#### 15 -ാം കേരള നിയമസഭ

#### 11 -ാം സമ്മേളനം

#### നക്ഷത്ര ചിഹ്നം ഇല്ലാത്ത ചോദ്യം നം. 6377

<u>10-07-2024 - ൽ മറുപടിയ്</u>ക്

#### <u>പി.എം.എം.എസ്.വൈ. - വൈപ്പിൻ-മുനമ്പം തീര സംരക്ഷണം</u>

ചോദ്യം		ഉത്തരം			
	ശ്രീ. കെ.എൻ. ഉണ്ണിക്കുഷ്ണൻ		ശ്രീ സജി ചെറിയാൻ (മത്സുബന്ധനം, സാംസ്കാരികം, യുവജനകാര്യ വകുപ്പ് മന്ത്രി)		
(എ)	വൈപ്പിൻ-മുനമ്പം തീര സംരക്ഷണത്തിനായി കേരള സംസ്ഥാന തീരദേശ വികസന കോർപ്പറേഷൻ തയ്യാറാക്കി പ്രധാനമന്ത്രി മത്സ്യ സമ്പദ യോജന (പി.എം.എം.എസ്.വൈ.) പദ്ധതിയിൽ ഉൾപ്പെടുത്തി കേന്ദ്ര സർക്കാരിന് സമർപ്പിച്ചിട്ടുള്ള 145.87 കോടി രൂപയുടെ മോഡേൺ ഇന്റഗ്രേറ്റഡ് ഫിഷ് ലാന്റിംഗ് ഫെസിലിറ്റിസ് ഇൻ ദി വൈപ്പിൻ-മുനമ്പം കോസ്റ്റൽ സൂച്ച് ഓഫ് എറണാകളം ഡിസ്ലിക് പദ്ധതിക്ക് എന്നത്തേക്ക് അംഗീകാരം ലഭ്യമാകുമെന്ന്	(എ)	Modern Integrated Fish Landing Facilities in the Vypin- Munambam Coastal Stretch of Ernakulam District പദ്ധതിക്കായി 145.87 കോടി ത്രപയുടെ പദ്ധതി ത്രപരേഖ കേരള സംസ്ഥാന തീരദേശ വികസന കോർപ്പറേഷൻ തയ്യാറാക്കിയിരുന്നു. പ്രസ്തുത പദ്ധതി പ്രധാനമന്ത്രി മത്സ്യ സമ്പദാ യോജന (PMMSY)-യിൽ ഉൾപ്പെടുത്തി നടപ്പാക്കുന്നതിനുള്ള അനുമതിക്കായി 12.01.2024 തീയതിയിലെ ബി1/356/2023 മഇവ നമ്പർ കത്ത് പ്രകാരം കേന്ദ്ര സർക്കാരിന് സമർപ്പിച്ചിട്ടുണ്ട്. പദ്ധതിക്ക് ഇത് വരെയായി കേന്ദ്രസർക്കാരിന്റെ അംഗീകാരം ലഭിച്ചിട്ടില്ല.		
(ബി)	കടൽ ഭിത്തികൾ ഇല്ലാത്തതിനാൽ വർഷം തോറും വർദ്ധിച്ചുവരുന്ന കടലാക്രമണ ഭീഷണിമൂലം ദുരിതമനുഭവിക്കുന്ന വൈപ്പിൻ ജനതയുടെ പ്രയാസങ്ങൾ കണക്കിലെടുത്ത് പ്രസ്തുത പദ്ധതിക്ക് അടിയന്തര അംഗീകാരം ലഭ്യമാക്കാൻ നടപടി സ്വീകരിക്കുമോ;	(ബി)	Modern Integrated Fish Landing Facilities in the Vypin- Munambam Coastal Stretch of Ernakulam District പദ്ധതിക്കായി 145.87 കോടി രൂപയുടെ പദ്ധതി രൂപരേഖ കേരള സംസ്ഥാന തീരദേശ വികസന കോർപ്പറേഷൻ തയ്യാറാക്കിയിരുന്നു. പ്രസ്തൃത പദ്ധതി പ്രധാനമന്ത്രി മത്സ്യ സമ്പദാ യോജന (PMMSY)-യിൽ ഉൾപ്പെടുത്തി നടപ്പാക്കുന്നതിനുള്ള അനമതിക്കായി 12.01.2024 തീയതിയിലെ ബി1/356/2023 മഇവ നമ്പർ കത്ത് പ്രകാരം കേന്ദ്ര സർക്കാരിന് സമർപ്പിച്ചിട്ടുണ്ട്. പദ്ധതിക്ക് ഇത് വരെയായി കേന്ദ്രസർക്കാരിന്റെ അംഗീകാരം ലഭിച്ചിട്ടില്ല.		
(സി)	പ്രസ്തുത പദ്ധതിയുടെ പകർപ്പ് ലഭ്യമാക്കാമോ?	(സി)	പദ്ധതി ത്രപരേഖയുടെ പകർപ്പ് അനുബന്ധമായി ചേർക്കുന്നം.		

സെക്ഷൻ ഓഫീസർ



# MODERN INTEGRATED FISH LANDING FACILITIES IN THE VYPINMUNAMBAM COASTAL STRETCH OF ERNAKULAM DISTRICT



Department of Fisheries, Government of India

**Submitted Under:** 

Pradhan Mantri Matsya Sampada Yojana (PMMSY)



#### MODERN INTEGRATED FISH LANDING FACILITIES IN THE VYPIN-MUNAMBAM COASTAL STRETCH OF ERNAKULAM DISTRICT

## Submitted to

# Department of Fisheries Government of India

### Under Pradhan Mantri Matsya Sampada Yojana (PMMSY)



Kerala State Coastal Area Development Corporation Ltd
Department of Fisheries, Government of Kerala

#### **DECEMBER 2023**

#### **TABLE OF CONTENT**

SI No	Content	Page No.
1	CHAPTER 1. PREFACE	3
2	CHAPTER 2. SALIENT FEATURES	6
3	CHAPTER 3. EXECUTIVE SUMMARY	8
4	CHAPTER 4. PROJECT BACKGROUND	12
4.1.	Project Introduction	12
4.2	Project Need	40
4.3	Project Objectives	45
4.4	Project Location	47
4.5	Project Components	55
4.6	Methodology Adopted	77
5	CHAPTER 5- FINANCIAL ESTIMATES AND COST PROJECTS	82
5.1	Financial Outlay	82
5.2	Means of Finance	87
5.3	Revenue Streams & Benefits of the project	87
5.4	Cost Benefit Analysis	89
5.5	Risk Assessment and Mitigation measures	90
6	CHAPTER 6- PROJECT IMPLEMENTATION	93
6.1	Project Management Organization	93
6.2	Contract Management Strategy	95
6.3	Implementation Schedule & WBS	96
6.4	Statutory Clearances & Impact Assessment	97
6.5	Quality Management Plan	98
6.6	Operation and Maintenance	100
6.7	Outputs and Outcomes	101
	Annexures	104

#### CHAPTER 1. PREFACE

Foreseeing the immense potential for development of fisheries and for providing focused attention to the sector, the Government of India in May, 2020 approved the "Pradhan Mantri Matsya Sampada Yojana (PMMSY) — A scheme to bring about Blue Revolution through sustainable and responsible development of fisheries sector in India" with an estimated investment of Rs. 20050 crores comprising of (i) Central share of Rs. 9407 crores, (ii) State share of Rs 4880 crores and (iii) Beneficiaries contribution of Rs. 5763 crores for its implementation for a period of 5 years from FY 2020-21 to FY 2024-25 in all States/Union Territories (Figure-1).

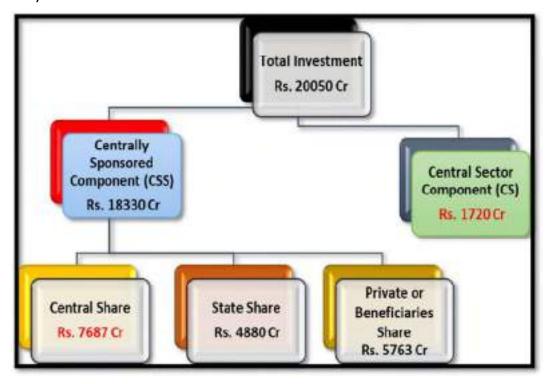


Figure 1. Implementation Schedule - 5 years (2020-21 to 2024-25)

The vision of the project is "Ecologically healthy, economically viable and socially inclusive fisheries sector that contributes towards economic prosperity and well-being of fishers, and fish farmers and other stakeholders, food and

nutritional security of the country in a sustainable and responsible manner".

#### The Aims and Objectives of the Pradhan Mantri Matsya Sampada Yojana (PMMSY) are:

- (a) Harnessing of fisheries potential in a sustainable, responsible, inclusive and equitable manner
- (b) Enhancing of fish production and productivity through expansion, intensification, diversification and productive utilization of land and water
- (c) Modernizing and strengthening of value chain post-harvest management and quality improvement
- (d) Doubling fishers and fish farmers' incomes and generation of employment
- (e) Enhancing contribution to Agriculture GVA and exports
- (f) Social, physical and economic security for fishers and fish farmers
- (g) Robust fisheries management and regulatory framework

The intended beneficiaries of the PMMSY Scheme are :-

- > Fishers
- Fish farmers
- Fish workers and Fish vendors
- Fisheries Development corporations
- Self Help Groups (SHGs)/Joint Liability Groups (JLGs) in fisheries sector
- > Fisheries cooperatives
- Fisheries Federations
- Entrepreneurs and private firms
- ➤ Fish Farmers Producer Organizations/Companies (FFPOs/Cs)
- SCs/STs/Women/Differently abled persons
- State Governments/UTs and their entities including
- State Fisheries Development Boards (SFDB)
- Central Government and its entities

#### **Targets of PMMSY:-**

#### > Fish Production and Productivity

- Increasing fish production to 22 million metric tons by 2024-25 from 13.75 million metric tons in 2018-19.
- Enhancing aquaculture productivity to 5 tons per hectare from the current national average of 3 tons.
- Augmenting domestic fish consumption from 5 kg to 12 kg per capita.

#### Economic Value Addition

- Increasing contribution of fisheries sector to the Agriculture GVA to about 9% by 2024-25 from 7.28% in 2018-19.
- Doubling export earnings to Rs.1,00,000 crores by 2024-25 from Rs.46,589 crores in 2018-19.
- Facilitating private investment and growth of entrepreneurship in the fisheries sector.
- Reduction of post-harvest losses from the reported 20-25% to about 10%.

#### > Enhancing Income and Employment Generation

- Generating 55 lakh direct and indirect employment opportunities along the value chain.
- Doubling the incomes of fishers and fish farmers.

The project for "Construction of Fish Landing Centres in the Vypin- Munambam Coastal Stretch of Ernakulam district", is proposed under "Pradhan Mantri Matsya Sampada Yojana (PMMSY) scheme.

The proposal envisages in Construction of Modern Integrated Fish Landing Facilities in the Vypin Munambam stretch of Ernakulam district. The proposal is suggested under "Non- Beneficiary Oriented Activities under Centrally Sponsored Components of Pradhan Mantri Matsya Sampada Yojana, B. Infrastructure and Post Harvest Management, 3. Development of Fishing Harbours and Fish Landing Centres 3.3. Modern Integrated Fish Landing Centres. of PMMSY scheme.

#### **CHAPTER 2. SALIENT FEATURES**

1	Title	Construction of Fish landing Centres in the Vypin-		
		Munambam coastal stretch of Ernakulam district.		
2	Implementing Agency	Department of Fisheries, Government of Kerala		
3	Construction Agency	Kerala State Coastal Area Development		
		Corporation Limited- Accredited Govt Agency		
4	Unit Cost	Rs. 25.00 Crore (5 units), Rs.20.87 Crore (1 unit)		
5	No of units	6		
6	Total Project Cost	Rs. 145.87 Crore		
7	Pattern of Assistance	60% CSS : 40 % State		
	Central Share	Rs. 87.522 Crore		
	State Share	Rs. 58.348 Crore		
8	Project Duration	24 Months		
9	Project Location	Ernakulam district		
	Block Panchayat	Vypin		
	Taluk	Kochi		
	State	Kerala		
10	DPR prepared by	Kerala State Coastal Area Development		
		Corporation Limited		
11	Nature of the Project	Fish Landing Centre & coastal protection		
12	Details of project risks	Climatic Issues		
		Cash Flow Issues		
		Schedule of rates Revision		
		Seabed level variation during execution		
		Stoppage of work in monsoon		
		Natural hazards		
		Unexpected technical issues		
112	l –	Estimation, Technical Sanction, Tendering and		
13	Details of project			
13	Details of project management organization	Agreement Execution will be done by KSCADC		

		,
		scrutinizing and transmitting the estimates  Tendering will be done by inviting online e-tenders
		from pre-qualified contractors.  MS project is the tool used for scheduling the
		projects
		Work execution and preparation of bills will be done through Assistant Executive Engineer and Assistant Engineer, other experienced site supervisors and will be passed by Executive Engineer and will be counter Signed by Chief Engineer  Passed bills will be submitted to funding agency
4.4	Data the of Contract	for release of funds
14	Details of Contract  Management	The Public Works manual approved by the state government specifies the duties, responsibilities
	Management	and delegated powers of officers in contract management. It also specifies fines for project delays and incentives for early completion.
15	Details of Project Implementation Schedule	Details given in DPR
16	Details of Statutory Clearances	CRZ Clearance- Permitted Activity
17	Quality Control infrastructure and mechanism	KSCADC will ensure quality through government approved laboratories and through National Institutes like IIT, Madras, NIOT etc
18	Operation & Maintenance (O&M) arrangements of the project after completion	Maintenance will be required once in 10 years only. This will be entrusted with the custodian
19	Whether detailed estimate	Yes
	attached and plans	
	attached	

#### CHAPTER 3. EXECUTIVE SUMMARY

The "Modern Integrated Fish Landing Facilities in the Vypin Munambam Coastal Stretch" project is an ambitious initiative aimed at enhancing the fishing infrastructure and livelihoods of the fishing community in the Vypin Munambam coastal area. The Vypin Munambam coastal stretch in Ernakulam district is home to a vibrant fishing community. However, the existing beach landing method poses significant risks to the safety of fishermen and the quality of the catch. Additionally, the absence of proper auction facilities hampers the marketing and sale of the catch, leading to potential financial losses for the fishing community. This project aims to address these critical issues and promote safer, more sustainable, and economically viable fishing practices in the region. The primary objective of the project is to provide safer fish landing facilities. This involves the construction of landing centres and related infrastructure to facilitate the landing of fishing boats and the transfer of catch without the risks associated with beach landings.

Shoreline changes induced by erosion and accretion are natural processes that take place over a range of time scales. They may occur in response to smaller-scale (short-term) events, such as storms, regular wave action, tides and winds, or in response to large-scale (long-term) events such as glaciation or organic cycles that may significantly alter sea levels (rise/fall) and tectonic activities that cause coastal land subsidence or emergence. Hence, most coastlines are naturally dynamic, and cycles of erosion are often an important feature of their ecological character. Wind, waves and currents are natural forces that easily move the unconsolidated sand and soils in the coastal area, resulting in rapid changes of the shoreline. Human activities along the coast (land reclamation, port development, shrimp farming), within river catchments and watersheds (river damming and diversion) and offshore (dredging, sand mining) in combination with these natural forces often exacerbate coastal erosion in

many places and jeopardize opportunities for coasts to fulfill their socio-economic and ecological roles in the long term at a reasonable societal cost.

The 24 km long stretch from Vypin to Munambam is continuously prone to severe sea erosion. The coastal stretch includes potential sites for fishing. Due to the continuous eroding of beach, the fishermen's operational man-days have considerably reduced plunging them into poverty. The major portion of the seawall existing in the proposed coastal stretch requires repair and maintenance which will be undertaken by Irrigation Department. Considering the situation, it is high time to create a holistic development approach for stabilizing the entire 24 km coastal stretch from Vypin to Munambam to enhance the fishing activities of the entire coastal stretch.

Kerala State Coastal Area Development Corporation Limited (KSCADC) and Department of Ocean Engineering, IIT Madras has conducted a systematic investigation on the stability of defined shoreline along the Vypin coastal stretches, north of Cochin Port entrance in the Ernakulam district with specific reference to shoreline erosion. The study shows that some area where fishing is a major activity requires reclamation of beach area, other area which is more of tourism friendly requires a stabilized beach, some areas where the inhabitants are more in numbers requires protection from severe huge attacks

Considering the comprehensive requirement of the whole proposed stretch, it is proposed to construct fish landing facilities which includes Auction hall, sea wall strengthening, yard lighting, toilet block, drainage etc. The proposal also includes installation of offshore breakwater using geotubes in selected sites and groynes in other sites. This project proposal is mainly intended to enhance the fishing activity of the Vypin Munambam stretch and also to manage coastal erosion problems and to restore coastal capacity to accommodate short-and long-term changes induced by human activities, extreme events and sea level rise from Vypin to Munambam area in Ernakulam district.

The major types of works involved are:-

- Valappu beach- 6 submerged geotubes of 3 m dia of 820 m length at a distance of 1600 m from shore, Auction hall of 28.3 m x 6.4 m, Toilet block of 12.5 m x 5.1 m, Seawall strengthening, parking area.
- Malipuram beach- installation of 4 groynes (both T groyne and straight groyne), Auction hall of 28.3 m x 6.4 m, Toilet block of 12.5 m x 5.1 m, parking area.
- Valiyathanparambu installation of 2 groynes (1 new and 1extension), Auction hall of 28.3 m x 6.4 m, Toilet block of 12.5 m x 5.1 m, parking area.
- Puthenkadappuram Groynes of length 180 m and 150 m, Auction hall of 28.3 m x 6.4 m, Toilet block of 12.5 m x 5.1 m, Seawall strengthening, parking area.
- Pazhangadu- Groynes of length 180m x 140 m.
- Saidh Mohammed beach- Groynes of length 160 m and 120 m, Auction hall of 28.3 m x 6.4 m, Toilet block of 12.5 m x 5.1 m, Seawall strengthening, parking area.

The unit cost of five proposed Fish Landing Facilities are Rs 25.00 Crore and one landing facilityis Rs. 20.87 Crore. The total project cost comes to Rs 145.87 crores (Rupees One hundred and forty five crore and eighty seven lakh only).

The total amount of **Rs. 145.87 Crore (Rupees One hundred and forty five crore and eighty seven lakh only)** required for "Modern Integrated Fish Landing Facilities in the coastal stretch of Vypin to Munambam in Ernakulam district" is proposed under PMMSY scheme, Government of India. The proposal is suggested to be implemented under "Non- Beneficiary Oriented Activities under Centrally Sponsored Components of Pradhan Mantri Matsya Sampada Yojana, B. Infrastructure and Post Harvest Management, 3. Development of Fishing Harbours and Fish Landing Centres 3.3. Modern Integrated Fish Landing Centres. 60% of the project cost ie. Rs. 87.522 crore shall be met as PMMSY share and balance 40% ie. Rs. 58.348 Crore as State share.

The "Modern Integrated Fish Landing Facilities in the Vypin Munambam Coastal Stretch" project offers a range of benefits that extend to the local fishing community, the environment, and the regional economy. Enhancement of Fishing activity, environmental protection including protection of the shoreline of Ernakulam district stretching between Vypin to Munambam, prevention of calamities and loss of life, prevention of recurring costs for rehabilitation and compensations, and employment opportunities to the coastal areas in addition to direct revenue generation for the Government.

The project will be implemented within a period of two years.

#### CHAPTER 4. PROJECT BACKGROUND

#### 4.1. PROJECT INTRODUCTION

Fishing and fisheries are an important part of Kerala's social and economic heritage. This is a sector that augments nutrition and helps generate employment and revenue. India is the third largest fish producing country in the world and accounts for 7.96 per cent of global production. The sector has been one of the major contributors of foreign exchange earnings, with India being one of the leading seafood exporting nations in the world. The export of marine products stood at 13.69 lakh MT with a value of Rs. 57,586.5 crore in 2021-22 (Marine Products Export Development Agency). India is also a major producer of fish through aquaculture and ranks second in the world after China.

The fisheries sector plays an important role in the economy of the State. The share of fisheries sector in the total Gross State Value Added (GSVA at constant price) in 2021-22 constitutes 0.97 per cent and accounts for 0.84 per cent of Gross State Domestic Product (GSDP). Fisheries and aquaculture contributes 10.92 per cent of the GSVA (constant prices 2021-22 (Q)) from the Agriculture and allied sectors.

Kerala with a coastline over 590 km., and an Exclusive Economic Zone (EEZ) of 2.18 lakh Sq km have a significant marine fisheries sector that has long been an important source of occupation and livelihood for the coastal population in the State. The marine population in Kerala is estimated to be approximately 8.08 lakh in 222 coastal villages spread along the nine coastal districts of Kerala. The number of inland fishing villages is 113 and the fishermen population is 2.41 lakh.

Fish production in India in 2020-21 is estimated at 147.3 lakh MT with a contribution of 112.5 lakh MT from inland sector and 34.8 lakh MT from marine sector (Annual report 2021-22, Department of fisheries, Ministry of Fisheries, Animal Husbandry and Dairying, Government of India). In 2021-22, Kerala recorded an inland fish production of 2.25 lakh tonnes and the contribution from

the marine sector was 6.01 lakh tonnes. The high value species among the fish catches are still few and prominent among them are seer fish, prawns, ribbon fish and mackerel. Due to climate change and anthropogenic activities such as juvenile fishing, overfishing and unscientific fishing, the catch of marine fisheries showed a declining trend in the last decade. But the timely amendment of the Kerala Marine Fishing Regulation Act (KMFRA), introduction of KMFR Rule and its strict enforcement led to an increase of 26 per cent in marine capture in 2018-19. The year 2021-22, has registered an increase in marine fish production compared to that of the production obtained during 2019-20 and 2020-21, which demonstrates the revival in the sector and increase in man-days. The inland fish production also increased in 2021-22 due to the introduction of diversified and innovative fish farming practices, across the State

The fishermen population of Kerala is well known for their fishing skills. They have proved their expertise not only in the shallow coastal water fishing but also in deep sea fishing. They venture out from Gujarat coast in the west to Andaman islands in the east. Their skills at launching boats, competence in preparing and handling the nets and other equipments; endurance to with stand the rough sea; knowledge about weather, currents, winds and stars are far superior to fishermen of other state. Hence the contribution of fishermen to the State exchequer is quite significant.

Though the fishermen render significant contribution to the total fish production of Kerala, they remain socially and economically backward. The main stream society has made rapid socio-economic strides in the past sixty years. It's quite an irony that the fishermen who had played a significant role in State's development remained elusive of the general economic prosperity. Lack of proper infrastructure facilities is one of the reasons for their backwardness.

#### 4.1. 1. Fisheries Infrastructure in Kerala

Majority of the fish landings of the State are confined to the existing 25 fishing harbours and more than 220 fish landing centres distributed over 222 fishing villages of the State. These centers are a set of facilities required between

the capture of fish and its consumption. Depending upon the variety and extent of facilities for cleaning, sorting, storage and selling, handling and packing, distribution and maintenance facilities, they may be classified either a fishing harbour or landing centre. Fish landing centre is the backbone of fishery industry of any country. The very existence of the industry depends upon the features of this component. List of Fishing Harbours and Fish Landing Centres are given in Table 1 & Table 2.

**Table.1. List of Fishing Harbours in Kerala** 

SI No	District	Fishing Harbour
1	Thiruvananthapuram	1. Vizhinjam
		2. Muthalapozhy
2	Kollam	1. Thankassery
		2. Neendakara
3	Alappuzha	1. Kayamkulam
		2. Thottapally
		3. Chethy (I&II)
		4. Arthungal II
4	Ernakulam	1. Chellanam (I&II)
		2. Munambam
5	Thrissur	1. Chettuva
6	Malappuram	1. Ponnani
		2. Tanur
7	Kozhikkode	1. Beypore
		2. Puthiyappa
		3. Koyilandi
		4. Vellayil
		5. Chombal
8	Kannur	1. Kannur
		2. Mopla bay
		3. Azheekal
9	Kasargode	1. Kasargode
		2. Cheruvathur
		3. Manjeswaram

**Table.2. List of Fish Landing Areas in Kerala** 

SI No	District	Fish Landing Centre
1	Trivandrum	1. Kollemkode
		2. Paruthiyoor
		3. Poovar
		4. Karimkulam
		5. Kochuthura
		6. Puthiyathura
		7. Pallom
		8. Erayamanthura
		9. Chempakaramanthura
		10.Adimalathura
		11.Vizhinjam
		12.Vizhinjam North
		13.Kovalam
		14.Poonthura
		15.Bheemapally
		16.Cheriyathura
		17. Valiyathura
		18.Vettucaud
		19.Kochuveli
		20.Valiyaveli
		21.Pallithura
		22.Fathima Thumba
		23.St Andrews
		24.Puthenthoppe
		25.Vettuthura
		26.Shanthipuram
		27.Maryanad
		28.Puthukurichy
		29.Muthalapozhy
		30.Anjengo
		31.Mampally
		32.Vettoor
		33.Chilakkur
		34.Edava

		0.5.01
		35.Singarathoppu
		36.Thazhampally
		37.Odayam
		38.Kapil
		39.Kananthura
		40. Valiyathoppe
		41.Kochuthoppe
		42.Poonthura
2	Kollam	1. Azheekal
		<ol><li>Parayakadavu</li></ol>
		3. Cheriyazhhekal
		4. Vallanathuruthu
		5. Ponmana
		6. Kovilthottam
		7. Puthenthura
		8. Neendakara FH
		9. Shakthikulangara
		10.Valavithoppu
		11.Ozhukkuthodu
		12.Thankassery FH
		13.Wadi
		14.Moothakara
		15.Jonapuram
		16.Quilon Port
		17.Pallithoottam
		18.Kakkathoppu
		19.Eravipuram
		20. Kolathumpaddam
		21.Mukkom
		22.Chillakal
		23.Thottupuzhi
		24.Parakkada
		25.Thanni
3	Alappuzha	1. Chethy
		Punnapara viyani
		3. Alappuzha ESI
		3. Alappuzna ESI

		4. Pallithodu
		5. Pallithodu Chappa
		6. Anthakaranazhy
		7. Cheriyassery
		8. Arattuvazhi
		9. Polackal
		10.Thaikal beach
		11.Arthungal
		12.Chenna vally
		13.Pollathai
		14.Vadakkal
		15.Paravoor
		16. Valiazheekal
		17. Thrikunnapuzha
		18.Viyani
		19.Valanjavazhy
		20.Komana FLC
		21.Thottapally
		22.Pallana HS FLC
4	Ernakulam	1. Murikkam Padam
		2. Kalamukku FLC
		3. Kalamukku pvt
		4. Gosreepuram FLC
		5. Puthuvypeen FLC
		6. Mulippuram Chappa
		7. Ayyampilli beach
		8. Kuzhipilli beach
		9. Puthankadappuram
		10.Munambam FH
		11.Munambam Mini
	l l	
		12. Kunji Thai
		12. Kunji Thai
		12. Kunji Thai 13.Ezhikkara
		12. Kunji Thai 13.Ezhikkara 14.Chathanad

		18.Cheriyakadavu
		19.Kannamaly
		20.Puthenthodu
		21.Chellanam FH
		22.Cherai Beach
		23.Edavanakkadu
		24.Beach Road
5	Thrissur	1. Azhikode
		2. Munnakal
		3. Eriyad
		4. Kara
		5. Kathiyalam
		6. Attupuram
		7. Perinjanam
		8. Arattukadavu
		9. Vanchipura
		10.Companykadavu
		11.Chamakal
		12.12. Palapetty
		13.Kazhimbram
		14. Nattika beach
		15.Nambikadavu
		16.Vadanapally
		17.Chettuva
		18. Munakkadavu
		19.Blangad
		20.Puthen Kadappuram
		21.Edakazhiyoor
		22.Panchavadi
		23. Manthalamkunnu
6	Malappuram	1. Palapetty
		2. Veliyamkodu
		3. Ponnani
		4. Koottayi
		5. Thekkekoottayi
		6. Pallivalappu

	T	
		7. Vakkad
		8. Puthengaadu
		9. Thevar
		10.Tanur
		11.Farukhpalli
		12.Parappanangadi
		13.Alungal beach
		14.Vallikunnu/Angadi
		15.Kadalundi
7	Kozhikkode	1. Chaliyam
		2. Beypore
		3. Kozhikkode South
		4. Chombala
		5. Badagara
		6. Badagara, Azhithala
		7. Kolavi (Iringal)
		8. Thikkodi (Kodikkal)
		9. Valavi Kadappuram
		10. Muthayakadappuram
		11.Moodadi
		12.Koloth
		13.Quilandy/ Koloth
		14.Kovalad
		15.Pollikaavu
		16.Kappad
		17.Edakadavu
		18.Elathur
		19.Puthiyappa
		20.Vellayil
8	Kannur	1. Edakkad
		2. Gopalpatai
		3. Thalayikunhi
		4. New Mahe
		5. Dharmadam FC
		6. Terminal
		7. Ettikulam

		8. Azheekal Jetty
		9. Tellichery
		10.Ayikkara
		11.Azhikkode South
		12.Muzhapilangad
		13.Palakode
9	Kasargode	<ol> <li>Pallikara</li> </ol>
		2. Chittari
		3. Kottikulam
		4. Bekal
		5. Kizhur
		6. Kizhur Harbour
		7. Talangara jetty
		8. Kasaba
		9. Adakathbayal
		10.Mogral
		11.Koippadi
		12.Uppala
		13.Arikkadi
		14. Hosabettu
		15.Kunzhathur
		16.Ajanoor- N-Bella
		17.Chittari
		18.Hosdurga-S-Bella
		19.Thaikadappuram
		20. Poonchavikadappuram

With regard to the harbours and landing places for fishing vessels,

Article 6.17 of the FAO Code of Conduct for Responsible Fisheries states
that "States should ensure that fishing facilities and equipment as well as all
fisheries activities allow for safe, healthy and fair working and living
conditions and meet internationally agreed standards adopted by relevant
international organizations."

- Article 8.9 of the FAO Code of Conduct for Responsible Fisheries refers to Fishing Operations and it states that Concerned States should take into account, inter alia, the following in the design and construction of harbours and landing places:
- a) Safe havens for fishing vessels and adequate servicing facilities for vessels, vendors and buyers are provided.
- b) Adequate freshwater supplies and sanitation arrangements should be provided.
- c) Waste disposal systems should be introduced, including for the disposal of oil, oily water and fishing gear.
- d) Pollution from fisheries activities and external sources should be minimized.
- e) Arrangements should be made to combat the effects of erosion and siltation.

#### 4.1.2. Resource Potential

Kerala is one of the active maritime states in India. Kerala rank second in marine fish production of India, around 3.91 lakh MTs in the year 2020-21 and earned an income of 7673.58 crores. Around 3.24 lakh people are directly involving the marine fishing activity contributing 21% to the total annual production. It makes a significant contribution to the National Income through export of marine products.

According to the available estimates of potential fishery resources of the West coast, particularly in the south west coasts, Kerala possess the richest fishing grounds in the region. The latest picture regarding the exploitable marine resources of Kerala coast is the one furnished by the Expert Committee on Marine Fisheries in Kerala, 1989, headed by AG.Kalawar.

Stock **Depth Zones** 21-80 m 0-20 m 81-200 m Total 37,935 90,432 17,040 1,45,407 Dermersal (26.1%)(62.2%)(11.7%)(100%)Pelagic 3,07,539 7,32,908 1,37,863 11,78,310 (26.1%)(62.2%)(11.7%)(100%)Total 13,23,717 3,45,490 8,23,252 1,54,875

**Table.3. Resources in Tonnes** 

Table.4. Maximum Sustainable Yield

MSY	Depth Zones			
	0-20 m	21-80 m	81-200 m	Total
Dermersal	22,761	54,249	10,224	87,344
(60%)	(26.1%)	(62.2%)	(11.7%)	(100%)
Pelagic	1,84,786	4,40,349	82,831	7,07,956
(60%)	(26.1%)	(62.2%)	(11.7%)	(100%)
Total	2,07,547	4,94,608	93,055	7,95,300

#### 4.1.3. Marine Fish Production

Fish production in India in 2020-21 is estimated at 147.3 lakh MT with a contribution of 112.5 lakh MT from inland sector and 34.8 lakh MT from marine sector (Annual report 2021-22, Department of fisheries, Ministry of Fisheries, Animal Husbandry and Dairying, Government of India). In 2021-22, Kerala recorded an inland fish production of 2.25 lakh tonnes and the contribution from the marine sector was 6.01 lakh tonnes. The high value species among the fish catches are still few and prominent among them are seer fish, prawns, ribbon fish and mackerel. Due to climate change and anthropogenic activities such as juvenile fishing, overfishing and unscientific fishing, the catch of marine fisheries showed a declining trend in the last decade. But the timely amendment of the Kerala Marine Fishing Regulation Act (KMFRA), introduction of KMFR Rule and its strict enforcement led to an increase of 26 per cent in marine capture in 2018-19. The

year 2021-22, has registered an increase in marine fish production compared to that of the production obtained during 2019-20 and 2020-21, which demonstrates the revival in the sector and increase in man-days. The inland fish production also increased in 2021-22 due to the introduction of diversified and innovative fish farming practices, across the State.

The production of most of the marine fishes like elasmobranchii, oil sardine, lesser sardine, anchoviella, saurida, perches, sciaenid's ribbon fish, other carangids, mackerel soles, seer fish, tuna, leiognathids, penaeid prawn, crabs, and cephalopods have shown an increase in 2021-22. The per capita fish consumption of Kerala is 19.4kg per year. Among the union territories the Andaman and Nicobar islands per capita fish consumption is 59.5kg per year (Handbook of Fisheries Statistics, 2020). The species-wise marine fish landings in Kerala from 2018-19 to 2021-22 are given in Table 5.

Table 5. Species-wise composition of Marine fish landings in Kerala (2018-19 to 2021-22) (in Metric Tonnes)

Sl. No	Species	2018-19	2019-20	2020-21	2021-22
1	Elasmobranchs	7645	2764	1753	3596
2	Eels	593	879	860	1099
3	Cat Fish	30	258	34	126
4	Chirocenrtrus	23	108	73	82
5(a)	Oil Sardine	87331	44499	6762	12340
(b)	Lesser Sardine	19337	33199	42525	62042
(c)	Hilsa ilisha	0	0	0	0
(d)	Other Hilsa	0	311	523	93
(e)	Anchovilla	33242	58490	27247	38683
(f)	Trissocles	8444	7377	7510	5654
(g)	Other Clupeids	6177	5804	6479	7049
6(a)	Harpodon nehereus	0	0	0	0
(b)	Saurida & Saurus	14215	17445	14724	20308
7	Hemirhamphus &	9581	739	722	753
	Belone				
8	Flying Fish	3818	8	40	67

9	Perches	34962	40955	47996	71572
10	Red Mullets	463	443	410	1006
11	Polynemides	3925	9	0	2
12	Sciaenides	16519	5406	5830	8396
13	Ribbon fish	10617	5425	1524	9949
14(a)	Caranx	5412	2323	1695	1454
(b)	Chorinemus	1427	268	277	519
(c)	Thachynotus	1814	11	87	6
(d)	Other Carangids	56389	37775	53118	83392
(e)	Coryphaena	881	1046	1074	1856
(f)	Elacate	16	287	33	173
15(a)	Leiognathus	1761	2942	2058	2344
(b)	Gazza	233	0	1	19
16	Lactrious	246	839	903	1081
17	Pomfrets	4624	2147	6482	2758
18	Mackerel	127419	35894	60592	63587
19	Seer fish	6230	4329	3806	6176
20	Tunnas	29810	16793	13197	23067
21	Sphyraena	3131	3480	5040	7120
22	Mugil	25	55	16	31
23	Bregmaceros	0	0	0	0
24	Soles	8547	14197	6245	12100
25(a)	Penaeid Prawn	52331	39905	33524	54868
(b)	Non Penaeid Prawn	8613	2515	2187	2825
(c)	Lobsters	172	41	48	101
(d)	Crabs	2777	5080	4087	6145
(e)	Stomatopods	0	488	12	158
26	Cephalopods	30679	35686	19786	42716
27	Miscellaneous	10271	45148	12403	45489
	Total	609730	475368	391683	600802

Table 6. Fish Production in Kerala& India (2016-17 to 2021-22) (lakh tonnes)

Year	Kerala			Allindia		
	Marine	Irland	Total	Morine	Inland	Total
	(Provisional)					
2016-17	466	188	0.76	56.25	78.06	314.51
2017-18	484	189	6.73	56.88	89.02	125.9
2018-19	63	192	8.02	58.53	972	13573
2019-20	4.75	2,125	6.0	57.27	104.37	141.94
2020-21	5.9	2.05	5.95	34.0	112.5	147.5
2021-22	6.01	225	826	Not available		

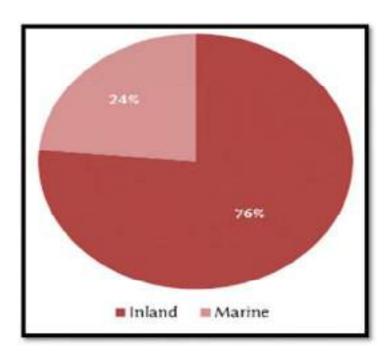


Figure 2. Fish production in India (2020-21)

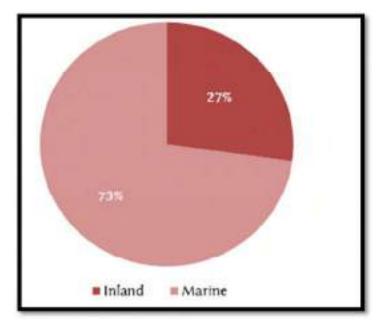


Figure 3. Fish production in Kerala (2021-22)

District-wise fish production in Kerala is given in Table 7.

Table 7. District wise fish production in Kerala 2021-22 (lakh tonnes)

District	Marine Fish	Inland Fish	Total Fish
	Production	Production	Production
Thiruvananthapuram	0.58	0.022	0.6
Kollam	1.11	0.11	1.22
Alappuzha	0.33	0.43	0.76
Pathanamthitta	NA	0.04	0.04
Kottayam	NA	0.56	0.56
Ernakulam	2.04	0.39	2.43
Idukki	NA	0.015	0.02
Thrissur	0.33	0.13	0.46
Palakkad	NA	0.05	0.05
Malappuram	0.33	0.04	0.37
Kozhikkode	0.925	0.024	0.95
Wayanad	NA	0.012	0.01
Kannur	0.16	0.04	0.2
Kasargode	0.2	0.39	0.59

State(Kerala)	6.01	2.25	8.26	
Source: Directorate of Fisheries				

Kerala has made vital contributions to export of marine products the country. In 2021-22, export of marine products from Kerala was 1.8 lakh tonnes valued at Rs.6,396.2 crore. It accounts for 13.2 per cent in terms of quantity and 11.1 per cent in terms of value of the marine products export from India. Details are provided in Table 8.

Table 8. Export of Marine Products from India and Kerala( Q: Quantity in Metric Tonnes V: Value - Rs. in crore)

	1				
Year		India	Kerala	% share of Kerala	
2013-14	Q	983756	165698	16.84	
	V	30213.26	4706.36	15.58	
2014-15	Q	1051243	166754	15.86	
	V	33441.61	5166.08	15.45	
2015-16	Q	945892	149138	15.77	
	V	30420.82	4644.42	15.27	
2016-17	Q	1134948	159141	14.02	
	V	37870.9	5008.54	13.23	
2017-18	Q	1377244	178646	12.97	
	V	45106.89	5919.03	13.12	
2018-19	Q	1392559	183064	13.15	
	V	46589.37	6014.7	12.91	
2019-20	Q	1289651	148227	11.49	
	V	46662	5020.34	10.76	
2020-21	Q	1149510	144700	12.59	
	V	4372098	5039.29	11.53	
2021-22	Q	1369264	180315	13.2	
	V	57586.5	6396.2	11.1	
Source : MPEDA					

#### 4.1.4. Mechanized Fishing

Kerala's prominence in the field of mechanized fishing is indeed noteworthy. The state has been a pioneer in adopting and promoting mechanized fishing techniques, thanks in part to various development schemes introduced under the Indo-Norwegian Project during the 1960s. This project brought modern fishing technologies and practices to the region, significantly enhancing the fisheries industry in Kerala.

Mechanized fishing in Kerala involves several methods and types of gear, including trawling, gill netting, hooks and lines, purse seining, and more.

- 1. **Trawling:** Trawling is a fishing method that involves dragging a net through the water behind a boat. In Kerala, mechanized trawling is typically carried out using boats that are around 12 to 20 meters in length. This method is effective for catching a variety of fish species, including those that live closer to the seabed.
- 2. **Gill Netting**: Gill netting is another common mechanized fishing method in Kerala. Smaller fiberglass-reinforced plastic (FRP) vessels, usually around 8 meters in size, are often used for gill netting. Gill nets are vertical panels of netting designed to entangle fish by their gills as they swim into the net.
- 3. **Hooks and Lines**: This method involves using fishing hooks, lines, and sometimes baits to catch fish. While it's not as mechanized as trawling or gill netting, it is still a popular and effective method for catching specific fish species, especially those that are closer to the surface.
- 4. **Purse Seining**: Purse seining is a fishing method that involves surrounding a school of fish with a large net and then "pursing" the net at the bottom to enclose the fish. This method is used to catch fish that tend to school together, such as sardines and mackerel.

Kerala's success in mechanized fishing has had a significant impact on the state's economy and the livelihoods of its coastal communities. The development schemes and the introduction of modern technologies have enabled Kerala's fishermen to increase their catch and improve their standard of living. This

pioneering effort in mechanized fishing has contributed to the state's status as a leader in India's fisheries industry.

#### 4.1.5. Artisanal Fishing

Artisanal fishing in Kerala is an integral part of the state's coastal communities, culture, and economy. It is estimated that there are approximately 25,000 such vessels in operation along its coast. These traditional craft come in various types, each suited to specific fishing practices. Some of the common types of traditional fishing craft in Kerala include:

- 1. **Dugout Canoes:** Dugout canoes are handcrafted from a single tree trunk. They are typically small and have been used for traditional fishing in Kerala for generations.
- 2. **Plank-Built Canoes:** Plank-built canoes are constructed using wooden planks, offering more stability and capacity compared to dugout canoes.
- 3. **Marine Plywood Canoes:** These canoes are made using marine-grade plywood and provide durability and resistance to saltwater.
- 4. **Catamarans (Cattamaram):** Catamarans are twin-hulled vessels, which provide stability in the water. They are often used for various fishing activities.
- 5. Large Kettuvalloms: Kettuvalloms are traditional houseboats, but some are adapted for fishing. These large vessels, about 20 meters in length, are often fitted with multiple outboard motors (OBMs) with a total power capacity of 25 to 40 horsepower.

The majority of these traditional fishing craft are equipped with Outboard Motors (OBMs), which makes them more efficient and versatile in their fishing operations. OBMs help fishermen reach their fishing grounds quickly and navigate effectively. Common types of fishing gear used with these traditional craft include gill nets, purse seines, and shore seines. Gill nets are vertical panels of netting used to entangle fish, while purse seines involve surrounding a school of fish with a large net and "pursing" it to enclose the catch. Shore seines are used in shallower waters near the coast.

Traditionally, the operations of these craft typically extend up to a range of 20 kilometers off the coast. However, some of the larger kettuvalloms, which are fitted with powerful OBMs, are capable of operating beyond this distance. It's worth noting that traditional, non-motorized craft are also being motorized with the assistance of financial institutions, which helps improve the efficiency and productivity of traditional fishing practices while preserving the cultural heritage of these crafts. This modernization and motorization have significantly impacted the fishing industry in Kerala, allowing fishermen to expand their reach and increase their catch.

#### 4.1.6. Shore Based Facilities

Shore based facilities like ice plant; cold storages etc. are available all along the coastal region. Rigorous fishing activities are already going on in and around the fishing villages of the State. The shore based facilities now available will be capable to take care of the additional landing due to up gradation of the fishery harbour. A well-developed road network connecting the coastal belt and the hinterlands makes the transportation of fish and fish products easier. Railways also play a major role in the transportation of fish products.

The presence of shore-based facilities such as ice plants and cold storages along Kerala's coastal region is essential for the efficient handling and preservation of fish and seafood. These facilities play a vital role in supporting the local fishing industry and contribute to the state's economy.

- 1. **Ice Plants:** Ice is crucial for preserving the freshness and quality of the catch. Ice plants provide a steady supply of ice to fishermen, enabling them to chill their catch immediately after it is brought ashore. This helps maintain the fish's quality and extends its shelf life.
- 2. **Cold Storages:** Cold storages are essential for storing fish and seafood at low temperatures to prevent spoilage. These facilities are valuable for fishermen, fishmongers, and exporters, as they allow for the preservation of fish until it is ready for distribution, further processing, or export.

- 3. **Fishing Villages:** Kerala's coastal fishing villages are hubs of rigorous fishing activity. The presence of shore-based facilities in these areas is essential for handling the significant volume of fish and seafood landed daily by local fishermen.
- 4. **Fishery Harbours:** Upgrading fishery harbours can lead to increased landing activity. The existing shore-based facilities, including ice plants and cold storages, are expected to handle the additional volume of fish due to these upgrades. This infrastructure is essential to prevent post-harvest losses and ensure the quality of the catch.
- 5. **Transportation Network:** Kerala benefits from a well-developed road network that connects the coastal regions to the hinterlands. This road network makes it easier to transport fish and fish products from fishing villages to markets, processing facilities, and export hubs.
- 6. **Railways:** The role of railways in the transportation of fish products is also significant. Rail transport can efficiently move large quantities of seafood over longer distances, allowing for broader distribution and access to markets beyond the immediate coastal region.

The availability of shore-based facilities, a robust transportation network, and railway connectivity are crucial components of the seafood supply chain in Kerala. They support the livelihoods of fishermen, ensure the availability of fresh seafood to consumers, and facilitate the state's participation in the broader seafood industry, including both domestic and international markets. These infrastructure elements are vital in maintaining the quality and value of the seafood industry in Kerala

#### 4.1.7. Fish Marketing

Fish marketing in Kerala is a complex and dynamic process that involves the buying, selling, and distribution of fish and seafood products. The state of Kerala, with its extensive coastline and a population that highly depends on seafood, has a well-established fish marketing system

- 1. **Fishermen and Catch:** The process begins with fishermen who go out to sea or fish in inland waters to catch a variety of fish and seafood. These fishermen use various traditional and modern fishing methods, including nets, hooks, and lines.
- 2. **Fish Landing Centers:** Fishermen bring their catch to designated fish landing centers along the coast. These centers serve as key collection points where fish are weighed, sorted, and recorded.
- 3. **Auction and Sales:** After landing, fish are often auctioned. Fish auction houses or markets are common in fishing communities, where wholesalers, retailers, and exporters participate in bidding for the catch. In addition to auctions, direct sales to buyers, including local consumers, are common.
- 4. **Wholesalers:** Wholesalers play a crucial role in the distribution chain. They purchase fish in bulk from auctions and landing centers. These wholesalers may sell fish to retailers, processing units, and exporters.
- 5. **Retailers:** Retailers, such as fishmongers and seafood shops, obtain their supplies from wholesalers. They are responsible for selling fish and seafood products to local consumers. Many of these retailers have shops in local markets and along the coast.
- 6. **Processing Units:** Kerala also has processing units that prepare fish for export and domestic markets. These units handle tasks like cleaning, filleting, freezing, and packaging. They source fish from various channels, including wholesalers and direct purchases from fishermen.
- 7. **Export:** Kerala is a significant exporter of seafood products, including shrimp, prawns, and various fish varieties. Exporters procure seafood from different sources, ensure quality standards are met, and distribute products to international markets.
- 8. **Government Regulation:** The government, through the Fisheries Department and related authorities, regulates fish marketing in Kerala. It enforces standards for fish quality and safety and oversees various aspects of the industry, including licensing and hygiene practices.
- 9. **Marketing Infrastructure:** Kerala has initiated activities to create network of marketing infrastructure, including fish markets, cold storage facilities, and

transportation networks that connect the coastal regions to the domestic and international markets.

- 10.**Consumer Market:** Kerala has a strong local demand for fish and seafood, with seafood being a staple in the state's cuisine. Consumers can access fresh seafood from local retailers and markets.
- 11. Cooperative Societies: Many fishermen in Kerala are organized into cooperative societies that facilitate collective marketing, ensuring fair prices for fishermen and efficient distribution of fish.

Fish marketing in Kerala is a vital sector of the state's economy, providing livelihoods for numerous people and serving as an essential source of food. The industry's success depends on maintaining quality, adherence to regulations, and sustainability practices to ensure the long-term viability of Kerala's fishing and seafood industry.

#### **4.1.8. Fishery Development Programmes**

The proper planned development of the fishing industry in Kerala involves several essential pre-requisites, including modernization of existing fishing crafts, the introduction of new-generation crafts, improved processing and marketing, and enhanced landing and shore-based facilities. Kerala has made significant progress in these areas in recent years.

Kerala has recognized the importance of infrastructure development for the fishing industry. Fishery harbours, which serve as central hubs for fishing activities, have been a major focus. The state has completed 24 fishery harbor projects, and several more are in progress. These harbours provide essential facilities for the landing, storage, and distribution of fish and seafood products. Adequate berthing and anchoring facilities are crucial for the safe and efficient operation of fishing vessels. Kerala has been investing in improving these facilities to meet the needs of both mechanized and artisanal fishing sectors.

Over the past decades, Kerala has made significant strides in developing its fishing infrastructure as a model to the Government development schemes. This progress has had a positive impact on the fishing industry, improving the livelihoods of fishermen and contributing to the state's economy. The government of Kerala has a dedicated focus on completing ongoing projects and bringing existing facilities up to international standards. This includes modernizing and expanding infrastructure, enhancing the efficiency of fish landing and handling, and ensuring that facilities meet modern standards for hygiene and safety.

Improving hygienic standards is a critical aspect of the comprehensive approach to fisheries development. Ensuring that fish handling, processing, and storage meet international hygiene standards is vital for product quality and safety. Also Kerala recognizes the importance of post-harvest infrastructure, including cold storage facilities. These facilities help preserve the freshness and quality of fish and seafood, making them available for longer periods and reducing post-harvest losses.

Kerala's comprehensive approach to fisheries development, including infrastructure improvements, hygiene standards, and post-harvest facilities, is a testament to the state's commitment to the fishing industry. These efforts aim to support the livelihoods of fishermen, improve the quality of seafood products, and enhance the industry's contribution to the state's economy. Furthermore, these developments contribute to the sustainability of the fishing sector and its alignment with global standards.

#### 4.1.9. Coastal Erosion in Kerala

With a coastline of over 590 Km, coastal erosion is considered as one of the significant threatening hazards faced by the coastal population of Kerala. The National Centre for Coastal Research (NCCR) has carried out a study on shoreline changes along the mainland of the Indian Coast. About 590 km long shoreline distributed among nine coastal districts and one UT was analyzed by NCCR for the period from 1990-2018 to estimate shoreline changes. The shoreline analysis

suggests that 46% of coast is eroding, 23% is accreting and 31% is in stable state. The details are given in Table 9.

Table 9. Erosion and accretion percentage along Kerala coast

1990-2018	Status	(7 Class)	Length	(3Class)	Length
		%	(in km)	%	(in km)
	High Erosion	1	5.53		
	Moderate Erosion	2	9.26	46	275.33
	Low Erosion	44	260.53		
	Stable	31	182.64	31	182.64
Kerala	Low Accretion	17	100.69		
	Moderate Accretion	3	17.84	23	134.99
	High Accretion	3	16.45		

The district wise analysis suggests that the Kozhikkode (67.7%) and Alappuzha (54.1%) coasts, erosion exceeds more than 50%, followed by Kollam (49.7%) and Malappuram (49.2%). Thrissur (49.1%) is the only coastal state, which is having more than 40% of accretion, followed by Thiruvananthapuram with 31.2%. Most of the coastal districts of Kerala shows eroding trend for the past 28 years shoreline change analysis. The district wise details of shoreline changes status are given below in Table 10.

Table 10. District wise shoreline changes (in percentage)

Districts	Coastal	Erosion	Stable	Accretion
	Length		In %	
Kasargode	83.51	38.8	42.6	18.5
Kannur	69.05	46.4	31.8	21.8
Kozhikkode	78.05	67.7	25.5	6.7
Malappuram	50.86	79.2	32.6	18.2
Thrissur	61.55	31.8	19.1	49.1
Ernakulam	45.05	43.2	38.30	18.50
Alappuzha	83.55	54.1	22.70	23.20
Kollam	45.72	49.7	31.90	18.40

Thiruvananthapuram	75.62	34.4	34.4	31.20
Total	592.96	46.4	30.80	22.80

Table 11. shows the seven different classes of erosion, accretion and stable in kilometers for all nine coastal districts of Kerala

**Table.11. District wise shoreline status of Kerala** 

Length in km (1990-2018)								
Districts	Length (in kms)	High Erosion	Moderate Erosion	Low Erosion	Stable	Low Accretion	Moderate Accretion	High Accretion
Kasargode	83.51	0.02	0.14	32.26	35.60	13.25	0.46	1.78
Kannur	69.05	0.05	0.18	31.82	21.97	11.72	2.84	0.46
Kozhikkode	78.05	0.76	0.57	51.53	19.93	4.67	0.34	0.25
Malappuram	50.86	0.12	1.28	23.60	16.58	8.93	0.20	0.14
Thrissur	61.55	0.00	0.41	19.18	11.76	18.23	7.92	4.04
Ernakulam	45.05	0.02	0.26	19.19	17.26	4.93	0.50	2.89
Alappuzha	83.55	2.03	5.29	37.85	18.99	11.79	3.26	4.35
Kollam	45.72	1.91	0.28	20.55	14.57	7.25	0.31	0.85
Thiruvananthapuram	75.62	0.62	0.85	24.55	25.98	19.92	2.01	1.69
Total	592.96	5.53	9.26	260.53	182.64	100.69	17.84	16.45
			275.3	3	182.64		134.99	

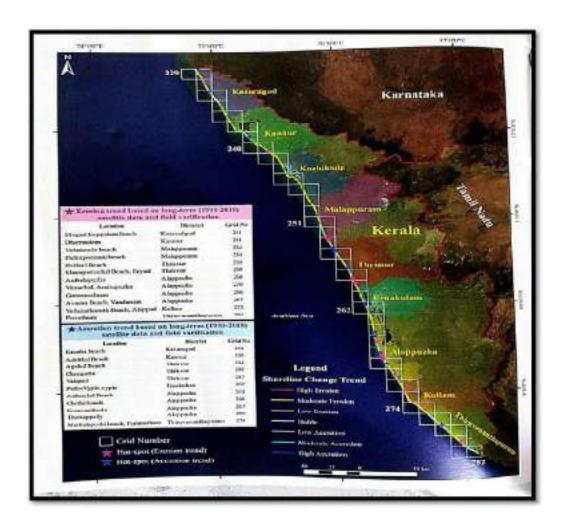


Fig.4. Shoreline Map of Kerala

The coastal stretch of Kerala extends along the southwestern Indian peninsula. It is divided into 9 districts (Thiruvananthapuram, Kollam, Alappuzha, Ernakulam, Thrissur, Malappuram, Kozhikode, Kannur, Kasaragode) along the coast. About 420 km of coastal stretch is protected by hard structures (such as sea walls, groyne field, etc.) (Sundar and Murali, 2007). The region has three distinct seasons, the pre-monsoon from February to May, the southwest monsoon from June-September, and Post monsoon from October to January, annually. The normal tide variation in Kerala is between 0.9 m in the south and 1.8m in the north (Thiruvenkatasamy and Girija, 2014). The net annual longshore sediment transport was reported to vary between 0.32 x 105 m3 and 2.3 x 105 m3 along

the Kerala coast with the net transport direction being pre-dominantly northerly for most locations along with Kerala. The Kerala coast faces high erosion by various natural processes such as wind, currents, and waves, the sediment moves along the shore, which changes the shoreline (Mallik et al., 1987). The longshore currents are predominantly northerly during the fair season, whereas it is mostly towards the south during the monsoon season.

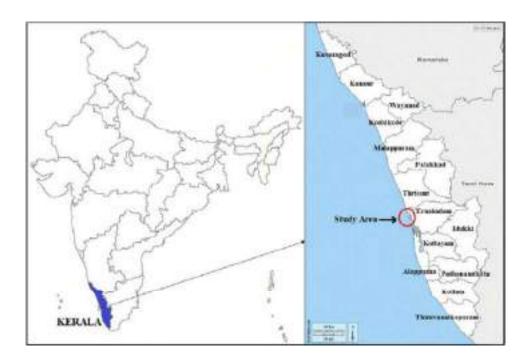


Fig.5. Kerala- Ernakulam district

The Kerala coastal stretch has been traditionally protected by seawalls and is facing a severe threat of coastal erosion owing to the continued intense wave and tide induced forces experienced along the exposed coastal stretches. It is necessary to protect the coastal stretch extending between Vypin and Munambam in order to conserve the flourishing fishing, industrial and tourism activities; in addition to preserving the state highway road which runs parallel to the said coastline.

Kerala State Coastal Area Development Corporation Limited (KSCADC) has entrusted IIT Madras to carry out a systematic investigation on the stability of defined shoreline along the Vypin coast stretches north of Cochin Port entrance in the Ernakulam district with specific reference to shoreline erosion. Accordingly, IIT, Madras has submitted the Technical and commercial proposal for protection of coastal stretch from Vypin to Munambam. The proposal was prepared by IIT, Madras based on:-

- Investigation of shoreline erosion rate along the specified coastal stretch (about 20km long stretch in the Vypin area north of Cochin port entrance) through satellite imageries over the past 2 decades.
- ➤ By conducting study on annual wave climate off the Vypin coastal stretches through detailed numerical modelling validated through measurements off Cochin coast
- > By conducting Field investigations of shoreline profile, beach profiles, sediment characteristics and littoral current.
- ➤ Land Usage- Identification.

The present proposal is prepared based on the model study conducted by IIT, Madras and the secondary datas collected from various agencies of State Government. (Model Study Report attached as Annexure 2)

#### 4.2. PROJECT NEED

## 4.2.1. The coastal stretch from Vypin to Munambam- Details

Coast line of Ernakulam district is found to be the most vulnerable compared to the other coastal stretches of the state. The aggressive wave climate, steep bed slope where the water depth is up to 6 meters within a distance of 100-120 meters from shore, results in heavy wave breaking close to the shore line. Due to this the conventional shore protection measures like rubble mound sea wall is found to be ineffective. These structures require frequent repairs and strengthening. Apart from this the sea wall itself is found to be a potential source of erosion in many places. Due to inadequate slope of sea wall on the sea side the wave energy is not fully absorbed. This results in the reflection of the incident high waves causing scour at the toe of the sea wall. Between Vypin and Munambam, the sandy beach is negligible in front of the sea wall. Hence heavy wave over topping is observed at many places in the area. This result in severe damages or total collapse of the fishermen houses situated close to the sea wall.

The area from Vypin to Azhimugam in Ernakulam district is one of the areas under extreme threat of sea attack. Due to constant climate change, sea attacks are increasing exponentially in this region. Fishermen living in this area lose their life and property during this time and even their daily work is difficult as they cannot go to the sea. Also the inhabitants are forced to relocate to nearest schools and other public building as their houses gets completely washed away. Earlier 4 groynes were established for coastal protection in this area but many of them have been destroyed due to constant sea attack. With the onset of monsoon season, the sea erosion intensifies, the sea water starts seeping into the houses thus causing the situation worse at these stretches especially in Edavanakkad, Nayarambalam and Veliyathanparambu beaches.

The entire coastal stretch includes potential sites for fishing as well as tourism. Due to the continuous eroding of beach, the fishermen's operational

man-days have considerably reduced plunging them into poverty. The major portion of the seawall existing in the proposed coastal stretch is in dilapidated condition making the situation more worse. Considering the situation, it is high time to create a holistic development approach for stabilizing the entire 24 km coastal stretch from Vypin to Munambam to provide infrastructure facilities for fish landing for enhancing the fishing activities of the area. The existing condition of random study area is depicted below:-

## Valappu beach

This stretch extends for 1.5 km and is observed to have a beach width of about 25m and it is located immediately north of the IOCL facilities. The beach slope is found to be very steep and it is understood that the beach width oscillates depending on the wave climate/seasons. The cross-shore sediment transport is found to be significant during south-west monsoon season. Valappu beach is identified to be an active tourist attraction and thus the aesthetics needs to be preserved



Image 1- Valappu beach

## Veliyathamparambu beach

The 200m stretch of this beach is located in between two existing groynes designed by IITM. The two groynes (North one constructed as the groyne, whereas the southern groyne has been protruding as an extension of an existing sea wall) have facilitated the formation of a beach width of about 30m wide. The head section of both the groynes is damaged which needs rehabilitation. At present, it is stated by locals that about 50 boats are using this beach as a landing facility and are pleading for its sustainability.



Image 2- Veliyathamparambu beach

#### Saidh Mohammed beach

This stretch has been protected with a groynes field designed by IITM which has been serving its purpose and has also encouraged the formation of beach on either side of each of the groynes. The beach thus formed has been serving as a buffer against the wave attack in the near shore region. Although, the existing groyne head sections may require strengthening post a detailed inspection of the same.



Image 3- Saidh Mohammed beach

# Saidh Mohammed beach 2 (North-Nearby Sudhan mukk)

There is no immediate threat to this section of the coastal stretch, and thus no protection measures need to be commissioned with immediate effect. The coastal stretch of cell 12 includes Saidh Mohammed beach (1) and Saidh Mohammed beach 2 (North-Nearby Sudhan mukk). The erosion and accretion

along the shore depend on season variation. The shoreline changes were observed from 2013-2018 & 2020 (7 years); the length of the shoreline is 1.42 km. The baseline buffer is 100 m from the shoreline and the spacing between the transects is 5m.

## 4.2.2. Fish landing Facilities in Vypin Munambam Stretch

The fish landing facilities in the Vypin-Munambam stretch are negligible; it points to a critical issue in the local fishing infrastructure. Inadequate or absent fish landing facilities can have several detrimental effects on the fishing community and the fishing industry in the region. Here are some potential consequences of a lack of fish landing facilities:

- **Safety Concerns:** Without proper fish landing facilities, fishermen may be forced to land their catches on open beaches or less secure areas. This can result in safety risks for both fishermen and their equipment.
- Loss of Catch: Landing fish without appropriate facilities can lead to damage and deterioration of the catch. This results in post-harvest losses and reduced economic returns for fishermen.
- **Limited Access to Markets:** The absence of fish landing facilities can hinder fishermen's access to markets, both local and regional. This, in turn, affects their ability to sell their catches efficiently and secure fair prices.
- **Inefficient Operations:** The lack of facilities may lead to less efficient fish handling and processing. This can negatively impact the quality and freshness of the catch and the profitability of the fishing operations.
- **Environmental Impact:** Open beach landings can have environmental consequences, such as the contamination of coastal areas and water bodies with fish waste, byproducts, and other materials.
- **Economic Hardship:** Fishing communities in the Vypin-Munambam stretch also face economic hardship due to the lack of proper fish landing facilities. This can result in lower income for fishermen and reduced economic activity in the region.

• **Development Hindrance:** The absence of substantial fish landing facilities can hinder the overall development of the local fishing industry especially the traditional fisherfolk and the growth of related industries, such as fish processing and tourism.

Given these potential consequences, it is essential for authorities to recognize the need for improved fish landing facilities in the Vypin-Munambam stretch. Addressing this issue may require investments in infrastructure development, including berthing areas, cold storage, processing units, and hygiene standards, to support the safety and economic well-being of the fishing community and the sustainable growth of the fishing industry in the region.

Fish landing facilities in the Vypin-Munambam stretch of Ernakulam district are essential for the sustainable development of the local fishing industry, the livelihoods of fishermen, and the overall economic and social well-being of the region. These facilities promote safety, efficiency, and better access to markets while contributing to the preservation and enhancement of the local fishing heritage.

### 4.3. PROJECT OBJECTIVES

- **Erosion Control:** The primary objective is to mitigate the impact of coastal erosion in the Vypin-Munambam stretch. Erosion can lead to the loss of land, property, and infrastructure, including fishing facilities, making it essential to protect the coastline.
- **Stable Beach:** Maintaining a stable beach helps preserve the natural environment, protect coastal ecosystems, and ensure the safety of coastal communities, including fishermen. A stable beach provides a secure and reliable environment for fishing activities.
- **Security for Fishermen:** The project seeks to provide a secure living environment for fishermen in the region. Shore protection measures not

- only protect against erosion but also enhance the safety of the fishing communities and their assets.
- Infrastructure Development: Develop essential infrastructure components, including beach berthing facility, auction facilities, drainage, and portable water facility, to support the efficient flow of fish and seafood products.
- **Preservation of Infrastructure:** Protecting the coastline is vital for safeguarding fishing infrastructure, such as fish landing facilities, boats, and equipment. It ensures that these assets remain operational and functional.
- **Minimize Post-Harvest Losses:** Reduce post-harvest losses by ensuring immediate handling, processing, and cold storage of fish and seafood products, preserving their quality and freshness.
- **Support Local Livelihoods:** Enhance the livelihoods of local fishermen and fishing communities by providing better access to markets and improved infrastructure for their operations.
- Promote Sustainable Fishing Practices: Encourage the use of sustainable and responsible fishing practices that protect marine ecosystems and fish stocks.
- Access to Markets: Improve access to local, regional, and international markets, allowing fishermen to secure fair prices for their catches and support the local economy.
- **Environmental Stewardship:** Implement environmental measures, such as groyne construction, to protect coastal areas, manage sedimentation, and reduce erosion.
- Regulatory Compliance: Ensure that the fish landing facilities meet local and national regulatory standards, including hygiene, safety, and environmental requirements.
- **Tourism Promotion:** Leverage improved fish landing facilities to attract tourists interested in fresh seafood and promote tourism in the area.
- **Community Development:** Contribute to broader community development by creating job opportunities, stimulating local industries, and fostering a sense of pride and identity among local residents.

- **Economic Growth:** Promote economic growth in the Vypin-Munambam stretch by strengthening the fishing industry, enhancing income for fishermen, and increasing revenue from seafood exports.
- **Sustainable Resource Management:** Emphasize the responsible management of fishery resources and the preservation of the region's fishing heritage.
- Quality Assurance: Implement quality control measures and standards to ensure that fish and seafood products meet international quality requirements.
- Infrastructure Maintenance: Establish a framework for the ongoing maintenance and sustainability of the developed fish landing facilities to ensure their long-term viability.

These objectives aim to transform the Vypin-Munambam coastal stretch into a thriving hub for the fishing industry, supporting the well-being of local fishermen and contributing to the economic and social development of the region while safeguarding the coastal environment.

#### 4.4. PROJECT LOCATION

# 4.4.1. Project Location

Vypin is one of the group of islands that form part of the city of Kochi, in the Indian state of Kerala. Vypin forms a barrier island which lies between the Arabian Sea in the west and the Cochin backwaters formed by various distributaries of Periyar river, in the east. The northernmost end of the island lies on the estuary of the Periyar river in Muziris (Kodungallur), and the southernmost end in the mouth of the Cochin Backwaters in Kalamukku near Fort Vypin. The island is about 27 kilometres (17 mi) long and is connected to mainland Kochi by a series of bridges known as the Goshree bridges, which start at Kalamukku in Vypin, touch other two islands and then finish at Marine Drive covering a total distance of around three km (1.9 mi). Vypin is 58th most densely populated islands in the world. Njarakkal is one of the most densely populated locations within Vypin

Munambam is a suburb of Kochi, India at the north end of Vypeen Island, surrounded by the Arabian Sea on the west, Periyar river on the east, and a mouth of the sea on the north. It comes under Edavanakkad Panchayath. It belongs to Central Kerala Division. It is located 32 KM towards North from District headquarters Kakkanad. 18 KM from Vypeen. 241 KM from State capital Thiruvananthapuram

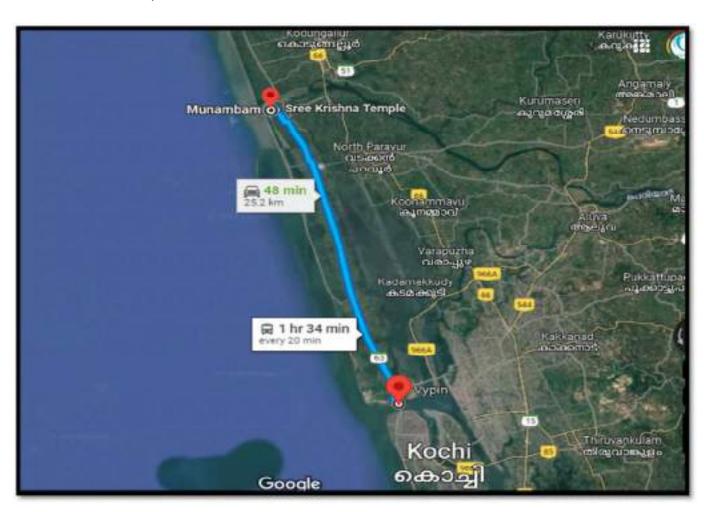


Fig- 6- Google Image- Vypin to Munambam Stretch Co-ordinates- Vypin 9.97439, 76.24488 Munambam- 10.18507, 76.16629

For the preparation of the proposal for Shore protection along the coastal stretch from Vypin to Munambam, few of the sites are identified and marked. The stretch is noted from LNG Petronet to Munambam training wall, spanning for about 24 km. The location has been marked as pillar 1-18 as shown in Fig 4 a and b and the location between pillars is marked as cell 1-17 as shown in Table 12.



Fig-7 a Location -- Pillar 1 to 11

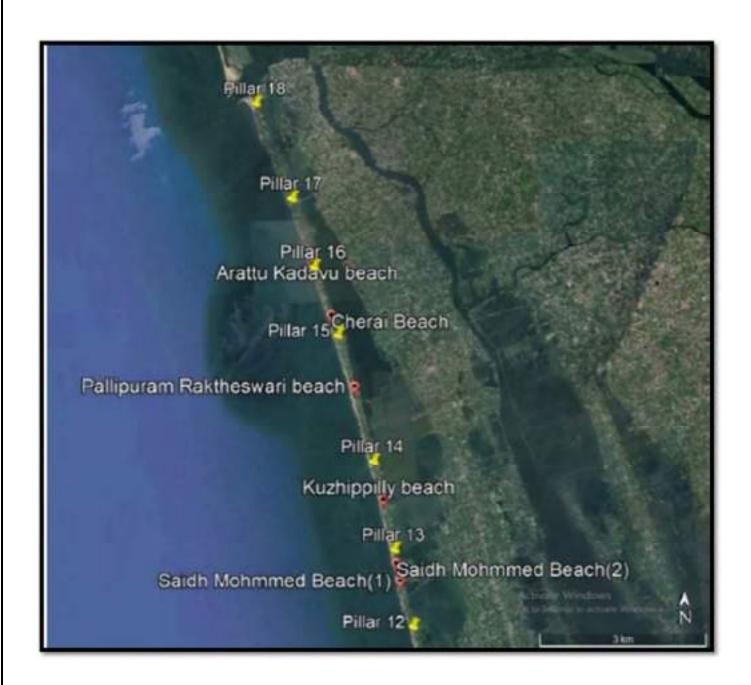


Fig-7 b Location -- Pillar 12 to 18

**Table.12. Location description of Cells and Pillars** 

Cells	Pillars	Shore Length (km)	Type of structure	Erotion/ Accretion	Site visit identified locations	Lantude Longitude of cells	Sea Wall/ Groyne (lon)	Open Ceast (km)
Cell 1	Piller 1-2	0.37	South of LNG jetty	High Accretion		9°58°27.17° N 76°13°33.13° E	3	0,37
Cett 2	Pillar 2-3	3.4	Single Training Wall	High Erosson		9°59'22 28° N 76°13'13.05" E	1 2	3.4
Cell 3	Pillar 3.4	2.5	End of IOCL 1.PG Terminal	High Esosion	Valappu	10° 1'4.17° N 76°12'50.23° E	- 1	2.5
Cell 4	Pillar 4-5	0.93	Sea Wall	93	Elandoumepurha	10° 1'48.84° N 76°12'35.37° E	0.93	#3
Cell 5	Piller 5-6	1,49	Sca Wall		Njececkel Azettovechi	10° 2'30.61" N 76°12'24.01" E	1.49	
Cell 6	Pillar 6-7	0.25	Single Groyue and sea wall	Moderate Esocios	-	10° 2'53.63° N 76°12'18.05° E	0.13	0.12
Cett 7	Pillnr 7-8	1.9	Sea Wall	7 35	Velryathauparambu	10° 3'22.67° N 76°12'3.43° E	1.9	*
Cell 8	Pillar 8-9	0.75	Geoyne Field	Moderate Erosion	1.50	10° 47.84° N 76°11'51.43° E	0.75	10
Cell 9	Pitter 9-10	0.4	Open Beach	Moderate Accretion	Aniyal beach	10° 4'25.19° N 76°13'47.40° E		0.4
Cell 10	Piller 10- 11	0.88	Open beach, Nanow strip	Moderate Accretion & Espaign		10° 4'46.04" N 76°11'42.43" E	0.44	0.44
Cell 11	Pollor 11- 12		Sea wall	18	. 59	10° 5'10.93"N 76"11'34 49"E	0.84	- 8
Cell 12		1.4			Saidt Mohammed 1	10°5'47.13" N 76°11'24.28" E	0.89	Activa
	Piller 12- 13		Open Coast, Seawall & Groyne Field	Moderate Erosion & accretion	South Michaeumed 2	1015/37,76" N 76111/21.90" E		0.51
Cell 13	Piller 13- 14	1.62	Open Coast	Moderate Excessor	Kozhippilly besch	10°6'34.49" N 76°11'14.56" E	* :	1.62
Cell 14	Pillar 14. 15	2.35	Open Coxst. Seawall	Moderate Esosion	Pallipuran Raktheiwari	10°7'40.55" N.76"10"57.99" E	0.35	2
Cell 15	Piller 15- 16	1.3	Open coast	Moderate Enouson	Cherai	10° 8'32 37° N 76°10'41.29° E	0.84	0.46
Cell 16	Pillar 16- 17	1.31	Seawall & Open coast	Moderate Ecosion	Anstu Kadevu	10° 9'12.40" N 76'10'26 74" E	1.33	*
Cell 17	Piller 17- 18	1.85	Sea Wall	- 9	*0	10°10'2.82" N 76'10'8.43" E	1.85	100

# 4.4.2. Project Connectivity

**Table.13. Location Connectivity** 

Place	Nearest Railway station	Nearest Airport	Nearest NH
Vypin	Edapalli (20.31 km)	Kochi International Airport (27.9 km)	NH966A (Vallarpadam -ICT Highway)
			NH 66 (Kodungallur-Paravur- Ernakulam Highway)
Munambam	Edapalli (21.09 km)	Kochi International Airport (29.3 km)	NH966A (Vallarpadam -ICT Highway) NH 66 (Kodungallur-Paravur- Ernakulam Highway)

# **4.4.3.** Details of Existing Shore Protection Structures in the proposed site

**Table. 14. Existing Shore Protection Facility** 

Site Name	North Lat/long	South Lat/long	Distance	Existing Structure
Malippuram, Chappakadavu	N 10°1'11.0604" E 76°12'47.4876"	N 10°1'15.8052" E 76°12'46.3104"	0.15 km	Nil
Njarakkal, Near Krishi Vitjaan Kendra	N 10°2'37.78951" E 76°12'23.14688"	N 10°2'38.79388" E 76°12'22.41781"	0.18 km	Sea wall at both sides, with a beach opening at southern end.
Veliyathampar ambu	N 10°2'49.94768" E 76°12'19.41192"	N 10°2'53.8669" E 76°12'17.50619"	0.13 km (beach opening)	Groynes and sea wall at both the sides
Puthenkadapp uram	N 10°3'53.60576" E 76°11'55.69982"	N 10°3'57.80577" E 76°11'54.10752"	0.14 km	Series of 6 groins at north and sea wall at southern
Aniyal	N 10°4'36.05833" E 76°11'44.34713"	N 10°4'39.22827" E 76°11'44.05199"	0.06 km	At southern end there is a groyne of 50m length at a distance of 130m from sea wall
Pazhangadu- Puthenkadapp uram	N 10°4'58.64154" E 76°11'39.52792"	N 10°5'1.18003" E 76°11'38.20931"	0.1 km ( beach opening)	Sea wall at both ends
Saidh Mohammed beach-2	N 10°5'51.75364" E 76°11'23.263"	N 10°5'55.86458" E 76°11'22.20465"	0.13 km	A series of 6 located south of the beach stretch

Kuzhuppilly	N 10°6'32.688" E 76°11'14.5356"	N 10°6'36.2916" E 76°11'13.9812"	0.11 km	Nil
Ayyambilly	N 10°7'5.7576" E 76°11'6.4176"	N 10°7'10.7328" E 76°11'5.2836"	0.16 km	Nil
Arattukadavu	N 10°8'57.40798" E 76°10'32.9444"	N 10°8'59.5872" E 76°10'32.15672"	0.07 km ( beach opening )	Both end covered with sea wall
Puthuvypen	N 9°59'51.9019" E 76°13'5.9023"	N 9°59'58.5019" E 76°13'4.8015"	0.21 km	Nil
Valappu	N 10°0'20.37899" E 76°13'0.49256"	N 10°0'45.35078" E 76°12'54.41616"	0.79 km	Nil
Saidh Mohammed beach-2	N 10°5'55.86458" E 76°11'22.20465"	N 10°8'28.068" E 76°10'42.78"	4.83 km	
Kuzhuppilly Beach				
Raktheswari Beach				
Cherai Beach				

#### 4.5. PROJECT COMPONENTS

The project components have been derived based on the shoreline changes assessed along the coast through satellite image processing techniques and statistically analyzed using DSAS tool of ArcGIS software application by IIT, Madras. Significant dynamics in the shoreline changes were derived mostly due to the seasonal monsoon effects along the coast. The study states that erosion is more predominant during the southeast monsoon season. The shore protection in the proposed stretch along with the fish landing facilities are briefed below:-

The proposed beaches are protected considering the potential activities undertaken in each area.

## 4.5.1. Valappu Beach

Valappu Beach is a popular fish landing area along the Ernakulam coast, situated in the vicinity of BPCL and IOCL oil refiner facilities.

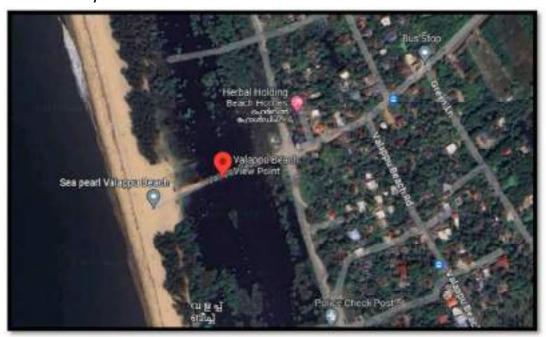


Image 4. Google image- Valappu beach

Based on the satellite imagery studies conducted this site has been observed to undergo moderate erosion rates. IIT Madras has already proposed a few costal protections measures adjacent to the BPCL and IOCL facilities; in addition to the aforementioned measures, commissioning a singular 820 m long section of a submerged geo-tube parallel to the shoreline is proposed, which would effectively function as an offshore submerged Morphodynamics induced around submerged breakwaters is strongly influenced by its positioning. The bed variations were shown to increase when the structures are progressively located offshore; when dissipative breaking mechanisms occur, decreasing inshore erosion is accompanied by an equally fast decrease of offshore erosion. Analysis of the vorticity fields show that breakwaters placed far from the shoreline induce an evolution of the vortices generated by breaking waves rather different from the one due to breakwaters placed closer to the shoreline (Postacchini et al., 2016). This offshore submerged geo-tube is proposed to erected at -5m water depth, 1600 m away from the shoreline. Fig 8 details the layout of the proposed protection measure. The adopted layout dimensions satisfy the conditions (Ls/X > 0.5, i.e., ratio of the breakwater length to its distance from the shore is 0.53 which is favourable for salient formations) put forth by Dally and Pope (1986) Chasten et al., (1993) and Seiji et.al, (1987) for the formation of salient for an offshore emerged structure. According to Lorenzoni et al., (2012) submerged configurations show larger shoreline retreats than the emerged ones at the same position and for the same wave attack conditions.

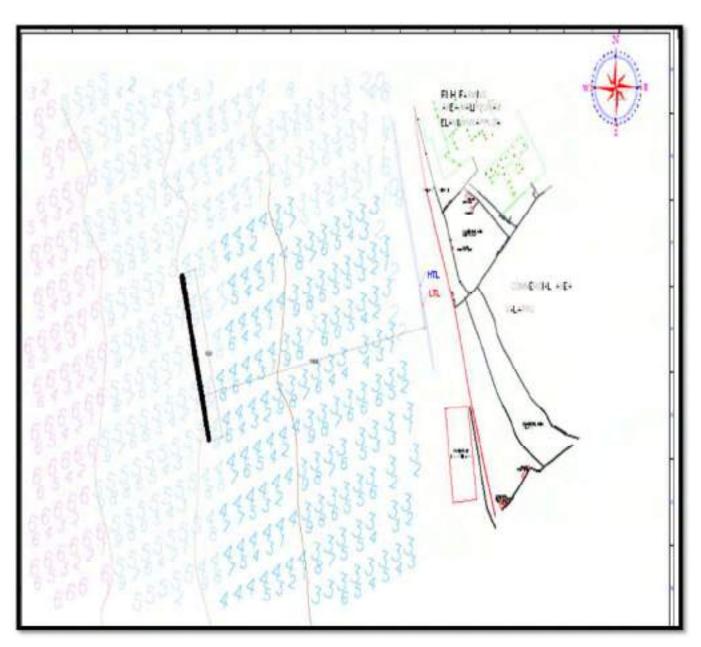


Fig-8- Layout- Valappu beach

An Auction hall building of size  $28.3 \text{m} \times 6.4 \text{m}$  is proposed in the Valappu beach. Sufficient beach area is available for construction of the auction hall, aslo there is road access to the proposed area.



Image 5. Proposed Area at Valappu beach

For the auction hall, coconut piling of length 6m long is provided for foundation. RCC M20 provided for foundations, centering & shuttering, Reinforcement cement concrete work (M20) in walls is provided for super structure. Necessary Steel reinforcement, plastering and painting works are also included in the Auction hall.

Provision for construction of a toilet block of size 12.5m x 5.1m is also included in the proposal. For the toilet block, RR masonry with cement mortar 1:6 is provided for the foundation. Solid block masonry of size 30x20x15cm and 40x20x10 cm are provided for super structure. Ceramic tiling is provided in the floor and in the bathroom region. Necessary fittings are also provided for toilet block. Other provisions include concrete parking area proposed near the Auction hall, construction of drain etc. Provisions for sea wall strengthening, sub soil investigation, water supply and sanitary arrangement, Electrification and yard lighting are also included in the proposal.

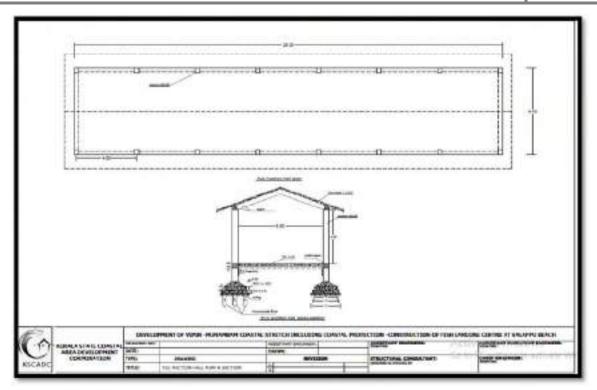


Fig-9- Auction hall, Valappu beach

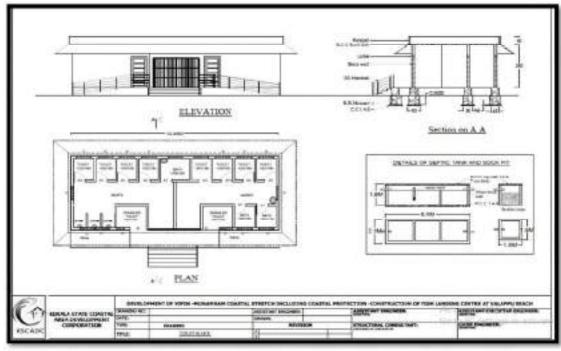


Fig-10- Toilet Block, Valappu beach

An amount of Rs. 25.00 crore is required for construction of Modern Integrated Fish Landing facilities at Valappu beach in Vypin Munambam stretch of Ernakulam district. (Estimate and plan attached as Annexure 1)

# 4.5.2. Malipuram

This coast is identified to experience high erosion at the rate of about -10m/yr through remote sensing studies. Although this site has been identified as a fish landing centre, there is an urgent need to protect the eroding coastline.

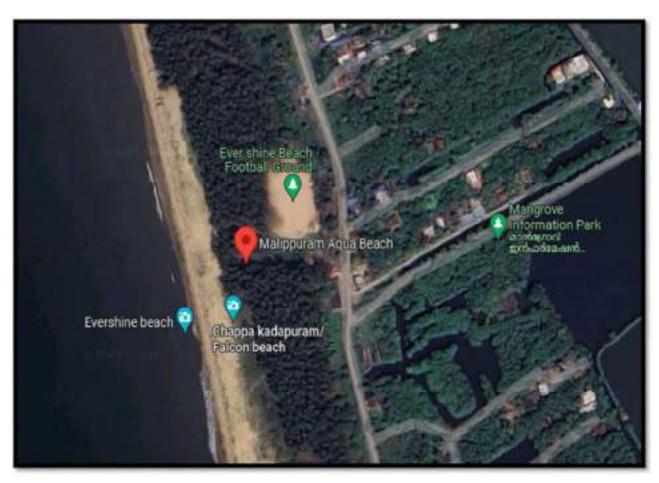


Image 6. Google image- Malipuram

Therefore, a series of six transitional groynes are proposed to be constructed across a stretch of about 1 km. Four number of T groynes, two on either ends and two number of straight groynes in the central section are proposed. The straight groynes can be further extended to form a fishing harbour if necessary. A base landing width of 250 m is provided to accommodate sufficient number of fishing vessels; these groynes extend upto a maximum water depth of about -2 m. The longest groyne in this series is about 120 m long and the shortest groyne is about 50 m long as seen in Fig 11.

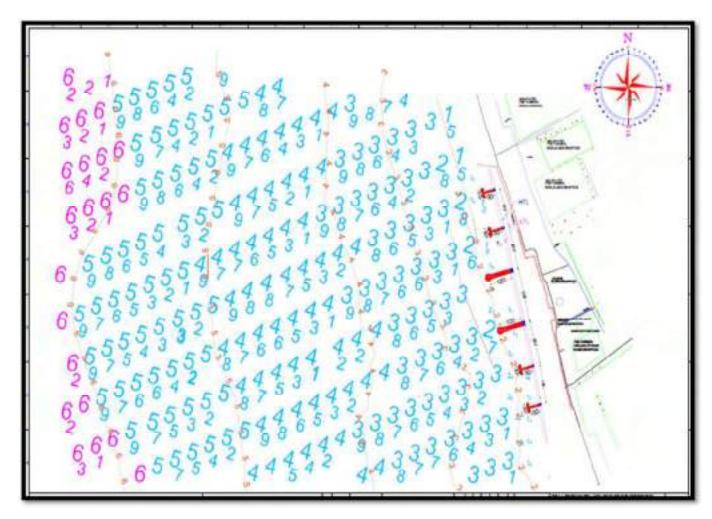


Fig-11- Layout- Malipuram

An Auction hall building of size 28.3m x 6.4m is proposed at Malipuram beach. Sufficient free land is available at Malipuram beach with sufficient road access.



Image 7. Proposed Area at Malipuram beach

For the auction hall, coconut piling of length 6m long is provided for foundation. RCC M20 provided for foundations, centering & shuttering, Reinforcement cement concrete work(M20) in walls is provided for super structure. Necessary Steel reinforcement, plastering and painting works are also included in the Auction hall. Provision for construction of a toilet block of size 12.5m x 5.1m is also included. For the toilet block, RR masonry with cement mortar 1:6 is provided for the foundation. Solid block masonry of size 30x20x15cm and 40x20x10cm are provided for super structure. Ceramic tiling is provided in the floor and in the bathroom region. Necessary fittings are also provided for toilet block. Other provisions include concrete parking area proposed near the the Auction hall. Provision for the construction of drain is also included. Water supply and sanitary arrangement, Electrification and yard lighting are also included.

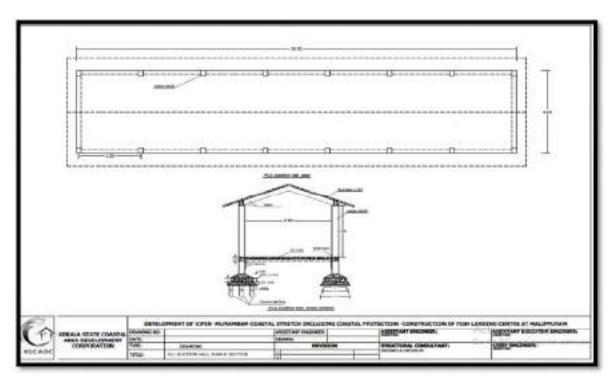


Fig-12- Auction hall, Malippuram

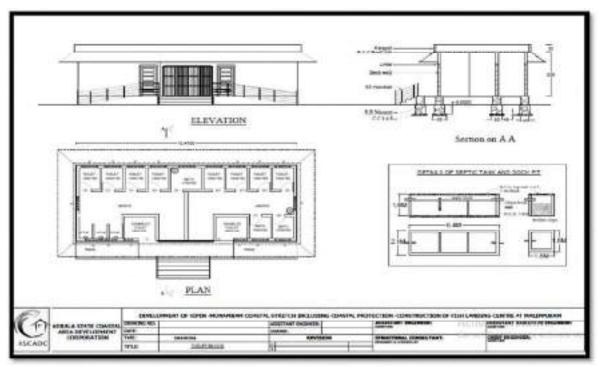


Fig-13- Toilet block, Malippuram

An amount of Rs. 25.00 crore is required for construction of Modern Integrated Fish Landing facilities at Malipuram beach in Vypin Munambam stretch of Ernakulam district. (Estimate and plan attached as Annexure 2)

# 4.5.3. Veliyathamparambu

This stretch of the coastline identified as a fishing landing centre is already protected with a seawall structure to its south and a single groyne exists in the northern side.

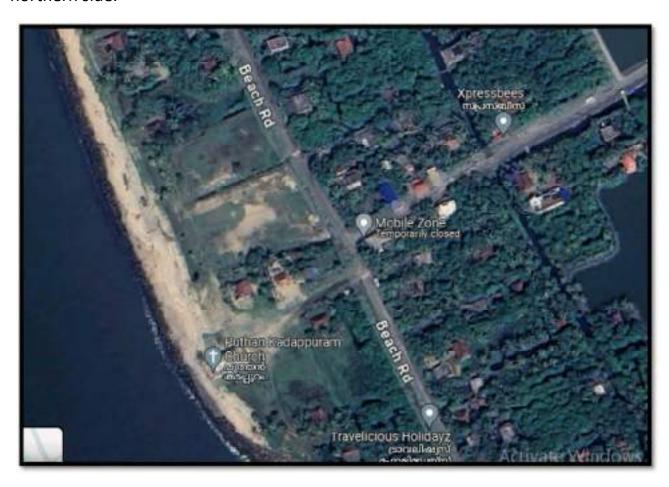


Image 8. Google image- Veliyathamparambu

The rate of erosion across this stretch is inferred to be less based on the satellite imagery studies, since it is already protected. Although a pair of inclined groynes as seen in Fig 14 are proposed to be constructed in order to effectively serve as a fish landing facility. These groynes are about 180 m long extending to water depths upto 3 m. Extension of Northern Groyne and provision of a new southern groyne is proposed. A filter layer of 1kg to 10kg category stone, Core layer using 100 to 300 kg stones , Toe Mound using 500 to 800 kg stones , Armour layer using 1.5T to 2.5T stones proposed here. In addition to that 2T tetrapods at 1.96m Thick and 4T tetrapods at 2.50m Thick is provided for armour layer

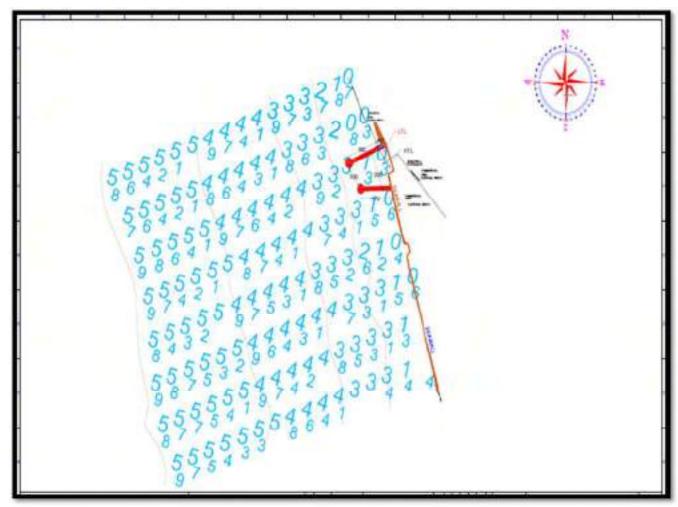


Fig-14- Layout- Veliyathamparambu

An Auction hall building of size 28.3m x 6.4m is proposed at Veliyathamparambuu beach. Sufficient free land with road access is available in Veliyathamparambu beach for FLC construction.



Image 9. Proposed Area at Veliyathamparambu beach

For the auction hall, coconut piling of length 6m long is provided for foundation. RCC M20 provided for foundations, centering & shuttering, Reinforcement cement concrete work (M20) in walls is provided for super structure. Necessary Steel reinforcement, plastering and painting works are also included in the Auction hall. Provision for construction of a toilet block of size 12.5m x 5.1m is also included in the estimate. For the toilet block, RR masonry with cement mortar 1:6 is provided for the foundation. Solid block masonry of size 30x20x15cm and 40x20x10cm are provided for super structure. Ceramic tiling is provided in the floor and in the bathroom region. Necessary fittings are also provided for toilet block. Other provisions include concrete parking area proposed near the Auction hall. Provision for the construction of drain is also included.

Provisions for water supply and sanitary arrangement, Electrification and yard lighting are also included

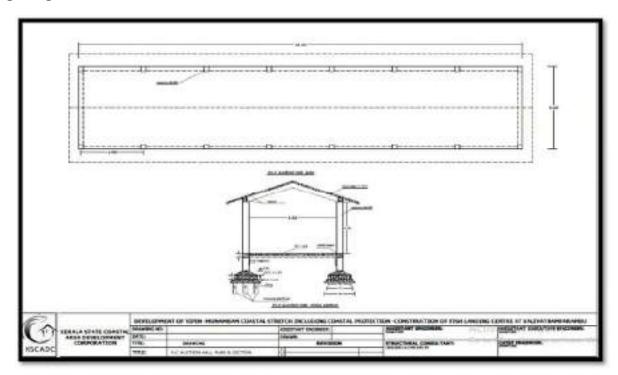


Fig-15- Auction hall, Veliyathamparambu

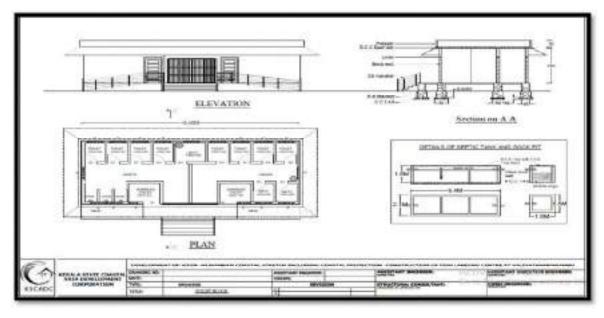


Fig-16- Toilet Block, Veliyathamparambu

An amount of Rs. 25.00 crore is required for construction of Modern Integrated Fish Landing facilities at Veliyathamparambu beach in Vypin Munambam stretch of Ernakulam district. (Estimate and plan attached as Annexure 3)

# 4.5.4. Puthenkadappuram

This stretch of the coastline identified as a fishing landing centre is already protected with a seawall structure to its south and groyne field on the northern side.

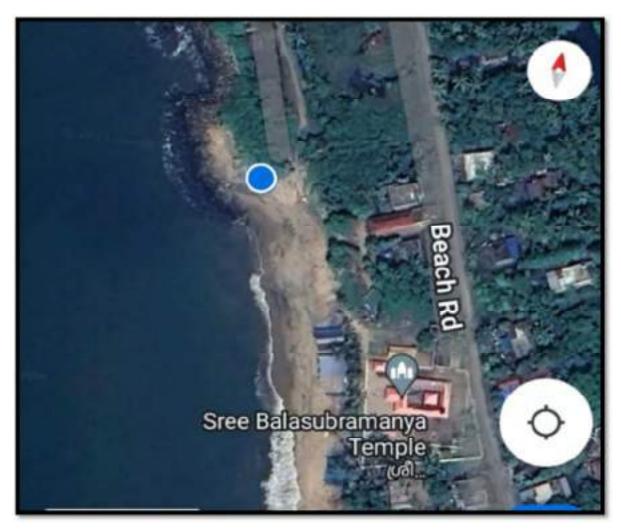


Image 10. Google image- Puthenkadappuram

A proposal to construct a pair of groynes as seen in Fig 17. is made, which includes the extension of an existing groyne on the northern side. A series of 2 transitional groynes are proposed. Groynes of length 180m and 150m are proposed. A filter layer of 1kg to 10kg category stone, Core layer using 100 to 300 kg stones , Toe Mound using 500 to 800 kg stones ,Armour layer using 1.5T to 2.5T stones proposed here. In addition to that 2T tetrapods of 1.96m Thickness and 4T tetrapods of 2.50m Thickness is provided for armour layer

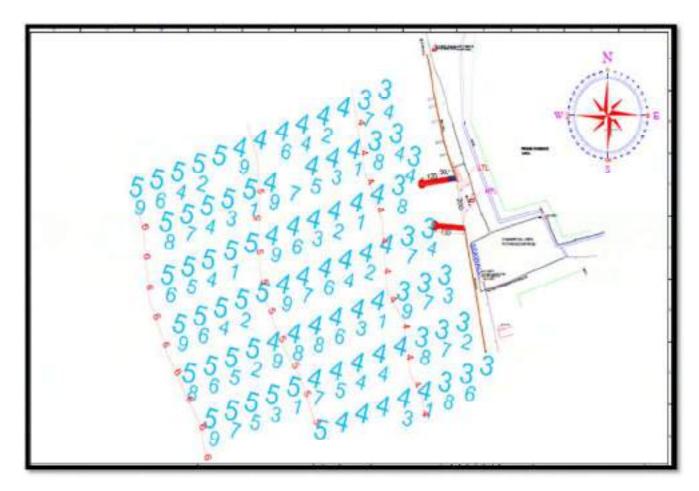


Fig-17- Layout- Puthenkadappuram

An Auction hall building of size 28.3m x 6.4m is proposed at Puthenkadapuram beach. An old Fish Landing Centre exits at Puthenkadappuram which is left abandoned due to its dilapidated condition. The fishermen of the area have requested to demolish the existing dilapidated FLC and to construct a new one to facilitate their day to day fishing activities.



Image 11. – Puthenkadappuram- Existing FLC

For the auction hall, coconut piling of length 6m long is provided for foundation. RCC M20 provided for foundations, centering & shuttering, Reinforcement cement concrete work (M20) in walls is provided for super structure. Necessary Steel reinforcement, plastering and painting works are also included in the Auction hall. Provision for construction of a toilet block of size 12.5m x 5.1m is also included in the estimate. For the toilet block, RR masonry with cement mortar 1:6 is provided for the foundation. Solid block masonry of size 30x20x15cm and 40 x 20 x 10 cm are provided for superstructure. Ceramic tiling is provided in the floor and in the bathroom region. Necessary fittings are also provided for toilet block. Other include concrete parking area near to the Auction hall. Provision for the construction of drain is also included in included. Sea wall strengthening, water supply and sanitary arrangement, Electrification and yard lighting are also included

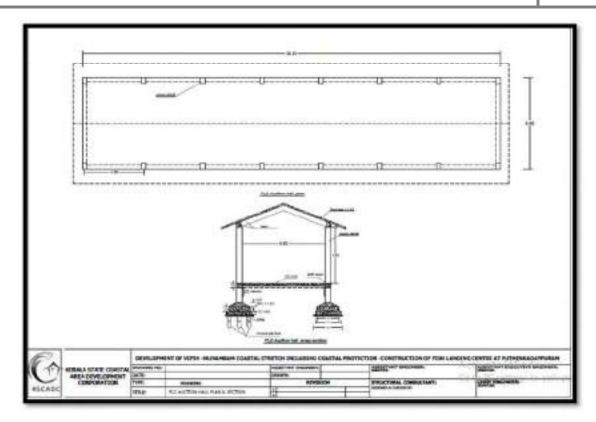


Fig-18- Auction hall, Puthenkadappuram

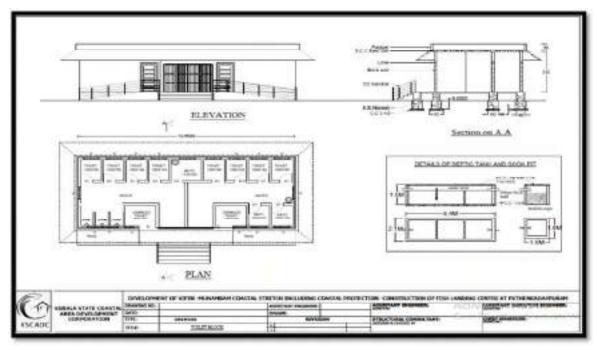


Fig-19.- Toilet Block, Puthenkadappuram

An amount of Rs. 25.00 crore is required for construction of Modern Integrated Fish Landing facilities at Puthenkadappuram beach in Vypin Munambam stretch of Ernakulam district. (Estimate and plan attached as Annexure 4)

## 4.5.5. Pazhangadu

This stretch of the coastline is identified as a fishing landing centre and it is already protected with seawall sections on either side.

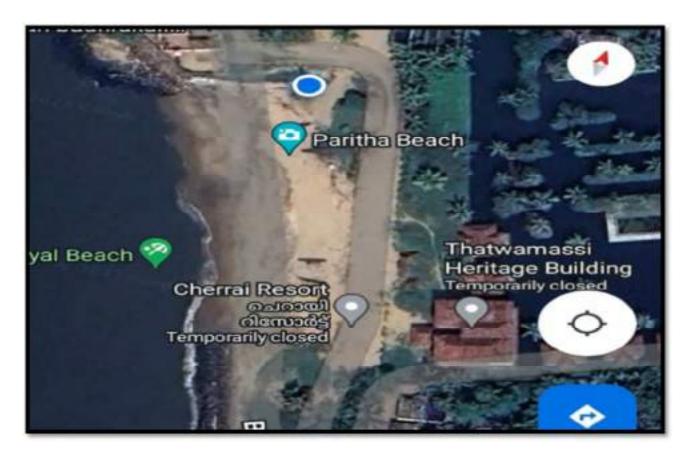


Image 12. Google image- Pazhangadu

A pair of groynes are proposed to be constructed as shown in Fig 20. A series of 2 transitional groynes are proposed. Groynes of lengths 180m and 140m are proposed. A filter layer of 1kg to 10kg category stone, Core layer using 100 to 300 kg stones, Toe Mound using 500 to 800 kg stones, Armour layer using 1.5T to 2.5T stones proposed here. In addition to that, 2T tetrapods of 1.96m Thickness and 4T tetrapods of 2.50m Thickness are provided for armour layer.

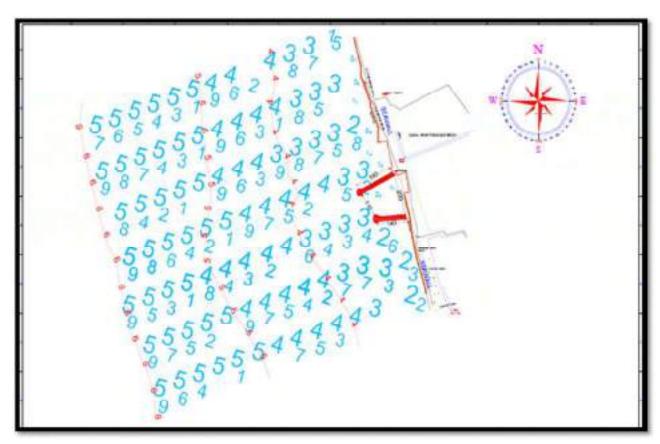


Fig-20- Layout- Pazhangadu

The geographical instability of the beach necessitates comprehensive shore protection measures to safeguard the area against erosion, tidal influences, and other environmental factors. However, the intricacy of the situation is further compounded by the remoteness of the location, characterized by the absence of a proper approach road. Given these challenges, the establishment of an FLC in this particular area is not deemed feasible.

It has been observed that only a limited number of fishermen, typically one or two, venture into the sea from this remote beach. Consequently, there arises a pivotal need for the stabilization of the beach itself. The primary objective of the proposed project in the particular area is to facilitate the formation of a stable and secure beach environment, addressing the unique challenges posed by the geographical instability of the area.

An amount of Rs. 20.87 crore is required for stabilizing the proposed beach and to facilitate the Fish Landing facilities at Pazhangadu beach in Vypin Munambam stretch of Ernakulam district. (Estimate and plan attached as Annexure 5)

#### 4.5.6. Saidh Mohammed beach

This stretch of the coastline is identified as a fishing landing centre and it is already protected with seawall and groynes.

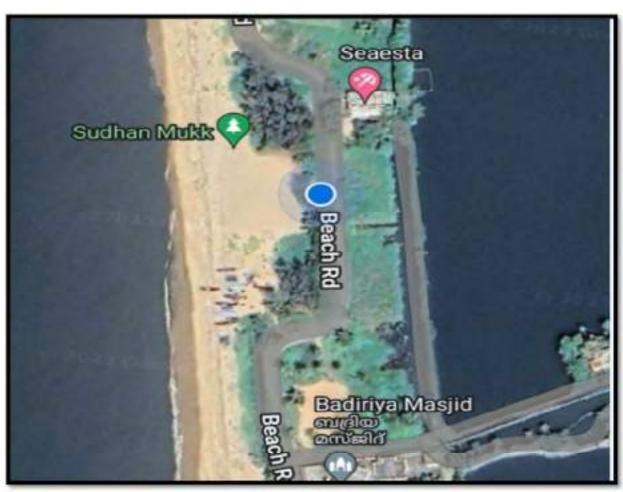


Image 13. Google image- Said Mohammed Beach

A proposal is made to extend the existing groynes for about 160 m in length (upto -3 m water depth) and construct a pair of groynes to form a fish landing centre with a base width of about 150 m as seen in Fig 23. A series of 2 transitional groynes are proposed. Accordingly, groynes of length 160m and 120m are proposed. A filter layer of 1kg to 10kg category stone, Core layer using 100 to 300 kg stones , Toe Mound using 500 to 800 kg stones , Armour layer using 1.5T to 2.5T stones proposed here. In addition to that 2T tetrapods at 1.96m Thick and 4T tetrapods at 2.50m Thick is provided for armour layer.

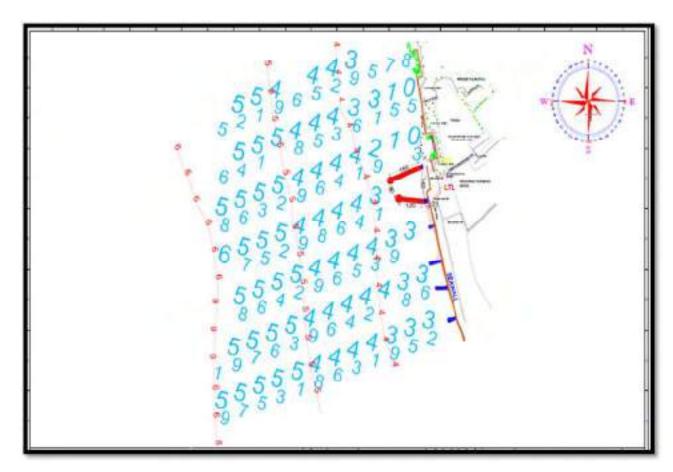


Fig-21- Layout- Said Mohammed Beach

An Auction hall of size 28.3m x 6.4m is proposed at Said Mohammed beach. Sufficient free land with road access is available for construction of fish landing centre at said Mohammed beach

For the auction hall, coconut piling of length 6m long is provided for foundation. RCC M20 provided for foundations, centering & shuttering, Reinforcement cement concrete work (M20) in walls is provided for super structure. Necessary Steel reinforcement, plastering and painting works are also included in the Auction hall. Provision for construction of a toilet block of size 12.5m x 5.1m is also included in the estimate. For the toilet block, RR masonry with cement mortar 1:6 is provided for the foundation. Solid block masonry of size 30x20x15cm and 40x20x10 cm are provided for super structure. Ceramic tiling is provided in the floor and in the bathroom region. Necessary fittings are also provided for toilet block. Other provisions include concrete parking area proposed near the Auction hall, construction of drain etc.

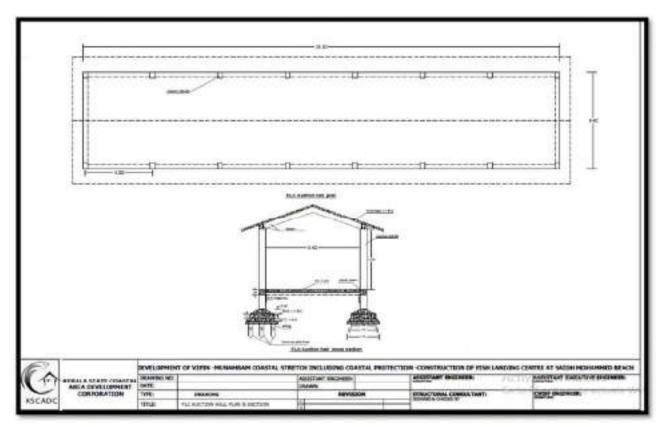


Fig-22- Auction hall, Said Mohammed Beach

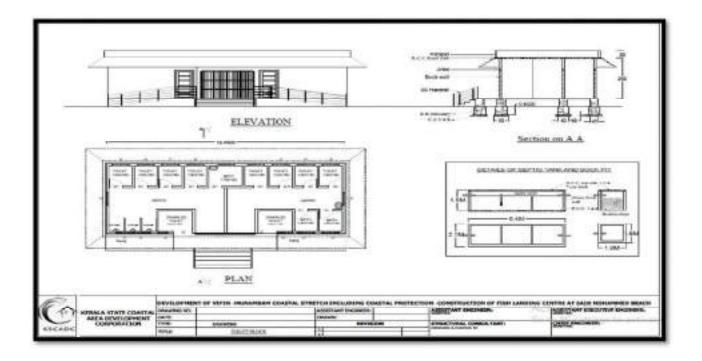


Fig-23- Toilet block, Said Mohammed Beach

An amount of Rs. 25.00 crore is required for construction of Modern Integrated Fish Landing facilities at Said Mohammed beach in Vypin Munambam stretch of Ernakulam district. (Estimate and plan attached as Annexure 6)

#### 4.6. METHODOLOGY ADOPTED

# 4.6.1. Field Investigation

A detailed field investigation study was commissioned to collect real-time field data which includes shoreline mapping, beach profile and sediment characteristics. The study area from Vypin to Munambam was sub-divided into 6 major stretches for ease of executing field measurements the details of which alongside the geo-coordinates of each site are projected in Table 6.

Distance (km) Starting Point **Ending Point** S. Place No. Lat/Long Lat/Long 1 10°01'54.20" N 10°0'58.03" N 1.2 Valappu Beach 76°13'5.76" E 76º12'50.31" E 10°01'12.60" N 10°1'55.13" N 1.4 2 Elamkunnapuzha Beach 76912'47.50" E 76º12'33.93" E 3 10°02°15.76" N 10°2'57.56" N 1.3 Njarackal Arattuvazhi Beach 76º12'16.72" E 76º12'28.03" E Veliyatham Parambu Beach 1.8 4 10°03'3.99" N 10°3'57.93" N 5 Nayarambalam Puthan 76º12'12.54" E 76º11'54.87" E Kadappuram 6 Edavankkadu Grama 3.3 Panchayat 10°04'10.15" N 10°5'54.10" N 7 Pazhangadu 76°11'50.81" E 76º11'23.34" E 8 Saidh Mohammed Beach 9 Kuzhippilly 6.8 Pallipuram 10 10°06'7.65" N 10°09'39.22" N Cherai 76º11'20.07" E 76º10'17.37" E 11 Arattu Kadavu Beach 12

**Table 15.:- Co-ordinates of the site** 

The science of shoreline mapping has significantly evolved over the years to reduce the uncertainties involved in measurement and data processing. The remotely collected data from satellite imagery, such as the Google Earth timeline imagery, can furnish valuable preliminary data to understand the dynamic behaviour of shoreline variation in a localized stretch. The comprehensive effect of shoreline changes can be understood by employing statistical approaches. The methodology adopted for the Model study includes data collection, shoreline demarcation, and shoreline change rate calculation. Multi-temporal satellite cloud-free data of Landsat TM and ETM sensors acquired from 2008 to 2020 along the Kerala Coast. The data source was used to demarcate the shoreline change using ArcGIS. The shoreline data analysis has been projected in Fig 24.

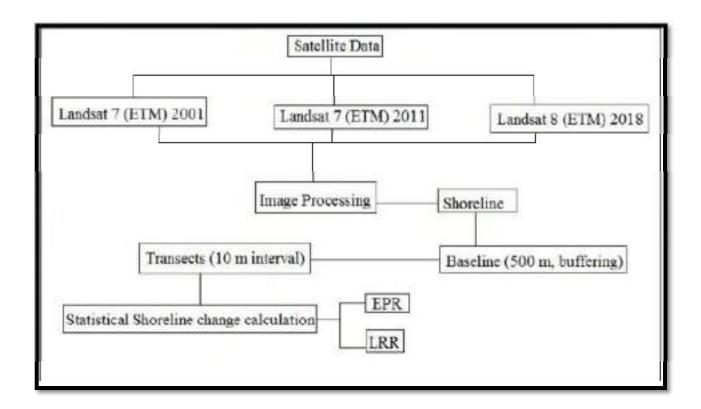


Fig 24. Flow chart for methodology

# 4.6.2. Topographic Survey

Beaches are extremely dynamic in nature experiencing continual changes in shape and shifting position with response to winds, waves, tides, relative sea level, and anthropogenic activities. The most significant changes occur due to seasonal changes in wave climate and during extreme events such as storm surge or cyclone events. The mapping of shoreline as well as demarcation of the existing seawall and groynes structures were measured using RTK GPS system. The beach profile at various transects for a given coastal stretch was also measured.

Navigation and data logging system includes 2 x Trimble R10 RTK GPS with Base and Rover accessories, 1 x Measuring Tape

## 4.6.3. Wave Modelling

An application of the spectral wave prediction model for the Arabian Sea has been carried out to evaluate the spectral wave parameters offshore off the Vypin to Munanbam for the planning of coastal protection. The global wave model is based on the "WAM" model has been adopted. This model simulates the evolution of two-dimensional ocean waves using the spectral energy balance equation, in which wave energies are balanced with the local wind input, wave dissipation and non-linear energy transfer. The coarser grid model has been executed over a regional domain, which includes the Indian Ocean, Bay of Bengal and the Arabian Sea. The finer grid model has been set up over the Arabian Sea with a focus along the south-west coast of India with boundary information from the coarse grid model. ECMWF wind vectors over an annual year have been obtained for the domain of interest and the wind-waves have been evaluated at a deep-water location off the study area as mentioned above. The near shore wave modeling that includes diffraction due to breakwaters caters for propagating deep water waves into the near shore. The littoral drift study transforms the deepwater wave climate into near shore normal wave characteristics.

#### 4.6.4. Littoral Drift Estimate

The wave characteristics viz., significant wave height, mean wave period and mean wave direction at a deep-water location off Vypin to Munambam, at Valappu Beach, Elamkunnapuzha Beach, Njarackal Arattuvazhi Beach, Veliyatham Parambu Beach, Edavankkadu Grama Panchayat, Saidh Mohammed Beach, Kuzhippilly, Pallipuram Raktheswari beach, Cherai beach, Arattu Kadavu beach Kerala have been extracted at every 6 hours interval from the European Centre for Medium-Range Weather Forecasts (ECMWF).

# 4.6.5. Numerical Modelling for Shoreline Evolution

Structures in the near shore environment are built for different purposes, which may be for the formation of artificial harbors, shore protection measures, seawater intake systems, disposal of effluent, etc. There are several

configurations of such structures with respect to the shoreline, among which, structures normal to the shore are most common. The construction of a shore-connected structure often leads to changes in the shoreline. This warrants a study on the shoreline due to the presence of the shore-connected structures. Such a study is very much essential in the planning stage; so as to assess the impact of shore connected structures on the adjacent shoreline.

Numerical models offer the capability to study the effect of the wave characteristics, structure dimensions and other associated parameters in providing reasonable estimates of the shoreline response. As the ocean waves approach the near shore it undergoes transformations like shoaling, refraction, diffraction and breaking. The phenomena of wave breaking throw sediments to the surface due to the turbulence generated. The sediments in suspension are then driven by the wave-induced currents. Since the direction of waves in the near shore is oblique, the currents induced by them have two components. One along the shore called the long shore current is mainly responsible for the long shore sediment transport, which plays an important role in the shoreline changes especially due to the shore connected structures. The other component is in the direction normal to the shore, in which case, the mode of sediment transport is called onshore-offshore sediment transport. When a structure normal to the shoreline is constructed, it will intercept the free passage of long shore sediment transport, which results in an imbalance in the quantity of sediment on the near shore, especially near the structure. This leads to accretion on the up-drift side and erosion on the down drift side of the structure.

# CHAPTER 5. FINANCIAL ESTIMATES AND COST PROJECTIONS

#### **5.1. FINANCIAL OUTLAY**

The major components of work are construction of fish landing facilities and supply and installation of the Geo tubes and groynes. The estimate for these items is done based on the rate analysis prepared for the supply of materials, construction and installation charges. A special data was worked out based on the actual site conditions and prevailing market rates.

The estimate for the civil works is prepared based on DSR 2018 and Cost Index of 35.59 % using the PRICE software. The total project cost works out to **Rs. 145.87 crore (Rupees One hundred and forty five crore and eighty seven lakh only).** (Details in Table 22). The expenditure will be phased over a period of 2 years from the date of commencement.

The detailed estimate and abstract prepared in PRICE software is attached. Consultancy charges payable to the PMC, taxes and other statutory expenses are included in the cost abstract. The abstract of each landing centre is given in table 16 to table 21

Table 16. Financial Outlay of Modern Integrated Fish landing facilities at Valappu Beach

SI	Project Components	Total Financial Outlay
No		(in Rs.)
1	Supplying and placing of geosynthetic tubes	15 48 97 319/-
2	Construction of Auction Hall	31 90 663/-
3	construction of Toilet block	24 10 666/-
4	construction of Parking Area	78 60 744/-
5	Construction of Drain	11 44 187/-
6	Seawall Strengthening	2 00 00 000/-
7	Sub soil investigation	15 00 000/-
8	Water supply and sanitary arrangement	25 00 000/-
9	Electrification and yard lighting	15 50 000/-

10	Unforeseen expenses @ 2.5%	49 00 000/-
11	Sub Total	19 99 53 579/-
12	GST @ 18%	3 59 91 644/-
13	Total Amount including GST 18%	23 59 45 223/-
14	Lumpsum for Round off	54 777/-
15	Total Amount	23 60 00 000/-
16	Consultancy @5%	1 18 00 000/-
17	GST on consultancy @ 18%	R21 24 000/-
18	Round off	76 000/-
	Grand Total	Rs 25 00 00 000/-
	Rupees Twenty Five Crore O	nly

Table 17. Financial Outlay of Modern Integrated Fish landing facilities at Malipuram Beach

SI No	Project Components	Total Financial Outlay (in Rs.)										
1	Groyne	18 13 68 224/-										
2	Construction of Auction hall	31 99 195/-										
3	Construction of Toilet block	22 56 232/-										
4	Parking Area	39 04 172/-										
5	Drain	11 81 928/-										
6	Sub soil investigation	10 00 000/-										
7	Water supply and sanitary arrangement	11 00 000/-										
8	Electrification and yard lighting	10 00 000/-										
9	Unforeseen expenses @ 2.5%	49 40 000/-										
10	Sub Total	19 99 49 752/-										
11	GST @ 18%	3 59 90 955/-										
12	Total Amount including GST 18%	23 59 40 707/-										
13	Lumpsum for Round off	59 293/-										
14	Total Amount	23 60 00 000/-										
15	Consultancy @5%	1 18 00 000/-										
16	GST on consultancy @ 18%	21 24 000/-										
17	Round off	76 000/-										
18	Grand Total	Rs.25 00 00 000/-										
	Rupees Twenty Five Crore Only											

Table 18. Financial Outlay of Modern Integrated Fish landing facilities at Valiyathamparambu

SI No	Project Components	Total Financial Outlay (in Rs.)
1	Groyne	17 75 05 385/-
2	Construction of Auction Hall	31 90 663/-
3	construction of Toilet block	24 10 666/-
4	construction of Parking Area	63 36 782/-
5	Construction of Drain	11 44 187/-
6	Sub soil investigation	15 00 000/-
7	Water supply and sanitary arrangement	19 00 000/-
8	Electrification and yard lighting	10 00 000/-
9	Unforeseen expenses @ 2.5%	49 90 000/-
10	Sub Total	19 99 77 684/-
11	GST @ 18%	3 59 95 983/-
12	Total Amount including GST 18%	23 59 73 667/-
13	Lumpsum for Round off	26 333/-
14	Total Amount	23 60 00 000/-
15	Consultancy @5%	1 18 00 000/-
16	GST on consultancy @ 18%	R21 24 000/-
17	Round off	76 000/-
18	Grand Total	Rs. 25 00 00 000/-
	Rupees Twenty Five Ci	rore Only

Table 19. Financial Outlay of Modern Integrated Fish landing facilities at Puthenkadappuram

SI No	Project Components	Total Financial Outlay (in Rs.)
1	Groyne	15 18 22 781/-
2	Construction Of Auction Hall	31 90 663/-
3	construction of Toilet block	24 10 666/-
4	construction of Parking Area	78 60 744/-
5	Construction of Drain	11 44 187/-

6	Seawall Strengthening	2 36 00 000/-								
7	Sub soil investigation	15 00 000/-								
8	Water supply and sanitary arrangement	25 00 000/-								
9	Electrification and yard lighting	10 00 000/-								
10	Unforeseen expenses @ 2.5%	49 00 000/-								
11	Sub Total	19 99 29 041/-								
12	GST @ 18%	3 59 87 227/-								
13	Total Amount including GST 18%	23 59 16 268/-								
14	Lumpsum for Round off	83 732/-								
15	Total Amount	23 60 00 000/-								
16	Consultancy @5%	1 18 00 000/-								
17	GST on consultancy @ 18%	21 24 000/-								
18	Round off	76 000/-								
19	Grand Total	Rs.25 00 00 000/-								
	Rupees Twenty Five Crore Only									

Table 20. Financial Outlay of Modern Integrated Fish landing facilities at Pazhangadu

SI No	Project Components	Total Financial Outlay (in Rs.)
1	Groyne	16 18 89 405/-
2	Yard lighting	1000000/-
3	Unforeseen expenses @ 2.5%	400000/-
4	Sub Total	166889405/-
5	GST @ 18%	30040093/-
6	Total Amount including GST 18%	196929498/-
7	Lumpsum for Round off	70502/-
8	Total Amount	19700000/-
9	Consultancy @5%	9850000/-
10	GST on consultancy @ 18%	1773000/-
11	Round off	77000/-
	Grand Total	Rs.208700000/-
	Rupees Twenty Crore and Eighty Seven lakh O	nly

Table 21. Financial Outlay of Modern Integrated Fish landing facilities at Said Mohammed Beach

SI No	Project Components	Total Financial Outlay (in Rs.)
1	Groyne	14 11 98 972/-
2	Construction of Auction Hall	31 90 663/-
3	construction of Toilet block	24 10 666/-
4	construction of Parking Area	78 60 744/-
5	Construction of Drain	11 44 187/-
6	Seawall Strengthening	3 25 00 000/-
7	Sub soil investigation	19 00 000/-
8	Water supply and sanitary arrangement	25 00 000/-
9	Electrification and yard lighting	23 00 000/-
10	Unforeseen expenses @ 2.5%	49 50 000/-
11	Sub Total	19 99 55 232/-
12	GST @ 18%	3 59 91 942/-
13	Total Amount including GST 18%	23 59 47 174/-
14	Lumpsum for Round off	52 826/-
15	Total Amount	23 60 00 000/-
16	Consultancy @5%	1 18 00 000/-
17	GST on consultancy @ 18%	21 24 000/-
18	Round off	76 000/-
19	Grand Total	Rs. 25 00 00 000/-
	Rupees Twenty Five Crore Only	

**Table 22- Total Financial Outlay** 

SI No	Name of component	Amount (Rs. in Crore)
1	Modern Integrated Fish landing facilities at Valappu Beach	25.00
2	Modern Integrated Fish landing facilities at Malipuram	25.00
3	Modern Integrated Fish landing facilities at Valiyathamparambu	25.00

4	Modern Integrated Fish landing facilities at Puthenkadappuram	25.00
5	Modern Integrated Fish landing facilities at Pazhangadu	20.87
6	Modern Integrated Fish landing facilities at said Mohammed	25.00
	Beach	
	Grand Total	145.87

#### **5.2. MEANS OF FINANCE**

An amount of **Rs 145.87 Crore** ( Rupees One hundred and forty five crore and eighty seven lakh only) is required for the proposal "Modern Integrated Fish Landing Facilities in the coastal stretch of Vypin to Munambam in Ernakulam district". The proposal is suggested to be implemented under " Non- Beneficiary Oriented Activities under Centrally Sponsored Components of Pradhan Mantri Matsya Sampada Yojana, B. Infrastructure and Post Harvest Management, 3. Development of Fishing Harbours and Fish Landing Centres 3.3. Modern Integrated Fish Landing Centres

**Table 23. Funding Pattern** 

Total Financial Outlay (Rs. in crore)	CSS Share under PMMSY (Rs. in crore) (60%)	State Share (Rs. in crore) (40%)
145.87	87.522	58.348

#### 5.3. REVENUE STREAMS AND BENEFITS OF THE PROJECT

The revenue streams and benefits associated with the project are multifaceted, encompassing both social and environmental dimensions. The primary focus of the project is to enhance fish activities in the designated area, thereby augmenting the number of fishing mandays. This, in turn, is expected to substantially boost the day-to-day revenue of the marginalized fishing community residing along the Vypin-Munambam stretch.

One of the paramount benefits of the project lies in the safeguarding of public property, including crucial infrastructure such as roads and residences. By providing effective shore protection, the project mitigates the risk of damage to these vital assets, ensuring the overall resilience and longevity of public infrastructure.

A significant outcome of the project is the creation of an expansive beach with an estimated average width of 40 meters along the entire stretch where shore protection is proposed. This widened beach not only enhances the aesthetic appeal of the coastal area but also serves a practical purpose. It provides an ideal landing site for local fishermen to bring in their fishing crafts, offering proximity to their residences. This strategic aspect of the project is designed to prevent the price slashing of landed fish and mitigate potential social issues arising from fishermen of one village landing their crafts in another village's landing center.

While conventional financial metrics such as returns and cost-benefit analysis may not be directly applicable due to the project's classification as a social project, the tangible social benefits are evident. The project stands as a catalyst for community development, fostering economic empowerment within the marginalized fishing community.

In addition to the social benefits, the project contributes significantly to environmental conservation. The adoption of an eco-friendly approach to shore protection, avoiding the use of quarry stones, exemplifies a commitment to sustainable practices. The utilization of sand dredged from the sea to fill Geo bags aligns the project with environmentally conscious strategies, minimizing the ecological impact.

Simultaneous beach nourishment initiatives further enhance the environmental benefits, actively preventing erosion on nearby beaches and ensuring the overall stability of the coastal ecosystem. The offshore breakwater structure, as highlighted by the National Institute of Ocean Technology (NIOT), is

anticipated to function as an artificial reef, providing a conducive breeding ground for diverse species of fishes.

In summary, the revenue streams and benefits of the project are diverse and impactful, spanning economic, social, and environmental dimensions. By fostering increased fishing activities, protecting public property, creating a functional and aesthetically pleasing beach, and adopting eco-friendly shore protection measures, the project emerges as a comprehensive and transformative initiative with enduring positive effects on the local community and the coastal environment.

#### 5.4. COST BENEFIT ANALYSIS

The fish landing centers and related infrastructures primarily serve poor fishermen communities and have a strong service-oriented focus, they can also yield substantial economic benefits for the broader community and the region as a whole. The economic analysis of such projects often reveals their potential for high returns on investment.

- 1. **Economic Impact Beyond Direct Beneficiaries:** While the primary objective of these projects is to support local fishermen, the positive economic impact extends beyond the fishing community. Improved infrastructure and services can attract additional economic activities, such as processing, transportation, and tourism, which can benefit the entire region.
- Reduced Post-Harvest Losses: Modern fish landing centers and associated facilities, including facilities to reduce post-harvest losses. This means more of the catch reaches the market in optimal condition, increasing the overall economic value of the fishing industry.
- 3. **Stimulating Local Economies:** The construction and operation of these facilities generate employment opportunities, both directly in the fishery sector and indirectly through support services. This can lead to higher income levels and improved standards of living for the local population.

- 4. **Tourism and Trade:** Upgraded infrastructure can attract tourists, traders, and investors to the area, further contributing to economic growth. Enhanced facilities often result in increased economic activity related to tourism and trade.
- 5. **Long-Term Environmental Benefits:** Sustainable fishing practices can help maintain the health of the marine ecosystem, preserving it as a valuable resource for the future. A healthy ecosystem can support long-term economic sustainability.
- 6. **Social Well-being:** While not always captured in economic analyses, improving the well-being and quality of life for the fishing community has social and economic implications. Healthier, economically stable communities are better positioned to contribute positively to the local economy.

In light of these factors, it is not uncommon for the economic analysis of fish landing centers and related infrastructure projects to demonstrate their high economic viability, especially when considering their multifaceted impact on the community and regional development. Furthermore, such projects often align with broader sustainable development goals by promoting economic growth, environmental sustainability, and social well-being in the region.

However if an economic analysis is carried out for any fishery related infrastructure or the like, the cost benefit accrued will be highly promising.

Considering the resources potential of the area, investment proposal of the project is found to be economically viable.

#### 5.5. RISK ASSESSMENT AND MITIGATION MEASURES

Project implementation schedule and proven construction management strategy are in place to reduce the probability and impact of risks in the proposed project. The following Risks are identified in the project and the responses to each are explained along with.

i. **Climatic conditions:** The work is to be done in the open sea where aggressive wave climate exists. Generally, the fair-weather season is from October to

- April. All the installation works are to be done during this short span of time. Even during this season there may be rough sea conditions occurring during spring tides, atmospheric depressions etc. Such changes may cause delay in completion of the work.
- ii. **Cash Flow issues:** Only pre-qualified contractors' bids shall be opened to assure that only solvent contractors are awarded the work. Proactive action shall be taken to plan the financial progress and to get the funds in advance to avoid delays
- iii. **Schedule of Rates Revision:** Revision of schedule of rates between the times of formulating the project to time of tendering may lead to tender excesses. Contingency reserve is made in the estimate to cover this risk.
- iv. **Sea bed level variations during execution**: It is obvious that any structure that constructed in the sea may cause bathymetric changes, This has to be addressed by the artificial nourishment methods.
- v. **Stoppage of work in Monsoon:** No work in the open sea is possible during May to September. During this time the dredgers barges etc.have to be moved to a safe tranquil basin.
- vi. **Natural hazards**: Cyclones and surges may result in displacement and damage of the Geo tubes, which are anchored and placed under water for filling. Daily warnings from the meteorological department are received at selected email addresses of departmental officers now to take preventive action in the case of rough sea conditions.
- vii. **Unexpected Technical issues** Assumptions made during formulation of the project are also sources of risks. Coastal processes involve many variables and heterogeneous environments. Bathymetry of the sea bed, shore lines, wave climate, wind data etc are used to run the models. Major changes in any of these variables may lead to changes in results of the model and the prototype. Models are run on the surveys and data collections made at the time of model study results to avoid risk originating from this source. In such cases, bathymetric and shoreline changes are being mapped on regular intervals and there is a project office at the project location itself to monitor any changes in the above variables. The project of construction of offshore

2023

breakwater using Geo Tubes is the first of its kind, being implemented in the state. Hence being an experimental project there may be practical issues coming across during implementation. To address the issues timely an expert committee will be constituted, and they will provide timely solutions to the issues.

#### CHAPTER 6. PROJECT IMPLEMNTATION

#### **6.1. PROJECT MANAGEMENT ORGANIZATION**

Kerala state Coastal Area Development Corporation, Government accredited agency will be the implementing organization

Preparation of detailed design, drawings, estimates and issue of Technical sanction will be done by Kerala State Coastal Area Development Corporation (KSCADC) as per the existing government guidelines applicable to Government Accredited Project Management Consultancies. KSCADC, a fully government owned corporation will be responsible for implementation of the present project. KSCADC will ensure that the Project's development objectives are achieved timely and efficiently.

KSCADC is equipped with an expert team of Engineering wing which includes Chief Engineer, Executive Engineers, Assistant Executive Engineers, Assistant Engineers (Civil), Assistant Engineers (Electrical) and Overseers. Structural Engineer and Architects are also working in the team. A project wing and administrative wing also functions at KSCADC which will ensure the completion of projects in all aspects in the stipulated time period.

The tendering process will be initiated by KSCADC once the Administrative Sanction is accorded. Relevant tenders will have Pre-Qualification verification by PQ committee. The tenders will be floated with the General conditions of contract, as per the prevailing PWD guidelines. The Chief Engineer, KSCADC will be the agreement authority.

With regard to the implementation of the works, Kerala State Coastal Area Development Corporation Limited will ensure participation of all line departments like Local Self Governments, Tourism, Culture, Fisheries, HED for the effective and time bound implementation of the proposed project. Handholding support will be ensured from national institutes like IIT, Madras, NIOT, CPWRS etc.

The KSCADC will henceforth undertake the following roles:

- Overall management for improved and sustainable development, including monitoring and evaluation of activities, outcomes and impacts.
- Support the development and management of existing common infrastructure, with improved financial and operational performance.
- Planning and construction of the integrated project with active participation of user groups, LSGs and line departments.
- Arranging social, technical, management and capacity building support.
   In addition to overall programme planning and management, the KSCADC will be responsible for:
- setting up and guiding the functioning of the Project Management unit.
- consolidation of work plans
- consolidation of periodic progress report
- liaison with GOK and the funding agency
- financial management and audit
- human resource development, including hiring of specialists
- fund flow management and fund releases
- procurement of goods, works and services
- overseeing implementation of the environmental management framework
- monitoring, learning, impact evaluations and MI
- quality control of works and processes.

The unexpected technical issues during execution if any, will be addressed timely and solutions will be provided without any delay. For this a high-level technical committee will be constituted. The committee will have include representatives from Department of Fisheries, from KSCADC and an expert from the Model study agency or any other reputed national Institute, and also an expert nominated by the Contractor.

#### **6.2. CONTRACT MANAGEMENT STRATEGY**

The Public Works manual approved by the state government specifies the duties, responsibilities and delegated powers of officers in contract management. It also specifies fines for project delays and incentives for early completion. The implementing department / KSCADC has approved delegated powers for inviting tenders and contract management. The Chief Engineer KSCADC is the tendering and contract signing authority in the case of projects of this magnitude. Prequalification tenders in two-cover system are invited for works having a value greater than Rs. 5.0Cr. Selection of qualified bidders is made by a pre-qualification committee. Tenders will be accepted as per the prevailing guidelines for acceptance of tenders. As this particular nature of work is not covered under the CPWD specifications, the specifications and design proposed by the model study agency is taken for estimation. Any way alternate designs will also be accepted from the bidders to have a better cost optimization. These designs shall be verified and approved by a premier institution acceptable for the evaluation committee.

The general conditions of contract have to be modified to some extend as this is a work of special nature. The tender evaluation committee will be examined and approved the tender conditions.

Contract management pertaining to technical specifications are supervised and managed by engineers and overseers assigned to the project. Contractors' payments are controlled by the KSCADC office. Divisional accounts officer posted at the KSCADC HQ and Senior Finance Officer will audit the contractors' bills prior to making payments

The Operation and Management of the completed works and observation of defects during defect liability period will be supervised by the Assistant Engineer. Operation and Management of the completed works and observation of defects during defect liability period will be also supervised by the Assistant Engineer.

#### **6.3. IMPLEMENTATION SCHEDULE AND WBS**

A detailed WBS and program of work shall be formulated on real time basis on scheduling software during the technical sanction procedure to finalize the baseline schedule. At present it is estimated that a period of 24 months is required for the implementation of the work. Tentative schedule is given in Table

**Table 24- Implementation Schedule** 

SI Task No							15	t Ye	ar					2 <sup>nd</sup> Year												
NO		1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4	5	6	7	8	9	10	1	1 2	
1	Approval of Project by GOI																									
2	State Government Level Approval and issuance of Administrative Sanction																									
3	Issuance of Technical Sanction for the works																									
4	Obtaining of Mandatory documents																									
5	E-tender process																									
6	Evaluation and approval of tender					_	_	_																		
7	Issuance of Selection Notice/work order/execution agreement																									
8	Acquiring of proposed land for construction purpose																									
9	Commencement of deployment of groins, geotubes, construction of Fish landing centre																									

10	Progress of Civil and Electrical works						_		_	_	_	_		
11	Installation of Ancillary items													
12	Final completion													
13	Official handing over of the completed works for commissioning													
14	Functioning of Fish Landing Centres													

### **6.4. STATUTORY CLEARANCES & IMPACT ASSESSMENTS**

Fish landing facilities and Shore protection works, vital for empowering the marginalized fishermen community and safeguarding coastal areas, are recognized as permissible activities under the Coastal Regulation Zone (CRZ) guidelines. Despite this recognition, a crucial procedural step involves obtaining clearance from the state Coastal Zone Management Authority (CZMA). This necessary clearance from the CZMA becomes an immediate priority upon the receipt of Administrative Approval for the shore protection project.

