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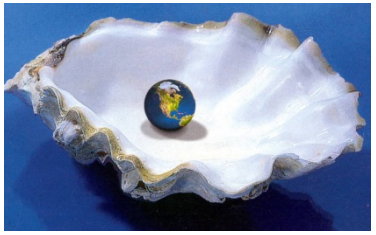
Dokumentasjon fra bygging til drift

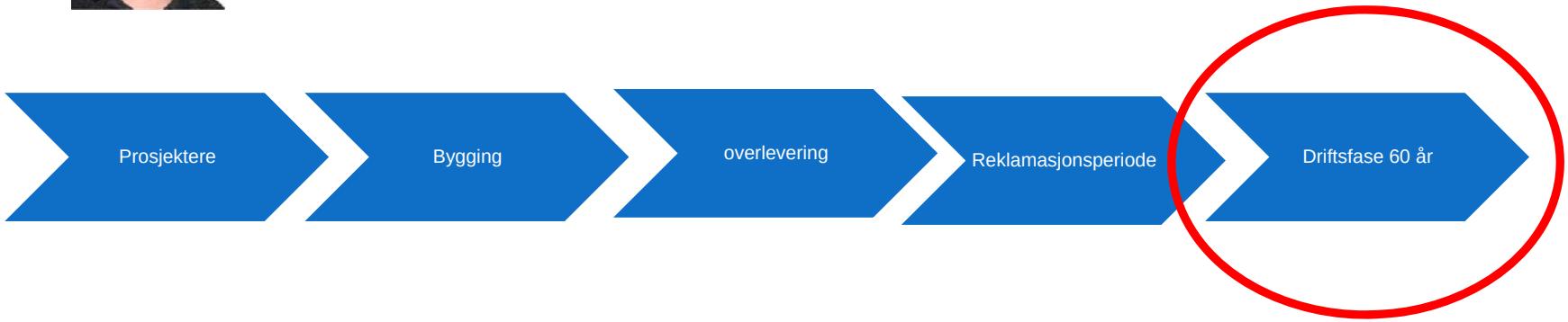
Bruk av Open BIM i FDV



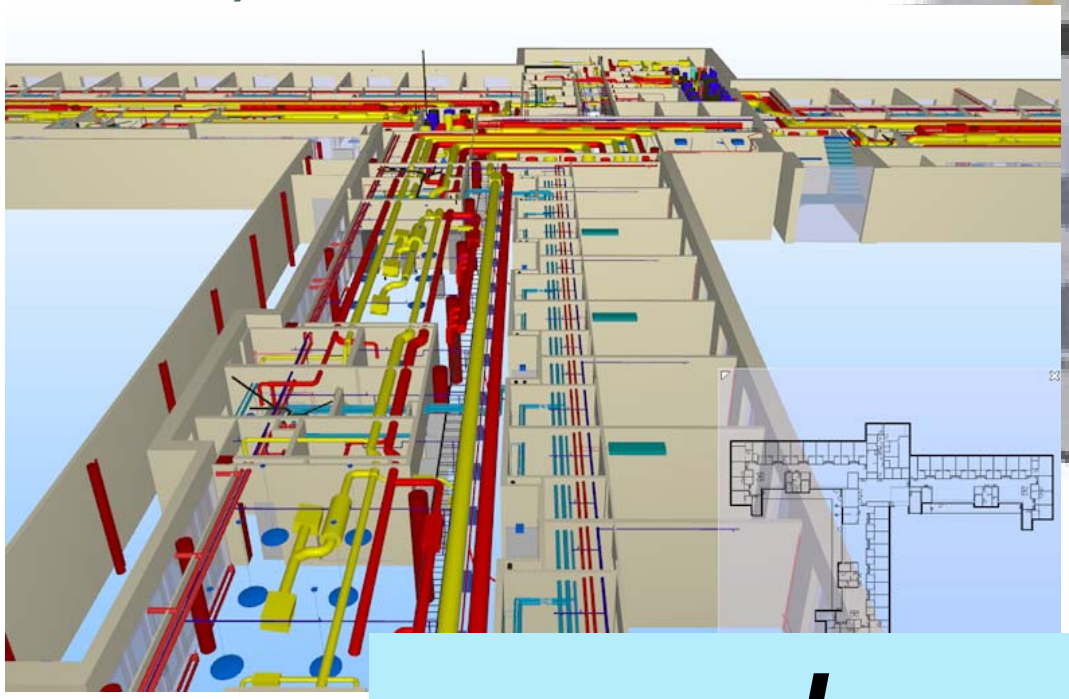
Brynjulf Skjulsvik (bsk@proim.no)

Tomas Jonsson (tomas.jonsson@norconsult.com)

Alexander W. Olsen (alexander.wnagsvik.olsen@norconsult.com)



BIM, Hvor er I'en

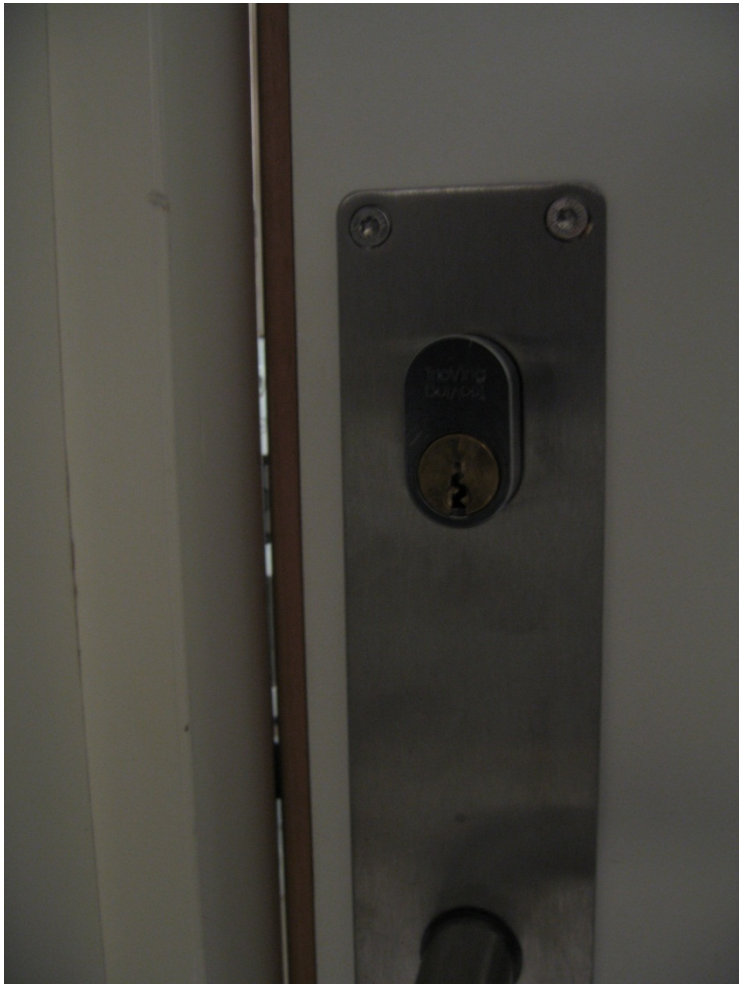


B I M

Viktig å berike prosjektet med
Informasjon som skal benyttes etter overtakelse.
Dvs informasjon som skal benyttes i driftsfasen.

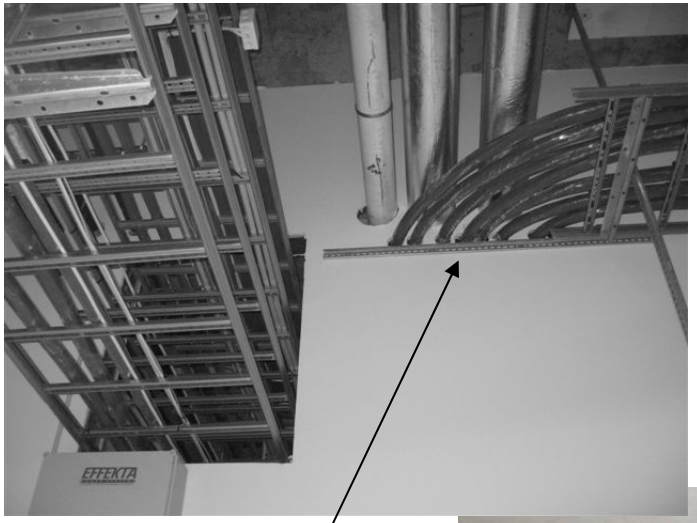
60 % av informasjonen gjelder bygging og legges i «arkivet»
40 % Er dynamisk og skal aktivt brukes i driftsfasen


40

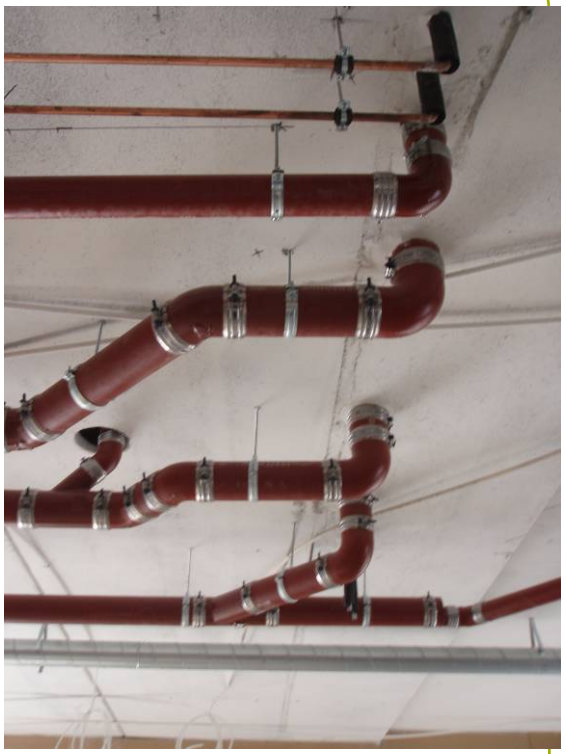


Ikke sikker på at denne branndøren er forsvarlig montert?

Løsninger, er det prosjektert?



