

**Issue Details**

Standard Ref:	P&E/312
Title:	Control, Safe Use and Operation of Abrasive Wheels, Disc Cutters and Grinders
Issue Number:	2
Issue Date:	12/09/2011
Standard Owner:	David Philpott, Professional Head of Railway Engineering

**For the attention of**

Assistant Project Managers (Technical), CEMs, CREs (P Way and others), Delivery Managers, Engineering Managers, Foreman, Gang Staff (who hold competency), Plant Managers and Operatives, Project Managers, Small Plant & Equipment Asset Manager, Supervisors, Welders, Welding Managers

**Purpose**

The purpose of this standard is to detail VolkerRail mandatory requirements for the operation of portable and supported disc cutting and grinding machines, fixed grinding machines located in depots and workshops and all associated abrasive wheels. This is to achieve compliance with legislation, good safety practice and facilitate safe methods of work.

Abrasive wheels are dangerous, due to the risk of bursting at high speed, and the emission of particles of heated grinding debris.

Every abrasive wheel has a maximum permissible speed which must not be exceeded otherwise the wheel may disintegrate. Every grinding/cutting machine must have its measured speed displayed. The maximum permissible speed of the abrasive wheel fitted must always exceed the speed displayed on the machine.

**Scope**

This standard applies to all VolkerRail work sites whether as main or sub contractor. In the event that a specific client has their own requirements, those requirements shall take priority over this instruction, provided they require a similar level of control. Where this option is to be exercised, the Engineering Director or Professional Head of Railway Engineering and HSQE Manager shall be formally consulted.

**Summary of Changes**

The standard has been reviewed and updated in line with current legislation, client requirements and changes to Organisations/Roles and Responsibilities within VolkerRail.

**Compliance**

This standard is mandatory across all VolkerRail sites, operations, employees and sub-contractors with effect from date of issue.

The arrangements of this standard are mandatory for all VolkerRail employees and its subcontractors.

**Further Information**

Any issue of clarification relating to this standard should be addressed to the Standard Owner shown above.



# Control, Safe Use and Operation of Abrasive Wheels, Disc Cutters and Grinders

Prepared by	 Professional Head of Railway Engineering
Approved by	 Engineering Director
Accepted for issue	 Performance & Standards Manager

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### Issue Details

This document will be updated when necessary by distribution of a complete replacement.

Amended or additional pages will be marked by a vertical black line in the adjacent margin.

<b>Issue No.</b>	<b>Date</b>	<b>Details of Change</b>
1	Oct 2008	This is a new Group Standard. This document was previously issued in Engineering & Safety Manual as 'E&SM 312' (this should be removed and destroyed). This document has been modified and is now part of the VolkerRail Group Standards.
2	12/09/2011	The standard has been reviewed and updated in line with current legislation, client requirements and changes to Organisations/Roles and Responsibilities within VolkerRail.

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**Appendices**

- A Samples of required Legislative Signs
- B Abrasive Wheel Marking System
- C Types of Abrasive Wheels

**Associated Forms**

None

**1. Purpose**

The purpose of this standard is to detail the VolkerRail management arrangements for the operation of portable and supported disc cutting and grinding machines, fixed grinding machines located in depots and workshops and all associated abrasive wheels.

The arrangements demonstrate the company’s compliance with UK legislation and demonstrate good safety practice and facilitate safe methods of work.

**2. Scope**

This standard applies to all VolkerRail work sites and **Operatives** whether as main or sub contractor and workshops. Client requirements may take priority over this instruction provided they require a similar or higher level of control. Where this option is to be exercised, the **Professional Head of Railway Engineering / Engineering Director** and **HSQE Manager** shall be formally consulted.

**3. Compliance**

This standard is mandatory across all VolkerRail sites, personnel and operations with effect from 12/09/2011.

Compliance with the requirements of this standard is necessary to enable the company to meet its responsibilities under current legislation.

All staff that manage, supervise and/or carry out work associated with this standard have a legal obligation to comply with the specified arrangements herein.

