

THE HANDOVER PROCESS

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A JOINT PROCESS WITH A PRE-INSPECTION PROVIDES FOR A GOOD HANDOVER.

The handover is an important process for a successful construction project, and the amount of defects at the time of handover is often a topic of discussions on improving the quality and productivity of the construction work. These defects cost time and money for both clients and contractors, so they have a mutual interest in improving the process up to the time of handover and hence come closer to the goal of a defect-free handover.

The handover is a crucial point as a conclusion to the preceding building process. It is also a legal turning point for a construction project, which is well-defined in the agreed documents AB92/ABT93. Active and constructive collaboration between the client, consultants and contractors throughout the construction process is an essential condition for the project to be handed over without any defects at the handover meeting. By investing in early action, prevention and focus, the subsequent rework will be reduced or entirely eliminated.

Focusing on the handover process alone will not address the quality issues facing the construction industry. This guide deals with a specific area, which is clearly a consequence of many other problems that need to be addressed earlier in the process (see Værdibyg's other guides). A good handover starts right back at the planning stage of a project and calls for a realistic schedule. It is all about creating a good, professional quality culture throughout the construction process, but regardless of the preceding construction process, the handover will call for focused efforts.

This guide contains a number of examples of activities and methods which do not claim to be exhaustive but may help to improve the concluding process up to the handover. In particular, it introduces pre-inspection as an activity to ensure fewer errors and defects at the time of handover. The guide should be read in conjunction with AB92, and it does not alter anything in AB92 or the practice associated with it.

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APPENDICES CAN BE DOWNLOADED FROM WWW.VAERDIBYG.DK

ABOUT THE GUIDE

This guide focuses on the handover process, and particularly on the process up to the handover. The legal handover is briefly described with reference to AB92. The guide is concerned with working proactively to ensure a good handover for the client, consultants and contractors.

The guide introduces the pre-inspection activity (sometimes called the pre-handover), which takes the form of a dialogue and process between the parties up to the handover. Pre-inspections are already used in practice on many building projects, at the instigation of clients, consultants and contractors. This is not a new kind of handover in the legal sense as defined in AB92, but a process involving keeping records in preparation for the actual handover meeting.

It is worth noting that the proposed model does not involve any change of practice in relation to the contracts entered in today, but focuses on collaboration between the parties in the building process, so the handover can take place without any defects. The structure of the pre-inspection will help to ensure that there are fewer errors and defects – which is a benefit for all involved.

Clients, consultants and contractors often find that many problems only manifest themselves at the time of handover. However it is important to state, that this initiative is not a universal solution to all the quality issues facing the construction industry. In this guide, we try to rectify the many errors and defects at the time of handover rather than tackle the challenges that cause these errors and defects and need to be addressed earlier in the process (as described in Værdibyg's other guides).

BEFORE AND AFTER HANDOVER

The guide focuses especially on the activities up to the legal handover. This work involves an interplay between the client, consultants and contractor (and also between the contractor and its sub-contractors). We also present some good tips on the client's handover of the project to the users. This is not part of the legal handover and does not involve the contractors.

DIFFERENT CONTRACT TYPES AND ROLES

This guide basically treats all types of contracts (turnkey, principal and trade contracts) as one. In some places, however, there are specific aspects that apply to a given type of contract, particularly in relation to the consultants:

- **In a turnkey contract** there will often be a client adviser who handles the tasks of the construction manager and the professional supervisors in the handover process – in consultation with the turnkey contractor.
- **In a main contract** the client will be assisted by the construction manager and the professional supervisors, but the main contractor will handle more tasks relating to its sub-contractors.
- **In a trade contract** the client will be assisted by the construction manager and the professional supervisors, and there is direct contact with the individual trade contractors (and their sub-contractors). The construction managers may have a crucial coordinating role to play here.

BASIS FOR A GOOD HANDOVER

TERMINOLOGY.

This guide uses the following terms:

- **Pre-inspection:** A process that starts some time ahead of the handover and includes recording, reviews and dialogue between the client and the contractor on the completion of the project.
- **Sub-project inspection:** Review of own work by the individual trade or sub-contractors prior to the pre-inspection.
- **Handover:** 'Handover' as defined in AB92/ABT93 (the guide refers only to AB92). The contractor's legal handover to the client. The risk passes to the client at this point.
- **Partial handover:** Handover of a single contract at a different time from the overall handover specified in the tender specification.
- **Rectification:** A limited period allowed for under AB92 for rectification of any defects.
- **Defect inspection:** Meeting following rectification of the defects that (despite the best intentions) were not rectified by the time of the handover. In other words, a review of the work after the agreed period for rectification, to enable the client to transfer the building to the users.
- **Handover (meeting):** Formal transfer from the client to the users.

The handover process is a key part of a successful construction project¹, but there are many parameters that must work together to produce a good handover process. The basis for a good handover lies in organising the whole process. A good handover benefits the contractors, the consultants and the client. So it is important for the client, consultants and contractor(s) to align their expectations early on if a pre-inspection is to be used to prepare for the formal handover. Clarity is also required for the procedure between the contractor and his sub-contractors.

