afac
Australasian Fire and Emergency Service Authorities Council

Common Hose Couplings for Australian AFAC Member Agencies

Version 6
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Executive Summary

Based on historic British models, Australian railways and fire services were started and operated by private enterprise before being taken over by government. In Britain they managed to standardise rail systems long ago and during WW2 adopted common couplings for fire services. In the late 90's Australia managed to standardise its interstate rail network yet many Australian fire services continue to operate using historic couplings that prevent interoperability without the need for adaptors. Given recent world events including the onset of global warming the time has arrived for Australian fire agencies to implement common hose couplings to achieve total interoperability.

Survey results indicated that the implementation of common couplings is widely supported but concerns exist about the cost of doing so. It was also evident that it is unlikely that agreement could be reached on the implementation of a single type of coupling for both urban and rural use due to their differing needs and the differing environments in which they operate.

A range of suitable couplings are in use around the world but to introduce another coupling into Australia is illogical given the cost implications and that fit for purpose products are already in use. The three couplings currently in use by Australian agencies that are viewed as worthy of consideration are the British Instantaneous, Storz and Forestry couplings. Storz and Forestry are of a hermaphrodite or sexless design and connect with a quarter turn whilst BIC has male and female ends and is push to connect.

The paper concludes that a combination of Storz and Forestry would best meet the needs of Australian AFAC member agencies due to their sexless design, lack of complexity and existing use by multiple agencies.

Proposal

The AFAC Common Couplings Working Group agreed by consensus that:

- Storz or Forestry couplings [(1)] or a combination of both be adopted as the AFAC standard for delivery hose couplings.
- Storz be adopted as the AFAC standard for suction hose couplings.
- Camlock be adopted as the AFAC standard coupling for applications involving aircraft or fuel.

It is proposed that AFAC, (Council) endorse these recommendations.

Subject to these being endorsed it is recommended that AFAC:

- Council encourage and pursue the implementation of the AFAC standard for delivery hose couplings by Australian member agencies by June 30th 2028;
- Seek Federal/State Government funding to assist in the standardisation of fire hose couplings for Australian fire agencies;
- Support the preparation of AFAC specifications for Storz and Forestry couplings as the precursor to the preparation of Australian Standards for both couplings.
- Work with building owners and the building industry to facilitate the change to Storz couplings on hydrants and hydrant boosters nationally.

(1) A 65mm Forestry Coupling is now available. This is an 'orphan' coupling and as such does not form part of this proposal.

Intent

The intent of this paper is to provide background information and recommendations relating to the identification and implementation of common fire hose couplings for all Australian - Australasian Fire Authorities Council, (AFAC) members. The recommendations contained in this paper were reached by consensus.

Preamble

Around 180 years ago the British settled Australia and naturally many of the business practices by which our society operated were similar to those used in Britain. A well-known example of this relates to railways, which were built and funded by the private sector and operated on owner specified gauges. When many of these railways were found to be unprofitable they were taken over by State Governments for regional development purposes. Unfortunately this led to each State having a railway system that operated on a different gauge to those used in other States. In 1995 under the "One Nation" project this situation was finally addressed with Brisbane, Sydney, Melbourne, Adelaide and Perth being connected by a standard gauge rail link.

This historical fact is relevant to many Australian fire agencies as most urban agencies can also trace their history back to the British model where insurance companies funded fire services with each using there own fire hose coupling. Like railways, fire services were eventually taken over by government but unlike railways the implementation of common couplings for Australian fire agencies has yet to be achieved. Britain implemented a common coupling for its fire agencies during World War Two as it recognised the genuine need for interoperability as did New Zealand not long after. It can be argued that interoperability and commonality between Australian fire agencies is now long overdue.

