

BW001

TECHNOLOGY OF CONSTRUCTIONS I



FACULTY OF CIVIL institute

ENGINEERING of technology, mechanization

and construction management

TOPIC I – week 1



- **Unite code:** BW001
- **Teaching period:** 6th semester of Bachelor's study programme
- **Extend of teaching:** **2 + 2 / accreditation + exam**
- **Credit rating:** 4

- **Lecturer:** Ing. Barbora Nečasová
- **Contact:**
 - Building B, 3rd floor, room no. 308
 - email: necasova.b@fce.vutbr.cz

- **Individual consultations are possible during office hours:**
 - Mo 15:00-15:50
 - Thu 13:00-13:50

- **Consultations can also be arranged outside the above hours on request. However, individual agreement with teacher is necessary prior the consultation (e-mail, in person)!**

- **LECTURES**

- Lectures will be provided in the form of a presentation in Power Point and will be given to students in PDF format – uploaded on MOODLE 3.x.
<https://lms.fce.vutbr.cz/>
- It is advisable to have a personal participation, since the lectures discuss the latest legislative developments.
- Teachers are entitled to carry out random checks of the presence of students in the classroom and make it advantageous for students who work regularly (benefit system is the responsibility of the teacher).



Exam: BW004 Technology of Construction II

December 11, 2017

Name: _____ Surname: _____

Test: **B** _____ Score/Grade: _____

A	100 – 91
B	90 – 81
C	80 – 71
D	70 – 61
E	60 – 50

- | | |
|----------|-----------|
| 1. _____ | 9. _____ |
| 2. _____ | 10. _____ |
| 3. _____ | 11. _____ |
| 4. _____ | 12. _____ |
| 5. _____ | 13. _____ |
| 6. _____ | 14. _____ |
| 7. _____ | 15. _____ |
| 8. _____ | _____ |

1. Tasks involved in site management are:

- site investigation before construction process starts;
- procurement management;
- regular performance monitoring;
- taking site records;
- none of offered answers is correct;

2. Which shape of steel element is NOT common in construction?

- T-shape beam;
- H-shape beam;
- I-shape beam;
- Z-shape beam;
- none of offered answers is correct;

3. In which way the basement space can get damp?

- free flowing surface or ground water entering through cracks or openings in the basement wall or floor;
- soil moisture wicking through the basement wall by capillary action;
- water vapor migration from cool damp soil to a warmer basement;
- condensation of water vapor on cold basement walls;
- none of offered answers is correct;

4. Which system cannot be classified as curtain wall?

- conventional stick system,
- capped system,
- structural silicone glazing system,
- unitized system,
- none of offered answers is correct;

5. Which doors can be classified as HINGED?

- battened, flushed and sliding;
- battened, louvered and flushed;
- flushed, revolving and sliding;
- flushed, battened and collapsible;
- none of offered answers is correct;



- What is 'site diary', purpose (function) – why it is necessary to have a site diary?
- Name some disadvantages of prefabrication.
- Describe the process (draw) of site zoning, why is it important.
- Name some general advantages of 'STEEL' as a structural material.
- Name some representatives of foam insulation, mention some advantages and disadvantages.
- Name at least 5 advantages of ventilated façade system.
- Describe main properties, so called product properties, of different types of drywalls (i.e. fire resistance etc.).
- Describe these defects in plaster – efflorescence, peeling, popping, rust stains, uneven surface.
- What is RESILIENT FLOORING?
- Name at least 3 examples of, battened doors' – describe differences

- **COURSE AIM**

- The course objective is to teach students to make a **technological regulation** of the selected partial construction processes and to be able to use these elaborated documents in practice for the construction execution.
- The task of the construction engineering is not only to plan the building correctly but also to perform it in high quality and reasonably.
- The topic of the branch of technology of buildings is the realization = execution.

- The subject includes study of areas of the construction processes related especially with the main construction production:
 - lay-out of buildings and built-up structures,
 - principles of technology processes,
 - performing of technology stages – earthworks, substructure and superstructure.

- **COURSE AIM**

- General foundation in the scientific field of the technology of constructions, analysis and principles of preparing construction sub--processes, principles of creating design projects for processes.
- Construction sub-processes connected in particular with the main construction of building structures.
- Principles of the staking out of buildings and built structures, principles of technological approaches and relationships during the performance of the technical stages of earthwork, basic lower structures, basic upper structures and the outer envelopes of buildings.
- Solution of the technological, spatial and temporal structures of construction processes, sequence of activities, level of preparedness of a workplace for construction, mutual dependencies and requirements concerning quality and safety – also with regard to the environment.

