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cfia
Colegio Federado de Ingenieros y de Arquitectos de Costa Rica

Raising the Bar: Elevate Project Outcomes with High-Quality BIM

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Solibri Americas

gks Latam

colegio de ingenieros civiles

Colegio de Arquitectos de Costa Rica CACR

ciemi

cit Colegio de Ingenieros Topógrafos de Costa Rica

CITEC colegio ingenieros tecnólogos 45

SECTOR AECO: ARQUITECTURA INGENIERÍA CONSTRUCCIÓN OPERACIONES

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Quality


SOLIBRI

KPMG

cutting through complexity

GLOBAL CONSTRUCTION SURVEY 2015

Climbing the curve

2015 Global Construction Project Owner's Survey

kpmg.com/building

KPMG INTERNATIONAL

69%

Of projects missed **budget** by > 10%

75%

Of projects missed **deadline** by > 10%

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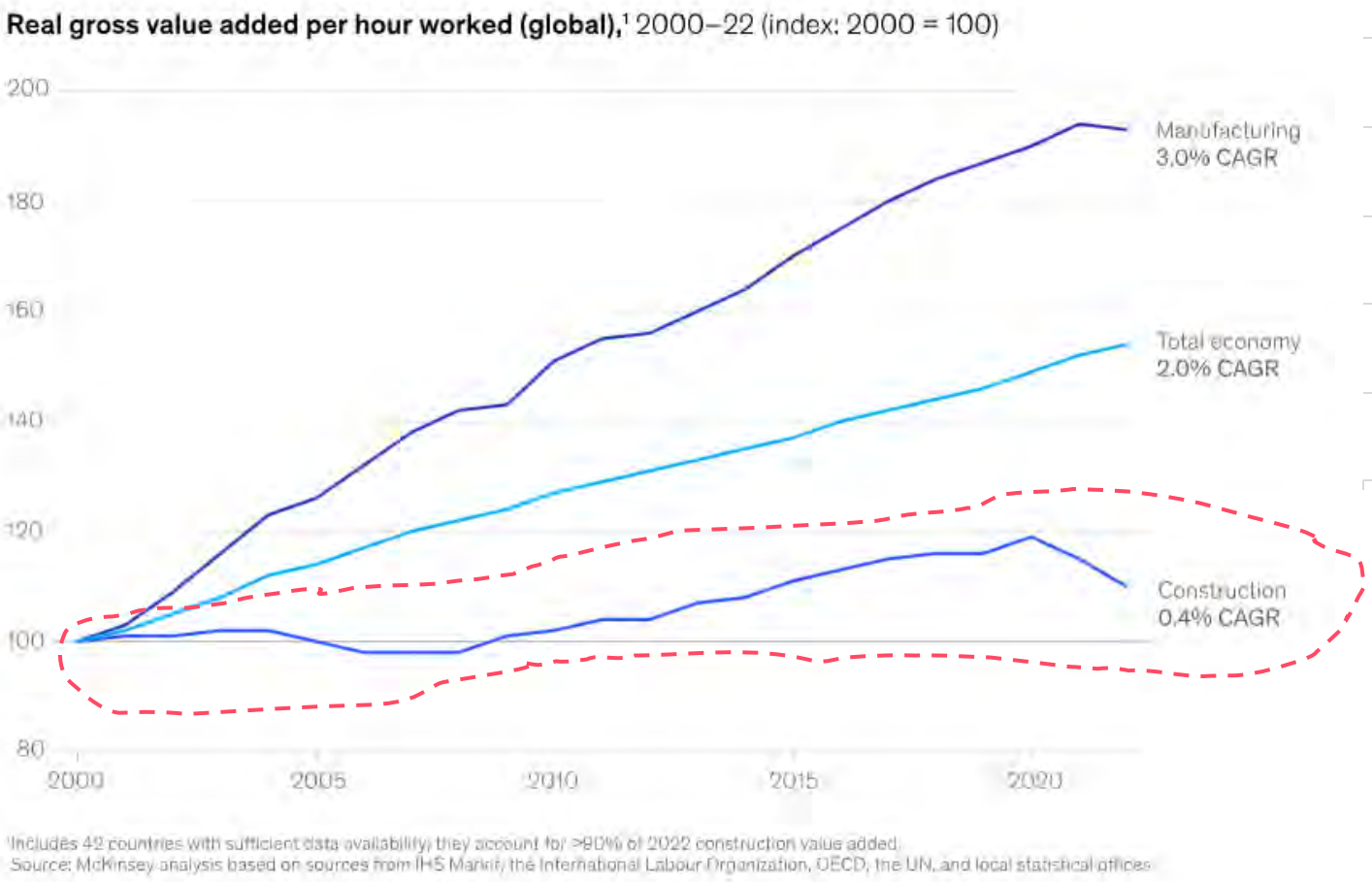
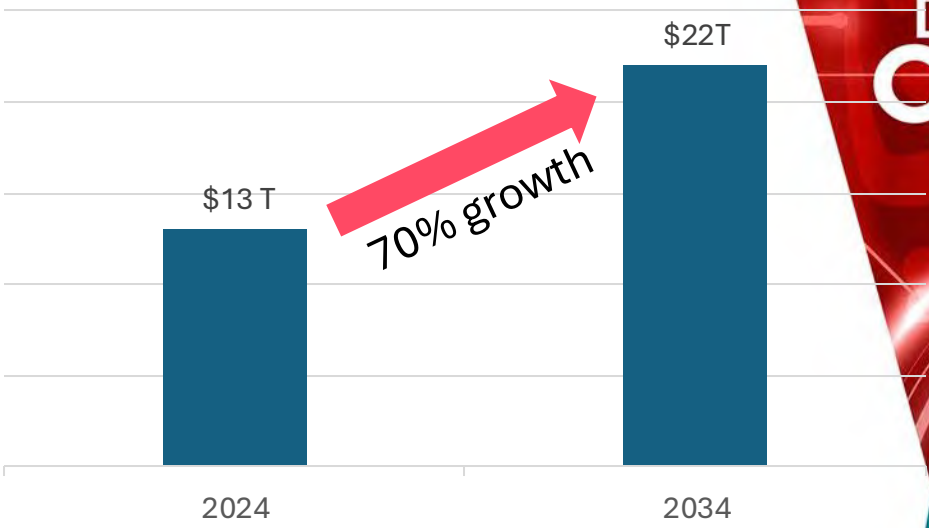
Labor productivity in construction continues to lag behind productivity in manufacturing and the total economy.



[1]Includes 42 countries with sufficient data availability; they account for >80% of 2022 construction value added.
Source: McKinsey analysis based on sources from IHS Markit, the International Labour Organization, OECD, the UN, and local statistical offices

McKinsey & Company

‘At the current trajectory of stagnant productivity and slow or negative projected workforce growth, construction output might fall short of demand by $40 trillion cumulatively by 2040’



$50B

VC / PE invested in AEC technology, 2020-2022

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https://www.mckinsey.com/capabilities/operations/our-insights/delivering-on-construction-productivity-is-no-longer-optional

“Improve quality and you automatically improve productivity”

William Edwards Deming

the Father of the Quality Movement

Building Information Modeling

What is BIM?

Promise of BIM

Size of BIM market

BIM quality

a [**collaborative] business process** for generating and leveraging building **data** to design, construct and operate the building during its **lifecycle**. BIM allows all stakeholders to have **access to the same information** at the same time through **interoperability** between technology platforms.

credit: US National BIM Standard

What is BIM?

Promise of BIM

Size of BIM market

BIM quality

Fewer errors, improved collaboration, reduced costs, higher quality, schedule improvements, FM / downstream capabilities, accurate takeoffs, automation….

What is BIM?

Promise of BIM

Size of BIM market

BIM quality

Research by Prophecy Market Insights recently published the global BIM market is set to increase by 212% over the next decade, from $8.5B to $26.4B.

What is BIM?

Promise of BIM

Size of BIM market

BIM quality

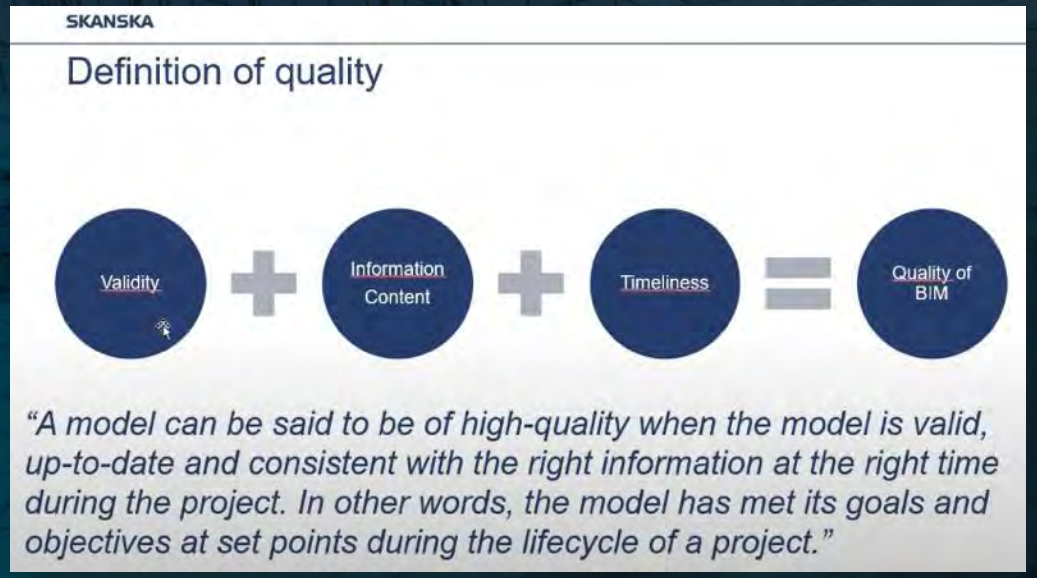
In a 2021 buildingSMART survey, 77% of respondents cited reducing errors / **improving quality** as the #1 way that BIM can help them most in the future.

What is BIM Quality?

