

SPECIFICATION MANUAL

As-Built Documentation

Version 2.5
Language: English
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Delta Gruppe Bahnhofstraße 15 84144 Geisenhausen T +49 8741 47-1055 F +49 8741 47-1924 info@delta-gruppe.de	HB-DTA-02-50-0001	Index V2.5	Handbuch
	Specification Manual DELTA As-Built Documentation		
	Stand 15.01.2025		Seite 2 / 23

Table of Contents

1.

General Overview of As-built Documentation

3

1.1

Preliminary remarks

3

1.2

Principles of As-Built Documentation

4

1.2.1

General Principles:

4

1.2.2

Drawing Standards (CAD-Standard)

6

1.2.3

Binder Labeling/Binder Structure

12

1.3

File Names, and Plan Numbers

12

1.4

Numbering

13

1.4.1

Room Numbers:

13

1.4.2

Door Numbers, Window Numbers:

13

1.4.3

Device Number (HLS/HVAC):

13

1.4.4

Distributor Numbers (Electrical engineering)

14

1.4.5

File Name

14

1.5

File Structure

14

1.6

Table of Contents

15

1.7

Quality Assurance

15

1.8

Ownership, Copyright and Data Protection

15

2

Technical Section of the As-Built Documentation

16

2.1

Description of the Building and Equipment

16

2.2

As-Built Drawings

17

1.9

Reports, inspections and certification

18

1.10

Maintenance Instructions, Notes on Inspections

20

1.11

Index of Manufacturers and Suppliers

20

1.12

Technical Documents / Product Descriptions

21

1.13

Building Approvals/Test Certificates

21

1.14

Calculations

22

1.15

Structural Design

22

Supporting Documents

23

Abbreviations / Terms

23

Other / Notes

23

Delta Gruppe Bahnhofstraße 15 84144 Geisenhausen T +49 8741 47-1055 F +49 8741 47-1924 info@delta-gruppe.de	HB-DTA-02-50-0001 Specification Manual DELTA As-Built Documentation Stand 15.01.2025	Index V2.5	Handbuch  Seite 3 / 23
--	--	-------------------	---

1. General Overview of As-built Documentation

1.1 Preliminary remarks

The contractor shall prepare and, if necessary, agree with the client on technical as-built documentation for the entire scope of services described in the present specifications, on the basis of the latest execution plans, the prepared and approved workshop and assembly plans, the latest architects' working drawings and the services performed, if necessary with additional information.

The technical documentation is the collection of the inspection and as-built documents to be created and handed over by the contractor. The user will be able to clearly and unmistakably see the structure, function and operation of all systems from these documents.

Documentation services as part of project execution:

Depending on the scope of the planning and documentation services, the completeness of the specifications is to be determined chapter by chapter in consultation with the project management.

The following is a definition of the content that must be included in the documentation relating to the structure, the building construction and the technical systems (cost groups 300ff, 400ff and 500 in accordance with DIN 276, and including additional content, if required).

The contents of the documentation are described here in general terms (across all trades). In order to define the content and scope of the documentation in accordance with existing regulations (VOB *Procurement and contract regulations for construction services*) Part C, HOAI *Fee Structure for Architects and Engineers*, VDI *Association of German Engineers*, VDE *Association for Electrical Engineering*, VDMA *German association of German and European mechanical and plant engineering companies*, AMEV *Working group for mechanical and electrical engineering in state and municipal administrations*, etc.), usually before the call for tenders, and to describe documentation services in detail.

The documentation tables of VDI (Association of German Engineers) Guideline 6026, Documentation in Technical Building Equipment (TBE), can be used as a basis for the content and nature of planning, execution and revision documents.

Definition:

Revision documents: Revision (in the sense of amending, checking, verifying, proofreading), primarily with regard to the technical trades cost groups 400ff, according to German Standard DIN 276 on costs in building construction.

As-built documentation: Documentation of the actual construction, including changes resulting from the construction process, primarily related to cost groups 300ff and 500ff.

Please note:

In order to ensure that the documentation is compiled properly, it is essential that coordination meetings (so-called CAD/CAFM kick-off meetings) and cross-trade coordination meetings are held and scheduled. Before delivery, a test must also be carried out in which the quality of the CAD drawings is assessed.

The documentation is to be provided in good time before acceptance in 1 paper copy, 1 copy on a data storage medium (CD or DVD) and in electronic form.

If these requirements are not met, the documents will be returned for re-working and noted as non-compliant in the acceptance report!

Delta Gruppe Bahnhofstraße 15 84144 Geisenhausen T +49 8741 47-1055 F +49 8741 47-1924 info@delta-gruppe.de	HB-DTA-02-50-0001 Specification Manual DELTA As-Built Documentation Stand 15.01.2025	Index V2.5	Handbuch  Seite 4 / 23
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1.2 Principles of As-Built Documentation

1.2.1 General Principles:

Principles for the application of the specifications:

The specifications must always be adhered to when documenting new buildings, conversions and extensions. For new building projects, all documentation must be created anew and the documentation guidelines must be fully adhered to. For conversions, extensions or work on existing buildings, the scope of the documentation depends on the measures to be taken in consultation with the client: either selective changes and additions to the documentation are made (e.g. cover pages or partial documentation) or a complete overhaul of the documentation is required (e.g. in the case of extensive refurbishments).

If digital as-built documentation is available, it will be prepared for the contractor as a basis for planning and project processing. These documents are to be compared with the actual on-site conditions by the contractor. In the case of conversions in existing buildings, the documentation standard of the existing documents is to be continued in consultation with the client and the specifications shall apply in addition.

If no digital as-built data is available in the as-built documentation, it must first be checked whether further building and property data is available and its usability must be determined by comparison and recording on site. Partial documentation must be created in accordance with the specifications. After completion of the construction work, a comparison is to be made with the actual construction work and the data is to be incorporated into the as-built documentation.

Creating the as-built documentation

The as-built documents to be created and handed over by the contractor must, together with the documents listed below, represent the complete and comprehensive documentation of the final state of his work.

The as-built documents must be marked as such and must include the final state of the executed deliveries and services. All changes that occur during execution must be entered to scale in the as-built drawings. All documents required for technical documentation (plant/equipment description, calculations, etc.) must be included in the as-built documents.

For reconstruction measures and projects in which the total scope described in this specification is not necessary, the required scope must be stipulated in the description in the bill of quantities.

Within Germany and other German-speaking countries all documents and plans must be written in German and English. Outside of Germany, documents and plans must be written in the respective national language and in English.

The client's project number and project name must always be included in correspondence and in the as-built documents.

- The files are to be saved on a data storage medium and must be named according to the specified structure..
- ▶ (SEE SUPPORTING DOCUMENTS : "INDEX_DATA CARRIER")
 - The data carrier is to be labeled as specified.
- ▶ (SEE SUPPORTING DOCUMENTS: "LABELING_DATA CARRIER.DOCX")
- The specified table of contents is mandatory both in paper form and for the data carriers.
- ▶ (SEE SUPPORTING DOCUMENTS : "TABLE_OF_CONTENTS.DOCX")
- ▶ (SEE SUPPORTING DOCUMENTS: "INDEX_DATA CARRIER ")
- Before any data exchange, it must be ensured that there is no malware on the medium. Each medium must therefore be examined for malware immediately before delivery. Professional virus protection must be used. In the event of damage, the party responsible may be required to pay compensation.

