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LIQUIP INTERNATIONAL PTY LTD - ENGINEERING DEPARTMENT - 13 HUME RD SMITHFIELD SYDNEY NSW AUSTRALIA 2164
PH: +61 2 9725 9000 FAX: +61 2 9609 4739 EMAIL: engineering@liquip-nsw.com.au

Tech Talk 63: Brake Interlock Pilot Valve Options.

Introduction

Australian Standards AS2809 and AS1940 require that a road tanker brakes be automatically applied should any liquid hose connection be made to the tanker. It also requires that the vapour vents be open before any liquid transfer can take place.

The universal method of achieving the basic 'trigger' is via the vapour gate (or guard bar) over the outlets which, when lifted to allow access to the API adaptors, actuates an air valve. The signal from this air valve is used to, among other things, actuate the spring brakes.

Spring Brakes

All modern vehicles and tankers have spring brakes on the rear axle(s).

Spring brakes are fail-safe in that a spring holds the brakes 'on' (i.e. the brakes are applied) in the absence of air supply to the brake's diaphragm actuator. When air is supplied by, for example, releasing the hand-brake, the diaphragm actuator pulls the brake lever into the 'off' position and holds it off against the spring. The vehicle may now be driven away. Any subsequent loss of air to the system allows the springs to overcome the force of the diaphragm actuator as the air pressure drops and the brakes come 'on' again.

In a typical road tanker, we insert a pilot operated valve into the supply air line to the spring brakes. This valve is 'triggered' from the vapour gate actuation to interrupt the normal operation and ensure the air brakes are exhausted and so applied to the 'on' position while loading or discharging.

Description of Related Functions

- **Airtanks**

Liquip always fits an additional separate air tank for tanker equipment operation. This air tank is separated from the brake system air tanks by a PR-2 hold-back valve. The hold-back valve acts as a priority valve to ensure that the brake system is protected against any pressure loss in the equipment tank: if pressure drops to approximately half normal pressure due to leaks on the tanker side, the PR-2 closes to protect the



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remaining pressure in the brake system. In this case, the equipment tank will continue to leak completely empty and will not replenish until the brake tanks have been pumped up to normal pressure again.

- Other Interlocks

Many operators fit an additional interlock to the vapour hose and also, where applicable to the p.t.o engagement switch. Some applications, mainly overseas, have been unable to extend the vapour gate to cover the overfill protection plug. Another interlock air valve is normally fitted to the truck plug in these cases.

- Equipment Actuation

All equipment actuation (vapour vents, internal valves, manifold valves) is by fail-safe means, i.e. air 'on' to open, air 'off' (or accidental loss of air) to close by means of a spring.

- Pilot Valve Option of Air 'On'

Historically, interlock valves have been set up as 'Air On to Pilot = Brakes On'. Most tankers built in the past 30 years have used this. The vapour gate 'trigger' provides an air pressure signal out when the gate is lifted in order to commence a liquid transfer.

This is the simplest and cheapest of systems as the pressure signal is used directly to feed the air pressure to all the valves and also to apply the brakes. Note that while the tanker is in transit there is no pressure in the pilot line and it is unlikely an incident or breakage would accidentally insert pressure and so inadvertently apply the brakes on the freeway.

Refer x202504 'A'

- Pilot Valve Option of Air 'Off'

Linfox/Mobil reported a few instances over the last few years where tankers with the pilot 'On' system had lost air pressure in the auxiliary tank, the pilot exhausted and the brakes suddenly released.



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They therefore requested the brake interlock be converted to air 'off' the pilot valve for the brakes to be 'on'.

This requires that the vapour gate trigger provide two different signals when actuated: one to be pressure signal as before to power the vapour vents and liquid valves, another to the brake pilot to exhaust the pilot to the brake interlock valve.

The simplest and cheapest way to achieve this is to fit a 5 port valve to the vapour gate in place of the previous 3 ports. However if an existing system is to be converted, a separate valve may be inserted in the system to act as a signal inverter to the brake interlock pilot.

