

Shedding Light

# 3 Better, Safer and Cost-Practical Ways to Light Mobile Mining Equipment



## Table of contents

---

Keeping Score: The benefits of modern LEDs	4
1. Durability: Can your LEDs keep up with your equipment?	5
2. Efficiency: How cost and energy-efficient are your chosen LEDs?	6
3. Adaptability: Can your LEDs meet specific lighting needs?	8
The All-In-One Checklist for LED Fixture Considerations	10



Day and night, operators of mobile equipment face every conceivable danger that today's surface mines can throw at them. Haul trucks brave dusty roads, excavators move mountains of dirt and blasthole drills smash through the earth. Without stringent safety measures, this harsh environment can quickly put mobile operators – and those around them – in harm's way.

But with simple lighting upgrades to their mobile fleet, mine operators can continue to keep their mobile operators safe, without impacting the economics and efficiency of operations. Even swapping traditional fixtures for modern LEDs unlocks greater levels of energy-efficiency and safety. Suddenly, mobile operators have lights that are instant-on, directional and powerful enough to pierce through dust, fog and darkness.

Perhaps you already use LED fixtures, but are looking for better alternatives to retrofit and improve the safety of your mobile fleet. In your search, you'll inevitably find a dizzying number of offerings out there, each with their own unique features or specifications.

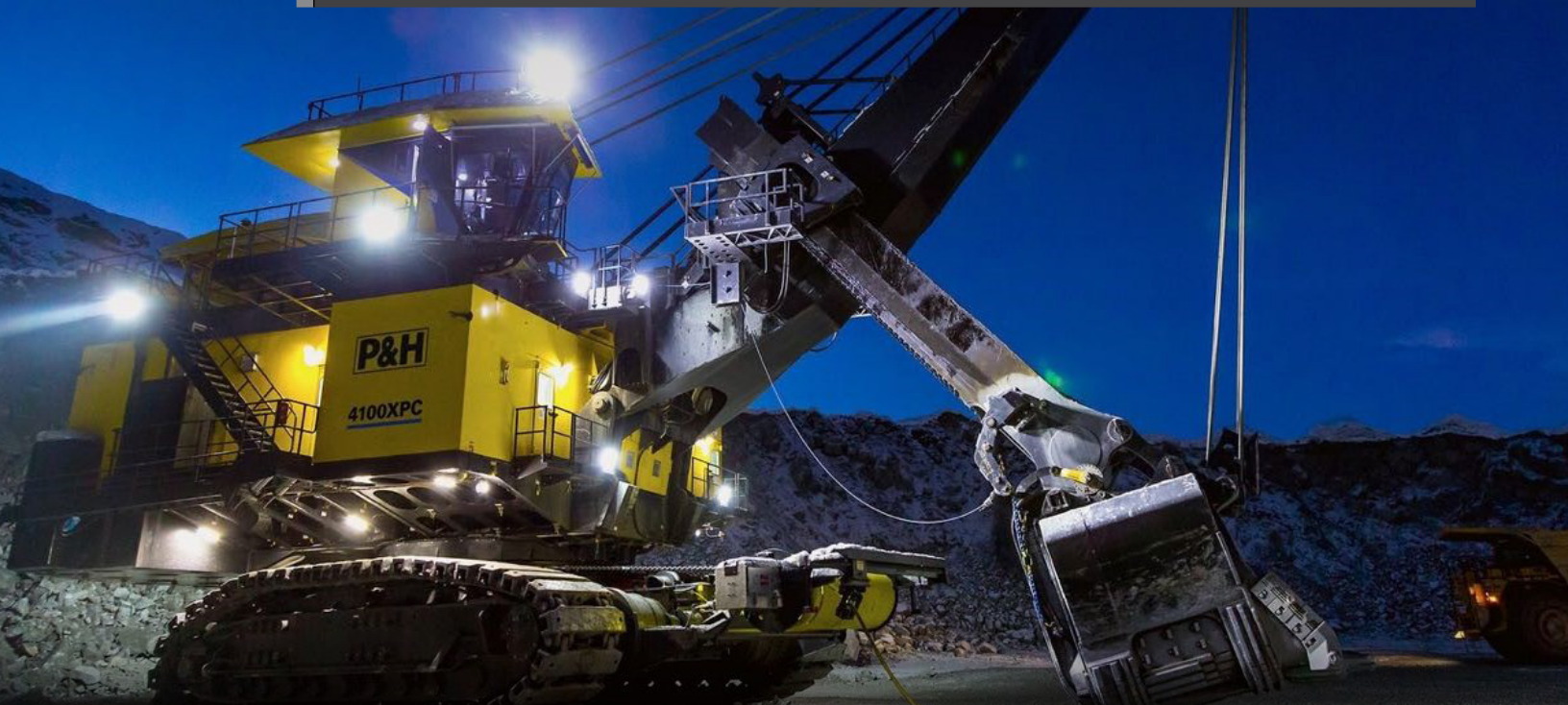
How do you make the right purchasing decision, one that ensures mobile operator safety while offering excellent returns for your investment? In this whitepaper, we detail three major considerations every mine operator should use to guide their search for the ideal fixture: durability, efficiency and adaptability.