Delta Gruppe Bahnhofstraße 15 84144 Geisenhausen T +49 8741 47-1055 F +49 8741 47-1924 info@delta-gruppe.de	HB-DTA-02-50-0001	Index V2.5	Handbuch
	Specification Manual DELTA As-Built Documentation		
	Stand 15.01.2025		Seite 5 / 23

- All documents required for operation (design documents, operating instructions, commissioning and instruction manuals, acceptance reports, etc.) are to be handed over in good time before final acceptance, sorted according to the table of contents.
- Text entries, tables, data sheets or other information are to be submitted without password protection in the common file formats of the current MS Office package and additionally as a PDF file.
- Digitized data sheets, photographs or other information are to be provided in the commonly used file formats of current standard software packages and also as a PDF file.
- The as-built documentation, sectional and detailed drawings must be enclosed as up-to-date, most recently implemented drawings to the respective scale.
- All original records, measurements, factory acceptance tests, etc. are to be included in the “main copy” of the technical documentation. In the other copies of the original documents, copies of documents are to be inserted at the appropriate place.
- Black ring binders are to be used for the as-built documentation and technical manuals/documentation. The binders are to be labelled according to the template.
- ▶ (SEE SUPPORTING DOCUMENTS: "LABELING_BINDER LABELS.XLSM")
 - Other documents that may be listed in the specifications are to be included in the documentation.
 - A handover confirmation must be created for the as-built documentation, which confirms the correctness of the entire documentation. The original signed handover confirmation must be attached in the “main copy”. Copies of the documents must be attached in the other copies in the appropriate places.
- ▶ (SEE SUPPORTING DOCUMENTS: "CONFIRMATION OF RECEIPT OF AS-BUILT DOCUMENTATION.DOCX")

Delta Gruppe Bahnhofstraße 15 84144 Geisenhausen T +49 8741 47-1055 F +49 8741 47-1924 info@delta-gruppe.de	HB-DTA-02-50-0001 Specification Manual DELTA As-Built Documentation Stand 15.01.2025	Index V2.5	Handbuch  Seite 6 / 23
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1.2.2 Drawing Standards (CAD-Standard)

General

The rules and specifications in this section form the basis for creating and processing digital drawings for the collection of as-built data. The CAD standard defined here is intended to ensure a data structure that is as uniform as possible as a basis for drawings that may originate from different CAD systems, program versions and individual working methods.

It is always assumed that the drawings represent a complete, homogeneous and up-to-date image of the building or the planned design and that they comply with current German DIN standards.

Template files are provided for each trade. These drawing-related basic settings, such as layer structure, symbol legend, etc., are already included.

Drawings provided by DELTA are to be used. If it is necessary to create new drawings, these are to be created/generated using the template drawings.

- ▶ (SEE SUPPORTING DOCUMENTS: "DRAWING TEMPLATE_CIVIL ENGINEERINGK.DWT")
- ▶ (SEE SUPPORTING DOCUMENTS: "DRAWING TEMPLATE_ELECTRICAL ENGINEERING.DWT")
- ▶ (SEE SUPPORTING DOCUMENTS: "DRAWING TEMPLATE_MECHANICAL ENGINEERING.DWT")

The as-built drawings and schematics must be presented in such a way that the delivered and installed systems are shown in their final state once installation is complete.

Only complete as-built drawings with the correct file names, the colour and layer specifications and the correct file location will be accepted. If this is not the case, the entire package will be returned to the respective company for reworking.

It is of course possible to send one or two sample plans per trade in advance to DELTA for checking.

In CAD drawings, no drawing is allowed on layer "0".

Format / System:

Unless otherwise specified in a CAD kick-off meeting, the formats apply as follows.

All plans are to be presented in CAD form (e.g. floor plans, detailed plans, lightning protection plan, outdoor facilities plan, schematics, etc.).

The system currently used is AutoCAD Architecture 2018.

For mechanical engineering, the AutoCAD add-on LiNear 2023 is also used.

For electrical engineering, the circuit diagrams must be submitted in EPLAN version 2024, unless otherwise specified in writing in the CAD kick-off meeting. For organizational reasons, EPLAN files that do not correspond to the specified version cannot be accepted or approved.

The design can be carried out in the defined version of Autodesk Revit, after consultation in the CAD start-up meeting. In addition, you will find the relevant documents for export to Autodesk AutoCAD and for compliance with the BIM standard in the supporting documents.

Drawing transfer/exchange format:

In order to ensure a smooth transfer of CAD data, the data formats for the transfer of drawings are specified to ensure data compatibility.

The original or certified Autodesk DWG format is the prescribed transfer format for CAD data. AutoCAD DWG in version AutoCAD 2018, or more recent.

EPLAN files are to be submitted as a secured project. File format ZW1.

Work done using Autodesk Revit to be submitted with .RVT file format or using the IFC interface.

Model space/Paper space:

Each floor plan, elevation, schematic or section drawing is a CAD drawing, a separate layout or a separate file, the content of which must be clearly identifiable from the file name/layout name. Only one type of drawing may be included in a DWG file. This means that schematics cannot be included in floor plans. Paper space (layout space): This is where the plan collection, layout, etc. are created. In addition, the layout-specific elements such as the drawing header, page margins and, where appropriate, the approval stamps are inserted.

Delta Gruppe Bahnhofstraße 15 84144 Geisenhausen T +49 8741 47-1055 F +49 8741 47-1924 info@delta-gruppe.de	HB-DTA-02-50-0001 Specification Manual DELTA As-Built Documentation Stand 15.01.2025	Index V2.5	Handbuch  Seite 7 / 23
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Model space: All trade-related, geometric and alphanumeric information in a drawing is created only in the model space.

Change indicators, legends, labels, drawing elements, and the symbols used in the plan must be created in the model space and displayed in the layout

Plan headers and plan margins

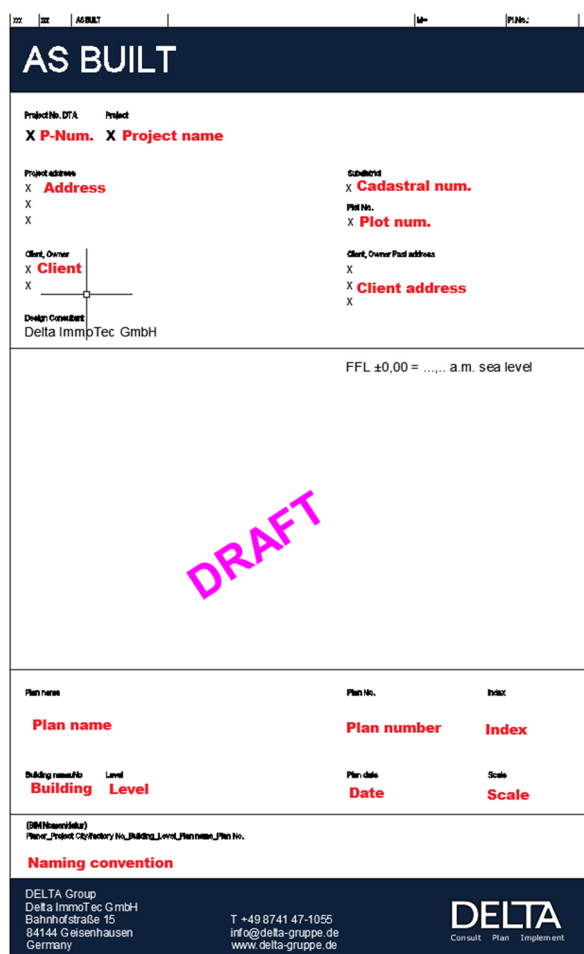
Drawing headers and borders are to be used in accordance with the supporting documents.

