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ROADS AUTHORITIES & UTILITIES COMMITTEE (SCOTLAND)

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(SCOTLAND)

ADVICE NOTE No 29

Guidance on Core & Vac excavation & reinstatement

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## 1. INTRODUCTION

Since the Specification for the Reinstatement of Openings in Roads (SROR) was published in October 2003 the demand for recycled materials has increased due to the development of European Waste Directives, increases in Landfill Tax and Aggregate Tax and the user communities' environmental policies.

The user communities are currently being incentivised to develop various types of recycled products and minimum-dig technologies. At various locations in the UK, trials of Alternative Reinstatement Materials (ARMs) and 'Core & Vac' technology has already been, and continues to be, successfully undertaken.

This document has been produced to clarify various issues associated with this new method of excavating and reinstatement which potentially will become more frequently used as it's adopted by the wider user community. Moving forward, this is unlikely to be incorporated in to the (SROR) for some time. This Advice Note has therefore been produced to give direction to Roads Authorities and Statutory Undertakers prior to its inclusion in any future publication of the specification. This Advice Note is in-line with and complements the government's drive towards maximising the use of recycled materials, encouraging minimum-dig technology.

## 2. SCOPE

This Advice Note outlines the methodology, procedures and specification to be used in the implementation of large diameter coring and the reinstatement of cores in roads. This Advice Note further covers the operation of cutting a core in the road surface, removing it, vacuum excavating to expose apparatus, backfilling and reinstating the surface core.

## 3. EQUIPMENT

Unless otherwise specified, all equipment necessary for the execution and completion of the work using the large diameter coring must be approved for use by operator's internal governance processes and manufactures instructions. The operation of large diameter coring equipment must be carried out in the correct manner of intended use.

## 4. TRAFFIC MANAGEMENT

Signing Lighting and Guarding must comply with the requirements outlined in the Safety at Street Works and Road Works - A Code of Practice.

## 5. MATERIALS

### 5.1 Suitability of Materials

All materials necessary for the execution and completion of core hole excavation and reinstatement will meet the requirements detailed within the SROR.

### 5.1 Bonding material for core hole reinstatement

Bonding material will be a packaged dry mix, non-shrinkable and be impervious to water penetration at the joint after application. The bonding material must securely bond the undamaged core to the existing surface and to fill the annular space at the joint.

Specifications for the bonding material shall meet the requirements of *BS 6319: Testing of resin and polymer/cement compositions for use in construction (Parts 3, 4 &7)* and *BS 1881: Part 116 - Testing concrete - Compressive Strength*. All mixing, handling and curing practices instructed by the manufacturer will be followed and will be considered part of this advice note.

Using the bonding material at temperatures below 10°C shall extend the curing time as per the manufactures instructions. The design life of the bonding material will be the same as or greater than the residual design life of the carriageway being excavated.

## **5.2 Backfill Materials**

All backfill material will be in accordance with the requirements of the SROR.

If the backfill material is not of a suitable grade, then imported material shall be used. Pea gravel is used to aid the levelling of the excavation and re-align the core back to its original position. This stabilisation and alignment layer of pea gravel must not exceed 50mm at any point and will act as a sealing support layer for the bonding agent used in the reinstatement process

## **6. EXCAVATION**

### **6.1 General**

All coring construction and maintenance work must ensure that the road surface is restored back to condition in accordance to SROR S2. Where possible, all excavations will be planned before commencement of works on site and in accordance with the timescales given in the Code of Practice for the Co-ordination of Works in Roads. All coring excavation work must be undertaken and supervised by qualified personnel to the satisfaction of the statutory undertaker.

### **6.2 Coring**

Care must be taken when cutting surface layers to avoid undue damage to the surrounding surface course and binder course materials. The removed core must be restored to its original orientation with the reinstated core level with the existing surface; and the compacted backfill sub-structure restored.

A 100mm pilot core shall be taken to determine the suitability of the existing construction.

Cutting of existing road surfaces must be performed with a suitable diamond tipped cutter. The cutter must be positioned vertically, and the cutting edge shall reach a depth which allows the upper surface course layers of the road structure to be removed as a complete core, using the pilot hole as a depth gauge.

