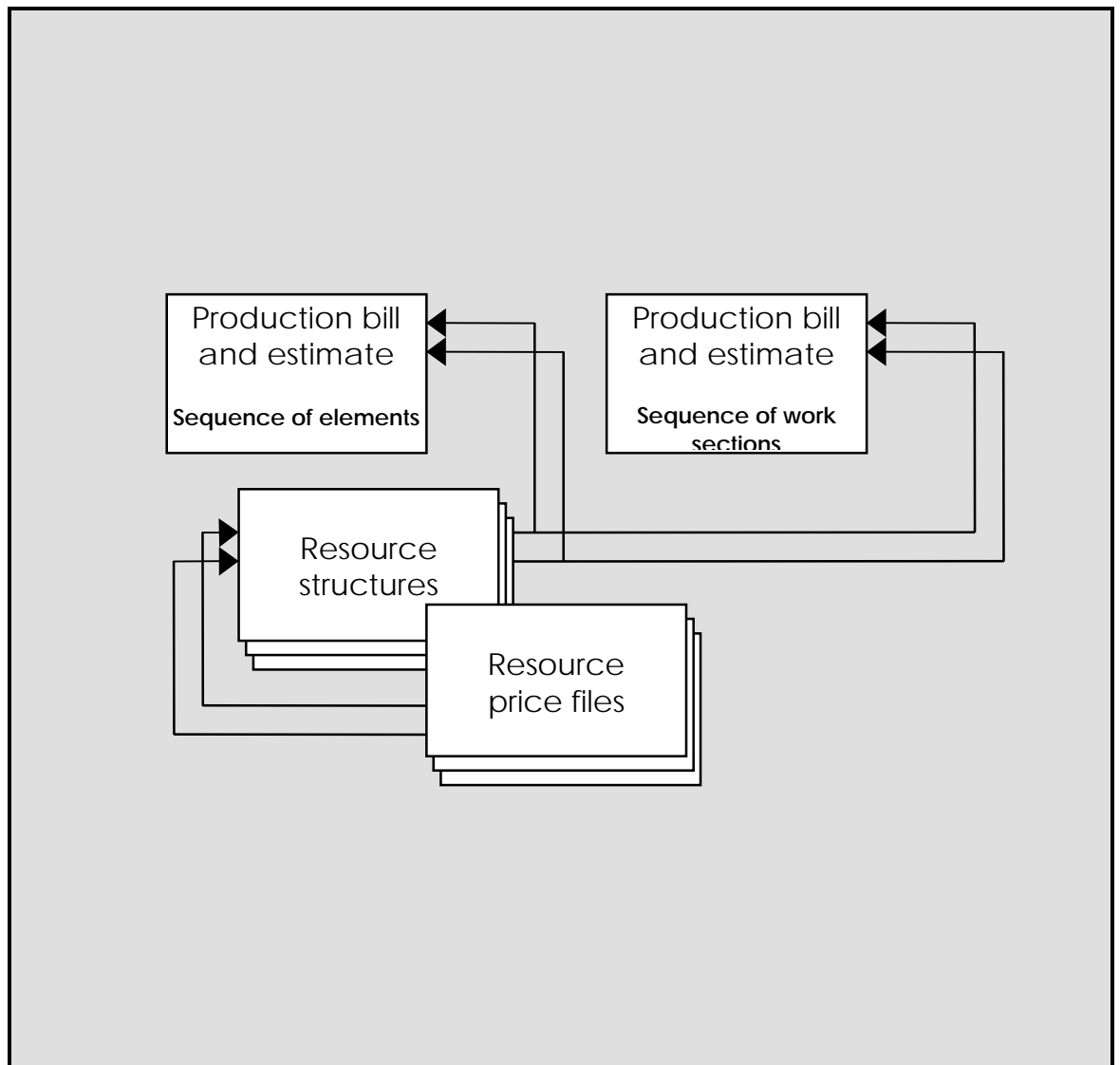


# Building 90

The Finnish building classification system



## Suomalaiselle lukijalle To the Finnish reader

**T**alo 90-yleisselosteen englanninkielinen laitos on toimitettu yleisselosteen pohjalta. Päähuomio on kiinnitetty nimikkeistöjen kääntämiseen ja *Talo 90 -järjestelmän* periaatteiden selostamiseen, jotta myös muita kansallisia ja mahdollisia kansainvälisiä menetelmiä käyttävät saisivat hyvän yleiskuvan suomalaisen nimikkeistön käyttötavoista ja ominaisuuksista.

Tekstiosa on muokattu kokonaan uudelleen kansainvälistä lukijakuntaa ajatellen. Sen lähdeaineistona on yleisseloste ja sitä kuvailevat kansainvälisissä eri yhteyksissä pidetyt esitelmät ja niitä tukevat muistiot. Tekstiosan täydennykseksi laaditut käyttöesimerkit (liitteet A...H) on laadittu kokonaan tätä julkaisua varten.

Nimikkeistöt on käännetty Talo 90 -yleisselosteesta ja ne ovat sen kanssa yhteensopivat. RYL 2000 -hankkeen yhteydessä tehdyt vähäiset nimiketarkistukset on sen vuoksi jätetty huomioon ottamatta. Sen sijaan lähdeteoksen ilmeiset painovirheet on korjattu. Tilanimikkeistö on kuitenkin vuonna 1998 valmistuneen jatkoselvityksen raportin mukainen, vaikka senkin periaatteet olivat jo yleisselosteessa.

Englanninkielistä versiota on sen eri vaiheissa käsitelty useissa Talo 90 päätoimikunnan ja työvaliokunnan kokouksissa.

Julkaisun tekstin ovat laatineet professori Juhani Kiiras ja yliarkkitehti Martti Tiula, joista jälkimmäinen on myös toimitannut kirjan julkaisukuntoon. Käyttöesimerkit on laatinut DI Sirpa Lamminluoto. Tekstin englanninkielisen tekstin on tarkistanut Mr. Eric Dachinger.

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## Preface

The Building 90 classification system has its origin in the early 1970's, when the construction industry started a development program aiming at more effective use of electronic data processing throughout the construction process. The system has been developed further during subsequent years so that a new version could be published every decade. The successive versions were known as *Talo 70*, *Talo 80* and *Talo 90* ('talo' for building). The latest version was published in 1993 and is here called *Building 90* in English.

Building 90 is not only a series of classification tables, but a comprehensive tool supporting design procedures as well as new methods of production planning and control. In Finland, all parties of the construction industry have widely committed themselves to the system since the beginning of the 1970's. The element classification is used in design, especially in specifications. The clients and contractors use the methodology in cost estimates of different accuracy by spaces, elements of construction or work sections as well as for detailed bills of quantities. The classification tables are also used in planning, scheduling and controlling the construction resources: labour, subcontracts, site equipment and purchases of building materials.

The first developer of the system was a pool of contractors. The National Building Board and some of the biggest cities joined forces in the 1970's and quite soon the most significant designer's associations joined, too. From the mid 1990's, the Building 90 group was transferred to the Building Information Institute which acts as the secretariat of this inter-disciplinary development. The recommendations are published as small booklets.

This booklet in English is an abstract from several publications in Finnish. It acquaints the reader with both the theoretical background and the practical applications of the system and its classification tables. The publication has been compiled by professor Juhani Kiiras and Mrs. Sirpa Lamminluoto (Helsinki University of Technology, Laboratory of Construction Economics). Mr. Martti Tiula has edited the publication in English and the translation has been examined by Mr. Eric Dachinger.

## Background and aims

Quite opposite to most countries, the Finnish construction industry has a tradition of controlling both the quality and the costs of a building project by elements of construction. Self evidently, this has resulted in a series of specific systems deviating from the ones used in other countries. The preliminary cost appraisal systems, construction specifications, cost estimating during the tendering procedure and construction cost control have different forms than those in most other countries applying work sections for these purposes.

The aim of the *Building 90* development project was to create a new general classification which covers the entire building construction process from client's brief to handover and maintenance supporting new methods in design and production control. Based on the *Building 90* classification, the different branches of the industry, as well as single companies, are able to specify applications suitable to their needs. The generally accepted classification kernel assists the information transfer within companies and activities as it lends itself to their specific needs, but does not force them to use detailed breakdowns not suitable to their activities.

*Building 90* (in Finnish *Talo 90*) is an offspring of previous systems (*Talo 70* and *Talo 80*), but has a wider inter-disciplinary support than its predecessors. It has been developed by the *Building 90* group in co-operation with the associations of clients, contractors, manufacturers of construction products, architects and other technical designers. The development was financed partly privately by membership fees of the group and partly publicly by the Technology Development Centre of Finland. The administration of *Building 90* group was – and still is – located in the Building Information Institute.

In Finland, all parties of a building project have since the beginning of the 1970's widely used the classifications and the cost estimating methods developed by the *Building 90* group and its predecessors. Especially the classification table of building elements has been used widely in building specifications, bills of quantities, cost estimates and cost control. There is long experience in Finland of determining and setting the quality requirements and calculating the cost estimates from the point of view of building elements, the end products of construction activities.

Although its predecessors already included other building category breakdowns, only *Building 90* includes a complete set of classification tables for spaces, building elements, work sections and different resources as construction products, labour and site equipment. Thus the *Building 90* classification follows the propositions of ISO/TR 14177, Classification of Information in the Construction Industry (1994). The classification tables themselves are compiled to support the typical Finnish construction practices.

*Building 90* has two major properties. Firstly, it specifies a series of *classification* tables to be used for indexing purposes throughout the construction process. Secondly, it states a *method*, a wide variety of breakdowns, to be used for cost estimation and control purposes.

## The Finnish building project process

Both the classification as well as the cost estimation and control methods are a part of the modelling of the production and the building itself. Thus, the classification depends on the design solutions and production processes applied during the project. In order to be able to understand the structure of

*Building 90*, one has to know the essential characteristics of the Finnish building process.

The principal part of building projects is that of multiple lump sum contracts, normally one main contract and several nominated subcontracts (e.g. mechanical, electrical). The client commissions the design consultants to produce complete plans, specifications and production drawings. The projects are led by specialised client project managers. The bids are not tendered on the basis of a client's bill of quantities; instead every contractor measures the quantities independently to set the price. Because of the lump sum price setting, general site costs are separated as independent items from the unit prices of other items.

Differing from the general practice elsewhere, the specifications and cost estimates are in Finland based on building elements. In production modelling the spaces and building elements are separated. The solutions of spaces and their finishes, fixtures, as well as mechanical and electrical equipment, depend on the functional requirements, set by the activities intended for the space. The design solutions, on the other hand define the characteristics of the building elements. The objectives of the project are set by the target price method from the space schedule of the brief.

Finland has traditionally had a vast standard system, covering general conditions of contracts and a selection of model documents, which have been used as references in projects. The cost estimates have also been based on public and company-specific price files for a long time.

## Classification tables

The basis of a successful information transfer is an analysis of the construction process and a classification based on the findings. During the process, it is necessary to see the building itself and the activities linked to its production from many different points of view, each of them having its specific use and user group.

The Building 90 classification is based on the following principles and aims:

- the classification functions as a tool in information transfer between the parties of the project, based on its standpoint related to the costs
- any classification table describes completely the costs of its branch of knowledge
- the classification tables are independent from each other
- the classification system neither controls the organisation of the project, the accuracy of its documents, the contracting procedures nor the agreement forms
- the building can be clearly seen from the point of view of design, production or maintenance
- the classification supports the information technology applications in the building process, e.g. the product modelling
- the building project may be described on different levels as product structures (elements of construction), production structures (work sections) and resource structures (construction products, labour and construction equipment)
- the classification complies with ISO/TR 14177 and lends itself both to national and international projects.

The relationships between activities and *Building 90* classification tables are shown below in the figure 1.

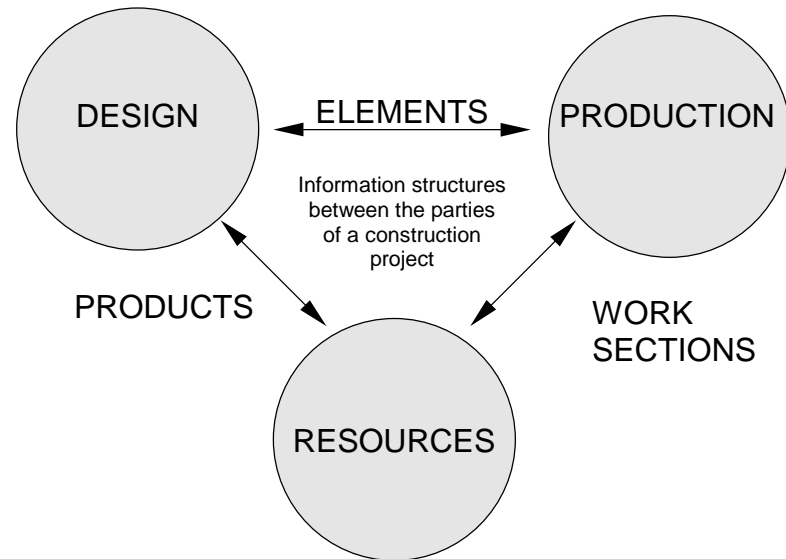


Figure 1. Relationships between activities and classification tables.

The key concept of *Building 90* is *structure*, which prevails between two classes.

*Product structures* – the end product building structures – are produced in the building and mechanical *design* process where the building is described as elements which further are broken down into *work sections*. The element breakdown is used in the building specification.

In the design phase, *space structures* are also produced. Spaces are broken down into building elements *enclosing* the spaces (as e.g. walls, floors and fittings) and *linking* them by technical services (e.g. heating service elements, telecommunication elements). The space structure approach is used in *room specification* and supports especially an open building system.

A third structural breakdown is used in production and incidentally also in the design phase. This is *production* or *resource structure* where the elements are broken down, first into work sections and further into work methods, illustrated by construction products, labour, subcontracting and construction equipment. The result is called *work specification* and it is used in tender estimation, production estimation and control for complicated work sections when adequate references to general specifications are not available.

## Standpoint – cost estimation system

The *production structure* is the primary breakdown in a contractor's plans and estimates. In production, the *tender estimation* and *target estimation* shall be seen as different procedures. The tender cost estimation is based on an elemental bill, which may be itemised by activities when needed. The target estimation is based on a schedule of work sections. The production planning is based on production structure, where:

- both building elements and work sections are used,
- cost estimation is based on consumption of resources and their prices
- the planning and control are based on activities and
- the activities are controlled by itemised schedules.

The *Building 90* estimation method supports the management by objectives. It takes advantage of public or company-specific structure and price files, and project-specific bills of quantities. The files include:

- product structures describing conventional design solutions,
- resource structures describing useful production solutions and
- resource price lists referring to the actual price level of construction products, labour, subcontracting and construction equipment.

The structures are composed of consumption figures of construction products and of other resources by unit. In other words, the actual unit prices are collected from the resource prices making use of *resource structures*. Together, the bills and structures will constitute both a *product model* of the elements of construction and a *production model* for the subject of the construction.

