Requirements for Computer Aided Design (CAD) in Fortum Oslo Varme

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fortum Oslo Varme	Utarbeidet av: **Jostein Lunder** Dokumenteier: **Fortum Oslo Varme - Varmeplan**		Antall sider: **Side: 1 av 9**
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Table of contents

1 DEFINITIONS AND ABBREVATIONS

Term	Definition
CAD	Computer Aided Design
MRM	Management, Regulation and Monitioring
BIM	Building Information Modeling
P&ID	Drawings (flow chart) which show a detailed description of equipment and instrumentation
XREF	Reference files in AutoCAD
WCS	World Coordinate System. The main coordinate system of the drawing
UCS	User Coordinate System. Locally user-defined coordinate system in the drawing that does not affect the main coordinate system of the drawing
DWG	The format of the files in AutoCAD
SCD	System Control Diagram
Process flow diagram	Drawings describing the flow of a process. The process flow diagrams provides an overall overview of the process and does not contain a detailed description of equipment.

2 PURPOSE

The purpose with this document is to provide a high-level framework for the preparation of Computer Aided Design. This is to ensure a uniform appearance on Fortum Oslo Varme's CAD-drawings and models regardless of who produced them.

3 SCOPE

The document contains general requirements for the use of CAD in Fortum Oslo Varme. The specification applies to all suppliers who produce/revise drawings and models for Fortum Oslo Varme. Regarding engineering tasks, requirements exceeding the contents of this specification may be specified.

4 GENERAL REQUIREMENTS FOR DRAWINGS

4.1 SOFTWARE

Fortum Oslo Varme has standardized on the following software for production of drawings/models:
Within the electrical field, drawings/models should be produced in EPLAN Electric P8.
Within the field of automation (SRO), SCDs should be produced in Microsoft Visio.
Process flow diagrams and P&IDs should be produced in AutoCAD P&ID/Autodesk BIM360 design, ref. chapter 4.4.
Pipe arrangement/isometric drawings should be produced in "pure" AutoCAD or AutoCAD Plant 3D. In projects where Fortum Oslo Varme requires a 3D model to be

produced, AutoCAD Plant 3D should be used. Use of any other software (modules) than mentioned above must be agreed with Fortum Oslo Varme.

4.2 DRAWING NUMBER

Drawing number should be labelled according to Fortum Oslo Varme's series of drawing numbers. Drawing numbers are provided by Fortum Oslo Varme in each project on request. Requests are sent to FOV.DOKVARME@fortum.com with the following information:
The assignment number/project number, the type of drawing category to be produced and the number within each drawing category. For the different drawing categories, see table 4.2 below

Table 4.2

Heat production plant	**Distribution network/customer**
Common issues	Customer central
Structural engineering	Indoor primary/secondary district heating/cooling pipes
Ventilation,cooling, heating and sanitation of the building	Outdoor primary/secondary district heating/cooling pipes
Piping	Manhole (chamber) primary/secondary network
Electrical and automation	Duct cables
Process flow diagram, P&ID	Alarm
Fire protection	

4.3 FILE NAME

All files must be entered with the drawing number first in the file name, followed by an explanatory title.
Example: 131.16-215601 – Process flow diagram Vika heat central district heating system.dwg

4.4 CONSTRUCTION AND DESIGN OF THE DRAWING

All drawings produced for Fortum Oslo Varme must be produced with Fortum Oslo Varme's drawing templates, located at fortum.no.
In model rooms, always draw in actual size (1:1). References should always be made to related drawings in the drawing itself where this is natural.
P&IDs are to be established in FOVs Autocad P&ID database. A "BIM360 design" license is required to access the in AutoCAD P&IDs. Fortum Oslo Varme must be contacted in the initial state of the project to get invited to the environment.

4.4.1 GEOGRAPHICALLY RELATED DRAWINGS

For all geographically related drawings, use Euref 89 zone 32 or NTM zone 10 as a coordinate system.
Origo must coincide with Euref origo on the equator.
For AutoCAD drawings this means WCS (World Coordinate System).

It is up to anyone to use user-defined coordinate systems (UCS in AutoCAD). These will naturally coincide with buildings' axes or similar. Origo and direction of rotation can be set as it suits at any time, as long as the motel is not moved in the world coordinate system.

4.4.2 LAYERING

Layers in the drawings should be organized by having lines, text, targets, symbols and figures on different layers and be drawn only once in the model. The layering should also be of such a character that the various elements can be switched on and off as needed. The layers should have names that make them easy to identify.

4.4.3 LINE TYPES

For line types and line thicknesses, reference is made to NS 8302. For special subject areas, it may be necessary to use other line types or line thicknesses than those described in the standard. The meaning of the lines must then be stated in other standards or explained on the current drawing.

