

CHAPTER TWO

Purpose and Arrangement of and Sources of Information for Specifications

THIS chapter is concerned with the functions of the specification, its general arrangement and the sources from which information needed in its compilation can be obtained.

FUNCTIONS OF SPECIFICATION

The specification is a very important contract document on a civil engineering contract, whereas on building jobs it is frequently dispensed with and its place is then taken by lengthy preamble clauses in the bill of quantities. A civil engineering specification is read in conjunction with drawings and a bill of quantities to supply the contractor with all the information he needs to submit a tender and execute the works.

The main function of the specification is to describe fully the workmanship and materials required to carry out the contract. It forms, in fact, a schedule of instructions to the contractor and will, to a large extent, determine the quality of the executed job.

On a civil engineering job, the descriptions of items contained in the bill of quantities are kept as brief as possible, with frequent references to specification clauses. This procedure avoids the duplication of much descriptive information, as full descriptions appear in a single document: the specification. During the execution of the contract, the existence of a comprehensive specification is of great value to the contractor, although at the tendering stage the contractor is obliged to make frequent reference to both documents, which slows down the job of pricing the bill of quantities.

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In addition to supplying detailed information on the work to be executed and the nature and quality of materials and workmanship, the specification also contains details of any special responsibilities of the contractor which are not covered by the conditions of contract. The specification clauses covering special responsibilities are often termed 'general clauses' as they are not confined to any particular section of work, but relate to the job as a whole. 'General clauses' will be described in some detail in the next chapter.

The specification should, as far as possible, amplify but not repeat and certainly never contradict the information detailed on the contract drawings and given in the bill of quantities and conditions of contract. When the various documents are taken together they should leave no doubt as to the character and extent of the contract works. The specification is a lengthy and complex document and requires considerable skill and wide technical knowledge in its preparation.

GENERAL ARRANGEMENT OF SPECIFICATIONS

Most civil engineering specifications start with 'general clauses' which relate to the job as a whole, and include the special responsibilities of the contractor which are not covered in the conditions of contract. The general clauses are followed by materials and work clauses which are related to the various sections of work making up the job. The latter type of clause is sometimes referred to as a 'special clause'.

The sequence of the materials and work clauses will follow one of two patterns.

- (a) Materials clauses are entered first, followed by work clauses in each section (earthwork, concrete work, etc.)
- (b) All materials clauses are written first followed by works clauses sub-divided on a sectional basis.

All specification clauses are generally numbered for ease of reference, the reference numbers usually running consecutively throughout the whole of the specification. Each clause is normally provided with a suitable heading, although a clause should be complete in itself without including the heading. Sub-headings act as useful signposts to the contractor. It is advisable to begin each section of a specification on a fresh page, to assist in breaking up the document and making it more readable.

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DRAFTING OF SPECIFICATION CLAUSES

(1) Material Descriptions

Considerable care must be exercised in the drafting of a specification, to prepare clauses which are concise, complete and free from ambiguity. For instance, when drafting materials clauses it is advisable to adopt some pre-arranged order of grouping the particulars, to avoid missing an important detail. The following build-up of a specification description for bricks will serve to illustrate this approach.

Particulars required	Actual description
Material	Bricks
Type	Southwater red No. 2 engineering bricks
Name of manufacturer or source of supply	Messrs. X of Y.
Prime cost	420/- per thousand, delivered to the site.
Desirable characteristics	Well burnt, of uniform shape, size and colour, and sound and hard.
Undesirable characteristics	Free from cracks, stones, lime and other deleterious substances.
Tests	Minimum compressive strength of 48.3 MN/m ² (7000 lbf/in. ²) Maximum water absorption of 7 per cent by weight.

Note: Reference to the appropriate British Standard will reduce considerably the amount of information to be given.

The following alternative methods of describing materials, or possibly a combination of them, can be used in a specification.

- (a) A full description of the material or component is given with details of desirable and undesirable characteristics and appropriate test requirements.
- (b) Relevant British Standard reference, together with details of class or type where required is given. The contractor can then refer to the British Standard for fuller information.
- (c) Name of manufacturer, proprietary brand or source of supply is

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stated and the contractor can obtain further particulars from the manufacturer or supplier.

- (d) A brief description of the material is given together with the prime cost for supply and delivery of a certain quantity of the material to the site.

Typical quantities are: a thousand bricks, a thousand kilogrammes (ton) of tarmacadam or a cubic metre (yard) of sand, and these normally represent the units by which the materials are sold.

This latter method ensures that all contractors are tendering on the same basis, without the need to obtain quotations from manufacturers or suppliers. It also permits the employer to defer the actual choice of material to a later date if he so wishes.

(2) Avoidance of Unsatisfactory Descriptions

In practice, use is made of a number of wide and embracing terms which are not sufficiently precise in their meaning and can be interpreted in different ways. This leads to inconsistencies in pricing with consequent undesirable effects. Some examples of undesirable terms are now given.

