



# Overview of Technical Support

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# What is Tech Support?

- MSHA has a staff of scientists, engineers and industrial hygienists who can suggest solutions to difficult mine safety and health problems.
- This staff is located at two centers:
  - Pittsburgh Safety and Health Technology Center
  - Approval and Certification Center

# Technical Support



# Approval & Certification Center (A&CC)



# **A&CC Mission**

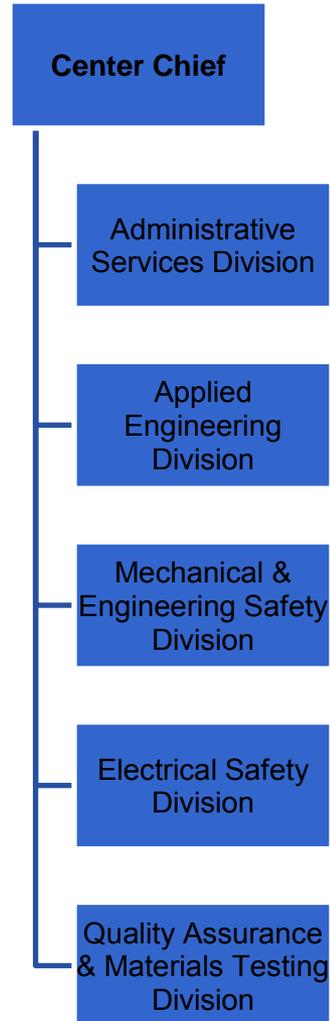
- **Administer MSHA's approval and certification program for equipment and materials manufactured for use in the mining industry in accordance with applicable parts of 30 CFR.**
- **Ensure the integrity of approved products through a quality assurance program.**
- **Provide scientific and engineering expertise in the resolution of technical problems involving mining equipment and materials, investigation of accidents and disasters, and litigation.**
- **Evaluate and develop new technology to enhance the safety of miners.**

# Principal Work Activities

Provide engineering support and technical assistance to the following areas:

- Accident investigations
- Engineering solutions
- Expert witness activities
- Compliance activities
- Equipment/product approvals
- Quality assurance activities
- Training
- Accident reduction programs

# Approval & Certification Center



# Applied Engineering Division

## Activities:

- Accident investigation assistance
- Incident reduction efforts – compliance assistance
- Technical assistance
- Litigation support
- Specialized training
- Innovation production evaluations



# Mechanical & Engineering Safety Division

## Approval programs:

- Machine features
  - vehicle braking systems
  - hydraulic systems
  - ensure overall safety of diesel machines
- Dust collector systems – underground rock drills
- Diesel engine components
  - emissions to control toxic gases and DPM
  - components for explosion proofing engines



# Mechanical & Engineering Safety Division

- Provide technical assistance:
  - nondestructive wire-rope testing
  - fire protection engineering
  - explosives safety
  - haulage-related issues
  - pressure vessels
  - vehicle-control systems
  - guarding
- Conduct accident investigations
  - identify causes and contributing factors
  - preventive measures
- Provide training to enforcement and industry  
(diesel rules, tire and rim safety, permissibility, pressure vessels, roof bolter safety, visibility, hydraulics, brakes, fire protection, explosives)
- Assist in developing new regulations



Nonfatal – shovel loses cab

# Electrical Safety Division

(approvals, intrinsic safety, permissibility)

- Provide technical assistance to enforcement
- Provide approval assistance to approval applicants/manufacturers
- Conduct accident investigations
  - electrical fatalities
  - explosions
- Investigate new technology
  - remote control proximity protection
  - communication and tracking systems



# Electrical Safety Division

- Product approvals to ensure compliance with 30 CFR
- Assist in development of new regulations
- Provide training to mining industry or MSHA personnel  
(accident investigation, annual electrical retraining, outreach efforts, workshops)
- Laboratory capabilities for testing  
(flash current for batteries, surface temperature, component drop, thermal shock, performance requirements, impact, dust)



Explosion-proof enclosure testing

# Quality Assurance & Materials Testing Division

- Programs
  - product audits
  - approvals
  - technical assistance
  - permissibility training
  - field comments
  - accident investigations
- Product audits
  - examine product for conformance
  - verify conformance of materials to applicable requirements
  - resolve product nonconformity issues
- Improve manufacturers' quality



