Asset lifecycle – Guidance Note

Water network EPDM gasket material

Purpose

The purpose of this Guidance Note is to clarify the material requirements for EPDM (Ethylene Propylene Diene Monomer) gaskets, where these are specified for use in the water networks (generally up to 250mm inside diameter). This aligns Watercare's Material Supply Standard (ESF-500-STD-601) to that of *WSA 109: 2021 Industry Standard of Flange Gaskets and O-Rings*.

The "WSA 109" Standard is widely recognised as the industry standard for gaskets used with AS/NZS 4087 flange configurations - this includes the manufacturing and testing requirements for gaskets.

Background

Since the introduction of the Material Supply Standard, Watercare have adopted reinforced EPDM gaskets. Prior to EPDM gaskets, natural rubber insertion (reinforced) gaskets were used for general applications including water networks.

The term insertion refers to a mesh of either cotton or nylon reinforcement that is inserted into an elastomeric compound during manufacture (refer Figures 1 & 2).

Insertion of the reinforcement aims to increase the tensile strength of the gasket and reduces creep relaxation following application of the bolt load.

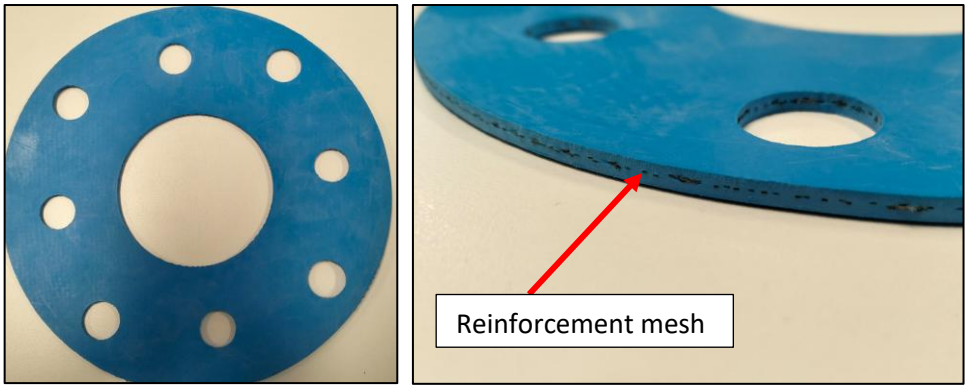

Figure 1: *Blue EPDM gasket with reinforcement visible.*

References

Watercare

- ESF-500-STD-601: Material Supply Standard
- DW02: Code of Practice for Land Development – Water drawing set

Other

- **AS/NZS 4087:** 2011 Metallic flanges for waterworks purposes
- **WSA 109:** 2021 Industry standard for flange gaskets and O-rings
- **AS/NZS 4020**: 2018 Testing of products in contact with potable water
- **Industrial Gasket Solutions Limited** (communications)

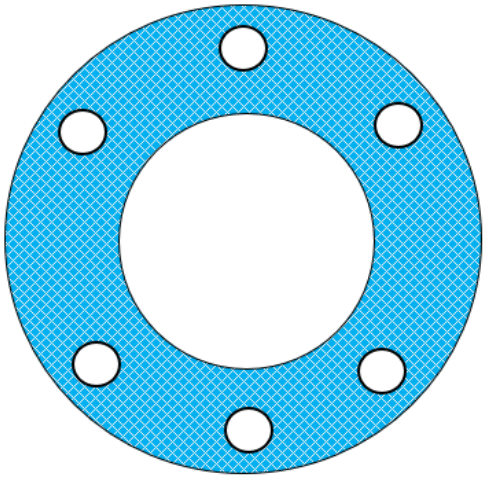

Figure 2: *Illustration of insertion reinforcement profile in current EPDM gaskets*

Current non-compliance issues

Watercare's requirements for local network water flanged assemblies are referenced in the Material Supply Standard and include:

- Flanges conforming to AS/NZS 4087: 2011 *Metallic flanges for waterworks purposes*
- All equipment shall comply with AS/NZS 4020: 2018 *Testing of products in contact with potable water*

What these Standards specify:

AS/NZS 4087: 2011 Metallic flanges for waterworks purposes

- Section 3.3 (Page 11): "*Flange gaskets shall comply with WSA 109*"

WSA 109: 2021 Industry standard for flange gaskets and O-rings

- Section 2.2 (Page 8): "Flange gaskets and O-rings shall comply with AS/NZS 4020."
- Section 3.1 (Page 10): "*Gaskets shall be* ***solid without fabric reinforcement*** *or* ***other composite materials****. The surfaces may be flat or profiled to the manufacturer's design requirements."*

AS/NZS 4020: 2018 Testing of products in contact with potable water

- Appendix R3 (Page 90): "*The water agencies require a satisfactory appraisal and acceptance, approval or authorization of the product before allowing the introduction of products into their water supply. For further information on appraisal, consult the Water Services Association of Australia (WSAA)."*

In addition to reinforced EPDM gaskets not being fully compliant with the above standards, there is also no formal method to certify reinforced EPDM gaskets for compliance with AS/NZS 4020:2018.

Performance Risks

In addition to compliance issues the following ***operational concerns*** have also been highlighted:

- The indentations around the reinforcement can attract bacteria which then accumulate and result in microbial growth.
- Weeping has been observed where fluid seems to pass along the reinforcement from the internal edge to the outside (see Figure 3 below), with the reinforcement mesh effectively creating a flow path through the gasket. Where water tracks or wicks, it can harbour bacteria.
- Reinforced EPDM gaskets may be susceptible to delamination and reduced mechanical (compressive) strength over time, although this depends on the material combination.

Figure 3: *Field examples of reinforced EPDM gasket weeping water through reinforcement*

The behaviour of a solid EPDM gasket, compliant with WSA 109, was observed during a test demonstration. The solid EPDM gasket was installed with the bolt flanged assembly being fitted in accordance with the recommended torque values documented in Watercare's Guidance Note: Steel bolted flanged joint assemblies. The test rig was subjected to a pressure significantly exceeding that in Watercare's network (+2500 kPa) without showing any signs of leakage or blowout for a 30-minute period as outlined below.

Notwithstanding this test, risks outlined above have led to the ongoing use of solid EPDM gaskets across Australian water utilities.

***Table 1**: Pressure test carried out on solid EPDM gasket*

 ***Step 1**: Set specified torquing value on torque wrench*	 ***Step 2**: Insert gaskets and torque bolts (in acceptable sequence) to specified values*	 ***Step 3**: Increase test pressure and observe gasket performance*

Conclusion

Following extensive investigation and feedback from industry specialists across Australia and New Zealand, It is recommended that reinforced EPDM gaskets are not suitable for use in water networks.

Watercare's Materials Supply Standard (version 2.2) has been updated to reflect compliance to the AS/NZS Standards and industry best practice for EPDM gaskets. This will also align to the requirements set out in WSA 109 for manufacture and testing, including compliance with water quality (AS/NZS 4020:2018). EPDM gaskets for potable water shall also be UV stabilised and blue of colour.

In addition, the use of reinforced natural rubber gaskets in wastewater applications is not recommended as these attract microbial growth and natural rubber becomes susceptible to deterioration. Nitrile rubber gaskets are preferred for wastewater applications, as they have shown to be more durable in contaminated environments.

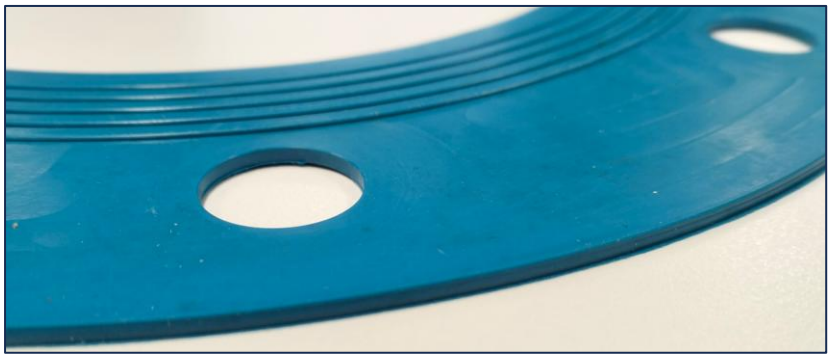

***Figure 4:** Example of a solid EPDM gasket without reinforcement (industry standard)*