

# Civil Engineering Specification

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Municipal Engineering Practice

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## Preface

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THIS book is primarily concerned with the drafting of specification clauses for civil and municipal engineering work. The specification on a civil engineering contract constitutes a contract document and its provision is essential if the material and workmanship requirements of the job are to be adequately detailed.

The book sets out to indicate how a comprehensive and yet straight-forward specification can be produced. The specification acts as one of the principal lines of communication between the Engineer and the Contractor and thus requires the exercise of considerable care and skill in its preparation.

The contents of this book should be helpful to engineers when compiling specifications and also of value to students who are studying the subject for degrees, diplomas and professional examinations in civil and municipal engineering.

Units of measurement, weight and pressure have been converted to their nearest metric equivalents using the analogue or 'rounding-off' method, and the imperial units are shown in brackets. Appendix IV contains an analogue metric conversion table which readers may find useful when preparing their own specifications on the metric system.

At the time of going to press the final decision on the form of the decimal marker had not been made by all participant bodies, but the point has been used throughout in line with the recommendation of the Decimal Currency Board.

I. H. SEELEY

*Nottingham,  
Spring 1968*

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## CHAPTER ONE

# Civil Engineering Contracts

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THIS Book is mainly concerned with the drafting of specifications for civil and municipal engineering work, but it is felt desirable to begin by considering the relationship of the specification to other contract documents, particularly the Conditions of Contract.

With any major civil engineering project, it is necessary for the engineer to prepare a set of comprehensive contract documents. These are all binding upon the contractor, who must pay full regard to their contents when tendering for a job and throughout the contract period, when the work is under way.

### CONTRACT DOCUMENTS

There are usually six contract documents for the larger civil engineering jobs, as listed below, although with very small contracts it is conceivable that a bill of quantities may be omitted.

- (1) Form of Contract.
- (2) General Conditions of Contract.
- (3) Specification.
- (4) Bill of Quantities.
- (5) Contract Drawings.
- (6) Form of Tender.

The nature and uses of each of these documents are now described.

#### (1) Form of Contract

The Form of Contract constitutes the formal agreement between the promoter and the contractor for the execution of the work in

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accordance with the other contract documents. It is usually covered by the Form of Agreement incorporated in the General Conditions of Contract for Works of Civil Engineering Construction. (See reference 1 at the end of the chapter.)

In the Form of Agreement, the contractor covenants to construct, complete and maintain the works in accordance with the contract, and the promoter or employer covenants to pay the contractor at the times and in the manner prescribed by the contract. These are the basic requirements of any civil engineering contract.

### (2) General Conditions of Contract

The General Conditions of Contract define the terms under which the work is to be undertaken, the relationship between the promoter or employer, the engineer and the contractor, the powers of the engineer and the terms of payment. For many years it had been considered desirable to establish a standard set of generally recognised conditions which could be applied to the majority of civil engineering contracts.

In 1945, the Institution of Civil Engineers, in conjunction with the Federation of Civil Engineering Contractors, issued a standard set of General Conditions of Contract for use in connection with Works of Civil Engineering Construction (1). The Association of Consulting Engineers was concerned with the preparation of later editions of this document, in addition to the two bodies previously mentioned. Furthermore, other sets of conditions have been specially prepared to cover civil engineering works which are to be performed overseas (2).

The Institution of Structural Engineers has issued a set of standard conditions for use on structural engineering contracts (3) and the main clauses will be considered later in this chapter.

For building work, it is customary to make use of the standard conditions issued under the sanction of the Royal Institute of British Architects and various other bodies, and generally referred to as the R.I.B.A. Conditions (4). There are alternative forms for use where quantities do or do not form part of the contract and there are, in addition, sets of conditions specially devised for use on local authority contracts. Practice notes are issued from time to time to clarify doubtful points.

Where a contract is very limited in extent and the use of the standard comprehensive set of conditions is not really justified, an abbreviated set of conditions, often worked up from the appropriate set of standard conditions, is frequently used.

With certain specialised classes of civil engineering work, the respon-

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sible authorities have seen fit to introduce a number of clauses which modify or supplement the standard clauses of the I.C.E. Conditions. Typical examples are the clauses prepared by the Central Electricity Generating Board for use on power station contracts, and the clauses introduced by the Ministry of Transport in connection with contracts for roads and bridges.

