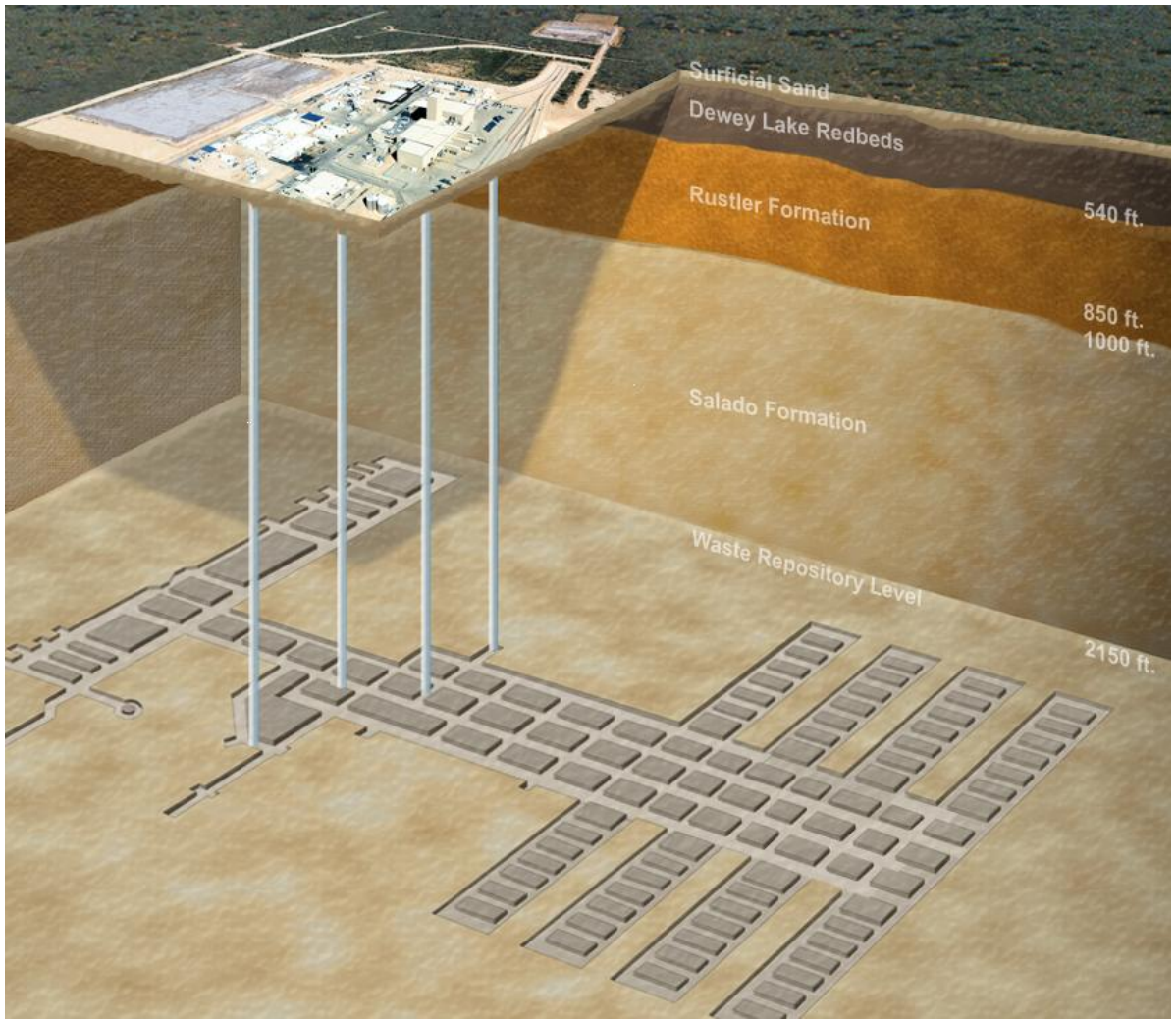
