load transferred to them. The columns will be braced at intervals and have to be designed for wind pressure and seismic loads whichever govern and the size of columns will be depend on the anticipated load from the rcc overhead water tank and also its very important to consider to second order effects(p-delta) and The process of designing of columns is the main force behind the making of 15 m RCC overhead water tank and minimum we have to need 6 main bars of size 16mm and the column tie bars should be not less than 8 mm diameter for making strength of column efficient and clear cover should also provide between 50 mm to 75 mm for providing better stability in columns and cover block use of 40 mm and after the binding of columns the process of concreting should be done by using the m25 grade of concrete (1:1:2) as per standards and columns is stand up along with ring beam from foundation level to the bottom dome slab.

In the Ghatigaon site of RCC overhead water tank total 6 columns are constructed along the ring beam of inner and outer diameter of 6150 and 1050 mm respectively and diameter of column is 400mm in circular shape and centre to centre spacing is 4150 and also clear cover is 75 mm provided and in the design of column there is a use of 10 no. of 12 mm bars@100c/c spacing and 8 mm diameter rings @ 190 C/c.


GPS Map Camera
Ghatigaon, Madhya Pradesh, India
AH47, Ghatigaon, Madhya Pradesh 475330, India
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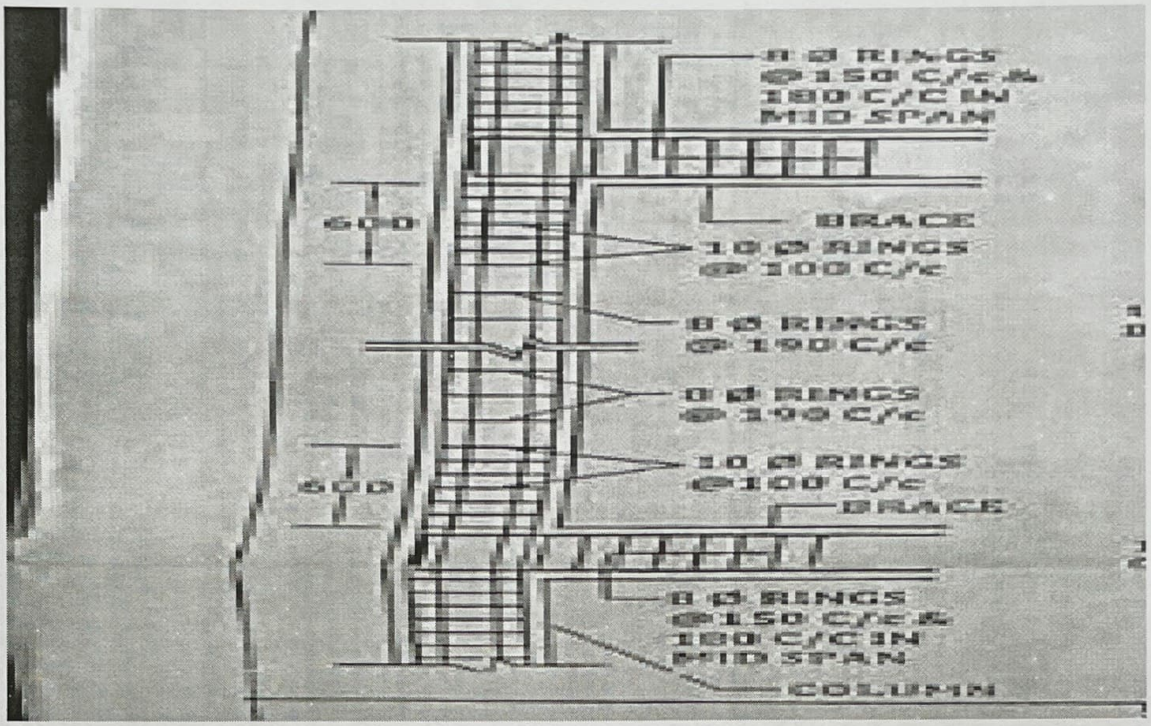
FIGURES OF DESIGN OF COLUMN



CHAPTER V

BRACING SYSTEM

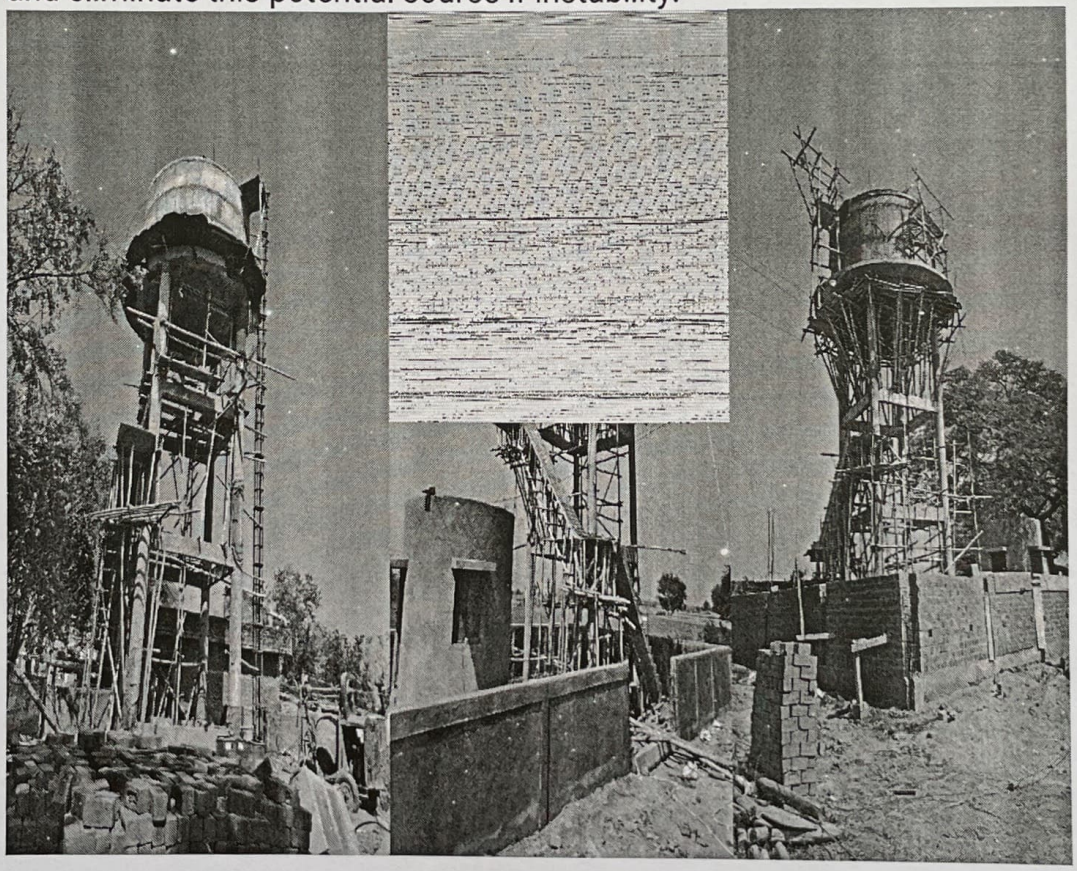
Without braces, elevated water tower would have inherent stability against force applied in every direction (all three axis-forward and backward, left-right, up-down). Hence Elevated tanks need braces for supporting in all condition.

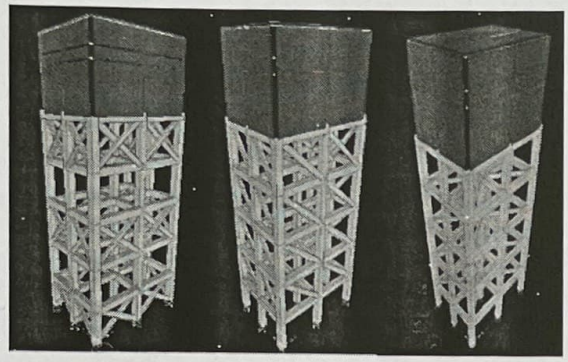
Let's assume a water tank is supported by a series of vertical legs located around the tanks's perimeter. Properly made this way it would have

inherent stability against forces applied in every direction (all three axes; left-right, up-down, forward and back) but there is nothing about this arrangement that would effectively prevent rotation, or twist, about the structure's vertical axis.

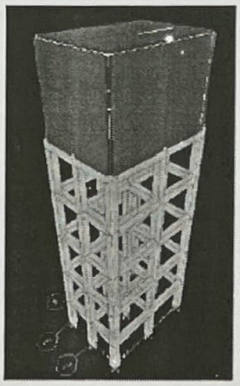
Any rotating moment (sometimes called rotational racking) that was initiated and not countered would multiply itself with the help of gravity from the tank's weight and result in a twisting collapse.

Stays under tension or brackets that are properly positioned diagonally in both directions across adjacent supporting legs to form triangles are used to hold the legs rigidly in relation to each other, arrest any twisting torque, and eliminate this potential source if instability.

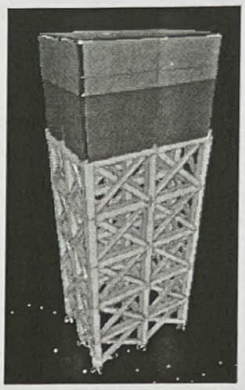




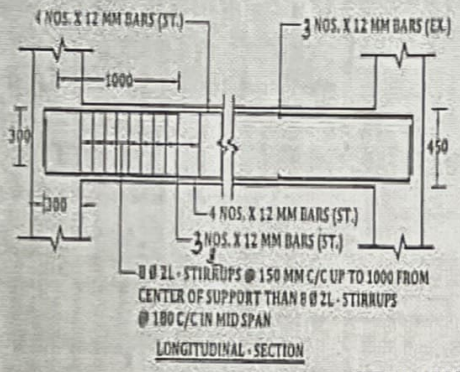
(c) Alternate X braces (d) Diagonal braces (e) Radial Braces



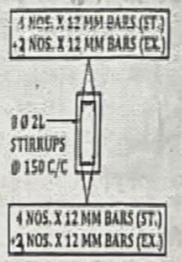
(a) Without braces



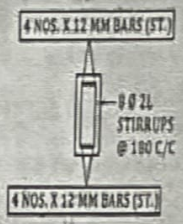
(b) X braces



LONGITUDINAL - SECTION

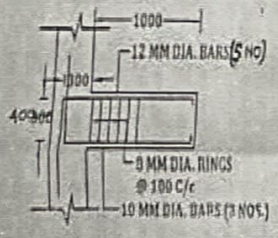


SECTION AT SUPPORT

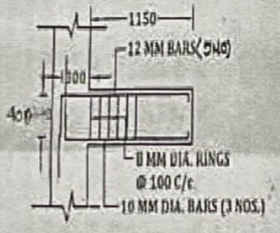


SECTION AT MID SPAN

DETAILS OF BRACE (200 X 450)



DETAILS OF BRACKET- B1 (200 X 400)



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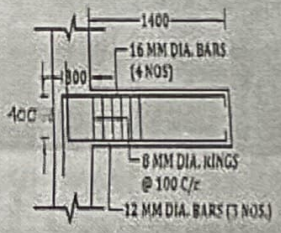


DETAILS OF BRACKET- B3 (200 X 400)

Superintending Engineer
Public Health Engineering Deptt
Gwalior Circle, Gwalior

Checked & Verified

Checked & Submitted For Approval

Executive Engineer
PHE Division Gwalior

Prof. A.K Saxena
Civil Engineering Deptt
M.I.T.S. Gwalior (M.P.)

