

STATSBYGG BIM-MANUAL 2.0 (SBM2)

- Why?
- What?
- How? (with demo)
- When?
- What's next?

EU BIM Task Group - 2019-08-28

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WHO – FRODE MOHUS



M.Sc. - NTNU – Norwegian University of Science and Technology, 1987

Chief Engineer – Domain Coordinator at Statsbygg BIM Section

Has worked with open BIM (IFC) solutions since 2003

One of the authors of Statsbygg BIM Manuals since 2008

Has been working with Statsbygg BIM Manual 2.0 solutions since 2015

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WHO – HARALD ONARHEIM



BIM-technician – FiO – Oslo Vocational University, 2009

CEO – Digital Problem Solver at DIGIBIM AS

Has worked with open BIM (IFC) solutions since 2008

Hass been implementing SBM1.2.1 in projects since 2011

One of the authors of SBM2 since 2014, and practical/technical implementation since 2019.

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WHY A BIM MANUAL?



SOME CHALLENGES

- Different projects specify the BIM requirements differently (extent of properties used vary, and non-standard properties used)
- The current BIM Manual is PDF only (>100 pages) difficult to follow and not according to 2019 digitalization ambitions
- The current BIM Manual is not very precise, and with imbalanced requirement levels
- The current BIM Manual can not easily be validated in software
- The current BIM Manual is old (Dec 2013) and partly out-of-date
- The current BIM Manual specifies IFC 2x3 requirements only (no IFC4)

FROM STATSBYGG DIGITALIZATION STRATEGY

«...a common digital model of all relevant buildings...»

Statsbyggs IKT-strategi understøtter regjeringens digitaliseringsstrategi.

Digitalt målbilde

Statsbygg vil fokusere mot fire hovedem ader som til sammen danner et fremtidig digitalt målbilde.

 Statsbygg har én felles digital modell av alle relevante bygg bforbindelse med nye byggeprosjekter og større vedlikeholdsprosjekter

Denne digitale modellen (som BIM, GIS, ol) ligger til grunn for samhandling i prosjektgjennomføring og overleveres «som bygget» til eier og eiendomsfor altning. Den digitale modellen skal utgjøre et felles grunnlag for videre forvaltning og utvikling av Statsbyggs bygninger.

II. Statsbyggs eiendommer og bygninger har effektiv drift gjennom høy grad av digitalisering

Digitalisering av eiendommer og bygninger fører til mer effektiv drift og lavere dimskostnader gjennom bl.a. bruk av sanntidsinformasjon til styring og analyser, i notbygg brukes for å prøve ut digitale teknologier

- III. Statsbygt samhandler digitalt med kunder, leverandører og andre samarbeidspart..ere Digital samhandling benyttes i utstrakt grad både internt og eksternt mot kunder, leverandører, rammesettere og befolkning
- IV. Statsbygg benytter digitalisering til å fremme innovasjon i bygge- og eiendomsnæringen Statsbygg utnytter digital teknologi til nye løsninger og tjenester bl.a. basert på innspill fra ansatte og digitale trender. Kunder, leverandører og akademia inviteres inn i utviklingsprosessene for å dra nytte av hverandres innsikt.

«...efficient buidling operations ... through digitalization...»

«...interact digitally...»

«...digitalization to promote innovation in AEC...»

WHAT WE HOPE FOR IN A NEW BIM MANUAL

- Common, precise base requirements for all projects (but further adapted to individual needs in each project) to raise model quality
- Use of «maturity» properties to communicate intended BIM usage better
- Avoid (and possibly remove) unwanted/unnecessary «spam» properties
- Automated validation in software for requirement set that can be carried out by *both* the design team and the client
- Freeing up time for handling tasks that can *not* be automated
- Using open standards for model (IFC), requirement set (mvdXML), and issue reporting back to CAD systems (BCF)





WHAT IS OUR NEW BIM MANUAL?



STATSBYGG BIM MANUALS – A BRIEF HISTORY

• The path to today's BIM Manual:

- 1.0 (2008): Made for «HITOS» full conceptional project (a lot of «BIM textbook»)
- 1.1 (2009): Made for «HITOS» coordinated project (very specific on some parts)
- **1.2** (2011): Transfer to today's tabular form
- 1.2.1 (2013): Minor changes, error corrections, clarifications this manual is still usually the legally valid version in building projects
- 1.2.1 (validation adapted interpretation 2019)
- The new BIM Manual (abbreviated SBM2):
 - 2.0 ARCH/STRU (started in 2015): with BIM Consult / SWECO BIM Lab
 - 2.0 MECH/ELEC/(ARCH/STRUC revision) (2017-2018): with COWI
 - 2.0 All domains (from Q3/2018→max 4 Years): with *Multiconsult / DigiBIM*

STATSBYGG BIM MANUAL 2.0 SCOPE & OUT OF SCOPE

SCOPE

- A manual with requirements for the information content and form in model deliverables («product»), from actors of different domains in different project milestones and phases (requirements that can be validated)
- A manual with a certain level of model structure guidance («product»)
 OUT OF SCOPE
- NOT a manual for defining the modelling *«processes»* (*«how* to make the product»)
- NOT a manual for CAD *drawing* requirements (CAD Manual)
- NOT a manual for setup and structuring of model deliveries in a web hotel

WHAT IS THE ESSENCE OF THE VALIDATION?

