INFORMATION PACKAGE

SYSTEM CHARACTERISTICS QUESTIONNAIRE
NOTICE TO FIXED GUIDEWAY SYSTEM VEHICLE SUPPLIERS

REQUEST FOR INFORMATION

(RFI 001)

HSST (High Speed Surface Transport) SYSTEM

Prepared by

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And
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TECHNOLOGY CHARACTERISTICS QUESTIONNAIRE

I– FUNCTIONALITY

1. *Please provide a brief product description of your system, including any special guideway general arrangements, cross sections and technical details.*

The proposed technology described in this response to RFI is the High Speed Surface Transport (HSST) urban maglev system It has undergone many years of development with numerous demonstration installations around the world, and commenced revenue operations in March 2005, with the opening of the 8.9 km Tobu Kyuryo Line in Nagoya, Japan.

There have been many developments in magnetic levitation (maglev) technology over the past several decades. These developments employ different magnetic levitation principles: attractive or repulsive, electro magnetic suspension (EMS) or electro dynamic suspension (EDS), electro magnets or permanent magnets, normal electro magnets or superconducting magnets. For propulsion, two major approaches have been developed, the linear induction motor (LIM) and the Linear Synchronous Motor (LSM).

For high speed maglev trains, the representative technologies are the German Transrapid and Japanese Yamanashi test train. Germany's Transrapid uses attractive-type, electro magnetic suspension for levitation, LSM for propulsion and achieved a top speed of 500 km/h. Japan's Yamanashi test train uses inductive type, electro dynamic suspension (superconducting magnets) for levitation and also uses LSM for propulsion. Its maximum speed is 550 km/h.
Our proposed HSST train uses attractive type electro magnetic suspension for levitation, and LIM for propulsion. The maximum speed for this technology is presently in the range of 120 km/h.

In the first few years of the 21st century, we witnessed the full scale commercial application of maglev technology in the public transportation arena, both in high speed and in low speed.

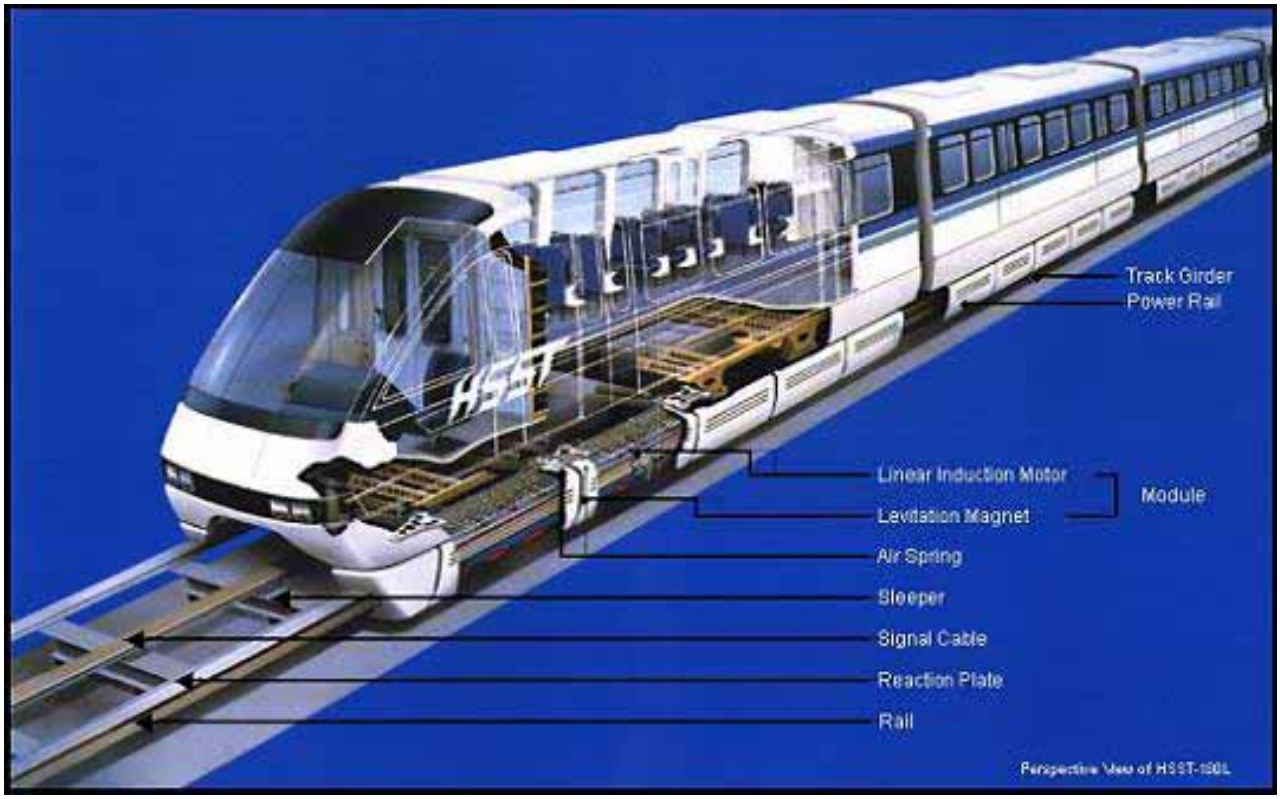
In January 2004 the Transrapid technology was successfully deployed for a 30 km line in Shanghai, China. This is an airport link connecting Shanghai's Pudong Airport to the City of Shanghai. The maximum operating speed of this line is 430 km/h and the total travel time is under 8 minutes.

