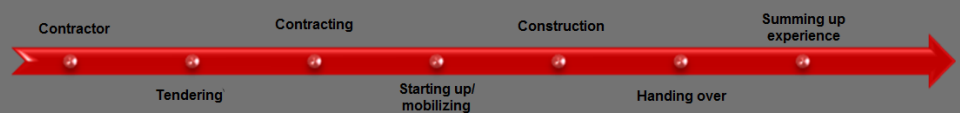


2011

HANDBOOK

For project and construction management
– Fundamental concepts



“Project coordination” From tender to 5 years inspection - Construction Management - final version

Københavns Erhvervsakademi and VIA University College,
Horsens



00 Introduction

This handbook is primarily intended for the use by students in their final semester of the constructing architect education - specializing in construction management. Construction management aims at a future career as a construction or project manager working for a contractor.

The handbook will also be useful as a guide for small and medium sized contractors.

The handbook is a joint venture between lecturers in construction management at VIA University College in Horsens (Vibeke Kragh, Benny Olsen, and Henrik Kopp) and KEA - Københavns Erhvervsakademi (Eva Weincke, Kaj Torben Hansen, Benny Lennart Bay, Anders Christensen and Lone Lykke Larsen).

Consequently, the handbook will contain requirements for documentation and other examples that are not necessarily relevant to contractors, but are deemed relevant for students.

The handbook is based on practical examples from a fictive contractor. In this context, relevant aspects from 'real-life' contractors will be included. The booklet is based on [project coordination](#) showing the progress in the construction process. The sections follow project phases from tender to handing over - in a main contractor contract. As turnkey contracting has been used to an ever increasing degree – this contract form will also be touched upon.

No rules without exemptions – assignment solutions may have a certain optional character.

The printed version of the handbook contains:

Specification of the construction process starting with the reception of tender documents and ending with the 5-year final inspection.

The digital version of the handbook contains:

The above mentioned specification of the construction process as well a collection of supplementary examples containing relevant documentation to be used during the construction process – including examples of the different tools used by the contractor and the project manager - from tender to 5 year inspection.

Each section will contain links to relevant web pages. By the end of each section you will find links to supplementary examples.

It is our hope that coming and newly graduated project managers will find inspiration in the systematic way in which the phases are described.

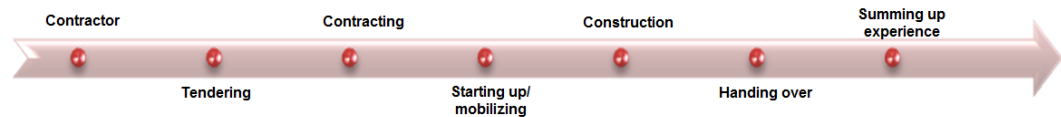
In order to improve the next edition, we welcome comments on the contents from experienced project managers.

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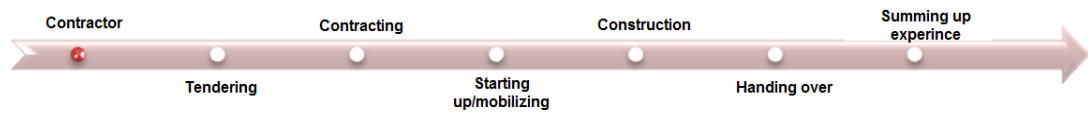
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01 The contractor

Introduction



The contents of this booklet are organized on the basis of an average size contractor, which could be a turnkey contractor, main contractor or an individual trade contractor.

No considerations have been given to the corporate form or ownership

The contractor possesses the in-house capacity to carry out for example concrete works, erection of concrete elements, earthwork operations and sewerage. A chartered sewerage contractor is often contracted.

The company possesses the equipment necessary to carry out basic tasks but does not own specialized equipment such as scaffolding and cranes. Due to lack of funds it is often an advantage to hire equipment rather than owning it.

The main emphasis will be put the contractor working as a main contractor and/or individual trade contractor.

The contractor is a member of [The Danish Construction Association](#) (Dansk Byggeri) and has a collective agreement with all members of staff.

The company described in the case has not defined any political aims with respect to such issues as innovation, environment, project sales promotion or personnel policy. It is, however, of vital importance that the company complies with current legislation, agreements and codes of practise applicable to this line of business.

For further studies of legislation etc. we refer to [The Danish Construction Association](#)

Project management

The contractor undertakes turnkey contracts as well as main and individual trade contracts with a focus on the following key competencies:

- Calculation and management of main contracts.
- Calculation and implementation of own production within earthwork, sewerage, concrete works and erection of industrialised building components.
- Rendering different types of service.

Contract forms

Main contract

Within this contract form the client negotiates with **one contractor only**. Project management is transferred from the client to the main contractor. The project responsibility, however, still belongs to the client.

Grouped contracts

The client may simplify the management to a certain extent by grouping related trades. In doing so, the coordination and the sharing of responsibility become more transparent. As it is the case with individual trade contracts, the coordination still rests with the client, but contrary to the individual trade contracts there will be fewer contracts to coordinate - and thereby reducing the risk.

Individual trade contract

Typically the client will start by entering a design agreement with an architect and an engineer. Once the project is ready, the client will enter contracts with a number of individual trade contractors corresponding to the number of trades involved in the construction. **Coordination and management rests with the client** – typically a by external consultants.

Risk management

In order to ensure the reputation and the earnings of the company and thereby its survival it is vital to undertake risk management of the project throughout the building project. The risk management applies to such issues as choice of methods, choice of equipment, choice of partners, control of client solvency etc.

We have chosen to use the below listed tools in the risk management

- Contractor's checklist of received tender documents
- Project journal
- Accumulated 'hands-on experience' from previous projects.
- Final evaluation including the summing up of experience gathered

Organization and management

As previously mentioned the company is affiliated to the [Danish Construction Association](#) ([Dansk byggeri](#).)

In the building projects we operate with the following management categories:

- **Project managers** in connection with turnkey contracts and partnering. The project manager is responsible for the design and construction management.
- **Construction managers** in connection with projects in main contracts. . The construction manager represents the client in aspects related to the planning and the implementation of individual trade contracts. In turnkey

01. The contractor

contracts and in partnering the construction manager refers directly to the project manager. The construction manager has the overall responsibility for all work on site. He supervises the work and is typically responsible for the coordination of building site safety.

- **Individual trade contract managers/clerks of work (CoW)** in connection with individual trade contracts carried out as 'own production'. CoWs refer directly to the construction manager. It is the responsibility of the CoW to ensure that the work is carried out within the stipulated time schedule and to ensure that the necessary work drawings, materials and equipment are present at the right time in the specified quantities. It is also the responsibility of the CoW to ensure and to document the quality of the work carried out. Further it is the responsibility of the CoW to ensure that all work is carried out in accordance with current safety regulations and to ensure that Work Place Assessments (WPAs) are implemented.
- **Foremen:** Management of workers in 'own production'. Is in the hands of foremen. The foremen are salaried employees and as such they are not financed through the budget of a particular project.

All managers are qualified safety managers and coordinators. They are also qualified in the application of the company's quality assurance system. In addition, the managers in the company have a well defined (limited) financial free scope.

Other employees such as craftsmen are organized in gangs, represented by a ganger.

The company trains safety representatives to the extend necessary.

All craftsmen are trained in the use of the company's quality assurance practice.

Remuneration and conditions of employment

The company has entered an agreement with all staff groups and has an interest in implementing incentive payment systems at all levels.

All members of staff have an employment contract stipulating job description, remuneration and other conditions.

The company estimates social costs on the basis of current legislation and existing agreements and based on expenditure during the past year.

All time work should be carried out on the basis of a piece-work contract and we recommend the use of schedules of wages and time elaborated for each trade. The company has established an extensive 'time data base' to be used when assessing the time required for each task.

All staff sign an employment contract stating job description, remuneration conditions and other conditions.

In this context it is important to notice observance of [Lov om ansættelsesbeviser](#).

Additional information concerning remuneration and employment conditions may be found this homepage [3F](#) (union for unskilled workers)

Communication and logistics

It is considered important that documents, drawings and goods have a continuous and well organized flow through the company at all levels. In order to secure this the company applies tools available.

In the case of turnkey contracts, a CAD manual is used in order to organize the drawings.

We recommend the use of [BIPS](#) folder structure when organizing documents.

In cases where the building project is web based, it is important to ensure that all parties involved are well trained and informed concerning the terms for document handling.

In the area of resource management it is important that all trade contractors are informed about the space made available to each one of them at the building site – as well as space available for vertical and horizontal transport at the site.

Rolling order – renouncement and supply plans shall be elaborated corresponding to work progress.

Quality assurance and management

The company has a well-developed quality assurance system to be used irrespective of the chosen contract form. In this booklet we will use the tools elaborated by The Danish Construction Association.

Staff members responsible for quality assurance are all trained in the routines and use of forms worked out by the company. Construction management is well-prepared at start-up meetings - whether meetings are called by themselves or have been organized on client's request

Environment- and safety management

When it comes to safety and an environmental profile, the company is very ambitious and aspires to receive working environment certification (arbejdsmiljøcertificeret).

Work Place Assessment (WPA) has been elaborated for all staff groups. All staff members with management responsibilities are trained safety managers. All involved parties know their duties - whether they are clients, consultants or employers. All parties are capable of undertaking the coordination of safety work. They are also able to work out a Plan for Health and Safety (PHS). The company possesses the equipment necessary in order to carry out dangerous work, and the construction management is capable of giving required instruction in the handling of this. A Work Place Assessment (WPA) is carried out every time dangerous work is carried out. All employees must undergo training and hold certificates as required by The Danish Working Environment Authority ([arbejdstilsynet](#)). When organizing safety work on the building site the company uses the so-called 'exemplary work place' as a tool.

