Kerala Infrastructure Investment Fund Board (KIIFB)

EPC
An Effective Way of Implementing Infrastructure Projects

- Introduction to EPC Contract
- Form and Vital Features of EPC Contracts being used in India

Atahar Parvez,
LEA Associates South Asia Pvt. Ltd. (LASA)

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Aspects Covered

- Contracts and Types of Contracts
- What is EPC Contract?
- Why Employers prefer EPC?
- Various EPC Contracts.
- Form of MCA based EPC Contract
- Some Important Features of MCA Based EPC Contracts

Contracts & Type of contracts

For implementation of any engineering project, there is an agreement between the owner of the facility and the contractor or Concessionaire who builds / constructs or provides it.

“Contract Agreement”

Is a voluntary arrangement between two or more parties that is enforceable by law as a binding legal **agreement.**

Contract Types

Based on the financing responsibility, the broad classifications of Contracts

- **PPP Contracts** – Wherein one or more private parties enter into an agreement with Public bodies to build and operate a public facility by taking the responsibility of arranging finances fully or partially.

- **Cash Contracts –** In a cash contract, the owner of the facility (Public body/department) owns responsibility of arranging finances to get a facility or a services provided by a private party.

PPP Contracts Formats

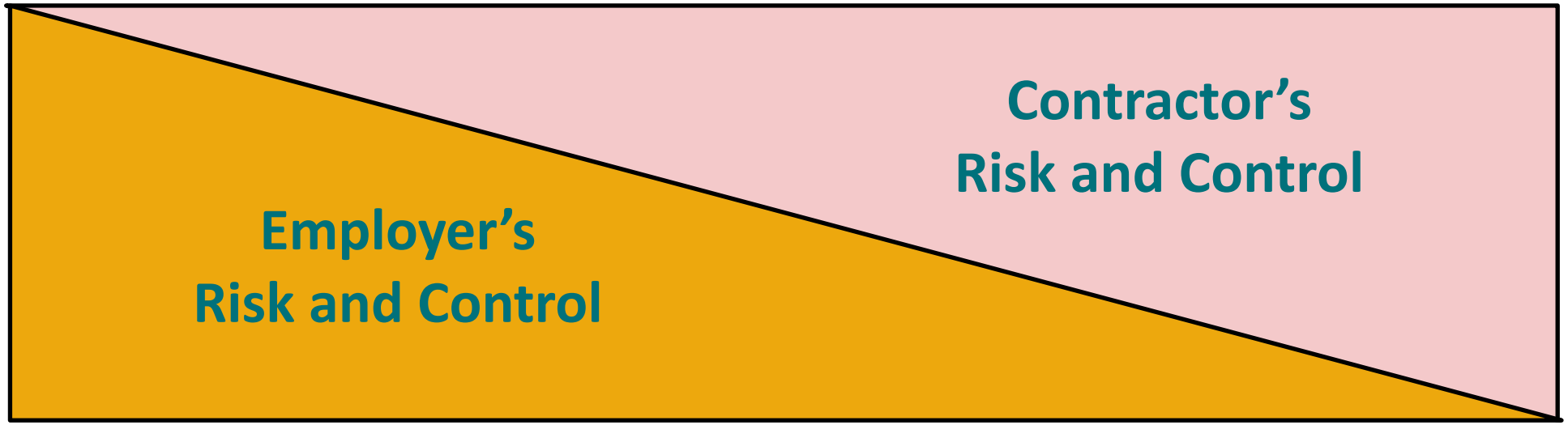
- Build-Operate-Transfer (BOT) – Toll
- Build-Operate-Transfer (BOT) – Annuity
- Build-Operate-Transfer (BOT) – HAM (Hybrid Annuity Model)
- Operation, Maintenance and Tolling (OMT)
- Toll Operate and Transfer (TOT)

Cash Contracts

- Item Rate Contracts
- Lump Sum Contracts
- Design Build (DB) Contract
- Turnkey Contracts
- **EPC Contracts**
- Etc.

Risk & Control Equation (cash contracts)

Employer Specified Project (e.g. Item Rate Contracts)	Employers specific Design Requirement (e.g. Design-Build)	Employers functions Requirement (e.g. EPC / Turnkey)



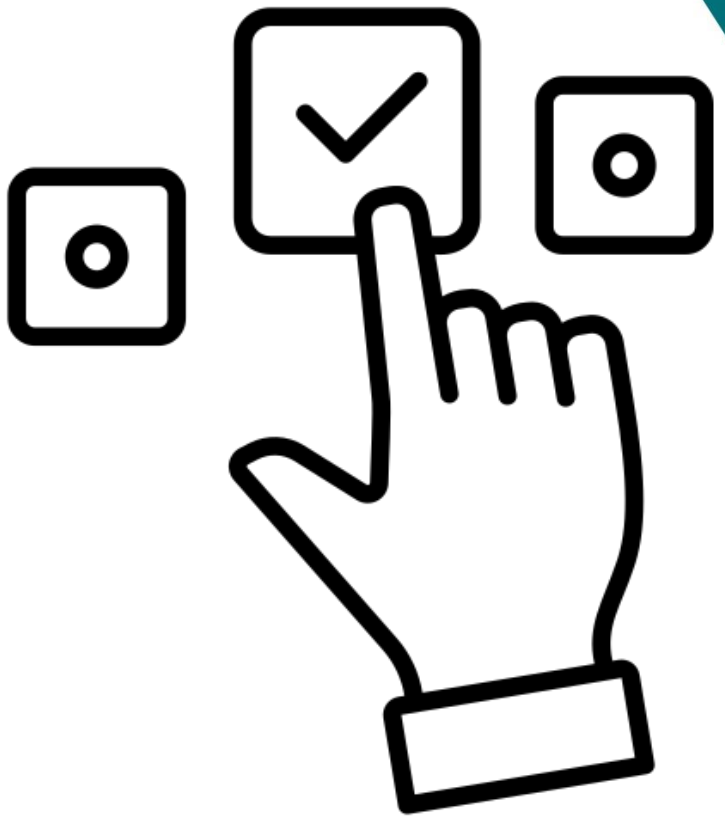
What is an EPC contract ?

Engineering, **P**rocurement and **C**onstruction contract (**EPC**) is

- A type of 'Cash Contract', which is LS in nature and
- wherein the responsibility to Engineer, Procure and Construct (E,P and C) rests with the Contractor.
- The payment to the Contractor during construction is made against certain stages of Construction and not as itemized quantities.
- The Contractor also receives payment against Maintenance works as well. (This is generally a fraction of Bid Project Cost)

Why Employers Prefer EPC?

- Time and Cost overrun risk transferred
- Avoidance of appointing multiple Contractors
- Limited participation ability of Project Employers
- Availability of expertise and experience in the form of private contractors



Various EPC contract Forms

Before MCA Based EPC Contracts; some popular EPC forms were

- FIDIC Conditions of Contract for Plant and Design-Build (Yellow Book)
- FIDIC Conditions of Contract for EPC/Turnkey Projects (Silver Book)
- State Government / Departmentally developed EPC Forms of Contracts.

Brief about
MCA – Model Concession Agreement

- Model Concession Agreement (MCA) forms the principle of PPP projects in India and provides a framework for execution of projects on PPP form; by clearly defining roles and obligations of all the parties involved.
- The MCA, after its first draft published in 2000 by Haldea, prepared for the Planning Commission (PC), Government of India, went through several modifications and process of evolution till it was published in 2009 as 'Amended MCA'.

Brief about
MCA – Model Concession Agreement

'Model Concession Agreement' has evolved over a period of 2 decades .

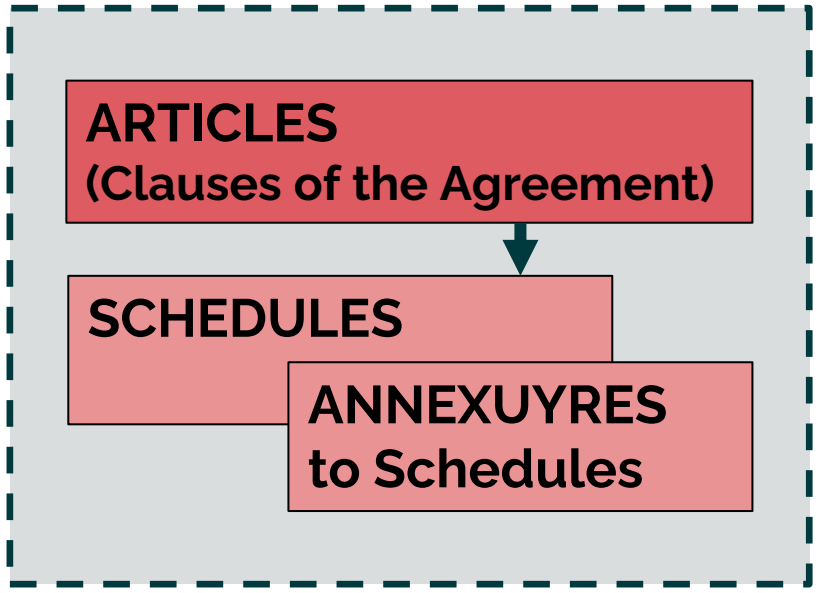
- It's quite a robust document and its variants are available for all forms of BOT projects.
- Multilateral funding agencies are using MCA for projects funded by them.
- Many other Countries have made use of MCA in developing their own CAs.

The efficacy of MCA has led to

formation of EPC document based on MCA which was essentially meant for PPP projects..

Composition of MCA Based EPC Agreement

The EPC Agreement framework consists of



- ✓ **Articles (total 27 articles)** – Articles are grouping of contract clauses based on subject.
- ✓ **Schedules (19 Schedules from A to S)** – Schedules are project specific detailing and forms & schedules.
- ✓ **Annexures to Schedules** (Varying in Numbers) – Annexures are elaborations of Schedules.

Articles in EPC Agreement

PART I : Preliminary	
1	Definitions and Interpretation
PART II: Scope of the Project	
2	Scope of the Project
3	Obligations of the Authority
4	Obligations of the Contractor
5	Representations and Warranties
6	Disclaimer

PART III: Construction and Maintenance	
7	Performance Security
8	Right of Way
9	Utilities and Trees
10	Design and Construction of the Project Highway
11	Quality Assurance, Monitoring and Supervision
12	Completion Certificate
13	Change of Scope
14	Maintenance
15	Supervision and Monitoring during Maintenance
16	Traffic Regulation
17	Defects Liability
18	Authority's Engineer

Articles in EPC Agreement

PART IV: Financial Covenants	
19	Payments
20	Insurance
Part V: Force Majeure and Termination	
21	Force Majeure
22	Suspension of Contractor's Rights
23	Termination
Part VI: Other Provisions	
24	Assignment and Charges
25	Liability and Indemnity
26	Dispute Resolution
27	Miscellaneous

Schedules in EPC Agreement

A	Site of the Project
B	Development of the Project
C	Project Facilities
D	Specifications and Standards
E	Maintenance Requirements
F	Applicable Permits
G	Form of Bank Guarantees
H	Contract Price Weightages
I	Drawings

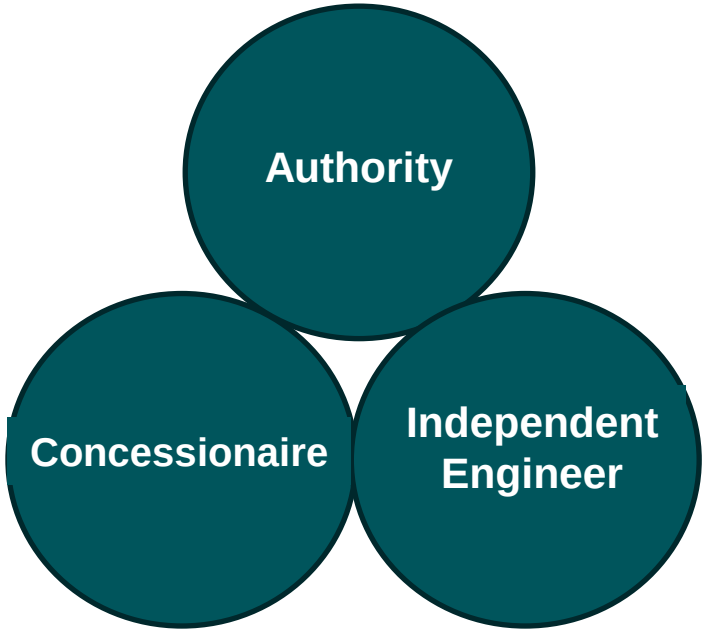
J	Project Completion Schedule
K	Tests on Completion
L	Completion Certificate
M	Payment Reduction for Non-Compliance
N	Selection of Authority's Engineer
O	Forms of Payment Statements
P	Insurance
Q	Tests on Completion of Maint. Period
R	Taking Over Certificate

Priority of agreement

1. Between two or more Clauses of the any of the Articles, the Clause relevant to the issue under consideration shall prevail
2. Between the Clauses of the Articles and the Schedules, the Articles shall prevail and between Schedules and Annexes, the Schedules shall prevail;
3. Between any two Schedules, the Schedule relevant to the issue shall prevail;

Some Important Features of MCA Based EPC Contracts

The Players in EPC Contracts



- **The Authority** – Employer / Owner of the facility

  Basic Obligation – Pay for Construction, Provide land, assist in approvals and removal of hindrances

- **The Contractor** – The EPC Contractor

  Basic Obligation- Engineering, Procurement and Construction / Operation and Maintenance

- **The Authority's Engineer** – A Consultancy Engineering Firm appointed as per Article-18 and Schedule-N of EPC Contract

  Basic Obligation – Contract Administration and Management, including Design Review, Quality Checks, payment certification, review of Social and Environmental tasks, etc..

Some Definitions in EPC Contract

"Appointed Date" means the date declared by the Authority as the project commencement date with the consent of the contractor

- Authority to handover min. 90% RoW and should have o tained Environmental Clearance.
- EPC Contractor should have submitted the Performance Security

"Base Date" means the last date of the calendar month, which precedes the Bid Due Date by at least 28 (twenty eight) days

"Change of Scope" means any change in specifications of any item of Works or omission of any work from the Scope of the Project or any additional works which are not included in the Scope of the Project

Scope of the Works in EPC

Article – 2 (Scope of the Project) specifies that;

1. Construction of project at site as set forth in Schedule-A and specified in Schedule-B (Works) and Schedule-C (Facilities) in conformity with Specifications and Standards set in Schedule-D.
2. Maintenance of Project Highway as per Schedule-E

SCHEDULES

A. Site of the Project
B. Development of the Project
C. Project Facilities
D. Specifications and Standards
E. Maintenance Requirements

Major Obligations of the Authority (Employer)

1. Responsible for the correctness of the Scope of the Project, Project Facilities, Specifications and Standards.
2. Provide not less than 90% of RoW within 30 days from the date of EPC agreement. (Damages for delays)
3. Approval of GADs for ROBs/RUBs from Railway Authorities with 30/60 days from the Appointed Date.
4. All Environmental Clearances as required.
5. Provide reasonable support in procuring Applicable Permits Government departments and access to all necessary infrastructure facilities and utilities.
6. Maintenance of the existing projects till Appointed Date to the same condition as was 10 days prior to bid submission date.

Major Obligations of the EPC Contractor

- The Contractor shall undertake the survey, investigation, design, engineering. procurement, construction, and maintenance of the Project.

- Shall obtain all applicable permits and keep them renewed.

- Shall Remedy all losses, defects and damages to the project road from Appointed date till Construction period, during DLP and Maintenance Period.

Major Obligations of the EPC Contractor

- Shall not sub-contract any Works in more than **49%** of the Contract Price. the Contractor shall inform it to the Authority prior to entering into any sub-contract exceeding 5% of the CP.
- Shall be responsible for shifting of Utilities / Trees and other obstructions to the project development in consultation with the respective departments.
- Environmental (EMP) and Social (RP) Safeguards
- Conduct Health Awareness Programs.

Major Duties of the Authority's Engineer

- Review drawings Designs
- Review Quality Assurance Plan, Review Methodology for construction
- Inspect the Construction works and submit monthly Inspection Report
- Recommend suspension of unsafe works.
- Carry out preconstruction review of Manufacturer's test certificates and other samples, source approvals, job mix approvals etc.

Major Duties of the Authority's Engineer

- Check 20% of tests for quality control.

- Witness all tests on completion as per Schedule-K and issue of Completion Certificate or Provisional Certificate.

- Verify Stage Payment Certificate

- Verify Monthly Maintenance Statement

- Inform the Authority and the Contractor of any event of Contractor's Defaults within one week of occurrence

AE needs Authority's Approval for;

- Any Time extension to EPC Contractor.
- Any additional cost to be paid by the Authority to the Contractor
- Termination Payment.
- Any matter having financial implication of more than a specified amount (Generally Rs 50 lacs).

Financial Agreements, Article 19

- The contract Price in EPC is a LS one and covers all contractor's obligations for works under Agreement for the Construction and the remedying of any defects in the Project.

- The Contract Price includes all duties, taxes, royalty, and other fees as law.

- Contract Price is not subjected for any change in costs, except price adjustments and Change in law.

Financial Agreements, Article 19

- **Advance Payment:** Interest Bearing Advance of 10% of CP (2 installments of 5% each)
- **Additional Advance payment:** up to 5% of CP payable against newly purchased key Construction equipment required for the works.
- **Payment during Construction:** Stage payment applicable on completion of stage in length, number or area as per Schedule-H till the end of each month.
- **Payment during Maintenance Period:** Annual maintenance payment is mentioned in Article 14 (generally a fraction of Contract Price) which is paid monthly. Maintenance amount progressively increases with time after completion.

Financial Agreements, Article 19

Adjustments on Contract Price

1. Price Adjustment: for increase or decrease in rates and price of labour, cement, steel, Plant, machinery and spares, bitumen, fuel and lubricants, and other material inputs in accordance with the principles, procedures and formulae specified.

2. Change in Law: If there occurs a change in law after the base date, and if such change has impact on the cost the same needs to be adjusted. Extra cost to be paid to the Contractor, where as savings to be passed on to the Employer.

Milestones and Project Completion

- ✓ Project Milestones (generally 3, 10%, 35% & 70%) and Scheduled Completion Date are specified in Schedule-J
- ✓ which are required to be achieved within 30 days.
- ✓ Else imposition of Damages @ 0.05% of Contract Price.

Extension of Time

Contractor entitled for extension of time in due to following reasons

- Delay in providing ROW, Environmental Clearance or approval from Railways.
- Change of Scope if needed
- Occurrence of Force Majeure Events.
- Any delay, impediments or prevention caused by Authority.

Contractor to inform AE within 15 days from the date of concurrence of event or the Contractor became aware of such event giving rise to EOT

Change of Scope (Variation), Article 13

1. *Change of Scope Means;*
   - Change of specifications of any item.
   - Omission of work from scope of project.
   - Any additional work
2. *No Change of Scope shall be executed unless the Authority has issued Change of Scope Order except any works necessary for meeting any Emergency.*
3. *The total value of all COS Orders shall not exceed 10 % of contract price.*
4. Payment for Change of Scope shall be made in accordance with the payment schedule specified in the Change of Scope Order

Dispute Resolution Mechanism, Article 26

Stage – 1 : Mediation by the Authority's Engineer

Stage – 2: Dispute Resolution Board (3 member Board)

Stage – 3: Conciliation (Conciliation Committee of Independent Experts formed by the Authority)

Stage- 4: Arbitration

Tests Before Issuing Provisional Completion /Completion, Article 12

- Contractor to notify AE for carrying out tests on completion-30 days prior to likely date of completion
- Details of Tests to be conducted are specified in Schedule-K. Authority and AE jointly witness the tests. These tests are
  - ✓ Visual Inspection
  - ✓ Riding Test
  - ✓ Load Test on Bridges
  - ✓ Environmental Audit
  - ✓ Safety Audit

During Maintenance, Article 14 & Schedule-K

Article 14 and Schedule E elaborates the maintenance management. It provides detailing on

- **Desired Level of Service**
- **Inspection Frequencies**
- **Time limits for rectification of defects.**
- **Imposition of Damages for non compliance**

A FEW MAJOR CHALLENGES EXPERIENCED

- Delay in handing over of ROW / land by the Authority.
- Delay in shifting of Utilities / Removal of Trees and Hindrances
- Discrepancies in Scope of Works (Contradictions with Contracts)
- Mismatch of existing Site Conditions w.r.t the one defined in the Contract.
- Change of Scope due to demands by local inhabitants.
- Change in Taxation Law for ongoing projects (GST etc.)

Discussions...

THANK YOU

parvez@lasaindia.com

Kerala Infrastructure Investment Fund Board

ENGINEERING PROCUREMENT CONSTRUCTION

An Effective Way of

Implementing Infrastructure Projects.

"Importance of Employers Requirements

for securing successful outcome in EPC Contracts"

Jose Kurian

Senior Project Advisor.

Risk Sharing in EPC Contracts

- FIDIC ‘Red Book’. This is a traditional form of contract where the employer appoints its own designers to design the works and the contractor is only responsible for constructing the works to the employer’s design.

- Design – Build, FIDIC ‘Orange Book’. Under this form of contract the contractor accepts responsibility for both the design and construction of the works and the resulting single point responsibility is seen as being a significant advantage for employers.

- EPC / Turnkey Contracts FIDIC ‘Silver Book’. Where certainty of final price and often of completion date are of extreme importance. For such projects it is necessary for the contractor to assume responsibility for a wider range of risks than under the traditional Red or Yellow Books.

Risk Sharing in EPC Contracts

- The Red and Yellow Books (at clauses 4.10 to 4.12). The employer is required to have made available to the contractor all relevant information in his possession prior to the base date on sub-surface and hydrological conditions at the site. The contractor is responsible for interpreting this data.

- Unforeseen physical conditions will allow the contractor to claim an extension of time and payment of any additional cost incurred provided the contractor complies with the relevant procedural requirements and the condition is ‘Unforeseeable’ as defined in the Red and Yellow Books.

Risk Sharing in EPC Contracts

- The position is however different under the Silver Book as while, according to clause 4.10, the employer is to make available to the contractor all relevant data in his possession on the subsurface and hydrological conditions at the site, the employer shall have no responsibility for the accuracy, sufficiency or completeness of such information. The contractor is responsible for verifying and interpreting the data and the contract price is stated to cover all of the contractor's obligations under the contract.

- Under clause 4.12 the contractor is deemed to have obtained all necessary information as to risks, contingencies and other circumstances which may affect the works and by signing the contract the contractor accepts total responsibility for having foreseen all difficulties and costs of successfully completing the works. The contract price shall not be adjusted to take account of any unforeseen difficulties or costs

- Under the Silver Book therefore the risk of unforeseeable ground conditions falls to the contractor. While the contractor will undoubtedly allow for this in his tender, lenders and employers are afforded certainty with regard to their potential exposure to additional costs in this regard.

Risk Sharing in EPC Contracts

- EPC contracts are, by their nature, different to traditional or design and build forms of contract and are intended for entirely different types of project. The risk allocation contained in them means that the contractor is required to assume a greater degree of risk, although the rewards for the contractor can also be greater, especially if the priced risks do not arise.

Employers Requirements

- Typically Provided for
  - Design Build Contracts or
  - EPC Contracts
- Should necessarily include
  - the specification for the building,
  - the scope of services required from the contractor and
  - an allocation of risk for unknown items.
- The Level details depends on the size and complexity of the project
  - Can very from simple Specifications to
  - fully developed performance specification and concept design.

Employers Requirements

- Statement of Owner's Requirements can vary from statement of outcome required ("black box"), to performance based specification, to detailed specification, or any combination thereof

. • Name can vary:

Owner's Statement of Requirements

Employer's Requirements

Performance Specifications

Output Specifications

Functional Specifications 32 Statement of O

Employers Requirements

Each section should include, in order:

- Statement of purpose/objectives to be met
- Performance measures and/or tests or other requirements that will demonstrate performance requirements are met
- Detailed specs but only where something truly is critical to Owner

Employers Requirements

- A properly prepared document will
  - Reduce the cost by removing ambiguities and
  - Reduce disputes

Type of Bids

- Single Sage or
- Two Stages

- Single Stage is suitable for Simpler structures where the Requirements are fully developed and Contractor is able to work out reasonable correct price.
- Two stage bids are suitable where the Project is complex and the requirements are not fully developed.

Suggested Contents.

- Scope
- Specifications
- Design Criteria
- Codes and Standards
- Allotment of Risks
- Tender Drawings
- Programme of Work

Suggested Contents

- A project overview.
- Site information.
- Scope of services required,
- Identification of elements requiring design.
- The form of contractor's proposals required.
- Format required for the contract sum analysis.
- Parts of the strategic brief (or project brief if this has been developed).
- Prescriptive or performance specifications (or a combination).

Suggested Contents

- Existing design drawings (if they exist), or perhaps an existing building information model.
- Programme and delivery process (including phasing).
- Proposed form of contract, perhaps including a model enabling amendment making a BIM protocol part of the contract documents.
- Procedures for inspection, testing, commissioning and handover.
- Responsibility for statutory approvals (such as planning permission and building regulations approvals) and information about any existing approvals or consultations.
- Design liability.
- Requirements for warranties.
- Professional indemnity and other insurance requirements.
- Allocation of risk.

Suggested Contents

- Requirements for samples and items for comment or approval.
- Tender pricing document (or form for contract sum analysis).
- Pre-construction Information.
- Client policies (such as environmental or health and safety policies).
- Collaborative practices.
- Employer's information requirements for building information modelling.
- Request for details of named or nominated sub-contractors.
- Any requirement for consultants to be novated or switched to the contractor once the contract has been executed.
- Targets for post-occupancy evaluation.

Pre Bid Meeting

- **All inconsistencies shall be ironed out during the Prebid meeting and Corrigendum issued.**

Post Bid Meeting

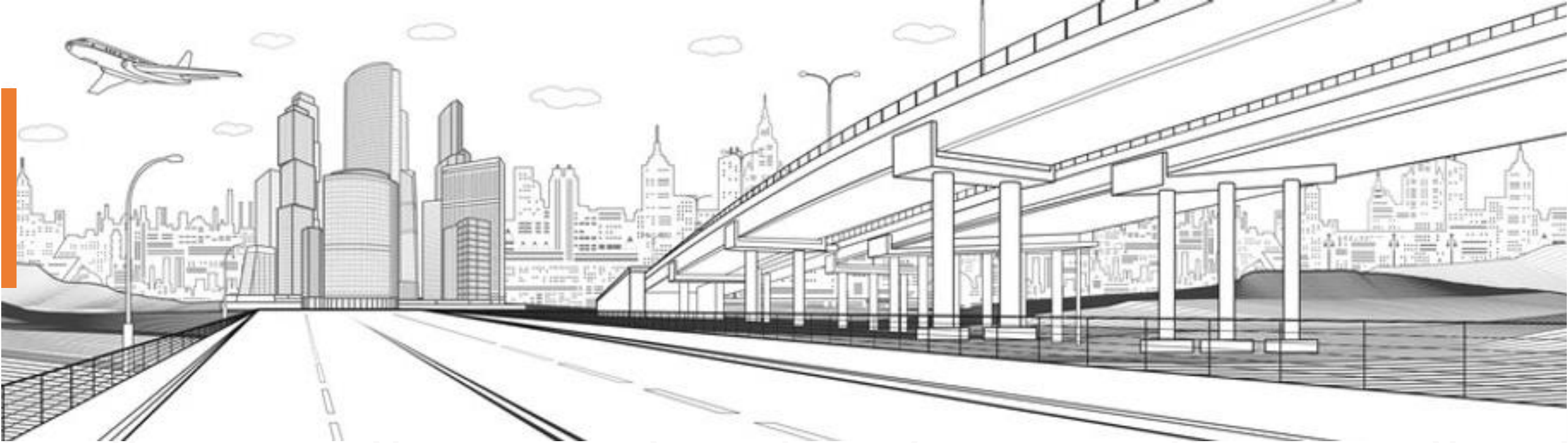
- Once the client has received the contractor's proposals, there is likely to be period of negotiation during which any inconsistencies between the contractor's proposals and the employer's requirements are discussed and either the contractor's proposals or the employer's requirements are amended to ensure agreement between them. This is an important part of the tender process as it is not always entirely clear which document prevails after the contract has been entered into.

Key to success

- Use of team (consultants and legal) experienced
- Expend substantial front end effort by Owner and Owner's Consultant
- Prepare comprehensive and well-drafted Performance/Output Specifications that clearly set out Owner's requirements, expectations and, where applicable, performance guarantees
- Designate one knowledgeable person to be responsible for constantly reviewing the whole of the Performance/Output Specifications for consistency and elimination of internal conflicts, and conflicts with "commercial" part of contract

Thank You

Questions?



EPC Contracts in Infrastructure Development

Advantages, and Challenges in Implementation

An interaction with

Kerala Infrastructure Investment Fund Board

24th June 2023

Contracts

A “form of contract” reflects the conditions that are likely to obtain in the course of planning and execution of any work through a different person. It is supposed to provide necessary provisions to lay down the requirements of the person awarding the contract; the returns/remuneration of the person executing the contract; and a mechanism for addressing and resolving potential conflicts arising in the process in a transparent, just, and amicable manner.

Objectives of the Government while taking up Infrastructure Development Projects

Sr. No.	Particulars
1.	Construction of the project in a manner that completely fulfils the intended purpose of providing the best, modern, safe and sustainable facility
2.	Design and implementation of the project based on global standards, incorporating the best quality control systems and safety measures
3.	Eliminating/minimizing any cost over-run beyond the estimated cost of the project
4.	Eliminating / minimizing any time-over run beyond the scheduled contract period
5.	Eliminating any dispute in the process of planning and construction
6.	Eliminating / Minimising claims on account of the Contract

Advantages of an EPC Contract

- Objective contract document
- Clearly defines roles and responsibilities of the Authority and the Contractor.
- Has provisions for quantifying losses due to default of either party
- Provides for taking timely action for the de-scoping portions of the project which cannot be taken up due to various reasons.
- The payment due on account of de-scoping is also defined.
- Method of assessing the quantum and cost of change of scope is objectively defined.
- Extension of time and other aspects are defined.
- Events of Authority and Contractor defaults are listed with provisions to handle Force Majeure situations.