SCHEDULE AND PLANNING

The handover process demands an effort from all the parties involved. In order to succeed, the schedule must be realistic², so that individual sub-contracts can be implemented without any defects. The schedule should allow time for commissioning and handover to the users, and this should also be kept in mind if a deadline is extended or if delays occur along the way.

A good handover is directly linked to a good building process. Among other things, this depends on the client playing an active role and promptly taking the necessary decisions along the way.

In his agreements with sub-contractors/trade contractors, the contractor can also usefully allow time for a sub-project inspection (see page 11) of the individual sub-contracts, so that most defects have been addressed before the contractor inspects the works with the consultant and the client.

AMENDMENTS TO THE TENDER SPECIFICATION

A proactive handover process does not alter the general conditions for the construction industry (AB92). If a pre-inspection is to be used, this should be described

¹ This is documented e.g. in the research reports 'Indicators for defect-free building projects' and 'Processes and methods in defect-free building projects' (by Kirsten Jørgensen et al., 2012 and 2013, DTU)

² See also Værdibyg's guide on 'Scheduling reports' at www.vaerdibyg.dk

in the tender specification or the contract³, so it can be included in both tender and schedule.

EARLY AND PROACTIVE ACTION

Proactive measures to address errors and defects might start off with a good project review. This will enable the consulting engineers and the contractor to improve the buildability of the project and to discover any factors that could imply particular difficulties or risks in the construction phase. This will prevent defects later in the process. This is not just a handover, but a joint process which requires the contractor to be well-prepared and familiar with the project.

The provisions in AB92 on the tender control plan point to an early view on the completion of the work, as well as the responsibility of the client and his professional supervisors to reject any works and materials that do not conform to the contract⁴. It is important for the client to decide early on any rejection in a given area. If the client only rejects unsatisfactory works at time of handover, it will typically be more expensive and difficult to rectify the position. That is why it is in the interests of both the client and the contractor that this should be done as early as possible.

QUALITY ASSURANCE AND PROFESSIONAL SUPERVISION

The handover process is naturally connected to other quality assurance activities throughout the building process. If the ongoing quality assurance works properly, this will minimise the risk of errors and defects in the building. Quality assurance is typically the contractor's responsibility (as described e.g. in the tender control plan), but there should be constant collaboration with the client and the consultants to ensure that expectations as to the level of quality are aligned. This

can be done by active quality assurance work along the way, at meetings with the client and at project meetings between the contractors.

The pre-inspection (which is described in the next section) focuses on ensuring that the agreed quality has been achieved before the handover, and so also facilitates the final documentation of the quality activities. The contents for a quality plan are exemplified in Appendix 1.

ALIGNMENT OF EXPECTATIONS AND MOCK-UPS

It is important for the contractor, consultant and client to align their expectations as to quality etc. at all times, so it is clear what level of quality is to be delivered. This can be done on a regular basis at meetings, possibly supplemented with component samples, mock-ups or show rooms/homes⁵. In this way, the level of quality can be agreed upon in relation to the contractual requirements before the whole project is completed, so all parties have a clear picture of what should ultimately be delivered. With good alignment of expectations along the way, the parties do not need to await the final handover to assess the quality of every single wall. Mock-ups, show homes and the like also enable a better dialogue and alignment of expectations between the client and his end-users.

COMMISSIONING AND TESTING

One of the major challenges for the handover is to monitor whether the project is actually meeting the contractual requirements. Before the building is in use, it may be hard to say whether the installations are working as intended or whether the indoor climate is OK. That is why commissioning and relevant tests both before and after handover are crucial to determine whether the building conforms to what was agreed. The scope of the tests and the documentation requirements for them should be included in the tender specifications and/or contract documents⁶.

³ See example wording in Appendix 8

⁴ AB92 § 11 subs. 4: "During the performance of the work, the client and its professional supervisors may reject work and materials that are not up to contract. Such rejection must be made at the earliest possible time."

⁵ In accordance with the AB92 rules on control plans.

⁶ You can find out more about this in Værdibyg's guides on 'The operations-oriented construction process' and 'The commissioning process'.

PRE-INSPECTION

A good, defect-free handover is the result of a focused construction process. Of course it is based on good preparatory work, always focusing on aligning expectations and assuring quality. But it always demands a focused effort to prepare for the handover.