## The user's requirements

Information used in a construction project shall be structured in a uniform manner from the point of view of different users. This enables the rational development of structuring, handling and transferring the information between different parties of the project.

In a building project the three major points of view are:

- requirements perspective
- production perspective and
- maintenance perspective.

The three points of view are shown in the figure 2. In the middle of the figure lies the common field of communication. The classification tables of this field are used by all parties of the project and shall be understandable from all three points of view.

For the *requirements perspective*, the building is divided according to the requirements set by the future user, builder and designer, and taking into account design solutions based on the functional requirements.

For the *production perspective*, the building is divided according to the needs of production control, cost control and site processes.

For the *maintenance perspective*, the building is divided according to the needs of usage, servicing, maintenance and cost control.

The general field of communication, common to all three, supports the information transfer of building and service elements (see project divisions classification tables) as well as building products (see construction products classification table). These are used to present the requirements set by users, designers, and required by virtue of the designed solutions. The requirements may be tested in terms of *building elements* and the mechanical and electrical *service elements*.

*Building 90 method* can be defined as an information control system which applies the *Building 90 classification*. The method consists of applications for different tasks and different branches of the construction industry. At its kernel is a documentation system, consisting of:

- plans and drawings,
- bills and schedules and
- estimates and budgets.

These documents contain the accrual of information from earlier documents to later ones resulting in increasing accuracy during the project progress (table 2).



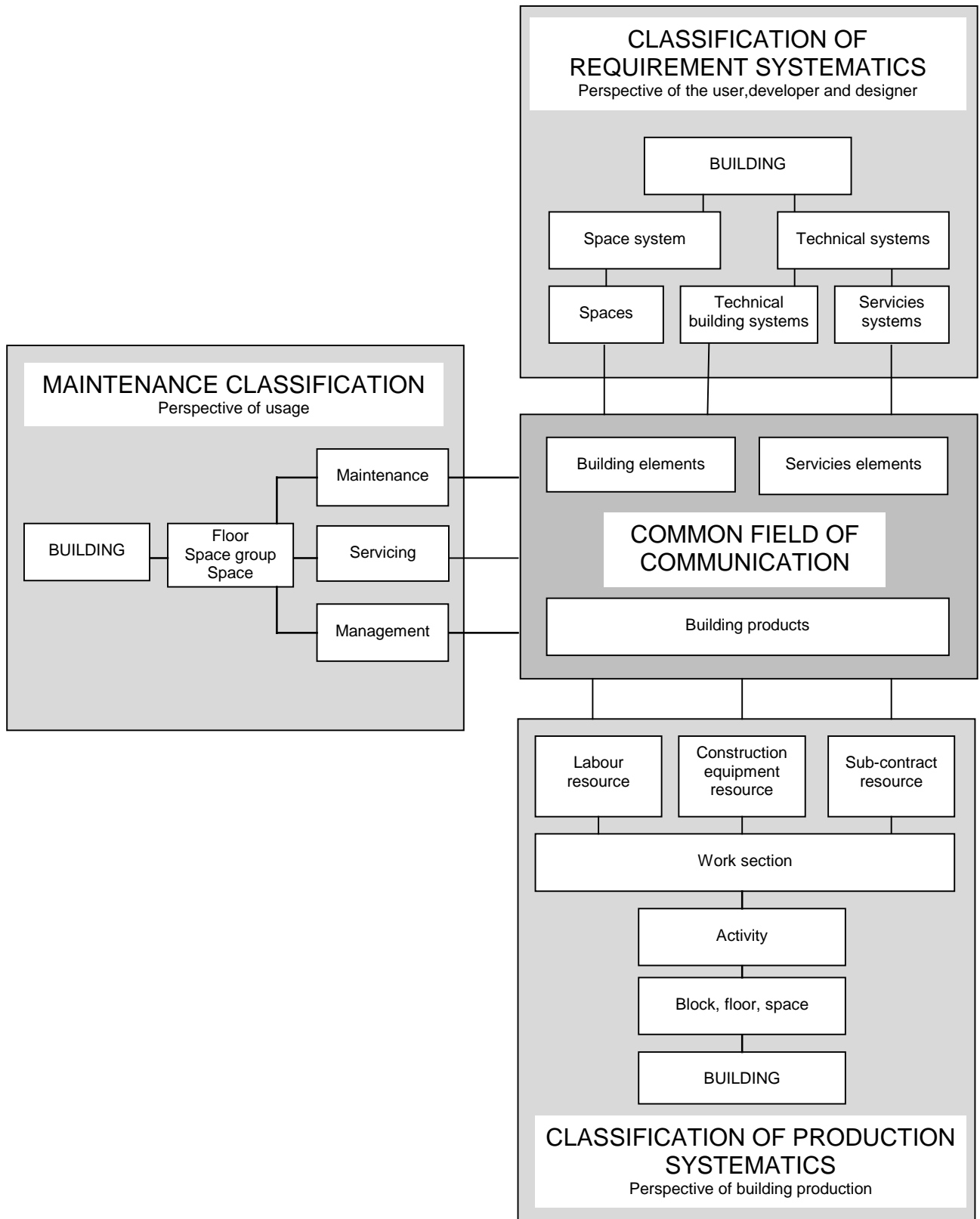


Figure 2. Perspectives of the building classification.

## Structure of Building 90

**B**uilding 90 structures the building and the operations connected to it from several points of view. Some of them do not need a commonly accepted classification, as their breakdown is defined by the user or depends on the project. Among these are types of building, subcontracting modules and site subdivision.

The classification tables covered by Building 90 are:

- spaces
- project divisions and building elements
- work sections
- resources: labour, products, subcontracts and construction equipment .

The classification tables and their purpose, contents and use in practice are presented in table 1. The classification tables are at the end of this book.

*Table 1. The structure of Building 90 classification system.*

<b>Classification subjects</b> <i>classification table</i>	<b>Purpose</b>	<b>Conceptual contents</b>	<b>Documents in practice</b>
<b>Spaces</b> <i>Space classification table</i>	Breakdown of the space groups and spaces	Schedule of spaces Room specification Cost estimation by spaces	<i>Project brief of spaces</i> <i>Room specification</i> <i>Target price budget</i>
<b>Project divisions</b> <i>Managerial project divisions tables (A. ... C and K ... M)</i>	Breakdown of the management fields of the project	Schedule by classes of expenditure	<i>Tender cost estimate</i> <i>Elemental estimate</i>
<b>Element divisions</b> <i>Building and service elements classification tables (D ... J)</i>	Breakdown of the physical parts of building	Preliminary specification Elemental specification of works Elemental bill and estimate	<i>Preliminary specification</i> <i>Elemental estimate</i> <i>Descriptive or performance specification (by elements)</i> <i>Tender cost estimate</i>
<b>Work sections</b> <i>Work sections classification table</i>	Breakdown of the work sections and trades	Activities bill and estimate Schedule of works and estimates (by work sections)	<i>Tender cost estimate</i> <i>Target estimate</i> <i>Work specification</i>
<b>Resources</b>			
Labour resources <i>Work sections classification table</i>	Breakdown of the construction labour by work sections	Labour structure plans and estimates Labour consumption and price files	<i>Activities control documents</i>  <i>Payroll</i>
Product resources <i>Construction product classification table</i>	Breakdown of the building products	Purchase schedules and estimates Product indices and price lists	<i>Procurement documents</i>
Subcontract resource <i>Work sections classification table</i>	Breakdown of the work sections	Subcontracting schedules and estimates Subcontracting indices and price lists	<i>Procurement documents</i>
Construction equipment resources <i>Site equipment classification table</i>	Breakdown of the site equipment	Site equipment plans and estimates Site equipment indices and price lists	<i>Acquisition documents</i>

*Space classification* breaks the building down into space groups (called premises) and spaces. The spaces correspond with the activities typical to the premises of the building. They are an essential starting point when the user and the designers define the functional, qualitative and quantitative requirements. The principal users of the space classification are the client, the designer and the property management body. The space classification is used in space programs of project briefs, room specifications and space estimates. For practical work site purposes, though, room specifications are listed in the order of project-specific room identifiers (room numbers).

*Project divisions classification* break the building down into managerial cost categories related to accounting and used in building management, design and production.

*Building elements classification* consists of physical building and service elements. It is the most important part of Building 90. It is used in building specifications and elemental bills and estimates.

*Work sections classification* breaks the project down into product-bound operations – conceptual trades – needed from the production point of view. Work sections are used in production bills and estimates as well as in plans and schedules of works and procurement. The designer may complete the building specification with separate work specifications for one or several work sections. The national general specifications (e.g. RYL2000) are written in the order of work sections.

*Resources* break the production down to procurement classes and are the pricing criteria. Labour, products and site equipment are the basic resources, subcontracting being a complementary one consisting of basic resources, but differing in the procurement method. The resource classification tables are used as a primary breakdown argument in resource structures and estimates, in resource indices and schedules of rates. As a secondary breakdown criteria, resources are used for production structures in production plans and estimates.

*Labour resources classification* breaks the production down into classes of labour. For this purpose, the work sections table is applied. Labour resource breakdown is used in labour structure plans, estimates and price files.

*Product resources classification* breaks the production down into classes of commodities. Product resources are construction products, defined in the Construction Products Directive, installed in the construction work in permanent way or consumed during the construction process. The classification table is used in purchase schedules, price files and product indices.

*Subcontract* is a complementary resource class which differs from the basic resources by the procurement method. A subcontract consists of labour i.e. service on site, products installed in place and use of specific work site equipment. Work sections are applied for classification of subcontracting resources. They are needed in procurement schedules, production estimates, price files, indices and statistics.

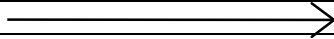
*Site equipment resources* break down the use of machines, tools and other construction equipment which are used in production, but which are not consumed during the construction process. The classification table is used in construction equipment schedules, indices and price lists.

## Practical applications

The *Building 90* classification tables are used in all building design and construction activities which need information transfer and sorting, as in plans and drawings, bills and schedules, estimates and budgets (table 2). The *Building 90 method* can be defined as an information control system which applies the *Building 90 classification*. From this background the following recommendations for building management, design and production have been defined.

For *construction management* the classification tables are used in design briefs, in pre-contract stage cost planning, in bills of quantities, in priced bills of quantities, in tender comparisons and in definitions of the limits of various contracts.

Table 2. The document system of Building 90.

Contents inherit 		
<b>Plans and drawings</b> describe the result	<b>Bills and schedules</b> control the activities	<b>Estimates and budgets</b> support the cost control
project plan	<i>Brief solution</i> schedule of spaces	target price budget
preliminary drawings preliminary specification general drawings building specification construction drawings specification of spaces	<i>Design solution</i> elemental bill product structure schedule space structure schedule	elemental estimate product structure estimate space structure estimate
production drawings detail and assembly drawing production plans programmes	<i>Production solution</i> production schedule activities schedule procurement schedule	production estimate cost plan activities estimate procurement estimate
maintenance manual operations manual maintenance plan	<i>Maintenance solution</i> space schedule installations schedule	maintenance budget control accounts

For *design* documents, the classification tables are used in preliminary specifications, building and work specifications and, if need be, in schedules of drawings.

The *contracting companies* use the classification tables for project estimates as bills of quantities and cost estimates, for tender and production cost estimates, for cost control during the project, for cost accounting and statistics. Further, the contractors use the tables on site for labour, purchase and procurement planning and practice, as well as for collecting data and supervising the productivity.

For *information service*, the tables are used in general and public publications e.g. general specifications, product files and indices, and work method and consumption files. The tables are used also to define and index the contents of textbooks, handbooks, research reports etc.

In *building modernisation* the activities of disassembling, repairing and assembling are seen as work stages, belonging to a certain building element. As additional items of breakdown the work section classification group 8 may be used.

The *building maintenance* is a continuous process, for which the *Building 90* does not apply without alterations. For this purpose there is available an activity based classification, not described in this book. The *Building 90* space classification is, though, used to itemise premises, space groups and spaces. The project division classification may also be used for servicing, e.g. in operation and maintenance manuals.

*Building 90* is a very versatile tool. It is flexibly adaptable in company applications to different levels of accuracy. The only restriction is that the borderlines of classes are kept unchanged. The main classification groups shall never be combined, but, on a lower level, the combinations are possible as long as the classes themselves are kept unchanged.

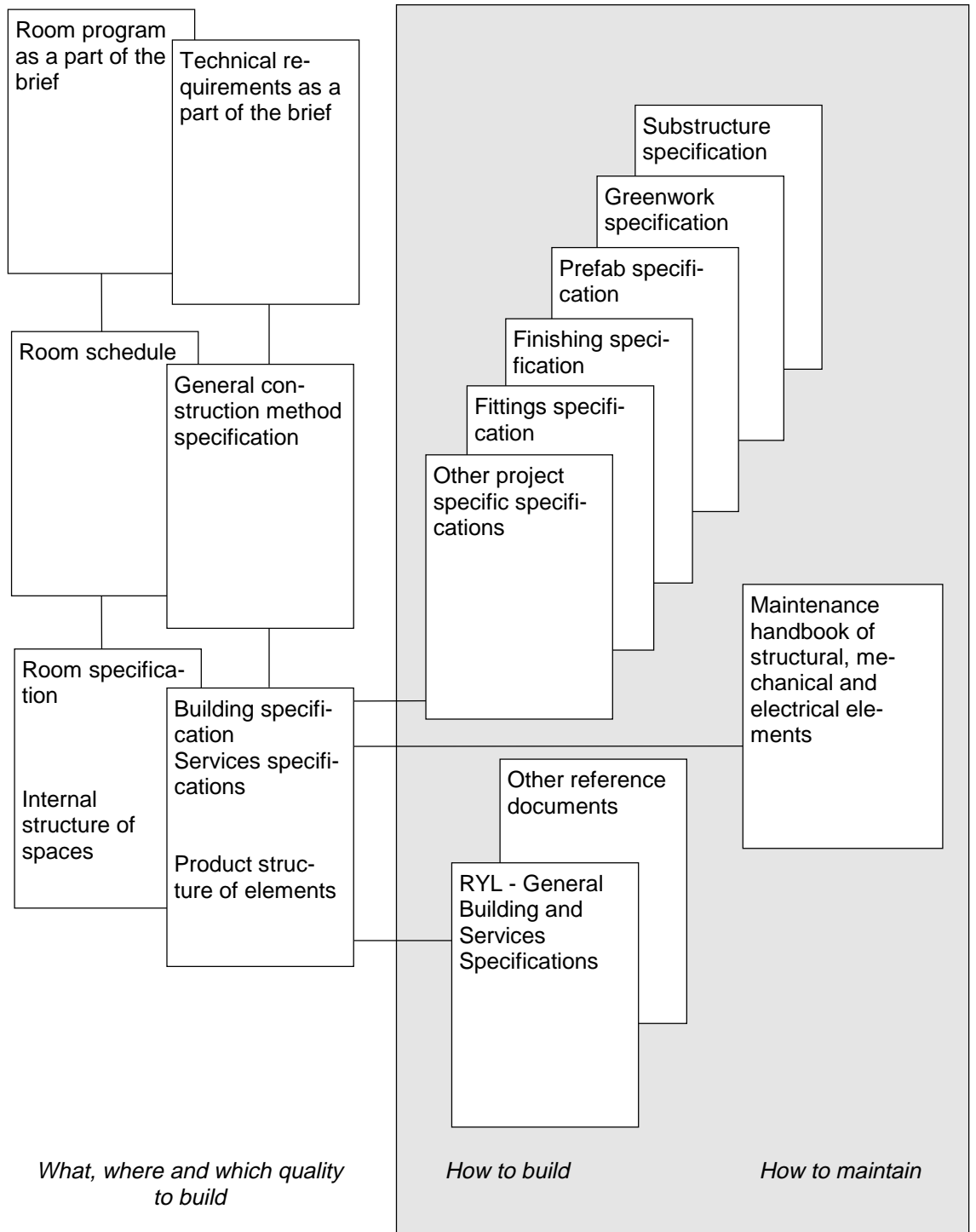


Figure 3. The relationship between technical design text documents of a building project.

