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PAYMENT ARRANGEMENTS IN THE IRISH CONSTRUCTION INDUSTRY – AN OVERVIEW

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Relevance

The payment arrangement adopted on a contract directly affects the level of risk borne by the client and the contractor. On *lump sum contracts* the contractor carries the risk for pricing the work ‘up front’. If the contractor prices the work too low, the tendered rates will not be adjusted and he/she must bear the loss arising from the under-pricing. Similar considerations govern *measured contracts*, where the works are valued on completion in accordance with the contractor’s tendered rates. On *smaller projects where quantities do not form part of the contract* the contractor typically agrees a lump sum for works on the basis of drawings and specifications; under this arrangement the contractor assumes the risk for both the quantity and the pricing. With *cost reimbursement contracts* the client assumes the risk for the quantity and pricing. The payment arrangement, therefore, directly motivates the contractor’s efforts to carry out the work in an efficient and economic manner. This in turn has a significant impact on the final price paid by the client.

Procurement Arrangements

Procurement deals with the methods used by employers to obtain construction products. The principle methods of construction procurement are often categorised according to who carries out the design; the main approaches include:

Traditional Procurement - where consultants produce the design, select the contractor and supervise the work through to completion. The contractor is typically selected on some basis of competition. Substantial projects are typically let on a with quantities basis; smaller projects are usually let on a drawings and specifications basis.

Design and Build Procurement - this is where the contractor provides the design and construction under one contract. Design and build projects are typically lump sum arrangements based on the contractor’s proposals.

Management Procurement: include approaches where the contractor is appointed before the works are tendered. The management contractor or construction manager works alongside the design and cost consultants, providing buildability advice and a construction management service. The management contractor does not undertake either the design or direct construction work. The design requirements are delivered by letting the various elements to work package contractors. These types of contracts are often arranged on a cost reimbursement basis.

In Fig 1 below, Clamp, Cox and Lupton (2007) have illustrated how risk is distributed between the client and the contractor according to the particular procurement approach selected. Bearing risk attracts a corresponding underwriting premium. The greater the risk borne by the contractor, the higher the premium to be paid by the client. Price should therefore rise in line with increasing risk.