Kjekt med kabelbroer



Avløpsledninger, manglende prosjektering

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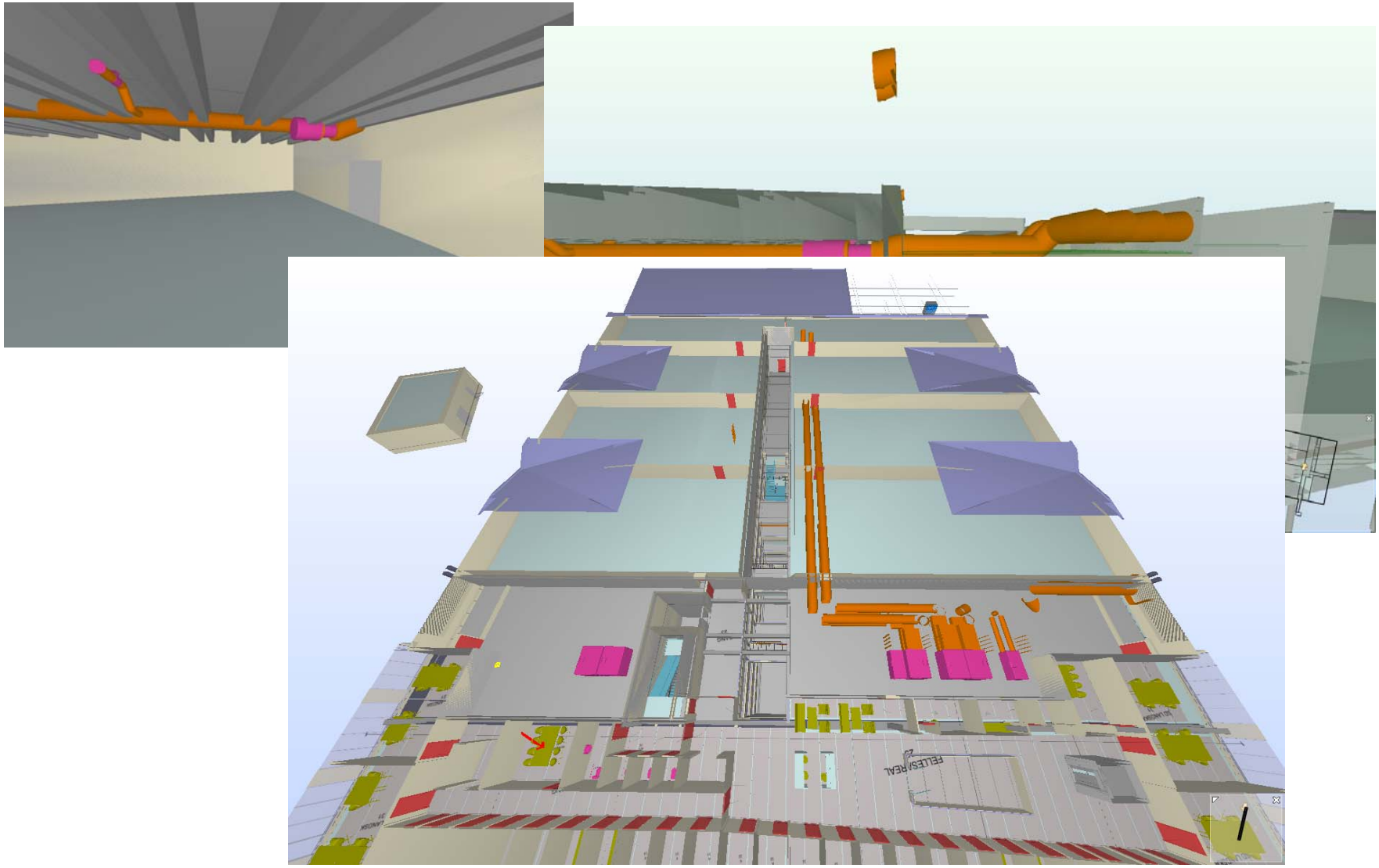
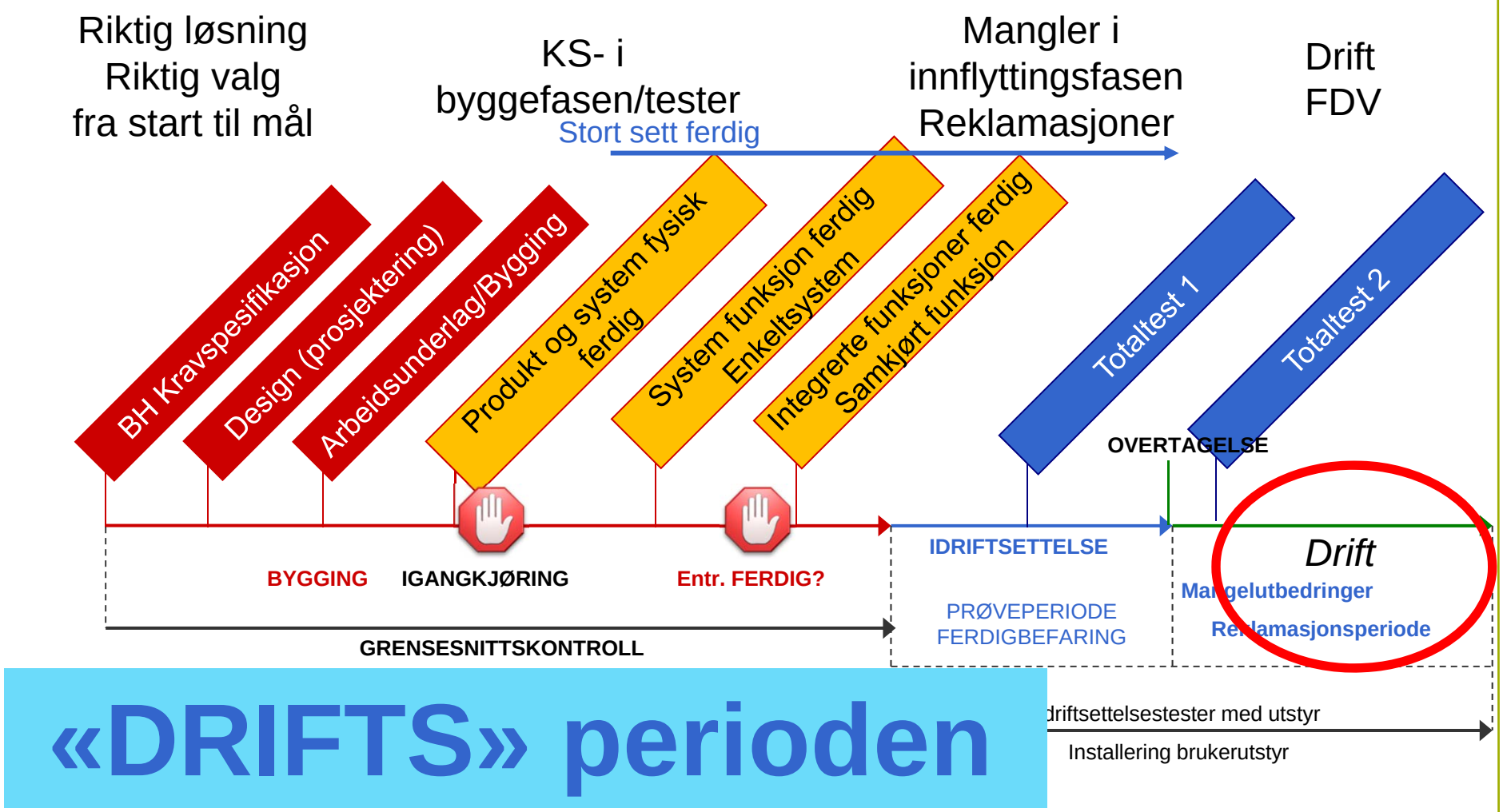
Rør i rør

Ikke bare VVS som har forbedringspotensial

«Prøvebygge»



Vi bygger for å «bruke byggene»



«DRIFTS» perioden

Gjøre de riktige tingene til riktig tid

NS 3454 Rev 2013

Tabell 2 – Kostnadsklassifikasjon

1 **Anskaffelses- og restkostnader**	2 **Forvaltnings-kostnader**	3 **Drifts- og vedlikeholds-kostnader**	4 **Utskiftings- og utviklings-kostnader**	5 **Forsynings-kostnader**	6 **Renholds-kostnader**
11 Tomt	21 Skatter og avgifter	31 Drift	41 Utskifting	51 Energi	61 Regelmessig renhold
12 Nybygg	22 Forsikringer	32 Vedlikehold	42 Utvikling	52 Vann og avløp	62 Periodisk renhold
13 Hovedombygging	23 Eiendoms-ledelse og administrasjon	33 Reparasjon av skader	43	53 Renovasjon	63 Rengjørings-relaterte service-oppgaver
14 Restkostnad	24	34	44	54	64
15	25	35	45	55	65
16	26	36	46	56	66
17	27	37	47	57	67
18	28	38	48	58	68
19	29	39	49	59	69

Hvem eier data, hva skal vi ha når.

Designinformasjon

Modellen

Driftsinformasjon

Vedlikeholdsinformasjon

Historisk informasjon benyttes ved tilbygg, ombygging

Informasjon som aktivt brukes i drift

Informasjon som brukes ved vedlikehold

"Byggeierkopi"

Link til Webserver produsent

Produsent

Oppdatert info erstatnings info

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ER det FDV-dokumentasjon vi får levert?

- 60 % er som bygget dokumentasjon.
- Dvs, Design dokumentasjon (DDV- dokumentasjon)

(Tegninger, beregninger, detaljer, og noe

§ 4-1. Dokumentasjon for driftsfasen

(1) Ansvarlig prosjekterende og ansvarlig utførende skal, innenfor sitt ansvarsområde, framlegge for ansvarlig søker nødvendig dokumentasjon som grunnlag for hvordan igangsetting, forvaltning, drift og vedlikehold av byggverk, tekniske installasjoner og anlegg skal utføres på tilfredsstillende måte.

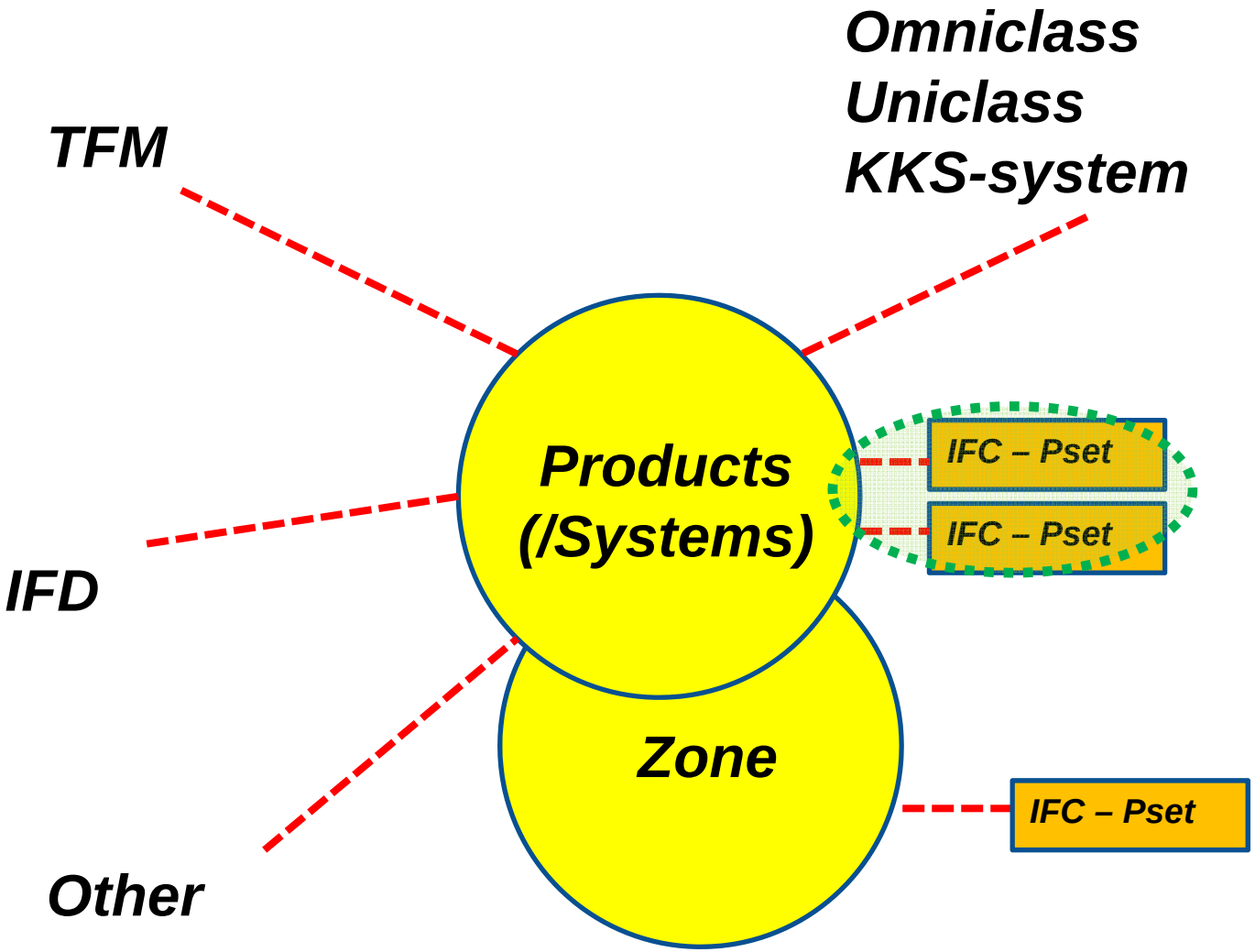
(2) I tilfeller der slik dokumentasjon åpenbart er overflødig, bortfaller kravet.