BIM Quality: Ensuring conformance to specifications

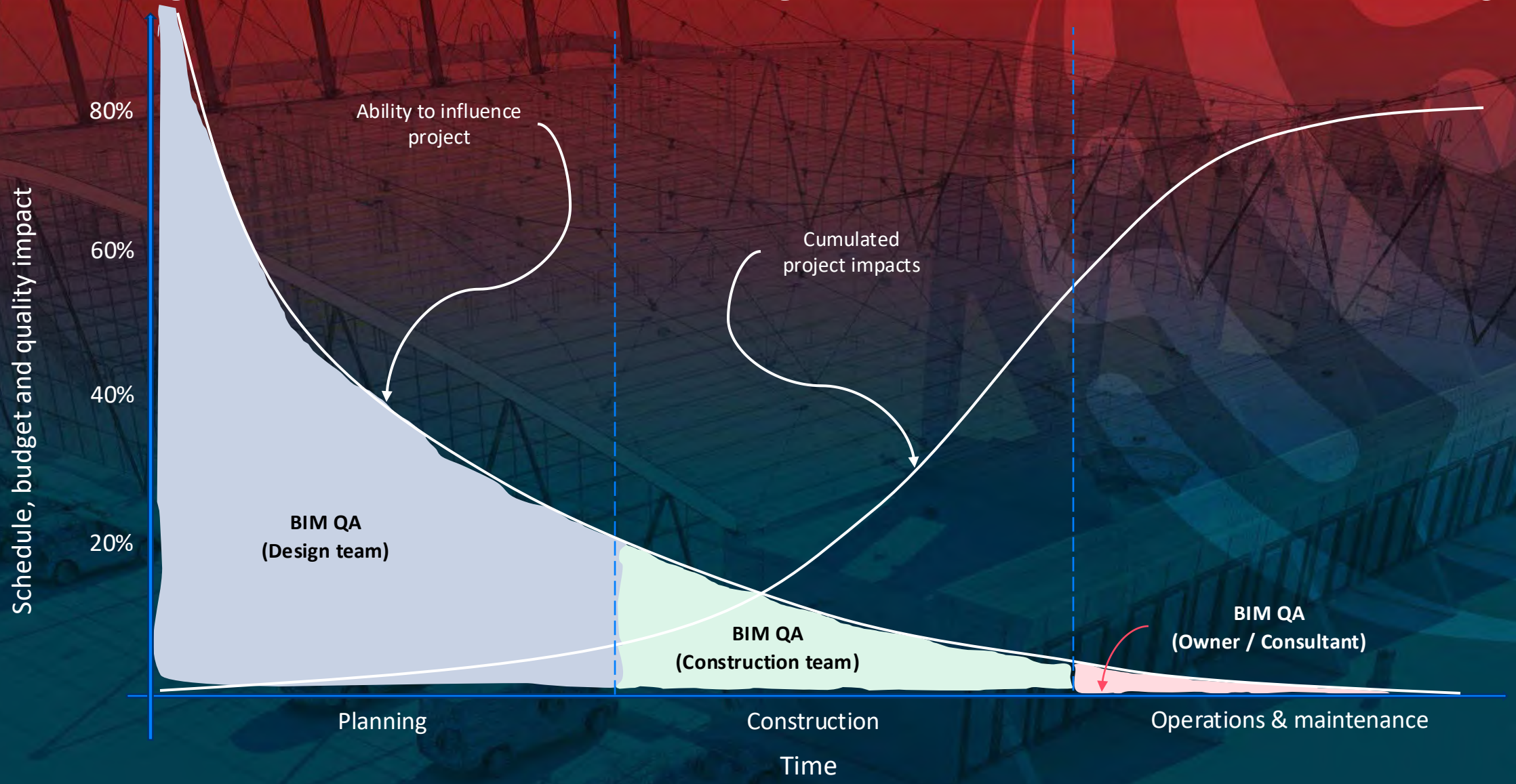
Quality Assurance ➔ QA
proactive measures for prevention

Quality Control ➔ QC
reactive measures for fixing

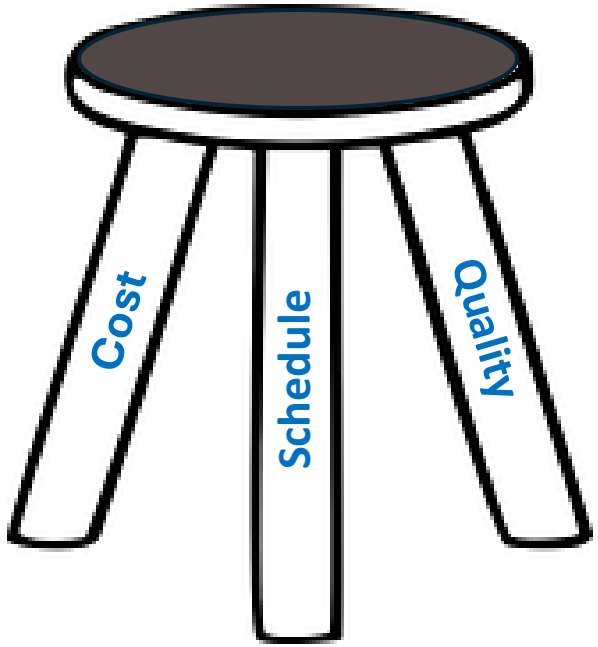


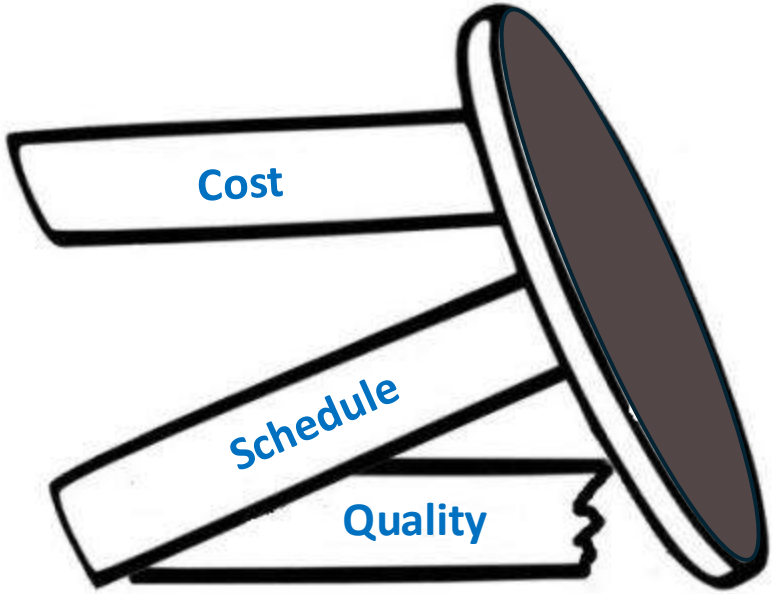
Quality assurance can be defined as "all the planned and systematic activities implemented within the quality system that can be demonstrated to provide confidence that a product or service will fulfill requirements for quality. "
https://asq.org/quality-resources/quality-assurance-vs-control

Impact of BIM Quality on Construction Projects



Construction’s 3-legged stool





Even with BIM, quality challenges persist

- → Fragmentation
- → Labor shortage
- → Lack of training
- → Supply chain issues
- → Changing codes
- → Client expectations
- → Time pressures
- → Project complexity
- → Lack of supervision (‘eyes on site’)

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imerso
CONSTRUCTION TECHNOLOGY

Experts Explain: Why Do Construction Projects Still Struggle Despite Growing Investments in BIM?

We believe the answer lies beyond the realm of technology alone. Let's see what industry professionals think about it.

Read the full article >>

Written by Frederico Valente
Updated: June 19, 2023

https://www.imerso.com/blog/experts-explain-why-do-construction-projects-still-struggle-despite-growing-investments-in-bim#table-of-contents

