CODE OF PRACTICE FOR INNOVATIVE PATCHING SYSTEMS
Foreword

This first edition of the Code of Practice has been produced by the RSTA Patch Repair Sub-Committee. This document only covers innovative patch repair systems including Spray Injection Patching and Thermal Road Repairs and cross references clause 946 in the MCHW Specification for Highway Works Volume 1. It does not cover standard hot mix asphalt products and excludes utility reinstatements regulated under HAUC.

The purpose of this Code is to identify the important aspects of these processes and provide practical guidance on achieving high quality repairs. All of the processes contained herein are regulated either by HAPAS or National Highway Sector Scheme 13 and operatives installing these techniques require a CSCS card as a minimum.

This document has been peer reviewed by ADEPT Soils, Materials, Design and Specifications Committee.

The information contained herein is intended to represent industry best practice. No liability is accepted by RSTA or ADEPT for any damages caused to property or personal injury resulting from using the guidance contained within this document.

RSTA is the Road Surface Treatments Association  www.rsta-uk.org

ADEPT is the Association of Directors of Environment, Economy, Planning and Transport www.adeptnet.org.UK
## DOCUMENT CONTROL

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**REVISION LIST – AMENDMENTS MADE IN THIS ISSUE**

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1 PREAMBLE
1.1 General

Innovative Patch Repair systems offer highway authorities an alternative to conventional hot-mix asphalt. They can provide a range of benefits including:

- reduced cost up to 50% lower;
- rapid installation up to 4 times faster;
- minimal disruption to the road user;
- zero waste generated;
- low carbon footprint up to 85% lower;
- some techniques require no saw cutting and jack hammering so no risk of Hand Arm Vibration

A useful way of comparing the effectiveness of Innovative Patch Repairs is to express it in terms of a ‘cost life index’. This is the cost per square metre of the work divided by the satisfactory life in years. It provides a measure of the “value for money” which the highway authority is achieving. A low ‘cost life index’ and “high value for money” is the result of high-quality work.

To the highway engineer Innovative Patch Repairs offer a fast, efficient and cost-effective way of removing defects; safety hazards; maintaining skid-resistance; preserving and protecting roads against the damaging effects of water. To obtain the best results it is necessary to give careful consideration to a wide range of detail, to plan and design the work carefully. The speed of the patching operation and the short duration of time during which motorists are inconvenienced is also an important consideration and advantage on roads carrying high volumes of traffic during peak periods.

Spray Injection Patching uses high volume low pressure air to clean the road surface defect, before applying a bond coat of either a hot or cold bitumen emulsion. Aggregate is then propelled, using high volume air at low pressure, before mixing it with the bitumen emulsion moments before it is compacted as it is placed in the patch. For heavier trafficked applications, compaction by a vibrating plate is often used. The new repairs can then be trafficked immediately after laying. Detailed information is given in Appendix A. The process is also included in BS 434-2:2006. The biggest advantages this technique has over traditional methods is the speed in which they are able to be carried out, the added bonus if being able to mobilise to carry out small repairs that are permanent. Spray Injection Patching does not repair underlying road base problems.

Thermal Road Repair involves applying heat to the upper 20-30mm of the surface course of a defective area to soften the material so it can be easily reworked with any extra materials added prior to compaction. Detail information is given in Appendix B. The biggest advantages this technique has over traditional methods is the speed in which they are able to be carried out, the added bonus of being able to mobilise to carry out small repairs that are permanent and that the whole process is completely recyclable. The compaction of the heated materials creates a homogenous bond between the repair and the adjacent surfacing. To obtain the best results it is necessary to utilise thermal repairs as part of preventative highway maintenance schemes. Thermal Road Patching does not repair underlying road base problems.
1.2 Health, Safety and Environment

All those involved in preparing and executing Innovative Patch Repairs operations have a legal duty of care for the health and safety both of the operatives carrying out the works, and those who come into contact with the operation whilst in progress and during aftercare.

The planning and organising for health, safety and environmental issues must commence as soon as a works programme is envisaged.

The client should employ a competent contractor. It is recommended that the simplest way for a client to achieve this is to select at tender stage contractors accredited to National Highways Sector Scheme 13 or approved installers under HAPAS. As a minimum contractors installing these techniques should carry a CSCS blue skill card.

The pre-construction information contained in the tender document should be detailed enough for the prospective contractors to take account of the health, safety and environmental issues in their tender submission.

It is the appointed Contractor's duty to prepare a detailed Health and Safety Plan for the particular contract of works from the Pre-construction information supplied by the Client. This must itemise the methods to be employed to overcome the specifically identified hazards and risk reduction measures that will be in force on this contract. They must also ensure adequate welfare is provided from the start of the contract.