- *Pdf filer av systemer og produkter*

§ 4-2. Oppbevaring av dokumentasjon for driftsfasen

Dokumentasjon for driftsfasen skal overleveres til og oppbevares av eier av byggverket.

ID-kode er «viktig», med Produkter, objekter



Hvordan finne informasjonen

Informasjonen skal høstes fra dag 1.

OBJEKTET er en Nøkkelen for informasjonssamling.

ID kode er andre nøkler, Produktnavn, handelsvare.

- Lokasjon (Gab, bygg, plan, akser (dekkes av BIM)
- Systemer (TFM / NS 3451)
- Funksjonelt produkt (TFM)
- Produkt (NS 3420)
- Delprodukt (NS 3420)
- Komponent
- Artikkel
- Bransjenummer NOB, NRL, REF etc
- Serienummer

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Hva koster "Drift" av bygg kr/m²BTA

NS 3454 LIVSLØPSKOSTNADER

Forvaltning	50 - 90	kr/ m² BTA år
Drift	370 - 400	kr/ m² BTA år
Vedlikehold	190 - 250	kr/ m² BTA år
Utvikling		
Sum FDVU	**610 -740**	**kr/ m² BTA år**

Investering ca 40.000 kr/m2

Investerings årskostnad ca 1500 -2500 kr/m² (LCC)

”Kjernevirksomhetens kostnad” 5.000 – 8.000 kr/m2. år

Hva er de store kostnadspostene? :

Energi.	150 kr/ m²år
Renhold	90 kr/ m²år
Avfall	12 kr/ m²år
Vakt og sikring	6 kr/ m²år

Drift og tilsyn? 120 - 170 kr/m²

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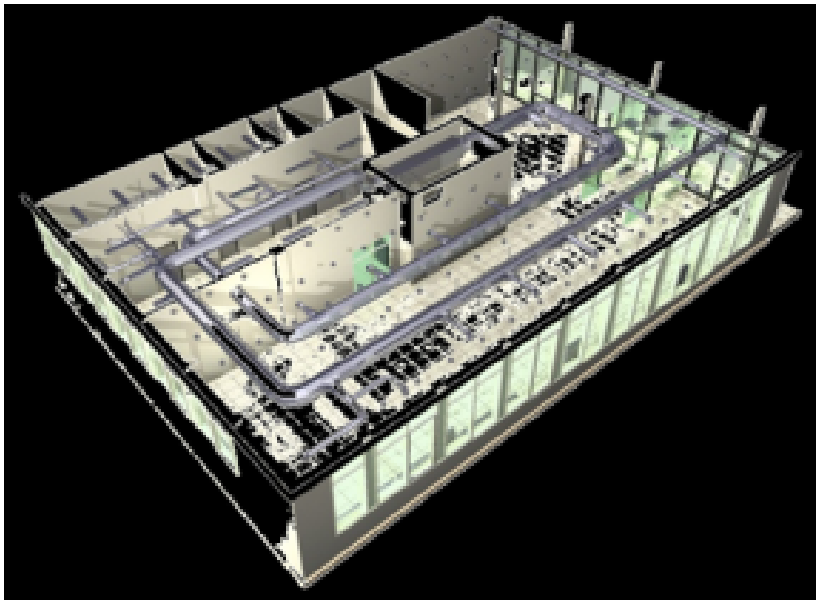
Bygge hus er ikke rakettforskning??

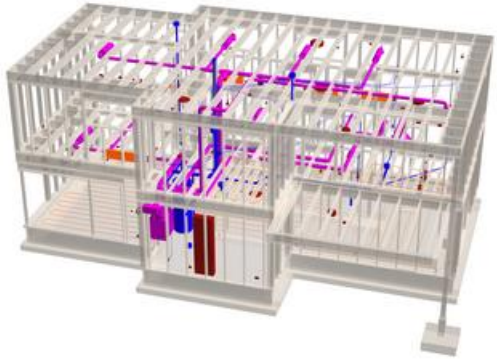
Bygg Skal fungere, kostnad ca 40.000 kr/m2

Samme ønske til at det skal fungere.

Bil skal fungere, kostnad ca 40.000 kr/m2

BIM har større nytteverdi enn bygging



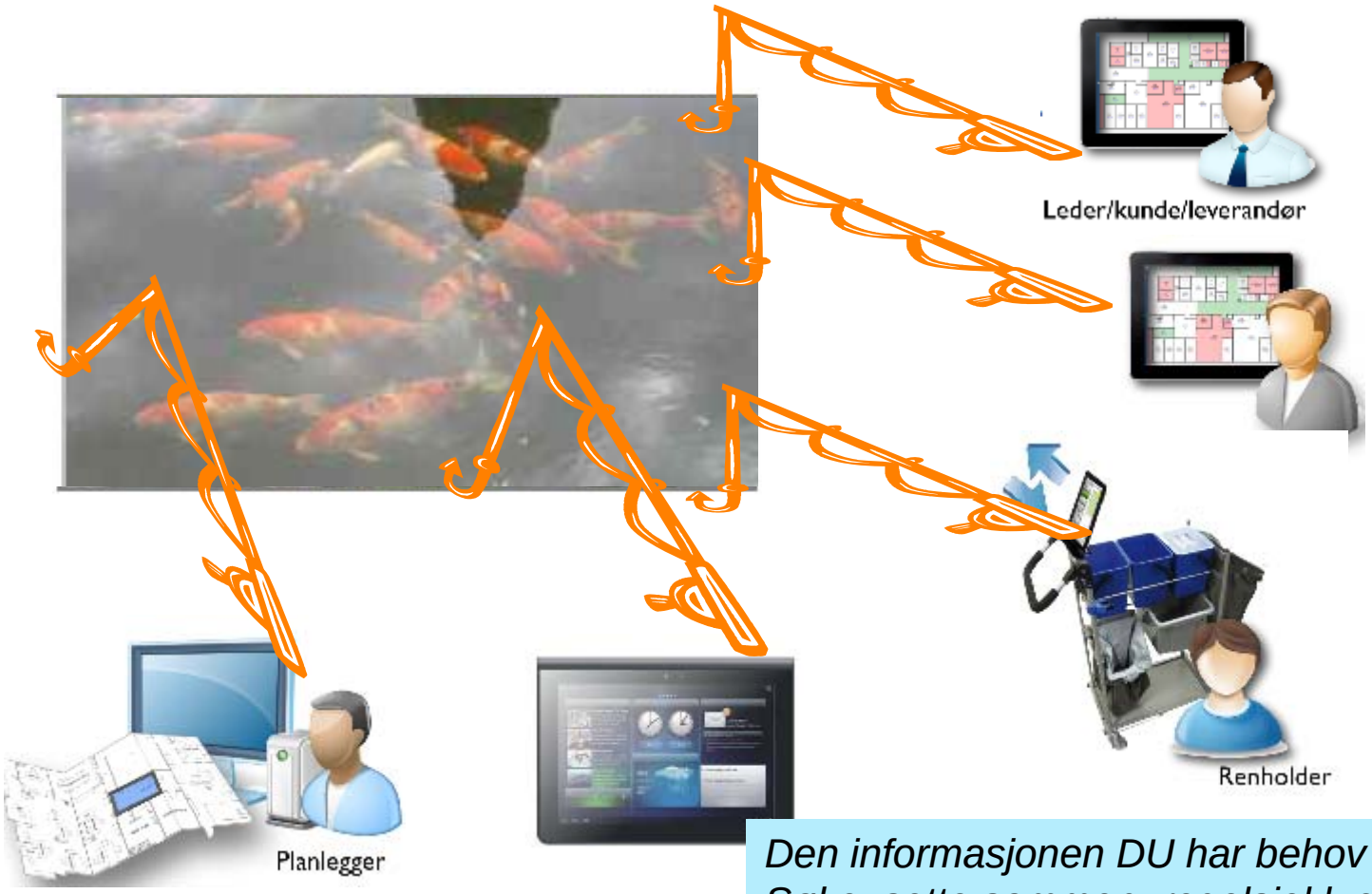


BIM gir oss mulighet til å "høste" informasjon for drift av bygget

Viktige elementer

IFC,IFD/BSDD,Pset, egenskaper

Hva trenger man i ferdigstillelse og driftsfasen!



Den informasjonen DU har behov for.
Søke, sette sammen, regelsjekk etc
All informasjon for FDV skal være digitalt/tabelarisk
Dokumentasjon levert på PDF avlives her og NÅ !

Open BIM, IFC 4, (BSDD/IFD)

http://buildingsmart-tech.org/ifc/IFC2x4/rc2/html/index.htm

En entitet (objekt) i IFC har predefinert en eller flere property-set (som kan benyttes), og arver også property-sets fra relaterte entiteter.

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B. Alphabetical Listing
B.1 Defined Types
B.2 Enumeration Types
B.3 Select Types
B.4 Entities
B.5 Functions
B.6 Rules
B.7 Property Sets
B.8 Quantity Sets

En pumpe er av/har en pumpetype, og pumpen (eller pumpetypen) kan ha ett eller flere tilknyttede Property Set med en samling av egenskaper. Dette er forenklet illustrert i utklipp fra IFC2x4 (http://buildingsmart-tech.org/ifc/IFC2x4/rc2/html) nedenfor

7.5.2.53 IfcPump

A pump is a device which imparts mechanical work on fluids or slurries to move them through a channel or pipeline. A typical use of a pump is to circulate chilled water or heating hot water in a building services distribution system.

Type Use Definition

IfcPump defines the occurrence of any pump; common information about pump types is handled by IfcPumpType.

The following property set definitions are applicable to this entity:

- Pset_PumpOccurrence
- Pset_PumpTypeCommon

7.5.3.80 Pset_PumpOccurrence

Applicable Entity: IfcPump

Definition: Pump occurrence attributes attached to an instance of IfcPump.

XML Specification: Pset_PumpOccurrence.xml

- **ImpellerDiameter**
  IfcPropertySingleValue / IfcPositiveLengthMeasure
  Diameter of pump impeller - used to scale performance of geometrically similar pumps.
- **BaseType**
  IfcPropertyEnumeratedValue / IfcLabel / **PEnum_PumpBaseType: FRAME, BASE, NONE, OTHER, NOTKNOWN, UNSET**
  Defines general types of pump bases. FRAME: Frame. BASE: Base. NONE: There is no pump base, such as an inline pump. OTHER: Other type of pump base.
- **DriveConnectionType**
  IfcPropertyEnumeratedValue / IfcLabel / **PEnum_PumpDriveConnectionType: DIRECTDRIVE, BELTDRIVE, COUPLING, OTHER, NOTKNOWN, UNSET**
  The way the pump drive mechanism is connected to the pump. DIRECTDRIVE: Direct drive. BELTDRIVE: Belt drive. COUPLING: Coupling. OTHER: Other type of drive connection.