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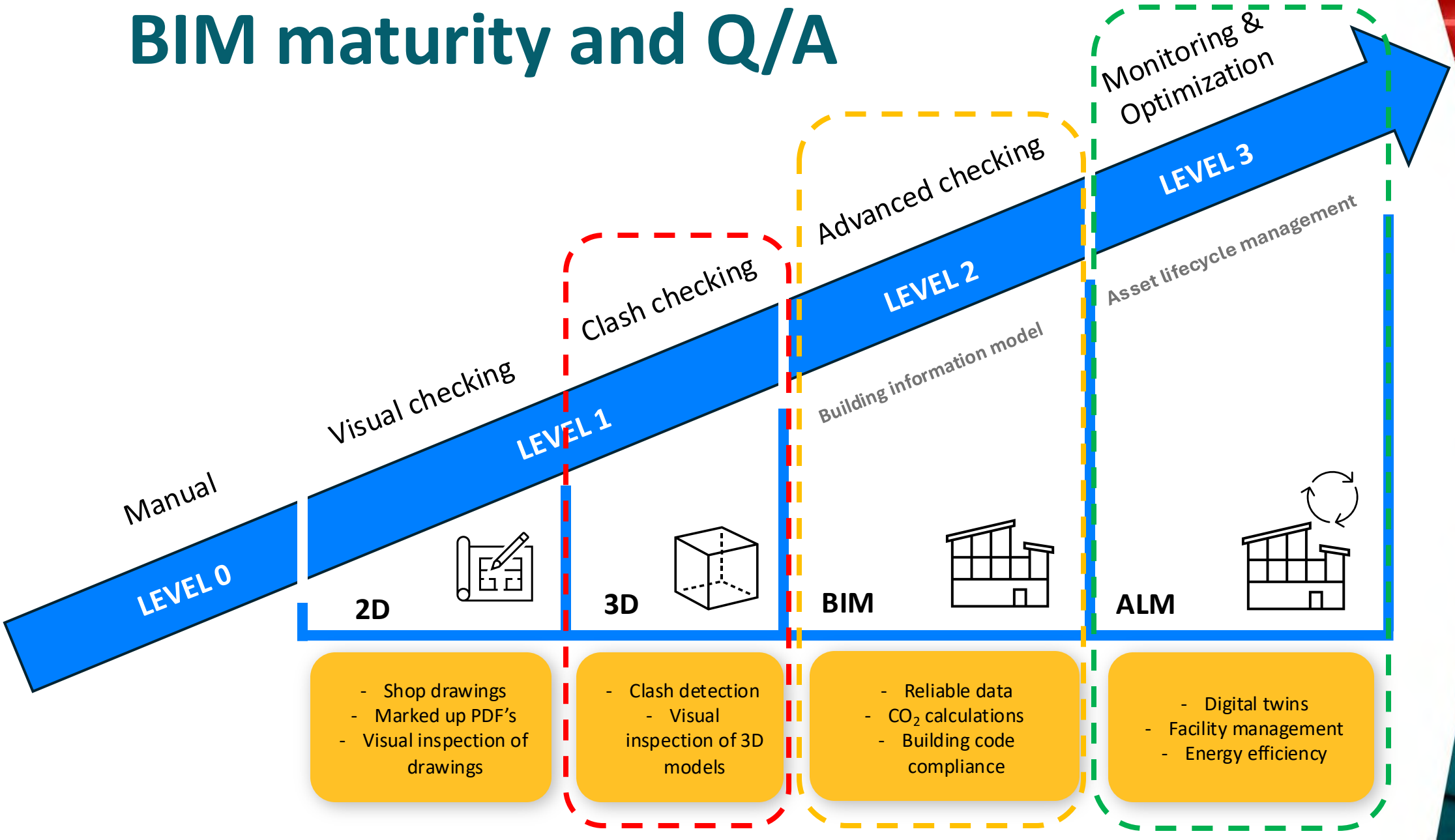
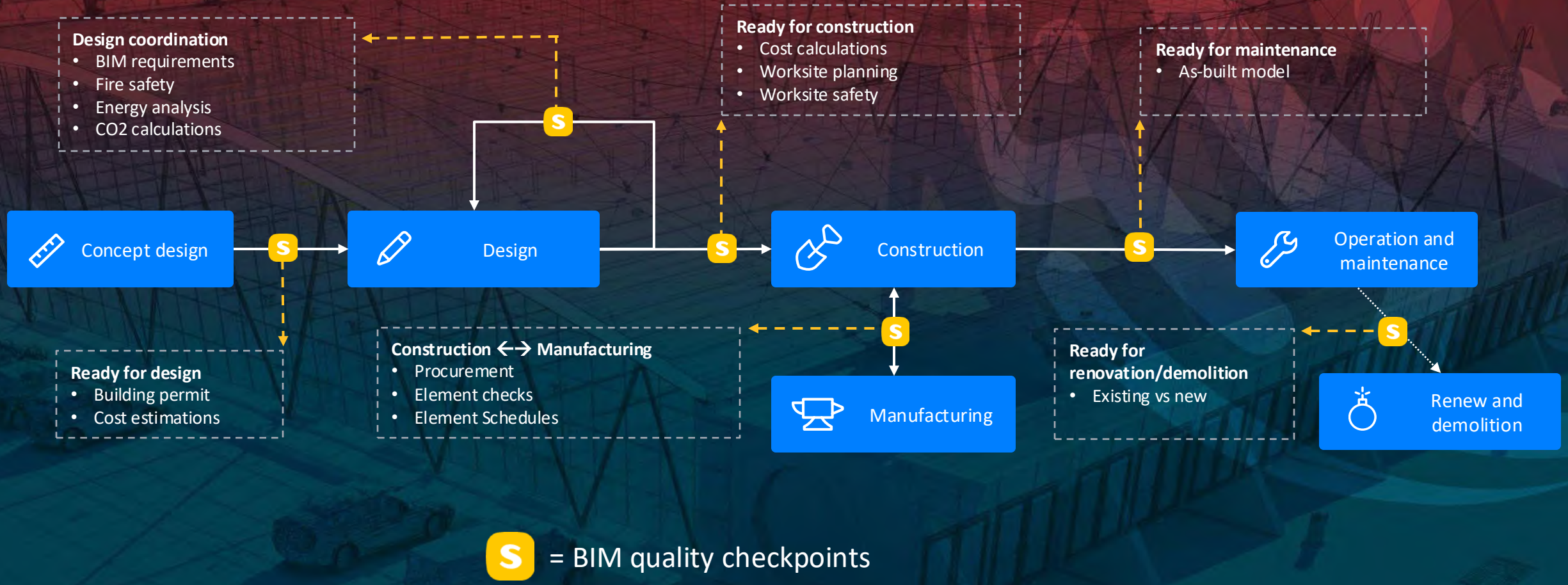
- Owners don't value (pay for) design work
- Don't have access to BIM data
- BIM software not used to full potential
- Contractual separation between Architect and GC
- Lack of interoperability, data quality, standardization
- BIM software only as good as those who use it

BIM maturity and Q/A



Construction workflow with BIM quality



Constructability checking

Integrated Project Delivery (IPD) or Design Build (DB)

Rule-based model checking S

Quality BIM

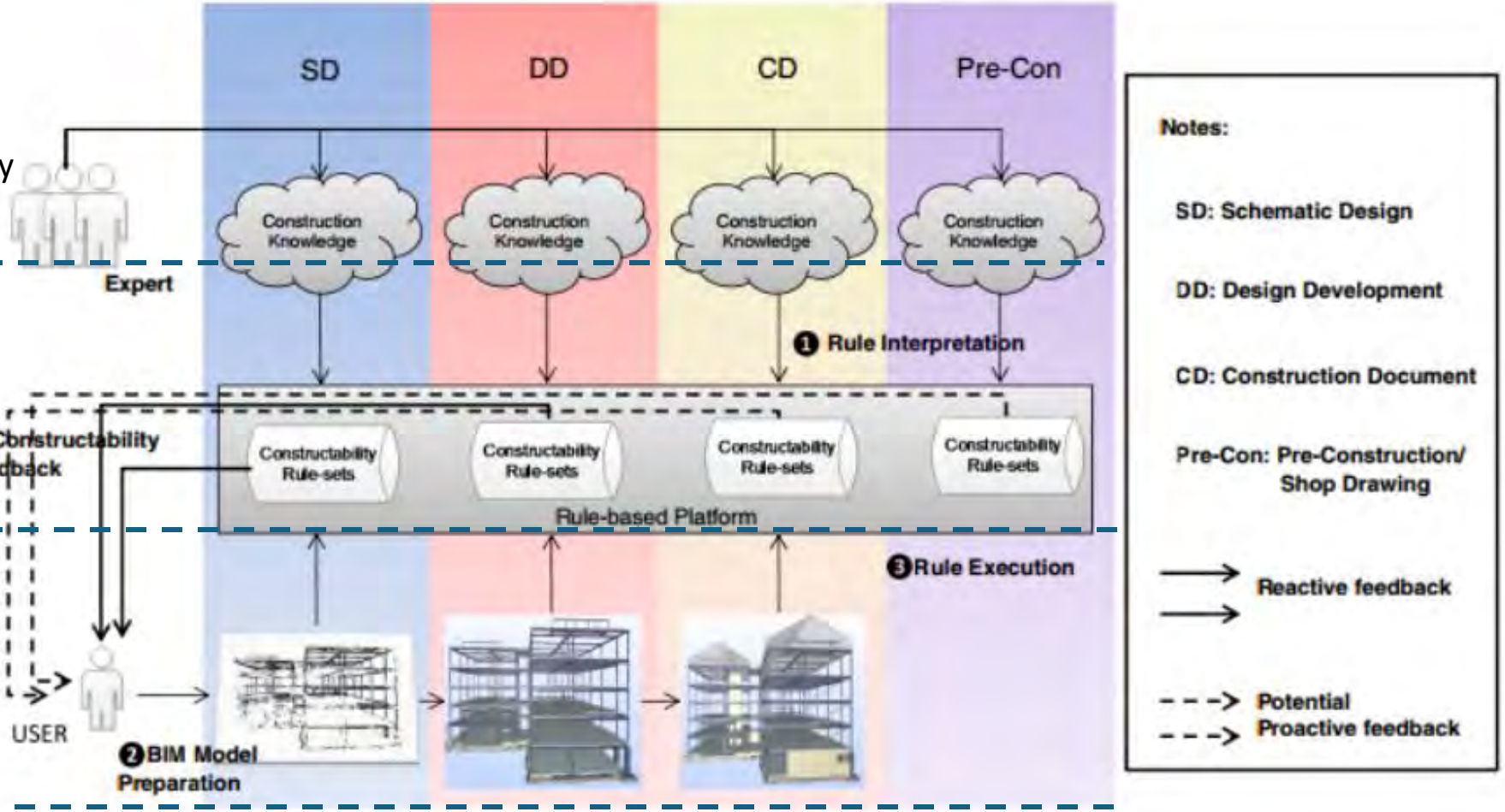


FIG. 2: Rule-based constructability checking (Jiang and Leicht, 2014) https://www.itcon.org/papers/2016_28.content.01379.pdf

What is rule-based checking?

A standardized system to validate the quality of BIM models in an organized, repeatable, and automated approach.

- Geometric checks
- Information checks
- Space checks
- Comparison checks
- Fire safety checks
- Accessibility checks

You

Your Projects

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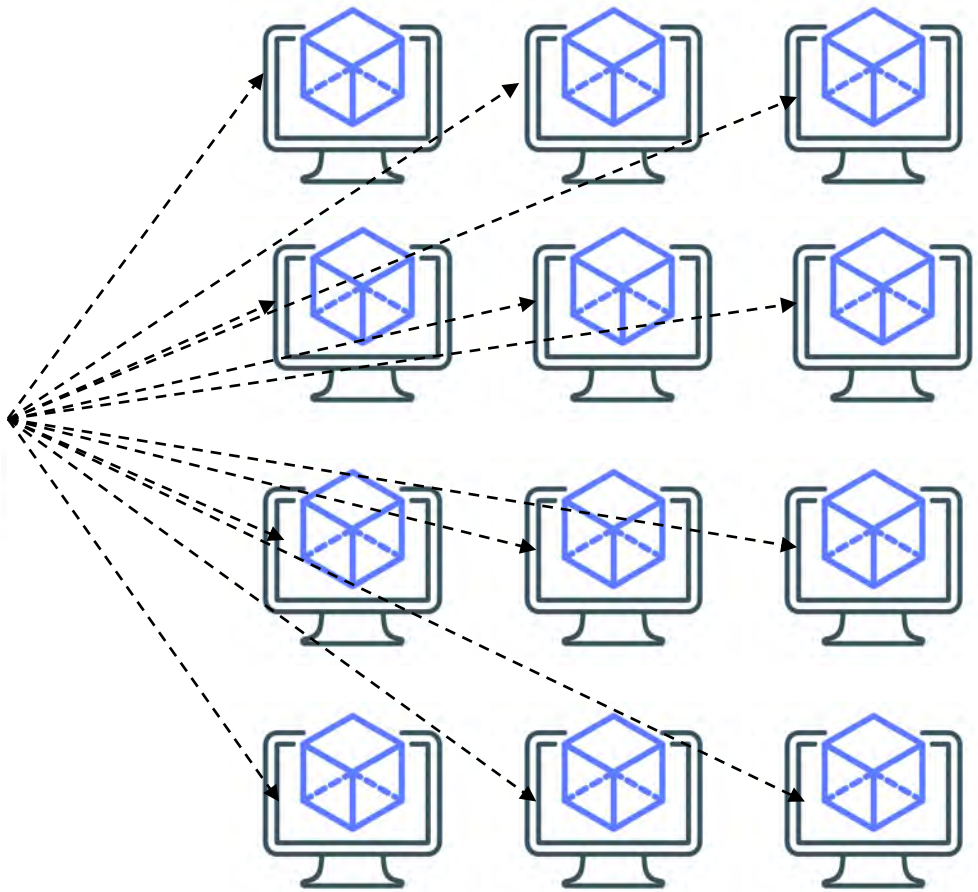
- ✓ Your rules and standards
- ✓ Years of wisdom and knowledge
- ✓ Company standards
- ✓ Building codes
- ✓ Client expectations
- ✓ Constructability knowledge



