SAINT-GOBAIN

CEILINGS

BIM OCH BRAND-SÄKERHET

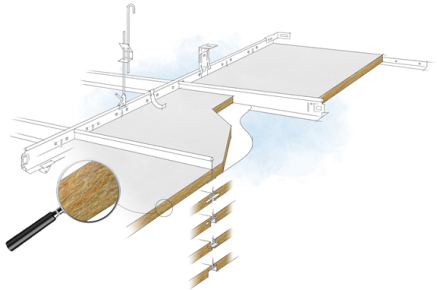
PRODUKTER I SIN BIM-KONTEXT

TORBJÖRN PERSSON
PIERRE CHIGOT

BIM and fire safety from a product producer perspective

Standards
Technical product data
Specifications
DoP
Classification reports
Building codes
Models

Components
Products
Systems



Room
Building

Safe, healthy, functional and sustainable buildings

BIM and fire safety from a product producer perspective

The building code – BBR. Obvious or…

5:522 Väggar och tak i utrymningsvägar

I utrymningsvägar ska väggar och tak utformas så att en brands utveckling i lokalen inte får nämnvärt bidrag från takens och väggarnas ytskikt.

Allmänt råd

I byggnader i klass Br1 och Br2 bör takytor och väggytor i utrymningsvägar ha ytskikt av lägst brandteknisk klass B-s1,d0. Ytskiktet bör fästas på material i brandteknisk klass A2-s1,d0 eller på beklädnad i lägst brandteknisk klass $K_2$10/B-s1,d0.

I byggnader i klass Br3 bör takytor och väggytor ha ytskikt enligt följande:

a) Utrymningsvägar i verksamhetsklass 4 och 5A bör ha ytskikt av klass B-s1,d0 på takytor och lägst klass C-s2,d0 på väggytor. Ytskikten bör fästas på material av A2-s1,d0 eller på beklädnad i klass $K_2$10/B-s1,d0.

b) Utrymningsvägar som är gemensamma för två eller flera bostads- eller kontorslägenheter bör ha ytskikt av klass B-s1,d0 på takytor och av lägst klass C-s2,d0 på väggytor.

c) Utrymningsvägar från lokaler i verksamhetsklass 6 bör ha tak- och väggytor med ytskikt av klass B-s1,d0 fäst på material av A2-s1,d0 eller på beklädnad i klass $K_2$10/B-s1,d0.

(BFS 2013:14).

BIM and fire safety from a product producer perspective

What we do as a producer of construction products

SVENSK STANDARD
SS-EN 13501-1:2019

SWEDISH STANDARDS INSTITUTE

Fastställd/Approved: 2019-01-02
Utgåva/Edition: 3
Språk/Language: engelska/English
ICS: 13.220.50;91.060.20

Brandteknisk klassificering av byggprodukter och byggnadselement –
Del 1: Klassificering baserad på provningsdata från metoder som mäter reaktion vid brandpåverkan

Fire classification of construction products and building elements –
Part 1: Classification using data from reaction to fire tests

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1 Scope

This document provides the reaction to fire classification procedure for all construction products, including products incorporated within building elements with the exception of power, control and communication cables which are covered by EN 13501-6.

Products are considered in relation to their end use application.

This document applies to three categories, which are treated separately in this document:

— construction products, excluding floorings and linear pipe thermal insulation products;

— floorings;

— linear pipe thermal insulation products.

The format of the reaction to fire classification for construction products excluding floorings and linear pipe thermal insulation products is:

Fire behaviour		Smoke production			Flaming droplets	
A1 *to* ***F*** *(as applicable)*	-	s	***1, 2*** *or* ***3*** *(as applicable)*	,	d	***0, 1*** *or* ***2*** *(as applicable)*

i.e. ***A1*** *to* ***F*** *(as applicable)* **–** ***s1, 2*** *or* ***3*** *(as applicable),* ***d0, 1*** *or* ***2*** *(as applicable)*

BIM and fire safety from a product producer perspective

What we do as a producer of construction products

B.4.3 Field of application

This classification is valid for the following product parameters (e.g. thickness, density…):

product property 1	Variation in *product property 1*
product property 2	Variation in *product property 2*
product property 3	Variation in *product property 3*
product property 4	Variation in *product property 4*
product property x etc.	Variation in *product property x etc.*

(include reference to the reference document + date used for undertaking this)

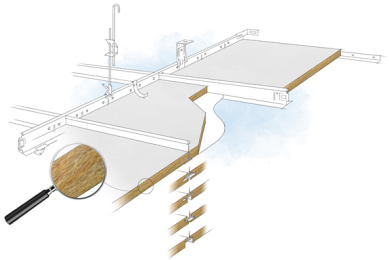
The classification is valid for the following end use applications:

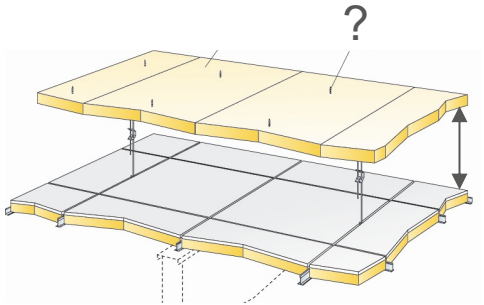
Details of substrates and/or air gaps

Details of methods and means of fixing

Details of joints

Details of other aspects of end use conditions





SAINT-GOBAIN

BIM and fire safety from a product producer perspective

Classification report

Field of application:

This classification is valid for the following end use conditions:

Orientation:

The classification is valid for both faces. The product may be mounted in a horizontal or vertical orientation.

Mounting:

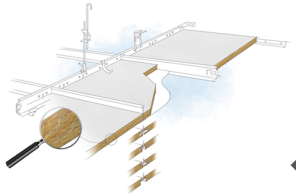
The tiles can be loosely placed or mechanically fixed to a metal framework that is suspended from a ceiling, i.e. mounted with a void. Alternatively the tiles can be mechanically fixed or glued directly with an acoustic cement glue (0.5 l/m^2) to a substrate either in a wall or ceiling configuration.

Substrates:

For each of the mounting configurations mentioned above the following substrates can be used:
Wood based substrates at least 12 mm thick having a density ≥630 kg/m^3.
Substrate of spruce at least 12 mm thick having a density ≥460 kg/m^3.
Substrates of Euroclass A1 and A2 at least 6 mm thick having a density ≥630 kg/m^3.

