Step-by-step guide for the **process management** of toxfree, circular and climate-neutral construction at municipalities

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NHC3 GoA1.3. Deliverable D.1.3

The NonHazCity draft set of practical guides for sustainable construction and construction materials

December 2023

This material was developed as part of the NonHazCity 3 (#C014) project, with financial support from the INTERREG Baltic Sea program of the European Union. The content of this material is solely the opinion of the authors, not that of the European Commission.

Interreg Baltic Sea Region

Co-funded by the European Union

SUSTAINABLE WATERS NonHazCity 3

NonHazCity

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Introduction

Picture by: Daina Indriksone, BEF-Latvia

Municipal building stock comprise various types of buildings - educational buildings (e.g., schools, kindergartens), apartment buildings and social houses, health care buildings, office buildings, catering buildings, museums, sports halls, etc. Depending on needs and possibilities municipalities are planning and implementing construction of new houses, making refurbishment or extension of the existing buildings. Acknowledging the UN Sustainable Development Goals and the global need for reduction of greenhouse gas emissions, efficient use of resources along with waste minimisation and reduction of hazards related to use of chemicals, municipalities as public authorities can play an outstanding role by setting targets and requirements for the public buildings at their administrative territories.

The **"Step-by-step guide for the process management of toxfree, circular and climate-neutral construction at municipalities"** has been developed within the frame of the NonHazCity3 (NHC3) project "Reducing hazardous substances in construction to safeguard the aquatic environment, protect human health and achieve more sustainable buildings" (Project Nr. C014), with financial support from the INTERREG Baltic Sea program of the European Union. The main aim of this material is to guide municipal specialists through various stages of construction process applying the NHC3 three pillar approach for tox-free, circular and climate neutral construction in the Baltic Sea Region.

According to the NHC3 project the three-pillar definition comprise[1]:

- **Tox free construction** is a construction that avoids hazardous substances in materials or finishes and therefore reduces the impact buildings have on human health and environment (especially the aquatic environment).
- **Circularity** concept of a closed-loop system for resources, materials, and products, which maintain the value and utility of resources and products for as long as possible, minimises waste and maximises resource efficiency. It promotes recycling, reusing, refurbishing, and sharing, while prioritizing easy repair, upgradability, and disassembly. It aims at removing hazardous substances from the material cycle to enable a circular economy that reduces environmental impact.

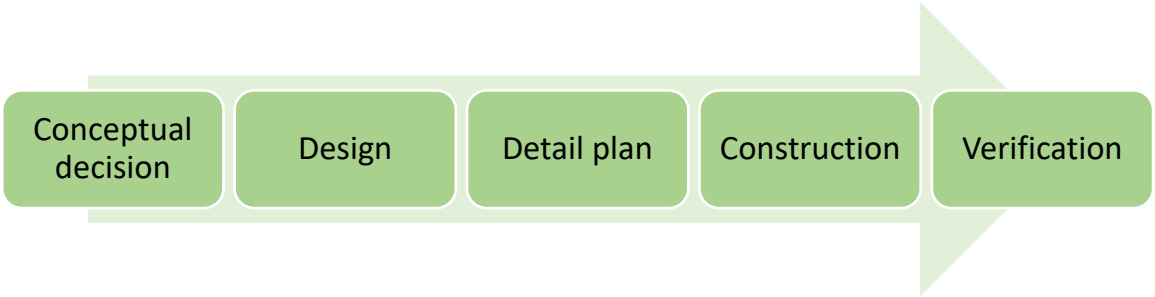
[1] NonHazCity Building material catalogue for tox-free construction (2023) - draft version

- **Climate neutrality** concept of a state in which human activities result in no net effect on the climate system. Achieving such a state would require balancing of residual emissions with emission (carbon dioxide) removal as well as accounting for regional or local, biogeophysical effects of human activities that, for example, affect surface albedo or local climate.

The construction process management

The construction process management in general includes overall planning, coordination, and control of a project team from the beginning to completion and is aimed at meeting a client's needs and requirements for a functionally and financially viable project. The construction process includes several stages, that may not be strictly sequential – some stages require iteration and others may be carried out in parallel or with overlapping time frames, depending on the nature, size and urgency of the project.[2]

The following five **milestones** relevant for construction process are distinguished and are targeted in the chapters of the Step-by-step guide – starting with the conceptual decision-making stage, towards elaboration of a building design, detailed planning and elaboration of a construction project, construction works including construction site management and verification of new housing/refurbishment and extension projects.



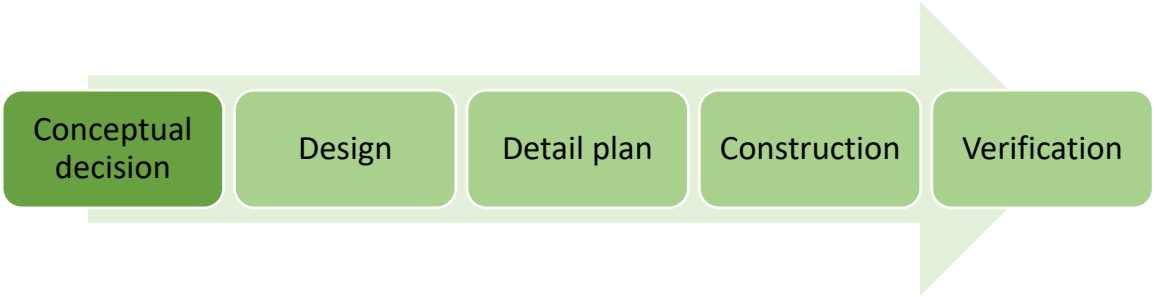
At the end of each chapter a checklist is provided to help municipal specialists to systematise the consideration of various aspects and application of tools.

The Step-by-step guide highlights aspects to consider for tox-free, circular and climate neutral construction and gives **recommendations** for selection and application of different methods and tools at different stages of construction processes, including preparation of public procurement.

The current version of the Step-by-step Guide shall be considered as a draft edition to be tested in the NonHazCity3 project municipal pilots of Riga (Latvia), Tallinn (Estonia), Stockholm, Västerås (Sweden) and Hamburg (Germany) in 2024-2025 and improved based on the feedback obtained and additional information from all partner municipalities gathered.

[2] J. Komsi (2021), Chapter 4: Management and Leadership in Construction Project, https://ebooks.rtu.lv/wp-content/uploads/sites/32/2021/06/Wood_Chapter4.pdf

1. Conceptual decision



Picture by: West Liberty University

Municipalities are responsible for the public building stock within their territory belonging to municipal administration – educational buildings (e.g., schools, kindergartens), apartment buildings and social houses, health care buildings, office buildings, catering buildings, museums, sports halls, etc. Depending on needs and budget available municipalities decide on refurbishment and/or extension of existing buildings and new construction.

National legislation requirements

Construction and refurbishment processes are regulated by national legislation and various type of building codes. For example, in Finland requirements for application of life cycle control scheme and M1 classification by TUKES (Finnish Safety and Chemicals Agency) are applied. The national building code of Finland specifies the general conditions concerning buildings and substantive technical requirements e.g. energy efficiency and good indoor air quality.[3]

In Denmark since 1 January 2023 performing the life cycle assessment (LCA) calculations are required for all new buildings. Buildings over 1000 m2 also have to meet a threshold of 12 kg CO_2 equivalent per square metre per year. This limit will be further reduced in 2025 and will also apply to smaller buildings. Front runners can already commit to the voluntary CO_2 class with a maximum emission of less than 8 kg CO2-eq/m^2 /year from 2023.[4]

[3] K. Kuusinen (2023), Procuring and building a Nordic-Swan-labelled Kindergarten from A to Z (presentation at Green Governance conference: Driving change: empowering sustainability through green governance (on 16 November 2023, in Tallinn, Estonia), available here

[4] KHR Architects (2022), New LCA requirements come into force, https://khr.dk/en/new-lca-requirements/

In some countries e.g., Lithuania, Latvia construction of public buildings is subject to mandatory green public procurement (GPP) procedures setting certain sustainability criteria.

Green Public Procurement in Latvia

Since 2014 in Latvia application of green public procurement criteria is mandatory for purchases of several product groups and services. Since 1st January 2024 application of GPP procedure for new construction, refurbishment, detailed planning, and demolition of certain types of public buildings is mandatory. Requirements and criteria are set for elaboration of detailed plan, construction works, demolition and construction site preparation.[5]

Municipality goals and ambitions

While national legislation predefines the minimum requirements, depending on needs, political goals and ambitions of a municipality towards environmental and health protection as well as the budget available, municipalities may set higher standards and targets for the "green" municipal building stock with respect to toxfree, circularity and climate neutrality aspects. Particularly concerning hazardous substances, consumers as well as professionals in the construction sector have the expectation that they can use and install all materials available on the market in any form without hesitation. According to the perception, EU and national legislation shall ensure that construction materials are free from hazardous chemicals, i.e. do not contribute chemical risks to human health and the environment. However, considering the mixture effect in such complex situations as buildings with different materials, coverings, claddings, etc. it makes sense if the municipality sets rules that go beyond the national legislation concerning chemicals in the construction sector.[6]

For example, in Sweden (Stockholm, Västerås) Miljöbyggnad Silver is the base target set by a political decision to follow for construction/refurbishment of a municipal building. Municipal Chemical action plan serves as a reference document for selection of assessed construction materials from the Byggvarubedömningen (BVB) data base.

In Denmark, Holbæk Municipality the DGNB-certification shall be applied for building projects exceeding 1000 indoor square meters.

In Finland, the City of Helsinki is having their own criteria for ecological construction. The criteria are set by the Facilities service of the Urban Environment Division of the City of Helsinki, and these criteria are more ambitious than the law requires. The criteria are set to comply with the Helsinki City Strategy and 2030 Carbon Neutral Helsinki action plan. For example, when evaluating whether to repair and expand an existing building or whether to demolish and replace it with a new one, the life cycle carbon footprints of the different options are calculated.[7]

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[5] LV Cabinet of Ministers Regulations Nr. 353 "Prasības zaļajam publiskajam iepirkumam un to piemērošanas kārtība" // Requirements for Green Public Procurement and Procedures for Application (adopted in 20.06.2017, latest amendments from 13.07.2023), available in LV at https://likumi.lv/ta/id/291867-prasibas-zalajam-publiskajam-iepirkumam-un-to-piemerosanas-kartiba and in English at https://likumi.lv/ta/en/en/id/291867-requirements-for-green-public-procurement-and-procedures-for-the-application-thereof

[6] NonHazCity Building material catalogue for tox-free construction (2023) - draft version

[7] K. Kuusinen (2023), Procuring and building a Nordic-Swan-labelled Kindergarten from A to Z (presentation at Green Governance conference: DRIVING CHANGE: EMPOWERING SUSTAINABILITY THROUGH GREEN GOVERNANCE (on 16 November 2023, in Tallinn, Estonia), available here

Needs assessment

The importance of the needs assessment of the end-users of a public building prior to performing of any construction/refurbishment/extension works shall not be underestimated. Wide range of needs assessment to define the problem to solve shall be performed before drafting technical specification of the procurement, especially when innovation uptake may originate e.g., setting higher standards then required by legislation, application of innovative technologies, solutions, approaches. The needs assessment can be performed through interviews of tenants of a dwelling house to be refurbished/extended, representatives of educational establishments in case a school or a kindergarten is planned to be constructed, etc. To increase the objectivity, needs assessment can be performed based by specialised companies having experienced in marketing and public opinion research activities or potential construction service provider companies. In this case, to avoid preferential treatment, all information received should be published/ communicated to other potential tenderers.[8]

Market dialogue

When initiating new construction, refurbishment and extension of a building, the conceptual decision-making stage is crucial to set good bases for the further procurement and construction processes. Therefore, when the needs are assessed, setting clear targets for the construction project should be done as early as possible.