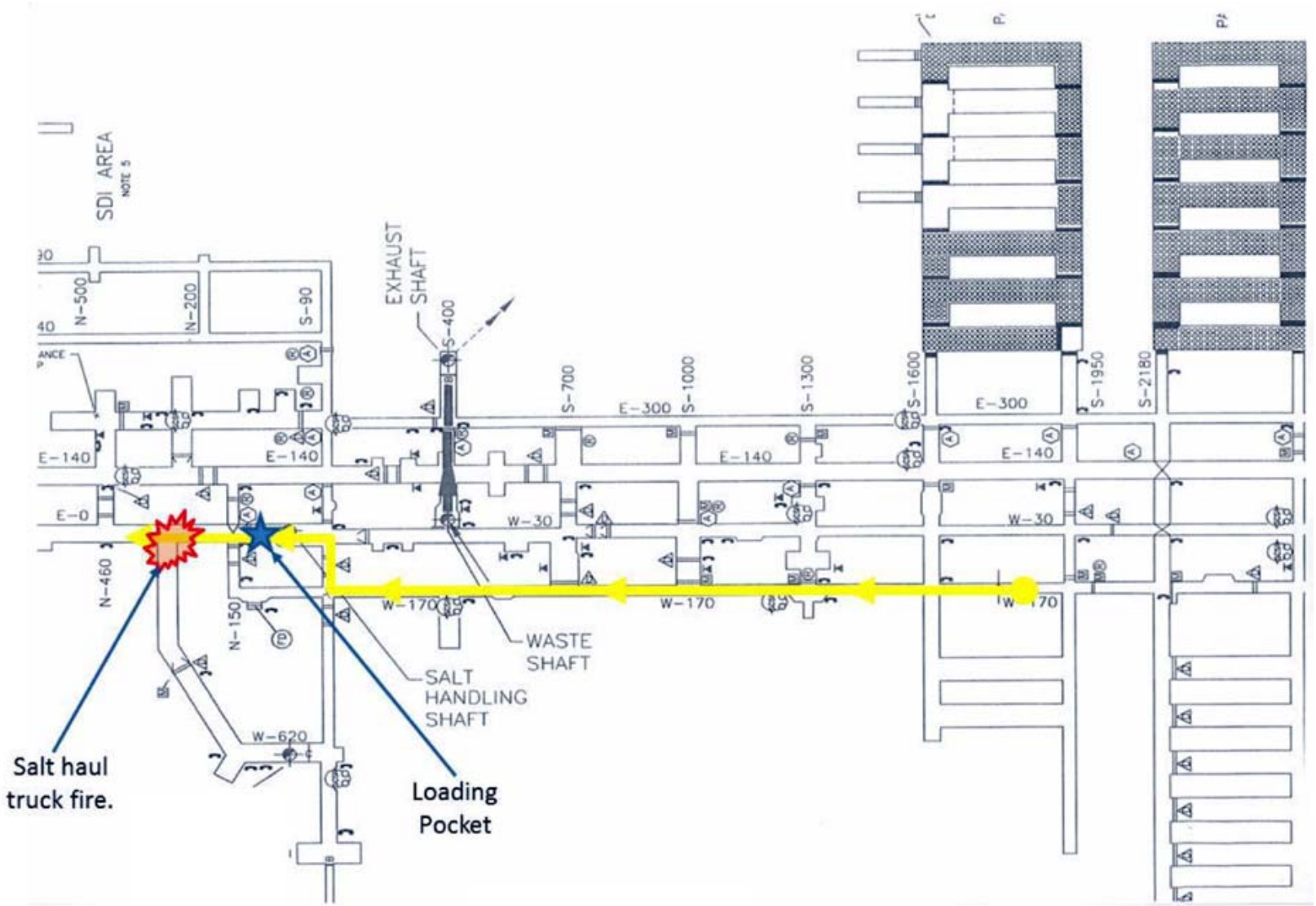
Repository


