

8.4 Digital Design

2016

This description of services for Digital Design is an addendum to DANSKE ARK's and FRI's Description of Services 2012 for Building and Planning, 2012 (DoS 2012).

The addendum combines chapter 3 "Design phase consultancy" of the description of services with chapter 8.4 "Digital Design" using building models and, for building and discipline models, states the extent of the digital project documentation for the individual phases. The left column of the guideline includes the exact wording of chapter 3 in the description of services. The right column describes the deliverables which are common with chapter 8.4. Digital Design.

The description of services describes only the extent of the digital project documentation for project implementation under DoS 2012.

Other chapter 8 services with ICT contents (Classification, Digital communication, Establishment of communication platform, Digital tendering, tendering, Bill of quantities and Digital delivery) are not covered by the addendum to the description of services.

The Description of Services for Digital Design is used together with DoS 2012 in connection with an agreement concluded between client and consultant.

In the addendum, the term "Digital project documentation" means 3D building models used to support the project drawing production for main drawings and layout drawings and for area and space extraction and as a basis for interdisciplinary collision and consistency control in respect of disciplines and phases.

All parties are responsible for their own building models and for ensuring that these are well-structured and mutually coordinated and that they include objects with properties enabling sorting, filtering and extraction in respect of the deliverables of the phases.

In order to clarify and support the digital cooperation between the project parties during the design phase, a process description and a technical specification must be prepared at project start-up, describing the cooperation between disciplines and phases with specification of processes and building parts using, for example, objects, geometry and properties.

It is assumed that the project parties use their own software. If the client wants other software, this must be handled separately.

3. Design phase consultancy

3.1 Outline proposal

3.2 Project proposal

3.3 Preliminary project (regulatory project)

3.4 Main project

3.5 Project follow-up

Glossary

3. Design phase consultancy

3.1 OUTLINE PROPOSAL

DoS References	DoS 2012 Project documentation	8.4 Digital project documentation
Paragraph 3.1.2	Architect:	Discipline model:
	<ul style="list-style-type: none"> - a description of the proposal, the architectural concept, functions and sustainability, including architectural reflections on design and MEP principles - proposals for the general choice of materials - a site plan/layout plan showing the relative location of buildings (scale 1:500/1:1000) - plan and elevation drawings (scale 1:200/1:500) - a report on floorage and plot ratios. 	<ul style="list-style-type: none"> - selected facades, roofs, suspended upper floors, columns and walls with doors and windows, which describe the main geometry and programmed principles of the overall proposal - programmed rooms and their net areas as well as the gross and net areas of the building.
Paragraph 3.1.2	Landscape architect:	Discipline model:
	<ul style="list-style-type: none"> - a description of the proposal, including preliminary studies and analyses undertaken, a description of site area topography, accessibility, climate, plants and trees, soil and designation of utilisation of open spaces, if any - proposals for the general choice of materials and vegetation - plan drawings (scale 1:500/1:1000) giving an overall impression of the site. 	<ul style="list-style-type: none"> - selected terrain, paving and plants and trees, which describe the overall planning and principles of selected terrain adjustment.
Paragraph 3.1.2	Engineer – structures:	Discipline model:
	<ul style="list-style-type: none"> - a description and sketches of design principles and main structural systems. 	<ul style="list-style-type: none"> - selected wall structures, slab structures, roof structures, columns and beams which are important for the overall space allocation, to the extent it is necessary to supplement the contents of the architect model.

Paragraph 3.1.2	Engineer – plumbing, heating and ventilation systems:	Discipline model:
	- a description and sketches of the extent and design of systems, an assessment of capacities, main supply principles, technical rooms and wiring/piping systems.	- volumes of selected supply facilities and main pipe routings, which describe the expected space allocation in technical plant rooms and equipment areas - volumes of selected horizontal and vertical main pipe routings, which describe the principles of the overall space allocation.
Paragraph 3.1.2	Engineer – electrical works:	Discipline model:
	- a description and sketches of the extent and design of systems, an assessment of capacities, main supply principles, technical rooms and wiring/piping systems.	- volumes of selected supply facilities and main cable routings, which describe the expected space allocation in technical plant rooms and equipment areas - volumes of selected horizontal and vertical main cable routings, which describe the principles of the overall space allocation.

