

## Construction/90 - development project for conceptual classification

The aim of this development project is to continue the tradition of the national classification systems on the construction branch by introducing a new conceptual classification - *Construction/90* - which is an offspring of the previous classifications: *Building-70* and *Building-80*. The first phase of the development work was finished in May 1988. It creates the theoretical basis for the design of the detailed classification system which will be operative from 1990.

The structure of the classification consists of three facets. Any of the facets is to be able to cover all the costs involved independently, in order to make an economical control possible from different points of view. Thus every facet totally covers its own particular point of view, giving a complete list of the conceptual items. Being a conceptual classification, the emphasis lies on the concepts, which in practical use are substituted by selected terms. It may as such be called a nomenclature, too. For computer use, however, there will be an alphanumeric characteristic for every item as well.

Every facet has its principal use. The facets and their users are:

- Product facet*, describes the product structure (elements of building) of the project. Principal user: the designer.
- Resource facet*, describes the resource structure (commodities, labour, subcontracts, site machinery) of the project. Principal user: contractor's purchasing.
- Production facet*, describes the operations structure of the project. Principal user: the site management.

The *Construction/90* classification covers all construction work, i.e. architectural, civil engineering and mechanical works. It also covers all phases of construction from preliminary and technical design to contracting and maintenance. It has been designed to meet the needs of the object oriented computer aided production.

Keywords: classification, nomenclature, design, acquisition of resources, production, construction economy





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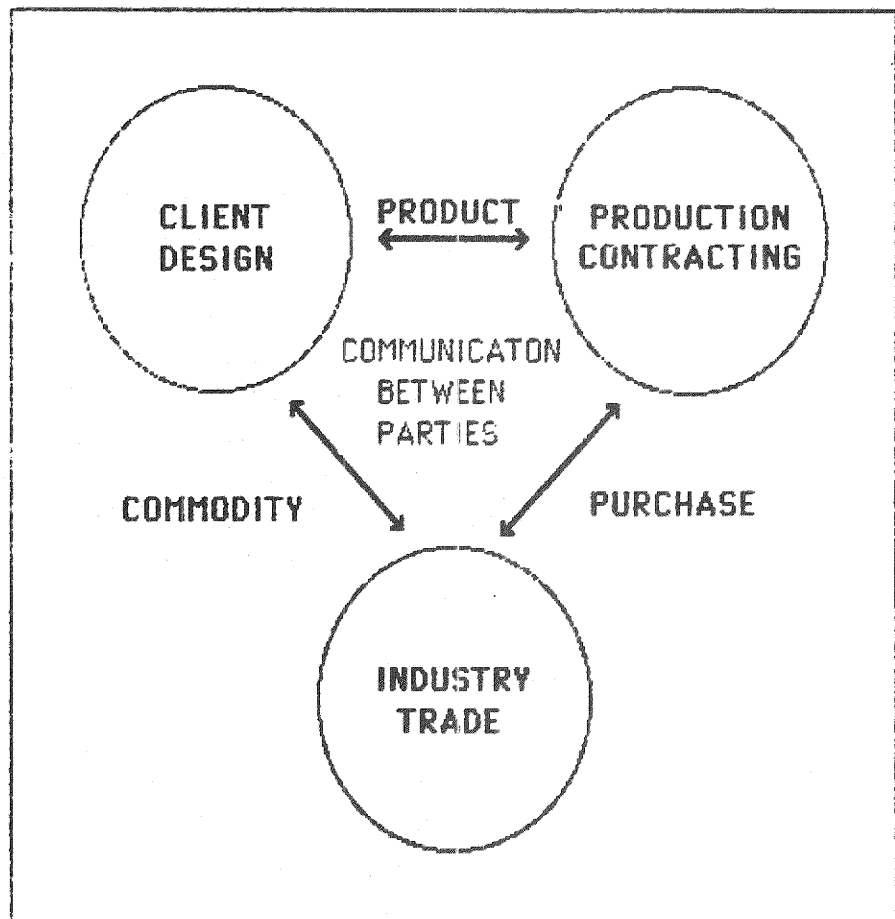
In Finland from the early 70's the construction industry has applied a series of classification systems, developed and issued by a joint organisation of public builders and contractors. The latest version in the series - *Building-80* - was introduced 1981, and it has been elaborated by further additions until 1988. Although we can say that the *Building-80* in its present form covers all the important areas of the building industry, e.g. earthwork, building construction, electrical installation, and heating, plumbing and air conditioning works, there are still shortages and omissions in the system. The principal point of view of *Building-80* is cost calculation, whereas the other aspects of building are only applications of the basic framework.

