



Appendix G

Version: 10/1/2021

New Jersey Transit Hudson-Bergen Light Rail

Description and Contacts

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Hudson–Bergen Light Rail (HBLR)

Overview

The **Hudson–Bergen Light Rail (HBLR)** is a light rail system in Hudson County, New Jersey, United States. Owned by New Jersey Transit (NJT) and operated by the 21st Century Rail Corporation, it connects the communities of Bayonne, Jersey City, Hoboken, Weehawken, Union City (at the city line with West New York), and North Bergen. The system began operating its first segment in April 2000, expanded in phases during the next decade, and was completed with the opening of its southern terminus on January 31, 2011. The line generally runs parallel to the Hudson River and Upper New York Bay, while its northern end and its western branch travel through the lower Hudson Palisades. HBLR has twenty-four stations along a total track length of just over 34 miles (55 km) and serves over 54,000 weekday passengers. There are plans for expansion through extensions and additional stations.

Physical Plant

The HBLR rail system's major maintenance, operational control, train storage, and vehicle wash track are housed at the Caven Point Avenue Maintenance Facility. In addition to shop and yard facilities, the HBLR administrative offices are located here.

All trains, stations and communications (normal and emergency) are monitored through Controllers at The 20 Office.

Vehicles

The Hudson–Bergen Light Rail system has 52 electrically powered air-conditioned vehicles built by Kinkisharyo International and numbered in the 2000 series. The cars were assembled in Harrison, New Jersey. Each vehicle is 90 feet (27 m) long and has four sets of double-opening doors on each side, with seats for 68 passengers and standing room for another 122 passengers (crush load is 240 passengers). The Newark Light Rail system uses the same type of vehicle, with slight modifications to the trucks and wheels due to the different rails used. The body of the LRV has three sections and three trucks. The center truck is directly connected to the center body section without independent steering rotation. This truck features low clearance because it does not employ through axles between the pairs of wheels, and therefore accommodated the required low floor above it. The center truck is not equipped with propulsion motors.

On July 3, 2013, NJ Transit released lengthened light rail car 2054 as a prototype. The expanded car consists of two new sections, increasing length by 37 feet (11 m) to a total of 127 feet (39 m). Seating capacity is increased from 68 passengers to 102 passengers, with standing capacity increased accordingly as well. Overall capacity increases from approximately 200 per vehicle to 300 per vehicle. The prototype was placed on rotations through the three lines of the system over the next 6 months, after which, NJ Transit started to expand 26 cars in total, or half of the total fleet. The contract to expand the remaining balance of 25 cars was approved on July 9, 2014. The expanded cars are being renumbered to the 5000 series.



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The purpose of the electrification system is to receive public utility power to a series of substations and distribute electric traction power for HBLR. It provides all related functions including conversion and switching of traction power, negative return, and auxiliary power. Critical physical boundaries for the electrification system include substation connections to incoming utility, Public Service Electric and Gas (PSE&G) power. Connections at the rail-to-impedance bond leads and traction power bonding, and connections to the auxiliary power equipment located in the train control, station and shop systems. Critical equipment also includes line feed switches and jumpers. The most visible and critical interface for electrification is between the Overhead Contact System (OCS) and the LRV pantograph.

The major subsystems within electrification include:

- Substation and power distribution, which include all traction power feeder cables to the feeders on the OCS as well as return cable;
- Overhead Contact System (OCS), which include catenary poles, overhead wire, sectionalizing bypass switches, pole-mounted disconnect switches, pole-mounted surge arresters, and cast-in-place foundations; and
- Stray current mitigation subsystem, which includes bonding and isolation.

Traction Power Substations (TPSS) are spaced along the right-of-way, approximately one mile apart. The substations have traction power rectification equipment and switch gear to supply 750 Volts Direct Current (VDC) power to the OCS. Normal operations can be maintained with one TPSS being inoperative/out of service.



The power distribution system conducts current from the traction power substation to the vehicle pantograph. The track system forms the return side of this circuit back to the substation.

The OCS provides consistent reliable service for a range of climatic conditions while presenting a low visual impact to the surrounding community.

All metallic system elements that support the OCS are grounded.

