シンガポールの規制要件に対応したSolibri

Solibri for Singapore Regulatory Requirements

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自己紹介 About Me

- 建設技術と管理の修士号を取得
- 政府資金による政府向けBIMソリューション開発において3年間の研究経験を有する
- 主な研究プロジェクトは、BIMベースの半自動プレキャストトラッキング、建設プロジェクトのBIM/VDCベースのプロセス変換
- GraphisoftおよびSolibri製品のカスタマーサクセスを担当

- holds a Master's Degree in Construction Technology and Management
- has 3 years of research experience in developing BIM solutions for government funded by government
- key research projects are BIM based semi-automatic precast tracking, BIM/VDC based process transformation for construction projects
- In GRAPHISOFT, he takes care of customer success for Graphisoft and Solibri products

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シンガポールのBIMジャーニー Singapore's BIM Journey

Building and Construction Authority (**BCA**) & Urban Redevelopment Authority (**URA**) + **その他の政府機関**

BCA & URA + Other Government Agencies

2001:
2D CADでの電子申請
2D CAD Electronic Submission

2010:
BIMロードマップをBCAが策定
BIM Roadmap Formulated by BCA

2013:
20,000㎡を超える**設計**の3D申請(軽量)
3D (lightweight) Architecture Submission for building > 20,000 m²

2014:
20,000㎡を超える**エンジニアリング**の3D申請(軽量)
3D (lightweight) Engineering Submission for building > 20,000 m²

2015:
5,000㎡を超える**設計&エンジニアリング**の3D申請(軽量)
3D (lightweight) Archi & Engineering Submissions for buildings > 5,000 m²

2016:
ネイティブフォーマットでの任意申請
Voluntary Submission in Native Format

2017:
ネイティブフォーマットでの確認申請義務化
Mandatory Submission in Native Format

2023:
CORENET X

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BIMロードマップ2010 BIM Roadmap 2010

チャレンジ
Challenges

- BIMに対する需要の欠如
  Lack of demand for BIM
- 現在の2D製図の慣習に定着
  Entrenched in the current 2D drafting practices
- 熟練したBIM人材の準備不足
  Lack of ready pool of skilled BIM manpower
- BIMの専門知識を構築するために必要な追加リソースAdditional resources needed to build up BIM expertise

戦略
Strategies

- 公共セクターが主導権を握る
  Public sector taking the lead
- BIM 導入者にインセンティブを与える
  Incentivizing BIM adopters
- 障害を取り除く
  Remove impediments
- BIMの能力とキャパシティの構築
  Build BIM capability & capacity
- サクセスストーリーの紹介
  Promoting success stories

シンガポールのBIMジャーニー Singapore's BIM Journey

Source: https://www1.bca.gov.sg/buildsg/digitalisation/integrated-digital-delivery-idd

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IDDユースケース

Essential IDD Use Cases

デザイン DESIGN	コンストラクション & ファブリケーション CONSTRUCTION & FABRICATION	アセット管理 ASSET MANAGEMENT
1. Digital Request for Information (RFI) 2. Integrated Concurrent Engineering (ICE) meetings 3. Visualisation and design checks 4. Digital submission & approval		
5. BIM-based documentation		
6. BIM-based cost estimation		
	7. Digital logistics	
	8. Digital construction scheduling and sequencing	
	9. Digital progress monitoring	
	10.Digital QA/QC inspections	
	11.Digital defects management	
		12. Digital handover
		13. Real-time monitoring of assets performance
		14. Digital operations and maintenance

法規要件

Regulatory Requirements

Building and Construction Authority (BCA) & Urban Redevelopment Authority (URA) + その他の政府機関

BCA & URA + Other Government Agencies

2013:
3D申請の義務化(軽量)
3D (lightweight) mandatory Submission

2016:
ネイティブフォーマットでの任意申請
Voluntary Submission in Native Format

2018:
電子申請システムのためのイノベーション補助金
Innovation grant (iGrant) for ePermitting system

2019:
自動モデルチェックのためのLTA研究助成金
LTA research grant for automated model checking.

2020:
URAのGFA計算
GFA Calculation for URA

2023:
CORENET X

Solibri

Solibri Model Checker V9

Solibri Model Checker V9.7

BIM申請のための自動コンプライアンス・チェック
Automated Compliance Check for BIM Submission

Solibri APIを使用したADC 3.1のルール開発
Develop Rules for ADC 3.1 using Solibri API

Solibri APIを使用したURA用GFA 1計算ルールの開発
Develop GFA 1 Calculation rule for URA using Solibri API

CX申請標準の事前チェック

IFC4 + IFC-SG
Pre-chck for CX Submission Standard
IFC4 + IFC-SG

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BCA iGrant – 電子確認申請システム プロジェクト

BCA's iGrant – ePermitting System Project

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電子確認申請システム

ePermitting System

- 規制遵守のための BIM 提出書類のチェックプロセスをデジタル化
- 規制遵守のための提出前のBIMチェックを合理化
- ローカル要件に対応した新しいルールを開発

- Digitize checking process of BIM submittals for regulatory compliance.
- Streamline BIM checking before submittals for regulatory compliance.
- Develop new rules for local requirements.

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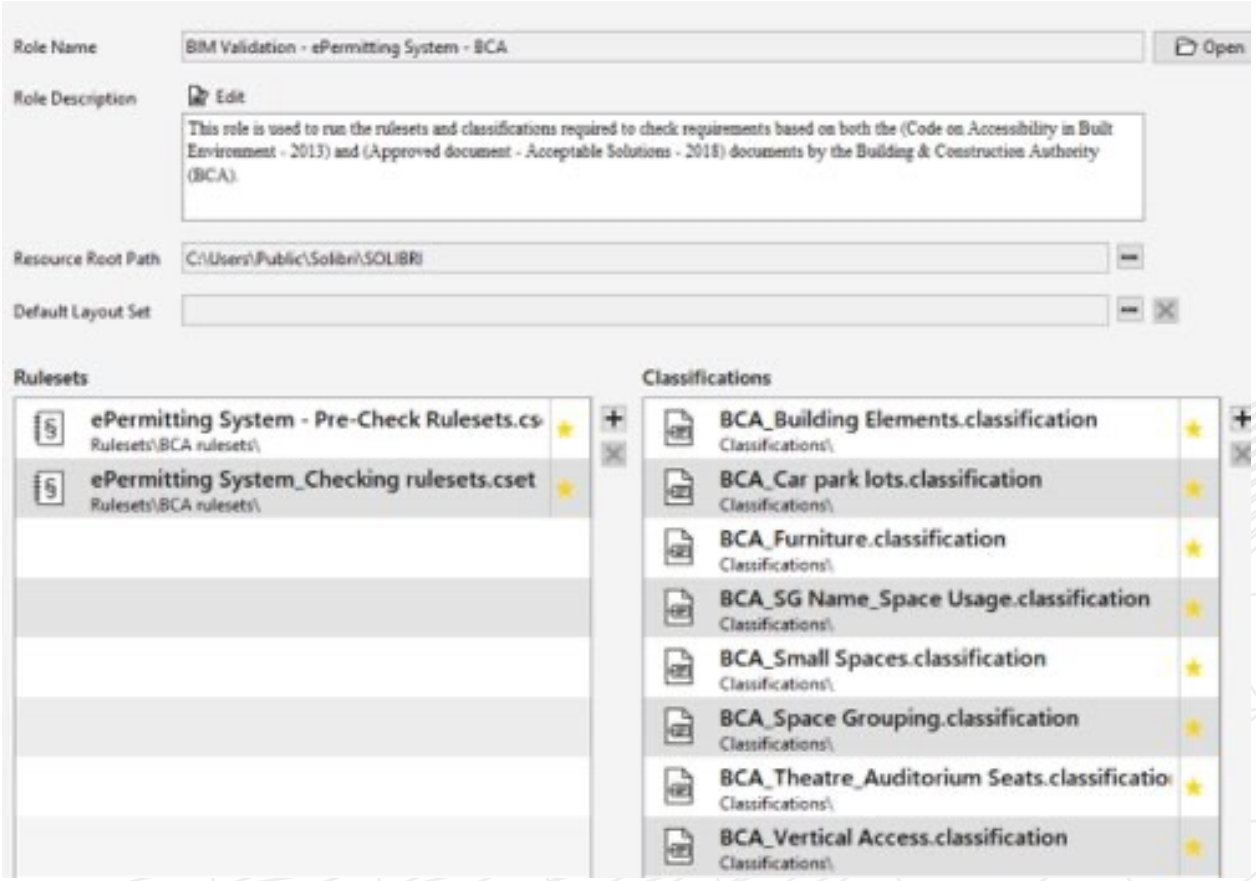
電子確認申請システム

ePermitting System

プロジェクトの成果物

Project Deliverables

- 電子確認申請システムのリソース
  - ルールセットの事前チェック - BIMデータの可用性と品質をチェック
  - ルールセットのチェック - SG建築要件に対するBIMのチェック
  - 分類 - 「SG_Names」または利用可能なパラメータに従って建築要素を特定し、再定義



- ePermitting system Resources
  - Pre-check Rulesets - Check BIM data availability and quality
  - Checking Rulesets - Check BIM against SG building requirements
  - Classifications - Identify and re-define building elements according to ‘SG_Names’ or available parameters.