On March 6, 2005, the Tobu Kyuryo Line commenced operation using HSST technology. This is an urban low speed maglev system with a maximum operating speed of 100 km/h.

The most important element of the HSST technology is the use of the Levitation and Propulsion Modules for providing levitation, guidance and propulsion. A module is similar to a bogie for conventional rolling stock, i.e., providing support, guidance, traction and braking for the vehicle. However, instead of just having

two bogies, each HSST vehicle car is equipped with multiple modules- five on each side for a total of ten. This allows the vertical and horizontal loads be transmitted between the carbody and the tracks in an evenly distributed manner, instead of in the form of concentrated loads as would be the case for a system using wheels. This in turn permits the vehicle body, modules and the supporting guideway to be of a lighter design. Each module is of an identical design and is fully interchangeable.

The modules are primarily made of aluminum alloy. Each module is equipped with magnets, gap sensors, linear induction motors, landing skids, guidance skids and emergency rollers. Hydraulic brakes are installed on certain modules only. Each pair of left and right modules i coupled by connection links.
Each module is equipped with one U-shaped iron magnet with four magnetic coils. These, together with the F-shaped guide rail on the guideway, form the Levitation and Guidance System (LGS) of the vehicle.



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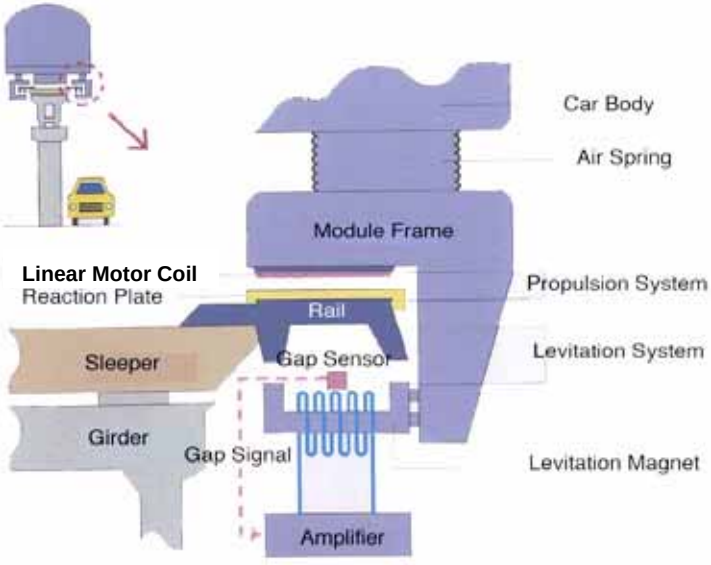
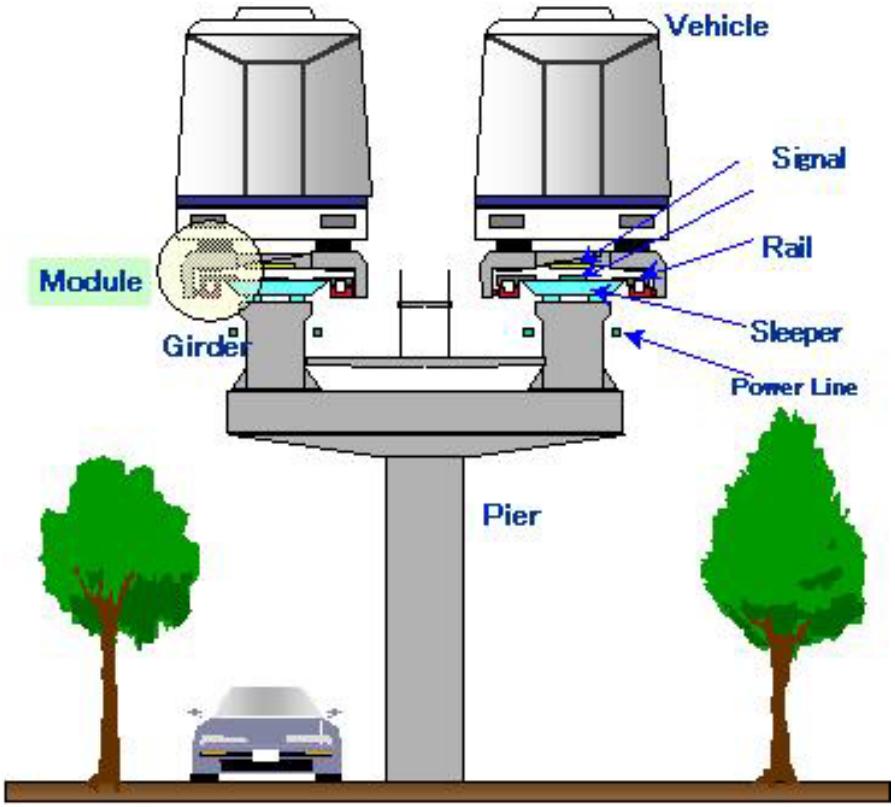
The HSST technology uses the Electro-Magnetic Suspension (EMS) approach for levitation. The levitation system is of the normal conducting, attractive type. The use of attractive EMS concentrates the magnetic flux between the rail and levitation magnet, eliminating the magnetic flux radiated into the surrounding or the train. The attractive force of the levitation magnet also provides lateral guidance of the vehicle. Furthermore, because of the EMS approach, the vehicles can remain in the levitated position even at station stops.





