TALLINN UNIVERSITY OF TECHNOLOGY
TTK UNIVERSITY OF APPLIED SCIENCES
CONSTRUCTION CENTRE

CCI-EE CLASSIFICATION SYSTEM: ESSENCE AND USE

SECOND UPDATED VERSION OF THE GUIDANCE MATERIAL

COMPILERS: ROODE LIIAS, IRENE LILL, RAIDO PUUST, AIVARS ALT, PILLE HAMBURG, KEA SIIDIRÄTSEP, ENN TAMMARU

Tallinn University of Technology.

TTK University of Applied Sciences.

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CONSTRUCTION
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INTERNATIONAL

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CCI-EE - Construction Classification International
Second updated version of the guidance material

Compilers:

Roode Liias

Irene Lill

Raido Puust

Aivars Alt

Pille Hamburg

Kea Siidirätsep

Enn Tammaru

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This guidance material has been compiled at the request of the Ministry of Economic Affairs and Communications (MEAC) and is intended for use by all participants in the construction and real-estate sector, including clients, material manufacturers, architects, designers, builders, real estate developers, etc., and it covers all stages of the construction process lifecycle, from planning and sketching solution to demolition. According to the CCI-EE system, both buildings and facilities are classified in the field of construction on the basis of uniform principles, therefore the term "construction entity" is used throughout this guide, unless it has been necessary to specify the type of a construction entity due to the content of the sentence.

1. WHY A CLASSIFICATION SYSTEM IS NEEDED IN CONSTRUCTION

The idea of using a common classifier is to enter the information once and make it available to all agents throughout the life cycle stages of the construction entity.

Indeed, the question may arise that if so far the construction process agents have classified their activities, e.g. material manufacturers did so by product properties, construction economists - by building parts, construction companies - by type of work in their chronological order, property maintenance providers - by repair and maintenance work, etc. then why a universal classifier is needed now. Construction entities are getting built anyway. Separately, everything would be fine, but the problem is that all these products, parts of buildings, and activities come together in one construction entity, and, in order to move from one stage of the construction process lifecycle to another, a lot of extra work is needed to make the data compatible and comparable. For example, the construction economist has classified the ceilings in one expenditure line, but the builder plans to build the ceilings alternately with construction of the walls, and the construction of the ceilings includes different types of work (shuttering, reinforcement, concreting, striking) which are done at different times and possibly even by different brigades. It may happen that the systematization of cost estimate lines by type of work is hasty and haphazard, resulting in delays in the work schedule. The universal classifier, in which materials, elements, parts of the building, works, etc. are interconnected, and this data is entered once, makes it possible to avoid these additional works and errors, not to mention saving time.

In a more global perspective, the low productivity of the construction sector should be mentioned first. The former main leader in innovation, with many achievement examples such as the Pyramids of Giza, the Roman Pantheon and aqueducts, and, in the recent past, the Empire State Building in New York, has become a stagnant sector today. D. Glennon has compared real productivity growth in the United States over the period 1940-2016 and found that while productivity in agriculture has increased by about 1,500% and in manufacturing and by 700% in trade, it has increased by only 6% in the construction sector (*Glennon, 2019*).

According to a survey by the *World Economic Forum* (*WEF*), the productivity of the US construction sector, which uses the *compound average growth rate* (CAGR) as an indicator, has even fallen by 19%, while the manufacturing industry index has risen by around 150% (WEF, 2016).

The reasons for the low productivity growth include the low digitalization of the construction sector, which is shown in Figure 1 compared to other sectors. Paradoxically, agriculture and hunting are in second place after the construction sector, and agriculture, despite its low level of digitalization, has grown significantly 15-fold in the last 70 years. Therefore, digitalization cannot be considered as the only reason for low productivity. As other reasons for the lack of investment, research and development have been cited. Expenditure on research and development in the construction sector is 1% of revenue, while similar expenditure in the automotive and aerospace industries is 3.5–4.5% (McKinsey & Co, 2016).

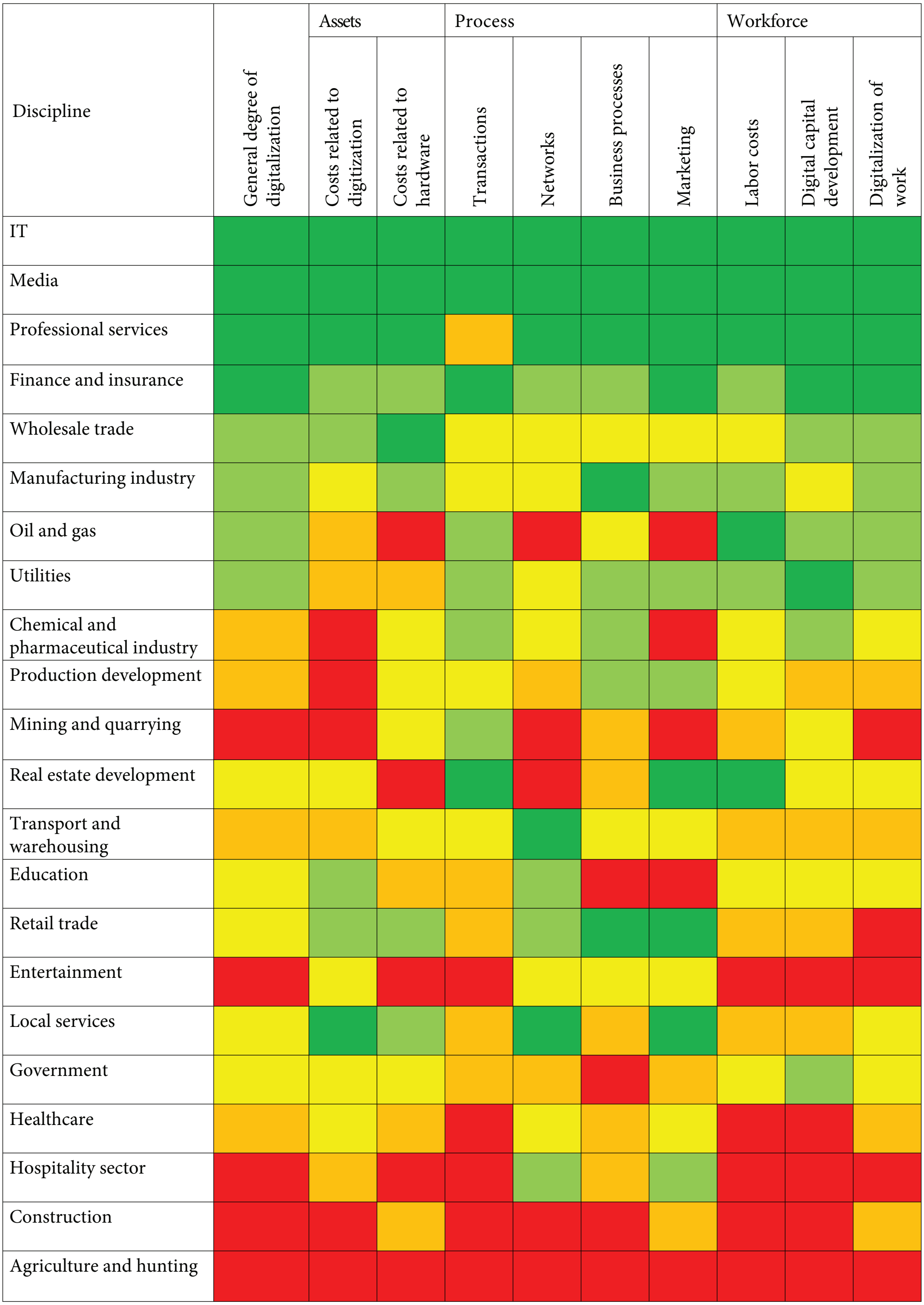

Figure 1. Digitalization of the construction sector compared to other economic sectors (McKinsey & Co, 2016) (color code: green indicates high, yellow – medium, and red – low)

When we talk about the digitalization of construction, we should have the same understanding of what it means. By digitalization, we mean paperless document circulation, design based on building information models, modeling with 3D digital twins, but also work management, financial and warehousing monitoring, and integration of different software. Uploading *Portable Document Format* (.pdf) files to any platform is not digitalization, as they only replace paper drawings and are not machine-readable. Thus, the digitalization of construction involves both building information models (BIMs) and finding digital solutions for all construction-related activities across the process lifecycle.

In everyday work, digital construction means the use of BIM and 3D models from the very beginning of the design, together with construction as-built models, which helps to avoid errors on the construction site and creates a precondition for their later use in management of the building. Creating and signing all documents in a digital environment increases the efficiency of the entire process and makes activities traceable.

Approximately 3.8 billion square meters of new floor area is built worldwide each year, and it is expected to double by 2060 compared to 2018 (*Lagaros, 2018*). At the end of 2020, the New York news portal Globe Newswire reported on its website Reportlinker.com that an international road construction project with a total cost of $ 2.54 trillion is currently underway worldwide (*Globe Newswire*). The construction sector accounts for 9.5% of the European Union's GDP (*FIEC, 2020*), therefore, given the global and regional scopes of the construction sector and its impact on the economy, productivity gains would have a very positive effect on the sector as a whole.

> The use of a common classifier across the process lifecycle will allow to take a step forward in the digitalization of construction and increase the productivity of the construction sector.

Low productivity is an even bigger problem **in Estonia**. The results of a survey commissioned by the Ministry of Economic Affairs and Communications to analyze the productivity, value added and economic impact of the construction sector show that the value added per employee in the Estonian construction sector in 2015 was half lower than the EU average (20 thousand euros) (see Figure 2). One of the reasons for the large lag is the extremely small share of research and development in the construction sector, where, according to Statistics Estonia, the corresponding expenditure on research and development in 2017 was 0.024% of sales revenue, compared to 1% at the global level (*RAKE, 2018*).

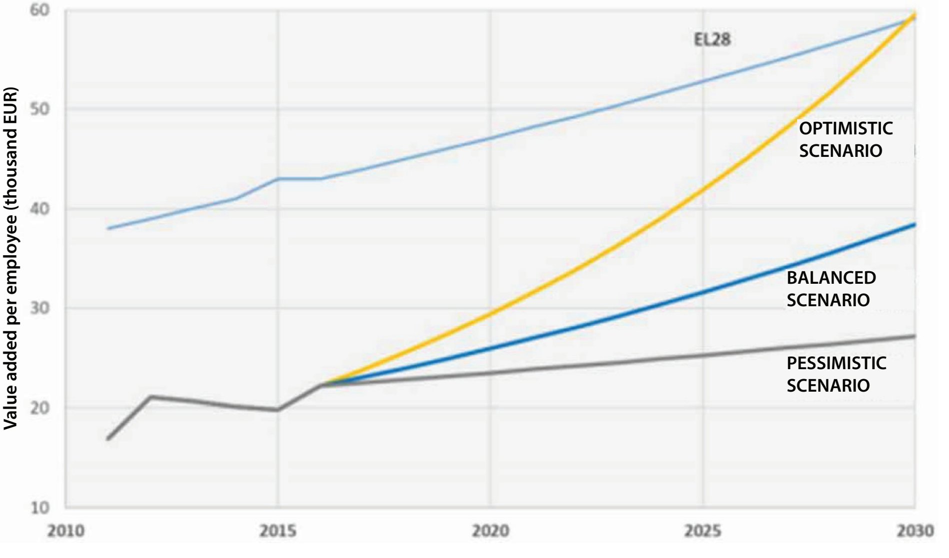

Figure 2. Productivity of the Estonian construction sector compared to the European Union (RAKE, 2018)

The goal of the MEAC is to catch up with the EU average by 2030, and the authors of the survey have compiled three possible scenarios. The EU average value added forecast is based on the EU average value added growth of 2.5% per year. The optimistic scenario of catching up with the EU average by 2030 assumes an increase in value added of 7% per year. The balanced and pessimistic scenarios shown in the figure assume an increase in value added of 4% and 2% per year, respectively. The authors of the survey have also pointed out the indicators influencing productivity growth, where the digitalization of construction has a decisive effect.

> The introduction of a uniform machine-readable classification system for the entire construction process lifecycle also contributes to this goal.

1.1. Why is a single classification system exactly what is needed?

The main obstacles to improving data exchange are the high fragmentation of the construction sector, both horizontally and vertically. Therefore, data and processes are scattered in very different systems, and there are also problems with the interaction of different software. As a result, one company's investment in more efficient data management does not pay off, as other agents in the sector are not ready to innovate (*CIVITTA, 2018*).

In one way or another, and based on different standards, the construction sector still classifies and systematizes construction products, parts of buildings, types of work, etc. The question arises as to why it is necessary to change the habit and apply a **uniform** classification system to everyone across the process lifecycle. The standards developed have been developed for a specific activity and allow a clear classification of information within a specific activity, such as costing, but moving from one stage of the construction process lifecycle to another (e.g. from cost calculation to construction work planning or construction entity management) merging errors occur because the overall picture is missing.

Arbitrary interpretation of data at different stages of the construction process lifecycle creates causes confusion and creates a lot of extra work, both in terms of rethinking it and entering it multiple times. For example, differences in the structure of data when cost calculation and planning the construction or subsequent repairs significantly reduce the reliability of forecasting and comparison of financial results. Therefore, it is important that the data is entered correctly and unambiguously at an early stage of the design and that it is updated later as the construction project progresses.

> The common classification system immediately links materials, structures, parts of the construction entity, types of work, etc. into a single system already in the geometric model and makes the data machine-readable.

1.2. Why a classification system based on CCI has been chosen

There are many classification systems in the world, and therefore the question is why the approach based on the CCS (*Cuneco Classification System*) created in Denmark was chosen, or why is Estonia not creating its own unique classification system?

The research group that prepared the classification system has analyzed and compared different classifiers, their compatibility and suitability for the Estonian construction sector, as well as copyright issues. All systems selected for comparison in Table 1 are inherently multifaceted classification systems that have been brought into line with the essential requirements of ISO 12006-2. The comparison table reflects the main properties of the analyzed classifiers based on ISO 12006-2:2015, which have also been used in Estonia.

Table 1. Comparison of different classification systems

ISO 12006-2:2015		OmniClass		UniClass	
A.2	Construction information	Tab 36	Info	FI	Information forms
A.3	Construction product	Tab 23	Products	Pr	Products
		Tab 41	Materials		
A.4	Construction agents	Tab 33	Competencies	Ro	Participants
		Tab 34	Organizational roles		
A.5	Construction aid	Tab 35	Supplies	TE	Supplies and equipment
A.6	Management	Tab 32	Services	PM	Project management
A.7	Construction process	Tab 31	Stages		Stages of the project
					Regions
					Districts
A.8	Construction complex			Co	Complex
A.9	Construction entity	Tab 11	Construction entities by function	Ne	Construction entities
		Tab 12	Construction entities by form		
				Ac	Activities
A.10	Built space	Tab 13	Spaces by function	SL	Spaces / locations
		Tab 14	Spaces by form		
A.11	Construction element	Tab 21	Elements	EF	Elements / functions
				Ss	Systems
A.12	Work result	Tab 22	Work results		
A.13	Construction property	Tab 49	Properties		Properties
				Zz	CAD

It was decided that there is no point in creating one's own unique classification system in Estonia, because many theoretical surveys in the field of classification have already been carried out internationally and the solutions created have also been practically implemented. In 2020, it was agreed to form the umbrella organization called CCIC (*Construction Classification International Collaboration*) of institutions interested in the classification of the construction industry in different countries, and a corresponding agreement was signed to organize further cooperation.

The CCIC classification system is intended for international use, where each member state joining the organization develops its own national classification system based on the CCI's core solutions; **Estonia develops the CCI-EE, accordingly**.

As standard EVS 885:2005 on classification of construction costs has been widely used in Estonia, the examples in this guidance material show the cost calculations based on EVS 885 and CCI-EE in order to show the suitability of the new classification system for cost calculation as well.

CCS/CCI	CoClass		ISO 81346-12
A104 Document management			
Components		Components	Components (production aspect)
A104 Document management			
A104 Document management			
Equipment			
A104 Document management			
A104 Document management			
	BX	Construction complexes	
Construction entity	BV	Construction entities	
Built spaces / user spaces	TU	Space	Spaces (location aspect)
Functional systems Technical systems Components	FS	Functional systems	Functional systems (functional aspect)
	KS	Structural (technical) systems	Technical systems (functional aspect)
		Production results, including maintenance activities	
Property classes		Properties	
		Land Information	

The entire construction process starts with the client and its needs for certain types of construction entities. Therefore, cooperation with the client and its role is very important already in the initial design stage, and the concept of a "smart client" comes into play.

1.3. Smart client

HIGHER THAN SILVER ASSETS AND MORE EXPENSIVE THAN THE LOADS OF GOLD, THE WISDOM MUST BE ACKNOWLEDGED!

With this subchapter, the authors have set themselves the task of sharing knowledge precisely with the client of the construction entity, which is the most important participant in the construction process lifecycle, as far too many aspects depend on the wisdom of its decisions.

The "Long-term View of Construction 2035" signed by the leaders of seventeen institutions that directly affect the construction industry in Tallinn on 9 July 2021, points to the need to take seven major steps in the construction industry and at the same time compile the Smart Client concept. This chapter should be one of the first steps in opening up and giving birth to such a concept.

Based on the above agreement, all decisions of the Smart Client should be:

▪ long-term intended	Measure thrice, check twice and cut once.
▪ smart and pioneering	Intelligence is endowed, but wisdom is learned.
▪ transparent and consensual, understandable to the community and stakeholders	What you give out is always returned.

All persons involved in the development of the decision shall be solely responsible for the decisions taken or shall be agents of the decision-making team in the performance of their duties by virtue of their job position. In order to provide clarity to the reader when introducing the classifier, we will look at making these decisions based on the job position. The Building Code has specified all those job positions that participate in the construction process lifecycle and should prove their competence, i.e. their **wisdom**, when working in different positions.

At professional associations in the construction and real-estate sector, there are professional committees which regularly organize the certification of competence for specialists working in the field.

First stage: SMART CLIENT IN PLANNING AND SELECTION OF CONSTRUCTION METHOD

OBJECTIVE

1. Assemble a capable and competent client's team to meet all the objectives set for the selection of the design and construction method.
2. Carry out all the necessary surveys to prepare a precisely target-value-dependent terms of reference for the design based on these surveys.
3. Prepare high-quality documentation for the design procurement, which is based precisely on the terms of reference for the design.
4. Choose the construction method arising from the terms of reference and involve the builder already at the design stage in the service of the client's team.