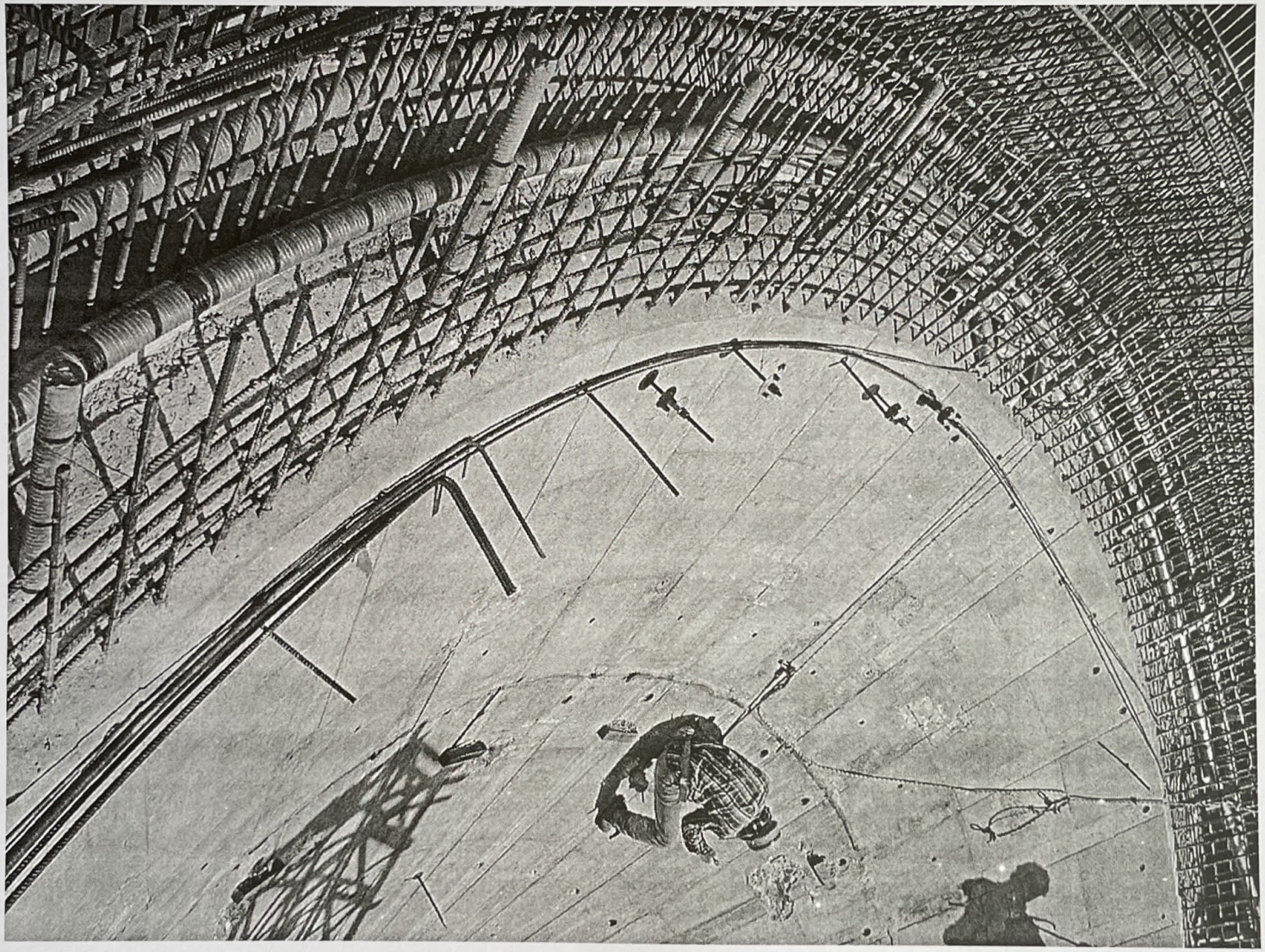
DESIGN & DRAWING OF 200 KL RCC OHT, 15 M STAGING & 20+40 KL SUMP WELL (P.H)		
VILL: GHATIGAON, BLOCK: GHATIGAON DISTT: GWALIOR (M.P.)		
FOR: E.E. PHE. DIVISION GWALIOR M.P.		
M/S SHRI RAM CONSTRUCTION, CO. MORENA (M.P.)	DESIGNED BY Er. P.K. JAIN (BE. M.Tech)	SEAL & SIGN

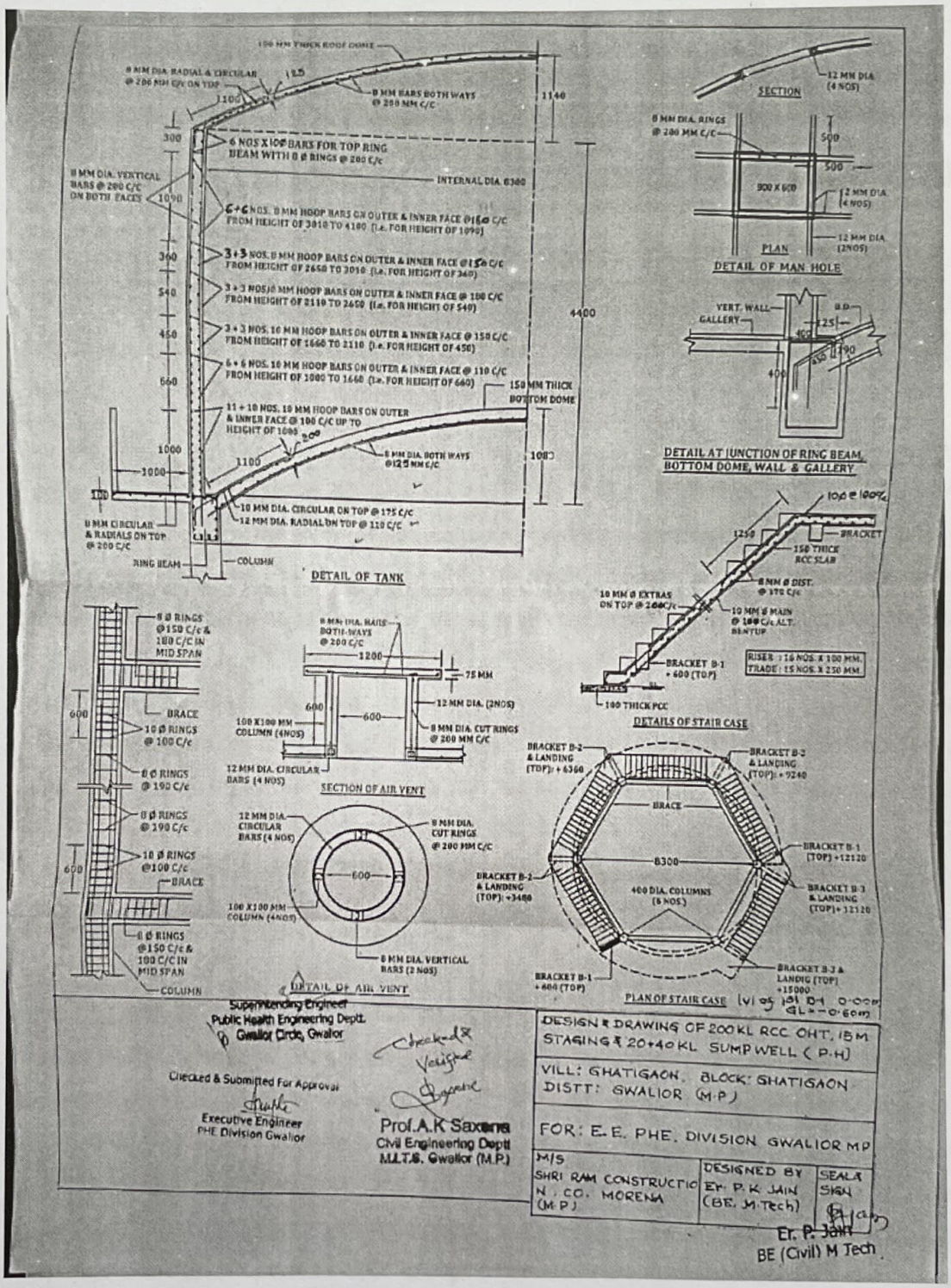
Er. P. Jain
BE (Civil) M Tech

CHAPTER VI

DOME

A dome may be defined as a thin shell generated by the revolution of a regular curve about one of its axes. The shape of the dome depends on the type of the curve and the direction of the axis of revolution. In spherical and conoidal domes, surface is described by revolving an arc of a circle. The centre of the circle may be on the axis of rotation (spherical dome) or outside the axis (conoidal dome). Both types may or may not have a symmetrical lantern opening through the top. The edge of the shell around its base is usually provided with edge member cast integrally with the shell. Domes are used in variety of structures, as in the roof of circular areas, in circular tanks, in hangers, exhibition halls, auditoriums, planetorium and bottom of tanks, bins and bunkers. Domes may be constructed of masonry, steel, timber and reinforced concrete. However, reinforced domes are more common nowadays since they can be constructed over large spans Membrane theory for analysis of shells of revolution can be developed neglecting effect of bending moment, twisting moment and shear and assuming that the loads are carried wholly by axial stresses. This however applies at points of shell which are removed some distance away from the discontinuous edge. At the edges, the results thus obtained may be indicated but are not accurate.





Superintending Engineer
Public Health Engineering Deptt.
Gwalior Circle, Gwalior

Checked & Submitted For Approval

Executive Engineer
PHE Division Gwalior

Checked & Verified

Prof. A.K Saxena
Civil Engineering Deptt
M.I.T.S. Gwalior (M.P.)

DESIGN & DRAWING OF 200 KL RCC OHT, 15 M STAGING & 20+40 KL SUMP WELL (P.H)

VILL: GHATIGAON, BLOCK: GHATIGAON
DISTT: GWALIOR (M.P.)

FOR: E.E. PHE. DIVISION GWALIOR M.P.

M/S	DESIGNED BY	SEAL & SIGN
SHRI RAM CONSTRUCTION CO. MORENA (M.P.)	Er. P.K JAIN (BE, M.Tech)	

Er. P. Jain
BE (Civil) M Tech

CONICAL WALL

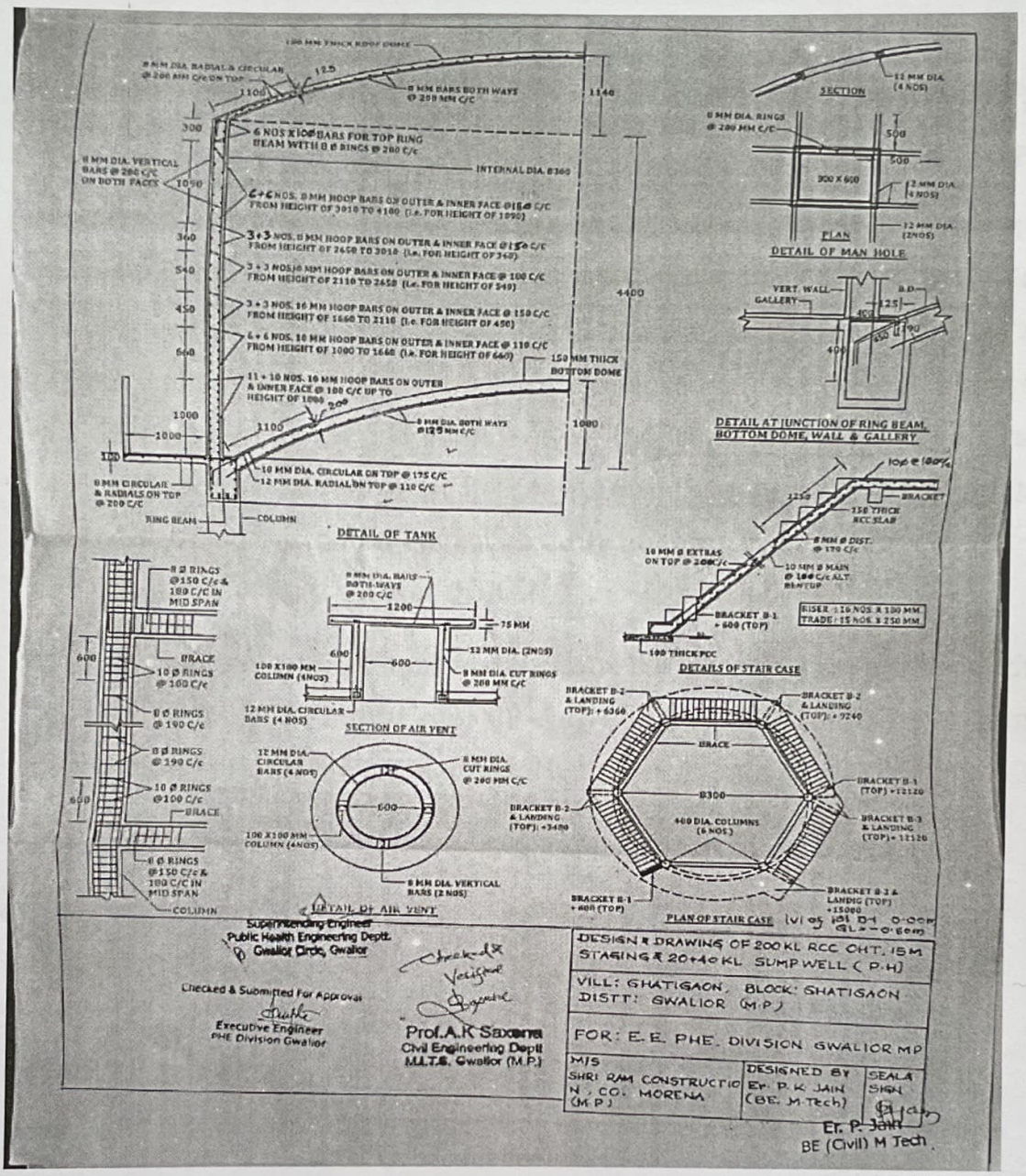
This has to be designed for hoop tension caused due to horizontal water pressure.

