Southern Environmental, Inc

ESP Rebuild Considerations

W W W.SEI-Group.com

Southern Environmental,Inc.
Pensacola,Florida
850-944-4475

Synergy with Cinergy

- SEI Can Help With:
  - Defining the scope of work
  - Providing Budgetary Pricing
  - Defining Engineering and Material lead Times
  - Defining Outage Time and Support Needs
  - Providing Commercial Review

SEI Engineering Support

- Engineering Studies
- ESP Design and Sizing
- Performance Calculations
- Gas Flow Modeling
- Civil, Structural, Mech., Electrical Design
- Technical Presentations
- Access to Vendors and Subcontractors

SEI ESP Parts Support

- Automated Parts On Line Support
- Automated Budgeting Support
- On Line Purchasing
- Providing Non SEI Parts

SEI- Other Capabilities

- Construction Services
  - Budgets, Schedules, Manpower, Equipment
- Shop Fabrication Of:
  - ESP, Baghouse, SCR, Scrubber Components
- ESP Inspections
  - Dirty and Clean

Needed From Cinergy

Drawings: (Minimum)

- External: Side and End Elevations
- Internal: Side and End Elevations
- Top: Plan Elevation
- Snapshot Data

Snap Shot Data

- Gas Volume, Temperature, and Pressure
- Inlet/ Outlet Loadings in gdscf
- Opacity and Stack Diameter
- Fuel, Flow Rate , and HHV (MBTU/#)
- Fuel Source
- TR Data: Layout and Volts/Amps
- Also needed:
  - Stack Test
  - -Fuel and Ash Analysis

SEI Guaranty and Warranty

Warranty:

Flexible to meeting contract requirements

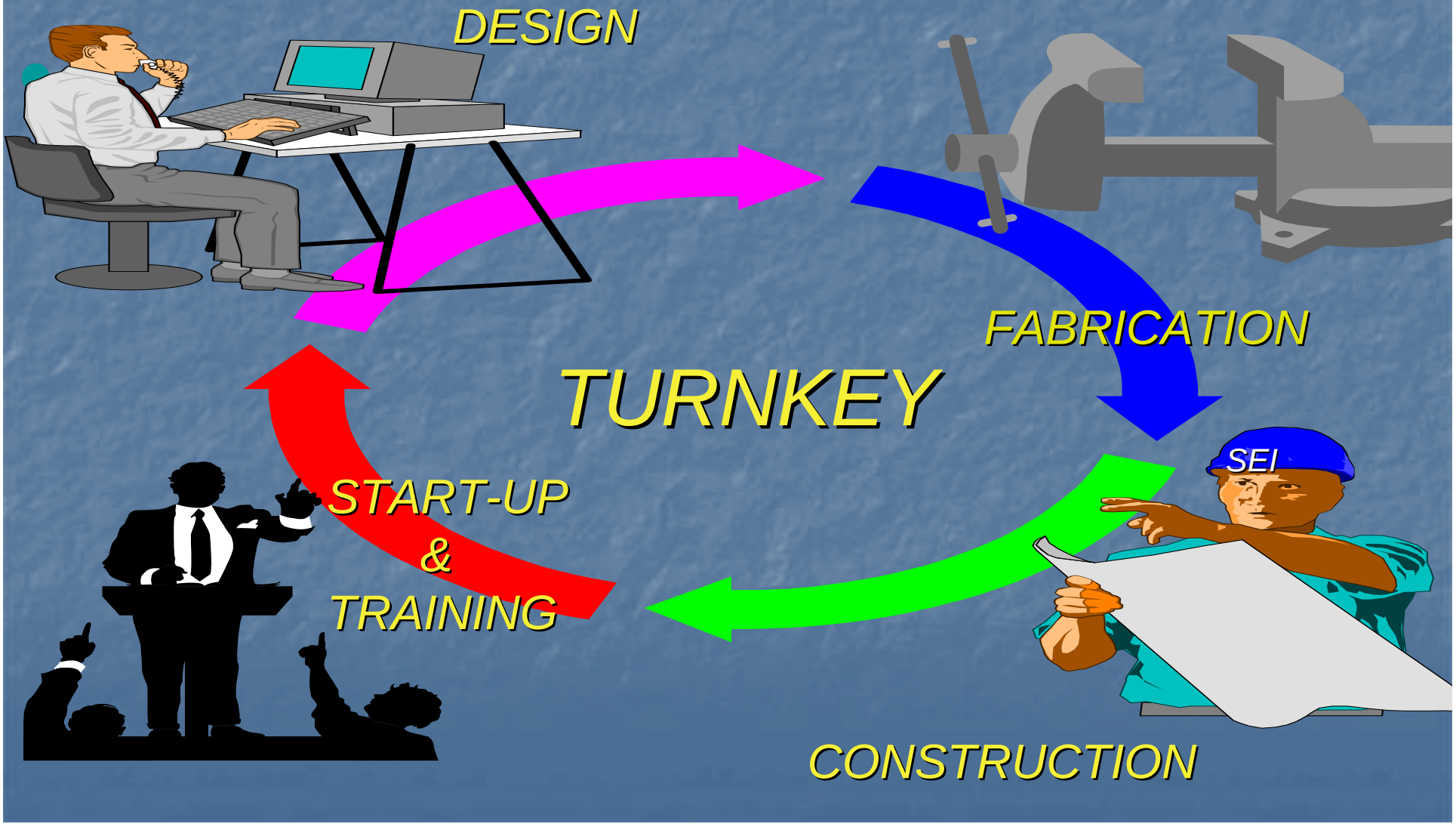
- **Guaranty:**

  Particulate Emissions- Based on grain loading

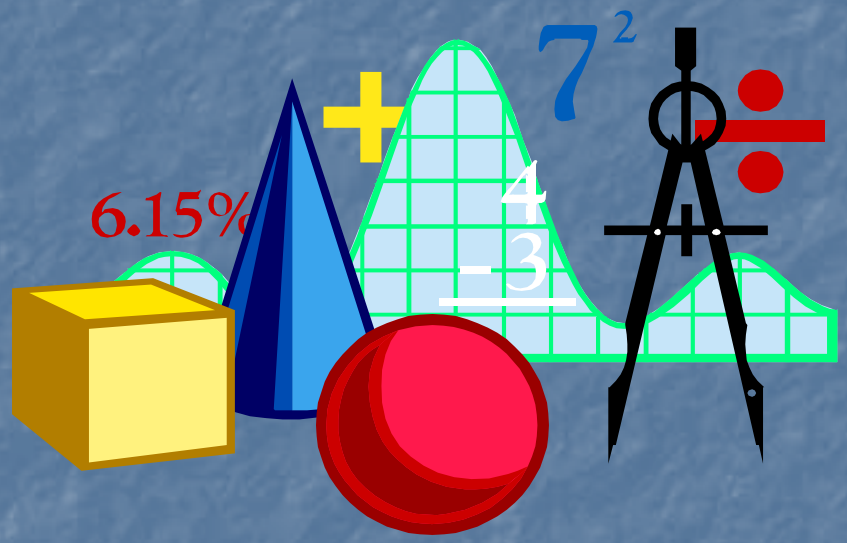
  Opacity

  Curves - Volume, Temperature, Dust load

Project Capabilities



SEI Precipitator Design



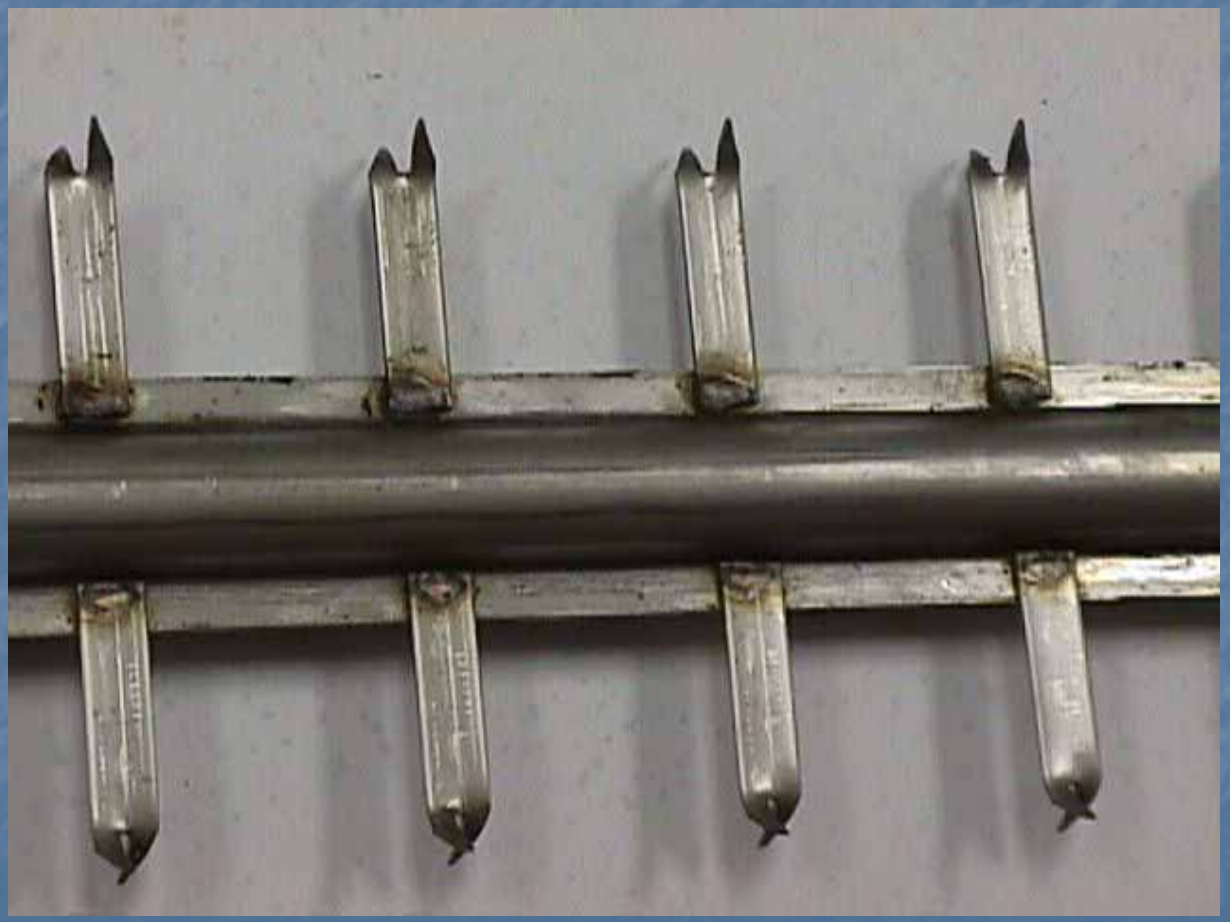
SEI Applications

Plate Spacing:	**9” to 16”**
Fuels:	**Coals, chemicals, waste**
ESPs:	**Dry and Wet**
Conversions	**Hot to Cold**
	Wires to Ridgid Electrodes
Industrial:	**Pulp & Paper , Cement**
Boilers	**Recovery, Power, Utility**

SEI/ELEX Discharge Electrode

- Rigid Electrode System
- Variable Emitter Point Settings
- Variable Emitter Tab Settings
- Low Corona Onset Voltage
- 3/4” Dia. 16 Gauge ASTM A-620 Steel
  - Roll Formed

SEI/ELEX Rigid Discharge Electrode (Optimized)



Collecting Electrodes

- Plate Problems Typically Initiate Decision To Rebuild
  - Replaced For Reliability: Corrosion And Metal Fatigue
  - For Performance: Clearance Problems Due To Warpage
- Plate Spacing:
  - Typically Varies From 9 To 16 inches
  - Plate Area Can Be Reduced By Increasing The Plate To Plate Spacing And Increasing The Precipitator Voltage Proportionally
- Plate Rapping
  - Maximize Rapping G forces Into Plate Verses Support Structures

Collecting Electrodes

- Corrosion -Correct by Good Control Over Boiler Or Process
- Metal Fatigue - Often Related to Design
- Warpage
  - Severe at 50 % of design clearance
  - Distorts Gas Distribution
  - Promotes Sneak By Gas Flow (2% Efficiency Losses)
  - Reintrains Gas Flow Particulates
  - Detrimental To Rapping Forces
  - Low Adhesion at Warped Surfaces

Rapping Systems

- Objectives:
  - To Clean Collecting and Discharge Electrodes
  - Minimize Reentrainment, Stack Puffs, and Back Corona
- Customer Needs:
  - Reliability, Low Maintenance, and Serviceability
- Types:
  - Hammer, Electromagnetic, and Vibrators

