

Role of an architect in projects involving EPC contracts

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Abstract

Purpose: Engineering, procurement, and construction (EPC) contracts are on their way to becoming the most common type of contract used by the private sector for large-scale infrastructure projects. Every project requires a strong relationship between all of the experts participating in EPC projects and the client. This relationship must be solidly established by an architect; otherwise, the project may fail for all parties involved, including the client, contractor, lenders, government, and others. The purpose of this study is to identify if the working of the EPC contracts is favourable for the architectural profession, and to identify the way in which the working could be improved.

Methodology: A qualitative approach was applied to analyze the critical points of EPC contracts based upon reviews of related case studies from the public sector and supplementary interviews with professionals in the field.

Main Finding: The architect's role in an EPC contract is not crucial and is equal to other stakeholders involved in the project. Also, EPC contractors have the power to dictate the workflow of the project and hence, architects might have to compromise in terms of the design, compensation, etc.

Implications: It is very important for every project to have an outcome based on each stakeholders/consultants inputs specially on larger projects, this article is a step towards understanding the role of architects under an EPC contract as the future projects will come under its purview.

Novelty: The study is done under the lens of a newly graduated architect and not as any other professional, thereby trying to develop an understanding for fresh architects.

INTRODUCTION

EPC expands to Engineering, Procurement and Construction. It is a type of contract where the contractor has the complete accountability for timely and guaranteed quality completion of the project. The contractor has to undertake activities from initial designing, procurement to site execution and Commissioning of the project. It is a type of Turnkey contract where the contractor takes responsibility for completing and safely handing over the complete project to the client. The contractor in case of failing to complete the project within time may involve scope for a penalty.

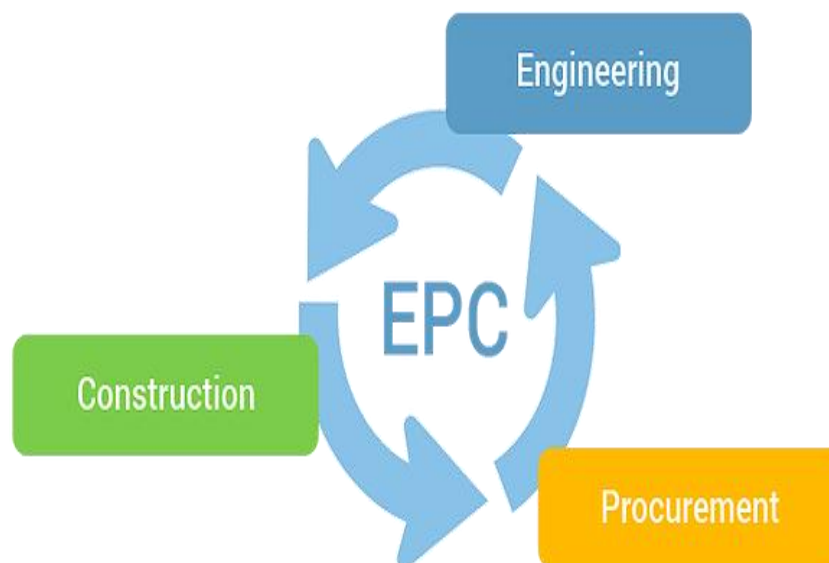


Figure 1: Cycle of EPC Projects

Source: veston.com

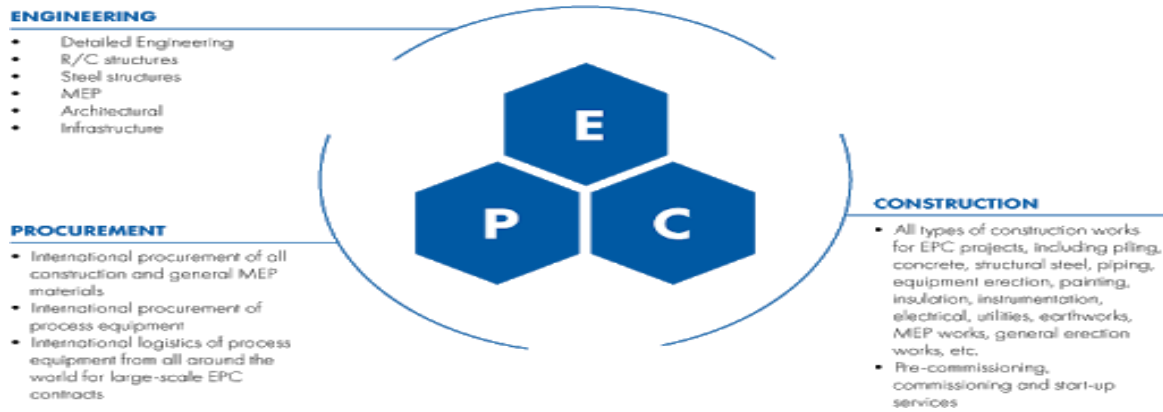


Figure 2: Components of EPC contract

Source: uechm.com

RESEARCH QUESTION

What is the role of an architect in the projects involving EPC contracts? And what is the workflow in such contracts?

Importance

The procurement of projects on turnkey-based contracts best suits the owner when the project is being financed by him. Also, EPC contracts are Turnkey type where it's the contractor's responsibility to complete the project within time and guaranteed quality and deliver to the owner.

By this route, funders and Owners expect to get the degree of certainty as to the time and costs that they require. The international federation of consulting engineers, FIDIC provided appropriate standards for EPC contracts in its book "The introduction of its conditions of contract for EPC/Turnkey Contracts" also known as FICID silver book.

Difference between EPC & Turnkey contracts

EPC contractor makes the detailed design based on the basic engineering provided to him by the employer. In turnkey, the employer provides only some technical specifications, whereas contractors prepare both the basic engineering and detailed design. For Commissioning and start-up in Turnkey, the contractor gets the responsibility to perform. Whereas in EPC, it's done by any third person.