The template drawings have an automatic layout. After selecting the plan margin, a context menu arrow appears with which you can select the paper size. If it is necessary to use a size other than the German standard DIN formats, you can select "User-defined" and then change the sheet to the desired format using the blue arrows. The border of the drawing must not be copied, otherwise the automatic labelling will no longer work. The only exception is copying the entire layout.

(Right-click on the layout -> "Move or Copy...")

Two different headers are available: one in DIN A4 format for layouts larger than DIN A2 and one in DIN A3 format for layouts in DIN A3 and DIN A4.

To ensure that the basic data is retained, plan headers are referenced separately in each layout using a reference path type (Xref).



AS BUILT

Project No. DTA Project
X P-Num. X Project name

Project address
X Address

Cadastral
X Cadastral num.

Plot No.
X Plot num.

Client, Owner
X Client

Client, Owner Plot address
X Client address

Design Consultant
Delta ImmoTec GmbH

FFL ±0,00 = ... a.m. sea level

DRAFT

Plan name	Plan No.	Index
Plan name	Plan number	Index

Building name/Level	Plan date	Scale
Building Level	Date	Scale

Naming convention

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DELTA
Consult Plan Implement

Plan headers are used to clearly identify a drawing and usually contain information about:

- Plan contents such as building/construction, trade, floor information
- Scale
- Date of plan version
- Plan number
- Index
- Property incl. Country and location
- Cadastral district/number
- Plot number
- Client and plot owner
- Draft creator
- BIM naming convention
- Project number
- Project name
- Heights
- Sheet size
- Company Logo Contractor
- Photo/ building view

The header is labeled with its basic data and stored in a separate file. The basic data here is the country and the location in the upper left and center (abbreviated form DE and GSH) as well as the country, location and property. The client, the property owner (if different), the project number and the **name** and the heights are also to be entered. (*shown in red in the picture*)

The attributes shown in **green** in the image (plan header labels) can be entered for each layout in the properties window of the plan block under Attributes.

► (SEE SUPPORTING DOCUMENTS: "G XXX DRAWING HEADER AS-BUILT A4.DWG")

► (SEE SUPPORTING DOCUMENTS: "G XXX DRAWING HEADER AS-BUILT SMALL.DWG")

Delta Gruppe Bahnhofstraße 15 84144 Geisenhausen T +49 8741 47-1055 F +49 8741 47-1924 info@delta-gruppe.de	HB-DTA-02-50-0001 Specification Manual DELTA As-Built Documentation Stand 15.01.2025	Index V2.5	Handbuch  Seite 8 / 23
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Formats/sizes: German standard DIN formats should be used as the standard format for margins. If other formats are used, the sheet size must be indicated in the header.

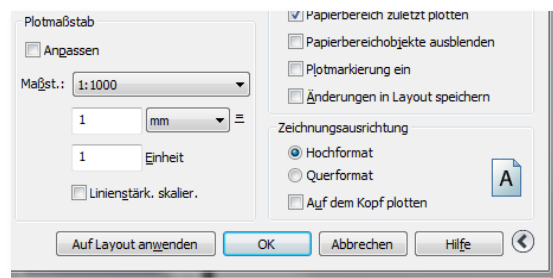
The plan documents must be created in accordance with the standards. The maximum paper height is 900 mm. The plan margins of the template files must be used and modified to the actual dimensions.

- ▶ (SEE SUPPORTING DOCUMENTS: "DRAWING TEMPLATES_CIVIL ENGINEERING.DWT")
- ▶ (SEE SUPPORTING DOCUMENTS: "DRAWING TEMPLATES_ELECTRICAL ENGINEERING.DWT")
- ▶ (SEE SUPPORTING DOCUMENTS: "DRAWING TEMPLATES_MECHANICAL ENGINEERING.DWT")

Scale:

The plans must be drawn to a scale of 1:1 (i.e. 1.00 drawing unit in the program corresponds to 1.00 measurement unit). Other common scales may be used for creating detailed drawings within plans.

Plot scale: 1:1

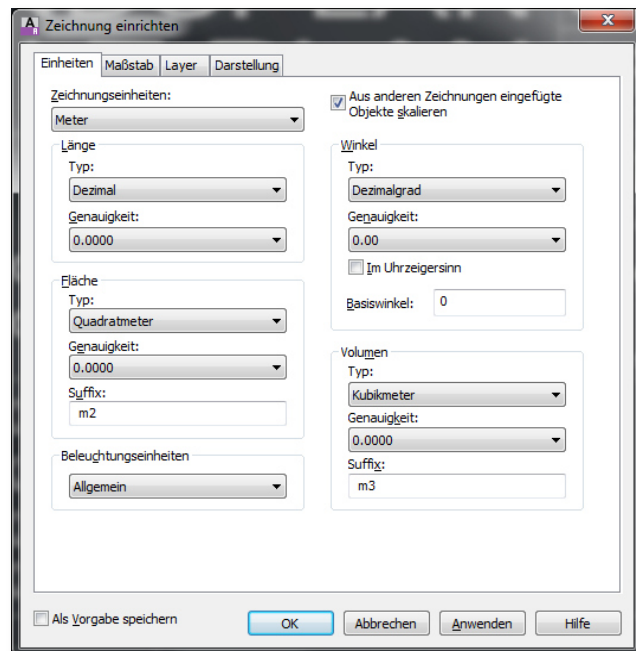


Units:

The following units of measurement are generally used in the model space:

- Civil engineering: meters [m]
- Mechanical engineering: millimeters [mm]
- Electrical engineering: meters [m]

Exception is when drawings come from the USA, where drawings are made in feet and inches.



Layer structure:

In general, the specified layer structure must be adhered to.

All drawing elements are to be created with the specified layer structure.

The color assignment of the drawing elements and drawing symbols is "by layer".

