Guide

‘AS BUILT’

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Foreningen af
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FRI

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VIRKSOMHEDER

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PREFACE

‘As built’ is a guide to FRI’s and the Danish Association of Architectural Firms’ Description of Services for Building and Landscape (YBL) and FRI’s Description of Services for Civil Works (YBA).

‘As built’ can be used together with YBL and YBA to conclude an agreement between the client and consultant and can contribute to the parties reaching appropriate agreements on the scope of ‘As built’ project documentation.

‘As built’ describes both project documentation prepared by the building or civil works consultants and project documentation prepared by the building or civil works contractors. The guide can therefore be used as a reference when entering into agreements with contractors.

‘As built’ helps to describe the service of bringing the project documentation to a level where the designed and the actual building or civil works are consistent with one another to the extent agreed.

Two levels are described:

Standard level, regulatory approval for initial operation
The standard level of ‘As built’ project documentation will be sufficient for many clients.
The standard level includes updating the most recently approved construction project and preparing other documentation to the extent necessary to obtain regulatory approvals and operating permit for the completed building or civil works.

Extended level
Extended level is used when the client has special requirements for consultants’ and contractors’ changes management and for updating and providing ‘As built’ project documentation for the completed building or civil works.

For both levels, the starting point is the approved construction project, cf. YBL or YBA, including changes incorporated into the project as a result of project follow-up and agreed or requested changes.

It is important that payment for changes to the construction project is agreed at the same time as the change is proposed and approved. This is regardless of whether it is a change that has implications for the project of one or more consultants, or whether the change must be incorporated into the contractor’s project.

‘As built’ project documentation can be included in the O&M documentation for the building or civil works, but the guide does not describe the adjustment and expansion of the documentation into a complete operating system.

For renovation projects, ‘As built’ includes only the building parts covered by the current renovation and conversion. If, for example, a single tenancy in an office property is converted, then ‘As built’ obviously includes conversions in the tenancy, but also any implications for, for example, shared ventilation and BMS systems outside the tenancy.

CONTENTS

0. DEFINITIONS

0.1 Definitions

Reference is generally made to definitions in the Description of Services for Building and Landscape (YBL) or the Description of Services for Civil Works (YBA).

The terms below are used specifically in this description of services.

Ax – deviation

Specifies requirements for maximum deviation of the position of a building part in the ‘As built’ documentation compared to what was actually constructed. Requirements for maximum deviation are stated in mm. A50, for example, specifies requirements equal to a maximum of +/- 50 mm. A- indicates that there are no specific requirements for the accuracy of the ‘As built’ documentation.

Requirements for maximum deviations will most often refer to horizontal measurements, but in many cases may also apply to vertical height or measurement deviations. This applies, for example, to common utility lines, which are normally surveyed both horizontally and vertically.

BIM

DS/EN ISO 19650-1 defines Building Information Modelling as ‘use of a shared digital representation of a built asset to facilitate design, construction and operation processes to form a reliable basis for decisions’.

Discipline model

A discipline model contains graphic and alphanumeric information linked to a specific specialist field/area of responsibility; e.g. architecture, structures and installations.

IFC

Industrial Foundation Classes is buildingSMART’s data model that makes it possible to exchange data between different software programs in connection with BIM planning.

ICT process manual

An ICT process manual means a cooperation document that establishes the framework for digital cooperation.

ICT specifications

ICT specification means an agreement appended to the description of services establishing the client’s ICT (Information and Communication Technology) requirements, if any. This includes the client’s requirements for data structure, formats and method for providing ‘As built’ project material.

Delivery specification

Explicitly describes which information about the planning, design and construction of the building or civil work must be available at various times during the design and construction process.

A delivery specification can describe what information must be available in building models, on drawings and in descriptions, but may also include time schedules, regulatory approvals, etc.

Delivery specification for building models

Explicitly describes which information about building parts must be present in a building model at various times during the design and construction process.

LOG/LOI

Level of Geometry (LOG) describes the building part's geometric representation and extent of included components.

Level of Information (LOI) describes associated property data for building parts either embedded, linked or otherwise related.