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[Technical details]

1. Vehicle

The general specifications and operating conditions for the proposed HSST vehicle are:

- Train Configuration : 4 cars/train (Preliminary)

[redacted]

- Max. Operating Speed : 100 km/h (62.1 mph) [Note: vehicle capable of 80mph]

[redacted]

- Max. Gradient : 11.3%

2. Power Distribution System

- Traction Power Supply DC1500V, Third rail type (Positive and Negative rail)

3. Train Control / Signaling System

The Train Control and Signaling System encompasses three major subsystems:

- The Automatic Train Protection (ATP) subsystem;
- The Automatic Train Operation (ATO) subsystem;
- The Automatic Train Supervision (ATS) subsystem;

4. Communications System

The Audio and Visual Communications (AVC) subsystem.

Audio Communications includes the following subsystems:

- Wayside Public Address
- Emergency Telephone (ETEL)
- Vehicle Voice Communications
- Recorded Audio Announcements, Messages and Music
- Operation and Maintenance (O&M) Radio Communications
- Transmission Equipment for Audio Communication subsystems
- Recording of Audio Transmissions
- Internal Telephones

Audio Communications can include a tamper-proof, vandal resistant, color CCTV system that will permit the Central Control Operator (CCO) to monitor passenger activities in the stations, the platform/vehicle doors of station platforms, the Maintenance & Storage Facility (M&SF), the guideway emergency walkways, and the interiors of the vehicles/trains in operation.

2. Are there any limitations with your system providing the required level of service along the First Project's 20 mile route selected and station spacing adopted? If so, please explain.

We would like to propose to adjust some system characteristics as follows for more efficient operations:

- Minimum Horizontal Radii

  Maintenance Facility: 246 ft. (greater than the required specification 150ft)

  Elevated Structure: 246 ft. (less than the required specification 400ft)

  This value of minimum horizontal radii has been demonstrated as preferable in proven operating systems.