To ensure expeditious progress and timely initiation of the project, a proactive approach will be adopted. The tendering process, a pivotal step in selecting contractors and finalizing project details, will be set into motion concurrently with the application for CRZ clearance. This parallel execution of the tendering process and the CRZ clearance procedure is strategically designed to eliminate unnecessary delays that might otherwise impede the implementation of the project.

By undertaking these processes concurrently, the aim is to streamline administrative procedures, optimize efficiency, and expedite the project timeline. This synchronized approach not only minimizes bottlenecks but also reflects a commitment to prompt and effective project execution, thereby contributing to the timely enhancement of coastal resilience and protection.

In essence, the concerted effort to secure CRZ clearance in tandem with the tendering process underscores a commitment to a seamless and efficient project implementation framework. This approach not only adheres to regulatory requirements but also exemplifies a strategic and proactive stance, ensuring that shore protection works are initiated without undue delay, ultimately contributing to the sustainable development and protection of coastal regions.

## 6.5. QUALITY MANAGEMENT PLAN

In the state, the implementation of all public works is meticulously governed by the Quality Manual, a document that has received official approval from the government. This comprehensive manual serves as the beacon for guiding the execution of diverse projects, delineating explicit quality control measures tailored to the specific requirements of each type of work. Furthermore, it allocates and fixes responsibility for ensuring the quality of project works across different levels within the organizational hierarchy.

Underpinning this commitment to quality is the establishment of a robust three-tier quality control system, a pivotal component of the overarching quality management plan. This strategic approach is geared towards upholding and safeguarding the integrity of public works through a multi-faceted quality assurance framework.

To operationalize this system, a Government-approved quality control laboratory will play a pivotal role in executing rigorous quality control measures. Additionally, collaboration with esteemed National Institutions, such as IIT Madras and NIOT, forms the bedrock of the second tier of quality control. These institutions will act as a regional quality control wing, meticulously overseeing and evaluating the quality of project execution to ensure compliance with established standards.

Adherence to the Public Works Department (PWD) circular for quality control is paramount in upholding the high standards set forth in the Quality Manual. The circular serves as a guiding document, and the responsibility for implementing the first tier of quality control is vested in the capable hands of

Assistant Engineers and Assistant Executive Engineers who operate at the project level.

Going beyond internal controls, the third tier of quality control involves an additional layer of scrutiny. Specifically, the quality of materials, such as geotubes and stones used in breakwater construction, will undergo verification at third-party laboratories. This verification process, undertaken at the expense of the contractors, ensures an unbiased and objective assessment of the materials' quality.

In summation, the state's commitment to quality in public works is not merely a procedural formality but a comprehensive and systematic approach. By integrating the guidelines outlined in the Quality Manual, collaborating with national institutions, and implementing multi-tiered quality control mechanisms, the state endeavors to deliver public projects that stand as benchmarks of excellence. The attached circular provides a detailed roadmap for stakeholders, reinforcing the commitment to uncompromising quality standards in public infrastructure development.

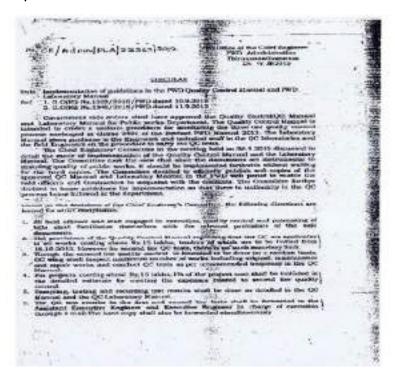


Image 14 State Quality Control circular

#### 6.6. OPERATION AND MAINTENANCE

The proposed fish landing facility and shore protection works are envisaged to be exceptionally durable, requiring minimal major maintenance for a substantial period spanning between 10 to 15 years. This longevity is a testament to the robust engineering and construction methodologies incorporated into the project, ensuring its resilience against the coastal elements.

A noteworthy facet of the project is the concurrent proposal for beach nourishment, a process integral to maintaining and enhancing the coastal environment. As part of this initiative, beach rebuilding activities will be undertaken in the designated area. Consequently, there will be a reduction in water depth, accompanied by a decrease in incident wave height. To counterbalance these changes, an off-shore breakwater will be strategically implemented. The installation of the off-shore breakwater serves a dual purpose: not only does it contribute to the protection of the shore, but it also fosters the creation of a sustainable beach. This carefully designed intervention is anticipated to preserve the natural dynamics of the coastal area, ensuring its integrity and stability for an extended period, projected to be not less than 15 years.

Recognizing the importance of environmental conservation, a green cover will be conscientiously maintained in the area surrounding the fish landing facility and shore protection works. This strategic inclusion of vegetation plays a vital role in stabilizing the beach ecosystem, contributing to its resilience and long-term sustainability.

While the project is anticipated to require minimal major maintenance, any minor periodic maintenance works that may arise will be the responsibility of the concerned Local Self Government. This decentralization of maintenance responsibilities ensures a swift and localized response to any emerging maintenance needs, fostering a proactive approach to preserving the functionality and structural integrity of both the fish landing facility and the shore protection structures.

The comprehensive approach to the proposed project not only emphasizes its durability and sustainability but also underscores a commitment to environmental preservation. The incorporation of beach nourishment, off-shore breakwater, and a green cover signifies a holistic strategy aimed at creating a resilient and lasting coastal infrastructure. The proactive involvement of the Local Self Government in maintenance activities further ensures the prolonged effectiveness of the fish landing facility and shore protection works.

#### 6.7. OUTPUTS & OUTCOMES

The "Modern Integrated Fish Landing Facilities in the Vypin Munambam Coastal Stretch" project, with its multifaceted approach, is expected to deliver a range of outputs and outcomes that will positively impact the local fishing community, the environment, and the regional economy.

#### **Outputs:**

- Construction of Fish Landing Center: The project will result in the establishment of a modern fish landing center equipped with safe and efficient infrastructure for fishermen to offload their catch.
- **Auction Hall**: An auction hall will be constructed, providing a centralized marketplace for the sale of fish, enhancing transparency and efficiency in the trading process.
- **Sea Wall Strengthening**: Strengthening the sea wall will provide coastal protection, reducing the risk of erosion and flooding and safeguarding the infrastructure from damage.
- **Toilet Blocks**: The project includes the construction of sanitation facilities, enhancing the working conditions and hygiene for the fishing community and visitors.
- **Drainage Improvements**: Drainage enhancements will prevent waterlogging and improve the overall cleanliness of the area.

• Shore Protection Activities: Shore protection measures, such as the deployment of groins and geotubes, will mitigate coastal erosion and enhance the resilience of the shoreline.

#### **Outcomes:**

- **Economic Empowerment**: The improved infrastructure, including the fish landing center and auction hall, is expected to increase the income of the local fishing community by providing better marketing opportunities and fair prices for their catch and major increase in the fishing mandays.
- **Environmental Sustainability**: The project's focus on shore protection and sustainable fishing practices contributes to the long-term preservation of the marine ecosystem in the Vypin Munambam coastal stretch, ensuring a healthier environment for future generations.
- Infrastructure Resilience: The strengthening of the sea wall and shore protection activities enhances the resilience of the coastal area, reducing the risks associated with erosion and flooding.
- Improved Quality of Life: The construction of sanitation facilities and drainage improvements enhances the overall quality of life for the local community. This includes better working conditions and a cleaner environment.
- **Economic Growth**: The modernized facilities are expected to stimulate economic activity in the region, generating income and job opportunities, supporting local businesses, and attracting tourism and trade.
- **Social Well-being:** The project has the potential to create a stronger sense of community, improved access to sanitation, and safer working conditions, contributing to the social well-being of the local population.

In summary, the project's outputs and outcomes are interlinked and collectively aim to enhance the economic prospects, environmental sustainability, infrastructure resilience, increased fishing man days and overall quality of life in the Vypin Munambam coastal stretch. It represents a holistic approach to

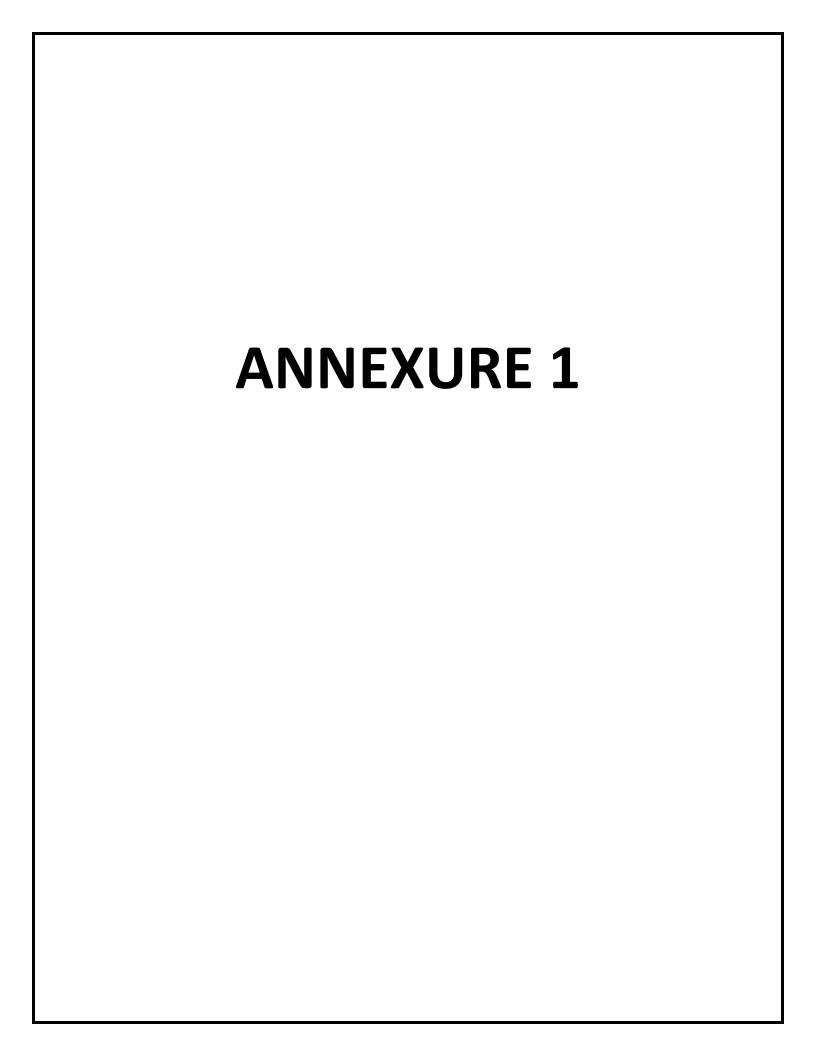
# Modern Integrated Fish Landing Facilities in the Vypin Munambam Coastal Stretch

2023

fostering positive change in the region, addressing the needs of the fishing community, the environment, and the broader community.

**MANAGING DIRECTOR** 

# **ANNEXURES**



PRICE EST NO:2023/19591

# Name of work : DEVELOPMENT OF VYPIN -MUNAMBAM COASTAL STRETCH INCLUDING COASTAL PROTECTION- CONSTRUCTION OF FISH LANDING CENTRE AT VALAPPU BEACH ESTIMATE REPORT

The estimate for the construction of Fish Landing Centre at Valappu is prepared based on the study conducted by IIT Madras in the shore protection works from Vtypin to Munambam stretch in the Coastal Area of Ernakulam District. The stretch extends for 1.5 km and is observed to have a beach width of about 25m and it is located immediately north of the IOCL facilities. The beach slope is found to be very steep and it is understood that the beach width oscillates depending on the wave climate/seasons. Based on the satellite imagery studies conducted, this site has been observed to undergo moderate erosion rates. The cross-shore sediment transport is found to be significant during south-west monsoon season. In the estimate, a combination of 6 submerged geotubes of 3m dia of 820m length at a distance of 1600m from the shore line is proposed. This offshore submerged geo-tube is proposed to be erected at -5m water depth. It is laid over a filter layer of 1kg to 10kg stone and covered using geotextile mattress. Provision for Auction hall building of size 28.3m x 6.4m is included in the estimate. For the auction hall, coconut piling of length 6m long is provided for foundation. RCC M20 provided for foundations, centering & shuttering, Reinforcement cement concrete work (M20) in walls is provided for super structure. Necessary Steel reinforcement, plastering and painting works are also included in the Auction hall. Provision for construction of a toilet block of size 12.5m x 5.1m is also included in the estimate. For the toilet block, RR masonry with cement mortar 1:6 is provided for the foundation. Solid block masonry of size 30x20x15cm and 40x20x10 cm are provided for super structure. Ceramic tiling is provided in the floor and in the bathroom region. Necessary fittings are also provided for toilet block. Other provisions in the estimate include concrete parking area proposed near the the Auction hall. Provision for the construction of drain is also included inthe estimate. Lump sum provisions for sea wall strengthening, sub soil investigation, water supply and sanitary arrangement, Electrification and yard lighting are also included in the estimate. Lump sum provision for unforeseen expenses @2.5% are also included in the estimate. Total amount of estimate comes to Rupees 23,60,00000/-(Rupees Twenty Three crore Sixty lakh only) including 18% GST charges but excluding consultancy charges. The estimate is prepared in PRICE based on DSR 2018 and cost index is 35.59%. The provisions adopted in the estimate are adequate for proper completion of work.

# DEVELOPMENT OF VYPIN -MUNAMBAM COASTAL STRETCH INCLUDING COASTAL PROTECTION- CONSTRUCTION OF FISH LANDING CENTRE AT VALAPPU BEACH

### **COST ABSTRACT**

1	APPENDIX - A Supplying geosynthetic tubes	Rs.	15 48 97 319/-
2	APPENDIX B CONSTRUCTION OF AUCTION HALL	Rs.	31 90 663/-
3	Appendix C- construction of Toilet block	Rs.	24 10 666/-
4	Appendix D- construction of Parking Area	Rs.	78 60 744/-
5	Appendix E - Construction of Drain	Rs.	11 44 187/-
6	Seawall Strengthening	Rs.	2 00 00 000/-
7	Sub soil investigation	Rs.	15 00 000/-
8	Water supply and sanitary arrangement	Rs.	25 00 000/-
9	Electrification and yard lighting	Rs.	15 50 000/-
10	Unforeseen expenses @ 2.5%	Rs.	49 00 000/-
11	Sub Total	Rs.	19 99 53 579/-
12	GST @ 18%	Rs.	3 59 91 644/-
13	Total Amount including GST 18%	Rs.	23 59 45 223/-
14	Lumpsum for Round off	Rs.	54 777/-
<i>15</i>	Total Amount	Rs.	23 60 00 000/-
<i>16</i>	Consultancy @5%	Rs.	1 18 00 000/-
<i>17</i>	GST on consultancy @ 18%	Rs.	21 24 000/-
18	Round off	Rs.	76 000/-
19	Grand Total	Rs.	25 00 00 000/-

Rupees Twenty Five Crore Only

## DEVELOPMENT OF VYPIN -MUNAMBAM COASTAL STRETCH INCLUDING COASTAL PROTECTION- CONSTRUCTION OF FISH LANDING CENTRE AT VALAPPU BEACH

General Abstract

(Dsor year: 2018, Cost Index Applied for this estimate is 35.59%)

SI No	Heading Description	Amount
1	APPENDIX - A Supplying geosynthetic tubes	154897318.97
2	APPENDIX B CONSTRUCTION OF AUCTION HALL	3190663.46
3	Appendix C- construction of Toilet block	2410665.96
4	Appendix D- construction of Parking Area	7860743.54
5	Appendix E - Construction of Drain	1144187.11
6	Seawall Strengthening	20000000.00
7	Sub soil investigation	1500000.00
8	Water supply and sanitary arrangement	2500000.00
9	Electrification and yard lighting	1550000.00
10	Unforeseen expenses @ 2.5%	4900000.00
	Provision for GST payments (in %) @	18.0%
	Amount reserved for GST payments	35991644.23
	Total	235945223.23
	Lumpsum for round off	54776.77
	Other Engineering Organis	sations TOTAL Rs 236000000.00
	DDIC	Rounded Total Rs 23,60,00,000
	Ru	pees Twenty Three Crore Sixty Lakh Only

(Cost Index Applied for this estimate is 35.59%)

## DEVELOPMENT OF VYPIN -MUNAMBAM COASTAL STRETCH INCLUDING COASTAL PROTECTION- CONSTRUCTION OF FISH LANDING CENTRE AT VALAPPU BEACH

**Detailed Estimate** 

(Dsor year: 2018, Cost Index Applied for this estimate is 35.59%)

SI No	Description	No	L	В	D	CF	Quantity	Remark
	1	APPENDI)	C - A Supply	ing geosyr	nthetic tube	es		
1	od207804/2023_2024 Supplying and laying necessary overlaps, a departmental officers	all cost, co	_			•		•
	Geotextile Mattress	2	82.000	25.000			4100.000	
			1190		Tota	al Quantity	4100.000	sqm
		1	CZA	То	tal Deducte	d Quantity	0.000 sqm	l
		613	X 2	51 X	Net Tota	al Quantity	4100.000	sqm
		180	Say	4100.000 so	qm @ Rs 83	3.20 / sqm	Rs 341	120.00
	charges required at qua sorting are taken on we having printouts using of of the breakwater include sqm size) or any suitabe 20T and placing the state breakwater as per the a hire and operational characteristics.	eigh bridge contractors ding convey le methods cones at se approved di arges of T	installed at supplied pay ance from sinstalled at a bed in unrawing and & P, tippler,	site at the pers, station sorting platforing site on a modiform layer design and a crane and a	cost of the eries and coorm and during crane of design transpecting the first control of the con	contractor vonveyed to some pring stone having a can hickness for the profile of the contractor.	with approve the approved as using tipp apaciaty of no r forming fil- nce in a wee	ed softward d alignmen er (3.5x2.s ot less that ter layer o
	Filter layer below Geotube(30cm)	2/3	820.000	21.600	0.300	2.65	9387.360	
					Tota	al Quantity	9387.360	tonne
				То	tal Deducte	d Quantity	0.000 tonr	ie
					Net Tota	al Quantity	9387.360	tonne
			Say 9387	.360 tonne (	@ Rs 1640.	26 / tonne	Rs 1539	7711.11
3	od207877/2023_2024 Supplying geosynthetic woven geosynthetic fab					•		

size 0.25mm, transporting of tubes to filling location, positioning of geotubes with concrete anchor blocks, hydraulic filling of geosynthetic tubes using sea sand with the help of sand pump or any other mechanical means as necessary to achieve designed finished height, closing the port mouth suitably as per the standard practice, conveying and placing in the specified location, inspecting the profile with the help of divers including all cost, stitching charges and labour charges, hire and operational charges of machinery etc including all incidental charges etc complete as per the direction of departmental officers at site GeoTextile tubes 6 41.000 246.000 (820m) **Total Quantity** 246.000 each **Total Deducted Quantity** 0.000 each **Net Total Quantity** 246.000 each Rs 139158487.86 Say 246.000 each @ Rs 565684.91 / each SI No Quantity Description No В Remark **2 APPENDIX B CONSTRUCTION OF AUCTION HALL** 1 2.8.1 Earth work in excavation by mechanical means (Hydraulic excavator) /manual means in foundation trenches or drains (not exceeding 1.5 m in width or 10 sqm on plan), including dressing of sides and ramming of bottoms, lift up to 1.5 m, including getting out the excavated soil and disposal of surplus excavated soil as directed, within a lead of 50 m.All kinds of soil column footing 16 -2.1002.100 1.900 134.064 below out side plinth 13.986 2\*7 3.700 0.450 0.600 beam 2 5.800 0.450 0.600 3.132 cross beam 1 rounded 3.818 3.818 **Total Quantity** 155.000 cum **Total Deducted Quantity** 0.000 cum 155.000 cum **Net Total Quantity** Say 155.000 cum @ Rs 296.94 / cum Rs 46025.70 2 od207799/2023\_2024 Supplying and stacking good quality coconut piles For pile 16 x5 Nos 80 6.000 480.000 =80 Nos **Total Quantity** 480.000 metre **Total Deducted Quantity** 0.000 metre 480.000 metre **Net Total Quantity** Say 480.000 metre @ Rs 107.64 / metre Rs 51667.20

2.18.1 Close timbering over a complete ( Measureme column excavation side		ding struttin	6.000 metre	Net Tot Rs 154.	al Quantity 21 / metre	16.000 mo	etre 467.36 quired
Close timbering over a complete ( Measureme		ding struttin	6.000 metre	Net Tot Rs 154.	al Quantity 21 / metre	16.000 mo	etre 467.36 quired
		Say 1	VSV.	Net Tot	al Quantity	16.000 m	etre
	101		Tem	3-217	STess		
			T	otal Deducte	od Ouantity	0.000 met	ŀr△
		TAG		7		16.000 m	
excess length of pile	16	1.000				16.000	
Cutting and removing the		ength of wo	ooden piles	to lines and	levels and r	removing the	e cut e
		Say 48	0.000 metre	e @ Rs 216.	92 / metre	Rs 104	4121.6
				Net Tot	al Quantity	480.000 n	netre
			To	otal Deducte	ed Quantity	0.000 met	tre
				Tot	al Quantity	480.000 n	netre
For coconut pile	80	6.000				480.000	
	For coconut pile  od207802/2023_2024  Cutting and removing the piles and stacking within	od207802/2023_2024 Cutting and removing the excess I piles and stacking within 150m	For coconut pile 80 6.000  Say 48  od207802/2023_2024  Cutting and removing the excess length of wo piles and stacking within 150m	For coconut pile 80 6.000  To  Say 480.000 metre  od207802/2023_2024  Cutting and removing the excess length of wooden piles piles and stacking within 150m	For coconut pile 80 6.000  Total Deducte  Net Tot  Say 480.000 metre @ Rs 216.  od207802/2023_2024  Cutting and removing the excess length of wooden piles to lines and piles and stacking within 150m  excess length of pile 16 1.000	For coconut pile 80 6.000  Total Quantity  Total Deducted Quantity  Net Total Quantity  Say 480.000 metre @ Rs 216.92 / metre  od207802/2023_2024  Cutting and removing the excess length of wooden piles to lines and levels and piles and stacking within 150m	For coconut pile 80 6.000 Total Quantity 480.000 no Total Quantity 480.000 no Total Quantity 0.000 med Net Total Quantity 480.000 no Say 480.000 metre @ Rs 216.92 / metre Rs 100 0d207802/2023_2024 Cutting and removing the excess length of wooden piles to lines and levels and removing the piles and stacking within 150m excess length of pile 16 1.000 16.000

					Tota	al Quantity	18.000 cun	n
				To	otal Deducte	d Quantity	0.000 cum	
					Net Tota	al Quantity	18.000 cun	n
			Say	18.000 cum	n @ Rs 1679	9.73 / cum	Rs 302	235.14
7	50.2.3.1 Pumping or Bailing out v		J	lush etc by ι	using pump	set includin	g cost of labo	our, oil hi
	For earth work 16 column	2	8.000				16.000	
	For coconut pilling	1	8.000				8.000	
	cc for footing &	1	8.000	a A			8.000	
	reinforcement work,shuttering@ concrete for footing	4	8.000		T		32.000	
		180			Tota	al Quantity	64.000 hou	ır
		alu	LKG	To	otal Deducte	d Quantity	0.000 hour	
		RA SE			Net Tota	al Quantity	64.000 hou	ır
				y 64.000 hou			Rs 182	14.40
8	4.1.8 Providing and laying in pshuttering - All work upnominal size)	osition c		rete of spec	ified grade e	excluding th		-
	column C1 to C16	16	1.700	1.700	0.200		9.248	
	below plinth beam	2*7	3.700	0.450	0.100		2.331	
	cross beam	8	5.600	0.450	0.100		2.016	
	AH floor	7	5.700	3.700	0.150		22.145	
	rounded	1	0.260				0.260	
					Tota	al Quantity	36.000 cun	n
				To	otal Deducte	d Quantity	0.000 cum	
					Net Tota	al Quantity	36.000 cun	n
			Say	36.000 cum	n @ Rs 6814	1.89 / cum	Rs 245	336.04
9	5.1.2 Providing and laying in centering, shuttering, fini sand :3 graded stone ag	shing and	d reinforcem	ent - All worl			•	

	column footing C1 to C16	16	1.500	1.500	0.300		10.800	
		16	((1.5*1.5)+ (.4*.3))/2		0.300		5.688	
	column up to plinth	16	0.300	0.400	1.000		1.920	
	rounded	1	0.592				0.592	
					Tota	al Quantity	19.000 cu	m
				To	otal Deducte	d Quantity	0.000 cum	1
					Net Tota	al Quantity	19.000 cu	m
			Say	19.000 cum	n @ Rs 9085	5.14 / cum	Rs 172	2617.66
	and string courses, fille excluding cost of center 3 graded stone aggregations	ring, shutte ate 20 mm	ring, finishing nominal size	g and reinfo )	orcement :1:		ment : 1.5 co	
	plinth beam	2	28.300	0.300	0.300	la constant	5.094	
	-do- cross	8	5.800	0.300	0.400		5.569	
	column up to beam C1 to C16	16	0.400	0.300	4.000		7.680	
	roof beam long	the2 Er	g 28.300 i	ngo.300 g	an <b>o.350</b> 10	ns	5.943	
	inglind beam	2*8	3.200	0.300	0.350	7	5.376	
	roof slab	2	29.500	4.5500	0.120		32.214	
	rounded	1	0.124				0.124	
					Tota	al Quantity	62.000 cu	m
				To	otal Deducte	d Quantity	0.000 cum	l
					Net Tota	al Quantity	62.000 cu	m
			Say 62	2.000 cum	@ Rs 10954	1.04 / cum	Rs 679	150.48
11	5.9.1 Centering and shutterin columns, etc for mass of	-	strutting, etc	c. and remo	oval of form	for:Foundat	ions, footing	s, bases
	Column base	16*4	1.500	0.300			28.800	
	Column up to plinth	16*2	0.400		1.100		14.081	
		16*2	0.300		1.100		10.560	
	rounded	1	0.559				0.559	
					Tate	al Quantity	54.000 sq	

				10		d Quantity	0.000 sqn	1
					Net Tota	l Quantity	54.000 sq	m
			Say	y 54.000 sqı	m @ Rs 335	.31 / sqm	Rs 18	106.74
12	5.9.3 Centering and shutte landings, balconies a	_	-	, etc. and r	emoval of f	orm for:Su	ispended flo	oors, ro
	roof slab bottom	2*7	3.700	3.200			165.761	
	side projection	2*2	4.500	0.600			10.800	
	slab projection	2	29.500	1.000			59.000	
	slab projection side	2	29.500	0.120			7.080	
	end side	2*2	4.500	0.120			2.160	
	rounded	1	5.199				5.199	
		1	334		Tota	l Quantity	250.000 s	qm
		11	TAG	To	otal Deducted	d Quantity	0.000 sqn	า
		1 1500	Dis		Net Tota	I Quantity	250.000 s	qm
13	5.9.5 Centering and shutter girders bressumers ar		g strutting, e	etc. and rem	m @ Rs 815	n for:Lintels		
13			g strutting, e	etc. and rem	noval of form	n for:Lintels		
13	Centering and shuttering girders bressumers ar	d cantileve	g strutting, e	etc. and rem	noval of form	n for:Lintels	s, beams, pl	
13	Centering and shutter girders bressumers ar plinth beam out side	d cantileve	g strutting, e	etc. and rem	noval of form	n for:Lintels	s, beams, pl	
13	Centering and shutter girders bressumers ar plinth beam out side plinth beam in side	d cantileve 2 2*7	g strutting, e	0.300 0.300	noval of form	n for:Lintels	16.980 15.541	
13	Centering and shutter girders bressumers ar plinth beam out side plinth beam in side cross beam	2 2*7 8*2	g strutting, e 28.300 3.700 5.800	0.300 0.300 0.400	noval of form	n for:Lintels	16.980 15.541 37.120	
13	Centering and shutter girders bressumers are plinth beam out side plinth beam in side cross beam roof beam out side	2 2*7 8*2 2	g strutting, e 28.300 3.700 5.800 28.300	0.300 0.300 0.400 0.300	noval of form	n for:Lintels	16.980 15.541 37.120 16.980	
13	Centering and shutter girders bressumers ar plinth beam out side plinth beam in side cross beam roof beam out side roof beam in side	2 2*7 8*2 2 2*7	g strutting, e 28.300 3.700 5.800 28.300 3.700	0.300 0.300 0.400 0.400	noval of form	n for:Lintels	16.980 15.541 37.120 16.980 20.721	
13	Centering and shutter girders bressumers are plinth beam out side plinth beam in side cross beam roof beam out side roof beam in side roof beam bottom	2 2*7 8*2 2 2*7 2*7	g strutting, e 28.300 3.700 5.800 28.300 3.700 3.700	0.300 0.300 0.400 0.400 0.300	noval of form	n for:Lintels	16.980 15.541 37.120 16.980 20.721 15.541	inth bea
13	Centering and shutter girders bressumers are plinth beam out side plinth beam in side cross beam roof beam out side roof beam in side roof beam bottom inglind beam side	2 2*7 8*2 2 2*7 2*7 2*8*2	g strutting, e 28.300 3.700 5.800 28.300 3.700 3.700 3.200	0.300 0.300 0.400 0.300 0.400 0.300 0.350	noval of form	n for:Lintels	16.980 15.541 37.120 16.980 20.721 15.541 35.840	
13	Centering and shutter girders bressumers are plinth beam out side plinth beam in side cross beam roof beam out side roof beam in side roof beam bottom inglind beam side inglind beam bottom	2 2*7 8*2 2 2*7 2*8*2 2*8	g strutting, e 28.300 3.700 5.800 28.300 3.700 3.700 3.200	0.300 0.300 0.400 0.300 0.400 0.300 0.350	noval of formanisatio	n for:Lintels	16.980 15.541 37.120 16.980 20.721 15.541 35.840 15.360	inth bea
13	Centering and shutter girders bressumers are plinth beam out side plinth beam in side cross beam roof beam out side roof beam in side roof beam bottom inglind beam side inglind beam bottom	2 2*7 8*2 2 2*7 2*8*2 2*8	g strutting, e 28.300 3.700 5.800 28.300 3.700 3.700 3.200	0.300 0.300 0.400 0.300 0.400 0.300 0.350 0.300	noval of formanisatio	n for:Lintels	16.980 15.541 37.120 16.980 20.721 15.541 35.840 15.360 0.917	qm
13	Centering and shutter girders bressumers are plinth beam out side plinth beam in side cross beam roof beam out side roof beam in side roof beam bottom inglind beam side inglind beam bottom	2 2*7 8*2 2 2*7 2*8*2 2*8	g strutting, e 28.300 3.700 5.800 28.300 3.700 3.700 3.200	0.300 0.300 0.400 0.300 0.400 0.300 0.350 0.300	Total Deducted	n for:Lintels	16.980 15.541 37.120 16.980 20.721 15.541 35.840 15.360 0.917	qm

		_						
	column C1 to C16	16*2	0.400	4.000			51.200	
		16*2	0.300	4.000			38.400	
	rounded	1	0.400				0.400	
					Tota	l Quantity	90.000 sq	m
				To	tal Deducte	d Quantity	0.000 sqm	ı
					Net Tota	l Quantity	90.000 sq	m
			Say	y 90.000 sqı	n @ Rs 863	.64 / sqm	Rs 77	727.60
15	5.22.6 Steel reinforcement fo binding all complete u				•	•		
	For column footing	1	16.580	8		100.0	1658.000	@100kg m3
	column up to plinth	1	1.800			120.0	216.000	@120kg m3
	rounded	1	6.000		18		6.000	@120kg m3
				Ye X	Tota	l Quantity	1880.000	kilogram
				To	tal Deducte	d Quantity	0.000 kilog	gram
		41a a a Eu		0.00	Net Tota	l Quantity	1880.000	kilogram
		ther Er	Say 1880.00		2 Rs 98.30		Rs 184	1804.00
16	5.22A.6 Steel reinforcement fo binding all complete at					<b>.</b>		
	qty vide item No 10 @ 100kg/m3	1	61.876			100.0	6187.600	@100 kç /m3
	rounded	1	12.400				12.400	@100 kg
								/m3
					Tota	al Quantity	6200.000	
				To	Tota		6200.000 0.000 kg	
				Тс	tal Deducte			kg
					tal Deducted	d Quantity	0.000 kg 6200.000	kg kg
17	7.1.1 Random rubble masor concrete 1:6:12 (1 cem level with:Cement mort	ent : 6 coa	rd stone in	Say 6200.00 foundation graded sto	Net Tota O kg @ Rs s	d Quantity al Quantity 98.30 / kg	0.000 kg 6200.000 Rs 609	kg <b>9460.00</b> with ceme

	below cross beam	2	5.800	0.450	0.600		3.132	
	rounded	1	0.882				0.882	
					Tota	al Quantity	18.000 cu	m
				To	otal Deducte	d Quantity	0.000 cum	า
					Net Tota	al Quantity	18.000 cu	m
			Say	18.000 cum	n @ Rs 7204	1.78 / cum	Rs 129	9686.04
18	2.25 Filling available excavat exceeding 20 cm in dep and lift up to 1.5 m.	•	_	•	•			•
	in betwen plinth beams	7	5.700	3.700	0.300		44.290	
	Back filling footing trenches	16	3.000				48.000	
	rounded	1	2.710	21/1	1		2.710	
					Tota	al Quantity	95.000 cu	m
			100	To	otal Deducte	d Quantity	0.000 cum	1
					Net Tota	al Quantity	95.000 cu	m
		hor Er			m @ Rs 258		Rs 24	564.15
19	13.7.1 12 mm cement plaster fi	nished with	h a floating o		cement of m		ement : 3 fin	e sand)
19		nished with			<b>4</b> T		ement : 3 find 268.450	e sand)
19	12 mm cement plaster fi For the roof slabs.		h a floating o	oat of neat	<b>4</b> T			e sand)
19	12 mm cement plaster fi For the roof slabs. Top	2	29.500	4.5500	<b>4</b> T		268.450	e sand)
19	12 mm cement plaster fi For the roof slabs. Top side	2 2	29.500	4.5500 0.130	<b>4</b> T		268.450 7.670	e sand)
19	12 mm cement plaster fi For the roof slabs. Top side end side	2 2 2	29.500 29.500 9.050	4.5500 0.130	cement of m		268.450 7.670 2.353	
19	12 mm cement plaster fi For the roof slabs. Top side end side	2 2 2	29.500 29.500 9.050	4.5500 0.130 0.130	cement of m	nix:1:3 ( 1 ce	268.450 7.670 2.353 1.527	qm
19	12 mm cement plaster fi For the roof slabs. Top side end side	2 2 2	29.500 29.500 9.050	4.5500 0.130 0.130	Total Deducte	nix:1:3 ( 1 ce	268.450 7.670 2.353 1.527 280.000 s	qm
19	12 mm cement plaster fi For the roof slabs. Top side end side	2 2 2	29.500 29.500 9.050 1.527	4.5500 0.130 0.130	Total Deducte	al Quantity d Quantity al Quantity	268.450 7.670 2.353 1.527 280.000 sqn 280.000 s	qm
20	12 mm cement plaster fi For the roof slabs. Top side end side	2 2 1	29.500 29.500 9.050 1.527	4.5500 0.130 0.130	Total Deducte	al Quantity d Quantity al Quantity	268.450 7.670 2.353 1.527 280.000 sqn 280.000 s	qm n qm
	12 mm cement plaster fi For the roof slabs. Top side end side rounded	2 2 1	29.500 29.500 9.050 1.527	4.5500 0.130 0.130	Total Deducte	al Quantity d Quantity al Quantity	268.450 7.670 2.353 1.527 280.000 sqn 280.000 s	qm n qm
	12 mm cement plaster fi For the roof slabs. Top side end side rounded  13.16.1 6 mm cement plaster of	2 2 2 1 mix:1:3 (1	29.500 29.500 9.050 1.527 Say	4.5500 0.130 0.130 To 280.000 squ	Total Deducte	al Quantity d Quantity al Quantity	268.450 7.670 2.353 1.527 280.000 s 0.000 sqn 280.000 s Rs 112	qm n qm

	long beam out side	2	28.300	0.300			16.980	
	bottom	2*7	3.700	0.300			15.541	
	slab bottom	2*7	3.700	3.200			165.761	
	roof projection end	2*2	4.500	0.600			10.800	
	out side beam projection side	2	29.500	1.050			61.950	
	column	16	4.000	1.400			89.600	
		1	4.047	1.000			4.047	
					Tota	al Quantity	435.000 s	qm
			1.000	To	otal Deducte	d Quantity	0.000 sqm	1
			160	100	Net Tota	al Quantity	435.000 s	qm
			Say	435.000 sq	m @ Rs 267	.59 / sqm	Rs 116	6401.65
21	13.4.1 12 mm cement plaster of	of mix:1:4 (	1 cement : 4	1 coarse sar	nd)			
	Auction hall floor	1	28.300	6.400	1.3	4	181.120	
	Rounded	1	3.880	Carry.		Age of	3.880	
		100			Tota	al Quantity	185.000 s	qm
		.1 1	77700	To	otal Deducte	d Quantity	0.000 sqm	1
	0	ther Er	ngineeri	ng Org	anisatio Net Tota	<b>NS</b> al Quantity	185.000 s	qm
			Say	185.000 sq	m @ Rs 325	.01 / sqm	Rs 60	126.85
22	13.43.1							
	Applying one coat of surface:Water thinnab			nt primer o	of approved	brand and	d manufactu	ire on v
	roof beam side & bottom	8	6.200	1.000			49.600	
	long beam out side	2	28.300	0.400			22.640	
	inside	2*7	3.700	0.400			20.721	
	bottom	2*7	3.700	0.300			15.541	
	slab bottom	2*7	3.700	3.200			165.761	
	roff projection end	2*2	4.500	0.600			10.800	
	roff projection side	2	29.500	1.050			61.950	
	column	16	4.000	1.400			89.600	
	side end	2	9.050	0.130			2.353	

	top of roof slab	2	29.500	4.550			268.450	
	rounded	1	4.914				4.914	
					Tota	al Quantity	720.000 s	qm
				To	otal Deducte	d Quantity	0.000 sqm	1
					Net Tota	al Quantity	720.000 s	qm
			Say	/ 720.000 s	qm @ Rs 70	).64 / sqm	Rs 50	860.80
23	13.44.1 Finishing walls with wa @ 3.84 kg/10 sqm)	ater proofing	g cement pair	nt of require	d shade:Ne	w work (Tw	o or more co	oats app
	slab bottom	2*7	3.700	3.200			165.761	
	roof projection end	2*2	4.500	0.600			10.800	
	roof projection side	2	29.500	1.050			61.950	
		1	1.489				1.489	
		11	TOUR	51/1	Tota	al Quantity	240.000 s	qm
		12		To	otal Deducte	d Quantity	0.000 sqm	า
					Net Tota	al Quantity	240.000 s	qm
	40.40.4	1.25	Say	240.000 sq	m @ Rs 107	7.39 / sqm	Rs 25	773.60
24	13.46.1 Finishing walls with Ac @ 1.67 ltr/10 sqm ove	-	th exterior pa	int of requir	ed shade:Ne	ew work (Tv	vo or more o	coat app
24	Finishing walls with Ad	-	th exterior pa	int of requir	ed shade:Ne	ew work (Tv	vo or more o	coat app
24	Finishing walls with Ac @ 1.67 ltr/10 sqm ove	r and includ	th exterior pa	int of requirect of external	ed shade:Ne	ew work (Tv	vo or more o 20 kg/10 squ	coat app
24	Finishing walls with Ac @ 1.67 ltr/10 sqm ove roof beam allround	r and includ	th exterior pa ling priming c 6.200	int of requir coat of exter 1.000	ed shade:Ne	ew work (Tv	vo or more o 20 kg/10 sqi 49.600	coat app
24	Finishing walls with Ac @ 1.67 ltr/10 sqm ove roof beam allround long beam out side	r and include 8	th exterior pa ling priming c 6.200 28.300	int of requirement of exterior 1.000	ed shade:Ne	ew work (Tv	vo or more o 20 kg/10 sqi 49.600 16.980	coat app
24	Finishing walls with Ac @ 1.67 ltr/10 sqm ove roof beam allround long beam out side long beam in side	8 2 2*7	th exterior pa ling priming c 6.200 28.300 3.700	int of requirement of exterior of exterior 1.000 0.300 0.400	ed shade:Ne	ew work (Tv	vo or more of 20 kg/10 square 49.600 16.980 20.721	oat app
24	Finishing walls with Ac @ 1.67 ltr/10 sqm ove roof beam allround long beam out side long beam in side bottom	8 2 2*7 2*7	th exterior pa ling priming c 6.200 28.300 3.700	int of requirement of exterior 1.000 0.300 0.400 0.300	ed shade:Ne	ew work (Tv	vo or more of 20 kg/10 square 49.600 16.980 20.721 15.541	coat app
24	Finishing walls with Ac @ 1.67 ltr/10 sqm ove roof beam allround long beam out side long beam in side bottom column C1 to C16	2 2*7 2*7 16	th exterior pa ling priming c 6.200 28.300 3.700 4.000	int of requirement of exterior 1.000 0.300 0.400 0.300 1.400	ed shade:Ne	ew work (Tv	vo or more of 20 kg/10 square 49.600 16.980 20.721 15.541 89.600	coat app
24	Finishing walls with Ac @ 1.67 ltr/10 sqm ove roof beam allround long beam out side long beam in side bottom column C1 to C16 top of roof slab	2 2*7 2*7 16 2	th exterior pa ling priming c 6.200 28.300 3.700 4.000 29.500	int of requirement of exterior 1.000 0.300 0.400 0.300 1.400 4.550	ed shade:Ne	ew work (Tv	vo or more of 20 kg/10 square 49.600 16.980 20.721 15.541 89.600 268.450	oat app
24	Finishing walls with Ac @ 1.67 ltr/10 sqm ove roof beam allround long beam out side long beam in side bottom column C1 to C16 top of roof slab side	2 2*7 2*7 16 2	th exterior pa ling priming c 6.200 28.300 3.700 4.000 29.500	int of requirement of exters 1.000 0.300 0.400 0.300 1.400 4.550 0.130	ed shade:Ne	ew work (Tv	vo or more of 20 kg/10 square 49.600 16.980 20.721 15.541 89.600 268.450 7.670	oat app
24	Finishing walls with Ac @ 1.67 ltr/10 sqm ove roof beam allround long beam out side long beam in side bottom column C1 to C16 top of roof slab side	2 2*7 16 2 2 2	th exterior pa ling priming c 6.200 28.300 3.700 4.000 29.500 29.500 9.050	int of requirement of exters 1.000 0.300 0.400 0.300 1.400 4.550 0.130	ed shade!Ne	ew work (Tv	vo or more of 20 kg/10 square 49.600 16.980 20.721 15.541 89.600 268.450 7.670 2.353	coat app
24	Finishing walls with Ac @ 1.67 ltr/10 sqm ove roof beam allround long beam out side long beam in side bottom column C1 to C16 top of roof slab side	2 2*7 16 2 2 2	th exterior pa ling priming c 6.200 28.300 3.700 4.000 29.500 29.500 9.050	int of requirement of exters 1.000 0.300 0.400 0.300 1.400 4.550 0.130 0.130	ed shade!Ne	ew work (Tvpplied @ 2.	vo or more of 20 kg/10 square 49.600 16.980 20.721 15.541 89.600 268.450 7.670 2.353 4.085	coat app
24	Finishing walls with Ac @ 1.67 ltr/10 sqm ove roof beam allround long beam out side long beam in side bottom column C1 to C16 top of roof slab side	2 2*7 16 2 2 2	th exterior pa ling priming c 6.200 28.300 3.700 4.000 29.500 29.500 9.050	int of requirement of exters 1.000 0.300 0.400 0.300 1.400 4.550 0.130 0.130	ed shade:Ne for primer a	ew work (Tvpplied @ 2.	vo or more of 20 kg/10 square 49.600 16.980 20.721 15.541 89.600 268.450 7.670 2.353 4.085 475.000 s	coat app
24	Finishing walls with Ac @ 1.67 ltr/10 sqm ove roof beam allround long beam out side long beam in side bottom column C1 to C16 top of roof slab side	2 2*7 16 2 2 2	th exterior pa ling priming c 6.200 28.300 3.700 4.000 29.500 29.500 9.050 4.085	int of requirement of exters 1.000 0.300 0.400 0.300 1.400 4.550 0.130 0.130	ed shade:Ne for primer a	ew work (Tv pplied @ 2.	vo or more of 20 kg/10 square 49.600 16.980 20.721 15.541 89.600 268.450 7.670 2.353 4.085 475.000 square 475.000 s	coat app

1	2.8.1							
	Earth work in excavati	-		, ,		•		
	trenches or drains (not		•			, .		
	ramming of bottoms, lifexcavated soil as direct	-				vated soil a	and disposa	I OT SU
	toilet block foundation	rea, man						
	all round	1	35.500	0.800	0.750		21.300	
	crosswall long	2	11.500	0.800	0.750		13.800	
	cross	1	6.050	0.800	0.750		3.630	
		1	3.150	0.800	0.750		1.891	
	bath room	1	4.800	0.800	0.750		2.880	
	ramp	2	4.500	0.800	0.750		5.400	
	step	1	3.500	1.200	0.600		2.520	
		1	3.000	0.800	0.750		1.801	
	setitank	1	6.700	2.400	2.000		32.160	
	sock pit	1	1.800	1.800	1.500	Land Control	4.860	
		1	4.758		00		4.758	
		41. a.v. T.				al Quantity	95.000 cu	ım
		mer E	ngmeeri		annsauc otal Deducte		0.000 cun	n
			D		Net Tota	al Quantity	95.000 cu	ım
			Say	y 95.000 cu	m @ Rs 296	6.94 / cum	Rs 28	3209.30
2	2.26.1 Extra for every additionaterials.All kinds of		5 m or part	there of in	excavation	/ banking	excavated	or sta
	tank	1	6.700	2.400	0.500		8.040	
	rounded	1	1.960				1.960	
					Tota	al Quantity	10.000 cu	ım
				To	otal Deducte	d Quantity	0.000 cun	n
					Net Tota	al Quantity	10.000 cu	ım
			Say	y 10.000 cu	m @ Rs 106	6.37 / cum	Rs 1	063.70
3	4.1.8							
3								

	toilet block foundation all round	1	35.500	0.800	0.150		4.260	
	crosswall long	2	11.500	0.800	0.150		2.761	
	cross	1	6.050	0.800	0.150		0.726	
		1	3.150	0.800	0.150		0.378	
	bath room	1	4.800	0.800	0.150		0.576	
	ramp	2	4.500	0.800	0.150		1.080	
	step	1	3.500	1.200	0.150		0.630	
		1	3.000	0.800	0.150		0.361	
	setitank	1	6.700	2.400	0.200		3.216	
	floor room	1	12.150	4.800	0.100		5.833	
	ramp& varandha	1	13.500	1.200	0.100		1.620	
	rounded	1	0.559		4 1		0.559	
		12		31/4	Total C	Quantity	22.000 cu	m
		16	DAY	To	otal Deducted C	Quantity	0.000 cum	า
					Net Total C	Quantity	22.000 cu	m
4	7.1.1	ther Er	ngineeri	no Oro	@ Rs 6814.89	9 / cum	Rs 149	9927.58
4	7.1.1 Random rubble masor concrete 1:6:12 (1 cem level with:Cement mort	nry with ha ent : 6 coai	ngineeri ard stone in rse sand : 12	ng Org foundation graded sto	@ Rs 6814.89	9 / cum	Rs 149	9927.58 vith cement
4	Random rubble masor concrete 1:6:12 (1 cem	nry with ha ent : 6 coai ar 1:6 (1 ce	ngineeri ard stone in rse sand : 12	ng Org foundation graded sto	@ Rs 6814.89	9 / cum	Rs 149	9927.58 vith cement
4	Random rubble masor concrete 1:6:12 (1 cem level with:Cement mort toilet block foundation	nry with ha ent : 6 coar ar 1:6 (1 ce	ngineeri ard stone in rse sand : 12 ement : 6 coa	ng Org foundation 2 graded sto arse sand)	@ Rs 6814.89 anisations and plinth incl ne aggregate 2	9 / cum	Rs 149 velling up w ominal size)	9927.58 vith cement
4	Random rubble masor concrete 1:6:12 (1 cem level with:Cement mort toilet block foundation all round	ent: 6 coal ar 1:6 (1 ce	rd stone in rse sand : 12 ement : 6 coa 35.500	foundation 2 graded sto arse sand) 0.600	@ Rs 6814.89 and plinth incl ne aggregate 2 0.600	9 / cum	Rs 149 velling up wominal size)	9927.58 vith cement
4	Random rubble masor concrete 1:6:12 (1 cem level with:Cement mort toilet block foundation all round crosswall long	ent: 6 coar ar 1:6 (1 ce	stone in rse sand : 12 ement : 6 coa 35.500	foundation 2 graded sto arse sand) 0.600	@ Rs 6814.89 and plinth include aggregate 2 0.600 0.600	9 / cum	Rs 149 velling up wominal size) 12.780 8.280	9927.58 vith cement
4	Random rubble masor concrete 1:6:12 (1 cem level with:Cement mort toilet block foundation all round crosswall long	ent: 6 coar ar 1:6 (1 ce	35.500 11.500 6.050	foundation graded sto arse sand) 0.600 0.600	@ Rs 6814.89 and plinth incl ne aggregate 2  0.600  0.600  0.600	9 / cum	Rs 149 velling up wominal size) 12.780 8.280 2.178	9927.58 vith cement
4	Random rubble masor concrete 1:6:12 (1 cem level with:Cement mort toilet block foundation all round crosswall long cross	ent: 6 coar ar 1:6 (1 ce 1 2 1	35.500 11.500 6.050 3.150	foundation graded sto arse sand) 0.600 0.600 0.600	@ Rs 6814.89 and plinth incl ne aggregate 2  0.600  0.600  0.600  0.600	9 / cum	Rs 149 velling up wominal size) 12.780 8.280 2.178 1.134	9927.58 vith cement
4	Random rubble masor concrete 1:6:12 (1 cem level with:Cement mort toilet block foundation all round crosswall long cross	ent: 6 coar ar 1:6 (1 ce 1 2 1	35.500 11.500 6.050 3.150 4.800	no Organical foundation of the control of the contr	@ Rs 6814.89 and plinth incl ne aggregate 2  0.600  0.600  0.600  0.600  0.600	9 / cum	Rs 149 velling up wominal size) 12.780 8.280 2.178 1.134 1.728	9927.58 vith cement
4	Random rubble masor concrete 1:6:12 (1 cem level with:Cement mort toilet block foundation all round crosswall long cross	nry with ha ent : 6 coar ar 1:6 (1 ce 1 2 1 1	35.500 11.500 6.050 3.150 4.800 4.500	0.600 0.600 0.600 0.600 0.600	@ Rs 6814.89 and plinth incl ne aggregate 2  0.600  0.600  0.600  0.600  0.600  0.600	9 / cum	Rs 149 Velling up wominal size)  12.780  8.280  2.178  1.134  1.728  3.240	9927.58 vith cement
4	Random rubble masor concrete 1:6:12 (1 cem level with:Cement mort toilet block foundation all round crosswall long cross	nry with ha ent: 6 coar ar 1:6 (1 ce 1	35.500 11.500 6.050 3.150 4.800 4.500 3.500	no Organical foundation of the property of the	@ Rs 6814.89 and plinth incl ne aggregate 2  0.600  0.600  0.600  0.600  0.600  0.600  0.600  0.600	9 / cum	Rs 149  Velling up wominal size)  12.780  8.280  2.178  1.134  1.728  3.240  1.891	9927.58 vith cement
4	Random rubble masor concrete 1:6:12 (1 cem level with:Cement mort toilet block foundation all round crosswall long cross  bath room ramp step toilet block basement	nry with ha ent: 6 coar ar 1:6 (1 ce 1	35.500 11.500 6.050 3.150 4.800 4.500 3.000	0.600 0.600 0.600 0.600 0.600 0.600 0.600 0.600	@ Rs 6814.89 and plinth incl ne aggregate 2  0.600  0.600  0.600  0.600  0.600  0.600  0.600  0.600  0.600  0.600	9 / cum	Rs 149  Velling up wominal size)  12.780  8.280  2.178  1.134  1.728  3.240  1.891  1.080	9927.58 vith cement
4	Random rubble masor concrete 1:6:12 (1 cem level with:Cement mort toilet block foundation all round crosswall long cross  bath room ramp step  toilet block basement all round	nry with ha ent: 6 coar ar 1:6 (1 ce 1	35.500 11.500 6.050 3.150 4.800 4.500 3.500 3.500	0.600 0.600 0.600 0.600 0.600 0.600 0.600 0.600 0.600	© Rs 6814.89  and plinth includes a garden a gar	9 / cum	Rs 149  Velling up wominal size)  12.780  8.280  2.178  1.134  1.728  3.240  1.891  1.080  7.189	9927.58 vith cement

	bath room	1	4.800	0.450	0.450		0.973	
	ramp	2	3.150	0.450	0.300		0.851	
		1	3.000	0.450	0.450		0.608	
	partition	10	1.500	0.450	0.450		3.038	
	rounded	1	0.508				0.508	
					Tota	al Quantity	52.000 cu	m
				To	tal Deducte	d Quantity	0.000 cum	1
					Net Tota	al Quantity	52.000 cu	m
			Say	52.000 cum	@ Rs 7204	I.78 / cum	Rs 374	1648.56
	Filling available excavexceeding 20 cm in d and lift up to 1.5 m.	epth, consoli	dating each	deposited la	ayer by rami		atering, lead	•
	for foundation	1	11.550	3.900	0.600		27.027	
	varandha	1	7.000	0.750	0.600	Ton-	3.150	
	rounded	1	4.823		%_2555	A STATE OF THE STA	4.823	
		1000			Tota	al Quantity	35.000 cu	m
		)41- a.s. E.s.			tal Deducte	-	0.000 cum	1
		Other Er	igineen	ng Orga	Net Tota	al Quantity	35.000 cu	m
		D	Say	y 35.000 cur	m @ Rs 258	3.57 / cum	Rs 90	)49.95
6	5.2.2	poroto work	in walls (any	(thicknoss)	including o	ttached pila	etore buttro	
	Reinforced cement co and string courses, fi excluding cost of cent 3 graded stone aggre	llets, column ering, shutte gate 20 mm	s, pillars, pie ring, finishin nominal size	ers, abutme g and reinfo	nts, posts a	nd struts et	c. up tot floo nent : 1.5 cc	or five le
	and string courses, fi excluding cost of cent 3 graded stone aggre basement allround	llets, column ering, shutte gate 20 mm	s, pillars, pie ring, finishin nominal size 35.500	ers, abutme g and reinfo	nts, posts a preement :1:	nd struts et	1.598	or five le
	and string courses, fi excluding cost of cent 3 graded stone aggre	llets, column ering, shutte gate 20 mm 1	s, pillars, pie ring, finishin nominal size 35.500 11.500	ers, abutme g and reinfo e) 0.450 0.450	0.100 0.100	nd struts et	1.598 0.518	or five le
	and string courses, fi excluding cost of cent 3 graded stone aggre basement allround	llets, column ering, shutte gate 20 mm 1 1	s, pillars, pie ring, finishin nominal size 35.500 11.500 6.050	ers, abutme g and reinfo e) 0.450 0.450	0.100 0.100 0.100	nd struts et	1.598 0.518	or five le
	and string courses, fi excluding cost of cent 3 graded stone aggre basement allround cross	llets, column ering, shutte gate 20 mm 1 1	s, pillars, piering, finishin nominal size 35.500 11.500 6.050 3.150	0.450 0.450 0.450	0.100 0.100 0.100 0.100	nd struts et	1.598 0.518 0.142	or five le
	and string courses, fi excluding cost of cent 3 graded stone aggre basement allround cross  bath	llets, column ering, shutte gate 20 mm  1  1  1  1  1	s, pillars, pie ring, finishin nominal size 35.500 11.500 6.050 3.150 4.800	0.450 0.450 0.450 0.450	0.100 0.100 0.100 0.100 0.100	nd struts et	1.598 0.518 0.273 0.142 0.217	or five le
	and string courses, fi excluding cost of cent 3 graded stone aggre basement allround cross	llets, column ering, shutte gate 20 mm  1  1  1  1  1  1	s, pillars, pie ring, finishin nominal size 35.500 11.500 6.050 3.150 4.800 3.150	0.450 0.450 0.450 0.450 0.450	0.100 0.100 0.100 0.100 0.100 0.100	nd struts et	1.598 0.518 0.273 0.142 0.217	or five le
	and string courses, fi excluding cost of cent 3 graded stone aggre basement allround cross  bath	llets, column ering, shutte gate 20 mm  1  1  1  1  1  1  1  1	s, pillars, pie ring, finishin nominal size 35.500 11.500 6.050 3.150 4.800 3.150 3.000	0.450 0.450 0.450 0.450 0.450 0.450 0.450	0.100 0.100 0.100 0.100 0.100 0.100 0.100	nd struts et	1.598 0.518 0.273 0.142 0.217 0.142 0.135	or five le
	and string courses, fi excluding cost of cent 3 graded stone aggre basement allround cross  bath	llets, column ering, shutte gate 20 mm  1  1  1  1  1  1	s, pillars, pie ring, finishin nominal size 35.500 11.500 6.050 3.150 4.800 3.150	0.450 0.450 0.450 0.450 0.450	0.100 0.100 0.100 0.100 0.100 0.100	nd struts et	1.598 0.518 0.273 0.142 0.217	or five le
	and string courses, fi excluding cost of cent 3 graded stone aggre basement allround cross  bath ramp	llets, column ering, shutte gate 20 mm  1  1  1  1  1  1  1  1	s, pillars, pie ring, finishin nominal size 35.500 11.500 6.050 3.150 4.800 3.150 3.000	0.450 0.450 0.450 0.450 0.450 0.450 0.450	0.100 0.100 0.100 0.100 0.100 0.100 0.100	nd struts et	1.598 0.518 0.273 0.142 0.217 0.142 0.135	or five le

slop	1	39.450	1.000	0.120		4.734	
 tank bottom	1	6.000	2.100	0.150		1.891	
beam	1	2.100	0.200	0.200		0.085	
cover slab	1	6.000	2.100	0.120		1.512	
	1	1.800	1.800	0.120		0.389	
rounded	1	0.105				0.105	
				Tota	al Quantity	23.000 cum	
			To	otal Deducte	d Quantity	0.000 cum	
				Net Tota	al Quantity	23.000 cum	
		Say 2	3.000 cum	@ Rs 10954	1.04 / cum	Rs 2519	42.9
Centering and shulandings, balconie	•		0.100	emovar or	101111 101.30	7.101	
cross	2	11.500	0.100	13		2.301	
01033	2	6.050	0.100		Š.	1.210	
	2	3.150	0.100			0.630	
bath	2	4.800	0.100			0.960	
ramp	Other En	gineeri 6.150	ng Orga	anisatio	ns	1.231	
				<b>T</b>	7		
-	10*2	1.500	0.100	,	4	3.001	
partition	10*2	1.500 76.000	0.100 0.150		1	3.001 22.800	
partition					1		
partition	2	76.000	0.150		4	22.800	
partition lintel roof slab	1	76.000 12.750	0.150 5.800	t		22.800 73.950	
partition lintel roof slab slop	1 1	76.000 12.750 39.450	0.150 5.800 1.000	) <u>t</u>		22.800 73.950 39.450	
partition lintel roof slab slop tank bottom	1 1 4	76.000 12.750 39.450 10.200	0.150 5.800 1.000 0.150	) <u>t</u>		22.800 73.950 39.450 6.120	
partition lintel roof slab slop tank bottom beam	1 1 4 1	76.000 12.750 39.450 10.200 2.100	0.150 5.800 1.000 0.150 0.600	) <u>t</u>		22.800 73.950 39.450 6.120 1.260	
partition lintel roof slab slop tank bottom beam	2 1 1 4 1 1 12	76.000 12.750 39.450 10.200 2.100 5.100	0.150 5.800 1.000 0.150 0.600 0.120			22.800 73.950 39.450 6.120 1.260 7.344	
partition lintel roof slab slop tank bottom beam	1 1 4 1 12 3	76.000 12.750 39.450 10.200 2.100 5.100 4.800	0.150 5.800 1.000 0.150 0.600 0.120	Tota	al Quantity	22.800 73.950 39.450 6.120 1.260 7.344 1.728	n
partition lintel roof slab slop tank bottom beam	1 1 4 1 12 3	76.000 12.750 39.450 10.200 2.100 5.100 4.800	0.150 5.800 1.000 0.150 0.600 0.120 0.120	Total Deducte		22.800 73.950 39.450 6.120 1.260 7.344 1.728 0.914	n
partition lintel roof slab slop tank bottom beam	1 1 4 1 12 3	76.000 12.750 39.450 10.200 2.100 5.100 4.800	0.150 5.800 1.000 0.150 0.600 0.120 0.120	otal Deducte		22.800 73.950 39.450 6.120 1.260 7.344 1.728 0.914 170.000 sqn	

	binding all complete	above plinth le	evel.Thermo	- Mechanic	ally Treated	bars of grad	de Fe-500D	or more			
	qty of cc	1	22.895			100.0	2289.500	@100kg m3			
	rounded	1	10.500				10.500	@100kg m3			
					Tota	al Quantity	2300.000	kg			
				To	otal Deducte	d Quantity	0.000 kg				
					Net Tota	al Quantity	2300.000 kg Rs 226090.00				
				Say 2300.00	00 kg @ Rs	98.30 / kg					
	confirming to IS 218: 1:6 ( 1 cement : 6 co wall all round	•		structure up	0.150	o level with	14.490	icm in : (			
	cross wal	1	12.150	2.800	0.150		5.103				
	centre cross	1	3.150	2.800	0.150	4	1.323				
		1	6.050	2.800	0.150	200	2.541				
	bath	1	4.800	2.800	0.150		2.016				
	septitank	Othor Er	16.200	1.800	0.200	12.0	5.833				
	step	1	3.000	0.600	0.450	1115	0.810				
	rounded	1	0.593		\	√`	0.593				
	shutter	1 1	3.000	2.400	0.150	_	-1.079				
	door D DA toilet	2	1.000	2.100	0.150		-0.630				
					Tota	al Quantity	32.709 cu	m			
				To	otal Deducte	d Quantity	-1.709 cur	n			
					Net Tota	al Quantity	31.000 cu	m			
			Say	31.000 cum	n @ Rs 6984	1.85 / cum	Rs 216	5530.35			
10	50.6.3.2 Solid block masonry using pre cast solid blocks (Factory made) of size 40x20x10 cm or nearest availab size confirming to IS 2185 part I of 1979 for super structure up to floor two level for 10 cm thick wall in CM 1:6 (1 cement: 6 coarse sand) including cost of scaffolding complete										
	toilet partition	10	1.500	2.800	0.100		4.200				
	urinal partition	2	1.000	1.400	0.100		0.280				
	uillai partition				1						
	parapet	1	37.100	0.600	0.100		2.227				

	sock pit	4	1.700	1.200	0.100		0.817	
	rounded	1	0.459				0.459	
	door D1	9	0.700	2.100	0.100		-1.323	
					Tot	al Quantity	8.323 cum	l
				To	otal Deducte	ed Quantity	-1.323 cun	n
					Net Tot	al Quantity	7.000 cum	1
	Say 7.000 cum @ Rs 7823.61 / cum Rs 54765.27							
11	13.1.1 12 mm cement plaster of mix:1:4 ( 1 cement : 4 fine sand)							
	out side wall	1	35.300	2.800			98.840	
	Parapet	1	37.100	1.400			51.940	
	toilet inside	10	5.400	2.800			151.200	
	DA toilet	2	6.600	2.800	4		36.960	
	out side	2	4.800	2.800	N. A.		26.880	
	bath	1	6.500	2.800	1 30		18.200	
	partition	2	3.150	2.800			17.640	
		1	5.300	2.800			14.840	
	(	Other E	5.500	2.800	anisatio	ns	15.400	
		1	3.200	2.800			8.960	
		1	4.850	2.800	` <b> </b> -	1	13.580	
		1	2.500	2.800			7.000	
	urinal partition	2	2.100	1.500			6.301	
	under side slab	1	12.750	5.800			73.950	
		1	39.450	1.000			39.450	
	rounded	1	5.927				5.927	
	door D	2	1.000	2.100			-4.200	
	toilet door D1	11	0.700	2.100			-16.169	
	ventilator	15	0.600	0.500			-4.500	
	shutter	1	3.000	2.400			-7.199	
					Tot	al Quantity	587.068 so	qm
				To	otal Deducte	ed Quantity	-32.068 sc	lm
					Net Tot	al Quantity	555.000 so	qm
			Say	555.000 sq	m @ Rs 314	4.09 / sqm	Rs 174	319.95

	13.7.1 12 mm cement plaste	or finished wit	th a floating o	east of post	coment of m	niv:1:2 ( 1 oc	mont : 2 fin	o cand)			
	slab top	1	12.750	5.800	Cement of II	11.1.3 ( 1 0	73.950	sanu)			
		1	39.450	1.000			39.450				
	rounded	1	1.600				1.600				
					Tota	al Quantity	115.000 s	qm			
				To	otal Deducte	d Quantity	0.000 sqm	1			
					Net Tota	al Quantity					
	Say 115.000 sqm @ Rs 401.21 / sqm										
13	13.7.2 12 mm cement plaste	er finished wit	th a floating o	oat of neat	cement of m	nix:1:4 ( 1 ce	ement : 4 find	e sand)			
	Septi tank inside	1	15.400	1.800	les .		27.721				
	bottom	1	6.000	1.700			10.200				
	partition wall	2*2	1.700	1.000	4.4.1		6.800				
	roumnded	1	0.279		133		0.279				
		100	Ma	Boy.	Tota	al Quantity	45.000 sq	m			
		1000		To	otal Deducte	d Quantity	0.000 sqm	า			
			777		Net Tota	al Quantity	45.000 sa	m			
	Net Total Quantity 45.000 sqm Other Engineering Organisations Say 45.000 sqm @ Rs 386.36 / sqm Rs 17386.20										
14	8.31	Other En	ngineeri Say	y 45.000 sq	anisatio	ns		386.20			
14	8.31 Providing and fixing I by the manufacturer any size as approved of cementmortar 1:3 including pointing in	st quality cer ), of approve d by Enginee (1 cement :	Say amic glazed d make, in a rin-Charge,in 3 coarse say	wall tiles co Il colours,s skirting, ris	m @ Rs 386 Informing to hades excepsers of steps of the granting with gr	0.36 / sqm  IS: 15622(the burgundy and dados bey cement s	Rs 17  nickness to be y, bottle gree s, over 12 me slurry @3.38	386.20 De spec en, blac m thick			
14	Providing and fixing I by the manufacturer any size as approved of cementmortar 1:3	st quality cer ), of approve d by Enginee (1 cement :	Say amic glazed d make, in a rin-Charge,in 3 coarse say	wall tiles co Il colours,s skirting, ris	m @ Rs 386 Informing to hades excepsers of steps of the granting with gr	0.36 / sqm  IS: 15622(the burgundy and dados bey cement s	Rs 17  nickness to be y, bottle gree s, over 12 me slurry @3.38	386.20 De spec en, blac m thick			
14	Providing and fixing I by the manufacturer any size as approved of cementmortar 1:3 including pointing in	st quality cer ), of approve d by Enginee (1 cement : white cemer	amic glazed ad make, in a rin-Charge,in 3 coarse saint mixed with	wall tiles co Il colours,s skirting, ris nd) and joir pigment of	m @ Rs 386 Informing to hades excepsers of steps of the granting with gr	0.36 / sqm  IS: 15622(the burgundy and dados bey cement services)	Rs 17 nickness to be a positive disconnection of the control of th	386.20 De spec en, blac m thick			
14	Providing and fixing I by the manufacturer any size as approved of cementmortar 1:3 including pointing in toilet	st quality cer ), of approve d by Enginee (1 cement : white cemer	ramic glazed at make, in a rin-Charge,in 3 coarse saint mixed with	wall tiles co Il colours,s a skirting, ris and) and joir pigment of 1.800	m @ Rs 386 Informing to hades excepsers of steps of the granting with gr	0.36 / sqm  IS: 15622(the burgundy and dados bey cement services)	Rs 17 nickness to be a positive of the state	386.20 De spec en, blac m thick			
14	Providing and fixing I by the manufacturer any size as approved of cementmortar 1:3 including pointing in toilet  DA toilet	st quality cer ), of approve d by Enginee (1 cement : white cemer	ramic glazed at make, in a rin-Charge,in 3 coarse saint mixed with 4.700 5.600	wall tiles co Il colours,s a skirting, ris and) and join pigment of 1.800	m @ Rs 386 Informing to hades excepsers of steps of the granting with gr	0.36 / sqm  IS: 15622(the burgundy and dados bey cement services)	Rs 17 nickness to be a positive of the process of t	386.20 De spec en, blac m thick			
14	Providing and fixing I by the manufacturer any size as approved of cementmortar 1:3 including pointing in toilet  DA toilet  bath	st quality cer ), of approve d by Enginee (1 cement : white cemer	ramic glazed at make, in a rin-Charge,in 3 coarse sant mixed with 4.700 5.600 5.800	wall tiles co Il colours,s a skirting, ris and) and join pigment of 1.800 1.800	m @ Rs 386 Informing to hades excepsers of steps of the granting with gr	0.36 / sqm  IS: 15622(the burgundy and dados bey cement services)	Rs 17  nickness to by, bottle green, over 12 ministering @ 3.38 ete.  93.060  20.160  10.440	386.20 De spec en, blac m thick			
14	Providing and fixing I by the manufacturer any size as approved of cementmortar 1:3 including pointing in toilet  DA toilet  bath  urinal portion	st quality cer ), of approve d by Enginee (1 cement : white cemer  11 2 1 3	amic glazed at make, in a rin-Charge,ir 3 coarse sant mixed with 4.700 5.600 5.800 2.600	wall tiles co Il colours,s a skirting, ris and) and join pigment of 1.800 1.800	m @ Rs 386  Informing to hades excepted sers of steps of matchings of matchings of the matching	0.36 / sqm  IS: 15622(the burgundy and dados bey cement services)	Rs 17  nickness to be a positive description of the second	386.20 be specen, blacem thick			
14	Providing and fixing I by the manufacturer any size as approved of cementmortar 1:3 including pointing in toilet  DA toilet  bath  urinal portion	st quality cer ), of approve d by Enginee (1 cement : white cemer  11 2 1 3	amic glazed at make, in a rin-Charge,ir 3 coarse sant mixed with 4.700 5.600 5.800 2.600	wall tiles co Il colours,s a skirting, ris ad) and join pigment of 1.800 1.800 1.600	m @ Rs 386  Informing to hades excepted sers of steps of matchings of matchings of the matching	IS: 15622(the of burgundy and dados ey cement shade complement and dados and dados experies and dados and	Rs 17  nickness to by, bottle green, over 12 minimum (2) 3.38 ete. 93.060 20.160 10.440 12.480 3.860	ge specen, blacem thick kg per s			
14	Providing and fixing I by the manufacturer any size as approved of cementmortar 1:3 including pointing in toilet  DA toilet  bath  urinal portion	st quality cer ), of approve d by Enginee (1 cement : white cemer  11 2 1 3	amic glazed ad make, in a rin-Charge,in 3 coarse saint mixed with 4.700 5.600 5.800 2.600 3.860	wall tiles co Il colours,s a skirting, ris ad) and join pigment of 1.800 1.800 1.600	m @ Rs 386  Informing to hades exception with graph of matchings.  Total Deducte	discrete state of the state of	Rs 17  nickness to key, bottle green, over 12 minsterness and sete.  93.060  20.160  10.440  12.480  3.860  140.000 sqmm  140.000 s	ge specen, blacem thick kg per s			

	manufacturer), of 1st q Grey, Fume Red Brow	•	ū			•		-	
	pointing the joints with				•		Journa Garra	<i>)</i> ,o.a	
	inside floor	1	12.150	4.800			58.320		
	Rounded	1	1.680				1.680		
					Tota	al Quantity	60.000 sq	m	
				To	otal Deducte	d Quantity	0.000 sqm	1	
					Net Tota	al Quantity	60.000 sq	m	
	Say 60.000 sqm @ Rs 1091.02 / sqm								
	:Providing and laying ir with water absorption colours & shades,laid grouting the joint	less than ( d on 20 mr	0.08 % and n thick cem	conforming ent mortar	g to I.S. 150 r 1:4 (1 cer	622, of app nent : 4 co	roved make parse sand)	e, in <b< th=""></b<>	
	ramp	2	5.200	1.200	1-21		12.480		
		1	3.500	1.200		E.	4.200		
	step	3	3.000	0.450			4.051		
	Rounded	1	2.269	MB-247			2.269		
	C	ther En	gineeri	ng Org	anisatio	al Quantity	23.000 sq	m	
				To	otal Deducte	d Quantity	0.000 sqm	1	
					Net Tota	al Quantity	23.000 sq	m	
			Say	23.000 sqm	@ Rs 1276	5.95 / sqm	Rs 29	369.85	
17	13.43.1 Applying one coat of surface:Water thinna			nt primer o	of approved	brand and	d manufactu	ire on	
17	Applying one coat of			nt primer c	of approved	brand and	555.000	ire on	
17	Applying one coat of surface:Water thinna	ble cement	primer	nt primer c		brand and			
17	Applying one coat of surface:Water thinna	ble cement	primer			al Quantity	555.000	qm	
17	Applying one coat of surface:Water thinna	ble cement	primer		Tota	al Quantity	555.000 555.000 s	qm	
17	Applying one coat of surface:Water thinna	ble cement	555.000	To	Tota	al Quantity d Quantity al Quantity	555.000 s 555.000 sqm 555.000 s	qm	
17	Applying one coat of surface:Water thinnal area vide item no 11  13.46.1 Finishing walls with Ac	tylic Smooth	555.000 Say	To / 555.000 so int of requir	Total Deducte  Net Tota  qm @ Rs 70  ed shade:No	al Quantity d Quantity al Quantity 0.64 / sqm	555.000 s 555.000 sqm 555.000 sq Rs 39	qm qm <b>205.20</b> coat app	
	Applying one coat of surface:Water thinnal area vide item no 11	tylic Smooth	555.000 Say	To / 555.000 so int of requir	Total Deducte  Net Tota  qm @ Rs 70  ed shade:No	al Quantity d Quantity al Quantity 0.64 / sqm	555.000 s 555.000 sqm 555.000 sq Rs 39	qm qm <b>205.20</b> coat app	

	rounded		4.220	<u> </u>	To	otal Quantity	4.220 155.000 s	am
				т		ted Quantity	0.000 sqn	•
						otal Quantity	155.000 sqn	
			Sav	155.000 so		93.89 / sqm		052.95
19	13.83.2 Wall painting with applying additional		vlic emulsion	paint of i	nterior gra	de, having V	•	
	toilet inside	10	5.400	1.000			54.000	
	DA toilet	2	6.600	1.000			13.200	
	out	2	4.800	2.800			26.880	
	bath	1	6.500	1.000			6.500	
	partition	2	3.150	2.800			17.640	
		1	5.300	2.800	1 1		14.840	
		1	5.500	2.800	100	3	15.400	
		1	3.200	2.800		9	8.960	
		1	4.850	2.800	136		13.580	
		1	2.500	2.800	• • • • •		7.000	
	urinal partition	Other El	2.100	1.500	anisati	ons	6.301	
	under side slab	1	12.750	5.800			73.950	
		1 1	39.450	1.000	/ 1		39.450	
	rounded	1	4.367				4.367	
	door D	2	1.000	2.100			-4.200	
	toilet door	11	0.700	2.100			-16.169	
	ventilator	15	0.600	0.500			-4.500	
	shutter	1	3.000	2.400			-7.199	
					To	tal Quantity	302.068 s	qm
				Т	otal Deduct	ted Quantity	-32.068 s	qm
					Net To	otal Quantity	270.000 s	qm
			Say	270.000 sc	ım @ Rs 13	34.10 / sqm	Rs 36	207.00
20	9.117.1 Providing and fixing dimension as below to be jointed with ga	(tolerance ±1	mm), with w	all thicknes	ss 2.0mm (	±0.2 mm), co	rners of the	door fr

 Toilet door 70x210	11	5.600				61.600	
DA toilet,100x210	2	6.200				12.400	
rounded	1	1.000				1.000	
				Т	otal Quantity	75.000 me	etre
Total Deducted Quantity 0.000 metre							
				Net T	otal Quantity	75.000 me	etre
		Say 7	5.000 metre	e @ Rs 26	0.94 / metre	Rs 19	570.50
galvanised/plastic brac	kets of size	75x220 mm	n having wa	all thicknes	s 1.0 mm and		teel scr
	kets of size or reinforce e lock rail n ickness,fixe with a uP\ mm and 1 g horizonta ufacturer's	e 75x220 mm d by inserting nade up of 'h ed to the shu /C multi-cha mm (± 0.1 m ally 6 mm ga s specification	n having wa g galvanise d' section, a utter styles ambered sin nm) wall thic alvanised M	all thickness of M.S. tubes a uPVC hole by means agle panel ckness. The M.S. rod a rection of	ss 1.0 mm and the of size 20x2 flow section of of plastic/gal of size not less the panels filled and fastened v	d stainless size mm and 1 size 100x24 vanised M.S ss than 620 livertically and with nuts and	teel scr 1 mm (± 4 mm a 6. 'U' cle mm, ha nd tie b nd wast
galvanised/plastic brace. The styles of the shutter mm) wall thickness. The mm (± 0.2 mm) wall the The shutter frame filled over all thickness of 20 two places by inserting complete as per man	kets of size or reinforce e lock rail n ickness,fixe with a uP\ mm and 1 g horizonta ufacturer's	e 75x220 mm d by inserting nade up of 'h ed to the shu /C multi-cha mm (± 0.1 m ally 6 mm ga s specification	n having wa g galvanise d' section, a utter styles umbered sin nm) wall thic alvanised M on and dir	all thickness of M.S. tubes a uPVC hole by means agle panel ckness. The M.S. rod a rection of	ss 1.0 mm and the of size 20x2 flow section of of plastic/gal of size not less the panels filled and fastened v	d stainless size mm and 1 size 100x24 vanised M.S ss than 620 livertically and with nuts and	teel scr 1 mm (± 4 mm a 6. 'U' cle mm, ha nd tie b nd wast
galvanised/plastic brace. The styles of the shutter mm) wall thickness. The mm (± 0.2 mm) wall the The shutter frame filled over all thickness of 20 two places by inserting complete as per man bathroom door shutter.	kets of size or reinforce e lock rail n ickness,fixe with a uP\ mm and 1 g horizonta ufacturer's r).	e 75x220 mm d by inserting nade up of 'h ed to the shu /C multi-cha mm (± 0.1 m ally 6 mm ga s specification	n having wa g galvanise d' section, a utter styles imbered sin nm) wall thic alvanised M on and dir	all thickness of M.S. tubes a uPVC hole by means agle panel ckness. The M.S. rod a rection of	ss 1.0 mm and the of size 20x2 flow section of of plastic/gal of size not less the panels filled and fastened v	I stainless size mm and fisize 100x24 vanised M.S is than 620 if vertically an with nuts an charge(For	teel scr 1 mm (± 4 mm a 6. 'U' cle mm, ha nd tie b nd wast
galvanised/plastic brace The styles of the shutter mm) wall thickness. The mm (± 0.2 mm) wall the The shutter frame filled over all thickness of 20 two places by inserting complete as per man bathroom door shutte Toilet door 70x210	kets of size or reinforced e lock rail no ickness, fixe with a uP\ mm and 1 g horizonta ufacturer's r).	275x220 mm d by inserting nade up of 'Hed to the shu /C multi-cha mm (± 0.1 m ally 6 mm ga s specification	n having wa g galvanise d' section, a utter styles ambered sin nm) wall thic alvanised M on and dir ng 2.100	all thickness of M.S. tubes a uPVC hole by means agle panel ckness. The M.S. rod a rection of	ss 1.0 mm and the of size 20x2 flow section of of plastic/gal of size not less the panels filled and fastened v	d stainless size mm and fisize 100x24 vanised M.S is than 620 divertically and with nuts and charge (Formally 16.170	teel scr 1 mm (± 4 mm a 6. 'U' cle mm, ha nd tie b nd wast
galvanised/plastic brace The styles of the shutter mm) wall thickness. The mm (± 0.2 mm) wall the The shutter frame filled over all thickness of 20 two places by inserting complete as per man bathroom door shutte Toilet door 70x210  DA toilet,100x210	kets of size or reinforced e lock rail no ickness, fixe with a uPN mm and 1 g horizonta ufacturer's r).  11	275x220 mm d by inserting hade up of 'Hed to the shu C multi-cha mm (± 0.1 m ally 6 mm ga s specification 0.700 1.000	n having wa g galvanise d' section, a utter styles ambered sin nm) wall thic alvanised M on and dir ng 2.100	all thickness of M.S. tube a uPVC hole by means agle panel ckness. The M.S. rod a section of anisation	ss 1.0 mm and the of size 20x2 flow section of of plastic/gal of size not less the panels filled and fastened v	stainless size mm and fisize 100x24 vanised M.S sis than 620 divertically and with nuts and charge (Form 16.170 4.200	teel scr 1 mm (± 4 mm a 6. 'U' cli mm, ha nd tie b nd wash r W.C.
galvanised/plastic brace The styles of the shutter mm) wall thickness. The mm (± 0.2 mm) wall the The shutter frame filled over all thickness of 20 two places by inserting complete as per man bathroom door shutte Toilet door 70x210  DA toilet,100x210	kets of size or reinforced e lock rail no ickness, fixe with a uPN mm and 1 g horizonta ufacturer's r).  11	275x220 mm d by inserting hade up of 'Hed to the shu C multi-cha mm (± 0.1 m ally 6 mm ga s specification 0.700 1.000	n having was g galvanise d' section, a utter styles ambered sin nm) wall thic alvanised Mon and dir 12.100	all thickness of M.S. tube a uPVC hole by means agle panel ckness. The M.S. rod a section of anisation	is 1.0 mm and the of size 20x2 flow section of of plastic/gal of size not less the panels filled and fastened when the constant in the constan	d stainless size 100x24 vanised M.S ss than 620 d vertically an with nuts and charge (For 16.170 4.200 0.630	teel scr 1 mm (± 4 mm a 6. 'U' cli mm, ha nd tie b nd wash r W.C.
galvanised/plastic brace The styles of the shutter mm) wall thickness. The mm (± 0.2 mm) wall the The shutter frame filled over all thickness of 20 two places by inserting complete as per man bathroom door shutte Toilet door 70x210  DA toilet,100x210	kets of size or reinforced e lock rail no ickness, fixe with a uPN mm and 1 g horizonta ufacturer's r).  11	275x220 mm d by inserting hade up of 'Hed to the shu C multi-cha mm (± 0.1 m ally 6 mm ga s specification 0.700 1.000	n having was g galvanise d' section, a utter styles ambered sin nm) wall thic alvanised Mon and dir 12.100	all thickness of M.S. tube a uPVC hole by means agle panel ckness. The M.S. rod a section of anisation of the control of the c	ss 1.0 mm and the of size 20x2 flow section of plastic/gallof size not less the panels filled and fastened with Engineer-in-cons	stainless size 100x24 vanised M.Ss than 620 I vertically anyith nuts and thange( For 16.170 4.200 0.630 21.000 sq	teel scr 1 mm (± 4 mm a 6. 'U' cland 1 mm, ha 1 nd tie b 1 nd wash 1 r W.C.

543SUB HEAD: 9 - WOOD & PVC WORK9.147BProviding and fixing factory made uPVC white colour fixed glazed windows/ventilators comprising of uPVC multi-chambered frame and mullion (where everrequired) extruded profiles duly reinforced with 1.60 ± 0.2 mm thick galvanizedmild steel section made from roll forming process of required length (shape &size according to uPVC profile), , uPVC extruded glazing beads of appropriatedimension, EPDM gasket, G.I fasteners 100 x 8 mm size for fixing frame to finishedwall, plastic packers, plastic caps and necessary stainless steel screws etc.Profile of frame shall be mitred cut and fusion welded at all corners, mullion (ifrequired) shall be also fusion welded including drilling of holes for fixinghardware's and drainage of water etc. After fixing frame the gap between frameand adjacent finished wall shall be filled with weather proof silicon sealant overbacker rod of required size and of approved quality, all complete as per approveddrawing & direction of Engineer-in-

	Charge. (Single / dou frame, sash and mullion shall be acceptable.Fi mm both having wall the upto 0.75 sqm.)	on extruded point and the contract of the cont	orofiles minu / ventilator r	us 5% tolera made of (sm	ancein dimer nall series) fi	nsion i.e. in rame 47 x 5	depth & wid 0 mm & mul	th of profile Ilion 47x 68		
	for ventilator	15	0.600	0.500			4.500			
					Tota	al Quantity	4.500 sqm	1		
				To	otal Deducte	d Quantity	0.000 sqm	1		
	Net Total Quantity 4.500 sqm									
	Say 4.500 sqm @ Rs 7626.06 / sqm Rs 34317.27									
	Providing and fixing ir with flat iron diagonal steel pulleys, comple priming coat of appro	te with bolts	size, with to , nuts,lockin imer .	op and bottong arranger	m rail of T-	iron 40x40x	6 mm, with s, including	40 mm dia		
	Front shutter	1	3.500	2.400	1-31		8.400			
	Rounded	1	0.600	1637	7-31)	L	0.600			
					Tota	al Quantity	9.000 sqm	1		
			-	To	tal Deducte	d Quantity	0.000 sqm	1		
		Other En	gineeri	ng Org	Net Tota	al Quantity	9.000 sqm	1		
	-	DI	Say	9.000 sqm	@ Rs 10205	.93 / sqm	Rs 91	853.37		
	Providing and fixing stainless steel (Grade 304) railing made of Hollow tubes, channels, plates etc including welding, grinding, buffing, polishing and making curvature (wherever required) and fitting the same with necessary stainless steel nuts and bolts complete, i/c fixing the railing with necessary accessories & stainless steel dash fasteners, stainless steel bolts etc., of required size on the top of the floor or the side of waist slab with suitable arrangement as per approval of Engineer-in-charge, (for payment purpose only weight of stainless steel members shall be considered excluding fixing accessories such as nuts, bolts, fasteners etc.)									
24	Providing and fixing a including welding, grid same with necessary accessories & stainles floor or the side of we payment purpose or	nding, buffing y stainless s ss steel dash aist slab wit nly weight c	g, polishing steel nuts a fasteners, h suitable a of stainless	and making and bolts co stainless stearrangemen steel men	g curvature omplete, i/c eel bolts etc t as per ap	(wherever r fixing the ., of require proval of E	equired) and railing with d size on the ngineer-in-c	d fitting the necessary e top of the harge, (for		
24	Providing and fixing a including welding, grid same with necessary accessories & stainles floor or the side of we payment purpose or	nding, buffing y stainless s ss steel dash aist slab wit nly weight c	g, polishing steel nuts a fasteners, h suitable a of stainless	and making and bolts co stainless stearrangemen steel men	g curvature omplete, i/c eel bolts etc t as per ap	(wherever r fixing the ., of require proval of E	equired) and railing with d size on the ngineer-in-c	d fitting the necessary e top of the charge, (for ding fixing		
24	Providing and fixing a including welding, grid same with necessary accessories & stainles floor or the side of we payment purpose or accessories such as	nding, buffing stainless ses steel dash aist slab with hely weight controlles nuts, bolts	g, polishing steel nuts a fasteners, h suitable a of stainless s, fasteners	and making and bolts co stainless stearrangemen steel men	g curvature omplete, i/c eel bolts etc t as per ap nbers shall	(wherever r fixing the ., of require proval of E be consid	equired) and railing with disize on the ngineer-in-clered exclu	d fitting the necessary e top of the charge, (folding fixing @20kg/m		
24	Providing and fixing a including welding, grid same with necessary accessories & stainles floor or the side of we payment purpose or accessories such as	nding, buffing stainless ses steel dash aist slab with hely weight controlles nuts, bolts	g, polishing steel nuts a fasteners, h suitable a of stainless s, fasteners	and making and bolts constainless steaments steel ments etc.)	g curvature omplete, i/c eel bolts etc t as per ap nbers shall	(wherever r fixing the ., of require proval of E be consided 20.0	required) and railing with disize on the ngineer-in-clered exclus	d fitting the necessary e top of the charge, (folding fixing @20kg/m		
24	Providing and fixing a including welding, grid same with necessary accessories & stainles floor or the side of we payment purpose or accessories such as	nding, buffing stainless ses steel dash aist slab with hely weight controlles nuts, bolts	g, polishing steel nuts a fasteners, h suitable a of stainless s, fasteners	and making and bolts constainless steaments steel ments etc.)	g curvature complete, i/c eel bolts etc it as per ap inbers shall  Tota otal Deducte	(wherever r fixing the ., of require proval of E be consided 20.0	equired) and railing with disize on the ngineer-in-diered exclusive 240.000 kg	d fitting the necessary e top of the charge, (for ding fixing @20kg/m		
24	Providing and fixing a including welding, grid same with necessary accessories & stainles floor or the side of we payment purpose or accessories such as	nding, buffing stainless ses steel dash aist slab with hely weight controlles nuts, bolts	g, polishing steel nuts a fasteners, h suitable a of stainless s, fasteners 6.000	and making and bolts constainless steaments steel ments etc.)	g curvature complete, i/c eel bolts etc it as per ap inbers shall  Tota otal Deducte	(wherever r fixing the ., of require proval of E be consided 20.0 al Quantity al Quantity	equired) and railing with disize on the ngineer-in-dered exclusion 240.000 kg 240.000 kg 240.000 kg	d fitting the necessary e top of the charge, (for ding fixing		

	16.78.1 Construction of grand mixing in a mechanica & lifts, spreading in a compacting with vibrative directions of Engineer having CBR Value- 30	al mix plant uniform laye tory power i -in- Charge	at OMC, Car ers of specific roller to achie	riage of mix ed thicknes eve the desi	ed material s with moto red density,	by tippers to r grader on complete as	o work site, to prepared so per specific	for all lea surface a cations a
	Auction hall front	1	40.000	30.000	0.150		180.000	
	side	2	6.000	6.000	0.150		10.800	
	AH west side	1	40.000	15.000	0.150		90.000	
	for road	1	30.000	6.000	0.150		27.000	
	rounded	1	4.200	(B)			4.200	
					Tota	al Quantity	312.000 c	um
		-	63 B	To	tal Deducte	d Quantity	0.000 cum	1
		61	N. R.	S\ /\	Net Tota	al Quantity	312.000 c	um
			Say 3	312.000 cum	@ Rs 2963	3.59 / cum	Rs 924	1640.08
	Construction of dry leading aggregate conforming ration not to exceed 1 not to be less than	to IS : 383, 5:1, aggreg 150 Kg/ cu	the size of control gate gradation m, optimum	coarse aggre n after blend moisture d	egate not ex ding to be a content to b	ceeding 25 s per specif be determin	mm, aggreg ication, cem ned during	ate cem ent cont trial len
	aggregate conforming ration not to exceed 1 not to be less than construction, concret transported to site, for roller, finishing and cu	to IS: 383, 5:1, aggreg 150 Kg/ cu te strength all leads & iring etc. co	the size of content of the size of content of the lifts, laid with mplete as pe	coarse aggreen after blend moisture describes than 10 a mechanic	egate not ex ding to be as content to k Mpa at 7 cal paver, co Engineer-in	ceeding 25 s per specif be determindays, mixeompacting w	mm, aggregication, cemned during ed in a batcrith 8-10 toni	ate cem ent cont trial lend thing pla
	aggregate conforming ration not to exceed 1 not to be less than construction, concret ransported to site, for roller, finishing and cultion hall front	to IS: 383, 5:1, aggreg 150 Kg/ cu te strength all leads & ring etc. co	the size of content of the size of content of the left of the size	moisture of moisture of moisture of a mechanic of direction of 30.000	egate not ex ding to be as content to k Mpa at 7 cal paver, co Engineer-in 0.150	ceeding 25 s per specif be determindays, mixeompacting w	mm, aggregication, cemned during ed in a batchith 8-10 toni	ate cem ent cont trial lend thing pla
	aggregate conforming ration not to exceed 1 not to be less than construction, concretransported to site, for roller, finishing and cultion hall front side	to IS: 383, 5:1, aggreg 150 Kg/ cu te strength all leads & ring etc. co	the size of content of of conte	moisture of mechanical	egate not ex ding to be as content to k Mpa at 7 cal paver, co Engineer-in 0.150	ceeding 25 s per specif be determindays, mixeompacting w	mm, aggregication, cemned during ed in a batch with 8-10 toning 180.000	ate cem ent cont trial lend thing pla
	aggregate conforming ration not to exceed 1 not to be less than construction, concre transported to site, for roller, finishing and cultion hall front side  AH west side	to IS: 383, 5:1, aggreg 150 Kg/ cu te strength all leads & ring etc. co	the size of contact gradation m, optimum not to be less laid with a specific model of the size of the	moisture of a mechanic of direction of moisture of moi	egate not ex ding to be as content to k Mpa at 7 cal paver, co Engineer-in 0.150 0.150	ceeding 25 s per specif be determindays, mixeompacting w	mm, aggregication, cemned during ed in a batch with 8-10 tonion 180.000 10.800	ate cem ent cont trial lend thing pla
	aggregate conforming ration not to exceed 1 not to be less than construction, concre transported to site, for roller, finishing and cultion hall front side  AH west side  for road	to IS: 383, 5:1, aggreg 150 Kg/ cu te strength all leads & ring etc. cor	the size of contact gradation m, optimum not to be less lifts, laid with applete as per 40.000 40.000 30.000	moisture of mechanical	egate not ex ding to be as content to k Mpa at 7 cal paver, co Engineer-in 0.150	ceeding 25 s per specif be determindays, mixeompacting w	mm, aggregication, cemned during ed in a batch with 8-10 tonion 180.000 10.800 90.000	ate cem ent cont trial lend thing pla
	aggregate conforming ration not to exceed 1 not to be less than construction, concre transported to site, for roller, finishing and cultion hall front side  AH west side	to IS: 383, 5:1, aggreg 150 Kg/ cu te strength all leads & ring etc. co	the size of contact gradation m, optimum not to be less laid with a specific model of the size of the	moisture of a mechanic of direction of moisture of moi	egate not ex ding to be as content to k 0 Mpa at 7 cal paver, co f Engineer-in 0.150 0.150 0.150	ceeding 25 s per specific determine days, mixempacting was charge	mm, aggregication, cemed during ed in a batch with 8-10 tonion 180.000 10.800 90.000 27.000 4.200	ate cem ent cont trial len ching pla ne vibrat
	aggregate conforming ration not to exceed 1 not to be less than construction, concre transported to site, for roller, finishing and cultion hall front side  AH west side  for road	to IS: 383, 5:1, aggreg 150 Kg/ cu te strength all leads & ring etc. cor	the size of contact gradation m, optimum not to be less lifts, laid with applete as per 40.000 40.000 30.000	moisture of a mechanic of direction of moisture of moisture of a mechanic of direction of moisture of	egate not ex ding to be as content to k ) Mpa at 7 cal paver, co f Engineer-in 0.150 0.150 0.150	ceeding 25 s per specific determine days, mixempacting was charge	mm, aggregication, cemed during ed in a batch with 8-10 tonion 180.000 10.800 90.000 27.000 4.200 312.000 c	ate cem ent cont trial len- ching pla ne vibrat
	aggregate conforming ration not to exceed 1 not to be less than construction, concre transported to site, for roller, finishing and cultion hall front side  AH west side  for road	to IS: 383, 5:1, aggreg 150 Kg/ cu te strength all leads & ring etc. cor	the size of contact gradation m, optimum not to be less lifts, laid with applete as per 40.000 40.000 30.000	moisture of a mechanic of direction of moisture of moisture of a mechanic of direction of moisture of	egate not excling to be associated to keep the content to keep the	ceeding 25 s per specific determine days, mixempacting was charge	mm, aggregication, cemed during ed in a batch with 8-10 tons 180.000 10.800 90.000 27.000 4.200 312.000 cm	ate cem ent cont trial leng ching pla ne vibrat
	aggregate conforming ration not to exceed 1 not to be less than construction, concre transported to site, for roller, finishing and cultion hall front side  AH west side  for road	to IS: 383, 5:1, aggreg 150 Kg/ cu te strength all leads & ring etc. cor	the size of contact gradation m, optimum not to be less lifts, laid with applete as per 40.000 40.000 30.000	moisture of a mechanic of direction of moisture of moisture of a mechanic of direction of moisture of	egate not excling to be associated to keep the content to keep the	ceeding 25 s per specific determine days, mixempacting was charge	mm, aggregication, cemed during ed in a batch with 8-10 tons 180.000 10.800 90.000 27.000 4.200 312.000 cm 312.000 cm 312.000 cm	ate cem ent cont trial len ching pla ne vibrat  um um
3	aggregate conforming ration not to exceed 1 not to be less than construction, concre transported to site, for roller, finishing and cultion hall front side  AH west side  for road	to IS: 383, 5:1, aggreg 150 Kg/ cu te strength all leads & ring etc. cor	the size of clate gradation m, optimum not to be leading to the lifts, laid with mplete as per 40.000 40.000 40.000 40.000 40.000	moisture of a mechanic of direction of moisture of moisture of a mechanic of direction of moisture of	egate not excling to be as content to ke ontent to ke ontent to ke on the part of the cal paver, conference of Engineer-in 0.150 0.150 0.150 0.150 Total Deducte Net Total	ceeding 25 s per specific determine days, mixe ompacting wan-charge  al Quantity d Quantity al Quantity	mm, aggregication, cemed during ed in a batch with 8-10 tons 180.000 10.800 90.000 27.000 4.200 312.000 cm 312.000 cm 312.000 cm	ate cem ent cont trial len ching pla ne vibrat

	and surface vibrators, I form work with sturdy construction & longitud filling joints with approvitem of joint fillers, seal considered in M-30 is @ separately.Cement con	M.S. chan inal joints (ved joint fille ants, dowel 340 kg/cur	nel section 10 mm wide er and seala bars with sl m. Excess/le	s, curing, mex 50 mm dex 5	naking proverse) by groeste all as persisted as paid	ision for coove cutting or direction (see separately)	ontraction / machine, pr of Engineer . Note: Cem	expansion, oviding and in-charge (
	Auction hall front	1	40.000	30.000	0.150		180.000	
	side	2	6.000	6.000	0.150		10.800	
	AH west side	1	40.000	15.000	0.150		90.000	
	for road	1	30.000	6.000	0.150		27.000	
	rounded	1	4.200	, 60 <sub>1</sub>			4.200	
			100		Tota	al Quantity	312.000 c	um
		1	C3 1	To	otal Deducte	d Quantity	0.000 cum	1
		613	YER	S1/1	Net Tota	al Quantity	312.000 c	um
		180	Say 31	2.000 cum	@ Rs 10302	.33 / cum	Rs 321	4326.96
4	5.22A.6 Steel reinforcement fo binding all complete at			The second secon				0D or more
	qty of CC	ther En	2307.8001	ng Orga	anisatio	<b>NS</b> 75.0	23085.000	@75Kg/m 3
	rounded		15.000				15.000	@75Kg/m 3
					Tota	al Quantity	23100.000	kg
				То	tal Deducte	d Quantity	0.000 kg	
					Net Tota	al Quantity	23100.000	kg
			Sa	ay 23100.00	00 kg @ Rs 9	98.30 / kg	Rs 227	0730.00
5	16.44 Extra for providing as specification in ceme	J	ū	compound	of approve	ed quality a	as per man	ufacturer's
	q t y o f c c 307.8*340=104652(20 93 bags	1	2093.000			0.2	418.600	@.20 Kg/bag
	Rounded	1	6.400				6.400	@.20 Kg/bag
					Tota	al Quantity	425.000 L	itre
				То	otal Deducte	d Quantity	0.000 Litre	Э

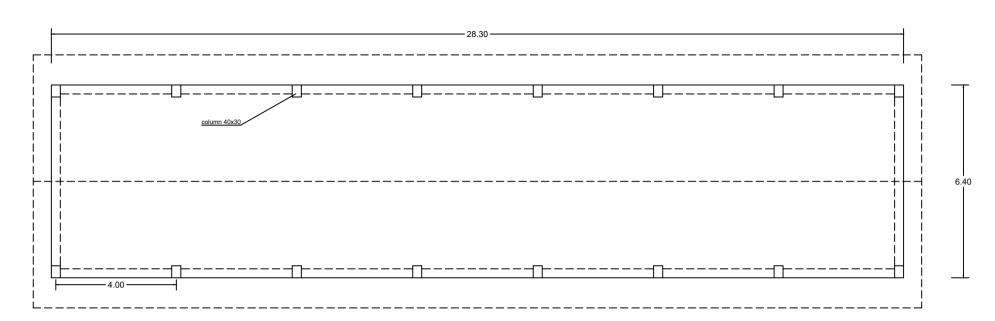
					Net Tota	al Quantity	425.000 L	itre
			Say	/ 425.000 Li	tre @ Rs 59	.86 / Litre	Rs 25	440.50
SI No	Description	No	L	В	D	CF	Quantity	Remark
		5 Appe	ndix E - Co	nstruction	of Drain			
1	2.8.1 Earth work in excavati trenches or drains (not ramming of bottoms, lifexcavated soil as direct	exceeding	g 1.5 m in w i m, includir	ridth or 10 s	sqm on plar ut the exca	ı), including	dressing o	f sides and
	main drain from Auction hall to sump	1	50.000	1.300	1.000		65.000	
			Be	-/B	Tota	al Quantity	65.000 cu	m
			-//1	To	otal Deducte	d Quantity	0.000 cum	า
		1	53 4		Net Tota	al Quantity	65.000 cu	m
		11	Say	y 65.000 cui	m @ Rs 296	5.94 / cum	Rs 19	301.10
	Earth work in excavat (exceeding 30 cm in de	epth, 1.5 m	in width as	well as 10	sqm on pla	n) including	disposal of	f excavate
	(exceeding 30 cm in de earth, lead up to 50 m a soil	epth, 1.5 m	in width as	well as 10 posed earth	sqm on pla	n) including led and nea	disposal of	f excavated
	(exceeding 30 cm in de earth, lead up to 50 m a soil	epth, 1.5 m and lift up t	in width as o 1.5 m, dis	well as 10 posed earth	sqm on pla	n) including led and nea	disposal of	f excavated
	(exceeding 30 cm in de earth, lead up to 50 m a soil  Pit of sump	epth, 1.5 m and lift up t	in width as o 1.5 m, dis	well as 10 posed earth	sqm on pla to be level	n) including led and nea	disposal of atly dressed	f excavated
	(exceeding 30 cm in de earth, lead up to 50 m a soil  Pit of sump  soak pit 2m dia	epth, 1.5 m and lift up t ther En	in width as o 1.5 m, dis	well as 10 posed earth	sqm on pla to be level 2.450 2.100	n) including led and nea	80.360 6.594 3.046	f excavated All kinds o
	(exceeding 30 cm in de earth, lead up to 50 m a soil  Pit of sump  soak pit 2m dia	epth, 1.5 m and lift up t ther En	in width as o 1.5 m, dis	well as 10 posed earth	sqm on pla to be level 2.450 2.100	n) including led and nea	80.360 6.594 3.046	f excavated All kinds o
	(exceeding 30 cm in de earth, lead up to 50 m a soil  Pit of sump  soak pit 2m dia	epth, 1.5 m and lift up t ther En	in width as o 1.5 m, dis	well as 10 posed earth	sqm on pla to be level 2.450 2.100 Total	n) including led and nea	80.360 6.594 3.046 90.000 cu	f excavated. All kinds of
3	(exceeding 30 cm in de earth, lead up to 50 m a soil  Pit of sump  soak pit 2m dia	epth, 1.5 m and lift up the En	in width as o 1.5 m, dis o 1.5	well as 10 posed earth 4.000 g	Total Deducte  Net Tota  Medical Grade e	n) including led and near ns  al Quantity d Quantity al Quantity .03 / cum	80.360 6.594 3.046 90.000 cur 90.000 cur Rs 19	m m 262.70
3	(exceeding 30 cm in de earth, lead up to 50 m a soil  Pit of sump  soak pit 2m dia  round of  4.1.8  Providing and laying in shuttering - All work up	epth, 1.5 m and lift up the En	in width as o 1.5 m, dis o 1.5	well as 10 posed earth 4.000 g	Total Deducte  Net Tota  Medical Grade e	n) including led and near ns  al Quantity d Quantity al Quantity .03 / cum	80.360 6.594 3.046 90.000 cur 90.000 cur Rs 19	m m 262.70
3	(exceeding 30 cm in de earth, lead up to 50 m a soil  Pit of sump  soak pit 2m dia  round of  4.1.8  Providing and laying in shuttering - All work up nominal size)	position ce	sament concrevel:1:4:8 (	well as 10 posed earth 14.000 S 1*1  To y 90.000 cur ete of speci	Total Deducte  Net Total  Medical Grade et a coarse sa	n) including led and near ns  al Quantity d Quantity al Quantity .03 / cum	80.360 6.594 3.046 90.000 cu 90.000 cu Rs 19 e cost of ce ed stone ag	m m 262.70
3	(exceeding 30 cm in de earth, lead up to 50 m a soil  Pit of sump soak pit 2m dia round of  4.1.8 Providing and laying in shuttering - All work up nominal size) for drain	position ce to plinth le	sament concrevel:1:4:8 (**	well as 10 posed earth 14.000 S 1*1  To y 90.000 cur ete of speci 1 cement : 4	Total Deducte  Net Total  Medical Grade et a coarse sa  0.150	n) including led and near ns  al Quantity d Quantity al Quantity .03 / cum	80.360 6.594 3.046 90.000 cu 90.000 cu Rs 19 e cost of ce ed stone ag	m m 262.70
3	(exceeding 30 cm in de earth, lead up to 50 m a soil  Pit of sump soak pit 2m dia round of  4.1.8 Providing and laying in shuttering - All work up nominal size) for drain sump bottom	position ce to plinth le	sament concrevel:1:4:8 (** 50.000 8.200	well as 10 posed earth 14.000 S 1*1  To y 90.000 cur ete of speci 1 cement : 4	Total Deducte Net Total m @ Rs 214 fied grade e4 coarse sa  0.150 0.200	n) including led and near ns  al Quantity d Quantity al Quantity .03 / cum	80.360 6.594 3.046 90.000 cu 90.000 cu Rs 19 e cost of ce ed stone ag 9.750 6.560	m m 262.70 ntering an
3	(exceeding 30 cm in de earth, lead up to 50 m a soil  Pit of sump soak pit 2m dia round of  4.1.8 Providing and laying in shuttering - All work up nominal size) for drain sump bottom	position ce to plinth le	sament concrevel:1:4:8 (** 50.000 8.200	well as 10 posed earth 124.000 g 1*1  To y 90.000 cure ete of special cement : 4  1.300 4.000	Total Deducte Net Total m @ Rs 214 fied grade e4 coarse sa  0.150 0.200	n) including led and near ns  al Quantity d Quantity al Quantity .03 / cum excluding the nd: 8 grad	80.360 6.594 3.046 90.000 cu 90.000 cu Rs 19 e cost of ce ed stone ag 9.750 6.560 0.690	m 262.70  ntering and gregate 40

	Say 17.000 cum @ Rs 6814.89 / cum					Rs 11	5853.13								
4	5.1.2 Providing and laying in centering, shuttering, fin sand :3 graded stone ag	nishing and	reinforceme	nt - All worl			•								
	drain bottom slab	1	50.000	1.200	0.100		6.000								
	side wall	2	50.000	1.000	0.200		20.000								
	cover slad for drain 50/.5	100	1.000	0.500	0.150		7.500								
	cover slab sump	16	3.500	0.500	0.120		3.360								
	do beam	1	7.500	0.300	0.300		0.675								
	cover slab soak pit	1	3.140	1.100	0.120		0.415								
	round	1	0.050		-		0.050								
		[	30 3	8. W	Tot	al Quantity	38.000 cu	m							
			13244	To	otal Deducte	d Quantity	0.000 cum	า							
	Net Total Quantity 38.000 cum														
				4				Say 38.000 cum @ Rs 9085.14 / cum Rs 345235.32							
5	5.9.1	HE.	Say	38.000 cum	n @ Rs 908	4	Rs 34	5235.32							
5	5.9.1 Centering and shutterin columns, etc for mass of	g including	THE COLUMN	11 22/		5.14 / cum									
5		g including concrete 2	THE COLUMN	11 22/		5.14 / cum									
5	Centering and shutterin columns, etc for mass of		strutting, et	c. and remo		5.14 / cum	ions, footing								
5	Centering and shuttering columns, etc for mass of side wall drain out	2	strutting, et	c. and remong org	oval of form anisatio	5.14 / cum	ions, footing	gs, bases							
5	Centering and shuttering columns, etc for mass of side wall drain out	2	strutting, et	c. and remong org	oval of form anisatio	for:Foundatins	100.000 90.000	gs, bases							
5	Centering and shuttering columns, etc for mass of side wall drain out	2	strutting, et	c. and remong org	Tot	for:Foundatins	100.000 90.000 190.000 s	gs, bases qm							
5	Centering and shuttering columns, etc for mass of side wall drain out	2	50.000 50.000	c. and remonder of the control of th	Tot	for:Foundates al Quantity d Quantity al Quantity	100.000 90.000 190.000 s 0.000 sqn	gs, bases qm							
5	Centering and shuttering columns, etc for mass of side wall drain out	2 2	strutting, et 50.000 50.000 Say	c. and remond of the control of the	Tot Net Tot m @ Rs 335	for:Foundatins al Quantity d Quantity al Quantity 5.31 / sqm	100.000 90.000 190.000 s 0.000 sqn 190.000 s Rs 63	qm qm qm 708.90							
	Centering and shuttering columns, etc for mass of side wall drain out side wall drain in  5.9.5 Centering and shuttering and shuttering and shuttering columns, etc for mass of side wall drain out side wall drain in	2 2	strutting, et 50.000 50.000 Say	c. and remond of the control of the	Tot Net Tot m @ Rs 335	for:Foundatins al Quantity d Quantity al Quantity 5.31 / sqm	100.000 90.000 190.000 s 0.000 sqn 190.000 s Rs 63	qm qm qm 708.90							
	Centering and shuttering columns, etc for mass of side wall drain out side wall drain in  5.9.5 Centering and shuttering girders bressumers and For cover slab drain	2 2 ng includin	strutting, et 1910-000 50.000 Say	c. and remonder of the control of th	Tot Net Tot m @ Rs 335	for:Foundatins al Quantity d Quantity al Quantity 5.31 / sqm	100.000 90.000 190.000 s 0.000 sqn 190.000 s Rs 63	qm qm qm 708.90							
	Centering and shuttering columns, etc for mass of side wall drain out side wall drain in  5.9.5 Centering and shuttering girders bressumers and For cover slab drain 105 x 50 x 15 cm  For cover slab Effluent	2 2 ng including cantileve	strutting, et 50.000 50.000 Say g strutting, et 75 3.100	c. and remond of the control of the	Tot Net Tot m @ Rs 335	for:Foundatins al Quantity d Quantity al Quantity 5.31 / sqm	100.000 90.000 190.000 s 0.000 sqn 190.000 s Rs 63	qm qm qm 708.90							
	Centering and shuttering columns, etc for mass of side wall drain out side wall drain in  5.9.5 Centering and shuttering girders bressumers and For cover slab drain 105 x 50 x 15 cm For cover slab Effluent tank sides	2 2 ng includin d cantileve 100	Say g strutting, et 50.000 So.000 Say g strutting, et 3.100 8.000	c. and remond of the control of the	Tot Net Tot m @ Rs 335	for:Foundatins al Quantity d Quantity al Quantity 5.31 / sqm	100.000 90.000 190.000 s 0.000 sqn 190.000 s Rs 63 s, beams, pl	qm qm qm 708.90							

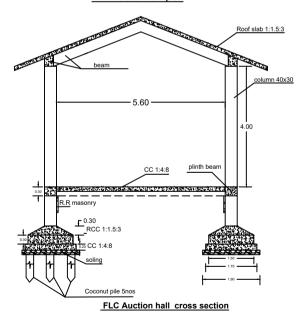
				To	otal Deducted	Quantity	0.000 sqn	1
					Net Total	Quantity	70.000 sq	m
		82 / sqm	Rs 45	487.40				
7	5.22A.1 Steel reinforcement for R.C.C work including straightening, cutting, bending, placing in position as binding all complete above plinth level.Mild steel and Medium Tensile steel bars							
	Qty of CC 38	1	38.000			90.0	3420.000	
					Total	Quantity	3420.000	kilogram
				To	otal Deducted	Quantity	0.000 kilo	gram
					Net Total	Quantity	3420.000	kilogram
		;	Say 3420.00	0 kilogram (	@ Rs 96.68 /	kilogram	Rs 330	0645.60
	size confirming to IS 21 1:6 (1 cement : 6 coars	se sand) et	complete		44	hickness 2		pove in:
	tank side wall	1 1	21.900	0.200	2.500	To the second	10.950	
	soak pit 2.00m dia - bottom	1	6.280	0.200	0.300		0.377	
			1,500				0.070	
	Rounded	1	0.673				0.673	
		. 1	0.673 ngineeri	ng Org	anisation	Quantity	12.000 cu	m
		. 1			anisat on Total			
		. 1			otal Deducted		12.000 cu	า
		. 1	ngineeri	To	otal Deducted	Quantity Quantity	12.000 cu 0.000 cun 12.000 cu	า
9	6.23 Honey-comb brick work structure above plinth le	ther Er	Say m thick with o	12.000 cum	Net Total  Rs 5908.  rnt clay brick	Quantity Quantity 32 / cum	12.000 cu 0.000 cun 12.000 cu Rs 70	n m <b>899.84</b> 7.5 in su
9	6.23 Honey-comb brick work	ther Er	Say m thick with o	12.000 cum	Net Total  Rs 5908.  rnt clay brick	Quantity Quantity 32 / cum	12.000 cu 0.000 cun 12.000 cu Rs 70	n m <b>899.84</b> 7.5 in su
9	6.23 Honey-comb brick work structure above plinth lessoak pit 2.00m dia -	10/11.4 cr	Say m thick with coor V level w	12.000 cum	Net Total  Rs 5908.  rnt clay brick	Quantity Quantity 32 / cum	12.000 cu 0.000 cun 12.000 cu Rs 70 designation	n m <b>899.84</b> 7.5 in su
9	6.23 Honey-comb brick work structure above plinth le soak pit 2.00m dia -bottom	ther Er	Say m thick with coor V level w 6.280	12.000 cum	Net Total  Net Services  Net Total  Res 5908.  rnt clay bricks mortar 1:4 (1	Quantity Quantity 32 / cum	12.000 cu 0.000 cun 12.000 cu Rs 70 designation 4 coarse sar 8.165	7.5 in sund).
9	6.23 Honey-comb brick work structure above plinth le soak pit 2.00m dia -bottom	ther Er	Say m thick with coor V level w 6.280	12.000 cum common bu rith cement 1.300	Net Total  Net Services  Net Total  Res 5908.  rnt clay bricks mortar 1:4 (1	Quantity Quantity 32 / cum s of class of cement : 4	12.000 cu 0.000 cun 12.000 cu Rs 70 designation 4 coarse sar 8.165 0.835	7.5 in sund).
9	6.23 Honey-comb brick work structure above plinth le soak pit 2.00m dia -bottom	ther Er	Say m thick with coor V level w 6.280	12.000 cum common bu rith cement 1.300	Net Total  Net Total  Rs 5908.  rnt clay bricks mortar 1:4 (1	Quantity Quantity 32 / cum s of class of cement : 4	12.000 cu 0.000 cun 12.000 cu Rs 70 designation 4 coarse sar 8.165 0.835 9.000 sqn	7.5 in sund).

			1		1			1
	for Drain side wall - inside	1	50.000	2.600			130.000	
	Effluent tank side wall	2	31.600	2.500			158.000	
	cross wall	2	3.200	2.500			16.000	
	bottom	1	7.600	3.200			24.320	
	Rounded	1	1.680				1.680	
					Tota	al Quantity	330.000 s	qm
				T	otal Deducte	d Quantity	0.000 sqn	า
					Net Tota	al Quantity	330.000 s	qm
			Say	330.000 so	ηm @ Rs 386	.36 / sqm	Rs 127	7498.80
SI No	Description	No	L/Car	В	D	CF	Quantity	Remark
			6 Seawall St	trengtheni	ng			
	Lu	mp-Sum T	otal		2	R	s 20000000.	00
	SI No Descr	iption	No	5 1/1	В	D	CF	Quantity
Remark		15	7 Sub	soil inves	tigation	<u> </u>		
	Lu	mp-Sum T	otal	VEN !	7	R	s 1500000.	00
	SI No Descr	iption	No	L	В	D	CF	Quantity
Remark		8 V	Vater supply	and sanit	ary arranger	ment		
	Q	mp-Sum T	otglineeri	ng Org	anisatio	ns R	s 2500000.	00
	SI No Descr	iption	No	L	В	D	CF	Quantity
Remark			9 Electrific	ation and y	yard lighting			
	Lu	mp-Sum T	otal			R	s 1550000.0	00
	SI No Descr	iption	No	L	В	D	CF	Quantity
Remark			10 Unfores	een exper	nses @ 2.5%	)		
	Lu	mp-Sum T	otal			R	s 4900000.0	00
			Pro	ovision for (	GST paymen	ts (in %) @	18	.0%
			Amount rese	rved for GS	ST payments		35991644.2	23
					Total	:	235945223.	23
				Lumpsum	for round off		54776.77	
						тс	TAL Rs 23	6000000.00
						Rounded	Total Rs 2	3,60,00,000
					Rupees T	wenty Thre	e Crore Sixt	y Lakh Only
					•	•		

(Cost Index Applied for this estimate is 35.59%)



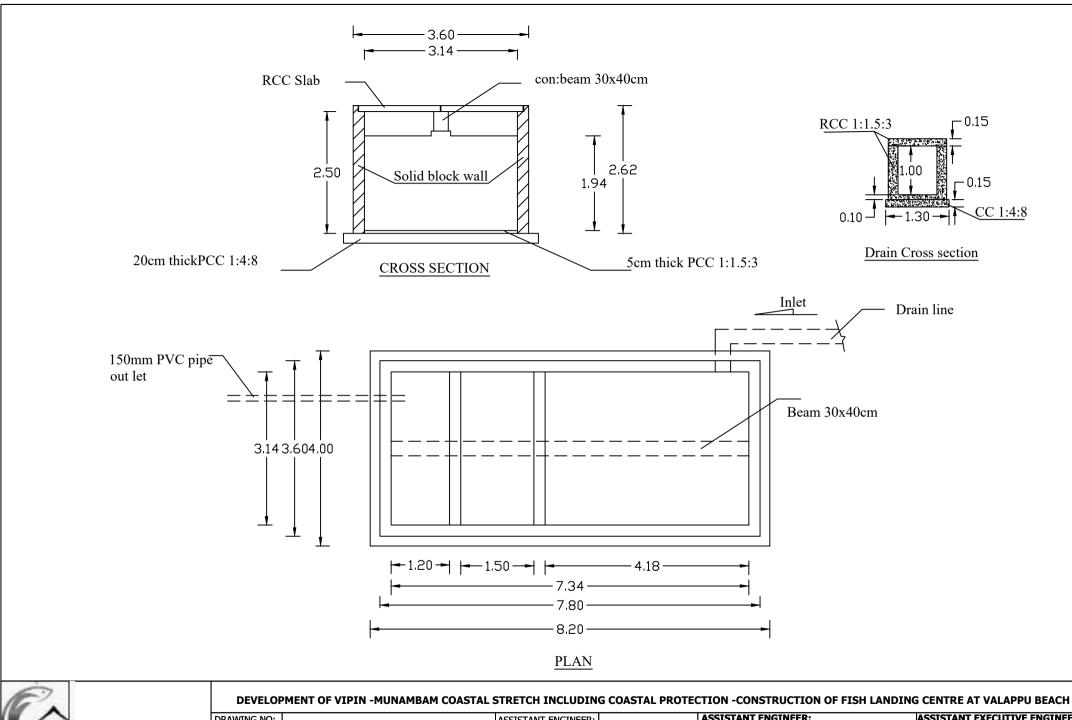
#### FLC Auction hall plan





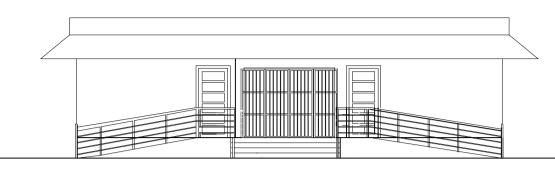
### DEVELOPMENT OF VIPIN -MUNAMBAM COASTAL STRETCH INCLUDING COASTAL PROTECTION -CONSTRUCTION OF FISH LANDING CENTRE AT VALAPPU BEACH

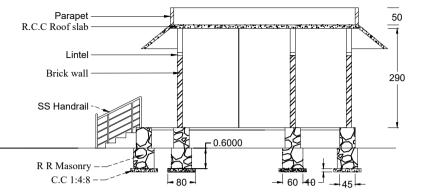
STAI	DRAWING NO:		ASSISTANT ENGINEER:		ASSISTANT ENGINEER: SIGNATURE:	ASSISTANT EXECUTIVE ENGINEER: SIGNATURE:
	DATE:		DRAWN:			
	TYPE:	DRAWING	REVIS	ION		CHIEF ENGINEER: SIGNATURE:
	TITLE.	ELC AUCTION HALL DIAM & CECTION	1.		DESIGNED & CHECKED BY	
	TITLE:	FLC AUCTION HALL PLAN & SECTION				





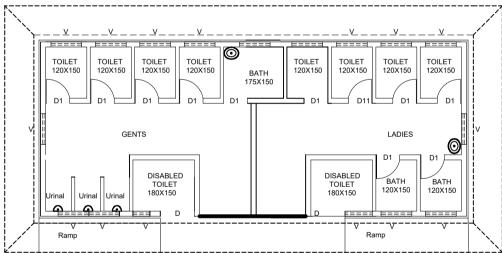
AL	DRAWING NO:		ASSISTANT ENGINEER:		ASSISTANT ENGINEER: SIGNATURE:	ASSISTANT EXECUTIVE ENGINEER: SIGNATURE:
	DATE:		DRAWN:			
	TYPE:	DRAWING	REVIS	ION	5 : NO C : 5 : E : E : E : E : E : E : E : E : E	CHIEF ENGINEER: SIGNATURE:
	TITLE.	FISH LANDING CENTRE DRAIN AND	1.		DESIGNED & CHECKED BY	
	TITLE:	TREATMENT TANK	2.			



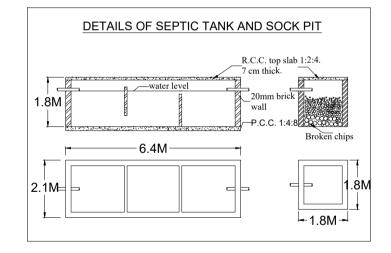


### **ELEVATION**





### Section on A A



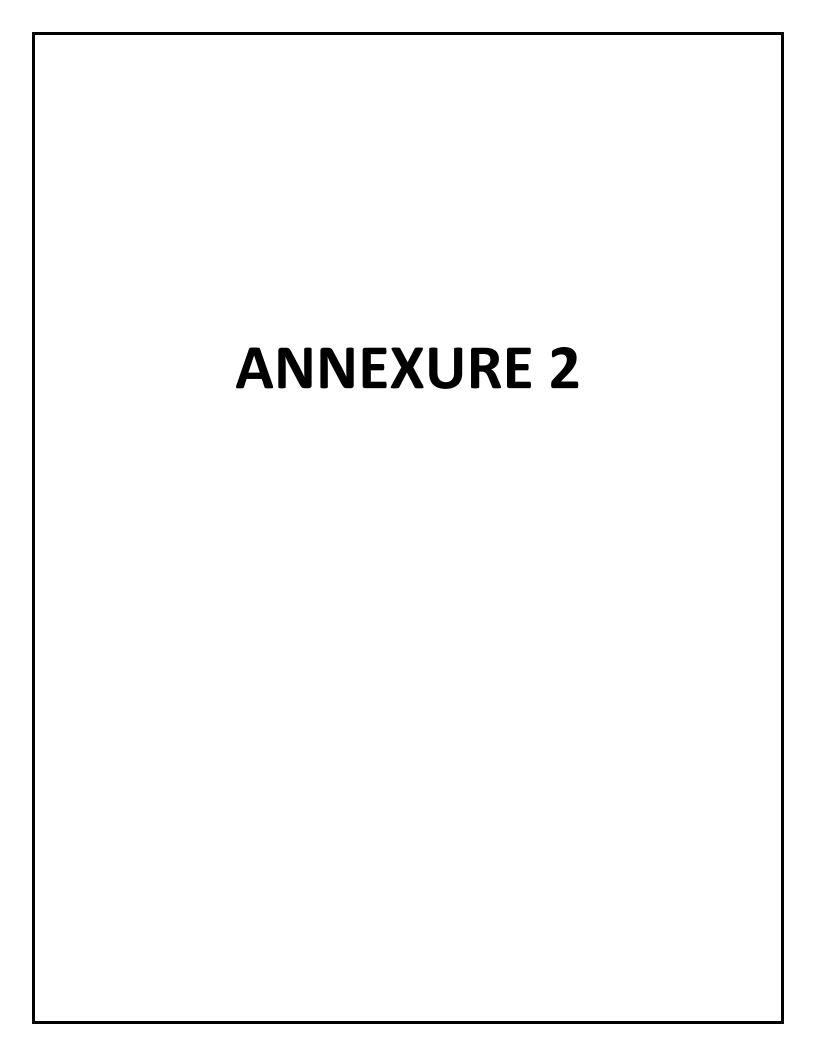






#### DEVELOPMENT OF VIPIN -MUNAMBAM COASTAL STRETCH INCLUDING COASTAL PROTECTION -CONSTRUCTION OF FISH LANDING CENTRE AT VALAPPU BEACH

	DD AMERICANO.			1	ACCICTANT ENCINEED.	ACCICTANT EVECUTIVE ENGINEED.
ΆL	DRAWING NO:		ASSISTANT ENGINEER:		ASSISTANT ENGINEER:SIGNATURE:	ASSISTANT EXECUTIVE ENGINEER: SIGNATURE:
	DATE:		DRAWN:			
	TYPE:	DRAWING	REVIS	ION		CHIEF ENGINEER: SIGNATURE:
	TITLE.	TOILET BLOCK	1.		DESIGNED & CHECKED BY	
	TITLE:	TOILET BLOCK				



## Name of work : DEVELOPMENT OF VYPIN -MUNAMBAM COASTAL STRETCH- INCLUDING COASTAL PROTECTION -CONSTRUCTION OF FISH LANDING CENTRE AT MALIPPURAM ESTIMATE REPORT

This estimate for development of fish landing centre and coastal protection at Malippuram based on the study conducted by IIT Madras for shore protection of Vypin to Munambam stretch in the Ernakulam district of Kerala, wherein groynes are proposed for coastal protection at Malippuram. In this estimate, a series of 4 transitional groynes are proposed. This includes 2 T groynes and 2 normal groynes. A filter layer of 1kg to 10kg category stone, Core layer using 100 to 300 kg stones, Toe Mound using 500 to 800 kg stones, Armour layer using 1.5T to 2.5T stones proposed here. In addition to that 2T tetrapods at 1.96m Thick and 4T tetrapods at 2.50m Thick is provided for armour layer. Provision for Auction hall building of size 28.3m x 6.4m is included in the estimate. For the auction hall, coconut piling of length 6m long is provided for foundation. RCC M20 provided for foundations, centering & shuttering, Reinforcement cement concrete work(M20) in walls is provided for super structure. Necessary Steel reinforcement, plastering and painting works are also included in the Auction hall. Provision for construction of a toilet block of size 12.5m x 5.1m is also included in the estimate. For the toilet block, RR masonry with cement mortar 1:6 is provided for the foundation. Solid block masonry of size 30x20x15cm and 40x20x10cm are provided for super structure. Ceramic tiling is provided in the floor and in the bathroom region. Necessary fittings are also provided for toilet block. Other provisions in the estimate include concrete parking area proposed near the the Auction hall. Provision for the construction ofdrain is also included inthe estimate. Lump sum provision for sub soil investigation, water supply and sanitary arrangement, Electrification and yard lighting are also included in the estimate. Lump sum provision for unforeseen expenses @2.5% are also included in the estimate. Total amount of estimate comes to Rupees 23,60,00000/-(Rupees Twenty three crore Sixty lakhs only) including 18% GST charges but excluding consultancy charges. The estimate is prepared in PRICE based on D SR 2018 and cost index is 35.59%. The provisions adopted in the estimate are adequate for proper completion of work.