Roles and Responsibilities of the Authority [*Employer*] in an EPC Contract

Roles and responsibility of Employer
To provide the required "Right of Way" for construction of the project and unencumbered access to such RoW
To accurately define the standards and specifications for construction of the project
To provide or facilitate obtaining all necessary permission for execution of the works
To accurately define the scope of the project to be construction

Roles and Responsibilities of the Contractor in an EPC Contract

Roles and responsibility of Contractor
Carry our survey, investigation, design, engineering, procurement and construction of the project
Adhere to specified timelines for construction and completion of project
To carry out testing to demonstrate that the constructed works are as per Authority's specifications and standards
To carry out maintenance of the project as per specified standards during the maintenance period, and rectify any defects occurring during the defect liability period

EPC Contracts

Conditions Precedent for an Organisation

1. Institutional preparation for effective implementation

2. Challenges in Implementation

   Adopting a proactive approach to project implementation

Institutional preparation for effective implementation

Sr. No.	Particulars
1.	Adoption of a standard form(s) of EPC Contract for the implementation of infrastructure projects
2.	Finalising standards and specifications to be adopted for the projects
3.	Establishing an empowered body for project management with the necessary powers to take decisions in a regular manner as required by the Contract.
4.	Delegation of powers for addressing day-to-day issues and decision-making during the project life cycle
5.	Specific focus on accurate assessment and quantification of the pre-construction activities for a project, and timely completion of such activities as per requirement of the Contract.
6.	Regular review of projects with focus on taking timely decisions commensurate with project progress and issues arising in the project
7.	Issuing a set of policy guidelines reflecting needs of the Government and to address issues that could help expedite projects, and resolve issues arising in the projects

1. Adoption of a standard form(s) of EPC Contract, and familiarisation for the implementation of infrastructure projects

An Organisation contemplating to take up projects under EPC mode needs to adopt a standard form [different standard forms for various sectors of work] of EPC contract suitable to its requirements.

The form of EPC Contract being used by MoRTH / NHAI was compiled by the then Planning Commission [*Now NITI AAYOG*] which has been customised for the highway sector.

A standard form ensures uniformity of interpretation and application of various provisions of the Contract.

Operation of a Contract should not be based on assumption of similarity with previous experiences on other forms of Contract. Every form of contract is unique and even the smallest difference from another contract could have unimaginable implications. An organization needs to familiarise itself with the form of Contract though individual reading, and thorough training and discussions.

2. Finalising standards and specifications to be adopted for the projects

An EPC Contract is based on scope of works to be constructed based on a certain Standards and Specifications.

The outcome of a projects is evaluated based on end result confirming to those standards.

Standards and Specifications for execution of any project on EPC mode need to be finalised before taking up the project.

The Standards and Specifications proposed for the project should comprehensive and should be laying down the complete design standards, method of execution, quality control systems, tests etc.

3. Establishing an empowered body for project management with the necessary powers to take decisions in a regular manner as required by the Contract.

Provisions of an EPC Contract mandates taking a lot of timely decisions. These decisions are crucial for successful implementation of an EPC Contract.

Existing organisational structures are often found wanting in taking such decisions or may not have the required authority to expeditiously take such decisions.

It is desirable to have a dedicated cell / body or a dedicated set of guidelines for facilitating operation and management of an EPC Contract.

AUTHORITY – Appointing the "Authority" on behalf of the Government for implementation of the Contract.

4. Delegation of powers for addressing day-to-day issues and decision-making during the project life cycle

The Authority's Representative / Project Implementing Office need to be appointed for every project.

The Authority's Representative / Project Implementing Office should have a certain delegation of power to address day to day decision making.

Such delegation could include powers to approve certain changes of scope.

5. Specific focus on accurate assessment and quantification of the pre-construction activities for a project, and timely completion of such activities as per requirement of the Contract.

The Authority's Primary responsibility is to provide encumbrance free RoW for the project.

Accurate assessment of pre-construction activities required to provide encumbrance free RoW is essential.

Pre-construction activities are desirable to be taken up separate from the Construction project to ensure fulfilling condition of availability of 90% of project length and other permissions.

Constitution of special cells for land acquisition, forest clearance, environmental clearance, approval of Railways etc. to expeditiously resolve preconstruction related issues.

6. Regular review of projects with focus on taking timely decisions commensurate with project progress and issues arising in the project

Periodic review of projects is essential for assessing the progress and identification of issues affecting the project.

Periodic review also help identify potential disputes

A formal structure for objective review of projects at various levels in the project implementation hierarchy is essential.

Such reviews should be empowered to take decisions I matters affecting the project progress. Decisions emanating from such reviews need to be communicated to the stakeholders and should be followed up by Action Taken Reports.

7. Issuing a set of policy guidelines reflecting the needs of the Government, and to address issues that could help expedite projects, and resolve issues arising in the projects

The provisions of the Contract on its own may not be sufficient to the changing policy or other conditions in the society.

Many situations like the implementation of GST, change in GST rates, pandemic and other similar situation require addressing them beyond the provisions of the Contract.

Project administration should be willing to timely acknowledge and address such issues as and when they arise.

Issuance of policy guidelines that enables incorporating new development and technology into an ongoing Contract

Stages in a project life-cycle

Sr. No.	Stage
1.	Project Planning & Detailed Project Report
2.	Appraisal and Approval of the project
3.	Bidding and award
4.	Appointed date
5.	Construction of the project
6.	Completion
7.	Maintenance
8.	Disputes & Claims

Stage 1
Project Planning & Detailed Project Report

- Preparation of a detailed project report comprising inter-alia the following is a pre-requisite for taking up any project
  - (i) Feasibility Report
  - (ii) Plan & Profile [Drawings]
  - (iii) Cost estimate
  - (iv) Report on pre-construction activities
  - (v) Bidding documents
- A DPR could be prepared through in-house efforts of any Govt. Department or through the engagement of a DPR Consultant
- Engagement of DPR Consultant is recommended for infrastructure projects to bring in professionalism and incorporate latest technology and approach.

Stage 1
Project Planning & Detailed Project Report

- The process of DPR preparation should be monitored by the Project proponent at every stage.
- Report on topographic survey should be analysed and cross-checked through site-inspection.
- LIDAR and Drone based topographic survey should be included in scope of DPR Consultant.
- Alignment proposals should be considered with due thought.
- Draft feasibility report should be thoroughly examined to understand the approach of the DPR Consultant and to ensure that it aligns with the requirement of the Authority.

Stage 2

Appraisal and Approval of the project

- After submission of DPR by the Consultant, a thorough technical appraisal of the project proposal is considered necessary.
- The technical appraisal should inter-alia include the following:

(i) Feasibility of the Consultant's technical proposal.

(ii) Verification of Consultant's assessment of exiting and required RoW.

(iii) Verification of the quantum of pre-construction

(iii) Ascertaining that the project proposal is aligned with the project objectives.

(iv) Comparing the estimated cost of various project components with the normative cost of those components.

(v) Examining and approving the deviations from the Standards proposed by the DPR Consultant.

(vi) Comparison of various documents of the DPR, viz, report, drawings, plan & profile, and schedules to ensure that there are no inconsistencies.

Stage 3

Bidding and award

- Approval of tender documents and bidding schedule
- Preparation of tender documents through a financial consultant.
- Ensuring that the tender form being used is updated and includes all latest amendments, if any.
- Comparison of schedules with the project cost estimate.
- Verification of Schedule – H.
- Verification of the tender documents to ensure that are no ambiguities. In particular, ambiguities between the provision of the schedules and the drawings.
- Comparison of the technical schedules with the project strip plan to ensure completeness of the scope of the project.
- Analysis of pre-bid queries and review of tender documents if required.
- Evaluation of bids through a financial consultant to eliminate errors and ensure consistency.
- Action also needs to be initiated for appointment of the Authority's Engineer.

Stage 3

Bidding and award – Evaluation of bids

- EPC offers a very simplified procedure for the evaluation of bids.
- A single cover 2 bids [Technical & Financial] system is used.
- Assessment of Contractor eligibility for a bid is based on the following financial parameters
    - (i) Bid capacity
    - (ii) Technical capacity
    - (iii) Average Annual Turn-over
    - (iv) Net-worth
    - (v) Single-value of work done
- The evaluation of the above is based on certification by the Statutory Auditor and employer's certificate. This renders the process very objective, simple and quick.
- Eliminates disputes in the bid evaluation process.

Stage 4

Appointed date

- Appointed Date is the Date of commencement of construction for the project.
- It marks the start the construction period.
- On the Appointed Date a certain conditions regarding availability of RoW must be fulfilled.
- In case of MoRTH / NHAI Contracts, it is availability of RoW in “Construction Zone” in 90% of the project length and availability of environmental clearance for the project.
- This date also signifies the start of the timeline for handing over balance RoW and other statutory permissions like approval of GAD form Railways etc.
- The Authority’s Engineer should also be in placed before the Appointed Date.

Stage 5

Construction of the project

- Construction of the project starts from the 'Appointed Date"
- The Contractor is required to execute the project and ensure prescribed financial progress for pre-decided milestones.
- In the case of road projects, the following 4-miletones are prescribed

Milestone stage	Financial Progress [%]	No. of days [for a 2 years contract]
1st	10	150
2nd	30	365
3rd	70	540
4th & Completion	100	730

- The Contractor has to achieve the above milestones by the prescribed date. A grace time of 30 days is allowed for achievement of intermediate milestone without affecting the final completion date.

Stage 5

Construction of the project

- In case of failure to achieve anytime milestone, penalty for delay is leviable if EOT is not approved.
- The Authority has to provide the remaining land within 150 days of the Appointed Date. Failure to provide the remaining land is an Authority Default and qualifies the Contractor to seek delay damages.
- The progress of the work is measured as completed stage and not in the quantity of any BoQ items.
- Payments are released upon completion of stages of work as per Schedule-H.
- There are mechanism to address defaults on the part of both the Authority and the Contractor.
- Change of scope if any identified during execution of work upto a net change of 10% of contract price can be got done through the Contractor.
- Contractor is required to submit “Monthly Progress Report” which has to be accepted by the Authority’s Engineer.

Stage 5

Construction of the project – management during construction

- The Authority to closely monitor the project through a system of periodic review and develop a professional system for project management.
- Any default on the part of the Contractor has to be analysed to identify factors causing the default and initiate action as per the Contract.
- The Authority should act to provide the balance land and approval with the specified period.
- The MPR submitted by the Contractor should be closely reviewed. In particular issues raised by the Contractor should be critically analysed as these may serve as a basis for claims.
- RFIs should be carefully seen.
- NCRs should be issued as and when required.
- Tests carried out upon completion should be through the use of technology.

Stage 5

Construction of the project – Contract Communications

- Relationship between the Authority and Contractor is entirely within the ambit of the signed agreement.
- All Communications from the Authority during the operation of the Contract should be in reference to the Contract.
- Letters should be specific and with reference to the specific Contract Clauses.
- Any changes from the Contract should be made legally tenable through the signing of a Supplementary Agreement on mutually agreed terms.
- No actions should be initiated in good faith.
- Opinion of the Contract expert forming part of the Authority's Engineer should be taken in matters of dispute.
- Meticulous record keeping

Stage 6

Completion

- Attempts should be made, and necessary facilitation should be provided to complete the project within the Scheduled Completion date.
- Any extension of the scheduled completion date results in prolongation of the Contract causing cost over-runs due to payment of additional amount towards price-adjustment, incidental cost due to non-availability of the project facility on time, and possible claims from the Contractor.
- Delay in completion happen primarily due to the following reasons :

  (i) **Delay on part of the Authority in proving balance RoW and necessary approvals** – The Contract has provision to descope upto 10% of the project and additional scope affected on account of forest clearance etc. The Authority should review and accept the delay in providing RoW and decide to de-scope such affected works to close the contract in time.

  Contract in case of defaults

Stage 6

Completion

(ii) **Delay on part of Contractor due to inadequate or poor mobilisation, delay in approval of designs and drawings, and poor work planning**. – In case of delay on part of the Contractor, necessary measures to penalise and terminate the contract should be initiated.

- A lingering project is not in the interest of the Authority and could result in exorbitant claims / arbitral awards. The Authority should be aware enough to take timely action to foreclose parts of the Contract in case of Authority's defaults and terminate contract in case of Contractor's default.

Stage 7

Maintenance

- Maintenance and defect liability period should be closely monitored through regular inspection and tests.
- Any non-conformity should be taken up with the Contractor for rectification to the prescribed standards.

Stage 8

Disputes and Claims

- Contractors generally can, with confidence, firm up their price for the situations described in the Contract.
- Claims arise due to 2 fundamental reasons :
  - (i) because the nature of the contract changes due to certain parameters which were not envisaged [*Element of unknown*]
  - (ii) errors in the drafting of contract [*ambiguity in the contract documents*] - Situations where contract provisions are amenable to multiple interpretations [*Misleading information*]
- The above situations influence the pricing strategy of the Contractor. In absence of a properly drafted contract document, Contractors will tend to guess the pricing / or exploit the loop-holes in the Contract.
- Addressing disputes at the time they arise could solve most of them. There are inbuilt mechanism in the Contract to address many such disputes.

Stage 8

Disputes and Claims

- For others, the Contract provides a mechanism for conciliation before going into arbitration.
- Conciliation of disputes should be preferred and explored as prolonged arbitral proceedings would add to the interest burden on the claim amount.
- All efforts should be made

Suggestions to Engineers and Policy makers

- Thorough and between the line reading of the complete EPC document and the Standards and Specifications of the project.
- Reading of the Indian Contract Act
- Involvement in every stage of the project
- A form of Contract is an evolving document enriched by the experience of engineers and policy makers. The quest to create a document that caters to the entire gamut of situation obtaining on the ground is an on-going one.

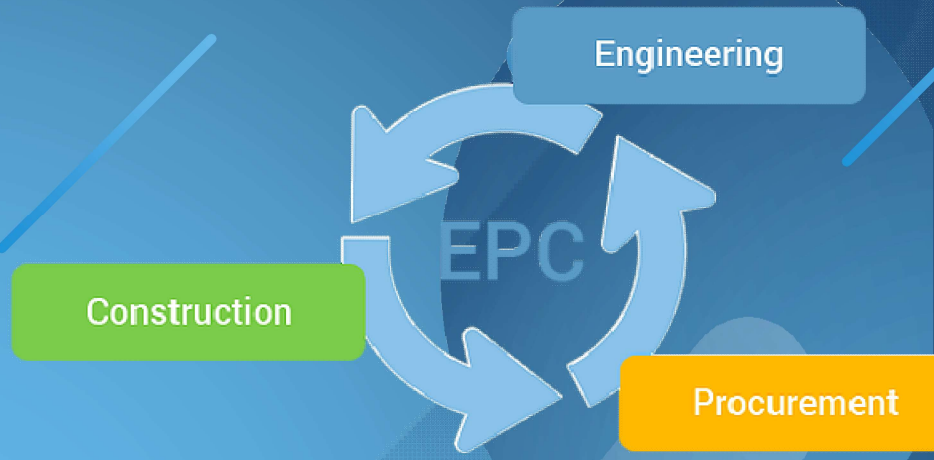
thank you

" EPC contract in Building Sector , Kerala Initiative"

Smt. Beena L
Chief Engineer (Buildin
PWD

Contents

EPC stands for:



- In EPC contract, the owner provides the functional requirements and approves the design and drawings.
- The contractor prepares the detailed engineering design, procures all the materials and equipments and then construct to deliver a functioning

NEED FOR EPC CONTRACT

ventional item-rate contracts are generally prone to time & cost overrun
o:

- Involvement of multiple agencies
- Failure of even one contract delays the project
- Lack of flexibility in replacing failed agency on real time basis
- Variation in items and quantities.
- Measurements recording and preparation of Bills laborious and consuming (particularly in buildings construction contracts)
- Cost overruns delaying payments to contractors at times.

OBJECTIVE OF EPC CONTRACT

mplementation of project to specified standards with a fair egree of certainty relating to time & cost while transferring he construction risk to contractor.

n EPC mode, Responsibility for INVESTIGATIONS, ESIGN and CONSTRUCTION lies with the ONTRACTOR for a LUMP SUM price determined hrough competitive bidding.

ngagement of professionally managed agencies.

Mode of execution of EPC Contract

(*Ref*: CPWD OM no. DG/MAN/Misc /26 dated 25/05/2019)

- Para 4.8 of CPWD works manual 2019 and OM no. DG/MAN/Misc/26 dated 25/05/2019, mandates that tenders for works costing more than 1 crores shall be called in EPC mode.

- Tenders in EPC ode must be in the order of preference .

Mode I	**Technology Neutral Tender**	**Preferred mode**
Mode II	**Technology Neutral Tender**	**Second in Preference**
Mode III	**Technology Pre - Selected**	**Third in Preference**

Mode I

s Engineering (preparation of
tectural , structural, Services
n and drawings) procurement
onstruction by the contractor
on conceptual architectural
ngs attached with the tender
documents

Mode II

Involves part Engineering (preparation of architectural , structural, Services design and drawings) procurement and construction by the contractor based on preliminary conceptual architectural design and drawings attached with the tender documents, detailed architectural design and drawings may be provided by the Engineer in charges in stages/ parts during execution.

Mode III

Involves procuremen
construction by th
contractor based
architectural, structur
services design ar
drawings attached wi
tender documents or
provided by the Engi
charge in stages/ p
during execution

Tenders can be invited under mode III only if any of (a), (b), (c) as hereu
is satisfied.

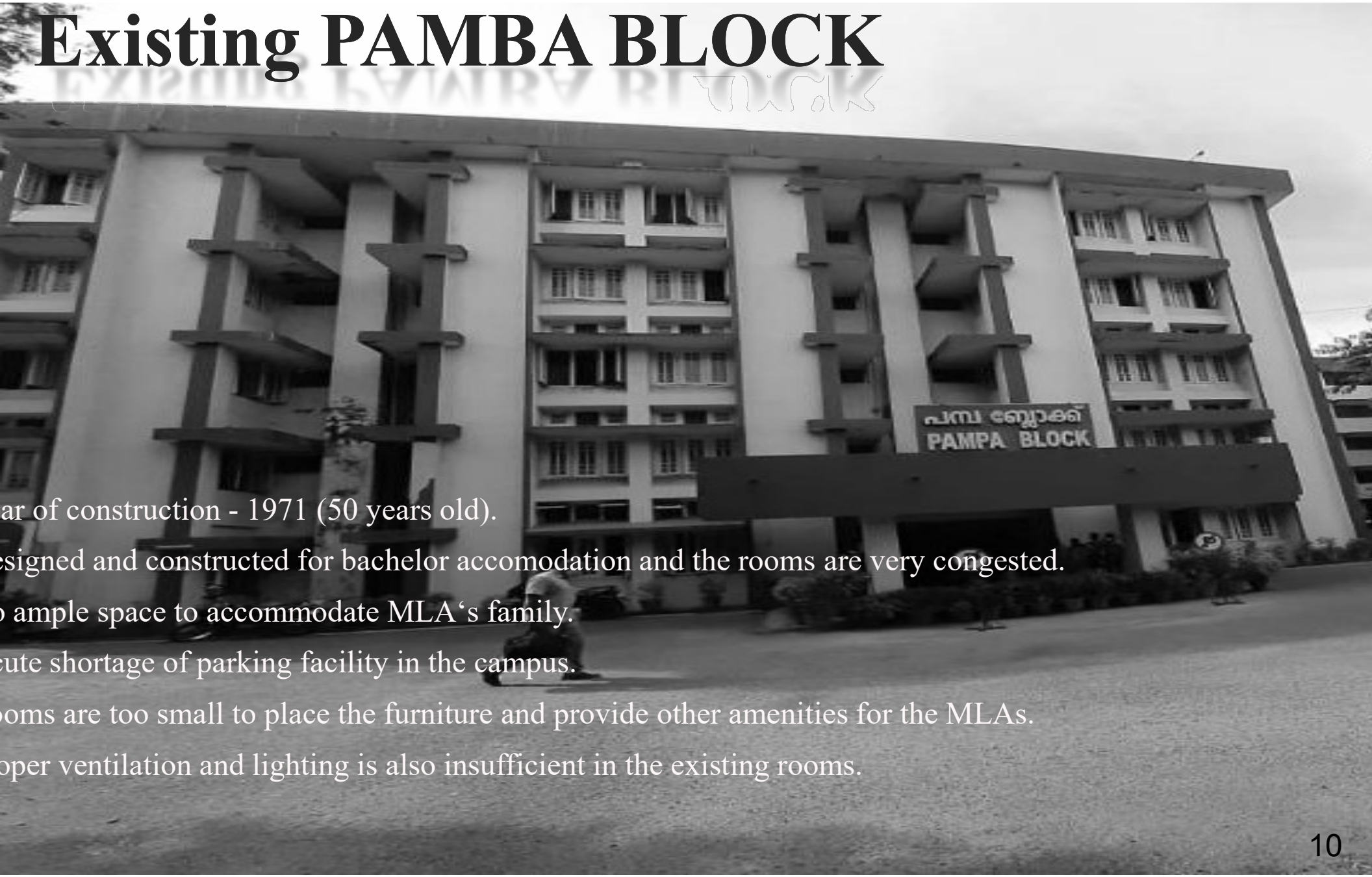
- Client resolves for a particular technology
- Client has already finalized all drawings (Architectural and Engineeri
- The functional requirement of work/ site requirement so demands

nstruction of a Multistoried sidential Apartment at MLA Hostel luding Multilevel Car Parking at LA Hostel Campus – EPC Mode

ral Wing, Kerala PWD

MLA HOSTEL PALAYAM TRIVAN

Existing PAMBA BLOCK



ar of construction - 1971 (50 years old).

esigned and constructed for bachelor accomodation and the rooms are very congested.

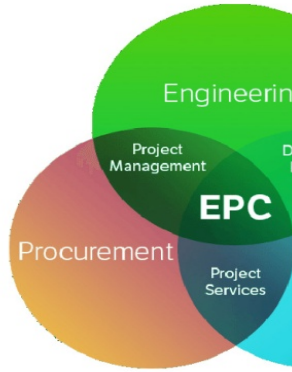
o ample space to accommodate MLA‘s family.

cute shortage of parking facility in the campus.

ooms are too small to place the furniture and provide other amenities for the MLAs.

oper ventilation and lighting is also insufficient in the existing rooms.

lew Pamba Block



As construction of new Pamba block, in EPC mode is taken up for the first time in PWD Buildings ing, a new composite standard bid document is prepared.

EW PAMBA BLOCK -3D model

W PAMBA BLOCK

he new proposal is a thirteen storey flat having a total plinth area of 11706 m2
ie. 1,25,956.56 Sq ft)

ach floor have 6 units and the total units in 10 floor is 60.

Guest suites are provided at the ground floor.

ellar 2 consists of car parking (12 nos), LPG gas cylinder room, pump room, generator room, store and UG sump etc.

ellar 1 consists of car parking (15 nos) and two wheeler parking (7 nos), driver's room and fire control room etc.

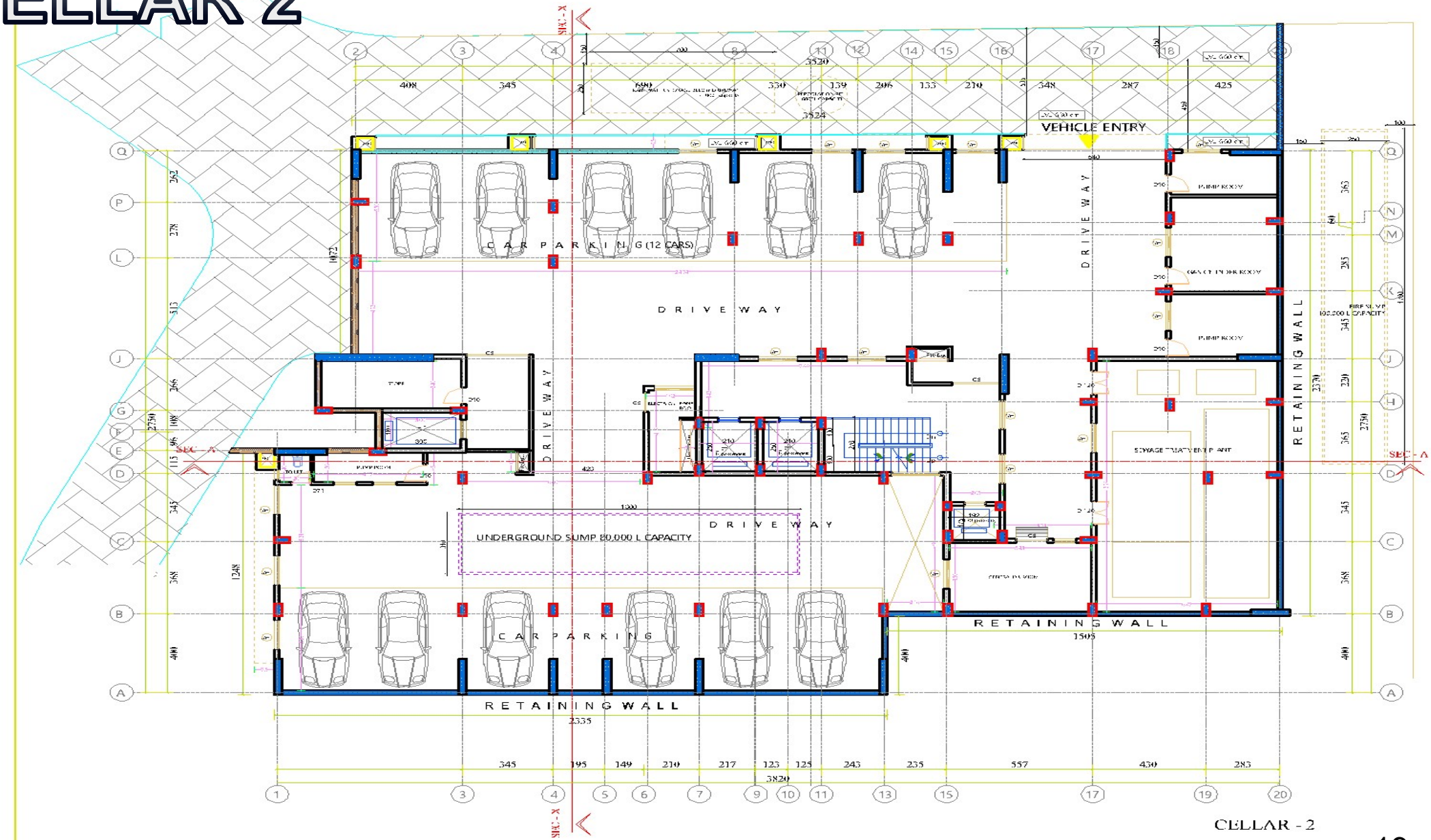
round floor consists of reception, guest suite apartment, gymnasium, canteen, kitchen, work area, multipurpose hall, r
ll etc.

rst floor to tenth floors are typical; each floor consists of 6 apartments.

rrace floor consists of over head tanks, lift machine rooms etc.

