



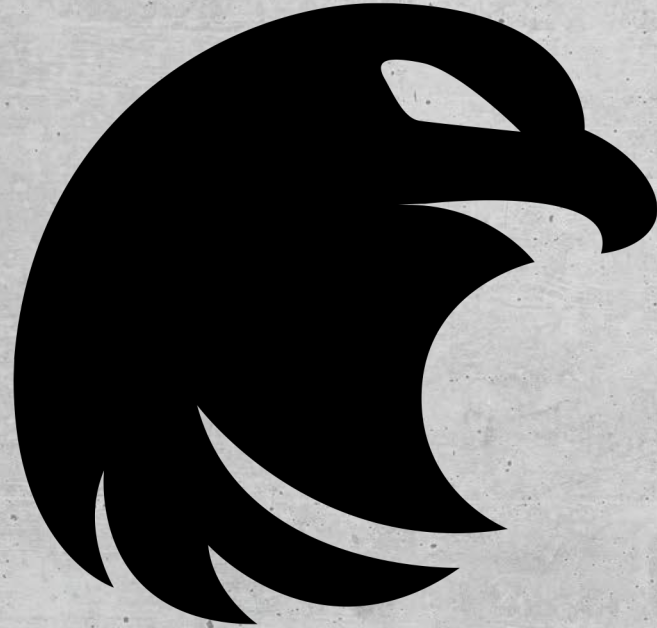
# Inspection of the Built Environment

## HOW to Inspect Concrete Structures

by Marcel Poser, CEO Screening Eagle Technologies



[www.linkedin.com/in/ProtectTheBuiltWorld](https://www.linkedin.com/in/ProtectTheBuiltWorld)