ACTIVITIES

1. Carry out competitions between competent specialists applying for job positions and recruit the client's team to cover the management of all stages of the client's activities (organization of finances, administration, personnel, construction pricing, risk management, construction activity, real-estate maintenance and operation, etc.).
2. Carry out all the necessary surveys to ensure that accurate raw data is available in all fields to compile the terms of reference for the design.
3. Carry out the necessary training so that the client's team can start working on a uniform basis.
4. Choose the method of construction procurement and construction work, and involve the selected builder together with your established partners in the preparation of the terms of reference for the design, thereby guaranteeing thorough preparation for the activities necessary for the preparation of the construction and the preparation necessary for the construction work management.
5. Prepare design procurement documentation.
6. Provide specific instructions to designers to represent all parts of the project in the BIM model and to link the model to the CCI-EE classifier.

RESULT

- The design terms of reference are meant to initiate and carry out design work without interruption, ensuring that the prepared design accurately ensures that the client's target will be achieved.
- Documentation of the execution of the design procurement.

Second stage: SMART CLIENT IN DESIGNING

OBJECTIVE

ACTIVITIES

1. Establish a design management system to monitor the progress of the design together with the winning design organization:
   - a system of routine meetings that analyze the progress of the design;
   - an operational information flow system;
   - a system for analyzing the proposed alternate approaches and confirming the decisions taken.
2. Provide additional information to the design organization during the design process:
   - to provide designers with solutions proposed by the integrated project execution team that bring them closer to the target value;
   - a system for analyzing the alternate approaches proposed by the designers and including their proposals for revisions;
   - to create a construction cost analysis system based on the CCI-EE classifier, which is used to control the application cost and the target value of the construction entity; revisions of scopes are made in line with the target value.

RESULT

- By the beginning of the construction preparation period, the design organization has submitted design documents covering all stages of the design that exactly correspond to the target value of the proposed construction entity.
- An audited BIM model of the construction entity has been created together with the project documentation.
- A realistic estimate of the cost of the construction entity has been prepared together with the project documentation.

Third stage: SMART CLIENT IN CONSTRUCTION PREPARATION

OBJECTIVE

1. To create a favorable situation for the selected builder to prepare the construction:
   - provide sufficient time to prepare for construction;
   - to finance everything necessary for the builder for the timely erection of the construction entity.

ACTIVITIES

1. Together with the selected builder, analyze in detail the activities required for the preparation of the construction and the time required for them.
2. To analyze the necessary for the preparation of construction and the performance of construction activities:
   - access from national or local roads, embarkation and disembarkation;
   - connection of the construction territory to the necessary engineering networks and financing of these connections during the construction;
   - delimitation of the construction site to prevent third parties from entering the hazardous area;
   - related to construction management (temporary construction entities and material conditions);
   - reliable assurance of the construction process with supplies and high-quality subcontractors;
   - logistics necessary for construction activities, and vertical and horizontal lifting;
   - compliance with occupational safety requirements based on risk analysis;
   - compliance with environmental protection conditions;

- to link all preparatory activities to the machine-readable list of construction costs through the CCI-EE classifier, thus creating an opportunity to adequately estimate the share of indirect costs to be submitted to the client.

RESULT

- A detailed analysis of the builder's indirect costs, through which an analysis of the client's costs is performed, which ensures that the construction entity is completed unconditionally and handed over to the client by the time specified in the contract.

Fourth stage: SMART CLIENT IN CONSTRUCTION AND DELIVERY OF THE CONSTRUCTION ENTITY

OBJECTIVE

1. Based on the project documents and the BIM model, prepare the correct construction procurement documentation that ensures that the client reaches the target value.
2. Carry out a construction procurement and select the team that accepts the most suitable for cooperation (cooperative and capable of learning) and manages the construction activities.
3. Take over from the builder the construction entity constructed in exact compliance with the design documentation submitted by the client and the execution documentation correctly reflecting the progress of the construction and the correct BIM as-built model that is easy to use during the maintenance and operation of the construction entity

ACTIVITIES

1. Establish a management system with the winning organization that:
   - includes a routine meeting system to analyze the progress of construction;
   - ensures the operational information flow;
   - analyzes the proposed alternate approaches and confirms the decisions made;
   - creates a common working and learning environment for the client and construction work management teams.
2. To provide the builder with additional information during the construction:
   - to provide the builder with solutions proposed by the integrated project execution team that bring them closer to the target value;
   - a system for analyzing the alternate approaches proposed by the builder and including their proposals for revisions;
   - to create a construction entity cost analysis system based on the CCI-EE classifier, which keeps the target cost and the application cost under control, introduces revisions so that the target value is achieved and, if necessary, the construction scope is changed.
3. Ensure that the supervision of the client is organized in such a way that construction activities are not hindered. The required enforcement documentation is filled in correctly and the reality-based BIM as-built model is created.
4. Ensure the arrival of procurements, technological equipment, built-in furniture, etc. from the client in strict accordance with the procurement schedules, in order to guarantee that the pace of construction is maintained. All procurements must be submitted together with CCI-EE codes to enable to obtain operational information about the BIM model and the construction entity information bank when using the construction entity.
5. To ensure the operational activity of the client's representative upon taking over the parts of the construction entity and the construction entity as a whole, thus creating preconditions for the preparation of the construction entity for timely use.
6. Ensure timely payment of all contractual payments, including to suppliers and subcontractors, and thus create preconditions for the construction to proceed according to plan.

RESULT

- A construction entity to be handed over to the client and fully prepared for use, together with the BIM as-built model and the perfect information bank, which allows the construction entity to be maintained and operated for the period specified in the construction project, i.e. at least 50 or 100 years.

Fifth stage: SMART CLIENT IN ORGANIZING THE MAINTENANCE AND OPERATION OF THE CONSTRUCTION ENTITY

OBJECTIVE

1. Prepare procurement documentation for the maintenance and operation of the construction entity focused on the client's target value.
2. Carry out the procurement and select the most suitable and competent company to organize the maintenance and operation.
3. Organize the maintenance and operation of the construction entity in strict accordance with the maintenance instructions provided in the documentation of the acceptance of the construction entity.
4. Organize operational work using information provided through the CCI-EE codes included in the BIM as-built model.

ACTIVITIES

1. Get acquainted in detail with the documentation of the handover of the construction entity and the BIM as-built model.
2. Prepare the procurement documentation necessary to find a company for the maintenance and operation of the construction entity .
3. Proceed to find a professional and competent certified maintenance company.
4. Enter into a contract for the maintenance of the construction entity, thus ensuring:
   - inspection and maintenance of the architectural part of the construction entity;
   - inspection and maintenance of the construction and special parts of the construction entity;
   - inspection and maintenance of heating and ventilation supply of the construction entity, its water supply and drainage systems, power supply system, and technical equipment;
   - inspection and maintenance of construction entity automation equipment;
   - perform simulations periodically to address potential emergency and / or hazardous situations;
   - prepare risk analyzes to mitigate risks and ensure service quality;
   - carry out periodic joint studies and trainings of the technical staff of the client and the maintenance company in order to be convinced of the readiness to use the BIM as-built model and the information bank built in the CCI-EE system to find quick solutions.

RESULTS

- THE SMART CLIENT has at its disposal a smart building consisting of smart spaces or a smart facility consisting of smart components, which is easy to use and rationally requires time and money.
- THE SMART CLIENT has performed essentially advanced engineering work with competent and cutting-edge specialists in various fields at all stages related to the construction of the construction entity and, in addition to an exemplary construction entity, has also received a competent management team to ensure the use of the construction entity.

1.4. Summary of the contents of the guidance material

In the following, the principles of the CCI-EE common classification system are introduced and instructions for its use are given. The guidance material contains the following chapters.

- The following chapter provides an overview of the CCI-EE system, its basic concepts and the history of its development. As the CCI-EE is a so-called living system, it is important to know how the classifier is updated due to differences in construction activities, innovation, etc.
- The general guide to the use of CCI-EE tables then describes in detail the structure of the classification system, the standards used and the principles for the use of codes, and gives a specific example of the formation of a reference designation set.
- Chapter four focuses on the reference model and its uses.
- The final chapter provides an overview of the construction cost in the CCI-EE system as soon as the subcontractor's view and gives a specific calculation example.

1.5 Used literature

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> Classification starts with setting a goal - what classified information is needed, and how it will be used in the future.

2. FORMATION OF CCI-EE CLASSIFICATION TABLES

2.1. Essence of the ISO 12006-2:2015 classification model

Once the purpose of the classification is set, the classes are designed and defined. For the data set to be examined, the essential properties that will form the basis for the classes must be described. The classes created must not leave "gray" areas - i.e. they must not show features that are suitable for several of the described classes at the same time. At the same time, a situation must not arise in which a suitable class is not found at all for some of the objects in the set. As a result of the classification of the general set, a situation must arise in which each object belonging to the set belongs to only one class, defined accordingly, and a suitable location has been found for all objects.

The created classification is usually described by a classification table. The classification table is a consolidated list of all the classes and subclasses that characterize the set, with their definitions. However, all classes / subclasses are always coded. Numbers (the so-called UDC system - universal decimal classification) or (usually) letters of the Latin alphabet can be used for coding. Mixed variants are also possible when coding.

Historically, it has long been argued that any classification system must be definitive and fully inclusive already when being created. When creating such a classification table, it is assumed that the created table will not need to be updated in the future.

In reality, society is evolving, and knowledge is evolving: both development in society and innovation in science take place. Inevitably, new objects / phenomena arise that could not have been foreseen before. All such new objects also need to be classified, as a general rule, on the basis of previously established systems. For new objects / phenomena, most definitive classification systems provide for the last class in the list called "other." However, practice shows that with the long-term use of final classification systems, more and more new objects will be classified in the "other" class over time. As a result, this "other" class will contain very different objects, including completely incomparable objects. In such a situation, the classification system used for a longer period of time already loses its relevance, as the data classes are no longer formed on the basis of the objective criteria originally defined.

More modern classification systems are designed to exclude finality rather than an unrealistic assumption. This means that when the system classification tables are compiled, they remain open - there is no universal summary class called "other." However, if new unique objects are created that the classification table created so far does not allow to be classified anywhere, a new suitable class / subclass is created in the existing class system and a corresponding definition is added. Of course, the new classes to be created must not conflict with the definitions of the classes already in use.

From the principles described above, it can be concluded that each classification system is always relative and subjective - classification systems created by people only describe the knowledge and interests of the persons who create the system at a given time and the stakeholders they represent. Each system can only evolve with the development of knowledge. However, in the case of the final systems, such a development cannot take place, as the system originally created will always describe the level of knowledge at the time of its creation. The "violent" adaptation and update of such a system in the course of its use will inevitably lead to conflicts in the systematization of data at different points in time and, in particular, in the use of terms.

International Standard ISO 12006-2:2001 and its revision ISO 12006-2:2015 "Construction. Organization of construction information. Part 2: Classification framework "provide an internationally accepted classification model for the built environment. In essence, it is a visual description of the purpose of classification in the field of construction - the drawing of the standard represents the built environment and the a model generalizing components related to its design (Figure 3). It is important to emphasize in this case that this is not just a classification of construction (as one activity). Since the goal is to create a built environment, the model describes all the components related to this process, of which construction is a part.

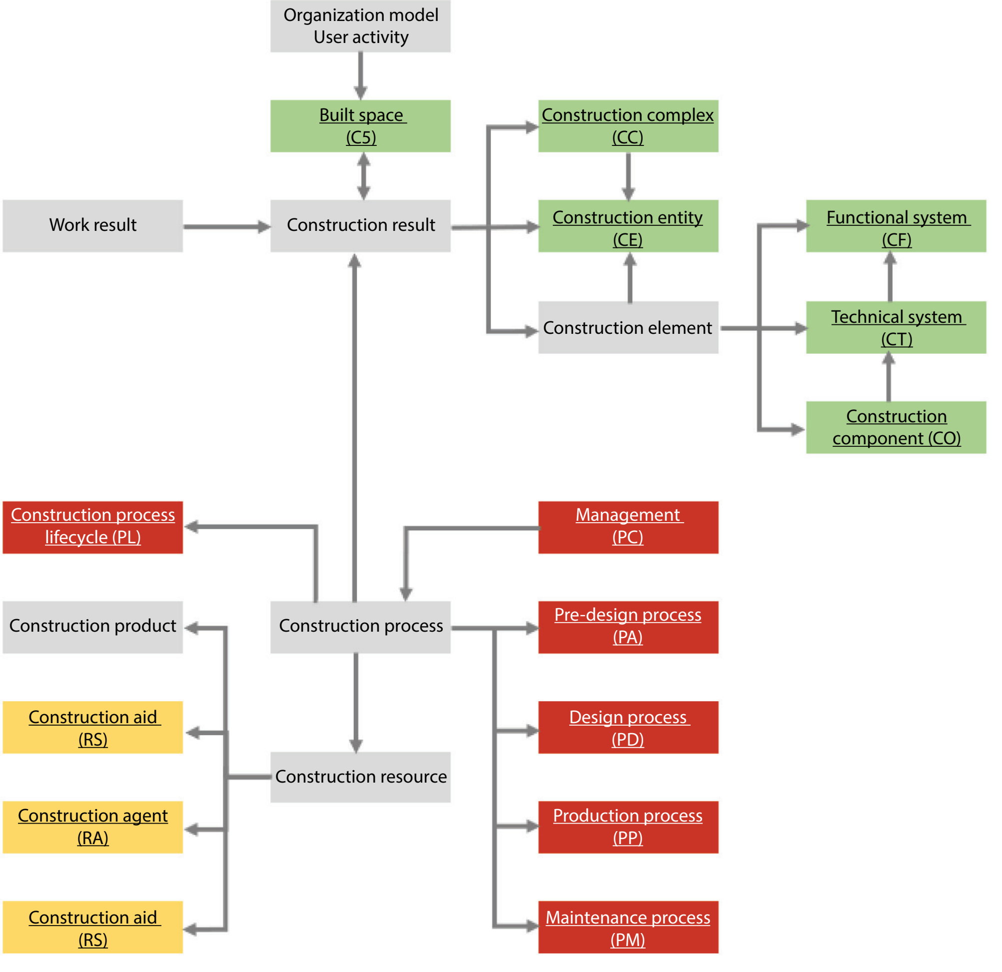

Figure 3. CCI-EE classification model based on ISO 12006-2:2015

Creating a built environment always starts with the needs of the client. The client wants a suitable "space" to be created for the client. "Space" in this case does not only mean "room", i.e. the present and delimited space(s) in the construction entity. The space also includes a pavement, a street, a stadium, and other areas / territories adapted for the client's intended use.

All the spaces created are the basis for the design of construction entities - a specific space (e.g. a gym) can be the basis for the design and construction of a building (sports hall). At the same time, functionally interconnected spaces (classrooms, workshops, public spaces, etc.) with different uses also form a construction entity (construction entities, e.g. schools). Several construction entities together form a complex of construction entities - structurally different construction entities are designed in such a way that they interact together and ensure the fulfillment of a function necessary for the client and society. For example, a single (multicompartment) residential house needs access roads, parking lots, a children's playground, utility networks - only the interaction of these construction entities reveals the real value in use of the main construction entity (residential house). For most factories, the building involved in the production process has a separate administrative building, warehouse(s), etc., but certainly transport facilities (access roads, loading bays, etc.), and finally the whole complex is fenced or walled. All these construction entities function together for a common purpose as a complex.

However, all construction entities consist of different functional (e.g. security systems) and technical (e.g. load-bearing structures) systems and a large number of individual components (e.g. windows, doors, skirting boards). In order to create each construction entity, it is necessary to contribute different activities to the expected activities, but it is necessary to involve employees with different training. Thus, the creation of construction entities requires different resources, both material and intellectual, and all of these resources are characterized by specific properties (describing quality).

Creating a built environment is always a long-term process - all important activities and resources are contributed to the construction entity by different persons / institutions at different points in the construction process lifecycle. Construction is therefore always visible on the timeline.

The model of the built environment described in ISO 12006-2:2015 allows a comparable analysis of all construction entities and their development factors and details both over time and by contributors. By selecting different parts of the model for analysis now, we can create the necessary overview of the built environment for different stakeholders. This classification model makes it possible to add the properties necessary for comparative analysis and relevant for searches, such as time parameters, descriptions of technical systems or persons involved in the construction of construction entities.

It is important that the classification model described in the standard does not provide mandatory classification tables. Based on the model, each user can create their own classification system that suits them.

2.2. Construction Classification International (CCI)

The CCI classification system and its national systems (in Estonia: CCI-EE) are open classification systems based on the ISO 12006-2:2015 model in 2020, which will be continuously developed and updated in co-operation with representatives of partner countries. The international non-profit organization CCIC (*Construction Classification International Collaboration*) has been established to organize the cooperation.

There are a number of countries in Europe that operate in the European Union's common economic space, while each country has its own legislation, its own national language and historically established national practices. At the same time, more and more cross-border business is taking place in all areas of life, including construction. International procurements are carried out, and the working language of many construction projects is often English, for example, because the participants in the project come from different cultures. In such a situation, it makes sense to organize activities in the field of construction according to uniform classification principles.

One of the key principles of classification is that there is always information that can be classified in a similar way in the world and in society, regardless of geographical location and host country. Only the language used to describe the classes is different, but the natural processes and the different specimens around us (plants, animals, rocks, etc.) can be described identically. The situation is similar with the technical and technological solutions in different fields - they can be described identically as a whole and as individual parts.

In addition to this determination, information that is largely location / region-based is used on a daily basis. The development of such information is conditioned by local and national legislation (along with the system of terms and definitions used and the traditional organization of their use), as well as due to established cultural practices. Generally accepted dictionaries may correspond to such terms in different languages, but, in essence, different communities refer to some different activities or events, and there is a constant mutual refinement of terms in the literature.