The *Building 90* method is a comprehensive one, reaching from preliminary estimates of design process through production control and finally into accounting of realised costs. The information flow from activities to documents during the construction process is illustrated in figure 4.

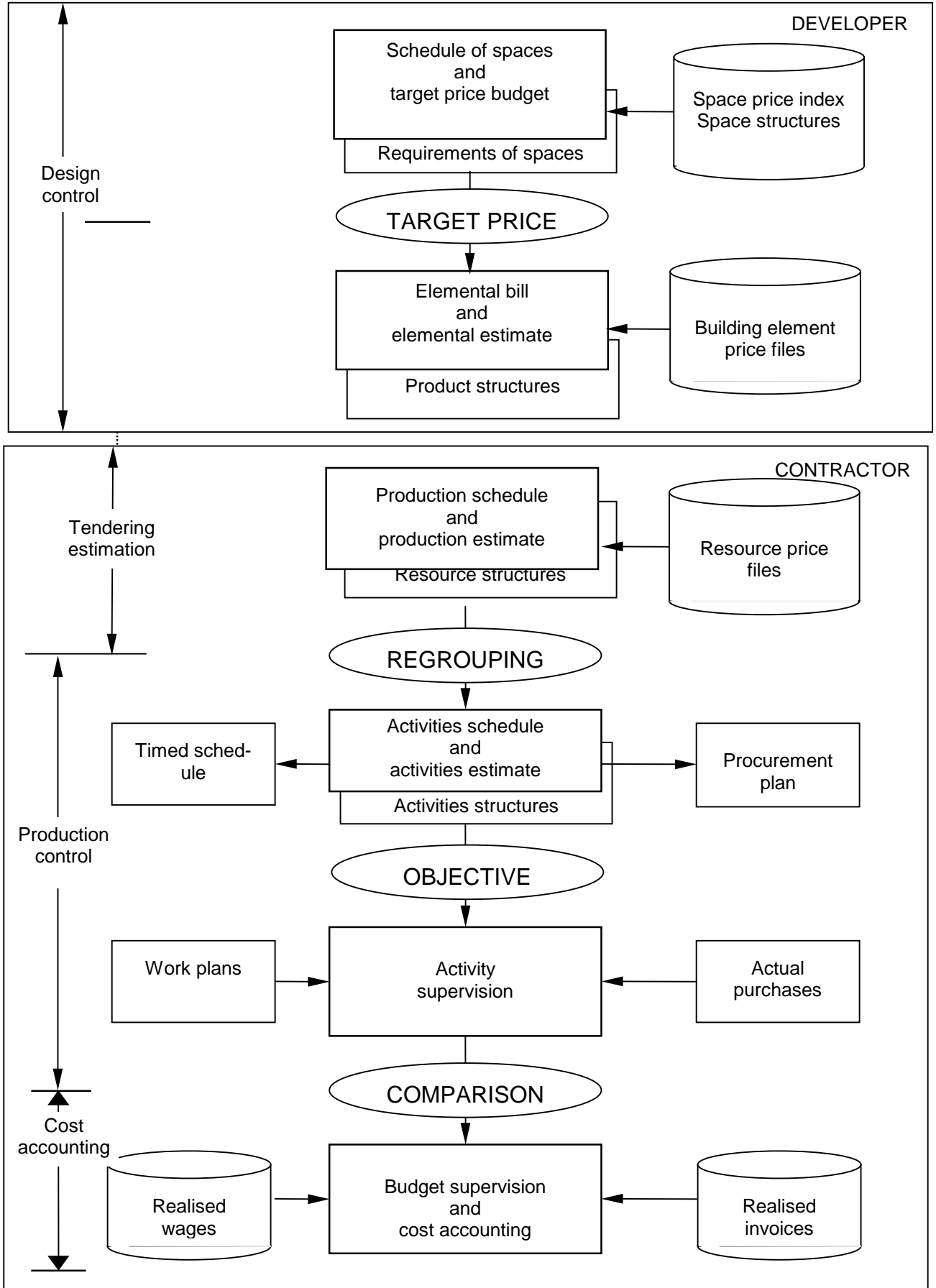


Figure 4. The comprehensive Building 90 method. The figure illustrates activities and documentation during the process.

## Design documentation and specifications

In the document system, requirements are transferred to solutions as the design process goes on. The information is derived from coarse and sketchy documents while its accuracy increases. A project specific specification defines the designed solutions and the quality level of the subject. The quality requirements of building products and workmanship are presented in the standards and RYL 2000 which are invoked in a project by reference. When needed, building specification may be completed with separate specifications of work sections, in which the required work methods and quality assurance are described.

The General Building Specification (RYL 2000) was revised in 1998 according to the *Building 90* disposition. At the same time a building specification model (*Building Specification 90*) was created to support both *Building 90* and the new general specification. The detailed system of design documents is shown in figure 3.

In most countries work sections or construction products are used as the disposition of building specifications. An example is Masterformat. The work section approach supports, however, poorly computer aided design and especially object oriented programs which aim at the end products, spaces and construction elements. Target setting also is focused on spaces and elements but less on materials and workmanship. The interest is, however, globally increasing in elemental disposition, as Unifomat and DIN 276 show.

The predecessors of the *Building Specification 90* model have been used in quantity surveying and cost estimation for a long time; from early 1970's. The model uses an accurate product structure model to describe the elements of construction (figure 5). The product structure of an element is a systematic list

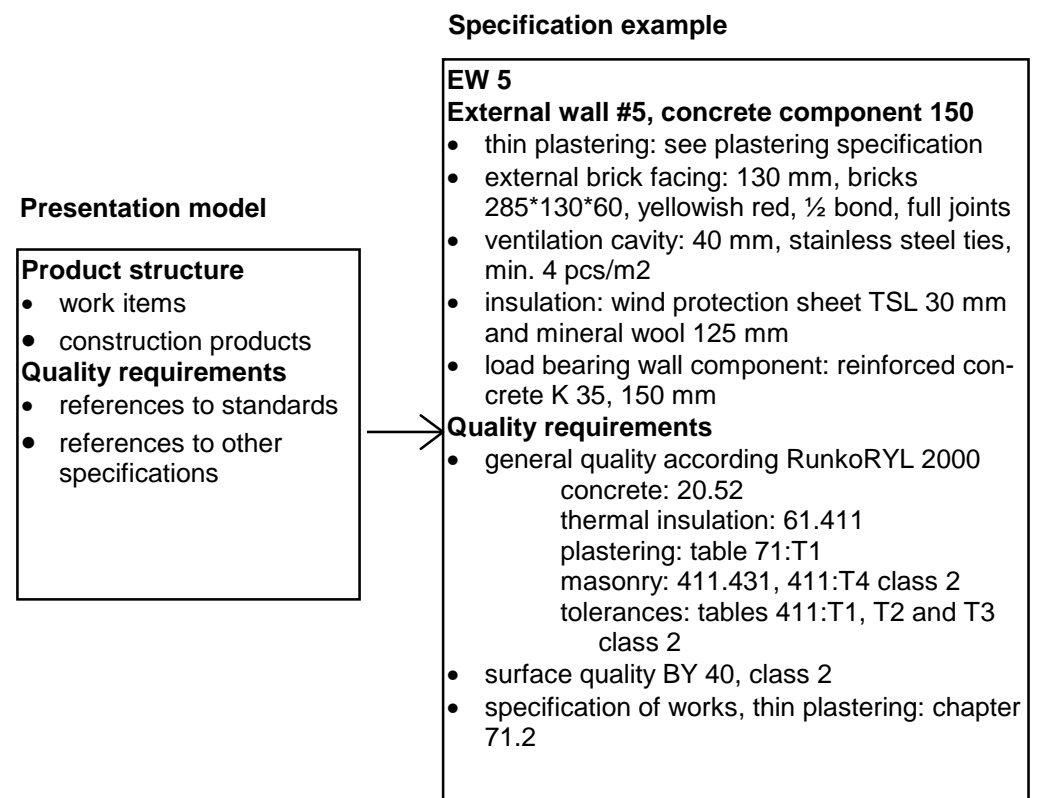


Figure 5. The specification model and an example of describing the product structure and quality requirements of a concrete component wall.

of prescribed work sections, i.e. building products and work items together with their quality requirements. Product structure descriptions are updated simultaneously with drawings during the project, from the first coarse drafts to the detailed assembly drawings. An example of a building specification is presented in appendix H.

Product structure headings from the *Building 90* element classification table are used directly to itemise the elemental bill (figure 6 and appendix B)), which is later completed by quantities to enable the calculation of labour, material and site equipment consumption.

## Cost estimation and planning during the design phase

The objective for the building cost is set during the project planning stage on the grounds of the brief and the program of spaces (schedule of spaces). It takes into account the costs caused by the *space requirements* (figure 6 and appendix A), which in turn are derived from the activities taking place within the spaces. The *target price budget* (figure 6 and appendix A) is determined by means of *space structures*. The public index of *target prices* of spaces is revised yearly. Both the yearly target price index and the project-specific schedules of spaces are arranged according to the *Building 90 space classification*.

The arrangement of cost estimation and control – the *Building 90 method* – is illustrated in figure 4. The costs of preliminary plans and drawings are estimated on the basis of the *elemental bill and estimate* (figure 7, appendices C and D A) and it is compared to the *target space budget* of the building project. In the elemental estimate the space infills – internal surfaces and equipment – are still handled as characteristics of spaces. The unit costs of spaces are determined by means of *space structures* which consist of *product structures*, i.e. building elements enclosing and linking spaces. For the purpose of product structures, the building elements are broken down into construction products and work sections. The elements are classified according to *Building 90* elements. The product structures of building elements are partly public, partly company-specific. The product structures in *Building 90 specification model* are widely used. The actual quantities of spaces and elements are counted from the designers' product models, i.e. preliminary drawings.

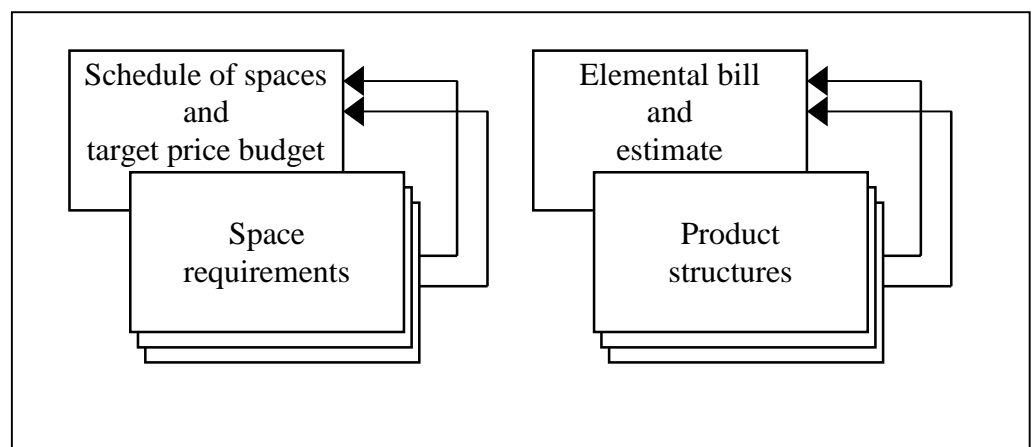


Figure 6. From space requirements to target price budget (left) and from product structures to elemental estimate (right). Examples of calculation sheets are shown in appendix A (procedure on left) and appendix B (process on right).



The client may also require a *production schedule* and a *production estimate* on the basis of the final production drawings and specifications. This procedure is, however, very seldom used in the tender phase.

## Cost estimation in production

In production, the *tender estimation* and the *target budgeting* shall be seen as different procedures. The tender cost estimate is based on an elemental bill which is itemised by work sections and resources. The target budget is based on a schedule of work sections. The production planning is based on these production structures.

The method differentiates between the *tender cost estimate* and the *production cost estimate*. The tender estimate aims at the pricing of the tender; the purpose of the production estimate is to set an objective for the contractor.

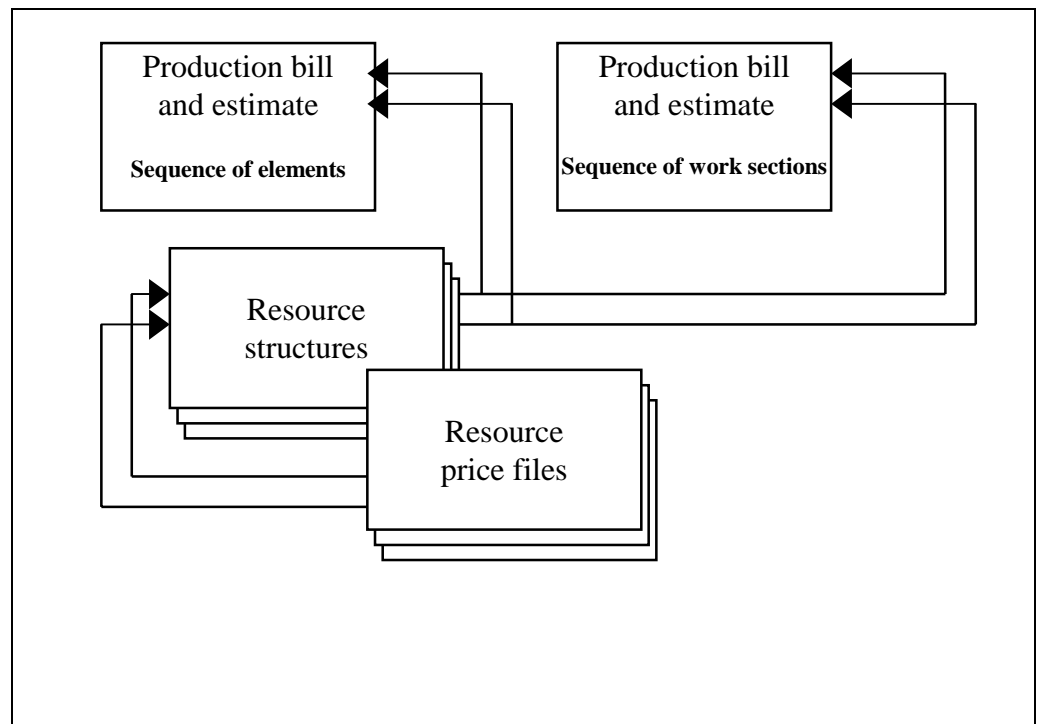


Figure 7. Two alternatives of production bill and estimate. Examples of calculation sheets are shown in appendix C (procedure on left) and in appendix D (procedure on right). In appendix E are shown examples of resource structure sheets and resource price files (at bottom).