A circular tank with a horizontal or flat floor slab is only economical for smaller storage capacity of up to 200,000 liters and diameters in the range of 500 to 800 cm. The depth of the storage is generally between 3 to 4 m. The side walls are designed for circumferential hoop tension and bending moment since the walls are fixed to the floor slab at the junction. The design forces are determined using coefficients recommended in IS: 3370

For smaller capacities rectangular tanks are used and for bigger capacities circular tanks are used .In circular tanks with flexible joint at the base tanks walls are subjected to hydrostatic pressure .so the tank walls are designed as thin cylinder. As the hoop tension gradually reduces to zero at top, the reinforcement is gradually reduced to minimum reinforcement at top. The main reinforcement consists of circular hoops. Vertical reinforcement equal to 0.3% of concrete are is provided and hoop reinforcement is tied to this reinforcement. The design of rigid base circular tank can be done by the approximate method. In this method it is assumed that some portion of the tank at base acts as cantilever and thus some load at bottom are taken by the cantilever effect. Load in the top portion is taken by the hoop tension. The cantilever effect will depend on the dimension of the tank and the thickness of the wall.

In case of large diameter elevated circular tanks, thicker floor slabs are required resulting in uneconomical domes. For Providing Greater Liquid Retaining Capacity for Equal Base Radios of a cylindrical Counterpart elevated conical tanks are considered as one of the most popular construction. In such cases, conical tank and bottom spherical domes provides an economical solution. As all of we know that measure of good civil engineering structure is economy in its design. Design of conical tank involves proportioning and structural design, in which proportioning part mainly depends upon geometric aspects. Optimum cost design of such a structure needs several trial design. In present study, an optimum cost design of conical tank Parametric Study on Conical Shape Tank. 118 considering geometric

and structural design aspects. The cost of the conical tank has been considered as the objective function and the geometric parameters have been considered as constraints.



Superintending Engineer
Public Health Engineering Deptt.
Gwalior Circle, Gwalior

Checked & Submitted For Approval

Executive Engineer
PHE Division Gwalior

Checked & Verified

Prof. A.K Saxena
Civil Engineering Deptt
M.I.T.S. Gwalior (M.P.)

DESIGN & DRAWING OF 200 KL RCC OHT, 15 M STAGING & 20+40 KL SUMP WELL (P.H)

VILL: GHATIGAON, BLOCK: SHATIGAON
DISTT: GWALIOR (M.P.)

FOR: E.E. PHE. DIVISION GWALIOR MP

M/S	DESIGNED BY	SEAL & SIGN
SHRI RAM CONSTRUCTION, CO. MORENA (M.P.)	Er. P.K JAIN (BE. M.Tech)	

Er. P. Jain
BE (Civil) M Tech

CHAPTER VIII

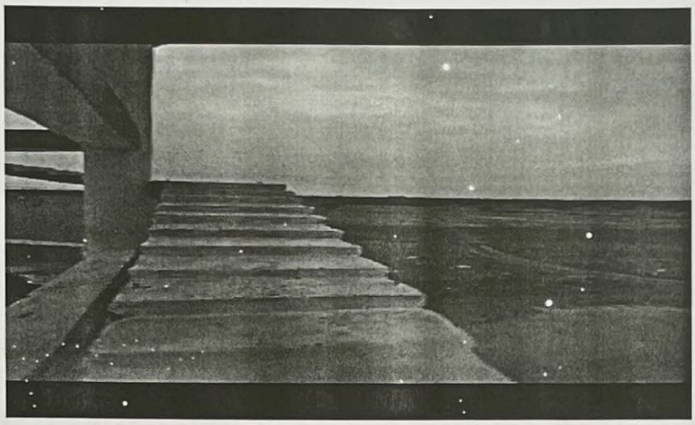
STAIRCASE

STAIRCASE are provided in reinforced concrete overhead tanks for ease of movement and safety up and down the tank and the staircase can be made up of steel straight ladders attached to the frame or constructed as a regular flight staircase to the top and the decision on the type of staircase will depend on the size and complexity of the water tank. For the circular rcc overhead tanks a spiral or helical staircase can be provided to wrap around the columns and the steel bars are not less than 10 mm diameter and grade of concrete not less than M20 Should be used.

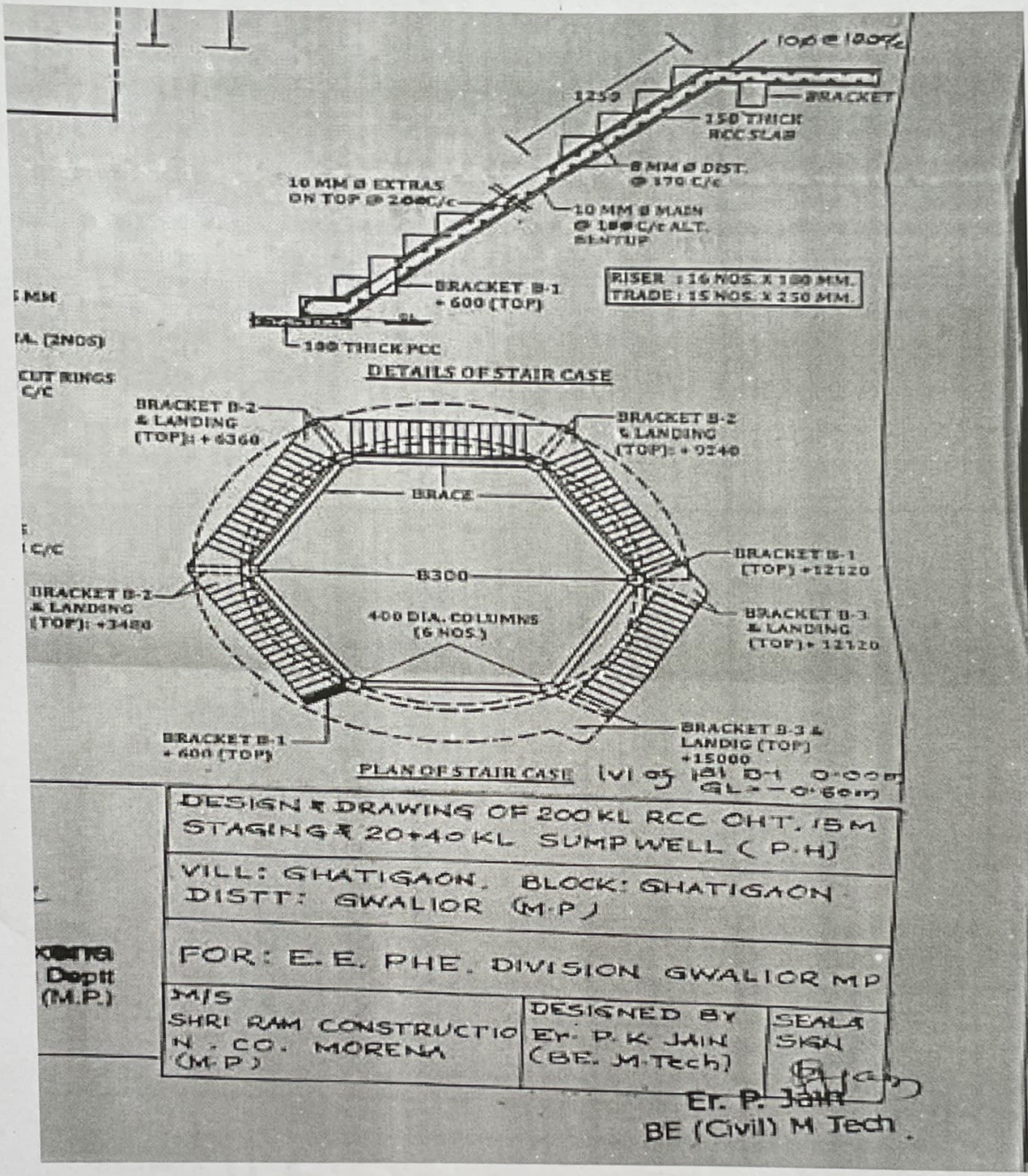
In this site 600 mm wide steel ladder of 50× 50× 5 mm size angle iron with 16 mm bars @ 300 mm c/c spacing and bars provided are 8 mm distribution bars @ 170 c/c and the 10 mm main bars @ 100 c/c and 10 mm extra bars on top @ 200 c/c and the staircase slab is 150 mm thick

RISER- 16 Nos× 180

TRADE-15 Nos ×250 mm



STAIRCASE DESIGN FIGURES



DESIGN & DRAWING OF 200 KL RCC OHT, 15 M STAGING & 20+40 KL SUMP WELL (P.H)

VILL: GHATIGAON, BLOCK: GHATIGAON
DISTT: GWALIOR (M.P)

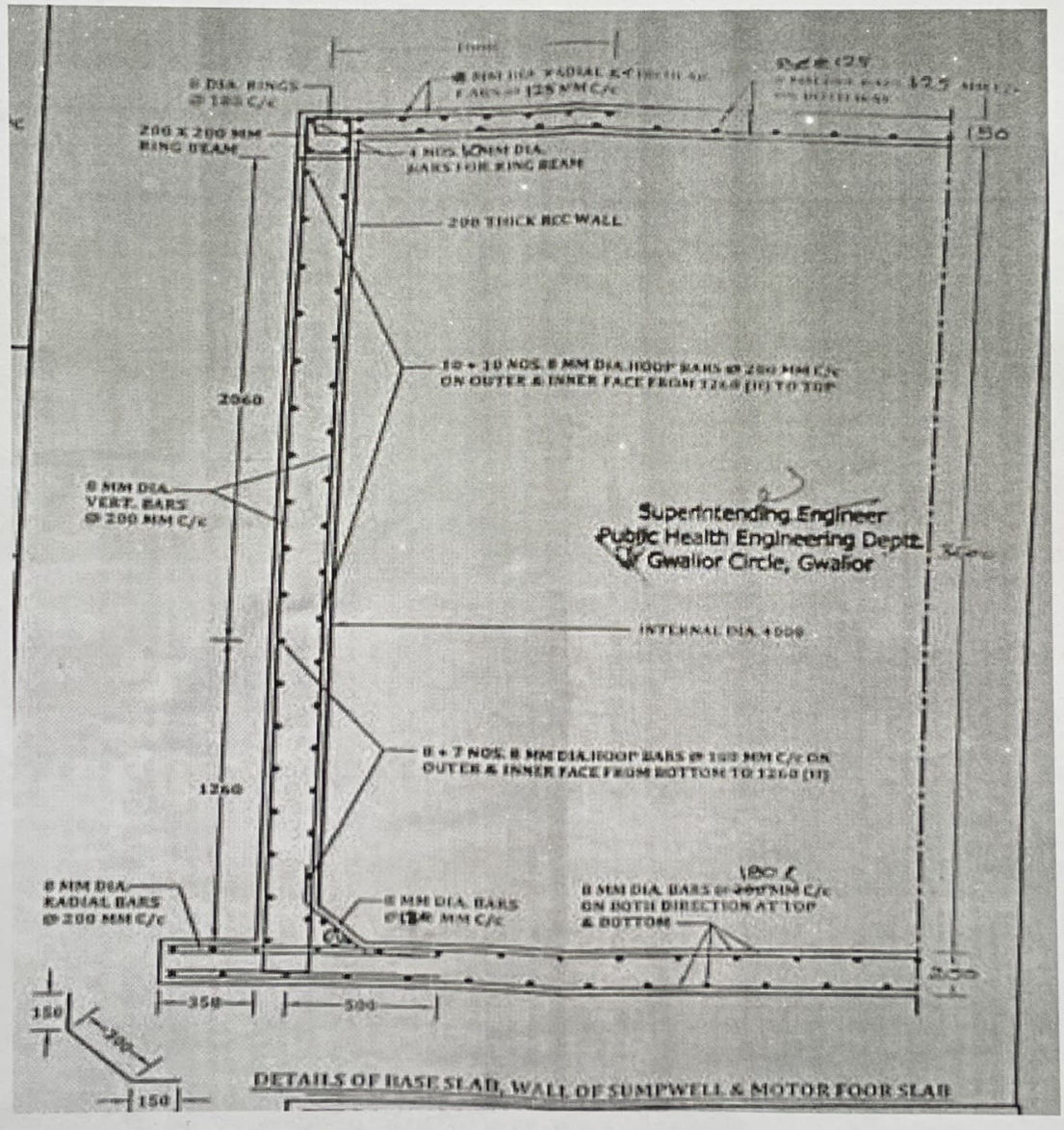
FOR: E.E. PHE. DIVISION GWALIOR MP

M/S	DESIGNED BY	SEAL & SIGN
SHRI RAM CONSTRUCTION CO. MORENA (M.P)	Er. P.K. JAIN (BE. M.Tech)	