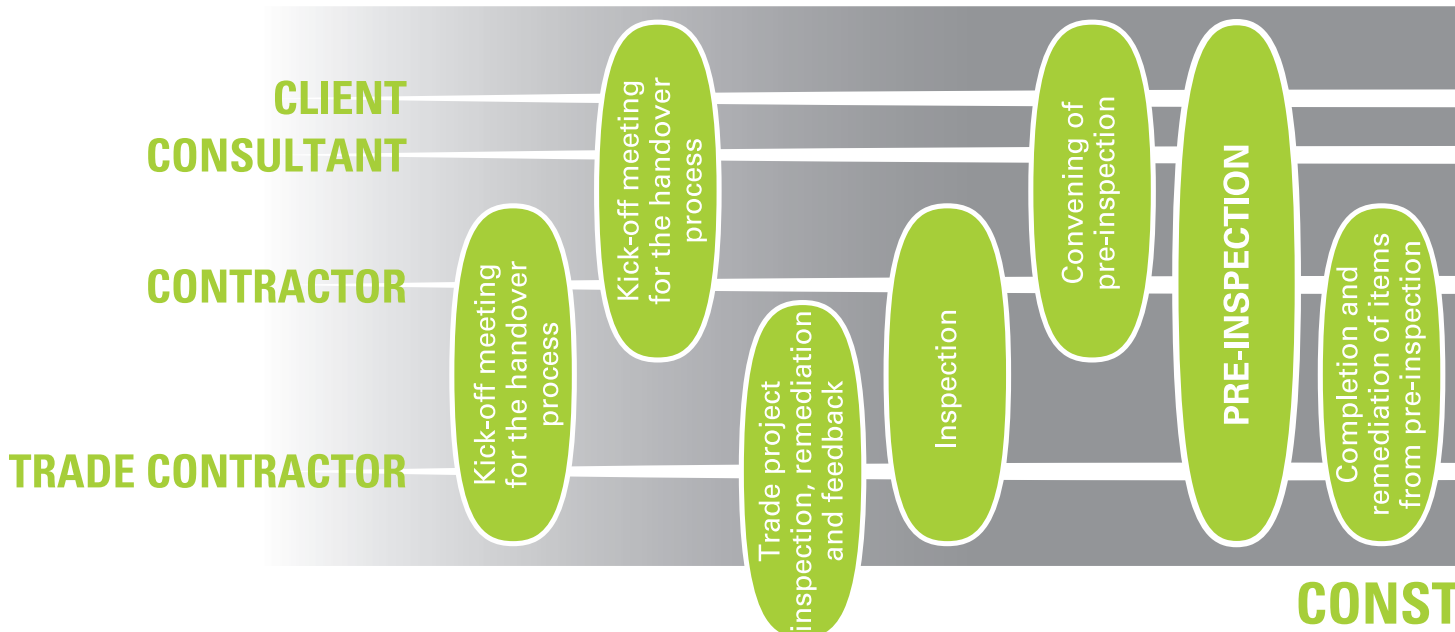
It is about making preparations for the handover into a natural part of the construction process, so the actual handover becomes a simple exercise for all concerned. This proactive handover process does not alter the existing framework (agreements, legislation etc.), but offers a systematic approach and an overview of the processes benefitting all parties.

PRE-INSPECTION

Before the actual handover meeting, the parties may conduct a so-called 'pre-inspection', which is not a formal handover but an exercise in recording, reviewing and a dialogue between the client and the contractor on the completion of the project.

A pre-inspection is a simple but effective step towards a better handover process with fewer errors and defects. The process is relatively easy to implement in the version described here. The first step is to make it clear to everyone what is going to happen during the pre-inspection, and this may usefully be defined already at the planning stage of the construction process and in the conclusion of the contracts⁷.

⁷ See example wording in Appendix 8

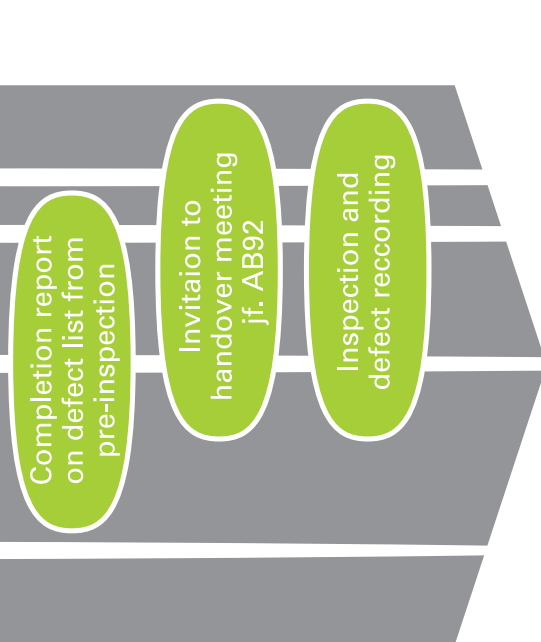


The term 'pre-inspection' reflects the fact that this is a preparation for the actual handover. A similar practice used to be called a 'technical review' or 'pre-handover'.

The pre-inspection process does not affect the division of responsibilities in the handover meeting, and the conveyance takes place in the normal way, i.e. later in the process.