**4. Definitions and Abbreviations**

Abrasive Wheel	A wheel consisting of bonded abrasive particles, or coated with abrasive particles, which are used for any grinding or cutting operation.
	The term ‘abrasive wheel’ applies to the discs used on disc cutters and grinders, as well as the conventional grinding wheel and all other wheel types (including cup and saucer wheels).
Abrasive	Means the abrasive used in the wheel construction, Aluminium Oxide is expressed as A, Silicon Carbide as C. See Typical Wheel Markings
CEWA	Civil Engineering Workplace Assessment or later Competence Standard required according to CMS or TAP
CMS	Competency Management System
Fixed Machine	A machine that is securely attached to a bench/foundations.

Grade structure and bond type	The grade refers to the way the grains are held together in the abrasive wheel with "soft" wheels and "hard" wheels, expressed in letters from A (soft) to Z (hard). The Bond refers to the way the grains are structured in the wheel, expressed in various letters e.g. V for vitrified.
Grain size	Means the sizes of abrasive particle used as cutting grain. The range of sizes is expressed as numbers which go from 8 (coarse) to 600 (very fine).
Method Statement	Includes Method Statement, Site Specific Addendum, Work Package Plan, Task Briefs or Tool Box Talk etc as appropriate constituting a Safe System of Work.
Portable Machine	A machine which is totally supported by hand during the whole of the machine cycle (but may have a support arm).
S&C Manager	Safety & Compliance Manager
SMOW	Safe Method Of Work  – Possession as protection shown – SSOW G  - Working under Lookout protection shown – SSOW R
Supported Machine	A machine that is firmly attached to an approved clamp, which itself is positively and rigidly attached to the work piece.
Typical wheel markings	51* A 36 L 5* V 23* (*Optional symbols)  A-Aluminium abrasive, 36-Medium grain, L-Medium grade, V-Vitrified bond.

**5. References**

**Legislation:**

ROGS – Railway and other Guided Transport Systems (Regulations)

The Provision and Use of Work Equipment Regulations 1992

The Supply of Machinery (Safety) Regulation 1992

The Health and Safety at Work etc Act 1974

The Personal Protection Equipment at Work Regulation 1992

The Construction, Design and Management Regulations 2007

**British Standards:**

BS 2092- Eye Protection

**Other:**

HSE HS (G) 17- Safety in the use of Abrasive Wheels

RSSB Rule Book

VolkerRail Standard SQE/04 - Accident, Incident, Near Miss Reporting Procedure and Post Event Management

VolkerRail Standard - OHS/02 Hand Arm Vibration Syndrome

VolkerRail Standard - SQE/53 Construction (Design & Management) Regulations 2007 Requirements

**6. Management Arrangements****6.1 Legislative Provisions**

Abrasive wheels are covered by the Provision and Use of Work Equipment Regulations 1992 (SI 1992/2932) and The Supply of Machinery (Safety) Regulation 1992 (SI 1992/3073).

Fixed abrasive wheel machines must be correctly maintained and the relevant statutory notices displayed in accommodation, workshops and depots. There is no requirement to exhibit notices for mobile disc cutter usage.

**6.2 Abrasive Wheels****6.2.1 Mounting of Abrasive Wheels**

Only persons who have been suitably trained and certificated are permitted to mount an abrasive wheel. A specific record of training and certification for this task will not be maintained on the competency database. The training and competency within VolkerRail is included in the specific plant competencies.

Where training is necessary on a number of different machine types a certificate of competence shall be held by the Operator for each type of machine.

Every abrasive wheel has a maximum permissible speed which must not be exceeded otherwise the wheel may disintegrate. Every grinding/cutting machine must have its measured speed displayed. The maximum permissible speed of the abrasive wheel fitted must always exceed the speed displayed on the machine. The speed of the machine shall always be confirmed as less than the speed of the disc before a new disc is fitted to the machine.

**6.2.2 Training for Staff who Mount Abrasive Wheels**

The training shall include suitable instruction in the following matters in relation to each class or description of abrasive wheel for which that person is being trained:

- Approved advisory literature relating to the mounting of abrasive wheels;
- Hazards arising from the use of abrasive wheels and precautions to be observed;

- 
- Methods of marking abrasive wheels as to type, speed and direction of rotation;
  - Methods of identifying abrasive wheels as to the type of material that they are intended to cut;
  - Methods of storing, handling and transporting abrasive wheels;
  - Methods of inspecting and testing abrasive wheels to check for damage;
  - The functions of all components used with abrasive wheels, including flanges, washers, bushes and nuts used in mounting and including knowledge of the correct and incorrect methods of assembling all components and correct balancing of abrasive wheels;
  - Determining the speed of rotation of the machine to ensure compatibility with the abrasive wheel which is to be mounted upon it.