Emergency Trip Stations (ETS), for removal of power are located at each traction power substation and at the rail entrances to the Shop building. At the substations, the ETS are mounted on the building wall beside the entrance door. When the mushroom button is pushed, the track current to the catenary is de-energized and transfer tripping takes down adjacent substations. The ETS in the shop building act only on the single DC breaker supplying the Shop catenary. ETS are not located at the passenger shelter stops or along the Right-of-Way (ROW). ETS are intended for rapid de-energization of the system by maintenance or possibly Emergency Service personnel.

Track

The primary purpose of the fixed guideway is to provide support and guidance to trains. The HBLR system utilizes three types of track which are:

- *Ballasted Track* – consisting of 115 lb. AREA rail installed on monoblock concrete ties fastened with a spring-loaded Pandrol clip. This type of track is utilized on the private right-of-way portions of the mainline. A modified form of ballasted track, utilizing wood ties, is used in selected yard areas and within interlockings.
- *Slab (Direct Fixation)* – consisting of 115 lb. AREA rail fastened directly to cast-in-place track plinths. The rail rests on resilient plates which are in turn bolted to the plinths. Special effort is made to provide electrical isolation of the rail from the concrete. This type of track is used in selected areas of at-grade private ROW and viaduct structures.
- *Embedded Track* – consisting of 115 lb. rail, which is directly supported on concrete and is then encased in a second pour. Special effort is made to achieve isolation of the rail through the use of rubber “boot”. This type of track is primarily utilized in locations where “in-street” running occurs. This portion of the HBLR track system is generally not provided with broken rail protection through the use of track circuits (track circuits are utilized only in a short embedded track section south of Canal Interlock). The embedded track and slab track may appear similar; however, they are entirely dissimilar in their method of construction and in their method of accommodating train loads

Related subsystem elements of the track include special appurtenances within interlockings such as turnouts and slip switches. Other special elements include guarded curve segments and station slab track segments. Crossover tracks and pocket tracks are located at suitable locations to permit trains to turn back at both ends of the system and at selected mid-line locations. Terminal and pocket tracks are used for holding “hot spare” vehicles during peak hours, and will provide capability for temporary storage of malfunctioning trains and permit reverse running in contingency situations.



Operation Control Center (OCC)

The OCC is located on the upper mezzanine of the Communipaw Yard & Shop Building. It is the centralized control point for the entire HBLR system and is staffed 24 hours a day, 7 days per week by qualified Controllers. It is operated under the direct authority of the Lead Controller who reports to the Transportation Superintendent, who in turn reports to the Deputy Director, Rail Operations.

The OCC has authority over all transportation and maintenance activities that may occur on or near the alignment. Four separate, but redundant, work stations are in the OCC. Each workstation includes two-way radio systems, telephones, public address system, and other advanced control systems to provide Controllers with the ability to manage all operations by:

- Monitoring the direction and location of all trains
- Monitoring and controlling all signals and switches
- Monitoring and controlling all traffic signals in street running sections
- Monitoring and controlling the traction power system
- Monitoring and responding to all fire and intrusion alarms
- Monitoring and responding to all elevator alarms as well as remote control operation of elevators
- Monitoring and responding to the Call-for-Aid telephone and CCTV systems
- Implementing Emergency Management Procedures (EMPs) and Station protocols when required.

The OCC Controllers have primary responsibility for failure response, notification to emergency response agencies, TFCRS management, NJ Transit, and other authorities as required by state or federal regulations.

Train Control System

The Train Control System (TCS) provides the primary functions of train routing and train separation at all locations other than in the Yard and in-street running. This system also provides the functions of on-board speed enforcement. Speed enforcement is applied for reasons of civil restrictions, train touring and train separation and for protection against broken rails. The TCS is not deployed on in-street running territory. The LRV Operator must assure operation at the proper speed in these locations.

The TCS is designed to Fail Safe or Vital principles. These principles recognize a single fault, or a series of faults, and cause the system to adopt a safe state. The system, in response to a failure, prevents the movement of a stationary train or imposes a braking action on a moving train which brings it to a stop independent of any Operator action.

The TCS employed on the HBLR is an audio frequency track circuit controlled system which displays the necessary commands in the vehicle cab. However, the train is manually controlled by an Operator in response to these commands, the Operator will receive an audible warning to take action. Failure to respond to cab displays will result in the system bringing the train to a safe



condition, automatically. The system provides full train protection and speed control in either direction on either track.

The HBLR operation is bi-directional with reverse signaling. The available speeds for operation are in increments between 5 and 55-mph. Two additional speed control limits are available for specific circumstances, namely a 15-mph Yard speed and a 35-mph Street Running mode. Neither of these special modes are automatically enforced and the operator is entirely responsible for train separation and observance of speed limits.