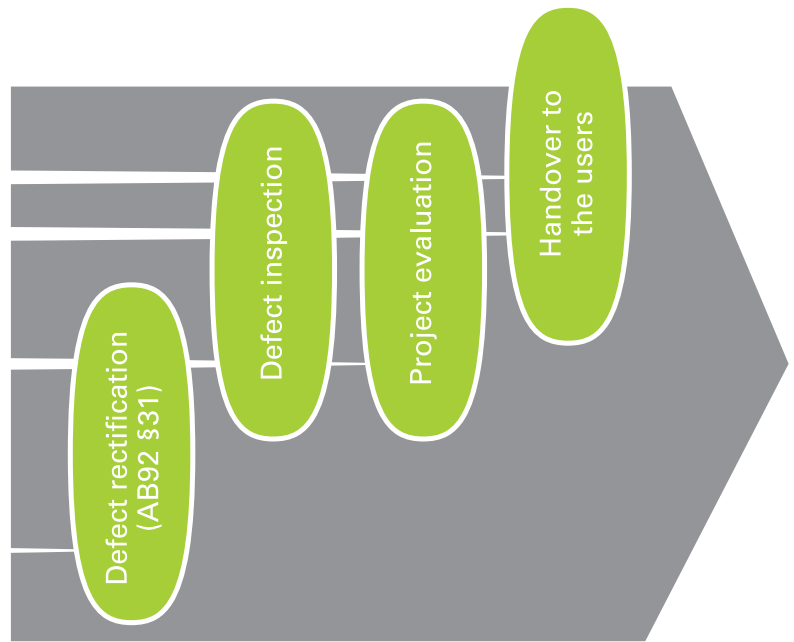
THE HANDOVER PROCESS INCLUDES THE FOLLOWING ELEMENTS:

- Convening of pre-inspection
- Recording of the state of work
- Pre-inspection meeting and review – agreement on completion and defect rectification
- Handover meeting as per AB92/ABT93
- Rectification of any remaining defects from the handover meeting
- Possible defect inspection



CONSTRUCTION PROCESS
CLIENT AND CONTRACTOR

AFLEVERINGSFORRETNING IHT, AB92 §28-29



OPERATION
CLIENT AND USERS

PRE-INSPECTION PROCESS

The client or the consultant will invite the parties (usually giving 30 days' notice) to a review/recording of the work – e.g. when 20% of the construction time is remaining (depending on the size and complexity of the project).

The pre-inspection involves contractors, consultants and the client. The client should be assisted by a person representing operations who has an understanding of the construction process – ideally an employee responsible for the subsequent technical operation of the property. This operations person should participate on the basis of his/her understanding of the project and knowledge of how the particular building is to be used. However, the inspection only concerns matters related to the requirements in the tender specifications/contract.

In good time ahead of the pre-inspection (e.g. a week before), the construction manager and the professional supervisors should prepare the following material in collaboration with the contractor⁸, to be sent to all participants:

- Records to show the degree of completion⁹, and details of critical elements in the remainder of the work period
- Completion plan broken down into activities and staffing
- Plan for adjustments and tests
- Plan for handover of the 'as-built' project, operations data, digital handover, instructions to operations staff etc.

The actual pre-inspection is a meeting lasting a few hours between the client, consultants and contractor(s). The parties discuss the time up to the handover, focusing on the remaining works and rectifying defects. The meeting also includes a tour of the site. See an exam-

8 In the individual project, it should be agreed (quite early) how these documents are to be produced. In some cases, it makes most sense for the contractor to provide a draft.

9 See example status report for pre-inspection in Appendix 2.

ple agenda for pre-inspection and a checklist for use at the meeting/inspection in Appendices 3 and 4.

The supervisor and/or construction manager should draw up minutes from the pre-inspection, with conclusions. The pre-inspection should result in a completion plan setting out a realistic process to carry out the remaining works, so the handover can take place as agreed. There should be an overview of commissioning and the execution of the relevant tests and adjustments. Unless this has been done earlier, it will also be a good time to produce a plan for handing over operations data and instructing operations staff¹⁰.

The pre-inspection will help the turnkey/main contractor and sub-contractors to agree on completion with the client, and to reduce the number of defects ahead of the handover meeting. The pre-inspection process is a natural transition between quality assurance and the handover meeting, including handover of the quality assurance documentation and operating and maintenance instructions. At the same time, the construction management and professional supervisors will be better able to monitor whether the work is being carried out as planned.

It is recommended that the pre-inspection, with procedures and forms, should be incorporated into the tender specifications and contract documents for consultants and contractors, and also into the agreements between the main contractor, sub-contractors and construction crews. It is possible to use bonus agreements, instalment payments or deadlines subject to penalties as an incentive for a good handover process.

Evaluations of the use of the pre-inspection process¹¹ show that clients, consultants and main contractors who have been directly involved have also benefited from the pre-inspection.

10 You can read more about the handover to operations and commissioning in Værdibyg's guides on 'The commissioning process' and 'The operations-oriented construction process'.

11 These evaluations are documented in the publication 'A new handover process for the construction industry' (2009), published by AlmenNet and the Danish Association of Construction Clients.

SUB-PROJECT INSPECTION

Several contractors have successfully introduced a 'sub-contractor inspection', in which they conduct a pre-inspection with the individual sub-contractors – quite independently of the client. The contractor assembles his suppliers and trade contractors for a meeting about the handover with the aim of planning and managing the handover process and the expectations to the sub-contractors.