Thus, the method stresses the importance of goals as well as the planning of production and purchases. In the tender phase, the elemental division is used. In cases, when the bids are tendered on the bases of a client's bill of quantities, the quantities apply invariably to elements. Most contractors have detailed resource or work item prize files of production structures of common elements according to their company methods of production. The unit cost is calculated by breaking down the *product structure* into the *production structure*, i.e. into work sections and further into resources of products, labour and site equipment (figure 7, appendices C, D and E).

The contractor estimates the tender using either the *elemental estimate* or the *production schedule* and *production estimate*. If the elemental estimate is used in the tendering phase, the production estimate is prepared separately before the work site is opened.

In the production estimation phase, the production solutions are chosen. These are used in the *production schedule*, which is priced using the resource price files (figure 7 and appendix E). It may be arranged either by elements and work phases (appendix C) or by work sections (appendix D). Both show the resources needed and use the same resource structure (appendix E). The *production bill and estimate with resource structures* is an objective of resource consumption and costs for the contractor.

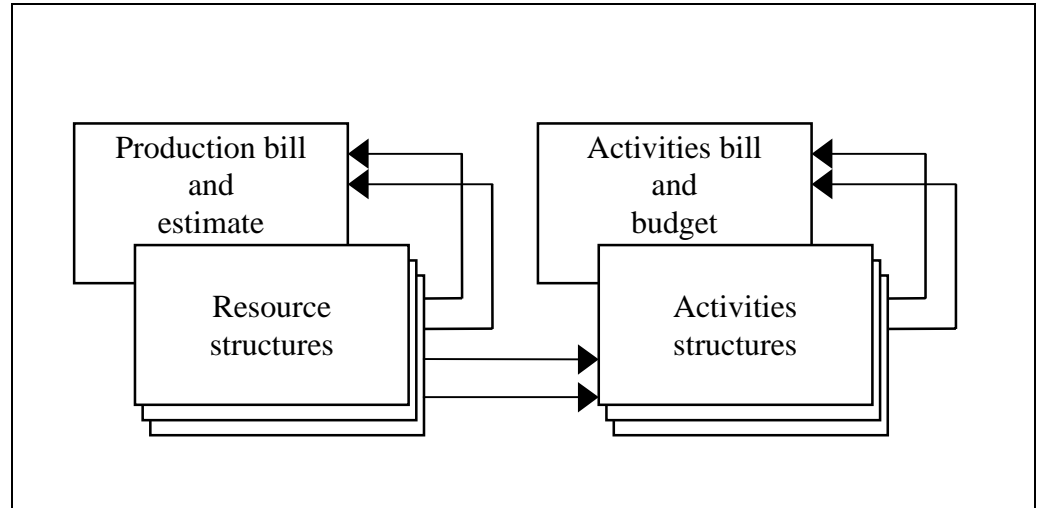


Figure 8. Target setting. Examples of calculation sheets are shown in appendices C and D (procedure on left) and in appendix F (procedure on right).

The *production estimate* follows both the *Building 90 project divisions* and the physical *building and service elements* classification, but it may be broken down also into work sections. The *product structure* describes the designed solution as products, as the *production structure* describes the production solution as resources. How various bills are broken down item by item into structures is presented in figure 9

The *production bill* (figure 8) is based on company-specific *resource structures* (appendix D), priced according to continuously updated *resource price files* (appendix E). The items are classified by both elements and work sections of *Building 90* classification tables. The resources are classified according to *Building 90* resource classification.

For the purpose of planning, control and supervision, the production estimate is regrouped into *activities bill and budget* (figure 8 and appendix F). The activities bill consists of labour activities, procurement activities and general site activities. The objective of every activity can be seen as allocated resources according to its activities structure (appendix F). Using the activities, a timed schedule of works and a procurement plan are further compiled. The activities are numbered consecutively, stressing that the timing of the work and the procurements are independent of classification.

In the *Building 90 activity control method* (figure 10), every activity is planned before execution and the calculated cost of the plan shall be lower than the target (appendix G, upper table). In the same way every procurement shall have a lower purchasing price than the target (appendix G, lower table). The purpose of this is to ensure that the controlling measures precede the start of work or the purchase order. The feedback from these activities helps to update the company-specific *resource price files* in real time. The *Building 90* resource classifications are used for the activity plans.

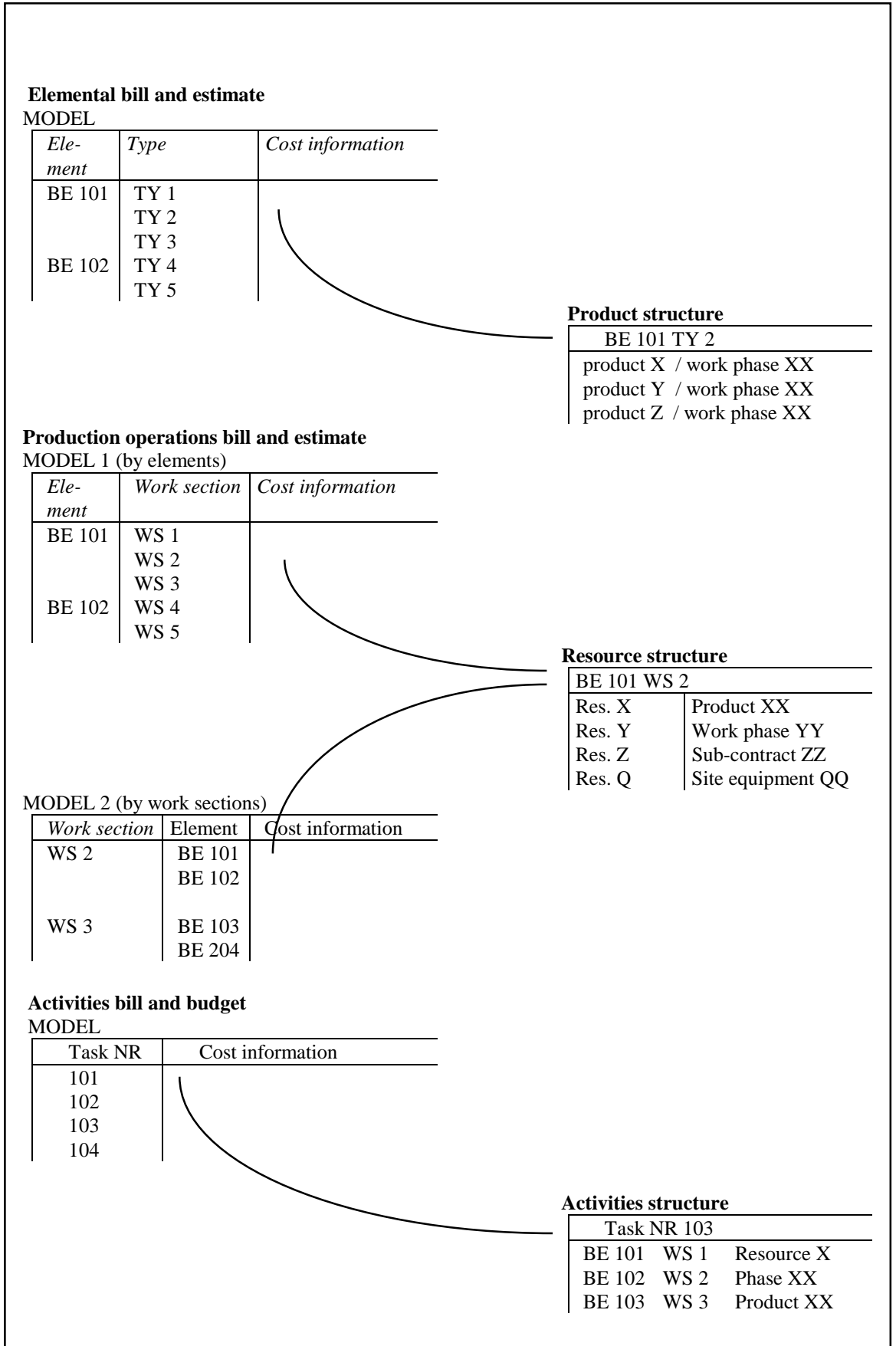


Figure 9. Elemental bill may be broken down into product structure, production operations bill into resource structure, and activities bill into activities structure.

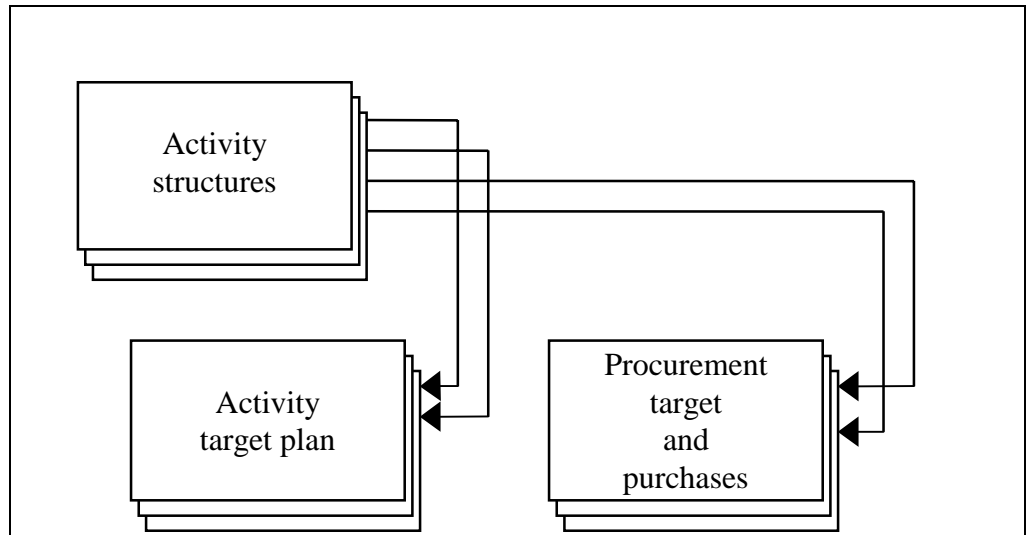


Figure 10. Activity control. Examples of calculation sheets are shown in appendix G.

As the project progresses, deviations from the plans and the target budget are noticed. The actual cost shall be compared to the *target budget* during the budget supervision. The actual cost items are filed both by activities and by resources. The company resource structures and price files are updated by the realised consumption and cost figures.

## Literature

### Building 90 publications

*Talo 90 -ryhmä (Building 90 group):* Talo 90, Nimikkeistö, yleisseloste (Building 90 classification, general description); 112 pages. Rakennustieto Oy, 1994.

The book includes a description of starting presumptions of the development, a theoretical review of the various classification perspectives, a description of the classification tables and their coding systems and finally a short guide to the use of the classification in practical tasks. In appendices 1 to 6 are the classification tables including a short definition of every class.

*Talo 90 -ryhmä (Building 90 group):* Talo 90, Määrälaskenta, rakennustekniset työt (Building 90, quantity surveying, construction works). 88 pages. Rakennustieto Oy, 1994.

The book includes a standard method of measurement, measurements according to Building 90 classification. The publication is richly illustrated and includes in appendix an example of comprehensive schedules of building elements, product structures and work sections of a condominium building of 10.000 m<sup>3</sup>.

*Talo 90 -ryhmä (Building 90 group):* Talo 90, Rakennuskustannusten laskentaohje, rakennustekniset työt (Building 90, Cost estimation guide for construction works). 103 pages. Rakennustieto Oy, 1994.

The book includes a comprehensive description of the Building 90 method. In appendix there is a set of different schedules and estimates concerning a group of three similar 3 floor condominium buildings.

*Talo 90 -ryhmä (Building 90 group):* Talo 90, Rakennusselostusohje (Building 90, Building specification guide). 128 pages. Rakennustieto Oy, 1998.

The book includes a verbal description of the Building 90 specification system stressing the difference between building specification (by sequence of elements) and specifications of works (by sequence of work sections). It in-

cludes further a specification writer's guide of items to prescribe in different element classes. In appendices there are two examples of specifications, one for an ordinary new condominium building and an other for the reparation of a multi-storey downtown building.

## Publications applying Building 90 method and classification

*MaaRYL 2000, Rakennustöiden yleiset laatuvaatimukset – Talonrakennuksen maatyöt.* (MaaRYL 2000 – Code of building practice, Earthworks for building construction). 269 pages. Rakennustieto Oy, 1997.

RYL code of building practice describes a generally accepted standard of good construction practice. In this volume the building elements of earthwork (D1...D8 and E1...E6) are presented with their connected work sections (11...19). The element part is intended to be used in design as a checklist of the properties connected to elements of earthwork. The work section part is intended to be invoked by reference in building specifications.

*RunkoRYL 2000, Rakennustöiden yleiset laatuvaatimukset – Talonrakennuksen runkotyöt* (RunkoRYL 2000 – Code of building practice, Building frame and external envelope). 434 pages. Rakennustieto Oy, 1998.

RYL code of building practice describes a generally accepted standard of good construction practice. In this volume the building elements of structural frame and external envelope (F5...F8) are presented with their related work sections. The element part is intended to be used in design as a checklist of the properties connected to the elements of the building frame and envelope. The work section part is intended to be invoked by reference in building specifications.

*SisäRYL 2000, Rakennustöiden yleiset laatuvaatimukset – Talonrakennuksen sisätyöt* (SisäRYL 2000 – Code of building practice, Internal finishes). 416 pages. Rakennustieto Oy, 1998.

RYL code of building practice describes a generally accepted standard of good construction practice. In this volume the building elements of internal finishes (F5 ... F8) are presented with their related work sections (24...79). The element part is intended to be used in design as a checklist of the properties connected to the elements of finishes. The work section part is intended to be invoked by reference in building specifications.

*Rakennustarvikkeet 1999* (Building products in Finland 1999). 593 pages. Rakennustieto Oy, 1999.

A yearly published index of building products, available in the Finnish market. Products are collected in accordance with the Building 90 product classification, which is extended by the publisher into 6<sup>th</sup> digit. Available also on CD-ROM as a part of RT Building Information File and on the Internet, [www.rakennustieto.fi](http://www.rakennustieto.fi).