- a) The cored excavation must be positioned in a true vertical alignment taking account of the offset of the road camber and gradient. The cutting edge shall extend through the full depth of the existing upper bound surface course layers. The maximum permitted longitudinal gradient of the road will not exceed 10% (5.7°). Where the maximum gradient is exceeded the excavation will be reinstated in compliance with the SROR.
- b) Reinstatement of the core (above 150mm up to 600mm diameter) shall not be performed in road surfaces where the course surface layers is less than 100mm thick, this will be checked with the pilot core in advance of cutting the main core. However, a further check on the larger core must be taken to confirm there is no depth less than 100mm over the circumference of the larger core.
- c) Temporary alignment marks must be made on the road surface prior to cutting to ensure that the removed section is replaced and aligned in the same orientation.
- d) Multiple cores can be taken at any time. However, no core can be replaced within 250mm of any other core, where cores are taken within 250 mm of each other, any reinstatement must conform to the SROR.

### 6.3 Vacuum Excavation

Material within excavations will be removed by air lance and vacuum extraction methods to expose the apparatus. The remaining excavated area shall remain essentially within a vertical or 'V' plane, extending directly below the edges of the removed surface course layers cored to avoid extensive undermining. (See Figure 1 below:)

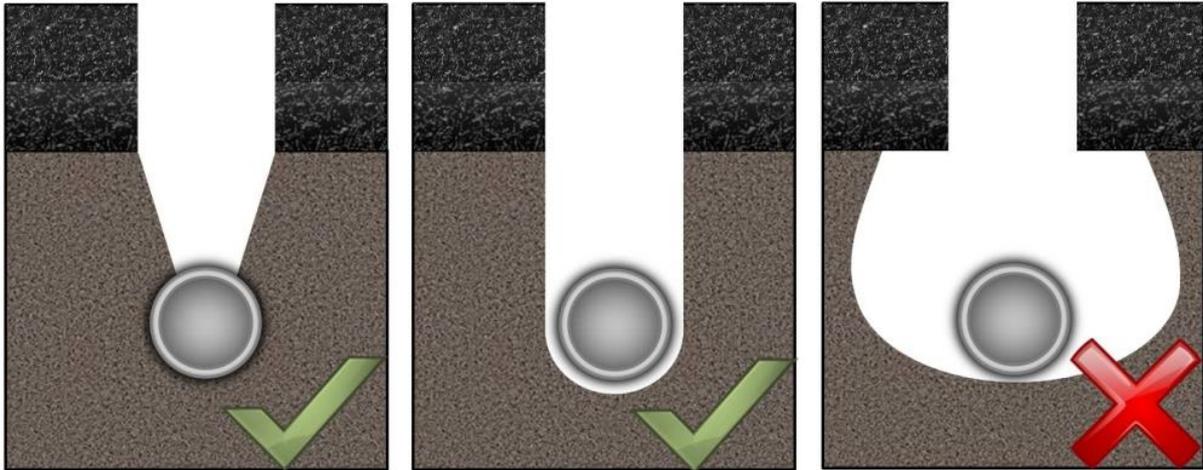


Fig 1. Alignment of Excavation

## 7. REINSTATEMENT

### 7.1 Backfill and compaction

The backfilling of the excavation shall be completed in accordance with the SROR.

### 7.2 Core Reinstatement and Bonding

The removed core shall be dry fitted back in to position. Marks on the road surface will be used to aid alignment back to it's the original orientation. Pea gravel may be required to assist with the levelling of the core base. The core must sit horizontally in the core-hole 25mm below the surrounding road surface with no edge of the core touching the edge of the core-hole with a clear annulus gap at least 7mm. An alignment clip can be used to aid this process to retain a consistent gap is between the existing road surface and the reinstated core.

Once the 'dry fit' process is complete the core must then be removed and four (4) alignment clips can be evenly spaced around the circumference prior to the bonding agent being added to pea gravel base layer. Then add the bonding agent to the base layer ensuring sufficient bonding agent is present to ensure no voids are retained in the annulus gap around outer diameter of the reinstated core.

The excess bonding shall be pushed out around the level core confirming no voids remain. The excess bonding material must then be removed prior to setting from the restored surface and the reinstated core must be left in an acceptable structural and visible condition.

### 7.3 Permanent Surface Restoration

The reinstatement of the core shall be completed when the associated operation is complete. Full reinstatement will be targeted for completion within 24 hours of cutting.