Duetz engine

# Quality Assurance & Materials Testing Division

- Provide technical assistance related to mining materials and equipment for enforcement and industry
- Investigate field complaints on approved/nonapproved mining materials and equipment
- Manufacturer product safety recalls
- Laboratory capabilities:
  - flammability testing
  - microscope imaging

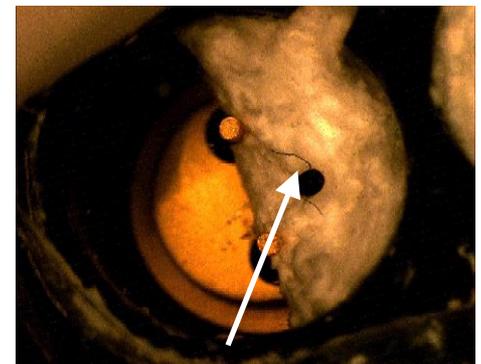


Image of Pelement Sensor  
in methane detector

# New Technology Evaluations



- Refuge chambers
  - Studies determine:
    - operational requirements
    - draft regulations
- Communication and tracking systems
  - Performance studies determine:
    - various wireless technologies
    - potential impact to existing regulations
    - ensure system works with/without mine power



# Pittsburgh Safety & Health Technology Center (PS&HTC)

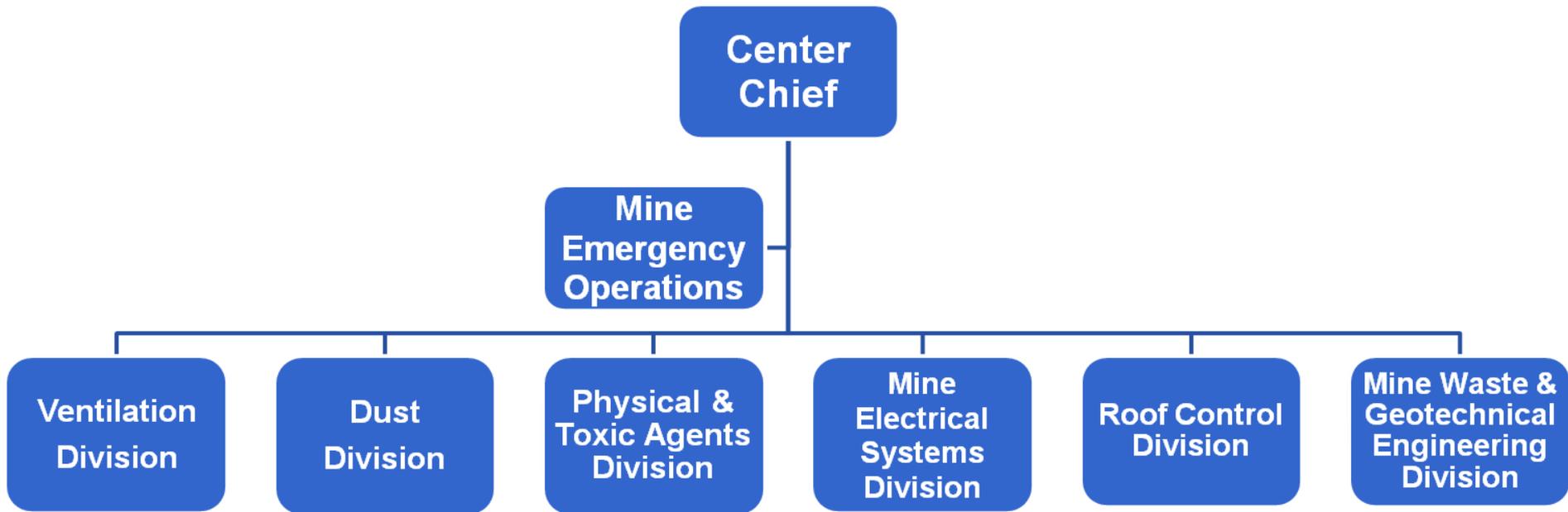


# PS&HTC Mission

- To provide engineering and scientific capabilities to assist MSHA, state agencies, and the mining industry in delineating technological mine safety and health problems, and conducting field investigations and laboratory studies to develop solutions to specific problems.
- The center responds to requests for assistance on safety and health problems at coal and metal/nonmetal mines in the United States involving their recognized expertise in their particular fields of mine-related work.