Once the works commence the Contractor has control of health, safety and environmental matters but liaison with the client, police and the general public on issues of congestion, diversions or closures must be on-going throughout the contract.

The Contractor has additional duties under other legislation to look after the health and safety not only of his own employees but of other persons who work alongside them and also of the passing public. Written specific risk assessments must be prepared which can be used to identify control measures for both physical and chemical hazards. The measures must form the Contractor's safe systems of work which enhance the safe behaviour of the workforce as well as protect the general public during the various stages of the works. These measures must be communicated to all involved in the project.
1.3 Training

The quality of the completed installation is dependent upon the skill and care of the operatives.

The National Highway Sector Scheme 13 now defines the minimum qualifications and competency required for all personnel involved in the design, supervision and installation of Spray Injection Patching. Thermal Road Repairs are regulated under HAPAS and as such training for operatives and supervisors is the responsibility of the certificate holder. It is the Association’s view that a competent qualified workforce is essential to achieving high quality durable repairs. The RSTA runs regular training courses, details of which can be obtained from the RSTA website www.rsta-uk.org/calendar.

1.4 Quality Assurance

The Road Surface Treatment Association continues its commitment to quality assurance and has been instrumental in producing the National Highway Sector Scheme 13 for the Supply and Application of Surface Treatments to Road Surfaces which includes Spray Injection Patching within its scope.

The Sector Scheme 13 Document is available on the UKAS website www.ukas.com.

The RSTA, from whom further details are available, currently chairs the National Highway Sector Scheme 13 Technical Advisory Committee.

Thermal Road Repairs are regulated under HAPAS and all current certificates can be obtained from the BBA website www.bbacerts.co.uk.

Membership of the Road Surface Treatment Association is available to contractors who have third party quality assurance (BSEN ISO 9001) for the type of Innovative Patching materials they undertake. The unanimous decision of the Association is to adopt this principle as an indication of its commitment to quality in all its undertakings.

“Well Maintained Highways”, the Code of Practice for Highway Maintenance encourages requirements for Quality Assurance and ADEPT recommends that its members have specifications which require registration under the relevant Sector scheme.

1.5 Planning and Co-ordination

Careful and detailed planning before work commences is an essential element of successful Innovative Patch Repair. There should be close co-ordination between contractors and their clients at every stage, commencing with a pre-works meeting, the purpose of which is to ensure total understanding of the way that the programme will proceed and to confirm suitability of the Innovative Patch Repair for each site. Ideally the client officer overseeing the Planning and Co-ordination of the works will have a clear understanding of the Innovative Patch Repair with its advantages and limitations and will have attended the RSTA Toolbox Training course.
It is in the interests of both contractors and clients that the programme of works flows smoothly from site to site without the need to travel many miles for the purpose of repairing one or two defects on a road.

2 TRAFFIC MANAGEMENT REQUIREMENTS

Traffic management must be managed by suitably qualified contractors in accordance with Chapter 8 Road Signs manual. Contractors will be able to provide evidence of appropriate training and qualifications in accordance with Sector Scheme 12 for Traffic Management.

3 DETERMINING THE SPECIFICATION

3.1 All Innovative Patching materials and processes can be specified in accordance with clause 946 www.dft.gov.uk/ha/standards/mchw/index.htm and also the HMEP Clause 946SR in Guidance for the Development of Standard Specification and Standard Details for Local Highway Maintenance Contracts Version 1 October 2012 published by the DfT.

3.2 The selection of the right type of patching techniques to be used in highways maintenance depends on the depth and the type of defect. Each site must be considered in the light of its unique characteristics, including nature of surface, geography, volume/speed of commercial and other traffic using the section of road.

4 SITE INFORMATION

The client determines the program of work and the contractor decides on a site by site basis whether the process is suitable. If for whatever reason the process is unsuitable the contractor shall consult with the client.

Information required from client for Traffic Management purposes includes the following;

4.1 Traffic flow data

This includes such factors as high peak hour flows, high percentage of LGV’s etc

4.2 Road Layout

This identifies the type of road under consideration e.g. whether it is an 8 metre wide main road with or without major junctions, or a single lane width country lane.

It is important that the client in charge of Innovative Patching materials programme fully understands the process and the type and extent of the work required.
5 PLANNING AND EXECUTION

5.1 Type of Control

The information from 4.1 and 4.2 will give the input necessary to decide the general type of traffic control required, e.g. restricted working hours, maximum site length, availability of alternative routes, advance public warning required. Narrow lanes may require to be temporarily closed or advance warning of delays given.

5.2 Stop and Go signs

The operators of these signs hold the appropriate qualification to operate the stop and go system, be in two way radio communication with one another and one of the operators should be nominated to have overall control of the traffic flow arrangements.