- (a) The word 'best' is widely used in specifications, where best quality materials or workmanship are obviously not required. If this term is frequently and loosely applied throughout the specification, without any real consideration as to its true intent and meaning, then the contractor will be tempted to disregard it. It is important to prevent this happening by using the term only when materials or workmanship of the highest quality are required. Materials are frequently produced in a number of grades and it is essential that a clear indication should be given of the particular grade required. For instance, it would be pointless to specify best quality glazed vitrified clay pipes when British Standard pipes were really required.
- (b) The word 'proper' is also frequently misapplied, particularly in descriptions of constructional methods. As a general rule it is far more satisfactory to include full instructions in the specification, and so leave the contractor in no doubt as to the actual requirements of the job. With minor items of work a comprehensive description of the method of construction may not be essential and in these circumstances the use of the word 'proper' may be acceptable.
- (c) The term 'or other approved' usually represents an undesirable feature in any specification, as it introduces an element of uncertainty. The contractor cannot be sure whether the materials or components

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which he has in mind will subsequently prove acceptable to the engineer. All specification requirements should be clear and certain in their meaning and be entirely free from doubt or ambiguity.

- (d) The term 'as specified' is used widely sometimes without specifying anything.

(3) Workmanship Clauses

Specification clauses covering constructional work and workmanship requirements, are generally drafted in the imperative, e.g. 'Lay manhole bases in concrete, class B, 225 mm (9 in.) thick', or alternatively 'The contractor shall lay, etc.'. All workmanship clauses should give a clear and concise description of the character and extent of the work involved.

The sequence of clauses within a section will normally follow the order of constructional operations on the site. This procedure reduces the possibility of omission of items from the specification and assists the contractor in working to its requirements on the site.

It is essential that the specification clauses should be kept as concise and straightforward as possible, with an absence of unreasonable requirements. Lengthy, involved clauses tend to confuse the contractor and may well result in higher prices. The specification writer must have a sound knowledge of the type of construction which he is specifying and know exactly how it will be executed, in order to be able to draft a specification which is entirely satisfactory in all respects. He must also avoid specifying standards of work and quality of materials which are completely out of keeping with the class of work involved.

The specification is a highly technical document and is drafted in technical language with the free use of recognised civil engineering terms. In this respect, it differs appreciably from a report prepared for an employer which should be kept as free from technical terms as possible.

SOURCES OF INFORMATION

Information for use in civil engineering specifications can be obtained from a variety of sources. The principal sources of information are now described.

(1) Previous Specifications

In the majority of cases specifications for past jobs are used as a basis in the preparation of a new specification for a job of similar type.

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This procedure expedites the task of specification writing considerably, but care must be taken to bring the specification clauses up-to-date by the incorporation of the latest developments and techniques. It is also necessary to be constantly on the alert for any changes of specification needed to cope with differences of design, construction or site conditions in the current job. Care must be taken to omit details which are not applicable and to insert information on additional features.

(2) Contract Drawings

The draft contract drawings will be prepared in advance of the specification, and these will show the character and extent of the works. The specification writer will extract a considerable amount of information from the drawings and will work systematically through them when compiling the specification.

(3) Employer's Requirements

The employer or promoter often lays down certain requirements in connection with the job and these will probably need to be incorporated in the specification. Typical requirements of this kind are programming of the works so as to provide for completion of certain sections at specified dates and the taking of various precautions so as to cause the minimum interference with productive processes in the employer's existing premises.

It is essential that requirements of this kind are brought to the notice of the contractor, as they may quite easily result in increased costs.

(4) Site Investigations

Some of the information inserted in a specification will arise from site investigations, such as information on soil conditions and water-table level and the extent of site clearance work. The contractor should be supplied with the fullest information available, to reduce to a minimum the risks that he must take and the number of uncertain factors for which he must make allowance in his tender.

(5) British Standards

Frequent references are made in civil engineering specifications to British Standards relating to materials and components. This practice permits a considerable reduction in the length of clauses relating to materials and components and ensures a good standard of product. It

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also helps the contractor, as he no longer has to read through lengthy descriptive clauses with wide variations from one contract to another.

(6) Codes of Practice

Reference can also be made in specifications to codes of practice in some instances. This practice ensures a good standard of construction and workmanship without the need for lengthy specification clauses.

(7) Trade Catalogues

Where proprietary articles are being specified for use on a job, reference will be made to the manufacturers' catalogues for the extraction of the necessary particulars for inclusion in the specification. It is often necessary to quote the catalogue reference when an article is produced to a number of different patterns.

This procedure will also reduce the length of specification clauses and will ensure the use of a specific article with which the engineer is familiar and in which he has every confidence. Some public bodies object to this practice as it restricts the contractor's freedom of choice and in some cases prevents the use of local products. Furthermore, it may prevent the contractor from using his regular sources of supply and may thus result in higher prices.

BRITISH STANDARDS

British Standards are prepared by the British Standards Institution, which is the approved body for the preparation and promulgation of national standards covering methods of test; terms, definitions and symbols; standards of quality, of performance or of dimensions; preferred ranges and codes of practice.

