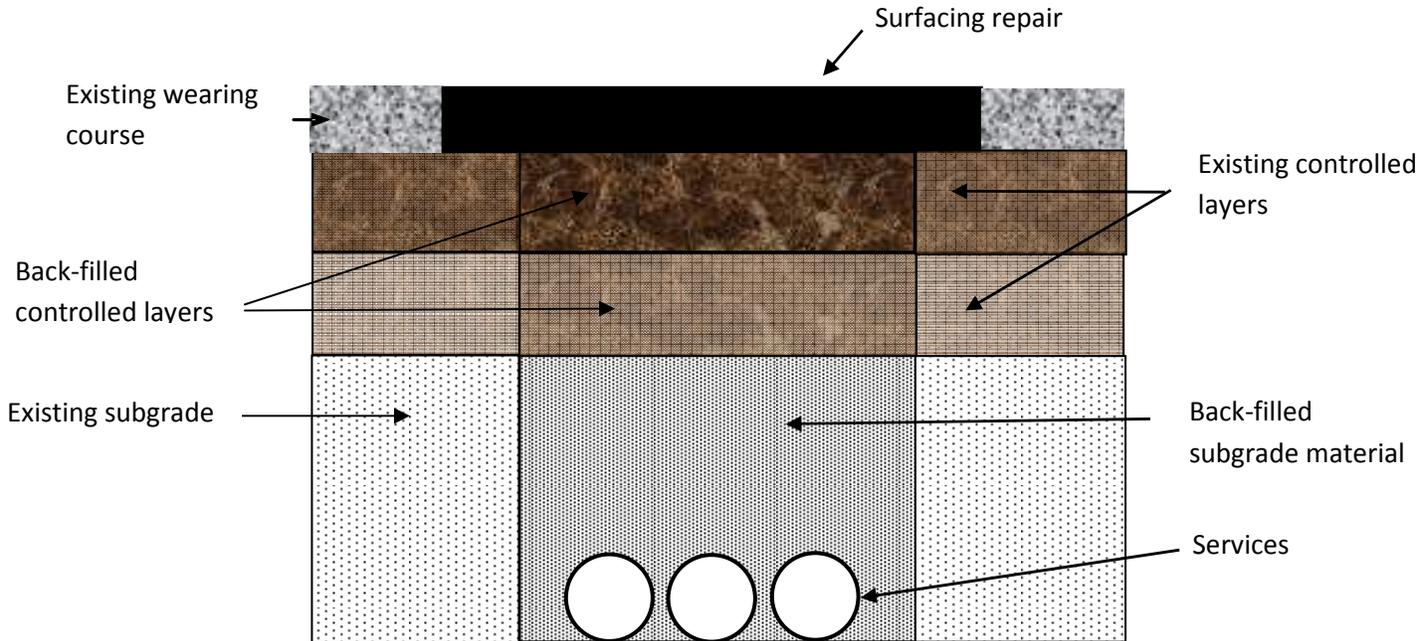


# Method statement for labour based construction of:

## Trench reinstatement



### Definition

Trench reinstatement is required when excavations, dug to accommodate services crossing an existing road, have to be backfilled with various materials to match the existing road surface. The width of the crossing will depend on the number and size if the individual services being laid in the trench. This method statement deals only with the reinstatement of the trench with backfill layers and the wearing course. It does not describe the excavation or the laying of the services.

### Application

This type of activity occurs regularly enough in urban areas and sometimes in rural areas when new services are laid or existing ones extended to meet development needs after the road had been constructed. By its very nature the work is usually confined to a narrow area and lends itself to labour based construction.

The main purpose of this method statement is to emphasise the attention to detail required during reinstatement to prevent traffic related damage to the installed services and minimize subsequent subsidence of the reinstatement causing an unacceptable depression in the road surface once reopened to traffic. Such depressions are normally due to shoddy workmanship, insufficient attention to material quality and inadequate compaction throughout the entire backfilling operation.

## Material requirements

**General** – The client or his agent should specify the both the quality of materials to be used in the various zones of the back-fill material and the degree of compaction required. In the absence of such specification, the material adjacent to controlled pavement layers should at least match the quality of such materials. Back-fill material in the zone below the control layers, i.e. the subgrade, should preferably be graded river or crushed sand, for ease of compaction.

**Asphalt:** - For wearing course, either hot or cold mix asphalt can be used. A conventional, dense graded wearing course with a nominal maximum aggregate size of 9,5 mm should be used for ease of handling and compaction. Where asphalt base is used a maximum nominal aggregate size of 26.5 mm should be adopted, given the confined space available for compaction.

**Prime:** - Diluted anionic stablemix grade 60% bitumen emulsion is recommended as a prime coat for the asphalt surfacing as it breaks faster and allows the work to be completed in one operation.

**Solvent/water:** - used to clean the equipment after use. If an emulsion is used they can be washed off with water. Solvents will be required if a cutback bitumen prime is used.

