

Specification for the Reinstatement of Openings in Roads 2003 (SROR)  
Appendix A9 Trial

**Approval of SMR as C4 Non Flowable Structural Material for  
Reinstatements (C4 NFSMR) for use in utility Reinstatements in  
accordance with SROR 2003**

Trial Start Date: 06 November 2012  
Trial End Date: 05 June 2015  
Date of Issue of Report: 15 September 2015



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## 1. Introduction

- 1.1 The reinstatement of utility excavations in the road is governed by a Code of Practice issued the Scottish Executive under Section 130 of the New Roads and Street Works Act 1991 ( NRSWA). The latest (third) edition of this Code of Practice, known as the Specification for the Reinstatement of Openings in the Road (SROR) came into force in October 2003. The SROR sets down the minimum standards for the reinstatement of openings made by Utility Companies in the course of managing their plant buried under the Road. This report is written on the understanding that readers will have a working knowledge of the SROR (third edition) and particularly Appendix 9 of this.
- 1.2 The SROR (third edition) sets down requirements for a range of standard reinstatement solutions, detailing options for the materials to be used and the workmanship necessary to achieve a satisfactory reinstatement.
- 1.3 Within the SROR, materials are generally specified in accordance with British or European standards but Appendix A9 sets out end performance criteria to enable the development and use of Alternative Reinstatement Materials (ARMs). ARMS may fall into one of two general categories;
  - 1.3.1 Stabilised Materials for Fills (SMFs), characterised by bearing capacity and aimed at use in the lower layers of reinstatements and
  - 1.3.2 Structural Materials for Reinstatements (SMRs) characterised by compressive strength and potentially of use up to the Base layer in roads and the Binder Course in footways as set down in Table A9.1 of SROR. SMRs may be either Flowable (FSMR) or Non-Flowable (NFSMR) in nature. Significant freedom is available regarding the production of SMRs, however their classification and thereby restrictions on where they may be used in any particular reinstatement is governed by their crushing strength at 28days, this can be either;  
  
C3/4 – Minimum C3/4 N/mm<sup>2</sup>, maximum C9/12 N/mm<sup>2</sup> or  
C1.5/2 – Minimum C1.5/2 M/mm<sup>2</sup>, maximum C9/12 N/mm<sup>2</sup>
- 1.4 This report details the evaluation of the “**SMR Eco Proprietary Binder**” product as a Class C3/4 Non-Flowable SMR (NFSMR) in accordance with Appendix A9 of SROR.

## 2. Parties Involved

- 2.1 This trial has been undertaken by Scottish Water and Glasgow City Council with technical support provided by SMR Eco Proprietary Binder & QA Process Supplier: METSSL Ltd.

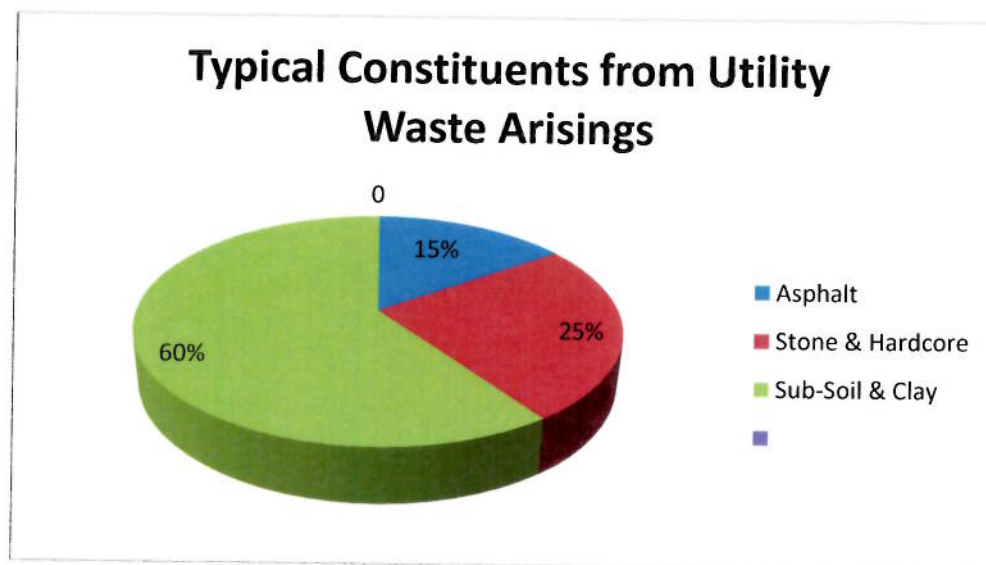
## 3. Drivers & Needs for C4 NFSMR produced with the SMR Eco Binder

