

WORK PACKAGE 7

Safety Assessment: Property Level Leakage and Accumulation



WP7 SAFETY ASSESSMENT

The Hy4Heat Safety Assessment has focused on assessing the safe use of hydrogen gas in certain types of domestic properties and buildings. The evidence collected is presented in the reports listed below, all of which have been reviewed by the HSE.

The summary reports (the *Precis* and the *Safety Assessment Conclusions Report*) bring together all the findings of the work and should be looked to for context by all readers. The technical reports should be read in conjunction with the summary reports. While the summary reports are made as accessible as possible for general readers, the technical reports may be most accessible for readers with a degree of technical subject matter understanding.

Safety Assessment:

Precis

An overview of the Safety Assessment work undertaken as part of the Hy4Heat programme.

Safety Assessment:

Conclusions Report

(incorporating Quantitative Risk Assessment)

A comparative risk assessment of natural gas versus hydrogen gas, including a quantitative risk assessment; and identification of control measures to reduce risk and manage hydrogen gas safety for a community demonstration.

Safety Assessment:

Consequence Modelling Assessment

A comparative modelling assessment of the consequences in the event of a gas leak and ignition event for natural gas and hydrogen gas.

Safety Assessment:

Gas Ignition and Explosion Data Analysis

A review of experimental data focusing on natural gas and hydrogen gas ignition behaviour and a comparison of observed methane and hydrogen deflagrations.

Safety Assessment:

Gas Dispersion Modelling Assessment

A modelling assessment of how natural gas and hydrogen gas disperses and accumulates within an enclosure (e.g. in the event of a gas leak in a building).

Safety Assessment:

Gas Dispersion Data Analysis

A review of experimental data focusing on how natural gas and hydrogen gas disperses and accumulates within an enclosure (e.g. in the event of a gas leak in a building).

Safety Assessment:

Gas Escape Frequency and Magnitude Assessment

An assessment of the different causes of existing natural gas leaks and the frequency of such events; and a review of the relevance of this to a hydrogen gas network.

Safety Assessment:

Experimental Testing - Domestic Pipework Leakage

Comparison of leak rates for hydrogen and methane gas from various domestic gas joints and fittings seen in typical domestic gas installations

WP7 SAFETY ASSESSMENT

Safety Assessment:

Experimental Testing – Commercial Pipework Leakage

Comparison of hydrogen and methane leak rates on a commercial gas pipework system, specifically the gas meter and equipment contained within the Plant Room of a MOD site.

Safety Assessment:

Experimental Testing - Cupboard Level Leakage and Accumulation

Comparison of the movement and accumulation of leaked hydrogen vs. methane gas within cupboard spaces in a typical domestic property.

Safety Assessment:

Experimental Testing - Property Level Leakage and Accumulation

Comparison of the movement and accumulation of leaked hydrogen vs. methane gas within a typical domestic property.

Safety Assessment:

Experimental Testing - Ignition Potential

Investigation of the ignition potential of hydrogen-air mixtures by household electrical items and a comparison with the ignition potential of methane-air mixtures.

HY4HEAT WP7 LOT3: PHASE 1 AND 2

Property Level Leakage and Accumulation Data Report

Department for Business, Energy & Industrial Strategy

Report No.: 625371, Rev. 3 FINAL

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Lot 3

Objective:

Convey experimental configuration and results from experiments in Hy4Heat WP7 Lot3.

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EXECUTIVE SUMMARY

DNV GL were commissioned by BEIS to conduct three programmes of experimental studies (Lots 2-4) within WP7 of the Hy4Heat project. WP7 of the Hy4Heat programme is concerned with determining the relative safety of hydrogen within a domestic property (i.e. downstream of the gas distribution network's final valve) compared to natural gas.

This report provides the results from two distinct phases in Lot 3, which had the objective to gather information on gas build-up following releases within rooms in a domestic property. The experiments involved releases of hydrogen and methane within a representative 2-story domestic property. Methane was used as a surrogate for natural gas for simplicity of both supply and gas analysis. The second phase of experiments was commissioned after completion of the first phase and involved iterations of different vent arrangements applied to the basement, kitchen and living room.

In the first phase (Phase 1); a program of 102 experiments was conducted, involving 53 hydrogen releases, 49 methane releases and variants in release size, flow rate and orientation into both the basement and kitchen boiler cupboard within the house. Releases were from holes ranging from 5 mm to 20 mm in diameter, with flowrates between $1.6 \text{ m}^3.\text{hr}^{-1}$ and $25.5 \text{ m}^3.\text{hr}^{-1}$ for methane and between $4.5 \text{ m}^3.\text{hr}^{-1}$ and $78.6 \text{ m}^3.\text{hr}^{-1}$ for hydrogen.


The second phase. Phase 2, consisted of an additional set of 20 experiments (18 hydrogen and 2 methane) variations in combinations of vent openings in the basement, kitchen and living room.

Experiments were carried out in a purpose-built row of houses, 'Hy Street', at DNV GL Spadeadam.

Some general observations are given below. External wind speed / direction and its effect on the gas accumulation is not considered in the following observations:

- For releases in the boiler cupboard at the higher rates in this programme, both hydrogen and methane formed layers of nominally uniform concentration above the point of the release. The layer height is affected by the cupboard geometry, whether the kitchen door or the vent above it are open or closed and the addition of cupboard vents.
- The effect of having the kitchen door open in experiments with hydrogen or methane being released into the boiler cupboard resulted in higher concentrations in the rooms outside the kitchen whilst not having much effect on the concentration measured at the high point in the kitchen. The mid- and low-height measurements in the kitchen showed reductions in concentration.
- The accumulation of gas (hydrogen or methane) was significantly affected by the orientation of the release in the basement. Downwards releases showed formation of deeper layers below the release point, approaching homogenous mixtures in the room as might be expected when release momentum effects are considered.
- For releases in the basement with methane, significant flammable concentrations in the rest of the house were not generally observed until the $8.8 \text{ m}^3.\text{hr}^{-1}$ rate experiment was conducted. The horizontal and upwards releases had the potential to produce higher concentrations in the rest of the house. With hydrogen this threshold was $25.5 \text{ m}^3.\text{hr}^{-1}$ to generate significant flammable concentrations. It should be noted that the $8.8 \text{ m}^3.\text{hr}^{-1}$ methane and the $25.5 \text{ m}^3.\text{hr}^{-1}$ hydrogen release rates were both generated with a 10 mm release orifice.
- The similar experiments performed with the basement door open and closed show that the effect of having the door open is to reduce the concentration observed in the basement and increase that observed in the rest of the house.

- Many experimental configurations and release rates considered with methane resulted in steady state concentrations in different positions in the kitchen or basement that were above the upper flammability limit for methane, albeit passing through the flammable range in the early parts of the release.
- No configurations produced hydrogen mixtures in areas outside of the cupboard which were above the upper flammability limit. The reactivity of hydrogen : air mixtures is such that some of the mixtures formed would be significantly reactive where the equivalent methane : air mixture would be non-flammable.
- 20 %vol hydrogen concentrations exhibit laminar burning velocities similar to that of ethylene and a factor of 2 higher than the worst case for methane. Concentrations of 30 %vol have a burning velocity about a factor of 5 higher than the worst case for methane. This can have significant effect on the severity of any subsequent explosion, even where some venting is available through weak parts of the structure such as windows.
- Inclusion of furniture and other obstacles is unlikely to have any effect on the accumulation of gas within the property but is known to have a significant effect on the potential explosion severity in natural gas explosions. Given the increased reactivity of hydrogen mixtures observed here, these should not be ignored when interpreting these results.
- Addition of a single 100 mm diameter vent above the kitchen door into the hallway in the 25 m³.hr⁻¹ hydrogen release rate case had the effect of reducing the concentration in the kitchen at the high and the mid-point, indicating a much-reduced layer thickness. It should be noted that some other regions of the house which were measured as non-flammable or low reactivity with no vent present, were now observed to be flammable or of increased reactivity after the introduction of the vent.
- Addition of 4 x 100 mm vent holes in the top and side of the kitchen boiler cupboard in the 25 m³.hr⁻¹ release case with hydrogen had the effect of reducing the concentration measured in the cupboard from nominally 65 %vol to approximately 45 %vol. The effect on the concentration profile in the kitchen appears to have been to increase the layer thickness such that the mid-point and high-point registered similar concentrations. The case with no cupboard vents showed much greater concentration at the high-point compared to the mid-point.
- Combining results from Phase 1 and Phase 2, it is possible to compare similar release rates with hydrogen and the effects of the various vent combinations:
 - All vent combinations in the kitchen involving vents to the outside or the hallway showed lower kitchen ceiling concentration than the unvented case.
 - The introduction of cupboard vents into releases in the kitchen with the larger (219 cm²) vent had the effect of reducing the concentration measured at the ceiling, although at both flow rates where this was observed, the wind speed was higher in the case of the vents in the cupboard being present.
 - At the highest flow rate in Phase 2 (78.6 m³.hr⁻¹), the venting (with either size of vent) had the effect of reducing the kitchen ceiling concentration from a rich mixture (~70 %vol) to that of a more reactive fuel : air ratio (~45 to 60%vol).
 - Where it was possible to compare the effectiveness of the ceiling vents to that of the vent above the kitchen door (i.e. at 8.9 m³.hr⁻¹), the ceiling vents appear more effective.

- 
- Use of the ceiling vents considerably reduced the measured concentrations in the ceiling void above the kitchen.
 - In the basement, the results are less clear when comparing the basement ceiling centre: the effect of increasing the vent area available increases the concentration at this one position. The results in the basement may be more susceptible to the wind direction at the time of the release and the positions of the air bricks open to venting.
 - In the living room, only two cases with vents above the door are available for comparison. The 100% increase in vent area into the hallway from one test to another gave a reduction in ceiling concentration of less than 10% of the lower vent area case concentration.

It should be noted that no consideration has been made for changes in atmospheric wind conditions between experiments. It is considered that this would not significantly affect the conclusions from the comparisons given here in that extreme changes in wind conditions between the experiments did not occur. The effects of wind speed and direction on the air flow through the specific rooms, the house and the vents could be investigated further to better quantify the effects of the mitigation techniques across a broader range of atmospheric conditions.

1 INTRODUCTION

DNV GL were commissioned by BEIS to conduct three programmes of experimental studies (Lots 2-4) within WP7 of the Hy4Heat project. WP7 of the Hy4Heat programme is concerned with determining the relative safety of hydrogen within a domestic property (i.e. downstream of the gas distribution network's final valve) compared to natural gas.

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The second phase. Phase 2, consisted of an additional set of 20 experiments (18 hydrogen and 2 methane) variations in combinations of vent openings in the basement, kitchen and living room.


Experiments were carried out in a purpose-built row of houses, 'Hy Street', at DNV GL Spadeadam.

2 EXPERIMENTAL ARRANGEMENT

The Hy Street facility consists of 3 houses of varying layout and construction. This test program was carried out in the eastern house of the block (left hand house in Figure 1). Hy Street's location on test site west (TSW) at DNVGL Spadeadam allows the required exclusion zones for testing to be enforced enabling the test program to be carried out safely. The house consists of a basement made up of a single room with stair access to the ground floor through a door into the hall (see photographs in Figure 2). The ground floor has a hallway, living room with chimney breast, kitchen and utility room. Open stairs from the hall lead to the first floor which is a single room with open stairs to the converted loft, which was also a single room. Pictures of the internal layout are included in Figure 3 - Figure 8. In some of the later experiments, a 100 mm diameter vent opening was introduced above the kitchen door into the hallway. This vent could be opened or sealed depending on the requirement of the experiment and a photograph is included as Figure 9. Similarly, 8 x 100 mm diameter vent openings were introduced into the kitchen boiler cupboard late in the programme (4 low and 4 high as indicated in Figure 10).

In Phase 2, ceiling vents were installed in the kitchen to provide some variation in ventilation. The vents were made from off-the-shelf cooker hood duct arrangements allowing the ceiling to be vented horizontally outside through the ceiling space (i.e. between the ceiling plaster board and the floorboards of the first floor). Two ducted vents were installed of equivalent cross-sectional areas of 78 cm^2 and 141 cm^2 such that it was possible to achieve three distinct vent arrangements of 0 cm^2 , 78 cm^2 , 141 cm^2 or 219 cm^2 by isolation of both, one or none of the two vents. Photographs and a set of measurements showing the position of the installed vents are given in Figure 11.

To provide variable ventilation in the basement in Phase 2, the clay air bricks in the basement were changed for plastic louvred vents with a free air ventilation area of 65 cm^2 quoted by the manufacturer. Three air bricks were left open in some experiments to give a total ventilation area of 195 cm^2 or all six



left open to give a ventilation area of 390 cm² in the basement. A photograph of one of the plastic louvered air brick vents is given in Figure 12.

Above the living room door into the hallway for use in Phase 2, two 85 cm² free air area vents were installed which could be independently open or closed. These are shown in Figure 13.

The construction of the house was block and brick with an external cavity wall and internal stud walls on the ground floor. The external wall cavities in the east house were not filled with any insulation. The floors on each level are constructed with timber joists and floorboards. Pneumatic rams were fitted to remotely control the windows (Figure 14) and basement door (Figure 15) to allow for venting of the houses following a test.

On completion of construction and prior to testing, air leakage rate tests were carried out on the house by an independent company. The air leakage tests were carried out with the open fireplace in the living room and the external air bricks on the house sealed and with this arrangement the results confirmed that the houses meet current building regulations for air tightness and are included in Appendix C and Appendix D for cases with the basement included in the tightness test and excluded respectively. The sealing of the fireplace and the air-bricks was kept in place throughout all experiments in Phase 1 with the air bricks being opened in the basement as required in Phase 2.

2.1 Gas supply

Up to four hydrogen or methane packs were manifolded together to supply gas for the experiments. This was routed to the house through the arrangement shown in Figure 16 and in the photograph in Figure 17. Actuated valves V33 and V34 allowed gas to be supplied to or vented from the rig remotely, allowing control from outside the 200 m exclusion zone. Flow control valve V35 was remotely controlled either manually operated by the test engineer or through an automatic control system to maintain a required outlet pressure or flowrate. This was connected to a PE gas main which feeds into the house. Internally, 22 mm copper pipe was used to route the gas to the boiler cupboard and basement. Gas was then released through a 5 mm, 10 mm or 15 mm diameter holes at the relevant release position and orientation. The release location was located at nominally mid-height within the boiler cupboard (above the internal shelf, see Figure 10) and immediately below the ceiling joists in the basement (2.4 m from the floor of the basement see Figure 2).

In Phase 2, two experiments were conducted releasing hydrogen into the living room of the house. The 10 mm diameter release hole was located at the floor level near to the fireplace to represent a leak from pipework supplying a gas fire and is shown in Figure 5.


2.2 Instrumentation arrangement

The gas supply system has been instrumented to record pressure, temperature and flow of gas into the house. A sampling system was used to monitor the gas accumulation within the building. Data on wind speed and direction has also been collected for the duration of the tests. Details of the instruments are given in the following sections.

2.2.1 Pressure measurement

Pressure in the gas supply system was measured at three locations:

- the outlet of the manifold the gas packs were connected to (range: 0 – 10 bar)
- the outlet of the flow control valve (range: 0 – 4 bar)
- the release point inside the house. (range 0 – 1 bar)



To keep all electrical equipment outside the house to minimise ignition risk, the transducer monitoring pressure at the release point was located outside the building and connected to the release location by a 1/8" stainless steel tube. The pressure transducers used in this programme were Druck UNIK5000 type transducers of the ranges specified above. All pressure transducers were calibrated prior to commencement of the programme against an onsite standard which, in turn, had been calibrated by a third party and traceable to national standards. The calibration was repeated periodically throughout the test programme.

2.2.2 Temperature measurement

The gas temperature was measured at the outlet of the flowmeter using a mineral insulated, stainless steel sheathed, Type T thermocouple connected to a thermocouple transmitter. The thermocouple was purchased together with a certificate of conformance and its transmitter calibrated for thermocouple conditioning using a thermocouple simulator, itself third-party calibrated and traceable to national standards.

2.2.3 Flow measurement


The flowrate was measured using a calibrated Bronkhorst thermal conductivity type flowmeter (model: F-206AI). The flowmeter had a range of 0 – 2.5 g/s hydrogen and was supplied with a factory calibration certificate. The same flowmeter was used for both hydrogen and methane with the application of a correction factor provided by the manufacturer for methane. The performance of the flow meter for both methane and hydrogen was checked against gaseous outflow theory through the release holes used in the programme and found to perform well for both gases.

2.2.4 Gas Sampling

Gas samples were taken from 23 locations in the house for the duration of each test. Sample lines were run from each sample location to a panel on the first floor (Figure 18) and then onward to one of three analysers through a stream selection panel. Analyser 1 and 2 both handled eight sample points each and analyser 3 handled seven. A stream selection system was used to cycle through the sample points by operation of 2-way solenoids (Figure 19). Each of the three analysers was equipped with an internal suction pump to pull samples at a rate of nominally 5 litres per minute through the analyser. The dwell time on each sample position could be altered depending on the test requirements but was typically 60 s resulting in a sample being taken from each location approximately every 8 minutes. Between sample periods, the sample lines had no flow meaning that when next sampled, there was the remnants of the previous sample in the line. The 60 s dwell time was determined in the commissioning of the system to give approximate 15-20 seconds of steady state 'live' sample after the clearing of the line from the previous sample.

Each analyser has three sensors to cover the full range of concentrations. The PPM (part per million) sensor detected levels up to 0.2 % hydrogen (disabled for methane tests) and was a City Technology 4-HYT type sensor. The LEL (lower explosive limit) sensors detected up to the LEL and were NCP-180 Pellistors fitted to a bridge conditioning board. This bridge conditioning board allowed the sensors to be balanced manually prior to each experiment in air. Balancing of the sensor was also possible using the SCADA system used to monitor and control the experiments.

The volumetric sensors, which were capable of measuring up to 100 % hydrogen / methane, were SGX Sensortech VQ6 series thermal conductivity bridge type sensors, connected to a similar bridge conditioning board as the LEL type sensors. The thermal conductivity of gas : air mixtures is non-linear, particularly at higher concentrations. The non-linearity of this sensor is discussed further in Section 5.2.



In addition to the sensors through which the samples were being analysed, each analyser enclosure also has an internal sensor which visibly alarmed on the control system and shut down the analyser if gas was detected inside the enclosure. A scripted control system was used to isolate each sensor in turn when its range had been exceeded to prevent poisoning of the cells.

Calibration of each sensor on an analyser was carried out before each test with certified span gas of hydrogen or methane depending on the test. Calibration gases with concentrations below the lower flammability limit used air as diluent and above the flammability limit, nitrogen. The calibration standards were as follows:

PPM Range: 1000 ppm Hydrogen in Air

LEL Range: 2 %vol Hydrogen (or Methane) in Air

Volumetric Range: 50 %vol Hydrogen (or 10 % Methane) in Nitrogen

2.2.4.1 Sample point locations

Approximately 40 sample point locations were installed in the house and a maximum of 23 of these could be sampled during any test by setup of the sampling panels within the house. Therefore, a judgement was made regarding which sample points would be of most benefit for accumulating useful data and for the safe operation of the test rig. Sample points in each room were located at high, mid and low-level. High level sample points were at ceiling level, mid-point at 1.2 m from floor level and low-level sample points were at floor level except for those in the basement which were 200 mm above floor level to prevent water being drawn into the sampling system. The basement was equipped with a sump point and drain but to maintain the airtightness of the building, the drain was closed during test periods. This meant that in cases of heavy rainfall, it was possible for small amounts of water to be present on the floor of the basement. The sample point locations recorded were consistent across tests with the same point of release.

For basement releases the sample point locations are detailed in Figure 20, Figure 21, Figure 24 and Figure 25, and Table 3.

For boiler cupboard release the locations are detailed in Figure 22, Figure 23, Figure 24 and Figure 25 and Table 4.

Concentrations within the boiler cupboard were monitored by 4 flying tube sample lines which were located as shown in Figure 26 and Figure 27.


For living room releases in Phase 2, the sample points in the boiler cupboard were moved to the living room and used such that 6 sample points could be positioned spaced along the central axis of the room as illustrated in Figure 28 and detailed in Table 5.

2.2.5 Wind Measurements

The wind speed and direction were measured nominally 50 m from the eastern edge of the house in each experiment. The instrument used was a Gill Windsonic ultrasonic anemometer providing wind speed and direction measurements at a height of 6 m above the local ground level.

2.3 Control and Data Acquisition

The tests were controlled from a remote control room using a SCADA control system. This allowed operation of the required valves as well as monitoring of the instrumentation on the rig. Figure 29 shows the on-screen layout of the system. This screen allows control of the inlet, vent and flow control valves as well as monitoring of the pressures and temperatures. The pneumatic rams on the windows



for each house can be controlled to allow remote venting of the houses following a test and the flowrate to and alarm status of each analyser can be viewed.

Analyser set up is carried out through the SCADA system and this can be remotely operated in case recalibration is required mid-test. Figure 30 shows the control screen. This allowed all required calibration gases to be routed to the analysers and flowrate to the analysers to be monitored. Individual sensors could be isolated for calibration and the auto function reinstated when a test was started. This used a script to automatically isolate sensors depending on the concentration of the gas being detected and protect them from high concentrations. This control screen also allowed the zeroing of all LKV's (last know values) at the end of a test.

Figure 31 shows the sample point monitoring system which indicates which sample point each analyser is sampling from at a given time. The graphs below show the live output from the analyser and display a percentage of the total range of the sensor the sample is passing through. The sensor being used is indicated by the colour of the line and the indicators below which show which sensors have been isolated. When the sample scrolling system is activated the analyser will sample from a location for the specified dwell time and then cycle onto the next location. The last live concentration recorded before the sample point switches is then recorded as the last know value (LKV) of the location.

3 MASTER TEST PLAN (MTP)

The MTP Version 2-2 (Table 1) details the 102 experiments carried out in Phase 1 with Table 2 providing details of the 20 experiments carried out in Phase 2. The following points confirm the test arrangements and amendments which were made to this during the test program.

- For releases into the basement, where the sealing arrangements describe the basement door as being closed, the door was wedged closed or connected to a pneumatic ram but not completely sealed. The pneumatic ram held the door closed for the duration of the test but allowed it to be opened at the end of the test for venting. The remaining doors in the house were wedged open.
- For releases into the basement, where the arrangements are described as 'all doors open', all internal doors in the house were wedged open.
- For releases into the kitchen boiler cupboard, where the arrangements are described as 'all doors closed', the cupboard door of the release point and the kitchen door was closed. The door to the basement was closed and sealed with tape for consistency with Lot 2 experiments. The living room and utility room doors remained open. Later in the test programme a 100 mm diameter circular vent was added above the kitchen door. This is indicated in Table 1.
- For releases into the kitchen boiler cupboard, where the arrangement is described as 'all doors open', the door to the basement remained closed and was taped shut. All other doors in the house were wedged open. Later in the test programme, the door of the adjacent cupboard was left open and a set of 4 x 100 mm diameter circular holes were created in the top of the cupboard and at low level (but above the internal shelf) to mimic ventilation. This is indicated in the Table 1.
- The door to the utility room and living room remained open for all tests.
- The fireplace in the living room was sealed closed for all tests.
- The external air-bricks were sealed for all tests in Phase 1 but the internal air-bricks in the basement were open into the wall cavity.

- In Phase 2, for basement releases, the air bricks were sealed or open as required.
- In Phase 2, for living room releases, one or both of the vents above the living room door were open and the living room door was closed but not sealed with tape.

4 EXPERIMENTAL PROCEDURE

The experiments in the test program were carried out in accordance with DNVGL Spadeadam Testing and Research Procedure STN0058 'Hydrogen and natural gas release into TSW houses – Hy Street'.

The same procedure was followed for both hydrogen and methane tests. When switching from one to the other, the control system was adjusted to allow the correct factor to be applied to the flowmeter readings and the PPM sensor to be isolated when testing with methane. Calibration gas bottles were changed as required and the analysers recalibrated.

To conduct a test, the appropriate release nozzle was connected to the pipework in the boiler cupboard or basement along with the release point pressure pipework. The internal door arrangements were set, and all doors were wedged into position. Isolation of power to the houses and operation of the window rams was confirmed. Gas bottle packs were connected to the manifold and the inlet pressure set as required depending on the test flowrate. Closure of the flow control valve and actuated gas inlet valve was confirmed and all manual valves to the rig were then opened.

An exclusion zone was enforced at 200 m from the house. This would ensure any personnel would be outside the area that could be affected by thrown debris in the event of an accidental ignition. CCTV cameras routed to the control room were used to monitor the area during a test.

Following calibration of the analysers, the auto protect function was set to prevent poisoning of the analyser cells and sample scrolling was started. The actuated inlet valve (V33) was opened and the flow control valve was manually stepped open until the required flowrate was achieved.

The control system logged all instrument readings continuously for the duration of the test.

The test was then monitored from the control room until the required conditions were achieved. For basement releases or boiler cupboard releases with doors open this criterion was steady state concentrations within the whole house. For boiler cupboard releases with doors closed tests were complete when steady state had been reached in the kitchen.

A steady state concentration was considered to be reached where the concentration increase in the previous hour was less than 10 %. Where tests had run for a period of greater than 3.5 hours, the discretion to stop the test was left with the test engineer based on the 'steady-state' criteria, gas availability and practicality of continued operation.

On completion of the test the gas flow to the house was stopped by closing the actuated valve and the windows (and if required the basement door) were opened remotely to allow ventilation of the building. The 200 m exclusion zone could be opened once the concentration in all locations within the house was below the lower flammable limit, but the house could not be entered until the gas concentration was less than 10 % LEL. Entry was then conducted by the Project Engineer with a hand-held gas meter to confirm that the building could now be accessed by checking of all voids and cavities.

5 RESULTS

Results from all the experiments in Lot 3 are presented in Appendix A, with the results from Phase 2 experiments being presented in Appendix B. For each experiment, there is a visualisation of the final or 'maximum' concentration profile throughout the house along with tabulated and trended values. The tabulated values show mean, maximum, minimum and standard deviation values for each measurement during the period selected. The selected period was manually chosen to encompass at least 2 measurements from every sample position in the property (i.e. a minimum of 10 minutes). In cases of changing wind conditions through a test, it may be that the latest period in a release does not necessarily correspond to the highest concentrations. The visualisations have been constructed from the raw data taken from the SCADA control system controlling the Hy Street facility. This raw data has been supplied in Excel Workbook form separately to this report. The raw data is kept within a 'Raw Data' worksheet in the workbook with any processing being performed in the 'Plot Data' worksheet.

5.1 Data Processing / Quality Check

Raw data in engineering units as well as measured units is provided within the results workbook for each experiment. The signals from all three ranges of gas sensor are provided in the workbook and the appropriate range selected by the user in the 'Plot Data' worksheet. Any offset in the baseline for each instrument / range is also applied in the 'Plot Data' worksheet, leaving the raw data intact and available for audit.

For each experiment the outflow of gas was checked for consistency against a simple outflow calculation, using the hole size and supply pressure as inputs – this provided as a cross check on the orifice size confirming that the correct fitting had been chosen and installed for an experiment. The evolution of concentration of gas within the room was checked for consistency against a simple gas accumulation model (Equation 1) using the outflow rate and an estimate for the air change rate within the room.

Equation 1: Simple Accumulation Model

$$C = \left(\frac{100Q_g}{Q_a + Q_g} \right) \left\{ 1 - \exp \left[- (Q_a + Q_g) t / V \right] \right\}$$

Where C is the concentration in %vol, Q_g is gas flow rate ($\text{m}^3 \cdot \text{hr}^{-1}$), Q_a is air flow rate ($\text{m}^3 \cdot \text{hr}^{-1}$), t is time (hr) and V is the volume into which the flows are mixing / accumulating (m^3 – this can be a layer or full room volume).

These consistency checks provided a verification of the test setup and results, i.e. that the installed hole size was correct and that the accumulation appeared consistent given the expected range of air change rates. The results of the checks can be seen in the 'Concentration' worksheet of the experiment workbook which also shows the raw and processed instrument trends.

The visualisation provided in this report is contained within the 'Concentration Visualisation' worksheet of the results workbook for each experiment. The visualisation indicates relative concentrations at each sample location on a simple layout of the house, not drawn to scale. The colours in the visualisation are chosen by Excel and are a function of the concentrations in the experiment with the highest concentration indicated by a red colour, lowest by a green colouring. The colouring is therefore not consistent quantitatively between experiments.

The tabulated data and the visualisation are generated using data taken between the times indicated in the header table of the visualisation and the dashed red line on the trends. The visualisation is generated

using the average reading across the time period specified. Different averaging periods can be chosen in the Excel workbook.

Within the visualisations, in some cases, the measurements recorded at certain sample positions have been removed. This is because the reading was determined not to be credible during the quality process. The readings associated with some of the sample lines were sometimes (although rarely) found to be spurious and it was discovered that some of the lines were able to vapour lock with condensed water (or ice in the colder weeks of the test programme). Partial or complete blocking of these lines would explain spurious measurements on the lines with blockage but would not affect the measurements made on other lines to the same analyser.

5.2 Volumetric Sensor Non-Linearity

Three volumetric range sensors used in these experiments measured by principle of thermal conductivity of the mixture. Hydrogen and methane both have higher thermal conductivity than that of air and consequently mixtures of either with air have higher thermal conductivity. Methane : air mixtures exhibit a near-linear relationship in thermal conductivity with proportion of methane in the mixture. A two-point calibration of the sensor (in air and then subsequently in 10 % calibration standard) is sufficient to give errors in the measurement in the low single-digit percentage region when interpreted linearly (approximately 1-3 % of full scale range, better around the calibration points).

Hydrogen does not exhibit the same linearity, particularly at higher hydrogen concentrations. During the hydrogen experiments, the sensor was calibrated using the same two-point calibration method, understanding that the linearity was good up to approximately 60 %vol in measurement. Figure 32 shows the results of a four-point calibration of two different volumetric analysers using the following calibration standards: 0 % (atmospheric air), 9.0 %vol, 50.58 %vol and 100 %vol (hydrogen from cylinder pack).

The response of the analysers is shown when the two-point calibration is applied as used in the experiments (i.e. error at 0 %vol and 50.58 %vol is zero). Similarity in results when repeated across two analysers showed the response is notably repeatable using the same calibration method as was used in the experiments (i.e. the non-linearity was the same). The chart in Figure 32 illustrates that the sensor responds as a quadratic with a small 2nd order term; the difference between the quadratic fit and the 1:1 line giving the error associated with the non-linearity of the sensor at the measured concentration. Below the 50.58 %vol calibration point, the quadratic fit indicates that the sensor over responds by a maximum of 2.6 %vol, corresponding to an error of 2.6 % of full-scale range. The maximum error due to non-linearity of the sensor is tabulated for each 10 %vol of the sensor range in Table 6 and the sensor performance is noted to become more non-linear above 60 %vol. At the upper flammable limit of hydrogen (75 %vol), the error due to non-linearity is ~5.0 % to 8.8% of the full scale range..

Where, in the results, comment is made that the sensor appears to have 'topped out' this could be due to two reasons:

1. The span of the data acquisition system and / or analyser was not set to incorporate the full 100% range. These are manually set at calibration and different for methane and hydrogen by virtue of the different thermal conductivity
2. The non-linearity of the sensor when used for hydrogen, according to the investigation results in Figure 32 and Table 6, would never report higher than 81 %vol hydrogen. There is potential to correct for this error using non-linear correction factors although this has not been performed in this report.

6 DISCUSSION

Whilst not within the scope of the project to perform detailed analysis of the data, some general observations are given below. External wind speed / direction and its effect on the gas accumulation is not considered in the following observations:

- For releases in the boiler cupboard at the higher rates in this programme, both hydrogen and methane formed layers of nominally uniform concentration above the point of the release. The layer height is affected by the cupboard geometry, whether the kitchen door or the vent above it are open or closed and the addition of cupboard vents.
- The effect of having the kitchen door open in experiments with hydrogen or methane being released into the boiler cupboard resulted in higher concentrations in the rooms outside the kitchen whilst not having much effect on the concentration measured at the high point in the kitchen. The mid- and low-height measurements in the kitchen showed reductions in concentration.
- The accumulation of gas (hydrogen or methane) was significantly affected by the orientation of the release in the basement. Downwards releases showed formation of deeper layers below the release point, approaching homogenous mixtures in the room as might be expected when release momentum effects are considered.
- For releases in the basement with methane, significant flammable concentrations in the rest of the house were not generally observed until the $8.8 \text{ m}^3.\text{hr}^{-1}$ rate experiment was conducted. The horizontal and upwards releases had the potential to produce higher concentrations in the rest of the house. With hydrogen this threshold was $25.5 \text{ m}^3.\text{hr}^{-1}$ to generate significant flammable concentrations. It should be noted that the $8.8 \text{ m}^3.\text{hr}^{-1}$ methane and the $25.5 \text{ m}^3.\text{hr}^{-1}$ hydrogen release rates were both generated with a 10 mm release orifice.
- The similar experiments performed with the basement door open and closed show that the effect of having the door open is to reduce the concentration observed in the basement and increase that observed in the rest of the house.
- Many experimental configurations and release rates considered with methane resulted in steady state concentrations in different positions in the kitchen or basement that were above the upper flammability limit for methane, albeit passing through the flammable range in the early parts of the release.
- No configurations produced hydrogen mixtures in areas outside of the cupboard which were above the upper flammability limit. The reactivity of hydrogen : air mixtures is such that some of the mixtures formed would be significantly reactive where the equivalent methane : air mixture would be non-flammable.
- 20 %vol hydrogen concentrations exhibit laminar burning velocities similar to that of ethylene and a factor of 2 higher than the worst case for methane. Concentrations of 30 %vol have a burning velocity about a factor of 5 higher than the worst case for methane. This can have significant effect on the severity of any subsequent explosion, even where some venting is available through weak parts of the structure such as windows.
- Inclusion of furniture and other obstacles is unlikely to have any effect on the accumulation of gas within the property but is known to have a significant effect on the potential explosion severity in natural gas explosions. Given the increased reactivity of hydrogen mixtures observed here, these should not be ignored when interpreting these results.

- Addition of a single 100 mm diameter vent above the kitchen door into the hallway in the 25 m³.hr⁻¹ hydrogen release rate case had the effect of reducing the concentration in the kitchen at the high and the mid-point, indicating a much-reduced layer thickness. It should be noted that some other regions of the house which were measured as non-flammable or low reactivity with no vent present, were now observed to be flammable or of increased reactivity after the introduction of the vent.
- Addition of 4 x 100 mm vent holes in the top and side of the kitchen boiler cupboard in the 25 m³.hr⁻¹ release case with hydrogen had the effect of reducing the concentration measured in the cupboard from nominally 65 %vol to approximately 45 %vol. The effect on the concentration profile in the kitchen appears to have been to increase the layer thickness such that the mid-point and high-point registered similar concentrations. The case with no cupboard vents showed much greater concentration at the high-point compared to the mid-point.
- Combining results from Phase 1 and Phase 2, it is possible to compare similar release rates with hydrogen and the effects of the various vent combinations:
 - All vent combinations in the kitchen involving vents to the outside or the hallway showed lower kitchen ceiling concentration than the unvented case.
 - The introduction of cupboard vents into releases in the kitchen with the larger (219 cm²) vent had the effect of reducing the concentration measured at the ceiling, although at both flow rates where this was observed, the wind speed was higher in the case of the vents in the cupboard being present.
 - At the highest flow rate in Phase 2 (78.6 m³.hr⁻¹), the venting (with either size of vent) had the effect of reducing the kitchen ceiling concentration from a rich mixture (~70 %vol) to that of a more reactive fuel : air ratio (~45 to 60%vol).
 - Where it was possible to compare the effectiveness of the ceiling vents to that of the vent above the kitchen door (i.e. at 8.9 m³.hr⁻¹), the ceiling vents appear more effective.
 - Use of the ceiling vents considerably reduced the measured concentrations in the ceiling void above the kitchen.
 - In the basement, the results are less clear when comparing the basement ceiling centre: the effect of increasing the vent area available increases the concentration at this one position. The results in the basement may be more susceptible to the wind direction at the time of the release and the positions of the air bricks open to venting.
 - In the living room, only two cases with vents above the door are available for comparison. The 100% increase in vent area into the hallway from one test to another gave a reduction in ceiling concentration of less than 10% of the lower vent area case concentration.

It should be noted that no consideration has been made for changes in atmospheric wind conditions between experiments. It is considered that this would not significantly affect the conclusions from the comparisons given here in that extreme changes in wind conditions between the experiments did not occur. The effects of wind speed and direction on the air flow through the specific rooms, the house and the vents could be investigated further to better quantify the effects of the mitigation techniques across a broader range of atmospheric conditions.



7 FIGURES



Figure 1: Hy Street drawings



Figure 2: Basement arrangement (release point identified by red arrow)



Figure 3: Location of boiler cupboard in kitchen



Figure 4: Kitchen layout



Figure 5: Living room and release point (shown with enhanced sample line arrangement used in Phase 2 (L3-A19 and L3-A20))

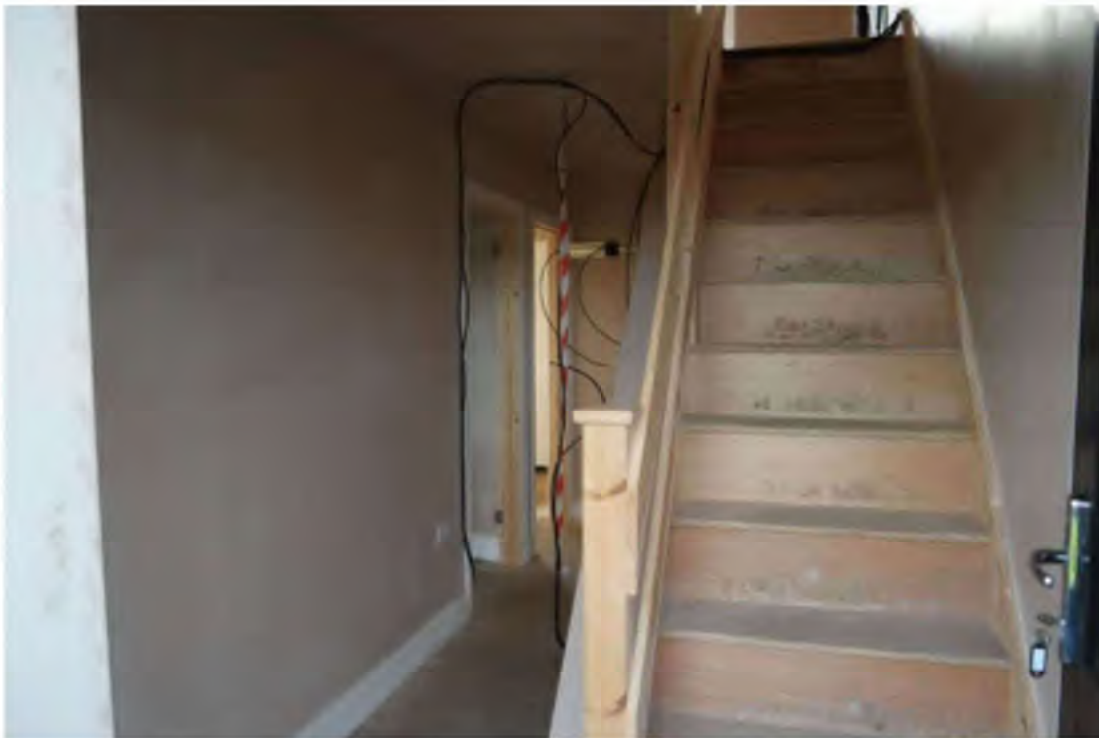


Figure 6: Hallway



Figure 7: 1st floor



Figure 8: Attic



Figure 9: 100 mm diameter vent opening above kitchen door into hallway

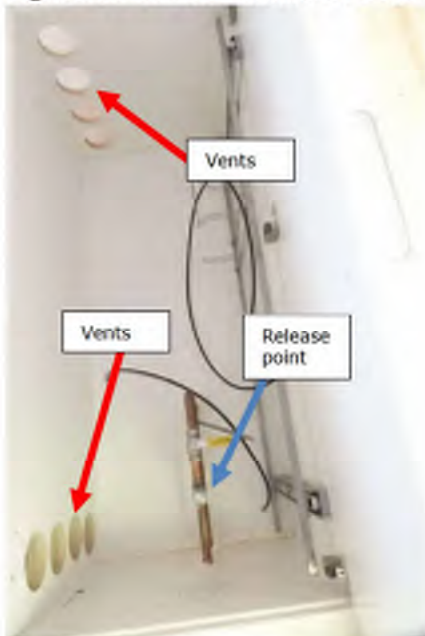


Figure 10: 8 x 100 mm diameter vent openings in kitchen boiler cupboard (adjacent cupboard door left open in experiments using the boiler cupboard vents)



Figure 11: 78 cm² and 141 cm² ducted ceiling vents in kitchen



Figure 12: 65 cm² opening air brick into basement c/w sample line inserted



Figure 13: 85 cm² vents above living room door (one open, one closed)



Figure 14: Pneumatically operated window ram



Figure 15: Pneumatic ram operating basement door

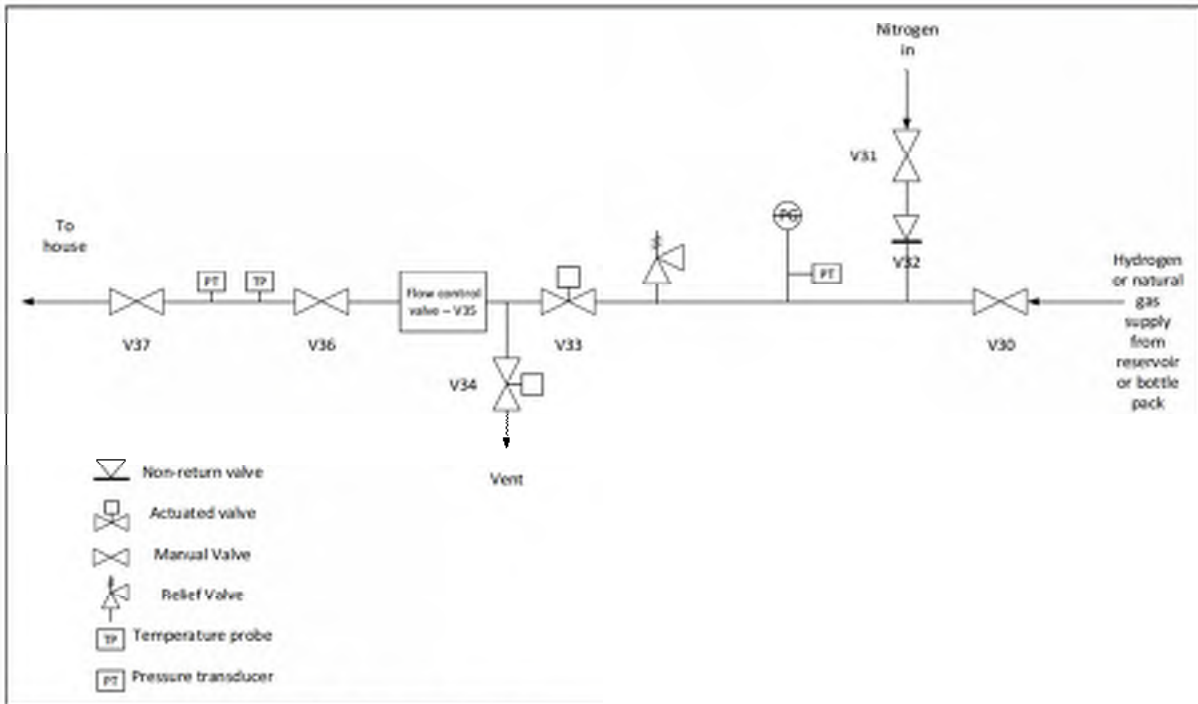


Figure 16: Pipework and valve layout diagram



Figure 17: Release control arrangement



Figure 18: Sampling panel

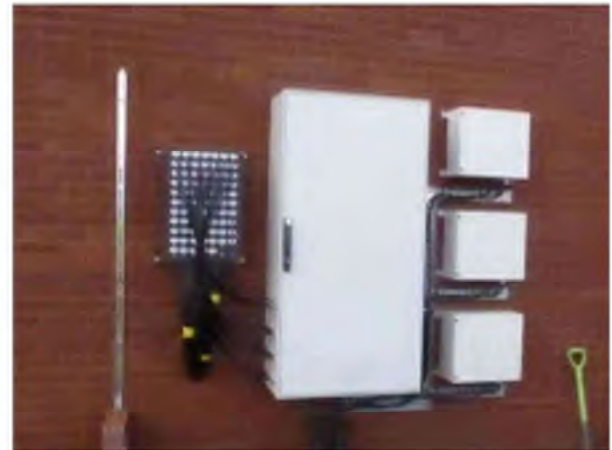


Figure 19: Stream selection and analysers

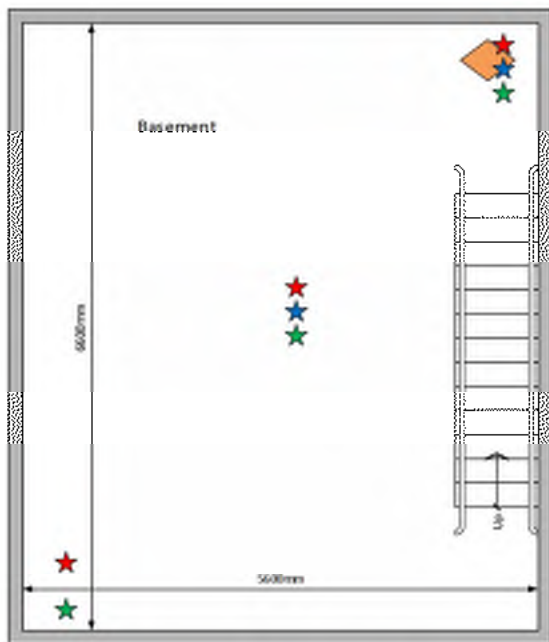


Figure 20: Basement sample point locations - for basement releases



Figure 21: Ground floor sample point locations for basement releases

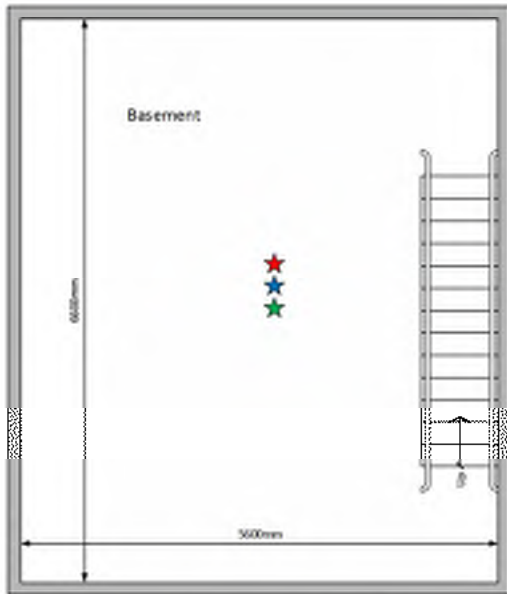


Figure 22: Basement sample point locations for boiler cupboard releases



Figure 23: Ground floor sample point locations for kitchen boiler cupboard releases

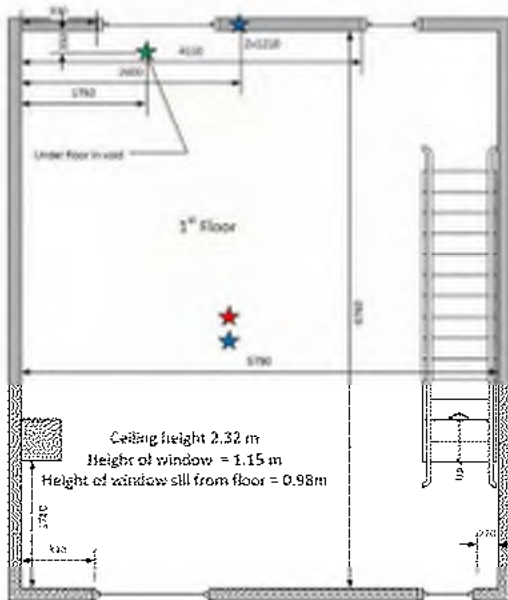


Figure 24: 1st floor sample point locations for all tests

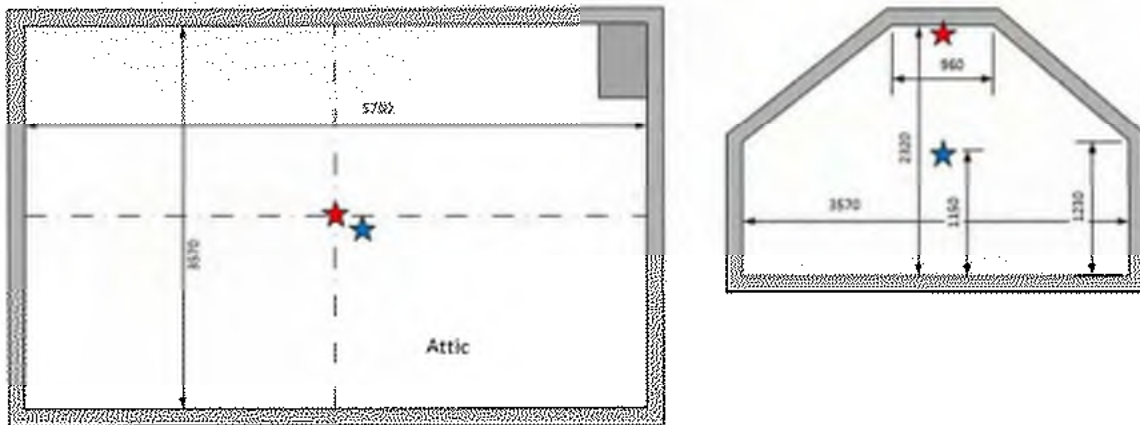


Figure 25: Attic sample point locations for all tests

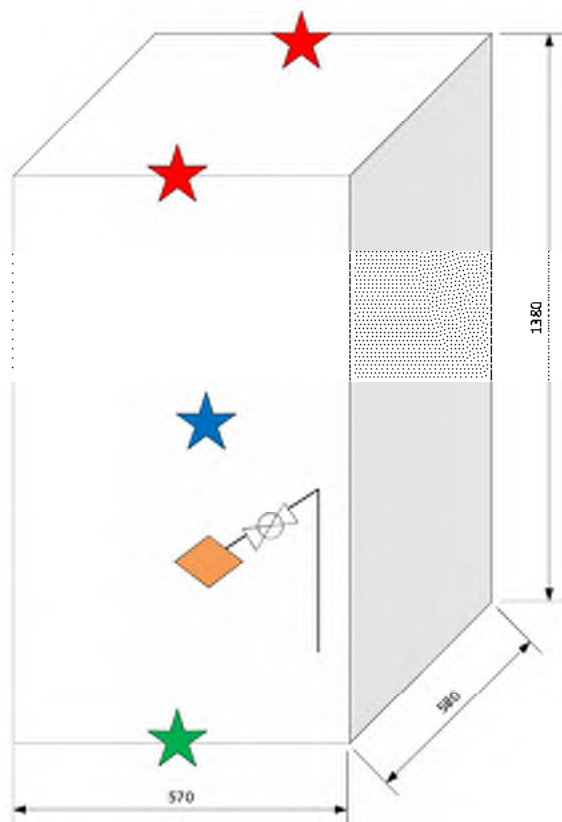


Figure 26: Boiler cupboard sample point locations

- ★ High sample point
- ★ Mid-height sample point
- ★ Low sample point
- ◆ Release point



Figure 27: Inside boiler cupboard (arrow indicates release point)

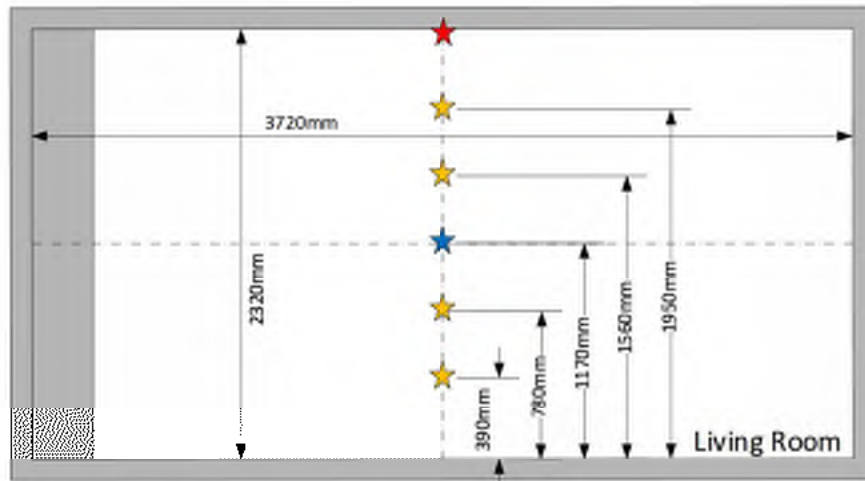


Figure 28: Sample point locations in living room in Phase 2 L3-A19 and L3-A20

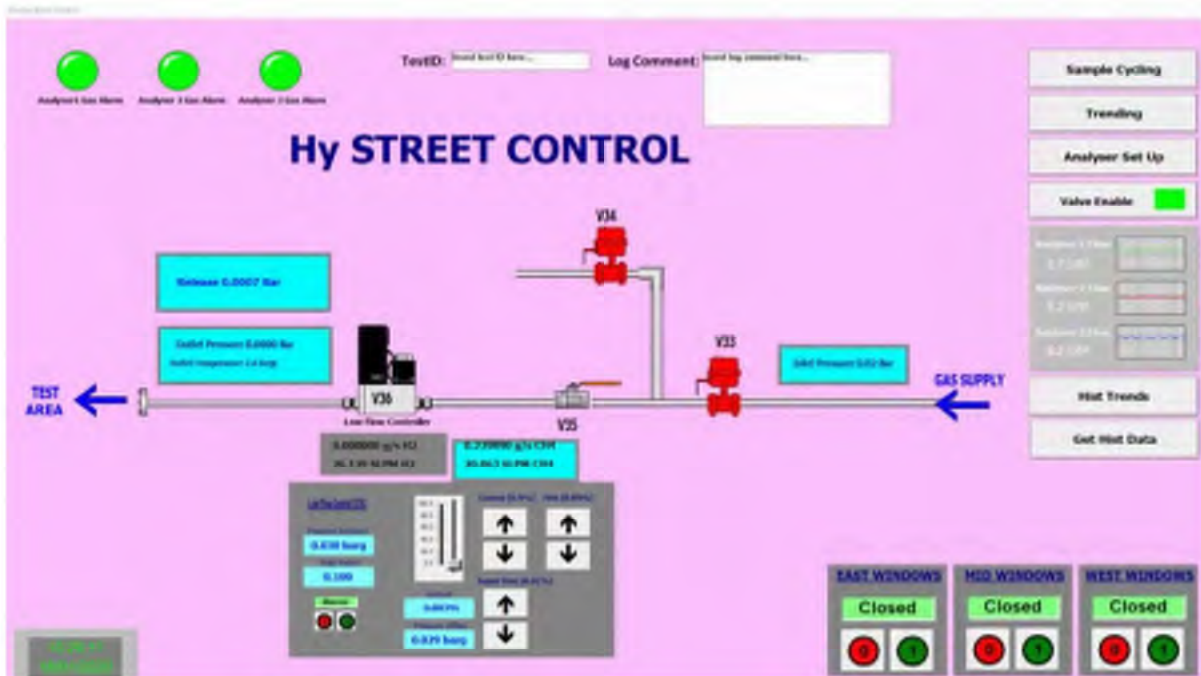


Figure 29: Hy Street SCADA control system

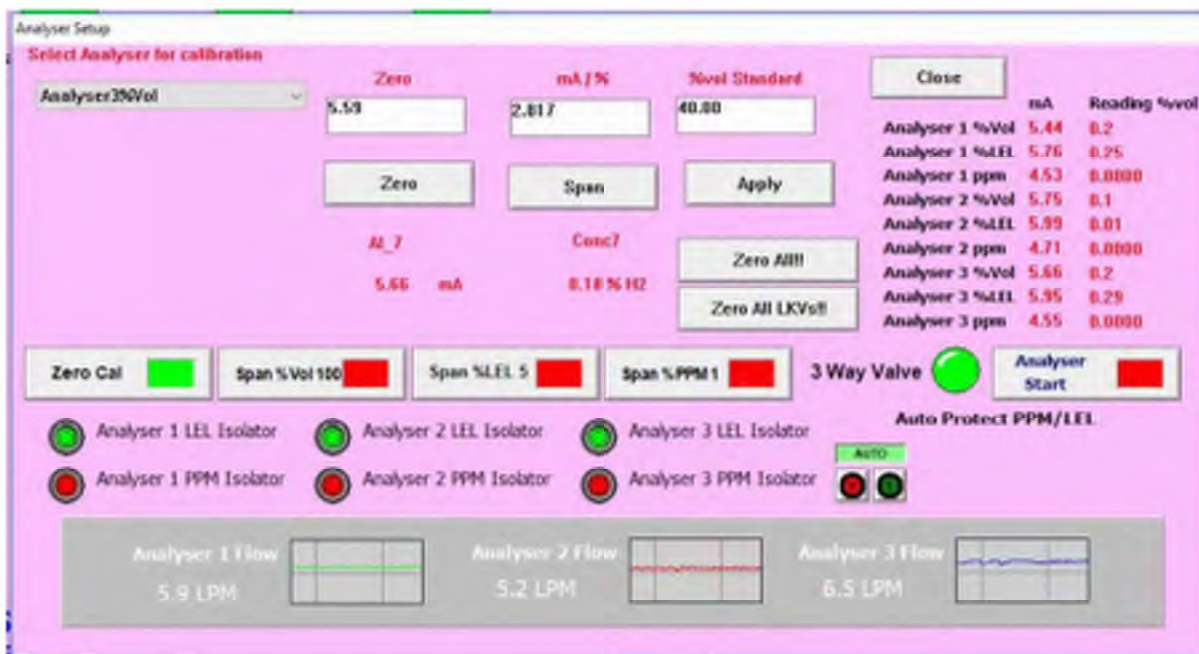


Figure 30: Hy Street SCADA system for analyser set up



Figure 31: Hy Street SCADA screen for sample point monitoring and last known values.

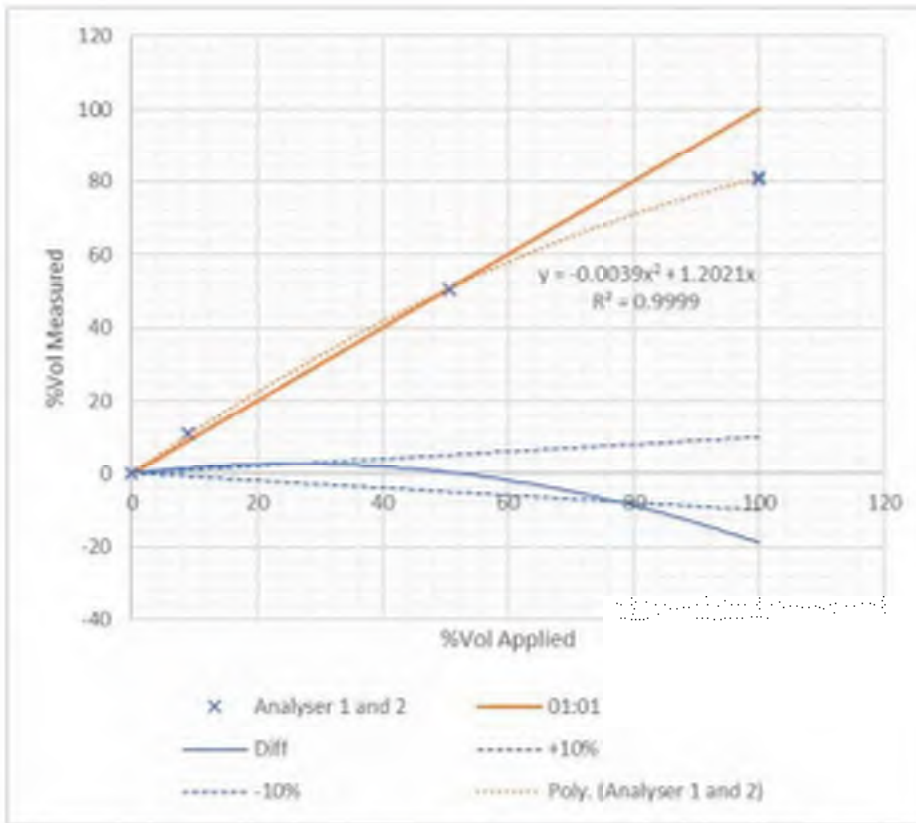


Figure 32: Volumetric sensor linearity

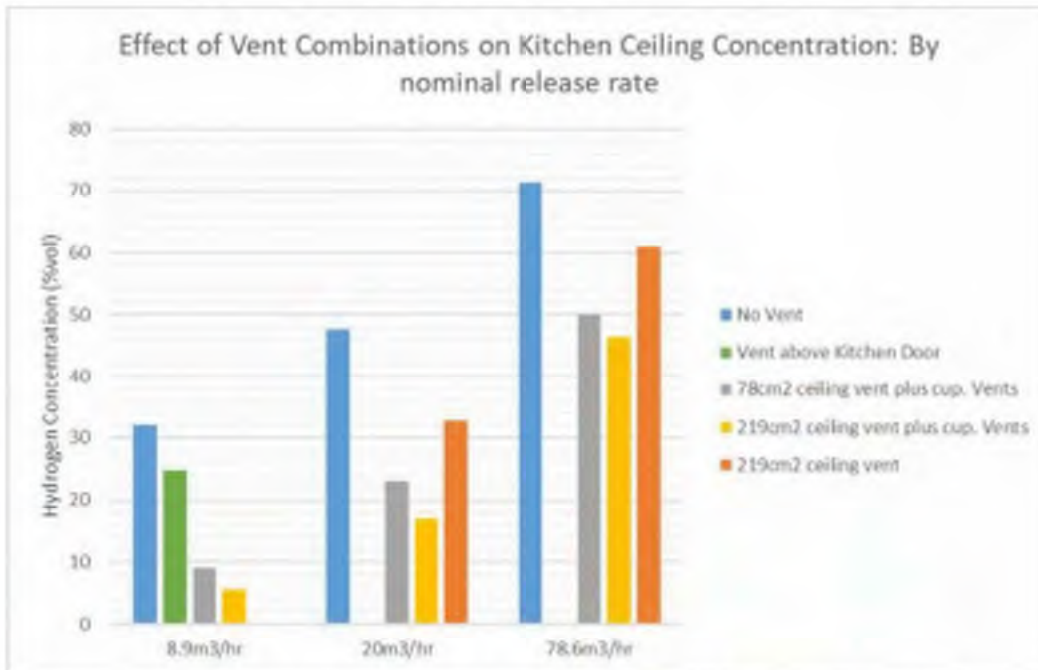


Figure 33: Effect of different vents on kitchen ceiling concentration

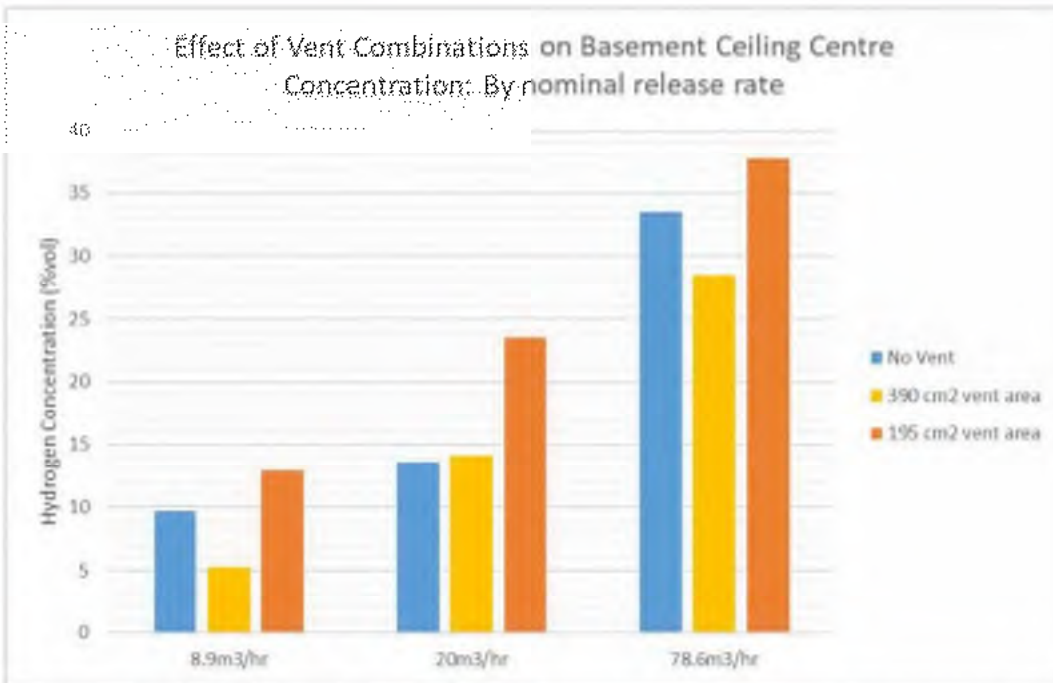


Figure 34: Effect of different vents on basement ceiling centre concentration

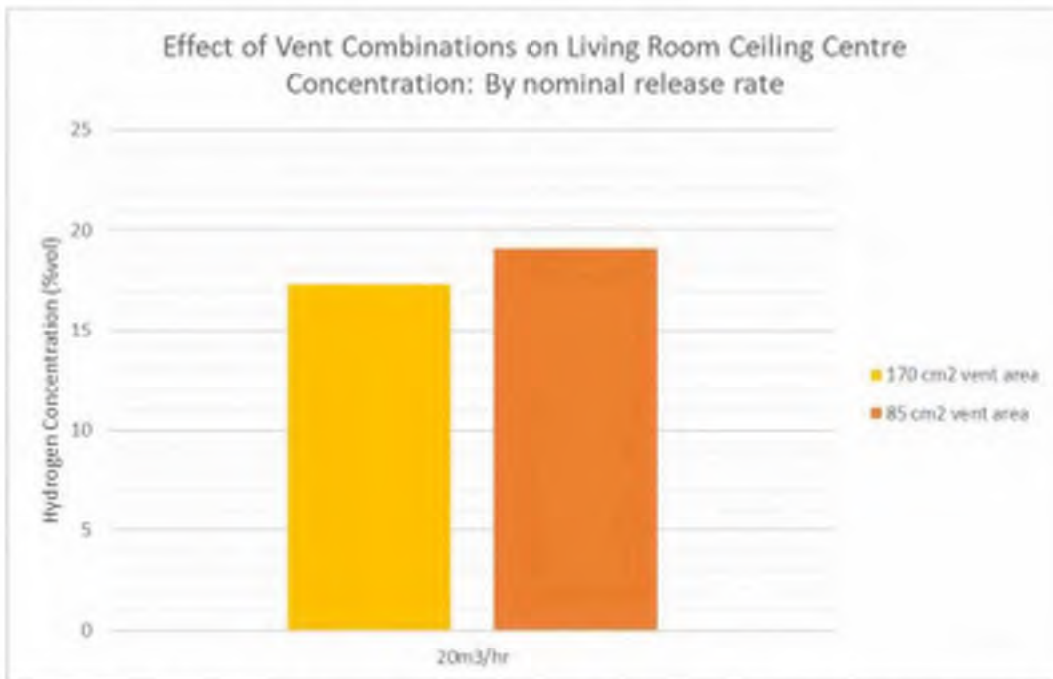


Figure 35: Effect of different vents on living room ceiling centre concentration

8 TABLES

Table 1: Phase 1 Experimental Programme

| ExperimentID | Fuel | Hole Size (mm) | Nominal Release Rate (m ³ /hr) | Source | Orientation / Location | Leak Location | Area | Sealing |
|--------------|---------|----------------|---|-------------|--------------------------|----------------------------|----------|----------------------|
| L3-001 | Methane | 5 | 1.6 | Copper Pipe | Upwards | 'Basement High' | 'House1' | Basement Door Closed |
| L3-002 | Methane | 5 | 2.2 | Copper Pipe | Upwards | 'Basement High' | 'House1' | Basement Door Closed |
| L3-003 | Methane | 5 | 3.1 | Copper Pipe | Upwards | 'Basement High' | 'House1' | Basement Door Closed |
| L3-004 | Methane | 10 | 6.2 | Copper Pipe | Upwards | 'Basement High' | 'House1' | Basement Door Closed |
| L3-005 | Methane | 10 | 8.8 | Copper Pipe | Upwards | 'Basement High' | 'House1' | Basement Door Closed |
| L3-006 | Methane | 10 | 12.4 | Copper Pipe | Upwards | 'Basement High' | 'House1' | Basement Door Closed |
| L3-007 | Methane | 10 | 25.5 | Copper Pipe | Upwards | 'Basement High' | 'House1' | Basement Door Closed |
| L3-008 | Methane | 15 | 27.5 | Copper Pipe | Upwards | 'Basement High' | 'House1' | Basement Door Closed |
| L3-009 | Methane | 5 | 1.6 | Copper Pipe | Downwards | 'Basement High' | 'House1' | Basement Door Closed |
| L3-010 | Methane | 5 | 2.2 | Copper Pipe | Downwards | 'Basement High' | 'House1' | Basement Door Closed |
| L3-011 | Methane | 5 | 3.1 | Copper Pipe | Downwards | 'Basement High' | 'House1' | Basement Door Closed |
| L3-012 | Methane | 10 | 6.2 | Copper Pipe | Downwards | 'Basement High' | 'House1' | Basement Door Closed |
| L3-013 | Methane | 10 | 8.8 | Copper Pipe | Downwards | 'Basement High' | 'House1' | Basement Door Closed |
| L3-014 | Methane | 10 | 12.4 | Copper Pipe | Downwards | 'Basement High' | 'House1' | Basement Door Closed |
| L3-015 | Methane | 10 | 25.5 | Copper Pipe | Downwards | 'Basement High' | 'House1' | Basement Door Closed |
| L3-016 | Methane | 15 | 27.5 | Copper Pipe | Downwards | 'Basement High' | 'House1' | Basement Door Closed |
| L3-017 | Methane | 5 | 1.6 | Copper Pipe | Horizontally | 'Basement High' | 'House1' | Basement Door Closed |
| L3-018 | Methane | 5 | 2.2 | Copper Pipe | Horizontally | 'Basement High' | 'House1' | Basement Door Closed |
| L3-019 | Methane | 5 | 3.1 | Copper Pipe | Horizontally | 'Basement High' | 'House1' | Basement Door Closed |
| L3-020 | Methane | 10 | 6.2 | Copper Pipe | Horizontally | 'Basement High' | 'House1' | Basement Door Closed |
| L3-021 | Methane | 10 | 8.8 | Copper Pipe | Horizontally | 'Basement High' | 'House1' | Basement Door Closed |
| L3-022 | Methane | 10 | 12.4 | Copper Pipe | Horizontally | 'Basement High' | 'House1' | Basement Door Closed |
| L3-023 | Methane | 10 | 25.5 | Copper Pipe | Horizontally | 'Basement High' | 'House1' | Basement Door Closed |
| L3-024 | Methane | 15 | 27.5 | Copper Pipe | Horizontally | 'Basement High' | 'House1' | Basement Door Closed |
| L3-025 | Methane | 5 | 1.6 | Copper Pipe | Downwards | 'Basement High' | 'House1' | All Doors open |
| L3-026 | Methane | 5 | 2.2 | Copper Pipe | Downwards | 'Basement High' | 'House1' | All Doors open |
| L3-027 | Methane | 5 | 3.1 | Copper Pipe | Downwards | 'Basement High' | 'House1' | All Doors open |
| L3-028 | Methane | 10 | 6.2 | Copper Pipe | Downwards | 'Basement High' | 'House1' | All Doors open |
| L3-029 | Methane | 10 | 8.8 | Copper Pipe | Downwards | 'Basement High' | 'House1' | All Doors open |
| L3-030 | Methane | 10 | 12.4 | Copper Pipe | Downwards | 'Basement High' | 'House1' | All Doors open |
| L3-031 | Methane | 10 | 25.5 | Copper Pipe | Downwards | 'Basement High' | 'House1' | All Doors open |
| L3-032 | Methane | 15 | 27.5 | Copper Pipe | Downwards | 'Basement High' | 'House1' | All Doors open |
| L3-033 | Methane | 5 | 1.6 | Copper Pipe | Horizontal into cupboard | 'Kitchen, boiler cupboard' | 'House1' | All Doors Closed |
| L3-034 | Methane | 5 | 2.2 | Copper Pipe | Horizontal into cupboard | 'Kitchen, boiler cupboard' | 'House1' | All Doors Closed |
| L3-035 | Methane | 5 | 3.1 | Copper Pipe | Horizontal into cupboard | 'Kitchen, boiler cupboard' | 'House1' | All Doors Closed |
| L3-036 | Methane | 10 | 6.2 | Copper Pipe | Horizontal into cupboard | 'Kitchen, boiler cupboard' | 'House1' | All Doors Closed |
| L3-037 | Methane | 10 | 8.8 | Copper Pipe | Horizontal into cupboard | 'Kitchen, boiler cupboard' | 'House1' | All Doors Closed |

| ExperimentID | Fuel | Hole Size (mm) | Nominal Release Rate (m ³ /hr) | Source | Orientation / Location | Leak Location | Area | Sealing |
|--------------|----------|----------------|---|-------------|--------------------------|----------------------------|----------|----------------------|
| L3-038 | Methane | 10 | 12.4 | Copper Pipe | Horizontal into cupboard | 'Kitchen, boiler cupboard' | 'House1' | All Doors Closed |
| L3-039 | Methane | 10 | 25.5 | Copper Pipe | Horizontal into cupboard | 'Kitchen, boiler cupboard' | 'House1' | All Doors Closed |
| L3-040 | Methane | 15 | 27.5 | Copper Pipe | Horizontal into cupboard | 'Kitchen, boiler cupboard' | 'House1' | All Doors Closed |
| L3-041 | Methane | 5 | 1.6 | Copper Pipe | Horizontal into cupboard | 'Kitchen, boiler cupboard' | 'House1' | All Doors Open |
| L3-042 | Methane | 5 | 2.2 | Copper Pipe | Horizontal into cupboard | 'Kitchen, boiler cupboard' | 'House1' | All Doors Open |
| L3-043 | Methane | 5 | 3.1 | Copper Pipe | Horizontal into cupboard | 'Kitchen, boiler cupboard' | 'House1' | All Doors Open |
| L3-044 | Methane | 10 | 6.2 | Copper Pipe | Horizontal into cupboard | 'Kitchen, boiler cupboard' | 'House1' | All Doors Open |
| L3-045 | Methane | 10 | 8.8 | Copper Pipe | Horizontal into cupboard | 'Kitchen, boiler cupboard' | 'House1' | All Doors Open |
| L3-046 | Methane | 10 | 12.4 | Copper Pipe | Horizontal into cupboard | 'Kitchen, boiler cupboard' | 'House1' | All Doors Open |
| L3-047 | Methane | 10 | 25.5 | Copper Pipe | Horizontal into cupboard | 'Kitchen, boiler cupboard' | 'House1' | All Doors Open |
| L3-048 | Methane | 15 | 27.5 | Copper Pipe | Horizontal into cupboard | 'Kitchen, boiler cupboard' | 'House1' | All Doors Open |
| L3-049 | Hydrogen | 5 | 4.5 | Copper Pipe | Upwards | 'Basement High' | 'House1' | Basement Door Closed |
| L3-050 | Hydrogen | 5 | 6.3 | Copper Pipe | Upwards | 'Basement High' | 'House1' | Basement Door Closed |
| L3-051 | Hydrogen | 5 | 8.9 | Copper Pipe | Upwards | 'Basement High' | 'House1' | Basement Door Closed |
| L3-052 | Hydrogen | 10 | 17.9 | Copper Pipe | Upwards | 'Basement High' | 'House1' | Basement Door Closed |
| L3-053 | Hydrogen | 10 | 25.3 | Copper Pipe | Upwards | 'Basement High' | 'House1' | Basement Door Closed |
| L3-054 | Hydrogen | 10 | 35.5 | Copper Pipe | Upwards | 'Basement High' | 'House1' | Basement Door Closed |
| L3-055 | Hydrogen | 10 | 73.0 | Copper Pipe | Upwards | 'Basement High' | 'House1' | Basement Door Closed |
| L3-056 | Hydrogen | 15 | 78.6 | Copper Pipe | Upwards | 'Basement High' | 'House1' | Basement Door Closed |
| L3-057 | Hydrogen | 5 | 4.5 | Copper Pipe | Downwards | 'Basement High' | 'House1' | Basement Door Closed |
| L3-058 | Hydrogen | 5 | 6.3 | Copper Pipe | Downwards | 'Basement High' | 'House1' | Basement Door Closed |
| L3-059 | Hydrogen | 5 | 8.9 | Copper Pipe | Downwards | 'Basement High' | 'House1' | Basement Door Closed |
| L3-060 | Hydrogen | 10 | 17.9 | Copper Pipe | Downwards | 'Basement High' | 'House1' | Basement Door Closed |
| L3-061 | Hydrogen | 10 | 25.3 | Copper Pipe | Downwards | 'Basement High' | 'House1' | Basement Door Closed |
| L3-062 | Hydrogen | 10 | 35.5 | Copper Pipe | Downwards | 'Basement High' | 'House1' | Basement Door Closed |
| L3-063 | Hydrogen | 10 | 73.0 | Copper Pipe | Downwards | 'Basement High' | 'House1' | Basement Door Closed |
| L3-064 | Hydrogen | 15 | 78.6 | Copper Pipe | Downwards | 'Basement High' | 'House1' | Basement Door Closed |
| L3-065 | Hydrogen | 5 | 4.5 | Copper Pipe | Horizontally | 'Basement High' | 'House1' | Basement Door Closed |
| L3-066 | Hydrogen | 5 | 6.3 | Copper Pipe | Horizontally | 'Basement High' | 'House1' | Basement Door Closed |
| L3-067 | Hydrogen | 5 | 8.9 | Copper Pipe | Horizontally | 'Basement High' | 'House1' | Basement Door Closed |
| L3-068 | Hydrogen | 10 | 17.9 | Copper Pipe | Horizontally | 'Basement High' | 'House1' | Basement Door Closed |
| L3-069 | Hydrogen | 10 | 25.3 | Copper Pipe | Horizontally | 'Basement High' | 'House1' | Basement Door Closed |
| L3-070 | Hydrogen | 10 | 35.5 | Copper Pipe | Horizontally | 'Basement High' | 'House1' | Basement Door Closed |
| L3-071 | Hydrogen | 15 | 73.0 | Copper Pipe | Horizontally | 'Basement High' | 'House1' | Basement Door Closed |
| L3-072 | Hydrogen | 15 | 78.6 | Copper Pipe | Horizontally | 'Basement High' | 'House1' | Basement Door Closed |
| L3-073 | Hydrogen | 5 | 4.5 | Copper Pipe | Downwards | 'Basement High' | 'House1' | All Doors open |
| L3-074 | Hydrogen | 5 | 6.3 | Copper Pipe | Downwards | 'Basement High' | 'House1' | All Doors open |
| L3-075 | Hydrogen | 5 | 8.9 | Copper Pipe | Downwards | 'Basement High' | 'House1' | All Doors open |
| L3-076 | Hydrogen | 10 | 17.9 | Copper Pipe | Downwards | 'Basement High' | 'House1' | All Doors open |

| ExperimentID | Fuel | Hole Size (mm) | Normal Release Rate (m ³ /hr) | Source | Orientation / Location | Leak Location | Area | Sealing |
|--------------|----------|----------------|--|-------------|--------------------------|----------------------------|----------|---|
| L3-077 | Hydrogen | 10 | 25.3 | Copper Pipe | Downwards | 'Basement High' | 'House1' | All Doors open |
| L3-078 | Hydrogen | 10 | 35.5 | Copper Pipe | Downwards | 'Basement High' | 'House1' | All Doors open |
| L3-079 | Hydrogen | 10 | 73.0 | Copper Pipe | Downwards | 'Basement High' | 'House1' | All Doors open |
| L3-080 | Hydrogen | 15 | 78.6 | Copper Pipe | Downwards | 'Basement High' | 'House1' | All Doors open |
| L3-081 | Hydrogen | 5 | 4.5 | Copper Pipe | Horizontal into cupboard | 'Kitchen, boiler cupboard' | 'House1' | All Doors Closed |
| L3-082 | Hydrogen | 5 | 6.3 | Copper Pipe | Horizontal into cupboard | 'Kitchen, boiler cupboard' | 'House1' | All Doors Closed |
| L3-083 | Hydrogen | 5 | 8.9 | Copper Pipe | Horizontal into cupboard | 'Kitchen, boiler cupboard' | 'House1' | All Doors Closed |
| L3-084 | Hydrogen | 10 | 17.9 | Copper Pipe | Horizontal into cupboard | 'Kitchen, boiler cupboard' | 'House1' | All Doors Closed |
| L3-085 | Hydrogen | 10 | 25.3 | Copper Pipe | Horizontal into cupboard | 'Kitchen, boiler cupboard' | 'House1' | All Doors Closed |
| L3-086 | Hydrogen | 10 | 35.5 | Copper Pipe | Horizontal into cupboard | 'Kitchen, boiler cupboard' | 'House1' | All Doors Closed |
| L3-087 | Hydrogen | 10 | 73.0 | Copper Pipe | Horizontal into cupboard | 'Kitchen, boiler cupboard' | 'House1' | All Doors Closed |
| L3-088 | Hydrogen | 15 | 78.6 | Copper Pipe | Horizontal into cupboard | 'Kitchen, boiler cupboard' | 'House1' | All Doors Closed |
| L3-089 | Hydrogen | 5 | 4.5 | Copper Pipe | Horizontal into cupboard | 'Kitchen, boiler cupboard' | 'House1' | All Doors Open |
| L3-090 | Hydrogen | 5 | 6.3 | Copper Pipe | Horizontal into cupboard | 'Kitchen, boiler cupboard' | 'House1' | All Doors Open |
| L3-091 | Hydrogen | 5 | 8.9 | Copper Pipe | Horizontal into cupboard | 'Kitchen, boiler cupboard' | 'House1' | All Doors Open |
| L3-092 | Hydrogen | 10 | 17.9 | Copper Pipe | Horizontal into cupboard | 'Kitchen, boiler cupboard' | 'House1' | All Doors Open |
| L3-093 | Hydrogen | 10 | 25.3 | Copper Pipe | Horizontal into cupboard | 'Kitchen, boiler cupboard' | 'House1' | All Doors Open |
| L3-094 | Hydrogen | 10 | 35.5 | Copper Pipe | Horizontal into cupboard | 'Kitchen, boiler cupboard' | 'House1' | All Doors Open |
| L3-095 | Hydrogen | 10 | 73.0 | Copper Pipe | Horizontal into cupboard | 'Kitchen, boiler cupboard' | 'House1' | All Doors Open |
| L3-096 | Hydrogen | 15 | 78.6 | Copper Pipe | Horizontal into cupboard | 'Kitchen, boiler cupboard' | 'House1' | All Doors Open |
| L3-081A | Hydrogen | 5.1 | 4.5 | Copper Pipe | Horizontal into cupboard | 'Kitchen, boiler cupboard' | 'House1' | All Doors Closed + 100mm vent |
| L3-083A | Hydrogen | 5.1 | 8.9 | Copper Pipe | Horizontal into cupboard | 'Kitchen, boiler cupboard' | 'House1' | All Doors Closed + 100mm vent |
| L3-085A | Hydrogen | 10 | 25.3 | Copper Pipe | Horizontal into cupboard | 'Kitchen, boiler cupboard' | 'House1' | All Doors Closed + 100mm vent |
| L3-085B | Hydrogen | 10 | 25.3 | Copper Pipe | Horizontal into cupboard | 'Kitchen, boiler cupboard' | 'House1' | All Doors Closed + Cupboard vent holes |
| L3-085C | Hydrogen | 10 | 25.3 | Copper Pipe | Horizontal into cupboard | 'Kitchen, boiler cupboard' | 'House1' | All Doors Closed + 100mm vent + cupboard vent holes |
| L3-037A | Methane | 10 | 8.8 | Copper Pipe | Horizontal into cupboard | 'Kitchen, boiler cupboard' | 'House1' | All Doors Closed + 100mm vent + cupboard vent holes |

Table 2: Phase 2 Experimental Programme

| Test No. | Injection Location | Gas | Hole size | Injection rate | SJPM | Vent Type | Vent size | vent in cupboard? |
|----------|-------------------------|----------|-----------|----------------|------|---|-----------|-------------------|
| A1 | Kitchen boiler cupboard | Hydrogen | 10mm | 20m3/hr | 333 | Ceiling vent with pipe to external wall | 200cm2 | no |
| A2 | Kitchen boiler cupboard | Hydrogen | 10mm | 20m3/hr | 333 | no vent | n/a | n/a |
| A3 | Kitchen boiler cupboard | Methane | 10mm | 20m3/hr | 333 | no vent | n/a | n/a |
| A4 | Kitchen boiler cupboard | Hydrogen | 15mm | 78.6m3/hr | 1310 | Ceiling vent with pipe to external wall | 200cm2 | no |
| A5 | Kitchen boiler cupboard | Hydrogen | 5mm | 8.9m3/hr | 148 | Ceiling vent with pipe to external wall | 100cm2 | yes |
| A6 | Kitchen boiler cupboard | Hydrogen | 5mm | 8.9m3/hr | 148 | Ceiling vent with pipe to external wall | 200cm2 | yes |
| A7 | Kitchen boiler cupboard | Hydrogen | 10mm | 20m3/hr | 333 | Ceiling vent with pipe to external wall | 100cm2 | yes |
| A8 | Kitchen boiler cupboard | Hydrogen | 10mm | 20m3/hr | 333 | Ceiling vent with pipe to external wall | 200cm2 | yes |
| A9 | Kitchen boiler cupboard | Hydrogen | 15mm | 78.6m3/hr | 1310 | Ceiling vent with pipe to external wall | 100cm2 | yes |
| A10 | Kitchen boiler cupboard | Hydrogen | 15mm | 78.6m3/hr | 1310 | Ceiling vent with pipe to external wall | 200cm2 | yes |
| A11 | Basement, horizontal | Hydrogen | 5mm | 8.9m3/hr | 148 | Vent Direct to outside | 200cm2 | n/a |
| A12 | Basement, horizontal | Hydrogen | 5mm | 8.9m3/hr | 148 | Vent Direct to outside | 400cm3 | n/a |
| A13 | Basement, horizontal | Hydrogen | 10mm | 20m3/hr | 333 | Vent Direct to outside | 200cm2 | n/a |
| A14 | Basement, horizontal | Hydrogen | 10mm | 20m3/hr | 333 | Vent Direct to outside | 400cm3 | n/a |
| A15 | Basement, horizontal | Hydrogen | 10mm | 20m3/hr | 333 | no vent | n/a | n/a |
| A16 | Basement, horizontal | Methane | 10mm | 20m3/hr | 333 | no vent | n/a | n/a |
| A17 | Basement, horizontal | Hydrogen | 15mm | 78.6m3/hr | 1310 | Vent Direct to outside | 200cm2 | n/a |
| A18 | Basement, horizontal | Hydrogen | 15mm | 78.6m3/hr | 1310 | Vent Direct to outside | 400cm2 | n/a |
| A19 | Living Room | Hydrogen | 10mm | 20m3/hr | 333 | above living room door | 100cm2 | n/a |
| A20 | Living Room | Hydrogen | 10mm | 20m3/hr | 333 | above living room door | 200cm2 | n/a |

Table 3: Sample point locations for basement releases

| Room | Sample point on analyser | Location |
|--------------------------------------|--------------------------|--|
| Basement | 3, 4, 5 | High, mid and low - SW corner |
| | 16, 17, 18 | High, mid and low - centre |
| | 6, 7 | High and mid - SE corner |
| Kitchen | 1, 2 | High and mid - centre |
| Living room | 8, 9 | High and mid - centre |
| Hall | 10, 11 | High and mid - centre |
| 1 st floor | 12, 13 | High and mid - centre |
| Attic | 14, 15 | High and mid - centre |
| External cavity wall | 19 | Ground floor - living room, front elevation |
| Internal stud wall | 20 | Ground floor- living room, internal wall to hall |
| Void ground to 1 st floor | 21 | Living room ceiling |
| Void 1 st floor to attic | 22 | 1 st floor ceiling |
| Void attic ceiling to roof | 23 | Attic ceiling |

Table 4: Sample point locations for boiler cupboard releases

| Room | Sample point on analyser | Location |
|--------------------------------------|--------------------------|--|
| Basement | 16, 17, 18 | High, mid and low – centre |
| Kitchen | 1, 2, 7 | High, mid and low - centre |
| Kitchen cupboard | 3 | Centre |
| | 4 | Top front centre |
| | 5 | Top back centre |
| | 6 | Bottom back centre |
| Living room | 8, 9 | High and mid - centre |
| Hall | 10, 11 | High and mid - centre |
| 1 st floor | 12, 13 | High and mid - centre |
| Attic | 14, 15 | High and mid - centre |
| External cavity wall | 19 | Ground floor – living room, front elevation |
| Internal stud wall | 20 | Ground floor- living room, internal wall to hall |
| Void ground to 1 st floor | 21 | Living room ceiling |
| Void 1 st floor to Attic | 22 | 1 st floor ceiling |
| Void attic ceiling to roof | 23 | Attic ceiling |

Table 5: Sample point locations for living room releases

| Room | Sample point on analyser | Location |
|--------------------------------------|----------------------------|--|
| Basement | 16, 17, 18 | High, mid and low – centre |
| Kitchen | 1, 2, 7 | High, mid and low - centre |
| Living room | 8 3 4 9 5 4 | High @ ceiling 1950 mm from floor 1560 mm from floor 1170 mm from floor 780 mm from floor 390 mm from floor |
| Hall | 10, 11 | High and mid - centre |
| 1 st floor | 12, 13 | High and mid - centre |
| Attic | 14, 15 | High and mid - centre |
| External cavity wall | 19 | Ground floor – living room, front elevation |
| Internal stud wall | 20 | Ground floor- living room, internal wall to hall |
| Void ground to 1 st floor | 21 | Living room ceiling |
| Void 1 st floor to Attic | 22 | 1 st floor ceiling |
| Void attic ceiling to roof | 23 | Attic ceiling |

Table 6: Maximum Non-linearity Error

| Measurement Range Start (%vol) | Measurement Range End (%vol) | Maximum Non-linearity Error (%vol) |
|--------------------------------|------------------------------|------------------------------------|
| 0 | 10 | 1.63 |
| 10 | 20 | 2.48 |
| 20 | 30 | 2.62 |
| 30 | 40 | 2.55 |
| 40 | 50 | 1.84 |
| 50 | 60 | -1.91 |
| 60 | 70 | -4.96 |
| 70 | 80 | -8.79 |
| 80 | 90 | -13.40 |
| 90 | 100 | -18.79 |



APPENDIX A: PHASE 1 RESULTS

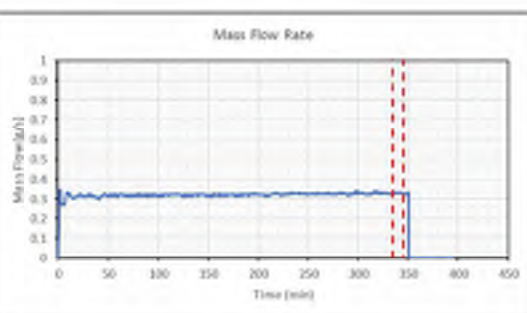
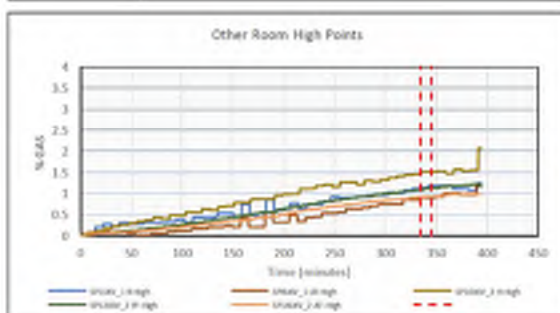
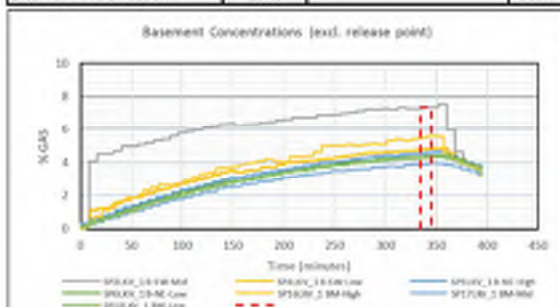
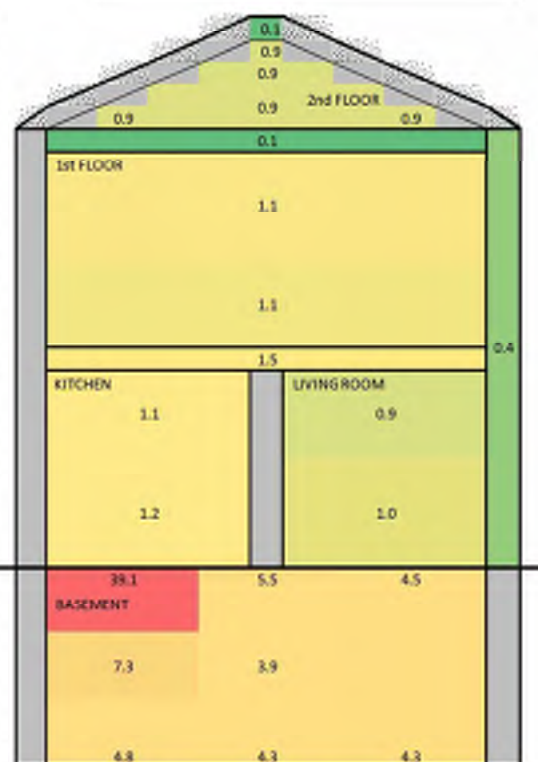
L3-001 RESULT

Hy4Heat WP7 Test Result

| | |
|---|----------------|
| MTP ID: L3-001 | |
| Hole Size: 5 mm | |
| Location: Basement upwards, door closed | |
| Gas: methane | |
| Date: 02/12/2019 | Time: 05:45:00 |
| Averaging Period Start: 335 min | End: 345 min |

Notes: small -0.1% offset removed from SP17-23

| Sensor | Average | Max | Min | STDEV | Units |
|-------------------------|---------|--------|--------|--------|---------|
| SP1KVV_1 K-High | 1.1 | 1.2 | 1.1 | 0.0 | %vol |
| SP2LKV_1 B-SW-High | 39.1 | 39.2 | 39.0 | 0.1 | %vol |
| SP3LKV_1 B-SW-Mid | 7.3 | 7.3 | 7.3 | 0.0 | %vol |
| SP4LKV_1 B-SW-Low | 4.8 | 4.8 | 4.7 | 0.0 | %vol |
| SP5LKV_1 B-N/E-High | 4.5 | 4.6 | 4.5 | 0.0 | %vol |
| SP6LKV_1 B-N/E-Low | 4.3 | 4.4 | 4.3 | 0.0 | %vol |
| SP7LKV_1 K-Low | 1.2 | 1.2 | 1.2 | 0.0 | %vol |
| SP8LKV_1 LR-High | 0.9 | 0.9 | 0.9 | 0.0 | %vol |
| SP9LKV_1 LR-Mid | 1.0 | 1.0 | 1.0 | 0.0 | %vol |
| SP10KV_2 H-High | 1.5 | 1.5 | 1.5 | 0.0 | %vol |
| SP11KV_2 H-Mid | 1.2 | 1.2 | 1.1 | 0.0 | %vol |
| SP12KV_2 FF-High | 1.1 | 1.1 | 1.1 | 0.0 | %vol |
| SP13KV_2 FF-Mid | 1.1 | 1.1 | 1.1 | 0.0 | %vol |
| SP14KV_2 AT-High | 0.9 | 0.9 | 0.9 | 0.0 | %vol |
| SP15KV_2 AT-Mid | 0.9 | 0.9 | 0.9 | 0.0 | %vol |
| SP16KV_1 BM-High | 5.5 | 5.6 | 5.5 | 0.1 | %vol |
| SP17KV_1 BM-Mid | 3.9 | 3.9 | 3.9 | 0.0 | %vol |
| SP18KV_1 BM-Low | 4.3 | 4.3 | 4.2 | 0.0 | %vol |
| SP19KV_1 NWALL-Cav | 0.4 | 0.4 | 0.4 | 0.0 | %vol |
| SP20KV_1 STUD-Cav | 1.3 | 1.3 | 1.3 | 0.0 | %vol |
| SP21KV_1 FF-Void | 1.5 | 1.5 | 1.5 | 0.0 | %vol |
| SP22KV_1 SF-Void | 0.1 | 0.1 | 0.0 | 0.0 | %vol |
| SP23KV_1 ROOF-Void | 0.1 | 0.1 | 0.0 | 0.1 | %vol |
| RELEASEPRESSURE | 0.0034 | 0.0037 | 0.0029 | 0.0002 | barg |
| LOWFLOWMETERCH4 | 0.3324 | 0.3411 | 0.3299 | 0.0021 | g/s |
| OUTLET_TEMP | 1.8 | 1.9 | 1.7 | 0.1 | degC |
| Volume Flow Rate | 27.8 | 28.5 | 27.6 | 0.2 | SLPM |
| Energy Flow Rate | 16.6 | 17.1 | 16.5 | 0.1 | kW |
| External Wind Speed | 1.2 | | | | m/s |
| External Wind Direction | 267.5 | | | | bearing |



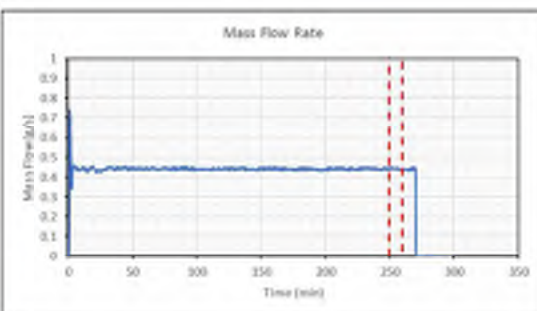
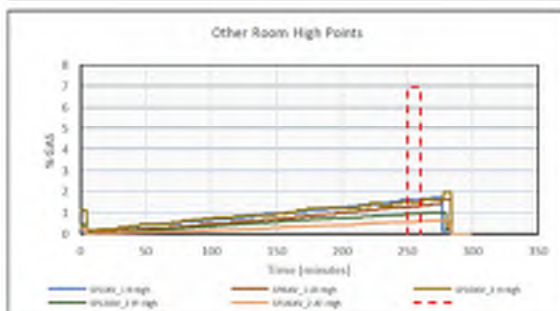
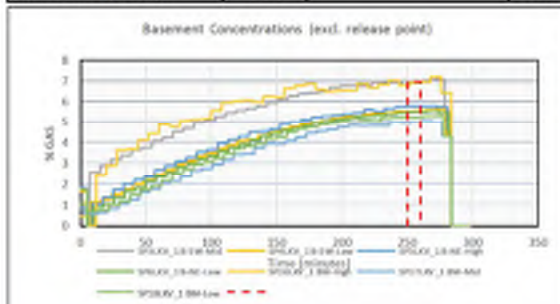
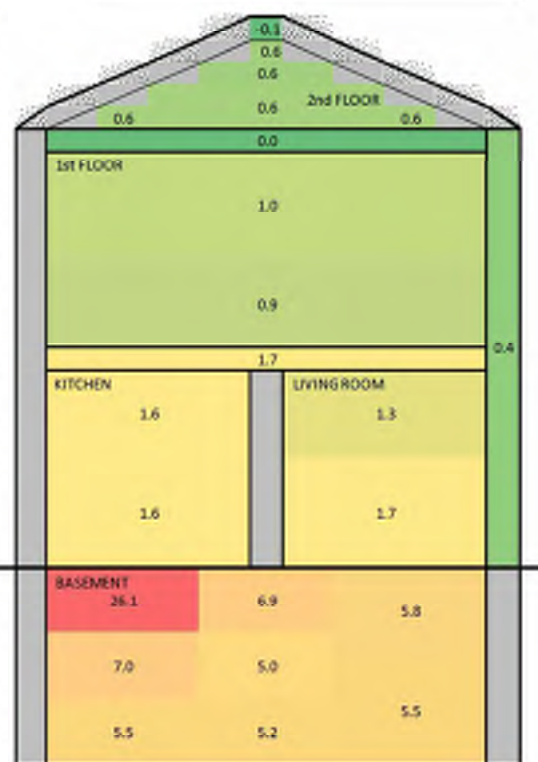
L3-002 RESULT

Hy4Heat WP7 Test Result

| | |
|---|----------------|
| MTP ID: L3-002 | |
| Hole Size: 5 mm | |
| Location: Basement upwards, door closed | |
| Gas: methane | |
| Date: 02/12/2019 | Time: 13:30:00 |
| Averaging Period Start: 250 min | End: 260 min |

