

# LINEAR VS HIGH BAY OR FLAT PANEL LIGHTING IN DATA CENTERS

Why fixture form matters as much as lumens

By Airey-Thompson

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## Introduction: Challenges in Data Center Lighting

In most industrial facilities, lighting is treated as a commodity — choose a high bay, space it every 20–30 feet, and call it a day. Data centers are different.

Unlike warehouses or manufacturing plants, data centers are dominated by **narrow, repetitive aisles of tall server racks**, often enclosed within hot/cold containment. Overhead framing for fiber and cables is common, creating obstruction for overhead lighting. Technicians work in confined spaces, airflow is tightly controlled, and equipment is highly sensitive to heat, glare, and electromagnetic interference (EMI).

Because of this, **fixture form factor — not just output — fundamentally shapes lighting performance**. The choice between **linear lighting** and **high bay (point-source) lighting** has a direct impact on visibility, safety, energy efficiency, maintenance, and long-term operational costs.

This article explains why **linear lighting is superior for data center aisles**, when high bays may still have a role, and how to make informed decisions for Tier III/Tier IV facilities.

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## What high bay and flat panel lighting was designed for

High bay luminaires were originally developed for:

- Warehouses
- Manufacturing floors
- Gymnasiums
- Big-box retail
- Open industrial spaces with high ceilings

Their defining characteristics:

- **Point-source light distribution**

- Mounted high above the floor (15–40+ feet)
- Wide beam spreads designed to blanket large open areas
- Minimal consideration for vertical illumination

In these environments, high bays work well. They are efficient at flooding large, open spaces with light.

**But data centers are not open spaces.**

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## The data center problem: narrow aisles, tall racks

A typical data center aisle is:

- 3–6 feet wide
- Lined with 7–9 foot tall racks
- Often enclosed in containment
- Filled with cables, equipment, and shadows

Lighting challenges include:

- Deep shadows between cabinets
- Poor vertical illumination on rack faces
- Glare bouncing off reflective equipment
- Inconsistent foot-candles at 18–30 inches above finished floor (AFF)
- Heat contribution in hot aisles
- Sensitivity to EMI and flicker

These are **exactly the conditions where high bays struggle.**

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## Why high bays underperform in server aisles

### 1) Poor vertical illumination on racks

High bays are optimized for **horizontal illumination (floor lighting)** — not vertical surfaces.

In a data center aisle, technicians spend most of their time looking at:

- Rack faces
- Patch panels
- Cables
- Equipment indicators

With high bays or flat panels, light often:

- Falls mostly on the tops of racks (wasted lumens and wattage)
- Skips over vertical surfaces
- Creates dark zones between cabinets

Result: Technicians strain to see clearly, increasing errors and reducing efficiency.

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## **2) Shadowing between racks**

**With single-point light sources**, shadows are inevitable.

In a typical layout:

- One high wattage light is centered over every 2–3 aisles
- Racks block light from reaching adjacent cabinets
- Deep shadows form between equipment

This leads to:

- Inconsistent lighting levels
  - Hard-to-read labels and indicators
  - Increased reliance on handheld task lighting
  - Inconsistent hot spots from lights
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## **3) Glare and visual discomfort**

High bays are bright, concentrated light sources. In a confined aisle, this can cause:

- Direct glare
- Reflected glare off shiny rack surfaces
- Eye fatigue for technicians
- Reduced visibility of small details

Linear fixtures distribute light more evenly, reducing harsh contrasts.

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## **4) Heat impact in hot aisles**

Even high-efficiency LED high bays still generate heat concentrated in a small area.

In hot aisle containment, this can:

- Increase cooling loads
- Disrupt carefully balanced airflow
- Add unnecessary thermal stress to equipment

Linear fixtures typically:

- Spread heat over a longer surface area
  - Run cooler in localized spots
  - Integrate better with airflow patterns
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## 5) Maintenance challenges

High bays are often:

- Mounted high above aisles
- Difficult to access with equipment in place
- Disruptive to replace or service (may require lift inside data center)

Linear aisle lighting is usually:

- Mounted lower and more accessible
  - Designed for serviceability
  - Easier to maintain without shutting down large sections of the data hall
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## Why linear lighting wins in data center aisles

### 1) Even, continuous illumination

Linear luminaires run **parallel to the aisle**, creating a continuous band of light that:

- Follows the length of the racks
- Eliminates dark gaps between fixtures
- Reduces harsh shadow lines

This is the single biggest advantage of linear lighting in data centers.