In accordance with the plan, the individual trade contractors first conduct their own sub-project inspections in order to identify any defects within their own area. Some defects can be rectified immediately, while others are listed to provide an overview of the remaining work, which the trade contractor subsequently carries out and reports to the contractor as complete. Experience shows that self-monitoring encourages a sense of ownership of the process and a better quality culture.

Just as the pre-inspection should be agreed between the client and the contractor, it should also be agreed early on between the contractor and sub-contractors (in the contract) that there should be a trade project inspection before the final handover.

The trade project inspection means that the contractor is ready for the pre-inspection with the client and the consultants, and the individual trades know what is expected of them in the final phase of the project.

After the pre-inspection, a meeting between the contractor and sub-contractors to follow up on the pre-inspection with the client should be organized.

RECORDING OF DEFECTS

To keep control of the large documentation volume associated with the handover process, it is a good idea to clarify what specific procedures are to be applied. This should be decided jointly, so the parties can build on their good experience or benefit from each other's methods and tools.

It is a good idea to have aligned expectations as to the level of quality and defects early in the project. If there are disagreements on the level, it is important to get these clarified. Inspiration may be taken from various industry guidelines and instructions.

DEFECT LISTS

Effective defect lists are crucial to the handover process, in providing an overview and systematic defect remediation and handover. There are many different approaches. With all methods, it should be clear who has the overview and is responsible for updating the overall defect list.

The defect list will typically include

- The number of the defect
- The location of the defect (building, floor, room-no etc.)
- A description of the defect and when it was found
- The contractor responsible for rectifying the defect
- The deadline for rectification
- A flag set when the defect has been rectified
- Approvals (self-monitoring, construction management, client)
- Space for comments, including specific matters relevant to assessing the defect
- Possible references to documents

An example of a defect list can be found in Appendix 5¹².

¹² You can also download the file from www.vaerdibyg.dk

RECORD OF DEFECTS

The defects are recorded in the defect list to make it easier to check whether a defect has been fixed. Clear numbering and details of the location are therefore essential. This can be done in two ways:

POST-ITS AND OVERVIEW DRAWINGS WITH NUMBERS

The defects should be shown on plans of the building, with numbers referring to the defect list.

Defects may also be marked in the building with a small sticky label or coloured post-it notes (or similar). The labels should state which contractor is to rectify the defect (it may help to use different colours for the various trades), with a number referring to the defect list and possibly an overview drawing. This will help the individual trades to get through the remediation work quickly.

PHOTO RECORDINGS

Pictures can also be taken of the defects. This may help to clarify or explain the location of the defect or what needs to be done. Photo recordings could be used in combination with a simple defect list or alongside more advanced IT systems for defect recording.





DIGITAL DEFECT LISTS

It is helpful to use digital defect lists. The digital defect list can be adapted to different uses at different stages of the digital handover process:

- As a checklist when producing records – e.g. for a pre-inspection
- As a final check ahead of the handover meeting
- As a defect list for the formal handover meeting, and for subsequent remediation and final inspection
- At the 1-year inspection – and subsequently at the 5-year inspection