### (3) Specification

The specification amplifies the information given in the contract drawings and the bill of quantities. It describes in detail the work to be executed under the contract and the nature and quality of the materials and workmanship. Details of any special responsibilities to be borne by the contractor, apart from those listed in the general conditions of contract, are often incorporated in this document. It may also contain clauses specifying the order in which various sections of the work are to be carried out, the methods to be adopted in the execution of the work, and details of any special facilities that are to be afforded to other contractors.

In *Civil Engineering Procedure* (5), issued by the Institution of Civil Engineers, it is recommended that the specification should require tenderers to submit an outline programme and a description of proposed methods and temporary works with their tenders.

The specification will always be a contract document on civil engineering contracts, while in the case of building contracts, operating under the R.I.B.A. form of contract, it will be only a contract document if there is no bill of quantities or when it is specifically made a contract document under the particular contract.

### (4) Bill of Quantities

A bill of quantities consists of a schedule of the items of work to be carried out under the contract, with quantities entered against each item. Quantities of civil engineering work are normally measured in accordance with the Standard Method of Measurement of Civil Engineering Quantities (6), whereas most building work is measured in conformity with the Standard Method of Measurement of Building Works (7). For road and bridge work, the notes issued by the Ministry of Transport (8) may prove useful, although they conflict with some of the provisions of the Standard Method of Measurement of Civil Engineering Quantities.

One of the primary functions of a civil engineering bill of quantities

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is to provide a basis on which tenders can be obtained and, when the bills are priced, they afford a means of comparing the various tenders received, both as regards totals and individual rates. After the contract has been signed, the rates in the priced bill of quantities can be used to assess the value of the work as executed, and help in the preparation of interim statements and calculation of bonus.

The quantities should be as accurate as possible, although on civil engineering contracts the work is invariably remeasured on site, whereas on building jobs the remeasurement of work on site is mainly limited to substructural and drainage work and work which is the subject of variations. Civil engineering billed descriptions are kept brief, with frequent references to specification clauses, whereas in building work detailed descriptions appear in the bill. In all cases, billed descriptions must indicate clearly the nature and scope of the work covered.

The unit rates entered by contractors against items in bills of quantities normally include for overheads and profit, and in civil engineering bills the rates also have to include for the majority of items of temporary work, such as trench timbering, keeping excavations free from water, and levelling and ramming bottoms of excavations. Special items of temporary work, such as the construction of a cofferdam around a sewer outfall into a river, may call for special billed items.

The actual arrangement of a civil engineering bill of quantities varies with the type of work being measured. For instance, a bill for a sewage disposal works will usually be split into sections, each covering a component part of the works, such as sedimentation tanks and biological filters. Within each section, the billed items will normally follow the order of subsections contained in part IV of the Standard Method of Measurement of Civil Engineering Quantities. In building work, the bill is subdivided into trades or work sections.

Where the same constructional work is to be performed under different conditions, separate billed items should be provided to give the contractor the opportunity to enter different prices against them. Typical examples are a reinforced concrete slab in the base of a pump well below ground and a similar slab in a water tower tank 21 m (70 ft) above ground. Where the quantity of work is uncertain, such as making up soft spots in a road formation, then these should be listed as 'provisional'.

Where 'prime cost' sums are entered in the bill to cover the cost of materials to be supplied or work to be done by sub-contractors, the main contractor must be given the opportunity of adding sums to cover profit and fixing of materials or attendance on sub-contractors. General provisional sums are frequently included in bills of quantities to cover

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contingencies and additional works that may arise during the course of the contract, due to site conditions or changes in design.

The Standard Method of Measurement of Civil Engineering Quantities permits the use of a system of comprehensive measurement for repetition work, mainly composite work of a uniform type of construction. A single billed item can be used, although several classes of workmanship and materials may be involved. Typical examples of work where this method can be employed are retaining walls, tunnel work and pipelines. In each case a subsidiary bill should be included in the description column listing, in the recognised units of measurement, the quantities of the component materials and work required to provide a unit of length, e.g. one metre (linear yard) of tunnel lining. Where the 'Variation of Price (Labour and Materials) Clause' operates, the contractor is permitted to claim the increased costs which occur after the date of tender, for labour, materials and consumable stores, which are used on the contract. It is the usual practice in these circumstances to include a schedule of basic rates at the end of the bill of quantities, in which the contractor can enter the basic prices on which his tender is based. In some cases the principal materials are entered in the schedule when the bill is being prepared, but the contractor can enter any other materials if he so wishes.