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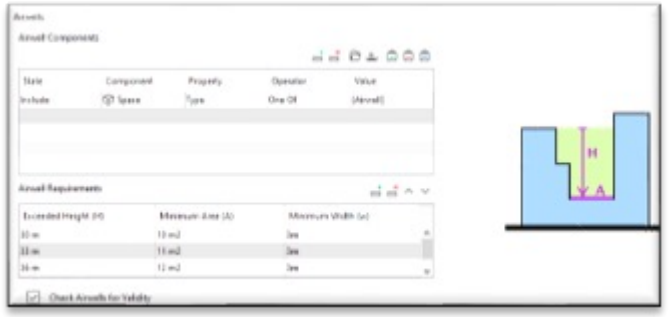
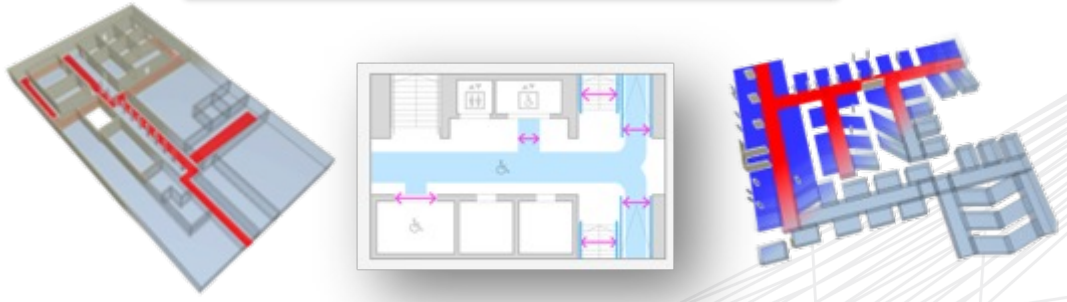
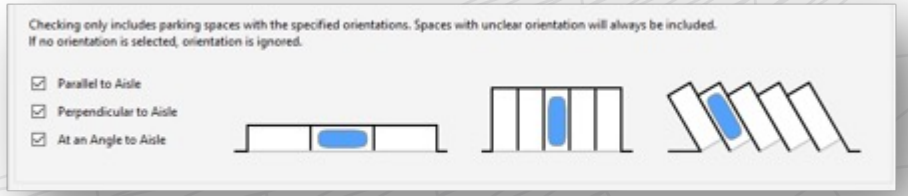
電子申請システム
ePermitting System

プロジェクトの成果物
Project Deliverables

- 新ルール
  - ルール#235 - 相対数ルール
  - ルール#236 -水平構造物からの落下防止ルール
  - ルール#237 - 駐車ルール
  - ルール#238 -ルートのアクセシビリティルール
  - ルール#240 - 有効範囲ルール
  - ルール#241 -スペース接続ルール
  - ルール#242 - 建物外面のルール
- New Rules
  - Rule #235 – Relative number rule
  - Rule #236 – Horizontal Structures must be Guarded against Falling rule
  - Rule #237 – Parking Rule
  - Rule #238 – Accessible route Rule
  - Rule #240 – Effective coverage Area Rule
  - Rule #241 – Space connection Rule
  - Rule #242 – building envelope Rule







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LTAの研究助成 - ADC 3.1の自動モデルチェック

LTA's Research Grant – Automated Model Checking for ADC 3.1

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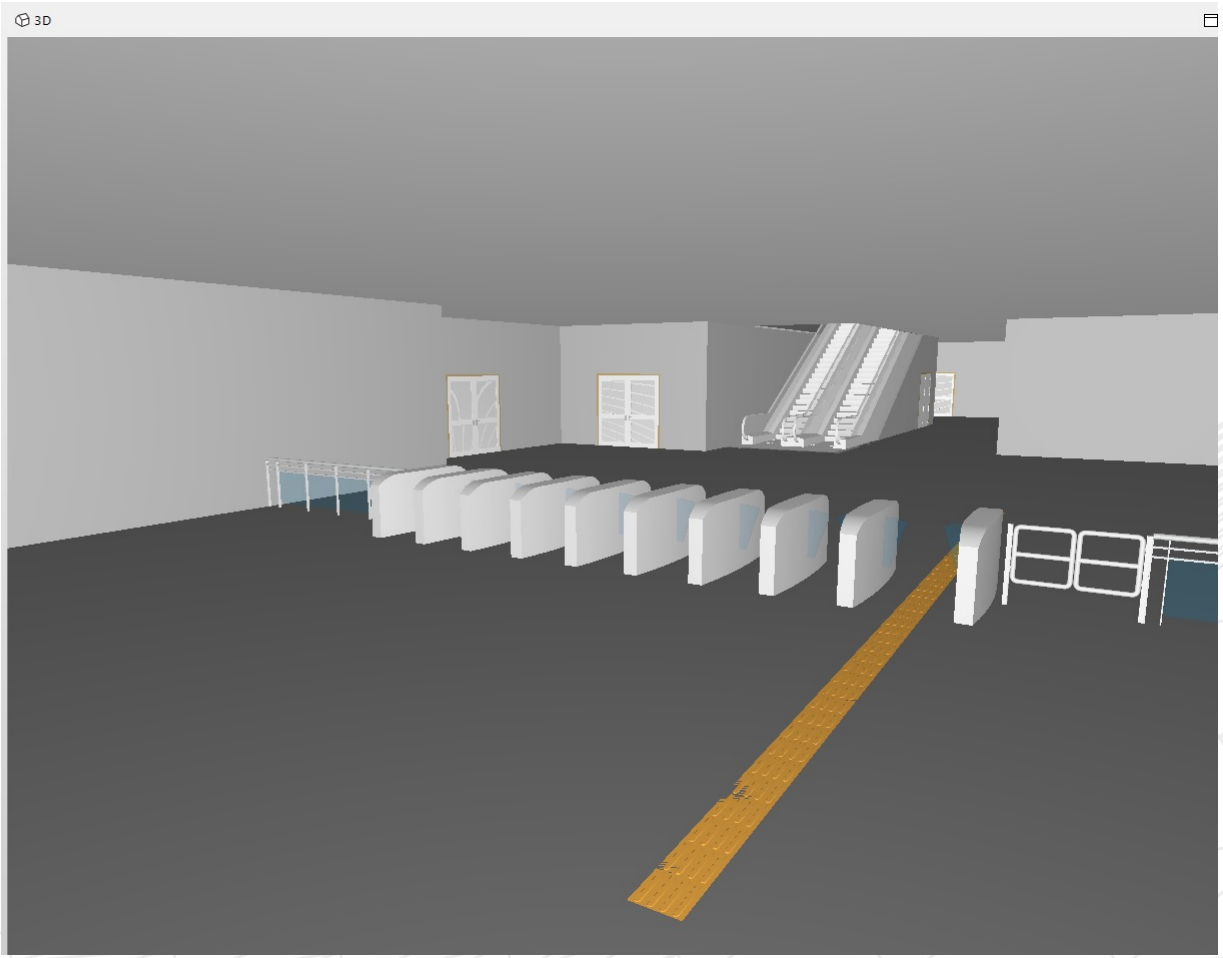
LTAの研究助成

LTA Research Grant

- GraphisoftはLTAとNTUと共同で、LTAのADC 3.1要件に対応したSolibriルールセットを開発する研究プロジェクトを行いました。
- ルールセットは60のルールで構成されており、いくつかのルールはデフォルトのルールでパラメータ化され、いくつかのルールはSolibri Java APIを使用してゼロから開発されました。
- 新たに開発したルールの例をご紹介します。



- Graphisoft worked with LTA and NTU on a research project to develop Solibri Rulesets on LTA's ADC 3.1 requirements.
- The Rulesets consisted of 60 rules. Some are parametrized using the default rules and some are developed from scratch using Solibri Java API.
- Examples of newly developed rules are shown in the following slides.

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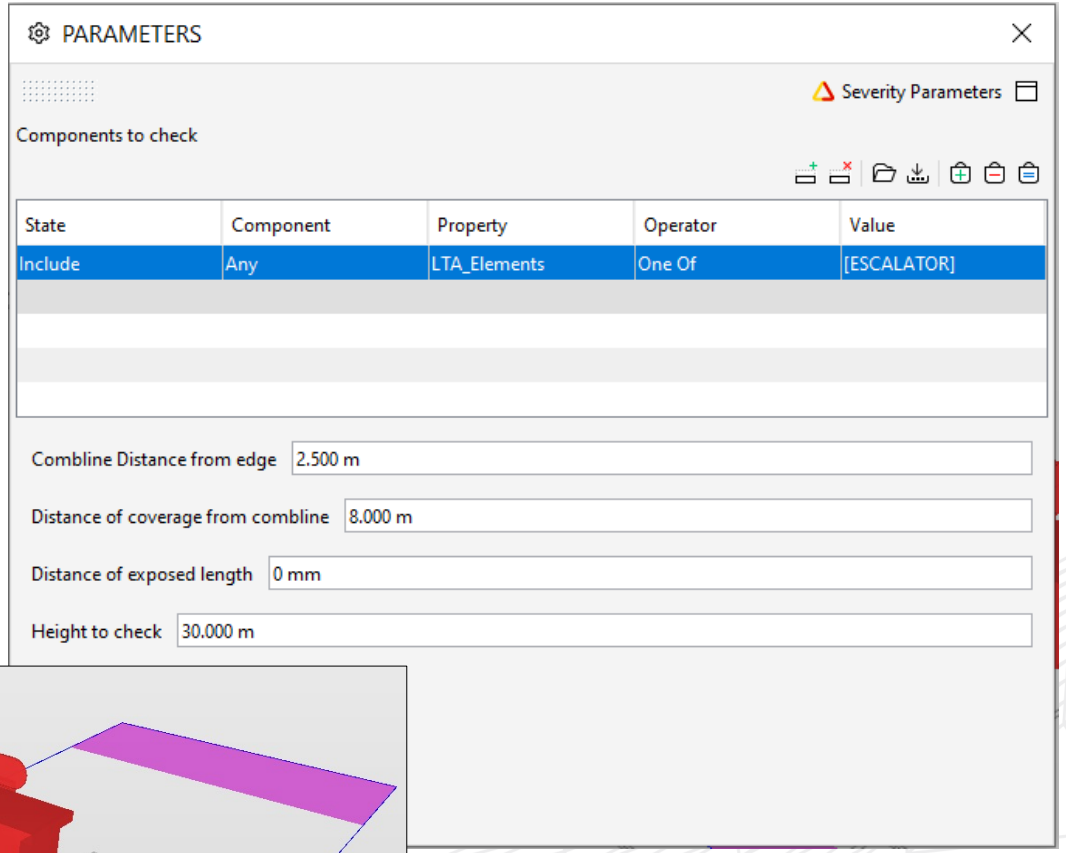
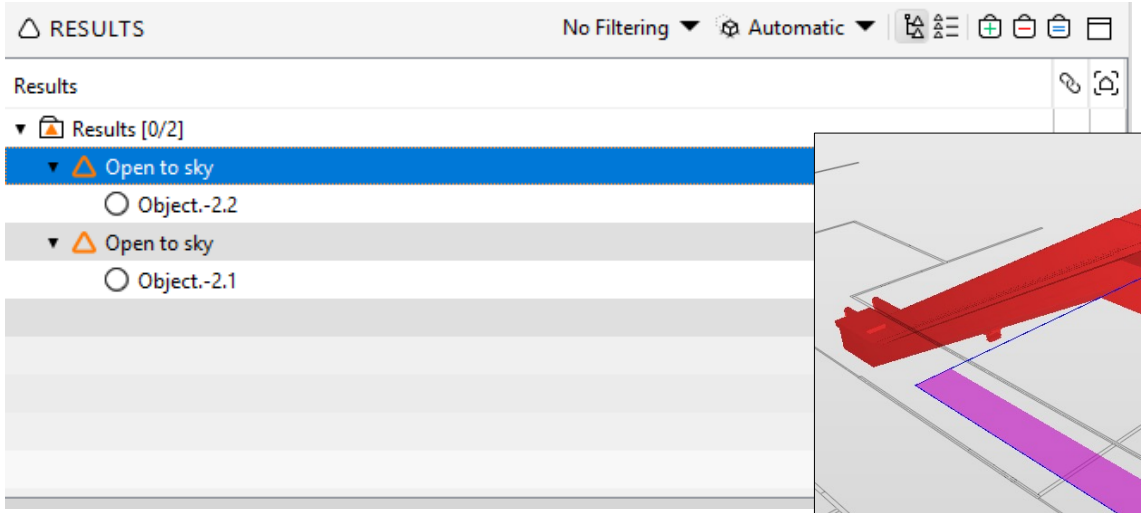
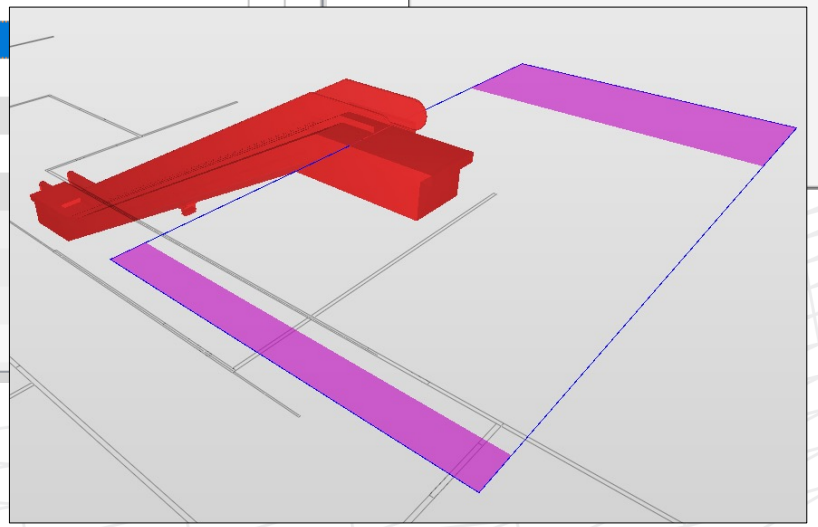
カバーエリアの確認(有効範囲ルール)

Check for Coverage Area

- 例
  - エスカレーターのカバーエリアが開放されているか確認する。
- Example
  - Check if coverage area of escalator is open to space.







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Solibri Office - MRT Sample

M... CHEC... COMMUNICA... INFORMATION TAKE... BCF LIVE CONNEC... S... + VIEWS

Spin Info Search

CHECKING

Check Model Report

Ruleset - Checked Model						
§ LTA019 Check clear space in front of Escalator						—
§ LTA019a Check for obstructions in front of sides of component						OK
§ LTA020a Stair clear height measured from the pitch line				△		
§ LTA020b Check escalator clear height from pitch line				△		
§ LTA020b Check for obstruction above the escalator				△		
§ LTA021 Count total number of objects in the building					△	
§ LTA022 Clear height of Bicycle Parking						—
§ LTA023 Check connection between between Bicycle Parking and Entrar						—
§ LTA024 Check if services in space are not serving public area						—
§ LTA024a Check presence of service in the space and check it is fire ratte						—
§ LTA025 Check for lights and water borne service above escalator						—
§ LTA026 Check if coverage area is open to sky				△		
§ LTA027 Check whether the canopy is connected with linkway						—
§ LTA028 Presence of rain water down pipe in canopy						—
§ LTA029 Check minimum clearance beyond the platform screen door er						—
§ LTA030 Check the distance between seating and other elements						—

RESULT SUMMARY

Report

	△	△	△	✕	✓
Issue Count	19	23	9	0	0
Issue Density	0.76	0.92	0.36	0	0

INFO

ADC Sec 3_1

Description

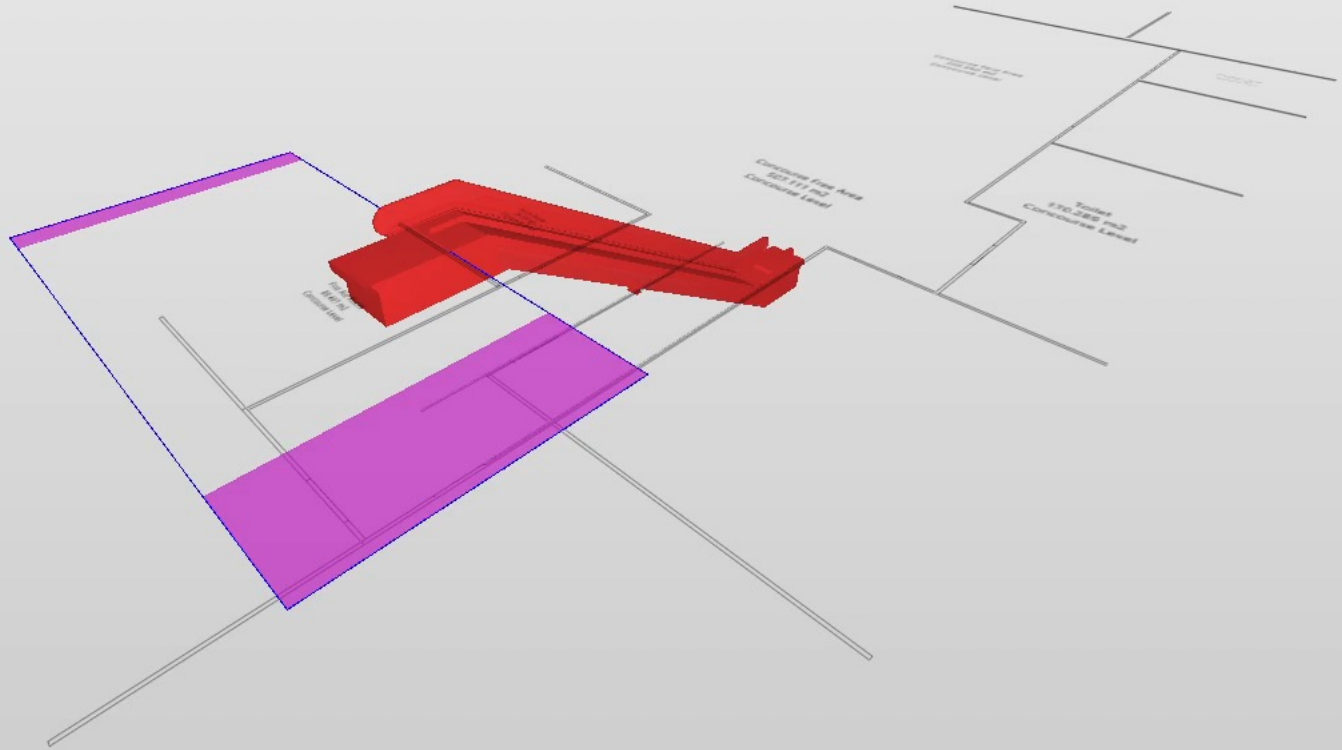
Enter the description here

RESULTS

No Filtering Automatic

Please select a checked rule with results.

3D



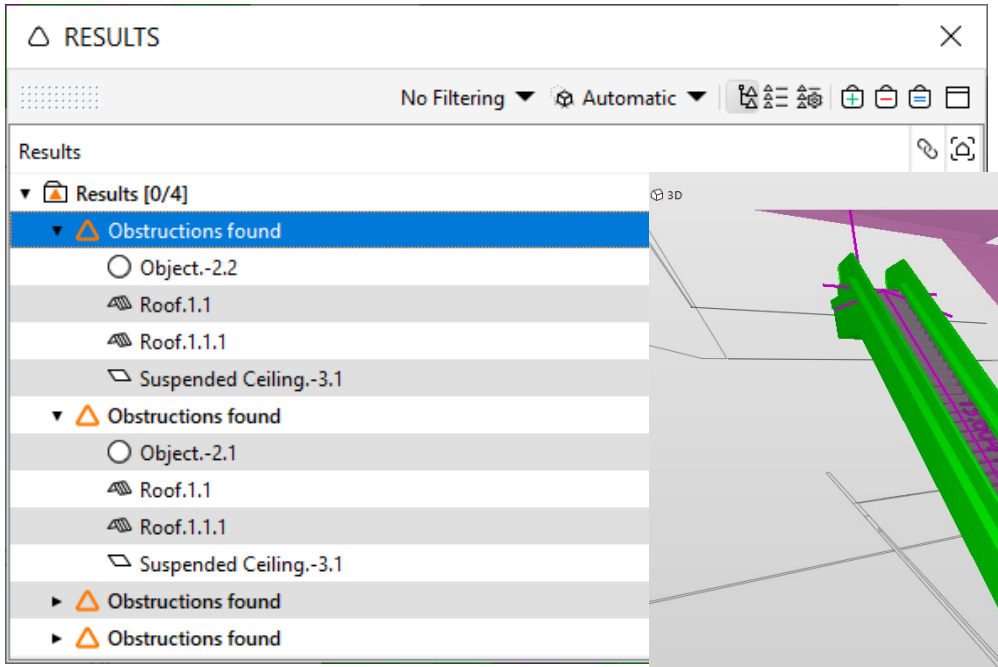
Welcome to Solibri Office

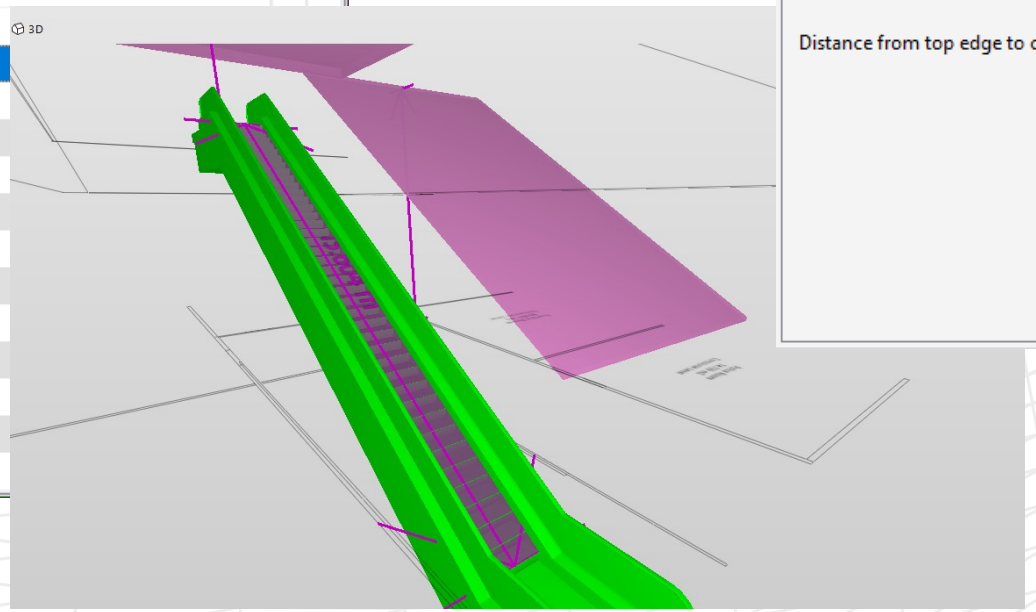
Role: LTA ADC Checking Selected: 0

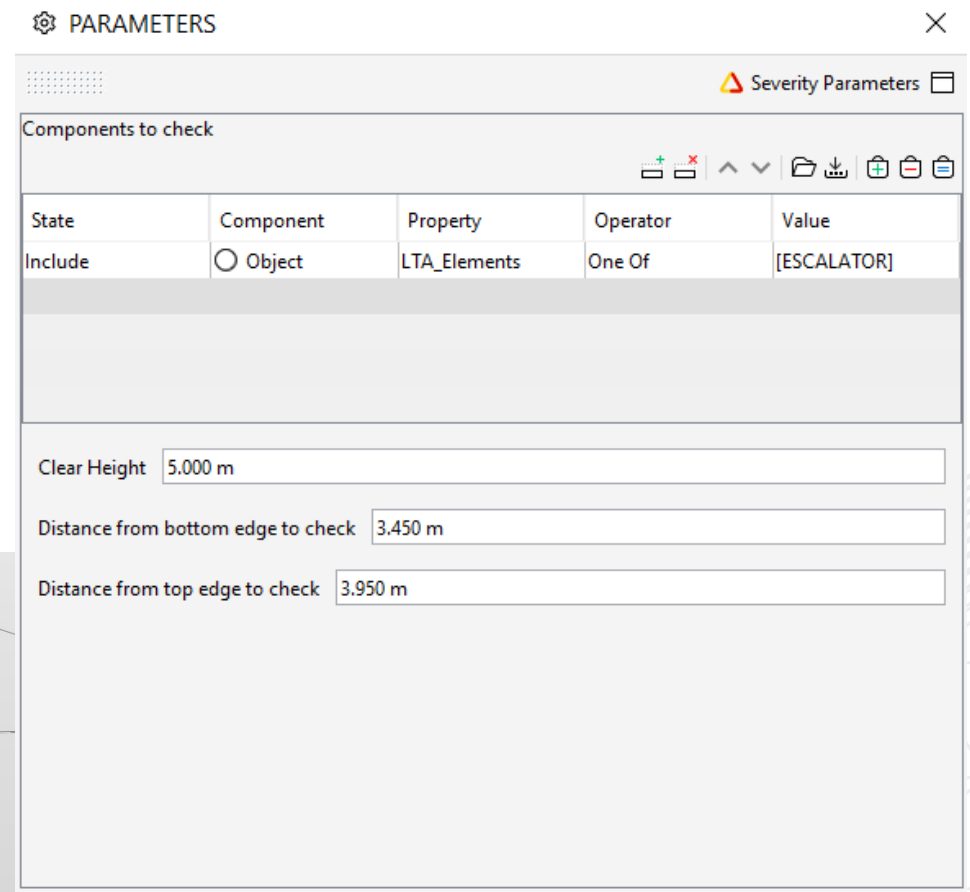
上にある障害物の確認

Check for Obstruction Above

- 例
  - エスカレーターのピッチライン上に障害物がないかチェック。
- Example
  - Check for obstruction above the pitch line of escalator.







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Solibri Office - MRT Sample

M... CHEC... COMMUNICA... INFORMATION TAKE... BCF LIVE CONNEC... S... VIEWS

Spin Info Search

CHECKING Check Model Report

Ruleset - Checked Model

- § LTA019 Check clear space in front of Escalator
- § LTA019a Check for obstructions in front of sides of component OK
- § LTA020a Stair clear height measured from the pitch line
- § LTA020b Check escalator clear height from pitch line
- § LTA020b Check for obstruction above the escalator
- § LTA021 Count total number of objects in the building
- § LTA022 Clear height of Bicycle Parking
- § LTA023 Check connection between between Bicycle Parking and Entrar
- § LTA024 Check if services in space are not serving public area
- § LTA024a Check presence of service in the space and check it is fire ratte
- § LTA025 Check for lights and water borne service above escalator
- § LTA026 Check if coverage area is open to sky
- § LTA027 Check whether the canopy is connected with linkway
- § LTA028 Presence of rain water down pipe in canopy
- § LTA029 Check minimum clearance beyond the platform screen door er
- § LTA030 Check the distance between seating and other elements

RESULT SUMMARY Report

Issue Count	0	2	0	0	0
Issue Density	0	0.080	0	0	0

INFO

§ LTA026 Check if coverage area is open to sky

Description

This rule checks if the specified coverage area is open to sky

(CEE@NTU - 2020-09-09)

Support Tag: NTU/LTA026/1.0

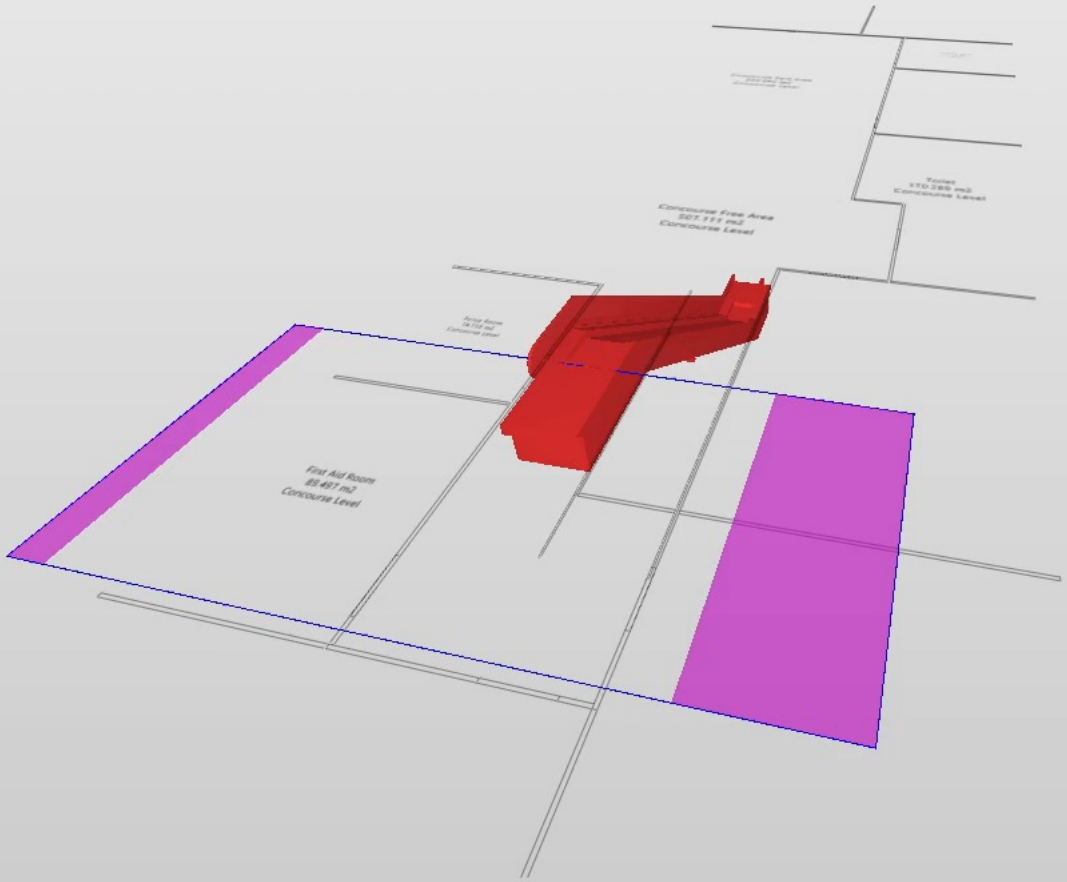
Rule Help

RESULTS No Filtering Automatic

Results

Results [0/2]

3D



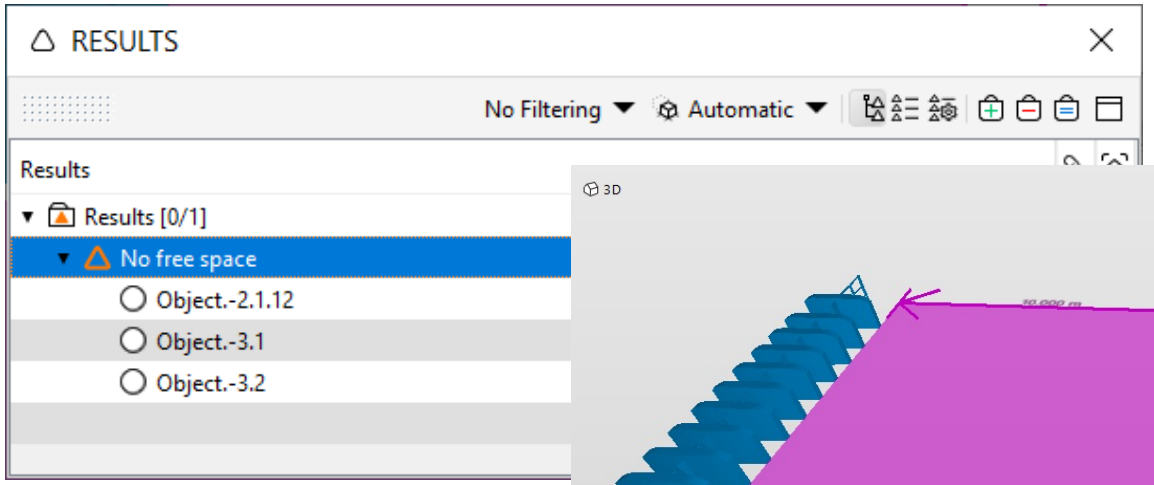
Welcome to Solibri Office

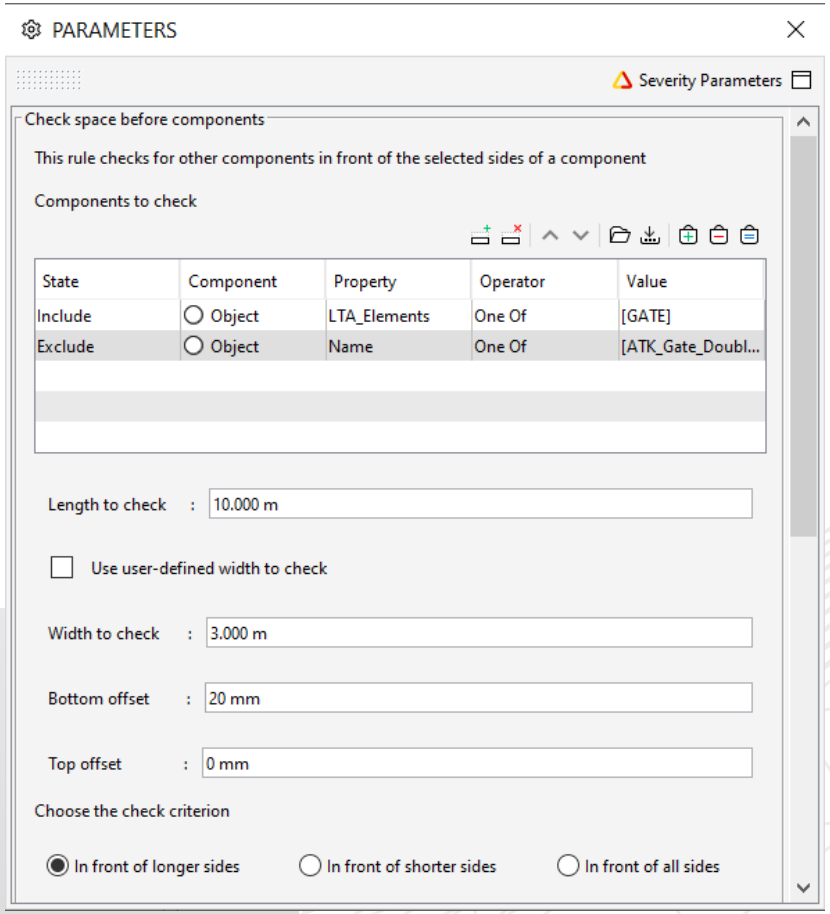
Role: LTA ADC Checking Selected: 0

前方の障害物の確認

Check for Obstruction Infront

- 例
  - 自動公正回収（AFC）ゲートの前に障害物がないか確認する。
- Example
  - Check for obstruction in-front of Automatic Fair Collection (AFC) Gates.





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Solibri Office - MRT Sample

M... CHEC... COMMUNICA... INFORMATION TAKE... BCF LIVE CONNEC... S... + VIEWS

Spin Info Search

CHECKING Check Model Report

Ruleset - Checked Model						
§ LTA013a Check for services allowed in the space						—
▸ § LTA014 Check the height of kerb based on from space and to space						—
§ LTA015 Check room width X length						OK
▸ § LTA016a Check space height to sofit of slab above with in the range of						—
§ LTA017 Check ventilation of the space				△		
§ LTA018 Check for railing at the rear end of room						OK
§ LTA019 Check clear space in front of Escalator						—
§ LTA019a Check for obstructions in front of sides of component						OK
§ LTA020a Stair clear height measured from the pitch line					△	
§ LTA020b Check escalator clear height from pitch line				△		
§ LTA020b Check for obstruction above the escalator						OK
§ LTA021 Count total number of objects in the building					△	
§ LTA022 Clear height of Bicycle Parking						—
§ LTA023 Check connection between between Bicycle Parking and Entrar						—
§ LTA024 Check if services in space are not serving public area						—
§ LTA024a Check presence of service in the space and check it is fire ratte						—

RESULT SUMMARY Report

	△	△	△	✕	✓
Issue Count	0	0	0	0	0
Issue Density	0	0	0	0	0

INFO

Object.-3.1

BIM Data | IFC Standard Properties | Custo...

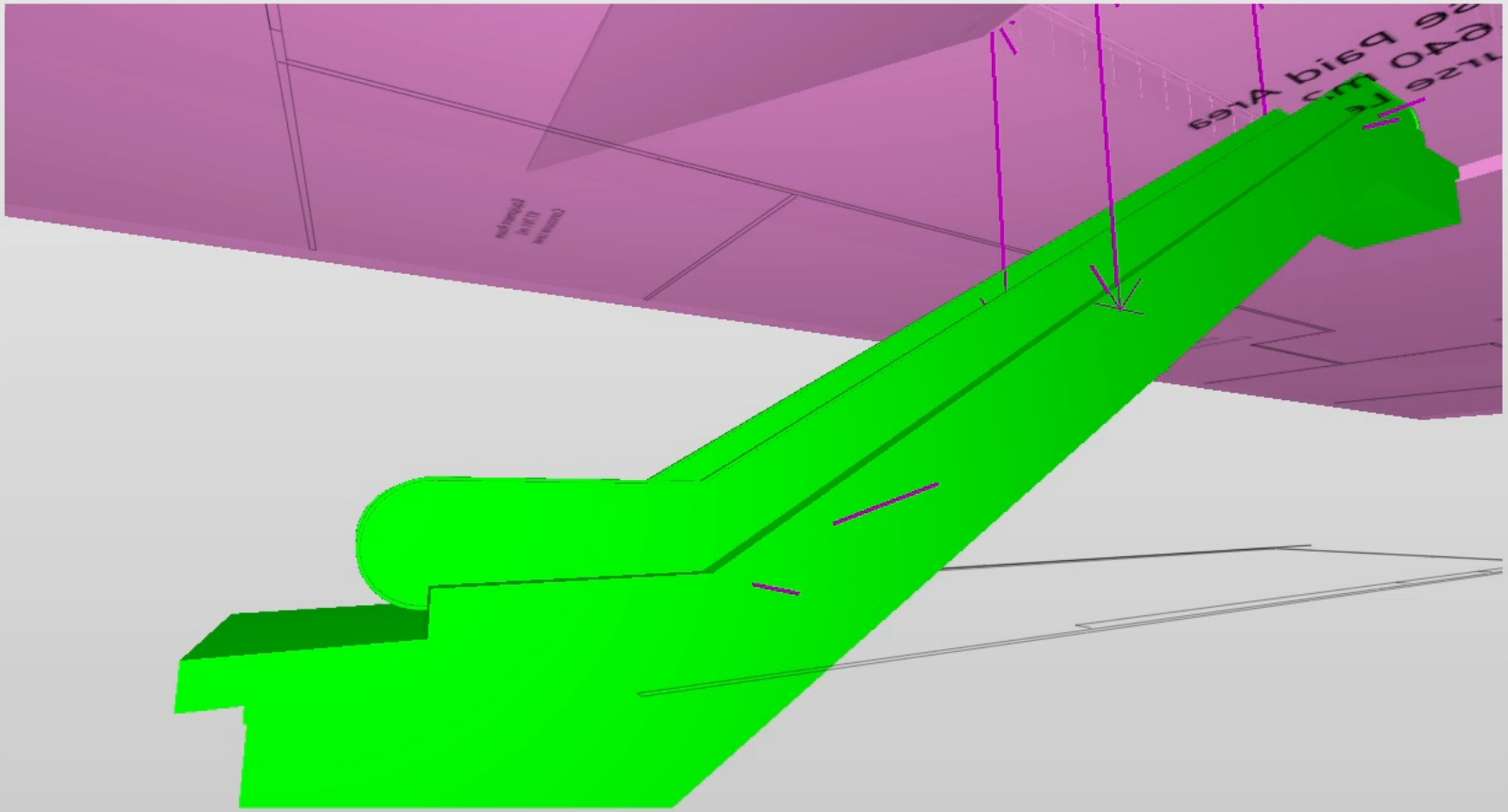
Pset_BuildingElementProxyCommon

Property	Value
Reference	ATK_Escalator

RESULTS No Filtering Automatic

Selected rule is passed.

3D



Welcome to Solibri Office

Role: LTA ADC Checking Selected: 0

URAのGFA算出ルールの開発

URA's GFA Calculation Rule Development

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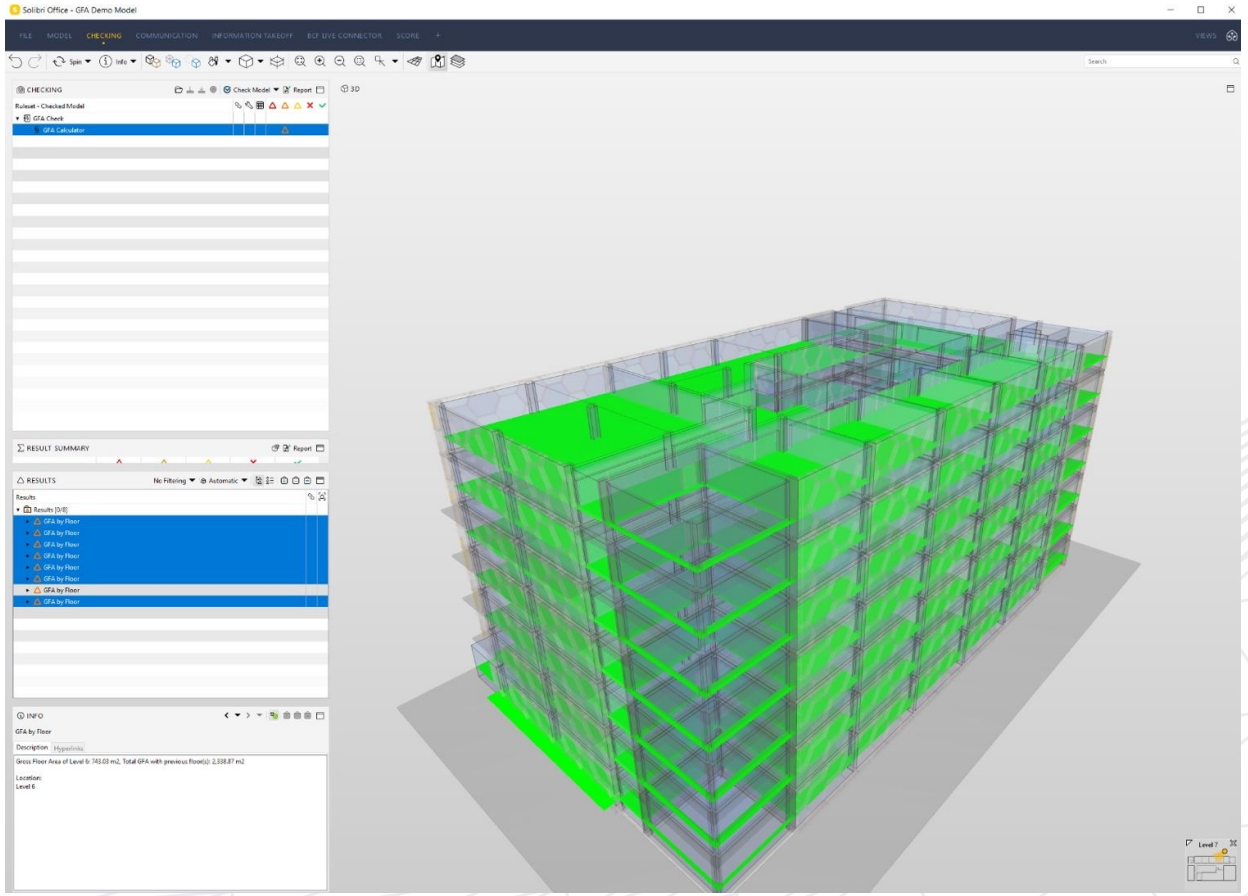
URAのGFA計算

GFA Calculation for URA

- GFAとは、外壁やその他の建物ファサード要素（窓、手すり、カーテンウォールなど）の厚さの半分を含む、覆われた床面積の総面積のことで、スペースは含まれない。

- GFA には以下が含まれる：
  - + 床面積
  - + 商業目的で使用される屋根のないエリア
  - + ストラタエリア
- GFA is the total area of covered floor space, including the half thickness of external walls or other building facade elements (e.g. windows, railings, curtain walls), but excluding voids.
- GFA includes:
  - + covered floor area of a development,
  - + uncovered area used for commercial purposes,
  - + strata area (covered or otherwise)



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Solibri for CORENET X 提出要件チェック

Solibri for CORENET X
Submission Requirement Check

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CORENET X

The CORENET X project was initiated in 2018 with the objective to leverage technologies such as Building Information Modelling (BIM) and automation, to transform the regulatory approval process for building works. CORENET X is conceived as the future ecosystem of regulatory approvals, redefining Government to Business interactions as a One Stop Integrated Digital Shopfront. It adopts the agile approach and is targeted to be rolled out from end 2023.

BIM Readiness

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GRAPHISOFT Archicad®

GRAPHISOFT BIMcloud®

GRAPHISOFT BIMx®

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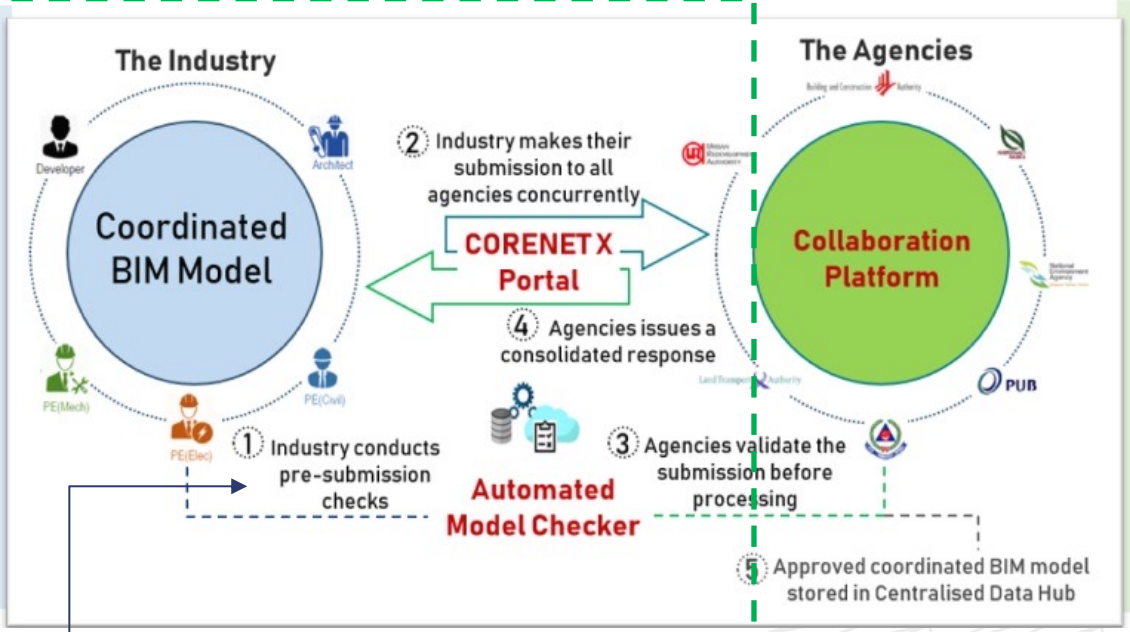
Integrated Pre-Check Solution

TRANSFORMATION of INDUSTRY

- Promote design coordination and teamwork
- Promote digitalization of construction sector
- Support IDD[1] & DfMA[2] imperatives

FIRST IN THE WORLD

One-Stop Integrated Digital Shopfront



TRANSFORMATION of REGULATORY AGENCIES

- Reduce silos, iterations & regulatory gateways
- Embrace collaboration & raise productivity amidst rising demands
- Improve accessibility & centralise information towards a Single Source of Truth

https://www1.bca.gov.sg/regulatory-info/building-control/corenet-x/more-information

*IDD and openBIM format, IFC-SG

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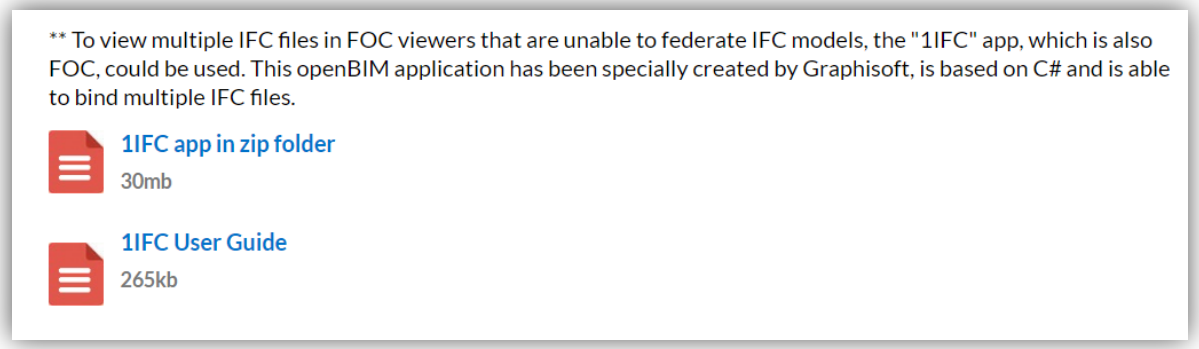
Solibri Anywhere

- IFCファイルの無料ビューア
- IFCシステムを閲覧可能
- 検索クエリにより、モデル要素を検索できる
- IFCファイルからグリッド要素を表示し



- Free viewer for IFC files
- IFC systems can be viewed.
- Search Query helps to search model elements.
- Displays Grid elements from IFC files.

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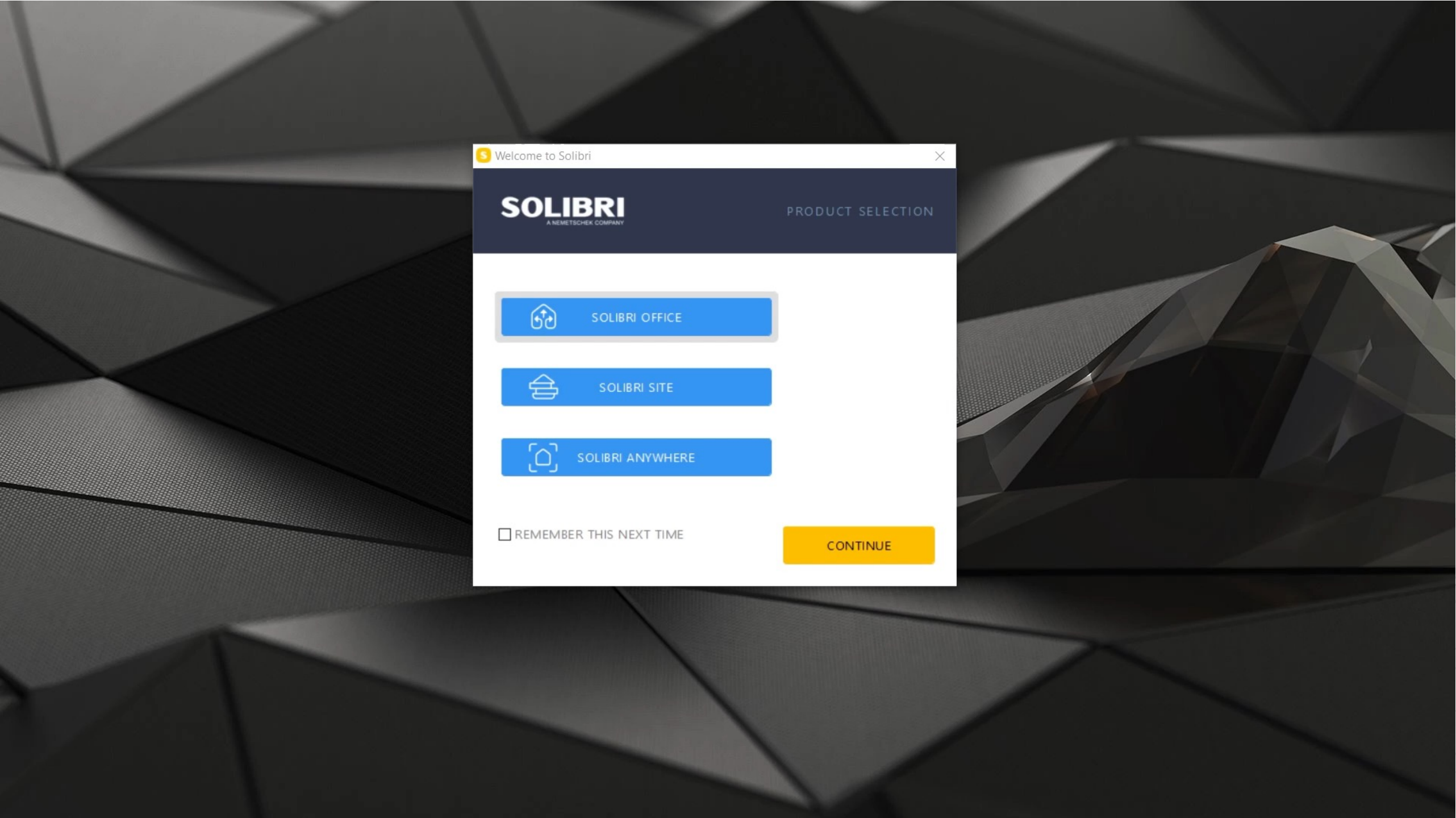
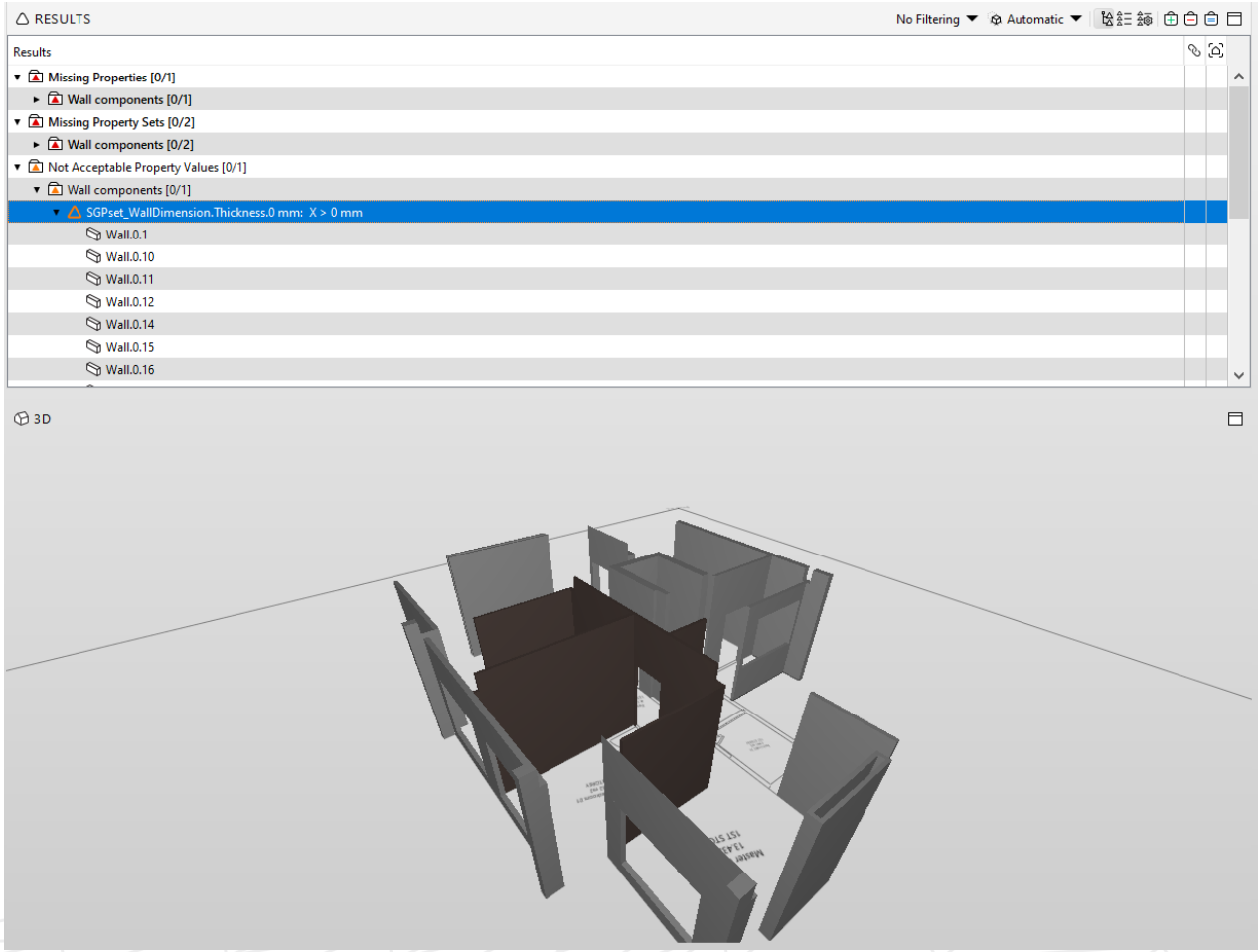

Welcome to Solibri
SOLIBRI
A NEMETSCHEK COMPANY
PRODUCT SELECTION
SOLIBRI OFFICE
SOLIBRI SITE
SOLIBRI ANYWHERE
REMEMBER THIS NEXT TIME
CONTINUE

Solibri Office

- SolibriはIFCベースのモデルチェックツール
- Archicad-Solibri Direct Connectionアドオンにより、包括的なモデルチェックが可能
- Solibriのルールセットは、パラメトリックで複雑な確認が可能です

- Solibri is an IFC based tool for Model Checking.
- Archicad-Solibri Direct Connection Add-on enables the comprehensive model checking.
- Rulesets in Solibri are highly parametric to check for complex criteria.



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Solibri Office

FILE | MODEL | CHECKING | COMMUNICATION | INFORMATION TAKEOFF | BCF LIVE CONNECTOR | SCORE | +

- Open Model...
- Add Models...
- Update Models...
- Save Model
- Save Model as...
- Integrations
- Security Settings...
- Close
- Recent
- Roles
- Solution Center
- Settings
- Help
- Ruleset Manager
- Exit

Recent Models

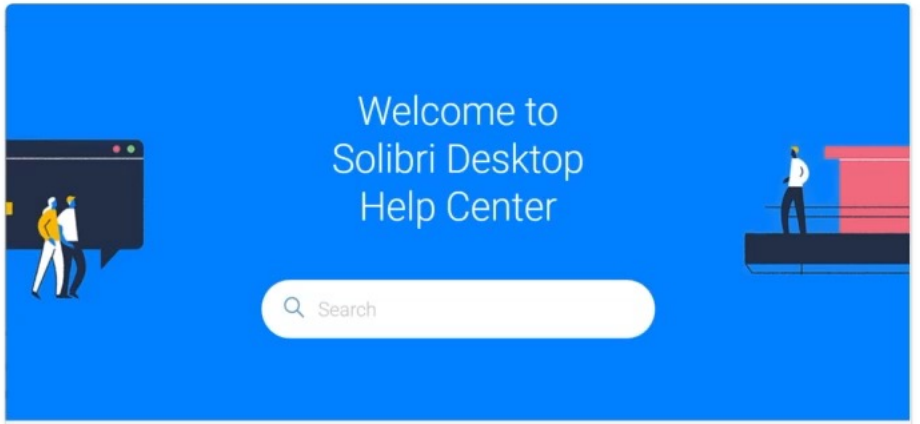
- Federated IFC Model.ifc — C:\Users\VThangasamy\Desktop\Federated Model Export\
- Sample.ifc — C:\Users\VThangasamy\Desktop\
- IFC SG Training Model Archi - AC 25 V3.ifc — C:\Users\VThangasamy\Desktop\
- IFC SG Training Model Archi - AC 25 V2.ifc — C:\Users\VThangasamy\Desktop\
- IFC SG Training Model Archi - AC 25.ifc — C:\Users\VThangasamy\Desktop\
- Solibri Building.ifc — C:\Users\Public\Solibri\SOLIBRI\Samples\ifc\
- MRT Sample.ifc — C:\Users\VThangasamy\ViMaL - GSSG\Solibri\NTU Solibri\
- RME_basic_sample_project.ifc — C:\Users\VThangasamy\Desktop\

Open

Recent Model Places

- Federated Model Export — C:\Users\VThangasamy\Desktop\
- Desktop — C:\Users\VThangasamy\
- ifc — C:\Users\Public\Solibri\SOLIBRI\Samples\
- NTU Solibri — C:\Users\VThangasamy\ViMaL - GSSG\Solibri\
- Downloads — C:\Users\VThangasamy\
- IFC Models — C:\Users\VThangasamy\ViMaL - GSSG\IFC SG\
- wetransfer_hdb-mep-library_v25_4-lcf_2023-09-08_0833 — C:\Users\VThangasamy\Downloads\
- OneDrive_1_2-23-2022 — C:\Users\VThangasamy\Downloads\

Welcome to Solibri Office



Got questions?

Want to learn more about using the software? Go to our Online Help Center to learn more about doing model checking, classifications, Information takeoff, and more.

Go to Help Center

Role: LTA ADC Checking Selected: 0

Thank You ☺

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