



Project Delivery Method Comparisons

CONTRACT DEFINITIONS

- **EPC – Engineer, Procurement, Construct**

Employer provides basic engineering to a Contractor and the latter shall perform detailed design based on the basic or preliminary design. The start-up and initial test work may be done by a 3rd party if not by the EPC Contractor.

- **EPCM – Engineer, Procurement, Construction Management**

Contractor (or Consultant) is responsible for Engineering, Procurement and Management of the construction phase of the project, on behalf of the Owner. EPCM Contractor/Consultant does not construct or commission the project, merely supervise and manage those works on behalf of the Owner.

- **BOOT – Build, Own, Operate, Transfer (BOOT)**

- **BOOM – Build, Own, Operate, Manage (BOOM)**

- **Alliance**

Contractor (or Consultant) and Owner form an integrated team that fully collaborates in order to de-risk complex projects. Under an alliance contract all participants (notionally) share in the risks and returns. Alliance contracting is often used for high risk projects where it is not possible to adequately or fully define the scope or the project outcomes in advance.

- **Turnkey – Design, Construct, Test, Transfer**

Employer will only provide certain specifications (Scope, Performance, Outcomes), of the project and it is the responsibility of the Contractor to prepare basic and detailed design of the Project, as well as undertake Commissioning.

CONTRACT FORMAT IS A HIGHLY DEBATED ISSUE

At a very high level, there are two ends to a wide range of contract delivery formats:

Lump Sum (EPC)

- Shifts some risks to the Contractor.
- Data shows this format is typically more expensive.
- Risk tolerance, team capability, project priorities may justify.

Reimbursable (EPCM)

- Owner retains proportionally more risk.
- Owner benefits from good project outcomes.
- Conducive to changes.
- Requires different capabilities and staffing.

CONTRACTING FORMAT CATEGORIES

EPC Lump Sum:

All execution work performed on a fixed price; use of incentives is less common.

EPCM Reimbursable:

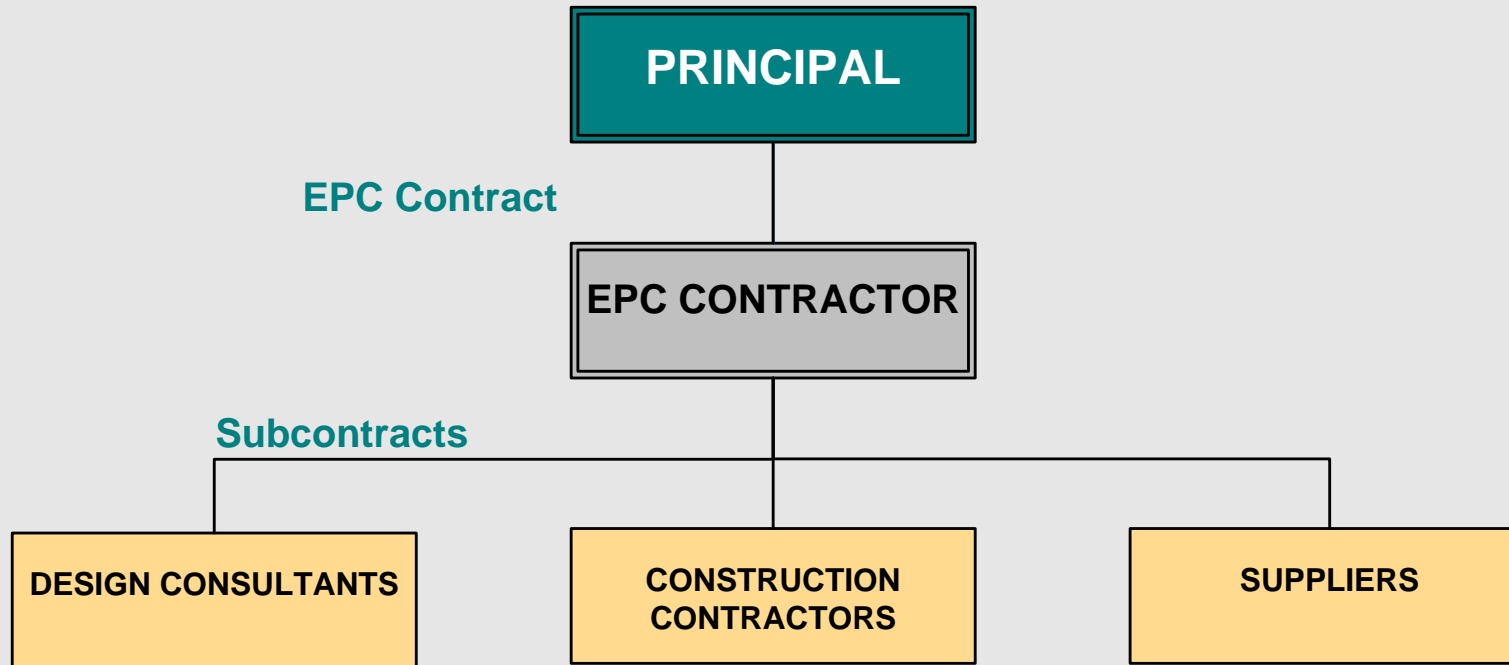
Cost-Plus, T&M, Unit Rates; incentives are more frequently used.