On roads where it is not possible to provide the desirable sideways safety zone between the plant/operatives and moving traffic, the speed of the passing traffic should be restricted to a maximum of 10 m.p.h.

5.3 Traffic Regulation Orders (TRO’s)

This is a legal process to allow the closing of roads or imposing a mandatory speed limit and needs to be arranged well in advance of the planned works by the local highway authority.

5.4 Road Markings

Where junction markings are going to be removed by Innovative Patching materials the client must be informed so that the appropriate warning signs can be provided until such a time when the road markings are replaced.

5.5 Safety Zones

Consideration must be taken at the design stage due to plant size and equipment, to achieve minimum safety zones according to Traffic Signs Manual Chapter 8 and a risk assessment approach adopted.

5.6 Temporary Diversions

Temporary diversions should not be introduced casually and will involve consultations between contractors and the highway authority. Legal processes often need to be followed to arrange closures or diversions.

5.7 Publicity

Poor planning can result in low daily output, increased costs and public criticism. Supervisory staff will give proper consideration to the order in which various sections are treated, the number of vehicle movements transporting materials to the site. Leafleting the public and street notification/signing in advance will help to inform the public of intended works and hopefully minimise criticisms.
6. INSTALLATION

The appendices provide detailed technical information regarding the installation of Innovative Patching systems.
APPENDIX A

SPRAY INJECTION PATCHING

1 CONTROLLING MATERIAL INSTALLATION

Technical Specification

Spray Injection Patching is a semi-permanent fast and economic alternative to conventional reinstatement patching. Examples of the typical Spray Injection Patching machines are photographed below. Please note that both of these systems are able to carry out similar repairs:

![Spray Injection Patching Machines](image1.jpg)

Typical materials used are:

- Binders – used for Spray Injection Patching are cationic bituminous emulsions in nature and comply with the requirements of BSEN 13808:2005. Spray Injection Patching machines generally use either 60 or 70% bitumen emulsion bond coats, applied either hot or cold. Polymer modified binders can be used if the contractor feels he needs a higher level of performance, particularly on high stressed sites or for less embrittlement. Some emulsions are available in summer and winter grades. Consideration should be given during the planning stages of the program to traffic volumes, road type, skid resistance requirements, weather, and future resurfacing plans as these may all affect the binder selection.

- Aggregates – used comply with BSEN13043 and are selected dependent on end use, in particular the site’s PSV requirements which are typically PSV of 56. The designer of the Spray Injection Patching asphalt mixture shall select suitable aggregate sources and sizes to ensure the installed product will be durable.
Assessment and Technical Investigations

The following is a summary of the Spray Injection Patching process.

**Use**
The Spray Injection Patching process is satisfactory for use as a semi-permanent road repair to highway defects such as pot-holes, haunching, cracks and crazing and pre surface dressing patching. It is particularly suitable for remedial works to the rural network.
Practicability of installation
The Spray Injection Patching produces material in a continuous controlled operation. Spray Injection Patching should only be installed by operatives and supervisors that satisfy the requirements of 1.3.

Traffic Management
The Spray Injection Patching Process requires appropriate traffic control as and when deemed necessary by the Highway Authority or as a result of a Risk Assessment by the Contractor. This shall be carried out in accordance with National Highway Sector Scheme 12.

Weather Considerations
Work should be carried out when the road temperature is 5°C and rising and below approximately 45°C depending on the binder being used. Some manufacturers produce both polymer and non-polymer modified winter and summer blends therefore it is vital that the material supplier or contractor provides installation guidelines and that the recommendations are followed.

On-site road surface temperatures and relative humidity should be recorded daily (AM and PM). This may be used to ensure correct Spray Injection guidelines are being followed.

Spray Injection Patching should not be executed during rainfall, however, it is possible to commence with works on a damp substrate subject to Spray Injection Patching guidelines being met. Furthermore, standing water will be blown away using the machines high pressure air or alternatively may be swept from the defects prior to repairs taking place. If rain is expected, it is advised to work on higher volume traffic sites and do not do repairs with large surface areas.

Preparation
High Volume air is used to remove all dust and debris from the area to be repaired before an application of a high pressure bond coat is applied to seal the entire area. Road preparation is important to avoid de-bonding failures. Mechanical sweepers are used to clean the road surface before Spray Injection Patching is carried out. In
extreme conditions such as heavy soiling additional measures may be required including the removal of loose material, vegetation, moisture and debris to the defect.

**Addition of bitumen emulsion and asphalt**
The Bitumen emulsion bond coat should be introduced into the air stream enabling it to be forced into every crack and crevice to improve the adhesion of the bond coat while at the same time sealing the repair and the road base from further water damage.