Notes:

| Sensor | Average | Max | Min | STDEV | Units |
|-------------------------|---------|--------|--------|--------|---------|
| SP1KVV_1 K-High | 1.6 | 1.6 | 1.6 | 0.0 | %vol |
| SP2LKV_1 B-SW-High | 26.1 | 26.3 | 26.0 | 0.2 | %vol |
| SP3LKV_1 B-SW-Mid | 7.0 | 7.0 | 7.0 | 0.0 | %vol |
| SP4LKV_1 B-SW-Low | 5.5 | 5.6 | 5.5 | 0.0 | %vol |
| SP5LKV_1 B-NW-High | 5.8 | 5.8 | 5.8 | 0.0 | %vol |
| SP6LKV_1 B-NW-Low | 5.5 | 5.5 | 5.5 | 0.0 | %vol |
| SP7LKV_1 K-Low | 1.6 | 1.7 | 1.6 | 0.0 | %vol |
| SP8LKV_1 LR-High | 1.3 | 1.3 | 1.3 | 0.0 | %vol |
| SP9LKV_1 LR-Mid | 1.7 | 1.7 | 1.7 | 0.0 | %vol |
| SP10KV_2 H-High | 1.5 | 1.5 | 1.5 | 0.0 | %vol |
| SP11KV_2 H-Mid | 1.1 | 1.1 | 1.1 | 0.0 | %vol |
| SP12KV_2 FF-High | 1.0 | 1.0 | 1.0 | 0.0 | %vol |
| SP13KV_2 FF-Mid | 0.9 | 0.9 | 0.9 | 0.0 | %vol |
| SP14KV_2 AT-High | 0.6 | 0.6 | 0.6 | 0.0 | %vol |
| SP15KV_2 AT-Mid | 0.6 | 0.7 | 0.6 | 0.0 | %vol |
| SP16KV_1 BM-High | 6.9 | 6.9 | 6.8 | 0.1 | %vol |
| SP17KV_1 BM-Mid | 5.0 | 5.0 | 4.9 | 0.0 | %vol |
| SP18KV_1 BM-Low | 5.2 | 5.2 | 5.2 | 0.0 | %vol |
| SP19KV_1 NWALL-Cav | 0.4 | 0.4 | 0.3 | 0.1 | %vol |
| SP20KV_1 STUD-Cav | 1.9 | 1.9 | 1.9 | 0.0 | %vol |
| SP21KV_1 FF-Void | 1.7 | 1.7 | 1.7 | 0.0 | %vol |
| SP22KV_1 SF-Void | 0.0 | 0.0 | -0.1 | 0.0 | %vol |
| SP23KV_1 ROOF-Void | -0.1 | -0.1 | -0.1 | 0.0 | %vol |
| RELEASEPRESSURE | 0.0055 | 0.0059 | 0.0052 | 0.0002 | barg |
| LOWFLOWMETERCH4 | 0.4426 | 0.4498 | 0.4386 | 0.0029 | g/s |
| OUTLET_TEMP | 3.4 | 3.5 | 3.3 | 0.0 | degC |
| Volume Flow Rate | 37.0 | 37.6 | 36.7 | 0.2 | SLPM |
| Energy Flow Rate | 22.1 | 22.5 | 21.9 | 0.1 | kW |
| External Wind Speed | 2.1 | | | | m/s |
| External Wind Direction | 241.8 | | | | bearing |



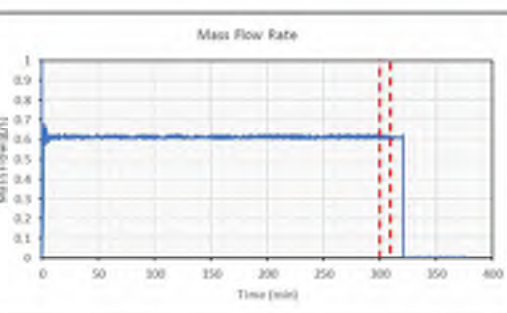
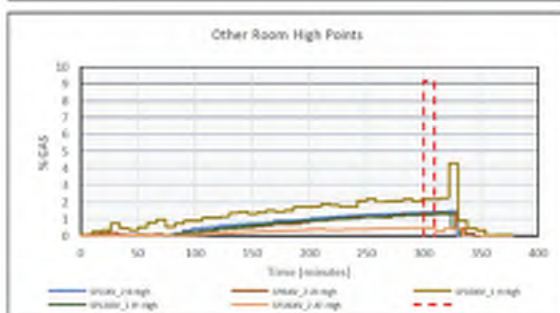
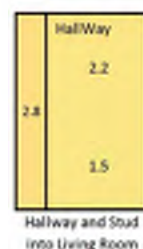
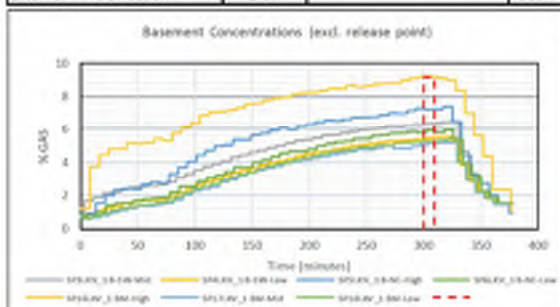
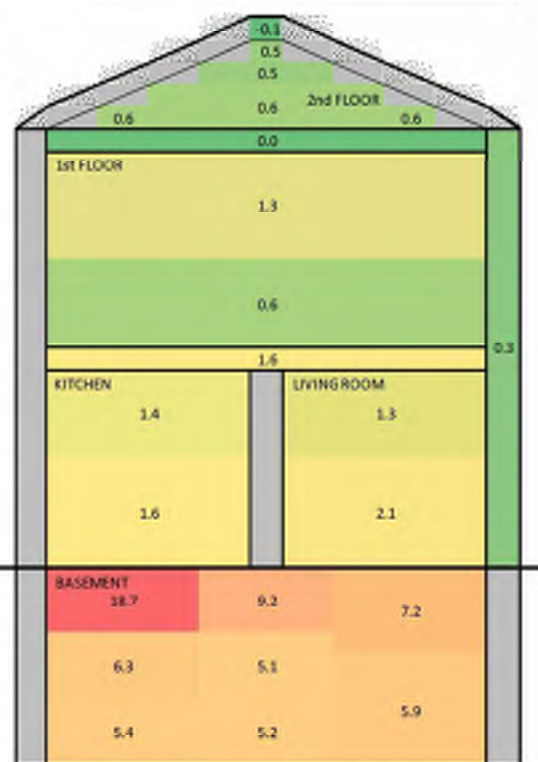
L3-003 RESULT

Hy4Heat WP7 Test Result

| | |
|---|----------------|
| MTP ID: L3-003 | |
| Hole Size: 5 mm | |
| Location: basement upwards release - basement door closed | |
| Gas: methane | |
| Date: 02/12/2019 | Time: 19:00:00 |
| Averaging Period Start: 300 min | End: 310 min |

Notes: Apparent change in ventilation circa 80 mins

| Sensor | Average | Max | Min | STDEV | Units |
|-------------------------|---------|--------|--------|--------|---------|
| SP1KVV_2 K-High | 1.4 | 1.4 | 1.4 | 0.0 | %vol |
| SP2LKV_1 B-SW-High | 18.7 | 18.7 | 18.6 | 0.1 | %vol |
| SP3LKV_1 B-SW-Mid | 6.3 | 6.4 | 6.3 | 0.0 | %vol |
| SP4LKV_1 B-SW-Low | 5.4 | 5.5 | 5.4 | 0.0 | %vol |
| SP5LKV_1 B-N/E-High | 7.2 | 7.3 | 7.2 | 0.0 | %vol |
| SP6LKV_1 B-N/E-Low | 5.9 | 5.9 | 5.7 | 0.1 | %vol |
| SP7LKV_2 K-Low | 1.6 | 1.6 | 1.6 | 0.0 | %vol |
| SP8LKV_2 LR-High | 1.3 | 1.3 | 1.3 | 0.0 | %vol |
| SP9LKV_1 LR-Mid | 2.1 | 2.1 | 2.1 | 0.0 | %vol |
| SP10KV_1 H-High | 2.2 | 2.2 | 2.2 | 0.0 | %vol |
| SP11KV_1 H-Mid | 1.5 | 1.5 | 1.5 | 0.0 | %vol |
| SP12KV_1 FF-High | 1.3 | 1.3 | 1.2 | 0.0 | %vol |
| SP13KV_2 FF-Mid | 0.6 | 0.8 | 0.6 | 0.0 | %vol |
| SP14KV_2 AT-High | 0.5 | 0.5 | 0.5 | 0.0 | %vol |
| SP15KV_2 AT-Mid | 0.6 | 0.6 | 0.6 | 0.0 | %vol |
| SP16KV_1 BM-High | 9.2 | 9.2 | 9.2 | 0.0 | %vol |
| SP17KV_1 BM-Mid | 5.1 | 5.2 | 5.1 | 0.0 | %vol |
| SP18KV_1 BM-Low | 5.2 | 5.2 | 5.2 | 0.0 | %vol |
| SP19KV_1 N/WALL-Cav | 0.3 | 0.3 | 0.3 | 0.0 | %vol |
| SP20KV_1 STUD-Cav | 2.8 | 2.8 | 2.7 | 0.0 | %vol |
| SP21KV_1 FF-Void | 1.6 | 1.7 | 1.6 | 0.1 | %vol |
| SP22KV_1 SF-Void | 0.0 | 0.0 | 0.0 | 0.0 | %vol |
| SP23KV_1 ROOF-Void | -0.1 | -0.1 | -0.1 | 0.0 | %vol |
| RELEASEPRESSURE | 0.0095 | 0.0100 | 0.0091 | 0.0003 | barg |
| LOWFLOWMETERCH4 | 0.6102 | 0.6185 | 0.6035 | 0.0047 | g/s |
| OUTLET_TEMP | 3.8 | 3.9 | 3.6 | 0.0 | degC |
| Volume Flow Rate | 51.0 | 51.7 | 50.5 | 0.4 | L/PM |
| Energy Flow Rate | 30.5 | 30.9 | 30.2 | 0.2 | kW |
| External Wind Speed | 1.4 | | | | m/s |
| External Wind Direction | 249.7 | | | | bearing |



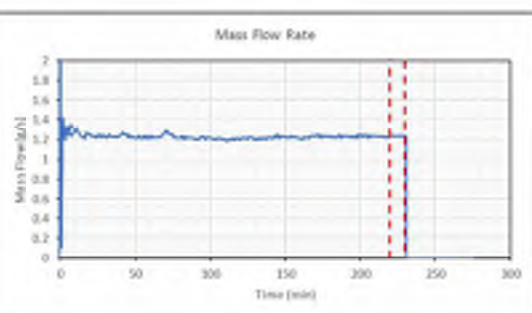
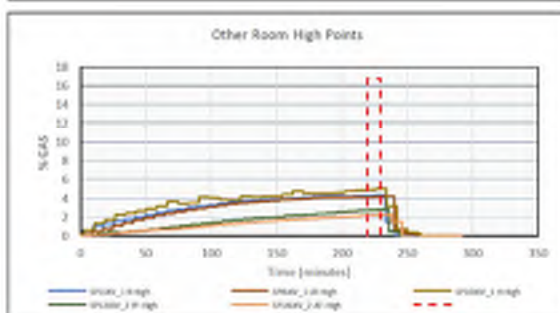
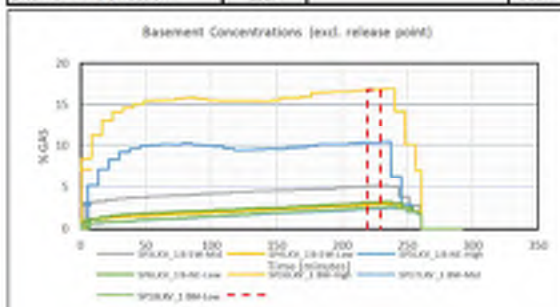
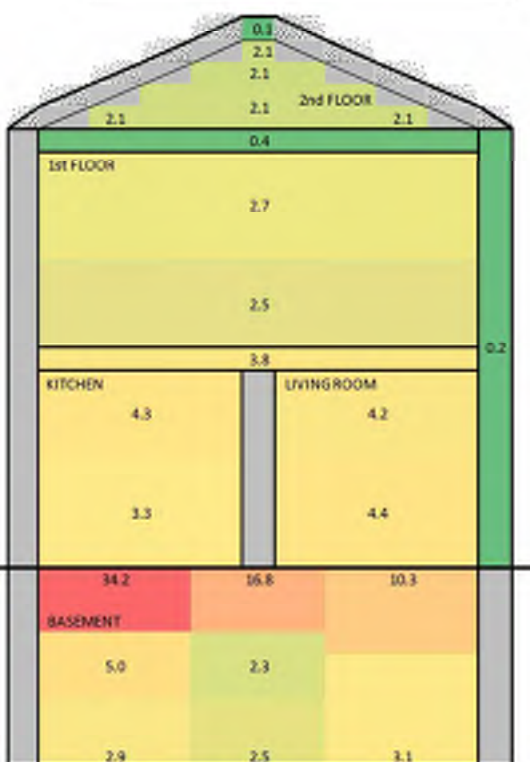
L3-004 RESULT

Hy4Heat WP7 Test Result

| | |
|---|----------------|
| MTP ID: L3-004 | |
| Hole Size: 10mm | |
| Location: Basement upwards, door closed | |
| Gas: methane | |
| Date: 05/12/2019 | Time: 01:30:00 |
| Averaging Period Start: 220 min | End: 230 min |

Notes:

| Sensor | Average | Max | Min | STDEV | Units |
|-------------------------|---------|--------|--------|--------|---------|
| SP1KLV_1 K-High | 4.3 | 4.3 | 4.3 | 0.0 | %vol |
| SP2LKV_1 B-SW-High | 34.2 | 34.4 | 34.2 | 0.1 | %vol |
| SP3LKV_1 B-SW-Mid | 5.0 | 5.1 | 5.0 | 0.0 | %vol |
| SP4LKV_1 B-SW-Low | 2.9 | 2.9 | 2.8 | 0.0 | %vol |
| SP5LKV_1 B-N/E-High | 10.3 | 10.4 | 10.2 | 0.1 | %vol |
| SP6LKV_1 B-N/E-Low | 3.1 | 3.2 | 3.0 | 0.1 | %vol |
| SP7LKV_1 K-Low | 3.3 | 3.3 | 3.3 | 0.0 | %vol |
| SP8LKV_1 LR-High | 4.2 | 4.2 | 4.2 | 0.0 | %vol |
| SP9LKV_1 LR-Mid | 4.4 | 4.4 | 4.3 | 0.0 | %vol |
| SP10KV_1 H-High | 4.9 | 4.9 | 4.9 | 0.0 | %vol |
| SP11KV_2 H-Mid | 3.2 | 3.3 | 3.1 | 0.0 | %vol |
| SP12KV_2 FF-High | 2.7 | 2.7 | 2.6 | 0.0 | %vol |
| SP13KV_2 FF-Mid | 2.5 | 2.5 | 2.4 | 0.0 | %vol |
| SP14KV_2 AT-High | 2.1 | 2.1 | 2.0 | 0.0 | %vol |
| SP15KV_2 AT-Mid | 2.1 | 2.2 | 2.1 | 0.0 | %vol |
| SP16KV_1 BM-High | 16.8 | 16.8 | 16.7 | 0.1 | %vol |
| SP17KV_1 BM-Mid | 2.3 | 2.4 | 2.3 | 0.0 | %vol |
| SP18KV_1 BM-Low | 2.5 | 2.6 | 2.5 | 0.0 | %vol |
| SP19KV_1 NWALL-Cav | 0.2 | 0.2 | 0.2 | 0.0 | %vol |
| SP20KV_1 STUD-Cav | 6.7 | 6.8 | 6.6 | 0.0 | %vol |
| SP21KV_1 FF-Void | 3.8 | 3.8 | 3.8 | 0.0 | %vol |
| SP22KV_1 SF-Void | 0.4 | 0.4 | 0.4 | 0.0 | %vol |
| SP23KV_1 ROOF-Void | 0.1 | 0.1 | 0.1 | 0.0 | %vol |
| RELEASEPRESSURE | 0.0038 | 0.0041 | 0.0034 | 0.0002 | barg |
| LOWFLOWMETERCH4 | 1.2322 | 1.2444 | 1.2219 | 0.0063 | g/s |
| OUTLET_TEMP | 4.1 | 4.2 | 4.0 | 0.1 | degC |
| Volume Flow Rate | 103.1 | 104.1 | 102.2 | 0.5 | SLPM |
| Energy Flow Rate | 61.6 | 62.2 | 61.1 | 0.3 | kW |
| External Wind Speed | 3.7 | | | | m/s |
| External Wind Direction | 231.4 | | | | bearing |



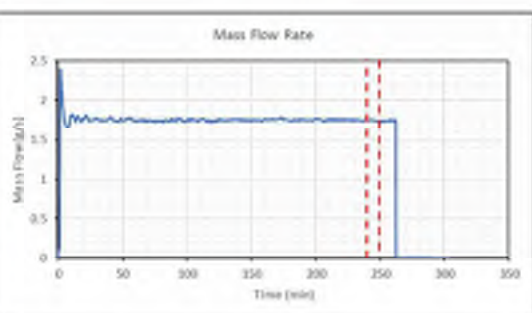
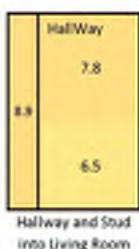
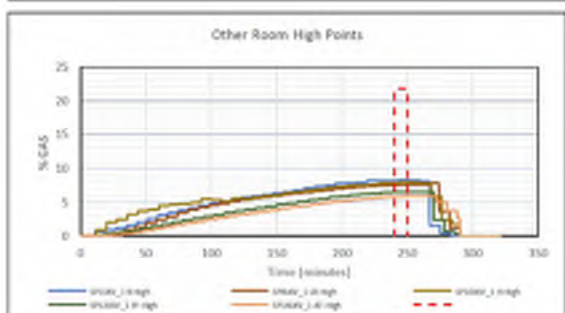
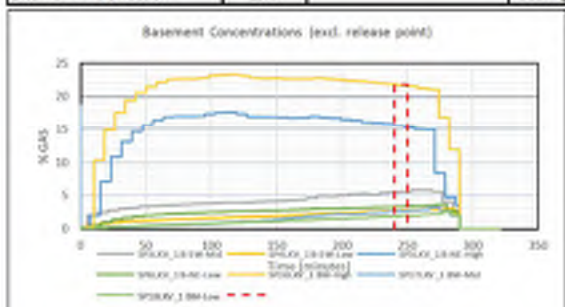
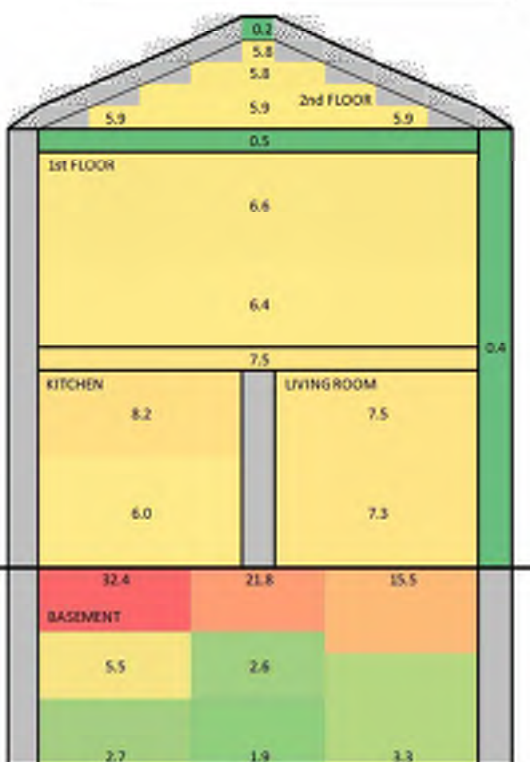
L3-005 RESULT

Hy4Heat WP7 Test Result

| | |
|--|----------------|
| MTP ID: L3-005 | |
| Hole Size: 10 mm | |
| Location: Basement upwards, basement door closed | |
| Gas: methane | |
| Date: 06/12/2019 | Time: 21:30:00 |
| Averaging Period Start: 240 min | End: 250 min |

Notes:

| Sensor | Average | Max | Min | STDEV | Units |
|-------------------------|---------|--------|--------|--------|---------|
| SP1KKV_1 K-High | 8.2 | 8.2 | 8.2 | 0.0 | %vol |
| SP2KKV_1 B-SW-High | 32.4 | 32.5 | 32.3 | 0.1 | %vol |
| SP3KKV_1 B-SW-Mid | 5.5 | 5.6 | 5.5 | 0.0 | %vol |
| SP4KKV_1 B-SW-Low | 2.7 | 2.7 | 2.7 | 0.0 | %vol |
| SP5KKV_1 B-NW-High | 15.5 | 15.6 | 15.3 | 0.1 | %vol |
| SP6KKV_1 B-NW-Low | 3.3 | 3.4 | 3.3 | 0.0 | %vol |
| SP7KKV_1 K-Low | 6.0 | 6.1 | 5.9 | 0.0 | %vol |
| SP8KKV_1 LR-High | 7.5 | 7.5 | 7.5 | 0.0 | %vol |
| SP9KKV_1 LR-Mid | 7.3 | 7.3 | 7.2 | 0.0 | %vol |
| SP10KKV_1 H-High | 7.8 | 7.9 | 7.7 | 0.1 | %vol |
| SP11KKV_1 H-Mid | 6.5 | 6.6 | 6.5 | 0.0 | %vol |
| SP12KKV_1 FF-High | 6.6 | 6.6 | 6.6 | 0.0 | %vol |
| SP13KKV_1 FF-Mid | 6.4 | 6.4 | 6.3 | 0.0 | %vol |
| SP14KKV_1 AT-High | 5.8 | 5.9 | 5.8 | 0.0 | %vol |
| SP15KKV_1 AT-Mid | 5.9 | 6.0 | 5.8 | 0.0 | %vol |
| SP16KKV_1 BM-High | 21.8 | 21.9 | 21.7 | 0.1 | %vol |
| SP17KKV_1 BM-Mid | 2.6 | 2.6 | 2.6 | 0.0 | %vol |
| SP18KKV_1 BM-Low | 1.9 | 2.0 | 1.8 | 0.1 | %vol |
| SP19KKV_1 NWALL-Cav | 0.4 | 0.4 | 0.4 | 0.0 | %vol |
| SP20KKV_1 STUD-Cav | 8.9 | 8.9 | 8.9 | 0.0 | %vol |
| SP21KKV_1 FF-Void | 7.5 | 7.5 | 7.5 | 0.0 | %vol |
| SP22KKV_1 SF-Void | 0.5 | 0.5 | 0.4 | 0.0 | %vol |
| SP23KKV_1 ROOF-Void | 0.2 | 0.3 | 0.1 | 0.1 | %vol |
| RELEASEPRESSURE | 0.0099 | 0.0103 | 0.0096 | 0.0002 | barg |
| LOWFLOWMETERCH4 | 1.7395 | 1.7535 | 1.7234 | 0.0066 | g/s |
| OUTLET_TEMP | -1.0 | -0.8 | -1.2 | 0.1 | degC |
| Volume Flow Rate | 145.5 | 146.7 | 144.1 | 0.5 | SLPM |
| Energy Flow Rate | 87.0 | 87.7 | 86.2 | 0.3 | kW |
| External Wind Speed | 1.3 | | | | m/s |
| External Wind Direction | 237.7 | | | | bearing |



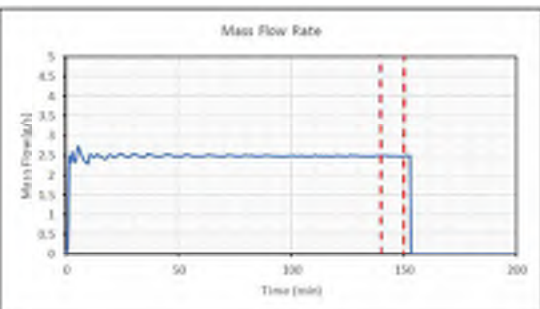
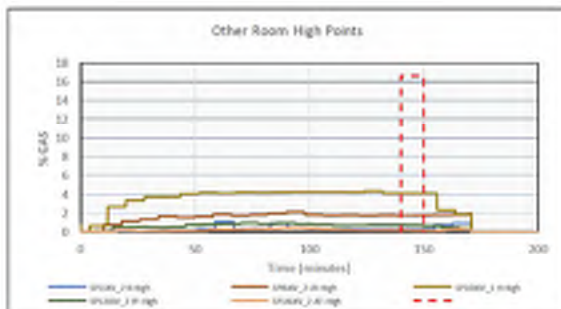
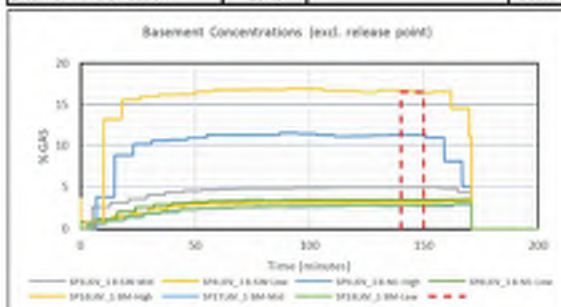
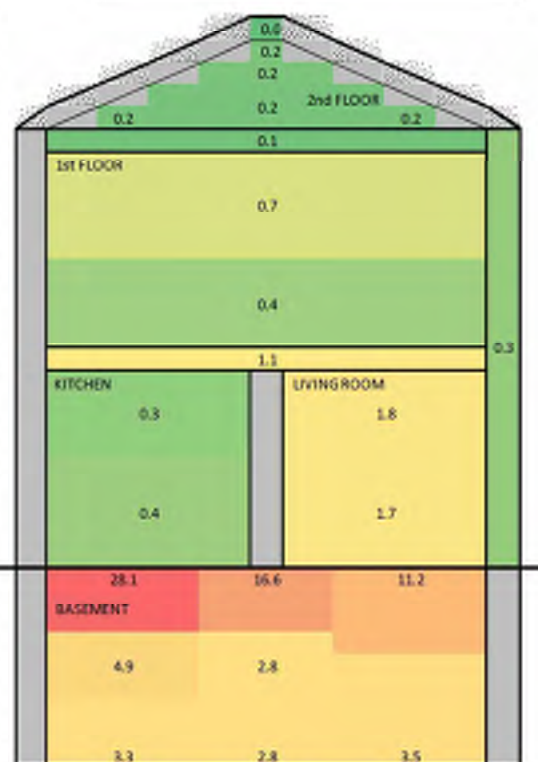
L3-006 RESULT

Hy4Heat WP7 Test Result

| | |
|--|----------------|
| MTP ID: L3-006 | |
| Hole Size: 10mm | |
| Location: Basement upwards, basement door closed | |
| Gas: methane | |
| Date: 17/12/2019 | Time: 09:00:00 |
| Averaging Period Start: 140 min | End: 150 min |

Notes:

| Sensor | Average | Max | Min | STDEV | Units |
|-------------------------|---------|--------|--------|--------|---------|
| SP1KLV_2 K-High | 0.3 | 0.3 | 0.3 | 0.0 | %vol |
| SP2LKV_1 B-SW-High | 28.1 | 28.2 | 27.9 | 0.0 | %vol |
| SP3LKV_1 B-SW-Mid | 4.9 | 5.0 | 4.9 | 0.0 | %vol |
| SP4LKV_1 B-SW-Low | 3.3 | 3.3 | 3.2 | 0.0 | %vol |
| SP5LKV_1 B-N/E-High | 11.2 | 11.2 | 11.2 | 0.0 | %vol |
| SP6LKV_1 B-N/E-Low | 3.5 | 3.5 | 3.5 | 0.0 | %vol |
| SP7LKV_2 K-Low | 0.4 | 0.4 | 0.4 | 0.0 | %vol |
| SP8LKV_2 LR-High | 1.8 | 1.8 | 1.8 | 0.0 | %vol |
| SP9LKV_2 LR-Mid | 1.7 | 1.7 | 1.7 | 0.0 | %vol |
| SP10LKV_1 H-High | 4.1 | 4.1 | 4.1 | 0.0 | %vol |
| SP11LKV_2 H-Mid | 0.4 | 0.5 | 0.3 | 0.0 | %vol |
| SP12LKV_2 FF-High | 0.7 | 0.7 | 0.7 | 0.0 | %vol |
| SP13LKV_2 FF-Mid | 0.4 | 0.4 | 0.4 | 0.0 | %vol |
| SP14LKV_2 AT-High | 0.2 | 0.2 | 0.2 | 0.0 | %vol |
| SP15LKV_2 AT-Mid | 0.2 | 0.2 | 0.1 | 0.0 | %vol |
| SP16LKV_1 BM-High | 16.6 | 16.7 | 16.5 | 0.1 | %vol |
| SP17LKV_1 BM-Mid | 2.8 | 2.8 | 2.7 | 0.0 | %vol |
| SP18LKV_1 BM-Low | 2.8 | 2.8 | 2.8 | 0.0 | %vol |
| SP19LKV_1 NWALL-Cav | 0.3 | 0.3 | 0.3 | 0.0 | %vol |
| SP20LKV_1 STUD-Cav | 2.5 | 2.5 | 2.5 | 0.0 | %vol |
| SP21LKV_1 FF-Void | 1.1 | 1.1 | 1.1 | 0.0 | %vol |
| SP22LKV_1 SF-Void | 0.1 | 0.1 | 0.1 | 0.0 | %vol |
| SP23LKV_1 ROOF-Void | 0.0 | 0.0 | 0.0 | 0.0 | %vol |
| RELEASEPRESSURE | 0.0208 | 0.0214 | 0.0203 | 0.0002 | barg |
| LOWFLOWMETERCH4 | 2.4808 | 2.4911 | 2.4685 | 0.0073 | g/s |
| OUTLET TEMP | -1.5 | -1.3 | -1.6 | 0.1 | degC |
| Volume Flow Rate | 207.5 | 208.3 | 206.5 | 0.6 | L/PM |
| Energy Flow Rate | 124.0 | 124.6 | 123.4 | 0.4 | kW |
| External Wind Speed | 1.5 | | | | m/s |
| External Wind Direction | 187.5 | | | | bearing |



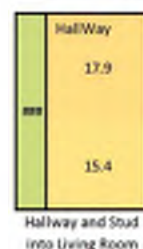
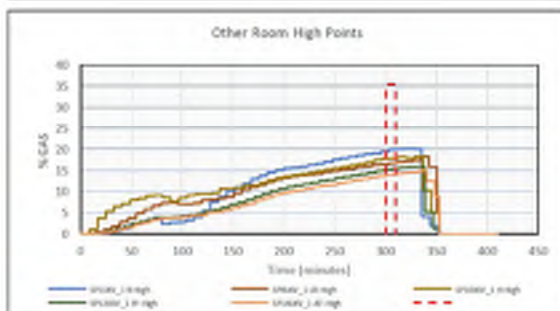
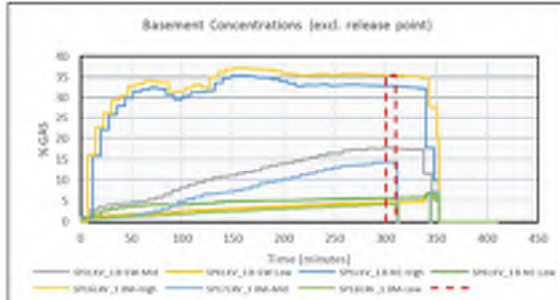
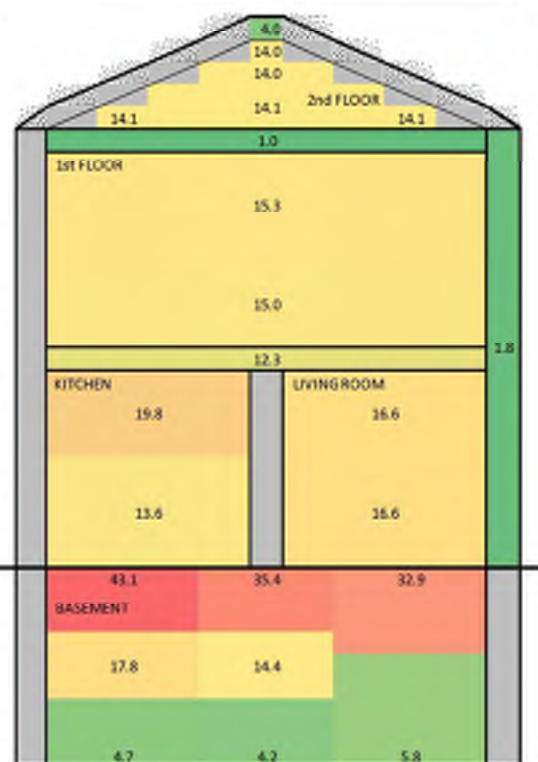
L3-007 RESULT

Hy4Heat WP7 Test Result

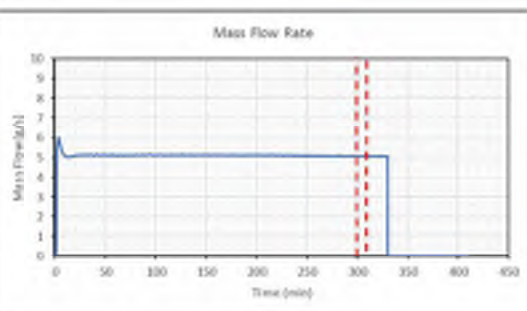
| | |
|--|----------------|
| MTP ID: L3-007 | |
| Hole Size: 10 mm | |
| Location: Basement upwards, basement door closed | |
| Gas: methane | |
| Date: 17/12/2019 | Time: 06:50:00 |
| Averaging Period Start: 300 min | End: 310 min |

Notes:

| Sensor | Average | Max | Min | STDEV | Units |
|-------------------------|---------|--------|--------|--------|---------|
| SP1KKV_1 K-High | 19.8 | 20.0 | 19.4 | 0.3 | %vol |
| SP2KKV_1 B-SW-High | 43.1 | 43.1 | 43.1 | 0.0 | %vol |
| SP3KKV_1 B-SW-Mid | 17.8 | 17.8 | 17.7 | 0.1 | %vol |
| SP4KKV_1 B-SW-Low | 4.7 | 4.7 | 4.7 | 0.0 | %vol |
| SP5KKV_1 B-NW-High | 32.9 | 32.9 | 32.8 | 0.0 | %vol |
| SP6KKV_1 B-NW-Low | 5.8 | 5.8 | 5.7 | 0.0 | %vol |
| SP7KKV_1 K-Low | 13.6 | 13.9 | 13.3 | 0.2 | %vol |
| SP8KKV_1 LR-High | 16.6 | 16.7 | 16.4 | 0.2 | %vol |
| SP9KKV_1 LR-Mid | 16.6 | 16.7 | 16.4 | 0.1 | %vol |
| SP10KKV_1 H-High | 17.9 | 17.9 | 17.9 | 0.0 | %vol |
| SP11KKV_1 H-Mid | 15.4 | 15.6 | 15.3 | 0.2 | %vol |
| SP12KKV_1 FF-High | 15.3 | 15.5 | 15.3 | 0.1 | %vol |
| SP13KKV_1 FF-Mid | 15.0 | 15.2 | 14.9 | 0.1 | %vol |
| SP14KKV_1 AT-High | 14.0 | 14.3 | 13.7 | 0.1 | %vol |
| SP15KKV_1 AT-Mid | 14.1 | 14.5 | 13.8 | 0.2 | %vol |
| SP16KKV_1 BM-High | 35.4 | 35.4 | 35.4 | 0.0 | %vol |
| SP17KKV_1 BM-Mid | 14.4 | 14.4 | 14.4 | 0.0 | %vol |
| SP18KKV_1 BM-Low | 4.2 | 4.2 | 4.2 | 0.0 | %vol |
| SP19KKV_1 NWALL-Cav | 1.8 | 1.8 | 1.8 | 0.0 | %vol |
| SP20KKV_1 STUD-Cav | 10.1 | 18.6 | -8.5 | 12.6 | %vol |
| SP21KKV_1 FF-Void | 12.3 | 17.9 | -8.5 | 10.9 | %vol |
| SP22KKV_1 SF-Void | 1.0 | 2.3 | -8.5 | 3.5 | %vol |
| SP23KKV_1 ROOF-Void | 4.0 | 4.2 | 3.6 | 0.3 | %vol |
| RELEASEPRESSURE | 0.0844 | 0.0853 | 0.0831 | 0.0004 | barg |
| LOWFLOWMETERCH4 | 5.0473 | 5.0718 | 5.0302 | 0.0090 | g/s |
| OUTLET_TEMP | 2.4 | 2.5 | 2.2 | 0.1 | degC |
| Volume Flow Rate | 422.1 | 424.2 | 420.7 | 0.8 | SLPM |
| Energy Flow Rate | 252.4 | 253.6 | 251.5 | 0.4 | kW |
| External Wind Speed | 1.6 | | | | m/s |
| External Wind Direction | 219.4 | | | | bearing |



Hallway and Stair into Living Room



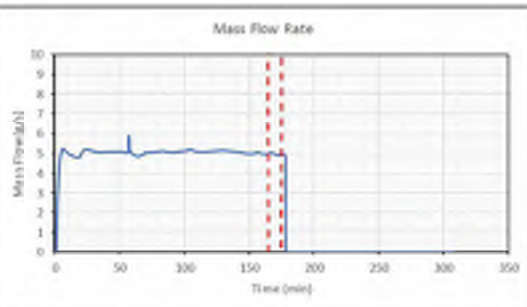
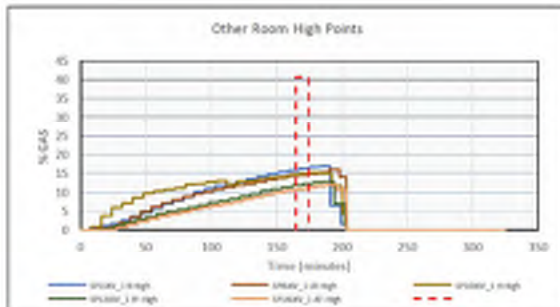
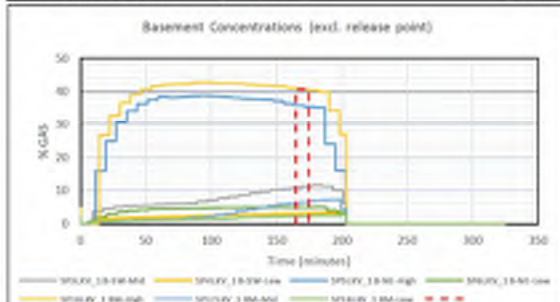
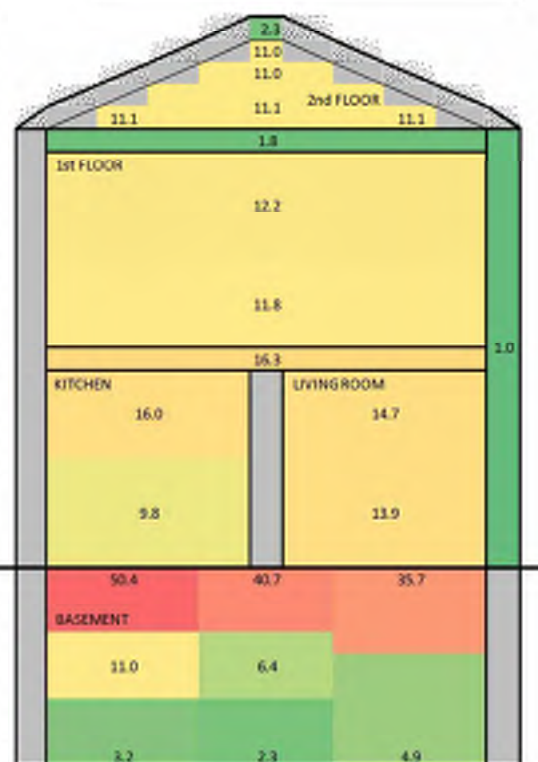
L3-008 RESULT

Hy4Heat WP7 Test Result

| | |
|--|----------------|
| MTP ID: L3-008 | |
| Hole Size: 15 mm | |
| Location: Basement upwards, basement door closed | |
| Gas: methane | |
| Date: 17/12/2019 | Time: 14:00:00 |
| Averaging Period Start: 165 min | End: 175 min |

Notes:

| Sensor | Average | Max | Min | STDEV | Units |
|-------------------------|---------|--------|--------|--------|---------|
| SP1KVV_1 K-High | 16.0 | 16.1 | 15.8 | 0.1 | %vol |
| SP2LKV_1 B-SW-High | 50.4 | 50.5 | 50.3 | 0.1 | %vol |
| SP3LKV_1 B-SW-Mid | 11.0 | 11.2 | 10.8 | 0.2 | %vol |
| SP4LKV_1 B-SW-Low | 3.2 | 3.2 | 3.1 | 0.1 | %vol |
| SP5LKV_1 B-N/E-High | 35.7 | 35.8 | 35.5 | 0.2 | %vol |
| SP6LKV_1 B-N/E-Low | 4.9 | 5.0 | 4.9 | 0.0 | %vol |
| SP7LKV_1 K-Low | 9.8 | 10.3 | 9.2 | 0.3 | %vol |
| SP8LKV_1 LR-High | 14.7 | 15.0 | 14.5 | 0.1 | %vol |
| SP9LKV_1 LR-Mid | 13.9 | 14.0 | 13.5 | 0.2 | %vol |
| SP10KV_1 H-High | 15.0 | 15.1 | 14.8 | 0.1 | %vol |
| SP11KV_1 H-Mid | 12.0 | 12.2 | 11.7 | 0.3 | %vol |
| SP12KV_1 FF-High | 12.2 | 12.5 | 12.0 | 0.2 | %vol |
| SP13KV_1 FF-Mid | 11.8 | 12.1 | 11.7 | 0.2 | %vol |
| SP14KV_1 AT-High | 11.0 | 11.4 | 10.8 | 0.2 | %vol |
| SP15KV_1 AT-Mid | 11.1 | 11.5 | 10.6 | 0.2 | %vol |
| SP16KV_1 BM-High | 40.7 | 41.1 | 40.4 | 0.2 | %vol |
| SP17KV_1 BM-Mid | 6.4 | 6.5 | 6.1 | 0.1 | %vol |
| SP18KV_1 BM-Low | 2.3 | 2.4 | 2.3 | 0.0 | %vol |
| SP19KV_1 NWALL-Cav | 1.0 | 1.1 | 1.0 | 0.0 | %vol |
| SP20KV_1 STUD-Cav | 17.3 | 17.6 | 17.1 | 0.2 | %vol |
| SP21KV_1 FF-Void | 16.3 | 16.5 | 16.2 | 0.1 | %vol |
| SP22KV_1 SF-Void | 1.8 | 1.8 | 1.8 | 0.0 | %vol |
| SP23KV_1 ROOF-Void | 2.3 | 2.5 | 2.3 | 0.1 | %vol |
| RELEASEPRESSURE | 0.0115 | 0.0121 | 0.0108 | 0.0003 | barg |
| LOWFLOWMETERCH4 | 4.9788 | 5.0491 | 4.8977 | 0.0423 | g/s |
| OUTLET_TEMP | 1.2 | 1.3 | 1.1 | 0.1 | degC |
| Volume Flow Rate | 416.4 | 422.3 | 409.6 | 3.5 | SLPM |
| Energy Flow Rate | 248.9 | 252.5 | 244.9 | 2.1 | kW |
| External Wind Speed | 2.4 | | | | m/s |
| External Wind Direction | 231.6 | | | | bearing |



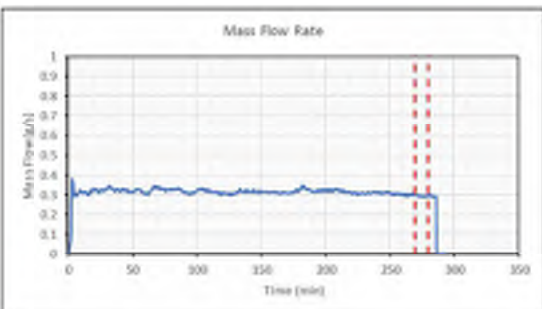
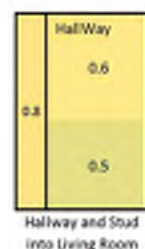
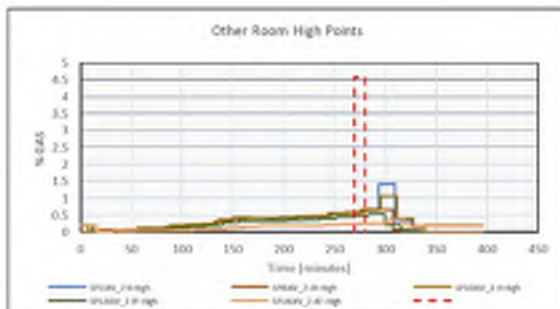
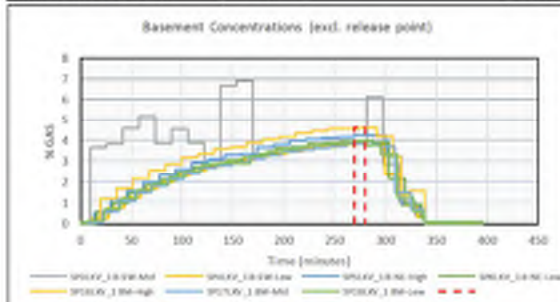
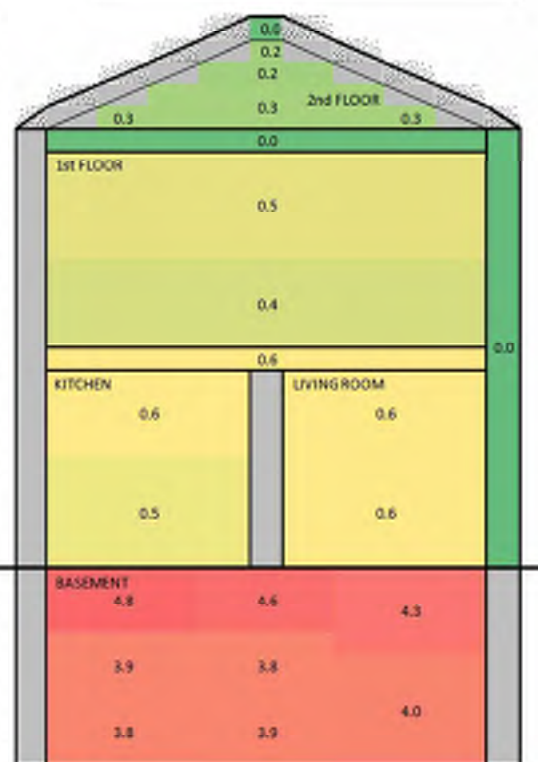
L3-009 RESULT

Hy4Heat WP7 Test Result

| | |
|--|----------------|
| MTP ID: L3-009 | |
| Hole Size: 5 mm | |
| Location: Basement downwards, basement door closed | |
| Gas: methane | |
| Date: 30/11/2019 | Time: 11:15:00 |
| Averaging Period Start: 270 min | End: 280 min |

Notes:

| Sensor | Average | Max | Min | STDEV | Units |
|-------------------------|---------|--------|--------|--------|---------|
| SP1KLV_2 K-High | 0.6 | 0.6 | 0.6 | 0.0 | %vol |
| SP2LKV_1 B-SW-High | 4.8 | 4.9 | 4.7 | 0.0 | %vol |
| SP3LKV_1 B-SW-Mid | 3.9 | 3.9 | 3.9 | 0.0 | %vol |
| SP4LKV_1 B-SW-Low | 3.8 | 3.8 | 3.8 | 0.0 | %vol |
| SP5LKV_1 B-N/E-High | 4.3 | 4.3 | 4.3 | 0.0 | %vol |
| SP6LKV_1 B-N/E-Low | 4.0 | 4.0 | 3.9 | 0.0 | %vol |
| SP7LKV_2 K-Low | 0.5 | 0.5 | 0.5 | 0.0 | %vol |
| SP8LKV_2 LR-High | 0.6 | 0.7 | 0.6 | 0.0 | %vol |
| SP9LKV_2 LR-Mid | 0.6 | 0.6 | 0.6 | 0.0 | %vol |
| SP10LKV_2 H-High | 0.6 | 0.7 | 0.6 | 0.0 | %vol |
| SP11LKV_2 H-Mid | 0.5 | 0.5 | 0.5 | 0.0 | %vol |
| SP12LKV_2 FF-High | 0.5 | 0.5 | 0.5 | 0.0 | %vol |
| SP13LKV_2 FF-Mid | 0.4 | 0.4 | 0.4 | 0.0 | %vol |
| SP14LKV_2 AT-High | 0.2 | 0.2 | 0.2 | 0.0 | %vol |
| SP15LKV_2 AT-Mid | 0.3 | 0.3 | 0.2 | 0.0 | %vol |
| SP16LKV_1 BM-High | 4.6 | 4.6 | 4.6 | 0.0 | %vol |
| SP17LKV_1 BM-Mid | 3.8 | 3.8 | 3.8 | 0.0 | %vol |
| SP18LKV_1 BM-Low | 3.9 | 4.0 | 3.8 | 0.0 | %vol |
| SP19LKV_1 NWALL-Cav | 0.0 | 0.0 | 0.0 | 0.0 | %vol |
| SP20LKV_1 STUD-Cav | 0.8 | 0.8 | 0.8 | 0.0 | %vol |
| SP21LKV_1 FF-Void | 0.6 | 0.6 | 0.6 | 0.0 | %vol |
| SP22LKV_1 SF-Void | 0.0 | 0.1 | 0.0 | 0.0 | %vol |
| SP23LKV_1 ROOF-Void | 0.0 | 0.1 | 0.0 | 0.0 | %vol |
| RELEASEPRESSURE | 0.0028 | 0.0032 | 0.0025 | 0.0002 | barg |
| LOWFLOWMETERCH4 | 0.2935 | 0.2961 | 0.2886 | 0.0025 | g/s |
| OUTLET_TEMP | 1.0 | 1.3 | 0.8 | 0.1 | degC |
| Volume Flow Rate | 24.5 | 24.8 | 24.1 | 0.2 | SLPM |
| Energy Flow Rate | 14.7 | 14.8 | 14.4 | 0.1 | kW |
| External Wind Speed | 1.9 | | | | m/s |
| External Wind Direction | 82.7 | | | | bearing |



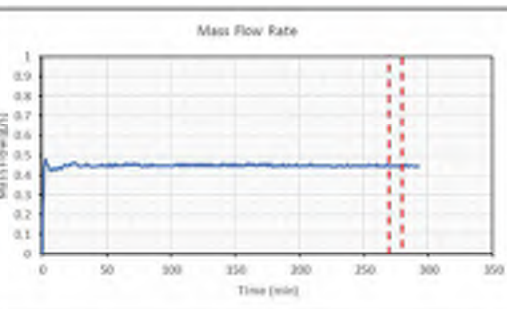
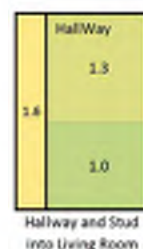
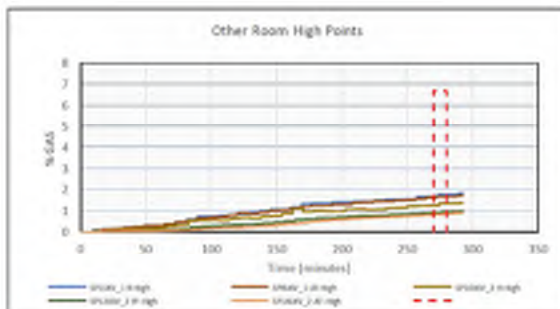
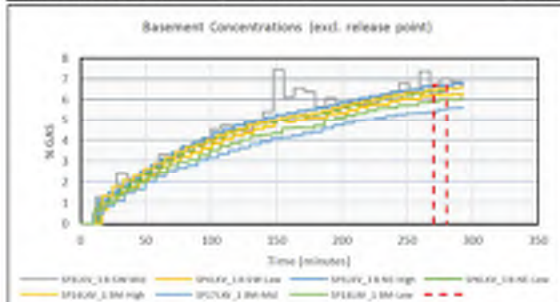
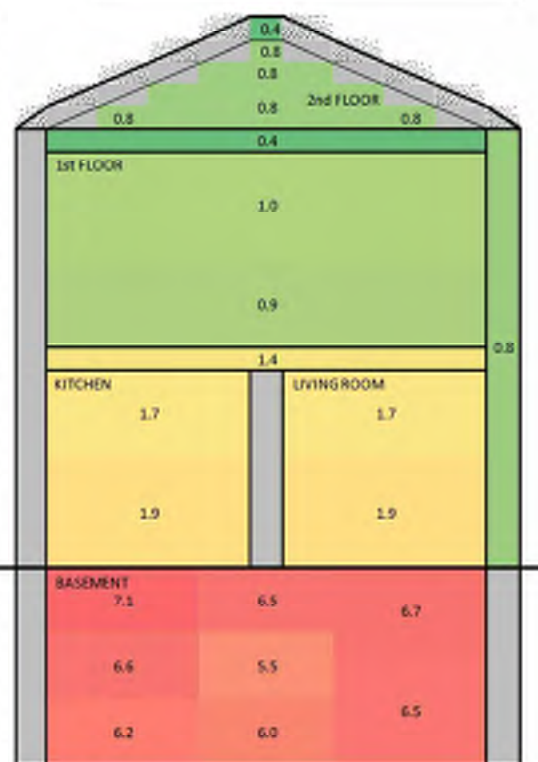
L3-010 RESULT

Hy4Heat WP7 Test Result

| | |
|--|----------------|
| MTP ID: L3-010 | |
| Hole Size: 5 mm | |
| Location: Basement downwards, basement door closed | |
| Gas: methane | |
| Date: 30/11/2019 | Time: 17:45:00 |
| Averaging Period Start: 270 min | End: 280 min |

Notes:

| Sensor | Average | Max | Min | STDEV | Units |
|-------------------------|---------|--------|--------|--------|---------|
| SP1KLV_1 K-High | 1.7 | 1.7 | 1.7 | 0.0 | %vol |
| SP2LKV_1 B-SW-High | 7.1 | 7.1 | 7.0 | 0.1 | %vol |
| SP3LKV_1 B-SW-Mid | 6.6 | 7.0 | 6.3 | 0.4 | %vol |
| SP4LKV_1 B-SW-Low | 6.2 | 6.2 | 6.2 | 0.0 | %vol |
| SP5LKV_1 B-N/E-High | 6.7 | 6.7 | 6.7 | 0.0 | %vol |
| SP6LKV_1 B-N/E-Low | 6.5 | 6.5 | 6.4 | 0.0 | %vol |
| SP7LKV_1 K-Low | 1.9 | 2.0 | 1.9 | 0.0 | %vol |
| SP8LKV_1 LR-High | 1.7 | 1.7 | 1.7 | 0.0 | %vol |
| SP9LKV_1 LR-Mid | 1.9 | 1.9 | 1.9 | 0.0 | %vol |
| SP10KV_2 H-High | 1.3 | 1.3 | 1.2 | 0.0 | %vol |
| SP11KV_2 H-Mid | 1.0 | 1.1 | 1.0 | 0.0 | %vol |
| SP12KV_2 FF-High | 1.0 | 1.0 | 0.9 | 0.0 | %vol |
| SP13KV_2 FF-Mid | 0.9 | 0.9 | 0.9 | 0.0 | %vol |
| SP14KV_2 AT-High | 0.8 | 0.8 | 0.8 | 0.0 | %vol |
| SP15KV_2 AT-Mid | 0.8 | 0.8 | 0.8 | 0.0 | %vol |
| SP16KV_1 BM-High | 6.5 | 6.5 | 6.5 | 0.0 | %vol |
| SP17KV_1 BM-Mid | 5.5 | 5.5 | 5.4 | 0.1 | %vol |
| SP18KV_1 BM-Low | 6.0 | 6.0 | 5.9 | 0.1 | %vol |
| SP19KV_1 NWALL-Cav | 0.8 | 0.9 | 0.7 | 0.1 | %vol |
| SP20KV_1 STUD-Cav | 1.6 | 1.6 | 1.6 | 0.0 | %vol |
| SP21KV_1 FF-Void | 1.4 | 1.5 | 1.4 | 0.0 | %vol |
| SP22KV_1 SF-Void | 0.4 | 0.5 | 0.4 | 0.0 | %vol |
| SP23KV_1 ROOF-Void | 0.4 | 0.4 | 0.4 | 0.0 | %vol |
| RELEASEPRESSURE | 0.0058 | 0.0062 | 0.0055 | 0.0002 | bar |
| LOWFLOWMETERCH4 | 0.4432 | 0.4460 | 0.4385 | 0.0023 | g/s |
| OUTLET_TEMP | -3.0 | -2.9 | -3.1 | 0.1 | degC |
| Volume Flow Rate | 37.1 | 37.3 | 36.7 | 0.2 | LPM |
| Energy Flow Rate | 22.2 | 22.3 | 21.9 | 0.1 | kW |
| External Wind Speed | 0.4 | | | | m/s |
| External Wind Direction | 343.7 | | | | bearing |



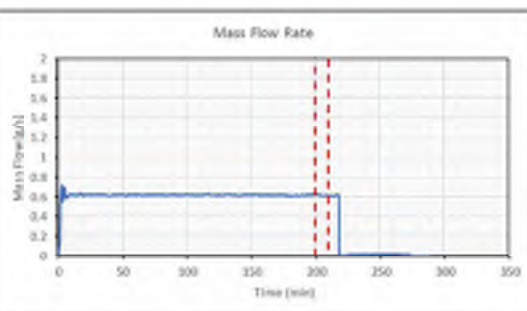
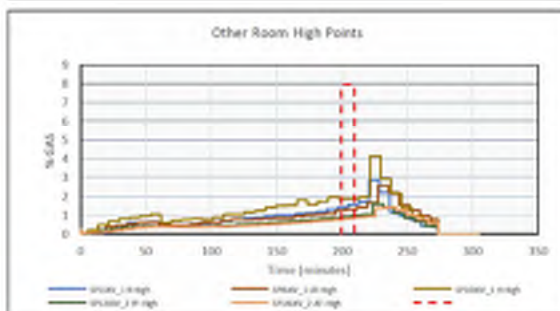
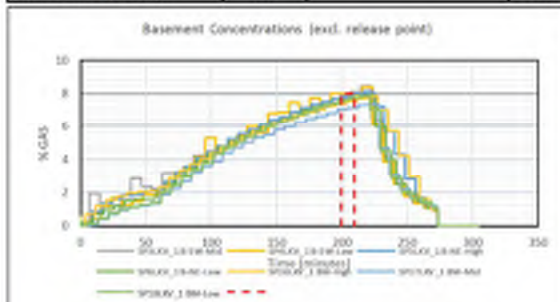
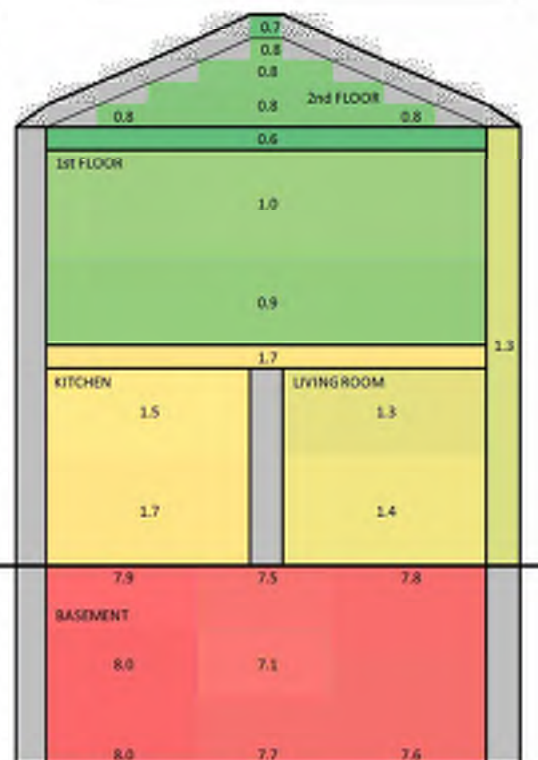
L3-011 RESULT

Hy4Heat WP7 Test Result

| | |
|--|----------------|
| MTP ID: L3-011 | |
| Hole Size: 5 mm | |
| Location: Basement downwards, basement door closed | |
| Gas: methane | |
| Date: 01/12/2019 | Time: 01:30:00 |
| Averaging Period Start: 200 min | End: 210 min |

Notes: Windows were left open by mistake in first 60 minutes of release then closed

| Sensor | Average | Max | Min | STDEV | Units |
|-------------------------|---------|--------|--------|--------|---------|
| SP1KVV_1 K-High | 1.5 | 1.6 | 1.4 | 0.1 | %vol |
| SP2LKV_1 B-SW-High | 7.9 | 8.0 | 7.9 | 0.0 | %vol |
| SP3LKV_1 B-SW-Mid | 8.0 | 8.1 | 7.9 | 0.1 | %vol |
| SP4LKV_1 B-SW-Low | 8.0 | 8.0 | 7.9 | 0.0 | %vol |
| SP5LKV_1 B-N/E-High | 7.8 | 8.0 | 7.7 | 0.1 | %vol |
| SP6LKV_1 B-N/E-Low | 7.6 | 7.8 | 7.4 | 0.1 | %vol |
| SP7LKV_1 K-Low | 1.7 | 1.8 | 1.7 | 0.0 | %vol |
| SP8LKV_1 LR-High | 1.3 | 1.3 | 1.3 | 0.0 | %vol |
| SP9LKV_2 LR-Mid | 1.4 | 1.4 | 1.4 | 0.0 | %vol |
| SP10KV_1 H-High | 1.9 | 1.9 | 1.9 | 0.0 | %vol |
| SP11KV_2 H-Mid | 1.0 | 1.1 | 1.0 | 0.0 | %vol |
| SP12KV_2 FF-High | 1.0 | 1.0 | 0.9 | 0.0 | %vol |
| SP13KV_2 FF-Mid | 0.9 | 1.0 | 0.8 | 0.0 | %vol |
| SP14KV_2 AT-High | 0.8 | 0.9 | 0.8 | 0.0 | %vol |
| SP15KV_2 AT-Mid | 0.8 | 0.8 | 0.8 | 0.0 | %vol |
| SP16KV_1 BM-High | 7.5 | 7.5 | 7.4 | 0.1 | %vol |
| SP17KV_1 BM-Mid | 7.1 | 7.1 | 7.1 | 0.0 | %vol |
| SP18KV_1 BM-Low | 7.7 | 7.7 | 7.6 | 0.1 | %vol |
| SP19KV_1 NWALL-Cav | 1.3 | 1.3 | 1.2 | 0.0 | %vol |
| SP20KV_1 STUD-Cav | 1.7 | 1.8 | 1.7 | 0.1 | %vol |
| SP21KV_1 FF-Void | 1.7 | 1.8 | 1.6 | 0.1 | %vol |
| SP22KV_1 SF-Void | 0.6 | 0.7 | 0.6 | 0.0 | %vol |
| SP23KV_1 ROOF-Void | 0.7 | 0.7 | 0.6 | 0.0 | %vol |
| RELEASEPRESSURE | 0.0100 | 0.0106 | 0.0099 | 0.0002 | barg |
| LOWFLOWMETERCH4 | 0.6133 | 0.6222 | 0.6072 | 0.0056 | g/s |
| OUTLET_TEMP | -5.2 | -4.9 | -5.4 | 0.1 | degC |
| Volume Flow Rate | 51.3 | 52.0 | 50.8 | 0.5 | SLPM |
| Energy Flow Rate | 30.7 | 31.1 | 30.4 | 0.3 | kW |
| External Wind Speed | 0.0 | | | | m/s |
| External Wind Direction | 79.2 | | | | bearing |



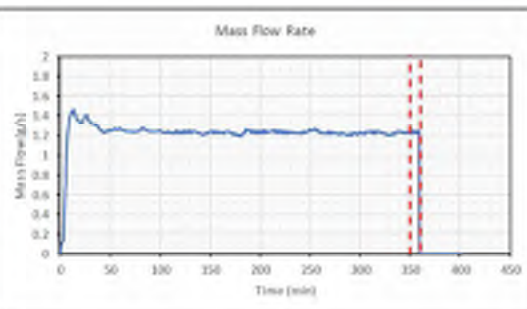
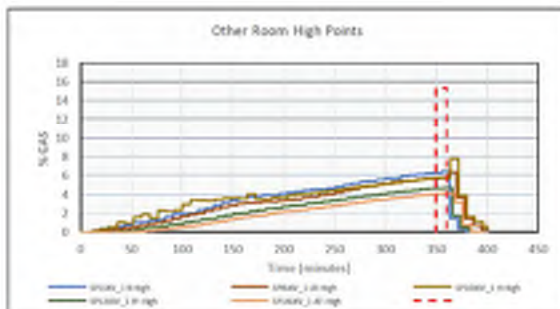
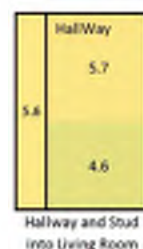
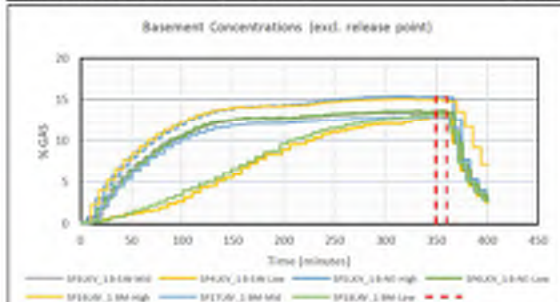
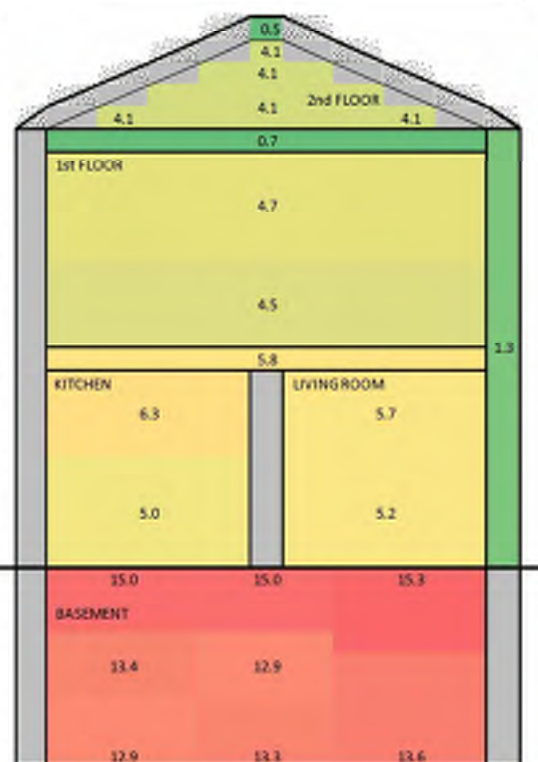
L3-012 RESULT

Hy4Heat WP7 Test Result

| | |
|---|----------------|
| MTP ID: L3-012 | |
| Hole Size: 10mm | |
| Location: Basement downwards, door closed | |
| Gas: methane | |
| Date: 04/12/2019 | Time: 18:00:00 |
| Averaging Period Start: 350 min | End: 390 min |

Notes:

| Sensor | Average | Max | Min | STDEV | Units |
|-------------------------|---------|--------|--------|--------|---------|
| SP1KVV_1 K-High | 6.3 | 6.4 | 6.3 | 0.1 | %vol |
| SP2LKV_1 B-SW-High | 15.0 | 15.1 | 14.9 | 0.1 | %vol |
| SP3LKV_1 B-SW-Mid | 13.4 | 13.5 | 13.4 | 0.0 | %vol |
| SP4LKV_1 B-SW-Low | 12.9 | 13.0 | 12.9 | 0.0 | %vol |
| SP5LKV_1 B-NE-High | 15.3 | 15.3 | 15.3 | 0.0 | %vol |
| SP6LKV_1 B-NE-Low | 13.6 | 13.7 | 13.6 | 0.0 | %vol |
| SP7LKV_1 K-Low | 5.0 | 5.0 | 5.0 | 0.0 | %vol |
| SP8LKV_1 LR-High | 5.7 | 5.8 | 5.7 | 0.1 | %vol |
| SP9LKV_1 LR-Mid | 5.2 | 5.2 | 5.2 | 0.0 | %vol |
| SP10KV_1 H-High | 5.7 | 5.7 | 5.7 | 0.0 | %vol |
| SP11KV_1 H-Mid | 4.6 | 4.7 | 4.5 | 0.0 | %vol |
| SP12KV_1 FF-High | 4.7 | 4.7 | 4.6 | 0.0 | %vol |
| SP13KV_1 FF-Mid | 4.5 | 4.5 | 4.5 | 0.0 | %vol |
| SP14KV_1 AT-High | 4.1 | 4.1 | 4.0 | 0.0 | %vol |
| SP15KV_1 AT-Mid | 4.1 | 4.1 | 4.0 | 0.0 | %vol |
| SP16KV_1 BM-High | 15.0 | 15.1 | 15.0 | 0.1 | %vol |
| SP17KV_1 BM-Mid | 12.9 | 12.9 | 12.9 | 0.0 | %vol |
| SP18KV_1 BM-Low | 13.3 | 13.3 | 13.3 | 0.0 | %vol |
| SP19KV_1 NWALL-Cav | 1.3 | 1.4 | 1.2 | 0.1 | %vol |
| SP20KV_1 STUD-Cav | 5.6 | 5.8 | 5.4 | 0.1 | %vol |
| SP21KV_1 FF-Void | 5.8 | 5.8 | 5.8 | 0.0 | %vol |
| SP22KV_1 SF-Void | 0.7 | 0.8 | 0.6 | 0.1 | %vol |
| SP23KV_1 ROOF-Void | 0.5 | 0.8 | 0.3 | 0.3 | %vol |
| RELEASEPRESSURE | 0.0038 | 0.0041 | 0.0034 | 0.0002 | barg |
| LOWFLOWMETERQ4 | 1.2350 | 1.2557 | 1.2219 | 0.0093 | g/s |
| OUTLET_TEMP | 3.7 | 3.8 | 3.6 | 0.1 | degC |
| Volume Flow Rate | 103.3 | 105.0 | 102.2 | 0.8 | SLPM |
| Energy Flow Rate | 61.7 | 62.8 | 61.1 | 0.5 | kW |
| External Wind Speed | 3.8 | | | | m/s |
| External Wind Direction | 229.4 | | | | bearing |



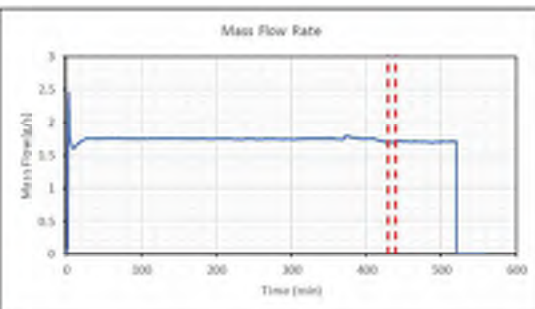
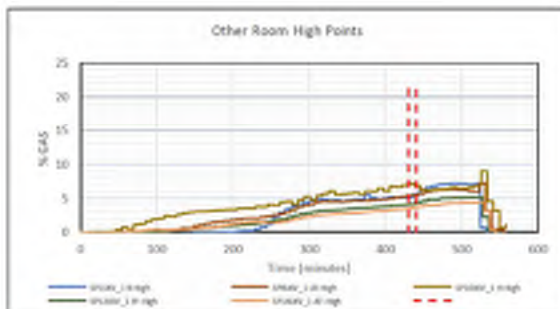
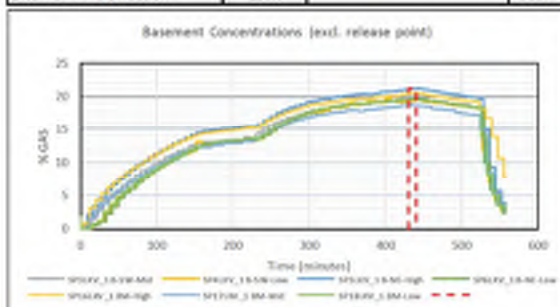
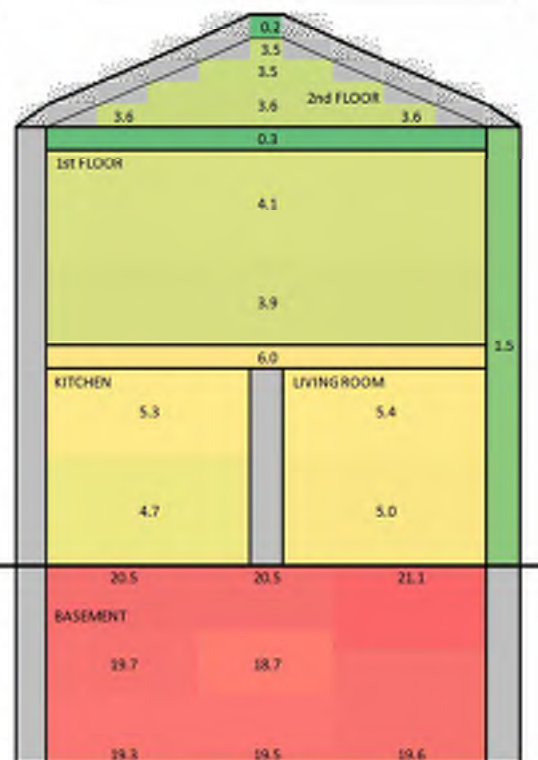
L3-013 RESULT

Hy4Heat WP7 Test Result

| | |
|--|----------------|
| MTP ID: L3-013 | |
| Hole Size: 10mm | |
| Location: Basement downwards, basement door closed | |
| Gas: methane | |
| Date: 12/12/2019 | Time: 15:50:00 |
| Averaging Period Start: 430 min | End: 440 min |

Notes: Kitchen window observed to be slightly open @ ~3.5 hours and subsequently closed. Test allowed to run to second steady state

| Sensor | Average | Max | Min | STDEV | Units |
|-------------------------|---------|--------|--------|--------|---------|
| SP1KKV_1 K-High | 5.3 | 5.6 | 5.2 | 0.2 | %vol |
| SP2KKV_1 B-SW-High | 20.5 | 20.6 | 20.4 | 0.1 | %vol |
| SP3KKV_1 B-SW-Mid | 19.7 | 19.8 | 19.5 | 0.0 | %vol |
| SP4KKV_1 B-SW-Low | 19.3 | 19.5 | 19.2 | 0.1 | %vol |
| SP5KKV_1 B-N/E-High | 21.1 | 21.2 | 21.0 | 0.0 | %vol |
| SP6KKV_1 B-N/E-Low | 19.6 | 19.6 | 19.5 | 0.0 | %vol |
| SP7KKV_1 K-Low | 4.7 | 4.8 | 4.6 | 0.1 | %vol |
| SP8KKV_1 LR-High | 5.4 | 5.5 | 5.4 | 0.1 | %vol |
| SP9KKV_1 LR-Mid | 5.0 | 5.1 | 5.0 | 0.0 | %vol |
| SP10KKV_1 H-High | 7.1 | 7.1 | 6.9 | 0.1 | %vol |
| SP11KKV_1 H-Mid | 4.2 | 4.3 | 4.0 | 0.1 | %vol |
| SP12KKV_1 FF-High | 4.1 | 4.4 | 4.0 | 0.1 | %vol |
| SP13KKV_1 FF-Mid | 3.9 | 4.0 | 3.9 | 0.1 | %vol |
| SP14KKV_1 AT-High | 3.5 | 3.6 | 3.4 | 0.1 | %vol |
| SP15KKV_1 AT-Mid | 3.6 | 3.6 | 3.5 | 0.1 | %vol |
| SP16KKV_1 BM-High | 20.5 | 20.5 | 20.5 | 0.0 | %vol |
| SP17KKV_1 BM-Mid | 18.7 | 18.8 | 18.7 | 0.0 | %vol |
| SP18KKV_1 BM-Low | 19.5 | 19.5 | 19.5 | 0.0 | %vol |
| SP19KKV_1 N-WALL-Cav | 1.5 | 1.7 | 1.5 | 0.1 | %vol |
| SP20KKV_1 STUD-Cav | 5.7 | 5.9 | 5.6 | 0.1 | %vol |
| SP21KKV_1 FF-Void | 6.0 | 6.0 | 5.9 | 0.1 | %vol |
| SP22KKV_1 SF-Void | 0.3 | 0.4 | 0.2 | 0.1 | %vol |
| SP23KKV_1 ROOF-Void | 0.2 | 0.2 | 0.1 | 0.1 | %vol |
| RELEASEPRESSURE | 0.0103 | 0.0106 | 0.0099 | 0.0002 | bar(g) |
| LOWFLOWMETERCH4 | 1.7006 | 1.7084 | 1.6896 | 0.0046 | g/s |
| OUTLET_TEMP | 1.9 | 2.0 | 1.8 | 0.0 | degC |
| Volume Flow Rate | 142.2 | 142.9 | 141.3 | 0.4 | SLPM |
| Energy Flow Rate | 85.0 | 85.4 | 84.5 | 0.2 | kW |
| External Wind Speed | 3.4 | | | | m/s |
| External Wind Direction | 236.6 | | | | bearing |



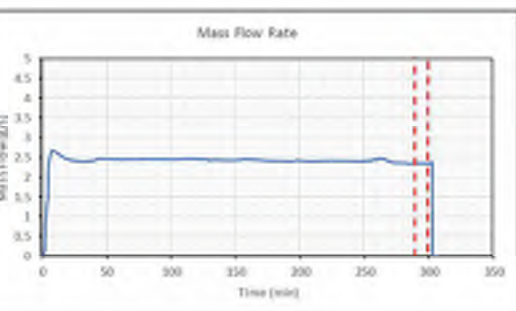
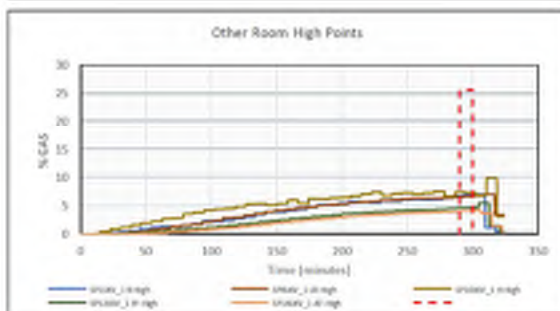
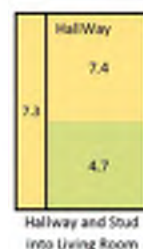
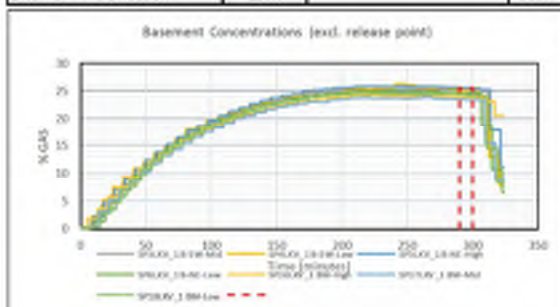
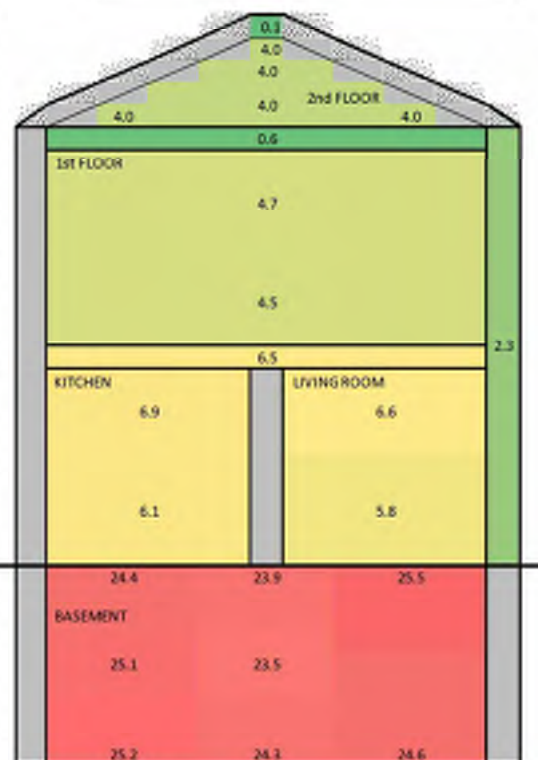
L3-014 RESULT

Hy4Heat WP7 Test Result

| | |
|--|----------------|
| MTP ID: L3-014 | |
| Hole Size: 10 mm | |
| Location: Basement downwards, basement door closed | |
| Gas: methane | |
| Date: 14/12/2019 | Time: 02:40:00 |
| Averaging Period Start: 290 min | End: 300 min |

Notes:

| Sensor | Average | Max | Min | STDEV | Units |
|-------------------------|---------|--------|--------|--------|---------|
| SP1KVV_1 K-High | 6.9 | 7.0 | 6.7 | 0.1 | %vol |
| SP2LKV_1 B-SW-High | 24.4 | 24.4 | 24.4 | 0.0 | %vol |
| SP3LKV_1 B-SW-Mid | 25.1 | 25.1 | 25.0 | 0.0 | %vol |
| SP4LKV_1 B-SW-Low | 25.2 | 25.6 | 25.0 | 0.2 | %vol |
| SP5LKV_1 B-N/E-High | 25.5 | 25.6 | 25.5 | 0.0 | %vol |
| SP6LKV_1 B-N/E-Low | 24.6 | 24.7 | 24.6 | 0.0 | %vol |
| SP7LKV_1 K-Low | 6.1 | 6.2 | 6.0 | 0.0 | %vol |
| SP8LKV_1 LR-High | 6.6 | 6.6 | 6.5 | 0.1 | %vol |
| SP9LKV_1 LR-Mid | 5.8 | 5.9 | 5.8 | 0.0 | %vol |
| SP10KV_1 H-High | 7.4 | 7.4 | 7.3 | 0.1 | %vol |
| SP11KV_1 H-Mid | 4.7 | 4.7 | 4.7 | 0.0 | %vol |
| SP12KV_1 FF-High | 4.7 | 4.7 | 4.7 | 0.0 | %vol |
| SP13KV_1 FF-Mid | 4.5 | 4.6 | 4.5 | 0.0 | %vol |
| SP14KV_1 AT-High | 4.0 | 4.1 | 3.9 | 0.0 | %vol |
| SP15KV_1 AT-Mid | 4.0 | 4.1 | 3.9 | 0.0 | %vol |
| SP16KV_1 BM-High | 23.9 | 24.0 | 23.9 | 0.0 | %vol |
| SP17KV_1 BM-Mid | 23.5 | 23.6 | 23.4 | 0.1 | %vol |
| SP18KV_1 BM-Low | 24.3 | 24.4 | 24.2 | 0.1 | %vol |
| SP19KV_1 NWALL-Cav | 2.3 | 2.3 | 2.2 | 0.0 | %vol |
| SP20KV_1 STUD-Cav | 7.3 | 7.4 | 7.3 | 0.1 | %vol |
| SP21KV_1 FF-Void | 6.5 | 6.6 | 6.5 | 0.0 | %vol |
| SP22KV_1 SF-Void | 0.6 | 0.6 | 0.6 | 0.0 | %vol |
| SP23KV_1 ROOF-Void | 0.1 | 0.2 | 0.1 | 0.0 | %vol |
| RELEASEPRESSURE | 0.0194 | 0.0199 | 0.0192 | 0.0002 | barg |
| LOWFLOWMETERCH4 | 2.1509 | 2.2594 | 2.3443 | 0.0048 | g/s |
| OUTLET_TEMP | 2.6 | 2.7 | 2.5 | 0.0 | degC |
| Volume Flow Rate | 196.6 | 197.3 | 196.1 | 0.4 | SLPM |
| Energy Flow Rate | 117.5 | 118.0 | 117.2 | 0.2 | kW |
| External Wind Speed | 5.2 | | | | m/s |
| External Wind Direction | 236.6 | | | | bearing |



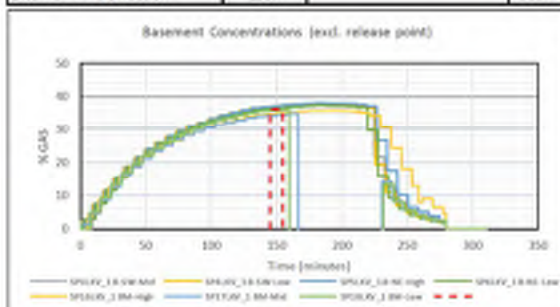
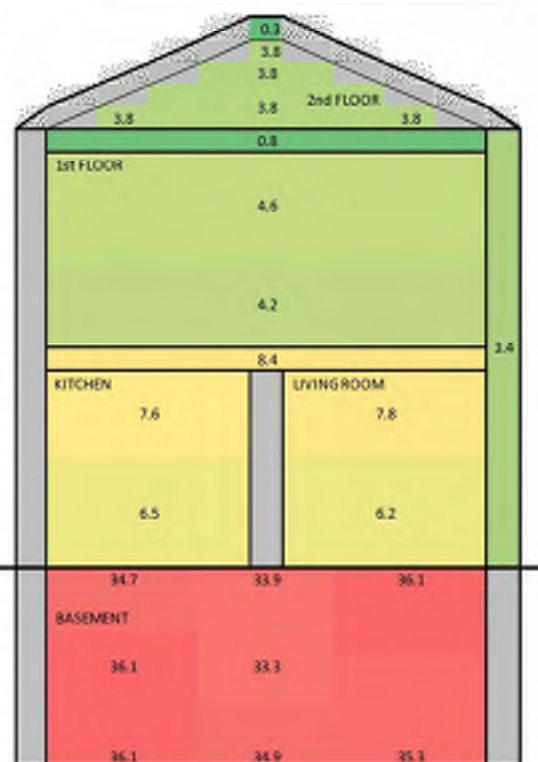
L3-015 RESULT

Hy4Heat WP7 Test Result

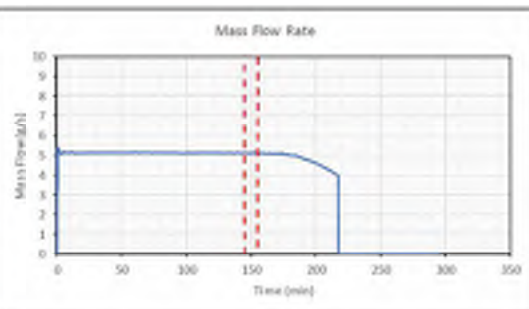
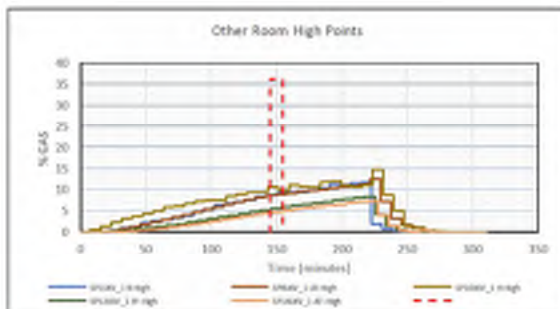
| | |
|--|----------------|
| MTP ID: L3-015 | |
| Hole Size: 10 mm | |
| Location: Basement downwards, basement door closed | |
| Gas: methane | |
| Date: 14/12/2019 | Time: 09:30:00 |
| Averaging Period Start: 145 min | End: 155 min |

Notes: Averaging period chosen prior to loss of analyser 3 (SP17-23)

| Sensor | Average | Max | Min | STDEV | Units |
|-------------------------|---------|--------|--------|--------|---------|
| SP11KV_1 K-High | 7.6 | 7.7 | 7.3 | 0.1 | %vol |
| SP21KV_1 B-SW-High | 34.7 | 34.9 | 34.2 | 0.3 | %vol |
| SP31KV_1 B-SW-Mid | 36.1 | 36.4 | 35.7 | 0.3 | %vol |
| SP41KV_1 B-SW-Low | 36.1 | 36.5 | 35.8 | 0.3 | %vol |
| SP51KV_1 B-N/E-High | 36.1 | 36.5 | 35.8 | 0.3 | %vol |
| SP61KV_1 B-N/E-Low | 35.3 | 35.9 | 35.1 | 0.4 | %vol |
| SP71KV_1 K-Low | 6.5 | 6.9 | 6.1 | 0.2 | %vol |
| SP81KV_1 LR-High | 7.8 | 8.3 | 7.2 | 0.3 | %vol |
| SP91KV_1 LR-Mid | 6.2 | 6.2 | 5.9 | 0.1 | %vol |
| SP10KV_1 H-High | 9.3 | 9.4 | 9.0 | 0.2 | %vol |
| SP11KV_1 H-Mid | 4.6 | 4.7 | 4.3 | 0.2 | %vol |
| SP12KV_1 FF-High | 4.6 | 4.8 | 4.3 | 0.2 | %vol |
| SP13KV_1 FF-Mid | 4.2 | 4.4 | 4.0 | 0.2 | %vol |
| SP14KV_1 AT-High | 3.8 | 4.1 | 3.7 | 0.2 | %vol |
| SP15KV_1 AT-Mid | 3.8 | 4.1 | 3.3 | 0.2 | %vol |
| SP16KV_1 BM-High | 33.9 | 34.3 | 33.0 | 0.3 | %vol |
| SP17KV_1 BM-Mid | 33.3 | 33.5 | 32.7 | 0.3 | %vol |
| SP18KV_1 BM-Low | 34.9 | 35.1 | 34.5 | 0.3 | %vol |
| SP19KV_1 N WALL-Cav | 3.4 | 3.4 | 3.3 | 0.0 | %vol |
| SP20KV_1 STUD-Cav | 9.4 | 9.7 | 9.2 | 0.2 | %vol |
| SP21KV_1 FF-Void | 8.4 | 8.8 | 8.1 | 0.3 | %vol |
| SP22KV_1 SF-Void | 0.8 | 0.8 | 0.8 | 0.0 | %vol |
| SP23KV_1 ROOF-Void | 0.3 | 0.3 | 0.2 | 0.0 | %vol |
| RELEASEPRESSURE | 0.0873 | 0.0876 | 0.0868 | 0.0002 | barg |
| LOWFLOWMETERCH4 | 5.0995 | 5.1059 | 5.0908 | 0.0052 | g/s |
| OUTLET_TEMP | 2.0 | 2.2 | 1.9 | 0.1 | degC |
| Volume Flow Rate | 426.5 | 427.0 | 425.8 | 0.4 | L/PM |
| Energy Flow Rate | 255.0 | 255.3 | 254.5 | 0.3 | kW |
| External Wind Speed | 4.5 | | | | m/s |
| External Wind Direction | 258.7 | | | | bearing |



Hallway and Stair into Living Room



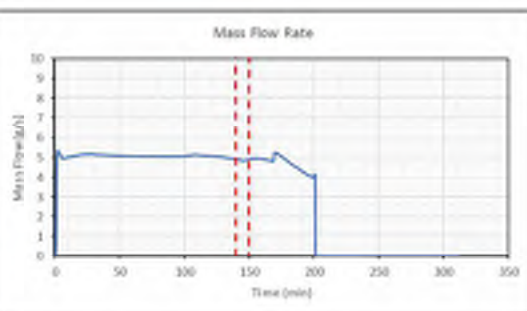
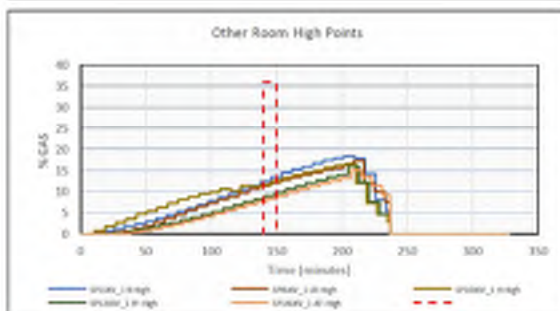
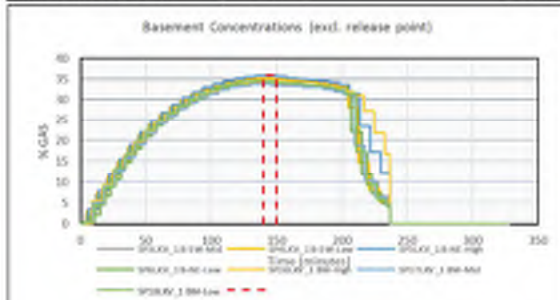
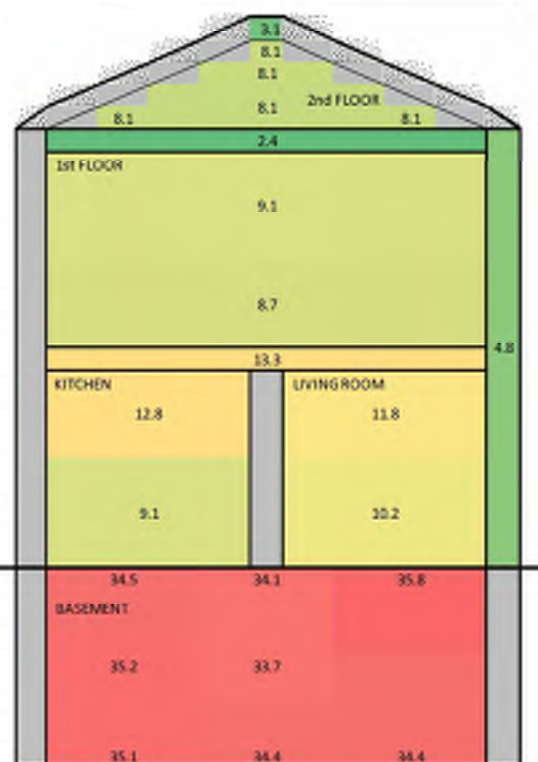
L3-016 RESULT

Hy4Heat WP7 Test Result

| | |
|--|----------------|
| MTP ID: L3-016 | |
| Hole Size: 15 mm | |
| Location: Basement downwards, basement door closed | |
| Gas: methane | |
| Date: 08/12/2019 | Time: 02:20:00 |
| Averaging Period Start: 140 min | End: 150 min |

Notes:

| Sensor | Average | Max | Min | STDEV | Units |
|-------------------------|---------|--------|--------|--------|---------|
| SP1KVV_1 K-High | 12.8 | 13.5 | 12.4 | 0.5 | %vol |
| SP2LKV_1 B-SW-High | 34.5 | 34.5 | 34.4 | 0.1 | %vol |
| SP3LKV_1 B-SW-Mid | 35.2 | 35.3 | 35.1 | 0.1 | %vol |
| SP4LKV_1 B-SW-Low | 35.1 | 35.2 | 34.9 | 0.1 | %vol |
| SP5LKV_1 B-N/E-High | 35.8 | 35.9 | 35.6 | 0.0 | %vol |
| SP6LKV_1 B-N/E-Low | 34.4 | 34.5 | 34.4 | 0.0 | %vol |
| SP7LKV_1 K-Low | 9.1 | 9.4 | 8.8 | 0.3 | %vol |
| SP8LKV_1 LR-High | 11.8 | 12.2 | 11.4 | 0.4 | %vol |
| SP9LKV_1 LR-Mid | 10.2 | 10.7 | 9.9 | 0.4 | %vol |
| SP10LKV_1 H-High | 11.9 | 12.5 | 11.7 | 0.4 | %vol |
| SP11LKV_1 H-Mid | 8.9 | 9.5 | 8.7 | 0.3 | %vol |
| SP12LKV_1 FF-High | 9.1 | 9.9 | 8.3 | 0.4 | %vol |
| SP13LKV_1 FF-Mid | 8.7 | 9.5 | 8.1 | 0.3 | %vol |
| SP14LKV_1 AT-High | 8.1 | 8.3 | 7.6 | 0.3 | %vol |
| SP15LKV_1 AT-Mid | 8.1 | 8.3 | 7.6 | 0.3 | %vol |
| SP16LKV_1 BM-High | 34.1 | 34.2 | 34.1 | 0.1 | %vol |
| SP17LKV_1 BM-Mid | 33.7 | 33.8 | 33.6 | 0.1 | %vol |
| SP18LKV_1 BM-Low | 34.4 | 34.5 | 34.2 | 0.1 | %vol |
| SP19LKV_1 N/WALL-Cav | 4.8 | 4.8 | 4.7 | 0.0 | %vol |
| SP20LKV_1 STUD-Cav | 12.6 | 13.4 | 11.8 | 0.4 | %vol |
| SP21LKV_1 FF-Void | 13.3 | 14.1 | 12.8 | 0.3 | %vol |
| SP22LKV_1 SF-Void | 2.4 | 2.4 | 2.3 | 0.1 | %vol |
| SP23LKV_1 ROOF-Void | 3.1 | 3.4 | 2.8 | 0.3 | %vol |
| RELEASEPRESSURE | 0.0108 | 0.0113 | 0.0106 | 0.0002 | barg |
| LOWFLOWMETERCH4 | 4.8702 | 4.9129 | 4.8410 | 0.0191 | g/s |
| OUTLET_TEMP | -1.9 | -1.8 | -2.1 | 0.1 | degC |
| Volume Flow Rate | 407.3 | 410.9 | 404.9 | 1.6 | SLPM |
| Energy Flow Rate | 243.5 | 245.6 | 242.0 | 1.0 | kW |
| External Wind Speed | 1.3 | | | | m/s |
| External Wind Direction | 200.4 | | | | bearing |



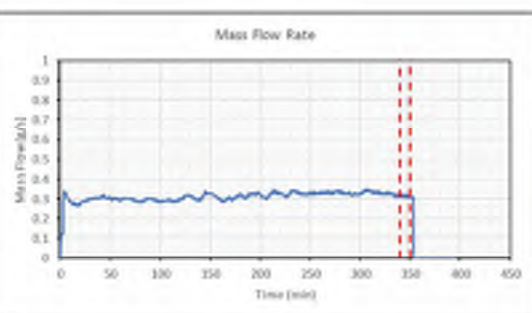
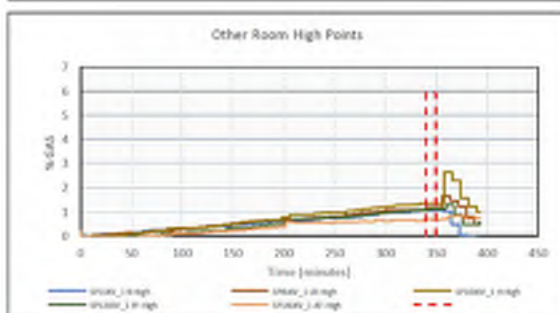
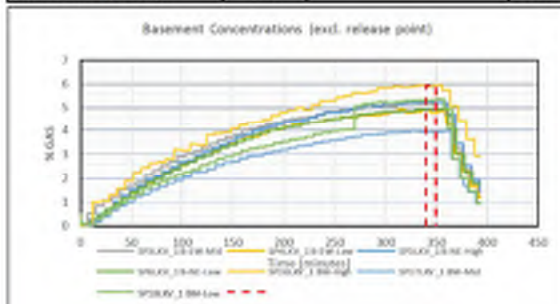
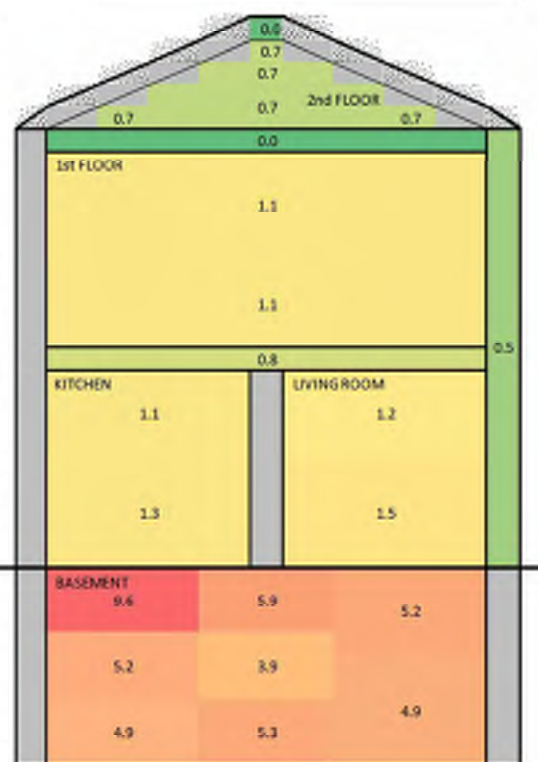
L3-017 RESULT

Hy4Heat WP7 Test Result

| | |
|--|----------------|
| MTP ID: L3-017 | |
| Hole Size: 5 mm | |
| Location: Basement horizontal, door closed | |
| Gas: methane | |
| Date: 06/12/2019 | Time: 09:00:00 |
| Averaging Period Start: 340 min | End: 350 min |