Delta Gruppe Bahnhofstraße 15 84144 Geisenhausen T +49 8741 47-1055 F +49 8741 47-1924 info@delta-gruppe.de	HB-DTA-02-50-0001 Specification Manual DELTA As-Built Documentation Stand 15.01.2025	Index V2.5	Handbuch  Seite 9 / 23
--	--	-------------------	---

- (SEE SUPPORTING DOCUMENTS: "DRAWING TEMPLATES_CIVIL ENGINEERING.DWT")
- (SEE SUPPORTING DOCUMENTS: "DRAWING TEMPLATES_ELECTRICAL ENGINEERING.DWT")
- (SEE SUPPORTING DOCUMENTS: "DRAWING TEMPLATES_MECHANICAL ENGINEERING.DWT")

To a reasonable extent, additions may be made to individual layers on a project-specific basis in consultation with the project management and specialist department (specialist designer) in individual cases. Missing layers must be recreated in accordance with the existing layer structure with the following characteristics:

- Put the first letter of the field in capital letters, e.g. "A" for architecture. (**A**_DOORS_TEXT)
- Separate individual words or letters with an underscore (A_DOORS_TEXT)
- Material or product name in German or English without numbers (A_**DOORS**_TEXT)
- Additional information in German or English without numbers (A_DOORS_**TEXT**)

For mechanical engineering the following applies:

The layer name for mechanical engineering is divided into three levels, each separated by underscores. The first level contains the company abbreviation "DTA", the second level the trade and the third level the medium:

1. Level:

- DTA → Delta company abbreviation

2. Level:

- M → Mechanical Engineering (HVAC)
- MEP → Mechanical Electrical Plumbing
- HEA → Heating
- STW → Trinkwasser (POT W potable water)
- SAW → Abwasser (Waste Water)
- SEW → Entwässerung (Drainage)
- BRW → Brauchwasser (service water)
- SAN → Sanitär (Gesamt) (Sanitary (general))
- RLT → Lüftung (Ventilation VS)
- KLT → Kälte (Refrigeration)
- MAK → Maschinenkühlung (Machine cooling)
- SGA → Gase (gases)
- FLA → Feuerlöschanlagen (fire extinguishing systems)
- SDL → Druckluft (compressed air)
- MCR → Measurement, Control Regulation

3. Level, examples:

- Supply air
- Exhaust air
- Feed
- Recovery

The full designation for a heating supply would therefore be:
DTA_HEA_Feed

Labelling and visualization:

Note for mechanical engineering:

Here, we don't use a plot style table. The corresponding colors, line types, and thicknesses are already included in the respective line properties and are also used when printing on paper.

The layers from the template drawing are to be used.

If additional layers are required that are not contained in the template, these are to be created using the specified structure.

When transferring the final as-built plans, it is essential that the specified layer structure is applied and submitted!

Delta Gruppe Bahnhofstraße 15 84144 Geisenhausen T +49 8741 47-1055 F +49 8741 47-1924 info@delta-gruppe.de	HB-DTA-02-50-0001 Specification Manual DELTA As-Built Documentation Stand 15.01.2025	Index V2.5	Handbuch  Seite 10 / 23
--	--	-------------------	--

All layers with the corresponding filters have already been created in the trade-specific template files. Once the drawing has been finalized, the unused layers must be removed.

Symbols or blocks must be used from the template drawings. If new symbols or blocks are required, these blocks must be created on layer "0" when using AutoCAD and inserted into the respective layers of the specified layer structure according to their content. The drawings must not contain any unused blocks when they are submitted. Before transferring the data, the drawings must therefore always be cleaned of "unused" blocks.

In addition to the DELTA symbols provided, symbols specific to the relevant countries are also permitted. Country-specific symbols must be clearly indicated with a legend.

Legends:

A legend must be created for each plan, listing only the symbols used.

If symbols are used that were not specified by DELTA, all symbols and drawing elements must be included in a separate DWG file named Legend.

► (SEE SUPPORTING DOCUMENTS: "AA-DTA_NAMING CONVENTION-REVITMODELLE, DRAWINGS, PLANS")

Hatching:

Any hatching used in the drawing must be shown either in the form of hatching or as an object or block. Hatching must therefore not be drawn as individual lines. The hatching used must be created on separate layers. Exceptions to this are hatching that is integrated into blocks, components, or objects from applications.

Dimensioning:

Unless otherwise agreed, dimensions shall be specified in accordance with the applicable German DIN standard. Dimensions must be created as associative dimensions. Dimensions must not be manipulated by overwriting dimension text. An exception to this is the height specification for door and window dimensions in 2D floor plan drawings. Only AEC dimensions or pure AutoCAD dimensions ("rotated dimensions") are permitted. Dimensions from external systems are only permitted if they are recognized by AutoCAD as having been created using the "rotated dimension" function.

Materials: The materials/types used must be labeled.

External References:

References must always be inserted with a relative path. External references in the form of drawings or pixel images must be supplied with the drawings if this data contains additional information on the master file or is important for the exchange of information. Supplied CAD data and reference drawings must refer to the same data set to avoid duplicate information. When assigning references, the special insertion layer from the CAD layer structure must be set and used as the current layer.

The file names or paths must not be changed so that any necessary external references can always be assigned correctly.

Coordinate system, insertion points, and alignment:

A drawing base point must be defined for each project before starting to draw and must be documented in the drawing.

In the Draft/Execution Planning, all drawing elements are drawn by DELTA in their correct position at point 0,0,0 (x,y,z of the world coordinate system = WCS).

This point is to be used as the base point.

To make drawing easier for rotated floor plans, user-defined coordinate systems (UCS) with other base points may be created. When sending plans, make sure that the WCS is set or that the UCS used is the same as the WCS.

If location-relevant references are inserted into the drawing or objects are copied from other drawings, these must also be inserted using WCS 0,0,0.

All drawing geometries must be created with accurate position, length, and angle using identical coordinate systems.

The base point for floor plan drawings must be the same for the entire as-built documentation transfer. A symbol may be inserted to clarify the mutually agreed base point.

Live Loads: The assumed live loads must always be included in the drawing for indoor and outdoor areas, together with a table and legend.

Labeling and visualisation:

The drawings must clearly show and label all rooms, fire resistance classes, components, and regulated/controlled system parts, as well as the associated electrical, measuring, and control devices in their interactive function.

All labels or multi-leader objects must be created using the "Arial" font.

Texts must be created as MText on corresponding layers in a font size appropriate to the scale. Care must be taken to ensure that texts, dimensions, and other labels do not overlap. (ACAD shortcut: Mtext -> Multi-line text that can be formatted)

Plots und PDF's:

All plots must be created using the plot style tables (*.ctb) provided.

Which plotter settings for which plans:

Plan type	Plot style table
All in PDF-Format	Fein color.ctb
Site Plans	Fein color.ctb
Measuring/Dimensioning	Fein color.ctb
Floor Plans	Fein color.ctb
Sections	Fein color.ctb
Elevations	Fein color.ctb
Outdoor Facilities	Fein color.ctb
Visualization	Fein color.ctb
Fittings / operating layouts	Fein color.ctb
Installation Plans Mechanical Engineering	none
Schemas Mechanical Engineering	none
Electrical Engineering overall:	Electro color.ctb

To create or plot PDF files, the corresponding plotter setup file "DWG To PDF.pc3" must be used.

Note on mechanical engineering:

No plot style table is used here. The corresponding colors, line types, and thicknesses are already included in the respective line properties and are also printed as such on paper.