7.5.3.82 Pset_PumpTypeCommon

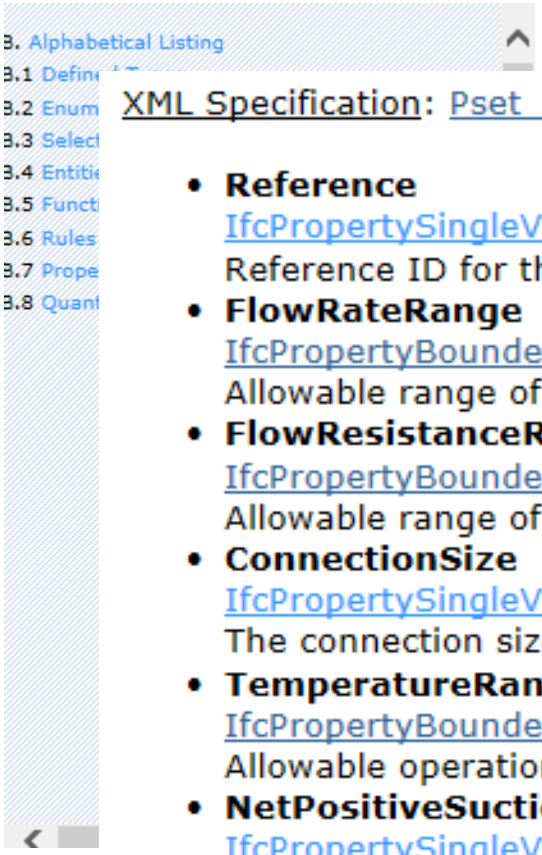
Applicable Entity: IfcPump

Definition: Common attributes of a pump type.

XML Specification: Pset_PumpTypeCommon.xml

- **Reference**
  IfcPropertySingleValue / IfcIdentifier
  Reference ID for this specified type in this project (e.g. type 'A-1').
- **FlowRateRange**
  IfcPropertyBoundedValue / IfcMassFlowRateMeasure
  Allowable range of volume of fluid being pumped against the resistance specified.
- **FlowResistanceRange**
  IfcPropertyBoundedValue / IfcPressureMeasure
  Allowable range of frictional resistance against which the fluid is being pumped.
- **ConnectionSize**
  IfcPropertySingleValue / IfcPositiveLengthMeasure
  The connection size of the to and from the pump.
- **TemperatureRange**
  IfcPropertyBoundedValue / IfcThermodynamicTemperatureMeasure
  Allowable operational range of the fluid temperature.
- **NetPositiveSuctionHead**
  IfcPropertySingleValue / IfcPressureMeasure
  Minimum liquid pressure at the pump inlet to prevent cavitation.
- **NominalRotationSpeed**
  IfcPropertySingleValue / IfcRotationalFrequencyMeasure
  Pump rotational speed under nominal conditions.

Hvilke egenskaper finnes?



B.4 Entities (759)

XML Specification: Pset_PumpTypeCommon.xml

- **Reference**
  IfcPropertySingleValue / IfcIdentifier
  Reference ID for this specified type in this project (e.g. type 'A-1').
- **FlowRateRange**
  IfcPropertyBoundedValue / IfcMassFlowRateMeasure
  Allowable range of volume of fluid being pumped against the resistance specified.
- **FlowResistanceRange**
  IfcPropertyBoundedValue / IfcPressureMeasure
  Allowable range of frictional resistance against which the fluid is being pumped.
- **ConnectionSize**
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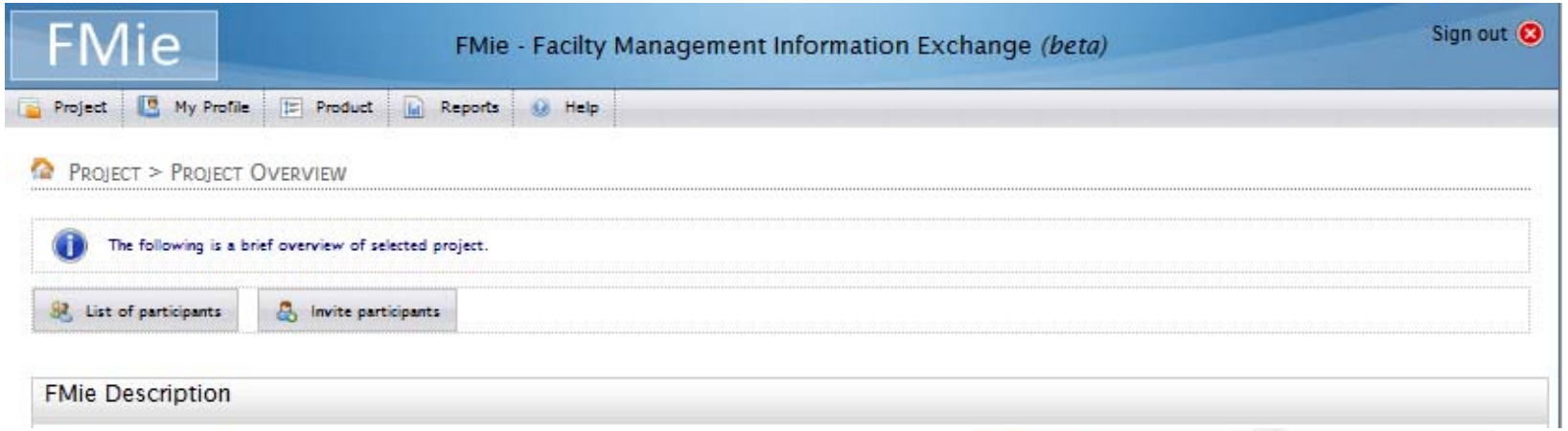
  The connection size of the to and from the pump.
- **TemperatureRange**
  IfcPropertyBoundedValue / IfcThermodynamicTemperatureMeasure
  Allowable operational range of the fluid temperature.
- **NetPositiveSuctionHead**
  IfcPropertySingleValue / IfcPressureMeasure
  Minimum liquid pressure at the pump inlet to prevent cavitation.
- **NominalRotationSpeed**
  IfcPropertySingleValue / IfcRotationalFrequencyMeasure
  Pump rotational speed under nominal conditions.

Fmie, Mange aktører deltar



buildingSMART NORGE

Norges bygg- og eiendomsforening

HELSE SØR-ØST

STATSBYGG

Forsvarsbygg

Helsebygg Midt-Norge

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Jotne

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MultiBIM AS

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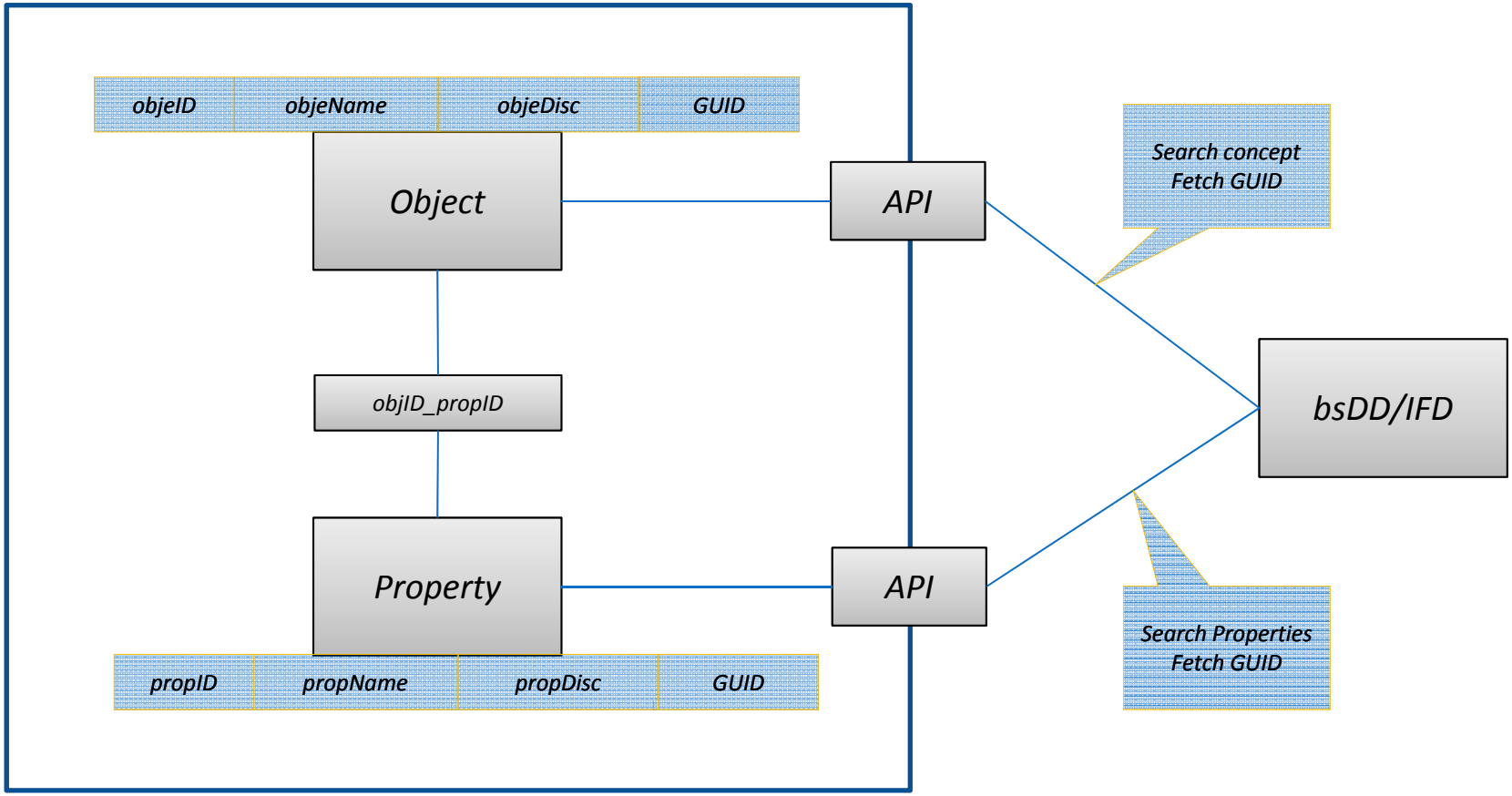
Kommunikasjon med bsDD/IFD




Welcome to FMie
Facilty Management Information Exchange (FMie) is a web based application for collecting and organizing required or missing properties for product- and systemcodes related to Facility Management (FM).
Brukernavn
Passord
Logg inn
Glemt passord

Back | Edit | New Property | Add language translation | Connect User Groups | Connect product to a Context

Object Information

Number (Int. English)	0
Name (Int. English)	Pump
Description (Int. English)	This is a demo-pump created to demonstrate functionality
Mapped contexts	*TFM: JP - Pumpe* ✖ *TFM: JQ - Pumpe i VA-installasjoner* ✖
Created date	25.04.2013 02:35:29
Changed date	00:00:00