A safety organisation with a size corresponding of the number of companies, trades and employees is established on the building site.

Financial aspects

The company budget envisages the management's expectations in relation to expected turnover as it is distributed on own production, sub-contractors and additional jobs. Social costs are calculated on the basis of specific company expenditure, agreement terms and legislation governing the area

When a building project starts the company management works out a cash budget showing capital needs during the building project in question. A chart account is also elaborated.

Depending on the extent of the building project, interim calculations and project stage assessments are elaborated as the project progresses

Final calculations are carried out at the conclusion of a building project.

Tender

The company participates in tenders as individual trade contractors as well as main- and turnkey contractors. In the case of individual trade contracts the company management calculates directly on the basis of quantities specified in the tender documents as well as registered site conditions.

Main contract tenders are based on: Calculation of own production cost, tenders received from sub-contractors and an assessment of additional costs in relation to the project in question.

Turnkey contract tenders are calculated on the basis of accumulated company experience (costs of similar projects already implemented) or by the use of successive calculation – unless it is a tender in accordance to fixed budget. In connection with the submissions of tenders, a risk analysis is always carried out in this company.

The contribution ratio is defined on the basis of company overhead costs and the expected profit.

CEC- construction evaluation centre

The company has a keen interest in entering into competition on large public projects and therefore aspires to conform to demands for contractors and designers as defined by [The Construction Evaluation Centre](#) (BEC).

Own production

When it comes to own production, the company normally uses employees who have been affiliated with the company for a longer period of time and with whom the company has an agreement. In cases where the company undertakes building projects outside the normal field of practice, it may be necessary to employ staff from outside the company. In such cases it is necessary to carry out a risk assessment.

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The company does not own large scale equipment, such as heavy construction equipment, shuttering and scaffolding. The company only possesses ordinary hand tools – all other equipment is hired.

Summing up experience

Construction projects inevitably generate enormous and complex amounts of experience. In most cases this experience is held by a few persons only. Consequently, a lot of knowledge vanished when members of staff left the company.

At present the company makes a systematic summing up of experience to be used by cost accountants, clerks of work, construction managers and project managers.

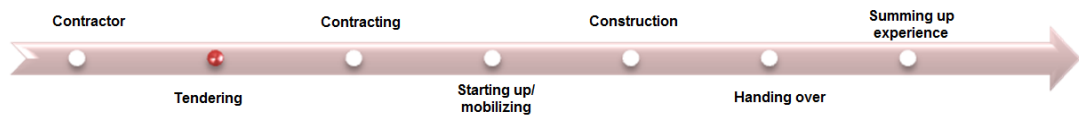
Legal aspects

When a company tenders, a number of legal aspects should be considered. More information concerning this issue may be found in the section 'Legal scrutiny'.

[Enclosures examples](#) contractor.

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Planning the tender

Tendering is a vital part of the company's activities. It is therefore important to plan the tender properly and to carry out a systematic scrutiny of the tender documents - irrespective of project size, contract/tender form and the extend of 'own production'. The company has developed its own procedures with respect to legal and technical scrutiny as well as risk assessment. Likewise, the procedures for building site inspection in connection with the tender have been established.

Contract area definition

It is pertinent to make a clear definition of contract area as early as possible in order to define what parts of the project will be carried out as 'own production' and, what parts will be carried out by sub-contractors. The main contractor shall also define what common conditions should apply sub-contractors.

Legal scrutiny

Upon reception of the tender documents, the contractor analyses the documents in order to identify any conditions that may not be expedient to the main contractor.

A possible outcome of this scrutiny could be that the contractor asks questions to the client, makes certain reservations in his tender, or chooses not to participate in the tender at all.

In accordance with AB92 (General Conditions of Work and Supply in Building and Construction Work) Section 2, subs. 2, tender bids submitted shall be based on information in the received tender documents – consequently, it is important to check that the tender documents received corresponds to the documents mentioned in [AB92](#) Section 2, subs. 2.

The contractor should call attention to whatever errors or shortcomings he might find in the tender documents in order to avoid a possible repetition of the same mistakes in the construction works.

The tender documents should mention that [AB92](#) forms the basis of all agreements in the building project. [AB92](#) defines the rules for the entire building project and describes how rights and obligations are shared between the client and the contractor. In principle [AB92](#) should be employed without modifications because the rules are worked out in such a way that they consider the interest of the client as well as the contractor. Consequently, the contractor should scrutinize the tender

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documents in order to identify possible deviations from [AB92](#) which may burden him with additional obligations towards the client. Should this be the case, the contractor should seriously consider whether he wants to submit a tender bid.

In case there is a clause in tender documents allowing for the handing in of alternative bids and in case the tender is ruled by the Danish Act on Tender Procedures or the EU Directive 2006/123/EC (on public services in the internal market) minimum requirements for such bids shall be described in the tender documents.

In cases where the contractor submits alternative bids he should be aware that he also takes over the responsibility of designing the alternative solution.

When undertaking a legal scrutiny of a building project, the following aspects shall be clarified:

The tender may take place in accordance with the Danish Act on Tender Procedures ([Tilbudsloven](#)) , the [EU Directive 2006/123/EC](#) ([EU's udbudsdirektiv](#)) or simply in accordance with the [Danish Contracts Act](#) ([Aftaleloven](#)). Guidelines can be obtained from The Danish Competition and Consumer Authority ([Konkurrencestyrelsen](#)) . Through the website [Retsinformation](#) you can obtain access to all current legislation. The rules to be applied depend on who the client is, and as the rules are different it is imperative to be acquainted with all of them.

1. Is the client private or public?
2. Is it a private construction work with public subsidy?
3. Is part of the agreement based on the Danish Act on Tender Procedures ?
4. Is the total contract sum above the threshold value?

Also the below issues shall be clarified:

1. What type of tender does the client use?
2. Selection criteria and requirements for the fulfilment of these criteria, documentation etc.
3. Awarding criteria
4. Is it possible to make reservations when a tender is handed in –what kind of reservations should be made? What type of information shall be handed in at the same time? And what are the possible consequences of reservations?

1. The tender documents

- *Contract form*
- *Legislation*
 - i. [AB 92](#)
 - ii. Governmental order on Fixed Price and Time (Cirkulære om fast pris og tid)
 - iii. Danish Act on Tender Procedures (Tilbudsloven)
 - iv. EU Directive 2006/123/EC (EU direktivet)

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- v. Governmental order on Quality Assurance (Kvalitetssikringsbekendtgørelsen)
- *Insurances*
 - i. All risks
 - ii. Contractor's insurance
 - iii. Building site insurance
- *Building project specifications*
 - i. Deviations from standard contract terms.
 - ii. Are reservations accepted?
- *Time schedule*
 - i. In compliance with [AB 92](#)
 - ii. Realistic
- *Bid schedules*
- *Realistic quantities*
- *Is the tender deadline realistic?*
- *Is the bid acceptance period acceptable?*
- *Are contract conditions acceptable?*
- *Sufficient geotechnical analysis?*
- *Tender selection criteria: Lowest price or competition on quality?*

2. Is the project under the umbrella of Digital Construction?

Tender form - sub-contractors

In the planning of tenders for sub-contractors it is important to investigate whether such tenders are subject to special legislation. The tender is always governed by The [Danish Contracts Act \(Aftaleloven\)](#). In addition the tender may also be governed by the Danish Act on Tender Procedures ([Tilbudsloven](#)).

Next step is to formulate an invitation to tender for the sub-contractors. In this invitation the tender form must be specified to ensure compliance with the above mentioned legislation .

Private clients

Private clients are not affected by the Danish Act on Tender Procedures but may choose to comply with the act.

In case the client chooses not to comply with the Danish Act on Tender Procedures no specific demands from this act will apply when the main contractor invites tenders. In this case the tender and accept of tender will be governed by the [Danish Contracts Act](#).

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The tender is governed by the Danish Act on Tender Procedures

In cases where the client is the State, a municipality, a region or a similar public entity the main contractor must use the Danish Act on Tender Procedures when inviting tenders from subcontractors – cf. guidelines ([Danish Competition and Consumer Authority](#)) for the Danish Act on Tender Procedures and the Act itself

Employment of governmental order on Price and Time

In case the client is the State the governmental order on Price and Time is employed guided by the ‘ABC- guidelines’ (published by the Danish National Housing and Construction Agency in order to help the interpretation of the Governmental order) .

The standard reservations issued by the Danish Construction Association (Dansk Byggeri) contain a clause stating that the Governmental order on Price and Time shall apply to the building project. Consequently, it is natural to include the governmental order in the sub-contractor’s tender documents.

Tender for suppliers

Tenders for suppliers are not governed by the provisions in the Danish Act on Tender Procedures (Tilbudsloven) and tenders from suppliers are in most cases governed by provisions in [The Danish Contracts Act](#) ([Aftaleloven](#)).

Supplies make take place in accordance with AB92 or in accordance with the [Danish Sale of Goods Act](#) ([Købeloven](#)).

In order to secure a uniform set of rules throughout the entire project we recommend that all supplies take place in accordance with the rules set out in [AB92](#) .

This recommendation applies to tenders from sub-contractors as well as tenders from suppliers.

