

<b>Technical Note</b>			<b>TN-012</b>
<b>Test:</b> All hot water tests			<b>Test no.:</b> 3a, 3b, 4a, 4b, 5a, 5b
<b>Assumption:</b> Cold Water Supply Temperature			<b>Assumption no:</b> 82
<b>Rev:</b> 01	<b>Date:</b> 21/09/2020	<b>Author:</b> Gareth Jones	<b>Checked:</b> Valeria Khnykina

## 1. Introduction

In the current (Rev-009) version of the BESA HIU Test Standard, the CWS supply temperature is maintained at 10°C for the DHW tests. This has been maintained since the original SBRI funded test, which was aligned with the Swedish F:103-7 test standard [1].

However, there has been periodic discussion regarding this assumption this over the past five years as it has been suggested that the 10°C design condition employed is lower than the average CWS temperature in the UK and, as a result, the calculated VWARD reported within the test results would consequently be lower than the measured VWARD in practise.

## 2. Considerations for CWS temperature

### 2.1. Consideration 1

There is a trade-off between the utility of the test results for use in design decisions (design condition operation temperature) and the accuracy of the VWARD.

Retaining a lower CWS temperature is more representative of design conditions (i.e. in the middle of winter) with test output therefore more useful for design decisions. However, the resultant VWARD is likely to be lower than reality (on an annualised basis).

Conversely, using a higher average input temperature may not be as realistic in terms of representing how an HIU will operate in design conditions, but is likely to give a more accurate VWARD (on an annualised basis).

Table 1 below shows variation in expected CWS temperature over the year. This data was obtained from EST field trials in 2008 and is presented in SAP 2012 (Table G2). The data shows that the average CWS temperature is 15.3°C, higher than the 10°C standard. The winter temperatures are closer to ~11°C, dropping slighter lower in February.

*Table 1: Cold water supply temperature in °C [2].*

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Oct	Nov	Dec
11.1	10.8	11.8	14.7	16.1	18.2	21.3	19.2	18.8	16.3	13.3	11.8

Therefore, the consideration here is whether to maintain DHW testing at the current temperature or change to the average temperature of 15°C given this data.

## **2.2. Consideration 2**

As the primary purpose of the BESA HIU Test Standard is to provide a comparative test of performance between HIUs, it is important to consider whether changing CWS temperature would be expected to have a differing impact across manufacturers.

A review was carried out on the likely impact of increasing the CWS temperature from 10°C to 15°C on the VWARD for four different manufacturers with different performance profiles. This resulted in a projected 2°C average increase in VWARD across the four, with a 0.5°C range in impact across the different manufacturers (from 1.5°C to 2.0°C) – i.e. there was no tangible comparative difference in projected impact across the manufacturers.

As such, changing CWS temperature would not be projected to have a material comparative impact on reported VWARD figures across HIUs.

## **2.3. Consideration 3**

The proposal is to include a new DHW test in the next revision of the BESA HIU Test Standard, which tests DHW output temperature as DHW flow rate increases. This will effectively enable engineers to assess the maximum output of HIUs at design condition.

This test would be more relevant given a 10°C CWS, as this is more representative of design conditions.

## **2.4. Consideration 4**

The response time tests (5a and 5b) would be significantly impacted by an increase in CWS test.

As these tests are designed to ensure sufficiently rapid delivery of DHW to residents, a shift to an *average* CWS temperature would risk DHW response times being longer than 15 seconds for a significant portion of the year and designers would need to take this into consideration. In effect, this would devalue the data from this test.

As such, retaining a 10°C CWS temperature would provide more useful data in this context and be in line with the goal of protecting resident comfort.

## **3. Conclusion**

There are valid arguments for both retaining a 10°C CWS temperature and for increasing it to 15°C.

While the use of a 15°C would be likely to yield a more accurate VWARD, it would not have any impact on the comparative performance of HIUs on this metric. As such, the increase would not have a significant benefit on the primary objective of the test.

Conversely, there are a number of advantages to utilising a 10°C CWS temperature with regards to the utility of test data for design purposes.

## **4. Recommendation**

Due to the arguments discussed in the sections above, **the recommendation is to maintain the CWS temperature at 10°C for DHW tests.**

## **5. References**

[1] – Certification of District Heating Substations. Technical Regulations F:103-7e, Swedish District Heating Association, April 2009.

[2] - The Government's Standard Assessment Procedure for Energy Rating of Dwellings, SAP 2012 v 9.92, October 2013.