# Pittsburgh Safety & Health Technology Center



# Mine Emergency Operations

- Coordinates and supervises the MEO response for PS&HTC
- Operates and maintains MSHA's MEO equipment and resources
- Develops and implements the Mine Emergency Response Development training programs

# Mine Emergency Operations



- Maintains two mobile Command Vehicles (Beckley, WV and Price, UT). New one ordered for Pittsburgh, PA
- Equipped with several types of communications equipment including satellite
- Computers



- MSHA Metal/Nonmetal Mine Rescue Team has 12 members
- Highly trained in rescue equipment
- Train one day each month

# Mine Explorer Robot

- Permissible
- Modified ANDROS Wolverine robot used by military and swat teams
- 3 TV cameras, remote display
- Continuous display of mine gases from Industrial Scientific detection instrument
- Approximately 5,000 feet of fiber optic control/data cable



# Ventilation Division

## Activities:

- Accident investigations
- Face ventilation studies
- Plant ventilation studies
- Cement ventilation studies
- Cement plant explosion investigations
- Consultations
- Training
- Litigation assistance
- Regulation development



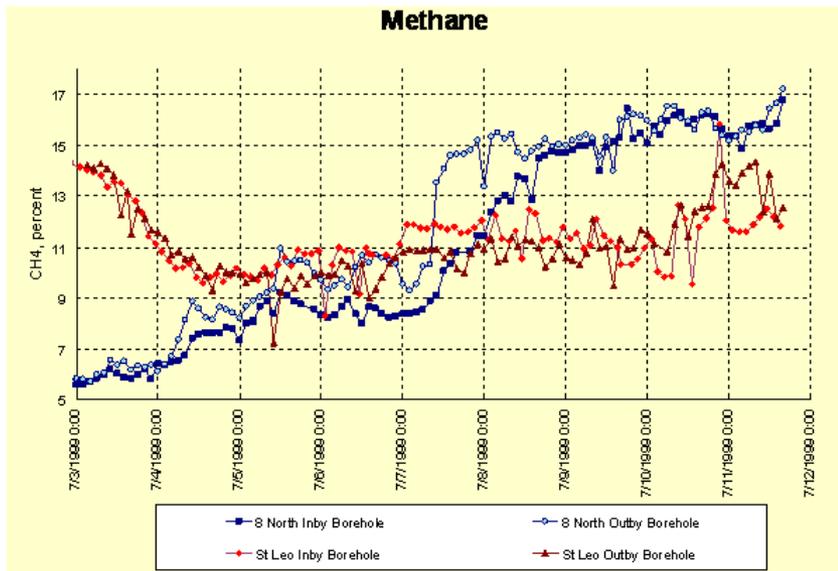
Mine ventilation surveys

# Ventilation Division

Onsite gas monitoring and data analysis at mine fires, gas inundations, and explosions



Provides decision making assistance at the scene of mine disasters for ventilation and explosibility related situations



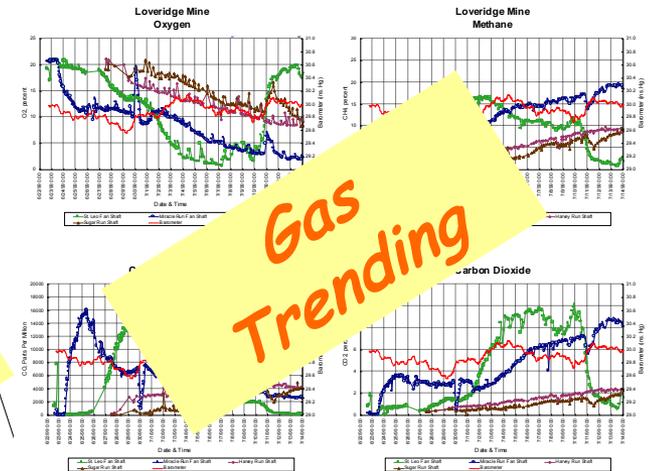
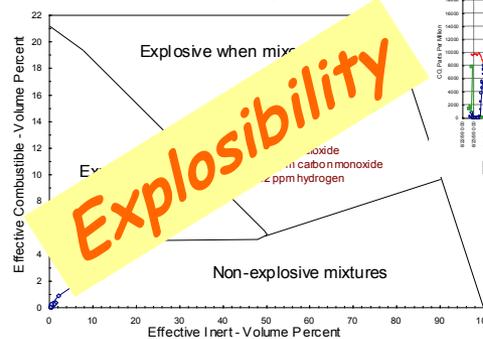


