



Budapest University of Technology and Economics

Department of Mechanics, Materials and Structures
English courses
General course /2017
Fundamentals of Structures

Lecture no. 6:

The process of design, construction and operation of buildings

Content:

Introduction

1. The phases of building design and authorization
2. Execution
3. Use and maintenance
4. Demolishment
5. Closing conclusions

Introduction

Environment:

Natural environment - built environment

Examples of **environment pollution**:

Natural environment:

-consequences of industrial wood-felling in the Amazonas valley: increase of the ozone hole and of the harmful effect of ultraviolet radiation

Built environment:

-increase of environment pollution sources: CO₂ emission, water pollution, noise pollution, light pollution
-aesthetical „pollution,,

Means of **environment protection**:

Natural environment:

- international environment protection actions and agreements
- environment protection legislation
- activity of national environment protection authorities
- rubbish collection actions on communal areas

Built environment:

- legislation: country development law, **building law**
- creation of regional and local **general (or urban) development projects (GDP-s)**
- activity of local and regional **building authorities**
(handing out of building permits)
- activity of specialized authorities intervening in building authorization: fire protection authority, public roads authority, water conservancy authority etc.

Erection and operation of buildings

The process of *creation* (design),
realization (construction),
functioning (operation) and the final
demolishment (pulling down) of an object of architecture

– of a building – will be discussed by looking always for the main **participants and their role** in each phase. Some of the important **requirements** are formulated through elaboration of **the urban development project** (GDP) of the area, where the building under consideration is to be placed at a later time. The process of architectural design can in itself be subdivided into different phases which will be mentioned. The number of participants during the realization process is in general greater than that of design. Depending of the function of the building, the number of users and operators can be the most numerous group of people who have direct connection to the building during its existence. Finally, when the decision concerning the demolition of the building is made, the last participants fulfil it.

1. The phases of design and authorization

1.1. **Urban design: making the general development project (GDP)**

Scale: 1:1000, 1:2000 fitting to content and the magnitude of the area concerned, with annexed projects (natural environment, road network and development plan, public utilities network and development plan etc.) up to scale 1:10000

Parties (**participants**)
job

Their function, contribution, project,

Members of the local (town, community) assembly
(**politicians**)

Formulating and acceptance of proposals for the content and **general features** of the urban development project
Entrust urban designers to make the general development project (GDP) of

Urban designer

the administrative area of the town (community) or of the related part of it.

Acceptance of GDP

Elaboration and defence of proposal for GDP, documentation of the GDP

which contains **detailed rules concerning the erection of buildings**, such as:

-where and what can be built, limits to respect concerning the minimum real estate area (necessary to erection of buildings), maximum % of occupied area, maximum building (facade) height, allowable roof and facade coverings, min. green area etc.

Remark: The *urban development* of the area includes naturally the supply of the area with *public utilities* (water supply, waste water canalization, energy (electricity and gas) supply, communication

systems etc.), all of which are to be designed, authorized and executed, but the concerning details are out of the scope of this presentation.
Authorization process of the GDP

1.2 Building design

Client (investor, owner)

- Generally the **owner** of the real estate (of the later construction site), where the building is to be erected.
- Contracts the general manager company** and/or all the parties intervening in the design and realization of the building (the project)
- Makes decisions concerning the different architectural projects (preliminary project, building permission project, working drawings)
- Finances the project**

- General manager company*
- Representation of the client in the project
 - Preparation of **contracts** of the architect (and of eventual other design parties like designer of external infrastructure (roads, water, electricity and gas supplies, telecommunication, waste water canalisation etc.)) and (if needed) of specialists of environment protection.
 - Call for tenders**¹
 - Participation in decisions by handing out of the project to the general contractor (the constructor)
 - Supervision** of the development of the project and continuous information supply to the client

¹ Tender: a kind of competition of general contractors (constructor firms) to be encharged with the project realization

Phases of building design

1.21 Preliminary project

Scale: 1:500, 1:200 fitting to the magnitude of the project

Architect

Price offer of the architect is generally based on a *preliminary project*

1.22. Building permission project

Scale: 1:100

Elaboration of the *building permission documentation* by the architect, contracting engineers or specialized engineering bureaus

Geodesic engineer

-site survey (geodesic measurements)

Soil mechanics engineer

-soil mechanics (to clarify subsoil conditions based on laboratory tests of soil samples)

Structural engineer

-structural engineering (design of load-bearing structures)

*Building mechanical engineer**

-installation engineering: (internal) electricity, water and gas supply, heating, waste-water canalization,

*Electric engineer, informatics engineer**

Illumination, ventilation, telecommunication, energetics

*Architect of the interior**

-interior design

*Garden architect**

-garden architecture

* These professionals sometimes enter at a later design phase

*Building authority*²
(local or regional)

Authorization of the building permission project, considering the fulfilment of the conditions stipulated in the general development project (GDP) of the administrative area. In case of more significant – and environment polluting – projects, taking also into consideration the project evaluation of *environment protection effect studies*.

Fire protection authority

Should be consulted by the architect, and the relevant expert opinion of the authority is to be jointed to the building permit documentation.

