

Longwall Automation: Making Mining Safer Through Technology



San Juan Mine

Safety Share

- Stop Work Authority
- Short Cuts
- We spend more time with our coal mining family than our real family.
- Not being afraid to speak up when we see someone taking a short cut.
- It might be uncomfortable the first time, but it gets easier and will become natural.



Jack Trackemas

- Three degrees, B.S. Mining Engineering, Associate Degree Mine Maintenance, and M.S. Mining Engineering.
- 37 years experience - 33 years industry and 4 years NIOSH.
 - Production – Coal Miner, Foreman, Mine Manager
 - Safety – Safety Engineer, Safety Manager
 - Engineering – Resident Engineer, Manager Technical Services, Director of Technical Services, General Research Engineer
 - Administration – General Manager Cumberland Mine (PA), Branch Chief NIOSH
 - Experience at Eastern, Mid-western, and Western Mines



Adam Zamora

- I have 2 associates degrees, one in Applied Sciences and one in Automotive technology.
- 12 years experience underground at San Juan Mine.
- 5 years as a Underground Mechanic.
- 2 years as a Longwall Production Foreman.
- 2 years as a Maintenance Foreman.
- 3 years as a Automation Specialist.





LONGWALL AUTOMATION: MAKING MINING SAFE THROUGH TECHNOLOGY

- What are we really trying to achieve through underground technology?
- Zero Harm to people and equipment.
- Increase equipment life span.
- Current dust standards that are being lowered.
- Reduce noise exposure from operating equipment.

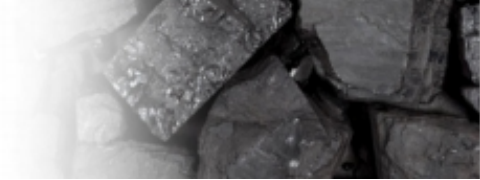


Administrative controls

- Specific operator locations through out the day to reduce exposure.
- PPE
- Air streams
- Dust masks
- Ear plugs

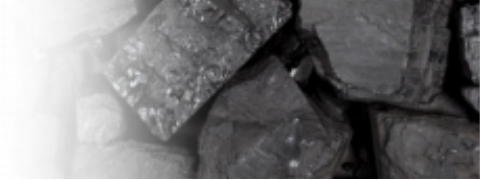


JOY Longwall



- JOY 7LS5 shearer
- JOY face conveyor
- JOY shields 35 tons line and 42 ton gates
- Face width is 1000 feet
- 176 shields on the face
- JOY RS20S shield electronics that allow full face automation with remote operation.

Engineered Water Controls



- Shield water sprays for dust control
 - 2 canopy tip sprays, programmable to shearer location.
 - 2 canopy roof sprays and 2 interior link sprays work off pilot pressure.
- Shearer water sprays
 - 15 body sprays, 44 drum sprays per drum, 10 ranging arm sprays per arm and 15 water boom sprays.
- Conflow water meters to monitor water flow to each ranging arm on shearer.

Engineered Drum Controls

- NIOSH noise quitting drums 3 DB reduction.