### INCLUDING COASTAL PROTECTION AND CONSTRACTION OF FISH LANDING CENTRE AT MALIPPURAM

### **COST ABSTRACT**

1	APPENDIX - A GROYNE	Rs.	18 13 68 224/-
2	APPENDIX B- CONSTRUCTION OF AUCTION		
2	HALL	Rs.	31 99 195/-
3	Appendix C- construction of Toilet block	Rs.	22 56 232/-
4	Appendix D- Parking Area	Rs.	39 04 172/-
5	Appendix E - Drain	Rs.	11 81 928/-
6	Sub soil investigation	Rs.	10 00 000/-
7	Water supply and sanitary arrangement	Rs.	11 00 000/-
8	Electrification and yard lighting	Rs.	10 00 000/-
9	Unforeseen expenses @ 2.5%	Rs.	49 40 000/-
<i>10</i>	Sub Total	Rs.	19 99 49 752/-
<i>11</i>	GST @ 18%	Rs.	3 59 90 955/-
<i>12</i>	Total Amount including GST 18%	Rs.	23 59 40 707/-
<i>13</i>	Lumpsum for Round off	Rs.	59 293/-
<i>14</i>	Total Amount	Rs.	23 60 00 000/-
<i>15</i>	Consultancy @5%	Rs.	1 18 00 000/-
<i>16</i>	GST on consultancy @ 18%	Rs.	21 24 000/-
<i>17</i>	Round off	Rs.	76 000/-
18	Grand Total	Rs.	25 00 00 000/-

Rupees Twenty Five Crore Only

### DEVELOPMENT OF VYPIN -MUNAMBAM COASTAL STRETCH- INCLUDING COASTAL PROTECTION -CONSTRUCTION OF FISH LANDING CENTRE AT

### **MALIPPURAM**

General Abstract

(Dsor year: 2018,Cost Index Applied for this estimate is 35.59%)

SI No	Heading Description	Amount				
1	Appendix A- Groyne	181368223.84				
2	Construction of Auction Hall	3199194.95				
3	Appendix C - Construction of Toilet block	2256232.44				
4	Appendix D- Parking Area	3904172.44				
5	Appendix E- Drain	1181928.31				
6	Subsoil Investigation	1000000.00				
7	Water supply and sanitary arrangement	1100000.00				
8	Electrification and yard lighting	1000000.00				
9	Unforeseen expenses@2.5%	4940000.00				
	Provision for GST payments (in %) @	18.0%				
	Amount reserved for GST payments	35990955.36				
	Total	235940707.36				
	Lumpsum for round off	59292.64				
	Philipped a P2/	TOTAL Rs 236000000.00				
	Other Engineering Organisation Rounded Total Rs 23,60,00,000					
	Rupees Twenty Three Crore Sixty Lakh On					

(Cost Index Applied for this estimate is 35.59%)

# DEVELOPMENT OF VYPIN -MUNAMBAM COASTAL STRETCH- INCLUDING COASTAL PROTECTION -CONSTRUCTION OF FISH LANDING CENTRE AT MALIPPURAM

## Detailed Estimate

(Dsor year: 2018,Cost Index Applied for this estimate is 35.59%)

SI No	Description	No	L	В	D	CF	Quantity	Remark
			1 Appendi	x A- Groyne	)			
1	od199258/2023_2024 [Based on 65.32]Supple 1.5T to 2.5T(70% of stage of the contractor of the breakwater to the levels including all cost of the contractor of the breakwater to the levels including all cost of the contractor of the breakwater to the levels including all cost of the breakwater to the levels include all the l	cones > 2.0 ming the present maching gorised store with appreyed to the selines and labout packing and hire setc inclu	ort) category imary armounderies, labournes after properties after properties after properties as pr	stones of a ir and berm ir charges re per sorting a are having p gnment of the per approved re and opera oile crane, in heries for idental cha	opproved que of rubble me equired at correct as a correct	ality having ount breakw luarry and a weigh bridg sing contrater and form with toleranges of mobile profile ond he roadware.	specific gravater inclusive at sorting place installed a ctors supplied in the primarce of +/- 20 ille crane and the in a week ay for move	vity range e of cost of ce and the t site at the ed paper ary armout cm in final excavator and cost of rement of
			750	Groyne-1				
	Chainage 0 to 60m	tner Ei	2712.690	ng Orga	anisatic	ns	2712.690	
				Groyne- 2				
	Chainage 0 to 120m	1	3875.300				3875.300	
				Groyne-3				
	Chainage 0 to 120m	1	3875.300				3875.300	
			•	Groyne- 4				
	Chainage 0 to 60m	1	2712.690				2712.690	
					Tota	al Quantity	13175.980	tonne
				To	tal Deducte	d Quantity	0.000 tonn	ie
					Net Tota	al Quantity	13175.980	tonne
			Say 13175	.980 tonne	@ Rs 1781.	12 / tonne	Rs 2346	8001.50
2	2.6.1 Earth work in excava (exceeding 30 cm in dearth, lead up to 50 m soil	epth, 1.5 n	n in width as	well as 10	sqm on pla	n) including	g disposal of	excavate

	From Ch 0.00 to 40.00m	4	40.000	35.000	2.000		11200.000		
					Tota	al Quantity	11200.000	cum	
				То	tal Deducte	d Quantity	0.000 cum	1	
					Net Tota	al Quantity	11200.000	cum	
			Say 11	200.000 cur	m @ Rs 214	.03 / cum	Rs 239	7136.00	
3	od199259/2023_2024 Supplying blasted rock category stones of ap primary armour and be machineries, labour of catagorised stones aft contractor with approve conveyed to the approve to the lines and levels cost and labour charges and packing and using and hire of machineries incidental charges etc.	proved qua erm of ruble charges re er proper sed software red alignment as per app s, hire and mobile crar	ality having ole mount be equired at quired at quired are to having print of the bree roved drawing operational cone, inspecting the roadw	specific gra reakwater in uarry and aken on we atouts using akwater and ngs with tole charges of m g the profile ay for move	avity ranges nclusive of at sorting eigh bridge contractors d forming the erance of +/ nobile crane once in a we ement of lore	s from 2.65 cost of store place and installed at supplied per primary are 20 cm in the and excavateek and costies/tippers/	to 2.8 for fores, hire of the measure site at the apers, station mour of the final levels in ator, rehandlist of spalls/queranes etc in	orming the lorries and cost of the pheries and breakwate neluding a long, placing uarry much cluding a neluding a	
	Toe Mound usi	ng 500 to 8	00 kg stones	s (Assuming	1/3 void an	d sp.gravity	2.7)- Groyno	e 1	
	Chainage 0 to 60m	ther Er	1466.450	ng Orga	ani.050io	ns	1539.773		
	T Head(30m)	1	1981.690		1.050		2080.775		
	Head	2	459.860		1.050		965.706		
				Groyne- 2					
	Chainage 0 to 120m	1	4490.180		1.050		4714.689		
	Head	1	351.820		4.050				
			0011020	Groyne- 3	1.050		369.411		
	Chainage 0 to 120m	1	4490.180	Groyne- 3	1.050		369.411 4714.689		
	Chainage 0 to 120m	1		Groyne- 3					
			4490.180	Groyne- 3 Groyne- 4	1.050		4714.689		
			4490.180		1.050		4714.689		
	Head	1	4490.180 485.070		1.050 1.050		4714.689 509.324		
	Head Chainage 0 to 60m	1	4490.180 485.070 1466.450		1.050 1.050 1.050		4714.689 509.324 1539.773		
	Head  Chainage 0 to 60m  T Head(30m)	1 1 1	4490.180 485.070 1466.450 1981.690		1.050 1.050 1.050 1.050 1.050	al Quantity	4714.689 509.324 1539.773 2080.775	tonne	
	Head  Chainage 0 to 60m  T Head(30m)	1 1 1	4490.180 485.070 1466.450 1981.690	Groyne- 4	1.050 1.050 1.050 1.050 1.050		4714.689 509.324 1539.773 2080.775 896.407		

			Say 19411.3	22 tonne @	② Rs 1781.1	2 / tonne	Rs 3457	'3893.84	
4	[Based on 65.30]Supplying granite blasted rock from approved quarry to sorting site by lorry/ tipper, an sorting the stones into 100kg to 300kg category stones of approved quality having specific gravity rangin from 2.65 to 2.8 for forming the core of rubble mound breakwater inclusive of cost of stones, hire contributes and machineries, labour charges required at quarry and at sorting place and measurements of categorized stones after proper sorting are taken on weigh bridge installed at site at the cost of the contractor with approved software having printouts using contractors supplied papers, stationeries and conveyed to the approved alignment of the breakwater and rehandling and forming the core of the breakwater to the lines and levels as per the approved drawings and inspecting the profile once in a week with tolerance of +/- 20cm in final levels including all cost and labour charges, hire and operational charges of light crane and cost of spalls/ quarry muck and labour for forming the roadway for movement of lorriest tippers / cranes etc including all incidental charges etc complete as per the direction of departments officers at site br> Ernakulam District								
	tippers / cranes etc including all incidental charges etc complete as per the direction of departments officers at site br> Ernakulam District  Core layer using 100 to 300 kg stones (Assuming 1/3 void and sp.gravity 2.7)- Groyne 2								
	Chainage 0 to 60m	1	2828.870		1.100		3111.757		
	T Head(30m)	1	1374.080	$\Delta Z \lambda$	1.100		1511.488		
	Head	2	282.960		1.100		622.512		
		144	C	Groyne- 2		ha.F			
	Chainage 0 to 120m	1	5890.370		1.100		6479.407		
	Head	ther E	506.930 ngineerin	g Orga Groyne- 3	1.100. anisatioi	1S	557.623		
	Chainage 0 to 120m	$D_1$	5890.370		1.100		6479.407		
	Head	1 -	314.970		1.100	1	346.468		
			(	Groyne-4					
	Chainage 0 to 60m	1	2828.870		1.100		3111.757		
	T Head(30m)	1	1374.080		1.100		1511.488		
	Head	2	235.400		1.100		517.881		
					Total	Quantity	24249.788	tonne	
				To	tal Deducted	Quantity	0.000 tonr	ne	
					Net Total	Quantity	24249.788	tonne	
			Say 24249.7	88 tonne @	2 Rs 1610.7	5 / tonne	Rs 3906	0346.02	
5	Say 24249.788 tonne @ Rs 1610.75 / tonne Rs 39060346.02  od209112/2023_2024  Supplying granite quarry run from approved quarry to sorting site by lorry/ tipper, and sorting the stone into 1 kg to 10 kg category stones of approved quality with specific gravity ranging from 2.65 to 2.8 forming the filter layer of breakwater inclusive of cost of stones, hire of lorries and machineries, labout charges required at quarry and at sorting place and the measurements of categorized stones after proper sorting are taken on weigh bridge installed at site at the cost of the contractor with approved software.								

	having printouts using contractors supplied papers, stationeries and conveyed to the approved alignment of the breakwater including conveyance from sorting platform and dumping stones using tippler (3.5x2.5											
	sqm size) or any suitab	•		• .		. •	•	,				
	20T and placing the s			•	_		•	•				
	breakwater as per the hire and operational ch	• •	J	ū		•		٦				
	direction of departmen	•				tai charges e	ito. complete	as per tile				
	Filter layer u	sing 1 to 10	kg stones (	Assuming 1	/3 void and	d sp.gravity 2	.7)- Groyne	1				
	Chainage 0 to 60m	1	871.140				871.140					
	T Head(30m)	1	511.430				511.430					
	Head	2	251.980				503.960					
	Groyne- 2											
	Chainage 0 to 120m	1	1856.210				1856.210					
	Head	1	291.110		Í		291.110					
		618	Y. R.	Groyne- 3	Th	1						
	Chainage 0 to 120m	1	1856.210		T3		1856.210					
	Head	1	281.750	Vay.		4	281.750					
		TOP		Groyne- 4								
	Chainage 0 to 60m	1	871.140	100			871.140					
	T Head(30m)	ther En	511.430	ng Orga	anisati	ons	511.430					
	Head	2	238.990				477.980					
					To	otal Quantity	8032.360	tonne				
				То	tal Deduc	ted Quantity	0.000 tonr	ne				
					Net To	otal Quantity	8032.360	tonne				
			Say 8032	.360 tonne (	@ Rs 1640	0.26 / tonne	Rs 1317	75158.81				
6	65.103											
	Moulding and supplying	`	, .	J	00 0							
	to 20mm and 30% 20r mix proportion 0.5:1:1		_	_				-				
	gravity of fine aggregat	-	_		•			, ,				
	cement shall be 43 gra						•	• /				
	day - 30 N/mm2 and m		-	_	_							
	and plants, mould, cu departmental officers	_	dling and s	tacking cha	rges etc.,	complete as	s per the ins	struction of				
	ARMOUR LAYER, 2T											
	tetrapods at 1.96m						4485.000					
	Thick											
					To	otal Quantity	4485.000	each				

7	65.104				tal Deducted	i Quantity	0.000 eac	n
7	65,104				Net Tota	I Quantity	4485.000	each
7	65.104		Say 448	5.000 each	@ Rs 7596.	47 / each	Rs 3407	0167.95
	Conveying 0.8cum (2T) specification and formin layer including hire and departmental officers at	g the armo	ur layer of	breakwater	to lines and	levels over	the second	ary armo
	ARMOUR LAYER, 2T tetrapods at 1.96m Thick	4485					4485.000	
			Bu	100	Tota	I Quantity	4485.000	each
				То	tal Deducted	d Quantity	0.000 eac	h
		1	J 4		Net Tota	I Quantity	4485.000	each
		PLI	Say 44	85.000 each	n @ Rs 912.	92 / each	Rs 409	4446.20
	and the cement shall be (ii) @ 28 day - 30N/mm2 of tools and plants moul and instructions of Engir	2 and minim ding and re	um density	of concrete	2.5 g/cc. inc	luding hire	and operation	onal chai
	tetrapods at 2.50m	1013					1615.000	pecificat
	tetrapods at 2.50m Thick	1013			Tota	I Quantity		
		1013		To		I Quantity	1615.000	each
		1013		То	tal Deducted	l Quantity	1615.000 0.000 eac	each h
		1013	Say 1615		tal Deducted	I Quantity I Quantity	1615.000 0.000 eac 1615.000	each h

				To	tal Deducte	d Quantity	0.000 eac	h
					Net Tota	al Quantity	1615.000	each
			Say 161	5.000 each	@ Rs 2042	.97 / each	Rs 329	9396.55
10	od199265/2023_2024 Supplying and laying necessary overlaps, a departmental officers	all cost, co	_			•	• /	•
			1	Groyne- 1	<b>.</b>	T	T	
	Chainage 0 to 60m	1	60.000		40.000		2400.000	
	T Head(30m)	1	30.000		40.000		1200.000	
			100	Groyne- 2				
	Chainage 0 to 120m	1	120.000	40.000			4800.000	
				Groyne- 3				
	Chainage 0 to 120m	1	4490.180		1.050		4714.689	
		10	1120	Groyne- 4	1-31			
	Chainage 0 to 60m	1	60.000	40.000	بالمارسا	E.	2400.000	
	T Head(30m)	1	30.000	40.000			1200.000	
			A Paris	A SECTION	Tota	al Quantity	16714.689	sqm
	0	ther Er	ngineeri	ng Or <del>g</del>	ital Deducte	d Quantity	0.000 sqm	)
	1				Net Tota	al Quantity	16714.689	sqm
			Say 1	6714.689 so	qm @ Rs 83	3.20 / sqm	Rs 139	0662.12
SI No	Description	No	L	В	D	CF	Quantity	Remark
1	2.8.1	2 C	onstruction	of Auction	Hall			
ı	Earth work in excavati trenches or drains (not ramming of bottoms, li excavated soil as direct	exceeding	g 1.5 m in w 5 m, includin	idth or 10 s	sqm on plar ut the exca	n), including	dressing o	f sides an
	column footing	16	2.100	2.100	1.900		134.064	
	below out side plinth beam	2*7	3.700	0.450	0.600		13.986	
	cross beam	2	5.800	0.450	0.600		3.132	
		1	3.818				3.818	
					Tota	al Quantity	155.000 c	um
				To	tal Deducte	d Quantity	0.000 cum	)
						<u> </u>		

					Net Tota	al Quantity	155.000 c	um		
			Say	155.000 cur	m @ Rs 296	.94 / cum	Rs 46	025.70		
2	od199352/2023_2024 Supplying and stacking	good qualit	y coconut p	iles			,			
	For pile 16 x5 Nos =80 Nos	80	6.000				480.000			
					Tota	al Quantity	480.000 metre			
				To	tal Deducte	d Quantity	0.000 met	re		
	Net Total Quantity 480.000 metre									
	Say 480.000 metre @ Rs 107.64 / metre									
	Coconut Pile- Driving including all hire charg pile driving down after 6x15=90m.	es and labo pointing th	our for fixing	g, staging pl	atform and	all other ap	opliances ne g 15 numbe	cessary		
	For pile	80	6.000	19-27	3 242		480.000			
		al Quantity	480.000 metre 0.000 metre							
			No.	10	tal Deducte	•				
	Net Total Quantity 480.000 metre  Other Engineering 182 16.92 metre  Rs 104121.60									
			Cay is	0.000	O 110 2 10.0	_ ,				
4	od199380/2023_2024 Cutting and removing to piles and stacking within	ne excess I	ength of wo	oden piles t	o lines and	levels and r	emoving the			
4	Cutting and removing t	ne excess I	ength of wo	oden piles t	o lines and	levels and r	emoving the			
4	Cutting and removing to piles and stacking within	ne excess I n 150m	ength of wo	oden piles t		levels and r		e cut end		
4	Cutting and removing to piles and stacking within	ne excess I n 150m	ength of wo			al Quantity	80.000	e cut end		
4	Cutting and removing to piles and stacking within	ne excess I n 150m	ength of wo		Tota	al Quantity	80.000 80.000 me	e cut end etre re		
4	Cutting and removing to piles and stacking within	ne excess I n 150m			Tota tal Deducted Net Tota	al Quantity d Quantity al Quantity	80.000 met 0.000 met 80.000 met	e cut end etre re		
5	Cutting and removing to piles and stacking within	ne excess I n 150m 80	Say 8	To 0.000 metre	Total deducted Net Total @ Rs 154.2	al Quantity d Quantity al Quantity 21 / metre	80.000 met 0.000 met 80.000 met Rs 12	etre etre a336.80 quired) e		
	Cutting and removing to piles and stacking within excess length of pile  2.18.1 Close timbering over a	ne excess I n 150m 80	Say 8	To 0.000 metre	Total deducted Net Total @ Rs 154.2	al Quantity d Quantity al Quantity 21 / metre	80.000 met 0.000 met 80.000 met Rs 12	etre etre a336.80		
	Cutting and removing to piles and stacking within excess length of pile  2.18.1 Close timbering over a complete ( Measureme column excavation	ne excess I n 150m 80 areas includents to be t	Say 8	0.000 metre	Total deducted Net Total @ Rs 154.2	al Quantity d Quantity al Quantity 21 / metre	80.000 met 0.000 met 80.000 met Rs 12 wherever recovered ing 1.	etre etre a336.80		
	Cutting and removing to piles and stacking within excess length of pile  2.18.1 Close timbering over a complete ( Measureme column excavation side	ne excess I n 150m 80 areas includents to be to	Say 8 ding strutting taken of the 2.000	0.000 metre	Tota tal Deducte  Net Tota  @ Rs 154.2  and packing timbered):D	al Quantity d Quantity al Quantity 21 / metre	80.000 met 0.000 met 80.000 met Rs 12 wherever reexceeding 1.	etre etre 336.80 quired) e		

					Net Tota	al Quantity	155.000 s	qm		
			Say	155.000 sqr	m @ Rs 136	3.88 / sqm	Rs 21	216.40		
6	od199892/2023_2024 Providing and laying filt not less than 600 mm vover the entire surface condition complete as pall materials, conveyance	vith smalle behind at er drawing	r size toward outment, with and technic	ds the soil and wall, reteated specificate	and bigger s urn wall to tion Clause	size towards the full hei	the wall an ght, compac	d providicted to fi		
	bottom of column footing	16	1.900	1.900	0.300		17.328			
	rounded	1	0.672				0.672			
			B	·61	Tota	al Quantity	18.000 cu	m		
			100	To	tal Deducte	d Quantity	ty 0.000 cum			
		1	83 B	82	Net Tota	al Quantity				
	Say 18.000 cum @ Rs 1679.73 / cum Rs 30235.14									
	For earth work 16 column	2 ther En	8.000	ng Org	micotio	nc	16.000			
	O1	her En		ng Org	micotio	nc	10.000			
		4	0.000	ing Orgo	amsauc	112	0.000			
	For coconut pilling	1	8.000	ng Orgo			8.000			
	reinforcement work,shuttering@ concrete for footing	1 1 4	8.000 8.000 8.000				8.000 8.000 32.000			
	cc for footing & soling reinforcement work, shuttering@	<b>D</b> 1	8.000		Tota	al Quantity	8.000	ur		
	cc for footing & soling reinforcement work, shuttering@	<b>D</b> 1	8.000	To	Total Deducte		8.000 32.000			
	cc for footing & soling reinforcement work, shuttering@	<b>D</b> 1	8.000	To	tal Deducte		8.000 32.000 64.000 ho	r		
	cc for footing & soling reinforcement work, shuttering@	<b>D</b> 1	8.000	To 64.000 hou	otal Deducte	d Quantity	8.000 32.000 64.000 ho 0.000 hou 64.000 ho	r		
8	cc for footing & soling reinforcement work, shuttering@	1 4 position ce	8.000 8.000 Say	64.000 hou	Net Total Net Total r @ Rs 284	d Quantity al Quantity .60 / hour	8.000  32.000  64.000 ho  0.000 hou  64.000 ho  Rs 18	r ur <b>214.40</b> ntering a		
8	cc for footing & soling  reinforcement work, shuttering@ concrete for footing  4.1.8  Providing and laying in shuttering - All work up	1 4 position ce	8.000 8.000 Say	64.000 hou	Net Total Net Total r @ Rs 284	d Quantity al Quantity .60 / hour	8.000  32.000  64.000 ho  0.000 hou  64.000 ho  Rs 18	r ur <b>214.40</b> ntering a		
8	cc for footing & soling reinforcement work, shuttering@ concrete for footing  4.1.8 Providing and laying in shuttering - All work up nominal size)	position ce	8.000 8.000 Say ement concr evel:1:4:8 (*	ete of speci	Net Total Net Total Ir @ Rs 284 fied grade 6 4 coarse sa	d Quantity al Quantity .60 / hour	8.000  32.000  64.000 ho  0.000 hou  64.000 ho  Rs 18  e cost of ce ed stone ag	r ur <b>214.40</b> ntering a		
8	cc for footing & soling reinforcement work, shuttering@ concrete for footing  4.1.8 Providing and laying in shuttering - All work up nominal size)  column C1 to C16	position ce to plinth le	8.000 8.000 Say ement concr evel:1:4:8 (**	ete of speci 1 cement : 4	Net Total  Res 284  fied grade 64  4 coarse sa  0.200	d Quantity al Quantity .60 / hour	8.000  32.000  64.000 ho  0.000 hou  64.000 ho  Rs 18  e cost of celed stone ag  9.248	r ur <b>214.40</b> ntering a		

	rounded	1	0.260				0.260			
		<u> </u>	0.200		Tota	I Quantity	36.000 cu	m		
				To	otal Deducted	·	0.000 cum			
						I Quantity	36.000 cu			
			Say	36.000 cum	@ Rs 6814			5336.04		
9	5.1.2 Providing and laying ir centering, shuttering, fir sand :3 graded stone as	nishing and	reinforceme	nt - All worl			•			
	column footing C1 to C16	16	1.500	1.500	0.300		10.800			
		16	((1.5*1.5)+ (.4*.3))/2	M.	0.300		5.688			
	column up to plinth	16	0.300	0.400	1.000		1.920			
	rounded	1	0.592	31/1		H	0.592			
		18	1339		Tota	I Quantity	19.000 cu	m		
	Total Deducted Quantity 0.000 cum									
			Mark Street	I a Par	Net Tota	I Quantity	19.000 cu	m		
	Say 19.000 cum @ Rs 9085.14 / cum Rs 172617.66									
10	5.2.2	ther Er	ngineerii				Rs 172	2617.66		
10	5.2.2 Reinforced cement con and string courses, fille excluding cost of cente 3 graded stone aggregations.	crete work ets, column ring, shutte	in walls (any s, pillars, pie ring, finishing	thickness) ers, abutme g and reinfo	including at	ns tached pila nd struts et	sters, buttre	esses, plint		
10	Reinforced cement con and string courses, fille excluding cost of cente	crete work ets, column ring, shutte	in walls (any s, pillars, pie ring, finishing	thickness) ers, abutme g and reinfo	including at	ns tached pila nd struts et	sters, buttre	esses, plint		
10	Reinforced cement con and string courses, fille excluding cost of cente 3 graded stone aggrega	crete work ets, column ring, shutte ate 20 mm	in walls (any s, pillars, pie ring, finishing nominal size	thickness) ers, abutme g and reinfo	including at nts, posts a proement :1:	ns tached pila nd struts et	sters, buttre	esses, plint		
10	Reinforced cement con and string courses, fille excluding cost of cente 3 graded stone aggregate plinth beam	crete work ets, column ring, shutte ate 20 mm 2	in walls (any s, pillars, pie ring, finishing nominal size 28.300	thickness) ers, abutme g and reinfo ) 0.300	, including at nts, posts an orcement :1:	ns tached pila nd struts et	sters, buttre tc. up tot flo ment : 1.5 cc	esses, plint		
10	Reinforced cement con and string courses, fille excluding cost of cente 3 graded stone aggregate plinth beam -do- column up to beam	crete work ets, column ring, shutte ate 20 mm 2 8	in walls (any s, pillars, piering, finishing nominal size 28.300	thickness) ers, abutme g and reinfo ) 0.300 0.300	including at nts, posts an orcement :1:	ns tached pila nd struts et	sters, buttre tc. up tot flo ment : 1.5 cc 5.094 5.569	esses, plint		
10	Reinforced cement con and string courses, fille excluding cost of cente 3 graded stone aggregation plinth beam -do-column up to beam C1 to C16	crete work ets, column ring, shutte ate 20 mm 2 8	in walls (any s, pillars, piering, finishing nominal size 28.300 5.800 0.400	thickness) ers, abutme g and reinfo  0.300  0.300  0.300	nts, posts and orcement :1::  0.300  0.400  4.000	ns tached pila nd struts et	sters, buttre c. up tot floo ment : 1.5 cc 5.094 5.569 7.680	esses, plint		
10	Reinforced cement con and string courses, fille excluding cost of cente 3 graded stone aggregation plinth beam -do-column up to beam C1 to C16 roof beam long	crete work ets, column ring, shutte ate 20 mm 2 8 16	in walls (any s, pillars, piering, finishing nominal size 28.300 5.800 0.400 28.300	thickness) ers, abutme g and reinfo  0.300  0.300  0.300	0.300 0.400 0.350	ns tached pila nd struts et	5.094 5.569 7.680	esses, plint		
10	Reinforced cement con and string courses, fille excluding cost of cente 3 graded stone aggregation plinth beam -do-column up to beam C1 to C16 roof beam long inglind beam	crete work ets, column ring, shutte ate 20 mm 2 8 16 2 2*8	in walls (any s, pillars, piering, finishing nominal size 28.300 5.800 0.400 28.300 3.200	thickness) ers, abutmers and reinfold 0.300 0.300 0.300 0.300 0.300	0.300 0.400 0.350 0.350	ns tached pila nd struts et	5.094 5.569 7.680 5.376	esses, plint		
10	Reinforced cement con and string courses, fille excluding cost of cente 3 graded stone aggregate plinth beam -do- column up to beam C1 to C16 roof beam long inglind beam roof slab	crete work ets, column ring, shutte ate 20 mm 2 8 16 2 2*8 2	in walls (any s, pillars, piering, finishing nominal size 28.300 5.800 0.400 28.300 3.200 29.500	thickness) ers, abutmers and reinfold 0.300 0.300 0.300 0.300 0.300	0.300 0.400 0.350 0.120	ns tached pila nd struts et	5.094 5.569 7.680 5.376 32.214	esses, plint or five leve parse sand		
10	Reinforced cement con and string courses, fille excluding cost of cente 3 graded stone aggregate plinth beam -do- column up to beam C1 to C16 roof beam long inglind beam roof slab	crete work ets, column ring, shutte ate 20 mm 2 8 16 2 2*8 2	in walls (any s, pillars, piering, finishing nominal size 28.300 5.800 0.400 28.300 3.200 29.500	thickness) ers, abutme g and reinfo ) 0.300 0.300 0.300 0.300 4.550	0.300 0.400 0.350 0.120	ttached pila nd struts et 1.5:3( 1 cer	5.094 5.569 7.680 5.376 32.214 0.124	esses, plint or five leve parse sand		
10	Reinforced cement con and string courses, fille excluding cost of cente 3 graded stone aggregate plinth beam -do- column up to beam C1 to C16 roof beam long inglind beam roof slab	crete work ets, column ring, shutte ate 20 mm 2 8 16 2 2*8 2	in walls (any s, pillars, piering, finishing nominal size 28.300 5.800 0.400 28.300 3.200 29.500	thickness) ers, abutme g and reinfo ) 0.300 0.300 0.300 0.300 4.550	nincluding at nts, posts an orcement :1:  0.300  0.400  4.000  0.350  0.350  0.120  Total	ttached pila nd struts et 1.5:3( 1 cer	5.094 5.569 7.680 5.943 5.376 32.214 0.124 62.000 cu	m		

11	5.9.1 Centering and shutter columns, etc for mass	-	strutting, et	tc. and remo	oval of form fo	or:Foundat	ions, footing	ıs, base:
	Column base	16*4	1.500	0.300			28.800	
	Column up to plinth	16*2	0.400	1.100			14.081	
		16*2	0.300	1.100			10.560	
	rounded	1	0.559				0.559	
					Total	Quantity	54.000 sq	m
				To	otal Deducted	Quantity	0.000 sqm	1
					Net Total	Quantity	54.000 sq	m
	Say 54.000 sqm @ Rs 335.31 / sqm							
12	5.9.5 Centering and shutter girders bressumers a	-	7.00	etc. and ren	noval of form	for:Lintels	, beams, pli	nth bea
	plinth beam out side	2	28.300	0.300	1-21		16.980	
	plinth beam in side	2*7	3.700	0.300	5 20		15.541	
	cross beam	8*2	5.800	0.400			37.120	
	roof beam out side	2	28.300	0.300			16.980	
	roof beam in side	the#7Er	gi3.700 ri	n 0.400 g	anisation	1S	20.721	
	roof beam bottom	2*7	3.700	0.300		1	15.541	
	inglind beam side	2*8*2	3.200	0.350		/	35.840	
	inglind beam bottom	8*2	3.200	0.300			15.360	
	rounded	1	0.917				0.917	
		175.000 s	qm					
				To	otal Deducted	Quantity	0.000 sqm	1
					Net Total	Quantity	175.000 s	qm
			Say	175.000 sq	m @ Rs 649.	82 / sqm	Rs 113	3718.50
13	5.9.3 Centering and shutte landings, balconies a	•	•	, etc. and	removal of fo	orm for:Su	spended flo	oors, ro
	roof slab bottom	2*7	3.700	3.200			165.761	
	side projection	2*2	4.500	0.600			10.800	
	slab projection	2	29.500	1.000			59.000	
	slab projection side	2	29.500	0.120			7.080	
	end side	2*2	4.500	0.120			2.160	

	rounded	1	5.199				5.199			
					Tota	al Quantity	250.000 s	qm		
				To	otal Deducte	d Quantity	0.000 sqm	1		
					Net Tota	al Quantity	250.000 s	qm		
			Say	250.000 sqı	m @ Rs 815	5.78 / sqm	Rs 203	3945.00		
14	5.9.6 Centering and shutte Abutments, Posts ar	•	ng strutting	g, etc. and	removal of	form for:C	olumns, Pil	lars, Pier		
	column C1 to C16	16*2	0.400	4.000			51.200			
		16*2	0.300	4.000			38.400			
	rounded	1	0.400	S)			0.400			
					Tota	al Quantity	90.000 sq	m		
		1	534	To	otal Deducte	d Quantity	0.000 sqm	1		
		11	The second	51/1	Net Tota	al Quantity	90.000 sq	m		
		150	Sa	y 90.000 sqı	m @ Rs 863	3.64 / sqm	Rs 77	727.60		
15	5.22.6 Steel reinforcement f binding all complete For column footing		evelThermo	- Mechanio		d bars of g		DD or mo @100kg		
	column up to plinth	P <sub>1</sub> ]	1.800		E	120.0	216.000	m3 @120kg m3		
	rounded	1	6.000				6.000	@120kg m3		
					Tota	al Quantity	1880.000	kilogram		
				To	otal Deducte	d Quantity	0.000 kilo	gram		
					Net Tota	al Quantity	1880.000	kilogram		
		S	Say 1880.00	0 kilogram @	@ Rs 98.30	/ kilogram	Rs 184	1804.00		
16	Say 1880.000 kilogram @ Rs 98.30 / kilogram Rs 184804.00  5.22A.6  Steel reinforcement for R.C.C work including straightening, cutting, bending, placing in position ar binding all complete above plinth level.Thermo - Mechanically Treated bars of grade Fe-500D or mo									
		above plinth	ievei. i nerm	- Wicchan				or mo		
		above plinth 2	28.300	0.300	0.300	100.0	509.401	@100kg m3		

				1		1	1	i
	column up to beam C1 to C16	16	0.400	0.300	4.000	100.0	768.000	@100kg/ m3
	roof beam long	2	28.300	0.300	0.350	100.0	594.300	@100kg/ m3
	inglind beam	2*8	3.200	0.300	0.350	100.0	537.600	@100kg/ m3
	roof slab	2	29.500	4.550	0.120	100.0	3221.400	@100kg/ m3
	rounded	1	12.498				12.498	
					Tota	al Quantity	6200.000	kg
				To	otal Deducte	d Quantity	0.000 kg	
			Mão		Net Tota	al Quantity	6200.000	kg
		98.30 / kg	Rs 609	9460.00				
	Random rubble masor concrete 1:6:12 (1 cem level with:Cement mortable) below out side plinth	ent : 6 coar ar 1:6 (1 ce	se sand : 12 ment : 6 coa	2 graded sto arse sand)	one aggrega	_	ominal size)	
	beam	2*7	3.700	0.450	0.600		13.986	
	below cross beam	the <sup>2</sup> En	5.800	0.450	0.600	ns	3.132	
	rounded	1	0.882		1		0.882	
					Tota	al Quantity	18.000 cu	m
				To	otal Deducte	d Quantity	0.000 cum	1
					Net Tota	al Quantity	18.000 cu	m
			Say	18.000 cum	n @ Rs 7204	.78 / cum	Rs 129	9686.04
18	2.25 Filling available excava exceeding 20 cm in depart and lift up to 1.5 m.	,	_	•	•			•
	in betwen plinth beams	7	5.700	3.700	0.300		44.290	
	Back filling footing trenches	16	3.000				48.000	@ 3m3/ one column
	rounded	1	2.710				2.710	@ 3m3/ one column
				1	Tota	al Quantity	95.000 cu	

				To	otal Deducte	d Quantity	0.000 cum	1
						al Quantity	95.000 cu	
			Sa	v 95 000 cu	m @ Rs 258	<u> </u>		564.15
19	13.7.1 12 mm cement plaster t	finished with		-				
	For the roof slabs.	2	29.500	4.550			268.450	
	side	2	29.500	0.130			7.670	
	end side	2	9.050	0.130			2.353	
	rounded	1	1.527				1.527	
			100	160	Tota	al Quantity	280.000 s	qm
				To	otal Deducte	d Quantity	0.000 sqn	1
		-7	Sept. 4		Net Tota	al Quantity	280.000 s	qm
		11.	Say	280.000 sq	m @ Rs 401	.21 / sqm	Rs 112	2338.80
20	13.16.1 6 mm cement plaster of	f mix:1:3 ( 1	cement : 3	fine sand)		L		
	For cross beams side	2*8	6.200	0.350			34.720	
	bottom	8	6.200	0.300			14.880	
	long beam in side	ther En	g1neer1 3.700	ng ()rg	anısatıo	ns	20.721	
	long beam out side	2	28.300	0.300			16.980	
	bottom	2*7	3.700	0.300			15.541	
	slab bottom	2*7	3.700	3.200			165.761	
	roof projection end	2	4.500	0.600			5.400	
	out side beam projection side	2	29.500	1.050			61.950	
	column C1 to C16	16	4.000	1.400			89.600	
	rounded	1	4.447				4.447	
					Tota	al Quantity	430.000 s	qm
				To	otal Deducte	d Quantity	0.000 sqm	1
					Net Tota	al Quantity	430.000 s	qm
			Say	430.000 sq	m @ Rs 267	7.59 / sqm	Rs 11	5063.70
21	13.4.1 12 mm cement plaster (	of mix:1:4 (	1 cement : 4	4 coarse sar	nd)			
	12 min comon plastor				۱۵,			

	rounded	1		3.880			3.880	
					Tota	al Quantity	185.000 s	qm
				To	tal Deducte	d Quantity	0.000 sqm	1
					Net Tota	al Quantity	185.000 s	qm
			Say	185.000 sqr	m @ Rs 325	.01 / sqm	Rs 60	126.85
22	13.43.1 Applying one coat of surface:Water thinnab			ent primer c	of approved	brand and	d manufactu	ure on wa
	roof beam side & bottom	8	6.200	1.000			49.600	
	long beam out side	2	28.300	0.400			22.640	
	inside	2*7	3.700	0.400			20.721	
	bottom	2*7	3.700	0.300			15.541	
	slab bottom	2*7	3.700	3.200	7 13		165.761	
	roff projection end	2*2	4.500	0.600	1-31		10.800	
	roff projection side	2	29.500	1.050		Sept.	61.950	
	column	16	4.000	1.400			89.600	
	side end	2	9.050	0.130			2.353	
	projection side	thez En	g29.500 <sup>11</sup>	ng.130g	anisatio	ns	7.670	
	top of roof slab	2	29.500	4.550			268.450	
		1	4.914				4.914	
					Tota	al Quantity	720.000 s	qm
				То	tal Deducte	d Quantity	0.000 sqm	1
					Net Tota	al Quantity	720.000 s	qm
			Sa	y 720.000 so	qm @ Rs 70	.64 / sqm	Rs 50	860.80
23	13.44.1 Finishing walls with wat @ 3.84 kg/10 sqm)	er proofing	cement pair	nt of require	d shade:Ne	w work (Tw	o or more co	oats appl
	slab bottom	2*7	3.700	3.200			165.761	
	roof projection end	2	9.000	0.600			10.800	
	roof projection side	2	29.500	1.050			61.950	
	round of	1	1.489				1.489	
					Tota	al Quantity	240.000 s	qm
				To	tal Deducte	d Quantity	0.000 sqm	1

					Net Tota	al Quantity	240.000 s	qm
			Say	240.000 sqr	m @ Rs 107	.39 / sqm	Rs 25	773.60
24	13.46.1 Finishing walls with Act @ 1.67 ltr/10 sqm over	•	-	•		•		
	roof beam allround	8	6.200	1.000			49.600	
	long beam out side	2	28.300	0.300			16.980	
	long beam in side	2*7	3.700	0.400			20.721	
	bottom	2*7	3.700	0.300			15.541	
	column C1 to C16	16	4.000	1.400			89.600	
	top of roof slab	2	29.500	4.550			268.450	
	side	2	29.500	0.130			7.670	
	side end	2	9.050	0.130			2.353	
	round off	1	4.085	SAZ			4.085	
		150	DW.		Tota	al Quantity	475.000 s	qm
		104	Ka	То	tal Deducte	d Quantity	0.000 sqm	١
		100			Net Tota	al Quantity	475.000 s	qm
		.1 E	Say	475.000 sqr	m @ Rs 193	.89 / sqm	Rs 92	097.75
SI No	Description	ther En	gineeri	ng Orga	anisatio	ns <sub>cf</sub>	Quantity	Remark
		3 Appendi	x C - Const	ruction of 1	Toilet block			
1	2.8.1 Earth work in excavat trenches or drains (no ramming of bottoms, li excavated soil as directions)	t exceeding	g 1.5 m in w 5 m, includir	idth or 10 s	sqm on plan ut the exca	), including	dressing o	f sides and
	toilet block foundation all round	1	35.500	0.800	0.750		21.300	
	crosswall long	2	11.500	0.800	0.750		13.800	
	cross	1	6.050	0.800	0.750		3.630	
		1	3.150	0.800	0.750		1.891	
	bath room	1	4.800	0.800	0.750		2.880	
	step	1	3.500	1.200	0.600		2.520	
		2	4.500	0.800	0.750		5.400	
	ramp	_						
	ramp	1	3.000	0.800	0.750		1.801	

	sock pit	1	1.800	1.800	1.500		4.860	
		1	4.758				4.758	
					Tota	al Quantity	95.000 cu	m
				To	otal Deducte	d Quantity	0.000 cun	า
					Net Tota	al Quantity	95.000 cu	m
			Say	y 95.000 cu	m @ Rs 296	6.94 / cum	Rs 28	209.30
2	2.26.1 Extra for every addit materials.All kinds o		.5 m or part	there of in	excavation	/ banking	excavated	or stac
	tank	1	6.700	2.400	0.500		8.040	
		1	1.960	5			1.960	
			-M		Tota	al Quantity	10.000 cu	m
		_	63 4	To	otal Deducte	d Quantity	0.000 cun	า
		11	The	51/1	Net Tota	al Quantity	10.000 cu	m
			Say	y 10.000 cu	m @ Rs 106	6.37 / cum	Rs 10	063.70
3	4.1.8 Providing and laying i shuttering - All work u nominal size)	ther E	level:1:4:8 (*	1 cement :	4 coarse sa	_	ed stone ag	_
3	Providing and laying i shuttering - All work u	ther E	level:1:4:8 (	1 cement :	4 coarse sa	_		_
3	Providing and laying i shuttering - All work u nominal size)	ther E	level:1:4:8 (*	1 cement :	4 coarse sa	_	ed stone ag	_
3	Providing and laying is shuttering - All work unominal size) toilet block foundationall round	ther E	ngineeri 35.500	1 cement :	4 coarse sa anisatio 0.150	_	4.260	_
3	Providing and laying is shuttering - All work unominal size)  toilet block foundationall round  crosswall long	ther E	35.500 11.500	1 cement : ng Org 0.800 0.800	4 coarse sa anisatio 0.150 0.150	_	4.260 2.761	_
3	Providing and laying is shuttering - All work unominal size)  toilet block foundationall round  crosswall long	ther E	35.500 11.500 6.050	0.800 0.800	4 coarse sa anisatio 0.150 0.150 0.150	_	4.260 2.761 0.726	•
3	Providing and laying is shuttering - All work unominal size) toilet block foundationall round crosswall long cross	ther E	35.500 11.500 6.050 3.150	0.800 0.800 0.800 0.800	4 coarse sa anisatio 0.150 0.150 0.150	_	4.260 2.761 0.726 0.378	_
3	Providing and laying is shuttering - All work unominal size)  toilet block foundationall round  crosswall long  cross  bath roo	ther E  1  2  1  1  1	35.500 11.500 6.050 3.150 4.800	0.800 0.800 0.800 0.800 0.800	4 coarse sa anisatio 0.150 0.150 0.150 0.150	_	4.260 2.761 0.726 0.378 0.576	_
	Providing and laying is shuttering - All work unominal size)  toilet block foundationall round  crosswall long  cross  bath roo  step	ther E  1  2  1  1  1  1	35.500 11.500 6.050 3.150 4.800 3.500	0.800 0.800 0.800 0.800 0.800 1.200	4 coarse sa anisatio 0.150 0.150 0.150 0.150 0.150 0.150	_	4.260 2.761 0.726 0.378 0.576 0.630	_
3	Providing and laying is shuttering - All work unominal size)  toilet block foundationall round  crosswall long  cross  bath roo  step	ther E  1  2  1  1  1  2	35.500 11.500 6.050 3.150 4.800 3.500 4.500	0.800 0.800 0.800 0.800 0.800 0.800	4 coarse sa anisatio 0.150 0.150 0.150 0.150 0.150 0.150	_	4.260 2.761 0.726 0.378 0.576 0.630 1.080	_
3	Providing and laying is shuttering - All work unominal size)  toilet block foundationall round crosswall long cross  bath roo step ramp	ther E  1  2  1  1  1  2  1  1  1  1  1  1  1	11.500 35.500 11.500 6.050 3.150 4.800 3.500 4.500 3.000	0.800 0.800 0.800 0.800 0.800 0.800 0.800	4 coarse sa anisatio 0.150 0.150 0.150 0.150 0.150 0.150 0.150	_	4.260 2.761 0.726 0.378 0.576 0.630 1.080 0.361	_
3	Providing and laying is shuttering - All work unominal size)  toilet block foundationall round crosswall long cross  bath roo step ramp  floor room	ther E  1  2  1  1  1  2  1  1  1  1  1  1  1	11.500 35.500 11.500 6.050 3.150 4.800 3.500 4.500 3.000 12.150	0.800 0.800 0.800 0.800 0.800 0.800 0.800 4.800	4 coarse sa anisatio 0.150 0.150 0.150 0.150 0.150 0.150 0.150 0.150 0.150	_	4.260 2.761 0.726 0.378 0.576 0.630 1.080 0.361 5.833	_
	Providing and laying is shuttering - All work unominal size)  toilet block foundationall round crosswall long cross  bath roo step ramp  floor room ramp& varandha	ther E  1  2  1  1  1  2  1  1  1  1  1  1  1	11.500 11.500 6.050 3.150 4.800 3.500 4.500 3.000 12.150 13.500	0.800 0.800 0.800 0.800 0.800 0.800 0.800 0.800 0.800 1.200 4.800	4 coarse sa anisatio 0.150 0.150 0.150 0.150 0.150 0.150 0.150 0.150 0.150 0.150	_	4.260 2.761 0.726 0.378 0.576 0.630 1.080 0.361 5.833 1.620	_
3	Providing and laying is shuttering - All work unominal size)  toilet block foundationall round crosswall long cross  bath roo step ramp  floor room ramp& varandha	ther E  1  2  1  1  1  2  1  1  1  1  1  1  1	11.500 11.500 6.050 3.150 4.800 3.500 4.500 3.000 12.150 13.500 6.700	0.800 0.800 0.800 0.800 0.800 0.800 0.800 0.800 0.800 1.200 4.800	4 coarse sa anisatio 0.150 0.150 0.150 0.150 0.150 0.150 0.150 0.150 0.150 0.150 0.200	_	4.260 2.761 0.726 0.378 0.576 0.630 1.080 0.361 5.833 1.620 3.216	gregate
	Providing and laying is shuttering - All work unominal size)  toilet block foundationall round crosswall long cross  bath roo step ramp  floor room ramp& varandha	ther E  1  2  1  1  1  2  1  1  1  1  1  1  1	11.500 11.500 6.050 3.150 4.800 3.500 4.500 3.000 12.150 13.500 6.700	0.800 0.800 0.800 0.800 0.800 0.800 0.800 0.800 0.800 2.400	4 coarse sa anisatio 0.150 0.150 0.150 0.150 0.150 0.150 0.150 0.150 0.150 0.150 0.200	nd: 8 grad	4.260 2.761 0.726 0.378 0.576 0.630 1.080 0.361 5.833 1.620 3.216 0.559	m

			Say	22.000 cum	n @ Rs 6814	.89 / cum	Rs 149	927.58
4	7.1.1 Random rubble mason concrete 1:6:12 (1 ceme level with:Cement mortal	ent : 6 coa	rse sand : 12	graded sto	•	•	• .	
	toilet block foundation all round	1	35.500	0.600	0.600		12.780	
	crosswall long	2	11.500	0.600	0.600		8.280	
	cross	1	6.050	0.600	0.600		2.178	
		1	3.150	0.600	0.600		1.134	
	bath room	1	4.800	0.600	0.600		1.728	
	ramp	2	4.500	0.600	0.600		3.240	
		1	3.000	0.600	0.600		1.080	
	step	1	3.500	1.200	0.450		1.891	
	basement allround	1	35.500	0.450	0.450		7.189	
	cross	2	11.500	0.450	0.450	T <sub>i</sub>	4.658	
		1	6.050	0.450	0.450		1.226	
		1	3.150	0.450	0.450		0.638	
	bath	thet E	9 4.800	n c0.450 g	an0.450io	ns	0.973	
	ramp	2	3.150	0.450	0.300		0.851	
		1	3.000	0.450	0.450	₹,	0.608	
	partition	10	1.500	0.450	0.450		3.038	
	round	1	0.508				0.508	
					Tota	al Quantity	52.000 cu	m
				To	otal Deducte	d Quantity	0.000 cum	Ì
					Net Tota	al Quantity	52.000 cu	m
			Say	52.000 cum	n @ Rs 7204	.78 / cum	Rs 374	648.56
5	2.25 Filling available excavate exceeding 20 cm in depart and lift up to 1.5 m.	,	_	•	•			•
	for foundation	1	11.550	3.900	0.600		27.027	
	varandha	1	7.000	0.750	0.600		3.150	
	rounded	1	4.823				4.823	
			•		Tate	al Quantity	35.000 cu	

				To	otal Deducte	d Quantity	0.000 cum	า
						al Quantity	35.000 cu	
			Sa	y 35.000 cu	m @ Rs 258	3.57 / cum	Rs 90	049.95
6	5.2.2 Reinforced cement cor and string courses, fille excluding cost of center 3 graded stone aggreg	ets, columr ring, shutte	ns, pillars, pio ering, finishin	ers, abutme g and reinfo	nts, posts a	nd struts et	c. up tot flo	or five leve
	basement allround	1	35.500	0.450	0.100		1.598	
	cross	1	11.500	0.450	0.100		0.518	
		1	6.050	0.450	0.100		0.273	
	1	1	3.150	0.450	0.100		0.142	
	bath	1	4.800	0.450	0.100		0.217	
	ramp	1	3.150	0.450	0.100		0.142	
		1	3.000	0.450	0.100		0.135	
	partition	10	1.500	0.450	0.100	Š.	0.675	
	lintel	1	76.000	0.150	0.150		1.710	
	roof slab	1	12.750	5.800	0.120		8.874	
	slop	thet E	g39.450ri	ng1.000 g	an0420ic	ns	4.734	
	tank bottom	1	6.000	2.100	0.150	7	1.891	
	beam	1	2.100	0.200	0.200	1	0.085	
	cover slab	1	6.000	2.100	0.120		1.512	
		1	1.800	1.800	0.120		0.389	
	rounded	1	0.105				0.105	
					Tota	al Quantity	23.000 cu	m
				To	otal Deducte	d Quantity	0.000 cum	า
					Net Tota	al Quantity	23.000 cu	m
			Say 2	3.000 cum	@ Rs 10954	1.04 / cum	Rs 25′	1942.92
7	5.22A.6 Steel reinforcement for binding all complete a			-	-	•		
	qty of cc	1	22.895			100.0	2289.500	100kg/m3
	rounded	1	10.500				10.500	100kg/m3
					Tota	al Quantity	2300.000	kg
				To	tal Deducte	d Quantity	0.000 kg	

					Net Tota	I Quantity	2300.000	kg
			;	Say 2300.00	00 kg @ Rs 9	8.30 / kg	Rs 226	6090.00
8	5.9.3 Centering and shutter landings, balconies	_		, etc. and r	emoval of f	orm for:Su	spended flo	oors, roofs
	basement	2	35.500	0.100			7.101	
	cross	2	11.500	0.100			2.301	
		2	6.050	0.100			1.210	
		2	3.150	0.100			0.630	
	bath	2	4.800	0.100			0.960	
	ramp	2	3.150	0.100			0.630	
		2	3.000	0.100			0.601	
	partition	10*2	1.500	0.100			3.001	
	lintel	2	76.000	0.150			22.800	
	roof slab	1	12.750	5.800	T the		73.950	
	slop	1	39.450	1.000			39.450	
	tank bottom	4	10.200	0.150			6.120	
	beam	1 1	2.100	0.600	. , .		1.260	
	cover slab	other Er	191neeri 5.100	ng Org 0.120	anisatio	ns –	7.344	
		3	4.800	0.120			1.728	
	rounded	1	0.914				0.914	
					Tota	I Quantity	170.000 s	qm
				To	otal Deducted	d Quantity	0.000 sqm	1
					Net Tota	I Quantity	170.000 s	qm
			Say	170.000 sqı	m @ Rs 815.	.78 / sqm	Rs 138	3682.60
9	50.6.2.2 Solid masonry using confirming to IS 2185 1:6 ( 1 cement : 6 coa	part I of 197	79 for super	• ,				
	wall all round	1	34.500	2.800	0.150		14.490	
	cross wall	1	12.150	2.800	0.150		5.103	
	centre cross	1	3.150	2.800	0.150		1.323	
		1	6.050	2.800	0.150		2.541	
	bath	1	4.800	2.800	0.150		2.016	

	tank	1	16.200	1.800	0.200		5.833	
	step	1	3.000	0.600	0.450		0.810	
	rounded	1	0.593				0.593	
	shutter	1	3.000	2.400	0.150		-1.079	
	door	2	1.000	2.100	0.150		-0.630	
					Tota	al Quantity	32.709 cu	m
				To	otal Deducte	d Quantity	-1.709 cur	n
					Net Tota	al Quantity	31.000 cu	m
			Say	31.000 cum	@ Rs 6984	1.85 / cum	Rs 216	530.35
	Solid block masonry us size confirming to IS 2 CM 1:6 ( 1 cement : 6	185 part I o	f 1979 for su	uper structu	re up to floo	or two level		
	toilet partition	10	1.500	2.800	0.100		4.200	
	urinal partition	2	1.000	1.400	0.100		0.280	
	parapet	1	37.100	0.600	0.100	See	2.227	
	seititank partition	2	1.700	1.000	0.100		0.340	
	sock pit	4	1.700	1.200	0.100		0.817	
	rounded	ther En	g10.45911	ng Orga	anisatio	ns	0.459	
	door	9	0.700	2.100	0.100		-1.323	
					Tota	al Quantity	8.323 cum	1
				To	otal Deducte	d Quantity	-1.323 cur	n
					Net Tota	al Quantity	7.000 cum	1
			Say	/ 7.000 cum	@ Rs 7823	3.61 / cum	Rs 54	765.27
11	13.1.1 12 mm cement plaster	of mix:1:4 (	1 cement : 4	fine sand)				
	out side wall	1	35.300	2.800			98.840	
	Parapet	1	37.100	1.400			51.940	
	toilet inside	10	5.400	2.800			151.200	
	DA toilet	2	6.600	2.800			36.960	
	out	2	4.800	2.800			26.880	
	bath	1	6.500	2.800			18.200	
	partition	2	3.150	2.800			17.640	
		1	5.300	2.800			14.840	

		1	5.500	0.000				
		1		2.800			15.400	
		1	3.200	2.800			8.960	
		1	4.850	2.800			13.580	
		1	2.500	2.800			7.000	
ı	urinal partition	2	2.100	1.500			6.301	
	under side slab	1	12.750	5.800			73.950	
		1	39.450	1.000			39.450	
I	rounded	1	5.927				5.927	
	door d	2	1.000	2.100			-4.200	
1	toilet door	11	0.700	2.100			-16.169	
,	ventilator	15	0.600	0.500			-4.500	
;	shutter	1	3.000	2.400	in the same of the		-7.199	
		6	510	S. N	Total Qua	antity	587.068 s	qm
				To	otal Deducted Qua	antity	-32.068 sc	mp
		RAT		Sets.	Net Total Qua	antity	555.000 s	qm
			Say	555.000 sq	m @ Rs 314.09 / s	sqm	Rs 174	319.95
	12 mm cement plaste	Juiei Ei	igineen	ing Org	cement of mix:1:3	3 ( 1 cer	ment : 3 fine	e sand)
:	slab top	1	12.750					
				5.800	1		73.950	
		1	39.450	1.000	H		73.950 39.450	
	rounded	1			E			
	rounded		39.450		Total Qua	antity	39.450	qm
	rounded		39.450	1.000	Total Qua	-	39.450 1.600	
	rounded		39.450	1.000		antity	39.450 1.600 115.000 se	1
	rounded		39.450 1.600	1.000 To	otal Deducted Qua	antity	39.450 1.600 115.000 sq 0.000 sqm 115.000 sq	1
13	rounded  13.7.2 12 mm cement plaste	1	39.450 1.600	1.000 To 115.000 sq	Net Total Qua Met Total Qua m @ Rs 401.21 / s	antity antity sqm	39.450 1.600 115.000 sq 0.000 sqm 115.000 sq Rs 46	qm 139.15
13	13.7.2	1	39.450 1.600	1.000 To 115.000 sq	Net Total Qua Met Total Qua m @ Rs 401.21 / s	antity antity sqm	39.450 1.600 115.000 sq 0.000 sqm 115.000 sq Rs 46	qm 139.15
13	13.7.2 12 mm cement plaste	r finished wit	39.450 1.600 Say	1.000  To  115.000 sq  oat of neat	Net Total Qua Met Total Qua m @ Rs 401.21 / s	antity antity sqm	39.450 1.600 115.000 sq 0.000 sqm 115.000 sc Rs 46	qm 139.15
13	13.7.2 12 mm cement plaste Septy tank inside	r finished wit	39.450 1.600 Say	1.000 To 115.000 sq oat of neat 1.800	Net Total Qua Met Total Qua m @ Rs 401.21 / s	antity antity sqm	39.450 1.600 115.000 sqm 115.000 sqm 115.000 sc  Rs 46  ment : 4 fine 27.721	qm 139.15
13	13.7.2 12 mm cement plaste Septy tank inside bottom	r finished wit	39.450 1.600 Say th a floating of 15.400 6.000	1.000 To 115.000 sq oat of neat 1.800 1.700	Net Total Qua Met Total Qua m @ Rs 401.21 / s	antity antity sqm	39.450 1.600 115.000 sqm 115.000 sqm 115.000 sc  Rs 46  ment : 4 fine 27.721 10.200	qm 139.15
13	13.7.2 12 mm cement plaste Septy tank inside bottom partition wall	r finished with 1 1 2*2	39.450 1.600 Say th a floating of 15.400 6.000 1.700	1.000 To 115.000 sq oat of neat 1.800 1.700	Net Total Qua Met Total Qua m @ Rs 401.21 / s	antity antity sqm	39.450 1.600 115.000 sqm 115.000 sqm 115.000 sqm 27.721 10.200 6.800	139.15 e sand)

					Net Tota	al Quantity	45.000 sq	m	
			Say	y 45.000 sq	m @ Rs 386	36 / sqm	Rs 17	386.20	
14	8.31 Providing and fixing Ist quality ceramic glazed wall tiles conforming to IS: 15622(thickness to be specified by the manufacturer), of approved make, in all colours, shades except burgundy, bottle green, black of any size as approved by Engineerin-Charge, in skirting, risers of steps and dados, over 12 mm thick be of cementmortar 1:3 (1 cement: 3 coarse sand) and jointing with grey cement slurry @3.3kg per squincluding pointing in white cement mixed with pigment of matchingshade complete.								
	toilet	11	4.700	1.800			93.060		
	DA toilet	2	5.600	1.800			20.160		
	bath	1	5.800	1.800			10.440		
	urinal portion	3	2.600	1.600			12.480		
	rounded	1	3.860				3.860		
			5,7 4		Tota	al Quantity	140.000 s	qm	
		61.	TO SE	To	otal Deducte	d Quantity	0.000 sqm	า	
		16	DIS		Net Tota	al Quantity	140.000 s	qm	
15	11.37 Providing and laying manufacturer), of 1s	- 1 <del>-</del> -	zed floor tile		300x300 mm	thickness	to be spec	-	
15		st quality confo own, laid on 2	zed floor tile rming to IS: 0 mm thick	es of size 3 15622, of a cement mo	300x300 mm approved ma rtar 1:4 (1 C	thickness ke in colou	to be spec	ified by White, Ive	
15	Providing and laying manufacturer), of 1s Grey, Fume Red Br pointing the joints w	st quality confo own, laid on 2	zed floor tile rming to IS: 0 mm thick ent and mat	es of size 3 15622, of a cement mo	300x300 mm approved ma rtar 1:4 (1 C	thickness ke in colou	to be spec rs such as V Coarse sand	ified by White, Ive	
15	Providing and laying manufacturer), of 1s Grey, Fume Red Br pointing the joints winside floor	et quality confo rown, laid on 2 vith white cem	zed floor tile rming to IS: 0 mm thick ent and mat	es of size 3 15622, of a cement mo	300x300 mm approved ma rtar 1:4 (1 C ent etc., com	thickness ke in colou	to be spectors such as Noted to be spectors and the control of the	ified by White, Ivo	
15	Providing and laying manufacturer), of 1s Grey, Fume Red Br pointing the joints winside floor	et quality confo rown, laid on 2 vith white cem	zed floor tile rming to IS: 0 mm thick ent and mat	es of size 3 15622, of a cement mo ching pigme 4.800	300x300 mm approved ma rtar 1:4 (1 C ent etc., com	thickness ke, in colou ement : 4 Caplete.	to be spectors such as Nooarse sand	ified by White, Ivo I), includ m	
15	Providing and laying manufacturer), of 1s Grey, Fume Red Br pointing the joints winside floor	et quality confo rown, laid on 2 vith white cem	zed floor tile rming to IS: 0 mm thick ent and mat	es of size 3 15622, of a cement mo ching pigme 4.800	300x300 mm approved ma rtar 1:4 (1 C ent etc., com Tota	thickness ke, in colou ement : 4 Caplete.	to be spectors such as Nooarse sand 58.320 1.680 60.000 sq	ified by White, Ivo I), includ m	
15	Providing and laying manufacturer), of 1s Grey, Fume Red Br pointing the joints winside floor	et quality confo rown, laid on 2 vith white cem	zed floor tile rming to IS: 0 mm thick ent and mat 12.150 1.680	es of size 3 15622, of a cement mo ching pigmo 4.800	300x300 mm approved ma rtar 1:4 (1 C ent etc., com Tota	i (thickness ke, in colou ement : 4 Caplete.  al Quantity d Quantity al Quantity	58.320 1.680 60.000 sq 60.000 sq	ified by White, Ivo I), includ m	
15	Providing and laying manufacturer), of 1s Grey, Fume Red Br pointing the joints winside floor	et quality conforcement, laid on 2 vith white cement of 1 on 1	zed floor tile rming to IS: 0 mm thick ent and mate 12.150 1.680  Say de antiskid to 0.08 % and m thick cem	es of size 3 15622, of a cement mo ching pigme 4.800  To 60.000 sqm illes of size a conforming pigme 1.800	Total Deducted in @ Rs 1091 300x300mm g to I.S. 156 r 1:4 (1 cer	in (thickness ke, in colourement : 4 Conplete.  al Quantity d Quantity al Quantity .02 / sqm  with thickness	to be spectrs such as Nooarse sand  58.320  1.680  60.000 sq  60.000 sq  Rs 65  ess eroved make parse sand)	m  461.20  ified by with the properties of the p	
	Providing and laying manufacturer), of 1s Grey, Fume Red Br pointing the joints winside floor rounded  od204530/2023_202 :Providing and laying with water absorptic colours & shades, laying manufacturers.	et quality conforcement, laid on 2 vith white cement of 1 on 1	zed floor tile rming to IS: 0 mm thick ent and mate 12.150 1.680  Say de antiskid to 0.08 % and m thick cem	es of size 3 15622, of a cement mo ching pigme 4.800  To 60.000 sqm illes of size a conforming pigme 1.800	Total Deducted in @ Rs 1091 300x300mm g to I.S. 156 r 1:4 (1 cer	in (thickness ke, in colourement : 4 Conplete.  al Quantity d Quantity al Quantity .02 / sqm  with thickness	to be spectrs such as Nooarse sand  58.320  1.680  60.000 sq  60.000 sq  Rs 65  ess ersved make parse sand)	m  461.20  ified by with the properties of the p	
	Providing and laying manufacturer), of 1s Grey, Fume Red Br pointing the joints winside floor rounded  od204530/2023_202 :Providing and laying with water absorpticolours & shades, I grouting < br> browling and laying with water absorpticolours & shades, I grouting < br>	et quality conforown, laid on 2 vith white cem  1  1  24 g industrial gration less than laid on 20 minustrial minustrial gration with white	zed floor tile rming to IS: 0 mm thick ent and mate 12.150 1.680  Say de antiskid to 0.08 % and m thick cement &	es of size 3 15622, of a cement moching pigme 4.800  To 60.000 sqm illes of size a conforming matching pigment mortal matching	Total Deducted in @ Rs 1091 300x300mm g to I.S. 156 r 1:4 (1 cer	in (thickness ke, in colourement : 4 Conplete.  al Quantity d Quantity al Quantity .02 / sqm  with thickness	58.320 1.680 60.000 sq 60.000 sq Rs 65 ess broved make parse sand)	m  461.20  ified by with the properties of the p	
	Providing and laying manufacturer), of 1s Grey, Fume Red Br pointing the joints winside floor rounded  od204530/2023_202 :Providing and laying with water absorpticolours & shades, I grouting < br> browling and laying with water absorpticolours & shades, I grouting < br>	et quality conforown, laid on 2 vith white cem  1  1  24 g industrial gration less than laid on 20 minustrial with white	szed floor tile rming to IS: 0 mm thick ent and mate 12.150 1.680  Say de antiskid t 0.08 % and m thick cem cement & 5.200	es of size 3 15622, of a cement moching pigme 4.800  To 60.000 sqm illes of size a conforming ment mortal matching 1.200	Total Deducted in @ Rs 1091 300x300mm g to I.S. 156 r 1:4 (1 cer	in (thickness ke, in colourement : 4 Conplete.  al Quantity d Quantity al Quantity .02 / sqm  with thickness	58.320 1.680 60.000 sq 60.000 sq Rs 65 ess broved make parse sand) e. 12.480	m  461.20  ified by to the property of the pro	

					Tota	al Quantity	23.000 sq	m
				To	otal Deducte	d Quantity	0.000 sqn	า
					Net Tota	al Quantity	23.000 sq	m
			Say	23.000 sqm	ı @ Rs 1276	.95 / sqm	Rs 29	369.85
17	13.43.1 Applying one coat o surface:Water thinns			nt primer c	of approved	brand and	d manufacti	ure on w
	area vide item no 11	1	555.000				555.000	
					Tota	al Quantity	555.000 s	qm
				To	otal Deducte	d Quantity	0.000 sqm	า
			Be	50	Net Tota	al Quantity	555.000 s	qm
			Say	/ 555.000 s	qm @ Rs 70	.64 / sqm	Rs 39	205.20
	Finishing walls with A @ 1.67 ltr/10 sqm ove		and the second second			•		
	out side wall	1		9900 Y.		and the second		
	Doronot	1	37.100	1.400			51.940	
	Parapet			1.400				
	rounded	1	4.220	II a PZZ			4.220	
		1		ng Org	anisa <b>Tot</b> a		4.220 155.000 s	
		1	4.220	ng Org	otal Deducte	d Quantity	4.220 155.000 s 0.000 sqn	า
		1	4.220 ngineeri	ng Org	otal Deducted	d Quantity	4.220 155.000 s	า
	rounded	1	4.220 ngineeri	ng Org	otal Deducte	d Quantity	4.220 155.000 s 0.000 sqn 155.000 s	า
19		1 Dther Ei	4.220  Say	ng Organia To	Net Tota m @ Rs 193	d Quantity al Quantity a.89 / sqm a, having V	4.220 155.000 s 0.000 sqn 155.000 s Rs 30	n qm 1052.95 e includ
19	rounded  13.83.2  Wall painting with prapplying additional controls.	1 Definition of the control of the c	4.220 Say	ng Organia 155.000 square paint of into achieve	Net Tota m @ Rs 193	d Quantity al Quantity a.89 / sqm a, having V	4.220 155.000 s 0.000 sqm 155.000 s Rs 30 OC (Volatil ur.Two coa	n qm 1052.95 e includ
19	rounded  13.83.2 Wall painting with prapplying additional controlled toilet inside	1 Dither End of the En	4.220 Say Vic emulsion ver required 5.400	ng Organia 155.000 square paint of into achieve 1.000	Net Tota m @ Rs 193	d Quantity al Quantity a.89 / sqm a, having V	4.220 155.000 s 0.000 sqm 155.000 s Rs 30 OC (Volatil ur.Two coa 54.000	n qm <b>052.95</b> e includ
19	rounded  13.83.2  Wall painting with prapplying additional control toilet inside  DA toilet	emium acry coats where	4.220 Say Vic emulsion ver required 5.400 6.600	ng Organism To achieved 1.000 1.000	Net Tota m @ Rs 193	d Quantity al Quantity a.89 / sqm a, having V	4.220 155.000 s 0.000 sqm 155.000 s Rs 30 OC (Volatil ur.Two coa 54.000 13.200	n qm 1052.95 e includ
19	rounded  13.83.2 Wall painting with prapplying additional content inside DA toilet out	emium acry coats where	4.220 Say Vic emulsion ver required 5.400 6.600 4.800	paint of into achieve 1.000 1.000 2.800	Net Tota m @ Rs 193	d Quantity al Quantity a.89 / sqm a, having V	4.220 155.000 s 0.000 sqn 155.000 s Rs 30 OC (Volatil ur.Two coa 54.000 13.200 26.880	n qm 1052.95 e includ
19	rounded  13.83.2 Wall painting with prapplying additional controlled toilet inside  DA toilet  out  bath	emium acry oats where	4.220 Say Vic emulsion ver required 5.400 6.600 4.800 6.500	paint of in to achieve 1.000 1.000 2.800 1.000	Net Tota m @ Rs 193	d Quantity al Quantity a.89 / sqm a, having V	4.220 155.000 s 0.000 sqn 155.000 s Rs 30 OC (Volatil ur.Two coa 54.000 13.200 26.880 6.500	n qm 1052.95 e includ
19	rounded  13.83.2 Wall painting with prapplying additional controlled toilet inside  DA toilet  out  bath	temium acrysoats where 10 2 2 1 2	4.220 Say Vic emulsion ver required 5.400 6.600 4.800 6.500 3.150	paint of in to achieve 1.000 1.000 2.800 2.800	Net Tota m @ Rs 193	d Quantity al Quantity a.89 / sqm a, having V	4.220 155.000 s 0.000 sqn 155.000 s Rs 30  OC (Volatil ur.Two coa 54.000 13.200 26.880 6.500 17.640	n qm 1052.95 e includ
19	rounded  13.83.2 Wall painting with prapplying additional controlled toilet inside  DA toilet  out  bath	temium acrysoats where 10 2 2 1 2 1	4.220 Say Alic emulsion ver required 5.400 6.600 4.800 6.500 3.150 5.300	paint of in to achieve 1.000 1.000 2.800 2.800 2.800	Net Tota m @ Rs 193	d Quantity al Quantity a.89 / sqm a, having V	4.220 155.000 s 0.000 sqn 155.000 s Rs 30 OC (Volatil ur.Two coa 54.000 13.200 26.880 6.500 17.640 14.840	n qm 1052.95 e includ
19	rounded  13.83.2 Wall painting with prapplying additional controlled toilet inside  DA toilet  out  bath	temium acrysoats where 10 2 2 1 2 1 1 1	4.220 Say Alic emulsion ver required 5.400 6.600 4.800 6.500 3.150 5.300 5.500	paint of in to achieve 1.000 1.000 2.800 2.800 2.800 2.800	Net Tota m @ Rs 193	d Quantity al Quantity a.89 / sqm a, having V	4.220 155.000 s 0.000 sqn 155.000 s Rs 30 OC (Volatil ur.Two coa 54.000 13.200 26.880 6.500 17.640 14.840 15.400	n qm 1052.95 e includi

	urinal partition	2	2.100	1.500			6.301	
	under side slab	1	12.750	5.800			73.950	
		1	39.450	1.000			39.450	
	rounded	1	4.367				4.367	
	door d	2	1.000	2.100			-4.200	
	toilet door	11	0.700	2.100			-16.169	
	ventilator	15	0.600	0.500			-4.500	
	shutter	1	3.000	2.400			-7.199	
					Tota	I Quantity	302.068 s	qm
				To	otal Deducted	d Quantity	-32.068 so	qm
			JAS		Net Tota	l Quantity	270.000 s	qm
			Say	270.000 sq	m @ Rs 134	.10 / sqm	Rs 36	207.00
20	9.117.1 Providing and fixing dimension as below to be jointed with ga hinge side vertical of	(tolerance ±1 Ivanized brace the frames re	mm), with w ckets and sta einforced by	vall thicknes ainless steel galvanized	s 2.0mm (±0 screws, joir M.S. tube of	0.2 mm), conts mitred a size 19 x 1	orners of the and plastic will 19 mm and 1	door fran velded. T I mm (± 0
20	Providing and fixing dimension as below to be jointed with ga	(tolerance ±1 Ivanized brace the frames reand 3 nos. state ection of Eng	mm), with workets and state einforced by ainless steel ineer-in-chain	vall thicknes ainless steel galvanized hinges fixe rgeExtruded	s 2.0mm (±0 screws, join M.S. tube of d to the fram section pro	0.2 mm), conts mitred a size 19 x 1 ne complete file size 48	orners of the and plastic w 19 mm and 1 e as per mai	door frai velded. T I mm (± 0
20	Providing and fixing dimension as below to be jointed with ga hinge side vertical of mm) wall thickness a specification and direction.  Toilet door 70x210	(tolerance ±1 Ivanized brace the frames reand 3 nos. statection of Eng	mm), with workets and state einforced by ainless steel ineer-in-charms 5.600	vall thicknes ainless steel galvanized hinges fixe rgeExtrudec	s 2.0mm (±0 screws, joir M.S. tube of d to the fram	0.2 mm), conts mitred a size 19 x 1 ne complete file size 48	orners of the and plastic villa mm and 1 as per mai x40 mm 61.600	door frai velded. T I mm (± 0
20	Providing and fixing dimension as below to be jointed with ga hinge side vertical of mm) wall thickness a specification and direct Toilet door 70x210  DA toilet,100x210	(tolerance ±1 Ivanized brace the frames reand 3 nos. state ection of Eng	mm), with workets and state inforced by ainless steel ineer-in-chain 5.600	vall thicknes ainless steel galvanized hinges fixe rgeExtruded	s 2.0mm (±0 screws, join M.S. tube of d to the fram section pro	0.2 mm), conts mitred a size 19 x 1 ne complete file size 48	orners of the and plastic villa mm and 1 as per mai x40 mm 61.600	door fran velded. T I mm (± 0
20	Providing and fixing dimension as below to be jointed with ga hinge side vertical of mm) wall thickness a specification and direction.  Toilet door 70x210	(tolerance ±1 Ivanized brace the frames reand 3 nos. statection of Eng	mm), with workets and state einforced by ainless steel ineer-in-charms 5.600	vall thicknes ainless steel galvanized hinges fixe rgeExtruded	s 2.0mm (±0 screws, join M.S. tube of d to the fram section pro	0.2 mm), conts mitred a size 19 x 1 ne complete file size 48	orners of the and plastic will mm and 1 e as per mai x40 mm 61.600 12.400	door frai velded. T I mm (± ( nufacture
20	Providing and fixing dimension as below to be jointed with ga hinge side vertical of mm) wall thickness a specification and direct Toilet door 70x210  DA toilet,100x210	(tolerance ±1 lvanized brace the frames reand 3 nos. statection of Eng	mm), with workets and state inforced by ainless steel ineer-in-chain 5.600	vall thicknessainless steel galvanized hinges fixed rgeExtruded rgeEx	s 2.0mm (±0 screws, join M.S. tube of d to the fram section pro	0.2 mm), conts mitred a size 19 x 1 ne complete file size 48.	orners of the and plastic will mm and 1 e as per mai x40 mm 61.600 12.400 1.000 75.000 me	door frai velded. T I mm (± ( nufacture
20	Providing and fixing dimension as below to be jointed with ga hinge side vertical of mm) wall thickness a specification and direct Toilet door 70x210  DA toilet,100x210	(tolerance ±1 lvanized brace the frames reand 3 nos. statection of Eng	mm), with workets and state inforced by ainless steel ineer-in-chain 5.600	vall thicknessainless steel galvanized hinges fixed rgeExtruded rgeEx	s 2.0mm (±0 screws, join M.S. tube of d to the fram section pro misation.  Total	0.2 mm), conts mitred a size 19 x 1 ne complete file size 48.	orners of the and plastic will mm and 1 e as per mai x40 mm 61.600 12.400 1.000 75.000 met	door fran velded. T I mm (± 0 nufacture
20	Providing and fixing dimension as below to be jointed with ga hinge side vertical of mm) wall thickness a specification and direct Toilet door 70x210  DA toilet,100x210	(tolerance ±1 lvanized brace the frames reand 3 nos. statection of Eng	mm), with workets and state inforced by ainless steel ineer-in-chair 5.600	vall thicknessainless steel galvanized hinges fixed rgeExtruded Drg	s 2.0mm (±0 screws, join M.S. tube of d to the fram section producted to the section producted t	o.2 mm), conts mitred a size 19 x 1 ne complete file size 48.	orners of the and plastic will mm and 1 as per mai x40 mm 61.600 12.400 1.000 75.000 met 75.000 met	door fran velded. T I mm (± 0 nufacture
21	Providing and fixing dimension as below to be jointed with ga hinge side vertical of mm) wall thickness a specification and direct Toilet door 70x210  DA toilet,100x210	(tolerance ±1 lvanized brace the frames reand 3 nos. statection of Eng	mm), with workets and state inforced by ainless steel ineer-in-chair 5.600	vall thicknessainless steel galvanized hinges fixed rgeExtruded Drg	s 2.0mm (±0 screws, join M.S. tube of d to the fram section pro misation.  Total	o.2 mm), conts mitred a size 19 x 1 ne complete file size 48.	orners of the and plastic will mm and 1 as per mai x40 mm 61.600 12.400 1.000 75.000 met 75.000 met	door fran velded. T I mm (± 0 nufacture

mm) wall thickness. The lock rail made up of 'H' section, a uPVC hollow section of size 100x24 mm and 2 mm ( $\pm$  0.2 mm) wall thickness, fixed to the shutter styles by means of plastic/galvanised M.S. 'U' cleats. The shutter frame filled with a uPVC multi-chambered single panel of size not less than 620 mm, having over all thickness of 20 mm and 1 mm ( $\pm$  0.1 mm) wall thickness. The panels filled vertically and tie bar at two places by inserting horizontally 6 mm galvanised M.S. rod and fastened with nuts and washers, complete as per manufacturer's specification and direction of Engineer-in-charge( For W.C. and

	Toilet door 70x210	11	0.700	2.100			16.170	
	DA toilet,100x210	2	1.000	2.100			4.200	
	rounded	1	0.630				0.630	
					Tota	al Quantity	21.000 sq	m
				To	tal Deducte	<u> </u>	0.000 sqm	
						al Quantity	21.000 sq	
			Say	21.000 sqm	@ Rs 2072	2.49 / sqm	Rs 43	522.29
	fixed glazed windows, everrequired) extruded made from roll forming extruded glazing beads frame to finishedwall, proceedings of the mitted controlling drilling of homeons.	I profiles do g process of s of approproplastic pack ut and fusio	uly reinforce of required riatedimensi kers, plastic n welded at	ed with 1.60 length (shapon, EPDM gon, Eaps and note all corners,	± 0.2 mm oe &size ac asket, G.I fa ecessary si mullion (ifre	thick galvant ecording to asteners 10 tainless ste equired) sha	nizedmild st uPVC profi 0 x 8 mm si el screws e Il be also fus	eel sectile), , uP ze for fix tc.Profile sion well
	between frameand adjated of required size and of a Charge. (Single / doubt frame, sash and mullion shall be acceptable. Fix mm both having wall thought 0.75 sqm.)	acent finished approved quelengles particularly lengles particularly ed windownickness of	ed wall shall uality, all co nes andsilio profiles min / ventilator i 1.9 ± 0.2 m	be filled with mplete as position sealant subsections to be subsectionally be subsec	h weather per approved shall be pail ncein dimerall series) fi	proof silicon drawing & of d separately nsion i.e. in rame 47 x 5	sealant ove direction of E y). Note depth & wid 0 mm & mu priate dimen	rbacker Engineer : For uP th of pro
	between frameand adjated of required size and of a Charge. (Single / doub frame, sash and mullion shall be acceptable. Fix mm both having wall the	acent finishe approved q le glass pa n extruded ed window	ed wall shall uality, all co nes andsilic profiles min ventilator i	be filled wit mplete as poson sealants us 5% tolera made of (sm	h weather per approved shall be pail incein dimerall series) fire glazing be	drawing & of d separately nsion i.e. in rame 47 x 5 and ofappro	sealant ove direction of E y). Note depth & wid 0 mm & mu priate dimen	rbacker Engineer : For uP Ith of pro Ilion 47x asion. (A
	between frameand adjated of required size and of a Charge. (Single / doubt frame, sash and mullion shall be acceptable. Fix mm both having wall thought 0.75 sqm.)	acent finished approved quelengles particularly lengles particularly ed windownickness of	ed wall shall uality, all co nes andsilio profiles min / ventilator i 1.9 ± 0.2 m	be filled with mplete as person sealant substitute to the sealant subs	h weather per approved shall be paid incein dimerall series) fire glazing be	drawing & cdd separatelynsion i.e. in rame 47 x 5 and ofappropal Quantity	sealant ove direction of E y). Note depth & wid 0 mm & mu priate dimen 4.500	rbacker Engineer : For uP Ith of pro Illion 47x asion. (A
	between frameand adjated of required size and of a Charge. (Single / doubt frame, sash and mullion shall be acceptable. Fix mm both having wall thought 0.75 sqm.)	acent finished approved quelengles particularly lengles particularly ed windownickness of	ed wall shall uality, all co nes andsilio profiles min / ventilator i 1.9 ± 0.2 m	be filled with mplete as person sealant substitute to the sealant subs	h weather per approved shall be pail nacein dimerall series) fire glazing be tall Deducte	drawing & cd separatelynsion i.e. in rame 47 x 5 and ofapproperately department of the control o	sealant ove direction of E y). Note depth & wid 0 mm & mu priate dimer 4.500 4.500 sqm	rbacker Engineer : For uP Ith of pro Illion 47x asion. (A
	between frameand adjated of required size and of a Charge. (Single / doubt frame, sash and mullion shall be acceptable. Fix mm both having wall thought 0.75 sqm.)	acent finished approved quelengles particularly lengles particularly ed windownickness of	ed wall shall uality, all cones and silic profiles minurate ventilator (1.9 ± 0.2 m)	be filled with mplete as person sealant substitute to the sealant subs	h weather per approved shall be pai incein dimerall series) fire glazing be tall Deducte	drawing & cd separatelynsion i.e. in rame 47 x 5 and ofapproperated Quantity d Quantity	sealant ove direction of E y). Note depth & wid 0 mm & mu priate dimer 4.500 4.500 sqm 0.000 sqm	rbacker Engineer : For uP Ith of pro Illion 47x asion. (A
23	between frameand adjated of required size and of a Charge. (Single / doubt frame, sash and mullion shall be acceptable. Fix mm both having wall thought 0.75 sqm.)	acent finished approved que glass particular ed window ed window alckness of the second secon	ed wall shall uality, all cones and silicones and silicone	be filled with mplete as person sealant sus 5% toleral made of (sm m) and single 0.500  Toleral y 4.500 sqm el shutters with p and bottom mention of the control of the con	h weather per approved shall be pai uncein dimerall series) fire glazing be Total Deducte  Net Total Deducte  Net Total with vertical m rail of T-	oroof silicon Idrawing & of separately insion i.e. in rame 47 x 5 and of appropriate Quantity d Quantity al Quantity 6.06 / sqm channels 20 iron 40x40x	sealant ove direction of E y). Note depth & wid 0 mm & mu oriate dimer 4.500 4.500 sqm 0.000 sqm 4.500 sqm Rs 34	rbacker Engineer : For uP th of pro Ilion 47x asion. (A
23	between frameand adjated of required size and of a Charge. (Single / doubt frame, sash and mullion shall be acceptable. Fix mm both having wall the upto 0.75 sqm.)  for ventilator  10.3  Providing and fixing in with flat iron diagonals steel pulleys, complete	acent finished approved que glass particular ed window ed window alckness of the second secon	ed wall shall uality, all cones and silicones and silicone	be filled with mplete as person sealant sus 5% toleral made of (sm m) and single 0.500  Toleral y 4.500 sqm el shutters with p and bottom mention of the control of the con	h weather per approved shall be pai uncein dimerall series) fire glazing be Total Deducte  Net Total Deducte  Net Total with vertical m rail of T-	oroof silicon Idrawing & of separately insion i.e. in rame 47 x 5 and of appropriate Quantity d Quantity al Quantity 6.06 / sqm channels 20 iron 40x40x	sealant ove direction of E y). Note depth & wid 0 mm & mu oriate dimer 4.500 4.500 sqm 0.000 sqm 4.500 sqm Rs 34	rbacker Engineer : For uP th of pro Illion 47x asion. (A
23	between frameand adjatof required size and of Charge. (Single / doubt frame, sash and mullion shall be acceptable. Fix mm both having wall thrupto 0.75 sqm.)  for ventilator  10.3  Providing and fixing in with flat iron diagonals steel pulleys, complete priming coat of approven.	position col 20x5 mm e with bolts red steel pr	ed wall shall uality, all cones and silicones and silicone	be filled with mplete as person sealant sus 5% toleral made of (sm m and single 0.500  Toleral y 4.500 sqm el shutters vop and bottong arrangen	h weather per approved shall be pai uncein dimerall series) fire glazing be Total Deducte  Net Total Deducte  Net Total with vertical m rail of T-	oroof silicon Idrawing & of separately insion i.e. in rame 47 x 5 and of appropriate Quantity d Quantity al Quantity 6.06 / sqm channels 20 iron 40x40x	sealant ove direction of E y). br>Note depth & wid 0 mm & mu 	rbacker Engineer : For uP th of pro Ilion 47x asion. (A
23	between frameand adjatof required size and of Charge. (Single / doubt frame, sash and mullion shall be acceptable. Fix mm both having wall through upto 0.75 sqm.)  for ventilator  10.3  Providing and fixing in with flat iron diagonals steel pulleys, complete priming coat of approvements.	position col 20x5 mm se with bolts yed steel pr	ed wall shall uality, all cones and silicones and silicone	be filled with mplete as person sealant sus 5% toleral made of (sm m and single 0.500  Toleral y 4.500 sqm el shutters vop and bottong arrangen	Total Deducte  Net Total  @ Rs 7626  with vertical m rail of T- nent, stopp	oroof silicon Idrawing & of separately insion i.e. in rame 47 x 5 and of appropriate Quantity d Quantity al Quantity 6.06 / sqm channels 20 iron 40x40x	sealant overside sealan	rbacker Engineer : For uP Ith of pro Illion 47x asion. (A

					Net Tota		9.000 sqn	<u>l</u>
			Say	9.000 sqm	@ Rs 10205	.93 / sqm	Rs 91	853.37
24	10.28 Providing and fixing including welding, grissame with necessary accessories & stainles floor or the side of we payment purpose or accessories such as	nding, buffing y stainless ss steel das aist slab w nly weight	ng, polishing steel nuts a ch fasteners, ith suitable a of stainless	and making nd bolts co stainless ste arrangemen steel men	g curvature ( omplete, i/c eel bolts etc. t as per app	(wherever r fixing the ,, of require proval of E	required) an railing with ed size on th ngineer-in-c	d fitting to necessate top of the charge, (
	hand rail	2	6.000				12.000	
			JAs	To	Tota	l Quantity	12.000 kg	
			611	11 30	Net Tota	al Quantity	12.000 kg	
		6		Say 12.000	kg @ Rs 67	77.34 / kg	Rs 8′	128.08
SI No	Description	No	L	В	D	CF	Quantity	Remark
		4	Appendix D	- Parking A	rea			
1	16.78.1 Construction of grand mixing in a mechanica & lifts, spreading in compacting with vibra	al mix plant iniform laye	at OMC, Car ers of specific	riage of mixe	ed material l s with moto	oy tippers to r grader on	o work site, prepared s	for all lea surface a
1	Construction of grand mixing in a mechanica & lifts, spreading in (	al mix plant iniform laye tory power -in- Charge	at OMC, Car ers of specific roller to achie	riage of mixed thicknessive the desir	ed material les with motoried density,	oy tippers to r grader on complete as	o work site, prepared s s per specifi	for all lea surface a cations a
1	Construction of grand mixing in a mechanica & lifts, spreading in compacting with vibra directions of Engineer	al mix plant iniform laye tory power -in- Charge	at OMC, Car ers of specific roller to achie	riage of mixed thicknessive the desir	ed material les with motoried density,	oy tippers to r grader on complete as	o work site, prepared s s per specifi	for all lea surface a cations a
1	Construction of grand mixing in a mechanica & lifts, spreading in compacting with vibra directions of Engineer having CBR Value- 30	al mix plant iniform laye tory power -in- Charge	at OMC, Car ers of specific roller to achie .With Materia	riage of mixed thicknesseve the desir	ed material les with motored density, go to Grade -	oy tippers to r grader on complete as	o work site, or prepared so so per specific ge 75 mm to	for all lea surface a cations a
1	Construction of grand mixing in a mechanica & lifts, spreading in a compacting with vibra directions of Engineer having CBR Value- 30 Auction hall front	al mix plant uniform laye tory power -in- Charge ) 1	at OMC, Car ers of specific roller to achie .With Materia	riage of mixed thicknesseve the desired conforming 20.000	ed material les with motored density, g to Grade -	oy tippers to r grader on complete as	o work site, or prepared site is per specific ge 75 mm to	for all lea surface a cations a
1	Construction of grand mixing in a mechanica & lifts, spreading in a compacting with vibra directions of Engineer having CBR Value- 30 Auction hall front side	al mix plant uniform laye tory power -in- Charge ) 1	at OMC, Car ers of specific roller to achie .With Materia 40.000	riage of mixed thickness eve the desir I conforming 20.000 6.000	ed material les with motored density, of to Grade - 0.150	oy tippers to r grader on complete as	o work site, o prepared s s per specifi ge 75 mm to  120.000  5.400	for all lea surface a cations a
1	Construction of grand mixing in a mechanica & lifts, spreading in a compacting with vibrated directions of Engineer having CBR Value- 30 Auction hall front side  AH west side	al mix plant uniform layer tory power -in- Charge ) 1 1	at OMC, Car ers of specific roller to achie .With Materia 40.000 6.000 40.000	riage of mixed thickness eve the desir I conforming 20.000 6.000	ed material les with motored density, of to Grade - 0.150 0.150	oy tippers to r grader on complete as	o work site, o prepared sis per specific pe 75 mm to 120.000   5.400   60.000	for all lea surface a cations a
1	Construction of grand mixing in a mechanica & lifts, spreading in a compacting with vibrated directions of Engineer having CBR Value- 30 Auction hall front side  AH west side  for road	al mix plant uniform laye tory power -in- Charge ) 1 1 1	at OMC, Carers of specific roller to achieve with Material 40.000 6.000 40.000 30.000	riage of mixed thickness eve the desir I conforming 20.000 6.000	ed material les with motored density, of to Grade -  0.150  0.150  0.150  0.150	oy tippers to r grader on complete as	o work site, o prepared sis per specific pe 75 mm to 120.000   5.400   60.000   22.500	for all leasurface a cations a 0.075 m
1	Construction of grand mixing in a mechanica & lifts, spreading in a compacting with vibrated directions of Engineer having CBR Value- 30 Auction hall front side  AH west side  for road	al mix plant uniform laye tory power -in- Charge ) 1 1 1	at OMC, Carers of specific roller to achieve with Material 40.000 6.000 40.000 30.000	riage of mixed thickness eve the desir I conforming 20.000 6.000 10.000 5.000	ed material les with motored density, of to Grade -  0.150  0.150  0.150  0.150	oy tippers to r grader on complete as I ( size rang	o work site, o prepared site is per specific pe 75 mm to 120.000   5.400   60.000   22.500   4.100	for all leasurface a cations a 0.075 m
1	Construction of grand mixing in a mechanica & lifts, spreading in a compacting with vibrated directions of Engineer having CBR Value- 30 Auction hall front side  AH west side  for road	al mix plant uniform laye tory power -in- Charge ) 1 1 1	at OMC, Carers of specific roller to achieve with Material 40.000 6.000 40.000	riage of mixed thickness eve the desir I conforming 20.000 6.000 10.000 5.000	ed material les with motored density, of to Grade -  0.150  0.150  0.150  Total deducted and the control of the	oy tippers to r grader on complete as I ( size rang	o work site, o prepared site in prepared sit in prepared site in prepared site in prepared site in prepared	for all leasurface a cations a 0.075 m
1	Construction of grand mixing in a mechanica & lifts, spreading in a compacting with vibrated directions of Engineer having CBR Value- 30 Auction hall front side  AH west side  for road	al mix plant uniform laye tory power -in- Charge ) 1 1 1	at OMC, Carers of specific roller to achieve the August 1997 Augus	riage of mixed thickness eve the desir I conforming 20.000 6.000 10.000 5.000	ed material les with motored density, of to Grade -  0.150  0.150  0.150  Total deducted and the control of the	oy tippers to r grader on complete as I ( size rang al Quantity d Quantity	o work site, o prepared site in prepared sit in prepared site in prepared site in prepared site in prepared	for all leasurface a cations a 0.075 m

	Auction hall front	1	40.000	20.000	f Engineer-ii 0.150	_	120.000	
	side		6.000	6.000	0.150		5.400	
	AH west side	1	40.000	10.000	0.150		60.000	
		1			0.150		22.500	
	for road rounded	1	30.000 4.100	5.000	0.150		4.100	
	rounded	1	4.100		Total	ol Ougatitu		
				T		al Quantity	212.000 c	
			- 6	10	otal Deducte		0.000 cum	
				.40.000		al Quantity	212.000 c	
3	16.43.1		Say 2	12.000 cum	n @ Rs 4569	9.25 / cum	KS 968	8681.00
	Providing and laying cement content as persize in appropriate prosleeve/tie bars wherever and surface vibrators form work with sturd construction & longituding joints with appropriate construction and surface vibrators.	er design m roportions a ver required , levelling to y M.S. cha dinal joints	ix, using coast per approvential in the second in the seco	rse sand and ed & specifie, spreading pe/ camber s, curing, rex 50 mm dec	nd graded s fied design g and compa , finishing w naking prov leep) by gro	tone aggreed criteria, producting mechalith required rision for cooper cutting	gate of 40 noviding dower anically by untersture, incontraction / machine, pr	nm nonel bars sing ne luding sexpans
	cement content as pe size in appropriate pr sleeve/tie bars wherev and surface vibrators, form work with sturd	er design many roportions and ver required by M.S. challing to dinal joints oved joint final alants, dower alants, dower alants, dower alants, dower alants	ix, using coasts per approvents, laying at site required slowned section (10 mm wide liber and sealed bars with slum. Excess/le	rse sand and ved & specifie, spreading pe/ camber s, curing, reax 50 mm dants, completeve/tie baress cement	nd graded sified design and comparations, finishing when the making provide the all as personated as	tone aggreed criteria, producting mechalith required vision for colove cutting ar direction of separately)	gate of 40 noviding down anically by untexture, incontraction / machine, professionals. Note: Cem	nm nonel bars sing ne luding sexpans oviding in-chair corrections
	cement content as persize in appropriate prosleeve/tie bars wherever and surface vibrators, form work with sturd construction & longitur filling joints with appropriate of joint fillers, sear considered in M-30 is	er design many roportions and ver required by M.S. challing to dinal joints oved joint final alants, dower alants, dower alants, dower alants, dower alants	ix, using coasts per approvents, laying at site required slowned section (10 mm wide liber and sealed bars with slum. Excess/le	rse sand and ved & specifie, spreading pe/ camber s, curing, reax 50 mm dants, completeve/tie baress cement	nd graded sified design and comparations, finishing when the making provide the all as personated as	tone aggreed criteria, producting mechalith required vision for colove cutting ar direction of separately)	gate of 40 noviding down anically by untexture, incontraction / machine, professionals. Note: Cem	nm nonel bars sing ne luding sexpans oviding in-chair corrections
	cement content as persize in appropriate prosleeve/tie bars wherever and surface vibrators form work with sturd construction & longitur filling joints with appropriate of joint fillers, see considered in M-30 is separately. Cement considered considered in M-30 is separately.	er design many roportions and ver required by M.S. challing to dinal joints oved joint final alants, dowed and the concrete preparations of the concrete preparations and the concrete preparations are the concrete pre	ix, using coast per approvential approvential in the section of th	rse sand and ved & specifie, spreading pe/ camber s, curing, rex x 50 mm dants, compleeve/tie barress cement ch mixing m	nd graded sified design and comparations, finishing when the second state of the second secon	tone aggreed criteria, producting mechalith required vision for colove cutting ar direction of separately)	gate of 40 noviding down anically by untexture, incontraction / machine, prof Engineer is payable/	nm nonel bars sing ne luding sexpans oviding in-chainent cor
	cement content as persize in appropriate prosleeve/tie bars wherever and surface vibrators form work with sturd construction & longitur filling joints with appropriate of joint fillers, see considered in M-30 is separately. Cement considered to the separately.	er design manager required wer required by M.S. chat dinal joints wored joint final alants, downward was a second of the concrete prepared to the	ix, using coast per approvants, laying at site required slowed to the section of	rse sand ar ved & specie, spreading pe/ camber s, curing, rex 50 mm dants, compleeve/tie baress cement ch mixing m	nd graded sign and comparations, finishing when the second states of the second states of the second	tone aggreed criteria, producting mechalith required vision for colove cutting ar direction of separately)	gate of 40 noviding down anically by untexture, incontraction / machine, prof Engineers. Note: Cemis payable/	nm nonel bars sing ne luding sexpans oviding in-chair corrections
	cement content as persize in appropriate prosleeve/tie bars wherever and surface vibrators form work with sturd construction & longitur filling joints with appropriate of joint fillers, see considered in M-30 is separately. Cement considered in M-30 is separately. Cement considered in M-30 is separately.	er design maroportions aver required, levelling to by M.S. chadinal joints oved joint fill alants, dowe and the second se	ix, using coas s per approva- , laying at site required slounnel section (10 mm wide ler and sealed bars with slum. Excess/leared with bat 40.000	rse sand ar yed & species, spreading pe/ camber s, curing, rex 50 mm dants, complete eve/tie baress cement ch mixing mand 20.000	nd graded sign design and comparations, finishing when the series of the paid used as perhachine 0.100 0.100	tone aggreed criteria, producting mechalith required vision for colove cutting ar direction of separately)	gate of 40 noviding down anically by untexture, incontraction / machine, prof Engineer is payable/  80.000  3.600	nm nonel bars sing ne luding sexpans oviding in-chair corrections
	cement content as persize in appropriate prosleeve/tie bars wherever and surface vibrators form work with sturd construction & longitur filling joints with approlatem of joint fillers, seasonsidered in M-30 is separately. Cement considered in M-30 is separately.	er design maroportions aver required, levelling to by M.S. chadinal joints oved joint fill alants, dowe and the second se	ix, using coas s per approva- s per approva- laying at site required slounnel section (10 mm wide ler and seals are with slum. Excess/leared with bat 40.000  40.000	rse sand ar yed & species, spreading pe/ camber s, curing, rex 50 mm dants, compleeve/tie baress cement ch mixing marges 20.000  6.000	nd graded sign design and compared and compared in the sign of the	tone aggreed criteria, producting mechalith required vision for colove cutting ar direction of separately)	gate of 40 noviding down anically by untexture, incontraction / machine, prof Engineer is payable/  80.000  3.600  40.000	nm nonel bars sing ne luding sexpans oviding in-chair corrections.
	cement content as persize in appropriate prosleeve/tie bars wherever and surface vibrators form work with sturd construction & longitur filling joints with appropriate of joint fillers, searconsidered in M-30 is separately. Cement considered in M-30 is separately.	er design maroportions aver required, levelling to by M.S. chadinal joints oved joint fill alants, dowe and the second se	ix, using coas s per approva- s per approva- laying at site required slounnel section (10 mm wide ler and seals are with slum. Excess/leared with bat 40.000  40.000  30.000	rse sand ar yed & species, spreading pe/ camber s, curing, rex 50 mm dants, compleeve/tie baress cement ch mixing marges 20.000  6.000	nd graded sign design and compared and compared in the provide and the provide	tone aggreed criteria, producting mechalith required vision for colove cutting ar direction of separately)	gate of 40 moviding down anically by untexture, incontraction / machine, proof Engineer is payable/  80.000  80.000  40.000  15.000	nm nonel bars sing ne luding sexpans oviding in-chainent correcover
	cement content as persize in appropriate prosleeve/tie bars wherever and surface vibrators form work with sturd construction & longitur filling joints with appropriate of joint fillers, searconsidered in M-30 is separately. Cement considered in M-30 is separately.	er design maroportions aver required, levelling to by M.S. chadinal joints oved joint fill alants, dowe and the second se	ix, using coas s per approva- s per approva- laying at site required slounnel section (10 mm wide ler and seals are with slum. Excess/leared with bat 40.000  40.000  30.000	rse sand ar ved & species, spreading pe/ camber s, curing, rex 50 mm dants, complete ve/tie baress cement ch mixing mar 20.000  10.000  5.000	nd graded sign design and compared and compared in the provide and the provide	tone aggreed criteria, pro- criteria, pro- criting mechanistion for co- ove cutting are direction of separately) design mix al Quantity	gate of 40 moviding down anically by untexture, incontraction / machine, proof Engineer is payable/  80.000  3.600  40.000  15.000  3.400	nm nonel bars sing ne luding sexpans oviding in-character cover
	cement content as persize in appropriate prosleeve/tie bars wherever and surface vibrators form work with sturd construction & longitur filling joints with appropriate of joint fillers, searconsidered in M-30 is separately. Cement considered in M-30 is separately.	er design maroportions aver required, levelling to by M.S. chadinal joints oved joint fill alants, dowe and the second se	ix, using coas s per approva- s per approva- laying at site required slounnel section (10 mm wide ler and seals are with slum. Excess/leared with bat 40.000  40.000  30.000	rse sand ar ved & species, spreading pe/ camber s, curing, rex 50 mm dants, complete ve/tie baress cement ch mixing mar 20.000  10.000  5.000	nd graded sofied design and compared in the provided in the pr	tone aggreed criteria, pro- criteria, pro- criting mechanistion for co- ove cutting are direction of separately) design mix al Quantity	gate of 40 moviding down anically by untexture, incontraction / machine, proof Engineer is payable/  80.000  3.600  40.000  15.000  3.400  142.000 c	nm nonel bars sing ne luding sexpans oviding in-chain correcover

								1
	qty of CC	1	138.600			60.0	8316.000	@ 60kg/m3
	rounded	1	14.000				14.000	
					Tota	al Quantity	8330.000	kg
				Тс	tal Deducte	d Quantity	0.000 kg	
					Net Tota	al Quantity	8330.000	kg
			5	Say 8330.00	00 kg @ Rs	98.30 / kg	Rs 818	3839.00
5	16.44 Extra for providing an specification in cemer	_	_	compound	of approve	ed quality a	as per man	ufacture
	q t y o f c c 307.8*340=104652(20 93 bags	1	2099.000	A.		0.2	419.800	@200ml 0kg cemen
	rounded	Œ	5.200	32			5.200	@200ml 0kg cemen
		MI		755	Tota	al Quantity	425.000 L	itre
	1 10	TO S		Тс	tal Deducte	d Quantity	0.000 Litre	Э
			A STATE	110,727	Net Tota	al Quantity	425.000 L	itre
	Ot	ther E	ngineesay	425.000 Li	tre @ Rs 59	.86 / Litre	Rs 25	440.50
SI No	Description	No	5 Append	ix E- Drain	D	CF	Quantity	Remark
1	2.8.1 Earth work in excavation trenches or drains (not ramming of bottoms, lift excavated soil as direct main drain from	exceedin t up to 1. ted, withi	g 1.5 m in w 5 m, includir n a lead of 5	idth or 10 s ig getting o 0 m.All kind	sqm on plar ut the exca ds of soil	n), including	dressing o	f sides a
	Auction hall to sump	1	50.000	1.300	1.000		65.000	
					Tota	al Quantity	65.000 cu	m
				To	tal Deducte	d Quantity	0.000 cun	า
					Net Tota	al Quantity	65.000 cu	m
			Say	/ 65.000 cui	m @ Rs 296	5.94 / cum	Rs 19	301.10
2	2.6.1 Earth work in excavat (exceeding 30 cm in de earth, lead up to 50 m a soil	epth, 1.5 n	n in width as	well as 10	sqm on pla	n) including	disposal of	excavate

	Pit of septic tank	1	8.200	4.000	2.450		80.360	
	soak pit 2m dia	1	3.140	1*1	2.100		6.594	
	round of	1	3.046				3.046	
					Tota	al Quantity	90.000 cu	m
				To	tal Deducte	d Quantity	0.000 cun	า
					Net Tota	al Quantity	90.000 cu	m
			Say	y 90.000 cur	n @ Rs 214	.03 / cum	Rs 19	262.70
3	4.1.8 Providing and laying in shuttering - All work up nominal size)	•		•	_	_		_
	for drain	1	50.000	1.300	0.150		9.750	
	Pit of septic tank	1	8.200	4.000	0.200		6.560	
	round of	1	0.690	SV			0.690	
		18	4538		Tota	al Quantity	17.000 cu	m
	1	101	Ma	To	tal Deducte	d Quantity	0.000 cun	า
		1/3			Net Tota	al Quantity	17.000 cu	m
4	5.1.2	ther Eı		17.000 cum	@ Rs 6814	.89 / cum		m 5853.13
4	5.1.2 Providing and laying in centering, shuttering, fir sand :3 graded stone addrain bottom slab	position	ngineeri specified gra I reinforceme	ng Orga ade of reinfo ent - All work	@ Rs 6814 anisatio	1.89 / cum	Rs 115	5853.13 the cos
4	Providing and laying in centering, shuttering, fir sand :3 graded stone at	n position in posi	ngineeri specified gra I reinforceme 0 mm nomin	ng Orga ade of reinfo ent - All work al size	@ Rs 6814 anisatio orced ceme a up to plinth	1.89 / cum	Rs 11s	5853.13 the cos
4	Providing and laying in centering, shuttering, fir sand :3 graded stone agdrain bottom slab	n position s nishing and ggregate 2	specified grad reinforcement of mm nomination 50.000	ng Organde of reinforment - All work all size	@ Rs 6814 anisatio préed ceme a up to plintr  0.100	1.89 / cum	Rs 11s e, excluding :3 (1 cemen	5853.13 the cos
4	Providing and laying in centering, shuttering, fir sand :3 graded stone as drain bottom slab side wall cover slad for drain	n position shishing and ggregate 2	specified grad reinforcement of mm nomination 50.000 50.000	ng Organde of reinforment - All work al size  1.200  1.000	@ Rs 6814 anisatio orced ceme a up to plinth  0.100  0.200	1.89 / cum	Rs 119 e, excluding :3 (1 cement 6.000 20.000	5853.13 the cos
4	Providing and laying in centering, shuttering, fir sand :3 graded stone as drain bottom slab side wall cover slad for drain 50/.5	n position in posi	specified grad reinforcement of mm nominal 50.000 50.000 1.000	ng Organde of reinfo ent - All work al size 1.200 1.000	@ Rs 6814 anisatio orced ceme c up to plinth 0.100 0.200 0.150	1.89 / cum	Rs 119 e, excluding :3 (1 cemen) 6.000 20.000 7.500	5853.13 the cos
4	Providing and laying in centering, shuttering, fir sand :3 graded stone as drain bottom slab side wall cover slad for drain 50/.5 cover slab septic tank	n position in posi	specified grad reinforcement of mm nominal solution of the specified grad reinforcement of the specifi	ng Organde of reinforment - All work all size  1.200  1.000  0.500	@ Rs 6814 anisatio orced ceme c up to plinth 0.100 0.200 0.150 0.120	1.89 / cum	Rs 119 e, excluding :3 (1 cemen) 6.000 20.000 7.500 3.360	5853.13 the cos
4	Providing and laying in centering, shuttering, fir sand :3 graded stone as drain bottom slab side wall cover slad for drain 50/.5 cover slab septic tank do beam	n position shishing and ggregate 2  1 2 100 16	specified grad reinforcement of mm nominal 50.000   50.000   1.000   3.500   7.500	ng Organde of reinforment - All work all size  1.200  1.000  0.500  0.300	@ Rs 6814 anisatio orced ceme c up to plinth 0.100 0.200 0.150 0.120 0.300	1.89 / cum	Rs 119 e, excluding :3 (1 cemen) 6.000 20.000 7.500 3.360 0.675	5853.13 the cos
4	Providing and laying in centering, shuttering, fir sand :3 graded stone as drain bottom slab side wall cover slad for drain 50/.5 cover slab septic tank do beam cover slab soak pit	n position in posi	specified grad reinforcement of mm nominal 50.000   50.000   1.000   3.500   7.500   3.140	ng Organde of reinforment - All work all size  1.200  1.000  0.500  0.300	@ Rs 6814 anisatio orced ceme a up to plinth 0.100 0.200 0.150 0.120 0.300 0.120	1.89 / cum	Rs 119 e, excluding :3 (1 cemen) 6.000 20.000 7.500 3.360 0.675 0.415	the cost 1.5 coa
4	Providing and laying in centering, shuttering, fir sand :3 graded stone as drain bottom slab side wall cover slad for drain 50/.5 cover slab septic tank do beam cover slab soak pit	n position in posi	specified grad reinforcement of mm nominal 50.000   50.000   1.000   3.500   7.500   3.140	ng Organde of reinforment - All work all size  1.200  1.000  0.500  0.300  1.100	@ Rs 6814 anisatio orced ceme a up to plinth 0.100 0.200 0.150 0.120 0.300 0.120	H.89 / cum OTS Int concrete Tevel:1:1:5	Rs 119 e, excluding :3 (1 cemen) 6.000 20.000 7.500 3.360 0.675 0.415 0.050	the cost 1.5 cost
4	Providing and laying in centering, shuttering, fir sand :3 graded stone as drain bottom slab side wall cover slad for drain 50/.5 cover slab septic tank do beam cover slab soak pit	n position in posi	specified grad reinforcement of mm nominal 50.000   50.000   1.000   3.500   7.500   3.140	ng Organde of reinforment - All work all size  1.200  1.000  0.500  0.300  1.100	@ Rs 6814 anisatio orced ceme a up to plinth 0.100 0.200 0.150 0.120 0.300 0.120 Tota stal Deducte	H.89 / cum OTS Int concrete Tevel:1:1:5	Rs 115 e, excluding :3 (1 cemen) 6.000 20.000 7.500 3.360 0.675 0.415 0.050 38.000 cu	the cost 1.5 coat
4	Providing and laying in centering, shuttering, fir sand :3 graded stone as drain bottom slab side wall cover slad for drain 50/.5 cover slab septic tank do beam cover slab soak pit	n position in posi	1 reinforcement of mm nominal specified grad reinforcement of mm nominal specified grad specified grad reinforcement of mm nominal specified grad specified	ng Organde of reinforment - All work all size  1.200  1.000  0.500  0.300  1.100	@ Rs 6814 anisatio orced ceme a up to plinth 0.100 0.200 0.150 0.120 0.300 0.120 Tota stal Deducte Net Tota	al Quantity d Quantity al Quantity	Rs 115  2, excluding 3 (1 cemen)  6.000  20.000  7.500  3.360  0.675  0.415  0.050  38.000 cu  0.000 cun  38.000 cu	the cost 1.5 coa

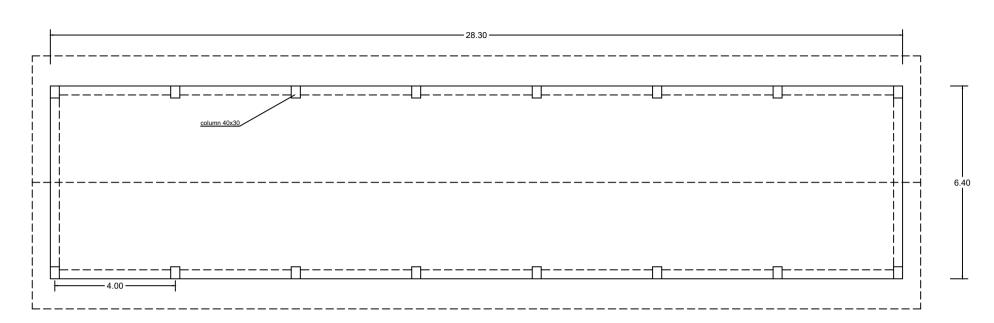
	side wall drain out	2	50.000	1.000			100.000	
	ide wall drain in	2	50.000	0.900			90.000	
					Tota	al Quantity	190.000 s	gm
				To	otal Deducte		0.000 sqn	·
						al Quantity	190.000 s	
			Say	190.000 sq	m @ Rs 649	9.82 / sqm	Rs 123	3465.80
6	5.9.1 Centering and shuttering columns, etc for mass of	-	g strutting, et	c. and remo	oval of form	for:Foundat	ions, footing	gs, bases
	For cover slab drain 105 x 50 x 15 cm	100	3.100	0.150			46.500	
	For cover slab Effluent tank sides	16	8.000	0.120			15.360	
	beam	1	7.500	0.900	133	1	6.750	
	round	1	1.390	Ley,			1.390	
					Tota	al Quantity	70.000 sq	m
		ther E	ngineeri		otal Deducte	10.0	0.000 sqn	า
			ngmeen		Net Tota	al Quantity	70.000 sq	m
			Sa	y 70.000 sq	m @ Rs 335	5.31 / sqm	Rs 23	471.70
						/		
7	5.22A.1 Steel reinforcement fo binding all complete a		`					
7	Steel reinforcement fo		`					
7	Steel reinforcement fo binding all complete a	bove plint	h level.Mild	steel and M	Medium Ten		ars	@90kg 3
7	Steel reinforcement fo binding all complete a	bove plint	h level.Mild	90.000	Medium Ten	sile steel b	3420.000	@90kg. 3 kilogram
7	Steel reinforcement fo binding all complete a	bove plint	h level.Mild	90.000	Total Deducte	sile steel b	3420.000 3420.000	@90kg 3 kilogram gram
7	Steel reinforcement fo binding all complete a	tove plintl	h level.Mild	90.000	Total Deducte  Net Total	al Quantity d Quantity al Quantity	3420.000 3420.000 0.000 kilo 3420.000	@90kg 3 kilogram gram
8	Steel reinforcement fo binding all complete a	ing pre cas	Say 3420.00 st solid block of 1979 for fo	90.000  To  0 kilogram o	Total Deducte  Net Tota  @ Rs 96.68	al Quantity d Quantity al Quantity / kilogram	3420.000 3420.000 0.000 kilo 3420.000 Rs 330	@90kg 3 kilogram gram kilogram 0645.60

	soak pit 2.00m dia - bottom	1	6.280	0.200	0.300		0.377	
	roumd	1	0.673				0.673	
					Tota	al Quantity	12.000 cu	m
				To	tal Deducte	d Quantity	0.000 cum	ı
					Net Tota	al Quantity	12.000 cu	m
			Say	12.000 cum	@ Rs 5908	.32 / cum	Rs 70	899.84
9	6.23 Honey-comb brick work structure above plinth leads to the comb brick work at the comb				•		•	•
	soak pit 2.00m dia - middle	1	6.280	1.300			8.165	
	rounded	1	0.835				0.835	
		1	37.5		Tota	al Quantity	9.000 sqm	1
		CL	1301	To	tal Deducte	d Quantity	0.000 sqm	1
		LAT	LAS		Net Tota	al Quantity	9.000 sqm	n .
	19		Sa	ay 9.000 sqr	m @ Rs 699	.37 / sqm	Rs 62	294.33
10	13.7.2 12 mm cement plaster	inished with	h a floating o	coat of neat	cement of m	ix:1:4 ( 1 ce	ement : 4 fine	e sand)
	for Drain side wall - inside		50.000	2.600		7	130.000	
	Effluent tank side wall	2	31.600	2.500			158.000	
	cross wall	2	3.200	2.500			16.000	
	h - 44							
	bottom	1	7.600	3.200			24.320	
	rounded	1	7.600 1.680	3.200				
				3.200	Tota	al Quantity	24.320	qm
					Tota	-	24.320 1.680	•
					tal Deducte	-	24.320 1.680 330.000 s	1
	rounded	1	1.680 Say	To 330.000 sqr	Net Tota m @ Rs 386	d Quantity al Quantity .36 / sqm	24.320 1.680 330.000 s 0.000 sqm 330.000 s Rs 127	qm <b>7498.80</b>
SI No		1 No	1.680 Say	Тс 330.000 sqr в	Net Tota m @ Rs 386	d Quantity	24.320 1.680 330.000 s 0.000 sqm 330.000 s	qm
SI No	rounded	1 No	Say L 6 Subsoil In	Тс 330.000 sqr в	Net Tota m @ Rs 386	d Quantity al Quantity .36 / sqm CF	24.320 1.680 330.000 s 0.000 sqm 330.000 s Rs 127	qm 7498.80 Remark
SI No	Description	No mp-Sum To	Say L 6 Subsoil In	To 330.000 sqr B	Net Tota  Met Tota  Met 386  D	d Quantity al Quantity .36 / sqm CF	24.320 1.680 330.000 s 0.000 sqm 330.000 s Rs 127	qm 7498.80 Remark
SI No	Description	No  Mp-Sum To	Say L 6 Subsoil In	To 330.000 sqr B nvestigation	Net Tota  n @ Rs 386  D  n	d Quantity al Quantity .36 / sqm CF	24.320 1.680 330.000 s 0.000 sqm 330.000 s Rs 127 Quantity	qm 7498.80 Remark

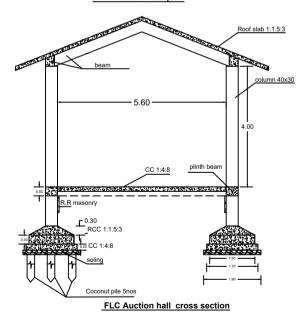
		1					
SI No	Description	No	L	В	D	CF	Quantity
		8 Electrific	ation and y	ard lighting	J		
	Lump-Sum To	otal			R	s 1000000.	.00
SI No	Description	No	L	В	D	CF	Quantity
		9 Unfores	seen expen	ses@2.5%			
	Lump-Sum To	otal			R	s 4940000.	.00
		Pr	ovision for G	ST paymen	ts (in %) @	18	8.0%
	A	Amount rese	erved for GS	Γ payments		35990955.	36
				Total	2	235940707	.36
			Lumpsum f	or round off		59292.64	ļ
		100	a Silv		то	TAL Rs 23	6000000.0
		-//	Mr.		Rounded	Total Rs 2	23,60,00,00
	1	53 0		Rupees T	wenty Three	e Crore Six	ty Lakh On
		Lump-Sum To	8 Electrific  Lump-Sum Total  SI No Description No  9 Unfores  Lump-Sum Total  Pr	8 Electrification and y  Lump-Sum Total  SI No Description No L  9 Unforeseen expense  Lump-Sum Total  Provision for G  Amount reserved for GS	8 Electrification and yard lighting  Lump-Sum Total  9 Unforeseen expenses@2.5%  Lump-Sum Total  Provision for GST payment  Amount reserved for GST payments  Total  Lumpsum for round off	B Electrification and yard lighting  Lump-Sum Total R SI No Description No L B D  9 Unforeseen expenses@2.5%  Lump-Sum Total R  Provision for GST payments (in %) @  Amount reserved for GST payments  Total 2  Lumpsum for round off  TO  Rounded	8 Electrification and yard lighting  Lump-Sum Total Rs 1000000.  SI No Description No L B D CF  9 Unforeseen expenses@2.5%  Lump-Sum Total Rs 4940000.  Provision for GST payments (in %) @ 16  Amount reserved for GST payments 35990955.3

(Cost Index Applied for this estimate is 35.59%)

Other Engineering Organisations
PRICE



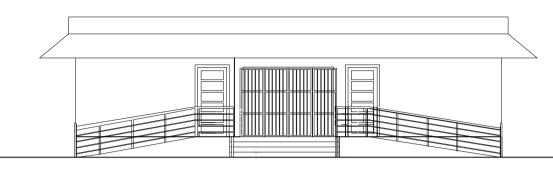
#### FLC Auction hall plan





#### DEVELOPMENT OF VIPIN -MUNAMBAM COASTAL STRETCH INCLUDING COASTAL PROTECTION -CONSTRUCTION OF FISH LANDING CENTRE AT MALIPPURAM

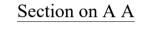
STAI	DRAWING NO:		ASSISTANT ENGINEER:		ASSISTANT ENGINEER: SIGNATURE:	ASSISTANT EXECUTIVE ENGINEER: SIGNATURE:
	DATE:		DRAWN:			
	TYPE:	DRAWING	REVIS	ION		CHIEF ENGINEER: SIGNATURE:
	TITLE.	ELC AUCTION HALL DIAM & CECTION	1.		DESIGNED & CHECKED BY	
	TITLE:	FLC AUCTION HALL PLAN & SECTION				

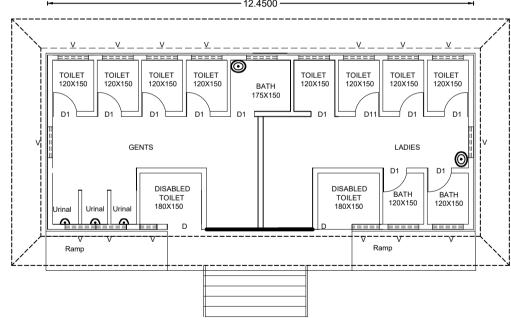


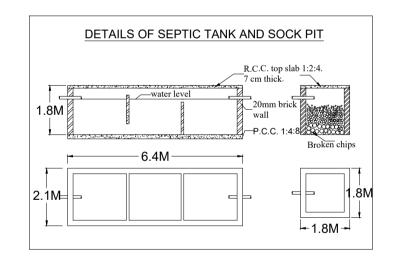
#### 

### **ELEVATION**







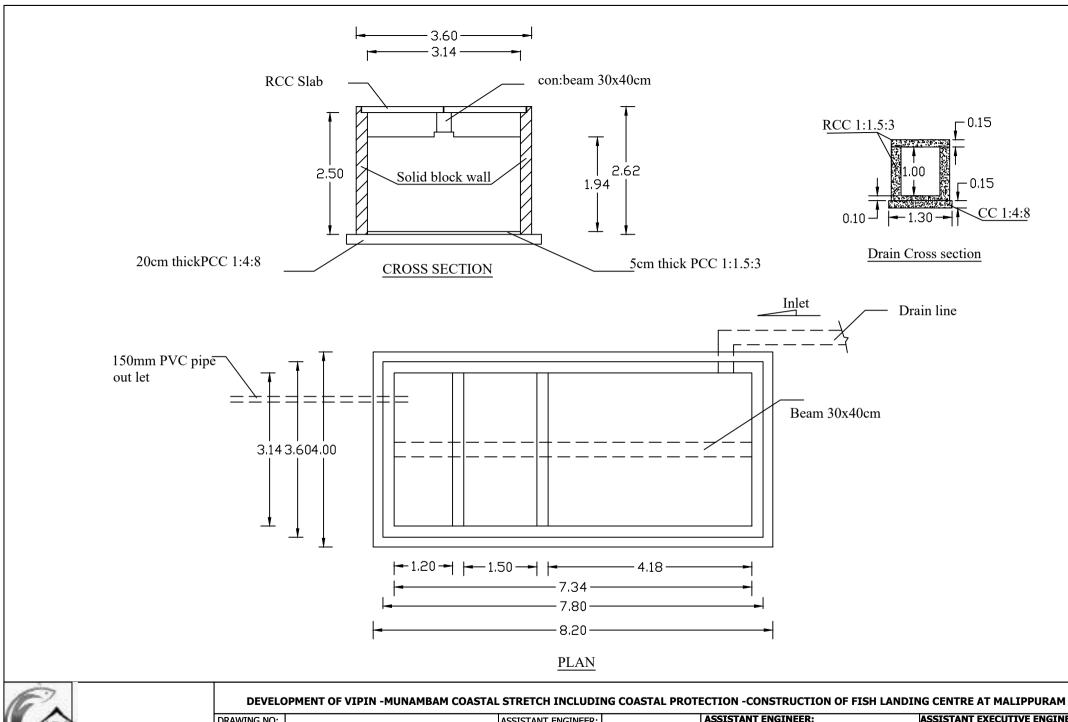


# $_{A}$ $\underline{PLAN}$



#### DEVELOPMENT OF VIPIN -MUNAMBAM COASTAL STRETCH INCLUDING COASTAL PROTECTION -CONSTRUCTION OF FISH LANDING CENTRE AT MALIPPURAM

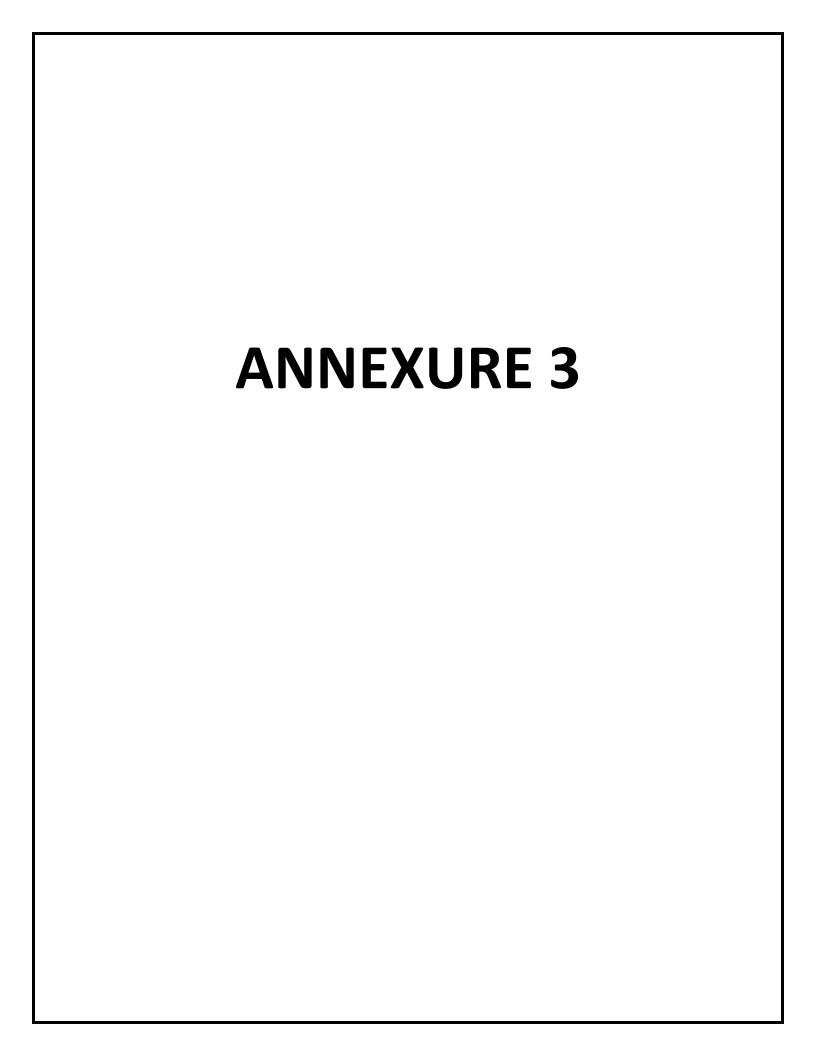
ΔΙ	DRAWING NO:		ASSISTANT ENGINEER:		ASSISTANT ENGINEER: SIGNATURE:	ASSISTANT EXECUTIVE ENGINEER: SIGNATURE:
Γ.	DATE:		DRAWN:			
	TYPE:	DRAWING	REVIS	ION	STRUCTURAL CONSULTANT:	CHIEF ENGINEER: SIGNATURE:
	TTT. F.	TOILET BLOCK	1.		DESIGNED & CHECKED BY	
	TITLE:	TOILET BLOCK				





ı	DRAWING NO:	ASSISTANT ENGINEER:	ASSISTANT ENGINEER: SIGNATURE:	ASSISTANT EXECUTIVE ENGINEER: SIGNATURE:
_	DATE:	DRAWN:		

Γ	DATE:		DRAWN:		
	TYPE:	DRAWING	REVIS	- 1.1.0 - 1.0 - 1.0 - 1.1 -	CHIEF ENGINEER: SIGNATURE:
	TTT1 C.	FISH LANDING CENTRE DRAIN AND	1.	DESIGNED & CHECKED BY	
	TITLE:	TREATMENT TANK	2.		



## Name of work : DEVELOPMENT OF VYPIN - MUNAMBAM COASTAL STRETCH INCLUDING COASTAL PROTECTION.-CONSTRUCTION OF FISH LANDING CENTRE AT VALIYATHAMPARAMBU ESTIMATE REPORT

This estimate is prepared based on the study conducted by IIT Madras towards the shore protection of Vypin to Munambam stretch in Ernakulam district of Kerala. Based on the study conducted by IIT Madras, the estiamte is prepared for the construction of Fish landing center at Valiyathamparambu where in 2 groynes are proposed for coastal protection. In this estimate, extension of Northern Groyne and provision of a new southern groyne is proposed. A filter layer of 1kg to 10kg category stone, Core layer using 100 to 300 kg stones, Toe Mound using 500 to 800 kg stones, Armour layer using 1.5T to 2.5T stones proposed here. In addition to that 2T tetrapods at 1.96m Thick and 4T tetrapods at 2.50m Thick is provided for armour layer. Provision for Auction hall building of size 28.3m x 6.4m is included in the estimate. For the auction hall, coconut piling of length 6m long is provided for foundation. RCC M20 provided for foundations, centering & shuttering, Reinforcement cement concrete work (M20) in walls isprovided for super structure. Necessary Steel reinforcement, plastering andpainting works are also included in the Auction hall. Provision for construction of a toilet block of size 12.5m x 5.1m is also included in the estimate. For the toilet block, RR masonry with cement mortar 1:6 is provided for the foundation. Solid block masonry of size 30x20x15cm and 40x20x10cm are provided for super structure. Ceramic tiling is provided in the floor and in the bathroom region. Necessary fittings are also provided for toilet block. Other provisions in the estimate include concrete parking area proposed near the the Auction hall. Provision for the construction of drain is also included in the estimate. Lump sum provisions for sub soil investigation, water supply and sanitary arrangement, Electrification and yard lighting are also included in the estimate. Lump sum provision for unforeseen expenses @2.5% are also included in the estimate. Total amount of estimate comes to Rupees 23.60 crore including 18% GST charges but excluding consultancy charges. The estimate is prepared in PRICE based on DSR 2018 and cost index is 35.59%. The provisions adopted in the estimate are adequate for proper completion of work. The estimate is prepared in PRICE based on DSR 2018 and cost index is 35.59%. The provisions adopted in the estimate are adequate for proper completion of work

### INCLUDING COASTAL PROTECTION AND CONSTRACTION OF FISH LANDING CENTRE AT VALIYATHAMPARAMBU

### COST ABSTRACT

1	APPENDIX - A GROYNE	Rs.	17 75 05 385/-
2	APPENDIX B- CONSTRUCTION OF AUCTION HALL	Rs.	31 90 663/-
3	Appendix C- construction of Toilet block	Rs.	24 10 666/-
4	Appendix D- construction of Parking Area	Rs.	63 36 782/-
5	Appendix E - Construction of Drain	Rs.	11 44 187/-
6	Sub soil investigation	Rs.	15 00 000/-
7	Water supply and sanitary arrangement	Rs.	19 00 000/-
8	Electrification and yard lighting	Rs.	10 00 000/-
9	Unforeseen expenses @ 2.5%	Rs.	49 90 000/-
<i>10</i>	Sub Total	Rs.	19 99 77 684/-
11	GST @ 18%	Rs.	3 59 95 983/-
<i>12</i>	Total Amount including GST 18%	Rs.	23 59 73 667/-
13	Lumpsum for Round off	Rs.	26 333/-
14	Total Amount	Rs.	23 60 00 000/-
<i>15</i>	Consultancy @5%	Rs.	1 18 00 000/-
<i>16</i>	GST on consultancy @ 18%	Rs.	21 24 000/-
<i>17</i>	Round off	Rs.	76 000/-
18	Grand Total	Rs.	25 00 00 000/-

Rupees Twenty Five Crore Only

## DEVELOPMENT OF VYPIN - MUNAMBAM COASTAL STRETCH INCLUDING COASTAL PROTECTION.-CONSTRUCTION OF FISH LANDING CENTRE AT VALIYATHAMPARAMBU

General Abstract

(Dsor year: 2018, Cost Index Applied for this estimate is 35.59%)

SI No	Heading Description	Amount
SI INO	Heading Description	
1	APPENDIX A_ GROYNE	177505384.77
2	APPENDIX B CONSTRUCTION OF AUCTION HALL	3190663.46
3	Appendix C- construction of Toilet block	2410665.96
4	Appendix D- construction of Parking Area	6336782.24
5	Appendix E - Construction of Drain	1144187.11
6	Sub soil investigation	1500000.00
7	Water supply and sanitary arrangement	1900000.00
8	Electrification and yard lighting	1000000.00
9	Unforeseen charges @2.5%	4990000.00
	Provision for GST payments (in %) @	18.0%
	Amount reserved for GST payments	35995983.04
	Total	235973667.04
	Lumpsum for round off	26332.96
		TOTAL Rs 236000000.0
	Other Engineering Organisa	tiOnRounded Total Rs 23,60,00,00
	Rupe	es Twenty Three Crore Sixty Lakh On

(Cost Index Applied for this estimate is 35.59%)

# DEVELOPMENT OF VYPIN - MUNAMBAM COASTAL STRETCH INCLUDING COASTAL PROTECTION.-CONSTRUCTION OF FISH LANDING CENTRE AT VALIYATHAMPARAMBU

**Detailed Estimate** 

(Dsor year: 2018,Cost Index Applied for this estimate is 35.59%)

SI No	Description	No	L	В	D	CF	Quantity	Remark	
		1	APPENDIX	A_ GROYN	<b>IE</b>				
1	od209388/2023_2024 Moulding and supplying mm, 30% 40 to 20mm design of mix proportion specific gravity of fine and the cement shall be (ii) @ 28 day - 30N/mm of tools and plants mound and instructions of Eng	, 30% 20 ton 0.5:,1.46 ggregate and grade 2 and minirulding and re	o 5mm usind a sind course a co	ng 380 kg co sight of wate ggregatesho ninimum cub of concrete	ement /m3 er cement, f buld not be l e strength r 2.5 g/cc. in	pf cpmcrete ine aggregatess than 2.7 requirement cluding hire	e as per ap ate, course a 73 and 2.5 re (i) @ 7 day and operation	proved mix aggregate ( espectively) - 20N/mm2 onal charge	
	ARMOUR LAYER, 4T tetrapods at 2.50m Thick	3015	B		13	<u>L</u>	3015.000		
		48			Tota	al Quantity	3015.000	each	
				То	tal Deducte	d Quantity	0.000 eac	h	
	Other Engineering Organi Net Total Quantity 3015.000 each								
		D 1	Say 3015	.000 each @	Rs 15999	.39 / each	Rs 4823	88160.85	
2	od209390/2023_2024 Conveying 1.6m3 (4T) forming the armour layer and operational charge	er of break	water to line	s and levels	_	•	•		
	ARMOUR LAYER, 4T tetrapods at 2.50m Thick	3015					3015.000		
					Tota	al Quantity	3015.000	each	
				То	tal Deducte	d Quantity	0.000 eac	h	
					Net Tota	al Quantity	3015.000	each	
			Say 301	5.000 each	@ Rs 2042	.97 / each	Rs 615	9554.55	
3	65.103  Moulding and supplying to 20mm and 30% 20mm ix proportion 0.5:1:1. gravity of fine aggregate cement shall be 43 grades.	nm to 6mm 46:3.22 by e and coars	using 380k weight of versight weight weight with weight of versight with the contraction with	g cement/ n water cemer should not	n3 of concr nt, fine agg be less thar	ete as per a regate, coa n 2.73 and 2	approved mirse aggrega 2.5 respective	x design o te (specific ely) and the	

	day - 30 N/mm2 and mi and plants, mould, cur departmental officers a	ing, rehan						
	ARMOUR LAYER, 2T tetrapods at 1.96m Thick	2705					2705.000	
					Tota	al Quantity	2705.000	each
				То	tal Deducte	d Quantity	0.000 eac	h
					Net Tota	al Quantity	2705.000	each
			Say 270	05.000 each	@ Rs 7596	.47 / each	Rs 2054	18451.35
	Conveying 0.8cum (2T specification and formir layer including hire and departmental officers at ARMOUR LAYER, 2T	ng the armo operational site	our layer of	breakwater	to lines and	levels over	the second	lary arm
	tetrapods at 1.96m Thick	2075				L	2075.000	
		1000			Tota	al Quantity	2075.000	each
		than Er			tal Deducte		0.000 eac	
			ngineeri		Net Tota		2075.000	
			Say 20	075.000 each	n @ Rs 912.	.92 / each	Rs 189	4309.00
5	2.6.1 Earth work in excavat (exceeding 30 cm in de earth, lead up to 50 m a	epth, 1.5 m	in width as	well as 10	sqm on pla	n) including	disposal of	excava
	From Chainage 0 to 40m	2	40.000	35.000	2.000		5600.000	
					Tota	al Quantity	5600.000	cum
				То	tal Deducte	d Quantity	0.000 cum	1
					Net Tota	al Quantity	5600.000	cum
			Say 5	5600.000 cur	n @ Rs 214	.03 / cum	Rs 119	8568.00
6	od209394/2023_2024 Supplying and laying necessary overlaps, a		•		^	•	• •	
	departmental officers	at site.						