Tender conditions shall be coordinated in relation to tender conditions in the main contract in such a way that the main contractor does not get into a jam between the the client on one side and the sub-contractor/supplier on the other side. This may apply to issues such as payment conditions, consequences of delay, price adjustments, bid acceptance period etc.

In case the client’s tender documents contain demands with respect to subcontractors, such demands must also be included in the tender documents submitted to the subcontractor, cf. for example:

[AB 92](#) § 5 concerning limitation on the rights to transfer obligations

[AB 92](#) § 5 concerning the client’s right to put forward a claim directly against the contractor’s subcontractors and suppliers

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Technical scrutiny

The subsequent section covers the contents of the technical scrutiny, including pre-investigations, geo-technical report etc.

From the tenderer's point of view the objective of the scrutiny is to create the best possible conditions in order to be able to hand in a precise and complete tender bid on the day of the tender.

To begin with you must check that you have received all the tender documents mentioned in the request for tenders.

During the scrutiny process you may come across conditions which are not adequately defined. Questions relating to such conditions should be brought up at the clarification meeting in order to shed light on the problem. There will, however, always exist a small fraction of not sufficiently clarified issues which shall be included in the risk assessment to be carried out later.

Construction scrutiny

It is recommended that the tenderer visits the future building site at an early stage in the scrutiny in order to assess access conditions, parking possibilities, neighbouring conditions, the construction area etc. This is important in order to take into account possible limitations/ obstacles that might influence the tender bid

Geo-technical scrutiny

A geo-technical report is prepared in most building projects and constitutes part of the tender documents. An environmental report is quite often prepared as well.

Information in the geo-technical report shall be worked into the tender bid because soil conditions greatly influence price, time and risk.

The main conclusions in the geo-technical report are most often summarized in its first section, but it is advisable to read the entire report and make notes of the information found in a so-called 'scrutiny note' to be used as the tender phase progresses.

Geo-technical scrutiny note

The list below describes some of the geo-technical aspects to consider in order to be well prepared for the calculation of the tender bid. The answers to the geo-technical questions raised will influence the tender bid directly as well as the risk assessment.

1. Scrutiny of levels:

- *Present ground level*
- *Future ground level*
- *Level of topsoil excavation*

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- *Top level of the stable stratum*
- *Bottom level of foundation*
- *Top level of the solid stratum*
- *Water table)*

This information should be noted in a detailed cross section.

2. Soil carrying capacity

- *Soil strength parameters and carrying capacity*

3. Water table

- *Lowering of the water table?*

4. Draining of surface water

- *Drainage needs, collecting wells and pumping.*

5. Excavation

- *Slope inclination, temporary bunting, conditions on neighbouring plots. Is soil suitable for backfilling?*

6. Building site

- *Temporary roads, substructures for storage sheds and site huts*

7. Environmental problems

- *Handling polluted soil, pollution degrees.*

Contract output and construction process

An overall assessment shall be carried out in order to find out whether the expected output of the assignment in question matches company competencies.

In order to assess whether sufficient competencies are present, the company produces an overall plan showing the construction process for the entire building project.

By analysing the the construction process plan of the project in question (imagining the building process) the management can assess whether the assignment matches company competencies

Drawings / specifications

Drawings and specifications are thoroughly scrutinized. During this process it is advisable to ask the following questions: Are project documents adequate? Are some areas muddled - leaving it up to the contractor to find solutions? Will it be

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necessary to carry out additional design? Are the materials chosen common and are they immediately available? Could there be supply problems?

Technical solutions and construction methods.

The buildability of the project is scrutinized with the object of assessing whether alternative construction methods are obvious. Areas suitable for own production are identified and areas suitable for sub-contracting will be tendered to subcontractors and suppliers. It is important to clearly define and delimit such areas.

Risk / responsibility aspects.

Risk management is a relatively new discipline within building construction and it is at present being systematically introduced.

Risk assessment and risk management are areas to be worked in through all phases of the building activity.

Starting in the **tender phase** it is required to assess structures, construction techniques and such external factors that might imply a risk in order to get an overview of whatever financial implications this may result in and consequently include a risk allowance in the tender bid.

During the **starting up phase** it is recommended to get acquainted with individual work processes and to work out risk analyses for all dangerous work.

During the **construction phase** the individual foremen shall take part in an examination of risk analyses and assess how to act in order to minimise the risk.

For more information on methods and diagrams: [Risk management in the building and construction industry](#) ([Risikostyring i bygge- og anlægssektoren](#)).

How building site conditions affect contract performance

The building site arrangement is an important aspect of the contractor's work. The arrangement affects work progress, safety conditions, construction logistics and the surrounding environment. The great variety of construction work takes place in very different surroundings. It is therefore important to carry out a thorough inspection of the building site conditions, conditions on neighbouring plots, access conditions and access possibilities for equipment etc.

The client's/ consultant's proposal for building site arrangement shall be included in the tender documents.

We recommend the use of [BAR-Ba](#)'s tools for the registration of existing conditions and for the monitoring of future conditions during construction.

Clarification meeting / cancellation letter

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Whatever questions may arise during the scrutiny should be brought up at the clarification meeting. A cancellation letter will subsequently be issued and becomes a tender document equally important to the other tender documents

Questions that cannot be answered shall be appraised on the basis of a risk assessment or it must be defined exactly what output can be expected – it may be necessary to make reservations

Timeline

The timeline is a planning tool which first of all helps to ensure that such milestones as the day of tender is reached without too many obstacles and secondly to ensure that the subsequent project phases are implemented according to time schedule.

The timeline is elaborated on the basis of the tender time schedule, which provides information about key dates defined by the employer and which *must* be observed.

Usually these dates are: tender date, time limit for clarification / clarification meeting, day of tender, expected date of construction commencement and handing-over date.

These dates are the skeleton over which the timeline is built and the contractor supplements with dates for additional activities deemed necessary for the successful completion of individual project phases .

In a specific building project, an effective tool to use would be a timeline showing the legal aspects to be considered during the course of the building project in question

In addition it may be a good idea for the company to work out a time line showing all ongoing building projects and tender bid calculations as well as upcoming projects.

Very often the tender/bid phase is short and hectic and for that reason a tight management is important

Calculation of individual trade contracts

In parallel with project scrutiny and the definition of construction methods the contractor starts the calculation. The calculation is carried out as shown on the calculation sheet.

The calculation is subdivided into 3 cost categories:

Category 1: Direct costs

Category 2: Indirect costs

Category 3: Other costs

Tender activities / bid schedule

Before the actual quantity surveying of materials and time estimation begins it is required to subdivide the calculation into sections. Each section refers to the building

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components / items as stated in the bid schedules being part of the tender documents. Final prices will be added to the bid schedules at a later stage.

In case the tender documents do not contain bid schedules it will be appropriate to subdivide the calculation of direct costs into activities clearly indicating a structural demarcation (for example: Substructure, primary elements, completions etc.)

Within each activity the different work processes, which shall be carried out in order to complete the said activity, should be stated.

Direct costs

Direct costs include expenses in connection with own production , i.e. labour costs for tradesmen purchase of materials - with a deduction of discounts - but adding the cost of waste, hire of equipment, transport, and building site expenses.

Taking off and time calculation

Taking off and estimating time consumption are very important parts of the contractor's tender bid. In order to be able to estimate the time consumption required in relation to the quantities taken off, it is important that the contractor keeps focus on process quantities, methods applied and waste.

On the basis of the measured quantities and methods applied the time consumption is determined by the use of price lists elaborated by the various trades and by the use of the contractor's own price catalogue (experience cost).

Wages, material and equipment

Special forms, so-called man-hour calculation forms are used when defining the time required to carry out specific tasks. The time required is determined on the basis of the agreement (guiding timetable), 'Anlægs Teknik 2' or 'collected data on time/costs'.

Materials and equipment costs are priced either through tender bids or prices are found on the internet.

Concealed quantities, material waste and piece rate pay should be taken into account.

Once the production figures are entered into the calculation, quantities shall be measured at the building site. Building site expenses are divided into two parts. One part refers to costs related to the establishment and dismantling of equipment and the other part relates to operating costs.

Social costs

Upon determination of wages for each activity the social costs are added. Social costs are paid in accordance with the legislation and in accordance with agreements in addition to the expenditure the company has had during the past year.

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Social costs are incorporated in the company budget.

Building site costs

Building site costs include expenditure which is necessary for company staff in order to perform their trade contracts. Such expenditures could be: site huts, storage sheds, field workshops including machinery, waste removal, distribution boards and working lights, health and safety precautions, special tools, tower crane, scaffolding and hoists/lifts, vehicles for horizontal transport and cutting and bending machine.

Indirect costs

In Denmark, indirect costs are sometimes referred to as 'capacity costs' because this type of costs is directly linked to a certain capacity. In this context it is important to define capacity in its broadest meaning i.e. production, stores, distribution, marketing, administration etc..

Indirect costs also cover costs related to for example contract managers, foremen with fixed salary, site accommodation, mileage allowances, tests, security, unpredictable costs and risk.

Supplier and sub-contractor fees

In cases where a supplier and a subcontractor make part of a given activity, an additional fee will be added to their (accepted) tender bids. This fee covers administration and profit.

Finally, the accepted tender + fee is added to the calculated gross price for the activity, and may hereafter be entered in the bid schedule.

Contribution margin / contribution ratio

The contribution margin expresses in per cent how much profit the contractor wishes to make on the building project. If the contractor wishes to make 15% profit on the building project then the direct and social costs will correspond to 85% of the final tender bid.