- (SEE SUPPORTING DOCUMENTS: "ELEKTRO COLOR.CTB")
- (SEE SUPPORTING DOCUMENTS: "FEIN COLOR.CTB")
- (SEE SUPPORTING DOCUMENTS: "DWG To Pdf.PC3")

Delta Gruppe Bahnhofstraße 15 84144 Geisenhausen T +49 8741 47-1055 F +49 8741 47-1924 info@delta-gruppe.de	HB-DTA-02-50-0001	Index V2.5	Handbuch
	Specification Manual DELTA As-Built Documentation		
	Stand 15.01.2025		Seite 12 / 23

1.2.3 Binder Labeling/Binder Structure

- The data carriers have to be labeled according to the template. Data carriers must be placed in the first folder of the documentation..
 - ▶ (SEE SUPPORTING DOCUMENTS: "LABELING_DATA CARRIER.DOCX")
- The specified folder structure and index have to be adhered to.
 - ▶ (SEE SUPPORTING DOCUMENTS: "INDEX_DATA CARRIER") (BINDER STRUCTURE)
- The folders have to be labeled according to the template.
 - ▶ (SEE SUPPORTING DOCUMENTS MU: "LABELLING_BINDER LABELS.XLSM")
- The folders need to have a cover page with information about the construction project.
 - ▶ (SEE SUPPORTING DOCUMENTS: "CONTENTS_FOLDER_COVER_SHEET.DOCX")
- The table of contents should be placed in a transparent plastic sleeve in the binder. Each binder should contain a list of the contents of all folders. The contents of each binder should be marked (*shaded gray*). The binders are to be numbered consecutively.
 - ▶ (SEE SUPPORTING DOCUMENTS: "TABLE_OF_CONTENTS.DOCX")
- The individual chapters/titles are to be separated with indexes (DIN A4) and labeled according to the supporting documents. The subchapters/titles are to be separated with tab dividers.
 - ▶ (SEE SUPPORTING DOCUMENTS : "TABLE OF CONTENTS_REGISTER.DOCX")
 - ▶ (SEE SUPPORTING DOCUMENTS: "TABLE OF CONTENTS_SEPARATING PAGES.DOCX")
- The originals of the product data sheets are to be filed in the "main file" and the others as color copies.
- Plans and documents should be written in English and the local language

1.3 File Names, and Plan Numbers

File names: The names of the drawing files and other documents created for the digital entry of as-built documentation must be structured. Structured file naming serves to clearly identify each file in the data exchange process and prepare it for clearly defined data storage. Names are to be assigned in accordance with the relevant template.

Plan numbers: The plans are to be given a distinct reference number and this number should also be recorded in the plan list so that the data package can be checked more quickly for completeness during data exchange.

- ▶ (SEE SUPPORTING DOCUMENTS: "AA-DTA_NAMING CONVENTION-REVITMODELLE, DRAWINGS, PLANS")

Delta Gruppe Bahnhofstraße 15 84144 Geisenhausen T +49 8741 47-1055 F +49 8741 47-1924 info@delta-gruppe.de	HB-DTA-02-50-0001 Specification Manual DELTA As-Built Documentation Stand 15.01.2025	Index V2.5	Handbuch  Seite 13 / 23
--	--	-------------------	--

1.4 Numbering

1.4.1 Room Numbers:

The specified template is to be used to assign correct room numbers.

► (SEE SUPPORTING DOCUMENTS: "AA-DTA_NUMBERING OF BUILDINGS AND ROOMS")

1.4.2 Door Numbers, Window Numbers:

The door number includes the room number in the direction in which the door panel opens, supplemented by the letter D and a sequential number relating to that room. In the next room, the door numbering starts again at "D01." If a door opens to the outside, it must be marked with the room number of the room it leads from.

- Door and window numbers are made up of the room number and an element number.
- Doors are designated with the letter "**D**" and windows with the letter "**W**".
- Doors always belong to the room they open into. Doors that open to the outside (into the open air) must be assigned to the room in which they are located..
- The first number combination is derived from the room number to which the corresponding item belongs. (**01-0-10** W01)
- A single space has to be left between the room number and the corresponding window number..
- The last part indicates the element number (01-0-10 W01) and must always be two digits long, following the letter and numbered consecutively in a clockwise direction on the drawing.

Example Door Numbers:

1-0-01 D01	⇒	(building 1, ground floor, room 01 + door number 01)
5.1-2-15 D03	⇒	(building 5.1, 2nd floor, room 15 + door number 03)
21-U2-70 D15	⇒	(building 21, 2nd floor underground, room 70 + door number 15)

Example Window Numbers:

1-0-01 W02	⇒	(building 1, ground floor, room 01 + window number 02)
5.1-2-15 W08	⇒	(building 5.1, 2nd floor, room 15 + window number 08)
21-U2-70 W05	⇒	(building 21, 2nd floor underground, room 70 + window number 05)

1.4.3 Device Number (HLS/HVAC):

Each piece of equipment, device, or relevant component must be marked with a corresponding device number. This number should then be used to identify the make, type, operating data, etc. in the as-built documentation.

The device name should be used to clearly identify equipment components. The device number should facilitate spare parts procurement and replacement. The device name should be displayed on the device and in the as-built documentation (plans, manufacturer's list, calculations, characteristic curves, etc.). Devices are generally identified by the room number and the trade. A short description of the equipment components should also facilitate identification.

Delta Gruppe Bahnhofstraße 15 84144 Geisenhausen T +49 8741 47-1055 F +49 8741 47-1924 info@delta-gruppe.de	HB-DTA-02-50-0001 Specification Manual DELTA As-Built Documentation Stand 15.01.2025	Index V2.5	Handbuch  Seite 14 / 23
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1.4.4 Distributor Numbers (Electrical engineering)

Electrical distribution panels are labeled as follows:

Distribution panel type - Feed type - Location - Sequential numbering (2 digits)

Distributor type:

- LVDB = low voltage main distribution board
- MDB = building main distribution board
- MD = main distribution
- SMDb = sub-main distribution board
- SDB = Machine sub-distribution boards (mostly for production)

Feed:

- UPS = Uninterruptible Power Supply
- PV = Photovoltaic System
- CHP = Combined Heat and Power Unit
- EPS/ DN = Emergency power supply general/ Diesel network

The general power supply/normal mains supply is not taken into account in the allocation of names.

If the types of plans or feed-in listed here are not sufficient, additional types must be agreed with the electrical designer.

Location:

- 40-01 = Building 40 – 1st floor above ground level.
- 27-00 = Building 27 – Ground level floor
- 39-B1 = Building 39 – 1st underground floor / basement

Examples:

Distribution box designation at the location:

GHV-40-01-19 (Building main distribution – normal network – Bldg 40 – 1 – Number 19)
UVM-DN-27-00-05 (Machine sub-dist. – diesel powered network – Bldg 27 – 0 – Number 5)
HV-SV-39-00-01 (Main distribution – emergency supply – Bldg 39 – 0 – Number 1)

1.4.5 File Name

The file name of the distribution plans consists of the abbreviations of the supporting documents (SD). However, the order has been changed here

Type_Location_Building_Distributor number from 1.4.4 (Type of distributor – Feed-in – Location – sequence nr.)

Example:

E_VIB_21_UVM-DN-27-00-05

► (SEE SUPPORTING DOCUMENTS: "AA-DTA_NAMING CONVENTION-REVITMODELLE, DRAWINGS, PLANS")

1.5 File Structure

The folder structure must be adhered to and may not be changed, as this is a centralized filing system.