	Northern Groyne							
	210m Chainage 0 to210	1	210.000	40.000			8400.000	
			South	ern Groyne	170m			
	Chainage 0 to 170m	1	170.000	40.000			6800.000	
		al Quantity	15200.000	sqm				
		d Quantity	y 0.000 sqm					
		al Quantity	15200.000 sqm					
		3.20 / sqm	Rs 126	4640.00				
7	od209395/2023_2024 [Based on 65.32]Supply 1.5T to 2.5T(70% of sto from 2.65 to 2.8 for form stones, hire of lorries a measurements of catago cost of the contractor stationeries and convey of the breakwater to the levels including all cost rehandling, placing and spalls/quarry muck lorries/tippers/cranes departmental officers  Armour lay Northern Groyne 210m Chainage 0 to210	ones > 2.0 ones > 2.0 ones > 2.0 ones > 2.0 ones ones ones ones ones ones ones ones	T) category mary armounderies, labour es after propoved softwar approved aligned levels as per charges, him dusing motion and maching all fine br> 5T to 2.5T section 1.55 to 2.5T section 1.55 to 2.55 section 1.55 sectio	stones of a r and berm r charges re per sorting a are having p gnment of the per approved re and operabile crane, in neries for idental cha akulam Dis	pproved quadret rubble more taken on printouts us the breakward drawings ational charmspecting the forming the targes etc. Constrict	ality having bunt breakwarry and a weigh bridg sing contracter and form with toleranges of mobile profile once he roadwarmplete as	specific gravater inclusive the sorting player installed a ctors supplication the primage of +/- 20 le crane and the in a week any for moves per the design of the design	vity ranges e of cost of ice and the it site at the ed papers, ary armour cm in final I excavator, and cost of vement of
	01 - 1 - 2 - 2 - 4 - 7 - 2			ern Groyne	170m		4000 700	
	Chainage 0 to 170m	1	4803.720		Tota	 al Quantity	4803.720 10737.720	tonno
				To	otal Deducte		0.000 tonr	
				10		al Quantity	10737.720	
8	Say 10737.720 tonne @ Rs 1781.12 / tonne Rs 19125167.8  od209396/2023_2024  Supplying blasted rock from approved quarry to sorting site and sorting the stones into 500kg to 80 category stones of approved quality having specific gravity ranges from 2.65 to 2.8 for forming primary armour and berm of rubble mount breakwater inclusive of cost of stones, hire of lorries machineries, labour charges required at quarry and at sorting place and the measurements catagorised stones after proper sorting are taken on weigh bridge installed at site at the cost of contractor with approved software having printouts using contractors supplied papers, stationeries							

	conveyed to the approve to the lines and levels cost and labour charges and packing and using and hire of machineries incidental charges etc. District	as per appi s, hire and o mobile cran s for formin	roved drawing perational of the contraction of the roadward of	ngs with tole charges of n g the profile ay for move	erance of +/ nobile crane once in a we	/- 20 cm in to and excava- reek and co- ries/tippers/	final levels in ator, rehandli st of spalls/q cranes etc in	ncluding all ing, placing uarry muck ncluding all
	Toe Mour	nd using 500	) to 800 kg s	stones (Assu	uming 1/3 vo	oid and sp.g	ravity 2.7)	
	Northern Groyne 210m Chainage 0 to210m	1	8849.300		1.050		9291.765	5% sinkage added
	Head	1	737.650	a.	1.050		774.533	5% sinkage added
		ونسيدا	South	ern Groyne	170m			
	Chainage 0 to 170m	1	7163.710	5. X	1.050		7521.896	
	Head	1	630.360		1.050		661.878	
		101	Ma		Tota	al Quantity	18250.072	tonne
		The		Тс	tal Deducte	d Quantity	0.000 tonr	ne
			772			al Quantity	18250.072	tonne
	0	ther En	Say 18250	.072 tonne	@ Rs 1781.	12 tonne	Rs 3250	5568.24
9	od209459/2023_2024 [Based on 65.30]Suppl sorting the stones into from 2.65 to 2.8 for fo lorries and machineries categorized stones aft contractor with approve conveyed to the approve water to the lines and let tolerance of +/- 20cm in light crane and cost of tippers / cranes etc incofficers at site by 2024	100kg to 30 rming the constant of the constant er proper some constant of the	Okg category core of rubb narges required from the having pringer the approver including a rry muck an noidental character of the caperover the approver including a conditional caperover including a conditional caperover including a caperover including a conditional caperover including a caperover including	y stones of a le mound b ired at quar aken on we atouts using eakwater an ed drawings Il cost and la d labour for	approved quareakwater in and at some contractors dependence and inspectations of the forming the approved the contractors and inspectations of the forming the contractors and inspectations of the contractors of the contrac	rality having inclusive of orting place installed at supplied p g and forminating the projes, hire and e roadway formating the projections and the projections are roadway formating the projections are really as the projection are really as the projection are really as the projection are really a	specific grave cost of store and measure site at the apers, station the core of the once in a store of the once in	vity ranging nes, hire of rements of cost of the oneries and of the break a week with charges of at of lorries/
	Core laye	er using 100	to 300 kg s	tones (Assu	ming 1/3 vo	id and sp.gr	avity 2.7)	
	Northern Groyne 210m Chainage 0 to210	1	10617.360		1.100		11679.097	10% sinkage added

	Head	1	387.010		1.100		425.711	10% sinkage added					
			South	ern Groyne	170m								
	Chainage 0 to 170m	1	8595.000		1.100		9454.500						
	Head	1	499.380		1.100		549.318						
		al Quantity	22108.626 tonne										
	Total Deducted Quantity 0.000 tonne  Net Total Quantity 22108.626 ton												
			Say 22108	.626 tonne (	@ Rs 1610.7	75 / tonne	Rs 3561	1469.33					
	into 1 kg to 10 kg cated forming the filter layer charges required at quasorting are taken on we having printouts using of the breakwater including sqm size) or any suitab 20T and placing the stable breakwater as per the ahire and operational challengthes.	gory stones of breakwa arry and at a eigh bridge contractors ding conveile methods ones at se approved d arges of T al officers	s of approve ter inclusive sorting place installed at supplied pal yance from s installed at a bed in un rawing and	Say 22108.626 tonne @ Rs 1610.75 / tonne  Rs 35611469.33  od209460/2023_2024  Supplying granite quarry run from approved quarry to sorting site by lorry/ tipper, and sorting the stone into 1 kg to 10 kg category stones of approved quality with specific gravity ranging from 2.65 to 2.8 f forming the filter layer of breakwater inclusive of cost of stones, hire of lorries and machineries, labo charges required at quarry and at sorting place and the measurements of categorized stones after prop sorting are taken on weigh bridge installed at site at the cost of the contractor with approved softwa having printouts using contractors supplied papers, stationeries and conveyed to the approved alignme of the breakwater including conveyance from sorting platform and dumping stones using tippler (3.5x2 sqm size) or any suitable methods installed at site on a moving crane having a capaciaty of not less the 20T and placing the stones at sea bed in uniform layer of design thickness for forming filter layer breakwater as per the approved drawing and design and inspecting the profile once in a week includir hire and operational charges of T & P, tippler, crane and all incidental charges etc. complete as per the direction of departmental officers at site. Eranakulam District									
	210m Chainage 0 to210	1	3341.270		g	and sp.grav	3341.270						
	210m Chainage 0	1	3341.270 305.420			and sp.gra							
	210m Chainage 0 to210		305.420	ern Groyne		and sp.gra	3341.270						
	210m Chainage 0 to210		305.420	ern Groyne		and sp.gra	3341.270						
	210m Chainage 0 to210 Head	1	305.420 South	ern Groyne		and sp.gra	3341.270 305.420						
	210m Chainage 0 to 210 Head Chainage 0 to 170m	1	305.420 South 2704.830	ern Groyne	170m	and sp.grav	3341.270 305.420 2704.830	tonne					
	210m Chainage 0 to 210 Head Chainage 0 to 170m	1	305.420 South 2704.830		170m	al Quantity	3341.270 305.420 2704.830 330.040						
	210m Chainage 0 to 210 Head Chainage 0 to 170m	1	305.420 South 2704.830		170m  Tota tal Deducte	al Quantity	3341.270 305.420 2704.830 330.040 6681.560	ne					
	210m Chainage 0 to 210 Head Chainage 0 to 170m	1	305.420 South 2704.830 330.040		170m  Tota tal Deducte  Net Tota	al Quantity d Quantity al Quantity	3341.270 305.420 2704.830 330.040 6681.560 0.000 tonr 6681.560	ne					

1	2.8.1 Earth work in excavation trenches or drains (not	-		` •		•					
	ramming of bottoms, life excavated soil as direct	•				vated soil a	and disposa	l of surplu			
	column footing	16	2.100	2.100	1.900		134.064				
	below out side plinth beam	2*7	3.700	0.450	0.600		13.986				
	cross beam	2	5.800	0.450	0.600		3.132				
	rounded	1	3.818				3.818				
		155.000 c	um								
		0.000 cum	1								
		al Quantity	155.000 c	um							
		3.94 / cum	Rs 46	025.70							
2	od209389/2023_2024 Supplying and stacking	good quali	ty coconut pi	les	14						
	For pile 16 x5 Nos =80 Nos	80	6.000			100	480.000				
	Total Quantity 480.000 metre										
	Other Engineering Or Total Deducted Quantity 0.000 metre										
					Net Tota	al Quantity	480.000 n	netre			
			Say 480	0.000 metre	@ Rs 107.	64 / metre	Rs 51	667.20			
3	od209391/2023_2024 Coconut Pile- Driving of including all hire charge pile driving down after 6x15=90m.	es and lab	our for fixing	յ, staging p	latform and	all other ap	pliances ne	cessary			
	0X13=90III.						1	I			
	For coconut pile	80	6.000				480.000				
		80	6.000		Tota	al Quantity	480.000 n	netre			
		80	6.000	To	Tota						
		80	6.000	To	otal Deducte		480.000 n	re			
		80			otal Deducte	d Quantity	480.000 n 0.000 met 480.000 n	re			
4	od209392/2023_2024 Cutting and removing the	ne excess	Say 480	0.000 metre	Net Tota  @ Rs 216.9	d Quantity al Quantity 92 / metre	480.000 n 0.000 met 480.000 n Rs 104	re netre 1121.60			
4	For coconut pile  od209392/2023_2024	ne excess	Say 480	0.000 metre	Net Tota  @ Rs 216.9	d Quantity al Quantity 92 / metre	480.000 n 0.000 met 480.000 n Rs 104	re netre 1121.60			

							0.000		
		d Quantity	0.000 met						
						al Quantity	16.000 me		
			Say 1	6.000 metre	@ Rs 154.2	21 / metre	Rs 24	167.36	
5	2.18.1 Close timbering over a complete ( Measureme	,							
	column excavation side	16*4	2.000	1.200			153.600		
	rounded	1	1.400				1.400		
					Tota	al Quantity	155.000 s	qm	
		d Quantity	0.000 sqm	1					
			1/40		Net Tota	al Quantity	155.000 s	qm	
		ونسيدا	Say	155.000 sqı	m @ Rs 136	5.88 / sqm	Rs 21	216.40	
	Providing and laying filt not less than 600 mm v over the entire surface condition complete as p all materials, conveyand	vith smaller behind ab er drawing	size towar outment, wi and technic	ds the soil and wall, ret	and bigger s urn wall to tion Clause	ize towards the full heig	the wall anght, compac	d providing cted to firm	
	bottom of column	the <sub>16</sub> En	gin.9001i	ng.900g	ano.30610	ns	17.328		
	rounding	1	0.672			7	0.672		
					Tota	al Quantity	18.000 cu	m	
				To	otal Deducte	d Quantity			
					Net Tota	al Quantity	18.000 cu	m	
			Say	18.000 cum	ı @ Rs 1679	0.73 / cum	Rs 30	235.14	
7	50.2.3.1 Pumping or Bailing out charges of pumpset, etc.		removing sl	ush etc by ι	ısing pump :	set includin	g cost of lab	our, oil hire	
	For earth work 16 column	2	8.000				16.000		
	For coconut pilling	1	8.000				8.000		
	cc for footing & soling	1	8.000				8.000		
	reinforcement work,shuttering@ concrete for footing	4	8.000				32.000		

					Total Qua	ntity	64.000 ho	ur
				To	otal Deducted Qua	intity	0.000 hou	r
					Net Total Qua	ntity	64.000 ho	ur
			Say	64.000 hou	ur @ Rs 284.60 / h	nour	Rs 182	214.40
8	4.1.8 Providing and laying ir shuttering - All work unominal size)	-		_				
	column C1 to C16	16	1.700	1.700	0.200		9.248	
	below plinth beam	2*7	3.700	0.450	0.100		2.331	
	cross beam	8	5.600	0.450	0.100		2.016	
	AH floor	7	5.700	3.700	0.150		22.145	
	rounded	1	0.260	13° 44	The same of		0.260	
		611	W. 2	5. N	Total Qua	ıntity	36.000 cur	m
		18	41892	To	otal Deducted Qua	ntity	0.000 cum	l
		ntity	36.000 cur	m				
			Say	36.000 cum	n @ Rs 6814.89 / o	cum	Rs 245	336.04
	Providing and laying in centering, shuttering, find sand: 3 graded stone and column footing C1 to C16	nishing and aggregate 2	d reinforceme	ent - All worl	allibations		_	
			,					
		16	((1.5*1.5)+ (.4*.3))/2		0.300		5.688	
	column up to plinth	16 16	1 ' '	0.400	0.300		5.688 1.920	
	column up to plinth		(.4*.3))/2	0.400				
		16	(.4*.3))/2	0.400		antity	1.920	m
		16	(.4*.3))/2		1.000		1.920 0.592	
		16	(.4*.3))/2		1.000 Total Qua	ntity	1.920 0.592 19.000 cui	1
		16	(.4*.3))/2 0.300 0.592	To	1.000  Total Quantal Deducted Quantal	ntity	1.920 0.592 19.000 cur 0.000 cur 19.000 cur	1

	plinth beam	2	28.300	0.300	0.300		5.094	
	-do- cross	8	5.800	0.300	0.400		5.569	
	column up to beam C1 to C16	16	0.400	0.300	4.000		7.680	
	roof beam long	2	28.300	0.300	0.350		5.943	
	inglind beam	2*8	3.200	0.300	0.350		5.376	
	roof slab	2	29.500	4.5500	0.120		32.214	
	rounded	1	0.124				0.124	
					Tota	al Quantity	62.000 cu	m
				To	tal Deducte	d Quantity	0.000 cum	1
			160	/61	Net Tota	al Quantity	62.000 cu	m
			Say 6	2.000 cum	@ Rs 10954	1.04 / cum	Rs 679	150.48
	Centering and shutterin columns, etc for mass column base		1.500	0.300	Lib	È.	28.800	
	Column base	16*4	1.500	0.300	1	Aug II	28.800	
	Column up to plinth	16*2	0.400		1.100		14.081	
		16*2	0.300	n a Orac	1.100	70 C	10.560	
				ng Orga	1.100 anisatio		10.560	
		16*2	0.300		1.100 anisatio	al Quantity	10.560 0.559 54.000 sq	
		16*2	0.300		1.100 anisatio	al Quantity	10.560 0.559 54.000 sq 0.000 sqm	1
		16*2	0.300 g 0.559	Тс	1.100 anisatio Tota tal Deducte Net Tota	al Quantity d Quantity al Quantity	10.560 0.559 54.000 sq	1
		16*2	0.300 g 0.559	Тс	1.100 anisatio Tota	al Quantity d Quantity al Quantity	10.560 0.559 54.000 sq 0.000 sqm 54.000 sq	1
12		16*2 the FE	0.300 g i0.55911 Say	/ To	1.100 Anisatio Tota tal Deducte Net Tota m @ Rs 335	d Quantity d Quantity al Quantity 5.31 / sqm	10.560 0.559 54.000 sq 0.000 sqm 54.000 sq Rs 18	m 106.74
12	rounded  5.9.3 Centering and shutter	16*2 the FE	0.300 g i0.55911 Say	/ To	1.100 Anisatio Tota tal Deducte Net Tota m @ Rs 335	d Quantity d Quantity al Quantity 5.31 / sqm	10.560 0.559 54.000 sq 0.000 sqm 54.000 sq Rs 18	m 106.74
12	rounded  5.9.3 Centering and shutter landings, balconies an	16*2 the Er	0.300 g 10.559 f 1	y 54.000 sqr , etc. and r	1.100 Anisatio Tota tal Deducte Net Tota m @ Rs 335	d Quantity d Quantity al Quantity 5.31 / sqm	10.560 0.559 54.000 sq 0.000 sqm 54.000 sq Rs 18	m 106.74
12	5.9.3 Centering and shutter landings, balconies ar roof slab bottom	16*2 the Fr	0.300 g 0.559	y 54.000 sqr , etc. and r	1.100 Anisatio Tota tal Deducte Net Tota m @ Rs 335	d Quantity d Quantity al Quantity 5.31 / sqm	10.560 0.559 54.000 sq 0.000 sqm 54.000 sq Rs 18	m 106.74
12	5.9.3 Centering and shutter landings, balconies ar roof slab bottom side projection	16*2 the FEr  ing including access 2*7 2*2	0.300 g 0.559 1 Say ng strutting platform 3.700 4.500	y 54.000 sqr , etc. and r 3.200 0.600	1.100 Anisatio Tota tal Deducte Net Tota m @ Rs 335	d Quantity d Quantity al Quantity 5.31 / sqm	10.560 0.559 54.000 sq 0.000 sqm 54.000 sq Rs 18 spended flo	m 106.74
12	rounded  5.9.3 Centering and shutter landings, balconies ar roof slab bottom side projection slab projection	ing including access  2*7  2*2  2	0.300 g 10.559 11 Say ng strutting platform 3.700 4.500 29.500	y 54.000 sqr , etc. and r 3.200 0.600 1.000	1.100 Anisatio Tota tal Deducte Net Tota m @ Rs 335	d Quantity d Quantity al Quantity 5.31 / sqm	10.560 0.559 54.000 sq 0.000 sqm 54.000 sq Rs 18 spended flo 165.761 10.800 59.000	m 106.74
12	rounded  5.9.3 Centering and shutter landings, balconies ar roof slab bottom side projection slab projection slab projection side	ing including access  2*7  2*2  2	0.300 g 0.559 11 Say ng strutting platform 3.700 4.500 29.500	y 54.000 sqr y 54.000 sqr , etc. and r 3.200 0.600 1.000 0.120	1.100 Anisatio Tota tal Deducte Net Tota m @ Rs 335	d Quantity d Quantity al Quantity 5.31 / sqm	10.560 0.559 54.000 sq 0.000 sqm 54.000 sq Rs 18 spended flo 165.761 10.800 59.000 7.080	m 106.74
12	rounded  5.9.3 Centering and shutter landings, balconies ar roof slab bottom side projection slab projection slab projection side end side	ing including access  2*7  2*2  2  2*2	0.300 g 0.559 11 Say ng strutting platform 3.700 4.500 29.500 4.500	y 54.000 sqr y 54.000 sqr , etc. and r 3.200 0.600 1.000 0.120	1.100 Anisatio Total Deducte Net Tota m @ Rs 335 removal of	d Quantity d Quantity al Quantity 5.31 / sqm	10.560 0.559 54.000 sq 0.000 sqm 54.000 sq Rs 18 spended flo 165.761 10.800 59.000 7.080 2.160	n m 106.74 Dors, ro

					Net Tota	al Quantity	250.000 s	qm			
			Say	250.000 sq	m @ Rs 815	5.78 / sqm	Rs 203	3945.00			
13	5.9.5 Centering and shutteri girders bressumers an	_	-	etc. and ren	noval of forn	n for:Lintels	, beams, pli	nth beams			
	plinth beam out side	2	28.300	0.300			16.980				
	plinth beam in side	2*7	3.700	0.300			15.541				
	cross beam	8*2	5.800	0.400			37.120				
	roof beam out side	2	28.300	0.300			16.980				
	roof beam in side	2*7	3.700	0.400			20.721				
	roof beam bottom	2*7	3.700	0.300			15.541				
	inglind beam side	2*8*2	3.200	0.350			35.840				
	inglind beam bottom	2*8	3.200	0.300			15.360				
	rounded	1	0.917	SYZ			0.917				
		15	MACH		Tota	al Quantity	175.000 s	qm			
		104	Ka	То	otal Deducte	d Quantity	0.000 sqm	1			
		17.7			Net Tota	al Quantity	175.000 s	qm			
		v1 <b>I</b>			m @ Rs 649		Rs 113	3718.50			
14	5.9.6 Centering and shuttering including strutting, etc. and removal of form for:Columns, Pillars, Pier Abutments, Posts and Struts										
	column C1 to C16	16*2	0.400	4.000			51.200				
		16*2	0.300	4.000			38.400				
	rounded	1	0.400				0.400				
					Tota	al Quantity	90.000 sq	m			
				To	otal Deducte	d Quantity	0.000 sqm	1			
					Net Tota	al Quantity	90.000 sq	m			
			Say	y 90.000 sq	m @ Rs 863	3.64 / sqm	Rs 77	727.60			
15	5.22.6 Steel reinforcement for binding all complete up		_	_							
	For column footing	1	16.580			100.0	1658.000	@100kg/ m3			

	rounded	1	6.000				6.000	@120kg m3
					Tot	al Quantity	1880.000	kilogram
				To	otal Deducte	ed Quantity	0.000 kilo	gram
					Net Tot	al Quantity	1880.000	kilogram
			Say 1880.00	0 kilogram (	@ Rs 98.30	/ kilogram	Rs 184	1804.00
16	5.22A.6 Steel reinforcement for binding all complete ab		-		-			
	qty vide item No 10 @ 100kg/m3	1	61.876			100.0	6187.600	@100 l /m3
	rounded	1	12.400				12.400	@100 l /m3
			85 4	9	Tot	al Quantity	6200.000	kg
		P.L.	PAR	To	otal Deducte	ed Quantity	0.000 kg	
		18	DIS		Net Tot	al Quantity	6200.000	kg
17	7.1.1 Random rubble mason concrete 1:6:12 (1 ceme	ent : 6 coa	ard stone in rise sand: 12	foundation		including le	velling up w	
17	Random rubble mason	ent : 6 coa	ard stone in rise sand: 12	foundation	and plinth	including le	velling up w	vith cem
17	Random rubble mason concrete 1:6:12 (1 cemelevel with:Cement mortal below out side plinth	ent : 6 coa ar 1:6 (1 co	ard stone in rise sand: 12 ement: 6 coa	foundation graded stourse sand)	and plinth	including le	velling up wominal size)	vith cem
17	Random rubble mason concrete 1:6:12 (1 cemelevel with:Cement mortal below out side plinth beam	ent : 6 coa ar 1:6 (1 co 2*7	ard stone in rse sand: 12 ement: 6 coa	foundation graded stourse sand) 0.450	and plinth one aggrega 0.600	including le	velling up wominal size)	vith cem
17	Random rubble mason concrete 1:6:12 (1 cemelevel with:Cement mortal below out side plinth beam below cross beam	ent : 6 coa ar 1:6 (1 co 2*7	ard stone in rise sand: 12 ement: 6 coa 3.700	foundation graded stourse sand) 0.450	and plinth one aggréga 0.600	including le	velling up wominal size)  13.986  3.132	vith cemup to pli
17	Random rubble mason concrete 1:6:12 (1 cemelevel with:Cement mortal below out side plinth beam below cross beam	ent : 6 coa ar 1:6 (1 co 2*7	ard stone in rise sand: 12 ement: 6 coa 3.700	foundation 2 graded sto arse sand) 0.450	and plinth one aggréga 0.600	including leate 20 mm no	velling up wominal size)  13.986  3.132  0.882	vith cemup to pli
17	Random rubble mason concrete 1:6:12 (1 cemelevel with:Cement mortal below out side plinth beam below cross beam	ent : 6 coa ar 1:6 (1 co 2*7	ard stone in rise sand: 12 ement: 6 coa 3.700	foundation 2 graded sto arse sand) 0.450	and plinth one aggrega  0.600  Tot  otal Deducte	including leate 20 mm no	velling up wominal size)  13.986  3.132  0.882  18.000 cu	rith cemup to pli
17	Random rubble mason concrete 1:6:12 (1 cemelevel with:Cement mortal below out side plinth beam below cross beam	ent : 6 coa ar 1:6 (1 co 2*7	ard stone in rise sand: 12 ement: 6 coe 3.700 5.800 0.882	foundation 2 graded sto arse sand) 0.450	and plinth one aggrega  0.600  Tot  otal Deducte	al Quantity al Quantity	velling up wominal size)  13.986  3.132  0.882  18.000 cum  18.000 cum	with cem up to pli m
17	Random rubble mason concrete 1:6:12 (1 cemelevel with:Cement mortal below out side plinth beam below cross beam	ent : 6 coa ar 1:6 (1 co 2*7 2 1	ard stone in rise sand: 12 ement: 6 coa 3.700 5.800 0.882 Say	foundation 2 graded sto arse sand) 0.450 0.450 To 18.000 cum	and plinth one aggrega  0.600  Tot otal Deducte Net Tot n @ Rs 7204	al Quantity al Quantity al Quantity 4.78 / cum	velling up wominal size)  13.986  3.132  0.882  18.000 cu  18.000 cu  Rs 129	m m 9686.04
	Random rubble mason concrete 1:6:12 (1 cemelevel with:Cement mortal below out side plinth beam below cross beam rounded  2.25 Filling available excavate exceeding 20 cm in dep	ent : 6 coa ar 1:6 (1 co 2*7 2 1	ard stone in rise sand: 12 ement: 6 coa 3.700 5.800 0.882 Say	foundation 2 graded sto arse sand) 0.450 0.450 To 18.000 cum	and plinth one aggrega  0.600  Tot otal Deducte Net Tot n @ Rs 7204	al Quantity al Quantity al Quantity 4.78 / cum	velling up wominal size)  13.986  3.132  0.882  18.000 cu  18.000 cu  Rs 129	m m 0686.04

	rounded	1	2.710				2.710	
					Tota	al Quantity	95.000 cu	m
				To	otal Deducte	d Quantity	0.000 cum	า
					Net Tota	al Quantity	95.000 cu	m
			Say	/ 95.000 cu	m @ Rs 258	3.57 / cum	Rs 24	564.15
19	13.7.1 12 mm cement plaster f	finished with	n a floating c	oat of neat	cement of m	nix:1:3 ( 1 ce	ement : 3 fin	e sand)
	For the roof slabs.	2	29.500	4.5500			268.450	
	side	2	29.500	0.130			7.670	
	end side	2	9.050	0.130			2.353	
	rounded	1	1.527				1.527	
		1	53 U	b ~~	Tota	al Quantity	280.000 s	qm
		11	The Re	To	otal Deducte	d Quantity	0.000 sqn	า
		150	MA		Net Tota	al Quantity	280.000 s	qm
			Say	280.000 sq	m @ Rs 401	.21 / sqm	Rs 112	2338.80
20	13.16.1 6 mm cement plaster of	f mix:1:3 ( 1	cement : 3	fine sand)			I	
	For cross beams side	ther <sub>8</sub> En	9 6.200 11	ngo.350g	anisatio	ns	34.720	
	bottom	8	6.200	0.300	7 1	7	14.880	
	long beam in side	2*7	3.700	0.400			20.721	
	long beam out side	2	28.300	0.300			16.980	
	bottom	2*7	3.700	0.300			15.541	
	slab bottom	2*7	3.700	3.200			165.761	
	roof projection end	2*2	4.500	0.600			10.800	
	out side beam projection side	2	29.500	1.050			61.950	
	column	16	4.000	1.400			89.600	
		1	4.047	1.000			4.047	
					Tota	al Quantity	435.000 s	qm
				To	otal Deducte	d Quantity	0.000 sqn	1
					Net Tota	al Quantity	435.000 s	qm
			Say	435.000 sq	m @ Rs 267	7.59 / sqm	Rs 116	6401.65
21								

	Auction hall floor	1	28.300	6.400			181.120	
	Rounded	 1	3.880				3.880	
			1		Tot	al Quantity	185.000 s	qm
				To	otal Deducte		0.000 sqm	
					Net Tot	al Quantity	185.000 s	qm
			Say	185.000 sq	m @ Rs 32	5.01 / sqm	Rs 60	126.85
22	13.43.1 Applying one coat of surface:Water thinnab			nt primer (	of approved	d brand and	d manufactu	ıre on
	roof beam side & bottom	8	6.200	1.000			49.600	
	long beam out side	2	28.300	0.400			22.640	
	inside	2*7	3.700	0.400	7 1 1		20.721	
	bottom	2*7	3.700	0.300	TYA		15.541	
	slab bottom	2*7	3.700	3.200		100	165.761	
	roff projection end	2*2	4.500	0.600			10.800	
	roff projection side	2	29.500	1.050			61.950	
	column	the <sub>16</sub> E	ngi4.00611	ng.406g	anisatio	ns	89.600	
	side end	2	9.050	0.130			2.353	
	projection side	2	29.500	0.130		1	7.670	
	top of roof slab	2	29.500	4.550			268.450	
	rounded	1	4.914				4.914	
					Tot	al Quantity	720.000 s	qm
				To	otal Deducte	ed Quantity	0.000 sqm	1
					Net Tot	al Quantity	720.000 s	qm
			Say	/ 720.000 s	qm @ Rs 70	0.64 / sqm	Rs 50	860.80
23	13.44.1 Finishing walls with wat @ 3.84 kg/10 sqm)	er proofinç	g cement pair	nt of require	ed shade:Ne	w work (Two	o or more co	ats ap
	slab bottom	2*7	3.700	3.200			165.761	
	roof projection end	2*2	4.500	0.600			10.800	
	roor projection end							

					Tota	al Quantity	240.000 s	qm
				To	otal Deducte	d Quantity	0.000 sqn	1
					Net Tota	al Quantity	240.000 s	qm
			Say	240.000 sqı	m @ Rs 107	7.39 / sqm	Rs 25	773.60
24	13.46.1 Finishing walls with Ac @ 1.67 ltr/10 sqm over	-	•	-		,		
	roof beam allround	8	6.200	1.000			49.600	
	long beam out side	2	28.300	0.300			16.980	
	long beam in side	2*7	3.700	0.400			20.721	
	bottom	2*7	3.700	0.300			15.541	
	column C1 to C16	16	4.000	1.400			89.600	
	top of roof slab	2	29.500	4.550			268.450	
	side	2	29.500	0.130	d 1/1		7.670	
	side end	2	9.050	0.130	T th		2.353	
		1	4.085			No. 0	4.085	
		100			Tota	al Quantity	475.000 s	qm
		.1 E		To	otal Deducte	d Quantity	0.000 sqn	1
	U	ther En	gineeri	ng Orga	anisatio Net Tota	nS al Quantity	475.000 s	qm
			Say	475.000 sqr	m @ Rs 193	3.89 / sqm	Rs 92	097.75
SI No	Description	No	L	В	D	CF	Quantity	Remark
		3 Append	ix C- constr	uction of T	oilet block			
1	2.8.1 Earth work in excavat trenches or drains (no ramming of bottoms, I excavated soil as dire	t exceeding	1.5 m in w m, includin	idth or 10 s	sqm on plan ut the exca	ı), including	dressing o	f sides and
	toilet block foundation all round	1	35.500	0.800	0.750		21.300	
	crosswall long	2	11.500	0.800	0.750		13.800	
	cross	1	6.050	0.800	0.750		3.630	
		1	3.150	0.800	0.750		1.891	
	bath room	1	4.800	0.800	0.750		2.880	
	ramp	2	4.500	0.800	0.750		5.400	
	step	1	3.500	1.200	0.600		2.520	

		4	2 000	0.000	0.750		1 001	
		1	3.000	0.800	0.750		1.801	
	setitank	1	6.700	2.400	2.000		32.160	
	sock pit	1	1.800	1.800	1.500		4.860	
		1	4.758				4.758	
					Tota	al Quantity	95.000 cu	m
				To	otal Deducte	ed Quantity	0.000 cun	1
					Net Tota	al Quantity	95.000 cu	m
			Sa	y 95.000 cu	m @ Rs 296	6.94 / cum	Rs 28	209.30
2	2.26.1 Extra for every addition materials. All kinds of		.5 m or part	there of in	excavation	n / banking	excavated	or stac
	tank	1	6.700	2.400	0.500		8.040	
	rounded	1	1.960	824			1.960	
		11	The	51/1	Tota	al Quantity	10.000 cu	m
		15	1000	To	otal Deducte	ed Quantity	0.000 cun	า
							40.000	
					Net Tota	al Quantity	10.000 cu	m
3	4.1.8 Providing and laying in	-	cement concr	ete of spec	m @ Rs 100	6.37 / cum	Rs 10	063.70
3	Providing and laying in shuttering - All work up nominal size)	-	cement concr	ete of spec	m @ Rs 100	6.37 / cum	Rs 10	063.70
3	Providing and laying in shuttering - All work up	-	cement concr	ete of spec	m @ Rs 100	6.37 / cum	Rs 10	063.70
3	Providing and laying in shuttering - All work up nominal size) toilet block foundation	to plinth	cement concr level:1:4:8 (	ete of spec 1 cement :	m @ Rs 106 ified grade e 4 coarse sa	6.37 / cum	Rs 10 e cost of ce ed stone ag	063.70
3	Providing and laying in shuttering - All work up nominal size)  toilet block foundation all round	to plinth	cement concr level:1:4:8 (	ete of spec 1 cement : 0.800	m @ Rs 106 ified grade 6 4 coarse sa 0.150	6.37 / cum	Rs 10 e cost of ce ed stone ag 4.260	063.70
3	Providing and laying in shuttering - All work up nominal size) toilet block foundation all round crosswall long	to plinth  1	35.500	ete of spec 1 cement : 0.800	m @ Rs 106 ified grade 6 4 coarse sa 0.150 0.150	6.37 / cum	e cost of ce ed stone ag	063.70
3	Providing and laying in shuttering - All work up nominal size) toilet block foundation all round crosswall long	to plinth  1  2  1	35.500 11.500 6.050	ete of spec 1 cement : 0.800 0.800	m @ Rs 106  ified grade 64 4 coarse sa  0.150  0.150	6.37 / cum	4.260 2.761 0.726	063.70
3	Providing and laying in shuttering - All work up nominal size)  toilet block foundation all round crosswall long cross	1 2 1 1	35.500 11.500 6.050 3.150	ete of spec 1 cement : 0.800 0.800 0.800	m @ Rs 106  ified grade 64 4 coarse sa  0.150  0.150  0.150	6.37 / cum	4.260 2.761 0.726 0.378	063.70
3	Providing and laying in shuttering - All work up nominal size)  toilet block foundation all round  crosswall long  cross  bath room	1 2 1 1 1	35.500 11.500 6.050 3.150 4.800	ete of spec 1 cement : 0.800 0.800 0.800 0.800	m @ Rs 106  ified grade 6 4 coarse sa  0.150  0.150  0.150  0.150	6.37 / cum	4.260 2.761 0.726 0.378 0.576	063.70
3	Providing and laying in shuttering - All work up nominal size)  toilet block foundation all round crosswall long cross  bath room	1 2 1 1 2 2	35.500 11.500 6.050 3.150 4.800 4.500	0.800 0.800 0.800 0.800 0.800	m @ Rs 106  ified grade 6 4 coarse sa  0.150  0.150  0.150  0.150  0.150	6.37 / cum	Rs 10 e cost of ce ed stone ag  4.260 2.761 0.726 0.378 0.576 1.080	063.70
3	Providing and laying in shuttering - All work up nominal size)  toilet block foundation all round crosswall long cross  bath room	1 2 1 1 2 1 1 2 1 1	35.500 11.500 6.050 3.150 4.800 4.500 3.500	0.800 0.800 0.800 0.800 0.800 0.800 1.200	m @ Rs 106  ified grade 6 4 coarse sa  0.150  0.150  0.150  0.150  0.150  0.150	6.37 / cum	Rs 10 e cost of ce ed stone ag  4.260 2.761 0.726 0.378 0.576 1.080 0.630	063.70
3	Providing and laying in shuttering - All work up nominal size)  toilet block foundation all round crosswall long cross  bath room ramp  step	1 2 1 1 2 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	35.500  11.500  6.050  3.150  4.800  4.500  3.500  3.000	0.800 0.800 0.800 0.800 0.800 0.800 0.800	m @ Rs 106  ified grade 6 4 coarse sa  0.150  0.150  0.150  0.150  0.150  0.150  0.150	6.37 / cum	Rs 10 e cost of ce ed stone ag  4.260 2.761 0.726 0.378 0.576 1.080 0.630 0.361	063.70
3	Providing and laying in shuttering - All work up nominal size)  toilet block foundation all round crosswall long cross  bath room ramp  step  setitank	1 2 1 1 2 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	35.500  11.500  6.050  3.150  4.800  4.500  3.500  3.000  6.700	0.800 0.800 0.800 0.800 0.800 0.800 0.800 2.400	m @ Rs 106  ified grade 6 4 coarse sa  0.150  0.150  0.150  0.150  0.150  0.150  0.150  0.150  0.200	6.37 / cum	Rs 10 e cost of ce ed stone ag  4.260 2.761 0.726 0.378 0.576 1.080 0.630 0.361 3.216	063.70
3	Providing and laying in shuttering - All work up nominal size)  toilet block foundation all round crosswall long cross  bath room ramp step  setitank floor room	1 2 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	35.500  11.500  6.050  3.150  4.800  4.500  3.000  6.700  12.150	0.800 0.800 0.800 0.800 0.800 0.800 1.200 0.800 2.400 4.800	m @ Rs 106  ified grade 6 4 coarse sa  0.150  0.150  0.150  0.150  0.150  0.150  0.150  0.150  0.150  0.150  0.150	6.37 / cum	Rs 10 e cost of ce ed stone ag  4.260 2.761 0.726 0.378 0.576 1.080 0.630 0.361 3.216 5.833	063.70

				То	otal Deducted Quantity	0.000 cum
					Net Total Quantity	22.000 cum
			Say	22.000 cum	n @ Rs 6814.89 / cum	Rs 149927.58
4		ent : 6 coar	se sand : 12	graded sto		levelling up with cement nominal size) up to plinth
	toilet block foundation all round	1	35.500	0.600	0.600	12.780
	crosswall long	2	11.500	0.600	0.600	8.280
	cross	1	6.050	0.600	0.600	2.178
		1	3.150	0.600	0.600	1.134
	bath room	1	4.800	0.600	0.600	1.728
	ramp	2	4.500	0.600	0.600	3.240
	step	1	3.500	1.200	0.450	1.891
		1	3.000	0.600	0.600	1.080
	toilet block basement all round	1	35.500	0.450	0.450	7.189
	crosswall long	ther Er	11.500	0.450	0.450	4.658
	cross	1	6.050	0.450	0.450	1.226
		1	3.150	0.450	0.450	0.638
	bath room	1 -	4.800	0.450	0.450	0.973
	ramp	2	3.150	0.450	0.300	0.851
		1	3.000	0.450	0.450	0.608
	partition	10	1.500	0.450	0.450	3.038
	rounded	1	0.508			0.508
					Total Quantity	52.000 cum
				To	otal Deducted Quantity	0.000 cum
					Net Total Quantity	52.000 cum
5	_	•	excluding roc	k) in trench	•	Rs 374648.56  undation etc. in layers not watering, lead up to 50 m
	for foundation	1	11.550	3.900	0.600	27.027

	varandha	1	7.000	0.750	0.600		3.150	
	rounded	1	4.823				4.823	
					Tota	al Quantity	35.000 cu	m
				To	tal Deducte	d Quantity	0.000 cun	า
					Net Tota	al Quantity	35.000 cu	m
			Say	y 35.000 cui	m @ Rs 258	3.57 / cum	Rs 90	049.95
6	5.2.2 Reinforced cement cor and string courses, fill excluding cost of center 3 graded stone aggregation.	ets, columr ering, shutte	ns, pillars, pie ering, finishin	ers, abutme g and reinfo	nts, posts a	nd struts et	tc. up tot flo	or five lev
	basement allround	1	35.500	0.450	0.100		1.598	
	cross	1	11.500	0.450	0.100		0.518	
		1	6.050	0.450	0.100		0.273	
		1	3.150	0.450	0.100		0.142	
	bath	1	4.800	0.450	0.100	t.	0.217	
	ramp	1	3.150	0.450	0.100		0.142	
		1	3.000	0.450	0.100		0.135	
	partition	the E	ngi1:500 ri	0.450	an <b>0</b> 490io	ns	0.675	
	lintel	1	76.000	0.150	0.150	7	1.710	
	roof slab	1	12.750	5.800	0.120	1	8.874	
	slop	1	39.450	1.000	0.120		4.734	
	tank bottom	1	6.000	2.100	0.150		1.891	
	beam	1	2.100	0.200	0.200		0.085	
	cover slab	1	6.000	2.100	0.120		1.512	
		1	1.800	1.800	0.120		0.389	
	rounded	1	0.105				0.105	
					Tota	al Quantity	23.000 cu	m
				To	tal Deducte	d Quantity	0.000 cun	า
					Net Tota	al Quantity	23.000 cu	m
			Say 2	3.000 cum	@ Rs 10954	.04 / cum	Rs 25	1942.92
7	5.9.3 Centering and shutte landings, balconies a	•	-	, etc. and r	emoval of	form for:Su	ıspended fl	oors, roo
	Tarramigo, Darrotinos a							

	cross	2	11.500	0.100			2.301	
		2	6.050	0.100			1.210	
		2	3.150	0.100			0.630	
	bath	2	4.800	0.100			0.960	
	ramp	2	6.150	0.100			1.231	
	partition	10*2	1.500	0.100			3.001	
	lintel	2	76.000	0.150			22.800	
	roof slab	1	12.750	5.800			73.950	
	slop	1	39.450	1.000			39.450	
	tank bottom	4	10.200	0.150			6.120	
	beam	1	2.100	0.600			1.260	
	cover slab	12	5.100	0.120			7.344	
		3	4.800	0.120	7 13		1.728	
		1	0.914		1-21		0.914	
		167			Tota	al Quantity	170.000 s	qm
		485		To	otal Deducte	d Quantity	0.000 sqm	1
					Net Tot:	al Quantity	170.000 s	~-~
					1401 1011	ar Quartity	170.000 3	qm
		Other En	nginesay	170.000 sq				gm 3 <b>682.60</b>
8	5.22A.6 Steel reinforceme binding all comple	nt for R.C.C w	ork including	g straighter	m @ Rs 815	5.78 / sqm , bending,	Rs 138	3682.60 osition an
8	Steel reinforceme	nt for R.C.C w	ork including	g straighter	m @ Rs 815	5.78 / sqm , bending,	Rs 138	3682.60 osition and
8	Steel reinforceme binding all comple	nt for R.C.C we te above plinth	ork including level.Therm	g straighter	m @ Rs 815	5.78 / sqm , bending, ed bars of g	Rs 138	osition and OD or more @100kg/m3
8	Steel reinforceme binding all comple qty of cc	nt for R.C.C we te above plinth	ork including level.Therm 22.895	g straighter	m @ Rs 815	5.78 / sqm , bending, ed bars of g	Rs 138 placing in p grade Fe-50 2289.500	00 osition and 00 or more 0100kg/m3 0100kg/m3
8	Steel reinforceme binding all comple qty of cc	nt for R.C.C we te above plinth	ork including level.Therm 22.895	straighten	m @ Rs 815	5.78 / sqm  , bending, ed bars of g  100.0	Rs 138 placing in p grade Fe-50 2289.500 10.500	00 osition and 00 or more 0100kg/m3 0100kg/m3
8	Steel reinforceme binding all comple qty of cc	nt for R.C.C we te above plinth	ork including level.Therm 22.895	straighten	m @ Rs 815 ning, cutting nically Treat  Tota	5.78 / sqm  , bending, ed bars of g  100.0	Rs 138 placing in parade Fe-50 2289.500 10.500 2300.000	00 osition and 00 or more 0100kg/m3 0100kg/m3 kg
8	Steel reinforceme binding all comple qty of cc	nt for R.C.C we te above plinth	ork including level.Therm 22.895 10.500	straighten o - Mechan	m @ Rs 815 ning, cutting nically Treat  Tota	5.78 / sqm  , bending, ed bars of gas 100.0  al Quantity ad Quantity al Quantity	Rs 138  placing in p grade Fe-50  2289.500  10.500  2300.000  0.000 kg  2300.000	osition an OD or mor @100kg, m3 @100kg, m3
9	Steel reinforceme binding all comple qty of cc	nt for R.C.C we te above plinth  1  1  1  ng pre cast soli 185 part I of 197	d blocks (fac	straighten o - Mechan To Say 2300.00	Total Deducte  Net Total  O kg @ Rs  of size 30x	5.78 / sqm  5.78 / sqm  6.78 / sqm  7. bending, ed bars of g  100.0  100.0  al Quantity al Quantity 98.30 / kg	Rs 138  placing in p grade Fe-50  2289.500  10.500  2300.000  0.000 kg  2300.000  Rs 226	osition an OD or mor @100kg/m3 @100kg/m3 kg
	Steel reinforceme binding all comple qty of cc rounded  50.6.2.2 Solid masonry using confirming to IS 24	nt for R.C.C we te above plinth  1  1  1  ng pre cast soli 185 part I of 197	d blocks (fac	straighten o - Mechan To Say 2300.00	Total Deducte  Net Total  O kg @ Rs  of size 30x	5.78 / sqm  5.78 / sqm  6.78 / sqm  7. bending, ed bars of g  100.0  100.0  al Quantity al Quantity 98.30 / kg	Rs 138  placing in p grade Fe-50  2289.500  10.500  2300.000  0.000 kg  2300.000  Rs 226	osition and OD or more @100kg/m3 @100kg/m3 kg

	centre cross	1	3.150	2.800	0.150		1.323	
		1	6.050	2.800	0.150		2.541	
	bath	1	4.800	2.800	0.150		2.016	
	septitank	1	16.200	1.800	0.200		5.833	
	step	1	3.000	0.600	0.450		0.810	
	rounded	1	0.593				0.593	
	shutter	1	3.000	2.400	0.150		-1.079	
	door D DA toilet	2	1.000	2.100	0.150		-0.630	
					Tota	al Quantity	32.709 cui	m
				To	otal Deducte	d Quantity	-1.709 cur	n
			1/40		Net Tota	al Quantity	31.000 cui	m
			Say	31.000 cum	n @ Rs 6984	1.85 / cum	Rs 216	530.35
	CM 1:6 ( 1 cement : 6	coarse san	d) including	cost of sca	ffolding com			
	size confirming to IS 2 CM 1:6 (1 cement : 6						ioi io ciii tii	iick waii
	toilet partition	10	1.500	2.800	0.100		4.200	
	urinal partition	0	4 000	4 400				
	unnai partition	2	1.000	1.400	0.100		0.280	
	parapet	ther Er	1.000	1.400 1.600 g	0.100 anogoje	ns	0.280 2.227	
			•			ns		
	parapet	ther Er	g37.100°i	ng.600g	anisotic	ns 1	2.227	
	parapet seititank partition	ther Er	937.100 <sup>-1</sup> 1.700	1.000	anigotic 0.100	ns 1	2.227 0.340	
	parapet seititank partition sock pit	ther En	937.100 <sup>1</sup> 1.700 1.700	1.000	anigatio 0.100	ns	2.227 0.340 0.817	
	parapet seititank partition sock pit rounded	ther En	1.700 1.700 0.459	1.000 1.200	0.100 0.100 0.100	ns 1	2.227 0.340 0.817 0.459	1
	parapet seititank partition sock pit rounded	ther En	1.700 1.700 0.459	1.000 1.200 2.100	0.100 0.100 0.100	al Quantity	2.227 0.340 0.817 0.459 -1.323	
	parapet seititank partition sock pit rounded	ther En	1.700 1.700 0.459	1.000 1.200 2.100	0.100 0.100 0.100 Total Deducte	al Quantity	2.227 0.340 0.817 0.459 -1.323 8.323 cum	n
	parapet seititank partition sock pit rounded	ther En	1,700 1,700 0.459 0.700	1.000 1.200 2.100	0.100 0.100 0.100 Total Deducte	al Quantity ad Quantity al Quantity	2.227 0.340 0.817 0.459 -1.323 8.323 cum -1.323 cum 7.000 cum	n
11	parapet seititank partition sock pit rounded	the Er	937.100 1.700 1.700 0.459 0.700	1.000 1.200 2.100	0.100  0.100  0.100  Total Deducte  Net Total	al Quantity ad Quantity al Quantity	2.227 0.340 0.817 0.459 -1.323 8.323 cum -1.323 cum 7.000 cum	n I
11	parapet seititank partition sock pit rounded door D1	the Er	937.100 1.700 1.700 0.459 0.700	1.000 1.200 2.100	0.100  0.100  0.100  Total Deducte  Net Total	al Quantity ad Quantity al Quantity	2.227 0.340 0.817 0.459 -1.323 8.323 cum -1.323 cum 7.000 cum	n I
11	parapet seititank partition sock pit rounded door D1  13.1.1 12 mm cement plaster	the Er  2  4  1  9	1.700 1.700 0.459 0.700 Say	1.000 1.200 2.100 To y 7.000 cum	0.100  0.100  0.100  Total Deducte  Net Total	al Quantity ad Quantity al Quantity	2.227 0.340 0.817 0.459 -1.323 8.323 cum -1.323 cum 7.000 cum Rs 54	n I
11	parapet seititank partition sock pit rounded door D1  13.1.1 12 mm cement plaster out side wall	the Er  2  4  1  9	1.700 1.700 0.459 0.700 Say 1 cement : 4	1.000 1.200 2.100 To y 7.000 cum	0.100  0.100  0.100  Total Deducte  Net Total	al Quantity ad Quantity al Quantity	2.227 0.340 0.817 0.459 -1.323 8.323 cum -1.323 cum 7.000 cum Rs 54	n I
11	parapet seititank partition sock pit rounded door D1  13.1.1 12 mm cement plaster out side wall Parapet	the Er  2  4  1  9	1.700 1.700 0.459 0.700 Say 1 cement : 4 35.300 37.100	1.000 1.200 2.100 To y 7.000 cum 4 fine sand) 2.800 1.400	0.100  0.100  0.100  Total Deducte  Net Total	al Quantity ad Quantity al Quantity	2.227 0.340 0.817 0.459 -1.323 8.323 cum -1.323 cum 7.000 cum Rs 54	n I

	bath	1	6.500	2.800			18.200	
	partition	2	3.150	2.800			17.640	
		1	5.300	2.800			14.840	
		1	5.500	2.800			15.400	
		1	3.200	2.800			8.960	
		1	4.850	2.800			13.580	
		1	2.500	2.800			7.000	
	urinal partition	2	2.100	1.500			6.301	
	under side slab	1	12.750	5.800			73.950	
		1	39.450	1.000			39.450	
	rounded	1	5.927				5.927	
	door D	2	1.000	2.100			-4.200	
	toilet door D1	11	0.700	2.100	7 17		-16.169	
	ventilator	15	0.600	0.500	1-21		-4.500	
	shutter	1	3.000	2.400		T <sub>a</sub>	-7.199	
		400			Tota	al Quantity	587.068 s	qm
			1000	To	otal Deducte	d Quantity	-32.068 s	qm
		Other Er	ngineeri	ng Orga	an Net Tota	Quantity	555.000 s	qm
		Other Er			n @ Rs 314			qm <b>4319.95</b>
12	13.7.1 12 mm cement plast	PI	Say	555.000 sqi	m @ Rs 314	I.09 / sqm	Rs 17	4319.95
12	13.7.1	PI	Say	555.000 sqi	m @ Rs 314	I.09 / sqm	Rs 17	4319.95
12	13.7.1 12 mm cement plast	er finished wit	Say	555.000 squoat of neat	m @ Rs 314	I.09 / sqm	Rs 17	4319.95
12	13.7.1 12 mm cement plast	er finished with	Say h a floating o	555.000 squooat of neat 5.800	m @ Rs 314	I.09 / sqm	Rs 174	4319.95
12	13.7.1 12 mm cement plast slab top	er finished with	Say h a floating of 12.750 39.450	555.000 squooat of neat 5.800	m @ Rs 314	I.09 / sqm	Rs 174 ement : 3 fin 73.950 39.450	<b>4319.95</b> e sand)
12	13.7.1 12 mm cement plast slab top	er finished with	Say h a floating of 12.750 39.450	555.000 square oat of neat 5.800	m @ Rs 314	ix:1:3 ( 1 ce	Rs 174 ement : 3 fin 73.950 39.450 1.600	######################################
12	13.7.1 12 mm cement plast slab top	er finished with	Say h a floating of 12.750 39.450	555.000 square oat of neat 5.800	m @ Rs 314 cement of m	ix:1:3 ( 1 ce	Rs 174 ement : 3 fin 73.950 39.450 1.600 115.000 s	######################################
12	13.7.1 12 mm cement plast slab top	er finished with	Say  h a floating of 12.750  39.450  1.600	555.000 square oat of neat 5.800	m @ Rs 314 cement of m	al Quantity d Quantity al Quantity	Rs 174 ement : 3 fin 73.950 39.450 1.600 115.000 sqn 115.000 s	######################################
12	13.7.1 12 mm cement plast slab top	er finished with 1 1 1	Say  h a floating of  12.750  39.450  1.600	555.000 squ toat of neat 5.800 1.000	Total Deducte Net Total m @ Rs 401	al Quantity d Quantity al Quantity 21 / sqm	Rs 174 ement : 3 fin 73.950 39.450 1.600 115.000 sqn 115.000 s	qm qm 139.15
	13.7.1 12 mm cement plast slab top rounded  13.7.2 12 mm cement plast	er finished with 1 1 1	Say  h a floating of  12.750  39.450  1.600	555.000 squ toat of neat 5.800 1.000	Total Deducte Net Total m @ Rs 401	al Quantity d Quantity al Quantity 21 / sqm	Rs 174 ement : 3 fin 73.950 39.450 1.600 115.000 sqn 115.000 s	qm qm 139.15
	13.7.1 12 mm cement plast slab top rounded 13.7.2	er finished with 1 1 1 1 1 er finished with	Say  h a floating of  12.750  39.450  1.600  Say	555.000 squ coat of neat 5.800 1.000 To	Total Deducte Net Tota m @ Rs 401	al Quantity d Quantity al Quantity 21 / sqm	Rs 174 ement : 3 fin 73.950 39.450 1.600 115.000 sqn 115.000 s Rs 46	qm qm 139.15

	roumnded	1	0.279				0.279	
					Tota	al Quantity	45.000 sq	m
				То	tal Deducte	d Quantity	0.000 sqm	1
					Net Tota	al Quantity	45.000 sq	m
			Say	/ 45.000 sqr	m @ Rs 386	3.36 / sqm	Rs 17	386.20
14	8.31 Providing and fixing Is by the manufacturer), any size as approved of cementmortar 1:3 (including pointing in w	of approved by Engineer 1 cement : 3	d make, in a in-Charge,in 3 coarse sar	II colours,sh skirting, ris nd) and join	nades excepters of steps	ot burgundy and dados ey cement s	r, bottle gree r, over 12 m slurry @3.3k	en, black om thick be
	toilet	11	4.700	1.800			93.060	
	DA toilet	2	5.600	1.800			20.160	
	bath	1	5.800	1.800			10.440	
	urinal portion	3	2.600	1.600			12.480	
	rounded	1	3.860		B		3.860	
		1114	A G	Jay Y	Tota	al Quantity	140.000 s	qm
		I Committee		То	tal Deducte	d Quantity	0.000 sqm	1
		Othor Er		na Orac		al Quantity	140.000 s	qm
		ther En	Say 1	40.000 sqm	@ Rs 1212	2.78 / sqm	Rs 169	789.20
15						◀		
15	11.37 Providing and laying manufacturer), of 1st of Grey, Fume Red Brow pointing the joints with	uality confo	rming to IS:	15622, of a cement mor	pproved ma tar 1:4 (1 C	ike, in colou cement : 4 0	rs such as V	Vhite, Ivor
	Providing and laying manufacturer), of 1st of Grey, Fume Red Brow	uality confo	rming to IS:	15622, of a cement mor	pproved ma tar 1:4 (1 C	ike, in colou cement : 4 0	rs such as V	White, Ivor
	Providing and laying manufacturer), of 1st of Grey, Fume Red Brow pointing the joints with	uality conformality, laid on 2 white ceme	rming to IS : 0 mm thick of ent and mate	15622, of a cement mor	pproved ma tar 1:4 (1 C	ike, in colou cement : 4 0	rs such as V Coarse sand	White, Ivor
	Providing and laying manufacturer), of 1st of Grey, Fume Red Brow pointing the joints with inside floor	uality conform, laid on 2 white cement	rming to IS: 0 mm thick cent and mate	15622, of a cement mor	pproved ma tar 1:4 (1 C ent etc., com	ike, in colou cement : 4 0	rs such as V Coarse sand 58.320	White, Ivor
	Providing and laying manufacturer), of 1st of Grey, Fume Red Brow pointing the joints with inside floor	uality conform, laid on 2 white cement	rming to IS: 0 mm thick cent and mate	15622, of a cement mor ching pigme 4.800	pproved ma tar 1:4 (1 C ent etc., com	ike, in colou ement : 4 C nplete.	rs such as V Coarse sand 58.320 1.680	White, Ivor
	Providing and laying manufacturer), of 1st of Grey, Fume Red Brow pointing the joints with inside floor	uality conform, laid on 2 white cement	rming to IS: 0 mm thick cent and mate	15622, of a cement mor ching pigme 4.800	pproved ma tar 1:4 (1 C ent etc., com Tota tal Deducte	ike, in colou ement : 4 C nplete.	58.320 1.680 60.000 sq	White, Ivor I), includin m
	Providing and laying manufacturer), of 1st of Grey, Fume Red Brow pointing the joints with inside floor	uality conform, laid on 2 white cement	rming to IS : 0 mm thick cent and mate 12.150 1.680	15622, of a cement mor ching pigme 4.800	pproved ma tar 1:4 (1 C ent etc., com Tota tal Deducte Net Tota	eke, in colousement : 4 Complete.  al Quantity d Quantity al Quantity	58.320 1.680 60.000 sq 60.000 sq	White, Ivor I), includin m
16	Providing and laying manufacturer), of 1st of Grey, Fume Red Brow pointing the joints with inside floor	ndustrial grad on 20 mr do 20 mr	rming to IS: 0 mm thick cent and mate 12.150 1.680  Say de antiskid ti 0.08 % and m thick cem	15622, of a cement morching pigme 4.800  To 60.000 sqm iles of size 3 conforming ent mortar	Total Deducted Rs 1091  800x300mm g to I.S. 156 1:4 (1 cer	elke, in colousement: 4 Complete.  al Quantity d Quantity al Quantity .02 / sqm  with thickness 622, of apprent: 4 co	58.320  1.680  60.000 sqn  60.000 sqn  60.000 sqn  roved make parse sand)	white, Ivor I), including m 461.20 In or nearese, in<

		1	3.500	1.200			4.200	
	step	3	3.000	0.450			4.051	
	Rounded	1	2.269				2.269	
					Tota	al Quantity	23.000 sq	m
				To	tal Deducte	d Quantity	0.000 sqn	า
					Net Tota	al Quantity	23.000 sq	m
			Say	23.000 sqm	@ Rs 1276	5.95 / sqm	Rs 29	369.85
17	13.43.1 Applying one coat surface:Water thin			nt primer c	of approved	brand and	d manufacti	ure on w
	area vide item no 11	1	555.000	S			555.000	
			-/W	W.	Tota	al Quantity	555.000 s	qm
		1	53 4	To	tal Deducte	d Quantity	0.000 sqn	า
		11	TY ES	51/1	Net Tota	al Quantity	555.000 s	qm
		150	Say	y 555.000 so	qm @ Rs 70	0.64 / sqm	Rs 39	205.20
18	13.46.1 Finishing walls with a @ 1.67 ltr/10 sqm ov	ver and includ	ing priming o	int of require	ior primer a	pplied @ 2.		
18	Finishing walls with	•		int of require		pplied @ 2.	20 kg/10 sq	
18	Finishing walls with @ 1.67 ltr/10 sqm ov out side wall  Parapet	othe1 Er	35.300 37.100	int of require coat of exter	ior primer a	pplied @ 2.	98.840 51.940	m)
18	Finishing walls with @ 1.67 ltr/10 sqm ov out side wall  Parapet	othe1 Er	35.300 37.100	int of require coat of exter 2.800 g	ior primer a	pplied @ 2	98.840 51.940 4.220	m) qm
18	Finishing walls with @ 1.67 ltr/10 sqm ov out side wall  Parapet	othe1 Er	35.300 37.100	int of require coat of exter 2.800 g	anisatio Tota	pplied @ 2	98.840 51.940 4.220 155.000 s	m) qm
18	Finishing walls with @ 1.67 ltr/10 sqm ov out side wall  Parapet	othe1 Er	35.300 37.100 4.220	int of require coat of exter 2.800 g	Total Deducte	pplied @ 2.	98.840 51.940 4.220 155.000 sqn 155.000 s	m) qm
18	Finishing walls with @ 1.67 ltr/10 sqm ov out side wall  Parapet	oremium acry	35.300 37.100 4.220 Say	int of require coat of exter 2.800 grant 1.400  To 155.000 square paint of in	Total Deducte  Net Total  m @ Rs 193	al Quantity d Quantity al Quantity 8.89 / sqm	98.840 51.940 4.220 155.000 s 0.000 sqn 155.000 s Rs 30	m)  qm  qm  052.95
	Finishing walls with  @ 1.67 ltr/10 sqm ov  out side wall  Parapet  rounded  13.83.2  Wall painting with p	oremium acry	35.300 37.100 4.220 Say	int of require coat of exter 2.800 grant 1.400  To 155.000 square paint of in	Total Deducte  Net Total  m @ Rs 193	al Quantity d Quantity al Quantity 8.89 / sqm	98.840 51.940 4.220 155.000 s 0.000 sqn 155.000 s Rs 30	m)  qm  qm  052.95
	Finishing walls with  @ 1.67 ltr/10 sqm ov  out side wall  Parapet  rounded  13.83.2  Wall painting with papplying additional	oremium acry	35.300 37.100 4.220  Say lic emulsion ver required	1.400 To paint of in to achieve	Total Deducte  Net Total  m @ Rs 193	al Quantity d Quantity al Quantity 8.89 / sqm	98.840 51.940 4.220 155.000 sqn 155.000 s Rs 30	m)  qm  qm  052.95
	Finishing walls with  @ 1.67 ltr/10 sqm ov  out side wall  Parapet  rounded  13.83.2  Wall painting with papplying additional  toilet inside	oremium acry coats wherev	35.300 37.100 4.220  Say lic emulsion ver required 5.400	To 155.000 square paint of into achieve	Total Deducte  Net Total  m @ Rs 193	al Quantity d Quantity al Quantity 8.89 / sqm	98.840 51.940 4.220 155.000 sqn 155.000 s Rs 30 OC (Volatil ur.Two coa	m)  qm  qm  052.95
	Finishing walls with  @ 1.67 ltr/10 sqm ov  out side wall  Parapet  rounded  13.83.2  Wall painting with papplying additional toilet inside  DA toilet	oremium acry coats wherev	Say lic emulsion ver required 5.400 6.600	To 155.000 square paint of into achieve 1.000	Total Deducte  Net Total  m @ Rs 193	al Quantity d Quantity al Quantity 8.89 / sqm	98.840 51.940 4.220 155.000 sqn 155.000 s Rs 30 OC (Volatil ur.Two coa 54.000 13.200	m)  qm  qm  052.95
	Finishing walls with  @ 1.67 ltr/10 sqm ov  out side wall  Parapet  rounded  13.83.2  Wall painting with papplying additional toilet inside  DA toilet  out	oremium acry coats wherever 10 2 2	Say lic emulsion ver required 5.400 6.600 4.800	To 155.000 square paint of into achieve 1.000 1.000 2.800	Total Deducte  Net Total  m @ Rs 193	al Quantity d Quantity al Quantity 8.89 / sqm	98.840 51.940 4.220 155.000 s 0.000 sqn 155.000 s Rs 30 OC (Volatil ur.Two coa 54.000 13.200 26.880	m)  qm  qm  052.95
	Finishing walls with  @ 1.67 ltr/10 sqm ov  out side wall  Parapet  rounded  13.83.2  Wall painting with papplying additional toilet inside  DA toilet  out  bath	oremium acry coats wherever 10 2 2 1	Say lic emulsion ver required 5.400 6.600 4.800 6.500	To 155.000 square paint of into achieve 1.000 1.000 2.800 1.000	Total Deducte  Net Total  m @ Rs 193	al Quantity d Quantity al Quantity 8.89 / sqm	98.840 51.940 4.220 155.000 s 0.000 sqn 155.000 s Rs 30 OC (Volatil ur.Two coa 54.000 13.200 26.880 6.500	m)  qm  qm  052.95

		1	3.200	2.800			8.960	
		1	4.850	2.800			13.580	
		1	2.500	2.800			7.000	
	urinal partition	2	2.100	1.500			6.301	
	under side slab	1	12.750	5.800			73.950	
		1	39.450	1.000			39.450	
	rounded	1	4.367				4.367	
	door D	2	1.000	2.100			-4.200	
	toilet door	11	0.700	2.100			-16.169	
	ventilator	15	0.600	0.500			-4.500	
	shutter	1	3.000	2.400			-7.199	
			611	1130	Total	Quantity	302.068 s	qm
		6	X 2	To	otal Deducted	Quantity	-32.068 s	qm
					Net Total	Quantity	270.000 s	qm
			Say	270.000 sq	m @ Rs 134.	10 / sqm	Rs 36	207.00
20	9.117.1 Providing and fixing f dimension as below (	tolerance ±1	mm), with w	all thicknes	s 2.0mm (±0	.2 mm), co	rners of the	door fran
20	Providing and fixing f dimension as below ( to be jointed with gal- hinge side vertical of mm) wall thickness a	tolerance ±1 vanized brace the frames re nd 3 nos. sta	mm), with we kets and sta einforced by ainless steel	vall thicknes ainless stee galvanized hinges fixe	s 2.0mm (±0 screws, join M.S. tube of d to the fram	.2 mm), co ts mitred a size 19 x 1 e complete	rners of the and plastic v 9 mm and o as per ma	door fran velded. T I mm (± 0
20	Providing and fixing f dimension as below ( to be jointed with galhinge side vertical of mm) wall thickness a specification and dire	tolerance ±1 vanized brace the frames read 3 nos. sta	mm), with we kets and state inforced by ainless steel ineer-in-char	vall thicknes ainless stee galvanized hinges fixe	s 2.0mm (±0 screws, join M.S. tube of d to the fram	.2 mm), co ts mitred a size 19 x 1 e complete	rners of the and plastic v 9 mm and as per ma x40 mm	door fran velded. T I mm (± 0
20	Providing and fixing f dimension as below ( to be jointed with galhinge side vertical of mm) wall thickness a specification and direct Toilet door 70x210	tolerance ±1 vanized brace the frames rection of Eng	mm), with workets and state inforced by ainless steel ineer-in-chares 5.600	vall thicknes ainless stee galvanized hinges fixe	s 2.0mm (±0 screws, join M.S. tube of d to the fram	.2 mm), co ts mitred a size 19 x 1 e complete	rners of the and plastic v 9 mm and r as per ma x40 mm 61.600	door fran velded. T I mm (± 0
20	Providing and fixing f dimension as below ( to be jointed with galhinge side vertical of mm) wall thickness a specification and direct Toilet door 70x210  DA toilet,100x210	tolerance ±1 vanized brace the frames read 3 nos. state ection of Eng  11  2	mm), with we kets and state inforced by ainless steel ineer-in-chart 5.600	vall thicknes ainless stee galvanized hinges fixe	s 2.0mm (±0 screws, join M.S. tube of d to the fram	.2 mm), co ts mitred a size 19 x 1 e complete	rners of the and plastic v 9 mm and as per ma ax40 mm 61.600	door fran velded. T I mm (± 0
20	Providing and fixing f dimension as below ( to be jointed with galhinge side vertical of mm) wall thickness a specification and direct Toilet door 70x210	tolerance ±1 vanized brace the frames rection of Eng	mm), with workets and state inforced by ainless steel ineer-in-chares 5.600	vall thicknes ainless stee galvanized hinges fixe	s 2.0mm (±0 screws, join M.S. tube of d to the fram I section prof	.2 mm), co ts mitred a size 19 x 1 e complete ile size 48	rners of the and plastic v 9 mm and 2 as per ma x40 mm 61.600 12.400	door fran velded. Tl 1 mm (± 0 nufacture
20	Providing and fixing f dimension as below ( to be jointed with galhinge side vertical of mm) wall thickness a specification and direct Toilet door 70x210  DA toilet,100x210	tolerance ±1 vanized brace the frames read 3 nos. state ection of Eng  11  2	mm), with we kets and state inforced by ainless steel ineer-in-chart 5.600	vall thicknes sinless stee galvanized hinges fixe rgeExtruded	s 2.0mm (±0 screws, join M.S. tube of d to the fram I section prof	.2 mm), co ts mitred a size 19 x 1 e complete ile size 48:	rners of the and plastic v 9 mm and 2 as per ma x40 mm 61.600 12.400 1.000 75.000 me	door fran velded. Ti 1 mm (± 0 nufacture
20	Providing and fixing f dimension as below ( to be jointed with galhinge side vertical of mm) wall thickness a specification and direct Toilet door 70x210  DA toilet,100x210	tolerance ±1 vanized brace the frames read 3 nos. state ection of Eng  11  2	mm), with we kets and state inforced by ainless steel ineer-in-chart 5.600	vall thicknes sinless stee galvanized hinges fixe rgeExtruded	s 2.0mm (±0 screws, join M.S. tube of d to the fram I section prof  Total	.2 mm), co ts mitred a size 19 x 1 e complete ile size 48:	9 mm and as per ma at 40 mm 61.600 12.400 1.000 me of the and plastic v	door fran velded. T 1 mm (± 0 nufacture
20	Providing and fixing f dimension as below ( to be jointed with galhinge side vertical of mm) wall thickness a specification and direct Toilet door 70x210  DA toilet,100x210	tolerance ±1 vanized brace the frames read 3 nos. state ection of Eng  11  2	mm), with wekets and state inforced by ainless steel ineer-in-char 5.600 6.200 1.000	vall thicknes sinless stee galvanized hinges fixe rgeExtruded	s 2.0mm (±0 screws, join M.S. tube of d to the fram I section prof  Total otal Deducted Net Total	.2 mm), co ts mitred a size 19 x 1 e complete ile size 48: Quantity Quantity	9 mm and as per ma at 40 mm 61.600 12.400 1.000 me 75.000 me	door fran velded. T I mm (± 0 nufacture etre
20	Providing and fixing f dimension as below ( to be jointed with galhinge side vertical of mm) wall thickness a specification and direct Toilet door 70x210  DA toilet,100x210	tolerance ±1 vanized brace the frames read 3 nos. state ection of Eng  11  2	mm), with wekets and state inforced by ainless steel ineer-in-char 5.600 6.200 1.000	vall thicknes sinless stee galvanized hinges fixe rgeExtruded	s 2.0mm (±0 screws, join M.S. tube of d to the fram I section prof  Total	.2 mm), co ts mitred a size 19 x 1 e complete ile size 48: Quantity Quantity	9 mm and as per ma at 40 mm 61.600 12.400 1.000 me 75.000 me	door fran velded. T 1 mm (± 0 nufacture

mm) wall thickness. The lock rail made up of 'H' section, a uPVC hollow section of size 100x24 mm and 2 mm (± 0.2 mm) wall thickness, fixed to the shutter styles by means of plastic/galvanised M.S. 'U' cleats.

	The shutter frame filled over all thickness of 20 two places by insertin complete as per man bathroom door shutter	mm and 1 r g horizonta ufacturer's	mm (± 0.1 m Ily 6 mm ga	nm) wall thic alvanised M	I.S. rod and fastened	d vertically a with nuts ar	nd tie bar at nd washers,
	Toilet door 70x210	11	0.700	2.100		16.170	
	DA toilet,100x210	2	1.000	2.100		4.200	
	rounded	1	0.630			0.630	
					Total Quantity	21.000 sq	m
				To	otal Deducted Quantity	0.000 sqn	า
			1.359	Carl	Net Total Quantity	21.000 sq	m
			Say	21.000 sqm	@ Rs 2072.49 / sqm	Rs 43	522.29
	extruded glazing beads frame to finishedwall, frame shall be mitred as	plastic pack					ze for fixing
	including drilling of he between frameand adja of required size and of Charge. (Single / doub frame, sash and mullio shall be acceptable.Fix mm both having wall thupto 0.75 sqm.)	oles for fixir acent finishe approved quale glass par n extruded parted window	nghardware ed wall shall uality, all co nes andsilio profiles mini / ventilator r	all corners, 's and drain be filled wit mplete as p on sealant us 5% tolera made of (sm	mullion (ifrequired) shanage of water etc. After the weather proof siliconter approveddrawing & shall be paid separate ancein dimension i.e. in tall series) frame 47 x \$	all be also fuser fixing frames sealant over direction of Edgl. <a href="https://www.edgl.com/">br&gt;Notedgeth &amp; wickers &amp; wickers &amp; wickers &amp; mu</a>	sion welded me the gap rbacker rod Engineer-in- : For uPVC Ith of profile Ilion 47x 68
	including drilling of ho between frameand adja of required size and of Charge. (Single / doub frame, sash and mullio shall be acceptable.Fix mm both having wall th	oles for fixir acent finishe approved quele glass par n extruded parted window	nghardware ed wall shall uality, all co nes andsilio profiles mini / ventilator r	all corners, 's and drain be filled wit mplete as p on sealant us 5% tolera made of (sm	mullion (ifrequired) shanage of water etc. After the weather proof siliconter approveddrawing & shall be paid separate ancein dimension i.e. in tall series) frame 47 x \$	all be also fuser fixing frames sealant over direction of Edgl. <a href="https://www.edgl.com/">br&gt;Notedgeth &amp; wickers &amp; wickers &amp; wickers &amp; mu</a>	sion welded me the gap rbacker rod Engineer-in- : For uPVC Ith of profile Ilion 47x 68
	including drilling of home between frameand adjate of required size and of Charge. (Single / doubt frame, sash and mullion shall be acceptable. Fix mm both having wall through 0.75 sqm.)	oles for fixir acent finished approved quality glass particular n extruded particular aced window spickness of	nghardware ed wall shall uality, all co nes andsilio profiles mini / ventilator r 1.9 ± 0.2 mi	all corners, 's and drain be filled with mplete as p on sealant us 5% tolera made of (sm m and single	mullion (ifrequired) shanage of water etc. After the weather proof siliconter approveddrawing & shall be paid separate ancein dimension i.e. in tall series) frame 47 x \$	all be also fuser fixing frames sealant over direction of Equipment of the sealant over depth & wick of the sealant over the sealant over depth & wick of the sealant over the s	sion welded me the gap rbacker rod Engineer-in- : For uPVC Ith of profile Ilion 47x 68 nsion. (Area
	including drilling of home between frameand adjate of required size and of Charge. (Single / doubt frame, sash and mullion shall be acceptable. Fix mm both having wall through 0.75 sqm.)	oles for fixir acent finished approved quality glass particular n extruded particular aced window spickness of	nghardware ed wall shall uality, all co nes andsilio profiles mini / ventilator r 1.9 ± 0.2 mi	all corners, 's and drain be filled with mplete as p on sealant us 5% tolera made of (sm m and single  0.500	mullion (ifrequired) shanage of water etc. After the weather proof siliconder approveddrawing & shall be paid separate ancein dimension i.e. in hall series) frame 47 x see glazing bead ofapproductions.	all be also furer fixing frames sealant over direction of Eq. (2). <a href="https://www.normals.com/bases/comm">https://www.normals.com/bases/com/</a>	sion welded me the gap rbacker rod Engineer-in- : For uPVC Ith of profile Ilion 47x 68 nsion. (Area
	including drilling of home between frameand adjate of required size and of Charge. (Single / doubt frame, sash and mullion shall be acceptable. Fix mm both having wall through 0.75 sqm.)	oles for fixir acent finished approved quality glass particular n extruded particular aced window spickness of	nghardware ed wall shall uality, all co nes andsilio profiles mini / ventilator r 1.9 ± 0.2 mi	all corners, 's and drain be filled with mplete as p on sealant us 5% tolera made of (sm m and single  0.500	mullion (ifrequired) sha nage of water etc. After the weather proof silicon er approveddrawing & shall be paid separate ancein dimension i.e. in hall series) frame 47 x see glazing bead ofappro	all be also furer fixing frames sealant over direction of Eq. (a). <a href="https://www.normannesses.org">br / with text of the sealant over direction of Eq. (a). <a href="https://www.normannesses.org">br / with text of the sealant over direction of Eq. (b). <a href="https://www.normannesses.org">br / with text of the sealant over direction of Eq. (b). <a href="https://www.normannesses.org">br / with text of the sealant over depth &amp; with text of</a></a></a></a>	sion welded me the gap rbacker rod Engineer-in- : For uPVC Ith of profile Ilion 47x 68 nsion. (Area
	including drilling of home between frameand adjate of required size and of Charge. (Single / doubt frame, sash and mullion shall be acceptable. Fix mm both having wall through 0.75 sqm.)	oles for fixir acent finished approved quality glass particular n extruded particular aced window spickness of	nghardware ed wall shall uality, all co nes andsilio profiles mini / ventilator r 1.9 ± 0.2 mi  0.600	all corners, 's and drain be filled with mplete as p on sealant us 5% tolera made of (sm m and single  0.500	mullion (ifrequired) shanage of water etc. After the weather proof siliconder approveddrawing & shall be paid separate ancein dimension i.e. in hall series) frame 47 x see glazing bead of appropriate appropriate approximately	all be also fuser fixing frager fixing frager sealant over direction of Ety). by). br> Note depth & wick of mm & mulpriate dimer 4.500 4.500 sqn 4.500 sqn 4.500 sqn	sion welded me the gap rbacker rod Engineer-in- : For uPVC Ith of profile Ilion 47x 68 nsion. (Area
23	including drilling of home between frameand adjate of required size and of Charge. (Single / doubt frame, sash and mullion shall be acceptable. Fix mm both having wall through 0.75 sqm.)	ples for fixing acent finished approved qualified window inickness of the second secon	nghardware ed wall shall uality, all co nes andsilid profiles mini / ventilator r 1.9 ± 0.2 mi  0.600  Sa  lapsible steesize, with to	all corners, 's and drain be filled with mplete as p on sealant us 5% tolera made of (sm m and single  0.500  To y 4.500 sqm el shutters w p and botto	mullion (ifrequired) shanage of water etc. After the weather proof siliconder approveddrawing & shall be paid separate ancein dimension i.e. in all series) frame 47 x see glazing bead ofapproducted Quantity  Net Total Quantity  Net Total Quantity  Net Total Quantity  Net Total Quantity  with vertical channels 2 cm rail of T-iron 40x40.	all be also fuser fixing frager fixing frager sealant over direction of Ety). by). br>Note depth & wick of mm & must priate dimer 4.500 4.500 sqn 4.500 sqn Rs 34 0x10x2 mm x6 mm, with	sion welded me the gap rbacker rod Engineer-in-: For uPVC lth of profile llion 47x 68 asion. (Area and braced 40 mm dia

	Rounded	1	0.600				0.600						
					Tota	al Quantity	9.000 sqm	1					
				To	tal Deducte	d Quantity	0.000 sqm	1					
					Net Tota	al Quantity	9.000 sqm	1					
	Say 9.000 sqm @ Rs 10205.93 / sqm												
24	10.28 Providing and fixing stincluding welding, grind same with necessary accessories & stainless floor or the side of wall payment purpose onliaccessories such as	ding, buffing stainless s s steel dash list slab wit ly weight o	g, polishing steel nuts a fasteners, h suitable a of stainless	and making nd bolts co stainless stearrangemen steel men	g curvature emplete, i/c eel bolts etc t as per ap	(wherever r fixing the ., of require proval of E	equired) an railing with d size on th ngineer-in-c	d fitting the necessary top of the tharge, (for					
	hand rail	2	6.000			20.0	240.000	@20kg/m					
		6	W. 2	55. X	Tota	al Quantity	240.000 k	g					
				То	tal Deducte	d Quantity	0.000 kg						
		101			Net Tota	al Quantity	240.000 k	g					
							34 / kg Rs 162561.60						
SI No	Description	No 4 Appendi	L	Bay 240.000  B  uction of Pa	D	CF	Quantity	Remark					
SI No	16.78.1 Construction of granul mixing in a mechanical & lifts, spreading in un compacting with vibrate directions of Engineer-i	4 Appendi ar sub- bas mix plant a niform layer ory power ro	x D- constr se by Provi t OMC, Car s of specific	B  uction of Pa  ding close of mixed thickness  eve the desir	parking Area graded Mated material s with motored density,	cr erial confor by tippers to r grader on complete as	Quantity  Tming to specifications  To work site, to prepared so per specifications	Remark ecifications for all leads urface and cations and					
	16.78.1 Construction of granul mixing in a mechanical & lifts, spreading in uncompacting with vibrate	4 Appendi ar sub- bas mix plant a niform layer ory power ro	x D- constr se by Provi t OMC, Car s of specific	B  uction of Pa  ding close of mixed thickness  eve the desir	parking Area graded Mated material s with motored density,	cr erial confor by tippers to r grader on complete as	Quantity  Tming to specifications  To work site, to prepared so per specifications	Remark ecifications for all leads urface and cations and					
	16.78.1 Construction of granul mixing in a mechanical & lifts, spreading in un compacting with vibrate directions of Engineer-i having CBR Value- 30	dar sub- bas mix plant a niform layer ory power ro n- Charge.V	x <b>D- constr</b> se by Provi t OMC, Car s of specific oller to achie	ding close or discovery the desired thickness over the desired the	parking Area graded Mated material s with motoled density, g to Grade -	cr erial confor by tippers to r grader on complete as	Quantity  The ming to specify to work site, in prepared so specify per specific ge 75 mm to	Remark ecifications for all leads urface and cations and					
	16.78.1 Construction of granul mixing in a mechanical & lifts, spreading in un compacting with vibrate directions of Engineer-i having CBR Value- 30 Auction hall front	4 Appendi lar sub- bas mix plant a niform layer ory power ro n- Charge.V	x D- constr se by Provi t OMC, Car s of specific oller to achie Vith Materia	ding close of mixed thicknessive the desired conforming 25.000	graded Mated material s with moto ed density, to Grade -	cr erial confor by tippers to r grader on complete as	Quantity  Thing to specific prepared so sper specific pe 75 mm to 150.000	Remark ecifications for all leads urface and cations and					
	16.78.1 Construction of granul mixing in a mechanical & lifts, spreading in un compacting with vibrate directions of Engineer-i having CBR Value- 30 Auction hall front side	ar sub- bas mix plant a niform layer ory power ro n- Charge.V	x D- constr se by Provi t OMC, Car s of specific oller to achie Vith Materia 40.000 6.000	ding close of mixed thickness we the desir I conforming 25.000	graded Mated material s with motored density, to Grade -	cr erial confor by tippers to r grader on complete as	Quantity  Tming to specific prepared size 75 mm to 150.000  10.800	Remark ecifications, for all leads urface and cations and					
	16.78.1 Construction of granul mixing in a mechanical & lifts, spreading in un compacting with vibrate directions of Engineer-i having CBR Value- 30 Auction hall front side AH west side	4 Appendidar sub- base mix plant a hiform layer for power ron- Charge.V	x D- constr se by Provi t OMC, Car s of specific oller to achie Vith Materia 40.000 6.000 40.000	ding close of the desired thickness to the desired the desired conforming 25.000 6.000	graded Mated material s with moto ed density, to Grade -  0.150  0.150  0.150	cr erial confor by tippers to r grader on complete as	Quantity  Tming to specific prepared size 75 mm to 150.000  10.800  60.000	Remark ecifications, for all leads urface and cations and					
	16.78.1 Construction of granul mixing in a mechanical & lifts, spreading in un compacting with vibrate directions of Engineer-i having CBR Value- 30 Auction hall front side AH west side for road	4 Appendi	x D- constr se by Provi t OMC, Car s of specifical oller to achie Vith Material 40.000 6.000 40.000	ding close of the desired thickness to the desired the desired conforming 25.000 6.000	graded Material s with motored density, to Grade - 0.150 0.150 0.150 0.150	cr erial confor by tippers to r grader on complete as	Quantity  Tming to specific prepared size 75 mm to 150.000  10.800  60.000  27.000	Remark ecifications for all leads surface and cations and 0.075 mm)					
	16.78.1 Construction of granul mixing in a mechanical & lifts, spreading in un compacting with vibrate directions of Engineer-i having CBR Value- 30 Auction hall front side AH west side for road	4 Appendi	x D- constr se by Provi t OMC, Car s of specifical oller to achie Vith Material 40.000 6.000 40.000	ding close or diage of mixed thickness eve the desir I conforming 25.000 6.000 6.000	graded Material s with motored density, to Grade - 0.150 0.150 0.150 0.150	crial conformer by tippers to represent the complete as I (size range)	Quantity  Tming to specific prepared size 75 mm to 150.000  10.800  60.000  27.000  4.200	Remark ecifications for all leads urface and cations and 0.075 mm)					
	16.78.1 Construction of granul mixing in a mechanical & lifts, spreading in un compacting with vibrate directions of Engineer-i having CBR Value- 30 Auction hall front side AH west side for road	4 Appendi	x D- constr se by Provi t OMC, Car s of specific oller to achie Vith Materia 40.000 6.000 40.000	ding close or diage of mixed thickness eve the desir I conforming 25.000 6.000 6.000	graded Material swith motored density, to Grade - 0.150 0.150 0.150 0.150 Total tall Deducte	crial conformer by tippers to represent the complete as I (size range)	Quantity  ming to specific prepared size 75 mm to 150.000  10.800  60.000  27.000  4.200  252.000 c	Remark ecifications for all leads curface and cations and 0.075 mm)					
	16.78.1 Construction of granul mixing in a mechanical & lifts, spreading in un compacting with vibrate directions of Engineer-i having CBR Value- 30 Auction hall front side AH west side for road	4 Appendi	x D- constr se by Provint OMC, Car s of specificaller to achies With Material 40.000 40.000 40.000 40.000 4.200	ding close or diage of mixed thickness eve the desir I conforming 25.000 6.000 6.000	graded Material swith motored density, to Grade - 0.150 0.150 0.150 0.150 Total tal Deducte	crial conformer by tippers to regrader on complete as I (size ranged) all Quantity de Quantity all Quantity a	Quantity  ming to specific prepared size 75 mm to 150.000  10.800  10.800  27.000  4.200  252.000 c	Remark ecifications, for all leads curface and cations and 0.075 mm)					

Construction of dry loaggregate conforming ration not to exceed not to be less than construction, concretransported to site, for roller, finishing and construction and construction are construction.	g to IS: 383, 15:1, aggrega 150 Kg/ cur ete strength r all leads & I	the size of cate gradations, optimum not to be lefts, laid with	coarse aggre n after blend moisture d ess than 10 a mechanid	egate not ex ling to be a content to b Mpa at 7 cal paver, co	ceeding 25 s per specif pe determinedays, mixeompacting was	mm, aggregication, cemned during ed in a batc	ate cement ent content trial length thing plant,		
Auction hall front	1	40.000	25.000	0.150		150.000			
side	2	6.000	6.000	0.150		10.800			
AH west side	1	40.000	10.000	0.150		60.000			
 for road	1	30.000	6.000	0.150		27.000			
rounded	1	4.200	6			4.200			
		1/10		Tota	al Quantity	252.000 c	um		
Total Deducted Quantity 0.000 cum									
	613	Y R	51/1	Net Tota	al Quantity	252.000 c	um		
	18	Say 2	252.000 cum	@ Rs 4569	9.25 / cum	Rs 115	1451.00		
cement content as b				مامماممام					
size in appropriate p sleeve/tie bars where and surface vibrators form work with sturc construction & longitu filling joints with appr Item of joint fillers, se considered in M-30 is separately.Cement co	roportions as ver required, , levelling to ly M.S. chan idinal joints ( oved joint fill alants, dowel @340 kg/cu	s per approvaleying at site required slounel section 10 mm wide er and sealed bars with slow. Excess/les	yed & specifie, spreading pe/ camber, s, curing, nex 50 mm dants, complete eeve/tie barress cement	fied design and compa finishing whaking proveep) by group eep) by group ete all as persto be paidused as per	criteria, pro cting mecha ith required rision for co ove cutting er direction separately)	anically by use texture, included intraction / machine, proof Engineer- s. Note: Cem	el bars with sing needle luding steel expansion, oviding and in-charge (		
size in appropriate p sleeve/tie bars where and surface vibrators form work with sturc construction & longitu filling joints with appr Item of joint fillers, se considered in M-30 is	roportions as ver required, , levelling to ly M.S. chan idinal joints ( oved joint fill alants, dowel @340 kg/cu	s per approvaleying at site required slounel section 10 mm wide er and sealed bars with slow. Excess/les	yed & specifie, spreading pe/ camber, s, curing, nex 50 mm dants, complete eeve/tie barress cement	fied design and compa finishing whaking proveep) by group eep) by group ete all as persto be paidused as per	criteria, pro cting mecha ith required rision for co ove cutting er direction separately)	eviding dower anically by use texture, included ontraction / machine, proposed of Engineer- of Note: Cem	el bars with sing needle luding steel expansion, oviding and in-charge (		
size in appropriate p sleeve/tie bars where and surface vibrators form work with sturc construction & longitu filling joints with appr Item of joint fillers, se considered in M-30 is separately.Cement co	roportions as ver required, , levelling to ly M.S. chan idinal joints ( oved joint fill alants, dowel @340 kg/cu	s per approvaleying at site required slouned section 10 mm wide er and sealed bars with slouned with bat red with bat	yed & specifie, spreading pe/ camber, s, curing, nex 50 mm deants, complete eeve/tie baress cement ch mixing means, mixing means cement of the cement of th	fied design and compa finishing w naking prov eep) by gro ete all as pe s to be paid used as per achine	criteria, pro cting mecha ith required rision for co ove cutting er direction separately)	eviding dower anically by use texture, included ontraction / machine, proof of Engineer- on. Note: Cem is payable/ n	el bars with sing needle luding steel expansion, oviding and in-charge (		
size in appropriate p sleeve/tie bars where and surface vibrators form work with sturc construction & longitu filling joints with appr Item of joint fillers, se considered in M-30 is separately.Cement co	roportions as ver required, , levelling to ly M.S. chan idinal joints ( oved joint fill alants, dowel @340 kg/cu oncrete prepa	s per approvaleying at site required slounel section 10 mm wide er and sealed bars with slow. Excess/legred with bat 40.000	yed & specifie, spreading pe/ camber, s, curing, nex 50 mm deants, complete eve/tie barress cement ch mixing mess.	fied design and compa finishing w haking proveep) by gro ete all as pe s to be paid used as per achine  0.150	criteria, pro cting mecha ith required rision for co ove cutting er direction separately)	texture, including dowers including the texture, including the texture of the t	el bars with sing needle luding steel expansion, oviding and in-charge (		
size in appropriate p sleeve/tie bars where and surface vibrators form work with sturc construction & longitu filling joints with appr Item of joint fillers, se considered in M-30 is separately.Cement co	roportions as ver required, , levelling to ly M.S. chardinal joints (oved joint fill alants, dowel @340 kg/cubncrete prepared	s per approvalusing at site required slowed section 10 mm wide er and sealed bars with slowed with bat 40.000	yed & specifie, spreading pe/ camber, s, curing, nex 50 mm deants, complete eeve/tie barress cement ch mixing mess.	fied design and compa finishing w haking proveep) by gro ete all as pe s to be paid used as per achine  0.150	criteria, pro cting mecha ith required rision for co ove cutting er direction separately)	texture, included in the contraction of the contrac	el bars with sing needle luding steel expansion, oviding and in-charge (		
size in appropriate p sleeve/tie bars where and surface vibrators form work with sturce construction & longitu filling joints with appr Item of joint fillers, se considered in M-30 is separately. Cement considered in M-30 is separately. Cement considered in M-30 is	roportions as ver required, , levelling to ly M.S. chardinal joints (oved joint fill alants, dowel @340 kg/cubncrete prepared	s per approvalusing at site required slowed section 10 mm wide er and sealed bars with slowed with bat 40.000 6.000 40.000	yed & specifie, spreading pe/ camber, s, curing, nex 50 mm deants, complete eeve/tie barress cement ch mixing mess complete 6.000	fied design and compa finishing w haking proveep) by gro ete all as per s to be paid used as per achine  0.150  0.150	criteria, pro cting mecha ith required rision for co ove cutting er direction separately)	texture, included in the second in the secon	el bars with sing needle luding steel expansion, oviding and in-charge (		
size in appropriate p sleeve/tie bars where and surface vibrators form work with sturc construction & longitu filling joints with appr Item of joint fillers, se considered in M-30 is separately.Cement co Auction hall front side AH west side for road	roportions as ver required, , levelling to ly M.S. chardinal joints (oved joint fill alants, dowel @340 kg/cubncrete prepared 1	s per approvalusing at site required slowed section 10 mm wide er and sealed bars with slowed with bat 40.000 6.000 40.000 30.000	yed & specifie, spreading pe/ camber, s, curing, nex 50 mm deants, complete eeve/tie barress cement ch mixing mess complete 6.000	fied design and compa finishing w haking proveep) by groete all as per s to be paidused as per achine  0.150  0.150  0.150	criteria, pro cting mecha ith required rision for co ove cutting er direction separately)	texture, included in the second in the secon	el bars with sing needle luding steel expansion, oviding and in-charge (sent content recoverable		
size in appropriate p sleeve/tie bars where and surface vibrators form work with sturc construction & longitu filling joints with appr Item of joint fillers, se considered in M-30 is separately.Cement co Auction hall front side AH west side for road	roportions as ver required, , levelling to ly M.S. chardinal joints (oved joint fill alants, dowel @340 kg/cubncrete prepared 1	s per approvalusing at site required slowed section 10 mm wide er and sealed bars with slowed with bat 40.000 6.000 40.000 30.000	yed & specifie, spreading pe/ camber s, curing, nex 50 mm deants, complete eve/tie barress cement ch mixing mex 25.000 6.000 10.000 6.000	fied design and compa finishing w haking proveep) by groete all as per s to be paidused as per achine  0.150  0.150  0.150	criteria, proceeding mecha ith required vision for co ove cutting er direction separately) design mix	poviding dower anically by use texture, includent anically by use texture, includent anically by use texture, includent anically	el bars with sing needle luding steel expansion, oviding and in-charge (sent content recoverable		
size in appropriate p sleeve/tie bars where and surface vibrators form work with sturc construction & longitu filling joints with appr Item of joint fillers, se considered in M-30 is separately.Cement co Auction hall front side AH west side for road	roportions as ver required, , levelling to ly M.S. chardinal joints (oved joint fill alants, dowel @340 kg/cubncrete prepared 1	s per approvalusing at site required slowed section 10 mm wide er and sealed bars with slowed with bat 40.000 6.000 40.000 30.000	yed & specifie, spreading pe/ camber s, curing, nex 50 mm deants, complete eve/tie barress cement ch mixing mex 25.000 6.000 10.000 6.000	fied design and compa finishing w haking proveep) by gro ete all as pe s to be paid used as per achine 0.150 0.150 0.150 Tota stal Deducte	criteria, proceeding mecha ith required vision for co ove cutting er direction separately) design mix	poviding dower anically by use texture, includent anically by use texture, includent anically by use texture, includent anically	el bars with sing needle luding steel expansion, oviding and in-charge (sent content recoverable luding steel ent content steel ent steel		
size in appropriate p sleeve/tie bars where and surface vibrators form work with sturc construction & longitu filling joints with appr Item of joint fillers, se considered in M-30 is separately.Cement co Auction hall front side AH west side for road	roportions as ver required, , levelling to ly M.S. chardinal joints (oved joint fill alants, dowel @340 kg/cubncrete prepared 1	s per approving at site required slowed section 10 mm wide er and seals bars with slowed with bat 40.000 6.000 40.000 30.000 4.200	yed & specifie, spreading pe/ camber s, curing, nex 50 mm deants, complete eve/tie barress cement ch mixing mex 25.000 6.000 10.000 6.000	fied design and compa finishing w haking proveep) by gro ete all as pe s to be paid used as per achine 0.150 0.150 0.150 Tota stal Deducte Net Tota	criteria, proceeding mecha ith required vision for coove cutting er direction separately) design mix	poviding dower anically by use texture, includent anically use texture, includent anically use texture, includent anical properties. Note: Cemis payable/ is payable/	el bars with sing needle luding steel expansion, oviding and in-charge (sent content recoverable luding steel ent content steel ent steel		

	qty of CC	1	307.800			60.0	18468.000	@60Kg/
	rounded	1	15.000				15.000	@75Kg/
					Tota	al Quantity	18483.000	kg
				To	tal Deducte	d Quantity	0.000 kg	
					Net Tota	al Quantity	18483.000	kg
			Sa	ay 18483.00	00 kg @ Rs	98.30 / kg	Rs 181	6878.90
5	16.44 Extra for providing ar specification in ceme	•		compound	of approve	ed quality a	as per man	ufacture
	q t y o f c c 307.8*340=104652(20 93 bags	1	2093.000	5%		0.2	418.600	@.20 Kg/ba
	Rounded	1	6.400			<u>L</u> .,	6.400	@.20 Kg/ba
			Maria	II BEZZ	Tota	al Quantity	425.000 L	itre
	0	ther Er	ngineeri	ng Org	tal Deducte	d Quantity	0.000 Litre	)
					Net Tota	al Quantity	425.000 L	itre
			Say	425.000 Li	tre @ Rs 59	).86 / Litre	Rs 25	440.50
SI No	Description -	No	L -	В	D	CF	Quantity	Remark
		5 Appe	endix E - Co	nstruction	of Drain			
1	2.8.1 Earth work in excavati trenches or drains (not ramming of bottoms, lifexcavated soil as directions)	exceeding	g 1.5 m in w 5 m, includin	idth or 10 s	sqm on plar ut the exca	n), including	g dressing o	f sides a
	main drain from Auction hall to sump	1	50.000	1.300	1.000		65.000	
					Tota	al Quantity	65.000 cu	m
				Тс	tal Deducte	d Quantity	0.000 cum	1
					Net Tota	al Quantity	65.000 cu	m

	soil		to 1.5 m, dis	posed eartr	n to be level	led and nea	atly dressed	.All kin
	Pit of sump	1	8.200	4.000	2.450		80.360	
	soak pit 2m dia	1	3.140	1*1	2.100		6.594	
	round of	1	3.046				3.046	
					Tota	al Quantity	90.000 cu	im
				To	otal Deducte	d Quantity	0.000 cun	n
					Net Tota	al Quantity	90.000 cu	ım
			Say	y 90.000 cu	m @ Rs 214	1.03 / cum	Rs 19	262.70
	Providing and laying in shuttering - All work up nominal size)	•			4 coarse sa	•		_
	for drain	1	50.000	1.300	0.150		9.750	
	sump bottom	1	8.200	4.000	0.200	£	6.560	
	round of	1	0.690	SPY.	(E)		0.690	
				II a Pizz	Tota	al Quantity	17.000 cu	ım
		ther Er	oineeri		otal Deducte	d Quantity	0.000 cun	n
			ngineeri		Net Tota	al Quantity	17.000 cu	ım
			Sout	17.000	Da C04	1/00 / 2000	De 11/	
			Say	17.000 cum	1 @ RS 08 14	1.89 / cum	1/3 11.	5853.1
4	5.1.2 Providing and laying ir centering, shuttering, fir sand :3 graded stone a	nishing and	specified gra	ade of reinfent - All worl	orced ceme	ent concrete	e, excluding	the co
4	Providing and laying in centering, shuttering, fin	nishing and	specified gra	ade of reinfent - All worl	orced ceme	ent concrete	e, excluding	the co
4	Providing and laying ir centering, shuttering, fir sand :3 graded stone a	nishing and ggregate 2	specified gra reinforceme 0 mm nomina	ade of reinfent - All worl	orced ceme	ent concrete	e, excluding :3 (1 cemen	the co
4	Providing and laying in centering, shuttering, find sand :3 graded stone and drain bottom slab	nishing and ggregate 2	specified grader reinforcement of mm nominated 50.000	ade of reinfo ent - All work al size 1.200	orced ceme orced ceme orced ceme orced ceme orced orced orced	ent concrete	e, excluding :3 (1 cemen 6.000	the co
4	Providing and laying in centering, shuttering, fin sand :3 graded stone a drain bottom slab side wall cover slad for drain	nishing and ggregate 20 1 2	specified gradereinforcement of the community of the comm	ade of reinfent - All work al size 1.200 1.000	orced ceme orced ceme orced ceme orced ceme orced orce	ent concrete	e, excluding :3 (1 cemen 6.000 20.000	the co
4	Providing and laying in centering, shuttering, fin sand :3 graded stone a drain bottom slab side wall cover slad for drain 50/.5	nishing and ggregate 20	specified grade reinforcement of mm nominal 50.000 50.000	ade of reinfent - All work all size 1.200 1.000	0.100 0.200 0.150	ent concrete	6, excluding 3 (1 cemen) 6.000 20.000 7.500	the co
4	Providing and laying in centering, shuttering, fin sand :3 graded stone a drain bottom slab side wall cover slad for drain 50/.5 cover slab sump	nishing and ggregate 20  1  2  100  16	specified grade reinforcement of mm nominal 50.000 50.000 1.000 3.500	ade of reinfent - All work all size 1.200 1.000 0.500	0.100 0.200 0.150 0.120	ent concrete	6.000 20.000 7.500 3.360	the co
4	Providing and laying in centering, shuttering, fin sand :3 graded stone and drain bottom slab  side wall  cover slad for drain 50/.5  cover slab sump  do beam	nishing and ggregate 20  1  2  100  16  1	50.000 50.000 1.000 3.500 7.500	1.200 1.000 0.500 0.300	0.100 0.200 0.150 0.300	ent concrete	6, excluding 3 (1 cemen) 6.000 20.000 7.500 3.360 0.675	the co
4	Providing and laying in centering, shuttering, fin sand :3 graded stone and drain bottom slab side wall cover slad for drain 50/.5 cover slab sump do beam cover slab soak pit	1 2 100 16 1	50.000 50.000 1.000 3.500 7.500 3.140	1.200 1.000 0.500 0.300	0.100 0.200 0.150 0.120 0.300 0.120	ent concrete	6, excluding 3 (1 cemen) 6.000 20.000 7.500 3.360 0.675 0.415	the co

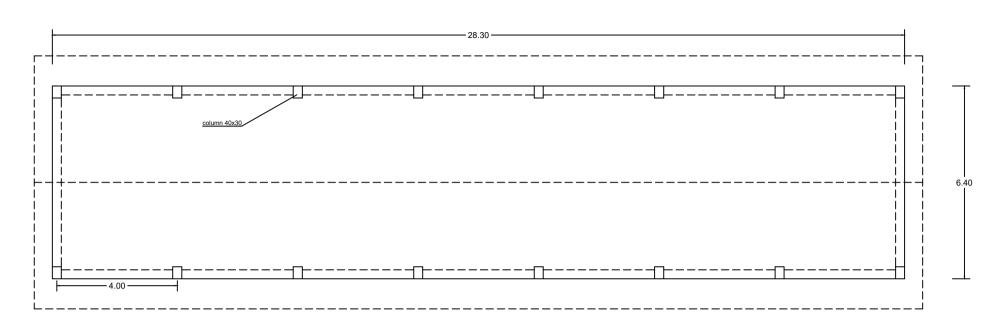
			Say	38.000 cum	@ Rs 9085	5.14 / cum	Rs 34	5235.32
5	5.9.1 Centering and shutterin columns, etc for mass of	•	g strutting, et	c. and remo	oval of form	for:Foundat	ions, footing	gs, bases
	side wall drain out	2	50.000	1.000			100.000	
	side wall drain in	2	50.000	0.900			90.000	
					Tota	al Quantity	190.000 s	qm
				To	otal Deducte	d Quantity	0.000 sqn	า
					Net Tota	al Quantity	190.000 s	qm
			Say	190.000 sq	m @ Rs 335	5.31 / sqm	Rs 63	708.90
6	5.9.5 Centering and shuttering girders bressumers and For cover slab drain	•		etc. and ren	noval of forn	n for:Lintels	s, beams, pl	inth bean
	105 x 50 x 15 cm For cover slab Effluent tank sides	16	8.000	0.120		<u>C</u>	15.360	
	beam	1	7.500	0.900	36		6.750	
	Rounded	1 1 E	1.390		• 4 •		1.390	
		iner Ei	ngineeri	ng Org	anisatic Tota	nS al Quantity	70.000 sq	m
				To	otal Deducte	d Quantity	0.000 sqn	า
					Net Tota	al Quantity	70.000 sq	m
			Say	y 70.000 sq	m @ Rs 649	9.82 / sqm	Rs 45	487.40
7	5.22A.1 Steel reinforcement for binding all complete all					•		osition a
	Qty of CC 38	1	38.000			90.0	3420.000	
					Tota	al Quantity	3420.000	kilogram
				To	otal Deducte	d Quantity	0.000 kilo	gram
					Net Tota	al Quantity	3420.000	kilogram
		;	Say 3420.00	0 kilogram	@ Rs 96.68	/ kilogram	Rs 330	0645.60
8	50.6.1.1 Solid block masonry using size confirming to IS 218	85 part 1 c	of 1979 for fo		•			
	1:6 (1 cement : 6 coars	e sand) et	c complete					

	soak pit 2.00m dia - bottom	1	6.280	0.200	0.300		0.377	
	Rounded	1	0.673				0.673	
					Tota	al Quantity	12.000 cu	m
				To	otal Deducte	d Quantity	0.000 cum	1
					Net Tota	al Quantity	12.000 cu	m
			Say	12.000 cum	n @ Rs 5908	3.32 / cum	Rs 70	899.84
9	6.23 Honey-comb brick work structure above plinth le				-		•	
	soak pit 2.00m dia - bottom	1	6.280	1.300			8.165	
	Rounded	1	0.835				0.835	
		/	CV 3		Tota	al Quantity	9.000 sqm	1
		66		To	otal Deducte	d Quantity	0.000 sqm	1
		135	16		Net Tota	al Quantity	9.000 sqm	1
	19	线性	Sa	ay 9.000 sq	m @ Rs 699	).37 / sqm	Rs 62	294.33
10	13.7.2 12 mm cement plaster f	inished wit	th a floating o	oat of neat	cement of m	nix:1:4 ( 1 ce	ement : 4 fine	e sand)
	for Drain side wall - inside		50.000	2.600	1		130.000	
	Effluent tank side wall	2	31.600	2.500			158.000	
	cross wall	2	3.200	2.500			16.000	
	bottom	1	3.200 7.600	2.500 3.200			16.000 24.320	
	bottom	1	7.600		Tota	al Quantity	24.320	qm
	bottom	1	7.600	3.200	Tota		24.320 1.680	•
	bottom	1	7.600	3.200	otal Deducte		24.320 1.680 330.000 s	)
	bottom	1	7.600 1.680	3.200 To	otal Deducte	d Quantity	24.320 1.680 330.000 s 0.000 sqm 330.000 s	)
SI No	bottom	1	7.600 1.680	3.200 To	otal Deducte Net Tota	d Quantity	24.320 1.680 330.000 s 0.000 sqm 330.000 s	qm
SI No	bottom  Rounded  Description	1 1	7.600 1.680 Say	3.200 To 330.000 sq	Net Tota m @ Rs 386	d Quantity al Quantity 5.36 / sqm	24.320 1.680 330.000 s 0.000 sqm 330.000 s Rs 127	qm <b>7498.80</b>
SI No	bottom  Rounded  Description	1 1 No	7.600 1.680  Say  L  6 Sub soil intotal	3.200 To 330.000 sq B nvestigatio	Net Tota  Met Tota  Met Sass  Met Tota  Met Tota  Met Tota	d Quantity al Quantity 5.36 / sqm CF	24.320 1.680 330.000 s 0.000 sqm 330.000 s Rs 127 Quantity	7498.80 Remark
SI No	bottom  Rounded  Description	1 1 No No	7.600 1.680 Say	3.200  To  330.000 sq  B  nvestigatio	Net Tota m @ Rs 386  D	d Quantity al Quantity 5.36 / sqm CF	24.320 1.680 330.000 s 0.000 sqm 330.000 s Rs 127 Quantity	qm 7498.80 Remark

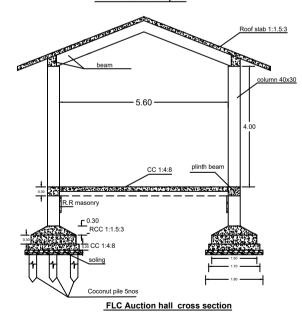
	SI No	Description	No	L	В	D	CF	Quantity
Remark			8 Electrifi	cation and y	ard lighting			
		Lump-Sum 7	Total			R	s 1000000	.00
	SI No	Description	No	L	В	D	CF	Quantity
Remark			9 Unfor	eseen charg	es @2.5%			
		Lump-Sum 7	Total			R	s 4990000	.00
			Р	rovision for G	ST payment	s (in %) @	1	8.0%
			Amount res	erved for GS	T payments		35995983.	04
					Total	2	235973667	.04
				Lumpsum f	or round off		26332.96	5
			103	a Silv		то	TAL Rs 23	36000000.
			-2/1			Rounded	Total Rs 2	23,60,00,0
			133 1		Rupees Tv	venty Three	e Crore Six	ty Lakh Or

(Cost Index Applied for this estimate is 35.59%)

Other Engineering Organisations
PRICE



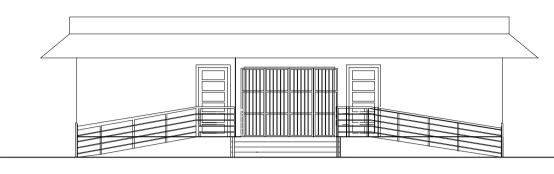
#### FLC Auction hall plan

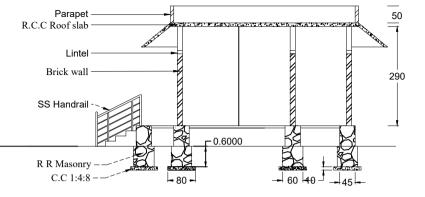




#### DEVELOPMENT OF VIPIN -MUNAMBAM COASTAL STRETCH INCLUDING COASTAL PROTECTION -CONSTRUCTION OF FISH LANDING CENTRE AT VALIYATHAMPARAMBU

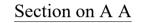
STAL	DRAWING NO:		ASSISTANT ENGINEER:			ASSISTANT EXECUTIVE ENGINEER: SIGNATURE:
	DATE:		DRAWN:			
	TYPE:	DRAWING	REVIS	ION	STREET CONSCIANT	CHIEF ENGINEER: SIGNATURE:
	TITLE.	FLC AUCTION HALL PLAN & SECTION	1.		DESIGNED & CHECKED BY	
	TITLE:	FLC AUCTION HALL PLAN & SECTION	2			

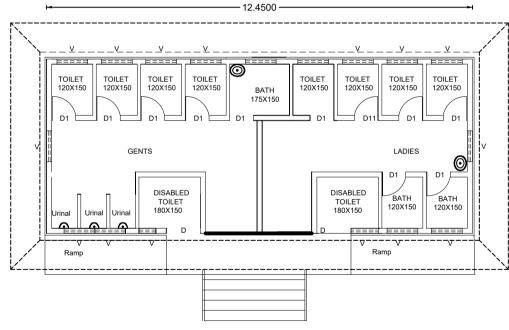


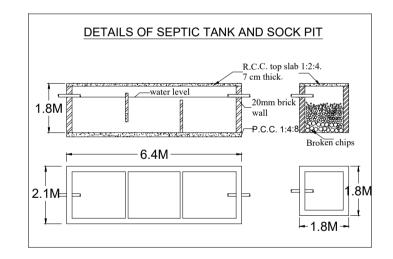


### **ELEVATION**







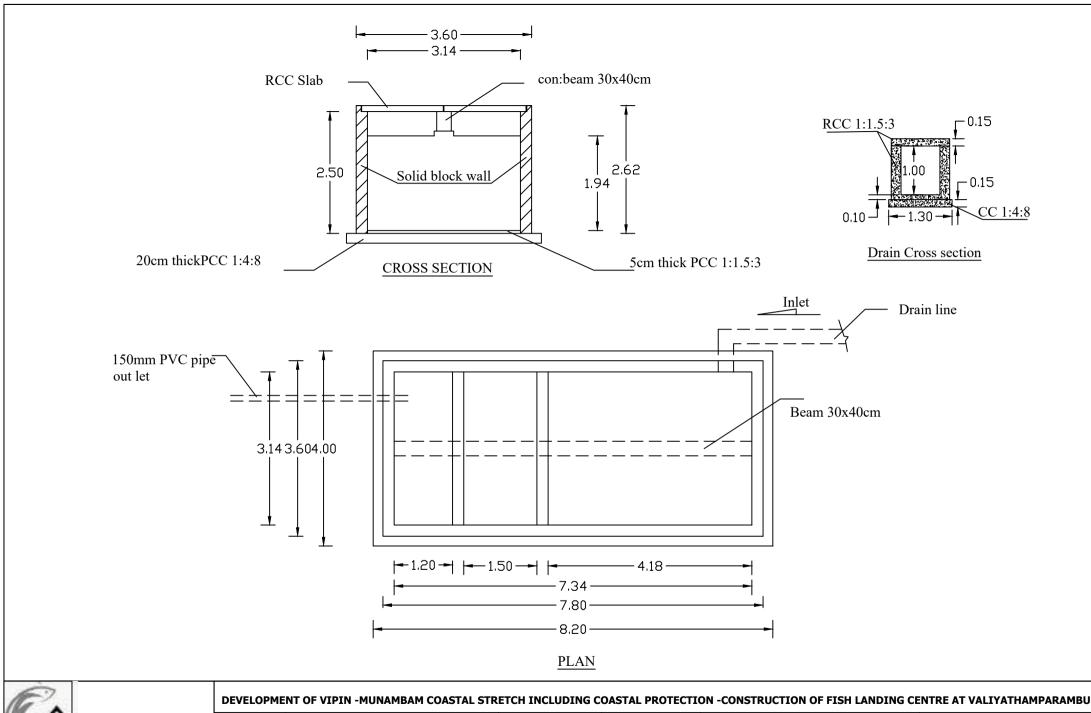


## $_{A}$ $\qquad \underline{PLAN}$



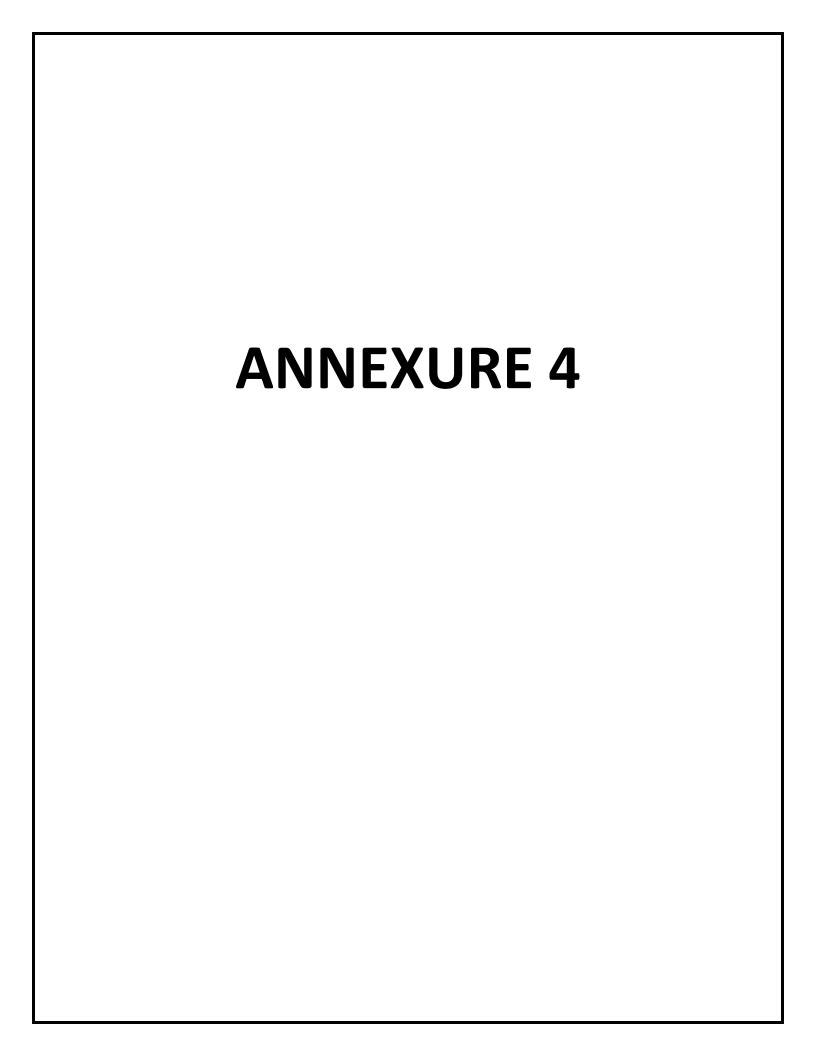
#### DEVELOPMENT OF VIPIN -MUNAMBAM COASTAL STRETCH INCLUDING COASTAL PROTECTION -CONSTRUCTION OF FISH LANDING CENTRE AT VALIYATHAMPARAMBU

ΓΔΙ	DRAWING NO:		ASSISTANT ENGINEER:			ASSISTANT EXECUTIVE ENGINEER: SIGNATURE:
T	DATE:		DRAWN:			
	TYPE:	DRAWING	REVIS	ION		CHIEF ENGINEER: SIGNATURE:
	TITLE.	TOILET BLOCK	1.		DESIGNED & CHECKED BY	
	TITLE:	TOILET BEOCK	2.			





STAL	DRAWING NO:		ASSISTANT ENGINEER:			ASSISTANT EXECUTIVE ENGINEER: SIGNATURE:
ENT	DATE:		DRAWN:			
N	TYPE:	DRAWING	REVIS	ION		CHIEF ENGINEER: SIGNATURE:
	TITLE:	FISH LANDING CENTRE DRAIN AND	1.		DESIGNED & CHECKED BY	
	TITLE:	TREATMENT TANK	2			



### Name of work : DEVELOPMENT OF VYPIN -MUNAMBAM COASTAL STRETCH INCLUDINGCOASTAL PROTECTION -CONSTRUCTION OF FISH LANDING CENTRE AT PUTHENKADAPPURAM ESTIMATE REPORT

This estimate is prepared for the construction of Fish landing centre and associated amenities based on the study conducted by IIT Madras wherein different types of groynes are proposed for coastal protection. In this estimate, a series of 2 transitional groynes are proposed. Groynes of length 180m and 150m are proposed. A filter layer of 1kg to 10kg category stone, Core layer using 100 to 300 kg stones, Toe Mound using 500 to 800 kg stones, Armour layer using 1.5T to 2.5T stones proposed here. In addition to that 2T tetrapods of 1.96m Thickness and 4T tetrapods of 2.50m Thickness is provided for armour layer. Provision for Auction hall building of size 28.3m x 6.4m is included in the estimate. For the auction hall, coconut piling oflength 6m long is provided for foundation. RCC M20 provided for foundations, centering & shuttering, Reinforcement cement concrete work (M20) in walls is provided for super structure. Necessary Steel reinforcement, plastering and painting works are also included in the Auctionhall. Provision for construction of a toilet block of size 12.5m x 5.1m is also included in the estimate. For the toilet block, RR masonry with cement mortar 1:6 is provided for the foundation. Solid block masonry of size 30x20x15cm and 40x20x10 cm are provided for superstructure. Ceramic tiling is provided in the floor and in the bathroom region. Necessary fittings are also provided for toilet block. Other provisions in the estimate include concrete parking area proposed near the the Auction hall. Provision for the construction of drain is also included in the estimate. Lump sum provisions for sea wall strengthening, sub soil investigation, water supply and sanitary arrangement, Electrification and yard lighting are also included in the estimate. Lumpsum provision for unforeseen expenses @2.5% are also included in the estimate. Total amount of estimate comes to Rupees 267500000/-(Twenty Six crore Seventy Five lakhs) The estimate is prepared in PRICE based on DSR 2018 and cost index is 35.59%. The provisions adopted in the estimate are adequate for proper completion of work

# DEVELOPMENT OF VYPIN - MUNAMBAM COASTAL STRETCH INCLUDING COASTAL PROTECTION AND CONSTRACTION OF FISH LANDING CENTRE AT PUTHENKADAPPURAM

### COST ABSTRACT

1	APPENDIX - A GROYNE	Rs.	15 18 22 781/-
2	APPENDIX B- CONSTRUCTION OF AUCTION		
_	HALL	Rs.	31 90 663/-
3	Appendix C- construction of Toilet block	Rs.	24 10 666/-
4	Appendix D- construction of Parking Area	Rs.	78 60 744/-
5	Appendix E - Construction of Drain	Rs.	11 44 187/-
6	Seawall Strengthening	Rs.	2 36 00 000/-
7	Sub soil investigation	Rs.	15 00 000/-
8	Water supply and sanitary arrangement	Rs.	25 00 000/-
9	Electrification and yard lighting	Rs.	10 00 000/-
<i>10</i>	Unforeseen expenses @ 2.5%	Rs.	49 00 000/-
<i>11</i>	Sub Total	Rs.	19 99 29 041/-
<i>12</i>	GST @ 18%	Rs.	3 59 87 227/-
<i>13</i>	Total Amount including GST 18%	Rs.	23 59 16 268/-
<i>14</i>	Lumpsum for Round off	Rs.	83 732/-
<i>15</i>	Total Amount	Rs.	23 60 00 000/-
<i>16</i>	Consultancy @5%	Rs.	1 18 00 000/-
<i>17</i>	GST on consultancy @ 18%	Rs.	21 24 000/-
18	Round off	Rs.	76 000/-
<i>19</i>	Grand Total	Rs.	25 00 00 000/-

Rupees Twenty Five Crore Only

## DEVELOPMENT OF VYPIN -MUNAMBAM COASTAL STRETCH INCLUDINGCOASTAL PROTECTION -CONSTRUCTION OF FISH LANDING CENTRE AT PUTHENKADAPPURAM

General Abstract

(Dsor year: 2018,Cost Index Applied for this estimate is 35.59%)

SI No	Heading Description	Amount
1	APPENDIX A - GROYNE	151822780.74
2	APPENDIX B CONSTRUCTION OF AUCTION HALL	3190663.46
3	Appendix C- construction of Toilet block	2410665.96
4	Appendix D- construction of Parking Area	7860743.54
5	Appendix E - Construction of Drain	1144187.11
6	Seawall Strengthening	23600000.00
7	Sub soil investigation	1500000.00
8	Water supply and sanitary arrangement	2500000.00
9	Electrification and yard lighting	1000000.00
10	Unforeseen charges @ 2.5%	4900000.00
	Provision for GST payments (in %) @	18.0%
	Amount reserved for GST payments	35987227.35
	Total	235916268.35
	Lumpsum for round off	83731.65
	Other Engineering Organis	sations TOTAL Rs 236000000.00
	DDIC	Rounded Total Rs 23,60,00,000
	Ru	pees Twenty Three Crore Sixty Lakh Only

(Cost Index Applied for this estimate is 35.59%)

### DEVELOPMENT OF VYPIN -MUNAMBAM COASTAL STRETCH INCLUDINGCOASTAL PROTECTION -CONSTRUCTION OF FISH LANDING CENTRE AT PUTHENKADAPPURAM

**Detailed Estimate** 

(Dsor year: 2018, Cost Index Applied for this estimate is 35.59%)

SI No	Description	No	L	В	D	CF	Quantity	Remark	
		1	APPENDIX	A - GROYN	<b>IE</b>				
1	od206893/2023_2024 Moulding and supplying mm, 30% 40 to 20mm design of mix proportion specific gravity of fine at and the cement shall be (ii) @ 28 day - 30N/mm of tools and plants mound instructions of Eng	, 30% 20 to on 0.5:,1.46 aggregate and e 43 grade of 2 and mining alding and re	o 5mm usin :3.22 by we nd course a or higher) m num density	ng 380 kg co eight of wate ggregatesho ninimum cub of concrete	ement /m3 er cement, f buld not be l e strength r 2.5 g/cc. in	pf cpmcrete ine aggrega ess than 2.7 equirement cluding hire	e as per ap ate, course a 73 and 2.5 re (i) @ 7 day and operation	proved mix aggregate ( espectively) - 20N/mm2 onal charge	
	ARMOUR LAYER, 4T tetrapods at 2.50m Thick	3272			YS.	L.	3272.000		
		485			Tota	al Quantity	3272.000	each	
			A Second		tal Deducte		0.000 each		
	Other Engineering Organia Total Quantity 3272.000 each								
		D	Say 3272	000 each @	Rs 15999	.39 / each	Rs 5235	50004.08	
2	od206895/2023_2024 Conveying 1.6m3 (4T) forming the armour layer and operational charge	er of break	water to line	s and levels	_	-			
	ARMOUR LAYER, 4T tetrapods at 2.50m Thick	3272					3272.000		
					Tota	al Quantity	3272.000	each	
				То	tal Deducte	d Quantity	0.000 eac	h	
					Net Tota	al Quantity	3272.000	each	
			Say 327	2.000 each	@ Rs 2042	.97 / each	Rs 668	4597.84	
3	65.103  Moulding and supplying to 20mm and 30% 20mm ix proportion 0.5:1:1. gravity of fine aggregate cement shall be 43 grading.	nm to 6mm 46:3.22 by e and coars	using 380k weight of versegate	g cement/ n water cemer should not	n3 of concre nt, fine aggi be less thar	ete as per a regate, coa n 2.73 and 2	approved mirse aggrega 2.5 respective	x design of te (specific ely) and the	

	day - 30 N/mm2 and min and plants, mould, cur departmental officers a	ing, rehan	-	=	_			_	
	ARMOUR LAYER, 2T tetrapods at 1.96m Thick	1725					1725.000		
					Tota	al Quantity	1725.000	each	
				То	tal Deducte	d Quantity	0.000 eac	h	
					Net Tota	al Quantity	1725.000	each	
			Say 172	25.000 each	@ Rs 7596.	.47 / each	Rs 1310	3910.75	
	Conveying 0.8cum (2T specification and forming layer including hire and departmental officers at ARMOUR LAYER, 2T	ng the armo	our layer of	breakwater	to lines and	levels over	the second	lary armo	
	tetrapods at 1.96m Thick	1725				Ŀ	1725.000		
		TO SEE			Tota	al Quantity	1725.000	each	
		1 77	1/2-71		tal Deducte	d Quantity	0.000 eac	h	
	Other Engineering Organine Total Quantity							1725.000 each	
			Say 17	25.000 each	@ Rs 912.	.92 / each	Rs 157	4787.00	
5	2.6.1 Earth work in excavat (exceeding 30 cm in de earth, lead up to 50 m a	epth, 1.5 m	in width as	well as 10	sqm on pla	n) including	disposal of	excava	
	From Chainage 0 to 40m	2	40.000	35.000	2.000		5600.000		
		5600.000	cum						
				То	tal Deducte	d Quantity	0.000 cum	1	
					Net Tota	al Quantity	5600.000	cum	
			Say 5	5600.000 cur	n @ Rs 214	.03 / cum	Rs 119	8568.00	
	od206899/2023_2024 Supplying and laying		•	Say 5600.000 cum @ Rs 214.03 / cum Rs 1198568.00  20 gram per sqm membrane (best quality) including provid reyance, labour charges etc complete as per the instruction					
6	necessary overlaps, a departmental officers		mveyance,	labout chai	ges etc cc			Struction	

Chainage 0 to 180m 1 180.000 40.000  Total Quant  Total Deducted Quant  Net Total Quant  Say 13200.000 sqm @ Rs 83.20 / sqi  7 od206900/2023_2024  [Based on 65.32]Supplying blasted rock from approved quarry to sorting site 1.5T to 2.5T(70% of stones > 2.0T) category stones of approved quality hav from 2.65 to 2.8 for forming the primary armour and berm of rubble mount bre stones, hire of lorries and machineries, labour charges required at quarry ar measurements of catagorised stones after proper sorting are taken on weigh b cost of the contractor with approved software having printouts using cor stationeries and conveyed to the approved alignment of the breakwater and f of the breakwater to the lines and levels as per approved drawings with tole levels including all cost and labour charges, hire and operational charges of m rehandling, placing and packing and using mobile crane, inspecting the profile spalls/quarry muck and hire of machineries for forming the roal lorries/tippers/cranes etc including all incidental charges etc complete departmental officers at site strick to 2.5T stones (Assuming 1/3 void and stotal Southern Groyne 150m Chainage 0 1 3768.380  Northern Groyne 150m Chainage 0 1 3768.380  Chainage 0 to 180m 1 3266.530  Total Quant	0.000 sqm 13200.000 sqm Rs 1098240.00
Total Quant  Total Deducted Quant  Net Total Quant  Say 13200.000 sqm @ Rs 83.20 / sqi  7 od206900/2023_2024  [Based on 65.32]Supplying blasted rock from approved quarry to sorting site 1.5T to 2.5T(70% of stones > 2.0T) category stones of approved quality hav from 2.65 to 2.8 for forming the primary armour and berm of rubble mount brestones, hire of lorries and machineries, labour charges required at quarry armeasurements of catagorised stones after proper sorting are taken on weigh b cost of the contractor with approved software having printouts using constationeries and conveyed to the approved alignment of the breakwater and fof the breakwater to the lines and levels as per approved drawings with total levels including all cost and labour charges, hire and operational charges of rehandling, placing and packing and using mobile crane, inspecting the profile spalls/quarry muck and hire of machineries for forming the roal lorries/tippers/cranes etc including all incidental charges etc complete departmental officers at site site Armour layer using 1.5T to 2.5T stones (Assuming 1/3 void and something of the stones).  Northern Groyne 150m Chainage 0 1 3768.380  Chainage 0 to 180m 1 3266.530  Total Quant Total Deducted Quant Net Total Quant	13200.000 sqm 0.000 sqm 13200.000 sqm Rs 1098240.00
Total Deducted Quant  Net Total Quant  Say 13200.000 sqm @ Rs 83.20 / sqi  7 od206900/2023_2024  [Based on 65.32]Supplying blasted rock from approved quarry to sorting site 1.5T to 2.5T(70% of stones > 2.0T) category stones of approved quality hav from 2.65 to 2.8 for forming the primary armour and berm of rubble mount brestones, hire of lorries and machineries, labour charges required at quarry armeasurements of catagorised stones after proper sorting are taken on weigh b cost of the contractor with approved software having printouts using corstationeries and conveyed to the approved alignment of the breakwater and for the breakwater to the lines and levels as per approved drawings with tole levels including all cost and labour charges, hire and operational charges of machineries for forming the profile spalls/quarry muck and hire of machineries for forming the roal lorries/tippers/cranes etc including all incidental charges etc complete departmental officers at site Armour layer using 1.5T to 2.5T stones (Assuming 1/3 void and short forming to 1 stones)  Northern Groyne 150m Chainage 0 1 3768.380  Chainage 0 to 180m 1 3266.530  Total Quant  Total Deducted Quant  Net Total Quant	0.000 sqm 13200.000 sqm Rs 1098240.00
Say 13200.000 sqm @ Rs 83.20 / sqi  7 od206900/2023_2024 [Based on 65.32]Supplying blasted rock from approved quarry to sorting site 1.5T to 2.5T(70% of stones > 2.0T) category stones of approved quality hav from 2.65 to 2.8 for forming the primary armour and berm of rubble mount brestones, hire of lorries and machineries, labour charges required at quarry armeasurements of catagorised stones after proper sorting are taken on weigh b cost of the contractor with approved software having printouts using corstationeries and conveyed to the approved alignment of the breakwater and fof the breakwater to the lines and levels as per approved drawings with tole levels including all cost and labour charges, hire and operational charges of m rehandling, placing and packing and using mobile crane, inspecting the profile spalls/quarry muck and hire of machineries for forming the road lorries/tippers/cranes etc including all incidental charges etc complete departmental officers at site Armour layer using 1.5T to 2.5T stones (Assuming 1/3 void and something of the profile southern Groyne 150m Chainage 0 1 3768.380  Chainage 0 to 180m 1 3266.530  Total Quant Total Deducted Quant Net Total Deducted Quant	Rs 1098240.00
Say 13200.000 sqm @ Rs 83.20 / sqr  7 od206900/2023_2024 [Based on 65.32]Supplying blasted rock from approved quarry to sorting site 1.5T to 2.5T(70% of stones > 2.0T) category stones of approved quality hav from 2.65 to 2.8 for forming the primary armour and berm of rubble mount brestones, hire of lorries and machineries, labour charges required at quarry armeasurements of catagorised stones after proper sorting are taken on weigh be cost of the contractor with approved software having printouts using constationeries and conveyed to the approved alignment of the breakwater and fof the breakwater to the lines and levels as per approved drawings with tole levels including all cost and labour charges, hire and operational charges of machineries for forming the profile spalls/quarry muck and hire of machineries for forming the roal lorries/tippers/cranes etc including all incidental charges etc complete departmental officers at site   Armour layer using 1.5T to 2.5T stones (Assuming 1/3 void and stones)   Southern Groyne   150m Chainage 0   1   3768.380   Total Quant   Net Total Quant	Rs 1098240.00
Total Quant   Total Quant	
[Based on 65.32]Supplying blasted rock from approved quarry to sorting site 1.5T to 2.5T(70% of stones > 2.0T) category stones of approved quality hav from 2.65 to 2.8 for forming the primary armour and berm of rubble mount brestones, hire of lorries and machineries, labour charges required at quarry ar measurements of catagorised stones after proper sorting are taken on weigh b cost of the contractor with approved software having printouts using corstationeries and conveyed to the approved alignment of the breakwater and fof the breakwater to the lines and levels as per approved drawings with tole levels including all cost and labour charges, hire and operational charges of more rehandling, placing and packing and using mobile crane, inspecting the profile spalls/quarry muck and hire of machineries for forming the road lorries/tippers/cranes etc including all incidental charges etc complete departmental officers at site departmental officers at site Armour layer using 1.5T to 2.5T stones (Assuming 1/3 void and something of the proper stones).  Northern Groyne 150m Chainage 0 1 3768.380  Chainage 0 to 180m 1 3266.530  Total Quant Total Deducted Quant Net Total Quant	
Southern Groyne 180m  Chainage 0 to 180m 1 3266.530  Total Quant  Total Deducted Quant  Net Total Quant	ig specific gravity ranges water inclusive of cost of at sorting place and the dge installed at site at the ractors supplied papers, ming the primary armourance of +/- 20 cm in final bile crane and excavator, nce in a week and cost of way for movement of as per the direction of
Chainage 0 to 180m 1 3266.530  Total Quant  Total Deducted Quant  Net Total Quant	
Total Quant  Total Deducted Quant  Net Total Quant	
Total Deducted Quant  Net Total Quant	3266.530
	3266.530 7 7034.910 tonne
	7034.910 tonne
Say 7034.910 tonne @ Rs 1781.12 / tonn	7034.910 tonne 0.000 tonne
8 od206901/2023_2024 Supplying blasted rock from approved quarry to sorting site and sorting the scategory stones of approved quality having specific gravity ranges from 2 primary armour and berm of rubble mount breakwater inclusive of cost of machineries, labour charges required at quarry and at sorting place a catagorised stones after proper sorting are taken on weigh bridge installed contractor with approved software having printouts using contractors supplie	7034.910 tonne 0.000 tonne 7034.910 tonne

to the lines and levels as per approved drawings with tolerance of +/- 20 cm in final levels including all cost and labour charges, hire and operational charges of mobile crane and excavator, rehandling, placing and packing and using mobile crane, inspecting the profile once in a week and cost of spalls/quarry muck and hire of machineries for forming the roadway for movement of lorries/tippers/cranes etc including all incidental charges etc complete as per the direction of departmental officers at site <br/> <br/>br>Ernakulam District

	Toe Moun	d using 50	00 to 800 kg st	ones (Assuming 1/3	3 void and sp.g	ravity 2.7)	
	Northern Groyne 150m Chainage 0 to 150m	1	6940.760	1.050		7287.799	5% sinkage added
	Head	1	630.360	1.050		661.878	5% sinkage added
			Southe	rn Groyne 130m			
	Chainage 0 to 130m	1	6016.440	1.050	S.,	6317.262	
	Head	1	617.190	1.050		648.050	
		18			Total Quantity	14914.989	tonne
		101	Ka	Total Deducted Quantity			ne
		K S		Net <sup>-</sup>	Total Quantity	14914.989	tonne
		.1	Say 14914.9	989 tonne @ Rs 17	31.12 / tonne	Rs 2656	55385.21
9	od208955/2023_2024	ther E		ng Organisat			

[Based on 65.30] Supplying granite blasted rock from approved quarry to sorting site by lorry/ tipper, and sorting the stones into 100kg to 300kg category stones of approved quality having specific gravity ranging from 2.65 to 2.8 for forming the core of rubble mound breakwater inclusive of cost of stones, hire of lorries and machineries, labour charges required at quarry and at sorting place and measurements of categorized stones after proper sorting are taken on weigh bridge installed at site at the cost of the contractor with approved software having printouts using contractors supplied papers, stationeries and conveyed to the approved alignment of the breakwater and rehandling and forming the core of the break water to the lines and levels as per the approved drawings and inspecting the profile once in a week with tolerance of +/- 20cm in final levels including all cost and labour charges, hire and operational charges of light crane and cost of spalls/ quarry muck and labour for forming the roadway for movement of lorries/ tippers / cranes etc including all incidental charges etc complete as per the direction of departmental officers at site <br >br > Ernakulam District

	Core laye	er using 100	to 300 kg s	tones (Assu	ming 1/3 vo	id and sp.gravity 2.7)	
	thern Groyne n Chainage 0 to n		7983.440		1.100	8781.784	10% sinkage added
Head	i	1	499.380		1.100	549.318	10% sinkage added

		South	ern Groyne	130m			
Chainage 0 to 130m	1	6920.260		1.100		7612.287	
Head	1	475.380		1.100		522.918	
				Tota	al Quantity	17466.307	tonne
			To	tal Deducte	d Quantity	0.000 toni	ne
	al Quantity	17466.307 tonne					
		Say 17466	.307 tonne	@ Rs 1610.	75 / tonne	Rs 2813	33854.00
Supplying granite quarinto 1 kg to 10 kg cate forming the filter layer charges required at quisorting are taken on with having printouts using of the breakwater inclusive sqm size) or any suitable 20T and placing the subreakwater as per the hire and operational cl	egory stones of breakwa arry and at s reigh bridge contractors ading convey ble methods stones at se approved d narges of T	s of approve ter inclusive sorting place installed at supplied pa yance from installed at a bed in un rawing and	ed quality will a of cost of seand the meand the meand the meand the pers, station sorting platfersite on a meaniform layer design and	th specific of stones, hire easurements cost of the eries and co orm and dur oving crane of design t inspecting t	gravity rang of lorries a s of categori contractor v onveyed to mping stone having a ca hickness fo he profile or	ing from 2.6 nd machine ized stones with approve the approve es using tipp apaciaty of n r forming fil	to 2.8 for ries, labourafter propered softward alignmenter (3.5x2.sot less that ter layer cek including
 Northern Groyne 150m Chainage 0 to	ayer using 1	at site. to 10 kg sto 2452.230	Eranakulam				e as per th
Filter la	ayer using 1	to 10 kg sto	Eranakulam			vity 2.7)	e as per th
Filter la Northern Groyne 150m Chainage 0 to 150m	ayer using 1	to 10 kg sto 2452.230 330.040	Eranakulam	ing 1/3 void		vity 2.7) 2452.230	e as per th
Filter la Northern Groyne 150m Chainage 0 to 150m	ayer using 1	to 10 kg sto 2452.230 330.040	Eranakulam nes (Assum	ing 1/3 void		vity 2.7) 2452.230	e as per th
Filter la Northern Groyne 150m Chainage 0 to 150m Head	ayer using 1	2452.230 330.040 South	Eranakulam nes (Assum	ing 1/3 void		vity 2.7) 2452.230 330.040	e as per th
Filter la Northern Groyne 150m Chainage 0 to 150m Head Chainage 0 to 180m	ayer using 1 there is a second of the second	2452.230 330.040 South	Eranakulam nes (Assum	1/3 void		2452.230 330.040 2125.650	
Filter la Northern Groyne 150m Chainage 0 to 150m Head Chainage 0 to 180m	ayer using 1 there is a second of the second	2452.230 330.040 South	ern Groyne	1/3 void	and sp.gravins	2452.230 330.040 2125.650 325.040	tonne
Filter la Northern Groyne 150m Chainage 0 to 150m Head Chainage 0 to 180m	ayer using 1 there is a second of the second	2452.230 330.040 South	ern Groyne	180m Total	and sp.gravins	2452.230 330.040 2125.650 325.040 5232.960	tonne
Filter la Northern Groyne 150m Chainage 0 to 150m Head Chainage 0 to 180m	ayer using 1 there is a second of the second	to 10 kg sto g111.cc11 2452.230 330.040 South 2125.650 325.040	ern Groyne	180m Total Deducte Net Total	and sp.grav	2452.230 330.040 2125.650 325.040 5232.960 0.000 toni 5232.960	tonne

1	2.8.1 Earth work in excavation trenches or drains (not ramming of bottoms, lift excavated soil as direct	exceeding t up to 1.5	g 1.5 m in w 5 m, includin	idth or 10 s	sqm on plai ut the exca	n), including	dressing o	f sides a		
	column footing	16	2.100	2.100	1.900		134.064			
	below out side plinth beam	2*7	3.700	0.450	0.600		13.986			
	cross beam	2	5.800	0.450	0.600		3.132			
	rounded	1	3.818				3.818			
					Tot	al Quantity	155.000 c	um		
		0.000 cum	1							
		155.000 c	um							
		Rs 46	025.70							
2	od206894/2023_2024 Supplying and stacking	good quali	ty coconut pi	les	4					
	For pile 16 x5 Nos =80 Nos	80	6.000			And the second	480.000			
	Total Quantity 480.000 metre									
	Ot	ther Er	ngineeri	ng Or <b>y</b> o	ital Deducte	d Quantity	0.000 met	re		
					Net Tot	al Quantity	480.000 n	netre		
			Say 480	0.000 metre	@ Rs 107.	64 / metre	Rs 51	667.20		
3	od206896/2023_2024 Coconut Pile- Driving down coconut pile to lines and levels through soft to medium clay soil strate including all hire charges and labour for fixing, staging platform and all other appliances necessary for pile driving down after pointing the bottom end. Details of one post of 6m long 15 numbers per date 6x15=90m.									
	For coconut pile	80	6.000				480.000			
					Tot	al Quantity	480.000 n	netre		
	Total Deducted Quantity 0.000 metre									
		480.000 n	netre							
		Net Total Quantity 480.000 me  Say 480.000 metre @ Rs 216.92 / metre								
			Say 400					1121.60		
4	od206897/2023_2024 Cutting and removing the piles and stacking within		·		o lines and	levels and i	removing the			
4	Cutting and removing th		·		o lines and	levels and i	removing the			

				Тс	otal Deducte		0.000 met			
						al Quantity	16.000 metre			
			Say 1	6.000 metre	@ Rs 154.2	21 / metre	Rs 24	167.36		
5	2.18.1  Close timbering over areas including strutting, shoring and packing cavities (wherever required) etc complete ( Measurements to be taken of the face area timbered):Depth not exceeding 1.5 m									
	column excavation side	16*4	2.000	1.200			153.600			
	rounded	1	1.400				1.400			
					Tota	al Quantity	155.000 s	qm		
			100	To	otal Deducte	d Quantity	0.000 sqm	1		
		155.000 s	qm							
		ونسيدا	Say	155.000 sqı	m @ Rs 136	6.88 / sqm	Rs 21	216.40		
	over the entire surface condition complete as p all materials ,conveyance	er drawing ce,labour cl	and technic narges, etc.	cal specifica complete 	tion Clause or>	1204.3.8 of	•			
	bottom of column	the <sub>16</sub> En	gin9001i	ng.900g	ano.30610	ns	17.328			
	rounding	1	0.672			1	0.672			
					Tota	al Quantity	18.000 cum			
				To	otal Deducte	d Quantity	0.000 cum			
					Net Tota	al Quantity	18.000 cu	m		
			Say	18.000 cum	@ Rs 1679	9.73 / cum	Rs 30	235.14		
7	50.2.3.1 Pumping or Bailing out charges of pumpset, etc.		removing sl	ush etc by ι	ısing pump :	set includin	g cost of lab	our, oil hire		
	For earth work 16 column	2	8.000				16.000			
	For coconut pilling	1	8.000				8.000			
	cc for footing &	1	8.000				8.000			
	reinforcement work,shuttering@ concrete for footing	4	8.000				32.000			

