

Las Vegas, USA

◁ INNOVIA Monorail 200 Automated monorail system ▷



Bombardier, as part of the Las Vegas Monorail Team, designed and supplied its ultra modern **BOMBARDIER* INNOVIA* Monorail 200** system for the Las Vegas Resort Corridor.

Linking seven stations over 4 miles, the fleet of nine **INNOVIA Monorail 200** 4-car trains provides a quick and comfortable ride just east of the famous Las Vegas Strip.

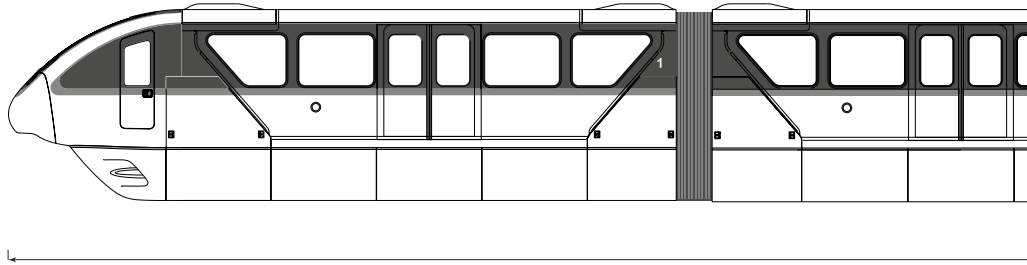
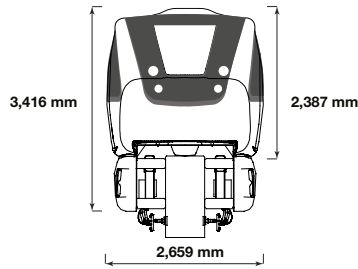
Designed to urban transit safety standards, this fully automated monorail integrates the two existing stations and the 0.8-mi. guideway of the MGM-Grand Bally's monorail line. Approximately 120 ft. of the elevated, dual guideway passes through the existing third and fourth floors of the Bally's Hotel Events Center.

The Las Vegas monorail project is the first modern public transportation system in the world that is totally funded by the private sector. Financing was generated through



Interior of **INNOVIA Monorail 200** vehicle

tax-exempt non-recourse revenue bonds tied to the farebox and advertising revenues. Bombardier has operated and maintained the system since it opened to passenger service in 2004.



Project Schedule

Contract award	September 2000
First vehicle delivery	January 2003
Revenue service	July 2004

Major Subsystems

Vehicle	INNOVIA Monorail 200
Signalling	fixed block
<ul style="list-style-type: none"> • 2 modes of operation <ul style="list-style-type: none"> - automatic train operation (ATO) - emergency manual 	
Power supply & distribution	750 Vdc
Power collection	guideway-mounted power rails
Traction power substations	5
Communications	fibre optic central transmission system, public address (PA) system, telephone (PABX), radio system, closed circuit television system (CCTV), supervisory control and data acquisition (SCADA), vehicle communication system, master clock system

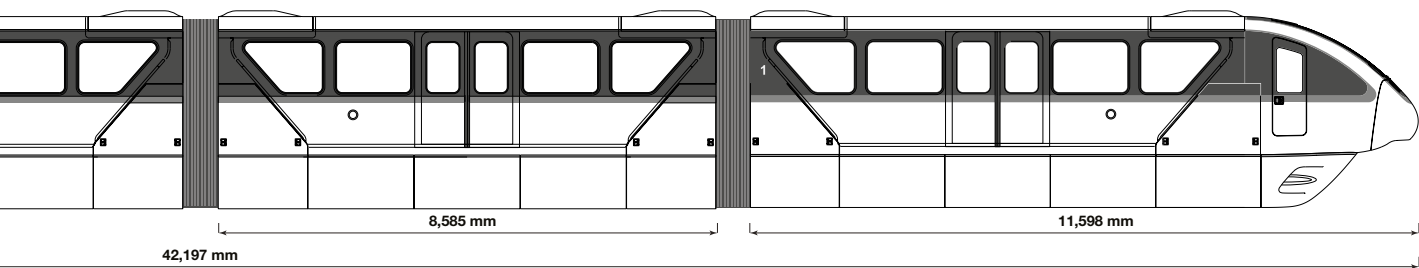
System Description

System type	INNOVIA Monorail 200
Number of lines	one
System length (elevated)	4.0 mi.
<ul style="list-style-type: none"> • existing system • system extension 	0.8 mi. 3.2 mi.
Maximum guideway elevation	approx. 60' above grade
Average guideway elevation	30'
Vehicle fleet	9 four-car trains
Train control	fully automated, driverless
System design capacity	3,200 pphpd
<ul style="list-style-type: none"> • first stage increase • second stage increase 	5,000 pphpd 8,000 pphpd

Maximum grade	6.5%
Average line speed	17.5 mph
Intermodal connections	bus
Special Features	36.6 m / 120' of guideway passes through Bally Hotel's Events Center
Operation	pinched loop

Fixed Facilities

Guideway types	elevated, precast concrete beams, pre-stressed, post-tensioned
Typical elevated guideway span	100'
Maximum elevated guideway span	120'
Guideway running surface width	26"
Switches	automatically controlled by ATC system 3 beam-replacement cross-overs, 1 beam-replacement turnout, 1 pivot
Number of stations	7 elevated
Average station spacing	0.5 mi.
Platform loading	level boarding, fully accessible
Platform length	243'
Beam to platform height	7 ⁷ / ₁₆ "
Station features	platform screen door system (PSDS)
Station accessibility provisions	station elevators, level boarding
Maintenance building size	18,000 sq.ft.
Yard operation	automatic
Yard storage capacity	four 4-car trains
Maintenance bay movement	automated and manual guidebeams within Operations, Maintenance and Storage Facility