Construction uses both internationally understood technical and technological information (e.g. structural elements and their components, equipment and machinery and their components) and location-based national information (e.g. definitions of stages of the construction project execution, professional titles and associated responsibilities). Standard ISO 12006-2:2015 provides only a general classification template for the construction industry, without distinguishing between possible international determination and possible national specificities. As long as some classification systems are only nationally applicable, the distinction made above is not relevant in distinguishing between international and national aspects. It will only become important to make such a distinction if the same classification is used simultaneously in different countries, i.e. in different operating environments.

In view of the differences described above, the components of the ISO 12006-2:2015 model for the CCI are divided into two components: the core components (green in Figure 3 of the classification model, which is common to all the CCI users in different countries) and the national components (yellow and red in Figure 3). There are no uniform international rules for the latter, and each country / community using the CCI classification system can and must design these classification tables by itself, taking into account national legal space, established practices and terms. It must be borne in mind that the tables described in this way must not cause problems when using core tables. The special feature of the CCI compared to many other internationally used classification systems is that the structure of the core components of the system is based on the ISO / IEC 81346 series called "Industrial systems, installations and equipment and industrial products. Structuring principles and reference designations" from the classification tables of different standards.

The purpose of compiling the ISO 81346 series of standards has been to agree on classification schemes for different objects, including the built environment, and the letter codes for the respective classes. It is assumed that the proposed classifier can be used in all technical fields, such as electricity, mechanics, manufacturing and construction technology, as well as in all industries, such as energy, chemistry, construction, vehicle building and shipbuilding, and maritime traffic. This principle is very suitable for the construction sector, because construction serves the whole society, creating a built environment for all areas of life.

The latest versions of the ISO / IEC 81346 series of standards available in Estonia have been used in the preparation of the CCI-EE, whereas the second part of the standard (EVS-EN IEC 81346-2:2020) had already been translated into Estonian by the time the CCI system was created. Throughout the Estonian translation of this standard, terms "liik / liigitus / liigitamine" ("type / classification / structuring") are used. However, terms "klass / klassifikaator / klassifitseerimine" ("class / classifier / classification") have long been used in construction. Linguistically, structuring and classification are synonymous, but it is always useful to continue with established traditions. (The term *classification* is also used throughout in English.) All ISO / IEC 81346 classification tables are supposed to follow the guidelines of ISO 704 and ISO 22274:2013, which recommend the use of general, multi-faceted and basic classification principles.

At the time of designing the CCI-EE (autumn 2020), to the best of our knowledge, the tables in the standards also list the possible sample objects belonging to the respective core classes of the system. Over time, the use of language develops, technology improves, and new knowledge is added. All this provides an opportunity (as well as an obligation for the operator of the classification system) to continuously make the necessary improvements and additions to the system. However, this layout of the classification system and the operating principles of the system administration pose a number of problems in updating the classification tables in the core.

At the time of the establishment of the CCI classification system, the partners using the system may confirm that the development of the core tables is based on specific ISO standards and relies entirely upon the tables provided therein. Over time, however, deviations from these standard tables will inevitably occur, as daily real needs in international and national construction markets will always be more frequent than international standards, which are usually updated at least once in five years or more. Therefore, the standards that have been the basis for the creation of the system today and the classification system will inevitably "live" different lives. The contents of these classification tables may even vary considerably.

> The classification system cannot be something carved in stone that may not be modified with revisions. In that case, the system would not be viable and would not meet the real needs of the market.

Reaching a consensus on the additions to the core classification tables will be a serious problem and a time-consuming undertaking in the future. Especially as the number of countries participating in the CCIC increases, various additions will be made on an ongoing basis. The current rules of procedure of the Technical Committee set up under the CCIC are based on the principle of consensus, but a time limit should also be set for the submission of reasoned objections with the corresponding procedures. The day-to-day problems in the construction sector in the CCIC partner countries are also different. This inevitably results in the different interest of the partners in dealing with the submitted application proposals. At the same time, it is the amendment author that is interested in ensuring that companies and organizations in their country can make quick decisions and be able to move forward with their day-to-day work. However, the work of the Technical Committee would be significantly hampered by the accumulation of a large number of unresolved additions.

2.3. CCI classification tables

The following subsections provide a brief overview of how the core classification tables have developed and what views have been used to compile the Estonian national classification tables.

At the time of compiling this guidance material (autumn 2021), not all international classification tables have been finally completed. The CCI classification system as a whole and its subsystems, including the CCI-EE, are constantly evolving, and it must be possible to innovate them constantly. It is only during use that usage patterns emerge and it becomes clear which starting points are most rational for the different classification tables.

Different colors and abbreviation codes have been used to describe the classification model described in Figure 3:

- the gray cells of the model are not furnished with tables, so there are no abbreviation codes; this is generally a box describing the concept connecting the tables at the lower classification level;
- the green boxes in the model describe the core classification tables, which are essentially identical for all countries using the system; the identification code C in the table is derived from the English term "*core*";
- the red boxes in the model describe the processes involved in creating the built environment; the identification code P is derived from the English term "*process*"; these are national tables that take into account the specificities of each user country;
- the yellow boxes in the model describe the resources needed to create the built environment; the identification code R is derived from the English term "*resource*"; these are national tables that take into account the specificities of each user country.

CCI core tables

Built space (CS)

Space, as the main category of this classification system, is limited in its three-dimensional scope, defined either physically or conventionally. Thus, it is not only in the case of buildings that it is necessary to have an established understanding of the enclosed area delimited by walls. Pavements and roads are also spaces that have been designed for use during construction. It is important to distinguish between two types of spaces:

- "activity space" means the spatial extension of an activity, the activity space surrounding a construction entity for the maintenance of that construction entity;

- "built space" means a space intended for the user activity or equipment, defined by the built or natural environment, or both (a built space is a space defined by a floor, ceiling and walls or a walkway or a electric line corridor; spaces occupied by building elements are called constructions spaces and are considered to be properties of construction elements).

These definitions allow the term "space" to be used more broadly to describe assets. Standard ISO / IEC 81346-2 is based on the "what the room is designed for" principle for the classification system for spaces. Such a principle would allow the use of a fixed designation throughout the construction process lifecycle without the need to change the code. However, the purpose of using many spaces changes throughout the construction process lifecycle, often several times. A change in the purpose of use of the built spaces generally requires the planning of the necessary reconstruction works and the accompanying design, in the course of which both the configuration of the spaces and the purpose of use change.

Construction complex (CC)

Most of the construction entities are not built separately, but rather as a complex of construction entities with different uses. We can conditionally distinguish between the "main construction entity" and the construction entities created for supporting activities. By classifying construction entities in this way on the basis of complexes, it is becoming clear to many involved that they do not have to deal only with, for example, a school building. The school is generally a fully functioning complex of construction entities, for the smooth functioning of which it is also necessary to ensure the condition of separate elements, e.g. boiler house and stadium.

Although the concept of a complex of construction entities and the need to define it are clear, no consensus has long been reached on its classification. In the Swedish classification system CoClass, such a classification table for complexes has been created, but discussions took place until late 2021 to reach a solution that satisfies all the CCI partners. The classification table was not agreed until early 2022. The main problem was the different planning practices of the countries and the definition of the purposes of the land plots and linking it to the practice of using construction entities.

CE - Construction entity

A construction entity is an object with one definite or several uses connected to the ground surface created as a result of human activity. The initial classification table for the construction entities was commissioned by the Danish consultancy Cuneco / Molio on behalf of the team preparing the ISO 81346 series for the Danish classification system CCS, following the example of a space classification table. This classification table can be used on the basis of either "what the construction entity was originally designed for" or "what the construction entity is currently used for" principle.

As this table has not yet been published in any of the ISO 81346 series standards, a more detailed analysis by the CCIC Technical Committee revealed its unsuitability for international classification. Several problems were identified in relation to the table.

- The level of detail in the subclasses is quite different in different classes. For the most common types of construction entities in everyday use, the lists are quite detailed, while for industrial and manufacturing-related businesses and production-related construction entities, the lists are now more generalizing.
- As the classification of construction entities is based on the principles of classification as spaces, the list is dominated by buildings and the names of buildings. More detailed classification of facilities and update of the table with international partners may be a natural follow-up.
- In 2015, the MEAC regulation "List of Purposes of Use of construction entity" (KAOL) has been in use in Estonia, which is the final classification table and contains the primary classification as buildings and facilities. For the transition from the KAOL to the CCI-EE and vice versa, it is necessary to use the corresponding translation table and the accompanying instructions.

Although discussions on the table of construction entities took place in parallel with the classification of the complexes, an agreement was reached in early 2022, however, it is possible that discussions will continue here.

Construction element

Standard ISO 12006-2:2015 describes a class called “construction element” in the classification system. In the ISO 81346 series, a construction element is represented open in accordance with the three components that specify the function of the building element in the construction entity:

- functional system;
- technical system;
- construction component.

Thus, a separate classification table “construction element” has not been provided, but three sub-tables have been created.

The functional system classification table is derived from standard ISO 81346-12:2018; normative annex A, table A1. The technical system classification table is set out in standard ISO 81346-12:2018; normative annex A, table A2.

The classification of construction components is based on standard EVS-EN IEC 81346.2:2020.

The CCI-EE national classification tables are marked in yellow and red in the basic structure diagram of the system (see Figure 3).

During the preparation of this guide (autumn-winter 2021), as the system’s partner organizations are looking for solutions to furnish their national classification tables, it has been suggested that future cooperation should share information on how and to what extent these tables could be unified.

Construction aid (RS)

Construction support refers to all equipment and means, including tools needed to do the job, that are not included in the final product. There is no known common international standard for construction aids. The aids are very closely linked to the technologies used on the construction site and to the work organization practices.

In the case of this classification, the classification developed in Estonia over a long period of time and entrenched concepts together with the corresponding general explanations and definitions are taken as a basis. The classifier does not list specific aids, but rather describes their function in construction.

Construction agent (RA)

In the case of a construction agent, they are often associated only with specific stages of the project lifecycle - builders contribute during the construction stage, designers do during the design stage, and so on. However, both of these project participants have their own legal and / or contractual obligations, such as warranty obligations, which need to be fulfilled during the use stage of the construction entity. At the same time, both the client and the engineers with different qualifications acting as consultants need to participate in the project both across the process lifecycle and only within individual stages. Newer Alliance-based engagement management models (e.g. IPT - *integreeritud projekti teostus*, i.e. Integrated Project Delivery) require the involvement of all (key) project partners at an early stage in the project lifecycle so that they can contribute and participate across the lifecycle. Therefore, it is not appropriate to classify agents not on a step-by-step basis, but rather on the basis of competencies and functions to be performed throughout the entire project.

The agents need to be seen primarily at two levels. First, the agents are different organizations (institutions, companies, associations, etc.), but also the specific persons / employees / specialists of the organizations who have professional training and who generally perform specific duties under their contract. The main activities of a construction entity user organization (e.g. a hospital as a health care facility that uses spaces) are generally significantly different from those performed by some of its staff (e.g. an engineer in the real estate department who has to maintain the hospital spaces).

The vocational training system is part of the Estonian qualification system, which links the education system to the labor market. The aim of the vocational training system is to contribute to the assessment and recognition of people's competences, regardless of where and how (in which form) the training has taken place. At present, the vocational training system is not linked to the various job titles used in the construction sector - the latter are largely based on organizations.

Unfortunately, the job title and the profession do not unambiguously define the tasks to be performed by the employee / person involved in the construction, i.e. they do not describe the role during the process lifecycle. The project manager may be employed by the client's organization as well as by the designer, contractor or maintenance company. A mason can be a general contractor for construction, a subcontractor, but also an employee of maintenance companies. A particularly universal profession and title is probably "engineer", to which can be added professional levels, specializations as well as traditional prefixes describing the hierarchical level - "head...", "senior...", "junior...", "lead...", etc.

In view of the above, it has been expedient to build the CCI-EE on the basis of the functions performed by different persons (as institutions) in the construction chain.

Management (PC)

Construction activities are project-based - new projects with different durations and scopes are constantly being implemented. Project management means setting goals and organizing the activities of groups of people so that the set goals are achieved.

Management is not classified in standards, and some activities are classified differently in different guidance materials due to the context. The academic management literature tends to agree on the classification of both management and construction project management. In the case of the CCI-EE, it has been expedient to follow the classification practice established in Estonia, which has been the basis for describing the requirements described in the professional standards as well as for compiling training programs related to them. The classifier of management is one-level, and the proposed distribution is also based on the division of labor developed in society.

Pre-design process (PA) and PD

Design process (PD)

The design-related processes are not entirely internationally standardized. This is mainly due to the fact that different countries have different administrative principles for obtaining the permits and approvals required to start construction. The issues related to the organization of design have been discussed and opened in more detail in various academic sources and especially in connection with the use of the BIM.

Standard EVS 932:2017 "Construction design documents" has been used as a basis for compiling the lists of activities to be performed both before the design and during the design. It is an up-to-date (i.e. meets the legal requirements) standard that describes and organizes design and has received very good feedback from professionals in the field. This standard gives guidance primarily on preparation of the construction project of a building, utility networks, road, road facilities, planting, and outdoor design facilities. All the described principles can be adapted and used for the preparation of construction projects of other unique construction entities.

Although this standard provides direct guidance on design, it also defines the inputs to design, i.e. the list of documents and activities required to begin the design.

Production process (PP)

By production process, we mean primarily the construction process, or construction. The types of work that best reflect construction as an activity are integrated into this classification table.

It has emerged that the approach to classification at these stages is different: if the designer thinks about the way the structural elements work, then it is important for the builder to plan the work and resources in time and the order of the work. Therefore, when classifying the production process, we must proceed from the types of work and the order in which they take place, both in time and space, which also differs significantly from the logic of cost calculation.

The classifier of types of work was first based on ISO 12006-2:2015 Appendix A.12 “Work results.” The short list of examples in the standard (excavation and backfilling, carcass, façade, lift installations, etc.) did not sufficiently cover the technical systems (supply systems) and the infrastructure sector. Therefore, the working group that developed the classifier decided to compile a more comprehensive table that would reflect the type of work involved in the construction process of both buildings and facilities. Standard EVS 885:2005 “Classification of construction costs” and the Technical Specifications of Road Works by the Road Administration were used as additional material. The current EVS885 is essentially obsolete and will be omitted in the future.

Depending on the need and technological development, it is possible to add types of work to the main groups and increase the level of detail in the subgroups. In addition, a number of works were found to be related to both buildings and facilities (e.g. cast in place concrete works, assembling of prefabricated structural elements, etc.). First, the main types of work related to the construction of buildings were added to the table, after which an attempt was made, for instance, to find a suitable place in the table of the production process for each main group of technical specifications of road works. Thus, several tables of types of work are related to both buildings and infrastructure construction entities.

As the table of types of work is not part of the core tables, it is easier to supplement it for future use and to add even more detailed explanations of the content to the type of work for more convenient use. However, while it is now common practice for (production process) construction to take place mainly on the construction site, industrialization in the construction sector is increasingly taking the production process to factories. At the same time, it is realistic that this classification table will also move towards factory production.

Maintenance process (PM)

It must be acknowledged that there has been a relatively clear understanding of these stages, sub-stages and activities during the design and construction over time. There is a considerable gap in both use and maintenance activities during use. There is no practice to even differentiate, systematize and link these activities (maintenance and use) to the rest of the construction activities. When classifying, a clear distinction must be made between use and maintenance of the construction entity and its parts.

The Swedish classification system CoClass differs from many other classification systems in the construction sector in that it also describes the period of use and the maintenance activities that take place during this period.

One of the more systematic approaches to the classification of maintenance activities is EVS-EN 15221-4:2011 “Facility management. Part 4: Taxonomy, classification and structures in facility management.” This standard aims to create a user-friendly (working) environment. However, when it comes to the maintenance of a construction entity, we primarily refer to the maintenance of the construction entity, its parts and structures, with the aim of preserving the construction entity and also ensuring that it can used for its intended purpose.

As the maintenance of construction entities is part of the national classifier, it is reasonable to proceed from the classifier of maintenance activities used in Estonia for almost 20 years (EVS 807:2001/2004/2010/2016 Management and maintenance of facilities) and the experience gained during its use. The Estonian classifier of maintenance activities is three-level, and the difference from the CCI principles is the UDC-based numerical coding.

The transition to the CCI-EE-based coding does not have to take place immediately. Such a transition to the new principles may take place evolutionarily when developments in digitalization necessitate the use of new codes, or when it is not already possible to add new number-based maintenance activity classes and subclasses to the system.

The main disadvantage of standard EVS 807 is that what has been written so far only describes the buildings and the related supply systems. Therefore, clarifications are needed, and maintenance activities related to infrastructure objects need to be added. In the case of roads, road maintenance activities are included as examples.

Construction process lifecycle (PL - Lifecycle)

The use of the English term "*lifecycle*" is widespread internationally. In Estonia, the equivalent / term "olelusring" has been introduced in official documents, as well as "eluring". Unfortunately, such a literal translation from English (elutsükkel) and the Estonian equivalent (olelusring) are not suitable for describing the existence of a construction entity, but it is more suitable for describing natural processes. However, if a construction entity has been depreciated or rendered useless for some other reason and is being demolished, "recycling" ("ümbertöötlemine" or "taaskasutus") is not a basis for talking directly about the life cycle of the construction entity. Demolition waste is often used as filling material in the foundations of new construction entities or for the production of new materials, which are then used in different construction entities and structures. However, even in this case, the existing standards must be followed first, when deciding to what extent and where specifically demolition waste can be used.

It is possible to talk about a new usage cycle of a construction entity in those cases when the construction entities (especially the buildings) are revalued and given a new purpose. When a building is being reconstructed and / or renovated, new usage is usually considered. For example, an old, already useless store building is given new "life" by transforming it into a restaurant. Thus, the cycles in the built environment are more like the usage cycles of construction entities - the building case can be associated with several different "usage cycles" during its existence.

It is very reasonable and understandable to use the term "process lifecycle" for a construction entity, which has a beginning (development and commissioning of the construction entity), an end (demolition of the construction entity and release of the land plot for new developments), and clear stages of development, maturity and decline.

Lifecycle is an internationally understood and fundamentally accepted term meaning lifetime or life history, but at the same time it is offered by different authors, working groups and documents in very different stages. The differences are reflected in both the level of detail and the names of the stages, which means that similar construction entities may be described differently on the basis of a time parameter, which is confusing, especially for benchmarking.