Er. P. Jain
BE (Civil) M Tech

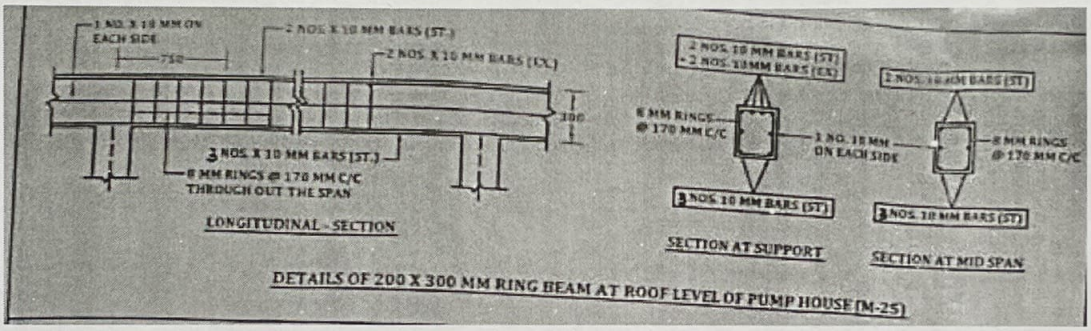
DESIGN OF 20KL + 40KL SUMP WELL

DETAILS OF BASE SLAB, WALL OF SUMPWELL & MOTOR FLOOR SLAB

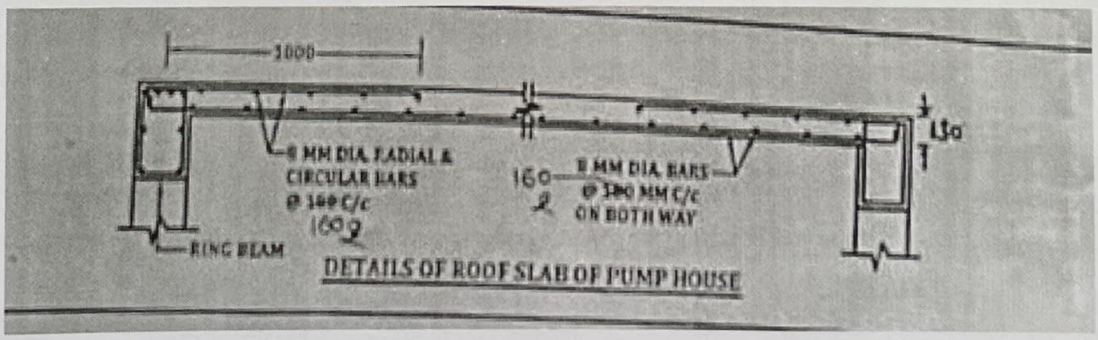


DETAILS OF RING BEAM AT ROOF LEVEL OF PUMP HOUSE :-

- Cross section area. 200*300MM
- Strength of concrete M25 grade
- 2Nos of 10MM Extra bars provided at support side

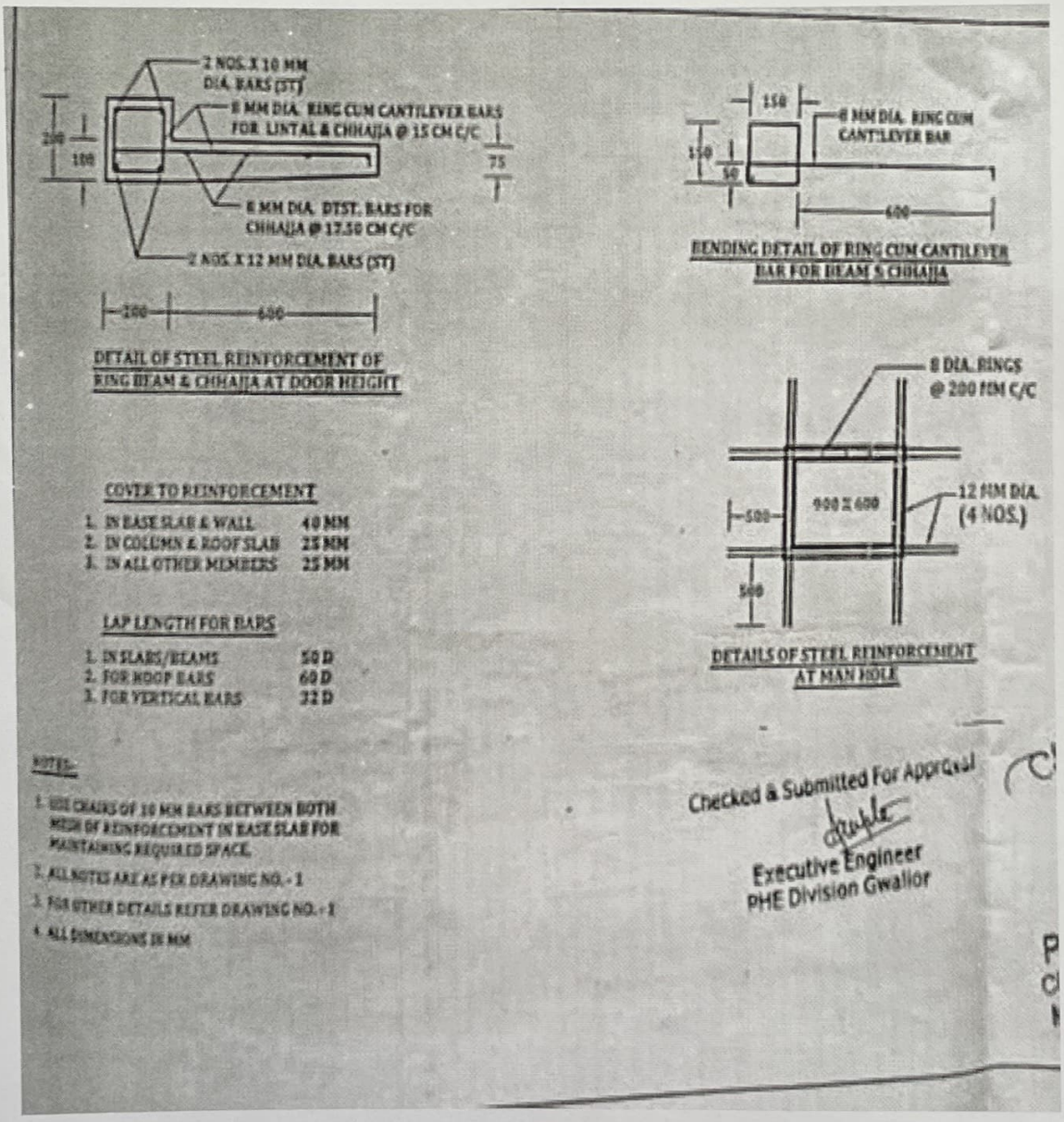


DETAILS OF ROOF SLAB OF PUMP HOUSE:-



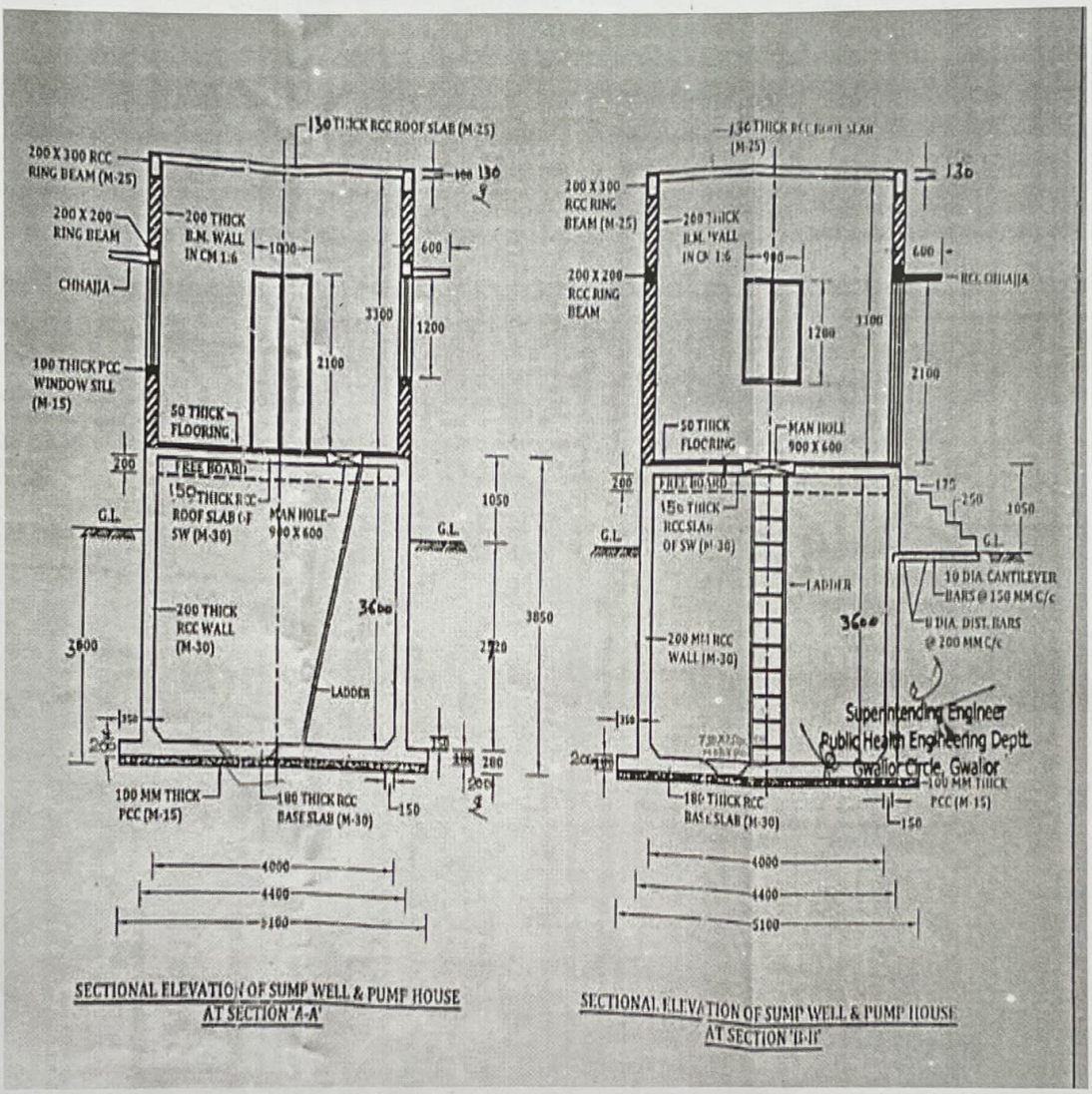
DETAIL OF STEEL REINFORCEMENT OF RING BEAM AT DOOR HEIGHT:-

- Ring beam 200*200
- Main hole 900*600MM
- Chhajja length 600MM



SECTION ELEVATION OF SUMP WELL & PUMP HOUSE(40KL):-

- Thickness of RCC base slab 180MM(M30)
- Thickness of PCC work. 100MM (M15)
- Depth to Ground level. 3000MM
-