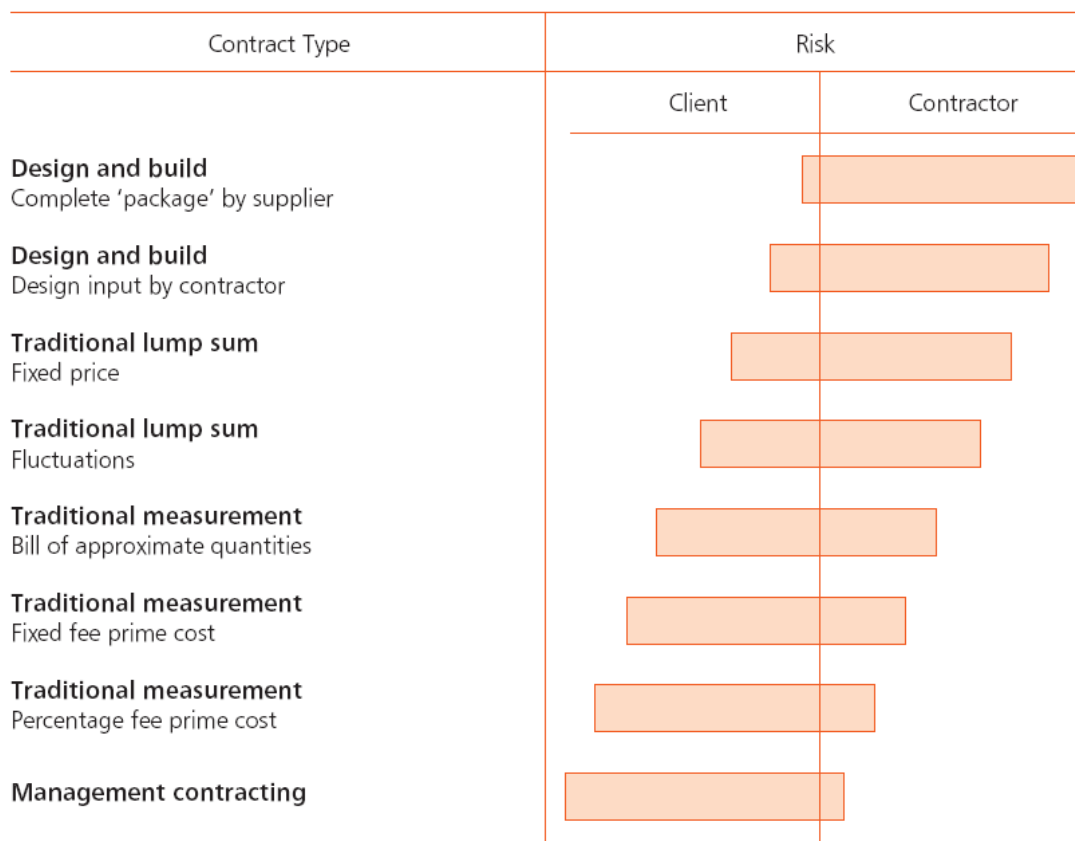


Fig 1 Speculative risk under various procurement approaches. Source Clamp et al. 2007 p45

Figure 1 indicates that the contractor bears practically all of the speculative risk where the contract is arranged on a design and build 'package deal' basis. Under this arrangement, the contractor bears the design, quantities, inflation and pricing risks, the client bears the residual risks – principally contractor insolvency. The client

progressively bears greater levels of risk in line with the listed procurement options. Under the design and build arrangement the client bears the design risk inherent in the employer's requirements. Under traditional lump-sum procurement the client assumes the entire design risk, the contractor retains the quantities and pricing risk – this is the basic drawings and specification approach 'without quantities'. Fluctuation risks, i.e. resource inflation risk, may be passed to the client under contracts such as the Royal Institution of Architects in Ireland (RIAI) 'yellow' and 'blue' forms of contract. Where bills of quantities form part of the contract, the client assumes the quantities risk; incorrect quantities are rectified and approximate quantities are remeasured. In certain circumstances, contracts may be arranged on a cost reimbursement basis where the client reimburses the contractor's production (resource) costs plus a fee to manage the project. The fee arrangement may be a fixed fee which can motivate the contractor to economise (client assumes the productivity risk); alternatively a percentage fee may be required in the particular circumstances (client assumes the management efficiency risk) (Hackett et al. 2007). Under management contracting arrangements the client, in effect, bears almost the entire speculative risk associated with design, quantum, cost and productivity. In the construction management arrangement there is no main contractor to bear any of the risk.

Payment Arrangements

The price basis on which the contract is to be awarded is, therefore, a central concern of the procurement arrangements. There are *two* basic ways of paying for construction work: fixed price based on some form of measurement, and cost reimbursement (Hackett, Robinson and Statham. 2007, Ashworth, Hogg and Higgs, 2013). Fixed price contracts, however, are often categorised as either 'lump sum' or 'measured' contracts, depending on how the price is determined for the work.

Lump sum contracts typically describe arrangements where the works can be 'fully' measured in advance, thereby enabling a price to be tendered 'up front' before the works are carried out. *Measured or remeasurement contracts* refer to contracts where the nature of the works is known at the time the work is tendered, but their extent is not known. This arrangement enables the contractor to tender rates to carry out the works, which are measured and valued in-situ after they have been completed. *Cost*

reimbursement contracts relate to agreements where the contractor is paid the prime cost of carrying out the work and a fee to cover overheads and profit.

Hackett et al (2007) and Ramus, Birchall and Griffiths (2006) comment that it is rare for a contract to be paid exclusively by one of the above methods and that two, or indeed all three methods of payment may be employed. For example, bills of quantities for private sector work in Ireland are primarily based on measured quantities (lump sums), but they often contain provisional quantities to be measured on completion (remeasured work), and may also contain provisional and/or prime cost sums involving cost reimbursement arrangements. The contract types adopted for the more non-routine procurement approaches also tend to adopt one or more of the above principles depending on the particular circumstances.

Lump Sum Contracts.

Under lump sum contracts, the price is agreed in advance and the final account is adjusted from the contract sum.

Lump sum contracts: occur where the contract sum is determined before construction starts with the amount being entered in the agreement. Examples of lump sum contracts include those let under the Government Contracts Committee for Construction's (GCCC) and RIAI standard forms. Design and build contracts are also lump sum contracts. This payment arrangement is used in the vast majority of substantial building contracts in Ireland. Indeed, the Capital Works Management Framework requires public sector contracts to be let on a fixed price lump sum basis.