In case ambitions and political goals, including environmental protection requirements towards the municipal building stock is already defined, for municipality specialists it is easy to take a conceptual decision on the standards for any new construction, refurbishment, or extension at municipality. At the same time along with advancements in technologies, global trends, changing consumer landscape, innovative architectural concepts for sustainable construction following green design principles are permanently improving, emphasizing architectural practices towards adaptation of technologically advanced materials e.g., created out of waste through recycling, upcycling, or sustainable sources. Thus, architectural practices/solutions that have been at the top during previous decades might be outdated already. Through the market dialogue process, municipalities can update their awareness and knowledge on technological possibilities and on new solutions suitable for designing tox free, circular and climate neutral construction.

A **market dialogue** is a process which aims at the interaction between contracting authorities and suppliers before the start of the public procurement procedures. Through a market dialogue, contracting authorities seek to improve market knowledge, identify products and/or services which cannot be currently specified, determine innovative solutions. Market dialogue gives an opportunity to suppliers and other stakeholders involved in construction business to obtain knowledge and raise awareness of the needs of public sector that could be included in future procurements.[9] Additional information on market dialogue can be found at NHC3 Deliverable D1.2. “Draft strategic solutions for managing procedures for construction materials and sites”.

[8] European Commission (6.7.2021), Notices from European Union institutions, bodies, offices and agencies; European Commission Notice: Guidance on Innovation Procurement (2021/C 267/01), https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:52021XC0706(03)&rid=6

[9] C. Dekker, PIANOo (2018), Format for a market dialogue session for Procurement of Bio-Based Products and Services, https://www.slideserve.com/phillipy/format-for-a-market-dialogue-session-powerpoint-ppt-presentation

Prior to the conceptual decision making for the building standard of new construction, refurbishment, or extension, consider conducting **market dialogue** with potential service providers e.g. design/architectural/ construction companies.

The purpose of market dialogue is to inform potential service providers on municipality plans for procurement and requirements, to seek advice from independent experts, other contracting authorities or from market actors. Advice obtained during market dialogue may serve for planning and conducting of procurement procedure, design of specifications and selection of standards. Market dialogue activities may not distort competition and breach the principles of non-discrimination and transparency. Through a market dialogue, it is possible to identify the availability of existing and new solutions and products, their application areas, prices, advantages, and disadvantages. It also gives an opportunity to identify potential suppliers interested and capable for implementing the contract. In the long-term applying market dialogue approach strengthens the communication between competent authorities and suppliers, gives opportunity to obtain feedback from suppliers on the procurement processes. Several preparatory steps should be taken before implementation of a market dialogue. Formulation of procurement needs, wishes and ambitions considering the most recent (national/regional, local) policy and legislation developments is the first step.

There are several options for conducting a market dialogue, e.g., by online surveys, online or face-to-face meetings. If an option for a meeting is chosen, preparation to this event includes setting date, location, and elaboration of a program. The program shall envisage **introduction** to the subject (key-note speech; plenary presentations on specific needs/products by contracting authority and suppliers), followed by **discussion** in plenary and/or in smaller working groups between public procurers, architects, engineers, suppliers, and experts on specific topics, and **informal networking**. Depending on complexity of the subject and number of participants, the meeting can take about 2 hours up to one day. Placing preliminary announcement online and sending out dedicated invitations can be done 8-12 weeks prior to the event.

To make sure a future procurement is open, fair, and transparent, information that public procurers share with market parties during market dialogues, should be **recorded** and made public. Several aspects must be made clear to attendees - how the information received from market parties will be treated, what will be covered in the report of the meeting and where it will be published. It shall be also explained that attending the meeting does not give suppliers a special position when issuing a call for tender.

Directly after the market dialogue meeting it is recommendable to ask participants for **feedback** e.g., by sending a short feedback template form to participants, preparing an online questionnaire. It is important to summarise the findings in a **report** that is afterwards sent to participants and made publicly available on the website. Participants should be also informed about the **next steps** (e.g., elaboration of a procurement) and the name of the **contact person** that can be approached in case of questions.

Conceptual plan - decision making

Once the needs for a municipal building have been assessed, knowledge on technological possibilities and market readiness to fulfil the needs and expectations are obtained, the next step is to take several conceptual decisions e.g., elaboration of a conceptual plan for the building. For example, for new construction and extension the conceptual plan should include details on building size (number of floors, etc.) and layout, the number of rooms and other facilities required, structure and use of a building (e.g., number of pupils of a school, need of classrooms and special rooms/laboratories/playground, etc.). In case of existing building, decisions shall be taken considering already existing situation and evaluating several possibilities (alternative options) for improvements. For existing building, most often the decision is taken on requirements for energy performance (energy consumption for heating calculated in kWh/m^2/year). However, it is also worth thinking about the second use of the existing building (e.g., re-use of a kindergarten for elderly people, when the demographic situation changes) or its demolishing. At the same time, it is important also to consider circularity aspects and identify possibilities for re-use of the materials that have been already applied in the building.

Prefeasibility study of a building at Ziepju 11, Riga, Latvia

The prefeasibility study of an existing multi-functional building was performed to find out the options for refurbishment considering circularity aspects. The study included the assessment of materials used in the building, their quality, and possibilities for dismantling and re-use of certain building elements. Two scenarios of refurbishment of a building have been developed. The carried-out assessment can form bases for setting the targets and elaboration of procurement documents (technical specification) of refurbishment of the building.[10]

During the decision making it can also be assessed if a new, better insulated building really helps to save (grey) primary energy, or if a modernization of an already existing building would be the better choice. Application of life cycle assessment (LCA) calculations help to make the grey energy of different options countable.

Consider performing a prefeasibility study including the **life cycle assessment** and calculation of different options e.g., refurbishment versus demolition of a building; possibilities to re-use an existing building or re-use the existing materials.

Setting the targets

At the conceptual stage of the project, the decision on certification of a building and application of eco certification of a building (e.g., Nordic Swan, BREEAM, LEED, DGNB) or other external party for verification can be taken. It must be noted that eco certification of a building comprises complex procedures and is time and resource consuming process – appropriate resources (staff and budget) must be allocated.

More information on various types of eco certification can be found in the NHC Fact sheet on Eco certification of Buildings.

[10] NOMAD architects (2022), Ziepju iela 11 (analysis for the circular renovation of a soviet-area building), available (in Latvian) at: https://nomadarchitects.lv/ziepju-iela-11

Building a Nordic Swan certified Kindergarten Soittaja in Kannelmäki, Helsinki, Finland


Picture by: Architects Rudanko + Kankkunen

Replacing a kindergarten built in 1969, the City of Helsinki has decided to build a new kindergarten that would meet the eco-certification criteria of Nordic Swan ecolabelling.

Having set this target, the architectural competition and feasibility study was performed in 2020. Project planning took placed in 2021-2022 and construction works implemented in 2022-2023. Kindergarten is to be opened in January 2024.

The kindergarten is a 2-storey building (2.370 m^2) and 300m^2 open-air terrace providing space for 224 children. The building has a concrete structure and wooden façade.

The decision on **eco-certification** of a building must be taken at a very early stage of construction or refurbishment process to be able to ensure the fulfilment of criteria since the very beginning of planning and construction process implementation, including the quality control and verification (certification) of a building.

If eco-certification of a building is not considered as an appropriate and feasible option, due to reasons already mentioned before, a municipality may still decide on stricter requirements and higher demands for a building than those required by national legislation that can be considered as minimum requirements to be followed. For example, municipality may decide to choose some elements i.e. particular aspects from eco certification procedure to be applied in construction, refurbishment of extension of a building. The decision can be made on application of environmentally friendly and/or local construction materials (e.g., wooden facades), avoiding certain hazardous substances e.g., volatile organic compounds (tox-free aspect), application of recycled or recyclable materials, easy to repair solutions (circularity aspect), particular requirements for energy performance of a building, application of renewable energy technologies (climate neutrality aspect), etc. Comprehensive information on construction materials highlighting their properties with respect to toxicity, circularity and climate neutrality is available in the NonHazCity Building material catalogue for tox-free construction (2023) - draft version. Information on ecolabel schemes for construction products is provided in the NHC Fact sheet on Ecolabels.

At the conceptual stage of a construction/ extension/refurbishment of a building, considering the NonHazCity3 three pillar approach related to tox-free, circular and climate neutral construction, the following decisions shall be made:

3 pillar approach	**Decisions for new construction / extension / refurbishment**	
Tox free	Environmentally friendly (local) materials avoiding (certain) hazardous substances. Use of eco-certified materials.	Eco-certification of a building e.g., Nordic Swan, BREAM, LEAD, DGNB
Circular	Reusable, easy to repair construction elements. Recycled/recyclable materials.	
Climate neutral	Requirements for energy performance of buildings. Application of renewable energy technologies.	

Consider setting **higher demands, goals and higher measurable targets** then required by national legislation construction/refurbishment/extension of a building with respect to toxicity, circularity, climate neutrality aspects.

Roles and responsibilities

Responsibilities for the decision making in construction project varies in the countries - the decision to build or renovate can be proposed/taken e.g., by the municipal department responsible for building, capital companies/organisations, a particular commission or a team assembled consisting of municipality's architects, developers, or it can be done by a municipality specialist in cooperation with a building consultant. Despite the ambitions and complexity of a project, any building construction/renovation/ extension of a building requires appropriate financial and human resources. In case several municipal entities (departments, municipal agencies, companies) are involved, clear roles and responsibilities must be defined since the very beginning of project implementation. As practice shows, most often the responsibilities for financial or management issues or even climate issues are defined at municipalities, while circularity and toxfree aspects could get forgotten during the construction project implementation, if there is no responsibility defined for certain municipal specialists to take care of.

Roles and responsibilities in a municipal construction project in Stockholm, Sweden.[11]
In Stockholm, if the option to use the BVB system is selected, the roles and responsibilities are clearly defined:

- **Construction project manager** (CPM) is responsible for delivering information to the BVB manager. In addition, a CPM must ensure that designers and contractors fulfil their mission in BVB.
- **Designer** is responsible for ensuring that the chosen products and goods meet the requirements and are recorded in the BVB Logbook during the design and detailed planning.
- **Contractor** is responsible for ensuring that all goods and chemical products used in the building as well as consumable products meet the requirements and are recorded in the BVB logbook.
- **BVB manager** administers the work in BVB and handles deviations. This includes creating logbooks, inviting designers and contractors to logbooks as well as training and attending construction meetings as needed.
- **Head of unit**, environmental unit (Customer side) approves or rejects deviations in planning and production as well as is the owner of all logbooks in BVB.

[11] NonHazCity Building material catalogue for tox-free construction (2023) - draft version

Assign the construction **project leader** (e.g., construction project manager) and supporting team with relevant competencies and capacities to supervise and manage the project implementation.

Documentation of the building process and selected materials

Although selection of building materials for new construction, refurbishment and extension comes at a later stages of construction process, it is important that the decision on procedure and tools for documentation of the building process and materials selected for the building is made already at an early stage. Documentation of selection of materials allows municipality to verify the conformity and deviations of supplied/used materials vs materials envisaged in the detailed plan of the building, defined in the technical specification of construction procurement, and identified in the construction contract. Moreover, having such documentation will allow municipality later to trace back materials when the building requires reparation of certain elements/substitution or refurbishment. For documentation of materials applied in a building a logbook can be created and used.

Creation of a digital logbook (e.g. pdf, Word or Excel format) is required for eco-certification of a building project e.g. by Nordic Swan ecolabel. In this case, it shall include all the construction products, goods, materials and chemical products used in the construction of the building. Reused products must also be registered in the logbook. As a minimum, the logbook must provide the following information:

- Name of the product;
- Type of product;
- Name of producer;
- The location of the product in the building e.g., ceiling, walls and floor, building's roof, facade, cellar, stairwell, slab, building's frame, terrace, bathroom, kitchen, balconies, garage, sports halls, garden, entrance hall, technical installation rooms, waste sorting room, laundry room, lift shaft.