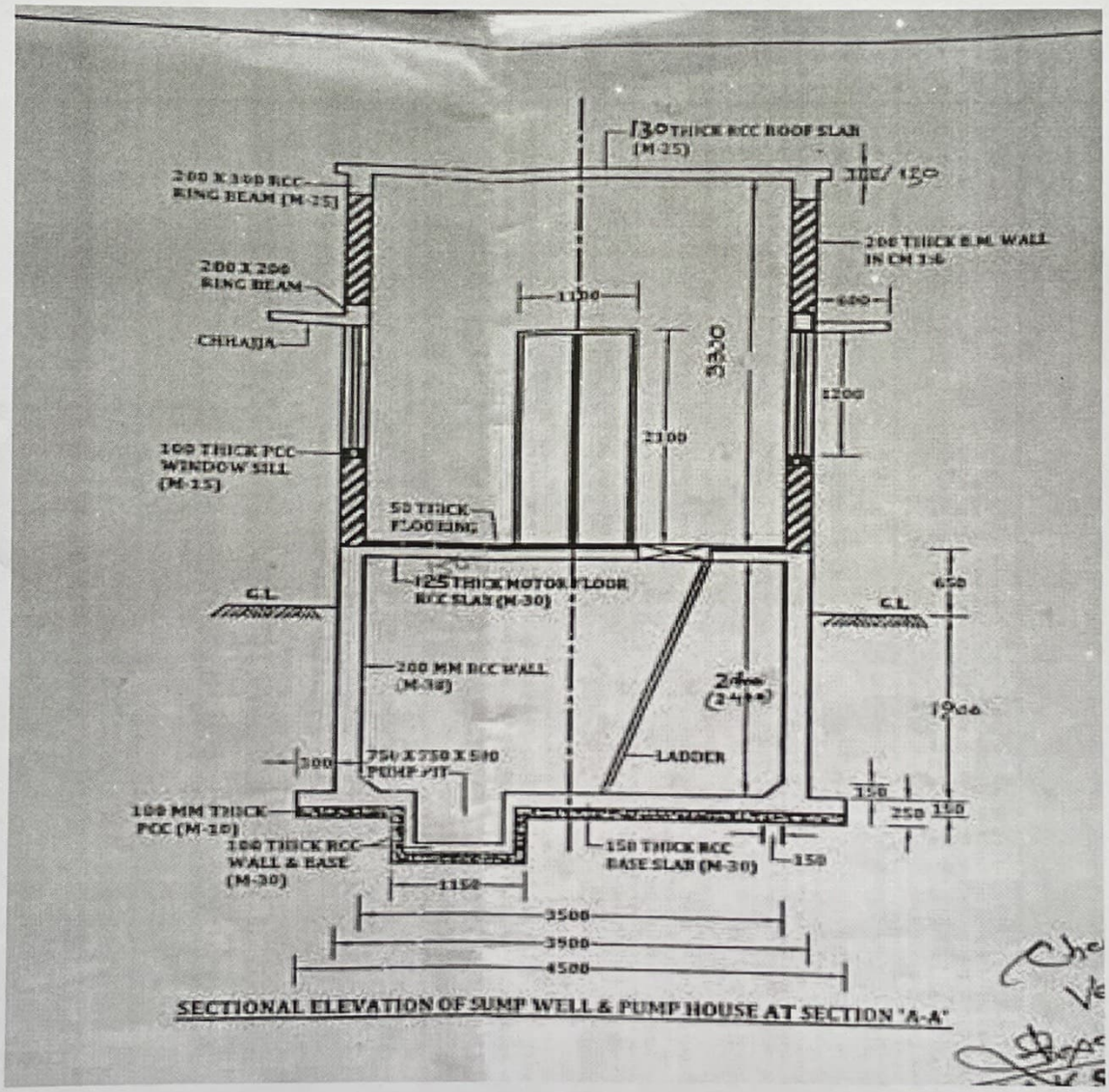


SECTIONAL ELEVATION OF SUMP WELL & PUMP HOUSE AT SECTION 'A-A'

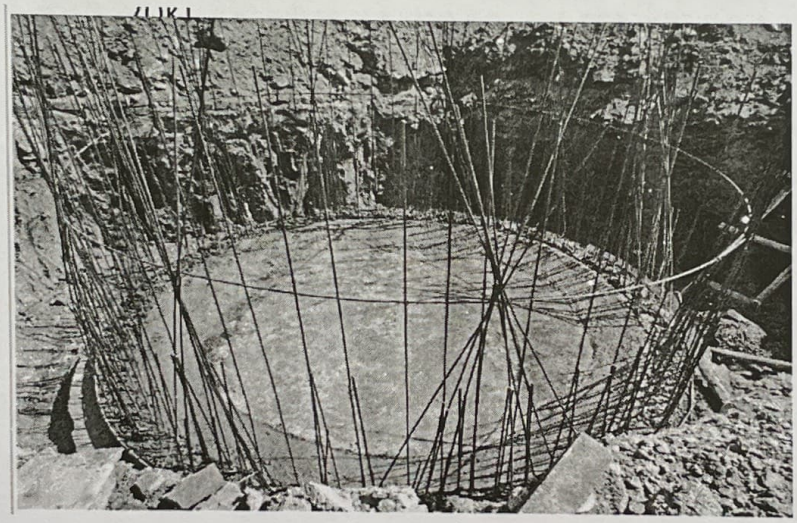
SECTIONAL ELEVATION OF SUMP WELL & PUMP HOUSE AT SECTION 'B-B'

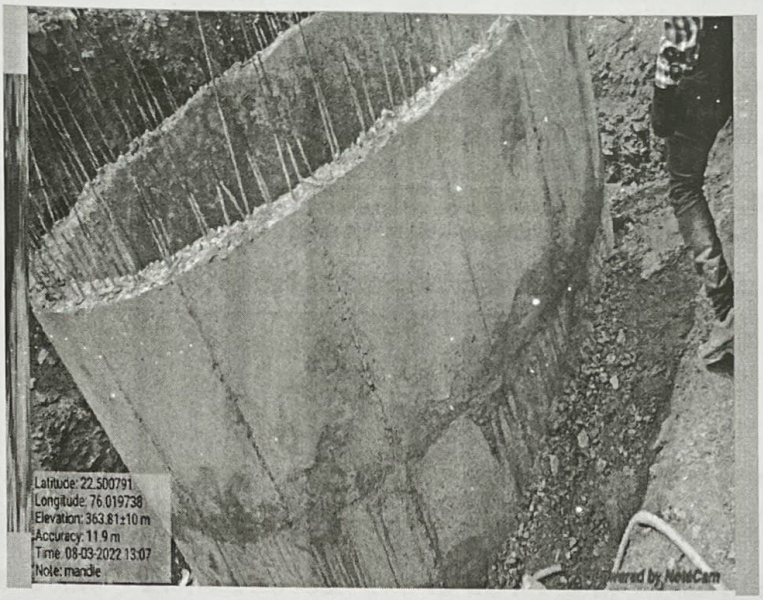
SECTION ELEVATION OF SUMP WELL (20KL)

- Strength of concrete uses M25 grade
- Thickness of RCC roof slab 130MM
- Thickness of PCC work 100MM (M10)
- Thickness of RCC Base slab 150MM (M30)
-



UNDER CONSTRUCTION OF SUMPWELL(20KL):-





CHAPTER IV

MISCELLANEOUS

GENERAL DESIGN REQUIREMENTS ACCORDING TO CODE OF PRACTICE (IS : 3370 - PART II, 1965)

Plain Concrete Structures.

Plain concrete member of reinforced concrete liquid retaining structure

may be designed against structural failure by allowing tension in plain concrete as per the permissible limits for tension in bending. This will automatically take care of failure due to cracking. However, nominal reinforcement shall be provided, for plain concrete structural member

.Permissible Stresses in Concrete.

(a) For resistance to cracking

For calculations relating to the resistance of members to cracking, the permissible stresses in tension (direct and due to bending) and shear shall confirm to the values specified in Table 1. The permissible tensile stresses due to bending apply to the face of the member in contact with the liquid. In members less than 225mm. thick and in contact with liquid on one side these permissible stresses in bending apply also to the face remote from the liquid.

(b) For strength calculations.

In strength calculations the permissible concrete stresses shall be in accordance with Table Where the calculated shear stress in concrete alone exceeds the permissible value, reinforcement acting in conjunction with diagonal compression in the concrete shall be provided to take the whole of the shear.

Grade of concrete	Permissible stresses (N/mm^2)		
	Direct Tension, σ_{td}	Tension due to Bending σ_{tb}	Shear τ_{sh} (Q / b jd)
M 15	1.1	1.5	1.5
M 20	1.2	1.7	1.7
M 25	1.3	1.8	1.9
M 30	1.5	2.0	2.2
M 35	1.6	2.2	2.5
M 40	1.7	2.4	2.7

Stresses due to drying Shrinkage or Temperature Change:-

Stresses due to drying shrinkage or temperature change may be ignored provided that –

(a) The permissible stresses specified above in (ii) and (iii) are not otherwise exceeded.

(b) Adequate precautions are taken to avoid cracking of concrete during the construction period and until the reservoir is put into use.

(c) Recommendation regarding joints given in article 8.3 and for suitable sliding layer beneath the reservoir are complied with, or the reservoir is to be used only for the storage of water or aqueous liquids at or near ambient

temperature and the circumstances are such that the concrete will never dry out.

(ii)Shrinkage stresses may however be required to be calculated in special cases, when a shrinkage co-efficient of 300 x 10-6may be assumed.

(iii) When the shrinkage stresses are allowed, the permissible stresses, tensile stresses to concrete (direct and bending) as given in Table 1 may be increased by 33.33 per cent.

Floor of tanks resting on supports

(a) If the tank is supported on walls or other similar supports the floor slab shall be designed as floor in buildings for bending moments due to water load and self weight.

(b) When the floor is rigidly connected to the walls (as is generally the case) the bending moments at the junction between the walls and floors shall be taken into account in the design of floor together with any direct forces transferred to the floor from the walls or from the floor to the wall due to suspension of the floor from the wall. 21 If the walls are non-monolithic with the floor slab, such as in cases, where movement joints have been provided between the floor slabs and walls, the floor shall be designed only for the vertical loads on the floor.

(c) In continuous T-beams and L-beams with ribs on the side remote from the liquid, the tension in concrete on the liquid side at the face of the supports shall not exceed the permissible stresses for controlling cracks in concrete. The width of the slab shall be determined in usual manner for

calculation of the resistance to cracking of T-beam, L-beam sections at supports.

(d) The floor slab may be suitably tied to the walls by rods properly embedded in both the slab and the walls. In such cases no separate beam (curved or straight) is necessary under the wall, provided the wall of the tank itself is designed to act as a beam over the supports under it.

(e) Sometimes it may be economical to provide the floors of circular tanks, in the shape of dome. In such cases the dome shall be designed for the vertical loads of the liquid over it and the ratio of its rise to its diameter shall be so adjusted that the stresses in the dome are, as far as possible, wholly compressive. The dome shall be supported at its bottom on the ring beam which shall be designed for resultant circumferential tension in addition to vertical loads.

Walls of Cylindrical Tanks.

While designing walls of cylindrical tanks the following points should be borne in mind:

(a) Walls of cylindrical tanks are either cast monolithically with the base or are set in grooves and key ways (movement joints). In either case deformation of wall under influence of liquid pressure is restricted at and

above the base. Consequently, only part of the triangular hydrostatic load will be carried by ring tension and part of the load at bottom will be supported by cantilever action.

(b) It is difficult to restrict rotation or settlement of the base slab and it is advisable to provide vertical reinforcement as if the walls were fully fixed at the base, in addition to the reinforcement required to resist horizontal ring tension for hinged at base, conditions of walls, unless the appropriate amount of fixity at the base is established by analysis with due consideration to the dimensions of the base slab the type of joint between the wall and slab, and , where applicable, the type of soil supporting the base slab

Roofs

Provision of Movement joints. To avoid the possibility of sympathetic cracking it is important to ensure that movement joints in the roof correspond with those in the walls, if roof and walls are monolithic. It, however, provision is made by means of a sliding joint for movement between the roof and the wall correspondence of joints is not so important.

