Denmark—its Building Industry and Practice

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Denmark, the home of SfB, is a small but prosperous country with a moderate rate of growth. It is a "brick" house country, using mainly low rise construction because land is plentiful. The architects are principally responsible for the design and technical accounting, but the work is undertaken under their supervision by technicians. Most building products are imported

This article completes a "trilogy" on Scandinavia contributed to the journal by Ted Skoyles and follows articles on Sweden (Volume 34 page 44) and Norway (Volume 32 page 141).

The country and its building market

Denmark is one of the smaller countries in the EEC, only having a population of about 5,000,000, and covering an area of 43,000 sq. km. But, it is one of the most affluent countries in the market with the highest output per head of population and the country has a moderate rate of population increase. Denmark belongs to the Nordic Building Conference – the joint committee of the national building authorities – the other members being Finland, Iceland, Norway and Sweden. This gives Denmark close relationships with the other Scandinavian countries in the field of building.

Ownership of the land is primarily private, although a few municipalities are considerable land owners. The house market is roughly equally divided between the public and private sectors. Much of the public sector is, however, socially supported housing, mainly local authority aided housing associations. Likewise in the private sector, work sponsored by housing associations having a non-profit making basis predominates. The projects are often sponsored by Unions or "co-operatives".

The public building sector is used to aid the seasonal unemployment. Since circa 1960 repair and maintenance work in this sector has been allowed only during the period from 1st October to 1st May. Special measures too are enforced to overcome the problems of winter building. The building and civil engineering output is divided equally between the public and private sectors.

Housing is about 33% of all fixed capital investment and other construction 35%. The remainder is spent on the maintenance of existing buildings.

Denmark is a "brick house" country, but the use of bricks (per dwelling house) is the lowest in the EEC – a rather striking point in view of the fact that no more timber than the average is required and very little cement, – 5.7 tons against an average of all other countries of 8.72 tons per house. The average area per dwelling is, however, 114 m^2 (to be compared to an EEC average of 84 m^2). Concrete and brick are the country's basic construction materials for most structural purposes, and abundant supplies of cement and aggregates exist.

Denmark is a country in which high quality building is appreciated and maintained. Many materials are imported. Iron and steel are coming mainly from West Germany, fittings usually come from Sweden and timber products from other countries in Scandinavia. No quality control over their manufacture is possible, or given on entry to the country. In many cases, but not always, they are examined and tested by the national testing establishment (Statsproveanstalten).

Control of the industry

The agency responsible for government policy in the building industry is the Ministry of Housing. Responsibility for public building is allocated to the other Ministries concerned for which they are "clients". Public and private investment in new building is co-ordinated at government level too.

Official approval of materials and methods of construction is undertaken at these levels:

(a) General approval from the Ministry of Housing. This is given for manufacturers' goods and materials also to new methods of construction which require approval by the Building Regulations Authorities.

(b) Approval by the local (Kommune) authority. All products, materials and methods of construction must be approved by the local authorities in accordance with the Building Regulations and local Bye Laws but this approval is valid for the proposed construction only. No general approval is given, except for products etc., which have approval from the Ministry of Housing and have their Approval Certificate. Until comparitively re-recently building regulations were not uniform and varied throughout the country but since 1961 this field has changed when the same building regulations were brought in for all the municipalities. Denmark now has its own Regulations Committee, (Nordiska Kommitten for Byggnadsbestammelser NKB).

Building Standards

Denmark now has the national building laws which empower a central authority to make regulations and local authorities to administer them and issue building permits. Only the Kommune of Copenhagen, has its own building laws. These concern not only safety and public health, but also performance and higher building standards. The regulations make extensive use of norms e.g., the norms for structural thermal insulation etc.

Building Control

There are two forms of building control:

Site and Production:

(a) Site control. The essential point is that the responsibility for site control must be accepted by one person, named to the local authority. This can be the owner, the architect, the contractor etc. This person is responsible for ensuring that the building is constructed in accordance with the drawings, specifications. regulations etc., and includes ensuring that the prescribed tests are done and works inspected. The building Inspector ensures that the building is in accordance with the Building Regulations.

(b) Production control is concerned with the quality of the products that cannot be checked on site, e.g., prefabricated materials. This inspection consists of checks carried out by the manufacturers and by an independent organisation.