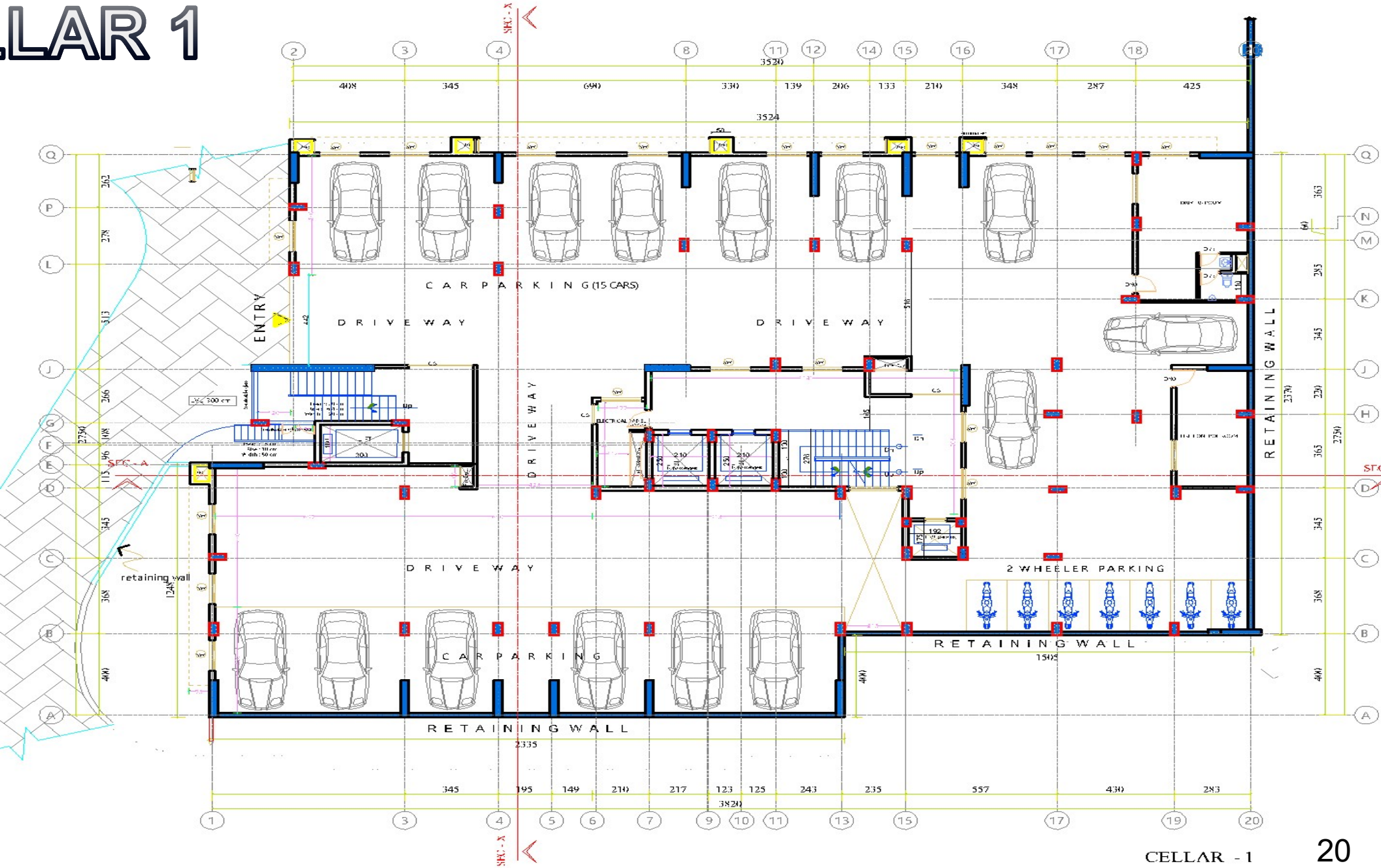
FLOORS	AREA
Cellar 2	299 Sqm
Cellar 1	289 Sqm
Ground Floor	918 Sqm
Typical Floor	873 Sqm (873x10 floors)
Terrace Floor	109 Sqm
Machine Floor	96 Sqm
Porch	28 Sqm
Parking	1333 Sqm
TOTAL AREA	**11706 Sqm**

ELLAR 2



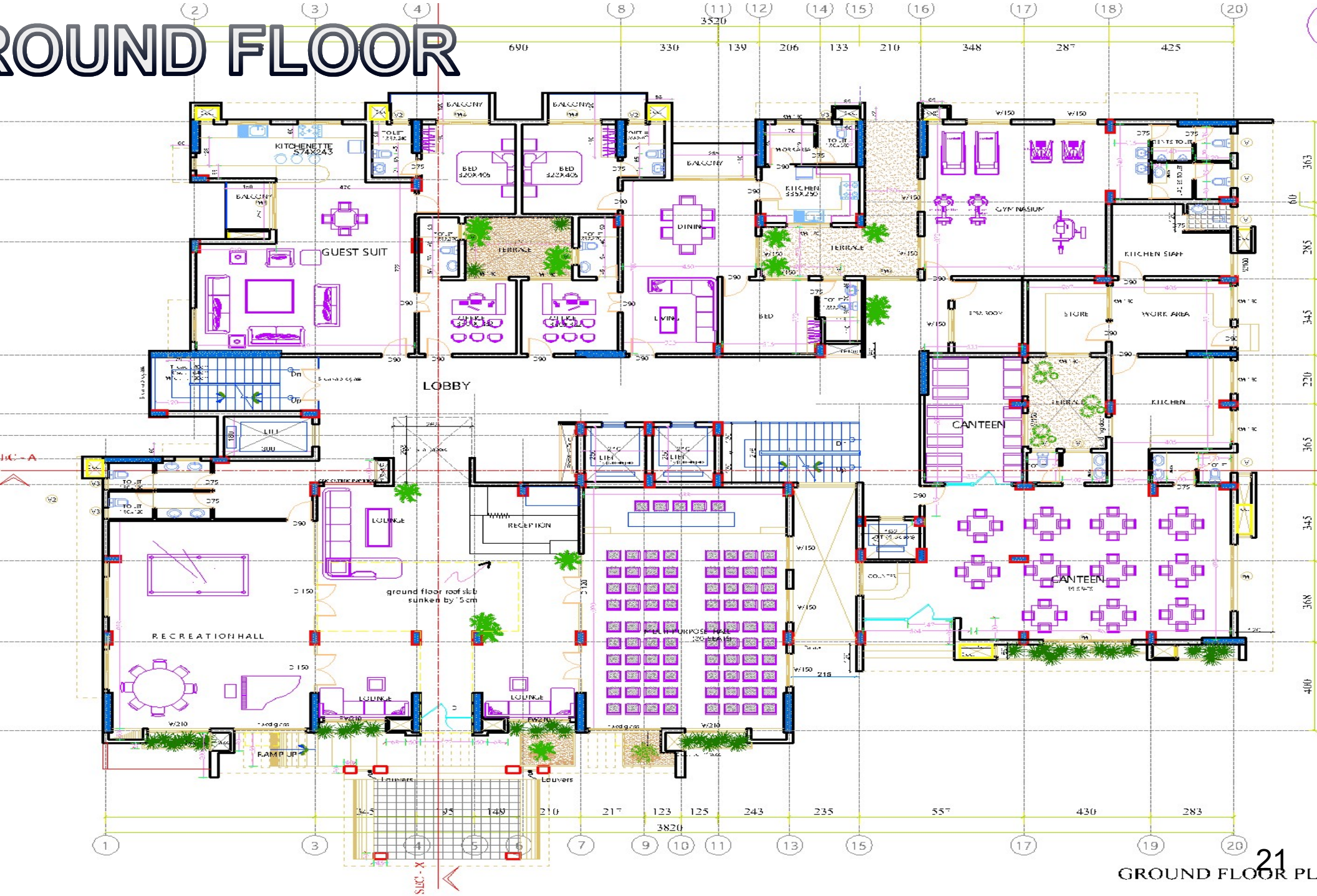
CELLAR - 2

LAR 1



CELLAR - 1

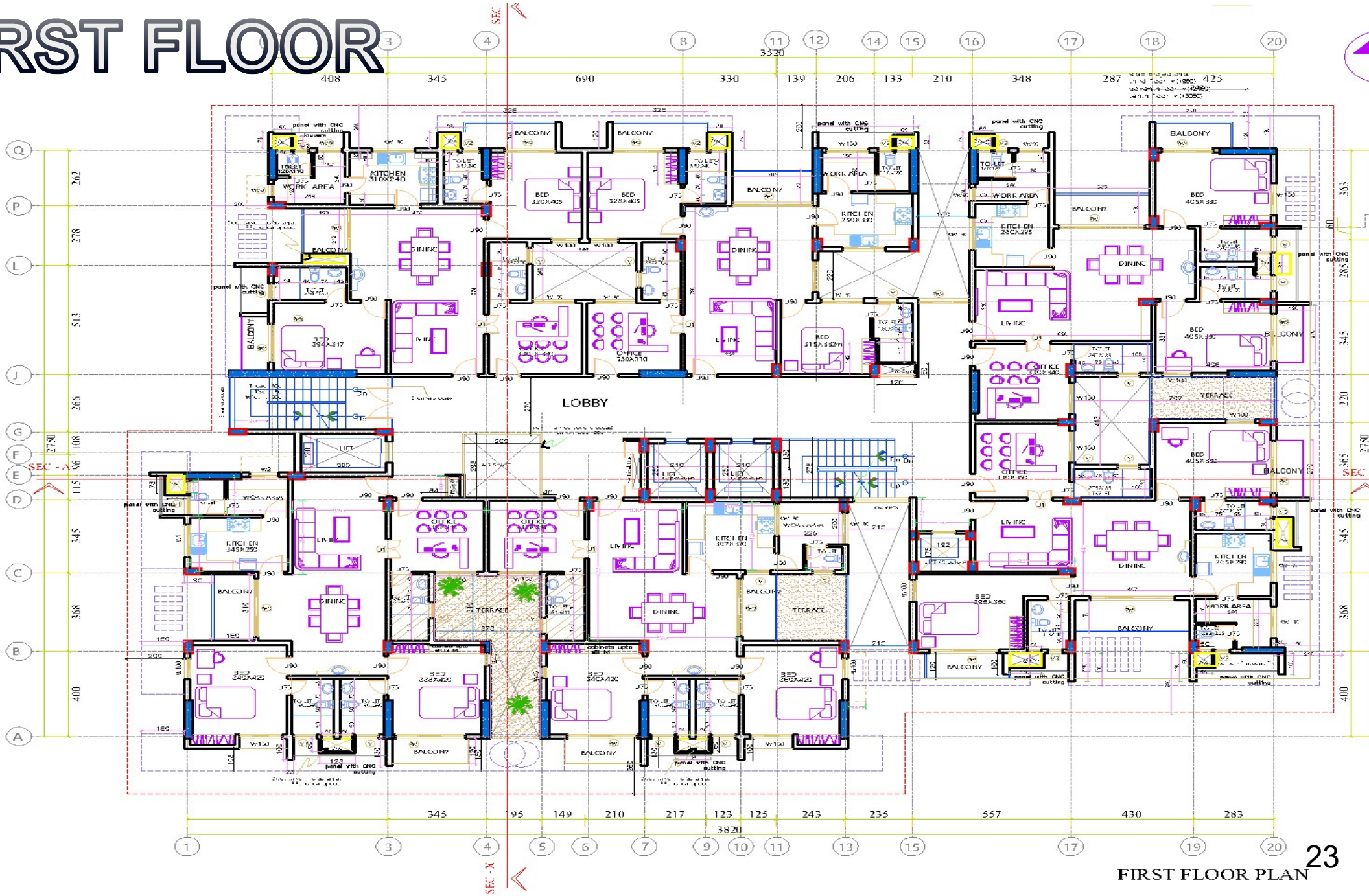
ROUND FLOOR



GROUND FLOOR PL

GROUND FLOOR PLAN

RST FLOOR

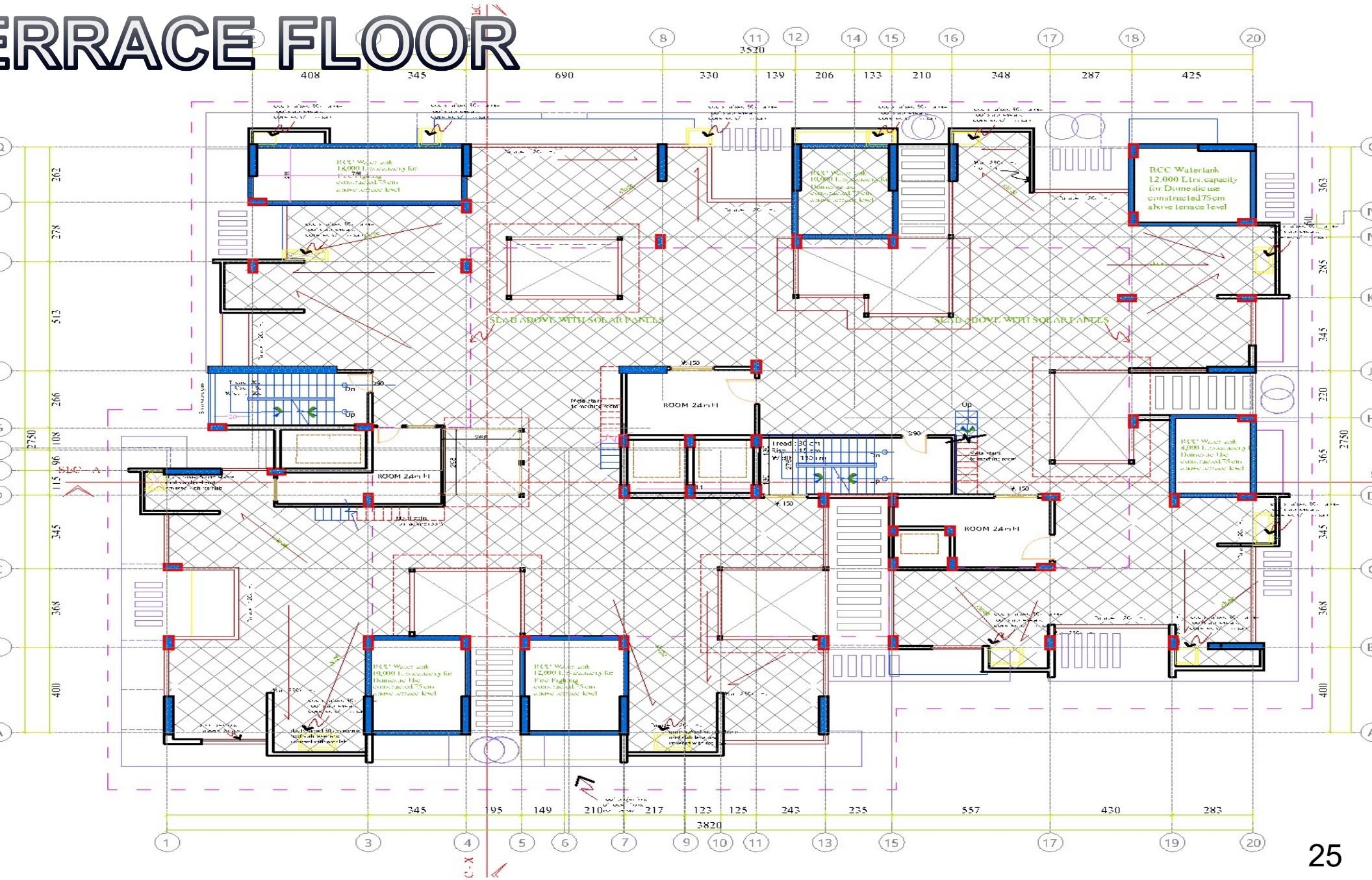


FIRST FLOOR PLAN

ICAL FLOOR


LOBBY
LIFT
AIR SHAFT
BALCONY
KITCHEN 310X240
WORK AREA
BED 320X405
BED 328X405
DINING
LIVING
OFFICE 330 X 330
OFFICE 330X330
BED 394X317
BED 315X332m
KITCHEN 250X330
KITCHEN 260X295
BED 405X330
OFFICE 330X340
OFFICE 330X350
KITCHEN 345X250
OFFICE 338X330
KITCHEN 307X320
KITCHEN 265X290
BED 380X350
BED 340X420
BED 338X420
BED 350X420
semi framed toughened glass balustrade 120 cm ht
Breakable glass
slab projection at third floor lvl(+1020) fifth floor lvl(+1620) seventhfloor lvl(+2220) nineth floor lvl(+2820)
slab projection at second floor lvl(+720) fourth floor lvl(+1320) sixth floor lvl(+1920) eighth floor lvl(+2520) tenth floor lvl(+3120)
slab projection at fourth floor lvl(+1320) seventh floor lvl(+2220) tenth floor lvl(+3120)

ERRACE FLOOR



Government Order No. Rt. No 1215/2022/PWD dated 12/12/2022

- The Govt vide G.O under reference has accorded Administrative Sanction for an amount of Rs. 76,96,51,000/- for the said work to be implemented in Engineering Procurement Construction (EPC) mode.

- The standard bidding document for EPC mode is prepared based on the model EPC document published by CPWD.

- The model EPC document and general conditions of Contract 2020 has been customised to suite the requirements for implementing the above project by Kerala PWD.

GOVERNMENT OF KERALA

PUBLIC WORKS DEPARTMENT

BID DOCUMENT FOR EPC CONTRACT

ased on Template from Model NIT and
ustomized with relevant GO's and
ircular.

INDEX

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1 Scope of Work, General Condition for Planning & Design
2 Safety, Health & Environment

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3 Design Basis Report for Civil Works
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Chapter- C: Scope and Specifications of Electrical and Mechanical Works

1 Association of Agencies for Execution of E&M Works by Main Contractor
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Chapter – D: Reports and Drawings (Indicative)

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2 Architectural Plans (Indicative)

Chapter – E: Schedule of Stage Payment

1 Payment Conditions and Schedule of Stage payment

Chapter – F: Schedule of Financial Bid

1 Schedule of Financial Bid

SCOPE OF WORK

Includes structural design, MEP design and detailed drawings of all required services for commencement o works, execution of Civil, Electrical, Electronics and Mechanical works including Multilevel car parking & services and handing over the assets after making them habitable in all aspects.

The scope is inclusive of topographic survey, sub soil investigation and all ancillary works.

The cost of labor, material, tools and plants and machinery required for execution of the whole project as pe approved Layout plan & detailed design and vetting of structural design drawings from IIT/NIT is within the scope of this work.

The work is to be executed on EPC mode.

Design proposal must satisfy NBC, KMBR and Local fire department as amended from time to time.

Prior NOC from Fire & Rescue department, Pollution control board, and any other statutory permits i required should be obtained by the contractor.

OUNDATION & FRAMED STRUCTURE WORKS

Confirmatory boring shall be done and type of foundation shall be decided to consultation w
ngineer in charge shall be done with all codal provisions.

Mix design (min. grade M-40) shall be provided unless and otherwise special sanction obtained fi
ngineer in charge.

SIGN CONSIDERATIONS & REQUIREMENTS (CIVIL WORK)

The Building for 13 floors [CF1, CF2, GF + 10 upper floors)

Type of Structure – The structure shall be either with conventional RCC framed cast-insitu construct
r precast construction or Monolothic shear wall construction as per Tenderer's Own Structu
Designs.

The tenderer should invariably adopt the architectural plans, elevations, sections and details enclosed
ender with minor changes if necessary with prior approval of Engineer-incharge.(in ** with Cl
ngineer)

All concrete to be used /prepared at site shall be Design Mix concrete/ RMC as per mix des
pproved by Engineer-in-charge.

Quality Assurance, Monitoring and Supervision

The Contractor shall procure all documents, apparatus and instruments, fuel, consumables, water, electricity, labour, Materials, samples, and qualified personnel as are necessary for examining and te the Project Assets and workmanship in accordance with the Quality Assurance Plan.

oratory at site:

The contractor shall establish a testing lab at site and provide testing equipment

materials for the field tests mentioned in the list of mandatory tests given in CPWD Specifications Vol. 1 & 2. Nothing extra shall be payable to him on this account.

er Laboratories:

At least 10% testing of materials shall be got done from external independent laboratories. The aboratories shall be decided by the Engineer-in-Charge.

rd party quality control/assurance:

Third part quality control/assurance may be conducted by IIT/NIT/Government Engineering College/Government Institutes or any other Empanelled agency, if directed by Engineer-in-Charge.

The contractor has to provide all necessary assistance and has to submit compliance report within ta ime frame.

ime allowed for execution of work: 30 months (Following breakup is indicative only)

Months for Planning, Designing and obtaining various approvals as per this contract document and omplying all pre-construction activities for commencing the construction work, thereafter

5 Months for execution and physical completion, occupancy certificate from local body and no bjection certificate from fire department and all local body approval.

efect Liability Period : **60 months,** after completion of construction work or record of final ompletion certificate, whichever is later.

Authority to decide:

(i) Extension of time	Agreement authority of major component of work or successor thereof with du recommendation of Engineer- in –charge of respective components. (The final autho decide final extension of time is **Superintending Engineer** or his successor thereof)
(ii) Rescheduling of mile stones	**Superintending Engineer** or his successor thereof

EDULE 'F'

Officer inviting tender	Superintending Engineer, PWD Buildings South Ci Thiruvananthapuram
Maximum percentage of quantity of items of work to be executed yond which rates are to be determined in accordance with Clause 12.2.	25%

Definitions:

(i)	Engineer-in-Charge For Civil items of work	Executive Engineer, KLC Construction Div Thiruvananthapuram or successor there
(ii)	For Electrical items of work	Executive Engineer (Electrical), Electrical D PWD, Thiruvananthapuram or successor th
(iii)	For Horticulture items of work	Executive Engineer, KLC Construction Div Thiruvananthapuram or successor there
(iv)	Accepting Authority	Superintending Engineer, PWD Buildings S Circle, Thiruvananthapuram.
(v)	Percentage on cost of materials and Labour to cover all overheads and profits	15%.
(vi)	Standard schedule of rates	DSR 2018

(vii)	Department	Public Works Department Govt. of Kerala
(viii)	Standard PWD Contract Form	GCC for EPC projects and SBD for projects

Clause 1	i) Time allowed for submission of Performance Guarantee, Programme Chart (Time and Progress) and applicable labour licenses, registration with various applicable Welfare Board or proof of applying thereof from the date of issue of letter of acceptance. ii) Maximum allowable extension with late fee @ 0.1% per day of Performance Guarantee amount beyond the period as provided in (i) above	28 Days 10 Days
Clause 2	Authority for fixing Compensation under Clause- 2	Superintending Engineer, PWD Build South Circle, Thiruvananthapuram
Clause 5	Number of days from the date of issue of letter of acceptance for reckoning date of start	10 Days

MILE STONE ACHIEVEMENT CHART

Duration (Months)	Cumulative Duration (Months)	
5	5	Design of structural drawing vetted by IIT/NIT. Obtaining all statutory approvals from concerned departments.
3	8	Construction of retaining wall and foundation including sump.
13	21	Completion RCC framed sub structure and super structure (13 floors)
5	26	Completion of masonry work, flooring including completion of doors and windows etc.
4	30	Finishing work & Handover.

Note: The contractor shall submit a detailed work break down structure which shall duly be approved by the Engineer in charge. It will form part of agreement and form the basis for effecting penalty charges on non-achievement of mile stone

A collaborative approach

t will be desirable to establish harmonious relationship with the ontractor in long-term contracts, especially with service element.

Contracting Agency

Contractor

Conclusion

EPC projects are quite popular in the present scenario as it leads to better designing, effectiveness, efficiency etc.

The maximum percentage of risks are transferred to contractors' side in EPC Contracts should be the duty of client to be clear and specific towards his design and contract requirements.

Delay in taking statutory approvals and shortage of funds are among the most comm reasons of time, cost overrun in most of the building construction projects regardless procurement method being adopted.

Because of fixed design, fixed cost parameters, EPC Contracts are found to be suitable public sector projects provided that all the approvals have been taken before commencem of construction work.

THANK YOU

TACKLING VARIATIONS IN EPC CONTRACTS

AUTHORED

BY

T. MOHAN

What is a EPC Contract?

- A contract for a Lumpsum price for Engineering, Procurement and Construction work, by the Contractor complying with Employer's Requirements.
- The legal responsibility for the design and planning rests with the Contractors.
- The most prudent way in administering the contract would be to avoid variations. However, in practice,
- 'Variations' during execution are almost inevitable.
- 'Variation' could be in/due to,
  - Quantity of component works
  - Quality
  - New items
  - Substituted items
- Variations attract time and or cost compensation.

Time compensation or EOT

- The best practice would be to assess EOT based on the base construction programme. As almost all the projects employ software's for construction programme, this has been made easy. Insert the entitled extension of time for varied activities and run the programme to arrive at the Revised completion date. This yields the EOT for completion. As the programme is submitted by the Contractor and approved by the Engineer there is hardly any room for dispute.

- Often it is noticed that EOT's are not granted ,then and there during the Contract Period. This practice should be discouraged. Such delayed determinations make handling delays difficult. Being an Arbitrator, I find many claims revolving around delay in grant of EOT and consequences ,there of. Equally important ,is the need to have documentary evidence like 'Hindrance Register'.

Time compensation or EOT-Continued

- The other important consequence of delay is ‘Levy of LD’
- Modern day contracts provide for the Contractor to carry out the work, during
  - the Contract Period
  - the approved extended contract period (without LD)
  - the period beyond extended period with levy of LD.
- The moment the contract spills over the completion date, EOT up to that point of time should have been/ be finalised. This should be followed up with periodical ‘delay analysis’.
- The moment the work spills over the extended contract period ,the contractor should be notified of the levy of LD. simultaneously the loss or damage to the Employer because of delay in completion should be identified and placed on record. Levy of LD and rate thereof is already agreed in the Contract.
- However, many Court Judgements insist on the proof for the incidence of damages/injury caused to the Employer consequent to such delays, if not the extent. So, it is in the Employer’s interest that documentation on ‘Delays and consequence’ is maintained and communicated contemporaneously.

Time compensation or EOT-Continued

- Now on to **'Cost compensation' due to variation**
- Let us remember EPC Contracts have lumpsum price There are no individual items of work with 'Quantity, Rate, Amount'. This makes the rate fixation for varied works difficult .To overcome this, let us look at options suggested by FIDIC and MORTH on 'Variations':
  - FIDIC SILVER BOOK
  - MORTH

FIDIC SILVER BOOK

- ‘Variations’ are dealt with in Clause 13 ,GCC.
- Variations may be initiated by the Employer, any time prior to issuing the ‘Taking over Certificate’ for the works either by instruction or by a request for contractor to submit a proposal.
- A variation shall not comprise the omission of any work which is to be carried out by others.
- The Contractor shall be bound to execute such variation unless they notify the Employer that,
  i. they cannot readily obtain the Goods required for variation,
  ii. it will reduce the safety or suitability of the Works or
  iii. it will have an adverse impact on the achievement Guarantees.

FIDIC SILVER BOOK-Continued

- On receipt of the notice the Employer shall cancel, confirm or vary the instruction.
- The Contractor at anytime may also submit to the Employer a written proposal under value Engineering which if adopted will reduce the cost, efficiency or value of the completed works or benefit to the Employer. Variation procedure shall be followed.
- Prior to instructing a variation the Employer may request a proposal from the Contractor on,

a) proposed design and/or work to be performed and a programme for its execution

b) modifications to the programme and time of completion

c) Contractor's proposal for adjustment to the contract price

FIDIC SILVER BOOK-Continued

- The Employer may approve, disapprove or comment on the proposal.
- Instruction for variation with any requirements for **recording of costs** shall also be issued.
- Upon instructing a variation the Employer shall proceed vide Sub Clause 3.5 to agree or determine, adjustments to contract price.
- As per 3.5 the Employer shall consult with the Contractor in an endeavour to reach agreement. If not, the Employer shall make a fair determination.
- Either way, the Employer shall notify so and if the Contractor is dissatisfied can respond within 14 days. Either party may then refer the matter to DAAB.
- Equally important is the suggestion under FIDIC 'Notes on preparation of Tender Documents':

  In order to value variations, tenderers may be required to include in their Tenders detailed price break downs, including quantities, unit rates and other pricing information…..

- So, 'Particular Conditions of Contract' should include this clause and the price breakdowns of individual items of work will be handy to evaluate costs for variations.

MORTH

- The EPC document terms the variation as ‘change of scope’.
- Change of scope means change in specification, omission of work subject to condition that the omitted work is not executed through any other authority, additional work, plant, materials or other services.
- If the Contractor determines at any time that a change of scope under ‘value Engineering’ will be beneficial to the Project/Employer they can submit an proposal for the consent of the authority.
- The Authority shall direct the Authority’s Engineer to issue **‘Change of Scope Notice’**
- The Contractor will document,
  - impact on time of completion
  - options for implementing proposed change of scope, with details

MORTH-Continued

- The contractor’s quotation of costs for the Change of Scope shall be determined as follows:
- (a) from current SOR of State PWD Circle, concerned. If current rates are not available updation thru’ WPI shall be resorted to.
- (b) for works not similar in nature, to the works being executed, cost of work shall be derived on the basis of MORTH Standard Data book and the applicable schedule of rates of relevant circle, updated with WPI’s.
- For items not included in the SOR, prevailing market rates as determined by the Authority’s Engineer, shall apply.
- Upon reaching an agreement the Authority shall issue **‘Change of Scope Order’**

MORTH-Continued

- The Contractor shall then proceed with the varied work.
- Unless the parties mutually agree to the contrary, the total value of all Change of Scope Orders shall not exceed 10(ten) per cent of the Contract Price.
- In the event of the Parties are unable to agree to the proposed Change of Scope Orders, the Authority may after giving notice to the Contractor invite open competitive bidding for the varied works and the contractor has the to match the first ranked bid, subject to payment of 2% of bid amount to the authority and their bid does not exceed the first placed Bid by >10%

Key points from the above narrative

- Define the ‘Scope of work’ accurately
- Rates for varied items of should be either:
  the relevant rates in the price breakdown /derived from such rates
  (or)rates as available in the SOR of govt departments
  (or) rates as fixed by the Authority’s Engineer,
  as the case ,may be.
  The Contract could provide for ‘the rates determined by the Employer is final and binding on the Contractor’
- If the total variation exceeds 20 % of Initial Contract Price, Performance guarantee should be proportionately enhanced
- A ‘cap’ for variation is desirable
- Ensure periodical finalisation of EOT without waiting for completion of work
- Maintain contemporaneous records/correspondence on levy of LD and incidences of damages suffered, therefor

Let us remember that it is the calibre of the Contract Managers that decides the successful completion of the Contract.
Let us try to improve the calibre and competence.

