



EPC and EPCM
delivery models

12 Engineering, Procurement and Construction (EPC) scope definition

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Role of the Scope of Work

Content

The Scope of Works (**SOW**) is among the most critical documents prepared in the design and construction process.

It defines the design and construction activities and responsibilities of the Contractor and others, including:

- fitness for purpose criteria for the project
- the Contractor's scope of work and design
- the minimum standards to be achieved
- technical criteria to be satisfied
- other project-specific obligations to be fulfilled by the Contractor
- the testing and commissioning process
- where relevant, how the Contractor's activities must interface with the activities of other designers and contractors.

Risk

Ill-defined scope obligations are among the primary causes of project failure.

Unfortunately, Principals often select a contract delivery method for a project and commence preparing the contract documents without identifying their goals and objectives at an early stage. Hence, those responsible for developing the contract documents do not have a clear understanding of what the Principal wants from the final product. It is also not uncommon for lawyers acting for a Principal to prepare the general conditions in isolation from the Principal's technical consultants responsible for the Principal's requirements and other technical documents.

This leads to inconsistencies between the various components of the construction contract and uncertainty as to the extent of the Contractor's obligations. It also increases the risk of important aspects of the Contractor's obligations not being comprehensively described in either the general conditions or the Principal's requirements and leads to a misalignment of the parties' expectations, which is a common cause of disputes and costly variations.

Implications for form of contract

The level of scope certainty as at the date of contract execution will also dictate the terms of the contract, both in relation to the contract type and the specific contract terms.

It is important for the parties not only to understand the level of scope certainty as at contract execution, but also the pathway to scope certainty beyond the date of contract.

Uncertain scope is difficult to price and programme. It is essential that the parties are of the level of certainty and carefully and realistically allocate responsibility and risk for the development of the scope to the point where procurement, detailed design at shop drawing level and actual construction can take place with confidence.

Disaggregated contracting

The threshold issue in the preparation of the SOW is whether the overall project is to be delivered through a single EPC contract or through a combination of contracts. The latter approach is usually described as a disaggregated model.

The fundamental risk with disaggregated contracting is the lack of a single point of responsibility. The interfaces between the various scopes that must be combined to make up the whole of the project must be managed and each SOW must be coordinated with the other SOW's so that the project fulfils the Principal's requirements.



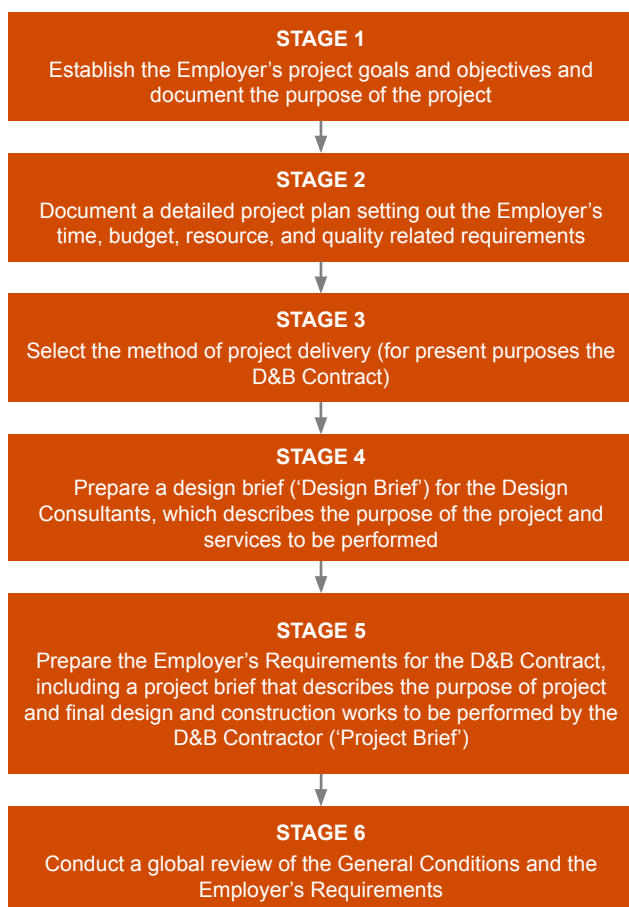
Key steps in preparing the SOW

The following guiding principles are a useful guide to the preparation of the SOW.