You

Solibri Rules

Your Projects

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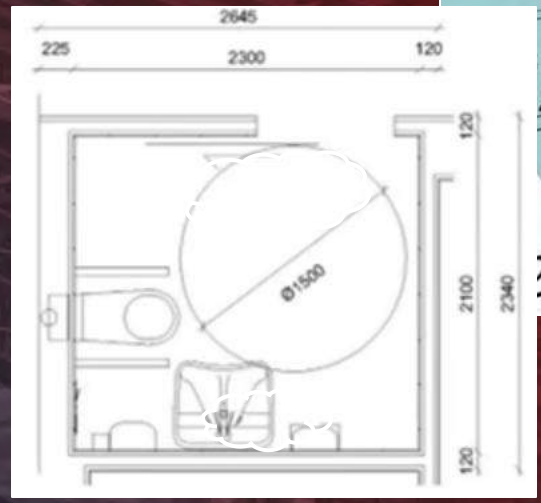
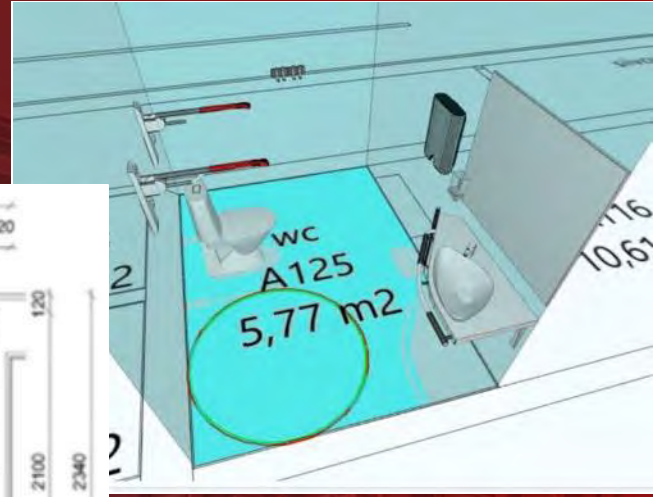
Copenhagen Airports CPH





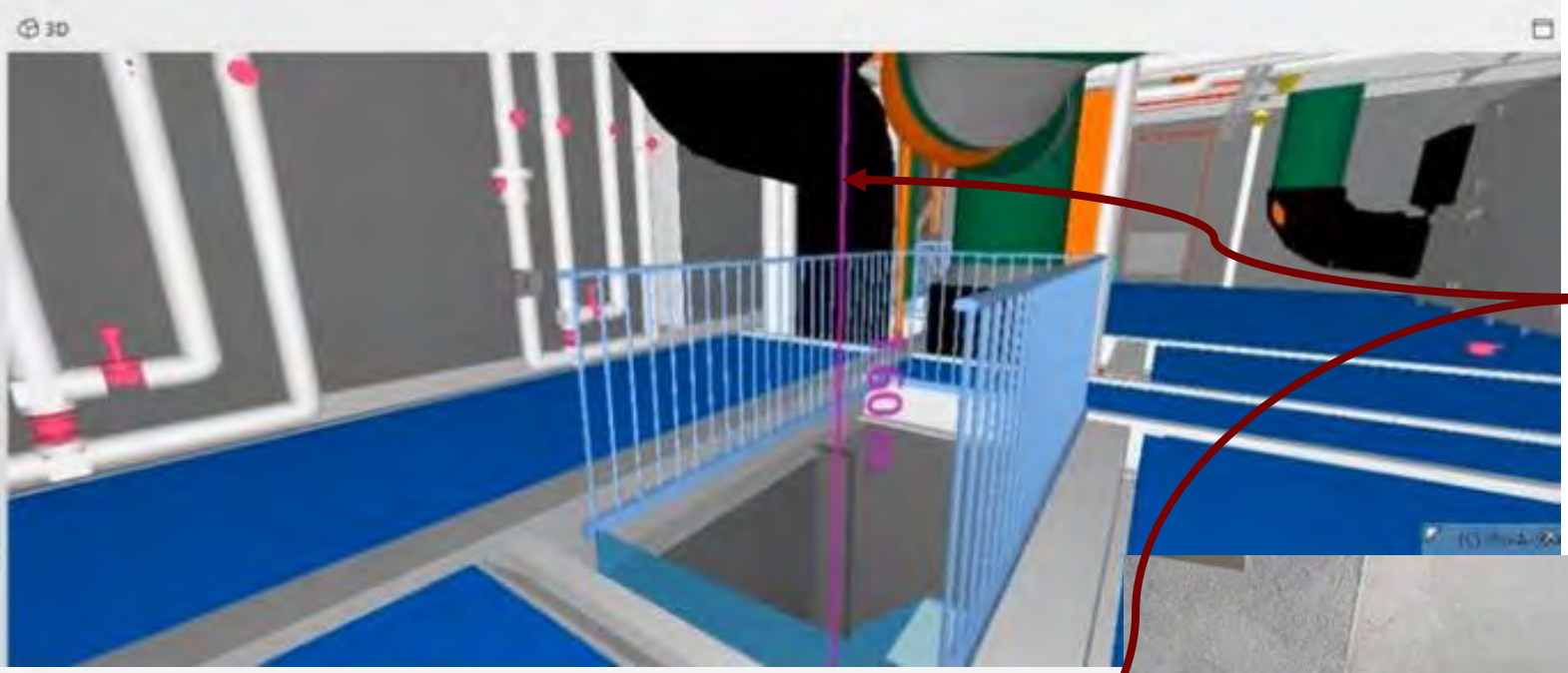
- Baggage handling project
- Accessible toilets / bathrooms

"We are **automating quality checks in Solibri** by creating the Asset Managers' quality assurance **standards into rules** and use them to check all the models. We are handing out these rulesets through our website to all the participants in the projects. It allows our Asset Managers to demand that these **rules are being used by all the stakeholders**."

"Our engineering team has calculated that we have **saved more than 400,000 € in this project** by finding issues that we wouldn't have recognized before."

Michael Orsted

Former Head of Department Technical Knowledge, CPH Airport



Check head space above stair (Rule #210)

Stairs

Minimum Width	0 mm	Minimum Clear Width	0
Maximum Stair Flight Height	4,000 mm	Minimum Landing Clear Width	90
Minimum Space at the Beginning	0 mm	Maximum Stair Height	12
Minimum Clear Height Above	0 mm	Minimum Space at the End	0
Minimum Intermediate Landing Length	0 mm	Minimum Clear Height Under	0
Minimum Number of Steps in a Flight	0	Maximum Number of Steps in a Flight	0
Minimum Angle for Winders	0 °	Maximum Angle for Winders	0
Minimum Riser Height	102 mm	Maximum Riser Height	17
Minimum Tread Length	279 mm	Maximum Tread Length	0
Use Tread Distance	☐	Tread Distance	50
Minimum Sum of Tread and Two Risers	0 mm	Maximum Sum of Tread and Two Risers	0
Maximum Step Nosing Length	0 mm	Check Slab Connections	☑
Allow Open Riser	☑	Check Riser Height for Equality	☑

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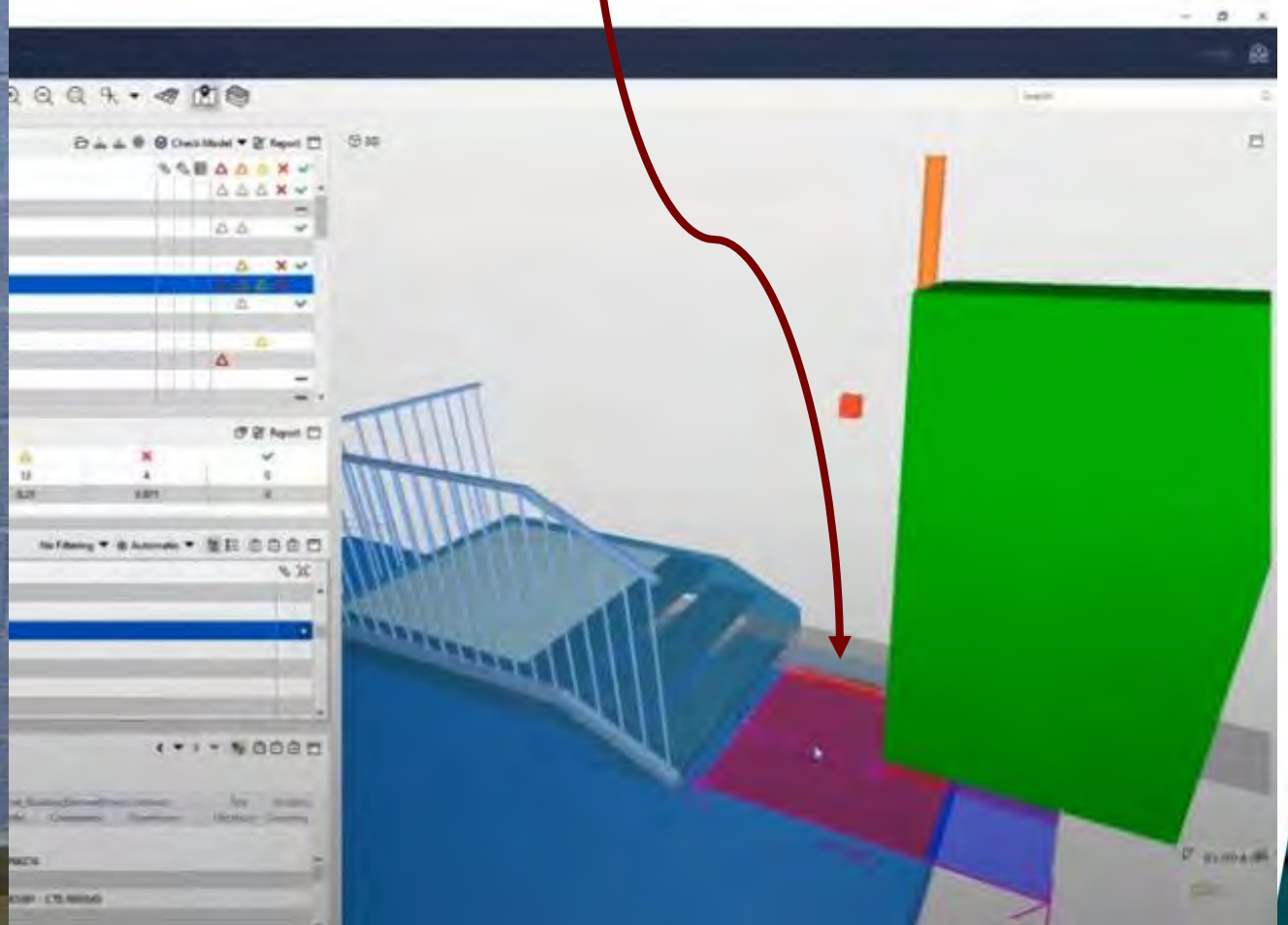
Check free space at end / beginning of stair (Rule #210)