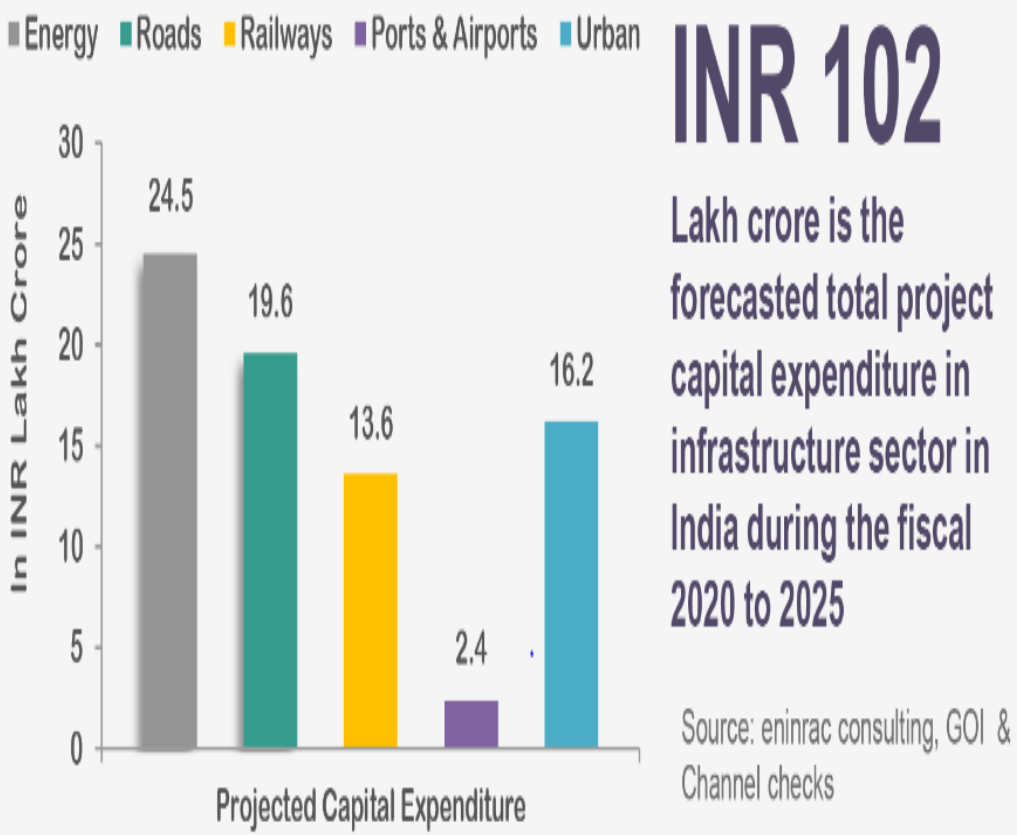
Best Wishes
&
Thank you

EPC CONTRACTS-CHANGING INFRASTRUCTURE CONTRACTING LANDSCAPE

Outline

- Indian Infrastructure Outlook
- Types of Contract
- Advantages/ Disadvantages of Various Types of Contracts
- Evolution of EPC Contracts in India
- Conclusion

Indian Infrastructure Outlook



Infrastructure Investment Plan under NIP 2020-2025

India would need to spend $4.51 trillion on infrastructure by 2030 to realise the vision of a $5 trillion economy by 2025, and to continue on an escalated trajectory until 2030

The industry's output will also be supported by investment of INR111 trillion ($1.5 trillion) under the National Infrastructure Pipeline (NIP), between the fiscal year (FY) 2020 and FY2025 (April 2019 to March 2025).

National Infrastructure Pipeline Sector wise Split

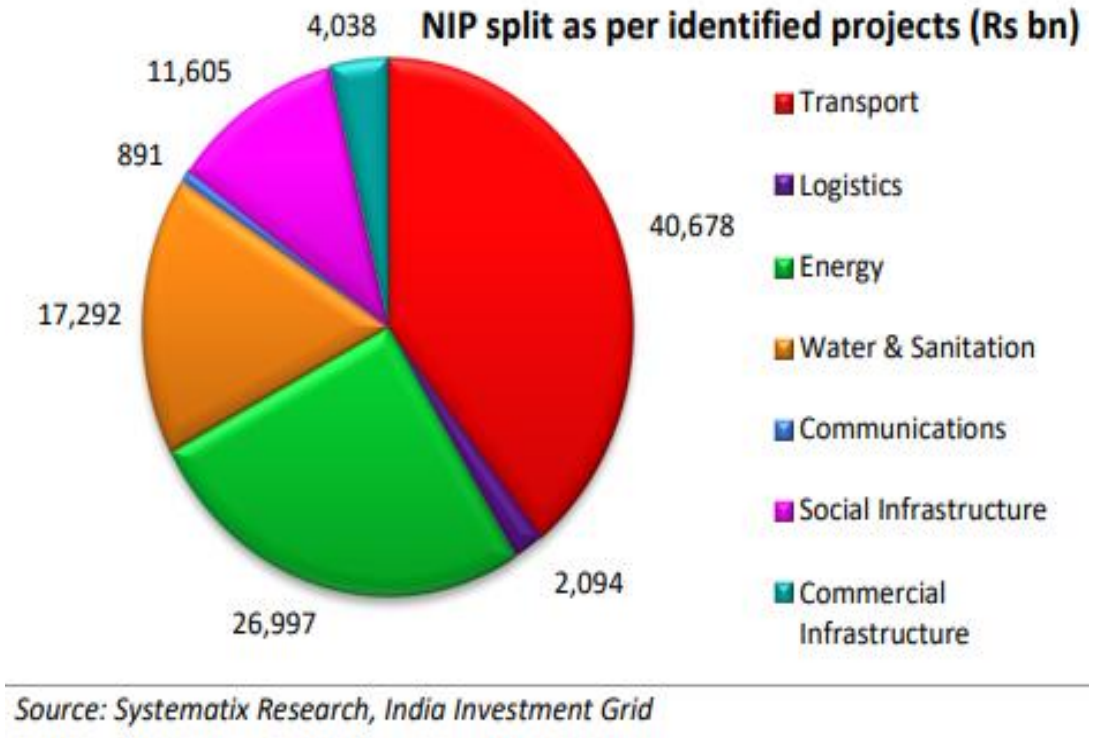
NATIONAL INFRASTRUCTURE PIPELINE

Five-year strategy for India's infrastructure development in important industrie**s.**

Planned investment-Centre (39%): state (39%):private (22%)

Total investment of INR 111 Lakh Crore over 5 years,

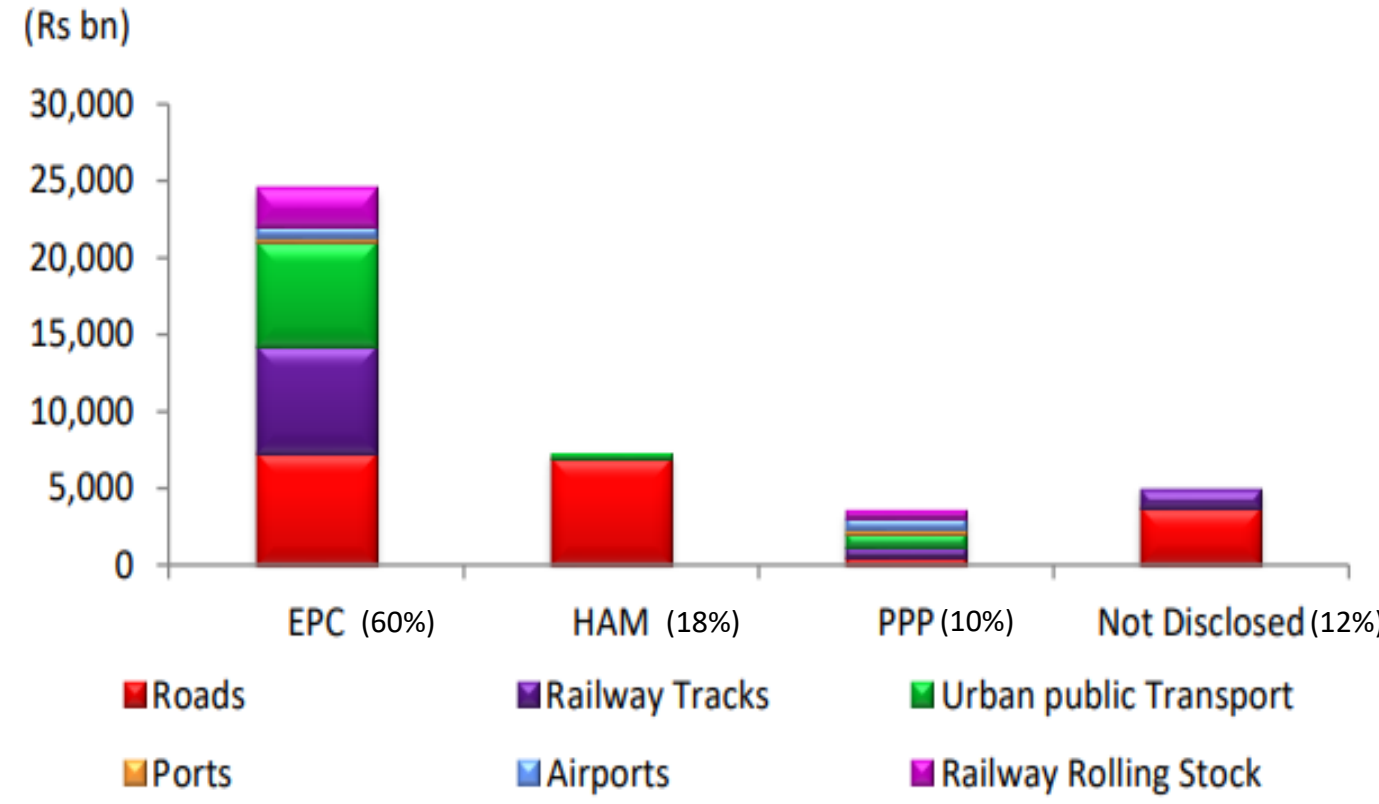
NIP, will create jobs, improve ease of living, and provide equitable access to infrastructure for all, thereby making growth more inclusive.



NIP Sector wise split (Rs Bn)

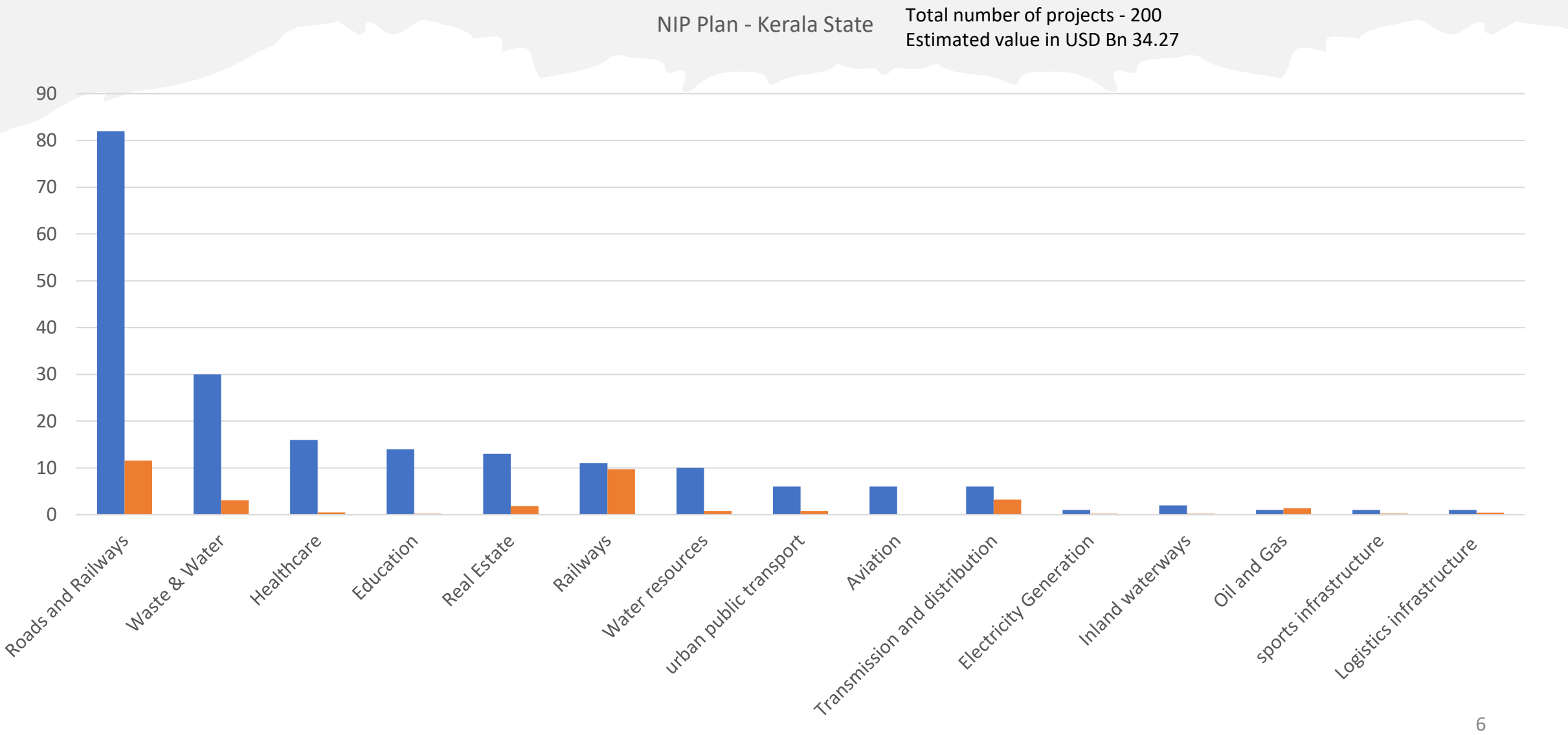
Opportunities planned under NIP- Procurement Model for Transport segment

- Under NIP: Bulk of the new transport segment opportunities are planned under the EPC/HAM route



Source: Systematix Research, India Investment Grid

Nation Infrastructure Pipeline Plan: Kerala state statistics



Source: indianinvestmentgrid.gov.in

TYPES OF CONTRACT

ITEM RATE CONTRACT (RE-MEASURABLE CONTRACT)

COST PLUS FEE CONTRACT (COSTS + % BASIS)

EPC/TURNKEY CONTRACT (FIXED LUMP SUM CONTRACT)

DESIGN AND BUILD CONTRACTS

BOT/DBFOT - BUILD OPERATE TRANSFER CONTRACT (PREMIUM OR GRANT PROJECTS)

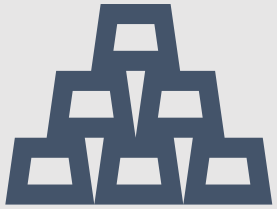
HAM MODEL

ITEM RATE CONTRACT (RE-MEASURABLE)

Based on estimated quantities of work items and unit price

The Design is provided by the Owner.

Quantities of work are measured and payment is made based on measurement



Re-determination of unit prices when substantial quantity deviations.

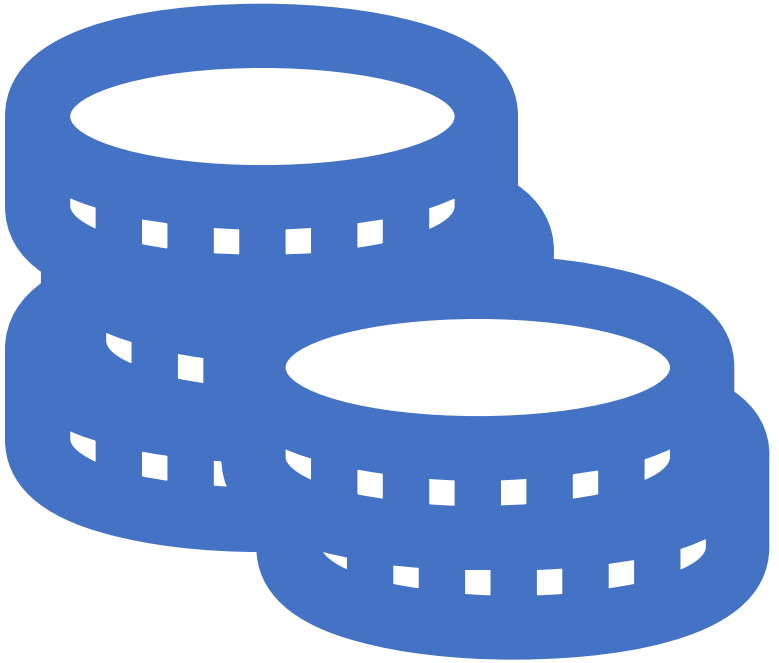
Useful in projects where the nature of the work is well defined, but the quantities of work cannot be accurately determined in advance of construction.

Contractor not to bear risks of quantity variation

Advantages:

COST PLUS CONTRACT

- Allowed expenses plus additional (%) towards overheads and profit.
- Open book accounting
- Advantages:



EPC CONTRACTS

Engineering, Procurement, and Construction.

EPC contractor responsible for the entire project lifecycle from design to construction and handover.

Contractor responsible for accuracy of estimated quantities – no payment against additional quantities

Contractor accepts total responsibility for having foreseen all difficulties and associated costs and no variation allowed in Contract Price to take account of any unforeseen difficulties or costs

EPC CONTRACTS

Advantages

- Clear Budgeting: The fixed price allows for accurate budgeting and financial planning.
- Low Risk for the Owner: The contractor bears the risk of Design, cost overruns and unforeseen circumstances.
- Well-Defined Scope: The scope of work is clearly specified, reducing the potential for disputes.
- Simplified Project Management: Single entity responsible for the entire project
- Time and Cost Efficiency: Streamlined communication and coordination reduce delays and cost overruns

EPC CONTRACTS

Disadvantages

- Limited Flexibility: Changes to the project scope may result in additional costs and delays.
- Ambiguity in Pricing: If the project scope is not well-defined, pricing may be uncertain or incomplete.
- Contractor Dependency: The success of the project heavily relies on the capabilities and reliability of the EPC contractor

Design and Build Contract

Contractor is responsible for design and construction, however design to be approved by Engineer / Employer's Representative

Contractor does not have risk of unforeseeable physical conditions (inc. sub-surface, soil and hydrological conditions)

Design quantity risk lies with Contractor, unless fundamental parameters are changed by Employer

Design and Build Contract

Advantages

•Single Point of Responsibility: client has a single point of contact for the entire project.

• Faster Project Completion: overlapping of design and construction activities can expedite the project timeline, reducing overall completion time.

•Value Engineering Opportunities

Disadvantages

•High level of trust and communication is required

•Design-bid-build allows time for value engineering and more cost-effective approaches, which can extend the overall timeline of the project

•More owner involvement in the build process

BOT CONTRACT

Advantages

- Private Sector Investment: reducing the burden on government finances.
- Faster Project Implementation: Private entities have a profit motive and are incentivized to complete the project efficiently and on time to start generating revenue.
- Risk Transfer: Risks associated with construction, operation, and maintenance are borne by the private entity, reducing the financial burden and liability on the government.
- Performance Incentives: incentives- linking revenue generation to the quality of service provided; resulting in better service quality for users.
- Technology and Innovation: Private entities bring technological expertise and innovation to infrastructure projects.

BOT CONTRACT

Disadvantages

Financial Viability Concerns: The financial viability of BOT projects relies on revenue generation, such as user fees or toll charges. There is a risk that projected revenue may not materialize as expected, which could impact the financial sustainability of the project.

Long-Term Commitments: If the private entity fails to fulfill its obligations or faces financial difficulties, it can create challenges in project continuity.

Limited Resources: Once the concession period ends, the infrastructure is typically transferred back to the public sector. The government may have limited resources in adapting the infrastructure to changing needs or technological advancements

HAM Model

It is a mix of BOT Annuity & EPC Models.

40% payment will be made by Government in equal instalment in construction period and remaining 60% will be made as annuity amounts after commercial operation.

During construction period, Concessionaire to arrange finance for 60% portion.

Government shares the financial risk and bears the revenue risk.

HAM Model

Advantages

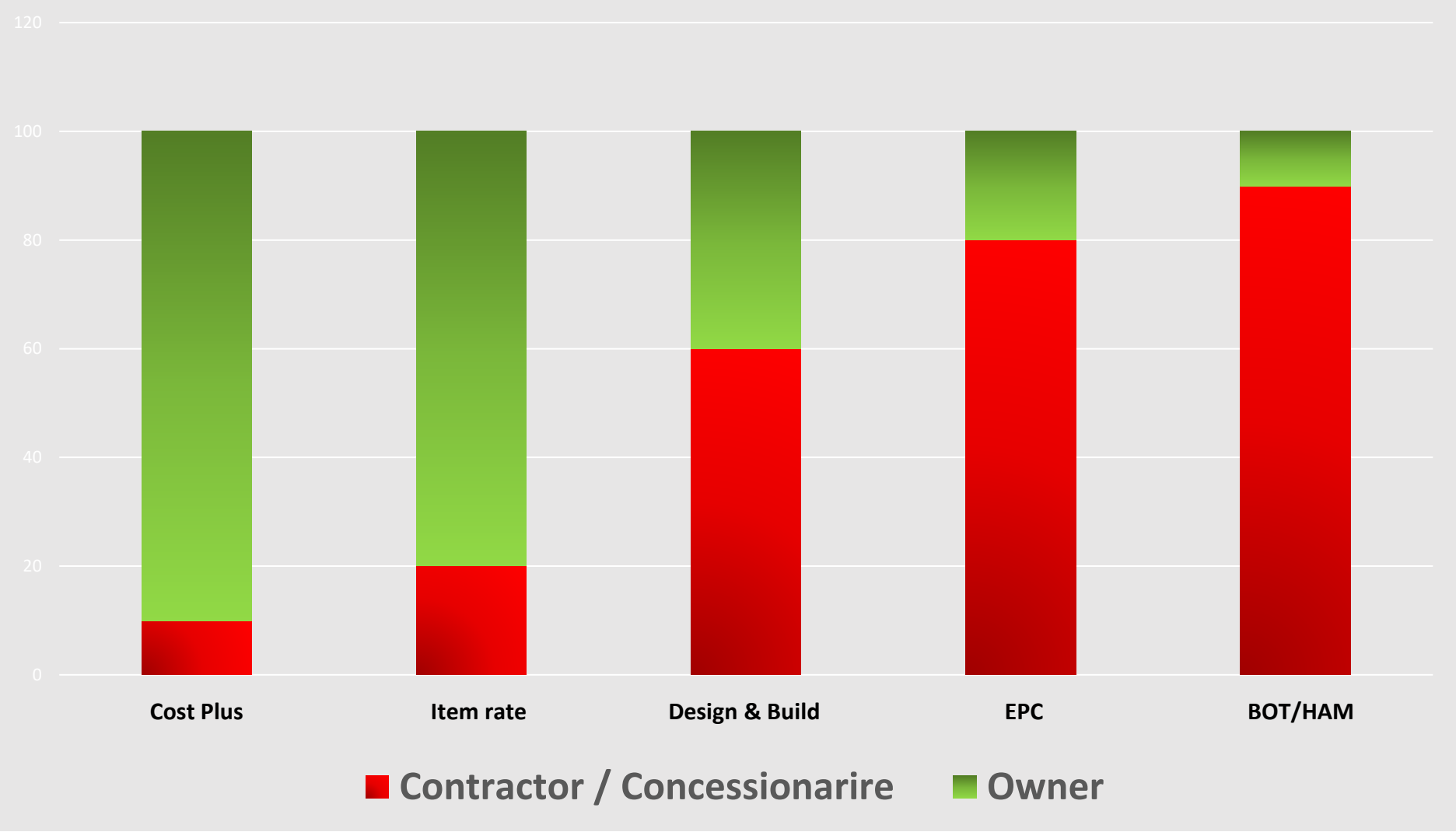
It gives enough liquidity to the developer and the financial risk is shared by the government.

While the private partner continues to bear the construction and maintenance risks as in the case of BOT (toll) model, he is required only to partly bear the financing risk

Challenges & Opportunities

In 2012, the share of Public Private Partnership (PPP) projects in India's national highways was 85 percent; today it stands at 2 percent. The Government needs to engage the private sector more proactively in infrastructure development, while agreeing to shoulder some of the financial burden and risk.

Risk Allocation - Contractor Vs Owner



EPC Contracts In India

- The EPC market in India has evolved over the last few years with increased project size and complexity, increasing private clients and entry of several foreign players.

- EPC contracts - a preferred choice for infrastructure projects in India due to their advantages and effective project delivery.

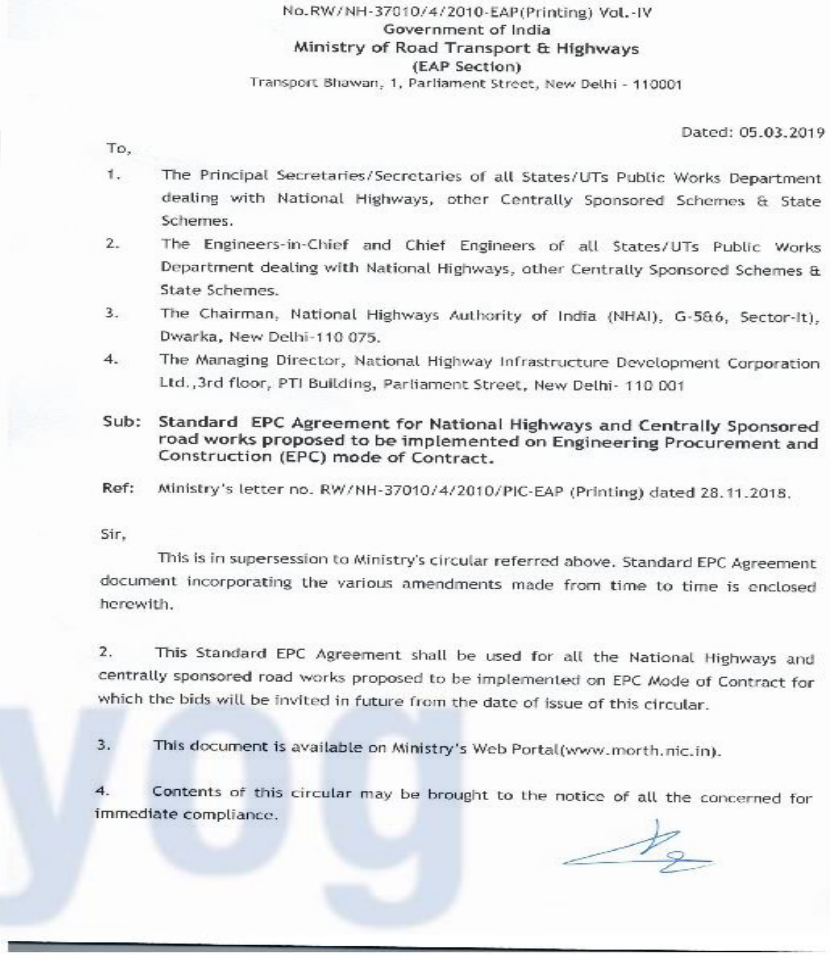
- Used in various sectors, including roads, railways, power, water, oil and gas, and renewable energy.

- visible shift from owner-managed projects to projects where the risk of time and cost overruns has been transferred to the contractor, along with the responsibility of designing, procurement and construction

MODEL CONTRACT AGREEMENT- NITI AYOG-MORTH-EPC CONTRACT

NITI Aayog has recommended implementing model agreements for improving contract procurement, which advocate adopting EPC contracting.

Ministry of Road Transport & Highways has endorsed use of the standard EPC Agreement for all the National Highways and Centrally sponsored road works in the year 2019.



No.RW/NH-37010/4/2010-EAP(Printing) Vol.-IV
Government of India
Ministry of Road Transport & Highways
(EAP Section)
Transport Bhawan, 1, Parliament Street, New Delhi - 110001

Dated: 05.03.2019

To,

1. The Principal Secretaries/Secretaries of all States/UTs Public Works Department dealing with National Highways, other Centrally Sponsored Schemes & State Schemes.
2. The Engineers-in-Chief and Chief Engineers of all States/UTs Public Works Department dealing with National Highways, other Centrally Sponsored Schemes & State Schemes.
3. The Chairman, National Highways Authority of India (NHAI), G-5&6, Sector-10, Dwarka, New Delhi-110 075.
4. The Managing Director, National Highway Infrastructure Development Corporation Ltd.,3rd floor, PTI Building, Parliament Street, New Delhi- 110 001

Sub: Standard EPC Agreement for National Highways and Centrally Sponsored road works proposed to be implemented on Engineering Procurement and Construction (EPC) mode of Contract.

Ref: Ministry's letter no. RW/NH-37010/4/2010/PIC-EAP (Printing) dated 28.11.2018.

Sir,

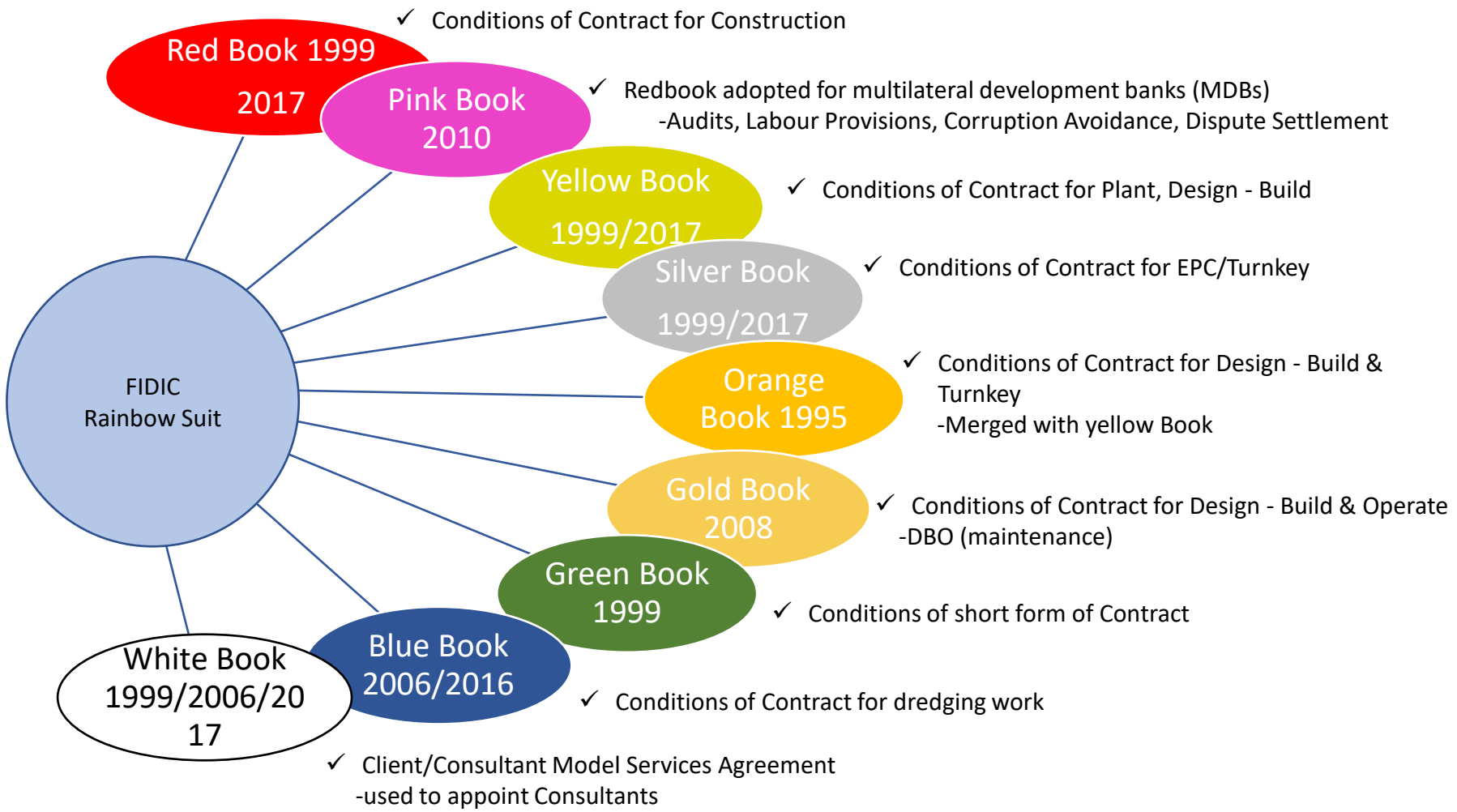
This is in supersession to Ministry's circular referred above. Standard EPC Agreement document incorporating the various amendments made from time to time is enclosed herewith.

