

METHOD OF CONSTRUCTING A ROADWAY

The present invention relates to a method of constructing a roadway. A roadway in this specification means a highway or other paved surface
5 (e.g. a runway).

Conventional methods for constructing a roadway involve the excavation of large volumes of material, so that a complicated system of supporting strata can be laid and compacted beneath the paved surface, to
10 provide a sufficiently stable foundation.

In regions where the ground is soft, even greater volumes of material must be removed, and replaced by foundation material. To ensure that settlement of the eventual paved surface is not excessive, extensive soil
15 investigations are required before work can proceed.

Where it is necessary to raise the level of the roadway, this has previously been achieved by compacting earth fill or by constructing a multi-span bridge structure onto which was laid a road surface. A
20 common problem with earth filled embankments is to find a suitable source of earth. Often the earth must be transported a considerable distance to the required site. The cost of construction is therefore very high. In addition, the earth fill method requires the
25 imported earth to be properly compacted to the required level and this normally takes a considerable time since the compaction procedure requires the compaction of many individual layers of fill. A further complication is the need to provide culverts to maintain the natural
30 water flow underneath the embankment. Despite these many disadvantages the earth fill method of embankment construction is the most common, since the "bridge" type method of embankment construction is even more expensive.

35 According to the present invention there is provided a method of constructing a roadway comprising placing piles in the ground, installing pile cap beams

on the piles, each pile cap beam extending across a plurality of the piles, and supporting preformed slabs on the pile cap beams, such that the slabs are disposed on the surface of the ground, the pile cap beams having
5 openings in which the piles fit freely, concrete being poured into the openings when the pile cap beams are installed over the piles.

The preformed slabs may be made from precast concrete and may be reinforced and may also be
10 prestressed. A large supply of slabs can be assembled on site before work begins, and so considerable time can be saved during construction, since the amount of in situ casting may be substantially reduced or eliminated.

15 In addition, extensive soil investigations are not necessary to ensure that the settlement of the paved surface will be within acceptable limits, since the piles may be arranged to transfer load over a greater depth than known paving methods. The use of a
20 Mackintosh probe to determine the soil conditions has been found sufficient. The length and spacing of the piles can be adjusted to suit the particular strata encountered, to ensure that the load is transferred to stronger deeper lying strata, and to minimise
25 differential settlement.

Preferably each slab is short in length and is supported directly on respective pile cap beams at the ends only of the slab. The pile cap beams may be supported on respective low bearing capacity piles.

30 It is possible to create a roadway with a smooth gradually changing gradient using flat slabs, provided that the slabs are short in length. If necessary, curved slabs could be used to enhance the ride quality.

The amount of excavation required using a piled
35 foundation system is greatly reduced and backfill does not require the same degree of compaction. The cost of construction is therefore further reduced, as is the

likelihood of work being suspended due to adverse weather conditions.

Since the span between supports is kept short, the piles, pile cap beams, and slabs are all easily
5 manageable and transportable and, since these elements are all preformed, construction can be made a continuous process which does not suffer from delays whilst large volumes of newly cast concrete cure on site. The overall speed of construction is therefore
10 greater than by a conventional system.

A particular advantage of using precast concrete slabs is that quality control at the casting and curing stages is extremely good, whilst the unit cost of the precast slabs is kept low. The high quality and
15 dimensional accuracy of the precast slabs makes assembly of the roadway and the laying of asphaltic road surfacing easier, and hence improves the ride quality of the finished roadway.

The preformed slabs may be provided with ducts or
20 may be hollow, so that the requirement for providing additional culverts is effectively eliminated. Indeed, the natural flow of surface water present before construction, is hardly effected by a roadway according to the present invention.

25 For a better understanding of the present invention, and to show how it may be carried into effect, reference will now be made, by way of example, to the accompanying drawings, in which:

Figure 1 is a plan view of a roadway;

30 Figure 2 is a side view of the roadway taken along line AA in Figure 1;

Figure 3 is a cross-section through the roadway taken on line BB in Figure 1;

35 Figure 4 shows the layout of piles beneath a pile cap beam;

Figure 5 is an enlarged fragmentary view of the

pile cap beam;

Figure 6 shows the pile cap beam positioned over the piles;

Figure 7 is a detailed side view of the roadway;

5 Figure 8 is an elevation of another form of roadway.

Referring to Figures 1 to 3, a roadway 2 comprises precast reinforced concrete slabs 4 supported on precast reinforced concrete pile cap beams 6. The
10 beams 6 are connected to the tops of precast reinforced concrete piles 8 driven into the ground G by means of a conventional jack-in piling system. An asphaltic layer 10 is laid over the slabs 4 by a known process and provides a smooth continuous road surface.