Operators of portable disc cutters must be trained and certificated as competent to change discs 'in the field'. This is included within the VolkerRail training for **CEWA Unit 3A "Cutting and drilling of rails"** and within the competency regime for **Track Welders** and **Assistant Track Welders**.

### 6.2.3 Selection of Abrasive wheels

There are many types of abrasive wheel, it is important that the most suitable one is selected for the job. The wrong type of wheel can be dangerous, as well as leading to extended cutting/grinding time.

Generally soft wheels are preferred on hard material, and hard wheels on soft material. Unsuitable wheels can become "clogged" i.e. the wheel surface chokes up with metal particles. If a wheel was too hard or too fine, 'glazing' would result. This often leads to excessive pressure being used and wheel breakage. If in doubt manufacturers advice should be sought when selecting abrasive wheels.

Abrasive wheels may be of any diameter to suit the machine. The maximum rated speed, as defined on the abrasive wheel by the manufacturer, must always exceed the machine speed on which it is to be used. In all cases a peripheral speed of 100 m/s must never be exceeded. The **SP&E Asset Manager/ Plant Suppliers** must ensure that all VolkerRail grinding/cutting machines have its measured speed displayed.

### 6.2.4 Storage and Handling of Abrasive Wheels

Abrasive wheels must be stored in accordance with any specific storage instructions specified by the Manufacturer.

Where there are no specific storage instructions shown guidance on the detailed arrangements to be applied to the storage of abrasive wheels shall be obtained from the **Engineering Manager, VolkerRail Plant**.



All abrasive wheels are relatively fragile. The following rules should be observed:-

- Wheels shall not be dropped or bumped;
- Wheels shall not be rolled;
- Suitable trucks or conveyors shall be used to transport those wheels which cannot be transported by hand;
- Wheels shall be stored in suitable racks as follows:
  - Plain and taper sided wheels are best supported on edge or on a central support through the centre hole of the abrasive wheel.
  - Wheels on edge should be prevented from rolling and falling sideways;
  - The storage area should be kept dry and not subjected to extreme temperatures.

### **6.3 Disc Cutting & Grinding**

#### **6.3.1 Training for Operators of disc cutting and grinding machines**

Instructions and information on the safe use of abrasive wheels must be given during the training of operators of portable disc cutting and grinding machines and fixed grinding machines.

The training will include general Health & Safety precautions, use of guards, use of PPE, ventilation etc. and training on the type of abrasive wheel in use.

Staff shall be certificated as competent and issued with an appropriate Certificate of Competence, records of which will be maintained by the relevant **Competence Systems Controller** on the training database.

This is included within the VolkerRail training for CEWA Unit 3A "Cutting and drilling of rails" (and subsequent revisions) and within the competency regime for **Track Welders** and **Assistant Track Welders**.

#### **6.3.2 Selection of Disc Cutting and Grinding Equipment**

Only approved disc cutting and grinding equipment appropriate to the task shall be used. Guidance on the application of specific equipment can be obtained from the **Engineering Manager, VolkerRail Plant or PWay Competency Assurance Manager (Projects)**.

#### **6.3.3 Rail Cutting Using Discs**

Only supported machines may be used for serviceable or new rail cutting.

The disc cutting machine shall be mounted using the correct brackets/frame. Unauthorised modifications or repairs to such equipment are prohibited.

**Operatives** must not force the machine/disc as this will lead to cuts which are out of tolerance.

Only scrap rail may be cut without the use of a brackets/frame, but the rail must still be supported correctly to avoid trapping the blade as the cut progresses.

## **6.4 Guards on machinery and stabilisation**

### **6.4.1 Guards**

All grinding machines must be supplied fitted with guards designed to contain the parts should a wheel break or burst. Machines must not be used with any part of the guard system missing or incorrectly fitted.

All machines must be provided with guards which:

- Must be kept in position;
- Shall, so far as is reasonably practicable, be designed to contain every part of the abrasive wheel in the event of a fracture or burst; as well as fragments of material that is being cut.
- Shall be properly maintained;
- Shall enclose the maximum area of the wheel and only expose the minimum necessary for use.