In the past ten years society has faced new challenges with the advent of terrorism and recognition that our climate is changing by becoming warmer. Australia has yet to face a terrorist attack but after the September 11th terrorist attack on the twin towers in New York the US Federal Emergency Management Agency, (FEMA), noted that:

> *"After the disaster, it became painfully clear that while emergency fire equipment from neighbouring geographic areas may have been compatible, there were grave incompatibilities hampering rescue and communications efforts when the equipment came from longer distances, as will happen during large-scale disasters."*

Whilst Australia has been spared from terrorist attacks indications are that it is already being impacted on by climate change. Consequently cross-jurisdictional operations between AFAC agencies, where equipment is transferred between States and Territories, will become increasingly commonplace with AFAC agencies from Queensland, New South Wales, ACT, Victoria, Northern Territory, Tasmania and South Australia already having been involved in such operations. Invariably these agencies have faced problems with achieving interoperability due to the different couplings used by each agency. Yes we can interoperate near State borders but not when brigades come from "longer distances". Would it not be wise for AFAC member agencies to learn from the events of September 11th and commit to the implementation of common hose couplings?

Couplings – The Current Situation

The following tables, (Table 1 & 2), identify the range of couplings used by AFAC member agencies in Australia for delivery and suction purposes.

Table 1

Agency	Delivery Hose			
	19mm	25mm	38mm	64mm
QFRS	-	-	QRT	QRT
Qld. Rural	Storz	Storz	Storz	QRT
Qld. DPI	Storz	-	Storz	-
NSWFB	Storz	Storz	Storz	Storz
NSW RFS	Storz	Storz	Storz	Storz
NSW DEC	Storz	Storz	Storz	Storz
NSW Forestry	Storz	Storz	Storz	Storz
ACT ESA	Storz	Storz	Storz	Storz
CFA	Forestry	Forestry	Forestry	3TPI/5TPI
MFB			Storz	Storz
DSE	Forestry	Forestry	Forestry	5 TPI V
TFS	-	Forestry	Forestry	5 TPI V
Forestry Tasmania		Forestry	Forestry	
Parks Tasmania		Forestry	Forestry	
SAMFS	-	-	SAFB	SAFB
SA CFS	-	Forestry	SAFB	SAFB
DEH	Forestry	Forestry	Forestry	SAFB
FSA	-	Forestry	Forestry	SAFB
FESA	-	-	BIC	BIC
DEC WA	Forestry	Forestry	Forestry	-
NTFS	-	BIC	BIC	BIC
Defence		BIC	BIC	BIC

Note: Squares shaded in this colour indicate agencies implementing couplings in accordance with Version 3.1 of this paper. (Correct as of

Table 2

Agency	Suction Hose			
	50mm	**64mm**	**75mm**	**100+**
QFRS	Camlock	-	Camlock	Storz
Qld. Rural	Camlock	-	Camlock	-
Qld. DPI	Camlock	-	Camlock	-
NSWFB	-	-	-	Storz
NSW RFS	-	Storz	Storz	Storz
NSW DEC	-	Storz	Storz	Storz
NSW Forestry	Storz	Storz		
ACT ES	-	Storz	-	-
CFA	-	-	Storz	Storz
MFB	-	-	-	Storz
DSE	Camlock	-	Camlock	-
TFS	Storz	Storz	-	Storz
Forestry Tasmania				
Parks Tasmania				
SAMFS	-	SAFB	-	
SA CFS	-	SAFB	-	Storz
DEH	SAFB	SAFB	-	-
FSA	-	-	-	Storz
FESA	-	-	-	Storz
DEC WA	-	Camlock	-	-
NTFS	-	Storz	-	Storz
Defence				

Note: Squares shaded in this colour indicate agencies implementing couplings in accordance with Version 3.1 of this paper. (Correct as of

Coupling History

Storz Coupling

The Storz coupling is widely used by fire services worldwide and was invented for this purpose by Guido Storz in 1882. It is a quarter turn internal lug coupling that is available in a size range of 12mm to 250mm albeit that in the smaller sizes the coupling is relatively inefficient due to the small bore size compared to the coupling size, (Refer Table 3). This leads to reduced flow and turbulence so increasing friction loss and is one of the reasons why the Canadian forestry industry developed its own coupling, (refer Forestry Coupling). A significant advantage with the Storz coupling is that it can be used for both suction and delivery provided appropriate washers are used. Agencies in Europe, North America and Australia use this coupling. In the 1990's AFAC informally adopted the Storz coupling as its standard for hose couplings and it was at that time that agencies in Queensland, NSW and Victoria adopted it. DIN standards14302 and 14303 cover Storz couplings.