- Acceleration and Service Braking Rate

  Max. Acceleration and Service Braking Rate: 2.5 miles per hour per second

  (less than the required specification 3.0 miles per hour per second)

  This value can satisfy the required Line Capacity, will provide better ride comfort than the required specification, and will result in energy savings.

- Minimum horizontal Length

Sprials:100ft
This length depends on ride comfort, alignment, and operating speed and is not a fixed value.

3. *Can your system carry a maximum of 9,000 pphpd during the peak periods? Please provide the number of vehicles per train, number of trains and headways for each case.*

   Also identify the square feet per seated and standing passenger assumed.

Yes, our system can meet the maximum requirement of 9,000 pphpd during peak periods. Following is our preliminary plan based on the run curve simulation according to the route map provided on the Honolulu City web site.

4. *Can your system deliver an average end-to-end travel time of 40 minutes for the First Project with a 20 second dwell time at each station?*

Yes, our system can meet this requirement. The result of the run curve simulation indicates an average end-to end travel time of approximately 40 minutes. However an exact travel time is subject to the detailed route alignment.

5. *Can your system accommodate guideway switching and crossing over with 2 minutes main line headways? If your system is other than a conventional rail technology, please provide details of the guideway switching apparatus (from an existing operating system) for both turnouts and crossovers, including general arrangement drawings, mechanism details and costs along with time to change routes.*

Yes, the HSST system can accommodate guideway switching and crossing over with 2 minutes main line headway.

The switch type is a segmented switch that consists of three straight segments of unequal lengths that are

swung into place by electric actuators. The segmented track allows the beam to go from a straight position to a curved one. Segmented switches are the most commonly used type of monorail switch in Japan. A schematic plan and side view of the HSST segmented switch is shown in the Attachment-2.

The switch requires 15 seconds to move through its cycle. Once through its cycle, the switch girder is held in place by a locking device. The girder-locking device and the rail-locking device are required to keep the two sections of track aligned in accordance with the alignment criteria. In the event of an electrical failure, the switch can be operated manually from the control box located adjacent to the switch. It takes approximately 20 minutes to move the switch through its cycle manually.

6. *If your system is other than a conventional rail technology, please provide a general layout and cross section of an existing storage yard and maintenance facility for a system of similar size and passenger loads.*

The following drawing shows the depot layout with the general information of the Tobu Kyuryo line.

Route length:	5.6 mile dual track
Number of stations:	9 stations
Number of trains:	9 trains (3 cars per train)
Design capacity:	30,000 passengers per day
	3,500 pphpd
Depot size:	8.6 acres: refer to Attachment-3

7. *Can your system support future expansions and extensions?*

Yes, our system can support future expansions and extensions.

8. *Can other manufactures provide interoperable vehicles in a future procurement? If so, please provide the names of up to four other manufactures of compatible equipment.*

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The HSST vehicles include unique proprietary equipment, such as the levitation/propulsion modules. However many of the components and subsystems, including Automated Train Control and Communications systems, are readily available in the industry. Other manufactures may be able to provide interoperable vehicles with our technical support.

9. *Can multiple manufacturers provide compatible interfacing systems equipment in a future procurement? If so, please provide the names of up to four other manufacturers of compatible train control/signaling, traction power distribution, propulsion and braking control equipment.*

Yes, non-vehicle equipment is generally available from major rail industry providers. The train control system can be supplied by companies such as Thales or Kyosan. Communications and power distribution equipment are standard and not unique to our system technology and could be competitively bid in future procurements.

10. *Would your system comply with federal and state regulations and requirements, including the following?*
    Americans with Disabilities Act (ADA);
    Buy America Act;
    Hawaii Seismic Codes;
    Fire Protection and safety evacuation regulations (including NFPA 130).

Yes, we can and would comply.

11. *What features does your system offer which could reduce the impact of construction?*

The HSST System provides the following advantages in reducing the impact of civil works:

- In addition to the light weight of the HSST vehicles, the load conditions on the civil structure are evenly distributed instead of concentrated wheel loads. These load conditions allow the size of the guideway superstructure to be reduced compared to other technologies, resulting in lower costs and reduced aesthetic impacts on the surrounding environment.

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12. *Provide high resolution digital photograph(s) of your proposed system and proposed vehicles which are currently in service that can be used in presentations and publicly released reports (do not provide artist renderings).*

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- ## II – COSTS

13. If your system requires a proprietary guideway, please provide a typical list of quantities for piers, beams, walkways and guidance mechanisms for 450 linear feet of dual guideway with a clearance of 20 feet above ground level. (Assumptions should include 150-foot long spans.)