Project documentation

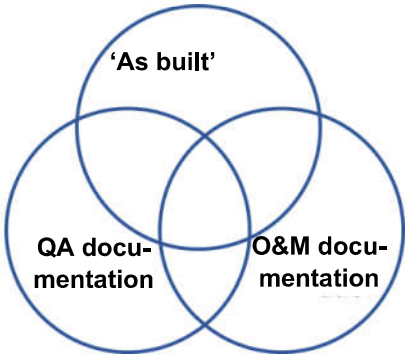
Project documentation is the documentation of the building or civil works in the form of drawings, descriptions, calculations, notes, etc.

In the case of digital planning, the project documentation includes digital discipline models and other digital documentation to the extent determined in the ICT specifications.

0.2 Interfaces

Several types of project documentation must be delivered to the client on completion of a building or civil works project, and it is important to understand the difference. This concerns QA documentation, 'As built' documentation and O&M documentation.

The figure below illustrates the relationship:



QA documentation includes in particular the contractors' control documentation of the quality of materials and the correct performance of the work, cf. the inspection plan, but also the supervisor's documentation of the supervision, cf. the supervision plan. Furthermore, it contains documentation of the parties' quality assurance of the completed design.

'As built' documentation includes documentation of the project actually constructed in the form of project documentation updated to reflect the actual construction to the extent and accuracy agreed.

O&M documentation includes all the basis for the operation of the building or civil works, including operation and maintenance manuals, operation, inspection and maintenance plan related specifically to fire safety. It also includes drawings and descriptions relevant to the operation, product and data sheets, registered operating data, etc.

The three forms of project documentation are partly overlapping, as can be seen from the illustration.

This guide deals only with the provision of ‘As built’ documentation. However, please note that the standard level of ‘As built’, which corresponds to the regulatory requirements, contains documentation that is actually included in the other two groups.

Also, please note that all three forms of documentation are provided in collaboration between consultants and contractors, including design contractors, as described later.

0.3 ‘As built’ specification

0.3.1 ‘As built’ specification

For building projects, an ‘As built’ specification must be drawn up based partly on the requirements of the Danish Building Regulations and partly on the client’s requirements.

For civil works, an ‘As built’ specification must be drawn up according to the client’s requirements, including based on the requirements of authorities and utility companies. Specifications, including delivery specifications for building models, are usually prepared schematically.

0.3.2 Delivery specification for building models

The delivery specification for building models operationalises the requirements set out in the ICT specifications, including any requirements for ‘As built’.

The delivery specification sets out requirements for LOG/LOI information for objects/building parts and is usually prepared before the project starts.

1. ORGANISATION, PROCESS AND DELIVERY

1.1 Assumptions

It is assumed that a construction project, cf. YBL or YBA, has been prepared by the consultant and/or by one or more design contractors, cf. the basis of the agreement. It is assumed that the construction project is updated with changes incorporated into the project as a result of project follow-up and agreed or requested changes.

The client’s requirement for ‘As built’ must be available at the time of the call for tenders for the consultancy agreement as a basis for the tender and agreement. If the client’s requirements are not clearly defined, the consultant is only required to deliver standard level ‘As built’ documentation.

Correspondingly, the client’s requirements for ‘As built’ to be provided by the building or civil works contractors must be specified in the basis for construction tendering processes and contracts. If the client’s requirements are not clearly defined, the contractor is only required to deliver standard level ‘As built’ documentation.

The consultant is responsible for ensuring that the client’s ‘As built’ requirements are included in the tender and contract basis with contractors within the consultant’s contract and area of responsibility. If the client’s requirements for delivery of documentation are changed or clarified after the conclusion of the agreement, this is considered an agreement modifying the contract according to the general rules.

For building projects, ‘As built’ documentation does not include preparation of QA documentation or O&M documentation beyond what is required to obtain regulatory approvals and operating permit, cf. the Danish Building Regulations.

Similarly, for civil works, ‘As built’ documentation does not include preparation of QA documentation or O&M documentation beyond what is required to obtain the approvals and operating permits from relevant authorities and utility companies for the finished works.
For civil works, it is assumed that such requirements are generally known or disclosed before entering into an agreement.

Requirements for services in connection with system setups and data processing are outside the scope of this publication and must be stated in the ICT specifications.

