



InCUBE

sustainable building innovations

Training on the InCUBE R-GUIDE

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Agenda

- **Introduction to the InCUBE R-Guide**
- **Components of R-Guide and Functionalities**
- **Q&A**
- **Site Visit**



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Introduction to the InCUBE R-GUIDE



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Introduction R-GUIDE

The R-GUIDE develops a system to ensure operational continuity, efficiency, and worker safety in on-site retrofitting, while minimizing waste and environmental impact.

It leverages **RINA-C's Resilience Dashboard** and CERTH's **AR/VR training** to support fast, safe renovation and monitoring. AR tools (smartphones, tablets, smart helmets) provide real-time guidance and training for workers on new technologies. The R-GUIDE will also interface with the InCUBE WINER for value-chain optimization.



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Resilience Dashboard



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R-GUIDE | Resilience Dashboard

WHAT: Digital Construction Site supports daily site management, ensuring operational continuity. It doesn't replace responsible staff but serves as a platform to collect, process, and share key site information, improving their work.

NEEDS ADDRESSED: Efficient management of site activities, with focus on safety, environment, and monitoring.

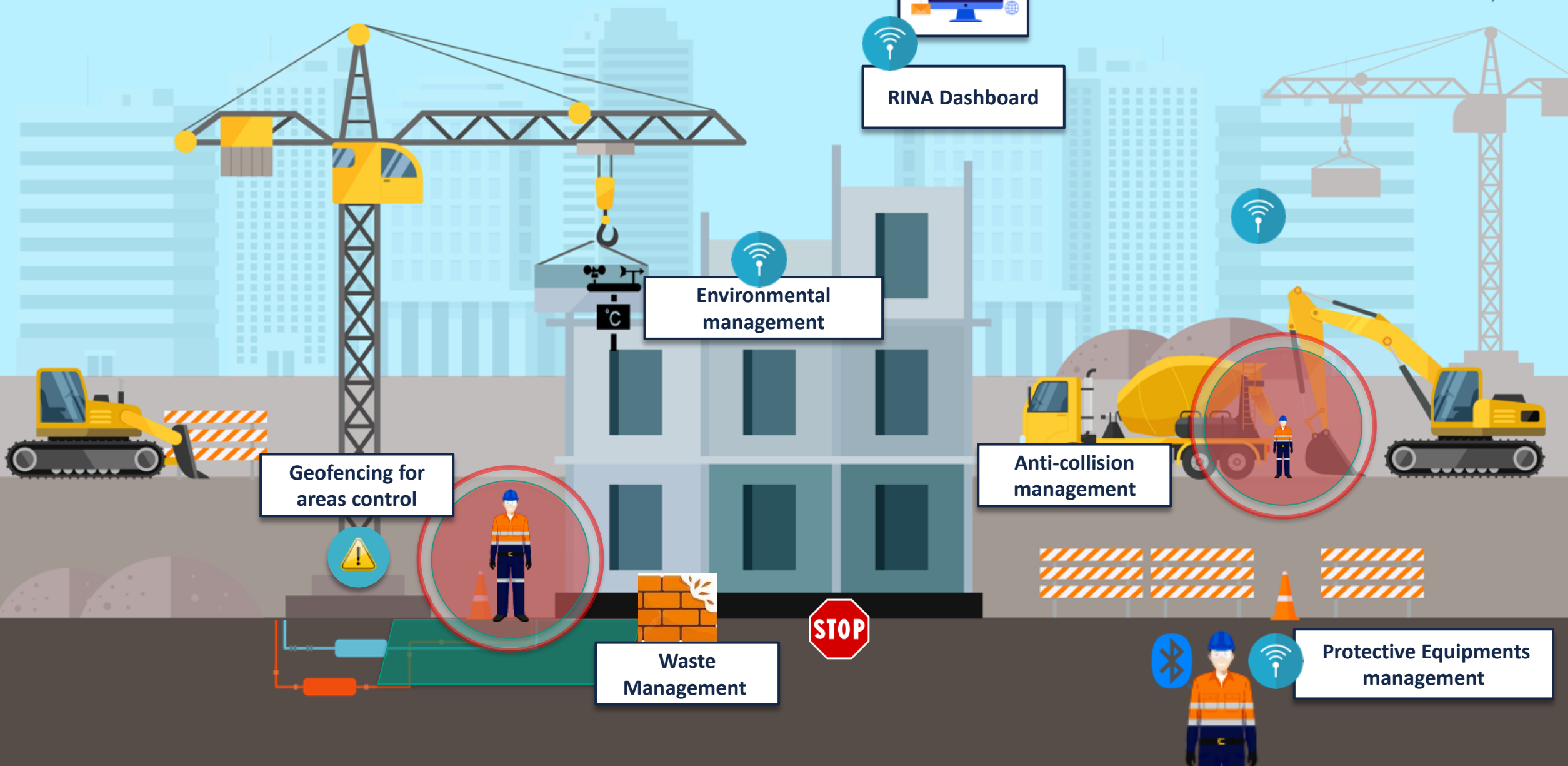
BENEFITS: Enhanced safety, protection of people and assets, fewer interruptions and delays, lower incident risk.



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Digital Construction Site



RINA Dashboard

Environmental management

Geofencing for areas control

Anti-collision management

Waste Management

Protective Equipments management

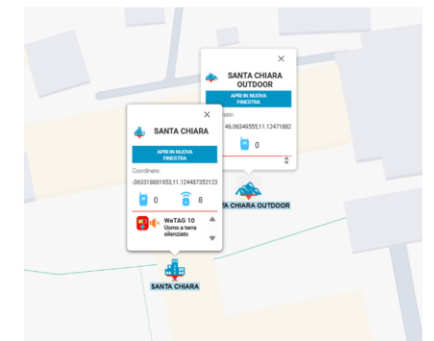
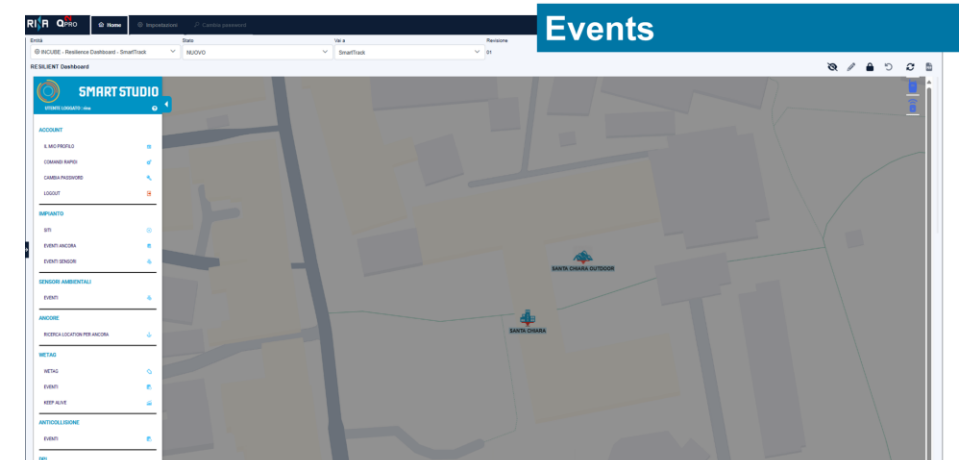
R-GUIDE / Resilience Dashboard