## Appendix A. Defining the target price

Space program and target price budget (lower table). The objective of the building cost (target price) is set in the building briefing stage. The prices are based on the space requirements and the space structures (upper table) defining the costs.

Building 90				26.1.1999
Space requirements				
Requirements	unit	value	commentaries	
<b>2 rooms + kitchen + sauna</b>				
<b>1 Measurements and form</b>				
room area	m2	55,0		
width * depth	m2	6,1 * 9,0		
floor to floor height	m	3,0		
room height	m	2,7		
span	m	6,1		
<b>2 Interior climate</b>				
temperature control	C	> + 22	no refrigeration	
cooker hood, sauna fresh air	euro/m 2	5,50		
incoming air speed			normal	
air evacuation	l/sm2	0,5		
humidity			no humidifier, normal	
<b>3 Sound insulation</b>				
partitions between premises	dB	56		
premise entry doors	dB	34		
<b>4 Lighting</b>				
external wall windows	m2	6,6		
illumination	W/m2	10		
windows on opposite walls	%	100		
:				

Building 90							19.1.1999
Space program and target price budget							
space	No	description	pcs	m2	euro/m2	euro, total	
1122	1	2 rooms + kitchen + sauna	9	522	661	344781	
113	2	3 rooms + kitchen + sauna	9	645	632	407318	
115	3	5 rooms + kitchen + sauna	9	951	592	563309	
		<b>Total dwellings</b>	27	2118		1315408	
1271	4	dwelling storage	4	18	546	9822	
721	5	washroom	4	12	1227	14722	
711	6	locker room	4	68	738	50207	
731	7	toilet	4	8	1307	10457	
821	8	inventory storage	3	94	552	51919	
		:					
		<b>Total programmed spaces</b>		2703		1645515	
911	15	horizontal communication space	3	19	764	14516	
921	16	stairwell	3	180	544	97950	
99	17	technical space	3	69	449	30958	
		<b>Total all spaces</b>		2971		1788939	

## Appendix B. Elemental bill

*Elemental bill of quantities and elemental estimate (upper table). In the preliminary design phase the costs are estimated by elemental estimate, and compared to target price. The internal surfaces and equipment are still estimated by spaces. Abbreviations used in table: BE building element, ID project-specific identification of the element.*

*The arrows from the rows of the upper table refer to product structures: building elements broken down into products and work items which cannot be described as products. The product structures of the project specification are used. Abbreviations: BE building element, WS work section, R resource, P product.*

Building 90						19.1.1999
Elemental bill and estimate						
BE	ID	Item	quantity	unit	euro/unit	euro, total
<b>F2</b>	<b>STRUCTURAL FRAME ELEMENTS</b>					202934
		:				
<b>F27</b>	<b>Floor slabs</b>					
	VP1	hollow core slabs 200 jv 7m pk easy	54	m2	28,48	1538
	VP2	hollow core slabs 265 jv 7m pk	2463	m2	34,17	84153
	VP3	hollow core slabs 265 jv 7m A120	272	m2	42,42	11537
	VP4	in situ concrete slab 200 board molding	268	m2	25,50	6834
		:				
<b>F6</b>	<b>INTERNAL SURFACES</b>					184157
	AS1	2 rooms + kitchen + sauna	522	m2	68,82	35922
	AS2	3 rooms + kitchen + sauna	645	m2	76,38	49267
	AS3	5 rooms + kitchen + sauna	951	m2	55,47	52749
		:				
<b>F7</b>	<b>INTERNAL EQUIPMENT</b>					251567
	AK1	2 rooms + kitchen + sauna	9	pcs	3639,67	32757
	AK2	3 rooms + kitchen + sauna	9	pcs	3991,17	35921
	AK3	5 rooms + kitchen + sauna	9	pcs	5060,83	45548
		:				
<b>C</b>	<b>SITE GENERAL</b>					235543
	TY1	cost bound share	14500	h	12,92	187292
	TY2	volume bound share	3406	m2	14,17	48252
		:				

Building 90						26.1.1999
Product structures						
			quantity		resource price	BE cost
BE/WS	R	WS/P	Item	unit	consumption	euro/unit
<b>F27 VP2</b>	<b>Hollow core slab 265 jv 7m pk</b>			<b>m2</b>		<b>34,16</b>
22	2	22 060	joint reinforcement A400H 6-12mm	kg	1,500	0,83
25	2	25 021	hollow core slab 265 jv 7m pk	m2	0,902	36,80
23	2	23 110	jointing concrete K25 1-2 s/vb 18mm	m3	0,017	64,25
		:				
<b>F6 AS1</b>	<b>2 rooms + kitchen + sauna</b>			<b>m2</b>		<b>241,91</b>
24	2	24 060	floor floating	m3	0,050	59,71
74	2	74 100	floor tiling	m2	1,000	41,69
51	2	51 150	studs c/c 600, quality V	m	5,760	0,668
56	2	56 021	ceiling boarding	m	10,500	0,630
		:				
<b>C TY1</b>	<b>Cost bound share</b>			<b>h</b>		<b>446,42</b>
09	5	09 010	management, responsible supervisor	mo	0,079	211,82
09	5	09 020	management, foreman	mo	0,048	92,61
		:				

## Appendix C. Production estimate, alternative 1

Production bill and estimate by sequence of elements and work phases (upper table). The building elements are broken down into work phases. Abbreviations: BE building element, WS work section.

The arrows from the rows of the upper table refer to resource structures which are picked up from the resource price file (lower table). The production estimate is based on detailed resource structures, priced by continuously updated company resource file. Abbreviations: R resource (1 = labour, 2 = product), WS work section.

Building 90													19.1.1999
Production bill and estimate													
Alternative 1: Sequence of elements													
BE	WS	Item	quantity		cons.	time	labour cost			procurement cost			
			quant	unit			h/unit	h	euro/h	soc/h	total	euro/unit	total
<b>C1 SITE GENERAL</b>													
<b>C11 Management</b>													
	09 010	responsible supervisor	11	mo							2657,33	29231	29231
	09 020	foreman	9	mo							1825,83	16433	16433
		:											
<b>C15 Site guarding</b>													
	09 050	guarding	14	mo	5,000	70					79,33	1111	1111
		:											
<b>F2 STRUCTURAL FRAME</b>													
<b>F27 Floors</b>													
		:											
	25 021	hollow core slab 265 jv 7m pk	2463	m2	0,300	739	9,57	6,70	12019	32,89	80996	93015	
	25 023	hollow core slab 265 jv 7m A120	272	m2	0,300	82	8,08	5,66	1121	38,82	10558	11679	
	25 025	hollow core slab 200 jv 7m pk easy	43	m2	0,300	13	9,57	6,70	210	30,29	1302	1512	
	27 010	component finishing, demanding	2778	m2	0,010	28	6,84	4,79	323	0,51	1421	1744	
		:											
<b>F6 INTERNAL SURFACES</b>													
<b>F61 Wall surfaces</b>													
		:											
	56 062	wall boarding											
	73 494	protective sauna st											
	74 010	wall tiling											
	74 021	wall tiling, damp sp											

Building 90													26.1.1999
Resource structures													
R	WS/P	Item	quantity		price	cost							
			unit	consumption			euro/unit	euro/unit					
		<b>25 021 Hollow core slab 265 jv 7m pk</b>	<b>m2</b>			<b>37,65</b>							
2	31 225	hollow core slab 265 4*10 7m pk	m2	1,000	28,57	28,57							
2	31 290	component transport 100 km	tn	0,367	8,23	3,02							
2	31 110	concrete K25 1-2 sVb 18 mm	m3	0,017	55,70	0,95							
2	31 130	concrete transport 10km 3 m3 bucket	m3	0,017	7,51	0,13							
2	32 105	steel plates Fe 37 B	kg	0,333	0,47	0,16							
2	34 145	batten 45*45 V	m	0,110	0,57	0,06							
1	25 021	component installing contract	h	0,200	11,43	2,29							
1	25 000	construction labour	h	0,100	5,86	0,59							
1	9	social cost	%	66		1,89							
		<b>51 021 Sauna woodwork</b>	<b>pcs</b>			<b>303,63</b>							
2	34 144	studs c/c 600 50*50 V	m	1,920	0,60	1,15							
2	34 212	ceiling boarding, stv 15 mm pine	m	10,500	0,63	6,62							
2	34 212	lighting fixture casement, 15 mm pine	m	0,000	0,63	0,00							
2	34 212	wall boarding, stv 15mm pine	m	10,500	0,63	6,62							
2	34 860	sauna platform	pcs	1,000	185,33	185,33							
1	51 021	wood boarding carpenter's work	h	5,300	10,91	57,80							
1	51 000	construction labour	h	0,300	5,82	1,75							
1	9	social cost	%	70		41,68							



## Appendix D. Production estimate, alternative 2

Production bill and estimate by sequence of work sections and products (upper table). The work sections are broken down into products. The arrows from the upper table refer to resource structures which are picked up from the resource file (lower table). Abbreviations: WS work section, P product, BE building element.

Building 90													19.1.1999	
Production bill and estimate														
Alternative 2: Sequence of work sections														
WS	P	BE	Item	quantity		cons.	time	labour cost			procurement cost			
				quant	unit			h/unit	h	euro/h	soc/h	total	euro/unit	total
<b>25</b>			<b>Concrete component work</b>											
25 212	31	F23 031	helical stair, 16 risers	9	pcs	2,000	18	7,70	5,39	236	1625,22	14627	14863	
25 012	31	F24 130	partition, 180mm 5m2/elem	734	m2	0,250	184	9,20	6,44	2869	39,83	29232	32101	
25 303	31	F25 080	concrete column d 280, round	29	pcs	2,000	58	6,65	4,65	656	119,00	3451	4107	
25 173	31	F26 021	concrete beam 100*280	10	m	1,500	15	9,57	6,70	244	22,40	224	468	
25 021	31	F27 025	hollow core slab 265 jv 7mpk	2463	m2	0,300	739	9,57	6,70	12019	32,89	80996	93015	
25 023	31	F27 023	hollow core slab 265 jv 7m A120	272	m2	0,300	82	8,08	5,66	1121	38,82	10558	11679	
25 025	31	F27 020	hollow core slab 200 jv 7mpk easy	43	m2	0,300	13	9,57	6,70	210	30,29	1302	1512	
			:											
<b>56</b>			<b>Internal wood lining work</b>											
			:											
56 010	56	F61 061	casing on wood, pine moldings	1054	m	0,050	53	10,91	7,63	977	0,91	959	1936	
56 020	56	F61 062	casing on concrete, pine moldings	862	m	0,100	86	10,91	7,63	1598	0,91	786	2384	
56 062	54	F61 020	wall boarding	360	m2	0,400	144	10,91	7,63	2670	6,62	2381	5051	
56 021	54	F62 030	ceiling boarding	324	m2	0,600	194	10,91	7,63	3604	6,63	2148	5751	
56 041	34	F62 072	lighting fixture casement of boards	72	pcs	2,000	144	10,91	7,63	2670	1,75	126	2796	
			:											
<b>9</b>			<b>Site management</b>											
09 010	9	C11 011	responsible supervisor	11	mo						2657,33	29231	29231	
09 020	9	C11 012	foreman											
09 050	9	C15 015	guarding											
			:											

Building 90													26.1.1999	
Resource structures														
R	WS/P	Item	quantity		price	cost								
			unit	consumption			euro/unit	euro/unit						
		<b>25 021</b>	<b>Hollow core slab 265 jv 7m pk</b>	<b>m2</b>		<b>37,65</b>								
2	31 225	hollow core slab 265 4*10 7m pk	m2	1,000	28,57	28,57								
2	31 290	component transport 100 km	tn	0,367	8,23	3,02								
2	31 110	concrete K25 1-2 s/vb 18 mm	m3	0,017	55,70	0,95								
2	31 130	concrete transport 10km 3 m3 bucket	m3	0,017	7,51	0,13								
2	32 105	steel plates Fe 37 B	kg	0,333	0,47	0,16								
2	34 145	batten 45*45 V	m	0,110	0,57	0,06								
1	25 021	component installing contract	h	0,200	11,43	2,29								
1	25 000	construction labour	h	0,100	5,86	0,59								
1	9	social cost	%	66		1,89								
		<b>51 021</b>	<b>Sauna woodwork</b>	<b>pcs</b>		<b>303,63</b>								
2	34 144	studs c/c 600 50*50 V	m	1,920	0,60	1,15								
2	34 212	ceiling boarding, stv 15 mm pine	m	10,500	0,63	6,62								
2	34 212	lighting fixture casement, 15 mm pine	m	0,000	0,63	0,00								
2	34 212	wall boarding, stv 15mm pine	m	10,500	0,63	6,62								
2	34 860	sauna platform	pcs	1,000	185,33	185,33								
1	51 021	wood boarding carpenter's work	h	5,300	10,91	57,80								
1	51 000	construction labour	h	0,300	5,82	1,75								
1	9	social cost	%	70		41,68								

## Appendix E. Pricing of resource structures

An example how resource structures are priced using continuously updated company resource files (lower table). Abbreviations: R resource (1 = labour, 2 =product).

Building 90			26.1.1999			
Resource structures						
R	WS/P	Item	quantity		price	cost
			unit	consumption	euro/unit	euro/unit
	<b>25 021</b>	<b>Hollow core slab 265 jv 7m pk</b>	<b>m2</b>			<b>37,65</b>
2	31 225	hollow core slab 265 4*10 7m pk	m2	1,000	28,57	28,57
2	31 290	component transport 100 km	tn	0,367	8,23	3,02
2	31 110	concrete K25 1-2 sVb 18 mm	m3	0,017	55,70	0,95
2	31 130	concrete transport 10km 3 m3 bucket	m3	0,017	7,51	0,13
2	32 105	steel plates Fe 37 B	kg	0,333	0,47	0,16
2	34 145	batten 45*45 V	m	0,110	0,57	0,06
1	25 021	component installing contract	h	0,200	11,43	2,29
1	25 000	construction labour	h	0,100	5,86	0,59
1	9	social cost	%	66		1,89
	<b>51 021</b>	<b>Sauna woodwork</b>	<b>pcs</b>			<b>303,63</b>
2	34 144	studs c/c 600 50*50 V	m	1,920	0,60	1,15
2	34 212	ceiling boarding, stv 15 mm pine	m	10,500	0,63	6,62
2	34 212	lighting fixture casement, 15 mm pine	m	0,000	0,63	0,00
2	34 212	wall boarding, stv 15mm pine	m	10,500	0,63	6,62
2	34 860	sauna platform	pcs	1,000	185,33	185,33
1	51 021	wood boarding carpenter's work	h	5,300	10,91	57,80
1	51 000	construction labour	h	0,300	5,82	1,75
1	9	social cost	%	70		41,68

Building 90			26.1.1999	
Resource price file				
R	WS/P	Item	unit	euro/unit
2	31 225	hollow core slab 265 4*10 7m pk	m2	28,57
2	31 280	hollow core slab 265 jv 7m A120	m2	34,51
		:		
2	34 144	studs timber 50*50 V	m	0,60
2	34 160	studs timber 19*95 V	m	0,54
2	34 125	studs timber 50*100 V	m	0,87
		:		
1	25 021	component installing work	h	11,43
1	51 021	wood boarding carpenter's work	h	10,91
		:		

## Appendix F. Planning the activities

For the purpose of planning, control and supervision of the production, the production schedule is re-arranged to be used as activities and procurement schedule and a budget for the objective of the production (upper table). The schedule consists of labour, procurement and site tasks. Abbreviations: No successive number of the activity, WS work section, P product. The objective of any activity (shaded headings) has been set using the resources according to the structure of the activity (lower table). The activities structures are further used to produce an activities time schedule and purchase plan. Abbreviations: R resource (1 = labour, 2 = product, 3 = subcontract, 5 = own general resource), WS work section, P product.