Forestry Coupling

The Forestry coupling, otherwise known as the Wajax or CUL coupling, is a quarter turn external lug coupling that was developed for the Canadian forestry industry in the mid 1970's with the stated intent of creating a national standard metric quick connect forestry hose coupling. In 1977 two companies, Wajax Manufacturing and Canada Metal Company designed and manufactured prototypes for evaluation. The Canada Metal prototype, after modification, was accepted as the preferred option. These couplings are now generally considered as the preferred coupling for land management agencies in Australia as they are better suited for use in a rural environment than Storz. Until recently Forestry couplings were only available in sizes up to and including 38mm but an 'orphan' 64mm coupling is also now available. The advantage of the Forestry coupling over Storz in a rural environment is that it is not subject to soil contamination issues, for hoses up to 38mm diameter the couplings are interchangeable irrespective of bore diameter and there is full flow at the stated diameter. Forestry couplings are covered by Underwriter Laboratory of Canada, (ULC), standards.

Both the Storz and Forestry couplings are hermaphrodite or sexless and both are considered "quick connect" by virtue of their quarter turn operation.

British Standard Instantaneous Coupling, (BIC),

The British Instantaneous coupling, or John Morris Coupling, was developed to achieve interoperability between British fire services and was adopted by them during World War Two. It is a quick connect coupling but unlike Storz and Forestry it is not a hermaphrodite coupling as it has male and female ends. The BIC coupling is reliant on pressure to produce a leak free joint and due to this cannot be used for suction connections. It also has the disadvantage of having moving parts on the female end and comes in only one size, 65mm. BIC couplings are covered by British Standard 366.

Camlock couplings are used by a number of agencies specifically on suction hoses. This coupling is widely used in industry because a good seal is obtained by virtue of the cam used to lock it. It is not a hermaphrodite coupling but is relatively quick and efficient to use.

All other couplings in use around Australia, (e.g. Queensland Round, Modified London Round, (SAFB), and V Thread), are best described as ‘Historic’ and are relatively inefficient when compared to Storz, Forestry or BIC.

There are a number of other fire hose couplings in use around the world such as the Nakajima quarter turn external lug coupling, the Machino ‘push to connect’ coupling and the Italian coupling that may be considered fit for purpose but to adopt wholesale change would be cost prohibitive and relatively pointless when fit for purpose couplings are already in use by AFAC member agencies.

Selection of Common Couplings

The process for selecting a common coupling for Australian AFAC member agencies commenced with a survey. Most of the respondents agreed that the implementation of a common coupling was logical but there were diverse views as to what that coupling should be. Consequently in the selection process fitness for purpose, ease of use and cost were used as determining factors rather than personal or historic preferences.

As any fire fighter will attest to there are times, albeit rare, when the wrong end of a hose is taken to the fire or hydrant. Invariably this occurs at the worst possible time and when people are under pressure. This can't happen with a hermaphrodite or sexless couplings as either end will fit. Both Storz and Forestry are hermaphrodite couplings but BIC is not. BIC couplings also have moving parts that add to their maintenance, cost and complexity. Consequently it is asserted that BIC is not the best option for a common coupling for all AFAC member agencies.

