

ENGINEERING THE EXTRAORDINARY: HOW UNILUMIN CREATED INDIA'S LARGEST AIRPORT LED CANVAS AT ALLURI SITARAMA RAJU BHOGAPURAM AIRPORT

With a bold vision to create India's largest airport LED installation, Unilumin delivered something truly iconic and unmatched in scale. The team worked closely with GMR's architects to provide detailed designs, technical drawings, and high-quality renderings, allowing them to visualise the impact of the screen and move ahead with its integration into the terminal design.

Unilumin's journey with Bhogapuram International Airport in Andhra Pradesh began in 2024 during the design phase with GMR and was completed in a total duration of 5 months, accelerating the original 8-month projected schedule. This rapid delivery was achieved by optimising workflows across three sequential core phases, moving seamlessly from engineering validation to physical installation, integration, and final performance testing.

The project was executed by M/s Techbizz Integrators Pvt. Ltd. as the designated System Integrator. Unilumin shares a robust, six-year consecutive partnership with Techbizz, collaboratively delivering major high-profile display infrastructure projects across India.

ENGINEERING, FABRICATION AND STRUCTURAL VALIDATION

Phase 1: Engineering, Fabrication, and Structural Validation

This foundational phase (Months 1-2)

focused on cross-checking technical drawings with actual site conditions to ensure structural integrity before manufacturing began.

Site Survey & Load Assessment: Engineers conducted precise laser measurements of the installation site and verified that the load-bearing walls or floor foundations could safely support the dead weight of the equipment and framing.

Shop Drawings & Structural Design: Detailed engineering blueprints, weight-distribution models, and structural framing plans were drafted using CAD software.

Architectural & Consultant Approval: The design packages were submitted to the client's architects and structural consultants. Technical signoffs were secured to ensure conformity with building safety and aesthetic guidelines.

Precision Metal Fabrication: Upon approval, structural mounting frames, custom brackets, and support matrices were fabricated off-site using heavy-duty, anti-corrosive metals.

Anchor & Base Installation: The fabricated structural grid was transported to the site, aligned using precision levelling lasers, and mechanically anchored to the building core.

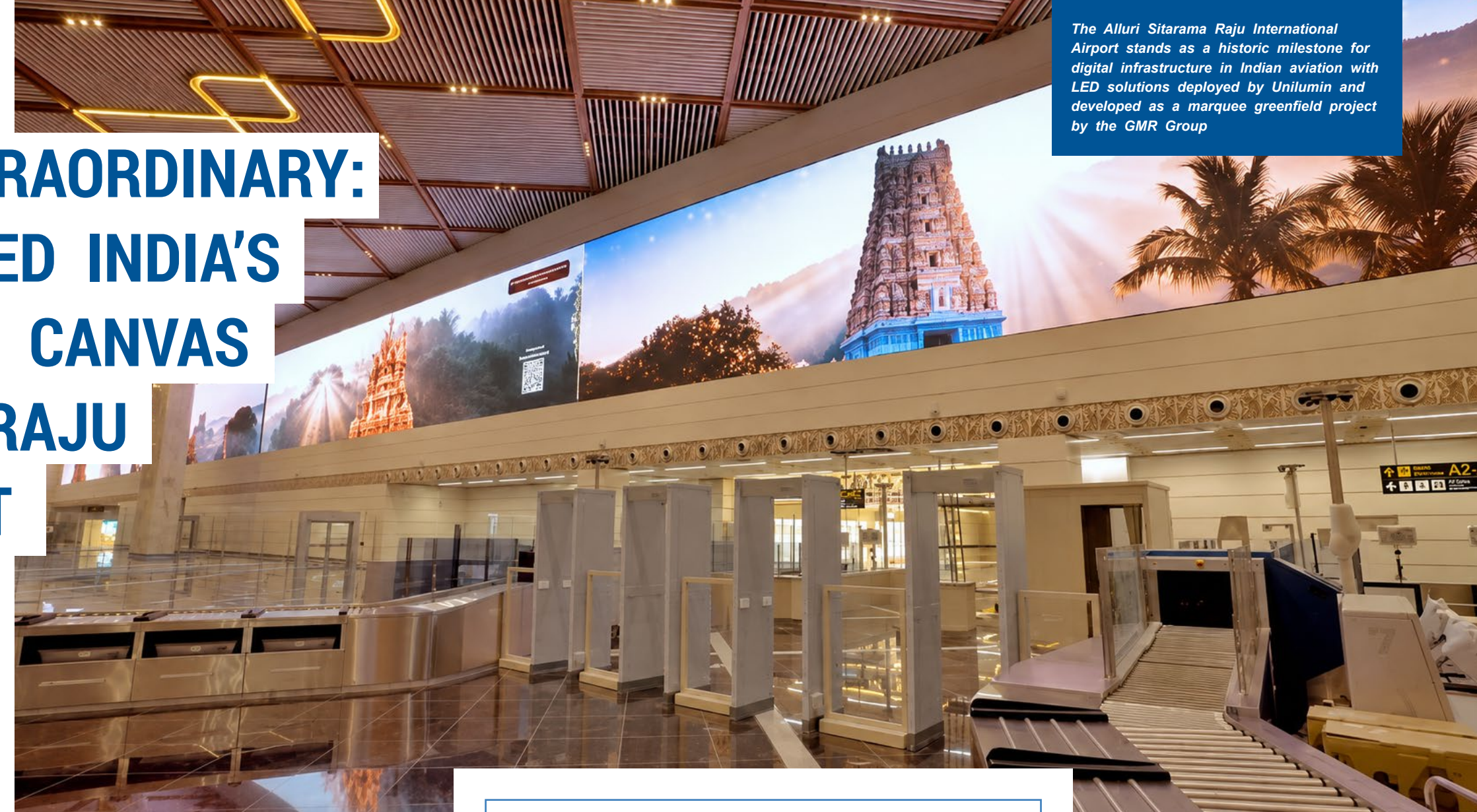
Phase 2: Cabinet Mounting and Infrastructure Integration