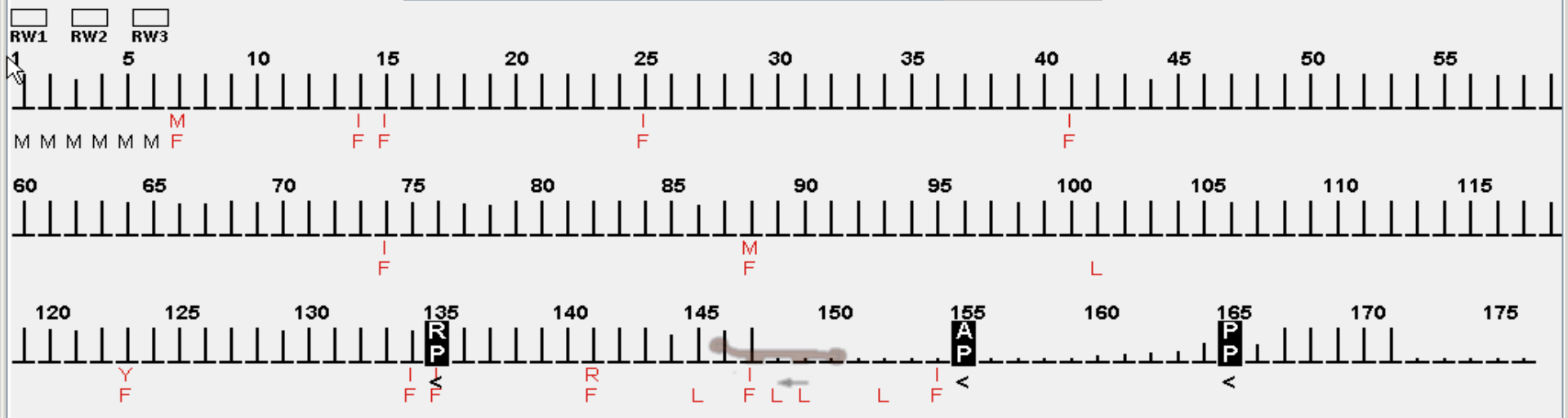
Shield Electronic Controls

- Mimic
- Stu (Solenoid Transducer Unit)
- Advancing ram with read rod
- Sprag ram (flipper) with read rod
- Leg transducers
- Canopy tilt sensor
- Ability to self diagnose

Shield Automation

- Adjacent Control
- Bank control up to 20 shields
- Shearer primes
- Active set monitoring
- Wedge point (taper)
- Anti-collision
- Fully configurable to fit your conditions or operating model.
 - 1200 parameters just for shields

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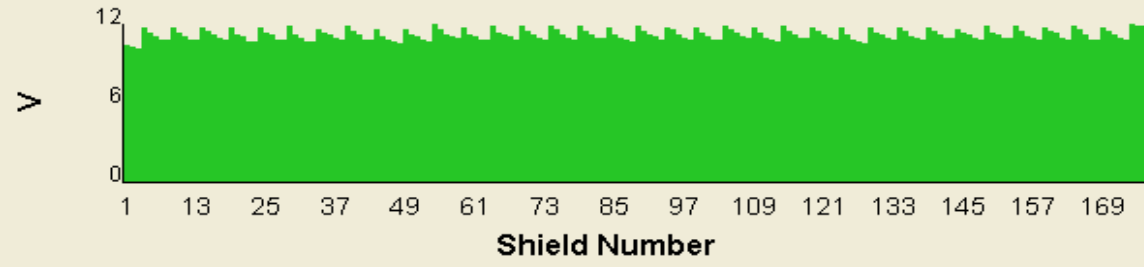
Shearer Primes				Free Running Primes				Fault Summary				
↑↓	155<	[-]	165<	↑↓		[-]		FEA		Transducer Fault (TF): 25T, 41T, 74T, 88T, 1...		
A1		↙	135<	A1		↙		STG		Lowered Shield (L): 4, 101, 145, 148, 148, +		
A2		↙		A2		↙				Advance Fault (AF): 1M, 2M, 3M, 4M, 5M, ...		
		↑↓				↑↓				Yield Fault (YF): 123		

Selected Shield							Status					
-100	-10	-1	1	+1	+10	+100	System	Priority ^	Unit	Tag	Description	
Ram Extension							0.5in	Shield	3	-	125	Last comms trip above SIM 165
Left Leg Pressure							3079psi	Shield	23	154	105	Push - Button Stuck
Right Leg Pressure							3240psi	Shield	29	173	161	Tilt Offset Fault Data disagree
System Voltage							10.6V	Shield	55	8	1119	Audible Warning Fault SIM 8
Selected Voltage							10.0V					