2. This Standard EPC Agreement shall be used for all the National Highways and centrally sponsored road works proposed to be implemented on EPC Mode of Contract for which the bids will be invited in future from the date of issue of this circular.

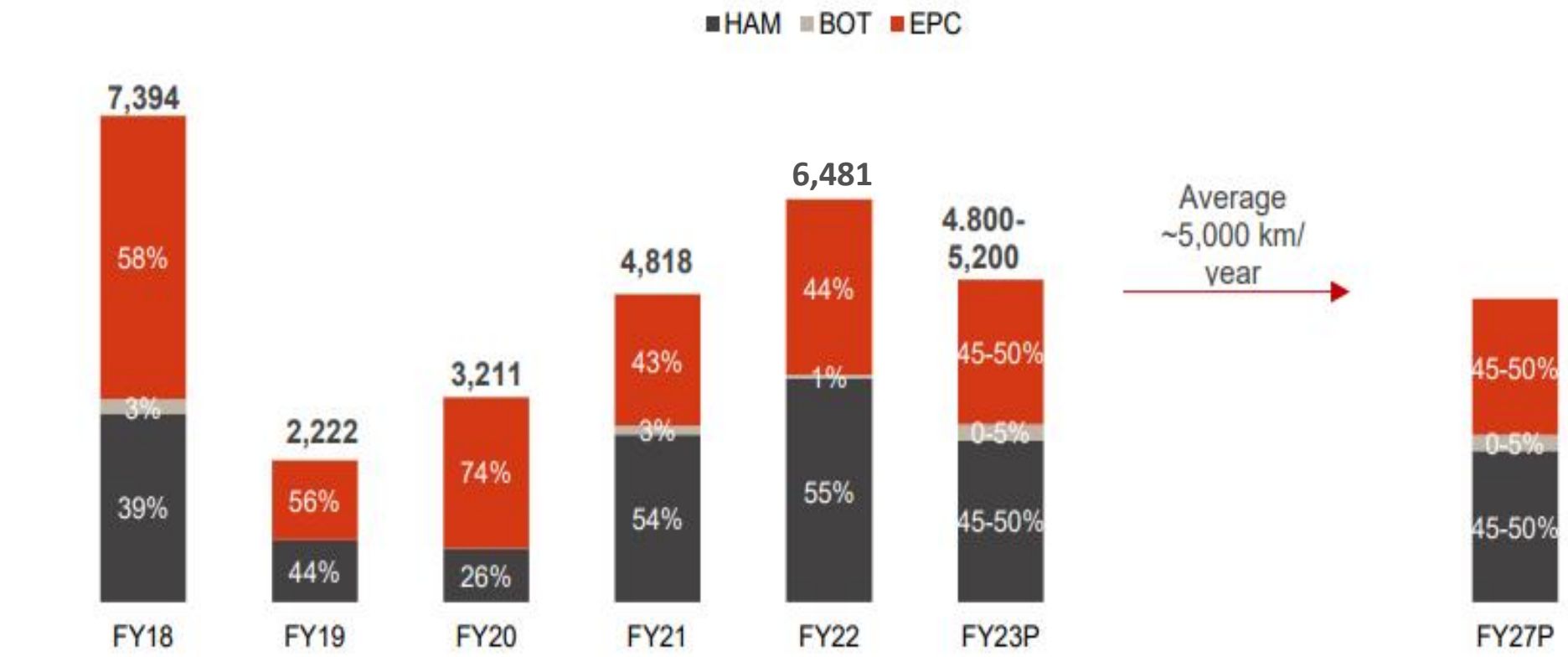
3. This document is available on Ministry's Web Portal(www.morth.nic.in).

4. Contents of this circular may be brought to the notice of all the concerned for immediate compliance.

MODEL AGREEMENT- FIDIC RAINBOW SUITE



NHAI Contracting Model Statistics



Source: NHAI, CRISIL MI&A Research

EPC
CHALLENGES AND MITIGATION STRATEGIES

Challenges	Mitigation Strategies
Passing on the larger risks on Contractor	Adopting balance Risk sharing Contract Agreement
Complete Dependency on the Contractor	Contractor Selection: due diligence to mitigate risks.
Engineering Challenges	Obligations management / Risk allocation
Scope Definition	Change Management: contract should outline a change management process.
Contractual Disputes	Dispute Resolution: robust mechanism such as arbitration

CONCLUSION

Selecting the right type of construction contract is essential for project success.

Each contract type offers distinct advantages and disadvantages, and the choice depends on project-specific requirements and priorities..

By consolidating responsibility, streamlining communication, and providing comprehensive project management, EPC contracts can deliver significant benefits, including simplified project execution, risk mitigation, and enhanced control and accountability.

EPC contract is the most effective way both in terms of time and cost for infrastructure works.


Thank
you

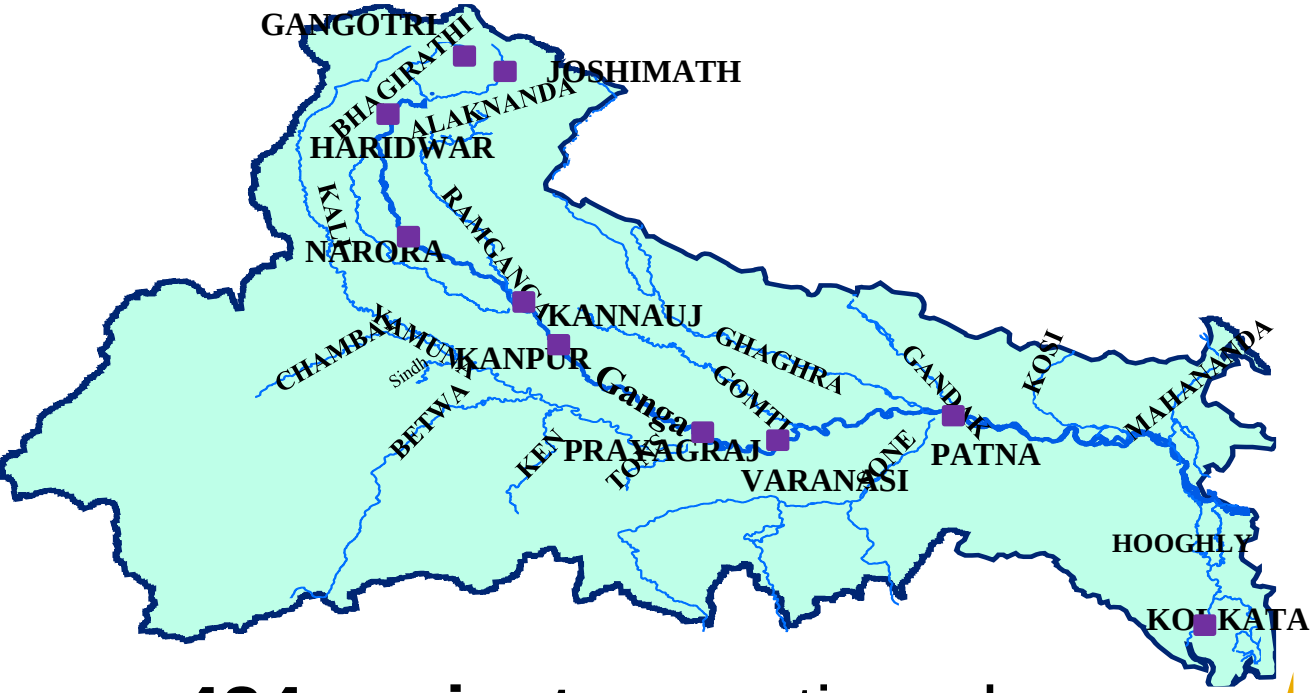
“How Cities Can Leverage Commercial Finance”

Date:24/06/2023

Innovations under Namami Gange

Madhava Kumar R
Advisor
Grant Thornton

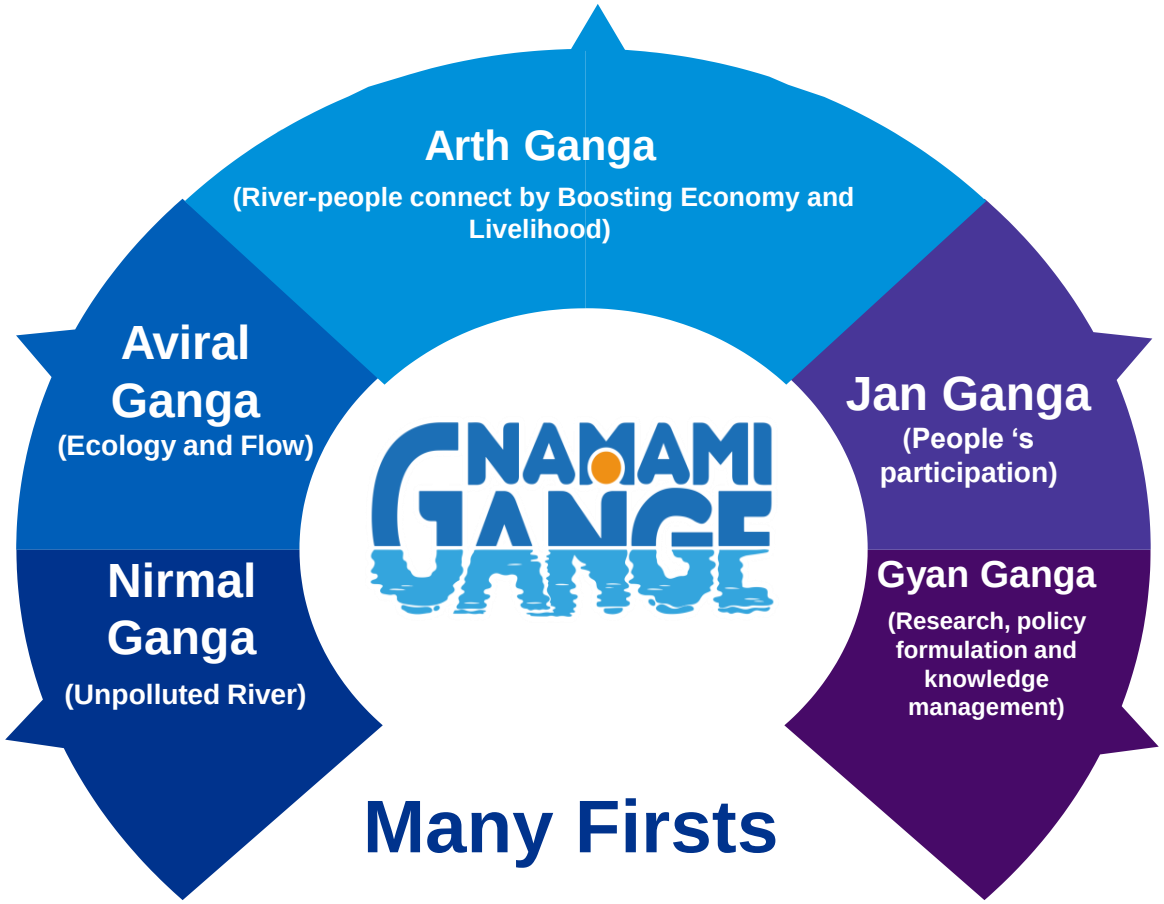
Namami Gange Mission – Enormity Vs Efficacy



2,525 km length	36 Major Tributaries
8.61 million square km area	28% of Water Resources
11 states, 139 Districts	43% of population
100 Ganga Basin Cities	40% of India's GDP

424 projects sanctioned
at the cost of over
Rs 35,414 Cr.

- Integrated river rejuvenation mission.
- Holistic approach, on pollution abatement, improving ecology and flow and strengthening people river connect
- 5 tier Goverance structure.
- Standard Methods & Documents
- Dedicated funding line(100% CSS)

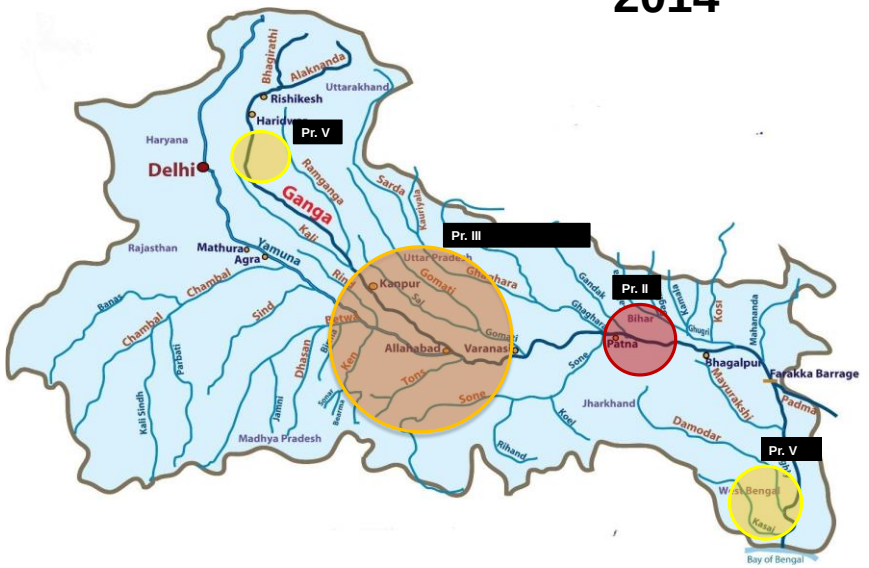


Many Firsts

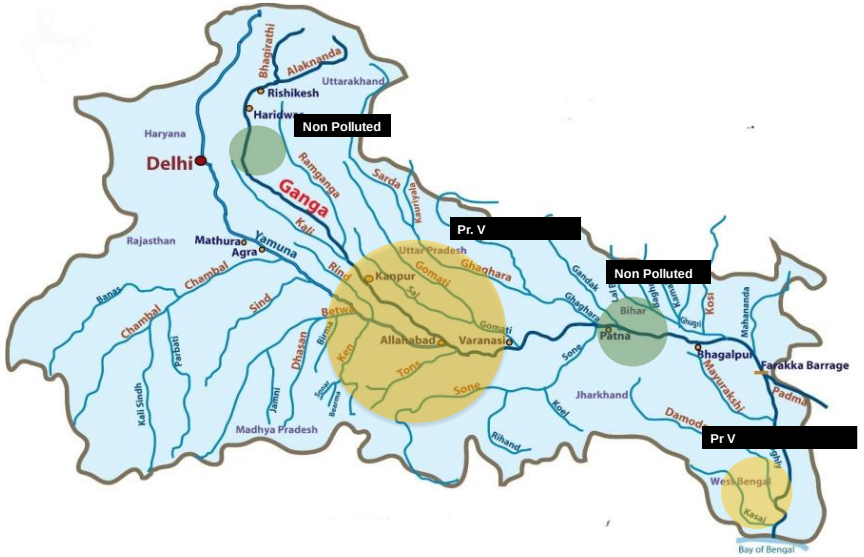
Impact of Namami Gange on Polluted Stretches of River Ganga

State	Polluted Stretches	Bio-Chemical Oxygen Demand (BOD)	
		2014-15	2022 (Jan to Sept)
Uttarakhand	Haridwar to Sultanpur	Polluted Priority-V 4.2 - 5.8 mg/l	Not Polluted < 3 mg/l
Uttar Pradesh	Kannauj to Varanasi	Polluted Priority-III 3.8 - 16.9 mg/l	Polluted Priority-V 2.5– 4.7 mg/l
Bihar	Buxar to Bhagalpur	Polluted Priority-II 7.8 - 27 mg/l	Not Polluted < 3 mg/l
West Bengal	Triveni to Diamond Harbour	Polluted Priority-V 3.1 - 5.8 mg/l	Polluted Priority-V 2.6 – 3.9 mg/l

2014



2022



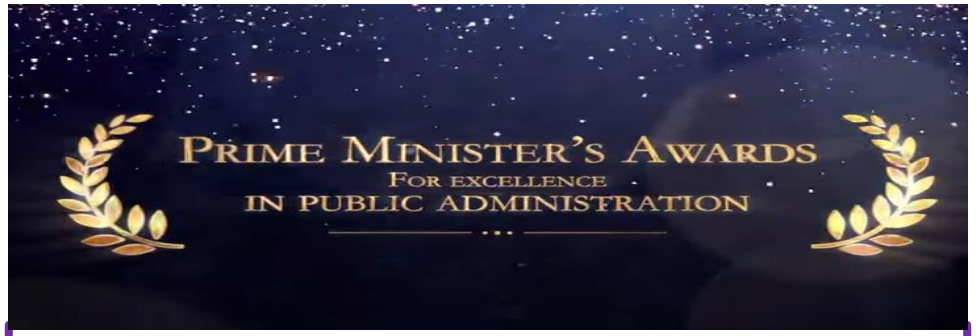
It is expected that the two stretches – Kannauj to Varanasi and Triveni to Diamond Harbour will be categorized as 'Unpolluted' (<3 mg/l) by 2025

Some of the Major Accolades Received

UN Decade on Ecosystem Restoration 2021-2030

World Restoration Flagships

Recognized as one of the top 10 World Restoration Flagship initiatives on 13th December 2022 at Montreal, Canada during UN Conference Biological Diversity (COP 15)



In 2020, Namami Gange Programme was included as a category under "**The Prime Minister's Awards for Excellence in Public Administration**". One award was to be given to one of the 57 District Ganga Committees (DGCs) under the Mission.

NMCG awarded as **Public Water Agency of the Year** in 2019 in London

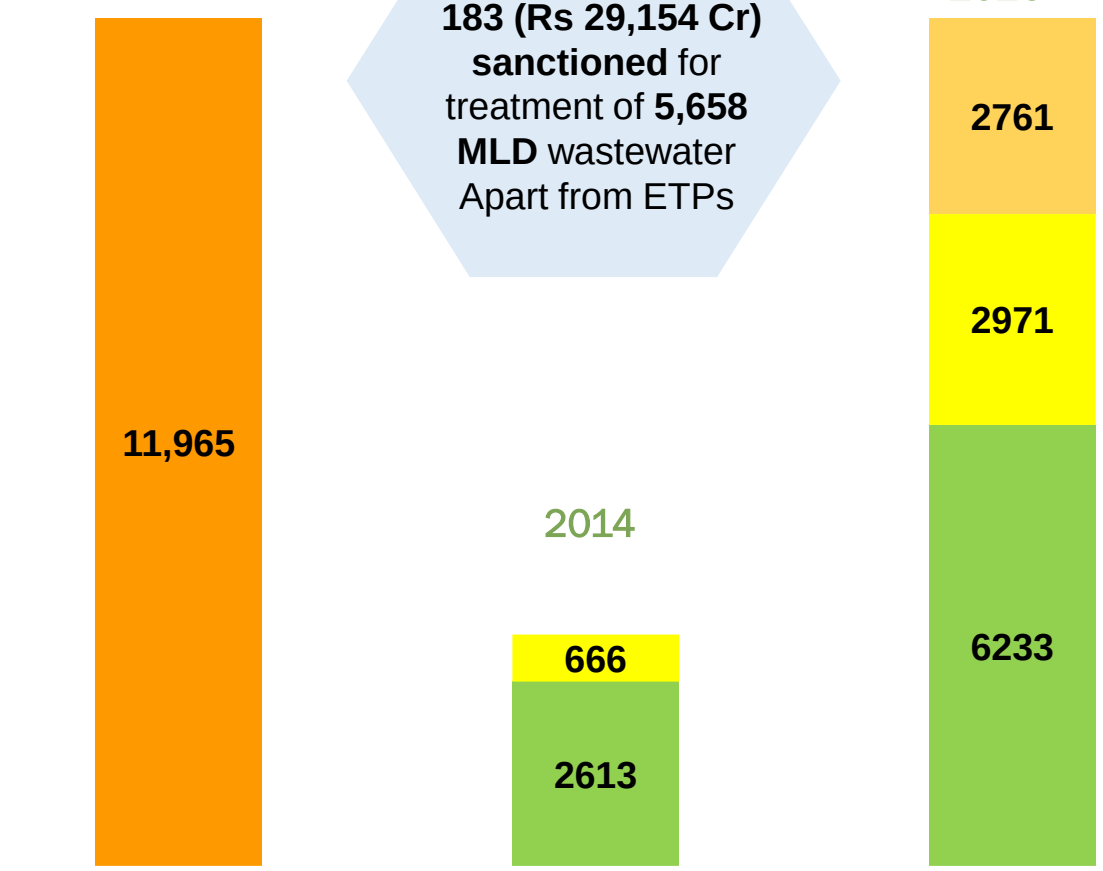
Asian Academy Creative Awards in 3 categories in 2022-

- *Best Documentary*
- *Best Current Affairs*
- *Best Natural History or Wildlife Programme*

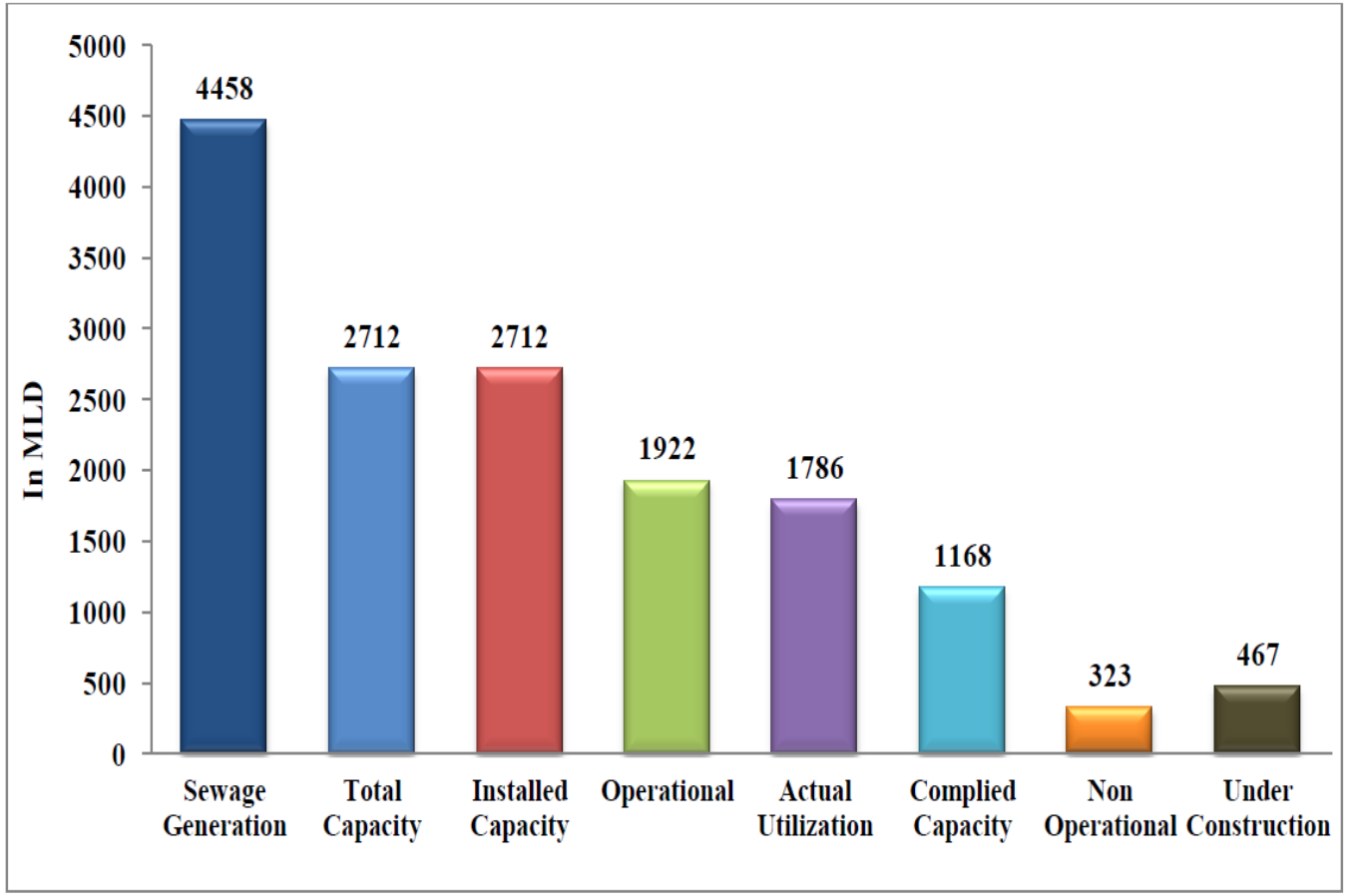
Nirmal Ganga or Unpolluted Flow

5 basin states

183 (Rs 29,154 Cr) sanctioned for treatment of **5,658 MLD** wastewater Apart from ETPs



Kerala Comparison



Source :CPCB Report 2021

Genesis of Ganga River Conservation Program

Gap I (Ganga Action Plan)
- Focus on main stem of Ganga
- 25 towns covered
- 260 schemes

Gap II (Ganga Action Plan)
- Merged with NRCP in 1996
- Yamuna, Gomti, Damodar & Mahananda - included

NRCP (National River Conservation Plan)
- 41 major rivers
- 8 Ganga basin rivers – Ganga, Yamuna, Gomti, Damodar, Mahananda, Betwa, Mandakini, Ramgangana

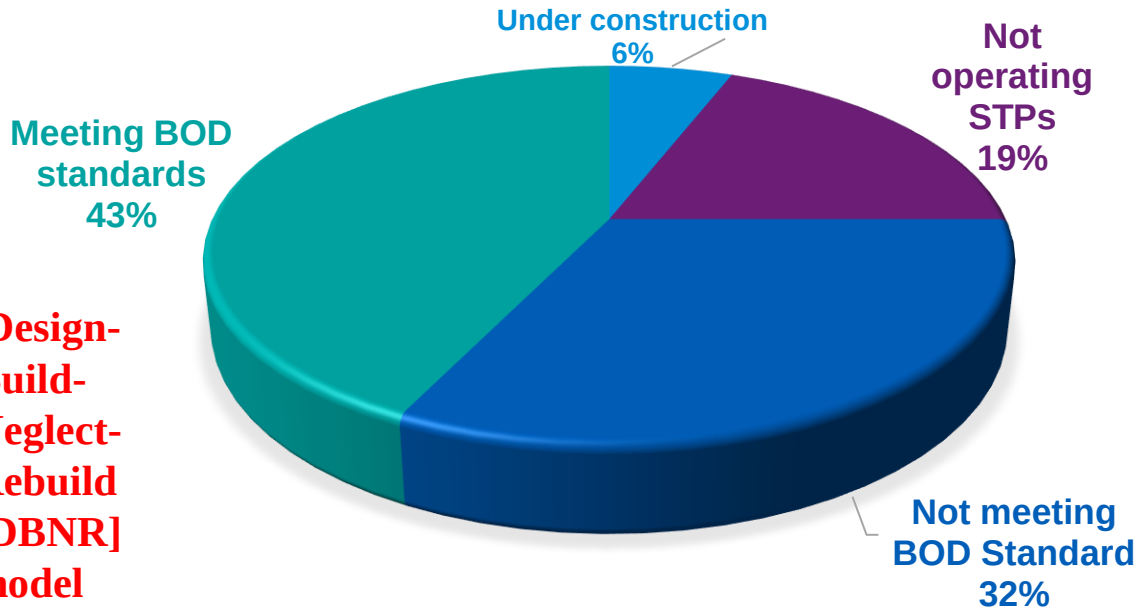
NGRBP (National Ganga River Basin Authority)
- Separate authority for Ganga in 2009
- 2011 World Bank funded with, NMCG, SPMG

Namami Gange I
- Rs 20,000 Cr from 2015-2021
- Basin based multi sectored approach
- Development of Ganga River Basin Management Plan

Namami Gange II
- Rs 22,500 Cr for the period 2021- 2026.
- Focus on sewerage infrastructure creation in Ganga tributaries.
- Arth Ganga.

