Domestic Chemical Water Treatment Manufacturers Association

DWTA
Domestic Water Treatment Association

Code of Practice for Chemical Cleaning and Inhibiting of Domestic Hot Water Central Heating Systems

A Guide for Installers and Specifiers

Prepared By the DWTA Technical Working Group

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1. Scope

This DWTA Code of Practice gives industry approved recommendations on good practice in respect to cleaning and inhibiting of domestic hot water central heating systems. From 2006, this will be a requirement under the Building Regulations for England and Wales, Part L., 2006. The regulations stipulate that cleaning and inhibiting is necessary when installing new central heating systems, or carrying out remedial work on existing central heating systems.

These measures have been introduced to minimise scale and corrosion formation, which have been demonstrated to lead to a reduction in energy efficiency of the system over time.

This Code of Practice is a practical document that incorporates modern cleaning and flushing techniques and methods of assessing compliance with the cleaning chemical manufacturer's recommendations. It is consistent with the requirements of BS7593:2006 which is a referenced document within the ADL Domestic Heating Compliance Guide. Following this Code of Practice will guarantee compliance with ADL.

2. Objectives of Water Treatment in Central Heating Systems

Water treatment fulfils a number of roles within domestic central heating systems.
These can be summarised as follows:

- to minimise the corrosion of metals within the system
- to inhibit the formation of the scale and sludge
- to inhibit the growth of microbiological organisms
- to maintain or restore the energy efficiency of the system through a combination of the above effects

3. Treatment of Water

3.1 External water supply

In most cases, the quality of the water supplied to the system is determined by local conditions. There is no practical method of external treatment which can reduce the potential for corrosion within system.

Although softened water has a proven benefit on scale reduction it markedly increases the propensity for corrosion within the system. Consequently if a system is filled with softened water, a corrosion inhibitor specifically designed for use within softened water must be used. The use of softened water is not necessary if a DWTA approved inhibitor is used at the recommended dose rate. This is because it will inhibit the formation of both corrosion and scale.

3.2 Internal system water

To minimise the likelihood of corrosion, scale and sludge formation, microbiological contamination, and to help to maintain the energy efficiency of the heating system, the system water must be treated with chemical inhibitor (see section 6). Inhibitors conforming to the DWTA industry standard, have been independently tested and proven to inhibit corrosion and scale formation and to be compatible with non-metallics currently used in central heating systems.

Before adding an inhibitor, the system needs to be thoroughly cleaned (see section 5) to ensure that it is free from contaminants, which can cause blockage or erosion within the system.

Within a new system, contaminants include corrosion debris, flux residues, grease, installation debris, metals swarf, solder pieces, stamping oil, welding rod, PVC tape and plastic pipe swarf.

Within an existing system contaminants include sludge, corrosion debris, bacterial growth and limescale.

4.1 General considerations

The installer has a choice of cleaning methodologies available which will meet the requirements of the Building Regulations for England and Wales, Part L., 2006. The regulations stipulate that a chemical cleaning agent must be used and that a fresh water flush only is no longer acceptable for either new or existing systems.

The installer must carry out a chemical clean followed by a fresh water flush before an inhibitor is added. The efficiency and efficacy of these operations can be improved by use of a powerflushing pump. Powerflushing has the advantage over gravity cleaning in that the process is both faster and can ensure a more effective clean in the majority of cases.

It is extremely important that both specifiers and installers appreciate that cleaning of both newly installed and existing systems takes time. A conventional clean and flush using gravity to empty the system, can take up to a full working day depending on the size of the heating system. Powerflushing is a dynamic technique and will not only reduce the time on-site for the installer, but will also improve the efficacy of the clean. Four to six hours should be allowed to powerflush and re-commission a typical domestic central heating system.

If microbial fouling is found within a central heating system (often detected by the presence of organic slime or a 'bad egg' smell), consideration should be given to treatment by chlorination. In the event of such an occurrence, further advice should be sought from the chemical treatment manufacturer.

Red water or red rust within an existing central heating system is an indication of oxygen ingress due to a system fault or incorrect component installation. These faults must be rectified before the system is cleaned and inhibited.

4.2 Choice of Chemicals

There are a number of different cleaning chemicals available. These range from mild, detergent cleaners, which may be designed for cleaning newly installed systems, to acid based cleaners, specifically designed to remove hardened limescale deposits and corrosion in older heating systems.

Manufacturer's recommendations and guidelines regarding the choice of chemical should be followed.

4.2.1 Special Considerations

A single feed cylinder, otherwise known as a primatic cylinder, differs from a conventional cylinder in that the heating water from the boiler is not contained within a coil, but is instead contained within a dome which separates the two water systems by an air bubble. This air bubble provides expansion capacity for the heating system. If in doubt as to whether a primatic cylinder is fitted, the installer of the system should be contacted. Chemical cleaning agents and most inhibitors cannot be used in these systems.