To secure uniformity of measurement, recognised units of measurement and general rules and principles appertaining to the work of measurement are detailed in the Standard Method. The application of these rules to the measurement of the different classes of civil engineering work is illustrated in a book by the author (9), which also describes the processes involved in the preparation of a bill of quantities.

### (5) Contract Drawings

Contract drawings depict the nature and scope of the work to be carried out under the contract. They must be prepared to a suitable scale and be in sufficient detail to permit a contractor to price the bill of quantities and to carry out the work satisfactorily. For instance, sewer plans are frequently drawn to a scale of 1 : 2000 (1/2500) or 1 : 500 (1/500), with sections prepared to an exaggerated scale, such as 1 : 2000 (1/2500) horizontal and 1 : 500 ( $\frac{1}{40}$  in. to 1 ft) vertical. Road plans are sometimes drawn to 1 : 500 (1/500) scale. Scales of 32 or 64 ft to 1 in. have been used to an increasing extent (multiples of  $\frac{1}{8}$  in. scale) but the 1 : 500 scale will now probably become universal. Manhole and gully details are usually drawn to a scale of 1 : 20 ( $\frac{1}{2}$  in. : 1 ft).

All available information as to the topography of the site, the nature

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of the ground and the water-table level, should be made accessible to contractors tendering for a job. Existing and proposed work must be clearly distinguished on the drawings. For instance, old and new sewers and other services can be depicted in different colours or different types of line. With alterations to buildings it is often preferable to prepare separate plans of old and new work.

All drawings should contain an abundance of descriptive and explanatory notes which should be clearly legible and free from abbreviations. Ample figured dimensions should be inserted on the drawings to ensure maximum accuracy in taking-off quantities and in setting-out the constructional work on the site.

Materials shown in section are best coloured or hatched for ease of identification, using the notation in the relevant British Standard (10). Guidance is also given in the British Standards on the use of lines for various purposes: for instance, dimension lines are to be thin and continuous with the dimension placed above the line and along it, and readable from the bottom or right-hand edge of the drawing.

There are nine recommended engineering drawing sheet sizes, ranging from 2 m × 1 m (72 in. × 40 in.) to 250 mm × 200 mm (10 in. × 8 in.) (sheet sizes as cut from roll) in B.S. 3429. Where a civil engineering department keeps a stock of ready-printed negative sheets, it will probably be decided to limit the number of sheet sizes to about 4-6. Recommendations are also included as to the layout of drawing sheets and numbering of drawings (10). It is good practice to keep a card index of drawings and to enter on drawings the date and nature of any amendments.

One set of contract drawings will be used by the contractor on the site, and these will probably be supplemented by further detailed drawings during the course of the contract. Prints are obtainable on paper or linen, the latter being more suitable for rough usage on the site. Dycline prints are not true to scale and can give rise to errors in scaling dimensions.

Information on drawings over-rides that given in the specification which, in its turn, over-rides the bill of quantities, and all three are over-riden by the Conditions of Contract.

### (6) Form of Tender

The Form of Tender constitutes a formal offer by the contractor to execute the contract works in accordance with the contract documents for the contract price or tender sum. It usually incorporates the contract period within which the contractor is to complete the works.

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The form of tender now generally used for civil engineering contracts is the form incorporated in the General Conditions of Contract for use in connection with Works of Civil Engineering Construction (1). This form of tender provides for a 'bond' amounting to 10 per cent of the tender sum. The contractor is generally required to enter into a bond, whereby he provides two sureties or a bank or insurance company who are prepared to pay up to 10 per cent of the contract sum if the contract is not performed satisfactorily.

The appendix to this form of tender covers the amount of the bond, minimum amount of third party insurance, time for completion, amount of liquidated damages, period of maintenance, percentage for adjustment of prime cost sums, percentage of retention, limit of retention money, minimum amount of interim certificates and the time within which payment is to be made after a certificate is issued.

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## CONDITIONS OF CONTRACT

The most important provisions of the two main standard sets of conditions used on civil engineering contracts are now summarised.

### I.C.E. Conditions

The duties of the engineer's representative are stated in clause 2: 'to watch and supervise the Works and to test and examine any materials to be used or workmanship employed in connection with the Works'. Furthermore, the engineer may delegate in writing any of his powers to his authorised representative.