A number of agencies have adopted Storz as their sole coupling. Whilst such an approach has significant merit in principle it was recognised that Storz couplings have a number of disadvantages when used in rural applications where long hose lays are utilised. The following table, (Table 3), provides an indication as to why those agencies currently using Forestry couplings for small diameter hoses have a preference for them over Storz as Forestry couplings are fully interchangeable up to 38mm irrespective of size and provide full flow rates relative to the designated hose size. Whilst similar flow rates can be achieved with Storz by using a coupling with the appropriate bore diameter, each coupling is a different size necessitating the use of adaptors and adding unnecessary complexity.

Table 3

	A		B		
Storz Designated Bore Size	**Theoretical Flow l/min @ 1 m/s**	**Storz Actual Bore Size**	**Actual Flow l/min**	***Flow* B vs. A**	**Water Velocity Storz A = 1[(2)]**
25	**29.45[(1)]**	**18**	**15.27**	**52%**	**1.93 m/s**
38	**68.05[(1)]**	**29.6**	**41.29**	**61%**	**1.65 m/s**
52	**127.42**	**44.8**	**94.58**	**74%**	**1.35 m/s**
65	**199.10**	**55**	**142.55**	**72%**	**1.40 m/s**
75	**265.07**	**65**	**199.10**	**75%**	**1.33 m/s**
100	**471.24**	**89**	**373.27**	**79%**	**1.26 m/s**
125	**736.31**	**114**	**612.42**	**83%**	**1.20 m/s**
150	**1060.29**	**126**	**748.14**	**71%**	**1.41 m/s**

[(1)] Actual flow rates for standard Forestry coupling.

[(2)] As water velocity increases power requirements increase.

The following two excerpts from the coupling survey provided an indication of the strength of feeling about Storz couplings in comparison to Forestry when used in a rural application

"I would require some serious work to convince me of the merits of Storz coupling on delivery hose of any size in a forest environment."

and

"You will note I am completely partisan about CUL, (Forestry), quarter turn couplings, historically and wrongly known as Wajax couplings. They are a very superior coupling system in wildland application."

The disadvantage with Forestry couplings is that they are unavailable in sizes greater than 65mm so making their selection as the sole standard coupling impractical in urban environments where the transfer of large volumes of water is sometimes required. In this environment Storz couplings have a significant advantage as they are available in sizes up to 250mm in diameter and hence can cater for not only existing requirements but also accommodate the increasing requirement for high volume hoses.

Given this background it is logical that both Forestry and Storz couplings are included in the proposal for common couplings for Australian AFAC member agencies as to propose only one fails to recognise the differing needs of agencies engaged in rural operations compared to those operating in a predominantly urban environment.

Storz & Forestry Couplings showing relative size, restrictive nature of Storz coupling compared to size and difference between an internal and external lug connection.

Implementation

Previous attempts to introduce a common coupling have failed due to the focus on achieving a single coupling solution and the perception that any changeover would need to occur as a single action and within a relatively short time frame. Such an approach would be at best cost prohibitive, logistically challenging and a significant impediment to the adoption of common hose couplings as was evident in previous attempts.

Under the proposed model there is a twenty year window, (until June 2028), provided for the implementation of common couplings by Australian AFAC member agencies. This timeframe is based on the widely accepted lifespan of twenty-years for appliances used by rural agencies. If each new or replacement appliance manufactured between now and 2028 were fitted with the proposed couplings, and adaptors were provided during the transitional period, all of the fleet will have been fitted with common couplings by 2028. Urban services would achieve a similar outcome in less time due to a shorter appliance lifespan, currently around fifteen years.

It is worth noting that when NSW RFS elected to completely change to Storz couplings it nominated an implementation of period of ten years with the actual changeover occurring in four years due to a rapid take up by brigades who appreciated the simplicity of using hermaphrodite couplings.

Cost Implications

Cost is invariably raised as the biggest single impediment to the implementation of common couplings amongst Australian AFAC member agencies. This is acknowledged as a significant issue as there are few short-term benefits to be gained from the implementation of common couplings and any costs incurred are hard to justify.