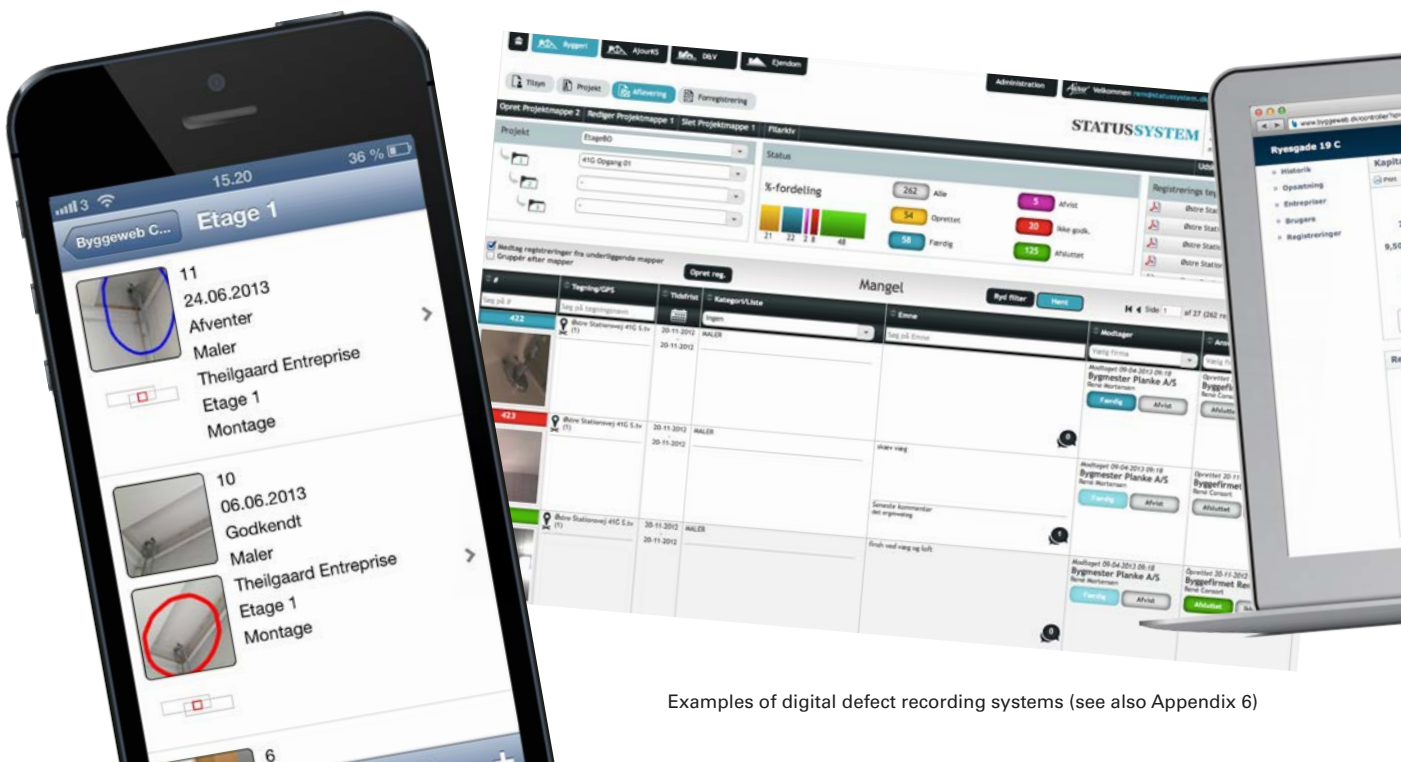
The use of digital defect lists supports a standardised approach to the handover process. It is also important for everyone to have access to the defect lists online, thus making it possible to work with a dynamic list. This means, for example, that the rate of rectification can be checked day by day and that the list is always up to date. This is a great advantage both for those directly involved – the professional supervisors and the contractors – and for the other parties in the process.

Based on the BIPS standards¹³ several digital systems have been developed to handle defect recording during the project. The digital tool typically keeps track of controls and documentation of quality, and the extent of the work done. All records and photographic documentation can be digitally linked to the project drawings. A defect can then be found digitally in the drawings by the contractor responsible, with the precise location, a description of the defect and a photo attached. All of this was listed on e.g. a tablet on the day when the defect was found. A checkbox will send an e-mail to the professional supervisors when the defect has been rectified. Records and photos combined with digital drawings can be used along the way, and may ultimately be included in the overall documentation material supplementing the control forms.

Often, however, a simple Excel file¹⁴ may be used, which can best be placed on a shared server (e.g. Google Docs or Dropbox) where everyone can work on the same document, thus reducing problems with different versions. Both solutions can be used on tablets

¹³ You can find guides to and examples of digital defect lists at www.bips.dk

¹⁴ You can download the defect list in Appendix 5 as an Excel file from www.vaerdibyg.dk



Examples of digital defect recording systems (see also Appendix 6)

(iPads etc.) or smartphones, which the workers can use on site. This will enable an agile process in which everyone can assist with remediation and approval.

KEEP IT SIMPLE

The paperwork involved in recording and keeping track of defects should not be excessive. It should be remembered that the aim is to eliminate the errors – not to document them. Sometimes it is quicker to fix the defect on the spot rather than spending time recording it in an IT system or a defect list.

Communication on defect rectification should generally be kept to a practical minimum. For example, the principal contractor should draw up a defect list for each trade contract. The trade/sub-contractor will receive this by e-mail – but the contractor's project manager will also make sure to place a copy the foreman's pigeon-hole.



DON'T SPEND TIME ON ADMINISTRATION

"On some projects, we have successfully focused on not administering defects in the final phase but rather on rectifying defects at this stage. Our experience is that a lot of resources can be spent on recording, writing down, photographing, communicating, sending back and forth, checking up and documenting defects and the rectification process. It may take just 5 minutes to fix a single small defect, but hours to administer it.

We have worked with multi-disciplinary defect teams, where people from consultants and contractors spend 1-2 days together with workers from all the trades to deal with defects without anything being written down. Simply by noting defects on post-it notes and identifying, marking and pointing out the defects, it becomes possible to significantly reduce the number of defects in the actual handover. As all trades are represented at these defect rectification days, the vast majority of issues are resolved without problems, and right away. When this process has been completed, the actual 'formal' defect recording and defect list can be produced. Now only the few remaining defects need to be recorded.

The costs arise from the fact that everyone has to provide resources for defect rectification from all the trades. This often means 6-10 workers and perhaps some consultants and a project manager to manage the rectification work. All in all, however, I think the investment pays off in administrative savings.

It is striking how many defects can be fixed in this way through direct dialogue, without spending time recording them and maintaining lists to be sent back and forth, which can be hard for the workers to understand."