					Tota	al Quantity	64.000 ho	ur
				To	otal Deducte	d Quantity	0.000 hou	r
					Net Tota	al Quantity	64.000 hour	
			Say	ึ 64.000 hoเ	ır @ Rs 284	.60 / hour	Rs 18	214.40
8	4.1.8 Providing and laying i shuttering - All work unominal size)	•		•	•	_		•
	column C1 to C16	16	1.700	1.700	0.200		9.248	
	below plinth beam	2*7	3.700	0.450	0.100		2.331	
	cross beam	8	5.600	0.450	0.100		2.016	
	AH floor	7	5.700	3.700	0.150		22.145	
	rounded	1	0.260	4.30			0.260	
		613	W. 2	35 X	Tota	al Quantity	36.000 cu	m
		d Quantity	0.000 cum					
		161			Net Tota	al Quantity	36.000 cu	m
			Say	36.000 cum	@ Rs 6814	.89 / cum	Rs 245	5336.04
	Providing and laying centering, shuttering, f sand :3 graded stone	inishing and aggregate 2	l reinforceme	ent - All work		TID	_	
	column footing C1 to C16	16	1.500	1.500	0.300		10.800	
		16 16	1.500 ((1.5*1.5)+ (.4*.3))/2	1.500	0.300		10.800 5.688	
		16	((1.5*1.5)+	0.400				
	C16	16	((1.5*1.5)+ (.4*.3))/2		0.300		5.688	
	C16  column up to plinth	16	((1.5*1.5)+ (.4*.3))/2 0.300		0.300	al Quantity	5.688	
	C16  column up to plinth	16	((1.5*1.5)+ (.4*.3))/2 0.300	0.400	0.300	<u>-</u>	5.688 1.920 0.592	m
	C16  column up to plinth	16	((1.5*1.5)+ (.4*.3))/2 0.300	0.400	0.300 1.000 Total	<u>-</u>	5.688 1.920 0.592 19.000 cu	m
	C16  column up to plinth	16	((1.5*1.5)+ (.4*.3))/2 0.300 0.592	0.400 To	0.300 1.000 Total	d Quantity	5.688 1.920 0.592 19.000 cu 0.000 cum	m

	plinth beam	2	28.300	0.300	0.300		5.094	
	-do- cross	8	5.800	0.300	0.400		5.569	
	column up to beam C1 to C16	16	0.400	0.300	4.000		7.680	
	roof beam long	2	28.300	0.300	0.350		5.943	
	inglind beam	2*8	3.200	0.300	0.350		5.376	
	roof slab	2	29.500	4.5500	0.120		32.214	
	rounded	1	0.124				0.124	
					Tota	al Quantity	62.000 cu	m
				To	tal Deducte	d Quantity	0.000 cum	1
			160	/61	Net Tota	al Quantity	62.000 cu	m
			Say 6	2.000 cum	@ Rs 10954	1.04 / cum	Rs 679	150.48
	Centering and shutterin columns, etc for mass column base		1.500	0.300	Lib	È.	28.800	
	Column base	16*4	1.500	0.300	1	Aug II	28.800	
	Column up to plinth	16*2	0.400		1.100		14.081	
		16*2	0.300	n a Orac	1.100	70 C	10.560	
				ng Orga	1.100 anisatio		10.560	
		16*2	0.300		1.100 anisatio	al Quantity	10.560 0.559 54.000 sq	
		16*2	0.300		1.100 anisatio	al Quantity	10.560 0.559 54.000 sq 0.000 sqm	1
		16*2	0.300 g 0.559	Тс	1.100 anisatio Tota tal Deducte Net Tota	al Quantity d Quantity al Quantity	10.560 0.559 54.000 sq	1
		16*2	0.300 g 0.559	Тс	1.100 anisatio Tota	al Quantity d Quantity al Quantity	10.560 0.559 54.000 sq 0.000 sqm 54.000 sq	1
12		16*2 the FE	0.300 g i0.55911 Say	/ To	1.100 Anisatio Tota tal Deducte Net Tota m @ Rs 335	d Quantity d Quantity al Quantity 5.31 / sqm	10.560 0.559 54.000 sq 0.000 sqm 54.000 sq Rs 18	m 106.74
12	rounded  5.9.3 Centering and shutter	16*2 the FE	0.300 g i0.55911 Say	/ To	1.100 Anisatio Tota tal Deducte Net Tota m @ Rs 335	d Quantity d Quantity al Quantity 5.31 / sqm	10.560 0.559 54.000 sq 0.000 sqm 54.000 sq Rs 18	m 106.74
12	rounded  5.9.3 Centering and shutter landings, balconies an	16*2 the Er	0.300 g 10.559 f 1	y 54.000 sqr , etc. and r	1.100 Anisatio Tota tal Deducte Net Tota m @ Rs 335	d Quantity d Quantity al Quantity 5.31 / sqm	10.560 0.559 54.000 sq 0.000 sqm 54.000 sq Rs 18	m 106.74
12	5.9.3 Centering and shutter landings, balconies ar roof slab bottom	16*2 the Fr	0.300 g 0.559	y 54.000 sqr , etc. and r	1.100 Anisatio Tota tal Deducte Net Tota m @ Rs 335	d Quantity d Quantity al Quantity 5.31 / sqm	10.560 0.559 54.000 sq 0.000 sqm 54.000 sq Rs 18	m 106.74
12	5.9.3 Centering and shutter landings, balconies ar roof slab bottom side projection	16*2 the FEr  ing including access 2*7 2*2	0.300 g 0.559 1 Say ng strutting platform 3.700 4.500	y 54.000 sqr , etc. and r 3.200 0.600	1.100 Anisatio Tota tal Deducte Net Tota m @ Rs 335	d Quantity d Quantity al Quantity 5.31 / sqm	10.560 0.559 54.000 sq 0.000 sqm 54.000 sq Rs 18 spended flo	m 106.74
12	rounded  5.9.3 Centering and shutter landings, balconies ar roof slab bottom side projection slab projection	ing including access  2*7  2*2  2	0.300 g 10.559 11 Say ng strutting platform 3.700 4.500 29.500	y 54.000 sqr , etc. and r 3.200 0.600 1.000	1.100 Anisatio Tota tal Deducte Net Tota m @ Rs 335	d Quantity d Quantity al Quantity 5.31 / sqm	10.560 0.559 54.000 sq 0.000 sqm 54.000 sq Rs 18 spended flo 165.761 10.800 59.000	m 106.74
12	rounded  5.9.3 Centering and shutter landings, balconies ar roof slab bottom side projection slab projection slab projection side	ing including access  2*7  2*2  2	0.300 g 0.559 11 Say ng strutting platform 3.700 4.500 29.500	y 54.000 sqr y 54.000 sqr , etc. and r 3.200 0.600 1.000 0.120	1.100 Anisatio Tota tal Deducte Net Tota m @ Rs 335	d Quantity d Quantity al Quantity 5.31 / sqm	10.560 0.559 54.000 sq 0.000 sqm 54.000 sq Rs 18 spended flo 165.761 10.800 59.000 7.080	m 106.74
12	rounded  5.9.3 Centering and shutter landings, balconies ar roof slab bottom side projection slab projection slab projection side end side	ing including access  2*7  2*2  2  2*2	0.300 g 0.559 11 Say ng strutting platform 3.700 4.500 29.500 4.500	y 54.000 sqr y 54.000 sqr , etc. and r 3.200 0.600 1.000 0.120	1.100 Anisatio Total Deducte Net Tota m @ Rs 335 removal of	d Quantity d Quantity al Quantity 5.31 / sqm	10.560 0.559 54.000 sq 0.000 sqm 54.000 sq Rs 18 spended flo 165.761 10.800 59.000 7.080 2.160	n m 106.74 Dors, ro

					Net Total Quantity	250.000 s	qm		
			Say	250.000 sq	m @ Rs 815.78 / sqm	Rs 203	3945.00		
13	5.9.5 Centering and shutteri girders bressumers an	_	-	etc. and ren	noval of form for:Linte	ls, beams, pl	inth beam		
	plinth beam out side	2	28.300	0.300		16.980			
	plinth beam in side	2*7	3.700	0.300		15.541			
	cross beam	8*2	5.800	0.400		37.120			
	roof beam out side	2	28.300	0.300		16.980			
	roof beam in side	2*7	3.700	0.400		20.721			
	roof beam bottom	2*7	3.700	0.300		15.541			
	inglind beam side	2*8*2	3.200	0.350		35.840			
	inglind beam bottom	2*8	3.200	0.300		15.360			
	rounded	1	0.917	SIZI		0.917			
		150			Total Quantity	175.000 s	qm		
		104	Ka	То	otal Deducted Quantity	0.000 sqn	า		
		177			Net Total Quantity	175.000 s	am		
	Net Total Quantity 175.000 sqm  Say 175.000 sqm @ Rs 649.82 / sqm								
		thor Er	Say		m @ Rs 649.82 / sqm				
14	5.9.6 Centering and shutte Abutments, Posts and		ngineeri	ng Org	m @ Rs 649.82 / sqm anisations	Rs 113	3718.50		
14	Centering and shutte	ring includ	ngineeri	ng Org	m @ Rs 649.82 / sqm anisations	Rs 113	3718.50		
14	Centering and shutte Abutments, Posts and	ring includ d Struts	ing strutting	ng Org	m @ Rs 649.82 / sqm anisations	Rs 113	3718.50		
14	Centering and shutte Abutments, Posts and	ring includ d Struts 16*2	ing strutting	, etc. and	m @ Rs 649.82 / sqm anisations	Rs 113	3718.50		
14	Centering and shutte Abutments, Posts and column C1 to C16	ring includ d Struts 16*2 16*2	ing strutting 0.400 0.300	, etc. and	m @ Rs 649.82 / sqm anisations	Rs 113 Columns, Pil 51.200 38.400 0.400	3718.50 lars, Pie		
14	Centering and shutte Abutments, Posts and column C1 to C16	ring includ d Struts 16*2 16*2	ing strutting 0.400 0.300	4.000 4.000	m @ Rs 649.82 / sqm anisations removal of form for:	Rs 113 Columns, Pil 51.200 38.400 0.400 90.000 sq	3718.50 lars, Pie		
14	Centering and shutte Abutments, Posts and column C1 to C16	ring includ d Struts 16*2 16*2	ing strutting 0.400 0.300	4.000 4.000	m @ Rs 649.82 / sqm annsaurons removal of form for:  Total Quantity	Rs 113 Columns, Pil 51.200 38.400 0.400 90.000 sq	m		
14	Centering and shutte Abutments, Posts and column C1 to C16	ring includ d Struts 16*2 16*2	0.400 0.300 0.400	4.000 4.000	m @ Rs 649.82 / sqm annsauons removal of form for:  Total Quantity	Rs 113 Columns, Pil 51.200 38.400 0.400 90.000 sq 0.000 sqn 90.000 sq	m		
14	Centering and shutte Abutments, Posts and column C1 to C16	ring includ d Struts 16*2 16*2 1	0.400 0.300 0.400 Say	4.000 4.000 To 7 90.000 sq	Total Quantity Net Total Quantity m @ Rs 863.64 / sqm	Rs 113 Columns, Pil 51.200 38.400 0.400 90.000 sqn 90.000 sqn Rs 77	m m 727.60		
	Centering and shutte Abutments, Posts and column C1 to C16  rounded  5.22.6 Steel reinforcement for	ring includ d Struts 16*2 16*2 1	0.400 0.300 0.400 Say	4.000 4.000 To 7 90.000 sq	Total Quantity Net Total Quantity m @ Rs 863.64 / sqm	Rs 113 Columns, Pil 51.200 38.400 0.400 90.000 sqn 90.000 sqn Rs 77	m m 727.60		

	rounded	1	6.000				6.000	@120kg m3
					Tot	al Quantity	1880.000	kilogram
				To	otal Deducte	ed Quantity	0.000 kilo	gram
					Net Tot	al Quantity	1880.000	kilogram
			Say 1880.00	0 kilogram (	@ Rs 98.30	/ kilogram	Rs 184	1804.00
16	5.22A.6 Steel reinforcement for binding all complete ab		-		-			
	qty vide item No 10 @ 100kg/m3	1	61.876			100.0	6187.600	@100 l /m3
	rounded	1	12.400				12.400	@100 l /m3
			85 4	9	Tot	al Quantity	6200.000	kg
		P.L.	PAR	To	otal Deducte	ed Quantity	0.000 kg	
		18	DIS		Net Tot	al Quantity	6200.000	kg
17	7.1.1 Random rubble mason concrete 1:6:12 (1 ceme	ent : 6 coa	ard stone in rise sand: 12	foundation		including le	velling up w	
17	Random rubble mason	ent : 6 coa	ard stone in rise sand: 12	foundation	and plinth	including le	velling up w	vith cem
17	Random rubble mason concrete 1:6:12 (1 cemelevel with:Cement mortal below out side plinth	ent : 6 coa ar 1:6 (1 co	ard stone in rise sand: 12 ement: 6 coa	foundation graded stourse sand)	and plinth	including le	velling up wominal size)	vith cem
17	Random rubble mason concrete 1:6:12 (1 cemelevel with:Cement mortal below out side plinth beam	ent : 6 coa ar 1:6 (1 co 2*7	ard stone in rse sand: 12 ement: 6 coa	foundation graded stourse sand) 0.450	and plinth one aggrega 0.600	including le	velling up wominal size)	vith cem
17	Random rubble mason concrete 1:6:12 (1 cemelevel with:Cement mortal below out side plinth beam below cross beam	ent : 6 coa ar 1:6 (1 co 2*7	ard stone in rise sand: 12 ement: 6 coa 3.700	foundation graded stourse sand) 0.450	and plinth one aggrega 0.600	including le	velling up wominal size)  13.986  3.132	vith cemup to pli
17	Random rubble mason concrete 1:6:12 (1 cemelevel with:Cement mortal below out side plinth beam below cross beam	ent : 6 coa ar 1:6 (1 co 2*7	ard stone in rise sand: 12 ement: 6 coa 3.700	foundation 2 graded sto arse sand) 0.450	and plinth one aggrega 0.600	including leate 20 mm no	velling up wominal size)  13.986  3.132  0.882	vith cemup to pli
17	Random rubble mason concrete 1:6:12 (1 cemelevel with:Cement mortal below out side plinth beam below cross beam	ent : 6 coa ar 1:6 (1 co 2*7	ard stone in rise sand: 12 ement: 6 coa 3.700	foundation 2 graded sto arse sand) 0.450	and plinth one aggrega  0.600  Tot  otal Deducte	including leate 20 mm no	velling up wominal size)  13.986  3.132  0.882  18.000 cu	rith cemup to pli
17	Random rubble mason concrete 1:6:12 (1 cemelevel with:Cement mortal below out side plinth beam below cross beam	ent : 6 coa ar 1:6 (1 co 2*7	ard stone in rise sand: 12 ement: 6 coe 3.700 5.800 0.882	foundation 2 graded sto arse sand) 0.450	and plinth one aggrega  0.600  Tot  otal Deducte	al Quantity al Quantity	velling up wominal size)  13.986  3.132  0.882  18.000 cum  18.000 cum	with cem up to pli m
17	Random rubble mason concrete 1:6:12 (1 cemelevel with:Cement mortal below out side plinth beam below cross beam	ent : 6 coa ar 1:6 (1 co 2*7 2 1	ard stone in rise sand: 12 ement: 6 coa 3.700 5.800 0.882 Say	foundation 2 graded sto arse sand) 0.450 0.450	and plinth one aggrega  0.600  Tot otal Deducte Net Tot n @ Rs 7204	al Quantity al Quantity al Quantity 4.78 / cum	velling up wominal size)  13.986  3.132  0.882  18.000 cu  18.000 cu  Rs 129	m m 9686.04
	Random rubble mason concrete 1:6:12 (1 cemelevel with:Cement mortal below out side plinth beam below cross beam rounded  2.25 Filling available excavate exceeding 20 cm in dep	ent : 6 coa ar 1:6 (1 co 2*7 2 1	ard stone in rise sand: 12 ement: 6 coa 3.700 5.800 0.882 Say	foundation 2 graded sto arse sand) 0.450 0.450	and plinth one aggrega  0.600  Tot otal Deducte Net Tot n @ Rs 7204	al Quantity al Quantity al Quantity 4.78 / cum	velling up wominal size)  13.986  3.132  0.882  18.000 cu  18.000 cu  Rs 129	m m 0686.04

	rounded	1	2.710				2.710	
					Tota	al Quantity	95.000 cu	m
				To	otal Deducte	d Quantity	0.000 cun	า
					Net Tota	al Quantity	95.000 cu	m
			Sa	y 95.000 cu	m @ Rs 258	3.57 / cum	Rs 24	564.15
19	13.7.1 12 mm cement plaster f	finished wit	h a floating c	coat of neat	cement of m	nix:1:3 ( 1 ce	ement : 3 fin	e sand)
	For the roof slabs.	2	29.500	4.5500			268.450	
	side	2	29.500	0.130			7.670	
	end side	2	9.050	0.130			2.353	
	rounded	1	1.527				1.527	
		_	43 B	8 2	Tota	al Quantity	280.000 s	qm
		11	The second	To	otal Deducte	d Quantity	0.000 sqn	า
		16-			Net Tota	al Quantity	280.000 s	qm
			Say	280.000 sq	m @ Rs 401	.21 / sqm	Rs 112	2338.80
20	13.16.1 6 mm cement plaster of	/1 D			anisatio	ns	0.4.700	
	For cross beams side	ther <sub>8</sub> E1		ngo.350g			34.720	
	bottom	8	6.200	0.300	<u> </u>	1	14.880	
	long beam in side	2*7	3.700	0.400			20.721	
	long beam out side	2	28.300	0.300			16.980	
	bottom	2*7	3.700	0.300			15.541	
	slab bottom	2*7	3.700	3.200			165.761	
	roof projection end	2*2	4.500	0.600			10.800	
	out side beam projection side	2	29.500	1.050			61.950	
	column	16	4.000	1.400			89.600	
		1	4.047	1.000			4.047	
					Tota	al Quantity	435.000 s	qm
				To	otal Deducte	d Quantity	0.000 sqn	า
					Net Tota	al Quantity	435.000 s	qm
			Say	435.000 sq	m @ Rs 267	7.59 / sqm	Rs 110	6401.65
	Say 435.000 sqm @ Rs 267.59 / sqm Rs							

	Auction hall floor	1	28.300	6.400			181.120	
	Rounded	1	3.880				3.880	
					To	tal Quantity	185.000 s	qm
				Т	otal Deduct	ed Quantity	0.000 sqm	1
					Net To	tal Quantity	185.000 s	qm
			Say	185.000 so	ηm @ Rs 32	5.01 / sqm	Rs 60	126.85
22	13.43.1 Applying one coat of surface:Water thinnab			nt primer	of approve	d brand and	d manufactu	ire on
	roof beam side & bottom	8	6.200	1.000			49.600	
	long beam out side	2	28.300	0.400			22.640	
	inside	2*7	3.700	0.400	71		20.721	
	bottom	2*7	3.700	0.300	TY3		15.541	
	slab bottom	2*7	3.700	3.200	بالإسلام	450	165.761	
	roff projection end	2*2	4.500	0.600			10.800	
	roff projection side	2	29.500	1.050			61.950	
	column	the <sub>16</sub> E1	gi4.00011	ng.4009	anisatio	ons	89.600	
	side end	2	9.050	0.130	T	7	2.353	
	projection side	2	29.500	0.130			7.670	
	top of roof slab	2	29.500	4.550			268.450	
	rounded	1	4.914				4.914	
					To	tal Quantity	720.000 s	qm
				Т	otal Deduct	ed Quantity	0.000 sqm	1
					Net To	tal Quantity	720.000 s	qm
			Say	/ 720.000 s	sqm @ Rs 7	0.64 / sqm	Rs 50	860.80
23	13.44.1 Finishing walls with wat @ 3.84 kg/10 sqm)	er proofinç	g cement pair	nt of require	ed shade:Ne	ew work (Tw	o or more co	oats app
	slab bottom	2*7	3.700	3.200			165.761	
	roof projection end	2*2	4.500	0.600			10.800	
	roof projection side	2	29.500	1.050			61.950	
			1.489				1.489	

					Tota	al Quantity	240.000 s	qm
				To	otal Deducte	d Quantity	0.000 sqn	1
					Net Tota	al Quantity	240.000 s	qm
			Say	240.000 sqı	m @ Rs 107	7.39 / sqm	Rs 25	773.60
24	13.46.1 Finishing walls with Ac @ 1.67 ltr/10 sqm over	-	•	-		,		
	roof beam allround	8	6.200	1.000			49.600	
	long beam out side	2	28.300	0.300			16.980	
	long beam in side	2*7	3.700	0.400			20.721	
	bottom	2*7	3.700	0.300			15.541	
	column C1 to C16	16	4.000	1.400			89.600	
	top of roof slab	2	29.500	4.550			268.450	
	side	2	29.500	0.130	d 1/1		7.670	
	side end	2	9.050	0.130	T th		2.353	
		1	4.085			No. 0	4.085	
		100			Tota	al Quantity	475.000 s	qm
		.1 E		To	otal Deducte	d Quantity	0.000 sqn	1
	U	ther En	gineeri	ng Orga	anisatio Net Tota	nS al Quantity	475.000 s	qm
			Say	475.000 sqr	m @ Rs 193	3.89 / sqm	Rs 92	097.75
SI No	Description	No	L	В	D	CF	Quantity	Remark
		3 Append	ix C- constr	uction of T	oilet block			
1	2.8.1 Earth work in excavat trenches or drains (no ramming of bottoms, I excavated soil as dire	t exceeding	1.5 m in w m, includin	idth or 10 s	sqm on plan ut the exca	ı), including	dressing o	f sides and
	toilet block foundation all round	1	35.500	0.800	0.750		21.300	
	crosswall long	2	11.500	0.800	0.750		13.800	
	cross	1	6.050	0.800	0.750		3.630	
		1	3.150	0.800	0.750		1.891	
	bath room	1	4.800	0.800	0.750		2.880	
	ramp	2	4.500	0.800	0.750		5.400	
	step	1	3.500	1.200	0.600		2.520	

		1	3.000	0.800	0.750		1.801			
	setitank	1	6.700	2.400	2.000		32.160			
	sock pit	1	1.800	1.800	1.500		4.860			
		1	4.758				4.758			
					Tota	al Quantity	95.000 cu	m		
				To	otal Deducte	d Quantity	0.000 cum	1		
					Net Tota	al Quantity	95.000 cum			
	Say 95.000 cum @ Rs 296.94 / cum Rs 28209.30									
2	2.26.1 Extra for every additional materials. All kinds of second		5 m or part	there of in	excavation	/ banking	excavated	or stac		
	tank	1	6.700	2.400	0.500		8.040			
	rounded	1	1.960		1		1.960			
		LL	DOM	51/2	Tota	al Quantity	10.000 cu	m		
		100	TOR	To	otal Deducte	d Quantity	0.000 cum	1		
					Net Tot	al Quantity	10.000 cu	m		
		18/49/-		Net Total Quanti Say 10.000 cum @ Rs 106.37 / cur						
3	4.1.8 Providing and laying in	position	Y no	A SECOND	m @ Rs 106	6.37 / cum	Rs 10	063.70		
3	Providing and laying in shuttering - All work up nominal size)  toilet block foundation	to plinth	cement concr level:1:4:8 (	ete of spec 1 cement :	m @ Rs 106 ified grade e 4 coarse sa	3.37 / cum	Rs 10 e cost of ce ed stone ag	063.70		
3	Providing and laying in shuttering - All work up nominal size) toilet block foundation all round	to plinth	ement concr level:1:4:8 (	ete of spec 1 cement : 0.800	m @ Rs 106 ified grade e 4 coarse sa 0.150	3.37 / cum	e cost of ce ed stone ag	063.70		
3	Providing and laying in shuttering - All work up nominal size)  toilet block foundation	to plinth	35.500 11.500	ete of spec 1 cement :	m @ Rs 106 ified grade e 4 coarse sa	3.37 / cum	Rs 10 e cost of ce ed stone ag	063.70		
3	Providing and laying in shuttering - All work up nominal size) toilet block foundation all round	to plinth	ement concr level:1:4:8 (	ete of spec 1 cement : 0.800	m @ Rs 106 ified grade e 4 coarse sa 0.150	3.37 / cum	e cost of ce ed stone ag	063.70		
3	Providing and laying in shuttering - All work up nominal size) toilet block foundation all round crosswall long	to plinth  1	35.500 11.500	ete of spec 1 cement : 0.800 0.800	m @ Rs 106 ified grade e 4 coarse sa  0.150  0.150	3.37 / cum	e cost of ce ed stone ag	063.70		
3	Providing and laying in shuttering - All work up nominal size) toilet block foundation all round crosswall long	to plinth  1  2  1	35.500 11.500 6.050	ete of spec 1 cement : 0.800 0.800	m @ Rs 106 ified grade 6 4 coarse sa  0.150  0.150	3.37 / cum	4.260 2.761 0.726	063.70		
3	Providing and laying in shuttering - All work up nominal size) toilet block foundation all round crosswall long cross	1 2 1 1	35.500 11.500 6.050 3.150	0.800 0.800 0.800 0.800	m @ Rs 106 ified grade 6 4 coarse sa  0.150  0.150  0.150  0.150	3.37 / cum	4.260 2.761 0.726 0.378	063.70		
3	Providing and laying in shuttering - All work up nominal size)  toilet block foundation all round crosswall long cross  bath room	1 2 1 1 1	35.500 11.500 6.050 3.150 4.800	0.800 0.800 0.800 0.800 0.800	m @ Rs 106 ified grade 6 4 coarse sa  0.150  0.150  0.150  0.150  0.150	3.37 / cum	4.260 2.761 0.726 0.378 0.576	063.70		
3	Providing and laying in shuttering - All work up nominal size)  toilet block foundation all round crosswall long cross  bath room ramp	1 2 1 1 1 2 2	35.500 11.500 6.050 3.150 4.800 4.500	0.800 0.800 0.800 0.800 0.800 0.800	m @ Rs 106 ified grade 6 4 coarse sa  0.150  0.150  0.150  0.150  0.150	3.37 / cum	Rs 10 e cost of ce ed stone ag  4.260  2.761  0.726  0.378  0.576  1.080	063.70		
3	Providing and laying in shuttering - All work up nominal size)  toilet block foundation all round crosswall long cross  bath room ramp	1 2 1 1 2 1 1	35.500 11.500 6.050 3.150 4.800 4.500 3.500	0.800 0.800 0.800 0.800 0.800 0.800 1.200	m @ Rs 106  ified grade 6 4 coarse sa  0.150  0.150  0.150  0.150  0.150  0.150  0.150	3.37 / cum	Rs 10 e cost of ce ed stone ag  4.260 2.761 0.726 0.378 0.576 1.080 0.630	063.70		
3	Providing and laying in shuttering - All work up nominal size)  toilet block foundation all round crosswall long cross  bath room ramp step	1 2 1 1 2 1 1 1	35.500  11.500  6.050  3.150  4.800  4.500  3.500  3.000	0.800 0.800 0.800 0.800 0.800 0.800 0.800	m @ Rs 106 ified grade 6 4 coarse sa  0.150  0.150  0.150  0.150  0.150  0.150  0.150	3.37 / cum	Rs 10 e cost of ce ed stone ag  4.260  2.761  0.726  0.378  0.576  1.080  0.630  0.361	063.70		
3	Providing and laying in shuttering - All work up nominal size)  toilet block foundation all round crosswall long cross  bath room ramp step  setitank	1 2 1 1 1 1 1 1 1	35.500  11.500  6.050  3.150  4.800  4.500  3.500  3.000  6.700	0.800 0.800 0.800 0.800 0.800 0.800 0.800 1.200 0.800 2.400	m @ Rs 106  ified grade 6 4 coarse sa  0.150  0.150  0.150  0.150  0.150  0.150  0.150  0.150  0.200	3.37 / cum	Rs 10 e cost of ce ed stone ag  4.260 2.761 0.726 0.378 0.576 1.080 0.630 0.361 3.216	063.70		
3	Providing and laying in shuttering - All work up nominal size)  toilet block foundation all round crosswall long cross  bath room ramp step  setitank floor room	1 2 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	35.500  11.500  6.050  3.150  4.800  4.500  3.500  3.000  6.700  12.150	0.800 0.800 0.800 0.800 0.800 0.800 1.200 0.800 2.400 4.800	m @ Rs 106  ified grade 6 4 coarse sa  0.150  0.150  0.150  0.150  0.150  0.150  0.150  0.150  0.150  0.150  0.150	3.37 / cum	Rs 10 e cost of ce ed stone ag  4.260  2.761  0.726  0.378  0.576  1.080  0.630  0.361  3.216  5.833	063.70		

				To	otal Deducted	d Quantity	0.000 cum	1
					Net Tota	I Quantity	22.000 cu	m
			Say	22.000 cum	@ Rs 6814	.89 / cum	Rs 149	9927.58
4	7.1.1 Random rubble masor concrete 1:6:12 (1 cemelevel with:Cement mortal)	ent : 6 coar	se sand : 12	graded sto	•	_	• .	
	toilet block foundation all round	1	35.500	0.600	0.600		12.780	
	crosswall long	2	11.500	0.600	0.600		8.280	
	cross	1	6.050	0.600	0.600		2.178	
		1	3.150	0.600	0.600		1.134	
	bath room	1	4.800	0.600	0.600		1.728	
	ramp	2	4.500	0.600	0.600		3.240	
	step	1	3.500	1.200	0.450		1.891	
		1	3.000	0.600	0.600	to .	1.080	
	toilet block basement all round	1	35.500	0.450	0.450		7.189	
	crosswall long	ther En	11.500	0.450	0.450	nc	4.658	
	cross	1 _	6.050	0.450	0.450	1112	1.226	
		1	3.150	0.450	0.450	<u> </u>	0.638	
	bath room	1	4.800	0.450	0.450		0.973	
	ramp	2	3.150	0.450	0.300		0.851	
		1	3.000	0.450	0.450		0.608	
	partition	10	1.500	0.450	0.450		3.038	
	rounded	1	0.508				0.508	
					Tota	I Quantity	52.000 cu	m
				To	tal Deducted	d Quantity	0.000 cum	1
					Net Tota	I Quantity	52.000 cu	m
			Say	52.000 cum	@ Rs 7204	.78 / cum	Rs 374	1648.56
5	2.25 Filling available excava exceeding 20 cm in depart and lift up to 1.5 m.	•	•	•	•			-
	for foundation	1	11.550	3.900	0.600		27.027	

	varandha	1	7.000	0.750	0.600		3.150	
	rounded	1	4.823				4.823	
					Tota	al Quantity	35.000 cu	m
				To	otal Deducte	d Quantity	0.000 cum	1
					Net Tota	al Quantity	35.000 cu	m
			Say	y 35.000 cu	m @ Rs 258	3.57 / cum	Rs 90	049.95
6	5.2.2 Reinforced cement cor and string courses, fill excluding cost of centers a graded stone aggregation.	ets, columi ering, shutte	ns, pillars, pie ering, finishin	ers, abutme g and reinfo	ents, posts a	and struts et	tc. up tot flo	or five lev
	basement allround	1	35.500	0.450	0.100		1.598	
	cross	1	11.500	0.450	0.100		0.518	
		1	6.050	0.450	0.100		0.273	
		1	3.150	0.450	0.100		0.142	
	bath	1	4.800	0.450	0.100	Co.	0.217	
	ramp	1	3.150	0.450	0.100		0.142	
		1	3.000	0.450	0.100		0.135	
	partition	the E	ngi1500 ri	0.450 g	an <b>0</b> 300ic	ns	0.675	
	lintel	1	76.000	0.150	0.150		1.710	
	roof slab	1	12.750	5.800	0.120	4	8.874	
	slop	1	39.450	1.000	0.120		4.734	
	tank bottom	1	6.000	2.100	0.150		1.891	
	beam	1	2.100	0.200	0.200		0.085	
	cover slab	1	6.000	2.100	0.120		1.512	
		1	1.800	1.800	0.120		0.389	
	rounded	1	0.105				0.105	
					Tota	al Quantity	23.000 cu	m
				To	otal Deducte	d Quantity	0.000 cum	1
					Net Tota	al Quantity	23.000 cu	m
			Say 2	3.000 cum	@ Rs 10954	1.04 / cum	Rs 25′	1942.92
7	5.9.3 Centering and shutte landings, balconies a	_	•	, etc. and ı	removal of	form for:Su	spended flo	oors, roc
	basement top	2	35.500	0.100			7.101	

	cross	2	11.500	0.100			2.301					
		2	6.050	0.100			1.210					
		2	3.150	0.100			0.630					
	bath	2	4.800	0.100			0.960					
	ramp	2	6.150	0.100			1.231					
	partition	10*2	1.500	0.100			3.001					
	lintel	2	76.000	0.150			22.800					
	roof slab	1	12.750	5.800			73.950					
	slop	1	39.450	1.000			39.450					
	tank bottom	4	10.200	0.150			6.120					
	beam	1	2.100	0.600			1.260					
	cover slab	12	5.100	0.120			7.344					
		3	4.800	0.120	7 13		1.728					
		1	0.914		1-21		0.914					
		167			Tota	al Quantity	170.000 s	qm				
		485		To	otal Deducte	d Quantity	0.000 sqm	1				
			Total Deducted Quantity 0.000 sqm  Net Total Quantity 170,000 sqm									
	Net Total Quantity         170.000 sqm           Other EngineSay 170.000 sqm@ Rs 815.78 / sqm         Rs 138682.60											
		Other En	nginesay	170.000 sq				•				
8	5.22A.6 Steel reinforceme binding all comple	nt for R.C.C w	ork including	g straighter	m @ Rs 815	5.78 / sqm , bending,	Rs 138	3682.60 osition an				
8	Steel reinforceme	nt for R.C.C w	ork including	g straighter	m @ Rs 815	5.78 / sqm , bending,	Rs 138	3682.60 osition and				
8	Steel reinforceme binding all comple	nt for R.C.C we te above plinth	ork including level.Therm	g straighter	m @ Rs 815	5.78 / sqm , bending, ed bars of g	Rs 138	osition and OD or more @100kg/m3				
8	Steel reinforceme binding all comple qty of cc	nt for R.C.C we te above plinth	ork including level.Therm 22.895	g straighter	m @ Rs 815	5.78 / sqm , bending, ed bars of g	Rs 138 placing in p grade Fe-50 2289.500	00 osition and 00 or more 0100kg/m3 0100kg/m3				
8	Steel reinforceme binding all comple qty of cc	nt for R.C.C we te above plinth	ork including level.Therm 22.895	straighten	m @ Rs 815	5.78 / sqm  , bending, ed bars of g  100.0	Rs 138 placing in p grade Fe-50 2289.500 10.500	00 osition and 00 or more 0100kg/m3 0100kg/m3				
8	Steel reinforceme binding all comple qty of cc	nt for R.C.C we te above plinth	ork including level.Therm 22.895	straighten	m @ Rs 815	5.78 / sqm  , bending, ed bars of g  100.0	Rs 138 placing in parade Fe-50 2289.500 10.500 2300.000	00 osition and 00 or more 0100kg/m3 0100kg/m3 kg				
8	Steel reinforceme binding all comple qty of cc	nt for R.C.C we te above plinth	ork including level.Therm 22.895 10.500	straighten o - Mechan	m @ Rs 815	5.78 / sqm  , bending, ed bars of gas 100.0  al Quantity ad Quantity al Quantity	Rs 138  placing in p grade Fe-50  2289.500  10.500  2300.000  0.000 kg  2300.000	osition an OD or mor @100kg, m3 @100kg, m3				
9	Steel reinforceme binding all comple qty of cc	nt for R.C.C we te above plinth  1  1  1  ng pre cast soli 185 part I of 197	d blocks (fac	straighten o - Mechan To Say 2300.00	Total Deducte  Net Total  O kg @ Rs  of size 30x	5.78 / sqm  5.78 / sqm  6.78 / sqm  7. bending, ed bars of g  100.0  100.0  al Quantity al Quantity 98.30 / kg	Rs 138  placing in p grade Fe-50  2289.500  10.500  2300.000  0.000 kg  2300.000  Rs 226	osition an OD or mor @100kg/m3 @100kg/m3 kg				
	Steel reinforceme binding all comple qty of cc rounded  50.6.2.2 Solid masonry using confirming to IS 24	nt for R.C.C we te above plinth  1  1  1  ng pre cast soli 185 part I of 197	d blocks (fac	straighten o - Mechan To Say 2300.00	Total Deducte  Net Total  O kg @ Rs  of size 30x	5.78 / sqm  5.78 / sqm  6.78 / sqm  7. bending, ed bars of g  100.0  100.0  al Quantity al Quantity 98.30 / kg	Rs 138  placing in p grade Fe-50  2289.500  10.500  2300.000  0.000 kg  2300.000  Rs 226	osition and OD or more @100kg/m3 @100kg/m3 kg				

	centre cross	1	3.150	2.800	0.150		1.323	
		1	6.050	2.800	0.150		2.541	
	bath	1	4.800	2.800	0.150		2.016	
	septitank	1	16.200	1.800	0.200		5.833	
	step	1	3.000	0.600	0.450		0.810	
	rounded	1	0.593				0.593	
	shutter	1	3.000	2.400	0.150		-1.079	
	door D DA toilet	2	1.000	2.100	0.150		-0.630	
					Tota	al Quantity	32.709 cui	m
				To	otal Deducte	d Quantity	-1.709 cur	n
			1/40		Net Tota	al Quantity	31.000 cui	m
			Say	31.000 cum	n @ Rs 6984	1.85 / cum	Rs 216	530.35
	CM 1:6 ( 1 cement : 6	coarse san	d) including	cost of sca	ffolding com			
	size confirming to IS 2 CM 1:6 (1 cement: 6						ioi io ciii tii	iick waii
	toilet partition	10	1.500	2.800	0.100		4.200	
	urinal partition	0	4 000	4 400				
	unnai partition	2	1.000	1.400	0.100		0.280	
	parapet	ther Er	1.000	1.400 1.600 g	0.100 anogoje	ns	0.280 2.227	
			•			ns		
	parapet	ther Er	g37.100°i	ng.600g	anisotic	ns 1	2.227	
	parapet seititank partition	ther Er	937.100 <sup>1</sup> 1.700	1.000	anigotic 0.100	ns 1	2.227 0.340	
	parapet seititank partition sock pit	ther En	937.100 <sup>1</sup> 1.700 1.700	1.000	anigotic 0.100	ns	2.227 0.340 0.817	
	parapet seititank partition sock pit rounded	ther En	1.700 1.700 0.459	1.000 1.200	0.100 0.100 0.100	ns 1	2.227 0.340 0.817 0.459	1
	parapet seititank partition sock pit rounded	ther En	1.700 1.700 0.459	1.000 1.200 2.100	0.100 0.100 0.100	al Quantity	2.227 0.340 0.817 0.459 -1.323	
	parapet seititank partition sock pit rounded	ther En	1.700 1.700 0.459	1.000 1.200 2.100	0.100 0.100 0.100 Total Deducte	al Quantity	2.227 0.340 0.817 0.459 -1.323 8.323 cum	n
	parapet seititank partition sock pit rounded	ther En	937.100 1 1,700 1,700 0.459 0.700	1.000 1.200 2.100	0.100 0.100 0.100 Total Deducte	al Quantity ad Quantity al Quantity	2.227 0.340 0.817 0.459 -1.323 8.323 cum -1.323 cur 7.000 cum	n
11	parapet seititank partition sock pit rounded	the Er	937.100 1.700 1.700 0.459 0.700	1.000 1.200 2.100	0.100 0.100  O.100  Total Deducte Net Total	al Quantity ad Quantity al Quantity	2.227 0.340 0.817 0.459 -1.323 8.323 cum -1.323 cur 7.000 cum	n I
11	parapet seititank partition sock pit rounded door D1	the Er	937.100 1.700 1.700 0.459 0.700	1.000 1.200 2.100	0.100 0.100  O.100  Total Deducte Net Total	al Quantity ad Quantity al Quantity	2.227 0.340 0.817 0.459 -1.323 8.323 cum -1.323 cur 7.000 cum	n I
11	parapet seititank partition sock pit rounded door D1  13.1.1 12 mm cement plaster	the Er  2  4  1  9	1.700 1.700 0.459 0.700 Say	1.000 1.200 2.100 To y 7.000 cum	0.100 0.100  O.100  Total Deducte Net Total	al Quantity ad Quantity al Quantity	2.227 0.340 0.817 0.459 -1.323 8.323 cum -1.323 cum 7.000 cum Rs 54	n I
11	parapet seititank partition sock pit rounded door D1  13.1.1 12 mm cement plaster out side wall	the Er  2  4  1  9	1.700 1.700 0.459 0.700 Say 1 cement : 4	1.000 1.200 2.100 To y 7.000 cum	0.100 0.100  O.100  Total Deducte Net Total	al Quantity ad Quantity al Quantity	2.227 0.340 0.817 0.459 -1.323 8.323 cum -1.323 cum 7.000 cum Rs 54	n I
11	parapet seititank partition sock pit rounded door D1  13.1.1 12 mm cement plaster out side wall Parapet	the Er  2  4  1  9	1.700 1.700 0.459 0.700 Say 1 cement : 4 35.300 37.100	1.000 1.200 2.100 To y 7.000 cum 4 fine sand) 2.800 1.400	0.100  0.100  0.100  Total Deducte  Net Total	al Quantity ad Quantity al Quantity	2.227 0.340 0.817 0.459 -1.323 8.323 cum -1.323 cum 7.000 cum Rs 54	n I

	bath	1	6.500	2.800		18.200	
	partition	2	3.150	2.800		17.640	
		1	5.300	2.800		14.840	
		1	5.500	2.800		15.400	
		1	3.200	2.800		8.960	
		1	4.850	2.800		13.580	
		1	2.500	2.800		7.000	
	urinal partition	2	2.100	1.500		6.301	
	under side slab	1	12.750	5.800		73.950	
		1	39.450	1.000		39.450	
	rounded	1	5.927			5.927	
	door D	2	1.000	2.100		-4.200	
	toilet door D1	11	0.700	2.100		-16.169	
	ventilator	15	0.600	0.500	1-21	-4.500	
	shutter	1	3.000	2.400	LULL	-7.199	
		485			Total Quan	tity 587.068 sqm	
			L. Conne	To	otal Deducted Quan	-32.068 sqm	
		Other Er	ngineeri	ng Orga	an Net Total Quan	tity 555.000 sqm	
			Say	555.000 sqı	m @ Rs 314.09 / so	qm Rs 174319.	95
12	13.7.1 12 mm cement plaster	finished wit	h a floating c	oat of neat	cement of mix:1:3 (	1 cement : 3 fine san	ıd)
	slab top	1	12.750	5.800		73.950	<del></del>
	oldin top	1	39.450	1.000		39.450	
	rounded	1	1.600			1.600	
					Total Quan		
				To			
				To	otal Deducted Quan	ntity 0.000 sqm	
			Say			0.000 sqm ntity 115.000 sqm	15
13	13.7.2	finished with	·	115.000 sqı	Net Total Quan	115.000 sqm  115.000 sqm  Rs 46139.1	
13	12 mm cement plaster		h a floating c	115.000 squ	ntal Deducted Quan Net Total Quan m @ Rs 401.21 / so	115.000 sqm  115.000 sqm  115.000 sqm  115.000 sqm  115.000 sqm  115.000 sqm  115.000 sqm	
13		finished with	·	115.000 sqı	ntal Deducted Quan Net Total Quan m @ Rs 401.21 / so	115.000 sqm  115.000 sqm  Rs 46139.1	

	roumnded	1	0.279				0.279					
	Tourninged	1	0.279		Tata							
						al Quantity	45.000 sq					
				10	tal Deducte	·	0.000 sqn					
	Net Total Quantity 45.000 sqm  Say 45.000 sqm @ Rs 386.36 / sqm											
			Say	/ 45.000 sqr	n @ Rs 386	36 / sqm	Rs 17	386.20				
14	8.31 Providing and fixing 1st quality ceramic glazed wall tiles conforming to IS: 15622(thickness to be specified by the manufacturer), of approved make, in all colours, shades except burgundy, bottle green, black any size as approved by Engineerin-Charge, in skirting, risers of steps and dados, over 12 mm thick be of cementmortar 1:3 (1 cement : 3 coarse sand) and jointing with grey cement slurry @3.3kg per sqr including pointing in white cement mixed with pigment of matchingshade complete.											
	toilet	11	4.700	1.800			93.060					
	DA toilet	2	5.600	1.800			20.160					
	bath	1	5.800	1.800			10.440					
	urinal portion	3	2.600	1.600			12.480					
	rounded	1	3.860		133		3.860					
		100	4	Serv.	Tota	al Quantity	140.000 s	qm				
		100		To	tal Deducte	d Quantity	0.000 sqn	า				
		Other Er	20120011	na Ora	Net Tota	al Quantity	140.000 s	qm				
			Say 1	40.000 sqm	@ Rs 1212	78 / sqm	Rs 169	9789.20				
15	11.37 Providing and laying						•	ified by				
	manufacturer), of 1st Grey, Fume Red Bro pointing the joints wit	wn, laid on 2	20 mm thick	cement mor	tar 1:4 (1 C	ement : 4 C		White, Ivo				
	Grey, Fume Red Bro	wn, laid on 2	20 mm thick	cement mor	tar 1:4 (1 C	ement : 4 C		White, Ivo				
	Grey, Fume Red Bro pointing the joints wit	wn, laid on 2 th white cem	20 mm thick of the contract of	cement mor	tar 1:4 (1 C	ement : 4 C	Coarse sand	White, Ivo				
	Grey, Fume Red Bro pointing the joints wit inside floor	wn, laid on 2 th white cem	20 mm thick of ent and mate	cement mor	tar 1:4 (1 C	ement : 4 C	58.320	White, Ivo				
	Grey, Fume Red Bro pointing the joints wit inside floor	wn, laid on 2 th white cem	20 mm thick of ent and mate	cement mor ching pigme 4.800	tar 1:4 (1 C	ement : 4 Caplete.	58.320 1.680	White, Ivo				
	Grey, Fume Red Bro pointing the joints wit inside floor	wn, laid on 2 th white cem	20 mm thick of ent and mate	cement mor ching pigme 4.800	Total Deducte	ement : 4 Caplete.	58.320 1.680 60.000 sq	White, Ivo				
	Grey, Fume Red Bro pointing the joints wit inside floor	wn, laid on 2 th white cem	20 mm thick of ent and mater 12.150 1.680	cement mor ching pigme 4.800	Total Deducte	ement : 4 Caplete.  Al Quantity  d Quantity  al Quantity	58.320 1.680 60.000 sq 60.000 sq 60.000 sq	White, Ivo				
16	Grey, Fume Red Bro pointing the joints wit inside floor	th white cem  1  1  industrial grantid on 20 miless than	20 mm thick of ent and mate 12.150 1.680 Say ade antiskid ti 0.08 % and m thick cem	4.800  To  60.000 sqm  iles of size 3 conforming tent mortar	Total Deducted Rs 1091  600x300mm g to I.S. 1566 1:4 (1 cer	ement: 4 Conplete.  al Quantity d Quantity al Quantity .02 / sqm  with thickness 622, of apprent: 4 con	58.320 1.680 60.000 sqn 60.000 sqn 60.000 sqn roved make	Mhite, Ivo				

		1	3.500	1.200			4.200	
	step	3	3.000	0.450			4.051	
	Rounded	1	2.269				2.269	
					Tota	al Quantity	23.000 sq	m
				To	tal Deducte	d Quantity	0.000 sqn	า
					Net Tota	al Quantity	23.000 sq	m
			Say	23.000 sqm	@ Rs 1276	.95 / sqm	Rs 29	369.85
17	13.43.1 Applying one coat surface:Water thin			nt primer c	of approved	brand and	d manufacti	ure on w
	area vide item no 11	1	555.000	S)			555.000	
			-/W	W.	Tota	al Quantity	555.000 s	qm
		1	53 4	To	tal Deducte	d Quantity	0.000 sqn	า
		11	TY ES	51/1	Net Tota	al Quantity	555.000 s	qm
		1 / 2	Say	v 555 000 so	qm @ Rs 70	.64 / sqm	Rs 39	205.20
18	13.46.1 Finishing walls with @ 1.67 ltr/10 sqm or	ver and includ	h exterior pa	int of require	ed shade:Ne	ew work (Tv		
18	Finishing walls with		h exterior pa	int of require	ed shade:Ne	ew work (Tv	20 kg/10 sq	
18	Finishing walls with  @ 1.67 ltr/10 sqm or  out side wall  Parapet	othet Er	h exterior paing priming of 35.300	int of require coat of exter	ed shade:Ne ior primer a	ew work (Tv	98.840 51.940	m)
18	Finishing walls with  @ 1.67 ltr/10 sqm or  out side wall  Parapet	othet Er	h exterior paing priming of 35.300	int of require coat of exter 2.800 g	ed shade:Ne ior primer a	ew work (Tv oplied @ 2	98.840 51.940 4.220	m) qm
18	Finishing walls with  @ 1.67 ltr/10 sqm or  out side wall  Parapet	othet Er	h exterior paing priming of 35.300	int of require coat of exter 2.800 g	ed shade:Ne ior primer a anisatio Tota tal Deducte	ew work (Tv oplied @ 2	98.840 51.940 4.220 155.000 s	m) qm
18	Finishing walls with  @ 1.67 ltr/10 sqm or  out side wall  Parapet	othet Er	h exterior paing priming of 35.300 37.100 4.220	int of require coat of exter 2.800 g	ed shade:Neior primer a	ew work (Tv oplied @ 2 al Quantity d Quantity	98.840 51.940 4.220 155.000 sqn 155.000 s	m) qm
18	Finishing walls with  @ 1.67 ltr/10 sqm or  out side wall  Parapet	oremium acry	h exterior paing priming of 35.300 37.100 4.220  Say	int of require coat of exter 2.800 grant 1.400  To 155.000 square paint of in	Total Deducte  Net Total  m @ Rs 193	ew work (Tv oplied @ 2 al Quantity d Quantity al Quantity s.89 / sqm	98.840 51.940 4.220 155.000 s 0.000 sqn 155.000 s Rs 30	m)  qm  qm  052.95
	Finishing walls with @ 1.67 ltr/10 sqm or out side wall Parapet rounded  13.83.2 Wall painting with p	oremium acry	h exterior paing priming of 35.300 37.100 4.220  Say	int of require coat of exter 2.800 grant 1.400  To 155.000 square paint of in	Total Deducte  Net Total  m @ Rs 193	ew work (Tv oplied @ 2 al Quantity d Quantity al Quantity s.89 / sqm	98.840 51.940 4.220 155.000 s 0.000 sqn 155.000 s Rs 30	m)  qm  qm  052.95
	Finishing walls with @ 1.67 ltr/10 sqm or out side wall Parapet rounded  13.83.2 Wall painting with papplying additional	oremium acry	h exterior paing priming of 35.300 37.100 4.220  Say lic emulsion ver required	1.400 To paint of in to achieve	Total Deducte  Net Total  m @ Rs 193	ew work (Tv oplied @ 2 al Quantity d Quantity al Quantity s.89 / sqm	98.840 98.840 51.940 4.220 155.000 sqn 155.000 s Rs 30	m)  qm  qm  052.95
	Finishing walls with @ 1.67 ltr/10 sqm or out side wall Parapet rounded  13.83.2 Wall painting with papplying additional toilet inside	oremium acry coats where	h exterior paing priming of 35.300 37.100 4.220  Say lic emulsion ver required 5.400	To 155.000 square paint of into achieve	Total Deducte  Net Total  m @ Rs 193	ew work (Tv oplied @ 2 al Quantity d Quantity al Quantity s.89 / sqm	98.840 51.940 4.220 155.000 sqn 155.000 s Rs 30 OC (Volatil ur.Two coa	m)  qm  qm  052.95
	Finishing walls with @ 1.67 ltr/10 sqm or out side wall Parapet rounded  13.83.2 Wall painting with papplying additional toilet inside DA toilet	oremium acry coats where 10	say lic emulsion ver required 5.400 6.600	To 155.000 square paint of into achieve 1.000	Total Deducte  Net Total  m @ Rs 193	ew work (Tv oplied @ 2 al Quantity d Quantity al Quantity s.89 / sqm	98.840 51.940 4.220 155.000 sqn 155.000 s Rs 30 OC (Volatil ur.Two coa 54.000 13.200	m)  qm  qm  052.95
	Finishing walls with @ 1.67 ltr/10 sqm or out side wall Parapet rounded  13.83.2 Wall painting with papplying additional toilet inside DA toilet out	oremium acry coats wherever 10 2 2	say lic emulsion ver required 5.400 6.600 4.800	To 155.000 square paint of into achieve 1.000 1.000 2.800	Total Deducte  Net Total  m @ Rs 193	ew work (Tv oplied @ 2 al Quantity d Quantity al Quantity s.89 / sqm	98.840 51.940 4.220 155.000 s 0.000 sqn 155.000 s Rs 30 OC (Volatil ur.Two coa 54.000 13.200 26.880	m)  qm  qm  052.95
	Finishing walls with @ 1.67 ltr/10 sqm or out side wall Parapet rounded  13.83.2 Wall painting with papplying additional toilet inside DA toilet out bath	oremium acry coats where 10 2 2 1	Say lic emulsion ver required 5.400 6.600 4.800 6.500	To 155.000 square paint of into achieve 1.000 1.000 2.800 1.000	Total Deducte  Net Total  m @ Rs 193	ew work (Tv oplied @ 2 al Quantity d Quantity al Quantity s.89 / sqm	98.840 51.940 4.220 155.000 s 0.000 sqn 155.000 s Rs 30 OC (Volatil ur.Two coa 54.000 13.200 26.880 6.500	m)  qm  qm  052.95

	i i	1	1	l	1			İ.
		1	3.200	2.800			8.960	
		1	4.850	2.800			13.580	
		1	2.500	2.800			7.000	
	urinal partition	2	2.100	1.500			6.301	
	under side slab	1	12.750	5.800			73.950	
		1	39.450	1.000			39.450	
	rounded	1	4.367				4.367	
	door D	2	1.000	2.100			-4.200	
	toilet door	11	0.700	2.100			-16.169	
	ventilator	15	0.600	0.500			-4.500	
	shutter	1	3.000	2.400			-7.199	
			611		Total	I Quantity	302.068 s	qm
		6	30.2	To	otal Deducted	I Quantity	-32.068 s	qm
		16	11		Net Total	I Quantity	270.000 s	qm
			11 13 74	DC 344	1 170	7		
20	9.117.1 Providing and fixing f dimension as below (	tolerance ±1	uPVC door mm), with w	frame mad	s 2.0mm (±0	ctruded sec	ctions havin	door fran
20	Providing and fixing f dimension as below ( to be jointed with gal- hinge side vertical of mm) wall thickness a	tolerance ±1 vanized brace the frames reads 3 nos. sta	uPVC door mm), with w kets and sta einforced by ainless steel	frame maderall thickness stee galvanized hinges fixe	e of uPVC ex s 2.0mm (±0 screws, join M.S. tube of d to the fram	ctruded sec .2 mm), co ts mitred a size 19 x 1 e complete	ctions havin rners of the and plastic v 9 mm and e as per ma	g an over door fran velded. T I mm (± 0
20	Providing and fixing f dimension as below ( to be jointed with gall hinge side vertical of mm) wall thickness a specification and dire	tolerance ±1 vanized brace the frames re nd 3 nos. staction of Eng	uPVC door mm), with w kets and sta einforced by ainless steel ineer-in-char	frame maderall thickness stee galvanized hinges fixe	e of uPVC ex s 2.0mm (±0 screws, join M.S. tube of d to the fram	ctruded sec .2 mm), co ts mitred a size 19 x 1 e complete	ctions havin rners of the and plastic v 9 mm and as per ma x40 mm	g an over door frar velded. T I mm (± 0
20	Providing and fixing f dimension as below ( to be jointed with galhinge side vertical of mm) wall thickness a specification and direct Toilet door 70x210	tolerance ±1 vanized brace the frames r nd 3 nos. sta	e uPVC door mm), with w ckets and sta einforced by ainless steel ineer-in-char 5.600	frame maderall thickness stee galvanized hinges fixe	e of uPVC ex s 2.0mm (±0 screws, join M.S. tube of d to the fram	ctruded sec .2 mm), co ts mitred a size 19 x 1 e complete	etions having rners of the and plastic volume as per mate as per mate 40 mm 61.600	g an over door frar velded. T I mm (± 0
20	Providing and fixing f dimension as below ( to be jointed with galkinge side vertical of mm) wall thickness a specification and direct Toilet door 70x210  DA toilet,100x210	tolerance ±1 vanized brace the frames r nd 3 nos. state ction of Eng 11 2	e uPVC door mm), with w ckets and sta einforced by ainless steel ineer-in-char 5.600 6.200	frame maderall thickness stee galvanized hinges fixe	e of uPVC ex s 2.0mm (±0 screws, join M.S. tube of d to the fram	ctruded sec .2 mm), co ts mitred a size 19 x 1 e complete	etions having rners of the and plastic volume as per mate as per m	g an over door frar velded. T I mm (± 0
20	Providing and fixing f dimension as below ( to be jointed with galhinge side vertical of mm) wall thickness a specification and direct Toilet door 70x210	tolerance ±1 vanized brace the frames r nd 3 nos. sta	e uPVC door mm), with w ckets and sta einforced by ainless steel ineer-in-char 5.600	frame maderall thickness stee galvanized hinges fixe	e of uPVC ex s 2.0mm (±0 screws, join M.S. tube of d to the fram I section prof	ctruded sec .2 mm), co ts mitred a size 19 x 1 e complete ile size 48:	etions having rners of the and plastic volume as per mark 40 mm 61.600 12.400 1.000	g an over door frar velded. T 1 mm (± 0 nufacture
20	Providing and fixing f dimension as below ( to be jointed with galkinge side vertical of mm) wall thickness a specification and direct Toilet door 70x210  DA toilet,100x210	tolerance ±1 vanized brace the frames r nd 3 nos. state ction of Eng 11 2	e uPVC door mm), with w ckets and sta einforced by ainless steel ineer-in-char 5.600 6.200	frame maderall thickness stee galvanized hinges fixe geExtruded	e of uPVC ex s 2.0mm (±0 screws, join M.S. tube of d to the fram I section prof	ctruded sec .2 mm), co ts mitred a size 19 x 1 e complete ile size 48:	etions having rivers of the and plastic via method of the as per material with the asper material with the aspect material with the asp	g an over door frar velded. T 1 mm (± 0 nufacture
20	Providing and fixing f dimension as below ( to be jointed with galkinge side vertical of mm) wall thickness a specification and direct Toilet door 70x210  DA toilet,100x210	tolerance ±1 vanized brace the frames r nd 3 nos. state ction of Eng 11 2	e uPVC door mm), with w ckets and sta einforced by ainless steel ineer-in-char 5.600 6.200	frame maderall thickness stee galvanized hinges fixe geExtruded	e of uPVC ex s 2.0mm (±0 screws, join M.S. tube of d to the fram I section prof	ctruded sec .2 mm), co ts mitred a size 19 x 1 e complete ile size 48:	etions having rivers of the and plastic via seper material with the second sec	g an over door frar velded. T I mm (± ( nufacture
20	Providing and fixing f dimension as below ( to be jointed with galkinge side vertical of mm) wall thickness a specification and direct Toilet door 70x210  DA toilet,100x210	tolerance ±1 vanized brace the frames r nd 3 nos. state ction of Eng 11 2	e uPVC door mm), with workets and state inforced by ainless steel ineer-in-chares 5.600 6.200 1.000	frame maderall thickness stee galvanized hinges fixe geExtruded	e of uPVC ex s 2.0mm (±0 screws, join M.S. tube of d to the fram I section prof	ctruded sec .2 mm), co ts mitred a size 19 x 1 e complete ile size 48:	etions having rivers of the and plastic via method of the and plas	g an over door frar velded. T I mm (± ( nufacture  etre tre
20	Providing and fixing f dimension as below ( to be jointed with galkinge side vertical of mm) wall thickness a specification and direct Toilet door 70x210  DA toilet,100x210	tolerance ±1 vanized brace the frames r nd 3 nos. state ction of Eng 11 2	e uPVC door mm), with workets and state inforced by ainless steel ineer-in-chares 5.600 6.200 1.000	frame maderall thickness stee galvanized hinges fixe geExtruded	e of uPVC ex s 2.0mm (±0 screws, join M.S. tube of d to the fram I section prof	ctruded sec .2 mm), co ts mitred a size 19 x 1 e complete ile size 48:	etions having rivers of the and plastic via method of the and plas	g an over door frar velded. T I mm (± ( nufacture

mm) wall thickness. The lock rail made up of 'H' section, a uPVC hollow section of size 100x24 mm and 2 mm (± 0.2 mm) wall thickness, fixed to the shutter styles by means of plastic/galvanised M.S. 'U' cleats.

	The shutter frame filled over all thickness of 20 two places by inserting complete as per man bathroom door shutters.	) mm and 1 ing horizonta nufacturer's	mm (± 0.1 m Ily 6 mm ga	nm) wall thic alvanised M	kness. The I.S. rod and	panels filled I fastened v	vertically an	nd tie bar at d washers,
	Toilet door 70x210	11	0.700	2.100			16.170	
	DA toilet,100x210	2	1.000	2.100			4.200	
	rounded	1	0.630				0.630	
					Tota	al Quantity	21.000 sq	m
				To	tal Deducte	d Quantity	0.000 sqm	า
			1.25	Cont.	Net Tota	al Quantity	21.000 sq	m
			Say	21.000 sqm	@ Rs 2072	2.49 / sqm	Rs 43	522.29
	everrequired) extrude made from roll formin extruded glazing bead frame to finishedwall, frame shall be mitred of including drilling of his between frame and adj of required size and of Charge. (Single / double frame, sash and mullion shall be acceptable. Fix mm both having wall to upto 0.75 sqm.)	g process of appropriate plastic packet and fusion ples for fixing acent finished approved quality approved quality and extruded exed window	of required liatedimension of required liatedimension of the series of t	ength (shapen, EPDM graps and mall corners, be filled with mplete as properties on sealant states and of (smaller ande of (smaller).	pe &size ac lasket, G.I fa lecessary si mullion (ifre hage of wat h weather per approved shall be pai ancein dimenall series) fu	ecording to asteners 10 tainless sterequired) shater etc. After proof silicon drawing & of d separately asion i.e. in	uPVC profice of the p	le), , uPVC ze for fixing tc.Profile of sion welded me the gap rbacker rod Engineer-in-: For uPVC th of profile llion 47x 68
	for ventilator	15	0.600	0.500			4.500	
					Tota	al Quantity	4.500 sqm	า
				To	tal Deducte	d Quantity	0.000 sqm	ı
					Net Tota	al Quantity	4.500 sqm	1
			Say	y 4.500 sqm	@ Rs 7626	6.06 / sqm	Rs 34	317.27
23	10.3 Providing and fixing in with flat iron diagonals steel pulleys, complet priming coat of appro	s 20x5 mm are with bolts	size, with to , nuts,lockir	p and botto	m rail of T-	iron 40x40x	6 mm, with	40 mm dia
	Front shutter	1	3.500	2.400			8.400	
		1						i contract of the contract of

	Rounded	1	0.600				0.600					
					Tota	al Quantity	9.000 sqm	1				
				To	tal Deducte	d Quantity	0.000 sqm	1				
					Net Tota	al Quantity	9.000 sqm					
	Say 9.000 sqm @ Rs 10205.93 / sqm											
24	Providing and fixing s including welding, grin same with necessary accessories & stainles: floor or the side of war payment purpose on	ding, buffing stainless s s steel dash aist slab wit ly weight o	g, polishing steel nuts a n fasteners, h suitable a of stainless	and making nd bolts co stainless ste arrangemen steel men	g curvature emplete, i/c eel bolts etc t as per ap	(wherever r fixing the ., of require proval of E	required) an railing with d size on th ngineer-in-c	d fitting the necessate top of the charge, (f				
	accessories such as hand rail	2	6.000	s etc.)		20.0	240.000	@20kg/i				
	Tiana ran	10	0.000	R 70	Tota	al Quantity	240.000 k					
		(E)	130	To	ital Deducte		0.000 kg	9				
		1 ST			1 17	al Quantity	240.000 k	g				
			Rs 162561.60									
		485		Say 240.000	kg @ Rs 6	77.34 / kg	Rs 162	2561.60				
SI No	Description	No 4 Appendi	x D- constr	В	D	CF	Rs 162	<b>Remark</b>				
SI No	Description  16.78.1  Construction of granu mixing in a mechanical & lifts, spreading in ur compacting with vibrate directions of Engineer-having CBR Value- 30	4 Appendi lar sub- base I mix plant a niform layer ory power ro	x D- constructions of specification of specification of specification achieves a specification of the specification of specif	B  ding close of mixed thicknessive the desiration of Parameters of mixed thicknessive the desiration of Parameters of Parameter	parking Area graded Mated material s with motored density,	cr erial confor by tippers to r grader on complete as	Quantity  Tming to specifications of the prepared services of the prepared services per specifications.	Remark ecification for all lead urface ar cations ar				
	16.78.1 Construction of granu mixing in a mechanical & lifts, spreading in ur compacting with vibrate directions of Engineer-	4 Appendi lar sub- base I mix plant a niform layer ory power ro	x D- constructions of specification of specification of specification achieves a specification of the specification of specif	B  ding close of mixed thicknessive the desiration of Parameters of mixed thicknessive the desiration of Parameters of Parameter	parking Area graded Mated material s with motored density,	cr erial confor by tippers to r grader on complete as	Quantity  Tming to specifications of the prepared services of the prepared services per specifications.	Remark ecification for all lead urface ar cations ar				
	16.78.1 Construction of granu mixing in a mechanical & lifts, spreading in ur compacting with vibrate directions of Engineer-having CBR Value- 30	4 Appendi lar sub- bas I mix plant a niform layer ory power ro in- Charge.V	x D- constructions of specific older to achie With Materia	ding close of mixed thicknessive the desired conforming	graded Mated material s with motored density, to Grade -	cr erial confor by tippers to r grader on complete as	Quantity  Tming to specific prepared so sper specific per 75 mm to	Remark ecification for all lea				
	16.78.1 Construction of granu mixing in a mechanical & lifts, spreading in ur compacting with vibrate directions of Engineer-having CBR Value- 30 Auction hall front	4 Appendi lar sub- bas I mix plant a niform layer ory power ro in- Charge.V	x D- construction of the c	ding close of mixed thicknessive the desired conforming 30.000	graded Mated material s with motored density, to Grade -	cr erial confor by tippers to r grader on complete as	Quantity  Thing to specific prepared size 75 mm to the specific period of the specific peri	Remark ecification for all lea				
	16.78.1 Construction of granu mixing in a mechanical & lifts, spreading in ur compacting with vibrate directions of Engineer-having CBR Value- 30 Auction hall front side	4 Appendi lar sub- bas l mix plant a niform layer ory power ro in- Charge.V	x D- construction of the c	ding close of mixed thickness we the desir I conforming 30.000	graded Mated material swith motored density, to Grade -	cr erial confor by tippers to r grader on complete as	Quantity  Thing to specific prepared size 75 mm to 180.000  10.800	Remark ecification for all lea				
	16.78.1 Construction of granu mixing in a mechanical & lifts, spreading in ur compacting with vibrate directions of Engineer-having CBR Value- 30 Auction hall front side AH west side	4 Appendi lar sub- bas l mix plant a niform layer ory power ro in- Charge.V	se by Provint OMC, Carros of specific Oller to achie With Materia 40.000  40.000	ding close of the desired thickness to the desired the	graded Mated material swith motored density, to Grade - 0.150 0.150	cr erial confor by tippers to r grader on complete as	Quantity  Tming to specific per 75 mm to 180.000  10.800  90.000	Remark ecification for all lea				
	16.78.1 Construction of granu mixing in a mechanical & lifts, spreading in ur compacting with vibrate directions of Engineer-having CBR Value- 30 Auction hall front side AH west side for road	4 Appendi lar sub- bas l mix plant a niform layer ory power ro in- Charge.V	x D- construction of the c	ding close of the desired thickness to the desired the	graded Mated material swith motored density, to Grade - 0.150 0.150 0.150	cr erial confor by tippers to r grader on complete as	Quantity  Tming to specific prepared size 75 mm to 180.000  10.800  90.000  27.000	Remark ecification for all lea surface al cations a 0.075 mi				
	16.78.1 Construction of granu mixing in a mechanical & lifts, spreading in ur compacting with vibrate directions of Engineer-having CBR Value- 30 Auction hall front side AH west side for road	4 Appendi lar sub- bas l mix plant a niform layer ory power ro in- Charge.V	x D- construction of the c	ding close or diage of mixed thickness eve the desir I conforming 30.000 6.000 6.000	graded Mated material swith motored density, to Grade - 0.150 0.150 0.150	crial conformer by tippers to represent the complete as I (size range)	Quantity  Tming to specific prepared size 75 mm to 180.000  10.800  90.000  27.000  4.200	Remark ecification for all lea urface a cations a 0.075 mi				
	16.78.1 Construction of granu mixing in a mechanical & lifts, spreading in ur compacting with vibrate directions of Engineer-having CBR Value- 30 Auction hall front side AH west side for road	4 Appendi lar sub- bas l mix plant a niform layer ory power ro in- Charge.V	x D- construction of the c	ding close or diage of mixed thickness eve the desir I conforming 30.000 6.000 6.000	graded Material swith motored density, graded - 0.150 0.150 0.150 0.150 0.150 0.150	crial conformer by tippers to represent the complete as I (size range)	Quantity  Tming to specific per specific per 75 mm to 180.000  10.800  90.000  27.000  4.200  312.000 c	Remark ecification for all lea curface an cations an 0.075 mm				
	16.78.1 Construction of granu mixing in a mechanical & lifts, spreading in ur compacting with vibrate directions of Engineer-having CBR Value- 30 Auction hall front side AH west side for road	4 Appendi lar sub- bas l mix plant a niform layer ory power ro in- Charge.V	x D- construction of the c	ding close or diage of mixed thickness eve the desir I conforming 30.000 6.000 6.000	graded Material swith motored density, graded - 0.150	crial conformer by tippers to represent the complete as I (size range) all Quantity	Quantity  Trming to specific prepared size 75 mm to 180.000  10.800  90.000  27.000  4.200  312.000 cum 312.000 c	Remark ecification for all lea curface an cations an 0.075 mm				

	Construction of dry leading aggregate conforming ration not to exceed 1 not to be less than construction, concret transported to site, for roller, finishing and cu	g to IS: 383, I5:1, aggreg 150 Kg/ cu te strength r all leads &	the size of cate gradation, optimum not to be leftifts, laid with	oarse aggre n after blend moisture d ess than 10 a mechanid	egate not ex ling to be a content to l Mpa at 7 cal paver, co	s per specifoe determine days, mixeompacting w	mm, aggregication, cemned during ed in a batc	ent content trial length thing plant
	Auction hall front	1	40.000	30.000	0.150		180.000	
	side	2	6.000	6.000	0.150		10.800	
	AH west side	1	40.000	15.000	0.150		90.000	
	for road	1	30.000	6.000	0.150		27.000	
	rounded	1	4.200	·6\			4.200	
			_/W		Tota	al Quantity	312.000 c	um
		1	43 B	To	tal Deducte	d Quantity	0.000 cum	1
		61	TO THE	SAX	Net Tota	al Quantity	312.000 c	um
			Say 3	12.000 cum	@ Rs 4569	9.25 / cum	Rs 142	5606.00
3	16.43.1 Providing and laying cement content as persize in appropriate provided to the size of the size	er design mi	x, using coa	rse sand ar	nd graded s	tone aggre	gate of 40 m	nm nomina
3	Providing and laying cement content as pe	er design miroportions a ver required, levelling to by M.S. chart dinal joints (oved joint fil alants, dowe @340 kg/cu	x, using coast per approvant laying at site required slowned section 10 mm wide ler and sealal bars with slown. Excess/les	rse sand ar yed & specifie, spreading pe/ camber, s, curing, n e x 50 mm d ants, comple eeve/tie bar ess cement	nd graded stied design and comparing proving proving proving growth at the proving proving proving proving growth at the proving growth growth at the proving growth growth at the proving growth	tone aggreence criteria, producting mechanistic required vision for convection are direction separately)	gate of 40 moviding dowernically by untexture, incontraction / machine, proof Engineer-  Note: Cem	nm nomina el bars with sing needle luding stee expansion oviding and in-charge ent conten
3	Providing and laying cement content as persize in appropriate pursue sleeve/tie bars where and surface vibrators form work with sturd construction & longitude filling joints with appropriate of joint fillers, sea considered in M-30 is	er design miroportions a ver required, levelling to by M.S. chart dinal joints (oved joint fil alants, dowe @340 kg/cu	x, using coast per approvant laying at site required slowned section 10 mm wide ler and sealal bars with slown. Excess/les	rse sand ar yed & specifie, spreading pe/ camber, s, curing, n e x 50 mm d ants, comple eeve/tie bar ess cement	nd graded stied design and comparing proving proving proving growth at the proving proving proving proving growth at the proving growth growth at the proving growth growth at the proving growth	tone aggreence criteria, producting mechanistic required vision for convection are direction separately)	gate of 40 moviding dowernically by untexture, incontraction / machine, proof Engineer-  Note: Cem	nm nomina el bars with sing needle luding stee expansion oviding and in-charge tent conten
3	Providing and laying cement content as persize in appropriate pursue sleeve/tie bars where and surface vibrators form work with sturd construction & longitude filling joints with appropriate of joint fillers, see considered in M-30 is separately. Cement construction of the construction of joint fillers.	er design miroportions aver required, levelling to by M.S. chaidinal joints (oved joint fill alants, dowe @340 kg/cubncrete preparations)	x, using coast per approvant laying at site required slowned section 10 mm wide ler and sealar bars with slam. Excess/leared with bat	rse sand ar yed & specifie, spreading pe/ camber, s, curing, n e x 50 mm d ants, comple eeve/tie bar ess cement of ch mixing m	nd graded stied design and comparing proveete all as per sto be paidused as per achine	tone aggreence criteria, producting mechanistic required vision for convection are direction separately)	gate of 40 moviding dower anically by untexture, incontraction / machine, proof Engineer- is payable/ in the payable of the pa	nm nomina el bars with sing needle luding stee expansion oviding and in-charge tent conten
3	Providing and laying cement content as persize in appropriate pursue sleeve/tie bars where and surface vibrators form work with sturd construction & longitude filling joints with appropriate of joint fillers, see considered in M-30 is separately. Cement construction hall front	er design mi roportions a ver required, , levelling to ly M.S. char idinal joints ( oved joint fil alants, dowe @340 kg/cu oncrete prepa	x, using coast per approvalent section 10 mm wide ler and sealed bars with slam. Excess/leared with bat 40.000	rse sand ar yed & specified, spreading pe/ camber, s, curing, nex 50 mm deants, complete eeve/tie bar ess cement och mixing med 30.000	nd graded sided design and comparing proveete all as per sto be paid used as per achine	tone aggreence criteria, producting mechanistic required vision for convection are direction separately)	gate of 40 moviding dower anically by untexture, incontraction / machine, proof Engineer- is payable/ in 180.000	nm nomina el bars with sing needle luding stee expansion oviding and in-charge tent conten
3	Providing and laying cement content as persize in appropriate pursue size in appropriate pursue and surface vibrators form work with sturd construction & longitude filling joints with approximate light layers and surface vibrators form work with sturd construction & longitude filling joints with approximate light layers are considered in M-30 is separately. Cement considered in M-30 is separately. Cement considered in M-30 is separately. Cement considered in M-30 is separately.	er design mi roportions a ver required, , levelling to ly M.S. char dinal joints ( oved joint fil alants, dowe @340 kg/cu oncrete prepared	x, using coast per approvalent section 10 mm wide ler and sealed bars with slam. Excess/leared with bat 40.000	rse sand ar yed & specified, spreading pe/ camber, s, curing, nex 50 mm deants, complete eeve/tie barress cement of mixing medium 30.000	nd graded sided design and comparing provee all as per achine 0.150	tone aggreence criteria, producting mechanistic required vision for convection are direction separately)	gate of 40 moviding dower anically by untexture, incontraction / machine, proof Engineer- 1. Note: Cemis payable/ 1180.000	nm nomina el bars with sing needle luding stee expansion oviding and in-charge tent conten
3	Providing and laying cement content as persize in appropriate pursue size in appropriate pursue and surface vibrators form work with sturd construction & longiture filling joints with appropriate of joint fillers, see considered in M-30 is separately. Cement considered in M-30 is separately.	er design mi roportions a ver required, , levelling to ly M.S. char dinal joints ( oved joint fil alants, dowe @340 kg/cu oncrete prepared	x, using coas per approvaled a sper approvaled section 10 mm wide ler and sealed bars with slam. Excess/leared with bat 40.000 6.000	rse sand ar yed & specified, spreading pe/ camber, s, curing, nex 50 mm deants, complete eeve/tie barress cement of the mixing medical mixing	nd graded sided design and compared finishing what have been by grown at the all as personated as pe	tone aggreence criteria, producting mechanistic required vision for convection are direction separately)	gate of 40 moviding dower anically by untexture, incontraction / machine, proof Engineer-  Note: Cemis payable/ 1  180.000  10.800  90.000	nm nomina el bars with sing needle luding stee expansion oviding and in-charge tent conten
3	Providing and laying cement content as persize in appropriate pursue size in appropriate pursue and surface vibrators form work with sturd construction & longiture filling joints with approximate the provided in M-30 is separately. Cement considered in M-30 is separately.	er design miroportions aver required, levelling to by M.S. chardinal joints (oved joint fill alants, dowe @340 kg/cubncrete prepared 1 2 1	x, using coas per approvaled a sper approvaled section 10 mm wide ler and sealed bars with slam. Excess/leared with bat 40.000 6.000 40.000 30.000	rse sand ar yed & specified, spreading pe/ camber, s, curing, nex 50 mm deants, complete eeve/tie barress cement of the mixing medical mixing	nd graded sided design and compare finishing whating proveete all as personal	tone aggreence criteria, producting mechanistic required vision for convection are direction separately)	gate of 40 moviding dower anically by untexture, incontraction / machine, proof Engineer- is payable/ in 180.000  10.800  90.000  27.000	nm nomina el bars with sing needle luding stee expansion oviding and in-charge tent conten recoverable
3	Providing and laying cement content as persize in appropriate pursue size in appropriate pursue and surface vibrators form work with sturd construction & longiture filling joints with approximate the provided in M-30 is separately. Cement considered in M-30 is separately.	er design miroportions aver required, levelling to by M.S. chardinal joints (oved joint fill alants, dowe @340 kg/cubncrete prepared 1 2 1	x, using coas per approvaled a sper approvaled section 10 mm wide ler and sealed bars with slam. Excess/leared with bat 40.000 6.000 40.000 30.000	rse sand ar yed & specifie, spreading pe/ camber, s, curing, nex 50 mm deants, complete eeve/tie barress cement of the mixing means of the second of the sec	nd graded sided design and compare finishing whating proveete all as personal	tone aggre- criteria, pro- criteria,	gate of 40 moviding dower anically by untexture, incontraction / machine, proof Engineer- is payable/ in 180.000  10.800  90.000  27.000  4.200	nm nomina el bars with sing needle luding stee expansion oviding and in-charge tent conten recoverable
3	Providing and laying cement content as persize in appropriate pursue size in appropriate pursue and surface vibrators form work with sturd construction & longiture filling joints with approximate the provided in M-30 is separately. Cement considered in M-30 is separately.	er design miroportions aver required, levelling to by M.S. chardinal joints (oved joint fill alants, dowe @340 kg/cubncrete prepared 1 2 1	x, using coas per approvaled a sper approvaled section 10 mm wide ler and sealed bars with slam. Excess/leared with bat 40.000 6.000 40.000 30.000	rse sand ar yed & specifie, spreading pe/ camber, s, curing, nex 50 mm deants, complete eeve/tie barress cement of the mixing means of the second of the sec	nd graded sided design and compare finishing what in the provent of the provent o	tone aggre- criteria, pro- criteria,	gate of 40 moviding dower anically by untexture, incontraction / machine, proof Engineer-  Note: Cemis payable/ 1180.000  10.800  90.000  27.000  4.200  312.000 c	nm nomina el bars with sing needle luding stee expansion oviding and in-charge ent conten recoverable

	qty of CC	1	307.800			75.0	23085.000	@75Kg/
	rounded	1	15.000				15.000	@75Kg/
					Tota	al Quantity	23100.000	kg
				To	tal Deducte	d Quantity	0.000 kg	
					Net Tota	al Quantity	23100.000	kg
			Sa	ay 23100.00	00 kg @ Rs	98.30 / kg	Rs 227	0730.00
5	16.44 Extra for providing ar specification in ceme	•		compound	of approve	ed quality a	as per man	ufacture
	q t y o f c c 307.8*340=104652(20 93 bags	Œ	2093.000	52		0.2	418.600	@.20 Kg/ba
	Rounded	1	6.400				6.400	@.20 Kg/ba
			Maria	II BEZZ	Tota	al Quantity	425.000 L	itre
	0	ther Er	ngineeri	ng Org	tal Deducte	d Quantity	0.000 Litre	)
					Net Tota	al Quantity	425.000 L	itre
			Say	425.000 Li	tre @ Rs 59	0.86 / Litre	Rs 25	440.50
SI No	Description -	No	L -	В	D	CF	Quantity	Remark
		5 Appe	endix E - Co	nstruction	of Drain			
1	2.8.1 Earth work in excavati trenches or drains (not ramming of bottoms, li excavated soil as directions)	exceeding	g 1.5 m in w 5 m, includin	idth or 10 s	sqm on plar ut the exca	n), including	g dressing o	f sides a
	main drain from Auction hall to sump	1	50.000	1.300	1.000		65.000	
					Tota	al Quantity	65.000 cu	m
				To	tal Deducte	d Quantity	0.000 cum	1
					Net Tota	al Quantity	65.000 cu	m

	(exceeding 30 cm in do earth, lead up to 50 m soil	•				,	•	
	Pit of sump	1	8.200	4.000	2.450		80.360	
	soak pit 2m dia	1	3.140	1*1	2.100		6.594	
	round of	1	3.046				3.046	
					Tota	al Quantity	90.000 cu	m
		0.000 cum						
		90.000 cu	m					
			Say	y 90.000 cu	m @ Rs 214	.03 / cum	Rs 19	262.70
	shuttering - All work up nominal size)	1	S. 2 9			nd : 8 grad		gregat
	for drain	1	50.000	1.300	0.150		9.750	
	sump bottom	1	8.200	4.000	0.200	E.	6.560	
	round of	1	0.690	Mrs-73			0.690	
			No. Contraction	M 91.P222		al Quantity	17.000 cu	
	0	ther Er	gineeri	100 100	otal Deducte	ns	0.000 cum	
					7	al Quantity	17.000 cu	
			Say	17.000 cum	@ Rs 6814	.89 / cum	Rs 11	5853.13
4	5.1.2  Providing and laying in	•					e, excluding	
	centering, shuttering, fill sand :3 graded stone a	ggregate 20	mm nomina	al size	· ·	i level:1:1:5		
	sand :3 graded stone a	ggregate 20	50.000	al size	0.100	i level:1:1:5	6.000	
	sand :3 graded stone a	ggregate 20	mm nomina	al size	· ·	n level:1:1:5		
	sand :3 graded stone a drain bottom slab side wall cover slad for drain	ggregate 20	50.000 50.000	1.200 1.000	0.100	n level:1:1:5	6.000	
	sand :3 graded stone a drain bottom slab side wall cover slad for drain 50/.5	ggregate 20 1 2 100	50.000 50.000 1.000	1.200 1.000 0.500	0.100 0.200 0.150	n level:1:1:5	6.000 20.000 7.500	
	sand :3 graded stone a drain bottom slab side wall cover slad for drain 50/.5 cover slab sump	1 2 100 16	50.000 50.000 1.000 3.500	1.200 1.000 0.500	0.100 0.200 0.150 0.120	n level:1:1:5	6.000 20.000 7.500 3.360	
	sand :3 graded stone a drain bottom slab side wall cover slad for drain 50/.5 cover slab sump do beam	1 2 100 16 1	50.000 50.000 1.000 3.500 7.500	1.200 1.000 0.500 0.500 0.300	0.100 0.200 0.150 0.120 0.300	n level:1:1:5	6.000 20.000 7.500 3.360 0.675	
	sand :3 graded stone a drain bottom slab side wall cover slad for drain 50/.5 cover slab sump do beam cover slab soak pit	1 2 100 16 1 1	50.000 50.000 1.000 3.500 7.500 3.140	1.200 1.000 0.500 0.500 0.300	0.100 0.200 0.150 0.120 0.300 0.120		6.000 20.000 7.500 3.360 0.675 0.415 0.050	t 1.5 co
	sand :3 graded stone a drain bottom slab side wall cover slad for drain 50/.5 cover slab sump do beam cover slab soak pit	1 2 100 16 1 1	50.000 50.000 1.000 3.500 7.500 3.140	1.200 1.000 0.500 0.500 0.300 1.100	0.100 0.200 0.150 0.120 0.300 0.120	al Quantity	6.000 20.000 7.500 3.360 0.675 0.415	m 1.5 co

			Say	38.000 cum	@ Rs 9085	5.14 / cum	Rs 34	5235.32
5	5.9.1 Centering and shutterin columns, etc for mass of	•	g strutting, et	c. and remo	oval of form	for:Foundat	ions, footing	gs, bases
	side wall drain out	2	50.000	1.000			100.000	
	side wall drain in	2	50.000	0.900			90.000	
					Tota	al Quantity	190.000 s	qm
				To	otal Deducte	d Quantity	0.000 sqn	า
					Net Tota	al Quantity	190.000 s	qm
			Say	190.000 sq	m @ Rs 335	5.31 / sqm	Rs 63	708.90
6	5.9.5 Centering and shuttering girders bressumers and For cover slab drain	•		etc. and ren	noval of forn	n for:Lintels	s, beams, pl	inth bean
	105 x 50 x 15 cm For cover slab Effluent tank sides	16	8.000	0.120		<u>C</u>	15.360	
	beam	1	7.500	0.900	36		6.750	
	Rounded	1 1 E	1.390		• 4 •		1.390	
		iner Ei	ngineeri	ng Org	anisatic Tota	nS al Quantity	70.000 sq	m
				To	otal Deducte	d Quantity	0.000 sqn	า
					Net Tota	al Quantity		
			Say	y 70.000 sq	m @ Rs 649	9.82 / sqm	Rs 45	487.40
7	5.22A.1 Steel reinforcement for binding all complete all					•		osition a
	Qty of CC 38	1	38.000			90.0	3420.000	
					Tota	al Quantity	3420.000	kilogram
				To	otal Deducte	d Quantity	0.000 kilo	gram
					Net Tota	al Quantity	3420.000	kilogram
		;	Say 3420.00	0 kilogram (	@ Rs 96.68	/ kilogram	Rs 330	0645.60
8	50.6.1.1 Solid block masonry using size confirming to IS 218	85 part 1 c	of 1979 for fo		•			
	1:6 (1 cement : 6 coars	e sand) et	c complete					

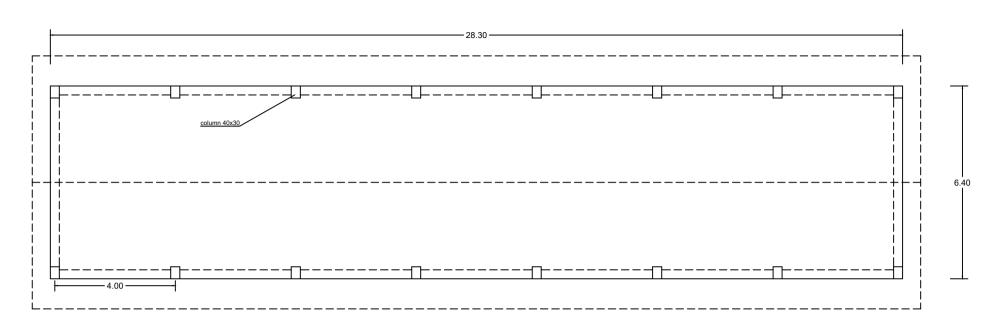
soak pit 2.00m dia - bottom	1	6.280	0.200	0.300		0.377	
Rounded	1	0.673				0.673	
				Tota	al Quantity	12.000 cu	m
			To	tal Deducte	d Quantity	0.000 cum	า
				Net Tota	al Quantity	12.000 cu	m
		Say	12.000 cum	@ Rs 5908	.32 / cum	Rs 70	899.84
				•		•	•
soak pit 2.00m dia - bottom	1	6.280	1.300			8.165	
Rounded	1	0.835				0.835	
	1	37.5		Tota	al Quantity	9.000 sqn	า
	Ch	1150	To	tal Deducte	d Quantity	0.000 sqn	ı
	155	LAS	Marie V	Net Tota	al Quantity	9.000 sqn	ı
19		S	ay 9.000 sqr	m @ Rs 699	.37 / sqm	Rs 62	294.33
13.7.2 12 mm cement plaster	finished wit	201120011				ement : 4 find	e sand)
for Drain side wall - inside		50.000	2.600			130.000	
Effluent tank side wall	2	31.600	2.500			158.000	
cross wall	2	3.200	2.500			16.000	
bottom	1	7.600	3.200			24.320	
Rounded	1	1.680				1.680	
				Tota	al Quantity	330.000 s	qm
			To	tal Deducte	d Quantity	0.000 sqn	า
				Net Tota	al Quantity	330.000 s	qm
		Say	330.000 sqr	m @ Rs 386	.36 / sqm	Rs 127	7498.80
Description	No	L	В	D	CF	Quantity	Remark
			trengthenin	g	_	- 0000000	
			1	В			Quantity
O. 140 Desci	Puon	140	_	ا ا	U		Quantity
		7 Sub	soil invest	igation			
	6.23 Honey-comb brick work structure above plinth le soak pit 2.00m dia -bottom Rounded  13.7.2 12 mm cement plaster for Drain side wall - inside Effluent tank side wall cross wall bottom Rounded	Rounded 1  Rounded 1  6.23 Honey-comb brick work 10/11.4 cr structure above plinth level upto flosoak pit 2.00m dia - bottom 1  Rounded 1  13.7.2 12 mm cement plaster finished with for Drain side wall - inside   1  Effluent tank side wall 2  cross wall 2  bottom 1  Rounded 1  Description No	Say	Say 12.000 cum	Dottom	Description   1	Dottom

							1
SI No	Description	No	L	В	D	CF	Quantity
	8 /	Water suppl	y and sanita	ry arrangem	ent		
	Lump-Sum 1	Total			R	s 2500000	.00
SI No	Description	No	L	В	D	CF	Quantity
		9 Electrific	cation and y	ard lighting			
	Lump-Sum 1	Total			R	s 1000000	.00
SI No	Description	No	L	В	D	CF	Quantity
		10 Unfor	eseen charg	es @ 2.5%			
	Lump-Sum T	Total			R	s 4900000	.00
		Р	rovision for G	ST payment	s (in %) @	18	8.0%
		Amount res	erved for GS	T payments	:	35987227.	35
		-M		Total	2	235916268	.35
		63 l	Lumpsum f	or round off		83731.65	;
	61	SKE	31/		то	TAL Rs 23	6000000.
·	18	41530		T-3.1	Rounded	Total Rs 2	23,60,00,0
	401	LKO		Rupees Tw	venty Three	e Crore Six	tv Lakh O
	SI No	SI No Description  Lump-Sum 7  Lump-Sum 7  SI No Description	8 Water suppl  Lump-Sum Total  SI No Description No  9 Electrific  Lump-Sum Total  SI No Description No  10 Unford  Lump-Sum Total	8 Water supply and sanita  Lump-Sum Total  9 Electrification and y  Lump-Sum Total  SI No Description No L  10 Unforeseen charg  Lump-Sum Total  Provision for G  Amount reserved for GS	8 Water supply and sanitary arrangem  Lump-Sum Total  SI No Description No L B  9 Electrification and yard lighting  Lump-Sum Total  SI No Description No L B  10 Unforeseen charges @ 2.5%  Lump-Sum Total  Provision for GST payments  Amount reserved for GST payments  Total  Lumpsum for round off	8 Water supply and sanitary arrangement  Lump-Sum Total R  SI No Description No L B D  9 Electrification and yard lighting  Lump-Sum Total R  SI No Description No L B D  10 Unforeseen charges @ 2.5%  Lump-Sum Total R  Provision for GST payments (in %) @  Amount reserved for GST payments  Total 2  Lumpsum for round off  TO  Rounded	8 Water supply and sanitary arrangement           Lump-Sum Total         Rs 2500000.           SI No         Description         No         L         B         D         CF           9 Electrification and yard lighting           Lump-Sum Total         Rs 1000000.         SI No         D         CF           10 Unforeseen charges @ 2.5%           Lump-Sum Total         Rs 4900000.           Provision for GST payments (in %) @         18           Amount reserved for GST payments         35987227.           Total         235916268.

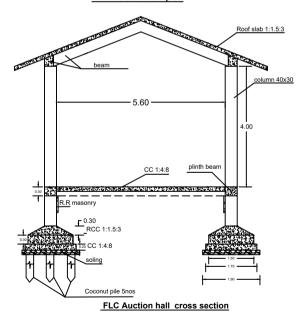
(Cost Index Applied for this estimate is 35.59%)

Other Engineering Organisations

PRICE



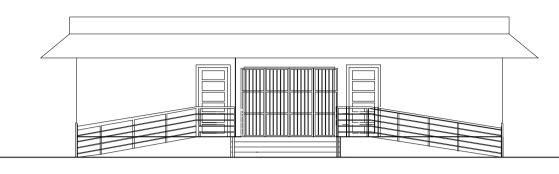
#### FLC Auction hall plan





#### DEVELOPMENT OF VIPIN -MUNAMBAM COASTAL STRETCH INCLUDING COASTAL PROTECTION -CONSTRUCTION OF FISH LANDING CENTRE AT PUTHENKADAPPURAM

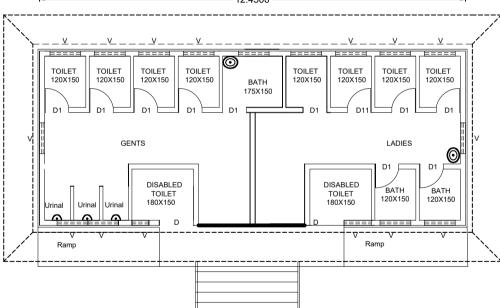
STAL	DRAWING NO:		ASSISTANT ENGINEER:		ASSISTANT ENGINEER: SIGNATURE:	ASSISTANT EXECUTIVE ENGINEER: SIGNATURE:
	DATE:		DRAWN:			
	TYPE:	DRAWING	REVIS	ION	STREET COMPOSITION	CHIEF ENGINEER: SIGNATURE:
	TITLE.	FLC ALICTION HALL DIANG CECTION	1.		DESIGNED & CHECKED BY	
	TITLE:	FLC AUCTION HALL PLAN & SECTION	_ 1			



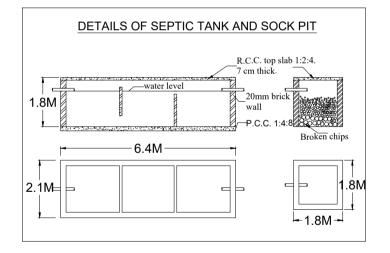
#### Parapet R.C.C Roof slab enkis karen etakkimikarian etakini biri antakin biri errekia Lintel Brick wall 290 SS Handrail -0.6000 R R Masonry C.C 1:4:8

### **ELEVATION**





### Section on A A



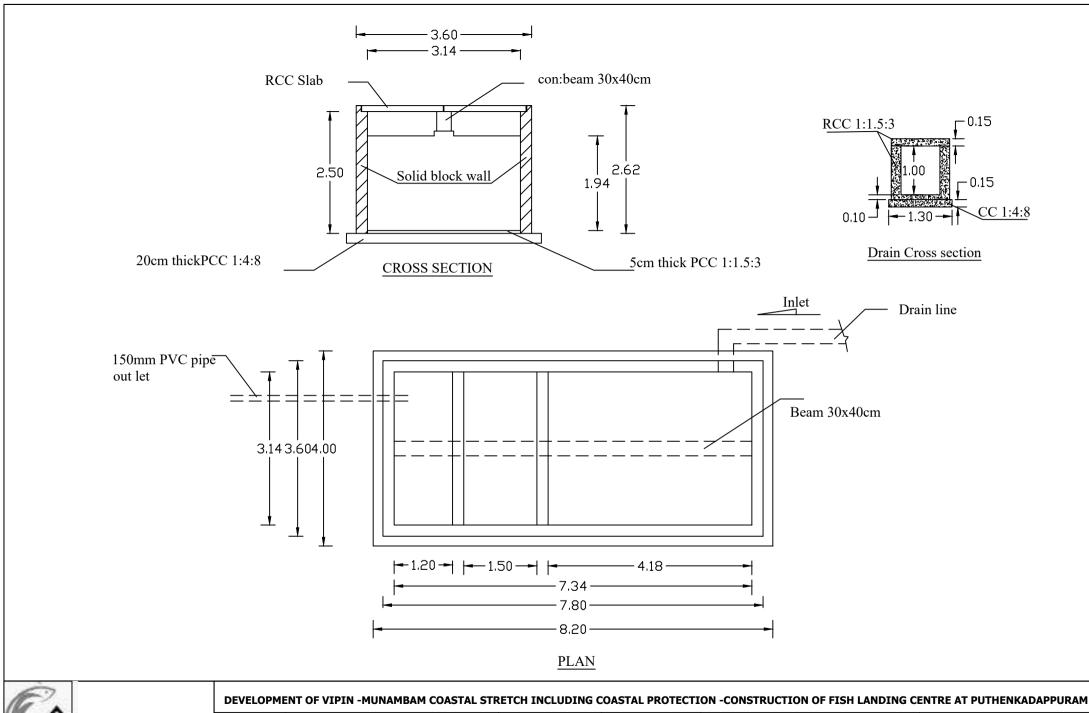
### **PLAN**





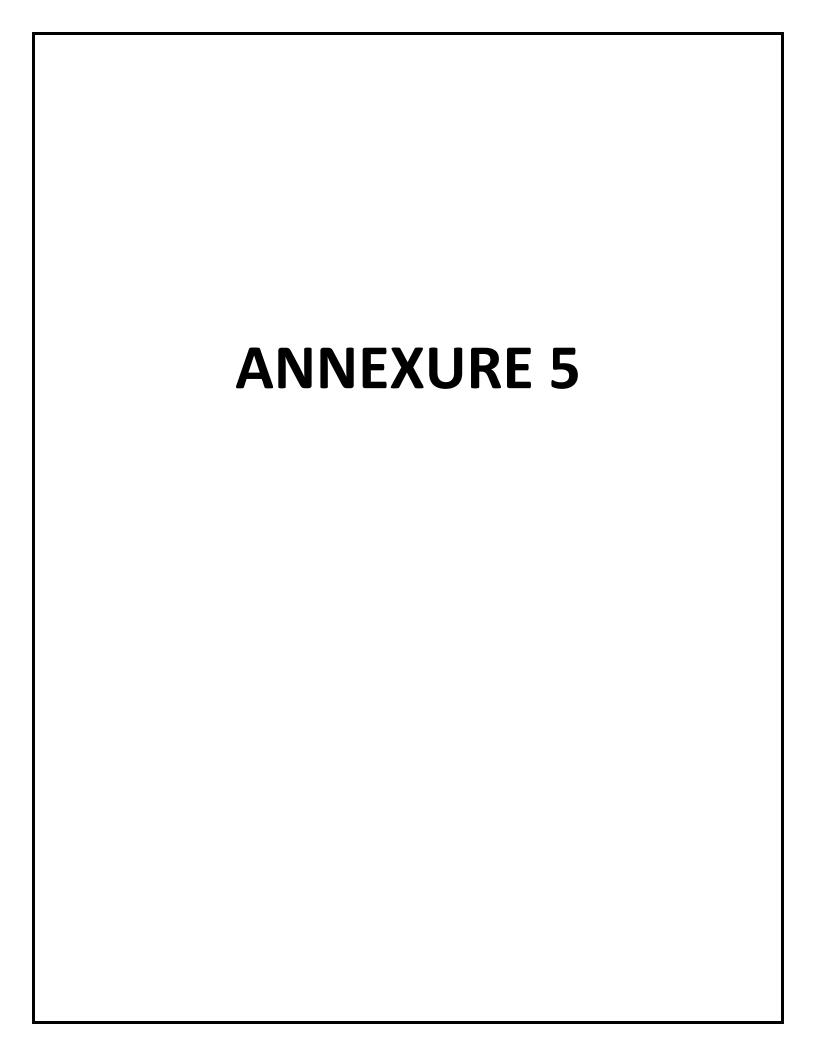
#### DEVELOPMENT OF VIPIN -MUNAMBAM COASTAL STRETCH INCLUDING COASTAL PROTECTION -CONSTRUCTION OF FISH LANDING CENTRE AT PUTHENKADAPPURAM

TAL	DRAWING NO:	RAWING NO:					ASSISTANT EXECUTIVE ENGINEER: SIGNATURE:		
IT	DATE:	ATE:		DRAWN:		3331.012			
	TYPE:         DRAWING           TITLE:         TOILET BLOCK   1.		REVIS	ION			CHIEF ENGINEER: SIGNATURE:		
			1.			DESIGNED & CHECKED BY			
	TITLE:	TOILET BLOCK	2.						





STAL	DRAWING NO:		ASSISTANT ENGINEER:		ASSISTANT ENGINEER: SIGNATURE:	ASSISTANT EXECUTIVE ENGINEER: SIGNATURE:
	DATE:		DRAWN:			
	TYPE:	DRAWING	REVIS	ION		CHIEF ENGINEER: SIGNATURE:
	TITLE.	FISH LANDING CENTRE DRAIN AND	1.		DESIGNED & CHECKED BY	
	TITLE:	TREATMENT TANK	2			



### Name of work : DEVELOPMENT OF VYPIN - MUNAMBAM COASTAL STRETCH INCLUDING COASTAL PROTECTION AT PAZHANGADU ESTIMATE REPORT

Based on the study conducted for shore protection at the Vypin-Munambam stretch by IIT Madras, different types of groynes are proposed for coastal protection at Pazhangadu beach.In this estimate, a series of 2 transitional groynes are proposed. Groynes of lengths 180m and 140m are proposed. A filter layer of 1kg to 10kg category stone, Core layer using 100 to 300 kg stones, Toe Mound using 500 to 800 kg stones, Armour layer using 1.5T to 2.5T stones proposed here. In addition to that, 2T tetrapods of 1.96m Thickness and 4T tetrapods of 2.50m Thickness are provided for armour layer. Lump sum provision for yard lighting is also included in the estimate. Lump sum provision for unforeseen expenses @2.5% are also included in the estimate. Total amount of estimate comes to Rupees 19,70,00,000/-(Rupees Nineteen Crore Seventy Lakh Only) including 18% GST charges but excluding consultancy charges. The estimate is prepared in PRICE based on DSR 2018 and cost index is 35.59%. The provisions adopted in the estimate are adequate for proper completion of work.

Other Engineering Organisations
PRICE

### DEVELOPMENT OF VYPIN - MUNAMBAM COASTAL STRETCH INCLUDING COASTAL PROTECTION AT PAZHANGADU

### **COST ABSTRACT**

1	Groynes	Rs.	16 18 89 405/-
2	Yard lighting	Rs.	10 00 000/-
3	Unforeseen expenses @ 2.5%	Rs.	40 00 000/-
4	Sub Total	Rs.	16 68 89 405/-
5	GST @ 18%	Rs.	3 00 40 093/-
6	Total Amount including GST 18%	Rs.	19 69 29 498/-
7	Lumpsum for Round off	Rs.	70 502/-
8	Total Amount	Rs.	19 70 00 000/-
9	Consultancy @5%	Rs.	98 50 000/-
<i>10</i>	GST on consultancy @ 18%	Rs.	17 73 000/-
11	Round off	Rs.	77 000/-
<i>12</i>	Grand Total	Rs.	20 87 00 000/-

Rupees Twenty Crore Eighty Seven Lakh Only

### DEVELOPMENT OF VYPIN - MUNAMBAM COASTAL STRETCH INCLUDING COASTAL PROTECTION AT PAZHANGADU

General Abstract

(Dsor year: 2018, Cost Index Applied for this estimate is 35.59%)

SI No	Heading Description	Amount					
1	GROYNES	161889405.28					
2	Yard lighting	1000000.00					
3	Unforeseen expenses @ 2.5%	400000.00					
	Provision for GST payments (in %) @	18.0%					
	Amount reserved for GST payments	30040092.95					
	Total	196929497.95					
	Lumpsum for round off	70502.05					
	ACCIONA	TOTAL Rs 197000000.00					
Rounded Total Rs 19,7							
		Rupees Nineteen Crore Seventy Lakh Only					

(Cost Index Applied for this estimate is 35.59%)



### DEVELOPMENT OF VYPIN - MUNAMBAM COASTAL STRETCH INCLUDING COASTAL PROTECTION AT PAZHANGADU

**Detailed Estimate** 

(Dsor year: 2018, Cost Index Applied for this estimate is 35.59%)

SI No	Description	No	L	В	D	CF	Quantity	Remark	
	1 GROYNES								
1	Moulding and supplying cement concrete 1.6m3 (4T) tetrapod with graded aggreg mm, 30% 40 to 20mm, 30% 20 to 5mm using 380 kg cement /m3 pf cpmcret design of mix proportion 0.5:,1.46:3.22 by weight of water cement, fine aggregate specific gravity of fine aggregate and course aggregateshould not be less than 2. and the cement shall be 43 grade or higher) minimum cube strength requirement (ii) @ 28 day - 30N/mm2 and minimum density of concrete 2.5 g/cc. including hire of tools and plants moulding and rehandling and stacking charge etc complete and instructions of Engineer							oroved mix aggregate ( espectively) - 20N/mm2 onal charge	
	ARMOUR LAYER, 4T tetrapods at 2.50m Thick	3200	K				3200.000		
		104	AG.		Tota	al Quantity	3200.000	each	
	Total Deducted Quantity 0.000 each								
		thor En	oin oori	na Ora	Net Tota	al Quantity	3200.000	each	
	Say 3200.000 each @ Rs 15999.39 / each Rs 51198048.00							8048.00	
2	od207063/2023_2024 Conveying 1.6m3 (4T) forming the armour layer and operational charge	er of break	water to line	s and levels					
	ARMOUR LAYER, 4T tetrapods at 2.50m Thick	3200					3200.000		
					Tota	al Quantity	3200.000	each	
				To	tal Deducte	d Quantity	0.000 eac	h	
					Net Tota	al Quantity	3200.000	each	
			Say 320	0.000 each	@ Rs 2042	.97 / each	Rs 653	7504.00	
3	· ·						x design of te (specific ely) and the n2 (ii) @ 28		

	and plants, mould, cur	_	idling and s	tacking cha	rges etc.,	complete as	s per the in	struction (		
	ARMOUR LAYER, 2T tetrapods at 1.96m Thick	2080					2080.000			
	Total Quantity 2080.000									
	Total Deducted Quantity 0.000 each									
					Net Tot	al Quantity	2080.000	each		
			Say 208	30.000 each	@ Rs 7596	.47 / each	Rs 1580	00657.60		
	Conveying 0.8cum (2T) specification and formin layer including hire and departmental officers at ARMOUR LAYER, 2T	g the armo	our layer of	breakwater	to lines and	d levels over	r the second	lary armo		
	tetrapods at 1.96m Thick	2080	138		B		2080.000	-		
				Mary.		al Quantity	2080.000			
	Total Deducted Quantity 0.000 each									
	Net Total Quantity 2080.000 each Other Engineering Organisations Say 2080.000 each @ Rs 912.92 / each Rs 1898873.									
5	2.6.1 Earth work in excavation by mechanical means (Hydraulic excavator)/manual means over area (exceeding 30 cm in depth, 1.5 m in width as well as 10 sqm on plan) including disposal of excavate earth, lead up to 50 m and lift up to 1.5 m, disposed earth to be levelled and neatly dressed. All kinds of soil									
	From Chainage 0 to 40m	2	40.000	35.000	2.000		5600.000			
					Tot	al Quantity	5600.000	cum		
				То	tal Deducte	ed Quantity	0.000 cun	1		
	Net Total Quantity 5600.000 cum							cum		
			Say 5	600.000 cur	m @ Rs 214	4.03 / cum	Rs 119	8568.00		
6	od207067/2023_2024 Supplying and laying Geotextile 120 gram per sqm membrane (best quality) including providing necessary overlaps, all cost, conveyance, labour charges etc complete as per the instruction									
	departmental officers	at site.								

	Northern Groyne		400.000	40.000			7000 000					
	180m Chainage 0 to 180	1	180.000	40.000			7200.000					
			South	ern Groyne	140m							
	Chainage 0 to 140m	1	140.000	40.000			5600.000					
					Tota	al Quantity	I Quantity 12800.000 sqm					
				To	tal Deducte	d Quantity	0.000 sqm	1				
					Net Tota	al Quantity	12800.000	sqm				
			Say 1	2800.000 s	qm @ Rs 83	3.20 / sqm	Rs 106	4960.00				
7	od207068/2023_2024 [Based on 65.32]Supply 1.5T to 2.5T(70% of sto from 2.65 to 2.8 for form stones, hire of lorries a measurements of catag cost of the contractor stationeries and convey of the breakwater to the levels including all cost rehandling, placing and spalls/quarry muck lorries/tippers/cranes departmental officers  Armour lay Northern Groyne 180m Chainage 0 to 180m	ones > 2.0 oning the pring	T) category mary armouseries, labouses after propoved softwar approved aligned levels as percharges, him dusing motion all fine all fine br> 5T to 2.5T series 4521.150	stones of a r and berm r charges re per sorting a are having gnment of the per approved re and oper polle crane, in neries for idental cha akulam Dia	pproved quadret at quired at quired at quired at quired at quire taken on printouts us the breakward drawings ational charmspecting the forming the targes etc. Castrict	ality having ount breakw uarry and a weigh bridg sing contracter and form with toleranges of mobile profile once he roadway omplete as	specific gravater inclusive the sorting plane installed a ctors supplicing the primare of +/- 20 le crane and the in a week any for moves per the design of	vity ranges re of cost of ace and the at site at the ed papers, arry armour cm in final dexcavator, and cost of vement of				
	Oh sin s no O to 440m	4		ern Groyne	140m		2050 040					
	Chainage 0 to 140m	1	3956.010		Tota	al Quantity	3956.010 8477.160	tonne				
				To	tal Deducte		0.000 tonr					
						al Quantity	8477.160					
			Say 8477	.160 tonne				98839.22				
Say 8477.160 tonne @ Rs 1781.12 / tonne Rs 150986  8 od207069/2023_2024  Supplying blasted rock from approved quarry to sorting site and sorting the stones into 500kg category stones of approved quality having specific gravity ranges from 2.65 to 2.8 for for primary armour and berm of rubble mount breakwater inclusive of cost of stones, hire of lo machineries, labour charges required at quarry and at sorting place and the measurer catagorised stones after proper sorting are taken on weigh bridge installed at site at the contractor with approved software having printouts using contractors supplied papers, stationed					kg to 800kg orming the lorries and rements of cost of the							

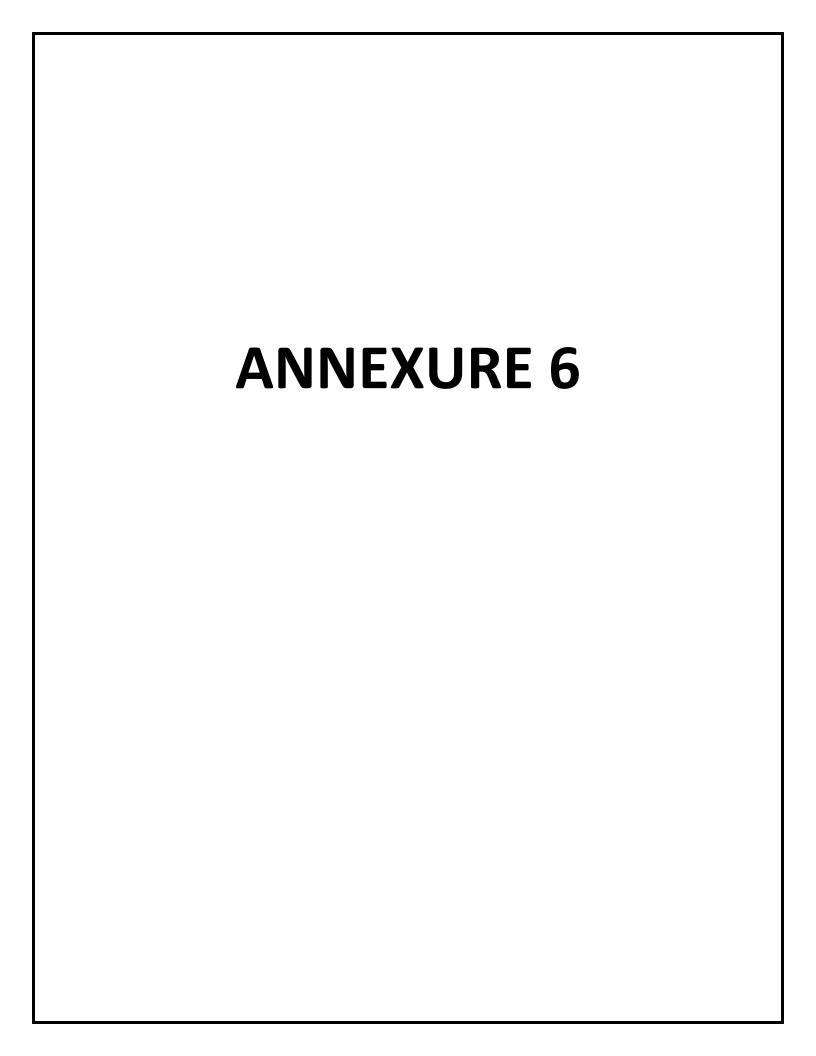
conveyed to the approved alignment of the breakwater and forming the primary armour of the breakwater to the lines and levels as per approved drawings with tolerance of +/- 20 cm in final levels including all cost and labour charges, hire and operational charges of mobile crane and excavator, rehandling, placing and packing and using mobile crane, inspecting the profile once in a week and cost of spalls/quarry muck and hire of machineries for forming the roadway for movement of lorries/tippers/cranes etc including all incidental charges etc complete as per the direction of departmental officers at site <br/> <br/>br>Ernakulam District Toe Mound using 500 to 800 kg stones (Assuming 1/3 void and sp.gravity 2.7) 5% Northern Groyne 1 180m Chainage 0 to 1.050 8743.613 sinkage 8327.250 180m added 5% Head 1 737.650 1.050 774.533 sinkage added Southern Groyne 140m 5899.520 1.050 6194.497 Chainage 0 to 140m 1 1 Head 485.070 1.050 509.324 **Total Quantity** 16221.967 tonne **Total Deducted Quantity** 0.000 tonne **Net Total Quantity** 16221.967 tonne Other En Say 16221.967 tonne @ Rs 1781.12 / tonne Rs 28893269.86 9 od208842/2023 2024 [Based on 65.30] Supplying granite blasted rock from approved quarry to sorting site by lorry/ tipper, and sorting the stones into 100kg to 300kg category stones of approved quality having specific gravity ranging from 2.65 to 2.8 for forming the core of rubble mound breakwater inclusive of cost of stones, hire of lorries and machineries, labour charges required at quarry and at sorting place and measurements of categorized stones after proper sorting are taken on weigh bridge installed at site at the cost of the contractor with approved software having printouts using contractors supplied papers, stationeries and conveyed to the approved alignment of the breakwater and rehandling and forming the core of the break water to the lines and levels as per the approved drawings and inspecting the profile once in a week with tolerance of +/- 20cm in final levels including all cost and labour charges, hire and operational charges of light crane and cost of spalls/ quarry muck and labour for forming the roadway for movement of lorries/ tippers / cranes etc including all incidental charges etc complete as per the direction of departmental officers at site <br >> Ernakulam District Core layer using 100 to 300 kg stones (Assuming 1/3 void and sp.gravity 2.7) 10% Northern Groyne 180m Chainage 0 to 1 9578.210 1.100 10536.031 sinkage 180m added

	Head	1	387.010		1.100		425.711	10% sinkage added
	Southern Groyne 140m							
	Chainage 0 to 140m	1	7078.240		1.100		7786.064	
	Head	1	314.970		1.100		346.468	
					Tota	al Quantity	19094.274	tonne
				To	tal Deducte	d Quantity	0.000 tonr	ne
					Net Tota	al Quantity	19094.274	tonne
			Say 19094	.274 tonne	@ Rs 1610.	75 / tonne	Rs 3075	6101.85
	forming the filter layer of charges required at qual sorting are taken on we having printouts using of the breakwater including sqm size) or any suitable 20T and placing the stable breakwater as per the ablaire and operational charaction of department Filter layer 180m Chainage 0 to 180m	eigh bridge contractors ding conver de methods ones at se approved d arges of T al officers	sorting place installed at yance from sinstalled at ea bed in unrawing and & P, tippler,	e and the me site at the pers, station sorting platfo site on a mo iform layer design and crane and Eranakulam	easurements cost of the eries and coorm and du oving crane of design to inspecting the all incidental	s of categoricontractor vonveyed to mping stone having a can hickness for the profile or all charges e	ized stones a with approve the approve es using tipp apaciaty of na r forming fil ance in a week tc. complete	after propered softwared alignmenter (3.5x2.5) ot less than ter layer oek including
	Head	1	305.420				305.420	
	ricau	ı		ern Groyne	140m		303.420	
	Chainage 0 to 140m	1	2227.510	313y110	. 10/11		2227.510	
	Head	1	281.750				281.750	
			1	I	Tota	al Quantity	5756.760	tonne
Total Deducted Quantity 0.						•	0.000 tonr	ne
						5756.760	tonne	
			Say 5756	.760 tonne	@ Rs 1640.	26 / tonne	Rs 944	2583.16
SI No	Description	No	L	В	D	CF	Quantity	Remark
			2 Yard	lighting		I		
	Lump-Sum Total					R	s 1000000.00	

	SI No	Description	No	L	В	D	CF	Quantity		
Remark	Remark 3 Unforeseen expenses @ 2.5%									
Lump-Sum Total							s 4000000.	4000000.00		
	Provision for GST payments (in %) @						18	3.0%		
	Amount reserved for GST payments							30040092.95		
					Total		196929497.95			
				Lumpsum f	or round off		70502.05			
	TOTAL Rs 197000000.00									
					_	Rounded	Total Rs 1	9,70,00,000		
	Rupees Nineteen Crore Seventy Lakh Only									

(Cost Index Applied for this estimate is 35.59%)

Other Engineering Organisations
PRICE



### Name of work: DEVELOPMENT OF VYPIN - MUNAMBAM COASTAL STRETCH INCLUDING COASTAL PROTECTION AND CONSTRACTION OF FISH LANDING CENTRE AT SAIDH MOHAMMED BEACH ESTIMATE REPORT

The estimate for the construction of Fish Landing Centre at Saidh Mohammed Beach is prepared based on the study conducted by IIT Madras for the coastal protection from Vypin to Munambam stretch wherein different types of groynes are proposed for coastal protection. This stretch of the coastline is identified as a fishing landing centre and it is already protected with seawall and groynes. A proposal is made to extend the existing groynes for about 160 m in length and construct a pair of groynes to form a fish landing centre. In this estimate, a series of 2 transitional groynes are proposed. Accordingly, groynes of length 160m and 120m are proposed. A filter layer of 1kg to 10kg category stone, Core layer using 100 to 300 kg stones, Toe Mound using 500 to 800 kg stones, Armour layer using 1.5T to 2.5T stones proposed here. In addition to that 2T tetrapods at 1.96m Thick and 4T tetrapods at 2.50m Thick is provided for armour layer. 2Provision for Auction hall building of size 28.3m x 6.4m is included in the estimate. For the auction hall, coconut piling of length 6m long is provided for foundation. RCC M20 provided for foundations, centering & shuttering, Reinforcement cement concrete work (M20) in walls is provided for super structure. Necessary Steel reinforcement, plastering and painting works are also included in the Auction hall. Provision for construction of a toilet block of size 12.5m x 5.1m is also included in the estimate. For the toilet block, RR masonry with cement mortar 1:6 is provided for the foundation. Solid block masonry of size 30x20x15cm and 40x20x10 cm are provided for super structure. Ceramic tiling is provided in the floor and in the bathroom region. Necessary fittings are also provided for toilet block. Other provisions in the estimateinclude concrete parking area proposed near the the Auction hall. Provision for the construction of drain is also included in the estimate. Total amount of estimate comes to Rupees 23,60,00000/-( Twenty Three crore Sixty lakh) including 18% GST charges but excluding consultancy charges. The estimate is prepared in PRICE based on DSR 2018 and cost index is 35.59%. The provisions adopted in the estimate are adequate for proper completion of work

# DEVELOPMENT OF VYPIN - MUNAMBAM COASTAL STRETCH INCLUDING COASTAL PROTECTION AND CONSTRACTION OF FISH LANDING CENTRE AT SAIDH MOHAMMED BEACH

### COST ABSTRACT

1	APPENDIX - A GROYNE	Rs.	14 11 98 972/-
2	APPENDIX B- CONSTRUCTION OF AUCTION HALL	Rs.	31 90 663/-
3	Appendix C- construction of Toilet block	Rs.	24 10 666/-
4	Appendix D- construction of Parking Area	Rs.	78 60 744/-
5	Appendix E - Construction of Drain	Rs.	11 44 187/-
6	Seawall Strengthening	Rs.	3 25 00 000/-
7	Sub soil investigation	Rs.	19 00 000/-
8	Water supply and sanitary arrangement	Rs.	25 00 000/-
9	Electrification and yard lighting	Rs.	23 00 000/-
10	Unforeseen expenses @ 2.5%	Rs.	49 50 000/-
11	Sub Total	Rs.	19 99 55 232/-
12	GST @ 18%	Rs.	3 59 91 942/-
13	Total Amount including GST 18%	Rs.	23 59 47 174/-
14	Lumpsum for Round off	Rs.	52 826/-
15	Total Amount	Rs.	23 60 00 000/-
16	Consultancy @5%	Rs.	1 18 00 000/-
<i>17</i>	GST on consultancy @ 18%	Rs.	21 24 000/-
18	Round off	Rs.	76 000/-
19	Grand Total	Rs.	25 00 00 000/-

Rupees Twenty Five Crore Only

## DEVELOPMENT OF VYPIN - MUNAMBAM COASTAL STRETCH INCLUDING COASTAL PROTECTION AND CONSTRACTION OF FISH LANDING CENTRE AT SAIDH MOHAMMED BEACH

General Abstract

(Dsor year: 2018, Cost Index Applied for this estimate is 35.59%)

SI No	Heading Description	Amount		
1	APPENDIX A- GROYNE	141198972.13		
2	APPENDIX B CONSTRUCTION OF AUCTION HALL	3190663.46		
3	Appendix C- construction of Toilet block	2410665.96		
4	Appendix D- construction of Parking Area	7860743.54		
5	Appendix E - Construction of Drain	1144187.11		
6	Seawall Strengthening	32500000.00		
7	Sub soil investigation	1900000.00		
8	Water supply and sanitary arrangement	2500000.00		
9	Electrification and yard lighting	2300000.00		
10	Unforeseen charges @ 2.5%	4950000.00		
	Provision for GST payments (in %) @	18.0%		
	Amount reserved for GST payments	35991941.80		
	Total	235947173.80		
	Lumpsum for round off	52826.20		
	Other Engineering Organia	sations TOTAL Rs 236000000.00		
	DDIC	Rounded Total Rs 23,60,00,000		
	Ru	pees Twenty Three Crore Sixty Lakh Only		

(Cost Index Applied for this estimate is 35.59%)

## DEVELOPMENT OF VYPIN - MUNAMBAM COASTAL STRETCH INCLUDING COASTAL PROTECTION AND CONSTRACTION OF FISH LANDING CENTRE AT SAIDH MOHAMMED BEACH

**Detailed Estimate** 

(Dsor year: 2018, Cost Index Applied for this estimate is 35.59%)

SI No	Description	No	L	В	D	CF	Quantity	Remark
		1	APPENDIX	A- GROYN	IE			
1	od207101/2023_2024 Moulding and supplying mm, 30% 40 to 20mm design of mix proportion specific gravity of fine and the cement shall be (ii) @ 28 day - 30N/mm of tools and plants mound instructions of Eng	, 30% 20 to on 0.5:,1.46 oggregate and e 43 grade 2 and mininal olding and re	o 5mm usin :3.22 by we nd course a or higher) m num density	ng 380 kg coight of water ggregateshouinimum cub of concrete	ement /m3 er cement, f buld not be I e strength r 2.5 g/cc. in	pf cpmcrete ine aggrega ess than 2.7 equirement cluding hire	e as per ap ate, course a 73 and 2.5 re (i) @ 7 day and operation	oroved mix aggregate ( espectively) - 20N/mm2 onal charge
	ARMOUR LAYER, 4T tetrapods at 2.50m Thick	2960	<b>B</b>			L	2960.000	
		The same			Tota	al Quantity	2960.000	each
			A Second	To	tal Deducte	d Quantity	0.000 eac	h
	0	ther En	gineeri	ng Orga	an Net Tota	al Quantity	2960.000	each
		$D_{\perp}$	Say 2960	.000 each @	® Rs 15999	.39 / each	Rs 4735	8194.40
2	od207103/2023_2024 Conveying 1.6m3 (4T) forming the armour layer and operational charge	er of break	water to line	s and levels	-	-	-	
	ARMOUR LAYER, 4T tetrapods at 2.50m Thick	2960					2960.000	
					Tota	al Quantity	2960.000	each
				To	tal Deducte	d Quantity	0.000 eac	h
					Net Tota	al Quantity	2960.000	each
			Say 296	0.000 each	@ Rs 2042	.97 / each	Rs 604	7191.20
3	65.103  Moulding and supplying to 20mm and 30% 20n mix proportion 0.5:1:1. gravity of fine aggregate cement shall be 43 grad	nm to 6mm 46:3.22 by and coars	using 380k weight of versight	g cement/ r water cement should not	n3 of concr nt, fine agg be less thar	ete as per a regate, coa n 2.73 and 2	approved mirse aggrega .5 respective	x design of te (specific ely) and the

	day - 30 N/mm2 and mi and plants, mould, cur departmental officers a	ing, rehan	=	=	_	-		_
	ARMOUR LAYER, 2T tetrapods at 1.96m Thick	2080					2080.000	
					Tota	al Quantity	2080.000	each
				То	tal Deducte	d Quantity	0.000 eac	h
					Net Tota	al Quantity	2080.000	each
			Say 208	30.000 each	@ Rs 7596.	47 / each	Rs 1580	0657.60
	Conveying 0.8cum (2T specification and forming layer including hire and departmental officers at ARMOUR LAYER, 2T	ng the armo	our layer of	breakwater	to lines and	levels over	the second	lary armo
	tetrapods at 1.96m Thick	2080				L	2080.000	
		TOP			Tota	al Quantity	2080.000	each
		4	1997		tal Deducte	d Quantity	0.000 eac	h
	0	ther Er	igineeri	ng Orga	Net Tota	Quantity	2080.000	each
			Say 20	)80.000 each	@ Rs 912.	92 / each	Rs 189	8873.60
5	2.6.1 Earth work in excavat (exceeding 30 cm in de earth, lead up to 50 m a soil	epth, 1.5 m	in width as	well as 10	sqm on pla	n) including	disposal of	excava
	From Chainage 0 to 40m	2	40.000	35.000	2.000		5600.000	
					Tota	al Quantity	5600.000	cum
				То	tal Deducte	d Quantity	0.000 cum	1
					Net Tota	al Quantity	5600.000	cum
			Say 5	5600.000 cur	n @ Rs 214	.03 / cum	Rs 119	8568.00
6	od207107/2023_2024 Supplying and laying necessary overlaps, a		•		,	•	- /	
	departmental officers							

	Northern Groyne 160m Chainage 0 to 160m	1	160.000	40.000			6400.000	
			South	ern Groyne	170m			
	Chainage 0 to 120m	1	120.000	40.000			4800.000	
			1	I	Tota	al Quantity	11200.000	sqm
				To	tal Deducte	d Quantity	0.000 sqm	1
					Net Tota	al Quantity	11200.000	sqm
			Say 1	1200.000 s	qm @ Rs 83	3.20 / sqm	Rs 931	840.00
7	od207108/2023_2024 [Based on 65.32]Supply 1.5T to 2.5T(70% of sto from 2.65 to 2.8 for form stones, hire of lorries a measurements of catag cost of the contractor stationeries and convey of the breakwater to th levels including all cost rehandling, placing and spalls/quarry muck lorries/tippers/cranes departmental officers  Armour la  Northern Groyne 160m Chainage 0 to 160m	ones > 2.0 ning the pring	T) category mary armouseries, labouses after propoved softwar approved aligned levels as percharges, him dusing motion all fine all fine br> 5T to 2.5T series 4521.150	stones of a r and berm r charges reper sorting a reproved representation of the reproved representation of the reproved representation of the representati	pproved quadretuble more taken on printouts us the breakward drawings ational charmspecting the forming the targes etc. Constrict	ality having ount breakwarry and a weigh bridg sing contracter and form with toleranges of mobile profile once he roadward complete as	specific gravater inclusive the sorting plane installed a ctors supplicing the primare of +/- 20 le crane and the in a week any for moves per the design of	vity ranges e of cost of ice and the it site at the ed papers, ary armour cm in final l excavator, and cost of vement of
			South	ern Groyne	120m			
	Chainage 0 to 120m	1	3876.890				3876.890	
					Tota	al Quantity	8398.040	tonne
				To	otal Deducte	<u> </u>	0.000 tonr	
						al Quantity	8398.040	
	1007400/0000 0004		Say 8398	.040 tonne	@ Rs 1781.	12 / tonne	Rs 1495	57917.00
8	od207109/2023_2024 Supplying blasted rock category stones of apprimary armour and be machineries, labour catagorised stones aft contractor with approve	oroved qua erm of rubb charges re er proper s	ality having ole mount be quired at quired are to sorting are to the sorting are th	specific grant reakwater in the control of the cont	avity ranges nclusive of at sorting eigh bridge	s from 2.65 cost of stor place and installed at	to 2.8 for fines, hire of the measure site at the	orming the lorries and ements of cost of the

conveyed to the approved alignment of the breakwater and forming the primary armour of the breakwater to the lines and levels as per approved drawings with tolerance of +/- 20 cm in final levels including all cost and labour charges, hire and operational charges of mobile crane and excavator, rehandling, placing and packing and using mobile crane, inspecting the profile once in a week and cost of spalls/quarry muck and hire of machineries for forming the roadway for movement of lorries/tippers/cranes etc including all incidental charges etc complete as per the direction of departmental officers at site <br/> <br/>br>Ernakulam District Toe Mound using 500 to 800 kg stones (Assuming 1/3 void and sp.gravity 2.7) 5% Northern Groyne 160m Chainage 0 to 1 sinkage 6742.310 1.050 7079.426 160m added Southern Groyne 120m Chainage 0 to 120m 1 4492,020 1.050 4716.622 **Total Quantity** 11796.048 tonne **Total Deducted Quantity** 0.000 tonne **Net Total Quantity** 11796.048 tonne Say 11796.048 tonne @ Rs 1781.12 / tonne Rs 21010177.01 9 od208628/2023\_2024 [Based on 65.30] Supplying granite blasted rock from approved quarry to sorting site by lorry/ tipper, and sorting the stones into 100kg to 300kg category stones of approved quality having specific gravity ranging from 2.65 to 2.8 for forming the core of rubble mound breakwater inclusive of cost of stones, hire of lorries and machineries, labour charges required at quarry and at sorting place and measurements of categorized stones after proper sorting are taken on weigh bridge installed at site at the cost of the contractor with approved software having printouts using contractors supplied papers, stationeries and conveyed to the approved alignment of the breakwater and rehandling and forming the core of the break water to the lines and levels as per the approved drawings and inspecting the profile once in a week with tolerance of +/- 20cm in final levels including all cost and labour charges, hire and operational charges of light crane and cost of spalls/ quarry muck and labour for forming the roadway for movement of lorries/ tippers / cranes etc including all incidental charges etc complete as per the direction of departmental officers at site <br > Ernakulam District Core layer using 100 to 300 kg stones (Assuming 1/3 void and sp.gravity 2.7) 10% Northern Groyne 8898.363 1 8089.420 1.100 160m Chainage 0 to sinkage 160m added Southern Groyne 120m 1 5892.770 1.100 6482.048 Chainage 0 to 120m 15380.411 tonne **Total Quantity Total Deducted Quantity** 0.000 tonne **Net Total Quantity** 15380.411 tonne

			Say 15380	.411 tonne	@ Rs 1610.	75 / tonne	Rs 2477	3997.02
10	od208768/2023_2024 Supplying granite quart into 1 kg to 10 kg cated forming the filter layer charges required at quasorting are taken on whaving printouts using of the breakwater inclused from the size) or any suitable 20T and placing the stable breakwater as per the abire and operational challength of department	gory stones of breakwa arry and at s eigh bridge contractors ding convey le methods ones at se approved di arges of T	s of approve ter inclusive sorting place installed at supplied paragram of the supplied paragram of the supplied at a bed in un rawing and a & P, tippler,	d quality with a of cost of and the most at the pers, station sorting platfinite on a most iform layer design and crane and	th specific of stones, hire easurements cost of the neries and coorm and duroving crane of design to inspecting that incidents	gravity rang of lorries a s of categori contractor v onveyed to t mping stone having a ca hickness fo he profile or	ing from 2.6 and machine ized stones with approve the approvers using tipp apaciaty of norming fillnce in a week	5 to 2.8 f ries, labo after prop ed softwa d alignme ler (3.5x2 ot less tha ter layer ek includir
	·		to 10 kg sto			and sp.grav	vity 2.7)	
	Northern Groyne 160m Chainage 0 to 160m	1	2545.720	34		1 3	2545.720	
		l SI	South	ern Groyne	120m	L	1	
	Chainage 0 to 120m	1	1856.970				1856.970	
			- Open	10,724	Tota	al Quantity	4402.690	tonne
	0	ther En	gineeri	ng Ory	otal Deducte	d Quantity	0.000 tonr	ne
					Net Tota	al Quantity	4402.690	tonne
			Say 4402	.690 tonne	@ Rs 1640	26 / tonne	Rs 722	1556.30
SI No	Description	No	L	В	D	CF	Quantity	Remark
1	2.8.1 Earth work in excavati trenches or drains (not ramming of bottoms, li excavated soil as directions)	on by mec exceeding	g 1.5 m in w i m, includin	ans (Hydra idth or 10 s	ulic excava sqm on plar out the exca	tor) /manua	dressing o	f sides a
	column footing	16	2.100	2.100	1.900		134.064	
	below out side plinth	2*7	3.700	0.450	0.600		13.986	
	cross beam	2	5.800	0.450	0.600		3.132	
	rounded	1	3.818				3.818	
			•		Tota	al Quantity	155.000 c	um
				To	otal Deducte		0.000 cum	
	1					•		

			Say	155.000 cui	m @ Rs 296	5.94 / cum	Rs 46	025.70
2	od207102/2023_2024 Supplying and stacking	good qualit	y coconut p	iles				
	For pile 16 x5 Nos =80 Nos	80	6.000				480.000	
					Tota	al Quantity	480.000 m	netre
				To	tal Deducte	d Quantity	0.000 met	re
					Net Tota	al Quantity	480.000 m	netre
			Say 48	0.000 metre	@ Rs 107.6	64 / metre	Rs 51	667.20
	Coconut Pile- Driving including all hire charg pile driving down after 6x15=90m.	es and labo	our for fixing	g, staging pl	atform and	all other ap	pliances ne	cessary
	For coconut pile	80	6.000	53/4			480.000	
		100	DI		Tota	al Quantity	480.000 m	netre
				To	otal Deducte	d Quantity	0.000 met	re
						al Quantity	480.000 m	
		ther En		0.000 metre			Rs 104	1121.60
4	od207105/2023_2024  Cutting and removing the piles and stacking within	ne excess I					emoving the	e cut end
	avecas langth of pile		1.000					
	excess length of pile	16	1.000				16.000	
	excess length of pile	16	1.000		Tota	al Quantity	16.000 me	etre
	excess length of pile	16	1.000	To	Tota	•		
	excess length of pile	16	1.000	To	otal Deducte	•	16.000 me	re
	excess length of pile	16		To 6.000 metre	otal Deducte Net Tota	d Quantity	16.000 met 0.000 met 16.000 me	re
5	2.18.1 Close timbering over a complete ( Measureme	ureas includ	Say 1	6.000 metre g, shoring a	Net Tota  @ Rs 154.2  and packing	d Quantity al Quantity 21 / metre	16.000 met 0.000 met 16.000 me Rs 24	re etre 167.36 quired) e
5	2.18.1 Close timbering over a	ureas includ	Say 1	6.000 metre g, shoring a	Net Tota  @ Rs 154.2  and packing	d Quantity al Quantity 21 / metre	16.000 met 0.000 met 16.000 me Rs 24	re etre 167.36 quired) e
5	2.18.1 Close timbering over a complete ( Measureme column excavation	reas includents to be t	Say 1	6.000 metre g, shoring a e face area	Net Tota  @ Rs 154.2  and packing	d Quantity al Quantity 21 / metre	16.000 met 0.000 met 16.000 met Rs 24 wherever recovered in 1.	re etre 167.36 quired) e
5	2.18.1 Close timbering over a complete ( Measureme column excavation side	areas includents to be to	Say 1	6.000 metre g, shoring a e face area	Net Tota  @ Rs 154.2  and packing timbered): E	d Quantity al Quantity 21 / metre	16.000 met 0.000 met 16.000 me Rs 24 wherever rececteding 1.	re etre 467.36 quired) e 5 m
5	2.18.1 Close timbering over a complete ( Measureme column excavation side	areas includents to be to	Say 1	6.000 metre g, shoring a e face area 1.200	Net Tota  @ Rs 154.2  and packing timbered): E	d Quantity al Quantity 21 / metre g cavities (v Depth not ex	16.000 met 0.000 met 16.000 met Rs 24 wherever recededing 1. 153.600 1.400	re etre 467.36  quired) e 5 m

			Say	155.000 sqı	m @ Rs 136	6.88 / sqm	Rs 212	216.40	
6	od207106/2023_2024  Providing and laying filter media with granular crushed aggregates as per specification to a thickness not less than 600 mm with smaller size towards the soil and bigger size towards the wall and providir over the entire surface behind abutment, wing wall, return wall to the full height, compacted to fir condition complete as per drawing and technical specification Clause 1204.3.8 of MoRD ncluding cost all materials ,conveyance,labour charges, etc. complete br>								
	bottom of column footing	16	1.900	1.900	0.300		17.328		
	rounding	1	0.672				0.672		
					Tota	al Quantity	18.000 cur	m	
			B	To	otal Deducte	d Quantity	0.000 cum	l	
			100		Net Tota	al Quantity	18.000 cur	m	
			Say	18.000 cum	@ Rs 1679	0.73 / cum	Rs 302	235.14	
7	50.2.3.1  Pumping or Bailing out charges of pumpset, et  For earth work 16		removing slu	ush etc by u	using pump	set including	g cost of lab	our, oil h	
	column	2	8.000				16.000		
	For coconut pilling	1 than En	8.000	n 0 0 0 0 0 0	onicotio	na	8.000		
	cc for footing & soling		8.000			7	8.000		
	reinforcement work,shuttering@ concrete for footing	4	8.000				32.000		
					Tota	al Quantity	64.000 ho	ur	
				To	otal Deducte	d Quantity	0.000 hou	r	
					Net Tota	al Quantity	64.000 ho	ur	
			Say	64 000 hou	ır @ Rs 284	00 / 1	Rs 18	24.40	
	Say 64.000 hour @ Rs 284.60 / hour  4.1.8  Providing and laying in position cement concrete of specified grade excluding the cost of centering an shuttering - All work up to plinth level:1:4:8 (1 cement : 4 coarse sand : 8 graded stone aggregate 4								
8	Providing and laying in	•	ment concr	ete of speci	fied grade e	excluding th	e cost of cer	ntering a	
8	Providing and laying in shuttering - All work up	•	ment concr	ete of speci	fied grade e	excluding th	e cost of cer	ntering a	
8	Providing and laying in shuttering - All work up nominal size)	to plinth le	ement concr	ete of speci	fied grade e 4 coarse sa	excluding th	e cost of cered stone ag	ntering a	
8	Providing and laying in shuttering - All work up nominal size)	to plinth lo	ement concr evel:1:4:8 (	ete of speci 1 cement : 4 1.700	fied grade 6 4 coarse sa 0.200	excluding th	e cost of cered stone ag	ntering a	

	rounded	1	0.260				0.260	
	Tourided	ı	0.260		Tota	ol Ougantitu		<u> </u>
				Т		al Quantity	36.000 cu	
				10	otal Deducte		0.000 cum	
			•	00.000		al Quantity	36.000 cu	
			Say	36.000 cum	ı @ Rs 6814	.89 / cum	Rs 24:	5336.04
9	5.1.2 Providing and laying ir centering, shuttering, fir sand :3 graded stone as	nishing and	reinforceme	nt - All work			_	
	column footing C1 to C16	16	1.500	1.500	0.300		10.800	
		16	((1.5*1.5)+ (.4*.3))/2	M.	0.300		5.688	
	column up to plinth	16	0.300	0.400	1.000		1.920	
	rounded	1	0.592	200	1.41		0.592	
		16	11039		Tota	al Quantity	19.000 cu	m
		144	130	To	otal Deducte	d Quantity	0.000 cum	า
			Marie Control	il a Par	Net Tota	al Quantity	19.000 cu	m
		ther Er	Say ngineeri	19.000 cum	@ Rs 9085	.14 / cum	Rs 172	2617.66
10	5.2.2 Reinforced cement con and string courses, fille excluding cost of cente 3 graded stone aggregations.	ets, column ring, shutte	s, pillars, pie	ers, abutme g and reinfo	nts, posts a	nd struts et	tc. up tot flo	or five level
	plinth beam	2	28.300	0.300	0.300		5.094	
	-do- cross	8	5.800	0.300	0.400		5.569	
	column up to beam C1 to C16	16	0.400	0.300	4.000		7.680	
	roof beam long	2	28.300	0.300	0.350		5.943	
	inglind beam	2*8	3.200	0.300	0.350		5.376	
	roof slab	2	29.500	4.5500	0.120		32.214	
	rounded	1	0.124				0.124	
					Tota	al Quantity	62.000 cu	m
				To	otal Deducte	d Quantity	0.000 cum	า
					Not Tota	ol Ougatitu	00 000	
					Net 10ta	al Quantity	62.000 cu	m