In addition to train speed and separation protection, the Train Control system ensures that conflicting routes cannot be set, either manually or automatically. Once a train is routed, all other conflicting moves are prevented by the logic incorporated into the wayside Central Instrument Houses (CIH). These features are provided at all interlockings where conflicting train movements could be initiated. The interlockings are provided with wayside signals which indicate where a train must stand, indicate an event of restrictive indication, and indicate the route to be followed in the event of a permissive display. Because non-compliance with a stop command at these locations would be extremely dangerous, the wayside signals are enforced by a 5-mph approach speed when a restrictive aspect is displayed. Over-running the signal location will cause the train to come to an immediate stop. The placement of the signal ensures that a train ignoring the restrictive command will stop short of the fouling point for other train movements.

The Communication System provides a link between signal locations and the OCC for supervision and control. The TCS also includes Train-to-Wayside (TWC) communications, which provides for routing requests at interlockings and supplemental information regarding train location. TWC devices are also located in street-running territory as a means of providing the OCC with information regarding train location. Train location provided by TWC is considered as non-vital and is not utilized by the TCS for any safety-related functions.

Intrusion detection is installed on fencing where the adjacent freight line runs parallel to the LRT alignment and in the Palisades area for falling rock protection. This fence is equipped with detection devices that are activated if the fence is displaced more than 30-degrees to the vertical. Should this event occur the tilt switch sends a warning to the TCS. This system shuts down the operations in the affected area.

Traffic Operating System

This system includes all traffic control software, computer hardware, and devices which control the movement of LRVs and road traffic across roadway and track intersections. High speed grade crossings with railroad-styled gated crossings are not included; such equipment exists on the West Side Branch at Pacific Avenue and Halladay Street and is part of the TCS described above.

TOS equipment in the field, including bar signals, is used to convey a non-vital aspect to the train regarding the status of the intersection or crossings. At certain locations (e.g., Wilson Street) the railway or highway configuration requires special rules on interpreting bar signals and wayside railroad signals that are in close relationship to each other. Such coordinated functionality is considered during the inspection and testing and preventive maintenance. At the OCC, the TOS includes a computer which indicated the status of crossings and is capable of exerting control of



the intersection. Coordination of supervisory control of train movements and traffic is through the OCC Controllers.

Integrated Control System

The Integrated Control System (ICS) is a state-of-the-art centralized Supervisory Control and Data Acquisition (SCADA) system located in the OCC. The primary purpose of the ICS is the supervision and control of the train movements, train control, traction power, and overhead catenary systems. It also provides the status of the Fire and Intrusion alarm systems.

Communications Infrastructure

The Communications System provides the infrastructure link between traction power, train control, traffic systems, and telephone systems in the field, and the indication, control, and communications functions available in the OCC. Much of the indication, control and communications functions available in the OCC are provided by the Integrated Control System (ICS). The Remote Terminal Unit (RTU) provided the ICS with communications connection to the Station Platforms for the purposes of intrusion detection at Ticket Vending Machines, Communications Lockers, Standalone Validators, Elevator Tower Rooms and fire detection equipment in Elevator Tower Rooms. A Passenger Information System (PIS) is used to communicate voice and data messages from the OCC to the Control Computer and vehicle radios and modems.

The Telephone Subsystem used the Communications Backbone to connect field Emergency Trip Station Telephones, Emergency Telephones, and Domestic Telephones to the Private Branch Exchange (PBX) located at the OCC.

Computerized Maintenance Management System (CMMS)

This system includes the Management Information Subsystem (MIS), the Maintenance Management Subsystem, payroll subsystems, and other subsystems which support HBLR administration. Included in this system are special dedicated hardware and peripherals, as well as software. The MIS in use is a specialized package referred to as a CMMS. Additionally, the CMMS is being updated to capture inspection information from NJDOT inspections, so that deficiencies are tracked until resolved. Reports are provided by the CMMS on maintenance actions taken, time between noted repairs and restoration, system element downtime, and materials, supplies, and other factors keeping the system element from service. In the event that a system element is permitted to operate with degraded performance, the report will note this as an outstanding maintenance action.