Key figures

Once the calculation is finished the contractor should make a note of the relevant key figures.

Key figures may represent average prices on elements in relevant structures.

The key figures may be entered into a database with a built-in price indexing. By doing so prices may be re-used in future projects.

Key figures based on experience may be re-used in the following instances:

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- Rough estimates.
- As a control measure in new price calculations.
- Analysing the choice of new types of construction.

Calculating main contracts

Once the calculation of own production is terminated and tender bids from sub-contractors and suppliers have been received and accepted it is possible to begin the final calculation of the main contract. Like it was the case with the individual trade contract this calculation is also broken down according to the costs required in the bid schedule and according to requirements stated in the building project specifications.

The breakdown may be carried out as follows:

1. Tender bids from sub-contractors with contracts constituting part of the main contract.
2. Costs related to the building site arrangement and operation
3. Costs related to managing the main contract.
4. Costs related to site accommodation – including furnishings, IT, telephone, heating etc.
5. Costs related to security / guarantees
6. Costs related to seasonal winter precautions.
7. Costs related to estimated risks.
8. Any other expenses mentioned in the tender documents

Cf 1: Tender bids from the selected sub-contractors (SC) are entered into the form. The next column contains a percentage indicating the desired administration fee and profit. Once this is calculated it is possible to determine the amount which must be entered into the bid schedule (the price we present as ‘our price’ to the client).

Cf 2: Costs related to building site arrangement and operation may be entered in a separate form where the possibility of carrying out a detailed calculation exists. In case the building project specifications state that the different SCs shall include costs related to building site arrangement in their tender bid, such costs will not be added here since they are already included in the SC’s tender bid. Examples of costs to be listed here could be: Electricity consumption at the building site, water, fencing, roads, establishing site accommodation and the like.

Cf 3: Costs related to site management can only be calculated after an organization chart has been elaborated, clearly stating how many staff will be required in order to carry out the main contract and for how long they will be stationed at the building site.

Cf 4: Calculation of costs related to site management accommodation and site hut may also be carried out in a separate form, and the sum subsequently transferred to the the main contract summary sheet. .

Cf 5: Costs related to security often amount to a considerable sum - this of course depends on the magnitude of the main contract.

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Cf 6: Seasonal winter precautions are calculated and added.

Cf 7: Risks identified during the scrutiny are calculated/estimated and the amount(s) entered into the calculation such that the funds will be available in case the identified risks are realized.

Cf 8: Other costs relating to the main contract are entered here.

Cf 9: Depending on the competitive situation it is decided how much should be charged as administration fee and how much as profit on the main contract.

Costs that cannot / should not be directly entered in the bid schedule such as expenses related to security /guarantee, risks, profit and maybe construction management can be distributed evenly across the amounts that must be entered in the bid schedule. In this way all costs will be reflected in the total tender bid that must appear in the bid schedule.

In case the tender documents do not contain a bid schedule, you simply add up all costs and hand in the tender bid.

It is important that the contribution margin corresponds to company demands regarding earnings.

Calculation of trade contracts

The principles used for the calculation of trade contracts are similar to those used in the calculation of main contracts.

The trade contractor has own production and employs subcontractors.

Calculation of turnkey contracts.

The calculation of turnkey contracts is similar to the calculation of main contracts. The calculation does, however, include more costs because it contains all expenditure in relation to the completely finished building whereas the main contractor's tender bid only contains the costs of the items mentioned in the tender documents.

In addition to costs already mentioned in 'Calculating main contracts' (above) the turnkey contract calculation also includes the below listed additional costs:

1. Designing
2. Printing drawings
3. Service charges (sewer, water, electricity, district heating etc.)
4. Planning permission
5. Other expenditures related to the building project in question.

Cf 1: Design expenditure (fees for architect, engineer, landscape architect etc.) shall be included in the tender bid. The client may have an agreement with an architect in formulating the project brief and may demand that the turnkey contractor accepts that final design will be carried out by the same architect but paid by the turnkey

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contractor. If this is not the case, the turnkey contractor sets his own team of professionals with whom he wants work and signs an agreement concerning fees. In most cases the professionals do not receive any payment in case the contract is not awarded to the turnkey contractor (no cure no pay).

Cf 2: The printing of drawings is quite often a considerable cost and should be included. In most cases the contractor knows by experience how much the printing will amount to.

Cf 3 Service charges may be considerable and should be investigated before the calculation is terminated.

Cf 4: The municipality demands payment for the issuing of a planning permission. The fee is calculated on the basis of the gross floor area multiplied by a square meter factor fixed by the municipality.

Cf 5: Other costs related to the project in question are entered here.

Working out the tender bid summary and the filling in of bid schedules (if they exist) are carried out in the same way as specified in 'Calculation of main contract' (see above).

Tender bid

Once the main contractor / the individual trade contractor has collected all information needed in order to work out the tender bid, he may complete his bid.

Completion of the bid takes place primarily by filling in the bid schedules and by drawing up a covering letter to the client.

This information must be included in the covering letter

- 1) The basis for tender bid
 - i. Invitation to tender
 - ii. Minutes from clarification meetings
 - iii. Cancellation letters related to tender documents
 - iv. Relevant legislation
- 2) Assumptions constituting the basis for the tender bid
- 3) Reservations – if any

We recommend that the contractor seriously contemplates the need to make reservations because he may risk that his reservations are considered ineligible (not acceptable). In case reservations are made it is recommended to use the standard reservations issued by the Danish Construction Association – minus whatever reservations that may conflict with the tender documents.

It is very important that the contractor double checks his bid before it is handed in.

According to the [Danish Contracts Act](#) a bid is binding upon the tenderer once it has been 'revealed to the client'. In principle the tenderer cannot revoke the bid after it has been communicated to the client.

Opening tender bids

On the opening date, tender bids are formally opened and read out loud in order to give the contractors who are present an impression of which tender best meets the criteria set out by the client. Subsequently, the client may use a couple of days analysing the bids. During this phase he capitalises whatever reservations the bidders have made trying to fix a value of the said reservations .

In case the contractor has made reservations concerning fundamental issues in the tender documents, the bid is considered ineligible and will not be accepted. For details on reservations reference is made to [The Danish Construction Association](#).

The tenderer uses reservations to inform the employer that he cannot accept given outputs the way they are specified in the tender documents. The reservations may refer to legal or financial aspects of the tender project (for example terms of payment, liability, insurance etc.).

Basically, it should be taken into consideration that reservations made by the tenderer may deem the tender bid ineligible. In case the tender documents explicitly dismiss the right to make reservations, all reservations will – no matter how insignificant they may seem – result in the dismissal of the bid as ineligible, i.e. the bid is not in agreement with the tender documents. In case the tender documents do not dismiss the right to make reservations and in case reservations made only refer to non-essential aspects of the tender documents, the client may still reject the tender bid as ineligible, but in case he chooses not to do so, he is obliged to capitalize the value of the reservation before he compares the bids. Reservations made need not necessarily be named 'reservations'. Any deviation from the tender documents is considered to be a reservation.

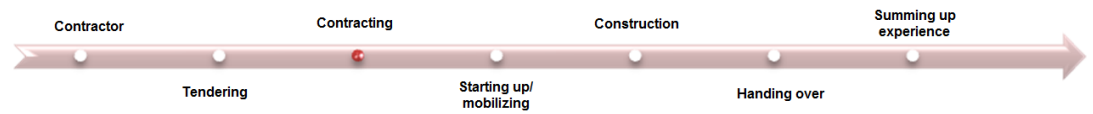
A tender bid is considered ineligible when it does not conform with the formal demands set out in the tender documents. This may happen when required documentation is not enclosed or when the enclosed documentation is incomplete.

Reference is made to (guidelines for the client) [bygherrevejledningen](#). You may find it here: [Danish Enterprise and Construction Enterprise \(Erhvervs og byggestyrelsens hjemmeside\)](#).

[Enclosures examples](#) to be used in the tendering phase

03 Contracting

Introduction



Negotiation

When bids are made on the basis of the Danish Act on Tender Procedures ([Tilbudsloven](#)) the client has the possibility of negotiating with the bidder as follows:

- A. When the criteria is 'lowest bid' the client is only allowed to negotiate with the lowest bidder.
- B. When the criteria is 'the most economical advantageous' the client is allowed to negotiate with the top three best bids

Reference is made to 'the Danish Act on Tender Procedures ([Tilbudsloven](#)) sections 10 and 11 concerning the right to negotiate and negotiation procedures.

Cost saving measures

It is not unusual that the client asks the lowest bidding main contractor to present cost saving measures. .

The main contractor and his sub-contractors and suppliers will jointly analyse the bid and elaborate a 'cost saving catalogue' and identify consequences of proposed savings.

Subsequently, the cost savings catalogue will be presented to the client and his consultants in a meeting where they will discuss and take a position on the individual savings, and decide which savings they accept.

Once the savings are accepted, a final contract may be signed on the basis of the reduced bid.

Savings catalogue

In addition to the actual savings, the savings catalogue shall also clearly specify what other consequences the savings may have in relation to the initial bid, for example: Life expectancy, wearability, operational expenditure, the look (samples), delivery time, reservations, changes in the time schedule, new working methods etc.

Additional conditions may apply.

Contract legislation

Once the client has awarded the tender to a contractor a contract must be prepared. The contract is based on the tender bid with a deduction of approved savings

03. Contracting

identified via cost saving measures. The contract cannot include any new issues, but shall be worked out on the basis of the tender documents, the tender bid, results of negotiations including cost saving measures.

