RICS PRACTICE INFORMATION

Change control and management

UK

1st edition, January 2021

RICS®

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1 April 2021

Published by the Royal Institution of Chartered Surveyors (RICS)
Parliament Square
London
SW1P 3AD

www.rics.org

This document was originally published in January 2021 as an RICS guidance note and was reissued in March 2024 as RICS practice information.

ISBN 978 1 78321 397 9

Typeset using Typefi

Acknowledgements

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RICS standards framework

RICS' standards setting is governed and overseen by the Standards and Regulation Board (SRB). The SRB's aims are to operate in the public interest, and to develop the technical and ethical competence of the profession and its ability to deliver ethical practice to high standards globally.

The RICS Rules of Conduct set high-level professional requirements for the global chartered surveying profession. These are supported by more detailed standards and information relating to professional conduct and technical competency.

The SRB focuses on the conduct and competence of RICS members, to set standards that are proportionate, in the public interest and based on risk. Its approach is to foster a supportive atmosphere that encourages a strong, diverse, inclusive, effective and sustainable surveying profession.

As well as developing its own standards, RICS works collaboratively with other bodies at a national and international level to develop documents relevant to professional practice, such as cross-sector guidance, codes and standards. The application of these collaborative documents by RICS members will be defined either within the document itself or in associated RICS-published documents.

Document definitions

Document type	Definition
RICS professional standards	**Set requirements or expectations for RICS members and regulated firms about how they provide services or the outcomes of their actions.** RICS professional standards are principles-based and focused on outcomes and good practice. Any requirements included set a baseline expectation for competent delivery or ethical behaviour. They include practices and behaviours intended to protect clients and other stakeholders, as well as ensuring their reasonable expectations of ethics, integrity, technical competence and diligence are met. Members must comply with an RICS professional standard. They may include: • mandatory requirements, which use the word 'must' and must be complied with, and/or • recommended best practice, which uses the word 'should'. It is recognised that there may be acceptable alternatives to best practice that achieve the same or a better outcome. In regulatory or disciplinary proceedings, RICS will take into account relevant professional standards when deciding whether an RICS member or regulated firm acted appropriately and with reasonable competence. It is also likely that during any legal proceedings a judge, adjudicator or equivalent will take RICS professional standards into account.
RICS practice information	**Information to support the practice, knowledge and performance of RICS members and regulated firms, and the demand for professional services.** Practice information includes definitions, processes, toolkits, checklists, insights, research and technical information or advice. It also includes documents that aim to provide common benchmarks or approaches across a sector to help build efficient and consistent practice. This information is not mandatory and does not set requirements for RICS members or make explicit recommendations.

Glossary

Term	Definition
Bill of quantities (BQ)	A list of items that gives detailed, identifying descriptions and firm quantities of the work comprised in a contract, which is eventually rated and used as a cost control document.
Building information modelling (BIM)	A process for creating and managing information on a construction project across its life cycle.
Build-ups	Construction of the price from labour, material and plant rates.
Collateral contract	A subsidiary contract that generally relies on the main contract.
Compensation event	A change to the works that may, if it is not the contractor's fault, entitle the contractor to be compensated for any effect the event may have on time or cost.
Computer-aided design (CAD)	The creation of technical drawings of the finished product using computer software.
Contract administrator (CA)	The person in charge of tenders, contract documentation and administration of the contract. This may also be a group of people or a team.
Contractor-designed portion or contractor's design portion (CDP)	An agreement for the contractor to design specific parts of the works.
Early warning notice (EWN)	Issued when the parties become aware of anything that may delay the works or increase costs.
Employer	The employer for the works, or employer's agent as instructed. Similar terms are the client, customer, stakeholder or owner.

Term	Definition
Employer's agent (EA)	The person in charge of the administration of the contract; this is a named term in the JCT Design and Build contract. The EA may also be a group of people or a team.
Fédération Internationale Des Ingénieurs – Conseils/International Federation of Consulting Engineers (FIDIC)	An international standards organisation that produces a suite of engineering and construction contracts.
Joint Contracts Tribunal (JCT)	An organisation that produces a suite of construction contracts.
New Engineering Contract (NEC)	A suite of contracts developed by the Institution of Civil Engineers (ICE).
New Rules of Measurement (NRM)	A standard set of measurement rules and essential guidance produced by RICS for the cost management of construction projects and maintenance works.
Objective	Outcomes that can be measured objectively.
Project execution plan (PEP)	An overarching document that provides the framework to execute, monitor, and assess and control the project.
Quantity take-off (QTO)	A BIM-based measure of the quantities for each element.
Request for information (RFI)	The collection of written information about specific areas or other clarification required for the project.
Scope of works	General description of the work that is expected to be done for the project.
Star rates	New rates for valuing variations from the contract quantities quoted in the BQ.
Variation	An alteration to the scope of works.

1 Introduction

Changes are almost inevitable during a construction project. Change management therefore encompasses the skills, tools and techniques that enable these changes to be carried out effectively at both pre- and post-contract stages, resulting in the best outcome for all parties. This practice information gives advice on how to handle changes in a construction contract and on a construction project. Such changes are known as variations in some forms of contract.

Change control is the process or processes that can lead to the alteration of the timescale, the cost or scope of the project. Change management in turn involves the management of the control process so that these changes to the timescale, cost and scope are effectively implemented.

Once a change has been accepted, effective management should strive to ensure that the project benefits from the change or at least suffers minimal disruption. The relevant person or people involved with the process will ensure the procedure set out in the contract is followed. Such changes may affect the risk profile for the project, and any subsequent assessment will comprise the qualitative assessment and quantitative measurement of individual risks, including their effects on the project. The employer or contractor then has to consider which risks can be countered with measures and how costly these measures may be.

This practice information defines change control and management under the following headings, as used in the RICS Assessment of Professional Competence (APC):

- general principles (Level 1: knowing)
- practical application (Level 2: doing)
- practical considerations (Level 3: doing/advising).

1.1 Scope

The guidance assumes that the employer or its agent has the legal right to order contract variations, and that the contractor or subcontractor has not overstepped its authority and carried out works it is not entitled to do. It also covers the role of the person requiring the change, whether this is the employer's agent (EA), the project manager (PM) or the contract administrator (CA), in relation to the contractual definition of each role.

Please be aware that the document does not deal with change in the wider context of company structures; neither does it consider which party is legally entitled to make changes, other than where stated in the relevant contract or subcontract. Note too that Levels 1 and 2 of this practice information only consider the role of the EA in the JCT Design and Build Contract 2016 as an example.

The guidance concentrates largely on changes proposed and made after the contract is agreed, rather than on pre-contract changes or value engineering before the contract award. However, it should be noted at the outset that a change is not always the same as a contract variation, because not all changes affect cost or programme duration. Furthermore, some changes require instructions but others do not, and not all instructions are variations, again because they may not affect cost or duration. Finally, certain contracts require instructions to be in writing and others accept verbal instructions. Useful guidance on such topics is provided by the current edition of RICS' Value management and value engineering.

1.2 Minimum level of service

A chartered quantity surveyor is expected to be able to fulfil the following duties as part of the core competency Contract practice, notwithstanding the terms of any appointment or contractual obligation:

- demonstrate knowledge and understanding of the various forms of contract used in the construction industry and the change control procedures they contain, along with the digital portals available for some contracts that can be used to control change on projects
- apply that knowledge at a project-specific level while being aware of the implications and obligations of the parties involved in the change control procedure and
- provide reasoned advice on the effect of the change control procedure, be able to prepare and present reports to employers to determine the correct change control procedure to use and advise on the correct documentation and procedure at the various stages of a construction contract.