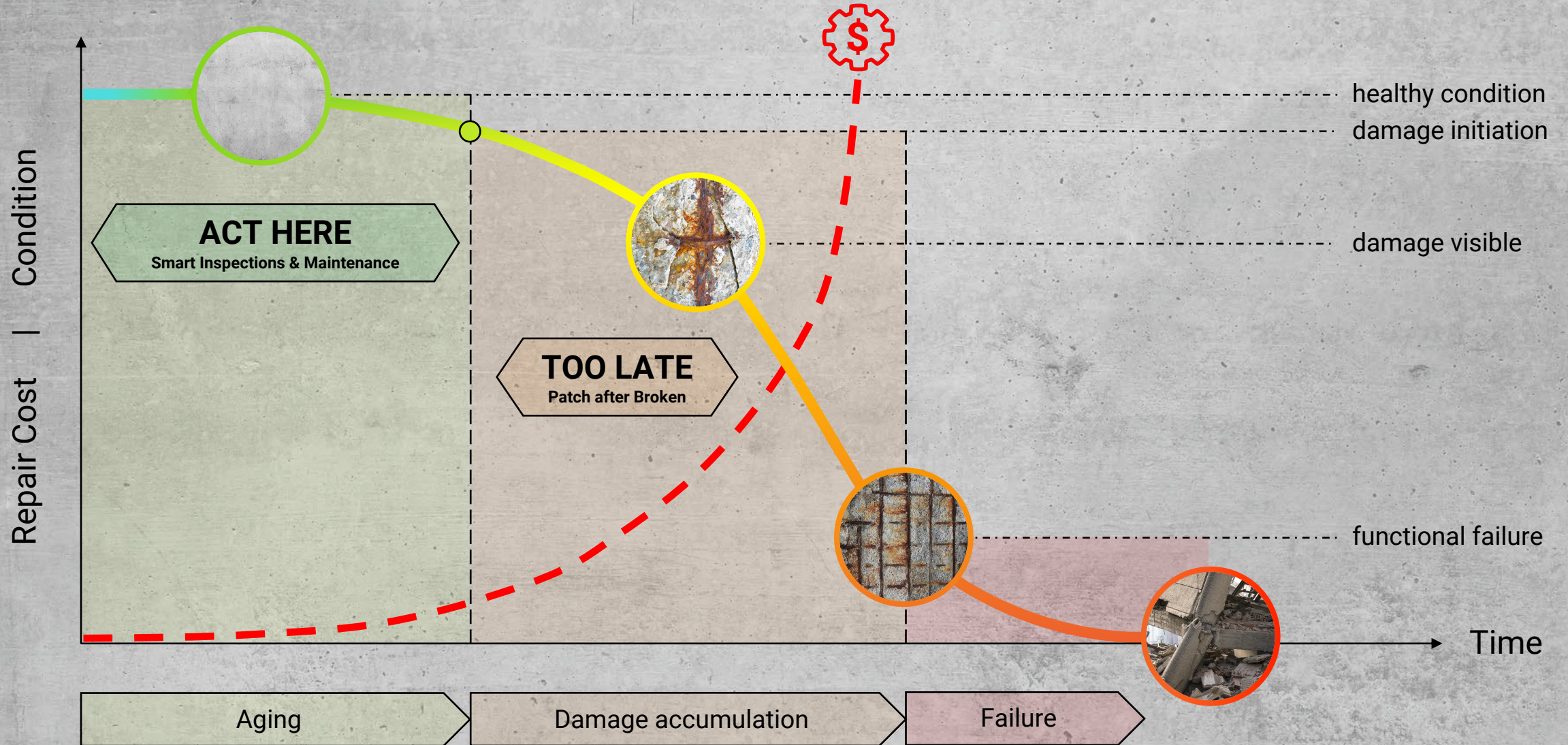


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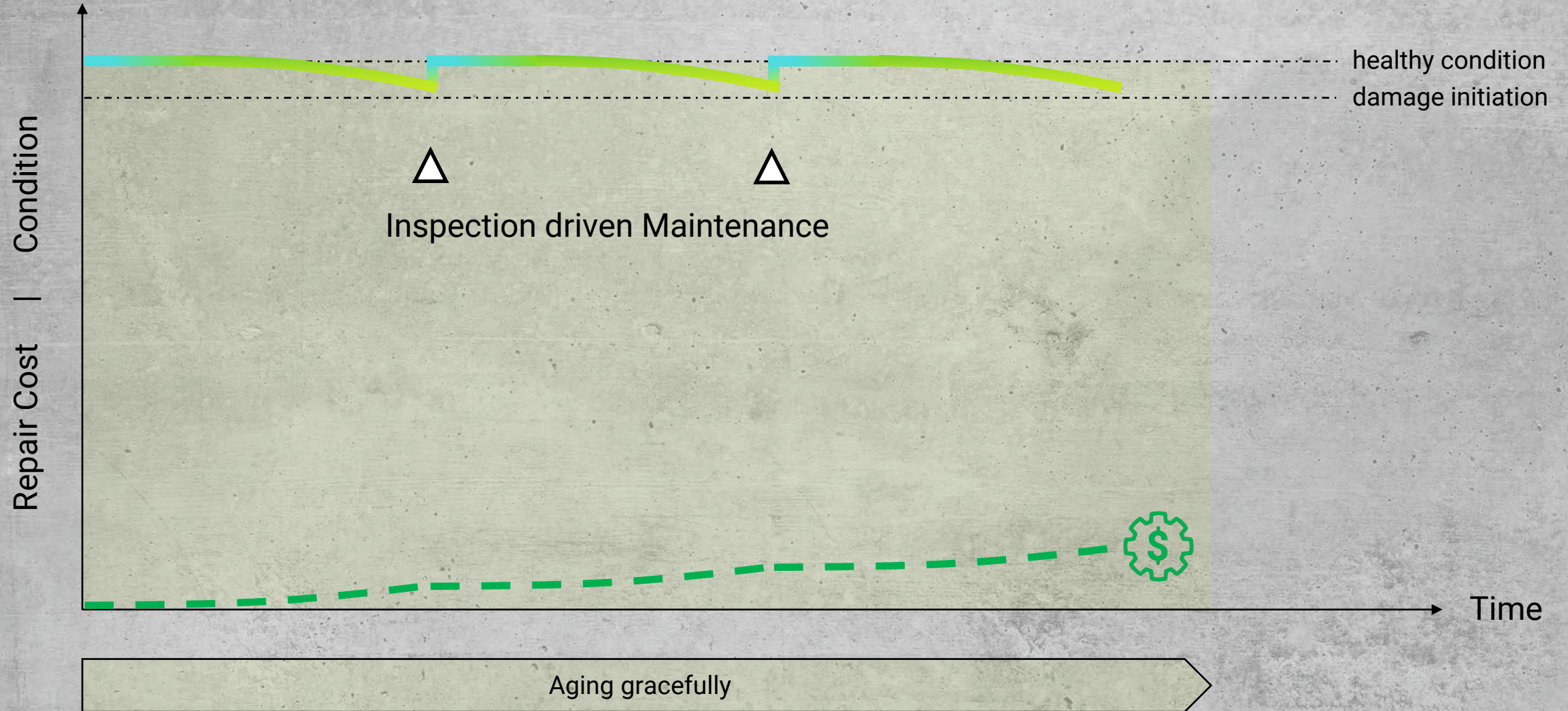
# HOW to Inspect Concrete Structures