A standard contract may be downloaded from [The Danish Construction Association Dansk byggeri](#).

In accordance with [AB92](#) section 6 the contractor shall provide security for the performance of his obligations towards the client. The bond provided shall correspond to 15% of the contract sum.

In accordance with AB92 section 7 the client shall - if the contractor so requires, - provide a performance bond for the due performance of his pecuniary obligations towards the contractor. The contractor is entitled to demand an increased performance bond in case additional works are added to the contract (section 14) and in case the total remuneration for all additional works – apart from those already paid for – exceeds 50% of one month average as agreed in the initial contract.

The contract specifies penalties and what indexes should be used for contract sum adjustment. See indexation figures at [Dansk statistik](#) (Denmark's Statistics). Penalty amounts are also stated.

In cases where the contract states that the contract sum shall be adjusted in accordance with index changes, such adjustments shall be made in accordance with [AB92](#) section 22, subs. 6

If the contractor fails to submit the final account to the client within a defined period of time, he shall forfeit his right (i.e. he loses his right) to claim payment as reimbursement for wage and price increases – cf. [AB92](#) section 22, subs. 8 and 9

Once the main contractor has entered a contract with the client he may subsequently enter contracts with his sub-contractors and accept bids from suppliers. Contract conditions will be based upon the tender documents that the main contractor has submitted to his sub-contractor as well as the sub-contractor's bid and the result of negotiations.

Insurances

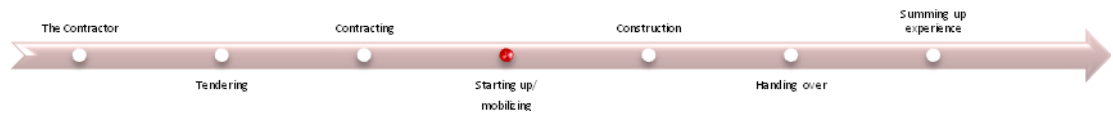
[AB92](#) section 8 states that the client shall take out and pay for the usual fire and tempest insurance. In this context it is important that the contractor is included in the insurance policy. In doing so, the contractor will be able to claim the insurance company directly in case of damage. This clause is included in the standard reservations prepared by The Danish Construction Association (Dansk Byggeri) and when the contractor uses these reservations, he will be covered automatically.

It is the sole responsibility of the contractor to take out an insurance covering accidental damages such as theft and wanton destruction. In case the tender documents mention that the client has taken out an 'all-risk' insurance the contractor will be covered by this insurance

[Enclosures examples](#) to be used in the contracting phase

04 Starting up / mobilizing

Introduction



Handing-over project to project manager

The purpose of a formal project handover after the contracts have been signed and before the building project starts is to ensure that the project manager gets the best possible conditions for an effective and rational start-up.

The project manager may not have been involved in tender bids or the negotiation of contracts and cost saving measures etc.

It is of utmost importance that the project manager gets familiar with the bid, associated contracts and other agreements and also that he prepares himself for the project review meeting and works out a realistic plan

The building project

The project manager shall thoroughly scrutinize common conditions, work specifications, drawings, geo-technical reports and similar pre-investigations. The project manager shall also get acquainted with the methods and mentioned in the calculation

In addition, the project manager shall:

- Enter an agreement with a land surveyor concerning the setting out of the building(s).
- Ensure that authority approval and permits have been issued.
- Notification of commencement
- Enter agreements concerning the handling of waste
- Provide signposting

Contract review

It is important that the project manager gets familiar with all agreements that have been entered. He shall also scrutinize confirmations, guarantees and whatever solemn declarations that have been made. In addition he shall get familiar with the solidity of involved parties.

In this context he should consider:

- What is the insurable basis?
- Have winter precautions been taken into consideration?
- Sub-contractors?
- Waste and bad weather payment?
- How much is the penalty?

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- Types of payment conditions?

Time schedule review

It is important that the project manager gets familiar with the time schedule or works out a time schedule in accordance with the contract

In order to finish work within the scheduled time it is considered essential that the work is coordinated in accordance with planned time, that resources and drawings are available at the right time, and in order to be able to work out a cash budget.

Finally the project manager shall ensure sufficient manning as well as the procurement of all necessary permits and approvals. He shall also ensure that all necessary investigations are made.

Risk analysis

The risk assessment (also referred to as scrutiny), which was carried out during the tendering phase, is followed up. The assessment takes place well in advance of the actual start of construction and should include:

- Analysis of drawings and specifications
- Analysis of planning and work processes
- Analysis of tender control plan
- Ensure that tasks are carried out in pursuance of current legislation, codes and standards.
- Information concerning local conditions
- Ensuring a clear demarcation between tasks in own production and tasks carried out by sub-contractors
- Ensuring that safety and environmental issues are systematized

It is the duty of the project manager to analyse – well in advance – whatever risks may occur as work progresses, for example technical problems, missing drawings, communication problems as well as problems related to workforce, suppliers or sub-contractors, in order to counteract failures and delays before they occur.

Building site inspection

The project manager makes a personal inspection of the building site in order to get familiar with site conditions and its nearest surroundings.

The following should be observed and recorded: Technical installations, access roads, welfare provisions, conditions on neighbouring plots, traffic, cleaning and maintenance of roads, fencing, excavations, demolitions, terrain conditions, the possibility of establishing site accommodation, stores and depots.

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Time planning / Time schedules including manning

Once the project manager receives relevant documents it shall be decided whether assumed time coordination and manning are sufficient and whether certain activities may be carried out faster.

To start with the below listed time schedules are worked out:

- Main work plan
- Rolling time schedules (depending on complexity – days, weeks, months)
- Milestones make part of the time planning indicating start time / finish time, coordination time, approval time
- Definition of average manning, explanation of task sequence and internal relationship between tasks, durations are defined and a time schedule is worked out.

Manning and equipment plan

For various reasons it is necessary to work out a manning plan - partly as a part of 'Plan for Health and Safety' (PHS), and partly to provide the company with an overview of which work resources are occupied during a given period of time.

It is possible to work out a histogram showing when there will be a need to level out resources and also showing peak loads on welfare installations.

An equipment plan should be worked out showing which machinery/equipment will be used at given times - referring to own equipment as well as hired equipment. Cranes, lifts/hoists, tents, and containers should also be entered in the plan.

Waste handling

Depending on specifications, the project manager shall work out a plan and rules for the handling of waste and find out how the costs related to transport and deposit of waste should be distributed in accordance with the agreements made with other contractors and the client. Rules for the removal of waste may vary from one municipality to the other - but they must be observed.

Setting out at the building site

The setting out of the main grid lines and levels shall be the responsibility of the client- All other setting out shall be the responsibility of the individual contractors and included in their bid. [AB92](#) section 9, subs. 2.

Production calculation

On the basis of the changes that have been made during the planning of the building project, the contractor works out a so-called production calculation.

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Whatever changes have been made during the planning phase shall be worked into the calculation. Such changes could refer to savings on sub-contracts, changed material prices, changes in project, errors identified etc.

The revised production calculation will subsequently form the basis for the stage assessment of the building project which usually takes place once a month.

Finances

In order to avoid misunderstandings which may result in the delay of payment - or even worse, no payment – it is important that all financial conditions are firmly established.

The tender documents shall state payment methods to be used.

In order to throw light on amounts to be paid out and times fixed for payment, it is pertinent to work out a payment plan indicating such amounts and conditions.

When payment is based on monthly interim payment certificates it shall be agreed what types of forms and enclosures should be used, as well as a date for submission of the interim payment certificate.

Part of defining the financial aspects also includes identification of persons who are authorized to make financial agreements as well as persons authorized to sign such agreements etc.

Payment is only made on the basis of documented work done on site or on the basis of signed agreement forms. A report documenting stages accomplished shall be worked out at least once a month.

A cash flow budget showing capital needs over time should be elaborated - indicating expected income and expenditure. The budget is detailed according to needs.

Chart of accounts

It is important to be in control of the entry of expenditure throughout the entire building project. Most companies have worked out an entry system with expenditure accounts. This information is useful in preparing the monthly stage assessment.

The individual trade contractor as project manager

The tasks assigned to the individual trade contractor in relation to planning and mobilizing the construction work are manifold, and for that reason he must be well organized and systematic.

The individual trade contractor may use whatever tools are available in order to facilitate his work.

His planning includes such issues as: risk assessment, time schedules including manning schedules, work environment, quality assurance plan, delivery plans, Work Place Assessment (WPA) with appurtenant instructions etc.

04. Starting up / mobilizing

Bid review

The individual trade contractor must get familiar with the bid with respect to quantities, time, prices and delivery conditions. The individual trade contractor needs also to know what methods, types of equipment etc. form the basis of the bid.

He should take the following aspects into consideration:

- How are building site costs included in the bid?
- Has time been allocated for testing etc.?
- Have reservations been made – if yes, what are they?
- Is there a special bid schedule referring to winter conditions?
- Have desired outputs been defined ?

Suppliers

The individual trade contractor must observe delivery conditions and time limits defined by the supplier.

Likewise, it is important to determine how supplier liability is defined and to observe that directions issued by the supplier are observed

Order- and delivery plan

The trade contractor is responsible for preparing an order- order cancellation- and delivery plan in keeping with construction progress. The individual trade contractor shall also observe such services / materials that may be supplied by the client.

Delivery plans are based on a system where the materials are delivered at the building site according to need and at the location where they are needed.