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Check the distance between components (Rule #222)

PARAMETERS

Severity Parameters

Distance Calculation

Checked Distance to Target Component

Shortest Distance Between Shapes

Allowed Maximum Distance 3 000,0 mm

Required Minimum Distance 3 000,0 mm

Use Door Swing in Distance Calculation

Space or Space Group Containment

Space or Space Group Containment: Ignore Space or Space Group

Space Group Type

Space Group

Source Component

Source Components to be Checked

State	Component	Property	Operator	Value
Include	Any	(Classification...	Matches	Fresh Air Valve

Target Component

Target Components to be Checked

State	Component	Property	Operator	Value
Include	Any	(Classificati...	Matches	Outlet Air V...

Some examples of where this check is used:

- ✓Are electrical outlets at the correct height above the floor?
- ✓Are light switches close enough to doors?
- ✓Is there adequate space above a suspended ceiling?
- ✓Are cable trays high enough off the ground for clearance, but low enough to be serviced?

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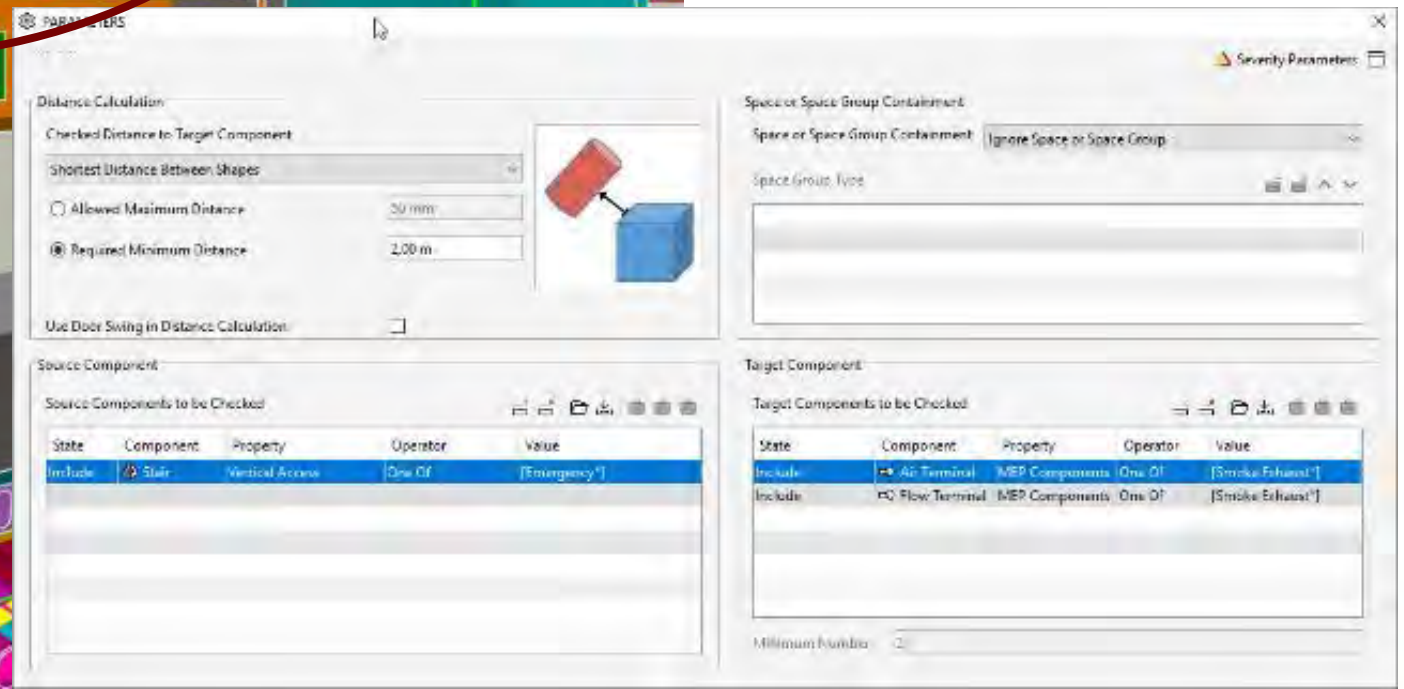
Smoke exhaust vent is located at the emergency route, too close to stairs



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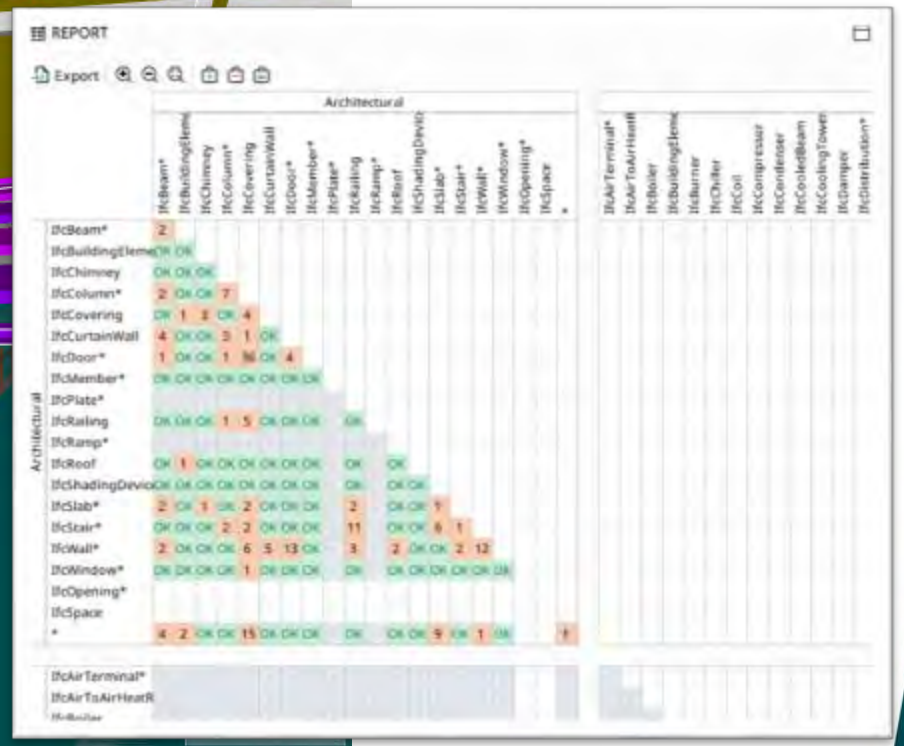
Ventilation ducts are clashing with steel trusses of the roof (Rule #1, #245)