BIM and fire safety from a product producer perspective

Same product / system – different classification



End use conditions

B-s2,d0

A2-s1,d0

BIM and fire safety from a product producer perspective

- CE Marking

Key Properties of DuPont™ Tyvek® FireCurb® Housewrap

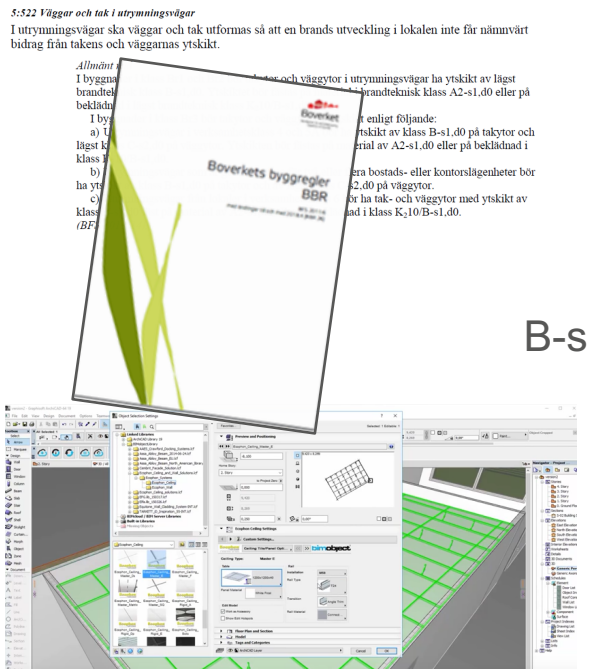
- **Style Name:** 2066B
- **Roll size:** 1.5 x 50m
- **Roll weight:** 5.5kg

- **Reaction to fire:** according to EN 13501-1 (on mineral wool, free-hanging or on cementitious boarding--> B-s1,d0 , if installed onto wood --> D-s2,d2)

- **Water vapour transmission (Sd):** 0.014m
- **Mass per unit area:** 68g/m2

BIM and fire safety from a product producer perspective

BIM - a key to quality assurance and right decisions



B-s1,d0

No! Cannot be done, no classification for combination with specified underlying material

Yes! Without restrictions

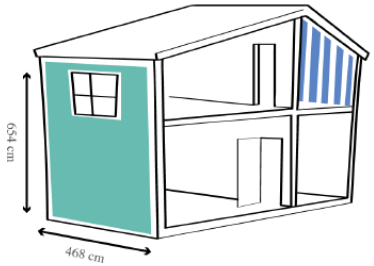
Yes! But ods ≥ 100 mm otherwise C-s2,d0

SAINT-GOBAIN

DELL

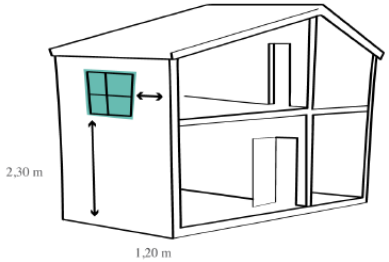
BIM IS GEOMETRY AND INFORMATION

Geometry | **Information**



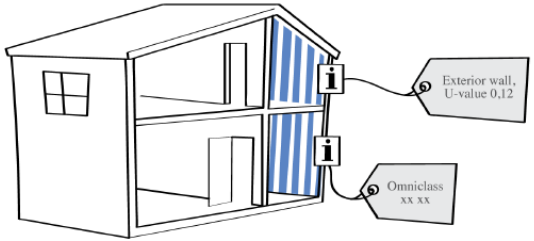
1. Building parts dimension

(ex. wall, window, column, cable, ceiling)



2. Building parts location and relations

(ex: plenum height)



3. Building parts properties (provided through classification or type code)

(ex: economy, time, compliances, fire class, absorption class etc)

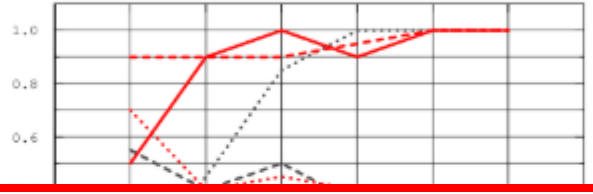
SAINT-GOBAIN

PRODUCT INFORMATION: SOUND ABSORPTION

Sound Absorption

Test results according to EN ISO 354. Classification according to EN ISO 11654, and the single value ratings for Noice Reduction Coefficient, NRC and Sound Absorption Average, SAA according to ASTM C 423.

α_p, Practical sound absorption coefficient



	THK SEP mm	o.d.s. mm	α_p, Practical sound absorption coefficient						α_w	Sound absorption class
			125 Hz	250 Hz	500 Hz	1000 Hz	2000 Hz	4000 Hz		
-	20	50	0.10	0.45	0.85	1.00	1.00	1.00	0.75	C
-	20	200	0.50	0.90	1.00	0.90	1.00	1.00	1.00	A

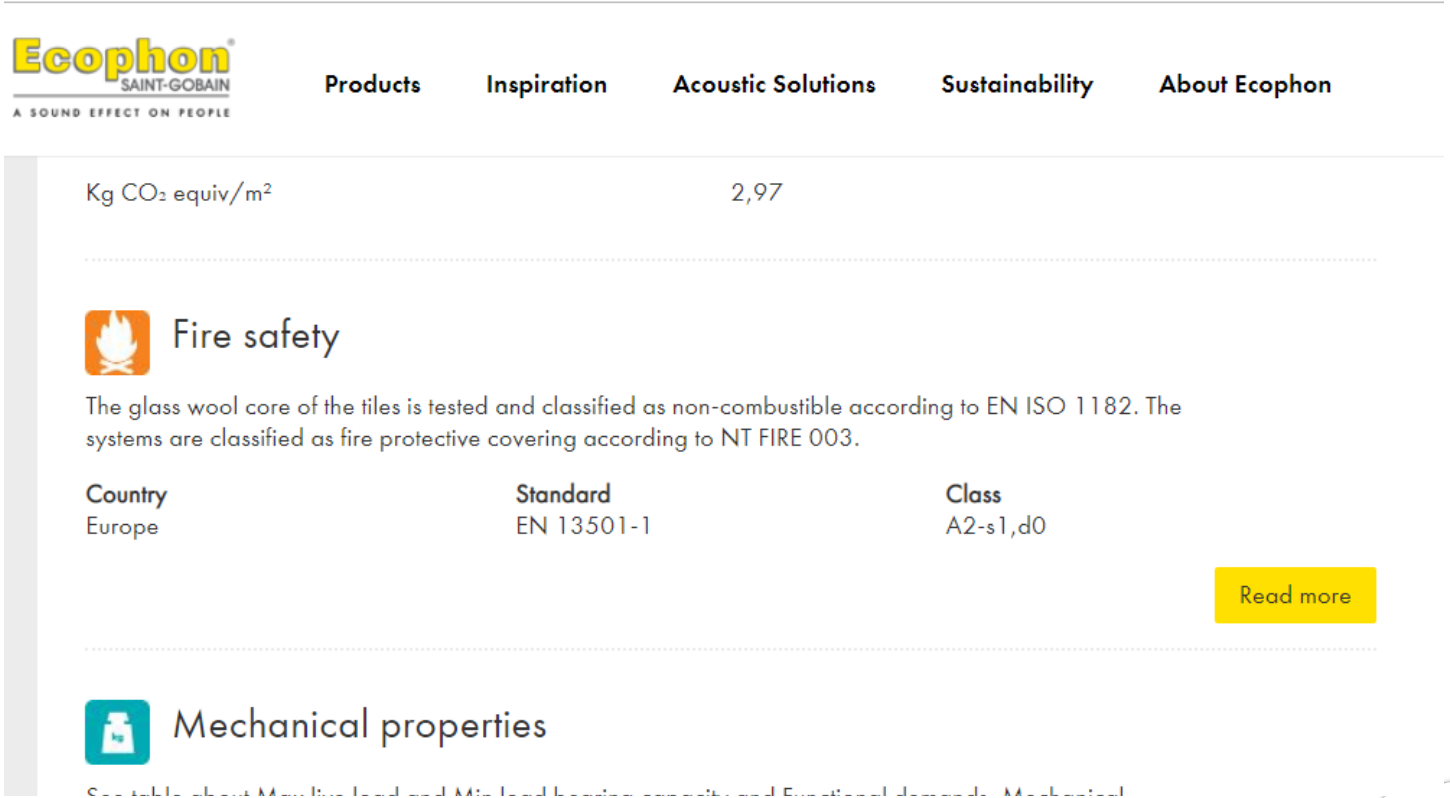
---- Focus A gamma 20 mm + Extra Bass 50 mm, 200 mm o.d.s.