Notes: 0.2% offset removed from SP17to SP23

| Sensor | Average | Max | Min | STDEV | Units |
|-------------------------|---------|--------|--------|--------|---------|
| SP1KKV_1 K-High | 1.1 | 1.1 | 1.1 | 0.0 | %vol |
| SP2KKV_1 B-SW-High | 9.6 | 9.6 | 9.5 | 0.0 | %vol |
| SP3KKV_1 B-SW-Mid | 5.2 | 5.2 | 5.2 | 0.0 | %vol |
| SP4KKV_1 B-SW-Low | 4.9 | 4.9 | 4.8 | 0.1 | %vol |
| SP5KKV_1 B-NIS-High | 5.2 | 5.3 | 5.2 | 0.0 | %vol |
| SP6KKV_1 B-NIS-Low | 4.9 | 4.9 | 4.9 | 0.0 | %vol |
| SP7KKV_1 K-Low | 1.3 | 1.3 | 1.3 | 0.0 | %vol |
| SP8KKV_1 LR-High | 1.2 | 1.2 | 1.1 | 0.0 | %vol |
| SP9KKV_1 LR-Mid | 1.5 | 1.5 | 1.5 | 0.0 | %vol |
| SP10KKV_1 H-High | 1.3 | 1.3 | 1.3 | 0.0 | %vol |
| SP11KKV_1 H-Mid | 1.1 | 1.2 | 1.1 | 0.0 | %vol |
| SP12KKV_1 FF-High | 1.1 | 1.1 | 1.1 | 0.0 | %vol |
| SP13KKV_1 FF-Mid | 1.1 | 1.1 | 1.0 | 0.0 | %vol |
| SP14KKV_1 AT-High | 0.7 | 0.7 | 0.7 | 0.0 | %vol |
| SP15KKV_1 AT-Mid | 0.7 | 0.7 | 0.7 | 0.0 | %vol |
| SP16KKV_1 BM-High | 5.9 | 6.0 | 5.9 | 0.0 | %vol |
| SP17KKV_1 BM-Mid | 3.9 | 3.9 | 3.9 | 0.0 | %vol |
| SP18KKV_1 BM-Low | 5.3 | 5.3 | 5.3 | 0.0 | %vol |
| SP19KKV_1 NWALL-Cav | 0.5 | 0.5 | 0.4 | 0.0 | %vol |
| SP20KKV_1 STUD-Cav | 1.1 | 1.1 | 1.0 | 0.0 | %vol |
| SP21KKV_1 FF-Void | 0.8 | 0.8 | 0.8 | 0.0 | %vol |
| SP22KKV_1 SF-Void | 0.0 | 0.0 | 0.0 | 0.0 | %vol |
| SP23KKV_1 ROOF-Void | 0.0 | 0.0 | 0.0 | 0.0 | %vol |
| RELEASEPRESSURE | 0.0031 | 0.0034 | 0.0027 | 0.0002 | barg |
| LOWFLOWMETERQ4 | 0.3174 | 0.3261 | 0.3074 | 0.0053 | g/s |
| OUTLET_TEMP | 2.7 | 2.9 | 2.6 | 0.1 | degC |
| Volume Flow Rate | 26.5 | 27.3 | 25.7 | 0.4 | SLPM |
| Energy Flow Rate | 15.9 | 16.3 | 15.4 | 0.3 | kW |
| External Wind Speed | 1.2 | | | | m/s |
| External Wind Direction | 280.4 | | | | bearing |



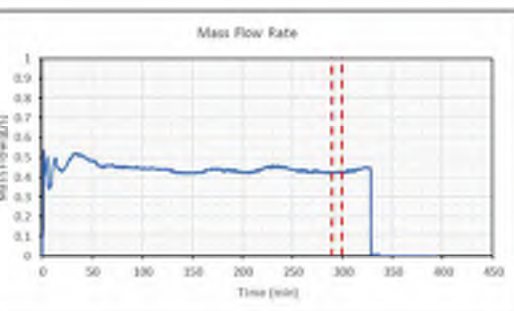
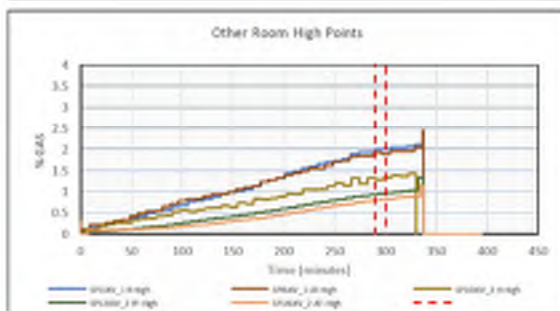
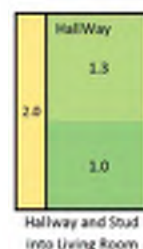
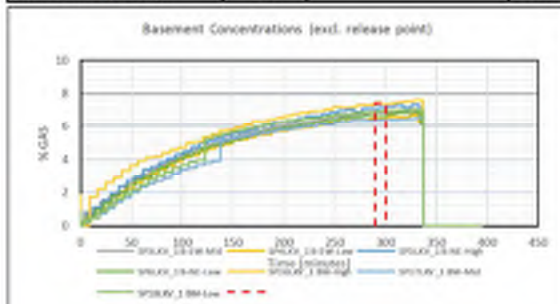
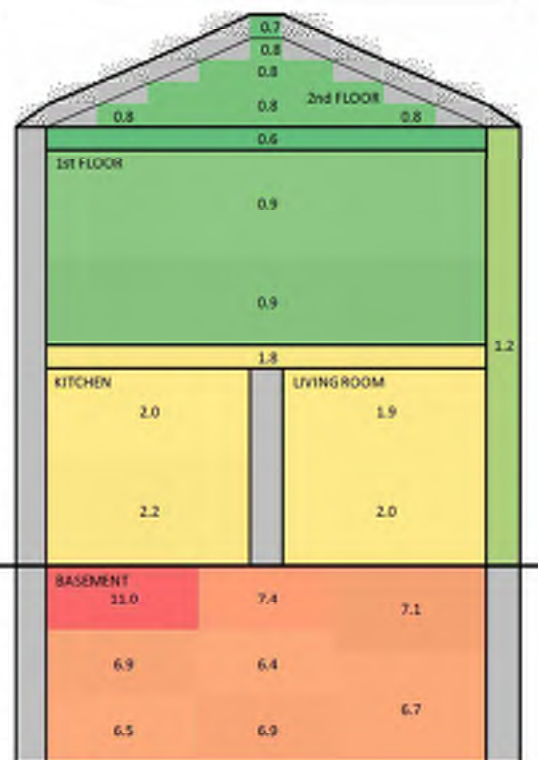
L3-018 RESULT

Hy4Heat WP7 Test Result

| | |
|--|----------------|
| MTP ID: L3-018 | |
| Hole Size: 5 mm | |
| Location: Basement horizontal, door closed | |
| Gas: methane | |
| Date: 06/12/2019 | Time: 16:30:00 |
| Averaging Period Start: 290 min | End: 300 min |

Notes:

| Sensor | Average | Max | Min | STDEV | Units |
|-------------------------|---------|--------|--------|--------|---------|
| SP1KVV_1 K-High | 2.0 | 2.0 | 1.9 | 0.0 | %vol |
| SP2LKV_1 B-SW-High | 11.0 | 11.2 | 10.8 | 0.1 | %vol |
| SP3LKV_1 B-SW-Mid | 6.9 | 6.9 | 6.9 | 0.0 | %vol |
| SP4LKV_1 B-SW-Low | 6.5 | 6.5 | 6.5 | 0.0 | %vol |
| SP5LKV_1 B-NE-High | 7.1 | 7.1 | 7.1 | 0.0 | %vol |
| SP6LKV_1 B-NE-Low | 6.7 | 6.7 | 6.7 | 0.0 | %vol |
| SP7LKV_1 K-Low | 2.2 | 2.2 | 2.2 | 0.0 | %vol |
| SP8LKV_1 LR-High | 1.9 | 1.9 | 1.9 | 0.0 | %vol |
| SP9LKV_1 LR-Mid | 2.0 | 2.1 | 1.7 | 0.1 | %vol |
| SP10KV_2 H-High | 1.3 | 1.3 | 1.3 | 0.0 | %vol |
| SP11KV_2 H-Mid | 1.0 | 1.1 | 1.0 | 0.0 | %vol |
| SP12KV_2 FF-High | 0.9 | 1.0 | 0.9 | 0.0 | %vol |
| SP13KV_2 FF-Mid | 0.9 | 0.9 | 0.9 | 0.0 | %vol |
| SP14KV_2 AT-High | 0.8 | 0.8 | 0.8 | 0.0 | %vol |
| SP15KV_2 AT-Mid | 0.8 | 0.8 | 0.8 | 0.0 | %vol |
| SP16KV_1 BM-High | 7.4 | 7.4 | 7.4 | 0.0 | %vol |
| SP17KV_1 BM-Mid | 6.4 | 6.4 | 6.4 | 0.0 | %vol |
| SP18KV_1 BM-Low | 6.9 | 7.0 | 6.9 | 0.0 | %vol |
| SP19KV_1 NWALL-Cav | 1.2 | 1.2 | 1.2 | 0.0 | %vol |
| SP20KV_1 STUD-Cav | 2.0 | 2.1 | 2.0 | 0.0 | %vol |
| SP21KV_1 FF-Void | 1.8 | 1.9 | 1.8 | 0.0 | %vol |
| SP22KV_1 SF-Void | 0.6 | 0.7 | 0.6 | 0.1 | %vol |
| SP23KV_1 ROOF-Void | 0.7 | 0.7 | 0.7 | 0.0 | %vol |
| RELEASEPRESSURE | 0.0055 | 0.0059 | 0.0052 | 0.0002 | bar |
| LOWFLOWMETERQ4 | 0.4225 | 0.4273 | 0.4198 | 0.0024 | g/s |
| OUTLET TEMP | -4.0 | -3.9 | -4.1 | 0.1 | degC |
| Volume Flow Rate | 35.3 | 35.7 | 35.1 | 0.2 | LPM |
| Energy Flow Rate | 21.1 | 21.4 | 21.0 | 0.1 | kW |
| External Wind Speed | 1.2 | | | | m/s |
| External Wind Direction | 290.4 | | | | bearing |



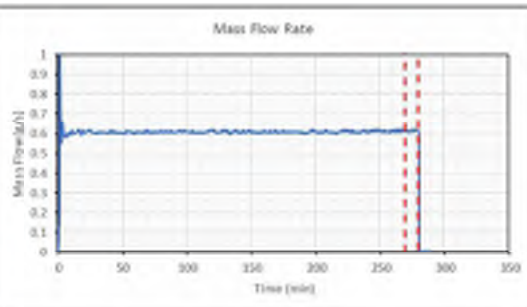
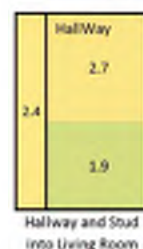
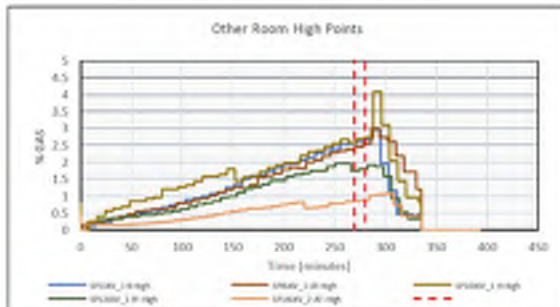
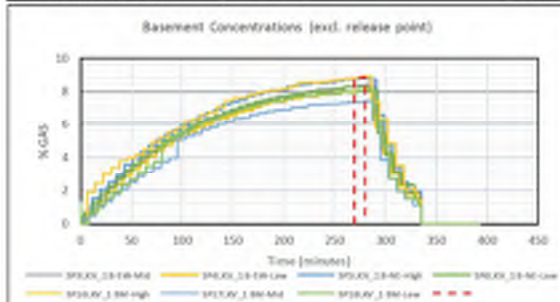
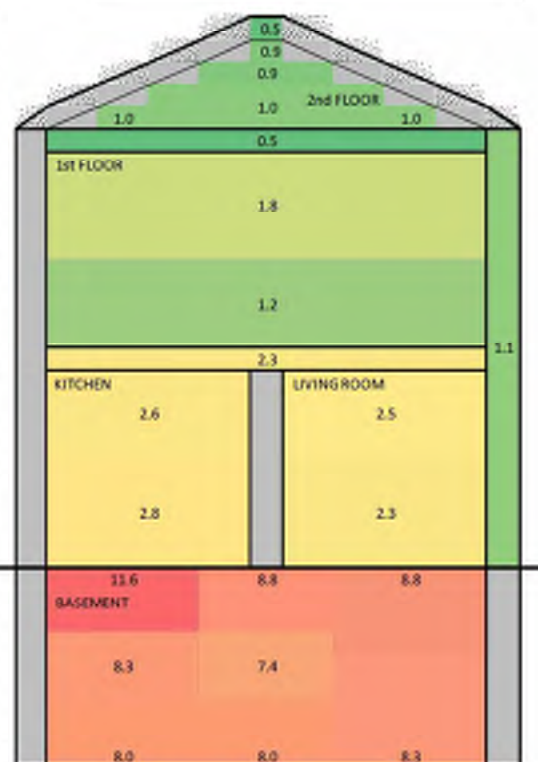
L3-019 RESULT

Hy4Heat WP7 Test Result

| | |
|--|----------------|
| MTP ID: L3-019 | |
| Hole Size: 5 mm | |
| Location: Basement horizontal, door closed | |
| Gas: methane | |
| Date: 06/12/2019 | Time: 23:15:00 |
| Averaging Period Start: 270 min | End: 280 min |

Notes:

| Sensor | Average | Max | Min | STDEV | Units |
|-------------------------|---------|--------|--------|--------|---------|
| SP1KLV_1 K-High | 2.6 | 2.6 | 2.6 | 0.0 | %vol |
| SP2LKV_1 B-SW-High | 11.6 | 11.7 | 11.4 | 0.1 | %vol |
| SP3LKV_1 B-SW-Mid | 8.3 | 8.4 | 8.3 | 0.1 | %vol |
| SP4LKV_1 B-SW-Low | 8.0 | 8.1 | 8.0 | 0.0 | %vol |
| SP5LKV_1 B-NIS-High | 8.8 | 8.8 | 8.8 | 0.0 | %vol |
| SP6LKV_1 B-NIS-Low | 8.3 | 8.3 | 8.3 | 0.0 | %vol |
| SP7LKV_1 K-Low | 2.8 | 2.9 | 2.8 | 0.0 | %vol |
| SP8LKV_1 LR-High | 2.5 | 2.6 | 2.4 | 0.0 | %vol |
| SP9LKV_1 LR-Mid | 2.3 | 2.3 | 2.2 | 0.0 | %vol |
| SP10KV_1 H-High | 2.7 | 2.7 | 2.6 | 0.1 | %vol |
| SP11KV_1 H-Mid | 1.9 | 1.9 | 1.9 | 0.0 | %vol |
| SP12KV_1 FF-High | 1.8 | 1.8 | 1.7 | 0.0 | %vol |
| SP13KV_2 FF-Mid | 1.2 | 1.2 | 1.2 | 0.0 | %vol |
| SP14KV_2 AT-High | 0.9 | 0.9 | 0.9 | 0.0 | %vol |
| SP15KV_2 AT-Mid | 1.0 | 1.1 | 0.9 | 0.0 | %vol |
| SP16KV_1 BM-High | 8.8 | 8.9 | 8.8 | 0.0 | %vol |
| SP17KV_1 BM-Mid | 7.4 | 7.4 | 7.4 | 0.0 | %vol |
| SP18KV_1 BM-Low | 8.0 | 8.0 | 7.9 | 0.1 | %vol |
| SP19KV_1 NWALL-Cav | 1.1 | 1.1 | 1.0 | 0.0 | %vol |
| SP20KV_1 STUD-Cav | 2.4 | 2.5 | 2.4 | 0.0 | %vol |
| SP21KV_1 FF-Void | 2.3 | 2.3 | 2.3 | 0.0 | %vol |
| SP22KV_1 SF-Void | 0.5 | 0.5 | 0.5 | 0.0 | %vol |
| SP23KV_1 ROOF-Void | 0.5 | 0.5 | 0.4 | 0.0 | %vol |
| RELEASEPRESSURE | 0.0099 | 0.0103 | 0.0093 | 0.0002 | barg |
| LOWFLOWMETERCH4 | 0.6170 | 0.6222 | 0.6072 | 0.0042 | g/s |
| OUTLET_TEMP | -3.1 | -2.9 | -3.2 | 0.1 | degC |
| Volume Flow Rate | 51.6 | 52.0 | 50.8 | 0.3 | SLPM |
| Energy Flow Rate | 30.8 | 31.1 | 30.4 | 0.2 | kW |
| External Wind Speed | 0.8 | | | | m/s |
| External Wind Direction | 278.5 | | | | bearing |



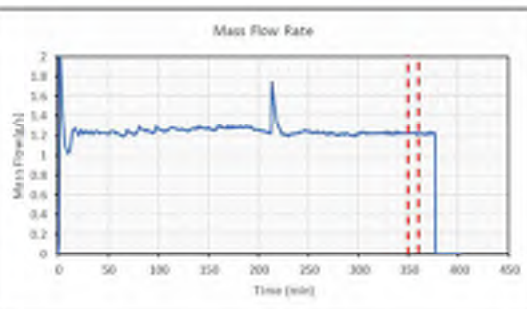
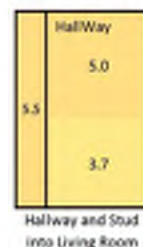
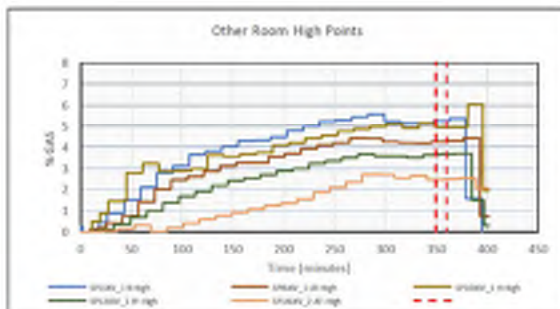
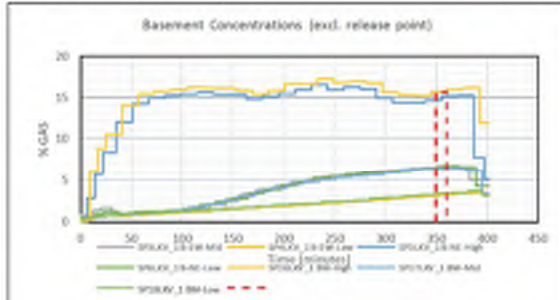
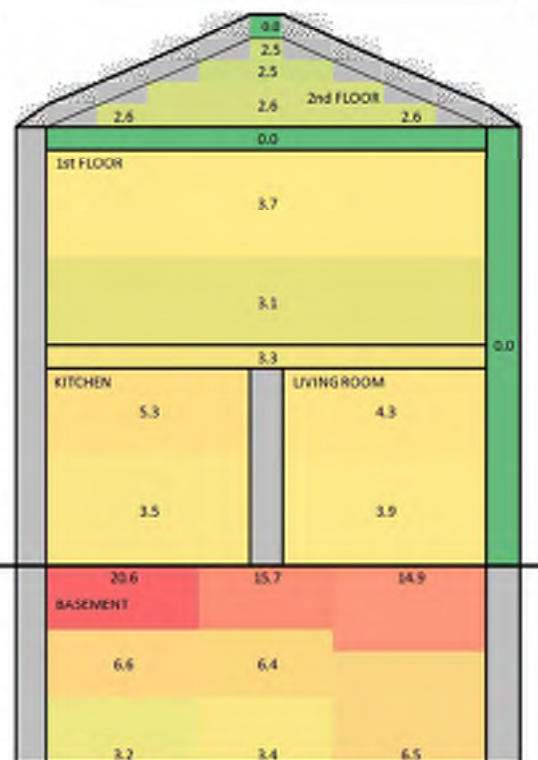
L3-020 RESULT

Hy4Heat WP7 Test Result

| | |
|--|----------------|
| MTP ID: L3-020 | |
| Hole Size: 10 mm | |
| Location: Basement horizontal, door closed | |
| Gas: methane | |
| Date: 04/12/2019 | Time: 08:30:00 |
| Averaging Period Start: 350 min | End: 390 min |

Notes: 0.3% offset on SP17 - 2B

| Sensor | Average | Max | Min | STDEV | Units |
|-------------------------|---------|--------|--------|--------|---------|
| SP1KVV_1 K-High | 5.3 | 5.3 | 5.3 | 0.0 | %vol |
| SP2LKV_1 B-SW-High | 20.6 | 20.6 | 20.6 | 0.0 | %vol |
| SP3LKV_1 B-SW-Mid | 6.6 | 6.7 | 6.4 | 0.1 | %vol |
| SP4LKV_1 B-SW-Low | 3.2 | 3.3 | 3.1 | 0.1 | %vol |
| SP5LKV_1 B-N/E-High | 14.9 | 15.2 | 14.7 | 0.3 | %vol |
| SP6LKV_1 B-N/E-Low | 6.5 | 6.7 | 6.5 | 0.1 | %vol |
| SP7LKV_1 K-Low | 3.5 | 3.5 | 3.5 | 0.0 | %vol |
| SP8LKV_1 LR-High | 4.3 | 4.3 | 4.3 | 0.0 | %vol |
| SP9LKV_1 LR-Mid | 3.9 | 3.9 | 3.9 | 0.0 | %vol |
| SP10KV_1 H-High | 5.0 | 5.0 | 5.0 | 0.0 | %vol |
| SP11KV_1 H-Mid | 3.7 | 3.7 | 3.7 | 0.0 | %vol |
| SP12KV_1 FF-High | 3.7 | 3.7 | 3.6 | 0.0 | %vol |
| SP13KV_2 FF-Mid | 3.1 | 3.1 | 3.1 | 0.0 | %vol |
| SP14KV_2 AT-High | 2.5 | 2.5 | 2.5 | 0.0 | %vol |
| SP15KV_2 AT-Mid | 2.6 | 2.6 | 2.6 | 0.0 | %vol |
| SP16KV_1 BM-High | 15.7 | 15.7 | 15.7 | 0.0 | %vol |
| SP17KV_1 BM-Mid | 6.4 | 6.4 | 6.4 | 0.0 | %vol |
| SP18KV_1 BM-Low | 3.4 | 3.4 | 3.4 | 0.0 | %vol |
| SP19KV_1 NWALL-Cav | 0.0 | 0.0 | 0.0 | 0.0 | %vol |
| SP20KV_1 STUD-Cav | 5.5 | 5.5 | 5.5 | 0.0 | %vol |
| SP21KV_1 FF-Void | 3.3 | 3.5 | 3.2 | 0.1 | %vol |
| SP22KV_1 SF-Void | 0.0 | 0.0 | 0.0 | 0.0 | %vol |
| SP23KV_1 ROOF-Void | 0.0 | 0.0 | 0.0 | 0.0 | %vol |
| RELEASEPRESSURE | 0.0036 | 0.0040 | 0.0034 | 0.0002 | barg |
| LOWFLOWMETERCH4 | 1.2236 | 1.2257 | 1.1995 | 0.0046 | g/s |
| OUTLET_TEMP | 5.2 | 5.3 | 5.2 | 0.0 | degC |
| Volume Flow Rate | 102.2 | 102.5 | 100.3 | 0.4 | SLPM |
| Energy Flow Rate | 61.1 | 61.3 | 60.0 | 0.2 | kW |
| External Wind Speed | 2.0 | | | | m/s |
| External Wind Direction | 232.4 | | | | bearing |



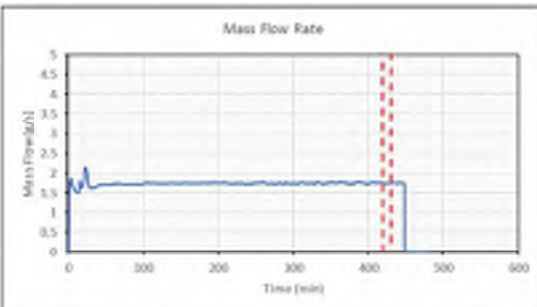
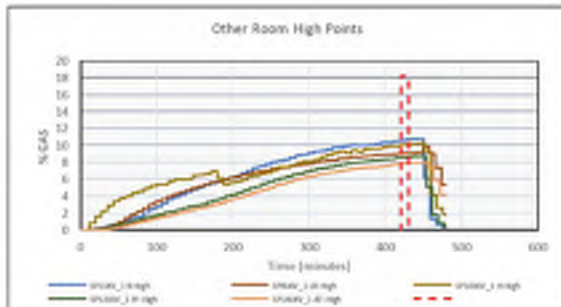
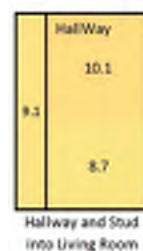
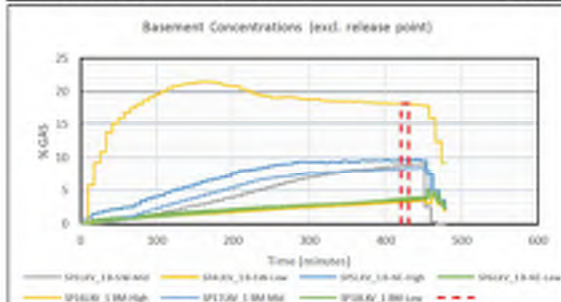
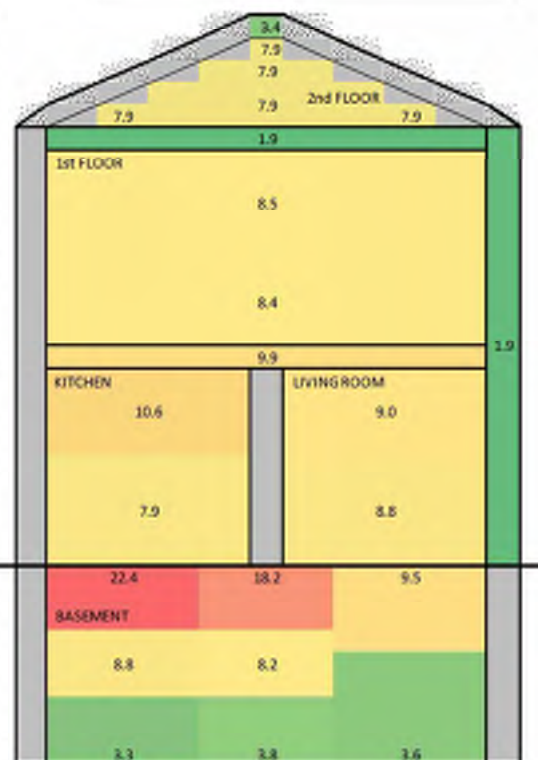
L3-021 RESULT

Hy4Heat WP7 Test Result

| | |
|---|----------------|
| MTP ID: L3-021 | |
| Hole Size: 10mm | |
| Location: Basement horizontal, basement door closed | |
| Gas: methane | |
| Date: 12/12/2019 | Time: 16:54:00 |
| Averaging Period Start: 420 min | End: 430 min |

Notes:

| Sensor | Average | Max | Min | STDEV | Units |
|-------------------------|---------|--------|--------|--------|---------|
| SP1KVV_1 K-High | 10.6 | 10.7 | 10.6 | 0.1 | %vol |
| SP2LKV_1 B-SW-High | 22.4 | 22.6 | 22.4 | 0.0 | %vol |
| SP3LKV_1 B-SW-Mid | 8.8 | 8.9 | 8.8 | 0.0 | %vol |
| SP4LKV_1 B-SW-Low | 3.3 | 3.4 | 3.3 | 0.0 | %vol |
| SP5LKV_1 B-N/E-High | 9.5 | 9.5 | 9.5 | 0.0 | %vol |
| SP6LKV_1 B-N/E-Low | 3.6 | 3.6 | 3.6 | 0.0 | %vol |
| SP7LKV_1 K-Low | 7.9 | 8.0 | 7.9 | 0.0 | %vol |
| SP8LKV_1 LR-High | 9.0 | 9.1 | 9.0 | 0.0 | %vol |
| SP9LKV_1 LR-Mid | 8.8 | 8.8 | 8.7 | 0.0 | %vol |
| SP10KV_1 H-High | 10.1 | 10.1 | 10.1 | 0.0 | %vol |
| SP11KV_1 H-Mid | 8.7 | 8.7 | 8.6 | 0.0 | %vol |
| SP12KV_1 FF-High | 8.5 | 8.7 | 8.5 | 0.0 | %vol |
| SP13KV_1 FF-Mid | 8.4 | 8.4 | 8.4 | 0.0 | %vol |
| SP14KV_1 AT-High | 7.9 | 7.9 | 7.9 | 0.0 | %vol |
| SP15KV_1 AT-Mid | 7.9 | 7.9 | 7.9 | 0.0 | %vol |
| SP16KV_1 BM-High | 18.2 | 18.2 | 18.2 | 0.0 | %vol |
| SP17KV_1 BM-Mid | 8.2 | 8.3 | 8.2 | 0.1 | %vol |
| SP18KV_1 BM-Low | 3.8 | 3.9 | 3.8 | 0.0 | %vol |
| SP19KV_1 NWALL-Cav | 1.9 | 1.9 | 1.8 | 0.0 | %vol |
| SP20KV_1 STUD-Cav | 9.1 | 9.2 | 9.0 | 0.0 | %vol |
| SP21KV_1 FF-Void | 9.9 | 9.9 | 9.9 | 0.0 | %vol |
| SP22KV_1 SF-Void | 1.9 | 1.9 | 1.9 | 0.0 | %vol |
| SP23KV_1 ROOF-Void | 3.4 | 3.5 | 3.3 | 0.1 | %vol |
| RELEASEPRESSURE | 0.0125 | 0.0128 | 0.0121 | 0.0002 | barg |
| LOWFLOWMETERCH4 | 1.7614 | 1.7535 | 1.7197 | 0.0083 | g/s |
| OUTLET_TEMP | 0.2 | 0.2 | 0.1 | 0.0 | degC |
| Volume Flow Rate | 145.6 | 146.7 | 143.8 | 0.7 | SLPM |
| Energy Flow Rate | 87.1 | 87.7 | 86.0 | 0.4 | kW |
| External Wind Speed | 1.3 | | | | m/s |
| External Wind Direction | 229.4 | | | | bearing |



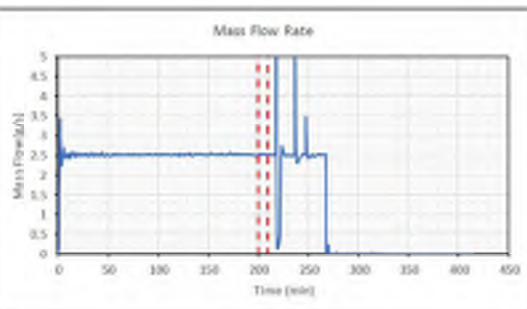
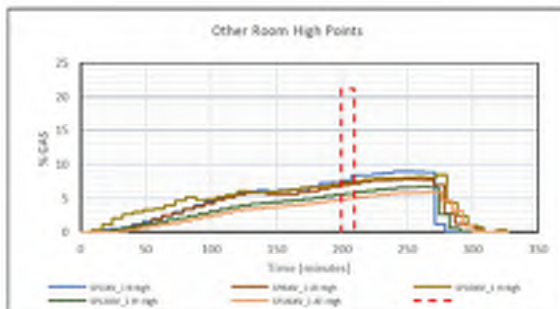
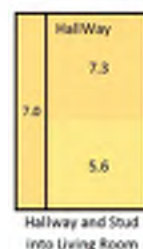
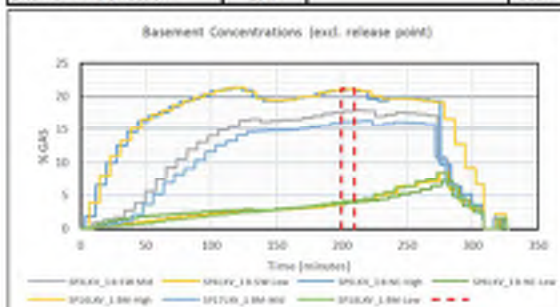
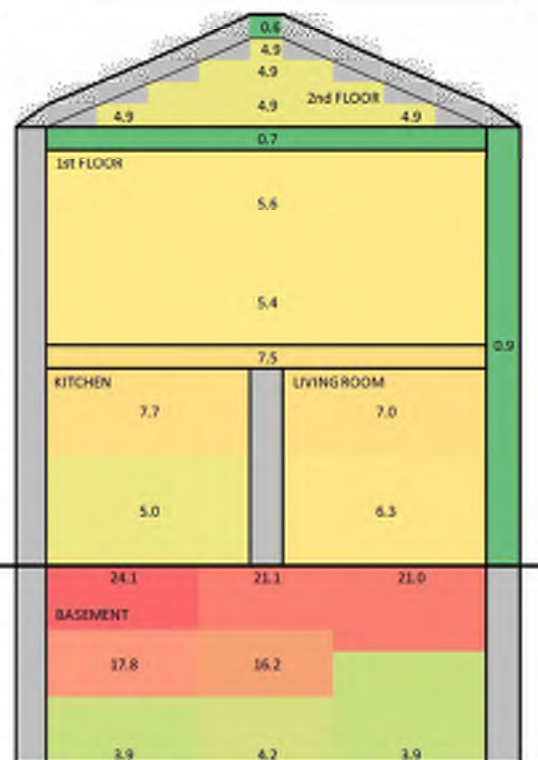
L3-022 RESULT

Hy4Heat WP7 Test Result

| | |
|---|----------------|
| MTP ID: L3-022 | |
| Hole Size: 10mm | |
| Location: Basement horizontal, basement door closed | |
| Gas: methane | |
| Date: 15/12/2019 | Time: 20:20:00 |
| Averaging Period Start: 200 min | End: 210 min |

Notes: Averaging period chosen prior to momentary loss of control @ ~220min

| Sensor | Average | Max | Min | STDEV | Units |
|-------------------------|---------|--------|--------|--------|---------|
| SP1KKV_1 K-High | 7.7 | 8.3 | 7.5 | 0.3 | %vol |
| SP2LKV_1 B-SW-High | 24.1 | 24.2 | 23.7 | 0.1 | %vol |
| SP3LKV_1 B-SW-Mid | 17.8 | 17.9 | 17.6 | 0.1 | %vol |
| SP4LKV_1 B-SW-Low | 3.9 | 4.0 | 3.7 | 0.1 | %vol |
| SP5LKV_1 B-N/E-High | 21.0 | 21.0 | 20.9 | 0.1 | %vol |
| SP6LKV_1 B-N/E-Low | 3.9 | 4.0 | 3.8 | 0.1 | %vol |
| SP7LKV_1 K-Low | 5.0 | 5.1 | 5.0 | 0.0 | %vol |
| SP8LKV_1 LR-High | 7.0 | 7.1 | 6.9 | 0.1 | %vol |
| SP9LKV_1 LR-Mid | 6.3 | 6.5 | 6.3 | 0.1 | %vol |
| SP10KV_1 H-High | 7.3 | 7.5 | 7.1 | 0.1 | %vol |
| SP11KV_1 H-Mid | 5.6 | 5.8 | 5.4 | 0.1 | %vol |
| SP12KV_1 FF-High | 5.6 | 5.7 | 5.5 | 0.1 | %vol |
| SP13KV_1 FF-Mid | 5.4 | 5.5 | 5.3 | 0.1 | %vol |
| SP14KV_1 AT-High | 4.9 | 5.0 | 4.8 | 0.1 | %vol |
| SP15KV_1 AT-Mid | 4.9 | 5.0 | 4.8 | 0.1 | %vol |
| SP16KV_1 BM-High | 21.1 | 21.1 | 21.1 | 0.0 | %vol |
| SP17KV_1 BM-Mid | 16.2 | 16.2 | 16.2 | 0.0 | %vol |
| SP18KV_1 BM-Low | 4.2 | 4.3 | 4.0 | 0.1 | %vol |
| SP19KV_1 N/WALL-Cav | 0.9 | 0.9 | 0.8 | 0.0 | %vol |
| SP20KV_1 STUD-Cav | 7.0 | 7.0 | 6.8 | 0.1 | %vol |
| SP21KV_1 FF-Void | 7.5 | 7.6 | 7.2 | 0.2 | %vol |
| SP22KV_1 SF-Void | 0.7 | 0.7 | 0.7 | 0.0 | %vol |
| SP23KV_1 ROOF-Void | 0.6 | 0.7 | 0.5 | 0.1 | %vol |
| RELEASEPRESSURE | 0.0211 | 0.0217 | 0.0203 | 0.0002 | barg |
| LOWFLOWMETERCH4 | 2.5130 | 2.5325 | 2.4911 | 0.0099 | g/s |
| OUTLET_TEMP | -1.2 | -1.2 | -1.3 | 0.1 | degC |
| Volume Flow Rate | 209.9 | 211.7 | 208.2 | 0.8 | SLPM |
| Energy Flow Rate | 125.5 | 126.6 | 124.6 | 0.5 | kW |
| External Wind Speed | 2.9 | | | | m/s |
| External Wind Direction | 204.4 | | | | bearing |



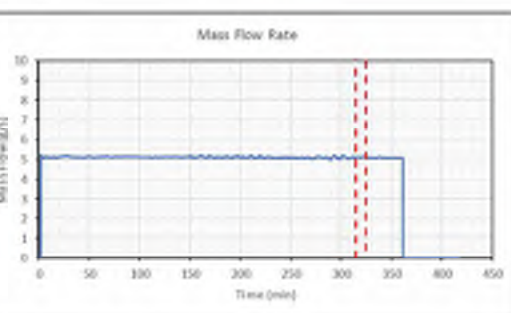
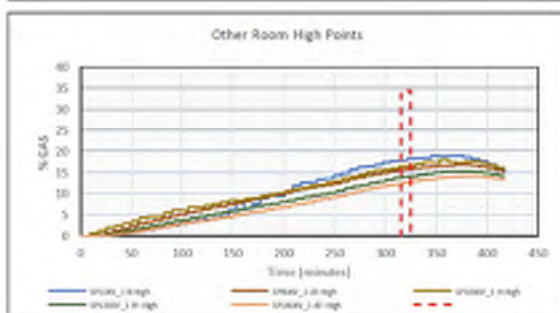
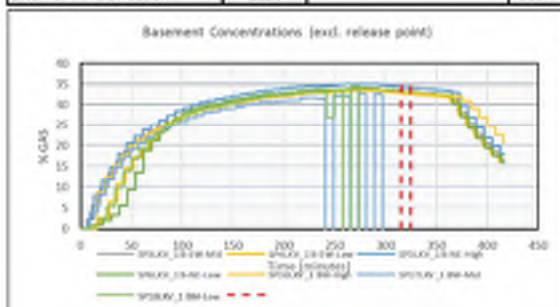
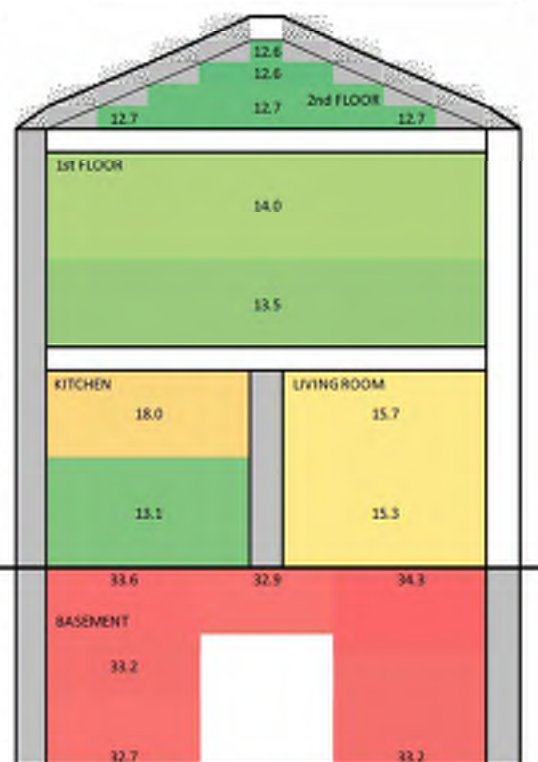
L3-023 RESULT

Hy4Heat WP7 Test Result

| | |
|---|----------------|
| MTP ID: L3-023 | |
| Hole Size: 10 mm | |
| Location: Basement horizontal, basement door closed | |
| Gas: methane | |
| Date: 06/12/2019 | Time: 10:55:00 |
| Averaging Period Start: 325 min | End: 325 min |

Notes: Analyser 2 in fault condition from circa 290min

| Sensor | Average | Max | Min | STDEV | Units |
|-------------------------|---------|--------|--------|--------|---------|
| SP11KV_1 K-High | 18.0 | 18.2 | 17.8 | 0.2 | %vol |
| SP21KV_1 B-SW-High | 33.6 | 33.6 | 33.6 | 0.0 | %vol |
| SP31KV_1 B-SW-Mid | 33.2 | 33.4 | 33.1 | 0.0 | %vol |
| SP41KV_1 B-SW-Low | 32.7 | 32.9 | 32.6 | 0.1 | %vol |
| SP51KV_1 B-N/E-High | 34.3 | 34.4 | 34.3 | 0.1 | %vol |
| SP61KV_1 B-N/E-Low | 33.2 | 33.3 | 33.1 | 0.1 | %vol |
| SP71KV_1 K-Low | 13.1 | 13.3 | 12.9 | 0.2 | %vol |
| SP81KV_1 LR-High | 15.7 | 15.8 | 15.6 | 0.1 | %vol |
| SP91KV_1 LR-Mid | 15.3 | 15.5 | 15.2 | 0.1 | %vol |
| SP10KV_1 H-High | 16.5 | 16.6 | 16.5 | 0.0 | %vol |
| SP11KV_1 H-Mid | 14.0 | 14.2 | 13.7 | 0.1 | %vol |
| SP12KV_1 FF-High | 14.0 | 14.2 | 13.7 | 0.1 | %vol |
| SP13KV_1 FF-Mid | 13.5 | 13.6 | 13.3 | 0.1 | %vol |
| SP14KV_1 AT-High | 12.6 | 12.7 | 12.3 | 0.2 | %vol |
| SP15KV_1 AT-Mid | 12.7 | 12.9 | 12.5 | 0.2 | %vol |
| SP16KV_1 BM-High | 32.9 | 32.9 | 32.8 | 0.0 | %vol |
| SP17KV_1 BM-Mid | | | | | %vol |
| SP18KV_1 BM-Low | | | | | %vol |
| SP19KV_1 NWALL-Cav | | | | | %vol |
| SP20KV_1 STUD-Cav | | | | | %vol |
| SP21KV_1 FF-Void | | | | | %vol |
| SP22KV_1 SF-Void | | | | | %vol |
| SP23KV_1 ROOF-Void | | | | | %vol |
| RELEASEPRESSURE | 0.0847 | 0.0859 | 0.0837 | 0.0005 | bar(g) |
| LOWFLOWMETERCH4 | 5.0990 | 5.1210 | 5.0681 | 0.0131 | g/s |
| OUTLET_TEMP | 0.9 | 1.0 | 0.7 | 0.1 | degC |
| Volume Flow Rate | 426.5 | 428.3 | 423.9 | 1.1 | SLPM |
| Energy Flow Rate | 255.0 | 256.1 | 253.4 | 0.7 | kW |
| External Wind Speed | 1.4 | | | | m/s |
| External Wind Direction | 222.5 | | | | bearing |



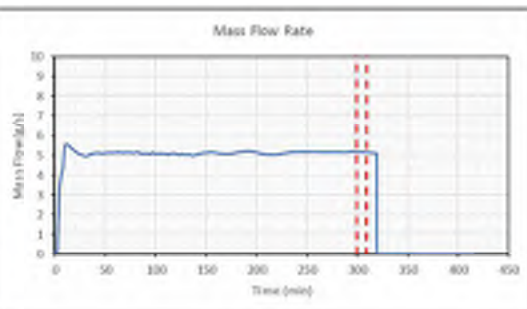
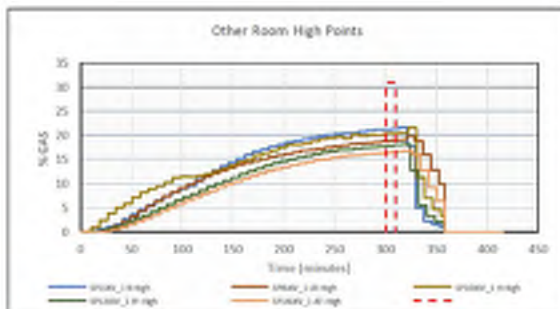
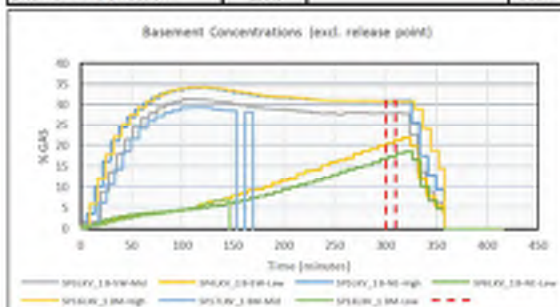
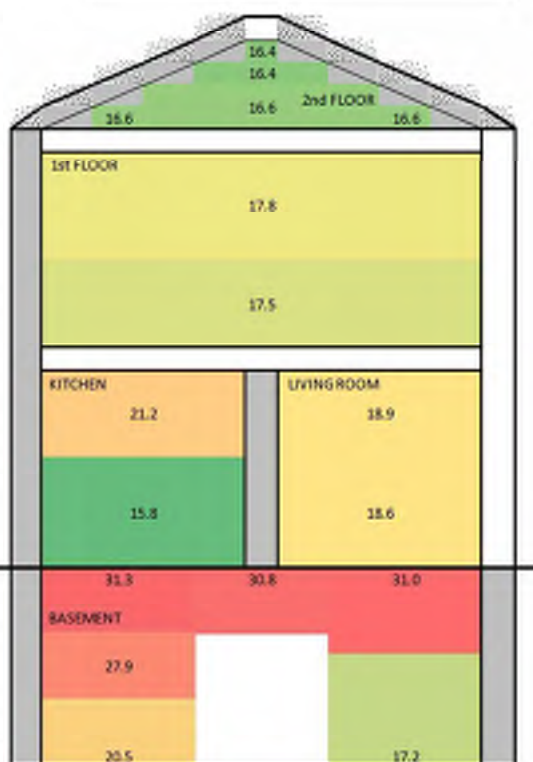
L3-024 RESULT

Hy4Heat WP7 Test Result

| | |
|---|----------------|
| MTP ID: L3-024 | |
| Hole Size: 15 mm | |
| Location: Basement horizontal, basement door closed | |
| Gas: methane | |
| Date: 17/12/2019 | Time: 18:50:00 |
| Averaging Period Start: 300 min | End: 310 min |

Notes: Analyser 2 in fault condition from ~150min

| Sensor | Average | Max | Min | STDEV | Units |
|-------------------------|---------|--------|--------|--------|---------|
| SP11KV_1 K-High | 21.2 | 21.3 | 21.1 | 0.1 | %vol |
| SP21KV_1 B-SW-High | 31.3 | 31.5 | 31.0 | 0.2 | %vol |
| SP31KV_1 B-SW-Mid | 27.9 | 28.1 | 27.9 | 0.1 | %vol |
| SP41KV_1 B-SW-Low | 20.5 | 21.3 | 19.9 | 0.3 | %vol |
| SP51KV_1 B-N/E-High | 31.0 | 31.1 | 31.0 | 0.0 | %vol |
| SP61KV_1 B-N/E-Low | 17.2 | 17.4 | 16.8 | 0.2 | %vol |
| SP71KV_1 K-Low | 15.8 | 15.9 | 15.7 | 0.1 | %vol |
| SP81KV_1 LR-High | 18.9 | 19.0 | 18.8 | 0.1 | %vol |
| SP91KV_1 LR-Mid | 18.6 | 18.7 | 18.6 | 0.1 | %vol |
| SP10KV_1 H-High | 20.3 | 20.3 | 20.3 | 0.0 | %vol |
| SP11KV_1 H-Mid | 18.1 | 18.1 | 18.1 | 0.0 | %vol |
| SP12KV_1 FF-High | 17.8 | 18.0 | 17.7 | 0.1 | %vol |
| SP13KV_1 FF-Mid | 17.5 | 17.7 | 17.4 | 0.1 | %vol |
| SP14KV_1 AT-High | 16.4 | 16.4 | 16.3 | 0.1 | %vol |
| SP15KV_1 AT-Mid | 16.6 | 16.6 | 16.5 | 0.0 | %vol |
| SP16KV_1 BM-High | 30.8 | 30.8 | 30.8 | 0.0 | %vol |
| SP17KV_1 BM-Mid | | | | | %vol |
| SP18KV_1 BM-Low | | | | | %vol |
| SP19KV_1 NWALL-Cav | | | | | %vol |
| SP20KV_1 STUD-Cav | | | | | %vol |
| SP21KV_1 FF-Void | | | | | %vol |
| SP22KV_1 SF-Void | | | | | %vol |
| SP23KV_1 ROOF-Void | | | | | %vol |
| RELEASEPRESSURE | 0.0108 | 0.0111 | 0.0105 | 0.0002 | bar |
| LOWFLOWMETERCH4 | 5.1422 | 5.1551 | 5.1286 | 0.0082 | g/s |
| OUTLET_TEMP | 1.4 | 1.5 | 1.3 | 0.1 | degC |
| Volume Flow Rate | 430.1 | 431.1 | 428.9 | 0.7 | LPM |
| Energy Flow Rate | 257.1 | 257.8 | 256.4 | 0.4 | kW |
| External Wind Speed | 1.4 | | | | m/s |
| External Wind Direction | 253.5 | | | | bearing |



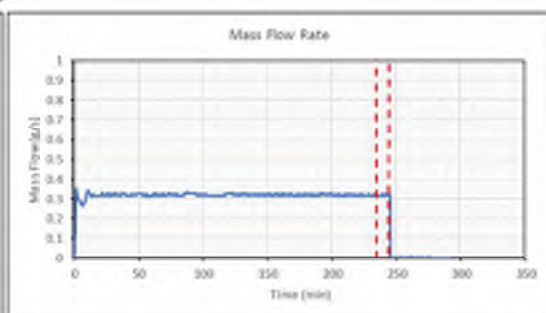
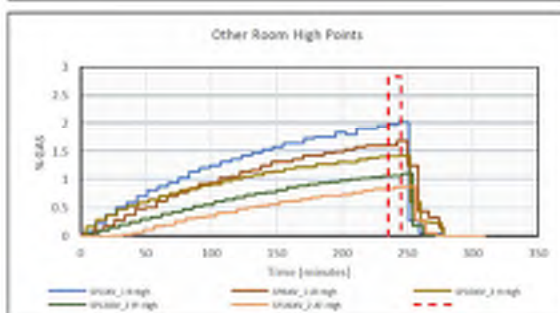
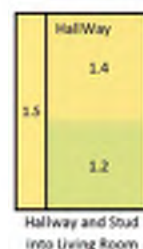
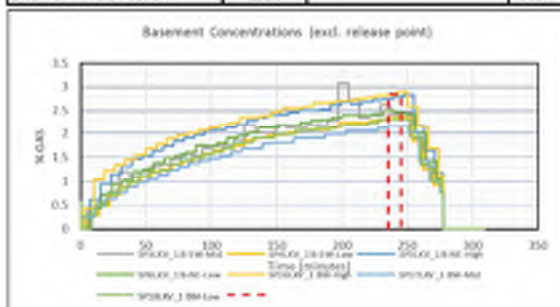
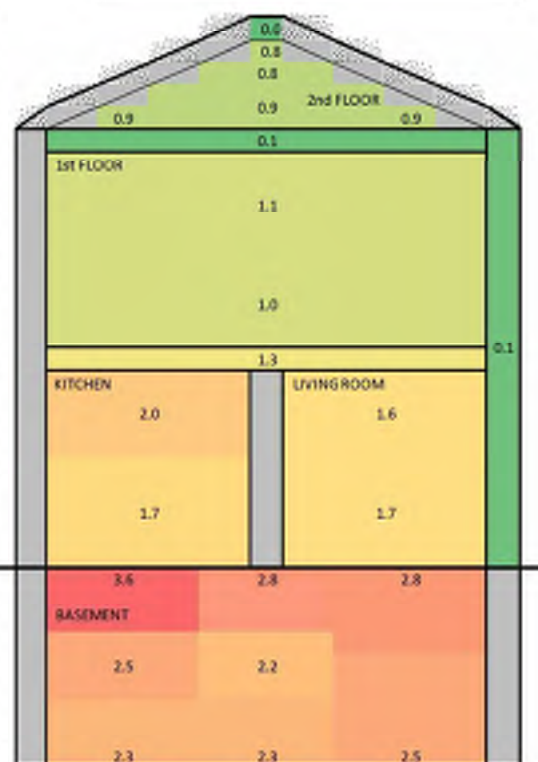
L3-025 RESULT

Hy4Heat WP7 Test Result

| | |
|--|----------------|
| MTP ID: L3-025 | |
| Hole Size: 5 mm | |
| Location: Basement downwards - door open | |
| Gas: methane | |
| Date: 03/12/2019 | Time: 02:30:00 |
| Averaging Period Start: 235 min | End: 245 min |

Notes:

| Sensor | Average | Max | Min | STDEV | Units |
|-------------------------|---------|--------|--------|--------|---------|
| SP1KVV_1 K-High | 2.0 | 2.0 | 2.0 | 0.0 | %vol |
| SP2LKV_1 B-SW-High | 3.6 | 3.7 | 3.2 | 0.2 | %vol |
| SP3LKV_1 B-SW-Mid | 2.5 | 2.6 | 2.4 | 0.1 | %vol |
| SP4LKV_1 B-SW-Low | 2.3 | 2.4 | 2.3 | 0.0 | %vol |
| SP5LKV_1 B-N/E-High | 2.8 | 2.8 | 2.7 | 0.0 | %vol |
| SP6LKV_1 B-N/E-Low | 2.5 | 2.5 | 2.5 | 0.0 | %vol |
| SP7LKV_1 K-Low | 1.7 | 1.8 | 1.7 | 0.0 | %vol |
| SP8LKV_1 LR-High | 1.6 | 1.7 | 1.6 | 0.0 | %vol |
| SP9LKV_1 LR-Mid | 1.7 | 1.7 | 1.6 | 0.0 | %vol |
| SP10KV_2 H-High | 1.4 | 1.4 | 1.4 | 0.0 | %vol |
| SP11KV_2 H-Mid | 1.2 | 1.2 | 1.1 | 0.0 | %vol |
| SP12KV_2 FF-High | 1.1 | 1.1 | 1.1 | 0.0 | %vol |
| SP13KV_2 FF-Mid | 1.0 | 1.1 | 1.0 | 0.0 | %vol |
| SP14KV_2 AT-High | 0.8 | 0.9 | 0.8 | 0.0 | %vol |
| SP15KV_2 AT-Mid | 0.9 | 0.9 | 0.8 | 0.0 | %vol |
| SP16KV_1 BM-High | 2.8 | 2.9 | 2.8 | 0.0 | %vol |
| SP17KV_1 BM-Mid | 2.2 | 2.2 | 2.1 | 0.0 | %vol |
| SP18KV_1 BM-Low | 2.3 | 2.3 | 2.3 | 0.0 | %vol |
| SP19KV_1 NWALL-Cav | 0.1 | 0.1 | 0.1 | 0.0 | %vol |
| SP20KV_1 STUD-Cav | 1.5 | 1.5 | 1.5 | 0.0 | %vol |
| SP21KV_1 FF-Void | 1.3 | 1.4 | 1.3 | 0.0 | %vol |
| SP22KV_1 SF-Void | 0.1 | 0.1 | 0.1 | 0.0 | %vol |
| SP23KV_1 ROOF-Void | 0.0 | 0.0 | 0.0 | 0.0 | %vol |
| RELEASEPRESSURE | 0.0032 | 0.0037 | 0.0029 | 0.0002 | bar(g) |
| LOWFLOWMETERCH4 | 0.3200 | 0.3298 | 0.3149 | 0.0043 | g/s |
| OUTLET_TEMP | 3.4 | 3.5 | 3.3 | 0.1 | degC |
| Volume Flow Rate | 26.8 | 27.6 | 26.3 | 0.4 | SLPM |
| Energy Flow Rate | 16.0 | 16.5 | 15.7 | 0.2 | kW |
| External Wind Speed | 3.6 | | | | m/s |
| External Wind Direction | 251.3 | | | | bearing |



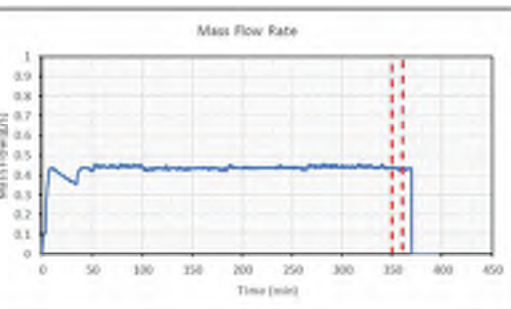
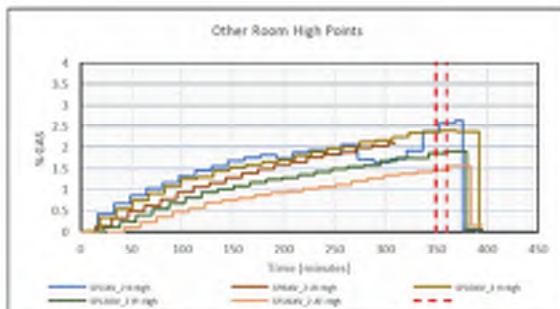
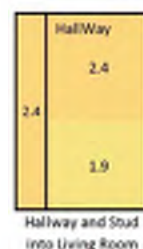
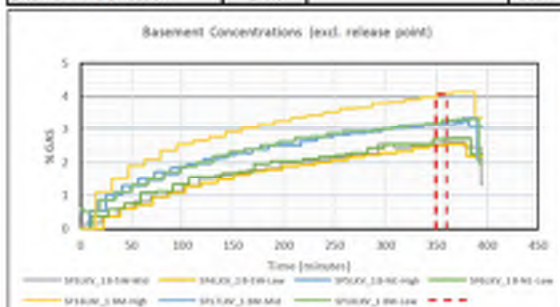
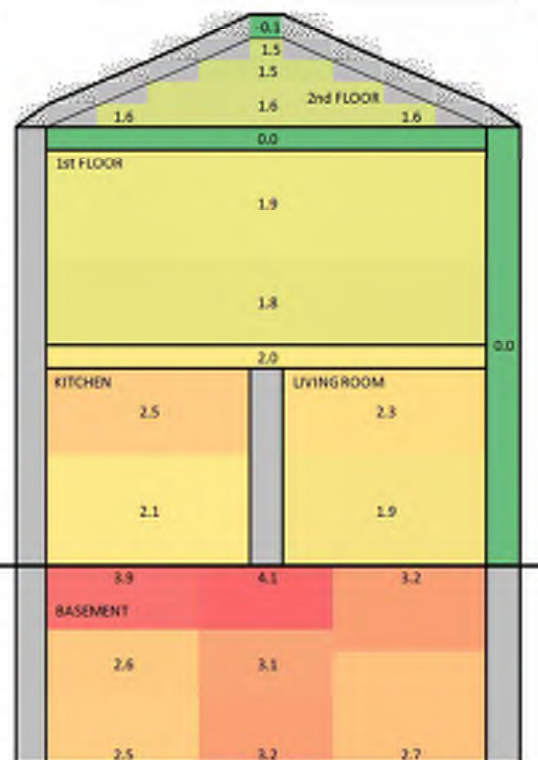
L3-026 RESULT

Hy4Heat WP7 Test Result

| | |
|--|----------------|
| MTP ID: L3-026 | |
| Hole Size: 5 mm | |
| Location: Basement downwards - door open | |
| Gas: methane | |
| Date: 03/12/2019 | Time: 09:45:00 |
| Averaging Period Start: 350 min | End: 390 min |

Notes: 0.6% offset removed from SP17 to 23

| Sensor | Average | Max | Min | STDEV | Units |
|-------------------------|---------|--------|--------|--------|---------|
| SP1KVV_2 K-High | 2.5 | 2.6 | 2.4 | 0.1 | %vol |
| SP2KVV_1 B-SW-High | 3.9 | 3.9 | 3.8 | 0.0 | %vol |
| SP3KVV_1 B-SW-Mid | 2.6 | 2.6 | 2.5 | 0.0 | %vol |
| SP4KVV_1 B-SW-Low | 2.5 | 2.5 | 2.5 | 0.0 | %vol |
| SP5KVV_1 B-NW-High | 3.2 | 3.2 | 3.2 | 0.0 | %vol |
| SP6KVV_1 B-NW-Low | 2.7 | 2.7 | 2.7 | 0.0 | %vol |
| SP7KVV_2 K-Low | 2.1 | 2.1 | 2.1 | 0.0 | %vol |
| SP8KVV_2 LR-High | 2.3 | 2.3 | 2.2 | 0.0 | %vol |
| SP9KVV_2 LR-Mid | 1.9 | 2.0 | 1.9 | 0.0 | %vol |
| SP10KVV_2 H-High | 2.4 | 2.4 | 2.4 | 0.0 | %vol |
| SP11KVV_2 H-Mid | 1.9 | 2.0 | 1.9 | 0.0 | %vol |
| SP12KVV_2 FF-High | 1.9 | 1.9 | 1.9 | 0.0 | %vol |
| SP13KVV_2 FF-Mid | 1.8 | 1.8 | 1.8 | 0.0 | %vol |
| SP14KVV_2 AT-High | 1.5 | 1.5 | 1.5 | 0.0 | %vol |
| SP15KVV_2 AT-Mid | 1.6 | 1.6 | 1.6 | 0.0 | %vol |
| SP16KVV_1 BM-High | 4.1 | 4.1 | 4.0 | 0.0 | %vol |
| SP17KVV_1 BM-Mid | 3.1 | 3.1 | 3.1 | 0.0 | %vol |
| SP18KVV_1 BM-Low | 3.2 | 3.3 | 3.2 | 0.0 | %vol |
| SP19KVV_1 NWALL-Cav | 0.0 | 0.1 | 0.0 | 0.0 | %vol |
| SP20KVV_1 STUD-Cav | 2.4 | 2.4 | 2.4 | 0.0 | %vol |
| SP21KVV_1 FF-Void | 2.0 | 2.0 | 2.0 | 0.0 | %vol |
| SP22KVV_1 SF-Void | 0.0 | 0.0 | 0.0 | 0.0 | %vol |
| SP23KVV_1 ROOF-Void | -0.1 | 0.0 | -0.1 | 0.0 | %vol |
| RELEASEPRESSURE | 0.0053 | 0.0056 | 0.0049 | 0.0002 | barg |
| LOWFLOWMETERCH4 | 0.4345 | 0.4423 | 0.4236 | 0.0055 | g/s |
| OUTLET_TEMP | 4.0 | 4.2 | 3.9 | 0.1 | degC |
| Volume Flow Rate | 36.3 | 37.0 | 35.4 | 0.5 | SLPM |
| Energy Flow Rate | 21.7 | 22.1 | 21.2 | 0.3 | kW |
| External Wind Speed | 8.2 | | | | m/s |
| External Wind Direction | 270.0 | | | | bearing |



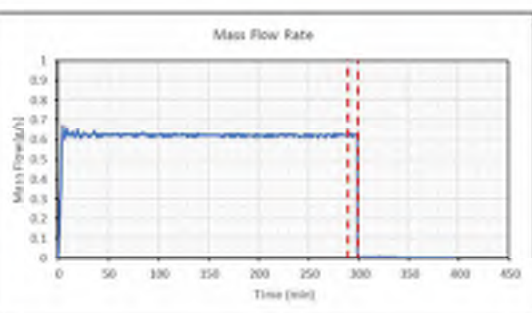
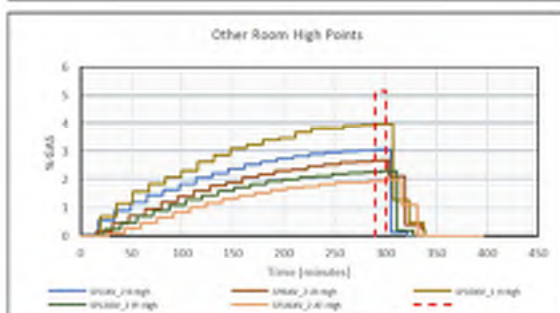
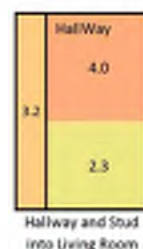
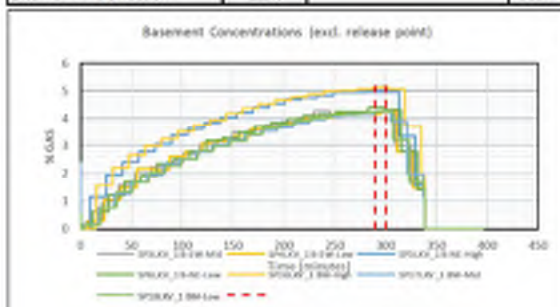
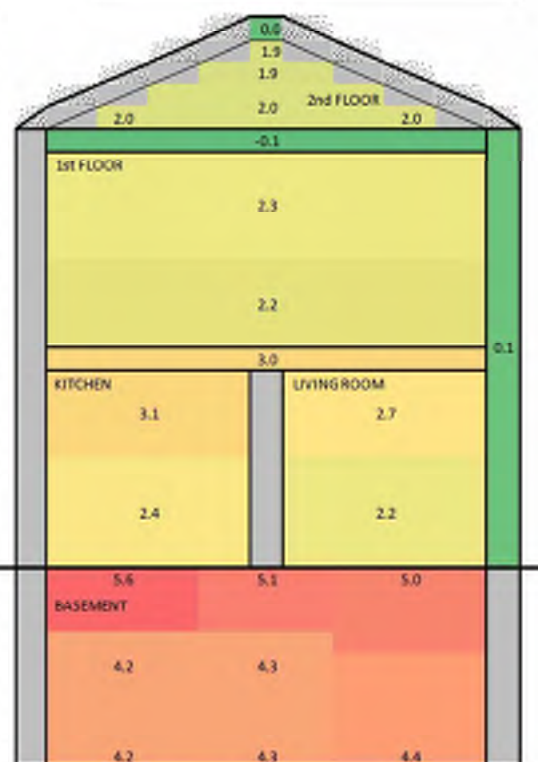
L3-027 RESULT

Hy4Heat WP7 Test Result

| | |
|--|----------------|
| MTP ID: L3-027 | |
| Hole Size: 5 mm | |
| Location: Basement downwards - door open | |
| Gas: methane | |
| Date: 03/12/2019 | Time: 17:30:00 |
| Averaging Period Start: 290 min | End: 300 min |

Notes:

| Sensor | Average | Max | Min | STDEV | Units |
|-------------------------|---------|--------|--------|--------|---------|
| SP1KLV_2 K-High | 3.1 | 3.1 | 3.0 | 0.0 | %vol |
| SP2LKV_1 B-SW-High | 5.6 | 5.6 | 5.6 | 0.0 | %vol |
| SP3LKV_1 B-SW-Mid | 4.2 | 4.3 | 4.2 | 0.0 | %vol |
| SP4LKV_1 B-SW-Low | 4.2 | 4.3 | 4.2 | 0.0 | %vol |
| SP5LKV_1 B-N/E-High | 5.0 | 5.0 | 5.0 | 0.0 | %vol |
| SP6LKV_1 B-N/E-Low | 4.4 | 4.4 | 4.4 | 0.0 | %vol |
| SP7LKV_2 K-Low | 2.4 | 2.4 | 2.4 | 0.0 | %vol |
| SP8LKV_2 LR-High | 2.7 | 2.7 | 2.7 | 0.0 | %vol |
| SP9LKV_2 LR-Mid | 2.2 | 2.2 | 2.2 | 0.0 | %vol |
| SP10KV_1 H-High | 4.0 | 4.0 | 3.9 | 0.0 | %vol |
| SP11KV_2 H-Mid | 2.3 | 2.3 | 2.3 | 0.0 | %vol |
| SP12KV_2 FF-High | 2.3 | 2.3 | 2.3 | 0.0 | %vol |
| SP13KV_2 FF-Mid | 2.2 | 2.2 | 2.2 | 0.0 | %vol |
| SP14KV_2 AT-High | 1.9 | 1.9 | 1.9 | 0.0 | %vol |
| SP15KV_2 AT-Mid | 2.0 | 2.0 | 2.0 | 0.0 | %vol |
| SP16KV_1 BM-High | 5.1 | 5.1 | 5.1 | 0.0 | %vol |
| SP17KV_1 BM-Mid | 4.3 | 4.3 | 4.2 | 0.0 | %vol |
| SP18KV_1 BM-Low | 4.3 | 4.3 | 4.2 | 0.0 | %vol |
| SP19KV_1 N/WALL-Cav | 0.1 | 0.1 | 0.1 | 0.0 | %vol |
| SP20KV_1 STUD-Cav | 3.2 | 3.3 | 3.2 | 0.0 | %vol |
| SP21KV_1 FF-Void | 3.0 | 3.1 | 3.0 | 0.0 | %vol |
| SP22KV_1 SF-Void | -0.1 | -0.1 | -0.1 | 0.0 | %vol |
| SP23KV_1 ROOF-Void | 0.0 | 0.0 | 0.0 | 0.0 | %vol |
| RELEASEPRESSURE | 0.0099 | 0.0103 | 0.0093 | 0.0002 | barg |
| LOWFLOWMETERCH4 | 0.6223 | 0.6297 | 0.6110 | 0.0038 | g/s |
| OUTLET_TEMP | 2.7 | 2.8 | 2.6 | 0.0 | degC |
| Volume Flow Rate | 52.0 | 52.7 | 51.1 | 0.3 | SLPM |
| Energy Flow Rate | 31.1 | 31.5 | 30.5 | 0.2 | kW |
| External Wind Speed | 5.7 | | | | m/s |
| External Wind Direction | 215.0 | | | | bearing |



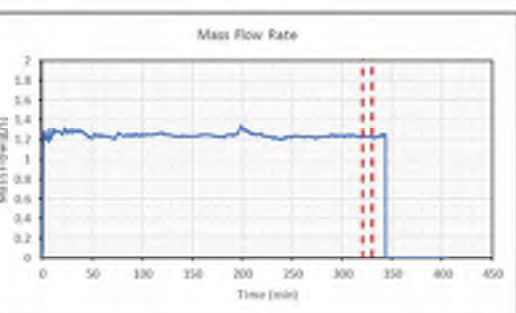
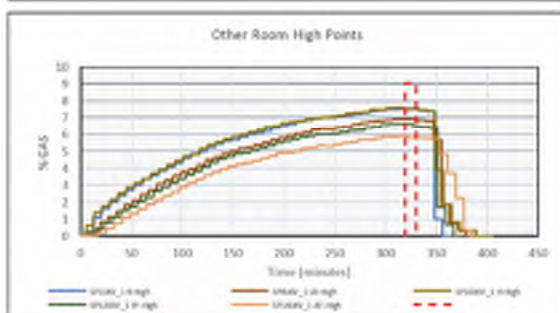
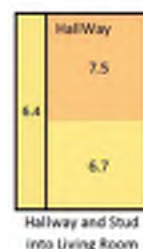
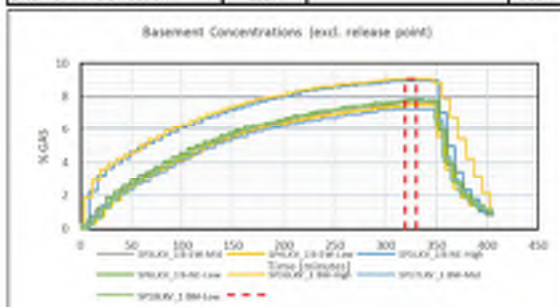
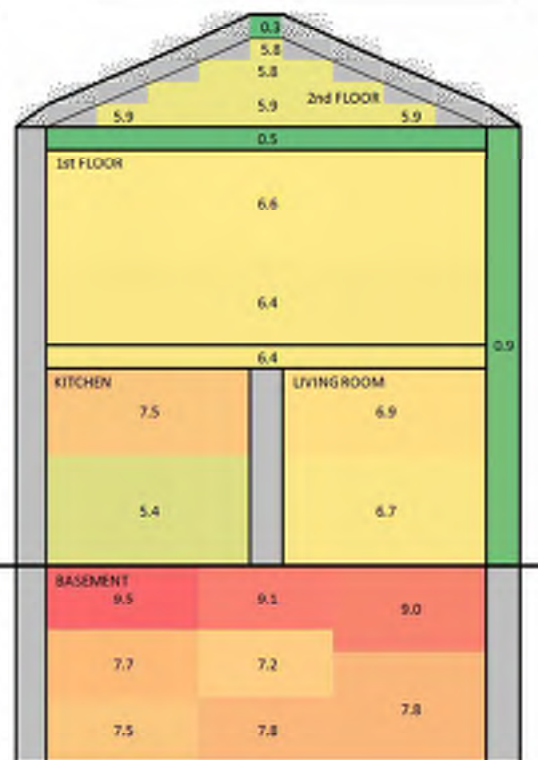
L3-028 RESULT

Hy4Heat WP7 Test Result

| | |
|--|----------------|
| MTP ID: L3-028 | |
| Hole Size: 10mm | |
| Location: Basement downwards - door open | |
| Gas: methane | |
| Date: 04/12/2019 | Time: 00:30:00 |
| Averaging Period Start: 320 min | End: 330 min |

Notes:

| Sensor | Average | Max | Min | STDEV | Units |
|-------------------------|---------|--------|--------|--------|---------|
| SP1KVV_1 K-High | 7.5 | 7.5 | 7.5 | 0.0 | %vol |
| SP2LKV_1 B-SW-High | 9.5 | 9.5 | 9.5 | 0.0 | %vol |
| SP3LKV_1 B-SW-Mid | 7.7 | 7.7 | 7.7 | 0.0 | %vol |
| SP4LKV_1 B-SW-Low | 7.5 | 7.5 | 7.4 | 0.0 | %vol |
| SP5LKV_1 B-N/E-High | 9.0 | 9.0 | 9.0 | 0.0 | %vol |
| SP6LKV_1 B-N/E-Low | 7.8 | 7.8 | 7.7 | 0.0 | %vol |
| SP7LKV_1 K-Low | 5.4 | 5.5 | 5.4 | 0.1 | %vol |
| SP8LKV_1 LR-High | 6.9 | 6.9 | 6.9 | 0.0 | %vol |
| SP9LKV_1 LR-Mid | 6.7 | 6.7 | 6.7 | 0.0 | %vol |
| SP10KV_1 H-High | 7.5 | 7.5 | 7.5 | 0.0 | %vol |
| SP11KV_1 H-Mid | 6.7 | 6.7 | 6.6 | 0.0 | %vol |
| SP12KV_1 FF-High | 6.6 | 6.6 | 6.5 | 0.0 | %vol |
| SP13KV_1 FF-Mid | 6.4 | 6.4 | 6.3 | 0.0 | %vol |
| SP14KV_1 AT-High | 5.8 | 5.9 | 5.8 | 0.0 | %vol |
| SP15KV_1 AT-Mid | 5.9 | 5.9 | 5.9 | 0.0 | %vol |
| SP16KV_1 BM-High | 9.1 | 9.1 | 9.1 | 0.0 | %vol |
| SP17KV_1 BM-Mid | 7.2 | 7.2 | 7.2 | 0.0 | %vol |
| SP18KV_1 BM-Low | 7.8 | 7.8 | 7.8 | 0.0 | %vol |
| SP19KV_1 NWALL-Cav | 0.9 | 1.0 | 0.9 | 0.0 | %vol |
| SP20KV_1 STUD-Cav | 6.4 | 6.4 | 6.4 | 0.0 | %vol |
| SP21KV_1 FF-Void | 6.4 | 6.7 | 6.2 | 0.1 | %vol |
| SP22KV_1 SF-Void | 0.5 | 0.6 | 0.5 | 0.0 | %vol |
| SP23KV_1 ROOF-Void | 0.3 | 0.4 | 0.2 | 0.1 | %vol |
| RELEASEPRESSURE | 0.0037 | 0.0041 | 0.0034 | 0.0002 | barg |
| LOWFLOWMETERQ4 | 1.2257 | 1.2369 | 1.2107 | 0.0058 | g/s |
| OUTLET_TEMP | 3.4 | 3.6 | 3.3 | 0.1 | degC |
| Volume Flow Rate | 102.5 | 103.5 | 101.3 | 0.5 | SLPM |
| Energy Flow Rate | 61.3 | 61.8 | 60.5 | 0.3 | kW |
| External Wind Speed | 2.6 | | | | m/s |
| External Wind Direction | 199.4 | | | | bearing |



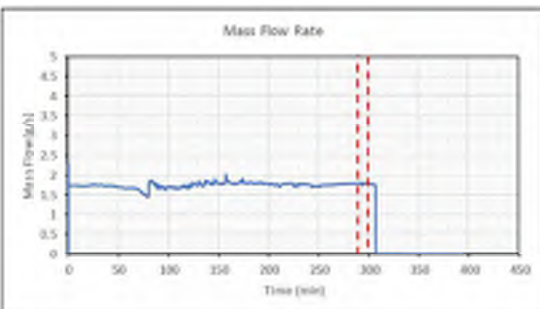
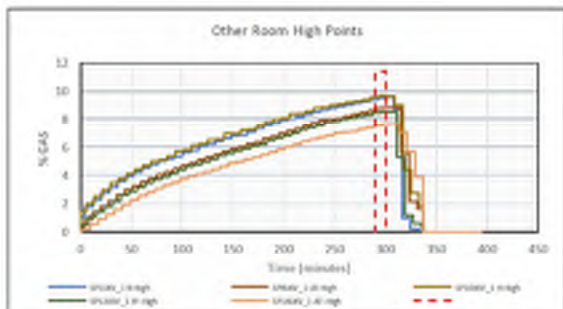
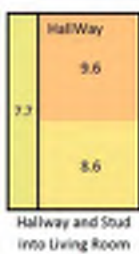
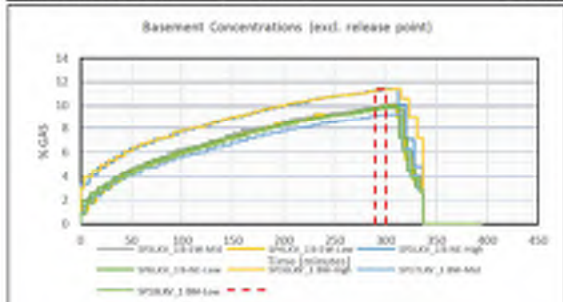
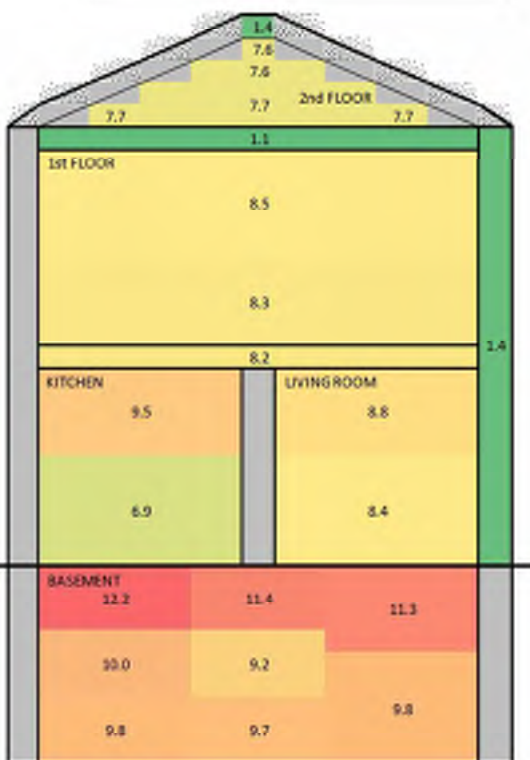
L3-029 RESULT

Hy4Heat WP7 Test Result

| | |
|--|----------------|
| MTP ID: L3-029 | |
| Hole Size: 10mm | |
| Location: Basement downwards, doors open | |
| Gas: methane | |
| Date: 14/12/2019 | Time: 16:00:00 |
| Averaging Period Start: 290 min | End: 300 min |

Notes:

| Sensor | Average | Max | Min | STDEV | Units |
|-------------------------|---------|--------|--------|--------|---------|
| SP1KVV_1 K-High | 9.5 | 9.5 | 9.4 | 0.1 | %vol |
| SP2LKV_1 B-SW-High | 12.2 | 12.3 | 12.0 | 0.1 | %vol |
| SP3LKV_1 B-SW-Mid | 10.0 | 10.0 | 9.9 | 0.1 | %vol |
| SP4LKV_1 B-SW-Low | 9.8 | 9.9 | 9.8 | 0.0 | %vol |
| SP5LKV_1 B-N/E-High | 11.3 | 11.4 | 11.3 | 0.1 | %vol |
| SP6LKV_1 B-N/E-Low | 9.8 | 10.0 | 9.8 | 0.1 | %vol |
| SP7LKV_1 K-Low | 6.9 | 7.0 | 6.7 | 0.1 | %vol |
| SP8LKV_1 LR-High | 8.8 | 8.8 | 8.6 | 0.1 | %vol |
| SP9LKV_1 LR-Mid | 8.4 | 8.5 | 8.4 | 0.0 | %vol |
| SP10LKV_1 H-High | 9.6 | 9.7 | 9.6 | 0.0 | %vol |
| SP11LKV_1 H-Mid | 8.6 | 8.6 | 8.5 | 0.0 | %vol |
| SP12LKV_1 FF-High | 8.5 | 8.5 | 8.5 | 0.0 | %vol |
| SP13LKV_1 FF-Mid | 8.3 | 8.3 | 8.3 | 0.0 | %vol |
| SP14LKV_1 AT-High | 7.6 | 7.7 | 7.6 | 0.0 | %vol |
| SP15LKV_1 AT-Mid | 7.7 | 7.8 | 7.6 | 0.0 | %vol |
| SP16LKV_1 BM-High | 11.4 | 11.4 | 11.2 | 0.1 | %vol |
| SP17LKV_1 BM-Mid | 9.2 | 9.2 | 9.1 | 0.1 | %vol |
| SP18LKV_1 BM-Low | 9.7 | 9.8 | 9.6 | 0.1 | %vol |
| SP19LKV_1 NWALL-Cav | 1.4 | 1.5 | 1.4 | 0.1 | %vol |
| SP20LKV_1 STUD-Cav | 7.7 | 7.8 | 7.7 | 0.1 | %vol |
| SP21LKV_1 FF-Void | 8.2 | 8.2 | 8.2 | 0.0 | %vol |
| SP22LKV_1 SF-Void | 1.1 | 1.2 | 0.9 | 0.1 | %vol |
| SP23LKV_1 ROOF-Void | 1.4 | 1.7 | 0.9 | 0.2 | %vol |
| RELEASEPRESSURE | 0.0117 | 0.0122 | 0.0110 | 0.0003 | bar(g) |
| LOWFLOWMETERQ4 | 1.7795 | 1.7949 | 1.7367 | 0.0166 | g/s |
| OUTLET_TEMP | 0.1 | 0.3 | -0.1 | 0.1 | degC |
| Volume Flow Rate | 148.8 | 150.1 | 145.1 | 1.4 | SLPM |
| Energy Flow Rate | 89.0 | 89.7 | 86.7 | 0.8 | kW |
| External Wind Speed | 1.5 | | | | m/s |
| External Wind Direction | 211.4 | | | | bearing |



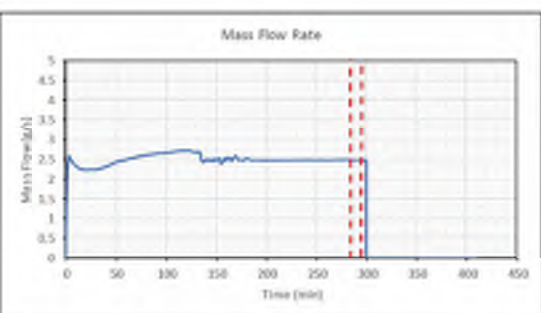
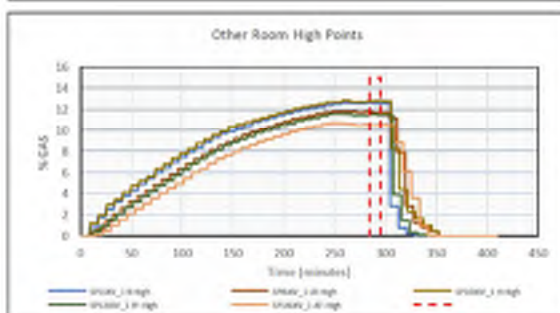
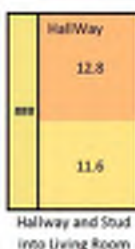
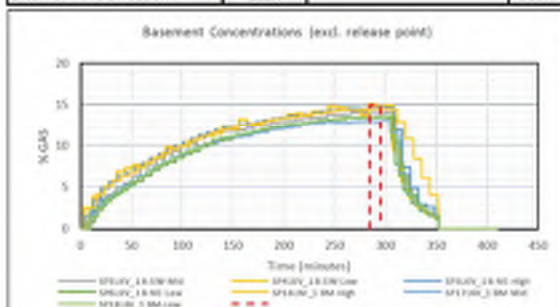
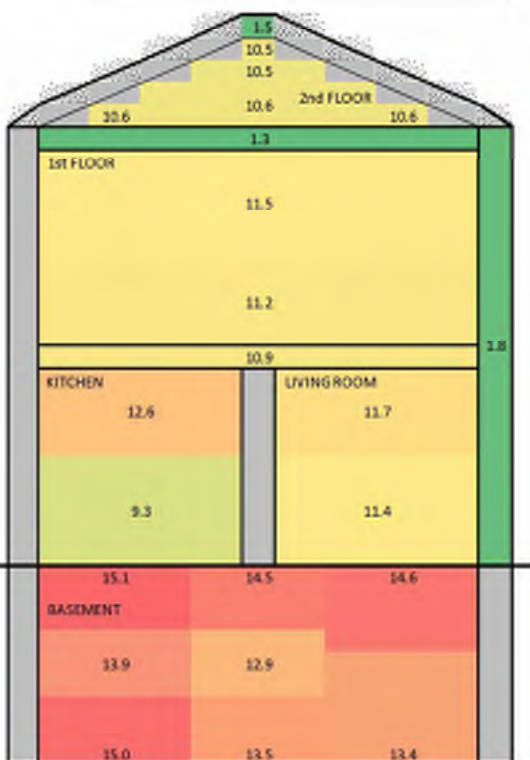
L3-030 RESULT

Hy4Heat WP7 Test Result

| | |
|--|----------------|
| MTP ID: L3-030 | |
| Hole Size: 10 mm | |
| Location: Basement downwards, doors open | |
| Gas: methane | |
| Date: 15/12/2019 | Time: 00:10:00 |
| Averaging Period Start: 285 min | End: 295 min |

Notes:

| Sensor | Average | Max | Min | STDEV | Units |
|-------------------------|---------|--------|--------|--------|---------|
| SP1KVV_1 K-High | 12.6 | 12.6 | 12.6 | 0.0 | %vol |
| SP2LKV_1 B-SW-High | 15.1 | 15.1 | 15.0 | 0.1 | %vol |
| SP3LKV_1 B-SW-Mid | 13.9 | 13.9 | 13.9 | 0.0 | %vol |
| SP4LKV_1 B-SW-Low | 15.0 | 15.1 | 14.8 | 0.1 | %vol |
| SP5LKV_1 B-NW-High | 14.6 | 14.6 | 14.6 | 0.0 | %vol |
| SP6LKV_1 B-NW-Low | 13.4 | 13.5 | 13.4 | 0.0 | %vol |
| SP7LKV_1 K-Low | 9.3 | 9.4 | 9.2 | 0.0 | %vol |
| SP8LKV_1 LR-High | 11.7 | 11.8 | 11.7 | 0.0 | %vol |
| SP9LKV_1 LR-Mid | 11.4 | 11.4 | 11.4 | 0.0 | %vol |
| SP10KV_1 H-High | 12.8 | 12.8 | 12.8 | 0.0 | %vol |
| SP11KV_1 H-Mid | 11.6 | 11.6 | 11.6 | 0.0 | %vol |
| SP12KV_1 FF-High | 11.5 | 11.5 | 11.5 | 0.0 | %vol |
| SP13KV_1 FF-Mid | 11.2 | 11.2 | 11.2 | 0.0 | %vol |
| SP14KV_1 AT-High | 10.5 | 10.5 | 10.5 | 0.0 | %vol |
| SP15KV_1 AT-Mid | 10.6 | 10.6 | 10.6 | 0.0 | %vol |
| SP16KV_1 BM-High | 14.5 | 14.5 | 14.4 | 0.0 | %vol |
| SP17KV_1 BM-Mid | 12.9 | 13.0 | 12.9 | 0.0 | %vol |
| SP18KV_1 BM-Low | 13.5 | 13.5 | 13.5 | 0.0 | %vol |
| SP19KV_1 NWALL-Cav | 1.8 | 1.8 | 1.8 | 0.0 | %vol |
| SP20KV_1 STUD-Cav | 10.8 | 10.8 | 10.8 | 0.0 | %vol |
| SP21KV_1 FF-Void | 10.9 | 10.9 | 10.9 | 0.0 | %vol |
| SP22KV_1 SF-Void | 1.3 | 1.3 | 1.3 | 0.0 | %vol |
| SP23KV_1 ROOF-Void | 1.5 | 1.6 | 1.3 | 0.1 | %vol |
| RELEASEPRESSURE | 0.0212 | 0.0217 | 0.0209 | 0.0002 | bar |
| LOWFLOWMETERQ4 | 2.4723 | 2.4760 | 2.4685 | 0.0022 | g/s |
| OUTLET_TEMP | -0.3 | -0.2 | -0.4 | 0.0 | degC |
| Volume Flow Rate | 206.8 | 207.1 | 206.5 | 0.2 | SLPM |
| Energy Flow Rate | 123.6 | 123.8 | 123.4 | 0.1 | kW |
| External Wind Speed | 2.2 | | | | m/s |
| External Wind Direction | 221.6 | | | | bearing |



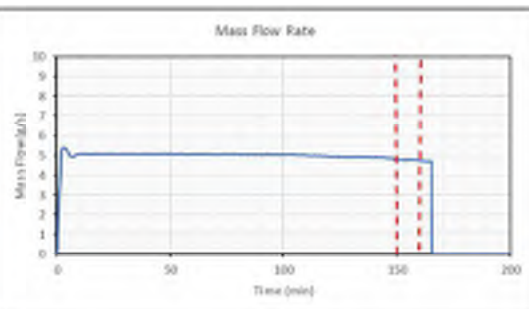
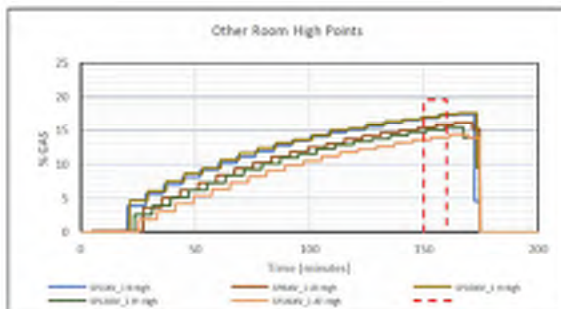
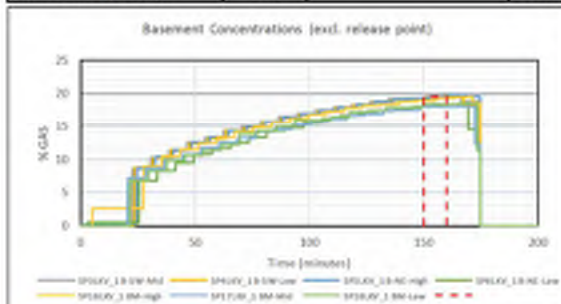
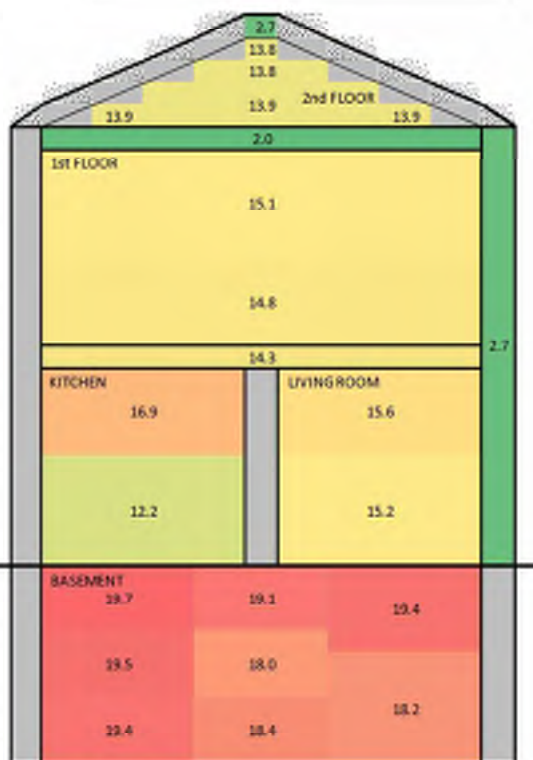
L3-031 RESULT

Hy4Heat WP7 Test Result

| | |
|--|----------------|
| MTP ID: L3-031 | |
| Hole Size: 10mm | |
| Location: Basement downwards, doors open | |
| Gas: methane | |
| Date: 15/12/2019 | Time: 07:00:00 |
| Averaging Period Start: 150 min | End: 160 min |

Notes: Flow rate reducing towards end of test due to supply pressure falling with MCP carbents

| Sensor | Average | Max | Min | STDEV | Units |
|-------------------------|---------|--------|--------|--------|---------|
| SP11KV_1 K-High | 16.9 | 17.3 | 16.8 | 0.2 | %vol |
| SP21KV_1 B-SW-High | 19.7 | 19.9 | 19.7 | 0.1 | %vol |
| SP31KV_1 B-SW-Mid | 19.5 | 19.7 | 19.3 | 0.1 | %vol |
| SP41KV_1 B-SW-Low | 19.4 | 19.7 | 19.2 | 0.1 | %vol |
| SP51KV_1 B-N/E-High | 19.4 | 19.5 | 19.3 | 0.1 | %vol |
| SP61KV_1 B-N/E-Low | 18.2 | 18.4 | 18.0 | 0.2 | %vol |
| SP71KV_1 K-Low | 12.2 | 12.4 | 12.0 | 0.2 | %vol |
| SP81KV_1 LR-High | 15.6 | 15.8 | 15.4 | 0.2 | %vol |
| SP91KV_1 LR-Mid | 15.2 | 15.4 | 15.0 | 0.2 | %vol |
| SP10KV_1 H-High | 17.0 | 17.4 | 16.9 | 0.2 | %vol |
| SP11KV_1 H-Mid | 15.2 | 15.5 | 14.7 | 0.2 | %vol |
| SP12KV_1 FF-High | 15.1 | 15.5 | 14.8 | 0.2 | %vol |
| SP13KV_1 FF-Mid | 14.8 | 14.9 | 14.5 | 0.2 | %vol |
| SP14KV_1 AT-High | 13.8 | 13.9 | 13.5 | 0.2 | %vol |
| SP15KV_1 AT-Mid | 13.9 | 14.0 | 13.6 | 0.2 | %vol |
| SP16KV_1 BM-High | 19.1 | 19.3 | 19.0 | 0.2 | %vol |
| SP17KV_1 BM-Mid | 18.0 | 18.0 | 17.9 | 0.0 | %vol |
| SP18KV_1 BM-Low | 18.4 | 18.5 | 18.4 | 0.0 | %vol |
| SP19KV_1 NWALL-Cav | 2.7 | 2.9 | 2.6 | 0.1 | %vol |
| SP20KV_1 STUD-Cav | 14.1 | 14.5 | 13.7 | 0.2 | %vol |
| SP21KV_1 FF-Void | 14.3 | 14.5 | 14.0 | 0.2 | %vol |
| SP22KV_1 SF-Void | 2.0 | 2.0 | 2.0 | 0.0 | %vol |
| SP23KV_1 ROOF-Void | 2.7 | 2.8 | 2.7 | 0.0 | %vol |
| RELEASEPRESSURE | 0.0768 | 0.0776 | 0.0754 | 0.0005 | bar |
| LOWFLOWMETERCH4 | 4.7428 | 4.7690 | 4.7047 | 0.0144 | g/s |
| OUTLET_TEMP | 0.7 | 0.9 | 0.5 | 0.1 | degC |
| Volume Flow Rate | 396.7 | 398.9 | 393.5 | 1.2 | SLPM |
| Energy Flow Rate | 237.1 | 238.5 | 235.2 | 0.7 | kW |
| External Wind Speed | 2.4 | | | | m/s |
| External Wind Direction | 235.5 | | | | bearing |



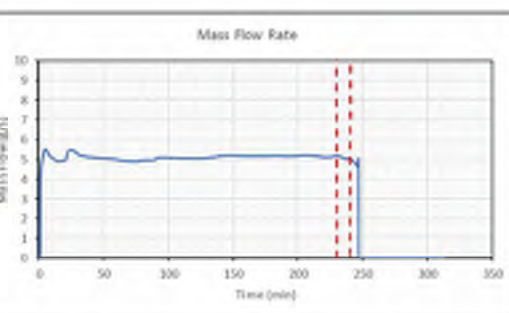
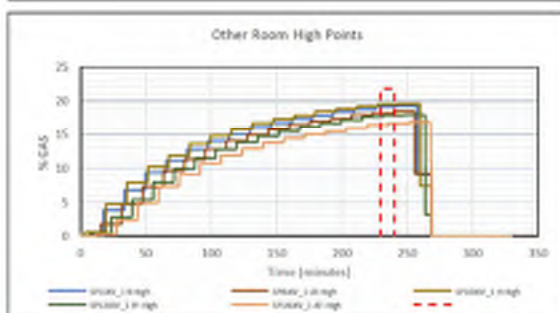
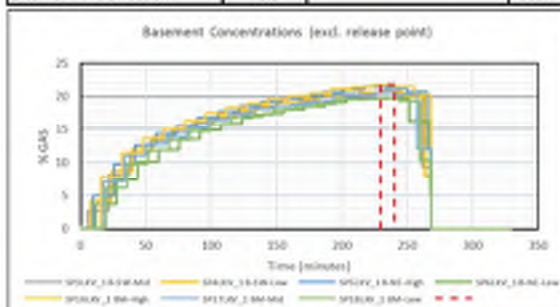
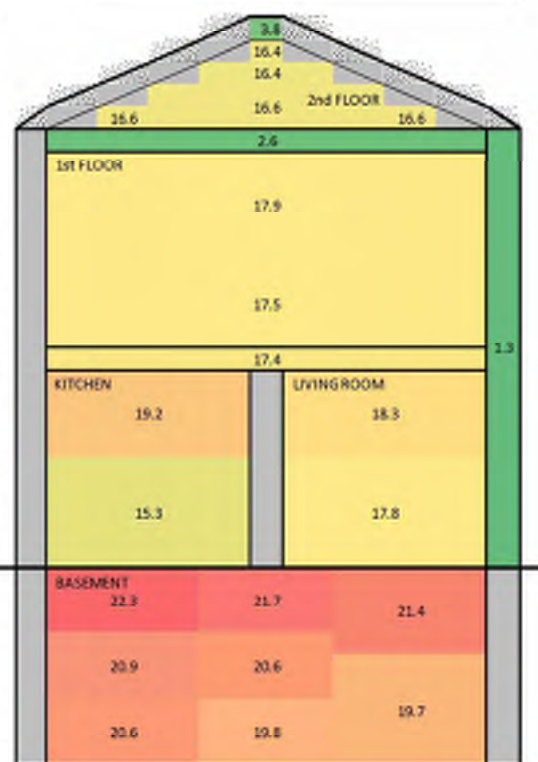
L3-032 RESULT

Hy4Heat WP7 Test Result

| | |
|--|----------------|
| MTP ID: L3-032 | |
| Hole Size: 15 mm | |
| Location: Basement downwards, doors open | |
| Gas: methane | |
| Date: 18/12/2019 | Time: 08:20:00 |
| Averaging Period Start: 230 min | End: 240 min |

Notes:

| Sensor | Average | Max | Min | STDEV | Units |
|-------------------------|---------|--------|--------|--------|---------|
| SP1KVV_1 K-High | 19.2 | 19.2 | 19.2 | 0.0 | %vol |
| SP2LKV_1 B-SW-High | 22.3 | 22.3 | 22.3 | 0.0 | %vol |
| SP3LKV_1 B-SW-Mid | 20.9 | 20.9 | 20.9 | 0.0 | %vol |
| SP4LKV_1 B-SW-Low | 20.6 | 20.6 | 20.6 | 0.0 | %vol |
| SP5LKV_1 B-NW-High | 21.4 | 21.5 | 21.4 | 0.1 | %vol |
| SP6LKV_1 B-NW-Low | 19.7 | 19.7 | 19.7 | 0.0 | %vol |
| SP7LKV_1 K-Low | 15.3 | 15.4 | 14.9 | 0.3 | %vol |
| SP8LKV_1 LR-High | 18.3 | 18.5 | 18.3 | 0.0 | %vol |
| SP9LKV_1 LR-Mid | 17.8 | 17.8 | 17.8 | 0.0 | %vol |
| SP10KV_1 H-High | 19.5 | 19.5 | 19.5 | 0.0 | %vol |
| SP11KV_1 H-Mid | 17.8 | 17.8 | 17.8 | 0.0 | %vol |
| SP12KV_1 FF-High | 17.9 | 17.9 | 17.7 | 0.1 | %vol |
| SP13KV_1 FF-Mid | 17.5 | 17.7 | 17.3 | 0.2 | %vol |
| SP14KV_1 AT-High | 16.4 | 16.6 | 16.3 | 0.1 | %vol |
| SP15KV_1 AT-Mid | 16.6 | 16.7 | 16.6 | 0.1 | %vol |
| SP16KV_1 BM-High | 21.7 | 21.8 | 21.5 | 0.1 | %vol |
| SP17KV_1 BM-Mid | 20.6 | 20.6 | 20.6 | 0.0 | %vol |
| SP18KV_1 BM-Low | 19.8 | 19.8 | 19.8 | 0.0 | %vol |
| SP19KV_1 NWALL-Cav | 1.3 | 1.3 | 1.3 | 0.0 | %vol |
| SP20KV_1 STUD-Cav | 17.4 | 17.4 | 17.2 | 0.1 | %vol |
| SP21KV_1 FF-Void | 17.4 | 17.4 | 17.3 | 0.0 | %vol |
| SP22KV_1 SF-Void | 2.6 | 2.8 | 2.3 | 0.2 | %vol |
| SP23KV_1 ROOF-Void | 3.8 | 3.9 | 3.3 | 0.1 | %vol |
| RELEASEPRESSURE | 0.0106 | 0.0110 | 0.0102 | 0.0003 | barg |
| LOWFLOWMETERCH4 | 5.0549 | 5.1324 | 4.9545 | 0.0584 | g/s |
| OUTLET_TEMP | -0.8 | -0.4 | -1.3 | 0.1 | degC |
| Volume Flow Rate | 422.8 | 429.3 | 414.4 | 4.9 | SLPM |
| Energy Flow Rate | 252.7 | 256.6 | 247.7 | 2.9 | kW |
| External Wind Speed | 2.9 | | | | m/s |
| External Wind Direction | 75.3 | | | | bearing |