If now the auxiliary tank starts to empty because of a leaky system, the valves and vents will close but the brakes will remain 'on'.

Note that the tanker now requires air pressure 'on' to the pilot while in transit. Any damage or connection loss in the pipe will result in the spring brakes applying while the tanker is in motion.

The use of push-in type fittings in this pilot system should be reviewed. As part of a pressurized system it may require approved nut-and-olive metal connectors.

Refer X202604 'A'

Summary

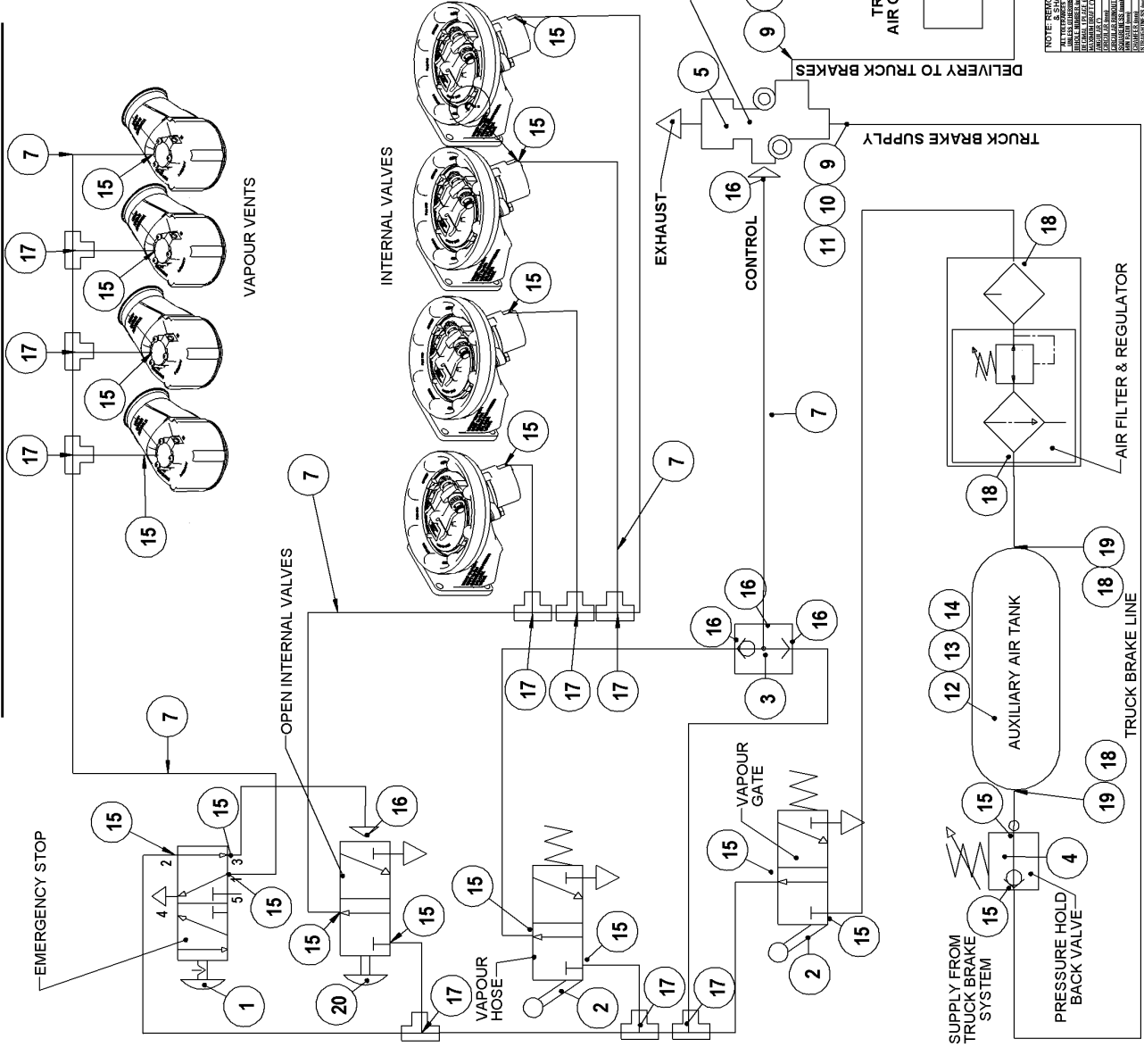
Failures of this nature occur only after (a) the driver failed to apply the normal park brake system and (b) air leaks remained in the system.