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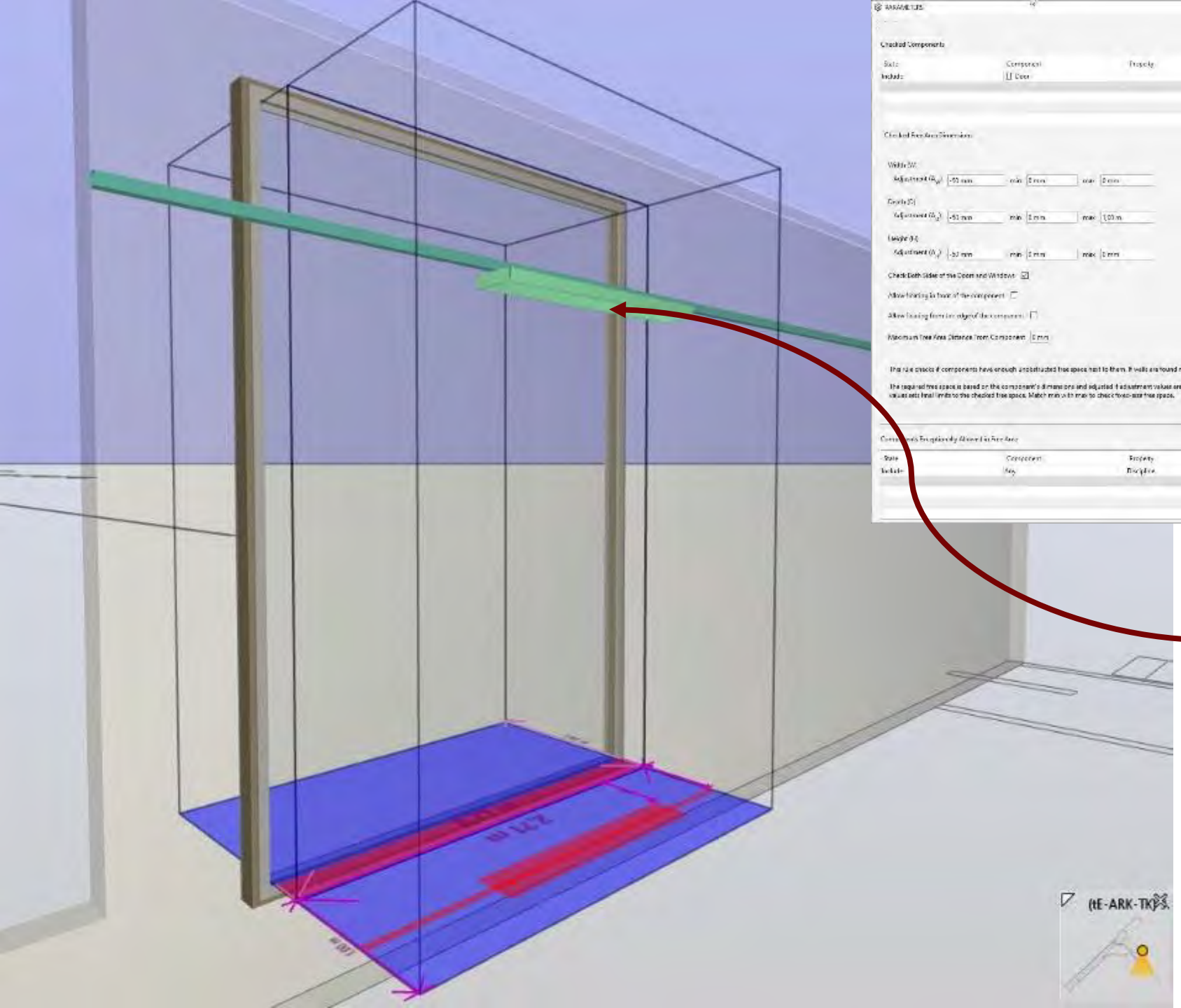

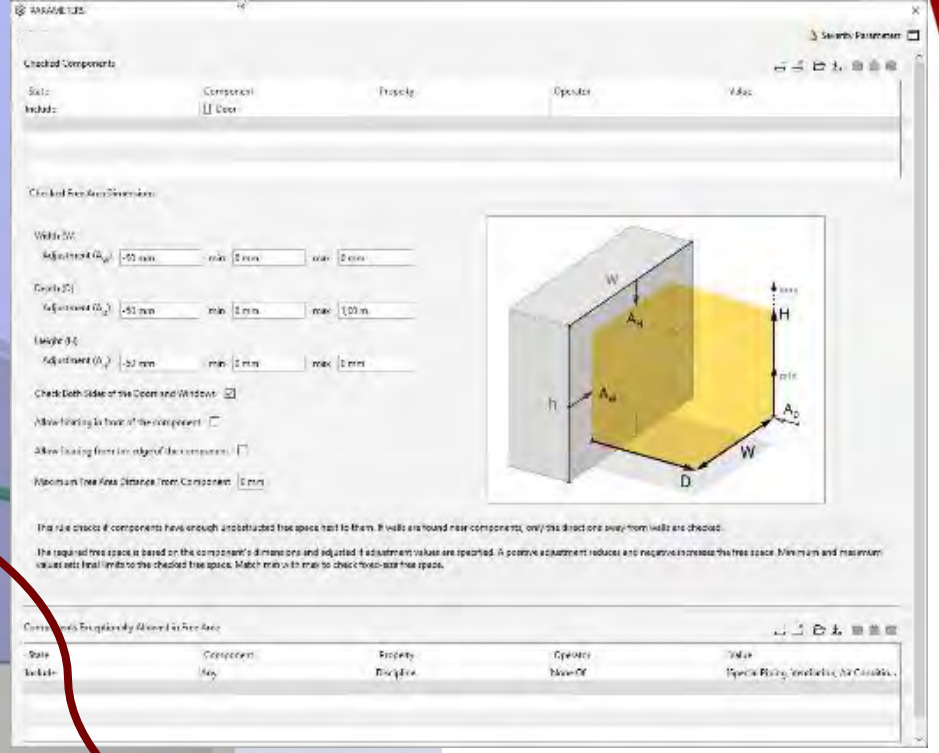

Check the free area in front of components (Rule #226)

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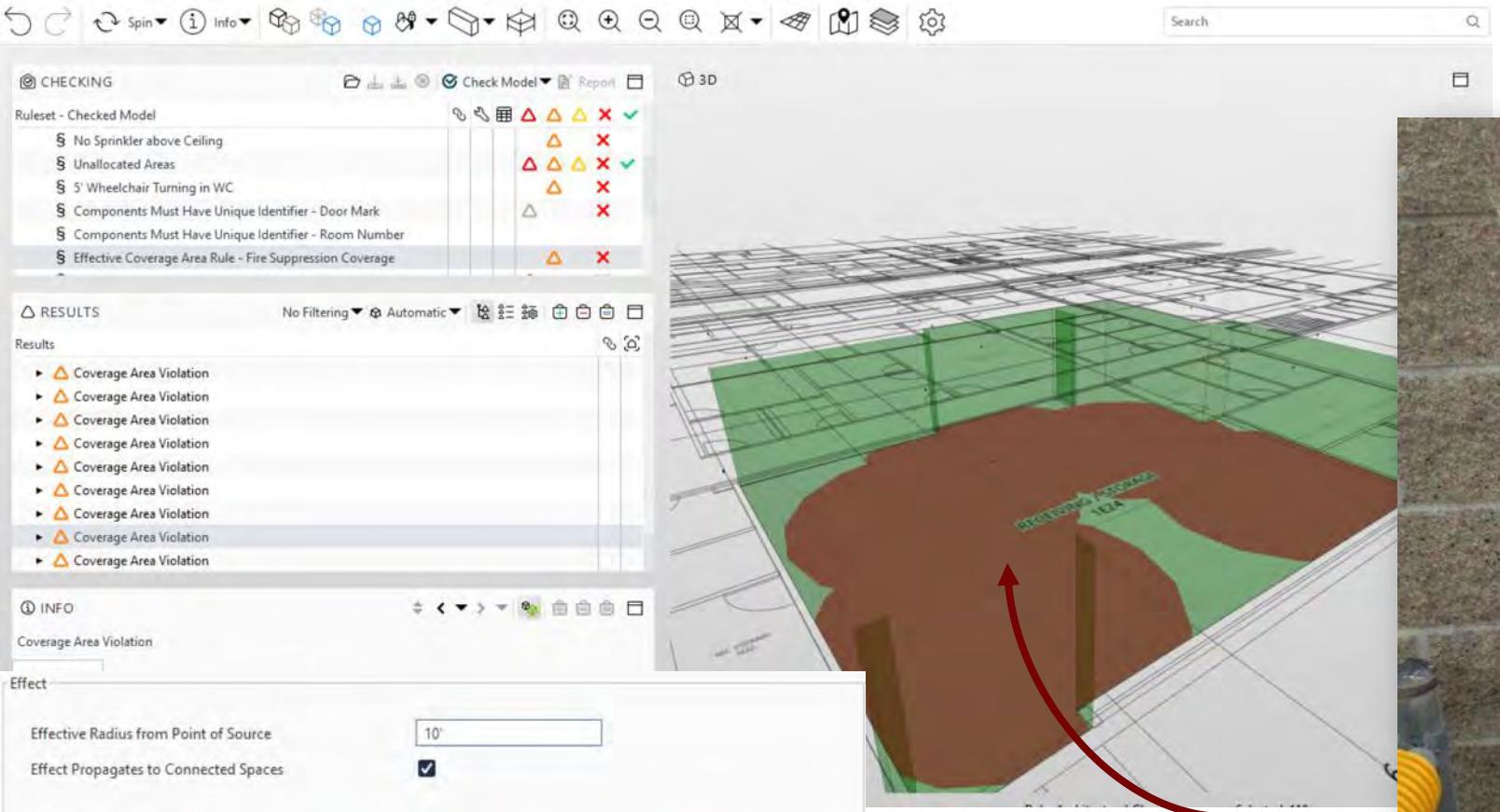

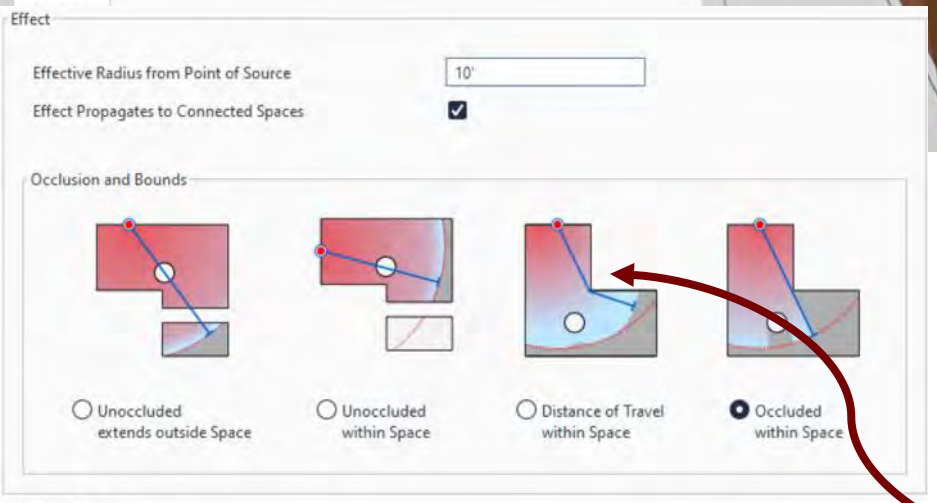

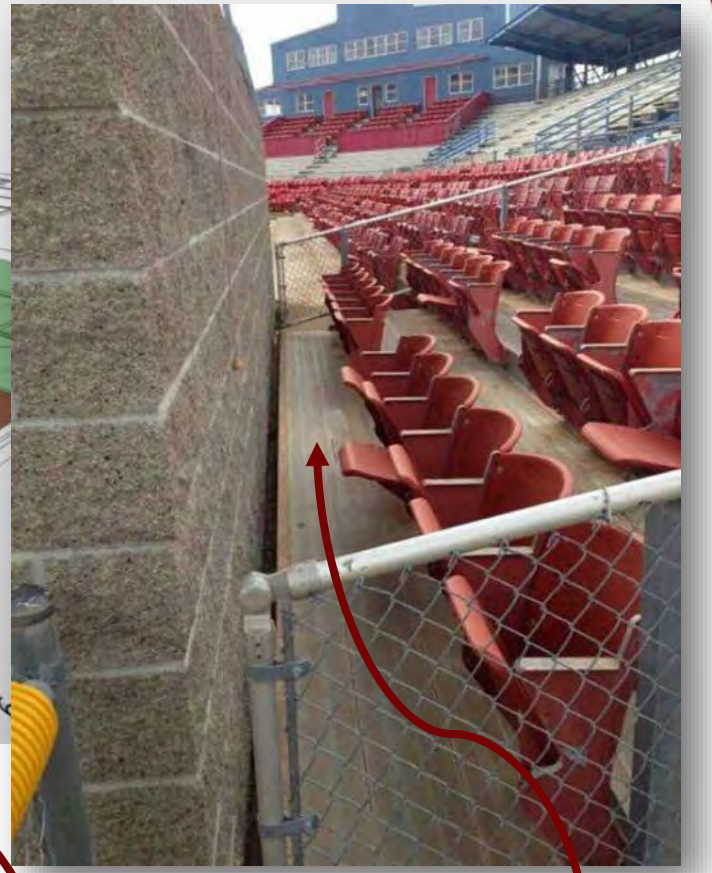

Find the coverage area of cameras, sprinklers, or line of site for exit signs or hospital beds to nurse's stations (Rule #240)