An Integrated System for Construction Worksites:

PPE & Man-Down Monitoring: Helmet sensors and Wetag track PPE use and worker well-being; inactivity alerts signal health risks.

Collision Prevention: Anti-collision and proximity sensors warn when workers approach cranes or heavy equipment.
Area Control: Geofencing secures hazardous zones, allowing only authorized access.

Real-Time Monitoring: Live data on alerts, sensors, battery, and worker location shown on a site map for rapid response.



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Resilience Dashboard Modules

Safety

The **Wetag** wearable device, worn on the belt, enhances worker safety by allowing **manual help requests and sending alerts when unsafe actions are detected**, such as entering restricted areas.

Realtime

Signal repeaters installed along corridors **enable the PPE antennas to track** the real-time location of workers. On the crane, a **triangulation system detects worker presence in high-risk load zones**.

This setup provides continuous data on worker movements, **time spent in hazardous areas**, and proximity to active equipment, **supporting proactive safety management**.

Historical

An **external sound level meter will assess noise from site activities**, with possible work suspension in **sensitive urban conditions**.

Air temperature and humidity sensors will monitor worker **thermal comfort**, allowing activity suspension during excessive heat.







Waste Management

A **dashboard form** allows **nearby recyclers** and the resilient manager to input data on recyclable materials, **available quantities, and material flows**.

This **maps outgoing site waste** and incoming recycler supply, **supporting circular material management**.



Resilience Dashboard Modules

STREAM	SENSOR	WHAT	IMAGE
WORKERS MANAGEMENT	Anchors	Signals gathering from/to sensors and communication	
	WeTAG and Smart Helmet	Worker's safety to get triggers and alarms thanks to positioning the worker in the site	
	Collision Prevention System	Send alarms in the proximity of vehicles	
ENVIRONMENT & WASTE MANAGEMENT	Waste track management	Optimize waste management IN/OUT the site	
	Environmental Probe	Get measures on temperature, wind, humidity, etc.	
	Acoustic Probe	Get information on noises and acoustic emissions during works	



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Resilience Dashboard | Anti-Collision System (ACS)

Anti-collision System (ACS) - Trento

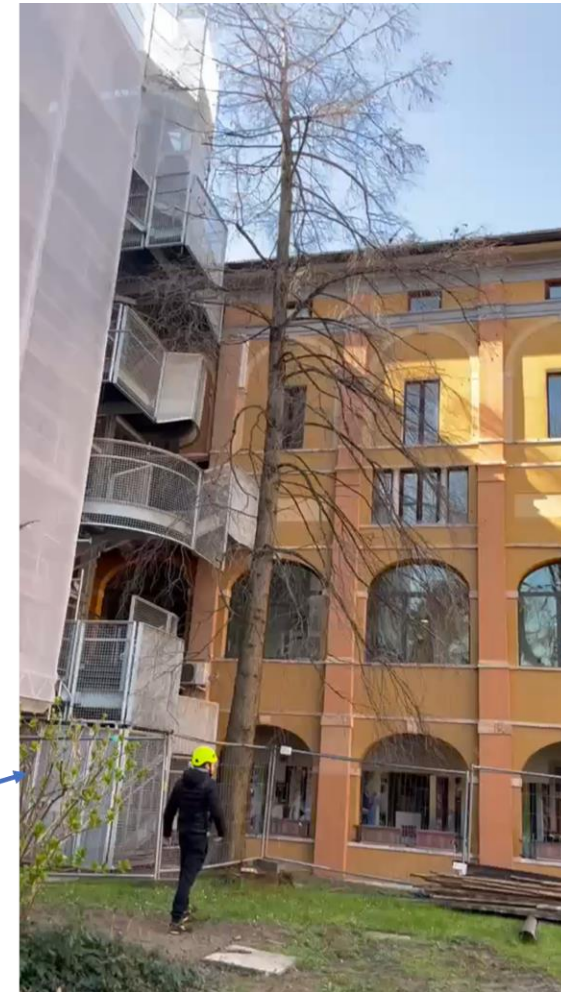


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Resilience Dashboard | Anti-Collision System (ACS)

