Steamside ACC Inspections
Including Induced Draft ACCs

ACCUG 2026

Andrew Howell

Clarksville, TN

July 14-16, 2026

Air Cooled Condenser Users Group

http://acc-usersgroup.org/

ACC.01: Guidelines for Internal Inspection of Air-Cooled Condensers

Original Issue: May 12, 2015
Revision due: May 12, 2018

Chairman, ACCUG:

Dr. A. G. Howell
Xcel Energy
Henderson, Colorado, USA
Email: andy.howell@xcelenergy.com

ACCUG Steering Committee Members:

Gary Bishop
GWF Energy, LLC
Pleasant Hill, California, USA
Email: gbishop@starwestgen.com

Dr. R.B. Dooley
Structural Integrity Associates
Southport, Merseyside, UK
Email: bdooley@structint.com

Hoc Phung
PG&E
San Francisco, California, USA
Email: hqp1@pge.com

David Rettke
NV Energy
Las Vegas, Nevada, USA
drettke@nvenergy.com

René Villafuerte
Falcon Group - Comego
Ramos Arizpe, Coahuila, Mexico
Email: rvillafuerte@comego.com.mx

Introduction: Why are inspections necessary?

- ACCs have very large carbon steel steamside surface area
- Corrosion results in iron transport and possible air in-leakage, which can be very problematic
- It is important to evaluate the influence of steam cycle chemistry on corrosion and to identify changes that may be beneficial

Two primary ways to evaluate corrosion in the ACC:

- Visual inspection of steamside surfaces
- Corrosion product monitoring in the steam cycle (primarily condensate)

Plant type / configuration considerations

Once through boiler

- minimal contamination is permissible
- condensate polisher and filter are likely
- high pH limits polisher effectiveness

Heat Recovery Steam Generators / Drum Boilers

- remove contaminants in boiler via blowdown but less likely to have polisher / filter
- may be more feasible to use amines in place of ammonia

ACC type / configuration considerations

Factors that may influence steamside corrosion:

- cooling tube length / entry shape
- number of rows
- number of fans
- operational flexibility
- condensate drainage
- heat exchanger alloy
- steam velocity – design, parallel cooling
- forced draft vs. induced draft

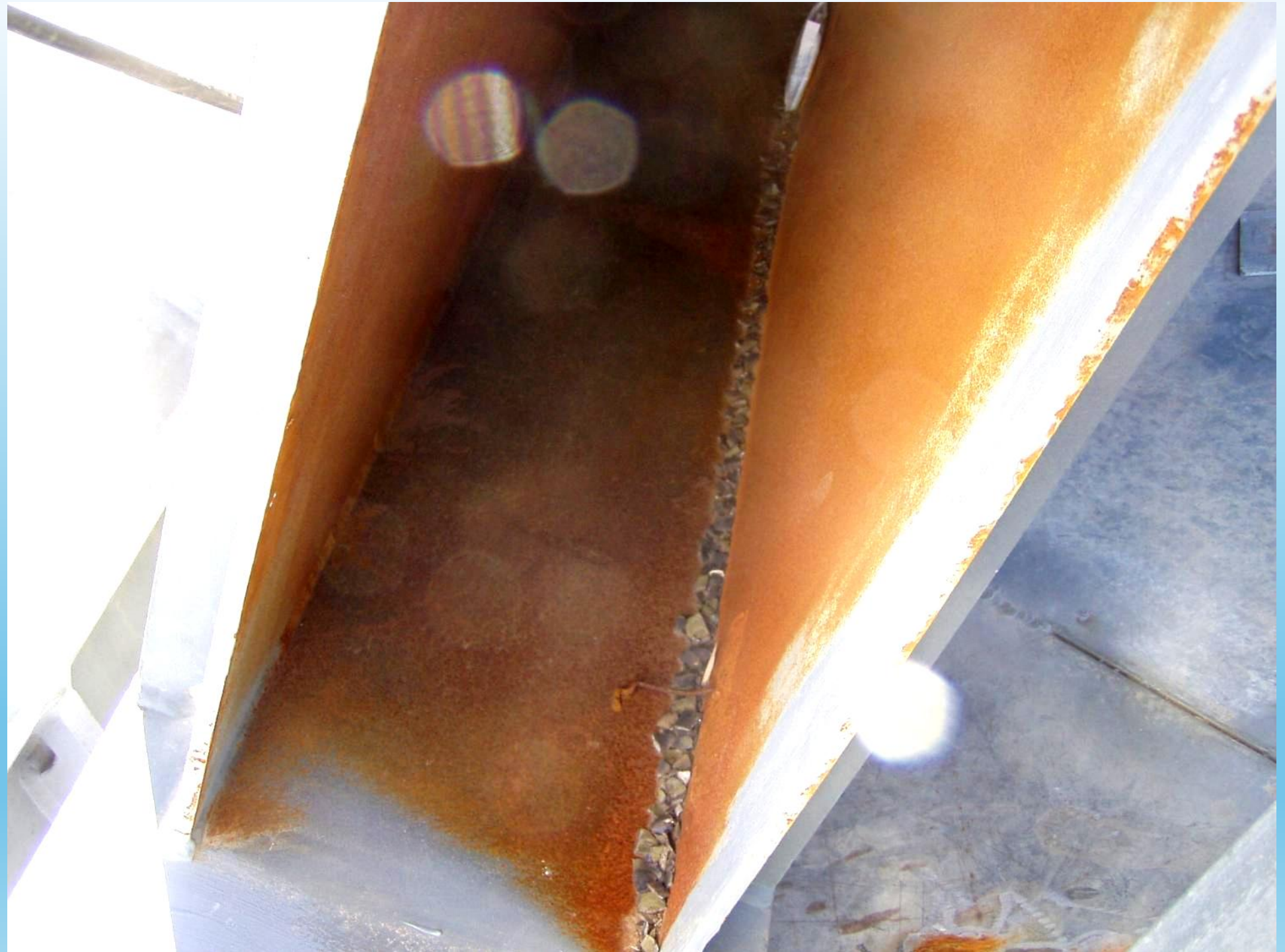
Operating considerations

- Higher pH reduces iron transport
- Neutralizing amines / filming chemicals may reduce corrosion better than ammonia alone
- Information on chemistry control, iron transport and unit operation are important
- ACC condition when off-line

Frequency of Inspection

- **Thoroughly during construction**
- Within first few months after commissioning, if possible
- Annually; select at least one duct for repeat examination, rotate others.
    - If no problems observed after 3 or 4 years, may change inspection to alternate years.