- Allocate sufficient time and resources to conduct market research, gather information and identify its overall requirements for the project.
- Document the project goals, objectives and purpose at the outset, so that those responsible for developing the contract documents have a clear understanding of what the Principal wants from the final product and what it expects the Contractor to deliver.
- Document the Principal's requirements in a manner so that it articulates precisely and consistently what must be designed and/or constructed by the Contractor and who will be responsible for design and other prior works (if any) undertaken by the Principal.
- Undertake a global review of the contract documents, utilising the combined knowledge of the Principal's project management team, expert technical consultants and lawyers to ensure consistent and clear drafting throughout the contract and certainty in relation to the project goals, objectives and purpose.

That process should be undertaken in the context of the requirements of the business case that has been approved, especially in relation to programme and budget.

The key stages in developing the Principal's requirements for an EPC Contract are:



Each stage of this process will be described in further detail below.

Stage 1: Establishing the project goals, objectives and purpose of the project

Prior to choosing the contract delivery method and attempting to articulate the Principal's requirements, the Principal must establish its goals and the purpose of the project. This will assist the Principal to consider and prioritise its goals and objectives at an early stage and will ultimately form the basis of the Principal's requirements to be included in the EPC Contract.

This will include consideration of the impact the project will have on its resources and existing operations and the commercial, technical, quality and timing requirements. It does not matter if the requirements cannot be finalised at this point because these requirements will be updated as the design and planning progresses.

The factors that the Principal must consider at this early stage include:

- the overall timing of the project, including understanding the Principal's current business market, where the market will be when the Principal intends to sell the product generated by the project and at what point in the boom/bust cycle the construction industry is at the time of the project
- key technology options
- supply chain constraints
- the specific timing requirements, including the critical stages and milestones for the project and when they are required to be completed
- budgetary restrictions and the Principal's economic and commercial drivers
- availability of both internal and external resources required to complete the project
- the external requirements of customers and other relevant parties and authorities.

Determining the target market and the requirements of customers and other external parties, in addition to the Principal's internal requirements, is critical during this stage. For example, in the property development sector, the external requirements of the residential and commercial sales contracts, tenancy agreements, relevant government authorities, Financiers (if any) and arrangements with utilities and services providers will all form the basis from which the Principal's requirements must be developed.

Analysing these external agreements and requirements is critical to the Design and Construct (D&C) Contract procurement process because they contain concessions which have been made by the Principal and which oblige the Principal to ensure that the project is designed and constructed in order to fulfil certain requirements. This will directly affect the D&C Contract and the Principal's requirements. Examples include:

- timing of construction
- approvals for commencement of the works
- labour, safety, environmental and development guidelines

- access restrictions
- design approval process
- construction methodology
- the standard and quality of materials and finishes
- performance requirements and outputs (if any)
- the pricing and approval of variations and extensions of time and financier step-in rights
- interface requirements with utilities and service providers
- the requirements for completion and certification.

It is therefore essential that the Principal determines what its obligations are in order to meet these external requirements from the outset. It can then communicate them to those responsible for developing the contract documents and, in turn, build those specific obligations into the Principal's requirements and ultimately pass on those obligations to the extent feasible to the consultants and the EPC Contractor.

Stage 2: Document a project plan

Once the Principal has established its internal and external requirements, it then needs to prepare a detailed plan for the delivery of the project that articulates those requirements. The plan should include:

- a clear statement of the purpose of the project
- the goals and objectives, including development time, the development cost, the whole of life cost, functionality and design life
- key project risks
- a resources plan that identifies internal resources and where external resources are required to produce the contract documentation and deliver the project
- budgets
- an overall development Programme and milestones
- any other specific requirements of the Principal
- the inputs for which the Principal is responsible, either through its own resources or by contracting with others.