Lars Jess Hansen, Enemærke & Petersen

THE HANDOVER

THE HANDOVER MEETING, AFTER THE PRE-INSPECTION

The traditional handover meeting should be held as described in AB92 (see box)¹⁵. If a pre-inspection process was carried out, the handover will be much easier, as most of the documentation will already exist and the number of errors and defects will be significantly reduced.

The contractor reports the work as complete, and a handover meeting is convened in accordance with AB92.

The contractor's active involvement in the pre-inspection should be specified in the contract agreement. This could state, for example, that the contractor should provide the following materials to the professional supervisors/construction manager prior to the review:

- Completion report stating that the work has been completed, or what work/remediation is still outstanding
- Plan for rectifying the remaining defects (superfluous if a defect-free handover is realistic; it should anyway include only very few and simple defects)
- Operations data for the contract(s) and documentation of training given to operations staff, and other materials called for in the agreement with the contractor (quality assurance documents, operations and maintenance guides, software, instructions etc.)

Prior to the handover meeting, the professional supervisor (consultant) should check that the work is complete on the basis of the material provided.

The handover will take place at a handover meeting involving the contractor and the client along with the construction manager and professional supervisors. In the case of turnkey contracts, where the client adviser

¹⁵ The book 'AB92 for practitioners' contains both the rules and comments on how they should be applied in practice.

From AB92: F. Handover of the work

HANDOVER MEETING

§ 28 Just before completion of the work, the contractor must inform the client in writing about the time of completion (completion notice). The client shall then invite the contractor to a handover meeting to take place within 10 working days of the time indicated; but cf. subs 4.

Subs. 2. The work is regarded as handed over to the client upon the conclusion of the handover meeting, unless material defects were discovered in the course thereof, in which case, a new handover meeting shall be arranged, to be held when the contractor has informed the client in writing that rectification has taken place, cf. subs. 1.

Subs. 3. If the client does not convene a handover meeting as provided in subs. 1, the work shall be taken to have been handed over 10 working days after the stated time of completion. The same shall apply in relation to a new handover meeting as provided in subs. 2, second part.

Subs. 4. Where the work comprises several contracts, the client must await the completion of all contracts before convening the handover meeting. However, it may have been provided for in the contract or appear from the circumstances that contracts or parts thereof are to be handed over at different times or that building sections are to be handed over separately.

Subs. 5. For engineering works – apart from those mentioned in § 36, subs. 1 – the individual contracts shall be handed over separately, unless otherwise agreed or indicated by the circumstances.

HANDOVER PROTOCOL

§ 29 During the handover meeting, a document shall be drafted (the handover protocol), in which shall be listed any claims for defective work and any other circumstances pointed out by the client. In addition to any comments made by the contractor thereon. It must appear from the document whether the parties consider the work as having been handed over or not.

Subs. 2. The document shall be signed by the client and the contractor.

Subs. 3. If either party is unrepresented at the handover meeting, the meeting may proceed without the representation of said party. The party present must as soon as possible inform the other party in writing of the proceedings of the handover meeting and of the contents of the handover protocol.

is involved, this adviser may handle the defect inspection and handover meeting.

According to AB92, the handover will be deemed to have taken place when there are no material defects, and the risk associated with the project will then pass to the client. If not, the risk will only be transferred after the significant defects have been rectified and a fresh handover meeting has been held.

The client (or the construction management assisted by the professional supervisors) will draw up a handover report describing defects and any other matters raised by the client and his advisers in relation to the handover (with deadlines for rectification where applicable). In this connection, any errors and defects must be capitalised, as a basis for withholding a reasonable amount from the contract sum until the defects have been rectified. It should also be stated whether the contractor has accepted the defects that have been identified, and whether the work has been delivered by the time of the handover meeting. If the client does not accept the work due to the number of defects, the contractor's response to this should be noted.

PARTIAL HANDOVERS

In some cases, it may make sense to carry out a sequential handover – e.g. for a project implemented in several stages or with many iterations, as in large residential developments.

Partial handovers may also be used to manage expectations of completion and final quality, so this is been defined before the other parts are handed over.

This may then require ongoing pre-inspections for the individual partial handovers, and for the client and the delivery team (contractors and consultants) to meet on a regular basis for partial handovers, which will otherwise proceed as described above.

THE CONCEPT OF DEFECTS

The concept of defects is defined in AB92 § 30 (see box).

Whether or not there are any defects will of course depend heavily on what is described in the tender specifications and contracts. As mentioned at the beginning, it is a good idea to have aligned expectations as to the quality level of materials, surfaces, decor etc. This should be done early in the process – possibly in connection with project review meetings.

'Material defects' is not a precise term, but it is basically a question of whether the building as a whole can be used as intended. A large number of minor defects taken together may thus constitute a significant defect.

THE CONCEPT OF DEFECTS ACCORDING TO AB92, § 30, SUBS. 1:

If the work has not been executed in accordance with the contract, with due professional care and skill or in accordance with any instructions given by the client under § 15, it shall be deemed to be defective. The same shall apply whenever the contractor has failed to provide other services agreed upon in relation to the work.

