INSITER & QUALITY ASSURANCE

Stakeholder meeting

Seville – Spain, 25 – 26 September 2018

INSITER INTUITIVE SELF-INSPECTION TECHNIQUES

INSITER & QUALITY ASSURANCE

Introduction

Carlos Bárcena

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INSITER INTUITIVE SELF-INSPECTION TECHNIQUES

MAKING OR RENOVATING A BUILDING

Making or renovating a building together needs a lot of different construction workers. Everyone wants to do his work good.

SOMETIMES THINGS GO WRONG:

Indentation of ducts

Thermal bridge

(Sewage) pipe in cavity wall

MAKING A (SUSTAINABLE) BUILDING

Important:

- (New) buildings have to consume less energy.
- Building becomes more complex:
  - Improved construction detailing
  - New techniques (Heatpumps, prefabricated wall parts)
- The indoor air quality must be good.
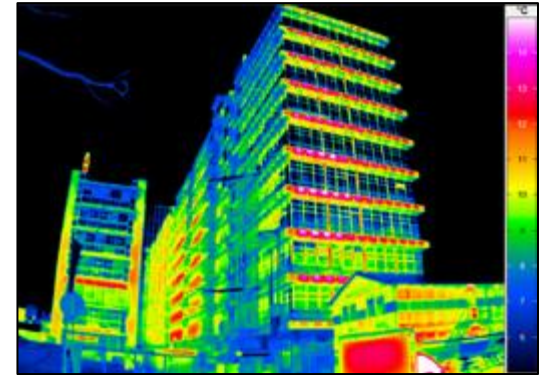- Materials have to be re-used.

This means:

Mistakes in building have a big(ger) influence on:

- Energy
- Indoor air quality

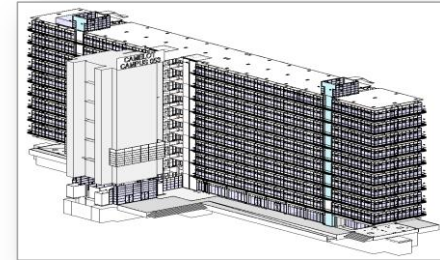Quality assurance can reduce these mistakes.

WHAT IS QUALITY ASSURANCE?

The check, prove and document the quality delivered in a project.

Quality Assurance for Contractors:

Risk management:

- Reducing failure costs

- Increasing construction workers satisfaction

- Increasing customer satisfaction

Quality Assurance for Customers:

A building with:

- Better quality

- Fewer defects

- In accordance with the agreed performance

WHAT IS QUALITY ASSURANCE?

Quality assurance helps the contractor to build better by:

- Identifying the risks in advance
- Defining required quality checks during project preparation

Advantages:
- Errors or deviations during construction can be prevented
- Improves the quality of the final building
- Ensures that the intended 'sustainability' is realized
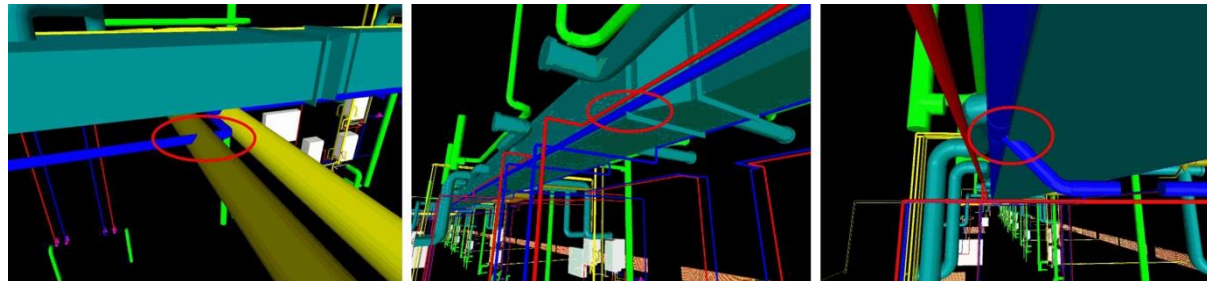
QUALITY ASSURANCE & INSITER

INSITER innovates Quality Assurance

WHAT IS INSITER?

- INSITER is a European research project with the aim to develop intuitive and affordable tools for self-instruction and self-inspection with the help of Augmented Reality (AR) and BIM.

SCOPE OF INSITER

- New self-inspection techniques and quality check measures for efficient construction processes.
- Portable and robust systems easily handled in the construction site.
- To avoid the presence of thermal bridges or to ensure and control proper air-tightness in low energy or prefab buildings.

- To avoid or reduce economic and time deviations of the construction processes.
- The solutions should be checked in real buildings
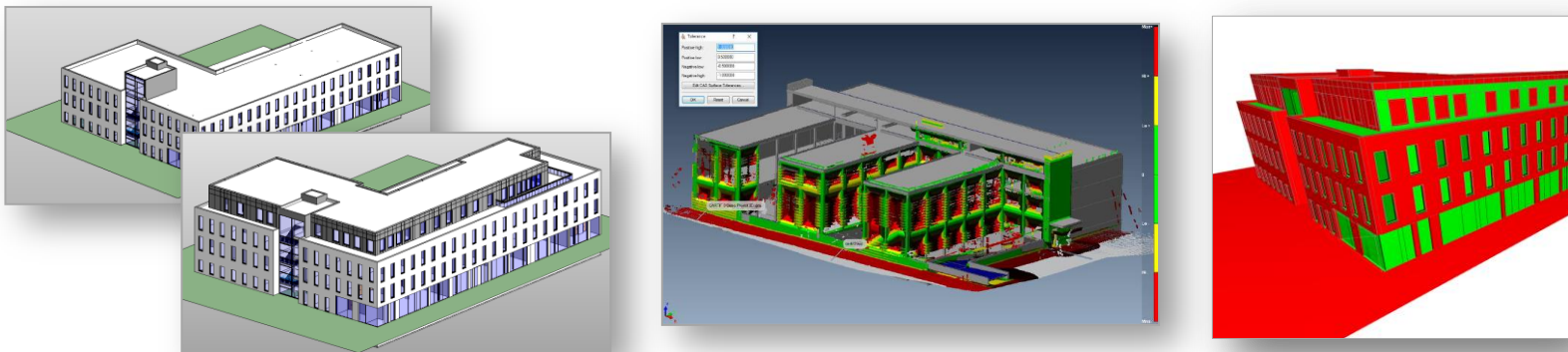
IMPROVEMENT OF QUALITY ASSURENCE BY INSITER