Surficial Sand
Dewey Lake Redbeds
Rustler Formation
540 ft.
850 ft.
1000 ft.
Salado Formation
Waste Repository Level
2150 ft.

Haul Truck Fire

Haul Truck Dumping

February 2013


SDI AREA
NOTE 5
EXHAUST SHAFT
N-500
N-200
S-90
S-400
S-700
E-300
S-1000
S-1300
S-1600
S-1950
S-2180
E-300
E-140
E-140
E-140
E-140
E-0
W-30
W-30
N-460
N-150
W-170
W-170
W-170
WASTE SHAFT
SALT HANDLING SHAFT
W-620
Salt haul truck fire.
Loading Pocket

Haul Truck had all 3 types of fires

54%

hydraulic fluid/fuel sprayed

12%

cutting/welding spark/slag/flame

10%

electrical short

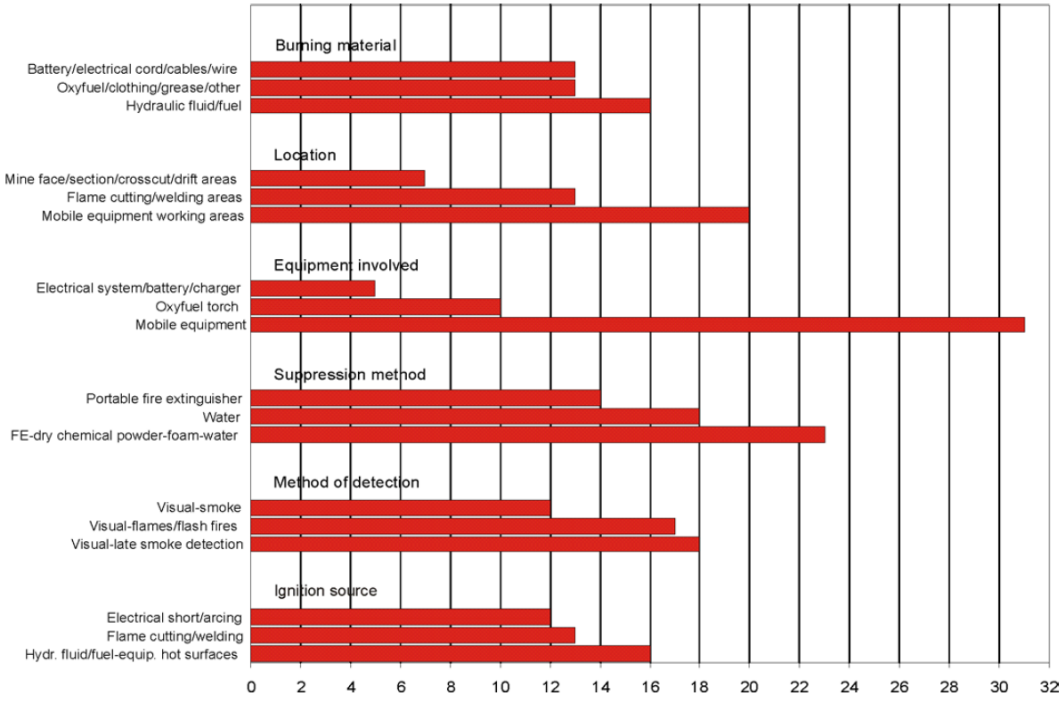
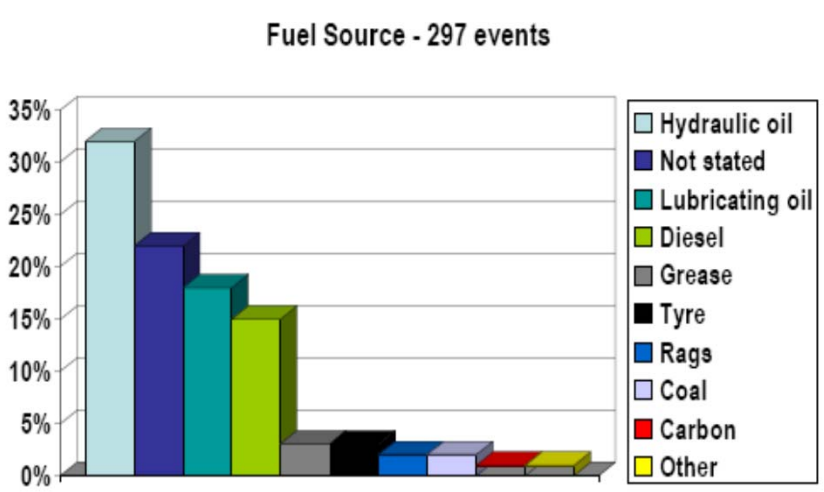
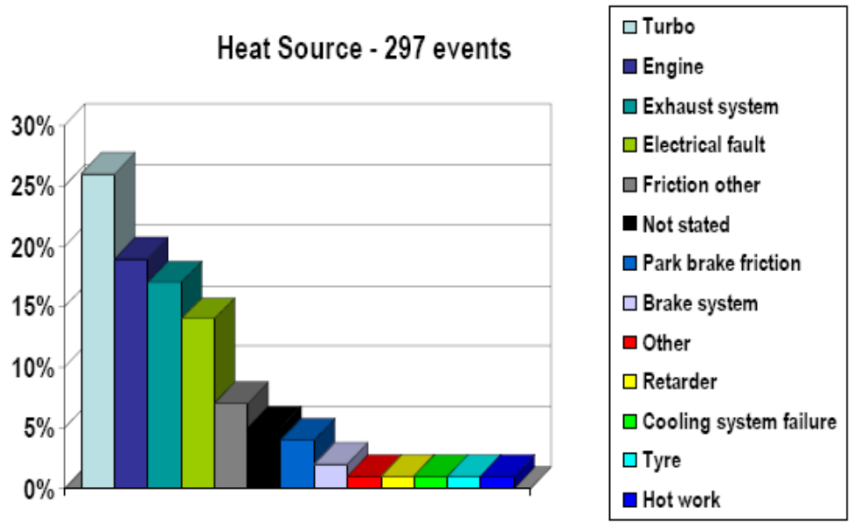