continuous infrared and electrochemical gas monitoring



Day 4 June 25, 1999

Loveridge No. 22 Mine  
Miracle Run Fan Shaft  
Explosibility Diagram



mine atmosphere analysis

# RAPID EMERGENCY RESPONSE

# Dust Division Lab

- Pre- and post-weigh cassettes
- Analyzes samples
  - respirable dust
  - silica
    - IR for coal samples
    - X-ray diffraction for M/NM samples
  - diesel particulate matter (DPM)
  - elemental analysis
    - ICP
  - fiber analysis



Robotic Automated Weighing System



Received samples

# Dust Division

## Compliance Assistance

Provide technical assistance for:

- Underground mines (Coal and M/NM)
  - dust and silica
  - DPM  
(ventilation, engines, environmental cabs, alternative fuels, work practices, filters)
- Surface plants – dust and silica
- Quarries – dust and silica
- Mills – dust, silica, and asbestos
- Refineries – dust, silica, and silver fumes



# Physical & Toxic Agents Division

- Technical areas:
  - noise
  - vibration
  - heat stress
  - cold stress
  - ergonomics
  - toxic chemicals
  - radiation
  - mine gases
  - mine emergency
  - industrial hygiene
- Calibrate inspectors' noise and radiation instruments
- Analyze air and liquid samples



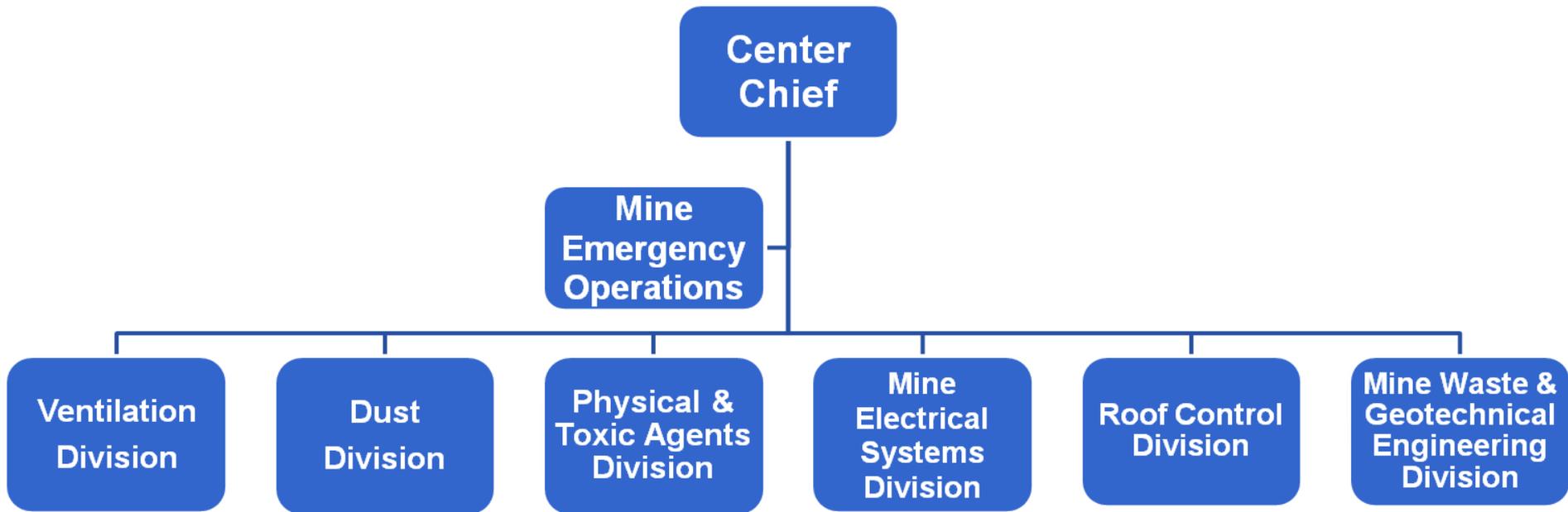
Evaluation of new noise control materials