Existing product translations

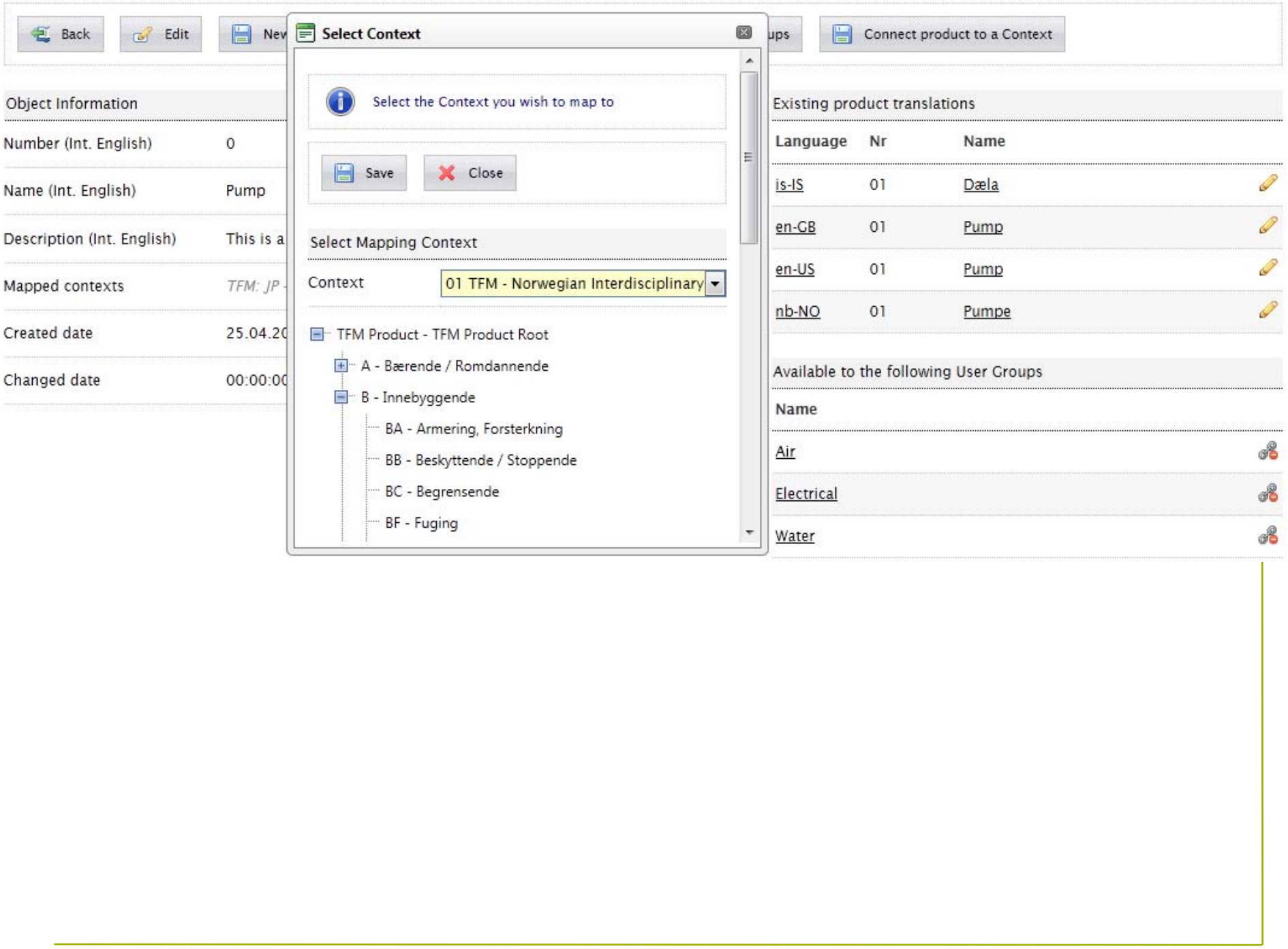
Language	Nr	Name
is-IS	01	Dæla
en-GB	01	Pump
en-US	01	Pump
nb-NO	01	Pumpe

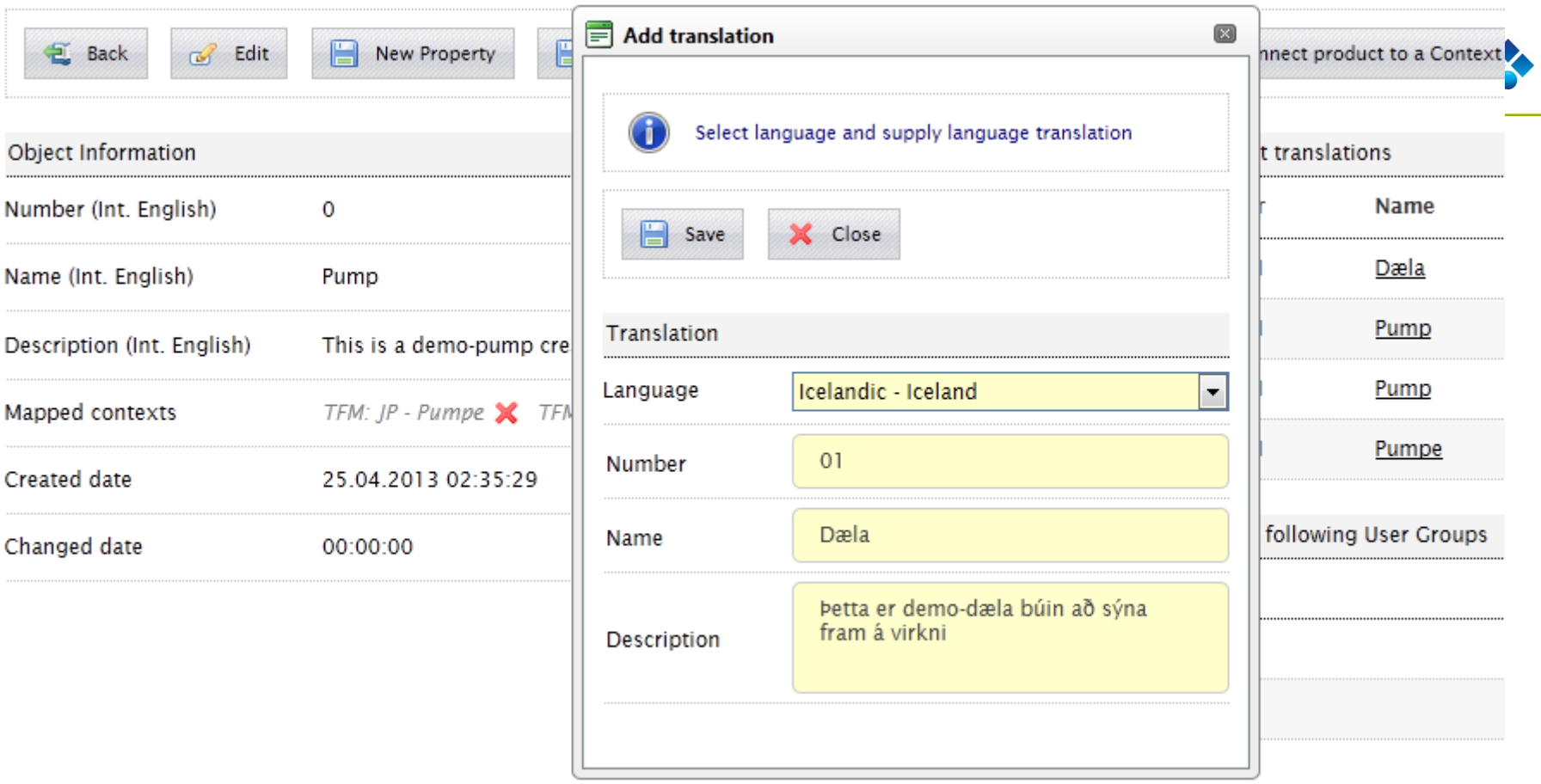
Available to the following User Groups

Name
Air
Electrical
Water

Connected Properties

Property Group	Property Name	Source
Documentation	Commissioning report provided	FMie
Documentation	Data sheet provided	FMie
Pset_Condition	AssessmentCondition	IFC
Pset_Condition	AssessmentDate	IFC


Back
Edit
Nev
Select Context
ups
Connect product to a Context
Object Information
Number (Int. English) 0
Name (Int. English) Pump
Description (Int. English) This is a
Mapped contexts TFM: JP
Created date 25.04.20
Changed date 00:00:00
Select the Context you wish to map to
Save
Close
Select Mapping Context
Context 01 TFM - Norwegian Interdisciplinary
TFM Product - TFM Product Root
A - Bærende / Romdannende
B - Innebyggende
BA - Armering, Forsterkning
BB - Beskyttende / Stoppende
BC - Begrensende
BF - Fuging
Existing product translations
Language Nr Name
is-IS 01 Dæla
en-GB 01 Pump
en-US 01 Pump
nb-NO 01 Pumpe
Available to the following User Groups
Name
Air
Electrical
Water


Back
Edit
New Property
nnect product to a Context
Object Information
Number (Int. English) 0
Name (Int. English) Pump
Description (Int. English) This is a demo-pump cre
Mapped contexts TFM: JP - Pumpe
Created date 25.04.2013 02:35:29
Changed date 00:00:00
t translations
Name
Dæla
Pump
Pump
Pumpe
following User Groups
Add translation
Select language and supply language translation
Save
Close
Translation
Language Icelandic - Iceland
Number 01
Name Dæla
Description Þetta er demo-dæla búin að sýna fram á virkni

New property

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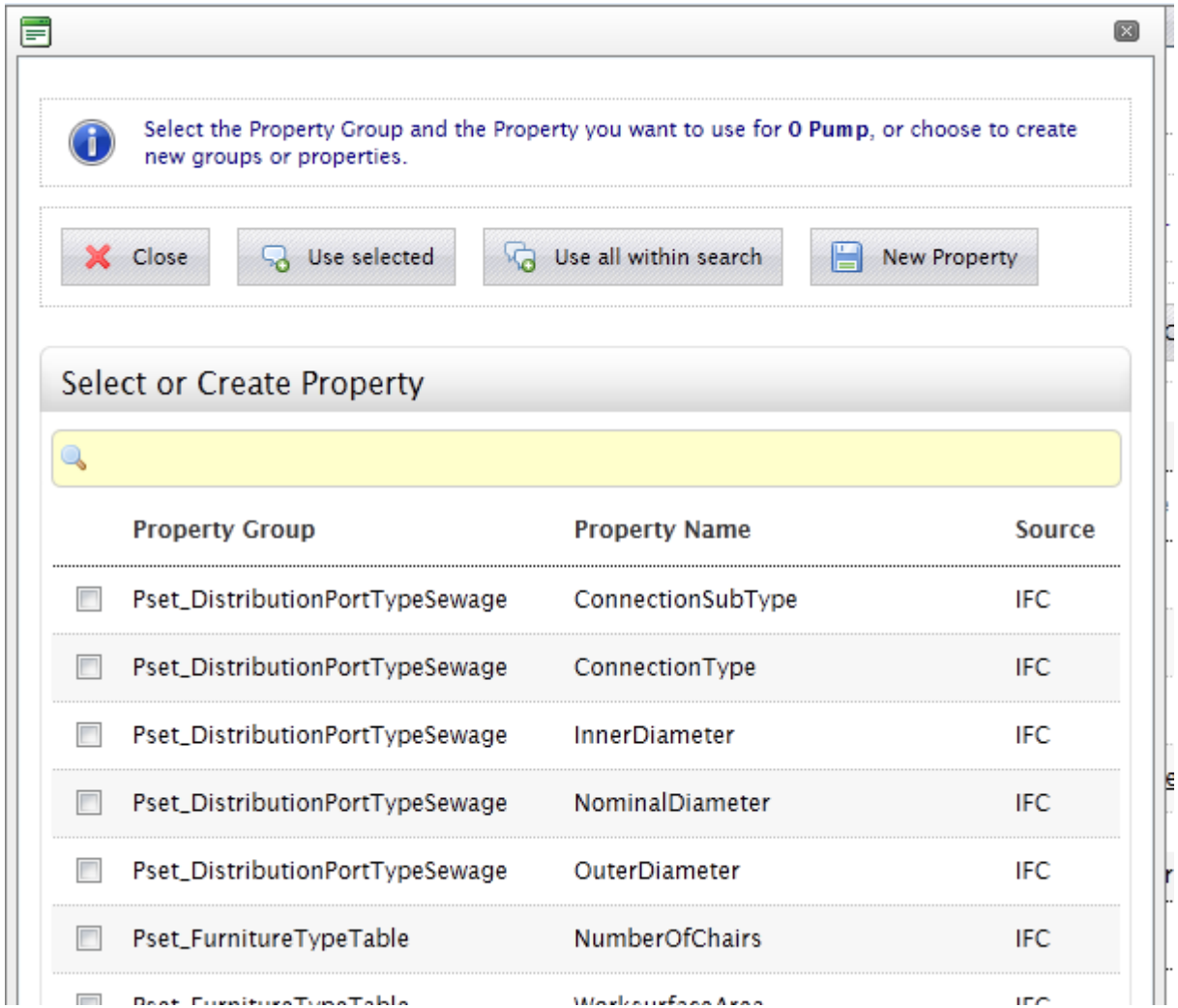