The logbook must be initiated and account for materials and products used in the initial stages of the building project i.e. before the construction begins. The logbook must always be updated with materials and products according to the current state of the construction. The final version of the logbook must be handed in when the building is handed over. There must be routines in place to ensure that the logbook in an electronic format is accessible to the owner of the building and to Nordic Ecolabelling.[12]

[12] Nordic Ecolabelling for New buildings: residential, educational and office buildings (version 4.0), https://www.nordic-swan-ecolabel.org/4ac245/contentassets/b9969713cbc445949d910bce4d4f3c1c/background-document_089_new-buildings-089_english.pdf

Example of a BVB Logbook tool is presented in Figures 1.1.- 1.3.

Byggvarubedömningen (BVB) data base and logbook tool in Sweden

Byggvarubedömningen (BVB) is a non-profit, membership, economic association in the construction industry who have gathered many actors with the purpose of non-toxic and sustainable construction. BVB homepage offers two possibilities (sections) – the Data base of construction products (from suppliers/ producers from all over Europe) and the Logbook tool.

The BVB database comprises 28 500 published assessments from chemical content and lifecycle aspects and include over 300 000 articles/products. On the product card for every assessment the user can find the assessment result based on chemical content and lifecycle aspects which make it easy for the user to understand how the product could affect the health and environment. Through the search tool the user can search for specific products or for a whole product category which helps to find and choose material to use in the construction projects.

The Logbook tool is the construction project's own venue for products where actors can collaborate on product selection and log what has been built in. Implementors of the construction projects use the Logbook tool where they add products that will be used in the projects. The Logbook tool has many functionalities such as deviation reports, reminders, export, and the possibility to invite participants in a project. The logging of products enables traceability of substances that we today have little knowledge about but which in the future may prove to be harmful.

The Logbook tool is available at https://byggvarubedomningen.com.

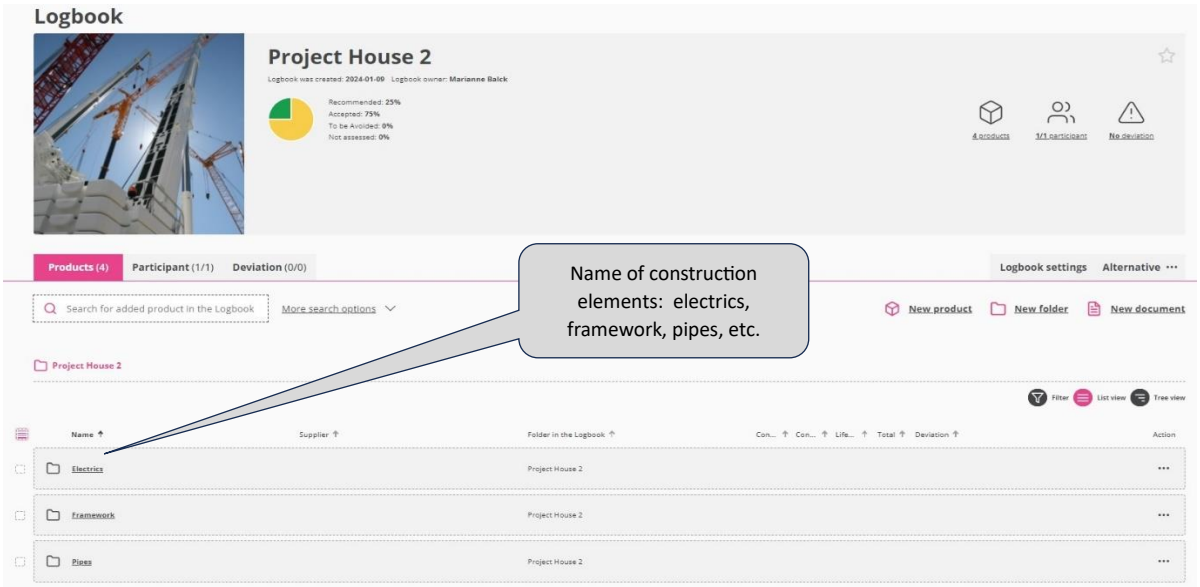


Figure 1.1. Illustrative example of the BVB logbook tool for creation of subfolders.

The BVB logbook tool allows the user to create a folder for a building to be constructed/refurbished/extended and insert folders to collect materials that could be selected/used for various applications (framework structure elements e.g. walls, pipes, etc.) from the BVB data base.

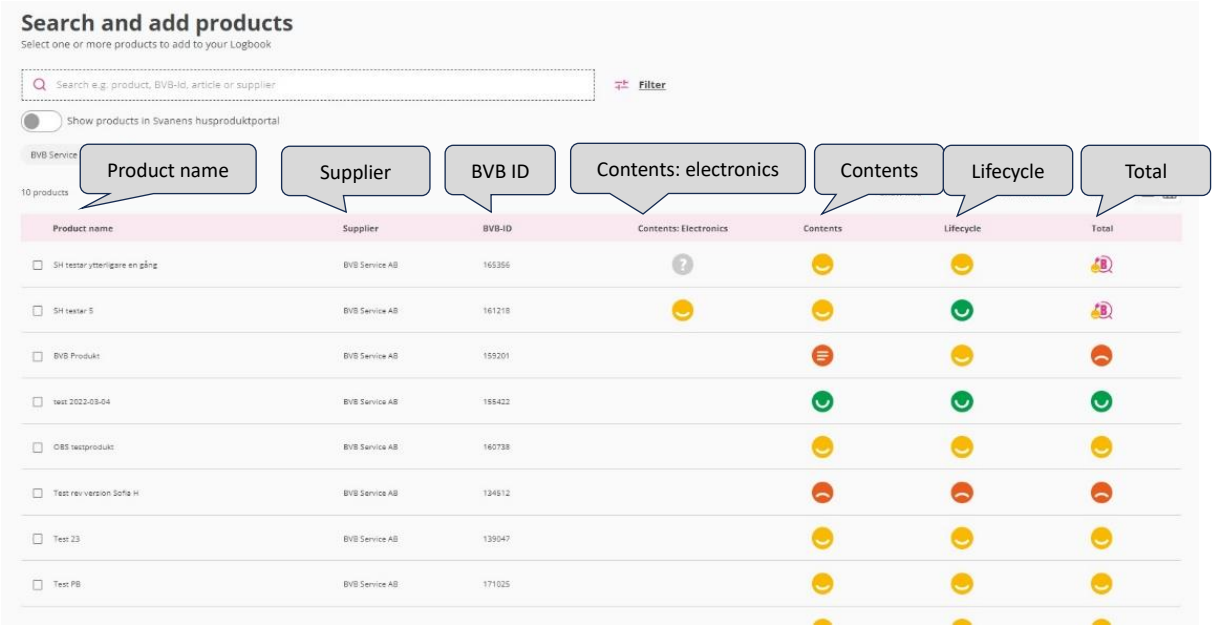


Figure 1.2. Illustrative example of the BVB data base – results of the search tool for the BVB assessed materials that are included in the data base.

Legend: Accepted Recommended To be avoided

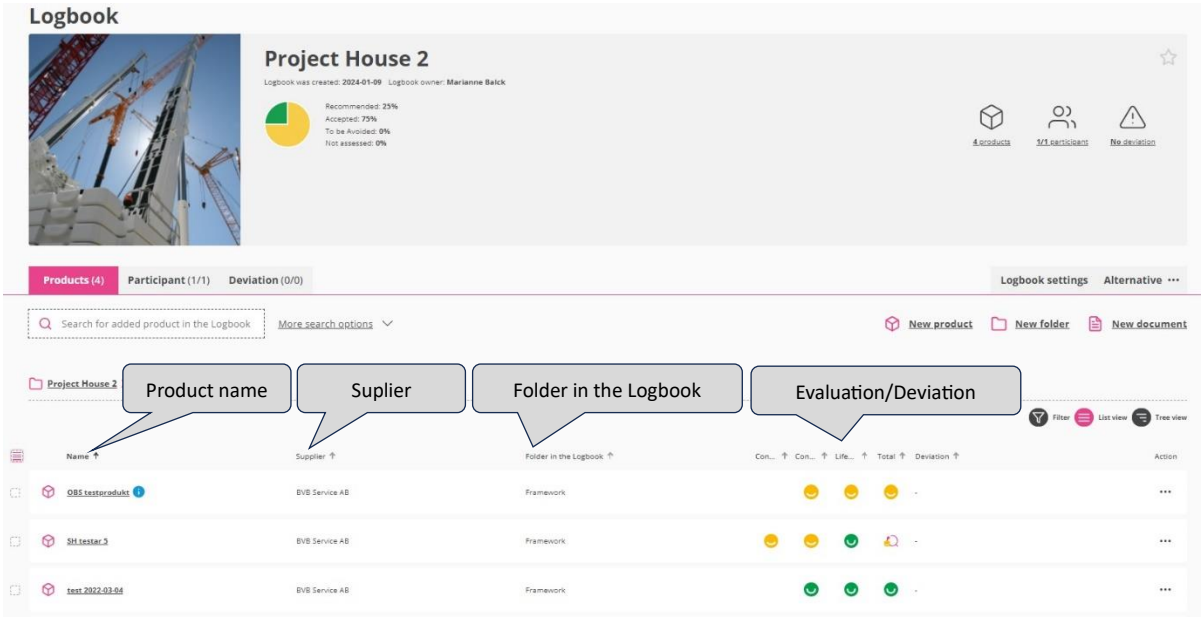


Figure 1.3. Illustrative example of the BVB logbook for feeding in the folders of construction elements with materials from the BVB data base.

Within the frame of the NonHazCity3 project, project partners have the free of charge possibility and are invited to test and use the BVB Logbook tool in their pilot projects. In 2023, several training courses on how to use the Logbook tool were organized by the project partner organisation Building Products Assessment - Byggvarubedömningen (BVB Service AB, Sweden). The Logbook User Guide has been prepared (in English) and is available for download. In Spring 2024 additional (recorded) trainings will be performed. Key elements and functionalities of the BVB Logbook tool are summarised in the Annex

of this Guide and can serve as an inspiration for municipalities to create their own Logbook tool considering their needs and possibilities.

Consider setting up and application of a digital **logbook** (in an online form) as a tool for documentation of all materials used during the construction, refurbishment, or extension of a building.