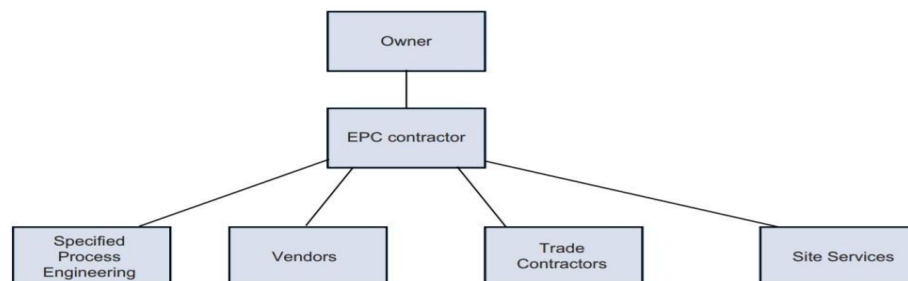


Figure 3: Stakeholders of EPC

Source: www.answer.com

	EPC	EPCM
Accountability	Contractor fully accountable	Owner has multiple points of accountability
Risk	Contractor holds risk	Owner holds risk
Time	Fixed date for completion	No fixed completion schedule
Price	Fixed price contract	Schedule of Rates / Cost Plus
Procurement	Contractor responsible for procurement	Procurement as agent for the owner only
Quality/Performance Guarantee	Contractor guarantees performance of completed facility	Contractor does not provide performance guarantees
Owner's Involvement	Contractor in control	Owner in control
Defective works/services	Contractor to rectify any defects	Assists owner to manage rectification of defects

Figure 4: Different parameters to understand EPC

Source: Aveston.com

SCOPE & LIMITATIONS

EPC Projects include civil works, Electricity installments, Fire Protection, Security, Interior Design, and Maintenance. EPC projects are studied only through the lens of a newly graduated architect and not as any other professional.

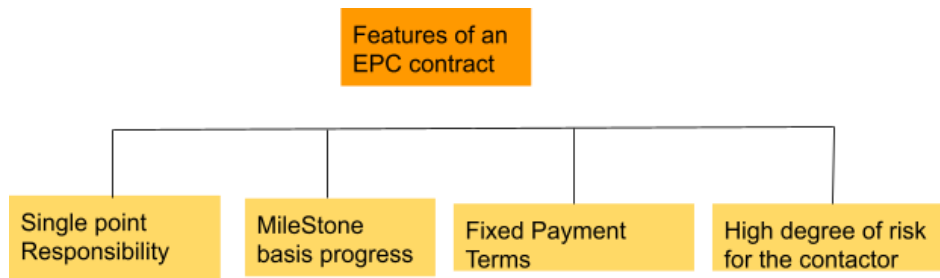


Figure 5: Features of EPC contract

Source: Author

Single point of Responsibility

The project owner hires only one EPC contractor, while he manages all the other subcontractors.

Milestone basis progress

The total contract activities will be segregated into various sets of activities with certain milestones to accomplish. The overall project has one milestone including these sub milestones.

Fixed Payment Terms

The payment terms are fixed and specific in EPC contracts and linked to the milestone-based performances of the EPC contractor and also has some kind of tension on the bills of payment until the contractor executes and delivers a successful product on time.

The high degree of risk

EPC contractor has single point responsibility in completing the project and he is the one who is accountable for failing to deliver on it on time. Therefore, the Contractor ensures a high degree of risk since he is bound to responsibilities.

INCENTIVES

Percentage of the amount to be deduced on computing the damage caused due to stated delay on the contractor's part. On completing the work before the stipulated time a bonus amount is paid to the Contractor. The Contractor shall have the Obligation to rectify construction defects minimum of up to 5 years from the day of project completion.

RESPONSIBILITIES & ROLE OF ARCHITECT-FUTURE AMENDMENTS

The responsibilities and importance will remain the same, be it a government project or a private one. Hence, the EPC contracts should also occur between the client and the architect, instead of between a contractor and client. For the activities from designing to commissioning of the project, Architects are also held responsible but given less importance in the current scenario and the EPC Contractor is given more importance.

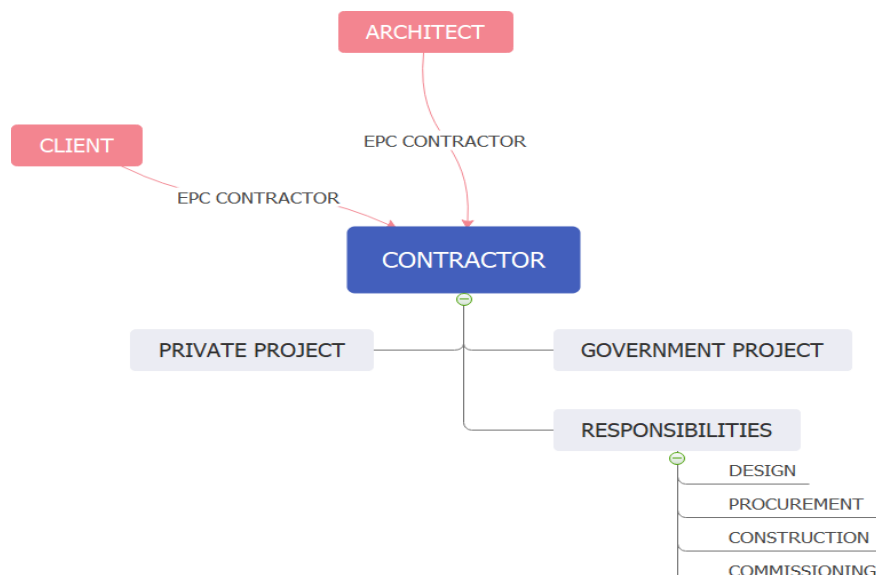


Figure 6: Relationship between contractor and architect

RESEARCH FRAMEWORK

The system-level changes that could be brought about, will be explored by interviewing the professionals in the field of architecture and successful project managers, for a broader and better understanding. Suggestions from the students would also add to the existing knowledge.