From these three considerations, you'll learn:

The 18 essential things to look out for when evaluating LED fixture options for your mobile mining equipment

The most important performance metrics, beyond cost, to consider when selecting the right LED fixture

Two examples of mining operations that benefited from picking fixtures that are durable, performance-oriented and adaptable



## Keeping Score:

# The benefits of modern LEDs

Still on the fence about LEDs? Here are five reasons why you should take the leap to brighter, safer and more cost-efficient lighting for your mobile equipment.

1



**70%**

reduced energy usage

2



**50%**

less light pollution

3



**85%**

reduced maintenance

4



**70%**

reduced carbon emissions

5



**1.91**

years to payback

# 1

## Durability: Can your LEDs keep up with your equipment?

Mobile equipment undergoes more shock, vibrations and g-forces in their operational lifetime than most LED fixtures can endure. Unless they were built tough, it's only a matter of time before those fixtures break, rendering the equipment unsafe. Replacing them removes useful equipment from the field, harming the productivity and hence, the profitability of mines.

Any fixture that claims it was built for mobile mining should be able to withstand every extreme of the mobile environment, from sudden shock to unending reverberations. Even better if these fixtures require little maintenance throughout their lifespan.

If you're evaluating fixtures from a certain manufacturer, check if their lights:



### **Come with heavy-duty mounting options.**

As the critical element connecting fixtures to equipment, the mount must be able to withstand immense abuse. Ask for fixtures with heavy-duty mount designs that can withstand upwards of 60Gs of continuous shock. Multiple mounting points are also great for a more secure hold.



### **Incorporate quality potting processes for LEDs.**

This is the expected minimum for LED fixture construction today, but it still bears examination. For best results, ensure fixtures are constructed with automated potting processes that are more consistent and reliable – lowering any potential internal faults in the LEDs.



### **Feature durable lens construction.**

As a potential weak point, fixture lenses must be constructed with the most durable materials available. Look for fixtures with IK10-rated polycarbonate and IK06-rated tempered glass lens options that are resistant to blunt impact, dirt and debris.



### **Have well-protected interiors.**

Phoenix ensures marine-grade conformal coating is applied to all our circuit boards as anti-stick protection against mining dust, mud and grime. This ensures fixtures withstand extreme mine conditions and the brutal elements.






As any mine operator knows, occasional collisions and shock will happen, especially in low-visibility conditions or through shift fatigue. Highly durable and shock-resistant fixtures could mean the difference between business continuity and swathes of your mining operations grinding to a complete halt.

## 2 Efficiency: How cost and energy-efficient are your chosen LEDs?

Not every LED fixture is built equal. While LEDs have proven to be superior to traditional fixtures in every aspect, apples-to-apples comparisons are much more competitive. Take the time to study the specification sheets of your shortlisted fixtures to find options that strike the best balance between cost and performance.

But as a rule of thumb, avoid making decisions purely on cost. Cheaper fixtures may require less upfront investment, but the overall cost of repairing and replacing them supersedes any savings gained.