15 Figure 4 shows the distribution of piles 8 beneath a pile cap beam 6. In the embodiment shown, piles 8 are disposed in pairs at equal intervals along the length of the pile cap beam 6.

As shown in Figure 5, the pile cap beam 6 is
20 provided with openings 32 when it is cast. The size and spacing of the openings 32 corresponds to the size and spacing of the piles 8, so that the pile cap beams 6 fit freely over exposed ends 44 of the piles 8. Figure 6 shows a pile cap beam 6 in place over a pair
25 of piles 8. A tapered opening 46 is cast into the pile cap beam 6 to accommodate a fixing nut 48.

Figure 7 shows in detail the assembled structure of the roadway 2. After positioning the pile cap beam 6 over the piles 8, concrete is poured into the
30 openings 32 and is compacted by vibration. Laminated elastomeric bearing strips 30 are then laid onto the pile cap beams 6 and the slabs 4 are laid end to end on top of the strips 30. The strips 30 are used to ensure that the slabs 4 rest evenly on the pile cap beams 6.
35 A bolt 42, provided with a washer 24, is inserted between the end of the slabs 4 into the fixing nut 48,

and is tightened to secure the slabs 4 relative to the pile cap beams 6.

The pile cap beam 6 may be set at ground level or a trench may be excavated and the pile cap beam 6 set in the trench. Where back filling is necessary, the back-fill does not have to be compacted as much as in conventional roadway construction.

Once the slabs 4 are in place and have been properly aligned, the asphaltic concrete road surface 10 is laid on top of the slabs 4 in a known manner.

Figure 8 illustrates a roadway with an even or gradually changing gradient in an area of weak soil strata SG. For example, the roadway may be the approach to a bridge or elevated highway section.

Soft ground piles 34 are driven into the soft ground SG at regular intervals and are then capped. Fill material F is then deposited over the ground SG, is compacted, and the correct gradient established, by known earth moving equipment.

Piles 8 are then driven through the newly formed embankment into the original ground SG. The roadway 2 is then constructed as described above.

Where the loading on the roadway will be very large and where it is desirable for the slabs 4 and beams 6 to be slender they may be made from prestressed concrete.

Ducts may be cast through the slabs 4 so that cables and pipes may be passed under the roadway. If hollow slabs 4 are used, no special ducts are required since the pipes and cables may be passed through the hollow interior of the slabs 4.

It should be noted that any combination of size, shape and distribution of piles, pile cap beams 6, and slabs 4 is contemplated, depending on the particular soil conditions encountered and the type of roadway required.

A method of constructing an elevated roadway is described and claimed in our copending Application No. 9108272.7 (Serial No. 2243637).



CLAIMS

1. A method of constructing a roadway comprising placing piles in the ground, installing pile cap beams on the piles, each pile cap beam extending across a plurality of the piles, and supporting preformed slabs on the pile cap beams, such that the slabs are disposed on the surface of the ground, the pile cap beams having openings in which the piles fit freely, concrete being poured into the openings when the pile cap beams are installed over the piles.
2. A method as claimed in claim 1, in which the pile cap beams extend transversely of the roadway.
3. A method as claimed in any one of the preceding claims, in which each slab is supported on respective pile cap beams at opposite edges only of the slab.
4. A method as claimed in any one of the preceding claims, in which the piles are placed in the ground over their full length.
5. A method as claimed in any one of the preceding claims, in which successive slabs in a longitudinal direction of the roadway are set at a successively greater angle to the horizontal, to form a curved roadway.
6. A method as claimed in claim 5, in which the preformed slabs are curved.
7. A roadway constructed according to a method as claimed in any one of the preceding claims.
8. A method substantially as described herein, with reference to Figures 1 to 7 or Figure 8 of the accompanying drawings.