What are the steps and workflow of the EPC contract? Pre contracting activities

Before signing the contract agreement, the project's financial and technical feasibility to be pre-analysed carefully. The Energy consumption and savings programmers, specifications, and program of energy equipment also need to be pre-determined.

Implementation

In the EPC contract document, a provision for Maintenance and Project Execution details is also clearly mentioned to maintain or improve the quality of project implementation.

Measurement and Verification (M&V)

It is suggested to maintain the Measure and Verification plan to analyse the project performance and establish the projected savings. A M&V plan includes the measure of frequency, equipment, and other variables. To ensure proper calculations it's suggested to use a standard in M&V calculations. In EPC all the payments are based on M&V results making it an important stage.

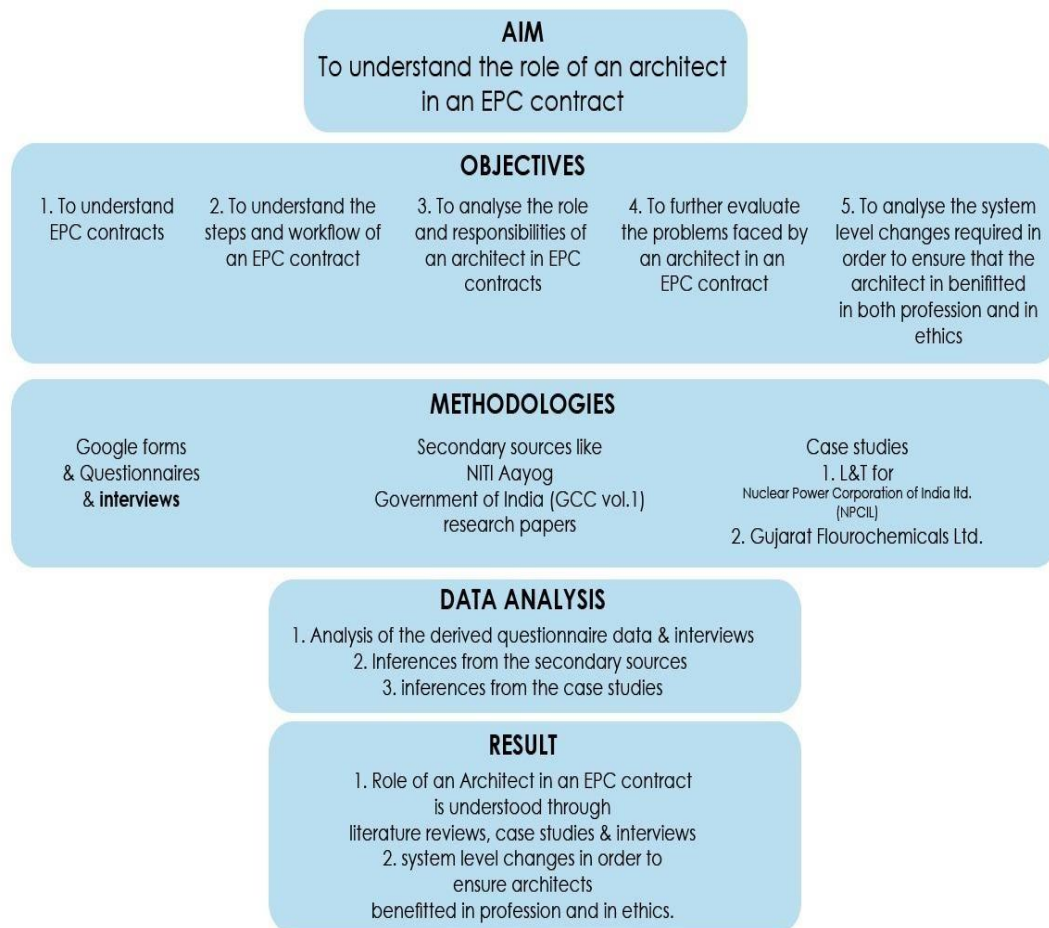


Figure 7: A research framework

Source: Author

End of contract

Many factors influence the implementation of EPC projects, including the tendering process, Financing, Equipment, and Energy supply. Generally, it takes 2-3 years for the implementation measures of EPC from the beginning to the end of the project.

The Client as a part of full benefits might assume the energy management and the equipment ownership is generally assumed by the client at the end of the EPC contract and the contract might be amended or extended based on when the client and Energy Savings Corporation (ESCO) deem it appropriate.

Workflow of an EPC contract

CONSTRUCTION WORKFLOW TEMPLATE

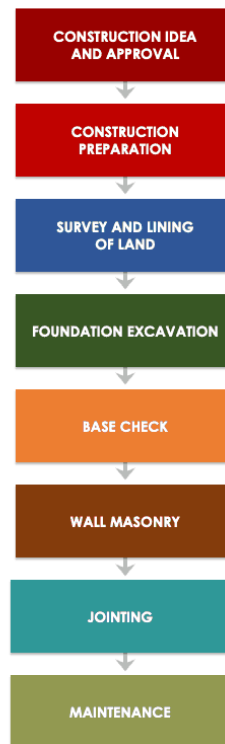


Figure 8: workflow of an EPC contract

Source: <https://insights.globalspec.com/article/9421/factors-to-consider-when-beginning-your-epc-project>

When an architect is involved with an EPC contract and further understands the responsibilities of an architect.

Design & Layout of Project Facilities

The sequence of the steps involved in the projects are described by the destinations of each member's roles and responsibilities in the design project and how the estimation of costs of a newly renovated projects facility are made by introducing the work typically performed by a consultant in the design process.