Where adjustable guards are fitted on portable machines, these shall be adjusted by ***the operator*** to give maximum protection to the process.

### **6.4.2 Supports to Machines and Work Pieces**

Additional support to stabilise machines shall be used and always adjusted to be as close as reasonably practicable to the exposed part of the abrasive wheel. Supports shall be properly maintained and secure.

Work pieces shall be adequately supported so that they are stable throughout the process of cutting and evenly supported at a number of locations under the work piece to give even and effective support throughout. This is so that on a typical rail cut, the rail has no prospect of sagging in the area of the cut and settling in a way that will cause the blade to become trapped as an incident would almost certainly occur in such circumstances. This essential requirement shall be considered at the planning / SMOW stage to ensure suitable support is available on site.

## **6.5 Safety Considerations**

### **6.5.1 General**

The operator and others nearby may be exposed to risks from the following: -

- Flying debris;
- Noise;
- Sparks;
- Fire caused by hot products;

- 
- Fumes;
  - Dust;
  - Loose clothing, e.g. Ties and jewellery;

A suitable Safe Method of Work that addresses these factors shall be utilised.

### 6.5.2 Personal Protective Equipment (PPE)

PPE must always be used by the operator and shall comprise flame retardant trousers, boots, gloves, head/ear/eye protection, dust mask as well as relevant Hi Vis equipment. Eye protection shall be to BS2092 Grade 1.

There should be a specified exclusion zone around the disc cutting work in the Safe Method of Work. This shall be not less than 5 metres. Where this is impossible within the job requirements, others working within 5 metres of the activity shall not be "in line" with the disc cutter/wheel to avoid projectiles and shall wear similar PPE to the operator except there is no requirement for flameproof trousers. The PPE, of other workers, may be reduced (only by agreement with **HSQE Manager**) if a fixed screen is proved between the work of cutting and the non involved personnel.

Where members of the Public may approach the worksite, precautions shall be set up so that they are not within 5 metres of the activity whilst work is progressing and work should cease if they are in line with the cut and particle/ spark trail. Strong consideration should be given to use of a screen in these circumstances.

### 6.5.3 Accidents/Incidents Involving Cutting Abrasive wheels

Any accident or incident involving a disc cutter or grinder must be immediately reported to VolkerRail Control Centre. This includes any instance of a wheel fracturing or displacing any part. Statutory reporting requirements will be undertaken by the **HSQE Advisor** or **Performance & Standards Manager** inline with SQE/04.

In this event of an accident/incident, full evidence (including photographic evidence) of the site, exactly as it is at the time of the event must be established. This shall include:

- Details of the machine, damage, Permissible RPM, maintenance validity etc.
- Details of the disc, coding, type, permissible RPM.
- Details of the material being cut and particularly the support arrangement to demonstrate that the wheel will not get pinched as the cut progresses by settlement of the work piece.
- Competence of the individual operator.
- General details of the site.

The machine concerned, together with the abrasive wheel must be withdrawn from use immediately and returned to the **Engineering Manager, VolkerRail Plant**, for investigation and testing.

#### 6.5.4 Vibration Risks to Health

It is possible that prolonged exposure to disc cutting and grinding machinery may cause a risk to health in the form of Hand Arm Vibration Syndrome (commonly known as Vibration White Finger). This is likely only to happen however if there is prolonged use for continuous periods throughout the day, every day. The **Local Manager** shall ensure that usage by an individual is managed in accordance with OHS/02.

Should any **Operator** experience any loss of feeling in the fingers, or observe any 'blanching' of the finger tips then their use of the machine must be discontinued and the matter reported to the **HSQE Manager** and to the **Occupational Health Nurse** who should consider medical examination as appropriate.

#### 6.6 Use of Disc Cutters and Grinders on or about Operational Lines

##### 6.6.1 General

Use of equipment such as disc cutters or grinders on, or near to any line which is open to traffic, without adequate controls in place is not permitted.

SSOW G is the VolkerRail Policy when working on the line using disc cutters or grinders. (See description in SMOW).