3.2 PROJECT PROPOSAL

DoS References	DoS 2012 Project documentation	8.4 Digital project documentation
Paragraph 3.2.2	Architect:	Discipline model:
	- a description, including a description of the overall architectural approach and substantiated choice of structures and materials - ground plan (scale 1:200/1:500) - levels, sections and elevations (scale 1:100/1:200) and any detail sections on a larger scale - basic furniture layout plans - a report on floorage and a calculation of plot ratios.	- established main geometry for facades, roof, walls, suspended upper floors, doors, windows, floors, ceilings, staircases, installation and lift shafts, sanitary installations and fixtures, which describe the overall proposal - expected main geometry of complementary building parts - furniture to the extent that covers general furnishing - rooms and their net areas as well as the gross and net areas of the building.

Paragraph 3.2.2	Landscape architect:	Discipline model:
	<ul style="list-style-type: none"> - a description of the site's main characteristics and data - a description of important parts and components - plan drawings (scale 1:200/1:500) as well as sections, describing the extent and nature of planned and existing sites seen in relation to buildings - a description of surfaces, plants and trees, ground structures and equipment, and all main levels and material earth-works must also be specified - an account of open spaces. 	<ul style="list-style-type: none"> - established main geometry of paving and plants and trees as well as principles of terrain adjustment, which describe the overall proposal - general location of equipment and fixtures in terrain.
Paragraph 3.2.2	Engineer - structures:	Discipline model:
	<ul style="list-style-type: none"> - a description of main design principles, calculations of estimates, a description of the main structural system and governing load scenarios - any noise and acoustic calculations with a view to complying with Danish building regulations - structural plans and sections (scale 1:100/1:200) as well as typical building components and critical details - assessment of openings required for building services - a report on ground works. 	<ul style="list-style-type: none"> - established main geometry of the load-bearing structure of the building in the form of foundation structures, roof structures, wall structures, slab structures, columns and beams, which describe the structural principles of the overall proposal - the building parts include important openings and holes for the functionality and space allocation of the building such as doors, windows and penetrations for main routings for building services.
Paragraph 3.2.2	Engineer – plumbing, heating and ventilation systems:	Discipline model:
	<ul style="list-style-type: none"> - a description of the extent, design and main components of such systems - layout plans indicating the location of building services (scale 1:100/1:200), schematic sections of building services and the main layout of technical plant rooms, as well as schematic diagrams - schematic diagrams for wiring/piping systems, including important openings through structures. 	<ul style="list-style-type: none"> - established routing principles and branches as well as main space-consuming components in plant rooms and technical areas - established horizontal and vertical main pipe routings in the expected dimensions including insulation for space allocation - established routing principles and branches for selected areas - established main geometry of space-consuming components in selected rooms.

Paragraph 3.2.2	Engineer – electrical works:	Discipline model:
	<ul style="list-style-type: none"> - a description of the extent, design and main components of electrical systems - layout plans indicating the location of building services (scale 1:100/1:200), schematic sections of building services and the main layout of technical plant rooms - schematic diagrams for wiring/piping systems, including important openings through structures - a description of lighting systems. 	<ul style="list-style-type: none"> - established routing principles and branches as well as main space-consuming components in plant rooms and technical areas - established horizontal and vertical main cable routings in the expected dimensions, for space allocation - established routing principles and branches for selected areas - established main geometry of space-consuming components in selected rooms.