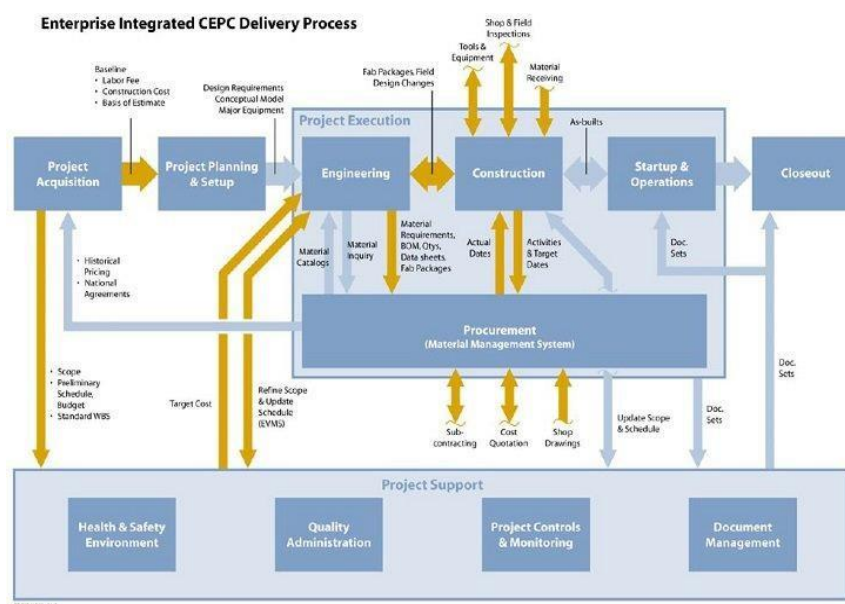


Figure 9: Construction workflow template

The Owner's Representative – Typical Roles and Responsibilities

The typical role of the owner's representative is opting for team members, including Architects, Consultants, and Others who are involved in the design process and project execution. The owner's representative is also involved in acquiring funds, establishing the project's operational goals, and approving the recommended equipment and materials needed in

the project.

The Architect: Typical Project Roles and Responsibilities

The architects work includes from designing, making detailed drawings to reviewing the work at site and inspection. Unlike in many Architectural projects the sole responsibility lies with the architect, In EPC projects the architect needs to work in coordination and following the contractor's guidelines.

Schematic Design

The schematic design of the building shows the entrances, movement pattern, and location of major building components. It is presented and revised by the owner several times. At the end of the schematic design phase a preliminary cost estimation is prepared.

Construction Documents

Construction documents generally include Site Execution Details like fabrication methods, Installation methods, Specification related to materials, structural systems and workmanship. It also includes designations of responsibilities, General contracting conditions and payments schedules.

Types of Specifications

Descriptive Specifications identify important characteristics of the material and Product specifications are identified by the proprietary specifications of product, manufacturer and model number and performance criteria is relatively independent of product specification.

Construction Coordination

The contractor prepares the review of drawings and equipment submittals by Examining the construction progress and identifying where the work fails to meet the requirements of the contract documents by checking with the "punch list".

CASE STUDY-1

Project

Inter-State Bus Terminal, Commercial Complex, and Multilevel Car Parking

Location

Katra, Jammu & Kashmir

Client

(K.D.A) Katra Development Authority

Scope of the Project

The project scope includes Interstate Bus Terminal (ISBT) Katra, Jammu Kashmir, a Commercial Complex, and a multilevel car parking. Architect under the supervision of the contractor involves in; Preparation of Detailed Architectural Drawings, Projection Execution plan; BOQ(Bill of quantities) needs to be prepared and getting approval from CPWD after reviewing if its satisfying the related specifications; Preparing and reviewing the structural design; Architect involves in Construction and Commissioning related works in reviewing and coordinating with the contractor. In this project the Architect needs to review and get approval of the project from Katra Development authority at every design stage. The Bidder needs to emphasise the requirement of pre-engineered structures and procure them based on load calculation by the approval of KDA and the designs have to be proof checked.

Project Details

ISBT

The approximated area of the bus terminal area is 12,060 sq. excluding bus bays. and development is to be done catering the future requirements.

COMMERCIAL COMPLEX

The approximate minimum area given for development of Commercial Complex is 83,100 sq. which includes its FAR and excludes the Basement Area. The Commercial complex should be built according to the existing regulations controlling the development programs at site.

MULTILEVEL CAR PARK

The approximated total built area is 24,880 sq. for the proposed multi-level car parking. For all types of levels in Bus terminal projects the ramp-based conventional car parking systems are used.

The Role of an Architect in the Project

Architects need to cover the detailed design for project execution, detailed architectural and preparation of all related

drawings by the architect, concerned with the execution of the Bus Terminal Facility. Architect needs to design the passenger facilities which include mainly the parking zones for both public and private uses, Public toilets which are essentially provided in public areas, drinking water facility, Indoor Waiting Halls and Outdoor seating arrangement and other services like dustbins, lighting design and placement for retail stalls which generate revenue. The design program of the architect also includes the Bus Terminal Facilities like mainly ample circulation area, Waiting Halls, Bus stands/bays, Counters for Ticketing services, Enquiry, Pre- Booking and Reservation Purposes. Bus Terminal Infrastructure Facilities Drinking Water supply, Sanitation facilities, Water and Water management facilities and Information and communication systems to be also designed by the architect and his design team. The Architect needs to coordinate with the other design team and the contractor in carrying out all construction works, bidding and contract, design negotiations and inspection of design and construction process.

Construction Coordination

The contractor works in coordination with architects, engineers and other design consultants in reviewing the drawings and other construction works. Contractors examine the construction progress and identify where the work is failing to meet the requirements by checking with the "punch list" and other construction-related documents.

Liabilities and Responsibilities of an Architect

The architect has to detail out to a certain extent where nothing is missed out. So the chances of the inaccuracy of design can be eliminated. It's more of teamwork in EPC contract where there's rolling involvement of all consultants and architects. In the EPC model is the whole design team is in the control of the contractor. As the EPC contract begins with the design stage the role of the architect becomes of utmost importance, also since the contract is bound till the end of the project there's a constant involvement of architects. The architect is one of the many team members in the project listen to the Contractor and gets paid based on his performance. Architects should also ensure that the contractor meets those rules and schemes.

CASE STUDY-2

Project

The project is to design Gandhinagar Railway Station for redevelopment and 300 Rooms Hotel Building developments above the railway station.