Delivery plans help to:

- Create a regular flow of materials with few urgent orders
- Reduce storage needs at the building site
- Reduce material damage and waste
- Optimize the total time used on planning and control of materials
- Avoid accidents related to the internal transfer of materials at the building site.

WPA and instructions

According to legislation it is the responsibility of the individual trade contractor to work out a written WPA (Work Place Assessment). Likewise he shall work out instructions detailing how work is carried out. The individual trade contractor may use the tools developed by [BAR-Ba's](#) to do so.

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A WPA shall include a description of possible physical, mental, chemical, biological and ergonomic impacts as well the risks of accidents.

Safety work

It is the client's responsibility to appoint a coordinator to conduct the coordination of safety work during the construction. Normally, this task will be conducted by one of the client's consultants or by the main contractor.

The coordination of the individual employer's safety precautions takes place at safety meetings and through personal contacts on the building site.

Site meetings

Site meetings with the purpose of coordinating own production as well as sub-contractor production are held at regular intervals in accordance with a predefined plan. All relevant parties are invited and will receive minutes from the meetings. Rules determining how objections against the minutes are made, must be defined.

Quality assurance

Quality control procedures, forms and other documentation worked out by the individual trade contractor must be approved. Also the individual trade contractor shall be informed that quality assurance is part of the agreed output as stated in contracts and agreement forms.

The individual trade contractor also participates in project examination meetings (kick-off meetings) and the starting-up meeting.

The main contractor as project manager

The tasks assigned to the main contractor in relation to planning and mobilizing the construction work are manifold and for that reason he must be well organized and systematic.

The main contractor may use whatever tools are available in order to facilitate his work.

The planning includes:

- Risk assessment
- Time schedules including manning schedules
- Working environment
- Quality assurance (QA)

The main contractor must ensure that:

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- Updated work drawings and specifications are available
- Work, including pertinent control, is planned in order to avoid failure or to detect a failure as early as possible.
- Deviations are recorded and handled
- Project changes are controlled, coordinated and approved by the main contractor and recorded in minutes from site meetings.
- Interim payment certificates are worked out on a monthly basis.
- Sub-contractors understand agreements entered concerning expected outputs.

The main contractor must also ensure that:

- Suppliers and sub-contractors (SCs) receive all relevant documents.
- A project examination meeting is called for with the participation of SCs and staff in own production.
- A review is carried out of the SC's quality assurance plan in order to find out if it corresponds to requirements as defined in the tender documents with respect to type and extent.
- Preceding works are concluded and approved and that succeeding SCs have carried out start-up controls.

Folder structure

A common folder structure based on [BIPS](#) or [Byggeweb](#) directions shall be established. The parties involved must follow these directions.

The main contractor is also responsible for organising the building project accounts and must make sure that the quality assurance system is accepted.

It is important that the main contractor follows common procedures with respect to the use of weekly reports of work, machine operator reports, , piece work agreements, delivery notes and invoices as well as rules for interim calculations.

Organization chart for the building project

The main contractor must be familiar with the building project organization chart and must ascertain that that all actors are authorized.

The main contractor must be familiar with all decision and responsibility levels in the building project and he must be aware of his own mandate and the responsibility he holds in the project in question.

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Project examination meetings (kick-off meetings)

It is the duty of the main contractor to make a plan for project examination meetings with the participation of sub-contractors, staff in own production and designers. It is important that all relevant persons involved participate in the meeting in order to secure optimal project implementation. This applies to contractors as well as designers. A successful project examination meeting is characterized by participants who are well prepared – clarification questions have been prepared beforehand.

The main contractor takes minutes from these meetings. Standard forms to be used in project examination meetings have been prepared by [The Danish Construction Association](#) ([Dansk Byggeri](#)) and [Udbudsportalen](#)

Starting-up meeting

The main contractor calls for a starting-up meeting immediately before construction starts. At this meeting documents relating to the building project will be examined again and last minute questions should be answered. It is important that all sub-contractors and staff in own production participate in the meeting .

Site and safety meetings

The main contractor makes arrangements with the client, sub-contractors and staff in own production concerning the time and frequency of site and safety meetings.

It is important to take minutes of the meetings because such minutes may later serve as documentation in cases where disagreements may have to be settled by arbitration.

På byggemøderne registreres blandt andet om tidsplanen følges, arbejdets stade, bemandingen og de ændringer, der løbende sker i projektet.

Safety meetings serve to examine issues of safety in the common areas (of the site). Accidents and near-by accidents are recorded.

Emergency meetings are called in case of serious accidents.

For more information concerning 'The Safety Hand book', reference is made to [Barba](#).

Process planning

The main contractor works out a detailed construction plan in collaboration with the subcontractors . This is done in order to secure an optimal construction process.

The construction plan is made as a process diagram using 'post-it notes'.

In order to get an overview of the work involved in the project, the main contractor works out an overall breakup of the work processes involved in the construction process. This breakup allows for a breakdown into smaller and more transparent activities.

This may refer to both main and sub-activities . Normally, the breakup follows contract areas, location and building sections.

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The main contractor must get an overview of the resources necessary in order to complete the work, and also identify the interdependencies between individual activities. In this way the process planning constitutes the basis for the main time schedule, order, order cancellation- and delivery schedules.

The main time schedule is worked out in collaboration with the client and his consultant and on the basis of the construction plan.

Plan for health and safety (PHS)

In a given project, the main contractor must find out whether it is necessary to work out a PHS? - Has a coordination agreement been entered with the client?

In case the main contractor is also safety coordinator, an agreement to this extent must be entered with the client. The agreement transfers coordinator duties from client to contractor and shall be in writing.

The main contractor should be aware that coordination only refers to common areas- A coordination agreement may also include a clause concerning the duty to complete the PHS.

Further, the following must be clarified:

- Has the consultant properly defined risk areas?
- Who is responsible for site registration?
- Who is responsible for the registration of lifting and hoisting equipment?
- Is the 'exemplary workplace' (Mønsterarbejdspladsen) or similar used as a model?

Safety work

The company's general safety handbook shall be subject-oriented. The introduction contains an organization chart indicating who is responsible for what at the building site. Next follows a time schedule for safety meetings to be held every fortnight. Participants in the meetings are also identified.

The building site must have a safety organization corresponding to the number of actors at the building site and the duration of the construction activity.

Safety organisation and procedures relating to safety work shall be identified before construction work commences.

Depending on contract type, the main contractor works out a risk assessment of the working environment, including:

- Noise, dust and vibrations
- The use of scaffolding and ladders
- Heavy lifts/ rigging
- Assembly /erecting

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- Use of dangerous chemicals etc.
- Fall risk

The tools mentioned in [Bar-ba](#) may be used in conjunction with the safety handbook (Sikkerhedshåndbogen). The 'exemplary workplace' (Mønsterarbejdspladsen) may also prove a useful tool in the day to day safety work.

It is the duty of the main contractor to ensure that staff is certified in the use of equipment and machinery and also to ensure that work with for example epoxy and asbestos is only carried out by staff certified to carry out this kind of work.

[The Danish Working Environment Authority \(Arbejdstilsynet\)](#) has worked out a list of legislation relating to this.

The main contractor must be familiar with, and able to find, information on the statutory requirements and rules worked out by the Danish Working Environment Authority. The main contractor should also be informed that help and advice can be obtained from [BST](#). (bedriftssundhedstjenesten)

The sub-contractors must be informed about building site regulations and must also be informed about what parts of the building site common areas are at his disposal during the construction period.

The exemplary workplace

In order to achieve maximum safety at the building site the main contractor may choose to follow guidelines as set out for the 'exemplary workplace' (Mønsterarbejdspladsen)

'The exemplary workplace' is a simple method used to register, to render visible and to follow up on the safety standards on a building site.

For more information, check [The Danish Construction Association \(Dansk byggeri\)](#), [Byggeproces](#) or [The Danish Working Environment Authority \(Arbejdstilsynet\)](#).

Link : <http://www.byggeproces.dk/>

Registration

In cases where no other agreement has been made, it is the client's responsibility to register the building site with [The Danish Working Environment Authority \(Arbejdstilsynet\)](#).

The main contractor must ascertain that the building site has been registered with The Danish Working Environment Authority. He must also ensure that of lifting and hoisting equipment is registered.

For those parts of the sewer and plumbing work where authorization is required the following rules must be observed:

04. Starting up / mobilizing

With respect to excavation and earth moving work the main contractor must observe current rules. These may vary from one municipality to the other.

The contractor(s) responsible for equipment used in the building project shall ensure that the necessary approvals have been obtained. He/they must also ensure that the staff operating the equipment has received adequate training when required.

More detailed information on this issue such as forms and certificates can be found at [The Danish Working Environment Authority \(Arbejdstilsynet\)](#)

Building site arrangement plans

The building site must be arranged in accordance with governmental orders and directions issued by The Danish Working Environment Authority (Arbejdstilsynet). Follow-up on the building site arrangement is in the hands of the safety coordinator. The plan (and the registration) must be conspicuous on site. Signposting on site must be adequate. Likewise, unambiguous directions concerning key contacts must be located immediately next to site entrance.

As the building project progresses, revisions will be made to the building site arrangement plan in accordance with the current construction stage.

Quality assurance

A governmental order concerning quality assurance of publicly subsidised construction work was issued in 1986. The order was issued with the purpose of reducing failure and errors in construction work. Most private clients have opted to follow the rules in this order.

Additional information can be found here: [The Danish Building Defects Fund \(Byggeskadefonden\)](#).

