The Development of the Underground Infrastructure of the System of Mobility in Torino

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ABSTRACT

The City of Torino has been interested, in the last years, by the realization yet in progress, of important rail, subway, underground infrastructure. The purposes of such works are both the improvement of the mobility, and the renew and the territory improvement. In the following the more significant works, already executed or planed, are briefly described.

1. INTRODUCTION

Since the second half of the ’80th, the works for the realization of the Torino junction have started with the renewal of the railway network. In particular we put underground and doubled the railway lines, with the purpose of separating the metropolitan and long distance traffic, in addition at the building of new stations more diffused on the territory. In the same years, the new town-planning scheme (PRGC) has taken the opportunity of recovering the areas become available thanks to the new underground railway lines, and to the releasing of large industrial areas, before developed near the railway tracing. It was the chance to reconnect and to improve large part of town having being separated for 150 years.

![Fig. 1. The road above the Torino railway bypass and the new underground railway section.](image)

On the end of the 90th the works for the realization of the automatic subway first line, known as VAL system, have started, with a track connecting the west and the south of the metropolitan area, through the city centre and connecting the railway bypass at the new Porta Susa station.
Fig. 2. The territory of Torino, with the tangential highway system, the railway bypass, the subway lines 1 and 2.

These integrated and connected underground transport systems, will be completely working by 2011, year of the 150th anniversary of the unity of Italy celebrations. They will be, besides the tramway line n. 4, the main framework of the Torino public transport and they are further on connected to the widespread public transport network.

Since the second half of the 90th have been realized the first underground parking; they are public parking and they also have private garages built below public property; now we can offer about 15,000 public parking places and 4000 private garage.

Fig. 3. San Carlo square – the ground and the underground parking.

The subway was the first time for the Torino people to move underground: it has been a milestone that would be improved with new subway lines and the new metropolitan railway system with his new underground stations.

The organization of the Olympic Winter Games 2006 has been the chance to realize two news vehicular underpasses, Rivoli Square and Corso Spezia. The first improves a road junction with a lot of traffic; we transferred underground 42,000 vehicles/day versus a total of 100,000 v/d, before crossing the ground. The underpass has been the opportunity to reorganize the ground traffic, with a large roundabout and to improve the environment. The all-inclusive cost has been about 13,000,000.00 €, the work lasted 24 months. The second underpass represents the first functional part of a more extensive work and currently connects to the main road network a parking with 4000 places serving an exposition area, a shopping centre and a railway station. The length is about 700m, the cost has been
45.000.000 and it was built in 18 months. One of the problems occurred during the working, beside the available short time, has been not to move far away a local market present in the area of the works.

Fig. 4. Rivoli Square – the underpass and the roundabout on the ground.

Fig. 5. Corso Spezia – the underpass and the covered ramp.

2. THE NEW UNDERGROUND NETWORK

The mobility planning of the town, among the strengthening of the public transport, provides for the realization of some new vehicular underpasses in the future, to resolve some road junctions, because the practicability of the ground has became unsuitable for the too much intense traffic.

Fig. 6. The Torino area and the planned underpasses.
One of the main planned works in the next years is the second part of the Spezia underpass, connecting Corso Spezia e Corso Sebastopoli, crossing the railway area between Lingotto and Porta Nuova stations. The railway area to be cross are about 350 m in width and concern railway, shunting areas and two maintenance train buildings.

The preliminary plan supposes different construction ways with different excavation systems:

- continuous flight auger bored pipes, and top-down excavation;
- monolith;
- fore-poling jet-grouting;
- pipes arch built by micro-tunnelling.

The supposed cost is about 140,000,000.00 €.

Another important work is the new underpass in Corso Mortara: it is in a former industrial area that is renewing by new residential building, shopping areas and gardens. The new tunnel is in substitution of a surface road with the purpose of decreasing the traffic disturbs to houses and gardens. The realization has been partially started, with a cost of 30,000,000 €.

Another tunnel is planned, crossing the road above the railway bypass, with a large roundabout on the ground (under that, there are the road underground level and below the railway level). This tunnel is in substitution of an overpass built in the 70s with a significant environmental impact.
Another important work of environmental improvement is due to the new track of the railway connecting Torino to its airport. The lowering of the city railway system, moved underground, involved the loss of the connection between the existing airport railway and the city railway system itself; to connect again the two railways is necessary to realize a new railway path in the underground under Corso Grosseto. But this new realisation will be in conflict with a road intersection resolved with a two levels overpass made in the 70s, with a significant environmental impact.

Fig. 9. Corso Grosseto two level overpass.

In the occasion we decided to re-organize and renew the road intersection, in particular with the substitution of the overpass with a tunnel and a new roundabout.

Fig. 10. The planned Grosseto intersection: ground and underground.

An other important work in program in the next years it is the realization of two underpasses, in Rebaudengo square and Derna square, in the same north area of Torino, to resolves a road junction with a lot of traffic.

The first underpass, going east – west, would transferred 22,000 vehicles/day versus a total of 65,000 v/d, now transiting on the ground. The second one, going south – north, both vehicular and tram, would transferred 10,000 vehicles/day versus a total of 50,000 v/d, now transiting on the ground. The all-inclusive cost will be about 13,000,000 € for the first one, and 18,000,000 € for the second. The supposed work lasting is respectively 24 and 36 months.
Another important work is the new underpass in Corso Mortara: it is in a former industrial area that is renewing by new residential building, shopping areas and gardens. The new tunnel is in substitution of a surface road with the purpose of decreasing the traffic disturbs to houses and gardens. Further on, we would like to tell about Corso Marche, an important north-south arterial road with three level; two underground, the highway level and below it the railway level, plus another superficial road level.

The railway would be the connection between the high capacity /high speed lines, the Orbassano goods-station and the Torino rail intersection. Though the new HC/HS lines has yet to be decided definitely, the Corso Marche layout is almost defined because of territory situation. The underground highway level would be a useful shortcut of about 5 km in the Torino highway net and would consent to cut the way to the Torino east area of about 6-7 km.