Location

Gandhinagar, Gujarat

Client

GARUD (Gandhinagar Railway & Urban Development Corporation Limited)

Architect

Kamlesh Parekh Architects

Scope of the Project

To design a Redevelopment of railway station and a 300 rooms capacity Hotel Building above the railway station based on Turnkey Contracts. The project location is at Gandhinagar, Gujarat.

Under the supervision of Contractor Architect works on

- (a) Preparation of detailed designs and project execution plan.
- (b) Reviewing the Construction and Commissioning of the Project Coordinating with other design team and Consultants.
- (c) Procurement of pre-engineered Structures by the approval of the owner.
- (d) Getting approval of the Project by the owner at different stages of design.

Architects role in Project Organization

Architect & Engineers, Managers, and all the technical staff are under the control of EPC contractor to satisfy all the required documents as per EPC agreement. To avoid the duplication of any designation, architects and engineers will allot the required designations to different project teams before adoption under the consultation of the contractor. For emergency purposes the control room radio communication connects the senior official's residences to all the important site offices, plants, workshops areas, off-site offices and other important areas present in the site. Also, emergency vehicles are provided at the control room which are kept ready to reach the rescue.

Architect's role in Design Phase

Design phase

The main requirements of the Design Phase are; the preliminary design; the final design; the construction reference

drawings

As part of the EPC document, the architect should make sure he clearly understood the contractor's technical proposal and the design development should be in compliance with the regulations and standards and conforming to the Outline Design Specifications and all other provisions the EPC Agreement. Engineering studies and comparative evaluations shall be performed to ensure that the designs incorporate features to achieve optimum performance. In addition, Building Services design, shall be reliable, energy and cost-efficient with due considerations to local climate and conditions, safety, ease of operation, maintenance, future replacements, etc.

Preliminary Design

The architect prepares the preliminary design based on the drawings attached to Schedule-I which covers; drawings for the mandatory project, and, developed to sufficiently detail and define the main structural elements. Whereas, the contractor's preliminary design technical proposal shall incorporate the QA Plan for the design of the Mandatory Project; conformity of the standards and specifications attached to the Agreement, including specifically those set out in Schedule- 9 (Standards and Specifications); submission of the design manuals, with the proposed design software; preliminary maintenance analysis; submission of specifications proposed for the works; the design codes and standards; the CAD procedures; the preliminary station sizing, including main structural components; the preliminary construction methodology; the preliminary traffic management plan; the preliminary passenger movement plan for various phases of the construction; the utility diversion plan; all the primary architectural drawing layouts and materials; all the proposed surveys; the working plan under railway operations, including the requirement for traffic and power blocks (and other Block Works).

Definitive Design

Final Design shall present with and include the Preliminary Design and shall be developed to the stage where all the structures are fully defined and specified. While preparing the final Design, the Contractor has to finish all the required surveys and necessary tests to complete the design of the construction Works. The final design submission shall be clear and properly combined and indexed with the complete set of documents and shall fully describe the Mandatory Project. In particular, it shall define; structural elements and members' dimensions; calculations and analysis of all the design; every significant element is delineated; every test and trails and sections of equipment and materials are needed to defined in the required documents. Shall take full account of the effect on the Permanent Works of the Mandatory project of the proposed methods of construction and the Temporary Works. Potential forces and movements due to all possible loadings and actions on the structures, and their accommodation; standard details; details for Project Utilities and Project Facilities (as required to be provided under the Agreement) and their interaction with the structures; Erection methods; Design commentary about use of prefabricated and precast elements for minimising Block Works; Utilities to be diverted/ supported; All the methods to predict movements and vibrations due to the railways operations all the Details of the civil services and traffic services affected Drawings showing the general arrangements, architectural elevations, perspectives and landscaping; Structural elements layout; Structural and surface drainage; Passenger access pathways and temporary road works; pumping systems, fire detections and alarm and fire fighting systems; station ventilation and air-conditioning; electrical plant room such as UPS, DG sets; existing utilities and proposed Project Utilities:

Reference Drawings of Construction following Mandatory Project

1. Design packages are made by dividing the definitive design and that will be submitted in advance.
2. The design packages clearly identify essential parts of proposed design.
3. Design Packages are made and submitted sequentially and progressively.
4. For the important elements of the proposal separate definitive designs are made and procured by sub-EPC agreement based on design specification and outline design.
5. To illustrate the mandatory project works and the drawings that guide the construction, upon the notice the contractor needs to complete all the design and construction requirements with respect to the definitive design.

CASE STUDY - 3

Project

Indian Institute of Management, Nagpur

Site area

132 acres

Architect

Rajender Kumar and Associates

Contractor

Ahluwalia contracts

Cost

Entire Project cost is INR 291crores.

Duration

The time duration for the entire project is 2 years, but sadly because of the covid pandemic the construction has been halted and resumed in the last month, giving the contractors an extension of 6 months because of the pandemic. So the new deadline is 5 months' way which is by end of May. They are left with 20-30% of the works to be completed in these next 5 months.

Typology

This is an institutional campus with site area is 132 acres. Academy buildings, classrooms, multipurpose hall, dining and other external development areas including spill out, oat, sports area, amenities, etc. Client is IIM Nagpur, they are handling the external agencies and looking into amenities. The contractors also Hired external consultants, and different agencies. The contractor company cannot hire all the consultants required so they take help from outside consultants. Architect has to take care of the client delivery, period and the specifications of the contract.

Data Collection

The following data consists of interviews taken from architects and project managers who are professionals in the field and the collected data is in tabular format. The interviews are conducted online through phone calls and text messages. The target interviewees were chosen so that they are currently working in an architecture firm / under a doctorate. The questionnaire consists of 2 major questions and 1 optional question. The questions were formed to bring out the role of an architect in an EPC contract and to get to know the challenges of an upcoming architect to work for an EPC contract.

From where was the data collected?

The data was collected through interviewing project managers, senior architects, and professionals who have been working on the projects involving EPC contracts for over 2 years and above.

When and over what period was the data collected?

The data was collected from professionals in the service for the past 2 years and above, and on their personal experience, so the collected data varies over the past 20 years.