1.3 Effective date

This RICS practice information is effective from 1 April 2021.

2 General principles (Level 1: knowing)

2.1 Contractual changes and their implications

Change control procedures are usually included in contracts between an employer and contractor or subcontractor. These procedures may describe the processes that should be followed when something detailed in the scope of works is replaced; this change can concern labour, materials or plant, or the location of the work, and could also be an amendment that affects the programme. The contract will typically contain a definition of what constitutes a change, and a mechanism for controlling it.

When making such a change, the person responsible should:

- identify the reason or reasons for change
- investigate the impact of items such as costs, timescales and locations
- strive to mitigate risks and maximise opportunities in relation to the overall objectives of the project and
- review and accept or reject the change.

Changes can be initiated by the employer altering the scope, or increasing the volume of an item under the existing scope. In working on the project, the contractor may also discover that changes to contractual requirements are necessary, or it might make a submission for change that could benefit the parties by reducing the timescale, creating a more durable product or lowering the cost of a project element or elements. Costs for changes are dealt with in the current edition of RICS' Valuing change, while the current edition of RICS' Employer's agent: design and build may also be relevant.

The contract will usually detail who is authorised to make changes to it and, once agreed, these changes will be contractually binding on both parties. For this reason, if standard contract form wording for a change control procedure is amended, the whole contract should be checked carefully by an appropriate legal professional.

It is important to understand the implication of change for both parties, as significant change may well affect the viability of the project for one party – or, conversely, improve it for another. The management of such change is essential in providing a good-value service to the relevant party.

Changes to a project can be made both before and after the award of the contract; however, this guidance concentrates on changes following contract agreement. After initial evaluation by the employer or its representative, a change request is dispatched to the contractor to

change the base scope of a project by addition or omission, or to change the scope of a programme in terms of time or location. This change can then be evaluated and approved, rejected or deferred.

2.2 Change management principles

A typical construction project can change at any point in its life cycle, from the pre-contract project initiation phase through the post-contract phase of live construction to completion and handover, and beyond that to the end of the liability period.

Changes can be divided into two principal categories as follows:

- changes from within the contractor's own organisation that do not involve the employer and
- changes specifically requested by the employer.

The first type can be further categorised as a design change, where the contract is of a design and build kind; for example, there could be a change in the manufacturer of roof tiles used during construction as a result of observations made on site. Alternatively, the change could relate to an issue following handover that may affect the safety or well-being of the project's occupants or users; this could include, for example, adding external handrails or accessible ramps for the occupants of a newly constructed building. Such a change may form a separate contract or instruction, unless the contractor is willing to carry out the works.

Employer changes are usually classed as a variation if they have been instructed, for example when a different type of external cladding is chosen as a result of personal preference. However, it could be the case that the contractor suggests a change that produces a quicker build, and therefore the employer may deem this change beneficial and agree to fund it. These types of change are illustrated in Figure 1.

Given that it is almost impossible for a project of any size to be completed without at least a single change, the principle of change management is that the project's priorities, budget or timescale should be changed, or any upgrades in quality made, in as reasonably practicable a way as possible while ensuring users' safety, health and welfare as well as the sustainability of the project.

Such changes may alter the project risk profile; the types of risk are as follows.

- **Political and business risks:** a public domain issue may have an adverse effect on the business.
- **Benefit risks:** the benefits of undertaking the project might not yield the expected results – for example failing to fulfil the planning requirements – resulting in a reduced number of units.
- **Consequential risks:** these may occur as a result of other risks; for example, if there were disruptions to power supply.

- **Project risks:** an issue may affect progress on the project, both in terms of time and quality.
- **Programme risks:** these represent risks that influence the time taken on the programme as a whole, rather than individual tasks.
- **Design development risks:** these include the risks associated with design development, changes in estimating data and third-party risks.
- **Construction risks:** these are the risks associated with site conditions and utilities during construction.
- **Employer change risk:** this covers the risks of employer-originated changes during both the design and construction processes.

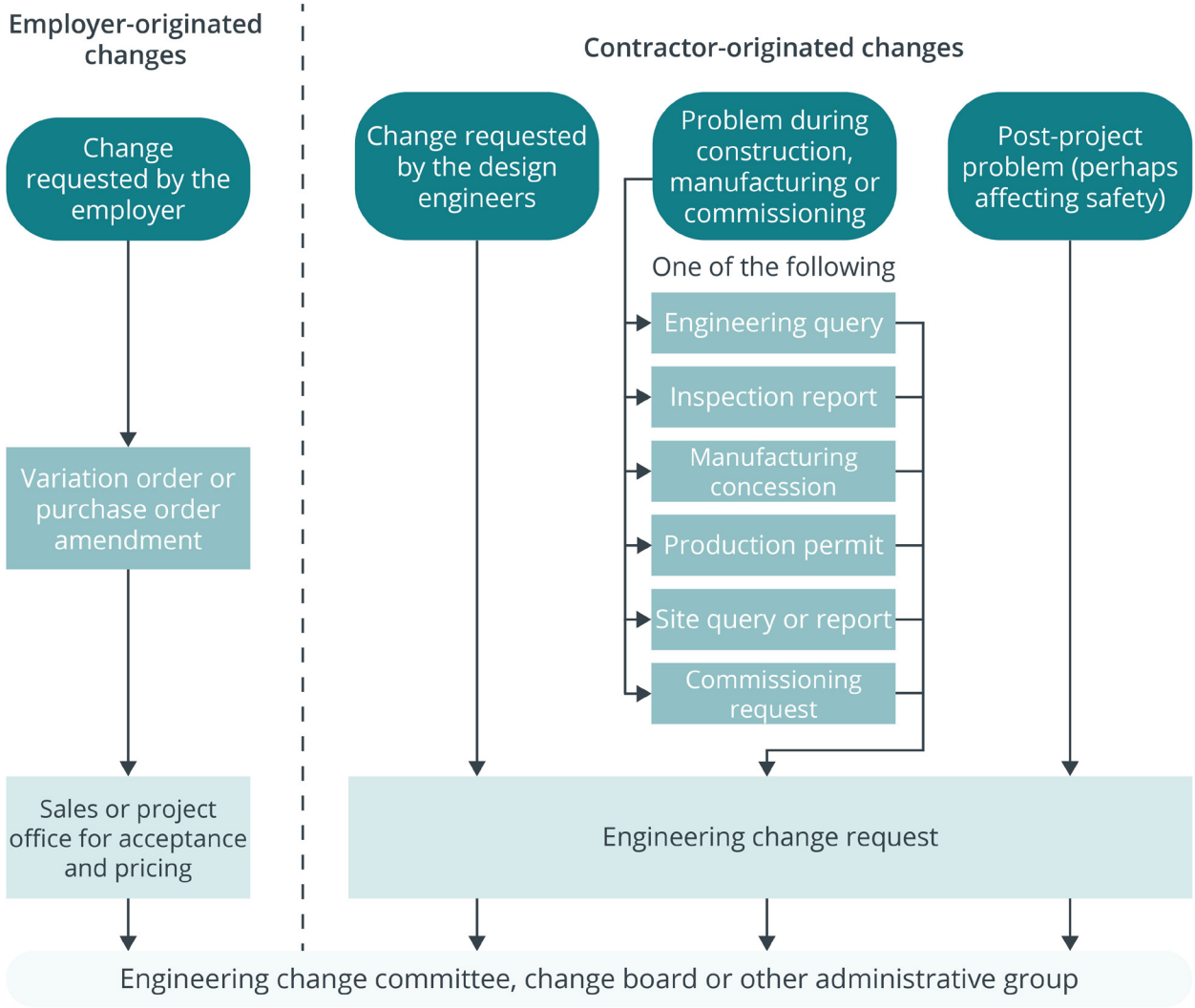

Figure 1: Comparing employer-originated changes with contractor-originated changes (Source: based on *Project Management*, 9th edition, by Dennis Lock, published by Gower Publishing. © Dennis Lock, 2007, used by arrangement with Taylor & Francis Books UK)

2.3 Types of and reasons for change

While a project is in progress, there are a number of possible reasons that a change may be made.