Liquids Laboratory



# Pittsburgh Safety & Health Technology Center



# Mine Electrical Systems Division

(power systems, grounding, hoists)

Capabilities and functions:

- Technical assistance
- Accident investigations
- Laboratory support
- Expert witness testimony
- Industry and MSHA standards
- Electrical Safety Seminars



# Mine Electrical Systems Division



Conduct evaluations and investigations of mine hoisting systems, including mine elevators and mine hoists

Conduct electrical accident investigations, and evaluate outby and surface power and remote control systems



Work in conjunction with EPD and EFS on electrical training trailers and demonstration modules used to train mine personnel

# Roof Control Division

Major work areas:

- Evaluation of roof support systems
- Field investigations
- Falling object protective structures
- Mine stress analysis and design
- Remote sensing
- Standards and regulations
- ASTM specifications



Canopy on front-end loader



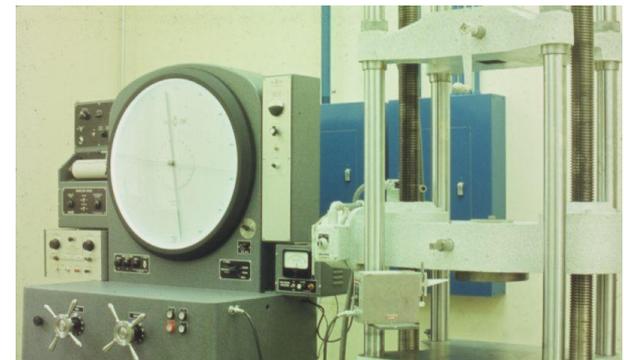
Accident investigation

# Roof Control Division

- Perform onsite investigations to resolve roof and ground control problems
- Conduct laboratory tests on roof support products
- Use latest technologies to identify potential ground control problem areas
- Perform computer modeling to evaluate mining methods and design parameters
- Evaluate machine-mounted roof-fall safety devices



Highwall evaluation



Roof Support Testing Lab  
Universal Testing Machine

# Mine Waste & Geotechnical Engineering Division

Main activities:

- Impoundment and tailings – dam safety
  - plan reviews
  - field investigations of problems
- Geotechnical Engineering
  - highwall & slope stability
  - mining under/near bodies of water
  - dump-point & surge-pile practices
  - haul roads
- Structural Engineering
  - preparation and processing plants
  - bins & silos
  - bridges & conveyor supports
- Accidents investigations
- Training presentations



Highwall and slope stability



Accident investigation

# Technical Support Conclusion

- MSHA does have a staff of engineers, scientists, and industrial hygienists to assist with difficult mining situations
- Feel free to contact these experts
- Phone numbers and other information about Technical Support are available on MSHA's website under Technical Assistance at: [www.msha.gov](http://www.msha.gov)

# Case Study

Conducted by Field Group of the Dust Division, PS&HTC

- Ground silica quarry and mill
  - 23 employees
- Ongoing overexposure to two occupations:
  - Kiln/dryer operator
    - 0.72 mg/m<sup>3</sup> 46% silica (0.49 mg/m<sup>3</sup> PEL)
  - Crusher operator/worker
    - 0.79 mg/m<sup>3</sup> 74% silica (0.13 mg/m<sup>3</sup> PEL)

# Why are Studies Conducted?

- Investigations are conducted at the request of:
  - District Manager
  - Arlington Headquarters
  - Mine operators can request assistance through the District Manager:
    - conflict of interest with independent consultants
    - mine operators can always phone call technical support for assistance

# With a District Manager's permission, mine is notified that a survey will be conducted

- Technical investigation, NOT an enforcement activity!
  - Technical Support does not have any ARs:
    - gives us the ability to concentrate on the problem, not inspecting
    - we do have Right of Entry
    - our samples can be used by enforcement personnel
      - a citation has never been issued based on our sampling results
- Allows us to contact the mine and obtain information for the survey

