

Rail Industry Safety Notice

12 JULY 2012

RISN No 5 / 2012

TRAIN BRAKE PIPE OBSTRUCTION FLEXIBLE AIRBRAKE HOSE

Background

On 2 July 2012 the supplier of airbrake hoses (Sigra Rolling Stock Components) issued a Technical Alert (copy attached) advising:

"A manufacturing fault has occurred where there is a possibility of O ring cork like projections being extruded from the internal hose wall. The projection takes the form of a 3mm diameter rubber extrusion coming out of the hose internal wall and can be up to 200mm long. The incidence of wall extrusions is thought to be possible in about 1 in 1000 hose assemblies."

Sigra supplies brake pipe hoses to Tasmanian Railway Pty Ltd (TasRail). TasRail advise that one anomaly in train brake performance has been experienced.

The driver of a train operated by Tasmanian Railway Pty Ltd reported that the braking performance of his train was not as expected. Apart from the train not slowing as expected, the driver reported that when applying the train brake the Brake Pipe (BP) Pressure gauge on the locomotive reduced as expected, but the corresponding reduction in BP pressure as indicated from the End of Train Unit was delayed beyond what would normally be the case.

An inspection of the rolling stock involved found one hose pipe was obstructed. Subsequent inspection of TasRail's fleet detected a further 2 affected hose pipes (total of 3 affected pipes in 350 examined).

Action

The Rail Safety Unit urges all rail operators to heed the Technical Alert issued by Sigra Rolling Stock Components (copy attached).

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Rail Safety Unit
Department of Infrastructure,
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2nd July 2012

TECHNICAL ALERT – SIGRA railway Airbrake hose made to AS2435

Introduction:

Sigra AS2435 airbrake hose is used to manufacture railway airbrake hose assemblies. A manufacturing fault has occurred where there is a possibility of O ring cord like projections being extruded from the internal hose wall.

The projection takes the form of a 3mm diameter rubber extrusion coming out of the hose internal wall and can be up to 200mm long. The incidence of wall extrusions is thought to be possible in about 1 out of 1000 hose assemblies.

Discussions with customer's brake engineers indicate that each Sigra customer should perform a risk analysis and determine whether it is necessary to check installed hoses for the fault. **Where a Sigra customer has supplied hose or assemblies to a third party, both that party and Sigra should be notified of the details to allow coordinated action.**

Important facts:

- There are in excess of 100,000 hose assemblies in service using Sigra hose and there has been no reported incidence of any safety or reliability issue due to this manufacturing fault or any other fault.
- Tensile tests have shown that a force of 6kg (58N) is required to break the projection off the hose wall.
- Calculations have shown that the orthogonal area of extrusion is only 14% of that required for maximum airflow to break the extrusion.
- Flow tests have shown a maximum of 2% reduction in airflow when an extrusion is present.
- All assemblies and cut lengths supplied by Sigra since April 2012 have been checked before dispatch for the fault and white band "ID check" placed around the middle of the assembly since June 26th 2012.
- To date, 2 examples of the fault have been found in 35mm ID hose from 2471 checked, 2 found in 29.5mm ID hose from 1189 checked, zero in 22.3mm ID from 1139 checked and zero in 12.5mm ID from 1184 checked.
- Future hose manufacturing batches are being made using different mandrels that cannot produce this fault.
- **The hose manufacturer has stated that the fault can only occur in 29.5mm ID and 35.0mm ID hose manufactured between March 2011 and March 2012 due to the installation of a high pressure Autoclave. Sigra has requested that the manufacturer perform controlled experiments to prove this is the case, and results should be available in a few days. - i.e. the extent of types and batch numbers of assemblies that may need to be checked for the fault.**

Action:

Sigra requests that customers perform a risk analysis as soon as possible and send the results to Sigra so that we can help coordinate a plan of action where required. Sigra is working with Railcorp NSW to determine the best methods of checking hoses on site, and will have detailed instructions and test equipment available in a few days.

Sigra has Bore Scope test equipment, hose marking bands, spare hose assemblies, procedures and training available, and will help to coordinate and document the process if field checking of hose assemblies is deemed necessary. The process for field checking would be to replace hoses in service with hoses that have an "ID Check" band fitted. Replacement hoses would come from customer spare stock or Sigra spare hose pool. Hoses removed would be tested on site in the workshop and have an ID check band fitted to enable a change out to continue. Hose removal would be necessary as Bore Scope monitor screens do not work well in high light levels and Bore Scope camera probes cannot be inserted through the coupling head end of the hose.

Identification:

Sigra AS2435 airbrake hose, the batch number, and whether an ID check has already been done can be identified as per the following photos. Please note that Sigra coupling heads have been supplied for use on non Sigra airbrake hose and that the presence of a Sigra coupling head does not necessarily indicate Sigra hose has been used. Only Sigra hose is affected by the manufacturing fault.

There are 4 different Sigra AS2435 Airbrake hose sizes – 12.5mm ID, 22.3mm ID, 29.5mm ID and 35.0mm ID. Details are marked in red raised letters on the hose layline which is repeated every 450mm. Other brands of hose have a visually similar layline, but will not be marked "Sigra Aust."



Hose manufacturing batch numbers are identified as shown. This hose is manufactured in November 2011, and an "A" suffix is always used in case two batches are manufactured in the same month. This has never happened, so all batch numbers have the "A" suffix



Sigra hose assemblies have a plastic label showing the hose assembly batch number, part number and customer details where applicable. The label is covered with a clear plastic band for durability and is placed close to the nipple end of an assembly.



Closer view of a hose assembly label.



The ID Check label fitted to recently manufactured hose assemblies



ID check label shown with the hose assembly label



Sigra coupling heads can also be found on hose assemblies not manufactured by Sigra and using other hose not affected by the fault.



Details:

The incidence of Oring cord like projections from the internal wall of 29.5mm and 35mm ID hose has been detected.



Hose is manufactured by wrapping uncured rubber on to a mandrel, and layers are built up of liner, braid and cover. The completed hose is wrapped to contain the shape and then autoclaved to cure the rubber.

The centre mandrel can have holes in the surface for the injection of compressed air to aid in the removal of the mandrel after manufacture. These holes are covered with paper tape to prevent rubber extruding through the hole. In 29.5 and 35mm ID hose, the bulk of rubber is more than in smaller sizes, and there have been incidences of the paper tape breaking, allowing rubber to be extruded into the hollow mandrel. Such projections can range from 10 to 20mm long and up to 250mm long.

The rubber is similar to Oring cord and is 3mm diameter. These extrusions would normally snap off when the mandrel is withdrawn, and Sigra checks cut hose lengths to ensure there are no internal deformations.

The incidence of this type of projection remaining in the hose was thought to be very low. Recently however, 2 cases have been found within a batch of 2000 metres of 35mm ID hose (2471 assemblies). And 2 cases within a batch of 1000 metres of 29.5mm ID hose (1189 assemblies). In 22.3mm ID hose, one small sliver 5mm long has been found in a batch of 1000 metres (1139 assemblies), and is not thought to be related to the problem existing in larger hose sizes. In 12.5ID hose, no projections have been found in a batch of 1000 metres (1184 assemblies). At this stage, 22.3mm and 12.5mm hose are expected to be free of the manufacturing fault, pending further testing by the hose manufacturer.

The cord projection is quite tough and is a moulded part of the hose wall. A Sigra experiment EXP120426 has shown that a force of 6kg (59N) is required to break the projection from the hose wall.

Sigra experiment EXP120622 conducted on a flow bench shows that a long extrusion does not affect the flow rate by more than 2%.

The hose manufacturer has reported that they are confident that such extrusions can only occur in 29.5 and 35mm ID hoses where the wall thickness and wrapping layers cause enough pressure in the Autoclave to make the rubber burst through the taped over mandrel holes. Furthermore, they claim that it can only happen in the new Autoclave that uses 8 Bar steam pressure, where the old Autoclave uses 4.5 Bar. The new Autoclave was commissioned in March 2011 and therefore only batches 03/11A, 11/11A and 03/12A will be affected. Further testing by the hose manufacturer is needed to confirm this statement.

The hose manufacturer has calculated the drag resistance of full flow at 100psi of the extrusions and advised that the orthogonal area is only 14% of that required to create a force greater than the 59N force required to break the extrusion. A test was conducted at 60Mpa and the extrusion was unaffected.

Although cut lengths are checked, until April 2012 when checks were properly audited, there is a possibility that an operator has failed to do the check. Sigra also supplies bulk hose to other companies, and in this case checks may not have been done once the hose is cut into lengths.

Current and future hose manufacturing batches will not use mandrels with air holes, air will instead be injected using a cone tool through the end of the hose. Extrusions will not be possible with this system.

The possibility therefore exists that there are hose assemblies in service with such projections. Although Sigra is not aware of any method by which a projection could become detached, the possibility should be investigated.

Contact:

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