- **MAIN TOPIC OF LECTURES**

1. **Introduction** to the scientific field of the technology of constructions. Analysis of building processes, process design.
2. **Earthwork processes.** Staking out a building, methods and procedures for the execution of earthwork. Construction machinery used in earthwork.
3. **Foundation construction processes.** Technical principles and procedures for the execution of shallow and deep foundations.
4. **Concrete structure formwork** – element, system and special. Principles of design and execution.
5. **Processes used in the reinforcement** of reinforced concrete structures. Preparation of reinforcement, production lines. Principles of laying reinforcement into formwork.
6. **Concrete mixing processes.** Production, haulage, placement, processing and treatment of fresh concrete. Monitoring of setting and hardening, principles of formwork removal. Technical breaks.
7. **Masonry processes.** Principles of the execution of walling from bricks, shaped bricks and stone. Module, technology and quality requirements.
8. **Assembly of timber structures and buildings.** Execution of classical and new-style trusses.

- **MAIN TOPIC OF LECTURES**

- 9. Timber buildings**, principles of production and assembly. Quality requirements.
- 10. Erection of enclosing shells and roof claddings.** Principles and procedures for the assembly of silicate, sandwich, and metal-plastic claddings.
- 11. Installation of small unit roof coverings.**
- 12. Execution of metalwork**, incl. metal coverings. Fixing and joining, quality requirements.
- 13. Working and protective scaffoldings.** Types, classification. Working procedures and principles for the assembly of scaffolding.

- **MAIN TOPIC OF EXERCISES**

1. - 2. Earthworks, measurements and demarcation of structures, procedures for earthwork execution, management of excavation work, time schedule.

3. Graphical representation of the earthwork processes, selection of machinery for earthworks, techniques used in working with selected machines, scheme for the movement of machinery on the construction site.

4. - 5. Formwork, reinforcement and concreting of monolithic reinforced concrete structures. Design of formwork systems for monolithic structures, installation process. Listing of elements, drafting of parts of wall and ceiling formwork, formwork details.

6. Procedure for executing the concreting of a monolithic structure, selection of suitable machinery, time schedule, scheme for the transportation of concrete mixture and its placement in formwork.

- **MAIN TOPIC OF EXERCISES**

8. Procedure for the execution of wall construction for one storey of a studied structure. Machinery, devices and tools used in wall construction.

9. Time schedule for the construction of walls for one storey of a structure, graphical representation of the wall construction process for one storey.

10 - 12. Alternatively (always in the form of technological regulation):

Assembly of wooden structures – execution of roof trusses or wooden buildings.

Construction of enclosing shells or roof cladding. Installation of small unit roof coverings.

Performance of metalworking on roofs, including sheet metal roof coverings.

13. Assessment of completed assignments, defense of proposed solutions, credit.

- **REFERENCES** (can be found in school library)

- BARRY, R.: The construction of buildings. Volume 2, Windows, doors, stairs, fires, stoves and chimneys, internal finishes and external rendering, 1999.
- BARRY, R.: The construction of buildings. Volume 3, Single-storey frames, shells and lightweight coverings, 1999.
- BARRY, R.: The construction of buildings. Vol. 4; Multi-storey buildings, foundations and substructures, structural steel frames, floors and roofs, concrete, concrete structural frames, walls and cladding of framed buildings, 2001.
- BARRY, R.: The construction of buildings /Vol. 5, Building services : water, electricity and gas supplies, foul water discharge, refuse storage, 1998.
- HILSON, BARRY.: Basic structural behaviour :understanding structures from models, 1993.
- FOSTER, JACK STROUD.: Structure and fabric. Part 2, 2000.
- DEAN, YVONNE.: Materials technology, 1998.
- OSBOURN, DEREK.: Introduction to building, 1997.
- RIBA, ALAN EVERETT.: Materials, 1994.