On the information presented to date there is no clear technical winner; both systems have plusses and minuses. It is the choice of the customer which to fit.

Finally, I would suggest our brake equipment suppliers be approached for ideas/suggestions on any third alternatives. Many years ago Shell had a system that ensured the park brake was 'on' before any other operation could take place but it was very expensive and complicated and was dropped. Time for another look?

DG 13-4-05

TYPICAL AIR SYSTEM POSITIVE PRESSURE TO APPLY BRAKES WHEN THE VAPOUR GATE IS OPEN



ITEM NO.	PART NUMBER	DESCRIPTION	QTY
1	2209	VALVE AIR EMERGENCY STOP	1
2	2207	VALVE AIR ROLLER 3/2 SPRING RETURN	2
3	2237	VALVE AIR SHUTTLE	1
4	2240	VALVE AIR HOLD BACK PR2	1
5	2238	VALVE AIR BRAKE TR3	1
6	2248	AIR REGULATOR/FILTER	1
7	1962	AIR LINE BLACK NYLON 1/4"	AS REQ
8	1954	AIR LINE BLUE BRAKE 3/8"	AS REQ
9	1910	AIR FITTING 3/8" x 1/4" BSP	2
10	1958	AIR LINE SPIGGOT 3/8"	2
11	1880	AIR FITTING 3/8" OLIVE x NUT	2
12	2241	AIR TANK AUXILIARY	1
13	2242	AIR TANK AUXILIARY BRACKET	1
14	2243	AIR TANK AUXILIARY DRAIN COCK	1
15	2222	AIR FITTING PUSH 1/4" x 1/8" BSP ELBOW	19
16	2226	AIR FITTING PUSH 1/4" x 1/8" BSP STRAIGHT	4
17	2205	AIR FITTING PUSH 1/4 x 1/4 x 1/4 TEE	9
18	2227	AIR FITTING PUSH 1/4 x 1/4 BSP STRAIGHT	4
19	0460	BUSH REDUCING 1/2" x 1/4" BSP BLACK	2
20	2234	VALVE AIR PUSH PILOT RETURN	1

NOTE: REMOVE ALL BARRIERS

DRAWING TITLE: TYPICAL TRUCK AIR SYSTEM POSITIVE PRESSURE TO APPLY BRAKES WITH TR3 VALVE

MATERIAL:

ITEM NO.	DESCRIPTION	QTY	UNIT
1	VALVE AIR EMERGENCY STOP	1	EA
2	VALVE AIR ROLLER 3/2 SPRING RETURN	2	EA
3	VALVE AIR SHUTTLE	1	EA
4	VALVE AIR HOLD BACK PR2	1	EA
5	VALVE AIR BRAKE TR3	1	EA
6	AIR REGULATOR/FILTER	1	EA
7	AIR LINE BLACK NYLON 1/4"	AS REQ	M
8	AIR LINE BLUE BRAKE 3/8"	AS REQ	M
9	AIR FITTING 3/8" x 1/4" BSP	2	EA
10	AIR LINE SPIGGOT 3/8"	2	EA
11	AIR FITTING 3/8" OLIVE x NUT	2	EA
12	AIR TANK AUXILIARY	1	EA
13	AIR TANK AUXILIARY BRACKET	1	EA
14	AIR TANK AUXILIARY DRAIN COCK	1	EA
15	AIR FITTING PUSH 1/4" x 1/8" BSP ELBOW	19	EA
16	AIR FITTING PUSH 1/4" x 1/8" BSP STRAIGHT	4	EA
17	AIR FITTING PUSH 1/4 x 1/4 x 1/4 TEE	9	EA
18	AIR FITTING PUSH 1/4 x 1/4 BSP STRAIGHT	4	EA
19	BUSH REDUCING 1/2" x 1/4" BSP BLACK	2	EA
20	VALVE AIR PUSH PILOT RETURN	1	EA

