

## The Use of Gypsum to Improve Soil Conditions

### Background

SEPA has previously adopted a Regulatory Position for the use of gypsum derived from waste plasterboard (WST-PS-018). If the processed gypsum has been fully recovered in compliance with PAS109:2008<sup>1</sup>, the subsequent storage, movement and use in plasterboard manufacturing, cement manufacturing, or as a soil conditioner will not be subject to the requirements of waste legislation. This regulatory position remains in place.

There is interest from contractors in applying waste gypsum (i.e. gypsum that does not comply with PAS109) to sites requiring restoration or to agricultural land to improve soil structure, nutrient status and soil pH.

The purpose of this guidance is to summarise the risks from using gypsum on land as a soil conditioner and to outline the controls which apply to the use of waste and non-waste gypsum for these purposes. It applies to all sources of calcium sulphate and is not restricted to waste gypsum from plasterboard processing.

In 2012 SEPA issued guidance advising against the use of waste gypsum and gypsum from waste plasterboard in animal bedding on basis that it may present a serious risk to life<sup>2</sup>. A waste management licence is required for this activity. This guidance has not been withdrawn.

### Introduction

#### Gypsum – background chemistry

Gypsum is the common name of hydrated calcium sulphate. It occurs naturally throughout the world and can also be manufactured through flue gas desulphurisation at power plants or arise as a waste from manufacture of certain acids and fine chemicals. It is commonly used as a building material as plasterboard or blocks and arises as waste during construction and demolition projects.

### Potential Uses of Gypsum

#### Use of Gypsum to improve soil structure

Gypsum will restore or improve soil structure only on areas that have been flooded with sea water. Trials have shown there is no benefit in treating peaty and coarse sandy soils with gypsum to improve soil structure.

Poor soil structure can be attributed to many factors, particularly compaction caused by using heavy plant in wet conditions. In circumstances where sea water contamination is not involved the poor structure conditions will not be improved by the application of gypsum.

#### Use of Gypsum to improve soil nutrient status

Sulphur is an essential nutrient required in all living cells and therefore is vital to build yield and achieve crop quality. Sulphur is taken up by roots as sulphate. Sulphate is highly soluble and most soils store very little sulphate from one year to the next, so there is unlikely to be a nutrient benefit from applying sulphate at a higher rate per year than the crop requires.

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<sup>1</sup> PAS 109:2008 - Specification for the production of recycled gypsum from waste plasterboard

[http://www.wrap.org.uk/sites/files/wrap/PAS109%20\(2013\).pdf](http://www.wrap.org.uk/sites/files/wrap/PAS109%20(2013).pdf)

<sup>2</sup> [http://www.sepa.org.uk/media/156470/wst\\_ps\\_-use\\_of\\_waste\\_gypsum\\_in\\_animal\\_bedding.pdf](http://www.sepa.org.uk/media/156470/wst_ps_-use_of_waste_gypsum_in_animal_bedding.pdf)

The annual requirements of sulphur are relatively low with most crops requiring around 20kg/ha S. In effect this means that application rates of a gypsum source containing 10% S (at 100% dry matter) should not be higher than 200 kg/ha of gypsum. This is equivalent to a maximum allowable rate of 400 kg/ha of gypsum at 50% dry matter.

If other materials being applied to the soil contain sulphur in significant quantities, there will be no need to also apply gypsum.

### Use of Gypsum to improve soil pH

Gypsum has little if any effect on soil pH. It cannot be used as a substitute for lime to correct soil acidity, i.e. it will not raise the soil pH.

### Risks from using gypsum

The use of waste plasterboard, gypsum and gypsum-containing materials together with biodegradable wastes (including farm manures and sewage sludges) can lead to the production of high concentrations of hydrogen sulphide gas. Hydrogen sulphide (H<sub>2</sub>S) is both odorous and toxic.

Anaerobic conditions and therefore the risks of H<sub>2</sub>S odours are much more likely when gypsum is mixed with organic materials which are easily decomposable and have a high BOD, compared to materials with highly stable organic material.

Heavy over application of sulphur may induce copper deficiency in cattle by forming compounds in the rumen which bind copper making it unavailable to the animal.

### Legal controls on application of Gypsum to land

If gypsum has been certified to PAS109 then its use as a soil conditioner ceases to be controlled under waste legislation. However, other legislation applies to the application of fertiliser to land. For example, CAR General Binding Rules apply to the storage and application of fertiliser including a requirement that fertilisers must not be applied to land in excess of the nutrient needs of the crop<sup>3</sup>.