3.3 PRELIMINARY PROJECT (REGULATORY PROJECT)

DoS References	DoS 2012 Project documentation	8.4 Digital project documentation
Paragraph 3.3.2	Architect:	Discipline model:
	<i>The architect prepares, possibly in cooperation with the landscape architect, a statement describing zoning, adjacent buildings as well as access and parking conditions for the project.</i>	The discipline model is not further described in connection with the preliminary project (regulatory project).
Paragraph 3.3.2	Landscape architect:	Discipline model:
	<i>The main drawings must comply with regulatory requirements for documenting legislative matters and describe the design, structures and technical installation principles.</i>	The discipline model is not further described in connection with the preliminary project (regulatory project).
Paragraph 3.3.2	Engineer:	Discipline model:
	The engineer provides acoustic calculations, if required, and prepares documentation for the purpose of meeting the requirements contained in Danish building regulations for energy requirements.	The discipline model is not further described in connection with the preliminary project (regulatory project).

3.4 MAIN PROJECT

DoS References	DoS 2012 Project documentation	8.4 Digital project documentation
Paragraph 3.4.2	Architect:	Discipline model:
	<ul style="list-style-type: none"> - <i>work specifications and schedules of rates</i> - <i>drawings comprising general drawings, layout drawings, building component drawings and detailed drawings</i> - <i>updates of floorage and plot ratio calculations</i> 	<ul style="list-style-type: none"> - final geometry of facades, roof, walls, doors, windows, floors, ceilings, staircases, sanitary installations, railings and fixtures, which describe the overall building - final geometry of complementary building parts - rooms and their net areas as well as the gross and net areas of the building
Paragraph 3.4.2	Landscape architect:	Discipline model:
	<ul style="list-style-type: none"> - <i>work specifications and schedules of rates</i> - <i>drawings comprising general drawings, layout drawings and detailed drawings</i> - <i>updates of open space calculations in relation to approval by the authorities.</i> 	<ul style="list-style-type: none"> - main geometry of terrain, paving and plants and trees - location of equipment and fixtures in terrain.
Paragraph 3.4.2	Engineer – structures:	Discipline model:
	<ul style="list-style-type: none"> - <i>work specifications and schedules of rates</i> - <i>drawings comprising general drawings, layout drawings, building component drawings and detailed drawings</i> - <i>reviews of other consultants' load requirements that affect structural capacities</i> - <i>updates of acoustic calculations, if any, as stipulated in the requirements of the Danish building regulations</i> - <i>static calculations.</i> 	<ul style="list-style-type: none"> - final geometry of the main structure in the form of foundation structure, roof structures, wall structures, slab structures, columns and beams - prefabricated roof, wall and slab structures are not divided into elements and the geometry is not final, but established - space-consuming connections, including corbels on the building parts of the main structure - the building parts include openings and holes for the functionality of the building such as space allocation for doors, windows, shafts and penetrations for routings for building services - holes for installation penetrations planned to be processed at the site are not included in the building parts.

Paragraph 3.4.2	Engineer – heating, water and sanitation installations:	Discipline model:
	<ul style="list-style-type: none"> - <i>work specifications and schedules of rates</i> - <i>drawings comprising general drawings, layout drawings, building component drawings, diagrams and detailed drawings</i> - <i>a report on openings through structures and their setting out</i> - <i>updating of documentation for compliance with the requirements of the Danish building regulations with respect to energy requirements.</i> 	<p>Discipline model:</p> <ul style="list-style-type: none"> - final geometry of supply facilities, main components, pipe systems and consumption systems for heating, water and sanitation installations - final location and dimensions of pipe routings, including insulation, and space reserved for components in plant room and technical areas, for example containers, boilers, mixing loops and heat exchangers - final location and final dimensions of pipe systems including insulation for main routings, associated duct branches, from the entry of supply pipes into the building to connection pipes, outlets or connection to consumption sites - final main geometry of all space-consuming heating, water and sanitation components in rooms, for example radiators, fancoils and sprinkler heads.
Paragraph 3.4.2	Engineer – ventilation systems:	Discipline model:
	<ul style="list-style-type: none"> - <i>work specifications and schedules of rates</i> - <i>drawings comprising general drawings, layout drawings, building component drawings, diagrams and detailed drawings</i> - <i>a report on openings through structures and their setting out</i> - <i>updates of documentation for the purpose of meeting the requirements contained in Danish building regulations for energy requirement.</i> 	<ul style="list-style-type: none"> - supply facilities, duct systems, consumption systems and components for ventilation systems - final location and expected dimensions of duct routings, including insulation, and space reserved for components in plant rooms and technical areas, for example ventilation units, air inlets, air vents and sound absorbers - final location and expected dimensions of horizontal and vertical main duct routings for duct systems and associated duct branches including insulation of ventilation ducts - established main geometry of space-consuming components in main duct routings, for example sound absorbers and mechanical dampers - established main geometry of air terminals in rooms - selected branches and connection in expected dimensions including insulation for air terminals in rooms.