Figure 3.—Major variables for underground metal/nonmetal and stone mine fires, 1990–2001. (FE = portable fire extinguisher)

Mine fire statistics





MSHA Contradiction

- Compliant with MSHA
- MSHA Expected causality
- *“Those MSHA guys who write the mine death reports are just dramatic.”*

Mining Path Forward

- *"This was the worst place for a fire"* (2-3 MW ventilated)
- *"It was just a New Guy."*
- *"Everything worked out, so we do not need much."*
- Appropriate Compensatory Measures Are in Place

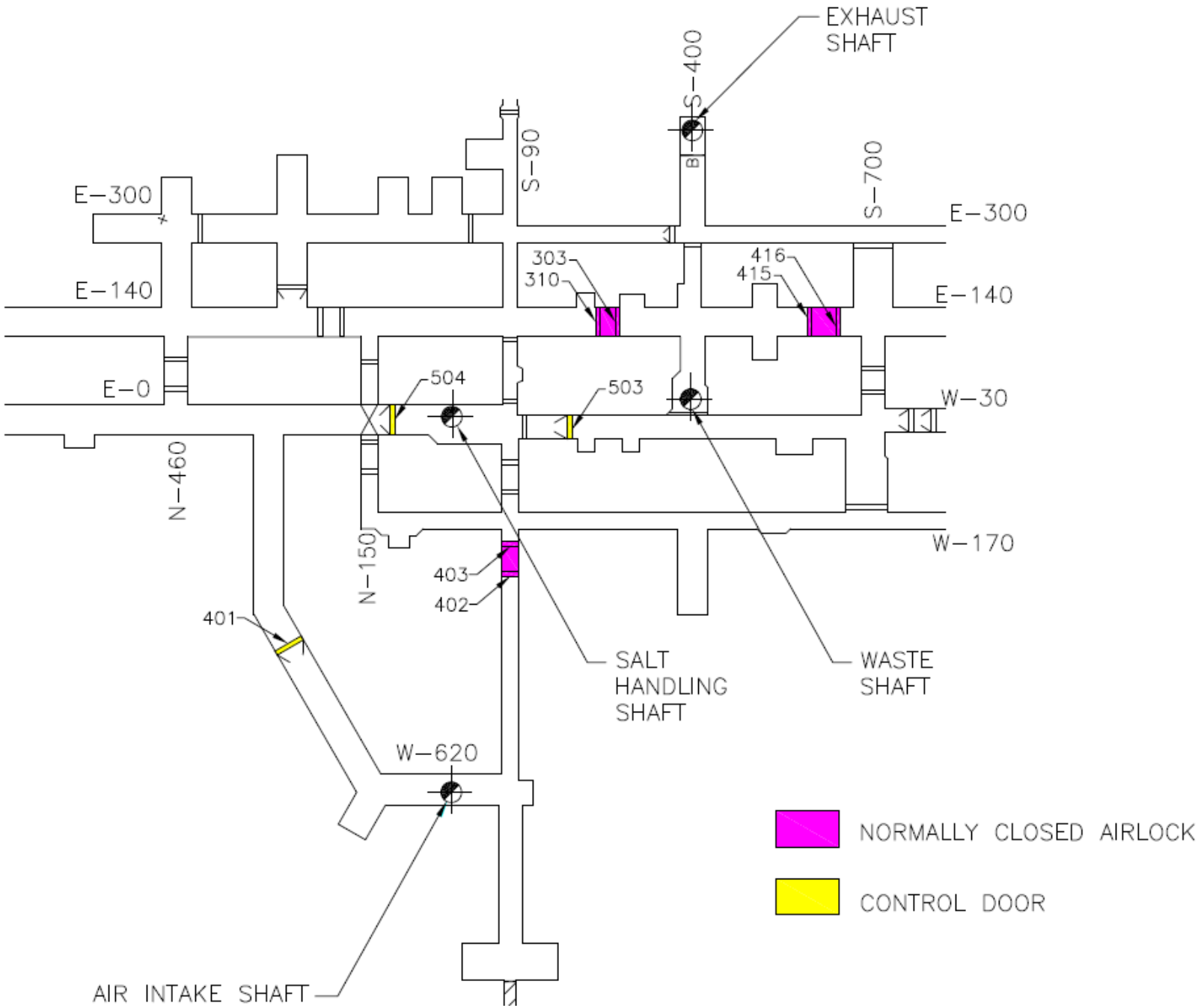
Compensatory is a Crutch

§ 57.4760 Shaft mines

control of fire, smoke, and toxic gases

- (1) *Control doors*
  - Closed or opened only according to predetermined conditions and procedures

- (3) *Evacuation*
  - Evacuation to the **surface** in **ten minutes**
  - Routes that will not expose persons to heat, smoke, or toxic fumes


EXHAUST SHAFT
S-400
S-90
S-700
E-300
E-140
E-0
N-460
N-150
W-30
W-170
W-620
303
310
416
415
504
503
403
402
401
SALT HANDLING SHAFT
WASTE SHAFT
AIR INTAKE SHAFT
NORMALLY CLOSED AIRLOCK