**THANK YOU
FOR YOUR ATTENTION**

THAT'S ALL FOLKS 😊



BW001

TECHNOLOGY OF CONSTRUCTIONS I



FACULTY OF CIVIL institute

ENGINEERING of technology, mechanization

and construction management

TOPIC I – week 2

INTRODUCTION TO TECHNOLOGY OF CONSTRUCTIONS



BACKGROUND

- **There are two general aspects to the construction of buildings:**
 - conventional or traditional methods;
 - modern or industrialized methods.
- **Conventional or traditional methods** are studied in the first two years of most construction courses, with the intention of forming a sound knowledge base before proceeding to studies of advanced techniques in the final years.
- There is, nevertheless, an element of continuity and overlap between traditional and contemporary, and both are frequently deployed on the same building, e.g. traditional brick facing to a prefabricated steel-framed commercial building or to a factory-made timber-framed house.

BACKGROUND

- Initial studies of building construction concentrate on the smaller type of structure, such as a domestic dwelling of one or two storeys built by labor intensive traditional methods.
- Generally it is more economic to construct this type of building by these methods, unless large numbers of similar units are required on the same site.
- In these circumstances, economies of scale may justify factory-manufactured, prefabricated elements of structure.
- These industrialized methods are usually a rationalized manufacturing process used to produce complete elements, i.e. floors, walls, roof frames, etc. in modules or standardized dimensional increments of ? mm.

BACKGROUND

- Very few building contractors in developed countries employ many staff directly.
- They are therefore relatively small companies when compared with the capital value of the work they undertake.
- Most practical aspects of building are contracted out to specialist subcontracting organizations, e.g. bricklayers, electricians, carpenters, in response to the main contractor's work load.
- The main contractor is effectively a building management company, which could be engaged on a variety of work, including major serial developments for the same client, maintenance work or aftercare programmes, extensions to existing structures, or possibly just small one-off projects.

• TECHNOLOGY IN CONSTRUCTION INDUSTRY

- Technological change and the drive towards sustainable and low-carbon construction impacts on skills needs within the industry.
- High level skills will be needed to drive the development and use of innovative methods of building and the uptake of new technologies and materials.
- Modern methods of construction (MMC) have the potential to introduce greater efficiencies into the construction process, chiefly through innovations in building design and management – for example in adoption of Building Information Modelling (BIM) – and in offsite construction processes.
- This presents a major opportunity to build quicker, to a higher quality, more sustainably, foster innovation and compete on the global market.
- MMC and the implementation of low carbon systems will require new skills and the adaption and upgrading of the skills of people currently working in the sector.

BACKGROUND

- **TECHNOLOGY**

- Building technology has evolved over the centuries between simple structures, though to hi – tech buildings.

