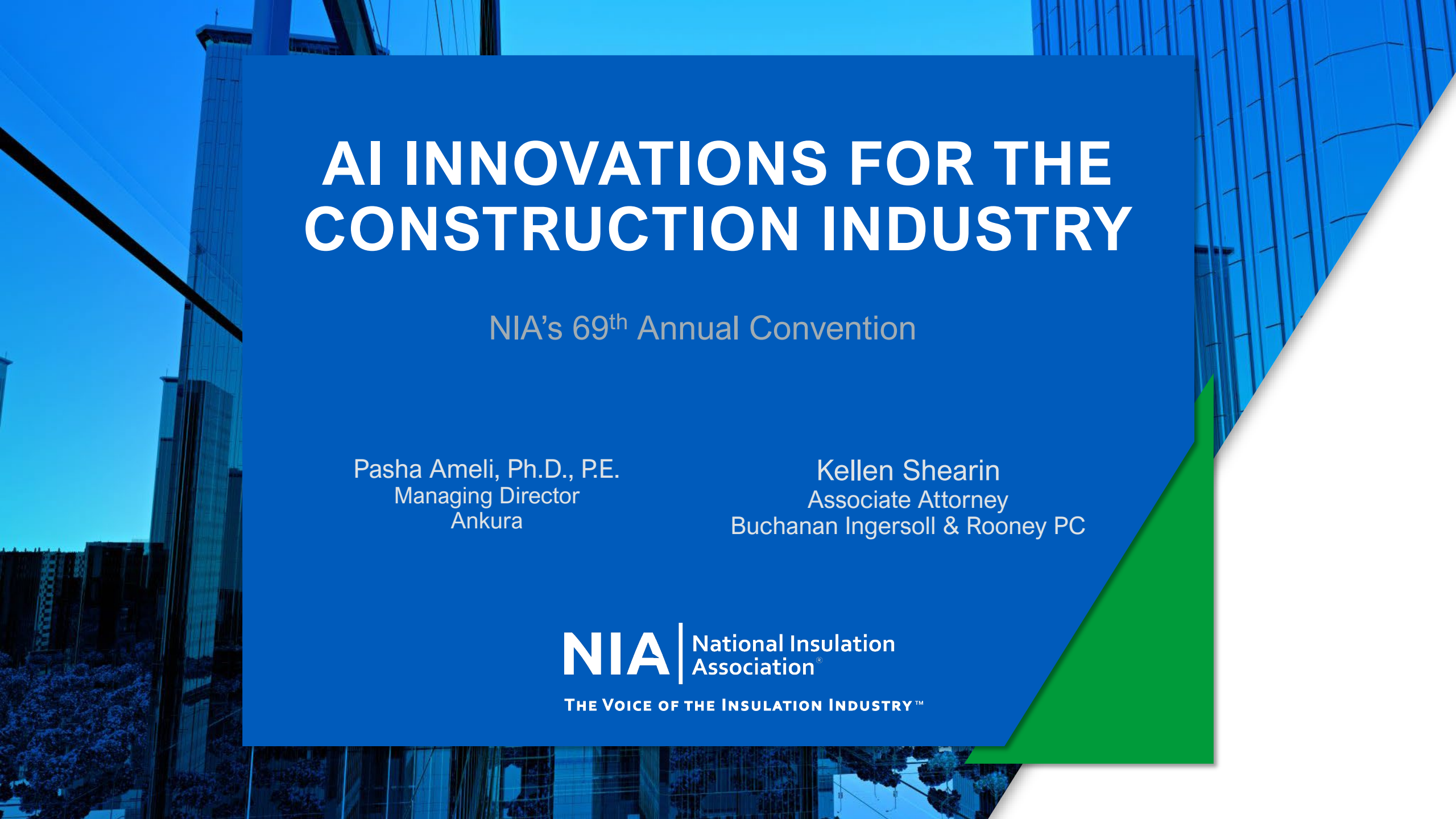


AI INNOVATIONS FOR THE CONSTRUCTION INDUSTRY

NIA's 69th Annual Convention

Pasha Ameli, Ph.D., P.E.
Managing Director
Ankura

Kellen Shearin
Associate Attorney
Buchanan Ingersoll & Rooney PC

NIA | National Insulation Association®

THE VOICE OF THE INSULATION INDUSTRY™

Presenters

Pasha Ameli, Ph.D., P.E.
Ankura
Washington, DC

Kellen M. Shearin
Buchanan Ingersoll & Rooney
Charlotte, NC

Agenda

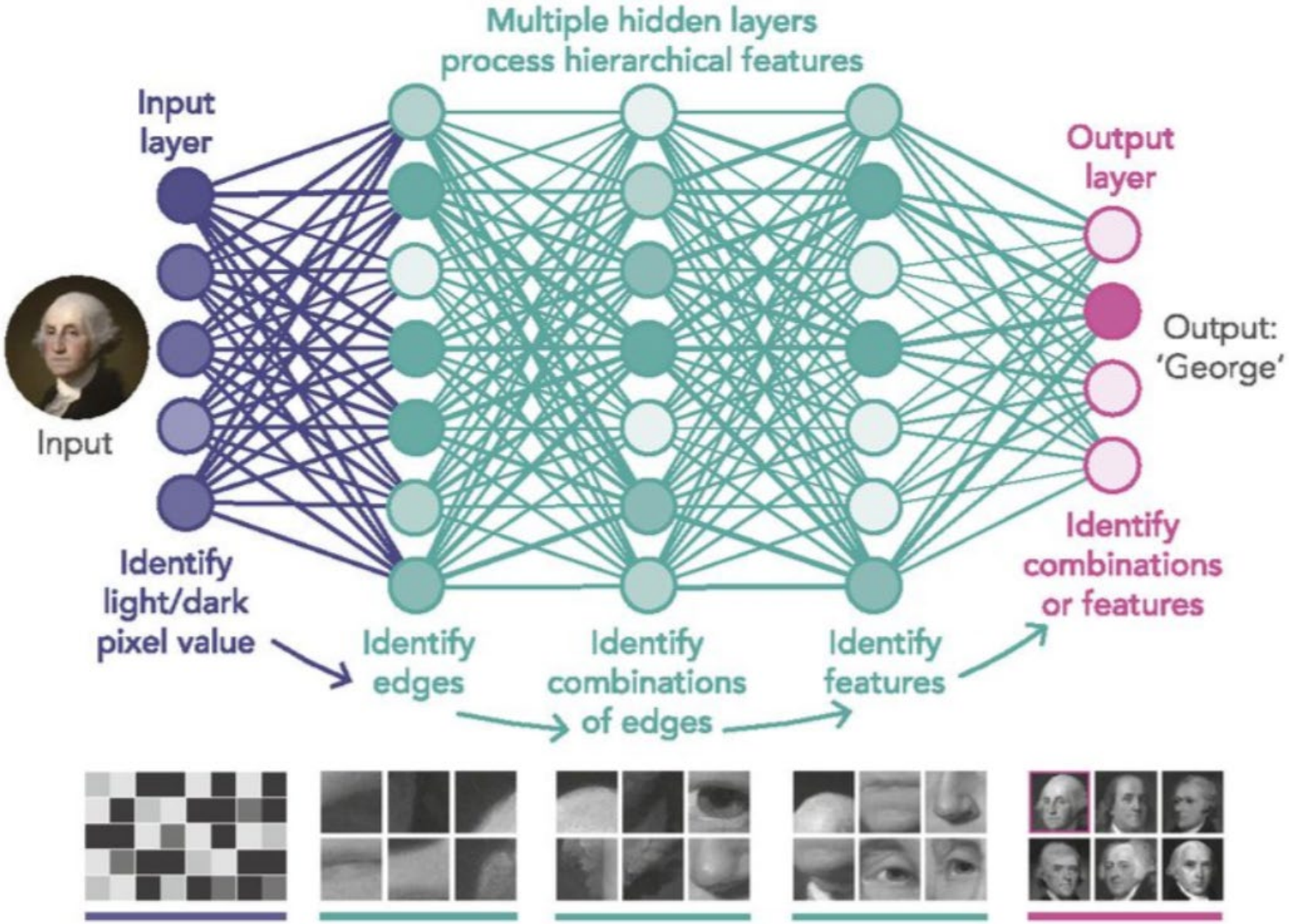
- Introduction to Artificial Intelligence (AI)
- Analytical AI vs. Generative AI
- AI in Construction Projects' Lifecycle
  - Design
  - Execution
  - Maintenance
- Key Legal Risks of AI Integration
- Ethical Considerations
- Mitigation Strategies