Prior to any work starting a suitable and sufficient risk assessment must have been carried out by the **Project Manager / CRE (PWay)** and a detailed method statement prepared, setting out the precise arrangements for the whole process but particularly the Operational Safety arrangements to be applied where adjacent lines may be open to traffic, the safety rules to be applied shall be clearly laid down in the SMOW.

##### 6.6.2 Use of Disc Cutters on Running Lines

**It is strictly forbidden to use a disc cutter on any line which is open to traffic.**

When it is necessary to use a disc cutter on any rail, the line(s) concerned must be blocked in accordance with the RSSB Rule Book or equivalent arrangement for other infrastructures.

##### 6.6.3 Use of Disc Cutters Near to any Line Open to Traffic

VolkerRail policy allows use of a disc cutter in situations near to the running line provided that **all** of the following conditions apply: -

- The disc cutter will not be used on any rail of a line open to traffic;
- The work group is suitably protected in accordance with the RSSB Rule Book (or other relevant Infrastructure Managers rules). The preferred method of protection is SSOW G. Where there is no alternative, SSOW R using lookout warning may be permitted following an appropriate risk assessment which has demonstrated that it is safe to do so and this has been approved by the **HSQE Manager**.

When lookout warning protection is permitted, the following additional instructions apply: -

- Equipment with Lookout Operated Mechanical cut out shall be used as first choice (e.g. "Gifas")
- Nominated Lookouts require LKT(K) endorsement on their competency certificate and trained on the specific equipment to be used.
- Best possible SMOW category for protection from Operational Traffic.
- Sufficient Lookouts must be provided to ensure that all personnel receive sufficient warning of approaching trains, bearing in mind the particular type of operation being undertaken and the warning time required.
- Where necessary sufficient Touch Lookouts are appointed to ensure that the warning of approaching trains is conveyed to each Machine Operator (and other essential personnel nearby) by touch.

#### **6.6.4 Use of Grinders on or near to any line open to traffic**

Grinders may be used on, or near to, a line(s) which is open to traffic, provided that all the following conditions apply: -

- The work party is suitably protected in accordance with the RSSB Rule Book. The preferred method of protection is SSOW G. Where there is no alternative, SSOW R working may be permitted following an appropriate risk assessment which has demonstrated that it is safe to do so and this has been approved by the **HSQE Manager**.

When lookout warning protection is permitted, the following additional instructions apply: -

- Sufficient Lookouts must be provided to ensure that all personnel receive sufficient warning of approaching trains, bearing in mind the particular type of operation being undertaken.
- Equipment with lookout operated mechanical cut out shall be used, where possible, as first choice. This requires the Lookout to possess LKT (K) on his sentinel card.
- Best possible SMOW category.
- Sufficient Touch Lookouts are appointed to ensure that the warning of approaching trains is conveyed to each Machine Operator and other personnel nearby by touch bearing in mind the particular type of operation concerned and the warning time required.

**6.6.5 Training, Competency and Certification**

For cutting/grinding new/serviceable rail, operatives shall be in possession of the relevant VolkerRail Competency Certificate.

Track CEWA 3A (New and Serviceable Rail) or upgrade

Welding included in Welder competency certification

Other Training Certificate/Competency for using the particular cutting or grinding machine

Records of the above training and competencies will be maintained on the company's training database.

Certificates of competency issued to individuals shall have appropriate words to demonstrate the included competency of mounting discs and or abrasive wheels as required by Clients.

**7. Monitoring**

The requirements of this standard may be subject to audit as part of the annual CAT 1 audit programme however, the standard owner must obtain self assurance that the requirements have been implemented through routine inspection/audit.

**8. Retention of Records**

<b>Record</b>	<b>Retained By</b>	<b>Retention Period</b>
Training & Competence	Competency Systems Controller/Archive	T + 40 years
Records as required to satisfy OHS02 exposure limits	Occupational Health/Archive	T + 40 years

### THE ABRASIVE WHEELS REGULATIONS 1970

SI 1970 No. 1161

*(Detailed text of the regulations follows in a dense, small font)*


5 8125

### ABRASIVE WHEELS

#### Dangers and precautions

Be aware of the danger of bursting through:

- 1 Overspeeding**  
The speed of the wheel must not exceed the maximum speed specified on the label.
- 2 Faulty Mounting**  
The wheel must be mounted on a hub which is suitable for the wheel and is in good condition.
- 3 Missuse by the operator**  
The wheel must be used only for the purpose for which it is intended and must not be used for any other purpose.



