

# Tsukuba Express—Introduction to Stations

## Line Overview, Station Design and Mobility

### General overview

The *Tsukuba Express*—Greater Tokyo's newest commuter rail line—began service on 24 August 2005. The line starts in Akihabara, Tokyo (the city's so-called Electric Town) and terminates in Tsukuba Science City, Japan's centre for high-tech

development (Fig. 1). The fastest trains travel the 58.3-km distance in 45 minutes, passing through four prefectures: Tokyo, Chiba, Saitama and Ibaraki.

The line is quickly becoming a major transit option for rail passengers travelling between the centre of Tokyo and north-east Greater Tokyo. Each of the 20 stations has been designed with its own identity. Seven stations offer connections to other

## Kazunobu Yamada

lines and the added convenience for commuters will undoubtedly reduce congestion on JR East's Joban Line and other older lines (Table 1). The line also offers improved transit options for people living and working near the line.

### Preparing for development

The operator, Metropolitan Intercity Railway Company (MIRC), took advantage of the Special Measures Law for Coordinated Development of Residential Areas and Railways in Metropolitan Areas (approved in June 1989 and enforced from September that year), which facilitates simultaneous construction of railways and development of residential land for large housing projects.

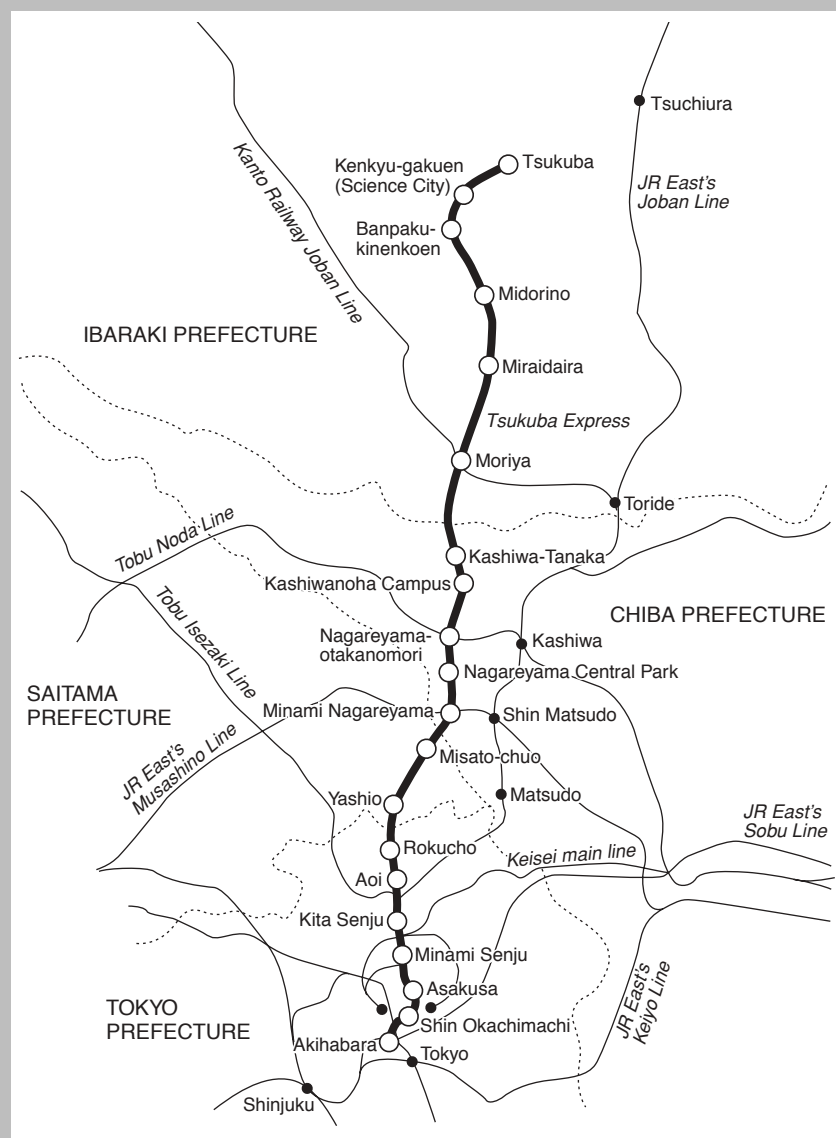
The law promotes railway development hand-in-hand with development of land near the proposed right-of-way, making it easier to promote simultaneous development of railway land, roads, parks, residential land, and other urban facilities. The railway construction company and its partners in the public sector buy up land lots during the preliminary stage and these lots are finally assembled and/or substituted for other lots to create a contiguous stretch of land purchased by the railway operator.