The index contents of the digital version must be filled in according to the as-built documentation folders of the paper version. Only the subfolders for the individual trades are included. The file structure should correspond exactly the contents of the as-built folders.

► (SEE SUPPORTING DOCUMENTS: "INDEX_DATA CARRIER_") (FOLDER STRUCTURE)

The construction project or location is named in the file path with the country, city, and property. An extra folder should be created for documentation and as-built drawings for buildings that span multiple locations or buildings. This folder also contains all site plans for the location. New folders are created for building-specific documents. All documents that can be directly assigned to the buildings are filed in these folders. The folder structure must be used in accordance with the "INDEX_Data carrier" template.

Delta Gruppe Bahnhofstraße 15 84144 Geisenhausen T +49 8741 47-1055 F +49 8741 47-1924 info@delta-gruppe.de	HB-DTA-02-50-0001	Index V2.5	Handbuch
	Specification Manual DELTA As-Built Documentation		
	Stand 15.01.2025		Seite 15 / 23

1.6 Table of Contents

For better navigation, the table of contents should be structured in the same way for each trade. The following table of contents shall apply, which may vary in the sub-items for the individual trades (see Part 2, Technical Part of the As-Built Documentation)

► (SEE SUPPORTING DOCUMENTS: "TABLE_OF_CONTENTS.DOCX")

1.7 Quality Assurance

It is assumed that all construction documentation will be checked by the contractor in accordance with the client's specifications before being handed over, so that the quality assurance of the revision and as-built documentation can be carried out on this basis.

This applies in particular to:

1. Check for completeness

The data to be provided for the as-built documentation must be compared with the specified scope of work and any project-specific appendices and checked thoroughly for completeness. This check is the responsibility of the contractor.

2. Content verification for accuracy and consistency with the scope of the project as executed.

The contractor must ensure that the data shown corresponds to the actual local site conditions as constructed.

3. Form and structure check

The contractor must check the existing documentation in accordance with the specifications (data types, file names, layer structure, data format, and additional identification by drawing number).

After the handover of the as-built documentation from the contractor to the client, the documentation must be checked again internally at DELTA by the project manager/specialist designer and the as-built documentation officer.

► (SEE SUPPORTING DOCUMENTS: "PROJECT COMPLETION.DOCX")

1.8 Ownership, Copyright and Data Protection

The Client is entitled to the exclusive use of the documents produced by the Contractor, in particular to modify, reproduce, or transfer their use to third parties. The above rights of use also apply to the structure(s) or facility(ies) constructed in accordance with the documents. The Client shall consult the Contractor before making any significant changes to any work protected by copyright.

The Contractor shall exercise due care to ensure that all persons entrusted by it with processing comply with the statutory provisions on data protection and do not disclose to third parties or otherwise use information obtained from the Client's sphere of activity. Any obligation on the part of such persons to maintain data confidentiality as required by data protection law shall be imposed prior to their commencement of work and proven to the Client upon request.

Delta Gruppe Bahnhofstraße 15 84144 Geisenhausen T +49 8741 47-1055 F +49 8741 47-1924 info@delta-gruppe.de	HB-DTA-02-50-0001 Specification Manual DELTA As-Built Documentation Stand 15.01.2025	Index V2.5 	Handbuch  Seite 16 / 23
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2 Technical Section of the As-Built Documentation

2.1 Description of the Building and Equipment

The documents are to be created for each individual trade and filed separately.

The description of facilities should contain the following information:

Structure, function, layout data or specifications, safety-related installations, location of the structures, warranty-related data, general description of the scope of installation.

2.1.1 Civil Engineering:

No further particulars

2.1.2 Electrical Engineering:

No further particulars

2.1.3 Mechanical Engineering:

The mechanical engineering sub-trades include:

- Heating engineering
- Sanitary engineering
- Ventilation engineering
- Air conditioning engineering
- Sprinkler engineering
- Fire extinguishing systems
- Compressed air engineering
- Cooling engineering
- Measurement, control and regulation engineering (MCR)

Separate as-built documentation is to be compiled for each trade

The technical description must describe the individual systems with all their design data (temperatures, pressures, etc.) and defined settings. For ventilation systems, the system numbers must be specified.

The technical and functional description for the MCR technology must describe the individual components of the control system with their respective tasks and functions.

Delta Gruppe Bahnhofstraße 15 84144 Geisenhausen T +49 8741 47-1055 F +49 8741 47-1924 info@delta-gruppe.de	HB-DTA-02-50-0001 Specification Manual DELTA As-Built Documentation Stand 15.01.2025	Index V2.5	Handbuch  Seite 17 / 23
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2.2 As-Built Drawings

The as-built plans must be created in accordance with the relevant CAD standards (see section 1.2.2) and plotted in color. The drawings must be filed with appropriate reinforcement at the perforation or stored in a separate standing file.

If the project involves remodeling, the current as-built plans must be requested from DELTA.

Drawing List:

All drawings are to be entered in a drawing list in accordance with the template. This list is to be filed as a printout.

► (SEE SUPPORTING DOCUMENTS: "DRAWING LIST_AS-BUILT DRAWINGS.XLSX")

2.2.1 Civil Engineering:

Construction Drawings:

All structural plans such as floor plans, elevations, sections, drainage, and detailed drawings must be filed here.

Site Plans:

Here, site plans of all utilities with their underground pipework such as water supply, drainage, gas, electricity (e.g., cable systems), district/local heating, telecommunications, and all utilities necessary for supply and disposal must be classified (including the altitudes of the respective pipes). These plans must be extremely accurate so that the exact location of the individual conduits can be determined during future renovation work.

Measuring:

Here you can find site plans such as digital land registry plans, boundary plans of properties, official site measurement plans, cadastral plans, and all necessary plans that pertain to the area of land registry or cadastral maps.

Outdoor Facilities:

Here it is necessary to file plans with information such as traffic and traffic routes, turnstiles, video surveillance, barriers, quiet zones, bicycle parking spaces, waste disposal, etc.

In addition, plans with the correct surfaces used (asphalt, paving, green space, etc.) including details of the different ground structures (layer types and layer thicknesses) should be filed here.

Visualizations/ Renderings:

All visualizations and renderings are to be filed here.

2.2.2 Electrical Engineering:

Installation plans, outdoor facilities, and site plans:

The location of all electrical components is specified in the floor plan. The meaning of the symbols used must be clearly legible in the legends. Installation heights and circuit numbers must be clearly assigned. Circuit numbers must correspond to the circuit diagrams and the local conditions.

► (SEE SUPPORTING DOCUMENTS: "DRAWING CONTENTS_ELECTRICAL AS-BUILT DRAWINGS.DOCX")

Circuit diagrams (distribution diagrams):

The diagrams are to be submitted as PDF files and in EPLAN format.

The main folder "Circuit diagrams" should contain the subfolders "EPLAN" and "PDF," and the files should be stored accordingly.

For the EPLAN exchange format, see section "1.2.2 Format and system." In consultation with the specialist planner, the existing documentation for the electrical distribution boards may be provided in DWG format in exceptional cases.

All parameters of the electrical components used must be clearly indicated in the circuit diagram.

Circuit drawings are to be made using detailed multi-pole symbols.