Mixed:

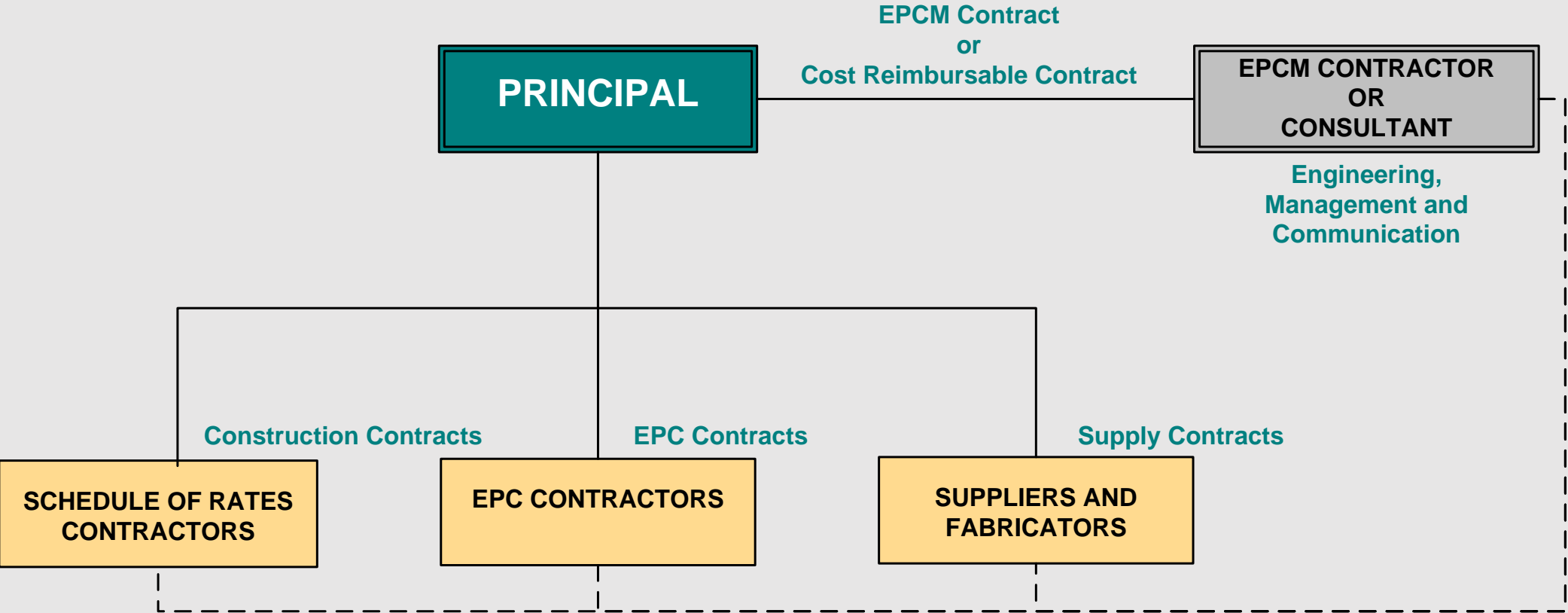
Engineering and procurement performed on a reimbursable basis with several third parties engaged directly with the Owner. Some construction works also likely to be engaged directly by the Owner on fixed-price and/or Schedule-of-rates basis. This project delivery model is defined by HARRADYNAMICS as a “Managing Contractor” model in that the Owner is more accepting of risks, and thereby the EPC Model does not add enough value to offset higher costs. Equally such Owners are less accepting of having a third party (such as an EPCM contractor) manage construction, commissioning, or other project management roles as they can be done “in-house”.

