



AN INTRODUCTION TO HEALTH AND SAFETY IN THE ASPHALT PAVEMENT INDUSTRY

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AN INTRODUCTION TO HEALTH AND SAFETY IN THE FLEXIBLE PAVEMENT INDUSTRY

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1. AAPA’S HEALTH, SAFETY AND ENVIRONMENT ROLE

Our HS&E “mission statement” is to contribute to the provision of a safe and healthy environment for industry employees and the community, within responsible environmental parameters.

Within this overall context, our objectives include:

- Helping industry tackle important issues relevant to health, safety and the environment,
- developing an information centre on HS&E matters for the benefit of our members, and
- adopting a responsive approach to industry’s needs on HS&E issues.

This booklet is a general introduction to some of the required conditions, advice and information necessary to create and maintain a safe and healthy workplace.

2. RESPONSIBILITY, LEGISLATION AND ORGANIZATION

Organization

The rights and duties of both parties, employer as well as employee, regarding occupational health and safety are embodied in national and international legislation.

Occupational health and safety is the responsibility of all levels in the organization of an asphalt or bitumen producing or contracting company. This means management and employees and all levels in between.

Disclaimer

Although the information contained in this booklet is believed to be fundamentally correct and current at time of printing, the Australian Asphalt Pavement Association does not accept any contractual, tortious or other form of liability for its contents or any consequences arising from its use.



Co-operation and consultation

Management

It is the responsibility of management to comply with legislation, formulate a company policy regarding occupational health and safety, to manage risks by elimination of health and safety risks as far as reasonably practicable and to train and to create the conditions by which employees are able to fulfill their jobs safely.

Management also has to ensure that these conditions are maintained and, if necessary, improved. The company policy should be translated into an action plan for the attainment of improvements, with clear targets and deadlines. Such action plans should include an inventory of any problems, determination of action and measures to remove these problems, and information and instruction programs.

Employees

It is the responsibility of the employee to make use of these means and to act within these conditions. But he or she should also seek improvements if he or *she* comes to the conclusion that working conditions can be safer. Within the organization of a company there should be the opportunity to discuss these improvements by consultation between employees and management.

Middle Management

There is also an important role for a person in middle management, as an intermediary between management and employees.

The middle manager should teach employees to recognize unsafe or unhealthy situations, and should instruct them in correct work method procedures and advise them of the appropriate regulations. People in this position must have the necessary authority given by senior management to fulfill their task.

When the health and safety structure of the company's organization is clear and everybody is aware of their duties and responsibilities the basis is created for positive co-operation between employer and employees when supported by regular consultation between the parties. This will support the realization of the company's strategy to create an environment which ensures a safe and healthy situation in the work place.

It is common practice to appoint one of the members of staff as special health and safety officer, whose task it is to see that the company's strategy is realized and maintained and that goals are reached. The support of external consultants or organizations can also be part of the safety strategy of the company.

3. TRAINING AND INSTRUCTION

To do a job properly one needs instruction and advice in accordance with safe work procedures developed for the work. This is especially true when the work is more complex, when tools and equipment are more complicated and when the materials and products are no longer simple composition.

Instruction and training are also necessary to make sure that the work complies with the requirements of the job, and to prevent the loss of expensive material or the risk of dissatisfied clients. Training and instruction are also needed from a technical point of view.

Training and instruction are paramount to guarantee the welfare of the employee. When we are young we learn a lot by trial and error, starting from the moment we first learn to walk as a baby. But this method of trial and error is unacceptable in relation to a safe and healthy situation in the work place.

Before employees are confronted with a new situation they must be properly prepared to ensure that their activities will not jeopardise their health and safety or that of others.

This implies that regular instruction is necessary for new employees as well as for employees who have to work with new equipment, new procedures or new materials.



Training and instruction

However, instruction is not only necessary when a worker is placed in a new situation. The risks of unsafe work situations are present even when employees are working in familiar circumstances. The day-to-day routine tends to make people less aware of possible danger or unhealthy situations. Because of this it is advisable that there is a regular check on whether rules and procedures are still being obeyed.

Part of the necessary instruction is to teach the employee how to recognise unsafe and unhealthy situations. Younger employees, in particular, need attention and support. By giving employees instruction, training and information, the risk of undesirable situations is minimised.

Nevertheless, risk can never be reduced to zero. This means that employees must also be trained in how to act in the case of accidents. Training in first aid and fire fighting must therefore be part of any instruction program.

4. EQUIPMENT

In the production and application stages of an asphalt job, health and safety in the work place is the likely outcome when the basic rules are followed.

This involves:

- clarity concerning tasks, authority and responsibility
- training and instruction
- consultation between team and team leader
- documentation and information on procedures
- a mentality of “good housekeeping”.

5. THE ASPHALT MIXING PLANT

The asphalt industry is a highly mechanised one. This applies especially to the production of hot-mix asphalt, where a team of five or six employees produces hundreds of tonnes of mixture, in combination with the delivery and storage of mineral aggregates and bitumen.

Obviously, it must be clear to everyone how the different tasks are divided among the crew operating an asphalt mixing plant: who is responsible for various decisions. This also applies to other departments in the company for example the workshop, the laboratory or the general office.

As mentioned before, all operators must be properly instructed in the operation of at least that piece of machinery or equipment for which they are responsible. This instruction should include basic training in operating the machine, as well as safety and maintenance aspects.

Handbook

In addition to written instruction, a handbook or manual should be available on site at all times. This handbook must be in clearly written English, and the most important sections should also be available in the native language of those employees who are not fluent in English.

The hand book should include, for example:

- a general description of the machine with its field of use, and the possible hazards if it is operated outside the normal field of use
- plans for safe and stable installation
- a list of (special) tools to carry out maintenance and a list of wear and spare parts
- instructions on how to carry out maintenance on places with special risk such as silos, tanks and electrical installations. In these situations the handbook should stipulate that the operation must be carried out by specially trained staff under supervision.

Besides the handbook, other important information must be clearly and permanently displayed on the relevant items of machinery and equipment.

Depending on the type of machinery this information could include:

- dimensions and weight (if transportable)
- information on the characteristics of the supplied or received type of energy (electric, air or hydraulic pressure), and means of isolation
- capacity (of vessels and tanks), including the type and quality of the content and possible pressure
- information on temperature and other thermal characteristics.

It is essential that all this information is up to date. This means that after any alterations the markings and the information in the handbook must be updated immediately.

All these actions are required to reduce the risks identified as specific and significant for production plants.

Hazards

Needless to say, like any industrial plant, an asphalt plant contains a number of potential hazards, including:

- mechanical hazards
- electrical hazards
- thermal hazards
- hazards generated by materials and products
- hazards generated by ignoring ergonomics
- hazards caused by failure or malfunction of power supply
- hazards caused by incorrect or lack of safety devices.

It is necessary for the employer who is responsible for safety at the mixing plant to do an inventory of possible unsafe or risky situations and prepare a specific checklist. It is important to remember that safety must be maintained in extraordinary situations as well as ordinary situations.

For example, work often has to be done at night as well as during the day. This means that, in the first place, the necessary illumination for **all** activities must be available.

But it must also be realised that most people will not be available at night. The various departments of the company will be closed, so staff can't be called on for assistance.

Other specialists can only be reached outside working hours if their mobile phone numbers are known – and even then they may not be available unless prior arrangements have been made to put them on standby.

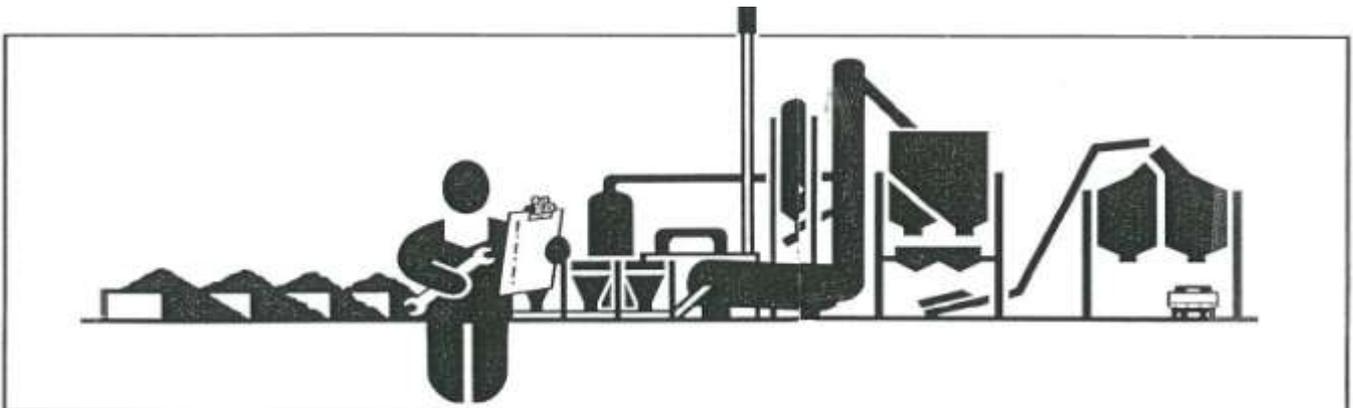
In other works normal work procedures have to be adapted to meet abnormal situations, and an emergency plan must be developed and available to cover all contingencies.

Maintenance

Another situation which requires special attention is when maintenance is carried out during normal operations of the asphalt plant. Everybody must know where the maintenance crew is operating and that all machinery and activities which could endanger the safety of the crew secured and sealed.

Sampling

Special attention must also be paid to the sampling procedure. In all cases the plant operator should be notified when samples will be taken, whether it is from the skip, the silos or the bitumen tanks.



Safety inventory

The sampling should be done with the help of mechanical devices, to prevent personnel being exposed to any hazards of burying, contact with moving parts, or burns by contact with hot material. Dangerous clambering on bitumen tanks with cans filled with hot bitumen should be avoided by installing a sampling tap in an easily accessible place.



Safety inventory

Good housekeeping

To create a safe and healthy situation in the work place a mentality of good housekeeping is required. This means the removal of all material spills, such as filler, bitumen, oil, etc, that may lead to falling or slipping.

The immediate and proper repair of damaged or broken parts, even if they do not affect the quality of the asphalt, is also necessary. This category includes bent handrails, loose steps on stairs and missing protective guards on chains and belts.

The axiom "A place for everything and everything in its place" is particularly relevant in safety context.

Personal protective equipment

All the necessary personal protective equipment, such as helmets, spectacles, earmuffs, gloves, safety shoes, long sleeves, trousers and masks, must be used. Any damaged items must be replaced immediately

First aid.

At least two, but preferably more than two crew members on each plant should be trained in first aid. A first aid kit must be available, and one member of the crew should be responsible for checking and replenishing the contents as required.

Firefighting

For successful firefighting the proper extinguishers must be available, with the right contents. These must be checked regularly. Everybody must know where the extinguishers are, so their location must be clearly indicated on site and on a plan in the control room, and everybody must know how to operate them. Regular training and instruction in firefighting techniques is **obligatory**.

Safety review

A regular audit should be carried out to ensure the safety programme is still appropriate and, if necessary, adaptations have to be made. These changes can also be made following suggestions from employees, who should be trained to recognise unsafe or unhealthy situations.

Of course, the goal of the safety programme is to avoid unsafe and unhealthy situations, but if undesirable situations or accidents occur, one must learn from them and use the available information to improve safety performance.

If adaptations are made to the safety programme everyone must be informed. The safety audit can be carried out by the company's safety professional or by an external consultant or institution.

6. CONSTRUCTION EQUIPMENT

The application on site is governed by more and more sophisticated machinery. In fact all items mentioned above regarding the asphalt mixing plant also apply to the situation on site. Instruction and training form the basis for a safe and healthy environment, together with clear lines of organisation and responsibility.

Cockpit

Pavers, rollers and tractors form a major part of the job in the asphalt industry, and employees spend many hours in the cockpit. The demand for high efficiency and quality has made these machines more complicated and has increased their capacity.

The demand on the machines has increased correspondingly and, consequently, the demand on cockpit construction is higher.



Ergonomics are essential

The following items must be considered for safety implications:

- Getting on and off the machine
- Geometry of the cockpit
- The driving position
- The driver's seat
- Control units
- Instruments
- Heating and ventilation
- Visibility and lighting
- Noise, vibration, fumes and dust

The future will bring even higher demands on the working environment and the quality of the work done. Thus it is important, when buying new machines, to establish guidelines for the ergonomics of the cockpit.

To obtain the maximum result when adapting existing cockpits it is important to involve people with experience in ergonomics, as well as those employees who can report their problems and experiences with existing machines.

In this regard regular consultation between asphalt industry and equipment suppliers is also important.

7. ON SITE

On site, all personnel must be aware of the possible dangers in relation to the various machines which are used. This is primarily the responsibility of the supervisor.

Asphalt workers have a frequently tough and heavy job. Ergonomic difficulties should be minimised by supplying suitable tools and, if possible, by job rotation.

It is essential to avoid unsafe situations, especially regarding the forward and backward movement of equipment such as pavers, trucks and rollers.

It is important to introduce correct procedures for all situations which might lead to danger, for instance loading of the paver, and opening and closing of the paver's hopper.

Visibility is another important aspect, which may be improved by the use of mirrors and cameras. Reversing warning devices such as beepers and lights should also be installed.

Compacting rollers can be equipped with rollover protection devices to prevent accidents involving workers.

Traffic

A special dimension of work on site is that it often has to be carried out while regular traffic is using part of the roadway. This creates a special hazard for asphalt workers, and can lead to a potentially stressful situation. Continuous traffic noise and other distractions add to the possibility of a dangerous situation.

Although, in most cases, the site will be sufficiently protected with signs and warning lights, there is always a delicate balance between the safety of the road user and the asphalt workers. While there is plenty of traffic, the road markings will help to create traffic congestion, which may not be to the road user's liking, but which reduces the speed of passing cars.



Avoid unsafe situations

The situation becomes more dangerous when traffic is lighter and speed goes up, especially during the night when the situation is less manageable. Illumination at night makes judging distances and speed more difficult, which decreases the safety of both drivers and workers. Most workers on an asphalt team are becoming more and more conscious of the potentially dangerous situation created by night work.

There are a number of precautionary measures which can be taken to improve the situation.



Recognise unsafe situations

Firstly, information and instructions are just as important on site as they are at the plant. In this case, however, the drivers of the passing cars also have to be instructed.

Placing the right signs in the right places, in accordance with the relevant standards, should make it perfectly clear to the driver what the situation is like and what to expect.

It is important that these signs are maintained in good clean and legible condition, that they are placed such that they do not get blown over by passing traffic, or cause hindrance by their placement. It is equally important that they be constantly placed in accordance with the moving worksite, and removed as soon as possible when no longer required.



Avoid unsafe situations

The prescribed road markings in these situations are developed both for the safety of drivers and of workers. Any unclear situation may cause accidents and can endanger the driver as well as the worker on site.

Obviously, the most favourable situation is the road under reconstruction to be completely closed to traffic. This measure is often objected to due to the presumed problem of re-routing. Experiments have shown that these problems can be avoided if the job is well prepared. This preparation includes securing the co-operation of many parties, contractor as well as client, but also police, road services, bus companies etc.

A significant advantage is that workers are no longer exposed to dust, noise and exhaust gases of passing traffic.

8. MATERIALS

Frequently, in the production and application of asphalt, more than just the traditional materials – bitumen and mineral aggregates – are used.

More and more materials are being added to adapt the characteristics of the asphalt to comply with the specific requirements of the job, for example, adhesion improving agents, material to prevent segregation, rejuvenators for recycling old asphalt, and pigments.

The applied bitumen may be also modified by the addition of polymers. During transport and application, release agents are used to prevent the asphalt from sticking to lorry skips or the hopper of the paver.

Various products are applied to carry out joints, connections to other constructions or to execute repair work. More and more products and additives are being introduced, mostly under the product name of the supplier.

Most of these products are relatively harmless, and require no extra attention beyond normal safe handling practices, but some of them may constitute health and safety risks if they are not applied in the proper way.

Some products, for example, may be highly inflammable or explosive, others may irritate skin or eyes, while yet others may be unhealthy if swallowed or inhaled.

When assessing the health hazard of any material, a number of different aspects must be taken into consideration:

- Chemical nature
- Physical conditions: temperature, phase
- Toxic effects (in test systems and known effects from human exposure)
- Possible exposure routes
- Potential for exposure



Accurate product information

The presence of toxic materials in the work environment does not necessarily mean that they represent a health hazard. Besides toxicological properties, other aspects such as handling, exposure routes, etc, need to be considered.

It is necessary for employees in the asphalt industry who work with these products to have access to this information to enable them to work safely with these materials.

'Safely' means that under the normal working conditions in which these products are applied there is no danger to the health of those who are working with them, either directly or in the long term, or for the surroundings.

But one must also be aware that abnormal situations can occur and know what the effects of the various products are. For instance, one

must realise that many of the products could possibly be applied at various temperatures, which are not originally envisaged.

Product information

As long as we are properly informed on the products being used, and as long as we apply them according to the information provided by the manufacturer, there should be no risk to health and safety.

It must be standard practice that before applying any product, all the necessary information is available. Clear and complete information allows the product to be used in the proper way, both technically and safely.

Standard labelling

The first question is how to recognise whether or not we are dealing either a hazardous product. The first indication in the case of hazardous products is marking on the packaging.

According to international regulations, all products that are dangerous to health or the environment must be identified by standard symbols which indicate the type of hazard.

As soon as one of these symbols appears on the packaging of a product it is necessary to look for more information.

All suppliers of products must make this information available. In most cases it is provided in the form of material safety data sheets.

Product data sheet

National associations such as AAPA can play an important role by organising a data bank of product safety data sheets for all the products used in the asphalt industry. This way of supplying information makes it possible to do an inventory on the various products that are applied in the industry, in co-operation with the producers and suppliers

It also creates the opportunity to present the information in a format which is uniform, useful and understandable for all employees. These sheets contain general physical characteristics and important data on the manifestation of the product (fluid, solid, gas) and a description of possible hazardous aspects.

Important information for users includes possible direct hazards and any effects that may occur in the case of fire, explosion, inhalation, swallowing, and contact with eyes and skin. This includes not only the possible acute effect but also possible long term effects after extensive and repeated exposure,

Even more important are methods of avoiding these effects, including the most effective personal protective equipment such as gloves, masks, spectacles, etc.

As for the proper use of personal protective equipment, it is important to use suitable materials. For instance, gloves can be made of more than ten different materials.



Personal protective equipment

When choosing a type of glove one must be sure that the material of the glove is resistant to the chemical product one needs protection against.

The product data sheets also give directions on handling in case any undesirable effects occur, including first aid and firefighting techniques.

Finally, the data sheets give information on the proper way to store the products, what to do in case of spills and how to remove them.

All this indicates how important it is to be well informed on the properties of the products one works with to ensure health and safety in the work place. It was mentioned above that first indication of hazardous products is usually the markings on the packaging. Needless to say, one must be extra careful with jerrycans, cans, and containers without any clear indication of contents.

To prevent this, one must follow a proper procedure when pouring or tipping the contents of one container into another. To be completely safe, always be sure that the proper information, in the form of markings and/or symbols, is on every container.

Again, as long as products are used according to the data safety sheets, there should be no danger to health and safety. This means that all employees have a responsibility for the safe use of the products.

The employer should arrange to make an inventory of all the products used in the company and to make the appropriate safety data sheets available. It must be clear where, how and in what quantity the products are stored, and for what purpose and under what circumstances they are to be used.

All this information must be properly documented, filed and kept up to date.

In particular when new products are introduced it is necessary to make this information available before they are used. This applies to application at the asphalt mixing plant and in the research and testing laboratory, as well as on the job site.

9. ASPHALT AND ASPHALT FUMES

The asphalt industry should seek to reduce exposure to fumes for the general health and comfort of its employees by taking the following measures, so far as is reasonably practicable.

'Reasonably practicable' means that one must assess, on the one hand, the magnitude of the risk of a particular work activity of environment, and, on the other hand, the physical difficulty, time, trouble and expense which would be involved in taking steps to eliminate or minimise those risks.

- Asphalt mix: avoid excessive temperatures of the asphalt during production and application
- Slip agents: seek alternatives to diesel for release agents

- Exhaust gases: adapt the layout of machinery and maintenance of diesel engines in order to minimise the exposure to exhaust gases
- Ventilation: create ventilation in those places with relatively high exposure levels
- Organic solvents: avoid the application of organic solvents used in the temporary softening of bitumen at the asphalt mixing plant.

Simple precautions can be taken to minimise skin contact with asphalt and derived products, for example:

- Using clean gloves
- Regular cleaning of overalls and using an appropriate laundry service
- Good housekeeping, which means regular cleaning of equipment and tools and removal of spillages
- Using appropriate cleaning materials if possible, other than kerosene,

Although swallowing of bitumen or asphalt is not very likely, the use of gloves and washing hands before eating and drinking is a good habit and will prevent it happening.

This simple measure is applicable in all cases when working with materials that are hazardous for health and safety. Washing in this situation means using water and an appropriate soap – **never** kerosene or white-spirit.

10. ORDER OF PRIORITIES OF SOLUTIONS

The various measures available to create a safe and healthy situation and minimise the exposure of workers to hazardous materials and situations can be grouped in four general categories:

1. Decreasing emissions at the source. This means, among other things:
 - Replacing the product with another less hazardous one
 - Improving the technical layout of the production process, for instance reducing dust exposure during cold milling or crushing of asphalt

To isolate the potential hazard source from workers implies taking measures to prevent the spillage of hazardous materials, for instance by installing recycling ducts or replacing open

containers or vessels with those with tight-fitting lids.

2. Using industrial ventilation to remove contaminated air and replace it with clean air. This can be done by local extraction, as in the laboratory when working with solvents, or by a ventilations system for the whole room, which also applies to the production and application of asphalt in confined locations.
3. Taking measures to separate the potential hazard source from workers, both in place and time. Such measures can imply:
 - Decreasing the number of employees who are exposed
 - Decreasing the exposure time of the individual workers
 - Installing technical provisions to separate workers and source.

This applies, for instance, to the application of special products or additives with potential hazard, or to certain activities like cold milling of tar containing layers. These activities should be carried out separately from other activities, both in place and time.

4. The use of personal protective equipment to protect:
 - Skin (gloves, boots, overalls)
 - Eyes (spectacles, caps, masks)
 - Nose and mouth (masks, filters, pressure caps)

Generally speaking one has to aim for the highest category level of safety, if this is reasonably practicable, by assessing, on the one hand, the magnitude of the risk of a particular activity, and, on the other hand, the physical difficulty, time, trouble and expense (or savings) which would be involved in taking steps to eliminate or to minimise those risks

Safety pays for itself.

11. SUMMARY AND GENERAL RECOMMENDATIONS

It has been shown in this booklet that within the asphalt industry the required conditions, advice and information are available to create and /or to maintain a safe and healthy situation in the work place.

AAPA recognises that the asphalt industry, like any other industry, should be responsibly managed in such a way that the health and safety of the employees is guaranteed. In summary, the following items are provided as a checklist for establishing the guiding parameters in achieving a safety management system.

- Formalisation of the company's organisation structure in such a way that all duties, responsibilities and authorities regarding health and safety are clearly understood;
- Management committed to transform the company policy into an actual action plan, including clear targets and a time schedule.
- Appointment by the management of one employee with responsibility to oversee or co-ordinate an organisation's safety efforts;
- Regular consultation between all levels in the company;
- An inventory, as part of the action plan, of potentially unhealthy or unsafe situations which should be regularly updated to find possible new troublespots and to check on the progress in solving the problems.
- A formal program to inform and train employees, particularly new and young employees, in the safe execution of the work and the safe use of materials and equipment;
- A documentation system for all information, both on materials (safety data sheets) and on equipment (handbook), which must be regularly updated;
- Availability of personal protective equipment, complete and kept in good condition, including instructions for employees on how to use it;
- Instruction of employees on how to act in case of emergency. An emergency plan must be available and regularly checked on for its appropriateness;

- Consultation between contractors and suppliers of equipment and materials to improve employee safety and ergonomics if necessary.

The Health, Safety and Environment Committee of AAPA hopes that with these guidelines a contribution has been made to one of the goals of the Australian Asphalt Pavement Industry: working in unison for the preservation and enhancement of a safe and healthy work place.

Acknowledgements

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Other guides in this series:

- *Guide 1: Guide to good practice in Asphalt and Bitumen Laboratories*
- *Guide 5: Guide to the safe use of SBS*
- *Guide 6: Safe Working in Heat*
- *Guide 7: Safe Use of Bitumen Hoses*
- *Guide 8: Guide for Environmental Management when Spraying Bituminous Materials*

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