Arrangement of the CCI-EE has not been based on the "reinvention of the wheel" (because no detailed model for the classification of the construction process lifecycle has been established in Estonia) and is based on the international standard ISO 15686-10 *Buildings and constructed assets - Service life planning - Part 10: When to assess functional performance.* The process lifecycle stages and sub-stages described in this standard also allow the design of a chain of activities suitable for the circular economy, if desired and necessary.

Construction information (RI)

Construction information is required to specify the type of construction component or associated properties and property sets. Construction information can be divided into function-based subgroups. The division into main groups here is based on the Danish CCS classification.

The properties are based on a two-letter code plus a three-digit code. The list of properties has been compiled on the basis of CCS as well as various other standards (incl. IFC 4.x, COBie, EN, ISO, etc.) if linking has been possible. Not all features are linked to some standards, as this is a more general property.

This classification table (RI) lists the different properties with a specific class code. This code must be used to refer to properties. Properties can be defined in very different data dictionaries, so it is important to ensure that they are unambiguous (see EVS-EN ISO 23386:2020). Properties based on a specific source (EVS, EVS-EN, EVS-EN ISO, etc.) or data dictionary (eg IFC, ETIM) have an appropriate identifier added so that they can be linked to different data tables.

Based on this, the name of the property is also harmonized on the basis of English. The property sets are created based on the client's needs, and the required property set, i.e. data template, is created based on the (RI) table. No property sets have been created within this project, but their creation should be based on standard EVS-EN ISO 23387.

The property table is structured so that it can be supplemented by adding codes (adding a new line of code that fits between the two existing ones). Properties are generally listed in alphabetical order within their set (based on English, as this is more universal when using different sources), unless these property sets are based on a specific standard and the list is based on that order. The Estonian name is a translation term that can be used to derive the name of a parameter when it is used in software / web services related to construction information models.

2.4. How to make additions to the CCI-EE

The common classification system (CCI) created conditionally consists of two parts: the international common part's core tables, the content of which is common to all partner countries, and national parts, which have also been based on international or national standards or other principles which consider rather construction management aspects.

The CCI, which was completed in late 2020, needs both international and national cooperation to be further developed and refined, and, as it is linked to a number of standards, they will be updated over time. Revisions and updates to class tables can also be made based on user needs. During the implementation of the CCI, a need for improvements and additions has emerged, but the system also needs to be constantly developed and updated.

It is necessary to make a clear distinction between the various terms used. The term "correction" ("parandus") is common. We can talk about corrections especially during the introduction of the new system, if errors occur in the use of the terms or in their spelling. If the problem only concerns the Estonian language, then it is relatively easy to make such a correction, because it remains within the competence of our national executive team. However, there may also be problems with English terms and their interpretation. As English is the intermediary language for partners when using the CCI system, such corrections already require the consent of the CCI International Technical Committee and must be included in the classification tables of all countries. However, the CCI Technical Committee does not include specialists whose native language is English, so specialists from different countries and their relevant proposals must be trusted.

As the CCI is an open and evolving classification system, it is normal to talk about developing and updating a system that adds new objects and aspects to the development of society and technology. Adding such a new class or subclass is an "update", and therefore the system becomes more voluminous, thus evolving.

In general, we can consider both "corrections" and "updates" as "changes" in the classification tables of the system. The process for introducing updates and corrections depends on the location of the need for revisions in the classification model.

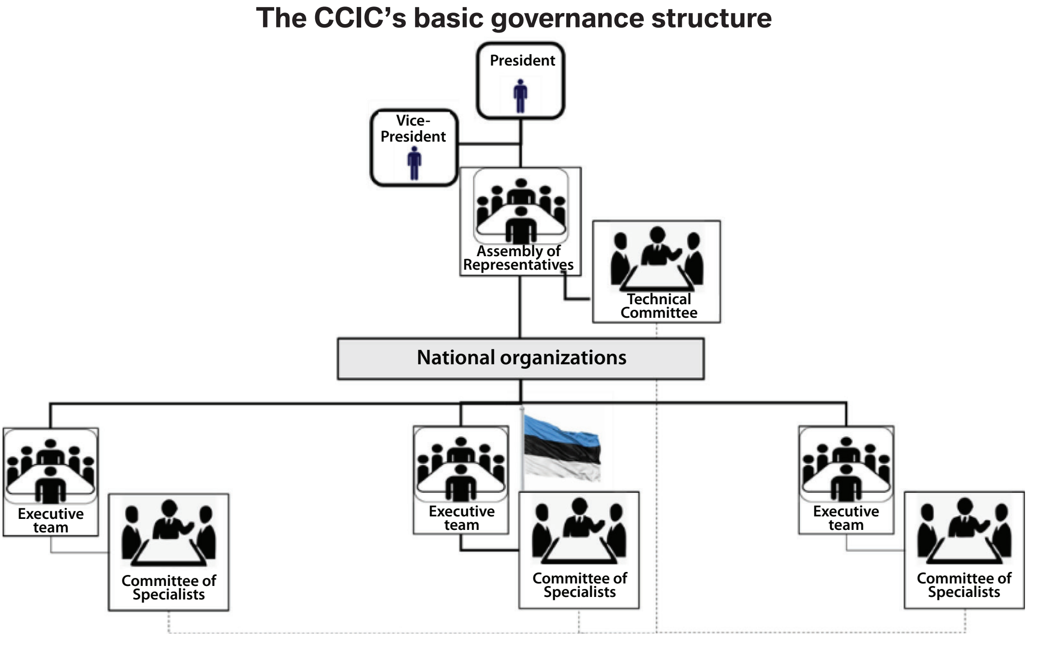

Figure 4. Basic scheme of the CCIC's governance structure.

The CCIC's governance structure is two-tiered. The representative body has been established to coordinate the organization's activities and is advised by the Technical Committee. There are no regulations for national organizations, and each partner country can arrange it to the best of its ability. In the case of Estonia, the executive team has been set up at the Estonian Construction Centre (EHITUSKESKUS of our company ET Infokeskuse AS), with various committees consisting of specialists. Depending on the essence and type of the revisions, additional specialists in the respective field may be involved. At the same time, an update, which initially seems simple, can also be much larger and more complex.

All revisions concerning the CCI-EE will be resolved by the national executive team. However, any such revisions to the core classification tables must be submitted to the CCIC's representative body and discussed in advance in the Technical Committee. Relevant meetings and discussions take place on a regular schedule, usually once a month. The revisions can also be based on the clearly expressed needs of only one participating partner, i.e. a country. The jointly approved revisions will then be implemented in all partner countries. At the same time, it must be borne in mind that the activities and working procedures of the Technical Committee as a new organization still need to be streamlined, as such revisions may take a few months to enter into force.

The CCI classification tables created and the classes they contain are grouped together as worksheets in an Excel spreadsheet, and the last page shows all corrections and updates in chronological order. In order to avoid duplication of classes, the Technical Committee shall code any revisions as soon as they are introduced and, where possible, leave room for new updates.

All revisions are submitted separately on the CCI-EE website https://ehituskeskus.ee in an electronically filled-in form, which partially copies the fields on the last worksheet of the CCI and indicates in which class the proposal for a revision is submitted. This will make it easier for members of the Technical Committee to find a suitable replacement. All proposals will be compiled chronologically into a database, with the applicant's contacts for possible clarifications. In any case, when proposing terms, the key terms related to the revision must also be provided in English.

Any revisions made to the CCI will be notified on the website and the version number of the CCI system will be changed upon renewal. The latest version with the date of approval can be seen on the CCI subpage on the Construction Centre's website.

Simple inquiries about the CCI can be sent to cci@ehituskeskus.ee, and they will reach the members of the CCI Executive Team or the Committee of Specialists, depending on the question. Practical usage questions can also be sent to the same e-mail, and over time they will be compiled on the CCI website with answers at the bottom of the FAQ section.

The CCI tables, manuals and additional information are free for all to use.

It is important for Estonia, as well as for other partners, that there is constant co-operation with specialists from the CCI partner countries, in order to ensure regular and consensual harmonization of the classification tables belonging to the core. The national (or CCI-EE) parts are updated and further developed in cooperation with the members of the CCI Estonia Executive Team and Technical Committee, which take into account changes in terminology and technology and the needs of actual users across the process lifecycle.

Standards referred to in the chapter

- ISO 12006-2:2001 Building construction - Organization of information about construction works - Part 2: Framework for classification of information
- ISO 12006-2:2020. Building construction - Organization of information about construction works - Part 2: Framework for classification (ISO 12006-2:2015)
- EVS-EN IEC 81346-2:2020 Industrial systems, installations and equipment and industrial products. Structuring principles and reference designations. Classification of objects and codes for classes
- ISO 81346-12:2018 Industrial systems, installations and equipment and industrial products - Structuring principles and reference designations - Part 12: Construction works and building services
- ISO 704:2009 Terminology work - Principles and methods
- ISO 22274:2013 Systems to manage terminology, knowledge and content - Concept-related aspects for developing and internationalizing classification systems
- EVS 932:2017 Construction design documents
- EVS 885:2005 Classification of construction costs
- EVS 807:2016 Management and maintenance of facilities
- ISO 15686-10 Buildings and constructed assets - Service life planning - Part 10: When to assess functional performance
- EVS-EN ISO 23386:2020 Building information modelling and other digital processes used in construction - Methodology to describe, author and maintain properties in interconnected data dictionaries
- EVS-EN ISO 23387:2020 Building information modelling (BIM) - Data templates for construction objects used in the life cycle of built assets - Concepts and principles

3. GENERAL INSTRUCTIONS FOR USING THE CCI-EE TABLES

This guide provides general instructions to the *Construction Classification International* (CCI) system, together with the national annexes (EE), used in Estonia to ensure the usage of construction-related information across the construction lifecycle. This general guide can also be found on the worksheet of the CCI-EE tables - **EE-Sissejuhatus** and in English also **EN-Introduction**. Although the guide is more general, the current version of the table has been taken into account at the time the guide was created.

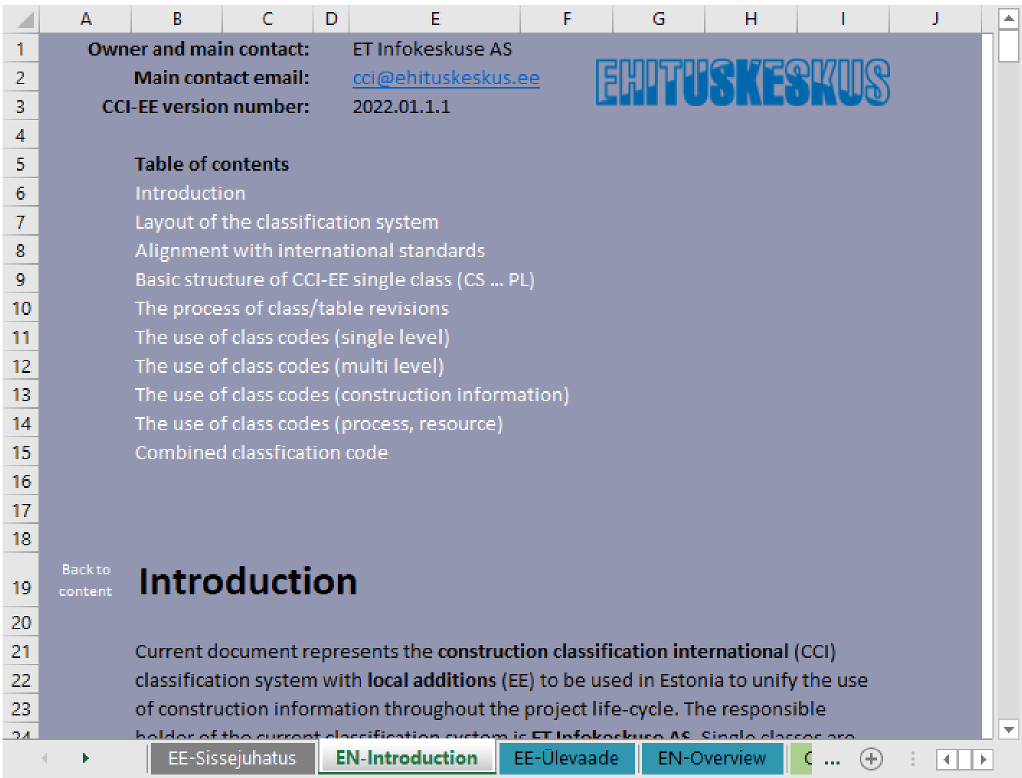

Figure 5. Home page of the CCI-EE classification system tables (EN-Introduction)

3.1. Layout of the classification system

The classification system consists of different classes, each of which is represented as a separate worksheet (the name of the worksheet is the short name of the respective class). A general overview of the classification system is provided in the EN-Overview worksheet. The classification system is based on standard EVS-EN ISO 12006-2. The individual classes can be distinguished by color code and refer to different aspects and processes concerning the construction process lifecycle.

CS	CC	CE	CF	CT	CO	RS	RA	RI	PC	PA	PD	PP	PM	PL

Green	Green classes represent the result of construction object which is formed or changed in state as the result of one or more construction processes (**Red**) using one or more construction resources (**Yellow**). Green classes are also called the "Core of the CCI" which is partly developed and updated by the CCI Committee (international committee). The CCI committee shares its proposals with the owner of this classification system, ET Infokeskuse AS, which then checks and coordinates the need to update all other classes and issues a new version with a change of version number.
Yellow	The yellow classes represent the construction resource used in the construction process (**Red**) to achieve a specific construction result. These classes are developed nationally, but their association with the core classes of the CCI system (**Green**) and the classes of the construction process (**Red**) is always ensured. Any revision to these classes will be confirmed and launched by ET Infokeskuse AS, which will add the class version number and update the file version number.
Red	The red classes represent a process that uses a construction resource (**Yellow**) to achieve a construction result. These classes are developed nationally, but their association with the core classes of the CCI system (**Green**) and the classes of the construction resource (**Yellow**) is always ensured. Any revision to these classes will be confirmed and launched by ET Infokeskuse AS, which will also add the class version number and update the file version number.

Note. All classes listed here must always be used in conjunction with each other. Therefore, the construction resource is related to the construction element, and the construction process is as element-neutral as possible.

3.2. Standards used

The classes are derived from various standards, which are also mentioned here. Among other things, deviations from the standards that have been deemed necessary to implement are represented.

Standard	Description
EVS-EN ISO 12006-2	**Building construction. Organization of information about construction works. Part 2: Tramework for classification** **Note:** The general framework of this standard has been used in the development of this classification system (including "CCI core classes" and national subclasses). See worksheet <**EN-Overview**> and the following subclass worksheets (CS–PL). **The main differences** The construction element is divided into classes: Functional system <**CF**>, Technical system <**CT**>, Construction component <**CO**>. The class "Construction product" is divided into two subclasses: "Construction component - **CO**" and "Construction information - <**RI**>", therefore it is not given as a separate class. The class "Work result" has been moved to the class "Production process", which also includes job descriptions.

EVS-EN 81346-1	**Industrial systems, installations and equipment and industrial products - Structuring principles and reference designations - Part 1: Basic rules** **Note.** This standard gives general structuring principles of the classification used in this classification system. Note that the principles of coding and structuring principles (including examples) are also covered in other standards.
EVS-EN IEC 81346-2	**Industrial systems, installations and equipment and industrial products - Structuring principles and reference designations - Part 2: Classification of objects and codes for classes** **Note.** General distribution of components applied to the class construction component <**CO**>. The focus is on the type of object and not on its property (this is described through a property or group of properties).
EVS-EN IEC 81346-12	**Industrial systems, installations and equipment and industrial products - Structuring principles and reference designations - Part 2: Classification of objects and codes for classes** **Note.** General distribution of functional and technical systems applied to the respective classes <**CF**> and <**CT**>.

Note. For more information on sources in other classes, see the final report: "Developing an unified construction classification system (31.07.2018–30.09.2020)".

3.3. General structure of a single class (CS–PL)

Each class worksheet contains a header section, followed by a class subdivision. All classes (worksheets) have the same structure in terms of rows and columns (only the Construction Information <RI> class contains additional columns that help to link a given property to other systems / standards with a predefined sample unit).

Note: All class worksheets are fixed (in terms of content, representation, coding, etc.) to a specific class version. All revisions, including subclass code / text revisions, additions, textual corrections, etc., will be launched by the owner of the classification system. See the "The process of table/class revisions" sub-section.

Header section (rows)

1: Class code	The short name of the CCI-EE class that matches the name of the worksheet and is used for any reference.
2: Class desc	A description of the CCI-EE class, which is also provided in the worksheet <**EN-Overview**>.
3: Version	The version number of the class associated with the <**EN-Revisions**> worksheet. This version number is generally not referenced, as this class is part of a complete classification system, and a change in one class will also result in the CCI-EE version change.
4: Function	A common feature identifier in environments related to construction information models that binds a class at either the component or project (construction entity) level.

5: Parameter name	The name of a parameter used in a software / web-based solution in which a value is associated with a specific class. The name of the parameter is based on the class code given in the <**AC**> sub-section of the Construction Information <RI> class. Space characters are not allowed when defining a parameter name. The name of the parameter depends on the version, as it is based on a specific class.
6: Parameter desc	The description of a parameter used in a software / web-based solution in which a value is associated with a specific class. The name of the parameter is based on the class code given in the <**AC**> sub-section of the Construction Information <RI> class. Space characters are not allowed when defining a parameter name. The description of the parameter depends on the version, as it is based on a specific class.