Paragraph 3.4.2	Engineer – electrical installations:	Discipline model:
	<ul style="list-style-type: none"> - <i>work specifications and schedules of rates</i> - <i>drawings comprising general drawings, layout drawings, building component drawings, diagrams and detailed drawings</i> - <i>drawings of electrical panels, including power circuits</i> - <i>a report on openings in structures and their setting out.</i> 	<ul style="list-style-type: none"> - supply, distribution plants, cable routings and electrical components - final location and dimensions of main cable routings and space reserved for components in plant room and technical areas, for example electrical panels, centrals and control units - final location and dimensions of main cable routings and distributions and associated branches, for example cable trays, cable ladders, installations ducts etc. - established main geometry of electrical components in ceiling systems, for example built-in lighting fixtures, suspended lighting fixtures and smoke detectors - expected location and main geometry of selected space-consuming electrical components in walls, floors and above suspended ceilings, for example floor stands, floor boxes, centrals - space reserved for electrical components, the number and location of which vary depending on the chosen make/type, for example IBI boxes, AC controllers etc. - other mounting material is included in the technical model as objects with 2D symbol representation, for example outlets, circuit breakers, sockets, floor boxes, floor stands, card readers, prints etc.

3.5 PROJECT FOLLOW-UP

DoS References	DoS 2012 Project documentation	8.4 Digital project documentation
Paragraph 3.5.2	<p><i>The consultant collects updated project documents, including any building models produced by suppliers and contractors in accordance with the consultant's requirements contained within the contracts with the individual suppliers and contractors.</i></p> <p><i>The consultant updates his project on the basis of the consultant's project clarifica-</i></p>	<p>Building models are not further described in connection with project follow-up.</p> <p>If further description of the building models is requested, for example for operation purposes, this is possible by selecting and specifying the agreement in chapter 5 "Operational phase consultancy" or 8.20 "As built".</p>

	<p><i>tions and any additional design performed by the consultant. The update is performed to an extent that permits regulatory approval and an occupancy permit within the consultant's area of responsibility.</i></p> <p><i>In digital design, the scope of the building models must be determined in an ICT specification, such that coordinated building models and project documentation can be supplied in digital form.</i></p> <p><i>Building models may be utilised to produce visualisations for suppliers and contractors during the building project, corresponding to the project phase.</i></p>	
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Glossary

In general, the definitions from DoS Building and Planning 2012

Principle

Illustrates a basic idea which, in the consultant's assessment, can be implemented in the building project after further detailing.

Expected main geometry/geometry

Indicates that the geometrical shape of the object/building element has not been defined and that the location in the building has not been determined.

Established main geometry/geometry

Indicates that the geometrical shape and location of the object/structural member in the building have been clarified and established, but adjustment may be made before the final shape and location are defined and decided.

Final main geometry/geometry

Indicates that the object/structural member has been finally clarified with respect to shape and location.

Selected

The consultant selects important elements/parts, which are detailed in the model. The selected parts illustrate typical parts (repeated many times) or critical parts (difficult with respect to technical solution or buildability).

Delivery

Indicates output. Delivery does not include a description of the process. A delivery usually requires the delivery of a service.

Discipline model

A building model which includes information related to a specific discipline / area of responsibility, for example architecture, structures, building installations.

Building model

A building illustrated in a digital model. A building model may include the entire building or parts of the entire building and may be represented by geometrical as well as non-geometrical information.