The contractor is entitled to two sets of drawings (clause 7) and he is required to examine the site before submitting his tender (clause 11). Clause 14 requires the contractor to submit a detailed programme, showing the order and method of carrying out the work. The contractor shall not assign any part of the contract or sub-let any part of the works without the written consent of the employer or engineer respectively (clauses 3 and 4).

The contractor is responsible for the true and proper setting-out of the works and for the provision of all necessary instruments and labour (clause 17). Under clause 16, the engineer may require the contractor to remove from the works any person who misconducts himself or who is incompetent or negligent.

The contractor is also responsible for the care of all permanent and temporary works (clause 20), insurance of the works (clause 21),

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damage to persons and property (clause 22), giving of notices and payment of fees (clause 26), supply of all plant, material and labour (clause 32), providing reasonable facilities for other contractors on the site (clause 31) and clearance of the site on completion (clause 33). It will be noted from clause 30 that the passage of traffic to and from the site is to be organised, as far as possible, so as to reduce to a minimum all claims for damage caused by extraordinary traffic.

Clause 34 provides for the payment of wages and observance of hours and conditions of labour not less favourable than those established for the trade or industry in the district where the work is carried out.

The requirements with regard to costs of samples and tests (clause 36) and the inspection and removal of improper work and materials (clauses 38 and 39) are very important. No work shall be covered up without being approved by the engineer, and the engineer has power to order, in writing, the removal of improper materials or work.

Clause 40 gives the engineer the right to suspend the progress of the works but, in the majority of cases, any extra cost incurred by the contractor as a result of the suspension will have to be borne by the employer.

The contractor is required to begin the works within 14 days after receipt of the engineer's written order to proceed (clause 41). Whilst clauses 43, 44, 47 and 48, relating to time for completion, liquidated damages for delay and certificate of completion, all have far-reaching effects.

The contractor is required to make good any defects arising from the use of materials or workmanship not in accordance with the contract appearing during the maintenance period (clause 49).

The engineer may alter the extent or character of the works, by orders in writing, without invalidating the contract, and the additional or amended works shall be valued at billed rates, as far as practicable (clause 51). The engineer is given the power to fix rates for varied work, and provision is also made for carrying out certain work on a daywork basis (clause 52). 'Daywork' is the method of valuing work on the basis of the time spent by the workmen, the materials used and the plant employed, plus a percentage to cover overheads and profit. This method is used when it is impracticable to value work at the billed rates and the only satisfactory method of evaluation of the work is on a daywork basis. The Standard Method of Measurement of Civil Engineering Quantities (6) details three ways of valuing work on this basis.

Clause 53 vests the ownership of all constructional plant, temporary work and materials on the site in the employer, and these cannot be removed by the contractor without the written consent of the engineer.



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The quantities are to be measured in accordance with the Standard Method of Measurement of Civil Engineering Quantities, and the work as executed is to be measured on completion (clauses 56 and 57).

Under clause 58, both selected suppliers of goods and selected sub-contractors on a civil engineering contract are referred to as 'nominated sub-contractors'.<sup>1</sup> No cash discounts are legally payable to the main contractor, unless he pays the sub-contractor, on the direction of the engineer, before he himself receives payment from the employer, although this procedure is not always followed in practice on account of the practical difficulties that arise in operation.

The contractor submits to the engineer a monthly statement of the estimated value of permanent work executed and, if it exceeds the minimum amount for interim certificates, the engineer issues a certificate authorising payment to the contractor, less retention money. The contractor is entitled to 5 per cent interest on overdue payments (clause 60).

If the contractor becomes bankrupt or fails to perform his obligations under the contract, he becomes liable to expulsion from the site (clause 63). The engineer is authorised to settle any disputes arising under the contract, but if the contractor is dissatisfied with his decision, he can take the matter in dispute to arbitration (clause 66).

The Variation of Price (Labour and Materials) clause can be incorporated where it is not to be a 'fixed price' contract.

### **Institution of Structural Engineers, Conditions**

The same provisions as in the I.C.E. Conditions apply as to assignment and sub-letting (clause 2). All work, including approximate items, shall be contained in the bill of quantities, otherwise the contractor can claim additional payment (clause 3). Under clause 4, the contractor is entitled to two copies of the drawings and other contract documents.

