

Management of Change within construction contracts

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In a series of three articles, Mark Castell considers what 'change' is, how it affects the construction and engineering industries and discusses some general contractual issues concerning the management of change. The subsequent two articles will discuss the types of systems and procedures firms should consider having in place in order to manage the changes to their contracts.

1. What is Change?

So what does the word 'change' mean? There are a number of uses of the word but by discounting 'an amount of small coins' and the 'act of putting different clothes on', we are left with:

- Making or becoming different
- New experience
- Substitution of one thing for another

It is these definitions that I want to address, but what does it mean in practice? Construction and engineering in Europe is going through radical change. For example, shipbuilding; apart from losing entire vessels to Yards in Asia, hull construction in Europe now takes place in Poland or Rumania and the Yards have to compete for the fit-out work. This means the focus is on the improved management of specialist sub-contractors.

Similarly, much of the oil and gas sector has also moved away from Europe and firms operating in this sector face greater international competition. They must look to overseas clients or new sectors, such as plant construction or structural engineering. International clients and new sectors operate their contracts differently and so project teams must learn new management procedures.

The creation of a single European market has meant each of the respective domestic civil and building industries now face increased competition from firms from other European countries. Public Authority clients are also under increased pressure to account for their actions, whether it is letting the projects according to complex EU directives, or in justifying why they are paying extra monies to contractors.

The consequence of these new circumstances is that everyone involved in construction and engineering, regardless of sector, have to manage their contracts in a more professional, compliant and business-like manner. One of the fundamental parts of this requires firms to deal with the changes that will surely occur on projects.

2. Types of Change in construction and engineering projects

What types of change occur on construction and engineering projects? When we are talking about change, perhaps those areas which come readily to mind are "additional, omitted, varied, modified or substituted work". These tend to mean a change to the scope of work to be undertaken and include examples such as:

- Quantity increases or decreases such as those arising from the issue of further drawings.

- Preferential engineering, for example on the design of an electrical installation.
- The provision of furniture not being required within the refurbishment of an office block.
- A different paint specification for certain parts of a ship.
- A modification to pipework that has already been installed due to a clash with a cable tray.

Changes can also be categorised as affecting the schedule, in other words the programme, timing or sequence of undertaking the works. Examples include:

- Time of year work is carried out. The seeding of the football pitches for a new sports park is not undertaken at the planned time due to the amount of unseasonable heavy rain that has waterlogged the ground.
- Holds placed on drawings affect the time that a pipework prefabrication and installation contractor can actually carry out the work.
- Late access to site prevents a contractor from excavating the foundations for an extension to a hospital when it was envisaged.
- Late issue of material or prolonged drawing review / approval periods that inhibit the start of work.

There is a third category of change, it is conditions i.e. the location the work is carried out; or the physical or geological or marine conditions encountered. Examples include:

- Rock being found when excavating for a new tunnel under a canal in the Netherlands.
- The identity of the employer's representative or consultants being changed.
- Different sub-contractors or vendors being used by other parties involved in the project.
- Overlapping of trades. The pipework, electrical and finishing contractors are all working at the same time rather than in a sequential fashion.
- Type of access to the site. All works traffic is only allowed onto the site of a new motorway from one end and not both ends as indicated to the contractor.

This categorisation is not always clear-cut. For example, an employer changing the type of equipment it wanted as part of the mechanical installation in a new industrial building or factory. The contractor responsible for the mechanical and electrical installation may initially view this as a scope of work change, since it has to provide additional or varied equipment. However, it transpires that the new equipment has a longer procurement period; in other words, it takes longer to purchase. As a result, installation and the electrical connections have to be done at a different time i.e. it is also a schedule change. Furthermore, the revised equipment is bigger, so there is less space available for the contractor to undertake the installation work and thus it is also a change in the conditions under which the contractor operates.

What relevance is this to the Management of Change? Well, its importance is twofold; firstly categorisation of the effects of change can aid the valuation process, and secondly, there are some contractual reasons. These three categories of change; scope of work, schedule and conditions comprise the types of changes that are generally allowable or foreseeable within most construction and engineering contracts. That is to say, that contracts generally provide for such changes to occur and set out a procedure for their implementation and valuation.

3. Originators of Change in construction and engineering projects

In addition to categorisation by subject, changes can be made by the different parties involved in a project. The employer can make certain of the changes I have already described:

- Providing access to site for the contractor later than envisaged.
- Prolonging the drawing review or approval periods.
- Amending the identity of the Employer's representative or consultants.