CONTROL DOOR

MSHA One Size Fits All

Mine Volume 

WIPP Volume 

§ 57.4260 Underground self-propelled equipment.

- (a) Equipment is used underground, a fire extinguisher shall be on the equipment

- (b) A fire suppression system an alternative to fire extinguishers if the system can be manually actuated.

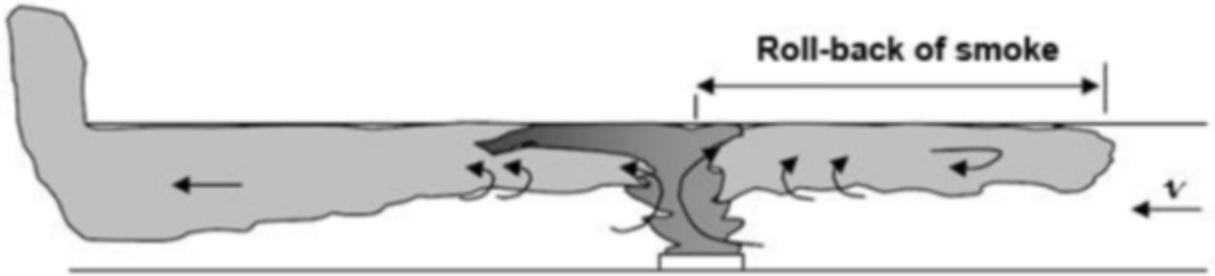
- *No new Suppression*

§ 57.4360 Underground alarm systems

- (a) Fire alarm systems capable of promptly warning every person underground, shall be provided and maintained in operating condition.
- (b) If persons are assigned to work areas beyond the warning capabilities of the system, provisions shall be made to alert them
- *No new Alarm*

§ 57.4363 Underground evacuation instruction

- Escape and evacuation plans
  - *Primary and Secondary or find your own way out*



§ 57.15031 Location of self-rescue devices

- (a) self-rescue devices shall be worn or carried by all persons underground.
- (b) located at a distance no greater than 25 feet.
- (c) on mobile equipment, self-rescue readily accessible.