PROTECTIVE TREATMENT: NONE

HEAT TREATMENT: NONE

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REV.	DESCRIPTION	DATE	BY	CHK
A	ORIGINAL ISSUE	11/17/2004		

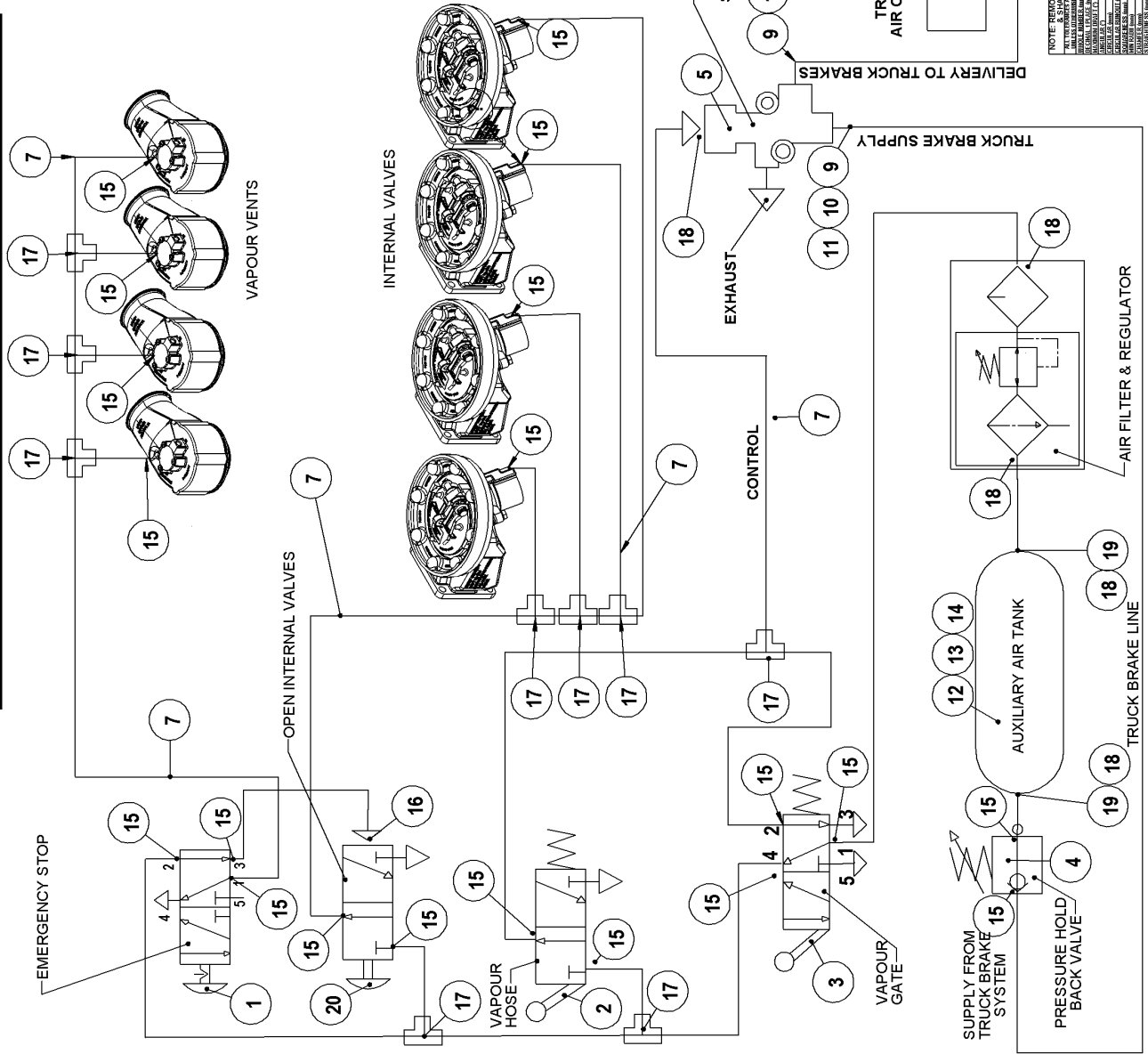
LIQUID AIR SYSTEM

GROUP	PART	DATE	BY
LIQUID	10/11/04		

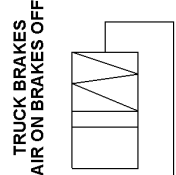
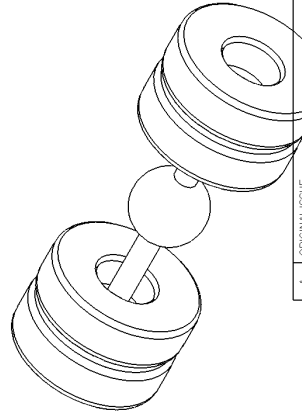
DRAWING NO: X202504

ISSUE: A

TYPICAL AIR SYSTEM NEGATIVE PRESSURE TO APPLY BRAKES WHEN THE VAPOUR GATE IS OPEN



ITEM NO.	PART NUMBER	DESCRIPTION	QTY
1	2209	VALVE AIR EMERGENCY STOP	1
2	2207	VALVE AIR ROLLER 3/2 SPRING RETURN	2
3		VALVE AIR 5/2 ROLLER SPRING RETURN	1
4	2240	VALVE AIR HOLD BACK PR2	1
5	5624	VALVE AIR BRAKE SV1	1
6	2248	AIR REGULATOR/FILTER	1
7	1962	AIR LINE BLACK NYLON 1/4"	AS REQ
8	1954	AIR LINE BLUE BRAKE 3/8"	AS REQ
9	1910	AIR FITTING 3/8" x 1/4" BSP	2
10	1958	AIR LINE SPIGGOT 3/8"	2