New property

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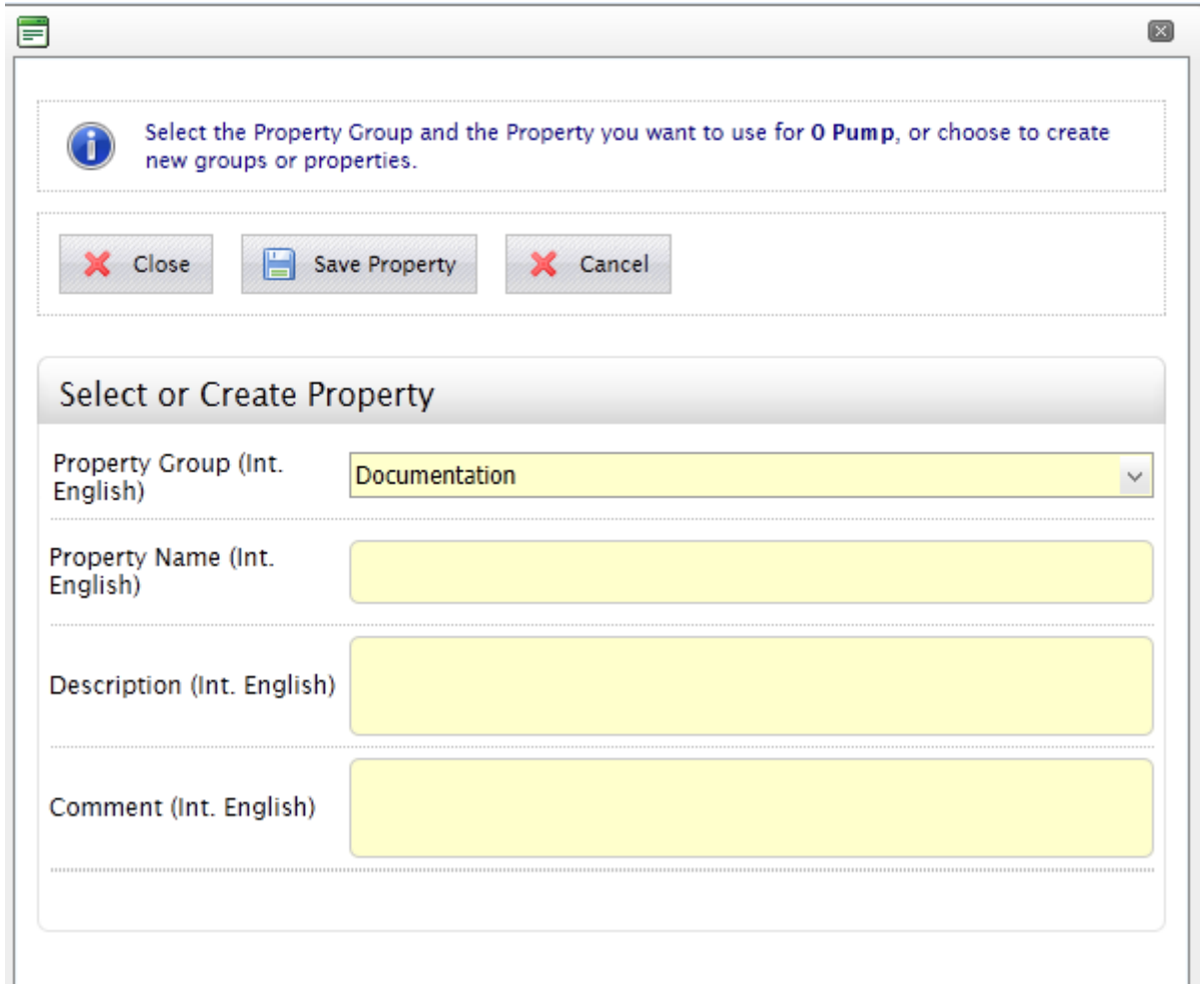

bsDD/IFD

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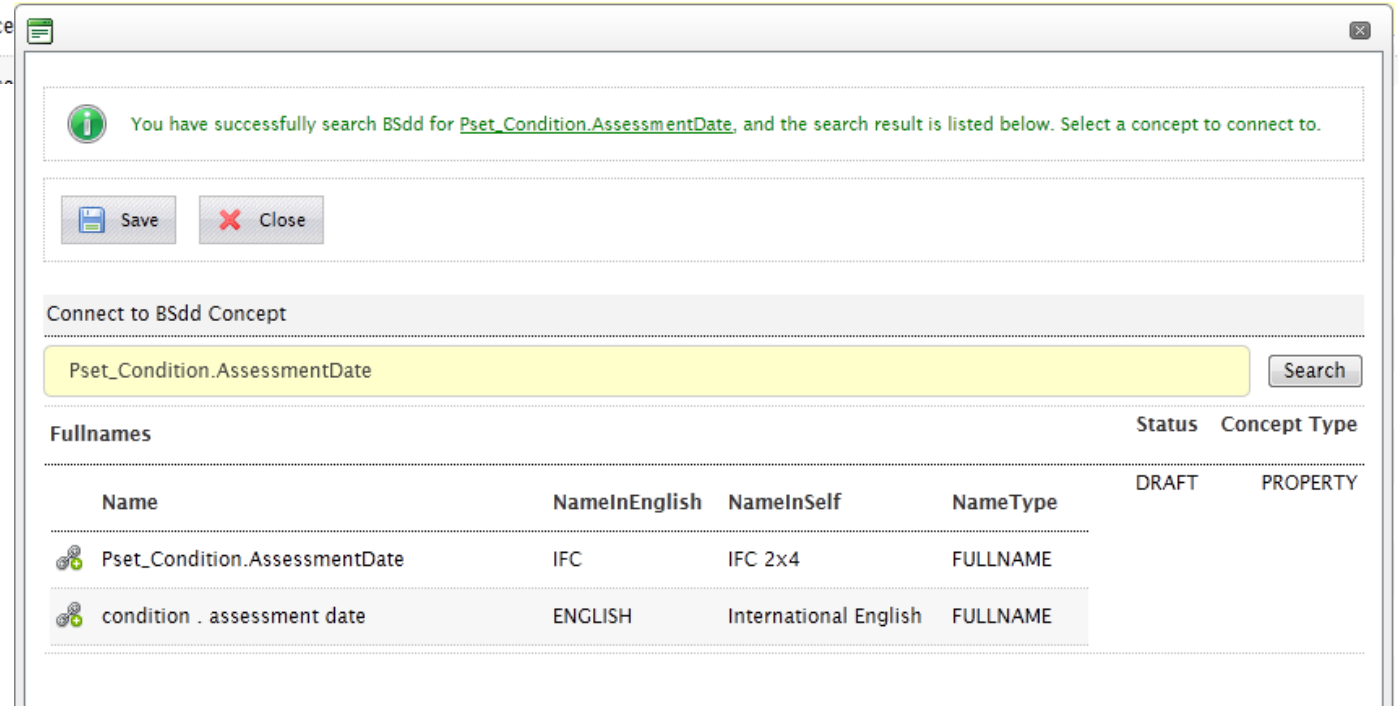
Documentation	Commissioning report provided	FMie
Documentation	Data sheet provided	FMie
Pset_Condition	AssessmentCondition	IFC
Pset_Condition	AssessmentDate	IFC
Pset_Condition	AssessmentDescription	IFC
Pset_ElectricalDeviceCommon	Current	IFC
Pset_ElectricalDevice		IFC

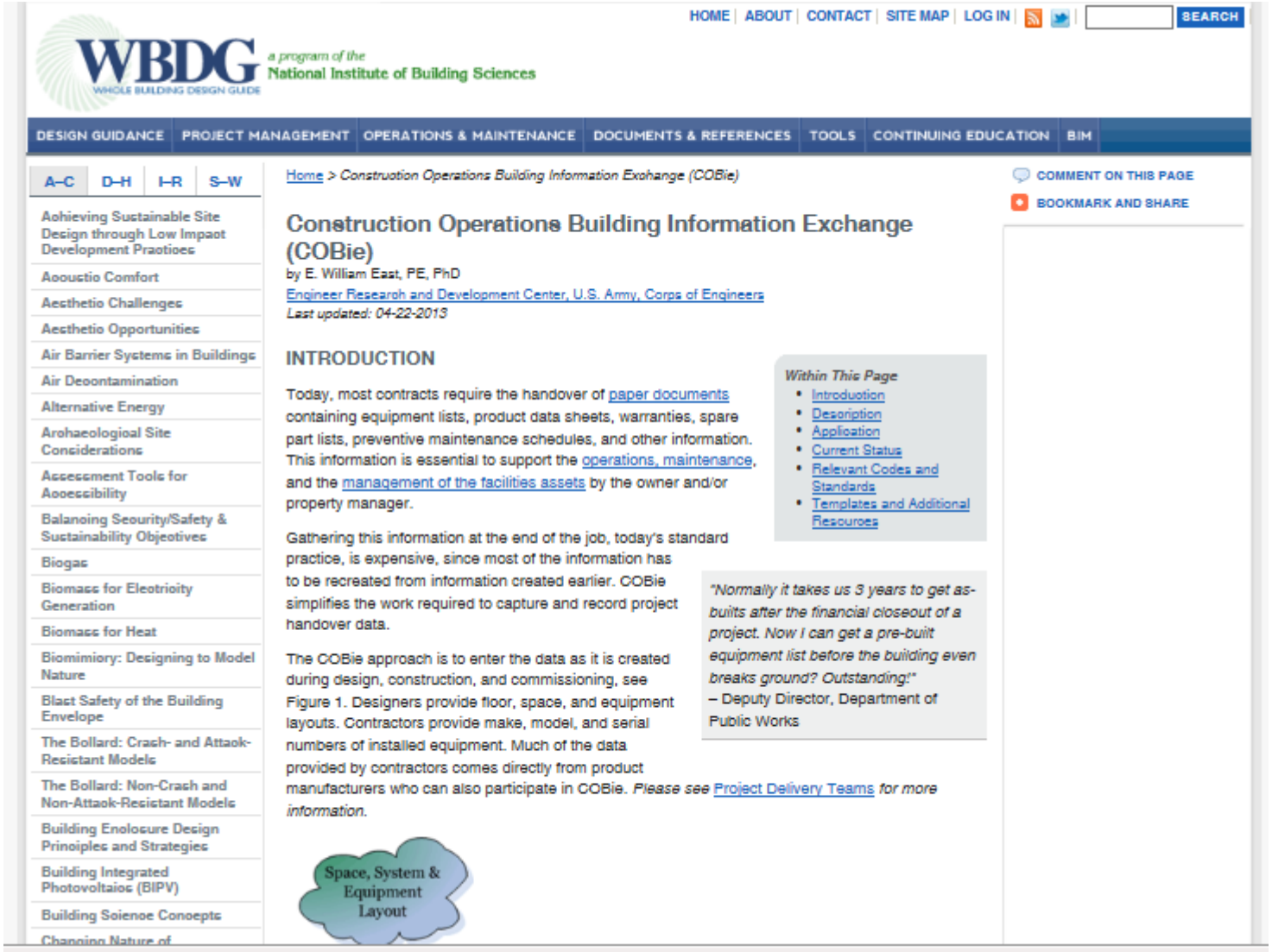


COBie, et supplemet

- *Når det beskrives COBie i dette dokumentet henviser det til innsamlingsregnearket som er utviklet av USACE og buildingSMART International for å lage et entydig grensesnitt mellom design og drift. Informasjon i dette regnearket kan høstes fra ulike BIM systemer eller kan brukes som ett tradisjonelt input-regneark hvor informasjonen legges inn manuelt.*