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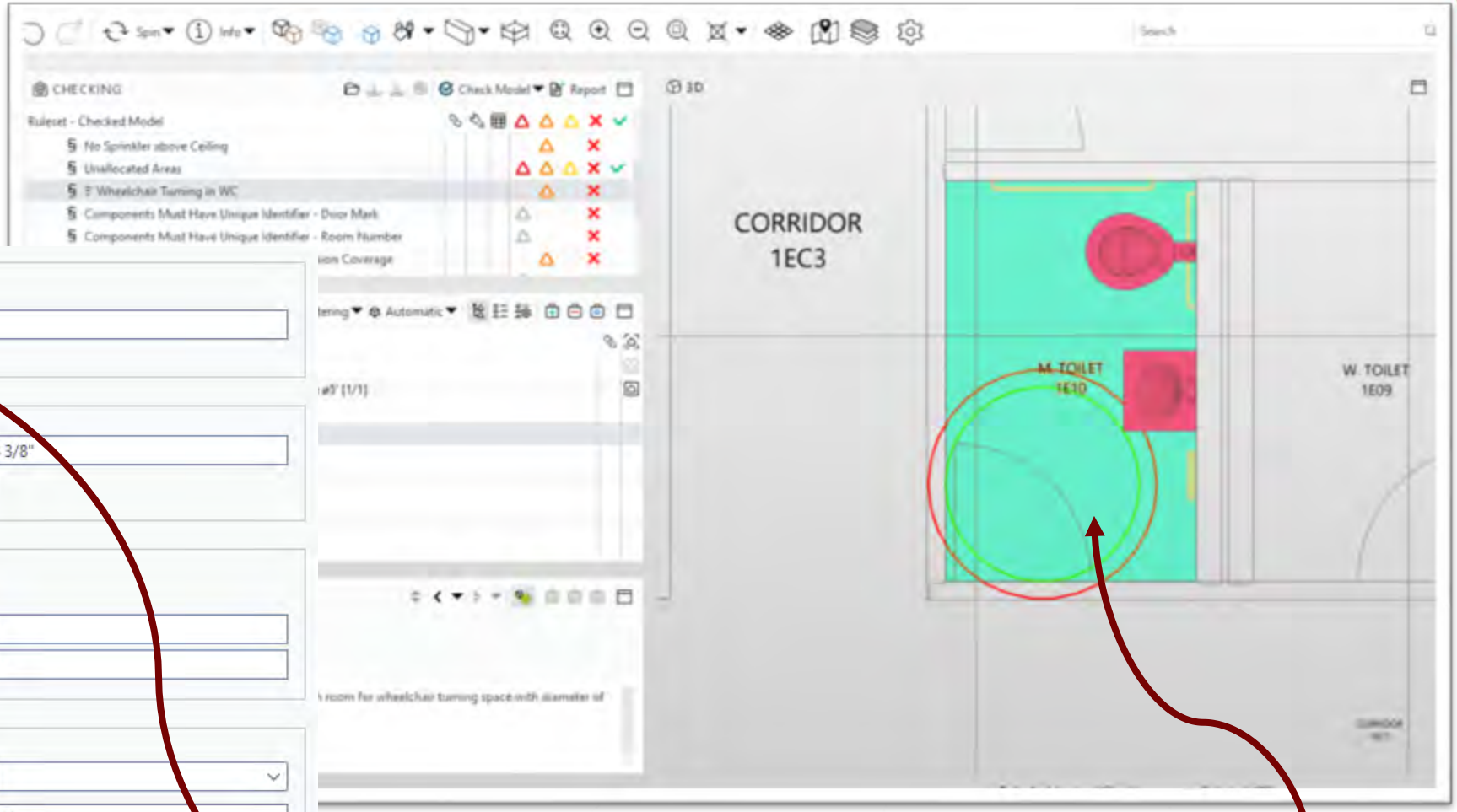

Free Wheelchair Turning Circle

Diameter 5'

Free Corridor

Width 3'-3 3/8"

Subtract Door Swings

Free Rectangle

Avoid Obstacles

Length 6'-6 3/4"

Width 3'-3 3/8"

Free Space on Side

Furniture Classification

Minimum Length (A) 0'

(A) Equals Furniture Length

Front and Back

Minimum Width (B) 0'

Double Sided

Furniture Distance

Furniture Classification

Minimum Distance 1'-3 15/16"

Maximum Distance 1'-5 15/16"

Double Sided

Ensure there is enough room for a wheelchair (or lift) to turn around in spaces (Rule #209)

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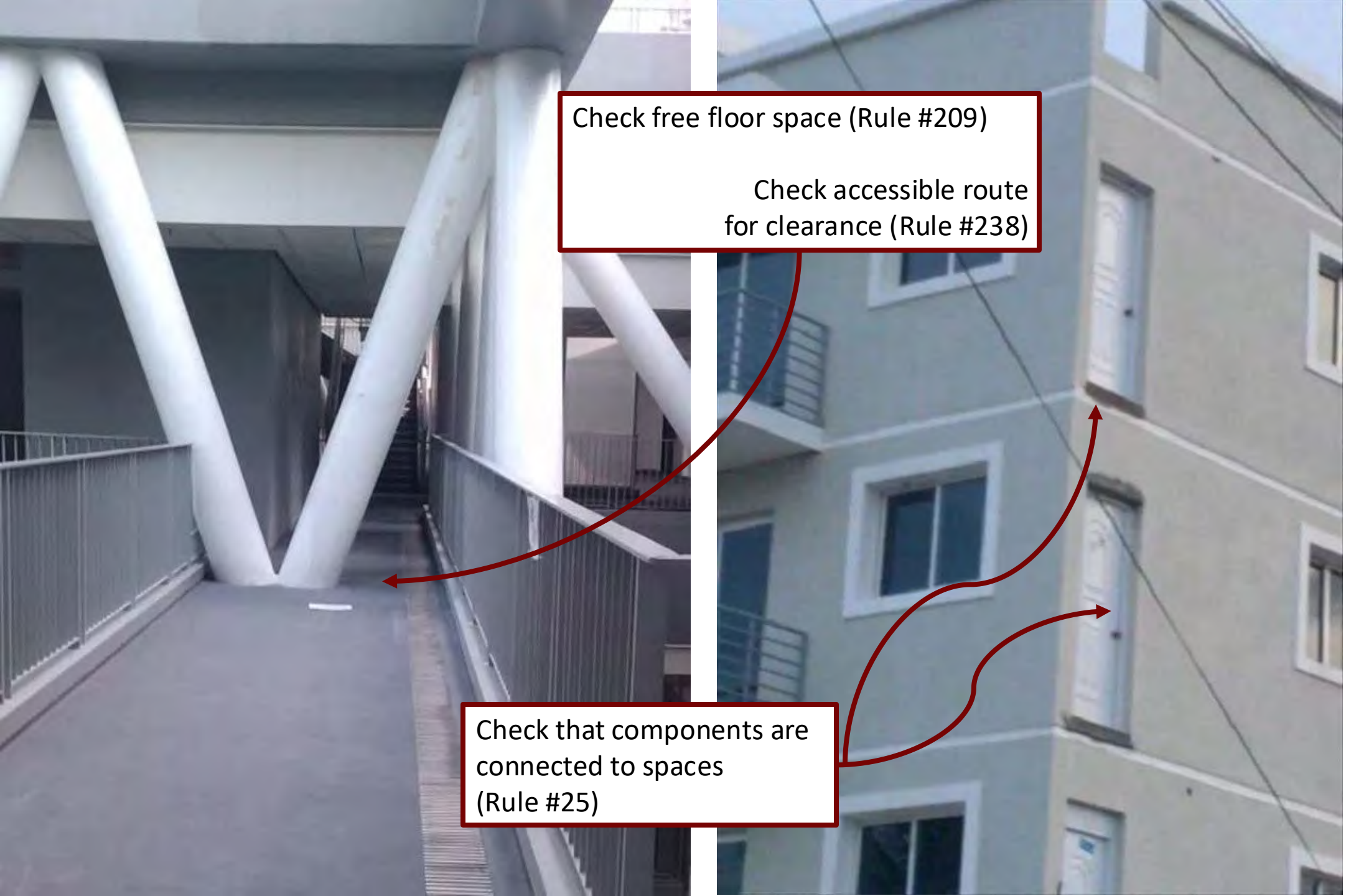

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Checking only includes parking spaces with the specified orientations. Spaces with unclear orientation will always be included. If no orientation is selected, orientation is ignored.

- [x] Parallel to Aisle
- [x] Perpendicular to Aisle
- [x] At an Angle to Aisle

Limit Checking to Parking Spaces with Obstructions on Sides

Obstruction Components to Check

State	Component	Property	Operator	Value

End Obstructions

Checking only includes parking spaces with end obstruction as specified.
If none is selected, obstruction to ends is ignored.