Loading Field covers of liquid retaining structures should be designed for gravity loads, such as the weight of roof slab, earth cover if any, live loads and mechanical equipment. They should also be designed for upward load if the liquid retaining structure is subjected to internal gas pressure. A superficial load sufficient to ensure safety with the unequal intensity of loading which occurs during the placing of the earth cover should be allowed for in designing roofs. The engineer should specify a loading under these temporary conditions which should not be exceeded. In designing the

roof, allowance should be made for the temporary condition of some spans loaded and other spans unloaded, even though in the final state the load may be small and evenly distributed.

Water tightness. In case of tanks intended for the storage of water for domestic purpose, the roof must be made water-tight. This may be achieved by limiting the stresses as for the rest of the tank, or by the use of the covering of the waterproof membrane or by providing slopes to ensure adequate drainage.

Protection against corrosion. Protection measure shall be provided to the underside of the roof to prevent it from corrosion due

CHAPTER X
SITE VISIT

Our group went to village Ghatigaon for site visit. There we visited 2 water tanks. The first water tank was under construction, the work of reinforcement of the bottom dome was going on.

I learned there that the shape of the bottom dome is not plain, but it is a hemisphere in shape, which helps in transferring the force given by the water to the wall.

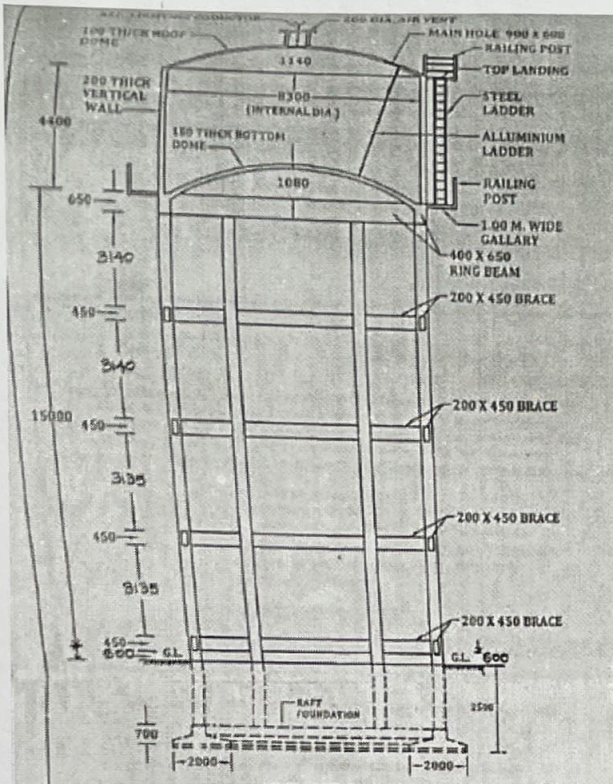
And in my previous chapters I was notified that the raft foundation is used for the construction of rcc overhead water tank

Our guide Mr. Sanjeev Gupta (SDO, PHE Morar) told us that by constructing elevated water tank, we provide water head which helps in water supply.

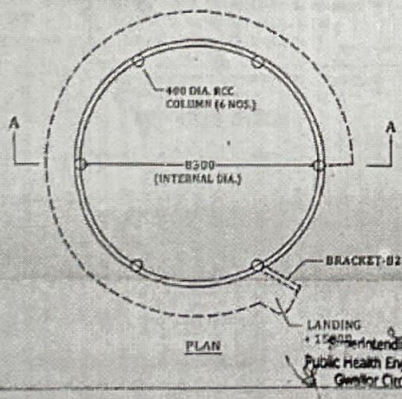
The sump well of the second water tank which was completed was shown And it was told by Mr. Gupta that first the water is brought to the sump well,

after that it is purified and pumped on the elevated water tank to supply water to the village for the drinking and sanitary purposes.

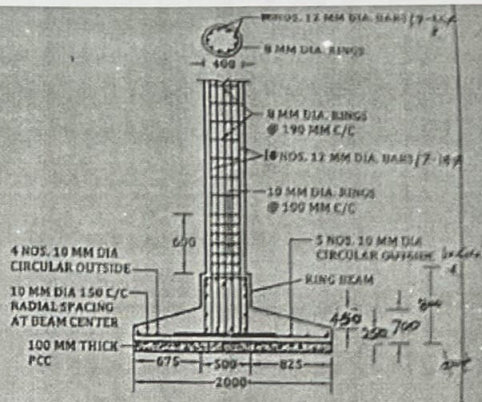
I am also attaching the photos of design of ghatigaon water tank and site visit pictures and its includes air vent and sump well also.



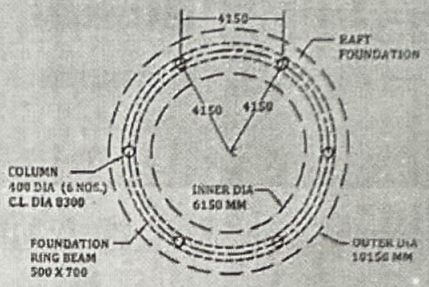
SECTION AT "A-A"



PLAN



DETAILS OF RCC RAFT FOUNDATION & COLUMN



PLAN OF RAFT FOUNDATION

NOTES

1. USE C.C. M -10 (Concrete Strength) FOR P.C.C.
2. USE C.C. M - 25 (Concrete Strength) FOR FOUNDATION
3. USE C.C. M - 25 (Concrete Strength) FOR STAGING
4. USE C.C. M - 30 (Concrete Strength) FOR TANK POWER
5. USE 8 MM & ABOVE BARS OF TOR STEEL.
6. 600 MM WIDE STEEL LADDER OF 50 X 50 X 5 MM SIZE ANGLE IRON WITH 16 MM BARS @ 300 MM C/C
7. RAILING OF 20 MM O.D. PIPES IN 3 ROWS IS PROPOSED
8. ALL DIMENSIONS IN MM.

LAP LENGTH FOR BARS		COVER TO REINFORCEMENT	
1. IN COLUMNS	32 D	1. IN FOUNDATION	60 MM
2. IN BRACE / BEAM	50 D	2. IN STAIR CASE	25 MM
3. FOR HOOP BARS	60 D	3. IN OTHER MEMBERS	40 MM

THE TANK IS DESIGNED FOR S.B.C. 12 T/Sqm.

Checked & Submitted For Approval

Executive Engineer
PHE Division Gwalior

Superintending Engineer
Public Health Engineering Deptt.
Gwalior Circle, Gwalior

Prof. A.K. Saxena
Civil Engineering Deptt.
M.I.T.S. Gwalior (M.P.)

DESIGN & DRAWING OF 200 KL RCC OHT, 15 M. STAGING & 20+40 KL SUMP WELL (P.H)

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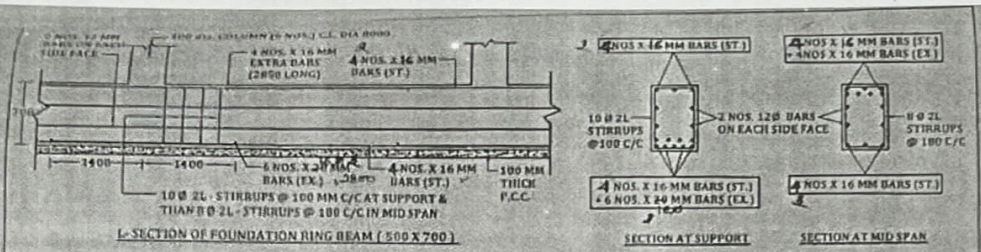
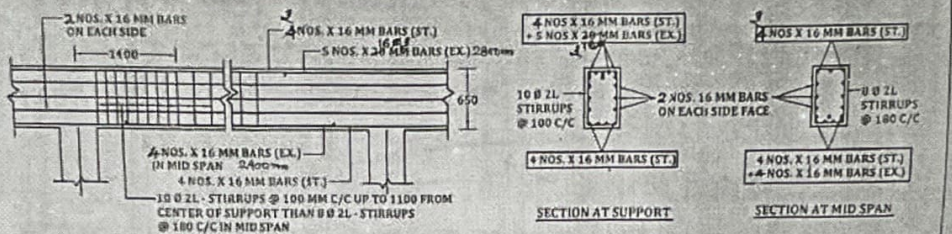


L-SECTION OF FOUNDATION RING BEAM (500 X 700)

SECTION AT SUPPORT

SECTION AT MID SPAN

DETAILS OF FOUNDATION RING BEAM (500 X 800)

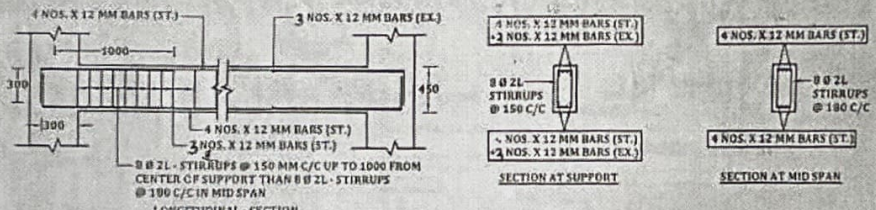


LONGITUDINAL - SECTION

SECTION AT SUPPORT

SECTION AT MID SPAN

DETAILS OF RING BEAM (400 X 650)

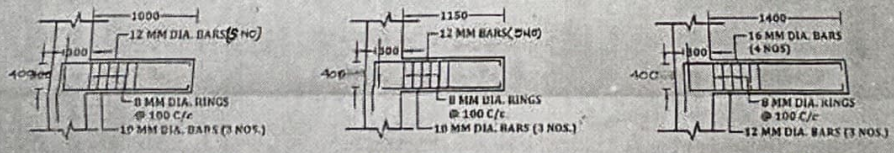


LONGITUDINAL - SECTION

SECTION AT SUPPORT

SECTION AT MID SPAN

DETAILS OF BRACE (200 X 450)



DETAILS OF BRACKET- B1 (200 X 400)

DETAILS OF BRACKET- B2 (200 X 400)

DETAILS OF BRACKET- B3 (200 X 400)

Superintending Engineer
Public Health Engineering Deptt
Gwalior Circle, Gwalior

Checked & Verified

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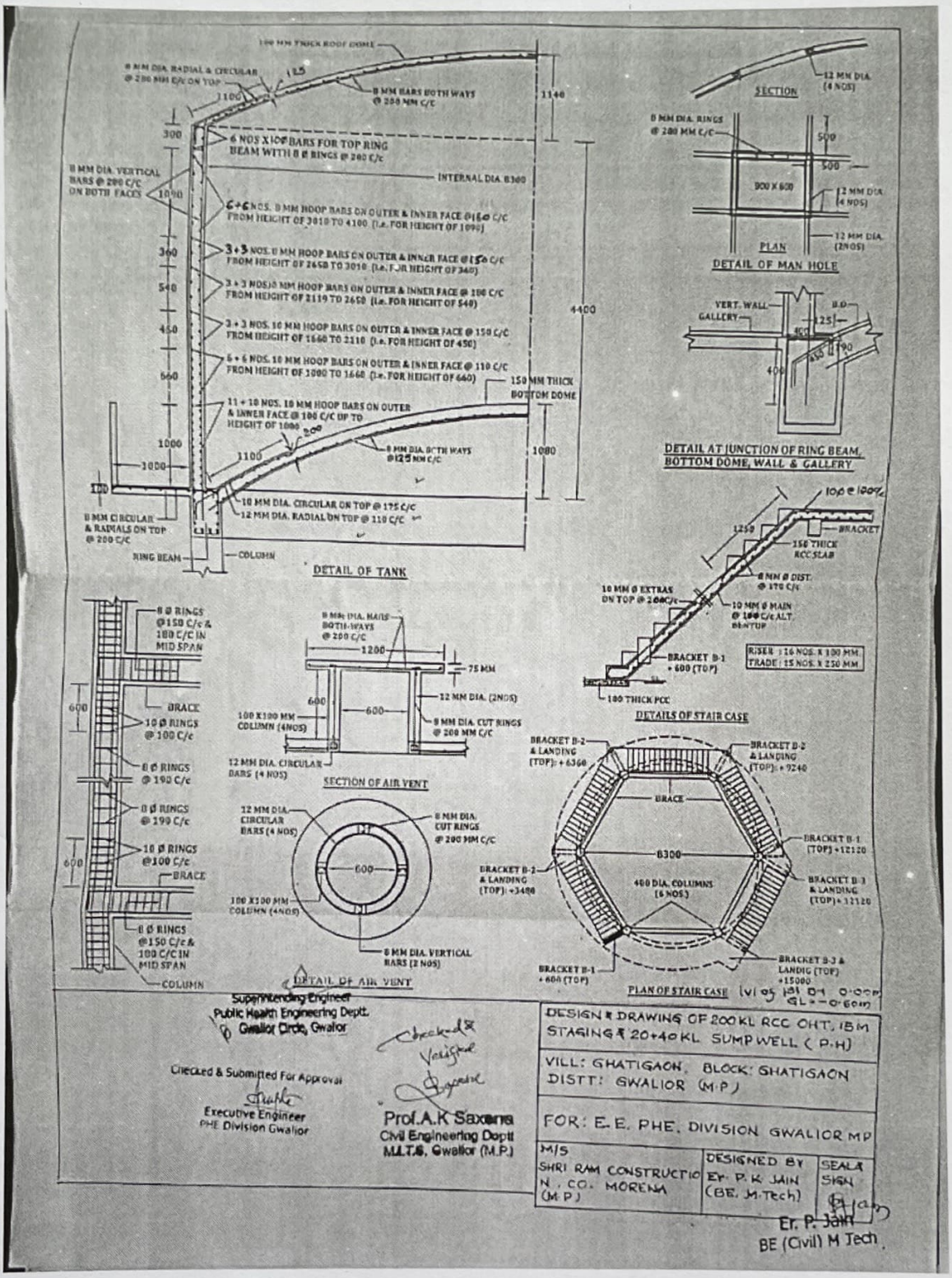