Artificial Intelligence

What Is Artificial Intelligence (AI)?

AI is created by training computer programs with lots of data to recognize patterns and make decisions.

Deep Learning: How Does it Work?



Artificial Intelligence

Different Categories of AI

- Analytical AI
- Generative AI

Analytical AI

Analytical AI concentrates on interpreting and analyzing data to derive insights and support decision-making processes:

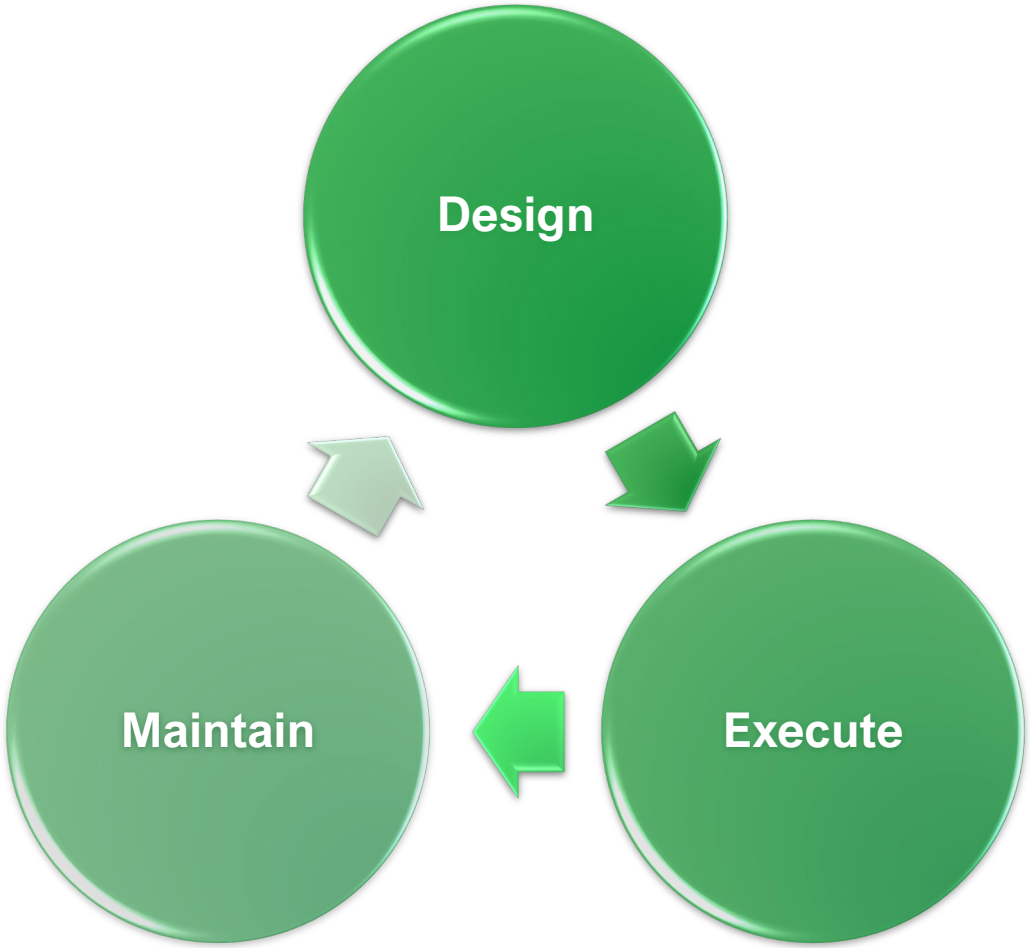
- Construction Management
- Expedited Analysis of Large Volume of Data
- Repeating and Reliable Analysis

Generative AI

Generative AI focuses on creating new content, such as text, images, or music, by learning patterns from existing data:

- Design and Value Engineering
- Execution and Maintenance Assistance
- Risk Identification and Casualty Avoidance

AI Is Applicable to All Stages of Construction Projects



Design Stage

Conceptual Designs and 3D Renderings

Three Story Commercial Office Building – Aluminum Curtain Wall vs. Brick Façade

Design Stage

Value Engineering and Design

HVAC System	Description	Advantages	Considerations	Estimated Cost
Centralized HVAC System with Chilled Water AHUs	Uses a central chiller to cool water, circulated to AHUs on each floor.	- Energy Efficiency - Consistent Temperature Control	- Higher Initial Cost - Space Requirements	$3,000 - $6,000 per ton
Variable Refrigerant Flow (VRF) System	Uses refrigerant as the cooling and heating medium, circulated to various indoor units.	- Flexibility - Energy Efficiency - Compact Design	- Complexity - Maintenance Requirements	$18 - $27 per square foot
Self-Contained Water-Cooled Unitary Devices (SWUDs) with Cooling Tower	Uses self-contained units that are water-cooled, with a cooling tower to dissipate heat.	- Independence - Ease of Installation - Redundancy	- Water Usage - Maintenance Requirements	$120 - $200 per ton

Three Story Commercial Office Building – HVAC System Options and Estimated Costs

Design Stage

Project Resourcing, Material Selection

HVAC System	Project Resourcing Options
Centralized HVAC System with Chilled Water Air Handling Units (AHUs)	- Design Configuration: Select appropriate chillers, cooling towers, pumps, and control valves. - Installation: Requires skilled labor for installation of chillers, AHUs, and piping. - Maintenance: Regular maintenance of chillers, cooling towers, and AHUs.
Variable Refrigerant Flow (VRF) System	- Design Configuration: Select appropriate outdoor condensing units and indoor evaporators. - Installation: Requires skilled labor for refrigerant piping and system controls. - Maintenance: Regular maintenance of refrigerant piping and indoor units
Self-Contained Water-Cooled Unitary Devices (SWUDs) with Cooling Tower	- Design Configuration: Select appropriate SWUDs and cooling towers. - Installation: Requires skilled labor for installation of SWUDs and cooling towers. - Maintenance: Regular maintenance of SWUDs and cooling towers

Three Story Commercial Office Building – HVAC System Resourcing Options

Design Stage

Environmental Compliance Considerations

Code/Standard	Description	Year
Arizona Mechanical Code (AMC)	Provides guidelines for the installation, maintenance, and operation of mechanical systems, including HVAC.	2018
Arizona Residential Code (ARC)	Sets standards for residential building construction, including HVAC systems.	2018
International Energy Conservation Code (IECC)	Establishes minimum requirements for energy-efficient building design, including HVAC systems.	2021
ASHRAE Standards	Includes various standards for HVAC system design, energy efficiency, and indoor air quality (e.g., ASHRAE 90.1 for energy efficiency, ASHRAE 62.1 for ventilation).	Various years
EPA Refrigerant Mandates	Regulates the use of refrigerants to minimize environmental impact and ensure compliance with environmental standards.	2025

Three Story Commercial Office Building – Applicable Codes for Design of HVAC Systems in AZ

Wait a Minute… Is all that information correct?