### Designs and signs

MIRC established a Design Planning Council for Signs and Other Features to:

- Define design concepts for four elements—advertising, station furniture, signage and station buildings—all of which follow MIRC's overall brand image strategies
- Develop basic principles for overall design and individual station design
- Determine implementation design policies for major parts of the four elements, and identify where these policies are to be implemented
- Ensure that the basic principles and implementation design policies are followed

Figure 1 *Tsukuba Express Route*



**Table 1 Tsukuba Express Profile**

Total line length	58.3 km, Akihabara to Tsukuba
Travel time	Fastest service, 45 minutes between Akihabara and Tsukuba
No. of stations	20 (7 in Tokyo, 2 in Saitama, 5 in Chiba, and 6 in Ibaraki prefectures)
Track gauge	1,067 mm
Maximum design speed	130 km/h
Power systems	DC section: Akihabara–Moriya (1,500 V) AC section: Moriya–Tsukuba (20,000 V)
Connections	Akihabara Station (JR East's Yamanote, Keihin-Tohoku and Sobu lines, Tokyo Metro's Hibiya Line) Shin Okachimachi Station (Tokyo Metropolitan Government's Oedo Line) Minami Senju Station (JR East's Joban Line, Tokyo Metro's Hibiya Line) Kita Senju Station (JR East's Joban Line, Tobu Isezaki Line, Tokyo Metro's Hibiya and Chiyoda lines) Minami Nagareyama Station (JR East's Musashino Line) Nagareyama-otakanomori Station (Tobu's Noda Line) Moriya Station (Kanto Railway's Joso Line)
Operator	MIRC
Construction	JRTT

A committee of members was established, representing relevant divisions and those of project partners, and obtained participation of the architectural and design firms, Koken Architects, Inc. and Rei Design & Planning.

The committee's work can be summarized as follows:

- Developed brand image for *Tsukuba Express*
- Decided overall colour scheme  
Brand image colours are blue (representing safety and reliability) and red (speed and energy), while bright whites are used as keynote colours for station concourse walls and ceilings (simplicity and space free of busy colours). Station signs have a red background, boarding instructional signs a blue background, and alighting instructional signs a yellow background.
- Decided sign font size, pictographs, station name sign designs for exits/entrances, platforms, and station numbers
- Developed consensus on station space

design plans and service facility plans

- Compiled infrastructure construction and accessibility design standard, illustrations for infrastructure construction design standards, and

established safeguards to ensure standards followed during implementation planning and construction

**Universal Design for accessibility**

The *Tsukuba Express* was planned when accessibility needs were well understood, so it presented a perfect opportunity for developing stations that incorporate Universal Design principles.

In the planning stages, the Japan Railway Construction, Transport and Technology Agency (JRTT) kept Universal Design principles in mind, and during discussions with the future operator, ensured that stations would be user friendly.

Service counters were constructed next to automatic wickets, making passageways user friendly. The service counter window permits eye contact between passengers and staff, and the counter is low enough for eye contact with wheelchair users. Wide wickets provide easy access for wheelchairs, and an intercom installed outside the wicketed area permits good passenger–staff communications.