Always ensure that the guard is in position before setting the wheel in motion.

5 8124

### THE ABRASIVE WHEELS REGULATIONS 1970

FACTORIES ACT 1961  
and certain provisions of the Factories Act 1963  
and certain provisions of the Factories Act 1972

**GROUP A**  
Flammable

**GROUP B**  
Inflammable

**GROUP W**  
Water-soluble

Group	Symbol	Meaning
A	Flame	Flammable
B	Flame	Inflammable
W	Water	Water-soluble

*(Additional technical details and diagrams follow)*

5 8123

**Marking**

12 This should conform to Annex A of BS EN 12413<sup>3</sup> (see Figure 1).

**Maximum permissible speed**

13 The maximum permissible speed in revolutions per minute (rpm) and metres per second (m/s) specified by manufacturers should be marked on every abrasive wheel larger than 80 mm in diameter, or on the blotter or identification label which is sometimes attached to it. Since it is not practicable to mark smaller wheels, the maximum permissible speed in rpm of wheels 80 mm in diameter or less should be stated in a notice posted in a position where it can easily be read. For speeds of 50 m/s and above, colour-coded stripes will appear on the wheel.

**Restrictions of use**

14 Annex A of BS EN 12413<sup>3</sup> and BS ISO 525<sup>5</sup> specify how wheels should be marked to indicate specific restrictions for use. These are:

(a) RE1: Not permitted for hand-held and manually guided grinding;

(b) RE2: Not permitted for hand-held cutting-off machines (see Figure 1);

(c) RE3: Not suitable for wet grinding;



(d) RE4: Only permitted for totally enclosed working area;

(e) RE6: Not permitted for face grinding.



**Shelf life**

15 All organic bonded wheels for hand-held applications will bear a use-by date of three years from the date of manufacture.

**Traceable number**

16 A code number should be marked on the wheel to indicate the source and manufacturing details of the wheel.

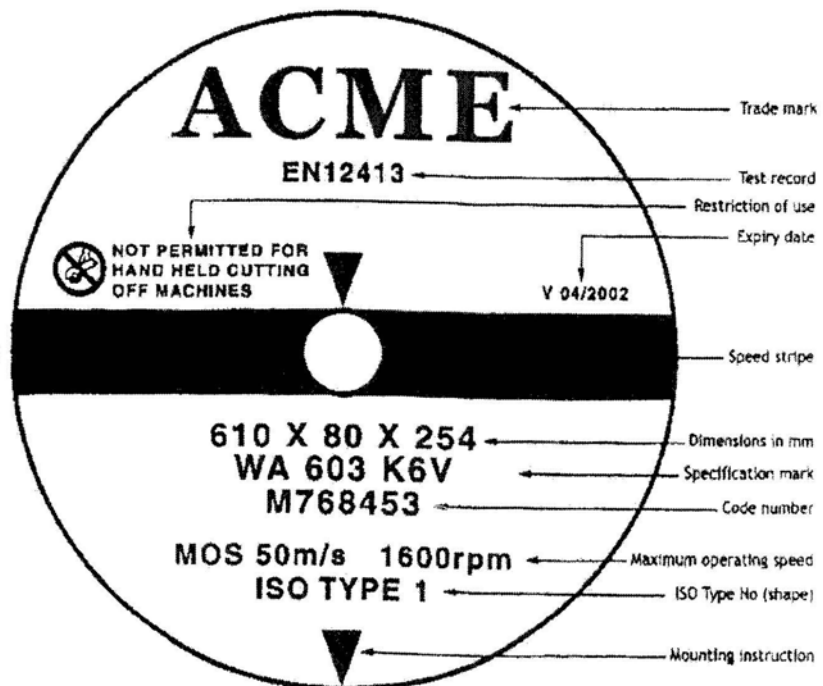


Figure 1 British Standard system for specifying abrasive wheels from BS EN 12413: 1999<sup>3</sup> and BS ISO 525: 1999<sup>5</sup>



Figure 5 Abrasive wheels - types  
(from Table 12 of BS EN 12413: 1993<sup>3</sup>)

