

Reinhold Environmental Ltd.



2006 APC Round Table
& Expo Presentation

July 16-18, 2006, Columbus, OH

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2006 APC Round Table & Expo
Columbus, Ohio

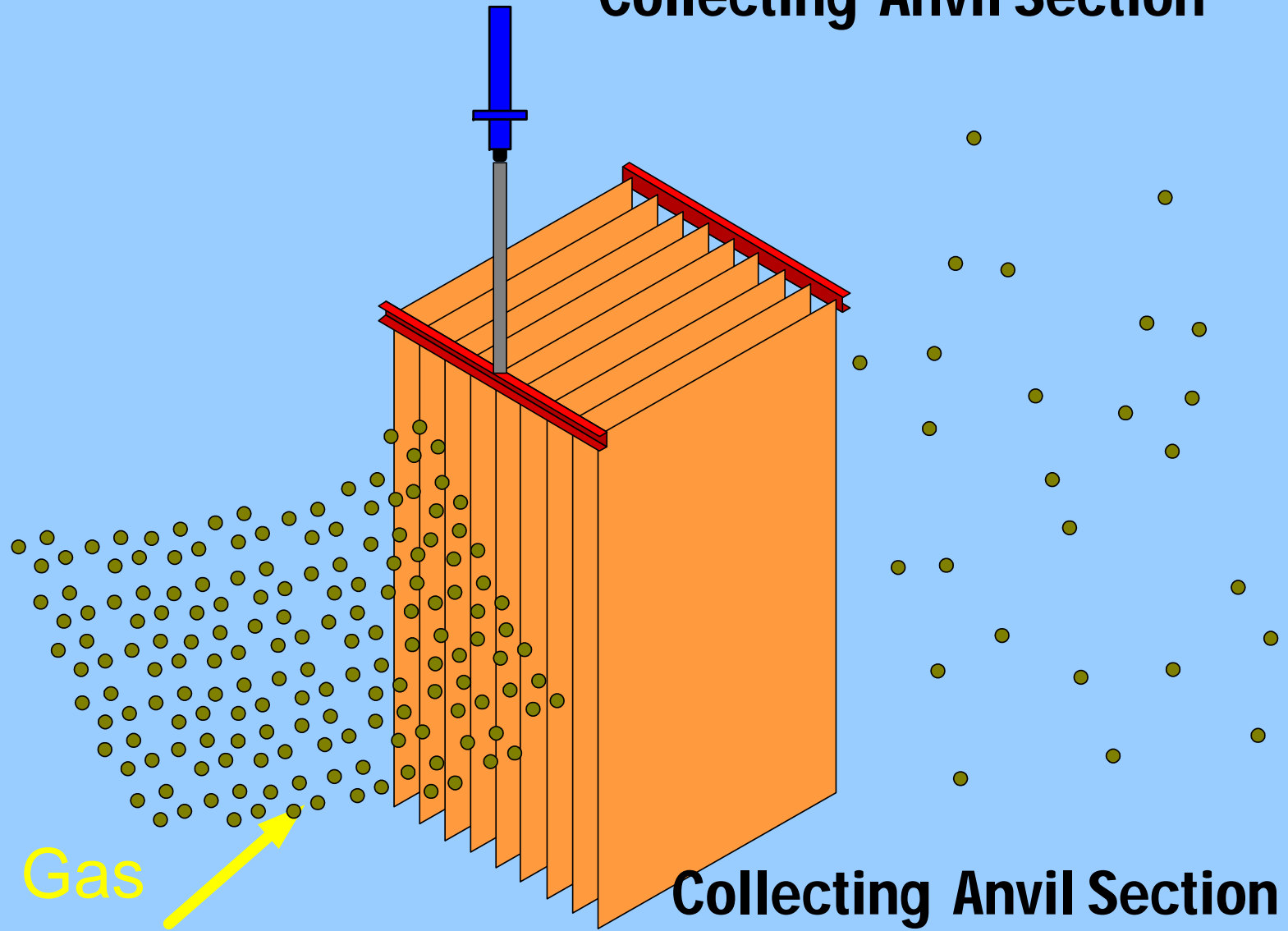
Electrode Design What Works -Where?

Gerry Klemm - Southern Company
7/18/06

Collecting Electrodes – How they Work

- Provides a Ground Plane For Dust Collection
- Allows for Surface Compaction of Dustcake
- Delivers Agglomerated Dustcake to Hoppers