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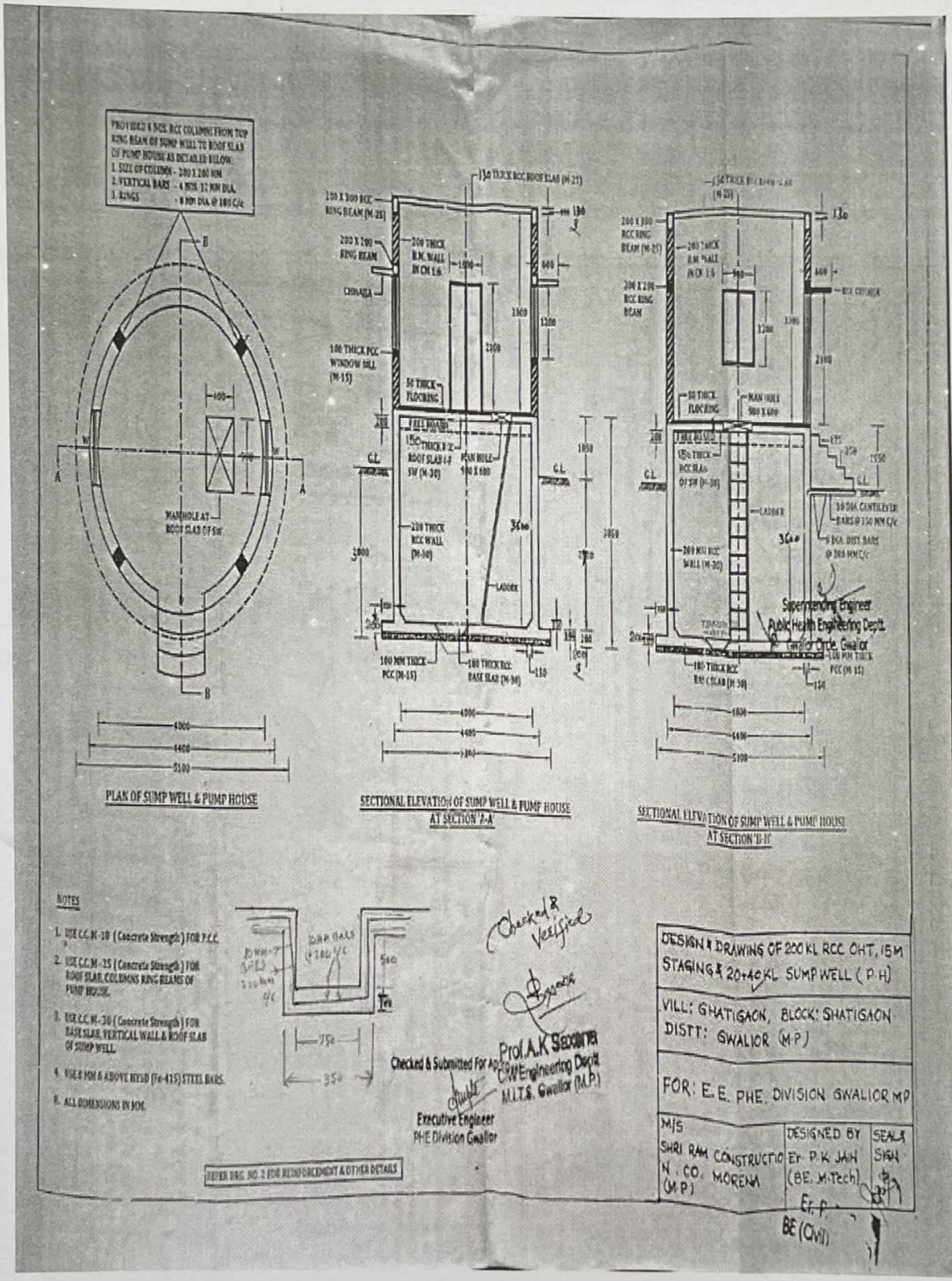
PROVIDED 4 NOS. RCC COLUMNS FROM TOP RING BEAM OF SUMP WELL TO ROOF SLAB OF PUMP HOUSE AS DETAILED BELOW:
1. SIZE OF COLUMN - 200 X 200 MM
2. VERTICAL BARS - 4 NOS. 12 MM DIA.
3. RINGS - 8 MM DIA @ 180 C/c
MANHOLE AT ROOF SLAB OF SW
PLAN OF SUMP WELL & PUMP HOUSE
SECTIONAL ELEVATION OF SUMP WELL & PUMP HOUSE AT SECTION 'A-A'
SECTIONAL ELEVATION OF SUMP WELL & PUMP HOUSE AT SECTION 'B-B'
Superintending Engineer
Public Health Engineering Deptt.
Gwalior Circle, Gwalior
NOTES
1. USE C.C.M-10 (Concrete Strength) FOR P.C.C.
2. USE C.C.M-25 (Concrete Strength) FOR ROOF SLAB, COLUMNS RING BEAMS OF PUMP HOUSE.
3. USE C.C.M-30 (Concrete Strength) FOR BASE SLAB, VERTICAL WALL & ROOF SLAB OF SUMP WELL.
4. USE 8 MM & ABOVE HYSD (Fe-415) STEEL BARS.
5. ALL DIMENSIONS IN MM.
Checked & Veerified
Checked & Submitted For Approval
Prof. A.K Saxena
C&W Engineering Deptt.
M.I.T.S. Gwalior (M.P.)
Executive Engineer
PHE Division Gwalior
REFER DRG. NO. 2 FOR REINFORCEMENT & OTHER DETAILS
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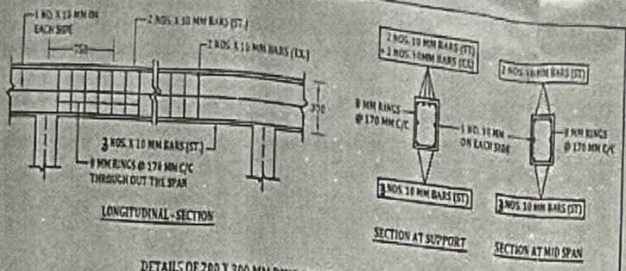
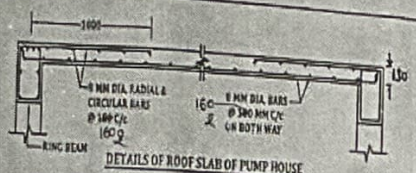
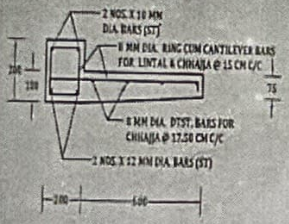
SEAL & SIGN
BE (Civil)



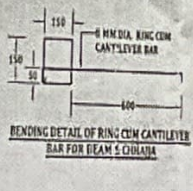
DETAILS OF 200 X 300 MM RING BEAM AT ROOF LEVEL OF PUMP HOUSE (M-25)



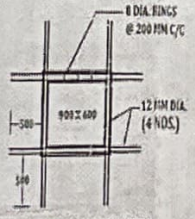
DETAILS OF ROOF SLAB OF PUMP HOUSE



DETAIL OF STEEL REINFORCEMENT OF RING BEAM & CHHAJA AT DOOR HEIGHT



BENDING DETAIL OF RING CUM CANTILEVER BAR FOR BEAM & CHHAJA



DETAILS OF STEEL REINFORCEMENT AT MAN HOLE

COVER TO REINFORCEMENT

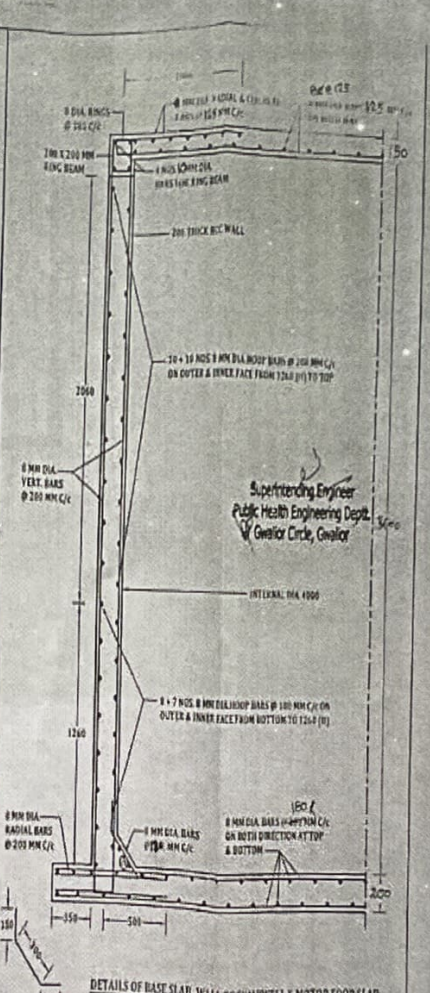
1. IN BASE SLAB & WALL	40 MM
2. IN COLUMN & ROOF SLAB	25 MM
3. IN ALL OTHER MEMBERS	25 MM

LAP LENGTH FOR BARS

1. IN SLABS/BEAMS	50 D
2. FOR HOOP BARS	60 D
3. FOR VERTICAL BARS	32 D

NOTES:

1. USE CHAIRS OF 10 MM BARS BETWEEN BOTH MESH OF REINFORCEMENT IN BASE SLAB FOR MAINTAINING REQUIRED SPACE.
2. ALL NOTES ARE AS PER DRAWING NO. - 1
3. FOR OTHER DETAILS REFER DRAWING NO. - 1
4. ALL DIMENSIONS IN MM



DETAILS OF BASE SLAB, WALL OF SUMPWELL & MOTOR FOOR SLAB

Checked & Submitted For Approval
Executive Engineer
PHE Division Gwalior

Checked
Verified
Prof. A.K Saxena
Civil Engineering Deptt.
M.I.T.S. Gwalior (M.P.)