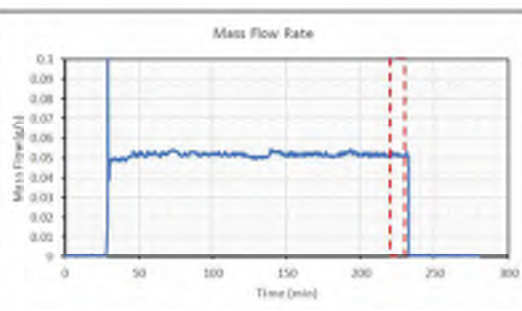
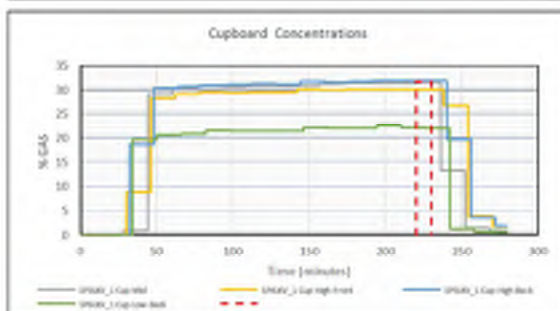
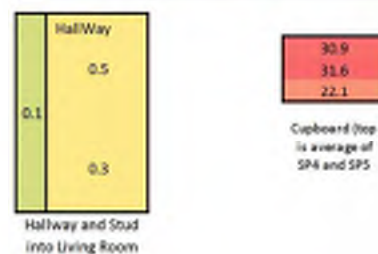
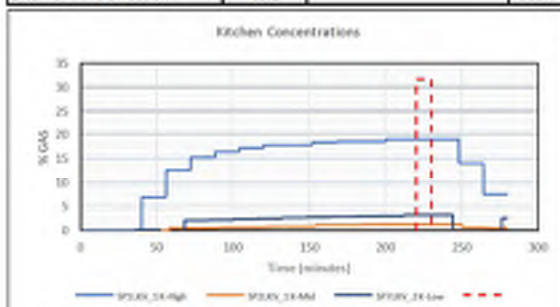
L3-033 RESULT

Hy4Heat WP7 Test Result

| | |
|---------------------------------|----------------|
| MTP ID: L3-033 | |
| Hole Size: 5.1 mm | |
| Location: boiler cupboard | |
| Gas: Methane | |
| Date: 06/11/2019 | Time: 15:20:00 |
| Averaging Period Start: 220 min | End: 230 min |

Notes:

| Sensor | Average | Max | Min | STDEV | Units |
|-------------------------|---------|--------|--------|--------|---------|
| SP1KLV_1 K-High | 19.1 | 19.1 | 19.1 | 0.0 | %vol |
| SP2KLV_1 K-Mid | 1.3 | 1.3 | 1.3 | 0.0 | %vol |
| SP3KLV_1 Cup-Mid | 31.6 | 31.6 | 31.4 | 0.0 | %vol |
| SP4KLV_1 Cup-High-Front | 30.0 | 30.0 | 30.0 | 0.0 | %vol |
| SP5KLV_1 Cup-High-Back | 31.8 | 31.8 | 31.8 | 0.0 | %vol |
| SP6KLV_1 Cup-Low-Back | 22.1 | 22.1 | 22.0 | 0.1 | %vol |
| SP7KLV_2 K-Low | 3.3 | 3.3 | 3.3 | 0.0 | %vol |
| SP8KLV_2 LR-High | 3.1 | 3.1 | 3.1 | 0.0 | %vol |
| SP9KLV_1 LR-Mid | 0.6 | 0.6 | 0.6 | 0.0 | %vol |
| SP10KLV_2 H-High | 0.5 | 0.5 | 0.5 | 0.0 | %vol |
| SP11KLV_2 H-Mid | 0.3 | 0.3 | 0.3 | 0.0 | %vol |
| SP12KLV_2 FF-High | 0.2 | 0.3 | 0.2 | 0.0 | %vol |
| SP13KLV_2 FF-Mid | 0.2 | 0.2 | 0.2 | 0.0 | %vol |
| SP14KLV_2 AT-High | 0.2 | 0.2 | 0.1 | 0.0 | %vol |
| SP15KLV_2 AT-Mid | 0.1 | 0.2 | 0.1 | 0.0 | %vol |
| SP16KLV_2 BM-High | 0.0 | 0.0 | 0.0 | 0.0 | %vol |
| SP17KLV_2 BM-Mid | 0.0 | 0.0 | 0.0 | 0.0 | %vol |
| SP18KLV_2 BM-Low | 0.0 | 0.0 | 0.0 | 0.0 | %vol |
| SP19KLV_2 NWALL-Cav | -0.1 | -0.1 | -0.1 | 0.0 | %vol |
| SP20KLV_2 STUD-Cav | 0.1 | 0.1 | 0.1 | 0.0 | %vol |
| SP21KLV_1 FF-Void | 14.2 | 14.3 | 14.1 | 0.1 | %vol |
| SP22KLV_1 SF-Void | 0.0 | 0.0 | 0.0 | 0.0 | %vol |
| SP23KLV_2 ROOF-Void | -0.1 | -0.1 | -0.1 | 0.0 | %vol |
| RELEASEPRESSURE | 0.0027 | 0.0029 | 0.0022 | 0.0002 | barg |
| LOWFLOWMETERCH4 | 0.3138 | 0.3261 | 0.3074 | 0.0036 | g/s |
| OUTLET_TEMP | 3.3 | 3.4 | 3.2 | 0.1 | degC |
| Volume Flow Rate | 26.2 | 0.0 | 0.0 | 0.0 | SLPM |
| Energy Flow Rate | 15.7 | 0.0 | 0.0 | 0.0 | kW |
| External Wind Speed | 2.4 | | | | m/s |
| External Wind Direction | 69.2 | | | | bearing |



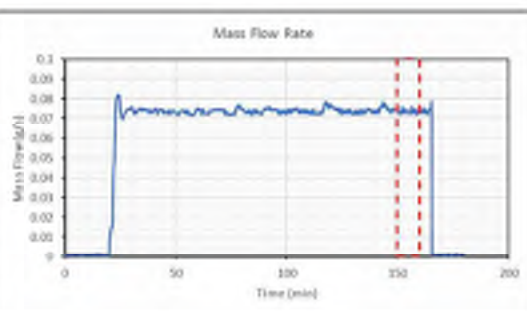
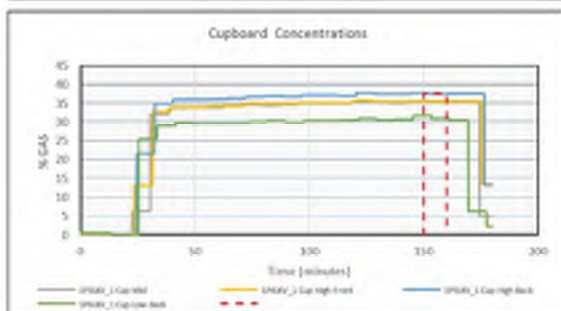
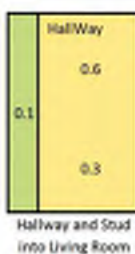
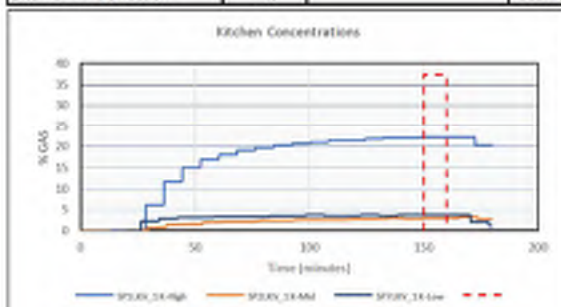
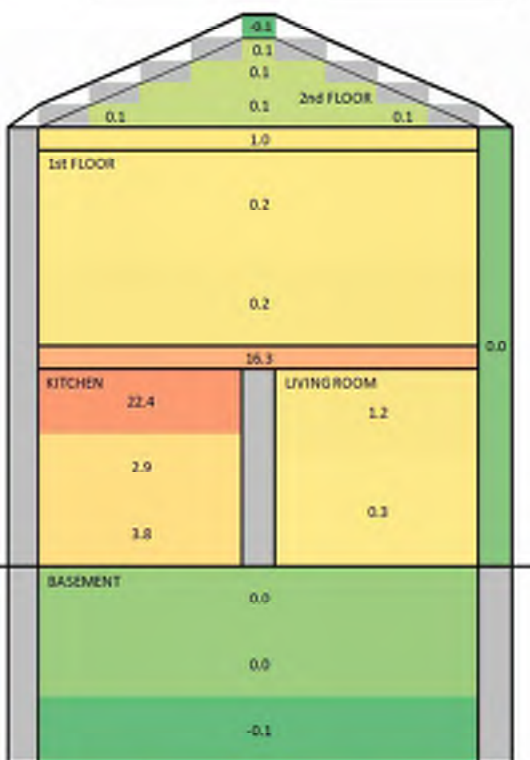
L3-034 RESULT

Hy4Heat WP7 Test Result

| | |
|---|----------------|
| MTP ID: L3-034 | |
| Hole Size: 5 mm | |
| Location: Boiler cupboard, all doors closed | |
| Gas: Methane | |
| Date: 06/11/2019 | Time: 21:00:00 |
| Averaging Period Start: 150 min | End: 160 min |

Notes: SP17 removed

| Sensor | Average | Max | Min | STDEV | Units |
|-------------------------|---------|--------|--------|--------|---------|
| SP1LKV_1 K-High | 22.4 | 22.4 | 22.4 | 0.0 | %vol |
| SP2LKV_1 K-Mid | 2.9 | 2.9 | 2.9 | 0.0 | %vol |
| SP3LKV_1 Cup-Mid | 35.4 | 35.4 | 35.2 | 0.1 | %vol |
| SP4LKV_1 Cup-High-Front | 35.5 | 35.5 | 35.5 | 0.0 | %vol |
| SP5LKV_1 Cup-High-Back | 37.5 | 37.8 | 37.4 | 0.2 | %vol |
| SP6LKV_1 Cup-Low-Back | 31.1 | 31.6 | 30.8 | 0.4 | %vol |
| SP7LKV_1 K-Low | 3.8 | 3.8 | 3.8 | 0.0 | %vol |
| SP8LKV_2 LR-High | 1.2 | 1.4 | 1.0 | 0.2 | %vol |
| SP9LKV_1 LR-Mid | 0.3 | 0.3 | 0.3 | 0.0 | %vol |
| SP10LKV_2 H-High | 0.6 | 0.6 | 0.6 | 0.0 | %vol |
| SP11LKV_2 H-Mid | 0.3 | 0.3 | 0.2 | 0.0 | %vol |
| SP12LKV_2 FF-High | 0.2 | 0.2 | 0.2 | 0.0 | %vol |
| SP13LKV_2 FF-Mid | 0.2 | 0.2 | 0.2 | 0.0 | %vol |
| SP14LKV_2 AT-High | 0.1 | 0.1 | 0.1 | 0.0 | %vol |
| SP15LKV_2 AT-Mid | 0.1 | 0.1 | 0.1 | 0.0 | %vol |
| SP16LKV_1 BM-High | 0.0 | 0.0 | 0.0 | 0.0 | %vol |
| SP17LKV_2 BM-Mid | | | | | %vol |
| SP18LKV_1 BM-Low | -0.1 | -0.1 | -0.1 | 0.0 | %vol |
| SP19LKV_2 NWALL-Cav | 0.0 | 0.3 | -0.2 | 0.1 | %vol |
| SP20LKV_2 STUD-Cav | 0.1 | 0.1 | 0.1 | 0.0 | %vol |
| SP21LKV_1 FF-Void | 16.3 | 16.3 | 16.3 | 0.0 | %vol |
| SP22LKV_1 SF-Void | 1.0 | 1.0 | 1.0 | 0.0 | %vol |
| SP23LKV_1 ROOF-Void | -0.1 | -0.1 | -0.1 | 0.0 | %vol |
| RELEASEPRESSURE | 0.0053 | 0.0056 | 0.0048 | 0.0002 | barg |
| LOWFLOWMETERCH4 | 0.4508 | 0.4648 | 0.4423 | 0.0058 | g/s |
| OUTLET TEMP | 3.1 | 3.2 | 3.1 | 0.0 | degC |
| Volume Flow Rate | 37.7 | 0.0 | 0.0 | 0.0 | SLPM |
| Energy Flow Rate | 22.5 | 0.0 | 0.0 | 0.0 | kW |
| External Wind Speed | 1.7 | | | | m/s |
| External Wind Direction | 77.9 | | | | bearing |



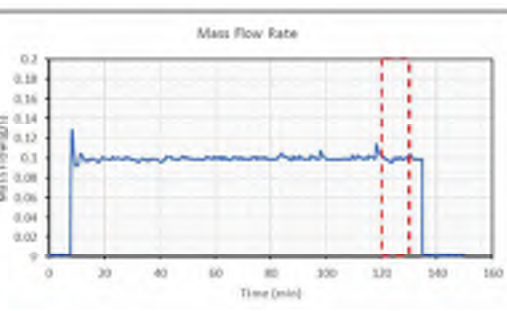
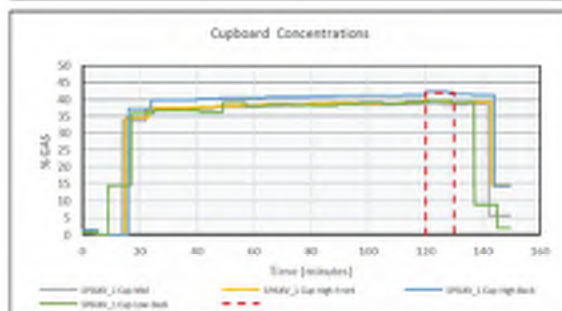
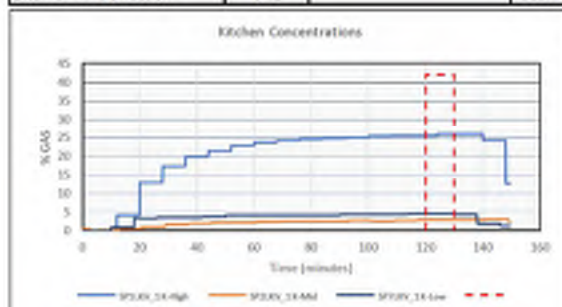
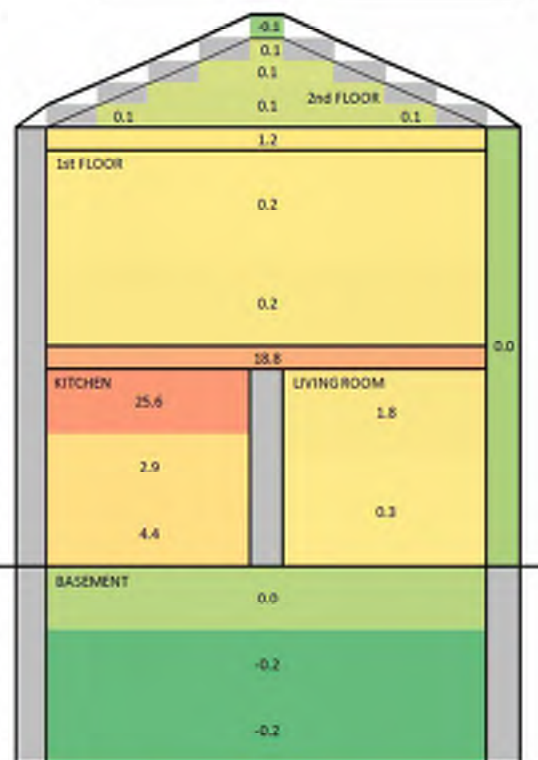
L3-035 RESULT

Hy4Heat WP7 Test Result

| | |
|---|----------------|
| MTP ID: L3-035 | |
| Hole Size: 5 mm | |
| Location: Boiler cupboard, all doors closed | |
| Gas: Methane | |
| Date: 07/11/2019 | Time: 01:00:20 |
| Averaging Period Start: 120 min | End: 130 min |

Notes:

| Sensor | Average | Max | Min | STDEV | Units |
|-------------------------|---------|--------|--------|--------|---------|
| SP1KLV_1 K-High | 25.6 | 25.7 | 25.3 | 0.2 | %vol |
| SP2KLV_1 K-Mid | 2.9 | 2.9 | 2.9 | 0.0 | %vol |
| SP3KLV_1 Cup-Mid | 38.6 | 38.7 | 38.4 | 0.2 | %vol |
| SP4KLV_1 Cup-High-Front | 39.6 | 39.8 | 39.2 | 0.3 | %vol |
| SP5KLV_1 Cup-High-Back | 42.0 | 42.2 | 41.3 | 0.3 | %vol |
| SP6KLV_1 Cup-Low-Back | 39.7 | 39.8 | 39.2 | 0.2 | %vol |
| SP7KLV_1 K-Low | 4.4 | 4.4 | 4.4 | 0.0 | %vol |
| SP8KLV_1 LR-High | 1.8 | 1.8 | 1.7 | 0.1 | %vol |
| SP9KLV_1 LR-Mid | 0.3 | 0.3 | 0.3 | 0.0 | %vol |
| SP10KLV_2 H-High | 0.6 | 0.7 | 0.6 | 0.0 | %vol |
| SP11KLV_2 H-Mid | 0.3 | 0.3 | 0.3 | 0.0 | %vol |
| SP12KLV_2 FF-High | 0.2 | 0.2 | 0.2 | 0.0 | %vol |
| SP13KLV_2 FF-Mid | 0.2 | 0.2 | 0.2 | 0.0 | %vol |
| SP14KLV_2 AT-High | 0.1 | 0.1 | 0.1 | 0.0 | %vol |
| SP15KLV_2 AT-Mid | 0.1 | 0.1 | 0.1 | 0.0 | %vol |
| SP16KLV_2 BM-High | 0.0 | 0.0 | 0.0 | 0.0 | %vol |
| SP17KLV_1 BM-Mid | -0.2 | -0.2 | -0.2 | 0.0 | %vol |
| SP18KLV_1 BM-Low | -0.2 | -0.2 | -0.2 | 0.0 | %vol |
| SP19KLV_2 NWALL-Cav | 0.0 | 0.1 | -0.1 | 0.1 | %vol |
| SP20KLV_2 STUD-Cav | 0.1 | 0.2 | 0.1 | 0.0 | %vol |
| SP21KLV_1 FF-Void | 18.8 | 18.9 | 18.6 | 0.0 | %vol |
| SP22KLV_1 SF-Void | 1.2 | 1.4 | 1.1 | 0.1 | %vol |
| SP23KLV_1 ROOF-Void | -0.1 | 0.0 | -0.2 | 0.1 | %vol |
| RELEASEPRESSURE | 0.0094 | 0.0103 | 0.0085 | 0.0004 | barg |
| LOWFLOWMETERCH4 | 0.6080 | 0.6372 | 0.5867 | 0.0103 | g/s |
| OUTLET_TEMP | 3.6 | 3.6 | 3.5 | 0.0 | degC |
| Volume Flow Rate | 50.9 | 0.0 | 0.0 | 0.0 | SLPM |
| Energy Flow Rate | 30.4 | 0.0 | 0.0 | 0.0 | kW |
| External Wind Speed | 2.5 | | | | m/s |
| External Wind Direction | 64.2 | | | | bearing |



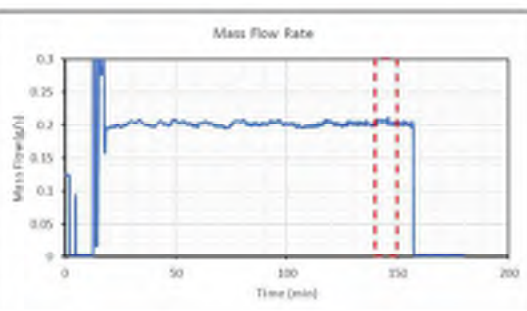
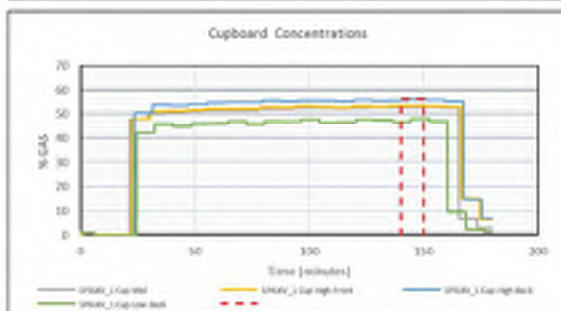
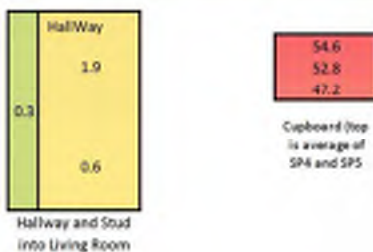
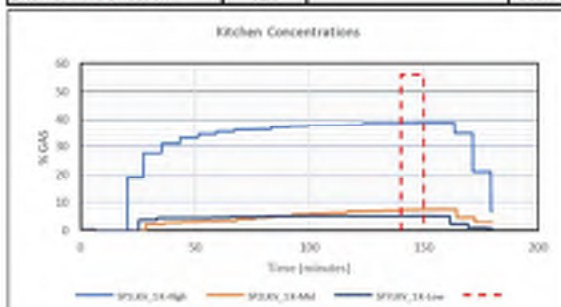
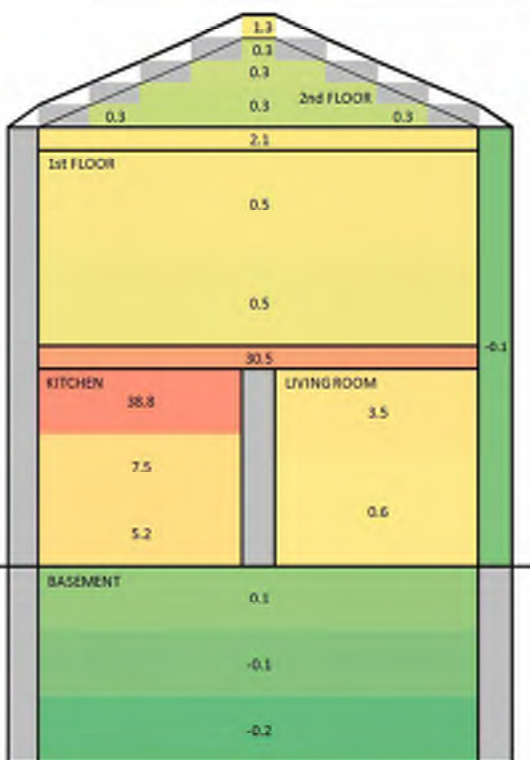
L3-036 RESULT

Hy4Heat WP7 Test Result

| | |
|---|----------------|
| MTP ID: L3-036 | |
| Hole Size: 10mm | |
| Location: Boiler cupboard, all doors closed | |
| Gas: Methane | |
| Date: 07/11/2019 | Time: 04:30:00 |
| Averaging Period Start: 140 min | End: 150 min |

Notes:

| Sensor | Average | Max | Min | STDEV | Units |
|-------------------------|---------|--------|--------|--------|---------|
| SP1KLV_1 K-High | 38.8 | 39.0 | 38.7 | 0.1 | %vol |
| SP2KLV_1 K-Mid | 7.5 | 7.6 | 7.2 | 0.1 | %vol |
| SP3KLV_1 Cup-Mid | 52.8 | 53.0 | 52.8 | 0.1 | %vol |
| SP4KLV_1 Cup-High-Front | 53.3 | 53.3 | 53.3 | 0.0 | %vol |
| SP5KLV_1 Cup-High-Back | 55.9 | 56.1 | 55.6 | 0.2 | %vol |
| SP6KLV_1 Cup-Low-Back | 47.2 | 47.8 | 46.4 | 0.7 | %vol |
| SP7KLV_1 K-Low | 5.2 | 5.3 | 5.2 | 0.1 | %vol |
| SP8KLV_1 LR-High | 3.5 | 3.6 | 3.4 | 0.1 | %vol |
| SP9KLV_1 LR-Mid | 0.6 | 0.8 | 0.5 | 0.1 | %vol |
| SP10KLV_2 H-High | 1.9 | 2.0 | 1.9 | 0.0 | %vol |
| SP11KLV_2 H-Mid | 0.6 | 0.6 | 0.6 | 0.0 | %vol |
| SP12KLV_2 FF-High | 0.5 | 0.5 | 0.5 | 0.0 | %vol |
| SP13KLV_2 FF-Mid | 0.5 | 0.5 | 0.5 | 0.0 | %vol |
| SP14KLV_2 AT-High | 0.3 | 0.3 | 0.3 | 0.0 | %vol |
| SP15KLV_2 AT-Mid | 0.3 | 0.3 | 0.3 | 0.0 | %vol |
| SP16KLV_2 BM-High | 0.1 | 0.1 | 0.1 | 0.0 | %vol |
| SP17KLV_1 BM-Mid | -0.1 | 0.0 | -0.2 | 0.1 | %vol |
| SP18KLV_1 BM-Low | -0.2 | -0.2 | -0.2 | 0.0 | %vol |
| SP19KLV_2 NWALL-Cav | -0.1 | -0.1 | -0.1 | 0.0 | %vol |
| SP20KLV_2 STUD-Cav | 0.3 | 0.3 | 0.3 | 0.0 | %vol |
| SP21KLV_1 FF-Void | 30.5 | 30.6 | 30.2 | 0.2 | %vol |
| SP22KLV_1 SF-Void | 2.1 | 2.1 | 2.1 | 0.0 | %vol |
| SP23KLV_2 ROOF-Void | 1.3 | 1.7 | 0.4 | 0.7 | %vol |
| RELEASEPRESSURE | 0.0051 | 0.0056 | 0.0047 | 0.0002 | barg |
| LOWFLOWMETERCH4 | 1.2487 | 1.2969 | 1.2257 | 0.0161 | g/s |
| OUTLET_TEMP | 3.9 | 4.0 | 3.7 | 0.0 | degC |
| Volume Flow Rate | 104.4 | 0.0 | 0.0 | 0.0 | SLPM |
| Energy Flow Rate | 62.4 | 0.0 | 0.0 | 0.0 | kW |
| External Wind Speed | 2.5 | | | | m/s |
| External Wind Direction | 62.0 | | | | bearing |



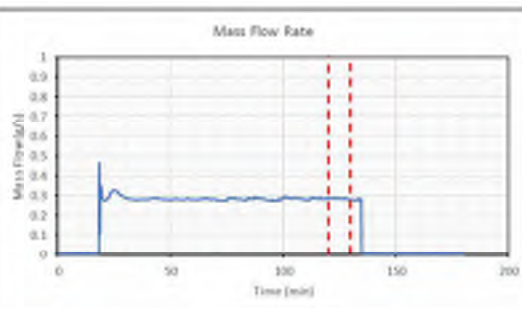
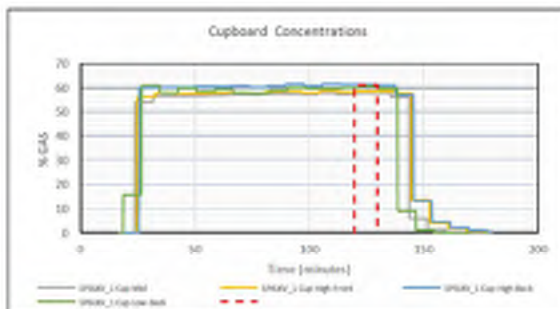
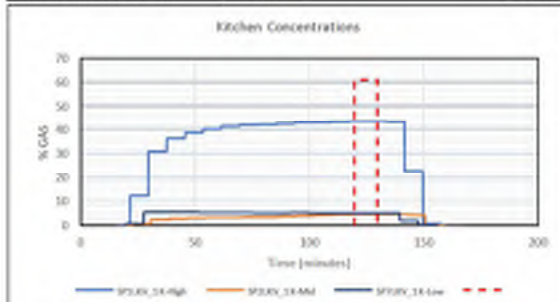
L3-037 RESULT

Hy4Heat WP7 Test Result

| | |
|---|----------------|
| MTP ID: L3-037 | |
| Hole Size: 10mm | |
| Location: Boiler cupboard, all doors closed | |
| Gas: Methane | |
| Date: 07/11/2019 | Time: 19:00:00 |
| Averaging Period Start: 120 min | End: 130 min |

Notes: Some drift on VOL sensor on analyser 3 gives -0.6 at SP23

| Sensor | Average | Max | Min | STDEV | Units |
|-------------------------|---------|--------|--------|--------|---------|
| SP1LKV_1 K-High | 43.6 | 43.6 | 43.6 | 0.0 | %vol |
| SP2LKV_1 K-Mid | 4.7 | 4.7 | 4.7 | 0.0 | %vol |
| SP3LKV_1 Cup-Mid | 57.9 | 57.9 | 57.9 | 0.0 | %vol |
| SP4LKV_1 Cup-High-Front | 58.5 | 58.5 | 58.2 | 0.1 | %vol |
| SP5LKV_1 Cup-High-Back | 61.3 | 61.3 | 61.0 | 0.0 | %vol |
| SP6LKV_1 Cup-Low-Back | 60.5 | 60.7 | 60.1 | 0.3 | %vol |
| SP7LKV_1 K-Low | 5.3 | 5.3 | 5.3 | 0.0 | %vol |
| SP8LKV_1 LR-High | 3.5 | 3.6 | 3.4 | 0.1 | %vol |
| SP9LKV_1 LR-Mid | -0.2 | -0.2 | -0.2 | 0.0 | %vol |
| SP10LKV_2 H-High | 2.1 | 2.1 | 2.1 | 0.0 | %vol |
| SP11LKV_2 H-Mid | 0.5 | 0.5 | 0.5 | 0.0 | %vol |
| SP12LKV_2 FF-High | 0.4 | 0.5 | 0.4 | 0.0 | %vol |
| SP13LKV_2 FF-Mid | 0.4 | 0.4 | 0.3 | 0.0 | %vol |
| SP14LKV_2 AT-High | 0.2 | 0.2 | 0.2 | 0.0 | %vol |
| SP15LKV_2 AT-Mid | 0.2 | 0.2 | 0.2 | 0.0 | %vol |
| SP16LKV_2 BM-High | -0.1 | -0.1 | -0.1 | 0.0 | %vol |
| SP17LKV_2 BM-Mid | 0.2 | 0.6 | -0.1 | 0.3 | %vol |
| SP18LKV_2 BM-Low | -0.1 | -0.1 | -0.1 | 0.0 | %vol |
| SP19LKV_2 NWall-Cav | -0.1 | -0.1 | -0.1 | 0.0 | %vol |
| SP20LKV_2 STUD-Cav | -0.1 | -0.1 | -0.1 | 0.0 | %vol |
| SP21LKV_1 FF-Void | 30.9 | 30.9 | 30.9 | 0.0 | %vol |
| SP22LKV_1 SF-Void | 1.9 | 2.0 | 1.8 | 0.1 | %vol |
| SP23LKV_1 ROOF-Void | -0.6 | -0.6 | -0.6 | 0.0 | %vol |
| RELEASEPRESSURE | 0.0100 | 0.0108 | 0.0096 | 0.0003 | barg |
| LOWFLOWMETERCH4 | 1.7575 | 1.7912 | 1.7234 | 0.0137 | g/s |
| OUTLET_TEMP | 3.0 | 3.1 | 2.9 | 0.1 | degC |
| Volume Flow Rate | 147.0 | 0.0 | 0.0 | 0.0 | L/PM |
| Energy Flow Rate | 87.9 | 0.0 | 0.0 | 0.0 | kW |
| External Wind Speed | 5.1 | | | | m/s |
| External Wind Direction | 27.0 | | | | bearing |



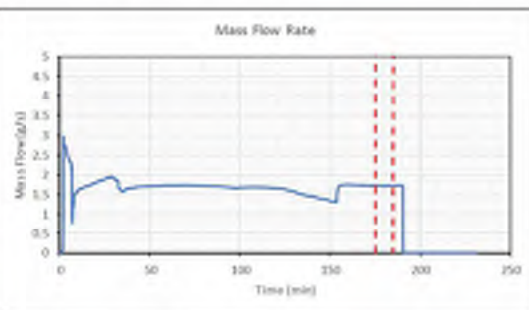
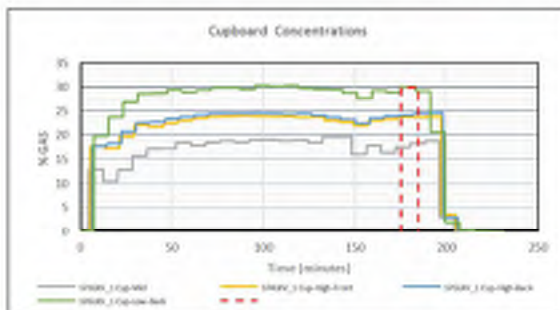
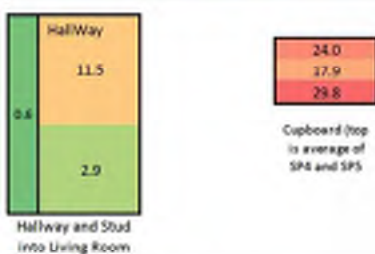
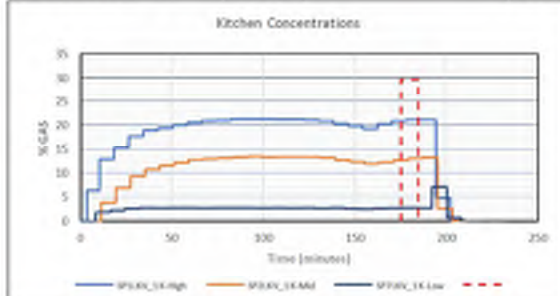
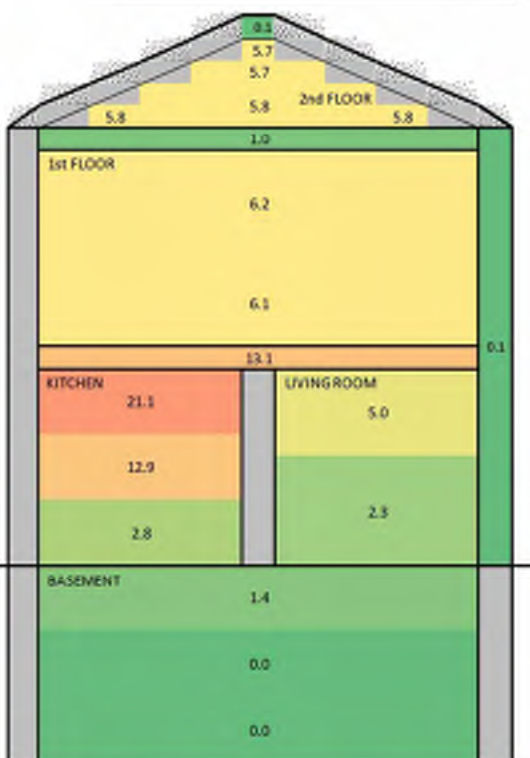
L3-037A RESULT

Hy4Heat WP7 Test Result

| | |
|--|----------------|
| MTP ID: L3-037A | |
| Hole Size: 10mm | |
| Kitchen boiler cupboard, doors closed, 100mm vent | |
| Location: above kitchen door and vents in cupboard | |
| Gas: methane | |
| Date: 15/01/2020 | Time: 15:45:00 |
| Averaging Period Start: 175 min | End: 185 min |

Notes: Release Pressure sensor faulty and removed from data set.
Outlet Pressure of flow meter show consistency with other methane tests at similar flow rates. -0.9% offset removed from SP17 to SP23

| Sensor | Average | Max | Min | STDEV | units |
|-------------------------|---------|--------|--------|--------|---------|
| SP11KV_1 K-High | 21.1 | 21.2 | 21.0 | 0.1 | %vol |
| SP21KV_1 K-Mid | 12.9 | 13.0 | 12.7 | 0.2 | %vol |
| SP31KV_1 Cup-Mid | 17.9 | 18.3 | 17.6 | 0.4 | %vol |
| SP41KV_1 Cup-High-Front | 23.7 | 23.7 | 23.7 | 0.0 | %vol |
| SP51KV_1 Cup-High-Back | 24.3 | 24.6 | 24.2 | 0.2 | %vol |
| SP61KV_1 Cup-Low-Back | 29.8 | 30.0 | 28.9 | 0.4 | %vol |
| SP71KV_1 K-Low | 2.8 | 2.8 | 2.7 | 0.0 | %vol |
| SP81KV_1 LR-High | 5.0 | 5.0 | 4.8 | 0.1 | %vol |
| SP91KV_1 LR-Mid | 2.3 | 2.3 | 2.3 | 0.0 | %vol |
| SP10KV_1 H-High | 11.5 | 11.6 | 11.3 | 0.2 | %vol |
| SP11KV_1 H-Mid | 2.9 | 3.0 | 2.8 | 0.1 | %vol |
| SP12KV_1 FF-High | 6.2 | 6.2 | 6.1 | 0.0 | %vol |
| SP13KV_1 FF-Mid | 6.1 | 6.2 | 6.1 | 0.0 | %vol |
| SP14KV_1 AT-High | 5.7 | 5.8 | 5.6 | 0.0 | %vol |
| SP15KV_1 AT-Mid | 5.8 | 5.8 | 5.7 | 0.0 | %vol |
| SP16KV_1 BM-High | 1.4 | 1.4 | 1.3 | 0.0 | %vol |
| SP17KV_1 BM-Mid | 0.0 | 0.0 | 0.0 | 0.0 | %vol |
| SP18KV_1 BM-Low | 0.0 | 0.0 | 0.0 | 0.0 | %vol |
| SP19KV_1 NWALL-Cav | 0.1 | 0.1 | 0.1 | 0.0 | %vol |
| SP20KV_1 STUD-Cav | 0.6 | 0.6 | 0.6 | 0.0 | %vol |
| SP21KV_1 FF-Void | 13.1 | 13.3 | 13.1 | 0.1 | %vol |
| SP22KV_1 SF-Void | 1.0 | 1.0 | 0.9 | 0.0 | %vol |
| SP23KV_1 ROOF-Void | 0.1 | 0.1 | 0.1 | 0.0 | %vol |
| RELEASEPRESSURE | | | | | barg |
| OUTLET PRESSURE | 0.0439 | 0.0460 | 0.0430 | 0.0008 | barg |
| LOWFLOWMETERCH4 | 1.7335 | 1.7422 | 1.7121 | 0.0067 | g/s |
| OUTLET TEMP | 3.7 | 3.8 | 3.6 | 0.1 | degC |
| Volume Flow Rate | 144.8 | 31.0 | 29.0 | 0.5 | SLPM |
| Energy Flow Rate | 86.6 | 2.3 | 2.2 | 0.0 | kW |
| External Wind Speed | 7.0 | | | | m/s |
| External Wind Direction | 221.6 | | | | bearing |





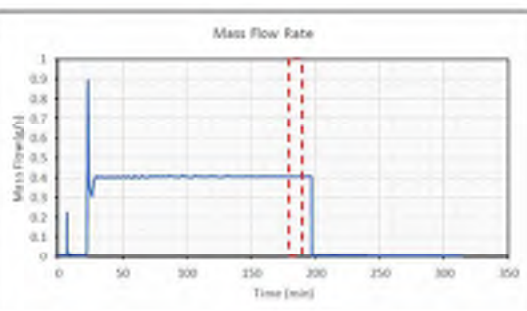
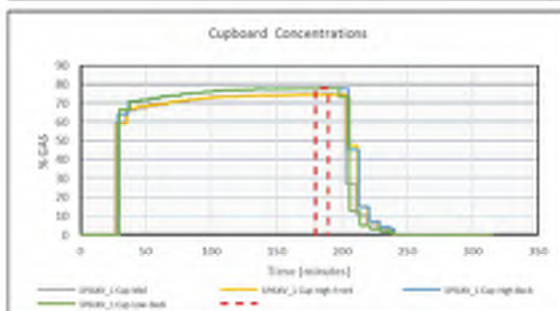
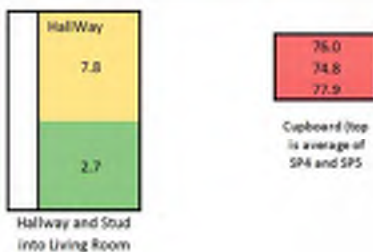
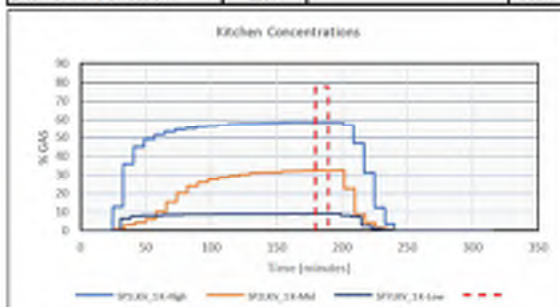
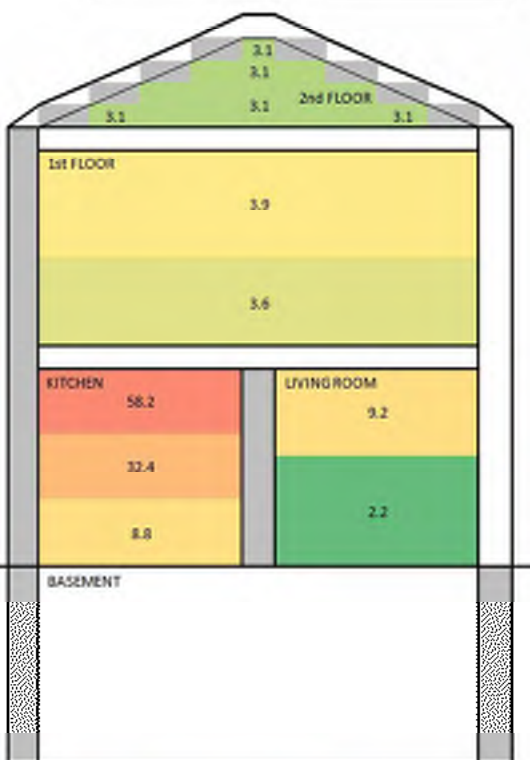
L3-038 RESULT

Hy4Heat WP7 Test Result

| | |
|---|----------------|
| MTP ID: L3-038 | |
| Hole Size: 10 mm | |
| Location: Boiler cupboard, all doors closed | |
| Gas: Methane | |
| Date: 00/11/2019 | Time: 20:00:00 |
| Averaging Period Start: 180 min | End: 190 min |

Notes: Analyser 2 tripped off circa 82 minutes

| Sensor | Average | Max | Min | STDEV | Units |
|-------------------------|---------|--------|--------|--------|---------|
| SP1KLV_1 K-High | 58.2 | 58.2 | 58.2 | 0.0 | %vol |
| SP2KLV_1 K-Mid | 32.4 | 32.5 | 32.2 | 0.1 | %vol |
| SP3KLV_1 Cup-Mid | 74.8 | 74.9 | 74.7 | 0.1 | %vol |
| SP4KLV_1 Cup-High-Front | 74.5 | 74.5 | 74.5 | 0.0 | %vol |
| SP5KLV_1 Cup-High-Back | 77.4 | 77.6 | 77.4 | 0.1 | %vol |
| SP6KLV_1 Cup-Low-Back | 77.9 | 78.0 | 77.9 | 0.0 | %vol |
| SP7KLV_1 K-Low | 8.8 | 8.8 | 8.8 | 0.0 | %vol |
| SP8KLV_1 LR-High | 9.2 | 9.2 | 9.2 | 0.0 | %vol |
| SP9KLV_1 LR-Mid | 2.2 | 2.2 | 2.2 | 0.0 | %vol |
| SP10KLV_1 H-High | 7.8 | 8.1 | 7.6 | 0.2 | %vol |
| SP11KLV_1 H-Mid | 2.7 | 2.8 | 2.6 | 0.1 | %vol |
| SP12KLV_1 FF-High | 3.9 | 3.9 | 3.9 | 0.0 | %vol |
| SP13KLV_1 FF-Mid | 3.6 | 3.7 | 3.6 | 0.0 | %vol |
| SP14KLV_1 AT-High | 3.1 | 3.4 | 3.0 | 0.1 | %vol |
| SP15KLV_1 AT-Mid | 3.1 | 3.1 | 3.0 | 0.1 | %vol |
| SP16KLV_2 BM-High | 0.0 | 0.1 | 0.0 | 0.0 | %vol |
| SP17KLV_2 BM-Mid | | | | | %vol |
| SP18KLV_2 BM-Low | | | | | %vol |
| SP19KLV_2 NWALL-Cav | | | | | %vol |
| SP20KLV_2 STUD-Cav | | | | | %vol |
| SP21KLV_1 FF-Void | | | | | %vol |
| SP22KLV_2 SF-Void | | | | | %vol |
| SP23KLV_2 ROOF-Void | | | | | %vol |
| RELEASEPRESSURE | 0.0200 | 0.0203 | 0.0194 | 0.0003 | barg |
| LOWFLOWMETERCH4 | 2.4938 | 2.5061 | 2.4798 | 0.0053 | g/s |
| OUTLET TEMP | 1.1 | 1.2 | 1.1 | 0.0 | degC |
| Volume Flow Rate | 208.6 | 0.0 | 0.0 | 0.0 | SLPM |
| Energy Flow Rate | 124.7 | 0.0 | 0.0 | 0.0 | kW |
| External Wind Speed | 2.9 | | | | m/s |
| External Wind Direction | 135.4 | | | | bearing |



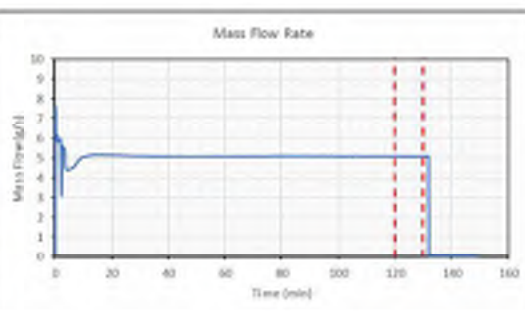
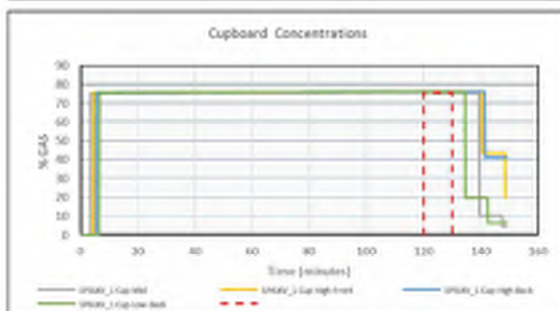
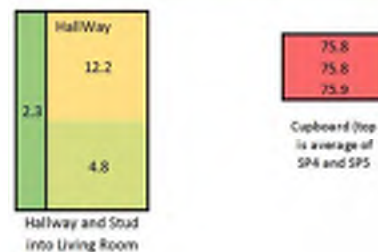
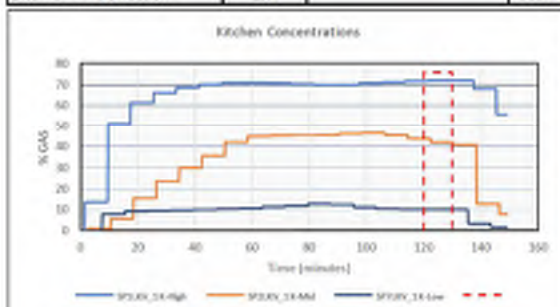
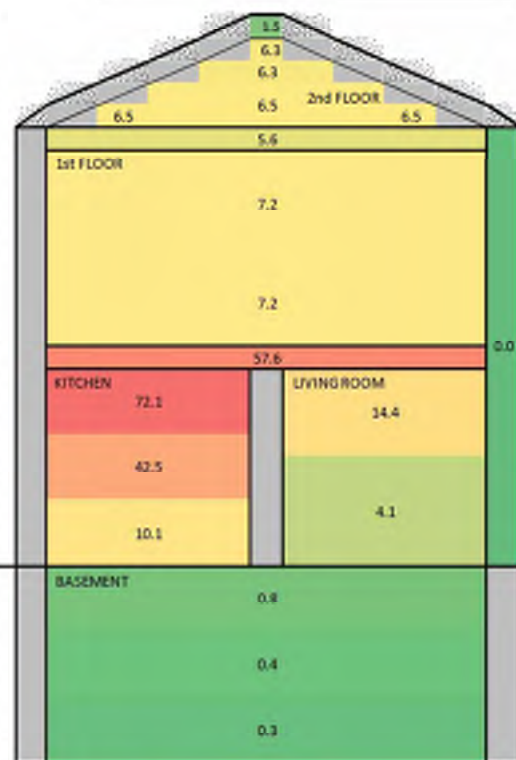
L3-039 RESULT

Hy4Heat WP7 Test Result

| | |
|--|----------------|
| MTP ID: L3-039 | |
| Hole Size: 10mm | |
| Location: Boiler Cupboard, kitchen door closed | |
| Gas: methane | |
| Date: 09/12/2019 | Time: 13:24:00 |
| Averaging Period Start: 120 min | End: 130 min |

Notes: Suspect VOL sensor in cupboard is 'topped out'

| Sensor | Average | Max | Min | STDEV | Units |
|-------------------------|---------|--------|--------|--------|---------|
| SP1KVV_1 K-High | 72.1 | 72.2 | 71.8 | 0.2 | %vol |
| SP2KVV_1 K-Mid | 42.5 | 43.7 | 42.0 | 0.8 | %vol |
| SP3KVV_1 Cup-Mid | 75.8 | 75.8 | 75.7 | 0.0 | %vol |
| SP4KVV_1 Cup-High-Front | 75.8 | 75.8 | 75.8 | 0.0 | %vol |
| SP5KVV_1 Cup-High-Back | 75.8 | 75.8 | 75.8 | 0.0 | %vol |
| SP6KVV_1 Cup-Low-Back | 75.9 | 75.9 | 75.9 | 0.0 | %vol |
| SP7KVV_1 K-Low | 10.1 | 10.1 | 10.0 | 0.0 | %vol |
| SP8KVV_1 LR-High | 14.4 | 14.7 | 13.9 | 0.2 | %vol |
| SP9KVV_1 LR-Mid | 4.1 | 4.2 | 4.0 | 0.0 | %vol |
| SP10KVV_1 H-High | 12.2 | 12.4 | 12.2 | 0.1 | %vol |
| SP11KVV_1 H-Mid | 4.8 | 4.9 | 4.8 | 0.0 | %vol |
| SP12KVV_1 FF-High | 7.2 | 7.3 | 7.1 | 0.1 | %vol |
| SP13KVV_1 FF-Mid | 7.2 | 7.3 | 7.1 | 0.1 | %vol |
| SP14KVV_1 AT-High | 6.3 | 6.6 | 6.2 | 0.2 | %vol |
| SP15KVV_1 AT-Mid | 6.5 | 6.7 | 6.5 | 0.1 | %vol |
| SP16KVV_1 BM-High | 0.8 | 0.8 | 0.8 | 0.0 | %vol |
| SP17KVV_1 BM-Mid | 0.4 | 0.5 | 0.4 | 0.0 | %vol |
| SP18KVV_1 BM-Low | 0.3 | 0.3 | 0.3 | 0.0 | %vol |
| SP19KVV_1 NWALL-Cav | 0.0 | 0.0 | 0.0 | 0.0 | %vol |
| SP20KVV_1 STUD-Cav | 2.3 | 2.4 | 2.1 | 0.1 | %vol |
| SP21KVV_1 FF-Void | 57.6 | 57.9 | 57.3 | 0.3 | %vol |
| SP22KVV_1 SF-Void | 5.6 | 5.8 | 5.6 | 0.1 | %vol |
| SP23KVV_1 ROOF-Void | 1.5 | 1.9 | 1.1 | 0.2 | %vol |
| RELEASEPRESSURE | 0.0847 | 0.0853 | 0.0838 | 0.0003 | barg |
| LOWFLOWMETERCH4 | 5.0623 | 5.0681 | 5.0529 | 0.0025 | g/s |
| OUTLET_TEMP | 5.7 | 5.8 | 5.5 | 0.1 | degC |
| Volume Flow Rate | 423.4 | 0.0 | 0.0 | 0.0 | SLPM |
| Energy Flow Rate | 253.1 | 0.0 | 0.0 | 0.0 | kW |
| External Wind Speed | 1.7 | | | | m/s |
| External Wind Direction | 29.4 | | | | bearing |



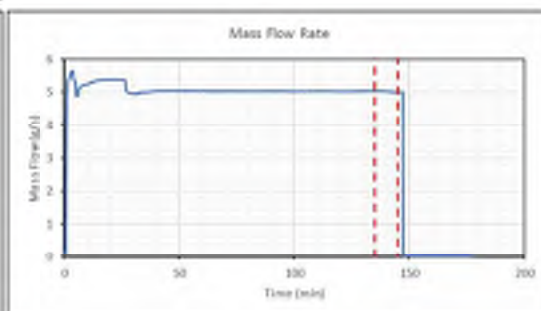
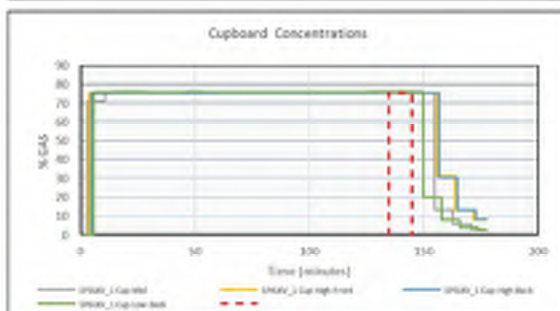
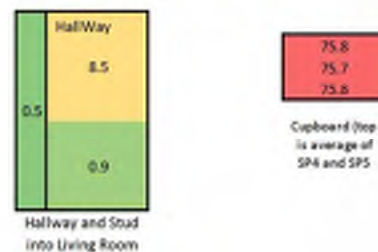
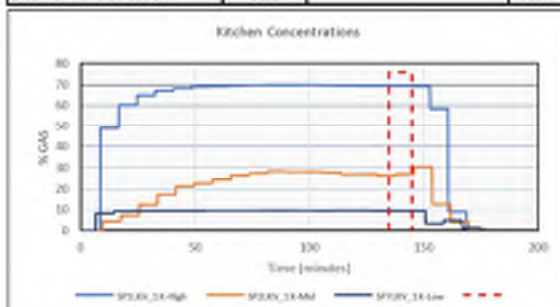
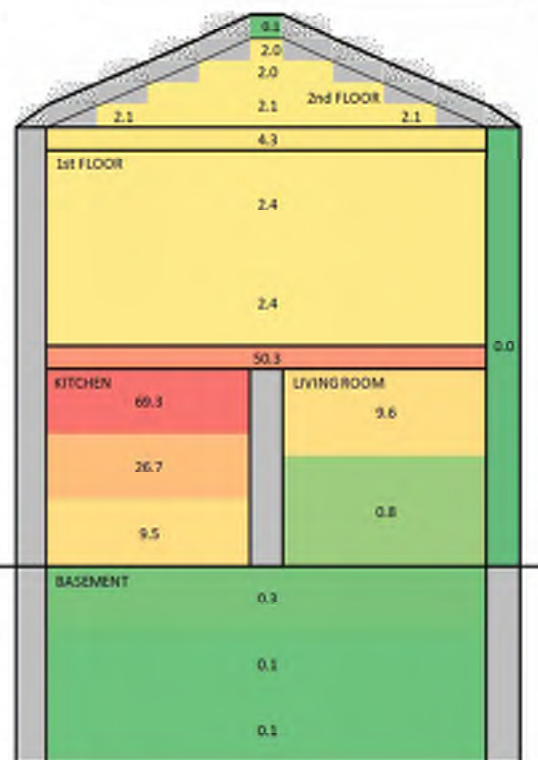
L3-040 RESULT

Hy4Heat WP7 Test Result

| | |
|--|----------------|
| MTP ID: L3-040 | |
| Hole Size: 15 mm | |
| Location: Boiler Cupboard, kitchen door closed | |
| Gas: methane | |
| Date: 09/12/2009 | Time: 16:55:00 |
| Averaging Period Start: 135 min | End: 145 min |

Notes: Suspect VOL sensor 'topped out' in boiler cupboard

| Sensor | Average | Max | Min | STDEV | Units |
|-------------------------|---------|--------|--------|--------|---------|
| SP1KVV_1 K-High | 69.3 | 69.4 | 69.2 | 0.0 | %vol |
| SP2KVV_1 K-Mid | 26.7 | 27.0 | 26.2 | 0.4 | %vol |
| SP3KVV_1 Cup-Mid | 75.7 | 75.7 | 75.7 | 0.0 | %vol |
| SP4KVV_1 Cup-High-Front | 75.8 | 75.8 | 75.8 | 0.0 | %vol |
| SP5KVV_1 Cup-High-Back | 75.8 | 75.8 | 75.8 | 0.0 | %vol |
| SP6KVV_1 Cup-Low-Back | 75.8 | 75.8 | 75.8 | 0.0 | %vol |
| SP7KVV_1 K-Low | 9.5 | 9.5 | 9.5 | 0.0 | %vol |
| SP8KVV_1 LR-High | 9.6 | 9.7 | 9.5 | 0.1 | %vol |
| SP9KVV_1 LR-Mid | 0.8 | 0.8 | 0.8 | 0.0 | %vol |
| SP10KVV_1 H-High | 8.5 | 8.6 | 8.2 | 0.2 | %vol |
| SP11KVV_2 H-Mid | 0.9 | 0.9 | 0.9 | 0.0 | %vol |
| SP12KVV_2 FF-High | 2.4 | 2.4 | 2.4 | 0.0 | %vol |
| SP13KVV_2 FF-Mid | 2.4 | 2.4 | 2.4 | 0.0 | %vol |
| SP14KVV_2 AT-High | 2.0 | 2.1 | 2.0 | 0.0 | %vol |
| SP15KVV_2 AT-Mid | 2.1 | 2.1 | 2.0 | 0.0 | %vol |
| SP16KVV_2 BM-High | 0.3 | 0.3 | 0.2 | 0.0 | %vol |
| SP17KVV_1 BM-Mid | 0.1 | 0.1 | 0.1 | 0.0 | %vol |
| SP18KVV_1 BM-Low | 0.1 | 0.1 | 0.1 | 0.0 | %vol |
| SP19KVV_1 NWALL-Cav | 0.0 | 0.0 | 0.0 | 0.0 | %vol |
| SP20KVV_1 STUD-Cav | 0.5 | 0.6 | 0.5 | 0.0 | %vol |
| SP21KVV_1 FF-Void | 50.3 | 50.3 | 50.3 | 0.0 | %vol |
| SP22KVV_1 SF-Void | 4.3 | 4.3 | 4.3 | 0.0 | %vol |
| SP23KVV_1 ROOF-Void | 0.1 | 0.1 | 0.1 | 0.0 | %vol |
| RELEASEPRESSURE | 0.0115 | 0.0121 | 0.0108 | 0.0002 | barg |
| LOWFLOWMETERCH4 | 5.0054 | 5.0226 | 4.9924 | 0.0088 | g/s |
| OUTLET_TEMP | 7.2 | 7.4 | 7.2 | 0.1 | degC |
| Volume Flow Rate | 418.6 | 420.1 | 417.5 | 0.7 | L/PM |
| Energy Flow Rate | 250.3 | 251.1 | 249.6 | 0.4 | kW |
| External Wind Speed | 2.7 | | | | m/s |
| External Wind Direction | 91.1 | | | | bearing |



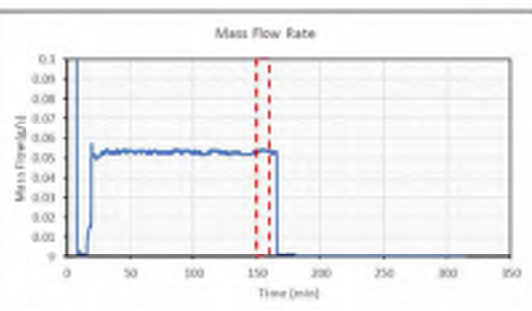
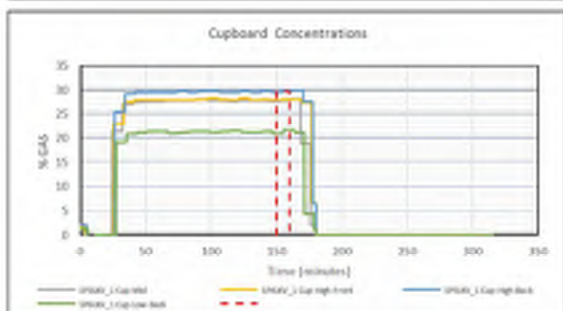
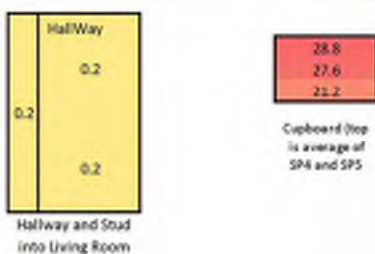
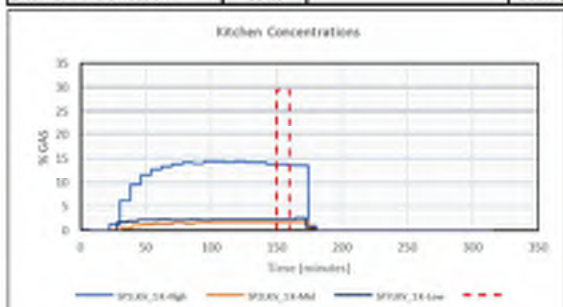
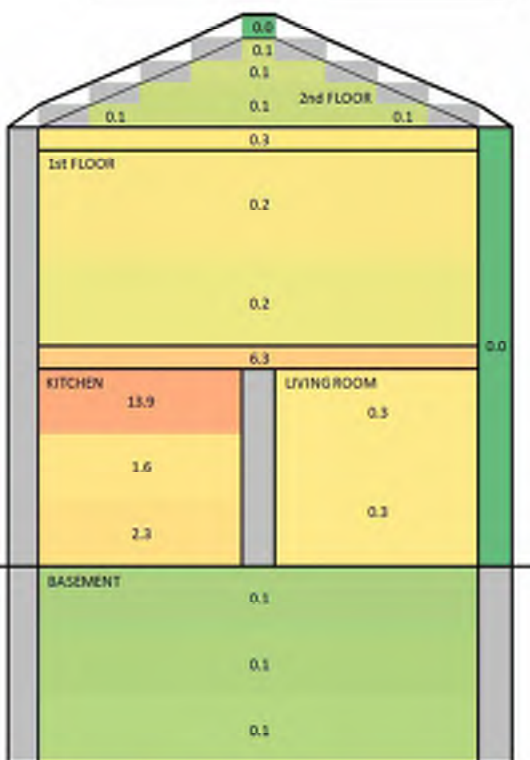
L3-041 RESULT

Hy4Heat WP7 Test Result

| | |
|---|----------------|
| MTP ID: L3-041 | |
| Hole Size: 5.1 mm | |
| Location: Boiler cupboard, all doors open | |
| Gas: Methane | |
| Date: 08/11/2019 | Time: 09:30:00 |
| Averaging Period Start: 150 min | End: 160 min |

Notes:

| Sensor | Average | Max | Min | STDEV | Units |
|-------------------------|---------|--------|--------|--------|---------|
| SP1KLV_1 K-High | 13.9 | 13.9 | 13.7 | 0.1 | %vol |
| SP2KLV_1 K-Mid | 1.6 | 1.6 | 1.6 | 0.0 | %vol |
| SP3KLV_1 Cup-Mid | 27.6 | 27.7 | 27.5 | 0.1 | %vol |
| SP4KLV_1 Cup-High-Front | 28.0 | 28.0 | 27.9 | 0.1 | %vol |
| SP5KLV_1 Cup-High-Back | 29.6 | 29.7 | 29.4 | 0.1 | %vol |
| SP6KLV_1 Cup-Low-Back | 21.2 | 21.7 | 20.8 | 0.5 | %vol |
| SP7KLV_1 K-Low | 2.3 | 2.3 | 2.3 | 0.0 | %vol |
| SP8KLV_2 LR-High | 0.3 | 0.3 | 0.2 | 0.0 | %vol |
| SP9KLV_1 LR-Mid | 0.3 | 0.4 | 0.2 | 0.1 | %vol |
| SP10KLV_2 H-High | 0.2 | 0.4 | 0.2 | 0.1 | %vol |
| SP11KLV_2 H-Mid | 0.2 | 0.2 | 0.2 | 0.0 | %vol |
| SP12KLV_2 FF-High | 0.2 | 0.2 | 0.2 | 0.0 | %vol |
| SP13KLV_2 FF-Mid | 0.2 | 0.2 | 0.2 | 0.0 | %vol |
| SP14KLV_2 AT-High | 0.1 | 0.1 | 0.1 | 0.0 | %vol |
| SP15KLV_2 AT-Mid | 0.1 | 0.1 | 0.1 | 0.0 | %vol |
| SP16KLV_2 BM-High | 0.1 | 0.1 | 0.1 | 0.0 | %vol |
| SP17KLV_2 BM-Mid | 0.1 | 0.1 | 0.1 | 0.0 | %vol |
| SP18KLV_2 BM-Low | 0.1 | 0.1 | 0.1 | 0.0 | %vol |
| SP19KLV_2 NWALL-Cav | 0.0 | 0.0 | 0.0 | 0.0 | %vol |
| SP20KLV_2 STUD-Cav | 0.2 | 0.2 | 0.2 | 0.0 | %vol |
| SP21KLV_1 FF-Void | 6.3 | 6.5 | 6.1 | 0.2 | %vol |
| SP22KLV_2 SF-Void | 0.3 | 0.3 | 0.3 | 0.0 | %vol |
| SP23KLV_2 ROOF-Void | 0.0 | 0.0 | 0.0 | 0.0 | %vol |
| RELEASEPRESSURE | 0.0030 | 0.0034 | 0.0027 | 0.0002 | barg |
| LOWFLOWMETERCH4 | 0.3286 | 0.3336 | 0.3186 | 0.0028 | g/s |
| OUTLET_TEMP | 2.5 | 2.6 | 2.4 | 0.1 | degC |
| Volume Flow Rate | 27.5 | 0.0 | 0.0 | 0.0 | SLPM |
| Energy Flow Rate | 16.4 | 0.0 | 0.0 | 0.0 | kW |
| External Wind Speed | 4.7 | | | | m/s |
| External Wind Direction | 354.8 | | | | bearing |



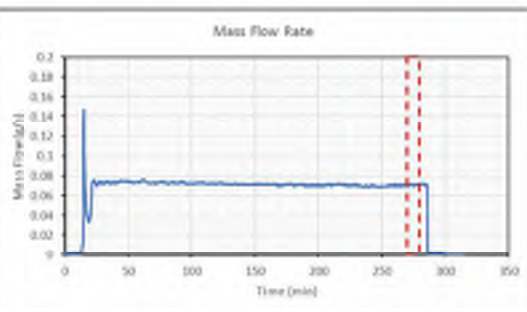
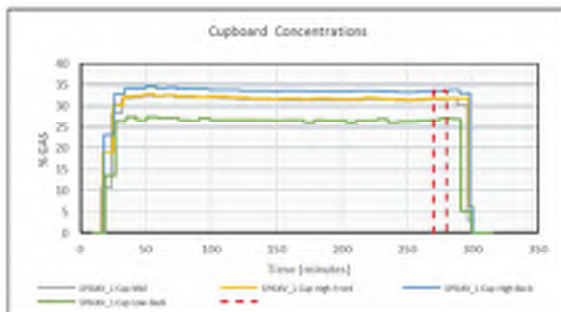
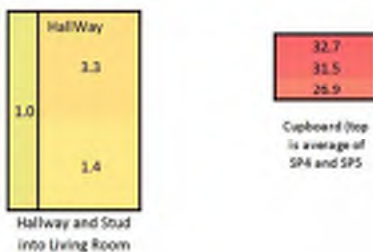
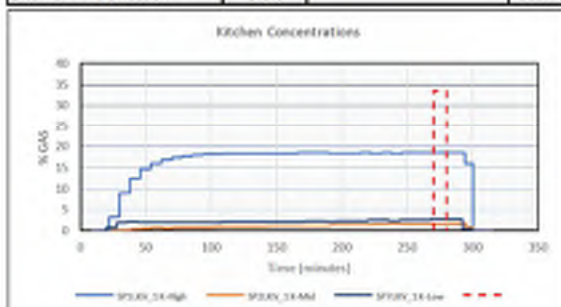
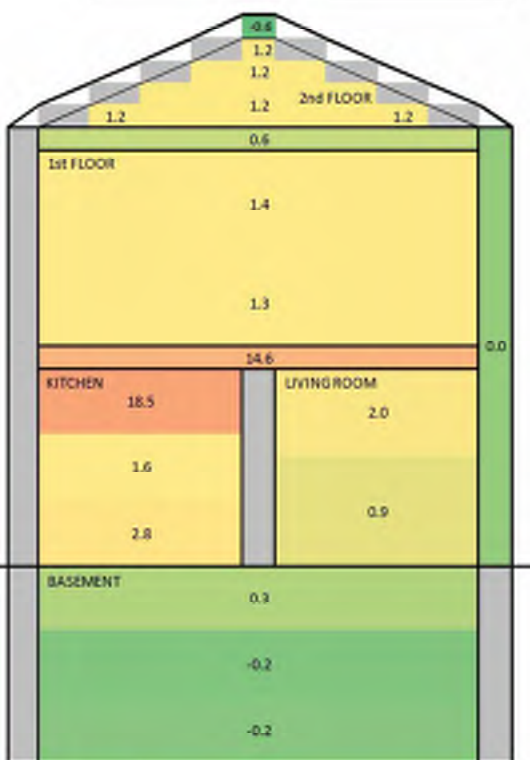
L3-042 RESULT

Hy4Heat WP7 Test Result

| | |
|---|----------------|
| MTP ID: L3-042 | |
| Hole Size: 5.1 mm | |
| Location: Boiler cupboard, all doors open | |
| Gas: Methane | |
| Date: 08/11/2019 | Time: 15:15:00 |
| Averaging Period Start: 270 min | End: 280 min |

Notes:

| Sensor | Average | Max | Min | STDEV | Units |
|-------------------------|---------|--------|--------|--------|---------|
| SP1KV_1 K-High | 18.5 | 18.5 | 18.5 | 0.0 | %vol |
| SP2KV_1 K-Mid | 1.6 | 1.7 | 1.6 | 0.0 | %vol |
| SP3KV_1 Cup-Mid | 31.5 | 31.7 | 31.5 | 0.0 | %vol |
| SP4KV_1 Cup-High-Front | 31.9 | 31.9 | 31.9 | 0.0 | %vol |
| SP5KV_1 Cup-High-Back | 33.6 | 33.6 | 33.5 | 0.1 | %vol |
| SP6KV_1 Cup-Low-Back | 26.9 | 27.1 | 26.6 | 0.2 | %vol |
| SP7KV_1 K-Low | 2.8 | 2.8 | 2.8 | 0.0 | %vol |
| SP8KV_2 LR-High | 2.0 | 2.1 | 1.9 | 0.1 | %vol |
| SP9KV_1 LR-Mid | 0.9 | 0.9 | 0.9 | 0.0 | %vol |
| SP10KV_2 H-High | 3.3 | 3.3 | 3.1 | 0.1 | %vol |
| SP11KV_2 H-Mid | 1.4 | 1.4 | 1.4 | 0.0 | %vol |
| SP12KV_2 FF-High | 1.4 | 1.4 | 1.4 | 0.0 | %vol |
| SP13KV_2 FF-Mid | 1.3 | 1.4 | 1.3 | 0.0 | %vol |
| SP14KV_2 AT-High | 1.2 | 1.2 | 1.1 | 0.0 | %vol |
| SP15KV_2 AT-Mid | 1.2 | 1.2 | 1.1 | 0.0 | %vol |
| SP16KV_1 BM-High | 0.3 | 0.3 | 0.3 | 0.0 | %vol |
| SP17KV_1 BM-Mid | -0.2 | -0.2 | -0.2 | 0.0 | %vol |
| SP18KV_1 BM-Low | -0.2 | 0.0 | -0.2 | 0.1 | %vol |
| SP19KV_2 NWALL-Cav | 0.0 | 0.1 | 0.0 | 0.0 | %vol |
| SP20KV_2 STUD-Cav | 1.0 | 1.0 | 1.0 | 0.0 | %vol |
| SP21KV_1 FF-Void | 14.6 | 14.7 | 14.5 | 0.1 | %vol |
| SP22KV_1 SF-Void | 0.6 | 0.6 | 0.6 | 0.0 | %vol |
| SP23KV_1 ROOF-Void | -0.6 | -0.6 | -0.6 | 0.0 | %vol |
| RELEASEPRESSURE | 0.0050 | 0.0055 | 0.0047 | 0.0002 | barg |
| LOWFLOWMETERCH4 | 0.4345 | 0.4423 | 0.4273 | 0.0041 | g/s |
| OUTLET_TEMP | -0.6 | -0.3 | -0.8 | 0.1 | degC |
| Volume Flow Rate | 36.3 | 0.0 | 0.0 | 0.0 | SLPM |
| Energy Flow Rate | 21.7 | 0.0 | 0.0 | 0.0 | kW |
| External Wind Speed | 1.0 | | | | m/s |
| External Wind Direction | 349.8 | | | | bearing |



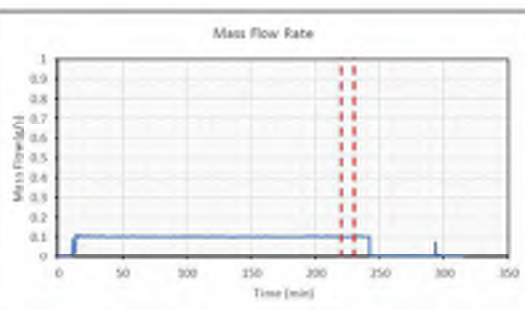
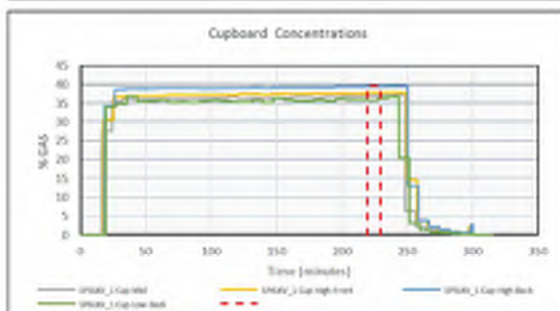
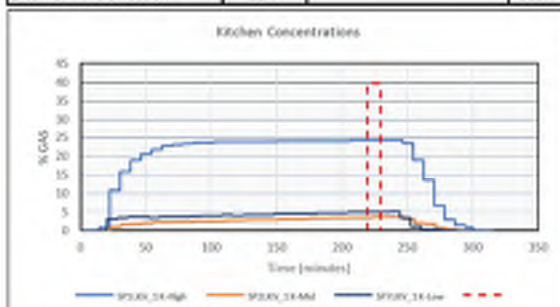
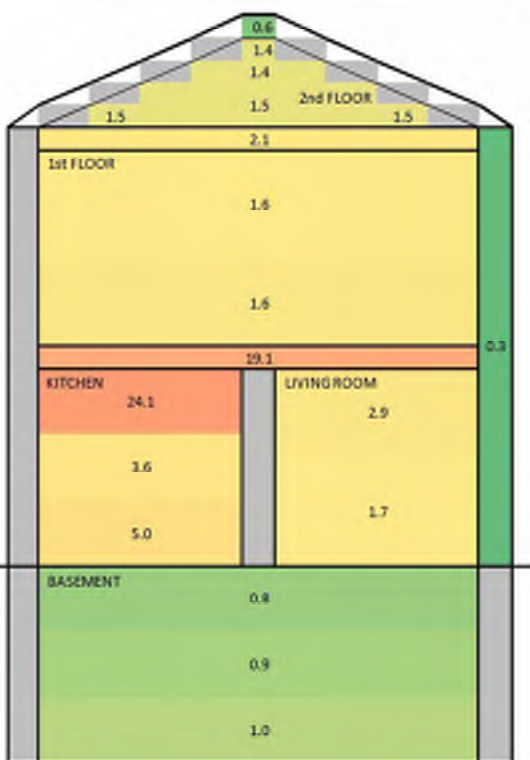
L3-043 RESULT

Hy4Heat WP7 Test Result

| | |
|---|----------------|
| MTP ID: L3-043 | |
| Hole Size: 5.1 mm | |
| Location: Boiler cupboard, all doors open | |
| Gas: Methane | |
| Date: 08/11/2019 | Time: 21:00:00 |
| Averaging Period Start: 220 min | End: 230 min |

Notes:

| Sensor | Average | Max | Min | STDEV | Units |
|-------------------------|---------|--------|--------|--------|---------|
| SP1KVV_1 K-High | 24.1 | 24.1 | 24.1 | 0.0 | %vol |
| SP2KVV_1 K-Mid | 3.6 | 3.7 | 3.4 | 0.1 | %vol |
| SP3KVV_1 Cup-Mid | 36.8 | 36.9 | 36.8 | 0.1 | %vol |
| SP4KVV_1 Cup-High-Front | 37.7 | 37.7 | 37.7 | 0.0 | %vol |
| SP5KVV_1 Cup-High-Back | 39.6 | 39.7 | 39.6 | 0.1 | %vol |
| SP6KVV_1 Cup-Low-Back | 35.8 | 36.2 | 35.7 | 0.2 | %vol |
| SP7KVV_1 K-Low | 5.0 | 5.0 | 5.0 | 0.0 | %vol |
| SP8KVV_1 LR-High | 2.9 | 2.9 | 2.8 | 0.0 | %vol |
| SP9KVV_1 LR-Mid | 1.7 | 1.7 | 1.7 | 0.0 | %vol |
| SP10KVV_1 H-High | 5.4 | 5.8 | 5.2 | 0.3 | %vol |
| SP11KVV_2 H-Mid | 1.6 | 1.6 | 1.6 | 0.0 | %vol |
| SP12KVV_2 FF-High | 1.6 | 1.6 | 1.6 | 0.0 | %vol |
| SP13KVV_2 FF-Mid | 1.6 | 1.6 | 1.5 | 0.0 | %vol |
| SP14KVV_2 AT-High | 1.4 | 1.5 | 1.4 | 0.0 | %vol |
| SP15KVV_2 AT-Mid | 1.5 | 1.5 | 1.4 | 0.0 | %vol |
| SP16KVV_2 BM-High | 0.8 | 0.8 | 0.8 | 0.0 | %vol |
| SP17KVV_1 BM-Mid | 0.9 | 0.9 | 0.9 | 0.0 | %vol |
| SP18KVV_2 BM-Low | 1.0 | 1.1 | 1.0 | 0.0 | %vol |
| SP19KVV_2 NWALL-Cav | 0.3 | 0.3 | 0.3 | 0.0 | %vol |
| SP20KVV_2 STUD-Cav | 1.2 | 1.3 | 1.2 | 0.0 | %vol |
| SP21KVV_1 FF-Void | 19.1 | 19.2 | 19.0 | 0.1 | %vol |
| SP22KVV_1 SF-Void | 2.1 | 2.2 | 2.0 | 0.1 | %vol |
| SP23KVV_1 ROOF-Void | 0.6 | 0.6 | 0.6 | 0.0 | %vol |
| RELEASEPRESSURE | 0.0099 | 0.0103 | 0.0096 | 0.0002 | barg |
| LOWFLOWMETERCH4 | 0.6249 | 0.6297 | 0.6185 | 0.0027 | g/s |
| OUTLET_TEMP | -1.5 | -1.3 | -1.5 | 0.1 | degC |
| Volume Flow Rate | 52.3 | 0.0 | 0.0 | 0.0 | SLPM |
| Energy Flow Rate | 31.2 | 0.0 | 0.0 | 0.0 | kW |
| External Wind Speed | 0.6 | | | | m/s |
| External Wind Direction | 127.4 | | | | bearing |



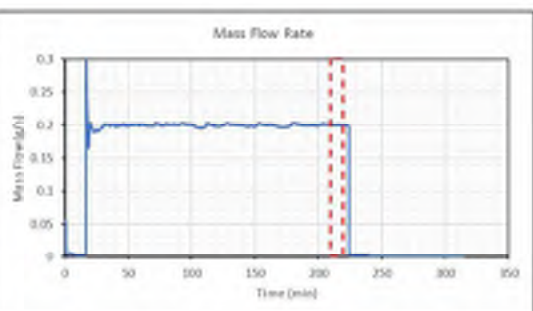
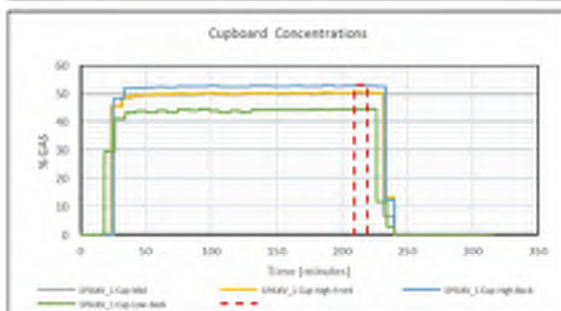
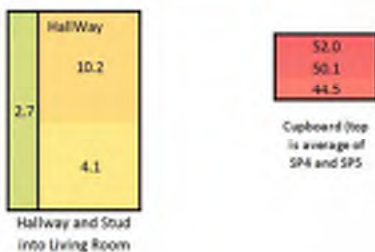
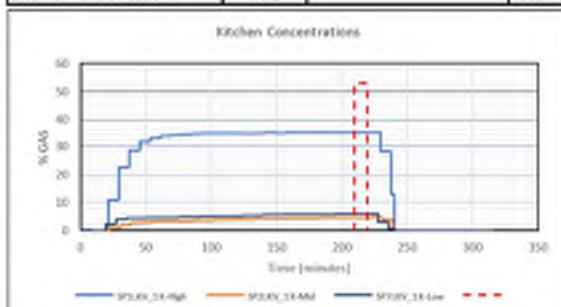
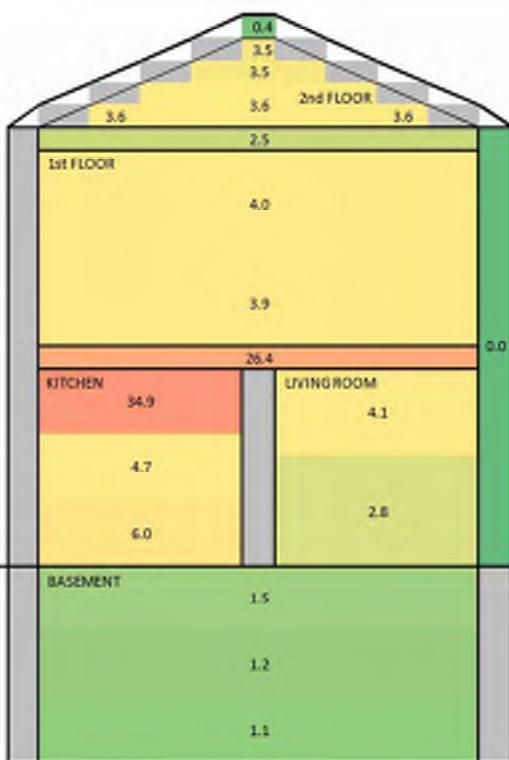
L3-044 RESULT

Hy4Heat WP7 Test Result

| | |
|---|----------------|
| MTP ID: L3-044 | |
| Hole Size: 10mm | |
| Location: Boiler cupboard, all doors open | |
| Gas: Methane | |
| Date: 09/11/2019 | Time: 02:45:00 |
| Averaging Period Start: 220 min | End: 220 min |

Notes:

| Sensor | Average | Max | Min | STDEV | Units |
|-------------------------|---------|--------|--------|--------|---------|
| SP1KV_1 K-High | 34.9 | 34.9 | 34.9 | 0.0 | %vol |
| SP2KV_1 K-Mid | 4.7 | 4.7 | 4.7 | 0.0 | %vol |
| SP3KV_1 Cup-Mid | 50.1 | 50.1 | 50.1 | 0.0 | %vol |
| SP4KV_1 Cup-High-Front | 50.8 | 50.9 | 50.7 | 0.1 | %vol |
| SP5KV_1 Cup-High-Back | 53.2 | 53.2 | 53.0 | 0.1 | %vol |
| SP6KV_1 Cup-Low-Back | 44.5 | 44.5 | 44.4 | 0.0 | %vol |
| SP7KV_1 K-Low | 6.0 | 6.0 | 6.0 | 0.0 | %vol |
| SP8KV_1 LR-High | 4.1 | 4.3 | 4.1 | 0.1 | %vol |
| SP9KV_1 LR-Mid | 2.8 | 2.8 | 2.8 | 0.0 | %vol |
| SP10KV_1 H-High | 10.2 | 10.3 | 10.1 | 0.1 | %vol |
| SP11KV_1 H-Mid | 4.1 | 4.2 | 4.0 | 0.1 | %vol |
| SP12KV_1 FF-High | 4.0 | 4.0 | 4.0 | 0.0 | %vol |
| SP13KV_1 FF-Mid | 3.9 | 4.0 | 3.9 | 0.0 | %vol |
| SP14KV_1 AT-High | 3.5 | 3.7 | 3.4 | 0.1 | %vol |
| SP15KV_1 AT-Mid | 3.6 | 3.7 | 3.4 | 0.1 | %vol |
| SP16KV_1 BM-High | 1.5 | 1.5 | 1.5 | 0.0 | %vol |
| SP17KV_1 BM-Mid | 1.2 | 1.2 | 1.2 | 0.0 | %vol |
| SP18KV_1 BM-Low | 1.1 | 1.2 | 1.0 | 0.1 | %vol |
| SP19KV_1 NWALL-Cav | 0.0 | 0.0 | 0.0 | 0.0 | %vol |
| SP20KV_1 STUD-Cav | 2.7 | 2.7 | 2.7 | 0.0 | %vol |
| SP21KV_1 FF-Void | 26.4 | 26.4 | 26.4 | 0.0 | %vol |
| SP22KV_1 SF-Void | 2.5 | 2.7 | 2.5 | 0.0 | %vol |
| SP23KV_1 ROOF-Void | 0.4 | 0.4 | 0.4 | 0.0 | %vol |
| RELEASEPRESSURE | 0.0049 | 0.0055 | 0.0047 | 0.0002 | barg |
| LOWFLOWMETERCH4 | 1.2223 | 1.2257 | 1.2182 | 0.0028 | g/s |
| OUTLET_TEMP | -1.7 | -1.6 | -1.9 | 0.1 | degC |
| Volume Flow Rate | 102.2 | 0.0 | 0.0 | 0.0 | SLPM |
| Energy Flow Rate | 61.1 | 0.0 | 0.0 | 0.0 | kW |
| External Wind Speed | 1.8 | | | | m/s |
| External Wind Direction | 70.2 | | | | bearing |



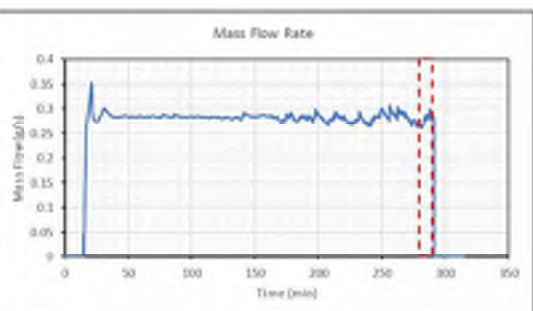
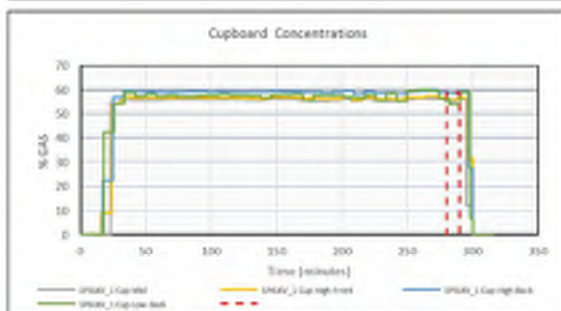
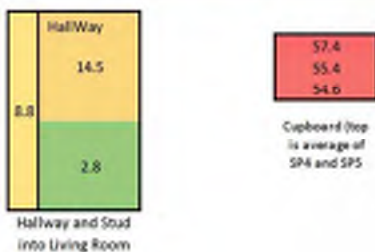
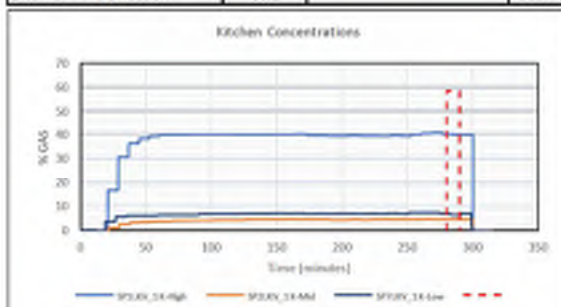
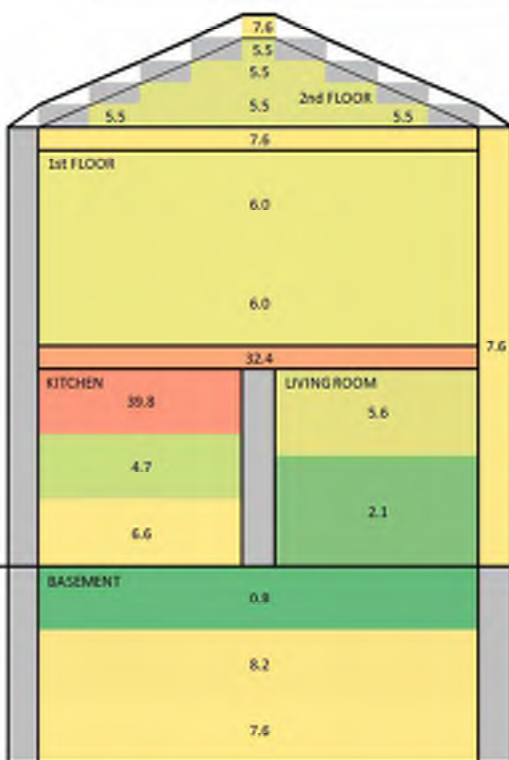
L3-045 RESULT

Hy4Heat WP7 Test Result

| | |
|---|----------------|
| MTP ID: L3-045 | |
| Hole Size: 10mm | |
| Location: Boiler cupboard, all doors open | |
| Gas: Methane | |
| Date: 09/11/2019 | Time: 09:00:00 |
| Averaging Period Start: 280 min | End: 290 min |

Notes:

| Sensor | Average | Max | Min | STDEV | Units |
|-------------------------|---------|--------|--------|--------|---------|
| SP1KVV_1 K-High | 39.8 | 40.0 | 39.7 | 0.2 | %vol |
| SP2KVV_1 K-Mid | 4.7 | 4.7 | 4.7 | 0.0 | %vol |
| SP3KVV_1 Cup-Mid | 55.4 | 56.2 | 55.1 | 0.5 | %vol |
| SP4KVV_1 Cup-High-Front | 56.1 | 56.7 | 56.0 | 0.3 | %vol |
| SP5KVV_1 Cup-High-Back | 58.7 | 59.3 | 58.5 | 0.3 | %vol |
| SP6KVV_1 Cup-Low-Back | 54.6 | 59.0 | 54.0 | 1.1 | %vol |
| SP7KVV_1 K-Low | 6.6 | 7.0 | 6.4 | 0.3 | %vol |
| SP8KVV_1 LR-High | 5.6 | 5.6 | 5.6 | 0.0 | %vol |
| SP9KVV_1 LR-Mid | 2.1 | 2.1 | 2.1 | 0.0 | %vol |
| SP10KVV_1 H-High | 14.5 | 14.5 | 14.4 | 0.1 | %vol |
| SP11KVV_1 H-Mid | 2.8 | 3.0 | 2.7 | 0.1 | %vol |
| SP12KVV_1 FF-High | 6.0 | 6.0 | 6.0 | 0.0 | %vol |
| SP13KVV_1 FF-Mid | 6.0 | 6.0 | 5.9 | 0.0 | %vol |
| SP14KVV_1 AT-High | 5.5 | 5.5 | 5.4 | 0.0 | %vol |
| SP15KVV_1 AT-Mid | 5.5 | 5.5 | 5.5 | 0.0 | %vol |
| SP16KVV_1 BM-High | 0.8 | 0.9 | 0.8 | 0.1 | %vol |
| SP17KVV_1 BM-Mid | 8.2 | 8.8 | 7.6 | 0.6 | %vol |
| SP18KVV_1 BM-Low | 7.6 | 7.6 | 7.6 | 0.0 | %vol |
| SP19KVV_1 NWALL-Cav | 7.6 | 7.6 | 7.6 | 0.0 | %vol |
| SP20KVV_1 STUD-Cav | 8.8 | 8.8 | 8.8 | 0.0 | %vol |
| SP21KVV_1 FF-Void | 32.4 | 32.4 | 32.4 | 0.0 | %vol |
| SP22KVV_1 SF-Void | 7.6 | 7.6 | 7.6 | 0.0 | %vol |
| SP23KVV_1 ROOF-Void | 7.6 | 7.6 | 7.6 | 0.0 | %vol |
| RELEASEPRESSURE | 0.0097 | 0.0115 | 0.0081 | 0.0007 | barg |
| LOWFLOWMETERCH4 | 1.7074 | 1.8401 | 1.6068 | 0.0598 | g/s |
| OUTLET_TEMP | 0.2 | 0.4 | 0.1 | 0.1 | degC |
| Volume Flow Rate | 142.8 | 0.0 | 0.0 | 0.0 | SLPM |
| Energy Flow Rate | 85.4 | 0.0 | 0.0 | 0.0 | kW |
| External Wind Speed | 2.7 | | | | m/s |
| External Wind Direction | 80.2 | | | | bearing |



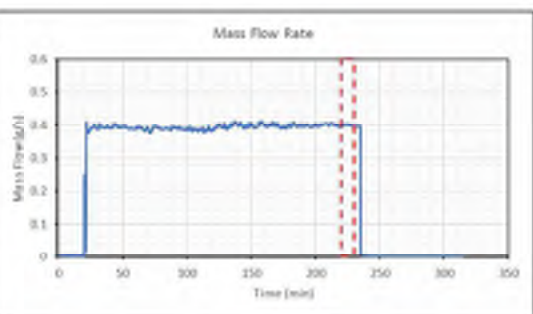
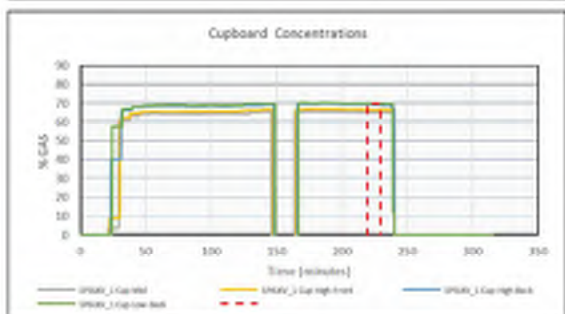
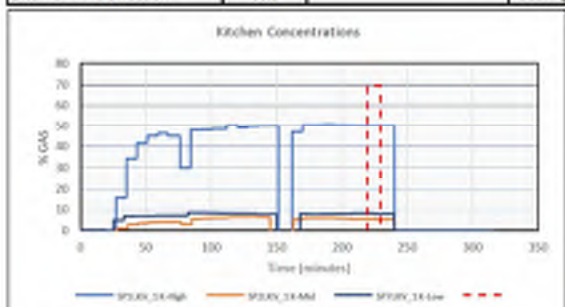
L3-046 RESULT

Hy4Heat WP7 Test Result

| | |
|---------------------------------|----------------|
| MTP ID: L3-046 | |
| Hole Size: 10mm | |
| Location: Boiler cupboard | |
| Gas: Methane | |
| Date: 10/11/2019 | Time: 13:30:00 |
| Averaging Period Start: 220 min | End: 230 min |

Notes:

| Sensor | Average | Max | Min | STDEV | Units |
|-------------------------|---------|--------|--------|--------|---------|
| SP1KLV_1 K-High | 50.0 | 50.0 | 50.0 | 0.0 | %vol |
| SP2KLV_1 K-Mid | 5.6 | 5.6 | 5.4 | 0.1 | %vol |
| SP3KLV_1 Cup-Mid | 65.4 | 65.4 | 65.4 | 0.0 | %vol |
| SP4KLV_1 Cup-High-Front | 66.4 | 66.7 | 66.3 | 0.1 | %vol |
| SP5KLV_1 Cup-High-Back | 69.2 | 69.4 | 69.0 | 0.1 | %vol |
| SP6KLV_1 Cup-Low-Back | 69.6 | 69.8 | 69.5 | 0.1 | %vol |
| SP7KLV_1 K-Low | 8.1 | 8.3 | 8.0 | 0.1 | %vol |
| SP8KLV_1 LR-High | 10.6 | 10.6 | 10.6 | 0.0 | %vol |
| SP9KLV_1 LR-Mid | 2.4 | 2.4 | 2.4 | 0.0 | %vol |
| SP10KLV_1 H-High | 21.9 | 22.1 | 21.8 | 0.2 | %vol |
| SP11KLV_1 H-Mid | 3.7 | 3.7 | 3.7 | 0.0 | %vol |
| SP12KLV_1 FF-High | 11.2 | 11.2 | 10.9 | 0.1 | %vol |
| SP13KLV_1 FF-Mid | 11.2 | 11.4 | 11.2 | 0.0 | %vol |
| SP14KLV_1 AT-High | 10.3 | 10.3 | 10.1 | 0.1 | %vol |
| SP15KLV_1 AT-Mid | 10.2 | 10.3 | 10.1 | 0.1 | %vol |
| SP16KLV_1 BM-High | 1.1 | 1.1 | 1.1 | 0.0 | %vol |
| SP17KLV_1 BM-Mid | 0.4 | 0.4 | 0.4 | 0.0 | %vol |
| SP18KLV_1 BM-Low | 0.4 | 0.4 | 0.4 | 0.0 | %vol |
| SP19KLV_1 NWALL-Cav | 0.8 | 0.8 | 0.8 | 0.0 | %vol |
| SP20KLV_1 STUD-Cav | 2.1 | 2.2 | 2.1 | 0.0 | %vol |
| SP21KLV_1 FF-Void | 37.6 | 37.6 | 37.6 | 0.0 | %vol |
| SP22KLV_1 SF-Void | 4.1 | 4.4 | 4.0 | 0.2 | %vol |
| SP23KLV_1 ROOF-Void | 1.8 | 1.9 | 1.7 | 0.1 | %vol |
| RELEASEPRESSURE | 0.0205 | 0.0209 | 0.0192 | 0.0005 | barg |
| LOWFLOWMETERCH4 | 2.4542 | 2.4723 | 2.4233 | 0.0113 | g/s |
| OUTLET_TEMP | -6.9 | -6.7 | -7.3 | 0.1 | degC |
| Volume Flow Rate | 205.3 | 0.0 | 0.0 | 0.0 | SLPM |
| Energy Flow Rate | 122.7 | 0.0 | 0.0 | 0.0 | kW |
| External Wind Speed | 1.3 | | | | m/s |
| External Wind Direction | 88.3 | | | | bearing |