- 3.1 The utility industry is currently faced with a number of challenges. In particular there is the acute need to reduce waste arisings sent to landfill, reduce the carbon footprint and produce high quality reinstatements in the footpaths and carriageways. The SMR Eco Proprietary Binder has been developed to help fulfil these needs:



### 3.2 Landfill Diversion

3.2.1 The SMR Eco Proprietary Binder has been developed to help achieve a much higher recovery rate on utility waste that traditional recycling solutions and materials. Traditional recycling is typically only able to recover the granular materials from utility trench arisings i.e. asphalt, hardcore and stone. This typically comprises of 45% of the utility waste, with the remaining 55% (typically sub-soil and clay) going for disposal. The SMR Eco proprietary binder enables the recovery of the sub-soil and clay element of utility waste in addition to the asphalt, hardcore and stone. This vastly increases the recovery rate on utility waste.



### 3.3 Carbon Footprint Reduction

3.3.1 By using SMR Eco the carbon footprint is reduced in a number ways:

1. Reduced Lorry movements from not having to send the sub-soil & clay segment of utility waste to landfill.
2. Elimination of the need for primary aggregates as the utility waste is recovered and used back in the utility trench instead of primary aggregates.
3. Reduced remediation costs due to the high performance/stiffness of the C4 NFSMR compared to traditional primary and secondary unbound aggregates e.g. Type 1 803.
4. Reduced lorry movements to and from the utility site if a Mobile Batching plant is used on-site to produce the C4 NFSMR
5. Reduced lorry movements by using a One-Stop-Shop Hub Recycling Facility. These are set up in logistically suitable locations to offer a 'One-Stop-Shop' solution to the utility industry. This is a solution where utility companies and their contractors are able to legally tip their waste and in return pick up the backfill products that they require. It is important to note that all the backfill products purchased from these facilities are produced under the *WRAP Quality Protocol for the Production of Recycled Aggregates*. It is very important that recycled backfill products are

produced to this protocol because if they are not, then they will technically still be classed as waste

### 3.4 Increased Reinstatement Performance

3.4.1 The batch mixed SMR ECO C4 NFSMR will produce a higher surface modulus than using traditional unbound aggregates e.g. Type 1 803

*'A stiffness modulus based on the application of a known load at the top of the foundation; it is a composite value with contributions from the underlying layers'*

3.4.2 This will help ensure that long term performance and durability of the utility trench reinstatement and reduce any subsidence and remediation costs. The higher performance stiffness of the material will also allow for good compaction of the asphalt layers on top.

## 4. Background

4.1 The SMR Eco Proprietary Binder is a cementitious based proprietary Binder whose intellectual property is owned by METSSL Ltd. The SMR Eco Proprietary Binder is used to produce a C4 Non Flowable Structural Material for Reinstatement (C4 NFSMR) as per the Specification for Road Openings in the Roads (SROR) 2003, Appendix A9.1.2.a.iii, and page 112;

### iii) Non-flowable SMRs (NFSMRs)

These materials comprise of any type and combination of aggregates and binders. They are non-flowable mixes that will normally require compaction on site, and will be capable of achieving strengths equivalent to FCRs in their compacted state. These materials may only be used on a trial basis by prior agreement

4.2 The purpose of the trial is to verify that the SMR Eco Proprietary Binder used to produce the C4 NFSMR is fit for purpose and has the structural longevity to be used in the relevant layers and depth thickness as detailed in table A9.1 of the SROR 2003. The processes and procedures to produce the C4 NFSMR with the SMR Eco Proprietary Binder are detailed in the WRAP Complaint Quality Protocol produced and supplied by METSSL Ltd.

### 4.3 Road Type & Layer Usage

4.3.1 The relevant road types, layer depths and thickness as to where a C4 NFSMR can be found in Table A9.1 of Appendix A9 of the SROR 2003 a copy of which can be found below.