4.4.4 SYMBOLS

Symbols should be placed as blocks in the drawing/model. The symbols should be according to ISO 14617/IEC 60617 (graphical symbols for diagrams) and IEC 61082 (electrotechnical documentation). See drawing
https://hafnohafslundno.blob.core.windows.net/files/fjernvarme/pdf/Fortum_Oslo_Varme_tegningsmaler_2017.zip
(under Drawing templates) for P&ID and the document "Fortum Oslo Varme – SCD legend" for SCD (to be sent on request).

4.4.5 LAYOUT, PLOT FILES

Drawings should not be based on CTB-files (plot files) that control the colors of printouts unless the CTB-files are distributed by Fortum Oslo Varme.

4.4.6 RASTER, XREF AND OLE OBJECTS

No raster files should be inserted in the drawings. Company logos and such should be drawn and be an integrated part of the drawing. In special cases exceptions may be made, e.g. scanned drawing substrate that is not appropriate to vectorize.
External references (XREF) can be used in the project, but must be linked to the drawing before it is handed over.
Use of OLE objects in drawings must be approved by Fortum Oslo Varme unless the OLE objects are already in a drawing template distributed by Fortum Oslo Varme.

4.4.7 BIM

Fortum Oslo Varme has currently not taken aim at using BIM. If the designer uses applications that supports BIM, is it desirable that as much as possible of the

information supplied to the models is correct. In practice, this means that one should not draw lines instead of cables, pipes and symbols without intelligence etc. The model files/drawings have a long life and if it is necessary to use BIM at a later occasion, it is desirable that the model files in to the greatest extent possible are information models and bear the correct information.

4.4.8 FILLING IN TITLE AND REVISION BLOCKS

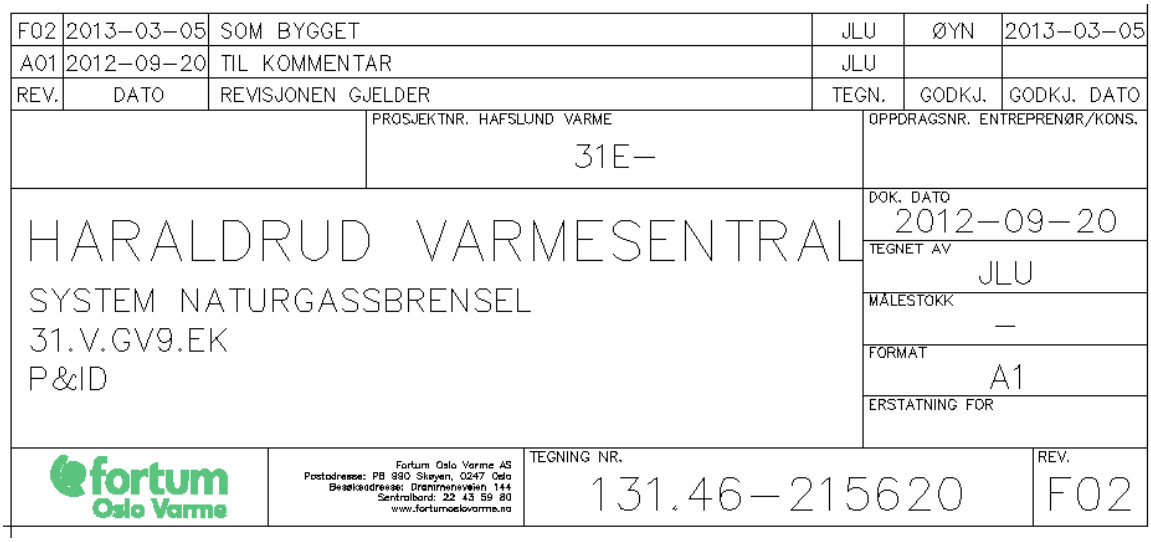
In title and revision blocks, only capital letters should be used.
The blocks must be filled in according to table 4.4.8:

Table 4.4.8

Explanation of the fields in the title field block		
English translation	**Norwegian translation**	**Explanation**
Drawing number (in the title field)	Tegning nummer (i tittelfelt)	Enter the drawing number provided by Fortum Oslo Varme
Drawing number (in the margin)	Tegning nummer (i marg)	Enter the same drawing number as in the box above
Revision number	Revisjonsnummer	The current revision for the drawing is entered into this field in accordance with chapter 5 Revisions
Title (line 1)	Tittel (linje 1)	Enter the address of the facility in question. Drawings for heat production plants and pumping stations must indicate which “object” applies. (Example: HARALDRUD VARMESENTRAL)
Title (line 2)	Tittel (linje 2)	Enter a descriptive text for the drawing
Title (line 3)	Tittel (linje 3)	Enter the AKS-, KKS- or ISO-number
Title (line 4)	Tittel (linje 4)	This field will describe what the drawing contains, plan, section, profile, P&ID etc.
Title (line 5)	Tittel (linje 5)	Available
Document date (YYYY-MM-DD)	Dok. Dato (ÅÅÅÅ-MM-DD)	Enter the date for the beginning of the drawing. The date format should be: YYYY-MM-DD
Drawed by (case worker)	Tegnet av (Saksbeh)	Enter the initials of the person who has drawn/designed the drawing
Scale	Målestokk	The main scale of the drawing should be indicated when the drawing is plotted out in 1:1
Format	Format	The field is already filled in with the format of the drawing, A1 etc. Do not change this
Substitute for	Erstatning for	If the drawing replaces an old drawing, the old drawing number must be entered here
Consultant	Konsulent	Enter the consultant’s company name. This is a hidden attribute in the title field
Project number Fortum Oslo Varme	Prosjektnr Fortum Oslo Varme	Enter the project number/assignment number specified by Fortum Oslo Varme
Work Order Contractor/ consultant	Oppdragsnr. Entreprenør/konsulent	Enter the contractor/consultant’s assignment number if needed
Explanation of the fields in the revision block		