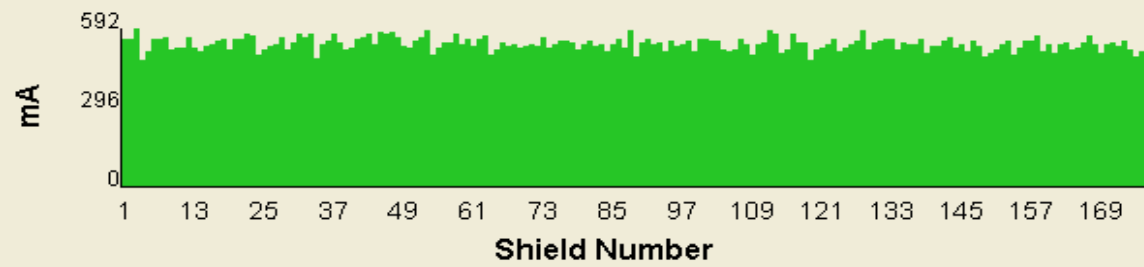


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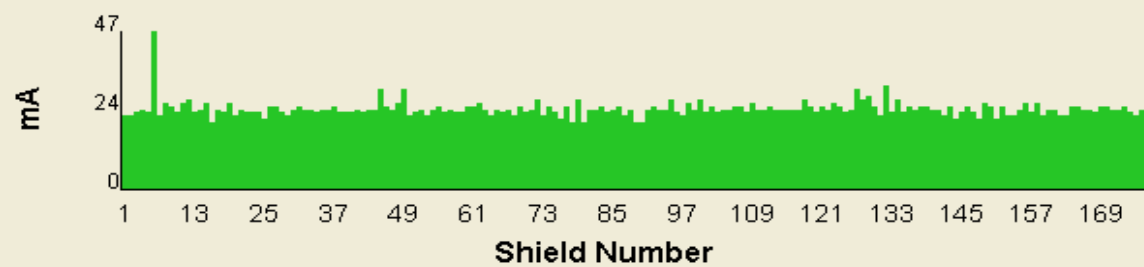
Current Sensors : Solenoid Voltage



Current Sensors : System Current



Current Sensors : Solenoid Current



Screen Help:
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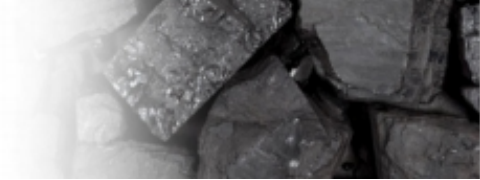
Sensors At End of LAS	Roof Loading
Current Sensors	Trending
Shield Position	Left Leg Pres
Right Leg Pressure	System Vol
System Current	Solenoid Vo
Solenoid Current	Cycle Tim
Sprag	Canopy Pit
stu1 earth leak low	stu1 earth lea

Upgrade your VNC Server license in order to benefit from premium security features and performance enhancements. Visit the RealVNC web site for more information.

Shearer Automation

- Approximately 650 shearer parameters.
- Shearer is integrated with the shields for primes.
- Boom modes
 - Override
 - Recorded roof
 - FX2
 - FX1
 - Duck
 - Manual

Shearer Automation



- We use a BiDi cutting sequence.
- Shearer linked to the shields for primes.
- 1 Shearer operator just to cut the roof.
 - Shearer cuts the floor off desired extraction height or predefined floor profile programmed into GOLP(graphic online planner).
- Remote operation from POD or (ROC).
 - Recorded roof allows the shearer to follow previous cut.
 - Vectors can change your roof or floor desired extraction.