Schematic Drawings:

Schematic diagrams of the various cabling systems for reference purposes (e.g., layout for IT systems, risers, fire alarms, burglar alarms, antennae, etc.)

Delta Gruppe Bahnhofstraße 15 84144 Geisenhausen T +49 8741 47-1055 F +49 8741 47-1924 info@delta-gruppe.de	HB-DTA-02-50-0001 Specification Manual DELTA As-Built Documentation Stand 15.01.2025	Index V2.5	Handbuch  Seite 18 / 23
--	--	-------------------	--

Lightning protection:

This folder contains all diagrams relating to lightning protection, such as foundation earthing diagrams, diagrams with numbered earth connection/safety flags, etc.

Schedule for handover of plans:

If two or more orders are placed with a contractor at one location as part of minor works, the as-built documentation must be handed over broken down by work item (order number).

The handover of different work items in one as-built plan should be the exception and must be agreed with the responsible specialist designer (client).

Removal:

If sockets, lamps, fuses, distributors, etc. are removed, these must be recorded in a separate plan and submitted to the client together with the as-built documentation.

2.2.3 Mechanical Engineering:

- Each plan must include a legend for the pipes (colors) and fittings/symbols!
- The client uses an AutoCAD add-on for the representation of mechanical engineering. The layers, colors, and symbols of this add-on must be used. (LiNear).
- The device names must be entered in the plans so that it is clear which device has been installed where.
- The plans must be labeled with a clearly identifiable plan number.
- Die The plans must include pipe axes, height and gradient specifications.
- Dimensions and pressure ratings of pipes and ducts must be specified.
- The materials used need to be listed.
- Flow velocities (m/s), volume flows (m³/h, kg/h, etc.) must be specified.
- Drainage and ventilation points are to be marked
- Building and operator boundary lines must be shown
- System numbers must be provided
- Temperatures are to be entered.
- Floor plans must be shaded gray as external references and submitted with the documentation.
- When creating MSC circuit diagrams and wiring diagrams, the specifications from the electrical works (see section 2.2.2) must be taken into account.

1.9 Reports, inspections and certification

Certification by the contractor that the delivered and installed systems comply with the relevant regulations, standards, guidelines, and official requirements and are free of defects, signed by the person responsible for the inspection.

The reports, certificates, records, acceptance certificates, TÜV (German technical inspection association), VdS (German insurance association), and expert approvals required by law or by authorities (e.g., fire department) must be filed in the corresponding sub-section.

The following applies to measuring reports: The measurement results should be summarized, comparing actual and planned values. The individual reports should contain information about the measuring point, measurement date, planned and actual values, and all other necessary parameters.

Proof of conformity for fire protection components must be compiled and submitted.

For newly installed systems/buildings, the contractor shall arrange an appointment for instruction.

The project management (DELTA) shall be consulted to determine which people are to receive instruction. The contractor shall keep a record of attendance at the instruction appointment. This record shall be submitted with the as-built documentation.

Delta Gruppe Bahnhofstraße 15 84144 Geisenhausen T +49 8741 47-1055 F +49 8741 47-1924 info@delta-gruppe.de	HB-DTA-02-50-0001 Specification Manual DELTA As-Built Documentation Stand 15.01.2025	Index V2.5	Handbuch  Seite 19 / 23
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2.3.1 Civil Engineering:

Reports, inspections, and certificates relating to the following categories must be filed here:

- Structural analysis
- Thermographic Survey
- Sound insulation and room acoustics
- Soil mechanics, earthworks and foundation
- Measurement
- Lighting and daylight systems
- Fire safety certificate
- Health and safety
- Environmental protection and contaminated sites
- Soil survey
- Soil pressure testing
- Camera inspection (Video, photos)
- Traffic safety measures
- Material testing
- Proof of proper disposal
- Coatings
- Other expert reports

2.3.2 Electrical Engineering

After completion of the construction phase, the systems must be tested in accordance with the applicable regulations and guidelines of the respective country (Germany: VDE regulations, DIN standards, ASR, etc.). For each trade and each individual item, such as equipment, transformers, distribution, etc., narrow dividers should be inserted in the file as separators.

- Acceptance Report
- Expert Inspection, Inspection reports, Inspector acceptance
(this includes e.g. **expert** reports on fire safety measures for non-standard approvals, etc.)
- Authorities:
(Documents which have been submitted to the authorities to obtain operating permits for equipment)
- Test and measurement reports

2.3.3 Mechanical Engineering:

- Acceptance report
- Expert reports, expert assessment, expert/official approval/certification (This includes, for example, expert assessments on fire protection systems for non-standard approvals, acceptance of fire dampers, etc.)
- Authorities
(Documents which have been submitted to the authorities to obtain operating permits for equipment)
- Test and measurement reports
(air volume report, air output report, balancing report, operational tests, etc.)
- Pressure and leak test reports
(Records of flushing and depressurizing the pipeline for a sufficient period of time)
- Certification (inspection tag/sticker)
(to provide proof of compliance with fire safety regulations, proof of conformity of building materials)
- Initial instruction and commissioning reports
(instruction of the operating staff – with signatures of the people who received the instruction, commissioning reports with all the settings, etc.)

Delta Gruppe Bahnhofstraße 15 84144 Geisenhausen T +49 8741 47-1055 F +49 8741 47-1924 info@delta-gruppe.de	HB-DTA-02-50-0001 Specification Manual DELTA As-Built Documentation Stand 15.01.2025	Index V2.5	Handbuch  Seite 20 / 23
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1.10 Maintenance Instructions, Notes on Inspections

This section contains general descriptions of maintenance and inspection activities and responsibilities during the usage phase, including maintenance and inspection intervals and any downtimes for the respective system (parts, components, etc.).

2.4.1 Civil Engineering:

Maintenance and inspection instructions for structural engineering systems that must be observed in accordance with applicable national law or comparable rules and regulations.

2.4.2 Electrical Engineering:

Maintenance and inspection instructions for electrical systems that must be observed in accordance with applicable national law or comparable rules and regulations.

2.4.3 Mechanical Engineering:

Maintenance activities and maintenance intervals must be created in accordance with the VDMA (Association of German Mechanical Engineering) template for the individual devices and system components. Unnecessary/unused work and systems are to be removed from the template.

The contractor shall draw up a corresponding list showing how many fittings, pumps, ventilation units, etc. are to be maintained. The offer shall specify which tasks are to be carried out by the company and which by a specialist firm. The contractor shall provide the client with a maintenance offer detailing the scope of the maintenance work..

1.11 Index of Manufacturers and Suppliers

The manufacturer or supplier index contains an alphabetical list of all relevant devices/components, specifying the type and manufacturer (including address and telephone number). Where possible, the model specifications should also be included directly with the power rating.