[redacted]

14. Please provide information regarding actual costs of your vehicles and equipment for similar transit systems recently built or in revenue service.

[redacted]

Are there any unique costs or proprietary technology considerations associated with your technology (positive or negative)? Please explain:

There are no unique costs or proprietary technology considerations.

Please tell us if your system would reduce the costs associated with right-of-way acquisition and/or reduce the impacts to traffic and the community when compared to an elevated 28 foot wide guideway built on single piers at approximately 150 foot spacing. Please explain:

Please refer to the drawing developed by HSST based on the requirements for guideway, emergency walkway and maintenance walkway given in this RFI. The HSST width may reduce the impacts to traffic and the community compared to an elevated 28 foot wide guideway.

Please note that pier spacing can be increase to 150 ft. by changing girder size/material and construction method.

- ## III – TECHNOLOGICAL MATURITY

15. Has your proposed transit system been proven in revenue service for at least five years?

Please provide information and local contacts regarding some of those locations.

HSST technology was developed over the past thirty years, with numerous systems in passenger carrying commercial operation since 1985 in various world expositions, including the 1985 Tsukuba Expo, 1986 Vancouver Transport Expo, 1988 Saitama Expo and the 1989 Yokohama Expo, with millions of passengers safely transported.

The most recent installation of HSST technology commenced revenue service in March 2005 with the opening of the Tobu Kyuryo Line (TKL) in Nagoya, Japan. The line is 8.9 km (5.53 mi) long with 9 stations.

The opening of the TKL coincided with the opening of the 2005 World Expo held in the suburbs of Nagoya City. As the Expo site was adjacent to the TKL, the line has played a very important role in transporting passengers between the World Expo site and the two main railroad lines which most people used for getting to the area. As a result of this, during the Expo period, the TKL carried regularly more than 3 times its design daily capacity of 30,000. Within a 6 month period, more than 20 million passengers have been transported by the system and in a record high day 155,000 passengers were carried. This kind of real life stress-test for a newly opened transit system is unprecedented. The fact that even under such extreme conditions the operation of the line has proven to be safe and reliable is solid proof of the maturity and robustness of the HSST technology.

16. Please provide the status of any regulatory approvals required or pending.

The HSST system is fully approved by the Japanese Ministry of Land, Infrastructure and Transport for revenue operation in manual driving as well as fully driverless automatic operation. No other regulatory approval of any sort is pending or lacking.

In addition, an environmental assessment had been duly carried out by Aichi prefecture and Nagoya City according to government regulations.

17. Please describe to what extent your technology uses proven and recognized off-the-shelf components and sub-components, which have been used in transit application with similar levels of performance and reliability.

Two distinct features of the HSST technology are the use of the electro-magnetic levitation system and a linear induction motor propulsion system. The magnetic-levitation system facilitates a largely contact-less operation as opposed to conventional "wheeled" technologies which result in substantially less maintenance for the HSST system.

The levitation system is a unique technology developed for the HSST application therefore it is not an off-the-shelf product. However, its maturity has been proven through decades of full scale testing and passenger carrying operations in many world expos, as well as the intensive operation of the Tobu Kyuryo Line mentioned above.

The levitation modules are now a proven standard design although not produced by other manufacturers. Each vehicle has 10 modules and these modules are easily stocked and interchanged in the maintenance depot. These modules can be manufactured by competent manufactures with experience in aluminum structural frame fabrication.

Linear motor technology for propulsion has been employed for mass transit application for more than 30 years. Its applications include Toronto's Scarborough Rapid Transit, Vancouver's Skytrain, Kuala Lumpur's Jeya Kelana Line, various subway lines in Tokyo, Osaka and Fukuoka of Japan, as well as the Line 4 of Guangzhou Metro of China. The inverter/converter for the power electronics are of a design common to all modern propulsion technology. The linear induction motors, due to the unique arrangement of the HSST modules as opposed to conventional bogies or trucks, have to be specifically designed but the working and construction principles are the same.

All other ancillary equipment/subsystems such as train management system, auxiliary power supply, air conditioning, air compressors, doors, lighting, etc. are off-the-shelf products with minor adaptation to suit individual client and local environmental requirements.