## Act smart... not stupid and too late!



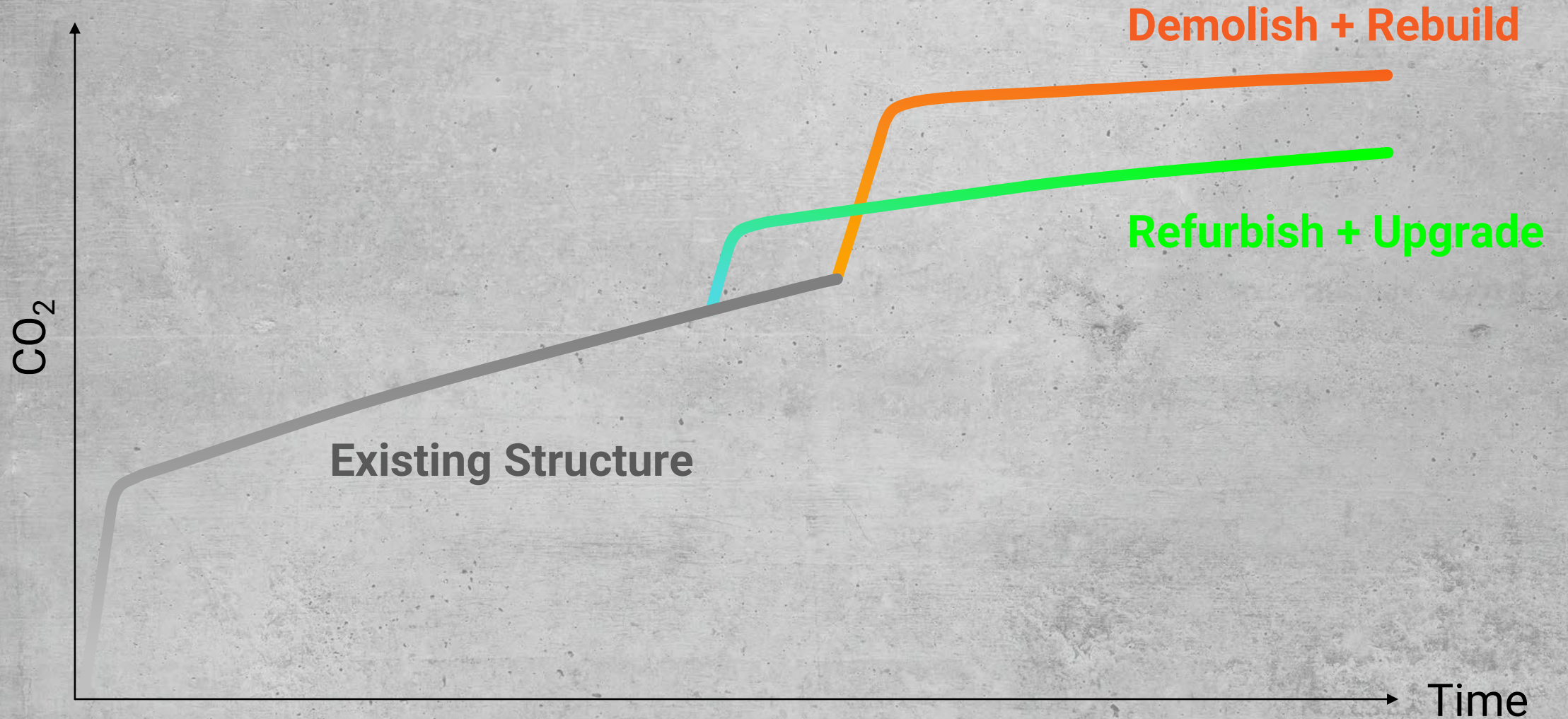


# Preventive Inspections drive Actionable Maintenance



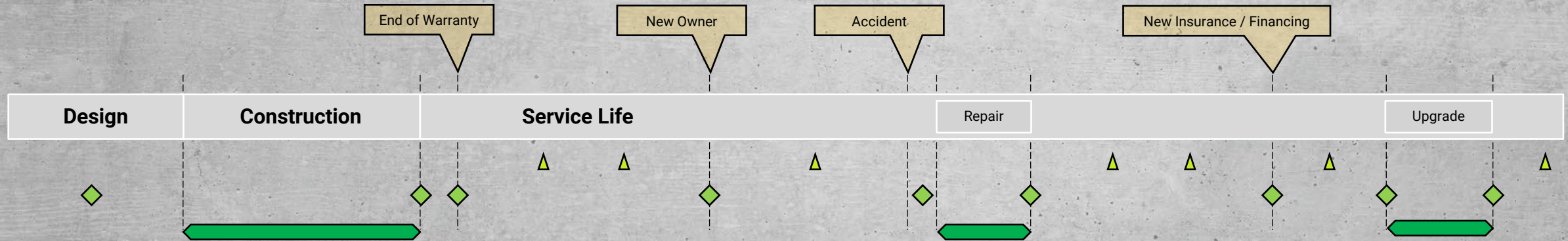


# Reduced CO<sub>2</sub> Impact





# Inspections & Maintenance during the Lifecycle of a Structure



## Preventive Inspections that trigger Sustainable Maintenance

Quality Control

**WHEN:** daily / weekly / monthly  
**WHAT:** visual, vital signs, imaging

= *Limit Birth Defects & Quality Records*

Condition Information

**WHEN:** targeted  
**WHAT:** visual, vital signs, imaging

= *Health Status & Maintenance Actions*  
= *Birth Certificate*

Periodic Inspection

**WHEN:** every 1 to 5 years  
**WHAT:** visual, vital signs, imaging

= *Updated Healthy Status & Maintenance Actions*

**IMPORTANT:** All inspection data need to be recorded digitally & need to be accessible over time!