# Pre-Visit Information

(Normally over the phone to both MSHA and Mine Operator)

- Assure mine will be working at full production at the time of the survey
- Obtain shift operating times
  - Plan our arrival at the mine
- Obtain directions to the mine
- Obtain background information:
  - Process information, material flow, workforce
    - plan our sampling strategy
  - Information on overexposure
    - extraneous circumstances that cause the overexposures

# Mine Knows We Will Do the Survey

- Allows the mine to prepare for our visit
  - Appropriate personnel are available
- Correct any obvious deficiencies
  - Our sampling can be used to verify mine improvements have reduced dust concentrations to acceptable limits (terminate citation)
- Helps to achieve proper production
  - We will continue the survey until normal production is achieved
  - May need to see the operation at several full production days

# Typical Mine Visit Strategy

- Personal samples
  - full shift
- Area samples
  - high concentration locations and times
- Observe work habits
- Observe and evaluate dust control devices
  - take air readings and pressure readings
- Time study

Technical Support Dust Division was requested by the District to make recommendations to reduce dust levels.

- At the time of the survey (November), crushing operations had been suspended for the winter months
- Could only sample screening and loading operations

# Four employees were working in the drying/screening area

## Personal Samples

Occupation	Actual Sample Time	Concentration SWA (mg/m <sup>3</sup> )	Silica %	TLV 10/(%+2) (mg/m <sup>3</sup> )	EF Error Factor	E TLV*EF	C/E Ratio
Electrician	423	0.07	*	*	*	*	*
Washing Plant Operator	697	0.22	35.7	0.27	1.20	0.32	0.69
Bagger	425	0.10	*	*	*	*	*
Dryer/Screen Operator	706	0.81	29.9	0.31	1.20	0.38	<b>2.15 OVER</b>