1.2 Organisation

Where several consultants are associated with building or civil works, the individual consultants are responsible for providing ‘As built’ documentation within their own area of responsibility, cf. the consultancy agreement.

Where several contractors are involved in a building or civil works, the individual contractors are responsible for providing ‘As built’ documentation within their own area of responsibility, cf. the construction contract.

In the case of a turnkey contract, the turnkey contractor is responsible for providing ‘As built’ documentation for the building or civil works. In this connection, please note that the design consultant’s service may be reduced, as

design and planning management, construction management and site supervision may not be included in the design consultant’s service, just as the construction project for several disciplines may be prepared by the turnkey contractor’s subcontractors and suppliers.

In the same way, the interface between the design consultant and the contractor will depend on the nature and organisation of the work. If the contractor has to prepare the construction project on the basis of a functional tender, the responsibility for updating the ‘As built’ project will rest with the design contractor.

Consultancy agreements and construction contracts must be drawn up to ensure clarity in the organisation and division of work.

Construction designer:

The responsibility of the construction designer is defined on the basis of SBi instruction 271 from the Danish Building Research Institute, and the construction designer is specifically tasked with coordinating the statics of the building across design consultants and contractors.

In relation to ‘As built’, the construction designer is therefore responsible for ensuring that the statics and static calculations of the building project are updated and coordinated to reflect the project actually constructed.

The construction designer will normally be the consulting structural engineer and is part of the consulting organisation.

Certified consultants:

The Danish Building Regulations stipulate that a certified structural engineer or a certified fire consultant be appointed for certain building projects.

In relation to ‘As built’, the certified consultants are responsible for checking that the documentation for the building project’s static conditions or fire safety conditions complies with the requirements of the Danish Building Regulations. For further information, reference is made to the Danish Building Regulations.

The certified consultants are part of the consulting organisation.

For buildings in structural class 4 and fire class 4 respectively, the Danish Building Regulations require the client to also appoint an independent certified consultant. Reference is made to the Danish Building Regulations.

The independent certified consultants are part of the client’s organisation.

Every certified consultant must have the opportunity to review and check the building project’s ‘As built’ documentation to the relevant extent before an application for operating permit is submitted and before the ‘As built’ documentation is handed over to the client.

Special provisions about utility lines:

For civil works, including in particular the construction or rerouting of roads, the design and construction of utility lines is often undertaken by the utility owner, using the utility owner’s own consultants and contractors.

This means that, to the extent that the utility owner has taken charge of planning and construction, the utility owner must take charge of the collection and establishment of ‘As built’ documentation for their own civil works.

For civil works, coordination between the civil works and the respective utility owners is undertaken by the utility coordinator, who is appointed by the client in collaboration with the utility owners. Reference is made to the YBA for the definition of the utility coordinator’s tasks and the interface with the construction project consultants and contractors.

For building projects, the design and construction of service lines is normally undertaken by the building project consultants and constructing contractors. In that case, the building project consultants and contractors update the ‘As built’ documentation for utility works, to the extent that it is specified in generally known and available requirements or in the consultancy agreement or in the construction contract.

In both cases, the division of work must be specified in the agreement basis.

1.3 Process

The table below describes a typical process from the client’s preparatory considerations until approved ‘As built’ documentation has been provided.

Agreements, design and planning:		
Role	**Task**	**Time**
Client	Describes requirements for the level of ‘As built’ documentation in the consultancy tendering process and contract. Defines delivery method requirements in the ICT specifications.	To be clarified before the consultancy tendering process and contract.
Project manager/ICT manager	Organises and describes the method for submission in the ICT process manual.	To be clarified during the design process.
Design consultant	Describes the requirements for the level of ‘As built’ documentation in the construction tendering process. Describes the delivery method.	To be clarified before the construction tendering process and contract.
Design consultant	Prepares the construction project within own area of responsibility.	To be prepared in the construction project phase.
Design contractors	Prepares the construction project within own area of responsibility.	To be prepared in the construction project phase.

During construction:		
Role	**Task**	**Time**
Design contractors	Updates the construction project as a result of project follow-up and agreed or requested changes within own area of responsibility.	Continuously during the construction phase.
Design consultant (project follow-up)	Updates the construction project as a result of project follow-up and agreed or requested changes within own area of responsibility.	Continuously during the construction phase.