A contractor is in a different position of course; it is on the receiving-end of changes made by the employer, but can also initiate changes that affect the employer. Examples include:

- Using a different project manager to the one it said it would use in contract negotiations. This may be an important issue for the employer.
- The standard and quality of the finished works is not as required by the specification.

In the same way as contractors, sub-contractors can be on the receiving-end to changes made by the employer and / or the contractor, but can also initiate changes that affect the employer and / or the contractor.

So summarising what I consider change within construction and engineering projects to be; it is something different from that agreed by the parties that can be caused by any of the parties involved, that affects the scope and/or schedule and/or conditions and has an impact on any of the parties involved.

4. The baseline

So what is the baseline from which change is measured? Simply, it is that agreed by the parties, in other words the contractual agreement. There is no one common contract that is used in the construction and engineering industries. There is, therefore, no common baseline for ascertaining change. The contract used will depend on certain variables:

Each type of industry has its own specific circumstances and needs. The UAV form of contract in the Netherlands is meant for use for building works. It is not suitable for use for a ship conversion. Similarly, the ICE form of contract is not drafted for building works, it is meant for civil engineering.

There are often many contracts in use on one project. The employer will have an agreement with the contractor; the contractor will have contracts with each of its subcontractors. The contents of each should be different as there are different obligations placed on the parties.

There are many different levels of responsibility for contracting. At one extreme is turnkey, where a contractor has virtually complete responsibility for constructing something and then at the end, 'hands the key to the employer'. Alternatively, the contractor may only be required to construct the works, the design being done by the employer or someone employed by him. Some projects have a combination of construct only and design and build within the various contracts.

Lastly, different obligations and responsibilities arise from the method of payment. A contractor may be paid a fixed lump sum or may be reimbursed its costs plus a fee. Again, this may not be consistent throughout all the contracts on a project.

The important point is that the contract sets out the baseline by which change is measured albeit the baseline will be different for every project and every contract. Hence, firms must have procedures in place that can be applied to a wide range of contractual situations. In the second article, I will consider these.

5. The Management of Change Process

In the first part above, I defined what change is and how the categorisation of changes into scope of work, schedule and conditions assists in determining whether the contract actually allows such a change to be ordered i.e. the so-called allowable or foreseeable changes. Whilst these are important issues, they do not by themselves define how companies should manage the change that will surely occur on projects.

The management of change does not start when an employer wants to issue a variation order or when a contractor receives a change order; it commences at a project's conception and continues to its completion. A process is required to ensure that each individual and their organisations put themselves in the best position to cope with the changes that will occur.

The remainder of this and my next article sets out such a framework.

6. Step 1 - Understanding of the Baseline

At the core of the whole process is the contract agreement. It is imperative to gain a good understanding of its contents as it is the baseline to which changes are measured against. Apart from setting out the obligations or responsibilities placed on the parties, the contract should stipulate what can be changed, how the change process works (i.e. written or verbal instructions, are deletions allowable?), and whether it is limited in any way (i.e. Are there any financial limits? Are there any timing restrictions?)

The following steps can be put in place to assist the understanding the contract agreement. It starts from project conception:

Tender Stage

- A contractor should check the contents of an enquiry to ensure that it is complete and request clarification if any documents are missing or have different references to those listed.
- A clean set of the tender documents should be kept in a master file available for future reference. The file should also include a copy of all correspondence requesting clarifications or further information. Provision should be made for storing e-mails, (i.e. an electronic storage folder that is accessible to all).

Pre-contract

- A schedule should be maintained that summarises all the changes resulting from negotiations. The schedule should state the date, the document (e.g. letter date and reference, or meeting date) and what the change was.
- Minutes of meetings should be issued in the form of a schedule of agreed changes at the end of any meetings. This should be signed by both parties at the time.

Contract Signature

- Both parties should ensure that all the agreed changes are clearly noted within the documents comprising the agreement.
- A list of all the contract documents with full references should be part of the agreement and copies of all documents within an Appendix.

Contract Commencement

- Contractors should have formal handover meetings from estimating departments to the project team.
- All the estimating files should be available to the project team.
- Time must be taken to read and understand the contract.

Compliance with these steps will not prevent all problems and obligations are sometimes found to be unclear during a project. This is often due to conflicting requirements in different parts of the contract.

In this event, reference should be made to the contract terms and whether they provide for an order of precedence and/or procedure to deal with anomalies. If not, a contractor should formally raise the matter and request clarification.