- **TECHNOLOGY OF CONSTRUCTIONS**

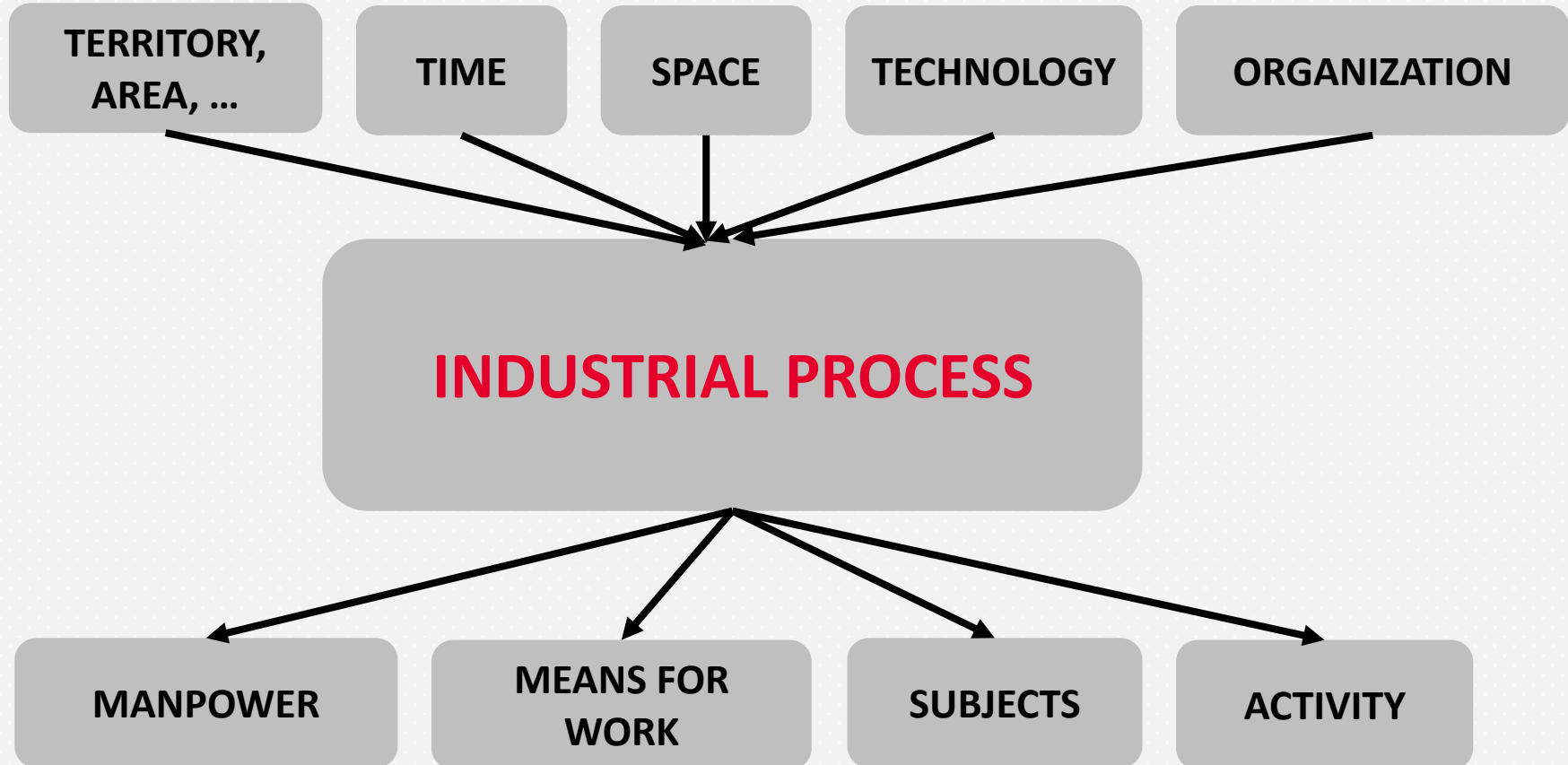
- The technology deals with methods and procedures of an optimum creation of the building process creation. So that these processes could be modelled, optimized and successfully controlled in technology.

- **INDUSTRIAL PROCESS**

- Is an activity/ operation whose aim is to create new values.
- The main result of industrial process in building construction is building production = houses, structures and constructions etc.