Right-of-Way

This system is composed of all at-grade, sub-grade, and drainage structures. It also includes duct bank and buried conduit, but does not include cable. ROW supports the track (the physical interface to ballasted track is at top of the sub-grade), and shelter stops/stations (interface is also at top of sub-grade). A secondary function of ROW is to provide drainage; this is not independent of the support function as adequate drainage is essential to the strength of the geo-structure. In



recognition of this, particular attention is devoted to cleaning and maintenance of drainage facilities. Special attention is directed to inspection of fences and of drainage adjacent to or beneath the track structure.

Deep foundations other than those associated with Elevator Guideway (Viaduct) are part of the ROW, as are culverts, drainage pipes and short span bridges. The viaduct and the tunnel are each considered as separate systems; however, and are not considered as part of the ROW.

Tunnel

A double track tunnel of approximately one mile in length exists. The Weehawken Tunnel runs beneath the municipalities of Weehawken Township, Union City, and North Bergen Township. It was designed to accommodate two transit tracks, and is equipped with electrical and mechanical systems to make it a vital part of the Hudson-Bergen Light Rail Transit System (HBLR). A new underground station, referred to as Bergenline Avenue Station, is constructed under Bergenline Avenue in Union City to serve the local populace of Union City and contiguous portions of West New York, North Bergen and Weehawken. The station platform is located approximately 160 feet below the surface.

All of the tunnel systems meet the requirements of the National Fire Protection Association (NFPA) 130 – Standard for Fixed Guideway Transit and Passenger Rail Systems.

Elevated Guideway (Viaduct)

The elevated guideway consists of special-built structures whose purpose is to elevate the tracks for distance longer than the length of a bridge. There are four elevated guideways on the HBLR: The viaduct which grade separates the rail from automotive traffic in portions of downtown Jersey City, Weehawken and the bridge, which spans Long Slip, providing entry into Hoboken Terminal.

Direct fixation track is used on the downtown Jersey City and Weehawken viaducts. On the Long Slip Bridge, the physical division between track and guideway is between the track plate and the bridge timber.

Clearance for individuals is provided on the guideway structures for routine and emergency access and for limited clearance from train movement. Interlockings exist on, or are immediately adjacent to, guideway sections. Shelter stops or stations are not located on the guideway.

Yard & Shop

The HBLR LRV Maintenance and Administrative Building, is the 21-acre Communipaw Yard & Shop located in Jersey City, just south of Communipaw Avenue. These areas contain the various service, maintenance, repair support and administrative areas. The Communipaw Yard & Shop Site includes the LRV Service and Maintenance Shop in a one-story building with two mezzanines. The Main Shop includes the following areas: Paint Preparation and Car Body Repair, Paint Booth, Car Wash, Car Inspection, Car Maintenance/Repair, and Parts/Supplies. The Lower Mezzanine includes Administrative Areas and a Bulk Storage Area. The Upper Mezzanine includes Administrative Areas, the OCC, and the UPS area.



The LRV Storage Building provides weather protection for the light rail vehicles. This building has eight tracks and is open at each end to allow free movement of the vehicles into and out of the building. A total of 48 vehicles can be stored in this building. The Substation is sized to supply power for the yard catenary, yard lighting, and building requirements.

The Yard consists of all of the ROW and equipment at Communipaw Yard outside of the limits of Yard South (YS), Yard North (YN), and Yard West (YW) interlockings, with the exception of equipment which are within the tracks and traction power systems, and the hydraulic switch machines. All Yard operations are under the authority of the OCC.

Mechanical rooms, storage spaces, and industrial working environments are only accessible to qualified workers as delineated by job description.

HBLR Contacts

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HBLR Minimum Standards for Safety

