No Low-Floor Railcars for the Interborough Express

By John B. Pegram[1]

Although there could be some advantages for using low-floor Light Rail Vehicles (LRVs) on street-level transit lines, there are no such advantages in the current plans for the Interborough Express (IBX) line in Brooklyn and Queens, NY. Most stations will below street level. Only one station is currently planned to be at street level, but it would be off-street.[2] Therefore, the potential advantages of a low-floor LRV are not applicable. However, the disadvantages of the limited, congested equipment space under the floors of such LRVs and the more complex trucks (wheel assemblies) necessary for low floors would remain. The results would be added railcar purchase and maintenance costs.

If there are no significant advantages to using low-floor railcars on the IBX line, and significant disadvantages, why would one choose the Light Rail mode in the first place? Only if street-running were necessary. I have suggested that street-running is not necessary or desirable in other articles on this site, here and here.

Let's turn now to the details concerning the choice between high and low-floor railcars.

Why Are Low Floor LRVs in the Current IBX Plans?

The initial Light Rail mode plan for the IBX line contemplated that much of the line and most of the stations would be at street level.[3] A low-floor railcar is attractive in such cases, because it would be easier to enter from a low platform and a high platform adjacent the street, with stairs, ramps and railings, would be less desirable. The January 2022 IBX Interim Report suggests that the Light Rail mode on the IBX line would use railcars similar to those used on NJ Transit

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[2] That station is at Metropolitan Avenue and is located in an off-street right-of-way at street level so the LRVs can begin street-running as they leave the station. If street-running is not adopted, there will be no need for a surface station and—indeed—no need to use LRVs.

[3] *Interborough Express: Feasibility Study and Alternatives Analysis—Interim Report* (Interim Report) (Jan. 2022), available at https://new.mta.info/document/72081, p. 12.

Hudson-Bergen Light Rail lines.[4] Those are the so-called 70% low-floor type, with the cab and some seating at either end raised above the power trucks.

By the time of the January 2023 PEL Report, the MTA and its consultants recognized, "Running at street level would create 24 new transit intersections. … [T]he new intersections may cause unnecessary delays and disruptions by bringing transit operations into contact with street-level vehicular and pedestrian traffic."[5] As a result, the MTA decided to avoid street-level tracks and stations.[6] But, the PEL Report Appendix reveals that the plan still was to use the Hudson-Bergen Light Rail type of railcars "with a minimum 70% low-floor passenger area to allow level boarding from station platforms."[7]

Wheel Trucks

Conventional railcars, as used—for example—on the Long Island Railroad and NYC Transit lines,[8] are essentially boxes (called car bodies), each resting on two, wheel assemblies (called trucks in North America or bogies elsewhere). In simplest terms, a center plate on the underside of the car body rests on a center plate on the truck, aligned by a center pin.[9] Gravity holds the car body in place on the truck. See picture below:

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4 Interim Report, p. 9

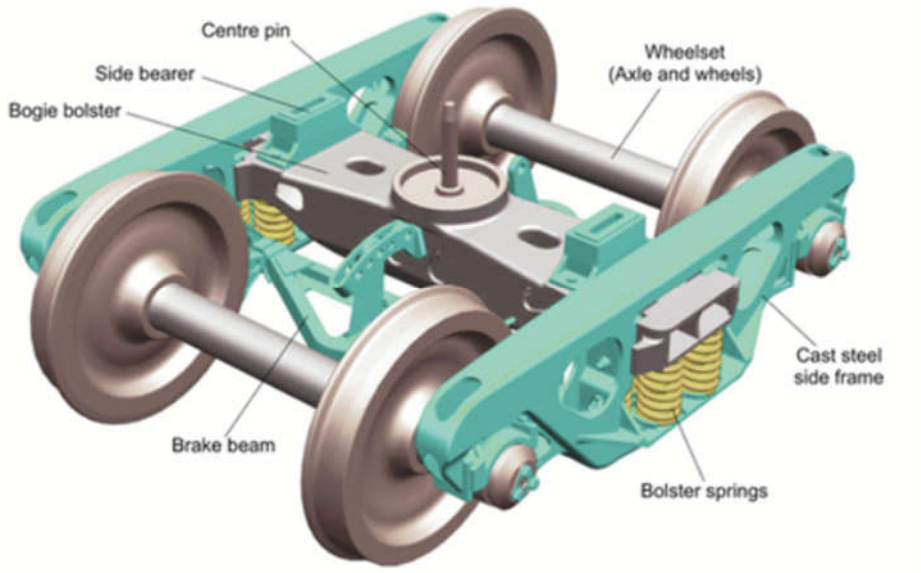
5 *The Interborough Express: Planning & Environmental Linkages Study* (PEL Report) (Jan. 2023), available at https://new.mta.info/document/103686, p.18.

6 *Id.*

7 PEL Report Appendix 1.4, available at https://new.mta.info/document/114891, p. 15/33 [194/1077].

8 In this article, I use the word "conventional" in its general sense and not to designate a particular mode, as "Conventional Rail" has been used in IBX reports.

9 *See generally*, WIKIPEDIA, "Bogie," available at https://en.wikipedia.org/wiki/Bogie; WIKIPEDIA, "List of railroad truck parts," available at https://en.wikipedia.org/wiki/List_of_railroad_truck_parts.



The subjects of truck design and rail-wheel interface are quite complex.[10] For present purposes, I will only say that there are substantial advantages to the classic, symmetric designs, used for conventional railcars. These have a frame and two pairs of wheels, each pair joined by an axle. A principal advantage of this arrangement is self-steering when running in either direction, *i.e.*, an inherent ability of the truck to follow the tracks and not derail.[11]

The design of trucks for low-floor LRVs is more complex and difficult. One recent study, by Megna *et al*, stated, "While low floor solutions improve passenger access to the vehicle, … they strongly impact the architecture of running gear, forcing manufacturers to design unusual and often complex solutions for wheel mounting, motor/transmission and braking component arrangement."[12]

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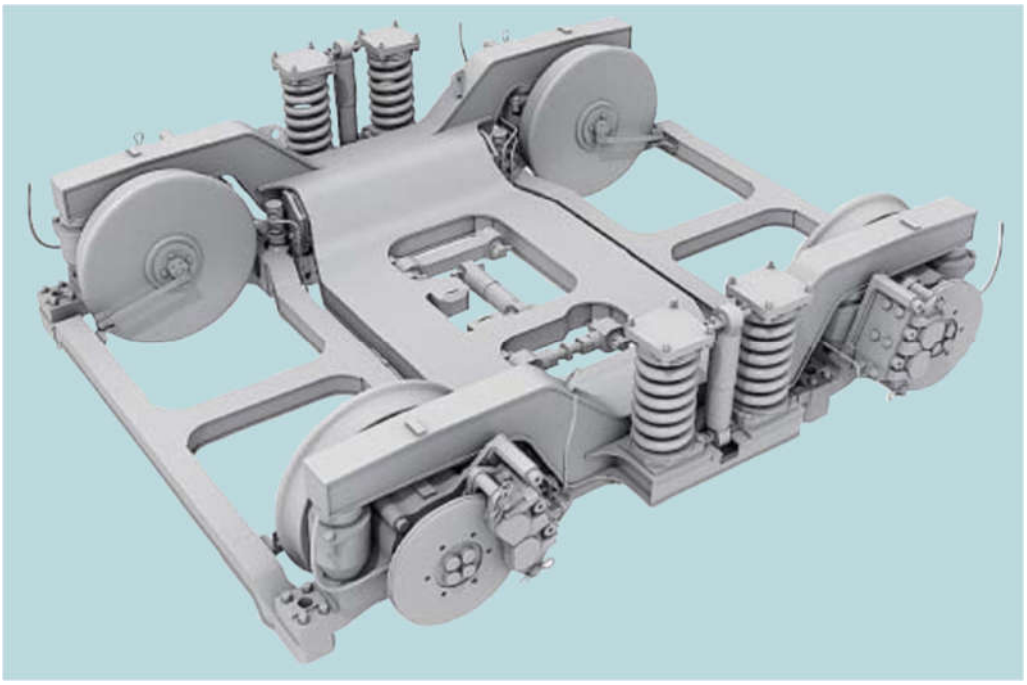
10 *See, e.g.*, Suda *et al*, "Improved curving performance using unconventional wheelset guidance design and wheel-rail interface – present and future solutions," VEHICLE SYSTEM DYNAMICS, 61:7, 1881-191 (2023), available at https://www.tandfonline.com/doi/epdf/10.1080/00423114.2023.2199937?needAccess=true; Megna *et al*, "Technical Comparison of Commercially Available Trams and Review of Standardization Frame and Design Principles," URBAN RAIL TRANSIT (2022) 8(1):16–31 (2022), available at https://doi.org/10.1007/s40864-021-00163-6; Hoshi *et al*, "Development of Bogie for User-Friendly, Extra Low Floor, Light Rail Vehicle (LRV) Using Independent Wheel System and Next Generation LRV," MITSUBISHI HEAVY INDUSTRIES, LTD. TECHNICAL REVIEW, Vol. 44, No. 2 (Jul. 2007), available at https://www.mhi.co.jp/technology/review/pdf/e442/e442006.pdf.

11 Suda *et al*, *supra* note 10 at 1881-82.

12 Megna *et al*, *supra* note 10 at 17.

In the case of 70% low-floor LRVs, conventional, powered trucks are placed under the raised sections at either end or, in some cases, two-wheeled asymmetric trucks are used at each end. One or more special trucks are located under the articulated joints between car sections. At those locations, typically, the wheels are in pockets under or behind seats. For 100% low-floor LRVs, all trucks often are of a special, no axle type. An example of this type of truck is shown below:[13]



Some truck designs for very low-floor trams have proved unsuccessful. As Megna *et al* stated, "vehicles with steering axles and independently rotating wheels, which could be the only structural way to eliminate wear and noise problems related to sharp curves, are no longer available on the market, probably because of their lower modularity and high manufacturing and maintenance costs."[14]

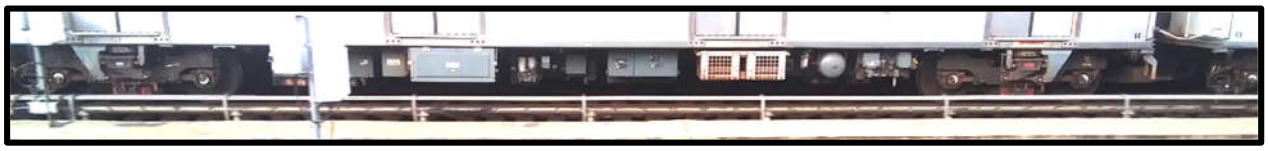
13 Hoshi *et al*, *supra* note 10 at 2

14 Megna *et al*, *supra,* note 10 at 29.

According to the Wikipedia article, *Low-floor trams*, "Some public transport companies have both low floor and high floor trams. They report that low floor trams have 15% higher maintenance costs for the rolling stock, and 20% higher maintenance costs for the infrastructure on average. Among the problems observed is that the missing bogies result in a higher level of wear and tear. Many low floor trams have fixed bogies which increase track wear and tear, while decreasing the speed at which a tram can drive through a curve (usually 4–15 km/h in 20 m [65 ft.] radius curve). "[15]

Space Under Railcars

The high-floor arrangement of a conventional railcar or high-floor LRV has considerable space under the car body for necessary equipment, such as an air compressor and air tank for the air brake system, air-conditioning compressor and condenser, electric air heater, batteries, and other auxiliary and main electrical power equipment. See photo below:[16]



Even with 70% low-floor railcars, the space under the car body is much more limited than with a conventional railcar. Most of the 30% that is not low-floor is occupied by power trucks. The space under 100% low-floor railcars is even more limited. As a result, the trucks and equipment there are less accessible for maintenance, and some equipment must be placed elsewhere, such as between the car ceiling and roof, where panels must be removed for access.

Conclusion

15 WIKIPEDIA, "Low-floor tram," available at https://en.wikipedia.org/wiki/Low-floor_tram.
16 Author's photo.

Low-floor railcars are likely to have significantly higher purchase and maintenance costs than otherwise similar high-floor railcars. Because IBX line stations will not be at street level, there does not appear to be any significant reason to incur the greater costs of low-floor LRVs.