COPPER ALLOYS IN WATER AGENCY INFRASTRUCTURE PRODUCTS

Background

In August 2017 it was announced that excessive levels of lead had been found in the drinking water of a Perth based children's hospital during the construction phase of a new building. The cause was attributed to approximately 1200 brass thermostatic mixing valves (used to combine hot and cold water) that had been installed within the plumbing network. Further details of the valve material have not been made public.

This incident led to the Australian Building Codes Board (ABCB) being requested by the Building Ministers Forum to undertake a research project into the risk of lead contamination from brasses used in the plumbing network. The ABCB subsequently engaged Macquarie University to undertake a literature review to determine to what extent plumbing products and materials may contribute to unacceptable lead levels in drinking water.

Whilst this review is centred on the plumbing network, WSAA has determined that a review of the risks should also be undertaken for the water agencies infrastructure network.

Regulation of water agency infrastructure products

Each water agency is responsible for the approval of products utilised within its area of control. Australian Standards are predominantly used as the basis for product approval. The WSAA Product Appraisal scheme is voluntary for manufacturers and suppliers.

There is a requirement within all Australian Standards for waterworks products to comply with AS/NZS 4020 which includes a test for the leachabilty of metals, including lead, from the product. The Standard allows for the application of scaling factors to take into account that the surface area of the product in service is in contact with substantially larger volumes of water than in the test. These scaling factors are typically 0.01 to 0.05 for valves and fittings.

End of line fittings also have a scaling factor applied to the in-product test results based on the fact that the volume of water contained within the fitting for the test will be diluted before consumption.

Copper alloys in the water agency infrastructure

This paper identifies commonly used infrastructure products that contain copper alloy components. The Australian Standards generally specify an acceptable basic copper alloy material grade but may also list alternative acceptable grades.

Table 1 details those products identified and nominates the relevant Australian Standard, a brief description of the copper alloy component within the product and the copper alloy grade specified.

Table 2 nominates the allowable lead content of the various copper alloys.

It should be noted that copper alloy components may be only one material option of alternatives allowable in a particular product standard.

All of the products utilised within the water agency infrastructure may essentially be considered as in-line fittings. Furthermore, the surface area of the copper alloy components within the products represents a comparatively low surface area exposure to the water in the pipeline.

TABLE 1: Water Infrastructure products containing copper alloys

Product	Standard	Component	Basic Copper Alloy Grade	Standard in WaterMark Schedule
Gate Valves-Metal Seated	AS/NZS 2638.1	Spindle Seal Retainer, Gate, Gate Nut, Seat Rings	C83600	Yes
Gate Valves – Resilient Seated	AS/NZS 2638.2	Spindle Seal Retainer, Gate Nut	C83600	Yes
Spring Hydrants	AS 3952	Dome	C83600	Yes
Non-return Valves	AS 4794	Disc, Seat Rings	C83600	Yes
Butterfly Valves	AS 4795.1 and AS 4795.2 and AS 5612	Disc, Bearings	C95810 C92710 C93500 C93700	Yes
Air Valves	AS 4956	Seat	C83600	No
Tapping Bands	AS 4793	Body, Outlet	C83600 C48600	Yes
Meters	AS3565	Body	Not specified	Yes
Ball Valves	AS 4796	Body	Not specified – typically CW602N	Yes
Automatic control valves	AS 5081	Piston, Guide Bushings, Pilot Valve Body, Plug	C90250 C83600 C93500	Yes
Gripper Rings for PE Pipe		Gripper Rings	Not specified - typically C37710, C83600	No
Ferrules	AS/NZS 3718, AS3496	Body	Not specified	Yes
Bronze Gate Valves	AS 1628	Body	Not specified	Yes
L-Type Hydrants	Spec only	Body	C83600	No
Copper pipe – Main to Meter	AS 1432	Pipe	C12200	Yes
Miscellaneous Fittings and Connectors	AS 3688	Body	Not specified	Yes

TABLE 2: Lead content for various copper grades nominated in Australian Standards

Grade of Copper	Lead Content
C83600	4%-6%
C48600	0.1% - 2.5%
C95810	0.05% max
C92710	4%-6%
C93500	8%-10% (see note)
C93700	8%-11% (see note)
C90250	0.3% max
C62700	0.05% max
C62300	0%
C35200	0.5% - 3.5%
C95210	0.05% max
C37710	1% - 3%
C12200	Nil
CW614N	2.5%-3.5%
CW602N	1.7% – 2.8%
CC491K	4.2%-5.8%

Note: These materials containing a high level of lead content relate only to shaft bearings in butterfly valves, which are not in contact with water.

This document was prepared by Peter Pittard for the Water Services Association of Australia.

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