Advanced Shearer Automation



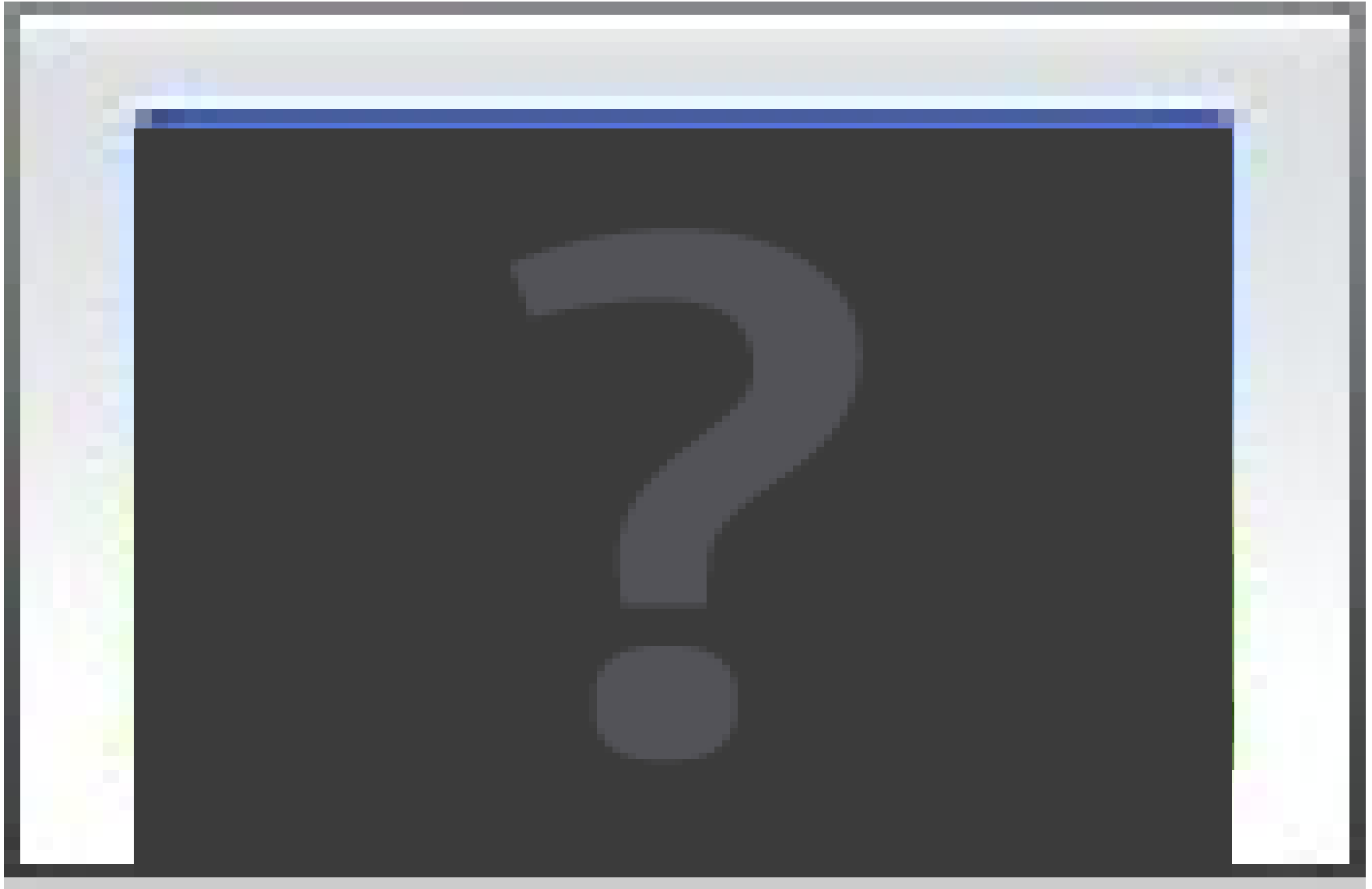




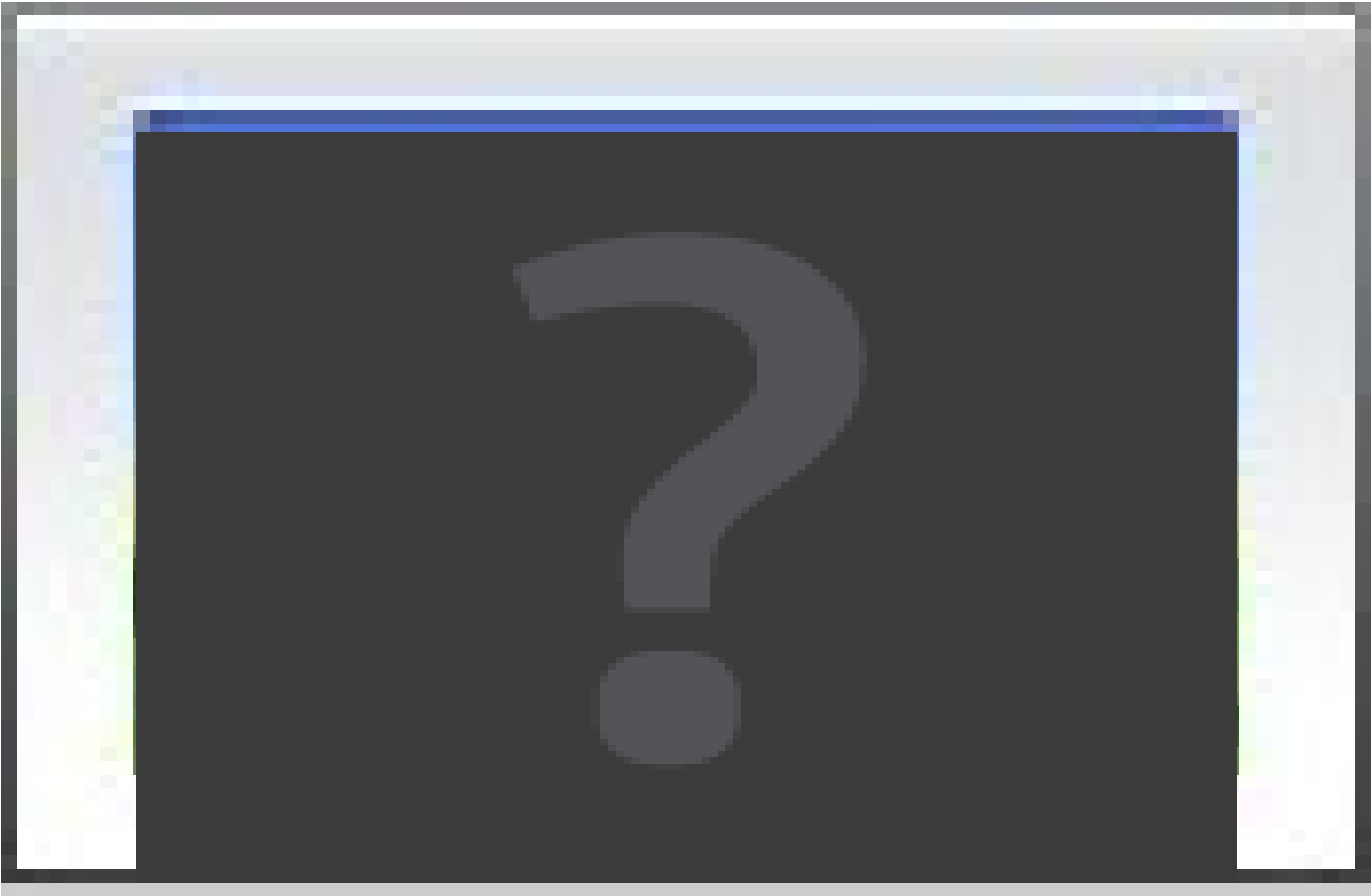
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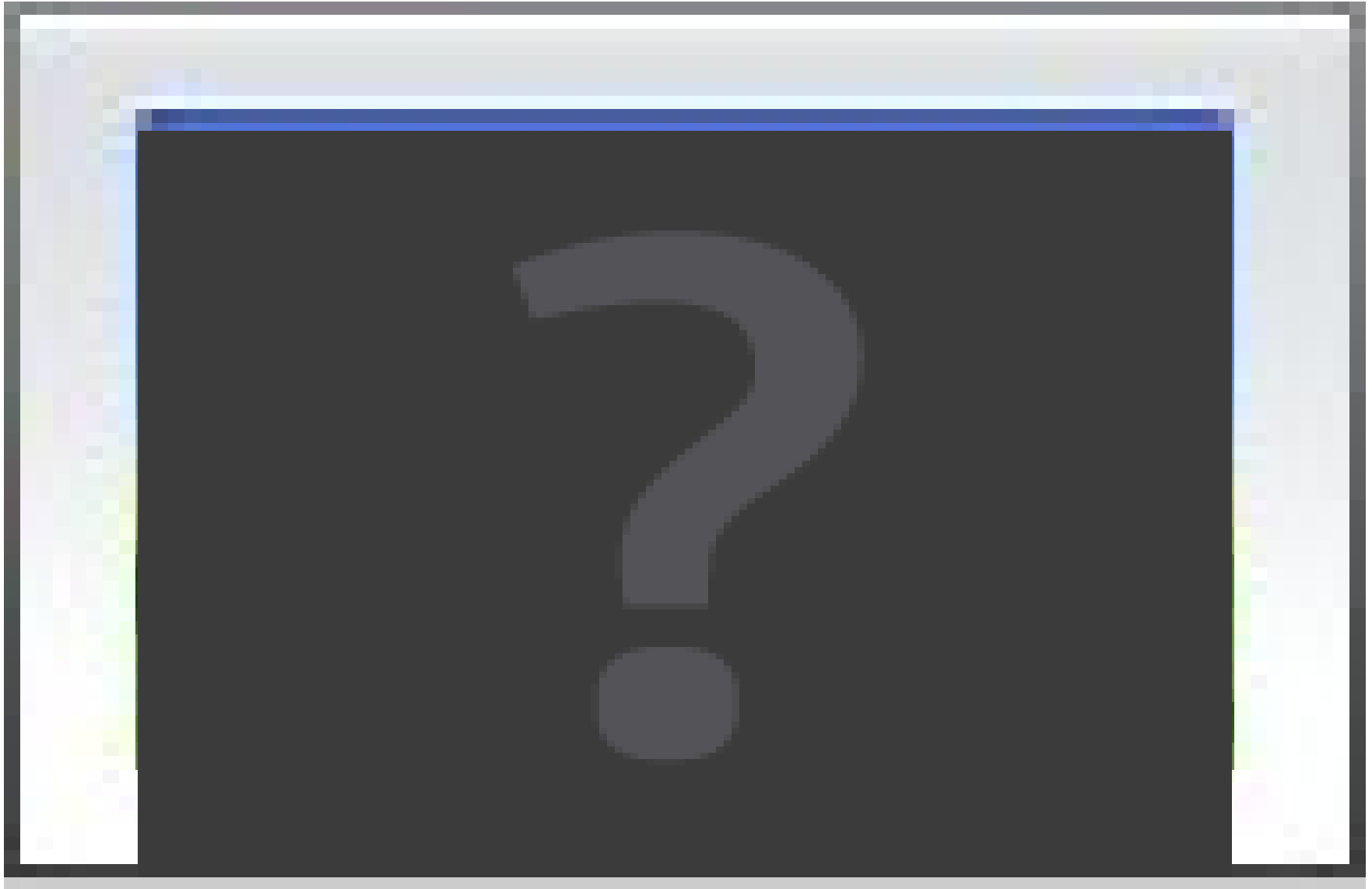