Mission:

- From instruction before/never to self-instruction on-site & just in time

- From inspection after realisation to self-inspection during realisation
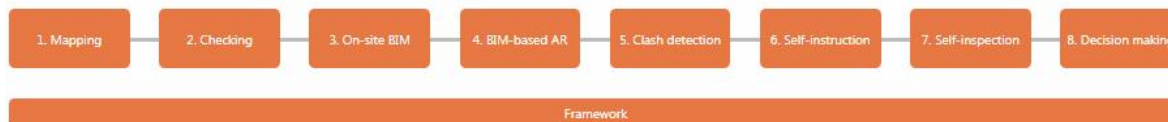Solution:

- INSITER 8-step methodology and toolset

Welcome to the INSITER collaboration platform. This platform serves as a central hub to exchange information and data throughout the INSITER process, and is both human as well as machine readable.

The platform is hosted by DEMO Consultants. If you do have any questions or need assistance please contact info@demobv.nl

The INSITER Toolset

| 1. Mapping | 2. Checking | 3. On-site BIM | 4. BIM-based AR | 5. Clash detection | 6. Self-instruction | 7. Self-inspection | 8. Decision making |

| Framework |

THE 8-STEP METHOD EXPLAINED

STEP 1: **Mapping**
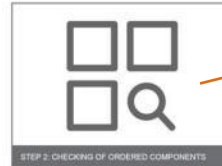Identify the real environment on-site, where the work should be performed

STEP 2: **Checking**
Check delivered components against design by using QR-Code for identification and verification

STEP 3: **BIM on site**
Deploying BIM on construction site

STEP 4: **BIM based AR**
Validate delivered elements against design requirements
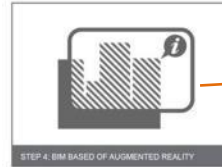
STEP 5: **Clash Detection**
Verification of the current site situation
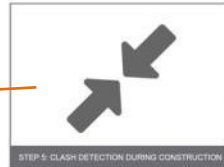
STEP 6: **Self-Instruction**
Guiding the construction process using a mobile device

STEP 7: **Self-Inspection**
Verify the current application or installation and fill in checklists for further processing

STEP 8: **Final Check**
Quality, time and cost evaluation by the Construction Managers

BEHIND THE SCENES & APPLICATION

BS: STEP 1 MAPPING

STEP 1: MAPPING

The mapping for assessment of the site conditions is supported by the next tools:

1. **3-D camera**
   For making a 3D image of the existing building

2. **Cyclone**
   For the merging of Point Clouds

3. **TruView**
   For viewing the Point Clouds in a light way

4. **3D Reshaper**
   For creating a 3D model out of Point Clouds

5. **RE Maintenance**
   For condition assessment in case of refurbishment
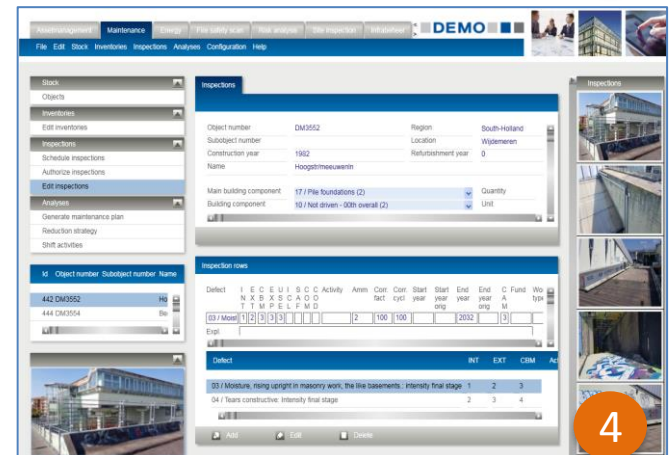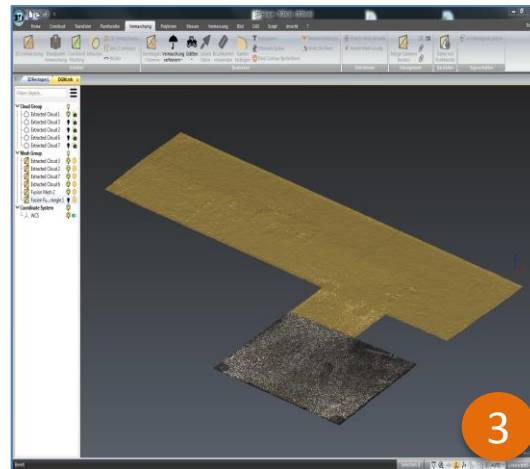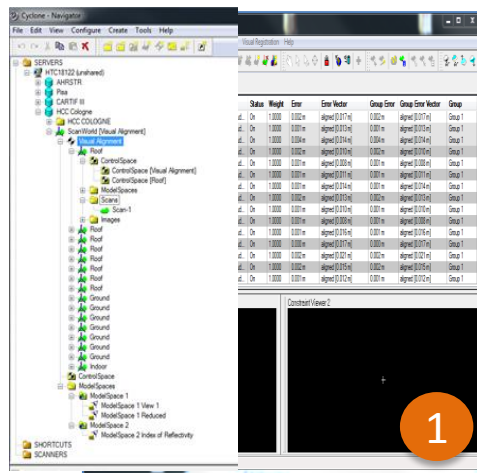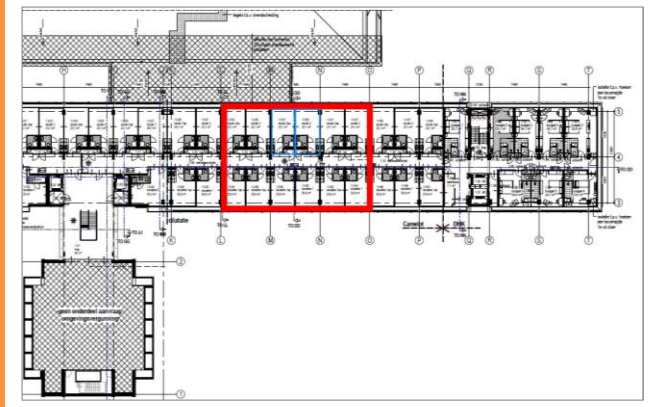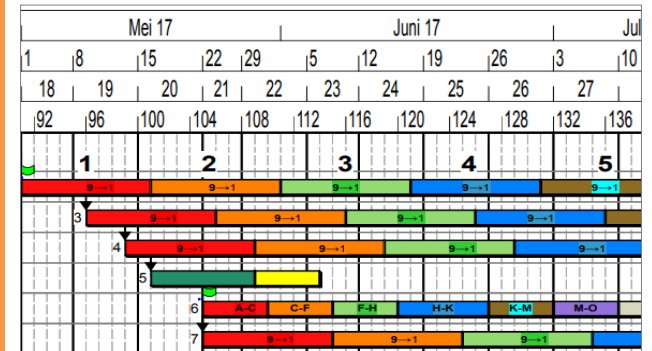
RESULT STEP 1 - MAPPING