- Requests are made by an employer or contractor, whether contractual or non-contractual.
- Value engineering is carried out to reduce costs; this process is generally defined as concentrating on maximising the project's effectiveness while minimising cost, to generate the greatest value for the employer.
- A relevant event as set out by the contract, for example in the JCT suite, occurs.
- Revisions to statutory requirements and regulations require changes to the contract, generally after it has been awarded; these can either relate to the employer's risk or the contractor's.
- Agreed tender assumptions prove to be incorrect; the party that carries the risk for these can depend on the contract or the qualifications made at tender stage.
- Unforeseen ground conditions are encountered, although this risk profile is usually covered in the contract.
- Specified items are unavailable in the programmed timescale – for instance, where supply does not meet demand – so finding a replacement product will benefit both parties.
- Additional works are required because of design omissions or errors in the way work has been carried out.
- There are discrepancies in or between contract documents, such as:
    - the scope creeps into other areas, gaps in scope are revealed or
    - prime costs, provisional sums or instructions to authorise expenditure of provisional sums are confirmed; whether defined, making due allowance for programming, planning and pricing preliminaries; or undefined, when no such allowance is required.

In addition to these project-specific reasons, change can also be a result of other factors such as:

- a change in the employer's business needs or requirements
- changing market conditions or external influences
- changes in planning regulation or law, although these will not generally affect existing planning permissions and
- changes in technology that may enable more rapid construction, or make a better, more economical product available.

2.4 Who carries the risk?

The employer is in most cases responsible for a change and can carry the related risk, depending on the contractual obligations. To help manage these risks, a risk register can be kept with risks ranked according to priority, and this should be updated weekly. As a minimum, this register should contain the following:

- the name of the risk and associated probabilities
- a planned response for managing each risk
- provision for monitoring and controlling the risk so that it is reassessed and re-evaluated and
- provision for additional identification of risks throughout the project.

Management of the risk profile not only entails regular meetings, but also:

- discussion of ideas that lead to a solution acceptable to all parties to the contract and
- avoiding or minimising risks by early identification and response.

The contract may apportion the risk to the contractor, as a JCT Design and Build contract does for instance (see 2.6.1). The contractor may also be responsible for the change, or identifying and agreeing the reasons for a change with a party to the contract. This can occur where, for example, a contractor's team has to remedy poor-quality work by its operatives or by a subcontractor, or work completed by a previous contractor following termination of the contract. In JCT contracts, the contractor can be responsible for designated items called the contractor-designed portion (CDP), which may also bear risk.

Depending on the wording of an amended contract – for example, if defects from a previous contractor are payable – such remedial work may be a recoverable cost. However, work resulting from the contractor's neglect or failure is termed a disallowed cost if unamended forms of NEC contract are being used, or a defect or non-recoverable cost in other forms of contract. Managing the disallowed cost should generally be a minor proportion of the contract administration duties as well as a minor proportion of the overall cost. Under JCT contracts, the contractor is obliged to carry out and complete the works in a proper and professional manner, and it must remedy defects at its own cost. The current edition of RICS' Management of risk discusses risk further and is a reference source for professionals on the discipline of risk management.

2.5 Pre-contract and post-contract stages

Changes in a project can occur at any point in its life cycle, and the associated costs are discussed and scrutinised by the parties to the contract. At the pre-contract stage, the employer should be given a comprehensive information package so it can be reviewed, changed if necessary and finally approved. At this stage, change control procedures may be initiated by the employer to ensure that the approved information in the scope of works is not changed without its express permission.

Alternatively, the package of information may not be complete, in which case it will require refining or updating at either the pre-contract or post-contract stage. The change control procedures may also be initiated at the following points, depending on which of these stages the project is at.

Pre-contract, it may begin:

- towards the end of concept design, if the project is tendered at this stage as design and build contracts are
- at the end of the concept design stage, when the project brief might be frozen; that is, when the design is fixed
- when the detailed design, technical design and specification are finalised or
- during the tender stage, when documentation needs amending or additional material needs to be added to reflect changes identified by the tendering process.

Post-contract, it may begin:

- when the contractor has been appointed and any further changes may qualify as a change or variation
- when the employer instructs the expenditure of a prime cost or provisional sum or
- under JCT Design and Build contracts, when the contractor proposes and makes an agreed change that is within its scope.

2.6 How standard forms deal with change

2.6.1 JCT, NEC and FIDIC

The JCT, NEC and FIDIC contracts make provision for change control, but differ in terms of definitions and terminology.

In the JCT suite changes are generally called variations, as they are in FIDIC, while in the NEC changes are called compensation events. Each sets out its own obligations, examples of which are indicated in subsection 3.3 of this practice information.

Responsibility for the change depends on the contract obligations, and not necessarily every suite or type is the same in this respect. For example, with the JCT Standard Form of Building Contract the owner or employer generally carries the risk for changes, whereas in the JCT Design and Build Contract the contractor is responsible.

Although this practice information does not deal with costs for changes in any detail – reference should be made to the current edition of RICS' Valuing change instead – the JCT contracts split time and cost into separate components, dealing with them and their subparts independently at various stages after the change. Conversely, the NEC deals with the effects of time and cost together, so the contractor can prepare a quotation for the PM to accept. With the FIDIC suite, change control is broadly dealt with by the employer instructing variations and adjustments to the contracts.

The parameters that determine whether there has been a change also differ in the separate contracts. The JCT and FIDIC suite provide several subjective tests for determining whether certain events give grounds for the contractor to initiate a change, whereas the NEC suite tends to rely on more objective tests for the compensation event process.

2.6.2 Building information modelling

Building information modelling (BIM) represents a managed approach to the use of shared and structured data in the design, construction and operation of projects, and can incorporate changes and value engineering by altering computer-aided design (CAD) information, as well as reducing waste and improving efficiencies. This can have a positive influence on the project cost and enable swift assessment of alternative design proposals before a change is implemented. Another advantage of BIM in change management is that the process enables the designer to modify or change the components of the structure in the model, highlighting these changes and visualising the finished product.

The maturity level of BIM essentially represents the supply chain's ability to operate and exchange information; more information is provided by the British Standards Institution's website. This includes details of BIM Asset Life Cycle, formerly called BIM Level 2. BIM Asset Life Cycle has been adopted by many new projects, and one of its key features is that the employer clearly defines the project information that contractors and architects are required to provide, including 2D and 3D CAD models, data schedules and documentation.