7. Step 2 - Monitor the obligations of the Parties

Having understood the parties obligations, the second step is to ensure that they are constantly monitored so that changes can be identified when they occur. This can be achieved by using documents that should be produced as part of the management of the contract. Some examples include:

- Design programmes and updates
- Construction programmes and updates
- Progress reports - internal and external
- Material/equipment delivery schedules
- Drawings and schedules - received, holds and approvals
- Payment applications and certificates
- Notices/requests for change
- Cost/value reconciliations

These various documents will show different things; the programmes, progress reports and materials equipment schedules give information relative to time and sequence and thus can be used to monitor changes in schedule. The drawings, payment information, notices requests for change however, are useful for determining changes to the scope of work.

Cost/value reconciliations are different again. In comparing the value of an item or section of work (i.e. tender allowance or manhours) with the forecast and or actual cost (or manhours) , they indicate where money is 'made' and where it is 'lost' on a project. This may either be a signal that a change may have occurred and that further investigation is required to be undertaken, or it may show the financial effect of a change.

A key question for an organisation at project start-up is therefore to determine which documents are to be maintained in addition to those required by the contract. It is not about keeping documents for the sake of it, but defining those that will satisfy the needs, and ensuring that they are produced.

Bear in mind that documentation needs may change throughout a project's life - flexibility is therefore also needed.

8. Step 3 - Document the Change and give Notice

The third step is to invoke the contract and conform to the procedures and constraints contained within.

I have previously explained the different categories of change and that allowable or foreseeable changes can concern scope, schedule or conditions. There are two further terms, 'actual' and 'constructive' changes, that fit above the scope, schedule or conditions level of categorisation. In other words, an actual change may affect the scope, schedule or conditions, or a combination. Likewise, a constructive change can have similar affects.

Constructive changes are often a consequential effect of an actual change and may cause additional work or prevent work from being undertaken as planned. Some examples include:

- Untimely or defective employer furnished specifications or drawings.
- Failure of the employer to disclose technical information.
- Directive from the employer to others that affects a contractor's work.
- Orders from a government or other authority requiring work to conform to different standards than that in the contract.
- Unreasonably strict contract interpretation by the employer.

There is a need to recognise both types as it will determine the contractual procedure that needs to be followed once the change has been identified. Actual changes are more easily identified, perhaps arising from a piece of paper with 'variation order' or 'change order' on top. Constructive changes however, are not so easily recognised or acknowledged, potentially creating the most problems for the parties.

If there is no specific procedure stipulated in the contract, the first objective should always be to notify the other party i.e. to submit a notice.

Notices are a requirement of most contracts in the event of a potential claim for additional time and or money and in certain cases, condition precedent to payment award of extra time. In the case of an objection being raised by the receiving party, it should also be remembered that notices are submitted for the benefit of the recipient. Their purpose is to inform the other party so that they can address the issue, pay appropriate attention to certain activities being carried out and maintain relevant records.

9. Step 4 - Maintain Records

Records must be kept albeit there may not be agreement as to whether a change has taken place and or liability for the change and the importance of records is something that is probably known to readers. However and notwithstanding that many contract clauses require them to be kept and or submitted, the quality and extent of record keeping is commonly found to be lacking. It is therefore worthwhile considering:

Why should they be kept?

I have already stated that they can aid the identification of change but in addition, it is good practice to keep records. Whilst their use is primarily in the preparation and defence of claims and for evidential purposes, they contain information on actual outputs, which is beneficial to the estimating department for use on future works.

What type of records should be kept?

Good practice dictates the following requirements:

- The contract and paper correspondence between parties.
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- Site diaries - a daily record of the job in progress.
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- Programme and progress reports - the original basecase programme, preferably the agreed version, along with reports showing progress against this programme. It is important that programmes showing progress at a certain time should be saved rather than overwritten with the following period's progress.
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Should records be agreed?

If possible, get signed agreement at the time but it is not mandatory or necessary nor likely. It is more important to record what happens and the effects of something occurring together with the reasons 'why'.

How should records be maintained for the future?

Different methods should be used for different types of records, but generally electronic copies should be retained wherever possible. Analysis and interrogation is much easier with current computer software. Records should not be thrown away at the end of a project without very careful examination and then only if they are unmarked duplicates. Once all the final accounts have been finalised, a further review can be made.

ARTICLE 2

In the second of a series of three articles, Mark Castell considers the types of systems and procedures firms must have in place in order to manage the changes within their contracts that will always occur. The series will be concluded in a third article, which will examine the valuation of both time and cost effects.

