




Specialized Approach for Inspection & Asset Management

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Inspection & Asset Management Methods

	Visual	Field Testing	Full Assessment / Advanced Testing
Description	Ground based binocular and visual observations from available access areas	Manned drops of structure exterior & interior with photo documentation of identified issues & problem areas	Inspection to clear a structure for continued use, or prior to major retrofit
Typical Range	6 to 24 months	2 to 5 years	Project specific
Typical Coverage	10 – 25%	40 – 60%	Project specific



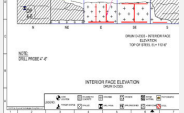
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Inspection & Asset Management Methods / Results

VISUAL INSPECTION

Locate and identify visible defects and deterioration

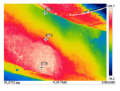
- Mappings / Drawings
- Photo Documentation



FIELD TESTING

Qualify and quantify deterioration and identify root cause

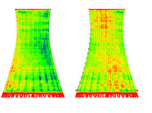
- Field data and lab test results
- Report with findings



ADVANCED TESTING

Gain detailed understanding of a structure's condition and service life expectancy


- Life cycle with no action
- Life cycle with repair options



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Inspecting Chimneys, Stacks & Cooling Towers


- Challenges
 - Internal elements only available during outages
 - Size / mass of concrete shell
 - Shape / access to structure
- Exterior Traditional Approach
 - Visual / Binocular Inspection
 - Limited "drops" / partial coverage



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Inspection & Asset Management Methods

	Visual	Enhanced Visual Full-Coverage	Field Testing	Full Assessment / Advanced Testing
Description	Ground based binocular and visual observations from available access areas	Utilize remote camera inspection as an enhancement to traditional visual inspection	Manned drops of structure exterior & interior with photo documentation of identified issues & problem areas	Inspection to clear a structure for continued use, or prior to major retrofit
Typical Range	6 to 24 months	12 to 24 months	2 to 5 years	Project specific
Typical Coverage	10 – 25%	80 – 100%	40 – 60%	Project specific



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Remote Visual Inspections




Data Gathering

Analysis

Report

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Chimney Inspection Video



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Remote Visual Inspections

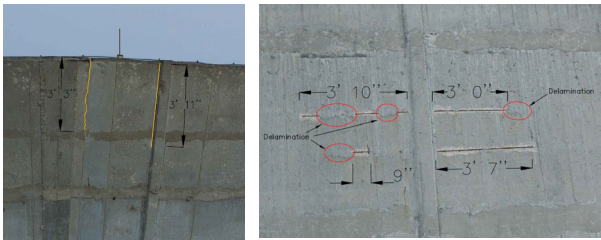
Data Gathering → Analysis → Report



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Remote Visual Inspections

Data Gathering → Analysis → Report

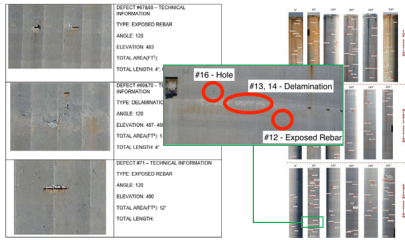


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Remote Visual Inspections

Data Gathering → Analysis → Report

Report



<p>DEFECT #16 - TECHNICAL INFORMATION</p> <p>TYPE: EXPOSED REBAR</p> <p>ANGLE: 120</p> <p>ELEVATION: 483</p> <p>TOTAL AREA(F²): 1</p> <p>TOTAL LENGTH: 4'</p>	<p>DEFECT #13, 14 - TECHNICAL INFORMATION</p> <p>TYPE: DELAMINATION</p> <p>ANGLE: 120</p> <p>ELEVATION: 487-488</p> <p>TOTAL AREA(F²): 11</p> <p>TOTAL LENGTH: 4'</p>	<p>DEFECT #12 - TECHNICAL INFORMATION</p> <p>TYPE: EXPOSED REBAR</p> <p>ANGLE: 120</p> <p>ELEVATION: 490</p> <p>TOTAL AREA(F²): 12'</p> <p>TOTAL LENGTH:</p>
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Benefits of Remote Inspections

- Safer / Quicker
- More comprehensive – total exterior coverage
- Allows for modeling options – long-term asset management