2.6.3 Risk management and NRM 1

The efficiency and accuracy of quantity surveying functions are significantly improved by aligning the BIM-based cost estimating and planning processes with the RICS New Rules of Measurement (NRM) 1 and 3. This process resolves the problems related to the quality of the building information models and the issues created by the change of design details.

The NRM is a three-volume suite of documents, comprising:

- *NRM 1: Order of cost estimating and cost planning for capital building works*
- *NRM 2: Detailed measurement for building works*
- *NRM 3: Order of cost estimating and cost planning for building maintenance works.*

The glossary in NRM 1 defines risk allowance as an amount set aside as a precaution against uncertain outcomes. In assessing a potential but significant change, risks should be identified and added to the risk register. The impact of individual risks such as scope creep, for example, can then be assessed in terms of time and cost.

On any project, the team will be required to review the risks and opportunities during the early stages. Once these have been identified and agreed with the employer and contingency levels have been assessed, suitable funding can be finalised and set aside. This contingency fund can be used to pay for any changes that occur, whether they have been explicitly predicted in the cost report or not.

The project team should understand how the contingency fund will be affected by any changes raised, and it requires a mechanism that allows funds to be allocated for changes of scope or other factors while the project is live.

NRM 1 classifies risks in four categories:

- **design development risks:** a contractor may incorporate an allowance in its tender price for design to reflect the risk of changes in estimated data and third-party risks
- **construction risks:** these are mainly risks related to site conditions
- **employer's change risk:** this covers both the design process and construction process and includes, for example, employer-originated changes and
- **employer's other risk:** this is an allowance for issues such as early handover – which can be a risk if it is partial and entails areas of the project having to be segregated for safety – securing additional funding for changes and liquidated damages.

3 Practical application (Level 2: doing)

3.1 Measuring progress

Figure 2 illustrates the change control procedure used at any point in the process. This is an indicative diagram, being general in nature, and items such as 'Contractor forwards cost' may not be carried out in each case.

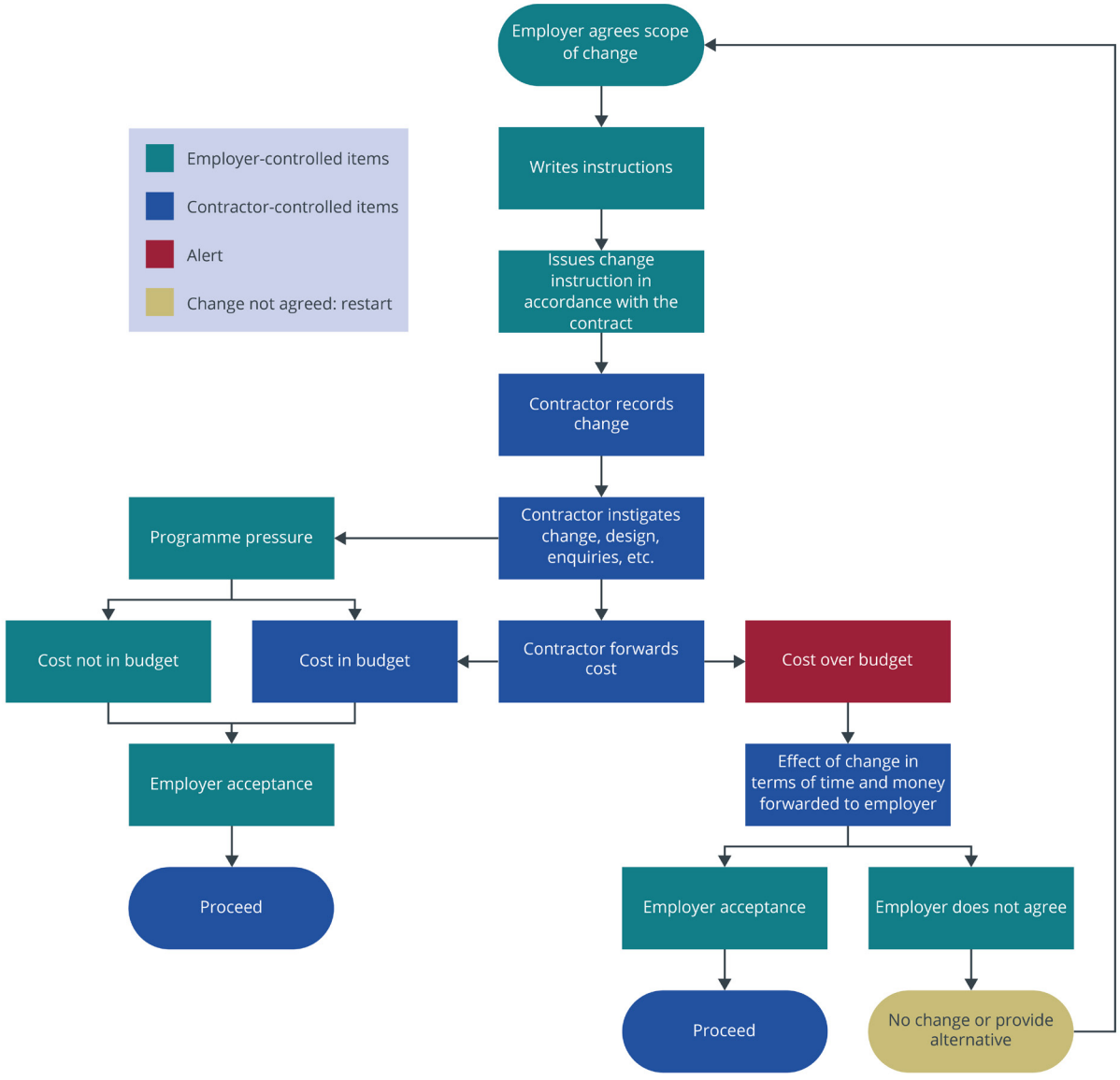

Figure 2: The procedure for change control and assessing progress

3.1.1 Evaluating and proposing changes

As Figure 2 shows, the employer agrees the scope of the change then writes and issues instructions in accordance with the contract. The contractor begins its evaluation process, which may involve recording the change in a register, and then measures the elements included in the change, or makes relevant enquiries with its subcontractors and suppliers, and considers the design and time implications. The contractor may also charge the cost for the change to the employer as either a lump sum or constituent parts, depending on the contractual obligations.

3.1.2 Approving changes

On receipt of the information, the employer may decide that the proposed change will not affect the time or budget of the project and can be accommodated by the scope. If so, it will accept the change and allow the contractor to implement it on the project.

3.1.3 Analysing changes

If the cost of the change submitted by the contractor will take the project over budget, or further clarification on time or content is needed, the employer may request more substantiation. After receipt of that information it may accept the change, and again implement that change on the project.

However, if the employer does not agree with the cost, the time taken, the content of the change or the possible disruption to the project, then no change is agreed and the scope may need to be amended to reflect this. The analysis will begin over again until agreement can be reached or the proposed change is dropped altogether. In some cases, an instruction may need to be given before the cost is agreed, to ensure the programme remains on schedule.

3.1.4 Implementation of change

Formal pre-contract and post-contract protocols for approving proposed changes are included in most forms of contract. The NEC suite is discussed first as an example, before consideration of change clauses for other commonly used contracts.