Building 90							19.1.1999
Activities and procurement bill and budget							
No.	WS/P	Item	quantity	unit	h	euro, total	
<b>F CONSTRUCTION WORK</b>							
114	25	concrete component work	3879	m2	1807	27497	
115	25	cavity installation work	2987	m2	886	13872	
		:					
126	54	partition work	1291	m2	657	9905	
127	56	sauna carpenter's work	684	m2	942	14706	
<b>PRODUCTS</b>							
204	31 100	concrete components	10080	m3		424299	
205	31 140	hollow core slabs	2987	m2		98475	
<b>SUBCONTRACTS</b>							
310	64	joir					
311	72	ren					

SITE GENERAL		
401	9	site
402	9	hea

Building 90								19.1.1999
Activities structures								
R	WS/P	Item	quantity	unit	consumpt.	euro/unit	h	euro
<b>127 Sauna carpenter's work</b>								
1	56 152	studs timber V	553	m2	0,100	10,91	55	603
1	56 021	ceiling boarding	324	m2	0,600	10,91	194	2119
1	56 041	lighting fixture casement	72	pcs	2,000	10,91	144	1570
1	56 062	wall boarding	360	m2	0,400	10,91	144	1570
1	56 071	false ceiling gypsum boarding	126	m2	0,300	10,91	38	413
1	56 092	sauna platform 170	27	pcs	2,000	8,00	54	432
1	56 000	construction labour	160	h		5,83	160	932
1	9	social cost	66	%				5042
			684	m2				12682
<b>205 Hollow core slabs</b>								
2	31 415	hollow core slab 200 4*10 jv 7m pk easy	43	m2	43,5	24,85		1080
2	31 425	hollow core slab 265 4*10 jv 7m pk	2736	m2	2735,8	26,40		72211
2	31 427	hollow core slab 265 bottom floor jv 7m nk	207	m2	207,4	38,92		8070
2	31 480	hollow core slab 265 jv 7m A120	272	m2	272,4	5,93		1616
2	31 490	component transport 100km	1094	tn	1093,7	8,23		8996
			2987	m2				91974
<b>311 Rendering</b>								
3	72 105	render spraying, ceiling	1430	m2	1430,4	1,12		1607
3	72 115	wall rendering, board joints once	2122	m2	2122,1	0,93		1963
3	72 130	wall rendering 2,5 times	3228	m2	3228,1	2,33		7532
3	72 135	wall rendering, damp space	976	m2	967,4	2,33		2257
			7748	m2				13359
<b>401 Site management</b>								
3	09 050	site guarding	14	Bmo	13,6	81,53		1110
5	09 010	responsible supervisor	11	mo	10,9	1793,55		19550
5	09 020	foreman	9	mo	8,4	1286,28		10753
5	09 011	responsible supervisor, additional 50%	11	mo	10,9	887,72		9676
5	09 021	foreman, additional 50%	9	mo	8,4	643,14		5377
5	09 040	site office	14	Bmo	13,6	1,72		23
			10080	Bm3				46490

## Appendix G. Activity plan and procurement

The labour activities are planned before starting. The task plan shows the planned cost which shall be lower than the set objective (upper table). The shadowed heading refers to Appendix F, lower table. Abbreviations: R resource, (1 = labour), WS work section, P product.

As with the labour activities, the procurements also shall be within the limits of the set objective (lower table). The shadowed heading refers to Appendix F, lower table. Abbreviations: R resource, (2 = product), WS work section, P product.

Building 90		26.1.1999							
Work activity plan									
R	WS/P	Item	quantity	unit	h/unit	euro/unit	euro/h	h	euro
<b>127 Sauna carpenter's work</b>									
OBJECTIVE									
1	56 021	ceiling boarding	324	m2	0,900		10,91	292	3180
1	56 041	lighting fixture casement	72	pcs	2,000		10,91	144	1570
1	56 062	wall boarding	360	m2	0,400		10,91	144	1570
1	56 092	sauna platform	27	pcs	2,000		10,91	54	589
1	56 152	studs timber V	553	m2	0,100		10,91	55	603
1	56 000	construction labour	297	h			5,86	297	1739
1	9	social cost	70	%					6476
OBJECTIVE, TOTAL									15728
WORK PLAN									
1		sauna carpentry contract	27	pcs		267			7200
1		time rate labour, 4 h/week	220	h			7,50	220	1650
1		social cost	70	%					6195
PLAN, TOTAL									15045
DIFFERENCE FROM OBJECTIVE									683

Building 90		26.1.1999					
Actual procurement							
R	WS/P	Item	quantity	unit	euro/unit	euro	
<b>205 Hollow core slabs</b>							
OBJECTIVE							
2	31 415	hollow core slab 200 4*10 jv 7m pk easy	43	m2	24,85	1069	
2	31 425	hollow core slab 265 4*10 jv 7m pk	2464	m2	26,40	65037	
2	31 427	hollow core slab 265 ground floor jv 7m nk	207	m2	38,92	8056	
2	31 480	hollow core slab 265 jv 7m A120	272	m2	5,93	1614	
2	31 490	component transport 100km	1094	tn	8,23	8998	
OBJECTIVE, TOTAL						84774	
ACTUAL PROCUREMENT							
components free on site, lump sum						84000	
PROCUREMENT, TOTAL						84000	
DIFFERENCE FROM OBJECTIVE						774	

## Appendix H. Building specification

Building specification is written in the sequence of §Building 90 building and services elements classification tables. The different types of elements are identified by a project-specific alphanumeric code (e.g. VP01 = floor element type1) and their descriptions are brought from public or private files which take advantage of general specifications and other public reference documents. Below, an extract of the specification clauses referred to in appendices A to G.

### F27 Floor slabs

#### VP01 Reduced thickness component slab

- hollow core slabs 200 jv 7 m pk easy

#### VP02 Normal thickness component slab

- hollow core slabs 265 jv 7 m pk

#### VP03 Fire proof component slab

- hollow core slabs 265 jv 7 m A120

#### VP04 In situ concrete slab

- in situ concrete slab 200 mm, board moulding

#### F27 Quality requirements

- general quality according to *RunkoRYL 2000*:
  - concrete work: clauses 23.45, 23.46 and 25.53
  - thermal insulation work: clauses 61.411 and 61.422
- surface quality *BY 40*, class 2
- tolerances according to *RTT Component constructions, part E*:
  - prestressed hollow core slabs: clause 4.6 normal
  - others: clause 4.8 normal
- noise insulation:  $R'w = 55\text{dB}$
- fire protection class A120

### F41 Attic floors and roofs

#### YP01 Component slab, built-up roof

- protective gravel:  $d = 8 \dots 16$  mm, 40 kg/m<sup>2</sup>
- waterproofing: class B rubber-bitumen felt,
  - bottom layer: pressure balancing felt point-glued by bitumen B 95/35
- concrete layer 40 mm, float finish
- paper backing
- light aggregate Ks-30, 300...700 mm, ventilated, inclination > 1:60
- sheets of polystyrene R at roof drains if aggregate layer is < 300 mm
- polyethylene film 0,2 mm, 200 mm overlapping
- hollow core slabs 265 mm
- steel sheet flashing at walls

#### YP02 Component slab, steel sheet roof

- machine seamed metal sheet roofing, 0,6 mm plastic coated galvanised steel sheets
- polyethylene strips 5 mm under sheets in the middle parallel to seams
- sheathing 22\*100 mm according to *RT 85-10562* and construction drawings, roof pitch > 1:6
- beams 22\*100 mm perpendicular over rafters
- roofing underlay according to *RT 85-10562*
- ventilation space 100 mm
- principal rafters according to construction drawings
- wind protection hardboard 3.2 mm at fringes  $b = 1000$  mm
- thermal insulation:
  - mineral wool 30 mm, class 03.030
  - mineral wool 125 + 125 mm, class 01.045
- polyethylene film 0,2 mm
- hollow core slabs 265 mm

**F41 Quality requirements**

- general quality according to *RunkoRYL 2000*:
  - concrete work: clauses 23.45 and 25.53
  - metal work: clauses 34.113 and 34.46
  - thermal insulation work: clauses 61.411 and 61.413
  - waterproofing work: clause 631.51
- surface quality *BY 40*, class 2
- tolerances according to *RTT Component constructions, part E*:
  - prestressed hollow core slabs: clause 4.6 normal
  - others: clause 4.8 normal
- *concrete*: weather resistant
- *light aggregate* layer ventilated according to construction drawings and manufacturer's instructions
- *thermal insulation* tongue and groove plates shall be laid tightly in two layers
- *waterproofing* work shall immediately be protected by enveloping layers
- *roofing underlay* shall enable free water flow to the eaves
- *sheet metal work*:
  - roofing and adjoining metal work of plastic coated *PVF 2*, colour according to colouring scheme
  - flashing according to *RT-80-10632* and *RT 39-10422*
  - roofing installation according to *RT 85-10562*
- *waterproofing work*:
  - roof felt flashing 300 mm up to wall
  - roof felt layers glued together thoroughly by hot melt bitumen

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**F55 Uniform surface structures****YH01 Sauna wall and ceiling**

- proofing: 2 layer polyethylene film 2 \* 0,02 mm, glued seams, in ceiling 100 mm ventilation space open to adjacent dry rooms
- studs 100 \* 50, c/c 600 mm
- mineral wool 100 mm, class 01.041
- aluminium laminated paper, tight seams, aluminium towards ventilation space
- open spaced board sheathing 100 \* 22 mm, c/c 600, ventilation space 22 mm
- wood boarding, surfaced knotless spruce, zinc coated casing nails
- surface finishing: *Maalaus 93*, combination #890
- under sauna platform the walls are covered by aluminium sheets according to drawing

**F55 Quality requirements**

- general quality according to *SisäRYL 2000*:
  - sheet metal work: chapter 34
  - internal wood boarding: chapter 56
  - thermal insulation work: chapter 61
- tolerances of surfaced timber: *SisäRYL 2000*: table 56:T2, class 2
- ventilation space open in upper and lower edge >15 mm
- floor proofing raised up against wall plinth

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# Classification tables

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# Space classification

**Building 90 space classification** is used as a classification base of design briefs and room specifications in building projects as well as for property management, property markets and statistics.

Each class is assigned a *number* and an *index term*. Together they are called *classification descriptors*. In practice they are also recommended to be used together, but where adequate space is not available, as in tables, schedules etc., only numbers may be used.

The classification consists of two tables. The first table describes the classes of premises. The second one describes the classes of spaces. The tables are independent, but used together.

The *premises* are assigned three digit numbers according to the classification of buildings by Statistics of Finland.

The *spaces* may have designated numbers from two to  $N$  digits. However, this publication presents only two digit classification groups, confirmed and recommended by the *Building 90* committee. Supplementary digits (and subclasses as well) may be added according to a publication in Finnish. For three or more digits, company or project specific applications are also possible.

When classifying the spaces of a building, the classification descriptors are chosen first for the type of premises, taking into account their use (e.g. 311 theatre premises). To this is added the space type classification (e.g. 512 cloakroom and service desk). Between the classification numbers of premises and spaces a colon is used (e.g. 311:512 theatre cloakroom). For electronic data processing purposes also fixed length classification numbers without colon are possible (e.g. 311512 00).



## Premises

The classification of premises classifies the premises by their intended use. Premises may occupy an entire building or a part of it. For instance, a town hall may be occupied completely by municipal offices (151 offices). It may, on the other hand, consist of several premises in one or several buildings, each for a defined use, e.g. offices (151), a health centre (214) and a library (322).

The headings in bold typeface are not a part of classification; they only indicate a suitable classification main group to the user. The descriptors having a number ending to 9 may be used for items not classified in the main group elsewhere.

### **Residential premises**

- 011 dwellings in detached or semi-detached buildings
- 021 dwellings in one-dwelling houses
- 031 dwellings in blocks of flats
- 041 dwellings in free time residential buildings

### **Commercial premises**

- 111 shopping malls and halls
- 112 department store and shopping centre premises
- 113 detached shops
- 118 special purpose shopping premises
- 119 other shopping premises
- 121 hotel premises
- 122 motel premises
- 123 holiday, rest and recreation homes
- 124 rental and shareholder's holiday premises
- 129 other hostelry premises
- 131 residential home, dormitory etc. premises
- 141 restaurant premises

### **Office premises**

- 151 offices

### **Transport and communications premises**

- 161 rail and bus stations, air and harbour terminal premises
- 162 vehicle depots and service premises
- 163 car parks
- 164 communications buildings
- 169 other transport and communications premises

### **Premises for institutional care**

- 211 general hospitals
- 213 other hospitals
- 214 health centre premises
- 215 specialised health care premises
- 219 other health care premises
- 221 old-age homes
- 222 children's home and reform school premises
- 223 nursing homes for the mentally retarded
- 229 other health care premises
- 231 children's day care centres
- 239 social service premises not elsewhere classified
- 241 prison premises

### **Assembly premises**

- 311 theatres, opera houses, concert halls and congress centres
- 312 cinema halls
- 322 libraries and archives
- 323 museums and art galleries
- 324 exhibition halls
- 331 association and club premises
- 341 churches, chapels, monasteries, convents and prayerhouses
- 342 parish halls
- 349 other premises of religious communities
- 351 ice rink premises
- 352 swimming pool premises
- 353 tennis, squash and badminton courts
- 354 gymnasias and other sports halls
- 359 other premises for sports and physical exercise
- 369 other assembly premises

### **Educational premises**

- 511 general education premises
- 521 vocational education premises
- 549 educational premises not elsewhere classified

### **Industrial premises**

- 611 power stations
- 613 public utility premises
- 691 manufacturing plant premises

692 workshops for industry and small scale industry

599 other industrial production premises

### **Warehouses**

711 industrial warehouses

712 commercial warehouses

719 other warehouses

### **Defence, rescue and fire fighting premises**

721 fire stations

722 civil defence shelters

729 other fire fighting and rescue service premises

731 police stations

741 barracks

742 sea and air surveillance premises

799 other defence and military premises

### **Agricultural premises**

811 cowsheds, pighouses, hen-houses etc.