11	5.9.1 Centering and shutter columns, etc for mass	-	g strutting, et	c. and remo	oval of form t	or:Foundat	ions, footing	ıs, base
	Column base	16*4	1.500	0.300			28.800	
	Column up to plinth	16*2	0.400		1.100		14.081	
		16*2	0.300		1.100		10.560	
	rounded	1	0.559				0.559	
					Tota	l Quantity	54.000 sq	m
				To	otal Deducted	d Quantity	0.000 sqm	1
					Net Tota	l Quantity	54.000 sq	m
			Say	y 54.000 sq	m @ Rs 335	.31 / sqm	Rs 18	106.74
12	5.9.3 Centering and shutte landings, balconies a	and access	platform	8.7	emoval of f	orm for:Su		oors, ro
	roof slab bottom	2*7	3.700	3.200	PA.		165.761	
	side projection	2*2	4.500	0.600	7 777		10.800	
	slab projection	2	29.500	1.000			59.000	
	slab projection side	2	29.500	0.120			7.080	
	end side	)th <b>2</b> †2E1	g 4.500 ri	ng0.120 g	anisatio	ns	2.160	
	rounded	1 1	5.199			7	5.199	
					Tota	I Quantity	250.000 s	qm
	-			To	otal Deducted	d Quantity	0.000 sqm	1
					Net Tota	I Quantity	250.000 s	qm
13	5.9.5 Centering and shutter girders bressumers a	J	g strutting, e	·	m @ Rs 815	·		3 <b>945.00</b> inth bea
	plinth beam out side	2	28.300	0.300			16.980	
	plinth beam in side	2*7	3.700	0.300			15.541	
	cross beam	8*2	5.800	0.400			37.120	
	roof beam out side	2	28.300	0.300			16.980	
	roof beam in side	2*7	3.700	0.400			20.721	
	roof beam bottom	2*7	3.700	0.300			15.541	
	inglind beam side	2*8*2	3.200	0.350			35.840	

	rounded	1	0.917				0.917	
					Tota	l Quantity	175.000 s	qm
				To	otal Deducted	d Quantity	0.000 sqn	า
					Net Tota	l Quantity	175.000 s	qm
			Say	175.000 sqr	m @ Rs 649	.82 / sqm	Rs 113	3718.50
14	5.9.6 Centering and shutter Abutments, Posts and	•	ng strutting	յ, etc. and	removal of	form for:C	olumns, Pil	lars, Pier
	column C1 to C16	16*2	0.400	4.000			51.200	
		16*2	0.300	4.000			38.400	
	rounded	1	0.400	S			0.400	
			1/10		Tota	l Quantity	90.000 sq	m
		1	53 U	To	otal Deducted	d Quantity	0.000 sqn	า
		PIL:	1 6	51/1	Net Tota	l Quantity	90.000 sq	m
		150	Say	y 90.000 sqr	m @ Rs 863	.64 / sqm	Rs 77	727.60
15	5.22.6 Steel reinforcement fo					•		
15	Steel reinforcement fo binding all complete u	pto plinth le	evelThermo	- Mechanio	cally Treated	d bars of g	rade Fe-500	OD or mor
15	Steel reinforcement fo binding all complete u	pto plinth le	evelThermo 16.580	- Mechanio		d bars of g	1658.000	@100kg/ m3 @120kg/
15	Steel reinforcement fo binding all complete u	pto plinth letther En	evelThermo	- Mechanio	cally Treated	d bars of g	rade Fe-500	@100kg/ m3 @120kg/ m3
15	Steel reinforcement fo binding all complete u	pto plinth letther En	evelThermo 16.580	- Mechanio	cally Treated	d bars of g	1658.000	@100kg/ m3 @120kg/ m3
15	Steel reinforcement for binding all complete up For column footing column up to plinth	ther En	916.580 1.800	- Mechanio	anisatio	d bars of g	1658.000 216.000	@100kg/ m3 @120kg/ m3 @120kg/ m3
15	Steel reinforcement for binding all complete up For column footing column up to plinth	ther En	916.580 1.800	- Mechanic	anisatio	120.0 120.0 120.0	1658.000 216.000	@100kg/ m3 @120kg/ m3 @120kg/ m3 kilogram
15	Steel reinforcement for binding all complete up For column footing column up to plinth	ther En	916.580 1.800	- Mechanic	Total Deducted	120.0 120.0 120.0	1658.000 216.000 6.000	@100kg/m3 @120kg/m3 @120kg/m3 kilogram
15	Steel reinforcement for binding all complete up For column footing column up to plinth	ther En	1.800 6.000	- Mechanic	Total Deducted	120.0 120.0 120.0 120.0	1658.000 216.000 6.000 1880.000 1880.000	@100kg, m3 @120kg, m3 @120kg, m3 kilogram
16	Steel reinforcement for binding all complete up For column footing column up to plinth	ther En	1.800 6.000 6ay 1880.000	To 0 kilogram @	Total Deducted Net Total @ Rs 98.30 /	120.0 120.0 120.0 120.0 120.0 120.0 120.0	1658.000 216.000 6.000 1880.000 0.000 kilo 1880.000 Rs 184	@ 100kg m3 @ 120kg m3 @ 120kg m3 kilogram gram kilogram
	Steel reinforcement for binding all complete up For column footing column up to plinth rounded  5.22A.6 Steel reinforcement for binding all complete up to plinth rounded	ther En	1.800 6.000 6ay 1880.000	To 0 kilogram @	Total Deducted Net Total @ Rs 98.30 /	120.0 120.0 120.0 120.0 120.0 120.0 120.0	1658.000 216.000 6.000 1880.000 0.000 kilo 1880.000 Rs 184	@ 100kg, m3  @ 120kg, m3  @ 120kg, m3  kilogram gram kilogram 4804.00  osition an
	Steel reinforcement for binding all complete under the column footing column up to plinth rounded  5.22A.6 Steel reinforcement for binding all complete about the complete about the column with the column and the column all complete about the column all colum	ther En	1.800 6.000 6ay 1880.000 ork including level.Therm	To 0 kilogram @	Total Deducted Net Total @ Rs 98.30 /	120.0 120.0 120.0 120.0 120.0 120.0 120.0 120.0 120.0	1658.000  216.000  6.000  1880.000  0.000 kilo  1880.000  Rs 184  placing in p	@ 100kg/m3  @ 120kg/m3  @ 120kg/m3  & 120kg/m3  kilogram  gram kilogram  4804.00  osition and 0D or more  @ 100 kg

				To	otal Deducte	d Quantity	0.000 kg	
					Net Tota	al Quantity	6200.000	kg
			;	Say 6200.00	00 kg @ Rs	98.30 / kg	Rs 609	9460.00
17	7.1.1 Random rubble mason concrete 1:6:12 (1 cemelevel with:Cement mortal)	ent : 6 coar	se sand : 12	2 graded sto	•	J	<b>.</b>	
	below out side plinth beam	2*7	3.700	0.450	0.600		13.986	
	below cross beam	2	5.800	0.450	0.600		3.132	
	rounded	1	0.882	Cont.			0.882	
			160	197	Tota	al Quantity	18.000 cu	m
			6/1	To	otal Deducte	d Quantity	0.000 cum	1
		1	37.9		Net Tota	al Quantity	18.000 cu	m
			Say	18.000 cum	e Rs 7204	1.78 / cum	Rs 129	9686.04
	exceeding 20 cm in dep	oth, consolid						-
	and lift up to 1.5 m.  in betwen plinth beams	the <u>r</u> En	dating each		ayer by ram			n layers not up to 50 m
	and lift up to 1.5 m.	1 5	dating each	deposited la	ayer by ram	ming and wa	atering, lead	-
	and lift up to 1.5 m.  in betwen plinth beams  Back filling footing	the <u>r</u> En	dating each	deposited la	ayer by ram	ming and wa	atering, lead	-
	and lift up to 1.5 m.  in betwen plinth beams  Back filling footing trenches	ther En	dating each 5.700 3.000	deposited la	anisatio	ming and wa	44.290 48.000	up to 50 m
	and lift up to 1.5 m.  in betwen plinth beams  Back filling footing trenches	ther En	dating each  5.700  3.000	ng org	anisatio	ns and wa	44.290 48.000 2.710	up to 50 m
	and lift up to 1.5 m.  in betwen plinth beams  Back filling footing trenches	ther En	dating each  5.700  3.000	ng org	Total Deducte	ns and wa	44.290 48.000 2.710 95.000 cu	up to 50 m
	and lift up to 1.5 m.  in betwen plinth beams  Back filling footing trenches	ther En	3.000 2.710	ng org	Total Deducte	al Quantity d Quantity al Quantity	44.290 48.000 2.710 95.000 cu 0.000 cum	m
19	and lift up to 1.5 m.  in betwen plinth beams  Back filling footing trenches	ther En	3.000 2.710	To	Total Deducte  Net Total  Met Total  Met Total  Met Total	al Quantity d Quantity al Quantity 3.57 / cum	44.290 48.000 2.710 95.000 cu 95.000 cu Rs 24	m m 564.15
19	and lift up to 1.5 m.  in betwen plinth beams  Back filling footing trenches  rounded	ther En	3.000 2.710	To	Total Deducte  Net Total  Met Total  Met Total  Met Total	al Quantity d Quantity al Quantity 3.57 / cum	44.290 48.000 2.710 95.000 cu 95.000 cu Rs 24	m m 564.15
19	and lift up to 1.5 m.  in betwen plinth beams  Back filling footing trenches  rounded  13.7.1  12 mm cement plaster f  For the roof slabs.	ther En	3.000 2.710 Sa	To y 95.000 cu	Total Deducte  Net Total  Met Total  Met Total  Met Total	al Quantity d Quantity al Quantity 3.57 / cum	44.290 48.000 2.710 95.000 cu 0.000 cum 95.000 cu Rs 24	m m 564.15
19	and lift up to 1.5 m.  in betwen plinth beams  Back filling footing trenches  rounded  13.7.1  12 mm cement plaster f  For the roof slabs.  Top	ther En	3.000 2.710  San a floating of 29.500	To y 95.000 cu	Total Deducte  Net Total  Met Total  Met Total  Met Total	al Quantity d Quantity al Quantity 3.57 / cum	44.290 48.000 2.710 95.000 cu 0.000 cum 95.000 cu Rs 24 ement : 3 fine	m m 564.15
19	and lift up to 1.5 m.  in betwen plinth beams  Back filling footing trenches  rounded  13.7.1  12 mm cement plaster f  For the roof slabs.  Top  side	ther En	3.000 2.710  San a floating of 29.500	To y 95.000 cu	Total Deducte  Net Total  Met Total  Met Total  Met Total	al Quantity d Quantity al Quantity 3.57 / cum	44.290 48.000 2.710 95.000 cu 0.000 cum 95.000 cu Rs 24 ement : 3 fine 268.450 7.670	m m 564.15

				To	otal Deducte	d Quantity	0.000 sqn	า
					Net Tota	al Quantity	280.000 s	qm
			Say	280.000 sq	m @ Rs 401	.21 / sqm	Rs 112	2338.80
20	13.16.1 6 mm cement plaster of	mix:1:3 ( 1	cement: 3	fine sand)				
	For cross beams side	2*8	6.200	0.350			34.720	
	bottom	8	6.200	0.300			14.880	
	long beam in side	2*7	3.700	0.400			20.721	
	long beam out side	2	28.300	0.300			16.980	
	bottom	2*7	3.700	0.300			15.541	
	slab bottom	2*7	3.700	3.200			165.761	
	roof projection end	2*2	4.500	0.600			10.800	
	out side beam projection side	2	29.500	1.050		u.	61.950	
	column	16	4.000	1.400	13		89.600	
		1	4.047	1.000		200	4.047	
		K S			Tota	al Quantity	435.000 s	qm
		.1 E			otal Deducte	d Quantity	0.000 sqn	า
		ther En	igineeri	ng Org	anisatio Net Tota	nS al Quantity	435.000 s	qm
			Say	435.000 sq	m @ Rs 267	7.59 / sqm	Rs 110	6401.65
21	13.4.1 12 mm cement plaster of	of mix:1:4 (	1 cement : 4	coarse sar	nd)			
	Auction hall floor	1	28.300	6.400			181.120	
	Rounded	1	3.880				3.880	
					Tota	al Quantity	185.000 s	qm
				To	otal Deducte	d Quantity	0.000 sqn	n
					Net Tota	al Quantity	185.000 s	qm
			Say	185.000 sq	m @ Rs 325	5.01 / sqm	Rs 60	126.85
22	13.43.1 Applying one coat of surface:Water thinnab			nt primer o	of approved	l brand and	l manufacti	ure on wa
	roof beam side & bottom	8	6.200	1.000			49.600	
	long beam out side	2	28.300	0.400			22.640	
	inside	2*7	3.700	0.400			20.721	

	bottom	2*7	3.700	0.300			15.541	
	slab bottom	2*7	3.700	3.200			165.761	
	roff projection end	2*2	4.500	0.600			10.800	
	roff projection side	2	29.500	1.050			61.950	
	column	16	4.000	1.400			89.600	
	side end	2	9.050	0.130			2.353	
	projection side	2	29.500	0.130			7.670	
	top of roof slab	2	29.500	4.550			268.450	
	rounded	1	4.914				4.914	
				in.	Tot	al Quantity	720.000 s	qm
	1		1/60	To	otal Deducte	ed Quantity	0.000 sqm	า
			6.1		Net Tot	al Quantity	720.000 s	qm
			Say	y 720.000 so	qm @ Rs 70	0.64 / sqm	Rs 50	860.80
	@ 3.84 kg/10 sqm)	1114	50	Ley,				ı
	@ 3.84 kg/10 sqm) slab bottom	2*7	3.700	3.200	A=20		165.761	
		2*7 2*2 Ther Er	3.700 4.500	3.200 0.600	anisatio	ins	165.761	
	slab bottom		1,000		anisatio	ons		
	slab bottom roof projection end	2*2 ther Er	4.500	0.600 ng ()rg	anisatio	ons	10.800	
	slab bottom roof projection end	2*2 ther Er	4.500 1911eeri 29.500	0.600 ng ()rg	anisatio	ons al Quantity	10.800 61.950	qm
	slab bottom roof projection end	2*2 ther Er	4.500 1911eeri 29.500	0.600 1.050		al Quantity	10.800 61.950 1.489	•
	slab bottom roof projection end	2*2 ther Er	4.500 1911eeri 29.500	0.600 1.050	otal Deducte		10.800 61.950 1.489 240.000 s	1
	slab bottom roof projection end	2*2 ther Er	4.500 9.500 1.489	0.600 1.050	otal Deducte	ed Quantity	10.800 61.950 1.489 240.000 s 0.000 sqm 240.000 s	qm
24	slab bottom roof projection end	2*2 ther En	4.500 29.500 1.489 Say	0.600 1.050 To 240.000 sqr	Net Tot m @ Rs 10 ed shade:N	ed Quantity al Quantity 7.39 / sqm	10.800 61.950 1.489 240.000 s 0.000 sqm 240.000 s Rs 25	qm 773.60
24	slab bottom roof projection end roof projection side  13.46.1 Finishing walls with Ac	2*2 ther En	4.500 29.500 1.489 Say	0.600 1.050 To 240.000 sqr	Net Tot m @ Rs 10 ed shade:N	ed Quantity al Quantity 7.39 / sqm	10.800 61.950 1.489 240.000 s 0.000 sqm 240.000 s Rs 25	qm 773.60
24	slab bottom roof projection end roof projection side  13.46.1 Finishing walls with Ac @ 1.67 ltr/10 sqm over	2*2 ther Er 2 D1 rylic Smoot	4.500 29.500 1.489 Say h exterior paing priming of	0.600 To 240.000 sqr int of require coat of exter	Net Tot m @ Rs 10 ed shade:N	ed Quantity al Quantity 7.39 / sqm	10.800 61.950 1.489 240.000 s 0.000 sqm 240.000 s Rs 25	qm 773.60
24	slab bottom roof projection end roof projection side  13.46.1 Finishing walls with Ac @ 1.67 ltr/10 sqm over	2*2 ther Er 2  Trylic Smoot and includ	4.500 29.500 1.489 Say h exterior paing priming of 6.200	0.600 To 240.000 sqr int of require coat of exter 1.000	Net Tot m @ Rs 10 ed shade:N	ed Quantity al Quantity 7.39 / sqm	10.800 61.950 1.489 240.000 s 0.000 sqm 240.000 s Rs 25	qm 773.60
24	slab bottom roof projection end roof projection side  13.46.1 Finishing walls with Ac @ 1.67 ltr/10 sqm over roof beam allround long beam out side	2*2 ther Er 2  Trylic Smoot and includ 8 2	4.500 29.500 1.489 Say h exterior paing priming of 6.200 28.300	0.600 To 240.000 sqr int of require coat of exter 1.000 0.300	Net Tot m @ Rs 10 ed shade:N	ed Quantity al Quantity 7.39 / sqm	10.800 61.950 1.489 240.000 s 0.000 sqm 240.000 s Rs 25 wo or more of 20 kg/10 squ 49.600 16.980	qm <b>773.60</b>
24	slab bottom roof projection end roof projection side  13.46.1 Finishing walls with Ac @ 1.67 ltr/10 sqm over roof beam allround long beam out side long beam in side	2*2 ther Er 2  D1  rylic Smoot and includ  8 2 2*7	4.500 29.500 1.489 Say h exterior paing priming of 6.200 28.300 3.700	0.600 To 240.000 sqr int of require coat of exter 1.000 0.300 0.400	Net Tot m @ Rs 10 ed shade:N	ed Quantity al Quantity 7.39 / sqm	10.800 61.950 1.489 240.000 s 0.000 sqm 240.000 s Rs 25 wo or more of 20 kg/10 squ 49.600 16.980 20.721	qm <b>773.60</b>
24	slab bottom roof projection end roof projection side  13.46.1 Finishing walls with Ac @ 1.67 ltr/10 sqm over roof beam allround long beam out side long beam in side bottom	rylic Smoot and includ 8 2 2*7 2*7	4.500 29.500 1.489 Say h exterior paing priming of 6.200 28.300 3.700 3.700	0.600 To 240.000 sqr int of require coat of exter 1.000 0.300 0.400 0.300	Net Tot m @ Rs 10 ed shade:N	ed Quantity al Quantity 7.39 / sqm	10.800 61.950 1.489 240.000 s 0.000 sqm 240.000 s Rs 25 vo or more of 20 kg/10 squ 49.600 16.980 20.721 15.541	qm 773.60

	side end	2	9.050	0.130			2.353		
		1	4.085				4.085		
					Tot	al Quantity	475.000 s	sqm	
				To	otal Deducte	ed Quantity	0.000 sqr	n	
					Net Tot	al Quantity	475.000 s	sqm	
			Say	475.000 sq	m @ Rs 193	3.89 / sqm	Rs 92	2097.75	
SI No	Description	No	L	В	D	CF	Quantity	Rema	
		3 Append	dix C- consti	ruction of T	Toilet block				
1	2.8.1 Earth work in excavation trenches or drains (not ramming of bottoms, line excavated soil as direct toilet block foundation	exceedin ft up to 1. cted, within	g 1.5 m in w 5 m, includir n a lead of 5	ridth or 10 s ng getting o 50 m.All kin	sqm on plan out the exca ds of soil	n), including	g dressing o	of sides	
	all round	1	35.500	0.800	0.750		21.300		
	crosswall long	2	11.500	0.800	0.750		13.800		
	cross	1	6.050	0.800	0.750	Age of	3.630		
		1	3.150	0.800	0.750		1.891		
	bath room	1	4.800	0.800	0.750		2.880		
	ramp	ther E	ngineeri 4.500	ng () rg	anisatio 0.750	ns	5.400		
	step	1	3.500	1.200	0.600		2.520		
		1	3.000	0.800	0.750		1.801		
	setitank	1	6.700	2.400	2.000		32.160		
	sock pit	1	1.800	1.800	1.500		4.860		
		1	4.758				4.758		
					Tot	al Quantity	95.000 cu	ım	
				To	otal Deducte	ed Quantity	0.000 cur	n	
	Net Total Quantity 95.000 cum								
			Sa	y 95.000 cu	m @ Rs 296	6.94 / cum	Rs 28	3209.30	
2	2.26.1 Extra for every addition		5 m or part	there of in	excavation	n / banking	excavated	or stac	
	tank	1	6.700	2.400	0.500		8.040		
			4.000				1.960		
	rounded	1	1.960				1.900		

				To	otal Deducted	d Quantity	0.000 cum	1	
					Net Tota	al Quantity	10.000 cu	m	
			Say	y 10.000 cui	m @ Rs 106	.37 / cum	Rs 10	63.70	
3	4.1.8 Providing and laying in shuttering - All work up nominal size)	-		•	•	•		-	
	toilet block foundation all round	1	35.500	0.800	0.150		4.260		
	crosswall long	2	11.500	0.800	0.150		2.761		
	cross	1	6.050	0.800	0.150		0.726		
		1	3.150	0.800	0.150		0.378		
	bath room	1	4.800	0.800	0.150		0.576		
	ramp	2	4.500	0.800	0.150		1.080		
	step	1	3.500	1.200	0.150		0.630		
		1	3.000	0.800	0.150	i.	0.361		
	setitank	1	6.700	2.400	0.200		3.216		
	floor room	1	12.150	4.800	0.100		5.833		
	ramp& varandha	thet En	g13.500ri	n g1.200 g	an¢490io	ns	1.620		
	rounded	1	0.559			7	0.559		
					Tota	l Quantity	22.000 cu	m	
		0.000 cum							
		22.000 cum							
	Say 22.000 cum @ Rs 6814.89 / cum							927.58	
4	7.1.1  Random rubble masonry with hard stone in foundation and plinth including levelling up with cemer concrete 1:6:12 (1 cement : 6 coarse sand : 12 graded stone aggregate 20 mm nominal size) up to plint level with:Cement mortar 1:6 (1 cement : 6 coarse sand)								
	toilet block foundation all round	1	35.500	0.600	0.600		12.780		
	crosswall long	2	11.500	0.600	0.600		8.280		
	cross	1	6.050	0.600	0.600		2.178		
		1	3.150	0.600	0.600		1.134		
	bath room	1	4.800	0.600	0.600		1.728		
	ramp	2	4.500	0.600	0.600		3.240		

6	exceeding 20 cm in dep and lift up to 1.5 m.  for foundation  varandha  rounded  5.2.2  Reinforced cement cond and string courses, fille excluding cost of center 3 graded stone aggregate basement allround cross	1 1 1 crete work ts, columning, shutte	11.550 7.000 4.823 Say in walls (anyons, pillars, piering, finishin	3.900 0.750  To y 35.000 cur y thickness), ers, abutme g and reinform	O.600  O.600  Total Qu  otal Deducted Qu  Net Total Qu  m @ Rs 258.57 /  , including attach	and water  antity  antity  antity  cum  and water  antity  antity  cum  antity  antity  cum	27.027 3.150 4.823 35.000 cu 0.000 cum 35.000 cu Rs 90 ters, buttre	m 049.95 sses, p		
6	and lift up to 1.5 m.  for foundation  varandha  rounded  5.2.2  Reinforced cement cond and string courses, fille excluding cost of center 3 graded stone aggrega	1 1 1 crete work ts, column ing, shutte tte 20 mm	11.550 7.000 4.823  Say in walls (anyons, pillars, piering, finishin nominal size	3.900 0.750  To y 35.000 cur y thickness) ers, abutme g and reinfo	O.600  O.600  Total Qu  Otal Deducted Qu  Net Total Qu  Met Total Qu  Met Total Qu  in @ Rs 258.57 /  including attach ents, posts and si orcement :1:1.5:3	and water  antity  antity  antity  cum  and water  antity  antity  cum  antity  antity  cum	27.027 3.150 4.823 35.000 cu 0.000 cum 35.000 cu Rs 90 ters, buttre up tot flocent: 1.5 cc	m 049.95 sses, p		
6	and lift up to 1.5 m.  for foundation  varandha  rounded  5.2.2  Reinforced cement condand string courses, fille excluding cost of center	1 1 1 crete work ts, columning, shutte	11.550 7.000 4.823 Say in walls (anyons, pillars, piering, finishin	3.900 0.750  To y 35.000 cur y thickness), ers, abutme g and reinform	O.600  O.600  Total Qu  otal Deducted Qu  Net Total Qu  m @ Rs 258.57 /  , including attach	and water  antity  antity  antity  cum  and water  antity  antity  cum  antity  antity  cum	27.027 3.150 4.823 35.000 cu 0.000 cum 35.000 cu Rs 90 ters, buttre	m 049.95 sses, p		
	and lift up to 1.5 m. for foundation varandha rounded	1	7.000 4.823	3.900 0.750	0.600  O.600  Total Questal Deducted Questal Deducted Questal	and water	27.027 3.150 4.823 35.000 cu 0.000 cum	m m		
	and lift up to 1.5 m. for foundation varandha	1	11.550 7.000	3.900 0.750	0.600  0.600  Total Quotal Deducted Qu	and water	27.027 3.150 4.823 35.000 cu	up to 5		
	and lift up to 1.5 m. for foundation varandha	1	11.550 7.000	3.900 0.750	0.600  O.600  Total Qu	and wate	27.027 3.150 4.823 35.000 cu	up to 5		
	and lift up to 1.5 m. for foundation varandha	1	11.550 7.000	deposited la	0.600 0.600	and water	27.027 3.150 4.823	up to 5		
	and lift up to 1.5 m. for foundation varandha	1	11.550 7.000	deposited la	o.600		ering, lead 27.027 3.150	•		
	and lift up to 1.5 m. for foundation	1	11.550	deposited la	o.600		ering, lead 27.027	•		
	and lift up to 1.5 m.		D	deposited la	ayer by ramming		ering, lead	•		
		th, consol	idating each	10 0 ()100	anications			•		
5	2.25 Filling available excavated earth (excluding rock) in trenches, plinth, sides of foundation etc. in layers exceeding 20 cm in depth, consolidating each deposited layer by ramming and watering, lead up to 50									
		cum /	Rs 374648.56							
		- 1	52.000 cum							
		(1)	DAME	To	otal Deducted Qu		0.000 cum			
	. Cariaca		0.000	9 6	Total Qu	antity	52.000 cu	m		
	rounded	1	0.508	0100	0.400		0.508			
	partition	10	1.500	0.450	0.450		3.038			
	ramp	1	3.000	0.450	0.300	$\longrightarrow$	0.608			
	bath room	1 2	4.800 3.150	0.450	0.450		0.973			
	hath room	1	3.150	0.450	0.450		0.638			
	cross	1	6.050	0.450	0.450		1.226			
	crosswall long	2	11.500	0.450	0.450		4.658			
	toilet block basement all round	1	35.500	0.450	0.450		7.189			
		1	3.000	0.600	0.600		1.080			
			3.500	1.200	0.450		1.891			

		1	3.150	0.450	0.100		0.142	
	bath	1	4.800	0.450	0.100		0.217	
	ramp	1	3.150	0.450	0.100		0.142	
		1	3.000	0.450	0.100		0.135	
	partition	10	1.500	0.450	0.100		0.675	
	lintel	1	76.000	0.150	0.150		1.710	
	roof slab	1	12.750	5.800	0.120		8.874	
	slop	1	39.450	1.000	0.120		4.734	
	tank bottom	1	6.000	2.100	0.150		1.891	
	beam	1	2.100	0.200	0.200		0.085	
	cover slab	1	6.000	2.100	0.120		1.512	
		1	1.800	1.800	0.120		0.389	
	rounded	1	0.105	8. 7	1 1		0.105	
					Tota	I Quantity	23.000 cu	m
		J. L.T.	1040	To	otal Deducted	d Quantity	0.000 cum	1
		166			Net Tota	I Quantity	23.000 cu	m
		460	Say 2		Net Tota @ Rs 10954.	-		m 1 <b>942.92</b>
7	5.9.3 Centering and shulandings, balconies		ngineeri ng strutting	3.000 cum	@ Rs 10954. anisatio	.04 / cum	Rs 251	942.92
7	Centering and shu	ttering includi	ngineeri ng strutting	3.000 cum	@ Rs 10954. anisatio	.04 / cum	Rs 251	942.92
7	Centering and shull landings, balconies	ttering includi and access	ngineeri ng strutting platform	3.000 cum	@ Rs 10954. anisatio	.04 / cum	Rs 251	942.92
7	Centering and shur landings, balconies basement top	ttering includi s and access 2	ngineering strutting platform	3.000 cum  ng Org , etc. and r	@ Rs 10954. anisatio	.04 / cum	Rs 251	942.92
7	Centering and shur landings, balconies basement top	ttering includi s and access 2 2	ng strutting platform 35.500	3.000 cum  ng Org , etc. and r  0.100  0.100	@ Rs 10954. anisatio	.04 / cum	7.101 2.301	942.92
7	Centering and shur landings, balconies basement top	ttering includi s and access 2 2 2	ng strutting platform  35.500  11.500  6.050	3.000 cum  ng Org , etc. and r  0.100  0.100  0.100	@ Rs 10954. anisatio	.04 / cum	7.101 2.301 1.210	942.92
7	Centering and shulandings, balconies basement top	ttering includi s and access 2 2 2 2	11.500 6.050 3.150	3.000 cum  ng Org , etc. and r  0.100  0.100  0.100  0.100	@ Rs 10954. anisatio	.04 / cum	7.101 2.301 1.210 0.630	942.92
7	Centering and shulandings, balconies basement top cross	ttering includi s and access 2 2 2 2 2	11.500 6.050 3.150 4.800	3.000 cum  ng Org , etc. and r  0.100  0.100  0.100  0.100  0.100	@ Rs 10954. anisatio	.04 / cum	7.101 2.301 1.210 0.630 0.960	942.92
7	Centering and shur landings, balconies basement top cross bath	ttering includi s and access 2 2 2 2 2 2	gineering strutting platform  35.500  11.500  6.050  3.150  4.800  6.150	3.000 cum  ng Org , etc. and i  0.100  0.100  0.100  0.100  0.100  0.100	@ Rs 10954. anisatio	.04 / cum	7.101 2.301 1.210 0.630 0.960 1.231	942.92
7	Centering and shur landings, balconies basement top cross  bath ramp partition	ttering includi s and access 2 2 2 2 2 2 2 10*2	11.500 6.050 3.150 4.800 6.150	3.000 cum  ng Orga , etc. and i  0.100  0.100  0.100  0.100  0.100  0.100  0.100	@ Rs 10954. anisatio	.04 / cum	7.101 2.301 1.210 0.630 0.960 1.231 3.001	942.92
7	Centering and shurlandings, balconies basement top cross bath ramp partition lintel	ttering includi s and access 2 2 2 2 2 2 2 10*2	11.500 6.050 3.150 4.800 6.150 1.500 76.000	3.000 cum  ng Orga , etc. and i  0.100  0.100  0.100  0.100  0.100  0.100  0.100  0.100  0.100	@ Rs 10954. anisatio	.04 / cum	7.101 2.301 1.210 0.630 0.960 1.231 3.001 22.800	942.92
7	Centering and shur landings, balconies basement top cross bath ramp partition lintel roof slab	ttering includi s and access 2 2 2 2 2 2 10*2 2	11.500 6.050 3.150 4.800 6.150 1.500 76.000	3.000 cum  ng Orga , etc. and i  0.100  0.100  0.100  0.100  0.100  0.100  5.800	@ Rs 10954. anisatio	.04 / cum	7.101 2.301 1.210 0.630 0.960 1.231 3.001 22.800 73.950	942.92
7	Centering and shur landings, balconies basement top cross  bath ramp partition lintel roof slab slop	ttering includi s and access 2 2 2 2 2 2 10*2 2 1 1	11.500 6.050 3.150 4.800 6.150 1.500 76.000 12.750 39.450	3.000 cum ng Orga , etc. and i  0.100  0.100  0.100  0.100  0.100  0.100  0.100  1.000  1.000	@ Rs 10954. anisatio	.04 / cum	7.101 2.301 1.210 0.630 0.960 1.231 3.001 22.800 73.950 39.450	942.92

		3	4.800	0.120			1.728	
		1	0.914				0.914	
					Tot	al Quantity	170.000 s	qm
				То	tal Deducte	d Quantity	0.000 sqn	า
					Net Tot	al Quantity	170.000 s	qm
			Say	170.000 sqr	m @ Rs 815	5.78 / sqm	Rs 138	3682.60
8	5.22A.6 Steel reinforcement binding all complete		-		•	•		
	qty of cc	1	22.895	.63		100.0	2289.500	@100kg m3
	rounded	1	10.500				10.500	@100kg m3
			CT 3	K. W	Tot	al Quantity	2300.000	kg
		1/2	11555	То	tal Deducte	d Quantity	0.000 kg	
		2300.000 kg						
		4.51	15/200	1000	Net Tot	ar Quartity		9
9	50.6.2.2 Solid masonry using confirming to IS 2185	TITHOU L	lid blocks (fac		00 kg @ Rs of size 30x	98.30 / kg	Rs 220	6090.00 ailable si
9	Solid masonry using confirming to IS 2185	part I of 19 arse sand) e	lid blocks (fac 79 for super setc complete	ctory made) structure up	of size 30x	98.30 / kg	Rs 220 r nearest av thickness 15	6090.00 ailable si
9	Solid masonry using confirming to IS 2185 1:6 ( 1 cement : 6 coawall all round	5 part I of 19 arse sand) e	lid blocks (fac 79 for super etc complete 34.500	ctory made) structure up 2.800	of size 30x to floor two 0.150	98.30 / kg	Rs 220 r nearest av thickness 15 14.490	6090.00
9	Solid masonry using confirming to IS 2185 1:6 ( 1 cement : 6 coawall all round cross wal	o part I of 19 arse sand) e	lid blocks (fac 179 for super setc complete 34.500 12.150	etory made) structure up 2.800 2.800	of size 30x to floor two 0.150	98.30 / kg	r nearest averthickness 15	6090.00
9	Solid masonry using confirming to IS 2185 1:6 ( 1 cement : 6 coawall all round	part Fof 19 arse sand) e 1 1	lid blocks (fac 179 for super setc complete 34.500 12.150 3.150	etory made) structure up 2.800 2.800 2.800	00 kg @ Rs of size 30x to floor two 0.150 0.150	98.30 / kg	Rs 220 r nearest average thickness 15 14.490 5.103 1.323	6090.00
9	Solid masonry using confirming to IS 2185 1:6 (1 cement: 6 coawall all round cross wall centre cross	part Fof 19 arse sand) e 1 1 1	lid blocks (fac 179 for super setc complete 34.500 12.150 3.150 6.050	2.800 2.800 2.800 2.800	0 kg @ Rs of size 30x to floor two 0.150 0.150 0.150	98.30 / kg	Rs 220 r nearest average thickness 15 14.490 5.103 1.323 2.541	6090.00
9	Solid masonry using confirming to IS 2185 1:6 (1 cement: 6 coawall all round cross wall centre cross	part Fof 19 arse sand) e 1 1 1 1	lid blocks (fac 179 for super setc complete 34.500 12.150 3.150 6.050 4.800	2.800 2.800 2.800 2.800 2.800	0 kg @ Rs of size 30x to floor two 0.150 0.150 0.150 0.150	98.30 / kg	Rs 220 r nearest average thickness 15  14.490  5.103  1.323  2.541  2.016	6090.00
9	Solid masonry using confirming to IS 2185 1:6 (1 cement: 6 coawall all round cross wall centre cross	part F of 19 arse sand) arse sand) arse sand) arse sand) arse sand) arse sand) arse sand are	lid blocks (fac 179 for super setc complete 34.500 12.150 3.150 6.050 4.800 16.200	2.800 2.800 2.800 2.800 1.800	0 kg @ Rs of size 30x to floor two 0.150 0.150 0.150 0.150 0.200	98.30 / kg	Rs 220 r nearest average thickness 15 14.490 5.103 1.323 2.541 2.016 5.833	6090.00
9	Solid masonry using confirming to IS 2185 1:6 (1 cement: 6 coawall all round cross wall centre cross bath septitank step	part F of 19 arse sand) e	lid blocks (fac 179 for super setc complete 34.500 12.150 3.150 6.050 4.800 16.200 3.000	2.800 2.800 2.800 2.800 2.800	0 kg @ Rs of size 30x to floor two 0.150 0.150 0.150 0.150	98.30 / kg	Rs 220 r nearest average thickness 15 14.490 5.103 1.323 2.541 2.016 5.833 0.810	6090.00
9	Solid masonry using confirming to IS 2185 1:6 (1 cement: 6 coawall all round cross wall centre cross bath septitank step rounded	1 1 1 1 1 1 1	lid blocks (fac 179 for super setc complete 34.500 12.150 3.150 6.050 4.800 16.200 3.000 0.593	2.800 2.800 2.800 2.800 2.800 1.800 0.600	0 kg @ Rs of size 30x to floor two 0.150 0.150 0.150 0.150 0.450	98.30 / kg	Rs 220 r nearest average thickness 15 14.490 5.103 1.323 2.541 2.016 5.833 0.810 0.593	6090.00 ailable si
9	Solid masonry using confirming to IS 2185 1:6 (1 cement: 6 coa wall all round cross wal centre cross bath septitank step rounded shutter	1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	lid blocks (fac 179 for super setc complete 34.500 12.150 3.150 6.050 4.800 16.200 3.000 0.593 3.000	2.800 2.800 2.800 2.800 2.800 1.800 0.600	0 kg @ Rs of size 30x to floor two 0.150 0.150 0.150 0.200 0.450	98.30 / kg	Rs 220 r nearest average thickness 15 14.490 5.103 1.323 2.541 2.016 5.833 0.810 0.593 -1.079	6090.00 ailable si
9	Solid masonry using confirming to IS 2185 1:6 (1 cement: 6 coawall all round cross wall centre cross bath septitank step rounded	1 1 1 1 1 1 1	lid blocks (fac 179 for super setc complete 34.500 12.150 3.150 6.050 4.800 16.200 3.000 0.593	2.800 2.800 2.800 2.800 2.800 1.800 0.600	0 kg @ Rs of size 30x to floor two 0.150 0.150 0.150 0.200 0.450 0.150	98.30 / kg	Rs 220 r nearest average thickness 15  14.490 5.103 1.323 2.541 2.016 5.833 0.810 0.593 -1.079 -0.630	ailable si
9	Solid masonry using confirming to IS 2185 1:6 (1 cement: 6 coa wall all round cross wal centre cross bath septitank step rounded shutter	1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	lid blocks (fac 179 for super setc complete 34.500 12.150 3.150 6.050 4.800 16.200 3.000 0.593 3.000	2.800 2.800 2.800 2.800 2.800 1.800 0.600	0 kg @ Rs of size 30x to floor two 0.150 0.150 0.150 0.150 0.450  0.150 Tot	98.30 / kg 20x15cm or blevel with the second	Rs 220 r nearest average thickness 15 14.490 5.103 1.323 2.541 2.016 5.833 0.810 0.593 -1.079 -0.630 32.709 cu	m
9	Solid masonry using confirming to IS 2185 1:6 (1 cement: 6 coa wall all round cross wal centre cross bath septitank step rounded shutter	1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	lid blocks (fac 179 for super setc complete 34.500 12.150 3.150 6.050 4.800 16.200 3.000 0.593 3.000	2.800 2.800 2.800 2.800 2.800 1.800 0.600	0 kg @ Rs of size 30x to floor two 0.150 0.150 0.150 0.150 0.450  0.150 Total Deducte	98.30 / kg 20x15cm or blevel with the second	Rs 220 r nearest average thickness 15  14.490 5.103 1.323 2.541 2.016 5.833 0.810 0.593 -1.079 -0.630	m m

10	50.6.3.2 Solid block masonry usize confirming to IS CM 1:6 (1 cement : 6	2185 part I c	of 1979 for s	uper structu	ire up to floor	two level			
	toilet partition	10	1.500	2.800	0.100		4.200		
	urinal partition	2	1.000	1.400	0.100		0.280		
	parapet	1	37.100	0.600	0.100		2.227		
	seititank partition	2	1.700	1.000	0.100		0.340		
	sock pit	4	1.700	1.200	0.100		0.817		
	rounded	1	0.459				0.459		
	door D1	9	0.700	2.100	0.100		-1.323		
	Total Quantity						8.323 cum		
	Total Deducted Quantity						-1.323 cur	n	
		613	X 2	35. X	Net Total	Quantity	7.000 cum		
		1/2	Sa	y 7.000 cum	n @ Rs 7823.6	31 / cum	Rs 54	765.27	
11	13.1.1 12 mm cement plaster of mix:1:4 ( 1 cement : 4 fine sand)								
	out side wall	1	35.300	2.800			98.840		
	Parapet (	Othet Er	937.100 i	n o1.400 o	anisation	1S	51.940		
	toilet inside	10	5.400	2.800			151.200		
	DA toilet	2	6.600	2.800	) H		36.960		
	out side	2	4.800	2.800			26.880		
	bath	1	6.500	2.800			18.200		
	partition	2	3.150	2.800			17.640		
		1	5.300	2.800			14.840		
		1	5.500	2.800			15.400		
		1	3.200	2.800			8.960		
		1	4.850	2.800			13.580		
		1	2.500	2.800			7.000		
	urinal partition	2	2.100	1.500			6.301		
	under side slab	1	12.750	5.800			73.950		
		1	39.450	1.000			39.450		
	rounded	1	5.927				5.927		
	door D	2	1.000	2.100			-4.200		

	toilet door D1	11	0.700	2.100			-16.169	
	ventilator	15	0.600	0.500			-4.500	
	shutter	1	3.000	2.400			-7.199	
					Tot	tal Quantity	587.068 s	qm
				T	otal Deducte	ed Quantity	-32.068 s	qm
					Net Tot	tal Quantity	555.000 s	qm
			Say	555.000 sq	ım @ Rs 31	4.09 / sqm	Rs 174	4319.95
12	13.7.1 12 mm cement plast	er finished wit	th a floating o	coat of neat	cement of r	mix:1:3 ( 1 ce	ement : 3 fin	e sand)
	slab top	1	12.750	5.800			73.950	
		1	39.450	1.000			39.450	
	rounded	1	1.600				1.600	
			G+7 9		Tot	tal Quantity	115.000 s	qm
		$f \downarrow L$		31/24	otal Deducte	ed Quantity	0.000 sqn	า
					Net Tot	tal Quantity	115.000 s	qm
		24/45	Say	115.000 so	ım @ Rs 40	1.21 / sqm	Rs 46	139.15
	Septi tank inside	Other E	15.400	ng Org 1.800	anisatio	ons	27.721	
	bottom	1	6.000	1.700			10.200	
	partition wall	2*2	1.700	1.000			6.800	
	roumnded	1	0.279				0.279	
					Tot	tal Quantity	45.000 sq	m
				T	otal Deducte	ed Quantity	0.000 sqn	า
					Net Tot	tal Quantity	45.000 sq	m
			Sa	y 45.000 sq	ım @ Rs 38	6.36 / sqm	Rs 17	386.20
14	8.31 Providing and fixing by the manufacturer any size as approve of cementmortar 1:3 including pointing in	r), of approve d by Enginee 3 (1 cement :	d make, in a rin-Charge,ir 3 coarse sa	ıll colours,s n skirting, ri nd) and joir	shades exce sers of step nting with g	ept burgundy s and dados rey cement s	v, bottle gree s, over 12 m slurry @3.3	en, blac m thick
	0. 0				]			
	toilet	11	4.700	1.800			93.000	
	toilet  DA toilet	11	4.700 5.600	1.800			93.060	

	urinal portion	3	2.600	1.600			12.480	
	rounded	1	3.860				3.860	
					Tota	al Quantity	140.000 s	qm
				To	tal Deducte	d Quantity	0.000 sqm	1
					Net Tota	al Quantity	140.000 s	qm
			Say 1	40.000 sqm	@ Rs 1212	2.78 / sqm	Rs 169	789.20
15	11.37 Providing and laying manufacturer), of 1st of Grey, Fume Red Brown pointing the joints with	quality confo vn, laid on 2	rming to IS:	15622, of a cement mor	pproved ma tar 1:4 (1 C	ke, in colou ement : 4 0	rs such as V	Vhite, Ivor
	inside floor	1	12.150	4.800			58.320	
	Rounded	1	1.680	1130	-		1.680	
		1	35.3	K V	Tota	al Quantity	60.000 sq	m
				To	tal Deducte	d Quantity	0.000 sqm	ı
		1 155		March 1	Net Tota	al Quantity	60.000 sq	m
16	od207112/2023_2024 :Providing and laying i	ndustrial gra	nde antiskid t	na I lra	300x300mm	with thickne	ess 9mn	
16	_	ndustrial gra n less than d on 20 mi	ide antiskid t 0.08 % and m thick cen	iles of size 3 conforming	300x300mm g to I.S. 150 1:4 (1 cer	with thicknown of the contract	ess 9mn proved make parse sand)	n or neares e, in al
16	:Providing and laying i with water absorption colours & shades,lai	ndustrial gra n less than d on 20 mi	ide antiskid t 0.08 % and m thick cen	iles of size 3 conforming	300x300mm g to I.S. 150 1:4 (1 cer	with thicknown of the contract	ess 9mn proved make parse sand)	n or neares e, in al
16	:Providing and laying i with water absorption colours & shades,lai grouting the join	ndustrial gra i less than d on 20 mi t with white	nde antiskid t 0.08 % and m thick cem cement &	iles of size 3 conforming nent mortar matching p	300x300mm g to I.S. 150 1:4 (1 cer	with thicknown of the contract	ess 9mn proved make parse sand) e.	n or neares e, in a
16	:Providing and laying i with water absorption colours & shades,lai grouting the join	ndustrial gra i less than d on 20 mi t with white 2	nde antiskid t 0.08 % and m thick cem cement & 5.200	iles of size 3 conforming nent mortar matching p	300x300mm g to I.S. 150 1:4 (1 cer	with thicknown of the contract	ess br>9mn proved make parse sand) 	n or neares e, in a
16	:Providing and laying i with water absorption colours & shades,lai grouting ramp	ndustrial gra i less than d on 20 mi t with white 2 1	nde antiskid t 0.08 % and m thick cem cement & 5.200 3.500	iles of size 3 conforming ment mortar matching p	300x300mm g to I.S. 150 1:4 (1 cer	with thicknown of the contract	ess br>9mn broved make parse sand) 	n or neares e, in a
16	:Providing and laying i with water absorption colours & shades,lai grouting ramp	ndustrial gra i less than d on 20 mi t with white 2 1 3	nde antiskid t 0.08 % and m thick cem cement & 5.200 3.500 3.000	iles of size 3 conforming ment mortar matching p	300x300mm to I.S. 156 1:4 (1 cer oigments et	with thicknown of the contract	ess broved make parse sand) e. 12.480 4.200 4.051	n or neares e, in br>a , including
16	:Providing and laying i with water absorption colours & shades,lai grouting ramp	ndustrial gra i less than d on 20 mi t with white 2 1 3	nde antiskid t 0.08 % and m thick cem cement & 5.200 3.500 3.000	iles of size 3 conforming ment mortar matching p 1.200 1.200 0.450	300x300mm to I.S. 156 1:4 (1 cer oigments et	with thickness of apprent : 4 co	ess br>9mm broved make parse sand) e. 12.480 4.200 4.051 2.269	n or neares e, in br>a , including
16	:Providing and laying i with water absorption colours & shades,lai grouting ramp	ndustrial gra i less than d on 20 mi t with white 2 1 3	nde antiskid t 0.08 % and m thick cem cement & 5.200 3.500 3.000	iles of size 3 conforming ment mortar matching p 1.200 1.200 0.450	Total Deducte	with thickness of apprent : 4 co	ess br>9mn broved make parse sand) e. 12.480 4.200 4.051 2.269 23.000 sq	n or neares e, in br>a , including
16	:Providing and laying i with water absorption colours & shades,lai grouting ramp	ndustrial gra i less than d on 20 mi t with white 2 1 3	ade antiskid t 0.08 % and m thick ceme cement & 5.200 3.500 3.000 2.269	iles of size 3 conforming ment mortar matching p 1.200 1.200 0.450	Total Deducte  Net Total	with thickness of apprent : 4 congress of apprent : 4	ess br>9mn broved make parse sand) e. 12.480 4.200 4.051 2.269 23.000 sq 0.000 sq 23.000 sq	n or neares e, in br>a , includin
16	:Providing and laying i with water absorption colours & shades,lai grouting ramp	ndustrial grant less than don 20 mit with white 2 1 3 1	side antiskid to 0.08 % and methick cement & 5.200 3.500 3.000 2.269	iles of size 3 conforming nent mortar matching r 1.200 1.200 0.450  To	Tota tal Deducte  Net Tota  @ Rs 1276	with thickness of apprent : 4 concerns of apprent : 4	ess br>9mn broved make parse sand) e. 12.480 4.200 4.051 2.269 23.000 sq 0.000 sqm 23.000 sq Rs 29	m m m 369.85
	:Providing and laying is with water absorption colours & shades, laid grouting < br/> ramp  step  Rounded  13.43.1  Applying one coat of	ndustrial grant less than don 20 mit with white 2 1 3 1	side antiskid to 0.08 % and methick cement & 5.200 3.500 3.000 2.269	iles of size 3 conforming nent mortar matching r 1.200 1.200 0.450  To	Tota tal Deducte  Net Tota  @ Rs 1276	with thickness of apprent : 4 concerns of apprent : 4	ess br>9mn broved make parse sand) e. 12.480 4.200 4.051 2.269 23.000 sq 0.000 sqm 23.000 sq Rs 29	m m 369.85
	:Providing and laying is with water absorption colours & shades, laid grouting < br/> ramp  step  Rounded  13.43.1  Applying one coat of surface: Water thinna	f water thin	side antiskid to 0.08 % and methick cement & 5.200 3.500 3.000 2.269 Say	iles of size 3 conforming nent mortar matching r 1.200 1.200 0.450  To	Total tall Deducte  Net Total  @ Rs 1276	with thickness of apprent : 4 concerns of apprent : 4	ess br>9mn broved make parse sand) e. 12.480 4.200 4.051 2.269 23.000 sqm 23.000 sqm 23.000 sqm Rs 29 d manufactu	m m 369.85

					Net Tota	I Quantity	555.000 s	qm
			Say	/ 555.000 so	qm @ Rs 70.	.64 / sqm	Rs 39	205.20
18	13.46.1 Finishing walls with @ 1.67 ltr/10 sqm o	-	•	•		,		
	out side wall	1	35.300	2.800			98.840	
	Parapet	1	37.100	1.400			51.940	
	rounded	1	4.220				4.220	
					Tota	I Quantity	155.000 s	qm
				To	otal Deducted	d Quantity	0.000 sqm	1
			Bo	SV.	Net Tota	I Quantity	155.000 s	qm
			Say	155.000 sqı	m @ Rs 193.	.89 / sqm	Rs 30	052.95
	Wall painting with papplying additional toilet inside	coats where	ver required	to achieve		_	ur.Two coa	
	tailat incida	10	5.400	1.000	J 7444	10	54.000	
		73.744			4 - 4 //		40.000	
	DA toilet	2	6.600	1.000			13.200	
	DA toilet out	2	4.800	2.800			26.880	
	DA toilet out bath	2 2 Othe† Er	4.800 g 6.500	2.800 ng1.000 g	anisatio	ns	26.880	
	DA toilet out	2 2 Othet Er	4.800 6.500 3.150	2.800 1.000 g 2.800	anisatio	ns	26.880 6.500 17.640	
	DA toilet out bath	2 2 Othe† Er	4.800 6.500 3.150 5.300	2.800 1.000 g 2.800 2.800	anisatio	ns	26.880 6.500 17.640 14.840	
	DA toilet out bath	2 2 Othet Er 2 1	4.800 6.500 3.150 5.300 5.500	2.800 1.000 g 2.800 2.800 2.800	anisatio	ns	26.880 6.500 17.640 14.840 15.400	
	DA toilet out bath	2 2 Othet Er 1 1	4.800 6.500 3.150 5.300 5.500 3.200	2.800 2.800 2.800 2.800 2.800	anisatio	ns	26.880 6.500 17.640 14.840 15.400 8.960	
	DA toilet out bath	2 2 Othe† Er 2 1 1	4.800 6.500 3.150 5.300 5.500 3.200 4.850	2.800 2.800 2.800 2.800 2.800 2.800	anisatio	ns	26.880 6.500 17.640 14.840 15.400 8.960 13.580	
	DA toilet out bath partition	2 2 Othe† Er 1 1 1	4.800 6.500 3.150 5.300 5.500 3.200 4.850 2.500	2.800 2.800 2.800 2.800 2.800 2.800 2.800	anisatio	ns	26.880 6.500 17.640 14.840 15.400 8.960 13.580 7.000	
	DA toilet out bath partition  urinal partition	2 2 Othe† Er 1 1 1 1 2	4.800 6.500 3.150 5.300 5.500 3.200 4.850 2.500 2.100	2.800 2.800 2.800 2.800 2.800 2.800 2.800 1.500	anisatio	ns	26.880 6.500 17.640 14.840 15.400 8.960 13.580 7.000 6.301	
	DA toilet out bath partition	2 2 Othef Er 1 1 1 1 2	4.800 6.500 3.150 5.300 5.500 3.200 4.850 2.500 2.100 12.750	2.800 2.800 2.800 2.800 2.800 2.800 2.800 1.500 5.800	anisatio	ns	26.880 6.500 17.640 14.840 15.400 8.960 13.580 7.000 6.301 73.950	
	DA toilet out bath partition  urinal partition	2 2 Othe† Er 1 1 1 1 2	4.800 6.500 3.150 5.300 5.500 3.200 4.850 2.500 2.100	2.800 2.800 2.800 2.800 2.800 2.800 2.800 1.500	anisatio	ns	26.880 6.500 17.640 14.840 15.400 8.960 13.580 7.000 6.301	
	DA toilet out bath partition  urinal partition under side slab	2 2 Othef Er 1 1 1 1 2 1	4.800 6.500 3.150 5.300 5.500 3.200 4.850 2.500 2.100 12.750 39.450	2.800 2.800 2.800 2.800 2.800 2.800 2.800 1.500 5.800	anisatio	ns	26.880 6.500 17.640 14.840 15.400 8.960 13.580 7.000 6.301 73.950 39.450	
	DA toilet out bath partition  urinal partition under side slab  rounded	2 2 Othef Er 1 1 1 1 2 1 1	4.800 6.500 3.150 5.300 5.500 3.200 4.850 2.500 2.100 12.750 39.450 4.367	2.800 2.800 2.800 2.800 2.800 2.800 2.800 1.500 5.800 1.000	anisatio	ns	26.880 6.500 17.640 14.840 15.400 8.960 13.580 7.000 6.301 73.950 39.450 4.367	
	DA toilet out bath partition  urinal partition under side slab  rounded door D	2 2 Othef Er 1 1 1 1 2 1 1 1 2	4.800 6.500 3.150 5.300 5.500 3.200 4.850 2.500 2.100 12.750 39.450 4.367 1.000	2.800 2.800 2.800 2.800 2.800 2.800 2.800 1.500 5.800 1.000	anisatio	ns	26.880 6.500 17.640 14.840 15.400 8.960 13.580 7.000 6.301 73.950 39.450 4.367 -4.200	

				To	otal Deducted Q	≀uantitv	-32.068 s	am
					Net Total Q		270.000 s	
			Say	270.000 sqı	m @ Rs 134.10	) / sqm	Rs 36	207.00
20	9.117.1 Providing and fixing fa dimension as below (to to be jointed with galva hinge side vertical of the mm) wall thickness an specification and direct	olerance ±1 anized brac ne frames re d 3 nos. sta	mm), with we kets and standard	vall thicknes ainless steel galvanized hinges fixed	s 2.0mm (±0.2) screws, joints M.S. tube of siz d to the frame of	mm), co mitred a ze 19 x 1 complete	rners of the nd plastic v 9 mm and o as per ma	door fran velded. T I mm (± 0
	Toilet door 70x210	11	5.600				61.600	
	DA toilet,100x210	2	6.200	6			12.400	
	rounded	1	1.000				1.000	
		1	57 B		Total Q	Quantity	75.000 m	etre
		618	17 6	To	otal Deducted Q	Quantity	0.000 met	re
					Net Total Q	Quantity	75.000 m	etre
21	9.118.1 Providing and fixing to and rails of a uPVC he	ollow sectio	or frames24 n of size 59	mm thick fa	d wall thicknes	/C door s	shutters ma (± 0.2 mm)	with inb
21	Providing and fixing to and rails of a uPVC he edging on both side galvanised/plastic brack The styles of the shutter mm) wall thickness. The mm (± 0.2 mm) wall the The shutter frame filled over all thickness of 20 two places by inserting complete as per man	ollow sections. The style ckets of size er reinforced be lock rail maickness, fixed with a uPN mm and 1 mg horizontal furfacturer's	or frames24 n of size 59 les and rai 75x220 mn d by insertin hade up of the d to the sho /C multi-cha mm (± 0.1 m	mm thick fall 2x24 mm and Is mitred and having was galvanised the styles butter styles butter styles butter styles butter wall thick alvanised M	actory made PV d wall thickness and joint at the ll thickness 1.0 d M.S. tube of si uPVC hollow se by means of pla gle panel of size kness. The pan l.S. rod and fas	/C door set as 2 mm and size 20x2 ection of astic/galve not lesses tened v	shutters ma (± 0.2 mm) rs by mea stainless s 0 mm and of size 100x20 vanised M.S s than 620 vertically a vith nuts ar	de of styl with inbu ns of M teel screv I mm (± 0 4 mm and 6. 'U' clea mm, havi and tie bar and washe
21	Providing and fixing to and rails of a uPVC he edging on both side galvanised/plastic brack The styles of the shutter mm) wall thickness. The mm (± 0.2 mm) wall the The shutter frame filled over all thickness of 20 two places by inserting complete as per many bathroom door shutter.	ollow sections. The style ckets of size er reinforced the lock rail manickness, fixed with a uPV mm and 1 mg horizontal aufacturer's er).	or frames24 n of size 59 les and rai 75x220 mn d by insertin hade up of 't ed to the sho /C multi-cha mm (± 0.1 m ally 6 mm ga specificati	mm thick fall 2x24 mm and Is mitred and having was galvanised the styles of the styles	actory made PV d wall thickness and joint at the ll thickness 1.0 d M.S. tube of si uPVC hollow se by means of pla gle panel of size kness. The pan l.S. rod and fas	/C door set as 2 mm and size 20x2 ection of astic/galve not lesses tened v	shutters ma (± 0.2 mm) rs by mea stainless s 0 mm and 2 size 100x20 vanised M.S s than 620 vertically all vith nuts ar charge( Fo	de of stylwith inbounced from (± 0 4 mm and 5. 'U' clearm, havind tie bar
21	Providing and fixing to and rails of a uPVC he edging on both side galvanised/plastic brack The styles of the shutter mm) wall thickness. The mm (± 0.2 mm) wall the The shutter frame filled over all thickness of 20 two places by inserting complete as per man	ollow sections. The style ckets of size er reinforced be lock rail maickness, fixed with a uPN mm and 1 mg horizontal furfacturer's	or frames24 n of size 59 les and rai 75x220 mn d by insertin hade up of the d to the sho /C multi-cha mm (± 0.1 m	mm thick fall 224 mm and Is mitred and having was galvanised the styles butter styles butter styles butter styles butter wall thick alvanised M	actory made PV d wall thickness and joint at the ll thickness 1.0 d M.S. tube of si uPVC hollow se by means of pla gle panel of size kness. The pan l.S. rod and fas	/C door set as 2 mm and size 20x2 ection of astic/galve not lesses tened v	shutters ma (± 0.2 mm) rs by mea stainless s 0 mm and of size 100x20 vanised M.S s than 620 vertically a vith nuts ar	de of stylens of Mateel screwing (± 0 4 mm and 5. 'U' clearm, having tie barted
21	Providing and fixing to and rails of a uPVC he edging on both side galvanised/plastic brack The styles of the shutter mm) wall thickness. The mm (± 0.2 mm) wall the The shutter frame filled over all thickness of 20 two places by inserting complete as per many bathroom door shutter Toilet door 70x210	ollow sections. The styleskets of size er reinforced the lock rail maickness, fixed with a uPV mm and 1 mg horizontal aufacturer's er).	or frames24 n of size 59 les and rai r75x220 mn d by insertin hade up of 'H ed to the sho /C multi-cha mm (± 0.1 m ally 6 mm ga specificati 0.700	mm thick fall 2x24 mm and Is mitred and having was galvanised by the styles in the sty	actory made PV d wall thickness and joint at the ll thickness 1.0 d M.S. tube of si uPVC hollow se by means of pla gle panel of size kness. The pan l.S. rod and fas	/C door set as 2 mm and size 20x2 ection of astic/galve not lesses tened v	shutters ma (± 0.2 mm) rs by mea stainless s 0 mm and size 100x2- vanised M.S s than 620 vertically al vith nuts ar charge( For	de of stylwith inbounced from (± 0 4 mm and 5. 'U' clearm, havind tie bar
21	Providing and fixing to and rails of a uPVC he edging on both side galvanised/plastic brack The styles of the shutter mm) wall thickness. The mm (± 0.2 mm) wall the The shutter frame filled over all thickness of 20 two places by inserting complete as per many bathroom door shutter Toilet door 70x210  DA toilet,100x210	collow sections. The style ckets of size er reinforced the lock rail maickness, fixed with a uPV mm and 1 may horizontal aufacturer's er).	or frames24 n of size 59 les and rai 75x220 mn d by insertin hade up of 'h ed to the she /C multi-cha mm (± 0.1 m ally 6 mm ga specificati  0.700  1.000	mm thick fall 2x24 mm and Is mitred and having was galvanised by the styles in the sty	actory made PV d wall thickness and joint at the ll thickness 1.0 d M.S. tube of si uPVC hollow se by means of pla gle panel of size kness. The pan l.S. rod and fas	/C door sets 2 mm and size 20x2 ection of astic/galve not lessels filled stened wheer-in-content in-content in	shutters ma (± 0.2 mm) rs by mea stainless s 0 mm and size 100x2- vanised M.S s than 620 vertically al vith nuts ar charge( For	de of styl with inbuns of Miteel screvill mm (± 04 mm and S. 'U' clearmm, havind tie barred washer W.C. a
21	Providing and fixing to and rails of a uPVC he edging on both side galvanised/plastic brack The styles of the shutter mm) wall thickness. The mm (± 0.2 mm) wall the The shutter frame filled over all thickness of 20 two places by inserting complete as per many bathroom door shutter Toilet door 70x210  DA toilet,100x210	collow sections. The style ckets of size er reinforced the lock rail maickness, fixed with a uPV mm and 1 may horizontal aufacturer's er).	or frames24 n of size 59 les and rai 75x220 mn d by insertin hade up of 'h ed to the she /C multi-cha mm (± 0.1 m ally 6 mm ga specificati  0.700  1.000	mm thick fall 2x24 mm and Is mitred and having was galvanised the styles is ambered singular mm) wall thick alvanised Mon and direct the styles is always as a style is always as alwa	actory made PV d wall thickness and joint at the Il thickness 1.0 d M.S. tube of si uPVC hollow se by means of pla gle panel of size kness. The pan I.S. rod and fas ection of Engin	/C door sets 2 mm and size 20x2 ection of astic/galve not lessels filled stened veneer-in-conductive	shutters ma (± 0.2 mm) rs by mea stainless s 0 mm and 2 size 100x2 vanised M.S s than 620 vertically al vith nuts are charge( For	de of stylwith inbounts of Mateel screw I mm (± 04 mm and S. 'U' clear mm, havind tie bar and washer W.C. a
21	Providing and fixing to and rails of a uPVC he edging on both side galvanised/plastic brack The styles of the shutter mm) wall thickness. The mm (± 0.2 mm) wall the The shutter frame filled over all thickness of 20 two places by inserting complete as per many bathroom door shutter Toilet door 70x210  DA toilet,100x210	collow sections. The style ckets of size er reinforced the lock rail maickness, fixed with a uPV mm and 1 may horizontal aufacturer's er).	or frames24 n of size 59 les and rai 75x220 mn d by insertin hade up of 'h ed to the she /C multi-cha mm (± 0.1 m ally 6 mm ga specificati  0.700  1.000	mm thick fall 2x24 mm and Is mitred and having was galvanised the styles is ambered singular mm) wall thick alvanised Mon and direct the styles is always as a style is always as alwa	actory made PV d wall thickness and joint at the ll thickness 1.0 d M.S. tube of si uPVC hollow se by means of pla gle panel of size kness. The pan l.S. rod and fas ection of Engin	/C door ses 2 mm and size 20x2 ection of astic/galve not lesses filled stened veneer-in-contract of the contract of the contra	shutters ma (± 0.2 mm) rs by mea stainless s 0 mm and 2 size 100x2 vanised M.S s than 620 vertically al vith nuts are charge( For 16.170 4.200 0.630	de of stylwith inbounts of Mateel screw I mm (± 04 mm and S. 'U' clear mm, havind tie bar and washer W.C. a
21	Providing and fixing to and rails of a uPVC he edging on both side galvanised/plastic brack The styles of the shutter mm) wall thickness. The mm (± 0.2 mm) wall the The shutter frame filled over all thickness of 20 two places by inserting complete as per many bathroom door shutter Toilet door 70x210  DA toilet,100x210	collow sections. The style ckets of size er reinforced the lock rail maickness, fixed with a uPV mm and 1 may horizontal aufacturer's er).	or frames24 n of size 59 les and rai r75x220 mn d by insertin hade up of 'h ed to the she /C multi-cha mm (± 0.1 m ally 6 mm ga specificati 0.700 1.000 0.630	mm thick fall 2x24 mm and Is mitred and having was galvanised by the styles in the sty	actory made PV d wall thickness and joint at the ll thickness 1.0 d M.S. tube of si uPVC hollow se by means of pla gle panel of size kness. The pan l.S. rod and fas ection of Engin  Total Q otal Deducted Q	/C door ses 2 mm and size 20x2 ection of astic/galve not lesses filled stened veneer-in-contractions.	shutters ma (± 0.2 mm) rs by mea stainless s 0 mm and r size 100x2 vanised M.S s than 620 vertically a vith nuts ar charge( For  16.170 4.200 0.630 21.000 sq 0.000 sqn 21.000 sq	de of styl with inbu ns of M teel screv I mm (± 0 4 mm and 6. 'U' clea mm, havi nd tie bar nd washe r W.C. a

543SUB HEAD: 9 - WOOD & PVC WORK9.147BProviding and fixing factory made uPVC white colour fixed glazed windows/ventilators comprising of uPVC multi-chambered frame and mullion (where everrequired) extruded profiles duly reinforced with 1.60 ± 0.2 mm thick galvanizedmild steel section made from roll forming process of required length (shape &size according to uPVC profile), , uPVC extruded glazing beads of appropriatedimension, EPDM gasket, G.I fasteners 100 x 8 mm size for fixing frame to finishedwall, plastic packers, plastic caps and necessary stainless steel screws etc. Profile of frame shall be mitred cut and fusion welded at all corners, mullion (ifrequired) shall be also fusion welded including drilling of holes for fixinghardware's and drainage of water etc. After fixing frame the gap between frameand adjacent finished wall shall be filled with weather proof silicon sealant overbacker rod of required size and of approved quality, all complete as per approveddrawing & direction of Engineer-in-Charge. (Single / double glass panes and silicon sealant shall be paid separately).<br/>
Note: For uPVC frame, sash and mullion extruded profiles minus 5% tolerancein dimension i.e. in depth & width of profile shall be acceptable. Fixed window / ventilator made of (small series) frame 47 x 50 mm & mullion 47x 68 mm both having wall thickness of 1.9 ± 0.2 mm and single glazing bead ofappropriate dimension. (Area upto 0.75 sqm.) 0.600 for ventilator 15 0.500 4.500 **Total Quantity** 4.500 sqm **Total Deducted Quantity** 0.000 sqm **Net Total Quantity** 4.500 sqm Say 4.500 sqm @ Rs 7626.06 / sqm Rs 34317.27 23 10.3 Providing and fixing in position collapsible steel shutters with vertical channels 20x10x2 mm and braced with flat iron diagonals 20x5 mm size, with top and bottom rail of T-iron 40x40x6 mm, with 40 mm dia steel pulleys, complete with bolts, nuts, locking arrangement, stoppers, handles, including applying a priming coat of approved steel primer. Front shutter 1 3.500 2.400 8.400 Rounded 1 0.600 0.600 **Total Quantity** 9.000 sqm **Total Deducted Quantity** 0.000 sqm **Net Total Quantity** 9.000 sqm Say 9.000 sqm @ Rs 10205.93 / sqm Rs 91853.37 24 10.28 Providing and fixing stainless steel (Grade 304) railing made of Hollow tubes, channels, plates etc., including welding, grinding, buffing, polishing and making curvature (wherever required) and fitting the same with necessary stainless steel nuts and bolts complete, i/c fixing the railing with necessary accessories & stainless steel dash fasteners, stainless steel bolts etc., of required size on the top of the floor or the side of waist slab with suitable arrangement as per approval of Engineer-in-charge, (for payment purpose only weight of stainless steel members shall be considered excluding fixing accessories such as nuts, bolts, fasteners etc.) hand rail 2 6.000 20.0 240,000 @20kg/m

					Tota	al Quantity	240.000 k	g
				To	otal Deducte	d Quantity	0.000 kg	
					Net Tota	al Quantity	240.000 k	g
			;	Say 240.000	kg @ Rs 6	77.34 / kg	Rs 162	2561.60
SI No	Description	No	L	В	D	CF	Quantity	Remark
		4 Appendi	x D- constr	uction of P	arking Area	1		
1	16.78.1 Construction of gran mixing in a mechanica & lifts, spreading in a compacting with vibra directions of Engineer having CBR Value- 30	al mix plant a uniform layer tory power ro r-in- Charge.\	at OMC, Car s of specific oller to achie	riage of mix ed thicknes eve the desi	ed material s with moto red density,	by tippers to r grader on complete as	o work site, to prepared so per specific	for all lea urface a cations a
	Auction hall front	1	40.000	30.000	0.150		180.000	
	side	2	6.000	6.000	0.150		10.800	
	AH west side	1	40.000	15.000	0.150		90.000	
	for road	1	30.000	6.000	0.150	L	27.000	
	rounded	1	4.200				4.200	
			A Committee	Mary 24	Tota	al Quantity	312.000 c	um
	(	Other Er	ngineeri	ng Or <del>g</del> o	otal Deducte	d Quantity	0.000 cum	1
		DI			Net Tota	al Quantity	312.000 c	um
			Say 3	312.000 cum	@ Rs 2963	3.59 / cum	Rs 924	1640.08
2	16.80 Construction of dry leaguregate conforming ration not to exceed 1	to IS : 383,	the size of c	oarse aggre	egate not ex	ceeding 25	mm, aggreg	ate cem
	not to be less than construction, concre transported to site, for roller, finishing and cu	150 Kg/ cur te strength all leads & I	n, optimum not to be le ifts, laid with	moisture of the second moisture of the second moist representation of the second moisture o	content to be Mpa at 7 cal paver, co	days, mixe	ned during ed in a bato	trial len hing pla
	not to be less than construction, concretransported to site, for	150 Kg/ cur te strength all leads & I	n, optimum not to be le ifts, laid with	moisture of the second moisture of the second moist representation of the second moisture o	content to be Mpa at 7 cal paver, co	days, mixe	ned during ed in a bato	trial len hing pla
	not to be less than construction, concre transported to site, for roller, finishing and cu	150 Kg/ cur te strength all leads & I iring etc. com	n, optimum not to be le ifts, laid with nplete as per	moisture of the moisture of th	content to be made of the content to be made	days, mixe	ned during ed in a bato rith 8-10 toni	trial len hing pla
	not to be less than construction, concre transported to site, for roller, finishing and cu	150 Kg/ cur te strength all leads & l iring etc. com	n, optimum not to be le ifts, laid with plete as per 40.000	moisture of the state of the st	content to be made on the manual paver, conference of the manual paver on the manual p	days, mixe	ned during ed in a bato rith 8-10 toni	trial len hing pla
	not to be less than construction, concre transported to site, for roller, finishing and cultural Auction hall front side	150 Kg/ cur te strength all leads & I iring etc. com	n, optimum not to be le ifts, laid with plete as per 40.000 6.000	moisture of ess than 10 a mechanic direction of 30.000 6.000	content to be made on the manual paver, conference of Engineer-in 0.150	days, mixe	ned during ed in a bate with 8-10 tone 180.000 10.800	trial len hing pla
	not to be less than construction, concre transported to site, for roller, finishing and culture Auction hall front side  AH west side	150 Kg/ cur te strength all leads & I iring etc. com	n, optimum not to be le ifts, laid with plete as per 40.000 6.000 40.000	moisture of ess than 10 a mechanic direction of 30.000 6.000	ontent to be made on the material paver, conference of Engineer-in 0.150 0.150 0.150	days, mixe	180.000 10.800	trial len hing pla
	not to be less than construction, concre transported to site, for roller, finishing and culture.  Auction hall front side  AH west side  for road	150 Kg/ cur te strength all leads & I iring etc. com 1 2 1	n, optimum not to be le ifts, laid with plete as per 40.000 6.000 40.000 30.000	moisture of ess than 10 a mechanic direction of 30.000 6.000	content to be made and paver, content to be made at 7 cal paver, conference of Engineer-in 0.150 cal paver.	days, mixe	180.000 10.800 27.000	trial len hing pla ne vibrat

occupied and laying and laying ament content as personal	er design many opportions and ver required to be a very requi	cement condix, using coans per approved, laying at site or required slope annel sections (10 mm wide aller and sealed bars with slope.	rse sand ar yed & specifie, spreading pe/ camber, s, curing, n e x 50 mm d ants, comple eeve/tie bar ess cement	O grade, in and graded sied design and compa finishing whaking proveep) by groete all as pesto be paidused as per	roads/ taxi tone aggreg criteria, pro cting mecha ith required rision for co ove cutting er direction separately)	tracks/ runvigate of 40 moviding dower anically by use texture, including texture, including the contraction / machine, proof Engineer-	nm noming hars wing need luding stee expansion oviding are in-charge ent conterns with the contents wi
roviding and laying ement content as per ze in appropriate prevertie bars wherevend surface vibrators, form work with sturd construction & longituding joints with appropriate of joint fillers, seat parately. Cement concuction hall front de	er design manager design manager required for the require	as per approved, laying at site or required slopennel sections (10 mm wide aller and sealed bars with slopennel secesored with bate 40.000	rse sand ar yed & specifie, spreading pe/ camber, s, curing, n e x 50 mm d ants, comple eeve/tie bar ess cement of ch mixing m	nd graded sified design and compa finishing whaking provete all as pees to be paid used as per achine	tone aggreed criteria, pro- cting mechanistin required rision for co- cove cutting er direction of separately)	gate of 40 moviding dower anically by use texture, including ontraction / machine, proof Engineer-in. Note: Cemis payable/ r	nm noming hars wing need luding stee expansion oviding are in-charge ent conterns with the contents wi
uction hall front  de  H west side	1 2	40.000				180.000	
H west side	6' 1	6.000					
	6' 1		6.000	0.150		10.800	
r road		40.000	15.000	0.150		90.000	
	1	30.000	6.000	0.150	E.	27.000	
ounded	1	4.200				4.200	
		16	E B P 27	Tota	al Quantity	312.000 c	um
	Other E	ngineeri	ng Or <b>b</b> g	tal Deducte	d Quantity	0.000 cum	1
				Net Tota	al Quantity	312.000 c	um
	P	Say 31	2.000 cum	@ Rs 10302	2.33 / cum	Rs 321	4326.96
		_	-		•		
ounded	1	15.000				15.000	@75Kg,
				Tota	al Quantity	23100.000	kg
			Тс	tal Deducte	d Quantity	0.000 kg	
				Net Tota	al Quantity	23100.000	kg
		Sa	ay 23100.00	00 kg @ Rs 9	98.30 / kg	Rs 227	0730.00
te in y	eel reinforcement folding all complete and of CC unded	eel reinforcement for R.C.C volding all complete above plints of CC 1 unded 1  .44 tra for providing and mixing	22A.6 eel reinforcement for R.C.C work including alling all complete above plinth level. Therm of CC 1 307.800 unded 1 15.000	22A.6  sel reinforcement for R.C.C work including straighten ading all complete above plinth level. Thermo - Mechan of CC 1 307.800  unded 1 15.000  To  Say 23100.00  .44  tra for providing and mixing hardening compound	Say 312.000 cum @ Rs 10302 22A.6  eel reinforcement for R.C.C work including straightening, cutting ading all complete above plinth level. Thermo - Mechanically Treate of CC  1 307.800  Total  Total Deducte  Net Total  Say 23100.000 kg @ Rs 9  444  tra for providing and mixing hardening compound of approve	Say 312.000 cum @ Rs 10302.33 / cum  22A.6  seel reinforcement for R.C.C work including straightening, cutting, bending, ading all complete above plinth level. Thermo - Mechanically Treated bars of grounded 1 307.800 75.0  Total Quantity  Total Deducted Quantity  Net Total Quantity  Say 23100.000 kg @ Rs 98.30 / kg  444  tra for providing and mixing hardening compound of approved quality and service of the second	Say 312.000 cum @ Rs 10302.33 / cum  Rs 321

	q t y o f c c 307.8*340=104652(20 93 bags	1	2093.000			0.2	418.600	@.20 Kg/bag
	Rounded	1	6.400				6.400	@.20 Kg/bag
					Tota	al Quantity	425.000 L	itre
				To	tal Deducte	d Quantity	0.000 Litre	Э
					Net Tota	al Quantity	425.000 L	itre
			Say	/ 425.000 Li	tre @ Rs 59	.86 / Litre	Rs 25	440.50
SI No	Description	No	L	В	D	CF	Quantity	Remark
		5 Appe	endix E - Co	nstruction	of Drain			
	trenches or drains (not ramming of bottoms, li excavated soil as direct main drain from	ft up to 1.5 cted, within	m, including a lead of 5	ng getting o 60 m.All kind	ut the exca	, -	and disposa	
	Auction hall to sump	1	50.000	1.300	1.000	Aug II	65.000	
		175		ula bij	Tota	al Quantity	65.000 cu	m
		than Ev			tal Deducte	d Quantity	0.000 cum	1
	O O	ther El	igineeri	ng Orga	Net Tota	al Quantity	65.000 cu	m
			Say	y 65.000 cur	m @ Rs 296	6.94 / cum	Rs 19	301.10
2	2.6.1  Earth work in excavate (exceeding 30 cm in defearth, lead up to 50 m soil	epth, 1.5 m	in width as	well as 10 posed earth	sqm on pla to be level	n) including	disposal of atly dressed.	excavate
	Pit of sump	1	8.200	4.000	2.450		80.360	
	soak pit 2m dia	1	3.140	1*1	2.100		6.594	
	round of	1	3.046				3.046	
					Tota	al Quantity	90.000 cu	m
				Тс	tal Deducte	d Quantity	0.000 cum	1
					Net Tota	al Quantity	90.000 cu	m
			Say	y 90.000 cui	m @ Rs 214	1.03 / cum	Rs 19	262.70
3	4.1.8 Providing and laying in shuttering - All work up	-		-	•	_		•

	for drain	1	50.000	1.300	0.150		9.750	
	sump bottom	1	8.200	4.000	0.200		6.560	
	round of	1	0.690				0.690	
					Tota	al Quantity	17.000 cu	m
				To	otal Deducte	d Quantity	0.000 cum	1
					Net Tota	al Quantity	17.000 cu	m
			Say	17.000 cum	n @ Rs 6814	.89 / cum	Rs 115	853.1
4	5.1.2 Providing and laying ir centering, shuttering, fir sand :3 graded stone a	nishing and	reinforceme	ent - All worl				
	drain bottom slab	1	50.000	1.200	0.100		6.000	
	side wall	2	50.000	1.000	0.200		20.000	
	cover slad for drain 50/.5	100	1.000	0.500	0.150	L.	7.500	
	cover slab sump	16	3.500	0.500	0.120		3.360	
	do beam	1	7.500	0.300	0.300		0.675	
	cover slab soak pit	thet Er	gi3.140 ji	ng1.100 g	an0420io	ns	0.415	
	round	1	0.050			7	0.050	
			K		Tota	al Quantity	38.000 cu	m
				To	otal Deducte	d Quantity	0.000 cum	1
					Net Tota	al Quantity	38.000 cu	m
			Say	38.000 cum	n @ Rs 9085	5.14 / cum	Rs 345	235.32
5	5.9.1 Centering and shuttering columns, etc for mass of		strutting, et	c. and remo	oval of form	for:Foundat	ions, footing	ıs, bas
	side wall drain out	2	50.000	1.000			100.000	
	side wall drain in	2	50.000	0.900			90.000	
					Tota	al Quantity	190.000 s	qm
				To	otal Deducte	d Quantity	0.000 sqm	1
					Net Tota	al Quantity	190.000 s	qm
			Say	190.000 sq	m @ Rs 335	5.31 / sqm	Rs 63	708.90
6	5.9.5							

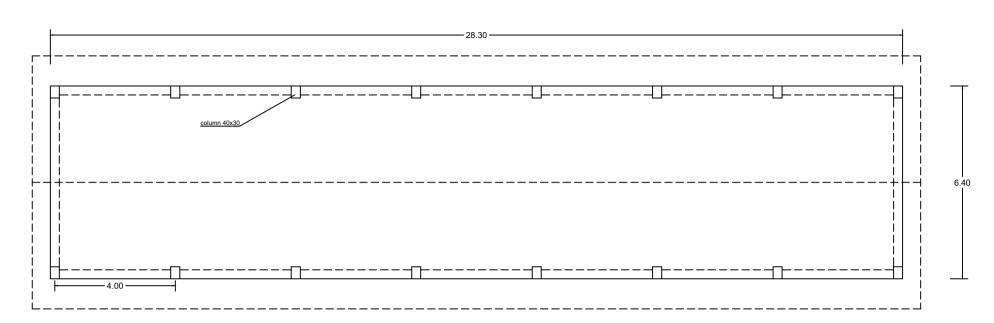
	girders bressumers and	cantilever	s	ı	I	ı		
	For cover slab drain 105 x 50 x 15 cm	100	3.100	0.150			46.500	
	For cover slab Effluent tank sides	16	8.000	0.120			15.360	
	beam	1	7.500	0.900			6.750	
	Rounded	1	1.390				1.390	
					Tota	al Quantity	70.000 sq	m
				To	tal Deducte	d Quantity	0.000 sqn	า
					Net Tota	al Quantity	70.000 sq	m
			Sa	y 70.000 sqı	m @ Rs 649	).82 / sqm	Rs 45	487.40
7	5.22A.1 Steel reinforcement for binding all complete all		- No. 10 5.75	-				osition a
	Qty of CC 38	1	38.000		1-21	90.0	3420.000	
		l XI			Tota	al Quantity	3420.000	kilogram
		找生	1000	To	tal Deducte	d Quantity	0.000 kilo	gram
			See Contract	Wa.P2//	Net Tota	al Quantity	3420.000	kilogram
	0	ther E	Say 3420.00	0 kilogram (	2 Rs 96.68	/ kilogram	Rs 330	0645.60
8	50.6.1.1				<b>4</b> T			
	Solid block masonry us size confirming to IS 21.1:6 (1 cement : 6 coars	85 part 1 c	of 1979 for fo			1		
	Solid block masonry us size confirming to IS 21	85 part 1 c	of 1979 for fo			1		
	Solid block masonry us size confirming to IS 21.1:6 (1 cement: 6 coars	85 part 1 c e sand) et	of 1979 for fo	undation an	d plinth with	1	20 cm and al	
	Solid block masonry us size confirming to IS 21 1:6 (1 cement: 6 coars tank side wall soak pit 2.00m dia -	85 part 1 c e sand) et	of 1979 for for complete 21.900	0.200	d plinth with	1	20 cm and al	
	Solid block masonry us size confirming to IS 21 1:6 (1 cement: 6 coars tank side wall soak pit 2.00m dia - bottom	85 part 1 ce e sand) et 1	21.900 6.280	0.200	2.500 0.300	1	10.950 0.377	pove in:
	Solid block masonry us size confirming to IS 21 1:6 (1 cement: 6 coars tank side wall soak pit 2.00m dia - bottom	85 part 1 ce e sand) et 1	21.900 6.280	0.200 0.200	2.500 0.300	thickness 2	10.950 0.377 0.673	m
	Solid block masonry us size confirming to IS 21 1:6 (1 cement: 6 coars tank side wall soak pit 2.00m dia - bottom	85 part 1 ce e sand) et 1	21.900 6.280	0.200 0.200	2.500 0.300 Total	thickness 2	10.950 0.377 0.673 12.000 cu	m
	Solid block masonry us size confirming to IS 21 1:6 (1 cement: 6 coars tank side wall soak pit 2.00m dia - bottom	85 part 1 ce e sand) et 1	1979 for for complete 21.900 6.280 0.673	0.200 0.200	2.500 0.300 Total Deducte Net Total	thickness 2 al Quantity d Quantity al Quantity	10.950 0.377 0.673 12.000 cu 12.000 cu	m
9	Solid block masonry us size confirming to IS 21 1:6 (1 cement: 6 coars tank side wall soak pit 2.00m dia - bottom	1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	sf 1979 for for complete 21.900 6.280 0.673 Say	0.200 0.200 To	2.500  0.300  Total Deducte  Net Tota  @ Rs 5908	al Quantity d Quantity al Quantity 3.32 / cum	10.950  0.377  0.673  12.000 cu  12.000 cu  Rs 70	m m 899.84

			1				1	
	Rounded	1	0.835				0.835	
					Tota	al Quantity	9.000 sqm	1
				Тс	tal Deducte	d Quantity	0.000 sqm	1
					Net Tota	al Quantity	9.000 sqm	1
			Sa	ay 9.000 sqr	m @ Rs 699	.37 / sqm	Rs 62	294.33
10	13.7.2 12 mm cement plaster f	inished wit	h a floating c	oat of neat	cement of m	ix:1:4 ( 1 ce	ement : 4 fine	e sand)
	for Drain side wall - inside	1	50.000	2.600			130.000	
	Effluent tank side wall	2	31.600	2.500			158.000	
	cross wall	2	3.200	2.500			16.000	
	bottom	1	7.600	3.200			24.320	
	Rounded	1	1.680				1.680	
		11	11/18	51/1	Tota	al Quantity	330.000 s	qm
		18		To	tal Deducte	d Quantity	0.000 sqm	1
		104	1500		Net Tota	al Quantity	330.000 s	qm
		17.5	Say	330.000 sqr	m @ Rs 386	.36 / sqm	Rs 127	498.80
SI No	Description	No	L	В	D	CF	Quantity	Remark
	O	ther Ei	6 Seawall St	rengthenin	nisatio	ns		
	Lu	mp-Sum T	otal			Rs	s 32500000.	00
	SI No Descr	iption	No	L	В	D	CF	Quantity
Remark			7 Sub	soil invest	igation			
	Lu	mp-Sum T	otal			R	s 1900000.0	00
	SI No Descr	iption	No	L	В	D	CF	Quantity
Remark		8 V	later supply	and sanita	ry arrangei	ment		
	Lu	mp-Sum T	otal			R	s 2500000.0	00
	SI No Descr	iption	No	L	В	D	CF	Quantity
Remark			9 Electrifica	ation and y	ard lighting	J		
	Lu	mp-Sum To	otal			R	s 2300000.0	00
	SI No Descr	iption	No	L	В	D	CF	Quantity
Remark			10 Unfores	seen charg	es @ 2.5%			
	Lu	mp-Sum To	otal			R	s 4950000.0	00
			Pro	ovision for G	ST paymen	ts (in %) @	18	.0%
			Amount rese	ved for GS	T payments		35991941.8	0
					Total		235947173.8	

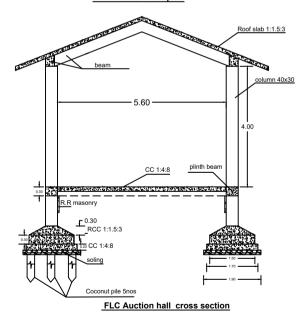
Lumpsum for round off	52826.20
	TOTAL Rs 236000000.00
	Rounded Total Rs 23,60,00,000
Rupees T	wenty Three Crore Sixty Lakh Only

(Cost Index Applied for this estimate is 35.59%)





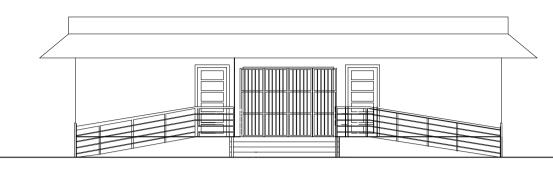
### FLC Auction hall plan





# DEVELOPMENT OF VIPIN -MUNAMBAM COASTAL STRETCH INCLUDING COASTAL PROTECTION -CONSTRUCTION OF FISH LANDING CENTRE AT SAIDH MOHAMMED BEACH

STAL	DRAWING NO:		ASSISTANT ENGINEER:		ASSISTANT ENGINEER: SIGNATURE:	ASSISTANT EXECUTIVE ENGINEER: SIGNATURE:
	DATE:		DRAWN:			
	TYPE:	DRAWING	REVIS	ION		CHIEF ENGINEER: SIGNATURE:
	TITLE.	FLC AUCTION HALL PLAN & SECTION	1.		DESIGNED & CHECKED BY	
	TITLE:	FLC AUCTION HALL PLAN & SECTION				

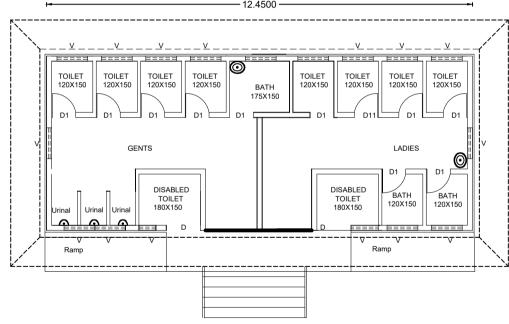


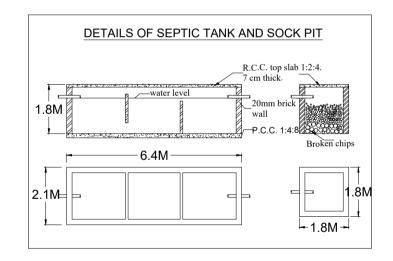
# Parapet R.C.C Roof slab Lintel Brick wall SS Handrail R R Masonry C.C 1:4:8

# **ELEVATION**



Section on A A





PLAN



# DEVELOPMENT OF VIPIN -MUNAMBAM COASTAL STRETCH INCLUDING COASTAL PROTECTION -CONSTRUCTION OF FISH LANDING CENTRE AT SAID MOHAMMED BEACH

DRAWING NO:

DRAWING NO:

DATE:

DRAWING

DRAWN:

ASSISTANT ENGINEER:
SIGNATURE:

SIGNATURE:

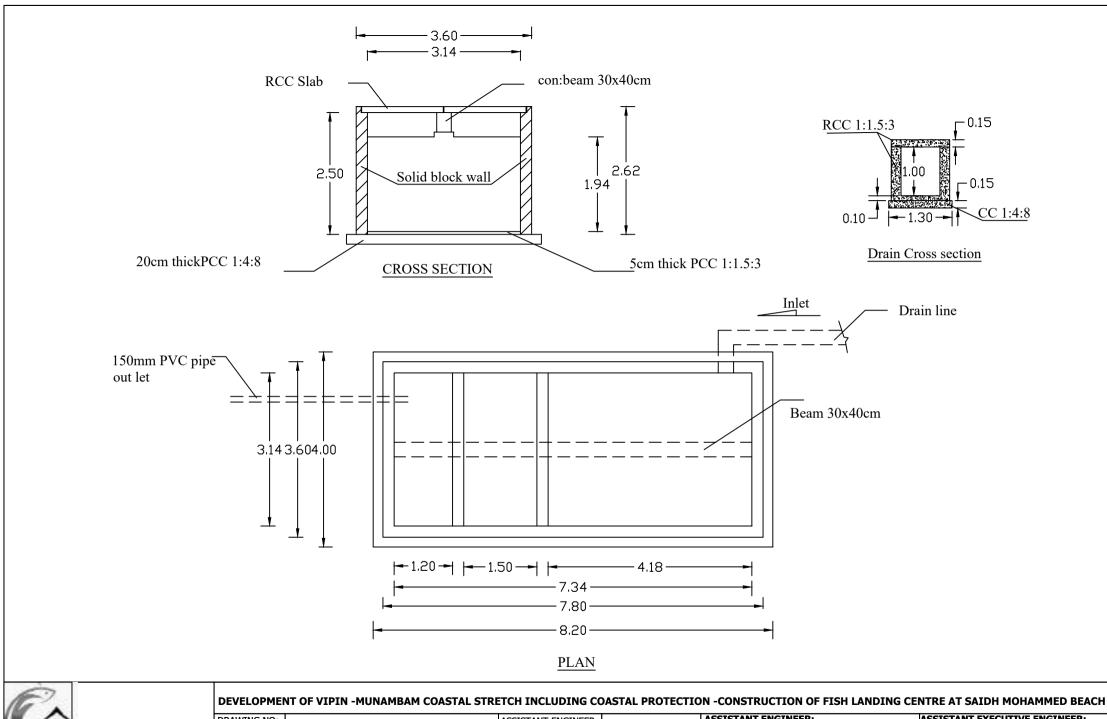
SIGNATURE:

SIGNATURE:

SIGNATURE:

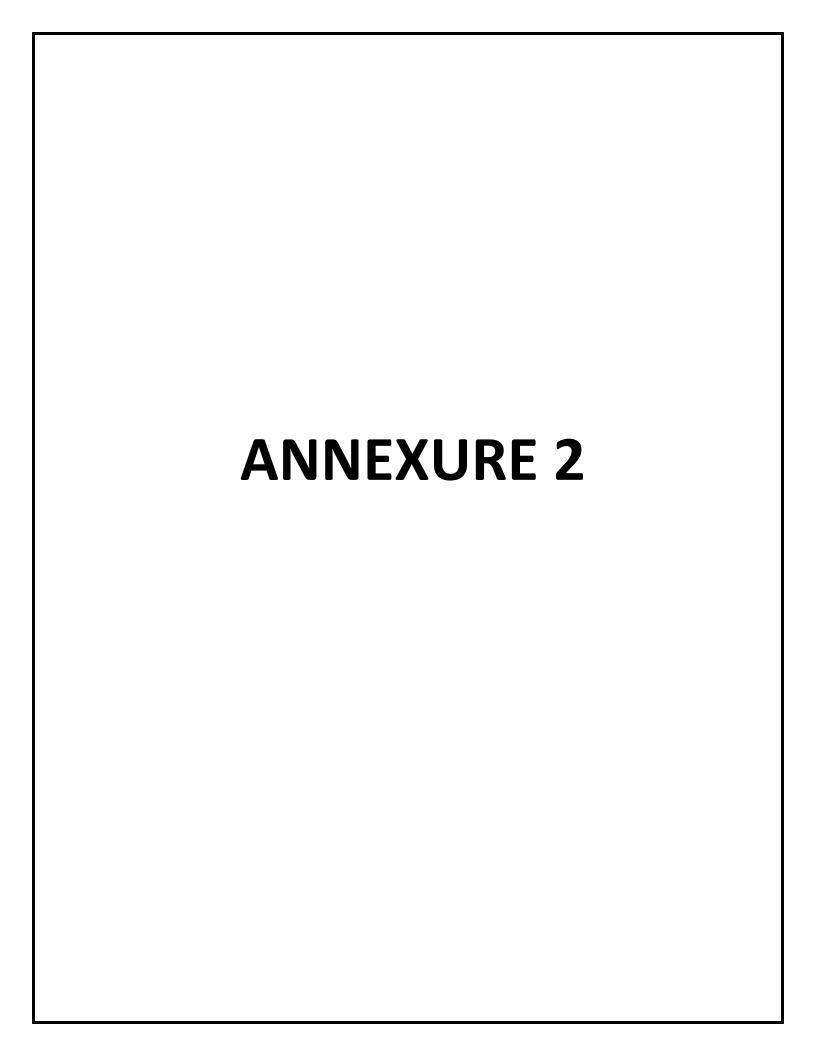
SIGNATURE:
SIGNATURE:
SIGNATURE:
SIGNATURE:
SIGNATURE:
SIGNATURE:
SIGNATURE:
SIGNATURE:
SIGNATURE:
SIGNATURE:
SIGNATURE:
SIGNATURE:
SIGNATURE:
SIGNATURE:
SIGNATURE:
SIGNATURE:
SIGNATURE:
SIGNATURE:
SIGNATURE:
SIGNATURE:
SIGNATURE:
SIGNATURE:
SIGNATURE:
SIGNATURE:
SIGNATURE:
SIGNATURE:
SIGNATURE:
SIGNATURE:
SIGNATURE:
SIGNATURE:
SIGNATURE:
SIGNATURE:
SIGNATURE:
SIGNATURE:
SIGNATURE:
SIGNATURE:
SIGNATURE:
SIGNATURE:
SIGNATURE:
SIGNATURE:
SIGNATURE:
SIGNATURE:
SIGNATURE:
SIGNATURE:
SIGNATURE:
SIGNATURE:
SIGNATURE:
SIGNATURE:
SIGNATURE:
SIGNATURE:
SIGNATURE:
SIGNATURE:
SIGNATURE:
SIGNATURE:
SIGNATURE:
SIGNATURE:
SIGNATURE:
SIGNATURE:
SIGNATURE:
SIGNATURE:
SIGNATURE:
SIGNATURE:
SIGNATURE:
SIGNATURE:
SIGNATURE:
SIGNATURE:
SIGNATURE:
SIGNATURE:
SIGNATURE:
SIGNATURE:
SIGNATURE:
SIGNATURE:
SIGNATURE:
SIGNATURE:
SIGNATURE:
SIGNATURE:
SIGNATURE:
SIGNATURE:
SIGNATURE:
SIGNATURE:
SIGNATURE:
SIGNATURE:
SIGNATURE:
SIGNATURE:
SIGNATURE:
SIGNATURE:
SIGNATURE:
SIGNATURE:
SIGNATURE:
SIGNATURE:
SIGNATURE:
SIGNATURE:
SIGNATURE:
SIGNATURE:
SIGNATURE:
SIGNATURE:
SIGNATURE:
SIGNATURE:
SIGNATURE:
SIGNATURE:
SIGNATURE:
SIGNATURE:
SIGNATURE:
SIGNATURE:
SIGNATURE:
SIGNATURE:
SIGNATURE:
SIGNATURE:
SIGNATURE:
SIGNATURE:
SIGNATURE:
SIGNATURE:
SIGNATURE:
SIGNATURE:
SIGNATURE:
SIGNATURE:
SIGNATURE:
SIGNATURE:
SIGNATURE:
SIGNATURE:
SIGNATURE:
SIGNATURE:
SIGNATURE:
SIGNATURE:
SIGNATURE:
SIGNATURE:
SIGNATURE:
SIGNATURE:
SIGNATURE:
SIGNATURE:
SIGNATURE:
SIGNATURE:
SIGNATURE:
SIGNATURE:
SIGNATURE:
SIGNATURE:
SIGNATURE:
SIGNATURE:
SIGNATURE:
SIGNATURE:
SIGNATURE:
SIGNATURE:
SIGNATURE:
SIGNATURE:
SIGNATURE:
SIGNATURE:
SIGNATURE:
SIGNATURE:
SIGNATURE:
SIGNATURE:
SIGNATURE:
SIGNATURE:
SIGNATURE:
SIGNATURE:
SIGNATURE:
SIGNATURE:
SIGNATURE:
SIGNATURE:
SIGNATURE:
SIGNATURE:
SIGNATURE:
SIGNATURE:
SIGNATURE:
SIGNATURE:
SIGNATURE:
SIGNATURE:
SIGNATURE:
SIGNATURE:
SIGNATURE:
SIGNATURE:
SIGNATURE:
SIGNATURE:
SIGNATURE:
SIGNATURE:
SI

KERALA STATE COASTAI AREA DEVELOPMENT CORPORATION



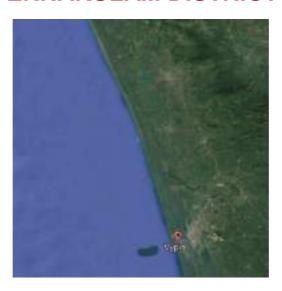


ΓAL						ASSISTANT EXECUTIVE ENGINEER: SIGNATURE:		
	DATE:		DRAWN:					
	TYPE:	DRAWING			511100101012 00110021711111	CHIEF ENGINEER: SIGNATURE:		
	TITLE.	FISH LANDING CENTRE DRAIN AND	1.		DESIGNED & CHECKED BY			
	TITLE:	TREATMENT TANK	2.					



# FINAL REPORT

# SHORE PROTECTION WORKS FROM VYPIN TO MUNAMBAM STRETCH IN THE COASTAL AREA OF ERNAKULAM DISTRICT



Client

Kerala State Coastal Area Development Corporation Limited (KSCADC) & GIDA

**Consultants** 

Prof. V.Sundar

Prof. S. A. Sannasiraj



Department of Ocean Engineering
Indian Institute of Technology Madras
Chennai 600 036, India
MAY 2022



# **Table of Contents**

1.0	BACKGROUND	1
2.0	OBJECTIVES	1
3.0	INTRODUCTION	2
4.0	PRELIMINARY INVESTIGATION	3
5.0	DSAS METHODOLOGY	7
5.1	DSAS	7
5.2	End Point Rate	8
5.3	Linear Regression Rate	8
5.4	RESULTS AND DISCUSSION	9
5.4.1	Cell 1-2 (Pillar 1-2-3) Before construction of Petronet	9
5.4.2	Cell 1 (Pillar 1 - Pillar 2)	11
5.4.3	Cell 2 (Pillar 2 - Pillar 3)	12
5.4.4	Cell 3 (Pillar 3 - Pillar 4)	13
5.4.5	Cell 4 (Pillar 4 - Pillar 5)	16
5.4.6	Cell 5 (Pillar 5 - Pillar 6)	16
5.4.7	Cell 6 (Pillar 6 - Pillar 7)	16
5.4.8	Cell 7 (Pillar 7 - Pillar 8)	20
5.4.9	Cell 8 (Pillar 8 - Pillar 9)	20
5.4.10	Cell 9 (Pillar 9-10)	21
5.4.11	Cell 10 (Pillar 10-11)	24
5.4.12	Cell 11 (Pillar 11-12)	25
5.4.13	Cell 12 (Pillar 12-13)	25
5.4.14	Cell 13 (Pillar 13-14)	27
5.4.15	Cell 14 (Pillar 14-15)	29
5.4.16	Cell 15 (Pillar 15-16)	31
5.4.17	Cell 16 (Pillar 16-17)	33
5.4.18	Cell 17 (Pillar 17-18)	35
5.5	SUMMARY AND CONCLUSION	36
6.0	FIELD MEASUREMENT	36
6.1	Methodology	36



6.1.1	Topographic Survey	37
6.2	Equipment	37
6.2.1	Trimble R10 GNSS system	37
6.3	RESULTS AND DISCUSSION	38
6.3.1	Valappu Beach	38
6.3.2	Elamkunnapuzha Beach	39
6.3.3	Njarackal Arattuvazhi Beach	41
6.3.4	Veliyatham Parambu Beach & Nayarambalam Puthan Kadappuram	41
6.3.5	Edavanakkadu Grama Panchayat, Pazhangadu & Saidh Mohammed	42
	Beach	
6.3.6	Kuzhippilly, Pallipuram, Cherai & Arattu Kadavu Beach	45
6.4	SEDIMENT ANALYSIS	52
7.0	WAVE MODELLING	52
7.1	General	52
7.2	The wave model WAM	53
7.3	Functionality and Output of the Model	54
7.3.1	Model setup	55
7.3.2	Wave characteristics	55
7.4	Validation of the Model (WAM)	62
8.0	LITTORAL DRIFT ESTIMATE	63
8.1	Distribution of Sediment Transport	63
8.2	Results on the Littoral Drift Estimate Valappu Beach	65
8.3	Results on the Littoral Drift Estimate Elamkunnapuzha Beach	67
8.4	Results on the Littoral Drift Estimate Njarackal Arattuvazhi Beach	70
8.5	Results on the Littoral Drift Estimate Veliyatham Parambu Beach	73
8.6	Results on the Littoral Drift Estimate Edavankkadu Grama Panchayat	76
8.7	Results on the Littoral Drift Estimate Saidh Mohammed Beach	79
8.8	Result Littoral Drift Estimate Kuzhippilly	82
8.9	Results on the Littoral Drift Estimate Pallipuram Raktheswari Beach	85
8.10	Results on the Littoral Drift Estimate Cherai Beach	88
8.11	Result Littoral Drift Estimate Arattu Kadavu Beach	91
9.0	Important Coastal Stretches – Feedback From Client	96
10.0	Proposed Shore Protection Works	100



10.1	Valappu Beach	100
10.2	Malipuram	101
10.3	Veliyathamparambu	102
10.4	Puthenkadappuram	102
10.5	Pazhangadu	102
10.6	Saidh Mohammed beach	102
10.7	Saidh Mohammed beach -2 to Cherai Beach	102
11.0	Numerical Modelling For Shoreline Evolution	103
11.1	General	103
11.2	Methodology	104
11.3	Input and Output	106
12.0	Wave Modelling	110
12.1	General	110
12.2	Details of the mesh structure	110
12.3	Results and Discussion	111
12.4	Valappu Beach	111
12.4.1	Computational domain	111
12.4.2	Results for Valappu beach	112
12.5	Malippuram	118
12.5.1	Computational domain	118
12.5.2	Results for Malippuram	119
12.6	Veliyathamparambu	126
12.6.1	Computational domain	126
12.6.2	Results for Veliyathamparambu	127
12.7	Puthenkadappuram	133
12.7.1	Computational domain	133
12.7.2	Results for Puthenkadappuram	134
12.8	Pazhangadu	140
12.8.1	Computational domain	141
12.8.2	Results for Pazhangadu	142
12.9	Saidh Mohammed Beach	148
12.9.1	Computational domain	148
12.9.2	Results for Saidh Mohammed Beach	150



12.10	Saidh Mohammed Beach 2 To Cherai Beach (Phase 1)	155
12.10.1	Computational domain	156
12.10.2	Results for Saidh Mohammed Beach 2 To Cherai Beach (Phase 1)	157
13.0	Coastal Protection Structures	163
13.1	Design water level	163
13.2	Design of Groynes	163
13.3	Design of geo-textile units	166
13.3.1	General	166
13.3.2	Geo-tubes	166
13.3.3	Geo-textile Mattress	167
13.3.4	Geotextile containers and bags	167
13.3.5	Geotextile filter layer	170
14.0	Sequences Of Cross Section Of Groynes	171
15.0	Recommendations	174
	Table of Figures	
Fig.1	Study Area	2
Fig.2	Location of sediment cells	4
Fig.3	Flow chart for methodology	7
Fig.4	Linear regression rate of shoreline changes	9
Fig.5a	Cell 1-2 (Pillar 1-2-3)	10
Fig.5b	Results of Cell 1-2 (Pillar 1-2-3)	11
Fig.6a	Cell 1 (Pillar 1 - Pillar 2)	12
Fig.6b	Results of Cell 1 (Pillar 1 - Pillar 2)	12
Fig.7a	Cell 2 (Pillar 2 - Pillar 3)	13
Fig.7b	Results of Cell 2 (Pillar 2 - Pillar 3)	13
Fig.8a	A view of the North of Valappu beach	14
Fig.8b	A view of the South of Valappu beach	14
Fig.9	A view of Elamkunnapuzha beach (North and South)	15
Fig.10a	Cell 3 (Pillar 3 - Pillar 4)	15
Fig.10b	Results of Cell 3 (Pillar 3 - Pillar 4)	15
Fig.11a	View of on its North (Njarackal Arattuvazhi beach)	17



Fig.11b	View of on its South (Njarackal Arattuvazhi beach)	17
Fig.12a	Views of Veliyathamparambu beach (North)	18
Fig.12b	Views of Veliyathamparambu beach (South)	18
Fig.13a	Cell 6 (Pillar 6 - Pillar 7)	19
Fig.13b	Results of Cell 6 (Pillar 6 - Pillar 7)	19
Fig.14a	Cell 8 (Pillar 8 - Pillar 9)	20
Fig.14b	Results of Cell 8 (Pillar 8 - Pillar 9)	21
Fig.15a	A view of Aniyal beach Edavanakkad Grama Panchayat (North)	22
Fig.15b	A view of Aniyal beach Edavanakkad Grama Panchayat (South)	22
Fig.16	A view of the damaged groyne Aniyal beach Edavanakkad Grama	22
	Panchayat (South)	
Fig.17a	Cell 9 (Pillar 9-10)	23
Fig.17b	Results of Cell 9 (Pillar 9-10)	23
Fig.18a	Cell 10 (Pillar 10-11)	24
Fig.18b	Results of Cell 10 (Pillar 10-11)	24
Fig.19a	View of Saidh Mohammed beach (1) (North)	25
Fig.19b	View of Saidh Mohammed beach (1) (South)	26
Fig.20a	Cell 12 (Pillar 12-13)	26
Fig.20b	Results of Cell 12 (Pillar 12-13)	27
Fig.21a	View of Kuzhippilly beach (North)	27
Fig.21b	View of Kuzhippilly beach (South)	28
Fig.22a	Cell 13 (Pillar 13-14)	28
Fig.22b	Results of Cell 13 (Pillar 13-14)	29
Fig.23a	View of Pallipuram Raktheswari beach (North)	29
Fig.23b	View of Pallipuram Raktheswari beach (South)	30
Fig.24a	Cell 14 (Pillar 14-15)	30
Fig.24b	Results of Cell 14 (Pillar 14-15)	31
Fig.25	Views of Cherai beach (North and South)	32
Fig.26a	Cell 15 (Pillar 15-16)	32
Fig.26b	Results of Cell 15 (Pillar 15-16)	33
Fig.27a	View of Arattu Kadavu Beach (North)	33
Fig.27b	View of Arattu Kadavu Beach (South)	34
Fig.28a	Cell 16 (Pillar 16-17)	34



Fig.28b	Results of Cell 16 (Pillar 16-17)	34
Fig.29	Trimble R10 GNSS System	37
Fig.30	Transect locations at Valappu Beach	38
Fig.31	Beach profile graph of Valappu Beach – Transect 1-5	39
Fig.32	Aerial view of Elamkunnapuzha Beach with transects	40
Fig.33	Beach profile graph of Elamkunnapuzha – Transect 1-2	40
Fig.34	Transect locations at Njarackal Arattuvazhi Beach	41
Fig.35	Beach profile graph of Njarackal Arattuvazhi – Transect 1	41
Fig.36	Aerial view of Veliyatham Parambu Beach	42
Fig.37	Aerial view of Nayarambalam Puthan Kadappuram Beach	42
Fig.38	Transect location at Edavanakkadu Grama Panchayat Beach	43
Fig.39	Transect location at Pazhangadu Beach	43
Fig.40	Transect location at Saidh Mohammed Beach	44
Fig.41	Beach profile graph of Edavanakkadu Grama Panchayat – Transect 1	44
Fig.42	Beach profile graph of Pazhangadu – Transect 1	44
Fig.43	Beach profile graph of Saidh Mohammed – Transects 1	44
Fig.44	Aerial view of Kuzhippilly Beach with transects	45
Fig.45	Beach profile graph of Kuzhippilly – Transect 1-7	46
Fig.46	Aerial view of Pallipuram Beach with transects	47
Fig.47	Beach profile graph of Pallipuram – Transect 8-13	48
Fig.48	Aerial view of Cherai Beach with transects	49
Fig.49	Beach profile graph of Cherai – Transect 14-16	49
Fig.50	Aerial view of Arattu Kadavu Beach with transects	50
Fig.51	Beach profile graph of Arattu Kadavu – Transect 17-22	51
Fig.52	Sediment Size Analysis	52
Fig.53	Wave rose diagram representing the significant wave height (m) along	57
	the direction for the month of January to December	
Fig.54	Wave rose diagram representing the significant wave height (m) along	59
	the direction for an annual year	
Fig.55	Significant wave height during the month of June 2016 with BUOY data	62
Fig.56	Significant wave height during the month of June 2016 with ADCP data	63
Fig.57a	Breaker wave heights of Valappu Beach	65
Fig.57b	Wave breaker angle of Valappu Beach	66



Fig.57c	Surf zone width of Valappu Beach	66
Fig.57d	Longshore Sediment transport rate of Valappu Beach	67
Fig.58a	Breaker wave heights of Elamkunnapuzha Beach	68
Fig.58b	Wave breaker angle of Elamkunnapuzha Beach	69
Fig.58c	Surf zone width of Elamkunnapuzha Beach	69
Fig.58d	Longshore Sediment transport rate of Elamkunnapuzha Beach	70
Fig.59a	Breaker wave heights of Njarackal arattuvazhi beach	71
Fig.59b	Wave breaker angle of Njarackal arattuvazhi beach	72
Fig.59c	Surf zone width of Njarackal arattuvazhi beach	72
Fig.59d	Longshore Sediment transport rate of Njarackal arattuvazhi beach	73
Fig.60a	Breaker wave heights of Veliyatham Parambu Beach	74
Fig.60b	Wave breaker angle of Veliyatham Parambu Beach	75
Fig.60c	Surf zone width of Veliyatham Parambu Beach	75
Fig.60d	Longshore Sediment transport rate of Veliyatham Parambu Beach	76
Fig.61a	Breaker wave heights of Edavankkadu Grama Panchayat	77
Fig.61b	Wave breaker angle of Edavankkadu Grama Panchayat	78
Fig.61c	Surf zone width of Edavankkadu Grama Panchayat	78
Fig.61d	Longshore Sediment transport rate of Edavankkadu Grama Panchayat	79
Fig.62a	Breaker wave heights of Saidh Mohammed Beach	80
Fig.62b	Wave breaker angle of Saidh Mohammed Beach	81
Fig.62c	Surf zone width of Saidh Mohammed Beach	81
Fig.62d	Longshore Sediment transport rate of Saidh Mohammed Beach	82
Fig.63a	Breaker wave heights of Kuzhippilly Beach	83
Fig.63b	Wave breaker angle of Kuzhippilly Beach	84
Fig.63c	Surf zone width of Kuzhippilly Beach	84
Fig.63d	Longshore Sediment transport rate of Kuzhippilly Beach	85
Fig.64a	Breaker wave heights of Pallipuram Raktheswari Beach	86
Fig.64b	Wave breaker angle of Pallipuram Raktheswari Beach	87
Fig.64c	Surf zone width of Pallipuram Raktheswari Beach	87
Fig.64d	Longshore Sediment transport rate of Pallipuram Raktheswari Beach	88
Fig.65a	Breaker wave heights of Cherai Beach	89
Fig.65b	Wave breaker angle of Cherai Beach	90
Fig.65c	Surf zone width of Cherai Beach	90



Fig.65d	Longshore Sediment transport rate of Cherai Beach	91
Fig.66a	Breaker wave heights of Arattu Kadavu Beach	92
Fig.66b	Wave breaker angle of Arattu Kadavu Beach	93
Fig.66c	Surf zone width of Arattu Kadavu Beach	93
Fig.66d	Longshore Sediment transport rate of Arattu Kadavu Beach	94
Fig.67	Schematic diagram for finite difference scheme	105
Fig.68	Definition sketch of angles considered	105
Fig.69	Shoreline analysis for Malippuram	107
Fig.70	Shoreline analysis for Veliyathamparambu	107
Fig.71	Shoreline analysis for Puthenkadappuram	107
Fig.72	Shoreline analysis for Pazhangadu	108
Fig.73	Shoreline analysis for Saidh Mohammed beach	108
Fig.74	Shoreline analysis for Saidh Mohammed beach 2 to Cherai beach	109
	Valappu Beach	
Fig.75	Computational domain	111
Fig.76	Mesh Structure adopted for the wave propagation modelling	112
Fig.77a	Phase distributions (Meter) and Wave height (Meter) distribution for the wave approach angle from $180^{\circ}$	113
Fig.77b	Phase distributions (Meter) and Wave height (Meter) distribution for the wave approach angle from 200 <sup>0</sup>	114
Fig.77c	Phase distributions (Meter) and Wave height (Meter) distribution for the wave approach angle from 225 <sup>0</sup>	115
Fig.77d	Phase distributions (Meter) and Wave height (Meter) distribution for the wave approach angle from 250 <sup>0</sup>	116
Fig.77e	Phase distributions (Meter) and Wave height (Meter) distribution for the wave approach angle from 270 <sup>0</sup>	117
Fig.77f	Phase distributions (Meter) and Wave height (Meter) distribution for the wave approach angle from 300 <sup>0</sup> Malippuram	118
Fig.78	Computational domain	119
Fig.79	Mesh Structure adopted for the wave propagation modelling	119
Fig.80a	Phase distributions (Meter) and Wave height (Meter) distribution for the	120
	wave approach angle from $180^{0}$	120
Fig.80b	Phase distributions (Meter) and Wave height (Meter) distribution for the wave approach angle from 200 <sup>0</sup>	121
Fig.80c	Phase distributions (Meter) and Wave height (Meter) distribution for the wave approach angle from 225 <sup>0</sup>	122
Fig.80d	Phase distributions (Meter) and Wave height (Meter) distribution for the wave approach angle from 250 <sup>0</sup>	123



Fig.80e	Phase distributions (Meter) and Wave height (Meter) distribution for the wave approach angle from 270 <sup>0</sup>	124
Fig.80f	Phase distributions (Meter) and Wave height (Meter) distribution for the wave approach angle from 300 <sup>0</sup> Veliyathamparambu	125
Fig.81	Computational domain	126
_	*	
Fig.82	Mesh Structure adopted for the wave propagation modelling	127
Fig.83a	Phase distributions (Meter) and Wave height (Meter) distribution for the wave approach angle from 180 <sup>o</sup>	128
Fig.83b	Phase distributions (Meter) and Wave height (Meter) distribution for the wave approach angle from 200 <sup>0</sup>	129
Fig.83c	Phase distributions (Meter) and Wave height (Meter) distribution for the wave approach angle from 225 <sup>0</sup>	130
Fig.83d	Phase distributions (Meter) and Wave height (Meter) distribution for the wave approach angle from 250 <sup>0</sup>	131
Fig.83e	Phase distributions (Meter) and Wave height (Meter) distribution for the wave approach angle from 270°	132
Fig.83f	Phase distributions (Meter) and Wave height (Meter) distribution for the wave approach angle from 300 <sup>0</sup>	133
	Puthenkadappuram	
Fig.84	Computational domain	134
Fig.85	Mesh Structure adopted for the wave propagation modelling	134
Fig.86a	Phase distributions (Meter) and Wave height (Meter) distribution for the wave approach angle from 180 <sup>0</sup>	135
Fig.86b	Phase distributions (Meter) and Wave height (Meter) distribution for the wave approach angle from 200 <sup>0</sup>	136
Fig.86c	Phase distributions (Meter) and Wave height (Meter) distribution for the wave approach angle from 225 <sup>0</sup>	137
Fig.86d	Phase distributions (Meter) and Wave height (Meter) distribution for the wave approach angle from 250 <sup>0</sup>	138
Fig.86e	Phase distributions (Meter) and Wave height (Meter) distribution for the wave approach angle from 270 <sup>0</sup>	139
Fig.86f	Phase distributions (Meter) and Wave height (Meter) distribution for the wave approach angle from 300°	140
	Pazhangadu	
Fig.87	Computational domain	141
Fig.88	Mesh Structure adopted for the wave propagation modelling	142
Fig.89a	Phase distributions (Meter) and Wave height (Meter) distribution for the wave approach angle from 180 <sup>0</sup>	142
Fig.89b	Phase distributions (Meter) and Wave height (Meter) distribution for the wave approach angle from 200 <sup>0</sup>	143
Fig.89c	Phase distributions (Meter) and Wave height (Meter) distribution for the wave approach angle from 225 <sup>0</sup>	144
Fig.89d	Phase distributions (Meter) and Wave height (Meter) distribution for the wave approach angle from 250 <sup>0</sup>	145



Fig.89e	Phase distributions (Meter) and Wave height (Meter) distribution for the	146
Fig.89f	wave approach angle from 270 <sup>0</sup> Phase distributions (Meter) and Wave height (Meter) distribution for the wave approach angle from 300 <sup>0</sup> Saidh Mohammed Beach	147
Fig.90	Computational domain	149
Fig.91	Mesh Structure adopted for the wave propagation modelling	149
Fig.92a	Phase distributions (Meter) and Wave height (Meter) distribution for the wave approach angle from 180 <sup>0</sup>	150
Fig.92b	Phase distributions (Meter) and Wave height (Meter) distribution for the wave approach angle from 200 <sup>0</sup>	151
Fig.92c	Phase distributions (Meter) and Wave height (Meter) distribution for the wave approach angle from 225 <sup>0</sup>	152
Fig.92d	Phase distributions (Meter) and Wave height (Meter) distribution for the wave approach angle from 250 <sup>0</sup>	153
Fig.92e	Phase distributions (Meter) and Wave height (Meter) distribution for the wave approach angle from 270 <sup>0</sup>	154
Fig.92f	Phase distributions (Meter) and Wave height (Meter) distribution for the wave approach angle from 300 <sup>0</sup> Saidh Mohammed Beach 2 To Cherai Beach (Phase 1)	155
Fig.93	Computational domain	156
Fig.94	Mesh Structure adopted for the wave propagation modelling	157
Fig.95a	Phase distributions (Meter) and Wave height (Meter) distribution for the wave approach angle from 180 <sup>0</sup>	157
Fig.95b	Phase distributions (Meter) and Wave height (Meter) distribution for the wave approach angle from 200 <sup>0</sup>	158
Fig.95c	Phase distributions (Meter) and Wave height (Meter) distribution for the wave approach angle from 225 <sup>0</sup>	159
Fig.95d	Phase distributions (Meter) and Wave height (Meter) distribution for the wave approach angle from 250 <sup>0</sup>	160
Fig.95e	Phase distributions (Meter) and Wave height (Meter) distribution for the wave approach angle from 270 <sup>0</sup>	161
Fig.95f	Phase distributions (Meter) and Wave height (Meter) distribution for the wave approach angle from 300 <sup>0</sup>	162



# **List of Tables**

Table 1	Location description of Cells and Pillars	5
Table 2	Coordinates of the site	36
Table 3	Beach Slope values at Valappu Beach	39
Table 4	Beach Slope values at Elamkunnapuzha Beach	40
Table 5	Slope of Kuzhippilly Beach Transects	46
Table 6	Slope of Pallipuram Beach Transects	48
Table 7	Slope of Cherai Beach Transects	49
Table 8	Slope of Arattu Kadavu Beach Transects	51
Table 9	Vypin to Munambam onshore soil sample test results	52
Table 10	Wave height vs Mean direction joint distribution	59
Table 11	Wave Period vs Mean direction joint distribution	60
Table 12	Wave height vs mean period joint distribution	61
Table 13	Wave characteristics for the present study point 1	64
Table 14	Wave characteristics for the present study point 2	64
Table 15	Sediment transport rate of Valappu Beach	67
Table 16	Sediment transport rate of Elamkunnapuzha Beach	69
Table 17	Sediment transport rate of Njarackal arattuvazhi beach	72
Table 18	Sediment transport rate of Veliyatham Parambu Beach	75
Table 19	Sediment transport rate of Edavankkadu Grama Panchayat	78
Table 20	Sediment transport rate of Saidh Mohammed Beach	81
Table 21	Sediment transport rate of Kuzhippilly	84
Table 22	Sediment transport rate of Pallipuram Raktheswari beach	87
Table 23	Sediment transport rate of Cherai beach	90
Table 24	Sediment transport rate of Arattu Kadavu Beach	93
Table 25	Comparison of littoral drift estimate results	95
Table 26	Primary plan for coastal protection measures	97
Table 27	Design specifications for geo-tubes	166
Table 28	Performance of High-density polyethylene	168
Table 29	Properties of Geo-textile bags	170
Table 30	Properties of Geotextile filter	170
Table 31	Details of groynes from Saidh Mohammed beach 2 to Cherai beach	173



## 1.0 BACKGROUND

The Kerala coastal stretch has been traditionally protected by seawalls and is facing a severe threat of coastal erosion owing to the continued intense wave and tide induced forces experienced along the exposed coastal stretches. It is necessary to protect the coastal stretch extending between Vypin and Munambam in order to conserve the flourishing fishing, industrial and tourism activities; in addition to preserving the state highway road which runs parallel to the said coastline. Kerala State Coastal Area Development Corporation Limited (KSCADC) has approached Prof. V. Sundar, Department of Ocean Engineering, IIT Madras to carry out a systematic investigation on the stability of defined shoreline along the Vypin coast stretches north of Cochin Port entrance in the Ernakulam district with specific reference to shoreline erosion. Accordingly, Prof. V. Sundar had detailed discussions with Mr. P.I. Sheik Pareeth, Managing Director, KSCADC and concerned officials on 08/12/2018. This technical and commercial proposal is made based on the requirement from KSCADC through lr. No. 4178/G/2018/KSCADC dt.19/12/2018 following the discussion with their officials on 08/12/2018. A work order was issued by KSCADC on 17.11.2021.

## 2.0 OBJECTIVES

The specific objectives of the work are defined as below.

- Investigation of shoreline erosion rate along the specified coastal stretch (about 20km long stretch in the Vipin area north of Cochin port entrance) through satellite imageries over the past 2 decades.
- To study annual wave climate off the Vipin coastal stretches through detailed numerical modelling validated through measurements off Cochin coast.
- Field investigations of shoreline profile, beach profiles, sediment characteristics and littoral current.
- Designing suitable coastal protection scheme at sub stretches in the Ernakulam district, Kerala with particular site-specific schemes. The sub stretches will be considered with sediment sub-cell concept and also, to facilitate the execution of the work in phases.
- Prediction of shoreline in the event of the construction of the proposed scheme in the future.
- Preliminary design of proposed sections keeping in consideration of environmental issues.

Client: (KSCADC) & GIDA, KERALA



## 3.0 INTRODUCTION

The coastal stretch of Kerala is 590 km long, extending along the southwestern Indian peninsula. It is divided into 9 districts (Thiruvananthapuram, Kollam, Alappuzha, Ernakulam, Thrissur, Malappuram, Kozhikode, Kannur, Kasaragod) along the coast; the present study area is situated in the Ernakulam district as shown in **Fig. 1**. About 420 km of coastal stretch is protected by hard structures (such as sea walls, groyne field, etc.) (Sundar and Murali, 2007). The region has three distinct seasons, the pre-monsoon from February to May, the southwest monsoon from June-September, and Post monsoon from October to January, annually. The normal tide variation in Kerala is between 0.9m in the south and 1.8m in the north (Thiruvenkatasamy and Girija, 2014). The net annual longshore sediment transport was reported to vary between 0.32 x 10<sup>5</sup> m<sup>3</sup> and 2.3 x 10<sup>5</sup> m<sup>3</sup> along the Kerala coast with the net transport direction being pre-dominantly northerly for most locations along with Kerala. The Kerala coast faces high erosion by various natural processes such as wind, currents, and waves, the sediment moves along the shore, which changes the shoreline (Mallik et al., 1987). The longshore currents are predominantly northerly during the fair season, whereas it is mostly towards the south during the monsoon season.

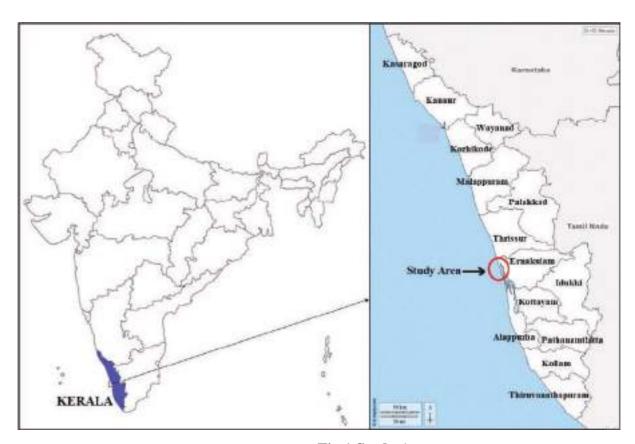


Fig.1 Study Area

Client: (KSCADC) & GIDA, KERALA



The factors for shoreline changes along the coast are both natural and anthropogenic. For studying the long-term stability of any coast, it is necessary to conduct a detailed analysis of the shoreline changes over the period under consideration, because the shoreline being dynamic is susceptible to changes by various driving factors.

A site visit was carried out by Prof. V. Sundar and Prof. S.A. Sannasiraj of IIT Madras along

## 4.0 PRELIMINARY INVESTIGATION

with Mr. Sheik Parith, Managing Director of Kerala State Coastal Area Development Corporation Limited (KSCADC) and his officials on 16 December 2021. This was to identify the vulnerable sites experiencing erosion. Although the water logging was present at several stretches of the coast due to the monsoon spell, the site visit was successfully completed and the details of which was reported by IITM to KSDAC during the last week of Dec 2021. For the study, the analysis of coastal changes along the Ernakulam coastal district sites is identified and marked. The stretch is noted from LNG Petronet to Munambam training wall, spanning for about 24 km. The location has been marked as pillar 1-18 as shown in **Fig 2** and the location between pillars is marked as cell 1-17 as shown in **Table 1**. The shore change at the Kerala coast is dynamic and comparing the long-term shoreline change using multi-dated satellite images gives a clear view of the erosion/accretion rates. The shoreline changes have

been observed for the identified cells encompassing open coasts, groyne protected structures,

Client: (KSCADC) & GIDA, KERALA

fishing hamlets, etc.





Pillar 16

Arattu Kadavu beachi

Pillar 15 Cherai Beach

Pillar 14

Kuzhippilly beachi

Pillar 13

Saidh Mohmmed Beach(1)

Pillar 12

b) From Pillar 12-18

Fig.2 Location of sediment cells

Client: (KSCADC) & GIDA, KERALA



Cells	Pillars	Shore	Type of	Erosion/	Site visit identified	Latitude	Sea Wall/	Open Coast
		Length (km)	structure	Accretion	locations	Longitude of cells	Groyne (km)	(km)
Cell 1	Pillar 1-2	0.37	South of LNG jetty	High Accretion	-	9°58'27.17" N 76°13'33.13" E	-	0.37
Cell 2	Pillar 2-3	3.4	Single Training Wall	High Erosion	-	9°59'22.28" N 76°13'13.05" E	-	3.4
Cell 3	Pillar 3-4	2.5	End of IOCL LPG Terminal	High Erosion	Valappu	10° 1'4.17" N 76°12'50.23" E	-	2.5
Cell 4	Pillar 4-5	0.93	Sea Wall	-	Elamkunnapuzha	10° 1'48.84" N 76°12'35.37" E	0.93	-
Cell 5	Pillar 5-6	1.49	Sea Wall	-	Njarackal Arattuvazhi	10° 2'30.61" N 76°12'24.01" E	1.49	-
Cell 6	Pillar 6-7	0.25	Single Groyne and sea wall	Moderate Erosion	-	10° 2'53.63" N 76°12'18.05" E	0.13	0.12
Cell 7	Pillar 7-8	1.9	Sea Wall	-	Veliyathamparambu	10° 3'22.67" N 76°12'3.43" E	1.9	-
Cell 8	Pillar 8-9	0.75	Groyne Field	Moderate Erosion	-	10° 4'7.84" N 76°11'51.43" E	0.75	-
Cell 9	Pillar 9-10	0.4	Open Beach	Moderate Accretion	Aniyal beach	10° 4'25.19" N 76°11'47.40" E	-	0.4
Cell 10	Pillar 10- 11	0.88	Open beach, Narrow strip	Moderate Accretion & Erosion	-	10° 4'46.04" N 76°11'42.43" E	0.44	0.44
Cell 11	Pillar 11- 12		Sea wall	-	-	10° 5'10.93"N 76°11'34.49"E	0.84	-
Cell 12		1.4			Saidh Mohammed 1	10°5'47.13" N 76°11'24.28" E	0.89	-

Client: (KSCADC) & GIDA, KERALA



	Pillar 12-		Open Coast,	Moderate	Saidh Mohammed 2	10°5'57.76" N 76°11'21.90" E	-	0.51
	13		Seawall &	Erosion &				
			Groyne Field	accretion				
Cell 13	Pillar 13-	1.62	Open Coast	Moderate	Kuzhippilly beach	10°6'34.49" N 76°11'14.56" E	-	1.62
	14			Erosion				
Cell 14	Pillar 14-	2.35	Open Coast,	Moderate	Pallipuram	10°7'40.55" N 76°10'57.99" E	0.35	2
	15		Seawall	Erosion	Raktheswari			
Cell 15	Pillar 15-	1.3	Open coast	Moderate	Cherai	10° 8'32.37" N 76°10'41.29" E	0.84	0.46
	16			Erosion				
Cell 16	Pillar 16-	1.31	Seawall &	Moderate	Arattu Kadavu	10° 9'12.40" N 76°10'26.74" E	1.33	-
	17		Open coast	Erosion				
Cell 17	Pillar 17-	1.85	Sea Wall	-	-	10°10'2.82" N 76°10'8.43" E	1.85	-
	18							

**Table.1 Location description of Cells and Pillars** 



### 5.0 DSAS METHODOLOGY

The science of shoreline mapping has significantly evolved over the years to reduce the uncertainties involved in measurement and data processing. The remotely collected data from satellite imagery, such as the Google Earth timeline imagery, can furnish valuable preliminary data to understand the dynamic behaviour of shoreline variation in a localized stretch. The comprehensive effect of shoreline changes can be understood by employing statistical approaches (Dolan et al., 1991). The methodology adopted for the present study includes data collection, shoreline demarcation, and shoreline change rate calculation. Multi-temporal satellite cloud-free data of Landsat TM and ETM sensors acquired from 2008 to 2020 along the Kerala Coast. The data source was used to demarcate the shoreline change using ArcGIS 10.6.1 software using the Digital shoreline analysis system technique. For each shoreline extraction, the high-water line boundary is considered as a shoreline proxy. The shoreline data analysis has been projected in **Fig 3**.

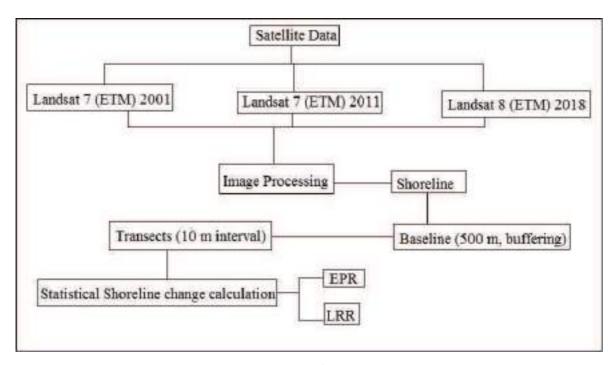


Fig.3 Flow chart for methodology

### 5.1 DSAS

To select the optimal technique, a revalidation study between the extracted shorelines and the corresponding physical measurements has been carried out in ArcGIS 10.6.1 for the three segments at different seasons. These are analyzed using the DSAS tool. The tool is used to Client: (KSCADC) & GIDA, KERALA



calculate the rate of shoreline movement and the changes. The DSAS is executed in five steps: (1) demarcation of shoreline; (2) baseline creation; (3) transects generation; (4) computation of distances between baseline and shorelines at each transect; and, (5) computation of rate of shoreline change.

The transect line is generated for a length of 100m from the baseline to the shoreline. The spacing between the transects is uniformly maintained at 5m and 10m intervals according to site conditions. The extracted shoreline from each year that intersects at each of the transects has been used for calculating the shoreline change rate, (i.e.) the difference between the extracted and the observed shoreline is calculated along transects perpendicular to the baseline.

## **5.2** End Point Rate

The End Point Rate (EPR) is calculated by dividing the shoreline change by the time elapsed between the oldest and the most recent shoreline. The major advantages of the EPR are the ease of computation and the minimal requirement of only two shoreline data. The extracted digital shorelines then were superposed to identify the shoreline change over the number of years. When the shoreline keeps fluctuating about a mean point, i.e., accreting and eroding throughout different seasons of the year, the observed value of the end point rate would be a minimum.

EPR = distance in meters/time between the oldest and most recent shoreline (1)

## **5.3** Linear Regression Rate

A linear regression rate of change statistics is determined by fitting a least-squares regression line to all shoreline points chosen for the study. The regression line is placed such that the sum of the squared residuals (determined by squaring the offset distance of each data point from the regression line and adding the squared residuals together) is minimized. The linear regression rate is the slope of the regression line.