Lump sum contracts are based on the contractor's commitment to complete the whole of the work for a specific sum. The arrangement operates most successfully where full design/production information is incorporated in the contractor's offer at contract award stage. The arrangement therefore can promise a high degree of cost certainty but demands considerable time to prepare and price the tender documentation. Lump sum contracts under 'traditional' procurement arrangements are based either on *drawings and specifications* which are recommended for smaller projects, or on *bills of quantities* which are recommended for more substantial projects. Under design-build arrangements the contractor's proposals form the basis of the lump sum.

Hughes, Champion and Murdoch (2015) make the following comment in relation to lump sum contracts and rates in bills of quantities or schedules of rates:

However, one thing remains constant. In all cases, the contractor offers to do the work for a price, not for reimbursement of cost. A contractor who estimates too low is held to the bargain, even if the job runs at a loss. Similarly, for a contractor who estimates too high, the bargain still holds, despite the employer paying over the odds. This principle underlies some important decisions in the courts that demonstrate reluctance to intervene in what turns out to be a bad bargain ... It applies as much to every rate in a bill as it does to the whole contract sum. This is one reason that the bills play such an important role in the management of construction contracts. An employer who does not wish to have the contract governed in this way should use an alternative procurement method.

Lump sum based on a bill of quantities

This arrangement is also known as a ‘with quantities’ approach and has been the traditional pattern for larger contracts. The purpose of the bill of quantities is ‘*to fully describe and accurately represent the quality and quantity of the work to be carried out*’ (ARM4). Ramus et al (2006) comment that the ‘*essential characteristics of this method is that both the quantities and the unit rates in the bill form part of the contract. Such a contract is a lump sum contract (sometimes called a fixed price contract) because a price is stated in the contract as payment for the work described in the bill.*’ Under this arrangement the employer bears the quantities risk. Incorrect quantities are corrected. Therefore, the contractor’s risk in relation to cost is limited to pricing.

Bills of quantities are prepared by the client’s consultant quantity surveyor who is expert in this area. Their use avoids the need for the tendering contractors to measure the works, thereby eliminating abortive work amongst unsuccessful bidders. This reduces the waste of estimating resources with consequent reductions in contractors’ general overhead costs which are ultimately passed on to construction clients. This approach is seen as both effective and efficient (Seeley, 1997).

Lump sum contracts perform best when the design is substantially complete before tenders are obtained. The requirement to produce bills of quantities in accordance with ARM4 imposes a discipline on both the design team and the client to progress, and ideally complete, the detailed design before obtaining tenders. This should facilitate accurate quantities to be generated and limit the extent of requests for information and variations during the construction phase, thereby increasing the degree of cost certainty for the client.

Where the contract is let on a ‘with quantities’ basis the client assumes the quantities risk. Premiums charged by contractors to take the quantities risk are reduced or avoided as a consequence. In the absence of bills of quantities, such premiums may be substantial, particularly where the time for tendering is inadequate and/or design is incomplete. Tenders should therefore be lower than would otherwise be the case. In this regard, it is interesting to note that the *Report on the Review of the Performance of the Public Works Contract* (Office of Government Procurement, 2014) claims that State expected tender levels on public sector projects to rise by up to 10% following the introduction of the GCCC suite of public works contracts. It is suggested here, that a large proportion of this expected increase was to cover the additional risk that would be borne by contractors in assuming the quantities risk and its associated knock-on programming effects.

A further benefit of their use is that tenders are obtained on a common basis and can be assessed on price alone. Ramus et al. (2006) comment that the contracting parties have a clear picture of the extent of their respective commitments. They add that the bill of quantities provides a detailed breakdown of the tender which provides a sound basis for the valuation of any variations to the design.

On the negative side, full design requires a significant amount of time to prepare the necessary designs and production information in advance of tendering. Bills of quantities are prepared as the final part of this process and have therefore become linked to the criticism that they (needlessly) hold up the tendering process. Attempts to ‘freeze’ the design may improve this situation, but this of course will have knock-on effects in the post tender and construction phases of the project if the design information is incomplete.

Ramus et al (2006) identify the problem of dealing with variations which are so fundamental or extensive as to change the character of the remainder of the work or the conditions under which it has to be carried out. They also explain that under this arrangement, contractors are not involved in the design process and the approach is not entirely suitable for partly designed work or where the work is unknown in character as occurs in some alteration schemes. It may be better to use measurement contracts in these situations.