11	1880	AIR FITTING 3/8" OLIVE x NUT	2
12	2241	AIR TANK AUXILIARY	1
13	2242	AIR TANK AUXILIARY BRACKET	1
14	2243	AIR TANK AUXILIARY DRAIN COCK	1
15	2222	AIR FITTING PUSH 1/4" x 1/8" BSP ELBOW	19
16	2226	AIR FITTING PUSH 1/4" x 1/8" BSP STRAIGHT	3
17	2205	AIR FITTING PUSH 1/4 x 1/4 x 1/4 TEE	10
18	2227	AIR FITTING PUSH 1/4 x 1/4 BSP STRAIGHT	5
19	0460	BUSH REDUCING 1/2" x 1/4" BSP BLACK	2
20	2234	VALVE AIR PUSH PILOT RETURN	1



REV	DESCRIPTION	DATE	BY	GH
A	ORIGINAL ISSUE	11/11/2004		

LIQUIP	AIR SYSTEM
DATE	11/11/2004
ISSUE	A
DRAWING NO.	X202604
ISSUE	A

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DRAWING TITLE: TYPICAL TRUCK AIR SYSTEM NEGATIVE PRESSURE TO APPLY BRAKES WITH SV1 VALVE

MATERIAL: NONE [HEAT TREATMENT: NONE]

PROTECTIVE TREATMENT: NONE

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