- COBIE = Construction Operations Building Information Exchange

http://www.wbdg.org/resources/cobie.php



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WBDG WHOLE BUILDING DESIGN GUIDE — a program of the National Institute of Building Sciences

DESIGN GUIDANCE | PROJECT MANAGEMENT | OPERATIONS & MAINTENANCE | DOCUMENTS & REFERENCES | TOOLS | CONTINUING EDUCATION | BIM

A–C | D–H | I–R | S–W

- Achieving Sustainable Site Design through Low Impact Development Practices
- Acoustic Comfort
- Aesthetic Challenges
- Aesthetic Opportunities
- Air Barrier Systems in Buildings
- Air Decontamination
- Alternative Energy
- Archaeological Site Considerations
- Assessment Tools for Accessibility
- Balancing Security/Safety & Sustainability Objectives
- Biogas
- Biomass for Electricity Generation
- Biomass for Heat
- Biomimicry: Designing to Model Nature
- Blast Safety of the Building Envelope
- The Bollard: Crash- and Attack-Resistant Models
- The Bollard: Non-Crash and Non-Attack-Resistant Models
- Building Enclosure Design Principles and Strategies
- Building Integrated Photovoltaics (BIPV)
- Building Science Concepts
- Changing Nature of

Home > Construction Operations Building Information Exchange (COBie)

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Construction Operations Building Information Exchange (COBie)

by E. William East, PE, PhD
Engineer Research and Development Center, U.S. Army Corps of Engineers
Last updated: 04-22-2013

INTRODUCTION

Today, most contracts require the handover of paper documents containing equipment lists, product data sheets, warranties, spare part lists, preventive maintenance schedules, and other information. This information is essential to support the operations, maintenance, and the management of the facilities assets by the owner and/or property manager.

Within This Page
- Introduction
- Description
- Application
- Current Status
- Relevant Codes and Standards
- Templates and Additional Resources

Gathering this information at the end of the job, today's standard practice, is expensive, since most of the information has to be recreated from information created earlier. COBie simplifies the work required to capture and record project handover data.

"Normally it takes us 3 years to get as-builts after the financial closeout of a project. Now I can get a pre-built equipment list before the building even breaks ground? Outstanding!"
– Deputy Director, Department of Public Works

The COBie approach is to enter the data as it is created during design, construction, and commissioning, see Figure 1. Designers provide floor, space, and equipment layouts. Contractors provide make, model, and serial numbers of installed equipment. Much of the data provided by contractors comes directly from product manufacturers who can also participate in COBie. *Please see* Project Delivery Teams *for more information.*

Space, System & Equipment Layout

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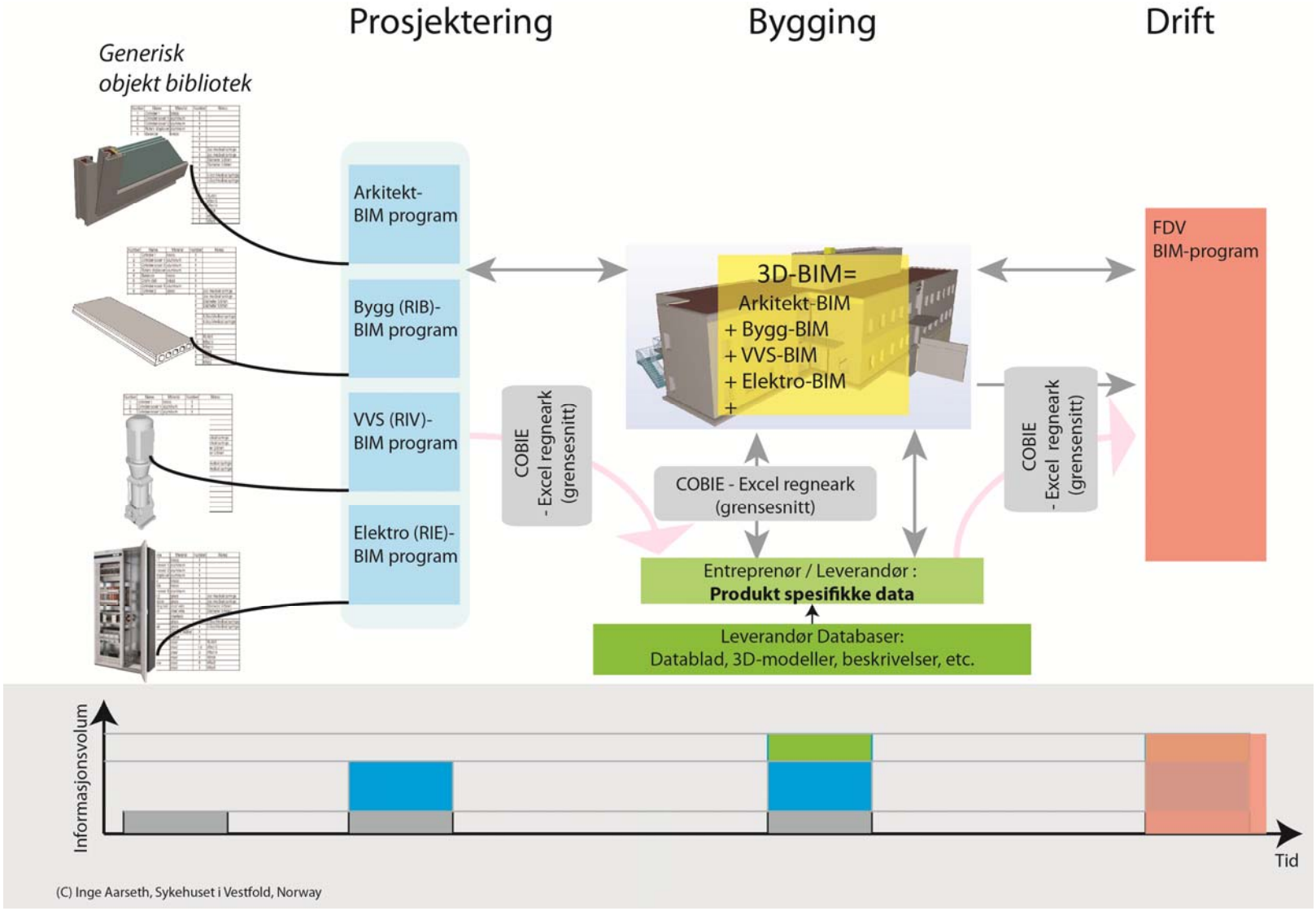
COBie 2.4 er et supplemet

A	E	F	G	H	I	J	K	L
Name	SheetName	RowName	Value	Unit	ExtSystem	ExtObject	ExtIdentifier	Description
FinishCeilingHeight	Space	EG.001	2.9	meters	IFC text editor	IfcQuantityLength	n/a	3.0-0.1
FinishCeilingHeight	Space	EG.002	2.9	meters	IFC text editor	IfcQuantityLength	n/a	3.0-0.1
FinishCeilingHeight	Space	EG.003	2.9	meters	IFC text editor	IfcQuantityLength	n/a	3.0-0.1
FinishCeilingHeight	Space	EG.004	2.9	meters	IFC text editor	IfcQuantityLength	n/a	3.0-0.1
FinishCeilingHeight	Space	OG1.002	2.9	meters	IFC text editor	IfcQuantityLength	n/a	3.0-0.1
FinishCeilingHeight	Space	OG1.003	2.9	meters	IFC text editor	IfcQuantityLength	n/a	3.0-0.1
FinishCeilingHeight	Space	OG1.004	2.9	meters	IFC text editor	IfcQuantityLength	n/a	3.0-0.1

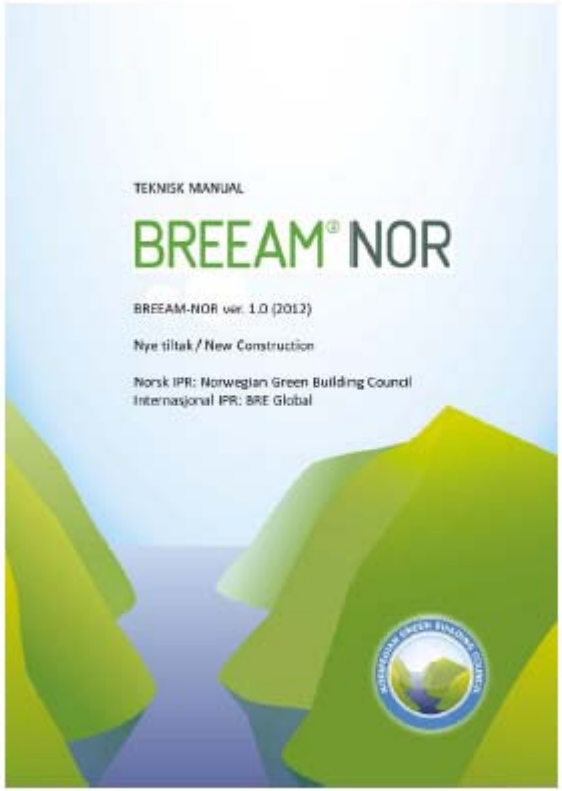
Instruction | Contact | Facility | Floor | Space | Zone | Type | Component | System

Spare | Resource | Job | Document | **Attribute** | Coordinate | Connection | Issue | PickLists

Name	CreatedBy	TimeDateStamp	Category	ApprovalBy	SheetName	RowName
026102 Product Data	Thomas.Liebich@AEC3.c	2009-09-01T12:34:56	Product Data	Information Only	Type	026102
L-1009 Product Data	Thomas.Liebich@AEC3.c	2009-09-01T12:34:56	Product Data	Information Only	Type	L-1009
Spk-001 Product Data	Thomas.Liebich@AEC3.c	2009-09-01T12:34:56	Product Data	Information Only	Type	Spk-001
Cbd-001 Product Data	Thomas.Liebich@AEC3.c	2009-09-01T12:34:56	Product Data	Information Only	Type	Cbd-001
Kit-001 Product Data	Thomas.Liebich@AEC3.c	2009-09-01T12:34:56	Product Data	Information Only	Type	Kit-001
tilt and turn two panel window - external Product D	Thomas.Liebich@AEC3.c	2009-09-01T12:34:56	Product Data	Information Only	Type	tilt and turn two panel window - external
fixed glazing window Product Data	Thomas.Liebich@AEC3.c	2009-09-01T12:34:56	Product Data	Information Only	Type	fixed glazing window
single right swing door - internal Product Data	Thomas.Liebich@AEC3.c	2009-09-01T12:34:56	Product Data	Information Only	Type	single right swing door - internal
single left swing door - internal Product Data	Thomas.Liebich@AEC3.c	2009-09-01T12:34:56	Product Data	Information Only	Type	single left swing door - internal
double swing door - internal Product Data	Thomas.Liebich@AEC3.c	2009-09-01T12:34:56	Product Data	Information Only	Type	double swing door - internal
double swing door - external Product Data	Thomas.Liebich@AEC3.c	2009-09-01T12:34:56	Product Data	Information Only	Type	double swing door - external