18-08
TMH
9-18-08



Frequency of Inspection

- Thoroughly during construction
- **Within first few months after commissioning, if possible**
- Annually; select at least one duct for repeat examination, rotate others.
  - If no problems observed after 3 or 4 years, may change inspection to alternate years.

Frequency of Inspection

- Thoroughly during construction
- Within first few months after commissioning, if possible
- **Annually; select at least one duct for repeat examination, rotate others.**
  - ***If no problems observed after several years, may reduce the frequency of inspection to alternate years.***

Access and Safety

- Falling – appropriate railing, walkways; elevators if possible
  - Fall protection equipment if necessary
- Upper distribution ducts – permanent ladders and platforms best
- Insure adequate air inside ducts
- Lighting
- Floor drain ports
- Plan for removal of personnel during injury

ACC Inspection Process

Take good quality typical / example photos of common areas:

- duct walls
- tube entries
- down the tubes as far as practical
- cross-bars / supports

In particular document:

- “shiny” metal
- different colors of iron oxide
- deposition

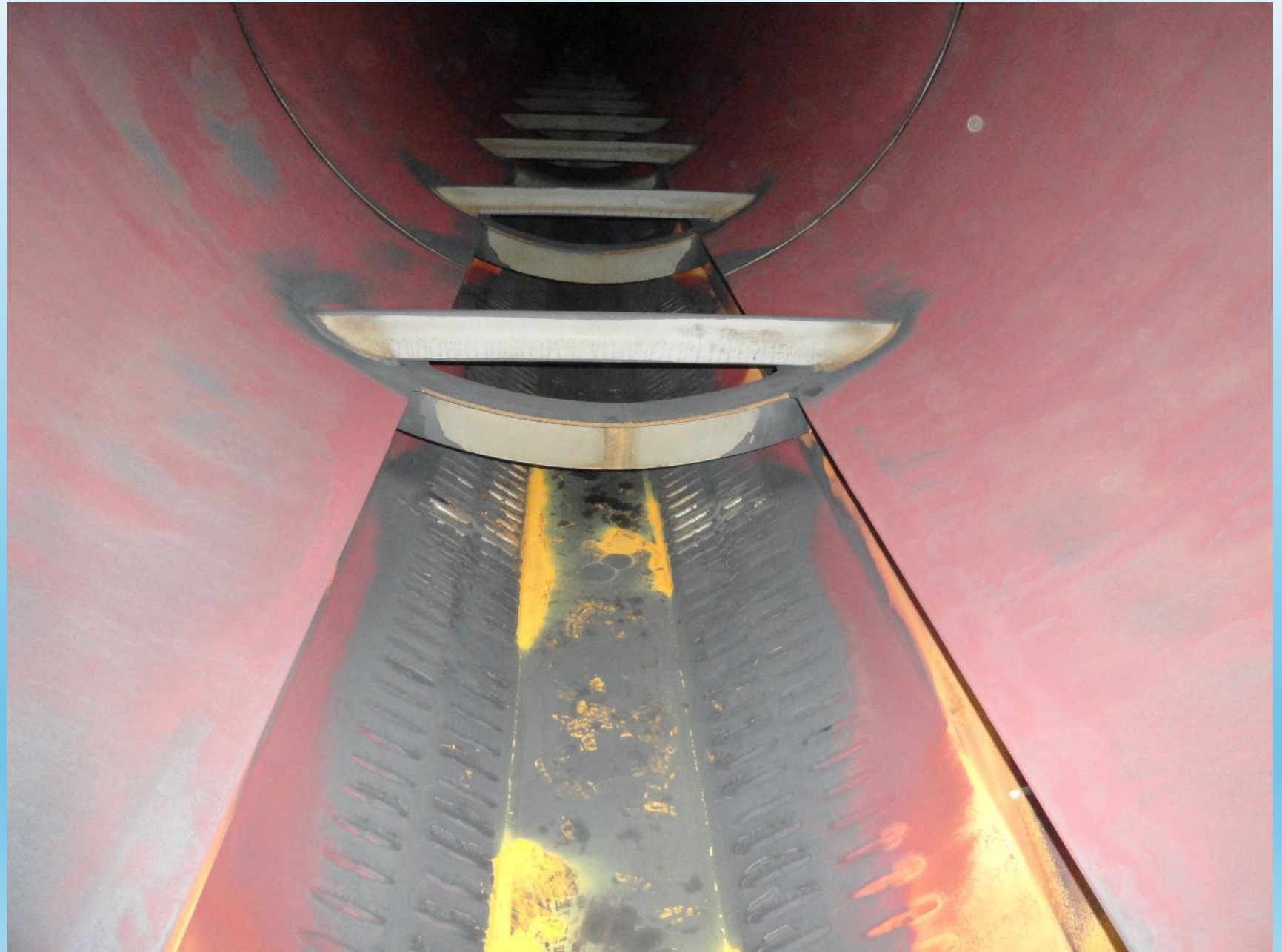
➢ Be sure to document “normal” areas as well as abnormal