Reinstatement of a core excavation will be constructed in line with the parameters in Figure 2 below:

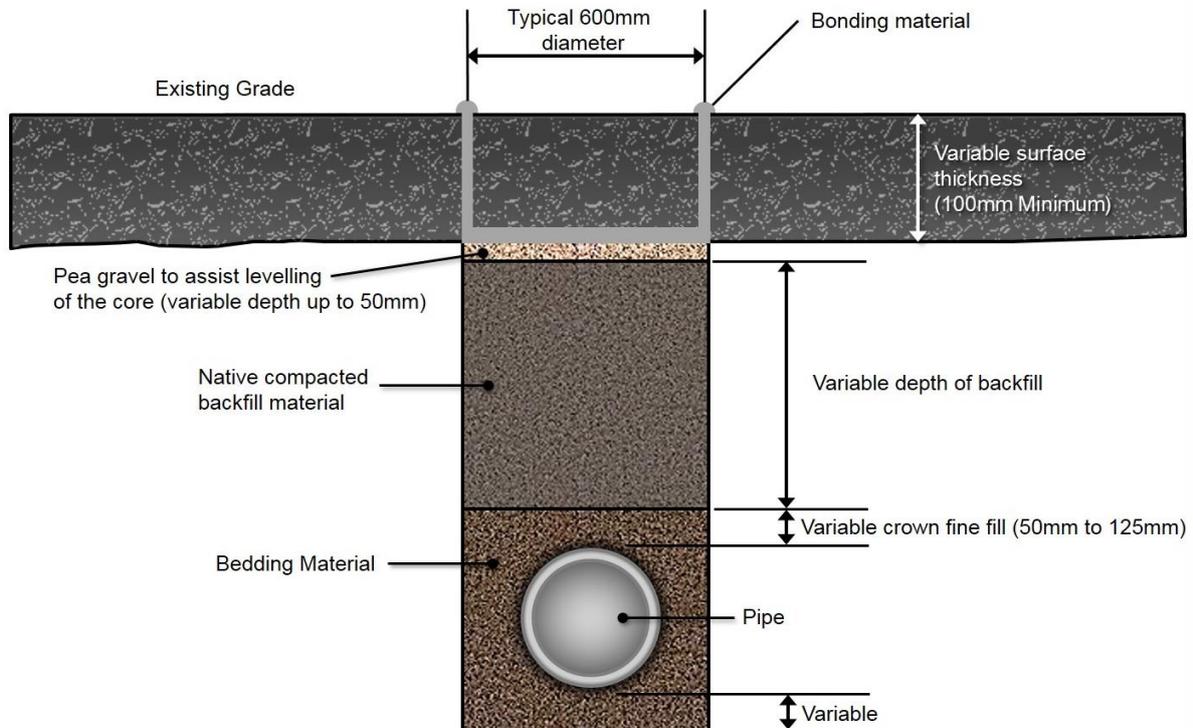


Fig 2 Typical Core Reinstatement

### 7.4 Temporary Condition

In the event a core cannot be reinstated within 24 hours of cutting, consideration must be given for the use of an approved and appropriately-sized road plate in line with the Safety at Street Works and Road Works – A Code of Practice. The removed core must be protected from any detrimental environmental effects until such a time that the core can be reinstated.

### 7.5 Mitigation of Defective reinstatements

Where the core hole is found to be fractured or defective upon removal, or the core depth is less than 100mm in depth at any location then conventional reinstatement techniques will be adopted after the backfill compaction has been completed. All in accordance with SROR

A core that has fractured in to individual segments along the vertical plane shall be considered defective and not be reinstated under any circumstance.

If the operator or Roads Authority has any doubt over the structural integrity of the core being reinstated then conventional reinstatement techniques will be adopted. All in accordance with the SROR.

## **7.6 Management and Disposal of Excess Material**

Management and disposal of excess materials excavated will be removed off site and disposed of as with any other conventional excavation.

Wherever possible:

- Spoil will be segregated and stored in such a way to protect it from weather deterioration;
- Selected excavated material (SEM) will be used as backfill wherever practical to do so; and
- Spoil that cannot be used for backfill will not be considered as landfill waste and be taken to recyclers for reprocessing.

SEM or recycled material shall always be used for backfilling in preference to virgin aggregate, wherever practical.

## **7.7 Records**

A record containing the location and details of all core reinstatements must be kept within the SRWR notice. SRWR requires a unique reference with the within the works reference field which must contain the words "C/VAC".

