



# BART Approved a Fixture for the M-Line Tunnel Lighting Upgrade That Did Not Meet Key Contract Specifications

## October 31, 2019 (Revised Version)\*

BART approved the Xeleum Pathfinder light fixture for the M-Line tunnel lighting upgrade although the fixture did not meet several key contract specifications. Approving a supplier that did not meet specifications undermines the purpose of having clear and detailed specifications and is unfair to other suppliers who put time and money into developing and testing a higher-performing fixture to meet the specifications. It also increases the risk that the selected fixture will require a higher level of maintenance or fail before the required life expectancy.

### Background

BART awarded a contract to ABM Electrical and Lighting Solutions to upgrade lighting in the M-Line tunnel. The specifications required the contractor to submit information regarding its proposed light fixtures to BART to review for compliance with the specifications. The contractor was also required to provide a sample light fixture and certified test reports of factory and field tests, performed in accordance with referenced standards, to demonstrate that the proposed fixture met the specifications. ABM submitted information for fixtures from two manufacturers and BART approved Xeleum's Pathfinder light fixture. The Office of the Inspector General received a complaint which alleged that BART should not have approved the Xeleum fixture because it did not meet several contract specifications and that BART did not accept features for another fixture that passed required tests.

### Key Recommendations

Key recommendations that the Office of the Inspector General made to BART to ensure the fixtures installed in the M-Line tunnel meet expectations include:

- Rescind approval of the Xeleum fixture
- Request ABM to provide new fixture submittals, based on the contract specifications, for BART to review and approve
- Provide modifications, if any, to the specifications prior to requesting the new submittals
- Provide appropriate extensions of time to ABM, without penalty to ABM, to complete the contract work based on the need for BART to review and approve a new light fixture and to provide sufficient lead time to manufacture and ship the approved fixtures

### Key Findings

The Xeleum Pathfinder fixture that BART staff approved did not meet several contract requirements, including:

- **Underwriters Laboratories (UL) Listing:** Xeleum provided documentation and a sample Pathfinder fixture to ABM for submittal that included the Edison Testing Laboratories (ETL) marking, an equivalent to UL, but had not yet been given an "authorization to mark" certification to demonstrate that the fixture had fully met the safety certification requirements.
- **LED Operating Hours:** The specifications require the LED to operate for at least 80,000 hours before its lumen output declines to 70 percent ("L70") of the initial output, which is the end of an LED's useful life. The Pathfinder LED tested to a useful life of 54,000 hours, or 32.5 percent less than the requirement. BART staff incorrectly interpreted the L70 test results to conclude that the lumen output would be 73.97 percent after 150,000 operating hours.
- **Coloring Rendering Index (CRI):** CRI, measured on a scale of 0 to 100, indicates how well a light source renders color, and 85 to 90 is considered good. The specifications required a CRI of 85, but the Pathfinder LED tested at 82.9, which means it is using an LED chip designed for a CRI of 80, +/-2, and cannot produce a CRI of 85.
- **LED Driver and Light Engine:** The LED driver (i.e., power supply) and light engine were each required to be rated IP65 or above, meaning they are protected from low-pressure water jets and dust, with limited ingress but no harmful effects. Xeleum's fixture has an overall rating of IP66, but the individual components are not rated. BART staff accepted the housing rating as sufficient to protect the individual components. However, the factory seal will be broken if the fixture is opened to replace a failed component, which will negate the IP rating and potentially expose individual components to damaging levels of dust and water.
- **Heat Sink:** The specifications required a heat sink that is resistant to debris buildup and has no fans, pumps, or liquids. Passive heat sinks are typically finned aluminum devices that spread heat over a large area and radiate it away from the fixture's components. The Pathfinder fixture does not have a separate heat sink; it uses the housing as a passive heat sink, which is common for interior commercial spaces but not industrial uses, such as the M-Line tunnel.

BART staff did not approve a competing fixture that ABM submitted for review, in part, because BART staff said the separate, finned heat sink would collect dirt and moisture, although the fixture passed the required dust and water ingress tests. BART staff also said the fixture's bracket design could cause the fixture to fall, although the fixture passed the required pressure wave test and the manufacturer reengineered the bracket design to ensure the fixture would not fall.

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