Optimal formats strike a balance between risk allocation, resource availability, and market forces. For some clients a decision is made to “in-house” many of the traditional EPCM roles (other than detailed design & engineering), to save costs and improve flexibility during project development and delivery. This model appears to be more commonly adopted for organisations with a long history of developing large and complex projects.

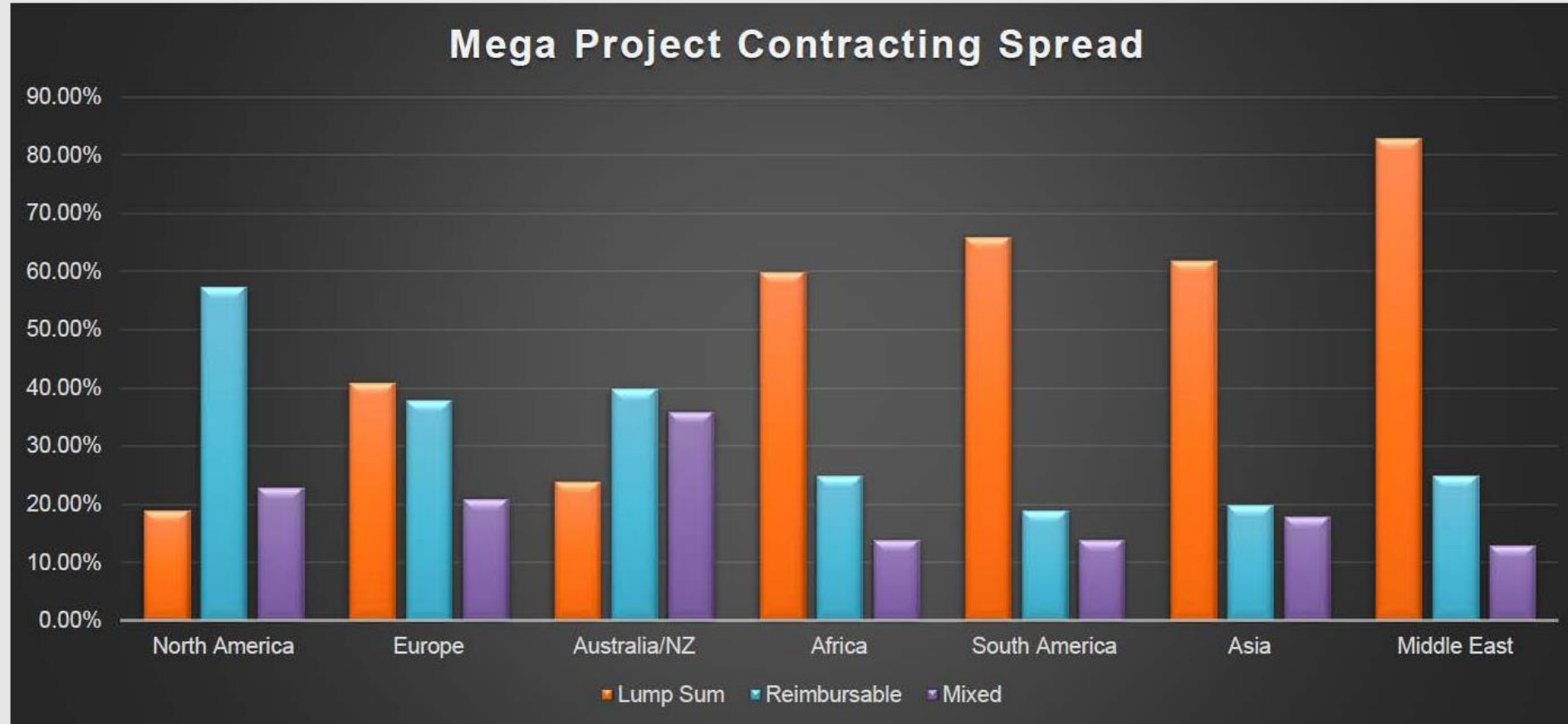
EPC ORGANISATION CHART



EPCM ORGANISATION CHART



CONTRACT STRATEGY BY REGION (2005 through 2023)