In 1987 the Building Information Institute and Mec-Rastor, a consulting company, were commissioned by *Building-80 Group* to study and create the basic principles of a new conceptual classification system, which would meet the requirements and needs of the 90's. The aim of the study was to define a classification framework, which could then serve as the criteria for the final creation of the classification tables. The result of the study was presented to the *Building-80 Group* at the end of June. If the proposed specifications for the new system will be accepted this autumn, the work for the classification tables can be started from January 1989 and the system as a tool for the industry will be operative from 1990.

### *The principles of Construction/90*

The aim of the research task was to create a theoretical framework for a conceptual classification system, based on the *Building-80* system at present in use, and applicable to the new design and production processes, which will be in extensive use in 90's. The new system should also link the different interests of building construction into one working entity, functioning as a means of communication during the whole life-span of a building, from preliminary feasibility studies, through the design and the production stages, to the maintenance stage of the erected building.

The principal communication interests between the parties of the construction process were defined as shown in the figure below. The communication between client and contractor concerns the definition of the end product, the building. The main emphasis between designers and manufacturers of goods is on commodities which are available and will be used for the building. Purchasing of commodities, labour and subcontracting are the emphasis between the contractor, and the trade of goods and services.



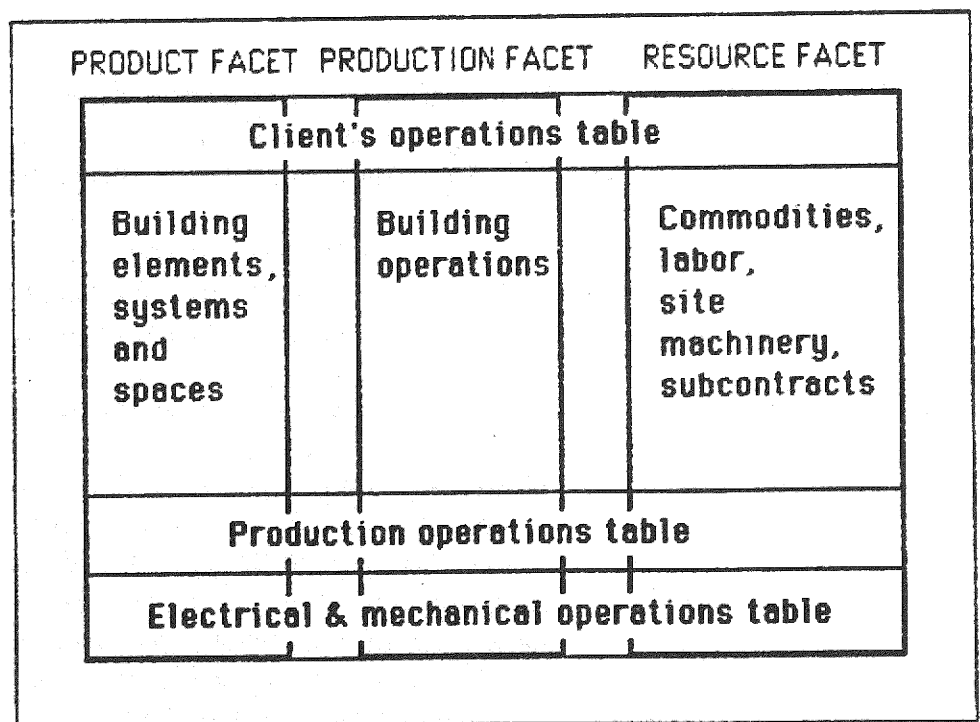
*Fig 1. The principal parties of a construction process and the communication between them.*

A set of principles were already given in the brief. They were refined during the research process and are as follows.

- The new classification should be used in all communications between the parties of a building project. Its structure shall be defined by its uses.
- It consists of several independent classification tables, with which its user will be able to describe the building project concerned totally, leaving no residue in terms of cost.
- Every classification table shall be intended for a defined set of users of the building project. It must be possible to keep every table updated independently.
- The classification shall in no way affect the organization of the project, the contents and the accuracy of the documents nor the contracting procedure and form.

*The solution*

The proposed *system solution* is illustrated in the figure below.



*Fig. 2. The structure of the principal facets and the transversal common tables of Construction/90.*

*Construction/90* classification system will consist of three principal facets which are:

- Product facet*, describes the product structure of the project, i.e. building elements, systems and spaces which are the result of product design.
- Resource facet*, describes the resource structure of the project, i.e. which commodities, labour, site machinery and subcontracting are needed to realize the design.
- Production facet* describes the operational structure of the project, i.e. which phases of work are needed to erect the designed building.