Self-rescuers have no equivalent in LSC

1% CO for 1 Hour

1.5%* CO *150°F

> 16.25% O_2

3 Workers Did Not Use PPE *Toxic not lethal*

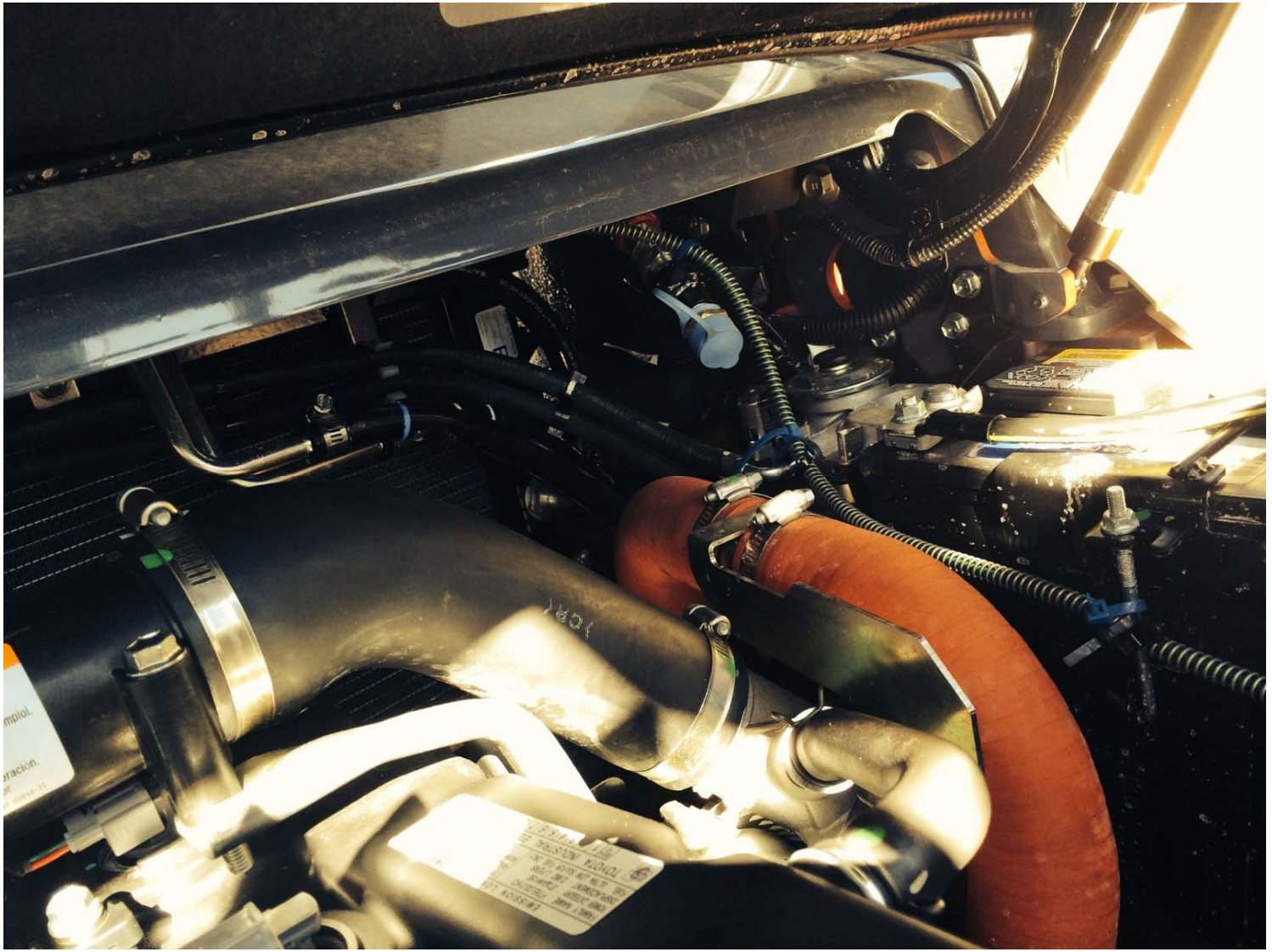
§ 57.11052 Refuge Areas

- Analysis completed by Mine engineering

New Requirements 1066

- Automatic Suppression on vehicles over ~~60 hp~~ 40 gallons.
  - Not skid steer loaders ☹
- AFFF over 150 hp. or turbocharged (HPR)
- Fire Resistant Hoses hydraulic and fuel (HPR)
- Fire Proof Lines turbo oil & fire suppression (HPR)
- 13D systems in offices
- Temporary and permanent suppression systems