3.4. Section describing the subclass (columns), starting with "line 7"

A: Level 1	Classes are divided into one or more groups / subgroups. **Level 1** represents the first letter of the class' short name. If this class also contains a subclass (Level 2, Level 3), then the code of the Level 1 class is written as <**Letter1**><**?**><**?**>, in which <**?**> represents a so-called placeholder for the following letters. If the class has only one subclass (**Level 2**), the short name is written as <**Letter1**><**?**> and if the class has only one class, the short name is written as <**Letter1**>. For example, the functional system <**CF**> is always represented by a one-letter code only, so the **wall system** can be represented as <**B**>.
B: Level 2	If the class also has one subclass, **Level 2** is added. Level 2 represents the second letter of the class' short name. If the short name of the class also has the following subclass (**Level 3**), then the short name is written as <**Letter1**><**Letter2**><**?**>, in which <**?**> represents the so-called placeholder for the following letters. If the class has one subclass, the short name is written as <**Letter1**><**Letter2**>. For example, the **technical system** <**CT**> is always represented with a two-letter code, so the basis can be represented as <**BA**>.
C: Level 3	If the class also has a second subclass, **Level 3** is added. Level 3 represents the third letter of the class' short name. If the class' short name also has the following level, a numeric code is used. For example, the **construction component** <**CO**> is always represented by a three-letter code, so the pool can be represented as <**CLA**>. Note. The construction information <RI> class uses numbers as the third level (Level 3). This is primarily due to the broader support for properties. Thus, the **CCI** class property can be represented as <**AC005**>.
D: Level 4	Level 4 is for the sake of flexibility of the classification system. The current classification system uses a three-level representation.
E: Mõiste (EE)	Description of the short name of the class in Estonian. This is an important name in a situation where a description is needed in addition to the short name (class code). In some cases, this field already covers a longer description. If a longer description is used, the **Definitsioon** (EE) field is generally left blank.

F: Definitsioon (EE)	Class description in Estonian. It clarifies the description of the short name **Mõiste (EE)** from some characteristic point of view. In some cases, it is left blank if the description of the short name already uses a longer explanation.
G: Term (EN)	Description of the short name of the class in English. This is an important name in a situation where a description is needed in addition to the short name (class code). In some cases, this field already covers a longer description. If a longer description is used, the **Definition (EN)** field is generally left blank.
H: Definition (EN)	Class description in English. It clarifies the description of the short name **Term (EN)** from some characteristic point of view. In some cases, it is left blank if the description of the short name already uses a longer explanation.
I: Notes (EN)	Additional notes on the subclass in English. Supports the **Definition (EN)** column, which can also be used as an extension of the previous specification. Examples may include, but are not limited to, references. Not always in use.
J: Märkused (EE)	Additional notes for the subclass, in English. Supports the column **Definitsioon (EE)**, which can also be expressed as an extension of the previous specification. Examples may include, but are not limited to, references. Not always in use.
K: IFC name	Additional column for class **Construction Information** <**RI**>. Associates the specified property with the IFC name (as of versions 4.x and above). Based on this field, it is possible to find additional information about a given property on the buildingSMART web-site (incl. name of the construction entity, additional notes, property sets, etc.). Used only if the property name can be linked to the IFC name.
L: Predefined value list	Additional column for class **Construction Information** <**RI**>. Displays a list of predefined properties from which the parameter value is set. Generally only in English, translations can only be done if applicable to the local space. Sample lists are based on either IFC or other documents / standards. Yes / No type property options are set to **True** or **False**.
M: Unit	Additional column for the **Construction Information** <**RI**> class. Represents a sample unit for a given property. It is generally based on an IFC property (4.x and above) or another standard (referenced). Not all features having the unit are met here. The units can be represented in different subsystems (e.g. the unit of length can be given as <**mm**> or <**m**>) and the unit is specified by the data template used, which sets the properties to be used based on the specific use case (incl. component, client requirements, etc.).

3.5. The process of table/class revisions

Changes to the classification system (including class) will be launched by the CCI-EE owner. The end user is not allowed to make any revision, and all classes must be used according to the launched version (incl. current wording, class code, name, etc.) with reference to the version number in the <**EE-Introduction**> header of this worksheet (**CCI-EE version number**).

Each new version will be launched by the CCI-EE owner along with a list of revisions described in the <**EN-Revisions**> worksheet. Each new revision updates both the CCI-EE version number and the class version number in which the revision was made. This is because any revision in one class may necessitate an revision in another class, and the launched version must be viewed as a whole. It is more important to refer to the CCI-EE version number than to a single class version.

If a revision is made and it is related to a class code, it must always be indicated in the revision table (even if the revision was not made with the code itself, for example, the name, description, etc. was revised). This is necessary to maintain backward compatibility with any system that uses a specific version of the CCI-EE and thus can be upgraded. An example line is provided in the <**EN-Revisions**> worksheet.

The revisions are divided into different groups.

CCI-EE-**2020**.**10**.**0**.**1**

2020	-	indicates the year in which the update was launched
10	-	indicates the month in which the update was launched
0	-	indicates the number of the main revision, which means that the revision was introduced in several different classes (worksheets)
1	-	provides a minor revision number that indicates that the revision was made within only one class (worksheet) or is the first version of the current calendar month

If the number of the main revision changes, the number of the sub-level is changed to zero.

2020.**10**.**0**.**1**	-	current version
2021.**04**.**1**.**0**		the revision was launched **in April 2021** (**20 April 2021**), it is the first version of April (the number of the main revision is .**0**, and the sub-number denoting the initial version of April as .**1**)

3.6. Using a class code (single level)

The class code can contain letters and numbers. Numbers can also contain zeros and are always used after the letter code (not the other way around). The one-level reference should be as short as possible (up to three letters and up to three digits). For example, the class <**CS**> (Built space) contains a 3-letter code (e.g. **BAB**), but <**RI**> (Construction Information) contains a 2-letter + 3-digit code (e.g. **AC025**).

One-level referencing means that only one specific class is used. Different prefixes are used to characterize the referenced class.

=	when related to a function (e.g. wall system can be referred to as =**B**)
-	as related to the product (construction element)
+	if related to location (e.g. meeting room +**BAB**)
%	if related to a specific type

Square parentheses (<...>) are used as the upper level to distinguish class codes.

#Example. Meeting room (**BAB**) from the class B**uilt space** (**CS**) can be referred to as <**CS**> +**BAB**

As an upper level class may contain several equivalent subclasses, they are distinguished by an additional number.

#Example. Meeting room no. 1 (BAB01) from the class Built space (**CS**) can be referred to as <**CS**>+B**AB**01 **#Example.** Meeting room no. 2 (BAB02) from the class Built space (CS) can be referred to as <**CS**>+**BAB**02

If you need to refer to a type and not a number, you can use the % prefix.

#Example. A window of type 01 (**QQA**) from the class Construction Component (**CO**) can be referred to as

<**CO**>%**QQA**01

3.7. Using a class code (multi-level)

Multi-level referencing combines single-level codes into a single ordered sequence. The following punctuation is used to separate individual single-level codes.

.	(dot) the separator of single-level codes

#Example. Construction component <**CO**> window no. 1 (**QQA01**) in technical system <**CT**> wall structure no. 1 (**BD01**), which belongs to the functional system class <**CF**> wall system no. 1 (**B01**), can be referred to as:

-**B01.BD01.QQA01**

Note. Because functional systems use 1-letter code, technical systems do 2-letter one, and construction components use 3-letter code, they can be easily distinguished from each other. Different components of the same system are referred to separately (with part of the codes of the equivalent class).

#Example. The construction of a carriageway consisting of different layers of construction and built on the ground (base) can be referred to (from top to bottom) as:

-**A01.AA01.NCA01** (layer: asphalt layer; component: paving)

-**A01.AA01.UMC01** (layer: granual base; component: reinforcing mass layer)

-**A01.AA01.ULA01** (layer: subgrade; component: base course)

- **A01.AA01.BA01** (terrain, technical system, onto which the carriageway is built)

#Example. If a specific type should be represented as well, it is added after the numbered component indicator:

-**A01.AA01.NCA01%NCA03** (layer: asphalt pavement; component: paving; type 03)

-**A01.AA01.UMC01%UMC02** (layer: granual base; component: reinforcing mass layer; type 02)

-**A01.AA01.ULA01%ULA04** (layer: subgrade; component: base course; type 04)

Note. The prefix % represents a specific type of component. For example, **%NCA03** represents a specific type of asphalt layer, which is represented by a number 03. Both, the "number" and the "type number" are defined in two-digit code and the prefix differentiate in between those (if it should be taken as a number or a type).

Different subclasses belonging to the same class (e.g. components that depend on each other) can also be linked in a multi-level representation.

#Example. Security chain, **RLA01**, which belongs to a door **QQC01**:

-**QQC01.RLA01**

3.8. The use of class codes (construction information)

In addition to the type of object, more detailed properties (construction information, <RI>) must be provided if necessary to distinguish between different aspects (including the required values or by reading the desired value automatically from the classification code).

(...)	parenthesis separate the part concerning the properties
#	if other aspects are referred to, the character represents a so-called placeholder for the corresponding property represented by the character as long as it is required (known)

The properties are combined under a specific data template (property sets), which also contains similar properties in one whole. Because data templates can be standardized (e.g., based on the client) and given a specific short name, they can be used to provide the required properties.

The short name of the data template can be based on the code of the construction information subgroup <RI>. Thus, when a data template focuses on performance-related properties, it can include, for example, three distinct properties: **Flowrate, Pressure, Effectiveness**.

The following presentation can be used to present it as a property set in the classification code.

#Example. Liquid velocity pump (<**CO**>**GPB01**) of type **GPB03** and properties with data template of type **DA01**, which includes three properties in a certain order:

-**GPB01%GPB03**(DA01;5;30;75)

Note. Values must be separated with a semicolon, as a comma is required to represent the decimal point. The data template represents the expected unit. For example, DA01 may state that these numbers should be read as: Flowrate = 5 l/s, Pressure = 30 mH2O, Effectiveness = 75%.

If some values (it usually depends on in which project stage the information is required/given) are not yet known, the # must be used as a placeholder.

#Example. Liquid velocity pump (<**CO**>**GPB01**) of type **GPB03** and properties with data template of type **DA01**, which includes three properties in a certain order but effectiveness is not known as it depends on the certain type / product:

-**GPB01%GPB03**(DA01;5;30;#)

The complete classification code begins with a reference to the class of the construction process and the construction resource used. As construction processes are divided into different classes, a reference to the class name followed by a specific class code must also be used. The same applies to construction resources and the production process.

#Example. The external water supply and drainage network, which is at the design stage (<PD>ADF), requires a construction aid such as welding device (<RS>FG) to be able to build water supply and drainage lines (<PP> TA):

<**PD**>**ADF**.<**RS**>**FG**.<**PP**>**TA**

Note. The first level can have class codes: <PC>, <PA>, <PD>, <PM>, <PL>. Second level class codes: <RS>, <RA>. The third level has only one class code option: <PP>.A>. The third level has only one class code option: <PP>.

3.9. The use of the class code (process, resource)

The complete classification code begins with a reference to the class of the construction process and the construction resource used. As construction processes are divided into different classes, a reference to the class name followed by a specific class code must also be used. The same applies to construction resources and the production process.

As construction processes are divided into different classes, a reference to the class name followed by a specific class code must also be used. The same applies to construction resources and the production process.

#Example. The external water supply and drainage network, which is at the design stage (<PD>ADF), requires a construction aid such as welding device (<RS>FG) to be able to build water supply and drainage lines (<PP> TA):

<**PD**>**ADF**.<**RS**>**FG**.<**PP**>**TA**

Note. The first level can have class codes: <PC>, <PA>, <PD>, <PM>, <PL>. Second level class codes: <RS>, <RA>. The third level has only one class code option: <PP>.

3.10 Combined classification code

The combined classification code starts with the process / resource sub-code, followed by the specification related to the construction element (location, function, system, component) and the construction information (data template, properties) is provided as part of the latter. The characters marked above are used to distinguish these parts.

Process / resource (<**PC**>, <**PA**>, <**PD**>, <**PM**>, <**PL**>; <**RS**>, <**RA**>; <**PP**>): (Process: 7-character code). (Resource: 6-character code). (Production: 6-character code) <**##**>**###**.<**##**>**##**.<**PP**>**##**

Note. The prefix / suffix is also taken into account, the delimiter of the code part is accounted for separately.

Location (<**CS**><**CC**><**CE**>):

(Space: 3 letters + 2 numbers). (Complex: 1 letter + 2 numbers). (Construction entity: 2 letters + 2 numbers)

+###$$.#$$.##$$

Note. The + prefix is used to separate the location code part from the process / resource-related part. The character $ is used to represent a numeric part of the code that is different from the letter part represented by the # character. A 4-character code is reserved for construction complexes.

Construction element (<**CF**><**CT**><**CO**>):

(Functional system: 1 letter + 2 numbers). (Technical system: 2 letters + 2 numbers) (Component: 3 letters + 2 numbers)

-#$$.##$$.###$$

Note: The prefix is used to separate a construction element code part from a location-based part.

Component type and properties (<**RI**>):

(Type: 3 letters + 2 numbers). (Data template: 2 letters + 2 numbers; parameter; parameter2; ...; parameterN)

%###$$.(##$$;#;#;…;#)

Note. The prefix % is used to separate the code part associated with the component type from the code part associated with the construction element, which is in a more general representation. Parentheses are used both to refer to a data template and to represent related properties. The number of properties in parentheses depends on the specific data template. If the value is unknown, the # or $ character is used as a placeholder.

<##>###.<##>##.<PP>##+###$$.#$$.##$$-#$$.##$$.###$$%###$$.(##$$;#;#;…;#)

Note. Information that is not known at any selected time is presented as a placeholder. It can also be used in part (for example, a class is known, but not a subclass).

3.11. Reference designation set examples

Examples of the reference designation set are specified for overview only. The scope of the code (several sections are recommended for use) is agreed in the requirements by the client (including taking into account the specifics of any required IT system).

#Example. Assume that a new carriageway route (corridor) is planned, which is initially represented with only a spatial plan and only one line (e.g. the term axis is used for a carriageway). This is a construction entity, so we mark the part of the construction entity with the code found in table <CE>: RA.

<##>###.<##>##.<PP>##+###$$.#$$.RA$$-#$$.##$$.###$$%###$$.(##$$;#;#;...;#)

Note. If it is necessary to differentiate the carriageway by this number (i.e. there are several carriageways planned), you can also add a number and differentiate different roads with a different code part from the planning stage.

<##>###.<##>##.<PP>##+###$$.#$$.RA01-#$$.##$$.###$$%###$$.(##$$;#;#;...;#)

The first part of the code represents the lifecycle stage of the carriageway and the specific activities it indicates (e.g. planning, design, management, etc.). We assume that, at the moment, we want to present the planning stage. So we use the sub-table <PL> and the code found there: ABA.

<PL>ABA.<##>##.<PP>##+###$$.#$$.RA01-#$$.##$$.###$$%###$$.(##$$;#;#;...;#)

Note. <PL>ABA - the code **ABA** comes from table <**PL**> and indicates: **A** = Portfolio management > **AB** = Pre-project stages > **ABA** = Concept of necessity.

The second part of the code (yellow) represents the resources. As the <RS> table contains physical techniques, it is not currently in use or it is too early to talk about it. However, we can bind the <RA> code, which is the code of the project participant. For example, carriageway planning can be done by: <**RA**><**ABA**>, i.e.: **A** = Developers > **AB?** > Designers > **ABA** = Planner.

The general code takes the following form:

<PL>ABA.<RA>ABA.<PP>##+###$$.#$$.RA01-#$$.##$$.###$$%###$$.(##$$;#;#;...;#).

As far as the construction entity is concerned, we can add or clarify that we are talking about the space to be planned for the vehicles and thus add FAA to the <CS> table.

<PL>ABA.<RA>ABA.<PP>##+FAA$$.#$$.RA01-#$$.##$$.###$$%###$$.(##$$;#;#;...;#)

We go to the element level of the carriageway (after the minus sign) when more is known about this carriageway (incl. components), see for instance the previous example. However, at the planning stage, it may also be necessary to indicate the properties that differentiate the additional requirements for the carriageway. They can be implemented by including a data template type that contains important parameters at the design stage (e.g. number of traffic lanes). This approach makes it possible to distinguish and take into account carriageway code parts separately when planning several different carriageways.

Moving on from the design stage, the first code part changes. For example, it may indicate a design stage. Note that there are several different code parts for the same carriageway, depending on the activity, methods of cost calculation, and so on. In other words, when a carriageway is being built, one line of code may indicate the use of a machine (code from the <RS> table) and another line may indicate the use of labor (from the <RA> table). Meanwhile the carriageway code itself with the number remains the same (for example: RA01). For example, 2 different activities related to the same carriageway are represented below, but this can be continued until the "n-activity" field.

Activity 1:

(<PL>BBB - construction; <RS>HD - tillage equipment is used; <PP>AA - remediation of the building site)

<PL>BBB.<RS>HD.<PP>AA+FAA$$.#$$.RA01-#$$.##$$.###$$%###$$.(##$$;#;#;...;#)

Activity 2:

(<PL>BBB - construction; <RS>HD - excavation equipment is used; <PP>DC - excavation work)

<PL>BBB.<RS>HA. <PP>DC +FAA$$.#$$.RA01-#$$.##$$.###$$%###$$.(##$$;#;#;...;#)

...

Activity n

For the sake of simplicity, we can also use shorter code parts for the same construction entity / element and thus differentiate between different, proposed codes:

+FAA$$.#$$.RA01

<PL>BBB.<RS>HD.<PP>AA

<PL>BBB.<RS>HA. <PP>DC

Or simply referring to a construction entity (project-based):

<CE>+RA01

<PL>BBB.<RS>HD.<PP>AA

<PL>BBB.<RS>HA. <PP>DC

4. BIM REQUIREMENTS OF FOR PUBLIC SECTOR CLIENTS AND CCI-EE

4.1. About the reference model

The compilers of the BIM requirements of public sector clients (PSC) have called on their prospective users to avoid imposing excessive procurement requirements. Unfortunately, at the moment we are in a situation where neither the customer nor the future executor of the procurement contract has full clarity about the future needs of the model being created when ordering model design. Therefore, it is reasonable to construct an optimal model scope based on the PSC's common BIM requirements that meets both the client's needs and the executor's capabilities.

> The purpose of the reference model is to ensure that the established PSC's BIM requirements can still be performed with the model design tools common in the sector today, and, in the next stage, the model will be able to support the performance of the model-based building register. The reference model is also an example for construction entity's information model compilers.

The following conditions have been taken into account when performing the work.