Instead, consider these *performance* metrics that would deliver positive benefits for your mine in the long term:

	<p><b>Lumens per Watt (LPW):</b></p> <p>This measures the lighting efficacy of a LED fixture. The ability to output more luminous light, with less energy, creates greater cost-savings in the long run. Look for fixtures with a LPW of over 100. That gives you lower cost-to-ownership that benefits mine operators and their shareholders.</p>
	<p><b>Lumens Output:</b></p> <p>When it comes to fixtures for mobile equipment, look for fixtures that have an output of over 5,000 lumens of light – which provides adequate brightness, but doesn't strain equipment operator eyesight.</p>
	<p><b>Lower Wattage:</b></p> <p>With lower wattage, less energy is drawn for always-on lighting. For mobile equipment with around-the-clock lighting needs, this level of energy efficiency means reduced fuel costs and a smaller environmental footprint.</p>
	<p><b>Color Correlated Temperature (CCT):</b></p> <p>Aim for fixtures with a CCT rating of 4000K to 5500K. This gives you cool white light that's easy on the eyes, while still effective for low-light or bad weather conditions.</p>
	<p><b>Voltage Range Options:</b></p> <p>Wider voltage range options mean that fixtures can be used for a greater range of mobile equipment. Alternatively, higher voltages (24-48V) can only be used for mining equipment, making them less likely to be misused for non-mining purposes.</p>

The above metrics should help you better select LED fixtures that balance long-term efficiency with existing cost restrictions. Above all remember that brighter, performance-oriented lighting doesn't just keep mobile operators safe, it also ensures operations are less at risk of show-stopping accidents. That itself is worth every dollar of investment you spend.



## Efficiency Case Study: **Copper Mine in Brazil**

---

### **The Problem:**

A copper mine in Brazil aimed to overhaul its trucks and extend the fleet's effectiveness until the end of the mine's life. Instead of purchasing new equipment – which would take decades more to pay off – the operator took the cost-sensible route of upgrading the lights on their equipment.

The mine operator had Phoenix install an array of Sturdilite® Master Series floodlights on a single haul truck, with intentions to trial the fixtures for two months. The fixtures exceeded all expectations, keeping equipment operators safe through the constant dust and high-traffic conditions. They were noticeably brighter than previous light fixtures, which drastically improved visibility and hence, safety.

### **The Results:**

Convinced, the mine operator overhauled its entire haul truck fleet with Phoenix's DC LEDs. The high luminosity of the fixtures, coupled with its minimal wattage draw, has created cost-savings for the mine. This has allowed it to more than recoup its initial investment and extend the safety, productivity and efficiency of its fleet for the rest of the mine's operational life.



# 3

## Adaptability: Can your LEDs meet specific lighting needs?

No single piece of mobile equipment remains on the same task for long. At any given time, equipment may be reassigned to different areas of the mine, to perform different functions in different environments. For instance, a hydraulic excavator could be excavating ramps one day and drainage ditches the next. For maximum safety, especially during low-visibility or night conditions, the right beam pattern is required.

Any good LED fixture can be relied upon to adapt to the dynamic workflows of any mobile equipment. In your quest to find the right fixture that allows your mobile operators to excel at their jobs, look for fixtures that:



### **Come with custom beam optics.**

At the most basic, your chosen fixture should come with pre-built optics for beam patterns like flood, spot and elliptical. This allows for optimized distribution of light, enabling operators to work accurately and confidently.



### **Feature built-in aiming indicators.**

The availability of aiming indicators allows accurate replication of specified lighting layouts for the job. The less time spent adjusting a fixture's angle and spread, the faster operators can get to work.



### **Provide application-specific lens options.**

Tough polycarbonate lenses reduce fixture glare at night, making them ideal for on-the-go equipment like haul trucks. Tempered glass provides clean and clear light that's perfect for hazardous tasks performed by excavators, dozers and wheel loaders.

Ask your fixture manufacturer for a lighting layout that's optimized for the workloads of your mobile equipment. With proper planning, you can cost-prioritize upgrades for your equipment, while ensuring operators have the right lights for their task.



## Adaptability Case Study: Gold Producing Mine in Colombia

### The Problem:

To remain a productive silver and gold producer, a mine in Colombia required front and back LED fixtures for their mobile equipment. Besides needing to operate around-the-clock, the fixtures had to also deliver consistent beams or elliptical light that extended 20 meters in either direction. And to ensure continued safety, fixture glare had to be kept to a minimum.

The mine contacted Phoenix and arranged to trial several LED fixtures for an unspecified period. The fixtures were installed, in pairs, at the front and back of a haul truck, replacing the traditional HID lights that initially came with the equipment. The fixtures were then evaluated for efficiency and performance daily.