# **Change Rate Calculation**

In this study, changes in the shoreline position are computed using four data analysis techniques (i.e., EPR and LRR). The EPR is evaluated by dividing the distance between any two shorelines by the number of years between them. This method is enormously prevalent in the calculation of the rate of movement of shoreline change, as it is widely used by different coastal researchers.

$$EPR = \frac{L_1 - L_2}{t_1 - t_2} \tag{2}$$

Client: (KSCADC) & GIDA, KERALA



wherein,  $L_1$  and  $L_2$  are the distances separating the shoreline and baseline;  $t_1$  and  $t_2$  are the dates of the position of the two shorelines considered. The second method adopted is through LRR, which consists of fitting a least-squares regression line to multiple shoreline position points for a particular transect (Mahapatra et al., 2014). The shoreline change rate along each transect for all periods is computed by plotting the points where the shorelines are intersected by transects and calculating the linear regression equation,

$$L = b + mx \tag{3}$$

where, L represents the distance (m), from the baseline, x is the shoreline date intervals (years), and m is the slope of the fitted line (m/year) (i.e., represents the shoreline change rate, LRR), and b is the y-intercept (**Fig. 4**).

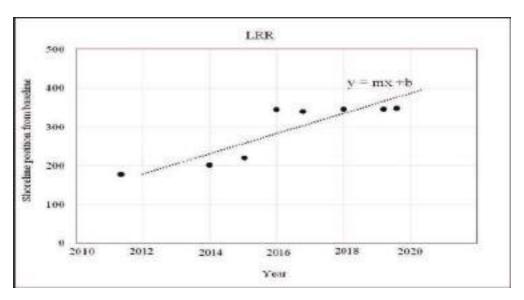


Fig.4 Linear Regression Rate of Shoreline changes

### 5.4 Results and Discussion

#### 5.4.1 Cell 1-2 (Pillar 1-2-3)

Prior to the construction of Petronet LNG jetty

The coastal stretch (see **Fig. 5a**) covers Petronet LNG, IOCL, BPCL; and the area is assessed before the construction of structures. The Petronet LNG limited was constructed in 2009. The shoreline changes have been observed for 2002, 2005, 2006 and 2007. The length of the shore is 3.8km, the baseline buffer is 150m from the shoreline and the spacing between the transects is 10m.



According to EPR and LRR, the rate of erosion is high in the north (i.e. at end of IOCL facility), and the rate of accretion is high in the south region (near Petronet LNG). The maximum rate of erosion is -20.3m/yr and the maximum rate of accretion is 10m/yr as shown in **Fig.5b**.

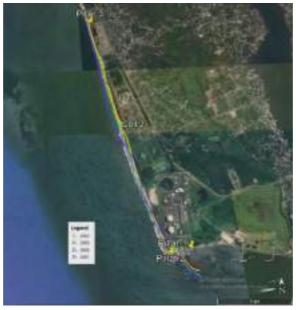


Fig.5a Cell 1-2 (Pillar 1-2-3)

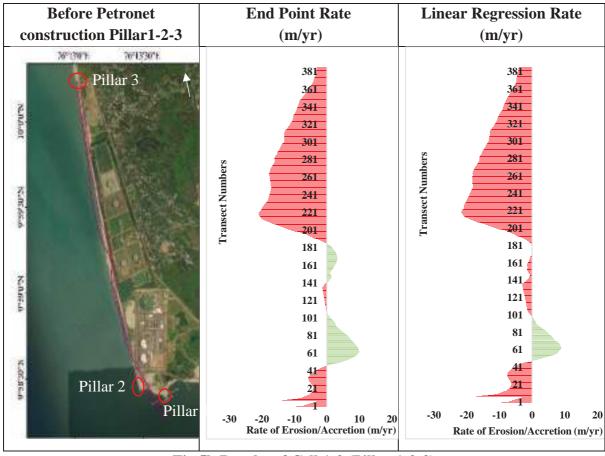


Fig.5b Results of Cell 1-2 (Pillar 1-2-3)



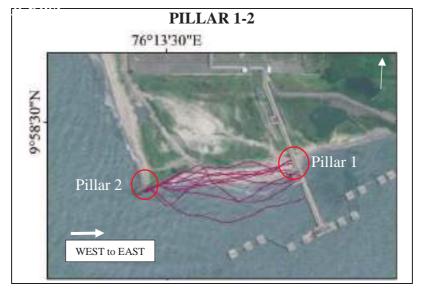
## 5.4.2 *Cell 1 (Pillar 1 - Pillar 2)*

The shoreline changes have been observed at the inlet of the channel. The Petronet jetty (constructed in 2009 and later expanded in 2010) is perpendicular to the inlet boundary, at an offset of 300m. A training wall was constructed at the entrance of the inlet in 2011. The shoreline changes for cell 1 have been observed for 2011-2020 (10 years). The length of the shore is 0.37 km (see **Fig 6a**); the baseline buffer is set 150m from the shoreline and the spacing between the transects is 5m.

According to EPR and LRR, the rate of accretion is high near the LNG jetty and the rate of erosion is low near the training wall. The maximum rate of accretion is 9.3 m/yr and the maximum rate of erosion is -1.7 m/yr as shown in **Fig.6b**.



Fig.6a Cell 1 (Pillar 1 - Pillar 2)





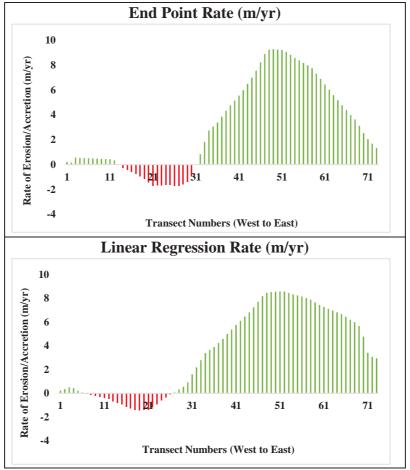


Fig.6b Results of Cell 1 (Pillar 1 - Pillar 2)

### 5.4.3 Cell 2 (Pillar 2 - Pillar 3)

After construction of Petronet jetty

The shoreline study area covers the coastal stretches of Petronet LNG, BPCL, and IOCL facilities (see **Fig 7a**.) The shoreline changes were observed for 2012 – 2020 (9 years), for a shore stretch of 3.4 km. The baseline buffer is set 100m from the shoreline and the spacing between the transects is 10m.

According to EPR and LRR, the rate of erosion is high at the south (near Petronet LNG and BPCL facilities) and the accretion is moderate at the north (near the end of IOCL). The maximum rate of erosion is -8.16 m/yr, for about 2km from the southern end and moderate accretion at north up to 2.4 m/yr as shown in **Fig 7b**.





Fig.7a Cell 2 (Pillar 2 - Pillar 3)

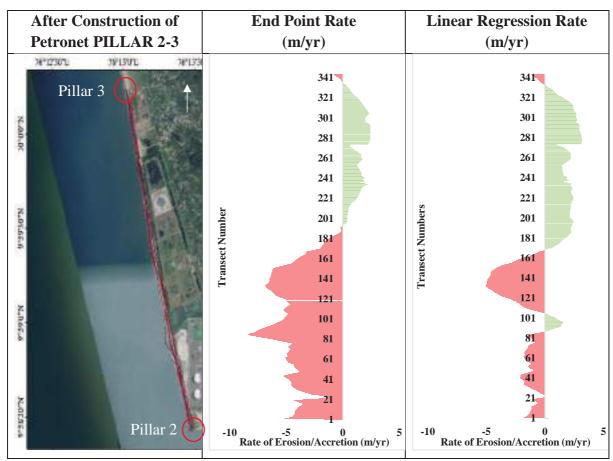


Fig.7b Results of Cell 2 (Pillar 2 - Pillar 3)

5.4.4 Cell 3 (Pillar 3 - Pillar 4) Valappu beach



This stretch extends for 1.5 km and is observed to have a beach width of about 25m and it is located immediately north of the IOCL facilities. The northern and southern coastal stretch from the Valappu beach beach are shown in **Fig.8**. The beach slope is found to be very steep and it is understood that the beach width oscillates depending on the wave climate/seasons. The cross-shore sediment transport is found to be significant during south-west monsoon season. Valappu beach beach is identified to be an active tourist attraction and thus the aesthetics needs to be preserved. The probable solution to be examined could be a submerged reef in the nearshore waters or a T-groynes which is to be decided after a detailed study.



Fig.8a A view of the North of Valappu beach



Fig.8b A view of the South of Valappu beach

### Elamkunnapuzha beach

This stretch is located north of Valappu beach. The shoreline in the vicinity of this beach is protected by rubble mound sea wall (**Fig. 9**) which has settled marginally due to severe erosion. This is certainly due to the protrusion of the landmass into the ocean serving as a littoral barrier leading to erosion on its southern end, as the net littoral drift at this stretch is likely to be towards the south.





Fig.9 A view of Elamkunnapuzha beach (North and South)

The shoreline changes are observed for the area after the commissioning of the IOCL and LPG import yard. The shore length is 2.5km, which includes a beach area, i.e., Valappu beach at the south and Elamkunnapuzha beach at the north (see **Fig 10a**). The shoreline changes have been observed from 2011-2012 and 2014-2020 (9 years). The baseline buffer is 100m from the shoreline and the spacing between the transects is 10m.

According to EPR and LRR, almost the entire stretch experiences active erosion with the maximum rate of erosion at -11.15 m/yr as shown in **Fig 10b**. The rate of accretion is less than 5% in the area as per EPR.



Fig.10a Cell 3 (Pillar 3 - Pillar 4)

PILLAR 3-4	End Point Rate (m/yr)	Linear Regression Rate
		(m/yr)



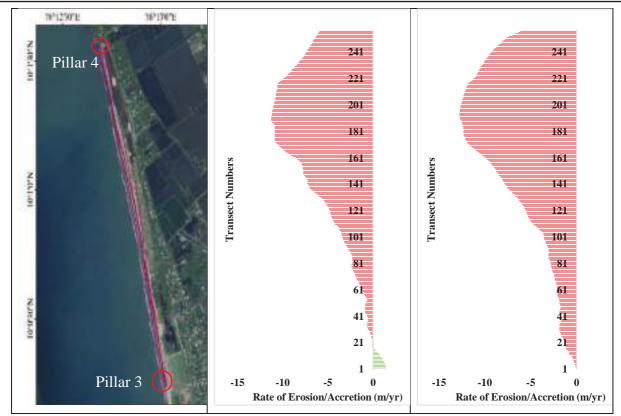


Fig.10b Results of Cell 3 (Pillar 3 - Pillar 4)

## 5.4.5 Cell 4 (Pillar 4 - Pillar 5)

This stretch is protected by a seawall (no immediate action required).

## 5.4.6 Cell 5 (Pillar 5 - Pillar 6)

This stretch is protected by a seawall. (No immediate action required).

## 5.4.7 Cell 6 (Pillar 6 - Pillar 7) Njarackal Arattuvazhi beach

The existing beach is protected with a seawall structure, which is serving its purpose with occasional overtopping. The toe of the seawall needs to be strengthened after accessing the present status of the profile of this seawall. Views of the seawall on the north and south of the location are projected in **Fig.11**.





Fig.11a View of Njarackal Arattuvazhi beach (Northern side)



Fig.11b View of Njarackal Arattuvazhi beach (Southern side)

### Veliyathamparambu beach

The 200m stretch of this beach is located in between two existing groynes designed by IITM. The views of the stretch north and south from the Veliyathamparambu beach are shown in **Fig** 12.

The two groynes (North one constructed as the groyne, whereas the southern groyne has been protruding as an extension of an existing sea wall) have facilitated the formation of a beach width of about 30m wide. The head section of both the groynes is damaged which needs rehabilitation. At present, it is stated by locals that about 50 boats are using this beach as a landing facility and are pleading for its sustainability. One possible solution could be an extension of both the existing groynes or to provide a T-section at their tips after the evaluation of the littoral drift.





Fig.12a Views of Veliyathamparambu beach (North)



Fig.12b View of Veliyathamparambu beach (South)

The Njarackal Arattuvazhi beach is located at the south (near Pillar 6) and Veliyathamparambu beach at the north (immediately after Pillar 7) (see **Fig.13a**). The shoreline changes have been observed from 2011 - 2020 (10 years) for a 0.25 km stretch. The baseline buffer is 100m from the shoreline and the spacing between the transects is 5m. According to EPR and LRR, the rate of erosion is low (-0.2 m/yr) as shown in **Fig.13b.** 





Fig.13a Cell 6 (Pillar 6 - Pillar 7)

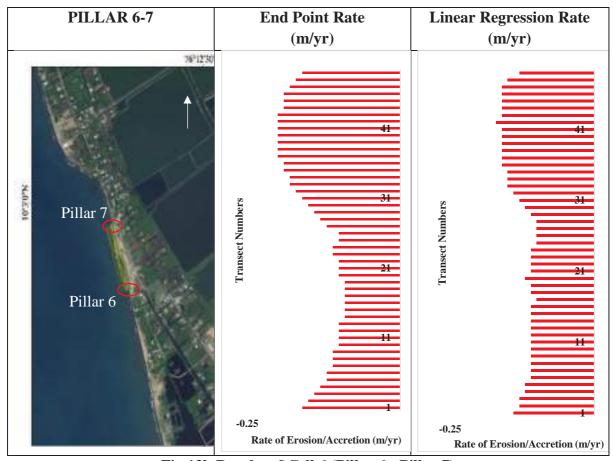


Fig.13b Results of Cell 6 (Pillar 6 - Pillar 7)



## 5.4.8 Cell 7 (Pillar 7 - Pillar 8)

This stretch is protected by a seawall. (No immediate action required).

## 5.4.9 Cell 8 (Pillar 8 - Pillar 9)

This shoreline stretch covers an existing groyne field and an open coast (see **Fig 14a**); where the shoreline changes were observed from 2012-2018 & 2020) (8 years). The length of the shoreline considered is 0.75 km with a baseline buffer of 100m from the shoreline and the spacing adopted between the transects is 5m.

According to EPR and LRR, the rate of erosion is moderate at the north and low accretion is observed at the south. The maximum rate of erosion is -2.36 m/yr and the maximum rate of accretion is 1.5 m/yr as shown in **Fig.14b.** 



Fig.14a Cell 8 (Pillar 8 - Pillar 9)



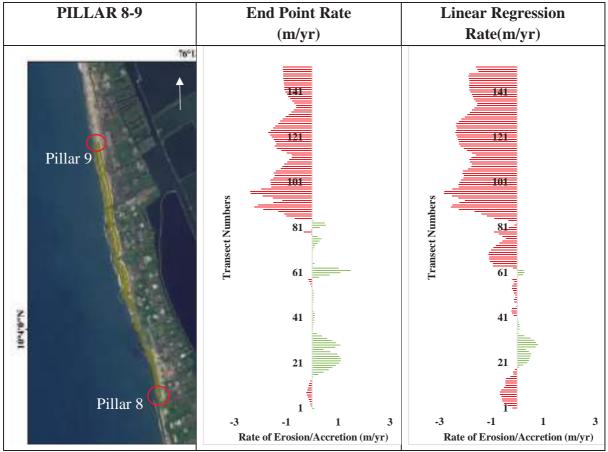


Fig.14b Results of Cell 8 (Pillar 8 - Pillar 9)

# 5.4.10 Cell 9 (Pillar 9-10) Aniyal beach, Edavanakkad Grama Panchayat

A close site inspection of the seawall was hindered owing to heavy water logging around the coastal area. For about a 3 km stretch, the existing sea wall is damaged probably due to inadequate toe protection. Frequent overtopping results in under toe (Flow of water beneath the sea wall, which might be leading to the gradual settlement of sea wall). The probable solution could be strengthening the toe as well as preparing a trench immediately on the landward side of the sea wall and filling it with smaller stones to serve as a mattress. Views of the present status of the seawall; groynes along this stretch are projected in **Fig.15 &16** which needs to be rehabilitated.





Fig.15a A view of Aniyal beach Edavanakkad Grama Panchayat (North)



Fig.15b A view of Aniyal beach Edavanakkad Grama Panchayat (South)



Fig.16 A view of the damaged groyne Aniyal beach Edavanakkad Grama Panchayat (South)

The Aniyal beach, Edavanakkad Grama Panchayat is located within cell 9 (see **Fig.17a**). The shoreline changes for the 0.4 km stretch have been observed from 2010 to 2020with a baseline buffer at 100m from the shoreline and adopting a transect spacing of 5m.

According to EPR and LRR, the rate of accretion is moderate and the maximum rate of accretion is 2.63 m/yr as shown in **Fig.17b.** 



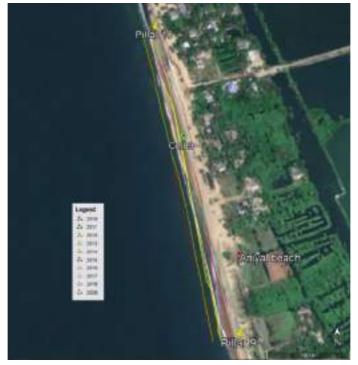


Fig.17a Cell 9 (Pillar 9-10)

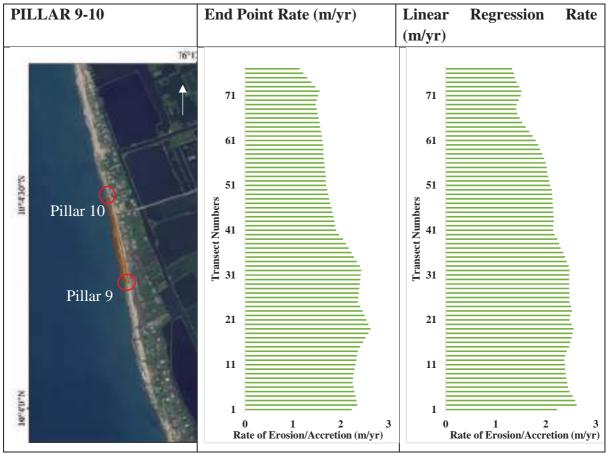


Fig.17b Results of Cell 9 (Pillar 9-10)



## 5.4.11 Cell 10 (Pillar 10-11)

The shoreline changes in this stretch (see **Fig.18a**) were observed for 2011-2018 & 2020 (9 years); the length of the shoreline is 0.88km. The baseline buffer is at 100m from the shoreline and the spacing between the transects is 5m.

According to EPR and LRR, the rate of erosion is moderate. The maximum rate of erosion is - 2 m/yr at the mid-region as shown in. and **Fig.18b.** 

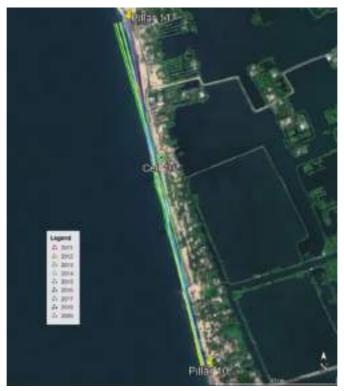


Fig.18a Cell 10 (Pillar 10-11)

PILLAR 10-11	<b>End Point Rate</b>	Linear Regression Rate
	(m/yr)	(m/yr)



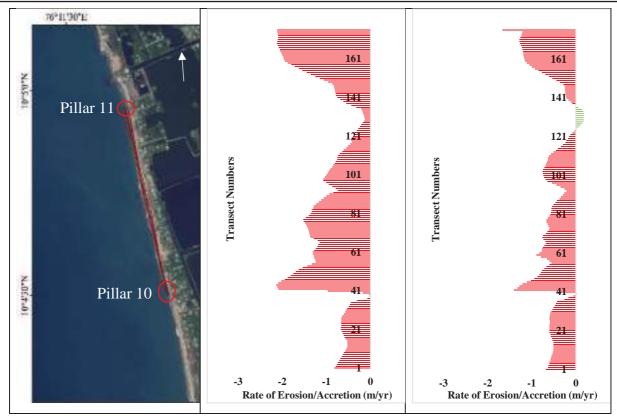


Fig.18b Results of Cell 10 (Pillar 10-11)

## 5.4.12 Cell 11 (Pillar 11-12)

This stretch is protected by a seawall. (No immediate action required).

# 5.4.13 CELL 12 (Pillar 12-13) Saidh Mohammed beach (1)

This stretch has been protected with a groynes field designed by IITM which has been serving its purpose and has also encouraged the formation of beach on either side of each of the groynes. The beach thus formed has been serving as a buffer against the wave attack in the nearshore region. Although, the existing groyne head sections may require strengthening post a detailed inspection of the same. Views of Saidh Mohammed beach1 along the north and south of the site are shown in **Fig.19**.





### Fig.19a View of Saidh Mohammed beach (1) (North)



Fig.19b View of Saidh Mohammed beach (1) (South)

## Saidh Mohammed beach 2 (North-Nearby Sudhan mukk)

There is no immediate threat to this section of the coastal stretch, and thus no protection measures need to be commissioned with immediate effect.

The coastal stretch of cell 12 includes Saidh Mohammed beach (1) and Saidh Mohammed beach 2 (North-Nearby Sudhan mukk) (see **Fig.20a**). The erosion and accretion along the shore depend on season variation. The shoreline changes were observed from 2013-2018 & 2020 (7 years); the length of the shoreline is 1.42km. The baseline buffer is 100m from the shoreline and the spacing between the transects is 5m.

According to EPR and LRR, the maximum rate of erosion is -1.62 m/yr and the maximum rate of accretion is 1.6 m/yr as shown in **Fig.20b.** 



Fig.20a Cell 12 (Pillar 12-13)



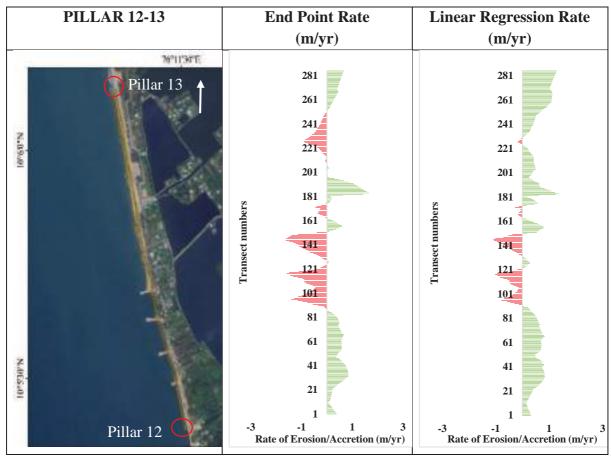


Fig.20b Results of Cell 12 (Pillar 12-13)

# 5.4.14 Cell 13 (Pillar 13-14) Kuzhippilly beach

This coastal stretch is located south of the Pallipuram beach. Owing to the tourist interest in the Kuzhipilly beach it is mandated to enhance the formation beach and also to preserve the existing beach width, for which a detailed investigation requires to be conducted prior to arriving at a decision on the optimum coastal protection measure. The views of the stretch of the coast north and south of the site location are shown in **Fig.21**.





## Fig.21a View of Kuzhippilly beach (North)



Fig.21b View of Kuzhippilly beach (South)

The coastal stretch considered for shoreline change assessment is shown in **Fig.22a**. The shoreline changes were observed for the years 2011-2018 & 2020 (9 years); the length of the shoreline is 1.62 km. The baseline buffer is 100m from the shoreline and the spacing between the transects is 5m.

According to EPR and LRR, the rate of erosion is moderate and the maximum rate of erosion is -1.44 m/yr as shown in **Fig.22b.** 

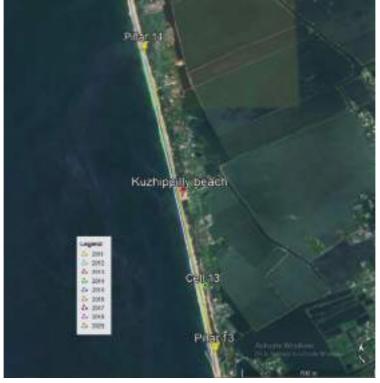


Fig.22a Cell 13 (Pillar 13-14)



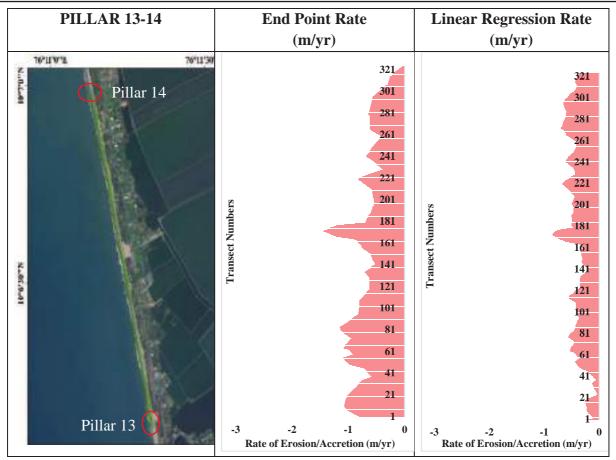


Fig.22b Results of Cell 13 (Pillar 13-14)

# 5.4.15 Cell 14 (Pillar 14-15) Pallipuram Raktheswari beach

This beach is located south of Cherai beach. The local residents and authorities reported drastic dynamic changes in the beach width depending upon the seasons. This stretch is of prime importance as it attracts tourists. After a detailed investigation, the prospect of a submerged geo-tube or a groyne field (T-Groynes) will be examined and proposed accordingly. The view of the Pallipuram Raktheswari beach on its north and south are shown in **Fig.23**.



Fig.23a View of Pallipuram Raktheswari beach (North)





Fig.23b View of Pallipuram Raktheswari beach (South)

The shoreline changes of the said coastal stretch (see **Fig.24a**) have been observed for the years2013-2018 & 2020 (7 years); the length of the shoreline is 2.35 km. The baseline buffer is 100m from the shoreline and the spacing between the transects is 5m.

According to EPR and LRR, the rate of erosion is moderate and the maximum rate of erosion is -2.5m/yr as shown in **Fig.24b**.

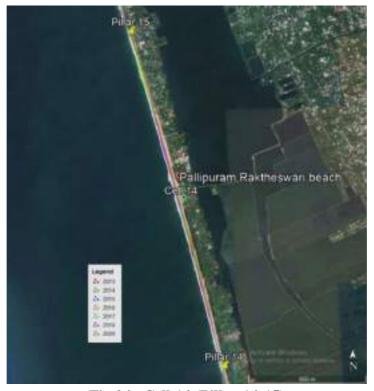


Fig.24a Cell 14 (Pillar 14-15)

<b>PILLAR 14-15</b>	End Point Rate	Linear Regression Rate
	(m/yr)	(m/yr)



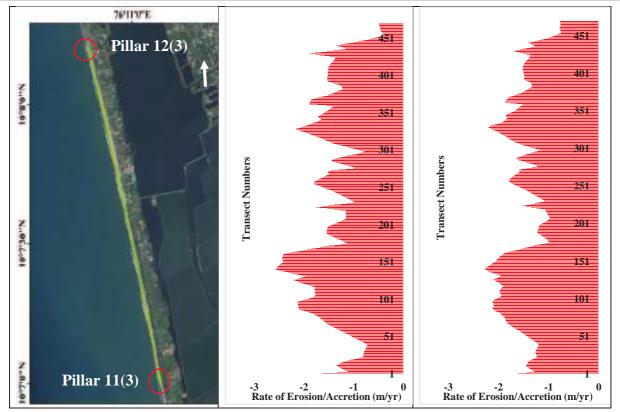


Fig.24b Results of Cell 14 (Pillar 14-15)

# 5.4.16 Cell 15 (Pillar 15-16) Cherai beach

This beach is located on the northern side of Pallipuram Raktheswari beach. There is an urgent need to examine in detail the behaviour of this stretch as erosion is severe leading to the failure of the seawall, posing danger to the existing infrastructure. Furthermore, as stated earlier this stretch of coast is a tourist attraction and hence needs to be protected either with T-groynes or submerged geo-tube after a detailed investigation by IITM. Views of this stretch of the coast are provided in **Fig.25**.





Fig.25 Views of Cherai beach (North and South)

The shoreline changes at Cherai beach (see **Fig.26a**) have been observed for the years 2012-2018 & 2020 (8 years); the length of the shoreline is 1.3km. The baseline buffer is 100m from the shoreline and the spacing between the transects is 5m.

According to EPR and LRR, the rate of erosion is moderate along the entire stretch and the maximum observed rate of erosion is -2.69 m/yr as shown in **Fig.26b.** 



Fig.26a Cell 15 (Pillar 15-16)



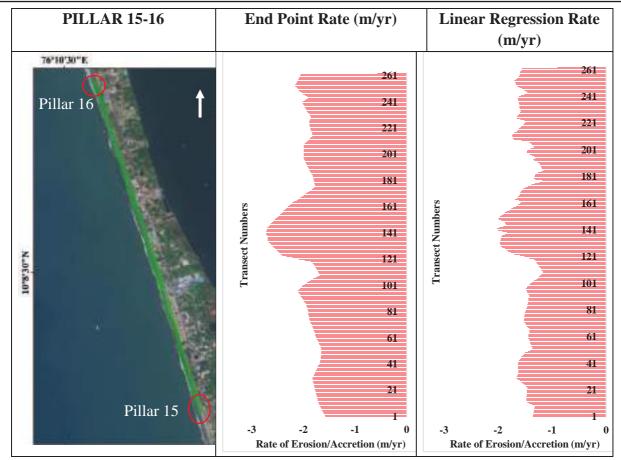


Fig.26b Results of Cell 15 (Pillar 15-16)

## 5.4.17 Cell 16 (Pillar 16-17) Arattu Kadavu beach

This beach is located immediately north of Cherai beach. The beach front slope is quite flat which facilitates significant run-up during moderate and extreme wave climates in the nearshore region. The northern and southern stretches of the beach are shown in **Fig.27**. The Arattu Kadavu beach looks like an ideal location for a short groyne field.



Fig.27a View of Arattu Kadavu Beach (North)





Fig.27b View of Arattu Kadavu Beach (South)

The shoreline changes along the Arattu Kadavu beach (see **Fig.28a**) have been observed from the period of 2012-2018 & 2020 (8 years); the length of the shoreline is 1.33 km. The baseline buffer is 100m from the shoreline and the spacing between the transects is 5m.

According to EPR and LRR, the area tends to have moderate erosion. The maximum rate of erosion is -2.17 m/yr as shown in **Fig.28b**.

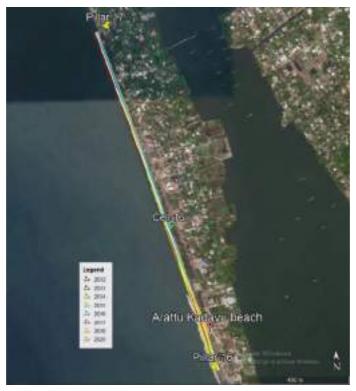


Fig.28a Cell 16 (Pillar 16-17)

PILLAR 16-17	End Point Rate	Linear Regression Rate
	(m/yr)	(m/yr)



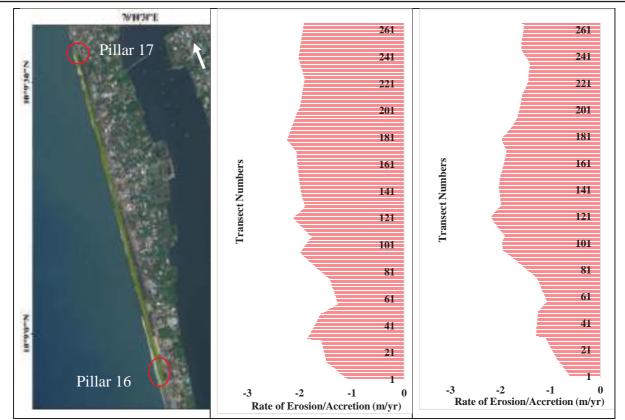


Fig.28b Results of Cell 16 (Pillar 16-17)

### 5.4.18 Cell 17 (Pillar 17 - Pillar 18)

This stretch is protected by a seawall. (No immediate action required).

## 5.5 Summary and Conclusion

The study area has been identified along the Ernakulam district, Kerala (Vypin to Munambam). The shoreline changes along the coast have been assessed through satellite image processing techniques and statistically analysed using DSAS tool of ArcGIS software application. Significant dynamics in the shoreline changes were observed mostly due to the seasonal monsoon effects along the coast. The analysis states that erosion is more predominant during the southeast monsoon season. The study further highlights the need to have a micro-level approach to understand the shoreline dynamics where site-specific coastal management measures need to be implemented.

- A detailed investigation of the shoreline behaviour using well-established EPR and LRR techniques has been presented.
- The stretches of the coast that are eroding and which needs immediate attention to coastal protection measures have been identified.



• This study is to facilitate us to arrive at the zones of erosion, which should tally with the field observed information.

### **6.0 FIELD MEASUREMENT**

A detailed field investigation study was commissioned to collect real-time field data which includes shoreline mapping, beach profile and sediment characteristics. The study area from Vypin to Munambam was sub-divided into 6 major stretches for ease of executing field measurements the details of which alongside the geo-coordinates of each site are projected in **Table 2**.

S.	Place	Starting Point	Ending Point	Distance (km)
No.	Flace	Lat/Long	Lat/Long	
1	Valappu Beach	10°01'54.20" N	10°0'58.03" N	1.2
	у атарри Беаст	76º13'5.76" E	76º12'50.31" E	
2	Elamkunnapuzha Beach	10°01'12.60" N	10º1'55.13" N	1.4
	Eranikumiapuzna Beach	76°12'47.50" E	76°12'33.93" E	
3	Njarackal Arattuvazhi Beach	10°02'15.76" N	10°2'57.56" N	1.3
	Njarackai Arattuvaziii Beacii	76°12'28.03" E	76°12'16.72" E	
4	Veliyatham Parambu Beach	10°03'3.99" N	10°3'57.93" N	1.8
5	Nayarambalam Puthan	76°12'12.54" E	76°11'54.87" E	
	Kadappuram	70 12 12.34 E	/0 11 34.07 E	
6	Edavankkadu Grama			3.3
	Panchayat	10°04'10.15" N	10°5'54.10" N	
7	Pazhangadu	76°11'50.81" E	76°11'23.34" E	
8	Saidh Mohammed Beach			
9	Kuzhippilly			6.8
10	Pallipuram	10º06'7.65" N	10°09'39.22" N	
11	Cherai	76º11'20.07" E	76º10'17.37" E	
12	Arattu Kadavu Beach			

Table.2 Coordinates of the site

### 6.1 Methodology

### 6.1.1 Topographic Survey

Beaches are extremely dynamic in nature experiencing continual changes in shape and shifting position with response to winds, waves, tides, relative sea level, and anthropogenic activities. The most significant changes occur due to seasonal changes in wave climate and during extreme events such as storm surge or cyclone events. The mapping of shoreline as well as demarcation of the existing seawall and groynes structures were measured using RTK GPS



system. The beach profile at various transects for a given coastal stretch was also measured. The details of survey instruments used for field investigation are discussed below.

## 6.2 Equipment

#### Navigation and Data Logging System

2 x Trimble R10 RTK GPS with Base and Rover accessories,

1 x Measuring Tape

### 6.2.1 Trimble R10 GNSS system:

The Trimble R10 GNSS receiver incorporates a GNSS antenna, receiver, internal radio, as shown in **Fig.29** and battery in a rugged light-weight unit that is ideally suited as an all-on-the-pole RTK rover or quick setup/rapid mobilization base station. LEDs enable to monitor satellite tracking, radio reception, data logging status, Wi-Fi status, and power. Bluetooth wireless technology provides cable-free communications between the receiver and controller.

The user can utilize the receiver as part of an RTK GNSS system within the Trimble Access<sup>TM</sup> software. The receiver can optionally record GNSS data to the receiver's internal memory and download it to a computer or USB flash memory stick. The receiver has no front panel controls for changing settings. To configure the receiver, use the web interface which is available by connecting to the receiver's Wi-Fi via a PC or a smartphone.



Fig.29 Trimble R10 GNSS System



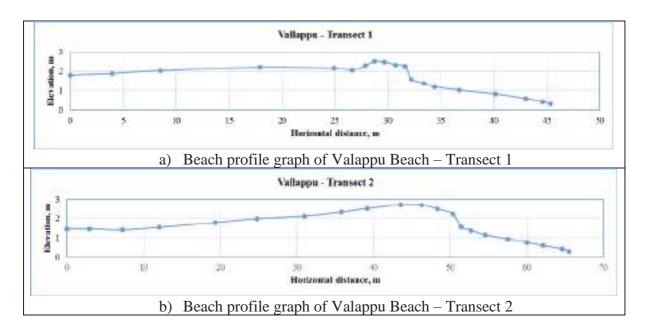
### **6.3** Results and Discussion

### 6.3.1 Valappu Beach

The shoreline (High tide line and Low tide line) are measured from the coordinates 10°01'54.20" N & 76°13'5.76" E to 10°00'58.03" N & 76°12'50.31" E for a distance of 1.2 km and beach profiling was conducted at five transects (see **Fig.30**). The beach profile graphs measured at the site are projected in **Fig.31**. The slope values at these transects are shown in **Table.3**.



Fig.30 Transect locations at Valappu Beach





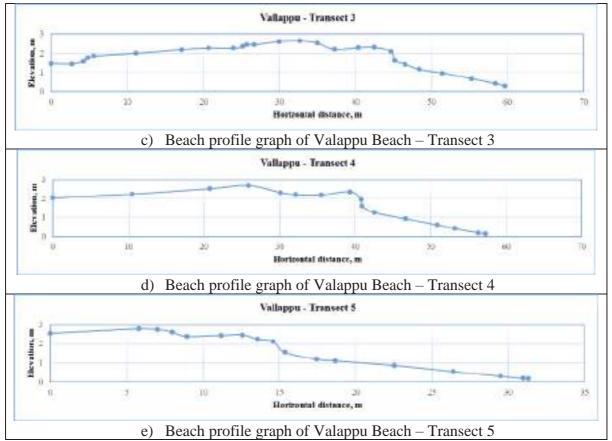


Fig.31 Beach profile graph of Valappu Beach– Transect 1-5

Table.3 Beach Slope values at Valappu Beach

Transect ID	Slope
Vallappu Transect 1	1 in 11.4
Vallappu Transect 2	1 in 11.8
Vallappu Transect 3	1 in 11.5
Vallappu Transect 4	1 in 11.8
Vallappu Transect 5	1 in 12.4

### 6.3.2 Elamkunnapuzha Beach

The shoreline (High tide line and Low tide line), and existing seawall are measured from the coordinates 10°01'12.60" N & 76°12'47.50" E to 10°01'55.13" N & 76°12'33.93" E for a distance of 1.4km and beach profiling was conducted at two transects (see **Fig.32**). The south transect 2 lies the open beach and the north of transect 2 is covered with seawall. The beach profile graphs measured at the site are projected in **Fig.33**. The slope values at these transects are shown in **Table 4**.



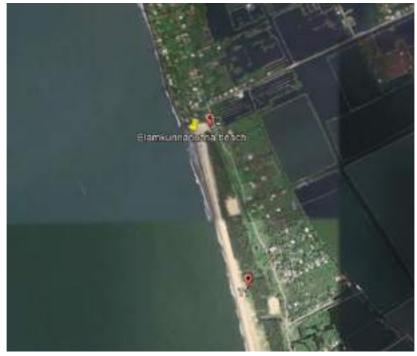


Fig.32 Aerial view of Elamkunnapuzha Beach with transects

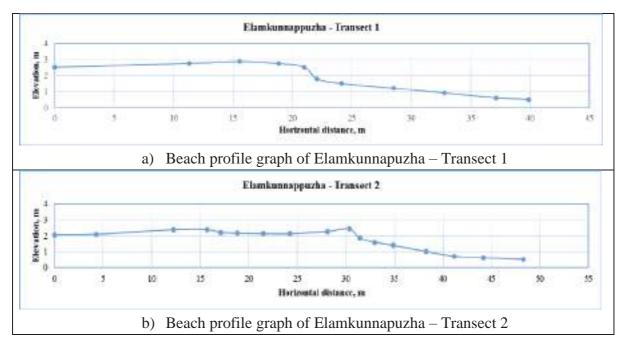


Fig.33 Beach profile graph of Elamkunnapuzha – Transect 1-2

Table.4 Beach Slope values at Elamkunnapuzha Beach

Transect ID	Slope
Elamkunnappuzha - Transect 1	1 in 14.2
Elamkunnappuzha - Transect 2	1 in 12.4



### 6.3.3 Njarackal Arattuvazhi Beach

The shoreline (High tide line and Low tide line), and existing seawall are measured from the coordinates 10°2′15.76" N & 76°12′28.03" E to 10°2′57.56" N & 76°12′16.72" E for a distance of 1.3km and beach profiling was conducted at one transect (see **Fig.34**). Here most of the coastal stretch is protected with a seawall and only a few meters of open beach front is available. The beach profile graph of the site is shown in **Fig.35**. The slope value of this transect is 1 in 8.1.



Fig.34 Transect locations at Njarackal Arattuvazhi Beach

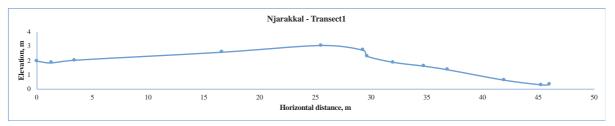


Fig.35 Beach profile graph of Njarackal Arattuvazhi – Transect 1

# 6.3.4 Veliyatham Parambu Beach & Nayarambalam Puthan Kadappuram

The existing seawall is measured from the coordinates 10°3'3.99" N & 76°12'12.54" E to 10°3'57.93" N & 76°11'54.87" E for a distance of 1.8 km. The aerial view of Veliyatham Parambu Beach and Nayarambalam Puthan Kadappuram are shown in **Fig 36** and **Fig 37** respectively.



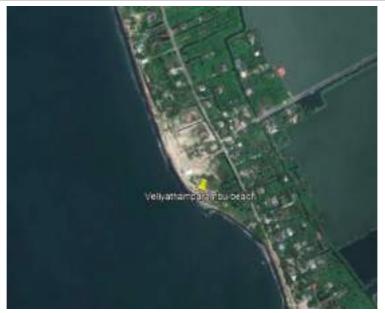


Fig.36 Aerial view of Veliyatham Parambu Beach



Fig.37 Aerial view of Nayarambalam Puthan Kadappuram Beach

## 6.3.5 Edavanakkadu Grama Panchayat, Pazhangadu & Saidh Mohammed Beach

The shoreline (High tide line and Low tide line), and existing seawall are measured from the coordinates 10°4′10.15" N & 76°11′50.81" E to 10°5′54.10" N & 76°11′23.34" E for a distance of 3.3km and beach profiling was conducted at one transect for each for the aforesaid coastal stretch. The location of the transect for Edavanakkadu Grama Panchayat, Pazhangadu and Saidh Mohammed Beach coastal stretches are shown in **Figs 38**, **39**, **40** respectively. The beach profile graphs of Edavanakkadu Grama Panchayat, Pazhangadu and Saidh Mohammed Beach



coastal stretches are shown in **Fig 41, 42, 43** respectively. The beach slopes at Edavanakkadu Grama Panchayat, Pazhangadu and Saidh Mohammed Beach coastal stretches are 1 in 19.8, 1 in 5.3 and 1 in 10.3 respectively.



Fig.38 Transect location at Edavanakkadu Grama Panchayat Beach

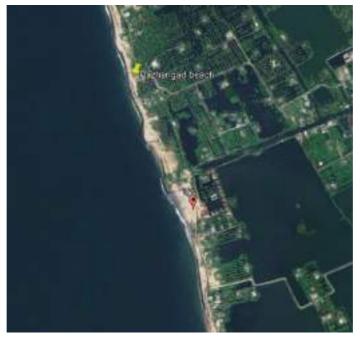


Fig.39 Transect location at Pazhangadu Beach





Fig.40 Transect location at Saidh Mohammed Beach

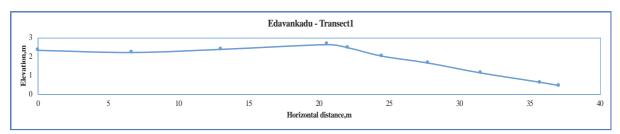


Fig.41 Beach profile graph of Edavanakkadu Grama Panchayat – Transect 1

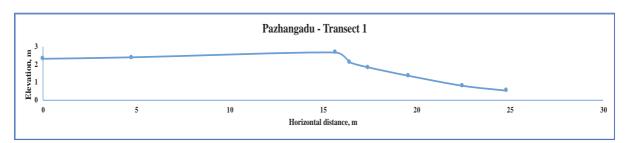


Fig.42 Beach profile graph of Pazhangadu - Transect 1

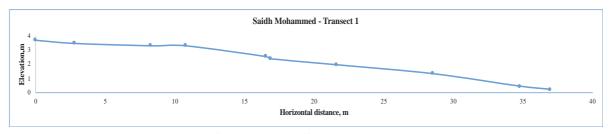


Fig.43 Beach profile graph of Saidh Mohammed – Transects 1



# 6.3.6 Kuzhippilly, Pallipuram, Cherai & Arattu Kadavu Beach

The shoreline (High tide line and Low tide line), and existing seawall are measured from the coordinates 10°6′7.65" N & 76°11′20.07" E to 10°9′39.22" N & 76°10′17.37" E for a distance of 6.8km and beach profiling was conducted at twenty-two transects. The aerial view of Kuzhippilly beach with transects is shown in **Fig.44.** The beach profile graphs measured at Kuzhippilly are projected in **Fig.45** and the slope values at these transects are shown in **Table 5.** 

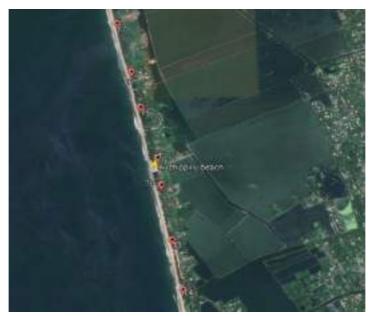
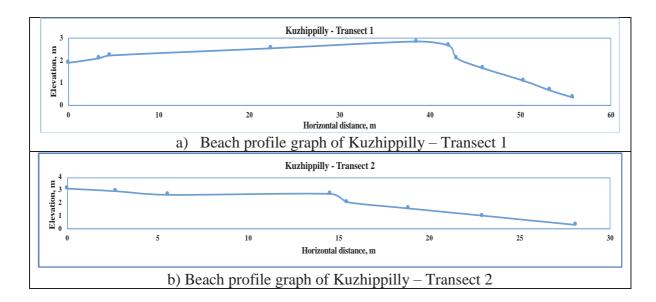


Fig.44 Aerial view of Kuzhippilly Beach with transects





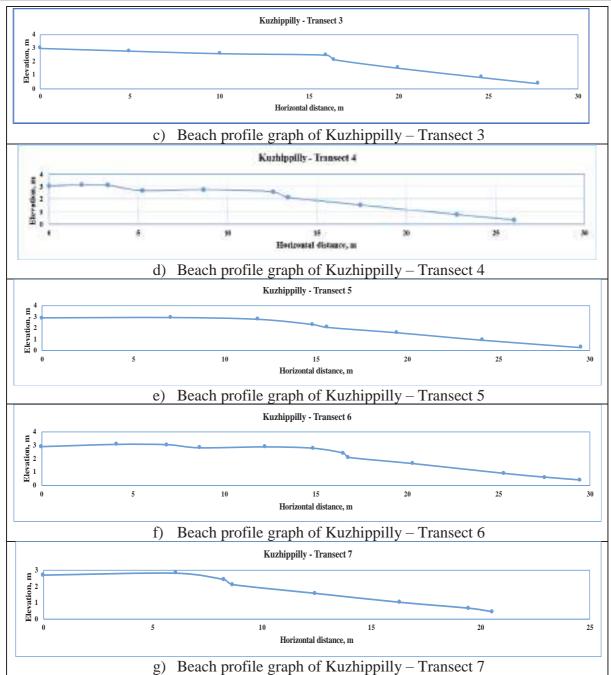


Fig.45 Beach profile graph of Kuzhippilly – Transect 1-7

**Table.5 Slope of Kuzhippilly Beach Transects** 

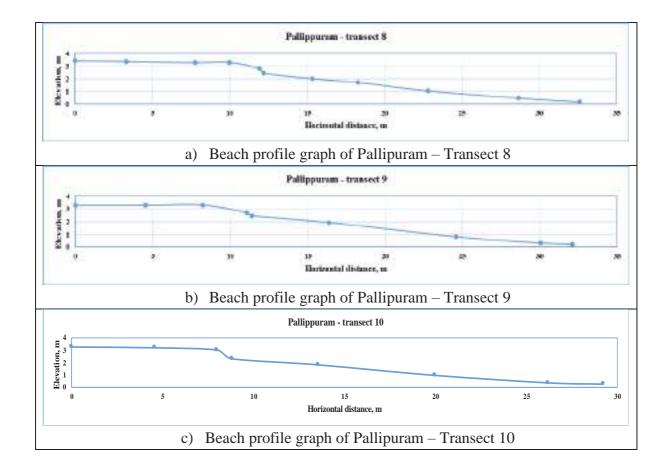
Transect ID	Slope
Kuzhippilly - Transect 1	1 in 7.4
Kuzhippilly - Transect 2	1 in 7.1
Kuzhippilly - Transect 3	1 in 6.3
Kuzhippilly - Transect 4	1 in 7
Kuzhippilly - Transect 5	1 in 7.7
Kuzhippilly - Transect 6	1 in 7.3
Kuzhippilly - Transect 7	1 in 7.2



The aerial view of Pallipuram beach with transects is shown in **Fig.46.** The beach profile graphs measured at Pallipuram are projected in **Fig.47** and the slope values at these transects are shown in **Table 6.** 



Fig.46 Aerial view of Pallipuram Beach with transects





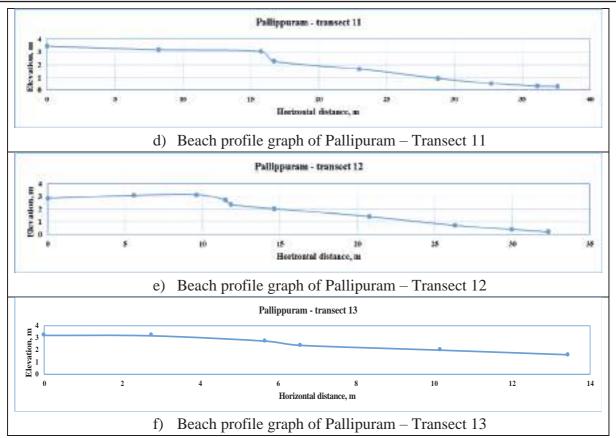


Fig.47 Beach profile graph of Pallipuram – Transect 8-13

**Table.6 Slope of Pallipuram Beach Transects** 

Transect ID	Slope
Pallipuram - Transect 8	1 in 8.7
Pallipuram - Transect 9	1 in 8.8
Pallipuram - Transect 10	1 in 9.5
Pallipuram - Transect 11	1 in 9.9
Pallipuram - Transect 12	1 in 9.3
Pallipuram - Transect 13	1 in 8.7

The aerial view of Cherai beach with transects is shown in **Fig.48**. The beach profile graphs measured at Cherai have been projected in **Fig.49** and the slope values at these transects are shown in **Table.7**.





Fig.48 Aerial view of Cherai Beach with transects

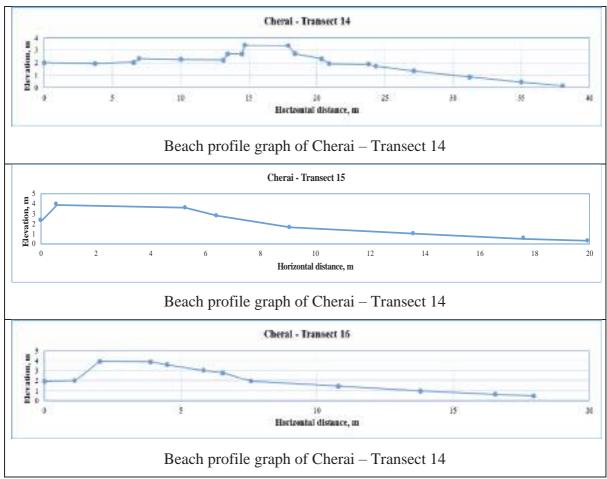


Fig.49 Beach profile graph of Cherai – Transect 14-16

**Table.7 Slope of Cherai Beach Transects** 

Transect ID	Slope
-------------	-------

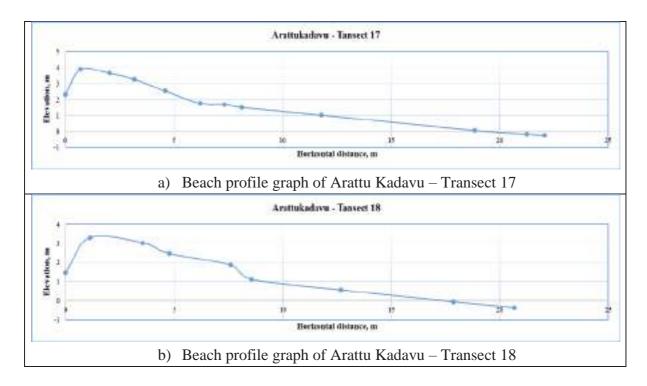


Cherai - Transect 8	1 in 8.7
Cherai - Transect 9	1 in 8.8
Cherai - Transect 10	1 in 9.5

The aerial view of Arattu Kadavu beach with transects is shown in **Fig.50**. The beach profile graphs measured at Arattu Kadavu are projected in **Fig.51** and the slope values at these transects are shown in **Table 8**.



Fig.50 Aerial view of Arattu Kadavu Beach with transects





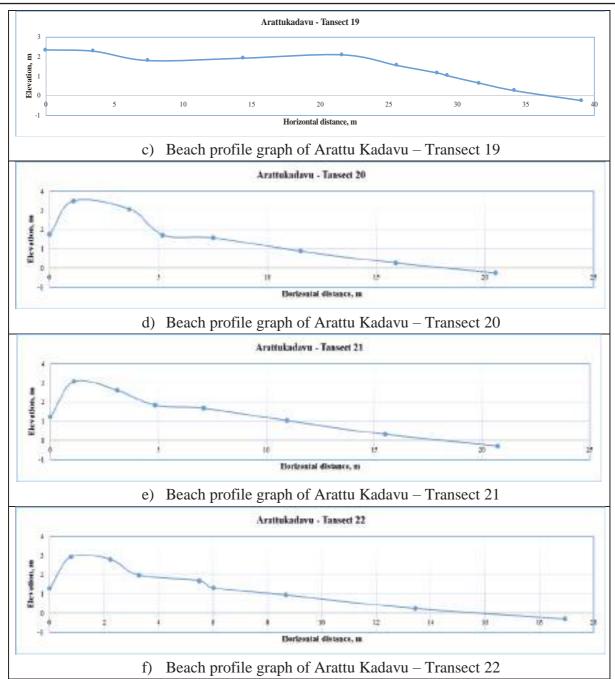


Fig.51 Beach profile graph of Arattu Kadavu – Transect 17-22

**Table.8 Slope of Arattu Kadavu Beach Transects** 

Transect ID	Slope
Arattu Kadavu - Transect 17	1 in 7.6
Arattu Kadavu - Transect 18	1 in 8.2
Arattu Kadavu - Transect 19	1 in 7.2
Arattu Kadavu - Transect 20	1 in 7.1
Arattu Kadavu - Transect 21	1 in 6.9
Arattu Kadavu - Transect 22	1 in 7.9



# 6.4 Sediment Analysis

The grain size distribution curve graph of collected samples is shown in **Fig.52** and specific gravity, uniformity co-efficient and co-efficient of curvature results were given in **Table.9**.

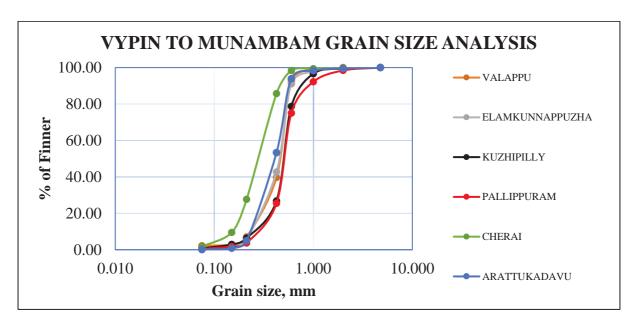


Fig. 52 Sediment Size Analysis

Table.9 Vypin to Munambam onshore soil sample test results

Sample ID	I	Distribu	tion siz	e	Coefficient of	Coefficient of
Sample 1D	D10 D30 D50 D60		uniformity,Cu	curveture,Cc		
Valappu	0.231	0.362	0.459	0.492	2.129	1.149
Elamkunnapuzha	0.236	0.352	0.451	0.488	2.064	1.074
Kuzhippilly	0.250	0.436	0.503	0.537	2.149	1.415
Pallippuram	0.274	0.441	0.512	0.547	2.000	1.301
Cherai	0.152	0.221	0.294	0.331	2.178	0.970
Arattukadavu	0.234	0.322	0.410	0.454	1.937	0.977

#### 7.0 WAVE MODELLING

#### 7.1 General

An application of the spectral wave prediction model for the Arabian Sea has been carried out to evaluate the spectral wave parameters offshore off the Vypin to Munanbam for the planning



of coastal protection. The global wave model is based on the "WAM" model has been adopted. This model simulates the evolution of two-dimensional ocean waves using the spectral energy balance equation, in which wave energies are balanced with the local wind input, wave dissipation and non-linear energy transfer. The coarser grid model has been executed over a regional domain, which includes the Indian Ocean, Bay of Bengal and the Arabian Sea. The finer grid model has been set up over the Arabian Sea with a focus along the south-west coast of India with boundary information from the coarse grid model. ECMWF wind vectors over an annual year have been obtained for the domain of interest and the wind-waves have been evaluated at a deep-water location off the study area as mentioned above. The near shore wave modeling that includes diffraction due to breakwaters caters for propagating deep water waves into the near shore. The littoral drift study transforms the deep-water wave climate into near shore normal wave characteristics.

#### 7.2 The wave model WAM

The WAM-model is a third-generation wave model, which solves the wave transport equation explicitly without any presumptions on the shape of the wave spectrum. The model runs for any a given regional or global grid with a prescribed topographic dataset. The grid resolution is arbitrary in space and time. The propagation can be done on a spherical (longitudinal-latitudinal) or Cartesian grid. The integration can be interrupted and restarted at arbitrary times. The equation for the energy balance of the wave spectrum, representing the basis of a possible exact theory of wave spectrum dynamics is,

$$\frac{\partial F}{\partial t}(k, x, t) + \upsilon \cdot \nabla_x F(k, x, t) = S \tag{4}$$

where F(k,x,t) is the energy spectrum in terms of wave number vector, k, the position vector, k in the ocean and time k. The group velocity vector, k, is defined as,

$$\upsilon = \frac{1}{2} \sqrt{\frac{g\left(\frac{k}{k}\right)}{k}} \tag{5}$$

The second term on the left-hand side is the divergence of the convective energy flux, v.F, and S is the total rate of change of the spectrum due to the generation, dissipation, and non-linear processes in the sea. For a given wind condition, the effects of fetch, duration, varying wind fields would be solved automatically by the computer integration of the differential equation.



The WAM model [Komen et al. (1994)] was developed as the global third generation model to solve the action balance equation in spherical coordinates for the action density ocean wave spectrum  $F(f,\theta,\phi,\lambda,t)$  with respect to wave frequency f and direction  $\theta$  as a function of latitude  $\phi$ , longitude  $\lambda$  and time t, which is governed by the transport equation,

$$\frac{\partial F}{\partial t} + (\cos\phi)^{-1} \frac{\partial}{\partial \phi} (\dot{\phi}\cos\phi F) + \frac{\partial}{\partial \lambda} (\dot{\lambda}F) + \frac{\partial}{\partial \omega} (\dot{\omega}F) + \frac{\partial}{\partial \theta} (\dot{\theta}F) = S$$
 (6)

where, the dotted variables,  $\dot{\phi}$ ,  $\dot{\lambda}$ ,  $\dot{\omega}$ ,  $\dot{\theta}$  represent the rate of change of the positions, the dispersion relation and propagating direction of waves travelling globally.

The source function is represented as superposition of source terms due to wind input, non-linear wave-wave interaction, dissipation due to wave breaking, and bottom friction. This leads to

$$S = S_{in} + S_{nl} + S_{ds} + S_{bot} \tag{7}$$

Except for the non-linear source term, which uses the discrete interaction approximation that simulates an exact non-linear transfer process formulated by the four-wave resonant interaction Boltzmann equation and characterizes the third-generation model, all the other source terms are individually parameterized to be proportional to the action density spectrum, F. The numerical integration of the source function is performed with an implicit integration scheme while the propagation scheme is a first order upwind flux scheme to handle the large difference between the dynamic adjustment time of the highest frequency and the integration time step. A consequence of the explicit scheme is that the time-step is proportional to the spatial step size. Therefore, as the mesh is refined, the time step must be reduced to maintain stability, thus increasing the computational effort. The wind time step can be chosen arbitrarily. Details of the processes and their implementations are given by Gunther et al. (1992) and Komen et al. (1994).

# 7.3 Functionality and Output of the Model

The following wave propagation processes are implemented in the model:

- Spherical propagation
- deep and shallow water
- depth refraction
- dissipation due to white-capping and depth limitation



- wave generation by wind
- non-linear wave-wave interaction

The model provides the following output quantities:

- significant wave height
- mean wave direction
- mean frequency

### 7.3.1 Model setup

The coarse grid bathymetry over the Indian waters is taken from GEBCO with 9.0 km resolution in latitude and longitude (Cartesian grid), covering the region 30°E to 120°E and 50°S to 30°N. The WAM is initially been set-up in the Indian Ocean comprises also the Bay of Bengal and the Arabian Sea which is bounded by the region 30°E-120°E & -50°S-30°N. A spherical grid resolution of 1/4° x 1/4° with 15° angular resolution for the directional spectra and 10-minute propagation time step is chosen. A finer grid model over the Arabian Sea covering the southern west-coast of India which is facing the Arabian sea has been set up in the domain covering longitudes 75.5°E to 76.5°E & latitudes 9.5°N to 10.5°N. The grid resolution is 1.5' x 1.5'. The same bathymetry file, GEBCO was used. The open boundary information for this finer grid model has been obtained from the coarser grid model. The employed wind data is the one entire annual year wind vectors obtained from ECMWF. The winds data is of 0.25° x 0.25° resolution.

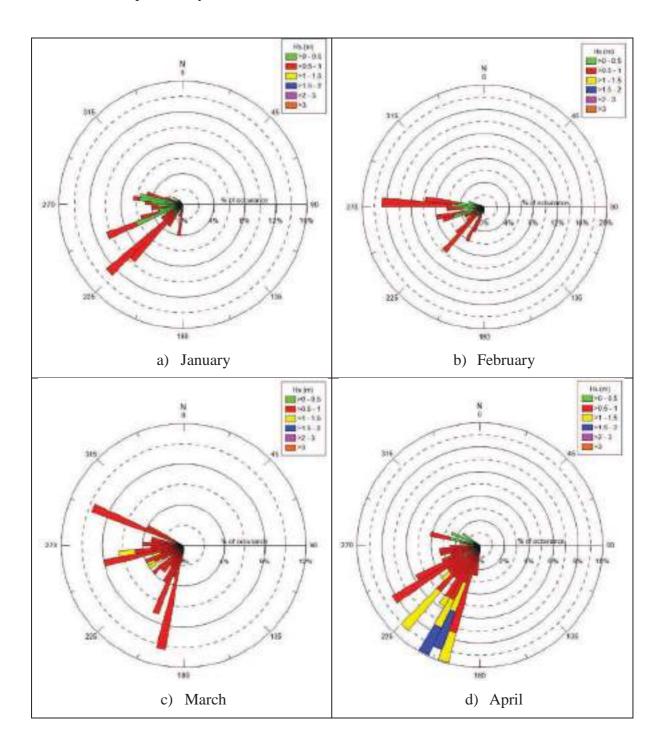
The wave hind-casting has been carried out using 24 directional bands, 25 frequency bands and frequency intervals extending from 0.042 to 0.41 Hz. For the coarser grid model, 10 minutes time step has been used for the integration of advection and source terms, considering the depth-dependent refraction. The above time step is 1 minutes for the finer grid run. The output time step adopted is 6 hours and the initial condition for the wave model has been set up by executing the wave model from its calm state for 5 days.

#### 7.3.2 Wave characteristics

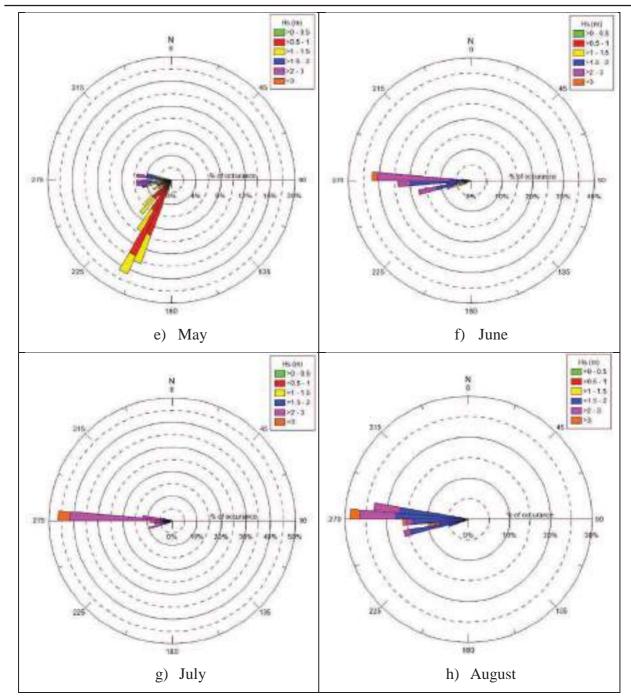
The wave characteristics such as significant wave height, mean wave period and mean wave direction at a deep-water location ( $10^{\circ}$  0'0.00"N,  $76^{\circ}$  0'0.00"E) have been extracted at every 6 hours interval. The wave field follows the wind pattern. It is noted that the spatial variability is closely related, the maximum  $H_s$  are associated with maximum wind speeds. **Fig.53 & 54.** represents the monthly and annual occurrence of wave climate. It is noticed that the offshore wave climate is predominantly from the west and south-west.



The joint distribution tables of significant wave height vs. wave direction, mean wave period vs. mean wave direction and significant wave height vs. mean wave period are presented in **Tables. 10, 11 and 12** respectively. The waves are predominantly of period varying from 6s to 8s period with the significant wave height ranging between 0.5m and 1m. However, higher waves with less probability of occurrence were also observed.









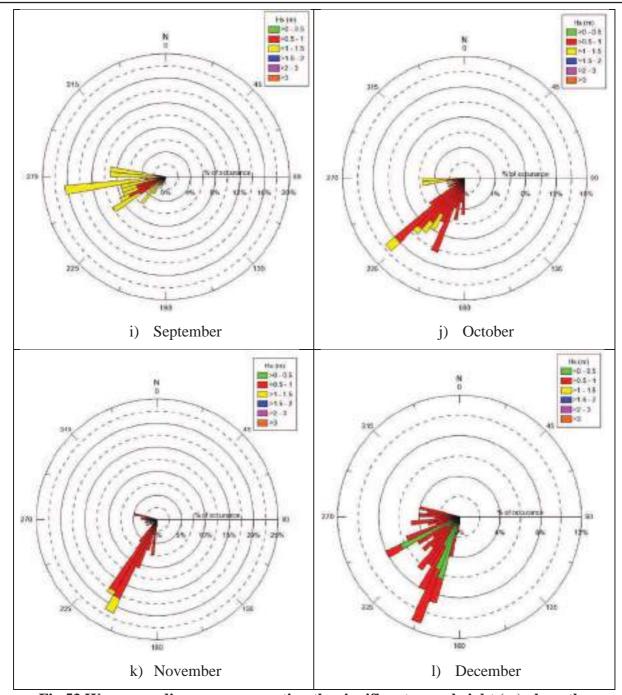


Fig.53 Wave rose diagram representing the significant wave height (m) along the direction for the month of January to December.



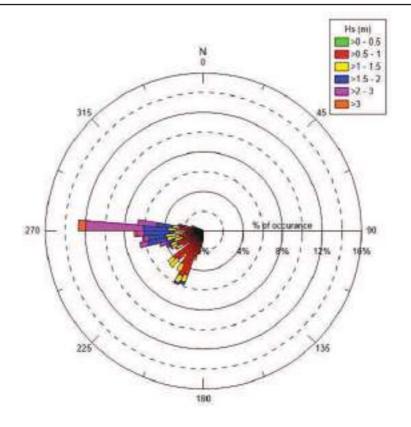


Fig.54 Wave rose diagram representing the significant wave height (m) along the direction for an annual year

Table.10 Wave height vs Mean direction joint distribution

		Wave Height (m)										
Wave	0-	0.5-	1-	1.5-	2-	2.5-	3-	3.5-	4-	4.5-	Total	
direction	0.5	1	1.5	2	2.5	3	3.5	4	4.5	5		
N-NNE	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
NNE-NE	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
NE-NEE	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
NEE-E	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
E-SEE	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
SEE-SE	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
SE-SSE	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	



SSE-S	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
S-SSW	0.14	2.74	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.88
SSW-SW	1.85	15.4 9	2.40	0.48	0.00	0.00	0.00	0.00	0.00	0.00	20.22
SW-SWW	1.10	13.2	2.74	0.00	0.00	0.00	0.00	0.00	0.00	0.00	17.07
SWW-W	2.88	8.84	3.70	2.19	1.85	0.07	0.00	0.00	0.00	0.00	19.53
W-NWW	3.02	7.40	4.66	9.87	4.04	5.28	1.17	0.00	0.00	0.00	35.44
NWW-NW	1.44	2.67	0.07	0.21	0.14	0.00	0.07	0.00	0.00	0.00	4.59
NW-NNW	0.27	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.27
NNW-N	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Total	10.6	50.3 8	13.5 7	12.7 5	6.03	5.35	1.23	0.00	0.00	0.00	100.0

Table.11 Wave Period vs Mean direction joint distribution

Wave		Wave Period (s)											
direction	0-2	2-4	4-6	6-8	8- 10	10- 12	12- 14	16- 18	18- 20	20-	22- 24		
N-NNE	0.0	0.0	0.0	0.0	0.0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
NNE-NE	0.0	0.0	0.0	0.0	0.0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
NE-NEE	0.0	0.0	0.0	0.0	0.0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
NEE-E	0.0	0.0	0.0	0.0	0.0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
E-SEE	0.0	0.0	0.0	0.0	0.0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	



Total	0.0	0.1 4	12. 61	49. 69	33. 79	3.43	0.34	0.00	0.00	0.00	0.00	100. 00
NNW-N	0.0	0.0	0.0	0.0	0.0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
NW-NNW	0.0	0.0	0.2 7	0.0	0.0	0.00	0.00	0.00	0.00	0.00	0.00	0.27
NWW-NW	0.0	0.1	3.7 7	0.2 7	0.4	0.00	0.00	0.00	0.00	0.00	0.00	4.59
W-NWW	0.0	0.0	5.2 8	14. 26	15. 35	0.55	0.00	0.00	0.00	0.00	0.00	35.4 4
SWW-W	0.0	0.0	1.8 5	13. 23	4.1 8	0.27	0.00	0.00	0.00	0.00	0.00	19.5 3
SW-SWW	0.0	0.0	0.7 5	11. 10	4.2 5	0.96	0.00	0.00	0.00	0.00	0.00	17.0 7
SSW-SW	0.0	0.0	0.2 7	10. 08	8.2	1.30	0.34	0.00	0.00	0.00	0.00	20.2
S-SSW	0.0	0.0	0.4	0.7 5	1.3 7	0.34	0.00	0.00	0.00	0.00	0.00	2.88
SSE-S	0.0	0.0	0.0	0.0	0.0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
SE-SSE	0.0	0.0	0.0	0.0	0.0	0.00	0.00	0.00	0.00	0.00	0.00	0.00
SEE-SE	0.0	0.0	0.0	0.0	0.0	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Table.12 Wave height vs mean period joint distribution

Hs		Tm (s)											Total
(m)	2	4	6	8	10	12	14	16	18	20	22	24	
0.5	0.00	0.00	0.00	0.00	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00
1	0.14	0.00	0.00	0.00	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.14
1.5	3.98	8.43	0.21	0.00	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	12.61



2	6.37	29.1	9.32	3.84	0.7 5	0.2 7	0.0	0.0	0.0	0.0	0.0	0.0	49.69
2.5	0.21	11.0	3.36	8.43	4.9	4.9	0.8 9	0.0	0.0	0.0	0.0	0.0	33.79
3	0.00	1.78	0.62	0.21	0.3 4	0.1 4	0.3 4	0.0	0.0	0.0	0.0	0.0	3.43
3.5	0.00	0.00	0.07	0.27	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.34
4	0.00	0.00	0.00	0.00	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00
4.5	0.00	0.00	0.00	0.00	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00
5	0.00	0.00	0.00	0.00	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00
Total	10.6 9	50.3 8	13.5 7	12.7 5	6.0	5.3 5	1.2 3	0.0	0.0	0.0	0.0	0.0	100.0

# 7.4 Validation of the Model (WAM)

The significant wave height obtained from wave modeling is validated with the available BUOY and ADCP data of the year 2016 which is presented in **Fig.55 and 56.** 

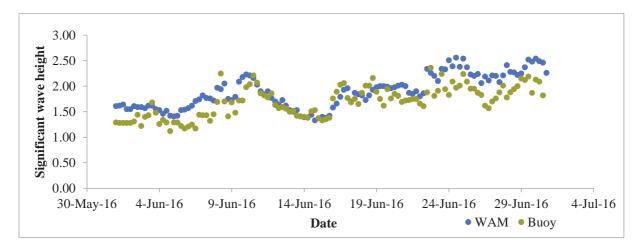


Fig.55 Significant wave height during June 2016 with BUOY data



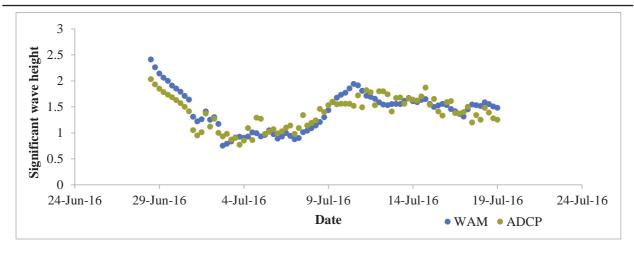


Fig.56 Significant wave height during July 2016 with ADCP data

#### 8.0 LITTORAL DRIFT ESTIMATE

### 8.1 Distribution of Sediment Transport

The wave characteristics viz., significant wave height, mean wave period and mean wave direction at a deep-water location off Vypin to Munambam, at Valappu Beach, Elamkunnapuzha Beach, Njarackal Arattuvazhi Beach, Veliyatham Parambu Beach, Edavankkadu Grama Panchayat, Saidh Mohammed Beach, Kuzhippilly, Pallipuram Raktheswari beach, Cherai beach, Arattu Kadavu beach Kerala have been extracted at every 6 hours interval from the European Centre for Medium-Range Weather Forecasts (ECMWF). Table 13 and Table 14 shows the offshore wave characteristics adopted for the present study. These are offshore wave climates and are transformed to the near shore location of the coast using Snell's law. The average breaking wave characteristics were derived from the available wave data.

Further, the derived wave characteristics were used to calculate the long shore sediment transport. Three different methods CERC (1984), Komar (1976a), and by integrating the distribution across the surf zone (Komar, 1976b) have been adopted to calculate the alongshore sediment transport rate.

Table.13 Wave characteristics adopted for the sites from Valappu beach Beach to Pallipuram Raktheswari Beach



Month	Deep water wave direction (θ₀) w.r.t North	Wave height, H(m)	Wave period, T(sec)
January	225	0.5	5.0
February	275	0.5	6.8
March	294	0.6	5.8
April	208	0.6	7.2
May	208	0.9	7.9
June	273	2.0	9.3
July	274	2.6	9.1
August	277	1.7	8.2
September	263	1.1	6.9
October	204	0.8	8.0
November	209	0.7	7.5
December	200	0.7	7.5

Table.14 Wave characteristics adopted for Cherai and Arattu Kadavu beach

	Deep water		
	wave direction	Wave height,	Wave period,
Month	(θ <sub>o</sub> ) w.r.t North	H(m)	T(sec)
January	221	0.4	4.8
February	218	0.5	6.9
March	254	0.6	6.6
April	207	0.6	6.9
May	208	0.8	7.9
June	266	1.8	8.6
July	269	2.4	9.1
August	271	1.5	8.6
September	258	1	6.8
October	217	0.8	7.9
November	208	0.6	8



December	204	0.6	7.8

### 8.2 Results on the Littoral Drift Estimate Valappu Beach

The monthly distribution of mean breaker wave height for the study area is shown in **Fig.57a**. The results indicate that the mean breaker height varies from about 0.6 m to 2.9 m. The breaker height is observed to be a maximum during the month of July. The monthly distribution of the mean breaker wave angle with respect to shore normal is shown in **Fig.57b**. From the results, it is seen that for the study area, the breaker angle with respect to shore normal and longshore current velocity are directed towards North in January, April, May and October to December and towards South in February, march and to June to September. The average surf width in which the long shore drift is predominant is further estimated from the breaker wave height for the given bathymetry and is projected in **Fig.57c** for the different months. It shows that the maximum surf width of about 175 m occurs during the month of July.

The average sediment transport rate for the different months is shown in **Fig.57d.** All three methods have yielded a similar order sediment transport rate. The net drift is found to be about -134255.841m<sup>3</sup> per annum and directed towards the North as shown in **Table.15.** 

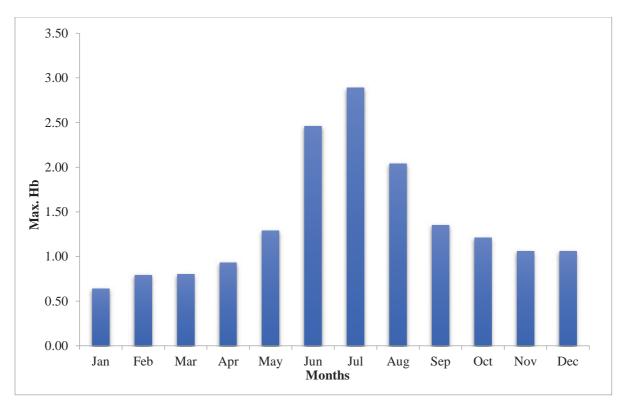


Fig.57a Breaker wave heights of Valappu Beach



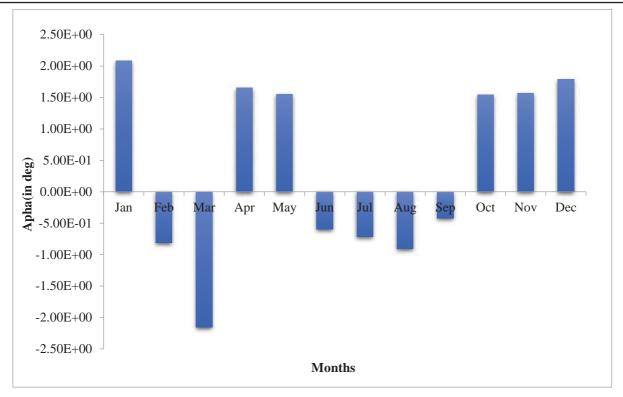


Fig.57b Wave breaker angle of Valappu Beach

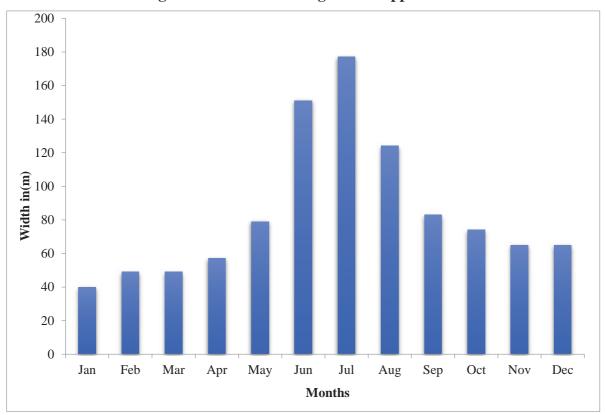


Fig.57c Surf zone width of Valappu Beach



Table.15 Sediment transport rate of Valappu Beach

Methods	Rate (m³/year)
Komar	-132350
CERC	-137851
Distribution	-132566

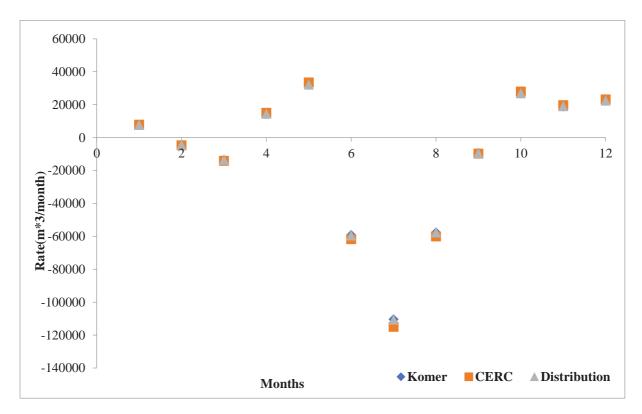


Fig.57d Longshore Sediment transport rate of Valappu Beach

# 8.3 Results on the Littoral Drift Estimate Elamkunnapuzha Beach

The monthly distribution of mean breaker wave height for the study area is shown in **Fig.58a**. The results indicate that the mean breaker height varies from about 0.6 m to 2.9 m. The breaker height is observed to be a maximum during the month of July. The monthly distribution of the mean breaker wave angle with respect to shore normal is shown in **Fig.58b**. From the results it is seen that for the study area, the breaker angle with respect to shore normal and longshore current velocity are directed towards North in January, April, May and October to December and towards South in February, march and to June to September. The average surf width in which the long shore drift is predominant is further estimated from the breaker Client: (KSCADC) & GIDA, KERALA



wave height for the given bathymetry and is projected in **Fig.58c** for the different months. It shows that the maximum surf width of about 175 m occurs during the month of July.

The average sediment transport rate for the different months is shown in **Fig.58d**. All the three methods have yielded similar order sediment transport rate. The net drift is found to be about - 130174.5963m<sup>3</sup> per annum and directed towards the North as shown in **Table.16**.

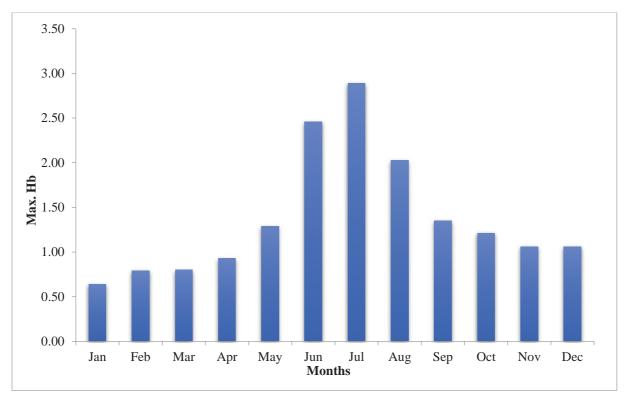


Fig.58a Breaker wave heights of Elamkunnapuzha Beach



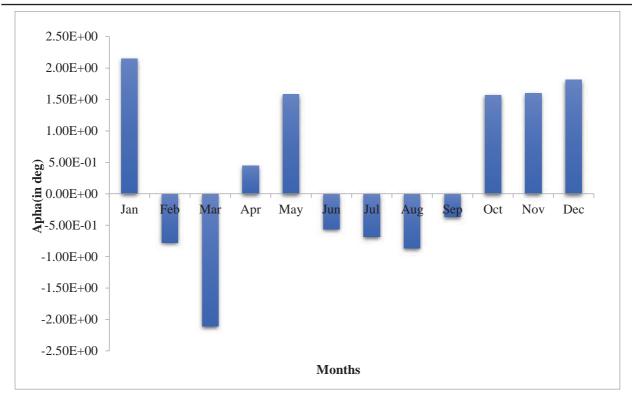


Fig.58b Wave breaker angle of Elamkunnapuzha Beach

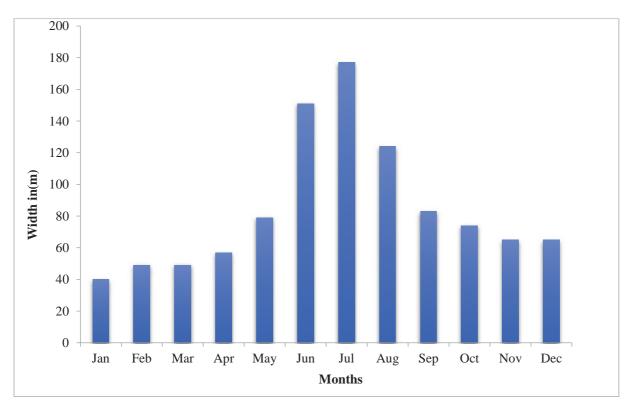


Fig.58c Surf zone width of Elamkunnapuzha Beach

Table.16 Sediment transport rate of Elamkunnapuzha Beach



Methods	Rate (m³/year)
Komar	-128325
CERC	-133658
Distribution	-128541

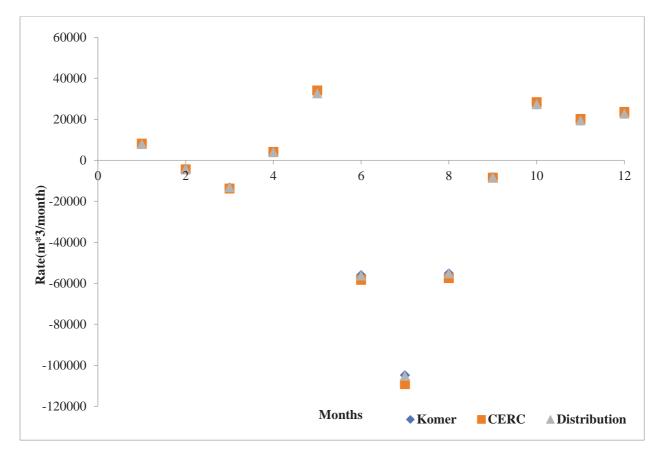


Fig.58d Longshore Sediment transport rate of Elamkunnapuzha Beach

# 8.4 Results on the Littoral Drift Estimate Njarackal Arattuvazhi Beach

The monthly distribution of mean breaker wave height for the study area is shown in **Fig.59a**. The results indicate that the mean breaker height varies from about 0.6 m to 2.9 m. The breaker height is observed to be a maximum during the month of July. The monthly distribution of the mean breaker wave angle with respect to shore normal is shown in **Fig.59b**. From the results it is seen that for the study area, the breaker angle with respect to shore normal and longshore current velocity are directed towards North in January , April , May and October to December and towards South in February , march and to June to September. The average surf width in which the long shore drift is predominant is further estimated from the breaker Client: (KSCADC) & GIDA, KERALA



wave height for the given bathymetry and is projected in **Fig.59c** for the different months. It shows that the maximum surf width of about 175 m occurs during the month of July.

The average sediment transport rate for the different months is shown in **Fig.59d**. All the three methods have yielded similar order sediment transport rate. The net drift is found to be about - 134255 m<sup>3</sup> per annum and directed towards the south as shown in **Table.17**.

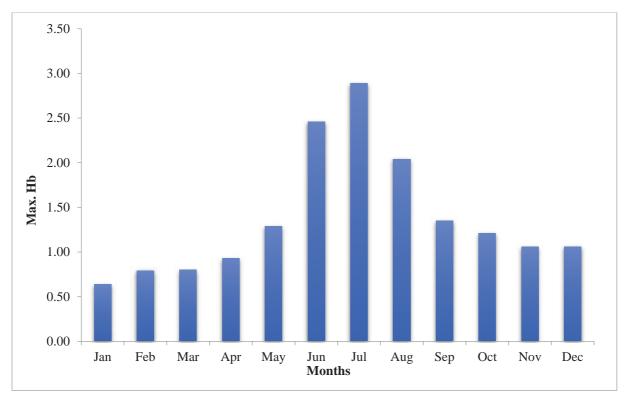


Fig.59a Breaker wave heights of Njarackal arattuvazhi beach



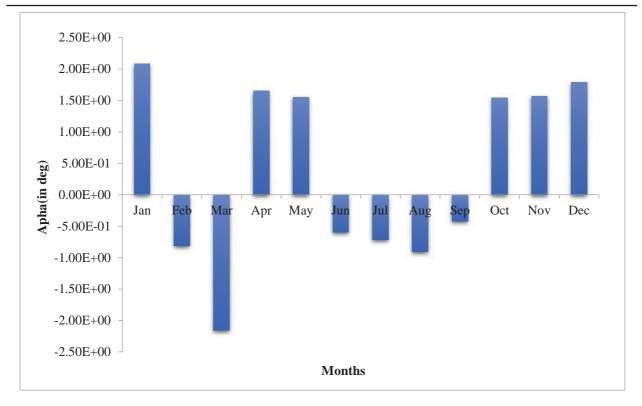


Fig.59b Wave breaker angle of Njarackal arattuvazhi beach

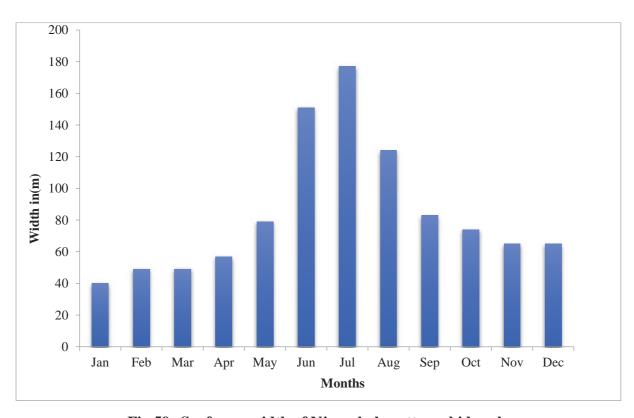


Fig.59c Surf zone width of Njarackal arattuvazhi beach

Table.17 Sediment transport rate of Njarackal arattuvazhi beach



Methods	Rate (m³/year)
Komar	-132351
CERC	-137851
Distribution	-132566

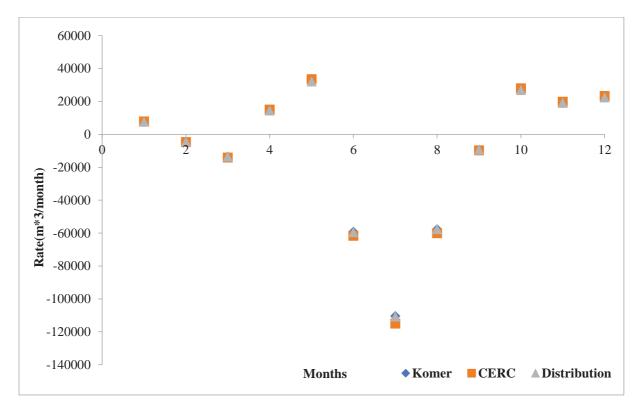


Fig.59d Longshore Sediment transport rate of Njarackal arattuvazhi beach

### 8.5 Results on the Littoral Drift Estimate Veliyatham Parambu Beach

The monthly distribution of mean breaker wave height for the study area is shown in **Fig.60a.** The results indicate that the mean breaker height varies from about 0.6 m to 2.9 m. The breaker height is observed to be a maximum during the month of July. The monthly distribution of the mean breaker wave angle with respect to shore normal is shown in **Fig.60b.** From the results it is seen that for the study area, the breaker angle with respect to shore normal and longshore current velocity are directed towards North in January, April, May and October to December and towards South in February, march and to June to September. The average surf width in which the long shore drift is predominant is further estimated from the breaker



wave height for the given bathymetry and is projected in **Fig.60c** for the different months. It shows that the maximum surf width of about 175 m occurs during the month of July.

The average sediment transport rate for the different months is shown in **Fig.60d.** All the three methods have yielded similar order sediment transport rate. The net drift is found to be about 57441m<sup>3</sup> per annum and directed towards the south as shown in **Table.18.** 

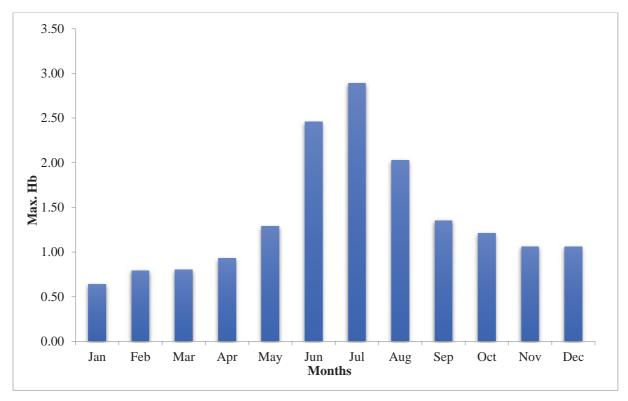


Fig.60a Breaker wave heights of Veliyatham Parambu Beach



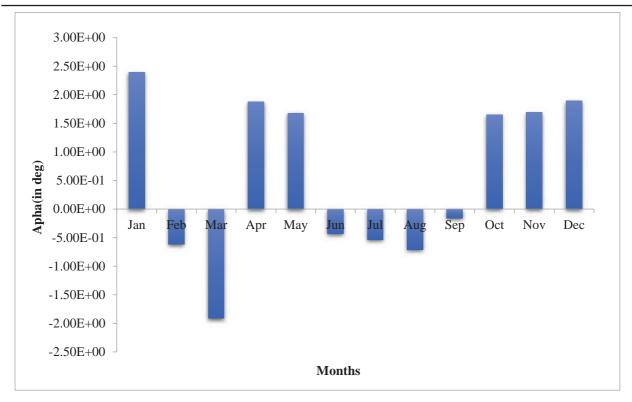


Fig.60b Wave breaker angle of Veliyatham Parambu Beach

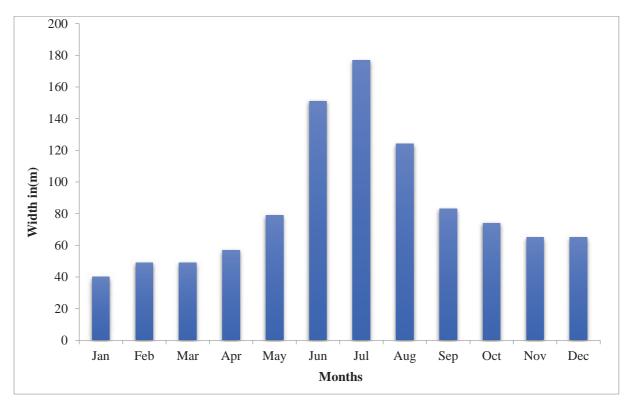


Fig.60c Surf zone width of Veliyatham Parambu Beach

Table. 18. Sediment transport rate of Veliyatham Parambu Beach



Methods	Rate (m³/year)
Komar	-56661.6
CERC	-59016.4
Distribution	-56644.1

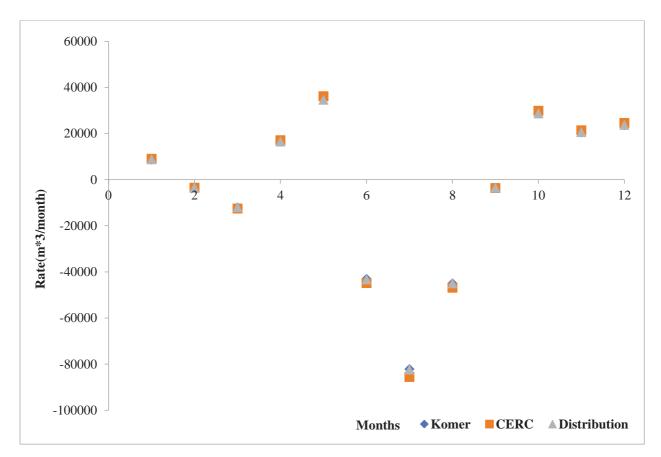


Fig.60d Longshore Sediment transport rate of Veliyatham Parambu Beach

# 8.6 Results on the Littoral Drift Estimate Edavankkadu Grama Panchayat

The monthly distribution of mean breaker wave height for the study area is shown in **Fig.61a.** The results indicate that the mean breaker height varies from about 0.6 m to 2.9 m. The breaker height is observed to be a maximum during the month of July. The monthly distribution of the mean breaker wave angle with respect to shore normal is shown in **Fig.61b.** From the results it is seen that for the study area, the breaker angle with respect to shore normal and longshore current velocity are directed towards North in January, April, May and October to December and towards South in February, march and to June to September. The average surf width in which the long shore drift is predominant is further estimated from the breaker



wave height for the given bathymetry and is projected in **Fig.61c** for the different months. It shows that the maximum surf width of about 175 m occurs during the month of July.

The average sediment transport rate for the different months is shown in **Fig.61d**. All the three methods have yielded similar order sediment transport rate. The net drift is found to be about - 73700 m<sup>3</sup> per annum and directed towards the North as shown in **Table.19**.

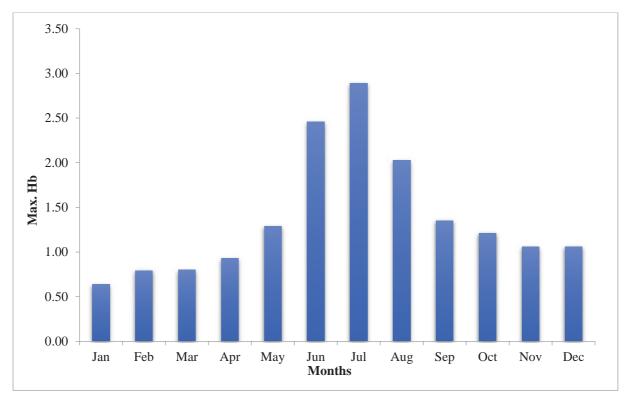


Fig.61a Breaker wave heights of Edavankkadu Grama Panchayat



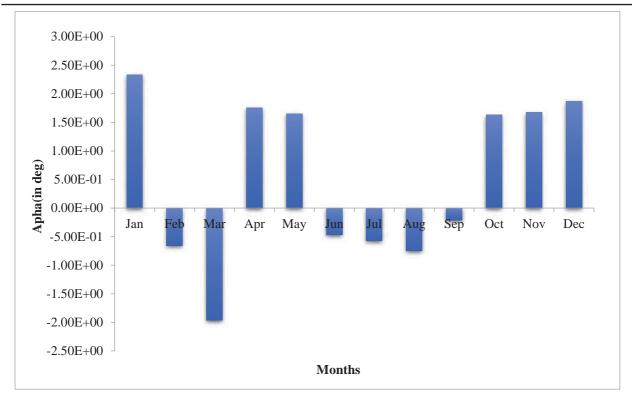


Fig.61b Wave breaker angle of Edavankkadu Grama Panchayat

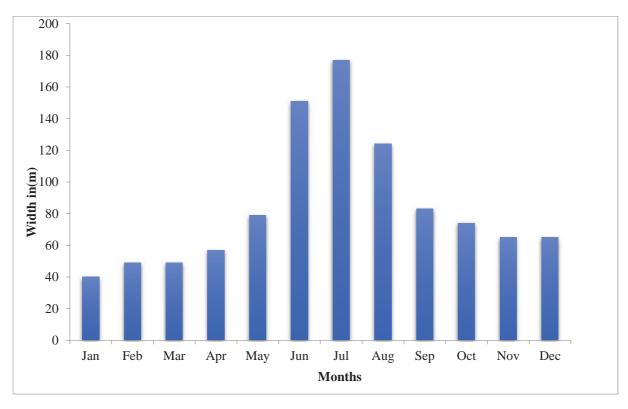


Fig.61c Surf zone width of Edavankkadu Grama Panchayat

Table.19 Sediment transport rate of Edavankkadu Grama Panchayat



Methods	Rate (m³/year)
Komar	-72682.8
CERC	-75703.4
Distribution	-72715.2

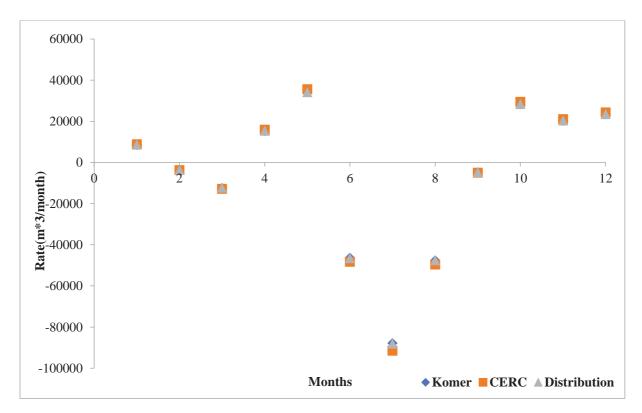


Fig.61d Longshore Sediment transport rate of Edavankkadu Grama Panchayat

### 8.7 Results on the Littoral Drift Estimate Saidh Mohammed Beach

The monthly distribution of mean breaker wave height for the study area is shown in **Fig.62a**. The results indicate that the mean breaker height varies from about 0.64 m to 2.89 m. The breaker height is observed to be a maximum during the month of July. The monthly distribution of the mean breaker wave angle with respect to shore normal is shown in **Fig.62b**. From the results it is seen that for the study area, the breaker angle with respect to shore normal and longshore current velocity are directed towards North in January, April, May and October to December and towards South in February, march and to June to September. The average surf width in which the long shore drift is predominant is further estimated from the breaker



wave height for the given bathymetry and is projected in **Fig.62c** for the different months. It shows that the maximum surf width of about 177 m occurs during the month of July.

The average sediment transport rate for the different months is shown in **Fig.62d**. All the three methods have yielded similar order sediment transport rate. The net drift is found to be about - 43174 m<sup>3</sup> per annum and directed towards the south as shown in **Table.20**.

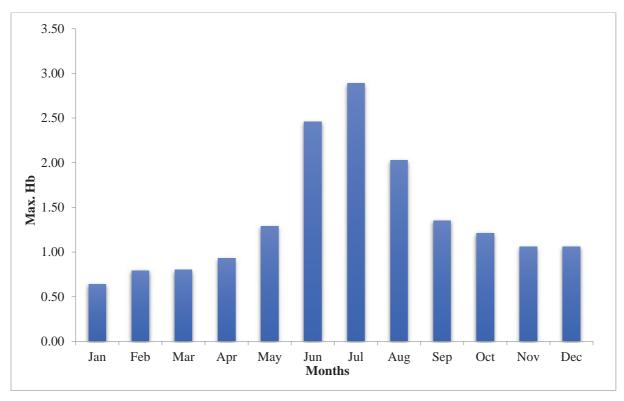


Fig.62a Breaker wave heights of Saidh Mohammed Beach



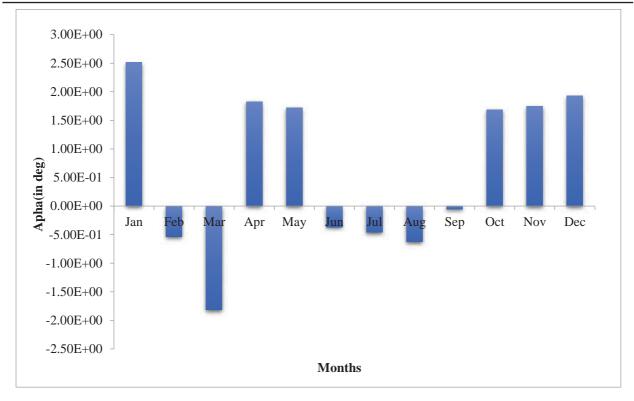


Fig.62b Wave breaker angle of Saidh Mohammed Beach

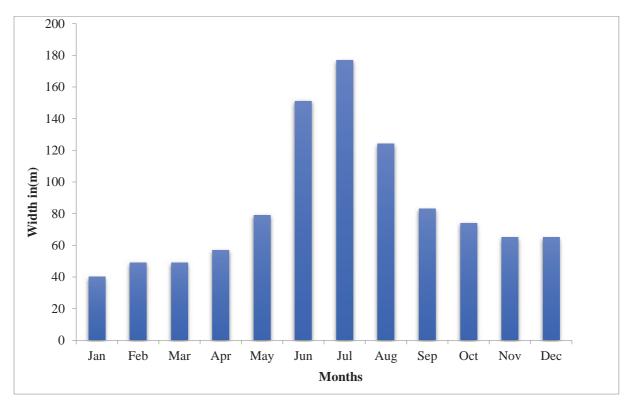


Fig.62c Surf zone width of Saidh Mohammed Beach

Table.20 Sediment transport rate of Saidh Mohammed Beach



Methods	Rate (m³/year)
Komar	-42603.7
CERC	-44374.2
Distribution	-42544.6

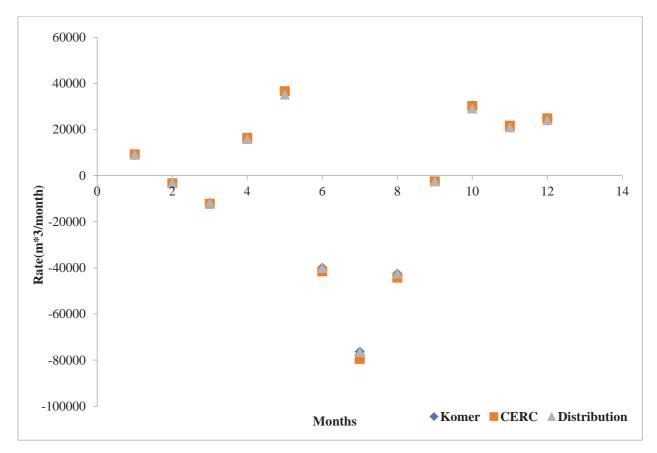


Fig.62d Longshore Sediment transport rate of Saidh Mohammed Beach

### 8.8 Result Littoral Drift Estimate Kuzhippilly

The monthly distribution of mean breaker wave height for the study area is shown in **Fig.63a**. The results indicate that the mean breaker height varies from about 0.64 m to 2.89 m. The breaker height is observed to be a maximum during the month of July. The monthly distribution of the mean breaker wave angle with respect to shore normal is shown in **Fig.63b**. From the results it is seen that for the study area, the breaker angle with respect to shore normal and longshore current velocity are directed towards North in January , April , May and October to December and towards South in February , march and to June to September. The average surf width in which the long shore drift is predominant is further estimated from the breaker Client: (KSCADC) & GIDA, KERALA



wave height for the given bathymetry and is projected in **Fig.63c** for the different months. It shows that the maximum surf width of about 177 m occurs during the month of July.

The average sediment transport rate for the different months is shown in **Fig.63d.** All the three methods have yielded similar order sediment transport rate. The net drift is found to be about - 104188m<sup>3</sup> per annum and directed towards the south as shown in **Table.21** 

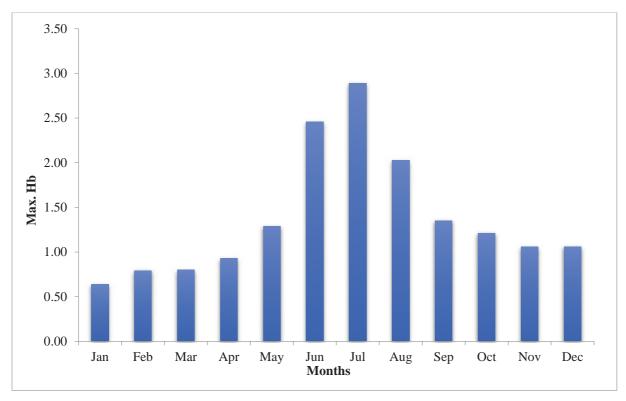


Fig.63a Breaker wave heights of Kuzhippilly



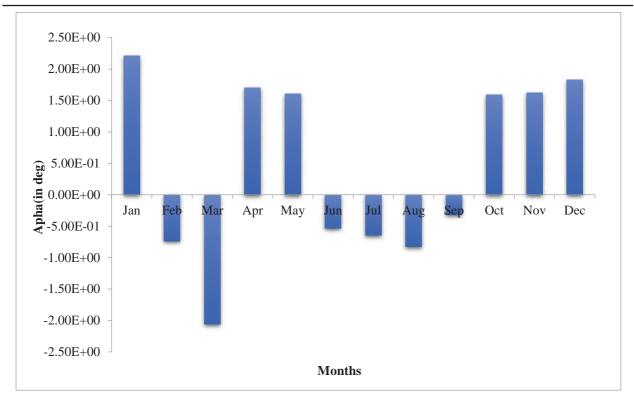


Fig.63b Wave breaker angle of Kuzhippilly

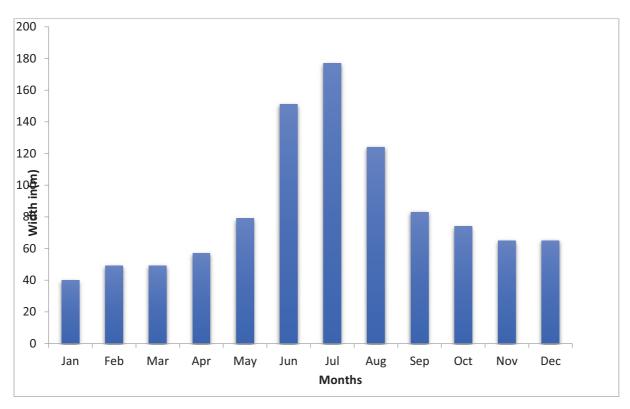


Fig.63c Surf zone width of Kuzhippilly

Table. 21 Sediment transport rate of Kuzhippilly



Methods	Rate (m³/year)
Komar	-102724
CERC	-106993
Distribution	-102848

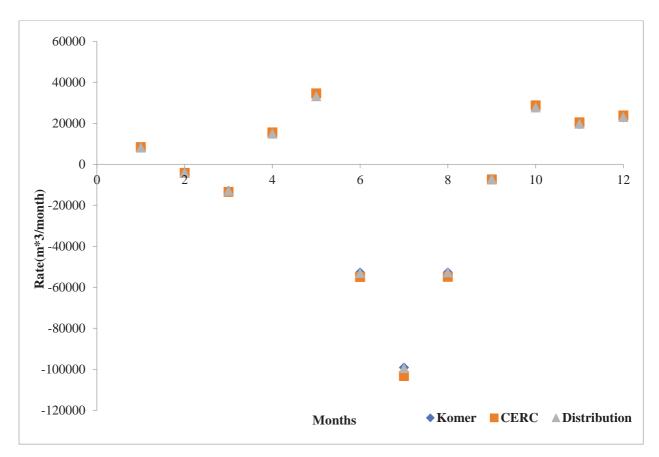


Fig.63d Longshore Sediment transport rate of Kuzhippilly

# 8.9 Results on the Littoral Drift Estimate Pallipuram Raktheswari Beach

The monthly distribution of mean breaker wave height for the study area is shown in **Fig.64a.** The results indicate that the mean breaker height varies from about 0.6 m to 2.9 m. The breaker height is observed to be a maximum during the month of July. The monthly distribution of the mean breaker wave angle with respect to shore normal is shown in **Fig.64b**. From the results it is seen that for the study area, the breaker angle with respect to shore normal and longshore current velocity are directed towards North in January , April , May and October to December and towards South in February , march and to June to September. The average surf width in which the long shore drift is predominant is further estimated from the breaker Client: (KSCADC) & GIDA, KERALA



wave height for the given bathymetry and is projected in **Fig.64c** for the different months. It shows that the maximum surf width of about 177 m occurs during the month of July.

The average sediment transport rate for the different months is shown in **Fig.64d**. All the three methods have yielded similar order sediment transport rate. The net drift is found to be about -134638 m<sup>3</sup> per annum and directed towards the south as shown in **Table.22**.

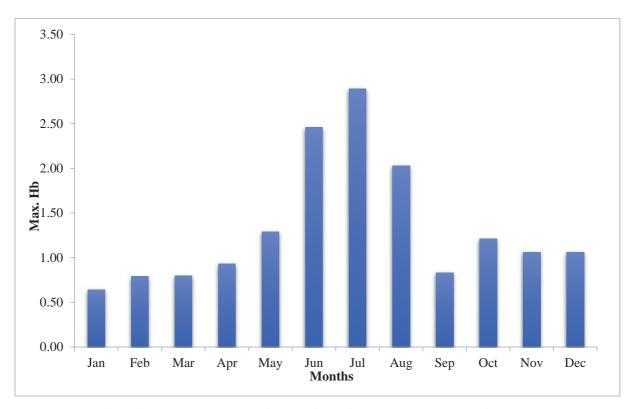


Fig.64a Breaker wave heights of Pallipuram Raktheswari beach



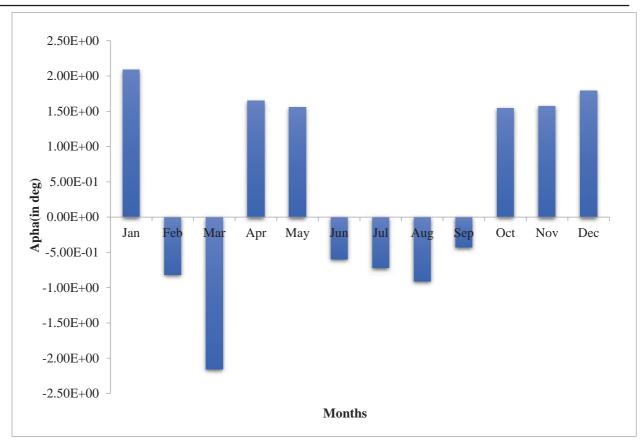


Fig.64bWave breaker angle of Pallipuram Raktheswari beach

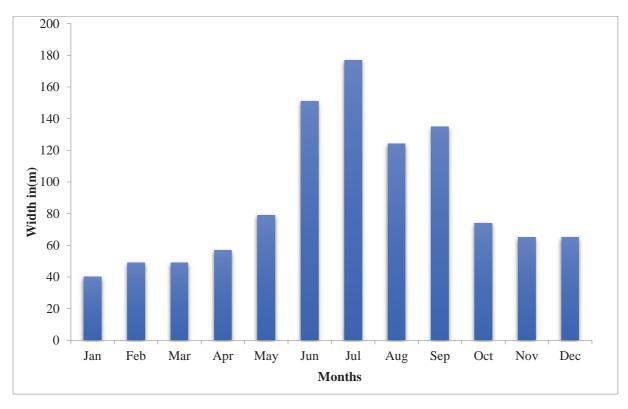


Fig.64c Surf zone width of Pallipuram Raktheswari beach



Table.22 Sediment transport rate of Pallipuram Raktheswari beach

Methods	Rate (m³/year)
Komar	-132727
CERC	-138243
Distribution	-132943

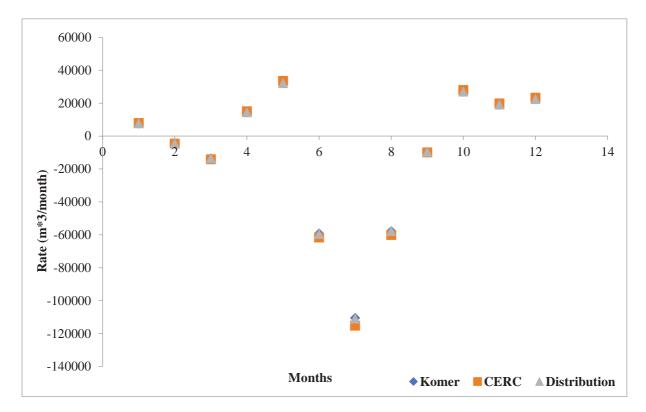


Fig.64d Longshore Sediment transport rate of Pallipuram Raktheswari beach

#### 8.10 Results on the Littoral Drift Estimate Cherai Beach

The monthly distribution of mean breaker wave height for the study area is shown in **Fig.65a**. The results indicate that the mean breaker height varies from about 0.64 m to 2.89 m. The breaker height is observed to be a maximum during the month of July. The monthly distribution of the mean breaker wave angle with respect to shore normal is shown in **Fig.65b**. From the results it is seen that for the study area, the breaker angle with respect to shore normal and longshore current velocity are directed towards North in January , April , May and October to December and towards South in February , march and to June to September. The average surf width in which the long shore drift is predominant is further estimated from the breaker Client: (KSCADC) & GIDA, KERALA



wave height for the given bathymetry and is projected in **Fig.65c** for the different months. It shows that the maximum surf width of about 177 m occurs during the month of July.

The average sediment transport rate for the different months is shown in **Fig.65d.** All the three methods have yielded similar order sediment transport rate. The net drift is found to be about -179855 m<sup>3</sup> per annum and directed towards the south as shown in **Table.23.** 

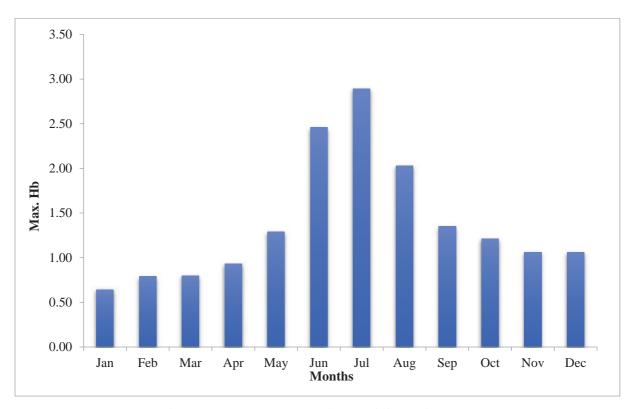


Fig.65a Breaker wave heights of Cherai beach



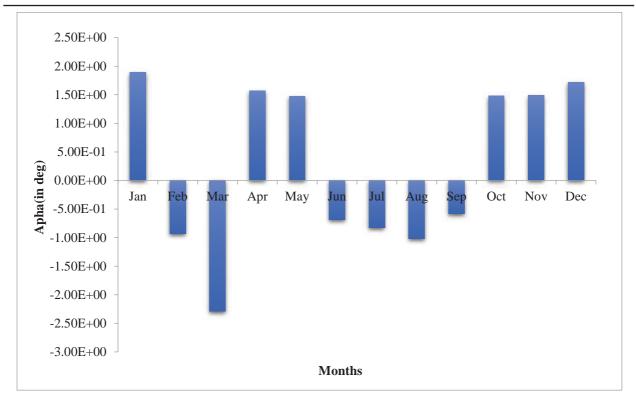


Fig.65b Wave breaker angle of Cherai beach

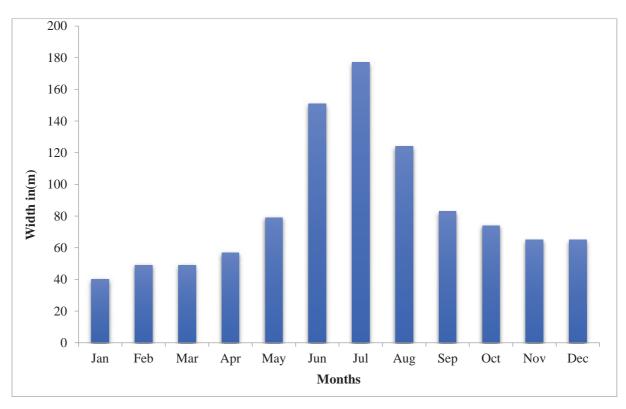


Fig.65c Surf zone width of Cherai beach

Table.23 Sediment transport rate of Cherai beach



Methods	Rate (m³/year)
Komar	-177282
CERC	-184650
Distribution	-177635

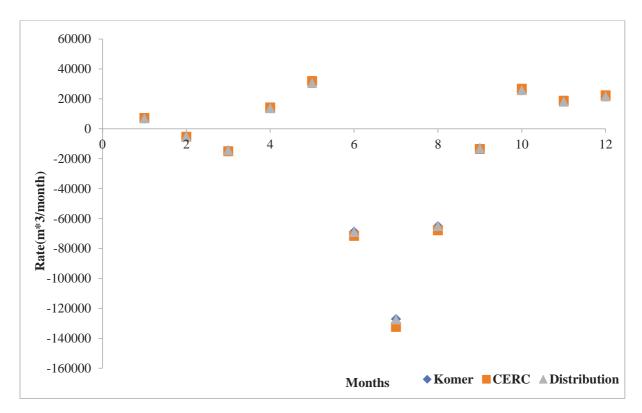


Fig.65d Longshore Sediment transport rate of Cherai beach

#### 8.11 Result Littoral Drift Estimate Arattu Kadavu Beach

The monthly distribution of mean breaker wave height for the study area is shown in **Fig.66a.** The results indicate that the mean breaker height varies from about **0.54 m to 2.74m**. The breaker height is observed to be a maximum during the month of July. The monthly distribution of the mean breaker wave angle with respect to shore normal is shown in **Fig.66b**. From the results it is seen that for the study area, the breaker angle with respect to shore normal and longshore current velocity are directed towards North in January , February , April , May and October to December and towards South in march and to June to September. The average surf width in which the long shore drift is predominant is further estimated from the breaker



wave height for the given bathymetry and is projected in **Fig.66c** for the different months. It shows that the maximum surf width of about 168m occurs during the month of July.

The average sediment transport rate for the different months is shown in **Fig.66d.** All the three methods have yielded similar order sediment transport rate. The net drift is found to be about -84496m<sup>3</sup> per annum and directed towards the south as shown in **Table.24.** 

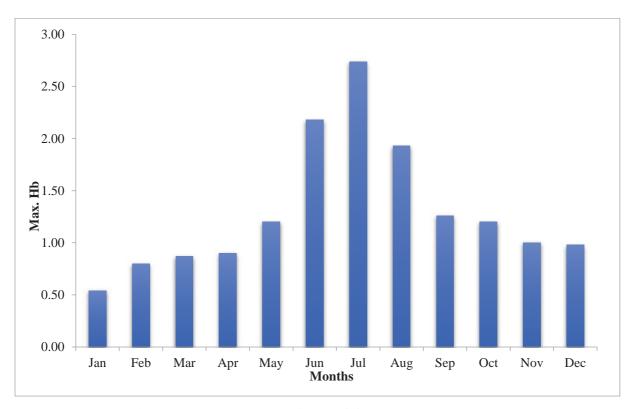


Fig.66a Breaker wave heights of Arattu Kadavu Beach



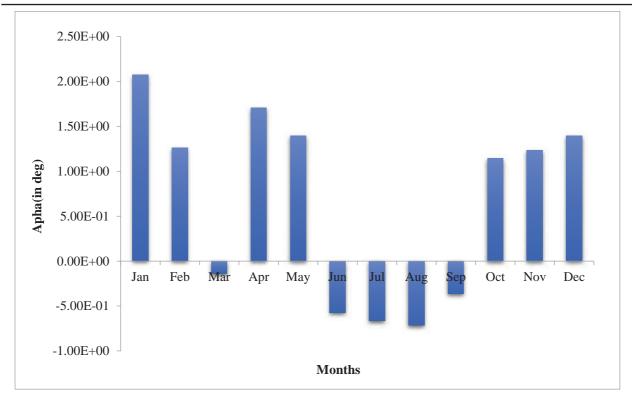


Fig.66b Wave breaker angle of Arattu Kadavu Beach

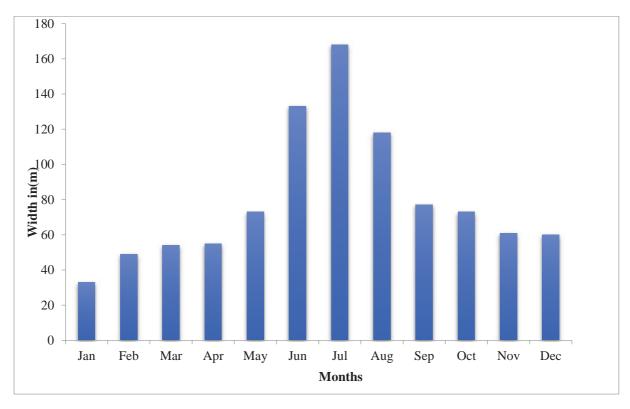


Fig.66c Surf zone width of Arattu Kadavu Beach

Table.24 Sediment transport rate of Arattu Kadavu Beach



Methods	Rate (m³/year)
Komar	-83164
CERC	-86620
Distribution	-83703

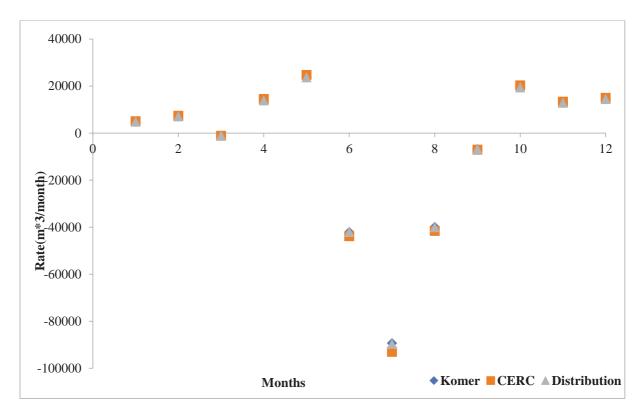


Fig.66d Longshore Sediment transport rate of Arattu Kadavu Beach

# 8.12. Comparison of sediment transport rates for different stretches

A comparison of a comprehensive study on the littoral drift along the study area is presented in **Table.25**. The breaker wave height for the entire stretch varies between 0.6 to 2.9m with a maximum surf width of about 175m in the month of July. The results shown are self-explanatory.

Table.25. Comparison of littoral drift estimate



Location		Littoral drift characteristics						
	Length of the stretch ( apx.)	Month of predominant direction of littoral drift		Sediment transport rate (10 <sup>6</sup> m <sup>3</sup> /yr)				
Site		Directed towards North	Directed towards south	Komar	CERC	Distributi on	Average	
Valappu Beach	1.2 km	January, April, May and October to December	February, March and June to September	-0.13	-0.14	-0.13	-0.135	
Elamkunnapuz ha Beach	1.4 km	January, April, May and October to December	February, March and June to September	-0.128	-0.133	-0.129	-0.13	
Njarackal Arattuvazhi Beach	1.3 km	January, April, May and October to December	February, March and June to September	-0.132	-0.138	-0.133	-0.134	
Veliyatham Parambu Beach	1.8 km	January, April, May and October to December	February, March and June to September	-0.057	-0.059	-0.057	-0.058	
Edavankkadu Grama Panchayat	3.3 km	January, April, May and October to December	February, March and June to September	-0.073	-0.076	-0.073	-0.074	
Saidh Mohammed Beach	3.3 km	January, April, May and October to December	February, March and June to September	-0.043	-0.044	-0.043	-0.043	
Kuzhippilly	6.8 km	January, April, May and	February, March and June to September	-0.103	-0.107	-0.103	-0.104	



		October to December					
Pallipuram Raktheswari beach	6.8 km	January, April, May and October to December	February, March and June to September	-0.133	-0.138	-0.133	-0.135
Cherai beach	6.8 km	January, April, May and October to December	February, March and June to September	-0.177	-0.185	-0.178	-0.180
Arattu Kadavu beach	6.8 km	January, February, April, May and October to December	March and June to September	-0.083	-0.087	-0.084	-0.085

# 9.0 IMPORTANT COASTAL STRETCHES - FEEDBACK FROM CLIENT

Based on the combined site visit/survey conducted by the Government departments of the Kerala state, the minutes of the meeting was communicated to Prof. Sundar (ref: 4178/G/2018/KSCADC). A preliminary comprehensive plan for the coastal measures along the identified stretches are projected in **Table.26**.



# **Table.26 Primary plan for coastal protection measures**

<b>Locations Identified</b>	Site Name	North Lat/long	South Lat/long	Distance	Existing Structure	Proposed Structures
Fish landing center	Malippuram, Chappakadavu	N 10°1'11.0604" E 76°12'47.4876"	N 10°1'15.8052" E 76°12'46.3104"	0.15 km	Nil	This stretch of <b>Cell 3</b> for a distance of about 1.5 km is experiencing erosion upto -10m/yr. The primary requirement is to protect this coast with transitional groyne and if the need arises the central portion of the groyne field covering a base width of 150 – 200 m could be developed as a fish landing harbour.  ( <b>Priority 1 and 2</b> )
Fish landing center	Njarakkal, Near Krishi Vitjaan Kendra	N 10°2'37.78951" E 76°12'23.14688"	N 10°2'38.79388" E 76°12'22.41781"	0.18 km	Sea wall at both sides, with a beach opening at southern end.	A major stretch of this coast is protected with rubble mound seawall and the available gap even for beach landing is hardly 50 m. Hence it may not be cost-effective unless the number of boats operating in this area is large. ( <b>Priority</b> 3)
Fish landing center	Veliyathamparambu	N 10°2'49.94768" E 76°12'19.41192"	N 10°2'53.8669" E 76°12'17.50619"	0.13 km (beach opening )	Groynes and sea wall at both the sides	The northern groyne to be extended upto a water depth of -3 to -4 m; with a base width of the waterfront of about 250 m another groyne south of the existing southern groyne to be constructed. This will accommodate about 100-150 boats ( <b>Priority 1</b> ). Since the erosion rate is very less (-0.25m/yr) this stretch is ideal for a fishing harbour
Fish landing center	Puthenkadappuram	N 10°3'53.60576" E 76°11'55.69982"	N 10°3'57.80577" E 76°11'54.10752"	0.14 km	Series of 6 groins at north	This stretch experiences an erosion rate of -0.5 m/yr. A fish landing facility can be provided by having a pair of groynes



			I	T		
					and sea wall at southern	with the northern groyne being longer than the southern. ( <b>Priority 2</b> )
Fish landing center	Aniyal	N 10°4'36.05833" E 76°11'44.34713"	N 10°4'39.22827" E 76°11'44.05199"	0.06 km	At southern end there is a groyne of 50m length at a distance of 130m from sea wall	This stretch of the coast is accreting at an average rate of 2.5 m/yr and owing to the reduced access to the roadways network construction of landing facilities may not be feasible. ( <b>Priority</b> 3)
Fish landing center	Pazhangadu- Puthenkadappuram	N 10°4'58.64154" E 76°11'39.52792"	N 10°5'1.18003" E 76°11'38.20931"	0.1 km (beach opening)	Sea wall at both ends	From the ending of seawall on the north a base width of 150 m could be considered for the development of a mini fish landing centre. The constructions of these 2 arms of the proposed harbour will not be affecting the adjoining shoreline, as it is protected by a seawall. ( <b>Priority 2</b> )
Fish landing center	Saidh Mohammed beach-2	N 10°5'51.75364" E 76°11'23.263"	N 10°5'55.86458" E 76°11'22.20465"	0.13 km	A series of 6 located south of the beach stretch	Adopt a base width of 150m from the existing southern end. Provision of a pair of curved arm breakwaters upto -2 m water depth to handle small fishing crafts. ( <b>Priority 2</b> )
Fish landing center	Kuzhuppilly	N 10°6'32.688" E 76°11'14.5356"	N 10°6'36.2916" E 76°11'13.9812"	0.11 km	Nil	Included in the stretch of the coast under item no. 13 of this table.
Fish landing center	Ayyambilly	N 10°7'5.7576" E 76°11'6.4176"	N 10°7'10.7328" E 76°11'5.2836"	0.16 km	Nil	
Fish landing center	Arattukadavu	N 10°8'57.40798" E 76°10'32.9444"	N 10°8'59.5872" E 76°10'32.15672"	0.07 km ( beach opening )	Both end covered with sea wall	A bay formation is seen in between two existing seawalls which could handle the ongoing erosion, a pair of curved groynes locally termed as pulimuttam



						could be adopted to form a fish landing facility. The groynes can extend up to a water depth of -2 m. ( <b>Priority 3</b> )
Tourism destination	Puthuvype	N 9°59'51.9019" E 76°13'5.9023"	N 9°59'58.5019" E 76°13'4.8015"	0.21 km	Nil	The shoreline change analysis projects an average rate of 2.5 m/yr of accretion.  No immediate action is required.  ( <b>Priority 3</b> ). Further, the proposal with IOCL is available which if implemented
Tourism destination	Valappu	N 10°0'20.37899" E 76°13'0.49256"	N 10°0'45.35078" E 76°12'54.41616"	0.79 km	Nil	will resolve the problem  Submerged reef geo-tubes (detached)  OR transitional T-groynes. Rate of erosion -0.25 m/yr. (Priority 2)
Tourism destination	Saidh Mohammed beach-2 Kuzhuppilly Beach Raktheswari Beach	N 10°5'55.86458" E 76°11'22.20465"	N 10°8'28.068" E 76°10'42.78"	4.83 km		This stretch of about 4.5 km will be protected with submerged geo-tubes (detached) or T groyne field ( <b>Priority</b> 1). Zaid Mhd beach 2: -1 to +1 m/yr.  Kuzhuppilly beach: -1 m/yr.
	Cherai Beach					Raktheswari beach: -2 m/yr. Cherai beach: -2 m/yr.



#### 10.0 PROPOSED SHORE PROTECTION WORKS

For the sites identified as Priority 1 and 2 in **Table 26**, detailed shore protection works are presented in this section. The layouts were finalized based on the results arrived from numerical model of CG wave and shoreline evolution. A total of 5 fishing landing centres and two important tourist locations were identified. Conventional shore connected transitional groynes or a pair of groynes were employed for effective shore protection and safe fish landing; the use of sustainable and environment friendly geo-synthetic materials are encouraged and adopted for the offshore submerged breakwaters as well as the shore connected low crested structures. Submerged coastal structures are widely perceived to be capable of providing beach protection, without the adverse impacts (including loss of beach amenity and aesthetic considerations) often associated with conventional hard engineering structures. When used for beach stabilization the function of offshore submerged structures is to reduce wave energy in their lee and thereby reducing the sediment carrying capacity of the waves to the shoreward. They can be designed to reduce or prevent the erosion of an existing beach or a beach fill, or to encourage natural sediment accumulation to form a new beach. The structures reduce the incoming wave energy across the structure by triggering wave breaking at and on the structure, by partially reflecting the waves and by dissipation. These structures have significant influence on the recreational conditions for beach users. Some influences are regarded as positive, while others are considered as negative. The influence is either direct due to the physical presence of the structure in the nearshore zone, or indirect due to the consequent effects on the local hydromorphodynamics. For the detached offshore structures, the pressure gradients produced by the setup forced by the waves breaking over submerged barriers between the protected area and the sea (Calabrese et al., 2008; Vicinanza et al., 2009) generate a seaward-flowing current, known as a "rip current" through the gaps between two contiguous breakwaters, as shown by Brocchini et al. (2004). Intense sediment transport toward the sea is generated by such currents, thus causing a significant sediment loss; also dangerous for swimmers' safety. Significant efforts have been undertaken in the last decade to investigate both the hydrodynamics (Kramer et al., 2005; Kriezi and Karambas, 2010; Losada et al., 2005) and the morphodynamics (Karambas, 2012; Zyserman et al., 2005) induced around low-crested structures. Therefore the spacing between these detached offshore structures needs to be planned with utmost attention to detail.

### 10.1 Valappu Beach



Valappu Beach is a popular tourist location along the Ernakulam coast, situated in the vicinity of BPCL and IOCL oil refiner facilities. Based on the satellite imagery studies conducted this site has been observed to undergo moderate erosion rates. IIT Madras has already proposed a few costal protections measures adjacent to the BPCL and IOCL facilities; in addition to the aforementioned measures, commissioning a singular 820 m long section of a submerged geotube parallel to the shoreline is proposed, which would effectively function as an offshore submerged breakwater. Morphodynamics induced around submerged breakwaters is strongly influenced by its positioning. The bed variations were shown to increase when the structures are progressively located offshore; when dissipative breaking mechanisms occur, a decreasing inshore erosion is accompanied by an equally fast decrease of offshore erosion. Analysis of the vorticity fields show that breakwaters placed far from the shoreline induce an evolution of the vortices generated by breaking waves rather different from the one due to breakwaters placed closer to the shoreline (Postacchini et al., 2016). This offshore submerged geo-tube is proposed to erected at -5m water depth, 1600 m away from the shoreline. Plate 1 details the layout of the proposed protection measure. The adopted layout dimensions satisfy the conditions  $(L_{\checkmark}X)$ > 0.5, i.e., ratio of the breakwater length to its distance from the shore is 0.53 which is favourable for salient formations) put forth by Dally and Pope (1986) Chasten et al., (1993) and Seiji et.al., (1987) for the formation of salient for an offshore emerged structure. According to Lorenzoni et al., (2012) submerged configurations show larger shoreline retreats than the emerged ones at the same position and for the same wave attack conditions. Although proper planning and execution of submerged structures will yield favourable results as seen in Yucan, Mexico (Alvarez et al., 2007); Teluk Kalong, Kemaman, Terengganu Malaysia (Lee and Douglas, 2011), etc.

### 10.2 Malipuram

This coast is identified to experience high erosion at the rate of about -10m/yr through remote sensing studies. Although this site has been identified as a fish landing centre, there is an urgent need to protect the eroding coastline. Therefore, a series of six transitional groynes are proposed to be constructed across a stretch of about 1 km. Four number of T groynes, two on either ends and two number of straight groynes in the central section are proposed. The straight groynes can be further extended to form a fishing harbour if necessary. A base landing width of 250 m is provided to accommodate sufficient number of fishing vessels; these groynes extend upto a maximum water depth of about -2 m. The longest groyne in this series is about 120 m long and the shortest groyne is about 50 m long as seen in **Plate 2**.



### 10.3 Veliyathamparambu

This stretch of the coastline identified as a fishing landing centre is already protected with a seawall structure to its south and a single groyne exists in the northern side. The rate of erosion across this stretch is inferred to be less based on the satellite imagery studies, since it is already protected. Although a pair of inclined groynes as seen in **Plate 3** are proposed to be constructed in order to effectively serve as a fish landing facility. These groynes are about 180 m long extending to water depths upto 3 m.

### 10.4 Puthenkadappuram

This stretch of the coastline identified as a fishing landing centre is already protected with a seawall structure to its south and groyne field on the northern side. A proposal to construct a pair of groynes as seen in **Plate 4** is made, which includes the extension of an existing groyne on the northern side. These groynes are about 130 m long and extend to a water depth of up to 3.5 m, with a base width of about 200 m.

# 10.5 Pazhangadu

This stretch of the coastline is identified as a fishing landing centre and it is already protected with seawall sections on either side. A pair of groynes are proposed to be constructed as shown in **Plate 5**. These groynes are about 180 m long and extend to a water depth of 3.4 m with a base width of about 200 m.

#### 10.6 Saidh Mohammed beach

This stretch of the coastline is identified as a fishing landing centre and it is already protected with seawall and groynes. A proposal is made to extend the existing groynes for about 160 m in length (upto -3 m water depth) and construct a pair of groynes to form a fish landing centre with a base width of about 150 m as seen in **Plate 6**.