A Piece of Construction Pipe Thinking

Wait a Minute… Is all that information correct?

Code/Standard	Description	Year
Arizona Mechanical Code (AMC)	Provides guidelines for the installation, maintenance, and operation of mechanical systems, including HVAC.	2018

Is there actually an Arizona Mechanical Code??

- The Arizona Mechanical Code (AMC) is not a separate code.
- It refers to the locally adopted version of the International Mechanical Code (IMC), published by the International Code Council (ICC).
- Arizona jurisdictions typically adopt the IMC with local amendments to address specific regional needs.

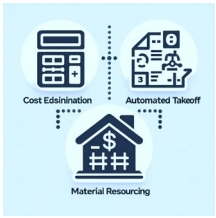
Construction Stage

Project scheduling, resource allocation, schedule optimization

Cloud-based data, streamlined collaboration between the design team, owner and management, and on-site personnel

Safety risk reduction, preventative and predictive safety assessments

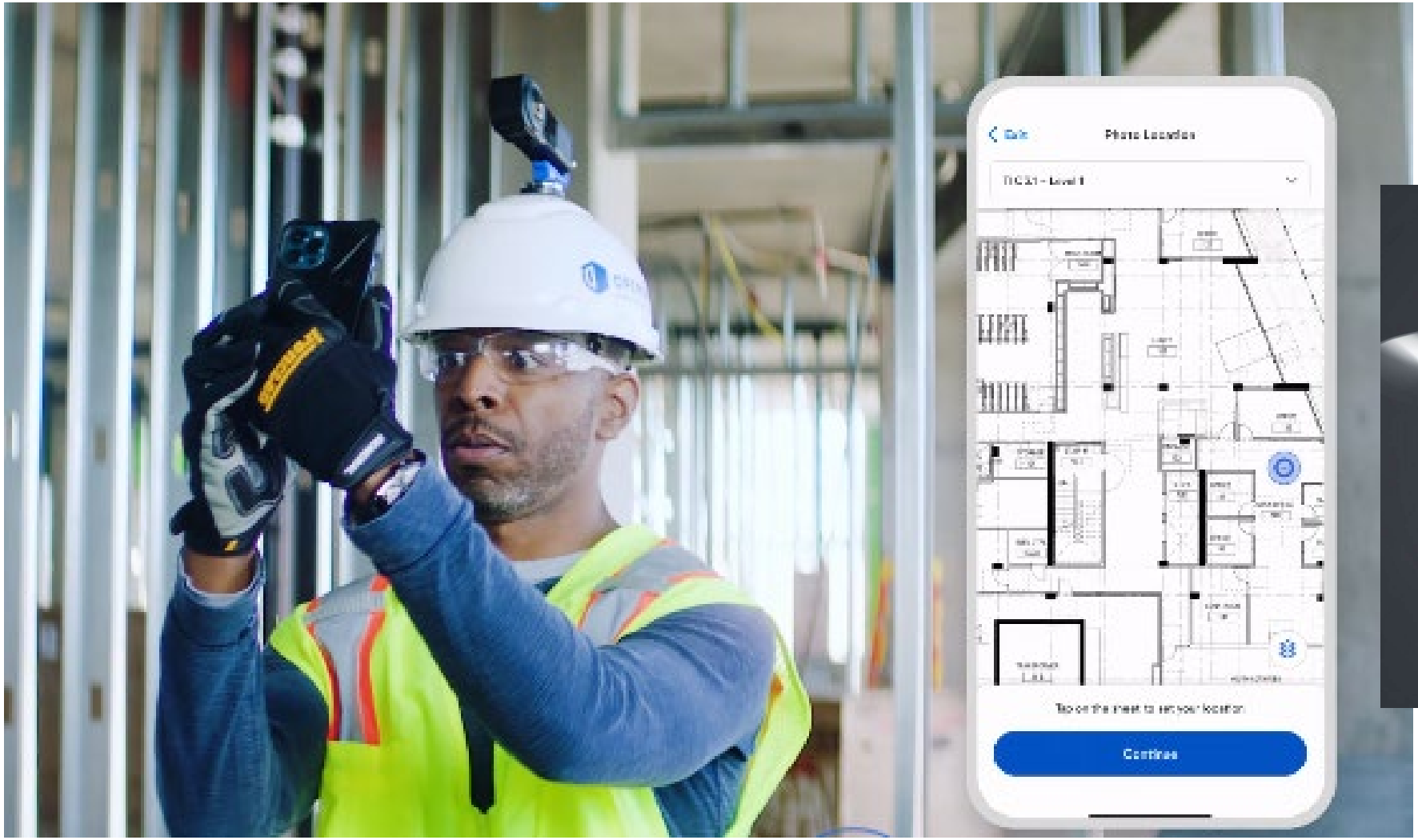
Project progress tracking, robots scanning the project site (360 degree cameras, LiDAR scanning)



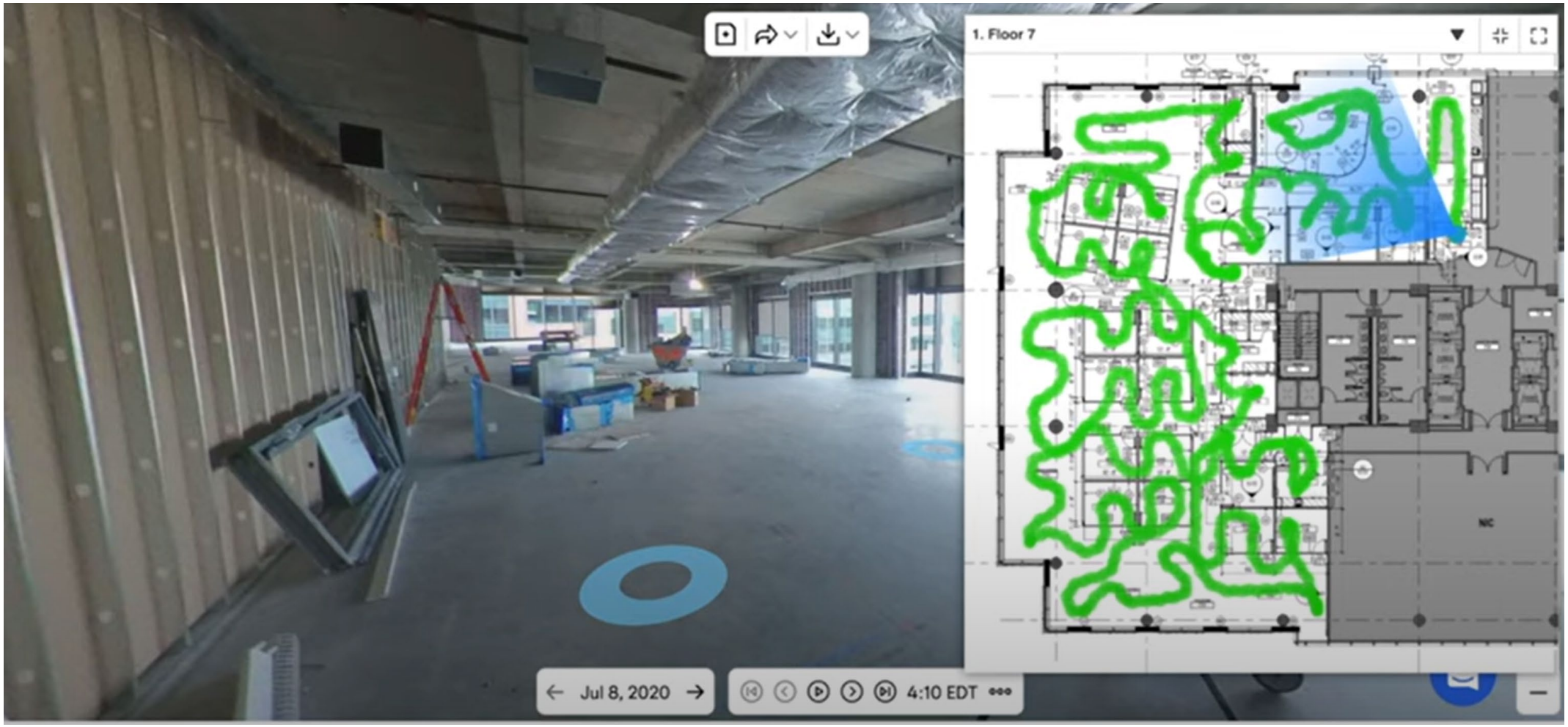
Cost estimation, automated takeoff, material resourcing