Checklist

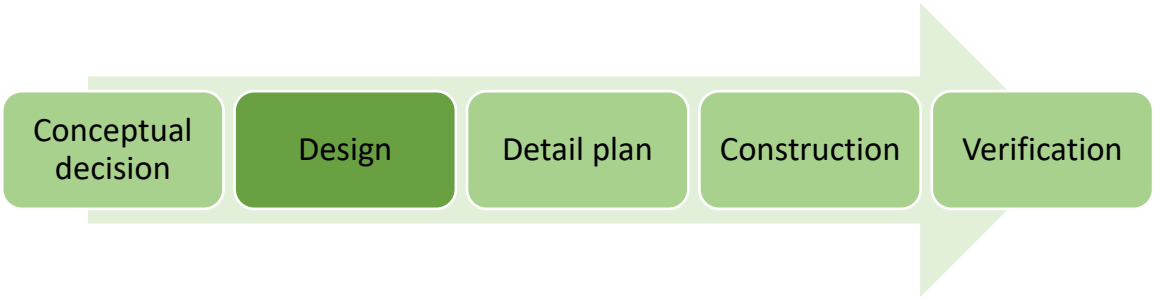
This checklist shall help a municipality specialist to consider the most important aspects during the conceptual decision-making stage of construction/refurbishment or extension of a municipal building:

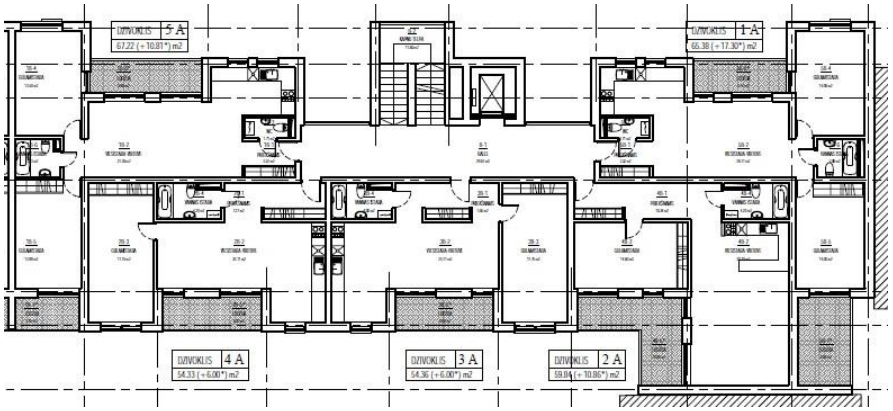
Nr.	Aspects to consider	Yes/No
1.	Are there **national legislation requirements** (e.g., mandatory green public procurement requirements) set regarding construction, refurbishment and extension of buildings related to avoiding hazardous substances, applying circularity and climate neutrality principles for municipal buildings?	
2.	Are there **political ambition and targets** of your municipality for tox-free, circular, climate neutral buildings defined e.g. in the Chemical action plan or any other relevant municipal strategical planning document?	
3.	Have the **needs assessment** of the end-users of the municipal building to be constructed/refurbished or extended performed?	
4.	Have you done **mapping of the key stakeholders** involved in the construction process (e.g., architects, construction companies, consultants) who could be potentially involved in the project?	
5.	Have you considered organisation of a **market dialogue** with stakeholders in the construction field e.g., architects, designers, construction companies to get acquainted with the latest technological developments and the associated costs?	
6.	Have you conducted a **pre-feasibility study,** including a screening by applying life cycle assessment methodology and calculation for the assessment of different options e.g., refurbishment versus demolition of a building; possibilities to re-use an existing building?	
7.	Have you considered undergoing **building certification** (e.g., Nordic Swan, BREEAM), eco standard or other external party verification of the planned construction, refurbishment, extension of the municipal building?	
8.	If building certification is not an option, have you defined **stricter goals and higher measurable targets** then required by national legislation with respect to avoiding/minimising hazardous substances, applying circularity and climate neutrality principles for your construction/refurbishment/ extension project?	

9.	Are the **roles and responsibilities** of different municipal entities clearly defined for supervision of implementation of various stages of construction/refurbishment/ extension project?	
10.	Is the **project leader** and supporting staff (team of specialists) assigned at the municipality to be involved and supervise the whole implementation of the project or to follow certain aspects e.g., toxicity, circularity, climate neutrality?	
11.	Has there been a decision taken on **documentation type** of the construction process and use of materials for construction/ refurbishment/extension of a building (e.g., (online) electronic **logbook)**?	

Outcome: Decision on the level of ambitions i.e., goals and measurable targets to be reached with respect to tox free, circularity and climate neutrality aspects for new construction, refurbishment, extension of a municipal building (project).

2. Design of a building





Picture by: "Arhitekta J. Pogas birojs" Ltd

When the conceptual decision on general requirements for the construction/refurbishment/extension is made, the building standard, main goals and targets to be achieved regarding non-toxic, circular and climate neutral construction are set, the process of elaboration of a visual appearance of a building reflecting the main structures (preparation of the design) can be started. The design of a building is done by an architect or group of architects being responsible for preparation of scaled drawings, either with computer software or by hand, for preparation of structure specifications, for providing preliminary estimates on costs and construction time. Even if a municipality has an architect or an architecture bureau, preparation of design of a building is usually outsourced and is implemented by a subcontracted architectural company selected during the procurement process.

Market consultations with design/architectural companies

Before launching a procurement, if market engagement still seems to be necessary, then as soon as a contracting authority has defined its procurement needs it is advisable to start preliminary market consultations. According to the Directive 2014/24/EU[13] (Article 40) e.g., municipality can seek advice from independent experts, authorities, or market participants, keeping in mind that such approach is not distorting competition and does not result in a violation of the principles of non-discrimination

[13] Directive 2014/24/EU of the European Parliament and of the Council of 26 February 2014 on public procurement and repealing Directive 2004/18/EC, https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32014L0024

and transparency.[14] Market consultations help to amend the procurement documents based on received information and enables to incorporate innovative solutions/approaches into the procurement process and avoid situation of non-realistic or outdated specifications, but resulting in definition of the best contractual terms and conditions.

Market consultations

During the market consultation process contracting authorities can determine the state of current and future market capabilities and price structure in relation to their specifications and needs. At the same time, service providers receive information on expected requirements of contracting authorities which will be applied in the procurement process. To avoid possible confusion, it should be noted that in opposite to market dialogue, market consultation is an integral part of the public procurement process, usually commenced by a Prior Information Notice (a notice used in public procurement to announce an upcoming procurement procedure). It includes description of the consultation process and announcement of the forthcoming public procurement exercise.[15] In cases where budget for the construction project exceeds certain thresholds, it is mandatory to use EU-channels to announce the procurement of architectural services. At the same time, it is advisable to use more channels to have a many interested bidders as possible.

Particularly if a decision to search for application of innovative solutions in new construction, refurbishment or extension of a building is taken, it is important to expand the pool of architectural design companies that have previously bid for or won similar contracts. A good practice is to share information publicly and widely so that as many potential bidders as possible become aware of the forthcoming procurement.

When the procurement needs are identified, but before launching a procurement consider performing **market consultations** inviting wide range of possible service providers (e.g. architectural companies).

It has been noted that market consultations can take various forms. If contracting authority is having already a good understanding and overview of the market (e.g. obtained during market dialogue process already earlier) and therefore it just needs minor clarifications and updates. In other cases, extensive research might be needed to gain the necessary knowledge to launch a procurement procedure.

[14] European Commission (6.7.2021), Notices from European Union institutions, bodies, offices and agencies; European Commission Notice: Guidance on Innovation Procurement (2021/C 267/01), https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:52021XC0706(03)&rid=6

[15] C. Dekker, PIANOo (2018), Format for a market dialogue session for Procurement of Bio-Based Products and Services, https://www.slideserve.com/phillipy/format-for-a-market-dialogue-session-powerpoint-ppt-presentation

There are different possibilities to organise market consultations depending on the needs of the contracting authority and the time available for the procurement planning phase. Preparation and implementation of market consultations include several steps (Figure 2.1).[16, 17,18]

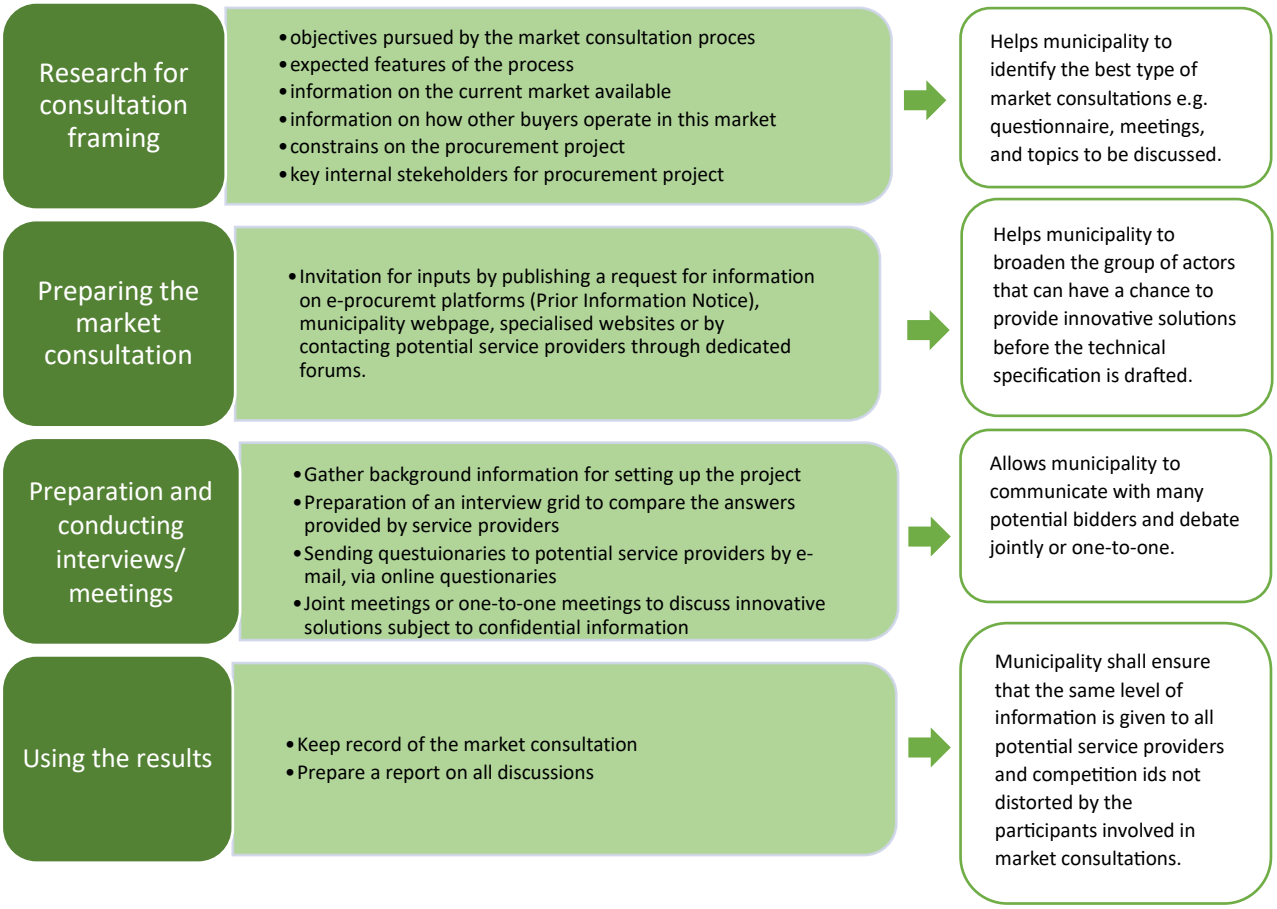


Figure 2.1. Steps for preparation and implementation of market consultations.

Procurement of the building design

There are many tools that can be incorporated into public procurement procedure e.g., widely used open and restricted procedures. Alternative public procurement procedures are e.g., negotiated procedure with competition, competitive dialogue, design contest. However, it must be admitted that procurement approaches differ at municipalities/countries and each procurement is very case specific. The choice and decision on procedure and technical specifications shall be made by the responsible public authority and there is no one single solution that fits to all circumstances, but rather provides is a set of tools (options) for application of new approaches that have been made possible

[16] D. Ramshaw (2024), Preliminary market consultations, https://www.lexisnexis.co.uk/legal/guidance/preliminary-market-consultations

[17] M. Sorokina (2022), Preliminary market consultations as a way to involve businesses in circular public procurement, https://www.ccdr-a.gov.pt/wp-content/uploads/2023/05/Manual-CircPro-ingl.pdf

[18] European Commission (6.7.2021), Notices from European Union institutions, bodies, offices and agencies; European Commission Notice: Guidance on Innovation Procurement (2021/C 267/01), https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:52021XC0706(03)&rid=6

under the modernised EU rules on Innovation Procurement.[19] Detailed and comprehensive information and proposals on Green Public Procurement (GPP) criteria that can be used in the procurement of services and works for the design, construction, renovation, demolition and management of buildings are provided in the draft JRC Technical report "EU Green Public Procurement (GPP) criteria for the design, construction, renovation, demolition and management of buildings".[20]

In practice, procurement for elaboration of the design of a building can be organised in several stages:

1st stage – prequalification for selection of the architectural/designer company. Selection criteria for the designer/architectural company includes requirements to prove experience/competencies of the architect/designer in similar constriction/refurbishment projects:

- building projects where circular economy principles have been applied and ability to use digital tools in this regard;
- the specification, procurement and installation of low environmental impact construction materials. To include reference to EPDs in compliance with ISO 14025 or EN 15804;
- the use of holistic assessment tools in the design and specification of environmentally improved buildings including LCC and LCA. Comparative studies in compliance with ISO 14040/14044 or EN 15978;
- design, specification and monitoring to address daylighting and glare, thermal comfort and indoor air quality;
- assessment of building environmental performance using multi-criteria building assessment and certification schemes.