- For this **OBJECT TYPE** (e.g. *lfcDoor*) that <u>exists</u> in the IFC model:
 - Does it contain the **PROPERTIES** (e.g. *FireRating*) that the BIM manual requires from THIS actor (e.g. ARCH) by THIS milestone (e.g. 3.2.9)?
 - Are these properties specified at the «**RIGHT PLACE**» in the model (e.g. for a door (*IfcDoor*) does the property *FireRating* exist in a property set (Pset) named *Pset_DoorCommon*) applied to *IfcDoor*?
 - IF requirements are set for data «values»: Are they according to valid VALUES? For a *FireRating* e.g.. *EI60* will be a valid value , whereas *DonaldTrump* is not.

...AND WHAT DOES IT NOT DO?

- SBM2 does NOT validate for:
 - the professional quality of the model
 - the correct professional design solutions
 - if correct object type is used for the right building part / component - e.g. if a stair is modelled as one lfcStair of a number of stacked lfcSlab objects
 - object types that do NOT exist in the current model - e.g. lfcRamp
 - Relations e.g. that this wall has a relation to the door at denne veggen har relasjon til dør mounted in the wall [SW like Solibri can]
 - Clash detection [SW like Solibri can]

- Checked only IF defined:
 - list of valid values e.g. EI30, EI60,
 EI90, EI120 for simple fire ratings)
 - «REGEX» expressions (the syntax of a composite string) if they are to be checked one has to agree om syntax, and this syntax must be supported by the software



HOW TO USE THE STATSBYGG BIM MANUAL? (WITH DEMO)





VALIDATION PRINCIPLE WITH SBM2





DEMO – WHO DELIVERS WHAT, HOW AND WHEN?

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Guidelines - Settings - Project Components - Model Components - Object cards Requirements - Documentation - Language - Account / Langua													elp		
Template: Statsbygg TEMPLATE: Statsbygg BIM Manual 2.0 TEMPLATE - ARK (WIP - MULTICONSULT)															
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Column	222	IfcColumn is a vertical structural member which often is a	i Object		IfcColumn										
Beam	223	An IfcBeam is a horizontal, or nearly horizontal, structural	Object		IfcBeam										
Curtain Wall	230	A curtain wall is an exterior wall of a building which is an a	a:Object		IfcCurtainWall										



DEMO – 👐

• Requirement templates for main domains/disciplines

- Architectural (ARK) [ARCH]
- Landscape (LARK) [LARCH]
- Structural (RIB) [STRU]
- Electrical (RIE) [ELEC]
- Mechanical and plumbing (RIV) [MECH]

Statsbygg TEMPLATE: Statsbygg BIM Manual 2.0 TEMPLATE - ARK (WIP - MULTICONSULT)	2.1 ARK	Statsbygg	Draft	Multiconsult: Use this database for working with ARCHITECTURAL requirements.	2019/08/22 01:58PM	Сору
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Statsbygg TEMPLATE: Statsbygg BIM Manual 2.0 TEMPLATE - RIV (WIP - MULTICONSULT)	2.1 RIV	Statsbygg	Draft	Multiconsult: Use this database for working with MECHANICAL requirements.	2019/05/27 01:19PM	Сору

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- Domain/discipline spesific requirements are structured by Objects (type), e.g. IfcWall, and include
 - General information
 - Object properties such as; Name, Description, etc. (existesnce check)
 - Level of Geometry (LoG)
 - Object geometrical maturity (manual check)
 - Property-sets Common/others (IFC Standard)
 - Object Property set properties such as; Acoustic rating, Fire rating, Is External, etc. (existance check)
 - Userdefined Property sets and properties; NOSSB_Nn
 - Additional requirements not covered by the IFC Standard such as; Design status (MMI), «TFM» ID code, ReqTriggers (e.g. Electrical power), etc.
 - Quantities (QTO) [not decided yet]