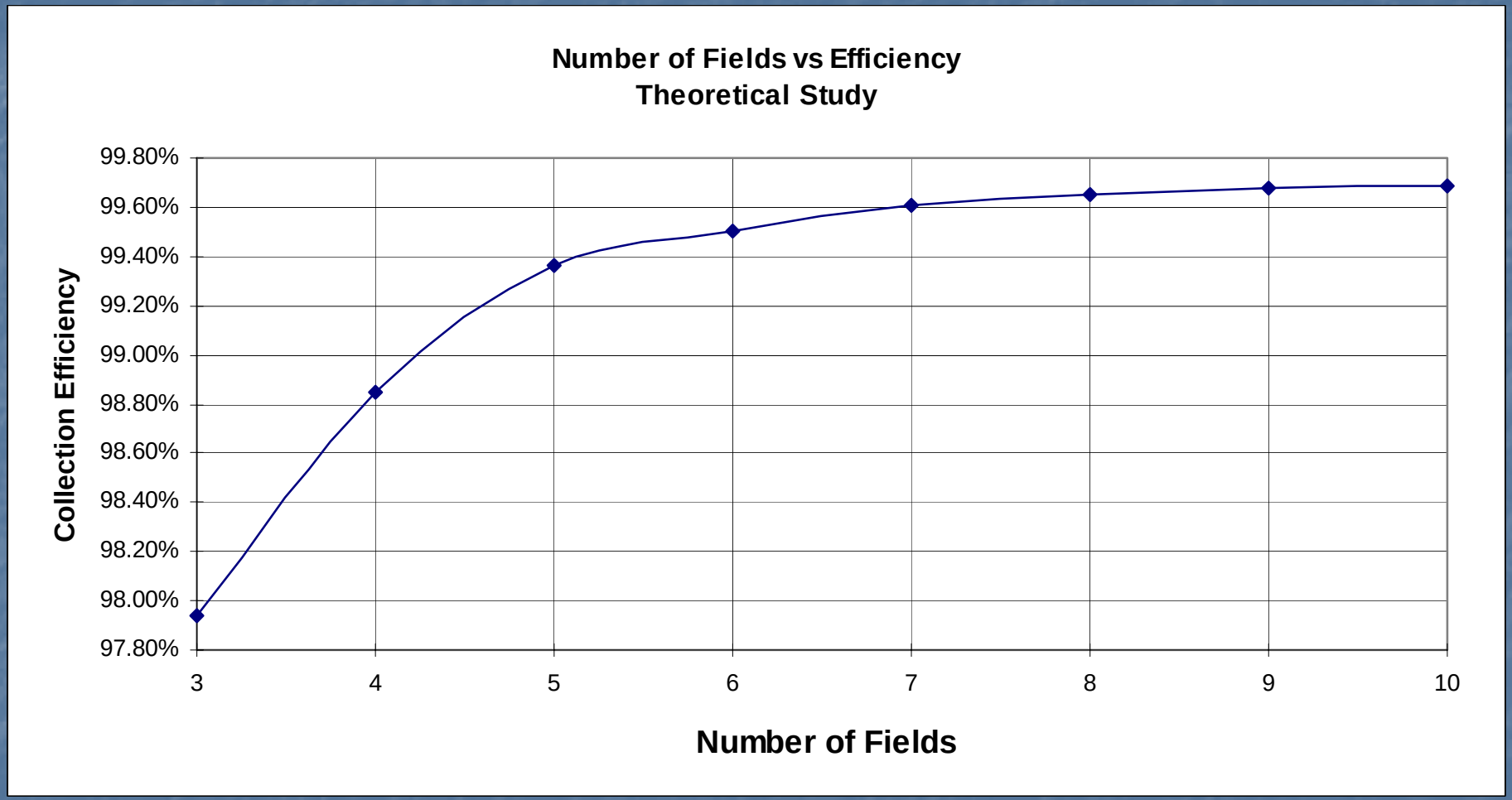
Electrical Sectionalization

- In Direction Of Gas Flow Allows Optimal Distribution Of Power
  - High Resistivity Condition -May Want To Increase Power
  - Low Resistivity Condition -May Want To Reduce Power
- Benefits:
  - Reliability
    - Minimize Loss Of Treatment Zone during failure
    - Continue To Operate At/ Or Near Design Efficiency
- Flexibility: (Of Greater Number Of Fields)
  - Ability To Handle Major Changes In Particulate Concentrations
  - Ability To Handle Greater Range of Particulate

Sectionalization

Recommendations For Optimal Number Of Fields:

Minimum Number	Efficiency Range
4 Fields	99.0 - 99.3%
5 Fields	99.4 - 99.6%
6 Fields	99.7 - 99.8%
7 Fields	99.9%


Number of Fields vs Efficiency
Theoretical Study
Collection Efficiency
99.80%
99.60%
99.40%
99.20%
99.00%
98.80%
98.60%
98.40%
98.20%
98.00%
97.80%
3
4
5
6
7
8
9
10
Number of Fields

Particulate Treatments

- Sulfur (SO_3) For High Resistivity Ash
- Ammonia For Fine Particulate
- Sodium For Hot Side ESPs

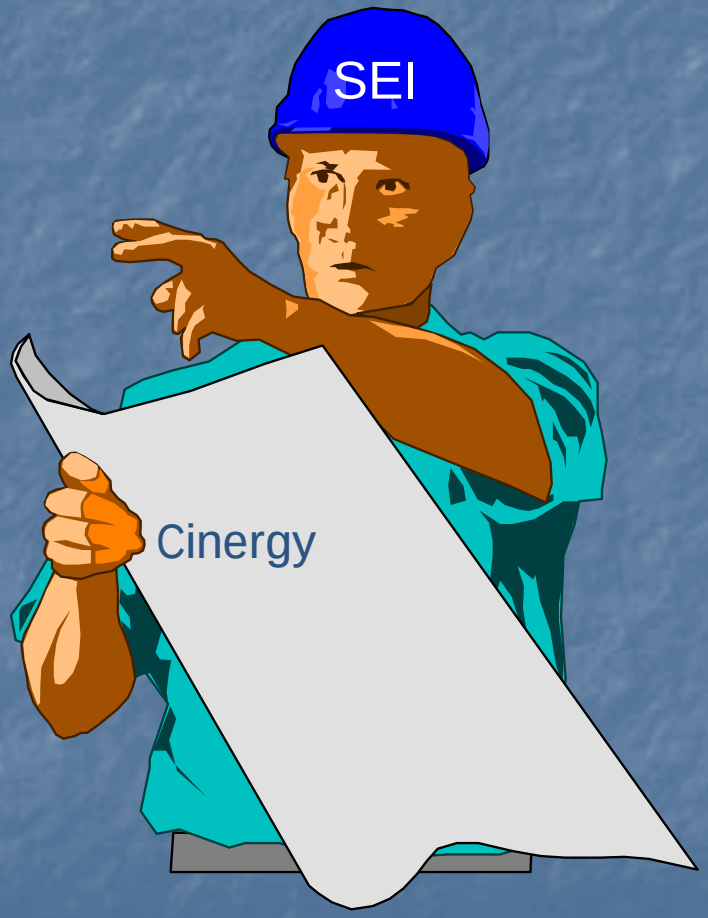
Hoppers

- Design:

Select Single Hopper Per Field To Minimize Efficiency Loss

- Include Baffling
  - Minimizes Re-entrainment & Bridging Probability
  - Aids in Avoiding Shorts And Large Clinker Formations

Southern Erectors Inc.



Southern Erectors, Inc.

- A mechanical contractor specializing in:
  - Shop Fabrication
  - Field Construction
  - New and Rebuild Projects


SEP 11 2003

Computer Controlled Plasma/Gas Machine


KALYN
SIEBERT
SEP 11 2003

SOUTHERN environmental INC.

Fabrication Shop Capabilities

- 300 tons production per month per shift
- 10 Acre complex
- 50,000 square foot shop with:
  - Four, five-ton overhead cranes
  - 200 ton press,
  - Roll machine
  - Plasma/gas cutting machine
  - Spray painting facility

SEI / ELEX RDE Shop

- 15,000 square foot building
- Cold roll forming equipment
- Pre and final assembly stations
- Quality control stations
- Special Crating

SEI Dry ESP Construction

SEI Wet ESP Construction

SEI Bag House Construction

Duke Power Cliffside Station

SOUTHERN environmental INC.

Utility Retrofit Project

- Duke Energy
- Clifside No. 5 – 600 MW
- Add new 4th field & rebuild 3 original fields in a 12 week outage
- $13+ MM Turnkey project

Construction Scope- Duke Power

- Rehab Inlet Chevron Duct
- Stiffen For (-32)” wg
- Replace Roof
- Retrofit Internals
- Hopper Cones 24 ea X 8Ft
- Add New Outlet Fields
- New TRs, Rappers, Controls
- Relocate Outlet Chevrons
- New Foundations and Electrical

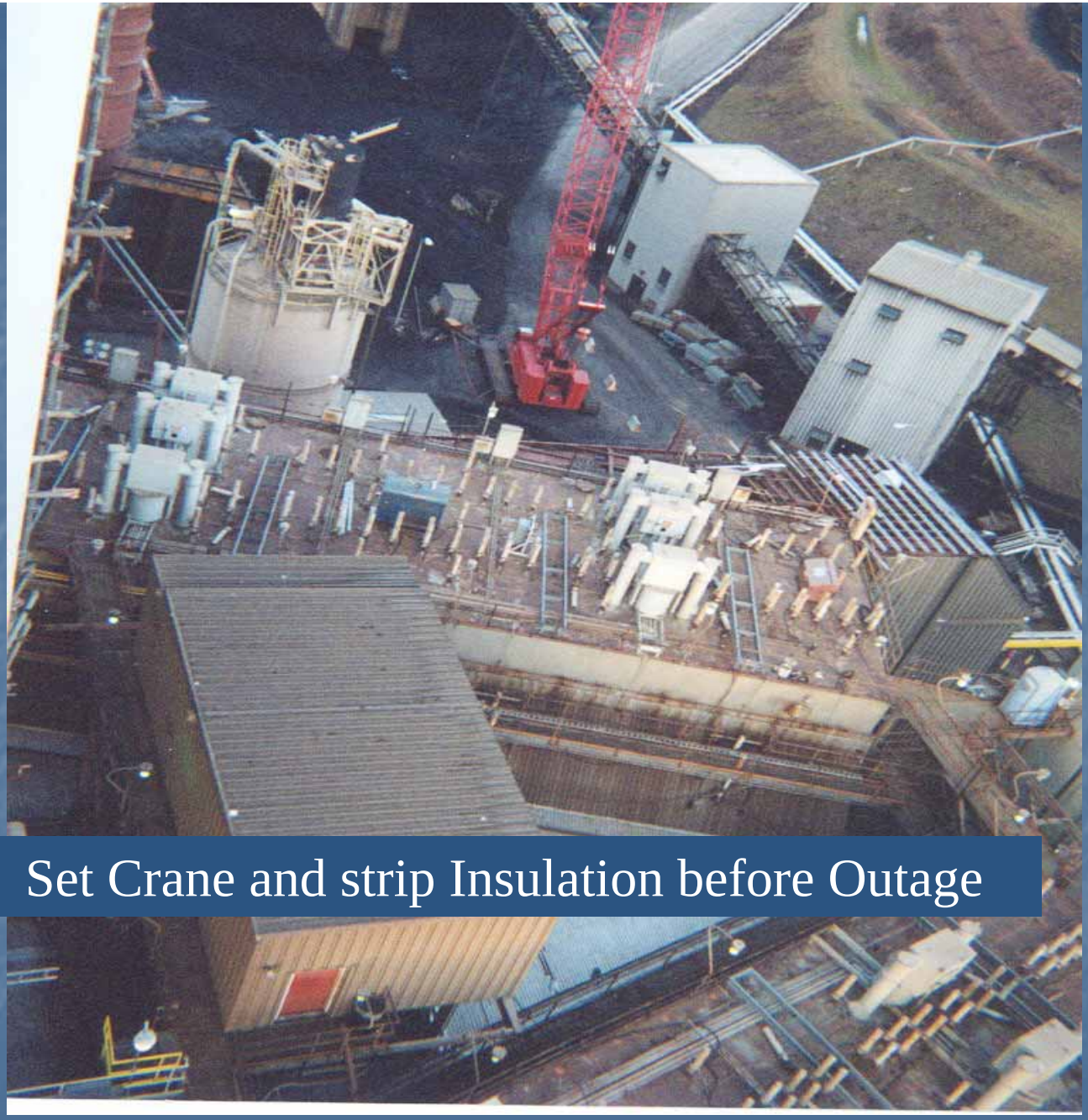
Installing the future SCR “cylinders” in the Inlet Duct