➢ Mark areas for future comparison

Inspection Photo Examples

Inspection Photo Examples

Inspection Photo Examples



Inspection Photo Examples

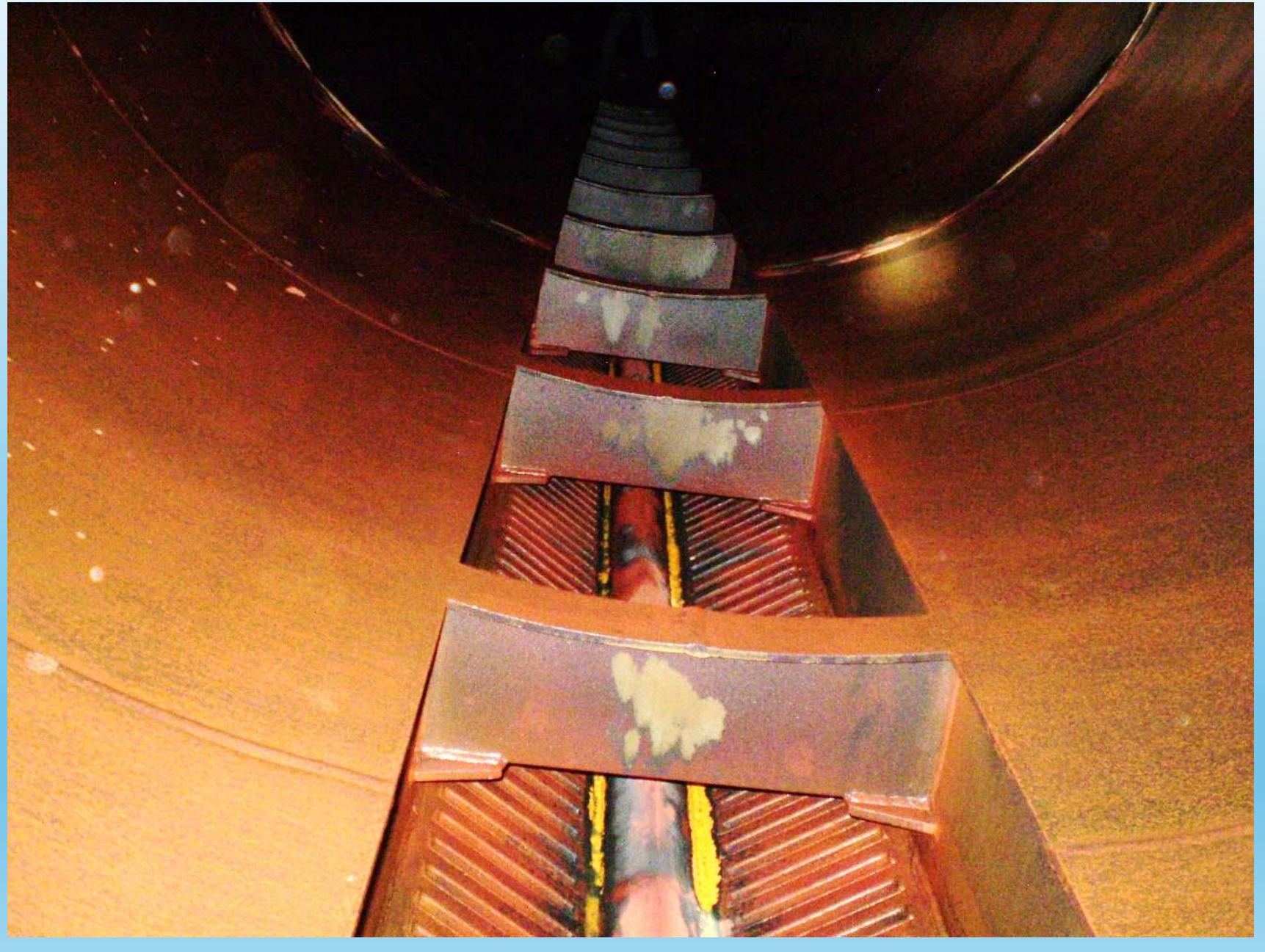
Inspection Photo Examples

Inspection Photo Examples

Inspection Photo Examples

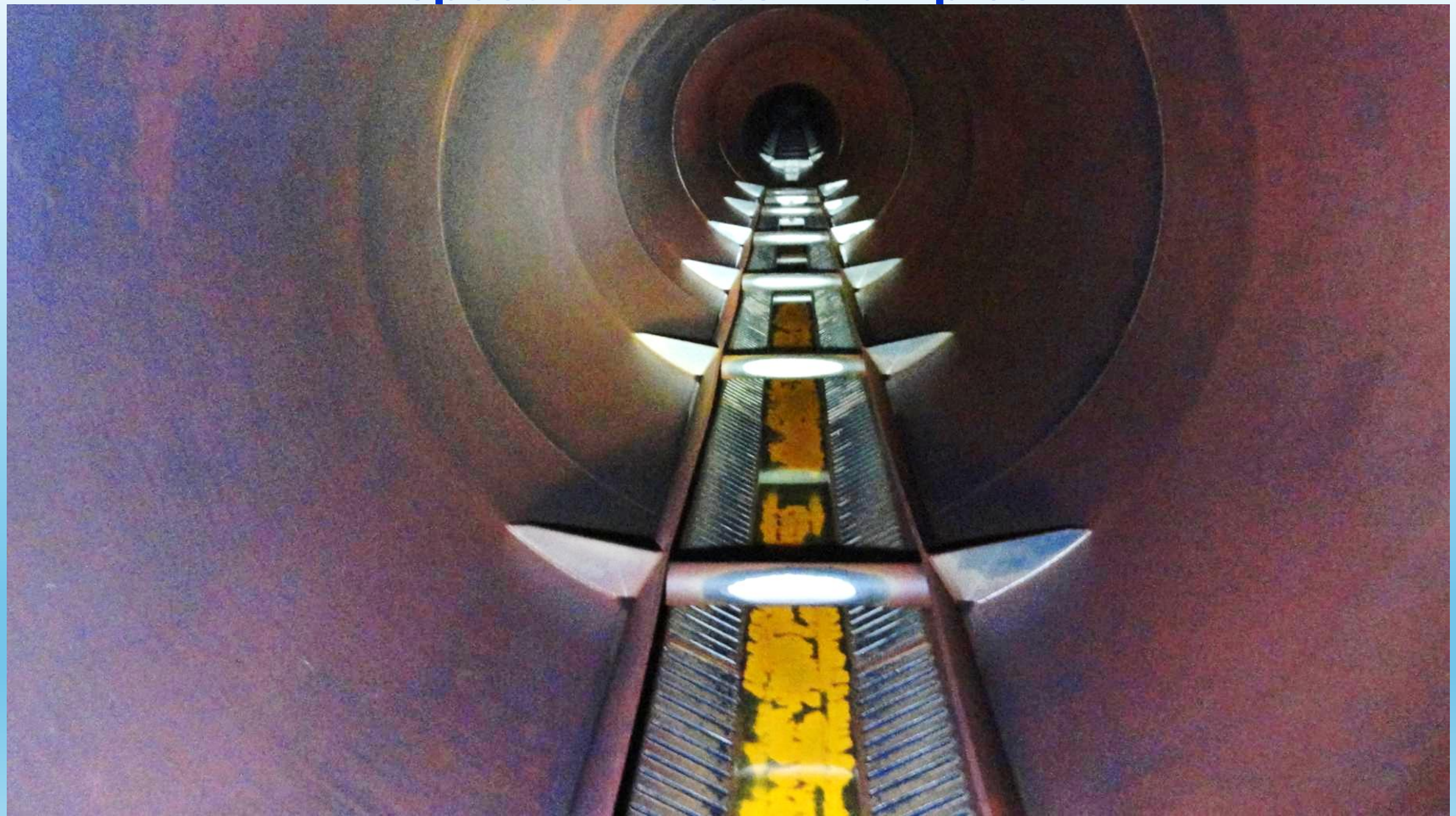
Inspection Photo Examples

Inspection Photo Examples



Inspection Photo Examples

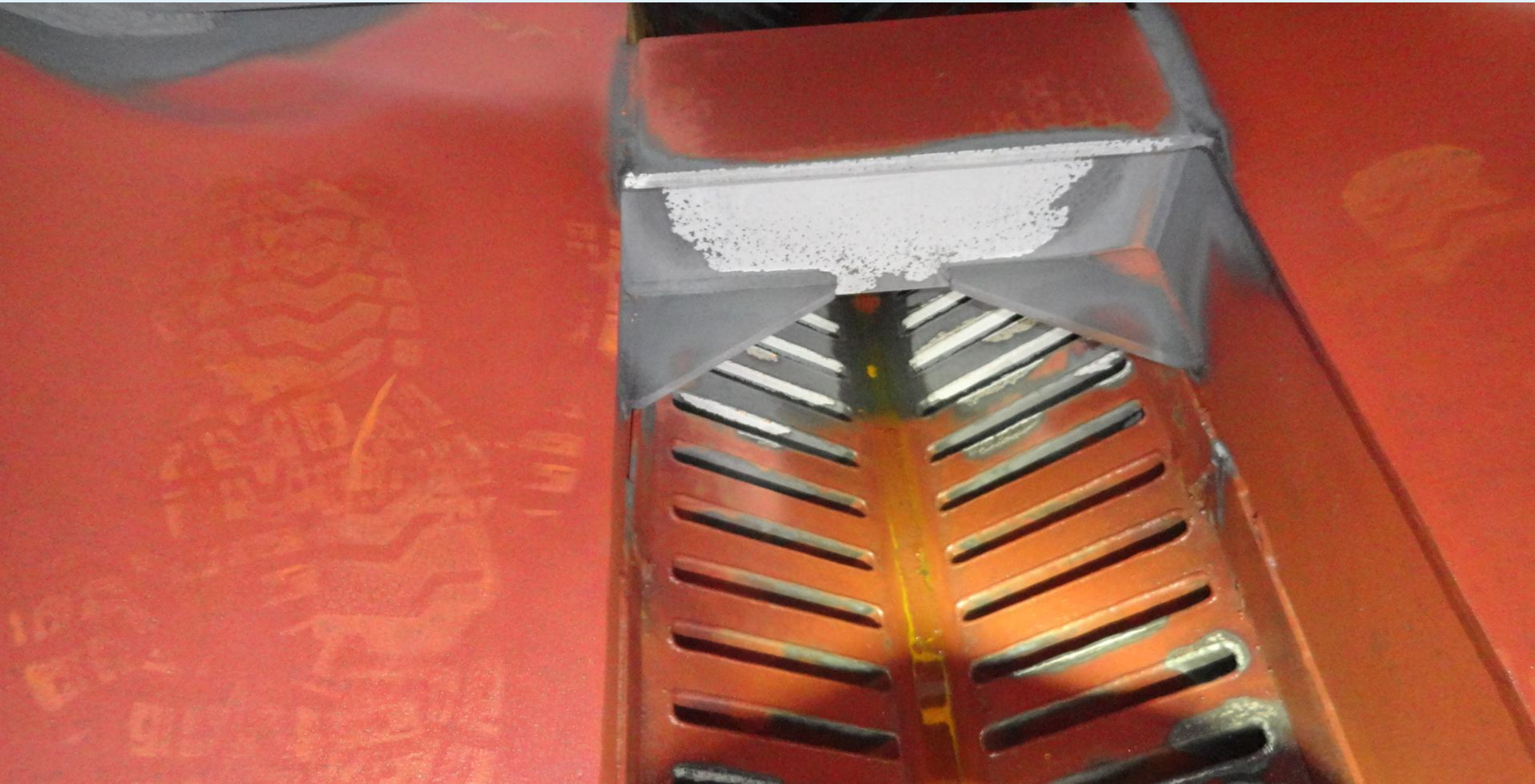
Inspection Photo Examples



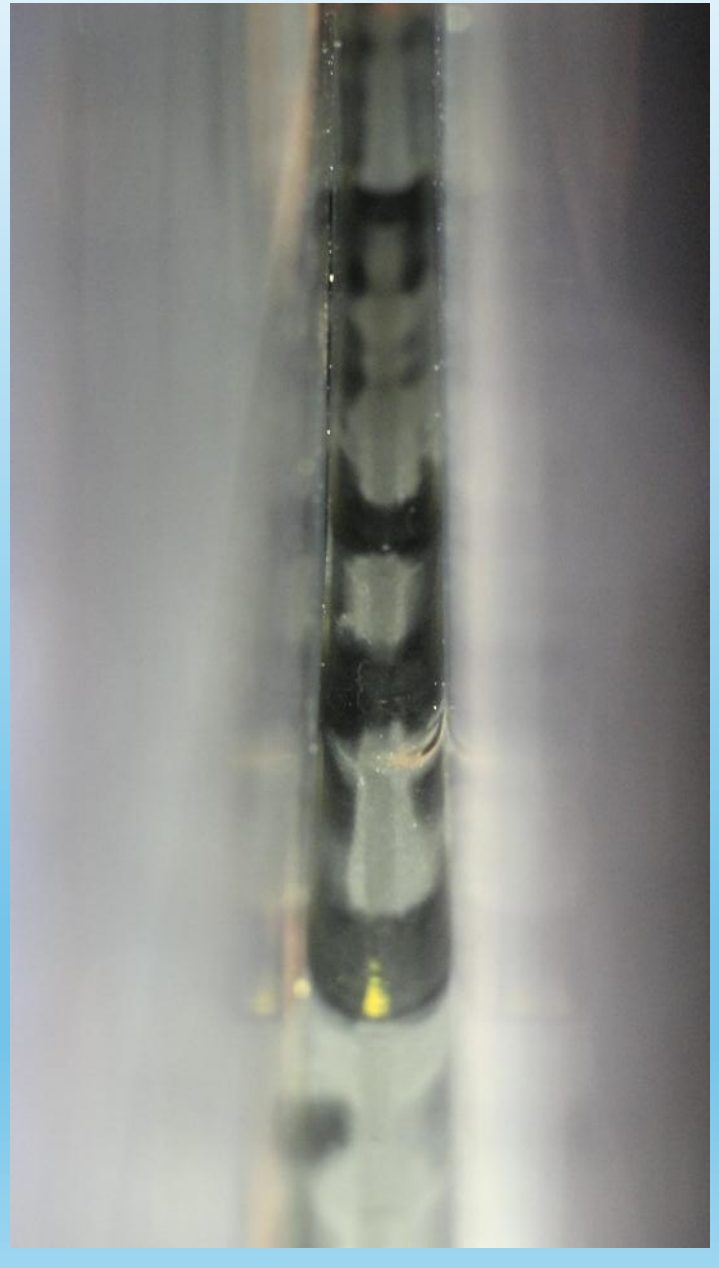
Inspection Photo Examples

Inspection Photo Examples

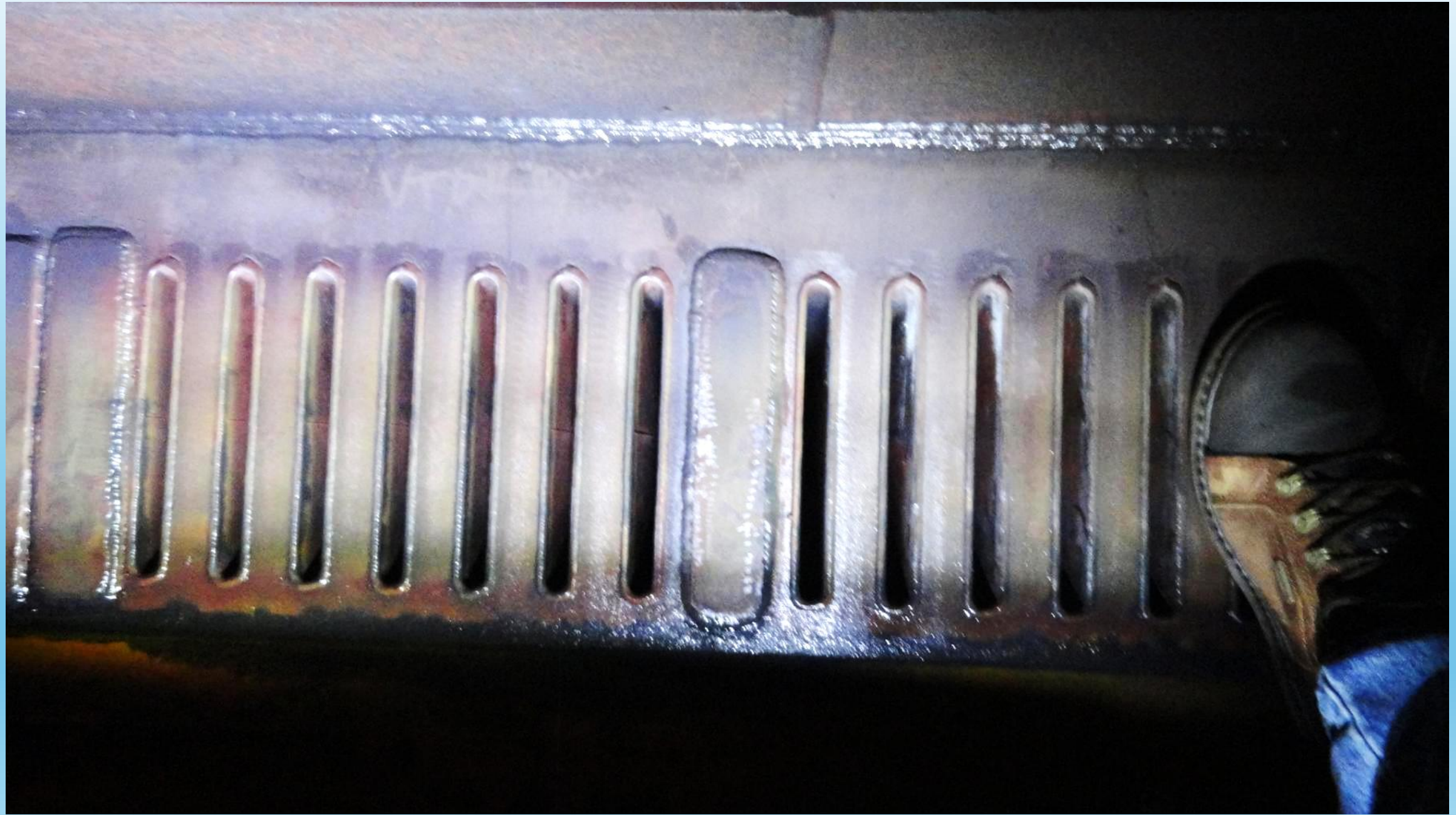
Inspection Photo Examples



Inspection Photo Examples: a few feet down the tube

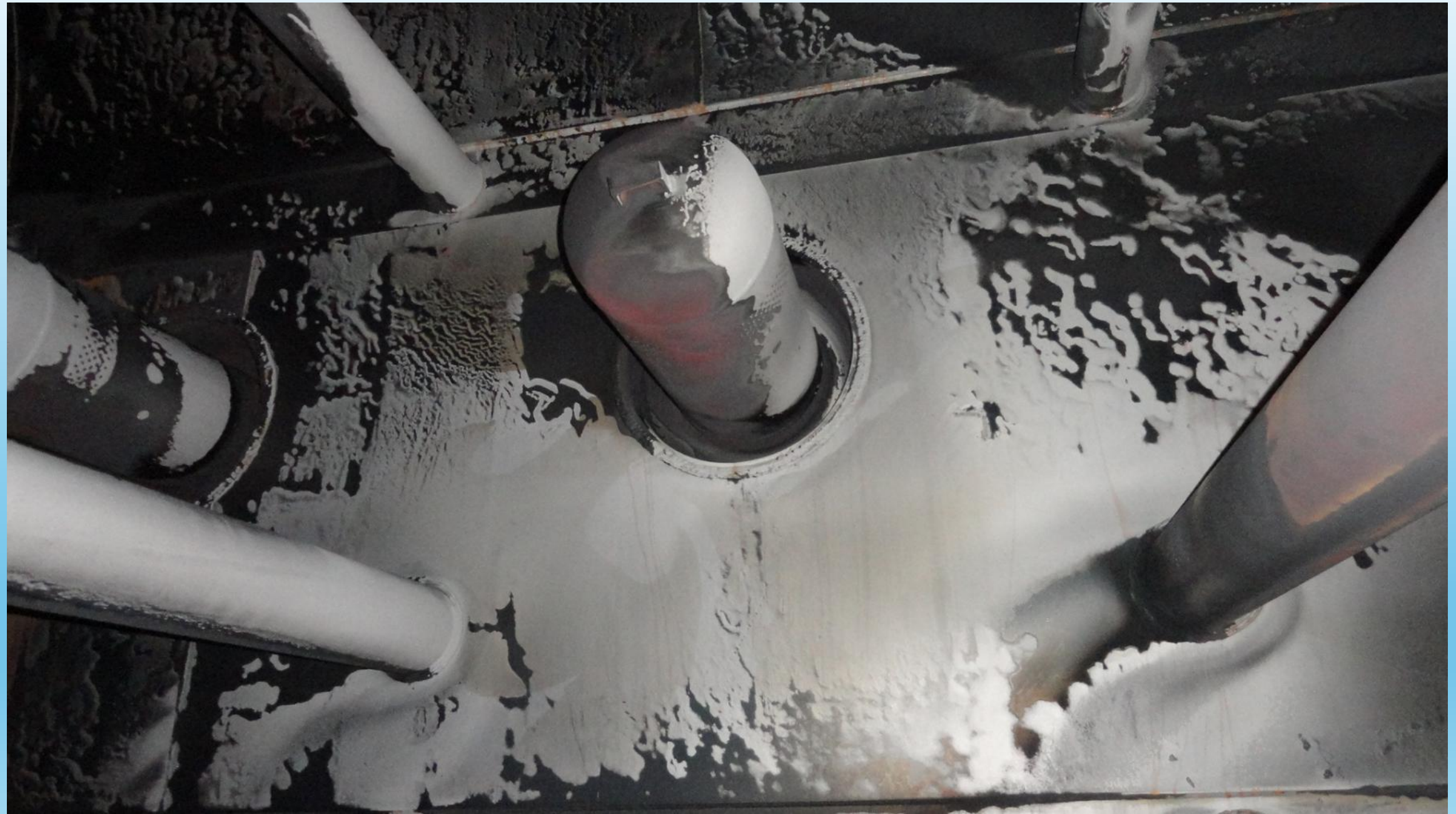


Inspection Photo Examples



Inspection Photo Examples

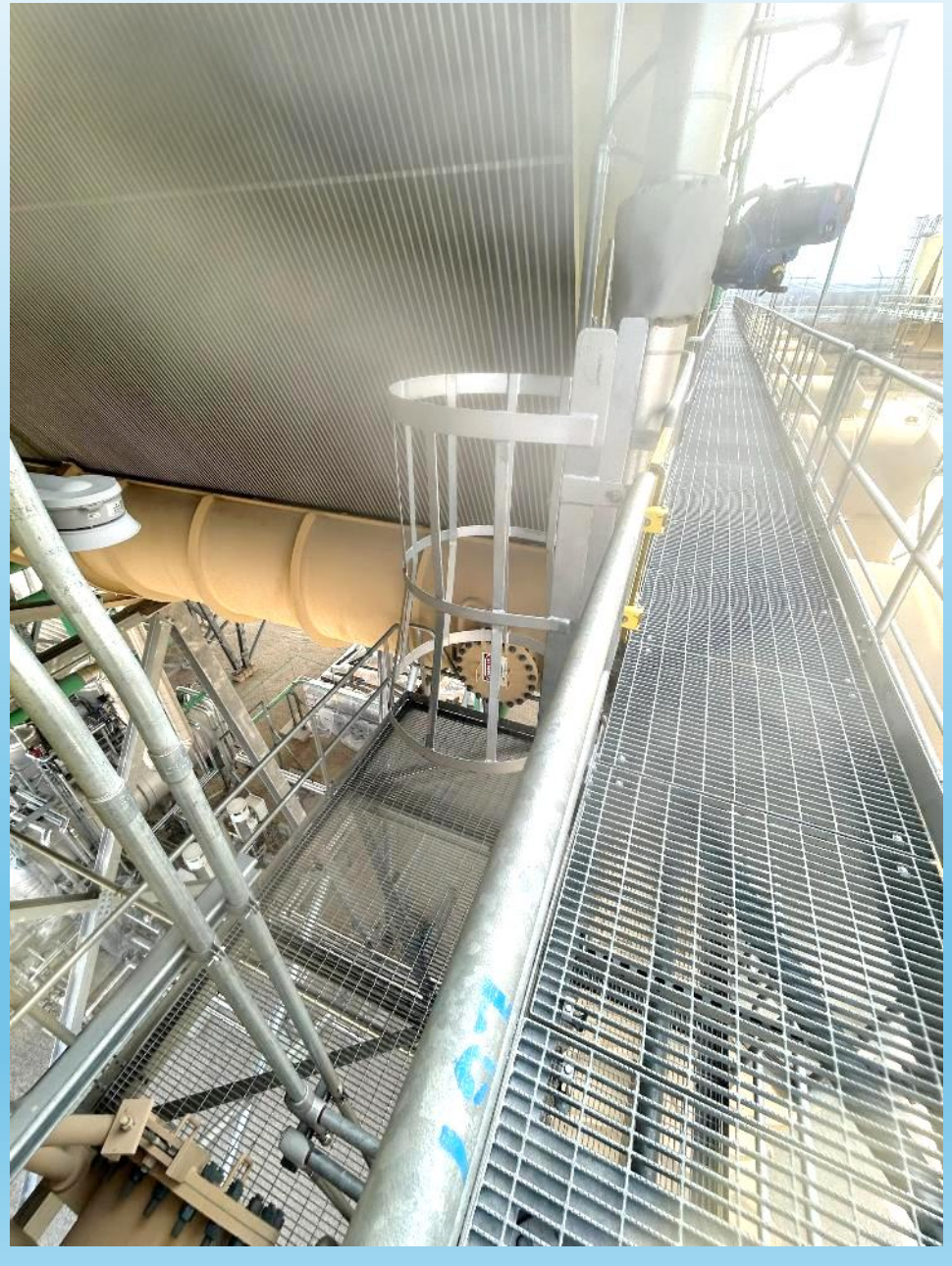