o.d.s = overall depth of system

	THK SEP mm	o.d.s. mm	α_p, Practical sound absorption coefficient						α_w	Sound absorption class
			125 Hz	250 Hz	500 Hz	1000 Hz	2000 Hz	4000 Hz		
-	20	50	0.10	0.45	0.85	1.00	1.00	1.00	0.75	C
-	20	200	0.50	0.90	1.00	0.90	1.00	1.00	1.00	A
+ Extra Bass,	70	200	0.90	0.90	0.90	0.95	1.00	1.00	0.95	A
gamma	20	200	0.55	0.40	0.50	0.35	0.20	0.25	0.30	D

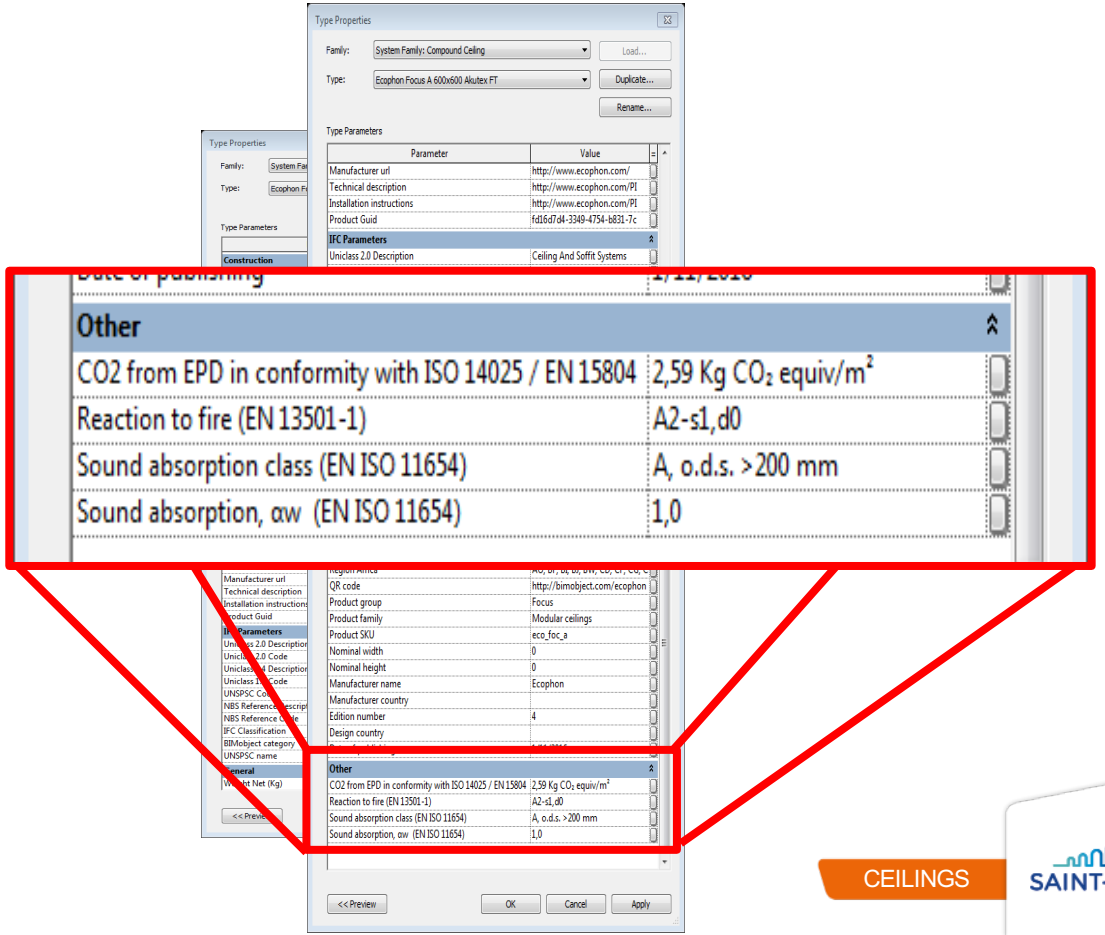
SAINT-GOBAIN

PRODUCT INFORMATION: FIRE SAFETY



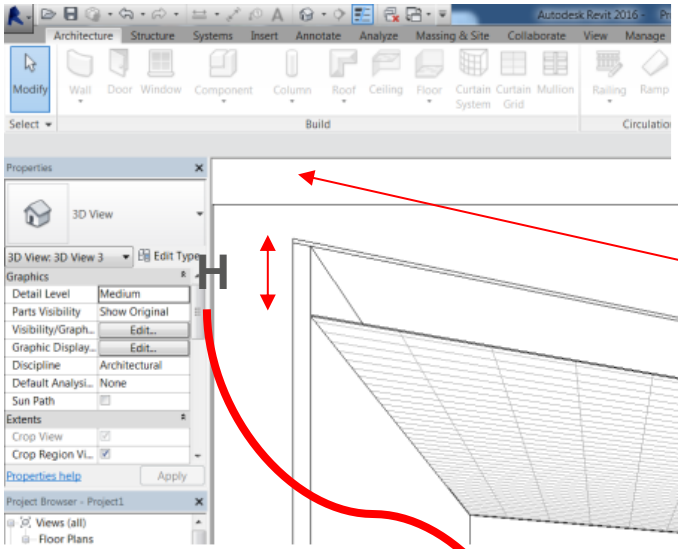
BIM: INHERENT VS CONTEXTUAL INFORMATION