COMPARING EPC AND EPCM CONTRACTING OPTIONS

1 Equipment Supply and Process Warranties



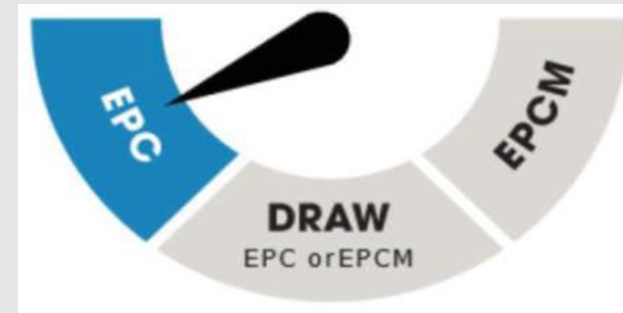
EPC CONTRACT

Single warranty between Owner and EPC Contractor, usually in the form a performance bond. EPC Contractor manages warranties with Subcontractors and Suppliers.

EPCM CONTRACT

Owner negotiates warranties with each Supplier and Contractor directly, often supported by multiple performance bonds.

2 Project Budget Cost Overruns



EPC CONTRACT

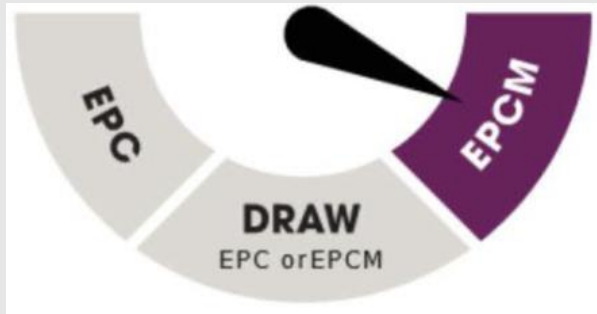
The cost risk for the project is borne by the EPC Contractor.

EPCM CONTRACT

The cost risk for the project is borne by the Owner.

COMPARING EPC AND EPCM CONTRACTING OPTIONS

3 Project Financing



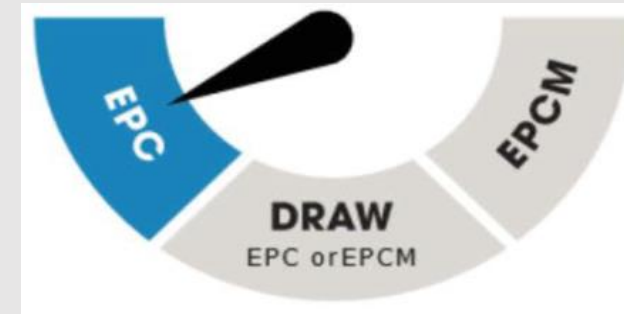
EPC CONTRACT

Usually requires a substantial down payment by Owner to EPC Contractor, generally requiring all financing to be in place at the onset of the project.

EPCM CONTRACT

Project financing can be any combination of down payments, accounts and/or letters of credit from Owner to different Suppliers.

4 Performance Risk



EPC CONTRACT

EPC Contractor provides a single point of accountability for performance and warranty of project execution; responsible for all risk provided by Contract Documents (e.g. schedule, cost and quality, as well as other requirements specific to the process, location of Customer).

EPCM CONTRACT

A common perception is that with EPCM, the risk is subject to each individual Contractor by Terms and Conditions, and financial hammers such as liquidated damages, although many claims focus on who influenced performance (or who owns the risk). A Project Manager or prime Contractor may be hired as an agent of the Owner, yet unless expectations are clear, risk sharing becomes indistinct.

COMPARING EPC AND EPCM CONTRACTING OPTIONS

5 Accurate and Timely Measurement of Performance



EPC CONTRACT

With a single Contractor, a uniform set of tools can be applied to record and measure performance. Reporting tools can be integrated across the project for attributes such as schedule, cost, materials, labour and quantities, which enhances accuracy through an interactive database.

EPCM CONTRACT

Depending on the size and capacity, the tools used to measure, and record performance can vary from logbooks to highly automated systems. If accurate and timely performance reporting is expected, the issue rests with who bears the cost to conform these assorted tools into a consistent report for the Owner or Project Manager.