BACKGROUND

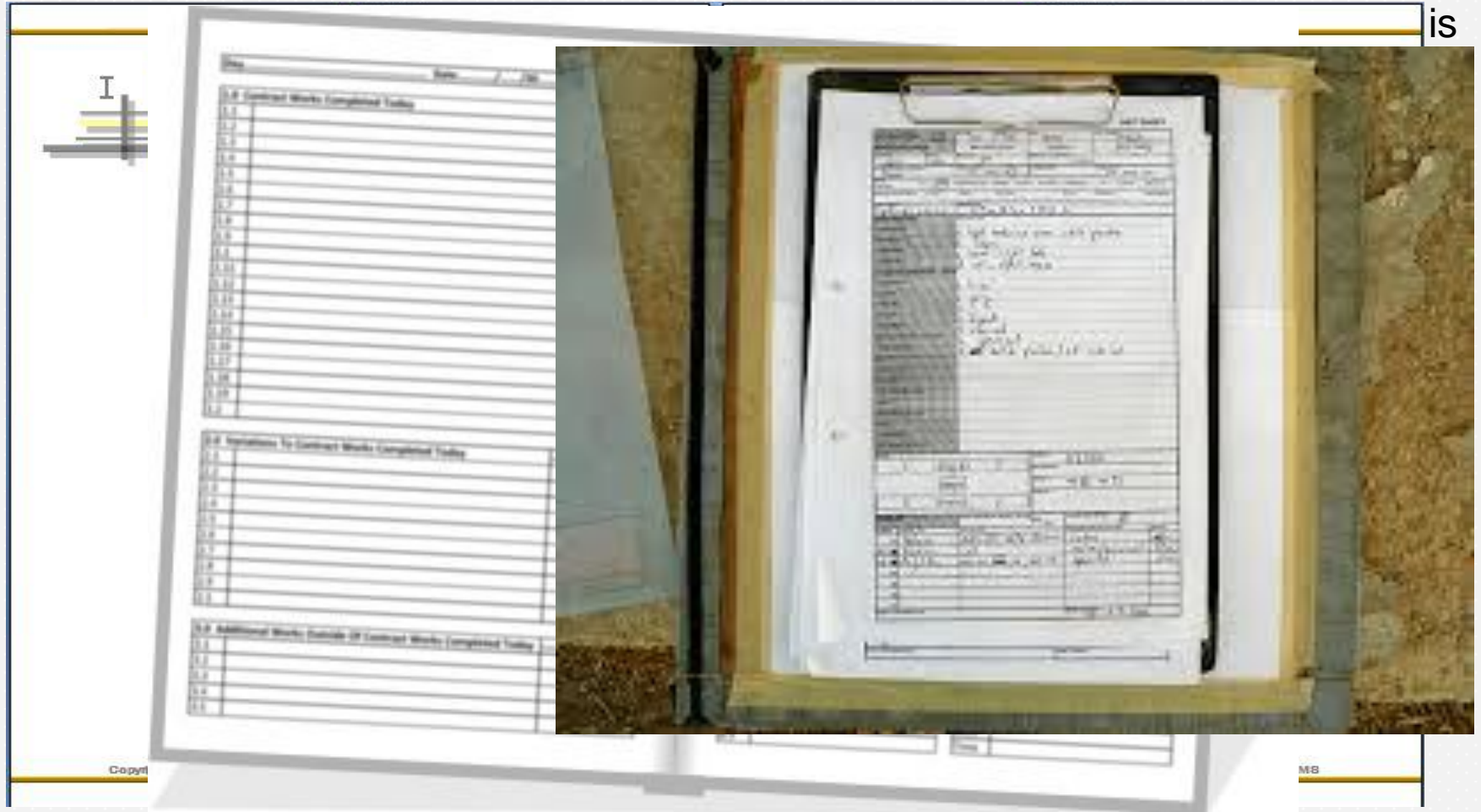
ENTER DATA



OUTPUT VALUES

BACKGROUND

- **BUILDING PROCESS**



LEGISLATION

- **Law no. 183/2006 coll., on town and country planning and building code (Building Act)**
- **Public notice no. 62/2013**
- **Public notice no. 503/2006, which was changed by regulation no. 63/2013**