Amerex System



Hydraulic Fluids

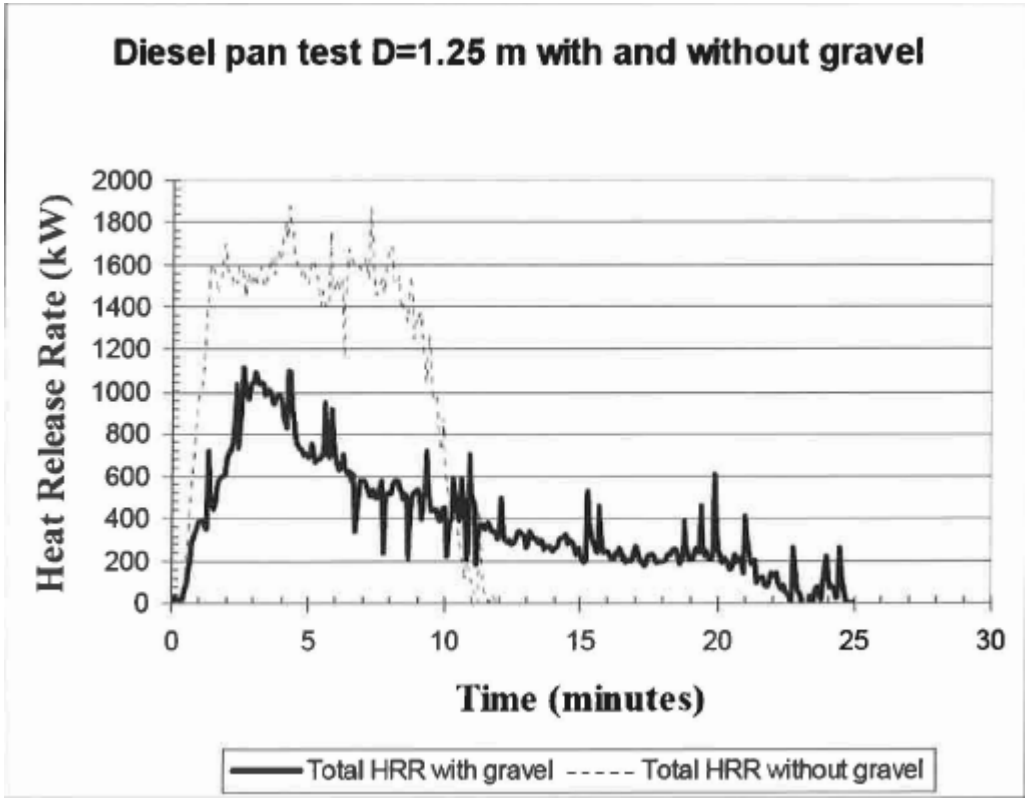
- 5 broad classes of hydraulic fluids FM Global data Sheet 7-98
- Mineral Based fluids temp limits are per on additives
- HF-A High water base temperature limits are 40° to 120°F
- HF-B Water-in-oil emulsion, temperature limits are 15° to 150°F
- HF-C Water-glycol temperature limits are 0° to 150°F
- HF-D Synthetic type fluids temperature limits are 20° to 200°F
  - Phosphate esters,
  - Chlorinated hydrocarbons,
  - Blends of phosphate esters, and chlorinated hydrocarbons
  - Other compositions

Hydraulic Oil Requirement

- I. All hydraulic fluids must have a flash point in excess of 400°F.
- 2. FM Global approval is required for HF-A, HF-B, HF-C and HF-D fluids
- 3. Machines using HF-A, HF-B, and HF-C fluids at elevated temperatures will require oil testing to ensures the correct concentration of water and the fire resistive capability is maintained.

MaxFire WIPP Industrial Fire

Decrease due to gravel



A Fire Scenario

- kW fans to control potential MW fires
- 5’ X 6’ diesel fire 30 ft^3
- Produce about 30,000 cfm of fire gases
- Require 11,500 cfm air stoichiometric
- Under ventilated today
- Low oxygen and elevated CO concentrations

Drift 112,500 ft^3 X 15’ X 15’ 500’

- 1^{St} min Visibility is 8’-9” 30,159 ft^3 hot gas
- 4^{th} min Visibility is 2’-1” 120,636 ft^3 hot gas
- 1000’ drift 4^{th} minute visibility is 4’-4”
- Pressure wave??
- ASET and RSET ??
- Drift Full of Smoke and 14% Oxygen

Intake Not Worst Place for Fire

Threshold of Tenability

- Criteria for a Safe Evacuation
- Self-rescue fails as tenability drops
- Critical values for safe evacuation
  - Visibility, V > 10 m.
  - Incident heat flux: q" < 2.5 kW/m^2.
  - Convective heat: T < 60°C.
  - Asphyxiant gases, 30 min Incapacitation Dose
    - X_{CO} < 1550 ppm 0.155%
    - X_{CO2} < 65000 ppm - 6.5%
    - X_{HCN} < 105 ppm 0.0105%
    - X_{O2} > 120,000 ppm - 12 %
      - FED < 0.3 Tunnels 11% perish *J. Gehandler*