The contractor is to be given full possession of the site within a stated number of days of the signing of the contract and he is to complete the works by a specified date. This latter date may be extended by virtue of one or more of the five causes mentioned in this clause. If the contractor fails to complete the works within the specified period, suitably extended where appropriate, he shall become liable for payment

<sup>1</sup> 'Nominated sub-contractors' on civil engineering contracts are specialist tradesmen, merchants and others carrying out work or supplying goods, for which provisional or prime cost sums are included in the bill of quantities. These sub-contractors are selected by the engineer on behalf of the employer, but they receive their instructions and payment from the main contractor. In building contracts, the person nominated for the supply of goods is described as a 'nominated supplier'.

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of a specified weekly sum as liquidated and ascertained damages (clause 6).

Clause 9 contains similar testing provisions to those contained in the I.C.E. Conditions, and similar powers with regard to the removal from the site of unsatisfactory persons (clause 10). Under clause 11, the contractor is responsible for paying all fees and giving all notices legally demandable, except that he can recover the cost of fees from the employer if they are not covered by a provisional sum in the bill of quantities. The contractor is to supply the engineer with a detailed programme showing the methods, plant and order to be adopted (clause 12).

Under clause 13, the contractor is obliged to pay rates of wages and observe hours of labour not less favourable than those commonly recognised by employers and trade unions in the district where the work is being performed. Furthermore, the billed rates are to include for welfare requirements and all labour costs.

The contractor is entitled to recover the amount of increases in the cost of wages and materials occurring during the period of the contract. Similarly, the employer will be entitled to the benefit of any decreases that occur (clause 14).

By virtue of clause 15, the contractor is responsible for the care of the works from their commencement to the end of the maintenance period and shall, at his own expense, make good any damage or loss unless this is caused by certain specified acts. The contractor is made liable for all injuries or damage caused to any person or property due to the construction of the works, with certain specified exceptions (clause 16). The contractor is also to insure all works against loss or damage by fire and other specified risks (clause 17).

Materials, plant and temporary works on the site vest in the employer (clauses 18 and 19).

The contractor is obliged to provide adequate supervisory staff on the job (clause 20). The resident engineer is empowered to order the removal of condemned work or materials and to order variations (clause 21). It is not specifically mentioned that these orders are to be in writing. Under clause 22, billed rates are to include all liabilities and obligations listed in the General Condition of Contract and Specification. Varied work is to be valued at billed rates as far as practicable (clause 23). Clause 24 introduces the quantity surveyor for measurement and valuation of work, whereas he was not mentioned in the I.C.E. Conditions. Clause 25 requires bills of quantities for structural work to be prepared in accordance with the Standard Method of Measurement of Building Works, but in practice the civil engineering code of measurement is often used.

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The contractor has the same responsibilities for setting-out the works as under the I.C.E. Conditions (clause 27). The contractor is to afford reasonable facilities on the site to contractors and workmen engaged by the employer (clause 28) and allow the employer and engineer access to the site and appropriate workshops (clause 29). The contractor is to give notice to the engineer before any work is covered up (clause 30).

Under clause 32, the contractor is entitled to extra payment for excavation in rock, running sand or artificial obstructions. The contractor shall not execute permanent work at night or weekends, without the written consent of the engineer, except in special circumstances (clause 33). Where the contractor is required to suspend the works, he will normally be recompensed for the additional cost involved (clause 34).

The contractor is entitled to 2½ per cent cash discount on sub-contractors' work and 5 per cent on nominated suppliers' work. If a contractor fails to pay nominated sub-contractors or suppliers the cost of work or materials included in previous certificates, the employer may pay the accounts direct and deduct the amounts paid from the sums due to the contractor (clause 36). This clause follows the procedure laid down in the R.I.B.A. Conditions.

The engineer is given the same power to vary the works as in the I.C.E. Conditions. Varied work shall be valued at billed rates wherever possible, and on a daywork basis if the extra work cannot be satisfactorily measured and valued (clause 37).

Under clause 38, the contractor is responsible for furnishing the engineer monthly with details of the amount of work performed and materials on site. The engineer is to issue his certificate within 14 days of the receipt of this statement. One-half of the retention money is to be paid to the contractor on certified completion and the remainder at the expiration of the maintenance period, provided that all defects have been remedied. This clause further provides that if the employer fails to honour certificates within 14 days of issue or to settle the final account within 28 days of receipt of written notice from the contractor, then the contractor is entitled to a 5 per cent rate of interest on outstanding sums.