\* Value could not be determined due to insufficient mass

# Area Sample Results

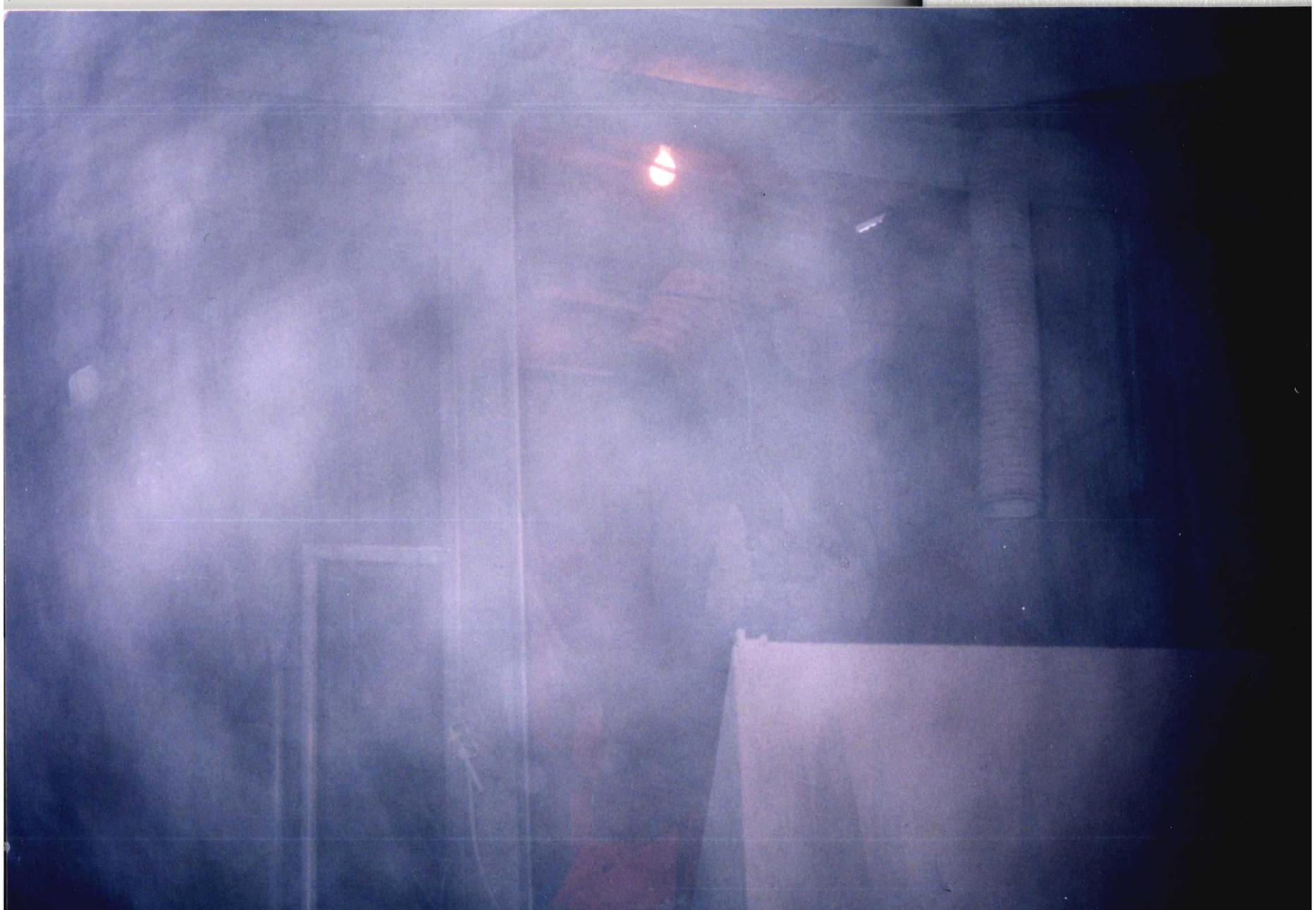
Location	Actual Sample Time	Mass (mg)	TWA (mg/m <sup>3</sup> )	Silica %	TLV 10/(%+2) (mg/m <sup>3</sup> )	C/E Ratio
On Desk in Washing Plant	694	0.203	0.17	36.9	0.26	0.65
Main Centron Screen Area	487	11.690	14.12	15.3	0.58	<b>24.34</b>
Between Magnets	484	2.600	3.1	19.2	0.47	<b>6.60</b>
Dryer/Screen Control Room	679	0.231	0.21	9.5	0.87	0.27
Bagging Area	408	0.033	0.05	*	*	*
Top of Hummer Screens	487	5.854	7.07	36.5	0.26	<b>27.19</b>

\* Value could not be determined due to insufficient mass.