- The data content of the building and infrastructure guides was modeled up to the as-built model stage. The working model of Viimsi State Gymnasium was used as an example.
- A vertical section has been modeled from the model of Viimsi State Gymnasium, which ensures compliance with the data content requirements of the PSC's BIM for all elements of the building.
- The supply systems are modeled as an integral system.
- The model uses a common project 0-point / base point for both buildings and infrastructure. In addition, a description has been prepared which is the best solution for observing the infrastructure and the building model within the same coordinates.
- A 0-point / base point is provided, and it is interfaced with an explanation of the workflow in the explanatory memorandum.
- In the integrated software, a structure tree has been created for orientation among different examples.
- Data export must be agreed upon when exporting models. The data content of the models can be viewed and checked in an open file format (IFC, LandXML).
- Sample objects are brought to the building on the example of facilities.
- In addition, the CCI classifier codes are added to the building and infrastructure attribute data.
- The explanatory memorandum specifies the workflow and includes a description of adding and exporting attribute data.
- The Land Board's restriction files (the Shape files) are tested as a partial model of boundaries and restrictions.
- A sample file for machine control of road works has been created, and a workflow description has been prepared in the explanatory memorandum.
- The part of the work is an explanatory memorandum, which describes the workflows and special cases, as well as parts, if it is not possible to model based on the data content requirements. Modeling differences are described in the data content tables.
- As an example, a cover letter has been created for one model.

The materials of the survey can be found at the following link: Final survey report.

4.2. Update of the CCI-EE to the reference model's data content tables

The proposals are based on the PSC's BIM requirements data tables for buildings and infrastructure. For buildings, updates have been made to the list of properties due to proposals of the development team of the MEAC's building register (tinyurl.com/24jn7wz5, tinyurl.com/nhxha37r, tinyurl.com/yc3nr9nh). In addition, the requirements of RKAS BIM 2021 (https://1drv.ms/x/s!AjxRObI666SpkpkxPofRvxpc39JEAQ?e=2RBXhX) which are valid since autumn 2021 have been taken into account when compiling the data content tables.

First, the values on the subpage of properties are linked to the CCI-EE properties.

Table 2. Example of linking the PSC's properties to the CCI-EE properties

	Omadused				
	CCI-EE VASTE	Property / Attribute	IFC reference	Data Type	Näide
	AN220_Nimetus	001_Nimetus	IfcRoot.Name	IfcLabel	Moodul-ripplagi
	AN350_Tüüp	002_Tähis	IfcObject.ObjectType	IfcLabel	RL-02
	AL070_Katastritunnus	010_Katastritunnus	IfcSite.LongName	IfcLabel	78401:118:0122
	FA030_Ehitatav ala	015_Ehitatav_pindala	TotalArea	IfcAreaMeasure	1295
	FA920_Pindala	020_Pindala	TotalArea	IfcAreaMeasure	3501
	FC044_Ehitise kõrguspiirang	025_Max_kõrgus	BuildingHeightLimit	IfcPositiveLengthMeasure	23
	AA030_Postiaadress	030_Hoone_aadress	IfcBuilding.BuildingAddress	IfcLabel	Lelle 24, Tallinn
	CH640_Sprinkleri kaitse	035_Sprinkler	SprinklerProtection	IfcBoolean	TRUE
	FC274_Kõrgus	040_Kõrgus	TotalHeight	IfcLengthMeasure	25,1

On the subpage of the set of properties, the values given on the property sheet are associated with a specific object.

Table 3. Example of binding an object to the CCI-EE values

AR	CCI-EE	Omadus / Atribuut	Näide
	AN220_Nimetus	001_Nimetus	Büroohoone
	AA030_Postiaadress	030_Hoone_aadress	Lelle 24, Tallinn
	CH640_Sprinkleri_kaitse	035_Sprinkler	TRUE
	FC274_Kõrgus	040_Kõrgus	25,1
	FA500_Alune_netopindala	045_Hoonealune_pindala	8000,1
	FA490_Põranda_netopind	050_Neto_pindala	10284,8
	FD390_Netomaht	055_Neto_ruumala	40054

The team in this survey has developed examples of template files for AutoCAD Architecture / MEP, Autodesk AutoCAD, Autodesk Civil 3D, and Autodesk Revit, as well as descriptions for adding the CCI-EE classification to software. Based on the created materials, the Estonian Digital Construction Cluster will continue to create basic software templates.

5. ON THE CLASSIFICATION OF CONSTRUCTION COSTS IN THE CCI-EE SYSTEM

Compiling the construction cost for the construction work is one stage in the entire construction process lifecycle. The pricing of a construction entity and its parts starts from the implementation of the initial ideas of the construction entity at an early stage until the end of the production process.

Both the public and private sectors compile a procurement plan for each subsequent period, using different classifiers. Standard EVS 885:2005 "Classification of construction costs" has been used by the state for participation in public procurement for construction of buildings. A large number of general contractors have used this system as a model for compiling the construction cost in their companies. Other classification tables are also used, such as TALO 2000 developed in Finland. In addition, the solutions developed by the company itself are also in use, some of them are based on EVS 885 or TALO 2000. The Transport Board uses a separate classification called "Technical description of road works." Subcontractors and suppliers each have their own solution that is different from that of general contractors. In general, subcontractors' tables are more detailed and contain information with the accuracy on resources.

This chapter focuses on the possibility of compiling the construction cost in the CCI-EE system. This can be used as a basis for a costing table to be drawn up as a basis for public procurement, on the basis of which the tenderer will be able to draw up a tender. For the most part, general contractors compile their cost tables in more detail than they send to the state as the client. The tables for subcontractors and suppliers, in turn, are even more detailed than those for general contractors.

The preparation of the tender in the CCI-EE system on the example of EVS 885 is considered below, as it includes both buildings and facilities around them. Comparing these two different systems, the matches are usually found in the CCI-EE tables. If necessary, the system can be upgraded. Depending on the client's wishes and needs, the CCI-EE tables can be combined to compile the construction cost. There is no need to update the current standard for the classification of construction costs, EVS 885, as it focuses on just one part of the process lifecycle. More detailed justifications are provided in the final report on the activities of the working group for creation of the CCI-EE, which was completed in late 2020.
(https://eehitus.ee/wp-content/uploads/2020/12/UKS-Lopparuanne CCI EE.pdf)

The following are descriptions and examples of how to use the CCI-EE classifiers instead of EVS 885.

The standard for the classification of construction costs, EVS 885:2005, contains three different types of cost groups (see Table 4):

1. client's costs in main group 0 related to the development and design of the construction entity;
2. direct costs in main groups 1–7 related to the construction entity as a finished product;
3. organizational and management costs in main groups 8–9 required to complete the product.

Table 4. Content of EVS 885 main groups

Code	Description of works	Explanation
0	Client's costs	Not included in the cost estimate prepared by the builder

Code	Description of works	Explanation
1-7	Exterior facilities, foundations and foundations, load-bearing structures, facade elements and roofs, space structures and surface covers, furnishing, fixtures, equipment, supply systems	Builder 's direct costs
8-9	Site establishment costs, site indirect costs	Construction support, i.e. the builder's site arrangement costs and and indirect costs, the company's indirect costs

Because preparing a quote for a tenderer is part of the lifecycle of a construction entity, further explanations are given in Table 4 for the last two columns in the form of figures and tables and two annexes. Annex 1 is an example of an excerpt from the general contractor's cost estimate, and Annex 2 is the same using the CCI-EE tables.

Currently, the construction cost is mostly compiled on the basis of MS Excel, where there is no linking of expenditure lines to the construction entity in the model. Therefore, little emphasis has been placed on the coding of expenditure lines in the cost estimates made so far, and the calculations have been made to the extent that the table can be looked up quickly.

When compiling the construction cost, information is collected from the various CCI-EE tables, which is the basis for the tender to be compiled, including both overhead costs and establishment costs related to the object under construction and its company (see Table 5).

Table 5. EVS 885 main groups and list of CCI-EE tables

EVS 885	CCI-EE
1 outdoor facilities 2 groundworks structures and foundations 3 load-bearing structures 4 facade elements and roofs 5 space structures and surface covers 6 furnishings, fixtures, and equipment 7 supply systems	CF functional system CT technical system CO construction component PP production process RI construction information
8 site establishment costs 9 site indirect costs	PC management RS construction aid RA construction agent RI construction information

Since the code created during pricing is one part of one reference designation set, in this example it is worth considering where the expenditure line codes in the construction contract are located as a whole. For more information on coding, see the General Guide to Using The CCI-EE Tables, and the explanations and examples in the CCI-EE Tables within the EE-Introduction worksheet.

As an example, the part of the reference designation set concerning the construction element is colored yellow:

<##>###.<##>##.<PP>##+###$$.#$$.##$$-#$$.##$$.###$$%###$$.(##$$;#;#;…;#)

5.1. Direct costs

The following are explanations and examples of how to use the CCI-EE classifiers to classify direct construction costs.

The direct costs of the total cost can be described through the construction element, where the detail is determined by either the contracting authority or the tenderer. Depending on the request, the classification can be started by using either the "CF" functional system or the "CT" technical system table as the base table. If the aggregate costs of different functional systems are important when filtering information, you should start from the "CF" table.

If the technical system table is chosen as the basis for compiling the cost calculation, then the main groups of direct costs consist of twelve groups:

- A - assembly system;
- B - structural system;
- C - ground surface construction system;
- D - railway system;
- H - supply system;
- J - transportation system;
- K - treatment system;
- L - monitoring and control system;
- M - information representing system;
- P - security system;
- Q - storage system;
- R - furnishing system.

Each of these main groups has a two-letter subclass, which is specified when compiling the cost. For example, the subclasses of a structural system are: groundworks, foundation, slab, wall, roof, floor, ceiling and routing structures. Further details can be found in the table for the construction component "CO". The latter is suitable for use by both subcontractors and suppliers, for whom it is important to obtain a cost at the component level.

In the following example, the construction components window no. 2 and no. 3 are classified, one of which is right-handed and the other one is left-handed. They are located in the technical system, in the exterior load-bearing wall number 1 (see Table 6).

Table 6. Component in the technical system "wall structure"

Table reference	Description	Cost calculation part code from the reference designation set
<CT>	BD01 wall structure no. 1	
<CO>	QQA02%QQA01 window with type designation 02 (in this example as right-handed) with the window number 01 of this type added	- BD01.QQA02%QQA01
<CO>	QQA03%QQA02 window with type designation 03 (in this example as left-handed) with the window number 02 of this type added	- BD01.QQA03%QQA02

Each component can be considered as a whole and include other subcomponents. For example, a window can be considered as a single component, but it can in turn comprise several smaller components (see Figure 6).

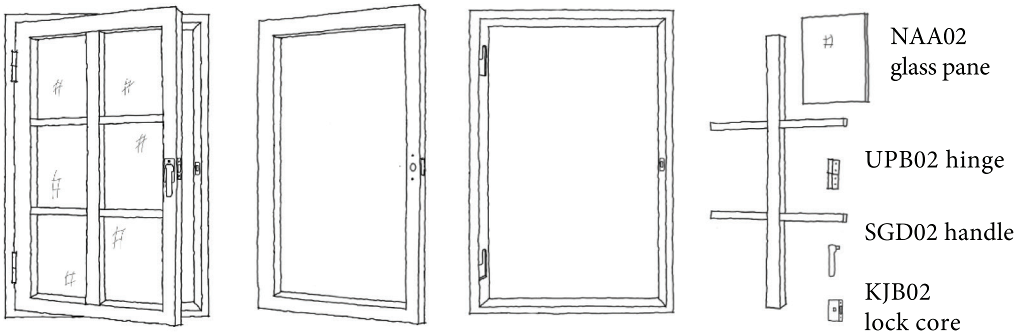

Figure 6. (Eckerberg, 2019) Example of an integral component consisting of separate components

A further example is where in one case it is possible to classify one integral component and in another case all the small components of the same component (see Table 7).

Table 7. Components in the technical system "wall structure"

Table reference	Description	Cost calculation part code from the reference designation set
<CO>	QQA02	
<CO>	UNC02 window frame	- QQA02.UNC02
<CO>	UNA02 window case	- QQA02.UNA02
<CO>	UND02 glass distribution	- QQA02.UND02
<CO>	NAA02 glass pane	- QQA02.NAA02
<CO>	UPB02 hinge	- QQA02.UPB02
<CO>	SGD02 handle	- QQA02.SGD02
<CO>	KJB02 lock core	- QQA02.KJB02

If, for example, one type of exterior wall is given, it may be sufficient to provide the general contractor with information on three cost lines: load-bearing masonry, thermal , and façade (see Figure 7).

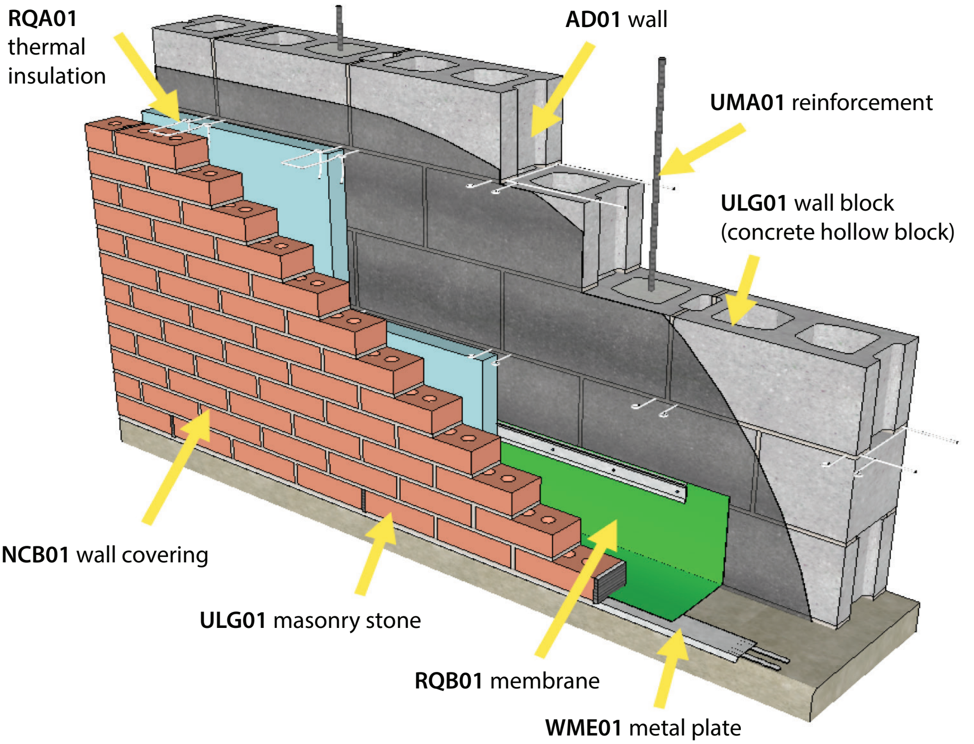

Figure 7. (Eckerberg, 2019) Technical system "wall" consisting of components

In this case, the following classification is appropriate for the main contractor (see Table 8). In given example, it is assumed that cost categories such as material, machinery, labor, etc. are included as part of the price of the component.

Table 8. Classified exterior wall at a more general level

Table reference	Description	Cost calculation part code from the reference designation set
<CT>	AD01 wall	
<CO>	ULG01 wall block	- AD01.ULG01
<CO>	RQA01 thermal insulation	- AD01.RQA01
<CO>	ULG01 wall block (brick)	- AD01.ULG02

For a specific system, a price request can be made, for example, to two different subcontractors, where one performs masonry work, and the other does insulation work and facade work. The general contractor may not care about each detailed resource item or scope at this stage or later, so a more general level of information will suffice. The person doing the specific work is interested in the list of different resources and separately in the exact scope and cost of each resource. The following is an example of a subcontractor pricing table within your organization (see Table 9). Depending on the agreement, the contractor will submit its tender to the main contractor either more generally (see Table 8) or in more detail (see Table 9).

Table 9. Classified exterior wall at a more detailed level

Table reference	Description	Cost calculation part code from the reference designation set
Subcontractor 1		
<CT>	AD01 wall	
<CO>	ULG01 wall block	- AD01.ULG01
<CO>	UMA01 reinforcement	- AD01.UMA01
<CO>	UMH01 concrete casting	- AD01.UMH01
Subcontractor 2		
<CT>	AD01 wall	
<CO>	RQB01 membrane	- AD01.RQB01
<CO>	RQA01 thermal insulation	- AD01.RQA01
<CO>	ULG02 masonry stone	- AD01.ULG02
<CO>	WME01 metal plate	- AD01.WME01

As the CCI-EE system is intended for use in both buildings and infrastructure, the following is an example of the classification of a bridge at the construction element level (see Figure 8).

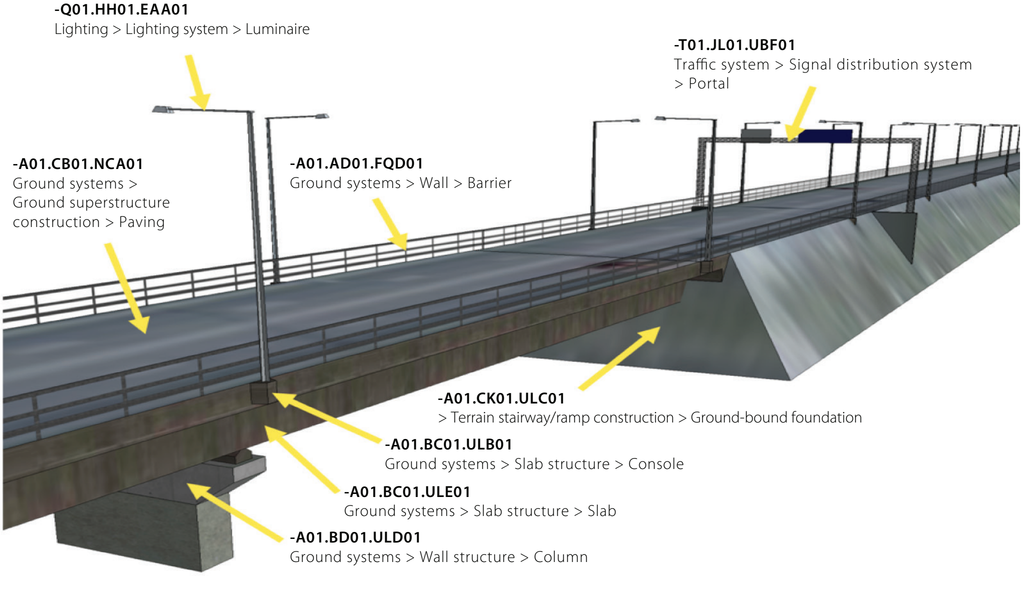

Figure 8. (Eckerberg, 2019) Construction entity, bridge, components

According to the figure above (see Figure 8), a fragment of the calculation has been compiled from the parts of the classified bridge (see Table 10). The main group for classifying parts of a construction entity is the functional system, which lists the technical system and the components at the most detailed level as a subgroup.