http://www.uur.cz/images/uzemnirozvoj/stavebnirad/183_2006_EN.pdf

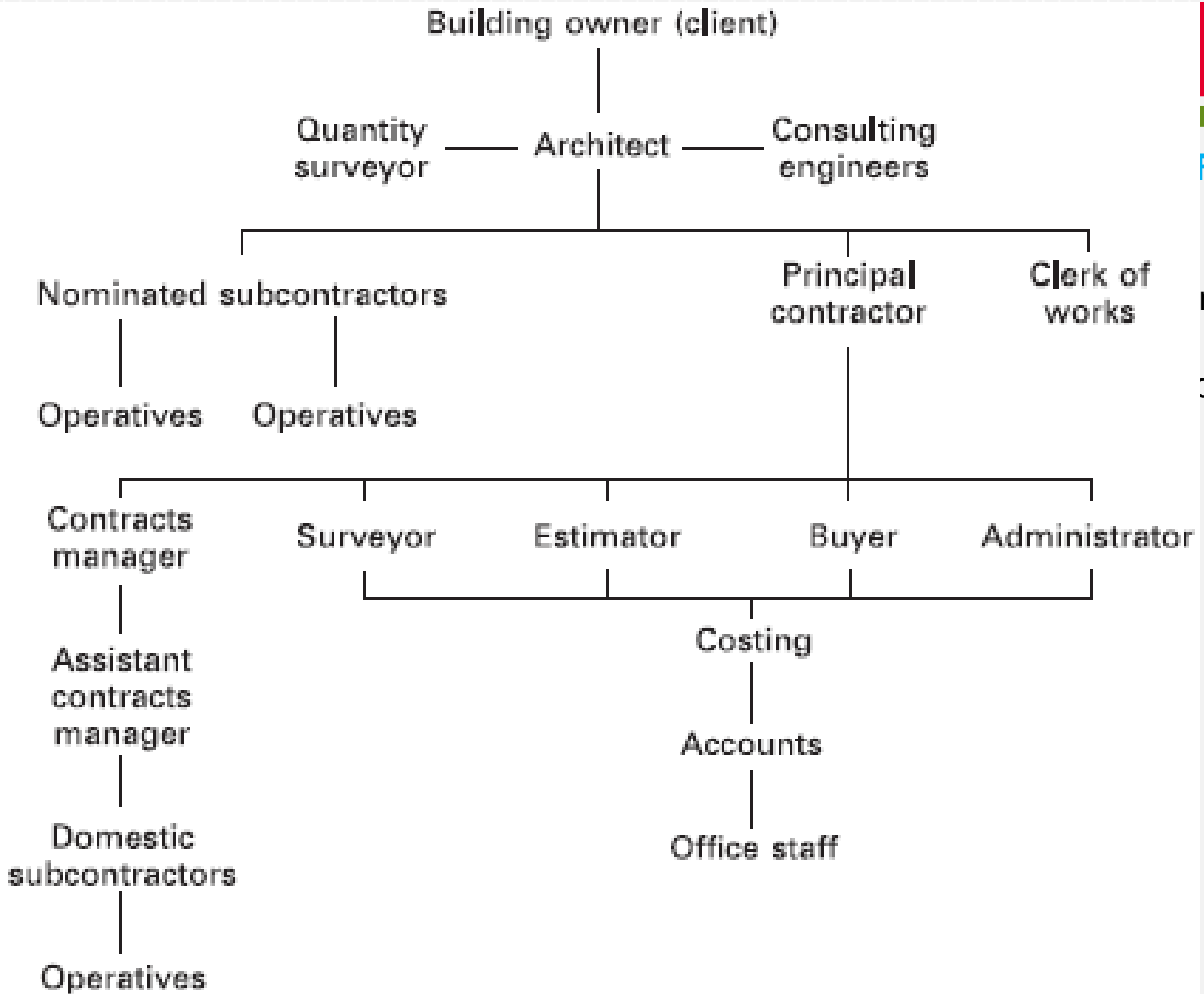
http://mmr.cz/getmedia/9a941cf5-268b-4243-9880-d1b169fb33d6/SZ_angl.pdf?ext=.pdf

GENERAL TERMS

- **CONSTRUCTION (BUILDING, STRUCTURE)**
- **Construction** is the process of creating and building infrastructure or a facility.
- **Building** is a man - made structure with a roof and walls standing more or less permanently in one place, such as a house or factory. Buildings come in a variety of shapes, sizes and functions.
 - Permanent
 - Temporary
 - For advertisement
- **Structure** is a fundamental, tangible or intangible notion referring to the recognition, observation, nature, and permanence of patterns and relationships of entities. This notion may itself be an object, such as a built structure.

- F
- E
- T

rtant
ction



GENERAL TERMS

- **PRIMARY, SECONDARY AND TERTIARY JOB ROLES REQUIRED FOR CONSTRUCTION:**
 - Modern Methods of Construction, including offsite construction, dictate a need for 'core' or primary job roles in addition to others at secondary and tertiary levels.
 - Primary job roles are essential for both design and delivery of offsite projects, whilst secondary job roles are required to contribute to delivery, for example by assembly offsite or onsite.
 - Tertiary roles carry out a supporting or indirect function, for example through scheduling of component delivery in a logistics role, procuring the right types of materials or by supplying finance for the project.

GENERAL TERMS

- **PRIMARY, SECONDARY AND TERTIARY JOB ROLES REQUIRED FOR CONSTRUCTION:**

Primary

- Architect
- BIM Modeller
- CAD Specialist
- Consultant
- Designer
- Logistics Manager
- Manufacturer
- Planner
- Project Manager
- Quantity Surveyor
- Site Supervisor
- Structural Engineer
- Supply Chain Manager
- Technician
- Technical Salesperson

Secondary

- Bricklayer
- Carpenter/Joiner
- Electrician
- Factory Worker
- Glazer
- Heating, Ventilation, Air-Conditioning and Refrigeration Engineer
- Insulation Installer
- Masonry Worker
- Painter/Decorator
- Plasterer
- Plumber
- Roofer
- Tiler
- Welder

Tertiary

- Banker
- Design Office Administrator
- General Labourer
- Insurer
- Procurer
- Scheduler

GENERAL TERMS

- **Architect**

- Architects design new buildings and the spaces around them.
- They also work on the restoration and conservation of existing buildings.
- They manage the construction process, control budgets and deal with planning issues.
- Engaged by the building owner as agent to design, advise and ensure that the project is kept within cost and complies with the design.