Routine operations, site health, and potentially hazardous situations identification

Construction Stage

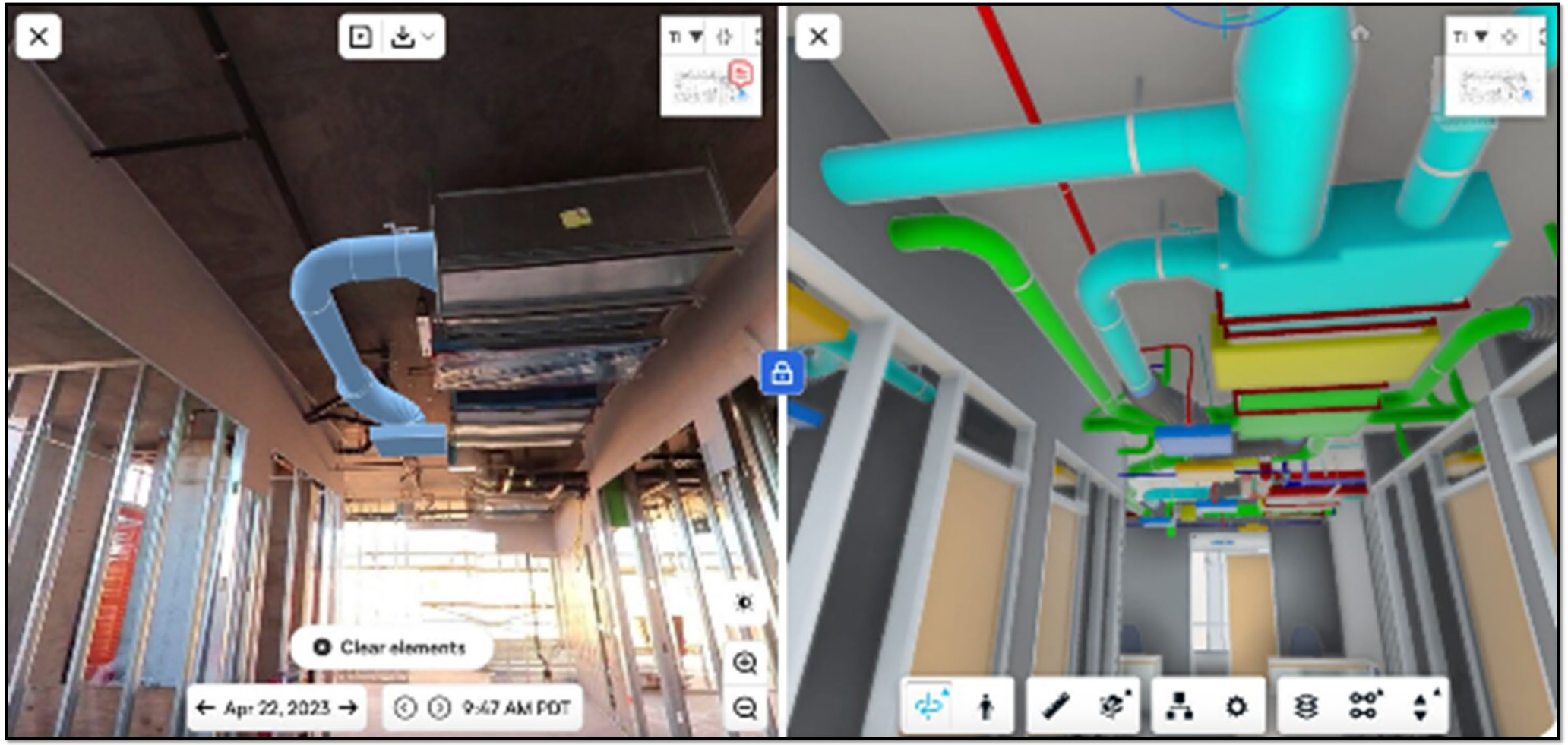


Construction Stage

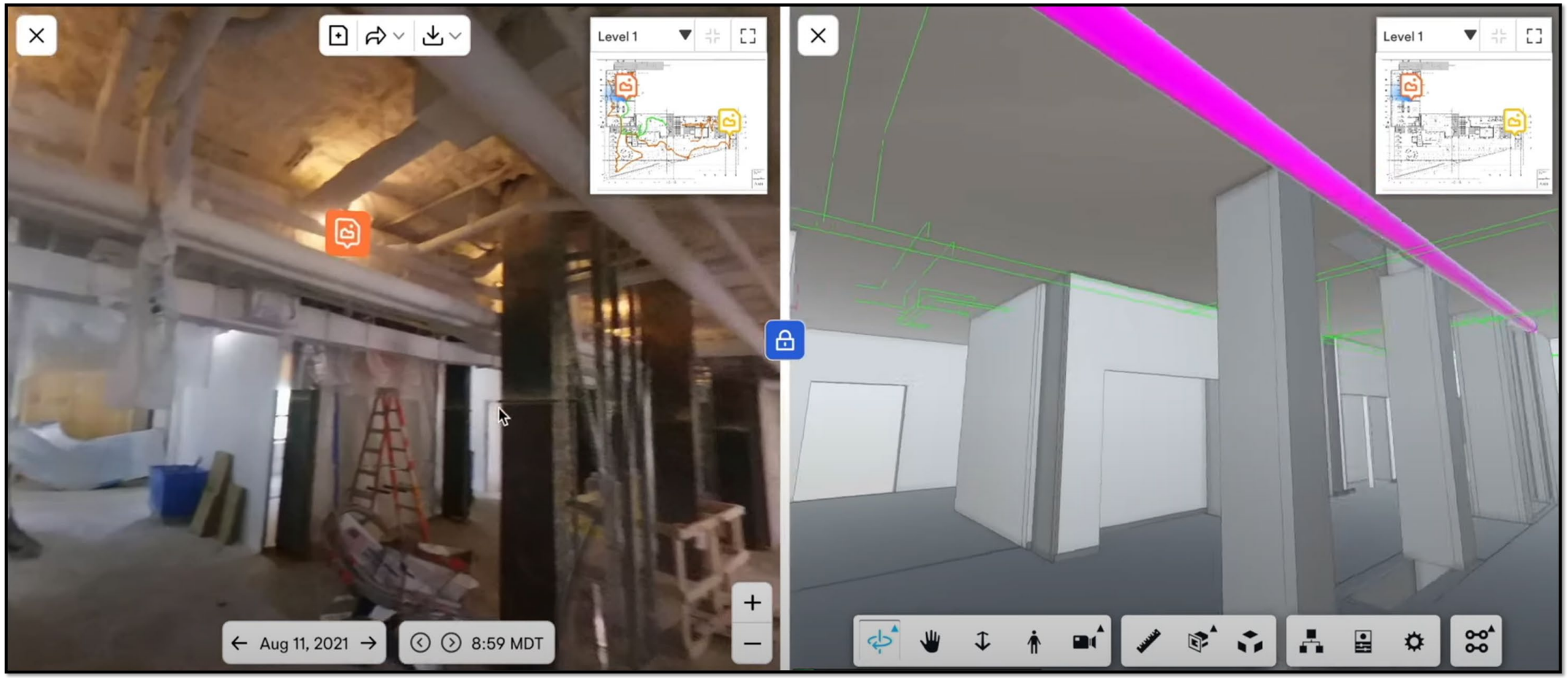


OPENSPACE

Construction Stage

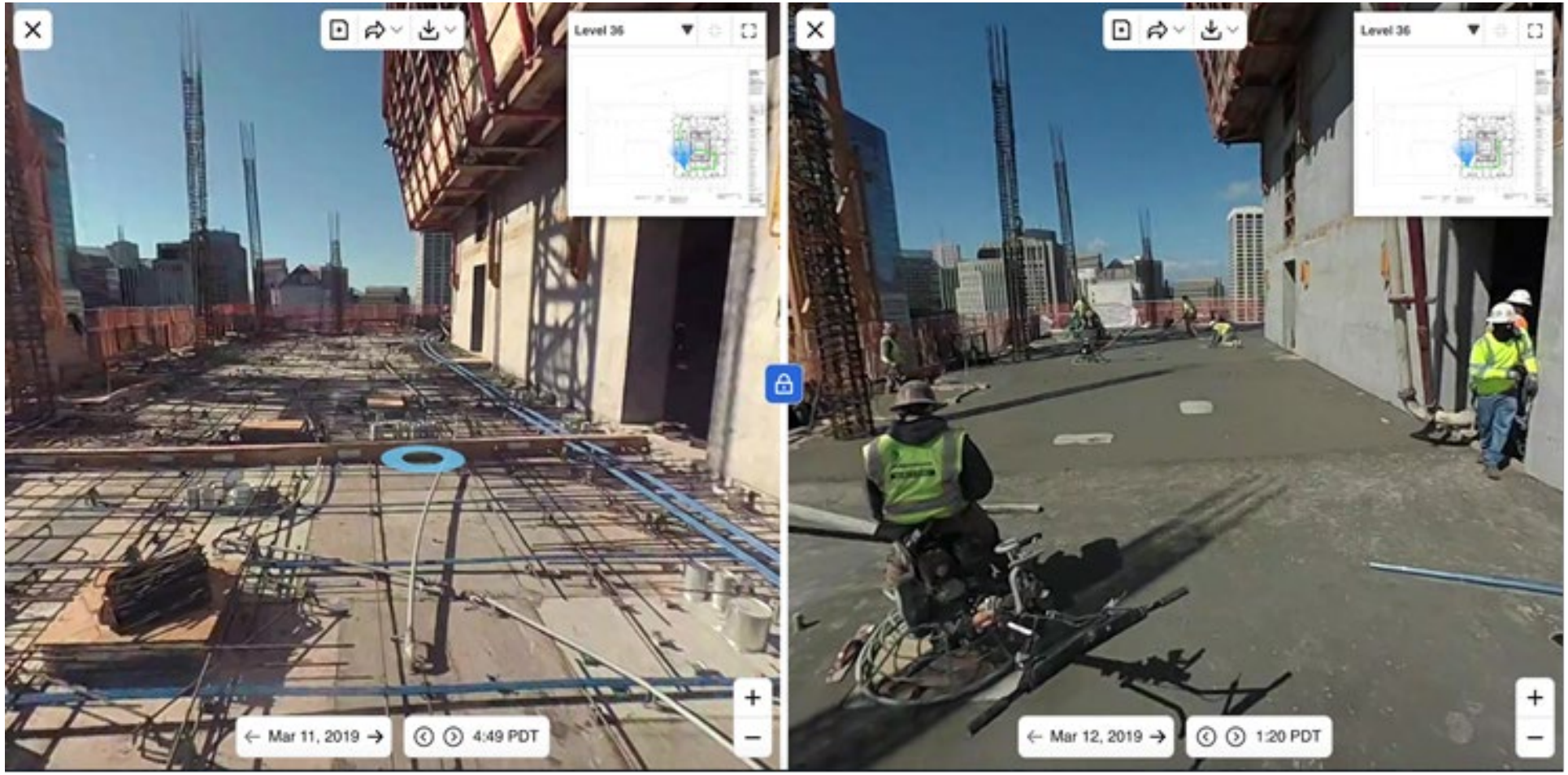


Construction Stage

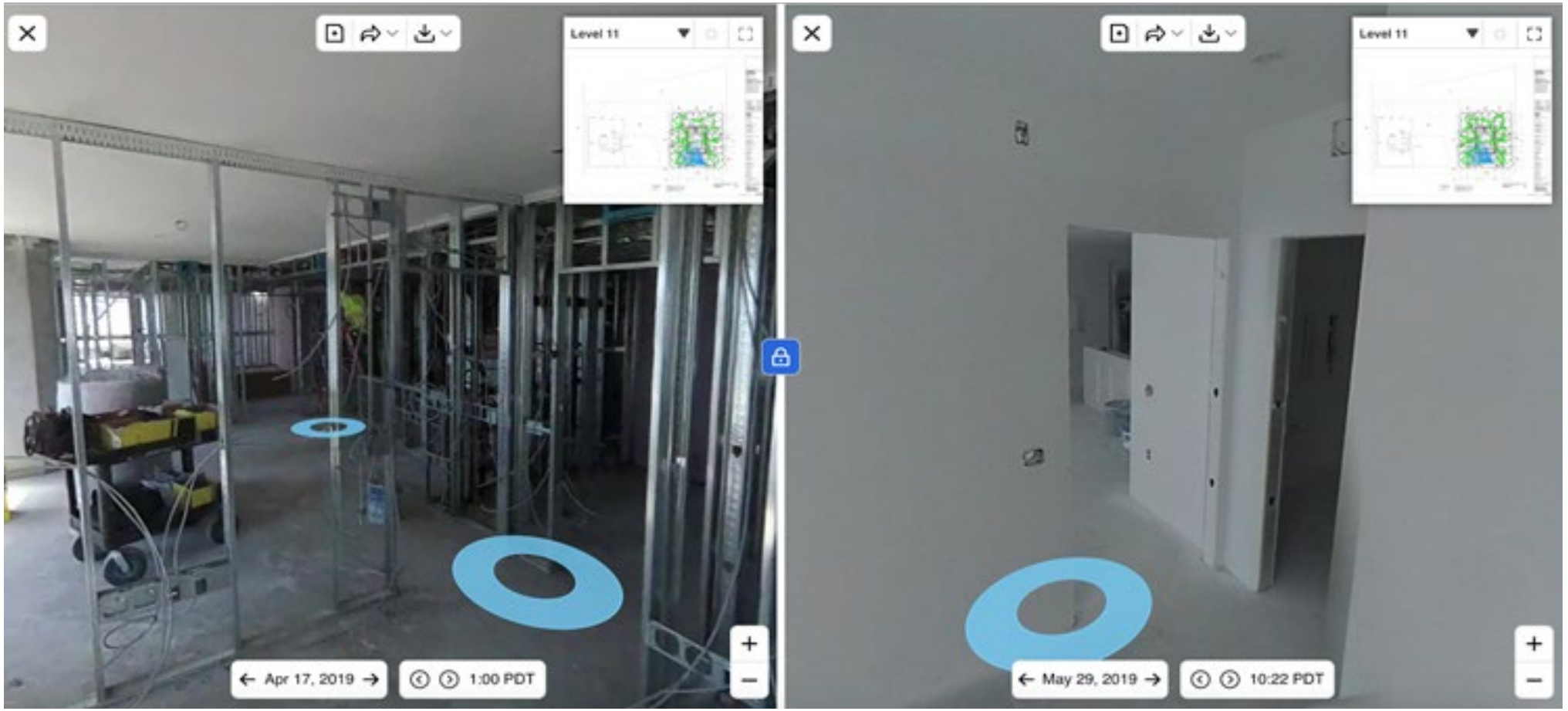


OPENSPACE