With the load-bearing framework securely in place, the team transitioned to physical equipment deployment and establishing robust utility pathways in Months 3-4.

Precision Cabinet Alignment: Individual hardware enclosures and display/server cabinets were unboxed, inspected for transit damage, and sequentially mounted onto the structural frame.

Mechanical Securing & Micro-Adjustments: The cabinets were interlocked tightly, and micro-adjustments were made to eliminate gaps, ensuring a perfectly seamless and uniform front-facing alignment.

Conduit & Trunking Layout: Dedicated, isolated pathways (conduits and cable trays) were routed behind the structures to separate high-voltage power lines from low-voltage data lines, preventing electromagnetic interference (EMI).



The Alluri Sitarama Raju International Airport stands as a historic milestone for digital infrastructure in Indian aviation with LED solutions deployed by Unilumin and developed as a marquee greenfield project by the GMR Group

Alluri Sitarama Raju Bhogapuram International Airport project stands as a definitive proof of concept that firmly establishes Unilumin as an industry benchmark in the Indian aviation market. By engineering and deploying India's largest airport LED display, Unilumin has proven its internal capability to design and execute engineering marvels of unprecedented scale. Backed by the proven track record of handling high-stakes terminal environments, alongside a growing nationwide portfolio of multiple aviation hubs, national news channels, and corporate flagships, Unilumin is uniquely positioned to capture the wave of upcoming greenfield and brownfield airport modernisations across India.

Power Cable Looping: Heavy-duty power cables were looped through the cabinets, connecting them back to the localised Power Distribution Units (PDUs) and Main Distribution Boards (MDBs).

Data & Signal Cable Looping: Shielded data lines (Cat6A/Fiber optic patches) were looped to establish point-to-point command pathways from the central processing racks to each individual module.

Phase 3: System Testing, Optimisation, and Commissioning

The final phase (Month 5) breathed life into the physical infrastructure through strict electrical validation, system calibrations, and multi-scenario performance testing.

Cold-Start Electrical Audits: Before powering on, technicians performed continuity and insulation resistance tests to ensure there were zero short circuits or grounding faults across the looped lines.

Setting a new benchmark for smart airport infrastructure, Unilumin integrates its most advanced displays, in partnership with the systems integrator - M/s Techbizz Integrators Pvt. Ltd.



Power-On & Firmware Initialisation: The system was booted incrementally. Each cabinet module received firmware updates, and initial hardware handshakes were verified with the central control matrix.