Asset creation and O &M left to ULBs | Part O &M included | Life Cycle costing for 15 years

1985 → 1993 → 1995 → 2009 → 2015 → 2016 → 2022



Design-Build-Neglect-Rebuild [DBNR] model

- Assurance of Desired Performance
- Sustained Performance
- Distinct Accountability
- Feasibility- Technical & Financial
- Development of Treated Water Recycling Market

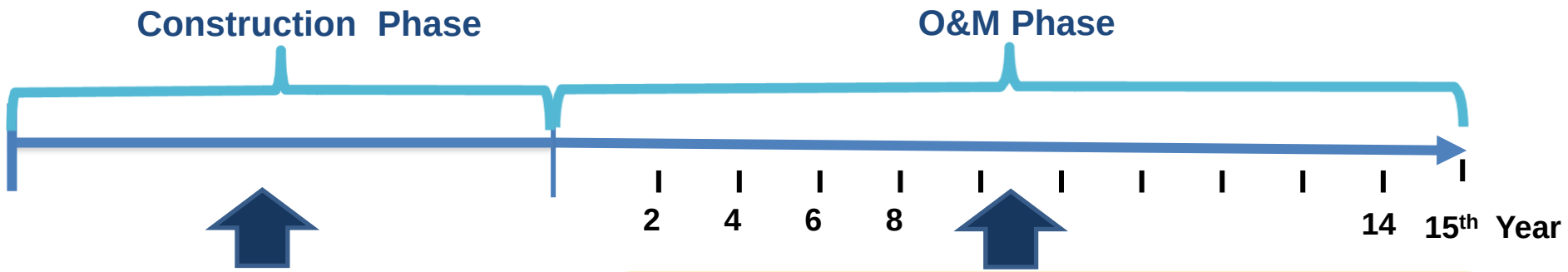
Adoption of Hybrid Annuity Model

~~Business as usual~~

Attract Private sector funding & efficiency

Hybrid Annuity Model (HAM)

- Shift from Asset procurement to Service procurement
- Performance based contracting
- Improved Governance
- Long term Planning for 30 years
- Focus on reuse



Upto 40% of Capital Cost by Government

Annuity payments

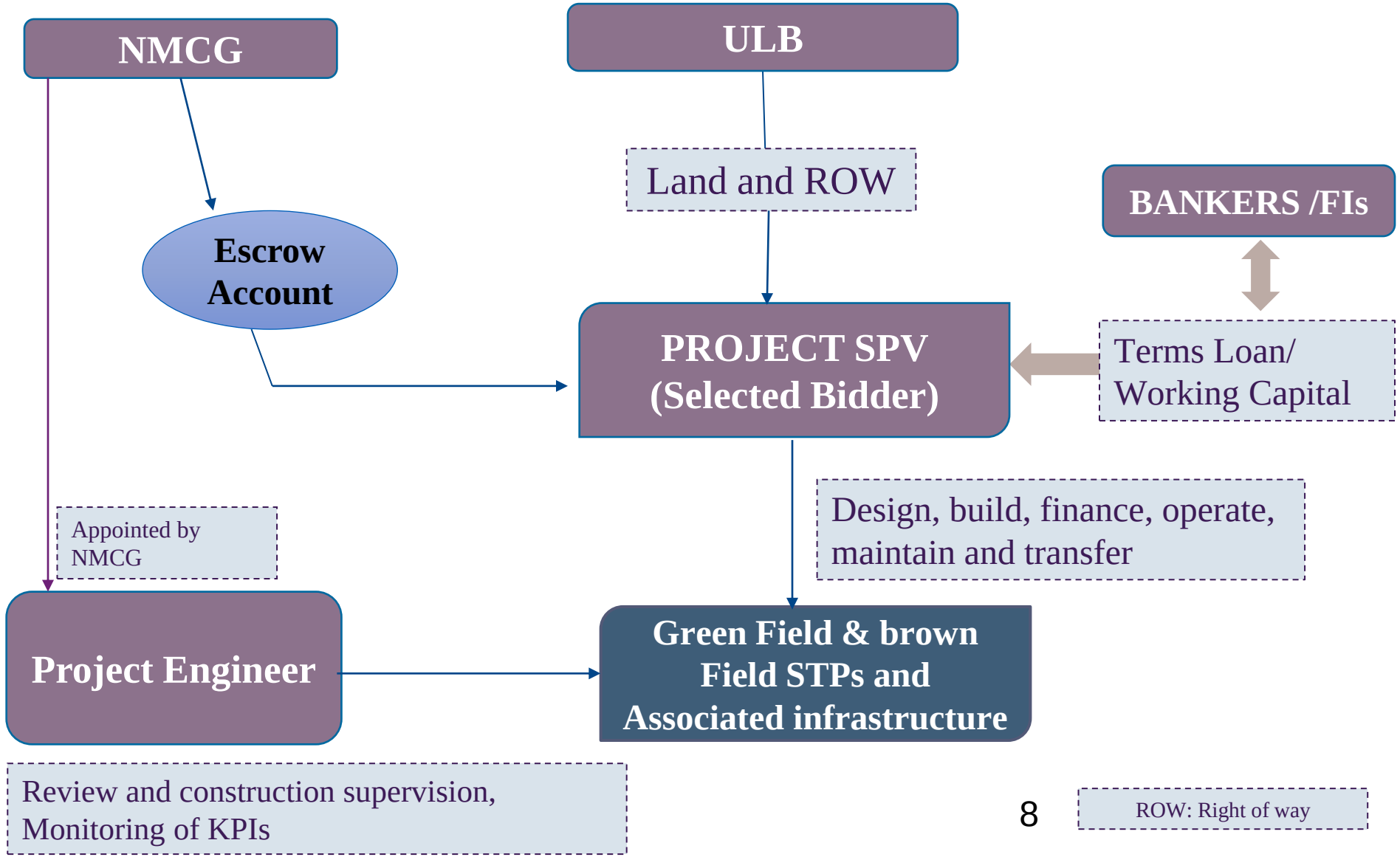
- *Remaining 60% capital investment*
- *Annual O&M cost*
- *Payments linked to performance standards*
- *As of now, independent of treated water recycling revenue*

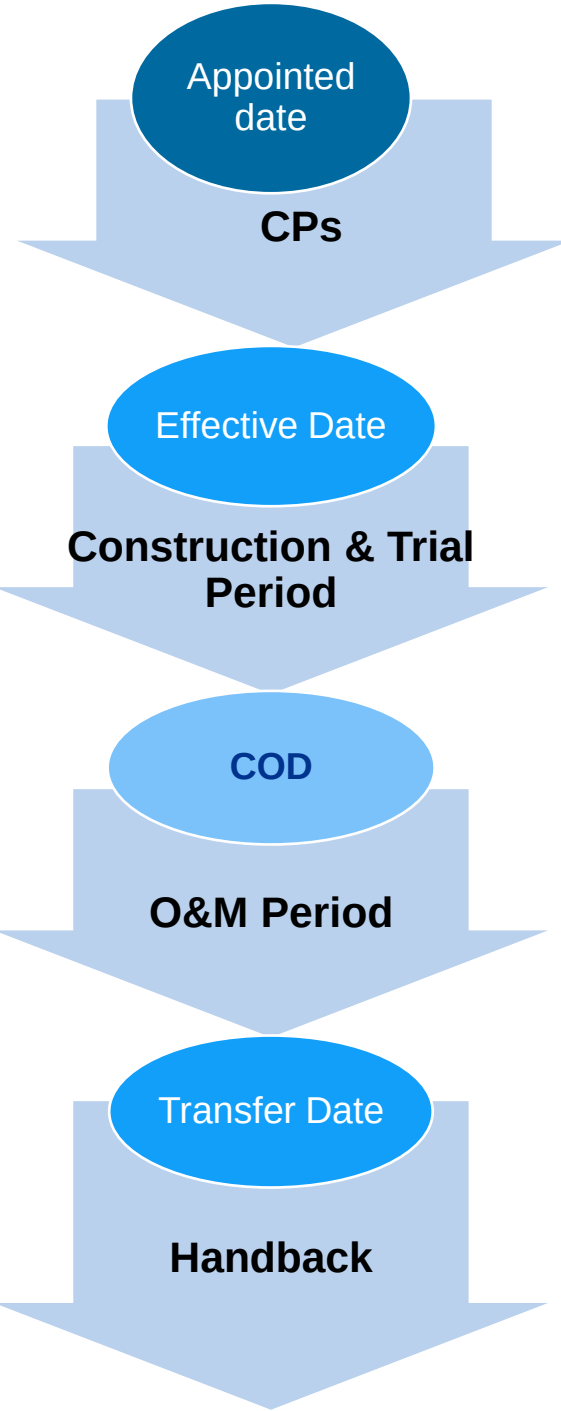
Payment Security mechanism

Interest rate risk and inflation risks are covered

Transaction Structure

Tripartite agreement to be executed between the Executing agency, NMCG and identified private developer



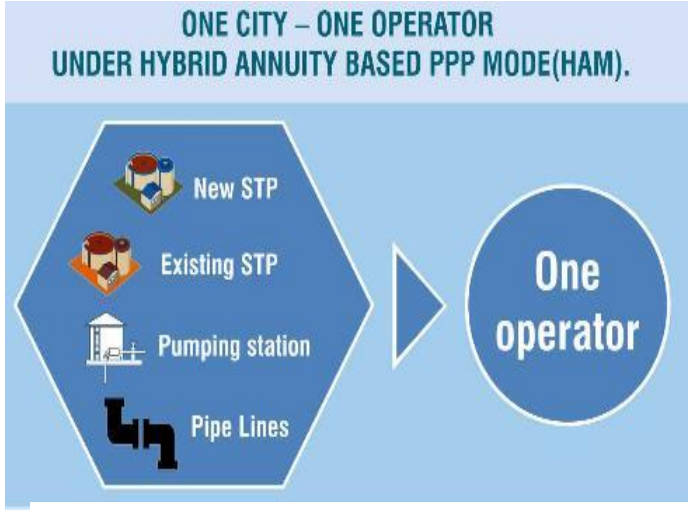


ROW: Right of way

Innovation Reimagined: One City One Operator (OCOP)

OCOP Model

- **Single ownership and accountability for assured performance**
- **Integration of new and existing sewage treatment infrastructure**



- **Total 32 projects in 22 packages.**
- **Awarded 18**
- **Bids received – 1**
- **Under Bidding – 3**
- **Total value– USD $ 1.475 billion(Rs.12100.82Cr)**
- **Total potential for private capital – USD $ 450 Mn million(Rs.3600Cr)**
- **Pvt. Capital Mobilized - $ 250 million(Rs.2000.Cr)**

Complexity

Varanasi, Haridwar

Primarily New STPs

March 2017

Mathura

Rehab- Brownfield and new STPs. Reuse of TWW

June 2018

Howrah, Allahabad Kanpur

Rehab - Brownfield, O&M of existing STPs, New STPs and Septage treatment

Dec 2018

Patna – Digha & Kankerbagh

Network (capex and O&M) – DBOT STPs – (Capex and O&M) - HAM

Agra, Meerut and Saharanpur, IBRD Guarantee

April 2019

Standardizing Procurement To attract investors

1.Threshold technical capacity: Construction experience equivalent to the project cost in last 5 years in any infrastructure sector.

2. STP construction experience: 1 STP of 25% of the total capacity in last 10 years.

3. STP operation experience: 1 STP of 25% of the total capacity for 1 year.

4. Financial capacity: Net Worth equivalent to 25% of project capital cost.

6. ETP/CETP experience acceptable at the capacity specified therein.

7. The STP experience can be met through a nominated sub contractor as well. In such a case 25% of the Threshold Technical capacity has to be met by the subcontractor.

8. 50% of the Performance security is to be provided by the Nominated sub contractor during construction.

9.Also the 50% of the O &M performance security is to be provided by the nominated sub contractor during O &M which is locked for 2 years

10.Technology agnostic.

Bareilly- 10	Agra-10	Ayodhya-11	Meerut-17(19)	N.Barackpore-8

Developers

HNB,Shapporji Pallonji, Triveni, Adani,Visvaraj SMS,Swachh, Suez,Essel Infra, Organica,JWIL JKB Infra, GA Infra RPC ECOS,EMIT Vital Capital, ECO protection Engineers, Enviro Infra

Lenders

Yes Bank
Indus Ind
PTCFSL
Tata Clean Tech
IFC
SBI, HDFC, BOI
Bank of Austria

HAM Vs EPC/DBOT

Particulars	EPC	DBOT	HAM
Design Ownership	Authority	Contractor	Contractor
Operational Ownership	Authority	Contractor	Concessionaire
Risk of non performance	High	Medium	Low
Chance of higher cost	High	Medium	Low
Chance of variation in specifications/quantity	High	High	Low
Total Life cycle cost	Not applicable	Medium	High(Interest cost)
Opportunity cost	May be high	High	Low(less payment)
Skin in the game	Nil	Almost Nil	High
Risk of faulty design	Authority	Authority-after DLP	Concessionaire
Incentive for Early completion	Low	Low	High(Haridwar)
Total cost of termination	High	High	Reasonable
Chance of front loading	Rare	Medium	High
Funding of the project	Immediate	Immediate	Over a period
Start of the project	1 month	1 month	4 -6 months(CP)
Design period	Before tender	3 months	CP period
Pre determination of specifications/needs/standards	Flexible	Reasonably flexible	Emphasized

One City One Operator (OCOP): 2 Case studies

Mathura Sewage Scheme:

- Brown field: 16 MLD UASB, 14 MLD WSP at Trans-yamuna, 14.5 MLD WSP at Masani.
- Green field: 30 MLD SBR and 20 MLD TTRO for supply of water to IOCL Refinery.
- Total Awarded Cost: CC: 250.69 Cr &O &M : Rs 187.26 Cr
- Term: Construction 2 years + O &M 15 years
- L1 Bidder: Triveni Industries Limited.
- COD declared.
- Issues: Change in effluent pipe line for Gokul barrage.
- Delay in handing over land for pumping stations.
- High Chemical Oxygen Demand(COD) levels affecting TTRO.
- Stretched Trail run and related issues.

Prayagraj Sewage Scheme:

- Brown field: 254 MLD in 2 packages(Major rehabilitation & minor rehabilitation).
- Green Field : 3 STPS of 78 MLD.
- Independent COD for each package to improve the cash flow.
- Total Awarded Cost: CC Rs 399.42 Cr & O &M Cost Rs 493. 38 Cr
- Term: Construction 2 years + O &M 15 years
- L1 Bidder: Adani Enterprises Ltd
- Status: COD declared for brown field packages.
- COD for greenfield to be declared by June 2023.
- Issues: Change in Land at Jhunsi STP has delayed the construction.
- Higher flow at some of the STPs.
- Work delayed due to Melas/events.
- Land issue at one of the pumping stations.

Case 3: Maheshtala STP project under Hybrid Annuity based PPP(HAM) under National Mission for Clean Ganga(NMCG)

Authority: KMDA, Kolkata

Project: 35 MLD STP, 4 pumping stations, 35 MLD MPS, 6 I & D structures, 5.989 kms of pipe line, 390 m of effluent line, 35 MLD Effluent pumping station.

Particulars	Capex Rs Cr	Opex Rs Cr	Total Rs Cr
Approved	**121.53**	**92.71**	**214.24**
L1	220.57	52.91	273.48
L2	175.11	143.04	318.26

Project period: 2 year Construction + 15 year Operations.

Number of bidding cycle: Second time bidding

Approved cost does not include IDCP cost and one year old.

As per clause 16.5 of the RFP document Authority is free to impose additional performance security if the bid is unbalanced.

Under HAM 40% of capex is paid during construction and balance 60% along with interest and O &M cost is paid over a period of 15 years as quarterly annuities.

Number of Bidders: 2

Overall cost increase of **L1 bidder is 27.65% higher** while it is 48.55% higher for L2 bidder.

Evaluation is based on **Life cycle cost**.

If the project is terminated after COD then payout is as follows: up to 3 years 60% of balance outstanding, 3-5 years 65%, and so on.

Case 4: Meerut sewage treatment plant under HAM

Authority: Uttar Pradesh Jal Nigam, Meerut

Project: 220 MLD STP, 220 MLD MPS, 2- I & D structures, 6.1 kms of pipe line, & Effluent pumping station.

Particulars	Capex Rs Cr	Opex Rs Cr	Total Rs Cr
Approved	**363.78**	**318.00**	**681.78**
L1	356.95	12.78	369.73
L2	283.20	119.11	402.31

Project period: 2.5 year Construction + 15 year Operations.

Number of bidding cycle: First time bidding

Approved cost does not include IDCP cost and one year old.

As per clause 16.5 of the RFP document Authority is free to impose additional performance security if the bid is unbalanced.

Under HAM 40% of capex is paid during construction and balance 60% along with interest and O &M cost is paid over a period of 15 years as quarterly annuities.

Number of Bidders: 17

Overall cost increase of **L1 bidder is 45.76% lower.**

L1 Bidder offered to supply free electricity by installing a solar power plant at a different location. Hence, he quoted power cost as zero.

Evaluation is based on **Life cycle cost**.

If the project is terminated after COD then payout is as follows: up to 3 years 60% of balance outstanding, 3-5 years 65%, and so on.

Learnings

1. Proper planning in **project preparation** to avoid **non-bankable DPRs & proper writing of Scope of work.**
2. Mitigation of **Lapses and delays** in project procurement & implementation
3. **Poor supervision of ESHS implementation**
4. **Issues in land acquisition post project award**
5. Local executing Agencies to gear up to raise to the occasion**.(Business as usual problem)**

Thank You

Contact us

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For more information or for any queries, write to us at **GTBharat@in.gt.com**

EPC Projects

-The Cochin Smart City Mission Experience

Presented by- *Sunil Mathew Thomas*

Team Leader, ***KIIFCON***

Cochin Smart Mission Limited (CSML) Projects

KIIFCON PRIVATE LIMITED

- KIIFCON Pvt Ltd is a fully owned subsidiary of KIIFB
- Key Clients:
  - Cochin Smart Mission Limited - PMC
  - Kerala Rubber Limited - PMC
  - Overseas Keralites Investment & Holding Ltd – Independent Engineer

Smart Cities Mission

- Smart Cities Mission was launched by the Hon' Prime Minister of India on 25 June, 2015
- A total of 100 cities have been selected to be developed as Smart Cities
- Kochi was one among the first 20 selected cities
- The main objective of Smart Cities Mission is to promote cities that provide core infrastructure, clean and sustainable environment and give a decent quality of life to their citizens through the application of 'smart solutions'

COCHIN SMART MISSION LIMITED (CSML)

A SPECIAL PURPOSE VEHICLE FORMED FOR THE SOLE PURPOSE OF IMPLEMENTATION OF THE SMART CITY MISSION AT THE CITY LEVEL IN KOCHI.

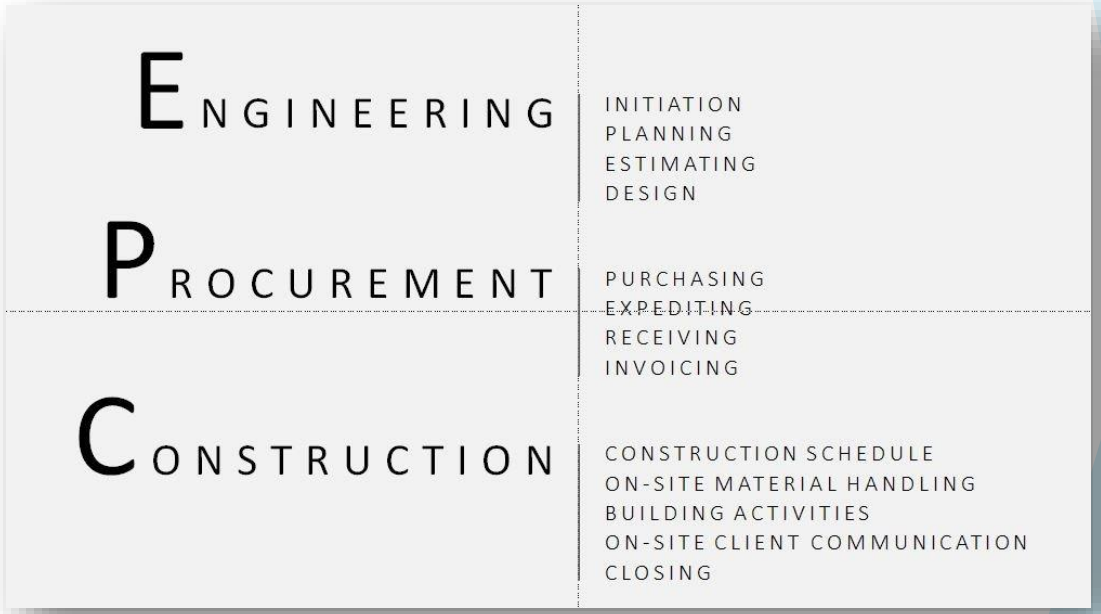
TOTAL PROJECT COST OF ABOUT RS.1000 CRORES WAS PROPOSED TO BE FUNDED EQUALLY BY THE CENTRE AND THE STATE

THE MISSION AIMS TO DRIVE ECONOMIC GROWTH AND IMPROVE QUALITY OF LIFE THROUGH COMPREHENSIVE WORK ON SOCIAL, ECONOMIC, PHYSICAL AND INSTITUTIONAL PILLARS OF THE CITY.

Sectors - Smart City Projects

EPC Contract

Three major components under EPC mode which falls under the obligations of contractor are:



- Engineering Procurement Construction (EPC) contract is most used construction contract for large and complex infrastructure projects where the risk of carrying out engineering designs, procurement of men, material & machinery, and execution of project within the stipulated time duration lies with the contractor.
- A form of building contract in which the builder (the EPC contractor) will deliver a completed project on a turnkey basis.
- Salient features of EPC contracts are found to be excerpted from The International Federation of Consulting Engineers (FIDIC) – Silver Book

Advantages

- Since all elements are integrated and allocated to single entity, cost will be lowered.
- Time for executing the contractual process is reduced since it has only one process.
- As the risk of the project is fully over one contractor, the client will have peace of mind since it becomes easier to communicate and manage the work through this single entity.
- Owner’s risk is getting reduced in EPC contracting mode.
- Suitable for large scale infrastructure projects and for complex works.
- Increased efficiency in delivery of project in stipulated time period.
- Use of innovative designs and latest technology in design and execution.

Disadvantages

Since the bidder has higher risk and full responsibility of project with less information about the proposal, the bidder assumes high cost and is likely to quote high price for such bid.

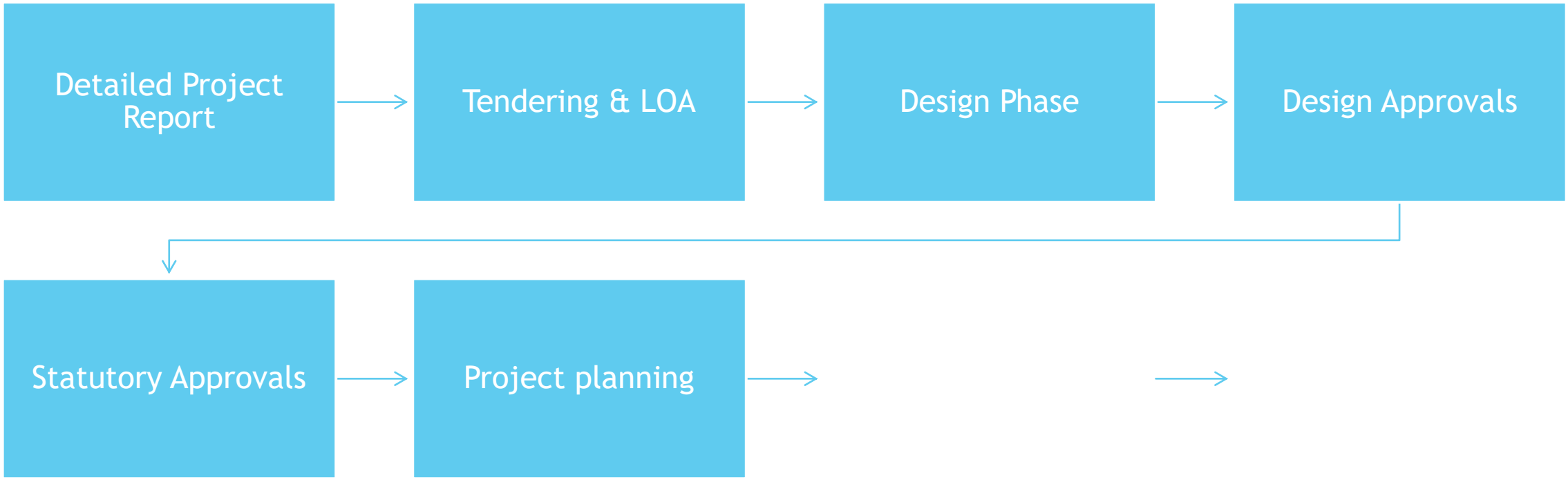
As each bidder has different criteria for assessing the risk involved in the project, there could be a wide variation between the quotes offered by bidders.

Due to less information about the proposal, the bidders may oversize the designs while submitting them at initial phase.

EPC Vs Item rate contract

Type of Contract	EPC Contract	Item Rate Contract
Cost	Scope of work and total cost of work is fixed. Extra claim for change in scope is not easily applicable in EPC works.	Scope of work can vary as per the employer's requirement. Contractor can easily claim for extra work done with respect to this scope change.Hence total cost of work will only be defined at the completion of work.
Feasibility	Work can be started when the land is acquired more than 90%.	Work can be started even if minimum land is acquired i.e. 25%.
Time Overrun	As the scope and cost of work is fixed, there is very less possibility for time extension.	Even though duration of project is defined, time extension can be availed as scope and cost of work is not fixed.
Cost Overrun	In EPC works, the cost of project is fixed. But if there is any undefined extra works such as utility shifting to be carried out, additional payment can be claimed from the client.	Several factors can affect cost overrun in item rate contract as the price escalation due to delay of work, variation to scope of work, extra items, other claims.
Risk	Risk of Engineering, Procurement and Construction lies solely with the contractor. Lower risk for the client.	Risk lies with both the contractor and the client. Client will not be certain about the total cost at the completion of work.
Billing & Payment	Billing and payment in EPC contracts are made against milestones. Preparation and processing of bills are faster.	In Item rate contract, the bills and payment are against individual item measurements. Preparation of M-book, abstract and bill is a laborious process.
Technical Resources/ Organization	EPC contracts are to be handled by organization having a structured technical resources- design execution and management	Item rate contract does not require that amount of design and technical procurement, management skills

Case Study - CSML works in EPC mode



Stages involved in EPC Contract

1. Detailed Project Report

- Feasibility study
- Project identification
- Concept description and development
- Concept drawings
- Design Philosophy
- Project requirement should be clearly specified
- Detailed guidance with must ‘meet the requirement’
- Budget Allocation

Benefit:

- Freedom of detailed design lies with contractor

CSML Experience

- For the Ernakulam Market Project, DPR was prepared by former PMC for an integrated market complex, while the RFP was called for the construction of the market building only.

KIIFCON Intervention:

- Apprised the client about the need for constructing an MLCP which was a part of original master plan, to comply with the mandatory requirements as per KMBR. Tender for the same is expected to be floated soon.

2. Tendering & LOA

- Preparation of RFP
  - Concept description
    - ✓ Provisions to be clearly mentioned
    - ✓ Approved make list and type/model to be specified
    - ✓ Technical specifications to be prepared with diligence
    - ✓ Meeting the minimum criteria is taken into consideration
  - Concept drawings only are provided mentioning provisions- no detailed designs
  - Selection Stage / Pre-Qualification Criteria
  - Relevant codes and manuals for general specifications
  - No detailed BOQ - only Payment Milestones in Schedule H
- Advertising the requirement.
  - Invitation to Tender
- Bid evaluation & Recommendation by PMC
  - Takes time if different bidders have considered different design & technologies
- Award of contract- LOA & Agreement
  - Schedule H for milestone payments should be carefully prepared to ensure cash flow to the project/contractor.

2. Tendering & LOA

Key considerations by the contractor

- Study of tender documents
- Clear understanding of the full project scope
- Study of technical specifications
- Study of financial requirements
- Consultations with competent Architectural ,Structural & MEP Design consultants/experts
- Raise queries at pre-bid meeting itself incase of lack of clarity about scope, discrepancies in tender drawings, technical specifications etc.
- Make sure that all the above points are clarified and well defined in pre-bid minutes/corrigendum
- Preparation of detailed BOQ

CSML Experience- just a few examples

- Ernakulam Market Project- Due to contradictory and non defined scope in the RFP , technical specifications and tender drawings , the contractor has put a claim for variation in the item "implementing of Solar System" – Refer subsequent slides.
- In both projects, the requirement for Green Building Certification is just mentioned as achieving IGBC Rating without clearly mentioning whether it is Silver, Gold or Platinum
- Thuruthy Tower - There was an ambiguity in the type of Water Closets to be used for the 195 apartments as the model/type was not clearly mentioned. Contractor had submitted very basic commercial model with PVC flush tank.

KIIFCON Intervention

- Thuruthy Tower - KIIFCON was able to convince the contractor and approve WC with ceramic tank with a decent aesthetics.
- In both Projects- KIIFCON has given directions to the Contractor to meeting the requirements for IGBC Gold Rating.

Defect Notification Period

Defects Notification Period 12 months. The period commencing on the date of issue of the Taking-Over Certificate. During the Defect Notification Period, the Contractor shall provide a 24-hour 'call-out' service to repair any equipment that has broken down.

Immediately answering the breakdown calls, the Contractor shall attend to such calls within a maximum time limit of 2 hours during night and 1 hour during daytime of receiving such calls.

Sanitary Fixtures

Part no. of sanitary work : Fences have been specified of ROCA make. The contractor may offerequivalent of split makes.

Hand Drier

The hand drier shall be no touch operating type with solid state time delay to allow user to keep hand in any position.