What form was the data taken in so that this might be useful to the purpose of your study?

The form in which the questions are framed is to bring out the challenges of an architect working in projects involving EPC contracts and their personal experience working on EPC contracts (if any).

The following is the data collected.

From the interviews listed in table 1, the following points are observed clearly.

1. In an EPC project, unlike traditional ways of an architect being an important lead, other people will also influence the project's design. The architect's role is to help the contractor get the details right and supervise the entire project.
2. A contractor needs to complete the project in the given limited time and the architect has to help the contractor detail the design.
3. On-site, every project is different, and there is nothing like a standard EPC contract protocol. The workflow may vary from project to project and the architect has to adapt to the upcoming challenges throughout the project.

Table 1: Interview Data

Interviewee	What is the role of an architect in projects involving EPC contracts, based on your experience?	What are the challenges faced by a newly graduated architect when involved in projects involving EPC contracts?	What are the challenges faced by women in projects involving EPC contracts?
Shruti, ex-Project coordinator and faculty member at SPA-New Delhi.	As the EPC contract begins with the design stage the role of the architect becomes of utmost importance, also since the contract is bound till the end of the project there is a constant involvement of architects. It's more of teamwork in EPC contract where there's rolling involvement of all consultants and architects	More than a challenge I would rather say it as getting an opportunity to be part of all teams of the designated work. However, the key things become how to gain knowledge to one's benefit rather than getting confused with varied data. The drawback of EPC if not managed is a lack of coordination. Or dependency of one team	Again let's not target women susceptible to a contract type, it's more of learning, as good as for a male counterpart. Well, I am not sure of the compensation, I could say compensation could be the only challenge for women.

		on another.	
Ar. Ravindra Singh Verma, Experienced real estate professional and visiting faculty at SPA-New Delhi.	The whole idea of an EPC contract is, traditionally we used to have architects and the architect does detailing and drawings and the contract responds to a tender document. Once the construction starts the contractor starts the blame game, blaming the architect for not giving details and drawings on time (scope creep). The advantage of the EPC model is that the whole design team is in the contractor's control, and the detailing has to be done later on. The architect has to detail out to a certain extent where nothing is missed out.	Historically it is the contractor who listens to the architect. In the EPC bid architect has to take instructions. Because the architect's employer is the contractor and there could also be a conflict of interest. The contractor wants to detail out the things a bit. In the EPC model is the contractor who becomes the interest of the project. The contractor will have greater control over the architect in this model. When the architect is part of EPC contracts in many cases the fee is compromised, the contractor might not pay the so the chances of the inaccuracy of design can be eliminated	architects according to the guidelines.
Ar. Premendra Raj Mehta, former president COA India, former member Expert Group of Ministry of Commerce and Services and Director, City neon DAG India Pvt. Ltd	The role of an architect doesn't change in any project. Regardless of any project.	The challenges faced by a newly graduated architect remain the same, be it an EPC contract or any other project.	
Ar. Anil dewan Professor, Architecture dept. at SPA-New Delhi. Founder and chief advisor Ivysure consulting	As the council of architecture, the traditional role of an architect is like a boss. Everybody else listens to an architect, the architect is the god and everybody listens to him/her. In an EPC contract, everybody is at an equal level. The out of the box idea might come from any person working on the project. All stakeholders are equal. In the profession, we listen to the person who signs our check. It is the reversal of the role of an architect. The architects are being felt bad regarding this. The architect is one of the many team members in the project and not like the most important person.	The new person thinks that he is the god and like that when it comes to practice he gets to know that he doesn't know anything. That realization has to come as soon as possible. You have to start your learning. In most cases, you have to unlearn the facts from the college and relearn the new methods. The school should prepare you for the last job in the profession, not the first job. School should broaden our horizons to take up the challenges in real life.	
Ar. Sonia Kapre Founder and director at Mathur and Kapre associate, visiting faculty at SPA-New Delhi.	There are variations in the kind of contract depending on the kind of project. In EPC, the entire responsibility is given to other agencies. They know their financial liabilities and they know their time limit. The client may even get the drawings in the beginning. As an architect, your work will be restricted to the office itself. Get the design and the coordination with	The contractor himself can make different kinds of contracts, the client is not concerned about the contractors taking their respective jobs.	

	the other colleagues. Making specifications, calling tenders. And finally, report to the senior. Now the difference is there may be a specified thing mentioned in the starting. Be it the time limit or finance. On-site EPC will need a supervising team, architects will supervise the work. The client is going to give money and you will have a time limit to submit the project	
Ar. Sreeram Asokan Project Manager at FHD Group, Hyderabad.	There are two types of contracts mostly used in India, turnkey and the second type is consultant type. We hire a separate contractor. The architect is considered as an advisor to the client. A normal client would not be having the expertise to ask what to ask the contractor. Architects should also ensure that the contractor meets those rules and schemes. Because the client can't know the project quality by looking at the building.	No matter what you take 2-3 years you take to cope up with the real-world practice. There is a standard EPC format when you study in college, but no two projects are similar in real life. So architects have to adapt to the given scenario. Which can be learned from practicing in the real world.
Aruni Sharma, Ahluwalia Contracts, Ltd.	In EPC we design and construct parallel In general, perspective what architects can do in EPC is the best form of tender because architects built the optimised design and avoid over reinforcement Architects can avoid the over design and it should be in sync with the drawings Architects play a very important role in building information modelling Architects coordinate with structural, interior, and others to avoid clashes Architects make all the details and conceptual drawings Architects proactively contact clients and suggest better specifications In EPC projects, architects need to be more cost-efficient	Newly graduated architects needs to be tuned by the senior architects Construction is the least digitised sector, Architects needs to be more updated with technology They have to go through the specification thoroughly

Source: Author

Content Analysis (interviews):

Data collection in the form of interviews from architects, EPC contractors & Project managers has been documented in a holistic approach to understand the reality of projects involving EPC contracts.

The table below gives the description of analysis of interviews which leads to inferences.