Table 10. Classified bridge components

Table reference	Description	Cost calculation part code from the reference designation set
<CE>	RK01 bridge	
<CF>	A01 ground systems	

Table reference	Description	Cost calculation part code from the reference designation set
<CT>	AD01 wall	
<CO>	FQD01 barrier	-A01.AD01.FQD01
<CT>	BC01 slab construction	
<CO>	ULB01 console	-A01.BC01.ULB01
<CO>	ULE01 slab	-A01.BC01.ULE01
<CT>	BD01 wall structure	
<CO>	ULD01 column	-A01.BD01.ULD01
<CT>	CB01 ground superstructure construction	
<CO>	NCA01 paving	-A01.CB01.NRK01
<CE>	RK01 bridge	
<CT>	CK01 terrain stairway/ramp construction	
<CO>	ULC01 ground-bound foundation	-A01.CK01.ULC01
<CF>	Q01 lighting	
<CT>	HH01 lighting system	
<CO>	EAA01 luminaire	-Q01.HH01.EAA01
<CF>	T01 traffic system	
<CT>	JL01 signal distribution system	
<CO>	UBF01 portal	-T01.JL01.UBF01

Depending on the procurement conditions and what is described in the project, it may be necessary to specify different properties of the construction component. For example, if there is an exterior wall in the procurement table in which the load-bearing part is a finished sandwich reinforced concrete panel, the entry “exterior wall panel” must be made in the construction component line and the necessary properties and their values must be added. If the same wall has openings, the cost of which is affected by the type, dimensions and required thermal transmittance of this material, the expenditure lines must also be supplemented with information on the material properties (see Table 11).

Table 11. Classified exterior wall components

Table reference	Description	Cost calculation part code from the reference designation set
<CF>	B01 wall system	
<CT>	AD01 wall	
<CO>	QQA01 A-01 2300 × 1325 mm, aluminum	-B01.AD01.QQA01.(AP028;#;#;#)(ED520;aluminum;#;#)(CP570;#;#;#)
<RI>	AP028 dimensions	
<RI>	ED520 material type	
<RI>	CP570 thermal transmittance	
<CO>	QQA09 A-09 3000 × 2000 mm, wood	-B01.AD01.QQA09.(AP028;#;#;#)(ED520;wood;#;#)(CP570;#;#;#)
<RI>	AP028 dimensions	
<RI>	ED520 material type	
<RI>	CP570 thermal transmittance	

Table reference	Description	Cost calculation part code from the reference designation set
<CO>	QQC01 VU-01 4600 × 2500 mm, aluminum	-B01.AD01.QQC01.(AP028;#;#;#) (ED520 ;wood;#;#) (CP570 ;#;#;#)
<RI>	AP028 dimensions	
<RI>	ED520 material type	
<RI>	CP570 thermal transmittance	
<CO>	QQC02 VU-02 1600 × 2500 mm, steel	-B01.AD01.QQC04.(AP028;#;#;#) (ED520 ;wood;#;#) (CP570 ;#;#;#)
<RI>	AP028 dimensions	
<RI>	ED520 material type	
<RI>	CP570 thermal transmittance	
<CT>	BD01 wall structure	
<CO>	ULM01 exterior wall panel	-B01.BD01.ULM01. (ED520;concrete;#;#) (CN495;#;#;#)(ED440;#;#;#)
<RI>	ED520 material type	
<RI>	CN495 concrete class	
<RI>	ED440 material color	
<CT>	ULD01 column	-B01.BD01.ULD01.(ED520;concrete;#;#) (CN495;#;#;#)(ED440;#;#;#)
<RI>	ED520 material type	
<RI>	CN495 concrete class	
<RI>	ED440 material color	

5.2. Indirect costs and establishment costs

The following are explanations and examples of how to use the CCI-EE classifiers to classify indirect costs and establishment costs of the construction.

The equipment, means, persons, etc. required to organize and carry out the construction depend on the site and its characteristics. The relevant CCI-EE classes must be used to estimate the cost during classification of organizational and indirect costs: management "PC", construction support "RS", construction agents "RA", and construction information "RI".

If it is necessary to provide a list of necessary construction work management costs, management classes must be used, specifying the construction agent if desired. In the latter case, the agents involved in the construction entity as a whole or in its individual parts can be designated. The expenditure lines required to organize construction can be described using classes of construction support information and construction information. The following example contains excerpts from the respective costs, and, based on these examples, each organization can compile its own exact list according to the object (see Table 12).

Table 12. Classified management costs and establishment costs

Table reference	Description	Cost calculation part code from the reference designation set
<RA>	CBB general contractor	<RA>CBB
<PC>	F construction work management	
<PC>	FA wage costs	
<PC>	FA01 project manager	<PC>FA01
<PC>	FA02 site manager	<PC>FA02
<PC>	FA03 object engineer	<PC>FA03
<PC>	FB office maintenance costs	
<PC>	FB01 site office maintenance costs	<PC>FB01
<PC>	FB02 company office maintenance costs	<PC>FB02
<PC>	FC wages of auxiliary workers	<PC>FC
<PC>	FD sampling and testing	<PC>FD
<PC>	FE security service	
<PC>	FE01 manned guarding	<PC>FE01
<PC>	FE02 video surveillance	<PC>FE02
<PC>	FF representation expenses	<PC>FF
<PC>	FG training	<PC>FG
<PC>	FH preparation of site documentation	<PC>FH
<RS>	CA manual vehicles	<RS>CA
<RS>	DC waste storage facilities	<RS>DC
<RS>	FK mixing equipment	<RS>FK
<RS>	AD water supply equipment	<RS>AD
<RI>	DA676 water (quantity)	<RS>AD.(DA676; #;#;#)
<RS>	AB power supply system (220 V + 3 × 220 V)	<RS>AB
<RI>	CF020 electricity	<RS>AB.(CF020; #;#;#)
<RS>	AH communications equipment	<RS>AH
<RS>	AE heat supply equipment	<RS>AH
<RI>	DA224 fuel	<RS>AE.(DA224; #;#;#)
<RI>	CF260 heat energy amount	<RS>AE.(CF260; #;#;#)

If the expenditure line is wanted to represent both components and activities for the completion of the product, the production process PP table must be used to describe the list of activities (see Table 13).

Table 13. Classified exterior wall components and related activities

Table reference	Description	Code
<CF>	B wall system	
<CT>	AD01 wall	
<CO> <PP>	QQA01 window 01 and its installation MA	<##>###.<##>##.<PP>MA+###$$.##$$.###$$-B$$. AD01. QQA01%###$$.(##$$;#;#;.;#)
<CO> <PP>	QQA09 window 09 and its installation MA	<##>###.<##>##.<PP>MA+###$$.##$$.###$$-B$$. AD01. QQA09%###$$.(##$$;#;#;.;#)
<CO> <PP>	QQC01 exterior door 01 and its installation	<##>###.<##>##.<PP>MB+###$$.##$$.###$$-B$$. AD01. QQC01%###$$.(##$$;#;#;.;#)
<CT>	BD01 wall structure	
<CO> <PP>	ULM01 exterior wall panel and its assembly	<##>###.<##>##.<PP>G#+###$$.##$$.###$$-B$$. BD01. ULM01%###$$.(##$$;#;#;.;#)
<CO> <PP>	ULD01 column and its assembly	<##>###.<##>##.<PP>G#+###$$.##$$.###$$-B$$. BD01. ULD01%###$$.(##$$;#;#;.;#)

ANNEX 1. COST ESTIMATE PREPARED BY THE BUILDER WITH EVS 885 CLASSIFIER

Code	Description
1	**OUTDOOR FACILITIES**
11	Preparation and demolition
115	Compensation for eliminated trees
	Elimination and outflow of trees
117	Demolition of buildings and facilities
	Demolition of existing pipeline routes
12	Building pit
121	Peeling the soil
	Peeling the soil, h = 300 mm
122	Excavations
	Excavation under the building (down to a depth of 11.00 m, at a cabbage storage facility down to a depth of 9.90 m)
123	Fillings
	Filling soil under the building and on its sides
128	Soil transportation
	Removal and outflow of excavated soil
14	Outdoor construction entities
141	Overpasses, ramps and slope ways
	Reinforced concrete slope way (axis D)
	Reinforced concrete slope way (axis A)
	Mudguards for external stairways and slope ways
142	Retaining walls and barriers
	Under the retaining wall's shoe base plates, the granual base structure is 300 mm
	Retaining wall's shoe base plate (LV-08), C30/37
	Reinforced concrete retaining walls (TM-01 to TM-02), C30/37
	Decorative aluminum ribs 50 × 250 mm
143	Exterior stairways
	Reinforced concrete external stairway (MBT-01, axis 18)
	Reinforced concrete external stairway (MBT-01, axis 1)
144	Open sheds
	Open shed (axis A), structure + surface finish
	Open shed (axis D), structure + surface finish
	Open shed (axis 18), structure + surface finish
	Open shed (axis 1), structure + surface finish
15	External networks

Code	Description
152	External drainage
	Waste-water drainage pipeline K11 of the immovable to the connection point
	Rainwater drainage pipeline K21 of the immovable to the connection point
	Oil separator NS10LM + sampling well PVK200
153	Outdoor lighting
	Outdoor luminaire P01, h = 4.0 m
	Outdoor luminaire P02, h = 0.563 m
154	Transport system for water
	Water supply pipeline V11 of the immovable to the connection point
156	Heating supply piping
	Heat supply piping T1
157	Cable lines
	Cable line 2W1
	Cable line 2W1.2
	Cable line W1.2
	Cable line W1.3
	Cable line W1.4
158	Communication lines
	Communication line S1 to the connection point
	Communication line S2
	Communication line S3
	Communication line S4
16	Excavations in the area
162	Excavations
	Peeling and excavation + removal and outflow of the soil from groundworks structures under roads and squares
17	Surface covers of the territory
171	Planting
	Restoration of pavements on the carriageway, walkway, lawn
	Impregnated table edge 25 × 115 mm
	Granite gravel for plant beds as mulch (fraction 1–32 mm)
	Bark mulch under the hedge (layer thickness 4.5 cm)
	EPDM rubber pavement 50 x 50 x 7 cm
	Shortgrass “Playground”
	Coniferous trees (Baltic pine)
	Deciduous trees (Sorbus “Dodong”)
	Medium-growing shrubs
	Low-growing shrubs
	Low-growing coniferous shrubs
	Perennials (reed canary grass, Faassen’s catnip, goldmoss stonecrop)

Code	Description
172	Groundworks structures under roads and squares
	Gravel under asphalt 300 mm
	Drainage layer under the asphalt 300 mm
	Sand groundworks structure under the lawn stone 200 mm
	Sand groundworks structure under the concrete stone 200 mm
	Sand groundworks structure under the concrete slab 200 mm
173	Groundworks structures under roads and pavements
	Asphalt parking area (AC16 surf 50 mm + AC16 base 60 mm)
174	Stone and tile coverings
	Parking area paved with the lawn stone
	Concrete stone-paved walkway
	Concrete slab 50 × 50 × 6 cm around the house to protect the facade
175	Curbs and gutters
	Carriageway curb 1000 × 290 × 150 mm
	Walkway curb 1000 × 200 × 80 mm
18	Small construction entities in the area
181	Barriers
	Fence 1.2 m
	Entrance gate 1-sided
	Entrance gate 2-sided
	Pedestrian gates
182	Exterior equipment attached to the building
	Cycle rack "Kaar 1000"
183	Sports and game equipment
	Swing double (1 baby seat, 1 children's seat)
	Ping-Pong table
185	Traffic area equipment
	Drawing of parking spaces + marking of disabled parking spaces
2	**GROUNDWORKS STRUCTURES AND FOUNDATIONS**
22	Foundations
221	Sand and gravel groundworks structures of foundations
	Compacted gravel groundworks structure, h = 300 mm
222	Monolithic reinforced concrete groundworks walls, plinths, foundation slabs
	Strip foundation's reinforced concrete shoe base plate (LV-01 to LV-07), C30/37
	Lift shaft's reinforced concrete shoe base plate (VU-01), C30/37
224	Groundworks structure masonry, plinths, and foundation slabs
	Reinforced concrete groundworks structure walls (MBS-01 to MBS-04), C30/37
	Reinforced concrete plinth shell (MBK), C30/37
227	Thermal insulation and hydroisolation of groundworks structures

Code	Description
	Hydroisolation
	Insulation between the groundworks structure wall and the plinth shell, 180 mm
	Insulation between the groundworks structure wall and the plinth shell, 250 mm
23	Subfloors
231	Sand and gravel groundworks structures
	PP-01 Compacted gravel groundworks structure, 200 mm
232	Concrete structures
	PP-01 Reinforced concrete floor tile 120 mm
236	Thermal insulation and hydroisolation
	PP-01 PE film
	PP-01 EPS120 insulation, 200 mm
	PP-01 Radon membrane
	PP-01 Geotextile, class II
3	**LOAD-BEARING STRUCTURES**
32	Load-bearing walls and exterior walls
322	Precast concrete structures
	1st floor reinforced concrete exterior wall panels (different insulation, different concrete thickness)
	2nd floor reinforced concrete exterior wall panels (different insulation, different concrete thickness)
	3rd floor reinforced concrete exterior wall panels (different insulation, different concrete thickness)
	4th floor reinforced concrete exterior wall panels (different insulation, different concrete thickness)
	5th floor reinforced concrete exterior wall panels (different insulation, different concrete thickness)
	Concrete posts (BP-01 to BP-03)
	Reinforced concrete partition panels for the 1st floor, 200 mm
	Reinforced concrete partition panels for the 2nd floor, 200 mm
	Reinforced concrete partition panels for the 3rd floor, 200 mm
	Reinforced concrete partition panels for the 4th floor, 200 mm
	Reinforced concrete partition panels for the 5th floor, 200 mm
328	Facade covering of walls
	Facade brick (e.g. Wienerberger Terca Brick Slips, tone: Dark Gray Graphite)
	Facade brick (e.g. Wienerberger Terca Brick Slips, tone: White Tuohi)
	PKV-01 4100 × 2227 × 1000 mm
	PKV-02 4100 × 2227 × 1000 mm
	PKV-03 2700 × 2211 × 650 mm
	PKV-04 2700 × 2211 × 650 mm
	PKV-05 5350 × 223 × 1300 mm
	PKV-06 5350 × 223 × 1300 mm

Code	Description
33	Slab systems and roof ceilings
332	Concrete structures
	Lift shaft ceiling plate (BPL-02)
	Concrete slab (BT-01)
333	Metal structures
	Steel slabs (TT-01 to TT-05)
335	Elements of ceilings
	Slab system panels for the 1st floor, 220 mm
	Slab system panels for the 2nd floor, 220 mm
	Slab system panels for the 3rd floor, 220 mm
	Slab system panels for the 3rd floor, 220 mm
	Slab system panels for the 5th floor, 220 mm
34	Stairway elements
343	Metal structures
	Metal ladder for access to the roof
345	Stairway elements
	Concrete elements for internal stairways (TE-01 to TE-07), C30/37 (26.02 m3)
347	Stairway railings
	Metal stairway railings on the stairwell wall
	Glass stairway railings in front of the stairwell windows
	Glass stairway railings on the inside of the stairway
	Corridor handrails on the wall
4	**FACADE ELEMENTS AND ROOFS**
41	Glass facades, display cases, and special windows
415	Smoke hatches, skylights
	SL-01 1200 × 1200 mm + automation
	KL-01 1000 × 1000 mm
42	Windows
421	Window sills
	Window sills
422	Aluminum windows
	A-10 2300 × 1325 mm
	A-11 2300 × 1325 mm
	A-12 2300 × 1325 mm
	A-13 2300 × 1325 mm
	A-14 700 × 1325 mm
	A-15 3250 × 1325 mm
	A-16 3250 × 1325 mm
	A-17 3250 × 1325 mm

Code	Description
426	Wooden and wood-aluminum windows
	A-01 3000 × 2000 mm
	A-01T 3000 × 2000 mm
	Airtight tape for wood-aluminum windows (on both sides)
428	Water stains
	Water stains
43	Exterior doors and gates
431	Locking and equipment
	Locking and equipment
432	Aluminum doors
	VU-01 4600 × 2500 mm
	VU-04 2300 × 2500 mm
	VU-05 2300 × 2500 mm
433	Steel doors
	VU-02 1600 × 2500 mm
	VU-03 1600 × 2500 mm
	Airtight tape for steel doors (on both sides)
435	Hatches and grilles
	VR-01 2000 × 2000 mm
	VR-02 1500 × 400 mm
	VR-03 850 × 400 mm
	VR-04 550 × 400 mm
48	Roof structures
481	Rainwater system and accessories
	Roof funnels and internal rainwater drainage
482	Leveling layers
	KL-01 Leveling casting
483	Metal structures
	Parapet supports (64pcs)
485	Elements
	Parapet elements, 120 mm and 200 mm (VSP-001 to VSP-019)
487	Thermal insulation and hydroisolation
	KL-01 Mineral wool board with ventilation grooves, 30 mm
	KL-01 EPS insulation, 100 + 150 mm
	KL-01 EPS insulation for slopes, 50.210 mm
	KL-01 Bitumen roll material + primer
488	Roofing
	KL-01 2xSBS roofing
	SBS upturn for the parapet