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### 2) Superior vertical lighting on rack faces

Linear fixtures are easier to aim and optimize for **vertical surfaces**, which is critical for:

- Reading labels
- Identifying patch cables
- Spotting equipment status lights
- Performing maintenance safely

A well-designed linear system can deliver consistent illumination across the entire rack face from top to bottom at lower wattages than point source lighting.

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### **3) Better foot-candle control at 18–30” AFF**

Most data centers specify illumination levels at:

- 18–30 inches above finished floor (AFF)
- Right where technicians work

Airey-Thompson linear luminaires can be tuned and spaced to meet these targets precisely, while high bays often overshoot or undershoot depending on placement.

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### **4) Reduced glare and visual fatigue**

Because linear fixtures distribute light over a larger area, they:

- Reduce peak brightness
- Soften contrasts
- Improve overall visual comfort

This is especially important for technicians working long shifts in confined spaces.

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### **5) Compatibility with hot/cold containment**

Linear fixtures integrate better with containment strategies because they:

- Can be mounted along the aisle rather than overhead in the center
  - Minimize interference with airflow
  - Can be designed with low-profile housings
  - Offer more flexible mounting options
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## 6) Controls and energy efficiency

Modern linear systems can be paired with:

- Occupancy sensors
- Zoning controls
- BMS (building management systems) integration
- Emergency battery backup

This allows lighting to dim or shut off when aisles are unoccupied — reducing energy use without sacrificing safety.

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## Linear vs single point: Direct comparison

| Factor                     | Single Point           | Airey-Thompson Linear Lighting   |
|----------------------------|------------------------|----------------------------------|
| Primary design intent      | Open industrial spaces | <b>Data center aisles</b>        |
| Light distribution         | Point source           | <b>Continuous line source</b>    |
| Vertical rack illumination | Weak                   | <b>Strong and uniform</b>        |
| Shadows between racks      | Common                 | <b>Non-existent</b>              |
| Glare                      | Higher                 | <b>Lower</b>                     |
| Heat concentration         | Localized              | <b>Distributed</b>               |
| Maintenance access         | Difficult              | <b>Easy</b>                      |
| Controls integration       | Add-on                 | <b>Native options</b>            |
| Performance in containment | Limited                | <b>Highly compatible</b>         |
| Customization              | Standardized           | <b>Project-specific possible</b> |

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## When high bays still make sense

Linear lighting should be the default for **server aisles**, but high bays can still have a role in certain areas:

### Appropriate uses for high bays:

- Large, open mechanical rooms
- Uncontained data halls with very wide spacing
- Loading docks
- Storage areas
- Facility support spaces

They are not ideal for:

- Contained hot/cold aisles
  - Tight rack layouts
  - Technician-heavy environments
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## Best practice recommendation for data centers

For optimal performance, we recommend:

- **Server aisles:**  
→ Linear lighting, mounted parallel to racks, tuned for 18–30” AFF.
  - **Cross aisles / end-of-row areas:**  
→ Linear or low-profile area lighting with good vertical distribution.
  - **Open rooms / support spaces:**  
→ Single point where appropriate.
  - **Hot aisles:**  
→ Low-heat but high heat rating, containment-friendly linear systems.
  - **Cold aisles:**  
→ Linear systems optimized for uniform rack illumination.
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## Why Airey-Thompson leads in linear aisle lighting

Airey-Thompson designs **purpose-built linear luminaires specifically for data center environments**, not generic industrial spaces.

Our approach prioritizes:

- Precision optics for rack illumination
- Consistent foot-candles at technician height
- Low-glare performance
- Minimal thermal and wattage impact
- Controls-ready architecture
- Rugged, serviceable, Made-in-USA construction

Where high bays are a one-size-fits-all solution, **Airey-Thompson linear systems are engineered around the realities of modern data centers.**

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## Conclusion

The choice between linear and high bay lighting is not just aesthetic — it directly affects safety, efficiency, and long-term operational costs in mission-critical facilities.

For data center aisles, **linear lighting is the superior solution** due to its:

- Uniform illumination
- Reduced shadows
- Better technician visibility
- Compatibility with containment
- Lower glare and heat impact
- Easier maintenance

High bays remain useful in open areas — but they are not the right tool for the most critical part of the data center: **the server aisle.**