The Design Team

Architects (Arkitets), undertake four years training to take a degree but there is an alternative method of qualification taking five years, in part time courses at Polytechnics. Architects have a professional code of conduct with their own fee scales and their professional society is the Danish Association of Architects (DAL), which has a membership of 2,000, including people overseas.

Architects undertake the complete design service, including the initial design and preparing working drawings, but do not usually supervise the work. For this task a co-ordinator is employed.

Recently a system has evolved to include an experienced manager (konductor) to co-ordinate all the parties from inception of the project. This has led to the formation of a number of new firms offering services within the field of management, such as preparations of the design, brief, technical accounting (like quantity surveying), network planning etc., and the complete design documentation (Totalprojektering) being prepared before construction is commenced. This procedure helps to keep variations to a very low incidence and hence is of great importance for the successful execution of a project by the removal of any of the disruptions to production these changes cause. However, this advantage only applies when the same consultant is responsible for preparation of the brief, design and management during the post tender period. Frequently these functions are shared by several firms and variations occur on the usual scale.

It has been found in Danish practice that complete documentation is necessary, both because the designer, owing to new methods, frequently cannot refer contractors to traditional procedures, and because the project documents form the basis for the preparation of time schedules and accurate cost estimates. Through the efforts of a co-ordination agency (SfB) (Samarbetskomnitten for Byggnadasfrager), set up in 1947, Denmark has been a leader in methods to effectively co-ordinate the work for the building team and its processes. The builder frequently produces working drawings necessary to execute the works for his trade and submits them for approval via the building co-ordinator.

Civil Engineering

Civil engineers are all graduates with a science degree at the technological universities. The Danish Association of Engineers (DIF), is the strongest professional engineers' association in Scandinavia.

Technical Accounting

No independent professional, practising solely as a building economist exists in Denmark. The architect is responsible for the building economics function but due to his lack of time and inadequate training – like the remainder of European designers, devotes less than 2% – 3% of his studies to this subject, and the work is delegated to technicians, the building cost adviser (BCA) The BCA also usually works for builders.

The principal tender documents comprise drawings, form of agreement and tender, general conditions of contract and the comprehensive specification. They are similar to those required in Scotland pre circa 1960.

The "bills of quantities" are prepared by the BCA and are used as a specification of work to be undertaken and not solely measures of labour and materials. Bills are not always part of a contract and are prepared for each trade, the contractor when a sub-trader or supplier only receives the part of the bills connected with his own section of work. For housing work the projects are usually smaller and undertaken by architectural assistants working in the designers' office.

The bills are generally prepared according to the SfB System and in many cases with the aid of computers. The whole principal of training for quantities and building costs is related to the SfB System too. Thus although bills of quantities are not officially recognised they are closely related in the planning and management of the work.

The document contains all the necessary information to elucidate the extent of the contract and materials required. It is divided up into items to allow detailed estimating related to the physical measurement of work related to units of finished work. Variations are not so common as in the United Kingdom but when alterations are unavoidable the bills serve as a basis for the settlement of the monies involved.

Descriptions are much briefer than in the UK bills of quantities, because they are related to standards. There are many standard schedules of prices produced by trade associations similar to the Ackord System (used in Sweden). Due to the documentation considering the materials required, Danish estimators appear to have a clearer idea regarding waste of materials than in other EEC countries, except the United Kingdom.

A minor difference from United Kingdom practice is that the traditional bills of quantities are part of the specification. Moreover, many lump sums are used and not all the bills require "measured rates" to be inserted. Together, the specification and bills of quantities form a document which begins with the chapters giving descriptions of the work and the preliminary items, followed by the trades. Each trade is then presented as a chapter, starting with a more general text which gradually becomes more specific until particular items are specified. When quantities are stated they are given as supplementary information.

Hence with inadequate detail in the documents sent out for tendering, the building cost adviser often has to prepare more detailed quantities to meet the data base requirements of the sub-trader level Ackord system.

Post tender technical accounting, certification and payment

There is no great difficulty in obtaining payment by builders in view of the arrangement made with the banks. The money is paid into a bank after "certification", hence, there are no problems of cash flow and distributing the monies to the various trades. The principle of interim valuation is of paying monies relating to the building programme in lieu of the work done.