A record of the compaction levels recorded during the reinstatement process must be retained for a minimum of the guarantee period of each core. Data downloaded from digital compaction monitors will be retained in an electronic format and be made available upon request for auditing or quality control and assurance programs. Appendix A shows an example of a quality assessment form which could be used to monitor on going reinstatement condition.

# **8. QUALITY ASSURANCE**

## **8.1 Tolerance**

The reinstated core shall be level with the adjacent road surface but shall not exceed +6 mm/-3 mm. Bonded cores must not leave any remaining gaps in the annulus space between the base of the core's vertical edge up to the surface of the road. This can be confirmed by the evidence of visible excess bonding agent being released in a continuous ring around the annulus space.

## **8.2 Conventional Reinstatement**

In the event of a core exceeding the tolerances given in 8.1 conventional reinstatement techniques will be adopted to ensure reinstatement can be carried out to as per the SROR requirements. If a core fails on the initial removal the excavation can still be carried out compacted and backfilled, with conventional techniques adopted to replace the top course layer.

## **8.3 Unacceptable cores**

All cores that are damaged or do not meet the surface tolerances in 8.1 shall be removed and reinstated using conventional techniques.

A core is considered unacceptable when one, or more, of the following conditions exist:

- a. The core contains any vertical cracks or voids  $\geq 3\text{mm}$  wide through the core; or
- b. If a deteriorated piece of base layer of the core is  $\geq 10\%$  of the overall core mass
- c. If horizontal delamination of multiple (more than two) layers of the core occurs.
- d. The core is less than 100mm in depth.

All unacceptable cores shall be removed, disposed of offsite, and conventional techniques will be adopted. In the case of any defective cores, this must be recorded, agreed with the Roads Authority and the final reinstatement must be to undertaken in accordance with the SROR.

#### **8.4 Guarantee**

The guarantee period for any core reinstatement will be in accordance with the current SROR guarantee period. The works originator shall maintain a quality control and assurance program to ensure that a representative sample of all reinstatements completed using this method are inspected annually.

The guarantee period associated to coring reinstatement will be adjusted in accordance with any future inclusions of this technique in the SROR.

A record of these inspections will be retained and available for a period of one year after the expiry of the guarantee period. This information must also be made available on Scottish Road Works Register (SRWR).

## Appendix A – Sample Core Reinstatement Inspection Form

<b>Inspectors name</b>	<b>Date:</b>	<b>Job No.</b>	<b>LA Reference No:</b> "C/VAC"
<b>Local Authority Area</b>	<b>Address:</b>		<b>Road Construction:</b> Reinf / Non reinf Flexible / rigid / comp
<b>Site Report:</b>		<b>Road Category:</b>	<b>Weather Conditions:</b>

### Core inspection

Inspection Criteria	*Inspection Category	Acceptable	Not Acceptable	Not Seen	Not Applicable
Surface profile acceptable	A / B / C				
Core alignment acceptable	A / B / C				
Crowning	A / B / C				
Edge depression	A / B / C				
Surface depression	A / B / C				
Structure	A / B / C				
Skid resistance	A / B / C				

<b>* Insp Category</b> A / B / C	<b>Core diameter</b> (mm)	<b>Pilot Core reinstated:</b> Yes / No	<b>Road grade as Categorised:</b> Yes / No	<b>Proximity to other excavations</b> (mm)	<b>Localised surface cracking on core</b> Yes / No
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### Backfill Record

<b>* Insp Category</b> A / B / C	<b>Any MOT used:</b> Yes / No	<b>SME used in backfill:</b> Yes / No	<b>Compaction Monitor Record:</b> Yes / No	<b>TM Confirmed Compaction data</b> Yes / No	<b>Grout Surface acceptable:</b> Yes / No
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<b>Comments</b>	<b>Photo</b> Yes / No
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### Site Inspection Re-check Record

Inspection Category	Date visited	By Reinst T/M	Any concerns (add to Comments)	Photo & attached	Comments
D+ 3 months (B)	__/__/__		Yes / No	Yes / No	
D+6 months (B)	__/__/__		Yes / No	Yes / No	
D+12 months (C)	__/__/__		Yes / No	Yes / No	
D+24 months (C)	__/__/__		Yes / No	Yes / No	

\*Reinstatement Inspection Category's - A= during the works, B= within six months, C= after six months