Anti-collision System (ACS) - Trento

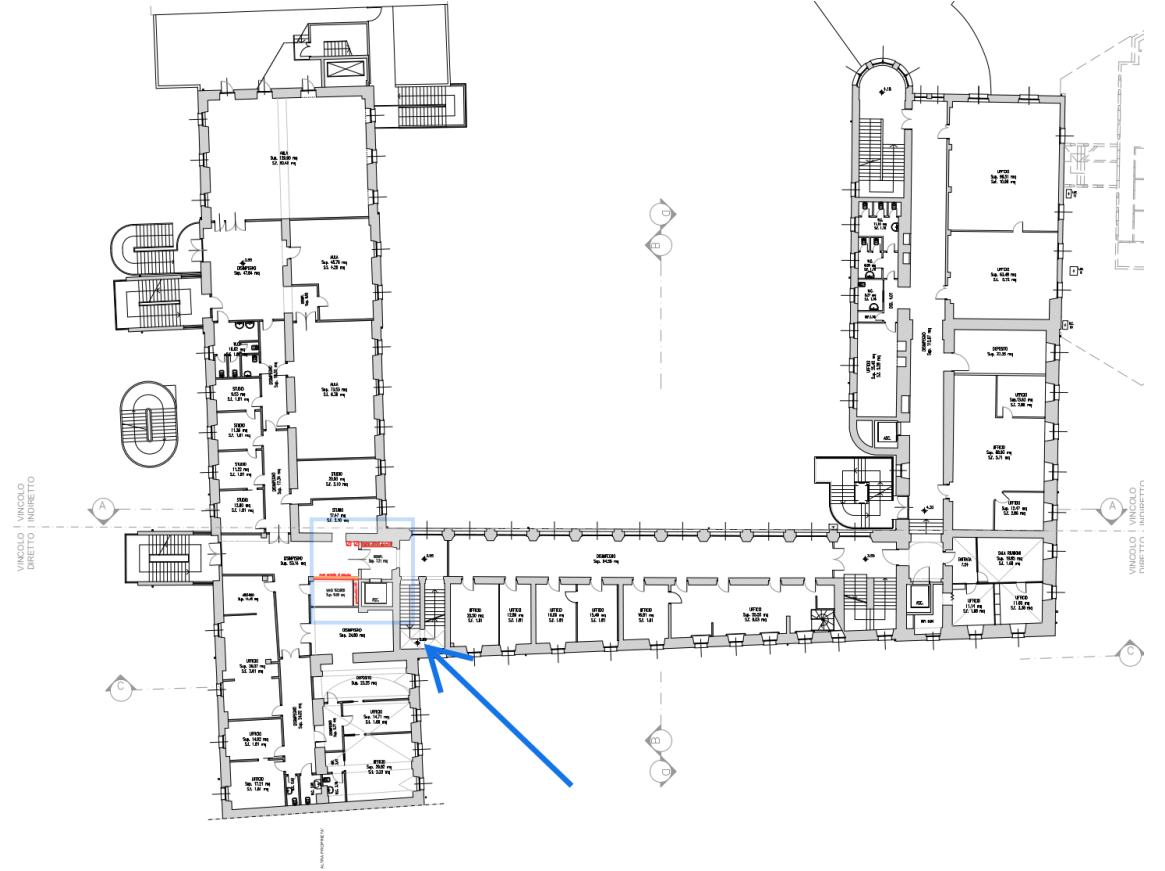


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Resilience Dashboard | Area Boundary (AB) System

Area Boundary (AB) System - Trento

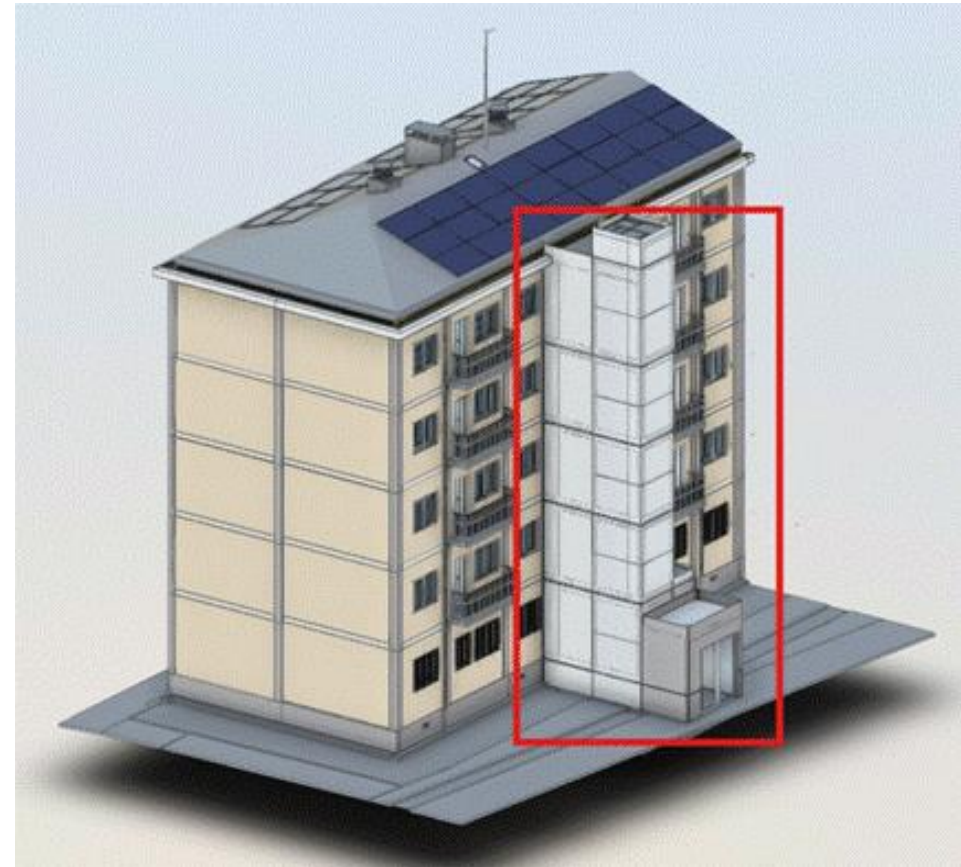
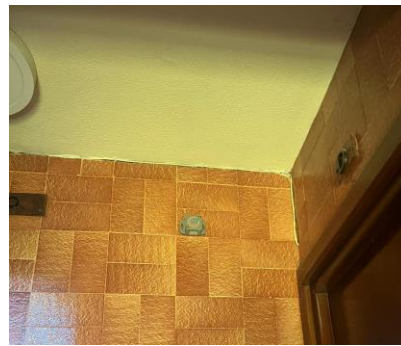


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Resilience Dashboard | Area Boundary (AB) System