### 10.7 Saidh Mohammed beach -2 to Cherai Beach

This stretch is an important tourist destination spanning a length of about 4 km. It covers four important tourist beaches namely the Saidh Mohammed beach, Kuzhuppilly Beach, Raktheswari, and Cherai. The erosion rate across these stretches is about -2m/yr and hence suitable protection measures for these sites are proposed to retrieve the lost beaches. Two different options are proposed for shore protection and the said works are preferred to be carried out in two phases. For *option 1* initially, a series of short straight transitional groynes (the length of these short groynes vary between 20 m and 70 m) are proposed to be constructed as **phase 1**. The longer groynes (i.e.) of length 60 m and above in the said layout is designed to be sustainable by adopting geo-containers for core layer and geo-bags for toe protection, which



are submerged at HWL (High Water Line). The details of these sustainable groynes are briefed in the design section. These groynes will immediately arrest the longshore sediments and result in beach width growth, the additional beach width gained can be utilized for establishing recreational activities. After observing the beach response to the structures constructed in phase 1, construction of submerged geo-tube units at the head of the longer groynes are proposed to be constructed as **phase 2**. The details of the proposed option 1 is given in **Plate 7**.

For *option 2*, the previously proposed **phase 1** is retained and in **phase 2**, after the assessment of the behaviour of shoreline, 3 detached offshore submerged geo-tube sections is proposed to be commissioned. The details of the proposed option 2 is given in **Plate 8**. The primary function of these submerged structures is to promote pre-mature breaking of ocean waves and thereby reducing the wave impact on the coast which in-turn diminishes the active erosion of the coast. The proposed length of the groynes does not exceed 70 m which is less than the surf zone width prevalent along the coast. The adopted layout dimensions satisfy the conditions ( $L_s/X > 0.5$ , i.e., ratio of the breakwater length to its distance from the shore is 0.6 which is favourable for salient formations;  $0.8 < L_g/X < 1.5$  possible erosion opposite to gap, i.e., ratio of the breakwater gap width to its distance from the shore is 1.1, the possibility of erosion is evaded owing to the presence of short groynes) put forth by Dally and Pope (1986) Chasten et al., (1993) and Seiji et.al., (1987) for the formation of salient of an offshore emerged structure.

# 11.0 NUMERICAL MODELLING FOR SHORELINE EVOLUTION

#### 11.1 General

Structures in the nearshore environment are built for different purposes, which may be for the formation of artificial harbors, shore protection measures, seawater intake systems, disposal of effluent, etc. There are several configurations of such structures with respect to the shoreline, among which, structures normal to the shore are most common. The construction of a shoreconnected structure often leads to changes in the shoreline. This warrants a study on the shoreline due to the presence of the shore-connected structures. Such a study is very much essential in the planning stage; so as to assess the impact of shore connected structures on the adjacent shoreline.

Numerical models offer the capability to study the effect of the wave characteristics, structure dimensions and other associated parameters in providing reasonable estimates of the shoreline response. As the ocean waves approach the nearshore it undergoes transformations like



shoaling, refraction, diffraction and breaking. The phenomena of wave breaking throw sediments to the surface due to the turbulence generated. The sediments in suspension are then driven by the wave-induced currents. Since the direction of waves in the nearshore is oblique, the currents induced by them have two components. One along the shore called the longshore current is mainly responsible for the longshore sediment transport, which plays an important role in the shoreline changes especially due to the shore connected structures. The other component is in the direction normal to the shore, in which case, the mode of sediment transport is called onshore-offshore sediment transport. When a structure normal to the shoreline is constructed, it will intercept the free passage of longshore sediment transport, which results in an imbalance in the quantity of sediment on the nearshore, especially near the structure. This leads to accretion on the up-drift side and erosion on the downdrift side of the structure.

### 11.2 Methodology

Kraus and Harikai (1983) proposed a numerical scheme to solve the one-line model using Crank Nicholson implicit finite difference method. The non-dimensional equation of shoreline is given below

$$y_{n,t^*+1}^* = B \left\{ Q_{n,t^*+1}^* - Q_{n+1,t^*+1}^* \right\} + C_n$$

where 
$$B = \frac{\delta t^*}{2 \times \delta x^*}$$
 and  $C_n = B \left\{ Q_{n,t^*}^* - Q_{n+1,t^*}^* + 2\delta x^* q_{n,t^*}^* \right\} + y_{n,t^*}^*$ 

The non-dimensional shoreline is divided into 'n' grid points at equal non-dimensional interval,  $\delta x^*$ . Then shoreline changes over a non-dimensional time,  $\delta t^*$  is calculated using Crank-Nicholson finite difference scheme. The schematic diagram for finite difference scheme is shown in **Fig. 67.** 

In this method,  $Q^*$  at the time interval  $(t^*+1)$  is expressed in terms of the shoreline co-ordinate of  $y^*$ , first isolating the term involving  $\alpha_{sp}$  (angle of shoreline normal to x-axis) using trigonometric identities. One of the term involving  $\alpha_{sp}$  is then expressed as first order quantities in  $y^*$  at time step  $(t^*+1)$ .

$$Q^* = K_D^2 \cos(\alpha_0) \sin(\alpha_b)$$

Where,  $\alpha_o = \alpha$  -  $\alpha_{sp}$  and  $\alpha$  is wave direction with respect to x-axis. The definition sketch showing the angles is shown in **Fig. 68.** 



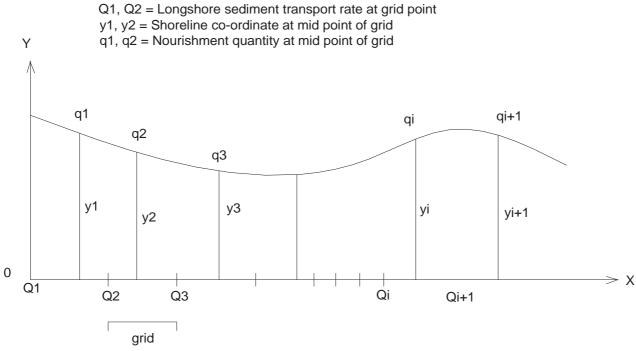


Fig. 67. Schematic diagram for finite difference scheme

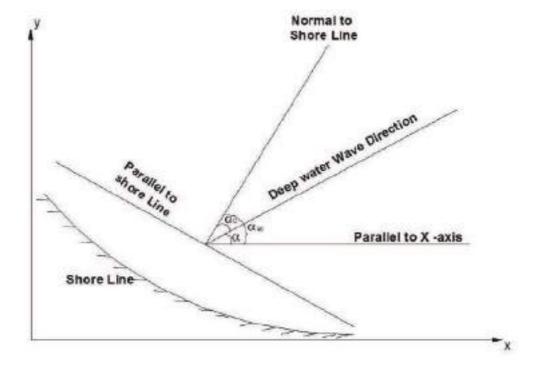


Fig. 68. Definition sketch of angles considered

The elliptical form of mild slope equation, which deals with combined refraction-diffraction,



$$Q^* \rightleftharpoons \rightleftharpoons K_D^2 \rightleftharpoons \cos \rightleftharpoons (\alpha - \alpha_{sp}) \sin \rightleftharpoons (\alpha_b)$$
(8)

$$Q^* \rightleftharpoons \rightleftharpoons K_D^2 \rightleftharpoons \sin \rightleftharpoons (\alpha_b) \rightleftharpoons \{\cos \rightleftharpoons (\alpha) \sin(\alpha_{sp}) \rightleftharpoons \cot(\alpha_{sp}) \rightleftharpoons + \rightleftharpoons \sin \rightleftharpoons (\alpha) \rightleftharpoons \sin \rightleftharpoons (\alpha_{sp})\}$$

$$(9)$$

$$Q^* \rightleftharpoons E_n \rightleftharpoons \{y_{n-1,t^*+1} - y_{n,t^*+1}^*\} + F_n \tag{10}$$

Where 
$$E_n = K_D^2 \left\langle \cos(\alpha) \sin(\alpha_{sp,t^*}) \sin(\alpha_{b,t^*}) \right\rangle / \delta x^*$$
 and  $F_n = K_D^2 \left\langle \sin(\alpha_{sp,t^*}) \sin(\alpha_{b,t^*}) \right\rangle$ 

By substituting above equations, give the final equation as given below

$$BE_n Q_{n-1,t^*+1}^* - (1+2BE_n)Q_{n,t^*+1}^* + BE_n Q_{n+1,t^*+1}^* = E_n [C_n - C_{n-1}] - F_n$$

The above equations represent a set of (N-1) linear equation for (N-1) unknowns. The end values are specified as boundary conditions, that is,  $Q^*_1 = 0$  and  $Q^*_{N+1} = Q^*_N$ . The above equation results into a tridiagonal form which is solved for  $Q^*$ . This process is repeated for the entire duration and non-dimensional quantity is converted into real quantities using the corresponding scale factors. The program has been validated with published results.

# 11.3 Input and Output

The numerical model to predict the shoreline evolution due to the shore-connected structures has been used to predict the shoreline changes due to the proposed groins. The wave characteristics are given as the input to the numerical model. The length of the groins, water depth at the end of the groins, and the present status of the shore are to be given as the input to the numerical model.

The numerical model was executed for the most frequently occurring wave characteristics for the different months as stated earlier. The result of the predicted shoreline variations for Malippuram, Veliyathamparambu, Puthenkadappuram, Pazhangadu, Saidh Mohammed beach and phase 1 of Saidh Mohammed beach 2 to Cherai beach over years is projected in **Figs. 69 to 74** respectively. The shoreline prediction has been made at the end of 1 year, 5 years, 10 years, 15 years, 20 years, and 25 years after the construction of the groins and has been presented by superimposing the shoreline patterns.



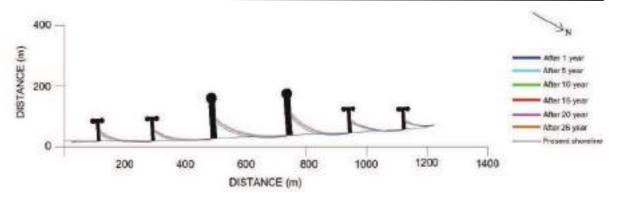


Fig. 69 Shoreline analysis for Malippuram

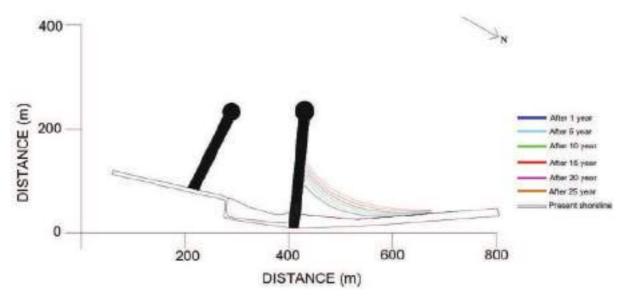


Fig. 70 Shoreline analysis for Veliyathamparambu

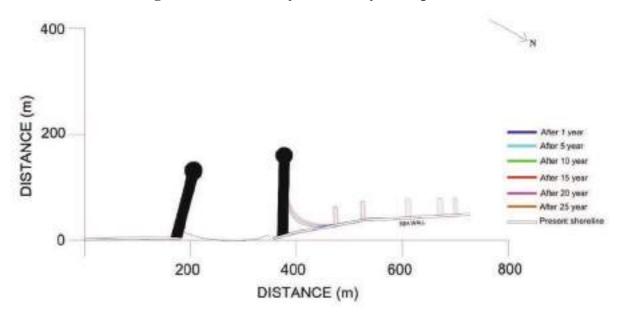


Fig. 71 Shoreline analysis for Puthenkadappuram



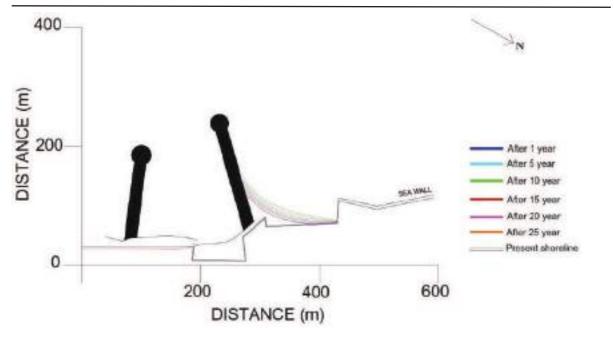


Fig. 72 Shoreline analysis for Pazhangadu

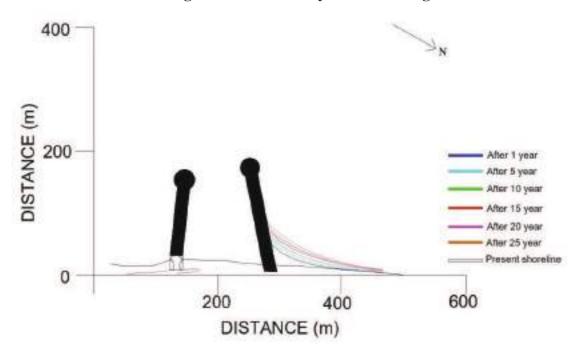


Fig. 73 Shoreline analysis for Saidh Mohammed beach



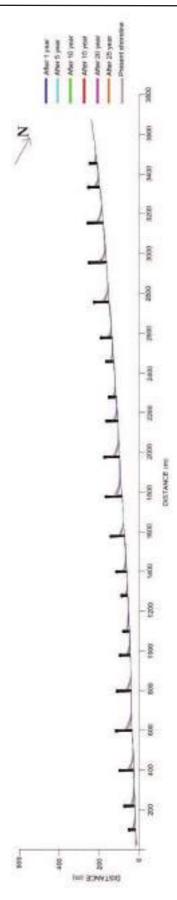


Fig. 74 Shoreline analysis for Saidh Mohammed beach 2 to Cherai beach



#### 12.0 WAVE MODELLING

#### 12.1 General

The study aims at providing an in-depth analysis on the wave characteristics along the proposed coastal protection measures between Valappu and Cherai Beach along the Ernakulam coastline. A suitable numerical model is required in order to carry out this task. For the present simulation, the well-known CGWAVE model has been used.

The nonlinear wave propagation associated with most of the observed phenomenon in the offshore region (e.g., wave reflection, refraction, and diffraction) is generally represented by the shallow water mild slope equation.

$$\nabla \cdot \left( C_p C_g \nabla \eta \right) + k^2 C_p C_g \eta = 0 \tag{11}$$

Where,

 $C_p$  and  $C_g$  are the wave celerity and group celerity respectively.

 $\eta$  is the water surface elevation.

*k* is the wave number.

For the computation of the nearshore wave field, this model (Eqn. (11)) is subjected to the proper boundary conditions. This is provided by the bathymetry and the shoreline.

A numerical method is required to solve the above Eqn. (11) for wave elevation. In this study, the Finite Element Method (herein abbreviated as FEM) is employed. This requires creating a mesh structure in the given computational domain. Upon creation of such a mesh, the domain is represented by nodal points which are connected with each other through the created mesh. The numerical solution of Eqn. (11) is sought in those nodes. This mesh has been generated using the commercial package GAMBIT. The procedure for generation of the grid in GAMBIT as follows:

- Based on the region of the sea whose analysis is required add a path in Google Earth software.
- Taking the two end nodes of the path draw a semicircle which would represent the domain for which the wave analysis is required.
- Choose the type of elements (tri/quad) and the sizing of mesh.
- Mesh will be generated from which we would be able to know significant wave height and phase at each node.

#### 12.2 Details of the mesh structure

The CGWAVE model utilizes triangular mesh units in the computational domain. Due to the complexity of the shoreline geometry, an unstructured mesh is desired. Hence a triangular Client: (KSCADC) & GIDA, KERALA



unstructured mesh is generated in GAMBIT, mesh generation software. In such a mesh the nodal spacing is optimized so as to adapt to the nearby portion of the shoreline boundary.

#### 12.3 Results and Discussion

A total number of five wave directions have been simulated in order to investigate the wave tranquility inside the proposed port region. The wave directions are chosen such that they represent an annual year. The wave period of the computations is given as 6s-12s to observe the wave climate. The wave phase diagram and the wave height distribution for different wave approach angles of 180°, 200°, 225°, 250°, 270° and 300° are computed for wave directional scenarios. The wave climates representing typical wave directions for Valappu beach beach, Malippuram, Veliyathaparambu, Puthenkadappuram, Pazhangadu, Saidh Mohammed beach and phase 1 of Saidh Mohammed beach 2 to Cherai Beach.

# 12.4 Valappu Beach

The study aims at providing an in-depth analysis on the wave characteristics along the geo containers at (-5 m) at Valappu beach beach.

# 12.4.1 Computational domain

The computational domain roughly approximates a semi-circle of radius of 2.5 km. **Fig.75** shows the domain where the computations are performed. The direction of the incident monochromatic wave is defined with respect to the geometric northern direction.

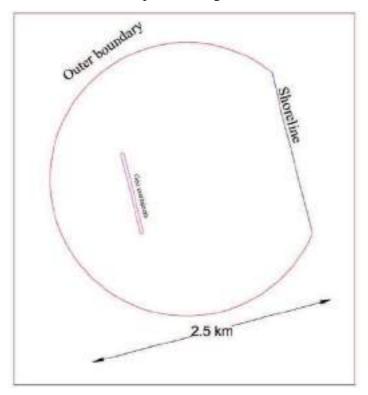


Fig.75 Computational domain



The outer semi-circular periphery is modelled by 1346 nodes with a spacing of 5m and the inner shoreline is modelled by nodes with a spacing of 5m. Then an unstructured mesh is created with an average spacing of 5m inside the domain. This leads to a total number of 248990 nodes with 495972 numbers of triangular elements. The mesh is shown in **Fig. 76.** 

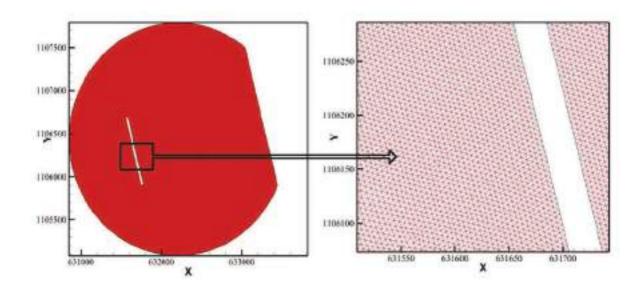
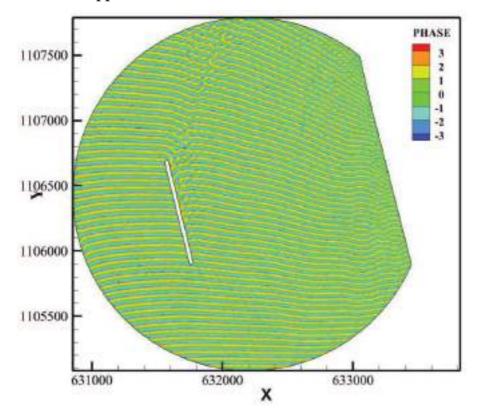


Fig.76 Mesh Structure adopted for the wave propagation modelling 12.4.2 Results for Valappu beach





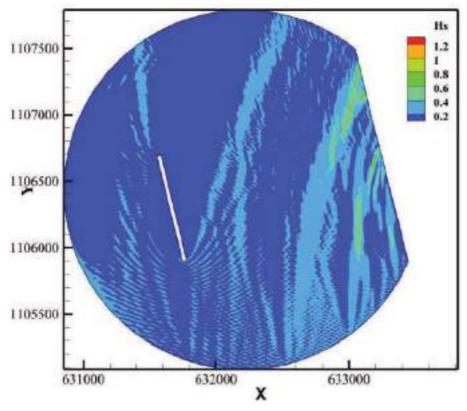
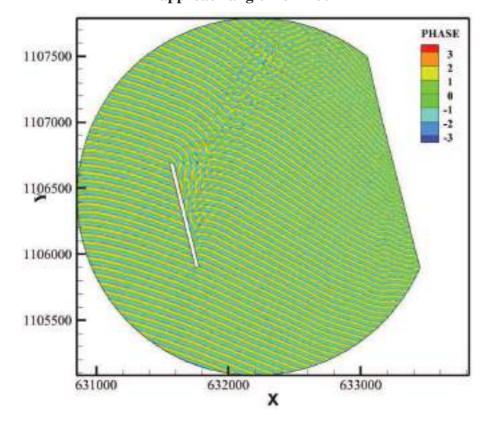


Fig.77a Phase distributions (Meter) and Wave height (Meter) distribution for the wave approach angle from  $180^{\rm 0}$ 





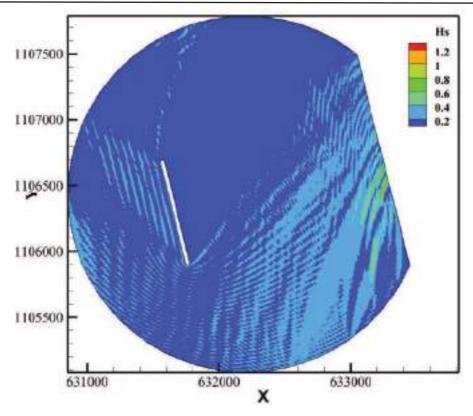
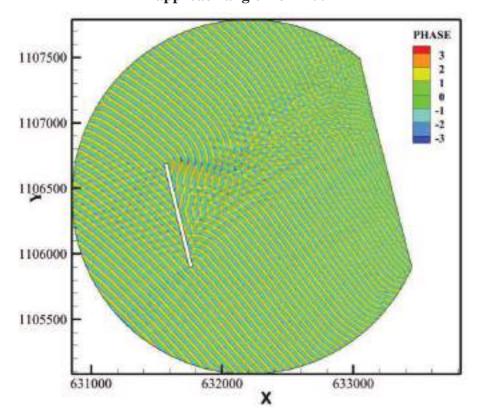


Fig.77b Phase distributions (Meter) and Wave height (Meter) distribution for the wave approach angle from  $200^{\circ}$ 





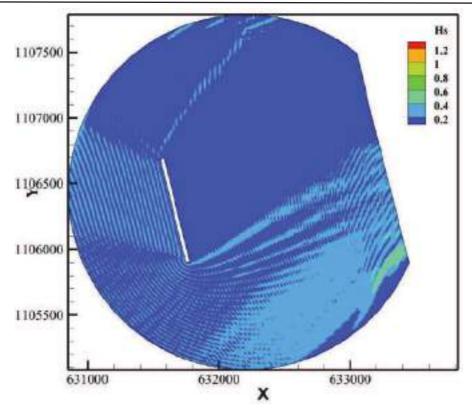
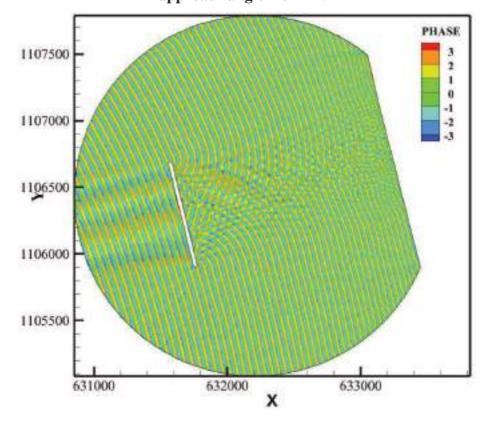


Fig.77c Phase distributions (Meter) and Wave height (Meter) distribution for the wave approach angle from  $225^{\circ}$ 





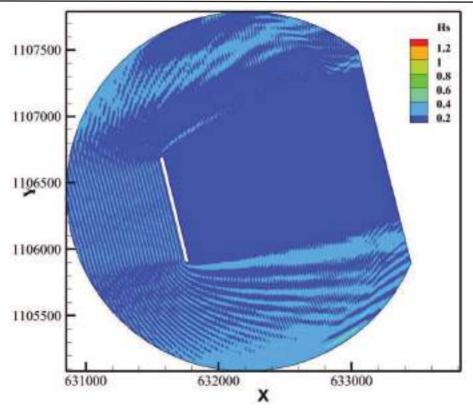
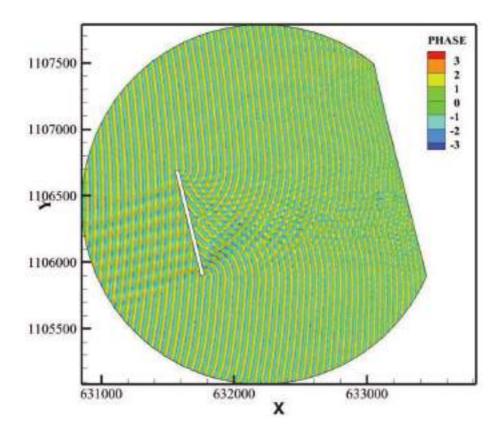


Fig.77d Phase distributions (Meter) and Wave height (Meter) distribution for the wave approach angle from  $250^{\circ}$ 





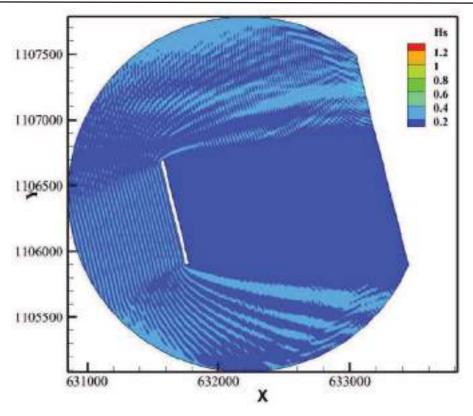
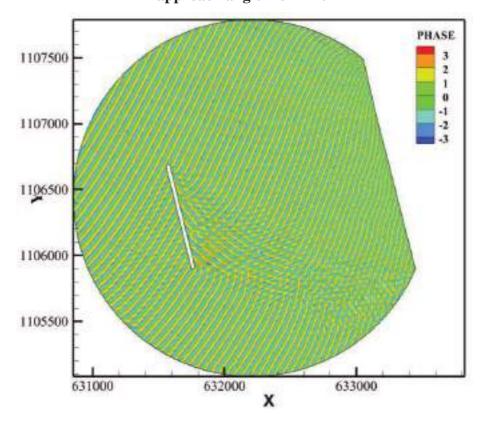


Fig.77e Phase distributions (Meter) and Wave height (Meter) distribution for the wave approach angle from  $270^{\circ}$ 





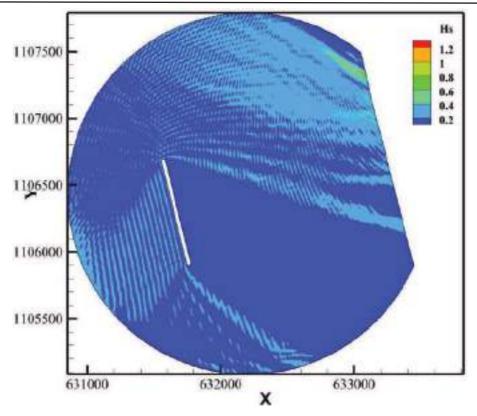


Fig.77f Phase distributions (Meter) and Wave height (Meter) distribution for the wave approach angle from  $300^{\circ}$ 

## 12.5 Malippuram

The study aims at providing an in-depth analysis of the wave characteristics along the Groyne field at Malippuram.

## 12.5.1 Computational domain

The computational domain roughly approximates a semi-circle of radius 2 km. **Fig.78** shows the domain where the computations are performed. The direction of the incident monochromatic wave is defined with respect to the geometric northern direction.



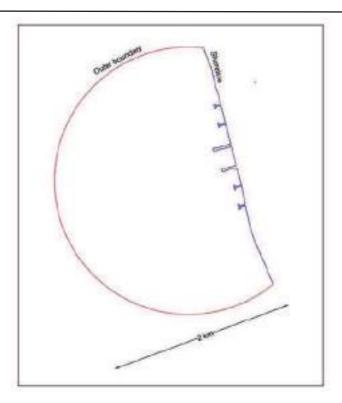


Fig.78 Computational domain

The outer semi-circular periphery is modelled by 956 nodes with a spacing of 5m and the inner shoreline is modelled by nodes with a spacing of 5m. Then an unstructured mesh is created with an average spacing of 5m inside the domain. This leads to a total number of 158533 nodes with 315368 numbers of triangular elements. The mesh is shown in **Fig. 79.** 

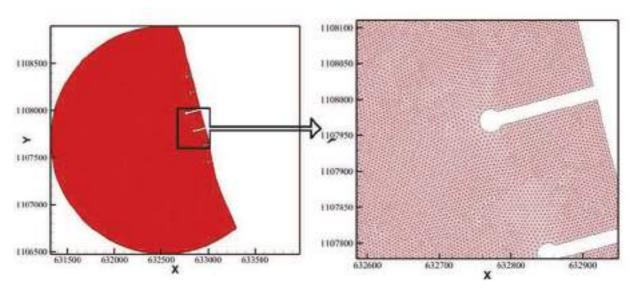


Fig.79 Mesh Structure adopted for the wave propagation modeling

## 12.5.2 Results for Malippuram



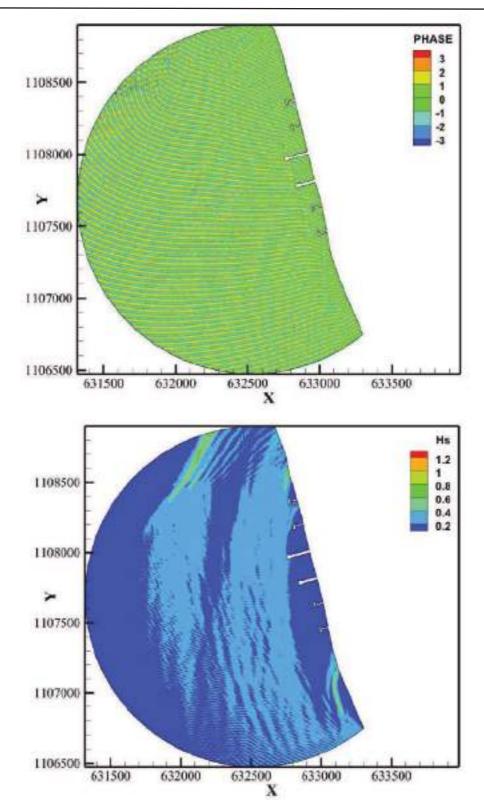


Fig.80a Phase distributions (Meter) and Wave height (Meter) distribution for the wave approach angle from  $180^{\rm 0}$ 



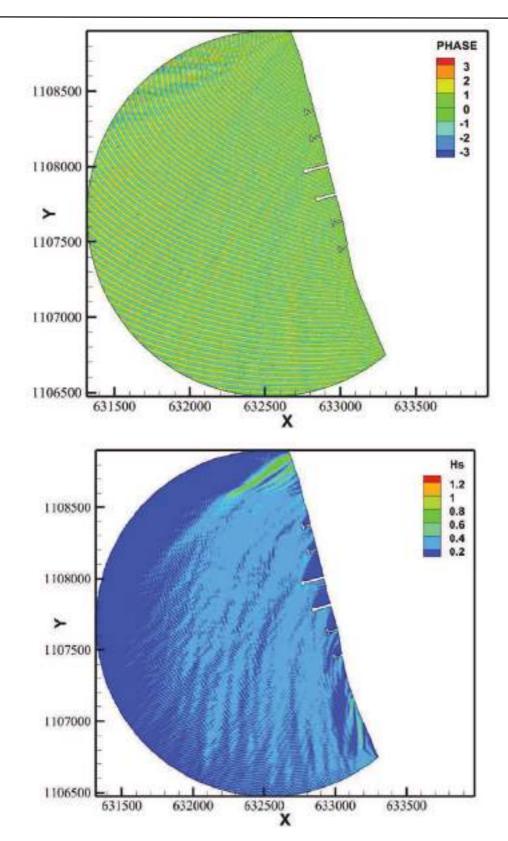


Fig.80b Phase distributions (Meter) and Wave height (Meter) distribution for the wave approach angle from  $200^{\rm 0}$ 



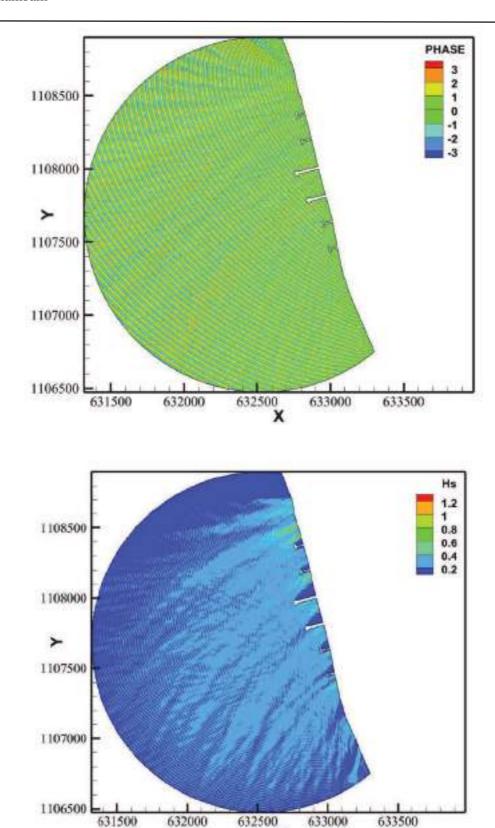


Fig. 80c Phase distributions (Meter) and Wave height (Meter) distribution for the wave approach angle from  $225^{\circ}$ 



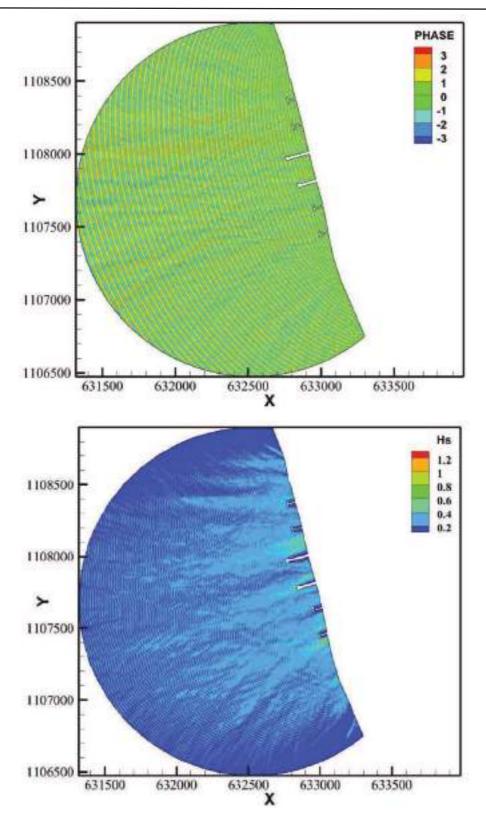


Fig.80d Phase distributions (Meter) and Wave height (Meter) distribution for the wave approach angle from  $250^{\circ}$ 



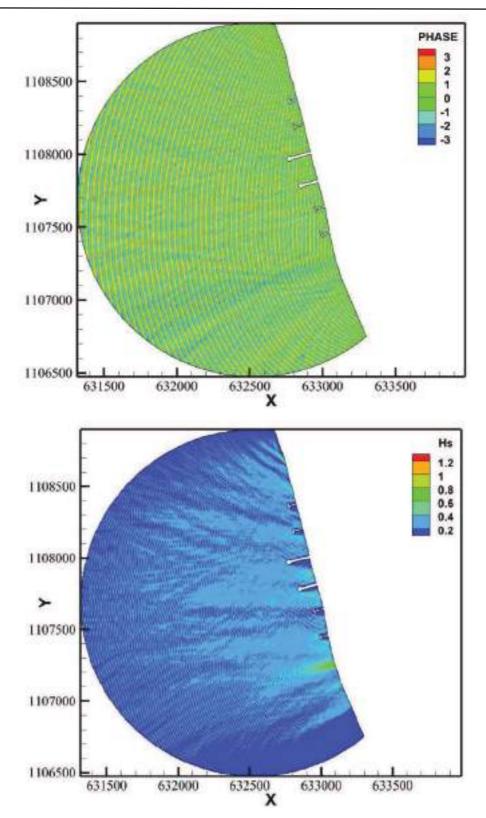


Fig. 80e Phase distributions (Meter) and Wave height (Meter) distribution for the wave approach angle from  $270^{\circ}$ 



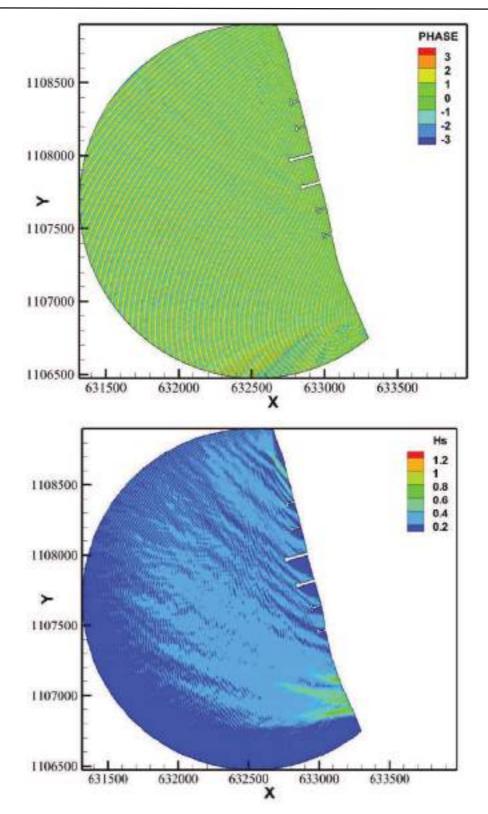


Fig.80f Phase distributions (Meter) and Wave height (Meter) distribution for the wave approach angle from  $300^{\rm 0}$ 



## 12.6 Veliyathamparambu

The study aims at providing an in-depth analysis on the wave characteristics along the Groyne field at Veliyathamparambu.

## 12.6.1 Computational domain

The computational domain roughly approximates a semi-circle of radius 1.5 km. **Fig.81** shows the domain where the computations are performed. The direction of the incident monochromatic wave is defined with respect to the geometric northern direction.

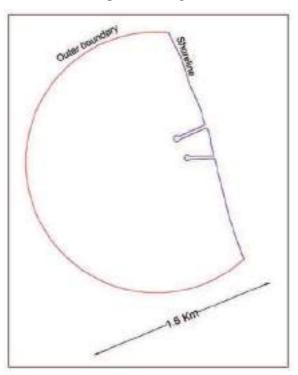


Fig. 81 Computational domain

The outer semi-circular periphery is modelled by 661 nodes with a spacing of 5m and the inner shoreline is modelled by nodes with a spacing of 5m. Then an unstructured mesh is created with an average spacing of 5m inside the domain. This leads to a total number of 76290 nodes with 151442 numbers of triangular elements. The mesh is shown in **Fig. 82.** 



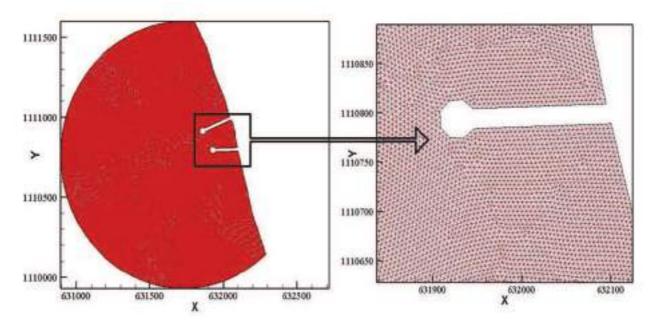
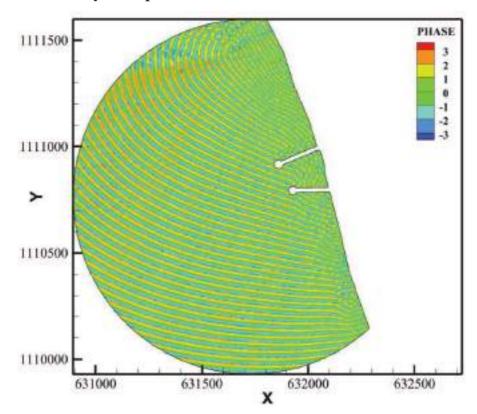


Fig.82 Mesh Structure adopted for the wave propagation modeling

# 12.6.2 Results for Veliyathamparambu





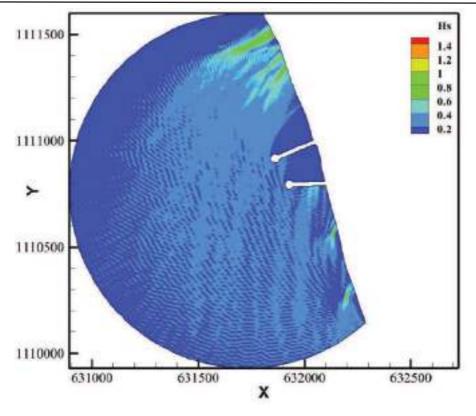
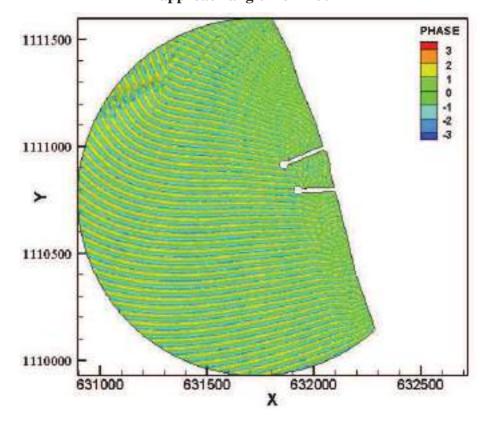


Fig.83a Phase distributions (Meter) and Wave height (Meter) distribution for the wave approach angle from  $180^{\rm 0}$ 





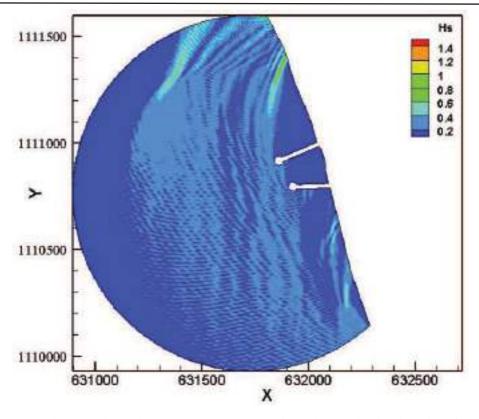
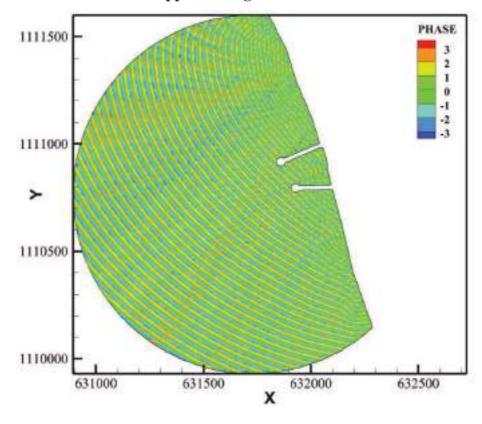


Fig.83b Phase distributions (Meter) and Wave height (Meter) distribution for the wave approach angle from  $200^{\rm 0}$ 





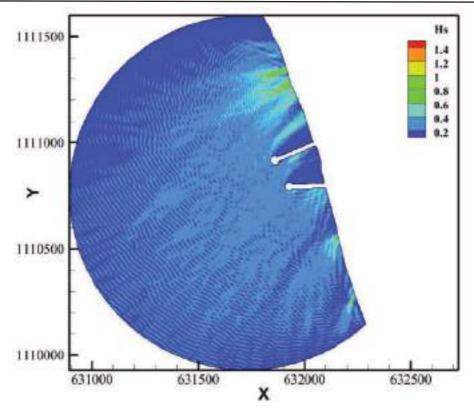
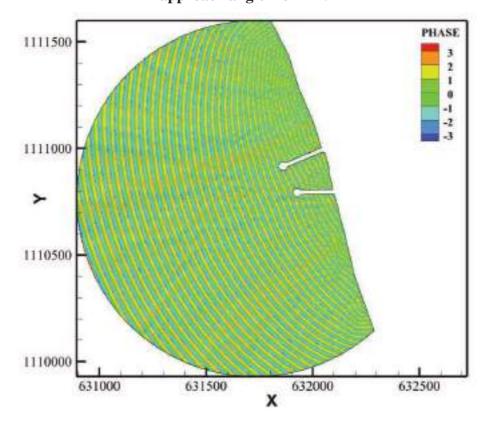


Fig.83c Phase distributions (Meter) and Wave height (Meter) distribution for the wave approach angle from  $225^{\circ}$ 





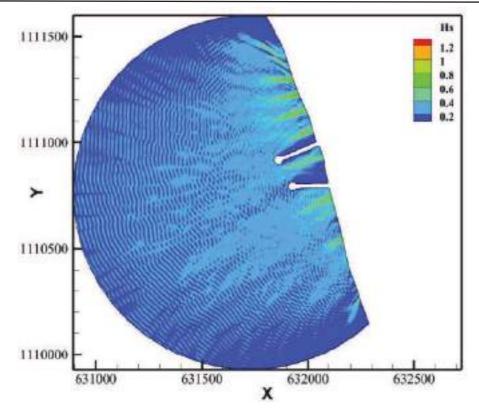
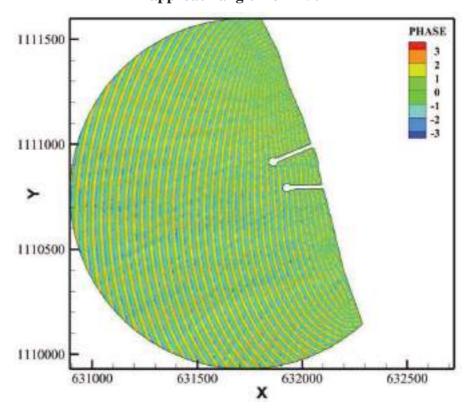


Fig.83d Phase distributions (Meter) and Wave height (Meter) distribution for the wave approach angle from  $250^{\circ}$ 





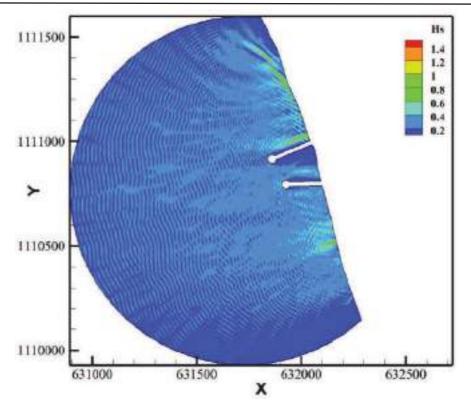
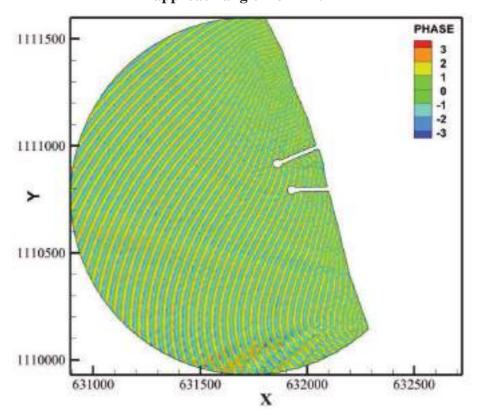


Fig.83e Phase distributions (Meter) and Wave height (Meter) distribution for the wave approach angle from  $270^{\circ}$ 





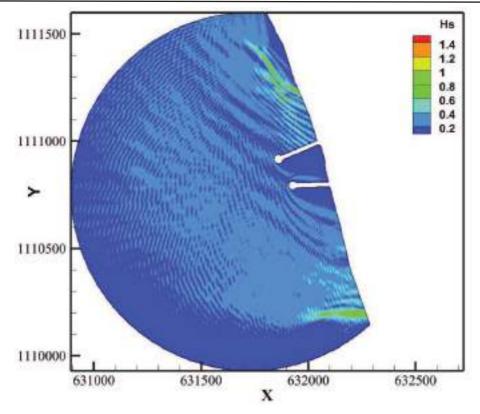


Fig.83f Phase distributions (Meter) and Wave height (Meter) distribution for the wave approach angle from  $300^{\circ}$ 

## 12.7 Puthenkadappuram

The study aims at providing an in-depth analysis on the wave characteristics along the Groyne field at Puthenkadappuram.

## 12.7.1 Computational domain

The computational domain roughly approximates a semi-circle of radius 2 km. **Fig.84** shows the domain where the computations are performed. The direction of the incident monochromatic wave is defined with respect to the geometric northern direction.



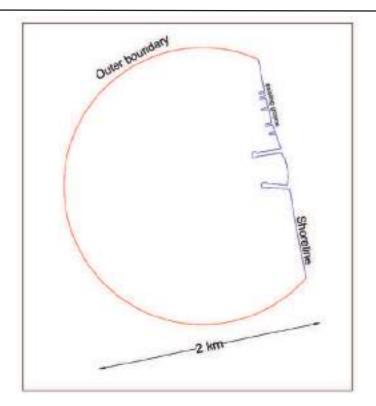


Fig.84 Computational domain

The outer semicircular periphery is modelled by 655 nodes with a spacing of 5m and the inner shoreline is modelled by nodes with a spacing of 5m. Then an unstructured mesh is created with an average spacing of 5m inside the domain. This leads to a total number of 72227 nodes with 143348 numbers of triangular elements. The mesh is shown in **Fig.85**.

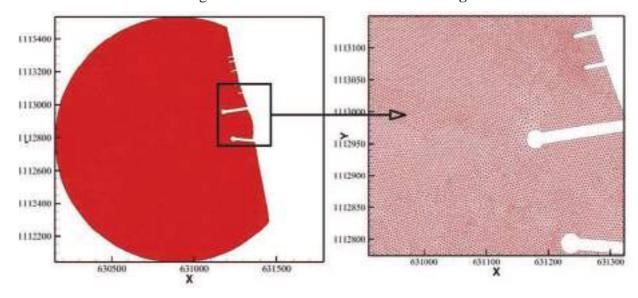


Fig.85 Mesh Structure adopted for the wave propagation modelling

## 12.7.2 Result for Puthenkadappuram



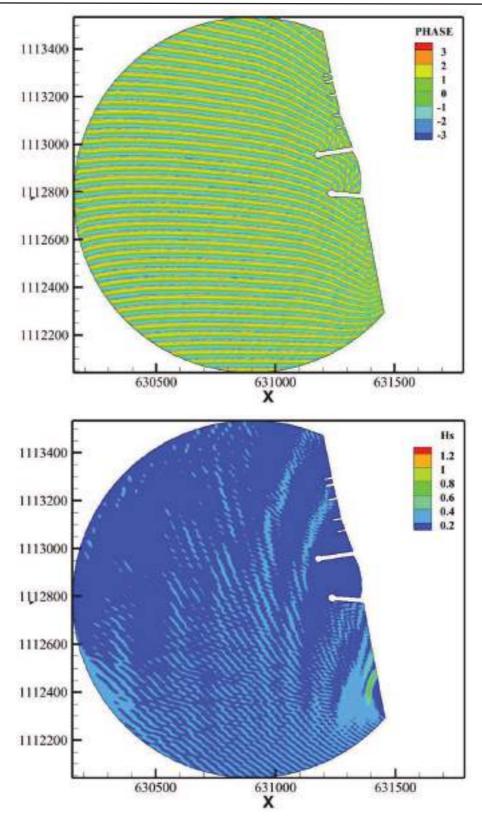


Fig.86a Phase distributions (Meter) and Wave height (Meter) distribution for the wave approach angle from  $180^{\circ}$ 



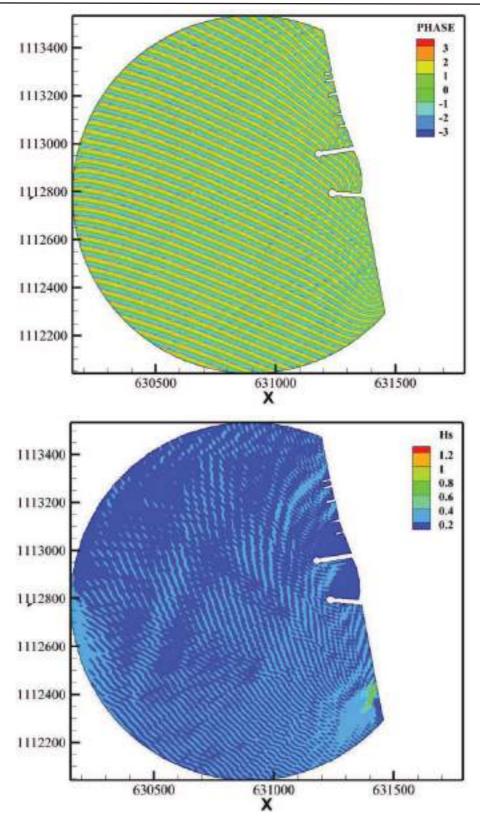


Fig.86b Phase distributions (Meter) and Wave height (Meter) distribution for the wave approach angle from  $200^{\rm o}$ 



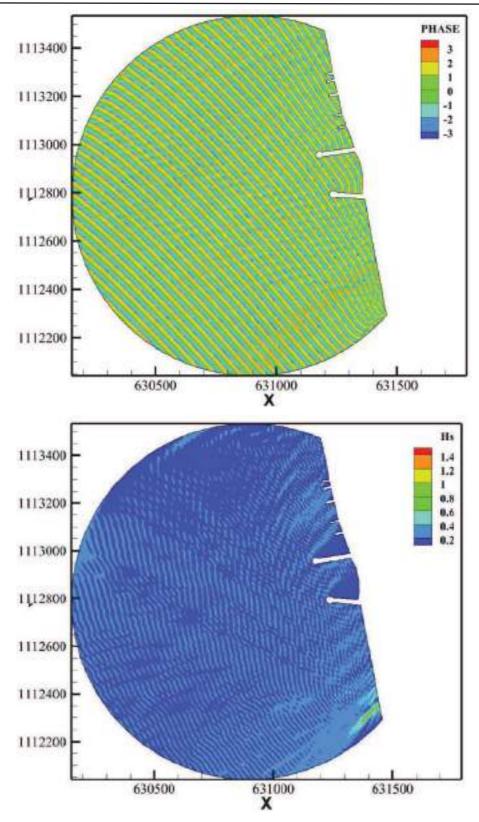


Fig.86c Phase distributions (Meter) and Wave height (Meter) distribution for the wave approach angle from  $225^{\circ}$ 



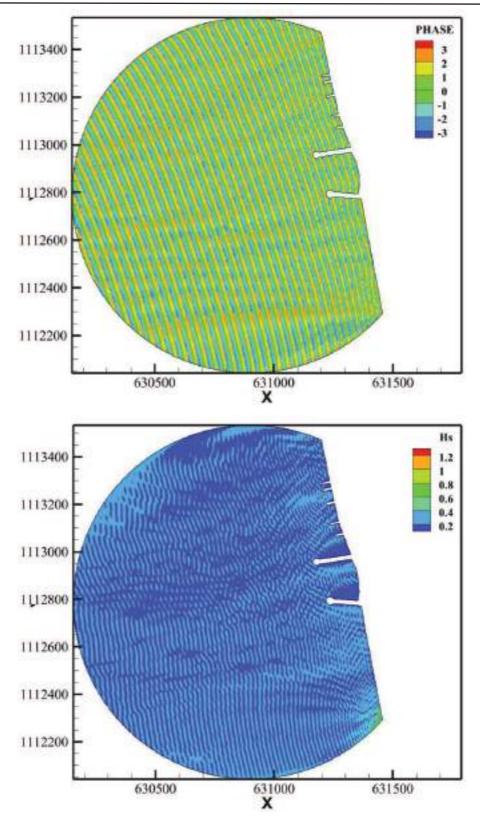


Fig.86d Phase distributions (Meter) and Wave height (Meter) distribution for the wave approach angle from  $250^{\circ}$ 



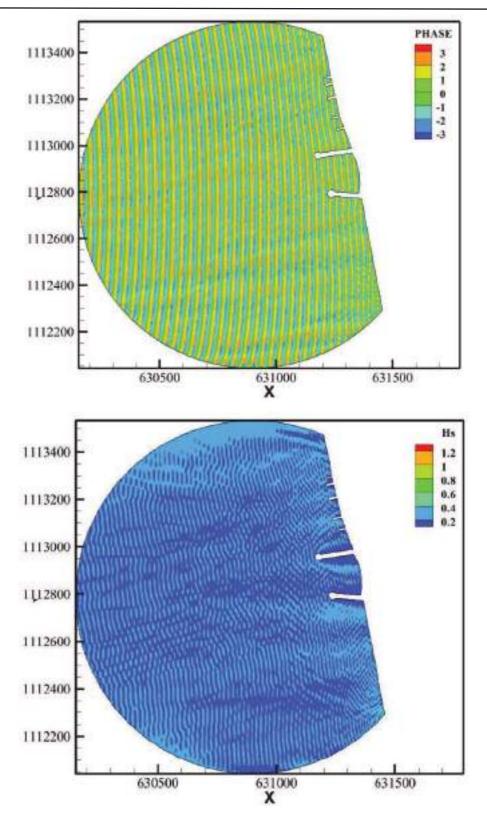


Fig.86e Phase distributions (Meter) and Wave height (Meter) distribution for the wave approach angle from  $270^{\circ}$ 



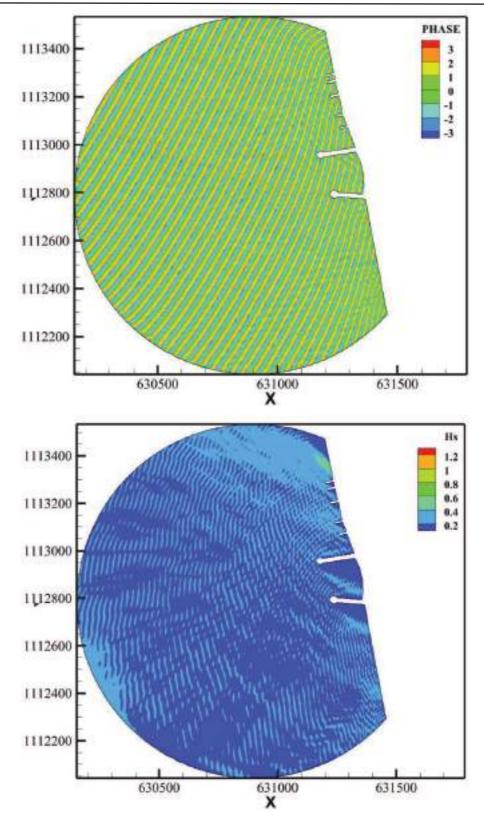


Fig.86f Phase distributions (Meter) and Wave height (Meter) distribution for the wave approach angle from  $300^{\rm o}$ 

## 12.8 Pazhangadu



The study aims at providing an in-depth analysis on the wave characteristics along the Groyne field at Pazhangadu.

## 12.8.1 Computational domain

The computational domain roughly approximates a semi-circle of radius 1.5 km. **Fig.87** shows the domain where the computations are performed. The direction of the incident monochromatic wave is defined with respect to the geometric northern direction.

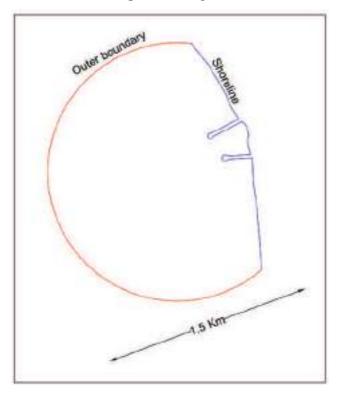


Fig.87 Computational domain

The outer semicircular periphery is modelled by 547 nodes with a spacing of 5m and the inner shoreline is modelled by nodes with a spacing of 5m. Then an unstructured mesh is created with an average spacing of 5m inside the domain. This leads to a total number of 55862 nodes with 110774 numbers of triangular elements. The mesh is shown in **Fig. 88**.



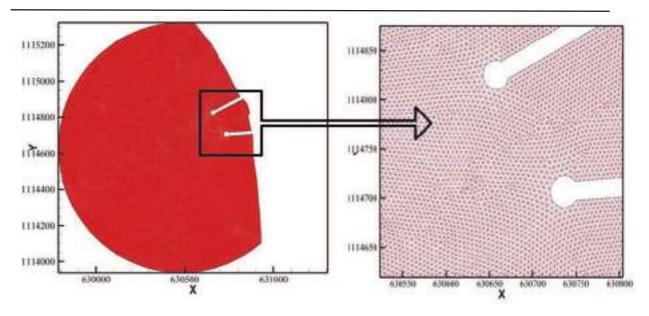
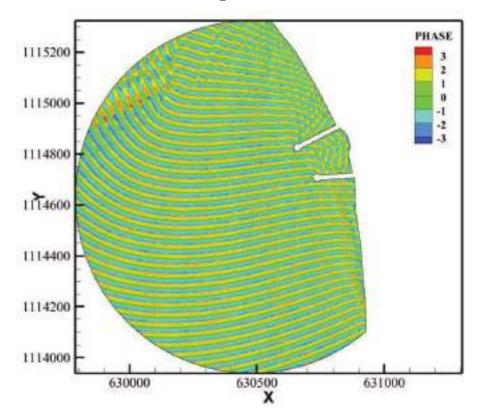


Fig.88 Mesh Structure adopted for the wave propagation modeling

## 12.8.1 Results and discussion for Pazhangadu





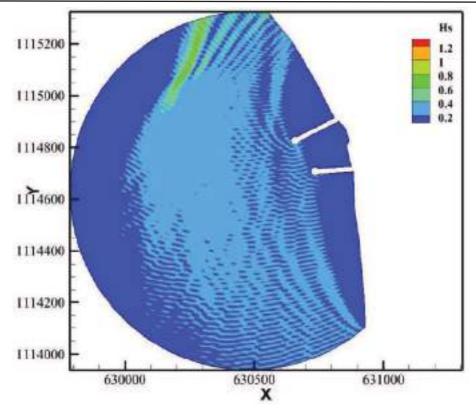
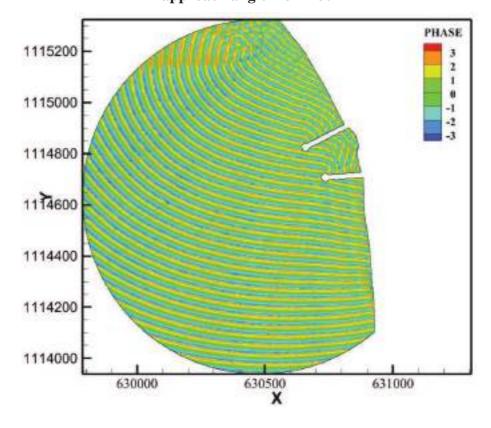


Fig.89a Phase distributions (Meter) and Wave height (Meter) distribution for the wave approach angle from  $180^{\rm 0}$ 





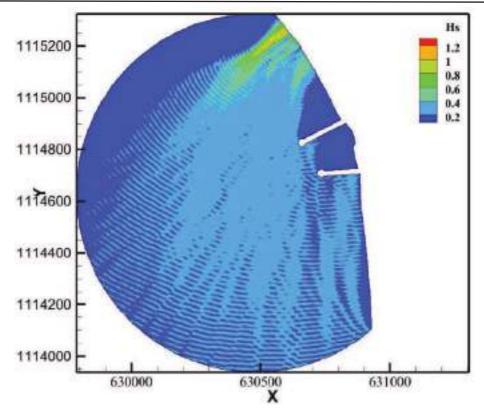
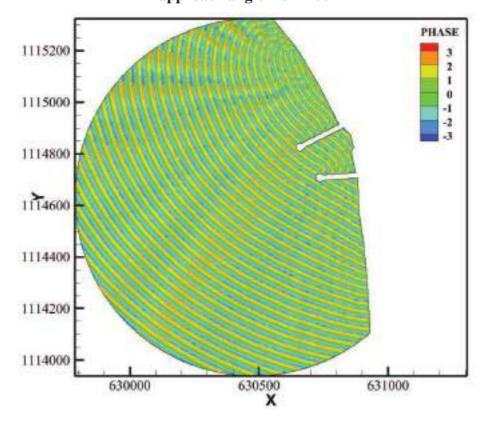


Fig.89b Phase distributions (Meter) and Wave height (Meter) distribution for the wave approach angle from  $200^{\rm 0}$ 





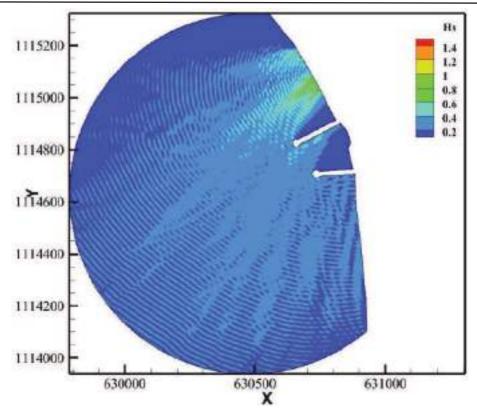
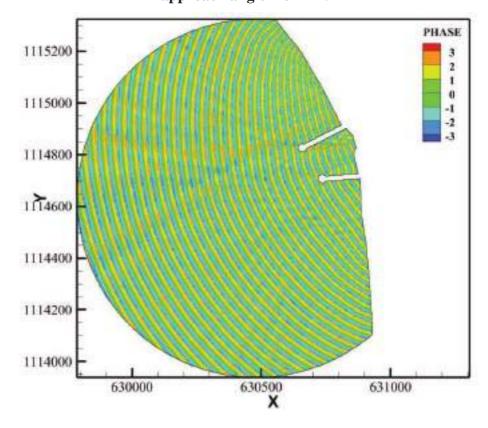


Fig.89c Phase distributions (Meter) and Wave height (Meter) distribution for the wave approach angle from  $225^{\circ}$ 





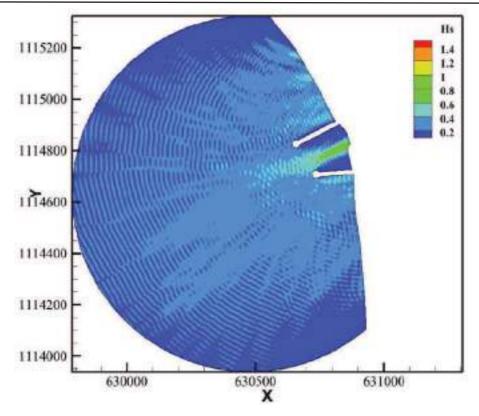
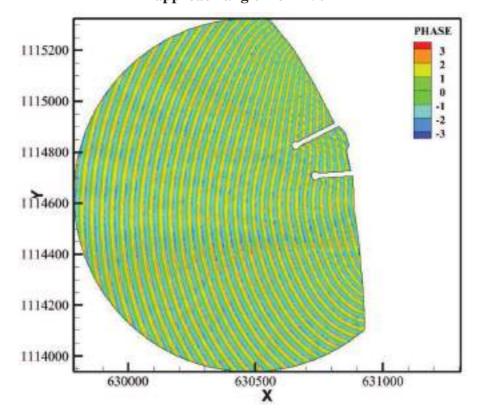


Fig.89d Phase distributions (Meter) and Wave height (Meter) distribution for the wave approach angle from  $250^{\circ}$ 





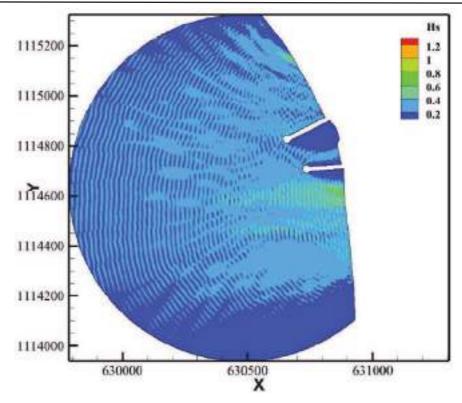
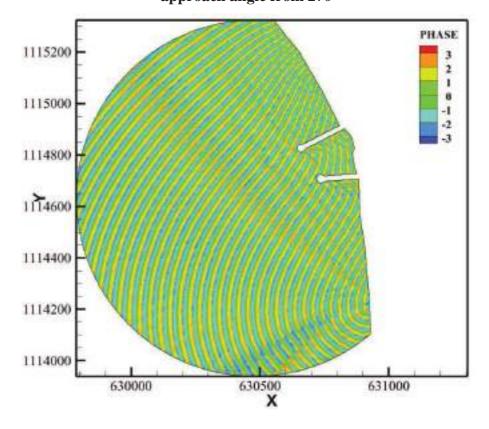


Fig.89e Phase distributions (Meter) and Wave height (Meter) distribution for the wave approach angle from  $270^{\circ}$ 





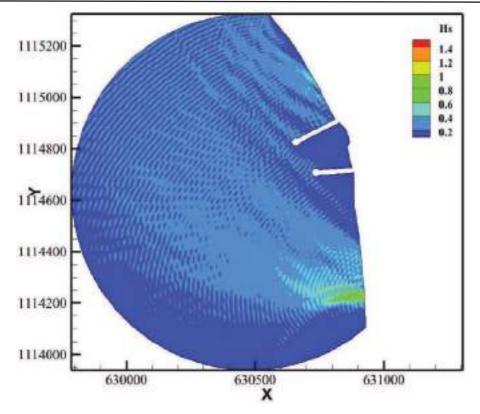


Fig.89f Phase distributions (Meter) and Wave height (Meter) distribution for the wave approach angle from  $300^{\circ}$ 

#### 12.9 Saidh Mohammed Beach

The study aims at providing an in-depth analysis on the wave characteristics along the Groyne field at Saidh Mohammed beach.

## 12.9.1 Computational domain

The computational domain roughly approximates a semi-circle of radius 1.5 km. **Fig.90** shows the domain where the computations are performed. The direction of the incident monochromatic wave is defined with respect to the geometric northern direction.



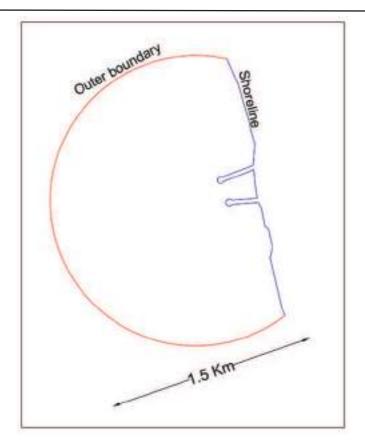


Fig.90 Computational domain

The outer semicircular periphery is modeled by 527 nodes with a spacing of 5m and the inner shoreline is modeled by nodes with a spacing of 5m. Then an unstructured mesh is created with an average spacing of 5m inside the domain. This leads to a total number of 48316 nodes with 95732 numbers of triangular elements. The mesh is shown in **Fig. 91.** 

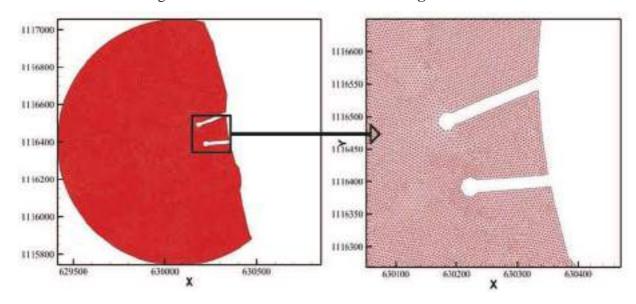


Fig.91 Mesh Structure adopted for the wave propagation modelling



## 12.9.2 Result for Saidh Mohammed beach

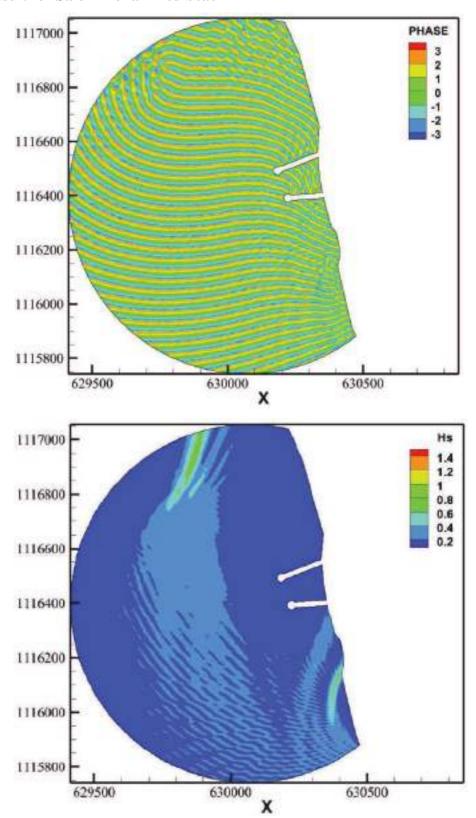


Fig.92a Phase distributions (Meter) and Wave height (Meter) distribution for the wave approach angle from  $180^{\rm 0}$ 



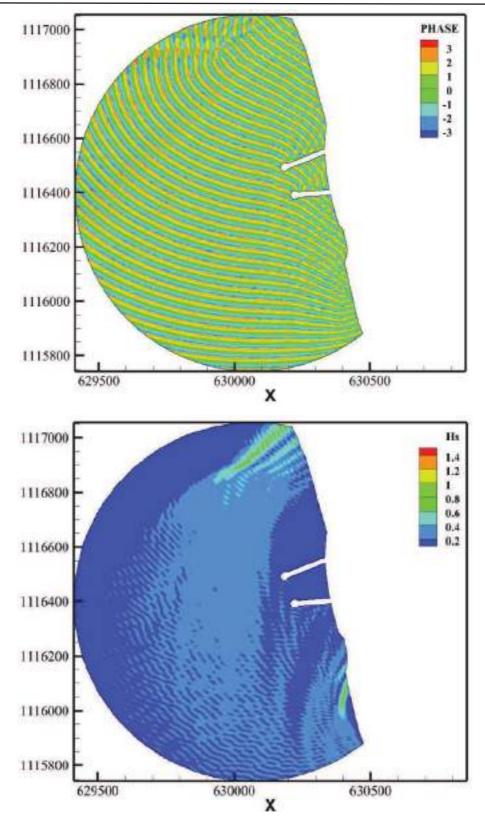


Fig. 92b Phase distributions (Meter) and Wave height (Meter) distribution for the wave approach angle from  $200^{\rm o}$ 



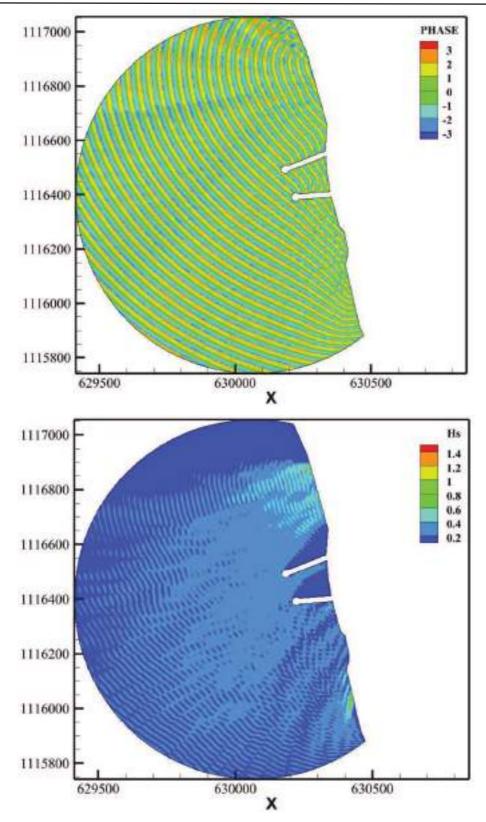


Fig.92c Phase distributions (Meter) and Wave height (Meter) distribution for the wave approach angle from  $225^{\circ}$ 



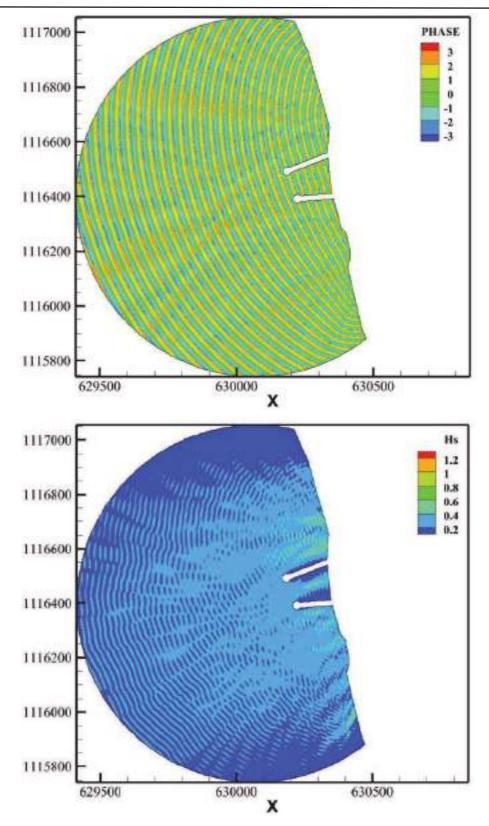


Fig.92d Phase distributions (Meter) and Wave height (Meter) distribution for the wave approach angle from  $250^{\circ}$ 



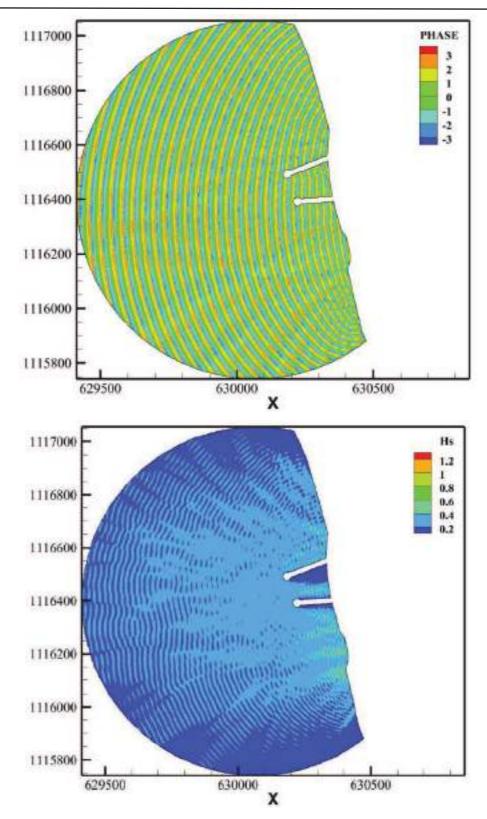


Fig.92e Phase distributions (Meter) and Wave height (Meter) distribution for the wave approach angle from  $270^{\circ}$ 



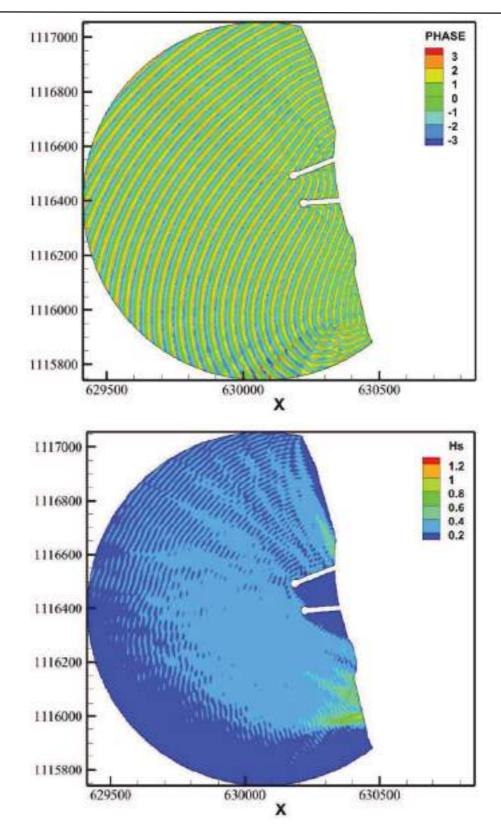


Fig.92f Phase distributions (Meter) and Wave height (Meter) distribution for the wave approach angle from  $300^{\rm 0}$ 

# 12.10 Saidh Mohammed Beach 2 To Cherai Beach (Phase 1)



The study aims at providing an in-depth analysis on the wave characteristics for series of groynes along the Saidh Mohammed beach 2 to Cherai Beach.

# 12.10.1 Computational domain

The computational domain roughly approximates a semi-circle of radius 4.5 km. **Fig.93** shows the domain where the computations are performed. The direction of the incident monochromatic wave is defined with respect to the geometric northern direction.

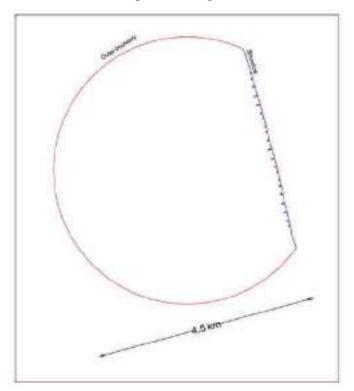


Fig.93 Computational domain

The outer semicircular periphery is modeled by 860 nodes with a spacing of 5m and the inner shoreline is modeled by nodes with a spacing of 5m. Then an unstructured mesh is created with an average spacing of 5m inside the domain. This leads to a total number of 133533 nodes with 265692 numbers of triangular elements. The mesh is shown in **Fig. 94.** 



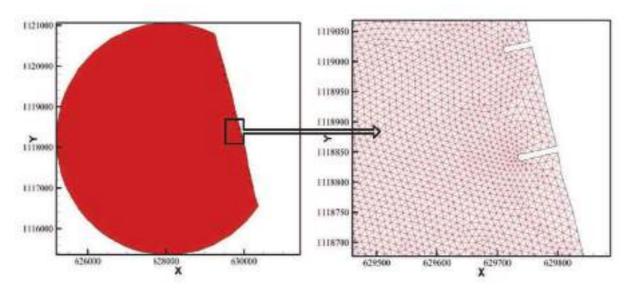
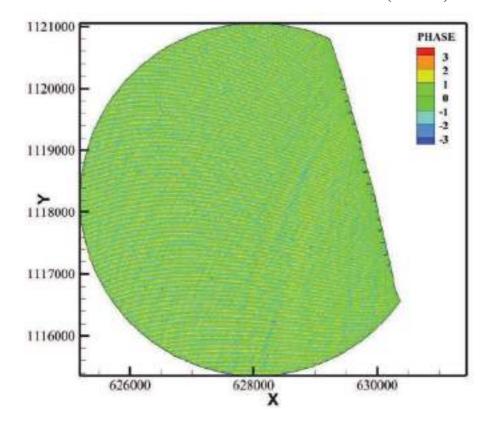


Fig.94 Mesh Structure adopted for the wave propagation modelling

# 12.10.2 Results for Saidh Mohammed Beach 2 To Cherai Beach (Phase 1)





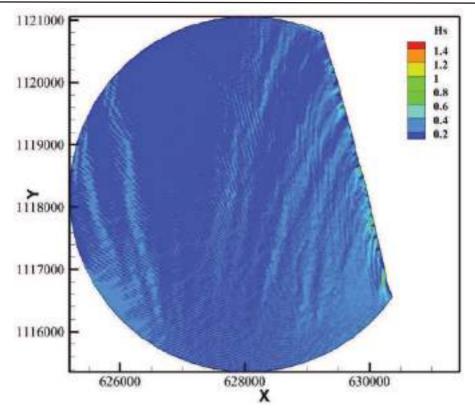
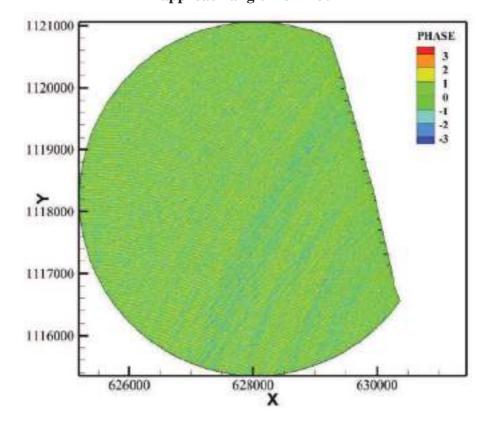


Fig.95a Phase distributions (Meter) and Wave height (Meter) distribution for the wave approach angle from  $180^{\rm 0}$ 





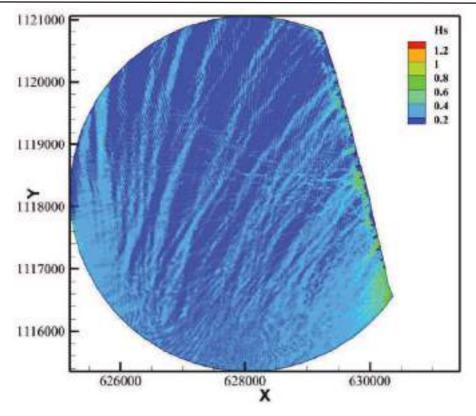
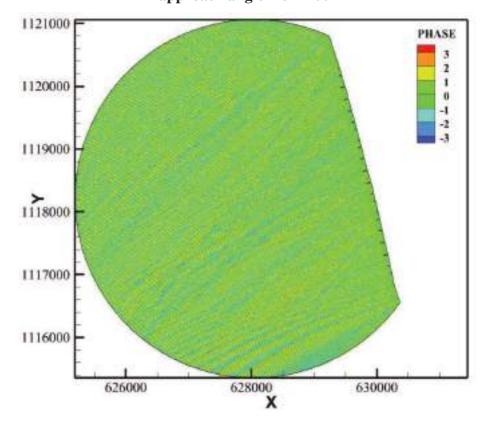


Fig.95b Phase distributions (Meter) and Wave height (Meter) distribution for the wave approach angle from  $200^{\circ}$ 





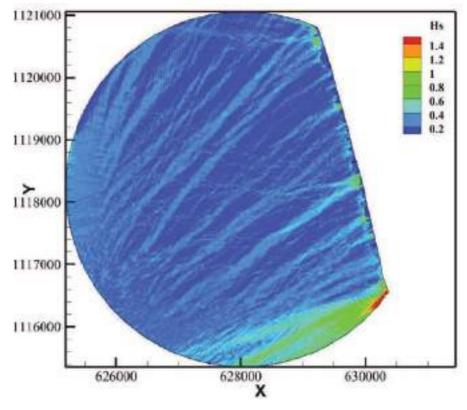
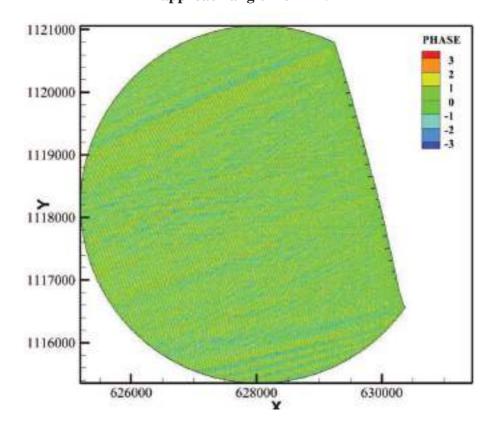


Fig.95c Phase distributions (Meter) and Wave height (Meter) distribution for the wave approach angle from  $225^{\circ}$ 





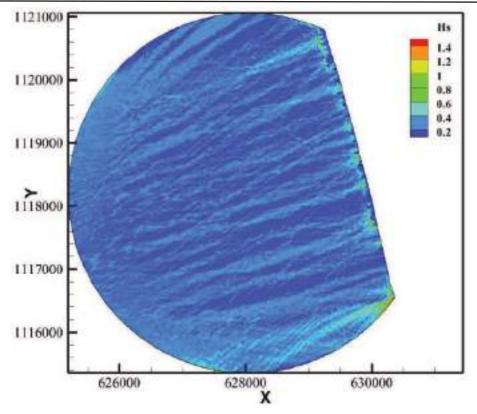
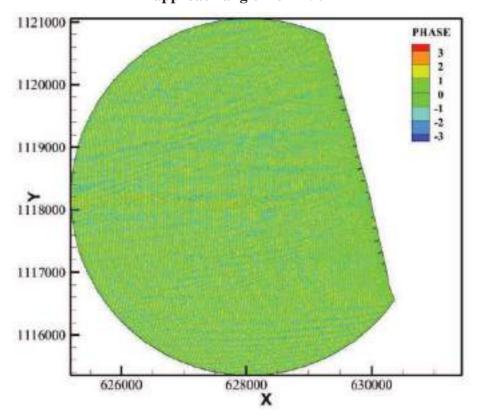


Fig.95d Phase distributions (Meter) and Wave height (Meter) distribution for the wave approach angle from  $250^{\rm 0}$ 





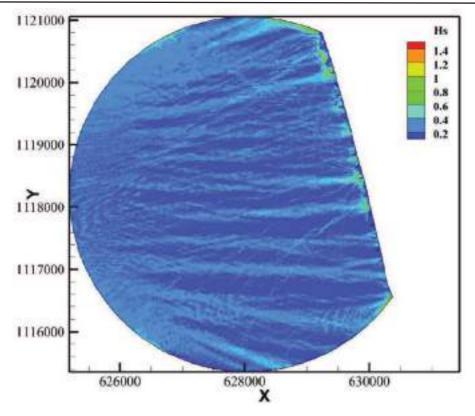
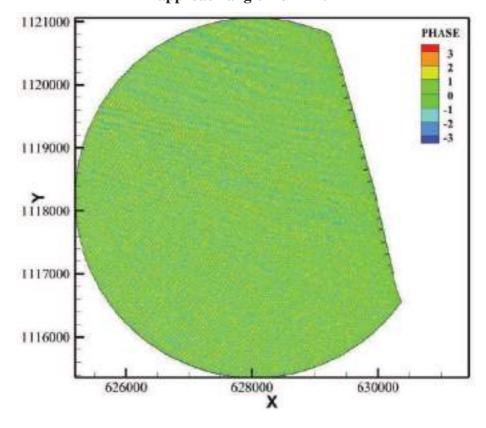


Fig.95e Phase distributions (Meter) and Wave height (Meter) distribution for the wave approach angle from  $270^{\circ}$ 





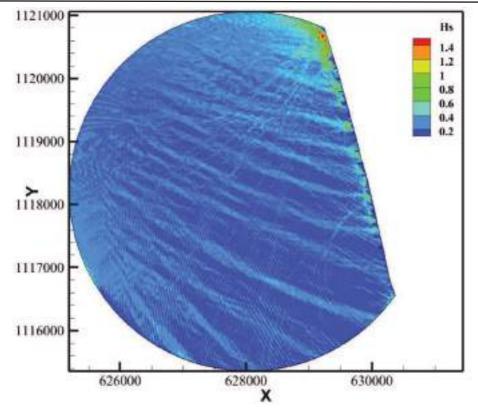


Fig.95f Phase distributions (Meter) and Wave height (Meter) distribution for the wave approach angle from  $300^{\circ}$ 

#### 13.0 COASTAL PROTECTION STRUCTURES

### 13.1 Design water level

Following design, data has been adopted for the design of the tetrapod section. The Mean highwater level was +1.05m CD. For the design of the section, MHWL is adopted as the maximum water level.

The design water level for the Groyne can thus be set as the sum of MHWS and the design water depth is,

d = 3.5+1.05+1.2=5.75m, where, +1.2m surge is considered.

 $H_{max} = 0.78 \times 5.75 = 4.48 \text{ m}$ 

Significant wave Height =  $H_{max}/1.6 = 2.80m$ , considered design wave height is 2.80m.

# 13.2 Design of Groynes

A typical design of Groyne is detailed below.

# Armour Layer

The size of the armour stones for the Groyne section is calculated by using the Hudson formula, which is recommended by CERC (1984). Tetrapods are used as armour stones.



$$W = \frac{W_r H_D^3}{K_D (S_r - 1)^3 \cot \theta} \tag{12}$$

Where, W=Weight of an individual armour unit in the primary cover layer,  $W_r$  =Unit weight of Tetrapods, 2.4 T/m<sup>3</sup>,  $H_D$  =Design wave height at the structure site in meter,  $S_r$  =Specific weight of armour unit relating to water at the structure  $S_r = (W_r / W_w)$ ,  $W_w$  =Unit weight of seawater = 1025 kg/m<sup>3</sup>,  $\theta$ =Angle of structure slope measured with the horizontal in degree =1:1.5 (Chosen)

 $K_D$  =Stability coefficient is 7 for tetrapod and 2 for rough quarry stones in breaking condition for trunk section and Stability coefficient is 5.0 for tetrapod for head section.

From Hudson's formula, the weight of the Stone is worked out to be 4T in two layers to withstand the design wave height of 2.80m at the maximum water depth.

### Thickness of armour/under Layer

The thickness of single armour or under layer, t is equal to the mean diameter of stones in that particular layer. However, if there are n numbers of layers, then the thickness is,

$$t = nk_{\delta}D_{n50} \tag{13}$$

Where,  $k_{\delta}$  is the layer coefficient in the range of 1.0 to 1.04 for stones rough quarry stones and teratpods respectively.

The thickness of the armour layer is calculated by following,

$$t = nK\delta \left[\frac{w}{w_r}\right]^{\frac{1}{3}} = 2.50$$

2.50m thickness was adopted for armour layer.

# Under layer

The size of stone in toe mound is taken as W/10 to W/15 (as per CERC, 1984).

Rough angular quarry stones of weight 500 Kg to 800 Kg are suggested for toe layer for which

$$W_r = 2650 \frac{kg}{m^3}$$
 with 1.25m thickness for the trunk and head portion.

### Core layer

The size of stone in core layer is 100 kg to 300 kg rough angular quarry stones are suggested for core layer for which  $W_r = 2650 \text{ kg} / \text{m}^3$ .

### Toe Mound

The size of stone in toe mound is taken as W/10 to W/15 (as per CERC, 1984).



Rough angular quarry stones of weight 500 Kg to 800 Kg are suggested for toe layer for which

$$W_r = 2650 \frac{kg}{m^3}$$
 with 1.25m thickness for the trunk and head portion.

#### Crest width

The crest width, r is the maximum of the following: First depends on the minimum number of stones (n) required. SPM (1984) suggests  $n_{min} = 3$ . Next, the width depends on the degree of overtopping.

 $r = \max(nk_{\delta}D_{n50}, construction/functional requirement)$ 

Crest width, r is arrived from the formula

$$r = nK_{\delta} \left[ \frac{W}{W_r} \right]^{\frac{1}{3}} \tag{14}$$

Where, n - number of tetrapod's or stones on the crest (n=2),  $K_{\delta}$  is layer coefficient, W - mass of armour unit and Wr - Mass density of armour unit kg/m<sup>3</sup>

Hence, Crest Width = 4m

#### Crest elevation

The groyne height or the crest elevation is an important parameter in the groyne design.

Crest elevation above the maximum high-water line = MHWS + Storm surge + R + FB

MHWS – Mean high water spring, R – Wave run-up, FB- Free board, Minimum height of 0.5m shall be adopted.

The wave run-up over the groyne slope is calculated from the design wave height (Hs) and surf similarity parameter ( $\zeta$ ).

$$\zeta = \frac{\tan \alpha}{\sqrt{s_{om}}} \tag{14}$$

Crest elevation = 0.5+Wave run-up + Storm surge + MHWL

$$= 0.5+2.7+1.2+1.05=5.4$$
m $\sim 5.5$ m

Freeboard may be adopted in calculating the design elevation to give free height for exceptional cases of storms and cyclone waves that hit the toe of the structure to avoid dangers. For Groynes, (+) 5.5m crest elevation is maintained up to +1.05 m (HTL) cross-sections.

# Filter layer

The size of stone in the filter layer is taken as 1 kg to 10 kg Rough angular quarry stones are for which  $W_r = 2650 \text{ kg} / m^3$ . The thickness of the filter layer is 0.3m.

The detailed cross-sections and head-sections drawings of the proposed conventional groynes at varying water depths are given in **Plates 9** to **14**.



# 13.3 Design of geo-textile units

#### **13.3.1** General

The wave characteristics adopted for the design of groynes are followed in this section as well. The cross-section of the low crested groynes (see **Plates 15** and **16**) in the coastal stretch between Saidh Mohammed beach and Cherai beach comprises of geo-containers and geo-bags. The cross-section and longitudinal section details corresponding to the option 1 of proposed shore protection works of the stretch from Saidh Mohammed beach to Cherai beach is given in **Plates 17**, **18** and **19**. The cross-sections details arrived for the offshore submerged geo-tubes (see **Plate 20**) is to be adopted for both the tourism destination sites namely Valappu beach Beach and option 2 of the stretch from Saidh Mohammed beach to Cherai beach.

### 13.3.2 Geo-tubes

Geo-tubes made out of polypropylene are widely used in the construction of nearshore/offshore detached reefs parallel to the coast. These structures have proven to be a better solution for coastal protection and aids in the formation of wide beaches. It can potentially be combined with beach nourishment for rapid beach stabilization. These tubes are often filled hydraulically with a slurry of sand and water, although many other fill materials may also be used. Each fill port may consist of a Geotextile sleeve having a length of at least 1.5 m and a circumference slightly greater than that of the filling pipe. Sometimes a double layer of sheets of woven textiles may also be required in consideration of added UV protection for prolonged life and sufficient abrasion resistance. A single unit of the geo-tube can be 20~25 m in length. The technical design specifications of the geo-tubes are given in the following **Table 27.** 

Table 27. Design specifications for geo-tubes

Technical parameter	Test method	Value
Weight per unit volume (GSM)	ASTM D 3776	$\geq$ 330 g/m <sup>2</sup>
Tensile strength (Warp/Weft)	IS 1969	≥80/78 KN/m
Wide width tensile strength	ISO 10319	≥ 200 KN/m
(MD/CD)		
Nominal Tensile elongation	ISO 10319	≤ 10 %
(MD/CD)		



Elongation at designated peak	IS 1969	Both ≤ 25%
tensile load (Warp/Weft)		
Trapezoidal tear strength	ASTM D 4533	Both 1600 N
(Warp/Weft)		
Seam strength (CD)	ISO 10321	≥ 160 KN/m
Abrasion resistance	ASTM D 4886	≥ 80 %
UV resistance at 500 hours	ASTM D 4355	≥ 90 %
CBR Puncture strength	ISO 12236	≥ 22 KN
Puncture strength	ASTM D 4833	≥ 600 N
Water permeability	ASTM D 4491	$\geq$ 18 l/m <sup>2</sup> s
Apparent Opening Size (AOS)	ASTM D 4751	≥250 microns
Pore Size O90	ISO 12956	0.35 mm

#### 13.3.3 Geo-textile Mattress

The *geotextile mattress* is made of 2 layers (bottom layer and top layer GSM  $\geq$ = 400 g/m<sup>2</sup> and 650 g/m<sup>2</sup> respectively; bottom layer and top layer tensile strength 42 KN/m<sup>2</sup> and 77 KN/m<sup>2</sup> respectively) -a flat bottom layer and top layer consisting of semi-circular pockets (0.5m diameter and 0.3m height). A lap distance of minimum 1m should be provided between the adjacent mattresses with an AOS of 70 microns.

# 13.3.4 Geotextile containers and bags

Geotextile containers and bags are similar units with an exception that the bags are smaller in size compared to the containers. The containers herein were a used for core of the groynes and the bags constitute the toe layer.

Geosynthetic containers are designed to withstand stresses developed while filling (placing) and under the marine loadings expected on the structure. The aperture opening should be selected such that soil is retained and water is drained out during filling. The geosynthetic containers placed under water are little affected by UV radiations. In the inter-tidal zone, the geosynthetics are covered very soon by algae which provide sufficient UV protection. Geotextile containers are generally manufactured using polypropylene or polyester fabric. Performance of polyethylene for exposure to various environments (Pilarczyk, 2000) is shown in **Table 28**.



Table 28. Performance of High-density polyethylene

Type of exposure	Short term	Long term
Dilute acids	Good resistance	Good resistance
Concentrated acids	Good resistance	Good resistance
Dilute alkali	Good resistance	Good resistance
Concentrated alkali	Good resistance	Good resistance
Salt (prine)	Good resistance	Good resistance
Oil (mineral)	Passable	Moderate
glycol	Good resistance	Good resistance
Micro organisms	Good resistance	Good resistance
UV light	Moderate	Not resistant
UV stabilized	Good resistance	Passable
Heat/dry <100° C	Passable	Moderate
Steam < 110° C	Passable	Moderate
Hydrolysis (moisture	Good resistance	Good resistance
absorption)		
Detergents	Good resistance	Good resistance
Tendency to creep	Passable	Moderate

The dimension of the designed geotextile container and geotextile bag at 80% volume fill condition is 1.5m x 0.9m x 0.5m and 1.2m x 0.68m x 0.32 m (in length x width x height) respectively. The dry weight of the geotextile container unit should be about 800 kg per container and the submerged weight of the container should be 450-500 kg per container. The dry weight of the geotextile bag unit should be about 330 kg per bag and the submerged weight of the bag should be about 200 kg per bag.

The weight and dimensions of the containers/bags were arrived based on the following formula:  $W \ (in \ kg) = 0.02323*Ss*V^6/[K*(Ss-1)^3]$ 

Where, V - velocity in m/sec, Ss - specific gravity of protection material (adopted between 1.5 to 1.8), K - Correction Factor =  $[1-\sin^2 0/\sin \Psi]^{1/2}$ , 0 - Angle of sloping bank,  $\Psi$  - Angle of repose of protection material

These units should remain stable against sliding, overturning, and overburden pressures, it was tested for the same and the cross-sections have been found to satisfy the stability conditions listed below.

(16)



Oumeraci et al. (2002a, 2002b, 2003)

$$N_{S,slope} = \frac{H_s}{\left(\rho_E/\rho_w - 1\right).D} < \frac{C_w}{\sqrt{\xi_0}}$$
(15)

 $D = l.\sin \alpha$ 

$$l_c = \frac{H_s^{3/4} \sqrt{T}}{C_w \left(\frac{2\pi}{g}\right) \left(\frac{\rho_{GSC}}{\rho_w} - 1\right) \sqrt{\frac{\sin(2\alpha)}{2}}}$$

$$N_{S,crest} = \frac{H_s}{(\rho_{GSC}/\rho_w - 1).D} < 0.79 + 0.09 \frac{R_C}{H_s}$$

$$l_c = \frac{H_s}{\left(\left(\frac{\rho_{GSC}}{\rho_w} - 1\right)\left(0.79 + 0.09\frac{R_C}{H_s}\right)\sin(\alpha)\right)}$$

Recio (2007)/ Recio and Oumeraci (2010)

$$l_{c,sliding} \ge u^2 \frac{\left[0.5KS_{CD}C_D + 2.5KS_{CL}C_L\mu\right]}{\left[\mu KS_R \Delta g - KS_{CM}C_M \frac{\partial u}{\partial t}\right]}$$

$$l \ge u^2 \frac{\left[0.05KO_{CD}C_D + 12.5KO_{CL}C_L\right]}{\left[0.05KO_{CD}C_D + 12.5KO_{CL}C_L\right]}$$

$$l_{c,overturning} \ge u^2 \frac{\left[0.05KO_{CD}C_D + 12.5KO_{CL}C_L\right]}{\left[0.5\Delta KO_R g - 0.1KO_{CM}C_M\frac{\partial u}{\partial t}\right]}$$
(17)

Where,

 $C_D, C_L, C_M$  – drag, lift and inertia coefficients;  $C_W$  - empirical parameter derived from  $N_S$ ; D – thickness of armour layer (m); g – acceleration due to gravity;  $H_s$  – incident significant wave height (m);  $K_D$  – stability coefficient; KO – coefficient accounting for deformation during overturning; KS – coefficient accounting for deformation during sliding;  $L_0$  – deep water wave length;  $l_c$  – length of the container (m);  $N_s$  – stability number;  $R_c$  – crest freeboard (m);  $\alpha$  – slope angle of structured slope (°);  $\xi_0$  – iribarren number;  $\Delta$  - ( $\rho s/\rho w$  – 1);  $\rho_s$  – density of armour unit ( $kg/m^3$ );  $\rho_w$  - density of water ( $kg/m^3$ );  $\rho_E$  - density of GSC ( $kg/m^3$ ).

### Geotextile Containers

For this material, the tensile strength, specific density and GSM are of a minimum value of 450 N/mm<sup>2</sup>, 950 kg/m<sup>3</sup> and 800 g/m<sup>2</sup> respectively. The apparent opening size is set at 70 microns and it possesses a puncture resistance of 1000 N. The elongation capacity can be upto 25% and



the strain is at 10%. Each geotextile container and bag is to be filled in-situ with locally available sand slurry or other materials and sealed at the open end.

# Geotextile bags

These units are similar to the containers except these bags are smaller in size compared to the containers. The containers herein were a used for core of the groynes and the bags constitute the toe layer. The properties of the non-woven geotextile material used for fabrication of geobags are highlighted in **Table 29**.

Table 29. Properties of Geo-textile bags

Properties	Reference for Test Method	Values
Nominal Mass	ISO 9864	$\geq$ 400 grams/m <sup>2</sup>
Tensile Strength	ASTM D4595	≥20 kN/m
Tensile Elongation	ASTM D4595	≥40% & ≤ 90%
Puncture Resistance	ASTM D4833	≥ 0.40 kN
Opening size	ASTM D4751	≥0.07mm &≤0.16mm
UV resistance	ASTM D435	70/50 %

# 13.3.5 Geotextile filter layer

The function of a geotextile filter is to allow water to enter a drainage media (such as gravel or a geosynthetic) while preventing the exchange/movement of soil particles. The physical, mechanical and hydraulic properties of the filter layer to be employed are given in **Table 30**.

Table 30. Properties of Geotextile filter

Physical Properties	Mechanical Properties	Hydraulic Properties
Mass per unit area (IS 1589	Tensile strength (Wide	Permeability (IS
(part 1):2011/ASTM D5261)	Width) (IS15891 (Part	14324:1995/ASTM D 4491)-
- 280 gm/sq.m	3):2011/ASTM D 4595) –	0.03mm/sec
	19kN/m	
Thickness (IS 15891	Grab Tensile strength	Apparent opening Size (IS
(part2):2011/ASTM D5199)	(ASTM D4632)- 1090 kN	14294:1995/ASTM D 4751)-
- 2.5mm		0.09mm

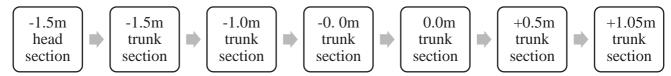


Trapezoi	dal Tear Resistance	Permittivity (IS
(IS	14293:1995/ASTM	14324:1995/ASTM D 4491)-
D4533) -	- 445 N	0.012/sec

# 14.0 SEQUENCES OF CROSS SECTION OF GROYNES

# Malippuram (from south to north)

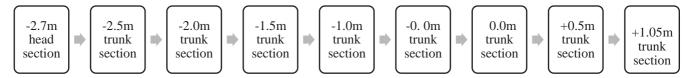
1. G1-50m T-groyne at (-1.5 m) water depth.



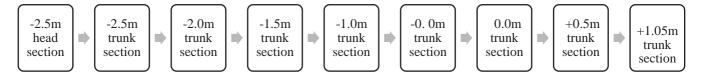
2. G2- 60m T-groyne at (-1.8 m) water depth.



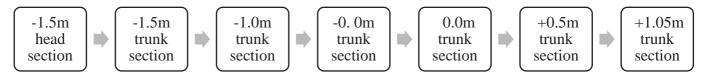
3. G3- 120m groyne at (-2.7 m) water depth.



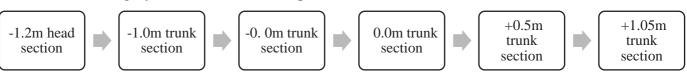
4. G4- 120m groyne at (-2.5 m) water depth.



5. G- 60m T-groyne at (-1.5 m) water depth.



6. G6- 50m T-groyne at (-1.5 m) water depth.



### Veliyathamparambu

1. Northern Groyne 230m and southern Groyne 170m at (-3.0 m) water depth Client: (KSCADC) & GIDA, KERALA



# Puthenkadappuram

1. Northern Groyne 150m and southern Groyne 130m at (-3.5 m) water depth



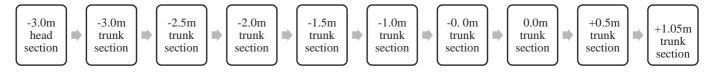
# Pazhangadu

1. Northern Groyne 180m at (-3.5 m) water depth.

2. Southern Groyne 140m at (-3.4 m) water depth.

### Saidh Mohammed beach

1. Northern Groyne 160m at (-3.0 m) water depth.



2. Southern Groyne 120m at (-2.5 m) water depth.

# Saidh Mohammed beach 2 to Cherai beach (from south to north)

A series of 21 transitional groynes are proposed for this stretch. The details of groyne length and water depth at the head of the structure is given in **Table 31**. The groynes G3, G4, G5,



G10, G11, G12, G17, G18 and G19 are low crested structures with its core composed of geocontainers and the toe section composed of geo-bags.

Table 31. Details of groynes from Saidh Mohammed beach 2 to Cherai beach

Groynes no from south to north	Length of groynes	Water depth
G1	20m	(-) 1.0 M
G2	40m	(-) 1.2 M
G3	60m	(-) 2.0 M
G4	70m	(-) 3.0 M
G5	60m	(-) 2.0 M
G6	40m	(-) 1.5 M
G7	20m	(-) 1.2 M
G8	20m	(-) 1.0 M
G9	40m	(-) 1.5 M
G10	60m	(-) 1.8 M
G11	70m	(-) 2.0 M
G12	60m	(-) 2.0 M
G13	40m	(-) 1.5 M
G14	20m	(-) 1.0 M
G15	20m	(-) 1.0 M
G16	40m	(-) 1.5 M
G17	60m	(-) 2.5 M
G18	70m	(-) 3.0 M
G19	60m	(-) 2.5 M
G20	40m	(-) 1.5 M
G21	20m	(-) 1.2 M



#### 15.0 FINAL RECOMMENDATIONS

The proposed layout and arrived cross-section details are based on the bathymetry data provided to IIT Madras by (KSCADC) & GIDA, KERALA. The layout and the cross-section is expected change if there is significant changes in bathymetry. Hence a detailed bathymetry survey should be extended for all the sites prior to the commencement of construction of the shore protection works. The length of each of the groins within a groin field is a function of depth and has to extend upto the water depth as indicated in this report. A comprehensive borehole data study to be executed at all the sites to ensure the geo-technical stability of the proposed gravity structures. A meticulous and continues monitoring of the shoreline changes during the construction phase of the protection is to be carried out and any major deviations from the equilibrium has to be immediately brought to the notice of IIT Madras.

PROF. V. SUNDAR

PROF. S. A. SANNASIRAJ



### **REFERENCES**

Brocchini, M., Kennedy, A., Soldini, L., and Mancinelli, A. (2004). Topographically controlled, breaking-wave-induced macrovortices. Part 1. Widely separated breakwaters. Journal of Fluid Mechanics. 507. 289 - 307. 10.1017/S002211200400878X.

Calabrese, M., Vicinanza, D. and Buccino, M. (2008). 2D Wave setup behind submerged breakwaters. Ocean Engineering. 35. 1015-1028. 10.1016/j.oceaneng.2008.03.005.

Dolan, R., Fenster, M.S. and Holme, S.J. (1991). Temporal analysis of shoreline recession and accretion. *Journal of coastal research*, pp.723-744.

Mahapatra, M., Ratheesh, R. and Rajawat, A.S. (2014). Shoreline change analysis along the coast of South Gujarat, India, using digital shoreline analysis system. *Journal of the Indian Society of Remote Sensing*, 42(4), pp.869-876.

Mallik, T.K., Samsuddin, M., Prakash, T.N., Vasudevan, V., and Machado, T. (1987). Beach erosion and accretion—An example from Kerala, Southwest Coast of India. *Environmental Geology and Water Sciences*, *10*(2), pp.105-110.

Kramer, M., Zanuttigh, B., Van der Meer, J. W., Vidal, C., & Gironella, F. X. (2005). Laboratory experiments on low-crested breakwaters. Coastal Engineering, 52(10-11), 867-885.

Oumeraci, H., Bleck, M., Hinz, M., and Kübler, S. (2002a). Großmaßstäbliche Untersuchungenzur hydraulischen Stabilität geotextiler Sand container unter Wellen belastung ("Large-scale investigations into the hydraulic stability of geotextile sand containers under wave loading"). Leichweiss-Institute for Hydraulic Engineering and Water Resources, Report Nr. 878, Braunschweig, Germany (in German).

Oumeraci, H., Bleck, M., Hinz, M., and Möller, J. (2002b). Theoretische Unter suchungenzur Anwendung geotextiler Sand containerim Küstenschutz ("Theoretical studies on the use of geotextile sand containers in coastal protection"). Leichweiss-Institute for Hydraulic Engineering and Water Resources, Report Nr. 866, Braunschweig, Germany, (in German).



Oumeraci, H., Hinz, M., Bleck, M., and Kortenhaus, A. (2003). Sand-filled geotextile containers for shore protection. Proceedings of 6 th conference of Coastal and port Engineering in Developing Countries. COPEDEC VI, Colombo, Sri Lanka. Pp.1-15.

Postacchini, M., Russo, A., Carniel, S., and Brocchini, M. (2016). Assessing the Hydro-Morphodynamic Response of a Beach Protected by Detached, Impermeable, Submerged Breakwaters: A Numerical Approach. Journal of Coastal Research. 32. 10.2112/JCOASTRES-D-15-00057.1.

Recio J (2007). Hydraulic stability of geotextile sand containers for coastal structures- effect of deformations and stability formulae. PhD thesis, Leichweiss-Institute for Hydraulic Engineering Water Resources, Braunschweig, Germany. Pages. 167. doi: 10.24355/dbbs.084-200802050100-0.

Recio J, Oumeraci H, Mocke G (2010). Stability formula and numerical model for structures made with geotextile sand containers used for coastal stabilization. In 2nd International Conference on Coastal Zone Engineering and Management (Arabian Coast 2010), Muscat, Oman.

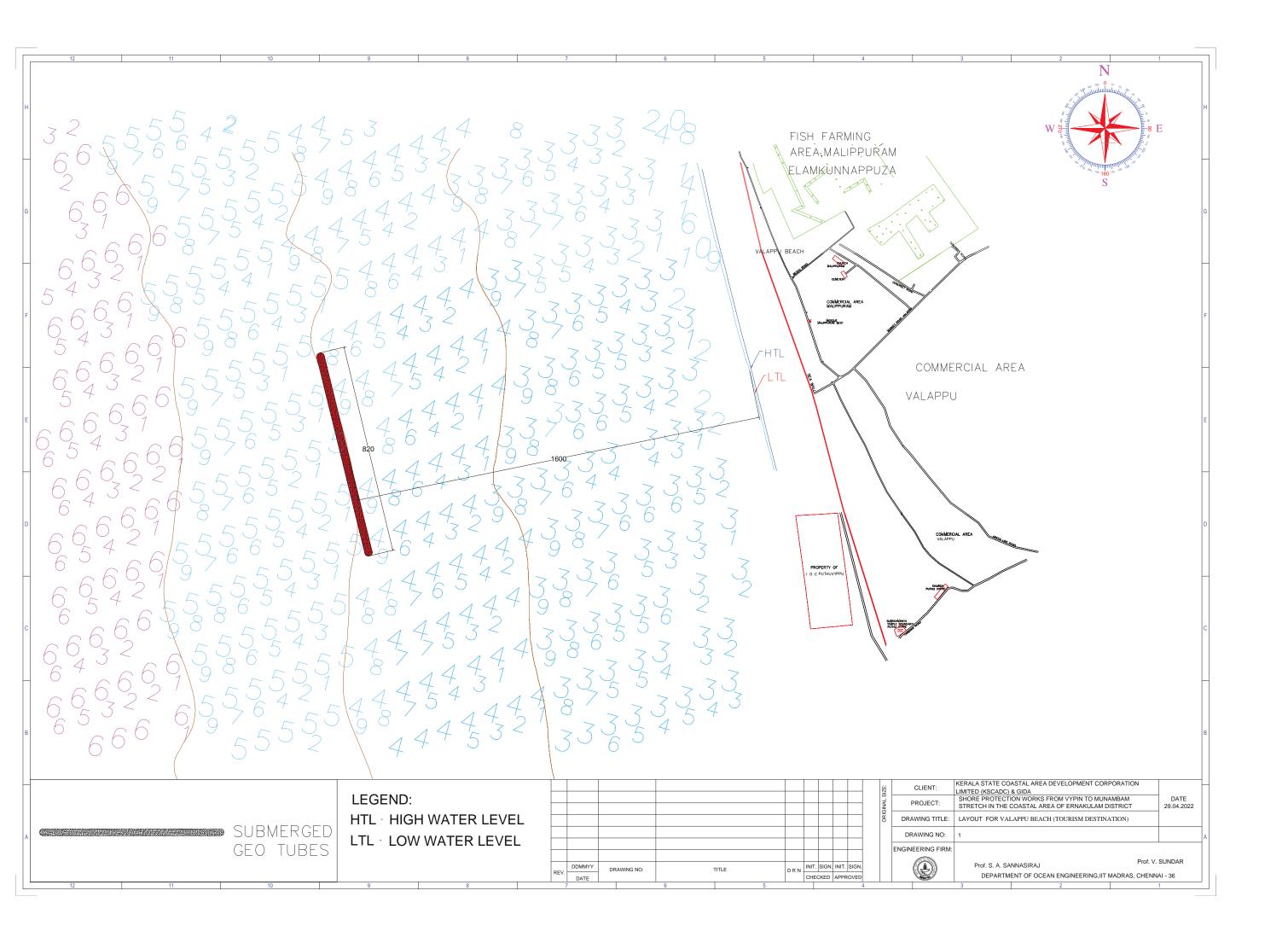
Sundar, V., and Murali, K. (2007). "Planning of coastal protection measures along Kerala coast", *Govt. of Kerala*.

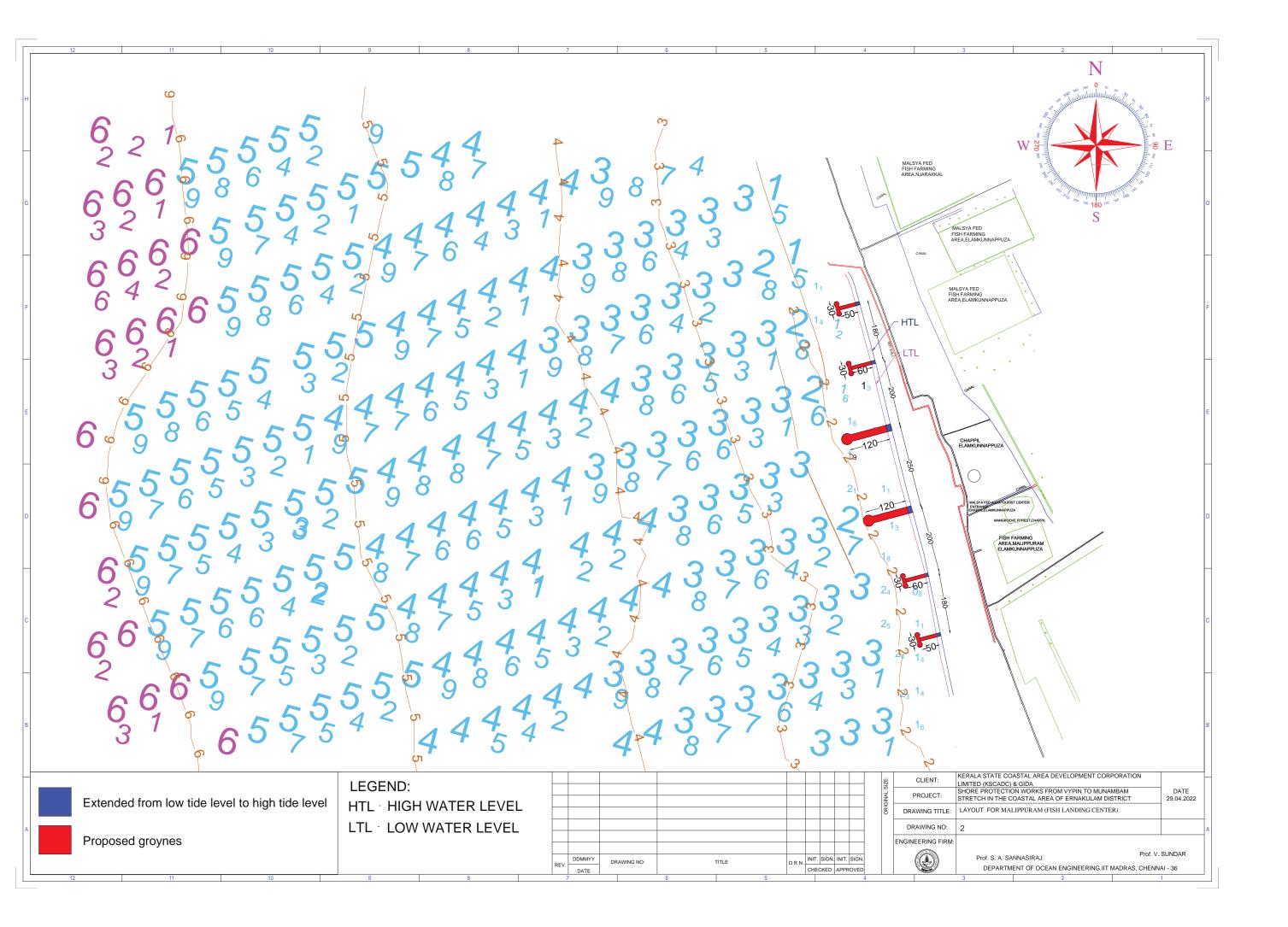
Shahul Hameed, T.S., Kurian, N.P., Thomas, K.V., Rajith, K. and Prakash, T.N., (2007). Wave and current regime off the southwest coast of India. *Journal of Coastal Research*, 23(5), pp.1167-1174.

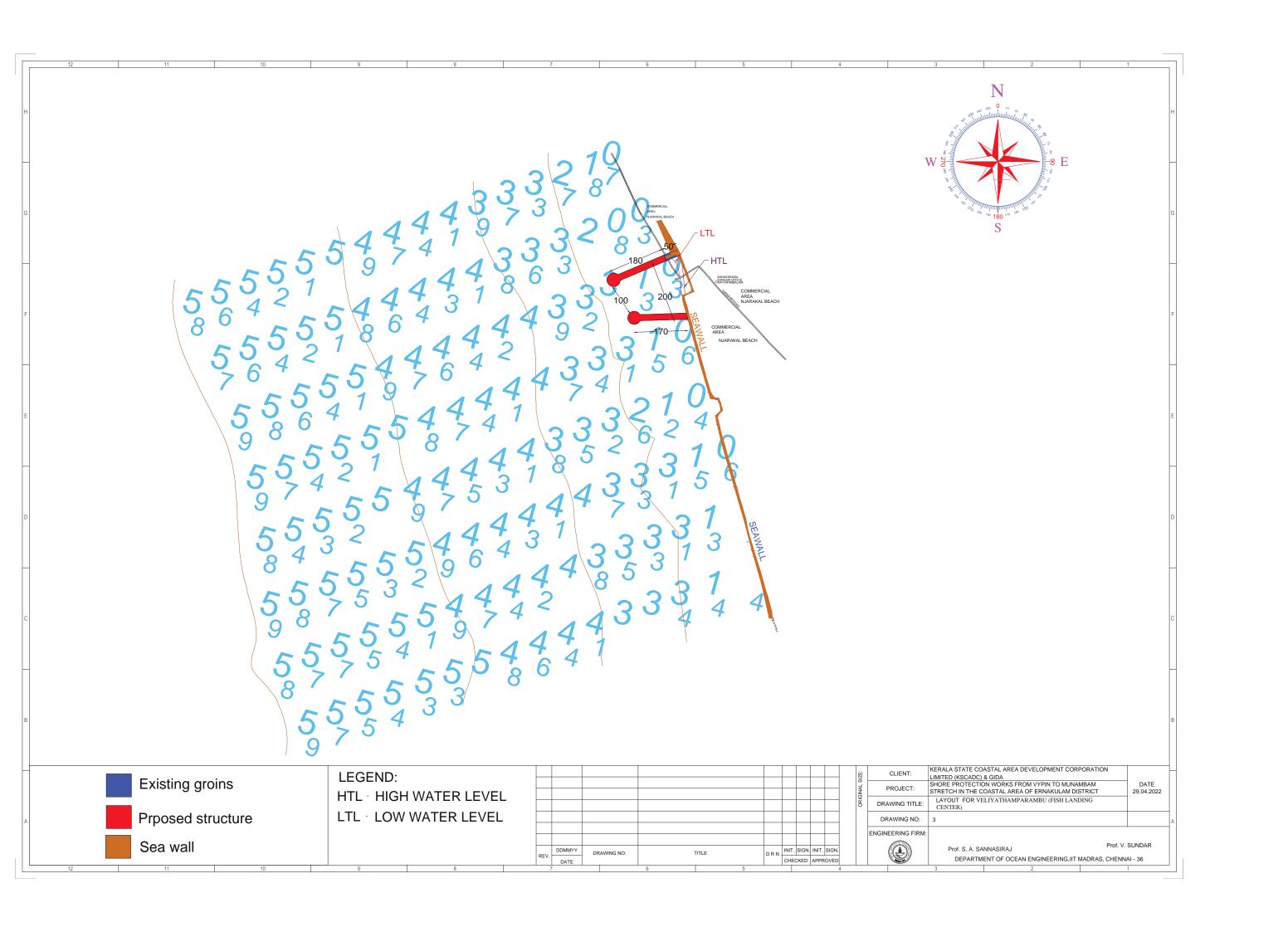
Thiruvenkatasamy, K. and Girija, D.B., (2014). Shoreline evolution due to construction of rubble mound jetties at Munambam inlet in Ernakulam–Trichur district of the state of Kerala in the Indian peninsula. *Ocean & coastal management*, 102, pp.234-247.

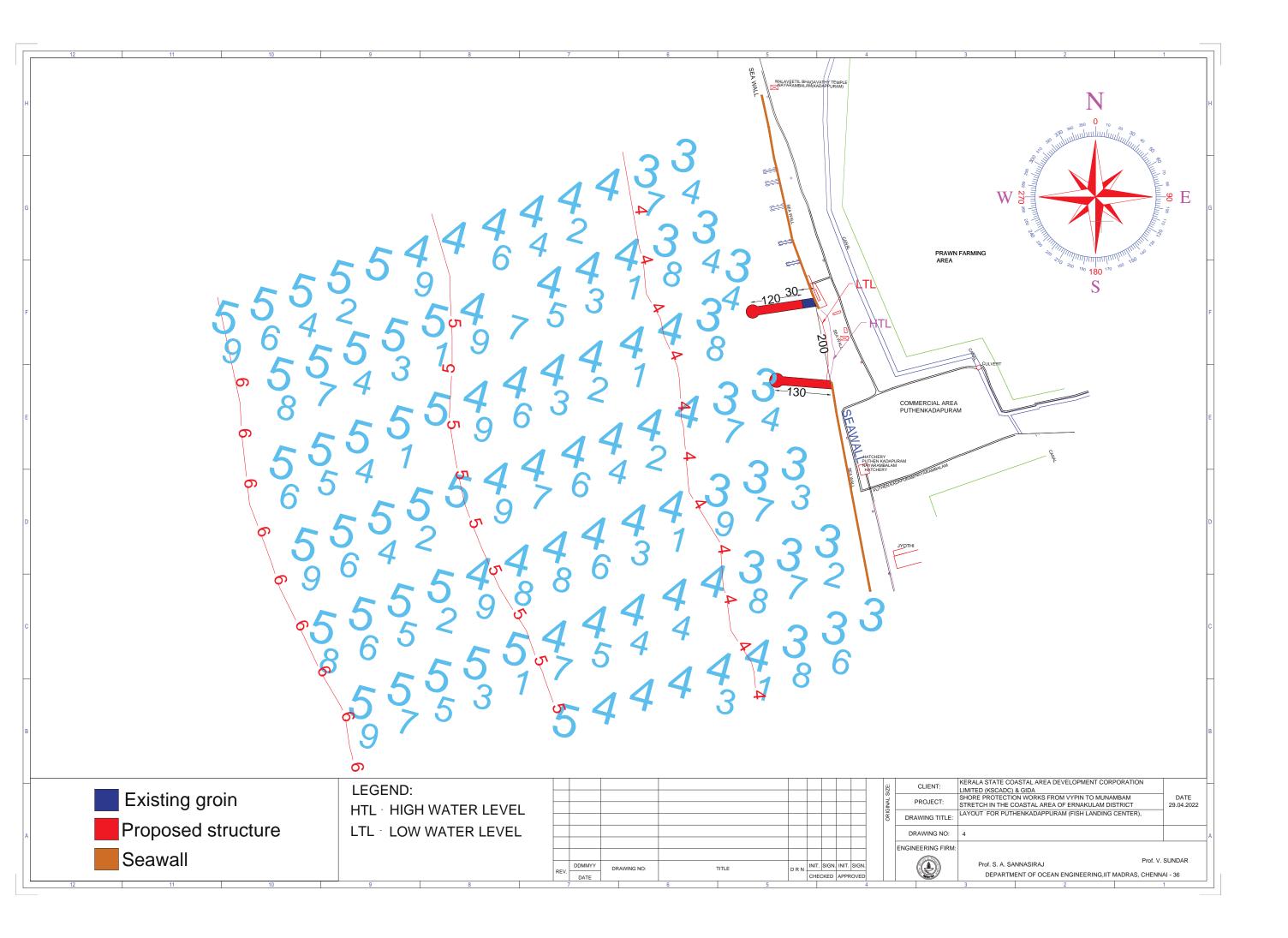


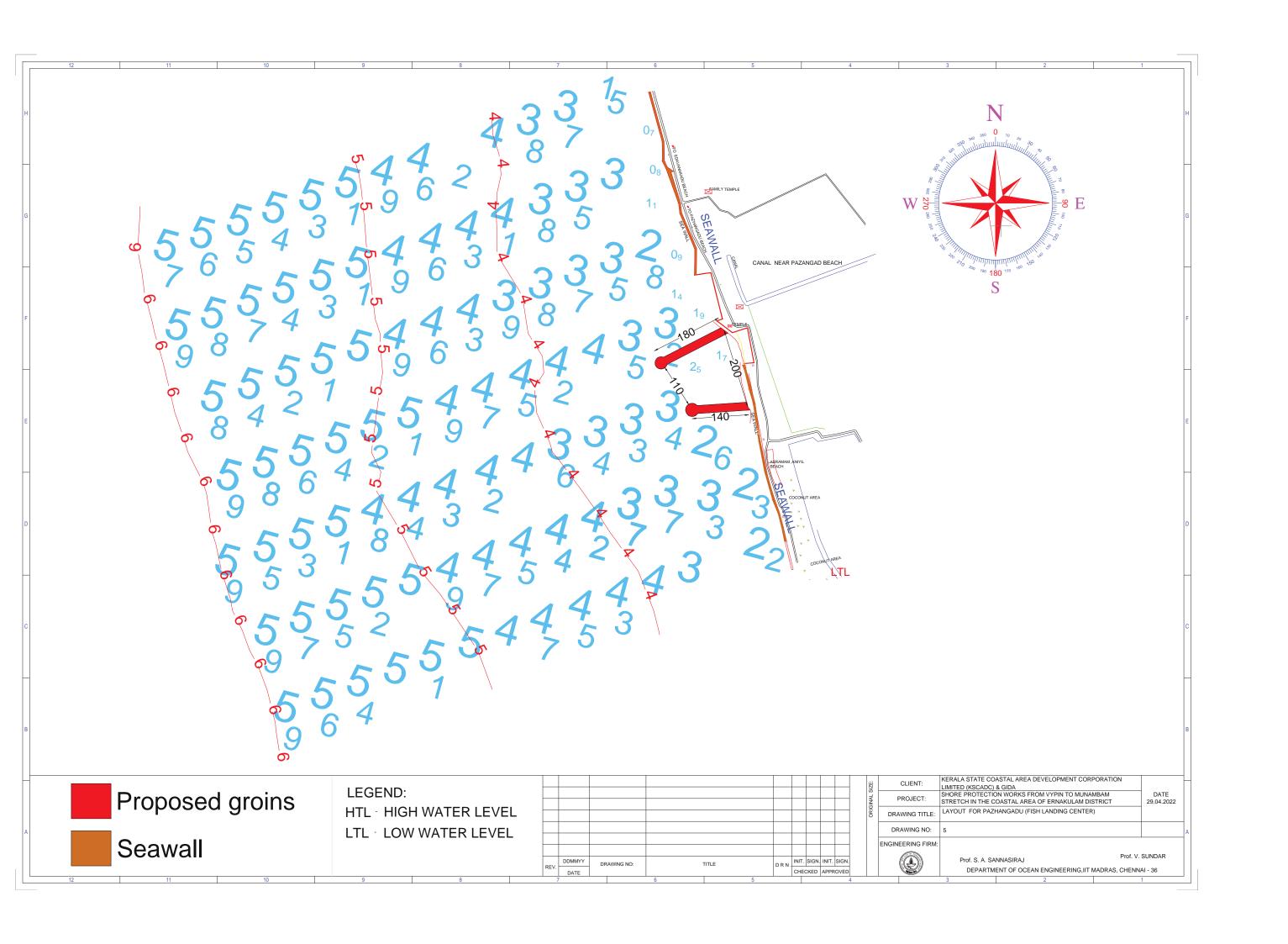
Vicinanza, D., Caceres, I., Buccino, M., Gironella, X., and Calabrese, M. (2009). Wave disturbance behind low-crested structures: Diffraction and overtopping effects. Coastal Engineering. 56. 1173-1185. 10.1016/j.coastaleng.2009.08.002.

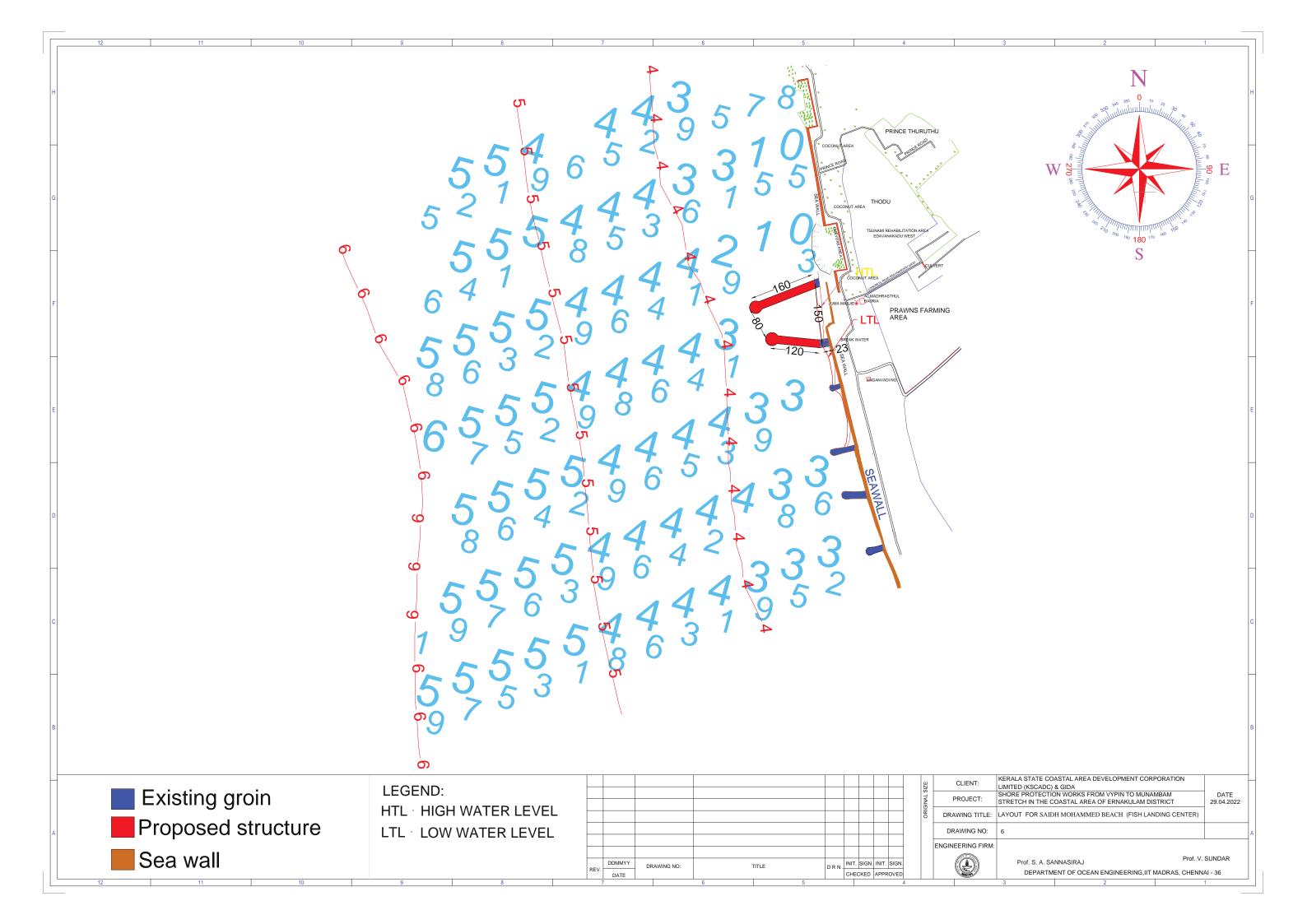












60 00 60 60 60 50000000 0 10 00 00 00 00 00 COOT ACT NOT C7 7 C7 AO AO AO AO AO AO AO OA OA 04 AA AO AV AO AO AO AO AO AO AN AA NA 14 X CU 3361 KERALA STATE COASTAL AREA DEVELOPMENT CORPORATION LEGEND: LIMITED (KSCADC) & GIDA SHORE PROTECTION WORKS FROM VYPIN TO MUNAMBAM STRETCH IN THE COASTAL AREA OF ERNAKULAM DISTRICT Groynes with Geo Containers & Geo bags ( short groyne phase 1 ) HTL · HIGH WATER LEVEL LAYOUT FOR SAIDH MOHAMMED BEACH TO CHERAI BEACH (TOURISM DRAWING TITLE: DESTINATION), WITH SERIES OF GROYNES AND SUBMERGED GEO Groynes exteneding from LTL Submerged shore parallel 50m long Geo-tubes/ phase 2 LTL · LOW WATER LEVEL DRAWING NO: Offshore submerged ENGINEERING FIRM: detached Geo -tubes Prof. V. SUNDAR DDMMYY DRN. INIT. SIGN. INIT. SIGN TITLE DEPARTMENT OF OCEAN ENGINEERING, IIT MADRAS, CHENNAI - 36