The HSST's technology can interface with any mature signaling and communication systems commonly available in the mass transit market.

18. Please describe the status of the engineering and detailed design of your transit system and identify any technology risks.

The design and engineering of the HSST system is proven by its successful operation at the Tobu Kyuryo Line mentioned above. This system has been designed according to severe building codes to withstand earthquakes and typhoons, which regularly occur in the area of the Tobu Kyuryo Line. As the environment of Honolulu and the system's intended operation is no more severe than the Tobu Kyuryo installation, we do not believe there will be any technology risks in implementing HSST for Honolulu.

19. How do you typically guarantee the long term availability of replacement vehicles, systems equipment, and spare parts, as well as software support?

MHI has been providing automated transit systems for over 30 years, and the transportation business is key to the company's future growth. The company is dedicated to continuing long term relationships with our customers, and will provide support for our systems, even if such support is needed decades after installation. Depending on the client's requirements, we can enter into contractual agreement with the client to guarantee the long term supply of systems equipment and spare parts for maintenance purposes. Long term software support can also be provided in a similar manner.

As for replacement vehicles, normally it will not be required at least 20 to 25 years from the commencement of operation. Due to the continuing developments and refinements in technology, generally it is advisable for the Owner to negotiate the fleet replacement after the useable life of the trains. This way the most appropriate and cost effective solution can be offered to the Owner at that time based on the state of technology and the needs of the system.

Alternatively, if it is envisaged that additional vehicles may will be required due to system expansion or increased ridership in a shorter horizon, such as three years from commencement of operation, often "options" for procuring additional vehicles are included in the contract, either at a fixed price or at a variable price with adjustment mechanisms taking into consideration of cost parameters such as consumer price index, industry cost index, currency exchange rates, etc.

In any case, MHI will be available to supply replacement vehicles, as it has always done for its other transit projects.

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VEHICLE CHARACTERISTICS QUESTIONNAIRE

General:

- Electric propulsion: YES ✓ NO _____
- High floor: YES ✓ NO _____
- Fully automatic train operation (manual back-up) YES ✓ NO _____
- Bi-directional vehicles: YES ✓ NO _____
- Third rail or equivalent current collection: YES ✓ NO _____
- Dynamic braking: YES ✓ NO _____
- Regenerative braking: YES ✓ NO _____
- ADA compliant: YES ✓ NO _____
- Level boarding: YES ✓ NO _____
- Crash worthiness compliant: YES ✓ NO _____
- Crash worthiness details provided: YES ✓ NO _____
- Fire performance to NFPA 130: YES ✓ NO _____
- Emergency evacuation provisions: YES ✓ NO _____
- Video monitoring and recording: YES ✓ NO _____
- Automatic vehicle location / VMS system: YES ✓ NO _____
- Vehicle life: 20 years minimum
- Details of noise mitigation measures provided: YES ✓ NO _____
- Vehicle maintenance an diagnostic system: YES ✓ NO _____

[redacted]

- Expected vehicle life: 25 years minimum
- Automatic passenger counting system: YES ✓ NO _____
- Vehicle general arrangement drawings provided: YES ✓ NO _____
- Vehicle cross section provided: YES ✓ NO _____

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- Vehicle to guideway interface details provided: YES ✓ NO _____
- Vehicle static clearance envelope provided: YES ✓ NO _____
- Vehicle dynamic clearance envelope provided: YES ✓ NO _____
- Vehicle length (over ends of vehicle): 44.3 ft. for mid car
  45.9 ft. for end car
- Vehicle length (over extended couplers): 46.9 ft. for end-car
- Vehicle width (maximum carbody): 8.5 ft.
- Vehicle width (over door threshold): 8.5 ft.
- Vehicle height (maximum): 11.3 ft. above the rail datum level
- Maximum weight per vehicle (empty): 38,581 lbs.
- Ergonomic design as specified: YES ✓ NO _____

2. Performance:
   - Maximum operating speed: 62.1 mph
   - Maximum acceleration rate: 2.5 mphps
   - Service braking rate: 2.5 mphps
   - Emergency braking rate: 2.8 mphps
   - Minimum horizontal radius curve: 246 ft.
   - Minimum vertical radius curve: 4921 ft., crest 4921 ft., sag
   - Maximum grade: 10.0 % for 300 ft.
   - Maximum sustained grade 7 %.