6 Performance Incentives



EPC CONTRACT

From an Owner's perspective, there is an advantage to selecting a Contractor willing to place free at risk based on performance incentives. With EPC, this can include specific milestones along the execution path such as first concrete, mechanical completion or energisation, but can also capture global components such as safety, cost, quality and schedule.

EPCM CONTRACT

Each Contractor can and should be prepared for incentives related to their specific scope of work, plus any global components such as safety, cost, quality and schedule. Incentives will be successful if they are designed to reward a Contractor for exceeding expectations, while penalising the same for not performing to specified goals.

COMPARING EPC AND EPCM CONTRACTING OPTIONS

7 Criticality of Project Completion Schedule



EPC CONTRACT

One of the key benefits with EPC is that the construction cycle can begin concurrently with detailed engineering. This significantly reduces the cycle time to construction completion and allows the duration from conceptual planning to an operating facility to be condensed. As a result, schedule critical projects are best suited for an EPC application.

EPCM CONTRACT

A hindrance to schedule compression under an EPCM profile, involves the Bid-Evaluate-Award (BEA) cycle associated with construction contracts. An effective and thorough BEA cycle consumes about 6 to 8 weeks and cannot begin until detailed design is substantially complete. If the BEA cycle is compromised, schedule compression is possible, however, project costs will suffer as a result.

8 Construction Work Packaging



EPC CONTRACT

Work packaging for a single EPC Contractor can readily adopt to many forms, typically driven by Scope, discipline or schedule of work. An EPC enables the team to plan the work based on the most efficient menu and sequence for prefabrication, modules, installation and start-up.

EPCM CONTRACT

Work packages for Contractors must be divided into groups based on both Scope and commercial content, i.e. the ability to attract a cohesive set of bids for evaluation. This may not always reflect the optimum installation process, and can also develop a rigid work process that fosters change order from poor definition of subdivided work.

COMPARING EPC AND EPCM CONTRACTING OPTIONS

9 Communication of Construction Issues and Changes



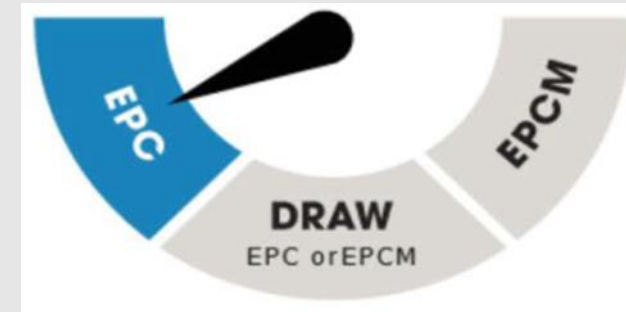
EPC CONTRACT

Construction progress, information and experience flows quickly to other team members under an EPC approach. Problems are solved rapidly, and results are available sooner, as the interface between the E.P and C functions is connected. Cycle times are reduced, and many traditional issues never occur as the team works daily as a cohesive unit.

EPCM CONTRACT

Traditional construction contracts bind communication with formal protocol, where changes, issues and reports are accompanied with written transmittals. This provides a highly accountable record of events through the project but drives cycle time between questions and answers to lengthy intervals. It can also prevent good ideas from fruition as they get lost through paperwork.

10 Ratio of Administrative, Technical & Supervisory Personnel to Specialists



EPC CONTRACT

For a project where a single Contractor is responsible for EPC, the ratio of field non-manual to specialists should be 15% to 20%. This includes all site personnel, such as clerks, safety professionals, field engineers, QA/QC inspectors, specialist supervisors and site management. In many cases, non-manual employees can fill multiple roles, reducing the overall staffing number and associated costs.

EPCM CONTRACT

The ratio between field non-manuals and specialists for each contract, should fall within a similar band width as for EPC, however, between the Contractor and Owner (or prime), there is often duplication in management and administration. This results in a much higher cost for the larger staff, typically required to fill the void between performance reporting and Contractor accountability.