The client must, in conjunction with the main contractor, approve a subject-oriented quality assurance handbook. The different types of forms and documentation used for acceptance check, process control and final check must also be approved. The main contractor shall participate in a project examination meeting together with the client or his consultant. Quality assurance procedures will be defined and approved at this meeting.

Procedures for quality assurance at the up-start of new works must be defined. Procedures for quality assurance at trade contract shift must also be worked out.

The main contractor works out a supervision plan for sub-contractors and for work in own production in correspondence with the tender control plan.

Documents worked out by [The Danish Construction Association](#) (Dansk Byggeri) may be used in this connection. Documents related to handing over issues and to the use of sub-contractors may also be found here.

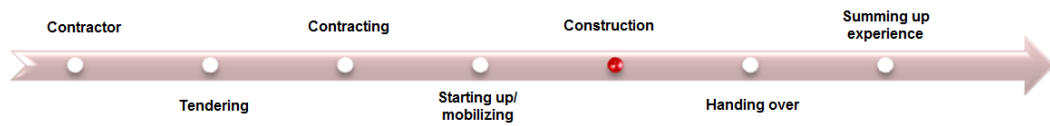
Sub-contractors' quality assurance procedures, forms and other documentation must be approved, and they must be informed that quality assurance constitutes part of the outputs agreed upon in contracts or agreement forms.

04. Starting up / mobilizing

[Enclosures examples](#) Starting-up/mobilizing

05 Construction

Introduction



Construction legislation

During the construction phase it is important to keep track of whatever changes may occur in contract conditions.

As a starting point, contract work will be carried out as agreed in the contract. In case it should prove necessary to change the contract conditions, it is required to draw up an additional contract, stating agreed alterations – Cf. [AB92](#) section 14, subs. 2

As a minimum it is required that the agreement is entered in the minutes from the site meeting. However, it is better to fill in an agreement form - can be downloaded from The Danish Construction Association ([Dansk byggeri](#)).

When agreements on extra works are entered, the contractor shall provide normal security to the client.

In cases where the contract is extended by the inclusion of extra works the contractor may, however, demand an increase of the clients' security - if the remuneration for all extra works – excepting those already paid for – exceeds 50 % of one month's average payment as agreed in the initial contract - cf [AB92](#) section 14.

The contractor takes care of registrations, applies for permits, asks for inspection and procures certificates - all in relation to the execution of the agreed work. The contractor also covers whatever costs this may accrue.

The contractor bears the risk for all work until it is handed over. He is also responsible for maintenance of work done until handing over. Hence, it is important that the contractor takes out an insurance covering his contract area against accidental damages such as , theft, wanton destruction and weather impact – areas not covered by the client's insurance against fire and storm.

The client's payment obligations appears from [AB92](#), section 22. Payments are made on the basis of interim payments – any deviations from this method of payment shall appear in the tender documents.

Work must be carried out in accordance with the agreed time schedule and the contractor is only entitled to extensions of time limits in case of delay of the work as described [AB 92](#) , section 24. Sanctions in the case of delays will be penalties or compensation in accordance with Danish legislation.

In case of disputes during construction it is important to secure and gather evidence. This may take place by requesting an inspection and survey by experts of the work in question. In this case one of the parties forwards a petition for inspection by

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experts and survey to the Building and Construction Arbitration Board in Copenhagen. Decisions made by the Arbitration Board are irrevocable. The rules applying to inspection and survey by experts are outlined AB 92, sections 45 and 46.

In case AB 92 is not applicable, legal action shall be taken through the court of law.

Script

General

The script concept derives from film production. The script describes every single scene of action (process) down to the last detail. The script is prepared because film production is very costly and nothing must fail.

The same applies to construction work and this is the reason why it is an advantage to use the same tool in this context.

Background

Construction / renovation of a building involves a number of construction processes. Knowledge about the content and the interrelationship of these processes are essential conditions in order to be able to carry out rational construction and at the same time achieve tight management and good quality assurance throughout the building process.

Purpose

A script is worked out with the purpose of familiarizing with the construction processes and thereby achieve a systematic overview aimed at a successful completion of work in own production.

Tools

As an example one could select two processes in own production and make a breakdown into the activities involved in the selected processes. Subsequently, the individual activities are systematically scrutinized and script notes are made – possibly in a systematic list

The connections to preceding and succeeding activities are noted down. Notes, indicating necessary check points as well as tools and accessories (material catalogues) to be used during construction, are entered. Such notes could refer to scaffolding, crane, form work, barricading, waste containers etc. A materials catalogue listing all necessary materials is also worked out as well as risk assessment of individual activities.

Coherence with other documents

A short description of coherence between individual documents:

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- Check points form the basis for quality assurance such as delivery and process control.
- The process diagram forms the basis for the detailed time schedule of own production. .
- Risk assessments forms the basis for a plan of action.
- Systematic knowledge about the construction processes forms the basis for building site arrangement and financial control

Work drawings

The main contractor (The individual trade contractor, the turnkey contractor) needs to work out the drawings determined for the construction work.

Examples:

- Building site arrangement plan, where changes will occur as the construction progresses through different stages
- Erection plans for elements and a matching delivery plan
- Casting plan indicating casting segments - design of casting joints
- Bending lists
- Sketches, elucidating and explaining work implementation – possibly in 3D.
- Interim constructions

Management / building project control

Based on the outputs jointly defined and by the parties involved in the building project and described in the contract, it is the project manager's task to manage the building process in accordance with:

1. The contractual agreement
2. The agreed time framework
3. The agreed tender sum + funds allocated for contingencies, winter provisions etc.
4. The agreed quality assurance corresponding to quality as documented in the tender documents.
5. The agreed building site conditions and current requirements concerning safety at the building site etc.

Meeting agenda

In order to ensure a satisfactory content when meetings are held, it is recommended to arrange meetings with an agenda based on experience and send to participants well in advance of the actual meeting.

Meeting examples:

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- Starting up meeting / project examination meeting
- Site meeting
- Safety meeting

Holding meetings

In order to secure the project implementation in accordance with the above mentioned steps, the following meetings should be held during the course of the building project.

- | | |
|---|---|
| 1. Project examination meeting (kick-off) | After contracting / before upstart. |
| 2. Starting-up meeting / mobilization meeting | immediately before start |
| 3. Site meetings | Normally once a week. |
| 4. Safety meetings | Normally once every second week. |
| 5. Meeting for handing over of work | After notice of completion - before occupation. |
| 6. 1 year inspection | 1 year after handing over. |
| 7. 5 years inspection | 5 years after handing over |

In addition to the above mentioned meetings, the project manager and the trade supervision may call meetings, as and when needed, in order to clarify matters related to: details in solutions, financial aspects, time planning and follow-up on quality assurance and safety etc.

Minutes

In order to secure that agreements made at meetings are legally binding for the parties involved it is required to take minutes and to approve such minutes. This procedure may require approval by signatures and shall be duly dated.

Objections raised concerning the minutes may be oral in the next meeting, or in writing, before the next meeting, but attention should be drawn to the fact that written objections may cause conflict.

Signed agreements

An agreement may be verbal but in case it is not honoured, it may be difficult to prove for lack of documentation.

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Minutes and a signed agreement facilitate follow-up and provides a higher degree of security.

Quality assurance

The optimal starting point for quality assurance is that quality is well documented in the tender documents in such a way that the following is agreed when contracting:

1. Project examination meetings (kick-off meeting)
2. The contractor's quality assurance handbook
3. Adequate specifications of material quality and workmanship in the building component specifications.
4. Demands for necessary preparations in connection with the execution of work.
5. The contractor's own control, (tender control plan in the work specification).
6. Demands for documentation of the contractor's delivery control, process control and final control.
7. Demands concerning documentation for operation and maintenance, including operational manuals
8. An account of contractor's conditions with respect to trade supervision.
9. Handover + 1- and 5 years inspections.

A good draft agreement for quality assurance during tender and contracting facilitates the implementation of quality by project management.

The contractor' quality assurance handbook

The contractor works out a subject-oriented quality assurance handbook based on the company's quality assurance handbook and quality demands in the tender documents. The handbook contains a description of procedures and systems to be used for quality assurance and project management. .

Additional information [The Danish Construction Association \(Dansk byggeri\)](#).

Control plans

The client defines his quality demands in the tender documents in the form of tender control plans. During the starting up phase, and based on these plans, the contractor works out his own control plans for delivery control, process control and final

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control. These plans are filled in during the building project and are handed in at handover

Supervision plans

In order to ensure that the client gets the desired quality, the designer works out a supervision plan showing the extent of supervision of the contractor's workmanship and also showing the extent of general supervision of the construction work.

The plan is worked out by the designer during the design phase. Supervision shall be conducted in areas where the risk of failure is eminent.

For more information [The Danish Construction Association](#) ([Dansk byggeri](#)).

Follow-up - and keeping the time plan

In a successful building project the keywords are: Planning and management.

The following issues should be considered when planning and managing a building project (may vary in accordance with the size and type of project in question):

1. The framework of the contracted tender time schedule must be enforced.
2. Basically, the time schedule shall be realistic – incorporating planned inclement weather days.
3. It may be an advantage to include all trades in the detailed implementation planning (this could be done through workshops in connection with the start-up meeting).
4. Time-critical deliveries shall be attuned with the detailed plan
5. Running update / status on forthcoming work, supplies and issues that might disturb the planned work should be carried out and recorded in the minutes of the weekly site meetings
6. Follow up may be carried out using 1 and 5 week plans respectively.