Service counter next to passageway at Akihabara Station

(JRTT)



Platform screen with moveable gate

(JR TT)



Underground station bench

(JR TT)



Signs in front of station toilet

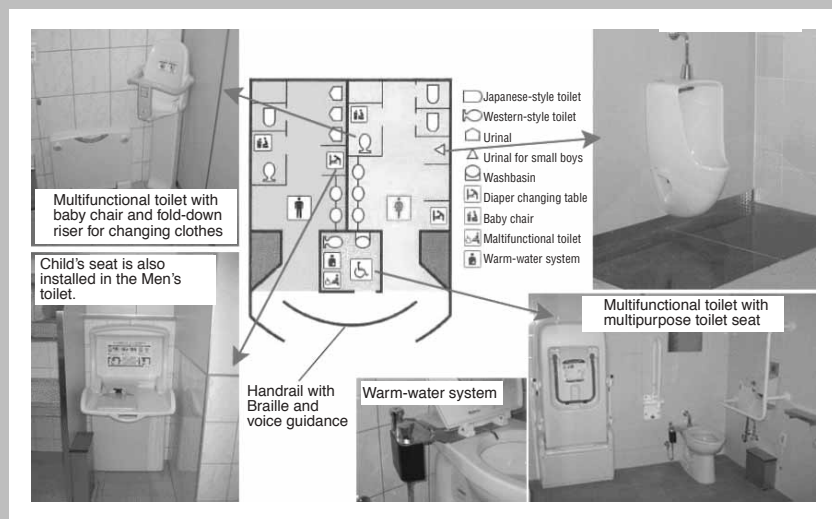
(JR TT)



Handrail with Braille and voice guidance

(JR TT)

Figure 2 Standard Floor Plan and Station Toilets



Platform screens along the platform edge with moveable gates prevent boarding and alighting passengers (especially the visually impaired) becoming jammed between carriages or falling on the track. The screens have an intercom system for emergency communications with station staff. Signs on the screens indicate car numbers, information on station stops, boarding/alighting locations. These are one design element in sign policies targeting smooth flows. All stations have the same design of platform bench with generous person seating width. There are two types of benches—one providing ample back support, and another with a higher seat to permit easier sitting down and standing up. In some cases, the two types are located

side-by-side as a unit. The seat material is non-combustible aluminium for underground stations and a pleasing recycled material for aboveground stations. The station designers went out of their way to ensure convenient, accessible facilities for users with all needs, such as multifunctional toilets and multipurpose toilet seats (including seats for children). A warm-water system is available for ostomates. Both the men's and women's toilets have easy-to-use multifunctional stalls, a diaper changing table and a clothing-change corner. The women's toilets even have a urinal for small boys accompanying their mothers and a fold-down riser for changing clothes (Fig. 2). Braille signs and voice guidance are installed at toilet entrances, giving easy-to-understand information on toilet layout and facilities.

### Hybrid station structural design

A 'hybrid' structure was developed for elevated stations with separate platforms to reduce construction time and cost and permit more design flexibility. Figure 3 shows typical conventional and hybrid structures. Parts shaded grey indicate supporting structures while unshaded parts indicate architectural structures. In the hybrid structure, the elevated supporting structure is covered

by the platform superstructure and enclosed within the station façade. The supporting and architectural structures are pinned together by horizontal braces under the platform, ensuring that only horizontal forces are transmitted. If the pillars are aligned in straight lines, vertical forces are exerted at the same pitch as the superstructure's vertical elements.

Since the structural behaviour of the supporting structure is different from that of the architectural structure, roller supports are used at contact points where the platform flooring supports and architectural frames meet, so that if an external force deforms the architectural frame, the platform is not pushed toward the track.