Vehicle Data

Type of vehicle	INNOVIA Monorail 200
Quantity ordered	36 cars
Train consist	semi-permanent 4-car trains

Dimensions and Weight

Length of 4-car train (over nose cone)	138' 5¼"
Length of 4-car train (over face of couplers)	136' 10"
Overall width	8' 8"
Bottom of skirt to top of A/C unit	11' 2½"
Top of beam to top of roof	7' 10"
Top of beam to floor	7⅝"
Doorway width (clear opening)	5' 2"
Doorway height (clear opening)	6' 4⅝"
Floor width (over door thresholds)	8'
Floor to ceiling height	7' 1⅜"
Load tire diameter	45⅜"
Car wheelbase	25' 8½"
Train weight (empty)	84,941 lb.

Technical Characteristics

Primary power	750 Vdc
Auxiliary power supply	230 Vac, 60 Hz, 3ø
Low-voltage power supply	24 Vdc
Propulsion	4 IGBT inverters per train / 4 powered axles per train
Service braking	regenerative dynamic, supplemented by hydraulic disc brakes
Emergency brakes	spring-applied, ventilated disc brak

Parking brakes	spring-applied, ventilated disc brake
Load tires	2 heavy duty, high-mileage tires per car, nitrogen-filled; lead tires with run-flat capability
Guidance tires	nitrogen-filled with back-up capability
Carbody	FRP composite shell, steel structure underframe
Fire safety design	floor rating exceeds ASTM E-119 NFPA 130 compliant
Accessibility design	compliant to Americans with Disabilities Act (ADA)
Side windows	tinted, single-glazed
Doors	8 electric bi-parting, outside sliding doors per train
Air-conditioning	dual 3.1-ton units per car, plus emergency ventilation

Performance and Capacity

Acceleration rate (service)	2.24 mphps
Braking rate (service)	2.24 mphps
Braking rate (emergency)	2.91 mphps
Maximum design speed	50 mph
Maximum operating speed	50 mph
Wheelchair locations	4 dedicated per train
Seated passengers	72 per train
Capacity per train (standees + seated)	
@ 2.7 sq.ft./pass.	152 + 72 = 224
@ 1.8 sq.ft./pass.	228 + 72 = 300
@ 1.35 sq.ft./pass.	304 + 72 = 376

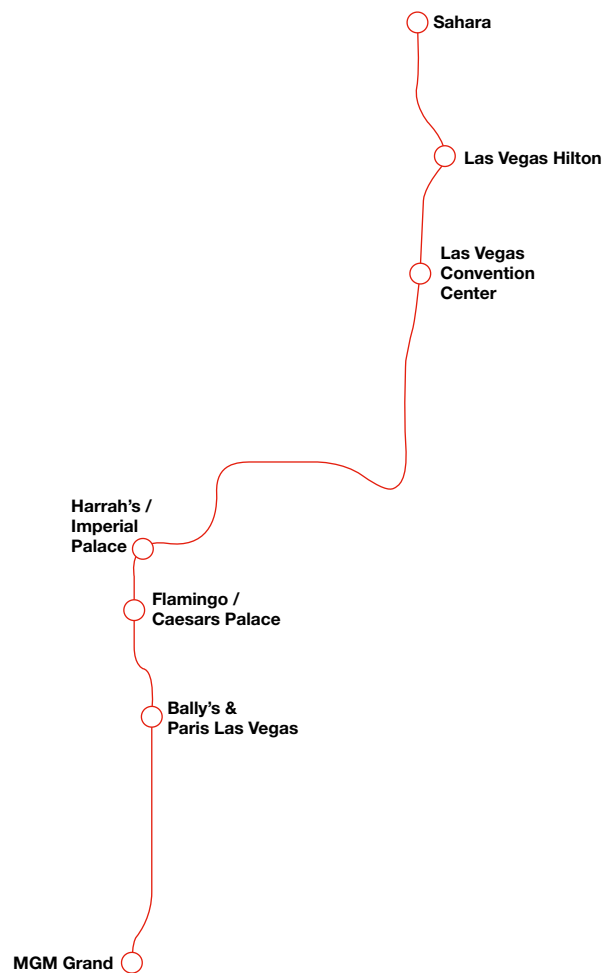
The Las Vegas Monorail Team, comprised of Bombardier and MGM Grand Granite Construction Company, was responsible for the full turnkey system contract.

Bombardier, as the lead member of the consortium, provided all the electrical and mechanical elements of the system including:

- 36 *INNOVIA Monorail 200* cars
- overall project management
- systems engineering and integration
- automatic train control
- communications systems
- power supply and distribution system
- automatic fare collection system
- guideway guidance and switching systems
- platform doors for 7 stations
- testing and commissioning
- workshop equipment
- training and manuals
- up to 15 years of operations and maintenance services

The fully automated monorail system connects seven stations east of the Las Vegas Boulevard, linking nine major resort properties and the Las Vegas Convention Center. Each station features station/hotel connectors.

Granite Construction Company was responsible for the design, supply and installation of the civil and architectural elements for the Operations, Maintenance and Storage Facility (OMSF), all of the stations and the monorail guideway.



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