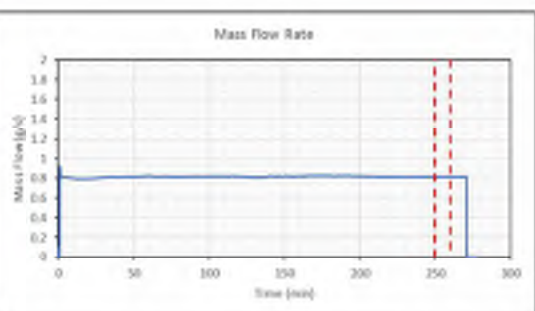
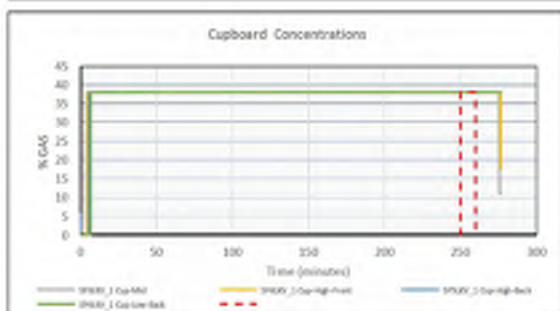
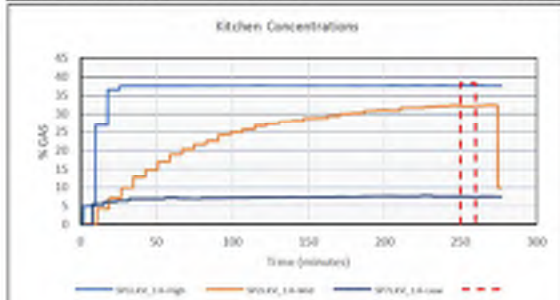
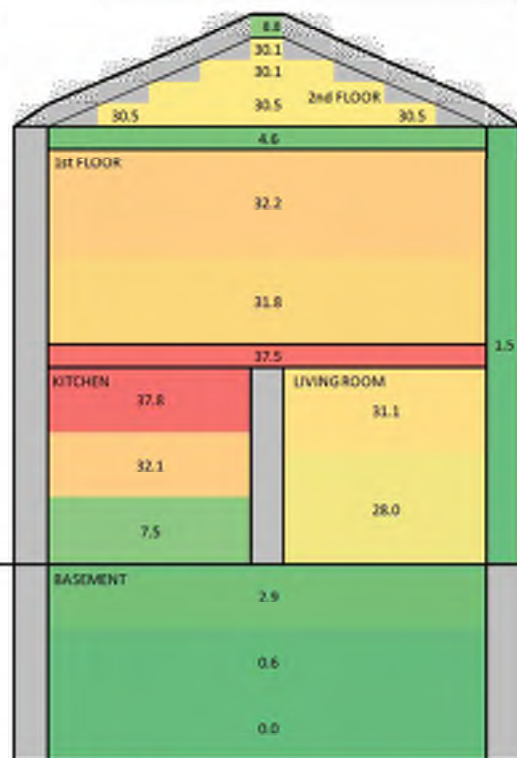
L3-047 RESULT

Hy4Heat WP7 Test Result

| | |
|--|----------------|
| MTP ID: L3-047 | |
| Hole Size: 10mm | |
| Location: kitchen boiler cupboard - doors open | |
| Gas: methane | |
| Date: 22/01/2020 | Time: 14:00:00 |
| Averaging Period Start: 250 min | End: 260 min |

Notes: CAUTION - Analyser 1 is 'topped out' on SP3 to SP5 (in the cupboard)

| Sensor | Average | Max | Min | STDEV | Units |
|-------------------------|---------|--------|--------|--------|---------|
| SP1K_V_1 K-High | 37.8 | 37.8 | 37.7 | 0.0 | %vol |
| SP2K_V_1 K-Mid | 32.1 | 32.3 | 32.1 | 0.1 | %vol |
| SP3K_V_1 Cup-Mid | 38.1 | 38.1 | 38.1 | 0.0 | %vol |
| SP4K_V_1 Cup-High-Front | 38.1 | 38.1 | 38.0 | 0.0 | %vol |
| SP5K_V_1 Cup-High-Back | 38.1 | 38.1 | 38.1 | 0.0 | %vol |
| SP6K_V_1 Cup-Low-Back | 38.0 | 38.0 | 38.0 | 0.0 | %vol |
| SP7K_V_1 K-Low | 7.5 | 7.5 | 7.4 | 0.0 | %vol |
| SP8K_V_1 LR-High | 31.1 | 31.1 | 31.1 | 0.0 | %vol |
| SP9K_V_1 LR-Mid | 28.0 | 28.1 | 27.8 | 0.0 | %vol |
| SP10K_V_1 H-High | 37.3 | 37.4 | 37.0 | 0.1 | %vol |
| SP11K_V_1 H-Mid | 30.5 | 30.6 | 30.3 | 0.1 | %vol |
| SP12K_V_1 FF-High | 32.2 | 32.2 | 32.1 | 0.0 | %vol |
| SP13K_V_1 FF-Mid | 31.8 | 31.9 | 31.7 | 0.1 | %vol |
| SP14K_V_1 AT-High | 30.1 | 30.1 | 30.1 | 0.0 | %vol |
| SP15K_V_1 AT-Mid | 30.5 | 30.6 | 30.5 | 0.0 | %vol |
| SP16K_V_1 BM-High | 2.9 | 3.0 | 2.9 | 0.0 | %vol |
| SP17K_V_1 BM-Mid | 0.6 | 0.7 | 0.6 | 0.0 | %vol |
| SP18K_V_1 BM-Low | 0.0 | 0.0 | 0.0 | 0.0 | %vol |
| SP19K_V_1 NWALL-Cav | 1.5 | 1.6 | 1.5 | 0.0 | %vol |
| SP20K_V_1 STUD-Cav | 13.7 | 13.7 | 13.7 | 0.0 | %vol |
| SP21K_V_1 FF-Void | 37.5 | 37.5 | 37.5 | 0.0 | %vol |
| SP22K_V_1 SF-Void | 4.6 | 4.7 | 4.6 | 0.0 | %vol |
| SP23K_V_1 ROOF-Void | 8.8 | 9.1 | 8.6 | 0.2 | %vol |
| RELEASEPRESSURE | 0.0788 | 0.0793 | 0.0785 | 0.0002 | barg |
| LOWFLOWMETERCH4 | 5.0681 | 5.0794 | 5.0605 | 0.0094 | g/s |
| OUTLET_TEMP | 6.6 | 6.7 | 6.5 | 0.0 | degC |
| Volume Flow Rate | 423.9 | 424.8 | 423.2 | 0.3 | SLPM |
| Energy Flow Rate | 253.4 | 254.0 | 253.0 | 0.2 | kW |
| External Wind Speed | 1.6 | | | | m/s |
| External Wind Direction | 267.5 | | | | bearing |



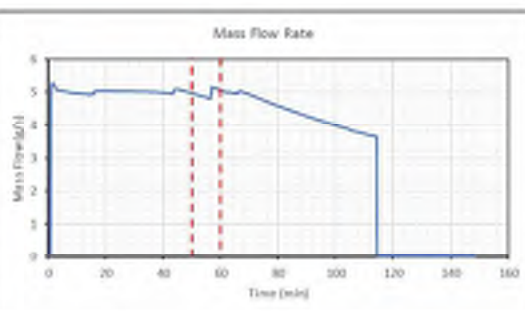
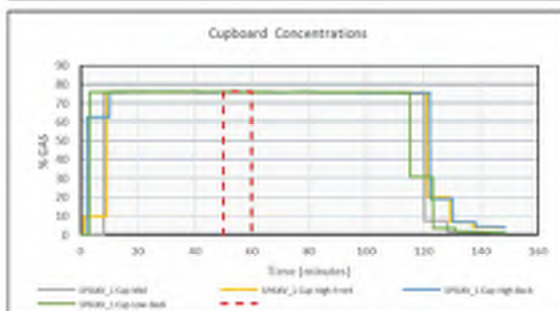
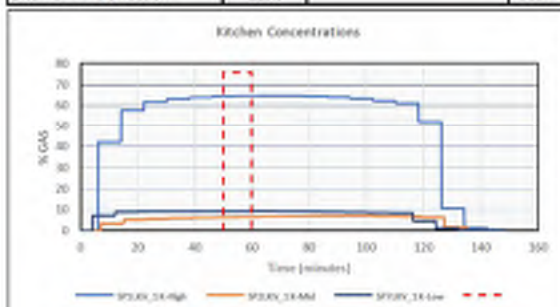
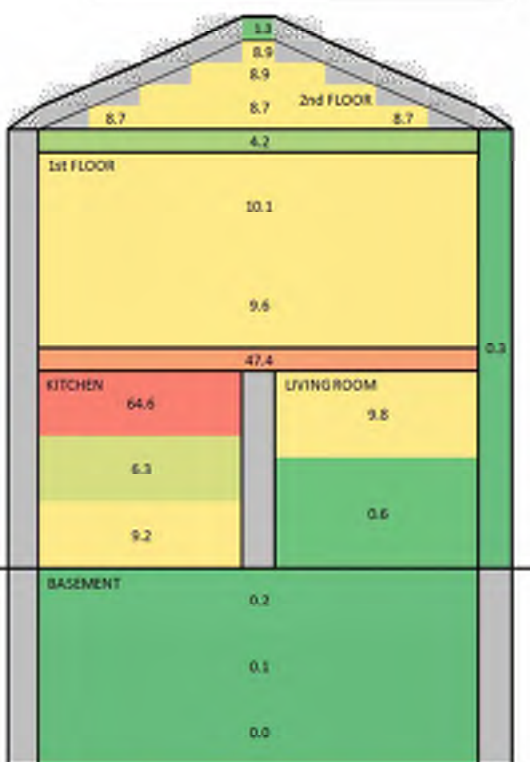
L3-048 RESULT

Hy4Heat WP7 Test Result

| | |
|--|----------------|
| MTP ID: L3-048 | |
| Hole Size: 15 mm | |
| Location: Boiler Cupboard, kitchen door open | |
| Gas: methane | |
| Date: 20/12/2019 | Time: 06:25:00 |
| Averaging Period Start: 50 min | End: 60 min |

Notes: Suspect VOL sensor 'topped out' for cupboard measurements

| Sensor | Average | Max | Min | STDEV | Units |
|-------------------------|---------|--------|--------|--------|---------|
| SP1KVV_1 K-High | 64.6 | 64.7 | 64.4 | 0.1 | %vol |
| SP2KVV_1 K-Mid | 6.3 | 6.4 | 6.3 | 0.1 | %vol |
| SP3KVV_1 Cup-Mid | 75.8 | 75.8 | 75.8 | 0.0 | %vol |
| SP4KVV_1 Cup-High-Front | 75.9 | 75.9 | 75.8 | 0.0 | %vol |
| SP5KVV_1 Cup-High-Back | 75.9 | 75.9 | 75.9 | 0.0 | %vol |
| SP6KVV_1 Cup-Low-Back | 76.0 | 76.0 | 75.9 | 0.0 | %vol |
| SP7KVV_1 K-Low | 9.2 | 9.2 | 9.2 | 0.0 | %vol |
| SP8KVV_1 LR-High | 9.8 | 10.3 | 8.9 | 0.7 | %vol |
| SP9KVV_1 LR-Mid | 0.6 | 0.6 | 0.5 | 0.0 | %vol |
| SP10KVV_1 H-High | 27.8 | 27.9 | 27.6 | 0.2 | %vol |
| SP11KVV_1 H-Mid | 2.6 | 2.7 | 2.6 | 0.0 | %vol |
| SP12KVV_1 FF-High | 10.1 | 10.9 | 9.7 | 0.6 | %vol |
| SP13KVV_1 FF-Mid | 9.6 | 10.8 | 8.0 | 0.6 | %vol |
| SP14KVV_1 AT-High | 8.9 | 10.1 | 7.6 | 0.6 | %vol |
| SP15KVV_1 AT-Mid | 8.7 | 9.0 | 7.7 | 0.6 | %vol |
| SP16KVV_2 BM-High | 0.2 | 0.2 | 0.1 | 0.0 | %vol |
| SP17KVV_1 BM-Mid | 0.1 | 0.1 | 0.1 | 0.0 | %vol |
| SP18KVV_1 BM-Low | 0.0 | 0.0 | -0.1 | 0.0 | %vol |
| SP19KVV_1 NWALL-Cav | 0.3 | 0.7 | 0.1 | 0.3 | %vol |
| SP20KVV_1 STUD-Cav | 0.0 | 0.1 | 0.0 | 0.0 | %vol |
| SP21KVV_1 FF-Void | 47.4 | 47.4 | 46.2 | 0.2 | %vol |
| SP22KVV_1 SF-Void | 4.2 | 4.3 | 4.0 | 0.1 | %vol |
| SP23KVV_1 ROOF-Void | 1.3 | 1.4 | 1.1 | 0.2 | %vol |
| RELEASEPRESSURE | 0.0115 | 0.0125 | 0.0106 | 0.0005 | barg |
| LOWFLOWMETERCH4 | 4.9590 | 5.1627 | 4.8031 | 0.1113 | g/s |
| OUTLET_TEMP | 5.7 | 6.0 | 5.5 | 0.1 | degC |
| Volume Flow Rate | 414.8 | 431.8 | 401.7 | 9.3 | L/PM |
| Energy Flow Rate | 248.0 | 258.1 | 240.2 | 5.6 | kW |
| External Wind Speed | 1.8 | | | | m/s |
| External Wind Direction | 128.3 | | | | bearing |



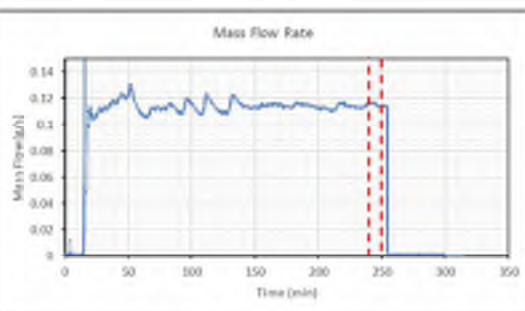
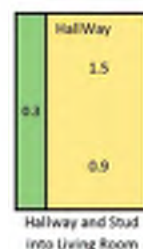
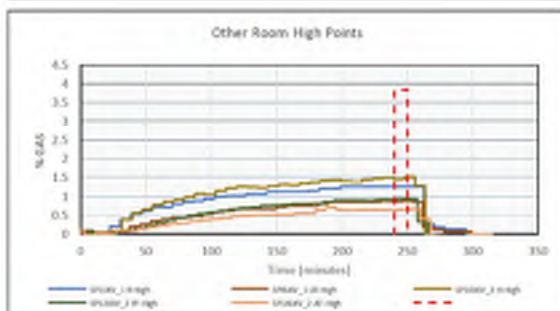
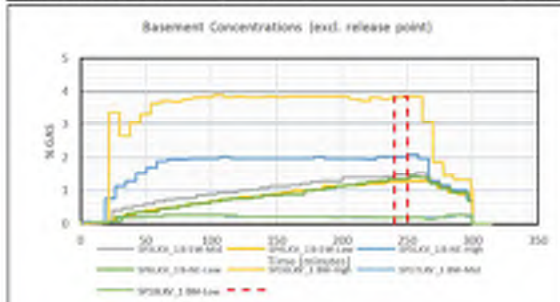
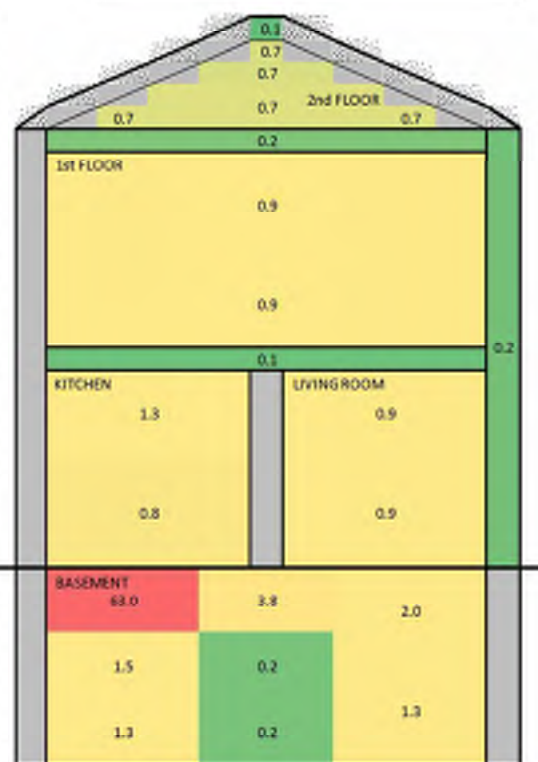
L3-049 RESULT

Hy4Heat WP7 Test Result

| | |
|---|----------------|
| MTP ID: L3-049 | |
| Hole Size: 5.1 mm | |
| Location: Basement High, upwards, door closed | |
| Gas: Hydrogen | |
| Date: 12/11/2019 | Time: 20:15:00 |
| Averaging Period Start: 240 min | End: 250 min |

Notes:

| Sensor | Average | Max | Min | STDEV | Units |
|-------------------------|---------|--------|--------|--------|---------|
| SP1KVV_1 K-High | 1.3 | 1.3 | 1.3 | 0.0 | %vol |
| SP2LKV_1 B-SW-High | 63.0 | 63.1 | 63.0 | 0.0 | %vol |
| SP3LKV_1 B-SW-Mid | 1.5 | 1.5 | 1.4 | 0.0 | %vol |
| SP4LKV_1 B-SW-Low | 1.3 | 1.3 | 1.3 | 0.0 | %vol |
| SP5LKV_1 B-N/E-High | 2.0 | 2.0 | 2.0 | 0.0 | %vol |
| SP6LKV_1 B-N/E-Low | 1.3 | 1.3 | 1.3 | 0.0 | %vol |
| SP7LKV_1 K-Low | 0.8 | 0.8 | 0.8 | 0.0 | %vol |
| SP8LKV_1 LR-High | 0.9 | 0.9 | 0.9 | 0.0 | %vol |
| SP9LKV_1 LR-Mid | 0.9 | 0.9 | 0.9 | 0.0 | %vol |
| SP10KV_2 H-High | 1.5 | 1.5 | 1.4 | 0.0 | %vol |
| SP11KV_2 H-Mid | 0.9 | 0.9 | 0.9 | 0.0 | %vol |
| SP12KV_2 FF-High | 0.9 | 0.9 | 0.9 | 0.0 | %vol |
| SP13KV_2 FF-Mid | 0.9 | 0.9 | 0.9 | 0.0 | %vol |
| SP14KV_2 AT-High | 0.7 | 0.7 | 0.6 | 0.0 | %vol |
| SP15KV_2 AT-Mid | 0.7 | 0.7 | 0.7 | 0.0 | %vol |
| SP16KV_1 BM-High | 3.8 | 3.9 | 3.8 | 0.0 | %vol |
| SP17KV_1 BM-Mid | 0.2 | 0.2 | 0.2 | 0.0 | %vol |
| SP18KV_1 BM-Low | 0.2 | 0.2 | 0.2 | 0.0 | %vol |
| SP19KV_3 NWALL-Cav | 0.2 | 0.2 | 0.2 | 0.0 | %vol |
| SP20KV_1 STUD-Cav | 0.3 | 0.3 | 0.3 | 0.0 | %vol |
| SP21KV_1 FF-Void | 0.1 | 0.1 | 0.1 | 0.0 | %vol |
| SP22KV_3 SF-Void | 0.2 | 0.2 | 0.2 | 0.0 | %vol |
| SP23KV_1 ROOF-Void | 0.1 | 0.1 | 0.1 | 0.0 | %vol |
| RELEASEPRESSURE | 0.0035 | 0.0040 | 0.0032 | 0.0002 | bar(g) |
| LOWFLOWMETER | 0.1154 | 0.1174 | 0.1131 | 0.0013 | g/s |
| | | | | | g/s |
| OUTLET TEMP | 1.8 | 1.9 | 1.7 | 0.1 | degC |
| Volume Flow Rate | 77.9 | 79.2 | 76.3 | 0.9 | SLPM |
| Energy Flow Rate | 13.8 | 14.1 | 13.6 | 0.2 | kW |
| External Wind Speed | 2.4 | | | | m/s |
| External Wind Direction | 43.2 | | | | bearing |



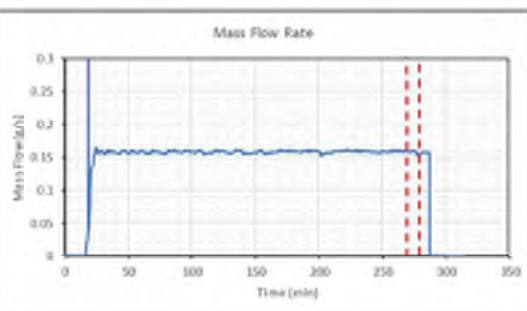
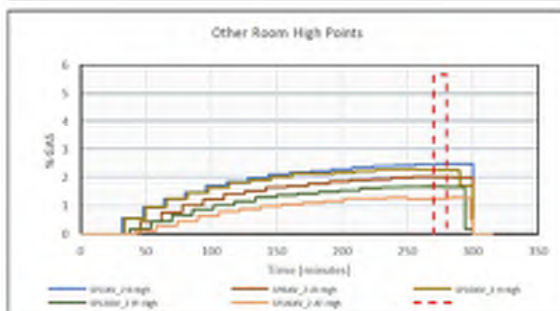
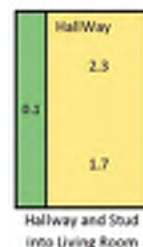
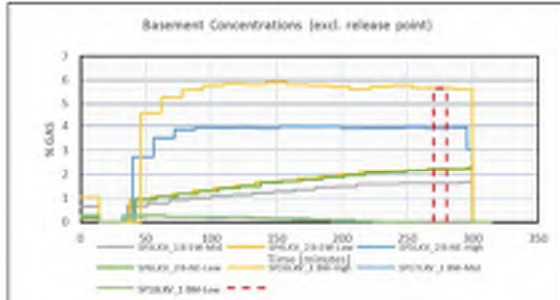
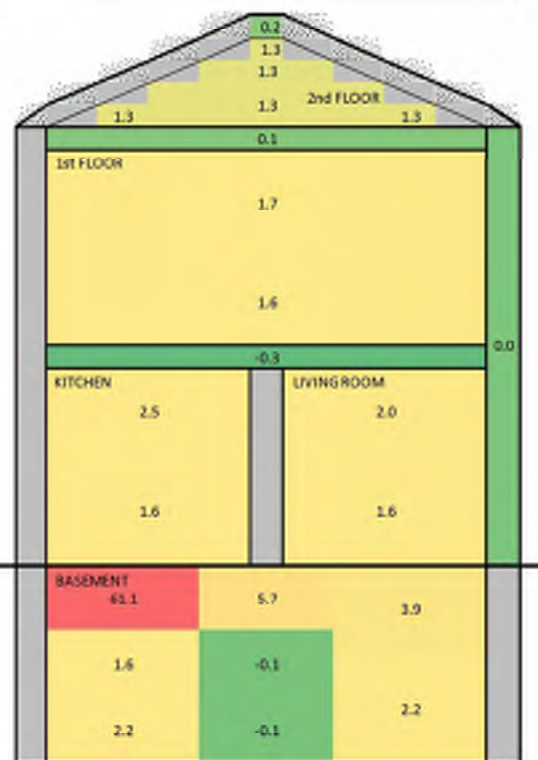
L3-050 RESULT

Hy4Heat WP7 Test Result

| | |
|---|----------------|
| MTP ID: L3-050 | |
| Hole Size: 5.1 mm | |
| Location: Basement High, upwards, door closed | |
| Gas: Hydrogen | |
| Date: 14/11/2019 | Time: 01:30:00 |
| Averaging Period Start: 270 min | End: 280 min |

Notes: LEL sensor on Analyser3 non-functioning so used VOL sensor

| Sensor | Average | Max | Min | STDEV | Units |
|-------------------------|---------|--------|--------|--------|---------|
| SP11KV_2 K-High | 2.5 | 2.5 | 2.5 | 0.0 | %vol |
| SP21KV_1 B-SW-High | 61.1 | 61.1 | 61.1 | 0.0 | %vol |
| SP31KV_1 B-SW-Mid | 1.62 | 1.6 | 1.6 | 0.0 | %vol |
| SP41KV_2 B-SW-Low | 2.17 | 2.2 | 2.2 | 0.0 | %vol |
| SP51KV_2 B-N/E-High | 3.92 | 4.0 | 3.9 | 0.0 | %vol |
| SP61KV_2 B-N/E-Low | 2.23 | 2.2 | 2.2 | 0.0 | %vol |
| SP71KV_2 K-Low | 1.59 | 1.6 | 1.6 | 0.0 | %vol |
| SP81KV_2 LR-High | 2.01 | 2.0 | 2.0 | 0.0 | %vol |
| SP91KV_2 LR-Mid | 1.58 | 1.6 | 1.6 | 0.0 | %vol |
| SP10KV_2 H-High | 2.26 | 2.3 | 2.3 | 0.0 | %vol |
| SP11KV_2 H-Mid | 1.66 | 1.7 | 1.7 | 0.0 | %vol |
| SP12KV_2 FF-High | 1.67 | 1.7 | 1.7 | 0.0 | %vol |
| SP13KV_2 FF-Mid | 1.58 | 1.6 | 1.6 | 0.0 | %vol |
| SP14KV_2 AT-High | 1.25 | 1.3 | 1.3 | 0.0 | %vol |
| SP15KV_2 AT-Mid | 1.31 | 1.3 | 1.3 | 0.0 | %vol |
| SP16KV_1 BM-High | 5.67 | 5.7 | 5.7 | 0.0 | %vol |
| SP17KV_1 BM-Mid | -0.06 | -0.1 | -0.1 | 0.0 | %vol |
| SP18KV_1 BM-Low | -0.05 | -0.1 | -0.1 | 0.0 | %vol |
| SP19KV_1 NWALL-Cav | 0.09 | 0.0 | 0.0 | 0.0 | %vol |
| SP20KV_1 STUD-Cav | 0.09 | 0.1 | 0.1 | 0.0 | %vol |
| SP21KV_1 FF-Void | -0.31 | -0.3 | -0.3 | 0.0 | %vol |
| SP22KV_1 SF-Void | 0.1 | 0.1 | 0.1 | 0.0 | %vol |
| SP23KV_1 ROOF-Void | 0.2 | 0.2 | 0.2 | 0.0 | %vol |
| RELEASEPRESSURE | 0.0059 | 0.0063 | 0.0055 | 0.0002 | barg |
| LOWFLOWMETER | 0.1576 | 0.1602 | 0.1528 | 0.0022 | g/s |
| | | | | | g/s |
| OUTLET TEMP | 2.4 | 2.4 | 2.3 | 0.0 | degC |
| Volume Flow Rate | 106.4 | 108.1 | 103.1 | 1.5 | SLPM |
| Energy Flow Rate | 18.9 | 19.2 | 18.3 | 0.3 | kW |
| External Wind Speed | 3.1 | | | | m/s |
| External Wind Direction | 5.3 | | | | bearing |



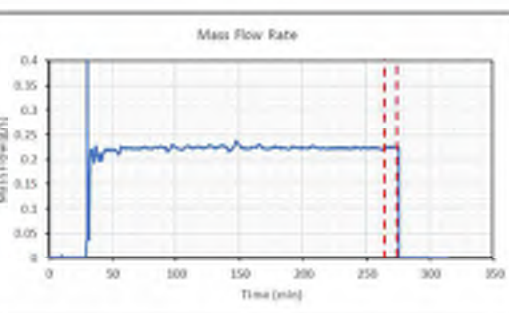
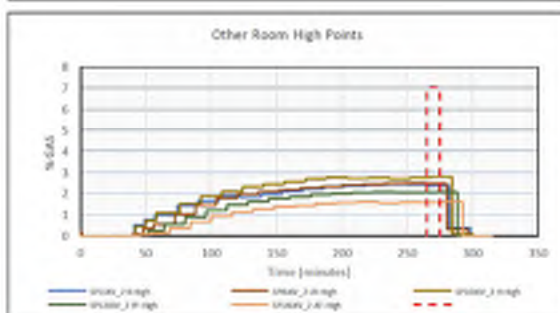
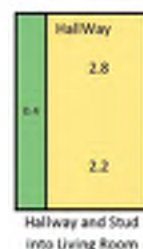
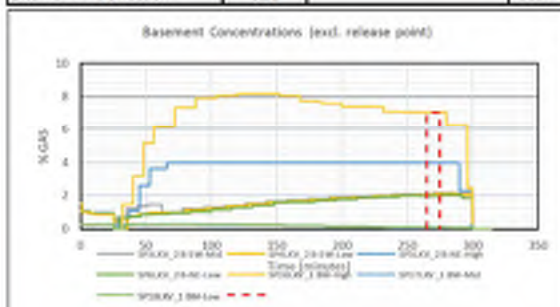
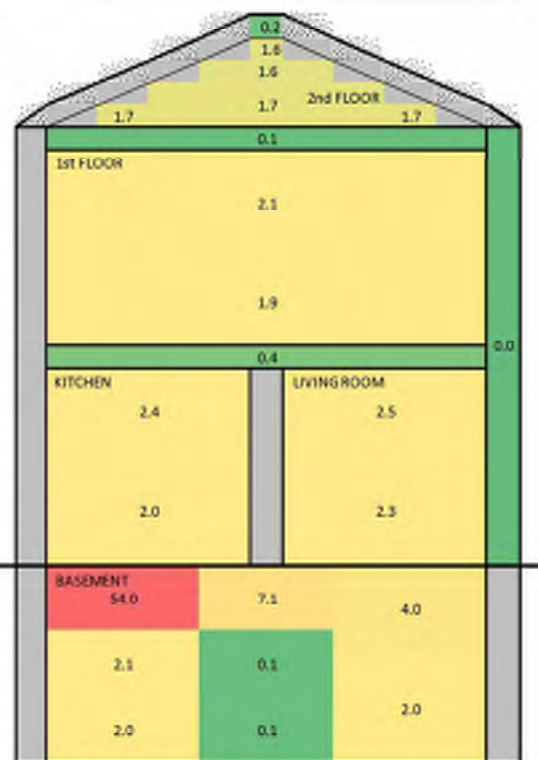
L3-051 RESULT

Hy4Heat WP7 Test Result

| | |
|---|----------------|
| MTP ID: L3-051 | |
| Hole Size: 5.1 mm | |
| Location: Basement High, upwards, door closed | |
| Gas: Hydrogen | |
| Date: 14/11/2019 | Time: 07:30:00 |
| Averaging Period Start: 265 min | End: 275 min |

Notes: LEL sensor on Analyser3 non-functioning, VOL used

| Sensor | Average | Max | Min | STDEV | Units |
|-------------------------|---------|--------|--------|--------|---------|
| SP11KV_2 K-High | 2.4 | 2.4 | 2.4 | 0.0 | %vol |
| SP21KV_1 B-SW-High | 54.0 | 54.1 | 53.9 | 0.1 | %vol |
| SP31KV_2 B-SW-Mid | 2.1 | 2.2 | 2.1 | 0.0 | %vol |
| SP41KV_2 B-SW-Low | 2.0 | 2.1 | 2.0 | 0.0 | %vol |
| SP51KV_2 B-N/E-High | 4.0 | 4.0 | 4.0 | 0.0 | %vol |
| SP61KV_2 B-N/E-Low | 2.0 | 2.0 | 2.0 | 0.0 | %vol |
| SP71KV_2 K-Low | 2.0 | 2.0 | 2.0 | 0.0 | %vol |
| SP81KV_2 LR-High | 2.5 | 2.5 | 2.5 | 0.0 | %vol |
| SP91KV_2 LR-Mid | 2.3 | 2.3 | 2.2 | 0.0 | %vol |
| SP10KV_2 H-High | 2.8 | 2.8 | 2.8 | 0.0 | %vol |
| SP11KV_2 H-Mid | 2.2 | 2.2 | 2.2 | 0.0 | %vol |
| SP12KV_2 FF-High | 2.1 | 2.1 | 2.1 | 0.0 | %vol |
| SP13KV_2 FF-Mid | 1.9 | 1.9 | 1.9 | 0.0 | %vol |
| SP14KV_2 AT-High | 1.6 | 1.6 | 1.6 | 0.0 | %vol |
| SP15KV_2 AT-Mid | 1.7 | 1.7 | 1.7 | 0.0 | %vol |
| SP16KV_1 BM-High | 7.1 | 7.1 | 7.1 | 0.0 | %vol |
| SP17KV_1 BM-Mid | 0.1 | 0.1 | 0.1 | 0.0 | %vol |
| SP18KV_1 BM-Low | 0.1 | 0.1 | 0.1 | 0.0 | %vol |
| SP19KV_1 NWALL-Cav | 0.0 | 0.0 | 0.0 | 0.0 | %vol |
| SP20KV_1 STUD-Cav | 0.4 | 0.4 | 0.4 | 0.0 | %vol |
| SP21KV_1 FF-Void | 0.4 | 0.4 | 0.4 | 0.0 | %vol |
| SP22KV_1 SF-Void | 0.1 | 0.1 | 0.1 | 0.0 | %vol |
| SP23KV_1 ROOF-Void | 0.2 | 0.2 | 0.2 | 0.0 | %vol |
| RELEASEPRESSURE | 0.0100 | 0.0108 | 0.0096 | 0.0002 | barg |
| LOWFLOWMETER | 0.2237 | 0.2256 | 0.2213 | 0.0010 | g/s |
| | | | | | g/t |
| OUTLET TEMP | 5.4 | 5.5 | 5.2 | 0.1 | degC |
| Volume Flow Rate | 151.0 | 152.2 | 149.3 | 0.7 | SLPM |
| Energy Flow Rate | 26.8 | 27.0 | 26.5 | 0.1 | kW |
| External Wind Speed | 5.3 | | | | m/s |
| External Wind Direction | 31.1 | | | | bearing |



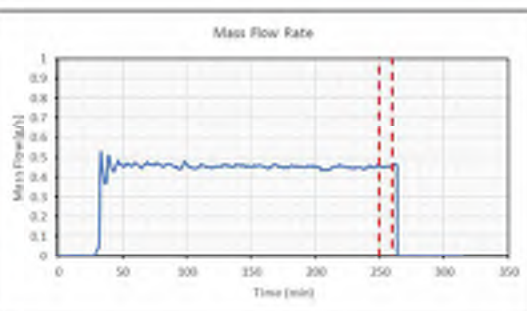
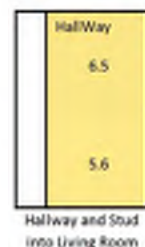
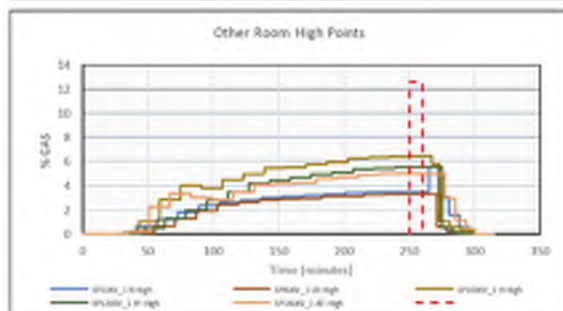
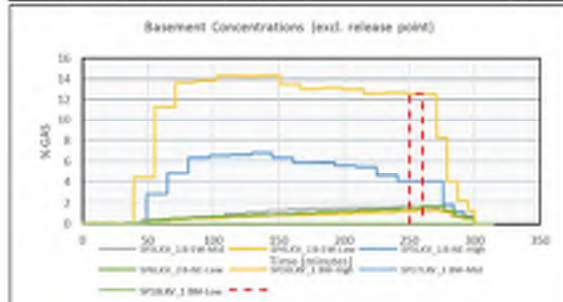
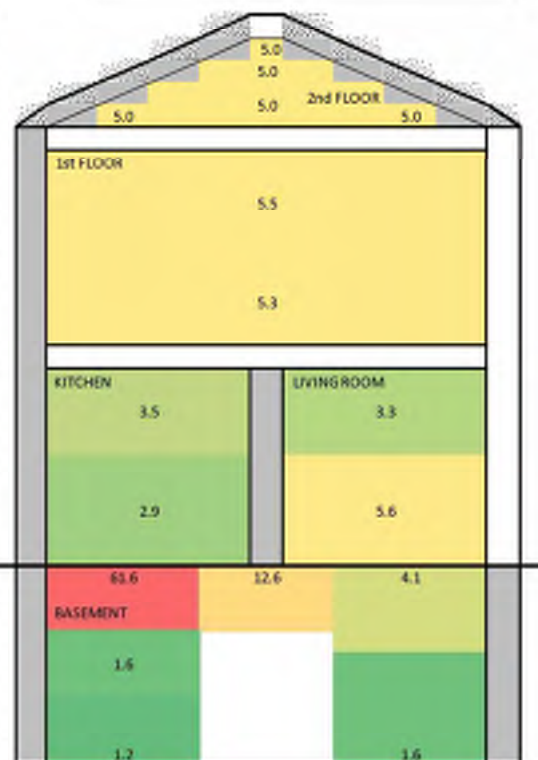
L3-052 RESULT

Hy4Heat WP7 Test Result

| | |
|---------------------------------|----------------|
| MTP ID: L3-052 | |
| Hole Size: 10mm | |
| Location: basement - upwards | |
| Gas: Hydrogen | |
| Date: 09/11/2019 | Time: 09:00:00 |
| Averaging Period Start: 250 min | End: 290 min |

Notes: VOL sensor on analyser 3 failed during test, removed

| Sensor | Average | Max | Min | STDEV | Units |
|-------------------------|---------|--------|--------|--------|---------|
| SP1KVV_1 K-High | 3.5 | 3.5 | 3.5 | 0.0 | %vol |
| SP2LKV_1 B-SW-High | 61.6 | 61.8 | 61.6 | 0.1 | %vol |
| SP3LKV_1 B-SW-Mid | 1.6 | 1.6 | 1.6 | 0.0 | %vol |
| SP4LKV_1 B-SW-Low | 1.2 | 1.3 | 1.2 | 0.0 | %vol |
| SP5LKV_1 B-NIS-High | 4.1 | 4.1 | 4.1 | 0.0 | %vol |
| SP6LKV_2 B-NIS-Low | 1.6 | 1.7 | 1.5 | 0.0 | %vol |
| SP7LKV_1 K-Low | 2.9 | 2.9 | 2.9 | 0.0 | %vol |
| SP8LKV_1 LR-High | 3.3 | 3.3 | 3.3 | 0.0 | %vol |
| SP9LKV_1 LR-Mid | 5.6 | 5.6 | 5.6 | 0.0 | %vol |
| SP10LKV_1 H-High | 6.5 | 6.5 | 6.4 | 0.0 | %vol |
| SP11LKV_1 H-Mid | 5.6 | 5.6 | 5.6 | 0.0 | %vol |
| SP12LKV_1 FF-High | 5.5 | 5.5 | 5.5 | 0.0 | %vol |
| SP13LKV_1 FF-Mid | 5.3 | 5.3 | 5.3 | 0.0 | %vol |
| SP14LKV_1 AT-High | 5.0 | 5.0 | 5.0 | 0.0 | %vol |
| SP15LKV_1 AT-Mid | 5.0 | 5.0 | 5.0 | 0.0 | %vol |
| SP16LKV_1 BM-High | 12.6 | 12.6 | 12.6 | 0.0 | %vol |
| SP17LKV_1 BM-Mid | | | | | %vol |
| SP18LKV_1 BM-Low | | | | | %vol |
| SP19LKV_1 NWALL-Cav | | | | | %vol |
| SP20LKV_1 STUD-Cav | | | | | %vol |
| SP21LKV_1 FF-Void | | | | | %vol |
| SP22LKV_1 SF-Void | | | | | %vol |
| SP23LKV_1 ROOF-Void | | | | | %vol |
| RELEASEPRESSURE | 0.0048 | 0.0052 | 0.0044 | 0.0002 | barg |
| LOWFLOWMETER | 0.4543 | 0.4584 | 0.4487 | 0.0022 | g/s |
| | | | | | g/t |
| OUTLET TEMP | 5.3 | 5.4 | 5.2 | 0.1 | degC |
| Volume Flow Rate | 306.6 | 309.4 | 302.8 | 1.5 | SLPM |
| Energy Flow Rate | 54.5 | 55.0 | 53.8 | 0.3 | kW |
| External Wind Speed | 1.8 | | | | m/s |
| External Wind Direction | 51.2 | | | | bearing |



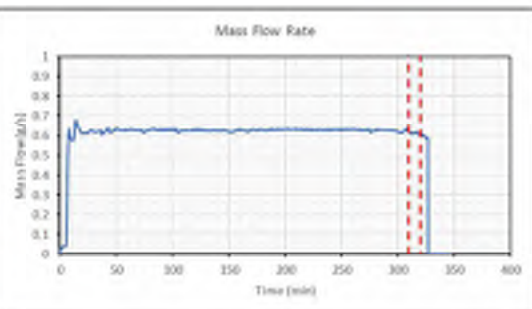
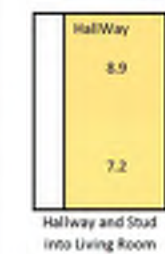
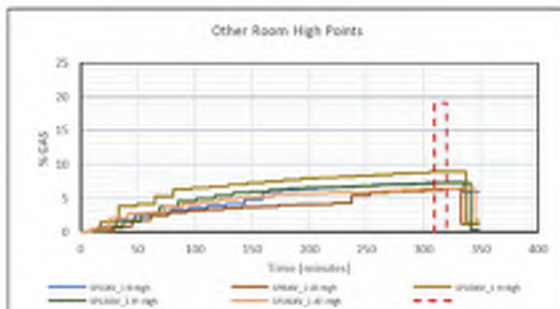
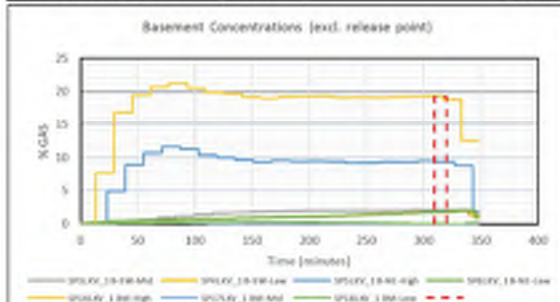
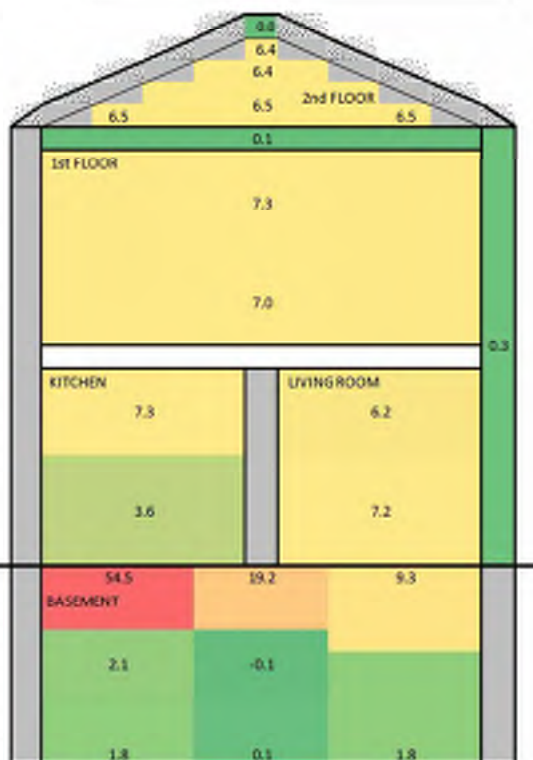
L3-053 RESULT

Hy4Heat WP7 Test Result

| | |
|---|----------------|
| MTP ID: L3-053 | |
| Hole Size: 10mm | |
| Location: Basement upwards - basement door closed | |
| Gas: hydrogen | |
| Date: 09/11/2009 | Time: 15:15:00 |
| Averaging Period Start: 300 min | End: 320 min |

Notes: SP20, 21 and 23 removed - suspected low flow (-ve readings)

| Sensor | Average | Max | Min | STDEV | Units |
|-------------------------|---------|--------|--------|--------|---------|
| SP1K_V_1 K-High | 7.3 | 7.4 | 7.3 | 0.0 | %vol |
| SP2LKV_1 B-SW-High | 54.5 | 54.5 | 54.5 | 0.0 | %vol |
| SP3LKV_1 B-SW-Mid | 2.1 | 2.1 | 2.1 | 0.0 | %vol |
| SP4LKV_1 B-SW-Low | 1.8 | 1.8 | 1.8 | 0.0 | %vol |
| SP5LKV_1 B-N/E-High | 9.3 | 9.5 | 9.3 | 0.0 | %vol |
| SP6LKV_1 B-N/E-Low | 1.8 | 1.8 | 1.7 | 0.0 | %vol |
| SP7LKV_1 K-Low | 3.6 | 3.7 | 3.6 | 0.0 | %vol |
| SP8LKV_1 LR-High | 6.2 | 6.4 | 6.2 | 0.1 | %vol |
| SP9LKV_1 LR-Mid | 7.2 | 7.3 | 7.2 | 0.0 | %vol |
| SP10KV_1 H-High | 8.9 | 8.9 | 8.9 | 0.0 | %vol |
| SP11KV_1 H-Mid | 7.2 | 7.2 | 7.2 | 0.0 | %vol |
| SP12KV_1 FF-High | 7.3 | 7.3 | 7.3 | 0.0 | %vol |
| SP13KV_1 FF-Mid | 7.0 | 7.0 | 7.0 | 0.0 | %vol |
| SP14KV_1 AT-High | 6.4 | 6.5 | 6.4 | 0.0 | %vol |
| SP15KV_1 AT-Mid | 6.5 | 6.5 | 6.5 | 0.0 | %vol |
| SP16KV_1 BM-High | 19.2 | 19.3 | 18.8 | 0.2 | %vol |
| SP17KV_1 BM-Mid | -0.1 | -0.1 | -0.2 | 0.0 | %vol |
| SP18KV_1 BM-Low | 0.1 | 0.1 | 0.1 | 0.0 | %vol |
| SP19KV_1 NWALL-Cav | 0.3 | 0.3 | 0.3 | 0.0 | %vol |
| SP20KV_1 STUD-Cav | | | | | %vol |
| SP21KV_1 FF-Void | | | | | %vol |
| SP22KV_1 SF-Void | 0.1 | 0.1 | 0.1 | 0.0 | %vol |
| SP23KV_1 ROOF-Void | | | | | %vol |
| RELEASEPRESSURE | 0.0092 | 0.0099 | 0.0088 | 0.0002 | barg |
| LOWFLOWMETER | 0.6154 | 0.6247 | 0.6083 | 0.0040 | g/s |
| | | | | | g/t |
| OUTLET TEMP | 0.4 | 0.6 | 0.3 | 0.0 | degC |
| Volume Flow Rate | 415.3 | 421.6 | 410.5 | 2.7 | SLPM |
| Energy Flow Rate | 75.8 | 74.9 | 72.9 | 0.5 | kW |
| External Wind Speed | 1.2 | | | | m/s |
| External Wind Direction | 53.3 | | | | bearing |



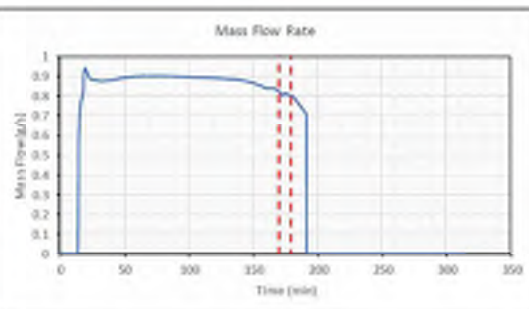
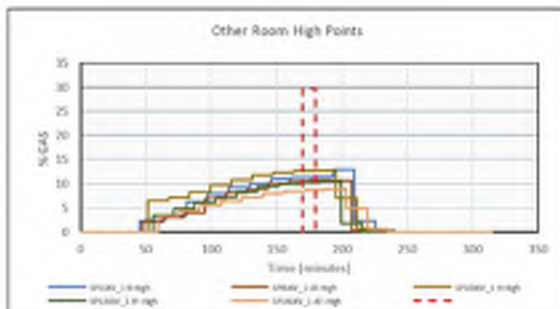
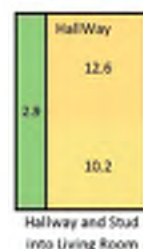
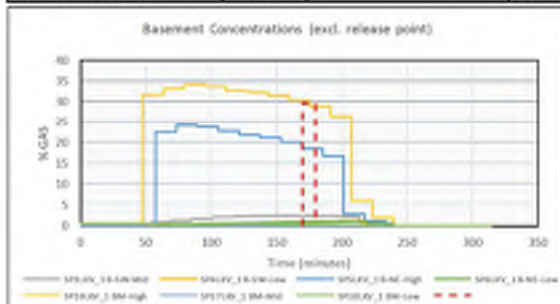
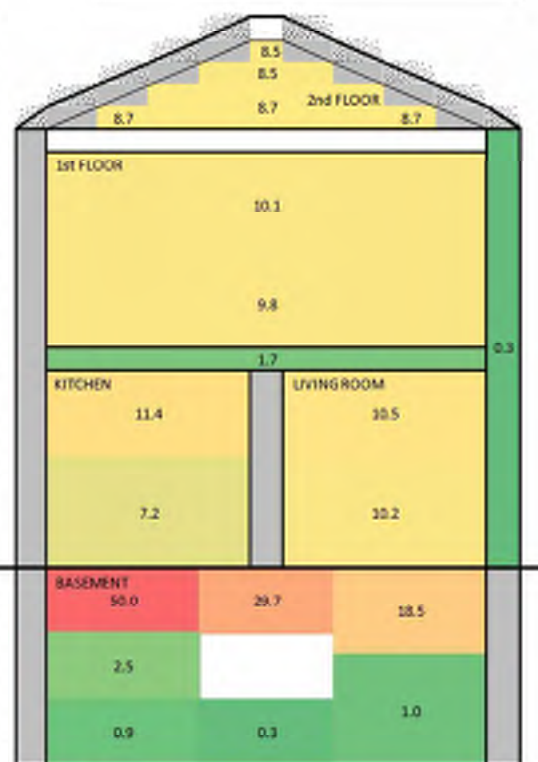
L3-054 RESULT

Hy4Heat WP7 Test Result

| | |
|---------------------------------|----------------|
| MTP ID: L3-054 | |
| Hole Size: 10mm | |
| Location: basement - upwards | |
| Gas: Hydrogen | |
| Date: 24/11/2019 | Time: 09:30:00 |
| Averaging Period Start: 170 min | End: 180 min |

Notes: SP17, 22 and 23 removed - suspected low flow, negative readings

| Sensor | Average | Max | Min | STDEV | Units |
|-------------------------|---------|--------|--------|--------|---------|
| SP1K_V_1 K-High | 11.4 | 11.4 | 11.4 | 0.0 | %vol |
| SP2LKV_1 B-SW-High | 50.0 | 50.0 | 49.5 | 0.1 | %vol |
| SP3LKV_1 B-SW-Mid | 2.5 | 2.5 | 2.5 | 0.0 | %vol |
| SP4LKV_1 B-SW-Low | 0.9 | 0.9 | 0.9 | 0.0 | %vol |
| SP5LKV_1 B-N/E-High | 18.5 | 18.5 | 18.5 | 0.0 | %vol |
| SP6LKV_1 B-N/E-Low | 1.0 | 1.0 | 0.9 | 0.0 | %vol |
| SP7LKV_1 K-Low | 7.2 | 7.3 | 7.0 | 0.1 | %vol |
| SP8LKV_1 LR-High | 10.5 | 10.6 | 10.4 | 0.1 | %vol |
| SP9LKV_1 LR-Mid | 10.2 | 10.4 | 10.1 | 0.1 | %vol |
| SP10KV_1 H-High | 12.6 | 12.6 | 12.6 | 0.0 | %vol |
| SP11KV_1 H-Mid | 10.2 | 10.2 | 10.2 | 0.0 | %vol |
| SP12KV_1 FF-High | 10.1 | 10.1 | 10.1 | 0.0 | %vol |
| SP13KV_1 FF-Mid | 9.8 | 9.8 | 9.8 | 0.0 | %vol |
| SP14KV_1 AT-High | 8.5 | 8.5 | 8.3 | 0.1 | %vol |
| SP15KV_1 AT-Mid | 8.7 | 8.8 | 8.5 | 0.1 | %vol |
| SP16KV_1 BM-High | 29.7 | 30.4 | 28.9 | 0.8 | %vol |
| SP17KV_1 BM-Mid | | | | | %vol |
| SP18KV_1 BM-Low | 0.3 | 0.3 | 0.3 | 0.0 | %vol |
| SP19KV_1 NWALL-Cav | 0.3 | 0.3 | 0.3 | 0.0 | %vol |
| SP20KV_1 STUD-Cav | 2.9 | 2.9 | 2.9 | 0.0 | %vol |
| SP21KV_1 FF-Void | 1.7 | 1.7 | 1.7 | 0.0 | %vol |
| SP22KV_1 SF-Void | | | | | %vol |
| SP23KV_1 ROOF-Void | | | | | %vol |
| RELEASEPRESSURE | 0.0150 | 0.0158 | 0.0144 | 0.0003 | barg |
| LOWFLOWMETER | 0.8079 | 0.8223 | 0.8001 | 0.0062 | g/s |
| | | | | | g/s |
| OUTLET TEMP | 7.8 | 7.9 | 7.7 | 0.1 | degC |
| Volume Flow Rate | 545.3 | 554.9 | 540.0 | 4.2 | SLPM |
| Energy Flow Rate | 96.9 | 98.6 | 95.9 | 0.7 | kW |
| External Wind Speed | 2.0 | | | | m/s |
| External Wind Direction | 62.0 | | | | bearing |



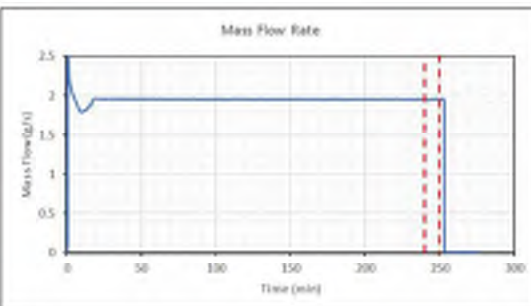
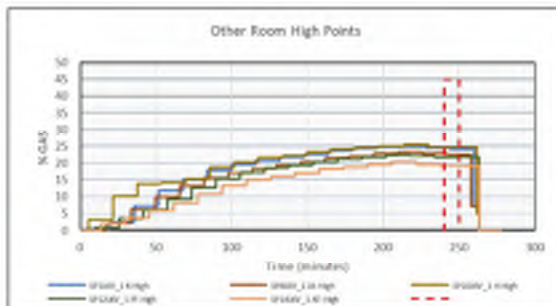
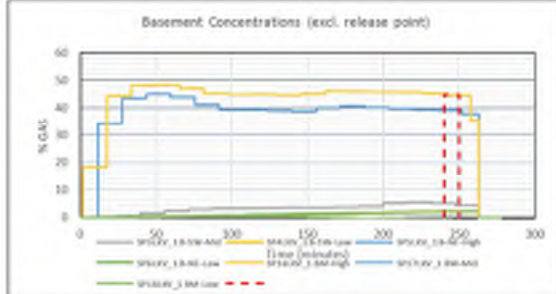
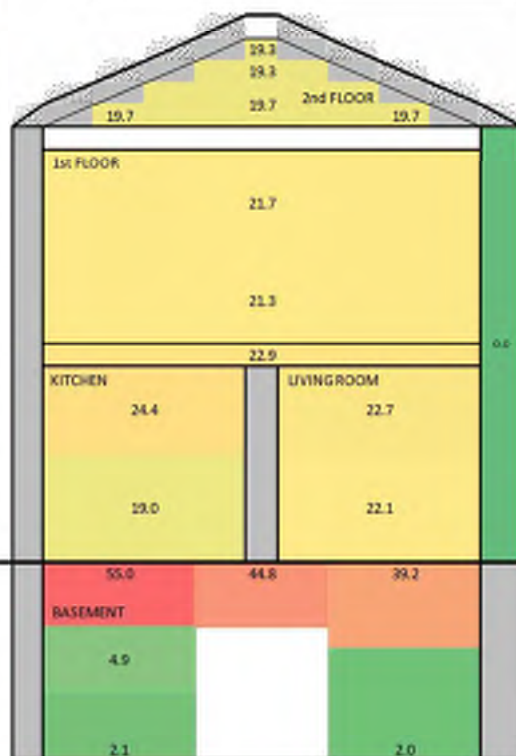
L3-055 RESULT

Hy4Heat WP7 Test Result

| | |
|---------------------------------|----------------|
| MTP ID: L3-055 | |
| Hole Size: 10 mm | |
| Location: basement - upwards | |
| Gas: Hydrogen | |
| Date: 20/11/2019 | Time: 13:30:00 |
| Averaging Period Start: 240 min | End: 250 min |

Notes: SP17, 18, 19, 22, 23 removed - suspected blockage.

| Sensor | Average | Max | Min | STDEV | units |
|-------------------------|---------|--------|--------|--------|---------|
| SP1KV_1 K-High | 24.4 | 24.5 | 24.3 | 0.1 | %vol |
| SP2KV_1 B-SW-High | 55.0 | 55.1 | 54.9 | 0.1 | %vol |
| SP3KV_1 B-SW-Mid | 4.9 | 5.1 | 4.4 | 0.3 | %vol |
| SP4KV_1 B-SW-Low | 2.1 | 2.1 | 2.1 | 0.0 | %vol |
| SP5KV_1 B-NE-High | 39.2 | 39.2 | 39.2 | 0.0 | %vol |
| SP6KV_1 B-NE-Low | 2.0 | 2.0 | 2.0 | 0.0 | %vol |
| SP7KV_1 K-Low | 19.0 | 19.0 | 19.0 | 0.0 | %vol |
| SP8KV_1 LR-High | 22.7 | 22.9 | 22.6 | 0.1 | %vol |
| SP9KV_1 LR-Mid | 22.1 | 22.2 | 22.1 | 0.1 | %vol |
| SP10KV_1 H-High | 24.9 | 25.0 | 24.8 | 0.1 | %vol |
| SP11KV_1 H-Mid | 22.0 | 22.1 | 21.9 | 0.1 | %vol |
| SP12KV_1 FF-High | 21.7 | 21.9 | 21.7 | 0.0 | %vol |
| SP13KV_1 FF-Mid | 21.3 | 21.3 | 21.3 | 0.0 | %vol |
| SP14KV_1 AT-High | 19.3 | 19.3 | 19.3 | 0.0 | %vol |
| SP15KV_1 AT-Mid | 19.7 | 19.7 | 19.7 | 0.0 | %vol |
| SP16KV_1 8M-High | 44.8 | 45.3 | 44.7 | 0.2 | %vol |
| SP17KV_1 8M-Mid | | | | | %vol |
| SP18KV_1 8M-Low | | | | | %vol |
| SP19KV_1 NWall-Cav | | | | | %vol |
| SP20KV_1 STUD-Cav | 24.8 | 25.4 | 24.8 | 0.1 | %vol |
| SP21KV_1 FF-Void | 22.9 | 22.9 | 22.9 | 0.0 | %vol |
| SP22KV_1 SF-Void | | | | | %vol |
| SP23KV_1 ROOF-Void | | | | | %vol |
| RELEASEPRESSURE | 0.0867 | 0.0882 | 0.0853 | 0.0006 | bar |
| LOWFLOWMETER | 1.9447 | 1.9564 | 1.9392 | 0.0044 | g/s |
| | | | | | g/s |
| OUTLET_TEMP | 2.0 | 2.1 | 1.9 | 0.1 | degC |
| Volume Flow Rate | 1312.5 | 1320.4 | 1308.8 | 3.0 | SLPM |
| Energy Flow Rate | 233.2 | 234.6 | 232.5 | 0.5 | kW |
| External Wind Speed | 4.6 | | | | m/s |
| External Wind Direction | 45.0 | | | | bearing |



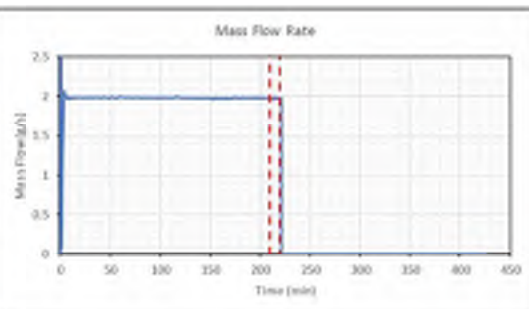
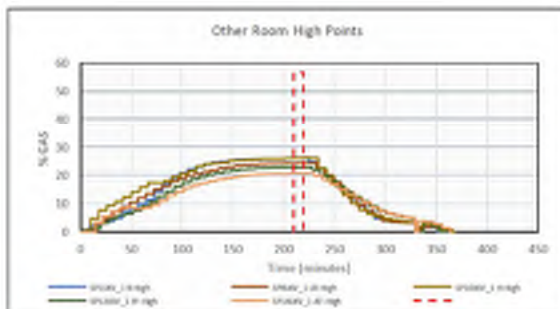
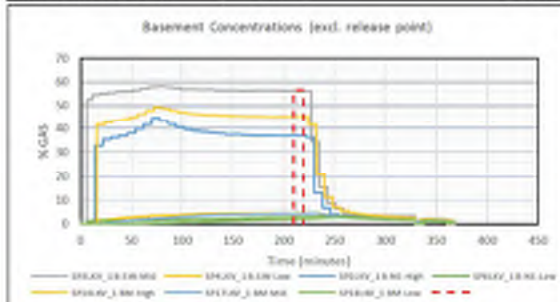
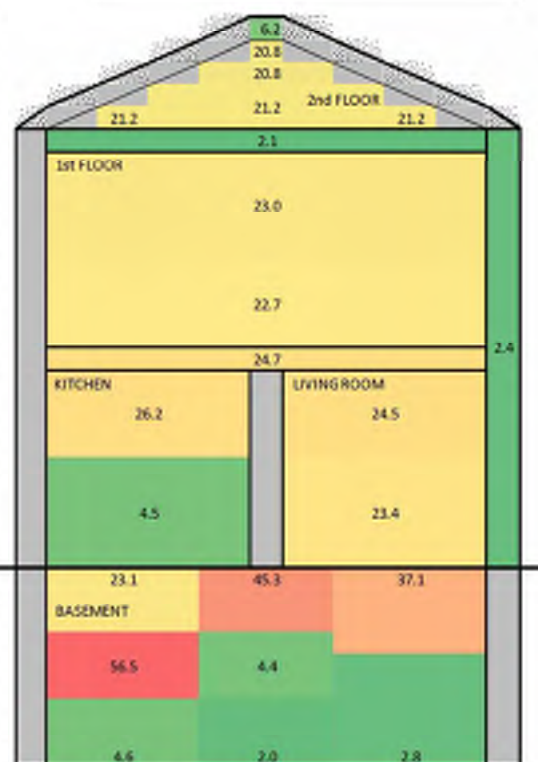
L3-056 RESULT

Hy4Heat WP7 Test Result

| | |
|---|----------------|
| MTP ID: L3-056 | |
| Hole Size: 15 mm | |
| Location: Basement, upwards, basement door closed | |
| Gas: Hydrogen | |
| Date: 20/12/2019 | Time: 11:00:00 |
| Averaging Period Start: 230 min | End: 220 min |

Notes: Windows kept closed through until ~360mins

| Sensor | Average | Max | Min | STDEV | Units |
|-------------------------|---------|--------|--------|--------|---------|
| SP1KVV_1 K-High | 26.2 | 26.2 | 26.1 | 0.0 | %vol |
| SP2LKV_1 B-SW-High | 23.1 | 23.2 | 23.1 | 0.0 | %vol |
| SP3LKV_1 B-SW-Mid | 56.5 | 56.5 | 56.2 | 0.1 | %vol |
| SP4LKV_1 B-SW-Low | 4.6 | 4.6 | 4.6 | 0.0 | %vol |
| SP5LKV_1 B-N/E-High | 37.1 | 37.1 | 37.1 | 0.0 | %vol |
| SP6LKV_1 B-N/E-Low | 2.8 | 2.8 | 2.7 | 0.0 | %vol |
| SP7LKV_1 K-Low | 4.5 | 4.5 | 4.4 | 0.0 | %vol |
| SP8LKV_1 LR-High | 24.5 | 24.5 | 24.5 | 0.0 | %vol |
| SP9LKV_1 LR-Mid | 23.4 | 23.4 | 23.4 | 0.0 | %vol |
| SP10KV_1 H-High | 26.2 | 26.3 | 26.2 | 0.1 | %vol |
| SP11KV_1 H-Mid | 23.4 | 23.4 | 23.3 | 0.0 | %vol |
| SP12KV_1 FF-High | 23.0 | 23.1 | 22.9 | 0.1 | %vol |
| SP13KV_1 FF-Mid | 22.7 | 22.7 | 22.6 | 0.0 | %vol |
| SP14KV_1 AT-High | 20.8 | 20.8 | 20.8 | 0.0 | %vol |
| SP15KV_1 AT-Mid | 21.2 | 21.3 | 21.2 | 0.0 | %vol |
| SP16KV_1 BM-High | 45.3 | 45.4 | 45.3 | 0.0 | %vol |
| SP17KV_1 BM-Mid | 4.4 | 4.4 | 4.4 | 0.0 | %vol |
| SP18KV_1 BM-Low | 2.0 | 2.1 | 1.9 | 0.0 | %vol |
| SP19KV_1 NWALL-Cav | 2.4 | 2.5 | 2.4 | 0.0 | %vol |
| SP20KV_1 STUD-Cav | 28.1 | 28.2 | 28.1 | 0.0 | %vol |
| SP21KV_1 FF-Void | 24.7 | 24.7 | 24.6 | 0.0 | %vol |
| SP22KV_1 SF-Void | 2.1 | 2.1 | 2.0 | 0.1 | %vol |
| SP23KV_1 ROOF-Void | 6.2 | 6.2 | 6.0 | 0.1 | %vol |
| RELEASEPRESSURE | 0.0142 | 0.0144 | 0.0137 | 0.0002 | barg |
| LOWFLOWMETER | 1.9666 | 1.9863 | 1.9545 | 0.0078 | g/s |
| | | | | | g/s |
| OUTLET TEMP | 6.0 | 6.1 | 5.9 | 0.1 | degC |
| Volume Flow Rate | 1327.3 | 1340.6 | 1319.1 | 5.3 | SLPM |
| Energy Flow Rate | 235.8 | 238.2 | 234.3 | 0.9 | kW |
| External Wind Speed | 1.6 | | | | m/s |
| External Wind Direction | 231.4 | | | | bearing |



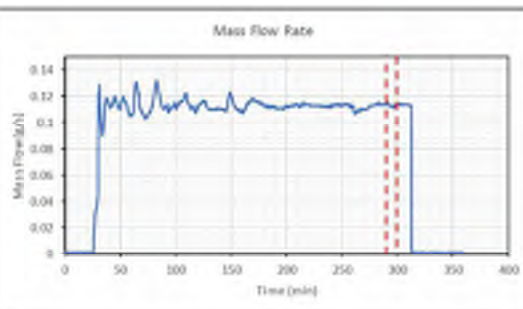
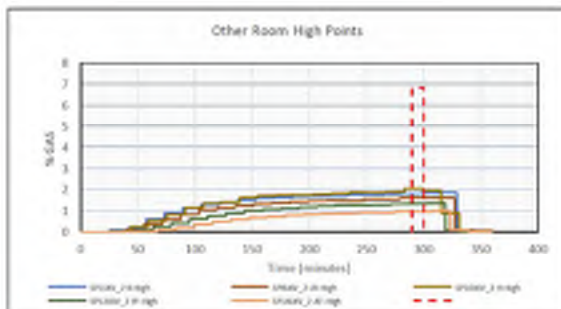
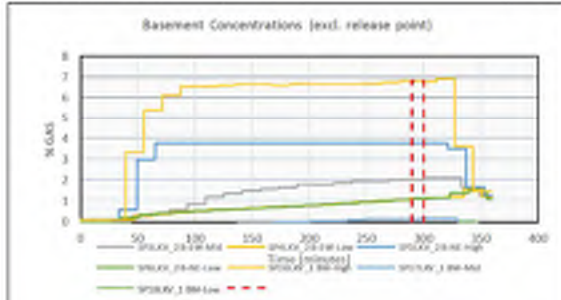
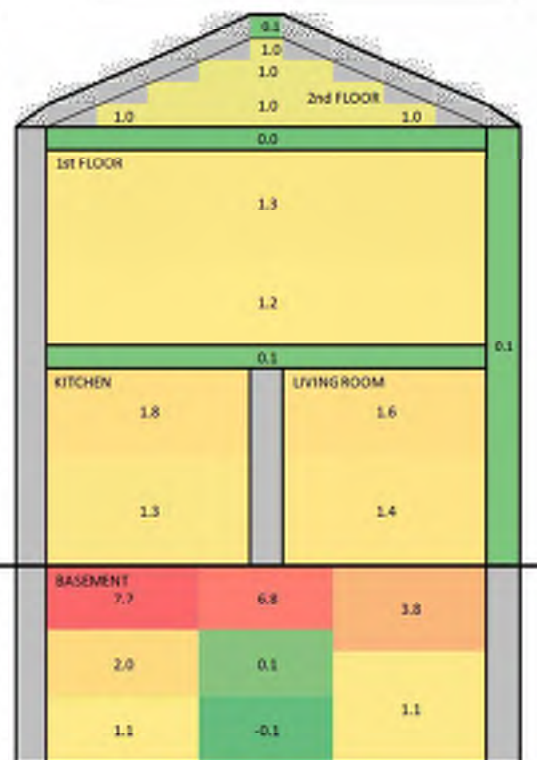
L3-057 RESULT

Hy4Heat WP7 Test Result

| | |
|---|----------------|
| MTP ID: L3-057 | |
| Hole Size: 5.1 mm | |
| Location: Basement High, downwards, door closed | |
| Gas: Hydrogen | |
| Date: 14/11/2019 | Time: 16:00:00 |
| Averaging Period Start: 290 min | End: 300 min |

Notes: LEL sensor on analyser 3 non-functioning so displaying VOL measurements

| Sensor | Average | Max | Min | STDEV | Units |
|-------------------------|---------|--------|--------|--------|---------|
| SP1KLV_2 K-High | 1.8 | 1.8 | 1.8 | 0.0 | %vol |
| SP2LKV_1 B-SW-High | 7.7 | 7.8 | 7.7 | 0.0 | %vol |
| SP3LKV_2 B-SW-Mid | 2.0 | 2.0 | 2.0 | 0.0 | %vol |
| SP4LKV_2 B-SW-Low | 1.1 | 1.1 | 1.1 | 0.0 | %vol |
| SP5LKV_2 B-N/E-High | 3.8 | 3.8 | 3.8 | 0.0 | %vol |
| SP6LKV_2 B-N/E-Low | 1.1 | 1.1 | 1.1 | 0.0 | %vol |
| SP7LKV_2 K-Low | 1.3 | 1.3 | 1.3 | 0.0 | %vol |
| SP8LKV_2 LR-High | 1.6 | 1.6 | 1.6 | 0.0 | %vol |
| SP9LKV_2 LR-Mid | 1.4 | 1.4 | 1.4 | 0.0 | %vol |
| SP10KV_2 H-High | 2.1 | 2.1 | 2.0 | 0.0 | %vol |
| SP11KV_2 H-Mid | 1.5 | 1.5 | 1.5 | 0.0 | %vol |
| SP12KV_2 FF-High | 1.3 | 1.3 | 1.3 | 0.0 | %vol |
| SP13KV_2 FF-Mid | 1.2 | 1.2 | 1.2 | 0.0 | %vol |
| SP14KV_2 AT-High | 1.0 | 1.0 | 1.0 | 0.0 | %vol |
| SP15KV_2 AT-Mid | 1.0 | 1.0 | 1.0 | 0.0 | %vol |
| SP16KV_1 BM-High | 6.8 | 6.8 | 6.8 | 0.0 | %vol |
| SP17KV_1 BM-Mid | 0.1 | 0.2 | 0.1 | 0.0 | %vol |
| SP18KV_1 BM-Low | -0.1 | -0.1 | -0.1 | 0.0 | %vol |
| SP19KV_1 NWALL-Cav | 0.1 | 0.1 | 0.1 | 0.0 | %vol |
| SP20KV_1 STUD-Cav | 0.1 | 0.1 | 0.1 | 0.0 | %vol |
| SP21KV_1 FF-Void | 0.1 | 0.1 | 0.1 | 0.0 | %vol |
| SP22KV_1 SF-Void | 0.0 | 0.0 | 0.0 | 0.0 | %vol |
| SP23KV_1 ROOF-Void | 0.1 | 0.1 | 0.0 | 0.0 | %vol |
| RELEASEPRESSURE | 0.0034 | 0.0040 | 0.0029 | 0.0002 | bar(g) |
| LOWFLOWMETER | 0.1131 | 0.1155 | 0.1113 | 0.0009 | g/s |
| | | | | | g/s |
| OUTLET TEMP | 3.3 | 3.4 | 3.2 | 0.1 | degC |
| Volume Flow Rate | 76.4 | 78.0 | 75.1 | 0.6 | LPM |
| Energy Flow Rate | 13.6 | 13.9 | 13.3 | 0.1 | kW |
| External Wind Speed | 6.4 | | | | m/s |
| External Wind Direction | 13.3 | | | | bearing |



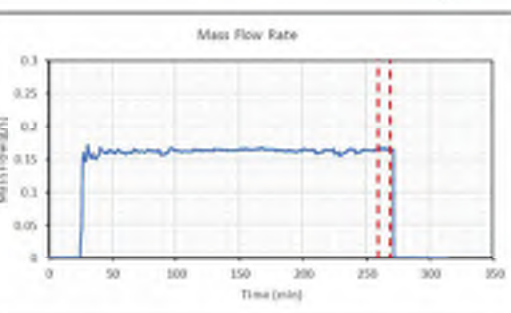
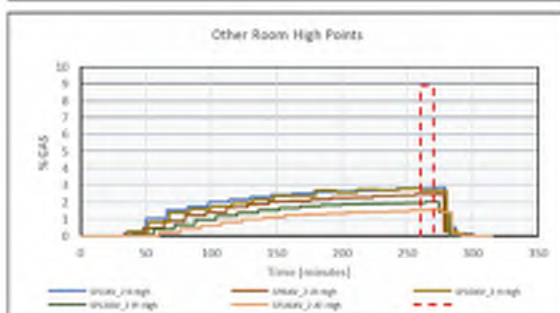
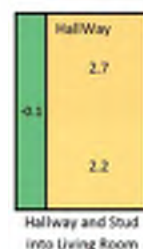
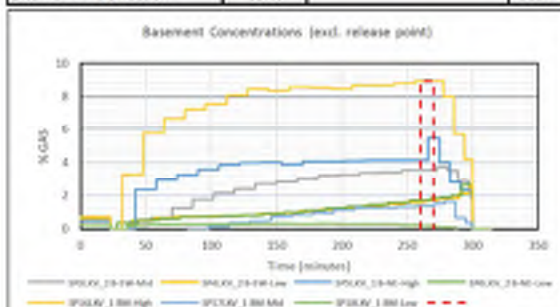
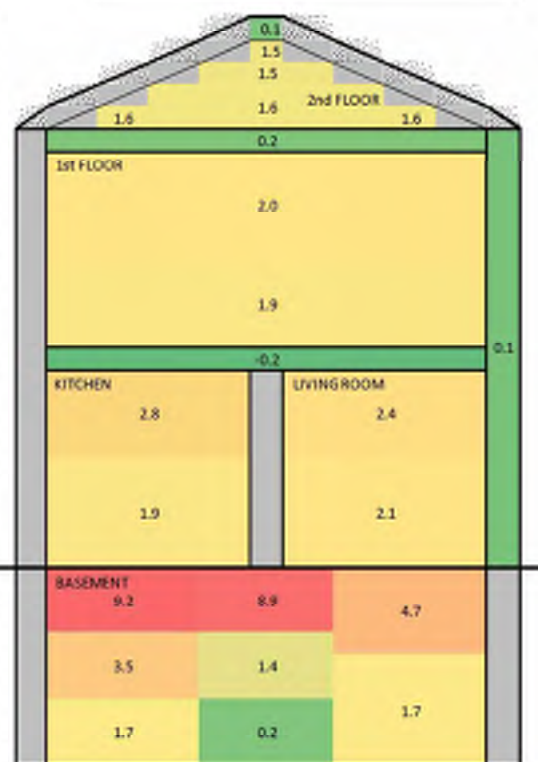
L3-058 RESULT

Hy4Heat WP7 Test Result

| | |
|---|----------------|
| MTP ID: L3-058 | |
| Hole Size: 5.1 mm | |
| Location: Basement High, downwards, door closed | |
| Gas: Hydrogen | |
| Date: 14/11/2019 | Time: 22:30:00 |
| Averaging Period Start: 260 min | End: 270 min |

Notes: SP17 removed. Analyser 3 LEL sensor non-functioning so using

| Sensor | Average | Max | Min | STDEV | Units |
|-------------------------|---------|--------|--------|--------|---------|
| SP1KKV_2 K-High | 2.8 | 2.8 | 2.8 | 0.0 | %vol |
| SP2KKV_1 B-SW-High | 9.2 | 9.2 | 9.2 | 0.0 | %vol |
| SP3KKV_2 B-SW-Mid | 3.5 | 3.5 | 3.5 | 0.0 | %vol |
| SP4KKV_2 B-SW-Low | 1.7 | 1.7 | 1.6 | 0.1 | %vol |
| SP5KKV_1 B-N/E-High | 4.7 | 5.4 | 4.1 | 0.7 | %vol |
| SP6KKV_2 B-N/E-Low | 1.7 | 1.8 | 1.7 | 0.0 | %vol |
| SP7KKV_2 K-Low | 1.9 | 2.0 | 1.9 | 0.0 | %vol |
| SP8KKV_2 LR-High | 2.4 | 2.4 | 2.4 | 0.0 | %vol |
| SP9KKV_2 LR-Mid | 2.1 | 2.1 | 2.1 | 0.0 | %vol |
| SP10KKV_2 H-High | 2.7 | 2.7 | 2.7 | 0.0 | %vol |
| SP11KKV_2 H-Mid | 2.2 | 2.2 | 2.2 | 0.0 | %vol |
| SP12KKV_2 FF-High | 2.0 | 2.0 | 2.0 | 0.0 | %vol |
| SP13KKV_2 FF-Mid | 1.9 | 1.9 | 1.9 | 0.0 | %vol |
| SP14KKV_2 AT-High | 1.5 | 1.6 | 1.5 | 0.0 | %vol |
| SP15KKV_2 AT-Mid | 1.6 | 1.6 | 1.6 | 0.0 | %vol |
| SP16KKV_1 BM-High | 8.9 | 8.9 | 8.9 | 0.0 | %vol |
| SP17KKV_1 BM-Mid | 1.4 | 1.4 | 1.4 | 0.0 | %vol |
| SP18KKV_1 BM-Low | 0.2 | 0.2 | 0.2 | 0.0 | %vol |
| SP19KKV_1 NWALL-Cav | 0.1 | 0.1 | 0.1 | 0.0 | %vol |
| SP20KKV_1 STUD-Cav | -0.1 | -0.1 | -0.1 | 0.0 | %vol |
| SP21KKV_1 FF-Void | -0.2 | -0.2 | -0.2 | 0.0 | %vol |
| SP22KKV_1 SF-Void | 0.2 | 0.2 | 0.2 | 0.0 | %vol |
| SP23KKV_1 ROOF-Void | 0.1 | 0.1 | 0.1 | 0.0 | %vol |
| RELEASEPRESSURE | 0.0062 | 0.0066 | 0.0059 | 0.0002 | barg |
| LOWFLOWMETER | 0.1653 | 0.1675 | 0.1638 | 0.0011 | g/s |
| | | | | | g/s |
| OUTLET TEMP | 4.0 | 4.2 | 3.9 | 0.1 | degC |
| Volume Flow Rate | 111.6 | 113.0 | 110.6 | 0.7 | SLPM |
| Energy Flow Rate | 19.8 | 20.1 | 19.6 | 0.1 | kW |
| External Wind Speed | 2.7 | | | | m/s |
| External Wind Direction | 357.0 | | | | bearing |



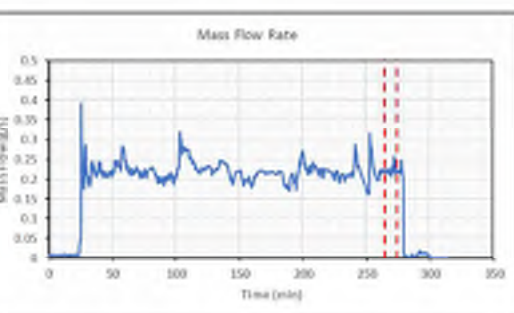
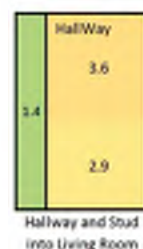
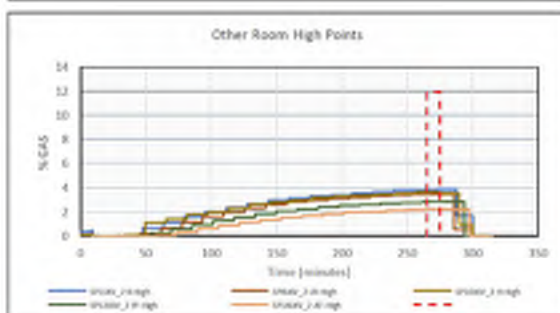
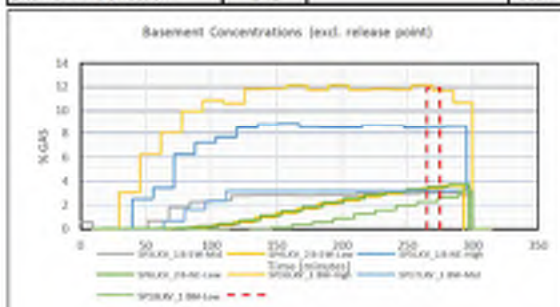
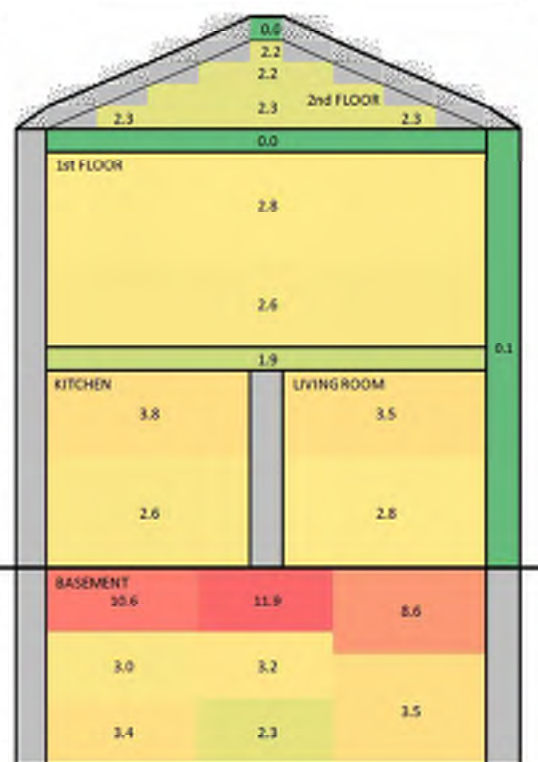
L3-059 RESULT

Hy4Heat WP7 Test Result

| | |
|---|----------------|
| MTP ID: L3-059 | |
| Hole Size: 5.1 mm | |
| Location: Basement High, downwards, door closed | |
| Gas: Hydrogen | |
| Date: 15/11/2019 | Time: 20:00:00 |
| Averaging Period Start: 265 min | End: 275 min |

Notes:

| Sensor | Average | Max | Min | STDEV | Units |
|-------------------------|---------|--------|--------|--------|---------|
| SP11KV_2 K-High | 3.8 | 3.9 | 3.8 | 0.0 | %vol |
| SP21KV_1 B-SW-High | 10.6 | 10.6 | 10.4 | 0.1 | %vol |
| SP31KV_1 B-SW-Mid | 3.0 | 3.0 | 3.0 | 0.0 | %vol |
| SP41KV_2 B-SW-Low | 3.4 | 3.4 | 3.4 | 0.0 | %vol |
| SP51KV_1 B-N/E-High | 8.6 | 8.6 | 8.6 | 0.0 | %vol |
| SP61KV_2 B-N/E-Low | 3.5 | 3.5 | 3.3 | 0.1 | %vol |
| SP71KV_2 K-Low | 2.6 | 2.6 | 2.6 | 0.0 | %vol |
| SP81KV_2 LR-High | 3.5 | 3.5 | 3.5 | 0.0 | %vol |
| SP91KV_2 LR-Mid | 2.8 | 2.8 | 2.8 | 0.0 | %vol |
| SP10KV_2 H-High | 3.6 | 3.6 | 3.5 | 0.0 | %vol |
| SP11KV_2 H-Mid | 2.9 | 2.9 | 2.9 | 0.0 | %vol |
| SP12KV_2 FF-High | 2.8 | 2.8 | 2.8 | 0.0 | %vol |
| SP13KV_2 FF-Mid | 2.6 | 2.6 | 2.6 | 0.0 | %vol |
| SP14KV_2 AT-High | 2.2 | 2.2 | 2.2 | 0.0 | %vol |
| SP15KV_2 AT-Mid | 2.3 | 2.3 | 2.3 | 0.0 | %vol |
| SP16KV_1 BM-High | 11.9 | 12.2 | 11.7 | 0.2 | %vol |
| SP17KV_1 BM-Mid | 3.2 | 3.2 | 3.2 | 0.0 | %vol |
| SP18KV_1 BM-Low | 2.3 | 2.7 | 2.3 | 0.1 | %vol |
| SP19KV_1 NWALL-Cav | 0.1 | 0.1 | 0.1 | 0.0 | %vol |
| SP20KV_1 STUD-Cav | 1.4 | 1.4 | 1.4 | 0.0 | %vol |
| SP21KV_1 FF-Void | 1.9 | 1.9 | 1.9 | 0.0 | %vol |
| SP22KV_1 SF-Void | 0.0 | 0.0 | 0.0 | 0.0 | %vol |
| SP23KV_1 ROOF-Void | 0.0 | 0.1 | 0.0 | 0.0 | %vol |
| RELEASEPRESSURE | 0.0102 | 0.0136 | 0.0085 | 0.0011 | barg |
| LOWFLOWMETER | 0.2234 | 0.2567 | 0.2066 | 0.0106 | g/s |
| | | | | | g/t |
| OUTLET TEMP | 4.5 | 4.6 | 4.4 | 0.0 | degC |
| Volume Flow Rate | 150.8 | 173.3 | 139.4 | 7.2 | SLPM |
| Energy Flow Rate | 26.8 | 30.8 | 24.8 | 1.3 | kW |
| External Wind Speed | 5.4 | | | | m/s |
| External Wind Direction | 14.2 | | | | bearing |



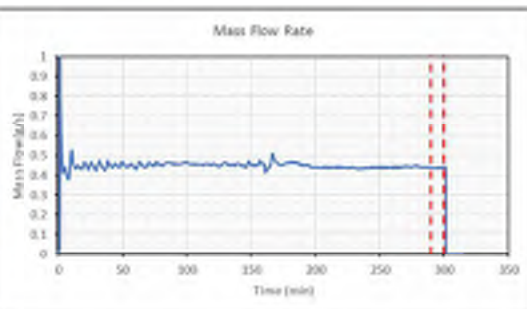
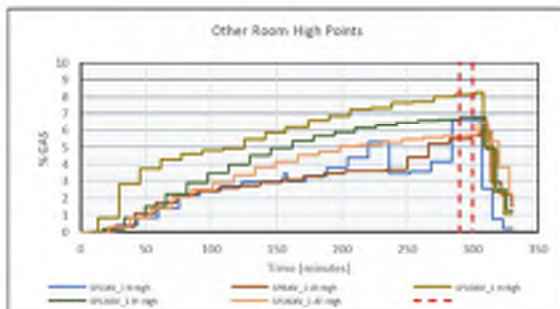
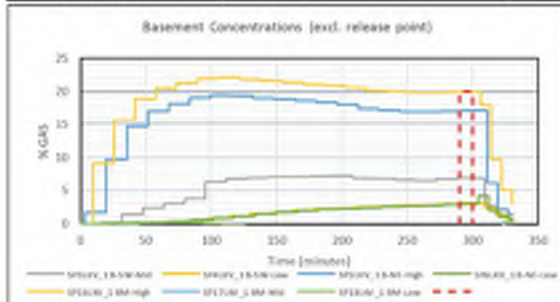
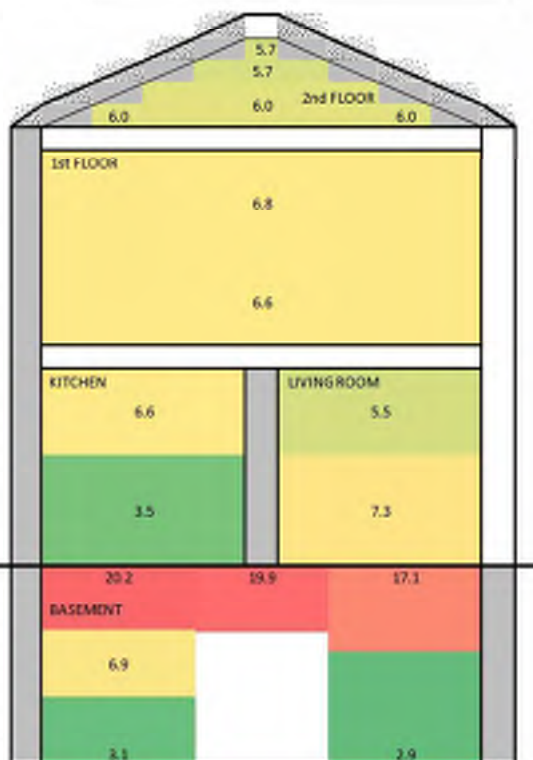
L3-060 RESULT

Hy4Heat WP7 Test Result

| | |
|--|----------------|
| MTP ID: L3-060 | |
| Hole Size: 10 mm | |
| Location: Basement downwards- basement door closed | |
| Gas: hydrogen | |
| Date: 18/11/2019 | Time: 09:59:10 |
| Averaging Period Start: 290 min | End: 300 min |

Notes: SP17-23 removed due to analyser failure

| Sensor | Average | Max | Min | STDEV | Units |
|-------------------------|---------|--------|--------|--------|---------|
| SP11KV_1 K-High | 6.6 | 6.6 | 6.6 | 0.0 | %vol |
| SP21KV_1 B-SW-High | 20.2 | 20.2 | 20.2 | 0.0 | %vol |
| SP31KV_1 B-SW-Mid | 6.9 | 6.9 | 6.9 | 0.0 | %vol |
| SP41KV_1 B-SW-Low | 3.1 | 3.1 | 2.9 | 0.0 | %vol |
| SP51KV_1 B-N/E-High | 17.1 | 17.1 | 17.1 | 0.0 | %vol |
| SP61KV_1 B-N/E-Low | 2.9 | 2.9 | 2.9 | 0.0 | %vol |
| SP71KV_1 K-Low | 3.5 | 3.5 | 3.4 | 0.0 | %vol |
| SP81KV_1 LR-High | 5.5 | 5.7 | 5.5 | 0.1 | %vol |
| SP91KV_1 LR-Mid | 7.3 | 7.3 | 7.3 | 0.0 | %vol |
| SP10KV_1 H-High | 8.1 | 8.1 | 8.1 | 0.0 | %vol |
| SP11KV_1 H-Mid | 7.0 | 7.0 | 7.0 | 0.0 | %vol |
| SP12KV_1 FF-High | 6.8 | 6.8 | 6.7 | 0.0 | %vol |
| SP13KV_1 FF-Mid | 6.6 | 6.6 | 6.5 | 0.0 | %vol |
| SP14KV_1 AT-High | 5.7 | 5.7 | 5.7 | 0.0 | %vol |
| SP15KV_1 AT-Mid | 6.0 | 6.0 | 5.9 | 0.0 | %vol |
| SP16KV_1 BM-High | 19.9 | 19.9 | 19.9 | 0.0 | %vol |
| SP17KV_1 BM-Mid | | | | | %vol |
| SP18KV_1 BM-Low | | | | | %vol |
| SP19KV_1 N/WALL-Cav | | | | | %vol |
| SP20KV_1 STUD-Cav | | | | | %vol |
| SP21KV_1 FF-Void | | | | | %vol |
| SP22KV_1 SF-Void | | | | | %vol |
| SP23KV_1 ROOF-Void | | | | | %vol |
| RELEASEPRESSURE | 0.0044 | 0.0047 | 0.0040 | 0.0002 | barg |
| LOWFLOWMETER | 0.4361 | 0.4426 | 0.4340 | 0.0020 | g/s |
| | | | | | g/s |
| OUTLET TEMP | 8.5 | 8.7 | 8.3 | 0.1 | degC |
| Volume Flow Rate | 294.4 | 298.7 | 292.9 | 1.3 | SLPM |
| Energy Flow Rate | 52.3 | 53.1 | 52.0 | 0.2 | kW |
| External Wind Speed | 1.0 | | | | m/s |
| External Wind Direction | 277.3 | | | | bearing |



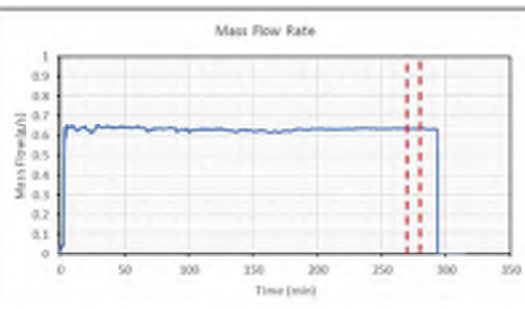
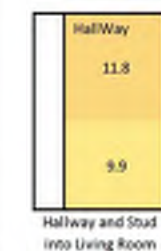
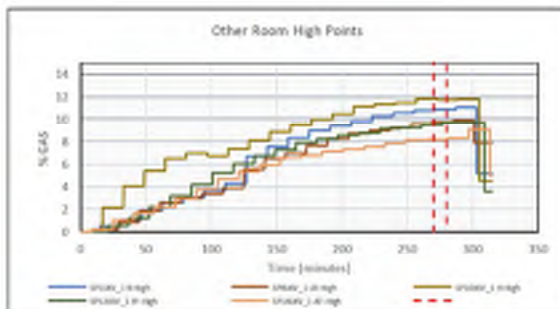
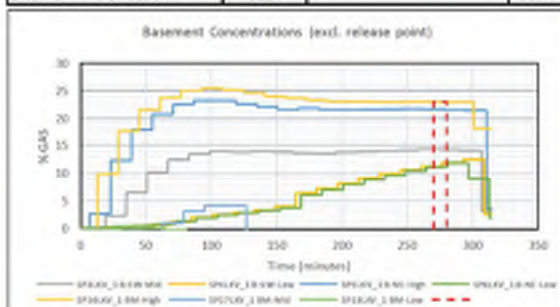
L3-061 RESULT

Hy4Heat WP7 Test Result

| | |
|--|--------------|
| MTP ID: L3-061 | |
| Hole Size: 10mm | |
| Location: Basement downwards- basement door closed | |
| Gas: hydrogen | |
| Date: #REF! | Time: #REF! |
| Averaging Period Start: 270 min | End: 280 min |

Notes: SP17 to 23 removed due to fault on analyser 3

| Sensor | Average | Max | Min | STDEV | Units |
|-------------------------|---------|--------|--------|--------|---------|
| SP1KVV_1 K-High | 10.9 | 10.9 | 10.8 | 0.0 | %vol |
| SP2LKV_1 B-SW-High | 23.0 | 23.0 | 23.0 | 0.0 | %vol |
| SP3LKV_1 B-SW-Mid | 14.3 | 14.3 | 14.2 | 0.0 | %vol |
| SP4LKV_1 B-SW-Low | 11.5 | 11.9 | 11.3 | 0.3 | %vol |
| SP5LKV_1 B-N/E-High | 21.7 | 21.7 | 21.6 | 0.0 | %vol |
| SP6LKV_1 B-N/E-Low | 11.2 | 11.2 | 11.2 | 0.0 | %vol |
| SP7LKV_1 K-Low | 7.9 | 7.9 | 7.9 | 0.0 | %vol |
| SP8LKV_1 LR-High | 9.8 | 9.8 | 9.8 | 0.0 | %vol |
| SP9LKV_1 LR-Mid | 10.1 | 10.1 | 9.9 | 0.1 | %vol |
| SP10LKV_1 H-High | 11.8 | 11.8 | 11.7 | 0.0 | %vol |
| SP11LKV_1 H-Mid | 9.9 | 10.0 | 9.9 | 0.1 | %vol |
| SP12LKV_1 FF-High | 9.6 | 9.7 | 9.5 | 0.1 | %vol |
| SP13LKV_1 FF-Mid | 9.2 | 9.3 | 9.2 | 0.0 | %vol |
| SP14LKV_1 AT-High | 8.2 | 8.2 | 8.2 | 0.0 | %vol |
| SP15LKV_1 AT-Mid | 8.4 | 8.4 | 8.4 | 0.0 | %vol |
| SP16LKV_1 BM-High | 23.0 | 23.0 | 23.0 | 0.0 | %vol |
| SP17LKV_1 BM-Mid | | | | | %vol |
| SP18LKV_1 BM-Low | | | | | %vol |
| SP19LKV_1 NWALL-Cav | | | | | %vol |
| SP20LKV_1 STUD-Cav | | | | | %vol |
| SP21LKV_1 FF-Void | | | | | %vol |
| SP22LKV_1 SF-Void | | | | | %vol |
| SP23LKV_1 ROOF-Void | | | | | %vol |
| RELEASEPRESSURE | 0.0100 | 0.0103 | 0.0099 | 0.0002 | barg |
| LOWFLOWMETER | 0.6388 | 0.6388 | 0.6345 | 0.0011 | g/s |
| | | | | | g/t |
| OUTLET TEMP | -2.6 | -2.5 | -2.8 | 0.1 | degC |
| Volume Flow Rate | 429.8 | 431.1 | 428.2 | 0.7 | SLPM |
| Energy Flow Rate | 76.3 | 76.6 | 76.1 | 0.1 | kW |
| External Wind Speed | 1.3 | | | | m/s |
| External Wind Direction | 322.6 | | | | bearing |



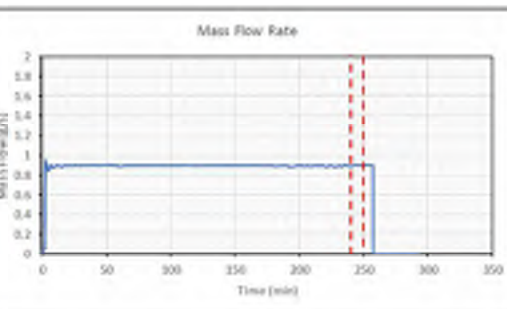
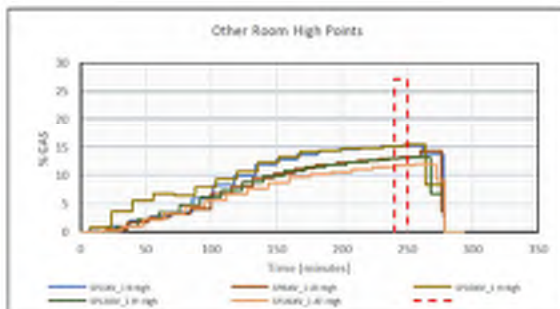
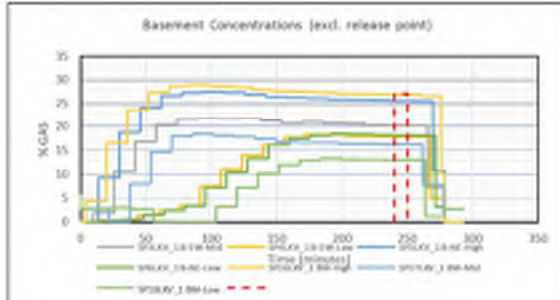
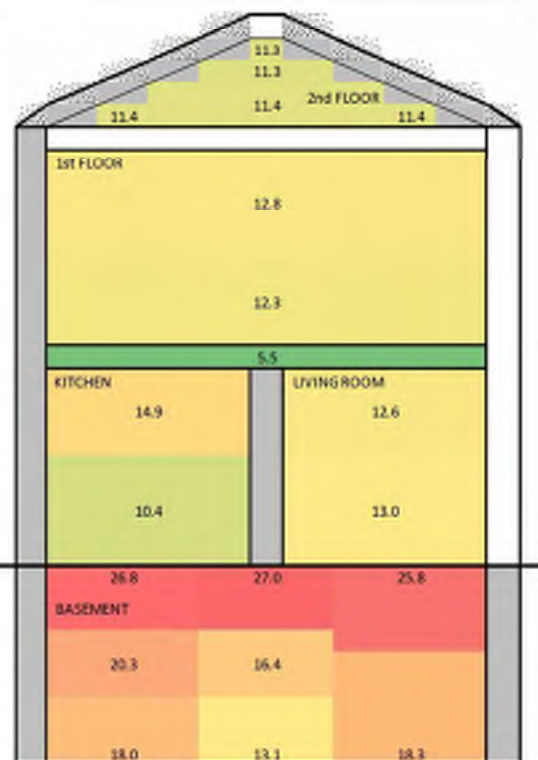
L3-062 RESULT

Hy4Heat WP7 Test Result

| | |
|--|----------------|
| MTP ID: L3-062 | |
| Hole Size: 10mm | |
| Location: Basement downwards- basement door closed | |
| Gas: hydrogen | |
| Date: 09/11/2019 | Time: 01:15:00 |
| Averaging Period Start: 240 min | End: 250 min |