- **Civil Engineer**

- As a civil engineer you would plan, design and manage a variety of construction projects.
- You could work on everything from bridges and tall buildings to transport links and sports stadium.

GENERAL TERMS

- **Project manager**
 - Project managers plan and organize resources and people to make sure projects finish on time, stay within budget and meet the requirements of the business.
- **Land surveyor**
 - Land surveyors use a combination of traditional instruments and digital technology to measure the shape of the land and gather data for civil engineering and construction projects. Projects can range from building roads and tunnels to mining and quarrying.

GENERAL TERMS

- **Architectural technician or technologist**
 - Architectural technicians and technologists use their skills in science and engineering to help bring architects' construction ideas to life.
 - They work on design plans, advise on the best use of building materials and monitor progress of projects.
- **Builders' merchant**
 - Builders' merchants supply products and materials to construction companies, tradespeople and the general public.
 - They make up and deliver orders, and advise customers on which products to use for particular job.

GENERAL TERMS

- **Building control officer**

- Building control officers make sure that regulations are followed when buildings are being constructed. The regulations cover areas like public health, fire safety, energy conservation and building accessibility.

- **Building technician**

- Building technicians support building managers on construction projects.

- **Clerk of works**

- A clerk of works is a manager on a construction site who checks to see that work is carried out properly and that health and safety rules are being followed.
- Employed on large contracts as the architect's on-site representative.
- The main function is to liaise between architect and main contractor and to ensure that construction proceeds in accordance with the design.
- They can offer advice, but directives must be through the architect.

GENERAL TERMS

- **Construction manager**

- Construction managers, also known as site managers or site agents, supervise and direct operations on a construction project to make sure it is completed safely, on time and within budget.

- **Technical surveyor**

- Technical surveyors, or surveying technicians, carry out tasks in support of chartered surveyors.
- Duties can range from draughting building design plans and mapping land use, through to making valuations and managing auctions.

GENERAL TERMS

- **Quantity surveyor**

- Engaged to prepare cost evaluations and bills of quantities, check tenders, prepare interim valuations, effect cost controls, and advise the architect on the cost of variations.

- **Principal or main contractor**

- Employed by the client on the advice of the architect, by nomination or competitive tendering. They are required to administer the construction programme within the architect's direction.

- **Surveyor**

- Employed by the main contractor to check work progress and assist the quantity surveyor in the preparation of interim valuations for stage payments and final accounts.
- May also be required to measure work done for bonus and subcontractor payments.

GENERAL TERMS

- **Estimator**
 - Prepares unit rates for the pricing of tenders, and carries out pre-tender investigations into the cost aspects of the proposed contract.
- **Buyer**
 - Orders materials, obtains quotations for the supply of materials and services.
- **Accountant**
 - Prepares and submits accounts to clients and makes payments to suppliers and subcontractors. May also have a costing department that would allocate the labor and material costs to each contract to assist with the preparation of accounts.
- **Administrator**
 - Organizes the general clerical duties of the contractor's office for the preparation of contract documents and payment of salaries, subcontractors' and suppliers' invoices, insurances and all necessary correspondence.

GENERAL TERMS

- **Nominated subcontractor**
 - Engaged by the client or architect for specialist construction or installation work, e.g. lifts, air conditioning.
- **Domestic subcontractor**
 - Employed by the principal contractor to assist with the general construction, e.g. ground workers, bricklayers.
- **Operatives**
 - The main workforce on-site; includes craftsmen, apprentices and labourers.

GENERAL TERMS

- The size of the building firm or the size of the contract will determine the composition of the construction team.
- For medium-sized contracts some of the above functions may be combined, e.g. that of the surveyor and estimator.
- Furthermore, many design-and-build practices have been created by combining the professional expertise of architect, builder and consultants.
- The objective is to improve communications and create better working relationships to provide the client with a more efficient and cost-effective service.

**THANK YOU
FOR YOUR ATTENTION**

THAT'S ALL FOLKS 😊