Generally, it is not until the completion of this stage that the Principal will be in a position to consider the appropriate method of project delivery.

Stage 3: Selecting the method of project delivery

There are numerous project delivery options for the Principal to choose from including:

- design by the Principal and construction by a Contractor
- preliminary design by the Principal and final design and construction by a Contractor
- total design and construction by a Contractor

- design by Principal, construction by trade Contractors and management of project delivery by a construction manager
- design commenced by Principal: design completion and construction by Contractor.

The selection of the most appropriate method requires careful thought and consideration of many of the factors identified in stages 1 and 2.

This paper will not attempt to provide an analysis of the various project delivery methods. However, for the purposes of illustrating stages 4 and 5 of the process, we will identify some of the issues (not exhaustive) to be considered by the Principal when preparing the contract documents for the project delivery method referred to in item (b) above. Here, the Principal elects to commence preliminary design using the Design Consultants engaged under separate agreements (**Consultancy Agreements**) before engaging the D&C Contractor to perform the final design and construction.

Stages 4 and 5 below focus on developing the two key construction-related documents for this method of project delivery, which are:

- the design brief for the preliminary design to be carried out by the Design Consultants (**Design Brief**)
- the Principal's requirements for a EPC Contract, the SOW.

Given that the scope and risk profiles will vary for each project and across construction sectors, it is not possible to provide a comprehensive list of all the issues the Principal should consider when preparing the Design Brief and the Principal's requirements. However, the following sections will highlight some of the important issues that should be considered when preparing those documents.

Again, it should be noted that regardless of the type of project or the specific risk profile, it is still essential for the Principal to clearly articulate the requirements it has developed during stages 1 to 3 in both the Design Brief and the Principal's requirements. This must be in a manner that is consistent with the general conditions and clearly describes the obligation of the respective parties.

Stage 4: Prepare the design brief for the consultancy agreements

Using the information compiled during stages 1 to 4, the Principal should prepare and include a Design Brief in the Consultancy Agreements. This is in addition to the contract documents which specify the actual scope of services and deliverables for each of the Design Consultants.

It is in this Design Brief that the Principal articulates its goals and objectives, including its time, cost, quality and other requirements and how the Design Consultants are to comply with those requirements so that the Principal can measure and enforce the Design Consultant's obligations.

The Design Brief will develop as the design develops, but one must be included at the outset in all of the Consultancy Agreements. The ultimate goal in the EPC Contract project delivery method is to have the EPC Contractor assume an overall fitness for purpose obligation for the final design and construction of the project and for it to become responsible for the preliminary design prepared by the Design Consultants on execution of the EPC Contract. Therefore, it is critical that the Design Brief prepared for the Consultancy Agreements is consistent with the Principal's requirements to be provided to the EPC Contractor.

Examples of other important aspects to be considered by the Principal when preparing the contract documents which specify the actual scope of services and deliverables for each of the Consultants include:

- the building information system to be utilised
- a clear description of the deliverables, coordination and interface obligations and the timing for the provisions of the services, for each of the Design Consultants, during each phase of the design
- the design Programme for the performance of the services which must be consistent with the Principal's overall development Programme and timing requirements described in stage 2 above
- administrative issues such as reporting and attendance at meetings and where applicable must be consistent with the D&C Contract
- a statement that each Design Consultant confirms that it understands the Principal's goals and objectives and the Design Brief
- interface requirements.

Often these obligations would be documented in the schedule of scope of services.

Stage 5: Prepare the Principal's requirements for the D&C contract

It is fundamental to the success of the project to identify precisely what must be designed and then constructed by the D&C Contractor and the performance criteria that must be satisfied. The particulars of that essential element of the procurement process must be contained in the Principal's requirements, including the requirements of external parties identified in stages 1 and 2.