Proof of quality for all materials and parts used, including the following information:

- Material/product name and designation/type
- Manufacturer (Name, address, telephone number, email)
- Supplier (Name, address, telephone number, email)

2.5.1 Civil Engineering:

No further specifics

2.5.2 Electrical Engineering:

No further specifics

2.5.3 Mechanical Engineering:

No further specifics

Delta Gruppe Bahnhofstraße 15 84144 Geisenhausen T +49 8741 47-1055 F +49 8741 47-1924 info@delta-gruppe.de	HB-DTA-02-50-0001 Specification Manual DELTA As-Built Documentation Stand 15.01.2025	Index V2.5	Handbuch  Seite 21 / 23
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1.12 Technical Documents / Product Descriptions

The technical documentation includes product descriptions, data sheets, operating and maintenance instructions, test logs, spare parts lists, and sectional and detailed drawings of all components and system parts relevant to operation and maintenance. The documentation must be sorted alphabetically according to the manufacturers index (see section 2.5). The different manufacturers must be separated by narrow dividers or coloured sheets of paper.

All execution documentation relating to the project, such as the approved installation and workshop drawings (manufacturer).

2.6.1 Civil Engineering:

Elevators, crane systems, automatic or electrically operated doors and gates, turnstiles, airlocks, loading bridges, chimneys, structural fire protection systems, induction loops, etc..

2.6.2 Electrical Engineering:

Measuring devices, lighting, lighting control, circuit breakers, installation devices, UPS systems, emergency power systems with switchover devices, compensation, transformers, medium-voltage systems, internal and external lightning protection, fire alarm systems, burglar alarm systems, access control, bus systems, building management systems and fault alarm systems, cabling for functional integrity, fire barriers, video surveillance systems, etc.

2.6.3 Mechanical Engineering:

The data sheets and manufacturer's documentation must be clearly identified (device number).
Fault lists and setting values for controllers and valves must be specified her..

1.13 Building Approvals/Test Certificates

Building authority approvals and/or test certificates must be provided for each component requiring such approval. The documents must be sorted alphabetically according to the manufacturer index (see point 2.5). The different manufacturers must be separated by narrow dividers or coloured sheets.

2.7.1 Civil Engineering:

No further specifics

2.7.2 Electrical Engineering:

No further specifics

2.7.3 Mechanical Engineering:

For all components relevant to safety and fire protection (e.g., fire dampers, etc.), the corresponding building authority approvals from DIBT (German Institute for Building Technology) or other approved testing institutes must be submitted. All test reports and certificates (factory certificates) for the above-mentioned components must also be submitted.

Delta Gruppe Bahnhofstraße 15 84144 Geisenhausen T +49 8741 47-1055 F +49 8741 47-1924 info@delta-gruppe.de	HB-DTA-02-50-0001 Specification Manual DELTA As-Built Documentation Stand 15.01.2025	Index V2.5	Handbuch  Seite 22 / 23
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1.14 Calculations

Structural calculations, certificates, conformity tests, etc. documenting the final state of the executed work.

2.8.1 Civil Engineering:

No further specifics

2.8.2 Electrical Engineering:

If lights other than those specified are installed, it must be demonstrated by calculation that the result is equivalent to the prevailing standard (German/European standard: DIN EN 12464).

It must also be demonstrated that the alternative light is of equivalent quality.

The same applies to emergency lighting.

If cable cross-sections are used that differ from those specified in the planning, a calculation has to be carried out to verify that they are sufficient for purpose (German standard on current carrying capacity: DIN VDE 0298). This also applies to all process design calculations and configuration criteria.

2.8.3 Mechanical Engineering:

Calculations / Characteristic Curves:

All process calculations and design criteria that had to be made for the design of the system (e.g., pipe network calculation, radiator layout, heat demand calculation, cooling load, etc.) must be submitted. The characteristic curves of pumps and fans are to be provided with their operating points. The corresponding device number is to be entered on the individual calculations and characteristic curves. Heating load, cooling load, pipe network calculations, radiator layout, etc. must also be provided..

1.15 Structural Design

Static calculations are used to verify the stability and structural integrity of a building.

- Title sheet
- Revision history
- Table of contents
- Preliminary remarks
- Load considerations ((Information on load such as dead loads, snow loads, wind loads, traffic loads, etc. must be explicitly stated. The approach to snow and wind loads on the building envelope should be outlined. Special features such as possible irregular build-up of snow, impact loads, ice loads, etc. must be documented, as must loads from fillings, machines, system components, cranes, etc. Considerations for construction and assembly conditions are to be explained.)
- Calculations and supporting data for individual items with load considerations, loads, internal forces, and dimensions and stress resultants
- Connection statics or Connection load tables
- Overview drawings, layout plans
- Formwork, structural, and reinforcement plans
- Final page with signature

Delta Gruppe Bahnhofstraße 15 84144 Geisenhausen T +49 8741 47-1055 F +49 8741 47-1924 info@delta-gruppe.de	HB-DTA-02-50-0001	Index V2.5	Handbuch
	Specification Manual DELTA As-Built Documentation		
	Stand 15.01.2025		Seite 23 / 23

Supporting Documents

- ▶ AA_PROJECT COMPLETION.DOCX
- ▶ LABELING_BINDER LABELS.XLSM
- ▶ LABELING_DATA CARRIER.DOCX
- ▶ AA-DTA_NAMENSKONVENTION-REVITMODELLE, ZEICHNUNGEN, PLÄNE
- ▶ G_XXX_DRAWING HEADER AS-BUILT _A4.DWG
- ▶ G_XXX_DRAWING HEADER AS-BUILT _SMALL.DWG
- ▶ CONTENTS_FOLDER COVER SHEET.DOCX
- ▶ TABLE OF CONTENTS.DOCX
- ▶ TABLE OF CONTENTS_INDEX.DOCX
- ▶ TABLE OF CONTENTS_DIVIDERS.DOCX
- ▶ DRAWING LIST_AS-BUILT.XLSX
- ▶ DRAWING CONTENTS_ELECTRICAL AS-BUILT DRAWINGS.DOCX
- ▶ DELIVERY CONFIRMATION AS-BUILT.DOCX CHANGE NAME TO CONFIRMATION OF RECEIPT
- ▶ INDES_DATA CARRIER (ORDNERSTRUKTUR)
- ▶ DRAWING TEMPLATE_CIVIL ENGINEERING.DWT
- ▶ DRAWING TEMPLATE_ELECTRICAL ENGINEERING.DWT
- ▶ DRAWING TEMPLATE_MECHANICAL ENGINEERING.DWT
- ▶ ELEKTRO COLOR.CTB
- ▶ FEIN COLOR.CTB
- ▶ DWG To Pdf.PC3

Abbreviations / Terms

AN	Contractor
AG	Client
DVD	Data carrier
MU	Supporting documents
HLS/HVAC	Heizung Lüftung Sanitär / Heating Ventilation Air-Conditioning
MS	Microsoft
ZE	Drawing units
2D	Two-dimensional
AEC	Architecture, Engineering, Construction
WCS	World Coordinate System
UCS	User Coordinate System
VDMA	Verband Deutscher Maschinen- und Anlagenbau e.V. (German Engineering Federation)
MCR	Measurement, Control and Regulation Technology
TÜV	Technischer Überwachungsverein (German Technical Inspection Association)
VdS	Verband der Sachversicherer (Association of Property Insurers in Germany)
VDE	Verband der Elektrotechnik, Elektronik und Informationstechnik (association for electrical, electronic and information technologies in Germany)
DIBT	Deutsches Institut für Bautechnik (German Institute for Building Technology)

Other / Notes