Data Gathering → Analysis → Report

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Long-Term Asset Management

Data Gathering → Analysis → Report → Model → Maintain → Update

- Utilize remote inspection data to create 3D models for long-term asset management

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Long-Term Asset Management

Model
Maintain
Update

- Build digital 3D model
- Assign locations of deterioration
- Plan tactile inspections and test locations

NORTH QUADRANT:

- Model 10 - Repair area
- Model 11 - Repair area
- Model 12 - Repair area
- Model 13 - Repair area
- Model 14 - Repair area
- Model 15 - Repair area
- Model 16 - Repair area
- Model 17 - Repair area
- Model 18 - Repair area
- Model 19 - Repair area
- Model 20 - Repair area
- Model 21 - Repair area
- Model 22 - Repair area
- Model 23 - Repair area
- Model 24 - Repair area
- Model 25 - Repair area
- Model 26 - Repair area
- Model 27 - Repair area
- Model 28 - Repair area
- Model 29 - Repair area
- Model 30 - Repair area
- Model 31 - Repair area
- Model 32 - Repair area
- Model 33 - Repair area
- Model 34 - Repair area
- Model 35 - Repair area
- Model 36 - Repair area
- Model 37 - Repair area
- Model 38 - Repair area
- Model 39 - Repair area
- Model 40 - Repair area
- Model 41 - Repair area
- Model 42 - Repair area
- Model 43 - Repair area
- Model 44 - Repair area
- Model 45 - Repair area
- Model 46 - Repair area
- Model 47 - Repair area
- Model 48 - Repair area
- Model 49 - Repair area
- Model 50 - Repair area

Small QR code photos

Long-Term Asset Management

Model
Maintain
Update

- Graphic QA/QC Documentation Improves quality of repairs
 - Added to model creates "As-Built" BIM Model asset management tool
 - Full documentation at all repair locations (not sample QA)
 - Real time remote access to project team

Long-Term Asset Management

Model
Maintain
Update

- Future remote inspections allow for full coverage updates and tracking of condition of structure
- Prioritize future maintenance schedules and budgets

Location	Type	Condition
Exterior: Pin 34	Steel / Weld	
Exterior: Pin 35	Steel / Weld	
Exterior: Pin 36	Steel / Weld	
Exterior: Pin 37	Steel / Weld	
Exterior: Pin 38	Steel / Weld	
Exterior: Pin 39	Steel / Weld	
Exterior: Pin 40	Steel / Weld	
Exterior: Pin 41	Steel / Weld	
Exterior: Pin 42	Steel / Weld	
Exterior: Pin 43	Steel / Weld	
Exterior: Pin 44	Steel / Weld	
Exterior: Pin 45	Steel / Weld	
Exterior: Pin 46	Steel / Weld	
Exterior: Pin 47	Steel / Weld	
Exterior: Pin 48	Steel / Weld	
Exterior: Pin 49	Steel / Weld	
Exterior: Pin 50	Steel / Weld	
Exterior: Pin 51	Steel / Weld	
Exterior: Pin 52	Steel / Weld	
Exterior: Pin 53	Steel / Weld	
Exterior: Pin 54	Steel / Weld	
Exterior: Pin 55	Steel / Weld	
Exterior: Pin 56	Steel / Weld	
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Exterior: Pin 90	Steel / Weld	
Exterior: Pin 91	Steel / Weld	
Exterior: Pin 92	Steel / Weld	
Exterior: Pin 93	Steel / Weld	
Exterior: Pin 94	Steel / Weld	
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Exterior: Pin 97	Steel / Weld	
Exterior: Pin 98	Steel / Weld	
Exterior: Pin 99	Steel / Weld	
Exterior: Pin 100	Steel / Weld	

Exterior: Pin 34

Type	Steel / Weld
Elevation	643.2'
Angle	248°
Total Area (sq')	N/A
Total Length	N/A
Level of Degradation	Low

Notes:
Chimney cap weld broken at mark 248. Steel hanging below drainage system.

Remote Inspection & Long-Term Asset Management

Data Gathering
Analysis
Report
Model
Maintain
Update

- Safe method for 100% visual inspection
- Improve quality of future inspections and maintenance activities
- Long-term approach improves scheduling & budgeting

Remote Visual Inspections

Model
Maintain
Update

Data Gathering
Analysis
Report

Data Gathering
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