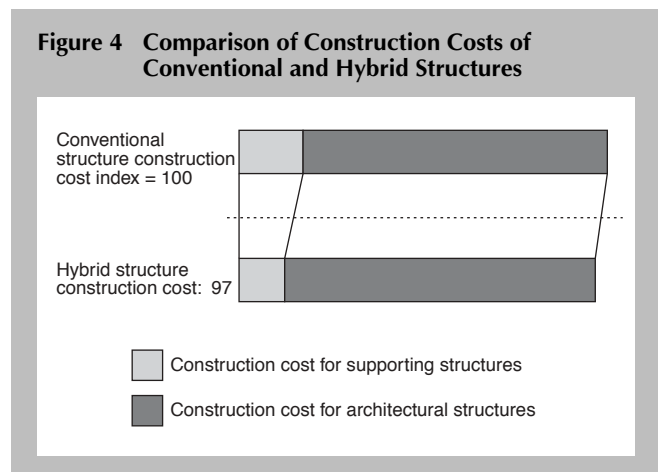
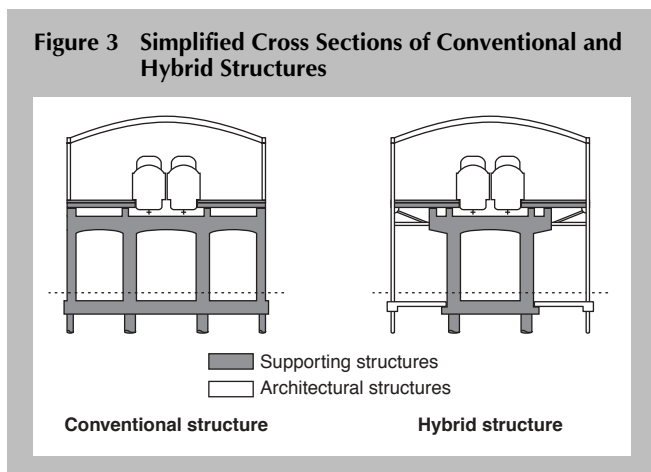
The hybrid structure offers a number of advantages. First, pillars on the outer walls of station buildings can be relatively thin. This makes it possible to install staircases and escalators closer to the façade, which in turn makes it possible to provide a wider space between staircases/escalators and the platform edge. Second, staircases and escalators can be constructed inside the steel pillar framework of the architectural structure, making it possible to locate them freely without restriction by the location of elevated track pillars or beams. In other words, placement of

station component elements is relatively restriction-free, station buildings can have a relatively compact design, and concourse ceiling height is unrestricted, creating opportunities for greater flexibility of space. Third, as Figure 4 shows, the cost of a hybrid structure is slightly less than that of a conventional structure.

The hybrid structure permits erection of thin steel frame pillars for external walls,



Staircase in hybrid structure (constructed adjacent to building façade) (JRTT)





Exterior wall of hybrid structure

(JR TT)



Naturally lit concourse

(JR TT)



Open feeling inside hybrid structure

(JR TT)

offering a slimmer design. A typical benefit of this design is a glass curtain wall using glazing for various effects and creating an open, airy atmosphere.

The slimmer external pillars and glass façade permit entry of good natural light—another advantage of the hybrid structure.

### Design and Layout of Four Aboveground Stations

#### Kashiwanoha Campus Station

Kashiwanoha Campus Station is the line's 13th station from Akihabara Station, the Tokyo terminus. It is in Kashiwa City in Chiba Prefecture, an area well known for its research and academic institutions that

are among the most advanced in the world, and for its natural beauty, parks and watercourses. Two design concepts, science and nature, were blended under the themes of wind, rhythm and flow, for the station building's external skin, which is actually the most imposing element of the building. The western façade has panels made of Glass-fibre Reinforced Concrete (GRC) finished on the outside with a urethane coating, while the eastern façade is covered with extrusion-molded cement panels, with the same type of coating on the outside. The panels are attached directly to pillars forming the structural framework at 5-m intervals, serving as both external skin and the interior wall. Although the GRC panels were made from a small number of molds, diversity is assured by different opening configurations. The maximum height of the façade from ground level is about 17 m. A hybrid structure was chosen in this station.

#### Moriya Station

Moriya Station is in Moriya City in Ibaraki Prefecture. It is the 15th station from Akihabara Station and was constructed next to an existing station of the same name serving the Joiso Line operated by Kanto Railway Co., Ltd. The station is



Kashiwanoha Campus Station façade

(JR TT)



Kashiwanoha Campus Station concourse

(JR TT)



Moriya Station external view

(JR TT)



Moriya Station platform

(JR TT)

elevated on three levels. Users move along a public corridor on the ground level to the concourse on the second level and the platforms on the third. Two island platforms serve the four tracks and a public corridor on the second level permits easy transfers with the Joso Line. The public corridor linking the two rail systems is nearly square and each corner has an elevator, double bank of escalators, and a staircase. The public corridor is connected to a pedestrian deck. The station serves as the southern gateway to Ibaraki Prefecture, which is noted for its open green spaces. The station takes openness and floating as its design themes—trusses for the platform housing are supported by ball joints to create an open, floating feeling, and triangular wall



Moriya Station concourse

(JR TT)



Miraidaira Station external view

(JRRT)



Miraidaira Station concourse

(JRRT)



Miraidaira Station platform

(JRRT)

frames made by the trusses are either left open or filled with panels that look like yacht sails.