Signal Calibration & Tuning: Video, data, and audio feeds were calibrated. Technicians adjusted colour uniformity, brightness matrix matching, signal latency, and pixel mapping to achieve optimal clarity.

Burn-In & Stress Testing: The entire installation was subjected to a continuous 72-hour stress test (burn-in period) under maximum load to identify any thermal issues or component vulnerabilities.

Final Commissioning & Client Handover: Following zero defects during the stress test, final operational logs were compiled. As-built drawings, technical manuals, and warranty certifications were compiled into a handover dossier, and the fully operational site was delivered to the client.

MEETING THE DEMANDS OF A HIGH-SECURITY AVIATION ENVIRONMENT

The installation had to meet stringent safety, operational, security, fire, electrical and system-control requirements.

Safety & Construction Rules

All structural frames supporting the display systems were required to undergo mandatory certification by qualified engineers. The total weight of all installed

equipment had to remain within the predetermined safe loading capacities specified for the terminal's floors and walls. Additionally, no installation could obstruct critical areas including passenger circulation routes, designated emergency evacuation exits, or any existing wayfinding and informational signage throughout the terminal.

Zero-Downtime Guarantee: 24/7 Operation

Every piece of hardware deployed in the system needed to meet industrial-grade specifications, specifically engineered for continuous operation around the clock throughout the entire year without scheduled downtime. Further, all systems were mandated to incorporate dual power supply feeds supported by Uninterruptible Power Supply (UPS) units to maintain seamless operations during outages. The data transmission infrastructure was designed with redundant cabling configured in a loop topology.

Strict Airport Security (AVSEC)

Every individual involved in the installation project was required to obtain official security clearance from airport authorities and carry valid temporary access passes for entry into restricted airport zones. A comprehensive inventory management system was implemented wherein each piece of equipment, including individual tools, mounting brackets, and cable segments, had to be formally documented, physically inspected, and passed through security scanning procedures at designat-

ed checkpoints.

All activities generating significant noise levels were strictly confined to designated nighttime hours between 23:00 and 05:00 to minimise disruption to passenger experience and airport operations.

Fire & Electrical Compliance

The entire cabling infrastructure was mandated to utilise Low Smoke Zero Halogen (LSZH) specification cables, which are specifically designed to prevent the emission of toxic fumes and dense smoke in the event of fire exposure. All enclosures, cabinets, and component housings had to be manufactured from certified fire-retardant materials that meet stringent flame-resistance standards.

Furthermore, the complete system was required to operate without generating electromagnetic emissions that could potentially cause interference with critical airport systems including air traffic control radar equipment or the airport's wireless communication networks.

Cooling & System Control

Each display unit was required to incorporate integrated cooling mechanisms with built-in ventilation fans capable of maintaining optimal operating temperatures independently, without depending on the airport's centralised HVAC infrastructure.

The entire system needed to be connected to the airport's central monitoring and control facility, enabling technical staff to

perform remote diagnostics, system health monitoring, and troubleshooting procedures from a centralised location without requiring physical access to individual display units.

860 SQUARE METRES OF DIGITAL CANVAS

In a breathtaking display of engineering and visual mastery, Unilumin has successfully deployed a staggering 860 square metres of cutting-edge LED technology across the terminal. The crown jewel of this massive installation is an awe-inspiring, single flagship screen spanning a monumental 720 square metres. Designed to serve as the airport's primary visual anchor, this colossal digital canvas dominates the main concourse, capturing passenger attention with vibrant clarity and high-impact imagery.

Complementing this mega-structure is a strategic network of secondary displays totalling 140 square metres. These screens, varying in size, are meticulously positioned across high-traffic passenger touchpoints, including check-in zones, security gates, and baggage claims, to ensure a seamless flow of real-time information and immersive brand content.

By unifying the entire 860-square-metre digital ecosystem under Unilumin's advanced hardware, the airport achieves flawless colour uniformity, synchronised brightness control, and streamlined central management, setting a new global standard for modern aviation architecture.

THE TECHNOLOGY BEHIND THE INSTALLATION

The deployment featured a specialised airport solution from Unilumin, combining high-performance hardware and software components including tailor-made Unilumin high-brightness LED products designed specifically for airport environments, advanced **NovaStar video processors** for seamless image quality, high-reliability **Drita servers** for powerful content playback, and **Navori CMS** for robust, real-time display scheduling and control. The key considerations for the project were engineered to meet strict aviation display standards, ensuring seamless 24/7 operations, absolute clarity, and high system reliability.

Technical Specifications

Technical Specs & Pixel Pitch: The system utilises an active LED P2.5 display setup. It features a Surface Mount Device (SMD) diode type with a 3,840 Hz refresh rate to avoid flickering on camera, an IP50 rating for indoor protection, and a massive lifetime of 100,000 hours.

Resolution & Dimensions: The display is a grand canvas split into two equal sections, each measuring 6 meters in height and 60 meters in length. Together, they form a continuous 120-meter long by 6-meter-high display capable of handling ultra-high-resolution content rendering up to 8K.

Brightness & Contrast: Designed for high-ambient airport lighting, the panels deliver a peak brightness of 1000 to 1,500 nits paired with a 5,000:1 contrast ratio and Multi-link HDR compatibility for vivid colour reproduction.

Viewing Angles: To guarantee perfect legibility for passengers from anywhere in the security check area, the display features wide 160° viewing angles both horizontally and vertically.

Content Management and Ambient Lighting

The project relies on the Navori CMS, operated via high-performance workstations. The CMS is built for 24/7/365 operations, fully complies with airport IT cybersecurity norms, and supports real-time multi-partition layout controls for text, image, and video content.

Airports feature high ambient light environments due to massive glass facades and bright architectural lighting. The display uses active LED P2.5 modules capable of auto-adjusting up to a peak brightness of 1,000 nits. This is reinforced by a high 5,000:1 contrast ratio and multi-link HDR compatibility to guarantee perfect clarity, vibrant colours, and readability under any daylight shift.

Engineering for 24/7/365 Continuous Operation

Airport displays cannot afford downtime. To address this, the system is designed with a premium lifespan of 100,000 hours. The backend Navori Content Management System (CMS) and dedicated Drita media servers are specifically rated for uninterrupted 24/7 operation. Additionally, the architecture utilises high-end mother-

boards with redundant power supplies to eliminate single points of failure.

Designed Around Passenger Flow

Positioned at the high-traffic Pre-Embarkation Security Check (PESC) area, the display spans a massive 120-metre length to command attention. It features wide (160°) H&V angle, ensuring that moving passengers can read information clearly from any stance or position within the queue.

In a high-security aviation hub, the installation follows strict EHS (Environment, Health, and Safety) guidelines and utilises IP50-rated Screen for secured ingress protection in indoor environment. Furthermore, the system is fully compliant with the airport's strict IT cybersecurity norms and possesses necessary safety credentials like BIS, UL, RoHS, CE, FCC, IC, KC, UKCA, EAC, CCC, CB, TÜV certifications.

SIX SCREENS ACROSS HIGH-IMPACT PASSENGER ZONES

The deployment comprises a total of six high-performance screens strategically positioned across two high-impact passenger zones.

The SHA (Security Hold Area): Features a monumental engineering achievement—India's largest LED screen installed at an airport. This flagship installation commands passenger attention with a staggering total footprint of 720 square metres.

Multiple areas: Comprises multiple synchronised displays distributed across five boarding gates, entry and exit, baggage belts, etc measuring 140 square metres in total, to deliver localised gate information and flawless viewing for waiting passengers.

CHALLENGES AND SOLUTIONS

The project involved several critical challenges and solutions, including structural design and engineering challenges associated with safely mounting India's largest airport screen (720 sq. mtr.) in the SHA zone, organising and routing heavy-duty dual cable networks (both power and data) to eliminate interference and ensure robust signal transmission, configuring the backend Drita servers and Navori CMS to flawlessly drive multi-partitioned layouts across 6 highly distributed screens; and managing strict airport security clearances, restricted night shifts, and EHS compliance to perform hot-installations without inter-

rupting passenger traffic.

DELIVERING THREE MONTHS AHEAD OF SCHEDULE

The project was governed by strict, time-sensitive milestones linked to the operational readiness of the airport terminal. Deploying India's largest airport screen (720 sq. mtr.) in the high-traffic SHA area and the multiple screens of different sizes which is total 140 sq. mtr. displays at the boarding gates required an aggressive, highly coordinated installation schedule.

To prevent any disruption to live terminal activities and meet upcoming airport launch deadlines, the execution schedule was significantly compressed. The fabrication, cabinet mounting, and advanced power/data looping phases were optimized through parallel workflows.

By leveraging advanced technical expertise and deploying round-the-clock specialised crews, our team successfully compressed an 8-month projected timeline into just 5 months, handing over a fully commissioned, operational site 3 months ahead of schedule.

REDUNDANCY AND FAILOVER FOR CONTINUOUS OPERATION

To meet the mandatory 99.99% system uptime SLA required in a high-security airport environment, the display infrastructure utilises a fully redundant architecture at every layer of operation.

Power Infrastructure Redundancy: The Drita media servers driving the displays are equipped with redundant power supplies. In the event of a primary power unit failure, the secondary backup power unit instantly takes over the load without causing system reboots or screen black-outs.

Dual-Drive Data Failover: The media servers feature a highly resilient storage architecture, deploying independent solid-state drives for the operating system (PCIe Gen 4, 512 GB M.2 SSD) and dedicated high-capacity drives for content media storage (PCIe Gen 4, 4 TB M.2 SSD). This configuration isolates system operations from media playback, protecting data integrity.

High-Loading Controller Backup: The NovaStar controllers feature massive

loading capacities (handling between 65 million to 104 million pixels) and are engineered to support multi-layer video distributions. The system is built to support a seamless signal failover route, ensuring that if a primary data loop path breaks, backup signal loops maintain continuous screen playback.

Network & CMS Resilience: The Navori CMS application operates via dedicated workstations designed for continuous 24/7 rendering. It includes local content caching mechanisms, allowing the screens to continue playing scheduled media seamlessly even if there is a temporary interruption in the central network connection.

A FIRST-OF-ITS-KIND DIGITAL LANDMARK

In the high-traffic Security Hold Area

Adding to the successful deployment, Pushpender Kaushik, Technical Head - India Region, Unilumin, stated, "The Bhogapuram International Airport project is a proud moment for Unilumin. As we help shape the future of India's aviation infrastructure by deploying a record-breaking 720-square-meter P2.5mm LED Canvas, the largest of its kind in the country, we aren't just installing hardware; we are redefining the passenger experience. This landmark installation showcases how our Metasight solutions bring together extreme structural reliability, energy efficiency, and AI-driven control to meet the intense demands of a 24/7 modern aviation hub."

(SHA), Unilumin successfully engineered and installed India's largest LED screen at an airport terminal. Delivering a flagship installation of this unprecedented scale required premier structural engineering and seamless synchronisation. By leveraging the trusted six-year consecutive partnership with M/s Techbizz Integrators Pvt. Ltd., the teams turned this massive vision into reality.

This landmark display completely redefines passenger engagement in Indian aviation, creating a truly immersive visual experience that sets a new benchmark for smart airport infrastructure nationwide.

A New Benchmark for Digital Infrastructure in Indian Aviation

The Bhogapuram Airport stands as a historic milestone for digital infrastructure in Indian aviation. Developed as a marquee greenfield project by the GMR Group, this development sets a new precedent for how large-format pro AV architecture can shape the identity and operational efficiency of a next-generation terminal. The definitive highlight is the integration of India's largest indoor LED display—a massive 720-square-meter P2.5 screen measuring 120 meters wide by 6 meters high. This colossal installation contributes to a staggering 850 square meters of total Unilumin fixed LED technology deployed across the terminal. By replacing fragmented, traditional signage with a single, continuous digital panorama, the airport creates a seamless passenger flow, with the mega-canvas serving a synchronised triple purpose: delivering critical real-time flight information, simplifying wayfinding, and hosting premium high-impact branding.

The advanced pro AV infrastructure is engineered to handle an initial influx of 6 million passengers annually, scalable up to 40 million, while the premium visual layout establishes the terminal as a high-value canvas for local tourism and high-revenue digital out-of-home (DOOH) advertising. True to modern greenfield standards, the display architecture operates with high energy efficiency and low heat emission, aligning perfectly with the terminal's broader eco-friendly design and smart building management frameworks.