See Beneath Concrete

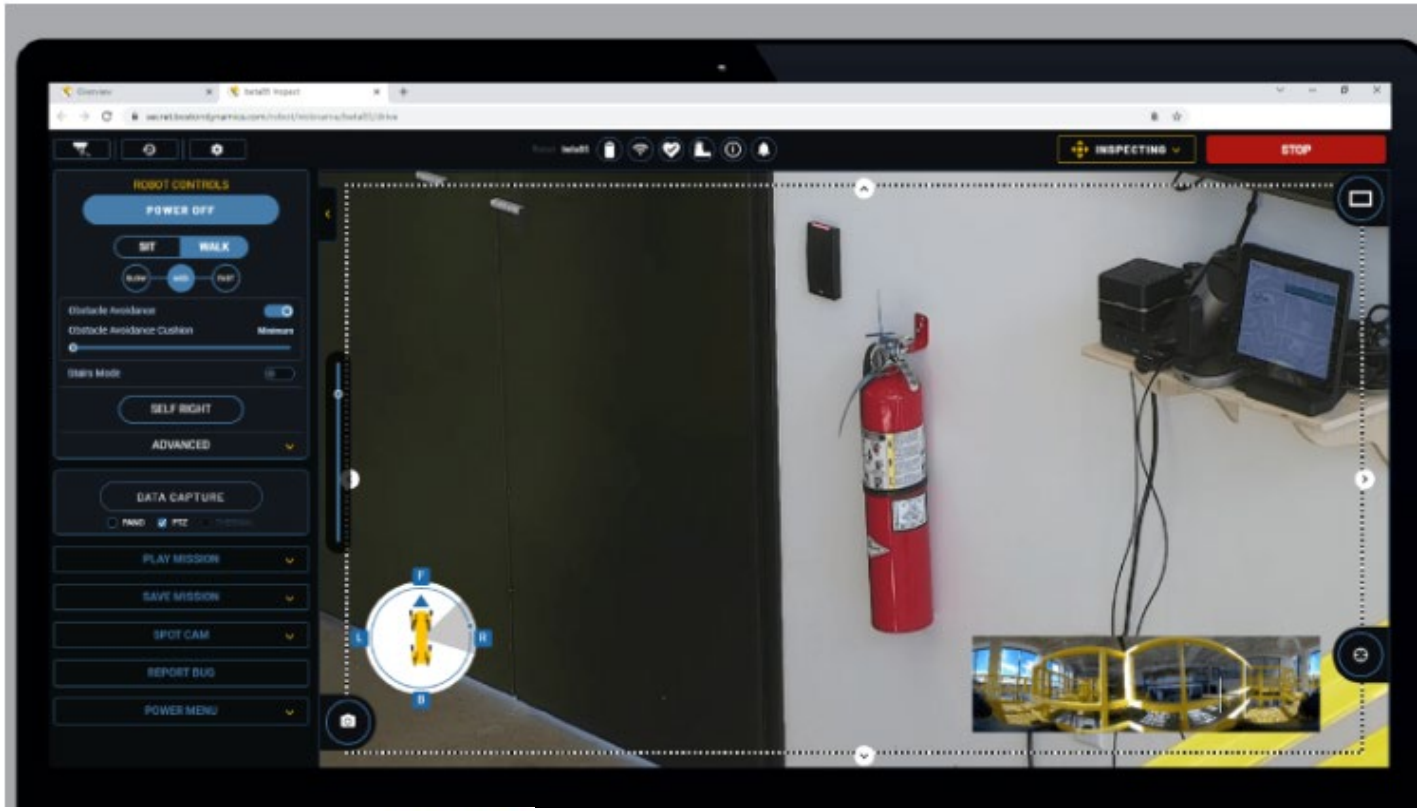


See Behind the Walls



OPENSPACE

Construction Stage



Robotic Arm

360 Camera / LiDAR Scanner

Mobility on Uneven Terrain

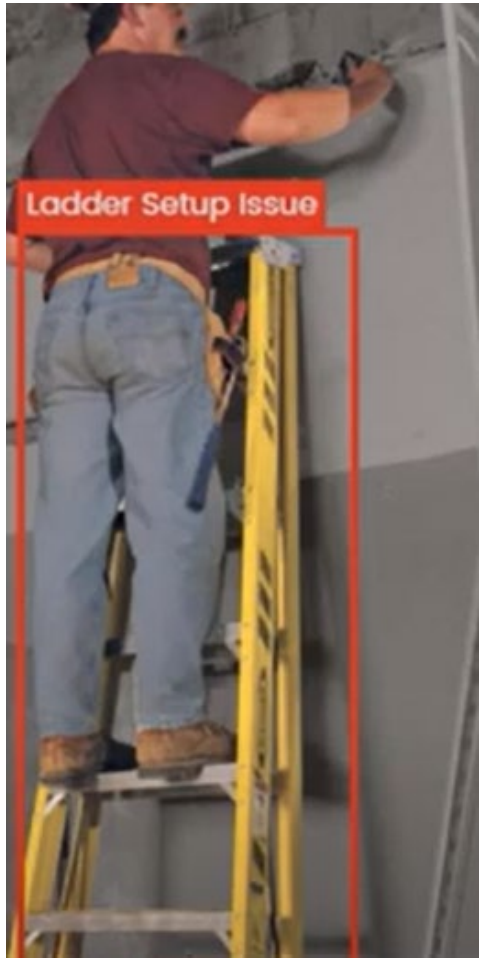
Boston Dynamics

Construction Stage

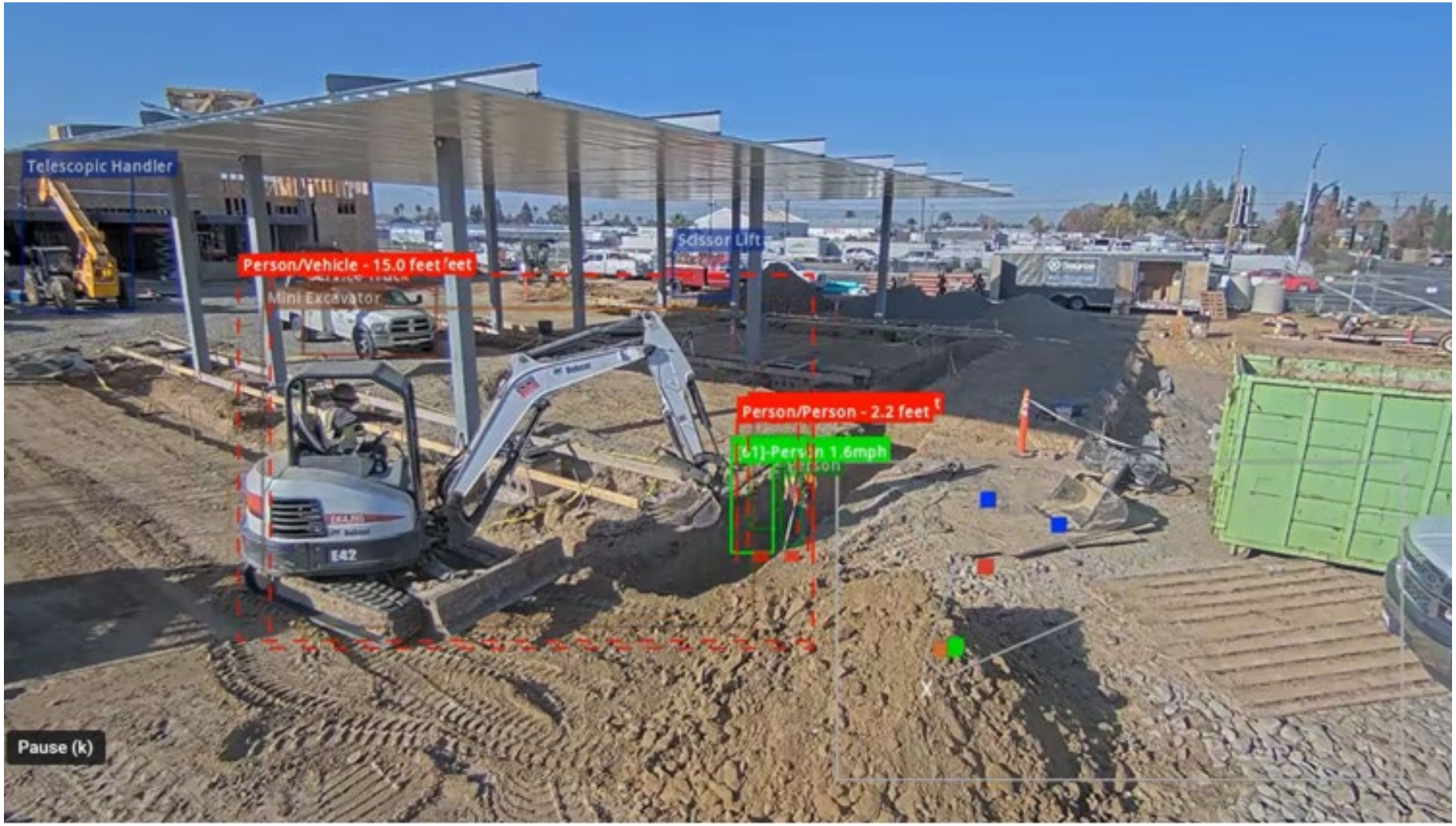
Floor	Last Capture	Tracking Status	Top Track	Framing	Drywall – Hung	Drywall – Taped