Layer	Road Type					Footway Footpath or Cycletrack
	0	1	2	3	4	
Combined Binder Course & Sub-base	NP	NP	NP	NP	NP	150mm C2
Base (Roadbase) Alone	NP	NP	NP	300 mm C2	200 mm C2	---
Base (Roadbase) & Sub-base	NP	450 mm C4	450 mm C4	450 mm C2	350 mm C2	---
Sub-base &/or below	150 mm C2	150 mm C2	150 mm C2	150 mm C2	150 mm C2	100 mm C2

Crushing Strength at 90 days	C4 - 4 N/mm <sup>2</sup> Minimum to 10 N/mm <sup>2</sup> Maximum C2 - 2 N/mm <sup>2</sup> Minimum to 10 N/mm <sup>2</sup> Maximum
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Note to Table A9.1: NP = Not Permitted ref A9.3.1

## 5. Methodology- Proposed Testing & Monitoring

- 5.1 Initial laboratory testing has been carried out on the SMR Eco proprietary binder by a UKAS accredited laboratory. Results of these tests are detailed in Appendix 1.
- 5.2 It is also proposed that the following in-situ testing and on-site monitoring is undertaken that a 2 Year sign off visual inspection be undertaken supported by photographic evidence.

## 6. Sites tested for Trial Sign Off

- 6.1 Thirteen sites have been detailed in Appendix 3 of this report however the minimum requirement detailed in the SROR 2003 Appendix A9, A9.5.2.1 (2) Scheme for Approved Trials is 2 sites.

Site Location	LA Reference	Road Type	Date Reinstated
Pollockshaws Rd/ Devon St	1453720	1	17/04/2013
Langside Ave	1484435	1	14/05/2013
303 Kilburn Rd, Glasgow	1483923	1	20/06/2013
Kilburn Rd, Glasgow	1618608	1	01/11/2014
342-394 Kilburn Rd, Glasgow	1473489	1	21/06/2013
Nether Auldhouse Rd, Glasgow	1473488	1	25/06/2013
Newlands Road, Glasgow	1513498	2	21/08/2013
Langside Drive, Glasgow	1513469	1	14/09/2013
Old Castle Road, Glasgow	1602124	1	17/10/2013
Allison Street, Glasgow	1450372	2	17/06/2013
London Road, Glasgow	1532092	1	08/07/2013
Duke Street, Glasgow	1612749	1	23/10/2013

## **7. Methods of Production**

- 7.1 In all cases the “**SMR Eco proprietary Binder**” used for reinstatement at these sites was mixed mechanically. The Quality Protocol in each case was based upon the WRAP Protocol for the Production of a C4 NFSMR. A copy of the WRAP protocol can be found in Appendix 2. Appendix 6 to this report also details the SMR Batch Mix End User Method Statement

## **8. Appendix A9 Trial Criteria – Evaluation**

### **8.1 Training/Assessment & Competency of Personnel**

- 8.1.1 All operatives producing the SMR Eco Batch mixed C4 NFSMR will have been trained by METSSL Ltd and been issued with a certificate stating this. In addition to this all producers of the C4 NFSMR will have the relevant certificates and qualifications to operate the plant and equipment used in the recycling process.

### **8.2 Control of Raw Materials**

- 8.2.1 Please see Appendix 2 ‘WRAP Compliant Quality Protocol’ (written and produced by METSSL Ltd) Section 3.4 and Appendix 1

### **8.3 Process Control**

- 8.3.1 Please see Appendix 2 ‘WRAP Compliant Quality Protocol’ Section 3.5, (written and produced by METSSL Ltd) Appendix 1 and Appendix 2.

### **8.4 Inspection, Testing & Frequencies**

- 8.4.1 Please see Appendix 2 ‘WRAP Compliant Quality Protocol’ Section 3.6.1 and 3.6.2 (written and produced by METSSL Ltd)

### **8.5 Transport & Delivery**

- 8.5.1 Please see Appendix 2 ‘WRAP Compliant Quality Protocol’ Section 3.5 and Appendix 1. (Written and produced by METSSL Ltd)
- 8.5.2 The C4 NFSMR will be transported and accompanied by a Delivery Note. This demonstrates the additional information accompanying the C4 NFSMR when it is transported and delivered to site.