Inspection Photo Examples



Inspection Photo Examples

Inspection Photo Examples: Induced Draft ACC

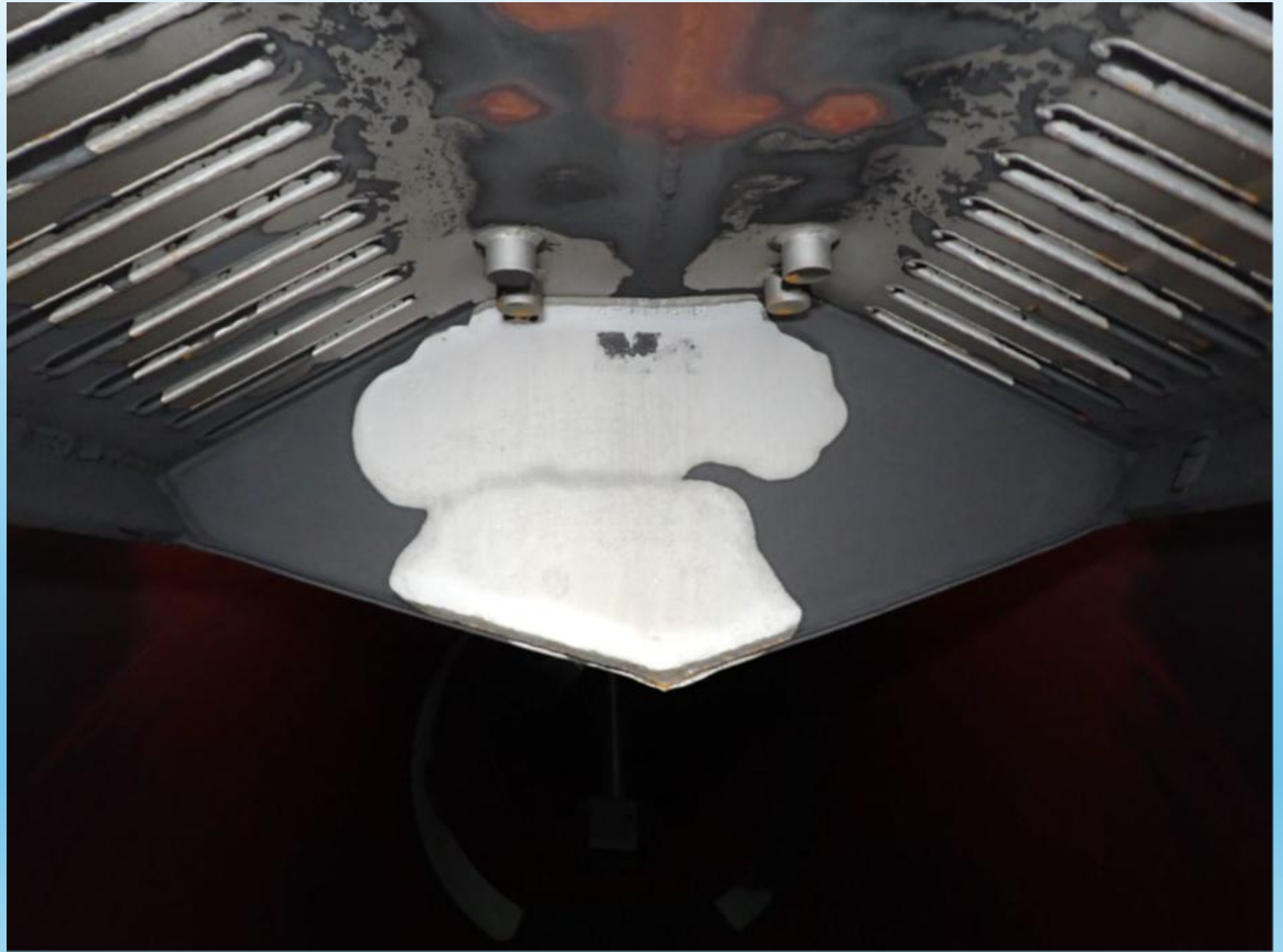
Inspection Photo Examples: Induced Draft ACC



Inspection Photo Examples: Induced Draft ACC

Inspection Photo Examples: Induced Draft ACC

Inspection Photo Examples: Induced Draft ACC



Rating: DHACI (1 – 5)

Upper Section: duct, cooling tube entries

- **1 - Good condition: no corrosion found**

Rating: DHACI (1 – 5)

Upper Section: duct, cooling tube entries

- 1 - Good condition: no corrosion found
- **2 - Minor corrosion: no bare metal, but black deposits at tube entries**

Rating: DHACI (1 – 5)

Upper Section: duct, cooling tube entries

- 1 - Good condition: no corrosion found
- 2 - Minor corrosion: no bare metal, but black deposits at tube entries