Area Boundary (AB) System - Zaragoza



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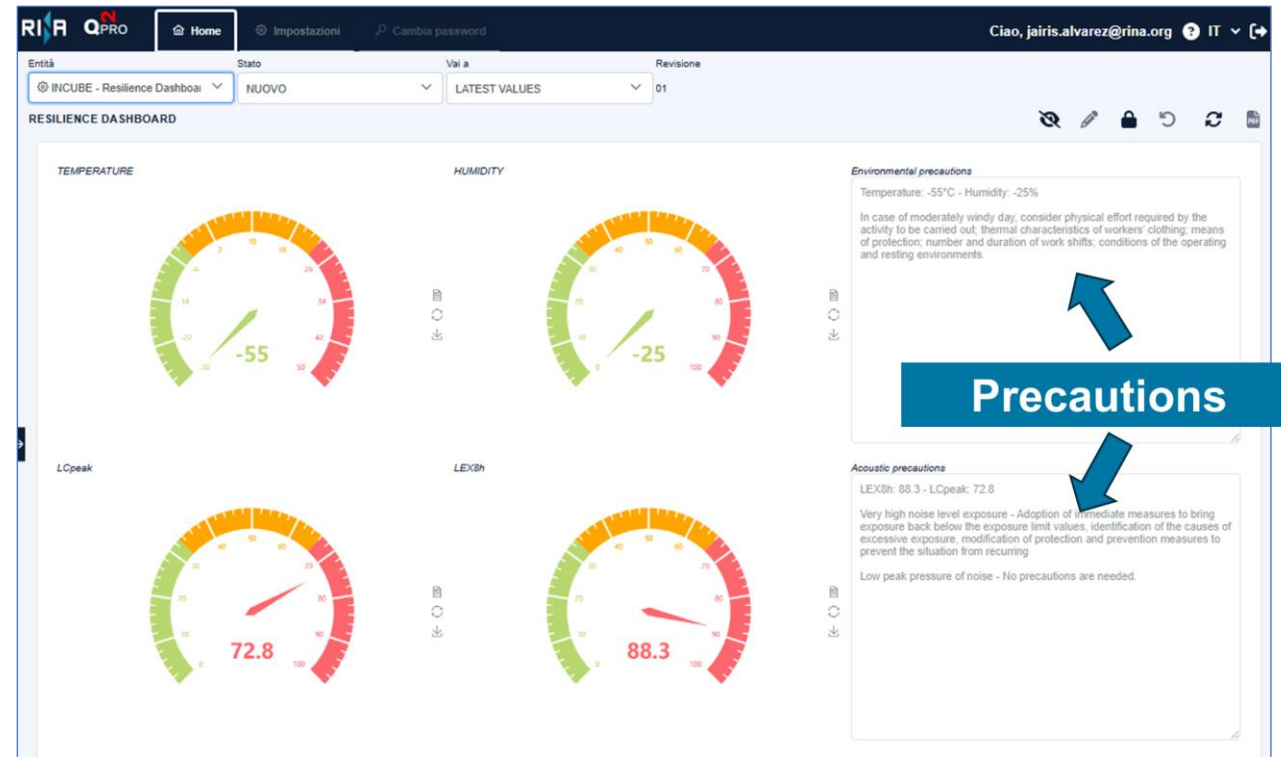
Resilience Dashboard | Realtime Module

The "Realtime" module allows to monitor environmental and acoustic parameters.

- Temperature and Humidity (environmental)
- LCpeak and LEX8h (acoustic)

In addition to displaying the values detected by the sensors, the module also provides guidance on the precautions to follow based on those values.

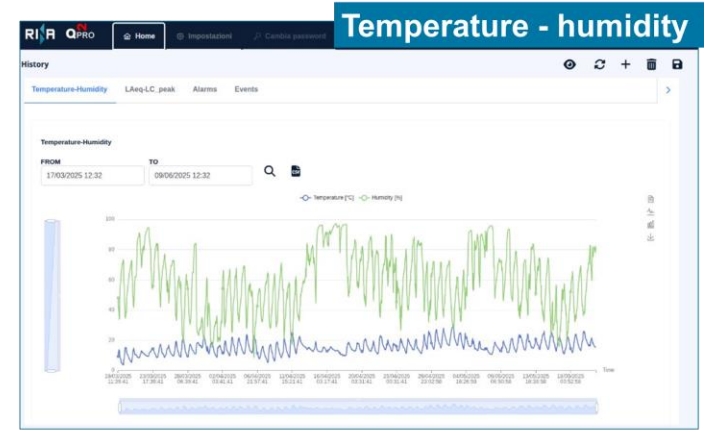
It also presents plots that show the real-time trends of the recorded parameters.



Resilience Dashboard | Historical Module

The "Historical" module consists of 4 submodules and allows to explore historical data related to:

- Environmental parameters:
 - Temperature - humidity
 - LA equivalent - LC peak
- Alarms for exceeding pre-established thresholds
- Events from safety sensors (PPE, Anti-collision, Geofencing)



DESCRIPTION	TIME	LOCATION	TAG MAC	TAG BATTERY PERC	X_POS	Y_POS	ANCHOR MAC	ANCHOR BATTI
POWER OFF	07/03/2025 15:41:33	SANTA CHARA	2C11858E53DE	80	7.80999942779541	1.720000296102295	0CF3EE00009	3000
DPI 1 FOUND	07/03/2025 15:43:00	SANTA CHARA	2C11858E53DE	80	16.709999084472956	0.69999998079071	0CF3EE00012	3000
MISSING DPI	07/03/2025 15:40:58	SANTA CHARA	2C11858E53DE	80	14	3	0CF3EE00002	3000
POWER ON	07/03/2025 15:38:06	SANTA CHARA	2C11858E53DE	80	6.8400005152547891	2.85999995629525	0CF3EE00002	3000
POWER OFF	07/03/2025 15:27:51	SANTA CHARA	2C11858E53DE	80	21.25	1.720000296102295	0CF3EE00010	3000
POWER ON	07/03/2025 15:22:00	SANTA CHARA	2C11858E53DE	80	6.880000114440918	3.18000057220459	0CF3EE00010	3000
POWER OFF	07/03/2025 14:59:23	SANTA CHARA	2C11858E5389	76	10	8	0CF3EE00004	3000

TYPE	TIME	VALUE 1
TEMPERATURE	18/04/2025 06:29:41	9.792772531
TEMPERATURE	18/04/2025 06:19:41	9.830921832
TEMPERATURE	18/04/2025 06:09:41	9.861441273
TEMPERATURE	18/04/2025 05:59:41	9.983519036
TEMPERATURE	18/04/2025 05:49:41	9.891960714
TEMPERATURE	18/04/2025 05:39:41	9.922480254
TEMPERATURE	18/04/2025 05:29:41	9.830921832
TEMPERATURE	18/04/2025 05:19:41	9.693584348
TEMPERATURE	18/04/2025 05:09:41	9.983519036



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Waste MGMT



PARAMETERS

Waste volume estimation (m3)	Weight of waste (Tn)
84,00	134,34
Number of expected different cointainers	Available space on site to store waste (% of total construction site)
4	17,7%
Construction year Italy	Type of work
Period 1	Partial demolition
Most connection types to be dismantled	Removables
Hard chemical	21,00%
Distance to nearest recycling facilities (kg CO2) - INERT	Distance to nearest recycling facilities (kg CO2) - MIXED WASTE
14,95	5,33
Distance to nearest recycling facilities (kg CO2) - SPECIAL WASTE	Distance to nearest recycling facilities (kg CO2) - WOOD
10,27	5,33
Distance to nearest recycling facilities (kg CO2) - SCRAP	Distance to nearest recycling facilities (kg CO2) - ASPHALT
44,33	30,29
Contribution to Climate Change	Level of transformation required for recycling/reuse
-49,77	Contaminated
Distance to nearest recycling facilities (€) - INERT	Distance to nearest recycling facilities (€) - MIXED WASTE
13,9265	4,9651
Distance to nearest recycling facilities (€) - SPECIAL WASTE	Distance to nearest recycling facilities (€) - WOOD
9,5669	4,9651
Distance to nearest recycling facilities (€) - SCRAP	Distance to nearest recycling facilities (€) - ASPHALT
9,5669	27,2475

DEMOLITION ANALYSIS

NETSCORE



DEMOLITION TYPE: Selective demolition is recommended only if the reuse of construction and demolition waste (CDW) is planned on-site

AR/VR Training Suite



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AR/VR Training Suite

Goal

"Empowering next-level training through augmented/virtual reality"

What is the AR/VR Training Suite?