The early warning notice (EWN) process caters for changes and is designed to bring the PM and contractor together. But an EWN does not necessarily lead to a compensation event in NEC contracts; it begins where the PM and the contractor or relevant parties to the particular type of contract formally provide the other parties with an early warning of certain events that could have a significant effect on cost and time. The contractor is given an incentive to issue an EWN because, without one, it can forfeit the chance to have a risk reduction meeting or may find the subsequent cost could be disallowed.

Generally, the events that require an EWN to be issued are:

- **cost:** an increase in the prices, which will be a compensation event (see 3.3.1.3 and 3.7)

- **time:** a delay to the project completion
- **time:** a delay to meeting a specific requirement or
- **time:** an event that may affect the performance of the works on the project.

Equally, the PM could share information leading to an EWN that benefits the project, the subject of which could be added to the risk register and discussed at the next risk reduction meeting. The contractor's main obligation is set out in clause 20.1, in which it is required to undertake the works in accordance with the works information; this ideally includes all the relevant information that the contractor requires for construction. However, a change comes into play if the works information does not include all the necessary parts, in which case the PM should issue an instruction for the information to be amended. This is where the compensation events become relevant, and subsections 3.3.1.3 and 3.7 provide more details of these.

By contrast, with JCT contracts the employer will generally introduce changes and instruct that a variation or change be issued in writing; likewise, with the JCT Design and Build contract, the contractor may propose a change to the employer's requirements (ERs). For example, there could be a change in the specification of roof tiles to a type that still complies with the British Standards and meets performance requirements, but that can be delivered more quickly or is more economical; the contractor may well benefit from this saving under that contract. For a significant change that is outside the scope of the ERs, the contractor may share the saving with the employer. If the employer accepts this change, both parties may save costs.

Under the NEC, both parties to the contract can benefit from the EWN process because it allows for good ideas that improve or enhance the project, as well as enabling issues to be tackled early so as to minimise their effect.

3.2 Work outside the clause or contract scope

The difference between a change to the works under a contract and a change required outside the contract was demonstrated in the case of *Blue Circle Industries Plc v Holland Dredging Co Ltd* (1987) 37 BLR 40. Here, the contract did not include an effective change clause, and although work needed to be done outside the scope of works by the employer, it could not be executed under the contract. In the absence of an effective change clause, the contractor was not obliged to carry out work that had been changed.

Under the Institution of Civil Engineers (ICE) Conditions of Contract that were being used for this project, it was held that the additional work required by the employer was not of a kind considered by the contract and therefore was not a variation of the original. In effect the work could be carried out but would have to be done under a separate contract, the court found, while the contractor could also have refused to carry out the work altogether.

3.3 Formal change management by contract

3.3.1 Main contracts

3.3.1.1 JCT Standard Building Contract without Quantities 2016 (SBC/XQ 2016)

This type of contract is used where the employer has to provide the drawings, a description of the works, and either a specification or work schedules at the tender stage. The principal characteristic of this arrangement is that the price and payment structure of the contract is based on lump sums defining the quality and quantity of the work the contractor is to perform. This form is therefore sometimes referred to as a specification and drawings or lump-sum contract. The employer does not provide the contractor with a bill of quantities (BQ), and instead generally uses a contract-sum analysis, while the contractor bears the risk by virtue of quantifying its contract-sum analysis or schedule of rates correctly.

Change is defined in clause 5.1 of this contract as follows:

- 'the alteration or modification of the design, quality or quantity of the [w]orks' or
- 'the imposition by the [e]mployer of any obligations or restrictions … or any addition to or alteration or omission of any … obligations or restrictions that are so imposed or are imposed by the [s]pecification/[w]ork [s]chedules or the [e]mployer's [r]equirements'; these obligations or restrictions refer specifically to 'access to the site or specific parts of [it;] limitations of working space [or] working hours; or … the execution or completion of the work in any specific order'.

Changes under the SBC/XQ 2016 are termed variations, and the employer and contractor exchange information to agree such variations in a consensual way. The change processes described in the bullet points above also apply under the JCT's Intermediate Building Contract 2016 and its Minor Works Building Contract 2016; this is provided for in less detail and a more simplified manner in the Minor Works Building Contract.

3.3.1.2 JCT Design and Build Contract 2016 (JCT D&B)

This type of contract is used where the employer and its consultants prepare ERs that set the basis of the contractor's scope of work obligation. The contractor may produce a proposal document, but the ERs take precedence in the process, and the contractor's proposal should reflect these. The JCT D&B Contract 2016 is based on the employer's initial design, which the contractor completes, and is a lump-sum contract rather than being based on quantities.

While this contract still refers to a change, in the other JCT main contracts and the JCT D&B Sub-Contract 2016 the changes are referred to as variations. This distinction may be traditional: variations are seen as originating from the employer whereas changes tend to be seen more often as originated by the contractor, and the JCT D&B Contract 2016 is one where the contractor takes most of the risk.

Change under this contract is defined as follows:

- ‘the alteration or modification of the design, quantity or quality of the works by a change of ERs’ or
- ‘the imposition by the employer of any [additional] obligations or restrictions, or the addition to or alteration or omission of any obligations or restrictions; these obligations or restrictions refer specifically to access to the site or parts of it, limitations on working space or working hours, and carrying out work in a specified order’.

3.3.1.3 NEC4 Engineering & Construction Contract (ECC) Option A

This type of contract is used with a priced activity schedule, and the contract sum is calculated from lump sums for each activity on that schedule. A schedule of cost components will be included.

Change occurs through the compensation events process. This is distinguished from the EWN process in that compensation events generally relate to incidents that have already occurred – though not always – while an EWN is generally issued before an event that may happen in the future.

Compensation events, defined in the NEC contract clauses, cover a range of situations that are agreed to be at the employer’s risk. There are now 21 of these listed in clause 60.1, such as the PM notifying the contractor that a quotation for a proposed instruction is not accepted, or when the contractor encounters challenging physical conditions on site, with the exception of weather.

Compensation events deal with the cost effect of the change, together with any extension of time and loss or expense that is due. The change to the activity schedule that the compensation event represents is valued by reference to the schedule of cost components, so affected resources can have their cost calculated or forecast.

3.3.1.4 FIDIC Construction Contract 2nd Ed (2017 Red Book)

This type of contract includes approximate measured quantities and the application of an agreed rate for any changes to them. The contract rate may also be adjusted if the difference in quantities makes the balance of the rate inaccurate. Under the obligations of clauses 12.1 and 12.2, items can also be added; for example, descriptions that were omitted can be included in the final measure using the appropriate rate.

In FIDIC contracts, changes are termed variations and defined as follows: ‘Variation means any change to the works, which is instructed or approved as a variation under [c]lause 13 [Variations and Adjustments]’.

3.3.2 Subcontracts and change

Most main contractors do not have the in-house resources to carry out construction works on large projects – many having chosen not to employ operatives directly – and they thus employ subcontractors for the work. On smaller projects, however, it may be that the main contractor has sufficient capability in house.

As well as making professional appointments, including an architect, a structural engineer and perhaps a mechanical and electrical engineer, the contractor generally sends enquiries to subcontractors, as well as procuring subcontractors for specialist advice and services on a labour-only or labour, materials and plant basis, according to its requirements and resources. When making such appointments, the contractor may use the subcontract form derived from the standard form of main contract being used for the project. In any event, the main contractor will be responsible for its obligations to the employer for change under the standard contract, whether work is carried out by the subcontractor or the contractor itself.