- [x] Neither End Obstructed
- [x] One End Obstructed
- [x] Both Ends Obstructed

Side Obstructions

Checking only includes parking spaces with side obstruction as specified.
If none is selected, obstruction to sides is ignored.

- [x] Neither Side Obstructed
- [x] One Side Obstructed
- [x] Both Sides Obstructed

- [ ] Only Regard as an Obstruction a Component Found within Obstruction Free Zone

Mid-Space Obstruction Free Zone Length 2,800.00 mm

Check size and obstructions of parking spaces (Rule #237)

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Looking Ahead

RAVA 3
PRO

National development project for automated process of BIM-Based Building Permit

SOLIBRI
A NEMETSCHEK COMPANY

MINISTRY OF FINANCE
FINLAND

Ympäristöministeriö
Miljöministeriet
Ministry of the Environment

KUNTALIITTO
Association of Finnish Municipalities

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23 Municipalities

ESPOO ESBO · Järvenpää · J•ENSUU · LAHTI · MIKKELI · PORI · Helsinki

LOHJA Järvikaupunki · OULU · salo · HYVINKÄÄ · Seinäjoki · TURKU · SYSMÄ · TUUSULA

HÄMEENLINNA · IISALMI · JYVÄSKYLÄ · KIRKKONUMMI KYRKSLÄTT · Vantaa · YLÖJÄRVI · ÄÄNEKOSKI · TAMPERE. FINLAND

Project owners

MINISTRY OF FINANCE FINLAND

Ympäristöministeriö
Miljöministeriet
Ministry of the Environment

KUNTALIITTO Association of Finnish Municipalities

KANSALLISARKISTO

Collaboration with ACCORD:

VTT · SYKE · Cloudpermit · SENAATTI · SOLIBRI A NEMETSCHEK COMPANY

Automation in permitting process

ACCORD

RAVA 3 PRO

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APPLICANT

Submits the application

Pre-checked IFC4

Update request

BCF

Issues

Integrated Checking as a service

§ Registry data
§ Accessibility regulations
§ Operational Safety & § Health regulations
§ Thermal and acoustic regulations
§ HVAC & SR data

Automated "Health check"

Integrated Microservice

OFFICIALS

Cloudpermit

Optional desktop

SOVA3D

Integrated Mapping services
Locating ifc into City Model

City models
Infra plans
Environmental reviews
Digital Twin POCs (Helsinki City)
Building Control 4D solution (Granlund Oy)

Public reviews:
Neighbours´reviews
Fire department reviews

Enriching the model
Fotogrammetry,
Rendering with AR

RYHTI

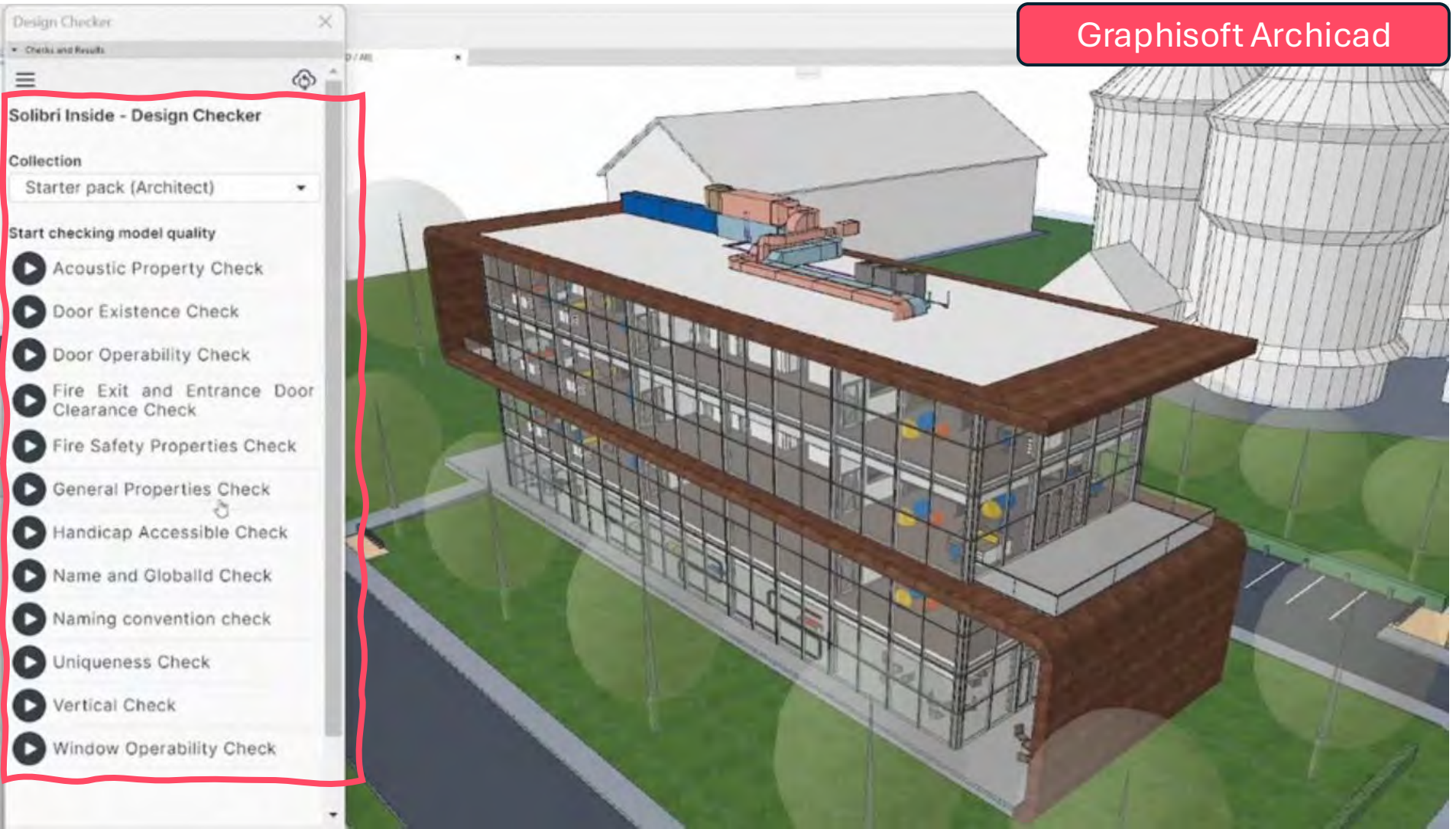
Built environment information system

KANSALLISARKISTO

National Archives

https://accordproject.eu/

Integrated BIM Quality Checking



Quality BIM is required

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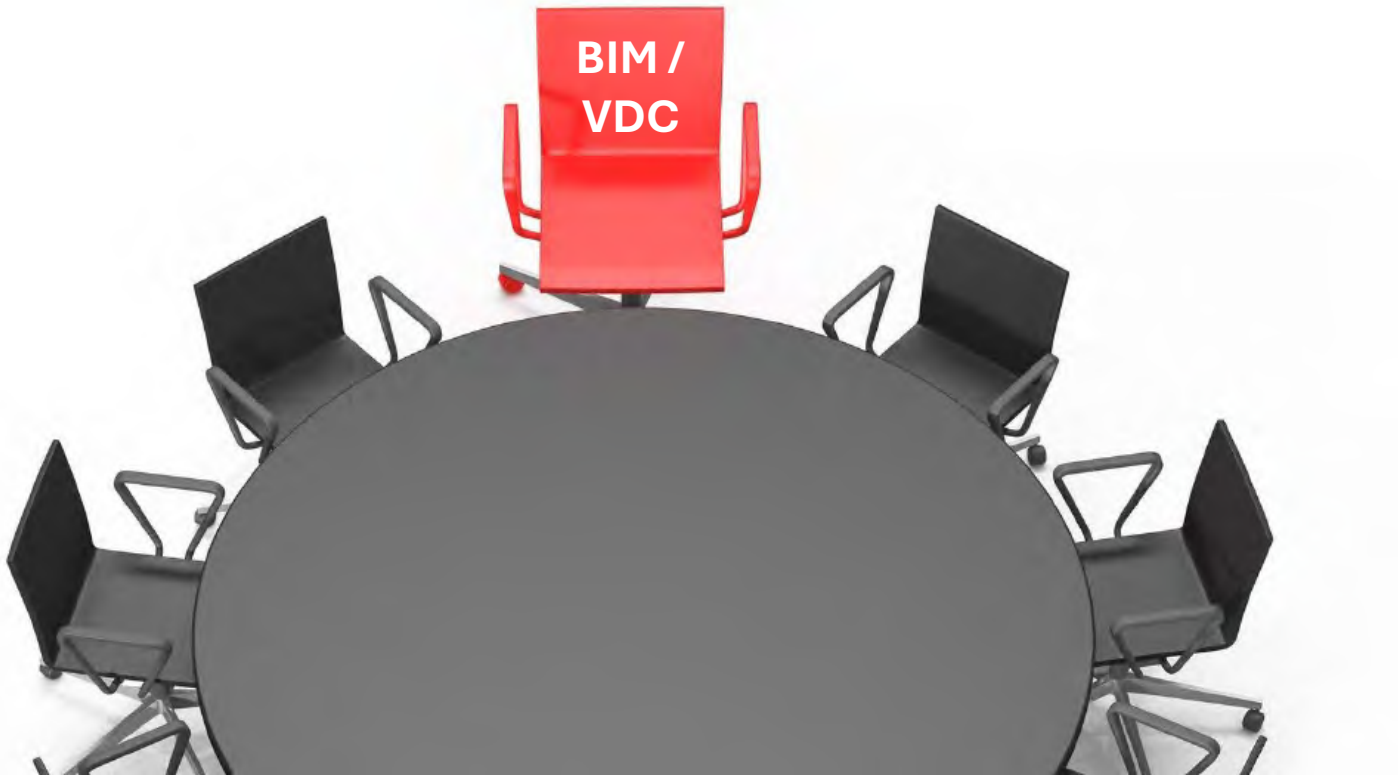
Elevate BIM / VDC in your company



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Summary

- Not all BIM is quality BIM
- Structure and automate your BIM Quality processes
- Make BIM Quality your strategic differentiator
- Aspire to create the image of BIM Quality in your client's mind

"Quality is not an act; it is a habit."

- Aristotle

Thank You!

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