Identify the real environment on-site, where the work should be performed

STEP 1: MAPPING

Story

After starting the INSITER app and getting his/her work assignment, the site-worker begins the work by defining / mapping the location/room/space within the building where to perform his work.
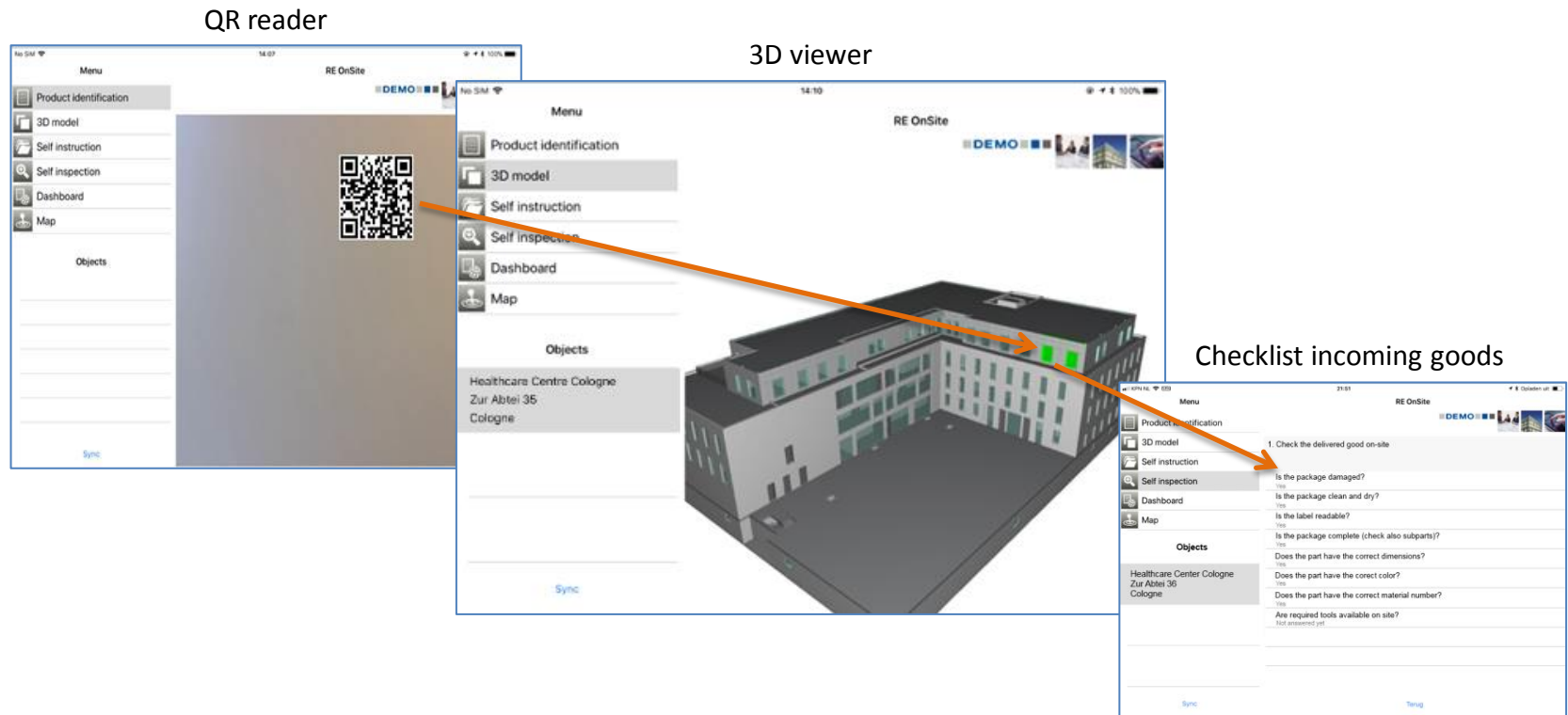
Screenshots