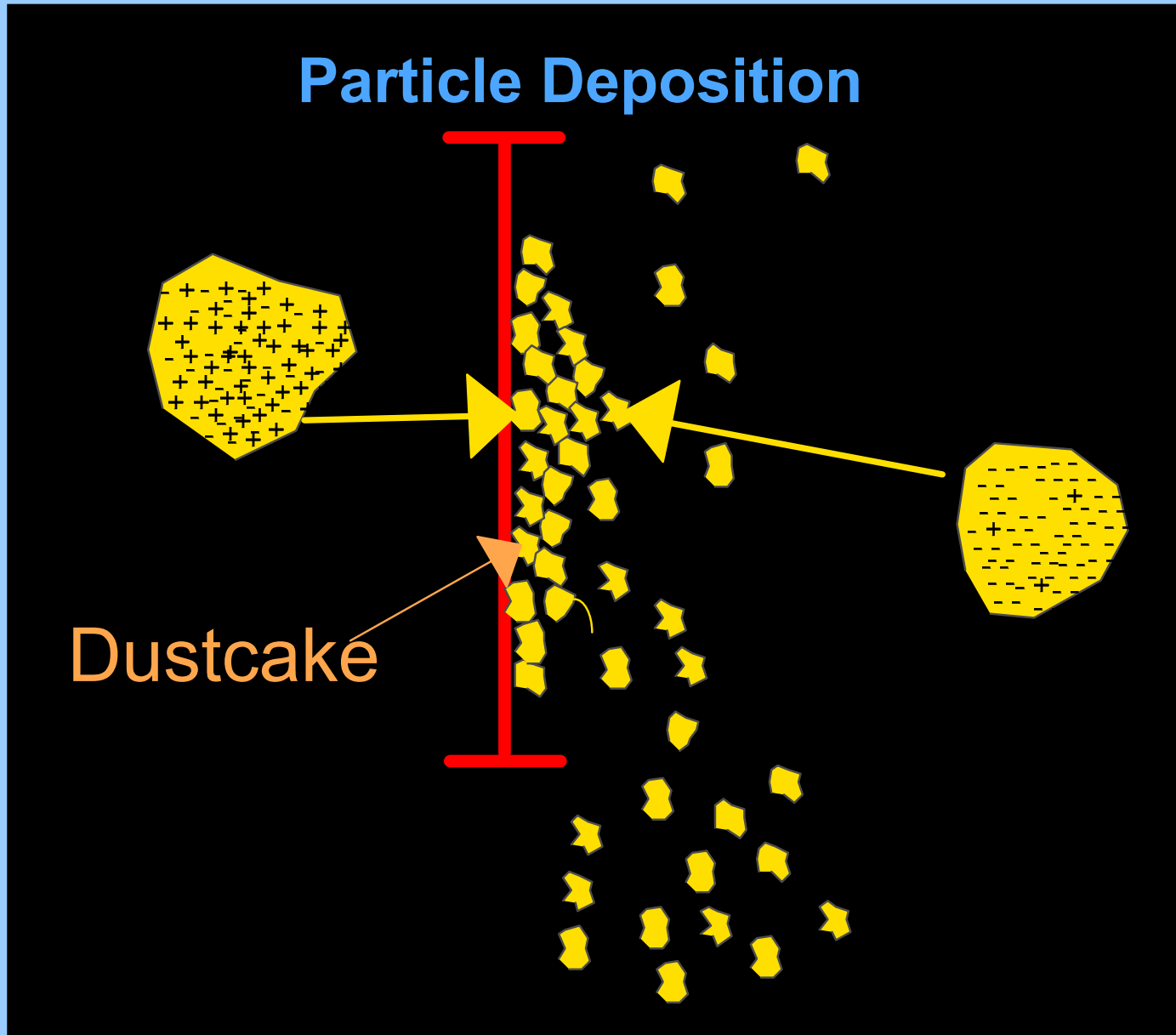
Collecting Anvil Section



Collecting Anvil Section

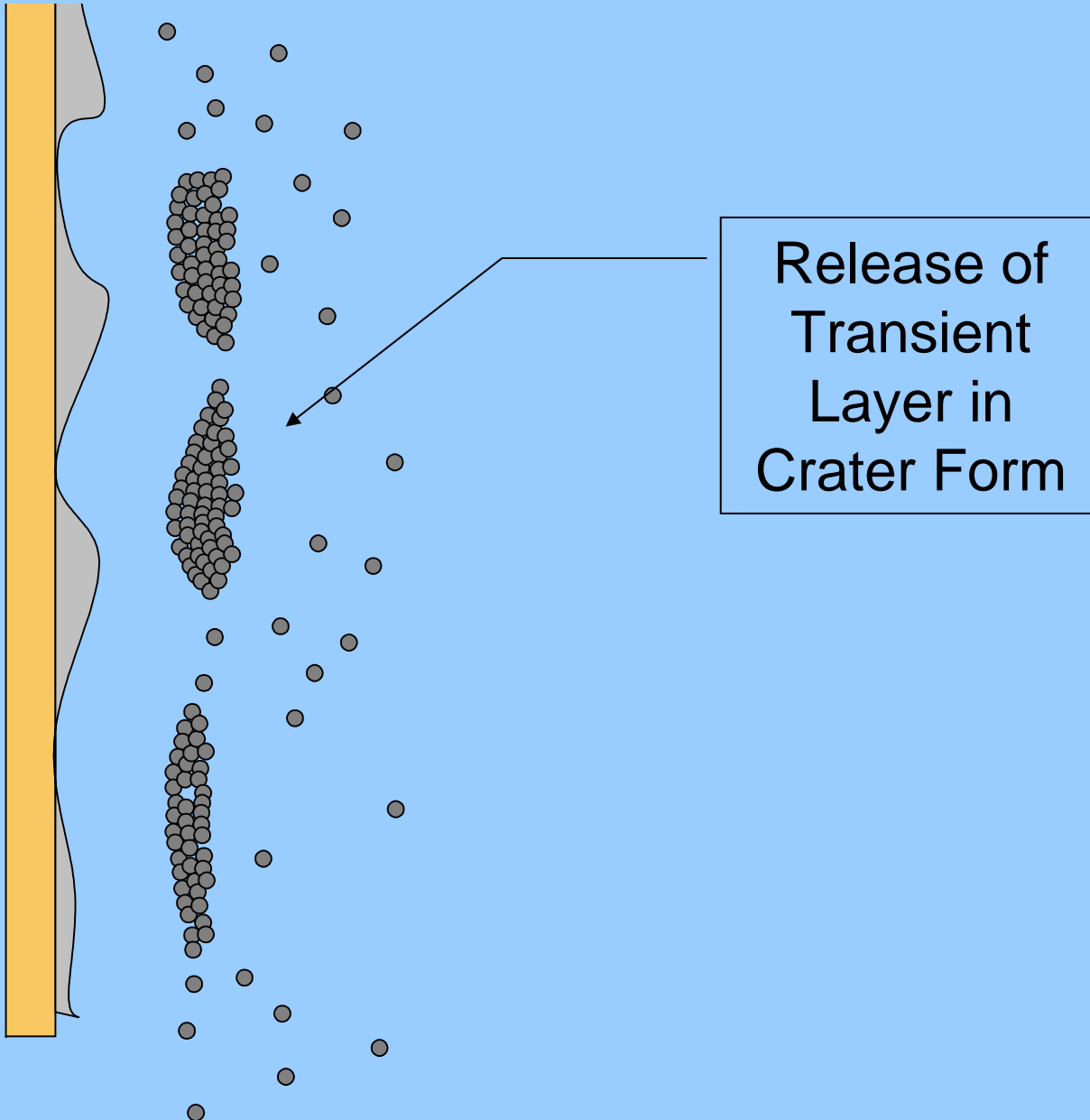
Gas
Flow

Particle Deposition

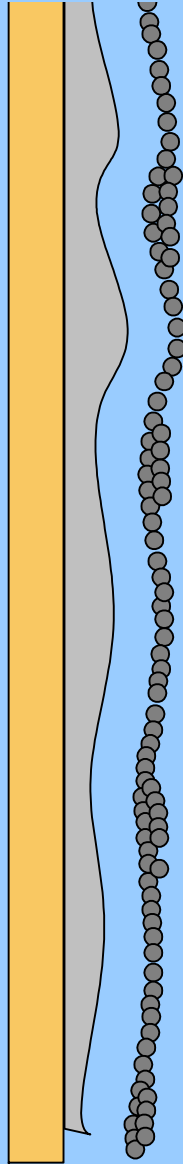


Dustcake

What we Want - Cratering

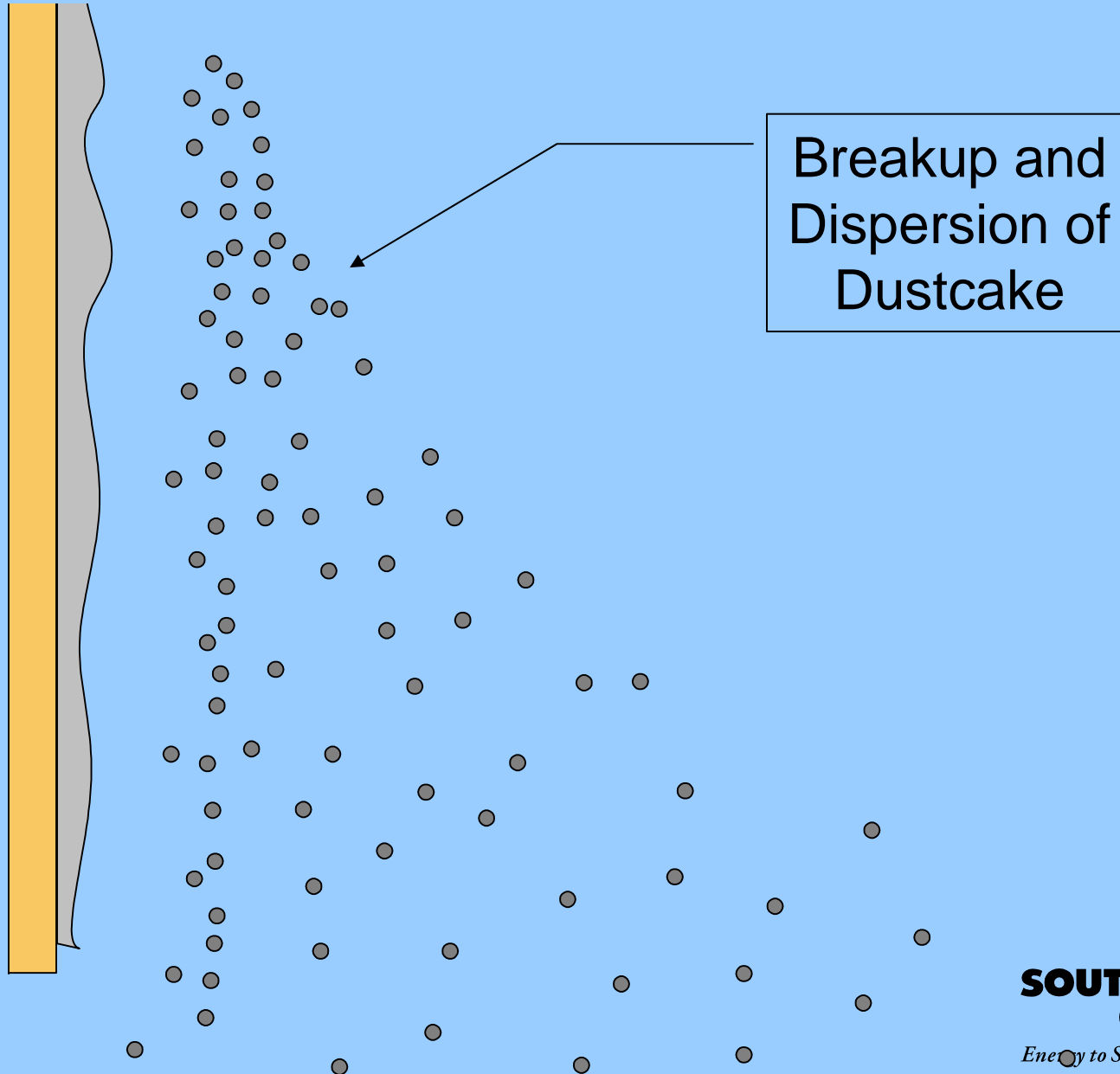


Dustcake Dynamics - Sheeting

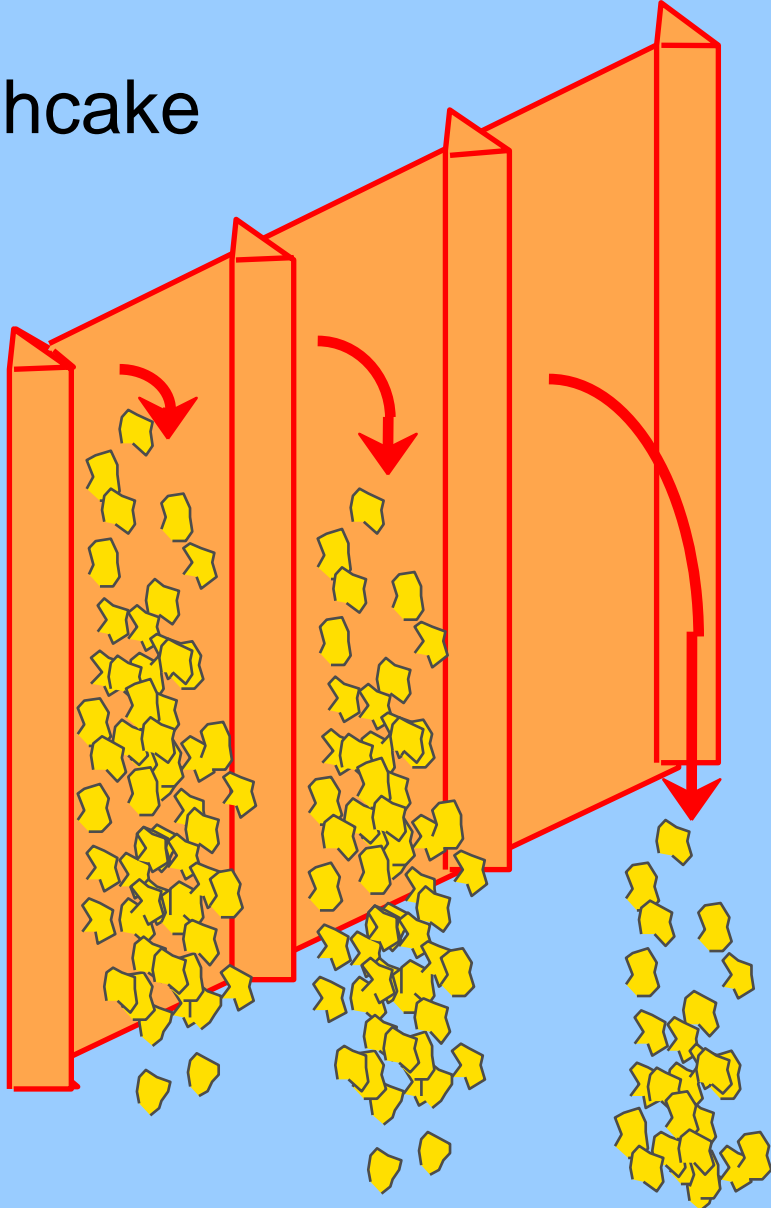


Release of
Transient
Layer in
Sheet Form

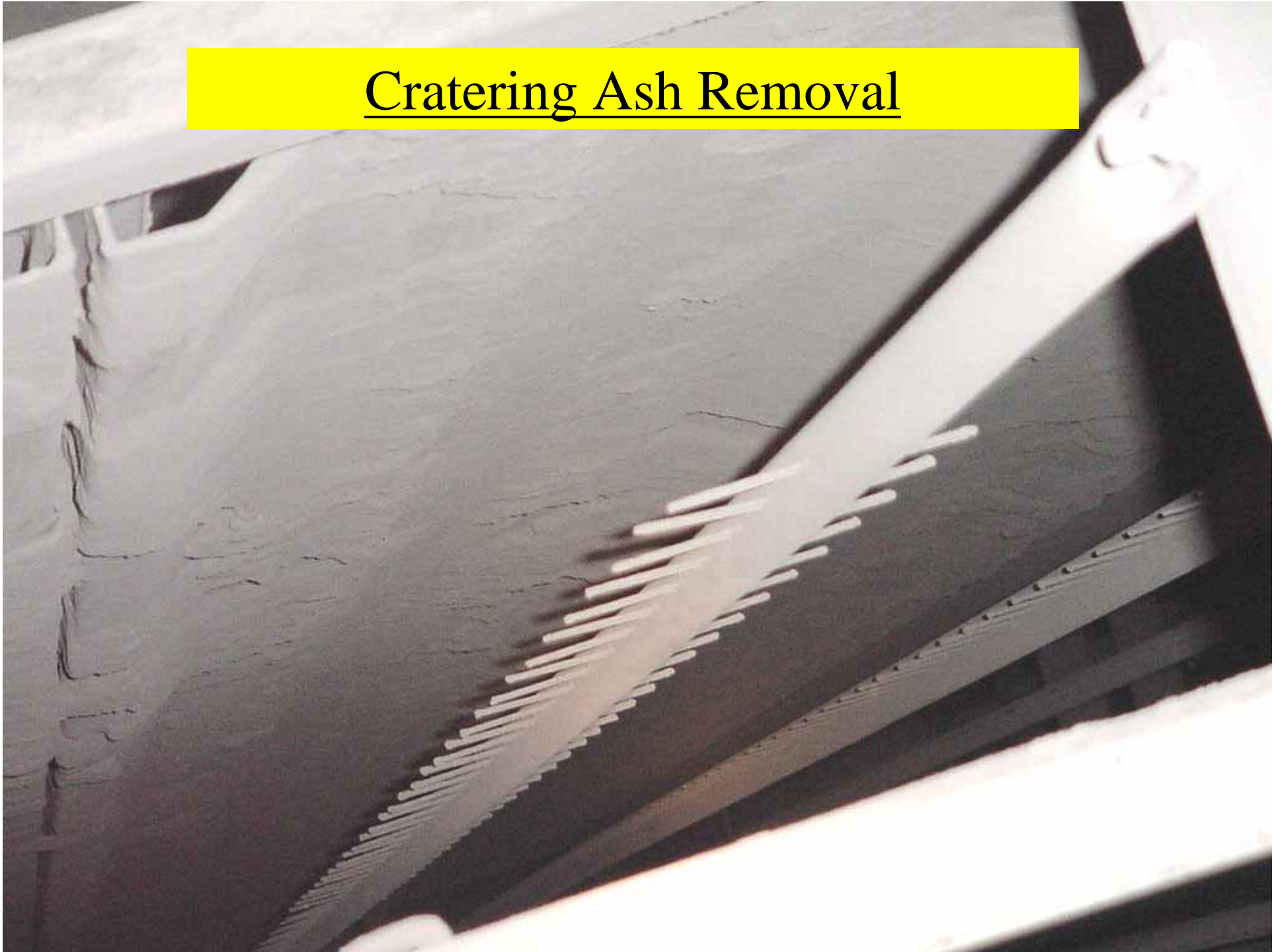
What we Don't Want - Sheeting



Release of Cohesive Ashcake



Cratering Ash Removal



Collecting Electrodes – Types

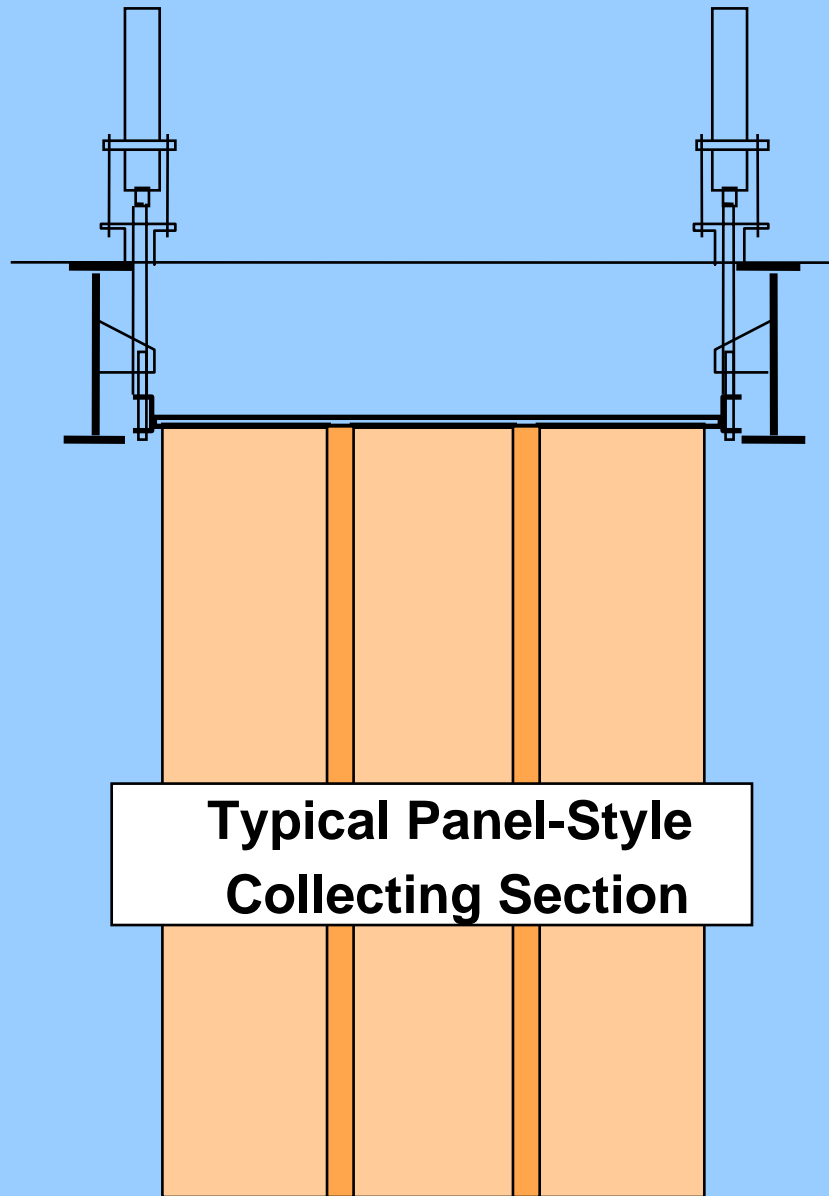
- Panel



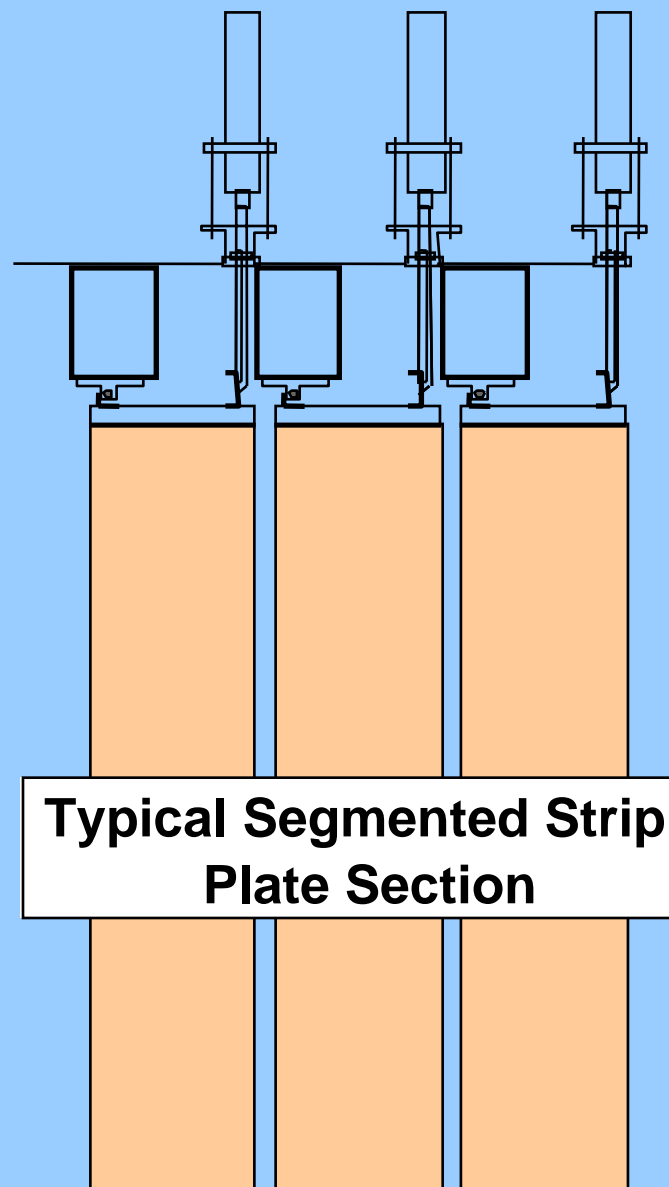
- Strip



Example of...



Example of...



**Typical Segmented Strip
Plate Section**

Pros and Cons

Panel

- Suited for Large Mech. Fields
- Good X-sect Alignment Possible
- Longitudinal Alignment Easier

- More Expensive
- More Difficult to Handle

Strip

- Inexpensive
- Easy to Handle
- Suited for Mechanical Rapping

- More Difficult to Align
- Requires Interlocking Clips

Panel Types

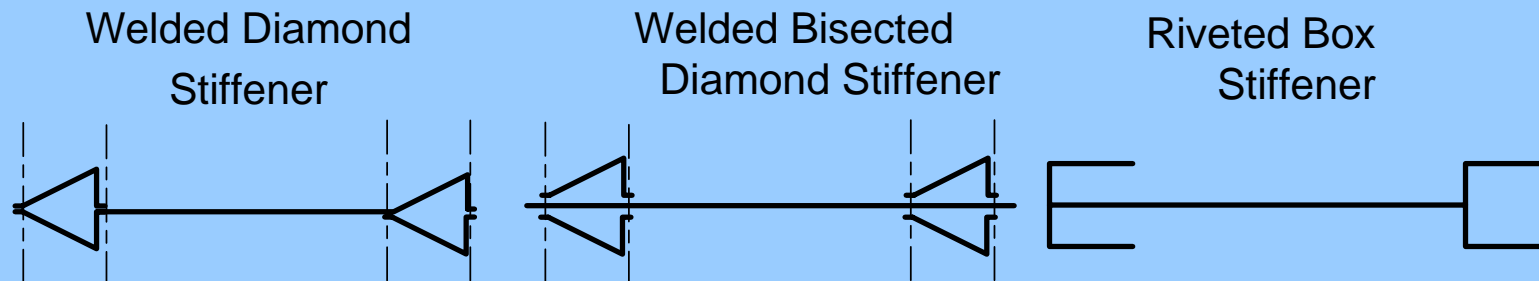
- Assembled
- Roll- Formed
- Friction- Interlocked

Panel Types – Cont.

Pros and Cons

Assembled

- High Beam Strength
- Good Rapping Transmission
- Smooth Pan
- Higher Cost
- Greater Unit Weight