### **8.6 Laying Operation**

- 8.6.1 The C4 NFSMR will be laid and compacted by qualified NRSWA operatives. The layer thickness and compaction rate can be found in Appendix A8 of the SROR 2003

### **8.7 Audit & Review**

- 8.7.1 Auditing on the Doocey N.E Ltd recycling facility that produces the C4 NFSMR can be seen in Appendix 6 of the ‘WRAP Compliant Quality Protocol’ as seen in Appendix 2 to this report. (Written and produced by METSSL Ltd)
- 8.7.2 On-site monitoring will comprise of a visual inspection accompanied by photographic evidence and a 2 year inspection, accompanied by photographic evidence.



8.7.3 Initial testing will comprise of UKAS laboratory testing and on-site Lightweight Deflectometer testing. After 2 years a visual inspection will be carried out to prove that the product has performed as expected.

## 8.8 Complaints Handling

8.8.1 In regards to the production of the C4 NFSMR any complaints regarding the production of the product will be logged and shared with all relevant parties. In regard to the laying and compacting of the C4 NFSMR, the complaints procedure will be detailed in the utility company's or contractor's working policies and health and safety policies.

## 8.9 Additional Information

8.9.1 The below information is not detailed in the Appendix A9 assessment criteria however has been added to the trial evaluation:

1. Corrective Actions: Flow Charts that help to assist in evaluating root causes for remedial works potentially encountered in the trial: Product Production, Product Transport, Product Storage, and On-site sinkage – See Appendix 4.
2. Obtaining Maximum Recovery Rates on Utility Waste: Document detailing how potentially the maximum recovery rate can be achieved on utility trench arisings by using binders in the recovery/recycling process and the products that can be produced – See Appendix 5.

## 9. Verification of Trial Outcomes

9.1 A visual inspection of all the sites detailed in the table below was undertaken by Craig McQueen of Scottish Water and David Murdoch of Glasgow City Council on 02/06/2015. The visual findings of these inspections have been documented in Appendix 3 to this report. An SMR Eco proprietary binder was added at an addition rate of 4% by weight to produce a C4 Non Flowable SMR and was used in the following road categories:

Site Location	LA Reference	Road Type	Date Reinstated
Pollockshaws Rd/ Devon St	1453720	1	17/04/2013
Langside Ave	1484435	1	14/05/2013
303 Kilmarnock Rd, Glasgow	1483923	1	20/06/2013
Kilmarnock Rd, Glasgow	1618608	1	01/11/2014
342-394 Kilmarnock Rd, Glasgow	1473489	1	21/06/2013
Nether Auldhouse Rd, Glasgow	1473488	1	25/06/2013
Newlands Road, Glasgow	1513498	2	21/08/2013
Langside Drive, Glasgow	1513469	1	14/09/2013
Old Castle Road, Glasgow	1602124	1	17/10/2013
Allison Street, Glasgow	1450372	2	17/06/2013
London Road, Glasgow	1532092	1	08/07/2013
Duke Street, Glasgow	1612749	1	23/10/2013

9.2 The inspections show that the SMR material is performing well with no failures attributable to the material. Six of the twelve sites inspected had defects identified that



were related to joint proximity, road markings and ironwork. No defects were due to the use of SMR.

## **10. Recommendation**


- 10.1 It is recommended that 'SMR Eco Proprietary binder' is approved as a C4 NFSMR in accordance with Appendix 9 of the SROR (third edition).

11. Signature Page

COUNCIL: Glasgow City Council

POSITION IN ORGANISATION: Head of Infrastructure Services,

PRINT NAME: ANDY WADDELL

SIGNATURE 

DATE: 25 November 2015.

UTILITY COMPANY: Scottish Water

POSITION IN ORGANISATION: General Manager – Customer Service

PRINT NAME: Mark McEwen

SIGNATURE 

DATE: 18th Nov 2015

PROPRIETARY BINDER SUPPLIER: METSSL Ltd

POSITION IN ORGANISATION: Director

PRINT NAME: Sebastian Love

SIGNATURE: 

DATE: 12/11/2015

## APPENDICES:



## **Appendix 1: Pre Job UKAS Laboratory Testing**

1. Classifications test for the Constituents of Coarse Recycled Aggregates
2. Determination of Reference Density and Water Content: BS EN 13286-4
3. Determination of the Particle Size Distribution
4. Determination of Reference Density and Water Content: BS EN 13286-4
5. Frost Heave of Recycled Aggregate With SMR Binder Ex. Rutherglen Recycling Centre
6. Determination of the Particle Size Distribution