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DEMO – WHAT O Available Object-type and applicable proper sets and properties				es rty		Descriptions for Object- type, Property sets, Properties and LoG (geometrical maturity)								REQUIR DATABA	
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Name	001	Building element code (no: NS3451) + type code (three	di Property	Label	IfcRoot.Name	x	X	X	x	х	х	х	x	x	
Description	002	User defined description of element type, including mater	riaProperty	Text	IfcRoot.Description	x		x	x	x	х	х	x	x	
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LoG Level 1	-	The object is represented with an approximate geometry.	Geometry (Loc		NOSSB_LoGLevel.LoGLevel*	x	х						-	-	
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LoG Level 5	-	The objects is detailed "as built".	Geometry		NOSSB_LoGLevel.LoGLevel5	-	-	-						-	
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NOSSB_Reference	150		Group	-									x	×	
NOSSB_ReqTriggers	150		Group							×	×	×	x	×	
NOSSB_ThermalCommon	150	A collection of properties that are commonly used by obj	ec Group		NOSSB_ThermalCommon					×	×	×	x	×	
Column	222	IfcColumn is a vertical structural member which often is	ali Object		IfcColumn					_					
Beam	223	An IfcBeam is a horizontal, or nearly horizontal, structura	Object		IfcBeam										
Curtain Wall	230	A curtain wall is an exterior wall of a building which is an	a: Object		IfcCurtainWall										

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DEMO – 👐

• SBM 1.2.1 = IFC 2x3

- Structured by IFC 2x3 object types, property sets and properties
- Includes all requirement sets in Statsbyggs current BIM manual (Ref#)
- Possible outputs/exports; .mvdXML and .pdf
- SBM 2.0 = IFC 4 + extensions (Statsbygg defined properties)
 - Structured by IFC 4 object types, property sets and properties
 - Includes all requirements reccommended by project team
 - Includes requirement specifications of object geometrical detail level (LoG)
 - Includes Statsbygg defined property sets and properties (NOSSB_Nn)



DEMO – THE VALIDATION PROCESS?



Video demo: https://youtu.be/HfTdoPyTZBU?t=168





WHEN WILL THE BIM MANUAL BE USEFUL AND FINISHED?



WORKING ON SBM2 MODULES – A LONG WAY TO GO...

End User Interface (GUI)									
Generic require	ements and guidance	Validation							
Design Phases	Construction	Construction FM and operations							
Domain (discipline) requirements ARCH/STRUC/ MECH/ELEC	Domain (discipline)Domain (discipline)requirementsrequirementsARCH/STRUC/ARCH/STRUC/MECH/ELECMECH/ELEC		'ENCE	UES	ax (REGEX)				
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	arding to project DIM		Valio	Va	datio				
4D (time planning)	Drill Robot			Vali					
3D reinforcement	Digital building pit	more							
	The requirements	Validat	ion of requ	irements					

GREEN = SBM2 solution exists	YELLOW = SBM2 solution started					
ORANGE = SBM2 solution approaching	GREY = SMB2 solution NOT started yet					

DEPENDING ON IFC4 CERTIFICATIONS TO ADVANCE...

Comparisons	SBM 1.2.1 (2013→)	SBM2 (2019→)
In use in current building projects	Yes	Not yet
Human Readable (PDF)	Yes, only	Yes, also
Machine Readable (mvdXML)	Yes	Yes
Generic / high level requirements exist (not validated)	Yes	Yes
Requirement type SHALL	Yes	Yes
Requirement type (SHALL), i.e. «only if activated in project)	Yes, if template adapted	Yes, template adapted
Requirement type SHOULD	Yes, if INTERPRETED	No
Requirement type «trigger»	No	Yes
Can be valideted vs. IFC2x3 models	Yes (SHALL req.)	Later on if we HAVE to
Can be valideted vs. IFC4 models	No	Yes
Validation of EXISTENCE of something	Yes (SHALL req.)	Yes
Validtion of VALUES of av valid list	No	Yes, if template adapted
Validation of valid SYNTAX (REGEX)	No	Planned

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REQUIREMENTS («X») ADAPTED TO PROJECT GOALS