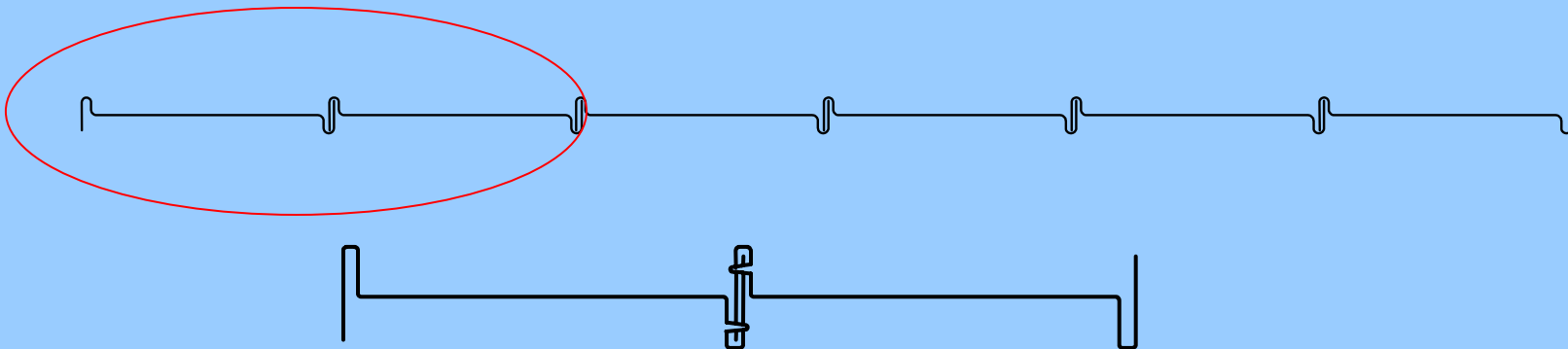


Panel Types – Cont.

Pros and Cons

Roll- Formed

- Low Cost
 - Narrow Profile
 - Smooth Pan
 - Easy to Straighten
- Tendency to Bow
 - Tendency to Sag
 - Medium Force Transmission



Panel Types – Cont.

	<u>Pros</u>	and	<u>Cons</u>
Friction Interlocked	<ul style="list-style-type: none">• Good Force Transmission• Medium Cost		<ul style="list-style-type: none">• Difficult to repair• More difficult to Straighten

Snapped-Together Strip segments



Strip Types

- Roll- Formed
- Welded



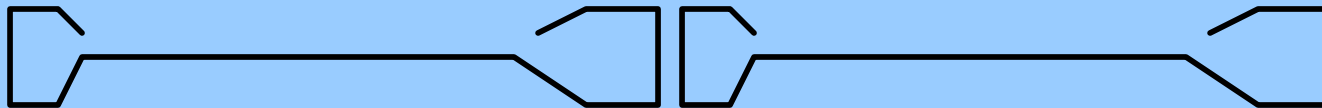
Strip Types

Pros and Cons

Roll- Formed

- Inexpensive
- Lightest Weight
- Prone to bowing
- Theoretically Shorter Life
- Lowest Rapping Transmission

Open Sigma



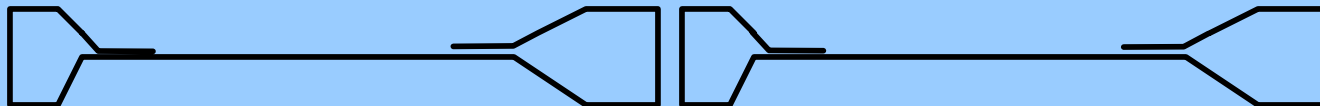
Strip Types

Pros and Cons

Welded

- Good Beam strength
 - Good Rapping Transmission
 - Maintains Straightness
- Heavier
 - Traps Ash in Stiffeners
 - Spot Welds Subject to Failure

Pentagon Box Stiffener



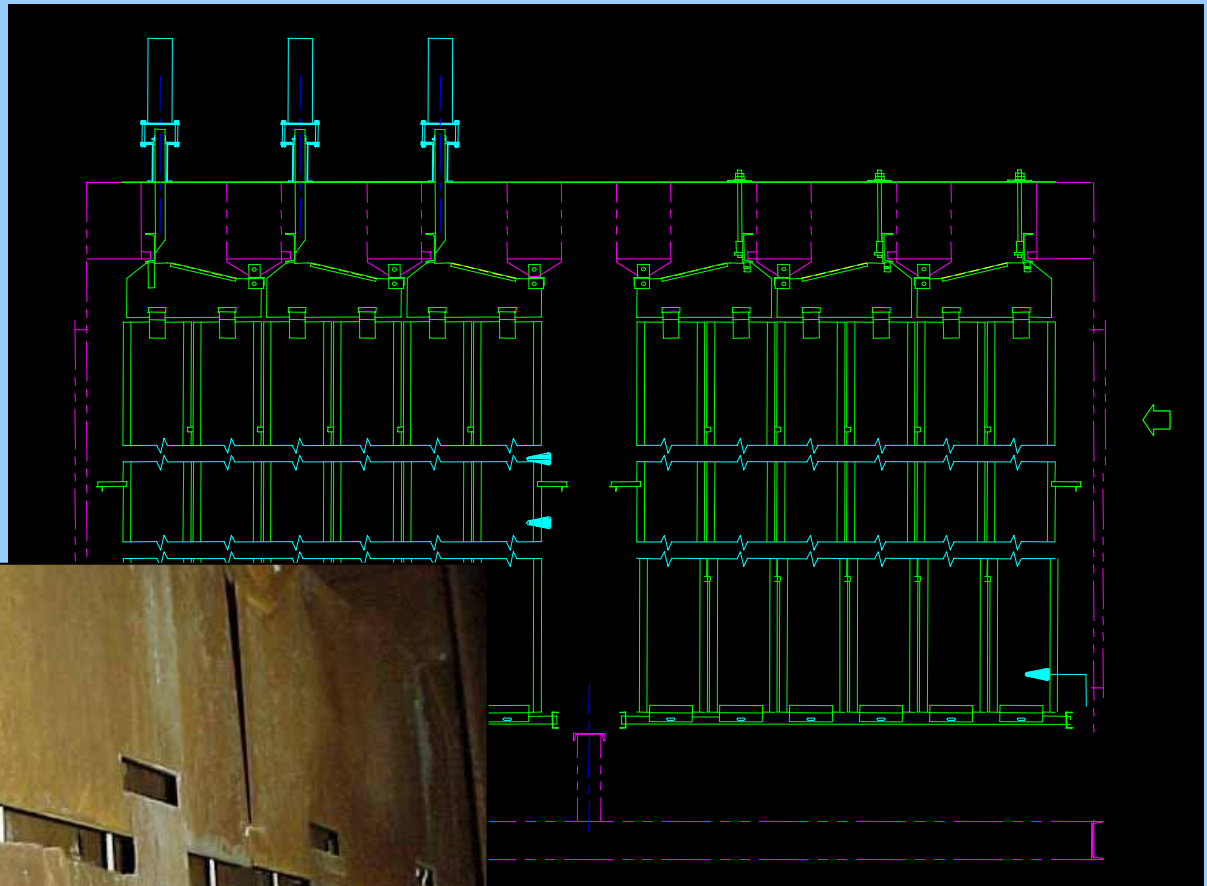
Design Considerations – Collecting Electrodes

- Support
- Rapping
- Alignment



Design Considerations – Collecting Electrodes

- Support
 - Transmission of Energy
 - Fatigue



Intermittently Supported

Design Considerations – Collecting Electrodes



- Support
 - Transmission of Energy Cont.