The institution has a general council which controls five divisional councils concerned with building, chemicals, engineering, textiles and codes of practice. Over seventy industrial standards committees, each representing a major section of industry, are responsible to the divisional councils. These committees are largely concerned with developing industrial standardisation, as they decide the subject-matter of new standards and their scope and extent, and approve the draft standards which are prepared by various technical committees. The technical committees comprise experts on the subject-matter of each standard and consist of representatives of the users, producers, researchers and other interests.

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The enormous scope of the British Standards Institution can be appreciated when it is realised that there are over 3000 operative British Standards. These are kept constantly under review in order that they may be up-to-date and abreast of progress. They have proved to be an efficient means of making the results of research available to industry in a practical form.

British Standards prescribe the recognised standards of quality for a wide range of materials and components, and also define the dimensions and tests to which they must conform. The coverage of British Standards is so extensive that almost every specification contains numerous references to British Standards. Appendix II, at the end of this book, contains a schedule of the principal British Standards relating to civil engineering materials and components.

British Standards are of great value in the drafting of specifications, as they reduce considerably the amount of descriptive work required, and yet at the same time ensure the use of a first-class product. The standards are prepared by committees, each of which is made up of experts in the particular field covered by the standard. Each standard does therefore incorporate the most searching requirements that the latest stage of technical development and knowledge can produce.

The contractor, who will encounter British Standards quite frequently, will possess a reasonable knowledge of their contents and will be freed from the necessity to examine carefully lengthy specification clauses relating to materials and components, in case they introduce some unusual requirement which will affect the price. The use of British Standards in this way materially assists in establishing a uniform basis for tendering, as each contractor is pricing for exactly the same articles.

The specification writer must, however, possess a good knowledge of the scope and contents of any particular standard, prior to making reference to it in a specification. Where different grades or classes of a material or component are given in a British Standard, then the particular grade or class of product required must be indicated in the specification. In practice, one frequently finds references to British Standards in this category without any class or grade being mentioned. Similarly, the specifying of first, second or best quality glazed vitrified clay pipes conforming to B.S. 65:1963 is entirely unsatisfactory, as the only three classes of pipe recognised by this standard are 'British Standard', 'British Standard Tested' and 'British Standard Extra'. The latter class of pipe can withstand increased loadings.

The British Standards mark (popularly referred to as the 'kite' mark) is a registered certification trade mark owned by the British Standards Institution, which may by licence permit manufacturers to use the mark

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on their products, after they have agreed to follow a routine of inspection, sampling and testing appropriate to the particular product. The mark is thus an independent assurance to the purchaser that the products are produced and tested in accordance with the requirements of the relevant British Standard and its associated certification scheme.

The British Standards Institution opened a testing and inspection centre at Hemel Hempstead New Town in 1959, and this has since been progressively extended. The functions performed by this centre can be broken down into three main categories.

- (a) To control the factory inspections and laboratory testing in connection with the B.S.I. certification marking scheme.
- (b) To undertake testing commissions from individual firms and organisations relating to overseas as well as British Standards.
- (c) To produce individual schemes of approval to serve the needs of particular industries.

In addition to the publication of British Standards and Codes of Practice, the British Standards Institution issues a British Standards Yearbook, an Annual Report and B.S.I. News. The Yearbook is particularly useful as it contains brief summaries of all operative British Standards and Codes of Practice. Complete sets of British Standards are maintained for reference in a large number of public libraries, universities and technical colleges throughout the United Kingdom.

CODES OF PRACTICE

Codes of Practice are issued by the British Standards Institution and represent a standard of good practice. The principal codes of practice relating to civil engineering work are listed in Appendix I. Codes of Practice cover design, construction and maintenance aspects, are extremely comprehensive in their scope, and are well illustrated. As their contents become more widely known and recognised they should secure improved standards of work within their respective fields of operation.

For instance, Code of Practice CP 2003: Earthworks deals with earthworks ancillary to other civil engineering work, but excludes consideration of tunnels and such works as dams, dykes, canals, dredging and river-training works. The first part of the Code describes methods of carrying out projects for cuttings and bulk excavation in the open and for the construction of embankments on areas of fill in road, railway

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and airfield construction. The second part covers trenches, pits and shafts, and deals with methods of excavating these in various types of ground and of forming temporary supports to the sides. The Code is intended to form a guide to engineers in the design and execution of works, but it is not intended that it should be used as a standard specification.

As a further illustration of the scope of codes of practice, CP 301: Building Drainage sets out recommendations for the design, layout and construction of foul and surface water drains and sewers not exceeding 300 mm (12 in.) in diameter (together with all ancillary works such as connections, manholes, inspection chambers, etc.), used from the building to the connection to a public sewer or to a treatment works, soak-away or watercourse. It deals with methods of excavation, keeping the work free from water, timbering and supporting, filling and consolidation and surface reinstatement.