Table 2: Content analysis of interview data

Name	What is the role of an architect in projects involving EPC contracts, based on your experience?	What are the challenges faced by a newly graduated architect when involved in projects involving EPC contracts?
Shruthi, Project manager and associate professor at SPA-New Delhi.	Architects are of utmost importance, teamwork is important.	Interdependency of consultants & coordination with consultants.
Ar. Ravindra Singh Verma, Experienced real estate professional and visiting faculty at SPA-New Delhi.	Design team will be in the control of the contractor.	Architect has to put extra effort in detailing
Ar. Premendra Raj Mehta, former president COA India, former member Expert Group of Ministry of Commerce and Services and Director, City neon DAG India Pvt. Ltd	Role of Architect doesn't change.	Same as in any other project.
Ar. Anil Dewan Professor, Architecture dept. at SPA-New Delhi. Founder and chief advisor Ivysure consulting	All stakeholders are equal in EPC contracts and the architect's role is not treated as most important.	Realisation about the practice. Taking up real life challenges in profession.
Ar. Sonia Kapre Founder and director at Mathura and Kapre associate, visiting faculty at SPA-New Delhi.	Work is restricted to the office itself. Design and coordination with other colleagues. Making specifications and calling tenders, reporting to the senior. Onsite supervision	Power in the hands of the contractor. Quality checks, PERT analysis. In time completion of project.
Ar. Sreeram Asokan Project Manager at FHD Group, Hyderabad.	Architect is an indirect advisor to the client. But, has to ensure that he meets the contractor's requirements.	In real world practice no two projects are similar, architects have to adapt to the scenario which can be learned while practicing in the real world.
Matcha Aditya, Contractor at Sri Sai Constructions, Visakhapatnam.	Coordination between contractors, providing dwgs, site checks, sending data for BOQ, site inspection along with contractors, fixing fees	No business knowledge, lack of coordination, site dealing.
Aruni Sharma, Ahluwalia Contracts, Ltd.	Perspective what architects can do in EPC is the best form of tender because architects built the optimised design and avoid over reinforcement Architects can avoid the over design and it should be in sync with the drawings Architects play a very important role in building information modelling Architects make all the details and conceptual drawings In EPC projects, architects need to be more cost-efficient	Newly graduated architects need to be tuned by the senior architects They have to go through the specification thoroughly

Source: Author

From the Analysis above, the architect's role in an EPC contract is not of utmost importance and is equal to any other stakeholder. The challenges faced by the freshly graduated architect when involved in an EPC contract are to face the real life projects in practice and might be restricted to office. There is also interdependency of consultants and no two projects are similar. Hence, timely PERT analysis check, coordination with consultants, and in time completion of project along with quality analysis becomes the challenging aspect in EPC contracts; for a newly graduated architect.

Analysis (Case study)

The analysis of the case study shows that the architect's role is of utmost importance since there is a constant involvement of the architect from the beginning of the project and it becomes the architect's prime responsibility to detail drawings for the project execution timely completion.

The challenges faced by the architect is that

1. Architect has to listen to the contractor in terms of the design process
2. Architect based on their performance

3. Construction coordination
4. Site supervision
5. Bidding and contract negotiation

Table 3: Case study 1 analysis

Case study-1	What is the role of an Architect in projects involving EPC contracts, based on your experience?	What are the challenges faced by a newly graduated architect when involved in projects involving EPC contracts?
Inter-State Bus Terminal, Commercial Complex, and Multilevel Car Parking	All the required architectural drawings, provision of passenger amenities for project execution works of design team will be under control of contractor	More efforts in detail to prevent inaccuracies, architect is one of the many team members in the project listen to the contractor and gets paid based on his performance

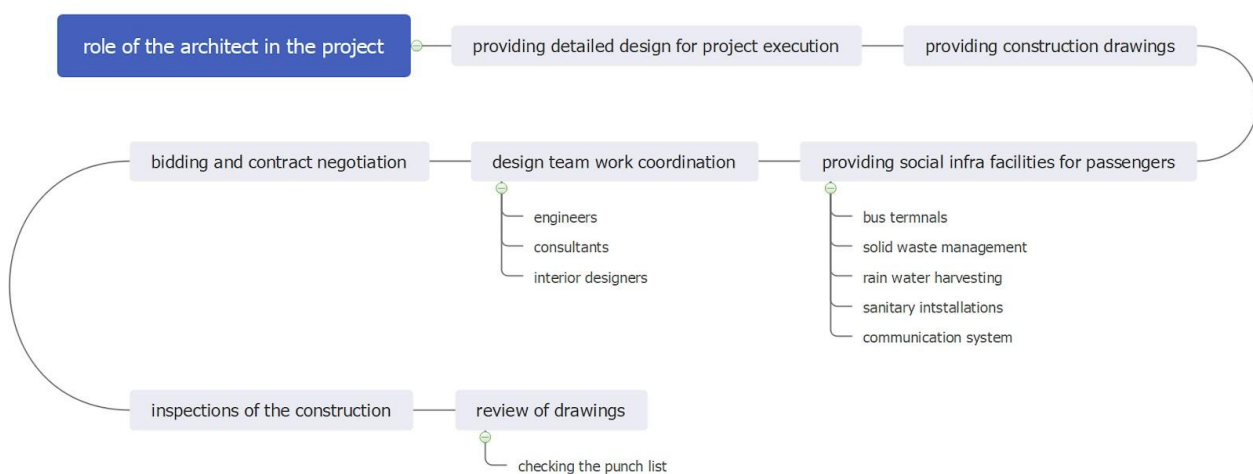


Figure 10: Role of the architect in the project

Source: Author

Table 4: Case study 2 analysis

Case study-2	What is the role of an Architect in projects involving EPC contracts, based on your experience?	What are the challenges faced by a newly graduated architect when involved in projects involving EPC contracts?
Gandhinagar Railway Station for redevelopment and 300 Rooms Hotel Building development above the railway station.	All the required architectural drawings, provision of passenger amenities for project execution works of design team will be under control of contractor	More efforts in detail to prevent inaccuracies, architect is one of the many team members in the project listen to the contractor and gets paid based on his performance