# Relevant Parties



**Owner**



**Bank / Insurance**



**Government / Policy Maker**



**Architect**



**Engineer**



**Supervisor, Inspector, Surveyor, Locator**



**General Contractor / Builder**



**Specialist Contractor / Subcontractor**




**Material / Component Supplier**




## HOW to Inspect Concrete Structures


# Healthy Concrete is a MUST



NO surface defects 


dense, uniform & strong concrete 


**Cross-Section**  
Concrete Element

rebars in the right location 

NO cracks, delamination, voids, honeycombing 

 objects in the correct location 

NO deep cracks 

correct cover 



HOW to Inspect Concrete Structures

# Quality Controlled Construction is a MUST





HOW to Inspect Concrete Structures

# Birth Certificate with all Birth Defects are a MUST





HOW to Inspect Concrete Structures

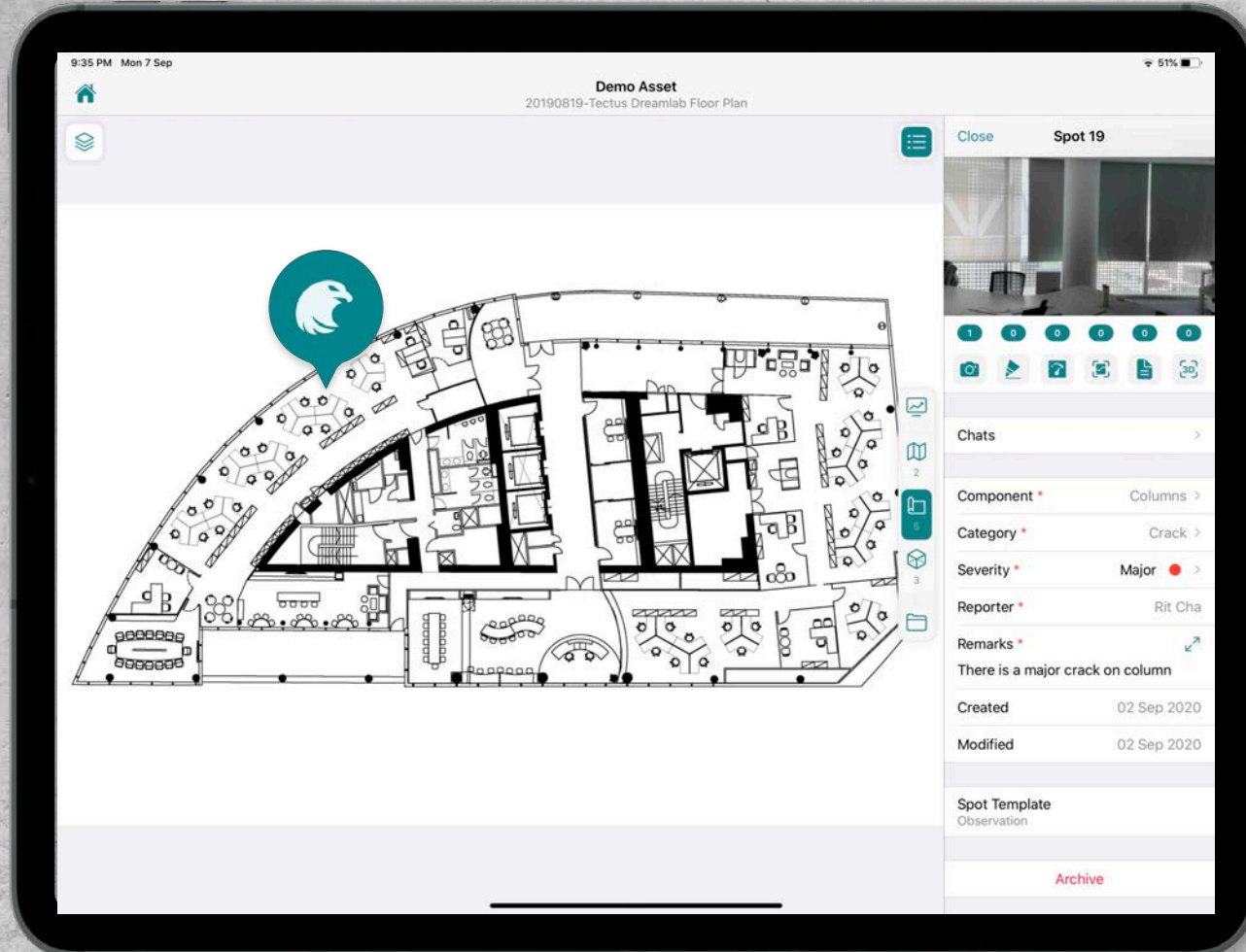
# Regular Visual Inspections are a MUST





HOW to Inspect Concrete Structures

# Regular Visual Inspections are a MUST





HOW to Inspect Concrete Structures

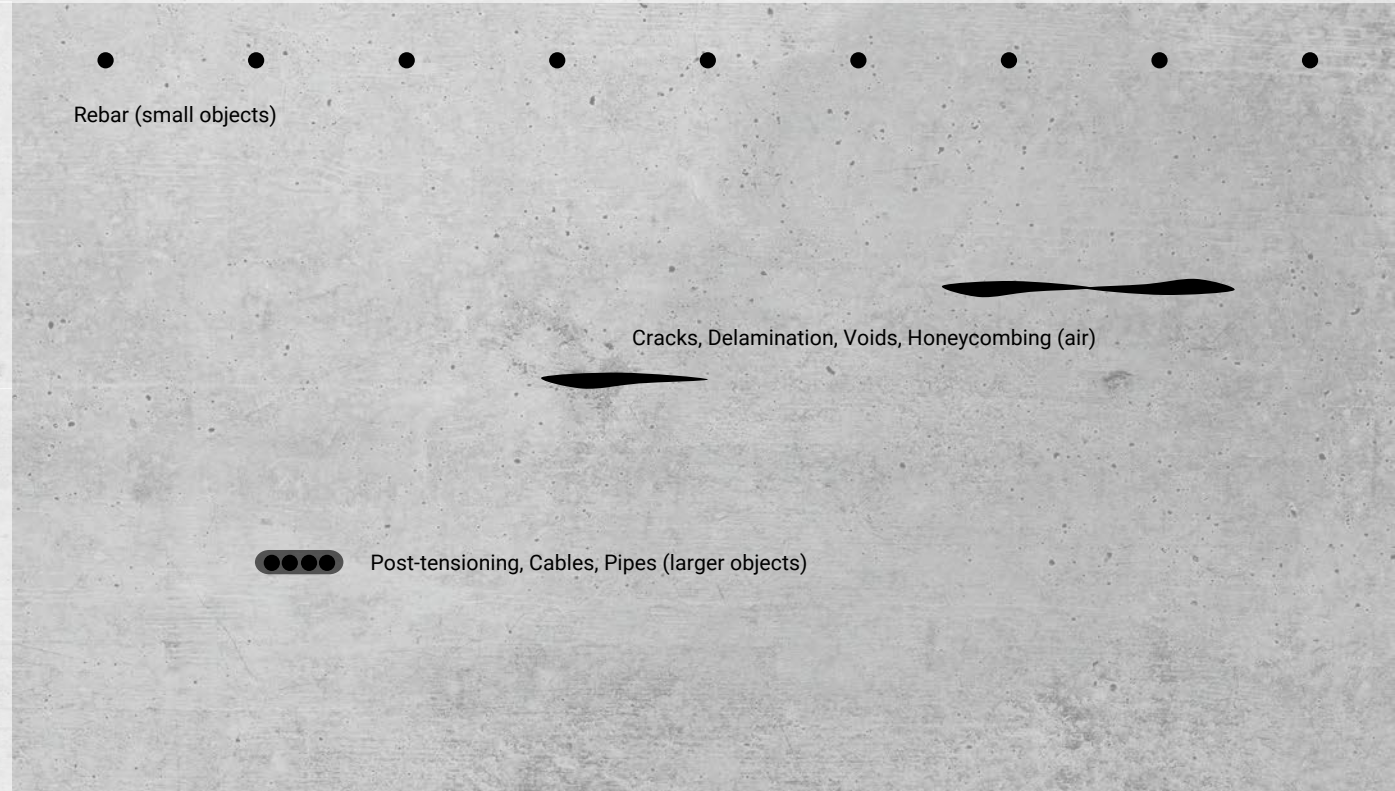
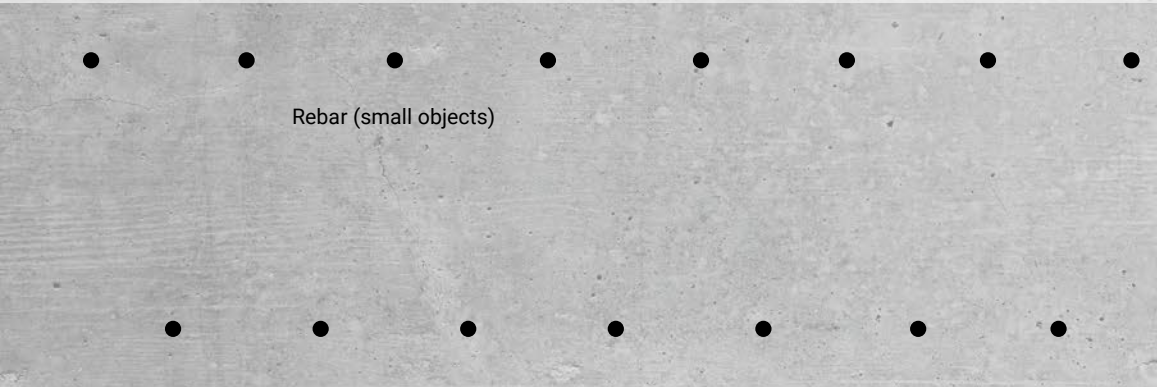
# Regular Non-Destructive Inspections are a MUST