- **3 – Moderate corrosion: scattered spots of bare metal, black deposits**

Rating: DHACI (1 – 5)

Upper Section: duct, cooling tube entries

- 1 - Good condition: no corrosion found
- 2 - Minor corrosion: no bare metal, but black deposits at tube entries
- 3 – Moderate corrosion: scattered spots of bare metal, black deposits
- **4 – Serious corrosion: widespread bare metal at tube entries along with widespread black deposits**

Rating: DHACI (1 – 5)

Upper Section: duct, cooling tube entries

- 1 - Good condition: no corrosion found
- 2 - Minor corrosion: no bare metal, but black deposits at tube entries
- 3 – Moderate corrosion: scattered spots of bare metal, black deposits
- 4 – Serious corrosion: widespread bare metal at tube entries along with widespread black deposits
- **5 – Very serious corrosion: holes in tubes or welds, widespread corrosion in other tubes**

Rating: DHACI (A – C)

Lower Section: turbine exhaust, lower duct, risers

- **A - Good condition: no corrosion found**

Rating: DHACI (A – C)

Lower Section: turbine exhaust, lower duct, risers

- A - Good condition: no corrosion found
- **B - Minor corrosion: some scattered spots of bare metal**

Rating: DHACI (A – C)

Lower Section: turbine exhaust, lower duct, risers

- A - Good condition: no corrosion found
- B - Minor corrosion: some scattered spots of bare metal
- **C – Serious corrosion: multiple, widespread areas of bare metal; black deposits**


C

Purpose of DHACI ratings

The DHACI rating system is used to compare between units, or to track changes corresponding to operating changes within a unit.

