

<b>Technical Note</b>			<b>TN-009</b>
<b>Test:</b> space heating			<b>Test no.:</b> 1a-1f
<b>Assumption:</b> Specific heat and density of water			<b>Assumption no:</b> 95. & 96.
<b>Rev:</b> 1	<b>Date:</b> 18 May 2020	<b>Author:</b> Martin Crane	<b>Checked:</b> Gareth Jones

## 1. Introduction

The current HIU Test space heating tests use fixed assumptions for the specific heat capacity and density of water. The parameters are required to be known to calculate the mass flow rate and heat content of the measured volumes of water.

## 2. Considerations for continuation of not including any test that use HIU pump

### 3. Consideration 1

In reality the specific heat capacity and density of water vary with temperature, and hence the use of fixed values do not result in the most accurate calculation of the heat transfer.

### 4. Consideration 2

Test 1a-1f do not require particularly high accuracy in the calculation of the power so the accuracy of the assessment of the power is not important. Correcting for variation in specific heat and density changes result in the calculated heat transfer value varying by less than 2%. The tolerance for the accuracy of the heat output for these tests is +/- 10% for the 1 and 2 kW Tests and 6% for the 4kW Test. With all the Test House using the same density and Cp figure this will not impact on the variation in VWART between Test rigs.

## 5. Conclusions

Use of pump would make achieving identical test conditions for each HIU very difficult to achieve. There is no clear benefit, in terms of data useful to the understanding and quantifying HIU performance, from using the HIU pump for the current HIU Tests. Use of the pump, controlled by the HIU controls may allow improved HIU performance but the HIU Test Regime would need to be expanded with additional tests to be able to assess such benefits.

## 6. Recommendation

The use of fixed values for density and specific heat capacity of water is not detrimental to the accuracy of the Test outputs and does not increase the possible variation in results from different Test rigs.

- 1) Recommend continued use of fixed values for specific heat of water and density.
- 2) Recommend the fixed values to be used are stated in the Test Regime Standard.

## **7. References**

[1] BSRIA provide Test calculations sheets