Source: Author

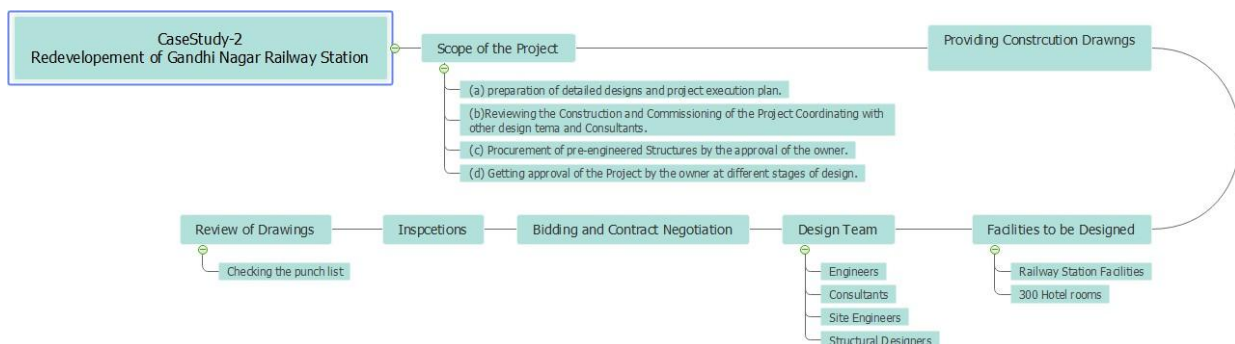


Figure 11: Case study 2 workflow

Source: Author

Inferences and Learnings

The importance of the architect in EPC contract is that apart from the architect involved from the contractor's side, an

architect is involved from the client's side in larger contracts. This ensures that the EPC project takes place as per the specifications and ensures the project's completion on time. It also ensures that the project is done within the specified budget. From the data collected and the case studies done, the following inferences are derived regarding the roles and responsibilities of an architect in an EPC contract.

1. Importance of an Architect

Architect is not given utmost importance in an EPC contract. In other architectural projects which may not be taken up in turn key method or any other contract like EPC model, the architect is treated like a keystone to an arch, where he is treated like a superior who is involved right from the design stage to the procurement and construction. EPC contracts do not involve direct interactions of the architect with the client and hence, not given the importance as the EPC contractor. This can vary depending on the scale and type of project as well. The interviews imply that the architect is given equal importance as other consultants, but not the utmost importance. Hence, EPC model is now taking forms of the EPCM model.

2. Importance in comparison to other stakeholders

As mentioned above, the architect's role is equal to the other stakeholders in the project like the consultants (electrical, structural, plumbing, HVAC). However, in comparison to other consultants, architects are constantly involved in the project execution and coordination hence, the architect's importance in comparison to other stakeholders is greater.

3. Role of an architect in EPC contract

The role of an architect in an EPC model (Engineering, procurement, construction) starts from the design stage. In Engineering, specifically, architecture and infrastructure engineering. In the construction phase, the architect is responsible for pre-commissioning and commissioning services, including piling, concrete, structural-equipment erection, instrumentation, earthwork, MEP work, etc., coordination with consultants. In the procurement stage, international procurement of all constructions and MEP material, process equipment is undertaken. Hence, the architect's role involves the design, execution, construction, coordination, site supervision, and commissioning and procurement of material in large-scale projects.

4. Liabilities of an architect

The architect has to detail to certain extent to eliminate the inaccuracy of design. Consistent team work of architects with other consultants of EPC contract is the key to success of an EPC contract, where careful examination and analysis for project completion using project evaluation review technique (PERT) becomes the architect's responsibility as any delay in the project has to be avoided through multiple PERT charts in the profession. Furthermore, the architect should ensure that the contractor meets the client's requirements since he is liable to the contractor and there is consistent involvement by him/her and the consultant which demands for teamwork and construction coordination.

5. Role of a freshly graduated architect in an EPC contract

The role of a freshly graduated architect is limited to the office. The architect here will be responsible for getting the design and coordination with other colleagues, making specifications, calling tenders, and finally reporting to the senior. Onsite EPC will also demand for architects to look over the work. The architect is responsible to submit the project in time, to be paid.

6. Relationship between an EPC contractor and an architect

In most projects involving EPC contracts, the architect has to follow the EPC contractor, even designing in some cases. It becomes evident that once the construction starts the contractor will start a blame game and this will lead to the scope creep of the project increasing the demand for the detailing. When the architect is a part of the EPC contract the fee is compromised sometimes and the contractor may not pay the architect according to the guidelines. The contractor has the opportunity to hire individual item rate sub-contractors for completion of the project and this will ultimately lead to the architect being a stakeholder of lesser importance as the architect gets paid based on the performance. More effort has to be put in by the architect.

7. Challenges faced by a freshly graduated architect

Projects involving EPC contracts are diverse based on the nature and scale of the project. Hence, no two projects are similar in the workflow and a freshly graduated architect will find it difficult to work with the EPC contractor. The architects have to learn to adapt to the real life situations which can be learned from practice and experience over the years. The college doesn't prepare the architect for the real life projects involving the EPC model. Hence, the theoretical knowledge gained in college is important in such circumstances to understand the reality of the practice. Like in other projects, some of the contracts like the turn key contract or the EPC style of working architect is not the head of the project therefore, working in such projects will require the architect to accept the fact that he is equally important to any other stakeholder in the project and has to make himself adapt to accepting ideas and exchanging information with the other consultants.

CONCLUSION

The architect's role in an EPC contract is not crucial and equal to other stakeholders involved. Also, EPC contractors

have the power to dictate the workflow of the project and hence, architects might have to compromise in terms of the design, compensation, etc. It becomes important to understand that coordination with consultants is the key for a successful EPC project. Therefore, a freshly graduated architect must be well aware of the theoretical aspects of the different types of the contracts in profession and the techniques of analysis like PERT, etc., to avoid delay and submit the project in time.

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