Installing the SCR “cylinders” in the Inlet Duct

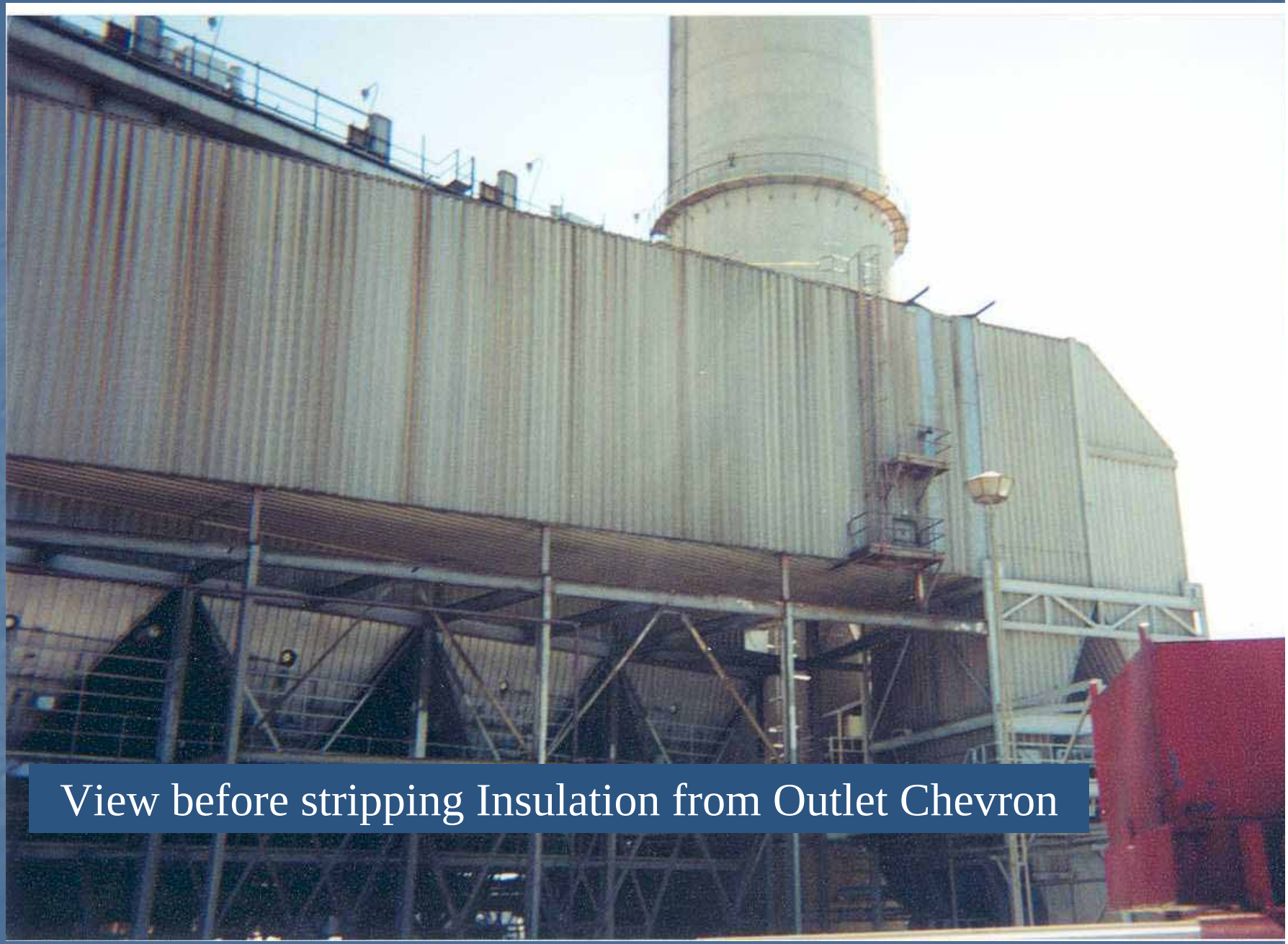
Installing the new Foundations

Checking/Strengthing the existing Foundations

Prior to pouring Slab



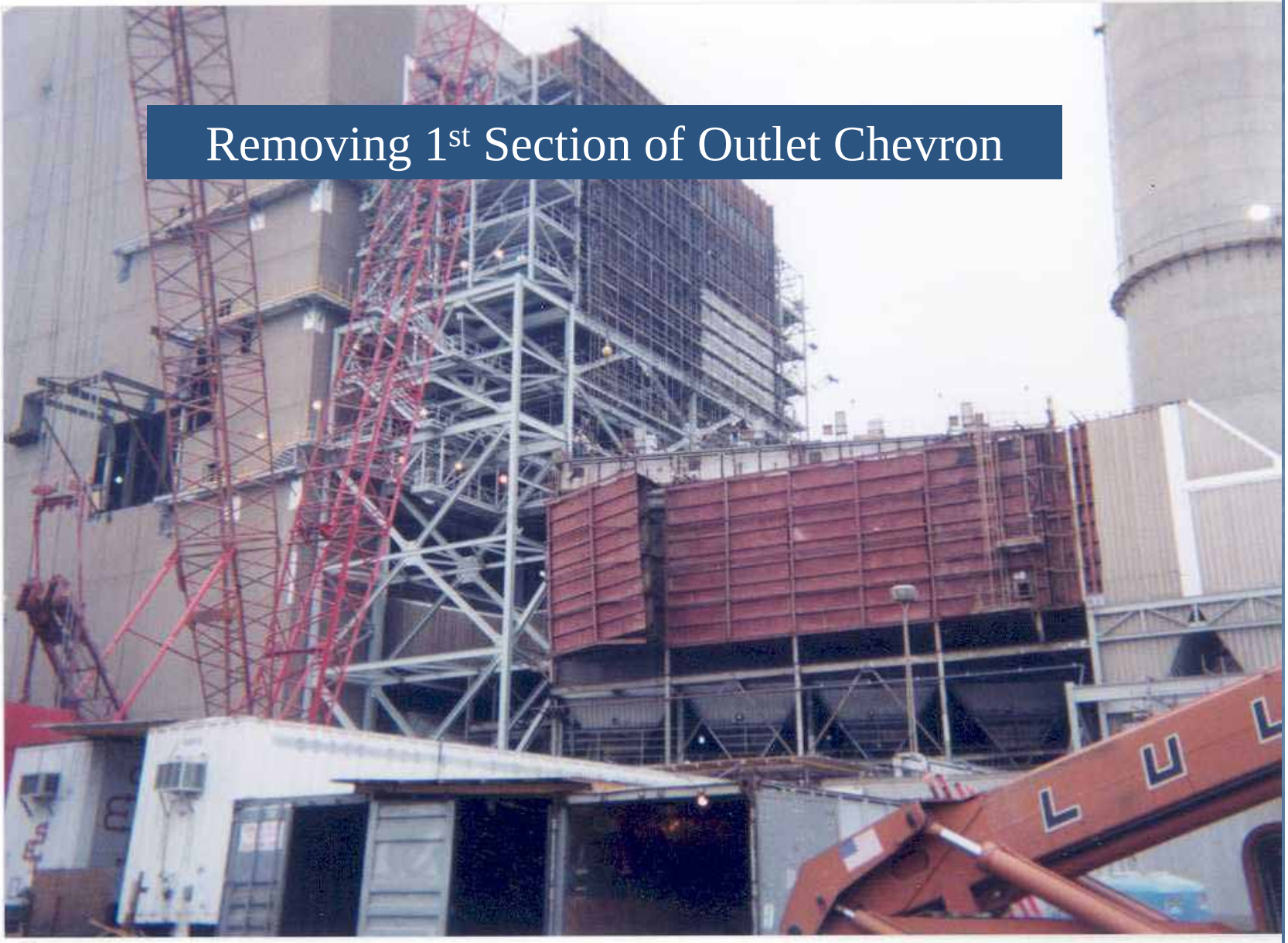
Set Crane and strip Insulation before Outage