Some of the larger contractors are reluctant to accept bills of quantities because they prefer design/build

solutions, but bills for service installations, ventilating and heating are used very widely by these larger firms.

Final Accounts

The trade contractor produces the final account using the services of the building cost adviser on his staff. These are usually small documents in size due to the general Danish attitude to pre planning and giving attention to detail before the contractor estimates for the job; aided by use of standard descriptions, and most important of all, the absence of major variations.

Final accounts are prepared for the contractors by their own building cost advisers.

Forms of Contracting

The majority of work is let by competitive tender on a lump sum basis. Negotiated contracts are used but are not so common as in the rest of the Common Market.

Contractual Procedures

The official general conditions of contract (Almindelige Betingelser fur Arbejder ug Leveraneer), used by the public sector is in principle very similar to the UK, JCT, form of contract. However, this document contains no reference to bills of quantities as contract documents, mainly because the Ministry of Housing is still reluctant to recognise bills as standard documents for competitive tendering.

However, rules for contracts published by the Handvaeksradt (Federations of Trades), includes bills of quantities as a contract document.

In accordance with Boorgmisteiet Cirkulcere, 21st June 1968, all public and privately financed building has to be according to a fixed price and time. (The fixed price is not changed from the signing of the contract to handing over the finished product). The need for this type of documentation has been stressed continuously in Denmark over many years.

All government financed and state subsidised building contracts are let on a firm fixed price basis.

Private contracts are also fixed price although there are break clauses which imply there should be no change in price from date of acceptance.

Open and restricted adjudication are used for all contracts.

A few years ago contractors used to submit details of their proposed tenders to trade organisations for checking and approval. Thus, a tender could be vetoed which was considered as too low and this often led to a form of private arbitration among contractors by themselves. This procedure is now prohibited by law and these "adjustment tenders" (like Opjet in Holland) are not allowed. However, meetings similar to the former activities of the UK "Builders Conference" frequently take place, but the one difference is the building owner must be invited and it is prohibited for prices to be discussed.

The Construction Industry

The construction industry is principally organised on the separate-trades system. There are a few large firms in the industry (like the rest of Scandinavia with the exception of Finland). The large firms are mainly system builders manufacturing their own components.

The building industry is structured in two ways:

1. Into specialised firms or establishments with each firm carrying out only part of the actual building process (this division of work accounts for the lack of integration of the building process).
2. Small firms, each part of the specialised group of the building industry – forming group enterprises. These, however, are on a small scale and reflect the lack of any major trend for "general contracting" Specialist consultants are active in preparing bills of quantities for competitive tendering; they also offer cost advice and sometimes management services. Danish building firms are skilled in the use of prefabrication techniques which are usually employed for flats, schools, commercial and industrial premises. A major factor in stimulating the market for prefabrication is the adoption of a national and legally enforceable system of modular co-ordination.

Fixed time planning

The fixed time planning used in Denmark is worthy of special note as it means that contractors are subject to sanctions and should keep the time limits fixed for the performance of their contract.

Time Planning attempts to achieve to a high degree the planning in all phases of the contract, from the brief stage over the design stage, to the final time schedule which must be in existence at the time of final documentations.

The fixed time and fixed price contracts stemmed from a report which postulated their principle in the year 1968 (By The Federation of Consulting Engineers) (FRI), together with the Federation of Practising Architects (PAR)

The only regularly published information relating to building costs (price data) is in the form of an index published by Danmarks Statistik (Statistical Department) in its series "Statistiske Efterretninger". The index concentrates on the construction of dwellings and can be obtained from:

Danmarks Statistik Frederiksholms Kanal 27
DK – 1220 Copenhagen K

No information on actual building production costs is available but the Danish Contractors Association has, however, a limited amount of labour production data in the form of labour outputs for operations.

Taxation

Foreign companies and branches are liable to national income tax payable on net profits made in Denmark. Foreign companies that own real estate are taxed on the income derived from it and are subject to a property tax. There is also withholding tax on dividends.

Developments in Building Practice

Denmark still has very strong craft organisations, and the craftsman enjoys the status which is only granted after recognised training qualifications are obtained and also helps to explain the large extent of trade contracts.