812 other animal shelters, harness horse stables, maneges etc.

891 grain drying and storage premises

892 greenhouses

893 fur farm premises

899 other premises in agriculture, forestry and fishing

### **Other premises**

931 sauna premises

941 outbuilding premises

999 premises not elsewhere classified

## **Spaces**

The classification of spaces classifies the rooms and other spaces by their intended use. For this purpose, spaces are considered to cover both rooms enclosed by floor, ceiling and walls, as well as spaces for defined functional requirements, but by imaginary limits. Thus, an entry space (83) may be a part of an open public service hall (84) or a closed room as required for security reasons in many office premises. The functional requirements of spaces are defined in detail in the design brief.

As is the case in Finland, the common target price estimation method is based on spaces, the classification follows that method and is arranged in four groups:

- spaces occurring only in certain types of premises (groups 1..4)
- spaces occurring in any kind of premises (groups 5..7)
- spaces common to several premises and defined in the design brief (group 8)
- communication and technical service spaces dependent on the design solution (group 9).

The descriptors having a number ending to 9 may be used for items not classified in the main group elsewhere.

### **1 Dwelling spaces**

11 dwellings according to the number of rooms an alternative to class 12, e.g., a dwelling of three rooms, a kitchen and necessary auxiliary spaces (113)

12 dwelling rooms independently an alternative to class 11, e.g. bedroom (122)

13 quartering rooms dwelling rooms separate from dwellings

14 dwelling rooms in old-age homes, children's homes and other health care premises

15 dwelling rooms in residential homes etc.

16 hotel rooms

17 barrack dwelling rooms

18 dormitories

19 other dwelling spaces see also: 2 administration and office spaces, 5 storage spaces, 6 culinary spaces, 7 staff facility spaces, 8 common spaces, 9 communication and technical service spaces

### **2 Administration and business spaces**

21 office spaces

22 commercial spaces kiosks, shops, shopping halls, shopping malls

23 auxiliary spaces for commerce

- e.g. bottle recycling spaces, handling spaces of foods
- 29 other administration and business spaces  
see also: 5 storage spaces, 6 culinary spaces, 7 staff facility spaces, 8 common spaces, 9 communication and technical service spaces
- 3 Education and research spaces**
- 31 classrooms
- 32 specific education spaces  
e.g. training kitchen (3242), biology class (32461), language studio (3249)
- 33 lecture rooms
- 34 auditoria
- 35 workshops of vocational training
- 36 laboratories
- 38 control rooms connected to educational spaces
- 39 other education and research spaces  
see also: 2 administration and office spaces, 5 storage spaces, 6 culinary spaces, 7 staff facility spaces, 8 common spaces, 9 communication and technical service spaces
- 4 Other premises-specific spaces**
- 41 manufacturing and other production spaces
- 42 health care spaces  
spaces for non-institutional care
- 43 hospital spaces  
spaces for institutional care
- 44 children's day care spaces
- 45 spaces for worship
- 46 spaces of cultural institutions  
e.g. spaces of libraries, theatre stages, exhibitions and their auxiliary spaces as ticket offices, publication kiosks etc.
- 47 physical exercise spaces  
e.g. for gymnastics, ball games and swimming
- 48 recreation and pleasure spaces  
e.g. dance halls, discotheques
- 49 other premises-specific spaces  
see also: 2 administration and office spaces, 5 storage spaces, 6 culinary spaces, 7 staff facility spaces, 8 common spaces, 9 communication and technical service spaces
- 5 Storage spaces**
- 51 cloakrooms
- 52 storages
- 53 archives
- 54 motor vehicle spaces
- 59 other storage spaces
- 6 Culinary spaces**
- 61 dining spaces
- 62 canteens
- 63 cafeterias and restaurants
- 64 kitchen spaces
- 65 kitchen cold stores
- 69 other culinary spaces  
see also: 2 administration and office spaces, 5 storage spaces, 7 staff facility spaces, 8 common spaces, 9 communication and technical service spaces
- 7 Staff facility spaces**
- 71 locker spaces
- 72 washrooms
- 73 toilets and lavatories
- 74 sauna spaces
- 75 break and rest spaces
- 77 club and hobby spaces
- 79 other staff facility spaces  
see also: 2 administration and office spaces, 5 storage spaces, 6 culinary spaces, 7 staff facility spaces, 8 common spaces, 9 communication and technical service spaces
- 8 Common spaces**  
common spaces of the premises which are defined in the design brief
- 81 civil defence shelters
- 82 store spaces of the property  
e.g. inventory stores, sports equipment and pram storages
- 83 entry spaces  
e.g. draft lobbies, waiting rooms, loading and unloading spaces
- 84 service spaces for the public e.g. banking halls
- 85 laundry spaces
- 86 spaces for cleaning utensils  
e.g. cleaning utensils room, janitor's shop, snow clearing machinery room
- 87 waste management spaces
- 88 special spaces of the property  
e.g. disposal spaces of poisonous or inflammable material
- 89 other common spaces
- 9 Communication and technical service spaces**  
spaces of the premises depending on the design solution
- 91 horizontal communication spaces
- 92 vertical communication spaces
- 94 heating, water supply and sewage spaces
- 96 ventilation and air conditioning spaces
- 97 spaces for electric services
- 98 outdoor spaces e.g. balconies, terraces, covered outdoor spaces
- 99 other communication and technical service spaces

# Project and element divisions

**Building 90 project and element classification** is used during the building project from the initiation to handover. Using this classification the total project can in any stage be broken down in its entirety into cost items needed in development, design and production. For this purpose, the classification consists of project divisions (classification subtables from A to C and K to M) and physical building and service elements divisions (classification subtables from D to J).

Each class is assigned an alphanumeric *symbol* (a letter followed by a number) and an *index term*. Together they are called *classification descriptors*. In practice they are also recommended to be used together, but where adequate space is not available, as in tables, schedules etc., only symbols may be used.

The classification subtables from A to C and K to M are used only in managerial accounting related tasks in developer's, builder's and contractor's management.

The main use of classification subtables from D to J is to co-ordinate all building construction activities, which can be described by *building or services elements*, and which need information transfer and sorting, as plans and drawings, bills and schedules, estimates and budgets, whether they are of managerial or technical nature.

## A Project division: Building management

**B**uilding management cost entries include feasibility studies, project planning, marketing, process personnel as well as operation and maintenance manuals. The information is broken down according to the developer's practice.

## B Project division: Development

**D**evelopment cost entries include developer's administration, design activities, official activities, measures to manage a company or partnership and fees of joining to public services.

### **B1 Developer's administration**

- B11 project management
- B12 site supervision
- B13 project committee
- B14 lawyer's fees
- B15 builder's representation
- B16 design competition and preparation of design contracts
- B17 tendering and preparation of construction contracts

### **B2 Design**

- B21 architect's design
- B22 construction design
- B23 mechanical services design
- B24 electrical services design
- B25 data processing services design
- B26 soil exploration and foundation design
- B27 other design and research activities
- B28 models, specimens, samples and tests
- B29 copying and data processing

### **B3 Official activities**

- B31 municipal building control
- B32 other official control activities

### **B4 Facility or partnership costs and payments**

- B41 establishment of company or partnership  
many housing developments have the legal status of a condominium stock company
- B42 costs of company or partnership management during the construction
- B43 costs of shared air-raid shelter
- B44 costs of shared parking facilities
- B45 other shares and payments

### **B6 Fees of joining to public services**

#### **B7 Additional costs**

- B71 additional work and alteration costs
- B72 compensation of costs level changes
- B73 taxation changes
- B74 labour market disturbances
- B75 other additional costs

## C Project division: Site general

The cost entries called *site general* include costs incurred by construction activities on site, but not directly needed to install construction products in building or service elements.

### C1 Site administration

- C11 supervision of work
- C12 site office
- C13 storeroom services
- C14 surveys
- C15 site guarding
- C16 technical training
- C17 representation
- C18 shop stewards, occupational health service
- C19 workers' safety protection

### C2 Temporary installations

- C21 site huts
- C22 site roads and storing areas
- C23 fences and signboards
- C24 water supply and sewage
- C25 provisional electric supply
- C26 provisional telecommunication supply
- C27 site lodgings

### C3 Auxiliary technical work and service

- C31 auxiliary construction work  
e.g. cutting holes in elements for subcontractors
- C32 connecting work to services networks
- C33 sheltering of finished works
- C34 care and cleaning of site huts
- C35 on-site transportation
- C36 traffic control
- C37 cleaning
- C38 final cleaning up
- C39 on-site reparations

### C4 Energy and supplies

- C41 on-site produced energy
- C42 electric energy
- C43 water
- C44 gas
- C45 fuels
- C46 district heating

### C5 Lifting and transportation

- C51 tower cranes
- C52 vehicle cranes
- C53 site lifts

- C54 scaffolding

### C6 Site equipment and utility goods

- C61 machines
- C62 tools
- C63 utility goods  
during the construction process consumed commodities which are not practical to register into elements of construction or work sections as nails, screws, bolts, wires, ropes as well as lamps, fuses, lubricants and toilet paper

### C7 Quality control and measurements

- C71 site measurements
- C72 quality control measurements and tests
- C73 research measurements and tests
- C74 soil exploration measurements and tests

### C8 Additional work caused by winter

- C81 snow and ice clearing
- C82 soil frost melting and breaking
- C83 thermal sheltering
- C84 heating and drying

### C9 Specific costs

- C91 site insurance
- C92 securities and fines
- C93 guarantee reparations
- C94 compensations for damages
- C95 loss of profits insurance
- C96 site lease
- C97 tool repayments to workers
- C98 compensation for travelling expenses

## D Element division: Building elements on plot

Building 90 project divisions from D to J are reserved for elements of construction – building elements and services elements. Division D, building elements on plot, has been separated from other elements to facilitate design, production and management of the maintenance.

The external limit of elements on plot is generally the propriety. The limit against the other building and services elements is the external surface of foundations.

### D1 Existing elements on plot

- D11 existing vegetation
- D12 existing buildings and other constructions
- D13 existing pipelines
- D14 existing electric cables and aerial conductors
- D15 existing paving

### D2 Earth excavation on plot

- D21 pit excavation in earth
- D22 trench excavation in earth

### D3 Rock excavation on plot

- D31 pit excavation in rock
- D32 trench excavation in rock
- D33 tunnels and cavities
- D34 rock reinforcement on site

### D4 Filling on plot

- D41 external construction backfill
- D42 pipeline backfill
- D43 landscape fillings
- D44 structural layers filling

### D5 Pipelines on plot

- D51 pipelines
- D52 manholes and inspection cambers
- D53 draining

### D6 Gardening

- D61 lawns
- D62 trees
- D63 bushes
- D64 other plants

### D7 Pavements

- D71 bituminous pavements
- D72 other pavements
- D73 kerbs and gutters

### D8 Equipment on plot

- D81 fences
- D82 building accessories  
e.g. flagpoles, mailboxes
- D83 guidance signboards
- D84 sports and playground equipment
- D85 waste disposal equipment
- D86 traffic area equipment
- D87 lighting equipment

### D9 External constructions on plot

buildings and other constructions detached from the very building as embankments, retaining walls, external car shelters, storehouses and tanks, ramps and stairs in terrain, culverts, bridges, pools, pergolas etc.; the breakdown is made by project because of the variety of items

## E Element division: Substructure elements

Elements of construction supporting the superstructure of building. The limit between substructure elements (E) and structural elements (F) is the lower side of footings and thermal insulation. The substructure elements include all elements under the very building. They may extend not more than 5 meters from the outer level of external wall, outside this they belong to elements on plot (D).

### E1 Earth excavation for buildings

- E11 foundation excavation in earth
- E12 pit excavation in earth
- E13 trench excavation in earth

### E2 Rock excavation for buildings

- E21 foundation excavation in rock
- E22 pit excavation in rock
- E23 trench excavation in rock
- E24 rock reinforcement for buildings

### E3 Filling for buildings

- E31 foundation base filling layers
- E32 foundation backfill
- E33 internal filling layers
- E34 internal pipeline backfill

### E4 Pipelines in building substructure

- E41 pipelines in substructure
- E42 manholes and inspection chambers
- E43 draining in substructure

### E5 Soil stabilisation

- E51 piles
- E52 soil reinforcement
- E53 special soil stabilisation

## F Element division: Structural elements

Elements of construction composed of general building products. The limit between substructure elements (E) and structural elements (F) is the lower side of footings and thermal insulation.

### F1 Foundations

- F11 footings
- F12 strip foundations
- F13 ground floor slabs
- F14 special foundation structural elements

### F2 Structural frame elements

- F21 civil defence shelters  
although the civil defence shelter normally is considered to be a space, a place is allocated to it as an structural frame element; this class includes not only the load bearing elements but also the special splinter and gas proof doors as well as the shelter inventory required by legislation
- F22 shafts
- F23 stairs
- F24 load bearing walls
- F25 columns
- F26 beams
- F27 floor slabs
- F28 box units  
excluding roof superstructure elements, see F45

### F3 External envelope

- F31 external walls
- F32 windows
- F33 external doors
- F34 external wall complementaries  
elements connected to external envelope, as loading docks, balconies, ladders, sunshades etc.

### F4 Roof elements

- F41 attic roofs and floors  
including both the load bearing floor, thermal insulation and waterproofing roof
- F42 gables and eaves
- F43 roof complementaries  
gutters, drainpipes, catwalks, snow barriers, bollards and other complementary elements of the roof
- F44 skylights
- F45 roof superstructure elements  
machine rooms for lifts, ventilation etc.
- F46 roof terraces



**F5 Internal complementaries**

- F51 internal doors
- F52 partitions
  - includes also windows in partitions as well as glazed partitions
- F53 suspended ceilings
- F54 access floors
- F55 uniform surface structures
  - surface structures covering both walls, ceilings and possibly floors, e.g. sauna sheathing
- F56 railings, maintenance platforms and catwalks
- F57 flues, ducts, chimneys, fireplaces
  - excluding electric stoves, see F73

**F6 Internal surfaces**

- F61 wall surfaces
- F62 ceiling surfaces
- F63 floor surfaces

**F7 Internal equipment**

- F71 fittings
  - e.g. built in cabinets, workbenches
- F72 equipment
  - e.g. coat racks, mirrors, nameboards, curtain rods, venetian blinds etc.
- F73 machines and devices
  - e.g. electric ranges, refrigerators, sauna stoves etc., see also F57
- F74 special internal equipment
  - fittings, equipment and machines designed and installed as an uniform entity according to the functional use of the space, e.g. equipment for large scale kitchens and laundries, gymnastic halls etc.

**F8 Transportation equipment**

- F81 lifts
- F82 escalators, conveyors
- F83 other transportation elements

**G Element division:  
Mechanical services elements**

**M**echanical services elements include heating, water and sewer, air conditioning, refrigerating, gas and compressed air, fire extinguishing systems and other similar systems.