Continuously Supported

Design Considerations – Collecting Electrodes

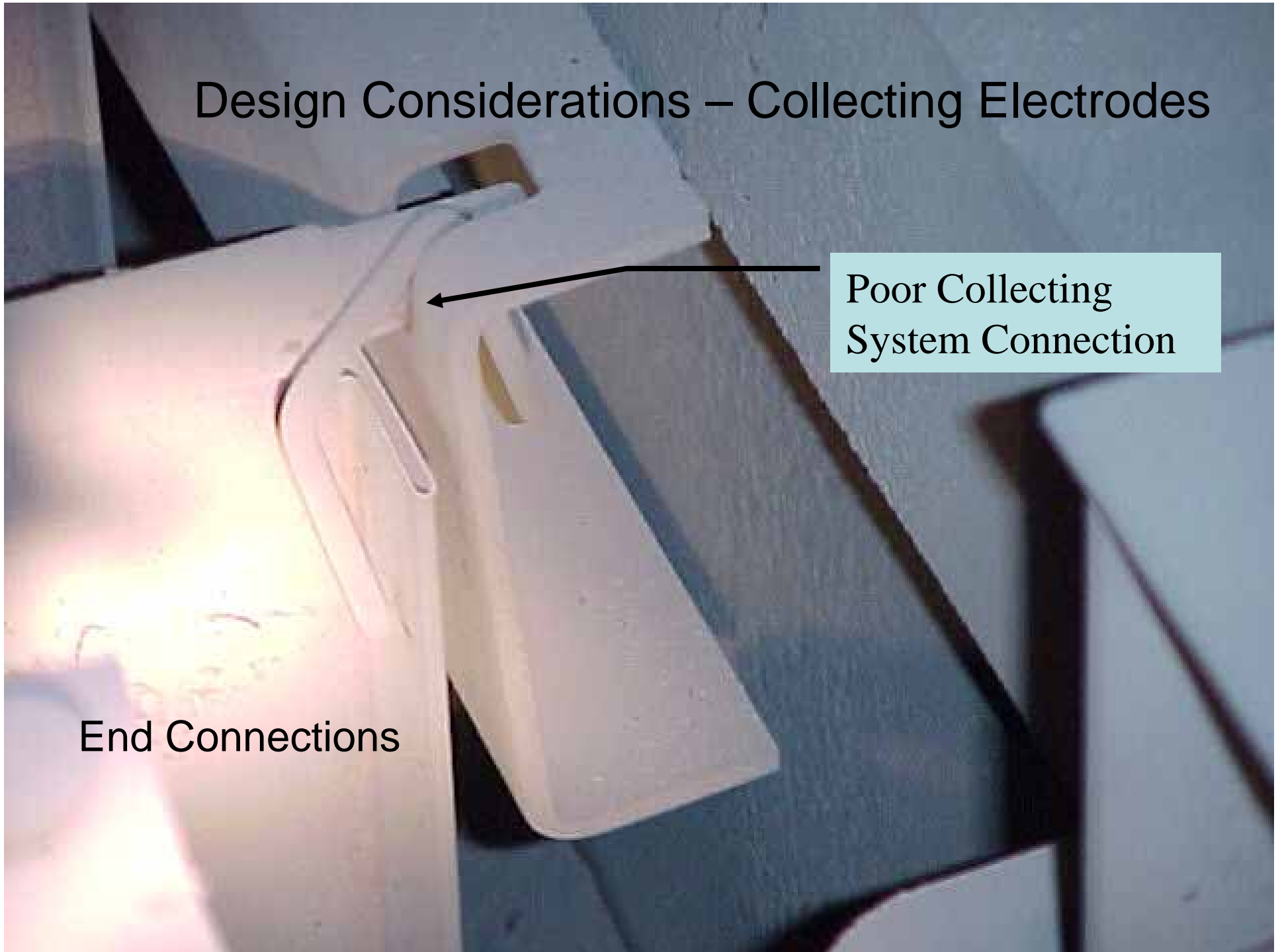
- Support-Cont.
 - Spot welds! ☹️



Design Considerations – Collecting Electrodes

Poor Collecting
System Connection

End Connections





Reinforcement
Measures

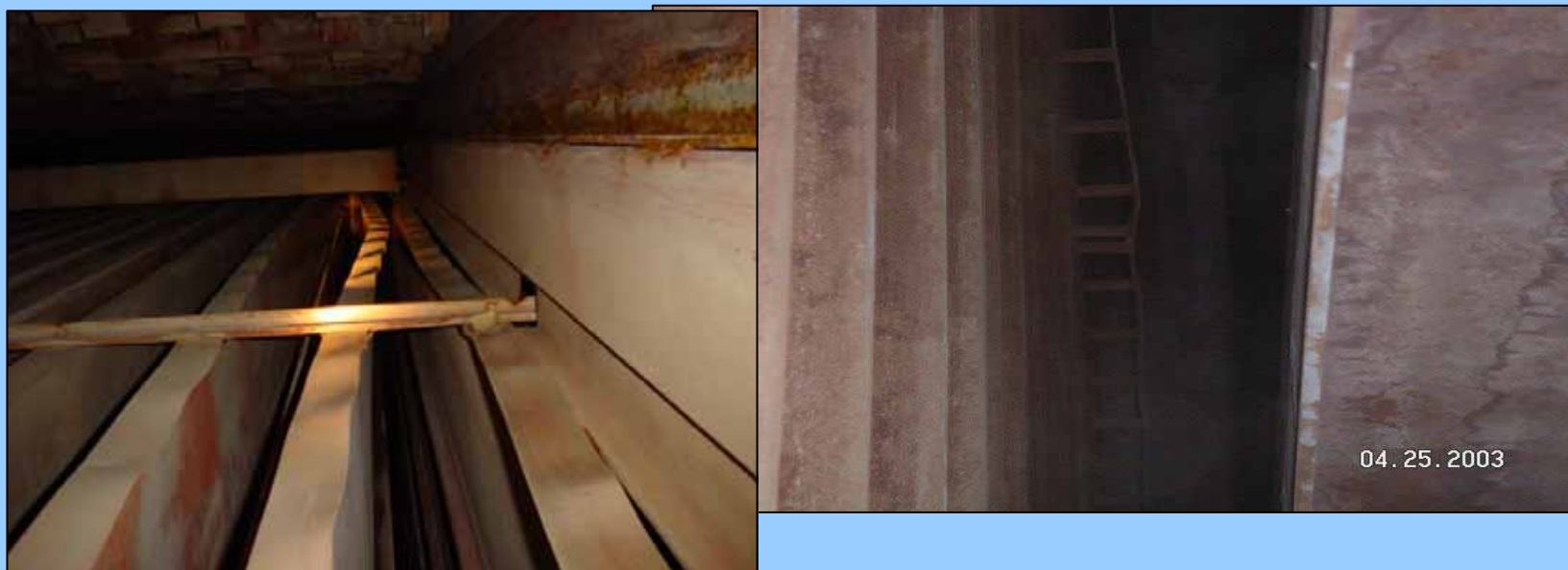
Design Considerations – Collecting Electrodes

- Rapping
 - Placement
 - Connections



Design Considerations – Collecting Electrodes

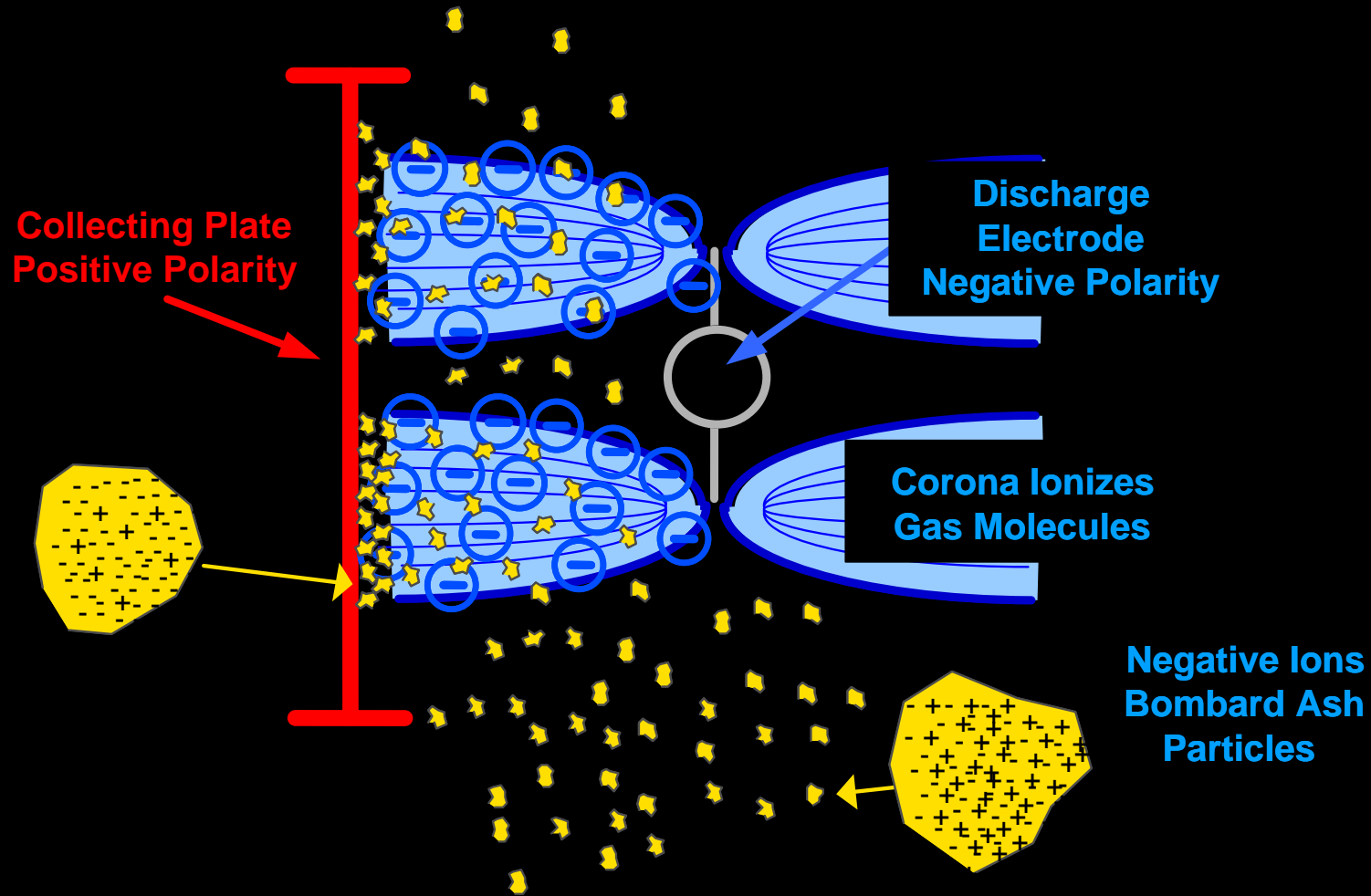
- Alignment
 - Mid Level, Lower Level
 - Requirements: Middle and Lower Elevations