MINIMUM STANDARD	DOCUMENT DESCRIPTION	DOCUMENT DATE	DOCUMENT VERSION NO	SSI
SSOPS	NJDOT Fixed Guideway SSO Program Standard	10/2021	Version 2.0	FALSE
ASP	Agency Safety Plan (ASP) – The ASP contains the requirements for the safety program and related activities at the RTA/RFGPTS.	8/3/2020	Revision 0	FALSE
CMP	Configuration Management Plan (CMP) – the Configuration Management Committee and processes are a required element/function within the RTA/RFGPTS safety program, along with safety and security certification and system modifications.	5/20/2013	TFC-OP-3, Rev 02	TRUE
EOP	Emergency Operations Plan (EOP) – this document provides the coordination and preparedness activities inside and outside of the RTA/RFGPTS.	August 2019	TFC-SS-20 was combined with TFC-TPC-30, Rev.4	TRUE
I&M	Inspection and Maintenance (I&M) Manuals, SOPs, and Standards – these documents provide the requirements for inspection and maintenance of the rail system, including facilities, infrastructure, and related vehicles. These documents should have the custom	7/26/2019 10/30/2008 12/15/2016	Fixed Plant: TFC-MW-01, Rev 11 LRV: TFCRC-LRVM-0001 Rev. H MW-21, Rev. O Instructions for Testing Signal Apparatus and Signal Systems	FALSE
Investigation Procedures	Investigation Procedures at the RTA/RFGPTS – this procedure includes a description of the types of events that need notification and investigation, who will perform those requirements, causal factor analysis, hazard analysis, and development of recommendation.	November 2019	TFC-AIP-1, Rev. 2	FALSE
Operating Rules	Rules and Instructions for Conducting Transportation – these are the rules that operators and others working around the rail system must follow.	12/2/2019	TFC-RI-1, TFC-SS-10, TFC-SI, TFC-LRVOP-1, Rev. 7	FALSE



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MINIMUM STANDARD	DOCUMENT DESCRIPTION	DOCUMENT DATE	DOCUMENT VERSION NO	SSI
RWP	Right-of-Way or Roadway Worker Protection (RWP) Plan – this document is related to the TFC-RI-1 from the perspective of the protections and procedures for workers on the rail right of way.			FALSE
SOPs - Command and Control	Command and Control/Train Control Standard Operating Procedures (SOPs) – these SOPs are used by the command and control staff/supervision to manage operations on the rail system for both usual and unusual operations, as well as managing maintenance and workers on the right of way. These SOPs should include troubleshooting information for frequent problems and managing emergencies on the rail system. These SOPs include the function of load control/management.	8/2019	TFC-TP-30, Rev 04	TRUE
SOPs - Field Supervision	Field Supervision SOPs – these SOPs are for supervision out on the rail system for support of service delivery, responsiveness to passengers, and safety. The field supervisors will often be the first supervision to arrive at the scene of a safety event on the rail system and provide at least initial investigation of events on the rail system.		Combined with TFC-SS-20	FALSE
SOPs - Safety	Procedure requiring review of SOPs related to Safety – this procedure requires that the minimum safety standards at the RTA/RFGPTS are also required to be reviewed, agreed to, and approved by the Safety Department.	8/2019	TFC-TP-30, Rev 04	FALSE
SCP	Safety Certification Plan (SCP) – this plan provides the required activities from the RTA/RFGPTS safety program for assuring that safety certification is completed for certain capital projects for new equipment/infrastructure or refurbishment of existing equipment/infrastructure. The main topics for safety certification are related design criteria, participation of the Safety Department, and a process of the RTA/RFGPTS assuring that all safety design criteria exist, were comprehensive, and were properly addressed including integrated testing of the final products.	5/2013	TFC-SC-1 Safety Certification Plan, Rev. 3	FALSE



MINIMUM STANDARD	DOCUMENT DESCRIPTION	DOCUMENT DATE	DOCUMENT VERSION NO	SSI
SSP/SEPP	System Security Plan (SSP)/Security and Emergency Preparedness Plan (SEPP) – this security program document describes the requirements for system security and emergency preparedness at the RTA/RFGPTS. Note that the new SSO Rule no longer defines the content of the SSP/SEPP and its processes and procedures. However, the NJDOT SSO program will now consider this security program document as a minimum safety standard in terms of its overlap with the safety program at the RTA/RFGPTS (risk assessment and management, and emergency preparedness). The NJDOT SSO program no longer has requirements for the content of the SSP/SEPP, but does require that the RTA/RFGPTS develop an appropriate security program document and the NJDOT SSO program will provide oversight of that document and the processes that it represents, but only from the safety program (all-hazards) perspective.	3/2019	TFC-SEPP-01, Rev. 04	TRUE
TAM	Transit Asset Management (TAM) Plan – this is a new plan now required for RTAs/RFGPTS and it is related to the CMP, but with a larger context.			FALSE

Updates:

- March 5, 2018 – initial release
- July 6, 2020 – minor word choice changes, update contact information, update minimum standards for safety
- September 22, 2020 – minor updates from the RFGPTS and NJDOT
- May 26, 2021 – minimum standard updates
- October 1, 2021 – NJDOT SSOPS date updated to 10/2021.