Verification of experience and competencies shall be proved by evidence of information and references related to contracts in the previous 5 years, supported by a CV of designers/architects.

2nd stage when e.g. 5 prequalified architects are selected, a competition can be organised to submit their proposals for the design of the building according to technical specification received.

Example of procurement approach in Hamburg, Germany

In Hamburg the procurement of the architecture company has be done according to the rules of the "Bauhandbuch Hamburg"[21]. In general, it describes two steps: first step – pre-design and design and in a second step detail planning and supervision of construction (both steps could be implemented by the same company). A company needs to prove skills and experience fitting to the given tasks and program (e.g. school for 1000 pupils). The technical specification is done by the design company in the phase of detail planning.

The procurement for the construction company is performed either for a general contractor or for different companies for implementation of different tasks (e.g. one company for woodworks, one for

[19] European Commission (6.7.2021), Notices from European Union institutions, bodies, offices and agencies; European Commission Notice: Guidance on Innovation Procurement (2021/C 267/01), https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:52021XC0706(03)&rid=6

[20] S. Donatello, A. Arcipowska, Z. Perez, A. Ranea (2022), EU Green Public Procurement (GPP) criteria for the design, construction, renovation, demolition and management of buildings (draft Technical report, v1.0), https://susproc.jrc.ec.europa.eu/product-bureau/sites/default/files/2022-03/GPP_Buildings_TR_v1.01.pdf

[21] Bauhandbuch Hamburg (viewed on March 2023), https://www.hamburg.de/contentblob/4339178/6bcd6e9b35f4ab4c413267a956e87400/data/vv-bau.pdf

dry construction works, one for flooring works, etc.). Selection criteria for a company is mainly based on economic criteria.

In case technical specification cannot be established with sufficient precision and depending on the degree of clarity the public buyer e.g. municipality has about the project, it can select a competitive procedure with negotiation, a competitive dialogue approach for the procurement procedure or a design contest.

Competitive procedure with negotiation

This procedure is suitable if a municipality is having a clear idea about the project and negotiations focus only on technical aspects of the works, including price and quality considerations. This procedure offers municipality more flexibility in awarding contracts, where readymade solutions are not available on the market.

Competitive dialogue

Competitive dialogue approach is applied to determine several unclear issues. It is a two-round procedure, where the public buyer describes its needs in a descriptive document or contract notice, sets minimum requirements for candidates and defines the contract award criteria based on Best Price Quality Ration. After verification of the selection criteria of the candidates, the public buyer initiates the competitive dialogue with the participants meeting the minimum requirements. The buyer obtains wide range of solutions that participants can propose. When the public buyer considers that the competitive dialogue has reached an optimal stage, the remaining participants are requested to submit the final tenders and the contract is awarded based on the Best Price Quality Ratio.

Design contests

The design contests are traditionally used for architectural designing works. Design contests may be organised with awarding prizes (with payments) or service contracts by means of a follow-up negotiated procedure without publication of a contract notice. Design contest offers participants large room for various options in proposing the best solution for the needs described in the contest notice. An autonomous jury performs evaluation of the design proposals and shall ensure the most objective and transparent way of evaluation.[22]

Depending on needs and knowledge about the envisaged construction/refurbishment/extension project, consider selection of the **most suitable innovation-friendly procurement procedure**.

The architectural company makes a design of the building, according to the given “program”, taking into consideration budget and the decision on standard, building type, number of storeys, type of roof (flat, steep slope), etc. During the elaboration of the design, following the main idea (motto) for the building, architect preliminary decides on shape of the building, grouping of parts of the building, compactness and good use of daylight, rooms and access areas considering soil and material saving aspects as much as possible. Decisions are taken on main materials for load bearing and insulation, windows, roof as well as heating, cooling, and ventilation concepts. Decision on materials shall be

[22] European Commission (6.7.2021), Notices from European Union institutions, bodies, offices and agencies; European Commission Notice: Guidance on Innovation Procurement (2021/C 267/01), https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:52021XC0706(03)&rid=6

made considering regional/local aspects. Possibilities to prevent occurrence of "hot spots", e.g., insulation of a heated basement are assessed.

Considering the NHC3 three pillar approach at the stage of the design elaboration for construction/extension/refurbishment several decisions have to be taken:

3 pillar approach	Decisions for new construction / extension / refurbishment
Tox free	• materials for building envelope (load bearing, insulation) • shape of the roof to prevent the outer walls against stormwater to reduce the need of use of biocides to prevent algae growth
Circular	• recyclability & reusability & easy to repair materials, building elements • building elements that can be separated easily in case of demolition • minimisation of new materials used by utilisation of materials/building elements already available (in an existing building) or by utilising the recycled materials
Climate neutral	• shape of the building concerning compactness and good use of daylight • orientation of windows to ensure maximums solar gains, natural shading, cross ventilation • insulation materials (thermal mass) that ensures preventing also overheating in summer • regionally/locally produced materials (avoiding long transportation distances) • avoidance of materials with high embodied energy (e.g., concrete, metal) as much as possible • air tightness of building (sealed envelope) • primary energy consumption and the threshold for use of fossil fuels • visual connectivity to the exterior landscape (mainly in case of new construction) • solutions for passive indoor climate control - passive heating/cooling options (mainly in case of new construction) • heating, cooling, and ventilation concept (traditional heating system vs passive house concept e.g., ventilation with heat recovery/use of renewable sources) • places for parking of bicycles and electric vehicles

The decisions taken at the stage of elaboration of the design set the bases for further phases of construction, thus active collaboration between the architect/designer and municipality specialists is essential to supervise correct implementation of rules and provide advice and guidance to ensure that the initial goals and targets set for toxfree, circular and climate-neutral building are taken into consideration and incorporated. For example, in Sweden in the design phase, the BVB manager creates a logbook in BVB and invites relevant actors to participate in using the logbook, assists with training, creates licenses, and distributes routines regarding documentation of materials to be selected and used during construction of the building.

During the elaboration of the building design process ensure **collaboration** (consultations) between the architecture/design company and municipal specialists responsible for implementation of the construction project.

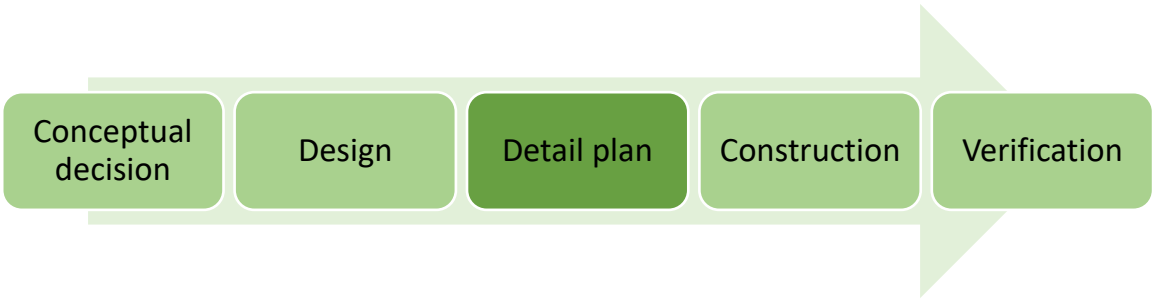
Checklist

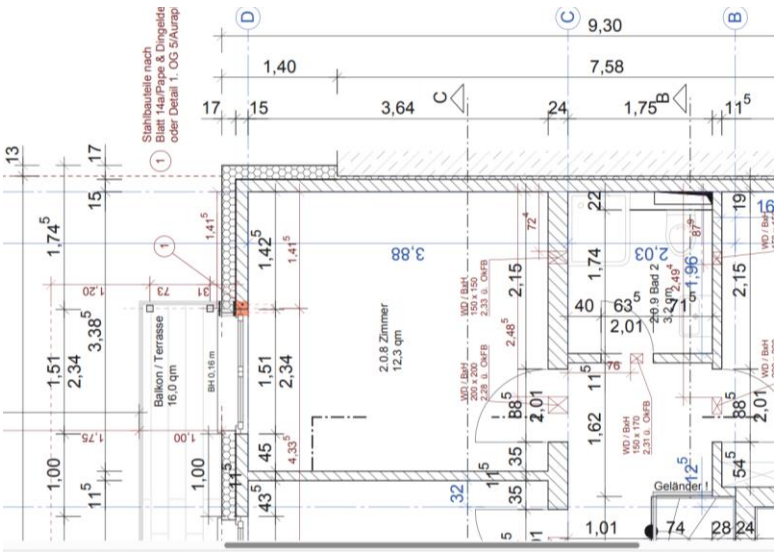
This checklist shall help a municipality specialist to consider the most important aspects during the design elaboration stage of construction/refurbishment or extension of a municipal building:

Nr.	Aspects to consider	Yes/No
1.	Are **responsibilities defined** at municipality on who will follow implementation of toxfree, circular and climate neutral aspects during the construction/refurbishment/extension project?	
2.	Is organisation of a **market consultations** with design/architectural companies considered prior to elaboration of procurement documentation and launching a procurement procedure?	
3.	Is application of **innovation-friendly procurement procedure** e.g. design contest considered?	
4.	Is **collaboration** procedure between the architect/designer and municipality specialists established to ensure elaboration of a building design meeting the targets for tox free, circular, climate neutral construction?	
5.	Is an (electronic, online) **logbook** created to identify potential materials to be used for construction/extension/refurbishment of a building?	
6.	Are options for application of materials containing reduced amount or **no hazardous substances** considered at the design stage?	
7.	Are options for using locally produced (e.g., wood, clay) and/or **eco certified materials** considered in the design of the building?	
8.	Are options to use **reusable, recyclable materials** and easy to repair solutions considered in the design?	
9.	Are options for application of materials having **low embodied energy** considered?	
10.	Is the new design so **flexible**, that it can serve for other needs than the original planned, to save reconstruction in case of the change of the need?	
11.	Are options for **increasing energy performance** of the building considered avoiding “hot spots” e.g., thermal bridges at the design stage?	
12.	Are options for use of **renewable energy sources** considered at the design stage?	

Outcome: Drawings/sketch usually in scale of 1:200/1:100, preliminary cost estimation for tox free, circular and climate neutral construction/refurbishment/extension applying innovative solutions.

3. Detailed planning





Picture by: AURAPLAN

When the design of the building is prepared, using designer's drawings and proposals detailed planning can be started for elaboration of technical construction documents for the construction/refurbishment/extension project. Construction documents are detailed plans that are used to secure building permits and serves as an outline to the construction company exactly how the building needs to be built, materials to be purchased, technical solutions implemented etc. This is the phase where decisions concerning precise structure and layers of wall, floor and roof are taken. The customer, in this case the municipality shall define the characteristics of visible surfaces in the rooms. They determine the image and atmosphere of a room, the comfort to use or maintenance of flooring or to ensure the durability of walls and paints.

Product data bases and platforms

Various information resources, databases, and platforms dedicated to aiding different stakeholders in the construction sector are available to guide purchasing decisions, making eco-friendly choices. There are data bases with features such as interactive project-logbooks, project databases, networking and certification options and other information sources using data(sets) that require comparison and interpretation by the reader.

More information on various information sources can be found in NHC Fact sheets on Product Data bases and platforms.