During construction:		
Role	**Task**	**Time**
Design manager (project follow-up)	Coordinates the management of project changes where these have an impact on interfaces etc. throughout the process.	To be handled during the construction phase.
Constructing contractors	Records project changes that have an impact on ‘As built’ documentation within the contractor’s area of responsibility. At standard level, changes which have consequences for regulatory matters. Changes are incorporated as specified in the delivery specification.	Continuously during the construction phase.
Site supervision	Records project changes requested by the supervisor that have an impact on the design consultant’s ‘As built’ project.	Continuously during the construction phase.
Design contractors	Collects recorded project changes for own specialist field, which must be included in ‘As built’, and carries out the agreed update.	Continuously during the construction phase.
Site supervision	Collects ‘As-built’ documentation from the contractors and hands it over for project follow-up.	Continuously during the construction phase.
Design consultant (project follow-up)	Collects recorded project changes for own specialist field, which must be included in ‘As built’, and carries out the agreed update.	Continuously during the construction phase, the last time being before delivery.
Design manager (project follow-up)	Coordinates the consultants’ update of the ‘As built’ project.	To be handled during the construction phase.
ICT manager	Plans the delivery, cf. the ICT specifications and implementation manual.	To be handled during the construction phase.

On initial operation and delivery:		
Role	**Task**	**Time**
Construction manager	Submits statements of completion and the basis for obtaining an operating permit.	
Design manager	Hands over ‘As built’ documentation to the client.	Before delivery.
Client	Approves ‘As built’.	In connection with the delivery.

1.4 Scope

‘As built’ documentation for building projects must be updated with information that corresponds to the requirements of the Danish Building Regulations, unless otherwise agreed.

For civil works with information that corresponds to generally known requirements for the civil works project in question, unless otherwise agreed.

In both cases, as a minimum in accordance with the requirements in relevant DS/ISO or DS/EN standards.

If the client has special requirements for information to be stated in the ‘As built’ documentation, this must be specified for the individual discipline/building parts.

1.5 Deviations

‘As built’ documentation for building projects must be updated with a geometric accuracy that corresponds to the requirements of the Danish Building Regulations, unless otherwise agreed.

For civil works, the ‘As built’ documentation must have an accuracy that corresponds to generally known requirements for the civil works project in question, unless otherwise agreed.

In both cases, as a minimum in accordance with the requirements in relevant DS/ISO or DS/EN standards.

If the client has special requirements for maximum geometric deviations between the project actually constructed and the ‘As built’ documentation, then a separate appendix regarding permissible deviations must be included in the agreement basis. Here, ‘Ax’ can be used as an abbreviation for the largest permissible geometric deviation. For example, A50 will mean that a building part in the ‘As built’ documentation may deviate by a maximum of +/- 50 mm in terms of position compared to the actual construction.

1.6 Delivery method

The delivery method for how ‘As built’ documentation is to be provided must be determined independently of the level chosen.

If the client has not made any requirement as to how and where the ‘As built’ documentation must be provided, delivery must be decided by the consultant or contractor. The material must appear coordinated and accessible.

Unless otherwise agreed in the ICT specifications, drawings and other project documentation must be delivered in PDF format.

If digital design has been agreed, discipline models must be provided in IFC format, unless otherwise agreed.

1.7 Responsibility

As stated above, ‘As built’ documentation is provided in collaboration between the design consultant and the construction contractors as well as with the contractors who also have a design responsibility and must prepare an construction project within their area of responsibility.

The starting point is:

- The construction contractors are responsible for ensuring that measurements/details about ‘As built’ are correct within their own area of responsibility.

- The design contractors are responsible for the ‘As built’ project within their own area of responsibility.
- The site supervision is responsible for randomly checking whether the contractor’s ‘As built’ project corresponds to the project actually constructed, cf. the supervision plan for own area of responsibility.
- The site supervision is responsible for randomly checking whether the contractor’s measurements/details about ‘As built’ for the consultant’s project are correct, cf. the supervision plan for own area of responsibility.
- The design consultant is responsible for correctly updating the ‘As built’ project within its own area of responsibility on the basis of the information received from contractors and supervision.