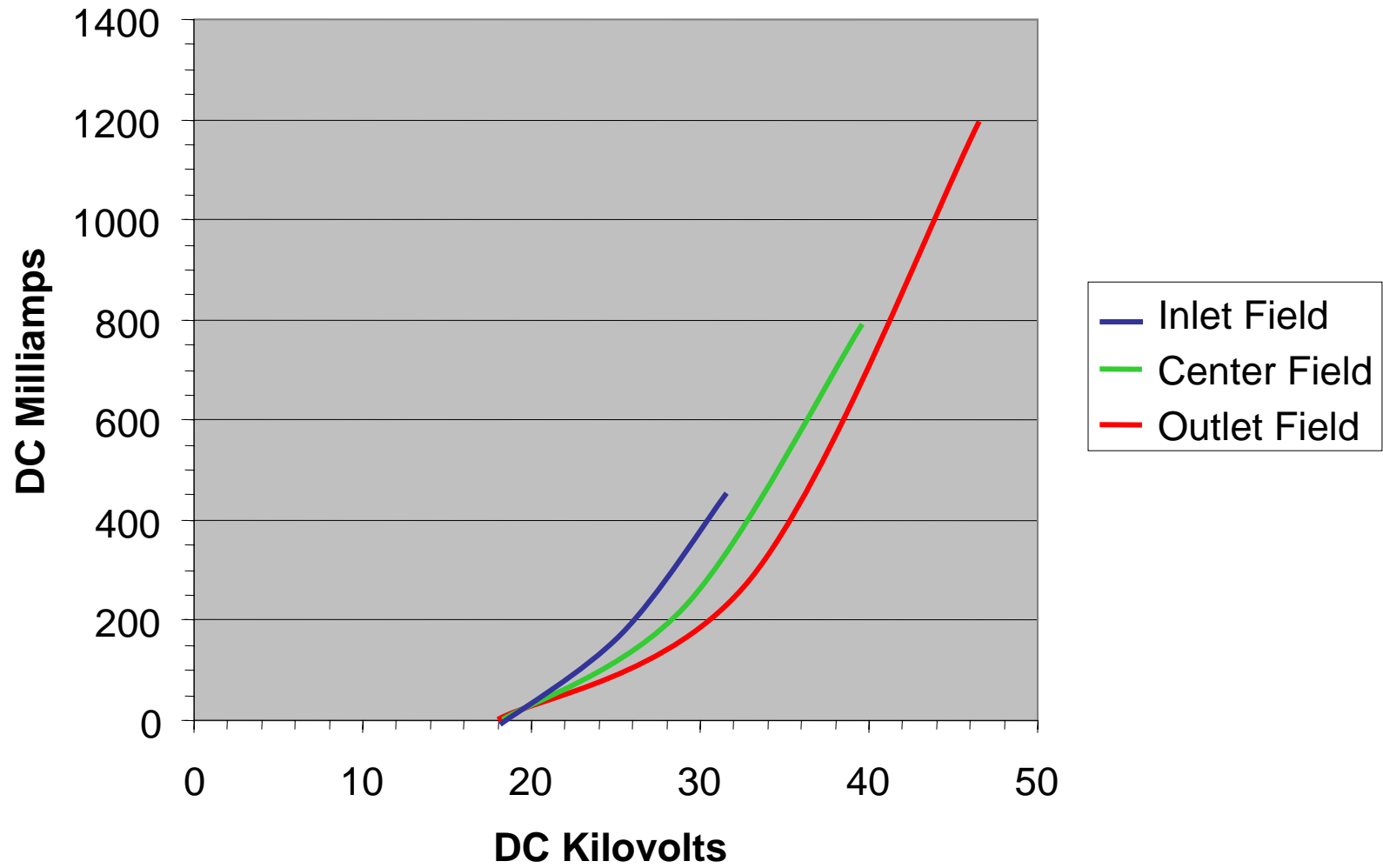
Discharge Electrodes – How they Work

- Provide High Tension Emitter Points to Charge incoming Dust Particles
- Deliver DC current to Provide the Locomotion of Dust Particles to the Collecting Surfaces.

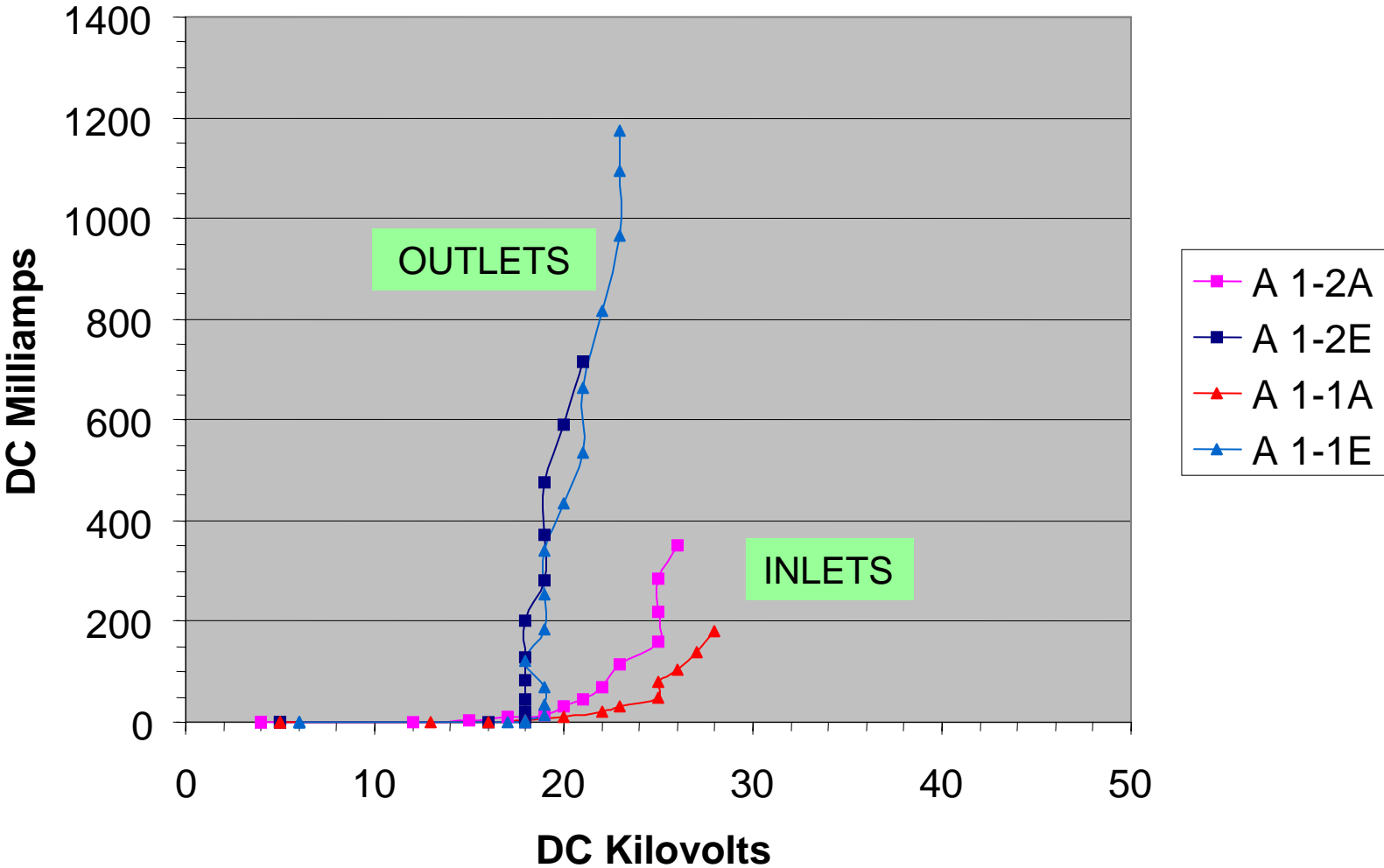
Particle Charging



Optimal VI Curves on Gas

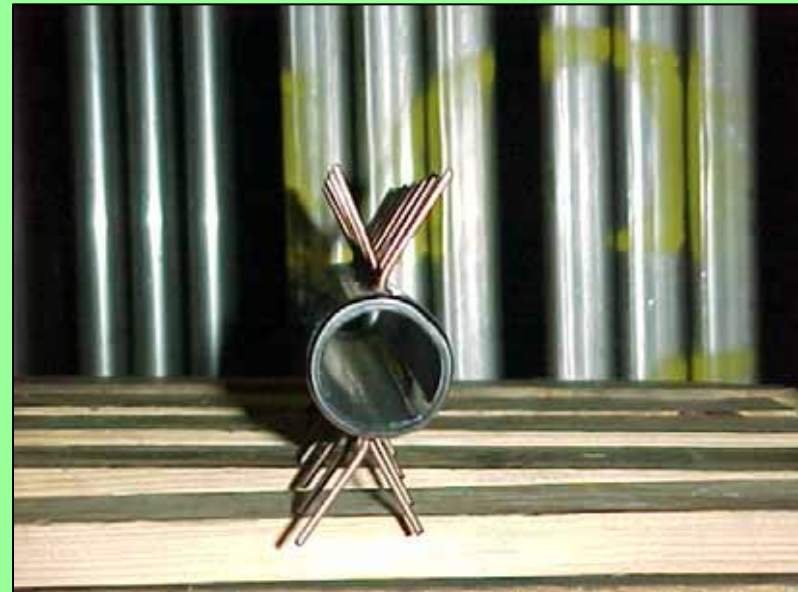


Example of Poor VI Curves

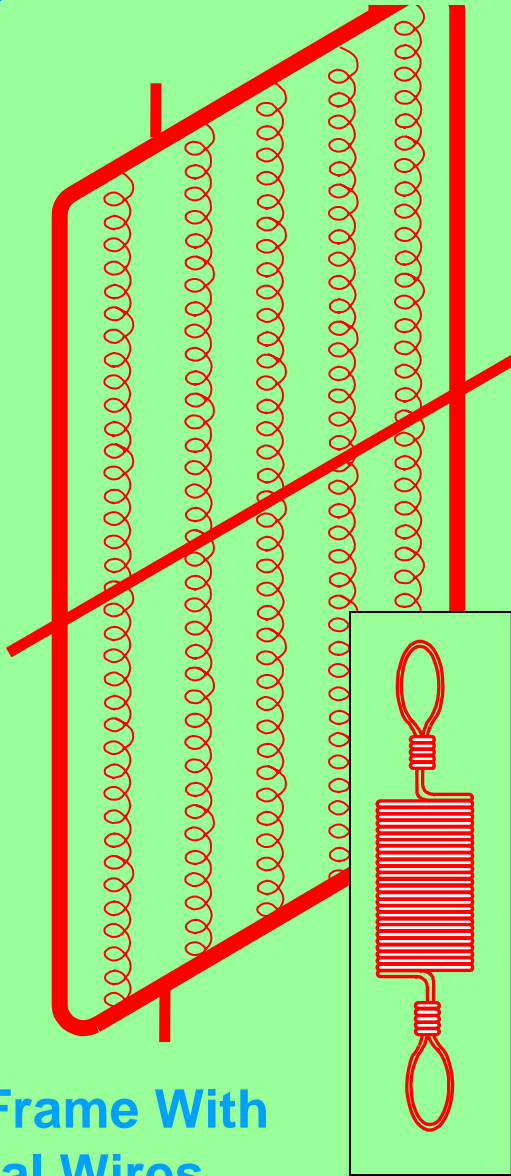


Discharge Electrodes – Types

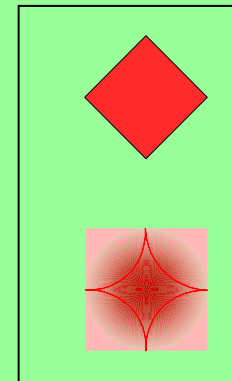
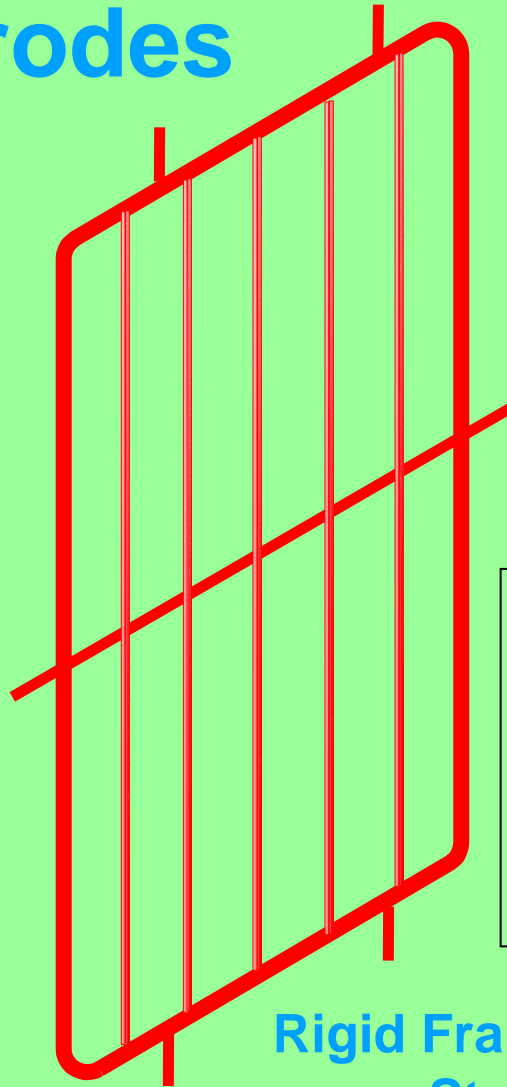
- Weighted Wire
- Self-Tensioned Wire (Spring)
- Rigid Electrode