Payment / construction accounting

In principle, the payment for building and construction work may be carried out as follows – cf [AB92](#) section 22 :

- Subs 1: Monthly interim payment certificates.
- Subs 2: Instalments plan

The principle of monthly interim payment certificates is as follows: By the end of each month, the contractor and the client calculate the total value of work carried out at the site. This amount is deducted the value of work already carried out and paid

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for. The difference corresponds to the value of the work carried out during the month in question. Payment is carried out as agreed in the contract.

In case of overdue payment, the client is bound to pay interest as from the day the interim certificate was received until the day of actual payment. This mode of payment is the most commonly used – not only between client and contractor but also between contractor and his sub-contractor(s).

The principle of an instalments plan is as follows: The value of characteristic parts of the building is calculated – for example ‘basement completed’, ‘roof on building’, ‘building heated’ or the like. An instalments plan could also be a plan where monthly payments are calculated on the basis of the initial time schedule.

Financial follow-up

Financial follow-up is one of the most important tasks of the project manager. In most cases, the project manager is required to account for the financial position of the project once a month, and the company will form an estimate of his ability to document company finances, which ultimately may have influence on his own payment (payment by results). It is therefore important to build up a system with the purpose of recording actual production costs and compare these costs with the calculated costs.

In this way it is possible to check whether the budget corresponds to actual costs, which reflects the current financial position and allows for a calculation of the final financial result of the building project in question.

The project manager must always be in a position to tell whether the calculated contribution margin is realistic - and if not, explain why.

The financial follow-up on a building project is an ongoing process because, in addition to the above mentioned, there is a constant flow of extra works resulting in additional income and thereby an increase in the contract sum and production costs. Unexpected costs may occur and expenditure to cover these must be entered in the follow-up schedule without delay.

Operation and maintenance

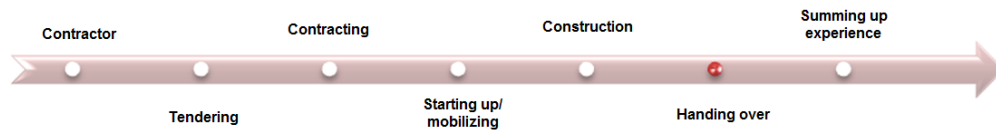
In turnkey contracts it is the duty of the turnkey contractor to work out operation and maintenance manuals.

In main and individual trade contracts, the contractors hand over the material to the consultants who in turn will work out the manuals based on the received material. .

[Enclosures examples](#) Tendering

06 Handing over

Introduction



Handing over contract

The contractor informs the client about the time of completion of the work. The client then convenes a handing-over meeting to take place within 10 workdays of the time indicated.

In case the work composes several contracts, all contracts shall (as far as possible) be completed before the handing-over meeting can take place.

Prior to the handing-over meeting, the contractor examines the work in order to establish possible essential defects.

The decision whether work is completed on time or not solely depends on the predefined work completion time as set by the contractor in the completion notice, whereas the handing over time is decisive for transfer of risk, responsibility etc.

In case essential defects are established during the handing-over meeting, the work cannot be handed over. An essential defect is defined as a defect that impedes occupation.

In case a defect is deemed essential the contractor shall rectify the defect and a new handing-over meeting is convened.

Postponement of hand-over due to essential defects may result in delay and consequently in the payment of penalties.

In cases where only minor defects are identified the client may withhold part of the contract sum until the defects have been rectified.

The handing-over date affects:

- Who bears the risk for the construction work – including duty of maintenance.
- Respite for submission of final accounts
- Defects assessment
- 5-years rule for complaints
- Deadline for rectification of defects
- Reduction of contractor's security bond
- Determination of the limitation period

06. Handing over

In cases where the tender documents state that the contractor shall submit documentation for operation and maintenance, a request for the handing in of such documents must appear in the invitation for the handing-over meeting.

Concluding the handing-over meeting, reasonable time limits are set for the contractor's rectification of 'non-essential' defects as well as the amount to be withheld from the contract sum, and a date for a new examination of the project - cf [AB92](#)

Once the building project is handed over to the client also the responsibility for coordination of health and safety as well as the safety plan are handed over. Finally, all documentation pertaining to the management of health and safety throughout the building project is also handed over to the client.

[The Danish Association of Construction Clients \(Bygherreforeningen\)](#) has, on an experimental basis, introduced what they term 'new handing-over'. This is an attempt to reduce defects and shortcomings in construction work.

Once the work is handed over the contractor's security bond will be reduced to 10%

For a period of 5 years after handing over, it is the contractor's right and plight to rectify defects established after handing-over.

In case the contractor does not rectify such defects, it is the client's right to rectify the defects and make out a bill to the contractor, or - demand a reduction in the contract sum.

The client's claims against the contractor in connection with building and construction work must be forwarded 5 years upon handing-over - at the latest.

However, the client's claims may be maintained for those parts of the work where:

- 1) The contractor has agreed to guarantee for an extended period of time.
- 2) It is being established at the handing-over that agreed quality control has essentially failed

or

- 3) Issues of gross negligence on the part of the contractor have been observed.

Handing over with sub-contractors

The main contractor should only conduct a handing-over meeting with his own sub-contractors after handing-over has taken place with the client. In this way he maintains his right to claim rectification of defects from a given sub-contractor in the work carried out by the said sub-contractor, and which may be established during his hand over to the client.

By doing so, the main contractor also ensures that his time limits for complaints towards the subcontractor run for a longer period of time than the client's time limits for complaints against himself. In this way the main contractor can avoid ending up in a situation where he will be made responsible for defects caused by the sub-contractor.

06. Handing over

A sub-contractor can enter an agreement of conditional hand-over with the main contractor, which means that the security bond can be reduced but time limits for complaints will depend on the time when the main contractor hands over to the client.

From the main contractor, the sub-contractor receives a trade-specific handing-over protocol listing defects and shortcomings in the work carried out. The protocol also states the latest time for rectifications of defects.

Final payment

Within 35 workdays of handing-over, the main contractor shall submit final accounts to the client- cf. [AB92](#) section 22. The final accounts must be final. Due to inclement weather it may not, however, be possible to terminate certain works, for example garden work. In such cases a certain amount of the final payment can be withheld, or it can be agreed to convene yet another handing-over meeting where uncompleted parts are being finally inspected and accounts settled.

In case the client is not in receipt of the final accounts at the expiry of 35 workdays of handing-over, he may submit a demand requiring the account to be forwarded within 10 workdays thereof.

If the contractor fails to submit the account to the client within this period, he shall forfeit his right (i.e. he loses his right) to claim payment as reimbursement for wage and price increases - cf. AB92, section 22 subs. 8 and 9.

1 and 5 years inspections

The client summons the contractor for an inspection of the work which shall take place one year after handing-over, at the latest. The client also summons the contractor for a final inspection of the work which shall take place at the latest 30 days prior to the expiry of a 5 year period after handing-over. The invitation deadline is defined in [AB92](#) section 39. for. In case the client has not summoned for the inspection as mentioned, the contractor may summon the client. The contractor's invitation shall be in writing and made minimum 10 workdays prior to the day of inspection.

Relevant documents to be used during 1 and 5 years inspections may be downloaded from The Danish Construction Association ([Dansk Byggeri](#).)

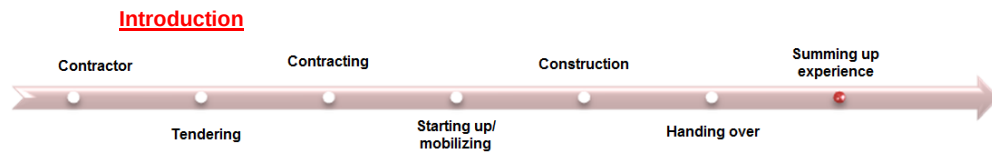
The condition and possible defects are registered during the 1-year inspection.

During the 5-years inspection it is controlled whether essential defects established during the 1-year inspection have been rectified. Also such defects that the client may have established after the 1-year inspection are registered.

Special rules apply in case works are covered by [The Danish Building Defects Fund \(Byggeskadefondens\)](#)

[Enclosures_examples](#) Handing over

07 Summing up experience



Summing up technical risks / experience bank

Once the project has been handed over to the client it is expedient to sum up the experience gathered. Subsequently, a report is produced and handed over to the company.

The experience collected is an evaluation of the building project in question with respect to the below mentioned issues:

Own organization	Internal professional competencies – were they sufficient?
Parties involved in the project	How was the cooperation during the course of the project? - Client - Consultants - Supplier - Sub-contractors
	A mark book may be worked out giving grades
Finances	Final calculation of the building project Profit? Contribution margin?
Risk	Calculated risk percentage – was it sufficient?
Planning and management	Was time schedule observed? Was follow-up sufficient?

07. Summing up experience

Technical risks	Was the information in the project documents regarding risks sufficient? - Quality of the project - Personal injuries (accidents and near-by-accidents) - Finances - Time
Materials	Good / bad experiences with materials
Equipment	Good / bad experience with the use of equipment
Handling authorities	How was the communication with authorities and with The Danish Working Environment Authorities?
Handing-over process	Defects and shortcomings? Conflicts?
The building project in general	The course of the building cycle
Particular experience in relation to:	- Quality assurance - Working environment - Environment - Professional issues

The company uses the experience gathered as an internal tool for future projects in order to optimize a project on the basis of previous experience. Based on this the contractor may work out 'hands-on-experience' leaflets containing solutions to problems repeatedly experienced in different building projects

[Enclosures_examples](#) Summing up experience