The main contract is commonly stepped down to the subcontract – meaning that the latter mirrors the clauses of the former – by use of the subcontract form produced for that contract type. The contractor's obligations for changes under the main contract and the subcontractor's under the subcontract are therefore aligned. By avoiding gaps in this way, the project is unlikely to suffer the effects of unwanted changes or costs stemming from the use of misaligned contracts and subcontracts.

Standard subcontract forms can also be useful if the same parties are involved at multiple stages of the same project; however, specific risks may have to be identified and dedicated clauses drafted carefully to deal with these risks. Professional advice should be sought when considering amendments to the standard subcontract forms. It is also important to be aware that not all main contract obligations can be stepped down to the subcontract, and this is also true for unusual provisions in the main contract.

Finally, the change clause in the standard form may not be suitable for all subcontractors on all projects, and should therefore be reviewed in each instance. For example, it may be that certain subcontractors do not have the design capability, requiring amendments to the subcontract form.

3.4 Evaluating and selecting changes to implement

When evaluating a change, the following should be taken into consideration:

- who is proposing the change, and the reasoning for it
- the impetus or desired outcome for the change:
  - **quicker construction:** this may be beneficial because it enables earlier occupation of a building by paying tenants
  - **improved performance:** a better product or improved components could ensure cheaper utility bills or maintenance costs for the building user, for instance
  - **more economical project:** this may benefit the employer or the contractor, or both if the profits are shared
- proposals for mitigating any onerous consequences of the change, to keep the construction programme on schedule
- the risks associated with the change and who bears them

- the effect of not making the change
- timing and time-bar provisions in the contractor's notices; for instance, clause 61.3 of the NEC contract stipulates that contractors must give notification of an event within eight weeks of becoming aware of it
- what happens if the PM does not notify the change in time; that is, if there is a late instruction to change:
  - will the change trigger an extension of time (EoT) or additional payment to take account of the delay, as would apply under JCT and FIDIC contracts?
  - under NEC contracts, if the PM fails to issue a compensation event notice at the same time as the change is instructed, then the contractor is automatically entitled to a change in the price and completion date because of the client or PM's failure. If the notice is issued by the PM, this will then entitle the contractor to more time and money, because the client or PM will have detailed as much in that notice.

Another important consideration is the project execution plan (PEP), which describes who does what and how, defines the project procedures and priorities that will be adopted, and may also include the facility for change beyond the scope of the main contract. The employer's overall project might include different stages or multiple contracts for the supply of goods and services, while formal change control procedures should be set out in the original contract documentation to avoid any misunderstanding or ambiguity about roles, responsibilities and the action to be taken in any given circumstance.

3.5 Responsibility and authority for change

Whenever change is initiated, it may have repercussions for many different elements of a project, as they are most likely to be inter-related. A competent person with the skill set to review the safety, reliability, performance, cost and timescale implications of changes should therefore be appointed. Every proposed change should also be considered by at least one other key member or designated representative from each project department; if there is no one in house with expertise then a relevant consultant can be appointed, subject to insurances and experience.

A committee or board should also be appointed to manage changes, especially on larger projects; this body should meet at regular intervals to assess, manage and record the changes in the period being considered.

Contractually, the final decision or request is down to a nominated person. For example, under an NEC contract this will be the PM, while under a JCT contract this will be the CA, although this may differ with a JCT D&B contract as the contractor may propose and make the changes if this is within its contractual remit.

The decision process is illustrated in Figure 3.

3.6 Managing changes in BIM

If change orders cannot be avoided, the next best option is to manage them as effectively and efficiently as possible. BIM can significantly reduce the number and severity of changes needed during construction because it requires precise geometry and specifications from the start; however, it should be noted that use of BIM does not mean that changes are never necessary.

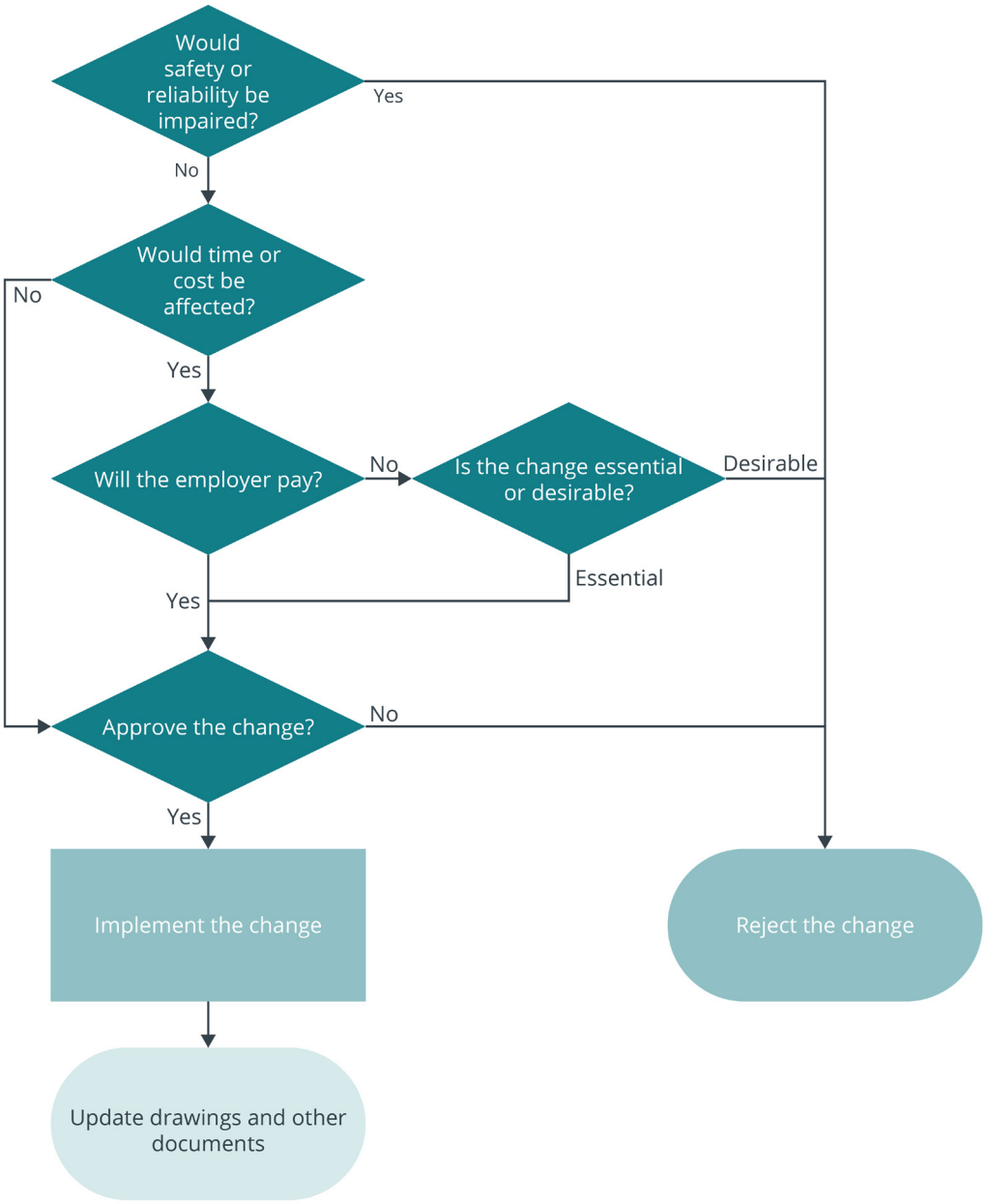

Figure 3: Flowchart of the change management process (Source: based on *Project Management*, 9th edition, by Dennis Lock, published by Gower Publishing. © Dennis Lock, 2007, used by arrangement with Taylor & Francis Books UK)

The current edition of RICS' International BIM implementation guide details how to use BIM in the design, construction and operation of the built environment. Over the life cycle of the project, whether it is infrastructure or a building, data-rich BIM will allow the team to formulate different scenarios, introduce changes and analyse whether they are beneficial. With the benefit of a fully designed building information model, the construction phase of a project can benefit from the following during change processes.