**Sealant:** - A bitumen emulsion to cover the edges of the surfacing to prevent moisture ingress at the edges.

**Base subbase and selected subgrade material:** - Materials as specified by the client or his agent or materials that at least match the quality of the adjacent base course, subbase and selected subgrade layers will be required. For expediency, upper layers may be stabilised with cement and asphalt base may be used. In such cases authorisation by the client or his agent should be sought.

**Sand fill material:** - River or crushed sand to be placed around the service ducts and in the zone below the controlled layers, i.e. base, subbase and selected subgrade.

## Plant and equipment requirements

Item	Number of items
Tape measure	1
Crayons	1 box
Straight edge	1
Shovels	4
Broom	2
Block brush	1
Hand stamper	1
Rakes	2
Compaction equipment ( pedestrian vibratory roller or vibratory plate compactor or vibratory rammer	
Hand stamper	
Water tank or cart to moisten backfill material	

## Labour requirements

Below is the typical composition of a small maintenance team required to undertake the reinstatement of a typical trench crossing. It is not possible to give an exact production rate for this work given the nature of the work being undertaken. It will depend on the depth and width of the trench.

Activity	Number of workers
Supervisor	1
General labour	6

As this operation is normally carried out in half widths, additional labour is required for traffic control. A minimum of 2 flag men will be required with signage to assist in a stop-go operation. Stop-go signage and large cones or delineators will be required to demarcate the working area and make it safe for the operation to be undertaken.

## **Construction**

### **Traffic control**

This operation is normally carried out in half widths. The road will need to be barricaded off in the correct manner and with proper signage to allow for the work to be undertaken in a safe manner, especially where the work is undertaken under traffic. The signage can be moved immediately once the full width of the road has been reinstated. This operation needs to be coordinated by the supervisor to ensure an efficient and safe operation.

### **Site Preparation**

The area will already have been excavated and the services laid and, where appropriate, protected.

To prevent direct ingress of water into the reinstated zone through cracks that may occur in the surfacing at the edge of the trench, the existing surfacing should be chipped out in a straight line, parallel to the trench, at least 150mm from the edge of the trench. .

### **Backfilling the trench with fill material**

It is the responsibility of the services laying team to ensure that the bedding of the services is of adequate quality to prevent undue settlement, displacement and damage during backfilling.

The area around and directly above the services will first need to be backfilled with sand to the underside of the controlled pavement layers. This material must be well compacted around and above the services to ensure that there are no voids that may cause settlement of the back-fill materials. No mechanical vibratory compaction equipment should be used less than 400mm vertically above the crown of service ducts or pipes. In this zone, manual means of compaction should be used.

Care should also be taken to ensure that no damage is caused to the service installation. Backfilling above the backfill material immediately surrounding the service ducts should be brought up in layers not exceeding 150 mm in depth with each layer compacted to the specified density using appropriate compaction equipment.

Normally, because of the restricted widths, either a plate compactor or a rammer will be used. Hand stampers should only be used in extremely restricted areas around services or street furniture. The backfill material should be at the optimum moisture content to ensure attainment of the required density. A nuclear gauge can be used to determine whether the required density has been obtained as each lift is completed.

### **Backfilling and compaction of the controlled pavement layers**

To ensure adequate strength in the upper zone of the reinstatement and to limit settlement once the road is reopened to traffic care needs to be taken to ensure that materials used in these layers are of the required quality and well compacted, meeting all the requirements of the client. A nuclear gauge should be used to determine whether the required densities for the various layers have been obtained.

The layer thicknesses will normally correspond with the adjacent pavement layers, but should in any case not exceed 150mm. The pavement layers would normally need to be completed up to wearing course level before the end of the days work.

If a granular base course has been used it may be necessary to extend the depth of this layer temporarily to correspond with the finished road level of the existing road, and the excess removed the following day and covered with a wearing course once it has dried out sufficiently or until the pavement layers in the entire trench reinstatement has been completed to facilitate ordering of sufficient quantities of wearing course material.

Note that, prior to placing the wearing course, the finished basecourse level should be such as to permit a wearing course of depth at least corresponding to the existing wearing course depth, but at any rate not less than 30mm. Where the existing wearing course depth is less than 30 mm the zone of existing base material between the trench edge and the edge of the existing surfacing should be trimmed to allow for the minimum thicknesses to be achieved.

### **Backfilling and compaction with hot mix asphalt base**

When using hotmix asphalt as a base course, the temperature of the asphalt must be maintained above 120 °C to permit the handling and achievement of the required compaction of the material. The material should be kept covered with a tarpaulin in heaps large enough to retain the heat for as long as is necessary. To avoid wastage only quantities required for the day's work should be ordered. Once the temperature of the asphalt has fallen below 120 °C it becomes unworkable and is wasted.

The top of the compacted asphalt base layer should be finished to a level as described above. The wearing course can be placed once compaction and finishing of the base layer has been completed and, preferably, having been allowed to cool overnight.

A roller should be used to compact the asphalt base if the trench width permits, otherwise a plate compactor can be used. A hand stamper should be used to tuck the edges down flush with the top surface of the base layer. This will ensure a neat edge joint for the wearing course.