### Miraidaira Station

Miraidaira Station is in Ibaraki Prefecture on the border between Ina Town and Yawara Village. It is the next station after Moriya Station and the 16th counting from Akihabara Station. It is the only station built over a cutting. The surrounding Inayawara uplands are known for their lush greenery and archaeological finds, including old tombs and shell mounds indicating that people have lived here since the Jomon (13,000 BC to 300 BC), Yayoi (300 BC to AD 300) and Kofun (300 to 538) periods. Remains of ancient buildings of uncertain date have also been unearthed. These discoveries were considered significant enough to use as a design tool to convey a sense of historic importance and community. The huge gently pitched roof supported by laminated beams is about 13 m at its highest point and is now a local landmark. The platforms are on Lower Level 1 with the concourse on the ground floor and the upper part of the station office on the second floor. Floor slabs over the concourse form the second floor that will accommodate shops in the future. Users enter the expansive roofed area and follow the concourse to the wickets.

The supports for the large roof are 150 x 550-mm laminated larch arches, providing a 20-m span. Skylights at the top of the arch and a 6-m diameter opening in the middle of the inner concourse floor let light onto the platforms.

### Kenkyu-gakuen Station

Kenkyu-gakuen Station is in Tsukuba City in Ibaraki Prefecture. It is the 19th station from Akihabara Station and is the last station before the Tsukuba terminus. Tsukuba 'Science City' is close by, so the station is expected to become the centre of the rapidly developing Katsuragi

district. Urban planners see the area as a subcentre, combining comfortable residential districts with the functions of a major urban centre. The area's future potential inspired the design of dynamic roof girders and a cloth-like roof over the platform.

During the day, sunshine filtering through the Teflon roof material bathes the platform in soft light. At night, the platform lighting is reflected back, creating an illuminated enclosure encompassing the entire platform level. This and other features ensure that the station will become a much-admired local landmark. The 6-m high ceiling over the concourse gives a feeling of liberated space and the extra height permitted construction of a mezzanine, serving as a gallery.

### Design and Layout of Two Underground Stations

#### Akihabara Station

Akihabara Station is the Tokyo terminus and is an important transit hub for transfers to JR East's Yamanote, Keihin-Tohoku and Sobu lines, and Tokyo Metro's Hibiya Line. The station has one aboveground level and four underground levels. The wickets are located at Lower Level 1, while the island platform is at Lower Level 4. The total station area is about 16,600 m<sup>2</sup>. There are 27 escalators, as well as two elevators each with capacity for 18 people.

Entrance/Exit 1 is a stand-alone structure, but will be incorporated into a hotel that will be built later. Entrance/Exit 3 was constructed as part of the existing Yodobashi Camera building. Entrance/Exit 2 faces an open area serving road transportation and is intended to remain as the only entrance/exit exclusively representing the *Tsukuba Express* above ground.

A geometrical design emphasizing straight lines was chosen for this underground station to help users orient themselves and intuit direction. This eases transfers to



Kenkyu-gakuen Station external view

(JR TT)