If PAS109 compliant gypsum is being applied as a fertiliser the application rate should not exceed 200 kg/ha of gypsum containing 10% sulphur at 100% dry matter (or equivalent). Other documents that will apply to the application of non-waste gypsum include the Prevention of Environmental Pollution from Agricultural Activities (PEPFAA) Code. This document contains practical guidance for farmers on minimising the risk of environmental pollution from farming operations.

If the gypsum is classed as a waste it will be regulated under the waste management licensing regime. It may be applied to land as an activity exempt from the requirement to hold a licence where there is a benefit to agriculture or ecological improvement. There are two exempt activities which allow the use of calcium sulphate/gypsum:

Exempt Activity Paragraph	EWC Code	Description
7- the treatment of agricultural land where it results in benefit to agriculture or ecological improvement	06 01 99 Waste from the manufacture, formulation, supply and use of acids	Gypsum
	07 07 12 Waste from the manufacture, formulation, supply and use of fine chemicals and chemical products not otherwise specified	Sludges from on-site effluent treatment other than those containing dangerous substances
	10 13 04 Wastes from manufacture of cement, lime and plaster and articles and products made from them	Gypsum
9- the treatment of land (including the restoration of	07 07 12 Waste from the manufacture, formulation, supply	Sludges from on-site effluent treatment other

<sup>3</sup> See Water Environment (Controlled Activities) (Scotland) Regulations 2011- A Practical Guide  
 SEPA Guidance - reference number

quarries) where it results in benefit to agriculture or ecological improvement	and use of fine chemicals and chemical products not otherwise specified	than those containing dangerous substances
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The above activities are only exempt from the requirement to have a waste management licence providing the type and quantity of waste gypsum and the method of recovery are consistent with ensuring the attainment of the 'relevant objectives'. These require that waste is managed without endangering human health and without using processes or methods which could harm the environment and in particular without—

- (i) risk to water, air, soil, plants or animals; or
- (ii) causing nuisance through noise or odours

In order to ensure attainment of the relevant objectives the waste gypsum should not be mixed with other organic materials including manures or slurries since in anaerobic conditions the toxic gas hydrogen sulphide (H<sub>2</sub>S) may be formed.

Waste gypsum must not be applied in excess of the crop requirement. Excessive application will be classed as a disposal activity requiring a PPC landfill permit.

When registering the exempt activity the benefit to agriculture or ecological improvement from applying a defined application rate of gypsum must be clearly demonstrated otherwise the registration will be refused.

### SEPA Guidance on the use of Gypsum

- SEPA advises against using gypsum with organic materials (e.g. manures or sewage sludge) as this may generate odorous and toxic gas. If PAS109 compliant gypsum is mixed with a waste material, or waste gypsum is mixed with a non-waste material, the whole amount will be regulated as waste.
- SEPA's view is that in the vast majority of circumstances, gypsum will not benefit soil structure. The only exception to this is the soil structure of land flooded with sea water. On cultivated soils, which are susceptible to structural deterioration and have been flooded with seawater, a single application of finely ground gypsum at 5 tonne/ha (at 100% dry matter) can be justified as beneficial once the soil has dried out. Higher application rates are not required. The gypsum should be incorporated within the soil for best effect.
- SEPA advises that where gypsum is used to improve soil nutrient status, the application rate should not exceed crop requirements for sulphur.
- Gypsum will not be required if other materials are also being applied which contain significant concentrations of sulphur.
- SEPA has issued guidance advising against the use of waste gypsum and gypsum from waste plasterboard in animal bedding on basis that it may present a serious risk to life<sup>4</sup> and clarifying that (a) a waste management licence is required for this activity and (b) is unlikely to be granted because of the risks involved.

### Acceptable uses of gypsum

In SEPA's opinion, therefore, gypsum can be applied to land to improve the soil structure of land that has been flooded by seawater at 5 tonne/ha (assuming 10% S and 100% dry matter), or where the land requires a low application of sulphur at an application rate of not more than 200kg/ha (assuming 10%S and 100% dry matter). Where the gypsum is not compliant with PAS109 this must be done under an exemption from waste management licensing.

**This Guidance applies only in Scotland. The terms of this statement may be subject to periodical review and be changed or withdrawn in light of technological developments, regulatory or legislative changes, future government guidance or experience of its use. SEPA reserves its discretion to take appropriate action to avoid any risk of pollution or harm to human health or the environment.**

<sup>4</sup> [http://www.sepa.org.uk/media/156470/wst\\_ps\\_-use\\_of\\_waste\\_gypsum\\_in\\_animal\\_bedding.pdf](http://www.sepa.org.uk/media/156470/wst_ps_-use_of_waste_gypsum_in_animal_bedding.pdf)  
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