# Centron screen at start of shift



# Centron screen during dusty conditions



# Hammer screens (not enclosed)



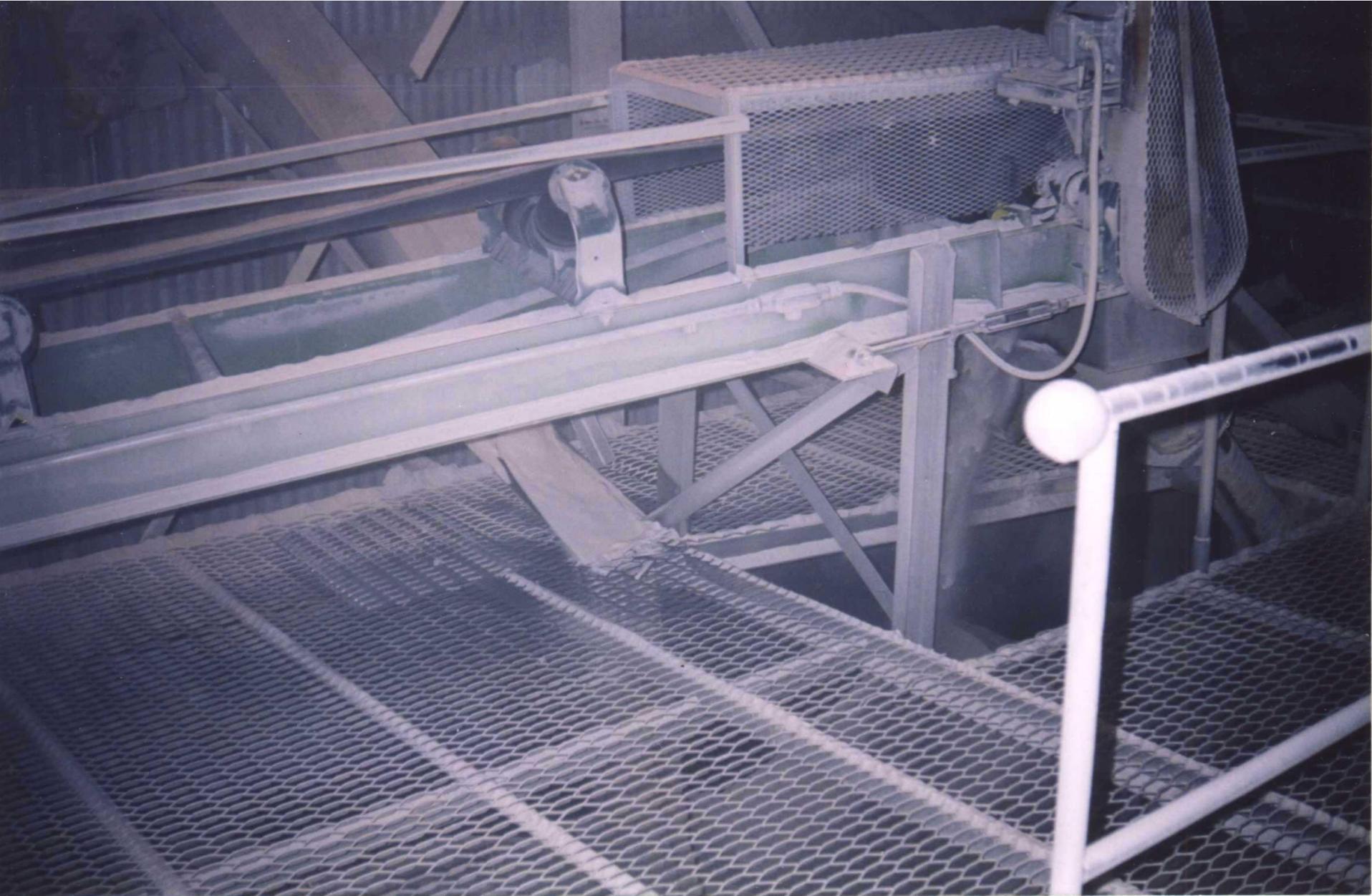
## Sizing screen (not enclosed)



# Magnet area



# Product dropping from belt into hopper



**Piles of silica around a fan which indicates poor maintenance and housekeeping**



# Ductwork piping in poor condition



# Recommendations

- Proper mill ventilation needs to be implemented at the plant.
- Boxed enclosures should be built around all screens, and suction hoses should be attached to these enclosures to provide negative pressure to remove the captured dust.
- Boxed enclosures should be built around all belt transfer locations, and suction hoses should be attached to these enclosures to provide negative pressure to remove the captured dust.
- All storage hoppers should be enclosed and should be ventilated by negative pressure.
- The isolation curtains surrounding the magnets need to be maintained, and negative air pressure needs to be applied to the enclosed areas.
- Once dust controls become effective in controlling the release of fugitive dust into the plant, a good housekeeping program needs to be implemented.
- Ventilation ductwork needs to be upgraded and maintained in proper working condition.
- Equipment needs to be maintained to reduce dust leaks.

# Recommendations, continued

- Because numerous pieces of equipment need to be modified to control fugitive dust, a program needs to be implemented to initiate these improvements. Until improvements are made and dust concentrations are reduced to acceptable limits, all employees working in this area must continue to wear respiratory protection.
- Employees entering high silica dust concentration areas should be provided with a soft rubber seal, half-mask, replaceable-filter respirator instead of the paper disposable half-mask respirators that are being used. Proper respirator fit testing must be completed.
- Employees should be given extensive training on the hazards of silica dust.
- When crushing activities commence during the Spring, the crusher control room operator needs to be re-sampled for respirable dust to ascertain dust concentrations and to evaluate the effectiveness of the recently installed filtered pressurizing unit.

# Our Ultimate Measure of Success



***Health and Safety  
Every Shift .... Every Day!***



# Contact

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