Entire Project	Feb 25, 2021	Floors Complete: 0 Floors In Progress: 9 Floors Not Started: 0	Overall: 95%	Overall: 76%	Overall: 50%	Overall: 22%
Level 10	Jan 30, 2021	IN PROGRESS	59%	27%	10%	—%
Level 2	Feb 5, 2021	IN PROGRESS	100%	100%	100%	62%
Level 3	Feb 9, 2021	IN PROGRESS	100%	83%	53%	20%
Level 4	Feb 10, 2021	IN PROGRESS	100%	100%	70%	34%
Level 5	Feb 10, 2021	IN PROGRESS	100%	84%	50%	20%
Level 6	Feb 10, 2021	IN PROGRESS	100%	84%	50%	20%
Level 7	Feb 10, 2021	IN PROGRESS	100%	70%	39%	13%

Construction Stage

- Early risk identification
- **20%** of your projects can carry **80%** of your risk
- Resource and supervision allocation



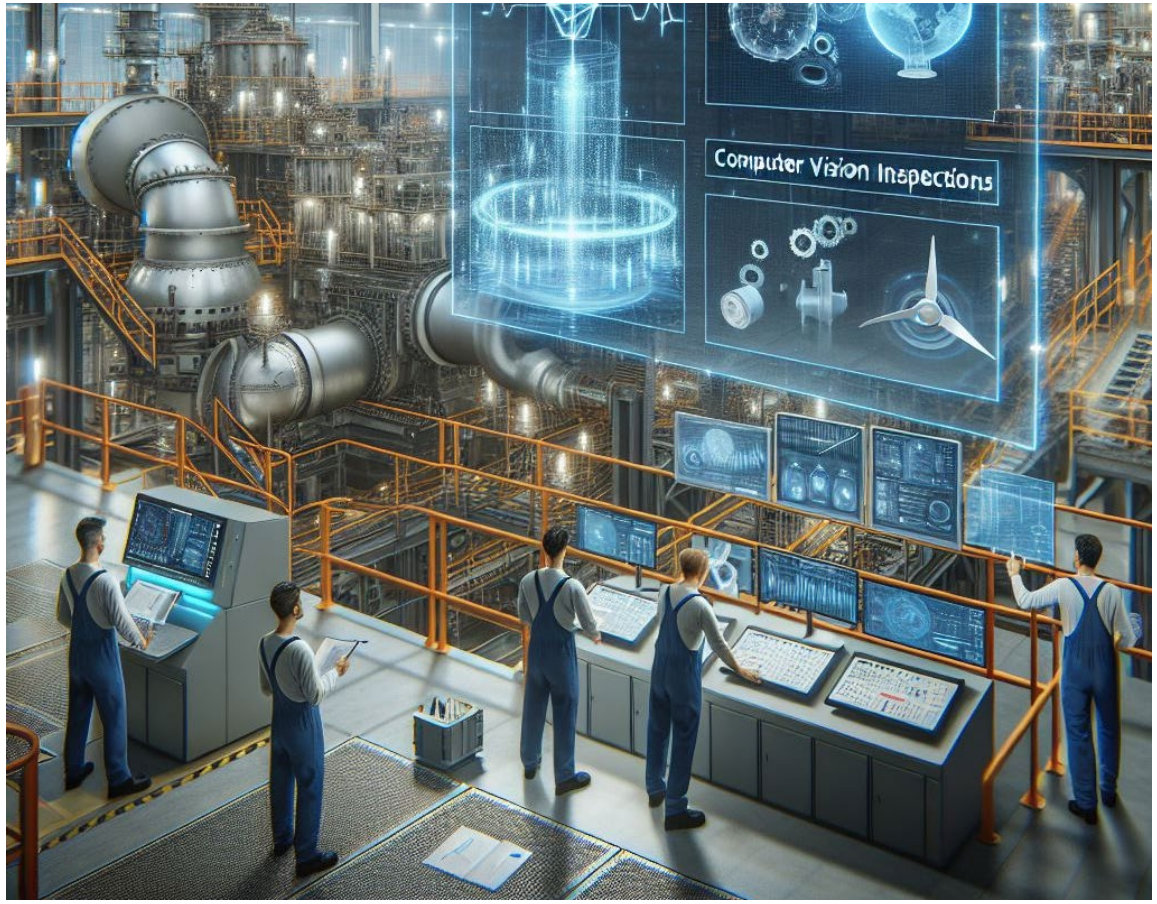
Construction Stage



EarthCam, Inc.