The Management of Change Process

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The management of change does not start when an employer wants to issue a variation order or when a contractor receives a change order; it commences at a project's conception and continues to its completion. A process is required to ensure that each individual and their organisations put themselves in the best position to cope with the changes that will occur.

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The concluding article examines step 5, the evaluation of the time and money effects.

ARTICLE 3

The Management of Change Process

In my first and second articles, I defined what change is, how the categorisation of changes into scope of work, schedule and conditions assists in determining how to deal with the change and the first four steps in an overall process for managing change:

- The first step is to read the contract to understand the parties' obligations. In other words, it is to understand the baseline.
- The second step is to ensure that the obligations are constantly monitored to ascertain whether there have been any changes.
- The third step is to document the change and give notice; in other words, invoke the contract and conform to the procedures and constraints contained within.
- The fourth step is to maintain records.

This third article looks at the last step; the evaluation of the time and money effects of the notified changes from the records that have been maintained.

- Step 5 - Isolate the time and cost effects

Let me introduce a framework of the effects of change. This shows the different effects of change that have to be considered in the valuation process.

Broadly speaking, the effects can be split into three elements:

- Time or schedule. Change can cause revisions to the timing and sequence in which work is carried out. The effect may be direct; the changed activities themselves suffer from revised timing or indirect where a change to one activity causes revisions to the timing and/or sequence of other activities.
- Cost. Change can cause increases or decreases to the actual cost of carrying out the works. Once again, the effect may be direct, that is to say that the cost of the changed activities themselves are revised, or indirect where a change to one activity causes revisions to the cost of undertaking other activities.

- Value. This means the amount of monies actually allowed for undertaking the works. This is quite different to the cost and indeed, needs to be higher in order to contribute profit to the business.

Time effect of change

This issue and the different methods used for delay analysis have been the subject of previous articles in the Digest and so will not be examined in depth here.

In summary however, most standard forms of contract contain provisions for the Employer to grant an extension of time, or EOT. The main effects of an EOT are merely that the Contractor is compensated for the damage suffered as a consequence of an Employer risk event and is relieved of its liability for liquidated damages during the period of extension. Contract provisions vary and an EOT can be granted for the extent that an Employer risk event is predicted to or, has prevented the works being completed by the then prevailing contract completion date. The award is not to be based on whether or not the Contractor needs an EOT in order not to be liable for liquidated damages.

For a delay to affect the contract completion date it must be on the critical path and issues concerning float and concurrency must be considered.

The benefit of an EOT for the Employer is that it establishes a new contract completion date and resets liquidated damages after this revised completion date.

It is often incorrectly thought that an entitlement to an EOT automatically carries with it an entitlement to compensation for prolongation during the period of the EOT. Under most standard forms of contract, entitlement to EOT is under one provision of the contract and a claim to compensation under another. Prolongation is an extended duration of the works during which costs (normally from time-related resources) are incurred as a result of delay. Delay will result in prolongation and prolongation causes additional cost.

The recoverability of compensation for prolongation also depends on the cause of the prolongation itself:

- Prolongation costs arising from Contractor risk events is for the Contractor
- Prolongation costs arising from Employer risk events must be borne by the Employer
- Lastly, the reference period for evaluating prolongation compensation should be the period in which the effect of the Employer risk was felt.

Cost effect of change

There are many different types of change; some could be classed as variations and some as breaches of the contract. Dependant on the wording of the contract and the legal jurisdiction, the cost of undertaking the change may be used as the basis of its valuation. To do so, the Contractor firstly has to consider the labour, materials, plant, equipment and subcontractors used; the extent of each would be based on records of the resources, time taken and material used that have been kept. Secondly and again dependant on the appropriate provisions, the amount of overheads and profit is to be added.

In calculating the actual cost of carrying out a change, it should be remembered that it is the total cost to the Contractor that is needed. For labour, it is not just the amount of wages or salary paid to the individuals. It includes all other costs of employment such as insurance, paid holidays, sick leave, travel costs (whether

via the reimbursement of expenses or provision of a company supplied vehicle), subsistence when staying away from home and any overtime payments.

The cost of materials is not necessarily the amount paid to a supplier. Consider whether further works have been undertaken following receipt and prior to incorporation into the works i.e. taking delivery and transportation either within the jobsite or from one location to another. Consider also waste; this may be capable of being ascertained or otherwise a reasonable allowance added.