The lower duct area is generally not a major concern, since the walls are thick compared with cooling tube walls.

Inspection worksheets can be helpful

ACC Inspection Worksheet: Background Information

Unit name	
Date inspected	
Inspector	
Plant contact	
Unit design (general / MW capacity)	
ACC design	
Tube type	
ACC manufacturer & startup year	
Condensate T (seasonal)	
Design steam flow	
Condensate polishing? (describe)	
Condensate filtration? (describe)	
Condensate Fe levels: startup	
Condensate Fe levels: routine	
Condensate pH control range	

ACC Inspection Worksheet: Locations

LP turbine blades, last stage(s)	
LP turbine exhaust, direct impact and vicinity	
Large steam exhaust duct	
•general surface	
•flow-related corrosion areas	
Lower distribution duct	
•flow-related corrosion areas	
•riser entries	
•other comments	
Lower Duct DHACI rating: A, B or C	
Upper distribution duct (which one?)	
•entry louvers	
•entry duct region	
•general duct	
•tubesheet and cross-supports	

Non-corrosion component integrity also should be considered

Conclusions

Inspection of the steamside of ACCs provides valuable information about the corrosivity of condensed steam on carbon steel components. Regular inspections and careful documentation are essential.

Induced draft ACCs appear to have similar corrosion patterns to forced draft units, but this cannot be confirmed until enough additional inspections are performed.

The ACCUG steamside ACC inspections document will be updated to include induced draft ACCs and the issue of corrosion downstream from finned tube steam entry.

Questions?