4.3 Choice of Methodology

When deciding on whether to use a gravity clean and flush or a powerflush there are a number of factors which need to be considered. These include the age and condition of the system, the degree of contamination and corrosion evident within a system, the time available to clean, and the system specification.

Simple chemical test kits are available from chemical manufacturers designed to aid the installer in making a decision on the state of the water inside the system. These provide tests for contaminants such as chloride from flux residues, dissolved iron, dissolved copper, and may also test pH, whether an inhibitor is present in the system and if so, the dosage level.

Chemical manufacturers may also provide a more accurate laboratory service for determining these parameters.

Existing systems with a high level of corrosion or black magnetite sludge will benefit most from powerflushing. Using a gravity clean will be time consuming and will leave contamination within the system, particularly below drain point levels. Special consideration should be given to the condition of the system if it has been operated in this state over a period of time. Corrosion debris could be blocking pin-holes in radiators, and in these instances powerflushing may lead to system leaks. In these circumstances, the radiators should be replaced, preferably before cleaning is undertaken.

Powerflushing is not suitable for all systems. As a general guide, the following systems or components should not be powerflushed:

- Single pipe systems
- Systems with passivated steel pipework
- Older systems with stainless steel pipework

The following systems require special consideration and engineers should refer to powerflushing machine manufacturers' guidance notes.

- Gravity hot water systems
- Twin entry radiator valves
- Primatic cylinders
- Thermal stores
- Microbore and minibore pipework
- Built in circulators which cannot be removed

If in doubt, contact the manufacturer.

4.4 Preparation before gravity cleaning and flushing

For new systems it is wise to check the integrity of the system before any cleaning chemical is added.

Isolate the cold water supply to the central heating system.

Drain down the primary water to a foul drain and if possible, determine the system volume. Ensure that discharge to drainage complies with any local or national discharge requirements.

For existing systems, carry out any remedial work.

Manually open any motorised valves and bypass (or temporarily remove) any anti-gravity/non-return valves in the system.

Fit or otherwise ensure that full bore drain off facilities are available on the system in accordance with BS EN 12831 and BS EN 12828[1].

4.5 Gravity cleaning and flushing

Dump system water to a foul drain and refill with fresh plain water.

Dose the system with the specified or selected chemical cleaning agent to the manufacturer's recommended level.

In the case of an open vented system, the cleaning agent may be introduced via the feed and expansion cistern, a venting point, or a radiator in accordance with the manufacturer's recommendations.

In the case of a sealed system, the cleaning agent can be introduced via the top-up vessel, a temporary top–up vessel, a pressurisation unit, the filling loop, a venting point or a radiator in accordance with the manufacturer's recommendations.

Ensure and verify that all primary water circuits are open and will remain open during the cleaning period.

Turn on the appliance and operate the system in accordance with the cleaning agent's manufacturer's recommendation. Each manufacturer will give recommendations for the temperature and time requirement for optimum product performance.

Switch off the system and isolate the cold feed. Completely drain the system from all low level full-bore drain points and valves. Vent all radiators to ensure that the system is fully drained. Once the system has been completely drained, close off the drain points.

Repeatedly refill and drain the system until the water runs clear. This will take a minimum of 3 fills and flushes. Clarity of the drain water can be checked using a turbidity tube. The drain water should also be checked to determine whether the system has been adequately flushed. A Total Dissolved Solids (TDS) meter is recommended for this purpose. The system water is considered adequately cleaned if the reading on the TDS from the flush water is within 10% of the TDS reading from the incoming mains water.

TDS meters and turbidity tubes are available from chemical treatment manufacturers.

4.6 Preparation before Powerflushing

For new systems it is wise to check the integrity of the system before any cleaning chemical is added. For existing systems, carry out any remedial work. Where possible, powerflushing should be undertaken with the old boiler in situ prior to the boiler replacement.

Establish whether the system is open vented or closed vented. If the system is open vented, cap-off or temporarily join together, the open vent and cold feed to the filling and expansion tank.

Turn off all electrical controls and electrically isolate the system.

Ensure all radiator and lockshield valves are open. Remove TRV heads to ensure maximum flow through the valve.

Set diverter or zone valves to their manual open setting.

Manually close any automatic airvents

Anti-gravity valves (non-return valves) if fitted should be bridged, by-passed or temporarily removed. (Failure to do so will prevent flow reversal and reduce the effectiveness of the cleanse).

Isolate the cold water supply to the central heating system.

Connect the powerflushing machine to the central heating system following the manufacturers' instructions. The cleaning chemical can be added directly through the reservoir on the powerflushing machine.

4.7 Powerflushing

Because power flushing machines operate differently, this section gives general guidelines, on power flushing procedures and the exact procedure will depend on the make of the powerflushing machine. At all times manufacturers recommendations should be followed. Some powerflushing units allow the boiler to be operated during powerflushing and chemical cleaning is more effective at increased temperatures. Consult the powerflushing machine manufacturers' instructions.

Allow the unit to run for at least 10 minutes with all radiator valves open, reversing the flow regularly.

Dump the dirty water to a foul drain whilst adding clean water to the reservoir tank until the TDS of the dump water is within 20% of the incoming mains water.

Add the chosen powerflushing chemical to the reservoir.

If the system has an indirect cylinder, divert the flow to the cylinder coil and circulate for 10 minutes, reversing the flow regularly. Divert the water back to the heating circuit.

Close off all the radiator valves except for the radiator furthest from the power flushing unit.

Allow the unit to pump through this radiator for a minimum of 5 minutes, or until even heat over the radiator surface is achieved in the case of a hot flush, reversing the flow regularly.

The cleaning time will vary depending on the size of the radiator and extent of debris and sludge within the radiator. Tap the radiator with a rubber hammer to dislodge any debris during this time.

Close the flow and return on the radiator and then move to the next radiator. Open the valves and repeat. Continue until all of the radiators have been cleaned, to within 10% of main, checking with the TDS.

If the boiler has been operated during the cleaning process, switch it off.

When the last radiator has been cleaned set the powerflushing machine in to dump position and flush the last radiator until the TDS of the dump water is within 10% of mains.

Repeat this process on all radiators in the opposite order to that in which they were cleaned.
When all the radiators have been cleaned, divert all the flow to the cylinder coil (if present) and dump until the TDS of the dump water is within 10% of mains.

Open all radiator valves wide and undertake a final full system flush, dumping the cleaning water to foul drain. This process will vary dependant on the make of the powerflushing machine.

Clarity of the wastewater can be checked using a turbidity tube.

4.8 System Restoration

Once the powerflush has been completed, the system should be restored to operating condition. The pump setting, radiator valve settings, and controls should be checked and any temporary loops, valves or caps on expansion and feed pipes removed.

5. Inhibiting of Central Heating Systems

It is important that the cleaned central heating system is treated with the chemical inhibitor immediately following cleaning. Limescale can deposit on heat exchanges as soon as the boiler is heated, which can result in energy efficiency losses. Treating the system with an inhibitor conforming to the DWTA/BuildCert performance standard will minimise this risk.

The addition of a chemical inhibitor to the cleaned system is a requirement under the Building Regulations for England and Wales, Part L 2006. The inhibitor will minimise the corrosion of metals within the system and also protect against the formation of limescale. This will ensure that design energy efficiency is maintained, replacement of components due to corrosion and erosion is minimised, and prevent the need to de-sludge the system in the future.

Because central heating system capacities vary, after addition of the inhibitor, it is prudent to check that the dosing level is adequate. This can be checked by use of a chemical manufacturer's inhibitor test kit, or via the manufacturer's analytical laboratory. After the inhibitor has been added, register the treatment regime in the boiler manufacturer's log book.

The level of an inhibitor should be checked on an annual basis. This can usually be undertaken by the boiler engineer as part of the annual service. Chemical inhibitors are usually supplied with a sticker to indicate the date of treatment and the product used. This should be completed and placed on the boiler casing in a convenient location to allow identification of the treatment regime.

DWTA approval does not necessarily mean that inhibitors from different manufacturers can be mixed within a central heating system. Indeed it is prudent and good practice not to mix inhibitors from different manufacturers. If the make of the previous inhibiting regime is in doubt, the system should be drained and refilled, and the new inhibitor added to the manufacturer's recommendation.

In the event of a system drain-down or partial system drain-down, the inhibitor level should be checked and topped up if necessary, and noted in the boiler manufacturer's log book. Draining and removal of a radiator from the wall for decorating purposes would constitute a partial drain-down. Underdosing of inhibitor can lead to a reduction in the protection of the heating system. Overdosing of an inhibitor will not have any adverse effects on the heating system.

6. Training

Many chemical water treatment product manufacturers provide training on the use of water treatment, system diagnostics using test kits, and powerflushing.

Further Information

For further information contact

The Domestic Chemical Water Treatment Manufacturers Association (DWTA)
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For further information about the DWTA/BuildCert standard

www.dwta.org.uk

Appendix 1 – References

BS EN 12828 and BS EN 12831 Hot water central heating systems for domestic premises England, Wales, Scotland, Northern Ireland and Republic of Ireland

BS 7593: 1992. Code of practice for treatment of water in domestic hot water central heating systems

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