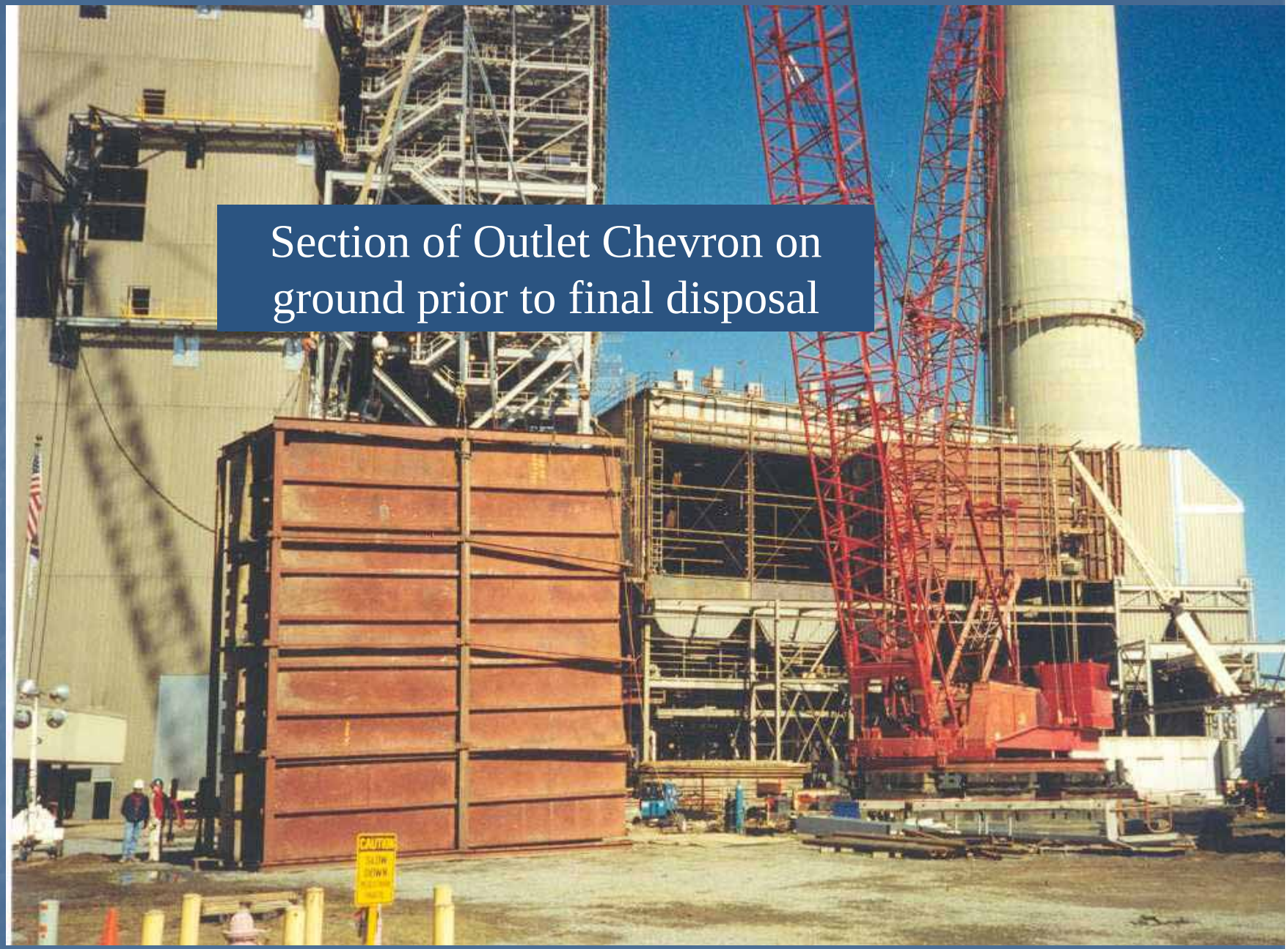
View before stripping Insulation from Outlet Chevron