The bitumen emulsion and an approved aggregate are delivered by the application tube, then immediately sprayed into the void at high speed. The new material is keyed into the existing surface.

**Compaction**
Compaction is not normally necessary as material compaction is part of the process however it may be required dependant on the type of environment the Spray Injection Patching Machine has been used in. Loose chippings larger than 6 mm can cause vehicle damage and should be removed as soon as possible following treatment by light sweeping.

The Client shall state whether compaction is required for that product laid on that particular class of road or footpath to ensure the correct finish and a durable product. Compaction by a vibrating plate is often used for heavier trafficked applications and on sites with turning traffic.
2 SPECIFICATION INSTALLATION

2.1 Installation Checks by the Client

All the materials required for the Spray Injection Patching process are delivered and stored in appropriate convenient locations close to the site. Material requisitions are raised and records are retained on the project file in accordance with the Installers ISO9001 Quality Control System and NHSS13.

The contractor should be able to demonstrate that the machines have been regularly serviced and maintained to ensure consistent material application rates. In addition, material quality control procedures must be in place.

The surface to be treated should be in a clean condition prior to the commencement of Spray Injection Patching work. If the site is not too dirty the Spray Injection machine can blast air and clean dust and debris from the site prior to application.

The Contractor should liaise with the Client regarding adequate surface preparation prior to installation in order to achieve superior adhesion. The following must be considered:

- The clearing of mud deposits at road edges (evident on country lanes),
- The sweeping of roads if necessary,
- The removal of all temporary repair materials on site as Spray Injection repair materials laid over these may sink into the temporary repair, e.g. deferred set macadams containing soft binders,
- The removal of thermoplastic road markings,
- The masking of ironwork, if a repair is to be carried out within the immediate vicinity,

2.2 Installation Checks by the Installer

The installer as part of his quality control procedures carries out the following checks:

Aggregates: Check delivery tickets, visually inspect the material as described in the quality plan.

Emulsion: Check delivery tickets, visually inspect the material as described in the quality plan, and take a sample for reference in case of doubt. These should also be stored in line with Oil Drum Regulations.

Recommended application rates of litres of emulsion used per cubic metre of material must also be recorded and be within the guidelines given for the chosen aggregate or aggregates used.
3 METHOD OF WORKING

The Spray Injection Patching Machine size and type is of major importance in assessing the following, due to the varying machine configurations available in the market.

On single carriageway trunk and principal roads, Spray Injection Patching falls into the category of “mobile works”. Under this type of working, traffic will be controlled by the use of stop and go signs as described in Section 8. The length subjected to this operation should be kept as short as possible consistent with safety requirements. Experience suggests that the safest method of operation is to treat one half of the road for the total length of the section. Traffic should be controlled to allow all plant and equipment to turn safely and position itself to treat the second half of the road.

Most contractors prefer to operate in the same direction as normal traffic movement. The decision on the direction of travel to be adopted will depend upon such factors as the speed of traffic and the visibility available. The direction of operation selected should form part of the risk assessment for each particular section of road.

On minor roads, a decision will be required at the initial planning stage as to whether or not the road is to be treated in one pass. The direction of working under these circumstances is probably not important.

Where the whole width is not to be treated in one pass and one way traffic operation past the Spray Injection Patching process is contemplated, it is essential to ensure that the width of road available to passing traffic is not less than the desirable minimum of 3.25 metres or the absolute minimum of 3 metres set out in paragraph 2.5.1.6 of Chapter 8 of the Traffic Signs Manual. Where these widths are not available, the interests of safety suggest that it is preferable to divert traffic away from the road, subject to a risk assessment and length of the diversion that would be necessary. However due to the speed of the process, mobility of the machine and anticipated traffic it may be possible to move the machine to the nearest parking place to allow traffic to pass. Where a road is to be temporarily closed to allow Spray Injection Patching operations to be carried out safely, proper contingency arrangements must be made to allow for the passage of emergency vehicles.

This covers single carriageway roads:

a) Over 7.3m wide
b) 6.0m – 7.3m wide
c) Under 6.0m
d) After completion of treatment, prior to final sweeping and relining.
4 LIMITATIONS

Understanding the limitations of the Spray Injection Patching process is key to the success and quality of the repairs carried out.

Contributory factors for repair failure;

- Incompatible material selection
- Operatives not trained and competent
- Repair mixture outside of specification
- Inclement weather immediately after application
- Incorrect Process Selection
- Road and Air Temperatures too high or low
- Quality control checks not carried out
- Aggregate contamination either on delivery or once delivered
- Binder outside of specification
- Lack of compaction where required.