Thuruthy Tower – Water Closet Specification

SPECIFICATIONS

S.NO	PARAMETERS	REQUIREMENTS	
[1]	**General**	(i)	100% of total treated water available on-site to be reused within the project site
		(ii)	Recharge of surplus rainwater runoff into aquifer to be carried out through appropriate filtration and treatment measures to remove minimum 80% Total Suspended Solids
		(iii)	Water Fixtures in Toilets: Water demand to be reduced through selection of low-flow fixtures by minimum 50% over the following IGBC baseline flow rates: 1 Water Closets — 2-4 LPF 2 Kitchen Faucets — 4 LPM 3 Urinals — 1 LPF 4 Lavatory faucets — 4 LPM 5 Shower head — 8 LPM
[2]	**Sanitary Fixtures**	(i)	Wall/Floor mounted W.C. flush pipe/bend to be connected to the W.C. by means of suitable rubber adapter
		(ii)	Wall hung W.C. to be supported by C.I. wall mounted bracket with concealed cistern.
		(iii)	Each wash basin to be provided with 32mm dia C.P. waste 32mm dia C.P Brass Bottle Trap with C.P. connection pipe to wall with flange
		(iv)	Urinals to be provided with 15 mm dia C.P. spreader, 32 mm dia C.P. domical waste and C.P. brass bottle trap with C.P pipe to wall with flange and to be fixed to wall by one C.I. bracket and two C.I. wall clips battery operated sensor.
		(v)	Each sink to be provided with 40 mm dia C.P. waste with chain and plug.
		(vi)	Urinal partitions to be of frosted 12mm toughened glass.
[3]	**Soil, Waste, Vent**	(i)	Wastes and vents shall be of CI 3989.

Thuruthy Tower – Water Closet Specification

3. Design Phase

- Detailed Design phase may take 2-3 months normally
  - Depends on complexity of project and departmental delays – could extend further

ARCHITECTURAL DESIGN

- Preparation of architectural drawings in accordance with KMBR rules.
- Inclusion of all relevant scopes as mentioned in the tender.
- Ensuring drawing requisites for obtaining building permits.
- Adoption of latest and sophisticated design practices
- Green Certifications

STRUCTURAL DESIGN

- Geotechnical observations and soil study
- Structural analysis and design based on architectural designs
- DBR and software models generation for consultants' approval
- Finalisation of structural designs through single window

MEP, HVAC, FIREFIGHTING

- MEP DESIGNS
- HVAC DESIGNS
- FIREFIGHTING DESIGNS

OTHER SPECIALISATIONS

- STP DESIGN
- IGBC/GRIHA
- SOLID WASTE MGMT

- Design Approvals
  - Proof checking by Government engineering colleges/NIT/IIT as specified in contracts
  - Submission of proof checked designs for SPV/consultant’s approval within the stipulated time frame

3. Design Phase

Key considerations

- Skilled and specialized consultants to be engaged by contractor – Equally competent experts should be deployed by the PMC/SPV
- Coordination (INTERFACE) between different consultants (architectural, structural, environmental etc.) are required before finalization of design.
- Delay in design – delay for entire project
- Lack of competency in design leads to disputes
- Statutory Approvals from concerned departments viz; LSGD, CRZ, Mining & Geology, Fire NOC, Pollution Control Board, Electrical Inspectorate etc

CSML Experience

- Optimized design with innovative technologies
- Value engineering option was successfully implemented in one of the projects- Contractor could save Rs.1.75 Crores as a result of redesigning of pile foundations
- Item rate contract - highly conservative, no optimization and over design that can increase the project cost

KIIFCON Intervention

- Experts in all disciplines were duly deployed by KIIFCON for review of multidisciplinary designs thereby ensuring that the designs are meeting project requirements and industry standards

Key considerations

- Qualified Planning Engineers are required at the contractor and PMC side to monitor and control of the project
- Cost control Engineer can effectively be deployed at the contractor side to ensure cost control throughout the project

4. Project planning

- Preparation of construction schedule
- Setting interim Milestones
- Time based evaluation
- Cashflow preparation
- Submission for approvals
- Document Control

5. Execution Phase

Key considerations

- Quality control to be ensured by PMC/SPV
- Contractor with efficient contract administration & Quality Management system can be successful in EPC Projects
- Cashflow to be ensured by timely billing and payment realisation

CSML Experience

- Well-equipped contractors for both the projects is ensuring fast construction
- Limited PMC staff required for supervision as detailed measurements are not required
- Detailed Quantity mention & approval in RFI is not required
- Flexibility from contractors helps in ensuring fast construction

KIIFCON Intervention

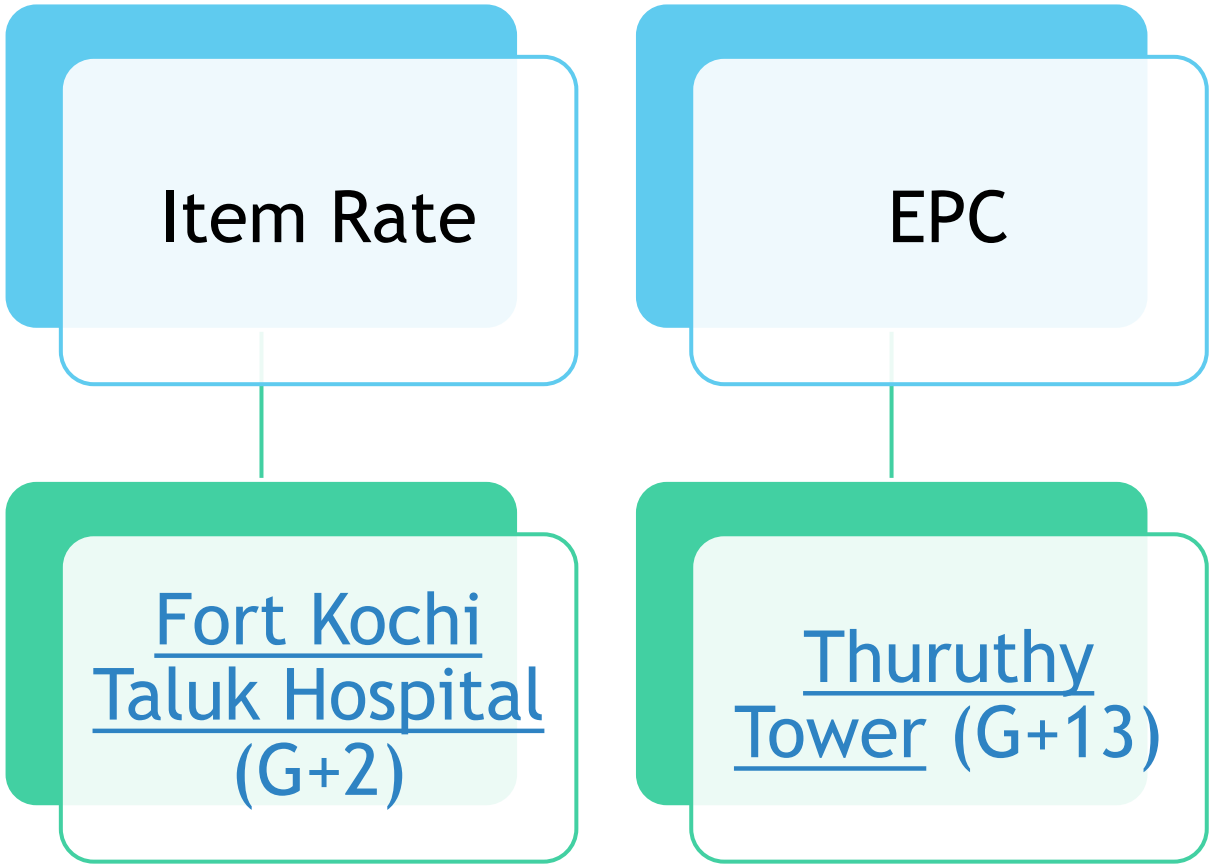
- Contractor bills were scrutinized and approved in minimum time (24 – 72 hrs) which ensure timely realisation of payments
- Amendment of Schedule H milestone payments in one of the projects ensured right cash flow for the project.

5. Execution phase - Payment Schedules

MILESTONE BASED PAYMENTS

PERCENTAGE BILLING

Bill Format-Item Rate V/s EPC



Measurement Book-Fort Kochi Hospital – RAB 10

Name of work : Construction of New Block at Fort Kochi Taluk Hospital Under Area Based Development of Kochi Smart City Mission										Date of Measurement:						
Name of Contractor: .Thrissur District Labour Contract Co-Operative Society										Agreement No. dated : 18-10-2019						
Reference to Estimate		Particulars		1	2	3	4	5	6	7	8			9		Remarks RFI NO;
				Measurement-up-to-date							Deduct Previous Measurement			Since last measurement		
Sub-head	Item no	CC 10th and part bill	Dia	No	L	B	H	Contents of area	Rate	Total value to date	Book	Page	Quantity	Quantity Cols 5-8	Value at rate in cols.6	
	1.28	50.6.1.5 : Solid block masonry using pre cast solid blocks (Factory made) of size 30x20x20cm or nearest available size confirming to IS 2185 Part 1 of 1979 for super structure up to floor two level thickness 20cm and above in: CM 1:6 (1 cement : 6 coarse sand) etc complete														
		Second floor Block work 20cm wall -Grid A1,G1-A3,G3 upto lintel height														348
	1	Grid G(1-3)		1	6.95	0.20	2.37	3.29								348
	2	Grid 3(F-G)		1	3.00	0.20	2.90	1.74								348
	3	Grid 1(F-G)		1	3.60	0.20	2.37	1.71								348
	4	Grid 1(E-F)		1	2.50	0.20	2.37	1.19								348
	5	Grid 1(C-E)		1	5.40	0.20	2.37	2.56								348
	6	Grid 1(B-C)		1	2.50	0.20	2.37	1.19								348
	7	Grid 1(A-B)		1	3.50	0.20	2.13	1.49								348
	8	Grid A(1-2)		1	3.60	0.20	2.13	1.53								348
	9	Grid A(2-3)		1	3.30	0.20	2.13	1.41								348
	10	Grid 3(E-F)		1	2.48	0.20	2.13	1.06								348
	11	Grid 3(C-E)		1	5.30	0.15	2.13	1.69								348
		Deductions														348
	1	D2		-1	1.00	0.20	2.37	-0.47								348
	2	D4		-1	1.60	0.20	2.13	-0.68								348
	3	W1A		-3	1.50	0.20	1.78	-1.60								348
	4	W2 A		-2	2.00	0.20	1.78	-1.42								348
	5	W3		-1	1.20	0.20	1.48	-0.36								348
	6	V		-1	0.60	0.20	0.60	-0.07								348
	7	W2		-2	2.00	0.20	1.78	-1.42								
		Total Quantity						**12.84**	**Cum**		**C/O RA BILL -10 KIFCON/B&S/MB 22**					

Bill Abstract - Fort Kochi Hospital – RAB 10

Name of work : Construction of New Block at Fort Kochi Taluk Hospital Under Area Based Development of Kochi Smart City Mission											Date of Measurement:							
Name of Contractor: THRISSUR DISTRICT LABOUR CONTRACT CO-OPERATIVE SOCIETY LTD											Agreement No. dated 18.10.2019							
	Reference to Estimate		Particulars	1	2		3		4	5		6	7	8			9		Remarks
			Measurement-up-to-date											Deduct Previous Measurement			Since last measurement		
Item no	Qty	Units	CC 10th and part bill							Contents of area		Rate	Total value to date	Book	Page	Quantity	Quantity of close 10	Value at rate in cols.10	
1.28	173.28		50.6.1.5 : Solid block masonry using pre cast solid blocks (Factory made) of size 30x20x20cm or nearest available size confirming to IS 2185 Part I of 1979 for super structure up to floor two level thickness 20cm and above in: CM 1:6 (1 cement : 6 coarse sand) etc complete																
			B/f from RA Bill 8							40.97									
			Qty vide page no 01 of KIFCON/B&S/MB 21							12.84									
			Qty vide page no 03 of KIFCON/B&S/MB 21							11.89									
			Qty vide page no 07 of KIFCON/B&S/MB 21							11.16									
			Qty vide page no 14 of KIFCON/B&S/MB 21							13.22									
			Total							90.08	Cum	5456.34	4,91,507.11			40.970	49.11	2,67,960.86	
1.29	86.40		50.6.3.2 : Solid block masonry using pre cast solid blocks (Factory made) of size 40x20x10 cm or nearest available 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																
			B/f from RA Bill 8							26.31									
			Qty vide page no of 02 KIFCON/B&S/MB 21							3.87									
			Qty vide page no 04 of KIFCON/B&S/MB 21							2.10									
			Qty vide page no 08 of KIFCON/B&S/MB 21							9.37									
			Qty vide page no 16 of KIFCON/B&S/MB 21							7.92									
			Total							49.57	Cum	6298.00	3,12,191.86			26.310	23.26	1,46,491.48	

Thuruthy Tower - BOQ

Name of Work : Construction of Multi-storeyed Housing Complex at Thuruthy , Fort Kochi on EPC basis
Authority : Cochin Smart Mission Limited
Authority Engin : KIIFB Consultancy
EPC Contractor M/s KHB Group

SPS No-09 | Stage Payment Statement | Period : 14-10-2022 to 23-03-2023

Contract Value: 44,00,73,817.00

Table No	Weightages in % to the Contract Price	Stage for Payment	As Per Contract (%) to Weightage	As Per Contract Amount (INR)	As per Amendment (%) to Weightage	As per Amendment Amount (INR)	As per Amendment Qty	Upto Previous Bill Amount	Upto Previous Bill Qty	This Bill Amount	This Bill Qty	Cumulative Bill Amount	Remarks
1	2	3	4	5	6	7	8	9	10	11	12	13	14
	1	Foundation	25.00%	11,00,18,454.25	16.00%	7,04,11,810.72	100.00%	7,04,11,810.72	0.00%	-	100.00%	7,04,11,810.72	
	2	Substructure	2.50%	1,10,01,845.43	4.00%	1,76,02,952.68	59.82%	1,05,29,927.41	26.30%	46,29,689.05	86.12%	1,51,59,616.46	
	3	Superstructure	14.00%	6,16,10,334.38	21.00%	9,24,15,501.57	0.00%	-	20.00%	1,84,83,100.31	20.00%	1,84,83,100.31	
	4	Block Masonry works	7.00%	3,08,05,167.19	6.00%	2,64,04,429.02		-		-		-	
	5	Finishing			7.00%	3,08,05,167.19		-		-		-	
	6	Flooring	15.00%	6,60,11,072.55	5.50%	2,42,04,059.94		-		-		-	
	7	Joinery			6.00%	2,64,04,429.02		-		-		-	
	8	Structural Steel			1.50%	66,01,107.26		-		-		-	
	9	Electrical Works & Fire fighting	10.00%	4,40,07,381.70	10.00%	4,40,07,381.70		-		-		-	
	10	Sanitary & Plumbing	2.00%	88,01,476.34	6.00%	2,64,04,429.02		-		-		-	
	11	Lift	2.00%	88,01,476.34	2.00%	88,01,476.34		-		-		-	
	12	STP	2.00%	88,01,476.34	1.000%	44,00,738.17		-		-		-	
	13	Yard & Roads	0.50%	22,00,369.09	1.00%	44,00,738.17		-		-		-	
	14	Water proofing	0.50%	22,00,369.09	0.50%	22,00,369.09		-		-		-	
	15	Roofing	0.50%	22,00,369.09	0.50%	22,00,369.09		-		-		-	
	16	Water Tank	2.00%	88,01,476.34	0.00%	-		-		-		-	
	17	Testing & commissioning	10.00%	4,40,07,381.70	5.00%	2,20,03,690.85		-		-		-	
	18	Statutory Approvals	3.00%	1,32,02,214.51	3.00%	1,32,02,214.51	50.00%	66,01,107.26		-	50.00%	66,01,107.26	
	19	Handing Over	4.00%	1,76,02,952.68	4.00%	1,76,02,952.68		-		-		-	
			100%	440073817.00	100%	44,00,73,817.00		-		-		-	
		Total Work Done Amount including 12% GST						8,75,42,845.39		2,31,12,789.36		11,06,55,634.75	
		Total Work Done Amount excluding 12% GST						7,81,63,254.81		2,06,36,419.07		9,87,99,673.89	

Measurement Book - Thuruthy Tower– RAB 11

Name of work: Construction of Multi Storeyed Housing Complex at Thuruthy, Fort Kochi on EPC Basis									Date of Measurement:						25-03-2023		
Name of Contractor: M/s KHB Group									Agreement No. dated 16.06.2021								
Reference to Estimate		Particulars	1	2	3	4	5		6	7	8				9		Remarks
			Measurement-up-to-date								Deduct Previous Measurement				Since last measurement		
Sub-head	Item no	CC 11th and part bill	No	L	B	H	Contents of area		Rate	Total value to date	Book	Page	Quantity		Quantity Cols 5-8	Value at rate in cols.6	
	3	SUPER STRUCTURE WORKS															
	1	Ground Floor	1					1.00	Nos								
	2	First Floor	1					1.00	Nos								
	3	Second Floor	1					0.80	Nos								
		SUMMARY															
		Ground Floor			1.00	Nos											
		First Floor			1.00	Nos											
		Second Floor			0.80	Nos											
		Total Quantity executed till date			**2.80**	Nos											
		Total Quanity of work			14	Nos											
		% of work done			20.00%												
		Super Structure Works	Nos	**14.00**	2.80	20.0%		**20.00%**									

Bill Abstract- Thuruthy Tower– RAB 11

Name of work: Construction of Multi Storeyed Housing Complex at Thuruthy, Fort Kochi on EPC Basis											Date of Measurement:				25-03-2023		
Name of Contractor: M/s KHB Group											Agreement No. dated 16.06.2021						
	Reference to Estimate		Particulars	1	2		3		4	5	6	7	8				9	
			Measurement-up-to-date										Deduct Previous Measurement				Since last measurement	
Item no	Qty	Units	CC 10th and part bill	No	L		B		H	Contents of area	Rate	Total value to date	Book	Page	Quantity	Value till previous	Quantity Cols 5-8	Value at rate in cols.6
2			**Super Structure**															
			B/f from RA Bill 10							0.00%								
			Qty Vide MB No. KIIFCON/EPC/MB - 020							20.00%								
			Total							20.00%	**9,24,15,501.57**	**1,84,83,100.31**			**0.00%**	**-**	**20.00%**	**1,84,83,100.31**
18			Statutory Approvals															
			B/f from RA Bill 4							50.00%								
			Total							50.00%	**1,32,02,214.51**	**66,01,107.26**			**50.00%**	**66,01,107.26**	**0.00%**	**-**
			Total									**11,06,55,634.75**				**8,75,42,845.39**		**2,31,12,789.36**

SCHEDULE H

CSML THURUTHY TOWER - PAYMENT EVALUATION SCHEDULE

Sl No	Description	Contract value				44,00,73,817.00
		%	Total Amount	%	Total Amount	CERTIFIED TILL DATE
1	Foundation	16	7,04,11,810.72	16	7,04,11,810.72	7,04,11,810.72
2.a	Substructure	3.5	1,54,02,583.60	3.5	1,54,02,583.60	92,13,686.49
2.b	Backfilling	0.5	22,00,369.09	0.5	22,00,369.09	13,16,240.93
3	Superstructure	21	9,24,15,501.57	1.5	66,01,107.26	
				1.5	66,01,107.26	
				1.5	66,01,107.26	
				1.5	66,01,107.26	
				1.5	66,01,107.26	
				1.5	66,01,107.26	
				1.5	66,01,107.26	
				1.5	66,01,107.26	
				1.5	66,01,107.26	
				1.5	66,01,107.26	
				1.5	66,01,107.26	
				1.5	66,01,107.26	
				1.5	66,01,107.26	
				1.5	66,01,107.26	
				1.5	66,01,107.26	
				1.5	66,01,107.26	
4	Block Masonry works	6	2,64,04,429.02	6	2,64,04,429.02	
5	Finishing - plastering	4	1,76,02,952.68			
	Internal Plastering			3.4	1,49,62,509.78	
	External plastering			0.6	26,40,442.90	

10	Electrical works	9	3,96,06,643.53			
	L.T Works - Internal Electrical Works					
	L.T Cable Pulling , Switches , sockets , DB			3	1,32,02,214.51	
	Final Fittings, Lights , fans			1	44,00,738.17	
	H.T Works - External Electrical Works					
	Cable Pulling , Switches , sockets , DB			1	44,00,738.17	
	Final Fittings, Lights , fans			1	44,00,738.17	
	Substation			3	1,32,02,214.51	
11	Fire fighting	1	44,00,738.17			
	Fire fighting- Internal			0.5	22,00,369.09	
	Fire fighting - External			0.5	22,00,369.09	
12	Sanitary and plumbing	6	2,64,04,429.02			
	Concealed Pipe with Pressure test			3	1,32,02,214.51	
	Installation of Sanitary firrings & acessories			1.5	66,01,107.26	
	External Plumbing works			1.5	66,01,107.26	
13	Lift- Supply & Installation	2	88,01,476.34	2	88,01,476.34	
14	STP- Supply and Installation	1	44,00,738.17	1	44,00,738.17	

SCHEDULE H – ERNAKULAM MARKET- DETAILED

A	Detailed Design, Construction, Testing & Commissioning of Redevelopment of Ernakulam Market, Ernakulam, Kerala on EPC Basis					
	STAGE PAYMENT STATEMENT					
Sl no.	Specification	Unit	Quantity	Amount	SPS% wrt quantity	SPS% w.r.t amount
A.1	**Shoring & Sheet Piling,Dewatering ,Excavation and disposal of earth**		**2.91%**	1,79,25,599.97		**2.91**
A.2	**Piling works**		**22.67%**	13,96,47,199.77		**22.67**
A.3	**All works up to basement floor level (Pilecap,grade beam,grade slab,HDPE liner etc complete**		**6.74%**	**4,15,18,399.93**		**6.74**
	All works up to basement floor level (Pilecap,grade beam,grade slab,HDPE liner etc complete	Sqm	4280.00	4,15,18,399.93		6.74%
B	**Basement of market building**					
B.1	**Civil works like retaining wall, ,BF columns,beam,ramp,BF roof slab up to GF level including**		**5.42%**	**3,33,87,199.95**		**5.42**
		Unit	Quantity	Amount	SPS% w.r.t quantity	SPS% w.r.t amount
	R.WALL	Cum	203	6731228.94		1.09
	B.F Column	Cum	114	3681199.02		0.60
	B.F Structural wall	Cum	41	1425566.56		0.23
	B.F roof beam	Cum	231	7244554.61		1.18
	B.F Roof Slab	Cum	397	12081582.23		1.96
	Stair	Cum	11	382469.08		0.06
	Ramp Slab	Cum	57	1840599.51		0.30
			1054.00	3,33,87,199.95		

Change of Scope

Key considerations

- The PMC/SPV should make sure that the scope of the project is well defined with detailed technical specifications and minimum requirements, so that the variations due to discrepancies in these will not result in contractor claim for extra cost
- Any scope change due to client/project requirement shall be incorporated as Variation Order based on prevalent DSR
- Payment for additional work is made at completion of that work or as per milestones specified in variation order

CSML Experience – Few Examples

- In the Ernakulam Market Project, the change in elevation of the building from a contemporary to classical design with clock tower has caused a change in scope and the contractor has claimed variation for this item.- This is a client warranted scope change and the contractor is eligible for this claim.
- Due to contradictory and non defined scope in the RFP , technical specifications and tender drawings , the contractor of Ernakulam Market projects has put a claim for variation in the item "implementing of Solar System" – shown in the upcoming slides

KIIFCON Intervention

- Ernakulam Market - Since the building has to comply with IGBC requirements, the contractor was asked to connect minimum requirements to achieve 2 credits in the relevant criteria of renewal energy which is 40 KW

All electrical and mechanical systems for the market complex shall be designed in accordance with the latest Energy Conservation Building Code published by Bureau of Energy Efficiency. The electrical and mechanical systems and equipment shall be certified for 5-star rating as per ECBC standards. The building energy performance index (kwh/sq.m./year) shall be less than 45. Bidder shall carry out the energy audit of the market complex through an independent agency approved by Employer and submit the energy efficiency certificate for the building. In case of any contradiction between the technical specification mentioned else where in the specification and the ECBC requirements, the ECBC requirements will supersede the other clauses.

Painting for the electrical and mechanical equipment enclosure shall comply to C5-M class (C5 very high corrosivity) coating defined in ISO 12944.

Bidder shall submit all the detailed design drawings, layouts, calculations etc related to the design of electrical and mechanical systems as per the requirement of Employer.

All the equipment suppliers shall be an established manufacturer with industry experience of minimum 5 years.

All the offered equipment should have valid type test reports.

Fire alarm system shall be integrated with the city command and control centre.

Building surveillance system shall be provided

ENGINEERING DELIVERABLES

The Bidder shall submit following minimum Engineering Deliverables from award of the Contract. Any other drawing / calculation which is not listed below and may be required for execution of the job shall also be submitted by the bidder.

Main Single Line Diagram indicating bus/breaker rating, cable/overhead conductor size, fault current, fault MVA etc

Electrical Drawing

Ernakulam Market – Solar Specifications

3.2. Detailed scope of work

- Design,Engineering, Supply, installation, testing and commissioning of the following:
- A class licenced contractor shall be engaged for elelctrical work.
- Tapping of 11 KV supply from the tapping point of KSEBL supply at the boundary line of the plot.
- HT Panel shall be designed as per project requirement and 0.5s class ht static tri-vector energy meter (for consumer net metering). Specification shall be as per KSEBL standard.
- Design, supply, installation, testing and commissioning of 11KV/433 V Compact Substations of 250 KVA and 500 KVAin place of existing oil type transformers and capable of being monitored and controlled by the Central SCADA of KSEBL via FRTU and modem
- If any shutdown work may be arranged request to obtaining work permit and shutdowns from respective section offices of KSEBL Prior to execution of work.
- Supply laying and termination of 11 KV 3CX300 Sq.mm XLPE cable from KSEB substation / 11 KV tapping point of , and interconnecting Compact substations to form a ring main system.
- Main LT panel shall be an adequate size and current capacity may provided
- 11 KV/415 volt Dry type distribution system of market complex.
- 11 KV cabling from 11 KV tapping point to 11 KV RMU.
- Diesel generator with Synchronised AMF system and exhaust systemBus riser and trunking system
- Building electrification using rigid heavy duty PVC conduits and FRLS wiring cables
- Internal Lighting distribution system
- LED Street lighting
- Fire alarm system
- Fire protection system
- CCTV and Camera system
- On grid Solar system
- Lightning protection system

Ernakulam Market – Solar Specifications

Engineering, Procurement and construction of Ernakulam Market, Ernakulam, (Third call)

COCHIN SMART MISSION LIMITED

- Maintain Lighting system installed by the contractor in a satisfactory condition for safe operation.
- Maintenance of Grid connected solar roof top system and solar tree.
- Maintain equipment and system at peak operating efficiency at all times.
- Provide maximum freedom from breakdowns during normal operation.
- Reduce to minimum downtime associated with breakdowns.
- Cleaning of light fixtures and panels and other electrical equipments installed by the contractor.
- Cleaning of solar panel using water once in 15 days or as and when required.
- Maintain high level of skill and efficiency in performance of the work.
- Recommended and genuine spare parts must be used, ensuring that renewal parts are always meeting maintenance requirements.
- Contractor should arrange qualified, licensed and trained specialists/experienced engineers with prior approval of CSML/KMC to carry out electrical work and all specialized electrical works as required and instructed by CSML/KMC O&M in the course of the Contract.

Ernakulam Market – Solar Specifications

53	Day light/Occupancy Sensor	Philips/ Lutrun/ Schnider/MK/Hagger
54	Lighting Poles (Hex/ Angular/ MS (Tubular Decorative)	Bajaj/Valmont/Utkarsh
55	HDPE underground cable duct	Rex Polyextrusion/ Tirupati Plasomatics/ Duraline/Kodoor pipes
56	Inverter	Luminous/ Microtek/Suckam
57	UPS	Emerson/ Schneider (APC)/ ABB/ Socomec/ Eton/ Delta
58	Sealed Maintenance Free Battery	Exide/ Global (Rocket)/ Hitachi
59	Hybride Filter Panel	P2 Power / Schneider
60	Battery Charging Panel/ Battery Charger	Caldyne/ Volstat/ Hitachi/ Nelco/ Crompton Greaves/Amara Raja / Mahamai
61	Solar PV Panels	Tata/ Schneider/ C&S/ P2-Power/ Jackson/ Sudhir/BHEL
62	Lightning and Surge Voltage Protection	ABB/ Hagger/ Schneider/ OBO/ Legrand

Ernakulam Market – Solar Specifications

Exception to § 7.2.8.1: Projects with solar hot water and/ or solar power generation systems.