Top view before removing Outlet Chevron

Removing 1st Section of Outlet Chevron




Removing final section of Outlet Chevron


Section of Outlet Chevron on ground prior to final disposal

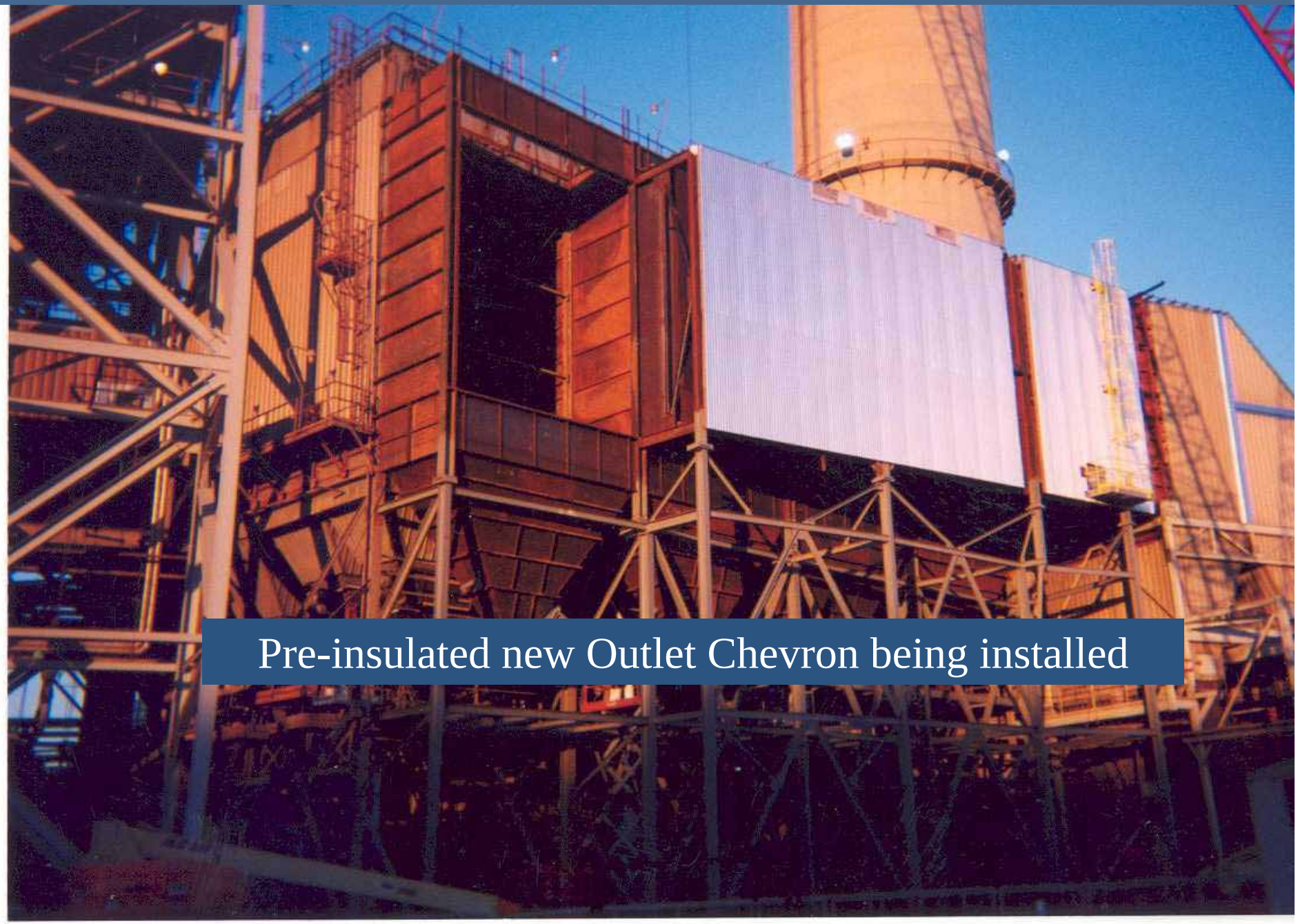
Outlet Duct disposal by lowboy trailer

Adding new hopper bottoms to existing hoppers

Installing dividing Walls for new Outlet Field

Outlet field dividing walls & upper & lower end walls installed

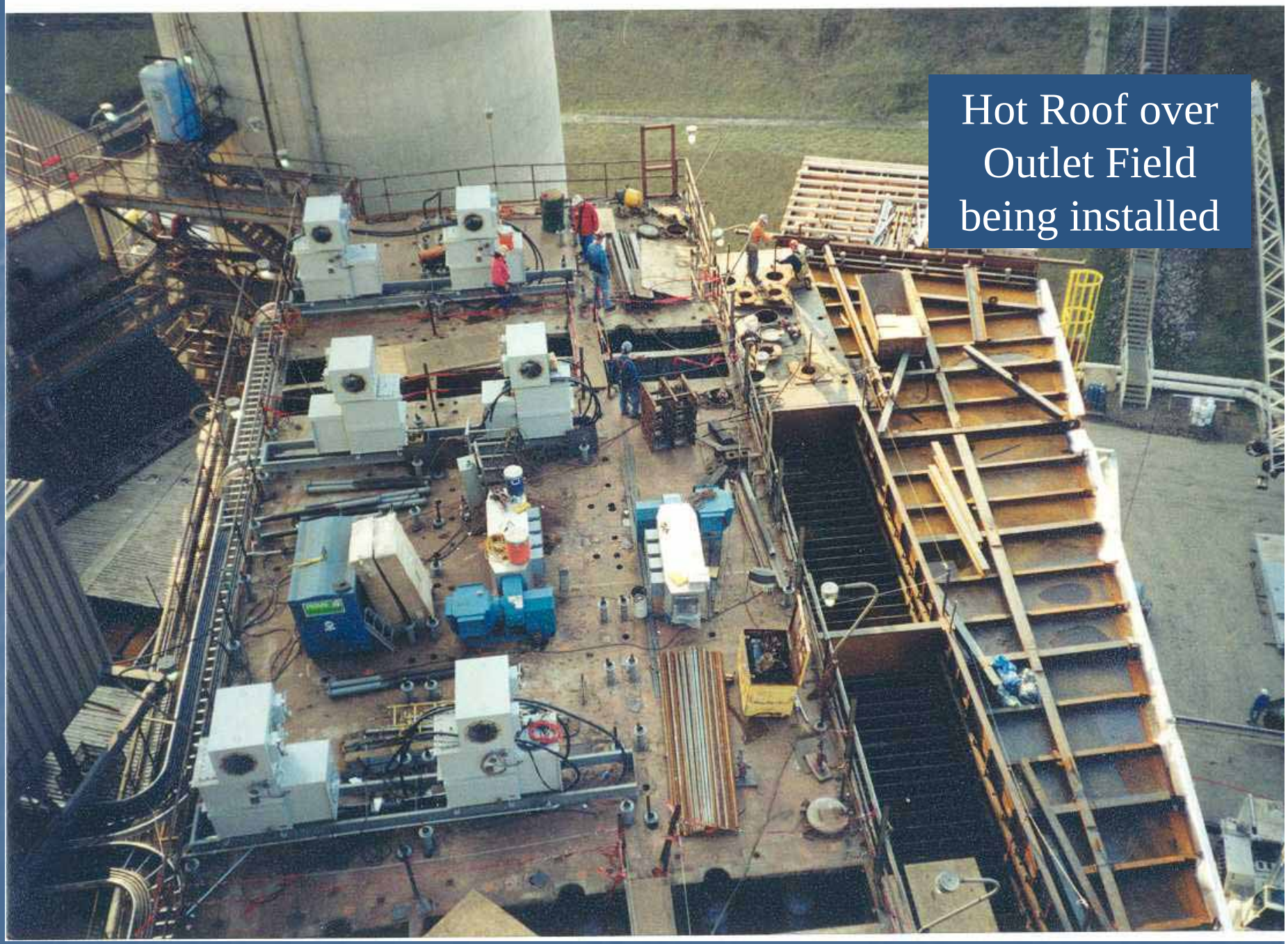
Top view of new Outlet Field



Pre-insulated new Outlet Chevron being installed

New Outlet Chevron almost complete

Last piece of new Outlet Chevron being installed


Hot Roof over
Outlet Field
being installed

Final Hot Roof section being installed

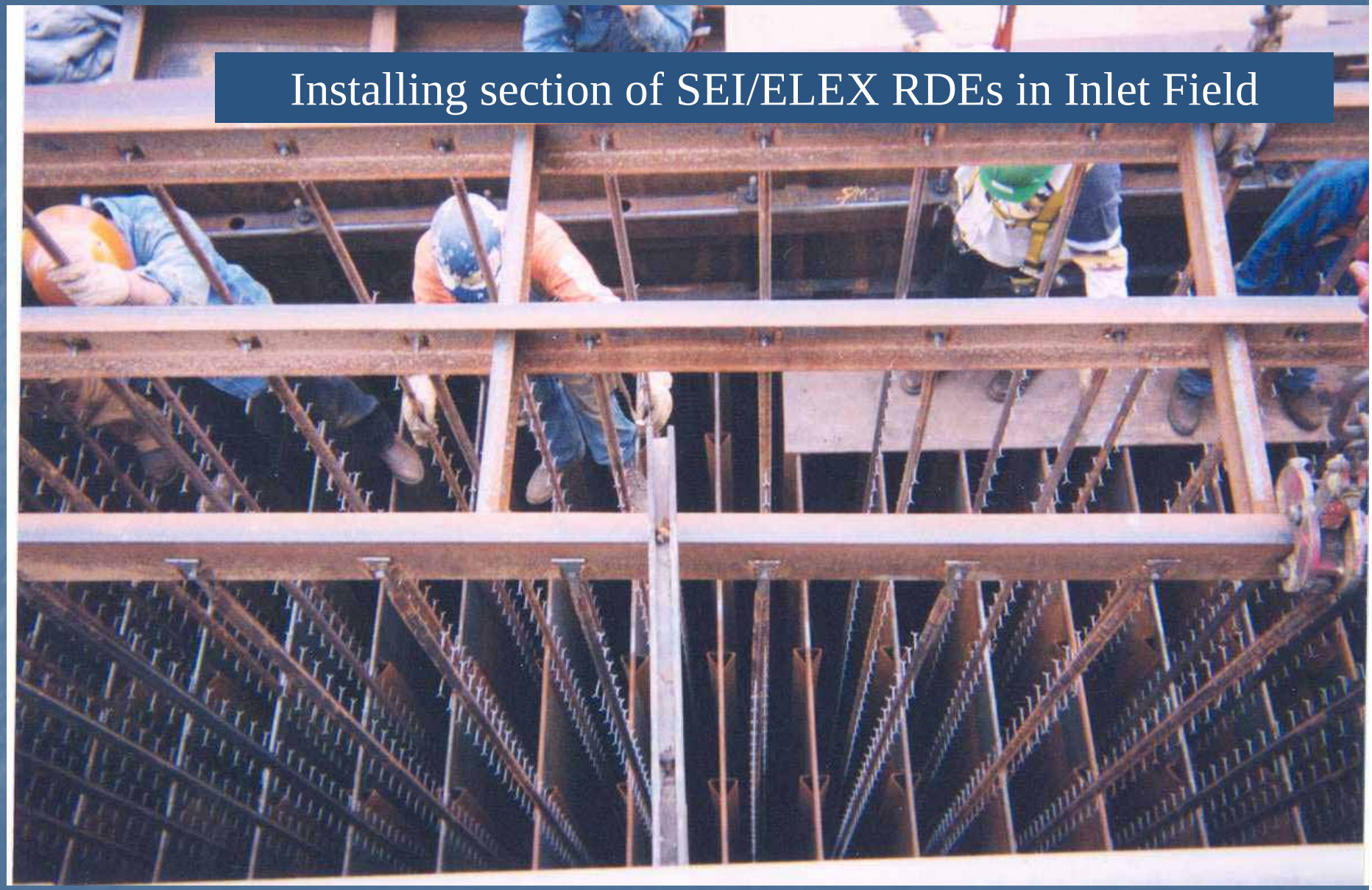
Hot Roof & Cold Roof over outlet field complete