3. Passenger Accommodations:

[redacted]

[redacted]

- Air conditioned: YES ✓ NO _____
- PA system with auto-announcer YES ✓ NO _____
- Passenger to OCC communications: YES ✓ NO _____
- Destination and passenger information displays: YES ✓ NO _____

4. Train Sets:
   - Capable of coupling to make multicar trains: YES ✓ NO _____
   - Capable of failed train retrieval YES ✓ NO _____
   - Capable of bi-directional operation from each car: YES ✓ NO _____

   Note: Bi-directional operation is possible from the driver's cab at both ends of the train

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1. Superelevation Limits

What are the superelevation requirements of your system?

The limit of superelevation is 14 %.

Please explain:

The maximum superelevation is set to 14% considering the levitation magnets lifting force performance. Levitation magnets are designed in order for vehicle to levitate and to land smoothly even at the location of maximum superelevation.

[redacted]

3. Hours of Operation:

Does your system meet the following?

- 4:00 a.m. to 12:00 a.m. service day;
- 6:00 a.m. to 9:00 a.m. morning peak;
- 3:00 p.m. to 6:00 p.m. evening peak.

YES ✓ NO _____

4. Station Dimensions:

- Platform length: 300 ft. maximum; with all doors on platform?

YES ✓ NO _____

If not, please explain:

_____

_____

5. Emergency Evacuation Walkways:

Does your system meet all of the following criteria?

- Must be along entire guideway;
- Must be accessible from vehicle;
- Minimum evacuation walkway width: 2' – 6";
- Minimum evacuation walkway height: 6' – 8"
- Minimum maintenance walkway width: 2' – 0";
- Minimum maintenance walkway height: 6' – 8";
- Walkway width is clear of the vehicle dynamic envelope;
- Walkway around switches meet state and local requirements.

YES ✓ NO _____

If not, please explain:

_____

_____

6. Traction Power:

- Power: Please provide Voltage and Distribution Configuration; Traction Power DC1,500V Third Power rail.

Power distribution system has to be designed based on the local conditions and detailed route alignment. Just for your reference, followings are information of the Tobu Kyuryo Line.

- Substation spacing — One substation for 8.9km (5.6mile) dual track (Tobu Kyuryo Line)

- Substation size: — 4 MW ;

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7. Train Control / Signal System:

Can your system be supplied with a bi-directional fully automatic train operation with manual back-up?

YES ✓ NO _____

If not, please explain:

_____

_____

8. Communications:

- Radio system: YES ✓ NO _____
- Passenger communication system to OCC / Operators: YES ✓ NO _____
- On-board Closed Circuit Television: YES ✓ NO _____
- Fire & emergency management system: YES ✓ NO _____
- On-board ADA message system: YES ✓ NO _____

9. Noise and Vibration:

- Can your system meet or exceed the levels and criteria as established by the FTA *Transit Noise and Vibration Impact Assessment Guidance Manual* and the goal of 75 dBA at stations?

YES ✓ NO _____

Please explain how this is achieved:
Measurement data on the exact same conditions with the FTA criteria is not available. The table shown as Attachment-5 is the HSST External measurement used for the EIS reports, showing 62 dBA at 7m from the rail center with the condition of accelerating from zero speed. It would therefore be expected that the noise levels for the HSST noise would be significantly lower than the FTA requirement of 75 dBA at stations.

If not, please explain:

_____

_____

- What noise level is achieved from your system operating on elevated guideway at 55 mph,

measured 50 feet from the guideway centerline?

_____ dBA

Measurement data on the exact same conditions described above is not available. Tha table of Attachment-5 is the HSST External measurement used for the EIS reports, showing 69 dBA at 7m from the rail center with the condition of decelerating from 49 mph (79 km/h). Note that for cruising speeds, the noise levels are between 59 dBA and 61 dBA for the proposed vehicle, significantly lower than for any other available technologies.

Cite a location where such a level can be measured:

See the Attachment-5.

10. Other Characteristics:

Does your system provide the following?

- Fully accessible and meets all ADA requirements, including the regulatory requirements of 49 CFR Parts 38, Transportation for Individuals with Disabilities;
- Meets all Buy America requirements; and
- Cost-effective to operate and maintain.

YES ✓ NO _____

If not, please explain:

Please explain how cost-effectiveness is achieved:

_____

_____