Kenkyu-gakuen Station platform

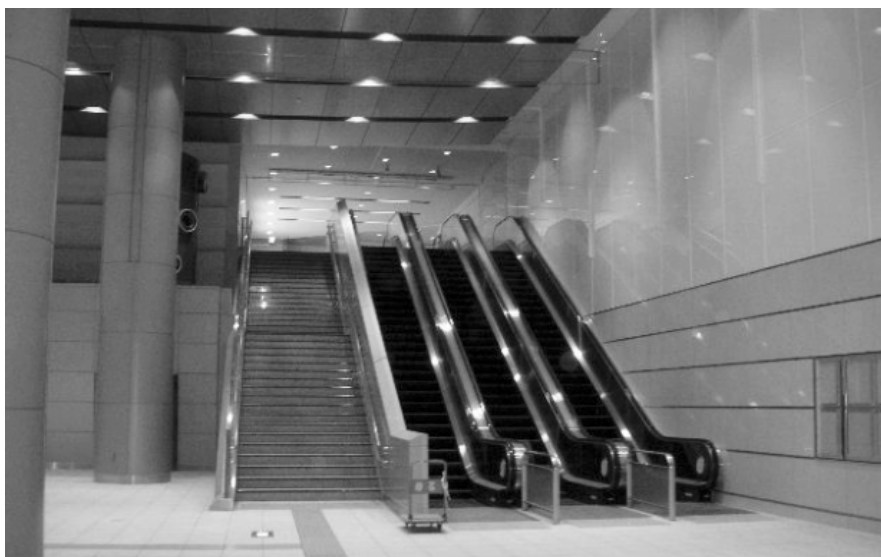
(JR TT)



Kenkyu-gakuen Station concourse

(JR TT)





Akihabara Station outer concourse

(JR TT)

other lines and raise convenience levels. The straight-line design also creates a mental image of high speed that the *Tsukuba Express* is known for.

The high concourse ceiling creates a feeling of unrestricted space that would not be generally expect underground. It is finished with laminated aluminium composite panels and the feeling of openness is further augmented by high walls with milky-white glazing for the upper section, and large light-coloured tiles for the lower.

The platform features a butterfly ceiling design that contrasts with the horizontal lines on walls on the far side of the tracks. The *Tsukuba Express* colours and logo help users orient themselves and indicate the station's importance as the line's Tokyo terminus.

### Asakusa Station

Asakusa is one of the most famous tourist spots in Tokyo with attractions including Asakusa Temple, the Kaminari (Thunder) Gate, and many shops leading to the temple. Asakusa Station is the new gateway to this important district. Annual festivals here include New Year's visits to temples and shrines, the Sanja Festival, and the Samba Carnival. As a station, the station's usage levels fluctuate widely and are very high during festivities.

The station has one aboveground level



Akihabara Station platform

(JR TT)



Akihabara Station Entrance/Exit 2

(JR TT)



Asakusa Station outer concourse

(JR TT)

and four underground levels. The total station area is about 14,000 m<sup>2</sup>. The wickets are located at Lower Level 1 while the island platform is at Lower Level 4. Machinery rooms, including the substation occupy Lower Levels 2 and 3. Until about 1955, Asakusa was one of the liveliest districts where Japanese pop culture and working-class customs and behaviours were defined. The station's design blends the old Asakusa traditions with the ultra-modern image of the *Tsukuba Express*.

People passing through the concourse from Entrance/Exit 1 to Lower Level 1 are struck immediately by the collage and collection of colourful murals illustrating scenes in the Asakusa district from the late 1800s to the mid-1900s. Glassworks in front of the wickets and stairwell walls feature panels humourously depicting people identified with the district. Other decorative elements include glass-block walls and a glass-cloth ceiling, adding to the bright, lively atmosphere.

The platform walls on the far side of the tracks are superb, with scenes idealizing Asakusa—cherry trees in full bloom, fireworks over the Sumida River, the Samba Carnival and the Sanja Festival. With artwork like this, more than a few passengers get off to relax for a few minutes on the platform. ■



Asakusa Station inner concourse

(JRTT)



Decorative wall at platform level on far side of track at Asakusa Station

(JRTT)



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Mr Yamada is Director of the Architecture Division in the Equipment Department of the Railway Construction Headquarters at the Japan Railway Construction Transport and Technology Agency (JRTT). He joined JNR in 1975 after graduating in architecture from Nagoya Institute of Technology. He became Equipment Department Director at the Kanto Branch of the Japan Railway Construction Public Corporation (JRCC) in 1998, and has been in his present post since 2000 (name changed to JRTT in 2003).