Helping Create A Safe Quarry Workplace

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General Equipment Safety Issues

- Machine access
- Sustainability
- Whole body vibration
- Silica
- Operator restraint usage
- Operator & spectator noise emissions
- Engine emissions
- Fuel / oil consumption rates
- Fluid usage & disposal
- Health & Safety related research
Quarry & Construction Trucks

773 – 777 F-Series
HELPING CREATE A SAFER WORKPLACE

• Stairway access
• Improved comfort
• Improved visibility
• Sustainability focus
Stairway Access System

- Stairway cab & maintenance platform access
- Lighted access & wider-railed cab access area
- Skid-resistant surface on all walk-ways & stairways
- Toe boards to help prevent falling objects
Comfortable, Roomy Cab

- Interior space up 17%
- Operator centered in cab
- CAT Comfort Seat: Adjust 8 ways to ease access to controls
- 3 point restraint standard
- 100% increase in glass area
- Increased HVAC capacity
  - Heat/cooling
  - Air flow
Lower vibration, Improved ergonomics

- New-design resilient cab isolation mounts (shown)
- Smooth-shifting transmission – ECPC
- Ergonomic placement of controls...hand & foot
- Dump lever moved next to shift lever
- Optional rubber body lining lowers loading shock
Improved Visibility

For cold and damp conditions

Large, heated rear-view mirrors standard
Improved Visibility

Optional HID Lights

• Greater visibility
• Longer life
• Less maintenance
Improved Visibility

Optional Color Rear Vision Camera & Monitor

115 degree view angle
Maintenance: Safe & Sustainable

- Easy access to check & service points...ground or stairway
- Sight gauges for fluid levels
- On-board diagnostics
- On-board “Quick-Evac”
- Ecology drains throughout
“Body-up” Safety Features

- **Shift Limiter**
  - Prevents shifting above a pre-programmed gear before body is fully lowered
  - Minimizes machine imbalance risk

- **Reverse Neutralizer**
  - Must be out of reverse before raising body
Lower Fuel / Oil Usage

- Increased fuel economy
  - 1 percent on 773F
  - 3 percent on 775F
  - 4 percent on 777F
- 500 hour vs. 250 hour service interval...use 50% less oil
Large Mining Trucks
(785 – 797)
785 – 797 Access Systems

- 793 & 797 trucks: Angled stairways from first production...600 mm wide retrofit packages available in 2007

- 785/789 600 mm wide retrofit stair in field tests...projected availability early 2007

793D – 600 mm width

In production now

6 Sigma Team design for powered stair underway...projected availability 2008
789B 600 mm Retrofit - Field Test

Before

After
Medium Wheel Loaders (950 - 980)
Cab Access

Standard: 950H-972H
- 5-degree angle
- Self-cleaning, non-skid

Standard: 980H

Optional Powered 950 - 980
- 15-degree angle
- Actuated by park brake

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Visibility Improvement

Front access windshield with additional handrails and platform.

Factory Option

Rear-Vision Color Camera / Monitor

- Stringent Global CCTV Supplier Selection Process
- Factory Option
- Over 1000 units in the field
**HID lighting: Factory Option**
- 6 to 10 X durability over halogen
- 2 X light of 65-watt halogen
- No filament, low current draw
- Sealed: resists water & vibration

**Command Control Steering**
Truck-Loading Application:
- 2 Passes/Min
- 50 Min/Hour
- 8 hour Shifts
Result: 800 v 11,200 movements
Operator effort reduced by 14X
**Hydraulic Service Center**
- Hydraulic Oil Filter
- Hydraulic Oil Tank Drain
- Transmission Oil Filter
- Centrally-Located Diagnostics
- Test Ports and Grease Fittings

**Electrical Service Center**
- Batteries (1)
- Electric Relay Panel (2)
- Hood Tilt Actuator Switch (3)
- Master Switch (3)
- Jump Start Receptacle – Option (3)
- Tool Box – Option (4)

**Grouped maintenance points**
- Remote Pressure Taps

**Ground level access**
Large Wheel Loaders
988 - 994
Safety Focus

- Windshield Walk Around
- Safety Harness Tie-Offs
- Emergency Cab Egress
- Bumper Walk Behind
- Lockout functions, Battery Disconnect, Engine Shutdown (on the opposite side)
- Rear Vision Option
- Powered Access Option
- Fender Work Lights
- Emergency Litter-Capable Platform – 600 mm Wide
- HID Work Lights
- Heated Rear-View Mirror Option
- Trainer seat
- Windshield Walk Around
- Mud Protection for Primary Access
- Emergency Cab Egress

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The LWL Access System 6 Sigma team studied 17 designs before selecting the lift shown.

- Pinch points on back and side eliminated by roll up metal sides.
- Generation 2 is in design & build phase...must be as reliable as the rest of the machine.
- The proven design will migrate to other LWL units.
- Note the ground-level service center w/ multi-functional lockable lockouts.

Generation 1 Prototype
Large Track-Type Tractors
D8T – D11T
TTT Access Development

- Retractable main access ladder plus high-capacity fuel tank & platform...2nd generation version in testing
T-Series TTT: Less Maintenance

- T-Series has increased lockable service lockout capabilities
- Optional dual rear wiper/washer option: 85% coverage + 19 liter fluid capacity
Conclusion / Strategy: Collision Detection Requires Multiple Technologies Integrated with Each Other and the Mining Machines to provide as few inputs to the operator as possible to allow safe operating decisions.

Collision Detection Umbrella May Include:

- WAVS (CCTV)
- Forward Looking Radar (FLR)
- Slow Speed Maneuvering (SSM) Detection
- 360 Detection – All technologies, all products
- MineStar / GPS Systems
- Collision Avoidance Strategy
Operator Fatigue

Operator Fatigue is a factor in a high percentage of accidents in 24/7 operations. There are numerous 3rd party technologies available.

- Percent eye closure
- Head droop or bobbing
- Reaction time to impetus
- Steering correction frequency & amplitude

These are reactive technologies. They can only monitor the affects of existing fatigue...we are also pursuing pro-active approaches.
Dust modeling software investigated...used to compare design options.
Thank You