Rigid Frame Electrodes

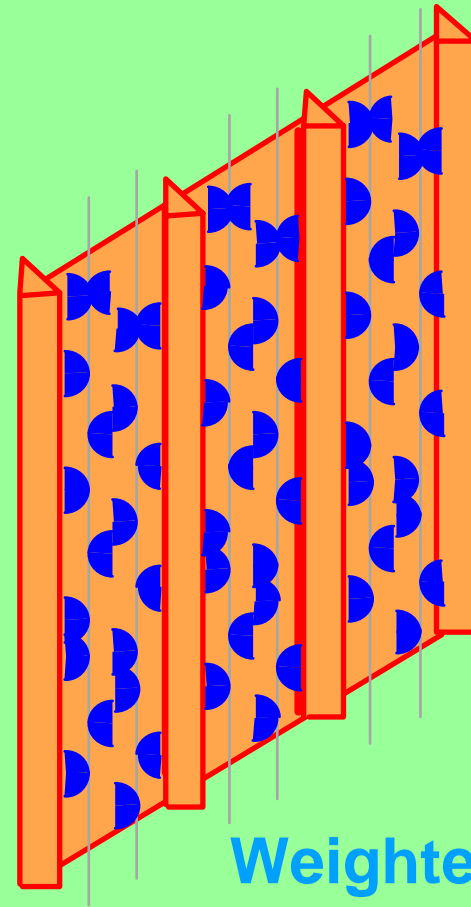
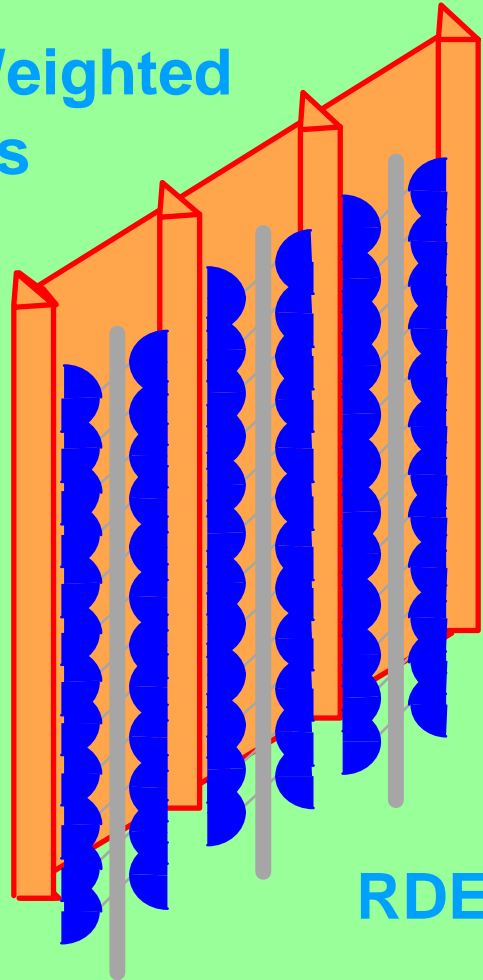


Rigid Frame With
Spiral Wires



Rigid Frame With Square
or Star Electrodes

Corona Distribution
Illustration
for
RDEs vs. Weighted
Wires



Weighted Wire

Pros and Cons

- Inexpensive
- Allows for narrow Spacing
- Easily Replaced

- Subject to Electrical Failure
- Failure Can Result is Loss of Multiple Bus Sections



Self-Tensioned Wire

Pros and Cons

- Inexpensive
 - Easily Replaced
 - Larger Corona Radius
- Subject to Electrical Failure
 - Failure Can Result is Loss of Multiple Bus Sections



Rigid Electrode

Pros and Cons

- Replaces 2 Wire-Type Electrodes
- Can be Custom Designed for Application
- Excellent Corona Distribution



- Difficult to replace
- Requires More rapping force to Clean
- Subject to Bowing and Erosion



Rigid Frame

- Isodyne
- Twisted bar, etc.
- RDE

Pros and Cons

- Easy to Align
- Best Design for Mechanical Rapped Units



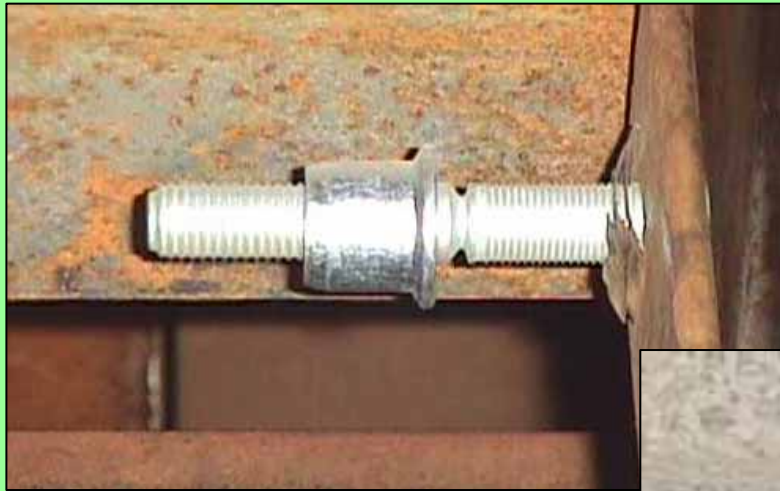
- Difficult to Replace
- Critical electrode Connections Subject to Spit Erosion

Design Considerations – Discharge Electrodes

- Support
- Rapping
- Alignment
- Emitter Configuration (RDE only)

Design Considerations – Discharge Electrodes

- Support Types



Hydraulic

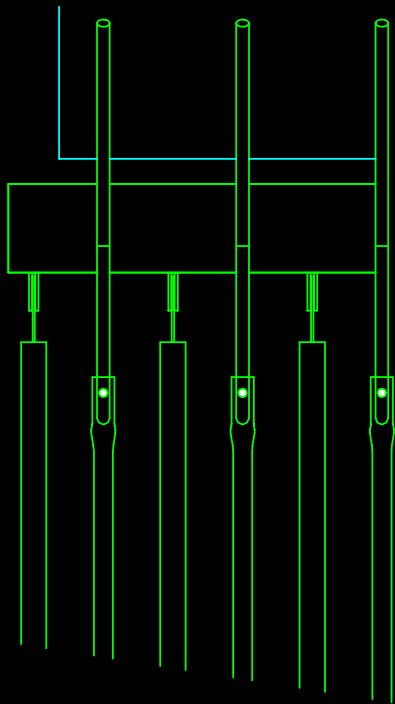


Bolted

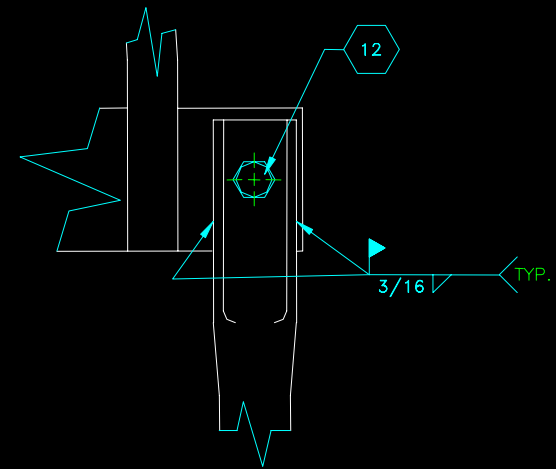
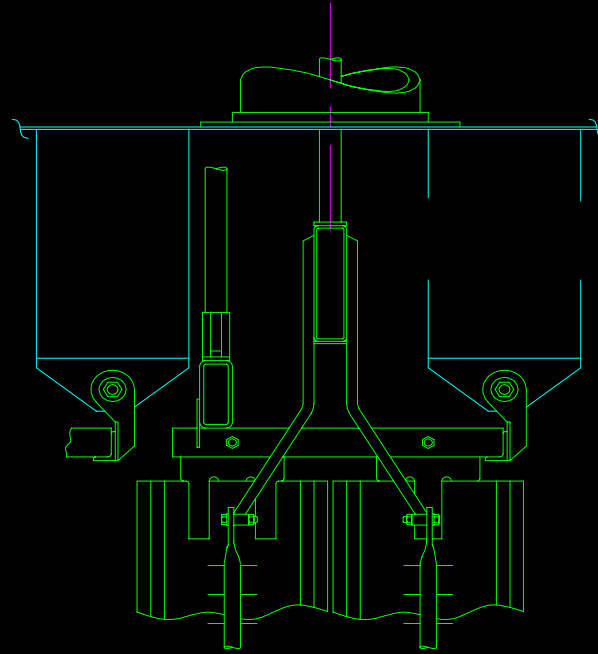