**G1 Heating services**

- G11 heating plant
- G12 heat distribution
- G13 room heaters and other heat dissipation
  - electric heaters, see H61
- G14 thermal insulation related to heating

**G2 Water and sewage services**

- G21 water treatment systems
- G22 domestic water installations
- G23 sewage treatment systems
- G24 sewer network installations
- G25 plumbing fixtures
- G26 insulation related to water and sewer services

**G3 Air conditioning services**

- G31 air conditioning plant
- G32 elements of air conditioning units
- G33 ducts
- G34 air conditioning terminal units
- G35 civil defence shelter ventilation
- G36 air conditioning systems of specific requirements
  - e.g. clean space air conditioning
- G37 insulation related to air conditioning

**G4 Refrigeration services**

- G41 refrigeration plant
- G42 refrigeration and cooling distribution
- G43 room coolers and other cooling dissipation
- G44 specific refrigeration and freezing systems
- G45 insulation related to refrigeration

**G5 Gas services**

- G51 compressed air services
- G52 medical gas services
- G53 industrial gas services
- G54 laboratory gas services
- G55 natural gas services
- G56 liquidated gas services

**G6 Steam services**

- G61 steam generation plant
- G62 steam distribution
- G63 insulation related to steam services

**G7 Fire extinguisher services**

- G71 portable fire extinguishers
- G72 fire hydrants
- G73 sprinkler system
- G74 water spray fixed systems
- G75 foam systems
- G76 CFC systems
- G77 CO<sub>2</sub> systems

**G8 Other mechanical services**

- G81 supplementaries for auxiliary power units
- G82 local exhaust systems
  - e.g. sawdust, exhaust gas, welding fume evacuation
- G83 smoke evacuation
- G84 central vacuum cleaner systems
- G85 pneumatic dispatch
- G86 swimming pool equipment

**H Element division:  
Electrical services**

**E**lectrical services include all electrical power service systems. The electrical information service systems are in division J.

**H1 Electrical services on plot**

external electric networks and equipment

**H2 Distribution boards**

- H21 high voltage equipment over 1000 V
- H22 distribution boards under 1000 V
- H24 filters

**H3 Installation channels**

- H31 cable shelves
- H32 cable ducts and power skirtings
- H33 cable flashings

**H4 Conductors and conductor equipment**

- H41 main supply
- H42 earthing
- H43 risers
- H44 power distribution
- H45 lighting distribution

**H5 Lighting systems**

- H51 lighting fixtures

**H6 Heaters and other equipment**

- H61 heaters
  - only electric heaters, see also F57,F31 and G61
- H62 equipment related to electric installations

**H7 Special electric systems**

- H71 special installations
- H72 auxiliary power systems
- H73 spare parts and tools
- H74 safety lightning
- H75 stage rigging systems

## J Element division: Information system services

Elements of information service systems include all electrical information systems as telephone, antennae, closed circuit broadcasting, property surveillance and integrated systems. The electrical power service systems are in division E.

### **J1 Telephone systems**

- J11 public telephone network systems
- J12 closed circuit telephone systems
- J13 other telephone systems

### **J2 Broadcast reception systems**

- J21 collective antenna systems
- J22 other antenna systems

### **J3 Sound reproduction and signalling systems**

- J31 closed circuit broadcasting
- J32 personal signalling systems
- J33 time display systems
- J34 conference systems
- J35 special systems  
e.g. hospital systems
- J36 other sound reproduction and signalling systems

### **J4 Property data systems**

- .J41 property data networks
- J42 property data system devices

### **J5 Security and surveillance systems**

- J51 fire detection systems
- J52 burglar detection systems
- J53 video surveillance systems
- J54 access control and working hours surveillance systems
- J55 fire fighting control system
- J56 other security and surveillance systems

### **J6 Building automation systems**

- J61 central control boards
- J62 local control boards
- J63 programmes
- J64 terminal devices
- J65 cables
- J66 other building automation devices

### **J7 Integrated systems**

- J71 open networks
- J72 other integrated devices

## K Project division: Project activities abroad

**B**uilding projects abroad may include developer's or builder's activities, not occurring in domestic projects. These may cause varying costs depending on the country in question.

### **K1 Specific developer's or builder's cost abroad**

- K11 sponsors and agents
- K12 financing
- K13 tendering documents
- K14 establishing a local partnership
- K15 specific cost of domestic personnel

### **K2 Specific site cost abroad**

- K21 lodging of the project staff
- K22 travelling
- K23 international transport
- K24 recruiting
- K25 insurance of the project staff
- K26 children's education
- K27 health care
- K28 boarding of the staff
- K29 recreation and leisure time of the staff

## L Project division: Plot

**D**eveloper's cost for acquisition of the plot, not included in the building cost.

- D1** purchase price, stamp duty tax and interest charges on the purchase price
- D2** plot rent and other plot costs during the construction time
- D3** expenditures for plot-related official activities, legal confirmation of possession and land surveying
- D4** expenditures of freeing the plot, evicting the tenants and maintenance of existing buildings
- D5** planning cost
- D6** off-site municipal engineering cost.

## M Project division: Operational investments

Operational investments include furniture, office devices and other inventory, as well as process machinery and starting cost of the activities in the building. These costs are not included in the building cost.

The information is broken down according to project specific needs.

# Work sections classification

**Building 90 work sections classification** is used in cost estimation, usually to break down items described as building elements. It includes all works of ordinary building materials (concrete, metal, stone, wood etc.). The works of mechanical and electrical installations are excluded, as these branches of building have classification tables of their own.

The table is also used to indicate trades and subcontracts.

The table has two digit classification. The first one indicates the main group and the second one the work section proper.

Each class is assigned a *number* and an *index term*. Together they are called *classification descriptors*. In practice they are also recommended to be used together, but where adequate space is not available, as in tables, schedules etc., only numbers may be used.

## Work sections

### 0 (vacant)

#### 1 Sitework

- 11 clearing and pulling down
- 12 excavation of earth
- 13 excavation of rock
- 14 pile driving work
- 15 stabilisation of earth and reinforcing the rock
- 16 filling work
- 17 pipeline installation work
- 18 soil superstructure work  
e.g. paving, tiling and planting
- 19 site equipment installation work

#### 2 Concrete work

- 21 form work
- 22 reinforcing work
- 23 concrete casting work
- 24 concrete surface casting  
e.g. in-situ floor topping
- 25 concrete component work
- 26 concrete surface finishing work
- 27 concrete trimming and filling work

#### 3 Metal work

- 31 structural steel work
- 32 metal door and window installation work
- 33 metal component work  
e.g. installation of metallic external wall components
- 34 sheet and profile metal work
- 35 metallic complementary elements installation work  
e.g. installation of railings, snow barriers, maintenance platforms, metallic partitions etc.
- 36 machine installation work  
e.g. installation of lifts

#### 4 Masonry work

- 41 brickwork
- 42 blockwork
- 43 natural stone work
- 44 tile dry laying  
e.g. roof tiling

#### 5 Carpentry work

- 51 structural carpentry work
- 52 door and window installation work
- 53 wood component work
- 54 partition work
- 55 panelling work

- 56 internal wood boarding and moulding work
- 57 cabinet installation work
- 58 cabinet joinery  
fixtures built on-site, e.g. bank counters

#### 6 Insulation and proofing work

- 61 thermal insulation work
- 62 acoustic insulation work
- 63 waterproofing work
- 64 jointing and sealing work
- 65 fire insulation work

#### 7 Surface finishing work

- 71 plastering work
- 72 rendering and screeding work
- 73 painting work  
includes also wallpapering
- 74 tiling work
- 75 carpet and linoleum work
- 76 floor coating work
- 77 parquet work
- 78 false ceiling work
- 79 glazing

#### 8 Renovation work

- 81 interim supporting work
- 82 dismantling work
- 83 groove and hole cutting work
- 84 interim sheltering and protection work
- 85 surface repairing work
- 86 special renovation work  
specialised architectural, decorative and restoration works depending on the project, e.g. gypsum mouldings, stucco lustro

#### 9 (vacant)

# Construction products classification

**Building 90 construction products classification** itemises commodities which are installed in the construction work in a permanent way or used up during the construction process (groups from 2 to 8). However, two exceptions have been made to this definition of Construction Products Directive to support public indices.

For this purpose the first deviation of the table is the group 1 *Worksite equipment*. It includes construction equipment, which are neither installed in the building nor used up during the construction process. They are, however, important on the building commodity market and thus deserve a place in public indices. – This group is omitted in activities schedules, work plans, and other similar project estimates; instead is used the independent *Site equipment classification* table.

The second deviation is group 9 *Operational devices*. It includes such devices which are often specified and selected during the design process, but which are not accounted for building products. Among such products are e.g. furniture, textiles and other decorative products, works of art, room plants and office electronics, and they are included in public indices. – As the operational devices are not accounted for building costs, this group is not used in developer's, builder's or contractor's estimates.

Each class is assigned a *number* and an *index term*. Together they are called *classification descriptors*. In practice they are also recommended to be used together, but where adequate space is not available, as in tables, schedules etc., only numbers may be used.

The *Building 90* committee has recommended to maintain the classification tables on two digit level also in company applications. For public indices, the Finnish Building Centre has published an application having an accuracy of 3 to 5 digits.



# Construction products

## 1 Worksite equipment

- 11 workers' protection equipment
- 12 temporary accommodation products
- 13 site machinery
- 14 machines, tools and their accessories
- 15 measuring and control devices
- 16 cold weather construction equipment
- 17 utility goods
- 18 special site equipment

## 2 Site and subconstruction products

- 21 blasting products
- 22 aggregates
- 23 subconstruction products
- 24 underground pipes
- 25 paving products
- 26 landscaping products
- 27 outdoor fittings
- 28 outdoor structural fittings

## 3 General products

construction products used for several groups of building elements, e.g. concrete, profiles of metal, bricks and blocks, timber, building boards etc.

- 31 concrete products
- 32 metal products
- 33 masonry products
- 34 timber
- 35 plastic products
- 36 building boards
- 37 insulation products
- 38 waterproofing products
- 39 structural building systems

## 4 Structure completing products

- 41 windows
- 42 doors
- 43 curtain wall products
- 44 partitions
- 45 suspended ceiling products
- 46 access floor products
- 47 fireplace, flue and chimney products
- 48 accessories  
includes prefabricated balustrades, hand-rails, ladders, roof bollards, snow barriers, roof catwalks, ironmongery for doors, windows and fixtures, and fasteners

## 5 Finishing products

- 52 tiles
- 53 floor coverings
- 54 wall finishes

includes rigid boards, flexible sheets, wallpapers and other wall finishing products

- 55 plasters, renders and glues
- 56 skirting products, profiles, tapes
- 58 paints
- 59 special finishing products

## 6 Building fixtures and fittings

- 61 general fixtures
- 62 domestic fixtures and fittings
- 63 office and workshop fixtures and fittings
- 64 storage fixtures and fittings
- 65 fixtures and fittings for the building
- 66 special fixtures and fittings
- 67 appliances
- 68 emergency shelter fixtures and fittings
- 69 transportation machinery

## 7 Mechanical installations products

- 70 general installation products  
includes pipes, tubes, hoses, valves, pumps and their accessories
- 71 heating systems products
- 72 water and sewage systems products
- 73 ventilation products
- 74 refrigeration appliances
- 75 pneumatic and gas piping products
- 76 steam piping products
- 77 fire fighting products
- 78 special mechanical installation products

## 8 Electric installation products

- 81 site power supply products
- 82 distribution boards and switchgear
- 83 conduits and their accessories
- 84 cables and wiring products
- 85 lightning fittings
- 86 heating appliances
- 87 special electric installation products
- 88 control and information appliances

## 9 Operational devices

- 91 furniture
- 92 decorative textiles
- 93 interior decoration products
- 94 works of art
- 95 plants, aquaria
- 97 by function specified devices  
fixtures and appliances specified by the function of the building or premises
- 98 uniform interior entities  
entities including products from all or several subgroups of 9.
- 99 unspecified devices (vacant for special use)

## Site equipment classification

**Building 90 site equipment classification** itemises the use of machines and tools during the construction process. Conceptually it has been divided into equipment used for specified work sections (groups from 1 to 8) and general equipment, the use of which is not specified by work sections.

The classification table is used to itemise the use of site equipment and sub-contracts in production estimates together with the products classification. It is also used in contractor's price files and public indices.

Each class is assigned a *number* and an *index term*. Together they are called *classification descriptors*. In practice they are also recommended to be used together, but where adequate space is not available, as in tables, schedules etc., only numbers may be used.

## Site equipment

### 1 Earthwork equipment

- 11 equipment for clearing and pulling down
- 12 earth excavation equipment
- 13 rock blasting and excavation equipment
- 14 filling equipment
- 15 pile driving equipment
- 16 earth stabilisation and rock reinforcing equipment
- 17 pipeline installation equipment
- 18 equipment for soil superstructure work

### 2 Concrete work equipment

- 21 forms
- 22 reinforcing equipment
- 23 casting equipment
- 24 surface casting equipment
- 25 concrete component work equipment
- 26 concrete surface finishing equipment
- 27 concrete trimming and filling equipment

### 3 Metal work equipment

- 31 steel skeleton installation equipment
- 32 metal door and window installation equipment
- 33 metal component installation equipment
- 34 metal sheet and profile installation equipment
- 35 metallic complementary units installation equipment
- 36 machine installation equipment

### 4 Masonry work equipment

- 41 brick masonry equipment
- 42 block masonry equipment
- 43 natural stone work equipment
- 44 tile dry laying equipment

### 5 Wood work equipment

- 51 timber skeleton installation equipment
- 52 door and window installation equipment
- 53 wood component installation equipment
- 54 partition installation equipment
- 55 panelling equipment
- 56 internal wood lining equipment
- 57 cabinet installation equipment
- 58 cabinet joinery equipment

### 6 Insulation and proofing equipment

- 61 thermal insulation equipment
- 62 acoustic insulation equipment
- 63 proofing equipment

- 64 jointing and sealing equipment
- 65 fire insulation installation equipment

### 7 Surface finishing equipment

- 71 plastering equipment
- 72 rendering and screeding equipment
- 73 painting equipment
- 74 tiling equipment
- 75 carpet and linoleum installation equipment
- 76 floor coating equipment
- 77 parquet installation equipment
- 78 suspended ceiling installation equipment
- 79 glazing equipment

### 8 Renovation equipment

- 81 supporting equipment
- 82 dismantling equipment
- 83 groove and hole cutting equipment
- 84 sheltering and protection equipment
- 85 surface repairing equipment
- 86 specialised renovation equipment

### 9 General site equipment

- 91 worker's protection equipment
- 92 temporary accommodation equipment
- 93 transportation and cleaning equipment
- 94 lifting and moving equipment, scaffolds
- 95 handicraft machinery and tools
- 96 measuring equipment
- 97 heating and sheltering equipment