Plant and equipment differs depending whether it is owned or hired. For owned plant consideration must be taken of: the purchase price and depreciation, maintenance, servicing and replacement parts, tax, storage and transportation, insurance, fuel and consumables.

If hired-in plant, the cost is not just that paid to the supplier; the costs of the operator and fuel needs to be added and normal wear and tear, where the responsibility of the hirer, needs to be considered.

Due to the complexity of the calculation required to determine true cost of plant and equipment, agreement is often reached to use a percentage of published rates. In the UK and Germany there are books that list the all-in working rates of plant. The rates are generally accepted as being generous and are also inclusive of overhead and profit.

The subject of overheads and profit is a thorny one. Firstly, the extent of their inclusion depends on the wording of the contract provisions (i.e. the definition of 'cost') and / or the legal jurisdiction. Secondly, the level to be added needs addressing.

The level of overheads should be reasonable, it may be that shown to be included in the contract price, that quoted in the contract or an agreed percentage. Onsite overheads need separate consideration from offsite overheads in any case, although both are capable of being calculated from first principles.

The level of profit, if allowed, is more difficult. Profit is not guaranteed, it varies under market conditions and according to many factors including, the technical difficulty of the works, the duration and schedule, the extent of added value, the skill and expertise required, the risk and the payment terms.

Contractors may not include a profit margin in their bid but rely on achieving a level of efficiency to realise profit later.

Care must be taken when abstracting either an overheads or profit margin from a company's published results. There are often differences between the financial accounting rules that govern published results and the methods used to build up contract sums, for example in the definition of overheads. In addition, extraneous factors affect the published results. Examples include the inclusion of abnormal profit from postponed income from claims on other contracts. Also income from non contracting activities and unrealistic valuation of work in progress. In addition, reduction of previous reserves against liabilities.

Lastly, some contracts require the forecast cost of changes to be agreed in advance and not ascertained after the event. If this is the case it is reasonable to consider the inclusion of some contingencies for matters of contractor risk. Reasonability again is the key and if there is disagreement as to the level to be included, the option open to both parties is to value the change on the actual cost.

Using Value rather than Costs

So why should we consider value when evaluating change, why shouldn't a Contractor just look to recover its costs then add a percentage for overhead and profit?

There are four reasons:

It may be a contract requirement to do so. Many forms of contract stipulate that variations in particular, are to be valued using rates derived from a build up to the contract sum.

It is sometimes easier to value works using rates from a schedule rather than the time consuming requirement to make and agree records and then ensure the costs claimed actually include all the costs actually incurred.

Using value as the basis of evaluating change is often perceived to be fairer. It implies that the Contractor has taken some risk on board when doing the changed work and that the Contractor has a reason to work efficiently in undertaking the changed works.

A Contractor can also sometimes recover a greater amount when using value as the basis of evaluating change. The method allows the Contractor to retain any efficiency or other advantages in the rates.

There are three established steps for using value to evaluate change, which form the basis of good quantity surveying practice and are stated in some forms of contract.

Firstly, if the work arising from a change is of similar character and undertaken under similar conditions as the contract work, then the contract rates can be used without adjustment.

Secondly, if the work arising from a change is not of similar character or undertaken under dissimilar conditions as the contract work, then the contract rates can be used with adjustment. In other words, they can be used as a basis for valuing the work arising from a change.

Finally, if the work arising from a change is of different character or undertaken under different conditions as the contract work, then the contract rates should not be used and a fair valuation perhaps based on cost should be considered.

In practice, there are many ways in which to amend existing rates, this ranges from a pro rata adjustment for different sizes of components to adjustment of the individual net allowances for labour and / or material and / or plant.

Indirect effect of change

In this category I include disruption and loss of productivity. Change can affect the sequence of operations and levels of output but may not cause critical delay. Change can result in a need for increased working hours or overtime working, additional numbers of resources to be used or more work faces to be advanced at the same time. There is universal acceptance that these factors generally cause operatives to become less productive and this has been highlighted in various empirical studies that have been carried out.

The assessment of loss of productivity is not straightforward and strict reliance should not be placed on these statistical studies. Wherever possible, actual production losses should be measured from observations of productivity from the site itself; either by comparing disrupted and non-disrupted periods of time, or areas of the site. Comprehensive records are key.

Summary

So to conclude, the effective management of change requires adherence to a procedure, or framework. The procedure should cover the whole period of a contract (i.e. from tender to completion). At the core of the whole process, is the contract agreement, an understanding of the obligations placed on the parties and adherence to the laid down procedures.