All the proposed facets (illustrated in the figure above as vertical columns) have a set of common transversal tables (illustrated as horizontal beams). These enable the user to describe the project without a residue, regardless of which one has been chosen as the point of view. These transversal tables are the *client's operations table*, the *production operations table* and the *electrical and mechanical operations table*. The last one may also be divided according to the three principal facets.

To enable the user to describe other design or production aspects than those covered by principal facets, there are some supplementary assortment aspects, too, which are:

- Assortment according to responsible parties,
- Assortment according to geometrical position,
- Assortment according to types of elements or operations,
- Assortment according to operative tasks.

These assortment aspects are dependent upon the nature of the project, and for them there will not be any general classification tables. Thus e.g. building or space classes, e.t.c. are identified and referred to in project documentation by their common names and, if necessary, by abbreviations of names, followed by successive numbering. For this purpose there are a number of conventions, too, specified by national standards.

The first phase of the development task did not include defined tables for the three proposed facets. The contents of the tables have although, been sketched, to test the general framework. These tests show that a majority of items can without changes be transferred from *Building-80* classification tables. This is self evident, because

the physical objects - building elements, products, labourer's skills e.t.c. - are a part of the existing construction procedures. The denominations used for items in tables, i.e. technical terms, will also be brought from previous versions into the new classification system to avoid confusion. For the headings of the basic tables, new names have been suggested to emphasize the new structure. Thus, the table of building elements and installation systems is called the *product facet*, and the table of commodities e.t.c. is called the *resource facet*.

The new information technology enables the use of headings for table items instead of alphanumeric coding. In some cases it will be useful to have a short coding system, too. The study doesn't yet propose any definitive coding (alphanumeric or other), but as soon as the contents of the classification tables have been finished, a suitable coding system will be created.

### *The use of the classification*

The structure of the classification system allows an overall description of the project regardless of the chosen facet. For instance an architect's description of the product structure (i.e. building specification) also involves the headings for the client's operations, production operations and the electrical and mechanical services. The product table opens thus a possibility to a cost control on general grounds during the entire process.

The product facet is intended for client's and designer's use. It may be applied to all documents which define the product structure, i.e. to all specifications. If needed, a subdivision of its headings by commodities and in certain cases, even workmanship, may be used. To avoid a complicated hierarchy of specification items a method of describing *product structure types* is recommended. A product structure type is a distinguishable order of specified commodities. It is used in the project and referred to in drawings and other documents by a project dependent alphanumeric sign. This method, and the extensive use of available quality standards and general specifications will significantly shorten the project specifications.

As the final product, the building or the construction work, is described by means of the product facet, it will automatically have a high status in communication between the product definition stage and production planning stage. The production facet, in turn, will be leading during the production stage. The material from product definition documents (drawings, specifications) is for this purpose sorted according to the production facet. By this means so called

*production lists* are drawn up. By them the project is viewed as production tasks, e.g. erection of 2nd floor prefab wall panels. When measured, priced, and scheduled they are called *production calculations*. They control the production.

The material from product definition documents and production lists or calculations may also be sorted according to resource facet. These *resource lists and calculations* will inherit the amounts of commodities, labour, subcontracting tasks or machines needed, as well as their installation dates from product definition documents and production lists and calculations. These lists are used in purchasing of the resources for erection of the contracted project.

The resource facet will also be used in public knowledge documents, as commodity catalogues and data files. The possibility to develop a common system for the building industry, manufacturers and trade of materials, was studied but rejected. Instead, interpretation from article numbering to commodities classification and vice versa will be easy to accomplish by means of data processing or even by manual tables.

#### *Changes to the current procedures*

When first employed, the new *Construction/90* system will affect all levels of building construction, because its structural principle differs from the one used now. The changes in practice will arise, however, from its principles and not from its details. Together with new working methods influenced by data processing, its usefulness is hoped to be proven.

On design level the new concept of *product structure types* shall be largely applied. In production, the changes are bigger, because *Construction/90* gives opportunities to control the production process simultaneously from different points of view. The most important change is caused by linking of documents from product definitions to production and resources calculations. The information in the latter documents is inherited from the former ones.

The use of *Construction/90* will cause a vast need for training throughout the construction industry. This has been seen to be worthwhile, regardless the cost. As a specific detail in this education, the status of a classification system must be understood. It is not a purpose but a means.