HOW to Inspect Concrete Structures

# 2D Imaging: see what is inside the concrete



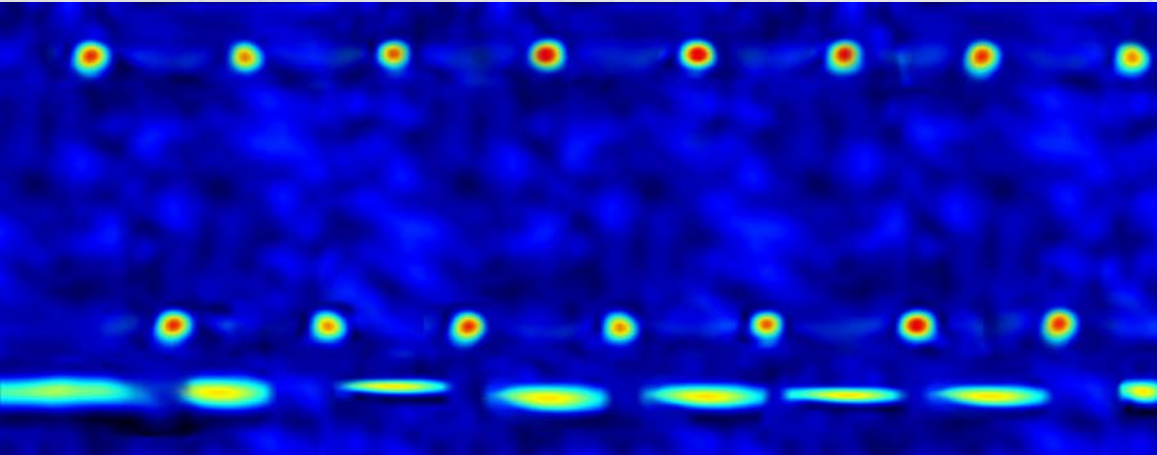
**Cross-Section**  
Concrete Element



HOW to Inspect Concrete Structures

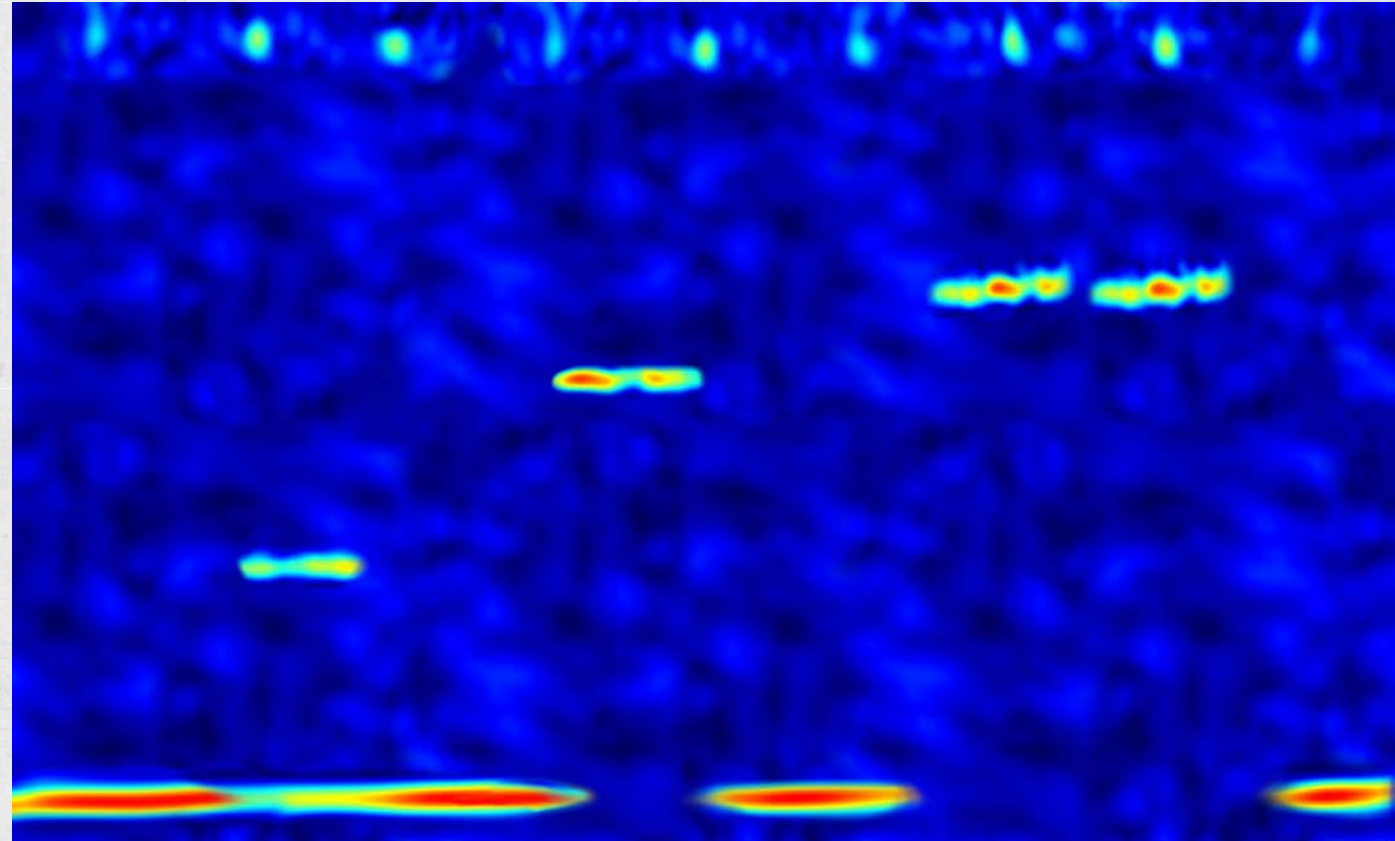
## 2D Imaging: see what is inside the concrete

Ground Penetrating Radar (GPR)