Installing new Collecting Electrodes in existing Inlet Fields

Inlet Field partially filled with new Collecting Electrodes

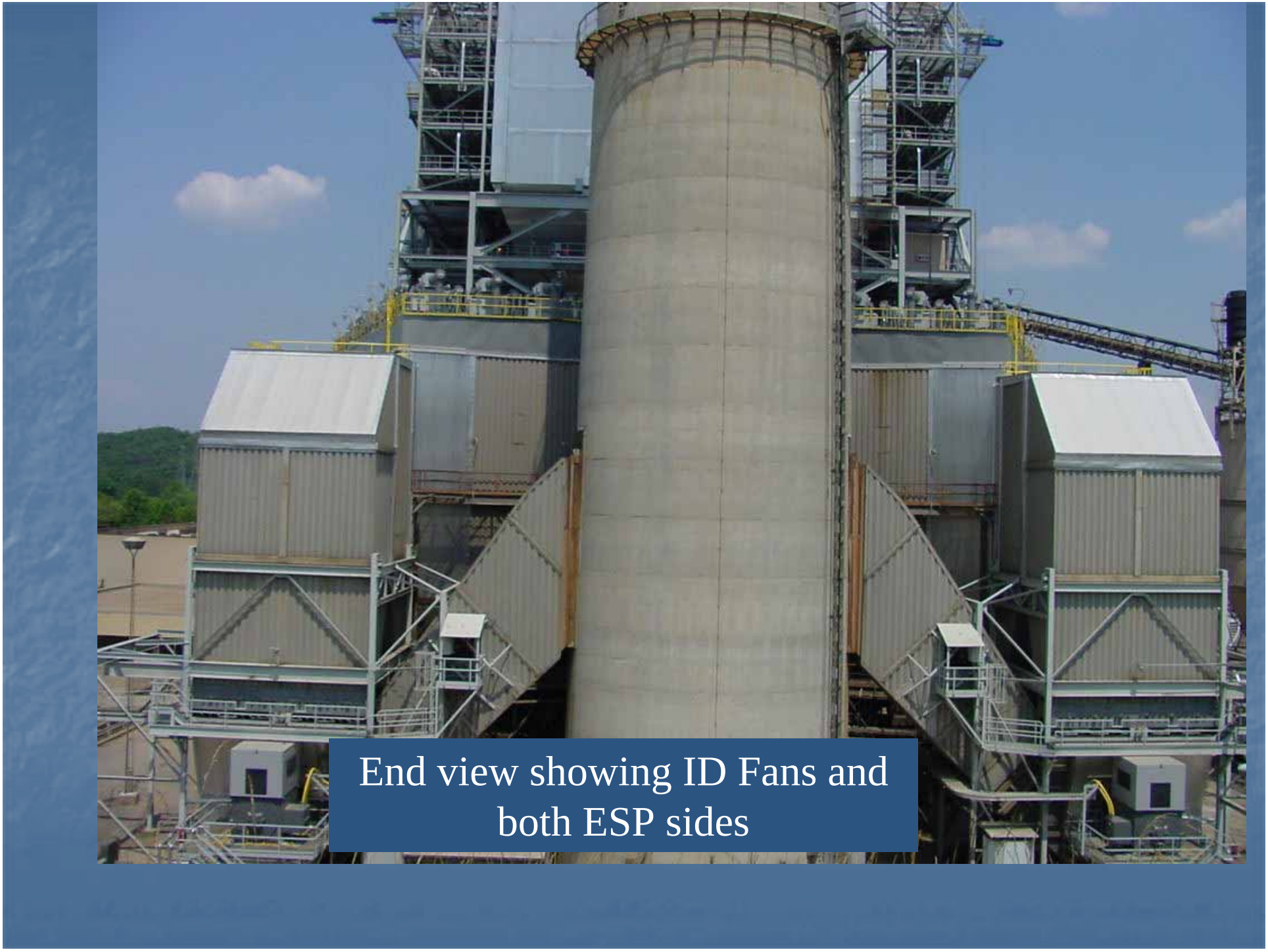
Lifting section
of SEI/ELEX
RDEs into place

Installing section of SEI/ELEX RDEs in Inlet Field



Completed Roof

Completed Project



End view showing ID Fans and both ESP sides


Side view
of rebuilt
ESP


Duke Power Marshall Station

SEI Scope- Marshall Plant

Provide Two New Stacked Precipitators

- Foundations
- Structural Steel
- Ductwork from APH to ID Fans
- Electrical and Controls
- Insulation and Lagging
- Demolition of 8 ESPs
- Startup and Training


MARSHALL
STEAM
STATION
POWER COMPANY


STEAM
STATION


MARSHALL
STEAM
STATION
GROVE

Thank You For Your Time!

Southern Environmental Inc