Pur	'n	ose R	elevant p	phases			٦	Sett kryss i feltene for de formål som anses relevante for de stil
8 AV 10 Nr.		BIM-formål	Relevant i Statsbygg-fase	Relevant i Statsbygg-fa B-2.1 B3.2.5	se B3.2.9 B4.	Relevant i Statsbygg-fase		BIM Ref. Faser i Statsbyggs prosjektmodell →
7	Pro	Statsbyggs faser/milepeler gramm ring og etablering av romprogram. ivitet om ratter synkronisering og kontroll av Ut erem orrægler, romfunksjoner og utstyr i	B3.1.1 B3.1.5 B5.1.0				$\frac{1}{2}$	Tehenal are og Unide siekt 4. 5 - Anslutte 5 - Anslutte
8	Kra ron Ko Ar	V II I link kiesen in n). stnadskalkyle (investeringsanalyse). halyse av livssykluskostnader. nalyse av miljø- og klimapåvirkning sorr CAN.	x x x	x x x x x x x x	x x x x x x	x x x x x x x x		I. Ikke et BIM-prosjekt. Avvik fra standard som skal begrunnes og forhåndsgodkjennes. Referanse til godkjent
	(E 1 U 2 F r	Ittrekk av 2D-tegninger. Prosjekteringsfremdrift (statussetting modenhetsnivå).	- X X - X X 	x x - x	x x x	x x x x x x x x x		2. 3D visualisering og generell kommunikasjon med prosjekterende, utførende, sluttbrukere, oppdragsgiver mv. 3. Tverrfaglig prosjekteringskontroll, med faglig koordinering og kollisionskontroll.
	13 14 15	Simulering og optimalisering av akustikk. Optimalisering og simulering av løsninger for evakuering.		- x x x x	x x	x x x		Areai- og volumkontroll - sammenligning mellom romprogram og prosjekterte arealer, romhøyder mv. Utstyrskontroll - sammenligning mellom planlaut/mrogram
	16	Energianalyser.	- x x	x x x x x x	x			utstyr som er avtalt at skal modelleres G. Grovt mengdeuttrekk for budsjett- enklo
	18 19	Sol- og skygge-studier. Vindanalyse (direkte vindpåvirkning, ortimelisering av utemilie og vardering mb	- X	x x x	×	I- I-	7 8.	Agussueregnings- og kontrollformål Arkanske 2D-tegninger og skjemaer generert fra «native»-BIM (original- Modellen) Utomhusplan og landskansme i si
							9.	 Energi- og inneklimasimulering o

«IFC4 – STILL LACK OF CERTIFIED SOFTWARE







WHILE WATING FOR IFC4 CERTIFEIED SOFTWARE...

- «Double Up» BIM Manuals efforts
 - Validation of IFC2x3 models with Statsbygg BIM Manual 1.2.1 requirement set
 - Validation of IFC4 models with Statsbygg BIM Manual 2.0 requirement set





WHAT'S NEXT IN THE PIPELINE?



WORKS <u>NOW</u>

- mvdXML requirements sets according to SBM1.2.1 for IFC 2x3 models for disciplines ARCH, STRUC, MACH, ELEC (published)
- mvdXML requirements sets according to SBM2 for IFC 4 models for disciplines ARCH, STRUC (not yet published by 2019-08-28)
- SBM2 site where the mvdXML files are published [Norwegian]: https://sites.google.com/view/statsbyggs-bim-manual-2-0-sbm2/hjem
- Google Translate of the SBM2 site (at your own risk @): <u>https://bit.ly/2NxbVWv</u>
- SBM2 teaser video [7 min]: <u>https://youtu.be/HfTdoPyTZBU</u>

COMING UP... [1]

- The work on a Landscape Architecture (LARCH) reuirement set template has come quite far hope for a launch Q4/2019
- Dialogue with the Norwegian Contractors Association (EBA) and the Precast concrete association about required properties for the construction and as built phases started
- Will be aligned with the results from Standards Norway and buildingSMART committee SN/K 374 for standardized Product Data Templates (PDT), based on CEN/TC 442 WG4

STATSBYGG

COMING UP... [2]

 Working with requirement sets for the «condition disciplines» like fire and acoustic engineering, that do NOT themselves have BUILT objects in the model, but set requirements for other discipline models, like ARCH models IfcRelSpaceBoundary used to generate IfcVirtualElement, that can have condition discipline type requirements







FOLLOWING IFC4 CERTIFICATION STATUS...

Most major CAD systems must have **IFC4 RV export** cetification before we can introduce IFC4 as an operational requirement in actual building projects



TESTING, TESTING, TESTING IN PROJECTS

- Gol trafikkstasjon
- UiO Livsvitenskap
- BUFetat Bergen
- Nasjonalmuseet (PNN)
- Norges arktiske universitetsmuseum
- Nytt veksthus Tøyen
- Ullersmo / Eidsberg fengsler
- BUS2 (Barne- og ungdomssjukehuset)
- Kunsthøyskolen i Bergen (KHiB)
- Statsbygg project names where models are tested Fosshaugane – Høgskulebygget (ARK «SlimBIM»)
- Inntrøndelag tingrett (ARK «SlimBIM»)
- Statsarkivet (ARK «SlimBIM»)
- Ørje Tollsted (ARK «SlimBIM»)

ALSO ON THE «TO DO» LIST...

- Running «pilot projects»
- In-house training and external «marketing»
- Improving the end user interface (GUI)
- Translations
 - BIMQ: English \rightarrow Norwegian
 - Generic requirement document: Norwegian \rightarrow English



BUILT ENVIRONMENT WITH A MEANING

THANK YOU FOR YOUR ATTENTION

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Frode Mohus – Harald Onarheim