None of these should occur with Contractors carrying out work in accordance with these guidelines.
Pre-Contract Checklist

1. Has the contractor all relevant site information i.e. location of schools, bus route, market days, events etc.?

2. What type of traffic control is to be operated and is there enough labour to carry out the works in a safe and proper manner?

3. Have all labour received the appropriate training?

4. Has the correct and adequate plant been allocated as required under the contract?

5. Are the materials specified under the contract available when required?

Site Checklist

6. Has the road been swept if required?

7. Is the road clear of parked vehicles or any other obstructions?

8. Are the correct signs in place?

9. Are the operatives all present and correct and wearing the relevant Personal Protection Equipment?

10. Is all the plant present and in safe working order?

11. Are there enough materials available, in good condition, at the correct storage area?

12. Are the weather conditions appropriate to commence work i.e. check forecast daily for high humidity levels, air temperatures and rain?

13. Is the planned method of operation safe, both to the operatives and the public?

14. What type of traffic control is to be implemented and does everybody understand the method of operation?

Post Contract Checklist.

15. Have arrangements been made for post-contract inspections and any required further sweeping?

16. Are signs being maintained in a satisfactory condition and placement and removed when required?

17. Is the required contract information being collected and documented?

18. Are re-inspection arrangements clear and agreed?
APPENDIX B – THERMAL PATCH REPAIRS

1 CONTROLLING MATERIAL INSTALLATION

The Thermal Repair Process must be undertaken in accordance with the Highway Authorities’ Product Approval Scheme (HAPAS) by the British Board of Agrément (BBA). The HAPAS Certificate of Agrément summarises the following;

Technical Specification

The Thermal Road Repair system is a permanent road repair system for surface course defects that re-heats and recycles the existing in-situ material using a Thermal heater.

Additional materials are added when necessary to facilitate the repair of the road surface.

The products used are:

• Bitumen emulsion — a proprietary bitumen emulsion, mixed into the re-heated surface before compaction.

• 0/6 mm or 0/10mm asphalt — two proprietary bitumen emulsion asphalts, mixed into the surface before compaction to ensure finished surface levels are restored.

• Coated chippings — the types and sizes of coated chippings is determined by the site-specific requirements, including location and contractual requirements for polished stone value (PSV); texture depth and/or other properties of the existing surface course.

Delivery and site handling

The component products packaging, weight and classification under The Chemicals (Hazard Information and Packaging for Supply) Regulations 2002 (CHIP3) are given in Table 1. Normal precautions are required when handling these types of products, i.e. wear suitable protective clothing and gloves.

Table 1 Component weight, packaging and CHIP3 classification

<table>
<thead>
<tr>
<th>Component</th>
<th>Weight/package type</th>
<th>Storage temperature (°C)</th>
<th>CHIP3 classification</th>
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<tr>
<td>Bitumen emulsion</td>
<td>25 litre drums</td>
<td>&gt;2&lt;90</td>
<td>Irritant</td>
</tr>
<tr>
<td>0/6 mm and 0/10mm asphalt</td>
<td>25 kg bags</td>
<td>&gt;0</td>
<td>Irritant</td>
</tr>
<tr>
<td>Coated chippings</td>
<td>25 kg bags</td>
<td>&gt;0</td>
<td>–</td>
</tr>
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Assessment and Technical Investigations

The following is a summary of the assessment and technical investigations carried out on the Thermal Road Repair System, HAPAS Requirements and Design.

Considerations;

**Use**
Thermal Road Repair System is satisfactory for use as a permanent road repair of highway surface course defects such as pot-holes, chipping loss, joint failures, consequential damage and surface cracks on asphalt surfaces. The heating process enables us to rework 20-30mm of the existing surface course.

**Practicability of installation**
The system is installed solely by contractors approved by the Certificate holder using specialised equipment in accordance with Certificate holder’s laying procedure.

**General**
The Thermal Road Repairs should only be installed by installers who have been trained and appointed by the Certificate holder.

**Traffic Management**
This should be in accordance with Department of Transport Traffic Safety at Street Works and Road Works Code of Practice and the following regulations:

- The Health and Safety (Safety, Signs and Signals) Regulations 1996

Traffic control is also a vital element of aftercare. On main road sites and points of particular stress, it is essential that personnel should stay to control traffic until such time as the treatment has settled down.

**Weather Considerations**
Use of the Thermal Road Repair system should be suspended during periods of continuous or heavy rain. Any free-standing water should be brushed away from the area prior to repair. The system should not be used when the air temperature falls below 0°C in anything other than calm, dry conditions. Use of the system should cease in all conditions when the air temperature falls below –3°C.
**Preparation**
The defective road surface is heated in accordance with the BBA Agreement Certificate using the Thermal heating equipment. Once the heater is removed the material temperature is then measured and recorded.