Notes: SP18, 21, 23 removed - suspected low flow. Offset removed from SP17,18, 20, 21 @ -2.6%

| Sensor | Average | Max | Min | STDEV | Units |
|-------------------------|---------|--------|--------|--------|---------|
| SP1K_V_1 K-High | 14.9 | 14.9 | 14.9 | 0.0 | %vol |
| SP2K_V_1 B-SW-High | 26.8 | 26.8 | 26.8 | 0.0 | %vol |
| SP3K_V_1 B-SW-Mid | 20.3 | 20.3 | 20.3 | 0.0 | %vol |
| SP4K_V_1 B-SW-Low | 18.0 | 18.0 | 18.0 | 0.0 | %vol |
| SP5K_V_1 B-N/E-High | 25.8 | 25.8 | 25.8 | 0.0 | %vol |
| SP6K_V_1 B-N/E-Low | 18.3 | 18.4 | 18.2 | 0.1 | %vol |
| SP7K_V_1 K-Low | 10.4 | 10.8 | 10.3 | 0.2 | %vol |
| SP8K_V_1 LR-High | 12.6 | 12.9 | 12.6 | 0.1 | %vol |
| SP9K_V_1 LR-Mid | 13.0 | 13.0 | 13.0 | 0.0 | %vol |
| SP10K_V_1 H-High | 14.9 | 14.9 | 14.9 | 0.0 | %vol |
| SP11K_V_1 H-Mid | 13.0 | 13.0 | 13.0 | 0.0 | %vol |
| SP12K_V_1 FF-High | 12.8 | 12.8 | 12.5 | 0.1 | %vol |
| SP13K_V_1 FF-Mid | 12.3 | 12.5 | 12.1 | 0.2 | %vol |
| SP14K_V_1 AT-High | 11.3 | 11.5 | 11.1 | 0.2 | %vol |
| SP15K_V_1 AT-Mid | 11.4 | 11.7 | 11.3 | 0.2 | %vol |
| SP16K_V_1 BM-High | 27.0 | 27.1 | 27.0 | 0.0 | %vol |
| SP17K_V_1 BM-Mid | 16.4 | 16.4 | 16.4 | 0.0 | %vol |
| SP18K_V_1 BM-Low | 13.1 | 13.1 | 13.1 | 0.0 | %vol |
| SP19K_V_1 NWALL-Cav | | | | | %vol |
| SP20K_V_1 STUD-Cav | 4.4 | 4.4 | 3.9 | 0.2 | %vol |
| SP21K_V_1 FF-Void | 5.5 | 5.7 | 5.1 | 0.2 | %vol |
| SP22K_V_1 SF-Void | | | | | %vol |
| SP23K_V_1 ROOF-Void | | | | | %vol |
| RELEASEPRESSURE | 0.0185 | 0.0192 | 0.0180 | 0.0003 | barg |
| LOWFLOWMETER | 0.8893 | 0.8955 | 0.8827 | 0.0044 | g/s |
| OUTLET TEMP | -3.3 | -3.3 | -3.5 | 0.1 | degC |
| Volume Flow Rate | 600.2 | 604.4 | 595.7 | 3.0 | SLPM |
| Energy Flow Rate | 106.6 | 107.4 | 105.8 | 0.5 | kW |
| External Wind Speed | 2.1 | | | | m/s |
| External Wind Direction | 313.5 | | | | bearing |



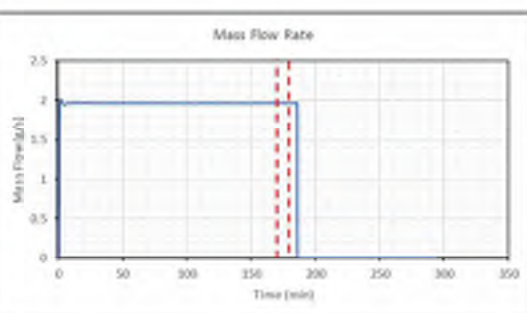
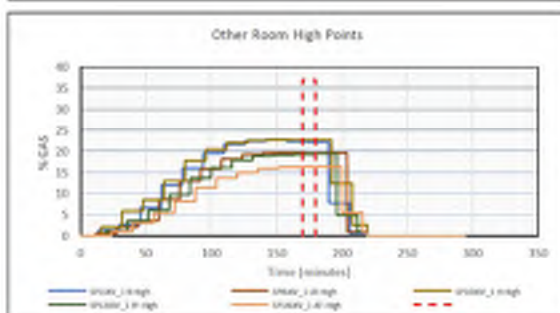
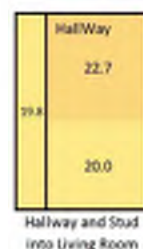
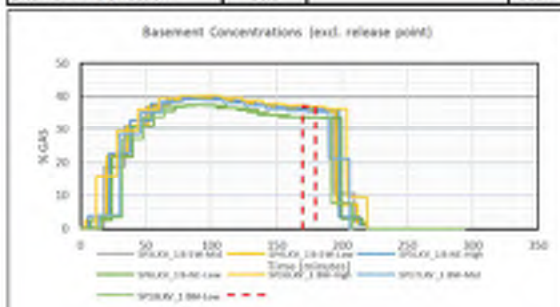
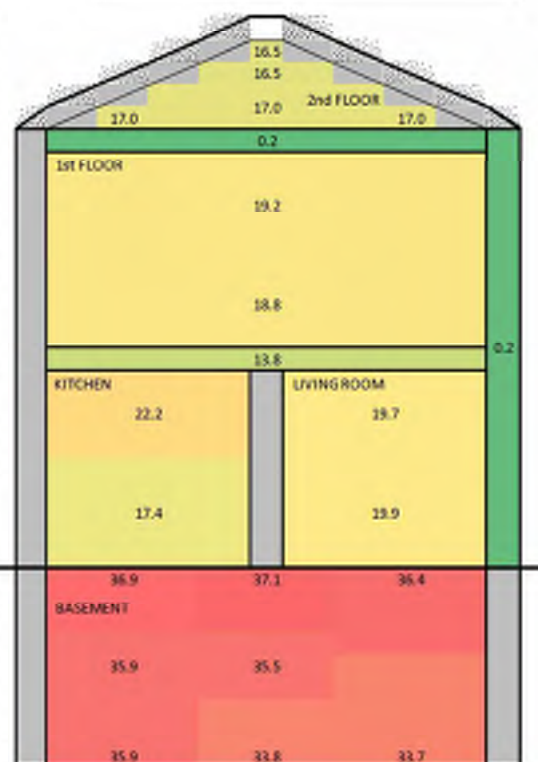
L3-063 RESULT

Hy4Heat WP7 Test Result

| | |
|--|----------------|
| MTP ID: L3-063 | |
| Hole Size: 10 mm | |
| Location: Basement downwards- basement door closed | |
| Gas: hydrogen | |
| Date: 21/11/2019 | Time: 14:00:00 |
| Averaging Period Start: 170 min | End: 180 min |

Notes: SP23 removed

| Sensor | Average | Max | Min | STDEV | Units |
|-------------------------|---------|--------|--------|--------|---------|
| SP1KKV_1 K-High | 22.2 | 22.3 | 22.1 | 0.1 | %vol |
| SP2KKV_1 B-SW-High | 36.9 | 37.1 | 36.6 | 0.2 | %vol |
| SP3KKV_1 B-SW-Mid | 35.9 | 35.9 | 35.8 | 0.1 | %vol |
| SP4KKV_1 B-SW-Low | 35.9 | 35.9 | 35.5 | 0.1 | %vol |
| SP5KKV_1 B-NIS-High | 36.4 | 36.4 | 36.4 | 0.0 | %vol |
| SP6KKV_1 B-NIS-Low | 33.7 | 33.7 | 33.7 | 0.0 | %vol |
| SP7KKV_1 K-Low | 17.4 | 17.4 | 17.4 | 0.0 | %vol |
| SP8KKV_1 LR-High | 19.7 | 19.8 | 19.6 | 0.0 | %vol |
| SP9KKV_1 LR-Mid | 19.9 | 20.0 | 19.9 | 0.0 | %vol |
| SP10KKV_1 H-High | 22.7 | 22.7 | 22.6 | 0.0 | %vol |
| SP11KKV_1 H-Mid | 20.0 | 20.0 | 19.9 | 0.0 | %vol |
| SP12KKV_1 FF-High | 19.2 | 19.4 | 19.2 | 0.0 | %vol |
| SP13KKV_1 FF-Mid | 18.8 | 18.8 | 18.8 | 0.0 | %vol |
| SP14KKV_1 AT-High | 16.5 | 16.5 | 16.5 | 0.0 | %vol |
| SP15KKV_1 AT-Mid | 17.0 | 17.0 | 17.0 | 0.0 | %vol |
| SP16KKV_1 BM-High | 37.1 | 37.3 | 37.0 | 0.1 | %vol |
| SP17KKV_1 BM-Mid | 35.5 | 35.7 | 35.4 | 0.2 | %vol |
| SP18KKV_1 BM-Low | 33.8 | 33.9 | 33.7 | 0.1 | %vol |
| SP19KKV_1 NWALL-Cav | 0.2 | 0.2 | 0.2 | 0.0 | %vol |
| SP20KKV_1 STUD-Cav | 19.8 | 19.8 | 19.7 | 0.0 | %vol |
| SP21KKV_1 FF-Void | 13.8 | 13.8 | 13.8 | 0.0 | %vol |
| SP22KKV_1 SF-Void | 0.2 | 0.2 | 0.2 | 0.0 | %vol |
| SP23KKV_1 ROOF-Void | | | | | %vol |
| RELEASEPRESSURE | 0.0880 | 0.0890 | 0.0874 | 0.0004 | barg |
| LOWFLOWMETER | 1.9650 | 1.9594 | 1.9633 | 0.0013 | g/s |
| OUTLET TEMP | 4.4 | 4.6 | 4.3 | 0.0 | degC |
| Volume Flow Rate | 1319.4 | 1322.4 | 1318.3 | 0.9 | SLPM |
| Energy Flow Rate | 234.4 | 234.9 | 234.2 | 0.2 | kW |
| External Wind Speed | 6.7 | | | | m/s |
| External Wind Direction | 90.0 | | | | bearing |



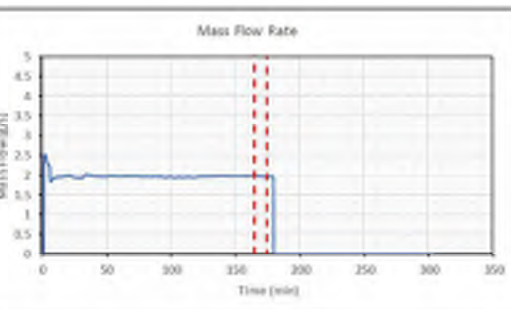
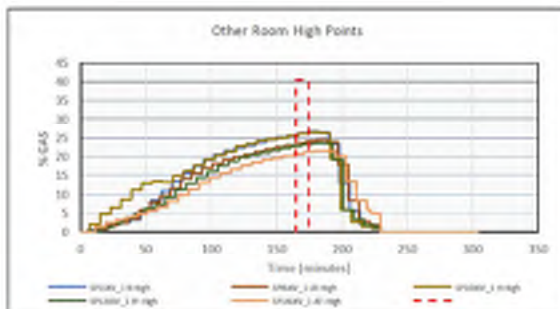
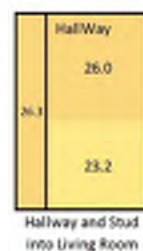
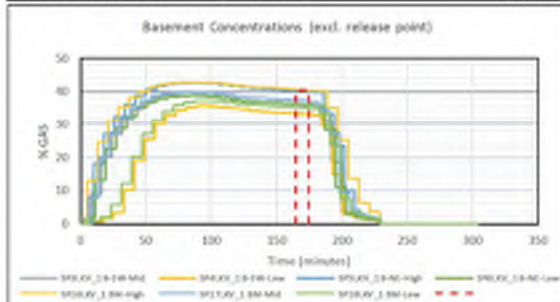
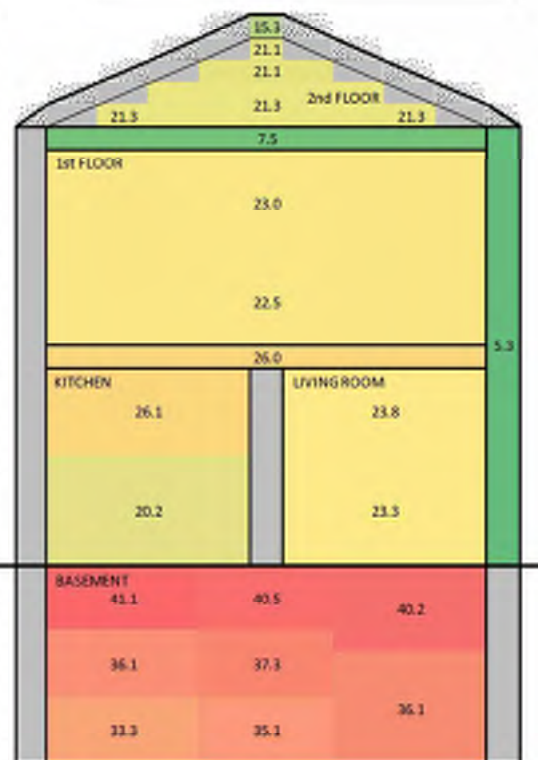
L3-064 RESULT

Hy4Heat WP7 Test Result

| | |
|--|----------------|
| MTP ID: L3-064 | |
| Hole Size: 15 mm | |
| Location: Basement downwards release, basement door closed | |
| Gas: Hydrogen | |
| Date: 29/11/2019 | Time: 17:00:00 |
| Averaging Period Start: 165 min | End: 175 min |

Notes:

| Sensor | Average | Max | Min | STDEV | Units |
|-------------------------|---------|--------|--------|--------|---------|
| SP1KKV_1 K-High | 26.1 | 26.7 | 25.5 | 0.3 | %vol |
| SP2KKV_1 B-SW-High | 41.1 | 41.5 | 41.0 | 0.2 | %vol |
| SP3KKV_1 B-SW-Mid | 36.1 | 36.1 | 36.0 | 0.1 | %vol |
| SP4KKV_1 B-SW-Low | 33.3 | 33.4 | 33.2 | 0.1 | %vol |
| SP5KKV_1 B-N/E-High | 40.2 | 40.3 | 40.1 | 0.1 | %vol |
| SP6KKV_1 B-N/E-Low | 36.1 | 36.2 | 36.0 | 0.1 | %vol |
| SP7KKV_1 K-Low | 20.2 | 20.7 | 20.0 | 0.3 | %vol |
| SP8KKV_1 LR-High | 23.8 | 24.2 | 23.1 | 0.2 | %vol |
| SP9KKV_1 LR-Mid | 23.3 | 23.7 | 22.7 | 0.2 | %vol |
| SP10KKV_1 H-High | 26.0 | 26.1 | 25.7 | 0.2 | %vol |
| SP11KKV_1 H-Mid | 23.2 | 23.3 | 22.9 | 0.2 | %vol |
| SP12KKV_1 FF-High | 23.0 | 23.2 | 22.8 | 0.2 | %vol |
| SP13KKV_1 FF-Mid | 22.5 | 22.8 | 22.2 | 0.3 | %vol |
| SP14KKV_1 AT-High | 21.1 | 21.4 | 20.9 | 0.3 | %vol |
| SP15KKV_1 AT-Mid | 21.3 | 21.5 | 21.2 | 0.2 | %vol |
| SP16KKV_1 BM-High | 40.5 | 40.8 | 40.3 | 0.1 | %vol |
| SP17KKV_1 BM-Mid | 37.3 | 37.5 | 37.0 | 0.1 | %vol |
| SP18KKV_1 BM-Low | 35.1 | 35.2 | 35.1 | 0.1 | %vol |
| SP19KV_1 N/WALL-Cav | 5.3 | 5.5 | 5.2 | 0.1 | %vol |
| SP20KV_1 STUD-Cav | 26.3 | 26.5 | 26.1 | 0.2 | %vol |
| SP21KKV_1 FF-Void | 26.0 | 26.2 | 25.8 | 0.2 | %vol |
| SP22KV_1 SF-Void | 7.5 | 8.1 | 7.1 | 0.5 | %vol |
| SP23KV_1 ROOF-Void | 15.3 | 15.6 | 14.9 | 0.1 | %vol |
| RELEASEPRESSURE | 0.0145 | 0.0144 | 0.0136 | 0.0002 | barg |
| LOWFLOWMETER | 1.9650 | 1.9771 | 1.9521 | 0.0078 | g/s |
| | | | | | g/s |
| OUTLET TEMP | -3.3 | -3.3 | -3.5 | 0.1 | degC |
| Volume Flow Rate | 1326.2 | 1334.4 | 1317.5 | 5.2 | SLPM |
| Energy Flow Rate | 235.6 | 237.1 | 234.1 | 0.9 | kW |
| External Wind Speed | 0.3 | | | | m/s |
| External Wind Direction | 352.0 | | | | bearing |



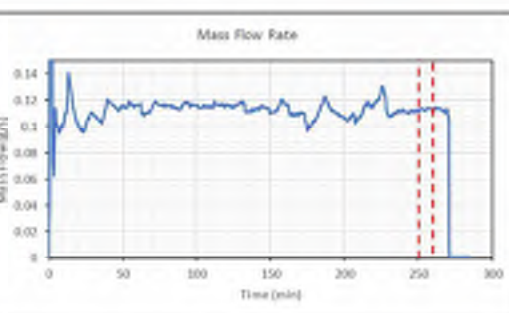
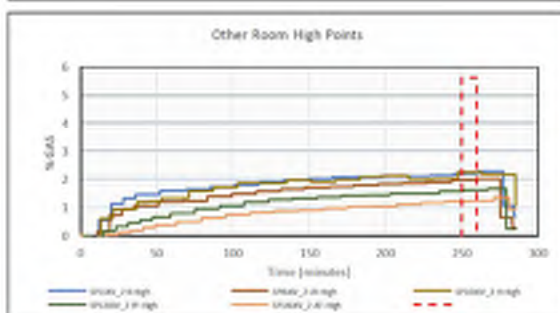
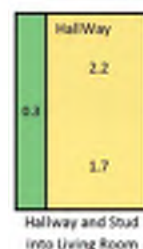
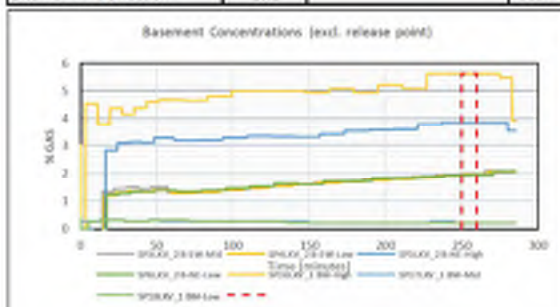
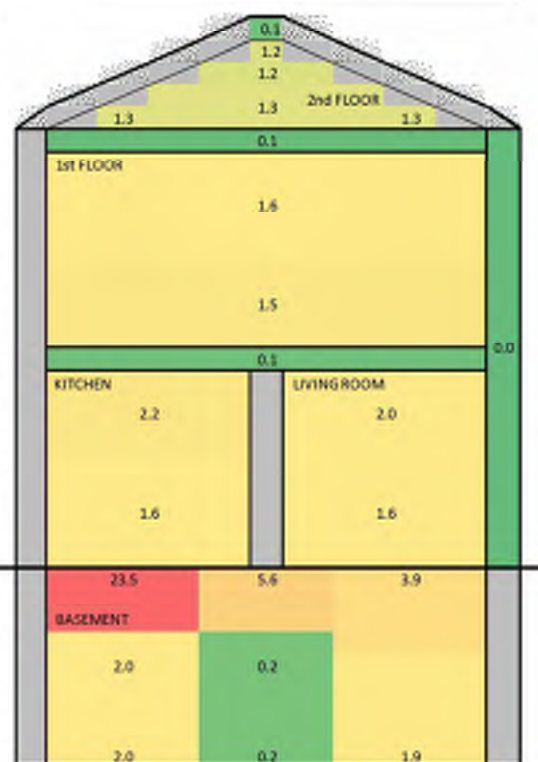
L3-065 RESULT

Hy4Heat WP7 Test Result

| | |
|---|----------------|
| MTP ID: L3-065 | |
| Hole Size: 5 mm | |
| Location: Basement horizontal- basement door closed | |
| Gas: hydrogen | |
| Date: 06/11/2009 | Time: 05:30:00 |
| Averaging Period Start: 250 min | End: 290 min |

Notes: Analyser 3 LEL sensor faulty so SP17 to SP23 taken from VOL sensor

| Sensor | Average | Max | Min | STDEV | Units |
|-------------------------|---------|--------|--------|--------|---------|
| SP1KV_2 K-High | 2.2 | 2.2 | 2.2 | 0.0 | %vol |
| SP2KV_1 B-SW-High | 23.5 | 23.5 | 23.5 | 0.0 | %vol |
| SP3KV_2 B-SW-Mid | 2.0 | 2.0 | 2.0 | 0.0 | %vol |
| SP4KV_2 B-SW-Low | 2.0 | 2.0 | 1.9 | 0.0 | %vol |
| SP5KV_2 B-NIS-High | 3.9 | 3.9 | 3.9 | 0.0 | %vol |
| SP6KV_2 B-NIS-Low | 1.9 | 2.0 | 1.9 | 0.0 | %vol |
| SP7KV_2 K-Low | 1.6 | 1.6 | 1.6 | 0.0 | %vol |
| SP8KV_2 LR-High | 2.0 | 2.0 | 2.0 | 0.0 | %vol |
| SP9KV_2 LR-Mid | 1.6 | 1.6 | 1.6 | 0.0 | %vol |
| SP10KV_2 H-High | 2.2 | 2.2 | 2.2 | 0.0 | %vol |
| SP11KV_2 H-Mid | 1.7 | 1.7 | 1.7 | 0.0 | %vol |
| SP12KV_2 FF-High | 1.6 | 1.6 | 1.6 | 0.0 | %vol |
| SP13KV_2 FF-Mid | 1.5 | 1.5 | 1.5 | 0.0 | %vol |
| SP14KV_2 AT-High | 1.2 | 1.2 | 1.2 | 0.0 | %vol |
| SP15KV_2 AT-Mid | 1.3 | 1.3 | 1.3 | 0.0 | %vol |
| SP16KV_1 BM-High | 5.6 | 5.6 | 5.6 | 0.0 | %vol |
| SP17KV_1 BM-Mid | 0.2 | 0.2 | 0.2 | 0.0 | %vol |
| SP18KV_1 BM-Low | 0.2 | 0.2 | 0.2 | 0.0 | %vol |
| SP19KV_1 NWALL-Cav | 0.0 | 0.0 | 0.0 | 0.0 | %vol |
| SP20KV_1 STUD-Cav | 0.3 | 0.3 | 0.2 | 0.0 | %vol |
| SP21KV_1 FF-Void | 0.1 | 0.1 | 0.1 | 0.0 | %vol |
| SP22KV_1 SF-Void | 0.1 | 0.1 | 0.1 | 0.0 | %vol |
| SP23KV_1 ROOF-Void | 0.1 | 0.2 | 0.1 | 0.0 | %vol |
| RELEASEPRESSURE | 0.0029 | 0.0032 | 0.0025 | 0.0002 | barg |
| LOWFLOWMETER | 0.1130 | 0.1143 | 0.1113 | 0.0007 | g/s |
| OUTLET TEMP | 7.1 | 7.3 | 7.0 | 0.1 | degC |
| Volume Flow Rate | 76.2 | 77.1 | 75.1 | 0.5 | SLPM |
| Energy Flow Rate | 13.5 | 13.7 | 13.3 | 0.1 | kW |
| External Wind Speed | 3.1 | | | | m/s |
| External Wind Direction | 26.2 | | | | bearing |



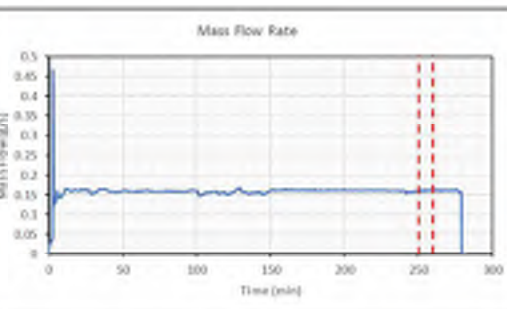
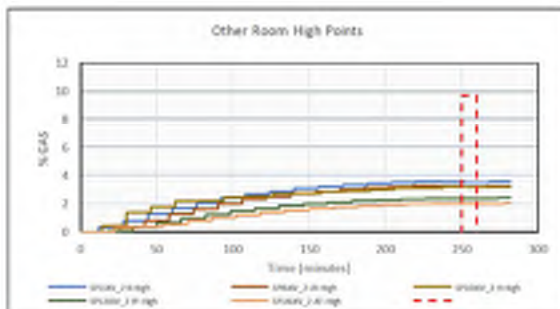
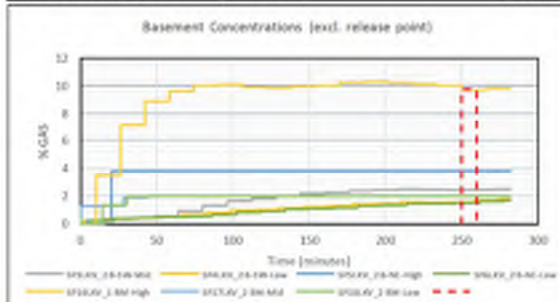
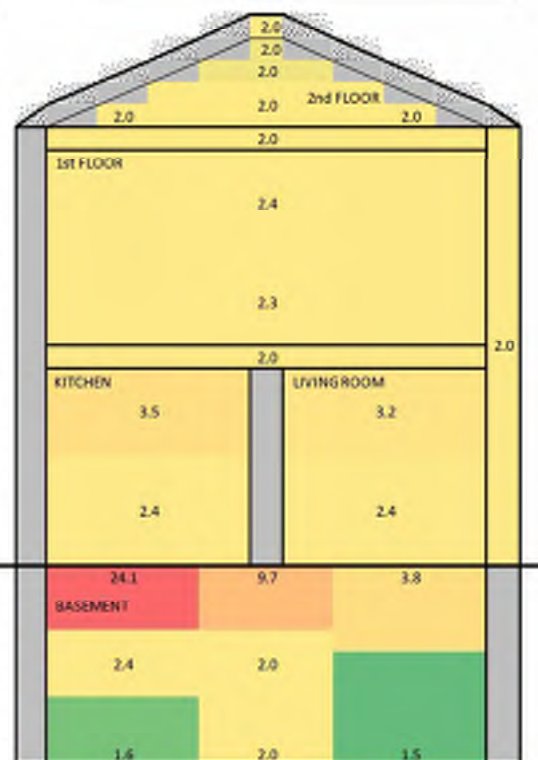
L3-066 RESULT

Hy4Heat WP7 Test Result

| | |
|---|----------------|
| MTP ID: L3-066 | |
| Hole Size: 5 mm | |
| Location: Basement horizontal- basement door closed | |
| Gas: hydrogen | |
| Date: 06/11/2019 | Time: 13:00:00 |
| Averaging Period Start: 250 min | End: 260 min |

Notes: SP17 - SP23 'topped out' on LEL sensor but greater than alternate readings on VOL sensor so left in @ 2.0%

| Sensor | Average | Max | Min | STDEV | Units |
|-------------------------|---------|--------|--------|--------|---------|
| SP1KLV_2 K-High | 3.5 | 3.5 | 3.5 | 0.0 | %vol |
| SP2LKV_1 B-SW-High | 24.1 | 24.2 | 24.1 | 0.0 | %vol |
| SP3LKV_2 B-SW-Mid | 2.4 | 2.5 | 2.4 | 0.0 | %vol |
| SP4LKV_2 B-SW-Low | 1.6 | 1.7 | 1.6 | 0.0 | %vol |
| SP5LKV_2 B-NIS-High | 3.8 | 3.8 | 3.8 | 0.0 | %vol |
| SP6LKV_2 B-NIS-Low | 1.5 | 1.5 | 1.5 | 0.0 | %vol |
| SP7LKV_2 K-Low | 2.4 | 2.4 | 2.4 | 0.0 | %vol |
| SP8LKV_2 LR-High | 3.2 | 3.2 | 3.2 | 0.0 | %vol |
| SP9LKV_2 LR-Mid | 2.4 | 2.4 | 2.4 | 0.0 | %vol |
| SP10KV_2 H-High | 3.2 | 3.2 | 3.1 | 0.0 | %vol |
| SP11KV_2 H-Mid | 2.5 | 2.5 | 2.5 | 0.0 | %vol |
| SP12KV_2 FF-High | 2.4 | 2.4 | 2.4 | 0.0 | %vol |
| SP13KV_2 FF-Mid | 2.3 | 2.3 | 2.3 | 0.0 | %vol |
| SP14KV_2 AT-High | 2.0 | 2.0 | 2.0 | 0.0 | %vol |
| SP15KV_2 AT-Mid | 2.0 | 2.0 | 2.0 | 0.0 | %vol |
| SP16KV_1 BM-High | 9.7 | 10.0 | 9.7 | 0.1 | %vol |
| SP17KV_2 BM-Mid | 2.0 | 2.0 | 2.0 | 0.0 | %vol |
| SP18KV_2 BM-Low | 2.0 | 2.0 | 2.0 | 0.0 | %vol |
| SP19KV_2 NWALL-Cav | 2.0 | 2.0 | 2.0 | 0.0 | %vol |
| SP20KV_2 STUD-Cav | 2.0 | 2.0 | 2.0 | 0.0 | %vol |
| SP21KV_2 FF-Void | 2.0 | 2.0 | 2.0 | 0.0 | %vol |
| SP22KV_2 SF-Void | 2.0 | 2.0 | 2.0 | 0.0 | %vol |
| SP23KV_2 ROOF-Void | 2.0 | 2.0 | 2.0 | 0.0 | %vol |
| RELEASEPRESSURE | 0.0058 | 0.0062 | 0.0056 | 0.0002 | barg |
| LOWFLOWMETER | 0.1607 | 0.1620 | 0.1589 | 0.0008 | g/s |
| | | | | | g/t |
| OUTLET TEMP | 6.1 | 6.2 | 6.0 | 0.0 | degC |
| Volume Flow Rate | 108.5 | 109.3 | 107.3 | 0.5 | SLPM |
| Energy Flow Rate | 19.3 | 19.4 | 19.1 | 0.1 | kW |
| External Wind Speed | 2.7 | | | | m/s |
| External Wind Direction | 2.2 | | | | bearing |



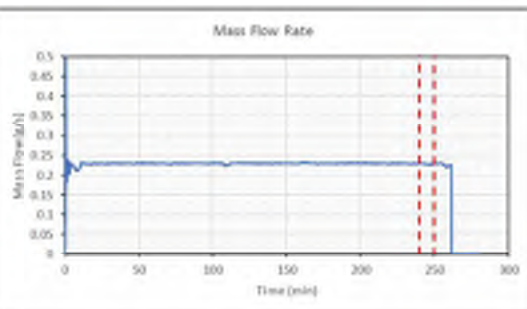
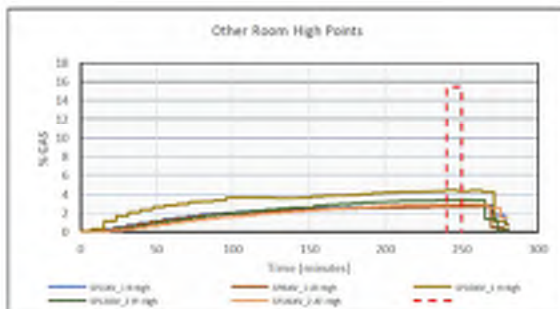
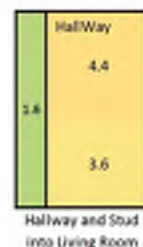
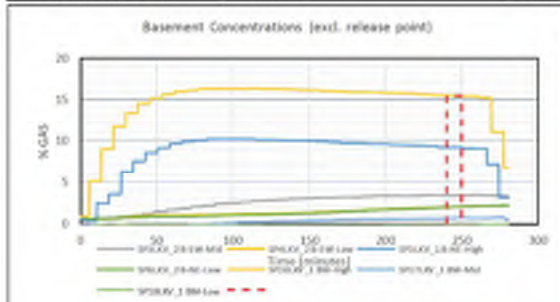
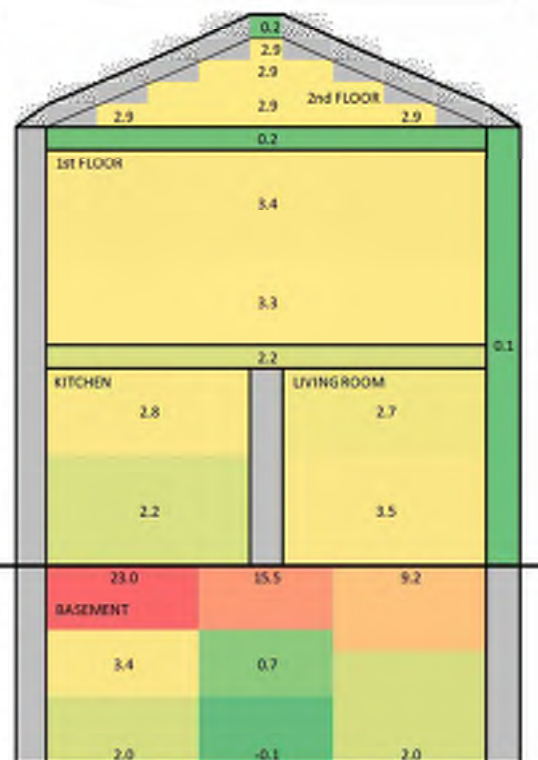
L3-067 RESULT

Hy4Heat WP7 Test Result

| | |
|---|----------------|
| MTP ID: L3-067 | |
| Hole Size: 5 mm | |
| Location: Basement horizontal- basement door closed | |
| Gas: hydrogen | |
| Date: 06/11/2019 | Time: 22:00:00 |
| Averaging Period Start: 240 min | End: 250 min |

Notes:

| Sensor | Average | Max | Min | STDEV | Units |
|-------------------------|---------|--------|--------|--------|---------|
| SP1KLV_1 K-High | 2.8 | 2.8 | 2.7 | 0.0 | %vol |
| SP2LKV_1 B-SW-High | 23.0 | 23.1 | 22.9 | 0.1 | %vol |
| SP3LKV_2 B-SW-Mid | 3.4 | 3.4 | 3.4 | 0.0 | %vol |
| SP4LKV_2 B-SW-Low | 2.0 | 2.1 | 2.0 | 0.0 | %vol |
| SP5LKV_1 B-N/E-High | 9.2 | 9.2 | 9.2 | 0.0 | %vol |
| SP6LKV_2 B-N/E-Low | 2.0 | 2.0 | 2.0 | 0.0 | %vol |
| SP7LKV_1 K-Low | 2.2 | 2.2 | 2.2 | 0.0 | %vol |
| SP8LKV_1 LR-High | 2.7 | 2.7 | 2.7 | 0.0 | %vol |
| SP9LKV_1 LR-Mid | 3.5 | 3.6 | 3.5 | 0.0 | %vol |
| SP10LKV_1 H-High | 4.4 | 4.4 | 4.3 | 0.1 | %vol |
| SP11LKV_1 H-Mid | 3.6 | 3.6 | 3.5 | 0.0 | %vol |
| SP12LKV_2 FF-High | 3.4 | 3.4 | 3.4 | 0.0 | %vol |
| SP13LKV_2 FF-Mid | 3.3 | 3.3 | 3.3 | 0.0 | %vol |
| SP14LKV_2 AT-High | 2.9 | 2.9 | 2.9 | 0.0 | %vol |
| SP15LKV_2 AT-Mid | 2.9 | 2.9 | 2.9 | 0.0 | %vol |
| SP16LKV_1 BM-High | 15.5 | 15.5 | 15.5 | 0.0 | %vol |
| SP17LKV_1 BM-Mid | 0.7 | 0.7 | 0.7 | 0.0 | %vol |
| SP18LKV_1 BM-Low | -0.1 | -0.1 | -0.1 | 0.0 | %vol |
| SP19LKV_1 NWALL-Cav | 0.1 | 0.1 | 0.1 | 0.0 | %vol |
| SP20LKV_1 STUD-Cav | 1.6 | 1.6 | 1.5 | 0.0 | %vol |
| SP21LKV_1 FF-Void | 2.2 | 2.2 | 2.2 | 0.0 | %vol |
| SP22LKV_1 SF-Void | 0.2 | 0.2 | 0.2 | 0.0 | %vol |
| SP23LKV_1 ROOF-Void | 0.2 | 0.2 | 0.2 | 0.0 | %vol |
| RELEASEPRESSURE | 0.0109 | 0.0113 | 0.0106 | 0.0002 | barg |
| LOWFLOWMETER | 0.2283 | 0.2298 | 0.2256 | 0.0012 | g/s |
| | | | | | g/t |
| OUTLET TEMP | 5.4 | 5.4 | 5.2 | 0.1 | degC |
| Volume Flow Rate | 153.9 | 155.1 | 152.2 | 0.8 | SLPM |
| Energy Flow Rate | 27.3 | 27.6 | 27.0 | 0.1 | kW |
| External Wind Speed | 1.4 | | | | m/s |
| External Wind Direction | 9.1 | | | | bearing |



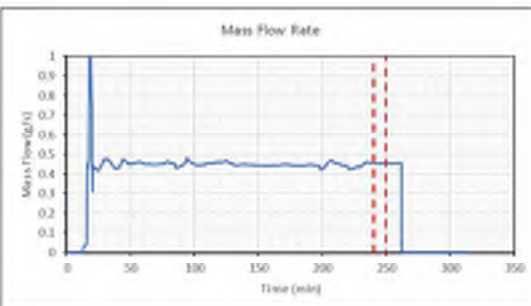
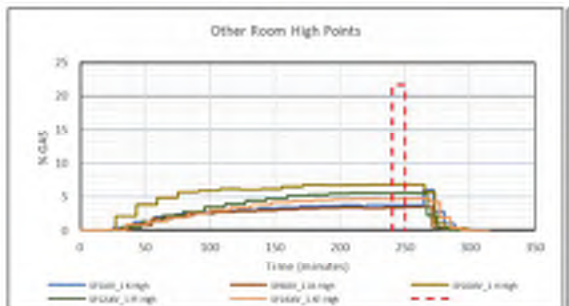
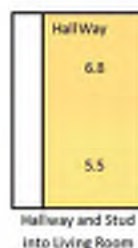
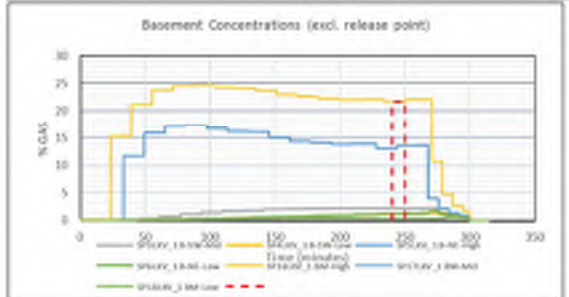
L3-068 RESULT

Hy4Heat WP7 Test Result

| | |
|-----------------------------------|----------------|
| MTP ID: L3-068 | |
| Hole Size: 10 mm | |
| Location: basement - horizontally | |
| Gas: Hydrogen | |
| Date: 17/11/2019 | Time: 13:30:00 |
| Averaging Period Start: 240 min | End: 250 min |

Notes: SP17, 20 and 21 removed - suspected low flow

| Sensor | Average | Max | Min | STDEV | units |
|-------------------------|---------|--------|--------|--------|---------|
| SP1KV_1 K-High | 3.7 | 3.7 | 3.7 | 0.0 | %vol |
| SP2KV_1 B-SW-High | 36.4 | 36.4 | 36.4 | 0.0 | %vol |
| SP3KV_1 B-SW-Mid | 2.2 | 2.2 | 2.2 | 0.0 | %vol |
| SP4KV_1 B-SW-Low | 1.2 | 1.2 | 1.1 | 0.0 | %vol |
| SP5KV_1 B-NE-High | 13.4 | 13.6 | 13.1 | 0.3 | %vol |
| SP6KV_1 B-NE-Low | 1.2 | 1.3 | 1.2 | 0.0 | %vol |
| SP7KV_1 K-Low | 2.8 | 2.9 | 2.8 | 0.0 | %vol |
| SP8KV_1 LR-High | 3.5 | 3.5 | 3.5 | 0.0 | %vol |
| SP9KV_1 LR-Mid | 5.4 | 5.4 | 5.4 | 0.0 | %vol |
| SP10KV_1 H-High | 6.8 | 6.8 | 6.8 | 0.0 | %vol |
| SP11KV_1 H-Mid | 5.5 | 5.5 | 5.5 | 0.0 | %vol |
| SP12KV_1 FF-High | 5.5 | 5.5 | 5.5 | 0.0 | %vol |
| SP13KV_1 FF-Mid | 5.3 | 5.3 | 5.2 | 0.0 | %vol |
| SP14KV_1 AT-High | 4.6 | 4.6 | 4.6 | 0.0 | %vol |
| SP15KV_1 AT-Mid | 4.8 | 4.8 | 4.7 | 0.0 | %vol |
| SP16KV_1 RM-High | 21.6 | 21.6 | 21.6 | 0.0 | %vol |
| SP17KV_1 RM-Mid | | | | | %vol |
| SP18KV_1 RM-Low | 0.3 | 0.3 | 0.3 | 0.0 | %vol |
| SP19KV_1 NWALL-Cav | 0.4 | 0.5 | 0.4 | 0.0 | %vol |
| SP20KV_1 STUD-Cav | | | | | %vol |
| SP21KV_1 FF-Void | | | | | %vol |
| SP22KV_1 SF-Void | 0.5 | 0.6 | 0.4 | 0.1 | %vol |
| SP23KV_1 ROOF-Void | 0.1 | 0.1 | 0.1 | 0.0 | %vol |
| RELEASEPRESSURE | 0.0052 | 0.0055 | 0.0047 | 0.0002 | bar |
| LOWFLOWMETER | 0.4534 | 0.4560 | 0.4517 | 0.0014 | g/s |
| | | | | | g/s |
| OUTLET_TEMP | 3.6 | 3.7 | 3.5 | 0.1 | degC |
| Volume Flow Rate | 306.0 | 307.8 | 304.9 | 0.9 | SLPM |
| Energy Flow Rate | 54.4 | 54.7 | 54.2 | 0.2 | kW |
| External Wind Speed | 2.9 | | | | m/s |
| External Wind Direction | 30.1 | | | | bearing |



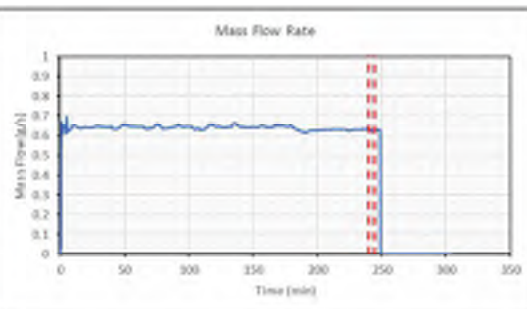
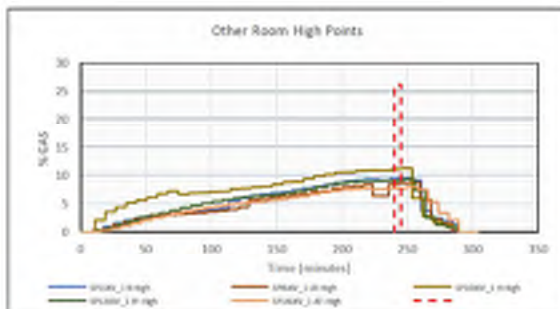
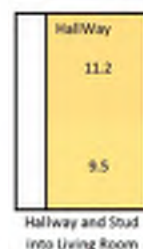
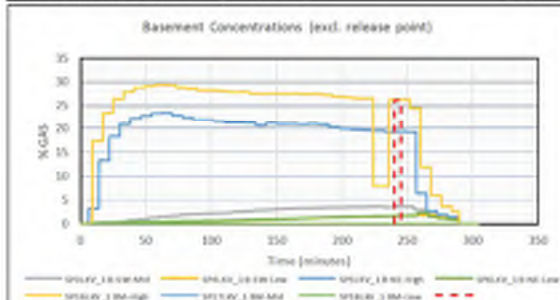
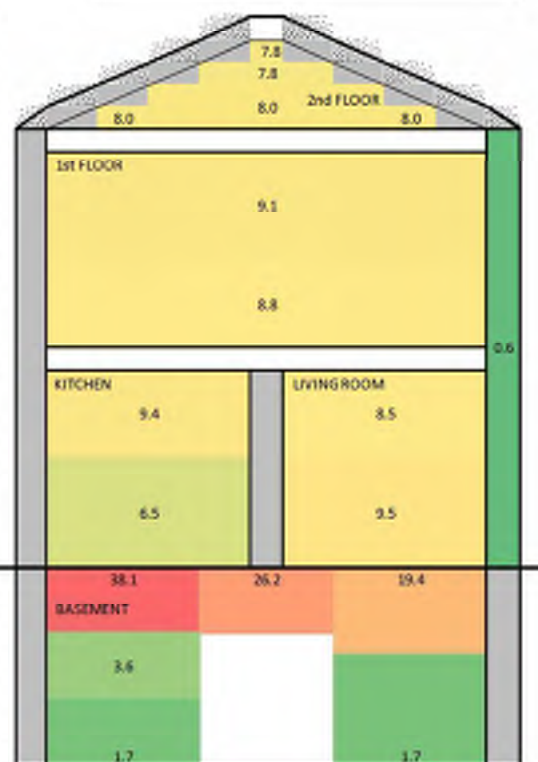
L3-069 RESULT

Hy4Heat WP7 Test Result

| | |
|---|----------------|
| MTP ID: L3-069 | |
| Hole Size: 10 mm | |
| Location: Basement horizontal- basement door closed | |
| Gas: hydrogen | |
| Date: 17/11/2019 | Time: 20:00:00 |
| Averaging Period Start: 240 min | End: 245 min |

Notes: Suspected low flow on SP17, 18, 20-23 so removed.

| Sensor | Average | Max | Min | STDEV | Units |
|-------------------------|---------|--------|--------|--------|---------|
| SP11KV_1 K-High | 9.4 | 9.4 | 9.4 | 0.0 | %vol |
| SP21KV_1 B-SW-High | 38.1 | 38.1 | 38.1 | 0.0 | %vol |
| SP31KV_1 B-SW-Mid | 3.6 | 3.6 | 3.6 | 0.0 | %vol |
| SP41KV_1 B-SW-Low | 1.7 | 1.7 | 1.6 | 0.0 | %vol |
| SP51KV_1 B-N/E-High | 19.4 | 19.4 | 19.3 | 0.0 | %vol |
| SP61KV_1 B-N/E-Low | 1.7 | 1.7 | 1.7 | 0.0 | %vol |
| SP71KV_1 K-Low | 6.5 | 6.5 | 6.4 | 0.0 | %vol |
| SP81KV_1 LR-High | 8.5 | 8.6 | 8.5 | 0.1 | %vol |
| SP91KV_1 LR-Mid | 9.5 | 9.5 | 9.5 | 0.0 | %vol |
| SP10KV_1 H-High | 11.2 | 11.2 | 11.2 | 0.0 | %vol |
| SP111KV_1 H-Mid | 9.5 | 9.5 | 9.5 | 0.0 | %vol |
| SP121KV_1 FF-High | 9.1 | 9.1 | 9.1 | 0.0 | %vol |
| SP131KV_1 FF-Mid | 8.8 | 8.9 | 8.7 | 0.1 | %vol |
| SP141KV_1 AT-High | 7.8 | 7.8 | 7.8 | 0.0 | %vol |
| SP151KV_1 AT-Mid | 8.0 | 8.1 | 8.0 | 0.0 | %vol |
| SP161KV_1 BM-High | 26.2 | 26.3 | 26.2 | 0.0 | %vol |
| SP171KV_1 BM-Mid | | | | | %vol |
| SP181KV_1 BM-Low | | | | | %vol |
| SP191KV_1 NWALL-Cav | 0.6 | 0.6 | 0.6 | 0.0 | %vol |
| SP201KV_1 STUD-Cav | | | | | %vol |
| SP211KV_1 FF-Void | | | | | %vol |
| SP221KV_1 SF-Void | | | | | %vol |
| SP231KV_1 ROOF-Void | | | | | %vol |
| RELEASEPRESSURE | 0.0142 | 0.1613 | 0.0088 | 0.0273 | barg |
| LOWFLOWMETER | 0.6345 | 0.6314 | 0.6180 | 0.0052 | g/s |
| | | | | | g/t |
| OUTLET TEMP | 2.8 | 2.9 | 2.8 | 0.1 | degC |
| Volume Flow Rate | 421.5 | 426.2 | 417.1 | 3.5 | SLPM |
| Energy Flow Rate | 74.9 | 75.7 | 74.1 | 0.6 | kW |
| External Wind Speed | 1.7 | | | | m/s |
| External Wind Direction | 360.0 | | | | bearing |



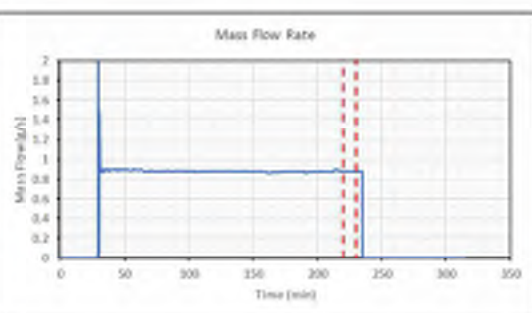
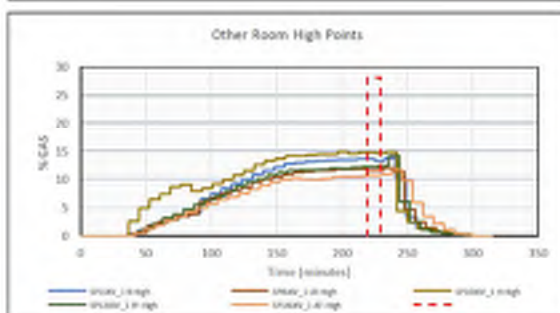
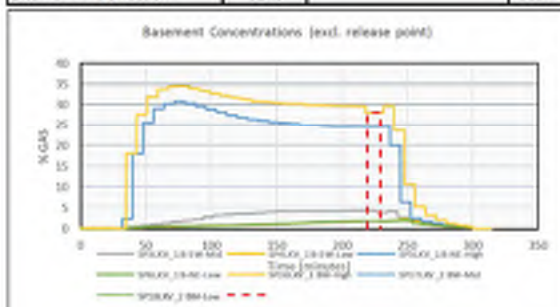
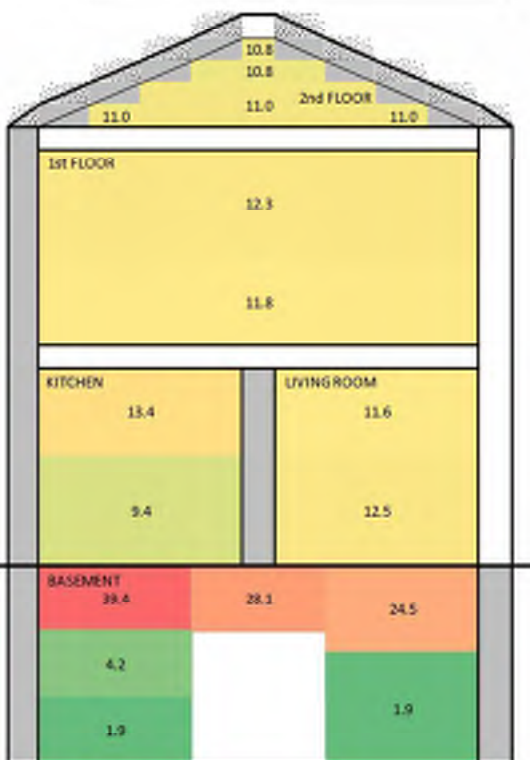
L3-070 RESULT

Hy4Heat WP7 Test Result

| | |
|---------------------------------|----------------|
| MTP ID: L3-070 | |
| Hole Size: 10mm | |
| Location: basement - horizontal | |
| Gas: Hydrogen | |
| Date: 18/11/2019 | Time: 02:30:00 |
| Averaging Period Start: 220 min | End: 230 min |

Notes: SP17-23 removed, analyser fault

| Sensor | Average | Max | Min | STDEV | Units |
|-------------------------|---------|--------|--------|--------|---------|
| SP1K_V_1 K-High | 13.4 | 13.6 | 13.3 | 0.2 | %vol |
| SP2K_V_1 B-SW-High | 39.4 | 39.4 | 39.3 | 0.0 | %vol |
| SP3K_V_1 B-SW-Mid | 4.2 | 4.3 | 3.9 | 0.2 | %vol |
| SP4K_V_1 B-SW-Low | 1.9 | 1.9 | 1.8 | 0.1 | %vol |
| SP5K_V_1 B-N/E-High | 24.5 | 24.6 | 24.5 | 0.0 | %vol |
| SP6K_V_1 B-N/E-Low | 1.9 | 1.9 | 1.8 | 0.0 | %vol |
| SP7K_V_1 K-Low | 9.4 | 9.4 | 9.4 | 0.0 | %vol |
| SP8K_V_1 LR-High | 11.6 | 11.6 | 11.6 | 0.0 | %vol |
| SP9K_V_1 LR-Mid | 12.5 | 12.5 | 12.4 | 0.1 | %vol |
| SP10K_V_1 H-High | 14.8 | 14.8 | 14.6 | 0.1 | %vol |
| SP11K_V_1 H-Mid | 12.7 | 12.7 | 12.7 | 0.0 | %vol |
| SP12K_V_1 FF-High | 12.3 | 12.5 | 12.3 | 0.1 | %vol |
| SP13K_V_1 FF-Mid | 11.8 | 12.0 | 11.8 | 0.1 | %vol |
| SP14K_V_1 AT-High | 10.8 | 11.0 | 10.8 | 0.0 | %vol |
| SP15K_V_1 AT-Mid | 11.0 | 11.0 | 11.0 | 0.0 | %vol |
| SP16K_V_1 BM-High | 28.1 | 28.1 | 28.1 | 0.0 | %vol |
| SP17K_V_2 BM-Mid | | | | | %vol |
| SP18K_V_2 BM-Low | | | | | %vol |
| SP19K_V_2 NWALL-Cav | | | | | %vol |
| SP20K_V_2 STUD-Cav | | | | | %vol |
| SP21K_V_2 FF-Void | | | | | %vol |
| SP22K_V_2 SF-Void | | | | | %vol |
| SP23K_V_2 ROOF-Void | | | | | %vol |
| RELEASEPRESSURE | 0.0185 | 0.0184 | 0.0177 | 0.0002 | barg |
| LOWFLOWMETER | 0.8786 | 0.8833 | 0.8753 | 0.0020 | g/s |
| | | | | | g/t |
| OUTLET TEMP | -0.9 | -0.7 | -1.2 | 0.1 | degC |
| Volume Flow Rate | 593.0 | 596.1 | 590.8 | 1.4 | SLPM |
| Energy Flow Rate | 105.3 | 105.9 | 105.0 | 0.2 | kW |
| External Wind Speed | 0.9 | | | | m/s |
| External Wind Direction | 324.5 | | | | bearing |



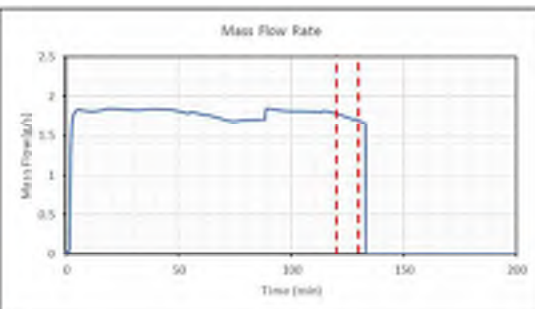
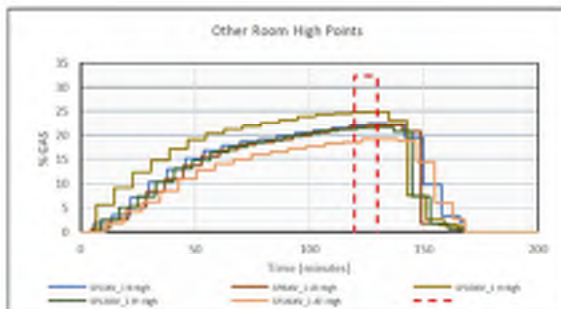
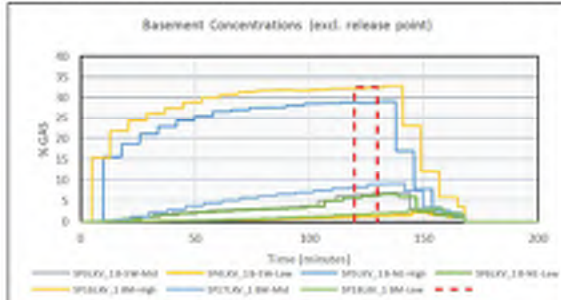
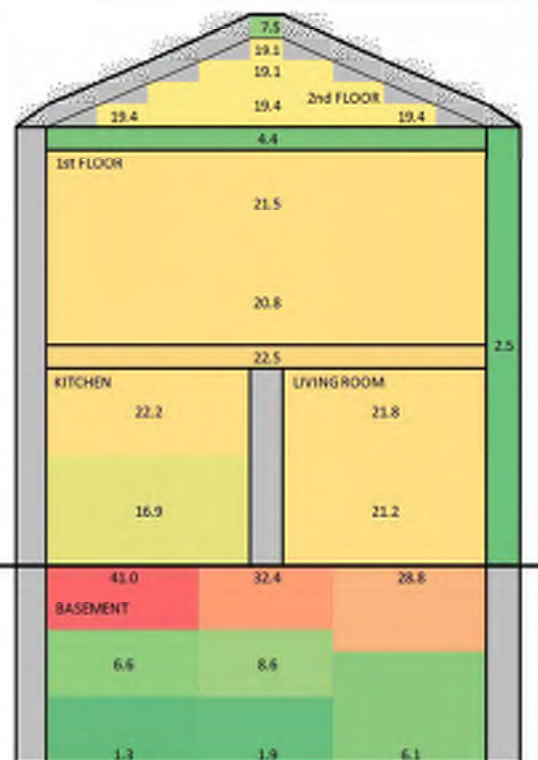
L3-071 RESULT

Hy4Heat WP7 Test Result

| | |
|---|----------------|
| MTP ID: L3-071 | |
| Hole Size: 15 mm | |
| Location: Basement horizontal release, basement door closed | |
| Gas: Hydrogen | |
| Date: 28/11/2019 | Time: 12:45:00 |
| Averaging Period Start: 120 min | End: 130 min |

Notes:

| Sensor | Average | Max | Min | STDEV | Units |
|-------------------------|---------|--------|--------|--------|---------|
| SP1KVV_1 K-High | 22.2 | 22.3 | 22.1 | 0.1 | %vol |
| SP2LKV_1 B-SW-High | 41.0 | 41.5 | 40.7 | 0.3 | %vol |
| SP3LKV_1 B-SW-Mid | 6.6 | 6.9 | 6.5 | 0.2 | %vol |
| SP4LKV_1 B-SW-Low | 1.3 | 1.4 | 1.1 | 0.1 | %vol |
| SP5LKV_1 B-NIS-High | 28.8 | 29.1 | 28.8 | 0.1 | %vol |
| SP6LKV_1 B-NIS-Low | 6.1 | 6.2 | 5.8 | 0.2 | %vol |
| SP7LKV_1 K-Low | 16.9 | 16.9 | 16.9 | 0.0 | %vol |
| SP8LKV_1 LR-High | 21.8 | 22.0 | 21.6 | 0.2 | %vol |
| SP9LKV_1 LR-Mid | 21.2 | 21.5 | 21.1 | 0.2 | %vol |
| SP10KV_1 H-High | 24.8 | 24.9 | 24.8 | 0.0 | %vol |
| SP11KV_1 H-Mid | 21.2 | 21.3 | 21.1 | 0.1 | %vol |
| SP12KV_1 FF-High | 21.5 | 21.7 | 21.2 | 0.1 | %vol |
| SP13KV_1 FF-Mid | 20.8 | 20.9 | 20.5 | 0.1 | %vol |
| SP14KV_1 AT-High | 19.1 | 19.3 | 18.7 | 0.3 | %vol |
| SP15KV_1 AT-Mid | 19.4 | 19.6 | 19.1 | 0.2 | %vol |
| SP16KV_1 BM-High | 32.4 | 32.5 | 32.3 | 0.1 | %vol |
| SP17KV_1 BM-Mid | 8.6 | 9.0 | 8.4 | 0.3 | %vol |
| SP18KV_1 BM-Low | 1.9 | 2.1 | 1.8 | 0.1 | %vol |
| SP19KV_1 NWALL-Cav | 2.5 | 2.9 | 2.4 | 0.2 | %vol |
| SP20KV_1 STUD-Cav | 21.9 | 22.3 | 21.5 | 0.2 | %vol |
| SP21KV_1 FF-Void | 22.5 | 22.7 | 22.2 | 0.1 | %vol |
| SP22KV_1 SF-Void | 4.4 | 4.7 | 3.7 | 0.5 | %vol |
| SP23KV_1 ROOF-Void | 7.5 | 7.8 | 7.3 | 0.2 | %vol |
| RELEASEPRESSURE | 0.0105 | 0.0113 | 0.0099 | 0.0004 | barg |
| LOWFLOWMETER | 1.7274 | 1.7748 | 1.6863 | 0.0271 | g/s |
| OUTLET TEMP | 4.1 | 4.2 | 4.0 | 0.1 | degC |
| Volume Flow Rate | 1165.8 | 1197.8 | 1138.0 | 18.3 | SLPM |
| Energy Flow Rate | 207.1 | 212.8 | 202.2 | 3.2 | kW |
| External Wind Speed | 3.1 | | | | m/s |
| External Wind Direction | 6.8 | | | | bearing |



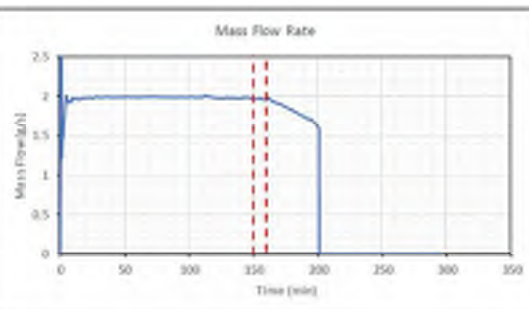
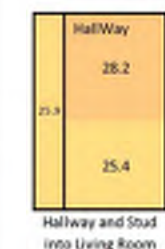
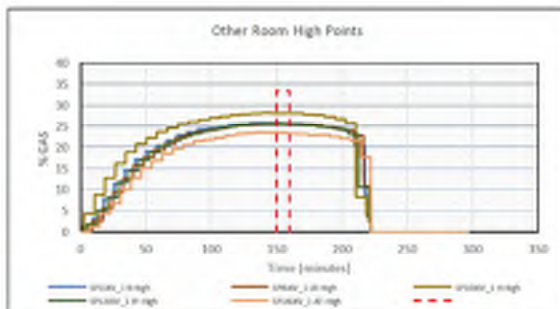
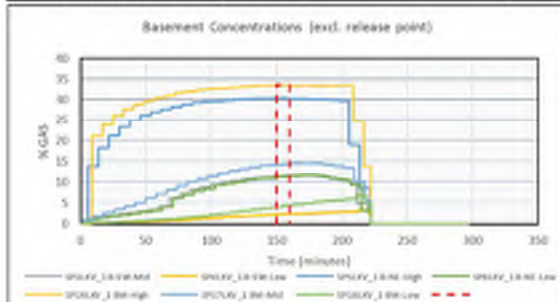
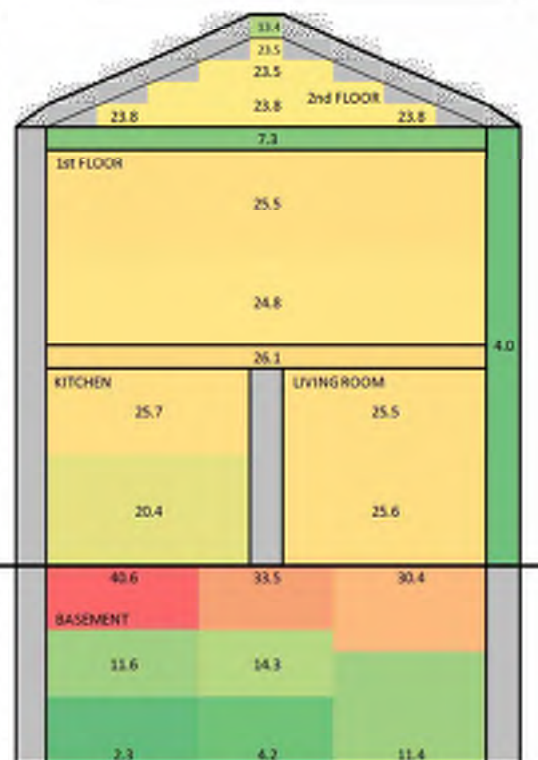
L3-072 RESULT

Hy4Heat WP7 Test Result

| | |
|---|----------------|
| MTP ID: L3-072 | |
| Hole Size: 15 mm | |
| Location: Basement horizontal release, basement door closed | |
| Gas: Hydrogen | |
| Date: 28/11/2019 | Time: 16:30:00 |
| Averaging Period Start: 150 min | End: 190 min |

Notes: Averaging period chosen prior to drop in gas flow rate ~160 mins

| Sensor | Average | Max | Min | STDEV | Units |
|-------------------------|---------|--------|--------|--------|---------|
| SP1KVV_1 K-High | 25.7 | 25.8 | 25.6 | 0.1 | %vol |
| SP2LKV_1 B-SW-High | 40.6 | 40.7 | 40.5 | 0.1 | %vol |
| SP3LKV_1 B-SW-Mid | 11.6 | 11.6 | 11.6 | 0.0 | %vol |
| SP4LKV_1 B-SW-Low | 2.3 | 2.4 | 2.2 | 0.1 | %vol |
| SP5LKV_1 B-N/E-High | 30.4 | 30.5 | 30.3 | 0.1 | %vol |
| SP6LKV_1 B-N/E-Low | 11.4 | 11.6 | 11.0 | 0.1 | %vol |
| SP7LKV_1 K-Low | 20.4 | 20.5 | 20.2 | 0.1 | %vol |
| SP8LKV_1 LR-High | 25.5 | 25.5 | 25.5 | 0.0 | %vol |
| SP9LKV_1 LR-Mid | 25.6 | 25.6 | 25.5 | 0.0 | %vol |
| SP10KVV_1 H-High | 28.2 | 28.2 | 28.2 | 0.0 | %vol |
| SP11KVV_1 H-Mid | 25.4 | 25.5 | 25.4 | 0.0 | %vol |
| SP12KVV_1 FF-High | 25.5 | 25.5 | 25.4 | 0.1 | %vol |
| SP13KVV_1 FF-Mid | 24.8 | 24.8 | 24.8 | 0.0 | %vol |
| SP14KVV_1 AT-High | 23.5 | 23.5 | 23.3 | 0.1 | %vol |
| SP15KVV_1 AT-Mid | 23.8 | 23.9 | 23.6 | 0.0 | %vol |
| SP16KVV_1 BM-High | 33.5 | 33.5 | 33.4 | 0.1 | %vol |
| SP17KVV_1 BM-Mid | 14.3 | 14.3 | 14.2 | 0.1 | %vol |
| SP18KVV_1 BM-Low | 4.2 | 4.4 | 4.0 | 0.2 | %vol |
| SP19KVV_1 NWALL-Cav | 4.0 | 4.1 | 3.9 | 0.1 | %vol |
| SP20KVV_1 STUD-Cav | 25.9 | 26.0 | 25.9 | 0.0 | %vol |
| SP21KVV_1 FF-Void | 26.1 | 26.2 | 26.0 | 0.1 | %vol |
| SP22KVV_1 SF-Void | 7.3 | 8.4 | 7.1 | 0.4 | %vol |
| SP23KVV_1 ROOF-Void | 13.4 | 15.1 | 12.7 | 1.1 | %vol |
| RELEASEPRESSURE | 0.0136 | 0.0140 | 0.0133 | 0.0002 | bar(g) |
| LOWFLOWMETER | 1.9692 | 1.9692 | 1.9484 | 0.0063 | g/s |
| OUTLET TEMP | 3.1 | 3.2 | 3.0 | 0.0 | degC |
| Volume Flow Rate | 1322.3 | 1329.0 | 1315.0 | 4.3 | SLPM |
| Energy Flow Rate | 234.9 | 236.1 | 233.6 | 0.8 | kW |
| External Wind Speed | 1.3 | | | | m/s |
| External Wind Direction | 329.8 | | | | bearing |



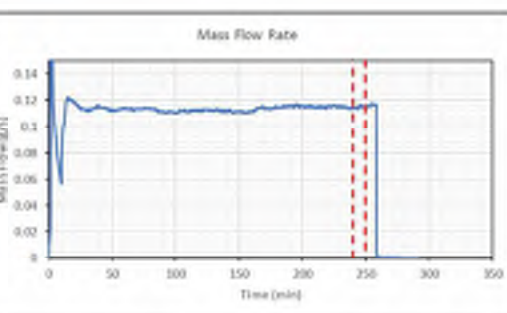
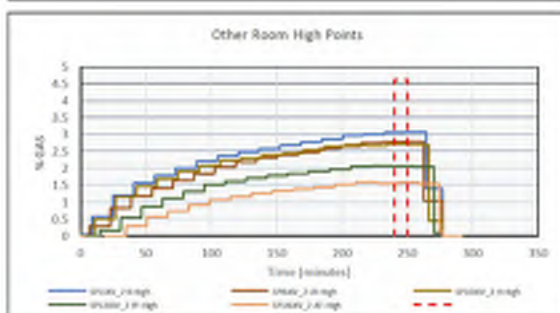
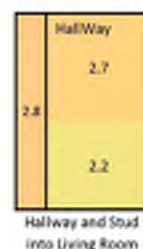
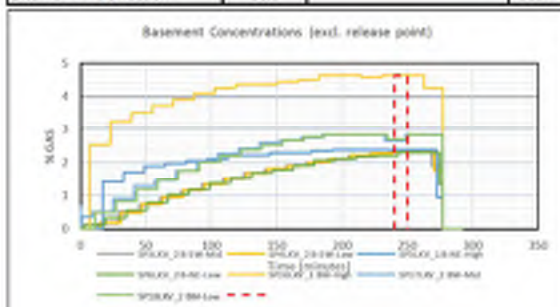
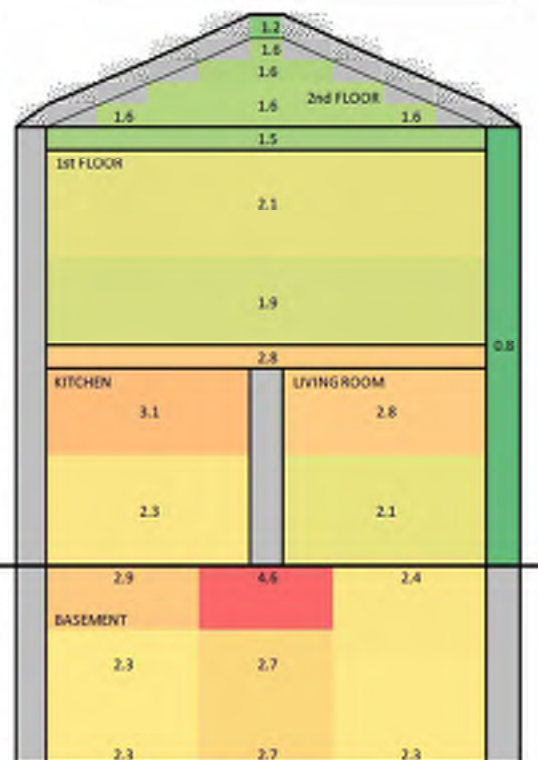
L3-073 RESULT

Hy4Heat WP7 Test Result

| | |
|------------------------------------|----------------|
| MTP ID: L3-073 | |
| Hole Size: 5 mm | |
| Location: Basement, all doors open | |
| Gas: Hydrogen | |
| Date: 22/11/2019 | Time: 15:15:00 |
| Averaging Period Start: 240 min | End: 250 min |

Notes: SP20 and 21 'topped out' at 2.8%

| Sensor | Average | Max | Min | STDEV | Units |
|-------------------------|---------|--------|--------|--------|---------|
| SP1KV_2 K-High | 3.1 | 3.1 | 3.1 | 0.0 | %vol |
| SP2KV_1 B-SW-High | 2.9 | 2.9 | 2.9 | 0.0 | %vol |
| SP3KV_2 B-SW-Mid | 2.3 | 2.3 | 2.3 | 0.0 | %vol |
| SP4KV_2 B-SW-Low | 2.3 | 2.3 | 2.3 | 0.0 | %vol |
| SP5KV_1 B-N/E-High | 2.4 | 2.4 | 2.4 | 0.0 | %vol |
| SP6KV_2 B-N/E-Low | 2.3 | 2.3 | 2.2 | 0.0 | %vol |
| SP7KV_2 K-Low | 2.3 | 2.4 | 2.3 | 0.0 | %vol |
| SP8KV_2 LR-High | 2.8 | 2.8 | 2.8 | 0.0 | %vol |
| SP9KV_2 LR-Mid | 2.1 | 2.1 | 2.1 | 0.0 | %vol |
| SP10KV_2 H-High | 2.7 | 2.7 | 2.7 | 0.0 | %vol |
| SP11KV_2 H-Mid | 2.2 | 2.2 | 2.2 | 0.0 | %vol |
| SP12KV_2 FF-High | 2.1 | 2.1 | 2.1 | 0.0 | %vol |
| SP13KV_2 FF-Mid | 1.9 | 1.9 | 1.9 | 0.0 | %vol |
| SP14KV_2 AT-High | 1.6 | 1.6 | 1.5 | 0.0 | %vol |
| SP15KV_2 AT-Mid | 1.6 | 1.6 | 1.6 | 0.0 | %vol |
| SP16KV_1 BM-High | 4.6 | 4.6 | 4.6 | 0.0 | %vol |
| SP17KV_2 BM-Mid | 2.7 | 2.8 | 2.6 | 0.1 | %vol |
| SP18KV_2 BM-Low | 2.7 | 2.7 | 2.7 | 0.0 | %vol |
| SP19KV_2 N/WALL-Cav | 0.8 | 0.8 | 0.8 | 0.0 | %vol |
| SP20KV_2 STUD-Cav | 2.8 | 2.8 | 2.8 | 0.0 | %vol |
| SP21KV_2 FF-Void | 2.8 | 2.8 | 2.8 | 0.0 | %vol |
| SP22KV_2 SF-Void | 1.5 | 1.6 | 1.2 | 0.2 | %vol |
| SP23KV_2 ROOF-Void | 1.2 | 1.4 | 1.2 | 0.1 | %vol |
| RELEASEPRESSURE | 0.0032 | 0.0034 | 0.0027 | 0.0002 | bar(g) |
| LOWFLOWMETER | 0.1146 | 0.1161 | 0.1131 | 0.0009 | g/s |
| OUTLET TEMP | 5.9 | 6.0 | 5.9 | 0.0 | degC |
| Volume Flow Rate | 77.3 | 78.4 | 76.3 | 0.6 | SLPM |
| Energy Flow Rate | 13.7 | 13.9 | 13.6 | 0.1 | kW |
| External Wind Speed | 5.1 | | | | m/s |
| External Wind Direction | 90.0 | | | | bearing |



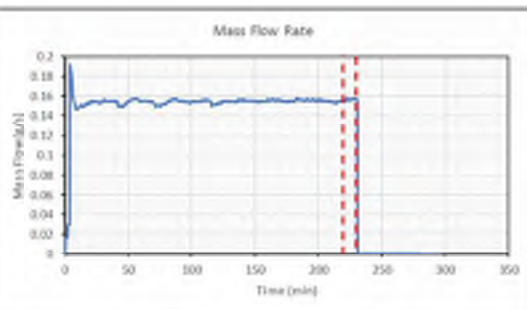
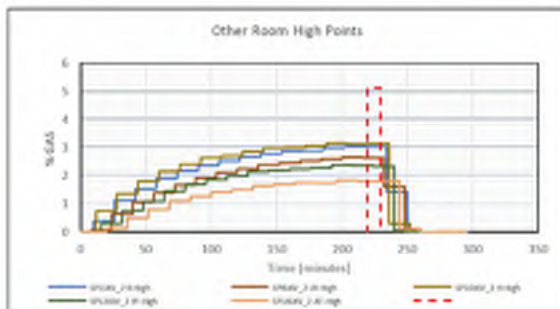
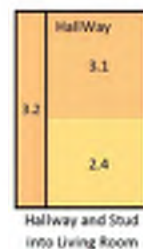
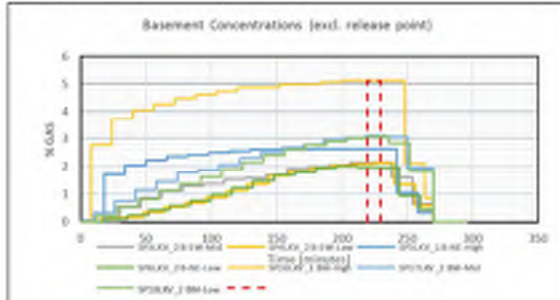
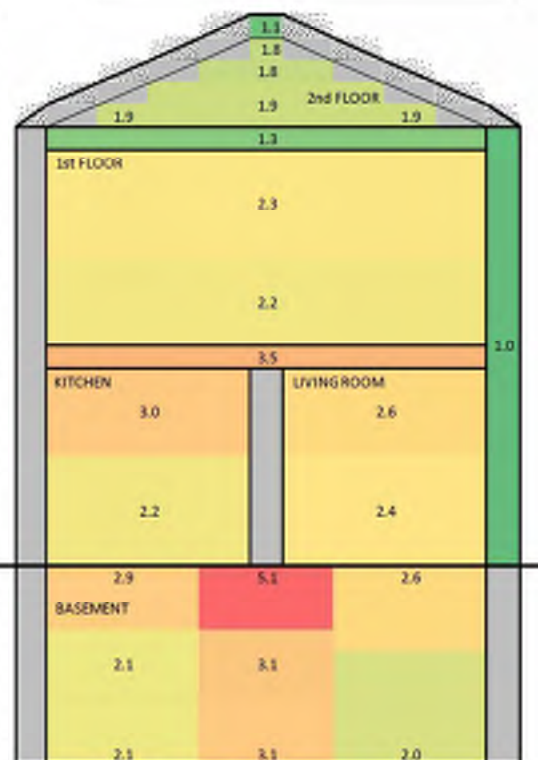
L3-074 RESULT

Hy4Heat WP7 Test Result

| | |
|------------------------------------|----------------|
| MTP ID: L3-074 | |
| Hole Size: 5 mm | |
| Location: Basement, all doors open | |
| Gas: Hydrogen | |
| Date: 22/11/2019 | Time: 22:00:00 |
| Averaging Period Start: 220 min | End: 230 min |

Notes:

| Sensor | Average | Max | Min | STDEV | Units |
|-------------------------|---------|--------|--------|--------|---------|
| SP11KV_2 K-High | 3.0 | 3.0 | 3.0 | 0.0 | %vol |
| SP21KV_1 B-SW-High | 2.9 | 3.0 | 2.9 | 0.0 | %vol |
| SP31KV_2 B-SW-Mid | 2.1 | 2.1 | 2.1 | 0.0 | %vol |
| SP41KV_2 B-SW-Low | 2.1 | 2.1 | 2.1 | 0.0 | %vol |
| SP51KV_1 B-N/E-High | 2.6 | 2.6 | 2.6 | 0.0 | %vol |
| SP61KV_2 B-N/E-Low | 2.0 | 2.0 | 2.0 | 0.0 | %vol |
| SP71KV_2 K-Low | 2.2 | 2.2 | 2.2 | 0.0 | %vol |
| SP81KV_2 LR-High | 2.6 | 2.6 | 2.6 | 0.0 | %vol |
| SP91KV_2 LR-Mid | 2.4 | 2.4 | 2.4 | 0.0 | %vol |
| SP10KV_2 H-High | 3.1 | 3.1 | 3.1 | 0.0 | %vol |
| SP11KV_2 H-Mid | 2.4 | 2.4 | 2.4 | 0.0 | %vol |
| SP12KV_2 FF-High | 2.3 | 2.4 | 2.3 | 0.0 | %vol |
| SP13KV_2 FF-Mid | 2.2 | 2.2 | 2.1 | 0.0 | %vol |
| SP14KV_2 AT-High | 1.8 | 1.8 | 1.8 | 0.0 | %vol |
| SP15KV_2 AT-Mid | 1.9 | 1.9 | 1.9 | 0.0 | %vol |
| SP16KV_1 BM-High | 5.1 | 5.1 | 5.1 | 0.0 | %vol |
| SP17KV_2 BM-Mid | 3.1 | 3.1 | 3.1 | 0.0 | %vol |
| SP18KV_2 BM-Low | 3.1 | 3.1 | 3.0 | 0.0 | %vol |
| SP19KV_2 NWALL-Cav | 1.0 | 1.0 | 1.0 | 0.0 | %vol |
| SP20KV_2 STUD-Cav | 3.2 | 3.2 | 3.1 | 0.0 | %vol |
| SP21KV_2 FF-Void | 3.5 | 3.5 | 3.4 | 0.0 | %vol |
| SP22KV_2 SF-Void | 1.3 | 1.4 | 1.3 | 0.1 | %vol |
| SP23KV_2 ROOF-Void | 1.1 | 1.1 | 1.1 | 0.0 | %vol |
| RELEASEPRESSURE | 0.0055 | 0.0059 | 0.0052 | 0.0002 | bar(g) |
| LOWFLOWMETER | 0.1588 | 0.1583 | 0.1547 | 0.0010 | g/s |
| | | | | | g/s |
| OUTLET TEMP | 7.2 | 7.3 | 7.1 | 0.1 | degC |
| Volume Flow Rate | 105.8 | 106.9 | 104.4 | 0.7 | SLPM |
| Energy Flow Rate | 18.8 | 19.0 | 18.5 | 0.1 | kW |
| External Wind Speed | 0.0 | | | | m/s |
| External Wind Direction | 0.0 | | | | bearing |



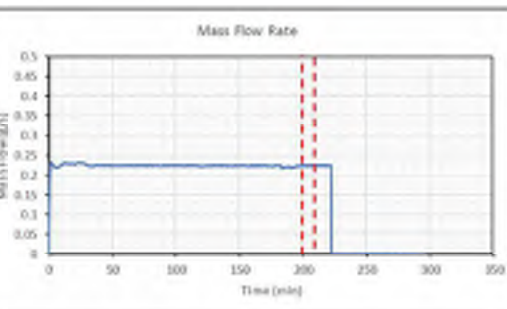
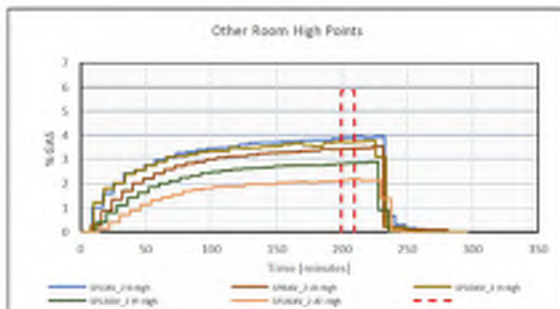
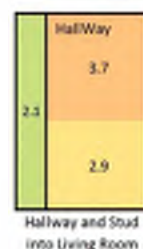
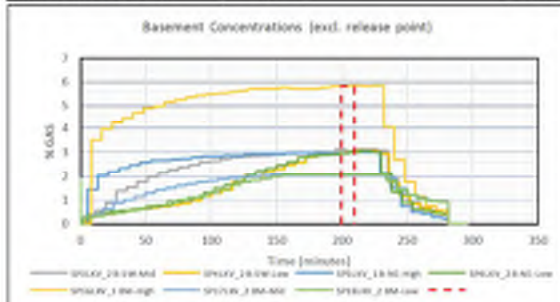
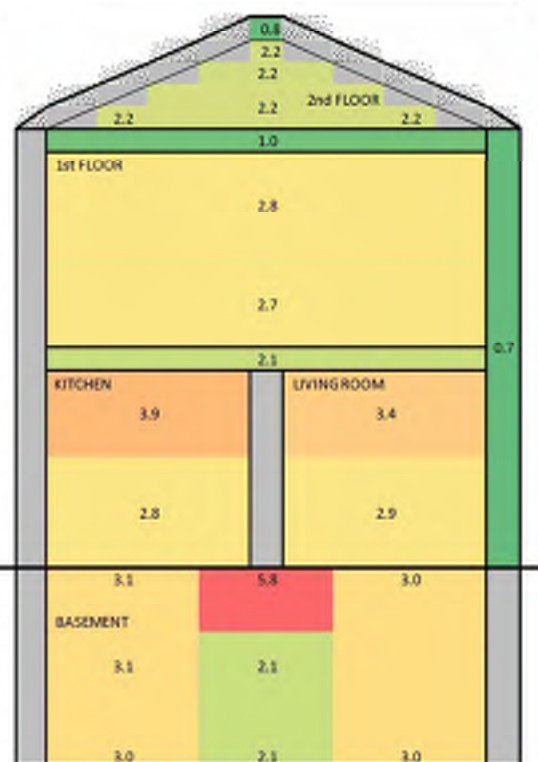
L3-075 RESULT

Hy4Heat WP7 Test Result

| | |
|------------------------------------|----------------|
| MTP ID: L3-075 | |
| Hole Size: 5 mm | |
| Location: Basement, all doors open | |
| Gas: Hydrogen | |
| Date: 23/11/2019 | Time: 02:45:00 |
| Averaging Period Start: 200 min | End: 210 min |

Notes: SP17, SP18, SP19, SP20 'topped out' on LEL at 2.1%

| Sensor | Average | Max | Min | STDEV | Units |
|-------------------------|---------|--------|--------|--------|---------|
| SP1KV_2 K-High | 3.9 | 3.9 | 3.9 | 0.0 | %vol |
| SP2KV_1 B-SW-High | 3.1 | 3.1 | 3.1 | 0.0 | %vol |
| SP3KV_2 B-SW-Mid | 3.1 | 3.1 | 3.1 | 0.0 | %vol |
| SP4KV_2 B-SW-Low | 3.0 | 3.0 | 3.0 | 0.0 | %vol |
| SP5KV_1 B-N/E-High | 3.0 | 3.0 | 3.0 | 0.0 | %vol |
| SP6KV_2 B-N/E-Low | 3.0 | 3.0 | 3.0 | 0.0 | %vol |
| SP7KV_2 K-Low | 2.8 | 2.8 | 2.8 | 0.0 | %vol |
| SP8KV_2 LR-High | 3.4 | 3.4 | 3.4 | 0.0 | %vol |
| SP9KV_2 LR-Mid | 2.9 | 2.9 | 2.9 | 0.0 | %vol |
| SP10KV_2 H-High | 3.7 | 3.7 | 3.7 | 0.0 | %vol |
| SP11KV_2 H-Mid | 2.9 | 2.9 | 2.9 | 0.0 | %vol |
| SP12KV_2 FF-High | 2.8 | 2.9 | 2.8 | 0.0 | %vol |
| SP13KV_2 FF-Mid | 2.7 | 2.7 | 2.6 | 0.0 | %vol |
| SP14KV_2 AT-High | 2.2 | 2.2 | 2.2 | 0.0 | %vol |
| SP15KV_2 AT-Mid | 2.2 | 2.3 | 2.2 | 0.0 | %vol |
| SP16KV_1 BM-High | 5.8 | 5.9 | 5.8 | 0.0 | %vol |
| SP17KV_2 BM-Mid | 2.1 | 2.1 | 2.1 | 0.0 | %vol |
| SP18KV_2 BM-Low | 2.1 | 2.1 | 2.1 | 0.0 | %vol |
| SP19KV_2 NWALL-Cav | 0.7 | 0.7 | 0.7 | 0.0 | %vol |
| SP20KV_2 STUD-Cav | 2.1 | 2.1 | 2.1 | 0.0 | %vol |
| SP21KV_2 FF-Void | 2.1 | 2.1 | 2.1 | 0.0 | %vol |
| SP22KV_2 SF-Void | 1.0 | 1.0 | 0.9 | 0.0 | %vol |
| SP23KV_2 ROOF-Void | 0.8 | 0.8 | 0.8 | 0.0 | %vol |
| RELEASEPRESSURE | 0.0105 | 0.0108 | 0.0100 | 0.0002 | barg |
| LOWFLOWMETER | 0.2228 | 0.2237 | 0.2207 | 0.0009 | g/s |
| | | | | | g/s |
| OUTLET TEMP | 7.8 | 7.9 | 7.7 | 0.0 | degC |
| Volume Flow Rate | 150.4 | 151.0 | 148.9 | 0.6 | SLPM |
| Energy Flow Rate | 26.7 | 26.8 | 26.5 | 0.1 | kW |
| External Wind Speed | 3.3 | | | | m/s |
| External Wind Direction | 40.1 | | | | bearing |



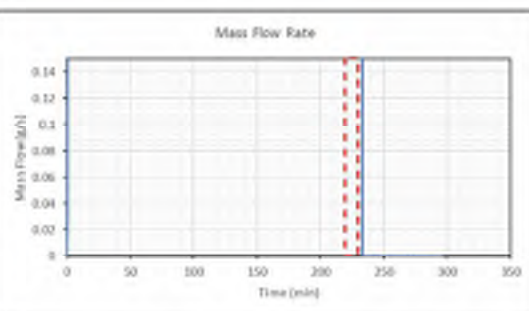
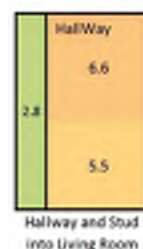
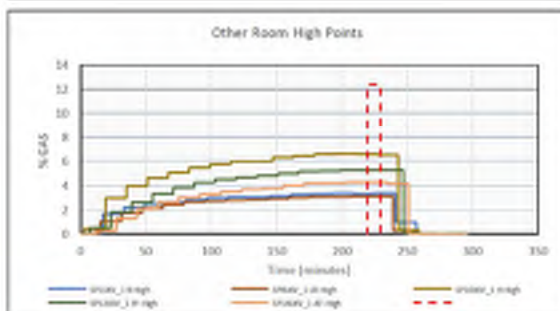
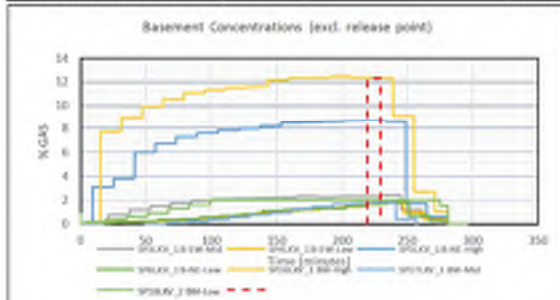
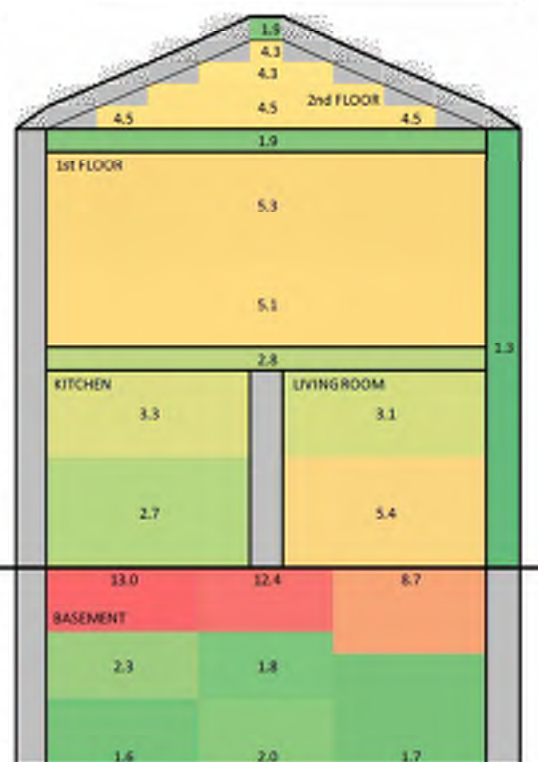
L3-076 RESULT

Hy4Heat WP7 Test Result

| | |
|------------------------------------|----------------|
| MTP ID: L3-076 | |
| Hole Size: 10mm | |
| Location: Basement, all doors open | |
| Gas: Hydrogen | |
| Date: 23/11/2019 | Time: 09:15:00 |
| Averaging Period Start: 220 min | End: 230 min |

Notes: SP20,21 'topped out' at 2.8%

| Sensor | Average | Max | Min | STDEV | Units |
|-------------------------|---------|--------|--------|--------|---------|
| SP1K_V_1 K-High | 3.3 | 3.4 | 3.3 | 0.0 | %vol |
| SP2LKV_1 B-SW-High | 13.0 | 13.0 | 12.9 | 0.1 | %vol |
| SP3LKV_1 B-SW-Mid | 2.3 | 2.4 | 2.3 | 0.0 | %vol |
| SP4LKV_1 B-SW-Low | 1.6 | 1.6 | 1.6 | 0.0 | %vol |
| SP5LKV_1 B-N/E-High | 8.7 | 8.7 | 8.7 | 0.0 | %vol |
| SP6LKV_1 B-N/E-Low | 1.7 | 1.7 | 1.7 | 0.0 | %vol |
| SP7LKV_1 K-Low | 2.7 | 2.7 | 2.7 | 0.0 | %vol |
| SP8LKV_1 LR-High | 3.1 | 3.1 | 3.1 | 0.0 | %vol |
| SP9LKV_1 LR-Mid | 5.4 | 5.4 | 5.4 | 0.0 | %vol |
| SP10KV_1 H-High | 6.6 | 6.6 | 6.6 | 0.0 | %vol |
| SP11KV_1 H-Mid | 5.5 | 5.5 | 5.4 | 0.0 | %vol |
| SP12KV_1 FF-High | 5.3 | 5.3 | 5.3 | 0.0 | %vol |
| SP13KV_1 FF-Mid | 5.1 | 5.1 | 5.1 | 0.0 | %vol |
| SP14KV_1 AT-High | 4.3 | 4.3 | 4.3 | 0.0 | %vol |
| SP15KV_1 AT-Mid | 4.5 | 4.5 | 4.4 | 0.0 | %vol |
| SP16KV_1 BM-High | 12.4 | 12.4 | 12.3 | 0.0 | %vol |
| SP17KV_1 BM-Mid | 1.8 | 1.8 | 1.7 | 0.0 | %vol |
| SP18KV_2 BM-Low | 2.0 | 2.0 | 2.0 | 0.0 | %vol |
| SP19KV_2 NWALL-Cav | 1.3 | 1.4 | 1.3 | 0.0 | %vol |
| SP20KV_1 STUD-Cav | 2.3 | 2.8 | 2.8 | 0.0 | %vol |
| SP21KV_1 FF-Void | 2.8 | 2.8 | 2.8 | 0.0 | %vol |
| SP22KV_2 SF-Void | 1.9 | 1.9 | 1.9 | 0.0 | %vol |
| SP23KV_2 ROOF-Void | 1.9 | 2.0 | 1.9 | 0.1 | %vol |
| RELEASEPRESSURE | 0.0047 | 0.0052 | 0.0044 | 0.0002 | bar(g) |
| LOWFLOWMETER | 0.4402 | 0.4426 | 0.4383 | 0.0011 | g/s |
| | | | | | g/s |
| OUTLET TEMP | 8.5 | 8.6 | 8.4 | 0.1 | degC |
| Volume Flow Rate | 297.1 | 298.7 | 295.8 | 0.8 | SLPM |
| Energy Flow Rate | 52.8 | 53.1 | 52.5 | 0.1 | kW |
| External Wind Speed | 5.7 | | | | m/s |
| External Wind Direction | 65.9 | | | | bearing |



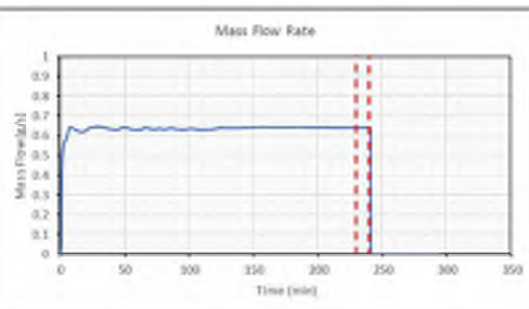
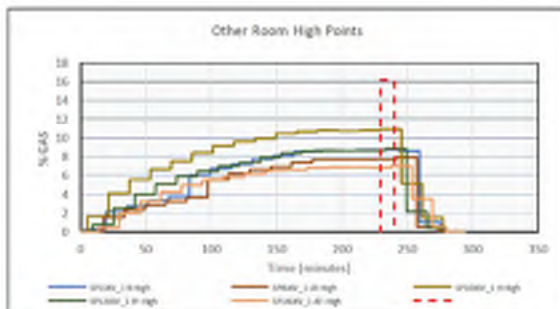
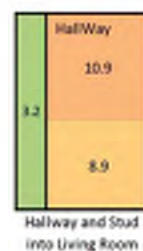
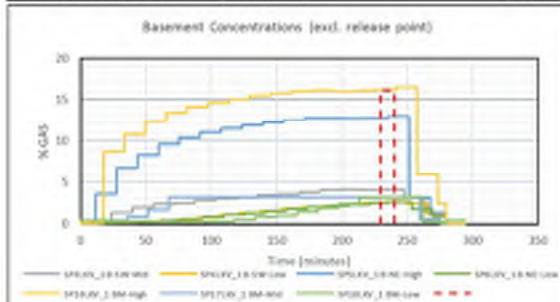
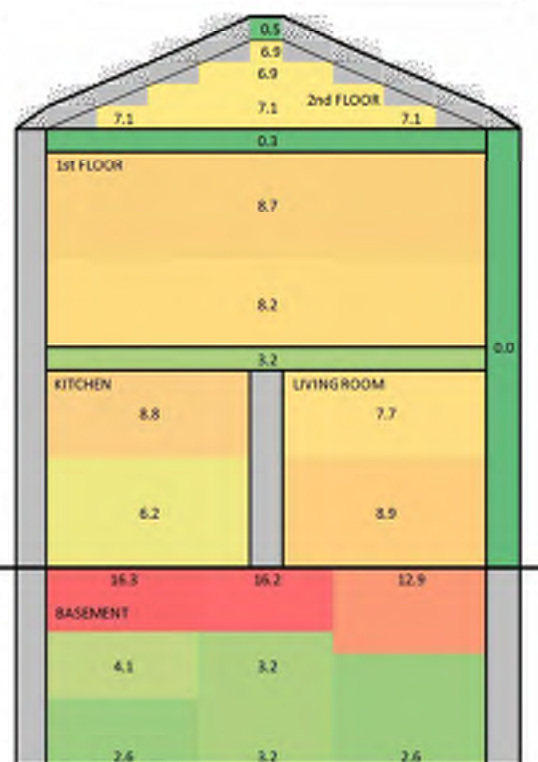
L3-077 RESULT

Hy4Heat WP7 Test Result

| | |
|------------------------------------|----------------|
| MTP ID: L3-077 | |
| Hole Size: 10mm | |
| Location: Basement, all doors open | |
| Gas: Hydrogen | |
| Date: 23/11/2019 | Time: 15:45:00 |
| Averaging Period Start: 230 min | End: 240 min |

Notes: 0.4% offset removed from SP17-23. SP17, 18, 20, 21 'Topped out' @ 3.2%

| Sensor | Average | Max | Min | STDEV | Units |
|-------------------------|---------|--------|--------|--------|---------|
| SP11KV_1 K-High | 8.8 | 8.8 | 8.8 | 0.0 | %vol |
| SP21KV_1 B-SW-High | 16.3 | 16.3 | 16.3 | 0.0 | %vol |
| SP31KV_1 B-SW-Mid | 4.1 | 4.1 | 4.1 | 0.0 | %vol |
| SP41KV_1 B-SW-Low | 2.6 | 2.7 | 2.5 | 0.1 | %vol |
| SP51KV_1 B-NW-High | 12.9 | 13.0 | 12.8 | 0.1 | %vol |
| SP61KV_1 B-NW-Low | 2.6 | 2.6 | 2.6 | 0.0 | %vol |
| SP71KV_1 K-Low | 6.2 | 6.3 | 6.2 | 0.0 | %vol |
| SP81KV_1 LR-High | 7.7 | 7.7 | 7.7 | 0.0 | %vol |
| SP91KV_1 LR-Mid | 8.9 | 8.9 | 8.9 | 0.0 | %vol |
| SP10KV_1 H-High | 10.9 | 10.9 | 10.9 | 0.0 | %vol |
| SP11KV_1 H-Mid | 8.9 | 8.9 | 8.8 | 0.1 | %vol |
| SP12KV_1 FF-High | 8.7 | 8.8 | 8.6 | 0.1 | %vol |
| SP13KV_1 FF-Mid | 8.2 | 8.3 | 8.2 | 0.1 | %vol |
| SP14KV_1 AT-High | 6.9 | 7.0 | 6.8 | 0.1 | %vol |
| SP15KV_1 AT-Mid | 7.1 | 7.3 | 7.1 | 0.0 | %vol |
| SP16KV_1 BM-High | 16.2 | 16.2 | 16.2 | 0.0 | %vol |
| SP17KV_1 BM-Mid | 3.2 | 3.2 | 3.2 | 0.0 | %vol |
| SP18KV_1 BM-Low | 3.2 | 3.2 | 3.2 | 0.0 | %vol |
| SP19KV_1 NWALL-Cav | 0.0 | 0.1 | -0.1 | 0.0 | %vol |
| SP20KV_1 STUD-Cav | 3.2 | 3.2 | 3.2 | 0.0 | %vol |
| SP21KV_1 FF-Void | 3.2 | 3.2 | 3.2 | 0.0 | %vol |
| SP22KV_1 SF-Void | 0.3 | 0.4 | 0.3 | 0.1 | %vol |
| SP23KV_1 ROOF-Void | 0.5 | 0.5 | 0.5 | 0.0 | %vol |
| RELEASEPRESSURE | 0.0096 | 0.0099 | 0.0093 | 0.0002 | barg |
| LOWFLOWMETER | 0.6400 | 0.6406 | 0.6400 | 0.0001 | g/s |
| | | | | | g/t |
| OUTLET TEMP | 8.3 | 8.4 | 8.2 | 0.0 | degC |
| Volume Flow Rate | 432.0 | 432.4 | 431.9 | 0.1 | SLPM |
| Energy Flow Rate | 76.7 | 76.8 | 76.7 | 0.0 | kW |
| External Wind Speed | 2.5 | | | | m/s |
| External Wind Direction | 70.2 | | | | bearing |



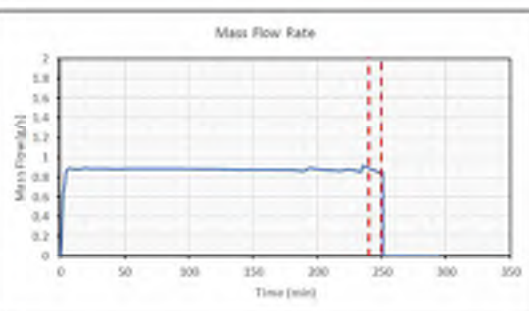
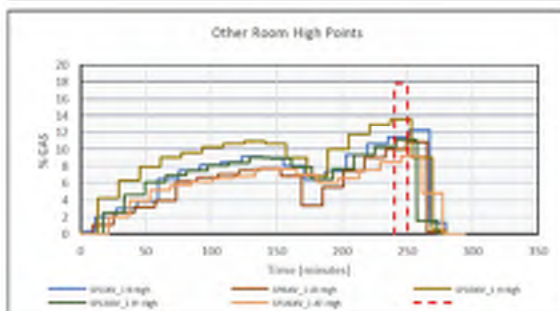
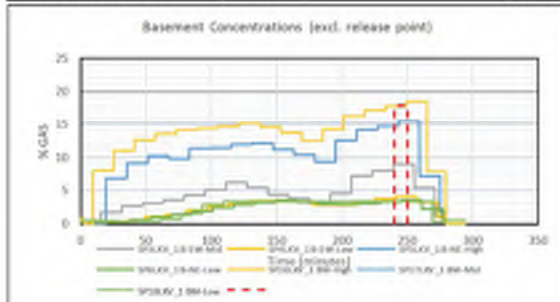
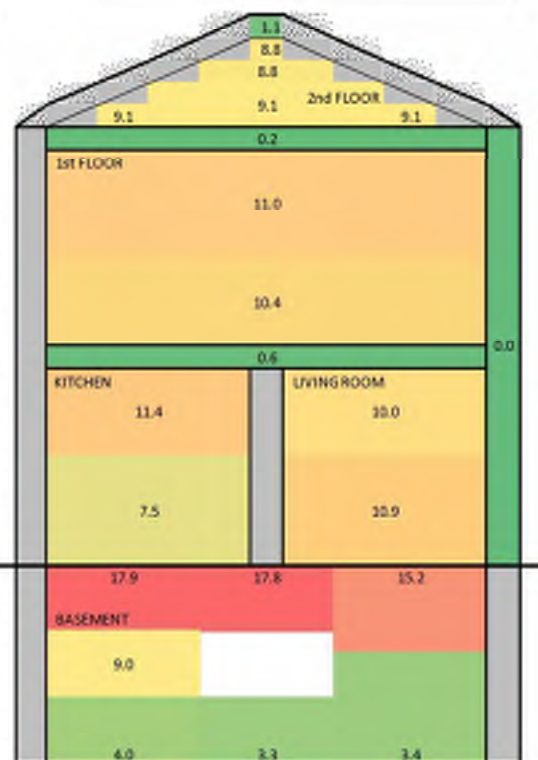
L3-078 RESULT

Hy4Heat WP7 Test Result

| | |
|------------------------------------|----------------|
| MTP ID: L3-078 | |
| Hole Size: 10 mm | |
| Location: Basement, all doors open | |
| Gas: Hydrogen | |
| Date: 23/11/2019 | Time: 21:30:00 |
| Averaging Period Start: 240 min | End: 250 min |

Notes: 0.5% offset on SP17 to SP23 removed. SP18, 30' topped out' at

| Sensor | Average | Max | Min | STDEV | Units |
|-------------------------|---------|--------|--------|--------|---------|
| SP1K_V_1 K-High | 11.4 | 11.4 | 11.4 | 0.0 | %vol |
| SP2K_V_1 B-SW-High | 17.9 | 17.9 | 17.9 | 0.0 | %vol |
| SP3K_V_1 B-SW-Mid | 9.0 | 9.0 | 9.0 | 0.0 | %vol |
| SP4K_V_1 B-SW-Low | 4.0 | 4.1 | 3.7 | 0.1 | %vol |
| SP5K_V_1 B-NW-High | 15.2 | 15.5 | 14.7 | 0.4 | %vol |
| SP6K_V_1 B-NW-Low | 3.4 | 3.5 | 3.3 | 0.1 | %vol |
| SP7K_V_1 K-Low | 7.5 | 8.0 | 7.3 | 0.3 | %vol |
| SP8K_V_1 LR-High | 10.0 | 10.9 | 10.0 | 0.2 | %vol |
| SP9K_V_1 LR-Mid | 10.9 | 10.9 | 10.9 | 0.0 | %vol |
| SP10K_V_1 H-High | 13.6 | 13.6 | 13.6 | 0.0 | %vol |
| SP11K_V_1 H-Mid | 11.3 | 11.3 | 11.3 | 0.0 | %vol |
| SP12K_V_1 FF-High | 11.0 | 11.1 | 10.3 | 0.3 | %vol |
| SP13K_V_1 FF-Mid | 10.4 | 10.6 | 9.9 | 0.4 | %vol |
| SP14K_V_1 AT-High | 8.8 | 9.2 | 8.5 | 0.4 | %vol |
| SP15K_V_1 AT-Mid | 9.1 | 9.7 | 8.9 | 0.4 | %vol |
| SP16K_V_1 BM-High | 17.8 | 18.5 | 17.8 | 0.2 | %vol |
| SP17K_V_1 BM-Mid | | | | | %vol |
| SP18K_V_1 BM-Low | 3.3 | 3.3 | 3.3 | 0.0 | %vol |
| SP19K_V_1 NWALL-Cav | 0.0 | 0.0 | 0.0 | 0.0 | %vol |
| SP20K_V_1 STUD-Cav | 2.3 | 3.3 | 2.1 | 0.4 | %vol |
| SP21K_V_1 FF-Void | 0.6 | 1.4 | 0.1 | 0.6 | %vol |
| SP22K_V_1 SF-Void | 0.2 | 0.2 | 0.2 | 0.0 | %vol |
| SP23K_V_1 ROOF-Void | 1.1 | 1.8 | 1.0 | 0.2 | %vol |
| RELEASEPRESSURE | 0.0173 | 0.0184 | 0.0159 | 0.0006 | bar(g) |
| LOWFLOWMETER | 0.8667 | 0.8943 | 0.8411 | 0.0155 | g/s |
| | | | | | g/s |
| OUTLET TEMP | 7.8 | 7.9 | 7.7 | 0.0 | degC |
| Volume Flow Rate | 585.0 | 603.6 | 567.7 | 10.4 | SLPM |
| Energy Flow Rate | 103.9 | 107.2 | 100.8 | 1.9 | kW |
| External Wind Speed | 2.7 | | | | m/s |
| External Wind Direction | 88.9 | | | | bearing |



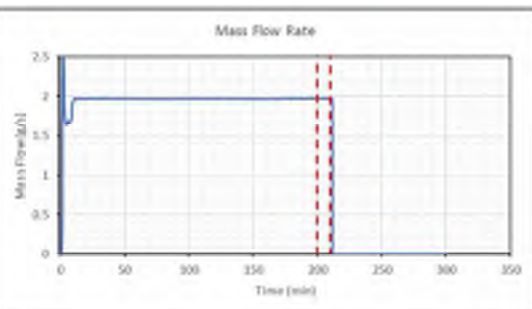
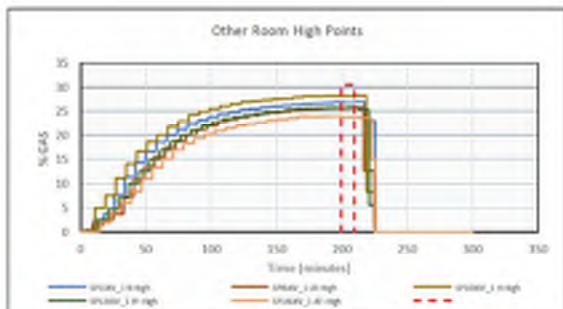
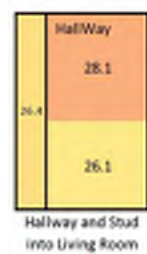
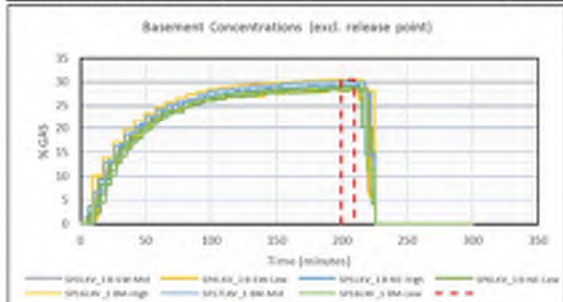
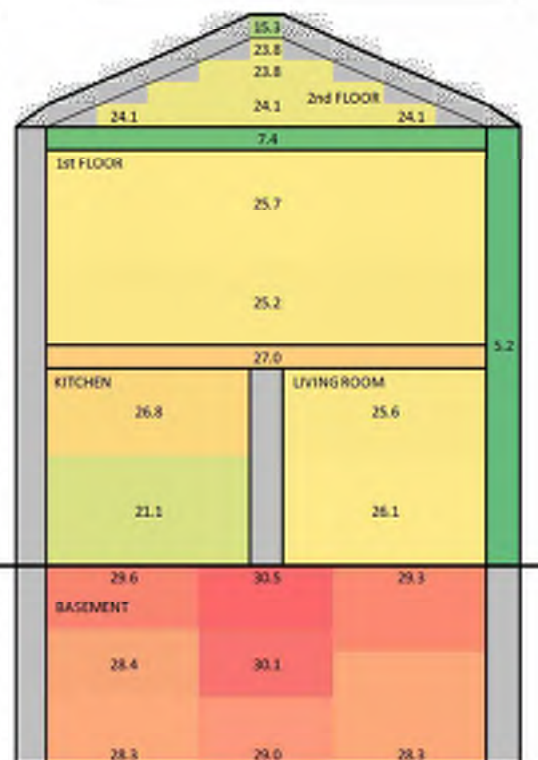
L3-079 RESULT

Hy4Heat WP7 Test Result

| | |
|--|----------------|
| MTP ID: L3-079 | |
| Hole Size: 10 mm | |
| Location: Basement downwards, basement door open | |
| Gas: Hydrogen | |
| Date: 28/11/2019 | Time: 23:30:00 |
| Averaging Period Start: 200 min | End: 210 min |

Notes:

| Sensor | Average | Max | Min | STDEV | Units |
|-------------------------|---------|--------|--------|--------|---------|
| SP1KVV_1 K-High | 26.8 | 26.9 | 26.8 | 0.0 | %vol |
| SP2LKV_1 B-SW-High | 29.6 | 29.6 | 29.6 | 0.0 | %vol |
| SP3LKV_1 B-SW-Mid | 28.4 | 28.4 | 28.4 | 0.0 | %vol |
| SP4LKV_1 B-SW-Low | 28.3 | 28.4 | 28.2 | 0.1 | %vol |
| SP5LKV_1 B-N/E-High | 29.3 | 29.3 | 29.3 | 0.0 | %vol |
| SP6LKV_1 B-N/E-Low | 28.3 | 28.5 | 28.3 | 0.1 | %vol |
| SP7LKV_1 K-Low | 21.1 | 21.2 | 21.0 | 0.0 | %vol |
| SP8LKV_1 LR-High | 25.6 | 25.7 | 25.6 | 0.0 | %vol |
| SP9LKV_1 LR-Mid | 26.1 | 26.1 | 26.1 | 0.0 | %vol |
| SP10LKV_1 H-High | 28.1 | 28.1 | 28.1 | 0.0 | %vol |
| SP11LKV_1 H-Mid | 26.1 | 26.2 | 26.0 | 0.1 | %vol |
| SP12LKV_1 FF-High | 25.7 | 25.8 | 25.7 | 0.1 | %vol |
| SP13LKV_1 FF-Mid | 25.2 | 25.2 | 25.2 | 0.0 | %vol |
| SP14LKV_1 AT-High | 23.8 | 23.8 | 23.8 | 0.0 | %vol |
| SP15LKV_1 AT-Mid | 24.1 | 24.1 | 24.1 | 0.0 | %vol |
| SP16LKV_1 BM-High | 30.5 | 30.5 | 30.5 | 0.0 | %vol |
| SP17LKV_1 BM-Mid | 30.1 | 30.2 | 30.0 | 0.1 | %vol |
| SP18LKV_1 BM-Low | 29.0 | 29.0 | 29.0 | 0.0 | %vol |
| SP19LKV_1 N/WALL-Cav | 5.2 | 5.2 | 5.1 | 0.0 | %vol |
| SP20LKV_1 STUD-Cav | 26.4 | 26.4 | 26.4 | 0.0 | %vol |
| SP21LKV_1 FF-Void | 27.0 | 27.0 | 26.9 | 0.0 | %vol |
| SP22LKV_1 SF-Void | 7.4 | 7.5 | 7.1 | 0.2 | %vol |
| SP23LKV_1 ROOF-Void | 15.3 | 15.8 | 14.5 | 0.3 | %vol |
| RELEASEPRESSURE | 0.0883 | 0.0893 | 0.0875 | 0.0004 | barg |
| LOWFLOWMETER | 1.9688 | 1.9723 | 1.9667 | 0.0014 | g/s |
| OUTLET TEMP | 0.0 | 0.2 | -0.2 | 0.1 | degC |
| Volume Flow Rate | 1328.8 | 1331.1 | 1327.4 | 1.0 | SLPM |
| Energy Flow Rate | 236.1 | 236.5 | 235.8 | 0.2 | kW |
| External Wind Speed | 0.9 | | | | m/s |
| External Wind Direction | 355.9 | | | | bearing |



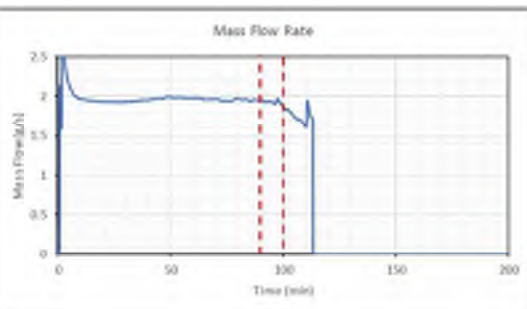
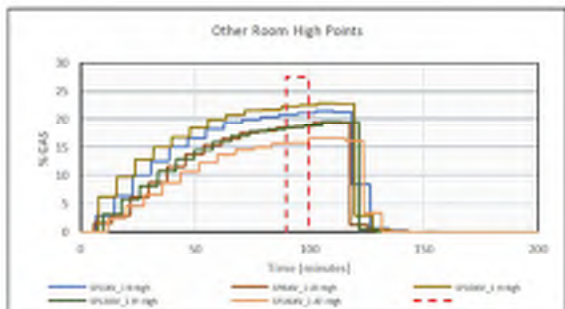
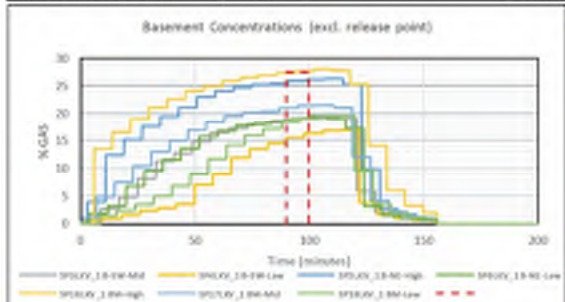
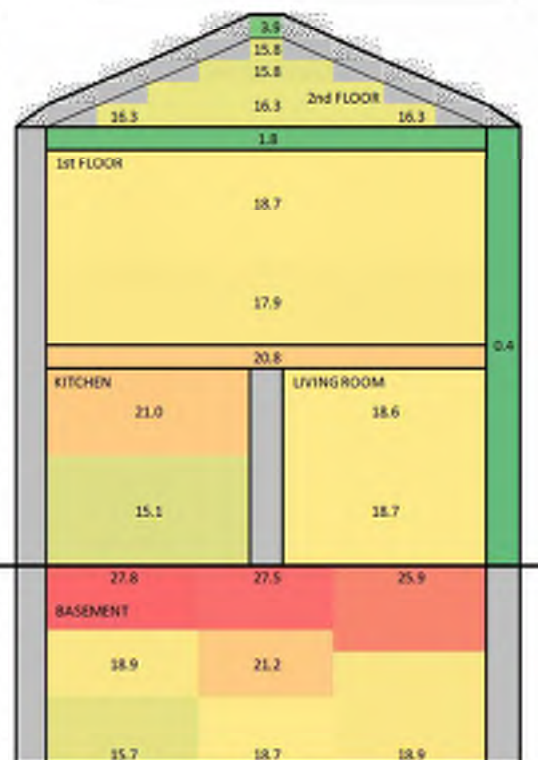
L3-080 RESULT

Hy4Heat WP7 Test Result

| | |
|------------------------------------|----------------|
| MTP ID: L3-080 | |
| Hole Size: 15 mm | |
| Location: Basement, all doors open | |
| Gas: Hydrogen | |
| Date: 28/11/2019 | Time: 07:30:00 |
| Averaging Period Start: 90 min | End: 100 min |

Notes: Averaging period chosen prior to flow rate destabilisation towards end of release

| Sensor | Average | Max | Min | STDEV | Units |
|-------------------------|---------|--------|--------|--------|---------|
| SP1KKV_1 K-High | 21.0 | 21.1 | 20.8 | 0.2 | %vol |
| SP2KKV_1 B-SW-High | 27.8 | 28.0 | 27.7 | 0.1 | %vol |
| SP3KKV_1 B-SW-Mid | 18.9 | 19.0 | 18.9 | 0.1 | %vol |
| SP4KKV_1 B-SW-Low | 15.7 | 16.3 | 15.5 | 0.3 | %vol |
| SP5KKV_1 B-NIS-High | 25.9 | 26.2 | 25.4 | 0.2 | %vol |
| SP6KKV_1 B-NIS-Low | 18.9 | 19.5 | 18.5 | 0.2 | %vol |
| SP7KKV_1 K-Low | 15.1 | 15.3 | 14.7 | 0.3 | %vol |
| SP8KKV_1 LR-High | 18.6 | 18.8 | 18.5 | 0.1 | %vol |
| SP9KKV_1 LR-Mid | 18.7 | 19.0 | 18.3 | 0.3 | %vol |
| SP10KKV_1 H-High | 22.4 | 22.5 | 22.3 | 0.1 | %vol |
| SP11KKV_1 H-Mid | 18.7 | 19.1 | 18.5 | 0.3 | %vol |
| SP12KKV_1 FF-High | 18.7 | 18.9 | 18.6 | 0.1 | %vol |
| SP13KKV_1 FF-Mid | 17.9 | 18.3 | 17.5 | 0.2 | %vol |
| SP14KKV_1 AT-High | 15.8 | 16.7 | 15.8 | 0.1 | %vol |
| SP15KKV_1 AT-Mid | 16.3 | 16.4 | 16.1 | 0.2 | %vol |
| SP16KKV_1 BM-High | 27.5 | 27.6 | 27.4 | 0.1 | %vol |
| SP17KKV_1 BM-Mid | 21.2 | 21.5 | 21.0 | 0.2 | %vol |
| SP18KKV_1 BM-Low | 18.7 | 19.1 | 18.3 | 0.4 | %vol |
| SP19KKV_1 NWALL-Cav | 0.4 | 0.5 | 0.3 | 0.1 | %vol |
| SP20KKV_1 STUD-Cav | 19.0 | 19.6 | 18.9 | 0.3 | %vol |
| SP21KKV_1 FF-Void | 20.8 | 21.3 | 20.4 | 0.2 | %vol |
| SP22KKV_1 SF-Void | 1.8 | 2.3 | 1.7 | 0.3 | %vol |
| SP23KKV_1 ROOF-Void | 3.9 | 4.0 | 3.7 | 0.2 | %vol |
| RELEASEPRESSURE | 0.0135 | 0.0137 | 0.0122 | 0.0004 | barg |
| LOWFLOWMETER | 1.9243 | 1.9655 | 1.8659 | 0.0217 | g/s |
| OUTLET TEMP | 6.4 | 6.5 | 6.3 | 0.1 | degC |
| Volume Flow Rate | 1298.7 | 1326.6 | 1259.3 | 14.7 | SLPM |
| Energy Flow Rate | 230.7 | 235.7 | 223.7 | 2.6 | kW |
| External Wind Speed | 5.6 | | | | m/s |
| External Wind Direction | 16.2 | | | | bearing |



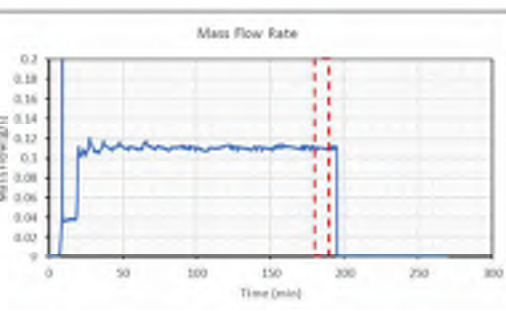
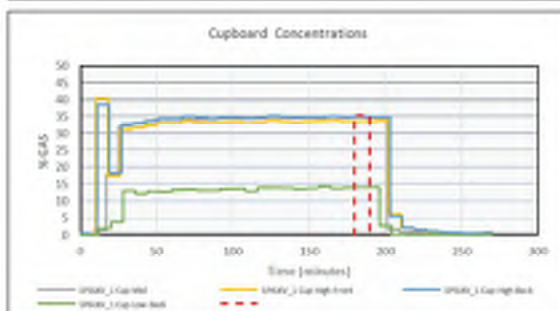
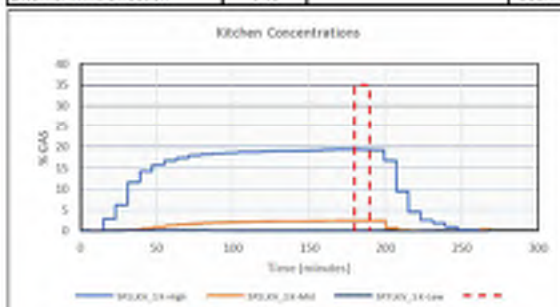
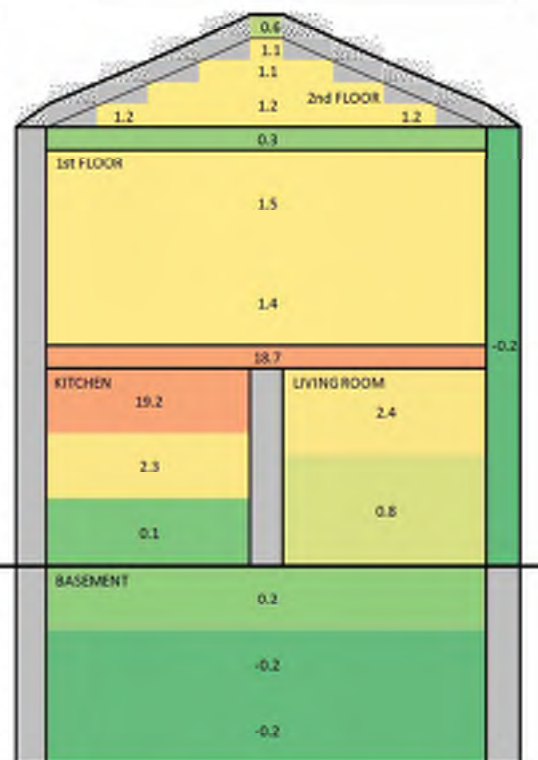
L3-081 RESULT

Hy4Heat WP7 Test Result

| | |
|---------------------------------|----------------|
| MTP ID: L3-081 | |
| Hole Size: 5.1 mm | |
| Location: Boiler cupboard | |
| Gas: Hydrogen | |
| Date: 06/11/2019 | Time: 16:00:00 |
| Averaging Period Start: 180 min | End: 190 min |

Notes:

| Sensor | Average | Max | Min | STDEV | Units |
|-------------------------|-----------|--------|--------|---------|---------|
| SP1KLV_1 K-High | 19.2 | 19.3 | 19.2 | 0.0 | %vol |
| SP2KLV_1 K-Mid | 2.3 | 2.3 | 2.3 | 0.0 | %vol |
| SP3KLV_1 Cup-Mid | 34.7 | 34.7 | 34.6 | 0.0 | %vol |
| SP4KLV_1 Cup-High-Front | 33.5 | 33.5 | 33.5 | 0.0 | %vol |
| SP5KLV_1 Cup-High-Back | 35.1 | 35.2 | 35.0 | 0.1 | %vol |
| SP6KLV_1 Cup-Low-Back | 14.1 | 14.2 | 14.0 | 0.0 | %vol |
| SP7KLV_1 K-Low | 0.1 | 0.1 | 0.1 | 0.0 | %vol |
| SP8KLV_1 LR-High | 2.4 | 2.4 | 2.4 | 0.0 | %vol |
| SP9KLV_1 LR-Mid | 0.8 | 0.9 | 0.8 | 0.0 | %vol |
| SP10KLV_2 H-High | 2.7 | 2.8 | 2.7 | 0.0 | %vol |
| SP11KLV_2 H-Mid | 1.1 | 1.1 | 1.1 | 0.0 | %vol |
| SP12KLV_2 FF-High | 1.5 | 1.5 | 1.4 | 0.0 | %vol |
| SP13KLV_2 FF-Mid | 1.4 | 1.4 | 1.4 | 0.0 | %vol |
| SP14KLV_2 AT-High | 1.1 | 1.1 | 1.1 | 0.0 | %vol |
| SP15KLV_2 AT-Mid | 1.2 | 1.2 | 1.1 | 0.0 | %vol |
| SP16KLV_2 BM-High | 0.2 | 0.2 | 0.2 | 0.0 | %vol |
| SP17KLV_2 BM-Mid | -0.2 | -0.2 | -0.2 | 0.0 | %vol |
| SP18KLV_2 BM-Low | -0.2 | -0.2 | -0.2 | 0.0 | %vol |
| SP19KLV_2 NWALL-Cav | -0.2 | -0.2 | -0.2 | 0.0 | %vol |
| SP20KLV_2 STUD-Cav | 0.6 | 0.6 | 0.6 | 0.0 | %vol |
| SP21KLV_1 FF-Void | 18.7 | 18.7 | 18.7 | 0.0 | %vol |
| SP22KLV_2 SF-Void | 0.3 | 0.6 | 0.3 | 0.0 | %vol |
| SP23KLV_2 ROOF-Void | 0.6 | 0.6 | 0.6 | 0.0 | %vol |
| RELEASEPRESSURE | 0.0025 | 0.0027 | 0.0019 | 0.0002 | barg |
| LOWFLOWMETER | 0.1096 | 0.1106 | 0.1076 | 0.0009 | g/s |
| | Q #DIV/0! | 0.0000 | 0.0000 | #DIV/0! | g/s |
| OUTLET TEMP | 10.3 | 10.4 | 10.3 | 0.1 | degC |
| Volume Flow Rate | 74.0 | 74.7 | 72.6 | 0.6 | SLPM |
| Energy Flow Rate | 13.1 | 13.3 | 12.9 | 0.1 | kW |
| External Wind Speed | 1.0 | | | | m/s |
| External Wind Direction | 64.8 | | | | bearing |



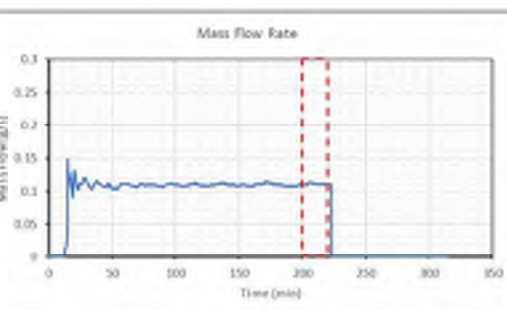
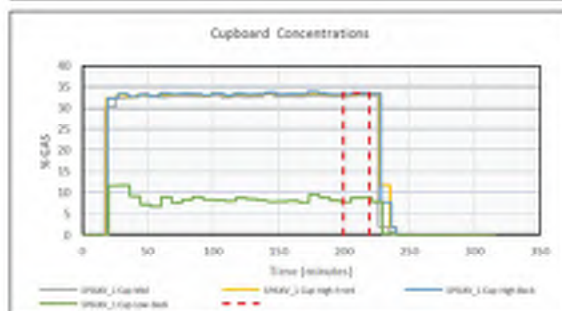
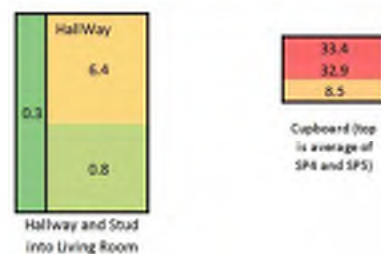
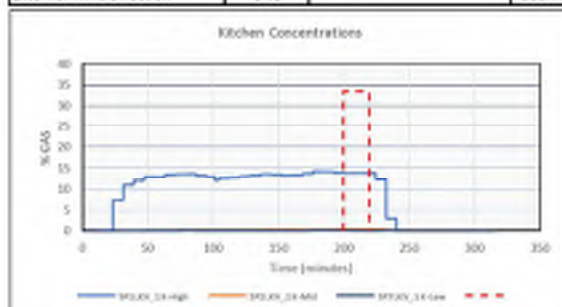
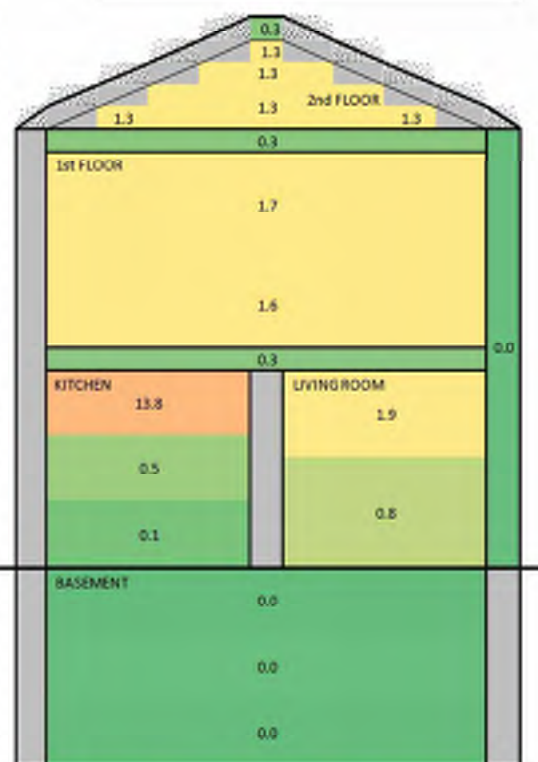
L3-081A RESULT

Hy4Heat WP7 Test Result

| | |
|---|----------------|
| MTP ID: L3-081A | |
| Hole Size: 5.1 mm | |
| Location: Boiler Cupboard, kitchen door closed + 100mm vent | |
| Gas: Hydrogen | |
| Date: 26/11/2019 | Time: 14:30:00 |
| Averaging Period Start: 200 min | End: 220 min |

Notes: SP17-23 had no functioning LEL sensor. PPM sensor shown and topped out at 0.3% vol. Nothing higher detected on 300%vol sensor so have left PPM readings in

| Sensor | Average | Max | Min | STDEV | Units |
|-------------------------|-----------|--------|--------|---------|---------|
| SP1KLV_1 K-High | 13.8 | 13.9 | 13.7 | 0.0 | %vol |
| SP2KLV_1 K-Mid | 0.5 | 0.5 | 0.5 | 0.0 | %vol |
| SP3KLV_1 Cup-Mid | 32.9 | 33.0 | 32.7 | 0.1 | %vol |
| SP4KLV_1 Cup-High-Front | 33.3 | 33.5 | 33.1 | 0.2 | %vol |
| SP5KLV_1 Cup-High-Back | 33.5 | 33.6 | 33.3 | 0.1 | %vol |
| SP6KLV_1 Cup-Low-Back | 8.5 | 8.8 | 7.8 | 0.5 | %vol |
| SP7KLV_1 K-Low | 0.1 | 0.2 | 0.1 | 0.0 | %vol |
| SP8KLV_1 LR-High | 1.9 | 2.0 | 1.9 | 0.0 | %vol |
| SP9KLV_1 LR-Mid | 0.8 | 0.8 | 0.7 | 0.0 | %vol |
| SP10KLV_1 H-High | 6.4 | 6.5 | 6.2 | 0.1 | %vol |
| SP11KLV_2 H-Mid | 0.8 | 0.8 | 0.7 | 0.0 | %vol |
| SP12KLV_2 FF-High | 1.7 | 1.8 | 1.6 | 0.0 | %vol |
| SP13KLV_2 FF-Mid | 1.6 | 1.6 | 1.5 | 0.1 | %vol |
| SP14KLV_2 AT-High | 1.3 | 1.3 | 1.2 | 0.0 | %vol |
| SP15KLV_2 AT-Mid | 1.3 | 1.4 | 1.2 | 0.0 | %vol |
| SP16KLV_3 BM-High | 0.0 | 0.0 | 0.0 | 0.0 | %vol |
| SP17KLV_3 BM-Mid | 0.0 | 0.0 | 0.0 | 0.0 | %vol |
| SP18KLV_3 BM-Low | 0.0 | 0.0 | 0.0 | 0.0 | %vol |
| SP19KLV_3 NWALL-Cav | 0.0 | 0.1 | 0.0 | 0.0 | %vol |
| SP20KLV_3 STUD-Cav | 0.3 | 0.3 | 0.3 | 0.0 | %vol |
| SP21KLV_3 FF-Void | 0.3 | 0.3 | 0.3 | 0.0 | %vol |
| SP22KLV_3 SF-Void | 0.3 | 0.3 | 0.3 | 0.0 | %vol |
| SP23KLV_3 ROOF-Void | 0.3 | 0.3 | 0.3 | 0.0 | %vol |
| RELEASEPRESSURE | 0.0030 | 0.0034 | 0.0027 | 0.0002 | bar(g) |
| LOWFLOWMETER | 0.1100 | 0.1131 | 0.1083 | 0.0012 | g/s |
| | Q #DIV/0! | 0.0000 | 0.0000 | #DIV/0! | g/s |
| OUTLET TEMP | 8.7 | 8.8 | 8.6 | 0.1 | degC |
| Volume Flow Rate | 74.4 | 76.3 | 73.0 | 0.8 | SLPM |
| Energy Flow Rate | 13.2 | 13.6 | 13.0 | 0.1 | kW |
| External Wind Speed | 1.0 | | | | m/s |
| External Wind Direction | 84.1 | | | | bearing |



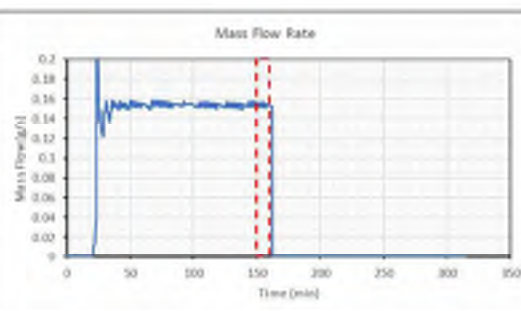
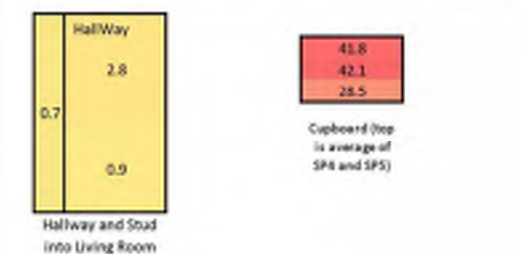
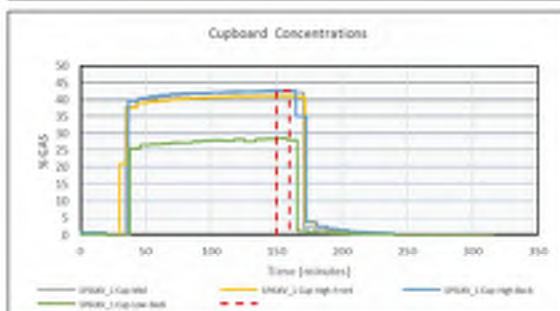
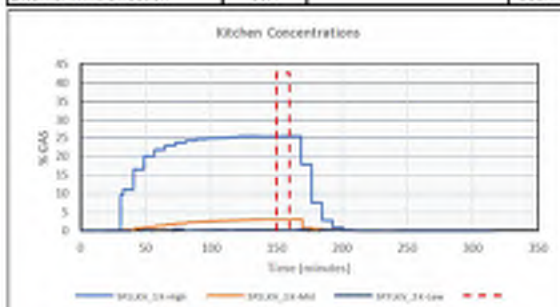
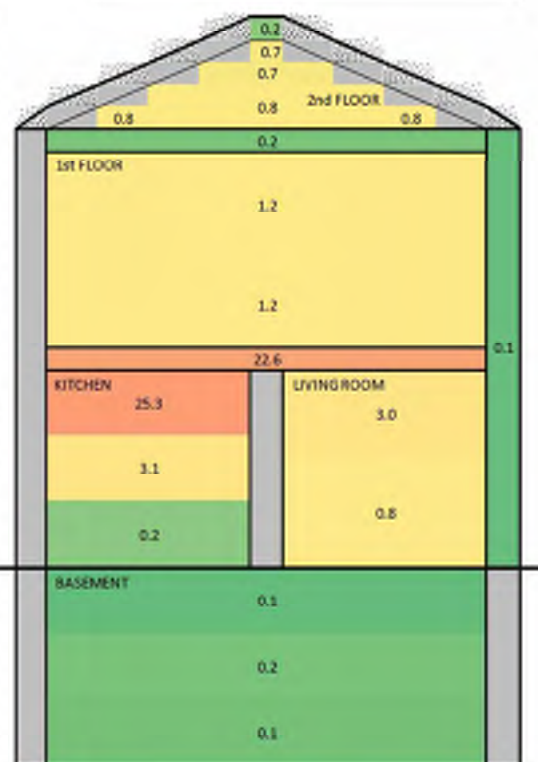
L3-082 RESULT

Hy4Heat WP7 Test Result

| | |
|---|----------------|
| MTP ID: L3-082 | |
| Hole Size: 5.1 mm | |
| Location: Boiler cupboard, all doors closed | |
| Gas: Hydrogen | |
| Date: 06/11/2019 | Time: 20:30:00 |
| Averaging Period Start: 150 min | End: 160 min |

Notes:

| Sensor | Average | Max | Min | STDEV | Units |
|-------------------------|-----------|--------|--------|---------|---------|
| SP1KLV_1 K-High | 25.3 | 25.3 | 25.2 | 0.1 | %vol |
| SP2KLV_1 K-Mid | 3.1 | 3.1 | 3.0 | 0.0 | %vol |
| SP3KLV_1 Cup-Mid | 42.1 | 42.2 | 42.0 | 0.1 | %vol |
| SP4KLV_1 Cup-High-Front | 41.0 | 41.0 | 40.9 | 0.0 | %vol |
| SP5KLV_1 Cup-High-Back | 42.6 | 42.6 | 42.6 | 0.0 | %vol |
| SP6KLV_1 Cup-Low-Back | 28.5 | 28.6 | 28.2 | 0.2 | %vol |
| SP7KLV_2 K-Low | 0.2 | 0.3 | 0.2 | 0.0 | %vol |
| SP8KLV_1 LR-High | 3.0 | 3.0 | 2.9 | 0.0 | %vol |
| SP9KLV_1 LR-Mid | 0.8 | 0.8 | 0.8 | 0.0 | %vol |
| SP10KLV_2 H-High | 2.8 | 2.8 | 2.7 | 0.0 | %vol |
| SP11KLV_2 H-Mid | 0.9 | 0.9 | 0.9 | 0.0 | %vol |
| SP12KLV_2 FF-High | 1.2 | 1.2 | 1.2 | 0.0 | %vol |
| SP13KLV_2 FF-Mid | 1.2 | 1.2 | 1.1 | 0.0 | %vol |
| SP14KLV_2 AT-High | 0.7 | 0.8 | 0.7 | 0.0 | %vol |
| SP15KLV_2 AT-Mid | 0.8 | 0.8 | 0.7 | 0.0 | %vol |
| SP16KLV_3 BM-High | 0.1 | 0.1 | 0.1 | 0.0 | %vol |
| SP17KLV_2 BM-Mid | 0.2 | 0.2 | 0.1 | 0.0 | %vol |
| SP18KLV_2 BM-Low | 0.1 | 0.1 | 0.1 | 0.0 | %vol |
| SP19KLV_2 NWALL-Cav | 0.1 | 0.1 | 0.1 | 0.0 | %vol |
| SP20KLV_2 STUD-Cav | 0.7 | 0.7 | 0.7 | 0.0 | %vol |
| SP21KLV_1 FF-Void | 22.6 | 22.6 | 22.6 | 0.0 | %vol |
| SP22KLV_1 SF-Void | 0.2 | 0.2 | 0.2 | 0.0 | %vol |
| SP23KLV_2 ROOF-Void | 0.2 | 0.3 | 0.2 | 0.0 | %vol |
| RELEASEPRESSURE | 0.0050 | 0.0055 | 0.0044 | 0.0002 | barg |
| LOWFLOWMETER | 0.1539 | 0.1571 | 0.1510 | 0.0016 | g/s |
| | Q #DIV/0! | 0.0000 | 0.0000 | #DIV/0! | g/s |
| OUTLET TEMP | 11.3 | 11.4 | 11.2 | 0.1 | degC |
| Volume Flow Rate | 103.9 | 106.0 | 101.9 | 1.1 | SLPM |
| Energy Flow Rate | 18.5 | 18.8 | 18.1 | 0.2 | kW |
| External Wind Speed | 2.6 | | | | m/s |
| External Wind Direction | 90.4 | | | | bearing |



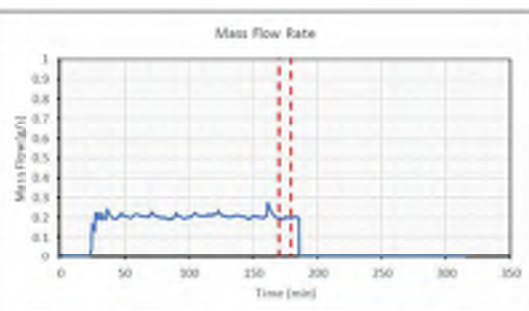
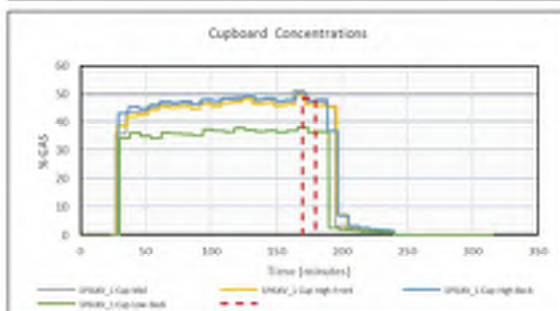
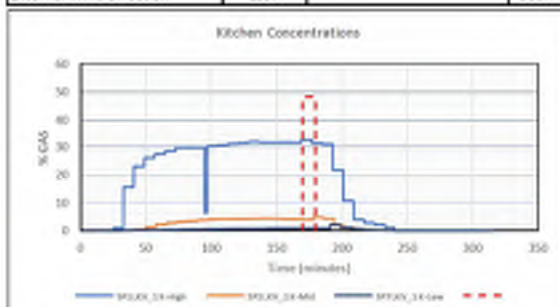
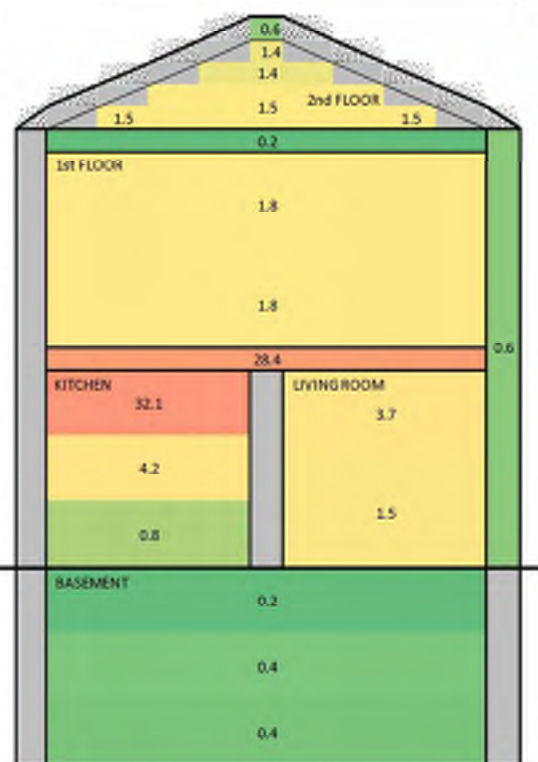
L3-083 RESULT

Hy4Heat WP7 Test Result

| | |
|---|----------------|
| MTP ID: L3-083 | |
| Hole Size: 5.1 mm | |
| Location: Boiler cupboard, all doors closed | |
| Gas: Hydrogen | |
| Date: 02/11/2019 | Time: 08:30:00 |
| Averaging Period Start: 170 min | End: 180 min |

Notes:

| Sensor | Average | Max | Min | STDEV | Units |
|-------------------------|-----------|--------|--------|---------|---------|
| SP1KVV_1 K-High | 32.1 | 32.5 | 31.2 | 0.6 | %vol |
| SP2KVV_1 K-Mid | 4.2 | 4.8 | 4.0 | 0.4 | %vol |
| SP3KVV_1 Cup-Mid | 47.7 | 51.3 | 47.3 | 1.2 | %vol |
| SP4KVV_1 Cup-High-Front | 46.9 | 49.6 | 45.9 | 1.4 | %vol |
| SP5KVV_1 Cup-High-Back | 48.4 | 50.2 | 47.6 | 1.2 | %vol |
| SP6KVV_1 Cup-Low-Back | 37.1 | 38.2 | 36.4 | 0.9 | %vol |
| SP7KVV_1 K-Low | 0.8 | 0.8 | 0.8 | 0.0 | %vol |
| SP8KVV_1 LR-High | 3.7 | 3.8 | 3.6 | 0.1 | %vol |
| SP9KVV_1 LR-Mid | 1.5 | 1.5 | 1.5 | 0.0 | %vol |
| SP10KVV_1 H-High | 4.3 | 4.3 | 4.3 | 0.0 | %vol |
| SP11KVV_1 H-Mid | 1.5 | 1.6 | 1.5 | 0.0 | %vol |
| SP12KVV_2 FF-High | 1.8 | 1.9 | 1.8 | 0.0 | %vol |
| SP13KVV_2 FF-Mid | 1.8 | 1.8 | 1.7 | 0.0 | %vol |
| SP14KVV_2 AT-High | 1.4 | 1.4 | 1.3 | 0.0 | %vol |
| SP15KVV_2 AT-Mid | 1.5 | 1.5 | 1.5 | 0.0 | %vol |
| SP16KVV_2 BM-High | 0.2 | 0.2 | 0.2 | 0.0 | %vol |
| SP17KVV_2 BM-Mid | 0.4 | 0.4 | 0.4 | 0.0 | %vol |
| SP18KVV_2 BM-Low | 0.4 | 0.4 | 0.4 | 0.0 | %vol |
| SP19KVV_2 NWALL-Cav | 0.6 | 0.8 | 0.5 | 0.1 | %vol |
| SP20KVV_2 STUD-Cav | 1.4 | 1.5 | 1.3 | 0.0 | %vol |
| SP21KVV_1 FF-Void | 28.4 | 28.8 | 28.2 | 0.3 | %vol |
| SP22KVV_1 SF-Void | 0.2 | 0.3 | 0.2 | 0.1 | %vol |
| SP23KVV_2 ROOF-Void | 0.6 | 0.7 | 0.5 | 0.1 | %vol |
| RELEASEPRESSURE | 0.0083 | 0.0091 | 0.0071 | 0.0004 | barg |
| LOWFLOWMETER | 0.1986 | 0.2060 | 0.1889 | 0.0048 | g/s |
| | Q #DIV/0! | 0.0000 | 0.0000 | #DIV/0! | g/s |
| OUTLET TEMP | 14.7 | 15.4 | 13.9 | 0.4 | degC |
| Volume Flow Rate | 134.0 | 139.0 | 127.5 | 3.2 | SLPM |
| Energy Flow Rate | 25.8 | 24.7 | 22.6 | 0.6 | kW |
| External Wind Speed | 2.3 | | | | m/s |
| External Wind Direction | 135.4 | | | | bearing |



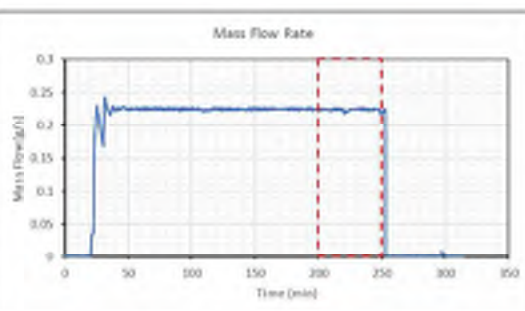
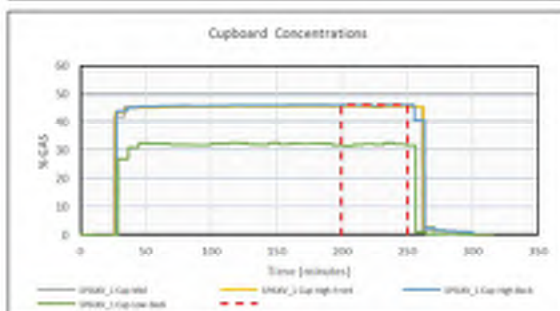
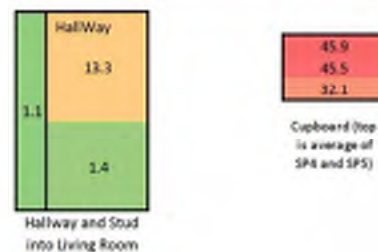
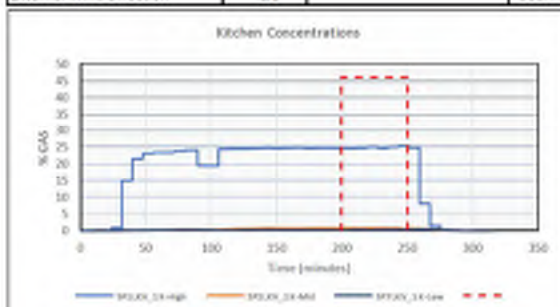
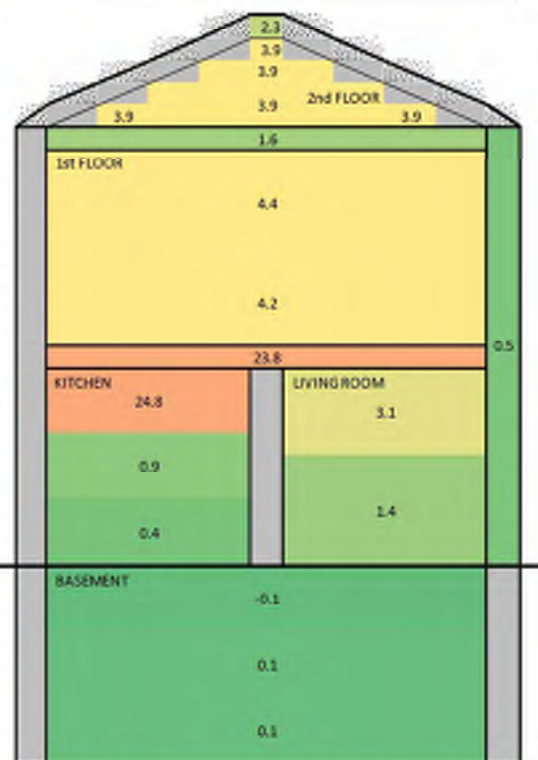
L3-083A RESULT

Hy4Heat WP7 Test Result

| | |
|---|----------------|
| MTP ID: L3-083A | |
| Hole Size: 5.1 mm | |
| Location: Boiler Cupboard, kitchen door closed + 100mm vent | |
| Gas: Hydrogen | |
| Date: 26/11/2019 | Time: 22:30:00 |
| Averaging Period Start: 200 min | End: 250 min |

Notes: LEL sensor on SP17-23 non-functioning so used Vol sensor

| Sensor | Average | Max | Min | STDEV | Units |
|-------------------------|-----------|--------|--------|---------|---------|
| SP1KVV_1 K-High | 24.8 | 25.2 | 24.5 | 0.2 | %vol |
| SP2KVV_1 K-Mid | 0.9 | 1.0 | 0.8 | 0.0 | %vol |
| SP3KVV_1 Cup-Mid | 45.5 | 45.6 | 45.3 | 0.1 | %vol |
| SP4KVV_1 Cup-High-Front | 45.8 | 45.9 | 45.4 | 0.2 | %vol |
| SP5KVV_1 Cup-High-Back | 46.1 | 46.2 | 45.8 | 0.1 | %vol |
| SP6KVV_1 Cup-Low-Back | 32.1 | 32.7 | 31.5 | 0.3 | %vol |
| SP7KVV_1 K-Low | 0.4 | 0.5 | 0.4 | 0.0 | %vol |
| SP8KVV_1 LR-High | 3.1 | 3.2 | 3.1 | 0.0 | %vol |
| SP9KVV_1 LR-Mid | 1.4 | 1.4 | 1.2 | 0.0 | %vol |
| SP10KVV_1 H-High | 13.3 | 13.6 | 13.1 | 0.2 | %vol |
| SP11KVV_1 H-Mid | 1.4 | 1.5 | 1.3 | 0.1 | %vol |
| SP12KVV_1 FF-High | 4.4 | 4.4 | 4.2 | 0.1 | %vol |
| SP13KVV_1 FF-Mid | 4.2 | 4.3 | 4.0 | 0.1 | %vol |
| SP14KVV_2 AT-High | 3.9 | 3.9 | 3.6 | 0.1 | %vol |
| SP15KVV_2 AT-Mid | 3.9 | 4.0 | 3.7 | 0.0 | %vol |
| SP16KVV_2 BM-High | -0.1 | -0.1 | -0.1 | 0.0 | %vol |
| SP17KVV_1 BM-Mid | 0.1 | 0.1 | 0.1 | 0.0 | %vol |
| SP18KVV_1 BM-Low | 0.1 | 0.1 | 0.1 | 0.0 | %vol |
| SP19KVV_1 NWALL-Cav | 0.5 | 0.8 | 0.1 | 0.2 | %vol |
| SP20KVV_1 STUD-Cav | 1.1 | 1.3 | 0.9 | 0.1 | %vol |
| SP21KVV_1 FF-Void | 23.8 | 24.1 | 23.5 | 0.2 | %vol |
| SP22KVV_1 SF-Void | 1.6 | 2.1 | 0.9 | 0.4 | %vol |
| SP23KVV_1 ROOF-Void | 2.3 | 2.7 | 1.7 | 0.3 | %vol |
| RELEASEPRESSURE | 0.0114 | 0.1693 | 0.0100 | 0.0091 | barg |
| LOWFLOWMETER | 0.2231 | 0.2262 | 0.2152 | 0.0019 | g/s |
| | Q #DIV/0! | 0.0000 | 0.0000 | #DIV/0! | g/s |
| OUTLET TEMP | 4.9 | 5.2 | 4.7 | 0.1 | degC |
| Volume Flow Rate | 150.6 | 152.6 | 145.2 | 1.3 | CFM |
| Energy Flow Rate | 26.8 | 27.1 | 25.8 | 0.2 | kW |
| External Wind Speed | 1.2 | | | | m/s |
| External Wind Direction | 41.1 | | | | bearing |



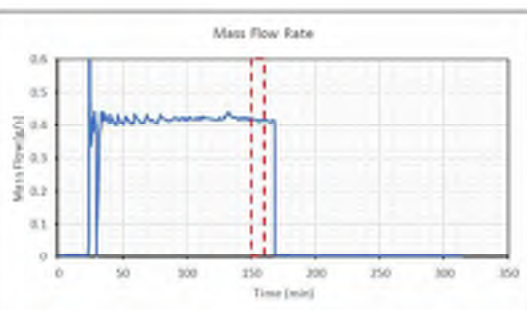
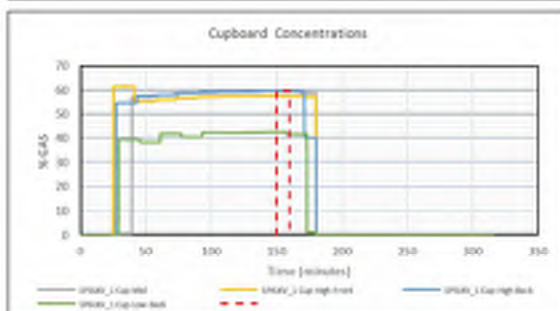
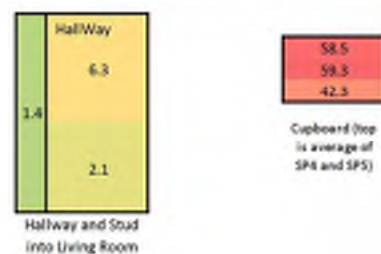
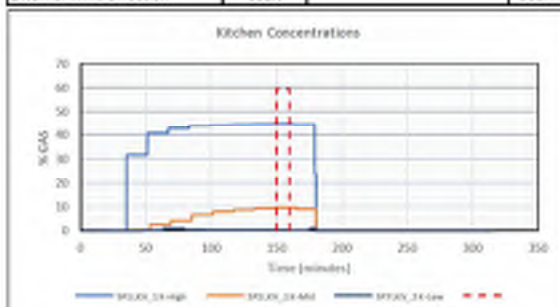
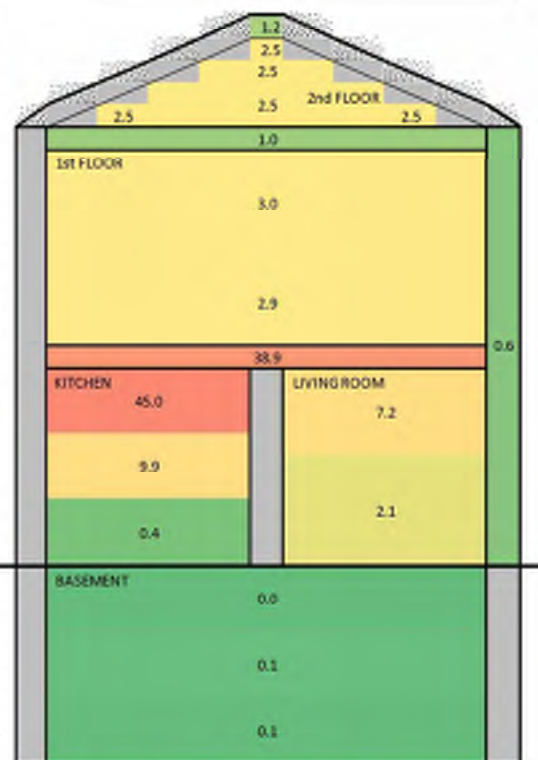
L3-084 RESULT

Hy4Heat WP7 Test Result

| | |
|---|----------------|
| MTP ID: L3-084 | |
| Hole Size: 10mm | |
| Location: Boiler cupboard, all doors closed | |
| Gas: Hydrogen | |
| Date: 05/11/2019 | Time: 19:30:00 |
| Averaging Period Start: 150 min | End: 160 min |

Notes:

| Sensor | Average | Max | Min | STDEV | Units |
|-------------------------|-----------|--------|--------|---------|---------|
| SP1KVV_1 K-High | 45.0 | 45.0 | 45.0 | 0.0 | %vol |
| SP2KVV_1 K-Mid | 9.9 | 9.9 | 9.9 | 0.0 | %vol |
| SP3KVV_1 Cup-Mid | 59.3 | 59.7 | 59.3 | 0.1 | %vol |
| SP4KVV_1 Cup-High-Front | 57.4 | 57.6 | 57.3 | 0.1 | %vol |
| SP5KVV_1 Cup-High-Back | 59.5 | 59.7 | 59.4 | 0.2 | %vol |
| SP6KVV_1 Cup-Low-Back | 42.3 | 42.6 | 41.7 | 0.4 | %vol |
| SP7KVV_2 K-Low | 0.4 | 0.4 | 0.4 | 0.0 | %vol |
| SP8KVV_1 LR-High | 7.2 | 7.2 | 7.2 | 0.0 | %vol |
| SP9KVV_1 LR-Mid | 2.1 | 2.1 | 2.1 | 0.0 | %vol |
| SP10KVV_1 H-High | 6.3 | 6.3 | 6.3 | 0.0 | %vol |
| SP11KVV_1 H-Mid | 2.1 | 2.1 | 1.9 | 0.1 | %vol |
| SP12KVV_1 FF-High | 3.0 | 3.1 | 2.9 | 0.1 | %vol |
| SP13KVV_1 FF-Mid | 2.9 | 3.0 | 2.8 | 0.1 | %vol |
| SP14KVV_1 AT-High | 2.5 | 2.5 | 2.5 | 0.0 | %vol |
| SP15KVV_1 AT-Mid | 2.5 | 2.6 | 2.5 | 0.0 | %vol |
| SP16KVV_3 BM-High | 0.0 | 0.0 | 0.0 | 0.0 | %vol |
| SP17KVV_2 BM-Mid | 0.1 | 0.1 | 0.1 | 0.0 | %vol |
| SP18KVV_3 BM-Low | 0.1 | 0.1 | 0.1 | 0.0 | %vol |
| SP19KVV_2 NWALL-Cav | 0.6 | 0.9 | 0.6 | 0.1 | %vol |
| SP20KVV_2 STUD-Cav | 1.4 | 1.4 | 1.3 | 0.1 | %vol |
| SP21KVV_1 FF-Void | 38.9 | 39.0 | 38.7 | 0.1 | %vol |
| SP22KVV_1 SF-Void | 1.0 | 1.1 | 0.8 | 0.1 | %vol |
| SP23KVV_2 ROOF-Void | 1.2 | 1.2 | 1.2 | 0.0 | %vol |
| RELEASEPRESSURE | 0.0046 | 0.0049 | 0.0041 | 0.0002 | barg |
| LOWFLOWMETER | 0.4144 | 0.4199 | 0.4089 | 0.0029 | g/s |
| | Q #DIV/0! | 0.0000 | 0.0000 | #DIV/0! | g/s |
| OUTLET TEMP | 4.4 | 4.6 | 4.2 | 0.1 | degC |
| Volume Flow Rate | 279.7 | 283.4 | 276.0 | 1.9 | SLPM |
| Energy Flow Rate | 49.7 | 50.4 | 49.0 | 0.3 | kW |
| External Wind Speed | 1.6 | | | | m/s |
| External Wind Direction | 352.0 | | | | bearing |



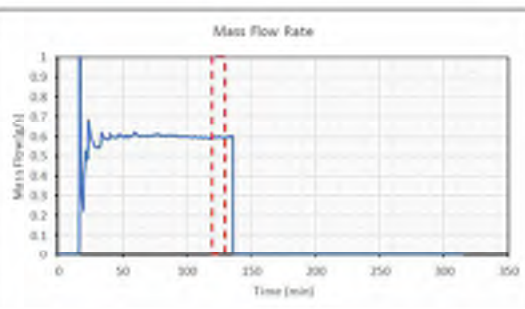
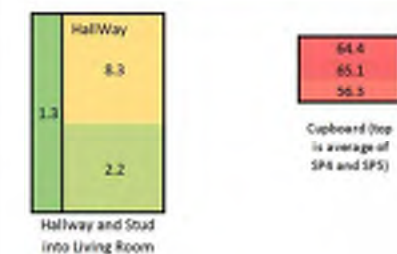
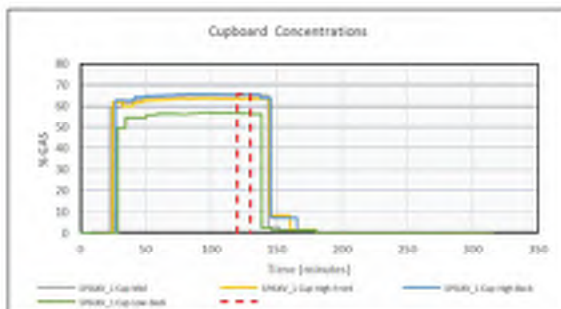
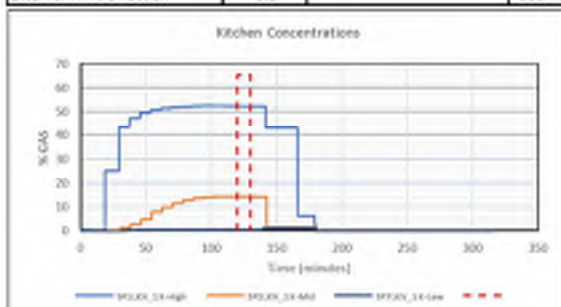
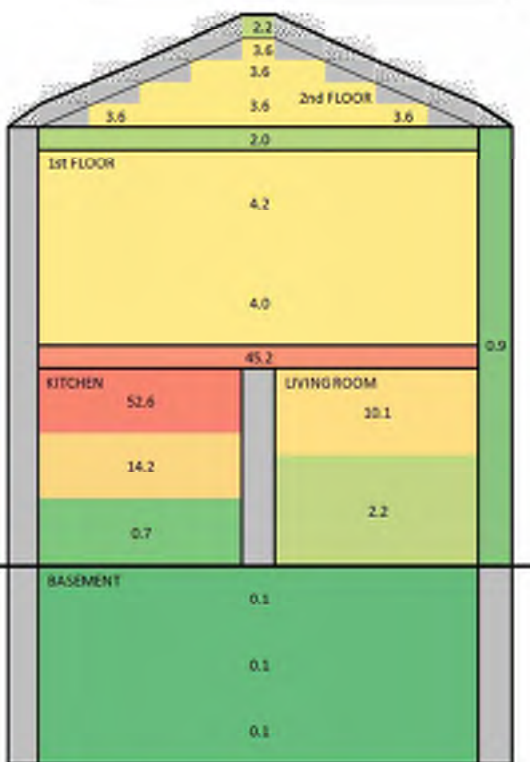
L3-085 RESULT

Hy4Heat WP7 Test Result

| | |
|---------------------------------|----------------|
| MTP ID: L3-085 | |
| Hole Size: 10mm | |
| Location: Boiler cupboard | |
| Gas: Hydrogen | |
| Date: 05/11/2019 | Time: 23:30:00 |
| Averaging Period Start: 120 min | End: 130 min |

Notes:

| Sensor | Average | Max | Min | STDEV | Units |
|-------------------------|-----------|--------|--------|---------|---------|
| SP1KVV_1 K-High | 52.6 | 52.7 | 52.6 | 0.1 | %vol |
| SP2KVV_1 K-Mid | 14.2 | 14.2 | 14.2 | 0.0 | %vol |
| SP3KVV_1 Cup-Mid | 65.1 | 65.1 | 65.1 | 0.0 | %vol |
| SP4KVV_1 Cup-High-Front | 63.3 | 63.4 | 63.3 | 0.0 | %vol |
| SP5KVV_1 Cup-High-Back | 65.5 | 65.5 | 65.4 | 0.0 | %vol |
| SP6KVV_1 Cup-Low-Back | 56.3 | 56.4 | 56.3 | 0.0 | %vol |
| SP7KVV_1 K-Low | 0.7 | 0.7 | 0.7 | 0.0 | %vol |
| SP8KVV_1 LR-High | 10.1 | 10.2 | 10.1 | 0.1 | %vol |
| SP9KVV_1 LR-Mid | 2.2 | 2.3 | 2.2 | 0.1 | %vol |
| SP10KVV_1 H-High | 8.3 | 8.4 | 8.3 | 0.0 | %vol |
| SP11KVV_1 H-Mid | 2.2 | 2.3 | 2.2 | 0.0 | %vol |
| SP12KVV_1 FF-High | 4.2 | 4.3 | 4.0 | 0.1 | %vol |
| SP13KVV_1 FF-Mid | 4.0 | 4.2 | 3.8 | 0.1 | %vol |
| SP14KVV_1 AT-High | 3.6 | 3.6 | 3.4 | 0.1 | %vol |
| SP15KVV_1 AT-Mid | 3.6 | 3.7 | 3.5 | 0.1 | %vol |
| SP16KVV_2 BM-High | 0.1 | 0.1 | 0.1 | 0.0 | %vol |
| SP17KVV_2 BM-Mid | 0.1 | 0.1 | 0.1 | 0.0 | %vol |
| SP18KVV_2 BM-Low | 0.1 | 0.1 | 0.1 | 0.0 | %vol |
| SP19KVV_2 NWALL-Cav | 0.9 | 0.9 | 0.8 | 0.1 | %vol |
| SP20KVV_2 STUD-Cav | 1.3 | 1.3 | 1.2 | 0.0 | %vol |
| SP21KVV_1 FF-Void | 45.2 | 45.3 | 45.2 | 0.1 | %vol |
| SP22KVV_2 SF-Void | 2.0 | 2.1 | 2.0 | 0.0 | %vol |
| SP23KVV_2 ROOF-Void | 2.2 | 2.2 | 2.2 | 0.0 | %vol |
| RELEASEPRESSURE | 0.0094 | 0.0099 | 0.0088 | 0.0002 | bar(g) |
| LOWFLOWMETER | 0.5948 | 0.5990 | 0.5893 | 0.0022 | g/s |
| | Q #DIV/0! | 0.0000 | 0.0000 | #DIV/0! | g/s |
| OUTLET TEMP | 3.0 | 3.2 | 2.9 | 0.1 | degC |
| Volume Flow Rate | 401.5 | 404.3 | 397.7 | 1.5 | SLPM |
| Energy Flow Rate | 71.3 | 71.8 | 70.7 | 0.3 | kW |
| External Wind Speed | 1.0 | | | | m/s |
| External Wind Direction | 5.1 | | | | bearing |



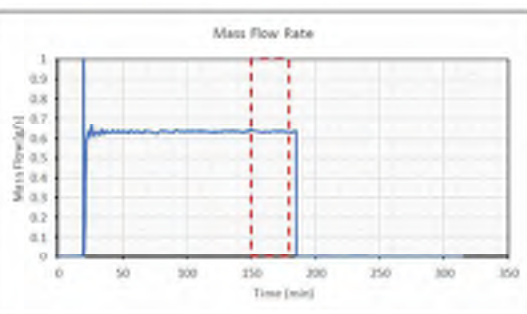
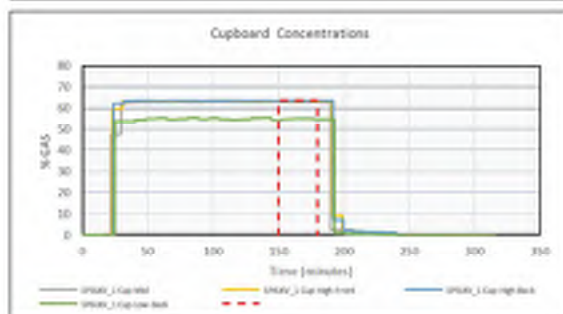
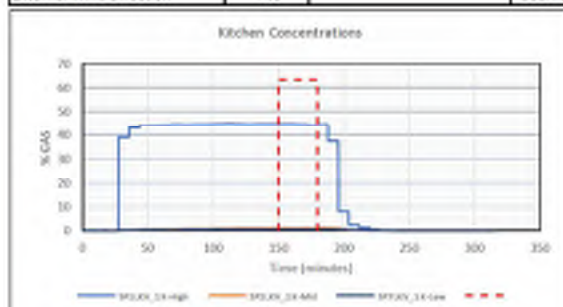
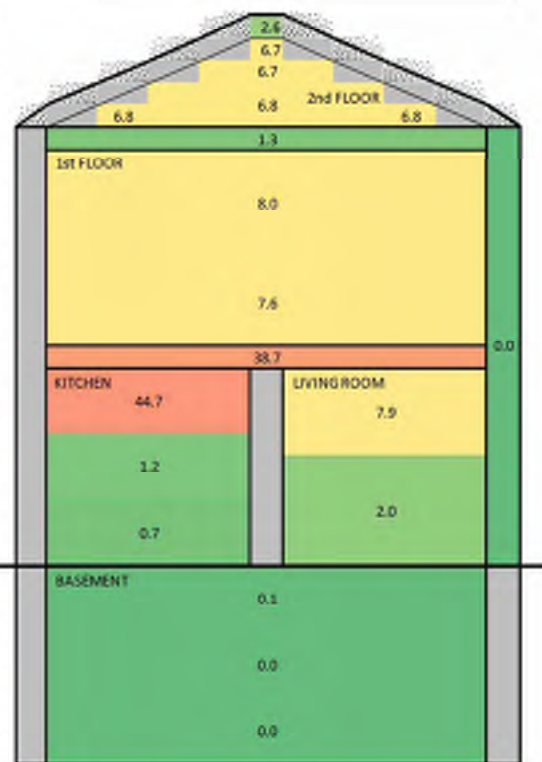
L3-085A RESULT

Hy4Heat WP7 Test Result

| | |
|---|----------------|
| MTP ID: L3-085A | |
| Hole Size: 10mm | |
| Location: Boiler Cupboard, kitchen door closed + 100mm vent | |
| Gas: Hydrogen | |
| Date: 27/11/2019 | Time: 04:00:00 |
| Averaging Period Start: 150 min | End: 180 min |

Notes:

| Sensor | Average | Max | Min | STDEV | Units |
|-------------------------|-----------|--------|--------|---------|---------|
| SP1KVV_1 K-High | 44.7 | 44.8 | 44.5 | 0.1 | %vol |
| SP2KVV_1 K-Mid | 1.2 | 1.2 | 1.2 | 0.0 | %vol |
| SP3KVV_1 Cup-Mid | 62.9 | 63.1 | 62.8 | 0.1 | %vol |
| SP4KVV_1 Cup-High-Front | 63.4 | 63.6 | 63.2 | 0.1 | %vol |
| SP5KVV_1 Cup-High-Back | 63.7 | 63.7 | 63.5 | 0.1 | %vol |
| SP6KVV_1 Cup-Low-Back | 54.7 | 54.9 | 54.1 | 0.2 | %vol |
| SP7KVV_1 K-Low | 0.7 | 0.7 | 0.7 | 0.0 | %vol |
| SP8KVV_1 LR-High | 7.9 | 8.0 | 7.8 | 0.1 | %vol |
| SP9KVV_1 LR-Mid | 2.0 | 2.1 | 2.0 | 0.0 | %vol |
| SP10KVV_1 H-High | 26.4 | 26.8 | 26.0 | 0.3 | %vol |
| SP11KVV_1 H-Mid | 2.1 | 2.2 | 2.1 | 0.0 | %vol |
| SP12KVV_1 FF-High | 8.0 | 8.0 | 7.7 | 0.0 | %vol |
| SP13KVV_1 FF-Mid | 7.6 | 7.6 | 7.5 | 0.1 | %vol |
| SP14KVV_1 AT-High | 6.7 | 6.8 | 6.6 | 0.1 | %vol |
| SP15KVV_1 AT-Mid | 6.8 | 6.9 | 6.7 | 0.0 | %vol |
| SP16KVV_2 BM-High | 0.1 | 0.1 | 0.1 | 0.0 | %vol |
| SP17KVV_1 BM-Mid | 0.0 | 0.0 | 0.0 | 0.0 | %vol |
| SP18KVV_1 BM-Low | 0.0 | 0.0 | 0.0 | 0.0 | %vol |
| SP19KVV_1 NWALL-Cav | 0.0 | 0.0 | 0.0 | 0.0 | %vol |
| SP20KVV_1 STUD-Cav | 1.9 | 1.9 | 1.9 | 0.0 | %vol |
| SP21KVV_1 FF-Void | 38.7 | 38.8 | 38.4 | 0.2 | %vol |
| SP22KVV_1 SF-Void | 1.3 | 1.5 | 1.2 | 0.1 | %vol |
| SP23KVV_1 ROOF-Void | 2.6 | 2.9 | 2.4 | 0.1 | %vol |
| RELEASEPRESSURE | 0.0100 | 0.0106 | 0.0096 | 0.0001 | barg |
| LOWFLOWMETER | 0.6366 | 0.6461 | 0.6308 | 0.0028 | g/s |
| | Q #DIV/0! | 0.0000 | 0.0000 | #DIV/0! | g/s |
| OUTLET TEMP | 5.4 | 5.5 | 5.2 | 0.1 | degC |
| Volume Flow Rate | 429.6 | 436.1 | 425.8 | 1.9 | SLPM |
| Energy Flow Rate | 76.3 | 77.5 | 75.6 | 0.3 | kW |
| External Wind Speed | 3.0 | | | | m/s |
| External Wind Direction | 44.8 | | | | bearing |



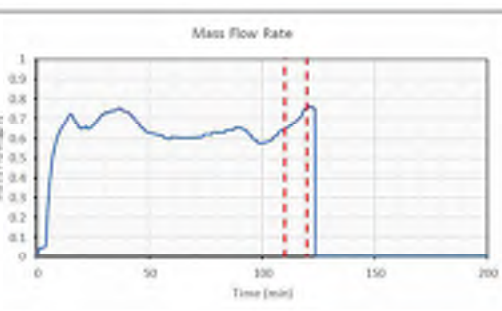
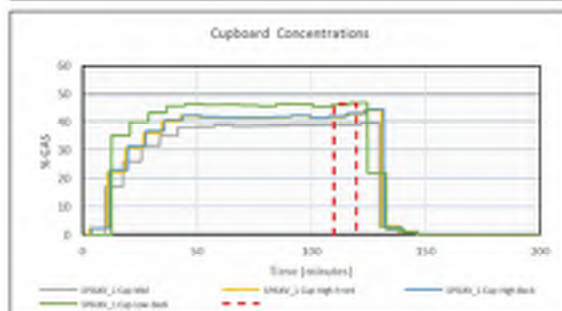
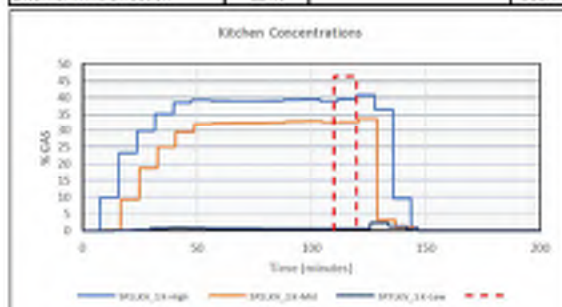
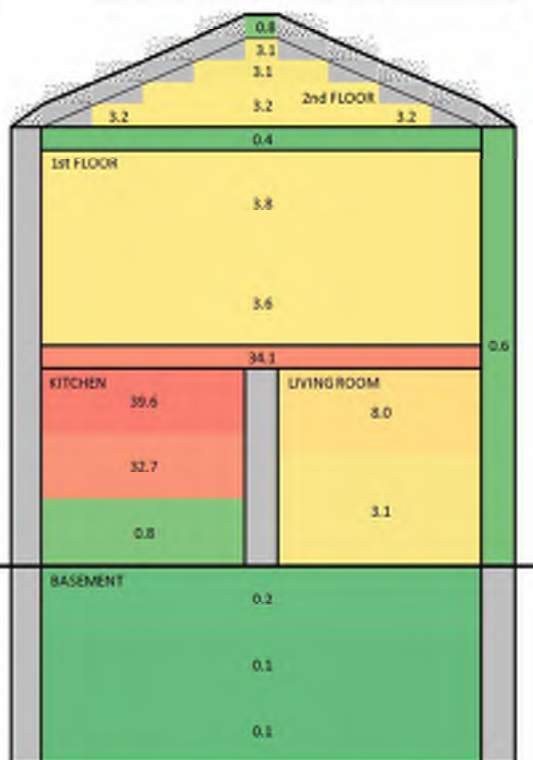
L3-085B RESULT

Hy4Heat WP7 Test Result

| | |
|--|----------------|
| MTP ID: L3-085B | |
| Hole Size: 10mm | |
| Location: kitchen boiler cupboard, vents in cupboard | |
| Gas: hydrogen | |
| Date: 12/01/2020 | Time: 13:35:00 |
| Averaging Period Start: 120 min | End: 120 min |

Notes: kitchen boiler cupboard, vents in side and top of cupboard/
neighbouring cupboard door open / kitchen door closed / vent
above kitchen door taped
Release pressure data not reliable, FM outlet pressure is
consistent with other tests at same flow rate

| Sensor | Average | Max | Min | STDEV | Units |
|-------------------------|---------|--------|--------|--------|---------|
| SP1KVV_1 K-High | 39.6 | 40.9 | 39.0 | 0.4 | %vol |
| SP2KVV_1 K-Mid | 32.7 | 32.7 | 32.6 | 0.0 | %vol |
| SP3KVV_1 Cup-Mid | 39.1 | 39.1 | 39.1 | 0.0 | %vol |
| SP4KVV_1 Cup-High-Front | 42.4 | 42.9 | 41.8 | 0.6 | %vol |
| SP5KVV_1 Cup-High-Back | 42.4 | 43.0 | 42.0 | 0.5 | %vol |
| SP6KVV_1 Cup-Low-Back | 46.5 | 47.0 | 46.3 | 0.4 | %vol |
| SP7KVV_1 K-Low | 0.8 | 0.8 | 0.8 | 0.0 | %vol |
| SP8KVV_1 LR-High | 8.0 | 8.2 | 8.0 | 0.1 | %vol |
| SP9KVV_1 LR-Mid | 3.1 | 3.2 | 3.0 | 0.0 | %vol |
| SP10KVV_1 H-High | 7.0 | 7.0 | 6.9 | 0.1 | %vol |
| SP11KVV_1 H-Mid | 3.3 | 3.4 | 3.2 | 0.1 | %vol |
| SP12KVV_1 FF-High | 3.8 | 3.9 | 3.7 | 0.1 | %vol |
| SP13KVV_1 FF-Mid | 3.6 | 3.7 | 3.5 | 0.1 | %vol |
| SP14KVV_1 AT-High | 3.1 | 3.2 | 3.0 | 0.1 | %vol |
| SP15KVV_1 AT-Mid | 3.2 | 3.2 | 3.2 | 0.0 | %vol |
| SP16KVV_1 BM-High | 0.2 | 0.3 | 0.2 | 0.0 | %vol |
| SP17KVV_1 BM-Mid | 0.1 | 0.2 | 0.1 | 0.0 | %vol |
| SP18KVV_1 BM-Low | 0.1 | 0.1 | 0.1 | 0.0 | %vol |
| SP19KVV_1 NWALL-Cav | 0.6 | 0.6 | 0.6 | 0.0 | %vol |
| SP20KVV_1 STUD-Cav | 1.8 | 1.9 | 1.8 | 0.0 | %vol |
| SP21KVV_1 FF-Void | 34.1 | 34.5 | 33.7 | 0.4 | %vol |
| SP22KVV_1 SF-Void | 0.4 | 0.4 | 0.4 | 0.0 | %vol |
| SP23KVV_1 ROOF-Void | 0.8 | 0.8 | 0.8 | 0.0 | %vol |
| RELEASEPRESSURE | | | | | barg |
| LOWFLOWMETER | 0.6953 | 0.7561 | 0.6510 | 0.0333 | g/s |
| OUTLET_PRESSURE | 0.0630 | 0.0734 | 0.0557 | 0.0053 | barg |
| OUTLET_TEMP | 5.2 | 5.4 | 5.1 | 0.1 | degC |
| Volume Flow Rate | 469.3 | 510.3 | 439.4 | 22.5 | SLPM |
| Energy Flow Rate | 83.4 | 90.7 | 78.1 | 4.0 | kW |
| External Wind Speed | 1.4 | | | | m/s |
| External Wind Direction | 224.6 | | | | bearing |



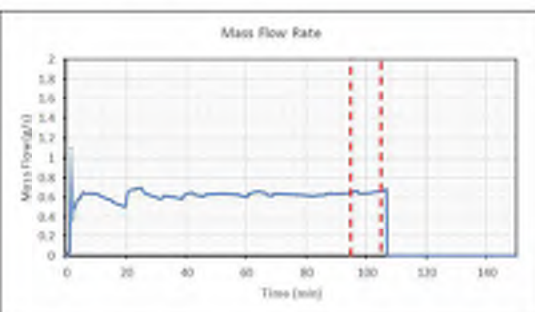
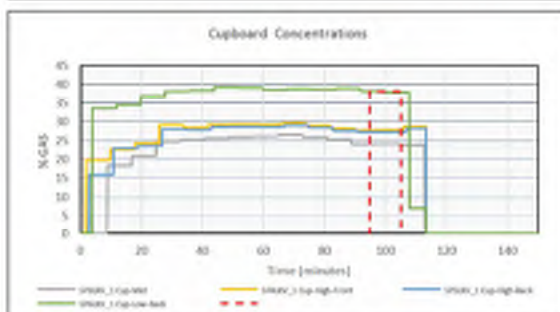
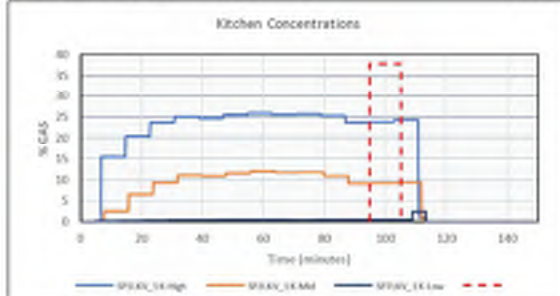
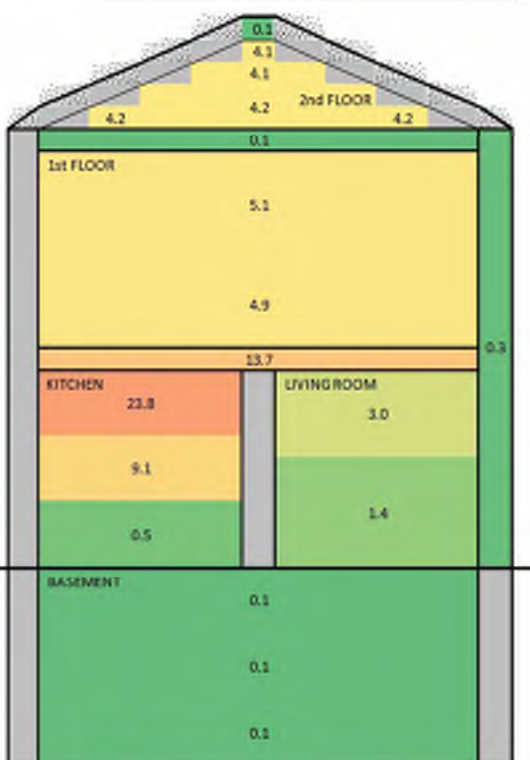
L3-085C RESULT

Hy4Heat WP7 Test Result

| | |
|--|----------------|
| MTP ID: L3-085C | |
| Hole Size: 10mm | |
| Kitchen boiler cupboard, doors closed, 100mm vent | |
| Location: above kitchen door and vents in cupboard | |
| Gas: Hydrogen | |
| Date: 13/01/2020 | Time: 13:45:00 |
| Averaging Period Start: 35 min | End: 105 min |

Notes: Release Pressure sensor malfunction, FM outlet sensor consistent with other tests at this flow rate

| Sensor | Average | Max | Min | STDEV | units |
|-------------------------|---------|--------|--------|--------|---------|
| SP1KV_1 K-High | 23.8 | 34.1 | 23.7 | 0.2 | %vol |
| SP2KV_1 K-Mid | 9.1 | 9.3 | 9.1 | 0.0 | %vol |
| SP3KV_1 Cup-Mid | 23.9 | 23.9 | 23.7 | 0.0 | %vol |
| SP4KV_1 Cup-High-Front | 27.7 | 27.7 | 27.6 | 0.0 | %vol |
| SP5KV_1 Cup-High-Back | 27.3 | 27.3 | 27.3 | 0.0 | %vol |
| SP6KV_1 Cup-Low-Back | 29.0 | 38.2 | 37.8 | 0.2 | %vol |
| SP7KV_1 K-Low | 0.5 | 0.5 | 0.5 | 0.0 | %vol |
| SP8KV_1 LR-High | 3.0 | 3.0 | 3.0 | 0.0 | %vol |
| SP9KV_1 LR-Mid | 1.4 | 1.4 | 1.4 | 0.0 | %vol |
| SP10KV_1 H-High | 11.9 | 12.0 | 11.6 | 0.1 | %vol |
| SP11KV_1 H-Mid | 1.3 | 1.3 | 1.3 | 0.0 | %vol |
| SP12KV_1 FF-High | 5.1 | 5.2 | 5.0 | 0.1 | %vol |
| SP13KV_1 FF-Mid | 4.9 | 4.9 | 4.9 | 0.0 | %vol |
| SP14KV_1 AT-High | 4.1 | 4.1 | 4.0 | 0.0 | %vol |
| SP15KV_1 AT-Mid | 4.2 | 4.2 | 4.2 | 0.0 | %vol |
| SP16KV_2 BM-High | 0.1 | 0.1 | 0.1 | 0.0 | %vol |
| SP17KV_1 BM-Mid | 0.1 | 0.1 | 0.1 | 0.0 | %vol |
| SP18KV_1 BM-Low | 0.1 | 0.1 | 0.1 | 0.0 | %vol |
| SP19KV_1 NWALL-Cav | 0.3 | 0.3 | 0.3 | 0.0 | %vol |
| SP20KV_1 STUD-Cav | 1.1 | 1.1 | 1.1 | 0.0 | %vol |
| SP21KV_1 FF-Void | 13.7 | 13.9 | 13.6 | 0.1 | %vol |
| SP22KV_1 SF-Void | 0.1 | 0.1 | 0.1 | 0.0 | %vol |
| SP23KV_1 ROOF-Void | 0.1 | 0.1 | 0.1 | 0.0 | %vol |
| RELEASEPRESSURE | | | | | bar |
| LOWFLOWMETER | 0.6528 | 0.6718 | 0.6400 | 0.0086 | g/s |
| OUTLET PRESSURE | 0.0582 | 0.0626 | 0.0557 | 0.0016 | g/s |
| OUTLET TEMP | 6.9 | 7.2 | 6.7 | 0.1 | degC |
| Volume Flow Rate | 440.6 | 453.4 | 431.9 | 5.8 | SUPM |
| Energy Flow Rate | 76.3 | 80.5 | 76.7 | 1.0 | kW |
| External Wind Speed | 0.0 | | | | m/s |
| External Wind Direction | 0.0 | | | | bearing |



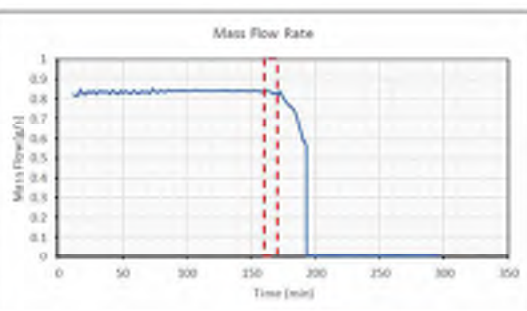
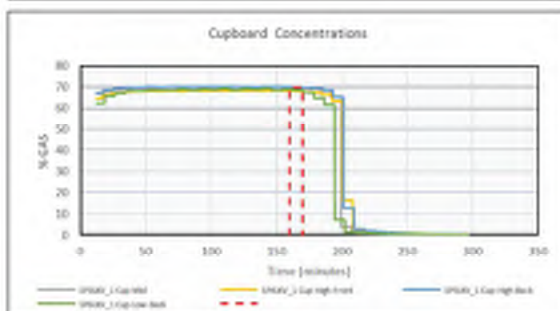
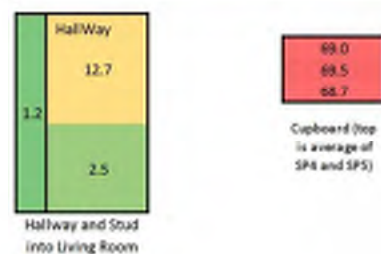
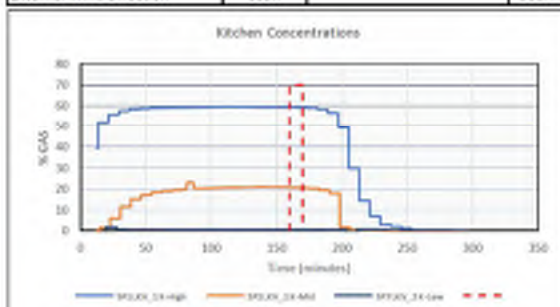
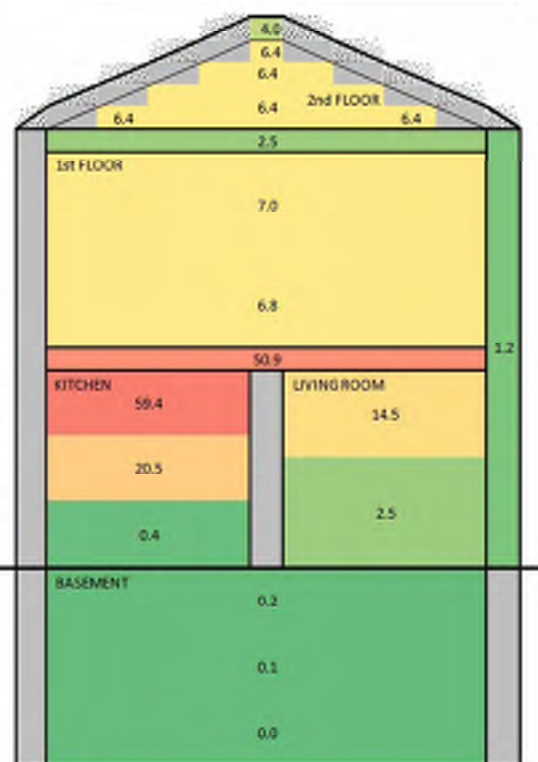
L3-086 RESULT

Hy4Heat WP7 Test Result

| | |
|--|----------------|
| MTP ID: L3-086 | |
| Hole Size: 10 mm | |
| Location: Boiler Cupboard, kitchen door closed | |
| Gas: Hydrogen | |
| Date: 05/11/2019 | Time: 05:00:00 |
| Averaging Period Start: 160 min | End: 170 min |

Notes: Data prior to 12 min not retrieved from SCADA unit

| Sensor | Average | Max | Min | STDEV | Units |
|-------------------------|---------|--------|--------|--------|---------|
| SP1KVV_1 K-High | 59.4 | 59.5 | 59.3 | 0.1 | %vol |
| SP2KVV_1 K-Mid | 20.5 | 20.6 | 20.4 | 0.1 | %vol |
| SP3KVV_1 Cup-Mid | 69.5 | 69.6 | 69.5 | 0.0 | %vol |
| SP4KVV_1 Cup-High-Front | 68.0 | 68.2 | 67.8 | 0.1 | %vol |
| SP5KVV_1 Cup-High-Back | 70.0 | 70.1 | 69.7 | 0.1 | %vol |
| SP6KVV_1 Cup-Low-Back | 68.7 | 69.1 | 68.6 | 0.2 | %vol |
| SP7KVV_2 K-Low | 0.4 | 0.4 | 0.4 | 0.0 | %vol |
| SP8KVV_1 LR-High | 14.5 | 14.5 | 14.5 | 0.0 | %vol |
| SP9KVV_1 LR-Mid | 2.5 | 2.5 | 2.4 | 0.0 | %vol |
| SP10KVV_1 H-High | 12.7 | 12.7 | 12.7 | 0.0 | %vol |
| SP11KVV_2 H-Mid | 2.5 | 2.5 | 2.5 | 0.0 | %vol |
| SP12KVV_1 FF-High | 7.0 | 7.0 | 6.9 | 0.0 | %vol |
| SP13KVV_1 FF-Mid | 6.8 | 6.9 | 6.8 | 0.0 | %vol |
| SP14KVV_1 AT-High | 6.4 | 6.4 | 6.3 | 0.0 | %vol |
| SP15KVV_1 AT-Mid | 6.4 | 6.4 | 6.4 | 0.0 | %vol |
| SP16KVV_1 BM-High | 0.2 | 0.2 | 0.2 | 0.0 | %vol |
| SP17KVV_1 BM-Mid | 0.1 | 0.1 | 0.1 | 0.0 | %vol |
| SP18KVV_1 BM-Low | 0.0 | 0.0 | 0.0 | 0.0 | %vol |
| SP19KVV_1 NWALL-Cav | 1.2 | 1.3 | 1.1 | 0.1 | %vol |
| SP20KVV_1 STUD-Cav | 1.2 | 1.2 | 1.2 | 0.0 | %vol |
| SP21KVV_1 FF-Void | 50.9 | 51.0 | 50.8 | 0.1 | %vol |
| SP22KVV_1 SF-Void | 2.5 | 2.7 | 2.4 | 0.1 | %vol |
| SP23KVV_1 ROOF-Void | 4.0 | 4.1 | 4.0 | 0.0 | %vol |
| RELEASEPRESSURE | 0.0185 | 0.0184 | 0.0174 | 0.0003 | barg |
| LOWFLOWMETER | 0.8317 | 0.8393 | 0.8209 | 0.0051 | g/s |
| OUTLET TEMP | 2.1 | 2.4 | 1.9 | 0.1 | degC |
| Volume Flow Rate | 563.3 | 566.4 | 554.1 | 3.5 | SLPM |
| Energy Flow Rate | 99.7 | 100.6 | 98.4 | 0.6 | kW |
| External Wind Speed | 0.5 | | | | m/s |
| External Wind Direction | 335.7 | | | | bearing |



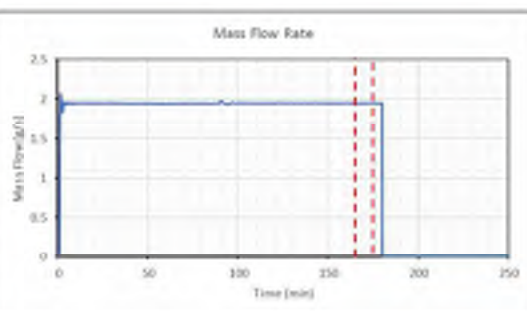
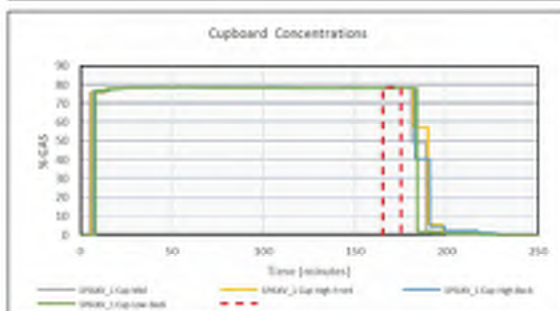
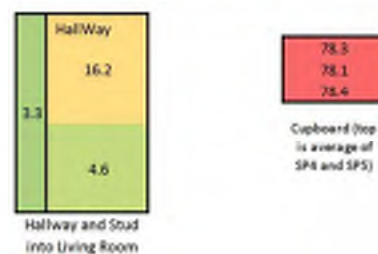
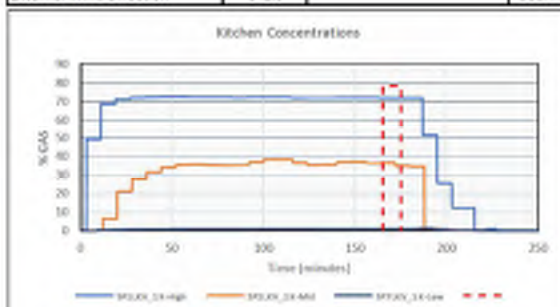
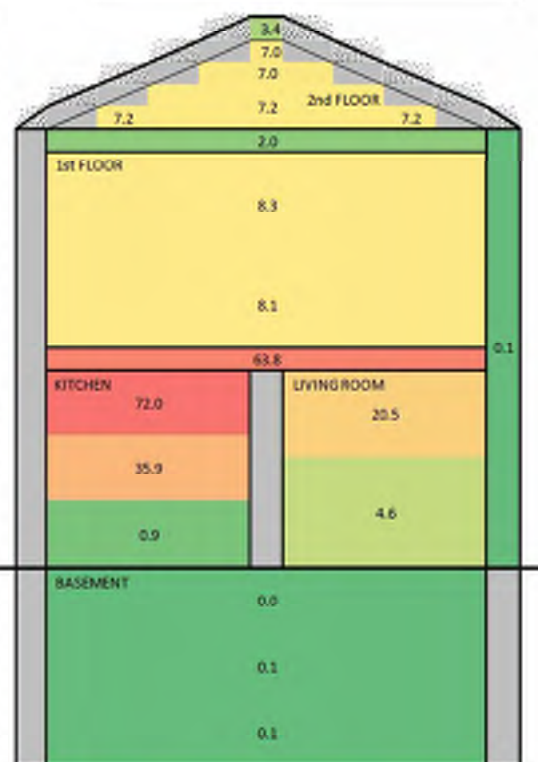
L3-087 RESULT