Under this proposal the implementation period to achieve common couplings is twenty years as they would only be introduced as fire appliances and hoses are replaced. Consequently it can be argued that the transition process would be cost neutral except for the cost of providing adaptors for use in the intervening period with the final cost being dependant on the type and number of adaptors provided.

This proposal necessitates two types of adaptors being provided for those agencies transitioning from ‘Historic’ couplings to Storz with agencies already using Storz only requiring one. “Transitional” adaptors will be required to transition from existing historic couplings to Storz couplings and “STC”, (Storz to Forestry), adaptors will be required to transition between Storz and Forestry.

Indicative costing, obtained in early 2007, of a “Transitional” adaptor, as depicted in the following photograph was quoted at $180 per set exclusive of GST. Two sets of ‘Transitional’ adaptors would be required on each appliance. The cost of the second adaptor, the “STC” adaptor would be approximately $70, exclusive of GST. Two of these would also be required.

The intent is to seek State and/or Federal Government funding to assist in the procurement of the adaptors required to achieve interoperability.

Example of an adaptor set, in this case Storz to Modified London Round, (SAMFS/SACFS)

Discussion

Prior to the release of this paper, Version 5, agencies in South Australia, Tasmania and the CFA in Victoria had already commenced implementing couplings in accordance with Version 3.1 of the paper.

After V3.1 of the paper was published AFAC released its Strategic Plan for 2008 – 2015 and implementation of common couplings for all Australian member agencies is in accord with the plan.

AFAC, (Council), in recognising that significant progress had been made towards the selection and adoption of common hose couplings for Australian fire agencies, and that critical mass was close to being achieved, endorsed the formation of a Common Couplings Working Group and this is the second paper prepared under the direction of that Group.

The proposals made in this paper are the outcome of a significant and comprehensive consultative process undertaken over an eighteen month period followed by deliberations undertaken by the Common Couplings Working Group that led to consensus.

The proposals detailed at the end of this paper were reached by consensus and are another step towards the implementation of common couplings for all Australian AFAC member agencies given that Queensland rural and land management agencies, DEC in WA and all agencies in South Australia, Victoria, Tasmania and NSW are either already compliant or are working towards becoming compliant with them.

Informal feedback from fire appliance manufacturers, equipment suppliers, hose suppliers, Standards Australia and the Building Codes Board indicates support for the standardisation of couplings.

Implementation of the AFAC standard for hose couplings will necessitate a change of couplings on fixed systems and static water supplies in those States implementing the standard. Whilst the change in couplings would be at the property owners expense a communications strategy and methodology will need to be developed to advise owners and builders of the change. Australian Standard 2419 will also need to be amended to reflect the change.

Implementation of common couplings for AFAC member agencies will provide an opportunity for member agencies to aggregate their coupling and hose purchases using the Collaborative Purchasing initiative.

Proposal

The AFAC Common Couplings Working Group agreed by consensus that:

- Storz couplings or Forestry couplings [(1)] or a combination of both be adopted as the AFAC standard for delivery hose couplings.
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- Camlock be adopted as the AFAC standard coupling for applications involving aircraft or fuel.

It is proposed that AFAC, (Council) endorse these recommendations.

Subject to these being endorsed it is recommended that AFAC:

- Council encourage and pursue the implementation of the AFAC standard for delivery hose couplings by Australian member agencies by June 30th 2028;
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(1) A 65mm Forestry Coupling is now available. This is an 'orphan' coupling and as such does not form part of this proposal.

Note.

All Australian AFAC Member Agencies were availed the opportunity to participate in the negotiation process that has led to agreement by consensus for common couplings. FESA did not attend meetings but provided written input into the consultation process for consideration.

This paper and the associated proposal reflect the position reached by the AFAC Common Couplings Working Group.

Tony Blanks, Chairperson Date.

Common Couplings Working Group

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