It is also assumed that each party ensures the quality of its own deliverables.

In some cases, the design consultant’s ‘As built’ project may later turn out to be incorrect due to incorrect information from one or more contractors. In those cases, it will generally not be the consultant’s responsibility.

In the event of split consultancy, where site supervision is undertaken by another consultant, the same situation may occur. In the same way, the design consultant will not be responsible for inaccuracies in its ‘As built’ project as a result of incorrect information received from the supervision.

The specific circumstances may differ and depend on the contractual conditions.

If a design consultant’s update of its ‘As built’ project is based on information from a third party, it is recommended, depending on the circumstances, that the consultant describes the scope of this in the project documentation, typically in the form of a note on the drawing.
It is also recommended to make the client more directly aware that the consultant’s updated ‘As built’ documentation is based on information from the contractor(s). This can be done by describing the scope in a letter or in the minutes of a client meeting, allowing the client to react if he has other expectations for the update.

In turnkey contracts, the responsibility for correct ‘As built’ project documentation rests with the turnkey contractor, who must organise the collection of information and updating of the project documentation.

In turnkey contracts, the design consultant will often provide only limited service and may not be responsible for design and planning management, construction management, site supervision or project follow-up in relation to the construction project. In that case, the design consultant must be particularly careful not to assume responsibility for measurements or project changes in which the consultant has not been involved. It probably requires the consultant to describe the assumptions for its ‘As built’ project in the same way as above, just as it is recommended to make the turnkey contractor aware of the assumptions in writing in a letter or in the minutes of a client meeting.

Both the client and consultant must therefore pay specific attention to aligning expectations in the early stages of the collaboration and ensuring that expectations are communicated to the contractors.

In turnkey contracts, it is equally important to align the expectations between the client, turnkey contractor and consultant.

1.8 Payment

It is assumed that, in its agreement with the consultant, the client has set out its requirements for change management during design and construction, and

that the consultant incorporates relevant provisions to this effect in the construction contracts.

It is important to note that the payment for changes to the consultant’s project should be agreed at the same time as the change is agreed.

After tendering, this applies regardless of whether the change is made in the construction project phase, during construction, or later, in connection with preparation of ‘As built’ documentation.

- Changes due to a defective project, cf. the General Conditions for Consulting Services (ABR), will not result in additional payment.
- Changes agreed in the construction project phase or during execution will normally lead to an adjustment of the payment, cf. the provisions of ABR.
- Changes registered by the contractors during construction or in connection with delivery, will normally result in an adjustment of the payment if the consultant’s project needs to be changed or if the changes otherwise result in additional work for the consultant.

Similarly, changes in the contractor’s agreed assumptions or agreed changes in the contractor’s project may result in changed payment for the design contractor.

Change management is generally undertaken by the client, cf. the provisions of the General Conditions (AB), typically in a change log.

The other parties must continuously ensure that this registration of changes (change log) is adequate and takes into account the party’s legitimate demands for payment, changed time frames or other things.

Most changes are difficult to predict, and it is therefore usually impossible for consultants and contractors to state a fixed price that includes ‘all’ changes.

2. STANDARD LEVEL: REGULATORY APPROVAL FOR INITIAL OPERATION

2.1 Scope

The standard level is based on the construction project, cf. YBL or YBA, and includes updating the construction project and preparing other documentation to the extent necessary to obtain regulatory approvals and operating permit.

The service is to ensure that, at the end of the building or civil works, project documentation and other technical documentation is available corresponding to requirements of the Danish Building Regulations and/or other generally known regulatory requirements for the building or construction in question, including as a basis for obtaining an operating permit.

If the client wants ‘digital design’ and ‘digital delivery’, it is assumed that these services have been selected, cf. YBL or YBA, and that, in the tendering process for consultancy services and contracts, ICT specifications and or ICT process manuals are available, so that the client’s requirements for digital design and digital delivery are specified.

Additional requirements that are disclosed or arise later are considered extended level and may result in additions to the agreement.

2.2 Description

The standard level corresponds to the requirements set out in FRI’s and the Danish Association of Architectural Firms’ Description of Services for Building and Landscape (YBL) and FRI’s Description of Services for Civil Works (YBA).