COMPARING EPC AND EPCM CONTRACTING OPTIONS

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Material Supply Cycle



EPC CONTRACT

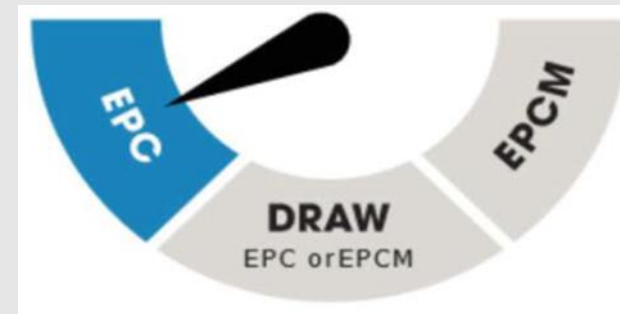
Procurement of engineered components, equipment and bulk materials can be performed on a schedule best suited for fabrication, delivery, installation and testing. Considerations for commitment and cash flow are built into the Procurement Plan, and control of materials is maintained by a single source throughout the project life. Leveraged buying provides further cost savings.

EPCM CONTRACT

Typically, the Owner or EP Contractor procures engineered components and equipment for EPCM projects, with bulk materials supplied by either the individual Contractor or available to all Contractors on a consignment or stock basis. Material control becomes more complex, and delays can lead to change orders or claims. Leveraged procurement does not apply well to an EPCM profile.

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Modularisation of Components and Equipment



EPC CONTRACT

Modularisation of plant components and equipment should be determined by availability of qualified fabrication shops, routes of transportation and site-specific conditions such as weather and terrain. An EPC Contractor can review module design during the constructability process, to assure that effective integration of module issues and logistics.

EPCM CONTRACT

If Modularisation is to be applied on an EPCM project, representative(s) from proposed erection Contractors should be consulted to assure effective integration of modules issues and logistics. As the planning period for module design is typically well in advance of the BEA cycle for construction, it is necessary to perform this activity independently.

COMPARING EPC AND EPCM CONTRACTING OPTIONS

13 Benefits of Innovations and Efficiencies



EPC CONTRACT

With an EPC approach the Owner has an integrated team accountable for delivering all facets of the project in a synchronous manner. It is advantageous for the EPC Contractor to foster innovations and efficiencies, as any improvements between the E, P and C functions translates into most effective, lowest cost project delivered in the shortest duration.

EPCM CONTRACT

Contractors engaged in EPCM are at a disadvantage for the benefits of innovation, as typically their focus is on the quickest completion of their Contract Scope. Willingness to accept new and innovative practices will usually be a by-product of improved fee potential. Incentives for innovations will be centred on a specific contract in lieu of a benefit to the total project.

14 Accountability for Labour Relations



EPC CONTRACT

EPC Contractors are responsible for the labour across the project. Effective and consistent application of labour relations is essential in maintaining respect with specialist personnel, including the momentum that will deliver the project as expected.

EPCM CONTRACT

Each Contractor on an EPCM project will have their preference for labour relations and application of work assignments. In many cases, these Contractors will employ jurisdictional decisions that favour their operation without respect for affect to other project Contractors. Owners may retain a labour Consultant, however, it is common practice for each Contractor to be responsible.

COMPARING EPC AND EPCM CONTRACTING OPTIONS

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Demand for Skilled Resources



EPC CONTRACT

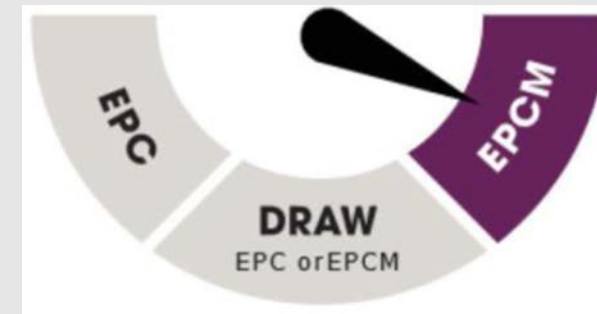
An EPC Contractor capable of executing substantial and complex scopes, usually provides a good draw for skilled labour, as the specialists view them as a stable source of work with consistent work rules. This can be critical when resources are challenged, and innovative recruiting actions are necessary to meet the staffing plans for large and complex projects.

EPCM CONTRACT

EPCM Contractors usually have good relationships with trade(s) sources, as their smaller team is tailored for consistent employment through seasonal changes. This results in a strong draw for labour up to their capacity, however, unless the project scope supports the dynamics of staffing multiple Contractors, resource recruiting can be challenging with less manning for staffing issues.