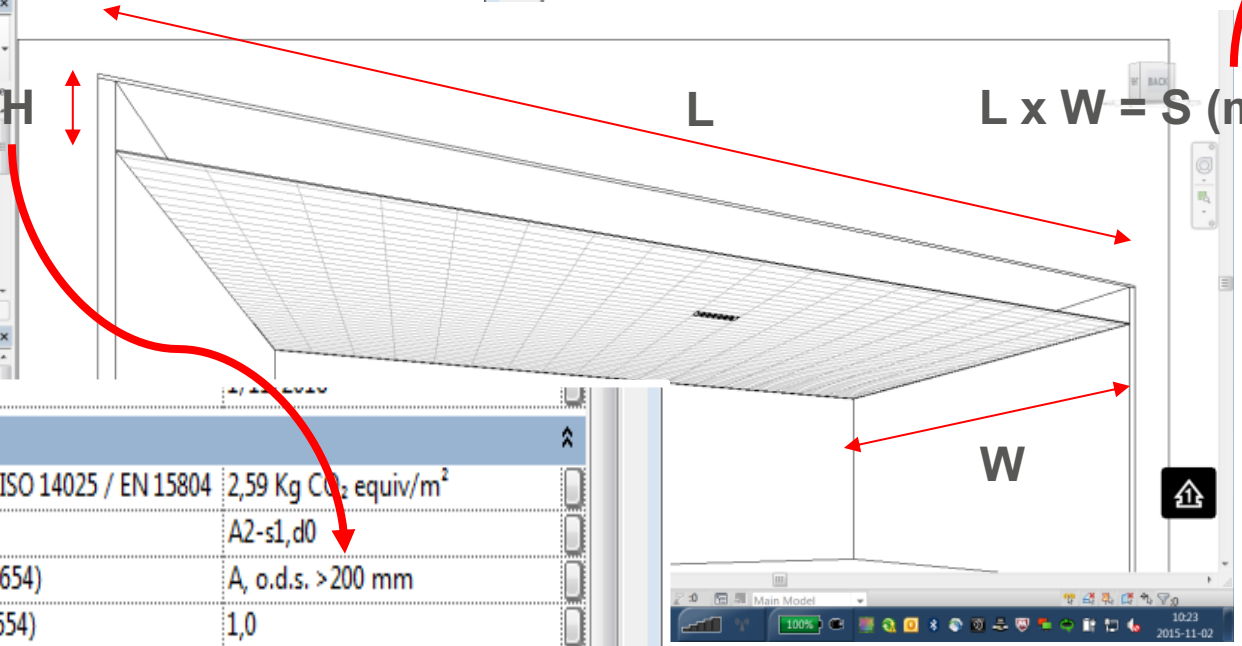
Ex: Ecophon Focus A 600 x 600



CONTEXTUAL / PROJECT DEF

Other	
CO2 from EPD in conformity with ISO 14025 / EN 15804	2,59 Kg CO_2 equiv/m^2
Reaction to fire (EN 13501-1)	A2-s1,d0
Sound absorption class (EN ISO 11654)	A, o.d.s. >200 mm
Sound absorption, αw (EN ISO 11654)	1,0



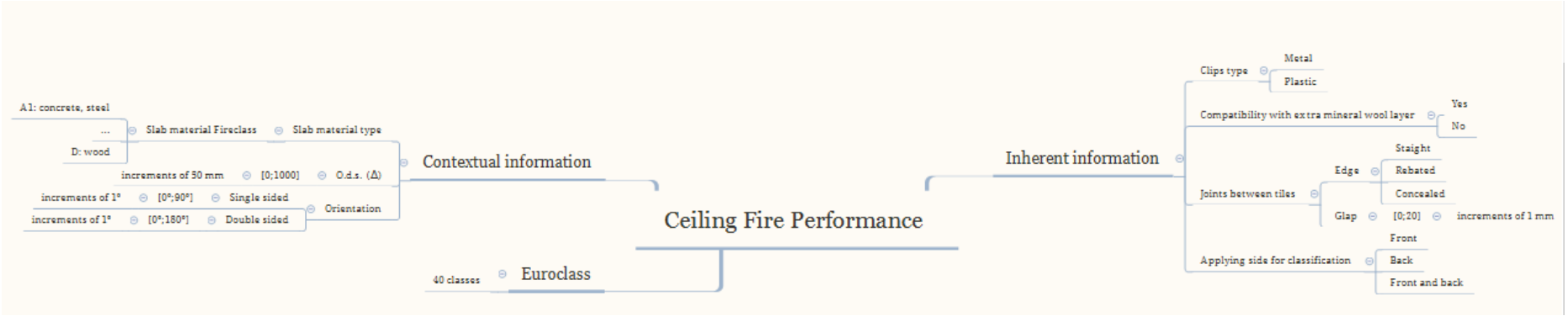


Other	
CO2 from EPD in conformity with ISO 14025 / EN 15804	2,59 Kg CO_2 equiv/m^2
Reaction to fire (EN 13501-1)	A2-s1,d0
Sound absorption class (EN ISO 11654)	A, o.d.s. >200 mm
Sound absorption, αw (EN ISO 11654)	1,0

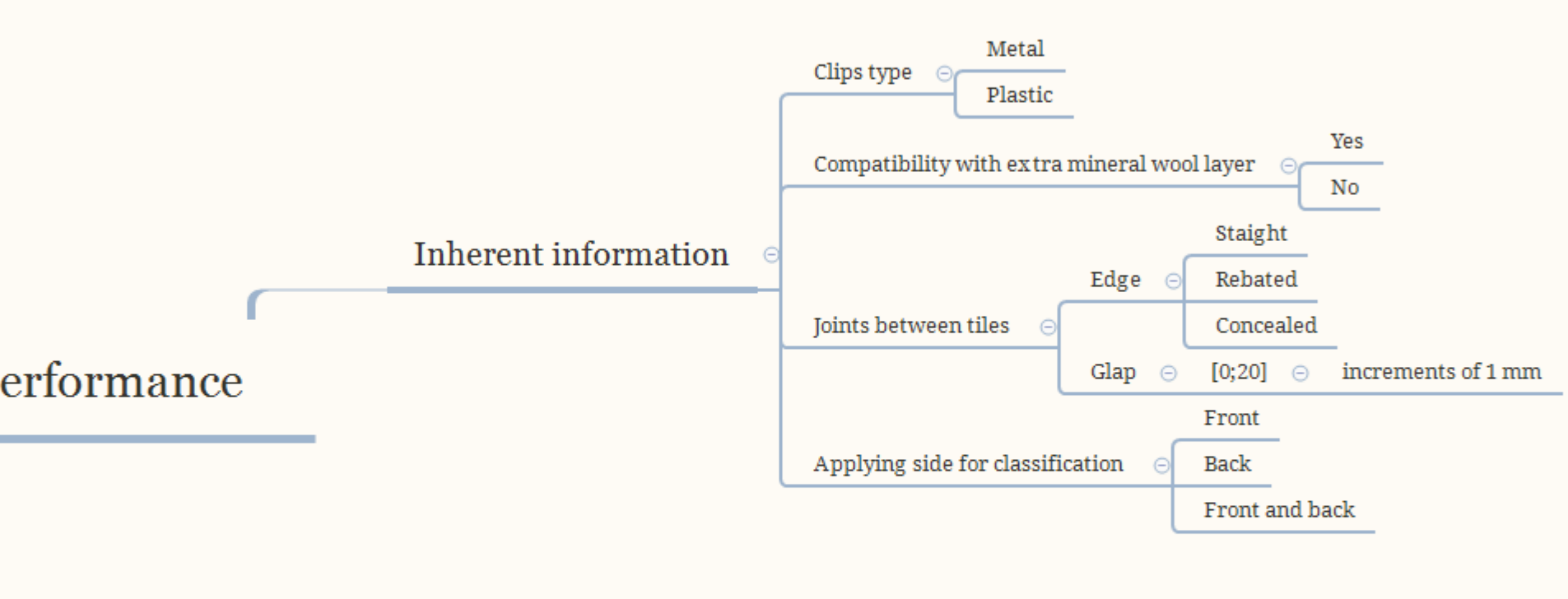
CONTEXTUAL RULES

Property	Descriptor	Value	Unit	Contextual rule (dependency)
Sound absorption	Absorption Class	A	n.a.	> 200 mm
Fire performance	Fire Class	A2,s1,d0	n.a.	

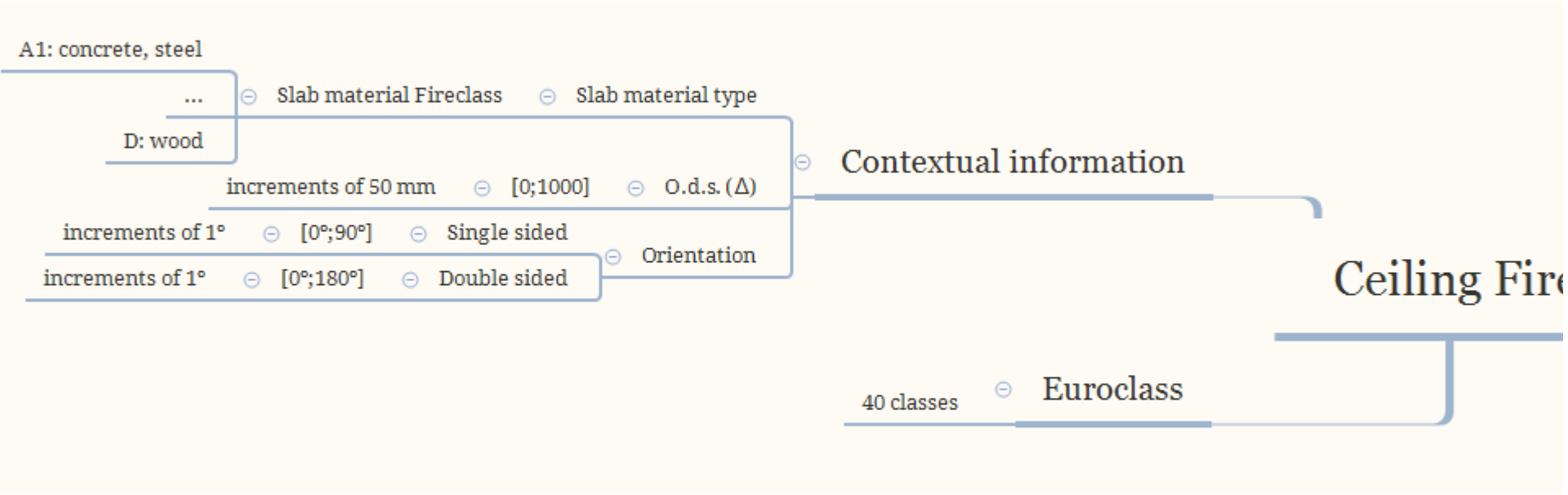
CEILING FIRE PERFORMANCE - MAPPING

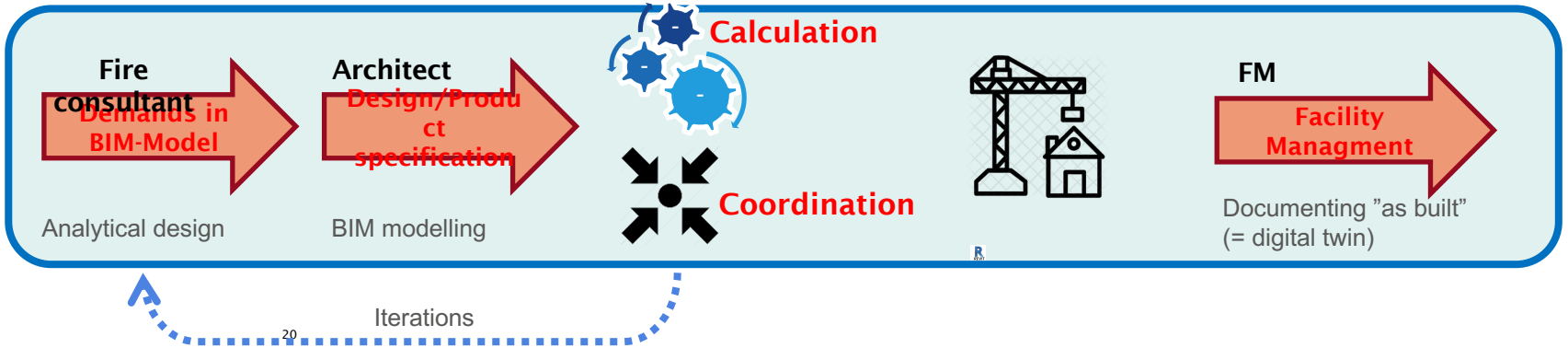


CEILING FIRE PERFORMANCE – INHERENT INFORMATION MAPPING



CEILING FIRE PERFORMANCE – CONTEXTUAL INFORMATION MAPPING




Fire consultant
Demands in BIM-Model
Analytical design
Architect
Design/Product specification
BIM modelling
Calculation
Coordination
FM
Facility Managment
Documenting ”as built”
(= digital twin)
Iterations

.json* * = or any other open-standard file format for list type data transfer

Example

BIM model

REVIT

Ruleset

XML (eXstensible Markup Language)

- Supports all functional demands / objects (“all or nothing”)

XML

Graphic representation

- Compliancies
- Flaws
- Possibilities

Example

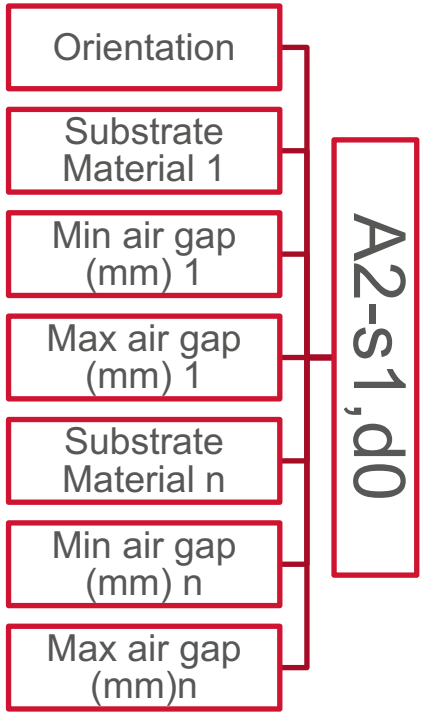
IFC

SAINT-GOBAIN

.XML RULESET

"Combine the conditions of the reaction to fire into an XML-file in a structured and consistent way".