Friction

RDE Top Attachment Orientation



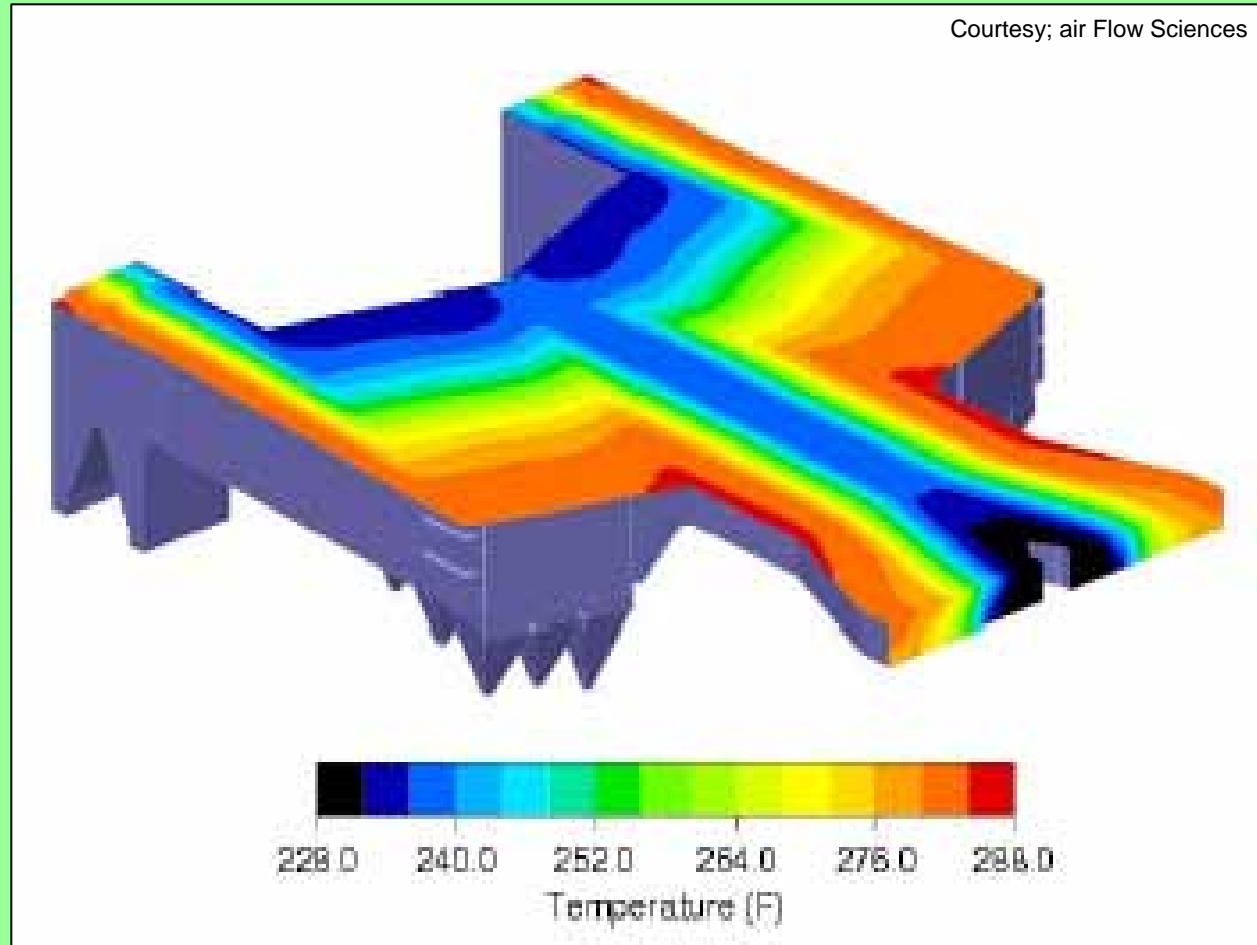
Transverse



Longitudinal



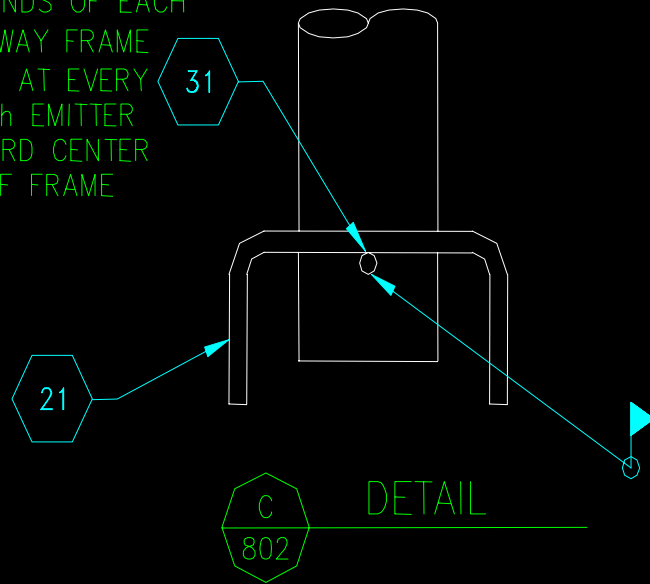
Bottom Attachment: To Fix or to Float???



Temperature Gradient

Bottom Connection- Floating

TYP. AT ENDS OF EACH
ANTI-SWAY FRAME
THEN AT EVERY
10th EMITTER
TOWARD CENTER
OF FRAME



Bottom Connection- Fixed



Bottom Connection Problems



Design Considerations – Discharge Electrodes

- Rapping



Design Considerations – Cleaning Problems



Donuts on Wires



Nodules On Spikes

More on Sintered Nodules



Nodules On Spikes

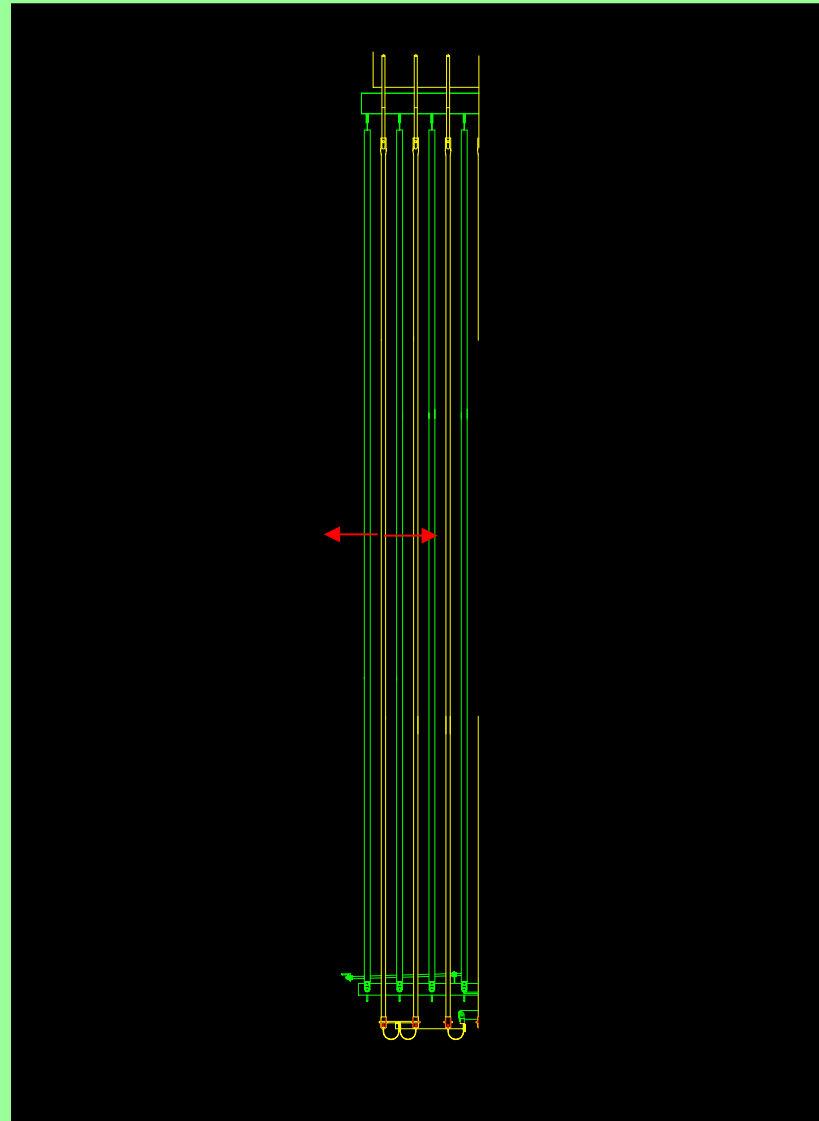
Design Considerations – Discharge Electrodes

- Frame Alignment



Design Considerations – Discharge Electrodes

- Electrode Alignment-Dynamic
 - RDE Diameter, Rigidity



Design Considerations – Discharge Electrodes

- Electrode Alignment- Static
 - Straightening From Middle



Heat Straightening RDE



Design Considerations – Discharge Electrodes, Cont.

- Electrode Alignment- Static
 - Straightening From Top



Design Considerations – Discharge Electrodes

- Emitter Configuration (RDE only)

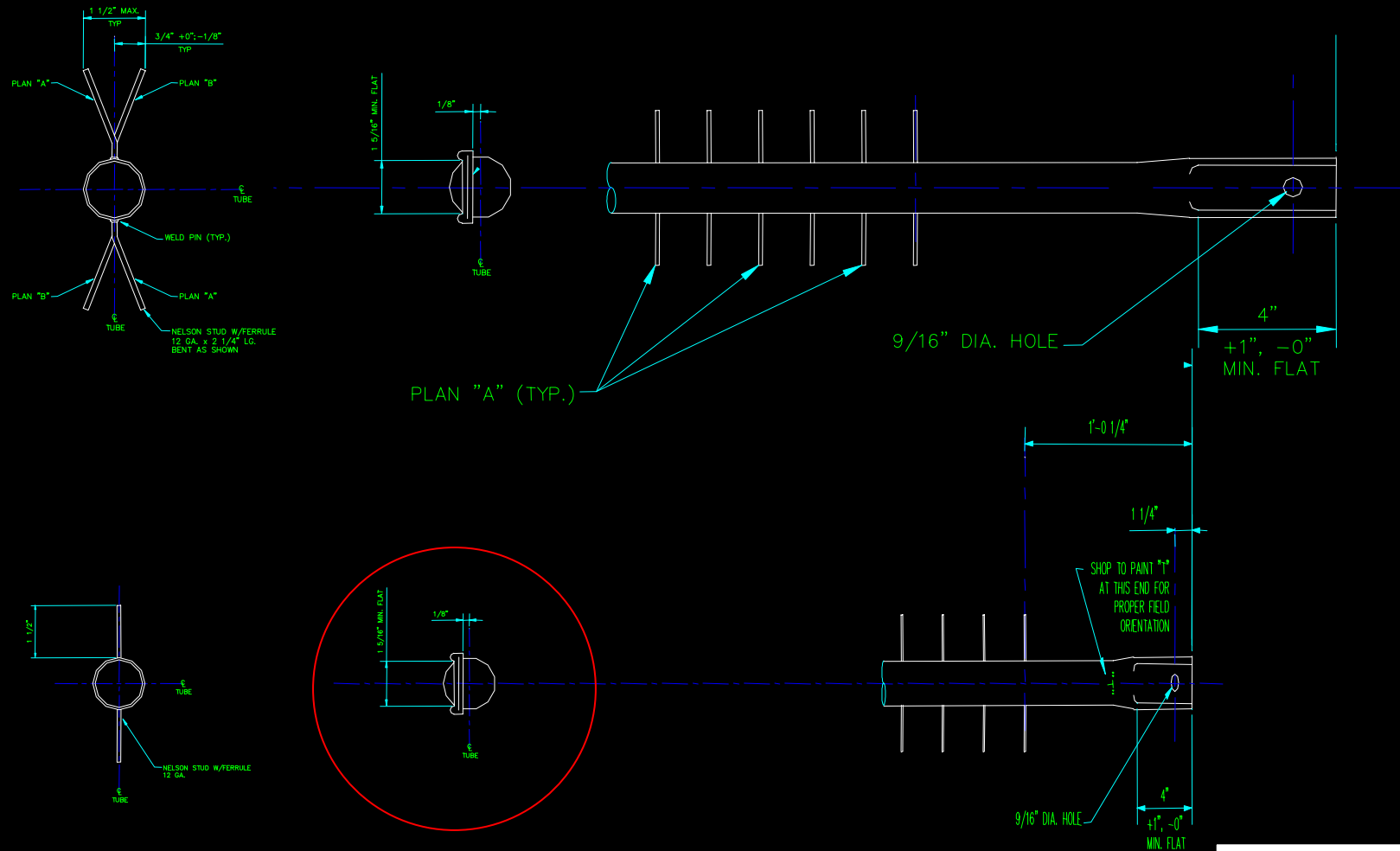


Pin Placement

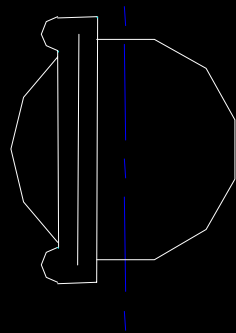


Corona Distribution

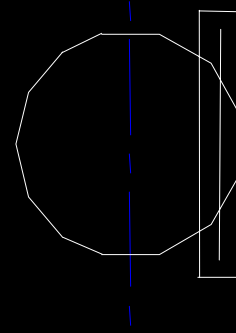
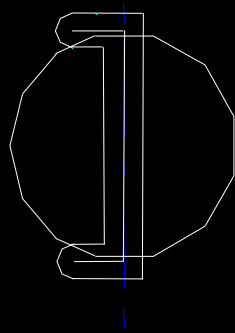
RDEs – Swage Design