The Danish Building Research Institute has voiced opinions and pointed to the shortcomings of traditional tendering procedures and "the gap between design and production". They have seen a number of shortcomings of untraditional procedures, but have tried to analyse the advantages and disadvantages of the various principles.

This philosophy has been stated by this Institute and the UK BRE, too.

However, the Danes seem to have equally little success in applying this work. As already noted the country has no formal feedback for labour or waste of materials, and design remains isolated from production.

Considerable interest is still shown in Denmark in SfB, where it was devised, together with computer systems and other forms of data co-ordination. The extent of their usage in practice, however, is apparently limited to only a small sector of the building market.

Moreover, the trend to packaged deals can be seen as the upshot of the decline in trade contracts developing between competitive tendering and design and build by the general contractor.

Interest of The United Kingdom in the Danish Industry

At present no quantity surveyors are known to practise in Denmark. While its market could attract the UK suppliers for good quality building components it is unlikely because of its size to offer opportunities for the technical accountant.

While Denmark may seem attractive for contractors, its market offers no opportunities comparable with other European growth countries. Language is not such a problem because many Danes learn English in school and about 38% are fluent in speaking and writing it - compared to 10% Danes being able to communicate in French and 38% of them in German.

It is an interesting market and much can be learnt from its study; in particular, the Danish use of abbreviated bills of quantities and fixed time contracts.

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Practice notes

JCT STANDARD FORM OF BUILDING CONTRACT

Clause 30(2) – Payment for on-site materials/goods

Retention of Title (Ownership) by Suppliers of Materials and Goods

The Joint Contracts Tribunal has been informed that omes Suppliers of building materials and goods are including provisions in their contracts of sale under which the Supplier retains ownership of such materials/goods after their delivery to site. The terms on which such retention of ownership is secured appear to vary but, in many cases, the passing of ownership to a Contractor or Sub-contractor is made dependent upon payment in full for the relevant materials/goods. It is understood that Suppliers anticipate being able to rely upon such provisions to enable them either to re-possess any materials/goods not paid for in full or to claim against the proceeds of any re-sale.

Consequently, some Employers (and their professional advisers) are seeking to obtain proof of ownership by the Contractor (or, through the Contractor, by any Sub-contractor) before operating the provisions of Clause 30(2). Moreover, in current tender documents some Employers are seeking to amend Clause 30(2) by making it a condition that the Contractor provides such proof of ownership.

Tribunal Decision not to amend Clause 30(2) and Clause 14(1)

The Tribunal has considered whether there is sufficient substance for the concern expressed by some Employers (and their professional advisers) to justify any change in the existing provisions of Clause 30(2) and 14(1) and, with the concurrence of its constituent bodies, does not think that any change is desirable. The main reasons for reaching this decision are as follows:

(1) A requirement on the Contractor to prove ownership of on-site materials and goods could raise serious legal problems for the Contractor, the relevant Sub-contractors, the Employer and his professional advisers. Such a requirement would, therefore, be difficult to meet and so might mean, in practice, that payment for on-site goods and materials would not be operated. Moreover, the obtaining of proof of ownership would add to administration costs as would the checking of such proof by, or on behalf of, the Employer. The Tribunal concluded that such a requirement would add to the costs of building work by reason of additional administration and might cause tender prices to rise because Contractors and Sub-contractors could no longer be certain that the value of materials and goods properly on site would be included in interim payment certificates.

(2) The degree of risk to the Employer from not obtaining proof of ownership before paying for on-site goods and materials in Interim Certificates was not considered sufficiently great to justify the possible additional costs referred to in (1) above for the following reasons:–

(a) The period of risk runs only until such time as the on-site goods and materials are incorporated in the Works; from the time of incorporation they cease to be chattels and any right to re-possess by a Supplier would be lost. This is unlikely to be more than a relatively short period.

(b) During the limited period referred to in (a), the risk of re-possession by a Supplier would only arise, in practice, if a main Contractor became insolvent. Such insolvency occurs only in a small proportion of the total number of building contracts and this reduces the degree of risk even further.

(c) The Tribunal understands that in many cases the supply contract permits the Contractor or Sub-contractor to re-sell the goods and materials. In such cases the Supplier's rights are against the proceeds of re-sale and the Supplier has no right to re-possess the goods and materials. This reduces the risk to the Employer still further.