The level of detail contained in the Principal's requirements will vary depending on the timing of its preparation and the extent of design completed prior to the formation of the D&C Contract. Clearly, the later the Principal's requirements are prepared, more are the details that can be incorporated. The preparation of the Principal's requirements during this stage is an excellent test to ascertain whether the Principal is in a position to sensibly articulate its requirements for the project. If it cannot describe its requirements with certainty in the Principal's requirements, then logically the contract procurement process has not reached a point where the D&C Contract can sensibly be distributed to tenderers.

The contents of the Principal's requirements will obviously vary depending on the nature of the project, the specific scope of work and risk profile. The information compiled during stages 1 to 4 will form the basis of which the Principal's requirements will be further developed and finally articulated. For instance, the Design Brief referred to in stage 4 will be further developed with the assistance of the Design Consultants and form an integral component of the Principal's requirements for the D&C Contract.

Examples of key aspects to be considered by the Principal and articulated in the Principal's requirements for any D&C Contract include:

- a list of the Principal's goals and objectives for the project. The emphasis in this regard, and at this critical stage, is on providing detailed and measurable objectives, rather than general objectives or motherhood statements.
- the obligations that must be satisfied by the Principal under separate arrangements with external parties that are to be passed on to the D&C Contractor must be specified in detail. These obligations will include development and planning approvals, environmental approvals, agreements for lease, sale agreements, agreements with adjacent lands and the requirements of banks and Lenders. Fundamentally, in preparing the Principal's requirements, the Principal must ask itself whether it has procured the D&C Contractor to fulfil all of the Principal's own relevant obligations with external parties.
- the Principal's future operational expenditure. The Principal must ensure that its requirements, in terms of operational expenditure once the project is taken over by it, including future concession or off-take agreements and arrangements with service and utility providers, are also specified. This is important, not only in relation to interface obligations, but also because reduced capital expenditure through design and selection of materials, which might be a source of savings for the D&C Contractor, will often only be achieved at the expense of increased future operating expenses. These are, of course, borne by the Principal.
- relevant industry standards and criteria. However, considerable care must be taken before specifying a benchmark existing project or using an existing Principal's requirements document for another project as the required standard to be achieved. It will be rare that any other project will encapsulate and be consistent with all of the Principal's specific requirements of its project. The Principal must also consider the commercial implications of using an existing project to set a minimum benchmark. The D&C Contractor will inevitably assess the risk of uncertainty between the actual required standard and the minimum benchmark and pass this cost onto the Principal in the contract price.

- quality of equipment and materials. For example, in a commercial or residential building project, the standard of finishes, floor coverings and sound proofing should be specified, as should the telecommunications and security requirements and ecologically sustainable development (ESD) requirements. However, particular care must be taken if the Principal intends to prescribe a product. Prescribing specific items can lead to difficulties in enforcing the D&C Contract in relation to fitness for purpose and design warranties. Rather than the Principal specifying a particular product, it may be preferable for it to describe the type, appearance and purpose of the product. The reason for this is, if the Principal prescribes a specific product and a defect is found in that product after it is installed, then it will have difficulty rejecting the product on a fitness for purpose basis.

The question should be which party is to be responsible if the material or equipment ultimately does not perform as required? If the Principal wants the answer to be the D&C Contractor, then it should not tell the D&C Contractor what specific product to use. The types of description that should be avoided include sizes, thickness, strength, suppliers and models. Of course, if the Principal has a specific requirement and wishes to use a particular product and in turn take the risk of that product performing, then it must clearly set out that requirement. For a residential development project, for example, it will often be in the interests of both parties to carefully draft a mechanism in the D&C Contract providing for the construction of a prototype villa or apartment so that issues of specified finishes and design functionality can be worked through at an early point in the design and construction process.