Revision number	Revisjonsnummer	Enter revision number for the drawing in accordance with chapter 5 Revisions
Revision date (YYYY-MM-DD)	Revisjonsdato (ÅÅÅÅ-MM-DD)	Enter the revision date. The date format should be: YYYY-MM-DD
Revision concern	Revisjon gjelder	Brief description of what changes have been made
Revision drawn by	Revisjon tegnet av	Enter the initials of the person who has drawn/designed the revision of the drawing
Revision approved by	Revisjon godkjent av	Enter the initials of the person who formally approved the revision of the drawing by the executive part
Revision approved date (YYYY-MM-DD)	Revisjon godkjent dato (ÅÅÅÅ-MM-DD)	Enter the date for when the revision of the drawing has been approved. The date format should be: YYYY-MM-DD

Example of a correctly filled in title block:



5 REVISION OF DRAWINGS

When modifications are made to installations that affect the existing documentation, the documentation must be revised so that it corresponds to reality. Changes to installations may also require new documentation. Fortum Oslo Varme considers whether to revise or create new documentation for each project.

Each time drawings are revised, this should be marked by increasing the revision number by one. This is entered in the field Revision number in the title block.
In addition should the revision block be re-inserted if there is not one that is “vacant” from the previous drawing. It should be filled in according to chapter 4.4.8.
The revision history should always indicate the most recent revision at the top. The revision number consists of a revision code (A-U) and a revision number (01-99), a total of 3 characters.

Changes are marked according to NS 8310 with revision cloud and revision symbol which indicates the revision number. The revision cloud and revision symbol are laid on

separate layers (ex. revision-01) and drawn in layout (paperspace). Cloud and symbol will become invisible by the next revision.

5.1 REVISION CODES

The following revision codes shall state the purpose of the revision:
A = Internal edition
B = Comment from the client (Fortum Oslo Varme)
C = Request for tender or offer
D = Contract
E = Construction, fabrication (blueprint)
F = Final edition (finished), as built
U = Expired

5.2 REVISION NUMBER

The revision number for a document or drawing is a sequential number that increases by 1 each time a new revision of the document is released. The revision number starts at 01, which is also the first edition of the document. If the revision code changes, the revision number must also change.
Example: A01, B02, C03, D04, E05, E06, F07

5.3 CODING OF EXPIRED DRAWINGS

When a drawing or document is deleted, should this be made visible by revision. The new revision shall have revision code U and a new revision number.
Reference should also be made to any documents that replace the old one.

6 FINAL DOCUMENTATION, AS BUILT

All final documentation must be submitted in original format + PDF.
For projects documented in EPLAN, this means that a zw1 file must be submitted in addition to a PDF file.
For drawings/models produced in AutoCAD, AutoCAD P&ID and AutoCAD Plant 3D, this means that drawings/models must be delivered in dwg format with all associated databases/libraries for 3D models.
On “as-built” drawings, all revision clouds and revision symbols should be removed.
The XREF used must be linked to the completed drawing (in AutoCAD, xbind, eTransmit).
PDF drawings should be properly oriented and show layering (separate function in Acrobat). If the drawing is produced with more than 1 layout (multiple drawings in 1 file), the name of the layout should be equal to the drawing number. It must be “cleaned up” in the drawing before handing it over to Fortum Oslo Varme.
By “cleaned up” it means data that is not used in the drawing such as blocks, layers + +, and objects lying around and “hovering” (purge command). When running a Zoom – Extents command, there should be no objects outside the drawing frame in layout.

Drawings/models and other material prepared in a project paid for or managed by the client, is the client's property.

7 REFERENCES

Document reference	Description
Drawing templates (Norwegian: Tegningsmaler)	Fortum Oslo Varme's drawing templates in a zipped folder at fortum.no
Tegning 130-110184 (under Drawing templates)	Overview drawing symbols in a zipped folder at fortum.no Link: https://hafnohafslundno.blob.core.windows.net/files/fjernvarme/pdf/Fortum_Oslo_Varme_tegningsmaler_2017.zip
Instruction for district heating development (Norwegian: Instruks for fjernvarmeutbygging)	Requirements regarding deliveries on distribution networks and customer centrals
Fortum Oslo Varme – SCD legend (will be sent on request)	Template for System Control Diagram