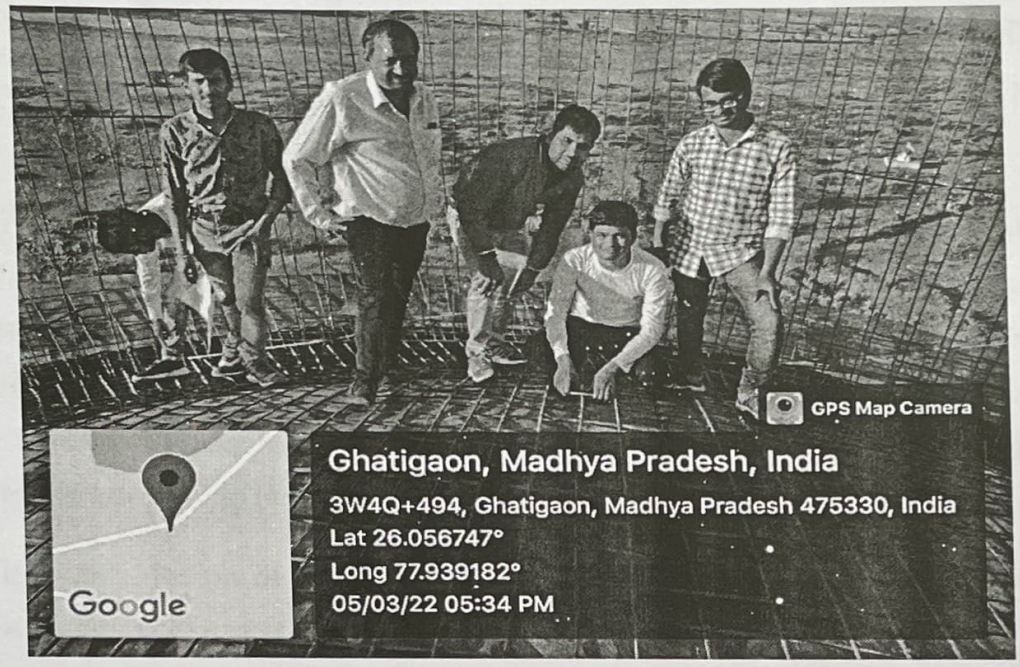
DESIGN & DRAWING OF 200 KL RCC CHT. 15 M STAGING & 20+40 KL SUMP WELL (P.H)

VILL: GHATIGAON, BLOCK: GHATIGAON
DISTT: GWALIOR (M.P.)

FOR: E.E. PHE. DIVISION GWALIOR M.P

M/S	DESIGNED BY	SEALE
SHRI RAM CONSTRUCTION CO. MORENA (M.P.)	Er. P.K. JAIN B.E. (Civil)	SIGN

GHTIGAON SITE



CHAPTER XI
CONCLUSION

This excellent period my college journey because I was learnt lot of things from this internship example like how fresh water is transmitted to our homes from reserviour to water tanks and use of water and need of water to Storage of water in the form of tanks for drinking and washing purposes, swimming pools for exercise and enjoyment, and sewage sedimentation tanks are gaining increasing importance in the present day life.

Basically design of RRCC OVER HEADWATER tanks are designed by the working stress method and also I will get knowledge about the bars and grade of concrete uses for different purposes

For small capacities we go for rectangular water tanks while for bigger capacities we provide circular water tanks. Design of water tank is a very tedious method. Particularly design of under groundwater tank involves lots of mathematical formulae and calculation. It is also time consuming.

During this internship program I visit on different sites where I get extra ordinary experience of civil engineering and I learn lot of things at site.

CHAPTER XII
REFERENCE

- Comprehensive R.C.C. DESIGN by Dr. B.C. Punamia, Ashok Kumar Jain & Arun Kumar Jain Laxmi Publications (P) LTD

- IS 456-2000 CODE FOR PLAIN AND REINFORCED CONCRETE

- Reinforced Concrete Structures by Sayal & Goel S.Chand publication.2004.

- IS 3370-1965 CODE FOR CONCRETE STRUCTURES FOR STORAGE OF LIQUIDS

PILGRIAM CHECK

naman.docx

Sources Overview

19%

OVERALL SIMILARITY

1. theconstructor.org
   INTERNET
2. www.enggroom.com
   INTERNET
3. structville.com
   INTERNET
4. ethesis.nitrkl.ac.in
   INTERNET
5. ijadce.com
   INTERNET
6. www.ijarse.com
   INTERNET
7. www.coursehero.com
   INTERNET
8. megphed.gov.in
   INTERNET
9. Federal University of Technology on 2021-10-15
   SUBMITTED WORKS
10. RICS School of Built Environment, Amity University on 2020-03-01
    SUBMITTED WORKS
11. University of Cape Town on 2021-01-03
    SUBMITTED WORKS

FORMAT

FORTNIGHTLY PROGRESS REPORT (FPR) FROM INDUSTRY MENTOR

Name of student	Naman Chhapaiya		Department	CIVIL	
Industry/Organization	PHE		Date/Duration	14/01/22 – 29/01/22	
Criterion	**Poor**	**Average**	**Good**	**Very Good**	**Excellent**
Punctuality/Timely completion of assigned work					✓
Learning capacity/Knowledge up gradation					✓
Performance/Quality of work					✓
Behaviour/Discipline/Team work					✓
Sincerity/Hard work					✓
Comment on nature of work done/Area/Topic	Visiting PHE office & Intract with SDO Sir. ✓				
OVERALL GRADE (Any one)	**POOR/AVERAGE/GOOD/VERY GOOD/EXCELLENT**				
Name of Industry Mentor	Sanjeev Gupta				
Signature of Industry Mentor	Gupta Assistant Engineer Public Health Engg. Deptt Sub Division Gu				

Receiving Date		Name of Faculty Mentor	A. K. Saxena	Sign	

FORMAT

FORTNIGHTLY PROGRESS REPORT (FPR) FROM INDUSTRY MENTOR

Name of student	Naman Chhapaoliya		Department	CIVIL	
Industry/Organization	PHE		Date/Duration	30/01/22 - 14/02/22	
Criterion	**Poor**	**Average**	**Good**	**Very Good**	**Excellent**
Punctuality/Timely completion of assigned work					✓
Learning capacity/Knowledge up gradation				✓	
Performance/Quality of work				✓	
Behaviour/Discipline/Team work					✓
Sincerity/Hard work				✓	
Comment on nature of work done/Area/Topic	Visiting our first site in Ghatigaon Le Cantt. Area ✓				
OVERALL GRADE (Any one)	**POOR/AVERAGE/GOOD/VERY GOOD/EXCELLENT**				
Name of Industry Mentor	Sanjeev Gupta				
Signature of Industry Mentor	Assistant Engineer Public Health Engg. Deptt Sub Division Gwalior				

Receiving Date	xxxx	**Name of Faculty Mentor**	xxx A.K. Saxena	**Sign**	xxx

FORMAT

FORTNIGHTLY PROGRESS REPORT (FPR) FROM INDUSTRY MENTOR

Name of student	Naman Chhajoujy		Department	CIVIL	
Industry/Organization	PHE		Date/Duration	15/02/22 – 02/03/22	
Criterion	**Poor**	**Average**	**Good**	**Very Good**	**Excellent**
Punctuality/Timely completion of assigned work				✓	
Learning capacity/Knowledge up gradation				✓	
Performance/Quality of work					✓
Behaviour/Discipline/Team work					✓
Sincerity/Hard work					✓
Comment on nature of work done/Area/Topic	Visiting in Chhatigaon there is an foundation work is going on. ✓				
OVERALL GRADE (Any one)	**POOR/AVERAGE/GOOD/VERY GOOD/EXCELLENT**				
Name of Industry Mentor	Sanjeev Gupta				
Signature of Industry Mentor	Assistant Engineer Public Health Engg. Deptt Sub Division Gwalior				

Receiving Date	xxxx	**Name of Faculty Mentor**	xxx A.K. Saxena	**Sign**	xxx

FORMAT

FORTNIGHTLY PROGRESS REPORT (FPR) FROM INDUSTRY MENTOR

Name of student	Naman Chhapaniya		Department	CIVIL	
Industry/Organization	PHE		Date/Duration	03/03/22 - 18/03/22	
Criterion	**Poor**	**Average**	**Good**	**Very Good**	**Excellent**
Punctuality/Timely completion of assigned work				✓	
Learning capacity/Knowledge up gradation					✓
Performance/Quality of work				✓	
Behaviour/Discipline/Team work					✓
Sincerity/Hard work					✓
Comment on nature of work done/Area/Topic	Almost foundation work is completed.				
OVERALL GRADE (Any one)	**POOR/AVERAGE/GOOD/VERY GOOD/EXCELLENT** ✓				
Name of Industry Mentor	Sanjeev Gupta				
Signature of Industry Mentor	Gupta Assistant Engineer Public Health Engg. Deptt Sub Division Gwalior				

Receiving Date		Name of Faculty Mentor	A.K. Saxena	Sign	

FORMAT

FORTNIGHTLY PROGRESS REPORT (FPR) FROM INDUSTRY MENTOR

Name of student	Naman Chhapariya		Department	CIVIL	
Industry/Organization	PHE		Date/Duration	19/03/22 - 03/04/22	
Criterion	**Poor**	**Average**	**Good**	**Very Good**	**Excellent**
Punctuality/Timely completion of assigned work					✓
Learning capacity/Knowledge up gradation				✓	
Performance/Quality of work				✓	
Behaviour/Discipline/Team work					✓
Sincerity/Hard work					✓
Comment on nature of work done/Area/Topic	Column work is started				
OVERALL GRADE (Any one)	**POOR/AVERAGE/GOOD/VERY GOOD/EXCELLENT**				
Name of Industry Mentor	Sanjeev Gupta				
Signature of Industry Mentor	Assistant Engineer Public Health Engg. Deptt Sub Division Gwalior				

Receiving Date		Name of Faculty Mentor	A.K. Saxena	Sign	

FORMAT

FORTNIGHTLY PROGRESS REPORT (FPR) FROM INDUSTRY MENTOR

Name of student	Naman Chhaparwal		Department	CBNL	
Industry/Organization	PHE		Date/Duration	04/04/22 - 19/04/22	
Criterion	**Poor**	**Average**	**Good**	**Very Good**	**Excellent**
Punctuality/Timely completion of assigned work					✓
Learning capacity/Knowledge up gradation				✓	
Performance/Quality of work				✓	
Behaviour/Discipline/Team work					✓
Sincerity/Hard work					✓
Comment on nature of work done/Area/Topic	Column work has done with M30 Grade of concrete admixture				
OVERALL GRADE (Any one)	**POOR/AVERAGE/GOOD/VERY GOOD/EXCELLENT**				
Name of Industry Mentor	Sanjeev Gupta				
Signature of Industry Mentor	Assistant Engineer Public Health Engg. Deptt. Sub Division Gwalior				

Receiving Date	**xxxx**	**Name of Faculty Mentor**	**xxx** A.K. Saxena	**Sign**	**xxx**

FORMAT

FORTNIGHTLY PROGRESS REPORT (FPR) FROM INDUSTRY MENTOR

Name of student	Naman Chhapaniya		**Department**	CIVIL	
Industry/Organization	PHE		**Date/Duration**	20/04/22 – 05/05/22	
Criterion	**Poor**	**Average**	**Good**	**Very Good**	**Excellent**
Punctuality/Timely completion of assigned work					✓
Learning capacity/Knowledge up gradation				✓	
Performance/Quality of work				✓	
Behaviour/Discipline/Team work					✓
Sincerity/Hard work					✓
Comment on nature of work done/Area/Topic	Bottom dome of over head tank has started Constructed along with staircase at ground level				
OVERALL GRADE (Any one)	**POOR/AVERAGE/GOOD/VERY GOOD/EXCELLENT**				
Name of Industry Mentor	Sanjeev Gupta				
Signature of Industry Mentor	Assistant Engineer Public Health Engg. Deptt Sub Division Gwalior				

Receiving Date		**Name of Faculty Mentor**	A. K. Saxena	**Sign**	

FORMAT

FORTNIGHTLY PROGRESS REPORT (FPR) FROM INDUSTRY MENTOR

Name of student	Naman Chhaporiya		Department	CIVIL	
Industry/Organization	PHE		Date/Duration	06/05/22 - 21/05/22	
Criterion	**Poor**	**Average**	**Good**	**Very Good**	**Excellent**
Punctuality/Timely completion of assigned work				✓	✓
Learning capacity/Knowledge up gradation					✓
Performance/Quality of work					✓
Behaviour/Discipline/Team work					✓
Sincerity/Hard work					✓
Comment on nature of work done/Area/Topic	we have visited our next site at Sigoan near Dabra for seeing complision of top dome & site wall of tank with staircase				
OVERALL GRADE (Any one)	**POOR/AVERAGE/GOOD/VERY GOOD/EXCELLENT**				
Name of Industry Mentor	Er. Sanjeev Gupta				
Signature of Industry Mentor	Assistant Engineer Public Health Engg. Deptt Sub Division Gwalior				

Receiving Date		Name of Faculty Mentor	A. K. Saxena	Sign	