- Separable portions, milestones, Programme and staging requirements for the project, particularly where the development is to occur adjacent to operating buildings and/or facilities or the Principal's external obligations dictate staged completion.
- The scope and extent of the works to be clearly delineated. The Principal must consider whether some of the works will be carried out by others and then consider the critical issue of the interaction and interface between those parties. This is a common cause of disputes and variation claims for delay.
- The scope of the D&C Contractor's design obligations and the existing design prepared by the Design Consultants. An issue that is peculiar to this type of D&C Contract delivery method involving the novation of the Principal's Design Consultants to the D&C Contractor is the status of the design work completed by those Design Consultants on behalf of the Principal (**Existing Design**). The purpose for using a D&C Contract delivery process is that the D&C Contractor is solely responsible for the final design of the project under the D&C Contract. However, a key question is, 'What happens to the Existing Design?' If the Existing Design contains elements that the Principal absolutely must have included in the final design, then these elements must be transferred to the Principal's requirements.

The Existing Design can be considered as a work in progress that the EPC Contractor can develop and change as the final design development proceeds.

However, to avoid disputes over design responsibility, the general conditions and Principal's requirements must be consistent on this point. The general conditions should provide that the D&C Contractor warrants and takes responsibility for any Existing Design included in the Principal's requirements, so that the Principal can enforce the D&C Contractor's overall design obligations and fitness for purpose warranties. It is possible to place overall design responsibility on the D&C Contractor while still ensuring the Principal retains control of the design process by incorporating carefully drafted design review regimes.

Alternatively, it is also possible to prohibit any changes by the D&C Contractor to the Existing Design, but this removes a fundamental commercial benefit to the D&C Contractor to value engineer its design and make allowance in its price for the cost savings it believes it can achieve by developing the design to suit its construction methods. It also potentially limits the design promises made by the D&C Contractor and must therefore be considered in that context. This balancing act between the requirements of the Principal to control the design and the commercial driver of the D&C Contractor is a very important dynamic to understand and should be foremost in the Principal's mind when selecting the project delivery method during stage 3 and then when deciding on the level of detail to be included in the Principal's requirements.

- Design documents and maintenance manuals to be provided by the D&C Contractor, including the form of the documents.
- Performance requirements for the works identified during stages 1 to 4. These are essential for a D&C Contract arrangement and they must be exhaustively specified. For example, the Principal's requirements for the construction of a high-rise building may include detailed performance requirements for air conditioning, lifts and other services, net lettable areas, environmental ratings, apartment sizes and car park numbers. These performance requirements should be carefully and thoroughly described, along with how satisfaction of those requirements will be determined. Consideration must be given to:
 - designing for whole of life requirements and the method of design review and approval
 - specific fitness for purpose requirements and a description of how satisfaction will be determined by the Principal
 - compliance with technical standards and specifications
 - performance guarantees and performance liquidated damages (if any)
 - the completion, testing and commissioning requirements. These include Principal supplied resources (both personnel and materials), responsibility for output (which can be blurred if the Principal provides resources), provision of input material (including quantity and quality) and provision for delayed testing if input material is not available.

- physical limits of the works including a description of the site boundaries and any connection points for services and access restrictions
- a list of exclusions that have not been included in the D&C Contractor's scope of work
- interface obligations with existing plant and/or auxiliary works
- interaction between the D&C Contractor and other Contractors
- interface obligations with adjoining property Principals
- plant or material to be supplied by the Principal
- training the D&C Contractor must provide to Principal's personnel
- future Operator/Principal access requirements for maintenance and repairs
- permits or approvals that the D&C Contractor is required to obtain
- an exclusive list of Principal's responsibilities such as obtaining planning approvals and supplying facilities, equipment or materials
- project-safety, quality and coordination policies, plans or procedures which the D&C Contractor is required to comply with or prepare
- approved working hours and any requirements or restrictions as to working hours
- defect rectification: Period and access requirements
- subcontractor and supplier warranties for specific works or materials or services for which the Principal wants a direct ongoing contractual relationship with the subcontractor, manufacturer or supplier in relation to performance and defect rectification.