BS: STEP 2 CHECKING 1/2

QR reader and digital checklist

As part of the checking process a QR reader has been developed for the identification of the goods delivered on-site and to quickly navigate to the associated part on the 3D BIM model for which a digital checklist is available.
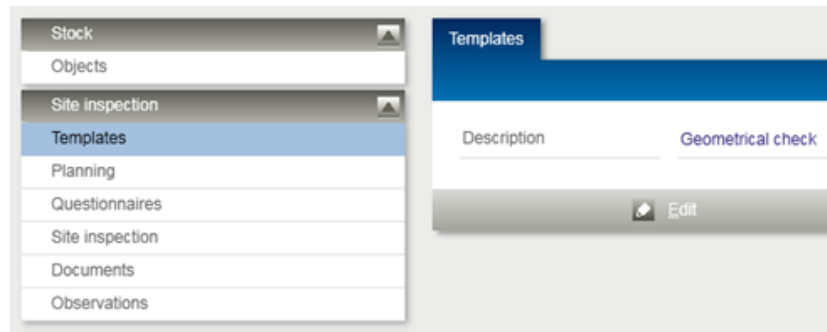

QR reader

3D viewer

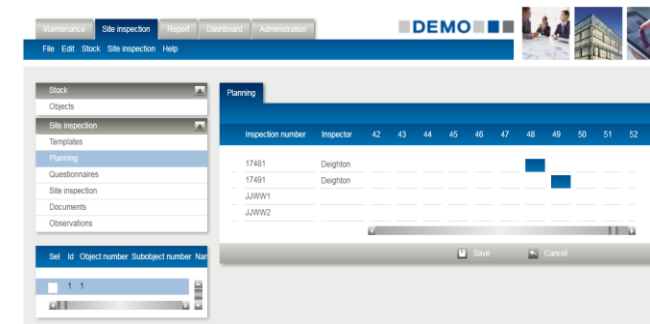Checklist incoming goods

BS: STEP 2 CHECKING 2/2

Digital Checklists templates

Checklist templates can be made in Excel and uploaded into the Site inspection system

From these templates checklists can be instantiated for a certain part of the building
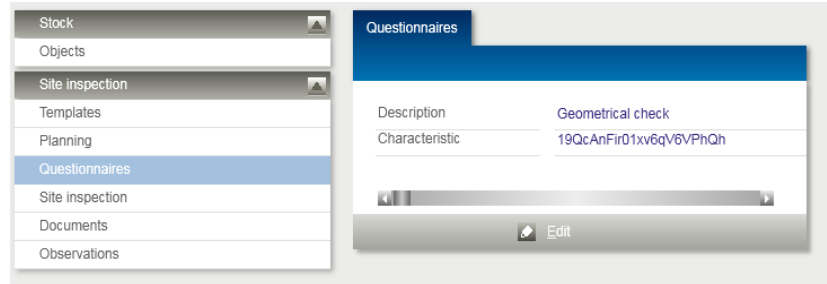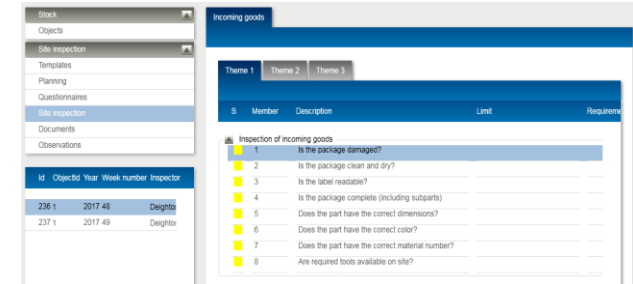
1. Upload a checklist template

3. Plan the inspection and assign to a person

2. Checklist per element by supplying GUID

4. Checklist ready for on-site inspections

RESULT STEP 2 - CHECKING

Check delivered components against design by using QR-Code for identification and verification

STEP 2: CHECKING OF ORDERED COMPONENTS

Story

The components to be installed/applied are delivered on the building site. Using QR or RFID scanning tool, the construction worker checks whether these are the correct components as specified in the BIM model and technical documents.

✓ Right components in right condition (no damages)
✓ Right connection material, in right condition and quantity.

Screenshots

BS: STEP 3 ON-SITE BIM

STEP 3: BIM FOR ON SITE CONSTRUCTION

The process step 3 On-Site BIM for creating and checking the 3D BIM model to be used on-site is supported by the next tools:

1. **CAD tools**
   Like Revit for creating the INSITER 3D BIM models

2. **Online 3D viewer**
   An on line 3D viewer for visualization of 3D models just with any web browser on any device

3. **Planning and scheduling tools**
   4D Synchro pro is applied for 4D simulations

4. **Clash detection tool**
   NavisWorks is applied for Clash detection on the 3D BIM model

5. **Model checking tool**
   Desite MD is applied for 3D BIM model checking

6. **Model issue checker**
   For the registration and processing of 3D BIM model issues

7. **Cost estimation tool**
   CostOS for cost estimation and BIM integration

8. **Tool for super imposing images**
   This tool has been developed for superimposing i.e. thermal, humidity, acoustic images on buildings

RESULT STEP 3 – BIM ON-SITE

Deploying BIM on construction site


STEP 3: BIM FOR ON SITE CONSTRUCTION

Story:

Using his mobile device, the construction worker opens the BIM model of the specific part of the building where he has to remove the existing components and install the new ones. In this BIM model, he can observe how the components are modelled and integrated within the building.

Depending of the level of detail additional information can be added to the BIM model

Screenshots:
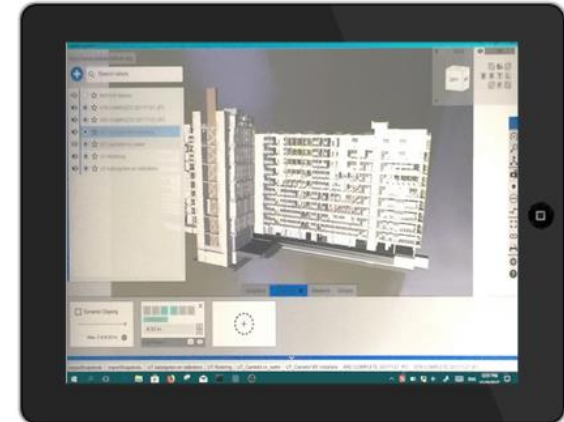
BS: STEP 4 BIM BASED AR
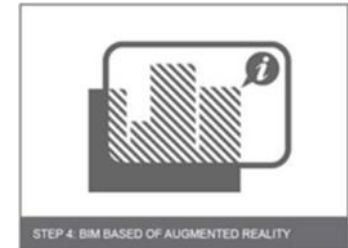
Step 4 deals with the application of AR technology in INSITER applying the next tools:

INSITER BIM AR Vision App

Visualization of building parts or equipment to be installed
BIM-based AR evaluation of defined BIM objects concerning the correct location and placement of the real construction objects
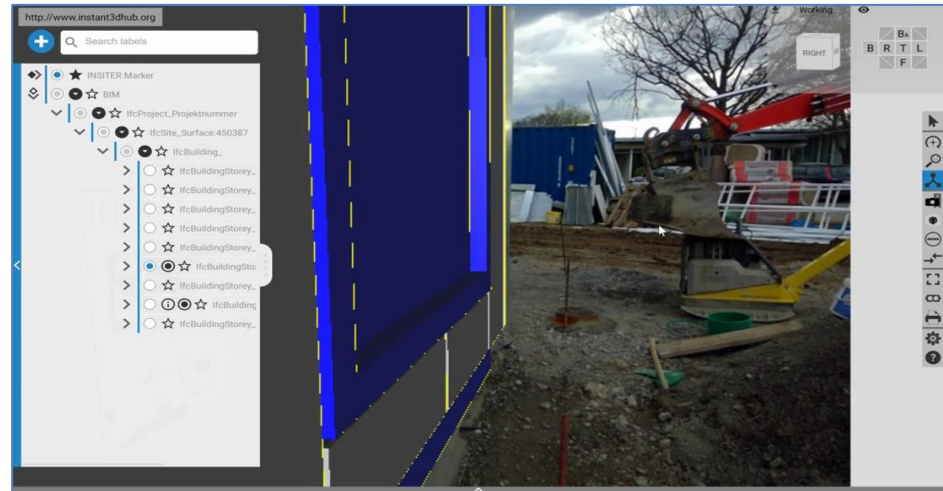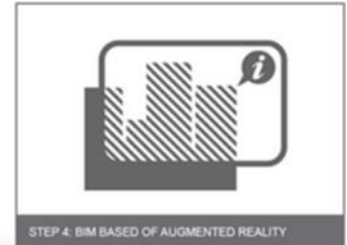

INSITER HoloLens BIM based reality App

Hands-free solution concerning detailed BIM model evaluation for self-inspection with focus on MEP and HVAC systems

RESULT STEP 4 – BIM BASED AUGMENTED REALITY

Validate delivered elements against design requirements
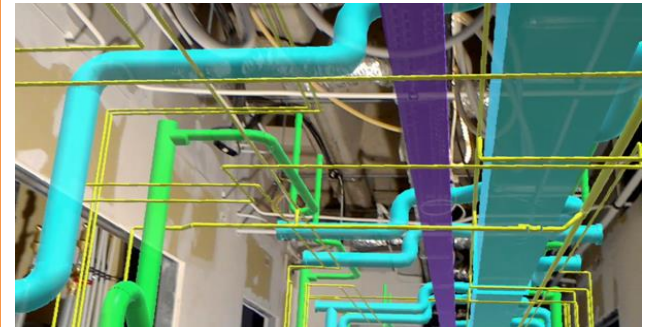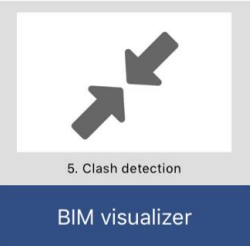
STEP 4: BIM BASED OF AUGMENTED REALITY

Story

The instruction how to apply the building parts was given by an self-instruction module.

For a more complex task Augmented reality can be very useful to guide the worker step by step through the process
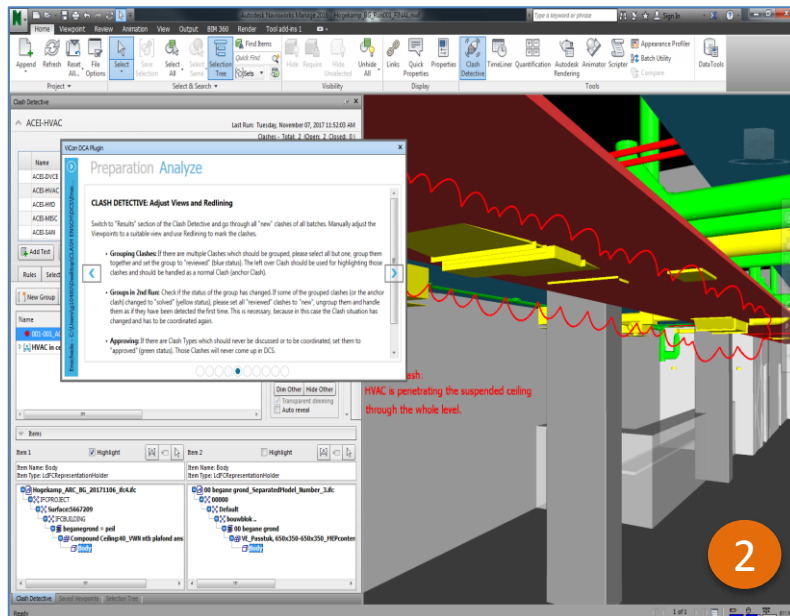
Screenshots:

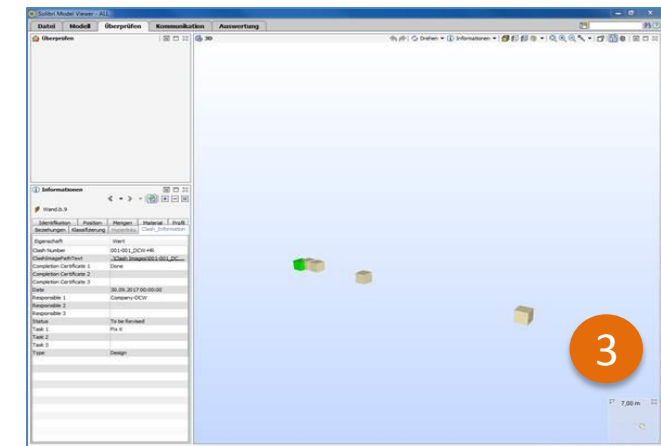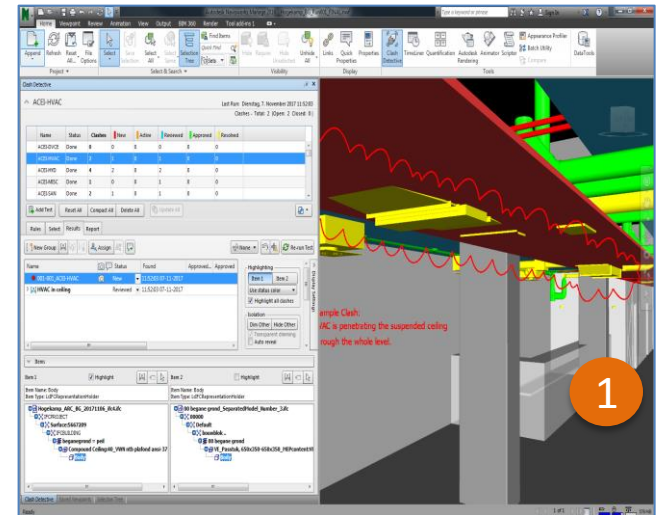5. Clash detection

BIM visualizer
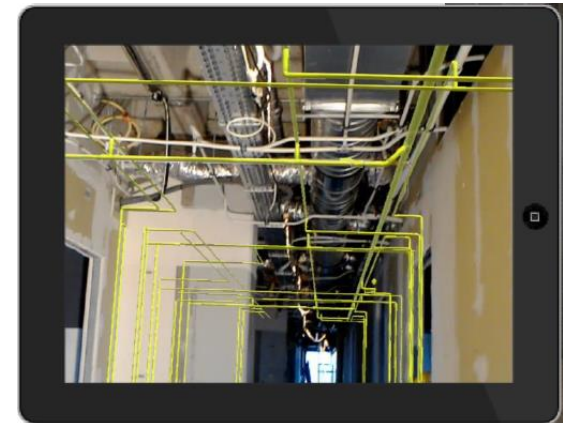
BS: STEP 5 CLASH DETECTION

The process step clash detection is supported by the next tools:

1. **NavisWorks Manage**
   For creating and checking clash batches

2. **Plug-in for NavisWorks manage DCA**
   For analysis, registration, reporting and actions

3. **Clash cube creator**
   For visualisation of clash information superimposed

RESULT STEP 5 – CLASH DETECTION ON-SITE

Verification of the current site situation

5. Clash detection

BIM visualizer
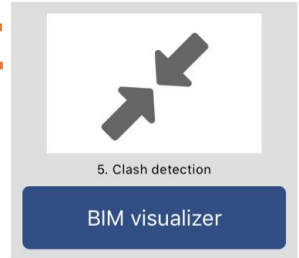
Story:

Through AR, the construction worker visually observes whether the components to be installed really fit within the intended building part/space/room, i.e. no "clashes" with structural building components, etc.
Get information about minor clashes which should be solved directly on site.

Screenshots:

- Clashes are detected off-site!
- Clash cubes are forwarded on-site
- Information is shown about clashes which have to be solved on-site
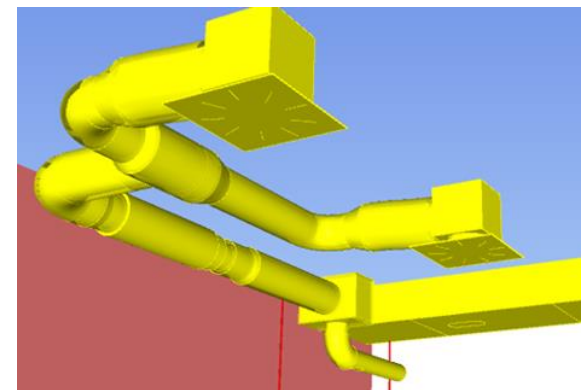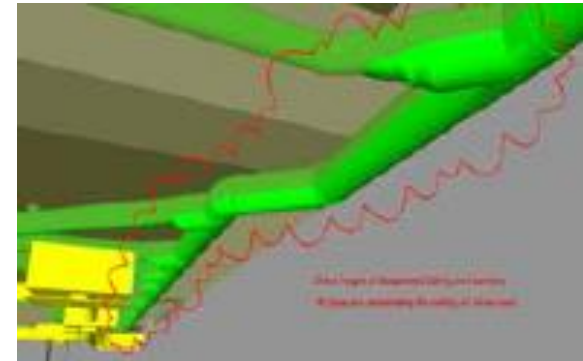
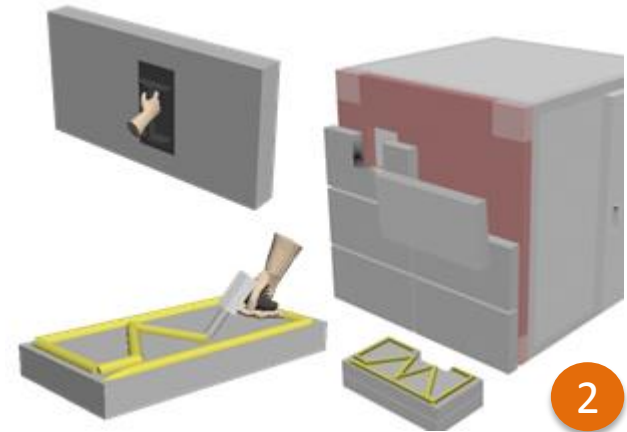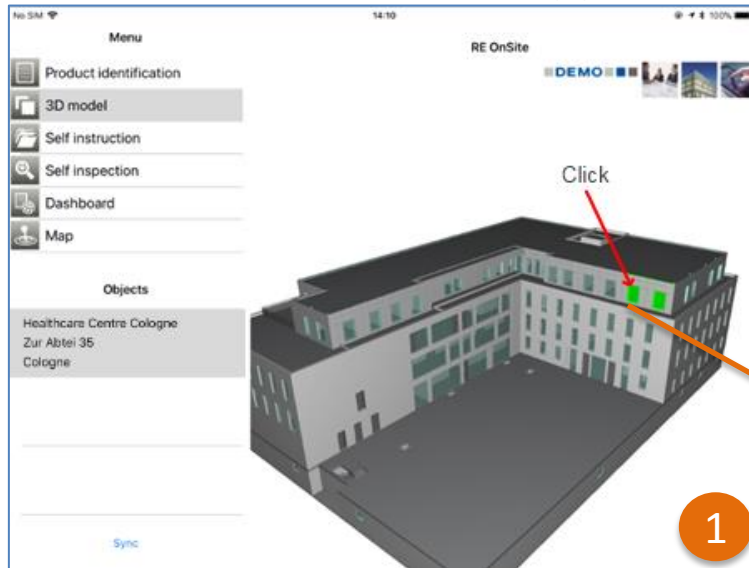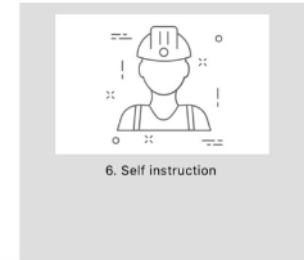# BS: STEP 6 SELF- INSTRUCTION

For the process step Self-Instruction the worker on-site is provided with the following means:

1. Self instruction functionality as part of the inspection App were documents, instructions, video's and interactive step-by-step instructions are available on-site

2. Self instruction functionality provided via AR technology

RESULT STEP 6 SELF- INSTRUCTION

Guiding the construction process using a mobile device
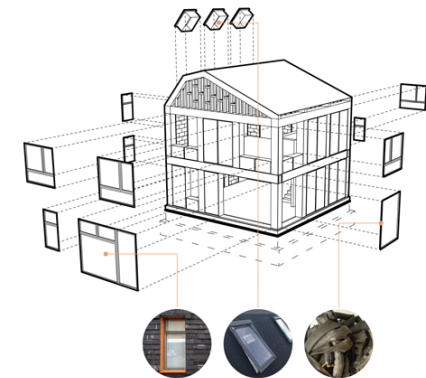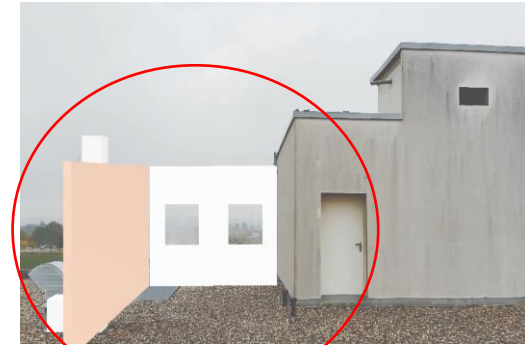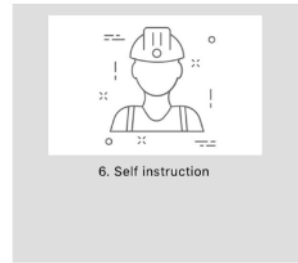

6. Self instruction

Story:

The instruction of the workers can be done in 2 steps:
1. Toolbox meeting
2. Self-instruction manual

The toolbox meeting can be replaced by a video with the specific project based information.
The self-instruction can easily be incorporated in the BIM-model.

Screenshots:

BS: STEP 7 SELF- INSPECTION

For the process step Self-Inspection the worker on-site is provided with the following means:

1. Self-inspection digital checklists
2. Registration functionality for observations, defects and escalations
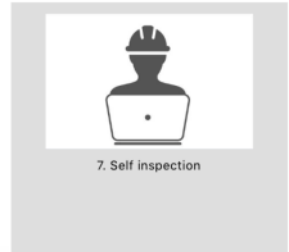3. Self-inspection applying AR technology

RESULT STEP 7 SELF- INSPECTIONS

Verify the current application installation and fill in checklists for
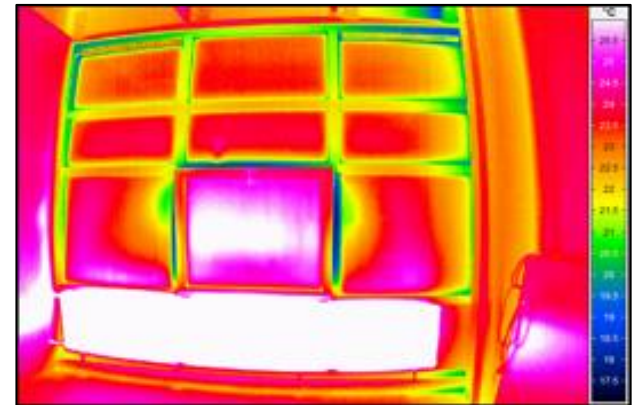further processing

7. Self inspection

Story:

Self-inspection for airtightness takes place during several
stages in the mounting process:

- Visual inspections
- Inspections with tools
  - Ultrasound(US)
  - Blower door
  - Thermography

Results are documented with checklists

Screenshots:
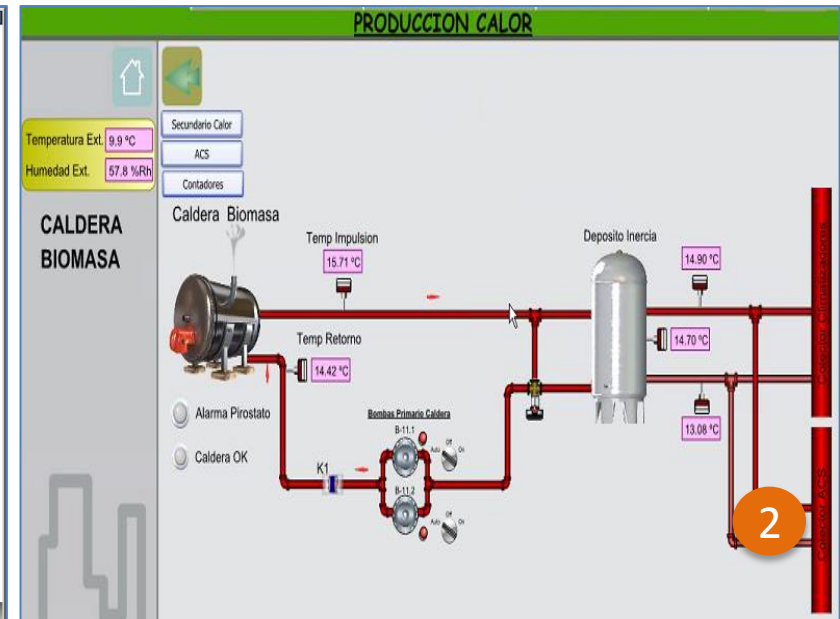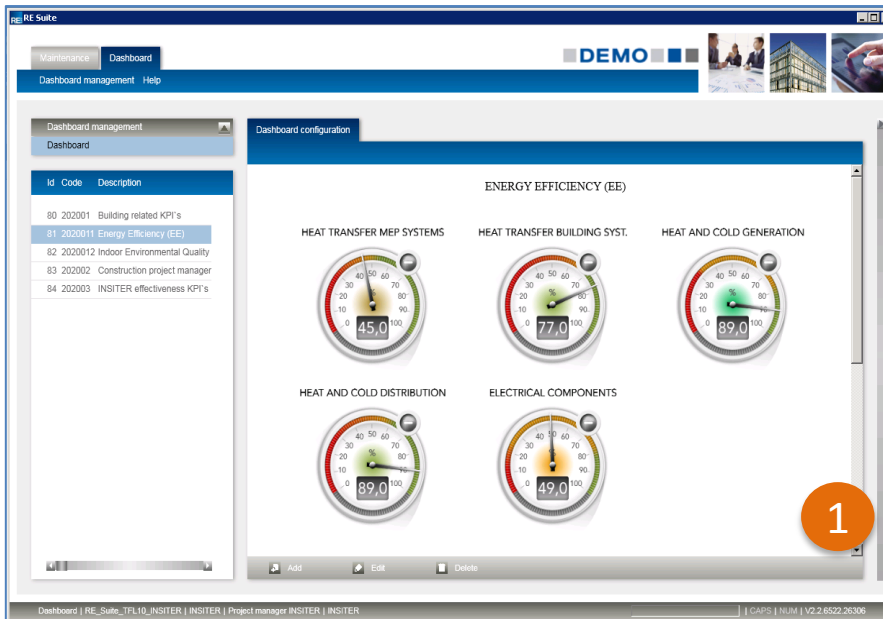
BS: STEP 8 FINAL CHECKS

For the process step Final Checks the project leader is provided with the following means:

1. A KPI dashboard for monitoring the installations in the project and taking the right decisions
2. TAC-Vista based monitoring platform for data visualization

STEP 8 – FINAL CHECKS

Quality, time and cost evaluation by the Construction Managers

8. Final check

Story:

The construction worker completes his assignment by reporting on the finished work, including some photos taken on-site. He should also note errors or doubts, if any, into his digital report through the mobile app. The site supervisor opens this report, and gives approval or asks for rework. The approved works appear on a common dashboard showing the level of quality and performance during the on-site process.

Screenshots:

PROGRAM

Time	Where		Issue	Presenter/Moderation
9:00 - 9:30	Meeting room	GROUP 1 + 2	Briefing and awareness training plenary common session	DEMO / DRA
9:30 - 10:00			Demonstration of AR / Accoustic Measurement	FHG / SIEMENS
10:00 - 12:00	Meeting room	GROUP 1	COLOGNE (10 min presentation + 10 min feedback)	3L
			VALLADOLID (10 min + 10 min)	DRAGADOS (on behalf of CARTIF)
			PISA (10 min + 10 min)	AICE?
			ENSCHEDE (10 min + 10 min)	DEMO
			DELFT (10 min + 10 min)	DEMO
	Module	GROUP 2	SEVILLA (10 min + 10 min)	DRA / SIEMENS
			Demonstration of AR / Accoustic Measurement	FHG / SIEMENS
12:00 - 12:30	Meeting room		Coffee break	
12:30 -14:30	Meeting room	GROUP 2	COLOGNE (10 min presentation + 10 min feedback)	3L
			VALLADOLID (10 min + 10 min)	DRAGADOS (on behalf of CARTIF)
			PISA (10 min + 10 min)	AICE?
			ENSCHEDE (10 min + 10 min)	DEMO
			DELFT (10 min + 10 min)	DEMO
	Module	GROUP 1	SEVILLA (10 min + 10 min)	DRA / SIEMENS
			Demonstration of AR / Accoustic Measurement	FHG / SIEMENS
14:30-15:30			Lunch	
15:30 - 16:30	Meeting room	GROUP 1 + 2	Common session in english with selected representatives of both groups	DRA / 3L
			Value proposition matrix – conclusions and leaving of the stakeholders	
16:30 - 17:30	Meeting room		Internal discussion INSITER partners	INSITER partners

COLOPHON

INSITER INTUITIVE
SELF-INSPECTION
TECHNIQUES