### The Results:

The results were spectacular: 250% increase in lux levels within 5 meters and 50% increase in lux levels beyond 25 meters. This gave the mine the confidence to proceed with retrofitting its entire mobile equipment fleet with Phoenix LED fixtures. The result? Continued safety for its employees, greater levels of productivity and – thus far – zero warranty claims for the fixtures.

**250%**

increase in lux levels  
within 5 meters

**50%**

increase in lux levels  
beyond 25 meters



# The All-In-One Checklist for LED Fixture Considerations

Are the fixtures:		The Benchmark: Sturdilite® Master Series
1. Durability Questions		✓
Built with die-cast construction methods that present zero weak points?	Die-cast aluminum housing and stainless-steel external hardware	
Built with automated potting processes for LEDs and their drivers for consistent construction quality?	Automated potting processes for LEDs	
Built with a super heavy-duty mount that can withstand continuous shock and vibration?	65G of shock and 5grms, 100-2200Hz of vibration along 3 axes	
Kitted with optics that can resist the hazards of mining environments?	Polycarbonate (IK10) and tempered glass (IK06) optical lenses	
Installed with interiors that are sealed and protected from the elements?	Marine-grade conformal coating for fixture's PCB	
Engineered with measures that dissipate heat or vapor accumulated from all-day use?	Pre-installed heatsinks and breather valves	
Able to operate in extreme temperatures and climate conditions?	Performs in temperatures from -40C to +65C	
Kitted with connectors that ensure continued operability even in the harshest conditions?	Molded Deutsch Connectors	

## The All-In-One Checklist for LED Fixture Considerations <sup>Con't</sup>

Are the fixtures:		The Benchmark: Sturdilite® Master Series
2. Efficiency Questions		✓
Able to output enough light for mobile operators to work comfortably, but not too much as to strain or blind them?	Over 2500 to 5000 effective lumens output	
Able to efficiently operate within a lower wattage range, reducing power draw and ensuring all-day energy efficiency?	Consistent 48 Watts power draw	
Designed to provide good levels of lighting efficacy? Can it achieve an efficient lumens per watt ratio of 100?	Average LPW of 104	
Able to provide an ideal color temperature that's easy on the eyes, yet bright enough for work?	Outputs cool white light with a CCT of 5000K	
Available in a range of voltages allowing broad use across various equipment (12-48V) or only specific mobile equipment (24-48V)?	12-48V and 24-48V	



## The All-In-One Checklist for LED Fixture Considerations <sup>Con't</sup>

Are the fixtures:		The Benchmark: Sturdilite® Master Series
<b>3. Adaptability Questions</b>		✓
Available in a range of optics that give your mobile operators the right beam pattern they need for their tasks?	Flood, Spot and Elliptical beam patterns	
Kitted with durable optics designed specifically for various mobile equipment tasks, from hauling to drilling, to earthworks?	Tough polycarbonate to minimize glare and tempered glass for clear and clean light	
Installed with aiming indicators that allow mobile operators to quickly replicate optimized lighting layouts and angles?	Pre-installed with a 120° Aiming Indicator and 3 Aiming Washers	
<b>4. Additional Questions</b>		✓
Does the fixture's manufacturer maintain a wide network of distributors, enabling shorter lead-times for replacements or warranty claims?	Global presence and growing	
Has the fixture proven itself in other mining operations or equally punishing environments, like in marine applications?	Used in mining, ports and marine applications	



# Illuminating the path to safer mining operations

---

When the safety of your mobile operators – and that of your entire site – is at stake, only the best LED fixtures will do. The above considerations, while extensive, should prove useful in guiding you toward LED fixtures that can keep your mobile operators safe, perform well and requires minimal maintenance or costly replacements in the long run.

These are the same considerations that our team at Phoenix use to help our mining customers find the right fixture for their mobile equipment needs. If you'd like further guidance on selecting a fixture for your mining operations or are interested in scheduling a trial with us, [contact us to tell us about your project.](#)



**PHOENIX<sup>®</sup>**  
DURABILITY X DESIGN™

We've been manufacturing durable lighting fixtures for well over a century and installing them on draglines and various mining equipment for the past 77 years. You'll find our fixtures in mines across the US and around the world – some have been in the field for over a decade.

Our latest offering – the Sturdilite® Master Series – draws from our years of mining experience and is engineered to keep mobile operators safe and focused on the job at hand. Phoenix also manufactures fixtures that are durable enough for the needs of marine, aviation, ports and dock loading applications in the US and around the world.