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Percentage of Speciality Work



EPC CONTRACT

An EPC Contractor is challenged executing high volumes of speciality work (e.g. insulation, roofing, pre-engineered buildings, containment liners), as both direct hire specialists and the Contractor's non-manual labour typically do not have the training required to install such components or systems. In such cases, the EPC Contractor will hire speciality Contractors to execute unique scopes of work.

EPCM CONTRACT

EPCM works well with speciality applications, where Contractors possessing unique qualifications, custom tooling or particular licenses, are best suited over a general Contractor. The quality of work typically meets or exceeds industry standards, however, schedule compression is unlikely as the administration of multiple speciality Contractors is time and resource consuming.

COMPARING EPC AND EPCM CONTRACTING OPTIONS

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Location of Engineering Teams



EPC CONTRACT

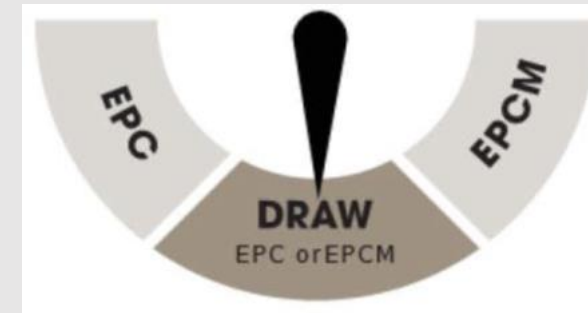
Where the engineering and detailed design is performed, should have minimal impact, if effective coordination and communication is established by the EPC Contractor. Efficient dialog is required early to assure constructability issues and lessons learned are incorporated in a timely fashion.

EPCM CONTRACT

EPCM can work effectively with remove engineering, as contract documents should be based on a defined scope with clear bid specifications. Work can be executed in an EPCM regardless of the location of the design centre, however, Contractor expertise should be retained during the construction.

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Management of Local Community and Indigenous Peoples



EPC CONTRACT

An established EPC Contractor with a formal labour relations program should be capable of executing an effective protocol for the hiring, training and involvement of local personnel. This includes developing agreements with labour leaders to provide access for indigenous people to the project, and the use of non-signatory local Contractors for portions of the work.

EPCM CONTRACT

Hiring local Contractors can fulfil some indigenous issues, however, there can be uncertainty around these Contractors having the skills and qualifications required for the project. With EPCM, the managing Contractor must validate the capabilities of local Contractors, to assure that Owner or community commitments for local affairs do not significantly compromise project execution.

COMPARING EPC AND EPCM CONTRACTING OPTIONS

19 “Build-Own-Operate-Transfer” (BOOT) Option



EPC CONTRACT

The BOOT option is being considered by more owners as plant development can proceed with innovative capital schemes. In a BOOT option, a high degree of Contractor accountability is required, as the risk associated with traditional workmanship warranties, is extended to include performance expectations over some period of an operating cycle.

EPCM CONTRACT

BOOT applications are possible under an EPCM Contract, however, it is more difficult and costly to align multiple Contractors in a risk pattern that extends beyond mechanical completion of their specific Contract. In addition, performance bonding of Contractors can be a concern, as for many the cost of extended risk exceeds their bond capability.

KEY PROJECT DESCRIPTION		EPC	EPCM	DRAW
1	Equipment Supply and Process Warranties			
2	Project Budget Cost Overruns			
3	Project Financing			
4	Performance Risk			
5	Accurate and Timely Measurement of Performance			
6	Performance Incentives			
7	Criticality of Project Completion Schedule			
8	Construction Work Packaging			
9	Communication of Construction Issues and Changes			
10	Ratio of Administration, Technical and Supervisory Personnel			
11	Material Supply Cycle			
12	Modularisation of Components and Equipment			
13	Benefits of Innovations and Efficiencies			
14	Accountability for Labour Relations			
15	Demand for Skilled Resources			
16	Percentage of Speciality Work			
17	Location of Engineering Team			
18	Management of Local Community and Indigenous People			
19	Build-Own-Operate-Transfer, Options			

COMPARISON SUMMARY FOR EPC vs EPCM

VARIABLE	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.