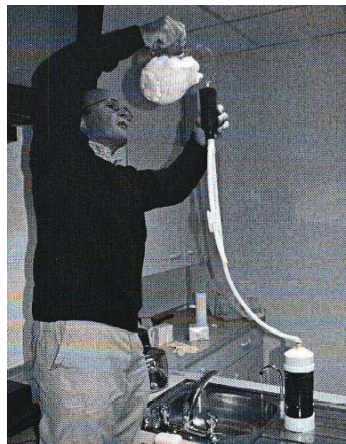


British Water / UKWTA Industry Standard Specification for the
Performance of Chemical Inhibitors for use in Domestic Hot Water
Central Heating Systems filled with Artificially Softened Water



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DRAFT FOR APPROVAL

FOREWORD

The Domestic Water Treatment Association (DWTA) have developed a standard for determining the performance of a chemical inhibitor using bottled hard and bottled soft waters to simulate extremes of 'mains' water qualities under controlled conditions.

In April 2006 a revised version of BS 7593 was released that said specifically in section 4.2 External: *Naturally soft waters of low alkalinity or those supplied via a base-exchange resin softener have an increased potential for corrosion and, if they are to be used in any central heating system, a corrosion inhibitor specifically formulated for the purpose should be added and properly maintained.*

Water softener manufacturers and boiler manufacturers need to satisfy themselves on behalf of their mutual customers that if artificially softened water is used to fill a central heating system, the performance of the chemical inhibitor has been tested under equivalent conditions.

This is a 'stand-alone' standard; manufacturers have the flexibility to meet the DWTA standard for conventional 'mains' treatments, BW / UKWTA standard for artificially softened water treatments, or both.

This standard has been borne out of collaboration between British Water and UKWTA with the assistance of Dr. Phil Munn of Corrosion & Environmental Services Ltd.

Thanks must go to DWTA for allowing their test method to be used and consequently this document should be read in conjunction with the DWTA standard which details apparatus, preparation of test solutions, cleaning, expression of results, etc.

Thanks must also go to HHIC for facilitating the cross-association collaboration between British Water, DWTA and UKWTA.

This Draft for Approval supersedes the August 2007 Draft for Discussion following a consultation process and subsequent joint water treatment trade association meeting at HHIC in September 2007.

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NORMATIVE REFERENCES

The following referenced and sub-referenced documents are indispensable for the application of this standard:

DWTA Industry Standard Specification for the performance of Chemical Inhibitors for use in Domestic Hot Water Central Heating Systems (May 2006)

BS EN 14743:2005 Water conditioning equipment inside buildings – Softeners – Requirements for performance, safety and testing

EN 973 Chemicals used for treatment of water intended for human consumption – sodium chloride for regeneration of ion exchangers

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INTRODUCTION

The performance of chemical inhibitors is evaluated in two stages:

- A short-term laboratory evaluation carried out in conventional glassware to determine the corrosion rate of standard metal coupons in solutions of manufacturers' strength inhibitor.
- An evaluation of the effect of the inhibitor on non-metallic materials.

As the purpose of adding artificially softened water to central heating systems is the avoidance of formation of lime-scale, it is not necessary to conduct a scaling test.

SECTION A

Describes the procedure for determining the corrosion rates of mild steel, copper, extruded aluminium, brass and stainless-steel under a variety of conditions in a glassware test.

Corrosion rates are determined at manufacturers' recommended inhibitor concentration in base-exchanged artificially softened water. Absolute corrosion rates are assessed using mass-loss coupons in uncoupled conditions.

SECTION B

Describes a test for determining the compatibility of inhibitors with commonly used non-metallic materials. Accelerated testing is undertaken in laboratory glassware tests.

APPROVED LABORATORIES

Tests to this standard specification can only be undertaken using BuildCert approved laboratories.

SECTION A – CORROSION RATE DETERMINATION

Follow section 1.1.1 through 1.1.7 inclusive of the DWTA standard to set up your apparatus.

Preparation of Test Solutions

Prepare test solutions by diluting the product to the manufacturers recommended solution strength in the artificially softened water as specified in the section 'Preparation of Test Water'. If the product comprises more than one component these components shall be mixed in accordance with the manufacturers instructions.

Test Specimens

Follow section 1.3.1 through 1.3.3 inclusive of the DWTA standard to prepare the test specimens.

Preparation of Test Water

Preparation of test water is a two-stage approach:

STAGE ONE

The artificially softened water shall be prepared from DWTA standard hard water (prepared according to section 1.4 of the DWTA standard).

STAGE TWO

The DWTA standard hard water will then be passed through a salt-regenerated cation exchange softener rig ¹ with a composition defined by the parameters given in the table below:

	Artificially Softened Water
Total hardness	< 5 mg/l
Carbonate ion concentration	150 ± 10 mg/l
Chloride	60 ± 10 mg/l
Sulphate	60 ± 10 mg/l

Analytical grade sodium carbonate, sodium chloride and sodium sulphate shall be added to adjust the composition as necessary.

Footnote 1

BS EN 14743:2005 is a European Standard which specifies requirements relating to the construction and mode of operation and relevant methods of testing of automatic, salt-regenerated, cation exchange softeners for drinking water installations inside buildings which are permanently connected to the mains supply.

To perform the task of passing DWTA hard water through a softener rig, it will need to be disconnected from the mains supply. Consequently the softener rig need not comply with all aspects of this standard. However the standard prescribes the cation exchange resin and salt used for regeneration which should be used within the softener rig devised by the laboratory to treat the water to achieve the desired composition.

Procedure

Perform a series of tests with the parameters given in the table below. All tests are to be undertaken using manufacturers' recommended inhibitor concentration. Tests are to be carried out in duplicate, making four test cells in total.

Test parameters for corrosion tests

Test	Aeration / De-aeration	Water
1	Air Sparging	Artificially Softened Water
2	Natural Aeration	Artificially Softened Water

Mount the bundles as DWTA section 1.5 then clean and evaluate the coupons as DWTA section 1.6 and express the results as DWTA section 1.7

Pass Criteria

The absolute corrosion rate of the metals shall not exceed those specified in the table below:

Maximum Corrosion Rates for Metal Coupons

Metal	Corrosion Rate mm / year	
	Artificially Softened Water Air Sparging	Artificially Softened Water Natural Aeration
Mild Steel	0.040	0.040
Copper	0.005	0.005
Extruded Aluminium	0.100	0.100
Brass	0.005	0.005
Stainless-steel	0.002	0.002

SECTION B – COMPATIBILITY WITH NON-METALLIC MATERIALS

The compatibility of an inhibitor with elastomeric materials commonly used within a central heating system will be assessed by measuring the percentage volume change on immersion using four times the manufacturers' recommended inhibitor strength for a period of 96 hours at 82°C ($\pm 2^\circ\text{C}$).

Test Solutions

Test solutions shall be made using four times the manufacturers' recommended concentration of the inhibitor in artificially softened water and meet the composition as defined in section A 'Preparation of Test Water'.

Follow section 3.2 through section 3.4 inclusive of the DWTA standard (but substituting artificially softened water) to determine the differences in volume.

Results

An inhibitor will have passed the test if the difference in volume between samples immersed in artificially softened water and the test solutions does not exceed 10%.

Follow section 3.6 of the DWTA standard to determine whether any deterioration has occurred, resulting in failure.

Reporting

A company confidential report shall be issued using the template provided in the appendix.

Validation

The 3rd party scheme provider BuildCert is to coordinate a series of validation tests. Once completed, this validation information will be able to be requested.

APPENDIX

Results:

Date of Issue:..... Product Identification Code:.....

Absolute corrosion rate

	Corrosion rate measured, mm/year			
	Artificially Softened Water air sparging		Artificially Softened Water natural aeration	
Metal	Coupon bundle 1	Coupon bundle 2	Coupon bundle 1	Coupon bundle 2
Mild steel				
	Average:		Average:	
Copper				
	Average:		Average:	
Extruded aluminium				
	Average:		Average:	
Brass				
	Average:		Average:	
Stainless steel				
	Average:		Average:	

Compatibility with non-metallic materials

Non-metallic material	% change in volume of samples in control test (Artificially Softened Water)		% change in volume of samples in test solution, with inhibitor		% age change in volume – control vs. inhibitor	Visual inspection notes
	Set 1	Set 2	Set 1	Set 2		
EPDM 70, sulphur-cured						
	Average:		Average:			
EPDM 70, peroxide-cured						
	Average;		Average:			
EPDM 70, resin-cured						
	Average:		Average:			
NBR 70, peroxide-cured						
	Average:		Average:			

Additional notes:

Disruption / equipment failure?

Date:

Detail: