



AAPA GUIDE TO THE SAFE USE OF BITUMEN HOSES

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AAPA GUIDE TO THE SAFE USE OF BITUMEN HOSES

1. FOREWORD

The safe transport and transfer/handling of hot bitumen requires the use of specialised equipment and proven practices to minimise the potential danger of being burnt by either the hot bitumen or a contact burn from hot pipe work and bitumen hoses. Bitumen is handled at elevated temperatures, usually in the range 150–180 °C, and any burns are far worse than a burn caused by a fluid such as hot water. Medical specialists' advice is that a burn from hot bitumen usually affects the full thickness of the skin, and a burn larger in area than a twenty-cent piece will probably require a skin graft.

Over the years, a variety of practices and equipment have been developed within the industry. Specialised handling/transfer equipment used include bitumen hoses, and their specification and correct use are covered in a number of publications and standards. AAPA members decided the industry should have a single protocol for bitumen hoses, and that this should reflect what is regarded as current best practice. The industry's first Guide on Safe Use of Bitumen Hoses was published in 2000 and was developed with input from members and hose manufacturers and suppliers. It provided guidance on the design, construction and safe management of flexible hoses and couplings, and work practices used in the handling and transfer of hot bituminous products.

2. SCOPE

Over the last few years several different types of metallic bitumen hoses have been tested and evaluated for handling and transferring hot bituminous products. There are now two different types of metal hoses available that are considered satisfactory and this updated Guide provides guidance on the design, construction and management of these hoses and couplings, and safe work practices used in the handling and transfer of hot bituminous materials.

Some other types of hoses were also tested but they are considered suitable only for transfer of bituminous emulsions which are handled at temperatures below 100 °C, and a separate guide will be issued covering the use of these types of hoses

for transferring and hand spraying bituminous emulsions.

This Guide provides information on the recommended safe and practical procedures to use in the handling and transfer of hot bitumen (maximum 200 °C) and bitumen-based products between bitumen sprayers, tankers, mobile and fixed storage tanks etc, as well as types of hoses, maintenance and testing of hoses and compliance with appropriate sections of the Australian Dangerous Goods Code, Edition 7 (ADG7).

This Guide does not cover other types of flexible hose that may be a part of the spraying system of a sprayer. These are the responsibility of the equipment manufacturer.

The nature of hot bitumen and the associated potential risks of burns and injuries mean it is vital that bitumen transfer hoses are inspected, tested and certified by a competent person or organization, at set regular intervals as specified in ADG7 or relevant Australian Standard.

To achieve these goals a hose management system should be in place which includes record keeping, labelling and procedures to ensure only tested and/or certified hoses are used. In addition, practical and proven procedures to further minimise the potential risks of injury should be adopted and appropriate training provided to personnel.

3. BACKGROUND

The bituminous materials used in the construction and maintenance of roads include bitumen, fluxed bitumen, cutback bitumen, bitumen emulsion, flux oils, cutter oils, additives such as adhesion agent, and modifiers and polymer modified bitumen. Some of these materials are classified as dangerous goods under the Australian Code for the 'Transport of Dangerous Goods' (Edition 7 as of January 2011). The ADG Code in general sets out the requirements and regulations that control the transport and storage of these materials.

Where applicable, the owner of bitumen hose assemblies must comply with the requirements described. In order to comply with the requirements of ADG7, and generally improve the safety aspects in

the design and handling of bitumen hoses, this AAPA Guide to the Safe Use of Bitumen Hoses provides information on:

- Recommended field procedures for safe transfer of bituminous materials;
- Specification of main types of bitumen hose materials;
- Required testing of hose assemblies, including in-service and new assemblies;
- Hose management system and requirements under ADG7;
- Hose assembly construction and maintenance;
- Hand spray hoses;
- References.

4. FIELD PROCEDURES

General Safety

Always wear the appropriate protective equipment such as overalls, boots, heat resistant gloves, safety glasses or goggles or helmet, long sleeved shirt and long trousers or overalls.

The following procedures are provided as a guide to minimise the potential of incidents occurring in the handling and transfer of hot bituminous materials, or explosions due to static electricity build-up during transfer of materials.

Transferring Material

Only use hoses with screw fittings, and have both ends connected.

- **DO NOT** use a hose with an unsecured end. If for some reason this is unavoidable tie the loose end with a chain or wire rope to a secure fixture.
- **Keep at a safe distance from the bitumen hose during transfer** as there is always the potential danger of being burnt when transferring hot material. Also instruct all personnel etc. not required for the operation to keep well away and not stand near or over the hose while it is in use.
- **ALWAYS stay with the** equipment during the transfer operation.

Always check that the valves on the receiving unit are open prior to starting the pump or any transfer of material.

Always check the type and level of material in both the supply and receiving tanks. If the receiving tank contains some material ensure that it is the same as, or compatible with, the material being delivered and that there is sufficient space for the quantity being delivered.

TRANSFER MATERIAL BY SUCTION ONLY.

Wherever possible, **transfer by suction only** using the pump on the receiving unit. The rate of flow can be controlled by the speed of the bitumen pump, and the amount the supply valve is opened.

Transferring material into a tank that is not fitted with

a pump means the transfer hose is operating under some pressure. Start the transfer with low pump speed (about 150rpm for a typical gear pump) and check the hose and fittings for leaks etc. before increasing the transfer rate. In most cases a safe and efficient rate of transfer is about 1000L/minute, which requires a speed of about 400–500rpm on most bitumen pumps.

At the end of the loading cycle, securely close the valve on the supply tank first.

Hose Sizes

Use an appropriate size hose for the transfer of material – refer to: 'Hose Specification and Manufacture' for details on hose diameters and lengths recommended.

The recommended hose lengths taking into account the weight of the hose assemblies and safe working distances between items of equipment are 2.5 to 3m for most transfers in the field between tankers and sprayers. Hoses should be kept as short as possible for the operation to be carried out. A longer hose is more likely to vibrate during the transfer of material, and this increases the possibility of leakage from the hose assembly at the fitting.

Hose Handling

For personal safety, and to ensure a long service life, hoses must be handled carefully. Metal flexible hoses cannot withstand twisting or sharp bends, and this also applies to most other types of transfer and hand lance hoses.

Hose assemblies should be carried flat or stored flat and straight, or they may be wound up into a coil as shown below. This procedure ensures they are not twisted or kinked as this may cause the hose to leak or fail.

When carried on items of plant or stored at the depot, both ends should be fitted with a dust cap to prevent entry of foreign material (e.g. stones) that may jam or damage the bitumen pump or block spraying nozzles.



Incorrect handling of new hose



Correct handling of new hose

The lock cone is easily damaged, particularly the softer aluminium type, and hoses must be handled with care to avoid damage. Any damage to the cone will generally result in the hose fitting to leak, and this cannot be overcome by extra tightening of the fitting during use.

The hose assembly should be retired from service or immediately returned to the manufacturer for inspection or repair should it suffer any damage or show any signs of wear.

Static Electricity

The simple act of a bituminous material flowing through a pipe or hose may generate sufficient static electricity to cause a spark when connecting/disconnecting hoses unless there is a continuous connection, with the appropriate electrical conductivity, between the two items of plant during transfer. Generally the longer the time of flow the greater the possibility of a higher level of static electricity generated.

The flexible metallic hose with screw fittings, correctly maintained and used, is one of the safest methods to transfer materials. The metal construction and fittings ensures that static electricity is eliminated during the transfer of materials between two items of plant.

Connecting the Hose

When using the hose for the first time on the day, the dust plugs must be removed and the inside of the hose checked to ensure it is free of obstructions or foreign material, and water.

NEVER stand directly behind the delivery pipe or outlet but stand to one side to enable you to hold the hose in one hand and turn the swivel nut with the other hand.

The hose cone should be pushed squarely against the receiving pipe and the swivel locking nut engaged and tightened by hand until the hose fits securely and squarely. It should then be further tightened with the special "C" type hose spanner. A hammer or other impact tool should not be used as it will damage the swivel nut and may break off the lugs, and it may also damage the hose fitting itself.

At the start of transfer the hose should be observed to note any leaks etc. and the coupling checked. It may require some further tightening.

Uncoupling the Hose

Always take care when uncoupling the hose, and don't automatically assume it is empty or all valves are closed fully and that it is safe to just unscrew the fitting. The following procedure minimises any risk of personal injury occurring:

- After completing the transfer of materials and any cleaning oil, check that the valves on both the supply and receiving units are closed and the bitumen pump is turned off.
- Only just loosen the swivel nut using the 'C' spanner, and while holding and lifting the hose

undo the nut by hand about a further one to one-and-a-half turns. This will crack the seal formed by the cone section and the receiving female fitting.

- A small amount of material may run out of the hose coupling onto the ground, indicating it is empty and safe to remove and there is no pressure.
- If there is a large amount of material, or residual pressure in the hose (perhaps due to a valve not having closed properly), by adopting the recommended procedure the hot material will squirt onto the ground rather than into the operator's face or over his body.
- Keep the free end of the hose clear of the ground to avoid dirt, stones etc. lodging in the hose. There are special hose chairs available to plug and hold the end clear off the ground, or the end may be turned up.

Cleaning

The bitumen hose must be kept clean, and this should be part of the normal daily operations and procedures. A clean hose will enable the operator to detect any leaks or other problems at an early stage, and thus reduce the risk and minimise any potential of personal injury. The outside of the hose can be kept clean using a long handled brush to lightly apply some cutter oil while the hose is still warm to hot.

The inside can be kept clean by loading any additives or cutter oil last. Where cutter etc. is not required in the load, then a small amount of cutter may be used to clean the hose and run into a container for proper disposal.

Hoses may be cleaned inside and outside by immersing the entire hose in a bath of cutter oil or a 50:50 mixture of distillate and cutter oil. This may take a day or even several days to be effective. The bath should be large enough for the hose to lay flat and should be fitted with a large sump to collect the 'dregs'. The 'dirty' oil may be used for cutting back or pre-coating etc. depending on the type of oil used.

Hoses shall not be cleaned using a gas torch or other forms of high temperature direct heat (such as placing the hose in a fire) as this will damage any packing causing the hose to leak, or damage the metal possibly causing failure of the hose.

Damaged hoses should be rendered unusable by either cutting the hose completely, or clearly indicating it is damaged by using an axe to enlarge the leaking area such that it is clearly visible. Damaged hoses should be clearly identified by a specific tag, and returned for maintenance. The hose fittings are expensive but may be able to be re-used several times.

Blocked Hoses

A hose that becomes blocked, or partially blocked, during transfer of material should be removed and replaced with a clean hose.

The ends of the hose must be free when attempting to clear a blockage.

Hoses blocked with bituminous material may often be cleared using **gentle heat only** but care must be taken, particularly if cutback bitumen or the more volatile materials such as cutter oil has been transferred earlier. Overheating the hose may lead to premature failure or leaking.

Hoses may also be cleaned using an auger to remove cold bitumen or polymer modified bitumen (e.g. crumbed rubber) plug.

If a hose becomes blocked while transferring warm or hot material, it may be possible to identify the location of the blockage with an infra red thermometer, and this may be of assistance in deciding a safe method to clear the blockage.

Hand Spraying Bituminous Materials

- Always wear the appropriate protective personal equipment.
- Use the lowest possible pressure necessary to uniformly spray the material. The spraying nozzle recommended is the Copley AN18 Intermediate type jet, rated at 18L/minute at about 90kPa. A hand spray lance should preferably only have one, or at the most two jets fitted to ensure the flow rates and pressure are kept at a safe level.
- **DO NOT** spray highly modified binders through the hand lance. These materials are very viscous and require higher pressures in order to be sprayed uniformly. With a properly planned job the areas requiring hand spraying should be outside the trafficked areas and therefore will often not require the highly modified binder. Use Class 170 bitumen or dilute the modified binder with normal bitumen, and perhaps add some additional cutter.
- Always have an assistant to keep the hose clear of the wheels of the sprayer, and to act as a look out. Keep other personnel and onlookers away from the operation.
- Clean the hand spray hose using cutter or distillate and ensure it is empty of all material before storage. Never carry out repairs to a hand spray hose while it is connected to the sprayer with the bitumen pump in operation.

5. HOSE SPECIFICATION AND MANUFACTURE

General

Transfer hoses are generally used to transfer material at temperatures NOT exceeding 200°C.

The hose is required to be able to withstand temperatures of up to 250°C with working pressures in the range of -15kPa to +600kPa. Depending on the type of bitumen pump and its drive mechanism, the delivery pressure generated by a bitumen pump may peak at a pressure as high as 800kPa and the

hose is required to be able to handle pressures of up to 1.5MPa without leaking.

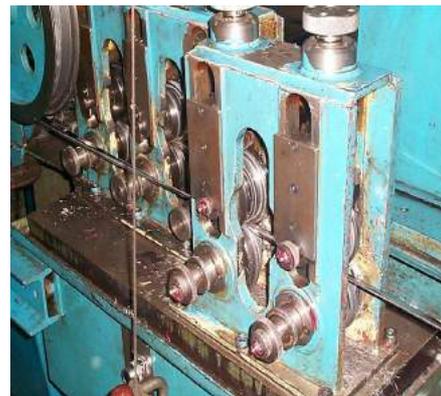
Types of Hoses

Various types of hoses are available, including metallic hoses and composite reinforced rubber type hoses. Based on many years of proven experience and performance, the metal hoses are recommended because they meet both the maximum temperature and pressure requirements at the high temperature.

Composite reinforced rubber type hoses as a general rule have difficulty in meeting both temperature and pressure requirements. Their maximum temperature rating is usually about 180°C, but their pressure rating is generally halved when operating temperatures exceed 100°C. This means that this type of hose cannot meet the specified pressure when handling hot bitumen but are acceptable for emulsion and some hand spraying.

Stripwound Hose

This pressure tight metal hose is manufactured from a stainless steel or galvanized metal strip, pulled through a set of dies to form the interlock section. This section is then rolled into the hose form and during this process a high temperature composite packing is fed into the strip to seal and lock sections together and provide a strong, leak proof hose.



Strip forming

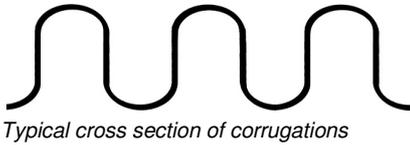


Stripwound hose with aluminium fittings

Stainless Steel Flexible Metal Hose

This type of hose is manufactured from stainless steel sheet. The sheet is cut to size and rolled through a number of dies then seam welded into a tube.

This tube is then fed into a corrugating machine where the corrugations are hydraulically formed. The size and spacing of the corrugations is important as it will influence the behaviour of the hose. Early hoses were very stiff and difficult to handle manually. The more recent types of Stainless Steel Flexible Metal Hose produced using the hydraulic process are quite flexible and can be rolled up into a coil and maintain its shape.



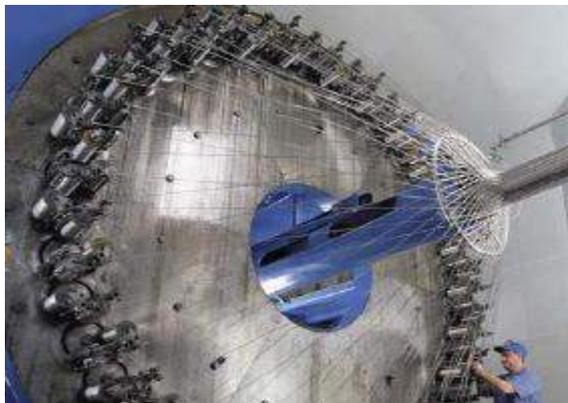
Typical cross section of corrugations

The hose is then ready for braiding. The braid is braided directly onto the hose, and this direct braiding process guarantees the working pressure of the hose. This is the most common form of stainless steel flexible metal hose used in the manufacture of bitumen hoses.

Depending on the manufacturer, the stainless steel flexible metal hose may first be wrapped in high temperature insulation and then the braid applied. This further improves the safety of the hose and reduces the outside temperature of the hose and minimises heat loss of the bituminous material during transfer. It does not noticeably reduce the flexibility of the hose.



Corrugations being formed



Braid being applied to stainless steel flexible metal hose



Braid being applied over top of optional insulation sleeve

The hose is then covered with galvanized steel armour wire to prevent damage to the braid. This allows the hose to be used on any surface that would ordinarily damage the braid and compromise the integrity of the stainless steel flexible metal hose.

Hose Fittings

The fittings to be used with the metallic hoses are the screw type fittings complying with the Australian Standard AS 2475 "Threaded Hose Connection Fittings for Bituminous Materials". These fittings may be manufactured out of either brass or aluminium.

Aluminium fittings are generally smaller and much lighter than brass and the aluminium hose assembly is therefore easier to handle. Brass fittings are longer lasting and may therefore be re-used more times.

Stripwound Hose

The stripwound hose fittings are as shown below and include a ferrule which secures the fitting to the hose. The ferrule is always made of brass and should be replaced when the fitting is removed for inspection or replacement.



Stripwound fitting components



Ferrule and lock nut in place during assembly

Stainless Steel Flexible Metal Hose

The hose fitting is simpler and does not use a ferrule. A mild steel socket is welded onto the stainless steel hose and braid ring. The aluminium or brass locking cone is then screwed into the socket and fixed with both industrial glue and grub screws.



Stainless steel flexible metallic hose with brass fitting



Aluminium fittings and with braid and protective armour wire applied

Cam Lock Type Fittings

Quick action, non-positive lock type fittings, such as 'Cam lock' are not acceptable for hot bitumen. They require a special locking ring to keep the cam locking levers in place which may vibrate loose during transfer of material, and the gaskets supplied are usually not heat proof.

Hose Dimensions

The metal flexible hose is available in a range of diameters and lengths. The recommended nominal internal diameters for typical applications are:

- 65mm diameter for most hot transfer applications;
- 38mm diameter for smaller transfer hoses, generally used on the lower viscosity materials such as cutter oils;
- 25mm diameter for hand lance hoses.

For safety, ease of handling and to avoid damage by twisting during coiling up a hose, it is recommended that hoses are kept as short as possible for the intended usage. The following lengths are recommended:

- 2.5 to 3m - for most transfers in the field between sprayers and tankers;
- 4 to 5m - for general storage facilities;
- 6 to 7m - for large storage facilities and areas in depots where access may be limited;
- If a length in excess of 7m is required, it is recommended that where possible, a combination of fixed pipe and a shorter length hose be used.

6. CARE AND MAINTENANCE OF HOSES

Repairing of bitumen hoses is a specialist operation and it is recommended hoses requiring maintenance, repair and/or testing should be returned to the manufacturer to ensure it is maintained at a high and safe standard.

Visual Inspection of In-Service Hoses

Daily Use

Where hose assemblies are used on a daily basis, they shall be visually inspected prior to each day's activities, typically this inspection will form part of the operations pre-start checklist. Operators should record the condition of the hose and report any observed defects to the supervisor immediately.

Monthly Inspections

Hose assemblies shall be subject to an inspection on a regular basis, typically this inspection will form part of the routine maintenance inspection.

Operators should inspect for the following items:

- Carcass of hose shows no signs of weeping or obvious damage;
- Couplings are secure to hose e.g. gland nut;
- Threads are free from damage or excessive wear;
- Locking cone is free of damage.

This information shall be recorded and maintained on the individual hose file.

External Heating of Hoses

It has been noticed that operators heat the outside of the hose with a gas torch to melt the dry bitumen

from the inside of the hose. This practice is not recommended as it can damage the structure and packing, and also burn the insulation and braiding on hoses. If this damage occurs it can create weak points and affect the safe use of hot hoses.



Poor practice: externally heating a hose with a gas torch

7. HOSE MANAGEMENT

Every hose assembly is to be identified by a unique number, and this must be clearly shown on the hose assembly and such that it cannot be easily removed, and remain visible. It should include detail such as date of assembly, date of testing, date of next due test, rated safe working pressure and temperature. This could be in the form of a metal tag securely wired on, or stamped on a major part of the assembly.

8. TESTING HOSES

The following tests are required on each assembly prior to delivery and first use.

Electrical Resistance

Because of the danger of static electricity build-up occurring during transfer of material through the hose, it is essential to avoid a spark occurring when connecting or disconnecting a hose from a fixed fitting on a tank. Therefore, the hose must be electrically continuous and able to meet certain criteria with regard to electrical conductivity to avoid this happening. Sparks caused by static electricity are always a potential danger and are thought to account for a fairly high percentage of any accidents that involved bituminous materials being the cause of explosions or fires.

The recommended values are:

- 1 ohm maximum per 1 metre length of metal hose;
- 0.1 ohm maximum per aluminium or brass fitting.

Testing of new hose assemblies indicate that they should readily meet this requirement. Used hoses may be expected to give lower conductivity values due to rust, bitumen having leaked into the lock section etc. Based on information collected to date on used hoses returned to the manufacturer (provided they are undamaged and still in a serviceable condition), indicates they are able to meet the above specified requirement.

Working Pressures

It is desirable to be able to pressure test the metallic hose assembly as safely and conveniently as possible. The relevant British Standard requires testing with hot oil at temperatures exceeding 100°C.

Based on the Australian experience it has been decided to adopt pressure testing at ambient temperature, using cold water. The hose assembly must be able to withstand a minimum pressure of 1.5MPa without leaking, visible distortion or elongating/dilating by more than 10%, and the metal hoses usually can withstand 2MPa without failing.

In-service hoses must be able to comply with the same testing requirements for electrical conductivity and pressure as new hose assemblies.

The frequency of testing is to be in accordance with any legal requirements, or in the absence of such requirement, by agreement between the purchaser and manufacturer. The following testing schedule is recommended as a minimum:

General Usage	Testing	Frequency
Daily or weekly	Pressure	Between 4 to 6 months
Infrequent	Pressure	Between 6 to 8 months
ALL hoses	Pressure, Electrical conductivity	Annually



Stripwound bitumen hose being pressure tested

9. HAND SPRAY HOSES

Type of Hose

Hand spray hoses may be manufactured from the smaller diameter metallic strip wound hose, usually about 25mm ID, and fitted with a standard BSP fitting to fit onto the hand lance and supply pipe. Often these fittings are welded onto the hose and cannot be salvaged and they are discarded at the end of the service life of the hose.

With proper and safe procedures the pressures generated during hand spraying are relatively low compared to transferring material between tanks.

Therefore, an acceptable alternative is a non-metallic, flexible, composite hose, manufactured from materials such as polyester and polyamide fabrics often covered with an outer layer of fibreglass or steel wire as reinforcement. This type of hose may be black or white in colour depending on the reinforcement. The composite type of hose is lighter and easier to handle than a metallic hose, but care must still be taken to avoid twisting or kinking it during hand spraying operations. They are often referred to by trade names such as type 966, transheat, bituflex or pyroflex.

This type of hose is available in a range of diameters but the size preferred for hand spray work is 25mm. They are fitted with a standard BSP fitting wired onto the ends of the hose using a proprietary or other special process, but this means that often the fittings can be salvaged and re-used.

They are all manufactured with either an inner or outer wire, or both, of galvanised steel for reinforcement and to provide electrical conductivity. Generally, this type of hose has a higher electrical resistance than a metallic hose, but should still be able to meet the specified requirements and no special dispensation has been provided in this Guide.

This type of hose is generally suitable for temperatures up to at least 180°C. Pressure rating vary from about 1000 to 2000kPa, but this rating is usually halved when material temperatures exceed 100°C, as applies in most hand spraying work. Therefore, a safe rating is between 500 and 1000kPa at elevated temperatures. This type of hose should generally be able to meet a pressure of at least 1.0MPa at 15–20°C.

Hydraulic type hose is also used by some in the industry, but it is doubtful that this type of hose will meet the requirements for both temperature and pressure, and may blister internally when exposed to hot bitumen, which could cause blockages and rupture of the hose.

It is therefore NOT recommended.

10. MAINTENANCE AND REPAIR

The maintenance and repair of bitumen hoses is a specialist task and it is recommended that hoses are returned to the manufacturer for repairs and testing.

11. TEST METHODS

General

The following test methods are those prescribed for electrical conductivity and hydraulic properties of full hose assemblies, i.e. a hose properly fitted with a fitting at both ends. Records of the properties attained must be kept for a period of seven (7) years.

Electrical Continuity

The hose assembly shall be tested in accordance with AS 2683 “Hose and hose assemblies for distribution of petroleum and petroleum products (excepting LPG)”, Appendix G using the test described in section F 5.2. “Electrical Continuity/insulation test”, sub section 5.2.1 “For Kind 1 Conducting Hoses”.

Hydraulic Properties

The working group could only identify one test deemed suitable for testing bitumen hoses. This was in AIP CP-27, 1996, which has been withdrawn and is no longer available. It made reference to a test described in AS 1180 D, but this method deals with testing composite type hoses, and does not apply to metallic type hose or even the composite hand spray hose.

The recommended test procedure has been adopted based on over 30 years' experience in testing metallic hoses and composite hand spray hoses using water as the testing fluid at ambient temperatures. There has not been any recorded failure in service of these hoses using this test method. The test method is considered safe and practical, effective and economical compared to other tests using hot oil.

Test Method

(a) Scope

This method is to determine the performance of hose assemblies, new or in-service, in relation to hydraulic properties to cope with the temperatures and pressures encountered in the transfer of bituminous materials.

(b) Equipment

The following equipment is required:

- Test rig to hold the hose assembly level and flat. It should be fitted with a pressure gauge, and a stopcock to let out air and release the pressure at the end of the test.
- Supply of clean water.
- A means to pressurise the hose assembly and be able to keep it at a pressure of at least 1.5MPa, for a minimum of 15 minutes.
- Pressure gauge, accurate to within ± 20 kPa over a range of 0 to 1500kPa.
- Standard metal measuring tape, 10m long.

(c) Procedure

- Visually inspect the hose to ensure it is clean on the inside. For in-service hoses this means essentially free from bituminous residue or any cleaning oils.
- Securely attach one end of the hose assembly to the test rig/arrangement. It should lay straight and flat for most of its length with no sharp bends or kinks.

- Seal-off the other end of the hose being tested. This could be done using a screwed dust plug fitted with a rubber gasket or blanked off hose fitting.
- Fill the hose assembly with water. Use the stopcock to let out the air and then close it securely.
- Pressurise the system and slowly raise it to the required test pressure of 1.5MPa. Maintain this pressure for a minimum of ten (10) minutes.
- Whilst at the test pressure, measure, check and record
 - Any leakage
 - Any evidence of distortion or elongation.

(d) Limits for Acceptance

- i) No leakage – accept
If any leakage – reject.
- ii) Distortion – metallic hoses are unlikely to distort to any noticeable degree, but the composite may be expected to suffer some distortion.
If less than 10% – accept
If over 10% – reject.

Record the test results in the hose register.

Acknowledgements

We want to thank the following organisations and their staff who have contributed to updating this Guide to reflect current practice and safe use of bitumen hoses in the transfer of hot bitumen.

- AAPA Members
- Radcoflex
- Convoluted Technologies
- Tyco Flexible Piping Systems.

References

Australian Standard AS 2475 “Threaded Hose Connection Fittings for Bituminous Materials”.
 Australian Dangerous Goods Code – Edition 7.
 Austroads – Bituminous Materials Safety Guide, 2008.

Other guides in this series:

- *Introduction to health and safety in the flexible pavement industry*
- *Guide 1: Guide to good practice in asphalt and bitumen laboratories*
- *Guide 2: Guide to safe work clothing*
- *Guide 5: Guide to the safe use of SBS*
- *Guide 6: Safe Working in Heat*
- *Guide 8: Guide for Environmental Management when Spraying Bituminous Materials*