Environment protection authority

When necessary, should be consulted by the architect, and the relevant

² Authorities are partially financed by the state, partially by their clients (architects in this case)

expert opinion of the authority is to be jointed to the building permission documentation.

Chimney cleaning authority

Should be consulted by the architect, and the relevant expert opinion of the authority is to be jointed to the building permit documentation

Environment protector engineers

Preparation of *environment protection effect study in* case of projects having considerable environment polluting effects.

Encharged and financed - by legal obligation – by the client.

*Local chief architect*³

Consultations with the architect of the project, representing the local interest in

³ Architectural critics formulated by the local chief architect or the local architect jury are to be handled as proposals only, and are not decisive by the authorization of the project

*Local architect jury*²

protection of the *architectural heritage* and respecting prescriptions of the GDP
Architectural evaluation of the building permission documentation before submitting to authorization.

1.23. Tender project

Scale: 1:100, 1:50

Detailing of the building permission documentation by supplementary **informations necessary to elaborate price offers** for the realization of the project (detailing of the structural solutions, listing of installation units, quantitative reports)

General contractor

(the constructor of the building) Winner of the tender, **enchaged with the realization of the building.**

1.24. Working drawings (or realization project)

Scales: 1:50, 1:20, 1:10, 1:5, 1:2, 1:1 according to needs

architect and all the
engineering directions
enumerated above un-
der the *building permission*
documentation

Elaboration and documentation of all
details necessary for the realization
of the project

1.25 Project realization documentation or „as built,, project

Scale: same as by working drawings

By order of the client to the architect, after the realization of the building all modifications made during execution should be introduced into the working drawings by the relevant designers to have a documentation of the building 100% exact.

1.26 Demolishment project

Scale: the same as for building authorization project

The client (owner) contracts the architect to prepare the demolition project.

The demolition project is based on the building permission documentation or – if not available – on *measurement projects* of similar content. The technical description of the documentation should contain

- safety aspects* of the demolition works and
- environment protection aspects* of the transportation and allocation (placement) of constructions and materials (quantities, depots of environment polluting materials).

2. The phase of **execution**

The local building authority should be informed about the *beginning of the execution works*.

building's manager
(or project manager)

The site realization is directed by the *building's manager* (or project manager), encharged by the general contractor. The general contractor may contract one or more *subcontractors* such as:

subcontractors:

- subcontractor for foundation works
- subcontractor for reinforced concrete superstructures
- subcontractor for steel constructions
- subcontractor for timber constructions
- subcontractor for bricklaying and allocation works
- subcontractor for scaffolding and carpentry works
- subcontractor for sanitary installations

subcontractor for electric installations
subcontractor for illumination works
subcontractor for elevator installation
subcontractor for telecommunication installations
subcontractor for tin-smith's works
subcontractor for safety systems installation
subcontractor for floor, wall and facade coverings
subcontractor for heating systems
subcontractor for ventilation systems
subcontractor for doors and windows allocation works
subcontractor for gypsum works (partition walls, false ceilings etc.)
subcontractor for water insulation works
subcontractor for thermal insulation works
subcontractor for glazing
subcontractor for painting works
subcontractor for external public utilities
subcontractor for garden architecture

technical supervisor

Contracted by the general manager as independent construction expert, who controls the quality of the execution regularly introducing the observations in the *construction diary* of the project

When finishing the execution an official *technical handing over ceremony* is taking place, where all the interested parties – designers, authorities and executors – are represented, and a report is made with indication of all the necessary alterations to be made or errors to be corrected before *putting the building into use*.

The official putting into use should be authorized by the local building authority.

3. The phase of **use and maintenance**

Operating manager company The client (the owner) can operate the building by himself or entrust a manager company or person with the operation

Users The relation of users to the building can range from members of a family in a family house to prisoners sitting in jail, so it could be the object of an other study.

Regular *technical maintenance* of the building may be, out of public interest, legal obligation of the operating manager: for example safety check of the load-bearing structural system by authorized structural expert in every 5 or 10 years.

4. The phase of **demolishment**

In consequence of

natural catastrophe (earthquake, inundation, cunamy or fire),
or due to *complete deterioration of the constructions* of the building
out of public interest,
or due to *functional ageing* ,
or simply by free *decision of the owner* – if not being a protected
monument –
the demolishment of the building may become necessary.

Closing conclusions

1. Well organized **cooperation** of a great number of contributors is needed to erect a building (to realize a project).
2. The **fulfilment of the fundamental design requirements** represent the interest of different participants of the project:

<i>requirement</i>	<i>the mostly interested participants</i>
functional requirements	users
safety requirements	users, the public
aesthetics	the public, users
economic requirements of the erection and demolition	the client
economic requirement of operation	users

It is the architect who during the design process should properly weigh these – sometimes partially contradictory – requirements.

3. From among the great number of contributors **the role of a few participants can be distinguished:**
- the **client** who is financing practically all the other participants,
 - the **general manager**, who does not do practically anything, only organizes and distributes jobs, but earns the most money as a confidential partner of the client and
 - the **architect**, who, although has to work the most on the project, and may not get enough money for that, but is stimulated by the hope to become creator of a recognized work of art of architecture.