Code	Description
	Catwalk, l = 800 mm (waterproof plywood + 1xSBS)
5	**SPACE STRUCTURES AND SURFACE COVERS**
51	Partition walls
514	Stacked partition walls
	SS-02 Lightweight gravel block, 150 mm
	SS-03 Lightweight gravel block, 100 mm
	SS-05 Lightweight gravel block Fibo Lux, 88 mm + air gap + lightweight gravel block Fibo Lux, 88 mm
516	Wooden and plasterboard partition walls
	SS-04 Reinforced gypsum board, 12.5 mm
	SS-04 Metal frame, 95 mm
	SS-04 Stone wool, 95 mm
	SS-04 Reinforced gypsum board, 12.5 mm
518	Interior windows
	SA1 2200 × 1500 mm; EI30
52	Interior doors
523	Steel doors
	SU3 2200 × 2350 mm; EI30
	SU4 2200 × 2350 mm; EI30
	SU6 1450 × 2350 mm; EI30
	SU7 1450 × 2100 mm; EI30
	TL-01 300 × 300 mm; EI30
	TL-01* 300 × 300 mm; EI30
525	Wooden doors
	SU1 1000 × 2350 mm
527	Locking and equipment
	Locking and equipment
528	Skirt boards
	Skirt boards
53	Partition surface covers
531	Paint coatings
	Putty + paint (SV01)
534	Plastering and leveling
	Internal plaster, ca. 10 mm
535	Tile coverings
	Ceramic tile (SV02, SV03)
537	Thermal insulation, acoustic insulation, and hydroisolation
	Hydroisolation for walls
54	Ceiling surface covers
541	Paint coatings

Code	Description
	Putty + paint (LV09)
543	Metal and sheet metal coverings of ceilings, suspended ceilings
	Acoustic suspended ceiling, moisture-resistant (LV04, LV05, LV08)
	Acoustic suspended ceiling (LV01, LV02, LV03, LV06, LV07)
55	Stairway surface covers
551	Paint coatings
	Painting of stairway
56	Floors and floor coverings
562	Floor leveling
	VL-01 Reinforced concrete floor tile 80 mm
563	Epoxy coatings and surface hardeners
	Impregnated concrete (PV09)
564	Floor tiles, gratings, joints, etc.
	Mudguard system in the lobby (PV08)
565	Tile floors
	Ceramic tile (PV05, PV06)
567	Thermal insulation, acoustic insulation, and hydroisolation
	VL-01 PE film, taped joints
	VL-01 Rigid mineral wool board in two layers, 30 + 20 mm
	Hydroisolation for floors
568	Roll floor coverings, carpets
	LVT floor covering (PV01, PV02, PV03)
	PVC floor covering (PV04)
	Antistatic PVC (PV07)
569	Moldings
	Wooden molding
	Plinth panel
	PVC upturn for the the wall
6	**FURNISHING, FIXTURES, EQUIPMENT**
61	Furnishing and furniture
	Equipment
66	Lifting and handling equipment
661	Lifts
	Lift Kone TransSys with installation
7	**SUPPLY SYSTEMS**
71	Water supply and drainage
711	Water supply
712	Drainage
72	Heating, ventilation and cooling supply

Code	Description
721	Heating supply pipes
722	Heaters
723	Boiler houses, heating units, boilers
724	Ventilation supply equipment
725	Ventilation supply ducts
726	Cooling supply equipment
727	Cooling supply pipes
73	Firefighting equipment
734	Fire-extinguishing equipment
74	High voltage supply system
741	Main electricity distribution systems
742	Cable routes
743	Cabling
744	Lighting systems
755	Electric heating, installation materials
746	Lightning protection system and earthing
748	Alternative energy equipment (solar panels 45 kW + ballast + inverter + installation)
75	Low voltage supply system and automation
8	**SITE ESTABLISHMENT COSTS**
9	**SITE INDIRECT COSTS**

ANNEX 2. COST ESTIMATE PREPARED BY THE BUILDER WITH CCI-EE CLASSIFIER

Cost calculation part code from the reference designation set		Description
		Assembly system
		Paving
AA01	NCA01%NCA01	Reinforced concrete slope way (axis D)
AA01	NCA02%NCA02	Reinforced concrete slope way (axis A)
		Finishing of floors
AC01	RQB02	VL-01 PE film, taped joints
AC01	RQA02	VL-01 Rigid mineral wool board in two layers, 30 + 20 mm
AC01	RQB03	Hydroisolation for floors
AC01	UMH4	VL-01 Reinforced concrete floor tile 80 mm
AC01	FSC01	Impregnated concrete (PV09)
AC01	NCC01	LVT floor covering (PV01, PV02, PV03)
AC01	NCC02	PVC floor covering (PV04)
AC01	NCC03	Antistatic PVC (PV07)
AC01	NCC04	Mudguard system in the lobby (PV08)
AC01	NCC05	Ceramic tile (PV05, PV06)
AC01	NEB01	Wooden molding
AC01	NEB02	Plinth panel
AC01	NEB03	PVC upturn for the the wall
AC01	NCC06	Mudguards for external stairways and slope ways
		Finishing of ceilings
AC02	FSA03	Putty
AC02	FSB02	Color
AC02	NCD01	Acoustic suspended ceiling, moisture-resistant (LV04, LV05, LV08)
AC02	NCD02	Acoustic suspended ceiling (LV01, LV02, LV03, LV06, LV07)
		Exterior wall
AD01	NCB01	Wall covering, facade brick 1
AD01	NCB02	Wall covering, facade brick 2
AD01	NCF01	Window sill
AD01	QQA01	A-10 2300 × 1325 mm, aluminum
AD01	QQA02	A-11 2300 × 1325 mm, aluminum
AD01	QQA03	A-12 2300 × 1325 mm, aluminum
AD01	QQA04	A-13 2300 × 1325 mm, aluminum

Cost calculation part code from the reference designation set		Description
AD01	QQA05	A-14 700 × 1325 mm, aluminum
AD01	QQA06	A-15 3250 × 1325 mm, aluminum
AD01	QQA07	A-16 3250 × 1325 mm, aluminum
AD01	QQA08	A-17 3250 × 1325 mm, aluminum
AD01	QQA09	A-01 3000 × 2000 mm, wood
AD01	QQA10	A-01T 3000 × 2000 mm
AD01	FSG01	Window seal, sealing tape
AD01	WME01	Gutter drip, water stain
AD01	QQC01	VU-01 4600 × 2500 mm, aluminum
AD01	QQC02	VU-04 2300 × 2500 mm, aluminum
AD01	QQC03	VU-05 2300 × 2500 mm, aluminum
AD01	QQC04	VU-02 1600 × 2500 mm, steel
AD01	QQC05	VU-03 1600 × 2500 mm, steel
AD01	FSG02	Door seal, sealing tape
AD01	QQD01	Ventilation grille, VR-01 2000 × 2000 mm
AD01	QQD02	Ventilation grille, VR-02 1500 × 400 mm
AD01	QQD03	Ventilation grille, VR-03 850 × 400 mm
AD01	QQD04	Ventilation grille, VR-04 550 × 400 mm
		Partition
AD02	QQC06	SU3 2200 × 2350 mm; EI30, steel
AD02	QQC07	SU4 2200 × 2350 mm; EI30, steel
AD02	QQC08	SU6 1450 × 2350 mm; EI30, steel
AD02	QQC09	SU7 1450 × 2100 mm; EI30, steel
AD02	QQC10.%QQC01	TL-01, right-handed, steel
AD02	QQC11.%QQC02	TL-01, left-handed, steel
AD02	QQC12	SU1, wood
AD02	NEE01	Skirt boards
AD02	QSA02	Door lock
AD02	KJB02	Lock core
AD02	SGD02	Handle
AD02	SGF02	The key
AD02	ULG01	SS-02 Lightweight gravel block, 150 mm
AD02	ULG02	SS-03 Lightweight gravel block, 100 mm
AD02	ULG03	SS-05 Lightweight gravel block Fibo Lux, 88 mm + air gap + lightweight gravel block Fibo Lux, 88 mm
AD02	NAB01	Reinforced gypsum board, 12.5 mm
AD02	RQA01	SS-04 Stone wool, 95 mm
AD02	ULD02	SS-04 Metal frame, 95 mm
AD02	QQA11	Interior windows, 2200 × 1500 mm; EI30

Cost calculation part code from the reference designation set		Description
AD02	FSA01	Internal plaster -10 mm
AD02	FSA02	Putty
AD02	FSB01	Color
AD02	RQB01	Hydroisolation for walls
AD02	NCB01	Ceramic tile (SV02, SV03)
		Retaining wall
AD03	ULL01	Retaining wall, reinforced concrete retaining walls (TM-01 to TM-02), C30/37
AD03	UMA03	Reinforcing rod
AD03	UMH03	Concrete casting
		External barriers
AD04	FQD01	Handrails, VKP-01-1 6330 × 80 × 1070 mm, metal
AD04	FQD02	Handrails, VKP-01-2 4210 x 80 x 1000 mm, metal
AD04	FQD03	Decorative aluminum ribs 50 × 250 mm
AD04	QQF01	Fence 1.2 m
AD04	QQF02	Entrance gate 1-sided
AD04	QQF03	Entrance gate 2-sided
AD04	QQF04	Pedestrian gates
		Internal barriers
AD05	FQD04	Metal stairway railings on the stairwell wall
AD05	FQD05	Glass stairway railings in front of the stairwell windows
AD05	FQD06	Glass stairway railings on the inside of the stairway
AD05	FQD07	Corridor handrails on the wall
AF01	XSC01	Ladder, metal ladder to the roof
		Internal stairways
AF02	XCA01	Stairways TE-01 to TE07
AF02	XCB01	Stairway march TE-01 ... TE07
AF02	FSB03	Color of stairways
		External stairway 1 (MBT-01, axis 18)
AF03	UMA01	Reinforcing rod
AF03	UMH01	Concrete casting
		External stairway 2 (MBT-01, axis 1)
AF04	UMA02	Reinforcing rod
AF04	UMH02	Concrete casting
		Structural system
		Groundworks structure
BA01	UTB02	Peeling the soil under the building, h = 300 mm

Cost calculation part code from the reference designation set		Description
BA01	UTB03	Excavation under the building (down to a depth of 11,00 m, at a cabbage storage facility down to a depth of 9,90 m)
BA01	UTA01	Compacted gravel groundworks structure, h = 300 mm, for a foundation
BA01	UTA02	PP-01 Compacted gravel groundworks structure, 200 mm, for a subfloor
BA01	UTA03	Under the retaining wall's shoe base plates, the granual base structure is 300 mm
BA01	UTA04	Filling soil under the building and on its sides
		Foundation structure
BB01	UMH08	Strip foundation's reinforced concrete shoe base plate (LV-01 to LV-07) C30/37
BB01	UMH09	Lift shaft's reinforced concrete shoe base plate (VU-01), C30/37
BB01	UMH10	Reinforced concrete groundworks structure walls (MBS-01 to MBS-04), C30/37
BB01	UMH11	Reinforced concrete plinth shell (MBK), C30/37
BB01	RQB07	Hydroisolation
BB01	RQA07	Insulation between the groundworks structure wall and the plinth shell, 180 mm
BB01	RQA08	Insulation between the groundworks structure wall and the plinth shell, 250 mm
BB01	UMH07	Retaining wall's shoe base plate (LV-08), C30/37
		Slab structure 2
BC01	ULE01	Slab, concrete slab (BT-01)
BC01	ULE02	Slab, steel slab, TT-01
BC01	ULE03	Slab, steel slab, TT-02
BC01	ULE04	Slab, steel slab, TT-03
BC01	ULE05	Slab, steel slab, TT-04
BC01	ULE06	Slab, steel slab, TT-05
		Precast concrete structures
BD01	ULM01	Wall panel, reinforced concrete exterior wall
BD01	ULM02	Partition panel, reinforced concrete partition
BD01	ULD01	Concrete posts (BP-01 to BP-03)
BE01		Open shed, axis A, structure + surface finish
BE02		Open shed, axis D, structure + surface finish
BE03		Open shed, axis 18, structure + surface finish
BE04		Open shed, axis 1, structure + surface finish
		Roof of the building
BE05	QQD05	Smoke hatch, SL-01, 1200 × 1200 mm + automation

Cost calculation part code from the reference designation set		Description
BE05	QQD06	Sunroof, KL-01, 1000 × 1000 mm
BE05	UMH05	Concrete casting, KL-01 leveling casting
BE05	RQA03	KL-01 Mineral wool board with ventilation grooves, 30 mm
BE05	RQA04	KL-01 EPS insulation, 100 + 150 mm
BE05	RQA05	KL-01 EPS insulation for slopes, 50–210 mm
BE05	RQB04	KL-01 Bitumen roll material + primer
BE05	NCE01	KL-01 2 × SBS roofing
BE05	NCE02	SBS upturn for the parapet
BE05	ULM03	Parapet elements 120 mm
BE05	ULM04	Parapet elements, 200 mm
BE05	XKD01	Roof funnels and internal rainwater drainage
BE05	ULM04	Parapet supports (64 pcs.), metal
BE05	ULE07	Catwalk, l = 800 mm (waterproof plywood + 1 × SBS)
		Subfloor
BF01	UMH06	PP-01 Reinforced concrete floor tile 120 mm
BF01	RQA06	PP-01 EPS120 insulation, 200 mm
BF01	RQB05	PP-01 PE film
BF01	RQB06	PP-01 Radon membrane
BF01	RQH01	PP-01 Geotextile, class II
		Load-bearing structure
BG01	ULK01	Plate, lift shaft ceiling plate (BPL-02)
BG01	ULK02	Slab system panels for the 1st floor, 220 mm
BG01	ULK03	Slab system panels for the 2nd floor, 220 mm
BG01	ULK04	Slab system panels for the 3rd floor, 220 mm
BG01	ULK05	Slab system panels for the 4th floor, 220 mm
BG01	ULK06	Intermediate ceiling panels for the 5th floor, 220 mm
		Ground surface construction system
		Subgrade construction
CA01	UTB01	Peeling and excavation + removal and outflow of the soil from groundworks structures under roads and squares
		Ground superstructure construction
CB01	NDA01	Carriageway curb 1000 × 290 × 150 mm
CB01	NDA02	Walkway curb 1000 × 200 × 80 mm
CB01	NCA03	Parking area paved with the lawn stone
CB01	NCA04	Concrete stone-paved walkway
CB01	NCA05	Concrete slab 50 × 50 × 6 cm around the house to protect the facade

Cost calculation part code from the reference designation set		Description
CB01	NCA06	Asphalt parking area (AC16 surf 50 mm + AC16 base 60 mm)
CB01	NCA07	Restoration of pavements on the carriageway, walkway, lawn
CB01	NCA08	Impregnated table edge 25 × 115 mm
CB01	NCA09	EPDM rubber pavement 50 x 50 x 7 cm
CB01	PHE01	Drawing of parking spaces + marking of disabled parking spaces
CC01		Traffic island construction
CD01		Shoulder
		Vegetation area construction
CF01	NCG01	Shortgrass “Playground”
CF01	TRA01	Coniferous trees (Baltic pine)
CF01	TRA02	Deciduous trees (Sorbus “Dodong”)
CF01	TRB01	Medium-growing shrubs
CF01	TRB02	Low-growing shrubs
CF01	TRB03	Low-growing coniferous shrubs
CF01	TRD01	Perennials (reed canary grass, Faassen’s catnip, goldmoss stonecrop)
CF01	NCH08	Granite gravel for plant beds as mulch (fraction 1–32 mm)
CF01	NCH09	Bark mulch under the hedge (layer thickness 4–5 cm)
		Foundation and ground support construction
CJ01	UTA03	Gravel under asphalt 300 mm
CJ01	UTA04	Drainage layer under the asphalt 300 mm
CJ01	UTA05	Sand groundworks structure under the lawn stone 200 mm
CJ01	UTA06	Sand groundworks structure under the concrete stone 200 mm
CJ01	UTA07	Sand groundworks structure under the concrete slab 200 mm
		Supply system
HA01		Indoor ventilation supply equipment
HB01		Indoor water supply equipment
HB02		Indoor drainage equipment
HC01		Indoor cooling supply equipment
		Indoor heating system equipment
HD01	EPA01	Heaters
HD01	FLE01	Expansion tank
HD01	EGC01	Heat exchanger

Cost calculation part code from the reference designation set		Description
HF01		Ventilation supply system
HG01		Indoor high-voltage equipment
		Outdoor lighting
HH01	EAA01	Outdoor luminaire P01, h = 4.0 m
HH01	EAA02	Outdoor luminaire P02, h = 0.563 m
		Indoor lighting
HH02	EAA03	Lighting systems
		Solar energy system
HH03	GRB01	Solar panels, 45 kW
HH03	TBB01	Inverter
		Transportation system
		Outdoor transport system for water
		Water supply pipeline V11 of the immovable to the connection point
JB02		Indoor transport system for water
JD01		Liquids outflow system
		External drainage
JD02	WPA02	Waste-water drainage pipeline K11 of the immovable to the connection point
JD02	WPA03	Rainwater drainage pipeline K21 of the immovable to the connection point
JD03		Internal drainage pipeline
JE01		Oil separator NS10LM + sampling well PVK202
JF01		Indoor cooling supply pipes
		Outdoor heating supply piping
JG01	WPA04	Heat supply piping T1
		Indoor heating supply piping
JG02	WPA05	Indoor heating supply piping
JJ01		Indoor ventilation supply ducts
		External cable lines
JK01	WDB01	Cable line 2W1
JK01	WDB02	Cable line 2W1.2
JK01	WDB03	Cable line W1.2
JK01	WDB04	Cable line W1.3
JK01	WDB05	Cable line W1.4
		Indoor cables
JK02	UBA01	Cable routes
JK02	WDB06	Cabling
		Communication lines

Cost calculation part code from the reference designation set		**Description**
JL01	WGB01	Communication line S1
JL01	WGB02	Communication line S2
JL01	WGB03	Communication line S3
JL01	WGB04	Communication line S4
JM01		Lift Kone TransSys
		Treatment system
		Solar screening system
KA01	NCB03	PKV-01 4100 × 2227 × 1000 mm
KA01	NCB04	PKV-02 4100 × 2227 × 1000 mm
KA01	NCB05	PKV-03 2700 × 2211 × 650 mm
KA01	NCB06	PKV-04 2700 × 2211 × 650 mm
KA01	NCB07	PKV-05 5350 × 223 × 1300 mm
KA01	NCB08	PKV-06 5350 × 223 × 1300 mm
MA01		Warning system
MB01		Audio-Video system
		Security system
		Fire-extinguishing equipment
PA01	FMD01	Fire extinguisher
PB01		Firefighting system
		Earthing system
PC01	WEB01	Earthing cable
		Lightning protection
PD01	XEF01	Lightning rod
		Furnishing system
		Furniture