A suite of tools that leverages augmented reality services to train workers on new technologies or procedures in a simulated environment.

AR/VR Training Suite

AR-creator web tool

- For creating tutorials for training

AR-viewer app

- Mobile app with user-friendly interface for presenting training tutorials
- Support of multimedia material
- Real-time remote assistance of workers



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AR/VR Training Suite | Applications

Critical procedure
tutorials

Step-by-step task
guidance (installation,
assembly,
maintenance, etc.)

Reminders on
infrequent tasks

Real-time remote
assistance to workers
through video calls

Presentation of
additional information
& safety alerts



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AR/VR Training Suite | Advantages

Advantage #1

- No need for new workers to be on-site to execute a training tutorial

Advantage #2

- Ideal for new and inexperienced users (on-screen hints provided)

Advantage #3

- Use of multimedia material such as images, videos, 3D models, animations, documents

Advantage #4

- AR-mode: Viewing 3D models within the real-world through camera

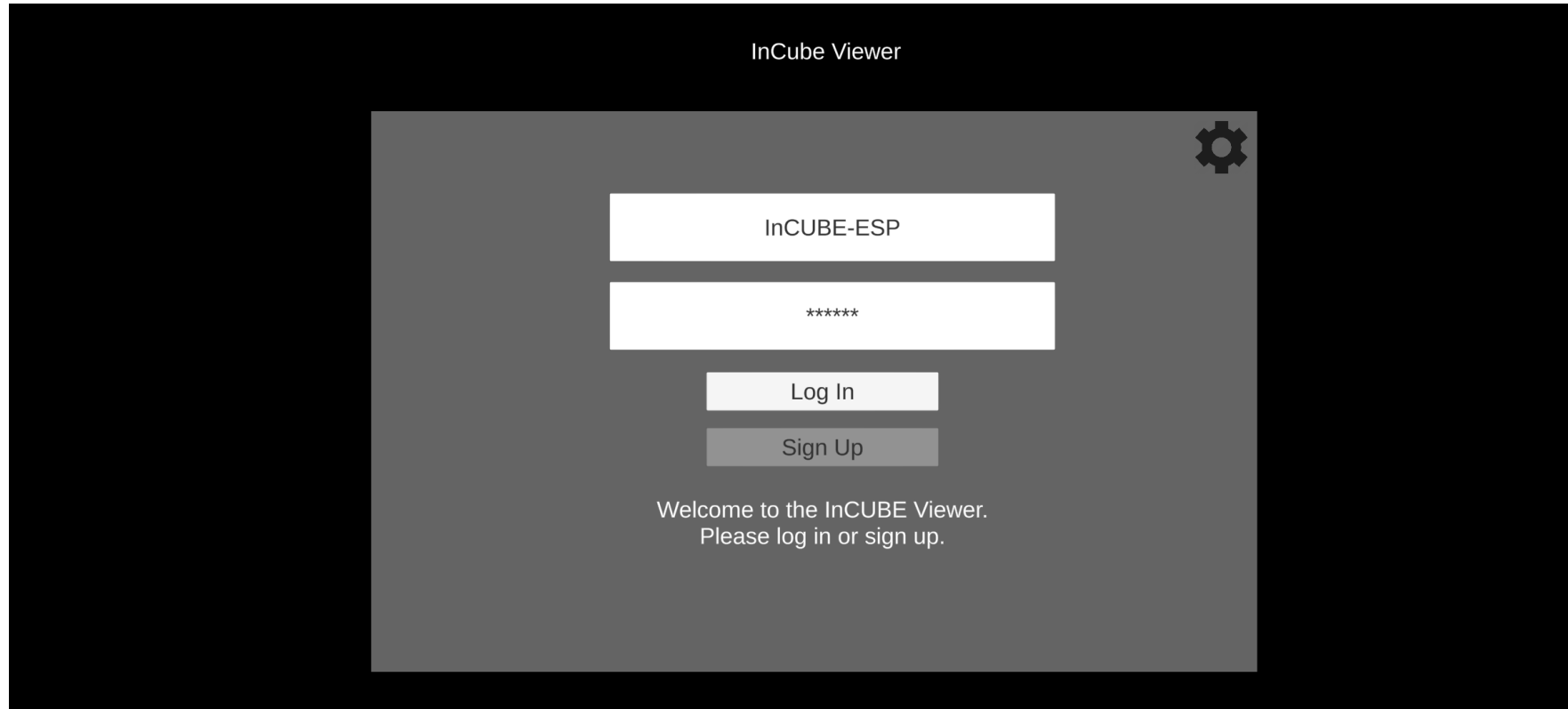


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AR/VR Training Suite | AR Viewer