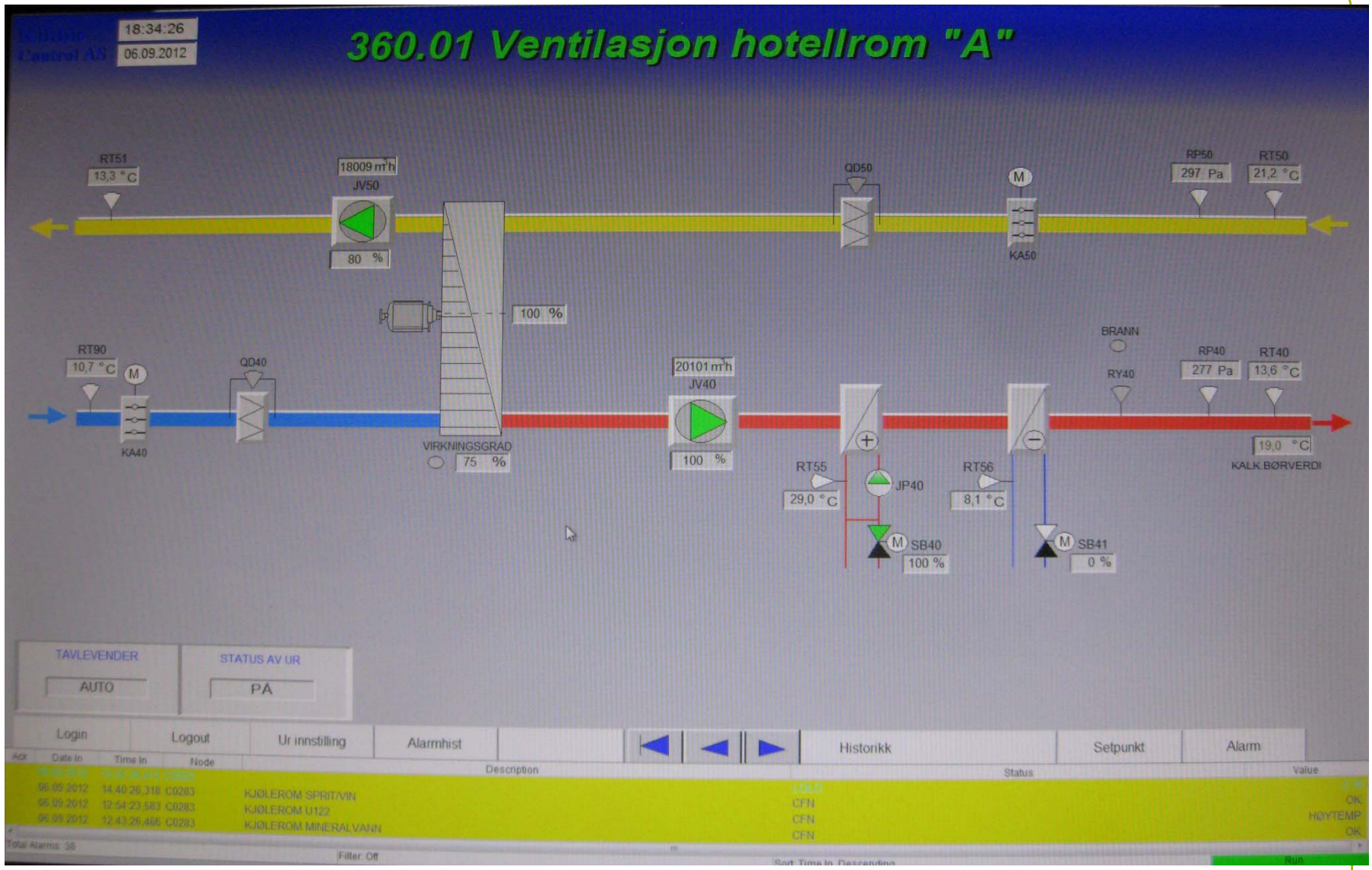

Prosjektering
Bygging
Drift
Generisk
objekt bibliotek
Arkitekt-
BIM program
Bygg (RIB)-
BIM program
VVS (RIV)-
BIM program
Elektro (RIE)-
BIM program
COBIE
- Excel regneark
(grensesnitt)
3D-BIM=
Arkitekt-BIM
+ Bygg-BIM
+ VVS-BIM
+ Elektro-BIM
+
COBIE - Excel regneark
(grensesnitt)
COBIE
- Excel regneark
(grensesnitt)
FDV
BIM-program
Entreprenør / Leverandør :
Produkt spesifikke data
Leverandør Databaser:
Datablad, 3D-modeller, beskrivelser, etc.
Informasjonsvolum
Tid
(C) Inge Aarseth, Sykehuset i Vestfold, Norway

Sertifisering krever også dokumentasjon

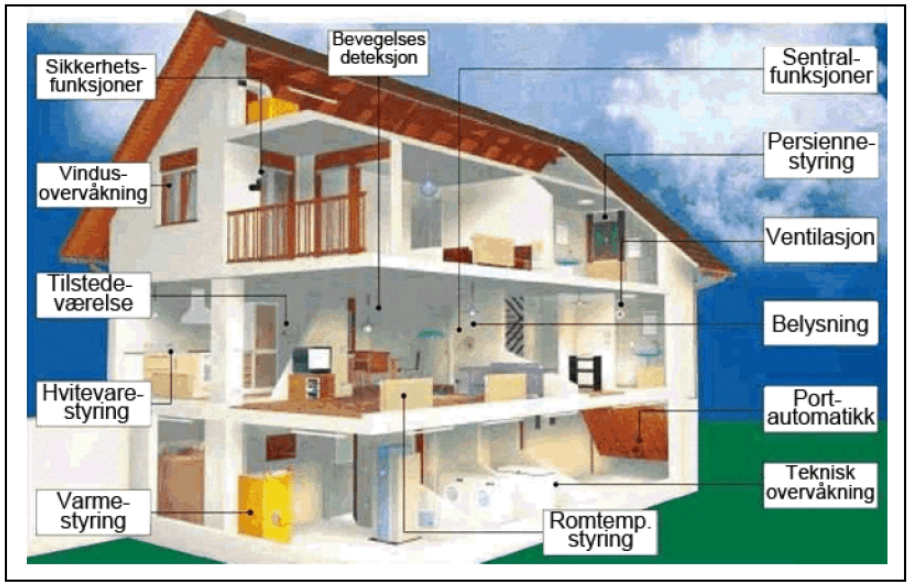


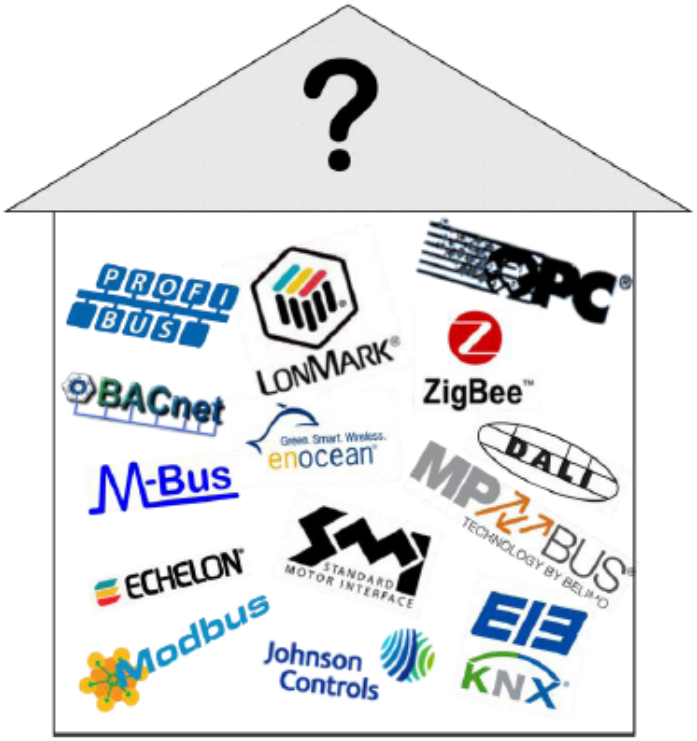
Miljøområder	Vekting (%)
Ledelse (MAN)	12
Helse og innemiljø (HEA)	15
Energi (ENE)	19
Transport (TRA)	10
Vann (WAT)	4,5
Materialer (MAT)	14
Avfall (WST)	7,5
Bruk av areal og økologi (LE)	10
Forurensing (POL)	8
Innovasjon (INN)	10

Mulighetene øker

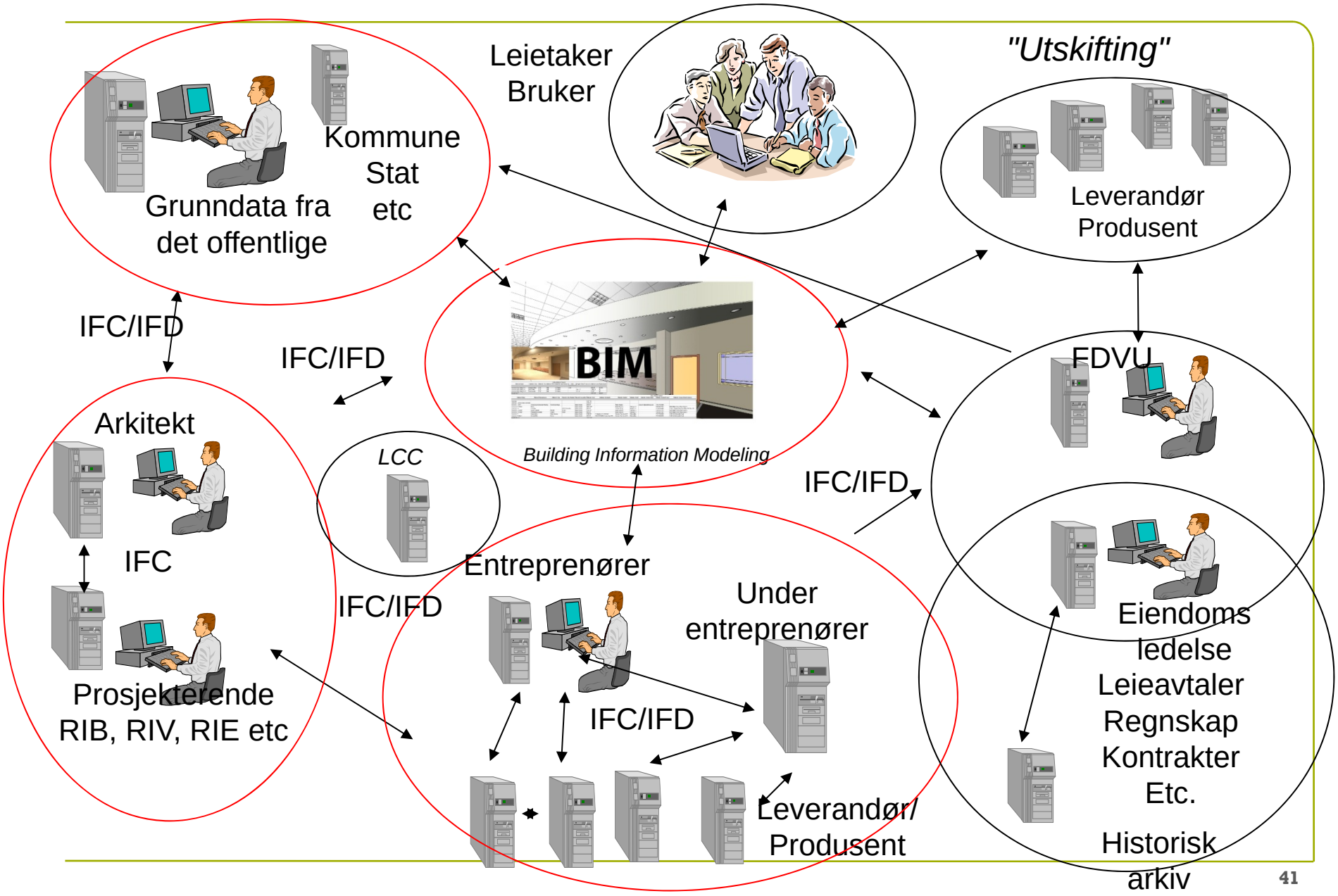


Utveksling av informasjon, IFCXML





informasjonsutveksling BIM IFC/IFD - Bærekraftig Eiendomsforvaltning



Utnytte BIM i driftsfasen……

Spørsmål ?

- …de e fali det?

- …det gir muligheter?