Lump sum based on drawings and specification

This arrangement is also known as the ‘without quantities’ approach and is the traditional ‘lump sum’ arrangement used for small contracts and/or for nominated subcontracts on larger contracts. The contract documents typically comprise full working drawings, schedules and details supported by a full specification which includes comprehensive preliminaries particulars. In theory, the drawings should be sufficiently well developed to enable the successful contractor to complete the works without the need to request further design information. Schedules may also be supplied in order to provide positional information. The specification will set out the required material and workmanship standards. Prime cost (PC) sums may be included within the specification to cater for specialist work; likewise provisional sums may be included to accommodate unresolved or incomplete design issues.

The *Liaison Committee Code of Practice for Tendering and Contractual Matters*, (2006) recommends that the without quantities approach should be limited to ‘minor’ building works projects, however no precise definition as to what constitutes minor works is presented in the current Code. In this regard it should be noted that the GCCC PWC-5 form of contract is required to be used on ‘minor’ public sector contracts whose value does not exceed €5 million. It should also be noted that public sector contracting authorities are encouraged to let contracts on a without quantities basis where sufficient information is provided to enable contractors to accurately assess the commercial risks involved in the project. It appears that many projects exceeding €1 million have been carried out in the private sector based on drawings and specifications alone.

Bills of quantities are typically ***not*** provided under drawings and specification arrangements. The contractor must, therefore, measure the works and consequently becomes responsible for the accuracy of the quantities – mistakes are not corrected. Where bills are supplied under this arrangement, their status is reduced to that of a ‘pricing document’ alone. In such cases tendering contractors would be well advised to carefully check the accuracy of the bills, as they assume the risk where these bills do not reflect the works requirements (drawings, specifications, schedules etc.) set out in the other tender documents. This is particularly important when tendering for public sector contracts, as the works requirements typically take priority over the pricing document particulars– this effectively means that such contracts become ‘without quantities’ arrangements.

In the absence of bills of quantities / pricing schedules provided by the client, tendering contractors are typically required to submit a tender breakdown or contract sum analysis to support of their tenders; Such breakdowns and/or analyses identify how the tender sum has been compiled and typically are not produced in accordance with ARM4. The rates contained in the tender breakdown are used primarily to value interim payments but they are also used as the basis for valuing variations.

Ramus et al (2006) comment that this arrangement provides both parties with a clear indication of their respective financial commitments at contract award stage. They also note that this approach does not require the production of a bill of quantities which therefore reduces the time required to prepare the tender documents.

Tenderers produce their own abbreviated 'builders' quantities' bill without wasting too much time and effort among the unsuccessful firms. This approach avoids the disproportionate costs of producing a full bill of quantities on the client's part. Nevertheless, this approach generates more abortive work for unsuccessful bidders. The Liaison Committee (2006) recommends that 'without quantities' forms should be limited to minimum of four, and a maximum of six tenders, and that all contract drawings and the specification should be issued. In addition they advise that a bill of quantities or schedule of items should be included in the tender enquiry.

Drawings and specifications contracts are, in theory, restricted to small projects and subcontracts. The approach requires complete designs to be ready before tendering takes place. This may take a considerable amount of time and may be viewed by clients as unnecessarily prolonging the development process. Measures taken to speed up the process, such as introducing provisional sums and quantities may be difficult to control from a cost point of view in the absence of a bills of quantities prepared in accordance with ARM4. Ramus et al (2006) add that the approach is not suitable for projects which may require numerous of extensive variations.

Measured contracts.

Under a measured contract arrangement the works are measured on completion and the final account is valued in accordance with tendered rates.

Measured contracts are also known as 'measure and value contracts' and/or 'remeasurement contracts'. These arrangements are used where the extent of the work

is unclear at the time of tendering and/or where a speedy start on site is essential. The approach is associated with excavation and earthworks, refurbishment/modernisation projects, civil engineering, and term, serial and/or maintenance contracts. Measured contracts approaches are not used for *single* projects in the public sector as these are perceived to provide insufficient cost certainty for State agencies. The approach is, therefore, not widely used in Ireland.