**Cross-Section**  
Concrete Element

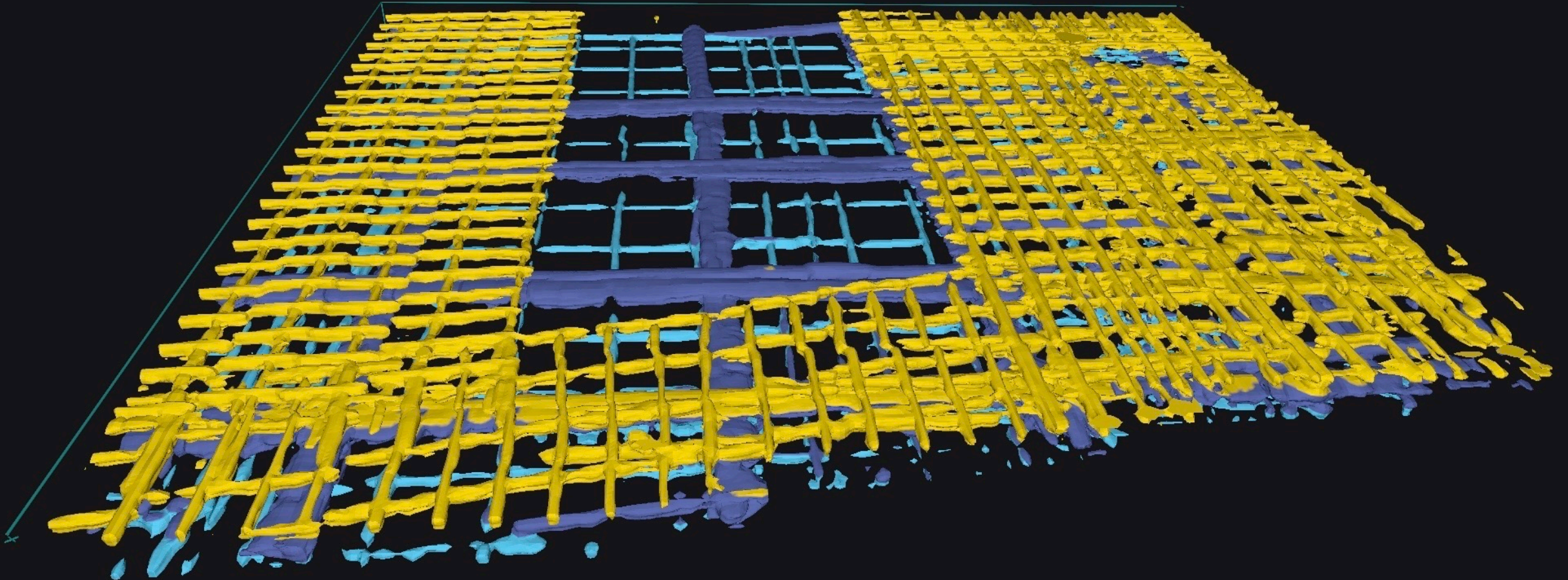
Ultrasound Pulse Echo





HOW to Inspect Concrete Structures

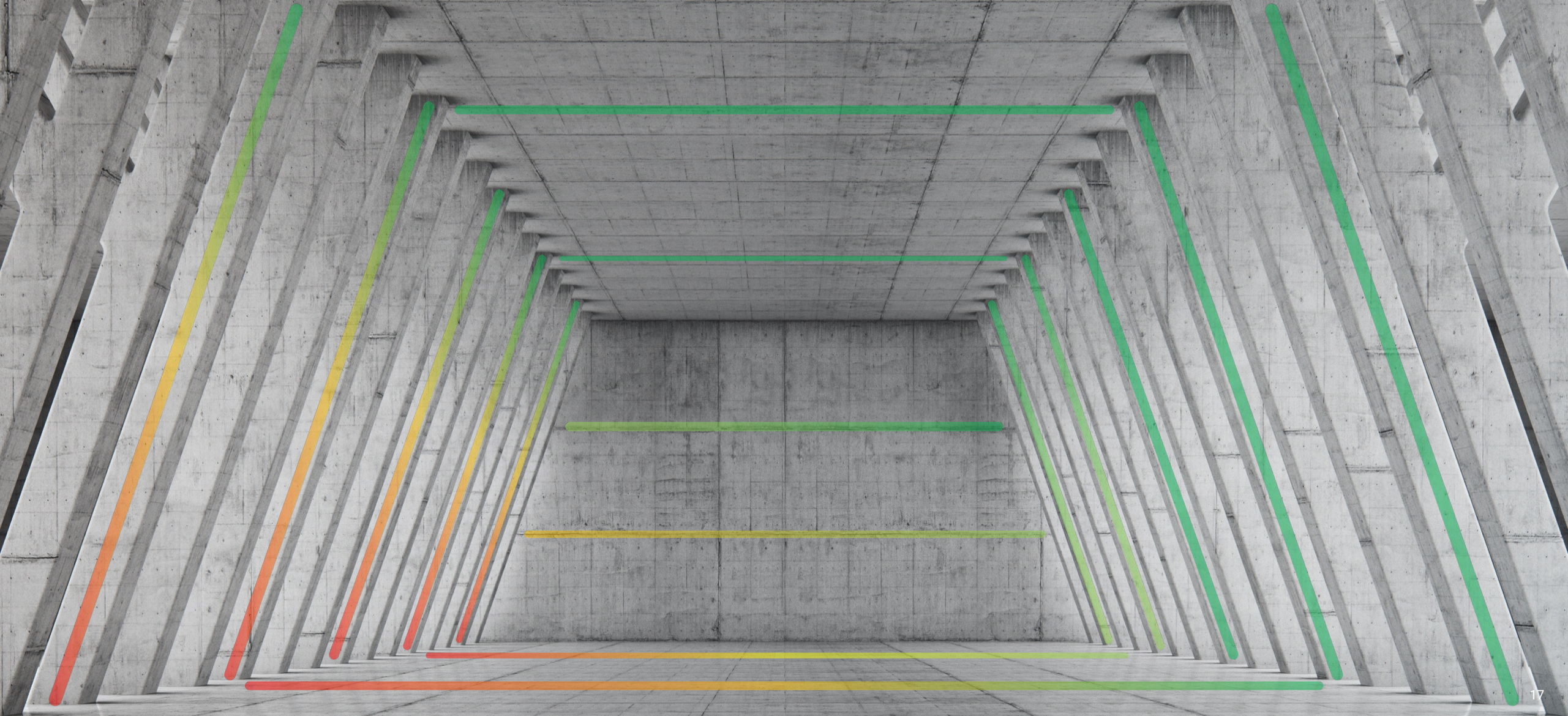
## 3D Imaging: see what is inside the concrete