AR Viewer User login

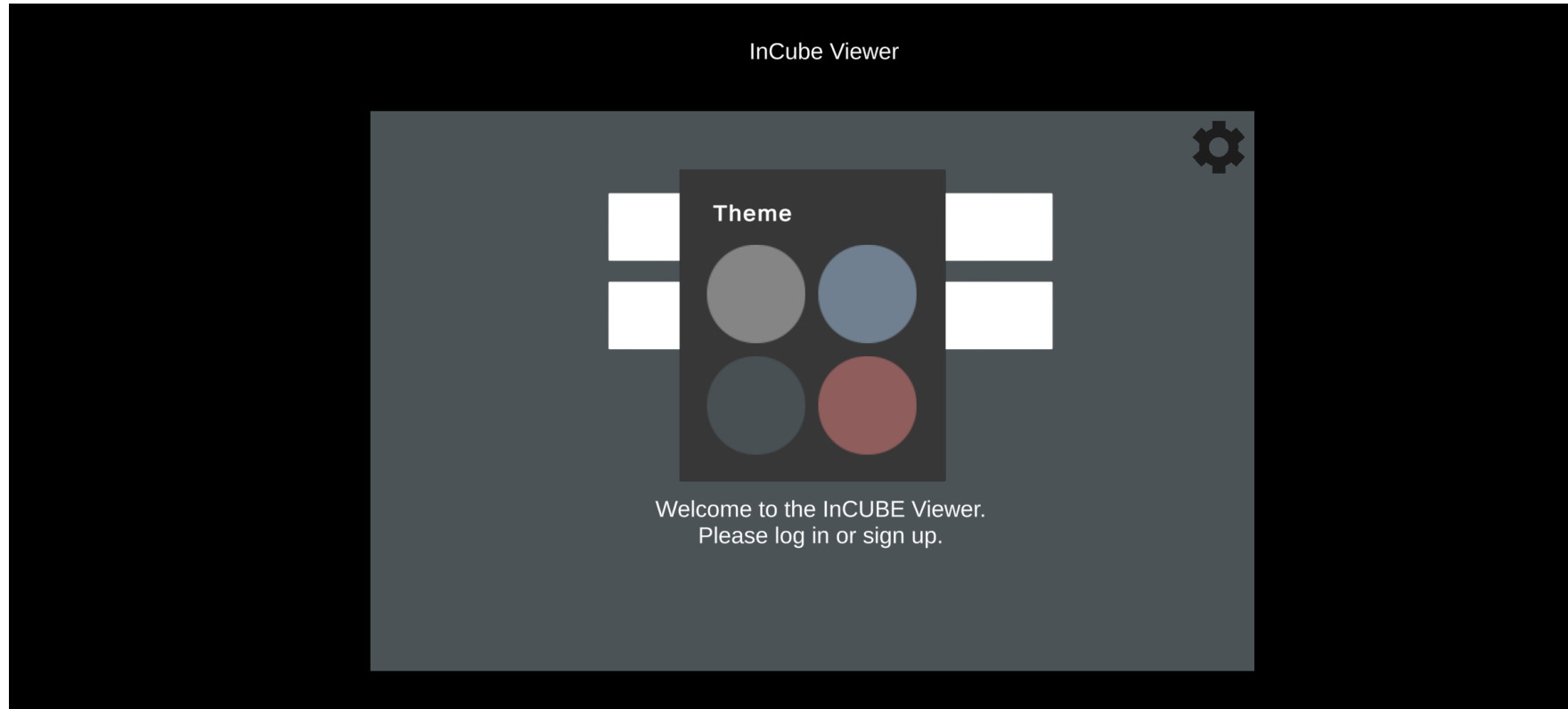


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AR/VR Training Suite | AR Viewer

AR Viewer: Colour theme selection



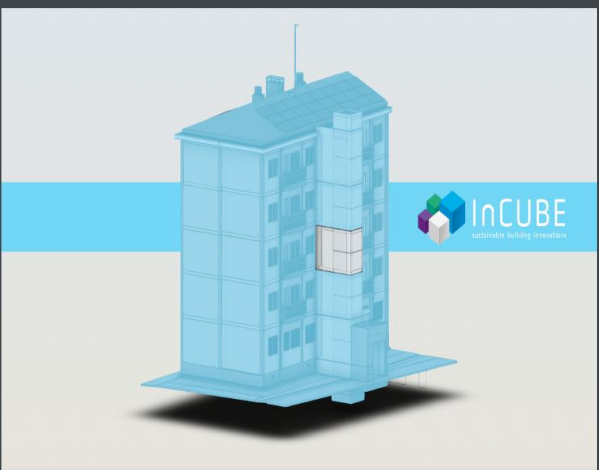
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AR/VR Training Suite | AR Viewer

AR Viewer: Tutorial selection

Select Procedure



ASSEMBLY SEQUENCE A single module



Complete tower

Buy procedure

Watch procedure

Select a procedure to view its description here.

Log Out



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AR/VR Training Suite | AR Viewer

AR Viewer: Tutorial of process presented in steps

ASSEMBLY SEQUENCE: Complete Tower n.01	Complete tower	→	ASSEMBLY SEQUENCE: Complete Tower n.01	→	Step 1	→	On-site assembly of Complete Tower (1/5)	Log Out
	On-site assembly of Complete Tower (1/5)							Back

On-site assembly of Complete Tower (1/5)

1: On-site assembly with crane: Once on-site, the modules are lifted and positioned by crane according to the predetermined layout, with each module being securely connected to form the complete structure.

2: Module 1 positioned

On-site assembly of Complete Tower (2/5)

On-site assembly of Complete Tower (3/5)

On-site assembly of Complete Tower (4/5)

On-site assembly of Complete Tower (5/5)

On-site adjustments of Complete Tower

Navigation icons: Home, Document, Image, Video, Folder, Headset, Cube, AR Device, InCUBE logo.

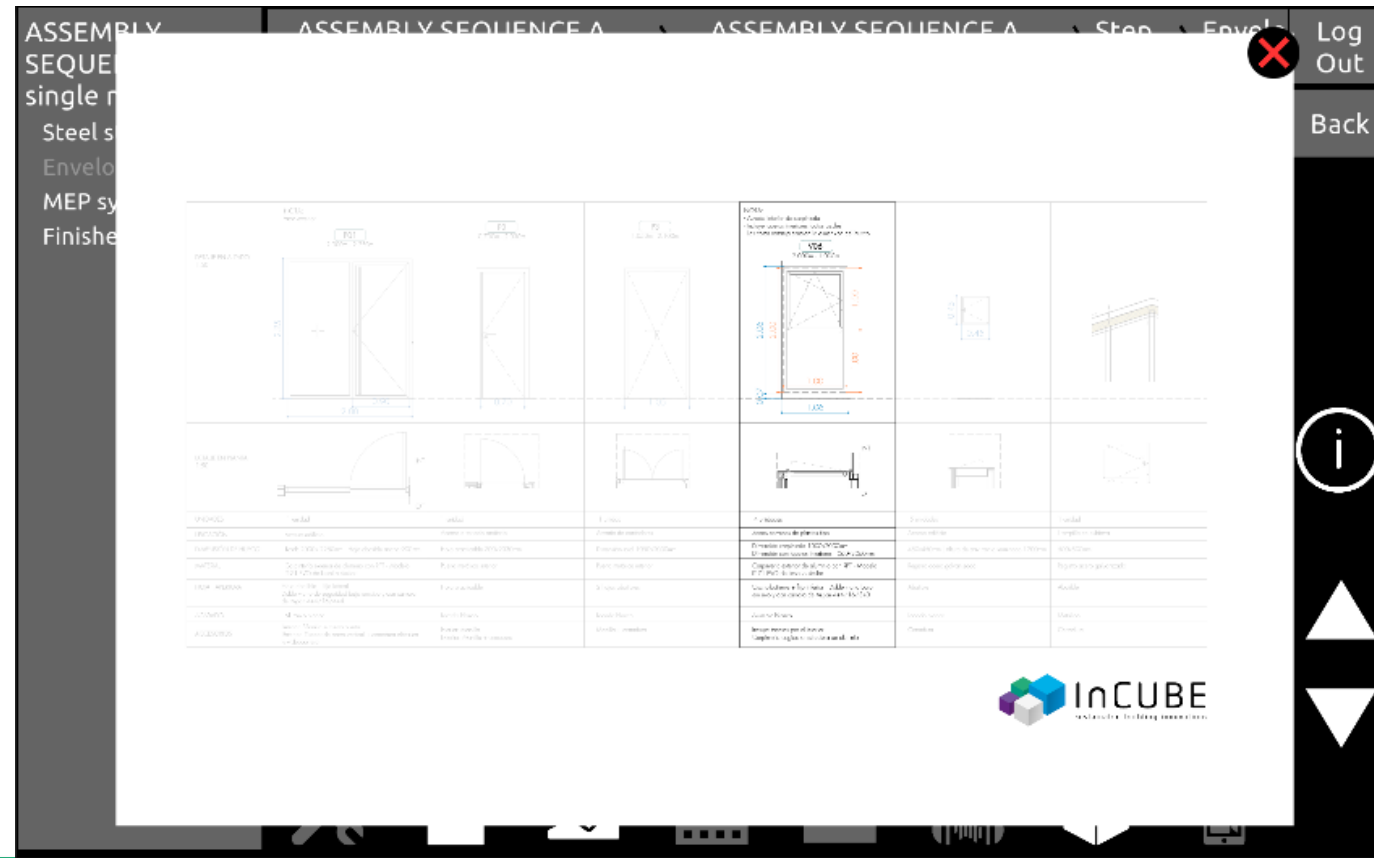


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AR/VR Training Suite | AR Viewer

AR Viewer: Display of images



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AR/VR Training Suite | AR Viewer

AR Viewer: 3D model view

The screenshot displays the AR Viewer interface. On the left, a vertical menu lists the assembly sequence steps: 'ASSEMBLY SEQUENCE: Complete Tower n.01', 'On-site assembly of Complete Tower (1/5)', 'On-site assembly of Complete Tower (2/5)', 'On-site assembly of Complete Tower (3/5)', 'On-site assembly of Complete Tower (4/5)', 'On-site assembly of Complete Tower (5/5)', and 'On-site adjustments of Complete Tower'. The main area shows a 3D model of a tower structure with a grid-like facade. At the top, a navigation bar indicates the current step: 'Complete tower' → 'ASSEMBLY SEQUENCE: Complete Tower n.01' → 'Step 1' → 'On-site assembly of Complete Tower (1/5)'. Below this, a 'Log Out' button is visible. A 'Back' button is located at the bottom right of the main area. The bottom of the interface features a toolbar with icons for tools, documents, images, video, folders, audio, 3D models, and a mobile device. The InCUBE logo is in the bottom right corner.



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AR/VR Training Suite | AR Viewer

AR Viewer: Display of Hints

The screenshot displays the AR Viewer interface. On the left, a vertical list shows the assembly sequence: 'ASSEMBLY SEQUENCE: Complete Tower n.01', followed by steps 1 through 5, and 'On-site adjustments of Complete Tower'. The main area shows a 3D model of a tower structure. At the top, a navigation bar indicates the current step: 'Complete tower' → 'ASSEMBLY SEQUENCE: Complete Tower n.01' → 'Step 1' → 'On-site assembly of Complete Tower (3/5)'. Below this, a 'Back' button is visible. On the right side, there are icons for 'Remote Assistance' (headset), 'Info' (i), 'Previous' (up arrow), and 'Next' (down arrow). At the bottom, a toolbar contains icons for 'Objects' (wrench), 'Texts' (document), 'Images' (picture), 'Videos' (play button), 'Documents' (folder), 'Sounds' (headphones), 'Models' (cube), 'AR mode' (AR icon), and the 'InCUBE' logo.



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AR/VR Training Suite | AR Viewer

AR Viewer: Augmented Reality mode

ASSEMBLY SEQUENCE:
Complete Tower n.01

- On-site assembly of Complete Tower (1/5)
- On-site assembly of Complete Tower (2/5)
- On-site assembly of Complete Tower (3/5)
- On-site assembly of Complete Tower (4/5)
- On-site assembly of Complete Tower (5/5)
- On-site adjustments of Complete Tower

Please move your device gently, until a white pattern appears in the floor. Then tap on ti to instantiate 3D model on AR view.

Log Out
Back
Remote Assistance
Info
Previous
Next
InCUBE



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AR/VR Training Suite | AR Viewer