When the surface has been heated to the required temperature, a joint of 50 mm inside the perimeter of the heated area is cut into the surface by hand.

The surface is then raked thoroughly to expose the maximum surface area within the material.

**Addition of bitumen emulsion and asphalt**

**Bitumen emulsion**

When necessary, bitumen emulsion is applied to the heated surface and raked in thoroughly with the existing material, prior to compaction.

The addition of the emulsion is dependent upon the visual condition of the asphalt at the time of the repair. The installer completes a visual inspection of the asphalt at the time of repair and uses the results of this inspection to determine if additional emulsion is needed to be applied to the surface.
Asphalt

Additional asphalt mixture is added when necessary to ensure satisfactory finished levels.

When required, coated chippings are applied to the surface taking care to ensure the finished texture level is achieved.

Temperature Reading

A temperature reading is taken of the repair to ensure it is between 80°C to 90°C and therefore ready for compaction. This is recorded.

Compaction

Thermal Road Repairs are fully compacted immediately using conventional compaction equipment, as contained within BBA Agreement Certificates.
After-care

Visual checks for uniform surface texture, blemishes and any discernible faults are conducted by the installer and any remedial works carried out as necessary.

During the cooling period no disturbance or trafficking of the system is permitted. The repair can generally be trafficked within an hour in the UK climate.

2 JOINTS

The Thermal Road Repair process provides a permanent seamless repair thus avoiding joints which are the potential point of weakness of the traditional pavement repair process. Thermal repairs can be undertaken across the pavement and do not have to avoid the wheel tracks of vehicles. The below photos illustrate a thermal repair immediately after completion, and one year after completion.

3 BINDERS

Binders used for Thermal Road Repairs are proprietary bitumen emulsions and must comply with the requirements of BS EN 13808 : 2005.

COSSH Assessments and Material Safety Data Sheets should be available to all persons occupational exposed to the Binders.
4 AGGREGATES

The levels and classes for aggregate properties shall be chosen from the appropriate properties and categories in BS EN 13043:2002 *Aggregates for bituminous mixtures and surface treatments for roads, airfields and other trafficked areas*.

5 ROLLERS AND ROLLING

Completed Thermal Road Repairs should be compacted in accordance with the BBA Agreement Certificate. Whilst the use of Pedestrian Rollers are not subject to CSCS qualifications, appropriate training must be provided to Roller Operators who should be deemed competent by their Supervisor before operating this type of plant.

6 SWEEPERS AND SWEEPING

Mechanical sweepers are not required as part of the Thermal Road Repair process, however the damaged areas should be hand swept to remove any debris or dust prior to undertaking the repair. Surplus chippings that can cause vehicle damage should be removed on completion of the repair, before opening the carriageway.

7 ALL PLANT

The noise levels of all plant should be ascertained from manufacturers or suppliers. If they are not available, the user must take measurements themselves and, ensure that all operators are provided with the correct hearing protection, where necessary. All plant and vehicles should be adequately maintained with regular inspection reports available in accordance with the Provision and Use of Work Equipment Regulations.

8 METHOD OF WORKING

On single carriageway trunk and principal roads, Thermal Road Repairs fall into the category of “mobile works”. Under this type of working, traffic will be controlled by the use of narrow lanes or stop and go signs as described in Section 7. The length subjected to this operation should be kept as short as possible consistent with safety requirements. Experience suggests that the safest method of operation is to treat small areas at a time. Traffic should be controlled to allow all plant and equipment to operate safely and position itself to treat the road. Most contractors prefer to operate in the same direction as normal traffic movement. The decision on the direction of travel to be adopted will depend upon such factors as the speed of traffic and the visibility available. The direction of operation selected should form part of the risk assessment for each particular section of road.

Where one way traffic operation past the Thermal Road Repair is contemplated, it is essential to ensure that the width of road available to passing traffic is not less than the desirable minimum of 3.25 metres or the absolute minimum of 3 metres set out in paragraph 2.5.1.6 of chapter 8 of the Traffic Signs Manual. Where these widths are not available, the interests of safety suggest that it is preferable to divert traffic away from the road, subject to a risk assessment and length of the diversion that would be necessary. Where for this purpose a road is to be temporarily closed to allow Thermal Road Repair operations to be carried out safely, proper contingency arrangements must be made to allow for the passage of emergency vehicles.
9 SITE SELECTION

Dependant on circumstances and client requirement, the Thermal Road Repair system can be used in both short term and long term instances. The photographs displayed below identify sites where the Thermal Road repairs may be used as a temporary solution to an issue which goes over and beyond repairs to the surface course:

- Extensive cracks and crazing
- Heavy deterioration
- Underlying Structural Issues
- Poor Substrate/delamination

The photographs displayed below identify sites where the Thermal Road Repair term may be used as a permanent solution to a surface course defect issue. These include the following:

- Surface course defects (as part of preventative maintenance / surface dressing programme)
Consequential damage

Footpath repairs

Joint Failures

Around Ironwork

Adding in Coated chippings

Re-heating and re-working
10 AFTERCARE

A good Thermal Road Repair, using all the right materials, equipment and procedure, is easily spoilt or totally ruined by lack of aftercare. Once a Thermal Road Repair has cooled down and stabilised it can cope with traffic stresses.

Before dealing specifically with the protection of Thermal Road Repairs and with aftercare and sweeping, it is worth noting a few elements of good housekeeping, which contribute to the creation of a successful treatment:-

1 Visual checks for uniform surface texture, blemishes and any discernible faults are conducted by the installer and any remedial works carried out as necessary.
2 Any accidental spillage of material onto parts of the carriageway which are not being treated or onto the kerb face, should be dealt with immediately. The longer they are left the more difficult it is to remove them.
RSTA Code of Practice for Innovative Patching Systems

Pre-Contract Checklist
1. Is the site suitable for the Thermal Road Repair treatment?
2. Has the approved contractor been certified in accordance with BBA Hapas?
3. Has the contractor got all the relevant site information i.e. location of schools, bus route, market days, events etc.?
4. What type of traffic control is to be operated and will the works be carried out in a safe and proper manner?
5. Have all labour received the appropriate training?
6. Has the correct and adequate plant been allocated as required under the contract?
7. Are the materials specified under the contract available when required?

Site Checklist
8. Has the area that will be repaired swept and cleared of rubbish?
9. Is the road clear of parked vehicles or any other obstructions?
10. Are the correct signs in place?
11. Are the weather conditions appropriate to commence work i.e. no heavy rain / running water?
12. Are the operatives all present and correct and wearing the relevant Personal Protection Equipment?
13. Is all the plant present and in safe working order?
14. Is there enough material to complete the job?
15. Is there enough gas to complete the job?
16. Has the compaction equipment got enough fuel/water to complete the job?
17. Is the planned method of operation safe, both to the operatives and the public?
18. Have the hotboxes been turned on and are they up to temperature?
19. Has everything that has been taken out of the repair vehicle positioned correctly?

Post Contract Checklist.
20. Have arrangements been made for post-contract inspections of the repairs and after photos been taken?
APPENDIX C

GLOSSARY OF TERMS

ADEPT

Association of Directors of Environment, Economy, Planning and Transport, previously known as the County Surveyors Society (CSS).

ADHESION

The property by means of which a binder sticks to the surface of a solid body, e.g. the road or chippings.

AGGREGATES

Aggregate from mineral sources which has been subjected to nothing more than mechanical processing and which has a particular grading.

AGGREGATES STORAGE AREA

A suitable hard standing for storing graded aggregate.

APPLICATOR

A purpose built innovative patching machine.

BINDER

Material serving to coat the particles of an aggregate and to assure its cohesion. The binder component of innovative patching is a bituminous emulsion which may be modified with polymer or other additives.

BINDER CONTENT

Difference between 100% and the percentage water content determined in accordance with BS EN 1428. (BS434-2).

BITUMEN

Virtually in-volatile, adhesive and waterproofing material derived from crude petroleum, or present in natural asphalt, which is completely or nearly completely soluble in toluene, and very viscous or nearly solid at ambient temperatures.

BITUMEN - MODIFIED

Bituminous binder whose rheological properties have been modified during manufacture by the use of one or more chemical agents. In this context, "chemical agent" includes natural rubber and synthetic polymers but not sulphur and certain organo-metallic compounds, oxygen or oxidation "catalysts" such as ferric chloride, phosphoric acid and phosphorus pentoxide. Fibres and inorganic powders ("fillers")
are not considered to be bitumen modifiers. In innovative patching techniques modified bitumens are employed in the form of emulsions.

**BITUMEN – EMULSION**

Liquid product in which a substantial amount of bitumen is suspended in a finely divided condition in an aqueous medium by means of one or more suitable emulsifying agents

**BOND**

The adhesion between the patch repair material and the underlying substrate.

**BREAK (EMULSION)**

The coagulation of the dispersed bituminous phase of an emulsion when in contact with mineral aggregate.

**BSI**

British Standards Institution.

**BSEN 13808:2005**

A Framework product standard for specifying cationic road emulsions.