HOW to Inspect Concrete Structures

# Smart Heatmaps: identify hot spot areas





# Preventive Structural Inspections – Medical Analogy

## Visual Inspections



## Vital Signs

(Non-Destructive Inspections)



## Imaging

(Non-Destructive Inspections)





## Visual | Vital Signs | Imaging

Document **birth-defects** on new structures + perform **health-checks** during service life = **actionable maintenance**

### Visual Inspections

- 1) visual condition assessment

- ▶ basic assessment

### Vital Signs (Non-Destructive Inspections)

- 1) strength & uniformity
- 2) homogeneity & thickness
- 3) defects & thickness
- 4) rebar cover & diameter (spot-check)
- 5) permeability

- ▶ structural strength
- ▶ structural strength & protection of rebars
- ▶ weak spots
- ▶ protection of rebars & structural strength
- ▶ risk of rebar corrosion

### Imaging (Non-Destructive Inspections)

- 1) rebars, tendons, cables, pipes (objects)
- 2) delamination, voids, honeycombing (defects)
- 3) rebar cover & diameter
- 4) corrosion potential

- ▶ structural elements correctly in place
- ▶ detect weak-spot & fight concrete cancer
- ▶ protection of rebars & structural strength
- ▶ risk of rebar corrosion





## HOW to Inspect Concrete Structures

# Visual | Vital Signs | Imaging

Document **birth-defects** on new structures + perform **health-checks** during service life = **actionable maintenance**

### Visual Inspections

- 1) visual condition assessment

▶ Digital Inspection – **Inspect**

### Vital Signs (Non-Destructive Inspections)

- 1) strength & uniformity
- 2) homogeneity & thickness
- 3) defects & thickness
- 4) rebar cover & diameter (spot-check)
- 5) permeability

▶ Rebound – **Schmidt** | UPV – **Pundit**

▶ Ultrasound Pulse Velocity (UPV) – **Pundit**

▶ Impact Echo – **Pundit**

▶ Eddy Current – **Profoscope (Profometer)**

▶ Resistivity – **Resipod**

### Imaging (Non-Destructive Inspections)

- 1) rebars, tendons, cables, pipes (objects)
- 2) delamination, voids, honeycombing (defects)
- 3) rebar cover & diameter
- 4) corrosion potential