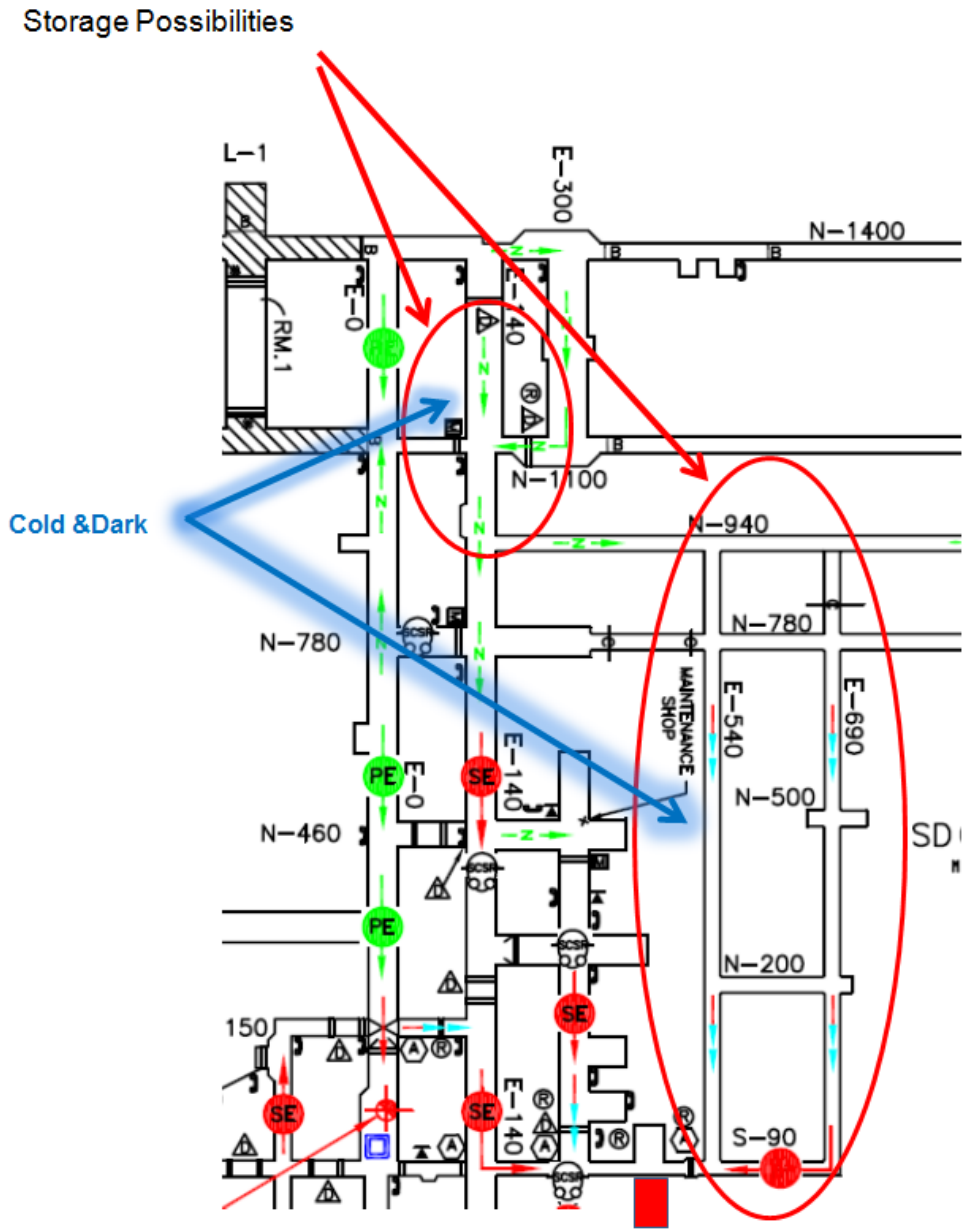
Salt Mine

Cold and Dark

Vast areas of the UG where there are no combustibles or activities presenting the possibility of a fire.

How to credit?

1066 Guidance?



Questions

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