Reaction to fire suspended ceilings				
	Example	Possible Value		
Class front side 1	A2-s1,d0	Fire class according to EN 13501-1		
Class front side n	B-s1,d0	Fire class according to EN 13501-1		
Clas rear side	A2-s1,d0	Fire class according to EN 13501-1		
Conditions				
Orientation	Random	Horisontal	Vertical	random
Substrate mtrl 1	B-s1,do or better	Fire class according to EN 13501-1		
Min air gap (mm) 1	0	Number	0	
Max air gap (mm) 1	unlimited	Number	unlimited	
Substrate mtrl n	D-s2,d0 or better	Fire class according to EN 13501-1		
Min air gap (mm) n	40	Number	0	
Max air gap (mm) n	unlimited	Number	Unlimited	



.xml ruleset

REQUIREMENT #1: DOCUMENT TYPE DEFINITION

A nomenclature/structure that applies for Fire in all BIM formats

- One cell, one content
- Retrieving of information
- No ambiguity

A hierarchy that governs logical operations

A

Functional demand

↓

Object

Or

B

Object

↓

Functional demand

To be evaluated …

CHALLENGES

”Det stora arbetet handlar inte om tekniken och formaten utan om att komma överens om alla begrepp. (Fi2)XML och IFC har datastrukturer som talar om hur objekt ska överföras och hur egenskaper ska formateras men deras definitioner och namn är svårare att hantera. Vissa egenskaper finns inte ens i processerna idag”

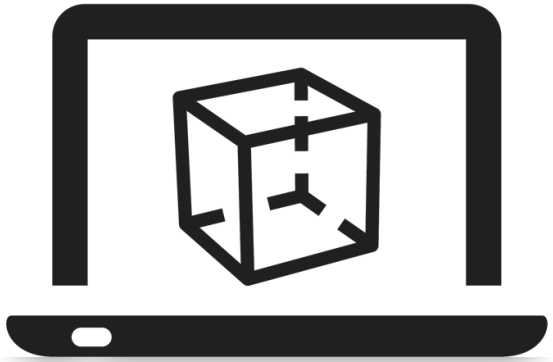
Väino Tarandi, Department of Real Estate and Construction Management, KTH
2012, in ”BIM visar vägen – exempel på tillämpningar”, OpenBIM (BIMAlliance)

IMPLEMENTATION IN BIM WORKFLOW

Use of Rulesets to implement and validate reaction to fire directly in the BIM-model

.xml ruleset

Ex: FME



Implementation

GRAPHISOFT. ARCHICAD

REVIT

SOLIBRI

CEILINGS

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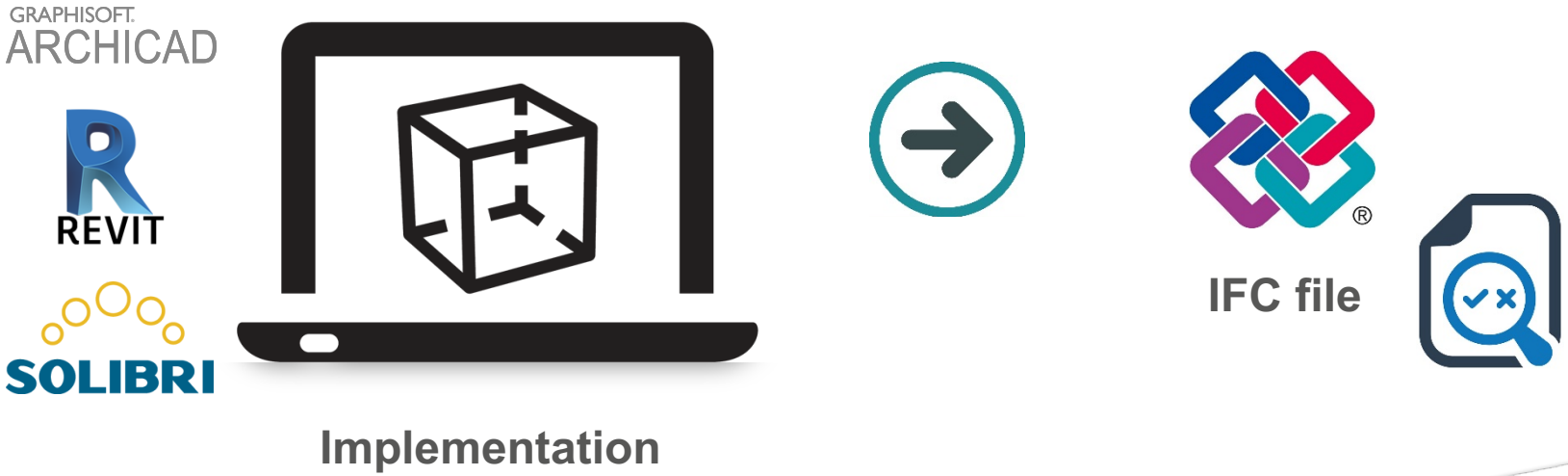
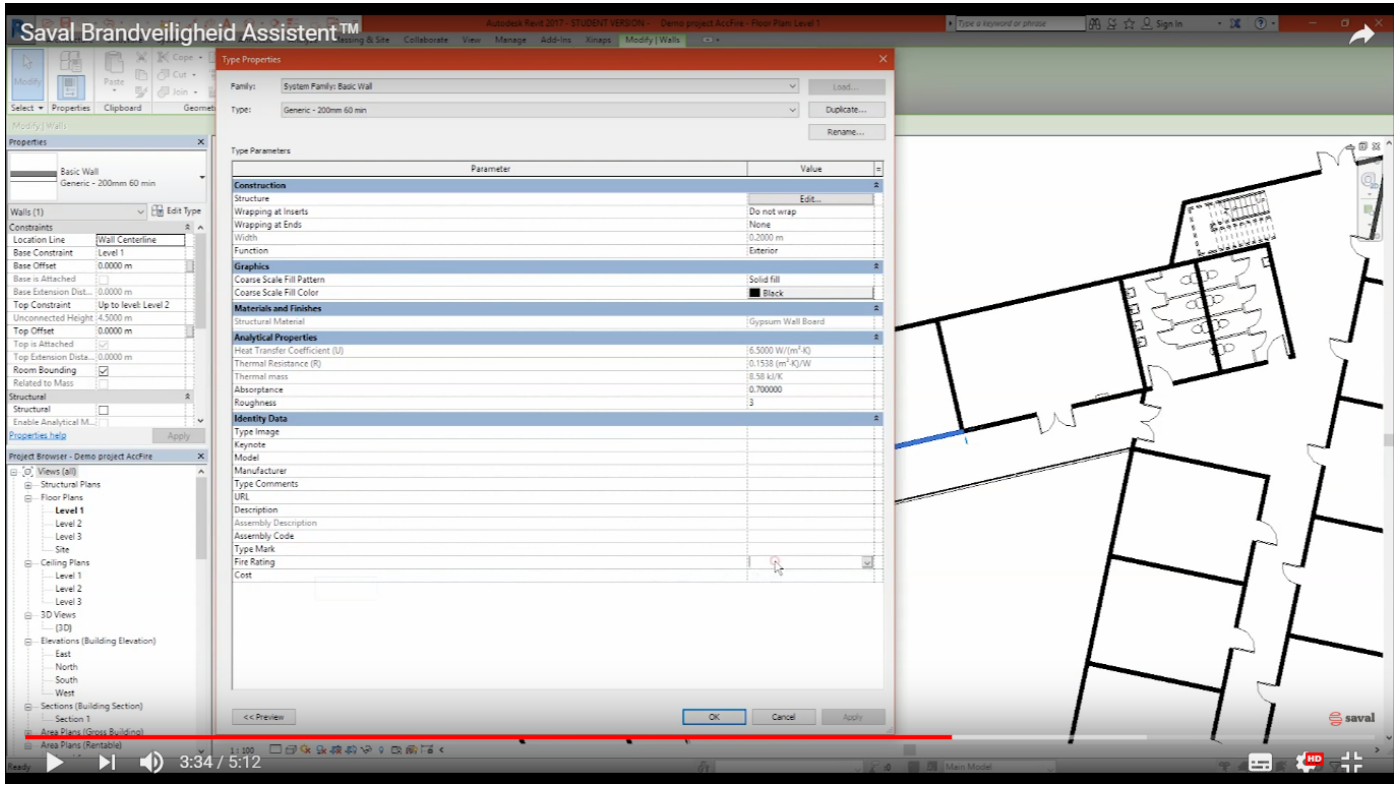
GRAPHIC DESCRIPTION FOR VISUAL FEEDBACK