Detailed requirements for substances to be avoided are set in the Nordic Swan Ecolabelling. The Table below gives an overview on construction products and materials where several substance groups of concern are regulated (i.e. limit values are set) by the Nordic Swan Ecolabelling (marked in red).[23]

Construction materials/ products	**Substance (groups) of concern**											
	Phthalates	VOC, Formaldehyde	SCCP & MCCP	Nonyl-octyl phenols	PFAS	Brominated flame retardants	Boric acid (boric compounds)	BPA, BPS, BPF	Heavy metals	Organic tin compounds	Isothiozolinones	Total preservatives
Walls & slabs	■	■	■	■		■	■					
Roofs	■		■	■					■			
Windows	■	■	■	■					■			
Facades		■	■	■			■		■			
Insulation	■		■	■		■	■			■		
Floors	■	■	■	■		■		■	■	■		
Coatings	■	■	■	■					■		■	■
Adhesives	■	■	■	■							■	■
Sealants	■	■	■	■				■	■	■	■	■
Renders, plasters	■	■	■			■	■					
Plates/ boards	■	■				■	■					
Materials from PVC	■		■		■	■		■	■	■		
Other plastics	■		■		■	■		■	■			

If the municipality has already taken the decision of guidance by a certification system or, for example, the BVB system in Sweden, the frame for the selection of materials is set.

Roles and responsibilities in a municipal construction project for selection of materials in Stockholm, Sweden.[24]

The BVB manager is also available for questions about material selection during the detailed design. The Construction project manager informs the BVB manager about quantities of goods for registration. The BVB manager reviews the logbook in BVB prior to construction start. The party that specifies or intends to use a product is responsible for ensuring that it is assessed in accordance with BVB's criteria, and that the product meets the following assessment levels:

• Products that have gotten the overall assessment “Recommended” or “Accepted” are approved for use. The higher level Recommended must be prioritized over the assessment Accepted.

[23] Nordic Ecolabelling, Nordic Ecolabelling for New buildings: residential, educational and office buildings, https://www.nordic-swan-ecolabel.org/4ac245/contentassets/b9969713cbc445949d910bce4d4f3c1c/background-document_089_new-buildings-089_english.pdf

[24] NonHazCity Building material catalogue for tox-free construction (2023) - draft version

• Products with the overall assessment "To be Avoided" may only be used after approval from the customer before use. Products with this assessment must be handled as a deviation.

To ensure that products and goods fulfil the requirements, they must be verified according to BVB's criteria before purchase and use. The criteria of BVB are updated regularly. This means that even if a product previously met the requirement for an assessment level, the assessment could have changed. Therefore, the current assessment of a product must always be confirmed prior to use. A hired consultant or contractor is responsible for documenting goods on BVB's web portal before they are purchased and used. The customer reimburses the verified license cost for BVB for one user per consulting company or contractor per project. Prior to final reporting, the consultant or contractor must notify the customer when registration of all included goods is completed.

If a decision on a particular certification system is not taken, the most crucial step is the setting of requirements in the tendering (procurement) specification. Here, materials and their characteristics should be described carefully step by step. Only an unspecific reference in the foreword to the three-pillar approach will not help the companies to offer truly circular construction types and tox free products. Furthermore, the site management should be described, e.g., if there shall be particular taking-care for substances present in materials or to reuse packaging.

Experience shows that during the detail planning stage the financial aspects (costs of the project) are the most discussed aspect. Cost estimations brought up at this stage provides more detailed and more realistic "picture" – in many cases the recalculated costs turn to be higher than estimated during the design stage. So, at this stage, it is important to pay high attention towards maintaining the NonHazCity3 three pillar approach high on agenda while considering budget saving possibilities.

Consider **long-term benefits** of toxfree, circular and climate neutral construction versus initial costs of the construction project.

Procurement of the detailed plan

Contracting authority (municipality) organises procurement, taking into consideration national legislation e.g., on green public procurement or the requirements established by municipality. Prior to initiation of the procurement process a market consultation with construction companies can be carried out (see the description of the procedure in the previous chapter).

The procurement can be organised in 2 stages.

During the **first stage** of procurement, the construction company for elaboration of a detailed construction project can be selected. Selection criteria include one or several requirements related to experience of the company. The potential service provider company shall prove the experience of the construction design manager in the following fields e.g.:

- experience in elaboration of detailed construction project of energy efficient buildings;
- experience in elaboration of construction project for building energy management systems (BEMS);
- experience in elaboration of construction project for installation of energy efficient water consumption systems.

As the result of the first stage procurement selected companies (e.g., top 3-5 candidates) are invited to the **second phase**. They receive technical specification and prepares proposals for elaboration of the detailed plan.

Depending on the building type (e.g. dwelling house, office building, educational building, medical treatment building), feasibility in relation to planned construction works (new construction, refurbishment, or extension), considering the NHC3 three pillar approach at the stage of detailed planning for construction/extension/refurbishment, several decisions (if not done already earlier) have to be taken. Requirements for these decisions indicated in the table below can be reflected in procurement documents.

3 pillar approach	Decisions for new construction / extension / refurbishment
Tox free	• Avoiding certain hazardous substances (HS) e.g., Phthalates, TVOC, Formaldehyde, SCCP, MCCP, PFAS, APEO, Flame retardants, Boric acid (boric compounds), BPA, BPS, BPF, Heavy metals (e.g., Cu, Cd, Hg), Organic tin compounds, MIT/CMIT, PVC plastic in materials completely or setting maximum allowed concentrations of HS • Eco-certified (eco-labelled) materials • Eco certification of a buildings e.g. Nordic Swan • Indoor air quality requirements
Circular	• Use of re-used and easy to recycle materials • Materials used should be recyclable/ reusable/easy to repair • Waste management at the construction site, incl. storage of recyclable construction waste
Climate neutral	• Low embodied energy of material • No materials transported from long distances (preference to local materials) • Energy performance standards (minimum up to low energy building, passive house) • Water saving devices • Machinery at site only with non-fossil fuels

The table below presents an example of Green Public Procurement (GPP) requirements for detailed planning of new construction/refurbishment of buildings in Latvia.

GPP Requirements for technical specification for elaboration of a detailed plan towards new construction/refurbishment of certain types of public buildings according to national legislation in Latvia*

3 pillar approach	Requirements
Tox free	• Emission limits for construction and finishing materials (ceiling tiles; paints and varnishes; textile floor and wall coverings; laminate and flexible floor coverings; wood and composite material floor coverings): 1) Total volatile organic compounds: < 300 µg/m^3 28 days after installation/laying 2) Formaldehyde: < 30 µg/m^3 • Requirements for ventilation and air quality

Circular	• Proportion of reused materials and/or easily recyclable materials in the building structure e.g., structural frames, external envelope or elements thereof, floor coverings, finishes, wall and/or ceiling panels • Requirement for storage place for reusable or recyclable waste
Climate neutral	**For new construction:** • the total primary energy consumption rating expressed in kWh/m^2 per year shall correspond to Class A+ • the primary non-renewable energy consumption rating shall not exceed 60% • the direct visual contact with the outdoor area (view to the outdoor area) shall be at least ≥75 % of the useful surface area of the building; • the design shall provide for solar protection, glare protection, and solar radiation protection **For refurbishment:** • the total primary energy consumption rating of the building may be determined at the level of Class A, • the primary non-renewable energy consumption rating above 60 % **For all types of construction/refurbishment:** • Parking space for bicycles and micro-mobility vehicles • Electric charging points (optional) • All sanitary and kitchen water facilities shall be equipped with water efficient fittings • Passive cooling/heating/ventilation (optional for refurbishment)

** Requirements for educational buildings, museums, libraries, office buildings, hotels; dwelling houses (different GPP requirements for detailed planning of different types of buildings are set). Requirements refer to the 3rd group buildings*[25]

When the detailed plan – a construction project is elaborated, there are several technical items, that must be checked by a contracting authority (municipality) prior to the approval of the plan. A qualified **team of experts** should be assigned to oversee the compliance of the detailed plan with requirements set in technical specification and to ensure that standards are met with respect to the NHC3 three pillars. The table below indicates only few examples of the aspects that have an impact on tox free, circular and climate neutral construction and therefore should be verified in the detailed construction project:

Building elements	Aspects to be checked
Construction materials	• meeting the standard of an ecolabel or certificated material (BVB/Nordic swan etc), or avoiding hazardous substances
Walls	• installation of windows/connection to insulation/sealings to prevent unwanted air exchange. • insulation material fitting to energy calculations • material thickness/thermal conductivity

[25] LV Cabinet of Ministers Regulations Nr. 353 "Prasības zaļajam publiskajam iepirkumam un to piemērošanas kārtība" // Requirements for Green Public Procurement and Procedures for Application (adopted in 20.06.2017, latest amendments from 13.07.2023), available in Latvian at https://likumi.lv/ta/id/291867-prasibas-zalajam-publiskajam-iepirkumam-un-to-piemerosanas-kartiba and in English at https://likumi.lv/ta/en/en/id/291867-requirements-for-green-public-procurement-and-procedures-for-the-application-thereof

	• cladding inside and outside the wall to prevent moisture use of materials that can absorb water and release it slowly fixation systems having an option to avoid glues
Roof	• layers of the construction fitting to building physics (vapor barrier etc) • consideration of a green roof as an option • durability of roofing materials • characteristics of insulation material to prevent also overheating in summer time (thermal mass)
Floors	• floor construction and surface • layers of construction, avoiding glues • thermal protection layer, characteristics of materials • use of natural materials or eco labelled materials • materials for final coating
Connectivity of construction elements	• planning of all connecting points and prevention of thermal bridges
Membranes and glues	• characteristics of all membranes and glues
HVAC	• solutions for heating system/pipes etc. • options for passive cooling and heating
Rain water management	• Possibilities for rain water saving system (cistern) • consideration of infiltration basins on site • consideration on materials for rain gutter and pipes

It is advisable to establish a procedure for **assessment of the construction project** and divide responsibilities of experts at municipality, building department for verification if the technical project corresponds to the requirements set in tender documents (technical specification) for elaboration of a detailed plan.

Checklist

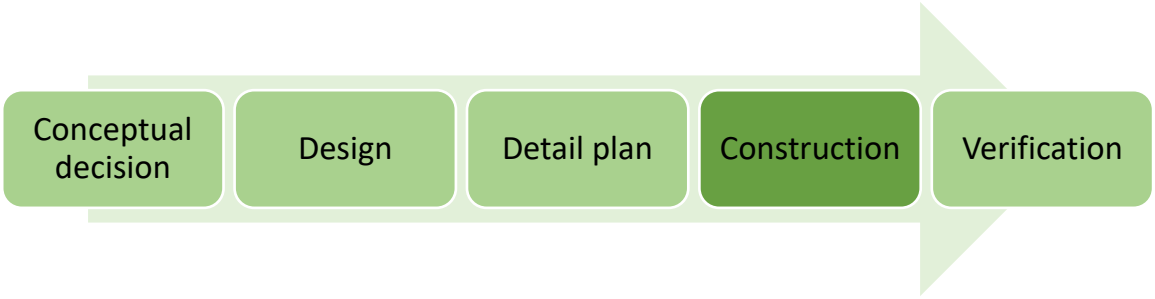
This checklist shall help a municipality specialist to consider the most important aspects during the detailed planning stage of construction/refurbishment or extension of a municipal building.

Nr.	Aspects to consider	Yes/No
1.	Are the requirements set in the technical specification for tox-free, circular, climate neutral construction **higher than national standards**?	
2.	Is there a **frame setting for the selection of materials**, e.g., to use eco labelled materials or to avoid “red” materials as in case of BVB system?	
3.	Is it possible **to avoid hazardous substances**, by using a “blacklist” or by setting clear rules on health issues?	
4.	Is it defined if and who will double check all positions of the **tendering specification** for tendering of companies for elaboration of the detailed plan in terms of the NHC3 three pillar approach?	
5.	Are there requirements in the specifications concerning **the site management** (e.g., safe handling of chemicals/reduction of waste)?	