▶ Ground Penetrating Radar – **Proceq GPR**

▶ Ultrasound Pulse Echo – **Pundit Array**

▶ Eddy Current – **Profometer**

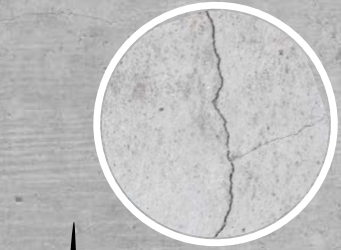
▶ Half-cell Potential – **Profometer**



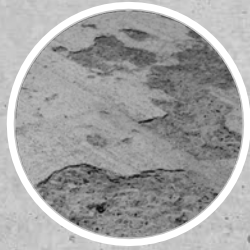


# HOW to Inspect Concrete Structures

## Visual Inspections



1 Crack Inspect



Surface Condition Inspect 2

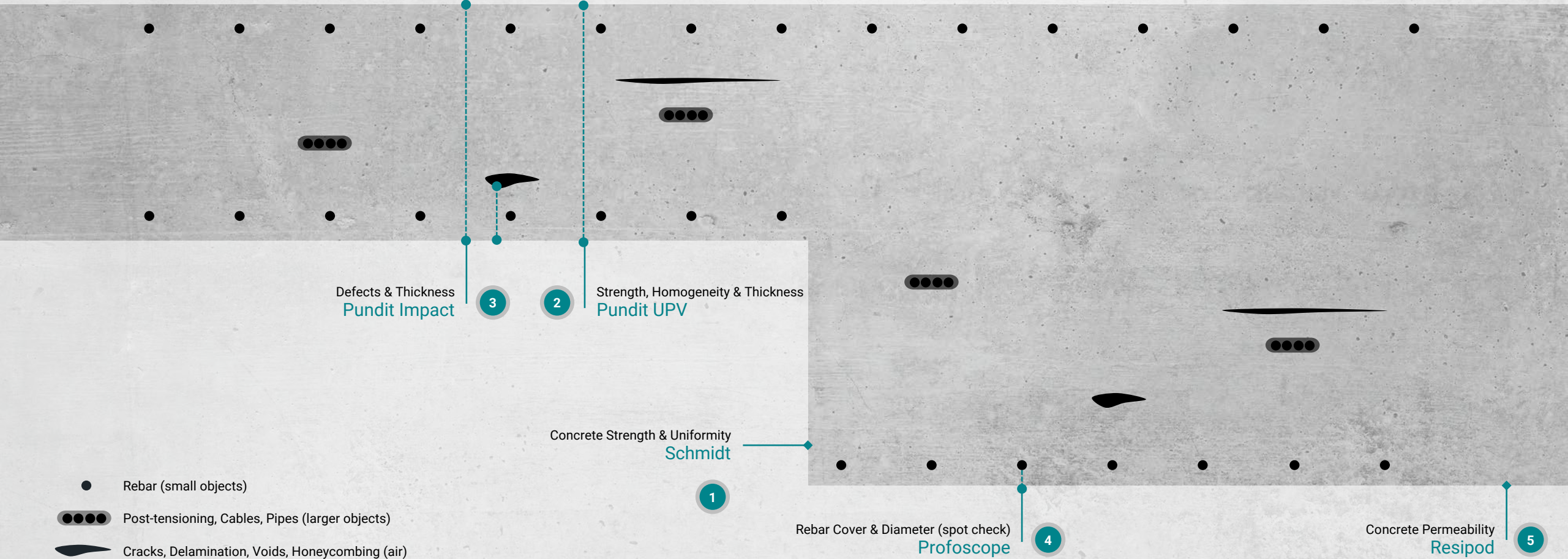


Concrete Cancer Inspect 3



# HOW to Inspect Concrete Structures

## Vital Signs (Non-Destructive Inspection)





# HOW to Inspect Concrete Structures

## Imaging (Non-Destructive Inspection)

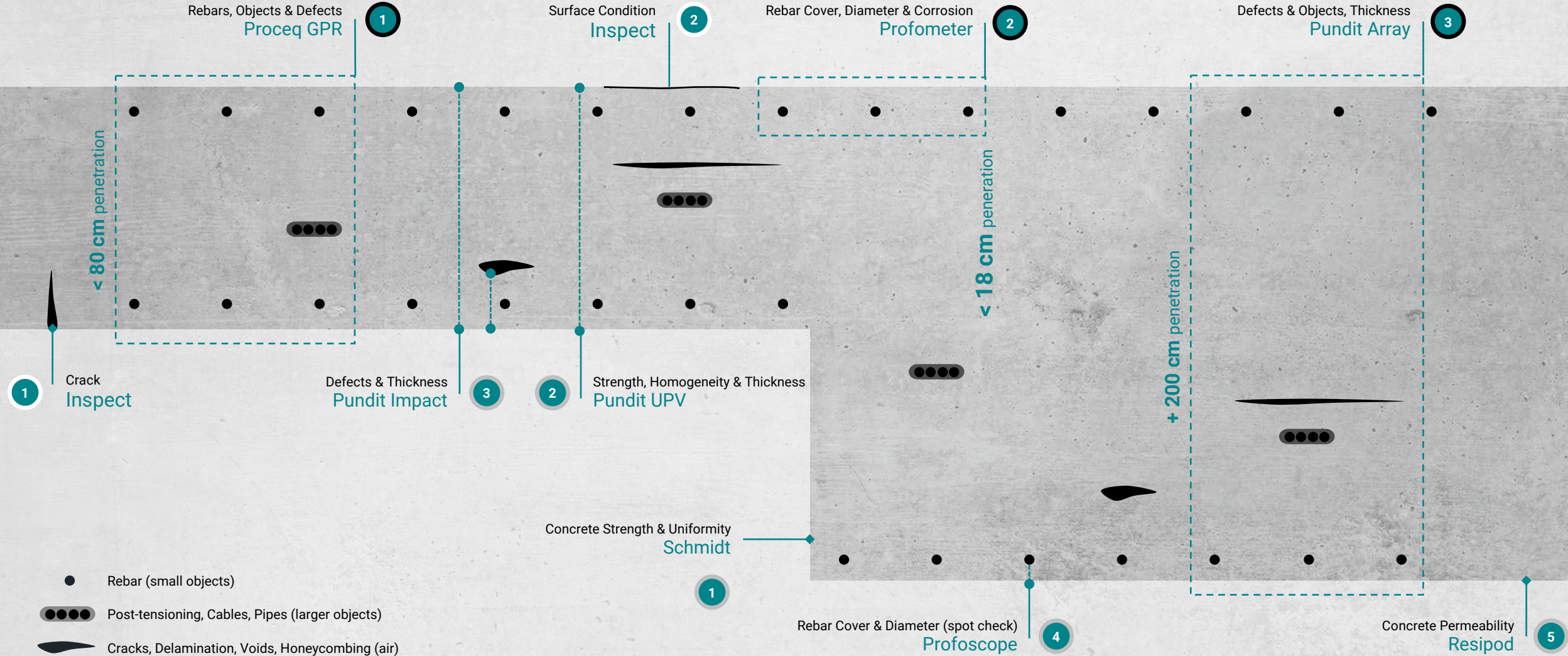


- Rebar (small objects)
- Post-tensioning, Cables, Pipes (larger objects)
- Cracks, Delamination, Voids, Honeycombing (air)



# HOW to Inspect Concrete Structures

## Visual | Vital Signs | Imaging





# HOW to Inspect Concrete

## Visual | Vital Signs | Imaging

Condition Assessment

Permeability

Strength

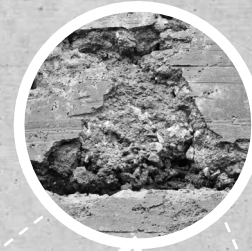
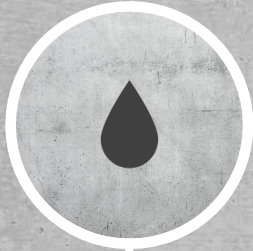
Uniformity & Homogeneity

Thickness

Defects

Objects

Rebars



Inspect

Resipod

Schmidt

Pundit UPV

Pundit Impact

Pundit Array

Proceq GPR

Profometer

Digital Inspection

Resistivity

Rebound

Ultrasound Pulse Velocity

Impact Echo

Ultrasound Pulse Echo  
Depth: 0 to > 200 cm

GPR  
Depth: 0 to < 80 cm

Eddy Current  
Depth: 0 to 18 cm  
Cover, Diameter, Corrosion

Visual

Vital Signs

Imaging



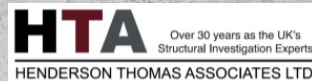
HOW to Inspect Concrete Structures

# Multi-Technology Approach

*“...there is **no single technology** that would address it all. The **multi-technology approach** is not an option, it is an **absolute must.**”*

**Warren Thomas (Director at HTA)**

HTA is a leading Structural Investigation Group operating in England, Scotland and Ireland



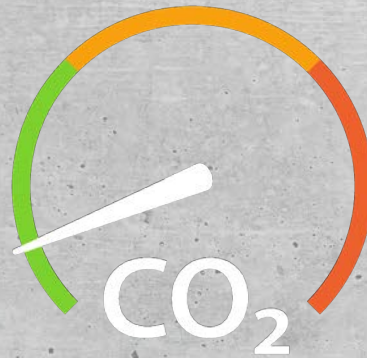


HOW to Inspect Concrete Structures

# Preventive Inspections for a Sustainable Built Environment



**Healthy Structures**



**Environmentally Friendly**



**Boost Net Present Value**



# Inspection of the Built Environment

## HOW to Inspect Concrete Structures

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