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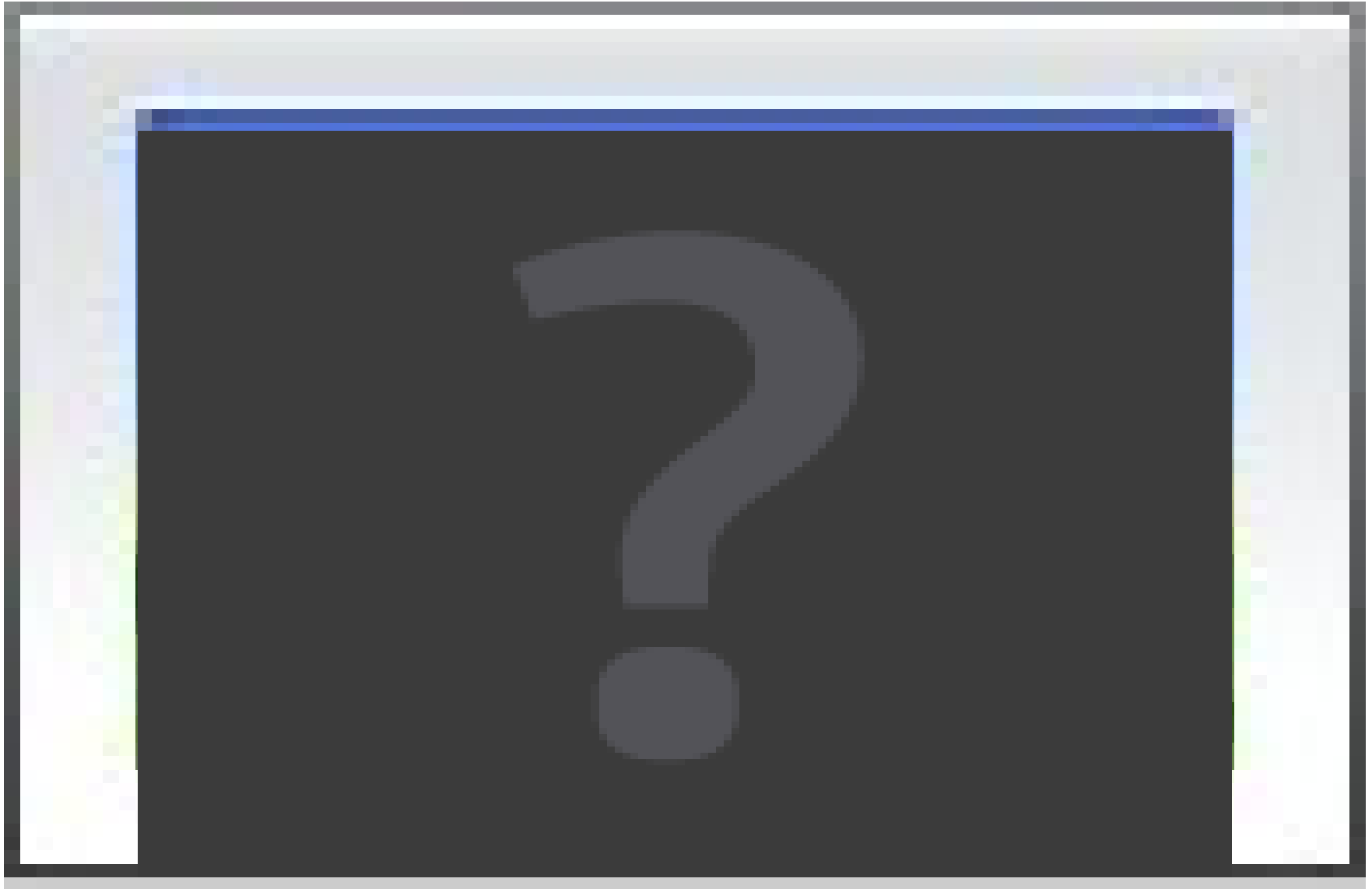
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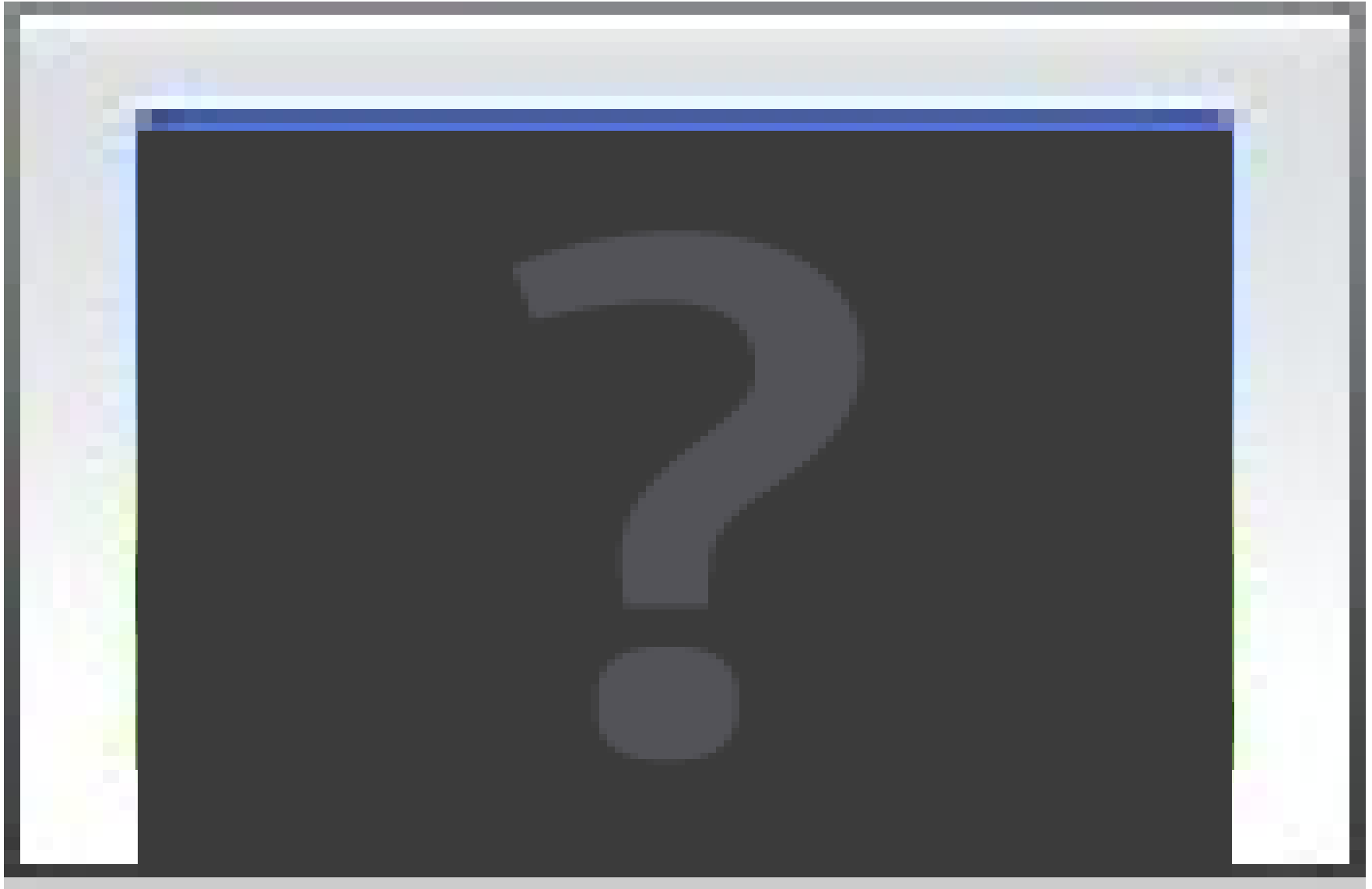
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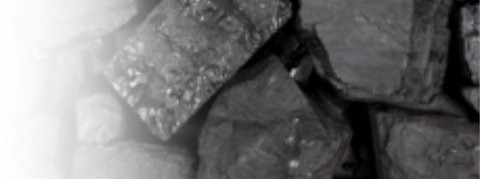


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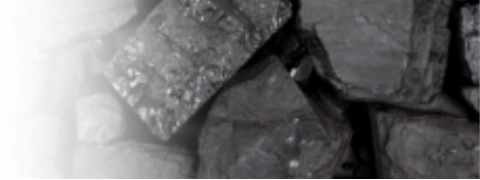


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WEST MICHIGAN UNIVERSITY
San Juan Mine

Increase Life of Equipment



- Shields have been in service since 2002.
- Over 80 million tons mined.
- Repairs to shields to increase life.
 - Pins and bores
 - Cylinder plating
- Chain life has increased from a flatter face and consistent chain tension.
- End of our current panel 22 million tons on 1 chain.



San Juan Mine