6.	Is there a procedure established for **assessment of the construction project** by municipality, building department for verification if the technical project corresponds to the requirements set in tender documents (technical specification) for elaboration of a detailed plan?	
7.	Is there a rule what happens, if the cost estimations and first offers will show, that **the budget is not sufficient**? Is it in this case "allowed or forbidden" to lower the planned standard of the building?	
8.	Is the procedure for use of electronic (online) **logbook tool** established?	
9.	Is there a procedure established in case there is a **supply bottleneck** during the construction phase? Is it in this case "allowed or forbidden" to lower the planned standard of the building?	
10.	Is there a procedure envisaged for **deviations** in selection of materials e.g., if certain products do not fit to the requirements or are not available on the market?	

Outcome: Detailed construction plan (in scale 1:50) for the construction/refurbishment/extension project according to the results of the design phase and considering toxfree, circularity and climate neutrality aspects.

4. Construction and construction site management



Source: https://baneconstruction.com

In this phase the NonHazCity3 three pillar-approach comes from planning into reality. After having the detailed technical project ready and approved, the contracting authority (municipality) can procure the construction company to perform construction/refurbishment/extension works considering national legislation requirements and criteria related to green public procurement (if applicable).

Procurement of the construction works

Procurement shall include criteria and requirements for the construction project manager and technical specification for construction process implementation. Depending on the peculiarities of the construction project, selection criteria shall include one or several requirements related to experience of the construction project manager. For example, in Latvia potential construction company shall prove the experience of the construction project manager in the following fields e.g.:

- experience in construction of energy efficient buildings;
- experience in installation and submission for exploitation of building energy management systems (BEMS);
- experience in installation of energy efficient water consumption systems;

- experience in implementation of waste management plan, minimising waste amounts, as well as knowledge and experience to ensure possibilities for waste treatment outside the construction site.

Information and recommendation letters must be submitted proving the experience on construction works performed during previous 5 years (including the works performed and data on results, measurements). CV of specialists that will be involved in implementation of the project shall be submitted as well as certification on capacity building in the respective fields.

Depending on the building type and requirements set by national legislation on green public procurement or the requirements established by municipality, criteria and requirements in the technical specification for construction/refurbishment/extension can be set e.g. for:

- impact of construction materials and finishing materials on indoor air quality;
- waste management at the construction site;
- materials e.g., use of timber and timber products of legal origin.

3 pillar approach	**Requirements/criteria for new construction / extension / refurbishment**
Tox free	• Concentration of VOC and Formaldehyde within the indoor air
Circular	• Limits for the volume of construction waste originating at a construction site
Climate neutral	• Timber or timber products used inside the construction must be legally harvested (e.g., FSC, PEFC certificates or equal according to EC regulation 995/2010)

During the phase of construction, it is important to identify all groups of actors involved in the construction process and to clarify the roles and responsibilities of all parties in task implementation, supervision, and control. If the municipality has taken the decision of guidance by a building certification system or for example selection of materials from the BVB data base in Sweden, the roles and tasks are mostly already defined by the system.

Construction service provider company (main contractor and subcontractors) performs the construction/refurbishment/extension works in line with the already approved construction project and purchases materials according to the criteria and requirements in the technical specification. It is important to perform regular checks if all materials are delivered and installed according to requirement in the tendering specification.

To ensure traceability of materials purchased, used and installed, beside the traditional journal on construction, filling of an **electronic logbook** for a building where all materials/elements used are documented (registered) should be considered.

Roles and responsibilities for selection and documentation of materials used in Sweden[26]

During construction, the contractor´s purchasing organization has an important role to play in relation to selection of non-hazardous construction materials and compliance with requirements in the agreement with the developer. All products, materials, and goods must be logged before they are used or installed. The BVB manager reviews the logbook within the framework of the final inspection and reports back to the responsible construction project manager. Designers and contractors must document and justify deviations from material requirements in a deviation report in BVB. The BVB manager from the contractor's side is responsible for the deviation management.

Construction/refurbishment and extension of a buildings is a long lasting and complicated process, involving several actors – contracting authority, business representatives, etc. An example of roles and responsibilities in construction process including quality control and supervision for construction processes in Hamburg is presented in the figure below.

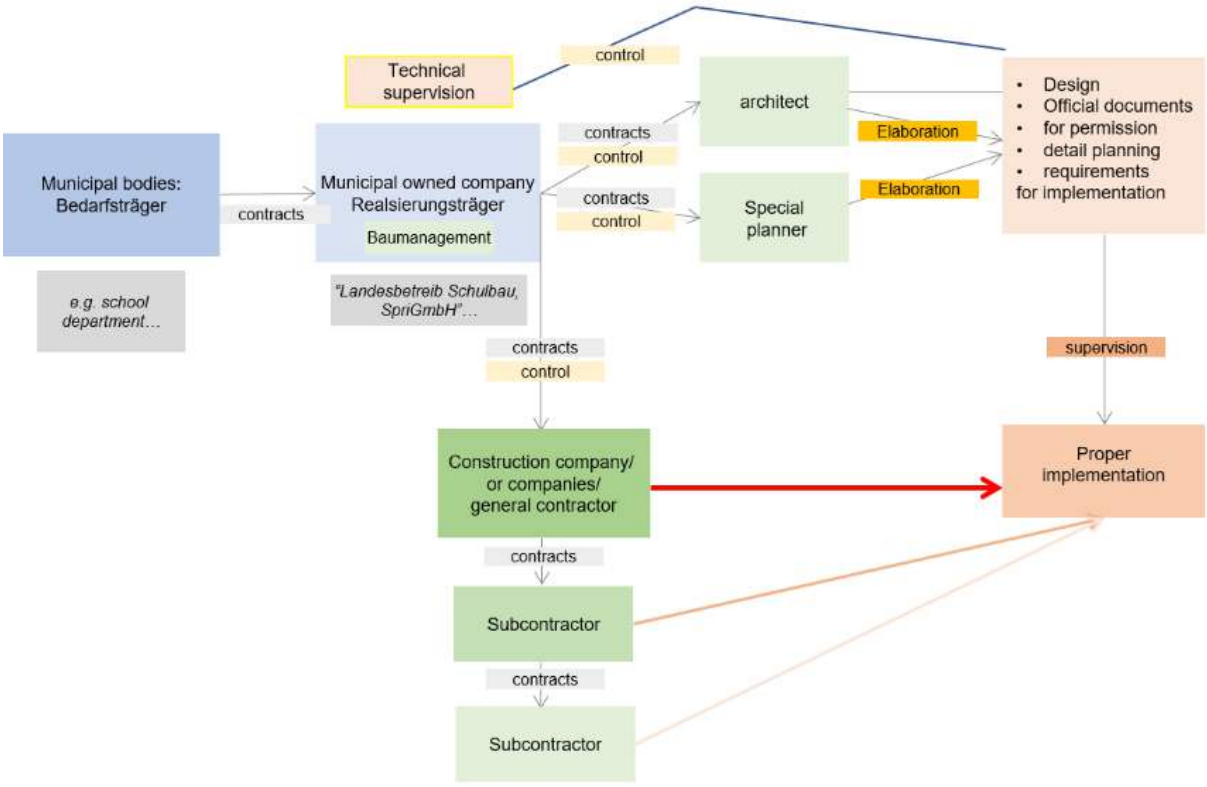


Figure 4.1. Example of roles and responsibilities over the supervision of municipal construction works in Hamburg

[26] NHC3 Catalogue

Roles and responsibilities over the supervision of municipal construction works in Hamburg

In Hamburg there are 2 main actors (in the following “chiefs”): The “content department” with less expertise on construction issues and the municipal owned company with expert knowledge (Realisierungsträger). Both are acting as the “chiefs” of the planning and implementation. The content department defines the need and is responsible for Conceptual plan - decision making. They are asked during the whole process, e.g. the question of flooring material, wall cladding. The “chiefs” procure according to defined rules the design team (architecture office) for predesign and design. (Note: there could be a second procurement for implementation not shown in the graph, to keep it less complicated). The “chiefs” procure together with the advice of the architect the special planners (heating/Statics etc). Architect and design team elaborates the design and prepares the permission (light orange box in the graph). After the permission is fulfilled, the implementation starts. This means the detail planning, tendering specification for the procurement of construction companies. The graph shows that the main construction company may engage a subcontractor for a certain part (e.g. flooring) and the subcontractor can engage a subcontractor (e.g. to install the flooring) and so on. This system means, that the main ideas of toxfree, circularity and climate neutrality can get lost, by this chain of actors. So sometimes it is forbidden to engage subcontractors. But it is not easy to hinder this. Therefore, supervision on construction site must have the main ideas in mind.

Construction site management shall be done by construction supervisor appointed by the customer/construction service provider/external supervisors. Inspection whether the construction is proceeding according to the project is done by an inspection authority. Municipality specialists shall follow up the construction process to supervise correct implementation of works and provide advice when necessary. There shall be an open and continuous dialogue between municipality, construction company, consultants and suppliers of materials e.g., on implementation process and deviations from the technical project, substitution of materials.

To ensure the smooth process of construction works, to identify any deviations from the technical project, discuss alternative/substitution options, etc. a **procedure for regular communication** between contracting authority and construction service provider should be established (meetings organised).

To ensure the desired outcome and meeting toxfree, circularity and climate neutrality targets, the quality control over the construction/refurbishment/extension works shall be performed throughout the whole construction process. Primarily, it is of utmost importance since the very beginning of the project to dedicate and clearly set the roles and responsibilities at municipality (e.g., municipal construction boards, municipal property departments) and at construction company (general contractor, subcontractors) for the supervision over the quality of construction works performed. Failure to meet project quality requirements can have several negative implications on the project final result.

Depending on the requirements set in the procurement documents, different follow up processes can be used for **quality monitoring**. Apart from a follow-up meeting between the contractor and/or material supplier, there are several other possibilities that can be applied[27]:

- measurement of quality through indicators or key figures;
- randomized verification of invoices;
- survey submitted to suppliers, clients or third parties (e.g., residents);
- follow-up of self-reporting from suppliers;
- follow-up of management systems for environment and quality;
- notified or unannounced follow-up visits to the supplier;
- planned or randomized audits of a supplier.

Establish a **quality management program** and ensure the quality management process that every construction work performance and results are reviewed.

[27] NonHazCity Building material catalogue for tox-free construction (2023) - draft version

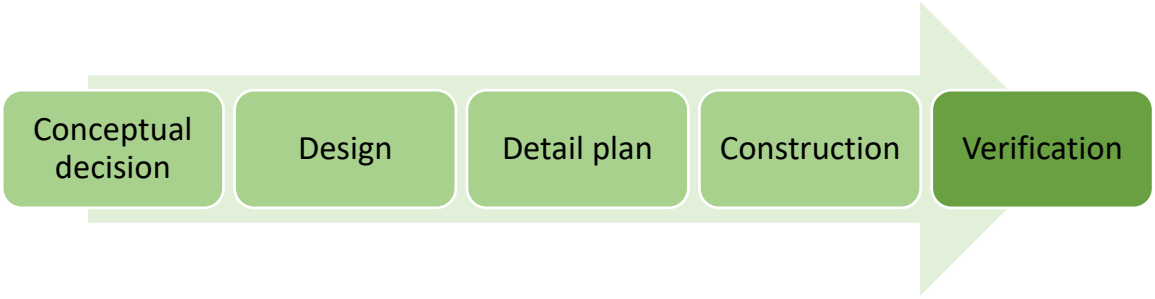
Checklist:

This checklist shall help a **municipality specialist** to consider the most important aspects during the construction stage of new construction/refurbishment or extension of a municipal building.