Under these arrangements, it is the unit rates which form part of the contract. The works themselves are measured *in situ* and are then valued in accordance with these rates. The ‘lump sum’ therefore, only becomes known on completion of the work. These arrangements may be said to be ‘fixed price’ to the extent that the price is fixed following the measurement of the completed works. The approach therefore provides limited cost certainty to clients, who retain the entire quantities risk.

The use of remeasurement arrangements enables contracts to be agreed and for works to commence on site before the design is complete. This overlapping of the design, tendering, and construction phases is referred to as fast-tracking and permits an earlier start/completion on site. Remeasurement arrangements may be appropriate when time is pressing, and there is insufficient time to produce full designs or quantities before obtaining tenders. The approach may therefore be suitable to achieve ‘hard’ deadlines, avail of tax-breaks or to establish a foothold in the market before competitors do.

As remeasurement approaches are typically based on incomplete design information, they do not achieve the level of cost certainty associated with firm bills, particularly where tenders are sought at an early stage in the design development process. There is therefore a considerable risk of cost overruns between the accepted tender and the final account. The approaches are often adopted with the feeling that they are second best to using firm quantities. Measured contracts are based on either bills of approximate quantities or schedules of rates, ideally these are described in accordance with ARM4 in order to avoid ambiguity among the tendering contractors.

Bills of Approximate Quantities

Bills of approximate quantities operate in a similar manner to ‘normal bills’ as described above and may be entered into using the RIAI ‘yellow’ form of contract. Approximate quantities tend to be used in situations where the extent of the work can be established with some degree of accuracy, for example, where a cost plan has been

produced. The reliability of the approximate quantities depends on the stage or degree to which the design has been developed at the time of tender. The more developed the design – the more accurate the ‘provisional’ quantities. Indeed this author has experienced situations where fully developed designs have been tendered using bills of approximate quantities. It could also be argued that where quantities form part of the contract and incorrect quantities are corrected, that all bills of quantities are, in effect, approximate in nature. The approximate quantities approach, however, differs from ‘firm’ quantities in that the extent of the entire works is uncertain rather than particular/limited sections being uncertain.

The bill of approximate quantities is normally drafted specifically for the particular project. Where the design team has already worked on similar projects together, many of the bill descriptions can be copied directly from the most similar previous project. Likewise, the quantities may be adjusted from that project or may be based on a cost plan for the particular project. In these cases, a bill of approximate quantities may be compiled very quickly. This approach overlaps the detailed measurement and tendering process thereby saving considerable time. This overlapping approach is the basis for what is termed two-stage tendering¹ in the UK (see footnote below) where the detailed design is completed and the quantities are ‘firmed up’ while the contractors are pricing the bill of approximate quantities.

While approximate quantities fail to provide optimum cost and time certainty, nevertheless the arrangement can work well, particularly where detailed design work has been progressed. At the other end of the range, approximate quantities may be little more than a guess. The uncertain nature of the quantities means that the planning and programming of site operations, and hence, the preliminaries costs cannot be accurately estimated. This can lead to valuation difficulties particularly where individual parts or elements of the bill bear little resemblance to the final design. The flexibility inherent in the approach may also tempt the design team into delaying design decisions thereby further increasing cost uncertainty.

¹ It should be noted that the term ‘two stage tendering’ has a different meaning in Ireland. In connection with Irish public sector contracts two stage tendering refers to a process whereby a contractor must prequalify (Stage 1) in order to be included in the final list of tendering contractors (Stage 2).

While the cost of producing a firm bill at tender stage is avoided, the works, nevertheless have to be remeasured, which may prove at least as costly as having to prepare bills of firm quantities in the first place.

Ramus et al (2006) note that the objectives of compiling an approximate quantities bill should be:-

- to measure the evolving design as realistically as possible in order that the tender amount is close to out-turn cost of the project.
- to compile an accurate preliminaries bill.
- to predict and measure the individual work items likely to be encountered.
- to strike a balance in the weighting of each trade or work section.
- to include an adequate contingency sum and other provisional sums to cover the worst case situation.