The contractor is to remedy, at his own expense, any defects in workmanship or materials occurring before the termination of the maintenance period (clause 40). The site is to be left in good order and free of surplus materials on completion (clause 41).

If the contractor becomes bankrupt or fails to carry out the terms of the contract, the contractor may be expelled from the site and he will not be entitled to any further payment until the end of the maintenance period (clause 42). Clause 43 lists a number of circumstances under which the contractor has the right to cease work and to recover the

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costs incurred from the employer. Clause 44 makes provision for the settlement of disputes by a single arbitrator where the parties are unable to reach agreement.

### TYPES OF CONTRACT

There are basically eight types of contract which can be used for civil engineering work, and each of these is now described and their uses are detailed.

#### (1) Bill of Quantities Contract

This is generally the soundest form of contract. It incorporates a bill of quantities, in which all the component items of work are listed and subsequently priced by the contractor to give the tender sum. The bill of quantities helps the contractor in pricing the job, and in the absence of this document he may have to prepare his own approximate bill in the limited time allowed for tendering.

Furthermore, the priced bill of quantities provides a basis for the valuation of variations, in addition to ensuring a common basis for tendering. It is good policy to use this form of contract on all but the smallest civil engineering jobs, or where the special circumstances on a job favour the use of some other form of contract.

#### (2) Lump Sum Contract

In a lump sum fixed price contract the contractor undertakes to carry out the contract works for a fixed sum of money. The details of the project are normally shown on drawings and described in a specification, but no bill of quantities is supplied. This form of contract is often used where the job is reasonably certain in character and small in extent, such as site clearance work and on small constructional jobs like pumping stations.

#### (3) Schedule Contract

This type of contract may take one of two forms.

- (a) The employer supplies a schedule of unit rates covering each item of work likely to be encountered, and contractors are required to state a percentage up or down on the rates, for which they are prepared to undertake the work.
- (b) The more usual method is to require contractors to insert a rate against each item of work in the schedule. It is good practice to

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include approximate quantities to assist contractors in pricing the schedule and for the subsequent comparison of tenders.

This type of contract is used mainly for maintenance work, but occasionally schedules of rates are used as a basis for negotiated contracts.

### **(4) Cost Plus Percentage Contract**

In a cost plus percentage contract the contractor is paid the actual cost of the work, plus an agreed percentage of the actual or allowable cost to cover overheads, profit, etc. It is useful in an emergency, when there is insufficient time available to prepare a detailed scheme before work is begun, but it will be apparent that an unscrupulous contractor could increase his profit by delaying the completion of the works. No incentive exists for the contractor to complete the works as quickly as possible or to try to reduce costs.

### **(5) Cost Plus Fixed Fee Contract**

In this form of contract, the contractor is paid the actual cost of the work plus a fixed lump sum, which has been previously agreed upon and which does not fluctuate with the cost of the job. It is not a particularly good form of contract, although it is superior to the cost plus percentage type contract, as there is some incentive to the contractor to complete the job as speedily as possible and so release his resources for other work.

### **(6) Cost Plus Fluctuating Fee Contract**

In this type of contract the contractor is paid the actual cost of the work plus a fee, with the amount of the fee being determined by reference to the allowable cost of the work on some form of sliding scale. Thus the lower the actual cost of the works, the greater will be the fee that the contractor receives. An incentive thus exists for the contractor to carry out the work as quickly and cheaply as possible, and it constitutes the best of the 'cost plus' or 'cost reimbursement' type of contract, from the employer's viewpoint.

### **(7) Target Contract**

In a target contract a basic fee is quoted as a percentage of an agreed target estimate obtained from a priced bill of quantities. The target estimate may be adjusted for variations in quantity and design and

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fluctuations in labour and material costs, etc. The actual fee paid to the contractor is determined by increasing or reducing the basic fee by an agreed percentage of the saving or excess between the actual cost and the adjusted target estimate. Thus there is a definite incentive to the contractor to complete the work as speedily and economically as possible, but it involves a considerable amount of contract document preparation, including a bill of quantities.

### (8) All-in Contract

With this type of contract the employer gives his requirements in broad outline to the contractor, who submits full details of design, construction and cost for the project. It is suitable in a few special cases, such as gas and chemical works, oil-refineries and nuclear power stations, but it is unlikely to be suitable for the majority of civil engineering contracts (5).

This type of contract is often referred to as a 'package deal'.

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