From the implementation, a graphic description is generated in an IFC-file.
Visualises compliances, flaws, possibilities, logical errors, etc



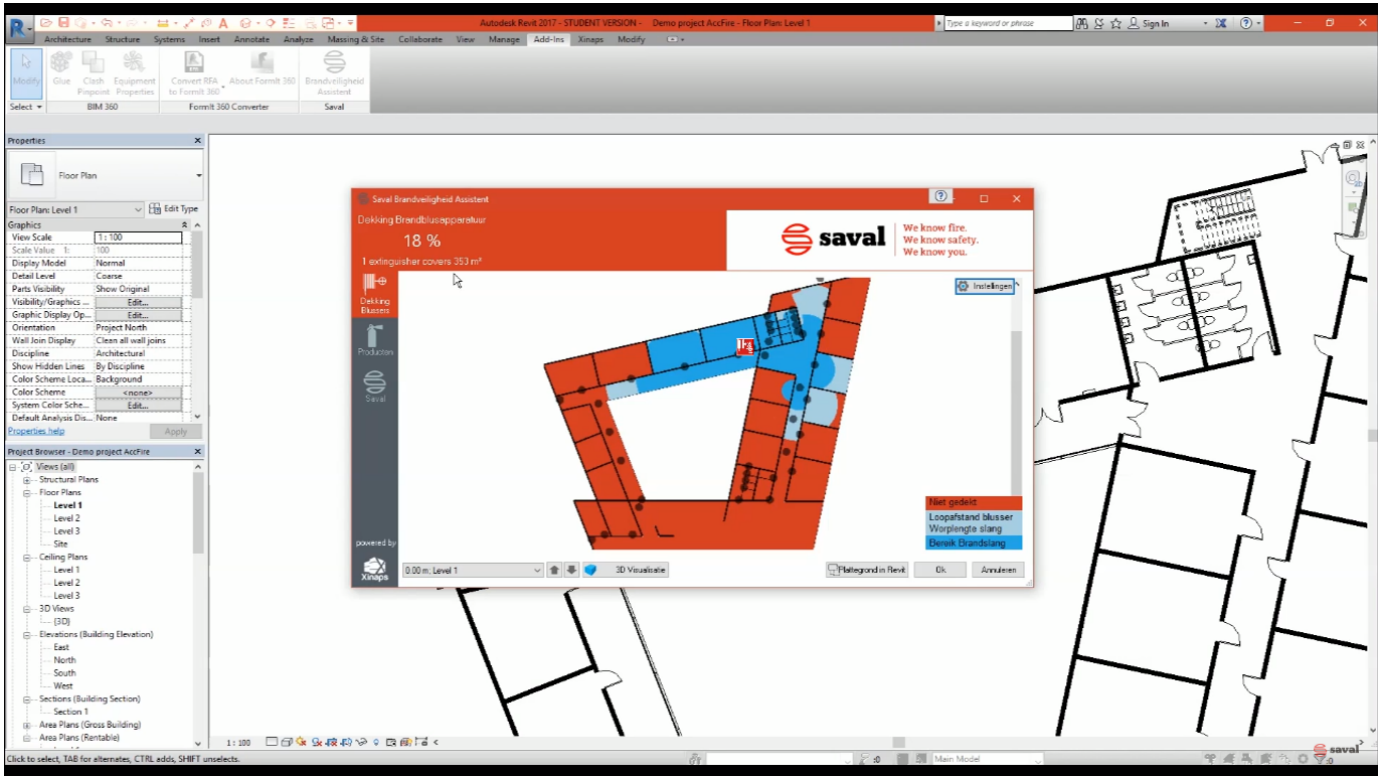
BENCHMARKS: SAVAL, NL



CEILINGS

SAINT-GOBAIN

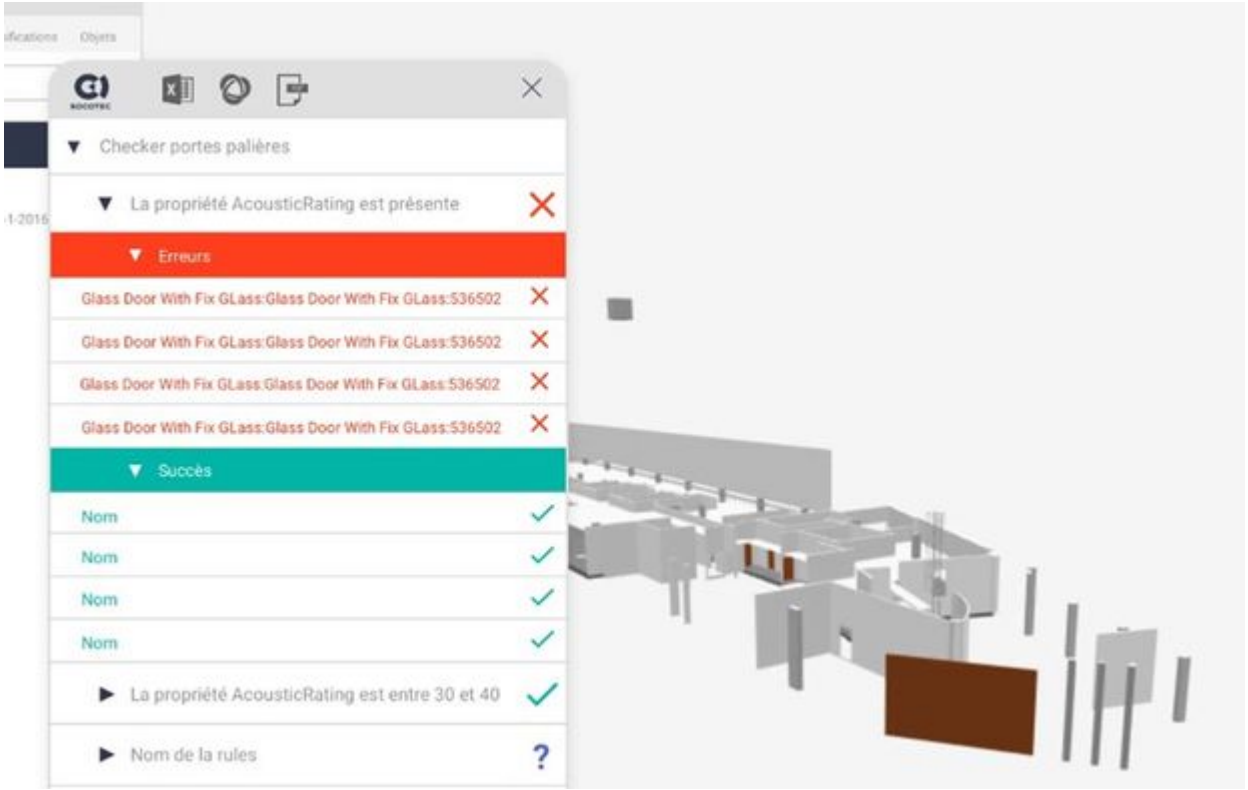
BENCHMARKS: SAVAL, NL



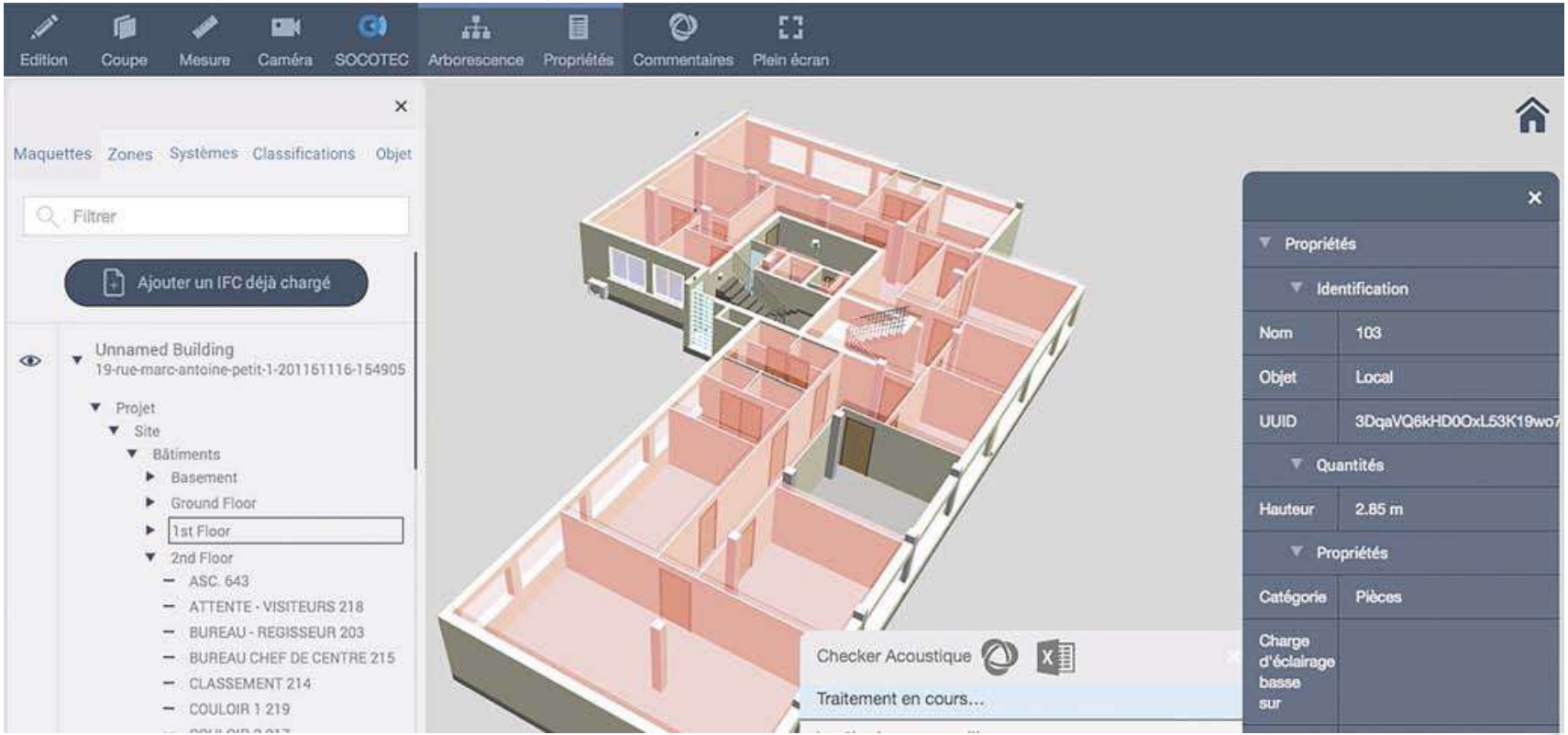
CEILINGS

SAINT-GOBAIN

BENCHMARKS: SOCOTEC, FR



BENCHMARKS: SOCOTEC, FR



FIRST STEP: OUTLOOK

SIS
- SIS TK 194 Undertakssystem
- SIS TK 181 Brandsäkerhet
- SIS/TK 269 Information för byggande och förvaltning

CEN
- CEN TC 277 Suspended ceilings
- CEN TC 127 Fire safety
- CEN/TC 442 Building Information Modelling (BIM)

and related work within ISO ...

”Industry Foundation Classes (IFC) for data sharing in the construction and facility management industries (ISO 16739:2013)”

BIM standardization work

TAKE AWAYS
Producentperspektivet & BIM

- Traditional information channels can miss to integrate contextual information
- Ceiling fire performance has been mapped
- BIM allows inherent information to be complemented with contextual information
- Ruleset to be implemented in an .xml ”channel”
- First step is to work on a Document Type Definition
- Challenge is to agree on terminology, names and definition (typical standardization work!)
- Tangible work packages to validate that BIM opens new opportunities for fire safety!