AB92 deals with "Defective work" in § 30-§ 36:

- § 30 The concept of defects
- § 31 Defects established during handover
- § 32 Defects established after handover
- § 33 Lapse of the contractor's obligation to rectify, etc.
- § 34 The client's right to a reduction of the contract sum
- § 35 The contractor's liability for consequential damages
- § 36 Cessation of the liability for defects

RECTIFICATION

The client, together with the construction management and the professional supervisors, will set an appropriate deadline for rectification of any defects found. These defects should ideally be rectified before the client hands the building over to the users, so they need to be accommodated within the contractor's overall schedule. Rectification can be done more efficiently if the users have not moved in, and discussions on possible moving-in damage etc. will thus be avoided. It is recommended that contractual tests should have been carried out before or during the handover (unless what was tested had faults and needs to be retested after rectification).

The client should allow for a rectification period as part of the construction process. A good construction and handover process will mean that this period can be reduced or eliminated.

DEFECT INSPECTION

When the agreed period for rectifying defects has finished, a defect inspection should be held. Before the defect inspection, the contractor provides a note on the rectification including details of any outstanding rectification work (only agreed postponements caused by weather conditions etc.) to the construction management and the professional supervisors. Remaining defects will be specified with details of the implementation period and any inconvenience to users. Before the defect inspection, the consultant and the client will review the work.

The defect inspection should take the form of a review involving the client, a consultant (supervisor/construction manager) and the contractor.

1- AND 5-YEAR INSPECTIONS AND FOLLOW-UP

The client will convene 1- and 5-year inspections involving the contractor, the consultant and the client. Rules for these inspections can be found in AB92, § 37-39.

It could be a good idea to undertake a final evaluation of the building project alongside the handover process. This could involve a meeting between the client, consultant and contractor, and also between the contractor and its sub-contractors. It is also possible that the project may be subject to more formal evaluation, in line with requirements for evaluation and KPIs.

HANDOVER AND COMMISSIONING

When the handover meeting with the contractor and any defect rectification is completed, the client can transfer the building to the end-users.

Before this transfer, it is essential to have reviewed data and documentation, trained the operations staff and handed over the building to the operations organisation. The responsibility for operation depends on how operations and users are organised. The end-users will often assume key operational obligations when they 'accept' the building.

HANDOVER TO OPERATION

Up until the handover, it makes sense to involve the operations staff in testing and adjusting technical installations and in specific instruction and training for the subsequent period of operation.¹⁶

¹⁶ You can read more on the involvement of operations staff in Værdiby's guide to 'The operations-oriented construction process' and on adjustment and commissioning in 'The commissioning process'.

HANDOVER OF DOCUMENTATION AND DATA

At the point of handover the building, the contractor(s) and consultants should also hand over operations data for what has been built. It is important for the client, contractor(s) and consultants to have agreed on how and in what format this information should be handed over – e.g. defined as a physical or electronic folder structure. This is especially important if data is intended for use in a digital operations management system.



A clear and transparent basis for the subsequent operational phase should be provided (not just in the form of overall product catalogues etc.). For each individual building element/component, the client should be able to find a file containing:

- Product code and name
- Manufacturer/supplier
- Contractor
- Materials
- Location(s)
- Maintenance and cleaning (including treatment and frequency)
- Special rules of conduct
- References to other product sheets etc.

See example of operations and maintenance documentation in Appendix 7 Note that compliance with instructions and maintenance frequency may be crucial to the contractor's guarantee.

HANDOVER TO THE USERS¹⁷

It is crucial to the success of a construction project that the users are satisfied when they take over the building. So it is important for the client to communicate and align expectations with the users, to make them prepared for what they are to receive.

If the client involved the users in the construction process in a positive way, the transfer will often be a simple formality, and the inauguration will be a celebration.

If possible, it is beneficial to involve the users earlier – e.g. by showing examples (and perhaps a mock-up) of quality levels. For commercial buildings, construction may also entail organisational changes or new workflows, and the staff also need to be prepared for this to prevent any frustrations from spilling over into the project. It may also be a good idea for the client to appoint a contact person to take comments from the users about the experience with the new building.

¹⁷ You can find out more about this in Værdibyg's guide to 'User involvement'.

APPENDICES

- 1 EXAMPLE TABLE OF CONTENTS FOR A QUALITY PLAN**
- 2 EXAMPLE STATUS REPORT BEFORE A PRE-INSPECTION**
- 3 EXAMPLE AGENDA FOR A PRE-INSPECTION**
- 4 EXAMPLE CHECKLIST/APPROVAL OF PRE-INSPECTION**
- 5 EXAMPLE DEFECT LIST**
- 6 EXAMPLES OF DIGITAL DEFECT RECORDING**
- 7 EXAMPLE O&M DOCUMENTATION**
- 8 PRE-INSPECTION – TENDER AND CONTRACT WORDING**

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