AR Viewer: Augmented Reality mode showing 3D model

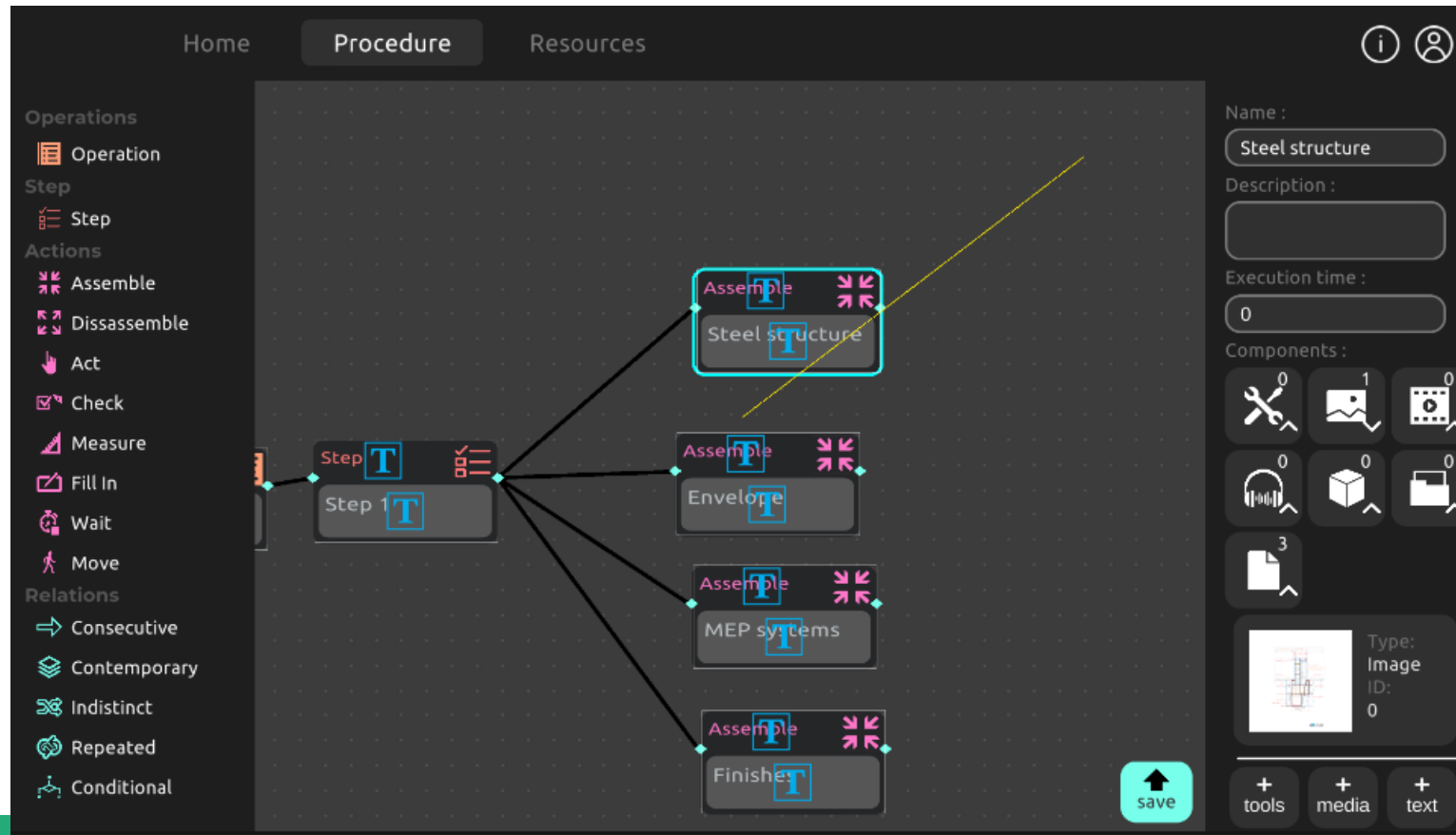


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AR/VR Training Suite | AR Creator

AR Creator: Designing the structure of a tutorial

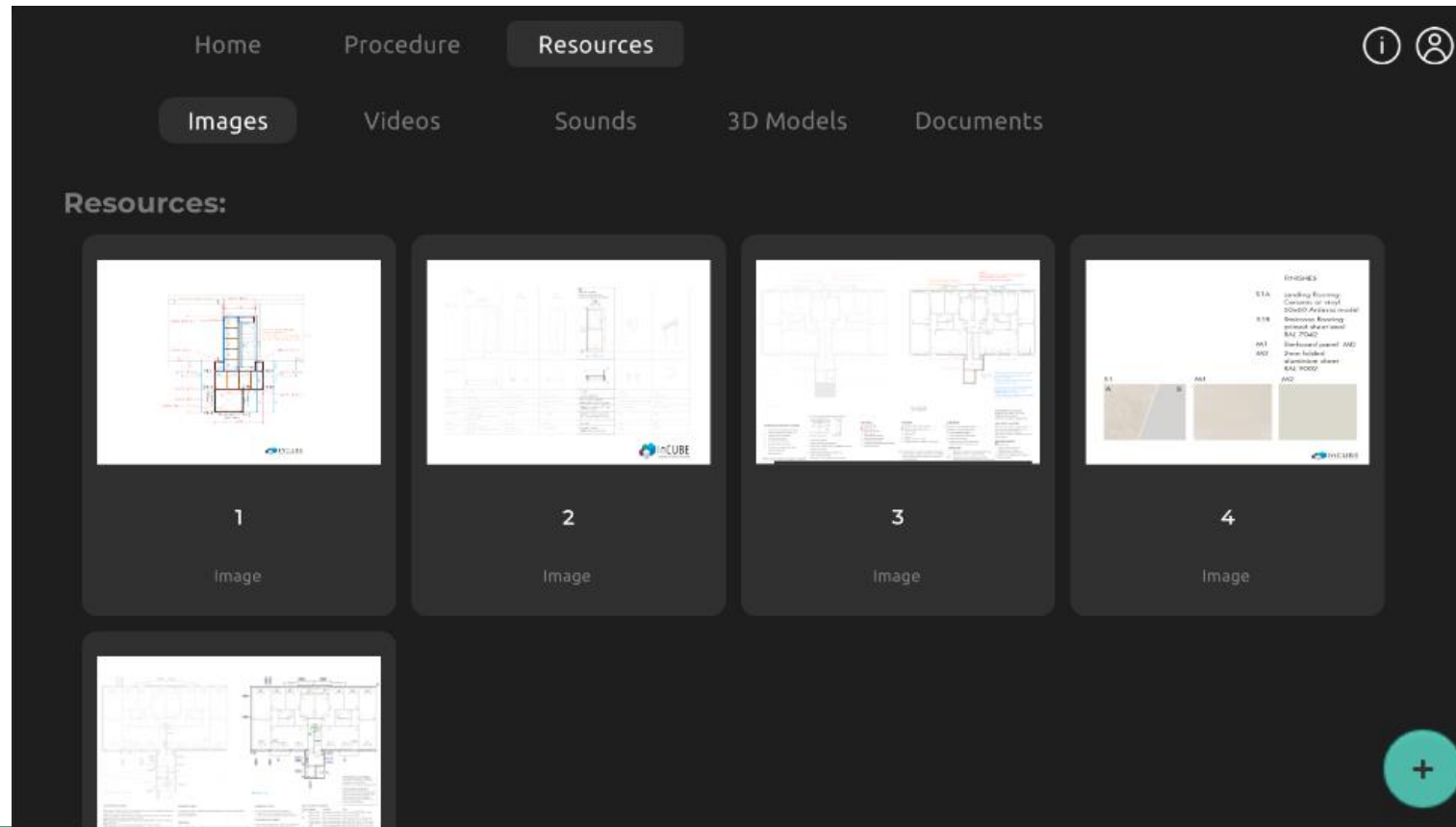


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AR/VR Training Suite | AR Creator

AR Creator: Adding resource files in a tutorial



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Thank you!

R-Guide & Resilience Dashboard

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COMUNE DI TRENTO



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