### **Wearing course layer**

For replacing the existing wearing course, either hot or cold mix asphalt can be used. Although the same basic principles apply to both, some differences will be highlighted below.

#### **Placing and compaction of hot mix asphalt wearing course**

The temperature of the hot mix asphalt must be maintained above 120 °C for the placing and compaction of the wearing course to be effective. The material should be kept covered with a tarpaulin in heaps large enough to retain the heat for as long as is necessary. To avoid wastage only quantities that can be handled for the day's work should be ordered. Once the temperature of the asphalt has fallen below 120 °C it becomes unworkable and is wasted.

The hot mix asphalt should be dumped as close to the area where it is required to reduce double handling and also to ensure there is minimal temperature loss.

After placing the hot mix asphalt it should be raked level. A certain amount of compression of the material during compaction should be allowed for by leaving the hot mix asphalt about 10 mm proud of the existing road surface. Use is made of the existing road edge as a guide for the required level. Compaction with the roller should commence, starting from the outer edge working towards the centre of the road. The surface of the compacted layer should be tightly knit together with no visible cavities or large voids. Care should be taken not to damage the surrounding surfacing with compaction vibration as this may lead to further pavement distress.

The surface should be checked for level with the straight edge. A trench reinstatement having a slight surface crowning not exceeding 12 mm (or 15 mm for trenches having widths in excess of 750 mm) is preferable to one creating a hollow. The surface crowning will allow for some additional compaction under traffic especially in the wheel paths of the vehicles.

All loose material should be swept from the surface. To ensure that the wearing course is waterproof, a sealant should be painted onto the surface to seal off all surface cavities as well as the joint between the existing surfacing and the newly placed wearing course. This will ensure that the repaired patch is waterproof and will prevent water seeping into the underlying layers.

The hot mix asphalt wearing course can be opened to traffic immediately after the sealant has set. A sprinkling of fine dust of sand can be placed over the sealant to

prevent the sealant from being spread by the vehicles tyres. This precaution will ensure that the repair has a neat and tidy appearance.

### **Placing and compaction with cold mix asphalt**

Having measured the quantity of wearing course required, the corresponding number of bags is opened and the material exposed to sunlight for some time to warm up and become sufficiently workable for it to be laid and compacted.

The compaction of the repair is the same as that for hot mix asphalt.

It should be noted that where cold mix is used, it should not be opened to traffic immediately after completion because the volatiles in the cold mix still need to evaporate for the mix to stiffen. If at all possible traffic should be kept off the patch repair until the following day.

### **Cleaning up and moving on**

Clean all the tools after the trench reinstatement has been completed to prevent any build up of emulsion and asphalt of the tools and equipment.

### **Quality control**

Two aspects are very important here namely the compaction effort and the choice of wearing course.

- It is critically important to ensure that level of compaction of the backfilling materials and layers meets the minimum requirements uniformly to prevent undue subsidence of the reinstatement. Experience has shown that all too often the backfilling operation is done in a rushed and slipshod manner, resulting in an unacceptable depression of the surface requiring further repair in and around the original trench crossing dealing with rutting, a deformed trench and potholes that form adjoining the trenched area.
- Compaction of the wearing course must be accomplished in such a manner so as not to damage the surrounding wearing course which could result in cracks leading to potholes forming around the edges of the trench crossing repair.
- Regarding the selection of wearing course asphalt, a number of factors need to be assessed, given the particular circumstances pertaining to work:
  - The use of hotmix asphalt wearing course allows the road to be opened to traffic immediately after the repair is complete which facilitates traffic accommodation. Its use does however require that the material is handled in such a way as to ensure that it remains hot enough during the operation for it to be adequately compacted and so to avoid wastage.
  - While the use of cold mix asphalt enables one to limit wastage, not being able to open the reinstatement to traffic immediately could pose a serious disadvantage

that needs to be assessed. These factors need to be weighed up so that a decision can be made regarding which product one uses for a particular maintenance operation.

- Proper compaction of the material is vital. Compaction plant should be selected carefully to give the best results on the material used. Specialised equipment can sometimes be required for narrow trenching or restricted sites but the following plant is likely to be the most commonly used means of compaction for the majority of reinstatement:
  - **hand rammer** - used for the compaction of all material where access is severely restricted, e.g. around underground services or street furniture. Should not be used as a substitute for mechanical compaction equipment.
  - **vibratory tamper** - easily transported and handled and especially suitable for narrow trench-work. Delivers between 450 and 650 blows per minute through a small plate to effect compaction. Its use is not recommended for the compaction of base or wearing course materials.
  - **vibratory roller** - the preferred method of compaction of bituminous materials. It may be single or twin drum. It is not suitable in small and/or narrow excavations with restricted access.
  - **vibratory plate compactor** - available in a range of weights and sizes of plate. It is suitable for compaction in trenches. If used on bituminous materials but will not give a good surface
- As with all road work carried out under traffic, it is vitally important that road users are aware of the roadworks through proper signage and traffic accommodation