Maintenance Stage

- Preventative Maintenance
- Real-Time Monitoring
- Vibration Analysis
- Computer Vision Inspections
- Digital Twin Models
- Cost Savings and Extension of Life-Expectancy of Various Components
- Automated Reports and Maintenance Scheduling



Key Legal Risks of AI Integration

- Liability
- Intellectual Property
- Data Privacy and Security
- Regulatory Compliance
- Employment and National Labor Relations Act (NLRA) Concerns

Liability Risks

- Errors by AI tools may cause injury or property damage
- Agentic AI adds complexity
  - autonomous decisions = unclear fault
- Companies may be liable under products liability law
- Deployers of agentic AI tools may be vicariously liable

Intellectual Property Concerns

Who owns AI-generated designs or solutions?

AI-generated inventions raise patent questions.

Risk of copyright infringement from training data.

Silverman vs. OpenAI, Inc.

- In 2023, Sarah Silverman and other writers filed a lawsuit against OpenAI
- Plaintiffs alleged Open AI used their copyrighted books to train its large language models, such as ChatGPT
- Case was dismissed but provides a blueprint for a successful claim

Data Privacy and Security

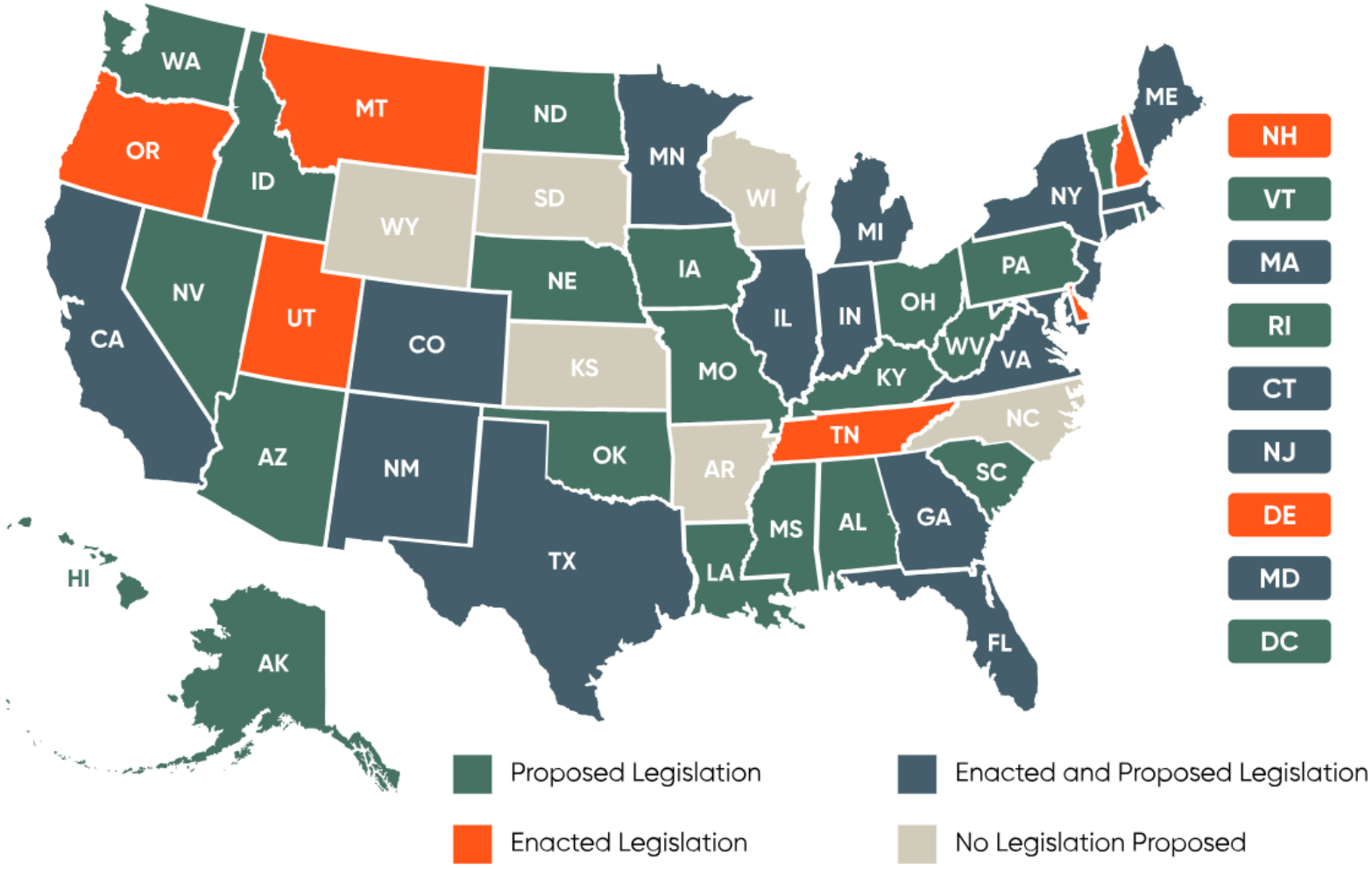
- Sensitive data gathered from wearables, GPS, etc.
- Must comply with data protection laws
- Cybersecurity is critical
  - Breaches = legal exposure
- Vet third-party vendors for data handling protocols

Regulatory Compliance

- AI must comply with safety and labor and employment laws, among others

- Companies must track AI decisions and conduct impact assessment

State Laws Add Complexity



Examples of State AI Laws

- Colorado Artificial Intelligence Act
- California AI Transparency Act
- Illinois Artificial Intelligence Video Act
- Legal counsel can help navigate the evolving standards

Employment and Hiring Risks

- AI tools in hiring may be biased
- Risk of discrimination under existing EEO laws
- Transparency in use of AI is required by certain state laws
- Human review in hiring processes is essential

National Labor Relations Act Considerations

- AI-driven automation may have implications on collective bargaining agreements
- Surveillance tools can infringe on rights protected under the NLRA

Ethical Considerations

- Algorithmic bias can perpetuate discrimination
- “Black box” issue
- Transparency and fairness must guide AI use
- Ethical frameworks to build trust with stakeholders, regulators, etc.

Mitigation Strategies

- Strong contracts with vendors
- Routine AI audits and testing
- Employee training and engagement
- Cybersecurity and data governance
- Staying current with AI regulations/laws

Human Oversight and Legal Guidance

Human oversight reduces errors and legal exposure

Use AI for support – not sole decision-making

Consult an attorney on issues that could arise from AI use

Questions?