Nr.	Aspects to consider	Yes/No
1	Is there a procedure established for **quality management** incl. regular communication (meetings) between contracting authority (municipality) and construction company?	
2	Is there a plan or a guidance elaborated how the **amount of waste** at construction site can be minimised?	
3	Is there a procedure established and responsibilities dedicated to take care and supervise **safe handling of chemicals** at construction site?	
4	Is there a documentation template applied for identification of materials used in the building e.g., electronic **logbook**?	
5	Is it defined what happens, if materials are **not delivered according** to the defined rules (e.g. materials without eco label and without derivation declaration)?	
6	Is it defined who will check the building with respect to the **quality control**?	
7	Is there a plan, what happens in case of **time pressure caused by supply bottleneck**? Is it allowed or forbidden to use "bad" materials in such cases?	
8	Is there a rule, what happens, if a **sub-contractor** occurs on construction site, who never heard about defined three pillar approaches?	
9	Is it defined who will check all **declarations** of construction companies concerning the NHC3 three pillar approach?	

Outcome: New, refurbished, or extended building built according to the plans and technical specification, considering requirements and the decided standard on tox-free, circular and climate neutral construction.

5. Verification



Source: https://www.planradar.com/

Construction/refurbishment and extension of a buildings is a long lasting and complicated process involving number of actors. On top of regular conformity and quality control checks performed during the construction process, it is important that final verification of the results achieved are taking place. Procedures (methods and tools) for verification of results shall be agreed and included as a part of the contract between the contracting authority and the construction service provider. Municipality can also subcontract an external service provider to perform measurements and/or additional tests for verification of conformity e.g., air quality measurements, measurements for airtightness and energy performance of building, detection of thermal bridges.

In case building is undergoing eco certification process e.g., Nordic Swan, BREEAM, LEED, DGNB verification is performed by the respective certification institute.

There are several tools available for verification of the results that can be applied during the final conformity check:

3 pillar approach	Verification methods and tools for new construction / extension / refurbishment
Tox free	• **Declaration** from the manufacturer of the chemical product, construction product, construction goods or construction material • **Safety data sheets** (SDS) in accordance with Annex II to REACH for all chemical products • **Documentation** from the manufacturer e.g., technical datasheet stating compliance with relevant standard • **Construction product declarations** or corresponding if available for the product • **Declaration** from confirming compliance with the requirement concerning antibacterial/ antiviral surfaces • Performing **air quality measurements** and analyses of measurement results (analysis report, including measurement methods and frequency)
Circular	• **Declaration** from the manufacturer of the construction product, construction goods or construction material • **Documentation** from the manufacturer e.g., technical datasheet stating compliance with relevant standard • **Certificates** for the origin of timber and/or timber products (e.g., FSC, PFSC) • Checking the **logbook of** materials used in the building during construction/refurbishment/extension works to identify if re-used/recycled materials have been used
Climate neutral	• Performing **thermographic measurements** to identify thermal bridges • Performing a **blower door test** to identify uncontrolled air leakages through the building envelope • Performing an **energy audit** and request for **energy performance certificate**

Air quality measurements

To verify the impact of construction process and finishing materials used in the building on indoor air quality, after certain time period (e.g., 4 weeks) when the indoor construction (finishing) works are finalised, **air quality measurements** can be done to check the indoor air concentration of volatile organic compounds and formaldehyde. The obtained result shall be verified against the maximum allowed concentrations e.g., as defined in the technical specification of the procurement of the construction works.

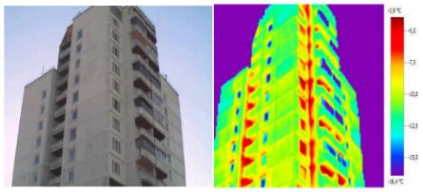
Measurements of energy performance

The **blower door test** is a diagnostic tool developed to measure the air tightness of a building, to measure and verify the level of air leakage reduction achieved and to help locate air leakage sites.

The blower door test was originally from the United States and has been used in Europe since the early 80s. The blower door test can be performed for apartment buildings, warehouses, office buildings, gyms, etc. [28, 29]

A blower door is a powerful fan that is temporarily mounted into the frame of an exterior doorway of the building. The test procedure consists of the measurement of the volumetric air flow, which is produced by the differential pressure by a calibrated fan (the fan pulls air out of the house, lowering the air pressure inside). With a differential pressure of 50 Pa the air flow volumes is determined [m^3/h]. Typical values for the air-change-rates (n50) are for untight building: n50 > 3 h^{-1}; low-energy house: n50 < 1,5 h^{-1}; passive house: n50 < 0,6 h^{-1}

Thermography is a tool to map the energy loss from a building through thermal bridges, and to detect problems with heating, ventilation and air conditioning systems, e.g., as duct leaks or equipment malfunctions. The method is quick and the infrared (IR) images along with the IR reports which the camera produces are a precise and convincing argumentation.[30]



Besides checking various types of documentation (declarations, safety data sheets, etc.) consider implementation of **additional tests** to verify the achieved results of the construction works performed e.g., for meeting the requirements for indoor air quality, achieved energy efficiency level of the building.

[28] Energy saver, https://www.energy.gov/energysaver/blower-door-tests

[29] IAN JACK Blower-Door-XXL (2023), Information Blower door test, https://www.blower-door-xxl.de/en/information-blower-door-test/

[30] FLIR Systems, Infrared Guidebook For Building Applications: An Informative Guide for the Use of Infrared in the Building Industry, https://crimsoniv.co.uk/wp-content/uploads/2011/05/T559320_EN-Infrared-Guidebook-for-building-Applications-Crimson-Industrial-Vision.pdf

Checklist

This checklist shall help a municipality specialist to consider the most important aspects during the verification stage of construction/refurbishment or extension of a municipal building.

Nr.	Aspects to consider	Yes/No
1.	Are the **roles and responsibilities** clearly set for the verification procedure to check that construction/refurbishment/extension works are performed according to the technical project?	
2.	Are the **methods and tools** selected to verify the conformity of the works performed?	
3.	Is the list of **all documentation** (declarations, certificates) compiled that will help to verify the conformity of the performed works/materials supplied?	
4.	Is the **logbook identifying materials** used in the building completed and available for a contracting authority to verify the compliance of materials with materials originally envisaged?	
5.	Are methods selected for measuring and monitoring **air quality** in the building after the construction works are finished?	
6.	Are methods selected for verification of fulfilment of the **energy performance requirements** of a building?	

Outcome: The verification procedure proves that construction/refurbishment/extension works meet the standards set for toxfree, circular and climate neutral construction and requirements identified in the contract between the contracting authority and construction company. Building is ready for use and further maintenance and long-term monitoring of results (e.g., air quality, energy performance) shall be ensured.

Picture by: Doina Indriksone, BEF-Latvia

Annex 1. Key elements and functionalities of the BVB Logbook tool

To create a new logbook in the BVB system there is a need to enter some data in the required fields:

- **Logbook name:** The name of the Logbook will appear in the title of the Logbook. If you fill in information in the fields Project number/ID and other, these will also be included in the heading after the Logbook name;
- **Project number/ID:** Enter the Project number/ID here if you wish. These will appear in the title of your Logbook, after the Logbook name;
- **Other identification:** Some projects have their own unique names and these can be entered in this field. This other text will appear in the header of your Logbook, after the Logbook name;
- **Invoice reference:** Fill in the unique reference here that must be stated on the invoice, in case your company requires it. It can be, for example, cost centre, project number, code string, etc.;
- **Phase:** Choose in which phase you want your Logbook to be in. If you are in the Project Design phase or the Production phase, select Production. If you are going to manage your property or facility, select Management. This setting can be changed at a later stage when Logbook is created;
- **Type:** indicate whether this Logbook relates to a Building or is for a Facility;
- **Property/Building:** Enter the name of the property to which Logbook relates, for example address of the building;
- **Land Title Identifier:** Enter the property identifier of the property which the Logbook relates to;
- **Property Entity:** Specify which property is being referred to;
- **Description of the Logbook:** Describe your logbook in few sentences or longer, you can write following e.g. background, scope, purpose and goals for later traceability or for information for the Logbook participants;
- **Logbook image:** upload an image of your project;
- **Activate Deviation management:** When entering a product that conflicts with any of the selected Logbook settings, the Logbook contributor will be given the opportunity to provide an explanation for the reason for the use of the product. If the explanation for the reason is to be mandatory, you should tick that alternative as well. The explanation for the reason in turn generates an automatic Deviation. The Logbook owner and all Logbook administrators are notified and can deal with the Deviation directly in the Logbook tool;
- **Enable mandatory quantity and location indication:** When setting up the Logbook, you can choose to activate mandatory quantity and mandatory location. This means that when a participant in the Logbook later tries to add a product, the participant will be asked to enter the quantity and location of the product.

Logbook interface and functionalities

Products	**User can select different products for particular project**
General product data	In the general product data area, you can search for products with specific BVB ID, article name, article number, BSAB code, BK04 code, etc. and the status of the product in the Web Service. It is worth mentioning that all products from Byggvarubedömningen's page are preselected – you see them marked with a pink check mark. If you do not want one of these parameters, uncheck them.
Participants of logbook	User can invite other participants to the logbook tool and give permission either to edit Logbook settings, activate deviation function, approve Deviations, activate and change dates for reminders, finish reporting folders and Logbook, invite participants, create subfolders, add/remove/change all products, add/remove/change their products, add documents, export the Logbook, see everything in the Logbook.
General	User can also copy the logbook, export documents, deactivate, convert to logbook + Nordic Swan, export BM documents. In the Logbooks view you can: • Mark which of the Logbooks (if these are several) you are working in as your favourites. • Search for Logbooks that belong to you. • Search for Logbooks in which you are a participant. • Search for Logbooks that your company has set up. • See a "List of Logbooks" of the Logbooks you are a participant in or have searched for.
My favourites	At the top of the page you can see the "My favourites" section. The Logbooks that you mark with a pink star in the "List of Logbooks" will appear as "picture cards" under "My favourites." You can sort the image cards by "Last viewed" (the Logbooks you last visited), "Last set up" (the date the Logbook was set up) or in "Alphabetical" order. If you have many favourites, meaning many "image cards," you can see more by "swiping" back and forth on the arrows.
Pie chart meaning 	In the upper left corner of the image card, a pie chart is shown. The size of the pie pieces gives an overview of the percentage of assessed products that belong to a specific assessment level. This can be shown in various colours (partly green, or only yellow depending what is the status of assessment of selected products).
Section "**Search Logbook**"	Under the section "**Search Logbook**" you can search for the Logbook(s) you wish to view and use. Click on the i-symbol to get more information. Search for Logbooks with the desired parameters, such as: Logbook name, property name, type of Logbook, when the Logbook is started, etc. If you have specific requirements when searching for the desired Logbook, click on "Advanced search."
"Advanced search" option	Under "**Advanced search**" there are a number of different search parameters to choose from. Here you can search for Logbooks containing a specific product, or Logbooks containing a product with certain characteristics.
Option "**Certifications area**"	In the **certifications area**, you can search for products that meet the requirements for different environmental certifications. The filter works both to search for Logbooks containing compliant products and also Logbooks containing non-compliant products. Read the i-symbols for support and help.

Product content and H-phrases	Search for Logbooks that contain products containing a specific substance or H-phrases. • In the box "Contains the following substance or alloy" you can "free text search" a substance or enter the CAS number, EC number or Alloy. • In the "Contains the following H-phrase/H-indication" box, select the desired choice from the drop-down list. • In the box "Contains substance within the category," select the desired choice from the drop-down list.
Filtering option	You can select which columns you want to see in your List of Logbooks by clicking on the **filter button** (funnel symbol). This will display a number of possible choices. Check the selections/columns you want to see. The web service will save your latest selections so that you will see the same filter selections next time. Of course, you can change the filter selections whenever you wish.
Products with Logbook-specific requirements	In this section you can search for Logbooks containing products that have a deviation report or rejected deviations. You can also search for Logbooks that have products with a specific location, are added during a specified period or are added by a specific person.
Products recorded with specific documentation	In the last section, you can search for Logbooks that contain products recorded with specific documentation.

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