As a basis for the service, it is assumed that there is an updated and approved construction project prepared by the consultant or prepared by the contractors, to the extent that the contractors have to carry out design.

As a basis for the consultant’s updating of its project, the contractor returns the consultant’s project with an indication of the changes in the project actually constructed compared to the one planned by the consultant, corresponding to the regulatory requirements.

If design services have been handed over to the contractor, the contractor must update its ‘As built’ project, to the extent necessary to obtain regulatory approvals and operating permit.

The consultant updates its ‘As built’ project based on the contractors’ feedback, cf. above, and based on its own records from project follow-up and feedback from the construction management and site supervision, to the extent necessary to obtain regulatory approvals and operating permit.

2.2.1 ‘As built’ regulatory project for building projects

For building projects, the scope of ‘As built’ is directly specified in the Danish Building Regulations and is described in more detail in the guide to the Danish Building Regulations: ‘Documentation of the Danish Building Regulations’ technical provisions in connection with statement of completion for the building project’.

Please note that the guide states that the scope of ‘As built’ will depend on the nature of the building project.

2.2.2 ‘As built’ regulatory project for civil works

For civil works, reference is made to general or specific requirements defined by the relevant authorities or utility companies, including private utility owners.

To the extent that the authority’s or utility company’s requirements are generally known and available, fulfilment of such requirements is considered part of the standard level.

Project-specific or special requirements that were not known when the agreement was concluded are considered extended level.

2.2.3 Civil works in connection with building projects

For civil works, including service lines and other supplies for building projects, the ‘As built’ requirements are the same as for building projects.

3. EXTENDED LEVEL

3.1 Scope

The extended level is used when the client has additional requirements for consultants’ and contractors’ changes management and for updating and providing ‘As built’ project documentation.

If the client wants ‘digital design’ and ‘digital delivery’, it is assumed that these services have been selected, cf. YBL or YBA, and that, in the tendering process for consultancy services and contracts, ICT specifications and or ICT process manuals are available, so that the client’s requirements for digital design and digital delivery are specified.

The client’s requirements for level of information (LOG/LOI or accuracy Ax) for the individual disciplines/building parts must be stated with reference to relevant standards.

Special client requirements for maximum geometric deviations between the project actually constructed and the ‘As built’ documentation must be specified in a separate appendix, cf. the principles in chapter 1.5.

Delivery of extended level ‘As built’ is a special service and entails additional costs for both consultants and contractors. If adequate and unambiguous information is not available at the time of tendering and entering into an agreement, delivery is assumed to be at the standard level.

3.2 Description

Extended level is used where the complexity or nature of the building project or civil works makes it important for the client to have project documentation after the completion of the building project or civil works which, in addition to standard level updating, is further updated ‘As built’.

The further update may include specific building parts or disciplines or information that the client needs in its management and operation of the building project or civil works.

Extended level is also used where the client has other specific requirements for the ‘As built’ project update, including special requirements for the digital delivery.

3.2.1 Examples for building projects

For a **residential rental property,** the client may, for example, need updated and measured apartment layout plans as well as registration of the apartment’s fittings, fixtures, white goods, etc.

For a **production building** for the pharmaceutical industry, the client will typically need, for example, a complete update of the project for the building’s technical systems, diagrams, etc.

For an **office rental property**, the client may, for example, need updated layout plans and descriptions of furnishings and installations for the individual tenancies, just as the landlord will need area calculations of tenancies, access areas and any common areas.

In all cases, the material will form part of the client’s basis for management, operation and maintenance of the property.

3.2.2 Examples for civil works

For a **municipal road facility,** the municipality’s and relevant utility companies’ requirements for ‘As built’ documentation for the road facility itself and any utility lines will often be specified in generally known requirements and are then included in the standard level. If this is not the case, updating to ‘As built’ will be extended level. Typically, there will be no generally known general requirements for adjacent parts of civil works/buildings or private lines. ‘As built’ for such works will most often be extended level and must be described by the client.

For **port construction projects**, which includes, for example, expansion of existing port areas, including filling, sheet piling, quay walls, pipe systems, paving etc. there will usually be no generally known requirements. The client’s requirement for ‘As built’ level will be extended level and must be described by the client.

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