- BIM-based requests for information (RFIs) can inform the change process by producing an integrated response.
- Change requests can be supported by procurement and design information about project components and products that are readily available in the model.
- Fabrication drawings can be produced to review and support changes.
- Risk management activities associated with changes can be analysed.
- BIM-based tools help cost scheduling, control and tracking of changes implemented during the construction phase of the project.
- The person in charge of BIM at the relevant stage can investigate efficiencies in the supply chain and streamline products if changes are introduced.

As Figure 4 shows, using BIM on a project enables the cost plan to be fully integrated with the design – from the BIM-based quantity take-off (QTO) until completion – in 3D, which differs to the traditional 2D BQ take-off.

Using the building information model, changes can be integrated and quantities automatically updated, whereas in the traditional BQ take-off changes would still need to be manually measured based on the 2D drawings. Therefore, in BIM the prospective or planned changes can be indicated in the amended model design, and the difference in cost indicated should the change proceed.

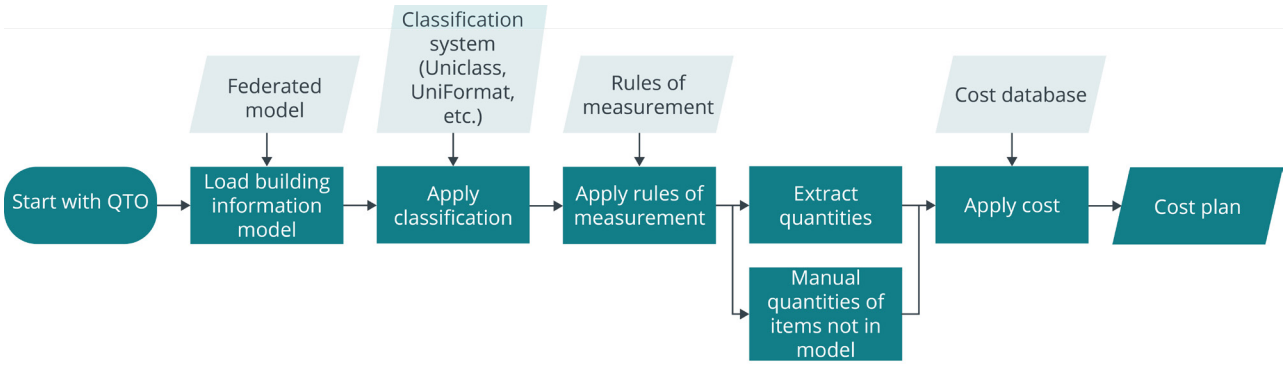

Figure 4: Cost planning process using BIM (Source: RICS' *International BIM implementation guide*)

3.7 Deemed changes or variations

Deemed changes or variations are also known as necessary changes. In the JCT Standard Form of Building Contract, for example, if there are changes to the statutory requirements after the base date, the contractor is obliged to alter its work to comply with the change. Such a deemed change would require a formal variation notice, pursuant to clause 2.15. The reinstatement of loss or damage under JCT Insurance Options B & C – clauses B.3.5 and C.4.5.2 respectively in the JCT D&B 2016 Standard Form of Building Contract – are other examples of deemed change in the JCT suite.

With NEC contracts, the mechanism for dealing with exceptionally inclement weather is detailed at clause 60.1(13). This provides for such conditions to be considered as a compensation event, whereby a contractor may be entitled to additional time and money if a weather measurement that would on average occur less frequently than once every ten years is recorded.

3.8 Valuing changes

More detail on dealing with time and cost implications is given in the current edition of RICS' Valuing change, but the following issues should still be considered.

- Valuations of variations are often based on the rates and prices provided by the contractor in its tender, assuming the work is of a similar nature and carried out in similar conditions. The valuation is either assessed by the employer and the contractor or the quantity surveyor, with the current edition of RICS' Valuing change detailing who should carry this out. Valuations must be based on the contractor's rates and prices, even if it becomes apparent that these are higher or lower than otherwise available commercial rates.
- Note that NEC contracts do not value variations based on rates in the tender; assessment of compensation events as they affect prices is based on their effect on defined cost plus the fee. This is different from some standard forms of contract where variations are valued on the basis of the rates and prices in the contract.
- Under the most commonly used forms of contract, NEC and JCT, time is dealt with by using slightly different terms and processes, although both suites provide for an employer to set a starting date, completion date and any sectional completion dates. JCT requires the contractor to submit a master programme, but gives no guidance on what type of detail to indicate and does not require revisions to the programme to be submitted. NEC demands a more formal, prescriptive programme, and the only formal document that can change a programme is an implemented compensation event.
- NEC contracts include time and cost in each compensation event, thereby removing the need for overarching claims.
- Under FIDIC contracts there is a right to vary in clauses 13.1 to 13.3, and variations and adjustments may be initiated by the contract-designated engineer at any time before

issuing the taking-over certificate for the works, subject to the correct notice, either by an instruction or by a request for the contractor to submit a proposal.

3.9 Who pays for change?

The cost of the change depends entirely on the reason for it, but the party who should pay for it will be indicated in the contract as the one bearing the risk. The cost of change should also include the cost of administrating it; the mechanism for calculating this should be determined by the relevant contract clause.

The inclusion of the cost or value and time impact of any changes is integral to the accurate forecasting of cash flow. A change can affect even the programming of the original contract works, and therefore the contractor's ability to apply for monies related to the works. In addition, the final account should factor in agreed or implemented changes, and final cost figures should be estimated to give the contractor and the employer an accurate representation of the full cost of the project and the flow of money throughout its life cycle.

The cash flow prediction should be undertaken on a monthly basis or when any change to the project is agreed, so that the parties can be advised accordingly.

3.10 Reporting

The following should be included in a change management process to enable clear and accurate reporting on a project:

- registering any change by any party to the contract on a suitable register and allocating a discrete number to it
- distributing and filing copies of the change documents
- inclusion of any change board meeting minutes
- distributing and filing copies of change documents after the committee instructions have been given
- follow-up to ensure that requested actions are taken and all drawings and specifications affected by the change are updated and reissued
- the responsible person named in the contract ensures that contractual forms produced by this process, such as a notice of a compensation event or a notice of variation, have been reviewed by the relevant competent person and are completed in a timely manner in line with the contract and
- all variations or changes should generally be agreed before any final account can be settled, even though as good practice they should have been agreed by parties as they arose throughout the project; these changes will form a constituent part of the project final account.