Bills of approximate quantities may also be used in connection with serial, term and maintenance contracts. These arrangements are most widely associated with public sector social housing projects. In this regard it should be noted the GCCC have issued PW CF-9 to establish framework agreements under which works packages can be let on the basis of the *Term Maintenance and Refurbishment Works Contract* PW CF-11 form of contract, which is a measurement rather than a lump sum contract. This form of contract is used where an employer requires a contractor to perform regular maintenance and refurbishment ‘*Task Orders issued from time to time by the Employer*’ during a specified period. Clause 1.6 of the contract clarifies the status of any quantities provided under this arrangement: ‘*Any quantities in the Pricing Document are notional quantities only, included only for tender assessment purposes. They do not describe the extent of the Works to be executed under this contract.*’ Ideally these Task Orders can be tendered on a lump sum basis, however, the contract envisages that tendered rates to apply to situations involving ‘provisional’ quantities. This contract form may also be used with unquantified schedules of rates.

Schedules of rates

Arrangements using schedule of rates differ from approximate quantities in that quantities are not supplied to the tendering contractors. The schedules consist of a list

of work descriptions with units of measurement stated against each item but with no quantities given. The approach tends to be used in situations involving a higher degree of uncertainty over the extent of the works, and/or in cases of greater urgency than those using approximate quantities. The benefits and disadvantages are similar to those under approximate quantities arrangements but are even more pronounced as a result of the increased uncertainty or urgency involved.

Schedules of rates in Ireland are now produced 'in-house'. Previously, pre-priced schedules of rates were published by the National Building Agency² and tendering contractors were invited to confirm or adjust the various sections or individual rates in the schedule. It is suggested that the nearest equivalent to using a pre-priced schedule would be to adapt a construction price book such as *Spons Irish Construction Price Book*, however this was last updated in the 2008 3rd edition. This approach would enable tendering contractors to price a very wide range of work descriptions.

On the other hand schedules produced 'in-house' tend to be more focussed on the particular project and may use a previous bills of quantities as their basis (historic schedules); alternatively they may be compiled especially for the particular project (ad-hoc schedule). Where unpriced schedules are provided the tendering contractors must insert rates against each of the individual works descriptions. Again, the approach taken will reflect the time and information available.

Published schedules such as those published by the British Cost Information Service in the UK contain a comprehensive list of items likely to arise in a typical construction project. The items are arranged according their trade/work section headings with a unit rate against each item. These schedules can be used for a variety of works, for example building works, mechanical services, electrical services, painting and decorating, landscape management and road works. Tenderers are asked to tender percentage additions (or deductions) to the listed rates, usually by sections or sub-sections, thus allowing for inflation and/or variations in production costs. Tenderers regularly using a particular schedule become familiar with both the item descriptions and the rates, and are able to assess percentage adjustments relatively easily.

² The National Building Agency was disbanded and amalgamated into the National Housing Agency in 2012

Where schedules are produced ‘in house’ the works requirements are more focussed and tenderers are only required to price a restricted range of items. This allows them to develop a clearer understanding of the scope of the project and consequently estimate unit rates or percentage differences more accurately.

A particular difficulty associated with schedules of rates arises from the absence of quantities. This makes the assessment of the most advantageous tender much more difficult as arbitrary quantities will have to be used to evaluate tenders. It is possible in these situations that changing the quantities of particular work items or weightings of particular work sections could produce a different tender outcome. The estimation of accurate preliminaries cost, is likewise, more difficult in these circumstances.

Cost Reimbursement Contracts.

Under cost reimbursement contracts the contractor is paid the actual cost of carrying out the work plus a fee to cover management, overheads and profit.

Cost reimbursement contracts are rarely used on new build commercial projects and there are no published Irish standard forms of contract catering for this approach. These arrangements tend to be used where the nature of the work is uncertain and its extent is also likely to be uncertain. The final account is arrived at on the basis of the actual costs of labour, plant and materials, plus a fee to cover management, overheads and profit. Contractors are, in effect, paid what they spend, plus an agreed fee, which may be based on a formula, to cover management, overheads and profit. In the private sector, traditionally procured building contracts often include provisional/contingency sums to cover work which cannot be defined at the time of tender and/or prime cost sums to cover the appointment of specialist subcontractors. Both arrangements lend themselves to valuation using cost reimbursement approaches.

Cost reimbursement contracts tend to be confined to emergency situations, for example, repairs to dangerous structures, where the work is so urgent that it would be inappropriate to delay starting the works in order prepare tender documentation or to figure out what it might cost. Cost reimbursement is also associated with contracts where particularly high standards of work where the particular specialists would not be prepared to quote a price in advance. Cost plus arrangements may also be used where measurement and valuation in accordance with tendered rates would be inappropriate, For example certain types of alteration work, work in inaccessible locations, or work in

existing premises where the employer intends to dictate the sequence, and the working hours and conditions from day to day. These approaches are sometimes described as ‘dayworks’ arrangements.

From an employer’s point of view cost reimbursement contracts present the highest degree of financial risk as he/she pays what the contractor’s spends on building the project. The approach may have gained an unfair reputation amongst quantity surveyors as being the equivalent of writing the contractor a blank cheque (Hackett et al 2007) to be used only as a last resort. As a result, quantity surveyors are often hesitant to recommend this approach, particularly where other, less risky, options are available. Seeley (1997) recommends that this approach should be confined to small projects.

In Ireland cost reimbursement arrangements may be based on approaches such as those contained in the *Schedule of Daywork Charges* (SCSI 2012a) and *Percentage Additions to Labour Costs* (SCSI 2012b) published by the *Liaison Committee* of the SCSI. These define the various terms used such as ‘prime cost’ and provide for percentages which may be added to the original costs to cover profit, overheads, etc.

These projects operate an ‘open book’ approach, recording the total cost of the work contained in the contractor’s detailed accounts, labour allocation sheet, and materials and plant invoices. These are checked by the quantity surveyor. The contractor’s fee is then added to the verified costs. Clamp, Cox and Lupton (2007) recommend that the scope/coverage and basis of the fee, which may take a variety of forms, should be agreed beforehand. The three most common methods of calculating the fee are:

- cost plus percentage fee.
- cost plus fixed fee.
- cost plus fluctuating fee, which is sometimes referred to as a target cost contract.

Which is likely to be the most appropriate depends on the particular circumstances. Again, the more developed the information and time available the more less risky options become available to clients.

The basic cost plus arrangement is *cost plus percentage fee*. Under this arrangement the fee is a fixed percentage and is generally associated with situations where the amount of work cannot be forecast in advance. Cost plus percentage fee has been heavily criticised because it provides little or no financial incentive to encourage the contractor

to be efficient. In effect the longer the contractor takes to complete the job and the more it costs, the more the contractor gets paid and the better the profit margin becomes. Ramus et al (2006) comment that '*the outstanding disadvantage (to the client) is that the more inefficient the contractor's operations are and the greater the waste of resources, the higher the fee paid to the contractor will be.*'

A second approach is the *cost plus fixed fee* arrangement. Under this arrangement the contractor is paid a fixed fee. This arrangement encourages contractors to complete projects efficiently in order to maximise profitability. However some degree of project information is necessary to prepare an estimate on which the fee is based. Ramus et al (2006) add that that the fee might vary if the scope of the work or the conditions of carrying it out change significantly. They also observe that the fee falls in percentage terms as the prime cost rises (see Table 1 below). Ashworth et al (2013) add that this may tempt the contractor to cut back on management input in order to improve profitability. This would be exactly what the client would not want to happen in these circumstances.

Cost plus fluctuating fee forms a third cost reimbursement method. This approach is a variety of 'target cost' contracting. This approach requires a realistic cost estimate of the works to be agreed in order to set a cost target for the project. The target then forms the basis for determining the contractor's fee. The fee, in turn, depends on the extent to which the final cost exceeds or is below the target cost. The approach encourages a win-win situation for the client and the contractor; the lower the project's costs the higher the contractor's fee. Conversely, the fee is reduced where the contractor's cost exceeds the cost target. This approach provides a much stronger incentive to the contractor to economise than either the percentage or fixed fee arrangements outlined above. Clamp et al (2007) explain that the presumption is that if cost increases due to the contractor's supposed inefficiency, then the fee will be reduced accordingly. They also comment that target cost contracts are not popular, (in the UK) and are likely to prove complex to administer.

Comparisons between the various cost reimbursement approaches

Ramus et al (2006) provide an interesting illustration of how a contractor's profit margin changes relative to the actual prime cost expenditure and chosen cost reimbursement approach. Their example relates to a contract where the total cost of

materials, labour and plant is initially estimated as £50,000. The contractor estimates his overheads at 15% (£7,500) and he also requires a 5% (£2,500) profit margin. He therefore tenders a 20% fee under a cost plus percentage arrangement. Similarly he tenders a £10,000 fee under a cost plus fixed fee arrangement, and agrees to a 50/50 split in the cost savings or cost overruns under a target cost contract. Table 1 below shows the effects on the contractor's profit margin where the prime cost expenditure rises to £55,000 and falls to £45,000 under the three arrangements.

	Original Estimate	Higher Outturn Cost	Lower Outturn Cost
Total prime cost	50,000	55,000	45,000
Overheads – assumed fixed	7,500	7,500	7,500
Real profit cost + %	(10,000-7500) ÷50,000 = 5%	(11,000-7,500) ÷55,000 = 6.4%	(9,000-7,500) ÷45,000 =3.3%
Real profit cost + fixed fee	As above = 5%	(10,000-7,500) ÷55,000 =4.6%	(10,000-7,500) ÷45,000 =5.6%
Real profit – variable fee 50/50 split	As above = 5%	(7,500-7,500) ÷55,000 =0%	(12,500-7,500) ÷45,000 =11.1%

Table 1 Profit margins under various cost plus arrangements (adapted from Ramus et al. 2006)

Table 1 indicates that under the cost plus percentage arrangement that the more the contractor spends on the project, the better the profit margin. The reverse occurs where the contract is delivered within the original estimate; the contractor's real margin suffers due to being spread over lower outturn costs. This approach, therefore, provides little or no incentive to contractors to work economically.

The position under the cost plus fixed fee arrangement is set out in row five of the table. In this instance the contractor's profit margin improves as the prime cost of the work fall and conversely the margin falls with increasing prime costs.

The contractor appears to be further incentivised to work economically under the target cost arrangement shown in row six of the table. In this instance the additional prime cost of the work in column three has absorbed all of the contractor's profit margin as a result of the penalty for exceeding the estimate. On the other hand, the contractor has

generated a healthy profit margin shown in column four by delivering within the original estimate.

Appraisal Cost Reimbursement Contracts

Regardless of the somewhat negative perception of the approach, cost reimbursement arrangements offer a number of attractive benefits.

The arrangement facilitates early contractor appointment and commencement of site operations, which in certain cases may be the client's most important priority. This saves time and reduces tendering costs. The approach promotes high quality material selection and workmanship in that contractors are not working to a fixed price consequently they need not be tempted to cut corners in order to improve margins. This should result in higher standards with fewer defects. It should be noted that management procurement approaches often adopt a cost plus arrangement; these projects are associated with fast-moving, high quality projects delivered by expert construction managers.

The approach is flexible and caters for an evolving detailed design in parallel with the construction operations. The approach should encourage more co-operative and harmonious working relationships between the construction participants and reduce contractual disputes and claims. In this regard fixed fee and target cost approaches introduce efficiency incentives and may encourage a win-win mind-set between contractors and employers.

The principle disadvantage of these arrangements from the client's point of view is the greater degree of financial risk assumed under these contracts. The arrangements are widely perceived as being ineffective from the cost perspective with limited scope to control costs on site. These difficulties are compounded by the fact that there is often little financial incentive for the contractor to work efficiently. It is not difficult to imagine the potential for serious cost over-runs in these situations. Clamp et al (2007) comment that it may not be easy to challenge accounts where a contractor '*uses a greater number of operatives than is reasonably required . . . and it could be very tricky for an architect to say 'you have charged for six carpenters but four could have done that job'*' Keane (2001) commenting on the related topic of dayworks notes that daywork accounts are not popular with architects because of the difficulty of verifying the correct amounts, particularly in relation to hours worked. These arrangements therefore require

constant monitoring and vigilance. It is prudent, therefore, only to use contractors whose *bona fides* have been well established. It should also be recognised that selecting a contractor on the basis of lowest percentage or fixed fee addition is no guarantee of the contractor's ability.

Conclusion

This study has examined various approaches used to pay for building construction work. Most substantial building contracts in Ireland are entered into by way of *lump sum arrangements* based on either detailed works requirements, bills of quantities or contractor's proposals; the contractor quotes a price 'up front' under these arrangements. Occasionally, *measurement approaches* may be used where the extent of the works are established in-situ and valued in accordance with tendered rates. On rare occasions, the contract may be arranged on a *cost reimbursement* basis whereby the client pays the contractor's production costs plus a fee to manage the construction process. The degree to which the design has been completed will influence the choice of payment arrangements. The arrangements employed, in turn, directly motivate the contractor's efforts to carry out the work in an efficient and economic manner. This ultimately has a significant impact on the final price paid by the client.

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