RDEs – Swage Design, Cont



Recommended



Not Recommended

Thank you





















NOV 8 2005

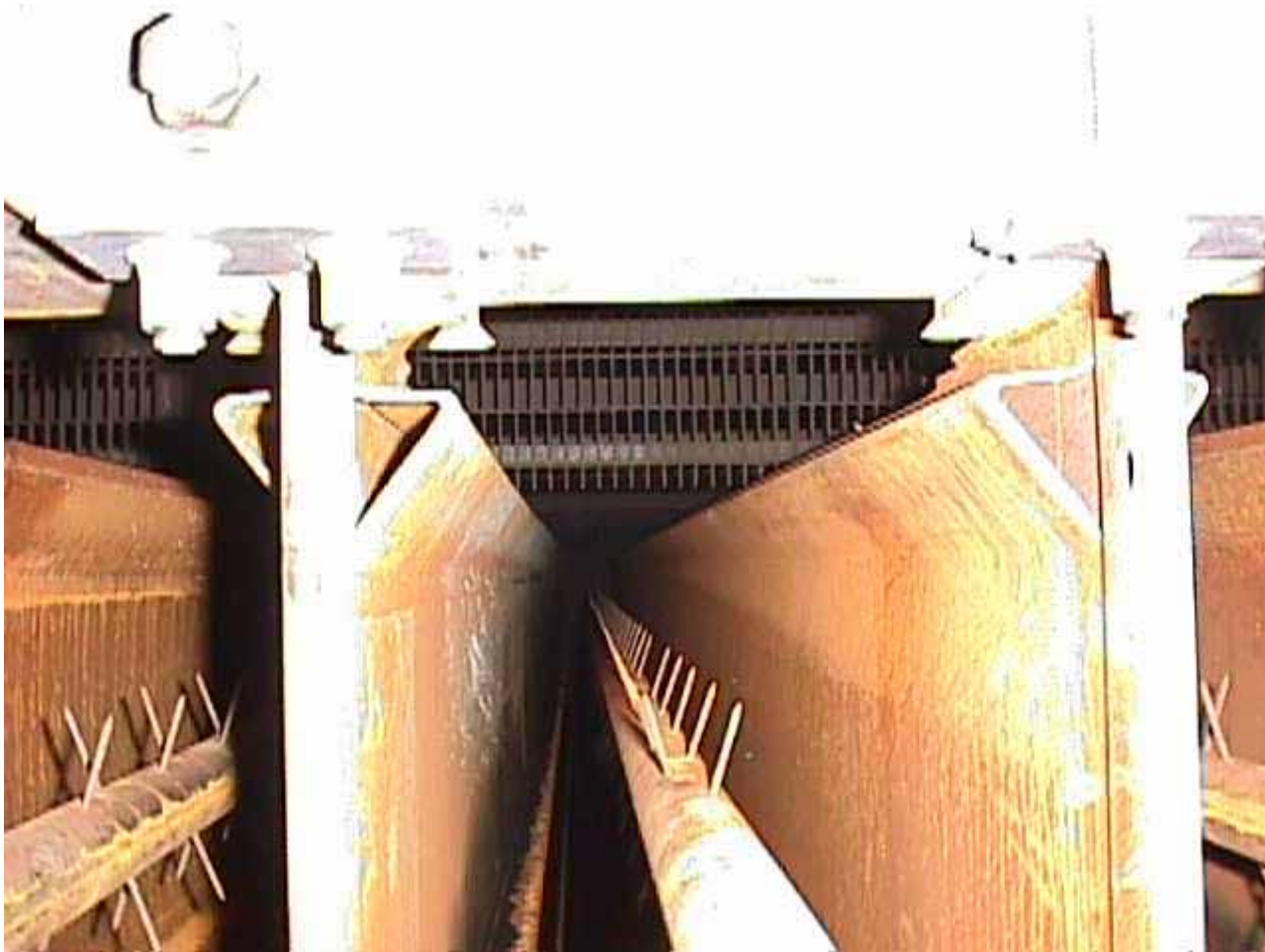


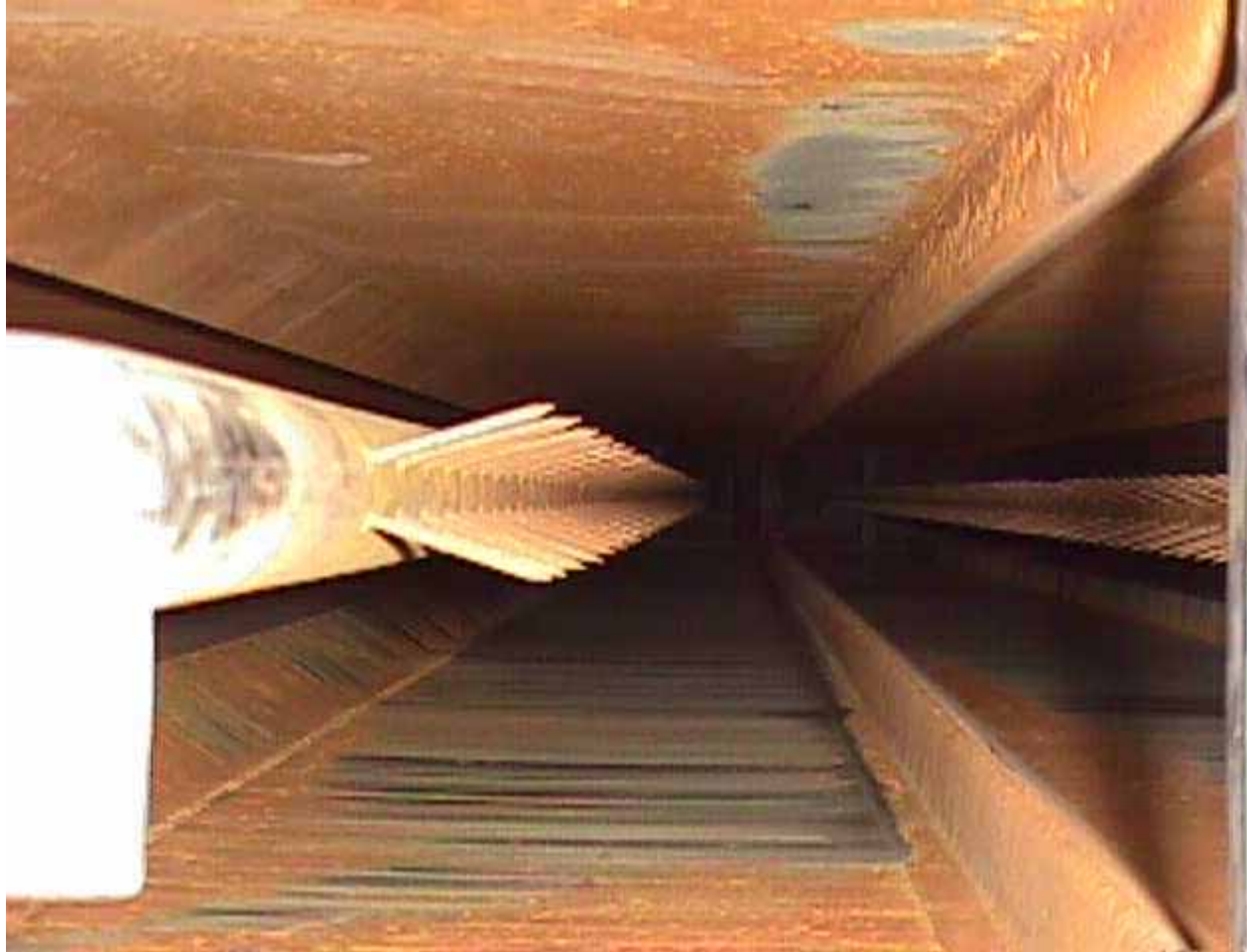








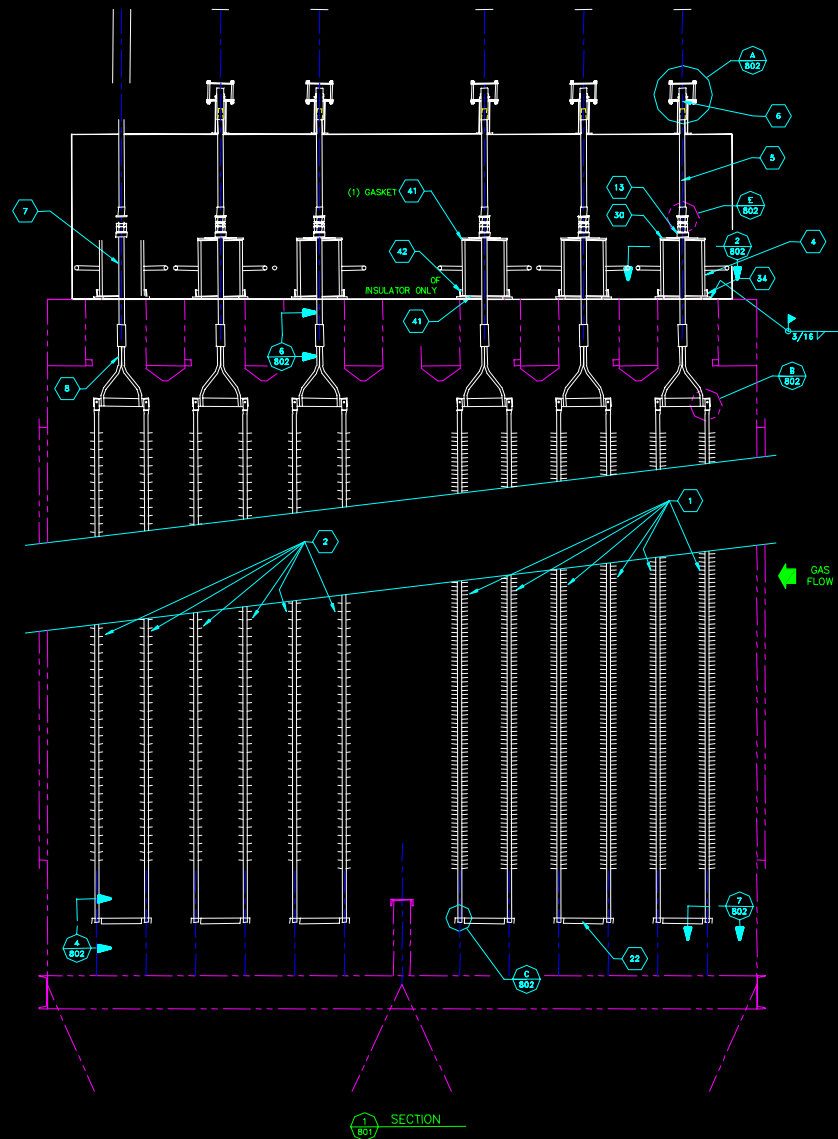


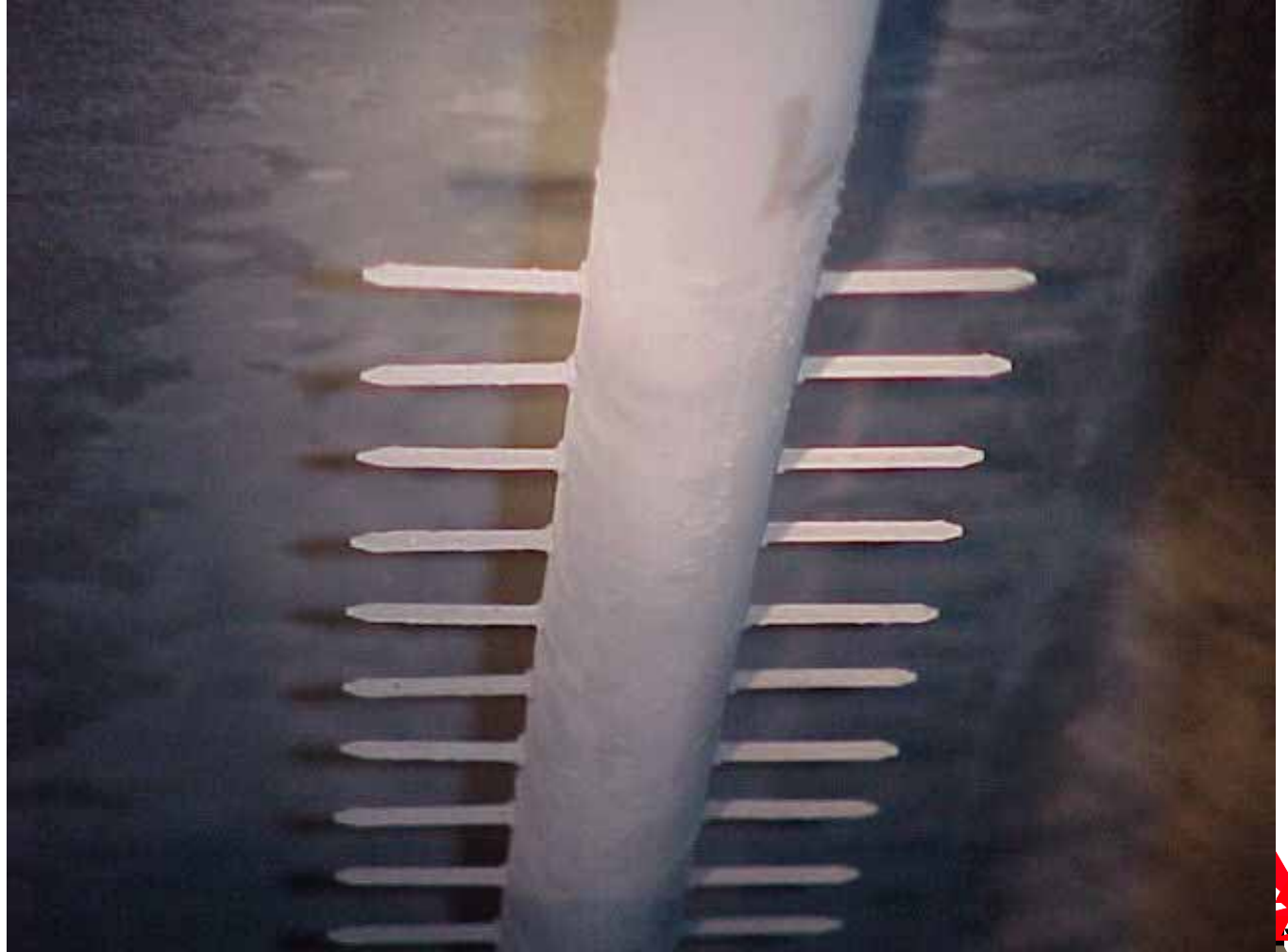






Emitting System





Electrode Build up