Table 7-5 Minimum Solar Zone Area/Renewable Energy Generating Zone Requirement for ECBC+ Building

Building Type	*Minimum Electricity to be Generated in REGZ*
All building types except below	Minimum 2% of total electrical load
Star Hotel > 20,000 m^2	Minimum 3% of total electricity load
Resort > 12,500 m^2	
University > 20,000 m^2	
Business >20,000 m^2	

Table 7-6 Minimum Solar Zone Area/Renewable Energy Generating Zone Requirement for SuperECBC Building

Building Type	*Minimum Electricity to be Generated in REGZ*
All Building types except below	Minimum 4% of total electrical load
Star Hotel > 20,000 m^2	Minimum 6% of total electrical load
Resort > 12,500 m^2	
University > 20,000 m^2	
Business >20,000 m^2	

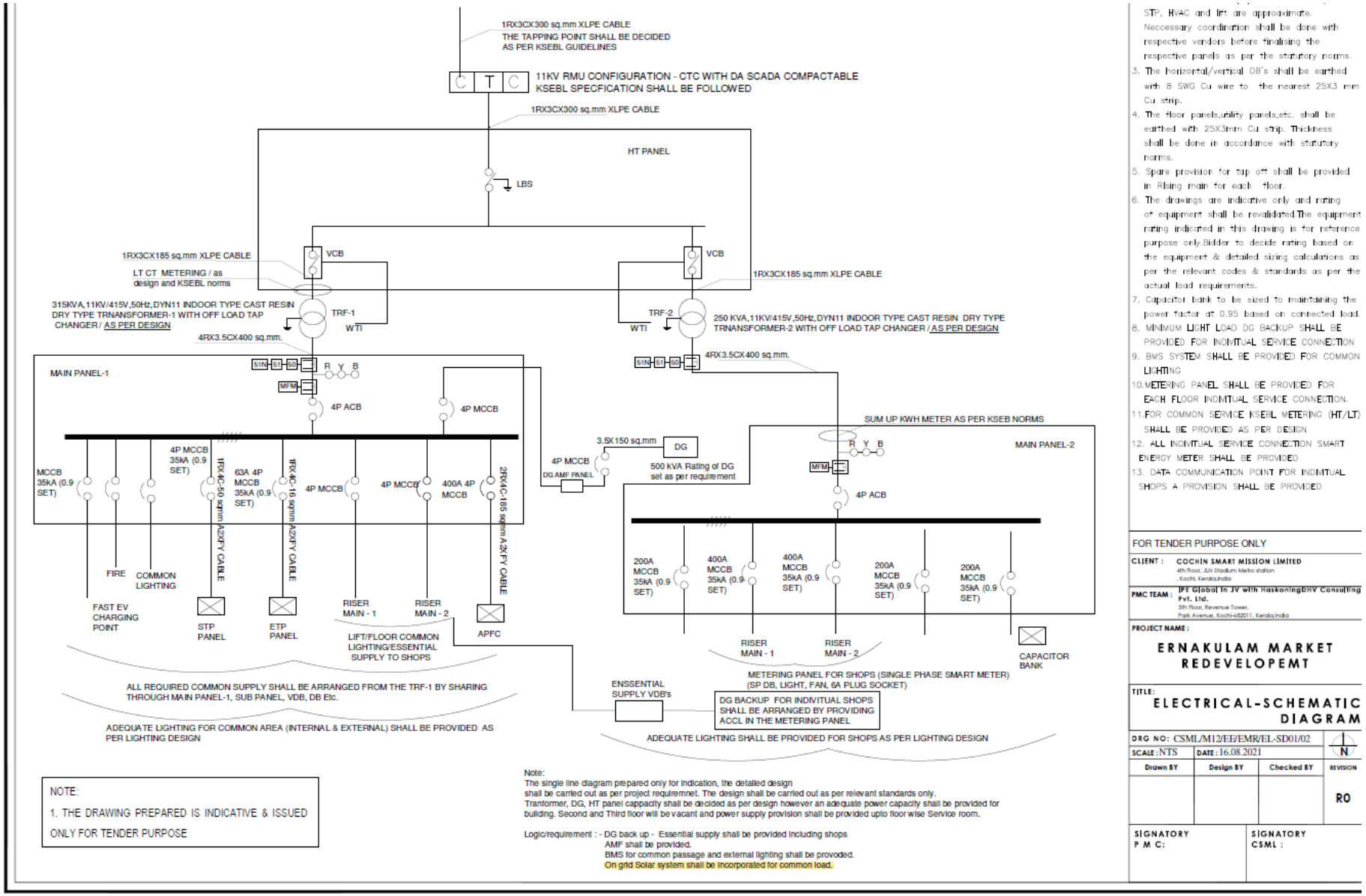
7.2.8.2 Main Electrical Service Panel

Minimum rating shall be displayed on the main electrical service panel. Space shall be reserved for the installation of a double pole circuit breaker for a future solar electric installation.

7.2.8.3 Demarcation on Documents

The following shall be indicated in design and construction documents:

ECBC Standards



Tender drawings

6. Completion phase

Closeout and handover

As built drawings

Conclusion

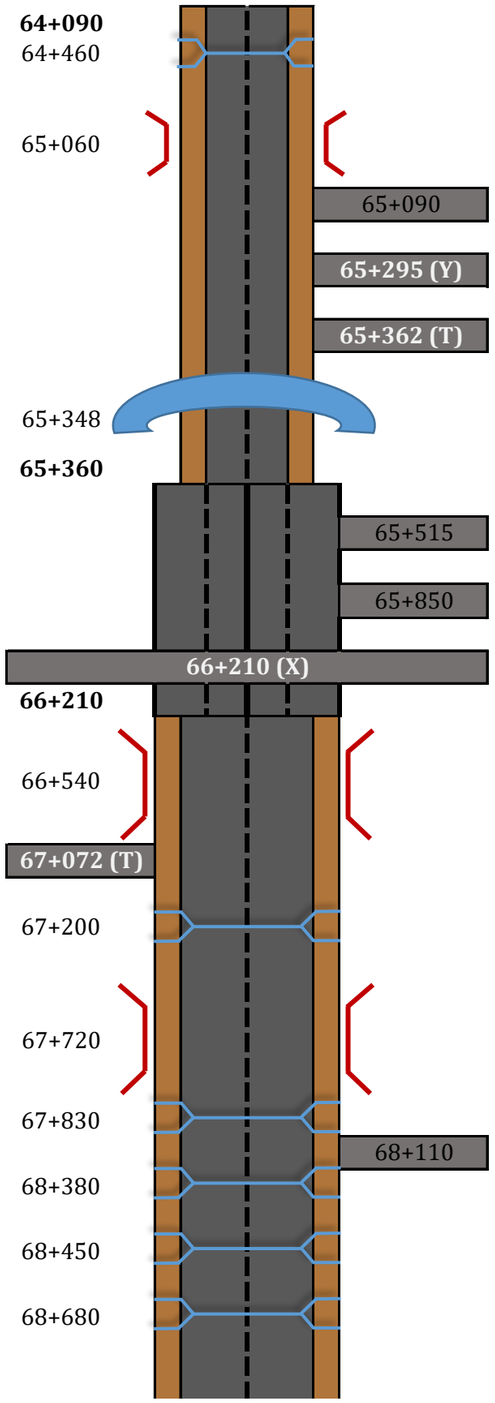
- In EPC mode of contract, a single contractor will have the responsibility of engineering, procurement, and construction. So, when the client is certain about the scope, approximate cost and duration of work (with limited time period), it is highly recommended to enter into EPC mode of contract.
- **KIIFB has taken a right step in initiating discussions on EPC projects in the state. As KIIFB has so far made revolutionary changes in the infrastructure development of the State, I am sure that the idea of shifting of medium to high value projects to EPC mode will foster development initiatives of the State Government**
- **I am sure KIIFB will soon produce a dossier on how to implement EPC projects in the State. Key insights and inspirations of this one-day seminar could be considered appropriately while preparing the document.**
- **The new initiatives by KIIFB in this direction is futuristic and will set high standards in the quality of construction. Contractors having qualified technical resources will reap the benefits.**

Thank You
For Your Attention

Slab Culvert
Pipe Culvert
Foot Under Bridge (FUB)
Foot Over Bridge (FOB)

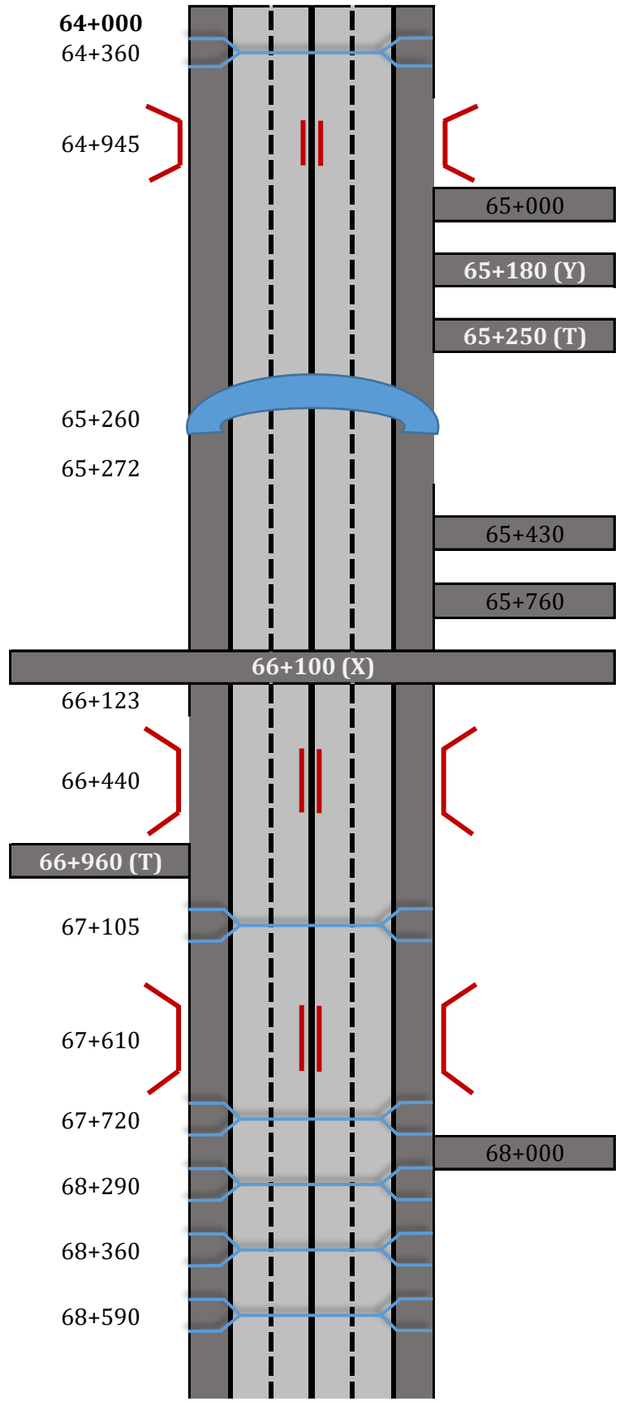
Major/Minor Bridge
0+000 Minor Junction
0+000 Major Junction

EXISTING DETAILS



	Span/Dia	Ex. Width	Remarks
64+460	1 X 600		
65+060	3X5.8	12	Stone Masonry
65+348	1X25	25	FOB (Steel Structure)
66+540	8 X 7.0	12	Total width inc. Footpath
67+200	1 X 1000	12	
67+720	4 X 5.0	12	Total width inc. Footpath
67+830	1 X 1000		
68+380	3X 1000	16.7	
68+450	1 X 1000		
68+680	3X 1200	16	

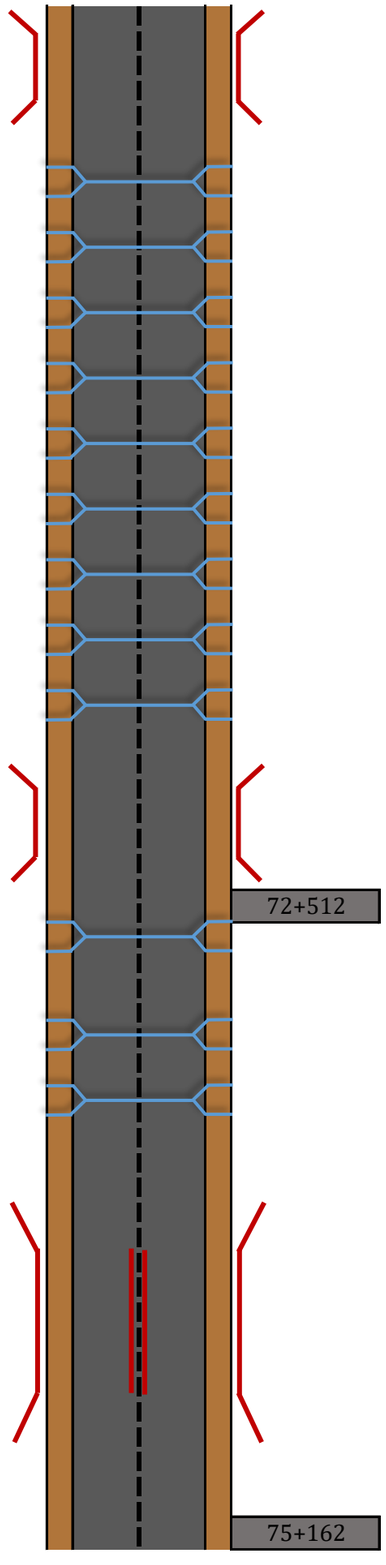
DESIGN DETAILS



	Span/Dia	Pro. Width	Remarks
64+360	1 X 1200	22.5	Reconstruction
64+945	3X5.8	2x11	Reconstruction
65+260	1X25	W=25.0 H=6.0	FOB Retained
66+440	8 X 7.0	11	Ex. Bridge Retained/ Parallel New Proposed
67+105	1 X 1000	22.5	Widening
67+610	4 X 5.0	11	Ex. Bridge Retained/ Parallel New Proposed
67+720	1 X 1200	22.5	Reconstruction
68+290	3X 1000	22.5	Widening
68+360	1 X 1200	22.5	Reconstruction
68+590	3X 1200	22.5	Widening

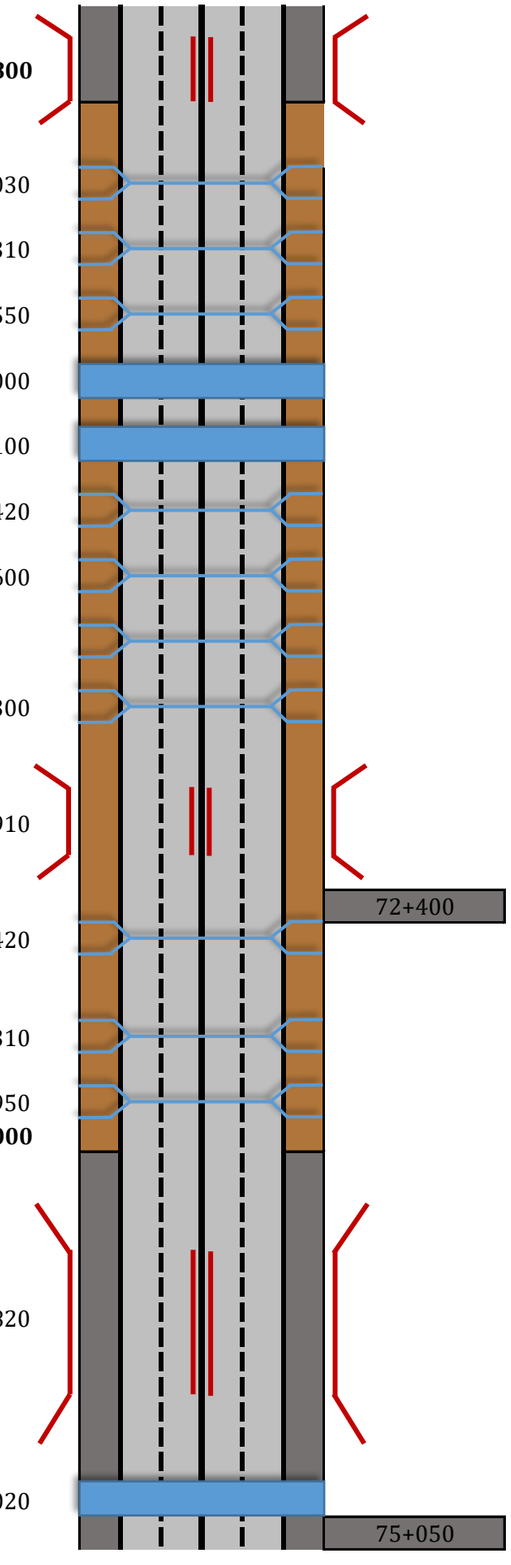
EXISTING DETAILS

	Span/Dia	Ex. Width	Remarks
68+910	3X5.0	9.5	
69+100	1 X 1000	12	
69+400	1 X 900		
69+630	1 X 900		
70+110	5 X 1200		
70+210	5 X 1200		
70+530	1 X1200	12	
70+690	1 X 900		
70+950	1 X 1200	12	
71+390	1 X 900		
72+030	3X5.0	10.5	Overall Width
72+510	1 X 900		
73+400	1 X 1200	12	
74+040	2 X 1200	12	
74+900	20X10 (Old) / 10X20 (New)	7.2 (Old) 8.0 (New)	
75+130	1X4.4	12.6	



DESIGN DETAILS

	Span/Dia	Pro. Width	Remarks
68+800	3X5.0	2x11	Reconstruction/ Parallel New Proposed
69+030	1 X 1000	22.5	Widening
69+310	1 X 1200	22.5	Reconstruction
69+550	1 X 1200	22.5	Reconstruction
70+000	1 X 5.0	22.5	Reconstruction
70+100	1 X 5.0	22.5	Reconstruction
70+420	1 X1200	22.5	Widening
70+600	1 X 1200	22.5	Reconstruction
	1 X 1200	22.5	Widening
71+300	1 X 1200	22.5	Reconstruction
71+910	3X5.0	11	Ex. Bridge Retained/ Parallel New Proposed
72+420	1 X 1200	22.5	Reconstruction
73+310	1 X 1200	22.5	Widening
73+950	2 X 1200	22.5	Widening
74+000			
74+820	10X20	11.0	Reconstruction (Old) Retained (New)
75+020	1X4.4	22.5	Widening



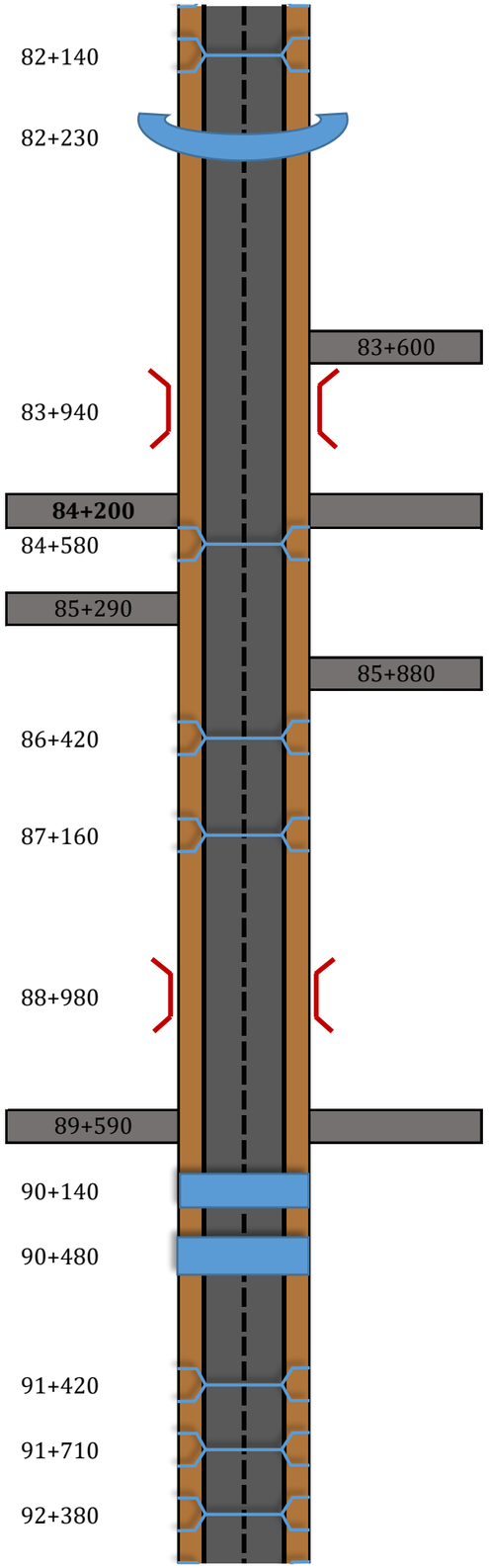
EXISTING DETAILS

	Span/Dia	Ex. Width	Remarks
75+420	6X5.8	7.5 (Old) 12 (New)	Stone Masonry
75+712			
76+340	1 X 900		
76+970	2 X 900		
77+165	Chocked		
77+820	1 X 900		
77+985	1 X 900		
78+260	1 X1000		
80+160	9X5.5 (OLD) 8x5.5 (New)	7.3 (Old) 8.7 (New)	
80+472			
80+590			
80+610	1 X 4	12.6	
81+120	Near Deola	12.5	Foot Under Bridge
81+435			
81+612 (T)			
81+700	5X5.5 (OLD) 5x5.5 (New)	6.5 (Old) 11.7 (New)	
81+880 (Y)			
82+000			
82+080	1 X 0.5m		

DESIGN DETAILS

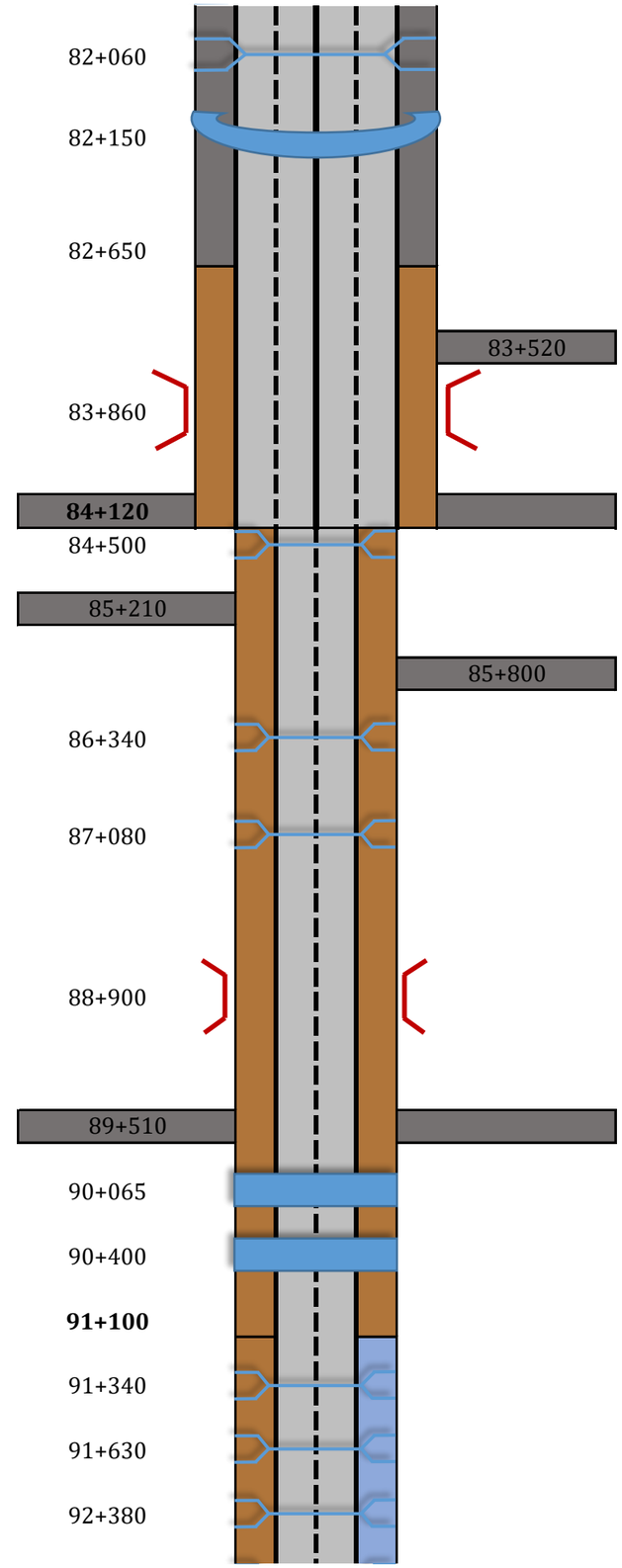
	Span/Dia	Pro. Width	Remarks
75+310	6X5.8	2x11	Reconstruction (Old) Retained (New)
75+370			
75+600			
76+225	1 X 1200	22.5	Reconstruction
76+870	2 X 1200	22.5	Reconstruction
77+070	1 X 1200	22.5	Reconstruction
77+500			
77+730	1 X 1200	22.5	Reconstruction
77+900	1 X 1200	22.5	Reconstruction
78+170	1 X 1200	22.5	Reconstruction
78+400			
80+085	8 X 5.8	11	Reconstruction (Old) Retained (New)
80+360			
80+500			
80+520	1 X 4	22.5	Widening
81+030	Near Deola	22.5	Widening Foot Under Bridge
81+320			
81+420 (T)			
81+633	5X5.5	11	Reconstruction (Old) Retained (New)
81+800 (Y)			
81+920			
82+000	1 X 1200	22.5	Reconstruction

EXISTING DETAILS



	Span/Dia	Ex. Width	Remarks
82+140	2 X 1000		
82+230	Near Deola	14	Foot Under Bridge
83+940	3x6m	12	
84+580	1 X 900		
86+420	1 X 900		
87+160	1 X 900		
88+980	1x11.2m	12	
90+140	1 X 2.3	12	
90+480	1 X 3.3	12	
91+420	2 X 1200	11.7	
91+710	2 X 1000		
92+380	1 X 900		

DESIGN DETAILS



	Span/Dia	Pro. Width	Remarks
82+060	2 X 1200	22.5	Reconstruction
82+150	Foot Under Bridge Near Deola	22.5	Widening
83+860	3x6m	22.0m	Widening
84+500	1 X 1200	14	Reconstruction
86+340	1 X 1200	14	Reconstruction
87+080	1 X 1200	14	Reconstruction
88+900	1x11.2m	16.0m	Widening
90+065	1 X 2.3	14	Widening
90+400	1 X 3.3	14	Widening
91+340	2 X 1200	14	Widening
91+630	2 X 1200	14	Reconstruction
92+380	1 X 1200	14	Reconstruction

EXISTING DETAILS

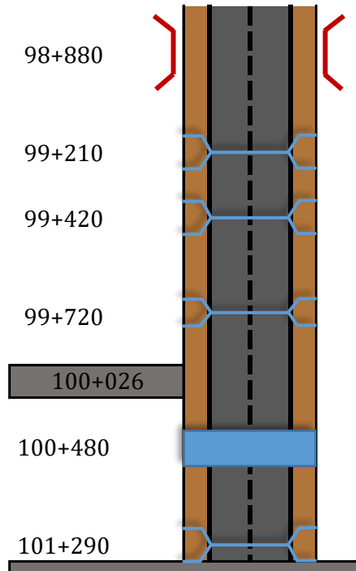
	Span/Dia	Ex. Width	Remarks
92+580	1 X 900		
92+740	2 X 900		
92+940	1 X 900		
93+410	4 X 1000		
93+620	2 X 1000		
94+020	1 X 1200		
94+220 (T)			
94+330	1 X 900		
94+620	1 X 3.2		
95+160	1 X 3.1		
95+340	2 X 1200		
95+685			
95+990	1 X 1200	12	
96+360	2 X 1000		
96+460	2x4.0m	12	
96+920	1 X 1000		
97+240	1 X 1000		
97+440	1 X 900		
97+520	1 X 1000		
97+790	1 X 3.3	12	
97+940	1 X 900		
98+230	1 X 900		
98+600	1 X 900		

DESIGN DETAILS

	Span/Dia	Pro. Width	Remarks
92+500	1 X 1200	14	Reconstruction
92+650	2 X 1200	14	Reconstruction
92+800	1 X 1200	14	Reconstruction
93+210	1 X 4.0	14	Reconstruction
93+500			
93+620	1 X 4.0	14	Reconstruction
93+820	1 X 1200	14	Reconstruction
94+020			
94+130	1 X 1200	14	Reconstruction
94+420	1 X 5.0	14	Reconstruction
94+960	1 X 5.0	14	Reconstruction
95+140	2 X 1200	14	Reconstruction
95+480			
95+790	1 X 1200	14	Widening
96+150	1 X 4.0	14	Reconstruction
96+260	2x4.0m	16.0m	Widening
96+720	1 X 1200	14	Reconstruction
97+040	1 X 1200	14	Reconstruction
97+240	1 X 1200	14	Reconstruction
97+320	1 X 1200	14	Reconstruction
97+590	1 X 3.3	14	Widening
97+740	1 X 1200	14	Reconstruction
98+030	1 X 1200	14	Reconstruction
98+390	1 X 1200	14	Reconstruction

EXISTING DETAILS

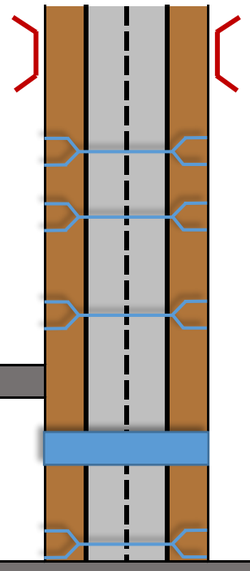
	Span/Dia	Ex. Width	Remarks
98+880	2x4.0m	12	
99+210	1 X 900		
99+420	2 X 1000		
99+720	1 X 1000		
100+026			
100+480	4 X 1200		
101+290	1 X 1000		



101+362
MUMBAI-AGRA HIGHWAY (OLD NH-3)

DESIGN DETAILS

	Span/Dia	Pro. Width	Remarks
98+680	2 X 4.0	16.0m	Widening
99+010	1 X 1200	14	Reconstruction
99+220	2 X 1200	14	Reconstruction
99+520	1 X 1200	14	Reconstruction
99+820			
100+280	1 X 6.0	14	Reconstruction
101+080	1 X 1200	14	Reconstruction



101+140
MUMBAI-AGRA HIGHWAY (OLD NH-3)