**BSEN 13043:2002**

European Product Standard for Aggregates for bituminous mixtures and surface treatments for roads, airfields and other trafficked areas.

**CATIONIC BITUMEN EMULSION**

Emulsion in which the cation of the emulsifier is at the interface with the bitumen particle that is positively charged and in which the aqueous phase is normally acid.

**MANUAL OF CONTRACT DOCUMENTS FOR HIGHWAY WORKS (MCHW) VOLUME 1 SPECIFICATION FOR HIGHWAY WORKS SERIES 900**

Road pavements – bituminous bound materials.

**COST LIFE INDEX**

The cost (in this case of innovative patching) expressed as the cost per square metre divided by the service life.

**DURABILITY**

Ability of a product to maintain its required performance, under the influence of foreseeable actions, for a reasonable economic working life.
JOINTS

Longitudinal or horizontal lengths along or across the pavement surface.

LAYING RECORD

A documented record providing details of the innovative patching process as laid.

MASK

An adhesive barrier tape or other similar material used to cover cat’s eyes, road ironwork, etc to prevent contact with the innovative patching materials during installation such that after removal these objects remain free from contamination and in full working order.

MIX DESIGN

A laboratory process for determining the optimum combination of innovative patching mixture components necessary to achieve the desired level of in service performance.

NVQ

National Vocational Qualifications (NVQ’s) are work based awards in England, Wales and N.Ireland that are achieved through assessment and training. In Scotland they are known as Scottish Vocational Qualification (SVQ).

To achieve an NVQ, candidates must prove that they have the ability (competence) to carry out their job to the required standard. NVQs are based on National Occupational Standards that describe the 'competencies' expected in any given job role. Typically, candidates will work towards an NVQ that reflects their role in a paid or voluntary position. For example someone working in an admin office role may take an NVQ in Business and Administration. There are five levels of NVQ ranging from Level 1, which focuses on basic work activities, to Level 5 for senior management.

POLISHED STONE VALUE (PSV)

A relative measure of the extent to which different types of aggregate in the surface course will polish under traffic.

PTR

An abbreviation for pneumatictyred roller used to compact innovative patching materials to achieve a denser more durable finish.

QA

An abbreviation for Quality Assurance.

QUALITY ASSURANCE

Quality assurance, or QA for short, is the systematic monitoring and evaluation of the
various aspects of an innovative patching operation to maximize the probability that minimum standards of quality are being attained by the production process.

Registration to BSEN ISO 9001 given to a contractor by a certification body indicates minimum standards are being attained.

ROLLER

Mobile plant/equipment used to compact innovation patching materials.

RSTA

The Road Surface Treatments Association is the trade body representing the road surface treatments industry. www.rsta-uk.org

SECTOR SCHEME

National Highway Sector Schemes are bespoke management schemes within an ISO9001:2000 framework. Each scheme is managed by a separate technical advisory committee made up of representatives from across the sector, regulated by UKAS.

THERMOPLASTIC

A term used to describe the materials used in most road markings and overbandings.

TRAFFIC SIGNS MANUAL

Regulatory guidance on the use of traffic signs at mobile works. Traffic Signs Manual Chapter 8: Traffic Safety Measures and Signs for Road Works and Temporary Situations.

UKAS

National Measurement Accreditation Services.
APPENDIX D

REFERENCES

  - HD 24/06 Traffic assessment (DMRB 7.2.1).
  - HD 28/04 Skidding resistance (DMRB 7.3.1).
  - HD 36/06 Surfacing material for new and maintenance construction (DMRB 7.5.1).
  - HD 37/99 Bituminous surfacing materials and techniques (DMRB 7.5.2).

  - Volume 1: Specification for Highway Works (MCHW 1)  
    www.dft.gov.uk/ha/standards/mchw/vol1/
  - Volume 2: Notes for Guidance on the Specification for Highway Works (MCHW 2)  
    www.dft.gov.uk/ha/standards/mchw/vol2/

BRITISH STANDARDS INSTITUTION Bitumen Road Emulsions – Part 2: Code of Practice for the use of Cationic Bitumen Emulsions in roads and other paved areas.

BRITISH STANDARDS INSTITUTION Aggregates for bituminous mixtures and surface dressings for roads, airfields and other trafficked areas. BS EN 13043.


APPENDIX E

FEEDBACK ON THIS DOCUMENT

Any observations, feedback or complaints relating to the content of this document or the process described herein should be addressed (using the form below) to:

Chief Executive
The Road Surface Treatments Association
Westwood Park
Little Horkesley
Colchester
Essex
CO6 4BS

Email: enquiries@rsta-uk.org

Tel: 01206 274052

Issue Identified:

Suggested Action:

Name:

Organization:

Address:

Contact details:

Date: