# RAPID TRANSIT RAILWAYS—SOME FEATURES OF CONSTRUCTION AND COST.*

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WITH the growth of population there is a stage in the development of every city where the daily travelling personnel can no longer be handled by the street railways. It is quite impossible to state any figure for population at which an urban rapid transit system must necessarily relieve the surface railways; for instance, the Boston Rapid Transit was operating its elevated lines and part of the subway when the inhabitants numbered little more than half a million, whilst in London, England, the population reached six millions before a unified electric rapid transit system was inaugurated. The width and disposition of the downtown streets, the layout and general efficiency of the street railway system, the size and speed of the cars, are all factors which, if favorable, will tend to defer the construction of rapid transit lines. Nevertheless, in matters of this kind it is necessary to plan many years into the future and preparations should be made for rapid transportation methods many years before the need for them is acutely felt. In view of the many millions of dollars now being expended on rapid transit projects it was thought interesting to summarize the principal costs of construction and equipment of rapid transit lines of various types. It is, of course, hardly necessary to mention that these costs are only intended as a rough approximation, such items as subway excavation, underpinning, etc., being different in every locality. The costs are mainly figured upon contracts placed during the last two years, but do not, of course, allow for the abnormal conditions prevailing at the present moment, particularly in reference to steel and labor.

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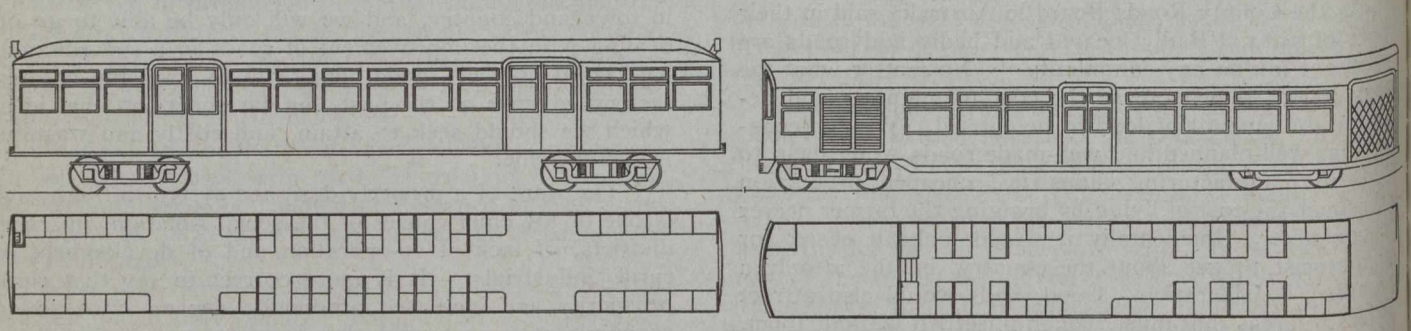
There are three systems of construction for rapid transit railways in cities and it will be interesting to compare these in detail. They are: (1) Elevated structures, (2) subways, and (3) tubes. The elevated railway, although less popular than the other types, provides the greatest return per dollar invested and is therefore worthy very careful consideration in every locality. The earliest elevated roads in Manhattan and Chicago were objectionable from being erected in narrow streets and with an open floor. The open-floor elevated road in which it is possible to see the underside of the cars from the street beneath gives rise to a great deal of noise and discomfort due to hot brake shoe particles, water, etc., dropping into the street. It has since been demonstrated, notably in Philadelphia, that a concrete-floor elevated road with ballasted tracks is perfectly unobjectionable except in narrow and busy streets and the noise produced is less than that of the street cars below. In European cities, too, every opportunity has been taken to render the elevated railway as sightly as possible. The ground beneath is turned into a parkway and supplied with benches whilst the floor of the road, being of concrete and sheet steel, affords protection against rain to those walking beneath.



DETAILS OF MOTOR CARS AND EQUIPMENT FOR ELEVATED, SUBWAY AND TUBE SERVICE

| | Elevated and Subway | Tube Motor | Tube Trailer |
|---|---|---|---|
| Length of Car | 60' 0" | 55' 0" | 55' 0" |
| Width " " | 8' 6" | 8' 2" | 8' 2" |
| Weight Body | 45000 lb | 38000 | 38000 |
| " Trucks | 26000 | 25000 | 12000 |
| " Equipment | 14000 | 18000 | - |
| " Total | 85000 | 75000 | 44000 |
| Capacity, seated | 64 | 50 | 56 |
| " total | 180 | 120 | 135 |
| Weight loaded | 111000 | 92000 | 63000 |
| Motors per car | 2 x 120 KW | 2 x 200 KW | - |
| Rated KW per ton | 4.3 | 4.3 | - |
| Cars per train | 5 | 2 | 3 |
| Cost per car | 16000 | 14000 | 8500 |
| " " train | 80000 | 53500 | |
| " " passenger | 89.00 | 83.00 | |

The subway next demands consideration and in comparing it with the elevated it should be remembered that each has exactly the same capacity, track for track. We shall find that the subway costs a good deal more, but in respect of handling traffic it is just as good and no better than the elevated road operating the same cars with the same headway and schedules. The extra cost of subway construction is therefore only justified where it has to be used. For example, in Lower Manhattan or Market Street, Philadelphia, the conditions do not permit of elevated structures, and subways in locations such as these are inevitable.

Subways, as at present being constructed in New York, are of steel beam construction with concrete floor and retaining walls. The excavation is through clay and