Stage 6: Global review of the D&C contract documents

Ideally, the Principal's requirements and the general conditions should not be prepared in isolation. Unfortunately they often are, despite the significant costs to the Principal in procuring the commercial, technical and legal expertise required to perform this task. It is also not uncommon for the Principal's requirements or documents prepared by the D&C Contractor (Contractor's Proposal) to be simply attached to the general conditions and distributed as the tender documents without a thorough global review of all components of the D&C Contract.

In practice the contract documentation, including the Principal's requirements, will continue to evolve during the tender process and negotiations until the D&C Contract is executed. However, failing to undertake a review of the entire D&C Contract prior to going to tender increases the risk of ambiguity and uncertainty existing between the Principal's requirements and the general conditions and various components of the Principal's requirements. This will inevitably lead to a disputes and costly variations.

The Principal cannot rely on inconsistencies or ambiguities being identified or raised by the D&C Contractor during the negotiation process. In fact, often Contractors will specifically look for ambiguity in contract documents during the tender process and internally identify ways to take advantage of any uncertainty during the performance of the works. For the same reason, the Principal should not include documents in the D&C Contract which have been prepared by the D&C Contractor, without a thorough review for consistency with the Principal's requirements and general conditions.

Another common cause of uncertainty is the use of unclear and inconsistent language in the Principal's requirements. The drafting must definitively articulate the Principal's requirements and the obligations of the parties. Using general motherhood statements or legalistic wording, rather than simple plain English drafting, will not only lead to uncertainty, costly disputes and/or variations, but also makes it more difficult and time consuming for the Principal's project delivery team to determine what is to be constructed and to administer and enforce the D&C Contract.

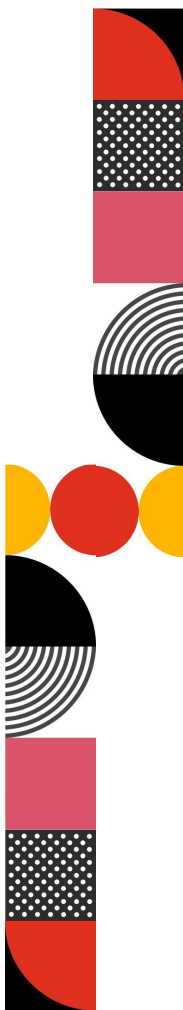
The following paragraph, taken from an existing D&C Contract used on an actual project, provides an example of drafting that fails to definitively describe the required scope, standard or duration of the D&C Contractor's design obligations in relation to designing temporary facilities and services:

The Contractor shall provide good quality design services and the like for temporary facilities necessary which may be in use for a few years pending completion of final permanent building works or infrastructure/roads to the project and which will need to be compatible with the buildings in normal use for that time.

The D&C Contractor's obligations under the above paragraph are uncertain. An alternative drafting style that more definitively describes the D&C Contractor's obligations might be:

The Consultant must design all temporary facilities required at the site to ensure that all services to existing buildings are maintained for the duration of the project and for a period not less than three years after the completion of the project. The temporary facilities must be compatible and, fully interface with, all existing buildings at the site.

While it is acknowledged that there are usually ambitious deadlines and budget restrictions imposed by Principals in relation to the contract procurement process, the global review, irrespective of the contract value, is critical. The review must combine input from the Principal's project management team, technical consultants and legal advisors. It must also be centrally managed by personnel with the requisite skill set and combined expertise in contract procurement, contract administration, project delivery and legal drafting.



How to contact us



If you have any questions about this paper, please contact the editor, Damian McNair, Partner, Energy Transition.

PwC Australia has a dedicated Energy Transition business, consisting of a hub of 132 multidisciplinary and highly-skilled experts helping to facilitate Australia's successful transition to a decarbonised economy by 2050. We are helping accelerate our clients through the energy transition and their related ESG priorities as Australia moves to a net zero economy.

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