4 Practical considerations (Level 3: doing/advising)

This section considers chartered surveyors who are giving advice and analysing the change process, taking into account the guidance in the previous section. A chartered surveyor should consider the following topics, along with their obligations under the form of contract being used, and they should refer to the current edition of RICS' Valuing change.

4.1 Actions on receiving formal instructions for change

4.1.1 Consideration of appropriate timelines

Effective change management should allow for the possibility of change being implemented, but should also aim to avoid the need for change entirely, to prevent a negative outcome for the employer or indeed the contractor. Change can be minimised at an early stage of the project by, for example, ensuring that a detailed site investigation and condition survey are carried out, while maintaining detailed risk registers.

If it is likely that a change will be required, the employer needs appropriate time to evaluate whether its impact will be acceptable and whether the proposal provides value for money, and a proper assessment should be made under the change management or variation process. Most contracts stipulate timings for issuing notices and requests, and there is usually also a payment clause related to the variation clause.

4.1.2 Effective stakeholder engagement

On larger projects with several stakeholders, which will often take longer and be more complex, it is likely that agreeing and authorising the change will take longer as well. This means the person in charge of the change should ensure that the information is shared with other parties in a timely manner, and that this information will not affect the change process itself or the project duration.

This change could be implemented by ensuring selective participation in the change management boards or committees – mentioned in subsection 3.5 – and selective stakeholder engagement by the relevant parties, depending on the expertise required to assess the change. This means the change is reviewed before sending it on to the employer to ensure it only goes to the required person or persons, reducing the time required for review and response. The change for example could involve a narrow matter such as landscape planting in a bed, which would require fewer participants than a major change involving all of the ironmongery in the project. However, it is essential to adhere to the periods for submission of change where these are stipulated in the contract because some

may be time-barred, such as the eight-week period for notification of events stipulated in clause 61.3 of the NEC contract.

4.2 Staying on budget

4.2.1 Timing and impact of change

Changes that occur towards the end of the project can cause greater cost and disruption than those that are proposed before work starts on site or at the early stages of a project. Changes to the project at the proposal stage are not uncommon, and may only result in additional feasibility studies, or BIM analysis if a model has already been produced. However, further into the project, when the contractor has already been appointed and started work on site, implementing change will have a greater impact on time and cost.

Changes the employer instructs the contractor to make, and that are in turn implemented by the subcontractor, may be reasonably easy to carry out. However, where different contractual forms or clauses are used for the subcontractor, these may affect its ability to implement the change. The change may also cost more than expected due to gaps in the scope that were not envisaged when the change was instructed. The employer should be made aware of these possible implications before finally issuing a change notice. Subcontract forms that step down the main contract should be used where possible to minimise these risks.

The cost of a change varies in relation to the project life cycle, with the opportunity for change decreasing as the project progresses and, conversely, the cost of that change increasing with time. The optimum point for making a change therefore is at the pre-contract stage or very early in the project.

4.2.2 Impact of excessive changes

If too many changes are made on contracts, this could possibly result in frustration, and may necessitate the creation of a collateral contract, as defined in this subsection. However, the likelihood that the original intentions for the project have been demonstrably frustrated will depend on the specific wording of the contract. A single large-scale change may have a similar impact as a number of smaller ones – changes of significant scope may well affect the timing and viability of the project for all parties.

If the changes result in a reduction in value or scope, meaning for instance that a large amount of work is omitted, the parties should ascertain the potential to increase the rates agreed in the contract, to ensure that the contractor can anticipate the same or a similar amount of money by getting paid more per item for fewer items. Conversely, if there are a significant number of changes on the project, these may prevent the contractor from completing the works as tendered, which could mean that the employer does not get the best value for money. However, with the FIDIC provision, it is possible to alter the rates in some cases.

Where there are a significant number of changes, this may result in in the formation of a second, collateral contract that depends on the original main contract. Collateral contracts are independent oral or written contracts that are made between two parties to a separate agreement, or between one of the original parties and a third party.

4.3 Considerations when advising on changes

It is important to develop an agreed change process with the employer or PM and the quantity surveyor. Submissions for change should be formal and consistently arranged, as the writing-up and assessment of the change will both be more efficient if the structure and content are similar for each document.

The employer and contractor should make sure this process complies with the contract obligations and procedures. Acknowledgement of the change submissions should be sought from recipients to ensure that the contract mechanism for timing is observed. If sending a notice, the contract will generally stipulate how this should be dispatched and by which means, for example by signed-for post. The change or variation register should be updated at least once a month.

4.3.1 Differing interpretations of change

It is paramount that the scope of work be specified as completely and accurately as possible. The more detail it provides, the less confusion on the part of the employer as to what it is paying for, and the less confusion on the part of the contractor as to what it is actually contracted to provide. When the parties can agree to the appropriate scope for a change, its cost or the time it will take, it is reasonably straightforward to implement that change.

However, if the employer wants a change and the project team does not consider that it actually constitutes a change, or the change is more expensive than the employer considers reasonable, the project team can provide alternative proposals to the employer to try to achieve the latter's objectives. With reference to Figure 2, this process will either lead to an agreed change or the change process starting over again. It is in the employer's interest to agree this change expediently so as not to affect the project's progress.

4.3.2 PM or EA

Whether the instructing person is the employer or PM, they should be able to guarantee that any changes proposed to the project's scope, cost or time or any upgrades in quality are recognised, assessed and endorsed or, if not viable, rejected. In the latter case, new proposals for change may then be submitted, but may be not permitted if deemed to add too much time to the project programme or be too expensive.

Effective management can enable the correct implementation of change: this will involve consideration of the project's objectives and priorities, as these may need revising and updating if a change creates extra costs, increases the project duration, alters its quality or has an impact on the planned or implemented safety measures.

Therefore, the PM or the EA will be responsible for the smooth roll-out of the change by monitoring and controlling the process efficiently to enable the intended modifications to the base scope or contract. The provision of accurate budgets for cost and time, and direct agreement of these with the other party, can inform the decision-making process. As mentioned in subsection 3.6, if the effect of the change can be considered using BIM, this can often help control and implement that change. The employer and contractor should both consider the change's effect on the project risk profile.

4.3.3 Quantity surveyor and cost management

The quantity surveyor together with the PM, EA or CA should assemble documentation for each change item to agree with the employer and contractor on a monthly basis.

This documentation should ordinarily include:

- formal instruction to vary the works, along with requisite notices and correspondence
- the legal basis for the change from the contract
- preparing a discussion of the change
- instruction to vary the works from the employer
- full substantiation of the quantities or lump sums
- rates, star rates to be used where the contract rates cannot be applied, BQ references, build-ups, quotations, purchase orders and invoices
- an unambiguous, detailed breakdown highlighting labour, materials, plant and other costs, such as specialist fees, so they can be included in the cost report and compared against the project budget
- drawings and specifications
- photographs where relevant
- preliminaries, insurances and, if affected, bonds
- a revised construction programme and
- a review of the change status: for example, whether the change is agreed, whether it is still being considered or more information has been requested, or whether it has been rejected; if it is still being considered, it may be prudent to agree a set of actions with timescales relevant to the construction programme or the current stage of the project.

This process will enable the inclusion of these changes in the final cost report or reconciliation.

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