Hy4Heat WP7 Test Result

| | |
|--|----------------|
| MTP ID: L3-087 | |
| Hole Size: 10mm | |
| Location: Boiler Cupboard, kitchen door closed | |
| Gas: Hydrogen | |
| Date: 27/11/2019 | Time: 12:30:00 |
| Averaging Period Start: 185 min | End: 175 min |

Notes:

| Sensor | Average | Max | Min | STDEV | Units |
|-------------------------|---------|--------|--------|--------|---------|
| SP1KVV_1 K-High | 72.0 | 72.0 | 72.0 | 0.0 | %vol |
| SP2KVV_1 K-Mid | 35.9 | 36.3 | 34.8 | 0.7 | %vol |
| SP3KVV_1 Cup-Mid | 78.1 | 78.1 | 78.1 | 0.0 | %vol |
| SP4KVV_1 Cup-High-Front | 78.1 | 78.2 | 78.1 | 0.0 | %vol |
| SP5KVV_1 Cup-High-Back | 78.4 | 78.4 | 78.3 | 0.0 | %vol |
| SP6KVV_1 Cup-Low-Back | 78.4 | 78.4 | 78.4 | 0.0 | %vol |
| SP7KVV_1 K-Low | 0.9 | 0.9 | 0.9 | 0.0 | %vol |
| SP8KVV_1 LR-High | 20.5 | 20.5 | 20.4 | 0.1 | %vol |
| SP9KVV_1 LR-Mid | 4.6 | 4.6 | 4.6 | 0.0 | %vol |
| SP10KVV_1 H-High | 16.2 | 16.3 | 15.9 | 0.1 | %vol |
| SP11KVV_1 H-Mid | 4.6 | 4.6 | 4.6 | 0.0 | %vol |
| SP12KVV_1 FF-High | 8.3 | 8.4 | 8.3 | 0.0 | %vol |
| SP13KVV_1 FF-Mid | 8.1 | 8.2 | 8.0 | 0.1 | %vol |
| SP14KVV_1 AT-High | 7.0 | 7.0 | 6.9 | 0.1 | %vol |
| SP15KVV_1 AT-Mid | 7.2 | 7.2 | 7.1 | 0.1 | %vol |
| SP16KVV_2 BM-High | 0.0 | 0.0 | 0.0 | 0.0 | %vol |
| SP17KVV_1 BM-Mid | 0.1 | 0.1 | 0.1 | 0.0 | %vol |
| SP18KVV_1 BM-Low | 0.1 | 0.1 | 0.1 | 0.0 | %vol |
| SP19KVV_1 NWall-Cav | 0.1 | 0.6 | 0.1 | 0.1 | %vol |
| SP20KVV_1 STUD-Cav | 3.3 | 3.5 | 3.3 | 0.0 | %vol |
| SP21KVV_1 FF-Void | 63.8 | 63.9 | 63.8 | 0.1 | %vol |
| SP22KVV_1 SF-Void | 2.0 | 2.2 | 2.0 | 0.1 | %vol |
| SP23KVV_1 ROOF-Void | 3.4 | 3.7 | 3.1 | 0.3 | %vol |
| RELEASEPRESSURE | 0.0900 | 0.0910 | 0.0890 | 0.0003 | barg |
| LOWFLOWMETER | 1.9427 | 1.9484 | 1.9300 | 0.0010 | g/s |
| OUTLET TEMP | 7.7 | 7.7 | 7.6 | 0.1 | degC |
| Volume Flow Rate | 1311.2 | 1312.9 | 1308.8 | 0.9 | SLPM |
| Energy Flow Rate | 232.9 | 233.2 | 232.5 | 0.2 | kW |
| External Wind Speed | 2.5 | | | | m/s |
| External Wind Direction | 342.9 | | | | bearing |



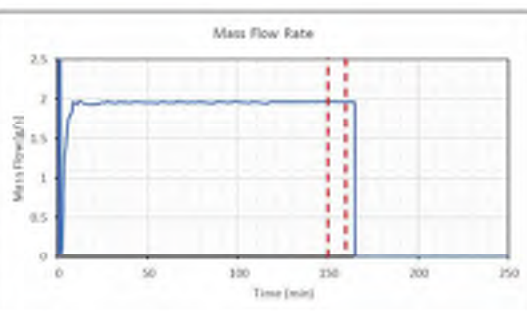
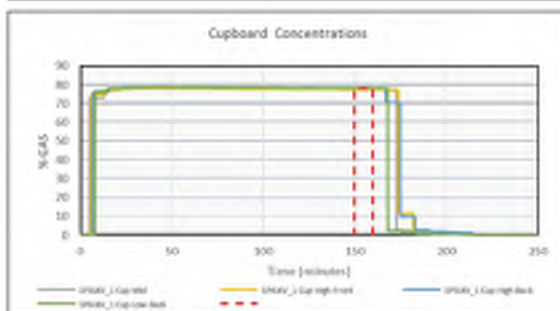
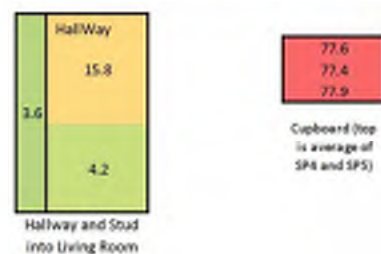
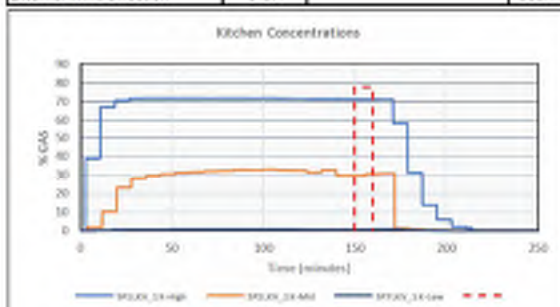
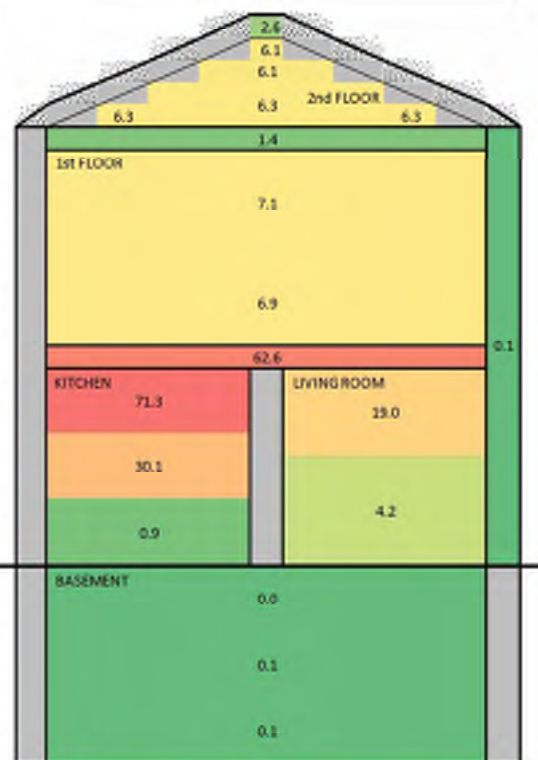
L3-088 RESULT

Hy4Heat WP7 Test Result

| | |
|--|----------------|
| MTP ID: L3-088 | |
| Hole Size: 15 mm | |
| Location: Boiler Cupboard, kitchen door closed | |
| Gas: Hydrogen | |
| Date: 27/11/2019 | Time: 20:00:00 |
| Averaging Period Start: 150 min | End: 160 min |

Notes:

| Sensor | Average | Max | Min | STDEV | Units |
|-------------------------|---------|--------|--------|--------|---------|
| SP1KVV_1 K-High | 71.3 | 71.4 | 71.3 | 0.0 | %vol |
| SP2KVV_1 K-Mid | 30.1 | 30.7 | 29.8 | 0.4 | %vol |
| SP3KVV_1 Cup-Mid | 77.4 | 77.4 | 77.4 | 0.0 | %vol |
| SP4KVV_1 Cup-High-Front | 77.4 | 77.5 | 77.4 | 0.0 | %vol |
| SP5KVV_1 Cup-High-Back | 77.7 | 77.8 | 77.7 | 0.0 | %vol |
| SP6KVV_1 Cup-Low-Back | 77.9 | 77.9 | 77.8 | 0.0 | %vol |
| SP7KVV_1 K-Low | 0.9 | 0.9 | 0.9 | 0.0 | %vol |
| SP8KVV_1 LR-High | 19.0 | 19.0 | 19.0 | 0.0 | %vol |
| SP9KVV_1 LR-Mid | 4.2 | 4.2 | 4.1 | 0.0 | %vol |
| SP10KVV_1 H-High | 15.8 | 16.0 | 15.7 | 0.1 | %vol |
| SP11KVV_1 H-Mid | 4.2 | 4.2 | 4.2 | 0.0 | %vol |
| SP12KVV_1 FF-High | 7.1 | 7.2 | 7.1 | 0.0 | %vol |
| SP13KVV_1 FF-Mid | 6.9 | 7.0 | 6.9 | 0.0 | %vol |
| SP14KVV_1 AT-High | 6.1 | 6.1 | 6.1 | 0.0 | %vol |
| SP15KVV_1 AT-Mid | 6.3 | 6.3 | 6.3 | 0.0 | %vol |
| SP16KVV_2 BM-High | 0.0 | 0.0 | 0.0 | 0.0 | %vol |
| SP17KVV_1 BM-Mid | 0.1 | 0.1 | 0.1 | 0.0 | %vol |
| SP18KVV_1 BM-Low | 0.1 | 0.1 | 0.1 | 0.0 | %vol |
| SP19KVV_1 NWALL-Cav | 0.1 | 0.1 | 0.1 | 0.0 | %vol |
| SP20KVV_1 STUD-Cav | 3.6 | 3.6 | 3.5 | 0.0 | %vol |
| SP21KVV_1 FF-Void | 62.6 | 62.9 | 62.6 | 0.0 | %vol |
| SP22KVV_1 SF-Void | 1.4 | 1.4 | 1.4 | 0.0 | %vol |
| SP23KVV_1 ROOF-Void | 2.6 | 2.6 | 2.6 | 0.0 | %vol |
| RELEASEPRESSURE | 0.0140 | 0.0144 | 0.0137 | 0.0002 | barg |
| LOWFLOWMETER | 1.9636 | 1.9667 | 1.9600 | 0.0019 | g/s |
| OUTLET TEMP | 8.0 | 8.1 | 7.9 | 0.1 | degC |
| Volume Flow Rate | 1323.9 | 1327.4 | 1322.9 | 1.2 | SLPM |
| Energy Flow Rate | 235.2 | 235.8 | 235.0 | 0.2 | kW |
| External Wind Speed | 3.8 | | | | m/s |
| External Wind Direction | 343.4 | | | | bearing |



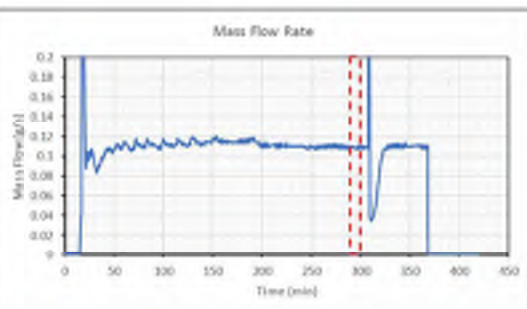
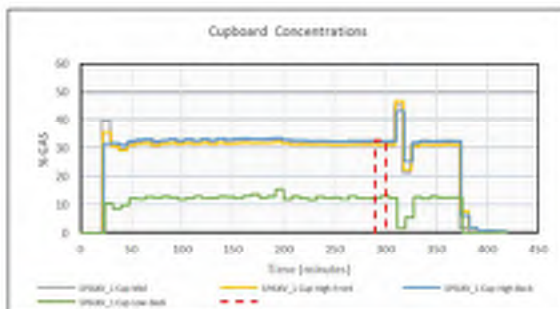
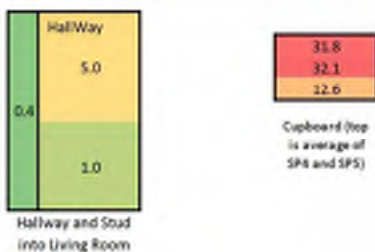
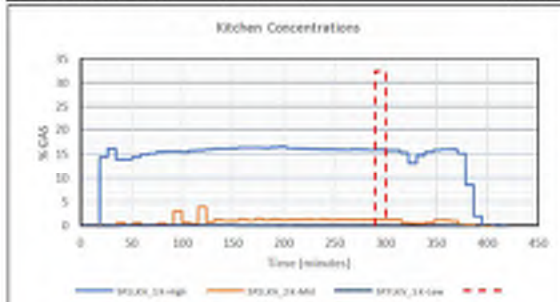
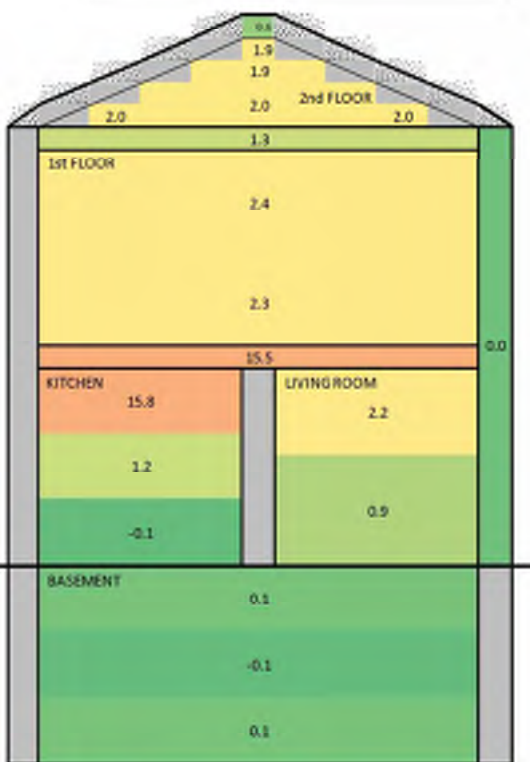
L3-089 RESULT

Hy4Heat WP7 Test Result

| | |
|--|----------------|
| MTP ID: L3-089 | |
| Hole Size: 5 mm | |
| Location: Boiler Cupboard, kitchen door open | |
| Gas: Hydrogen | |
| Date: 03/11/2019 | Time: 09:00:00 |
| Averaging Period Start: 290 min | End: 300 min |

Notes:

| Sensor | Average | Max | Min | STDEV | Units |
|-------------------------|-----------|--------|--------|---------|---------|
| SP1KLV_1 K-High | 15.8 | 15.8 | 15.7 | 0.0 | %vol |
| SP2KLV_2 K-Mid | 1.2 | 1.2 | 1.2 | 0.0 | %vol |
| SP3KLV_1 Cup-Mid | 32.1 | 32.3 | 32.1 | 0.1 | %vol |
| SP4KLV_1 Cup-High-Front | 31.1 | 31.2 | 31.0 | 0.1 | %vol |
| SP5KLV_1 Cup-High-Back | 32.6 | 32.7 | 32.5 | 0.1 | %vol |
| SP6KLV_1 Cup-Low-Back | 12.6 | 13.0 | 12.4 | 0.3 | %vol |
| SP7KLV_1 K-Low | -0.1 | -0.1 | -0.1 | 0.0 | %vol |
| SP8KLV_1 LR-High | 2.2 | 2.2 | 2.2 | 0.0 | %vol |
| SP9KLV_1 LR-Mid | 0.9 | 0.9 | 0.9 | 0.0 | %vol |
| SP10KLV_1 H-High | 5.0 | 5.0 | 4.9 | 0.0 | %vol |
| SP11KLV_2 H-Mid | 1.0 | 1.0 | 1.0 | 0.0 | %vol |
| SP12KLV_2 FF-High | 2.4 | 2.5 | 2.4 | 0.0 | %vol |
| SP13KLV_2 FF-Mid | 2.3 | 2.3 | 2.3 | 0.0 | %vol |
| SP14KLV_2 AT-High | 1.9 | 1.9 | 1.9 | 0.0 | %vol |
| SP15KLV_2 AT-Mid | 2.0 | 2.0 | 2.0 | 0.0 | %vol |
| SP16KLV_2 BM-High | 0.1 | 0.1 | 0.1 | 0.0 | %vol |
| SP17KLV_2 BM-Mid | -0.1 | -0.1 | -0.1 | 0.0 | %vol |
| SP18KLV_3 BM-Low | 0.1 | 0.1 | 0.1 | 0.0 | %vol |
| SP19KLV_3 NWALL-Cav | 0.0 | 0.1 | 0.0 | 0.1 | %vol |
| SP20KLV_2 STUD-Cav | 0.4 | 0.4 | 0.4 | 0.0 | %vol |
| SP21KLV_1 FF-Void | 15.5 | 15.5 | 15.4 | 0.1 | %vol |
| SP22KLV_2 SF-Void | 1.3 | 1.4 | 1.1 | 0.1 | %vol |
| SP23KLV_2 ROOF-Void | 0.6 | 0.6 | 0.4 | 0.1 | %vol |
| RELEASEPRESSURE | 0.0004 | 0.0027 | 0.0019 | 0.0002 | barg |
| LOWFLOWMETER | 0.1087 | 0.1106 | 0.1070 | 0.0011 | g/s |
| | 0 #DIV/0! | 0.0000 | 0.0000 | #DIV/0! | g/s |
| OUTLET TEMP | 10.4 | 10.5 | 10.4 | 0.0 | degC |
| Volume Flow Rate | 73.3 | 74.7 | 72.2 | 0.7 | SLPM |
| Energy Flow Rate | 13.0 | 13.3 | 12.8 | 0.1 | kW |
| External Wind Speed | 1.8 | | | | m/s |
| External Wind Direction | 6.9 | | | | bearing |



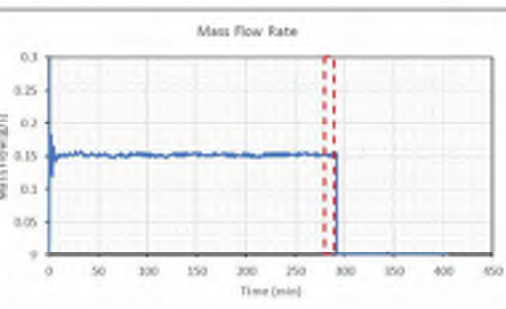
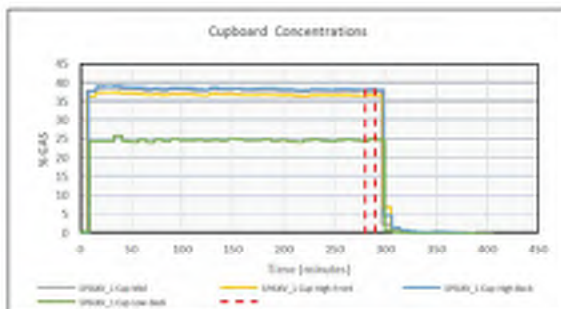
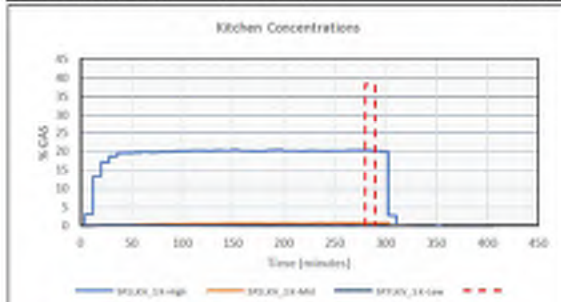
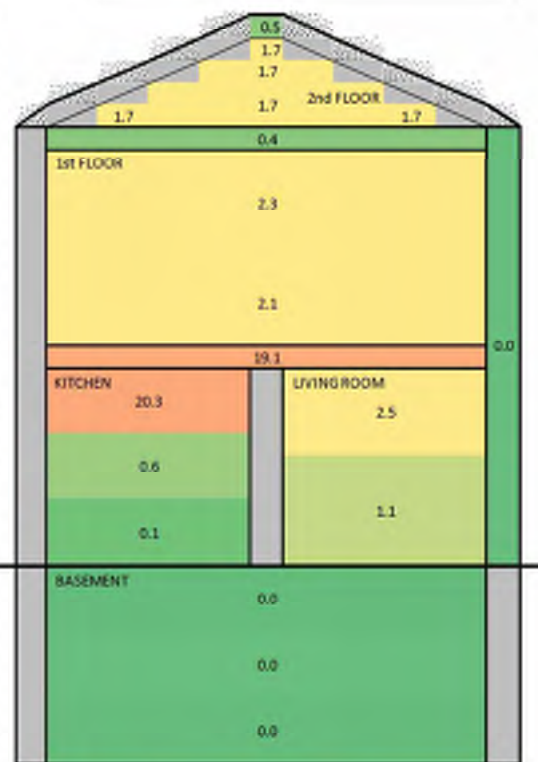
L3-090 RESULT

Hy4Heat WP7 Test Result

| | |
|--|----------------|
| MTP ID: L3-090 | |
| Hole Size: 5.1 mm | |
| Location: Boiler Cupboard, kitchen door open | |
| Gas: Hydrogen | |
| Date: 04/11/2019 | Time: 09:30:00 |
| Averaging Period Start: 280 min | End: 290 min |

Notes: 0.2% offset removed from SP17 to SP23

| Sensor | Average | Max | Min | STDEV | Units |
|-------------------------|---------|--------|--------|--------|---------|
| SP1KLV_1 K-High | 20.3 | 20.3 | 20.2 | 0.1 | %vol |
| SP2LKV_1 K-Mid | 0.6 | 0.6 | 0.6 | 0.0 | %vol |
| SP3LKV_1 Cup-Mid | 37.7 | 37.7 | 37.6 | 0.1 | %vol |
| SP4LKV_1 Cup-High-Front | 36.6 | 36.6 | 36.4 | 0.1 | %vol |
| SP5LKV_1 Cup-High-Back | 38.2 | 38.3 | 38.1 | 0.1 | %vol |
| SP6LKV_1 Cup-Low-Back | 24.7 | 25.0 | 24.2 | 0.3 | %vol |
| SP7LKV_1 K-Low | 0.1 | 0.1 | 0.1 | 0.0 | %vol |
| SP8LKV_1 LR-High | 2.5 | 2.5 | 2.5 | 0.0 | %vol |
| SP9LKV_1 LR-Mid | 1.1 | 1.1 | 1.1 | 0.0 | %vol |
| SP10LKV_1 H-High | 5.8 | 5.8 | 5.8 | 0.0 | %vol |
| SP11LKV_1 H-Mid | 1.1 | 1.1 | 1.1 | 0.0 | %vol |
| SP12LKV_1 FF-High | 2.3 | 2.3 | 2.3 | 0.0 | %vol |
| SP13LKV_1 FF-Mid | 2.1 | 2.1 | 2.1 | 0.0 | %vol |
| SP14LKV_1 AT-High | 1.7 | 1.7 | 1.7 | 0.0 | %vol |
| SP15LKV_1 AT-Mid | 1.7 | 1.7 | 1.7 | 0.0 | %vol |
| SP16LKV_1 BM-High | 0.0 | 0.0 | 0.0 | 0.0 | %vol |
| SP17LKV_1 BM-Mid | 0.0 | 0.0 | 0.0 | 0.0 | %vol |
| SP18LKV_1 BM-Low | 0.0 | 0.0 | 0.0 | 0.0 | %vol |
| SP19LKV_1 NWALL-Cav | 0.0 | 0.0 | 0.0 | 0.0 | %vol |
| SP20LKV_1 STUD-Cav | 0.7 | 0.8 | 0.7 | 0.0 | %vol |
| SP21LKV_1 FF-Void | 19.1 | 19.1 | 19.1 | 0.0 | %vol |
| SP22LKV_1 SF-Void | 0.4 | 0.4 | 0.4 | 0.0 | %vol |
| SP23LKV_1 ROOF-Void | 0.5 | 0.5 | 0.4 | 0.0 | %vol |
| RELEASEPRESSURE | 0.0048 | 0.0052 | 0.0044 | 0.0002 | barg |
| LOWFLOWMETER | 0.1536 | 0.1547 | 0.1485 | 0.0016 | g/s |
| OUTLET TEMP | 9.1042 | 9.2074 | 8.9633 | 0.0464 | degC |
| Volume Flow Rate | 102.3 | 104.4 | 100.3 | 1.0 | SLPM |
| Energy Flow Rate | 18.2 | 18.5 | 17.8 | 0.2 | kW |
| External Wind Speed | 1.4 | | | | m/s |
| External Wind Direction | 45.0 | | | | bearing |



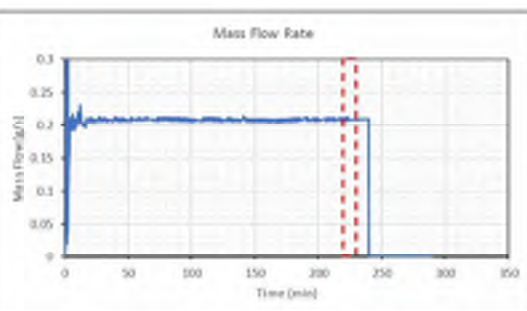
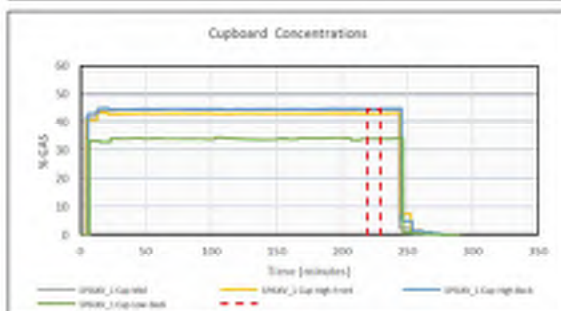
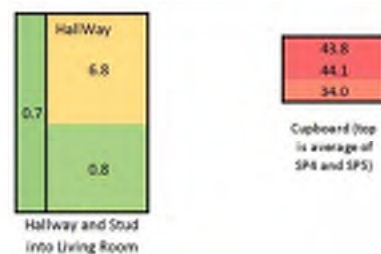
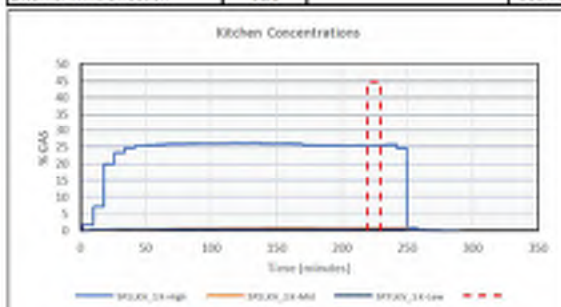
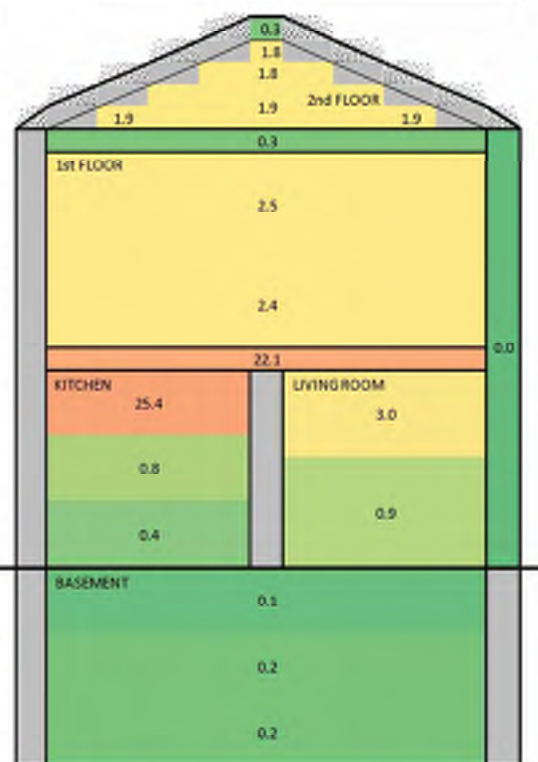
L3-091 RESULT

Hy4Heat WP7 Test Result

| | |
|---|----------------|
| MTP ID: L3-091 | |
| Hole Size: 5 mm | |
| Location: Kitchen boiler cupboard, doors open | |
| Gas: Hydrogen | |
| Date: 04/11/2019 | Time: 16:30:00 |
| Averaging Period Start: 220 min | End: 230 min |

Notes:

| Sensor | Average | Max | Min | STDEV | Units |
|-------------------------|---------|--------|--------|--------|---------|
| SP1KVV_1 K-High | 25.4 | 25.5 | 25.4 | 0.1 | %vol |
| SP2KVV_1 K-Mid | 0.8 | 0.9 | 0.8 | 0.0 | %vol |
| SP3KVV_1 Cup-Mid | 44.1 | 44.2 | 44.1 | 0.1 | %vol |
| SP4KVV_1 Cup-High-Front | 42.9 | 43.0 | 42.9 | 0.0 | %vol |
| SP5KVV_1 Cup-High-Back | 44.7 | 44.8 | 44.7 | 0.0 | %vol |
| SP6KVV_1 Cup-Low-Back | 34.0 | 34.0 | 34.0 | 0.0 | %vol |
| SP7KVV_1 K-Low | 0.4 | 0.4 | 0.4 | 0.0 | %vol |
| SP8KVV_1 LR-High | 3.0 | 3.0 | 3.0 | 0.0 | %vol |
| SP9KVV_1 LR-Mid | 0.9 | 1.0 | 0.9 | 0.0 | %vol |
| SP10KVV_1 H-High | 6.8 | 6.9 | 6.8 | 0.0 | %vol |
| SP11KVV_2 H-Mid | 0.8 | 0.8 | 0.8 | 0.0 | %vol |
| SP12KVV_2 FF-High | 2.5 | 2.6 | 2.5 | 0.0 | %vol |
| SP13KVV_2 FF-Mid | 2.4 | 2.4 | 2.4 | 0.0 | %vol |
| SP14KVV_2 AT-High | 1.8 | 1.8 | 1.8 | 0.0 | %vol |
| SP15KVV_1 AT-Mid | 1.9 | 1.9 | 1.9 | 0.0 | %vol |
| SP16KVV_2 BM-High | 0.1 | 0.1 | 0.1 | 0.0 | %vol |
| SP17KVV_2 BM-Mid | 0.2 | 0.2 | 0.2 | 0.0 | %vol |
| SP18KVV_2 BM-Low | 0.2 | 0.2 | 0.2 | 0.0 | %vol |
| SP19KVV_1 NWALL-Cav | 0.0 | 0.0 | -0.1 | 0.0 | %vol |
| SP20KVV_2 STUD-Cav | 0.7 | 0.7 | 0.7 | 0.0 | %vol |
| SP21KVV_1 FF-Void | 22.1 | 22.4 | 22.1 | 0.1 | %vol |
| SP22KVV_1 SF-Void | 0.3 | 0.3 | 0.2 | 0.0 | %vol |
| SP23KVV_2 ROOF-Void | 0.3 | 0.3 | 0.3 | 0.0 | %vol |
| RELEASEPRESSURE | 0.0090 | 0.0093 | 0.0085 | 0.0002 | barg |
| LOWFLOWMETER | 0.2086 | 0.2121 | 0.2060 | 0.0012 | g/s |
| OUTLET TEMP | 8.3 | 8.4 | 8.2 | 0.1 | degC |
| Volume Flow Rate | 140.8 | 143.2 | 139.0 | 0.8 | SLPM |
| Energy Flow Rate | 25.0 | 25.4 | 24.7 | 0.1 | kW |
| External Wind Speed | 5.5 | | | | m/s |
| External Wind Direction | 31.1 | | | | bearing |



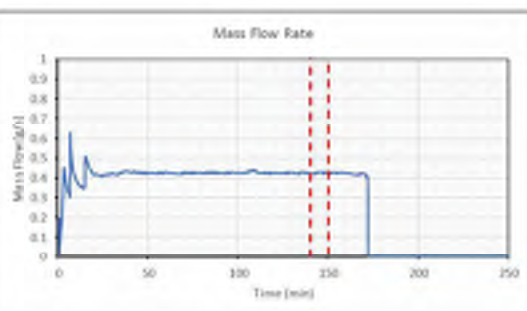
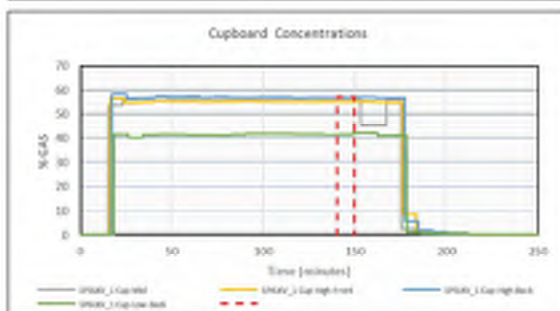
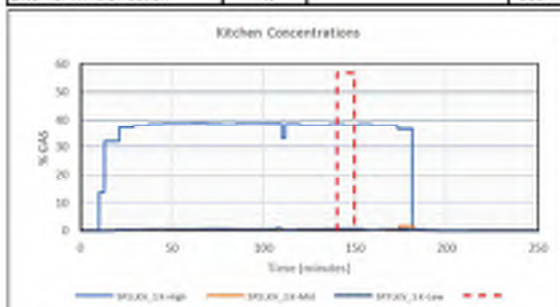
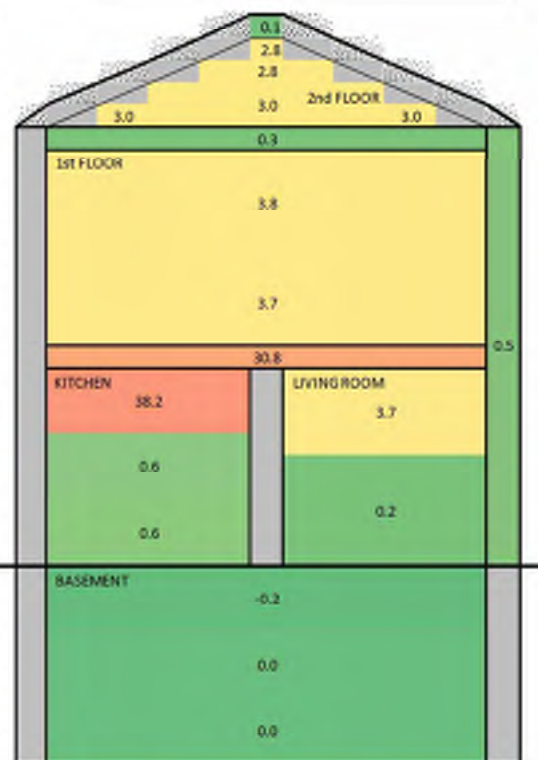
L3-092 RESULT

Hy4Heat WP7 Test Result

| | |
|--|----------------|
| MTP ID: L3-092 | |
| Hole Size: 10mm | |
| Location: Boiler Cupboard, kitchen door open | |
| Gas: Hydrogen | |
| Date: 04/11/2019 | Time: 22:00:00 |
| Averaging Period Start: 140 min | End: 150 min |

Notes:

| Sensor | Average | Max | Min | STDEV | Units |
|-------------------------|---------|--------|--------|--------|---------|
| SP1KLV_1 K-High | 38.2 | 38.4 | 38.0 | 0.2 | %vol |
| SP2KLV_1 K-Mid | 0.6 | 0.6 | 0.6 | 0.0 | %vol |
| SP3KLV_1 Cup-Mid | 56.6 | 56.6 | 56.6 | 0.0 | %vol |
| SP4KLV_1 Cup-High-Front | 55.2 | 55.3 | 55.2 | 0.0 | %vol |
| SP5KLV_1 Cup-High-Back | 57.0 | 57.1 | 57.0 | 0.1 | %vol |
| SP6KLV_1 Cup-Low-Back | 41.5 | 42.2 | 41.3 | 0.2 | %vol |
| SP7KLV_1 K-Low | 0.6 | 0.6 | 0.6 | 0.0 | %vol |
| SP8KLV_1 LR-High | 3.7 | 3.7 | 3.7 | 0.0 | %vol |
| SP9KLV_1 LR-Mid | 0.2 | 0.2 | 0.2 | 0.0 | %vol |
| SP10KLV_1 H-High | 11.8 | 12.2 | 11.4 | 0.4 | %vol |
| SP11KLV_2 H-Mid | 0.1 | 0.3 | 0.0 | 0.1 | %vol |
| SP12KLV_2 FF-High | 3.8 | 3.9 | 3.8 | 0.0 | %vol |
| SP13KLV_2 FF-Mid | 3.7 | 3.7 | 3.6 | 0.0 | %vol |
| SP14KLV_2 AT-High | 2.8 | 2.9 | 2.8 | 0.0 | %vol |
| SP15KLV_2 AT-Mid | 3.0 | 3.0 | 2.9 | 0.0 | %vol |
| SP16KLV_2 BM-High | -0.2 | -0.2 | -0.2 | 0.0 | %vol |
| SP17KLV_1 BM-Mid | 0.0 | 0.1 | 0.0 | 0.0 | %vol |
| SP18KLV_1 BM-Low | 0.0 | 0.0 | 0.0 | 0.0 | %vol |
| SP19KLV_2 NWALL-Cav | 0.5 | 0.5 | 0.5 | 0.0 | %vol |
| SP20KLV_2 STUD-Cav | 0.6 | 0.6 | 0.6 | 0.0 | %vol |
| SP21KLV_1 FF-Void | 30.8 | 30.9 | 30.7 | 0.0 | %vol |
| SP22KLV_1 SF-Void | 0.3 | 0.4 | 0.3 | 0.0 | %vol |
| SP23KLV_1 ROOF-Void | 0.1 | 0.1 | 0.1 | 0.0 | %vol |
| RELEASEPRESSURE | 0.0049 | 0.0052 | 0.0044 | 0.0002 | barg |
| LOWFLOWMETER | 0.4246 | 0.4291 | 0.4187 | 0.0039 | g/s |
| OUTLET TEMP | 7.2 | 7.4 | 7.1 | 0.1 | degC |
| Volume Flow Rate | 286.6 | 289.6 | 282.6 | 2.6 | SLPM |
| Energy Flow Rate | 50.9 | 51.5 | 50.2 | 0.5 | kW |
| External Wind Speed | 4.1 | | | | m/s |
| External Wind Direction | 7.0 | | | | bearing |



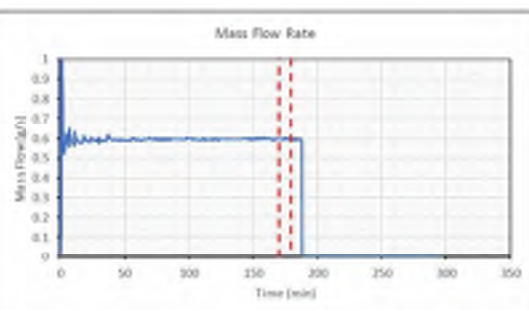
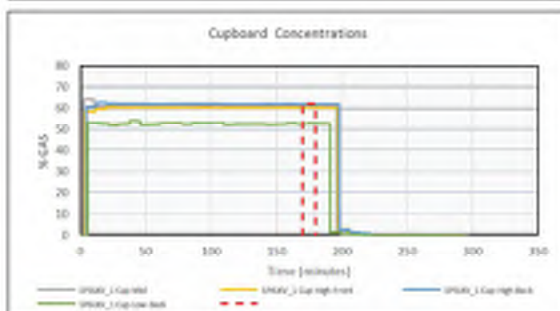
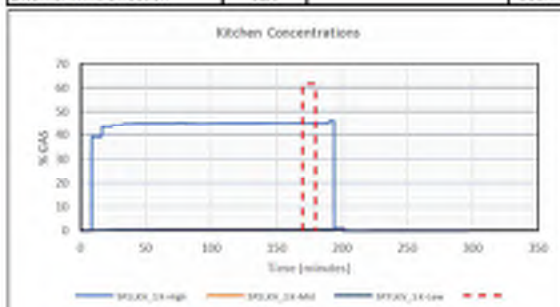
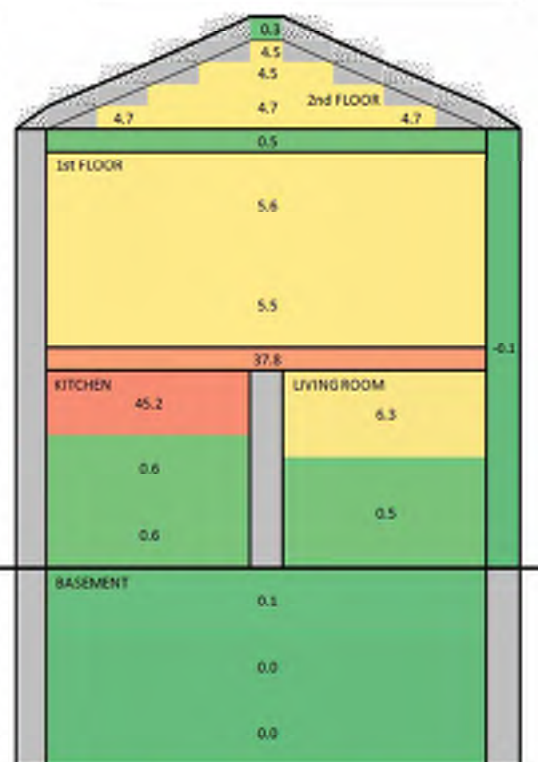
L3-093 RESULT

Hy4Heat WP7 Test Result

| | |
|--|----------------|
| MTP ID: L3-093 | |
| Hole Size: 10mm | |
| Location: Boiler Cupboard, kitchen door open | |
| Gas: Hydrogen | |
| Date: 05/11/2019 | Time: 02:00:00 |
| Averaging Period Start: 170 min | End: 180 min |

Notes:

| Sensor | Average | Max | Min | STDEV | Units |
|-------------------------|---------|--------|--------|--------|---------|
| SP1KVV_1 K-High | 45.2 | 45.2 | 45.1 | 0.0 | %vol |
| SP2KVV_1 K-Mid | 0.6 | 0.7 | 0.6 | 0.0 | %vol |
| SP3KVV_1 Cup-Mid | 61.3 | 61.4 | 61.3 | 0.0 | %vol |
| SP4KVV_1 Cup-High-Front | 60.0 | 60.1 | 60.0 | 0.0 | %vol |
| SP5KVV_1 Cup-High-Back | 61.9 | 61.9 | 61.8 | 0.0 | %vol |
| SP6KVV_1 Cup-Low-Back | 52.7 | 52.8 | 52.4 | 0.2 | %vol |
| SP7KVV_1 K-Low | 0.6 | 0.6 | 0.6 | 0.0 | %vol |
| SP8KVV_1 LR-High | 6.3 | 6.3 | 6.3 | 0.0 | %vol |
| SP9KVV_1 LR-Mid | 0.5 | 0.5 | 0.5 | 0.0 | %vol |
| SP10KVV_1 H-High | 16.6 | 16.8 | 15.8 | 0.4 | %vol |
| SP11KVV_1 H-Mid | 0.5 | 0.5 | 0.5 | 0.0 | %vol |
| SP12KVV_1 FF-High | 5.6 | 5.7 | 5.6 | 0.0 | %vol |
| SP13KVV_1 FF-Mid | 5.5 | 5.5 | 5.4 | 0.0 | %vol |
| SP14KVV_1 AT-High | 4.5 | 4.5 | 4.5 | 0.0 | %vol |
| SP15KVV_1 AT-Mid | 4.7 | 4.7 | 4.7 | 0.0 | %vol |
| SP16KVV_1 BM-High | 0.1 | 0.1 | 0.1 | 0.0 | %vol |
| SP17KVV_1 BM-Mid | 0.0 | 0.0 | 0.0 | 0.0 | %vol |
| SP18KVV_1 BM-Low | 0.0 | 0.0 | 0.0 | 0.0 | %vol |
| SP19KVV_1 NWALL-Cav | -0.1 | -0.1 | -0.1 | 0.0 | %vol |
| SP20KVV_1 STUD-Cav | 0.2 | 0.2 | 0.2 | 0.0 | %vol |
| SP21KVV_1 FF-Void | 37.8 | 37.8 | 37.8 | 0.0 | %vol |
| SP22KVV_1 SF-Void | 0.5 | 0.5 | 0.5 | 0.0 | %vol |
| SP23KVV_1 ROOF-Void | 0.3 | 0.3 | 0.3 | 0.0 | %vol |
| RELEASEPRESSURE | 0.0094 | 0.0099 | 0.0088 | 0.0002 | barg |
| LOWFLOWMETER | 0.5958 | 0.6021 | 0.5917 | 0.0020 | g/s |
| OUTLET TEMP | 7.5 | 7.6 | 7.4 | 0.1 | degC |
| Volume Flow Rate | 402.1 | 406.4 | 399.4 | 2.0 | SLPM |
| Energy Flow Rate | 71.4 | 72.2 | 70.9 | 0.3 | kW |
| External Wind Speed | 4.8 | | | | m/s |
| External Wind Direction | 52.0 | | | | bearing |



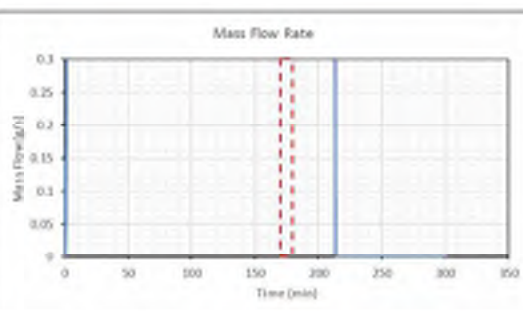
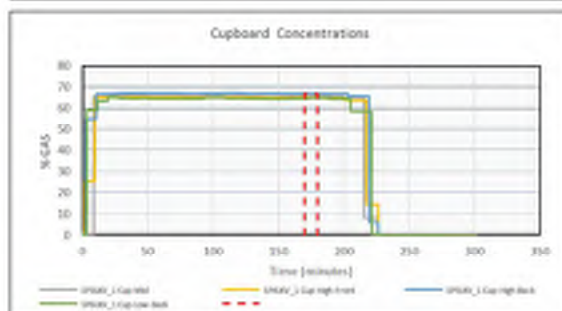
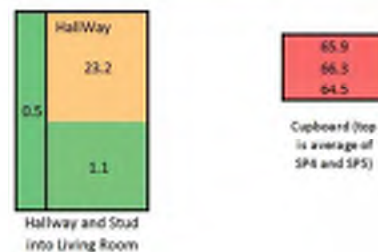
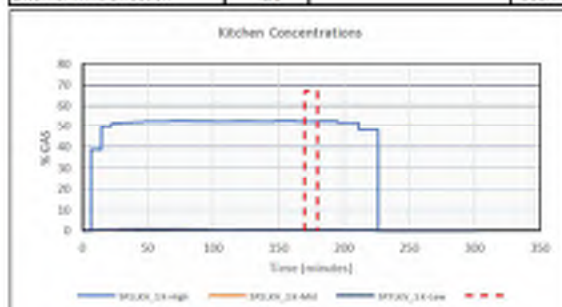
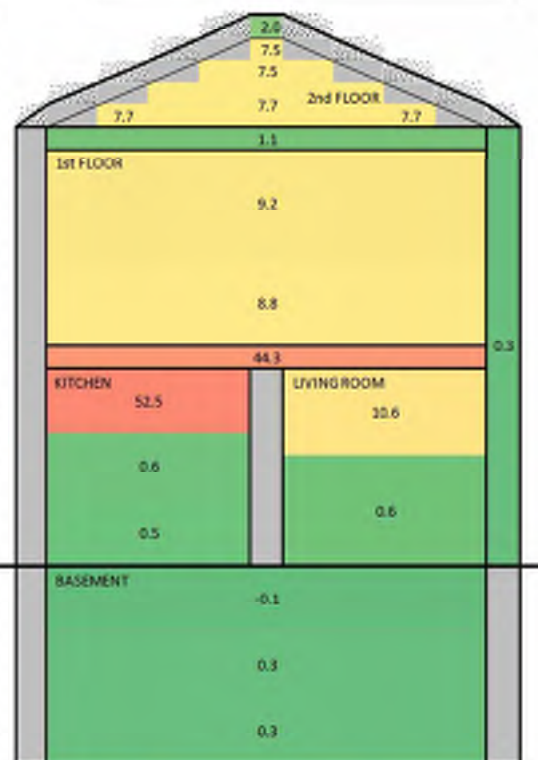
L3-094 RESULT

Hy4Heat WP7 Test Result

| | |
|--|----------------|
| MTP ID: L3-094 | |
| Hole Size: 10 mm | |
| Location: Boiler Cupboard, kitchen door open | |
| Gas: Hydrogen | |
| Date: 05/11/2019 | Time: 06:00:00 |
| Averaging Period Start: 170 min | End: 180 min |

Notes:

| Sensor | Average | Max | Min | STDEV | Units |
|-------------------------|---------|--------|--------|--------|---------|
| SP1KVV_1 K-High | 52.5 | 52.6 | 52.4 | 0.0 | %vol |
| SP2KVV_1 K-Mid | 0.6 | 0.6 | 0.6 | 0.0 | %vol |
| SP3KVV_1 Cup-Mid | 66.3 | 66.3 | 66.3 | 0.0 | %vol |
| SP4KVV_1 Cup-High-Front | 65.0 | 65.0 | 65.0 | 0.0 | %vol |
| SP5KVV_1 Cup-High-Back | 66.8 | 66.8 | 66.7 | 0.0 | %vol |
| SP6KVV_1 Cup-Low-Back | 64.5 | 64.6 | 64.2 | 0.2 | %vol |
| SP7KVV_1 K-Low | 0.5 | 0.5 | 0.5 | 0.0 | %vol |
| SP8KVV_1 LR-High | 10.6 | 10.7 | 10.5 | 0.1 | %vol |
| SP9KVV_1 LR-Mid | 0.6 | 0.6 | 0.6 | 0.0 | %vol |
| SP10KVV_1 H-High | 23.2 | 23.2 | 23.2 | 0.0 | %vol |
| SP11KVV_2 H-Mid | 1.1 | 1.1 | 1.1 | 0.0 | %vol |
| SP12KVV_1 FF-High | 9.2 | 9.2 | 9.2 | 0.0 | %vol |
| SP13KVV_1 FF-Mid | 8.8 | 8.9 | 8.8 | 0.0 | %vol |
| SP14KVV_1 AT-High | 7.5 | 7.5 | 7.4 | 0.0 | %vol |
| SP15KVV_1 AT-Mid | 7.7 | 7.7 | 7.7 | 0.0 | %vol |
| SP16KVV_2 BM-High | -0.1 | 0.0 | -0.1 | 0.0 | %vol |
| SP17KVV_2 BM-Mid | 0.3 | 0.3 | 0.3 | 0.0 | %vol |
| SP18KVV_2 BM-Low | 0.3 | 0.3 | 0.3 | 0.0 | %vol |
| SP19KVV_2 NWALL-Cav | 0.3 | 0.3 | 0.3 | 0.0 | %vol |
| SP20KVV_2 STUD-Cav | 0.5 | 0.5 | 0.5 | 0.0 | %vol |
| SP21KVV_1 FF-Void | 44.3 | 44.3 | 44.3 | 0.0 | %vol |
| SP22KVV_1 SF-Void | 1.1 | 1.1 | 1.0 | 0.0 | %vol |
| SP23KVV_1 ROOF-Void | 2.0 | 2.0 | 2.0 | 0.0 | %vol |
| RELEASEPRESSURE | 0.0183 | 0.0187 | 0.0180 | 0.0002 | barg |
| LOWFLOWMETER | 0.8398 | 0.8442 | 0.8368 | 0.0018 | g/s |
| OUTLET TEMP | 7.8 | 7.8 | 7.6 | 0.1 | degC |
| Volume Flow Rate | 566.8 | 566.7 | 564.8 | 1.2 | SLPM |
| Energy Flow Rate | 100.7 | 101.2 | 100.3 | 0.2 | kW |
| External Wind Speed | 2.3 | | | | m/s |
| External Wind Direction | 41.1 | | | | bearing |



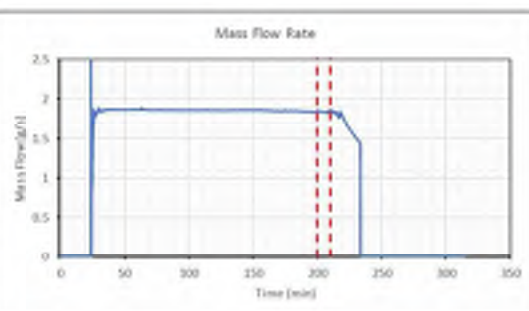
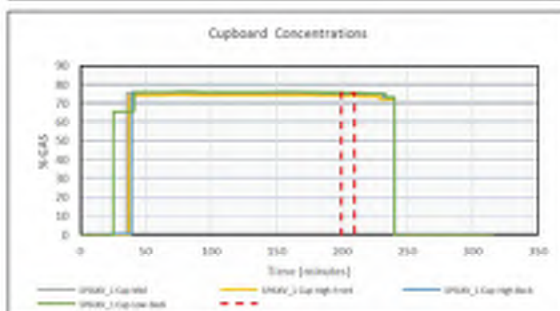
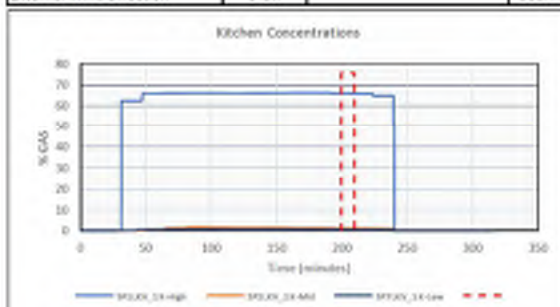
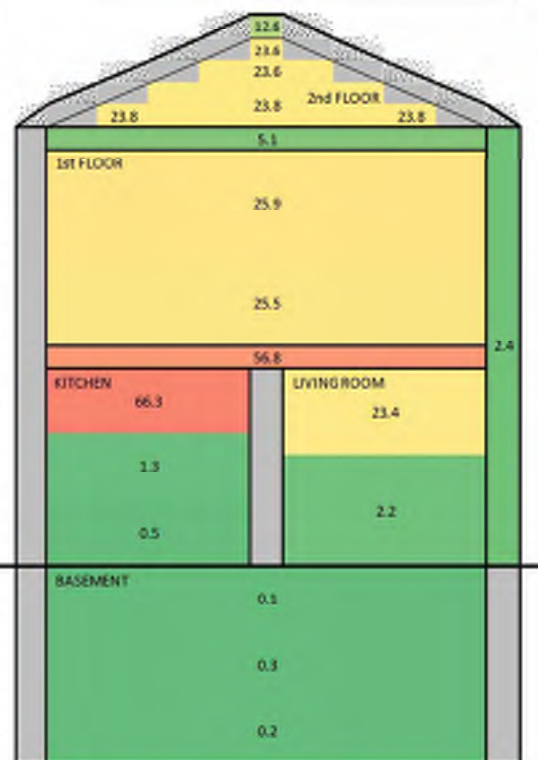
L3-095 RESULT

Hy4Heat WP7 Test Result

| | |
|--|----------------|
| MTP ID: L3-095 | |
| Hole Size: 10mm | |
| Location: Boiler Cupboard, kitchen door open | |
| Gas: Hydrogen | |
| Date: 05/11/2019 | Time: 13:00:00 |
| Averaging Period Start: 200 min | End: 210 min |

Notes:

| Sensor | Average | Max | Min | STDEV | Units |
|-------------------------|---------|--------|--------|---------|---------|
| SP1KVV_1 K-High | 66.3 | 66.3 | 66.1 | 0.1 | %vol |
| SP2KVV_1 K-Mid | 1.3 | 1.3 | 1.3 | 0.0 | %vol |
| SP3KVV_1 Cup-Mid | 75.3 | 75.3 | 75.3 | 0.0 | %vol |
| SP4KVV_1 Cup-High-Front | 74.2 | 74.2 | 74.2 | 0.0 | %vol |
| SP5KVV_1 Cup-High-Back | 75.4 | 75.4 | 75.4 | 0.0 | %vol |
| SP6KVV_1 Cup-Low-Back | 75.8 | 75.9 | 75.7 | 0.1 | %vol |
| SP7KVV_1 K-Low | 0.5 | 0.5 | 0.5 | 0.0 | %vol |
| SP8KVV_1 LR-High | 23.4 | 23.5 | 23.2 | 0.2 | %vol |
| SP9KVV_1 LR-Mid | 2.2 | 2.2 | 2.0 | 0.1 | %vol |
| SP10KVV_1 H-High | 42.4 | 42.5 | 42.1 | 0.1 | %vol |
| SP11KVV_1 H-Mid | 2.1 | 2.1 | 2.1 | 0.0 | %vol |
| SP12KVV_1 FF-High | 25.9 | 25.9 | 25.9 | 0.0 | %vol |
| SP13KVV_1 FF-Mid | 25.5 | 25.5 | 25.5 | 0.0 | %vol |
| SP14KVV_1 AT-High | 23.6 | 23.7 | 23.1 | 0.2 | %vol |
| SP15KVV_1 AT-Mid | 23.8 | 24.0 | 23.6 | 0.2 | %vol |
| SP16KVV_2 BM-High | 0.1 | 0.2 | 0.1 | 0.0 | %vol |
| SP17KVV_2 BM-Mid | 0.3 | 0.3 | 0.3 | 0.0 | %vol |
| SP18KVV_2 BM-Low | 0.2 | 0.2 | 0.2 | 0.0 | %vol |
| SP19KVV_2 NWALL-Cav | 2.4 | 2.4 | 2.4 | 0.0 | %vol |
| SP20KVV_2 STUD-Cav | 0.8 | 0.8 | 0.8 | 0.0 | %vol |
| SP21KVV_1 FF-Void | 56.8 | 56.8 | 56.8 | 0.0 | %vol |
| SP22KVV_1 SF-Void | 5.1 | 5.3 | 5.1 | 0.1 | %vol |
| SP23KVV_1 ROOF-Void | 12.6 | 14.1 | 11.0 | 1.6 | %vol |
| RELEASEPRESSURE | 0.0880 | 0.0903 | 0.0863 | 0.0010 | bar(g) |
| LOWFLOWMETER | 1.8379 | 1.8567 | 1.8233 | 0.0080 | g/s |
| | #DIV/0! | 0.0000 | 0.0000 | #DIV/0! | g/s |
| OUTLET TEMP | 5.4 | 5.5 | 5.4 | 0.0 | degC |
| Volume Flow Rate | 1240.4 | 1253.1 | 1230.4 | 6.0 | SLPM |
| Energy Flow Rate | 220.4 | 222.6 | 218.6 | 1.1 | kW |
| External Wind Speed | 1.3 | | | | m/s |
| External Wind Direction | 345.7 | | | | bearing |



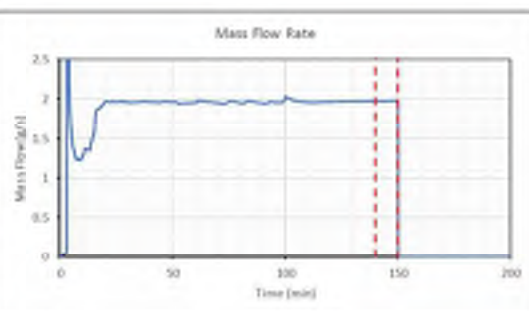
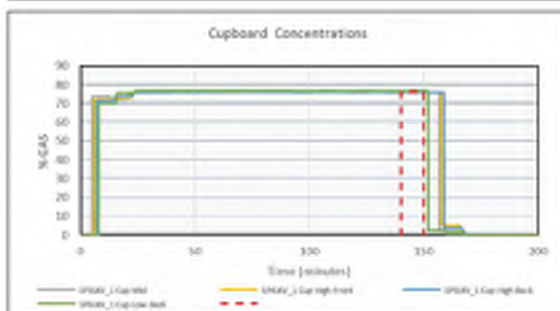
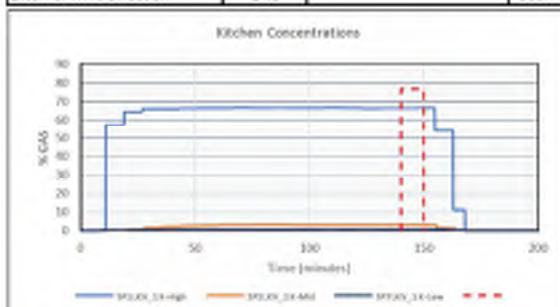
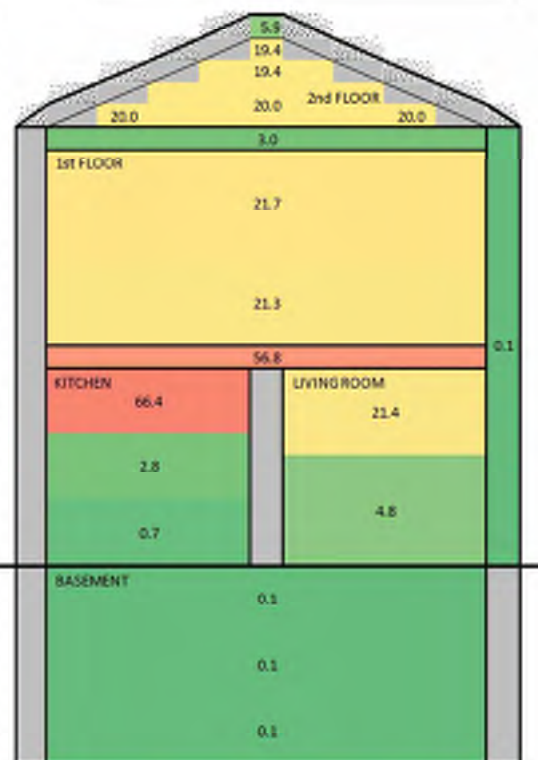
L3-096 RESULT

Hy4Heat WP7 Test Result

| | |
|--|----------------|
| MTP ID: L3-096 | |
| Hole Size: 15 mm | |
| Location: Boiler Cupboard, kitchen door open | |
| Gas: Hydrogen | |
| Date: 28/11/2019 | Time: 01:30:00 |
| Averaging Period Start: 140 min | End: 150 min |

Notes:

| Sensor | Average | Max | Min | STDEV | Units |
|-------------------------|---------|--------|--------|--------|---------|
| SP1KVV_1 K-High | 66.4 | 66.4 | 66.4 | 0.0 | %vol |
| SP2KVV_1 K-Mid | 2.8 | 2.8 | 2.8 | 0.0 | %vol |
| SP3KVV_1 Cup-Mid | 75.5 | 75.6 | 75.5 | 0.0 | %vol |
| SP4KVV_1 Cup-High-Front | 75.8 | 75.8 | 75.8 | 0.0 | %vol |
| SP5KVV_1 Cup-High-Back | 76.2 | 76.2 | 76.2 | 0.0 | %vol |
| SP6KVV_1 Cup-Low-Back | 76.4 | 76.4 | 76.4 | 0.0 | %vol |
| SP7KVV_1 K-Low | 0.7 | 0.7 | 0.6 | 0.0 | %vol |
| SP8KVV_1 LR-High | 21.4 | 21.4 | 21.2 | 0.0 | %vol |
| SP9KVV_1 LR-Mid | 4.8 | 4.8 | 4.8 | 0.0 | %vol |
| SP10KVV_1 H-High | 37.4 | 38.1 | 37.0 | 0.5 | %vol |
| SP11KVV_1 H-Mid | 4.8 | 4.8 | 4.7 | 0.0 | %vol |
| SP12KVV_1 FF-High | 21.7 | 21.7 | 21.7 | 0.0 | %vol |
| SP13KVV_1 FF-Mid | 21.3 | 21.4 | 21.2 | 0.1 | %vol |
| SP14KVV_1 AT-High | 19.4 | 19.4 | 19.3 | 0.1 | %vol |
| SP15KVV_1 AT-Mid | 20.0 | 20.1 | 19.8 | 0.1 | %vol |
| SP16KVV_2 BM-High | 0.1 | 0.1 | 0.1 | 0.0 | %vol |
| SP17KVV_1 BM-Mid | 0.1 | 0.1 | 0.1 | 0.0 | %vol |
| SP18KVV_1 BM-Low | 0.1 | 0.1 | 0.1 | 0.0 | %vol |
| SP19KVV_1 NWall-Cav | 0.1 | 0.1 | 0.0 | 0.1 | %vol |
| SP20KVV_1 Stud-Cav | 1.8 | 1.9 | 1.8 | 0.1 | %vol |
| SP21KVV_1 FF-Void | 56.8 | 56.8 | 56.7 | 0.1 | %vol |
| SP22KVV_1 SF-Void | 3.0 | 3.3 | 3.0 | 0.1 | %vol |
| SP23KVV_1 ROOF-Void | 5.9 | 5.9 | 5.8 | 0.1 | %vol |
| RELEASEPRESSURE | 0.0145 | 0.0144 | 0.0137 | 0.0002 | barg |
| LOWFLOWMETER | 1.9678 | 1.9710 | 1.9643 | 0.0014 | g/s |
| OUTLET TEMP | 8.1 | 8.2 | 8.0 | 0.0 | degC |
| Volume Flow Rate | 1328.1 | 1330.3 | 1325.7 | 1.0 | SLPM |
| Energy Flow Rate | 235.9 | 236.3 | 235.5 | 0.2 | kW |
| External Wind Speed | 3.2 | | | | m/s |
| External Wind Direction | 24.2 | | | | bearing |





APPENDIX B: PHASE 2 RESULTS

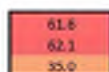
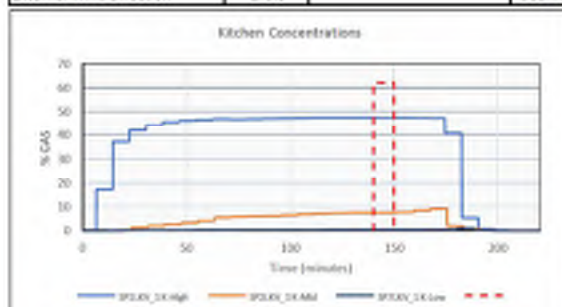
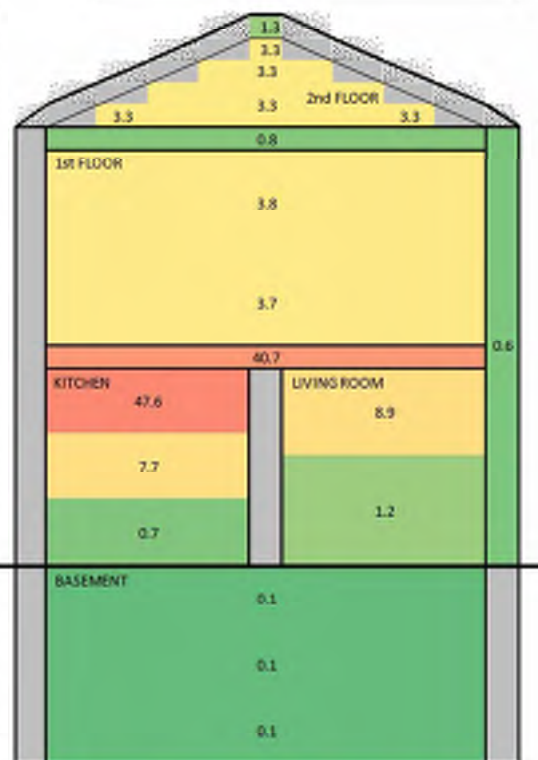
L3-A02 RESULT

Hy4Heat WP7 Test Result

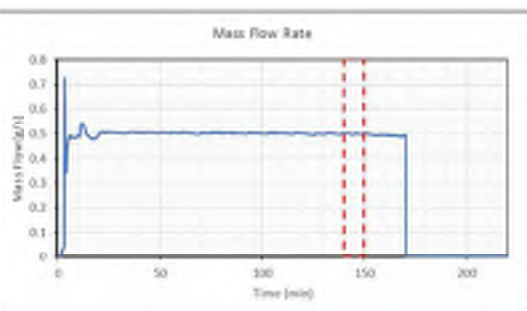
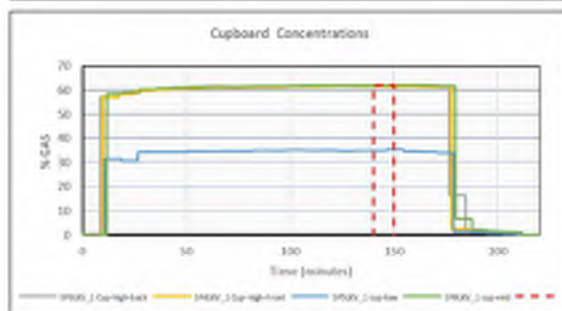
| | |
|------------------------------------|----------------|
| MTP ID: L3-A2 | |
| Hole Size: 10 mm | |
| Location: Boiler Cupboard no vents | |
| Gas: hydrogen | |
| Date: 01/04/2020 | Time: 06:48:00 |
| Averaging Period Start: 30 min | End: 150 min |

Notes: Conducted to provide baseline for vented cases with hydrogen

| Sensor | Average | Max | Min | STDEV | Units |
|-------------------------|---------|-------|-------|-------|---------|
| SP1KVV_1 K-High | 47.6 | 47.6 | 47.6 | 0.0 | %vol |
| SP2KVV_1 K-Mid | 7.7 | 7.8 | 7.7 | 0.0 | %vol |
| SP3KVV_1 Cup-high-back | 61.8 | 61.8 | 61.8 | 0.0 | %vol |
| SP4KVV_1 Cup-High-Front | 61.5 | 61.5 | 61.4 | 0.0 | %vol |
| SP5KVV_1 cup-low | 35.0 | 35.3 | 34.8 | 0.2 | %vol |
| SP6KVV_1 cup-mid | 62.1 | 62.1 | 62.1 | 0.0 | %vol |
| SP7KVV_1 K-Low | 0.7 | 0.7 | 0.7 | 0.0 | %vol |
| SP8KVV_1 LR-High | 8.9 | 8.9 | 8.9 | 0.0 | %vol |
| SP9KVV_1 LR-Mid | 1.2 | 1.3 | 1.2 | 0.0 | %vol |
| SP10KVV_1 H-High | 5.9 | 5.9 | 5.9 | 0.0 | %vol |
| SP11KVV_2 H-Mid | 1.6 | 1.6 | 1.6 | 0.0 | %vol |
| SP12KVV_2 FF-High | 3.8 | 3.8 | 3.8 | 0.0 | %vol |
| SP13KVV_2 FF-Mid | 3.7 | 3.8 | 3.7 | 0.0 | %vol |
| SP14KVV_2 AT-High | 3.3 | 3.3 | 3.2 | 0.0 | %vol |
| SP15KVV_2 AT-Mid | 3.3 | 3.4 | 3.2 | 0.0 | %vol |
| SP16KVV_2 BM-High | 0.1 | 0.1 | 0.1 | 0.0 | %vol |
| SP17KVV_1 BM-Mid | 0.1 | 0.1 | 0.1 | 0.0 | %vol |
| SP18KVV_1 BM-Low | 0.1 | 0.1 | 0.1 | 0.0 | %vol |
| SP19KVV_1 NWALL-Cav | 0.6 | 0.6 | 0.6 | 0.0 | %vol |
| SP20KVV_1 STUD-Cav | 0.6 | 0.6 | 0.6 | 0.0 | %vol |
| SP21KVV_1 FF-Void | 40.7 | 40.7 | 40.7 | 0.0 | %vol |
| SP22KVV_1 SF-Void | 0.8 | 0.8 | 0.8 | 0.0 | %vol |
| SP23KVV_1 ROOF-Void | 1.3 | 1.3 | 1.3 | 0.0 | %vol |
| OUTLET PRESSURE | 0.0354 | 0.036 | 0.034 | 0.001 | bar |
| LOWFLOWMETER | 0.5000 | 0.503 | 0.496 | 0.003 | g/s |
| OUTLET TEMP | 6.8 | 7.0 | 6.6 | 0.1 | degC |
| Volume Flow Rate | 337.5 | 339.5 | 335.0 | 1.2 | LPM |
| Energy Flow Rate | 60.0 | 60.3 | 59.5 | 0.2 | kW |
| External Wind Speed | 2.1 | | | | m/s |
| External Wind Direction | 275.3 | | | | bearing |



Cupboard (top is average of SP6 and SP5)



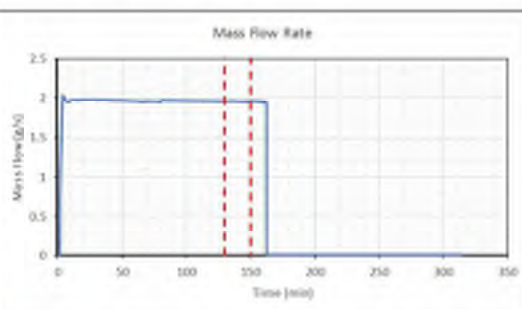
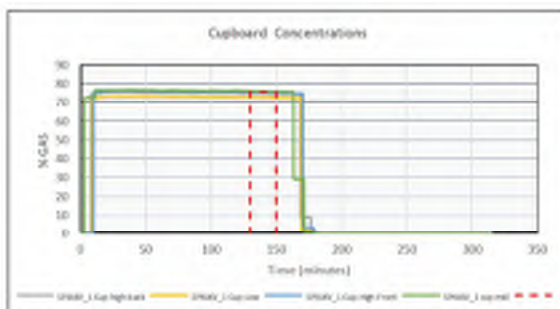
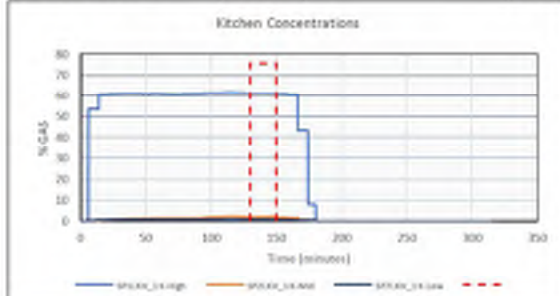
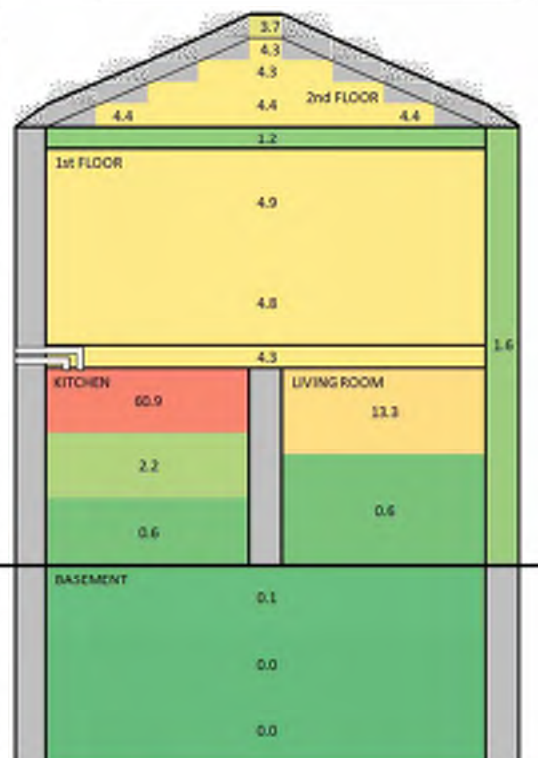
L3-A04 RESULT

Hy4Heat WP7 Test Result

| | |
|---|----------------|
| MTP ID: L3-A4 | |
| Hole Size: 15 mm | |
| kitchen boiler cupboard with 200cm ² ceiling vent, | |
| Location: with no cupboard vents | |
| Gas: hydrogen | |
| Date: 27/04/2020 | Time: 06:23:00 |
| Averaging Period Start: 130 min | End: 150 min |

Notes: Similar flow rate in no vent scenario (L3-088) gave ~71% at kitchen ceiling high, 30% at kitchen mid

| Sensor | Average | Max | Min | STDEV | units |
|-------------------------|---------|--------|--------|-------|---------|
| SP11KV_1 K-High | 60.9 | 60.9 | 60.9 | 0.0 | %vol |
| SP21KV_1 K-Mid | 2.2 | 2.3 | 2.1 | 0.1 | %vol |
| SP31KV_1 Cup-high-back | 75.0 | 75.1 | 75.0 | 0.1 | %vol |
| SP4KV_1 Cup-Low | 72.9 | 72.9 | 72.8 | 0.0 | %vol |
| SP5KV_1 Cup-High-Front | 75.4 | 75.5 | 75.3 | 0.1 | %vol |
| SP6KV_1 cup-mid | 75.8 | 76.0 | 75.7 | 0.1 | %vol |
| SP71KV_1 K-Low | 0.6 | 0.6 | 0.5 | 0.0 | %vol |
| SP8KV_1 UR-High | 13.3 | 13.5 | 13.1 | 0.1 | %vol |
| SP9KV_1 UR-Mid | 0.6 | 0.6 | 0.5 | 0.0 | %vol |
| SP10KV_1 H-High | 10.4 | 10.7 | 10.0 | 0.3 | %vol |
| SP11KV_1 H-Mid | 0.5 | 0.5 | 0.4 | 0.0 | %vol |
| SP12KV_1 FF-High | 4.9 | 4.9 | 4.8 | 0.0 | %vol |
| SP13KV_1 FF-Mid | 4.8 | 4.8 | 4.7 | 0.0 | %vol |
| SP14KV_1 AT-High | 4.3 | 4.4 | 4.3 | 0.0 | %vol |
| SP15KV_1 AT-Mid | 4.4 | 4.4 | 4.4 | 0.0 | %vol |
| SP16KV_1 BM-High | 0.1 | 0.1 | 0.1 | 0.0 | %vol |
| SP17KV_2 BM-Mid | 0.0 | 0.0 | 0.0 | 0.0 | %vol |
| SP18KV_2 BM-Low | 0.0 | 0.0 | -0.1 | 0.0 | %vol |
| SP19KV_2 NWALL-Cav | 1.6 | 1.8 | 1.4 | 0.2 | %vol |
| SP20KV_2 STUD-Cav | 0.2 | 0.2 | 0.1 | 0.0 | %vol |
| SP21KV_1 FF-Void | 4.3 | 4.6 | 3.5 | 0.4 | %vol |
| SP22KV_2 SF-Void | 1.2 | 1.5 | 1.1 | 0.1 | %vol |
| SP23KV_2 ROOF-Void | 3.7 | 3.8 | 3.6 | 0.1 | %vol |
| OUTLET PRESSURE | 0.3766 | 0.379 | 0.375 | 0.003 | barG |
| LOWFLOWMETER | 1.9540 | 1.961 | 1.948 | 0.002 | g/s |
| OUTLET TEMP | 9.4 | 10.2 | 8.7 | 0.4 | degC |
| Volume Flow Rate | 1318.8 | 1323.3 | 1314.6 | 1.6 | SLPM |
| Energy Flow Rate | 234.3 | 235.1 | 233.5 | 0.3 | kW |
| External Wind Speed | 1.3 | | | | m/s |
| External Wind Direction | 203.1 | | | | bearing |



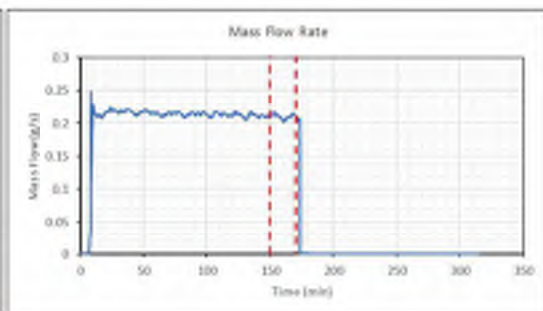
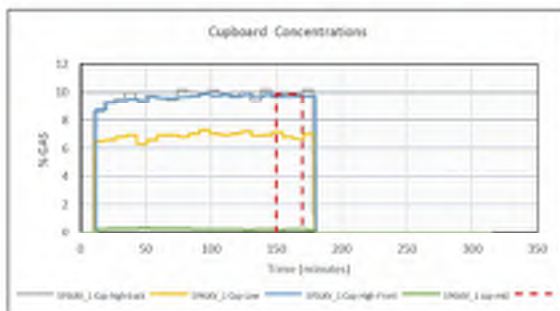
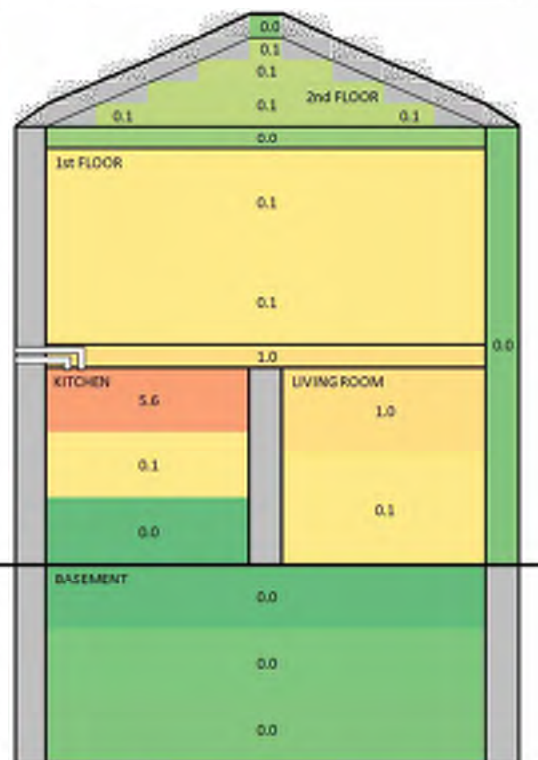
L3-A06 RESULT

Hy4Heat WP7 Test Result

| | |
|---|----------------|
| MTP ID: L3-A6 | |
| Hole Size: 5 mm | |
| Location: kitchen boiler cupboard with 200cm ² ceiling vent. | |
| Location: with cupboard vents | |
| Gas: hydrogen | |
| Date: 22/04/2020 | Time: 06:04:00 |
| Averaging Period Start: 150 min | End: 170 min |

Notes: Similar release with smaller ceiling vent (L3-A5) gave approx 9% at ceiling high level

| Sensor | Average | Max | Min | STDEV | units |
|-------------------------|---------|-------|-------|-------|---------|
| SP11KV_1 K-High | 5.6 | 5.9 | 5.4 | 0.2 | %vol |
| SP21KV_1 K-Mid | 0.1 | 0.2 | 0.1 | 0.0 | %vol |
| SP31KV_1 Cup-high-back | 9.8 | 9.9 | 9.7 | 0.1 | %vol |
| SP41KV_1 Cup-Low | 6.8 | 7.2 | 6.7 | 0.2 | %vol |
| SP51KV_1 Cup-High-Front | 9.7 | 9.7 | 9.7 | 0.0 | %vol |
| SP61KV_1 cup-mid | 0.3 | 0.3 | 0.2 | 0.0 | %vol |
| SP71KV_1 K-Low | 0.0 | 0.0 | 0.0 | 0.0 | %vol |
| SP81KV_2 LR-High | 1.0 | 1.0 | 1.0 | 0.0 | %vol |
| SP91KV_1 LR-Mid | 0.1 | 0.1 | 0.1 | 0.0 | %vol |
| SP10KV_2 H-High | 0.5 | 0.5 | 0.5 | 0.0 | %vol |
| SP11KV_2 H-Mid | 0.2 | 0.2 | 0.2 | 0.0 | %vol |
| SP12KV_2 FF-High | 0.1 | 0.1 | 0.1 | 0.0 | %vol |
| SP13KV_2 FF-Mid | 0.1 | 0.1 | 0.1 | 0.0 | %vol |
| SP14KV_2 AT-High | 0.1 | 0.1 | 0.1 | 0.0 | %vol |
| SP15KV_2 AT-Mid | 0.1 | 0.1 | 0.1 | 0.0 | %vol |
| SP16KV_2 BM-High | 0.0 | 0.0 | 0.0 | 0.0 | %vol |
| SP17KV_2 BM-Mid | 0.0 | 0.0 | 0.0 | 0.0 | %vol |
| SP18KV_2 BM-Low | 0.0 | 0.0 | 0.0 | 0.0 | %vol |
| SP19KV_2 NWALL-Cav | 0.0 | 0.0 | 0.0 | 0.0 | %vol |
| SP20KV_2 STUD-Cav | 0.2 | 0.2 | 0.2 | 0.0 | %vol |
| SP21KV_2 FF-Void | 1.0 | 1.1 | 0.8 | 0.1 | %vol |
| SP22KV_2 SF-Void | 0.0 | 0.0 | 0.0 | 0.0 | %vol |
| SP23KV_2 ROOF-Void | 0.0 | 0.0 | 0.0 | 0.0 | %vol |
| OUTLET_PRESSURE | 0.0366 | 0.020 | 0.014 | 0.003 | barg |
| LOWFLOWMETER | 0.2307 | 0.217 | 0.202 | 0.004 | g/s |
| OUTLET_TEMP | 9.9 | 10.4 | 9.5 | 0.3 | degC |
| Volume Flow Rate | 142.2 | 146.5 | 136.1 | 2.6 | LPM |
| Energy Flow Rate | 25.3 | 26.0 | 24.2 | 0.5 | kW |
| External Wind Speed | 4.6 | | | | m/s |
| External Wind Direction | 67.3 | | | | bearing |



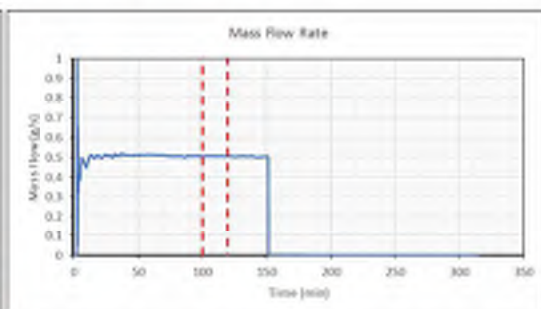
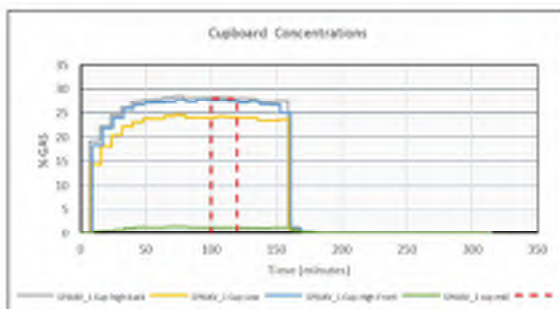
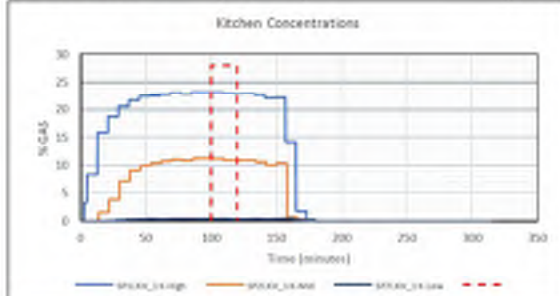
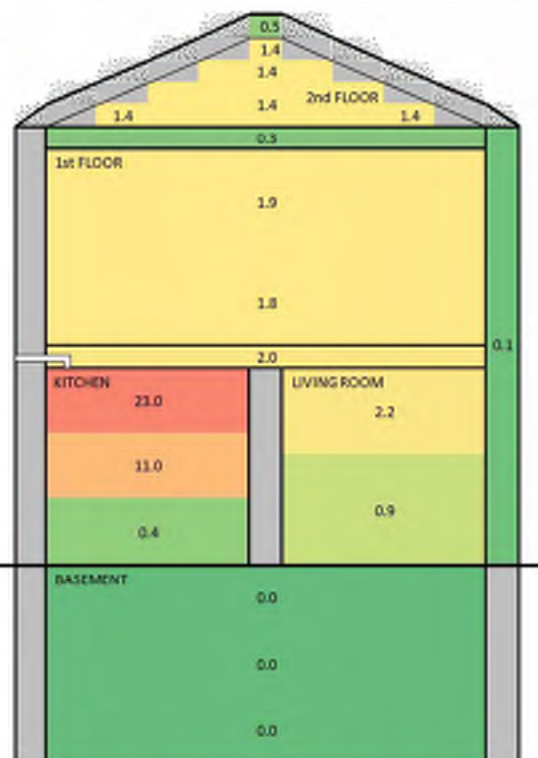
L3-A07 RESULT

Hy4Heat WP7 Test Result

| | |
|---|----------------|
| MTP ID: L3-A7 | |
| Hole Size: 10 mm | |
| kitchen boiler cupboard with 100cm ² ceiling vent, | |
| Location: with cupboard vents | |
| Gas: hydrogen | |
| Date: 23/04/2020 | Time: 06:08:00 |
| Averaging Period Start: 000 min | End: 120 min |

Notes: Similar release rate with no vent in cupboard or ceiling in L3-A2 gives kitchen high concentration of 48% and mid of 7.7%

| Sensor | Average | Max | Min | STDEV | units |
|-------------------------|---------|-------|-------|-------|---------|
| SP11KV_1 K-High | 23.0 | 23.1 | 22.8 | 0.1 | %vol |
| SP21KV_1 K-Mid | 11.0 | 11.2 | 10.9 | 0.1 | %vol |
| SP31KV_1 Cup-high-back | 28.0 | 28.2 | 27.8 | 0.2 | %vol |
| SP4KV_1 Cup-Low | 24.2 | 24.3 | 24.0 | 0.1 | %vol |
| SP5KV_1 Cup-High-Front | 27.6 | 27.6 | 27.5 | 0.1 | %vol |
| SP6KV_1 cup-mid | 1.3 | 1.3 | 1.3 | 0.0 | %vol |
| SP71KV_1 K-Low | 0.4 | 0.4 | 0.4 | 0.0 | %vol |
| SP8KV_1 LR-High | 2.2 | 2.2 | 2.1 | 0.0 | %vol |
| SP9KV_1 LR-Mid | 0.9 | 1.0 | 0.9 | 0.0 | %vol |
| SP10KV_1 H-High | 3.6 | 3.6 | 3.5 | 0.0 | %vol |
| SP11KV_2 H-Mid | 1.2 | 1.2 | 1.1 | 0.0 | %vol |
| SP12KV_2 FF-High | 1.9 | 1.9 | 1.8 | 0.0 | %vol |
| SP13KV_2 FF-Mid | 1.8 | 1.8 | 1.7 | 0.0 | %vol |
| SP14KV_2 AT-High | 1.4 | 1.4 | 1.3 | 0.0 | %vol |
| SP15KV_2 AT-Mid | 1.4 | 1.5 | 1.4 | 0.0 | %vol |
| SP16KV_2 BM-High | 0.0 | 0.0 | 0.0 | 0.0 | %vol |
| SP17KV_2 BM-Mid | 0.0 | 0.0 | 0.0 | 0.0 | %vol |
| SP18KV_2 BM-Low | 0.0 | 0.0 | 0.0 | 0.0 | %vol |
| SP19KV_2 NWALL-Cav | 0.1 | 0.1 | 0.0 | 0.0 | %vol |
| SP20KV_2 STUD-Cav | 0.9 | 0.9 | 0.9 | 0.0 | %vol |
| SP21KV_2 FF-Void | 2.0 | 2.1 | 1.9 | 0.1 | %vol |
| SP22KV_2 SF-Void | 0.3 | 0.3 | 0.3 | 0.0 | %vol |
| SP23KV_2 ROOF-Void | 0.5 | 0.5 | 0.4 | 0.0 | %vol |
| OUTLET PRESSURE | 0.0369 | 0.039 | 0.034 | 0.003 | barG |
| LOWFLOWMETER | 0.5047 | 0.506 | 0.502 | 0.003 | g/s |
| OUTLET TEMP | 6.0 | 6.3 | 5.8 | 0.1 | degC |
| Volume Flow Rate | 340.7 | 341.6 | 339.1 | 0.7 | SLPM |
| Energy Flow Rate | 60.5 | 60.7 | 60.2 | 0.1 | kW |
| External Wind Speed | 3.4 | | | | m/s |
| External Wind Direction | 62.7 | | | | bearing |



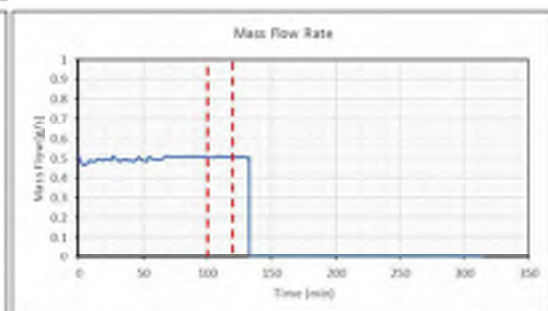
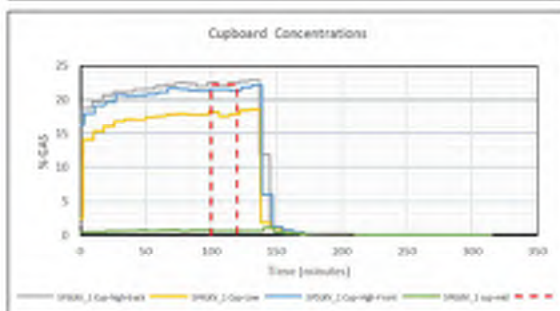
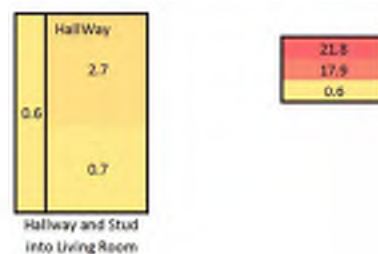
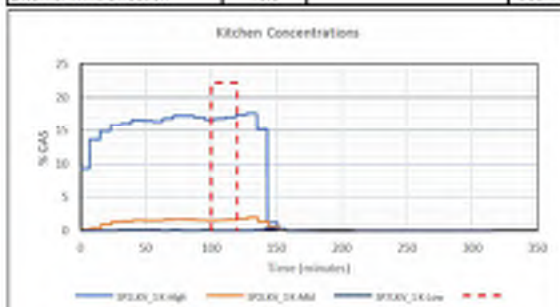
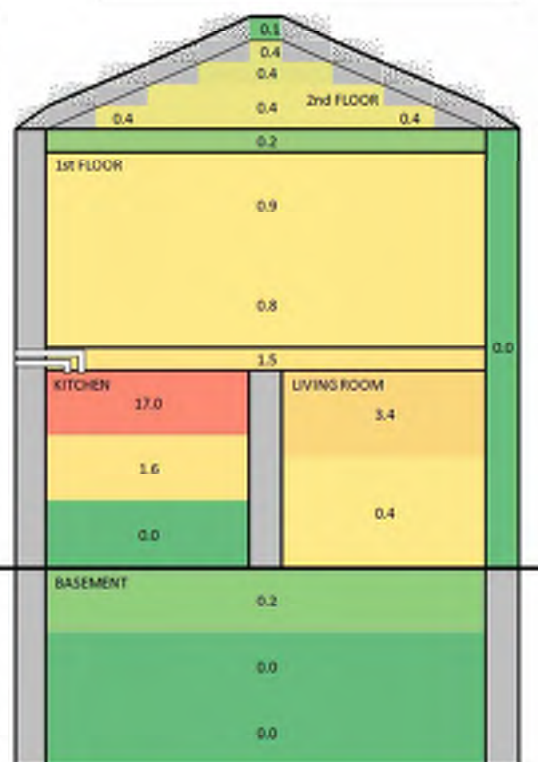
L3-A08 RESULT

Hy4Heat WP7 Test Result

| | |
|--|----------------|
| MTP ID: L3-A8 | |
| Hole Size: 10 mm | |
| Location: kitchen boiler cupboard with 200cm ² ceiling vent, w/ | |
| Gas: hydrogen | |
| Date: 23/04/2020 | Time: 10:15:00 |
| Averaging Period Start: 900 min | End: 120 min |

Notes: Similar case with no ceiling or cupboard vents (L3-A2) resulted in kitchen ceiling concentration ~48%, single ceiling vent case gave 23% at kitchen ceiling

| Sensor | Average | Max | Min | STDEV | Units |
|-------------------------|---------|-------|-------|-------|---------|
| SP1KVV_1 K-High | 17.0 | 17.5 | 16.7 | 0.2 | %vol |
| SP2KVV_1 K-Mid | 1.6 | 1.6 | 1.5 | 0.1 | %vol |
| SP3KVV_1 Cup-high-back | 22.3 | 22.4 | 22.1 | 0.1 | %vol |
| SP4KVV_1 Cup-Low | 17.9 | 18.3 | 17.6 | 0.3 | %vol |
| SP5KVV_1 Cup-High-Front | 21.4 | 22.5 | 21.3 | 0.1 | %vol |
| SP6KVV_1 cup-mid | 0.6 | 0.7 | 0.6 | 0.0 | %vol |
| SP7KVV_1 K-Low | 0.0 | 0.1 | 0.0 | 0.0 | %vol |
| SP8KVV_2 LR-High | 3.4 | 3.5 | 3.3 | 0.1 | %vol |
| SP9KVV_1 LR-Mid | 0.4 | 0.4 | 0.4 | 0.0 | %vol |
| SP10KVV_2 H-High | 2.7 | 3.0 | 2.5 | 0.2 | %vol |
| SP11KVV_2 H-Mid | 0.7 | 0.7 | 0.7 | 0.0 | %vol |
| SP12KVV_2 FF-High | 0.9 | 1.0 | 0.9 | 0.0 | %vol |
| SP13KVV_2 FF-Mid | 0.8 | 0.9 | 0.8 | 0.0 | %vol |
| SP14KVV_2 AT-High | 0.4 | 0.4 | 0.3 | 0.0 | %vol |
| SP15KVV_2 AT-Mid | 0.4 | 0.4 | 0.4 | 0.0 | %vol |
| SP16KVV_2 BM-High | 0.2 | 0.2 | 0.1 | 0.0 | %vol |
| SP17KVV_2 BM-Mid | 0.0 | 0.0 | 0.0 | 0.0 | %vol |
| SP18KVV_2 BM-Low | 0.0 | 0.0 | 0.0 | 0.0 | %vol |
| SP19KVV_2 NWALL-Cav | 0.0 | 0.1 | 0.0 | 0.0 | %vol |
| SP20KVV_2 STUD-Cav | 0.6 | 0.6 | 0.6 | 0.0 | %vol |
| SP21KVV_2 FF-Void | 1.5 | 1.6 | 1.5 | 0.0 | %vol |
| SP22KVV_2 SF-Void | 0.2 | 0.2 | 0.1 | 0.0 | %vol |
| SP23KVV_2 ROOF-Void | 0.1 | 0.1 | 0.1 | 0.0 | %vol |
| OUTLET PRESSURE | 0.0395 | 0.041 | 0.038 | 0.001 | bar |
| LOWFLOWMETER | 0.5067 | 0.512 | 0.502 | 0.003 | g/s |
| OUTLET TEMP | 18.1 | 18.9 | 17.4 | 0.4 | degC |
| Volume Flow Rate | 342.0 | 345.7 | 338.7 | 1.7 | LPM |
| Energy Flow Rate | 60.7 | 61.4 | 60.2 | 0.3 | kW |
| External Wind Speed | 3.9 | | | | m/s |
| External Wind Direction | 73.8 | | | | bearing |



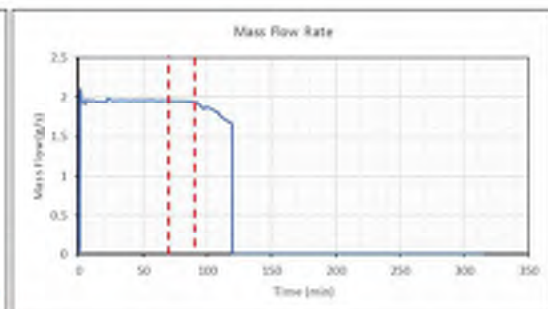
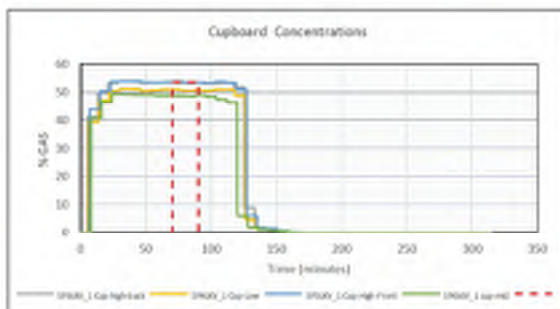
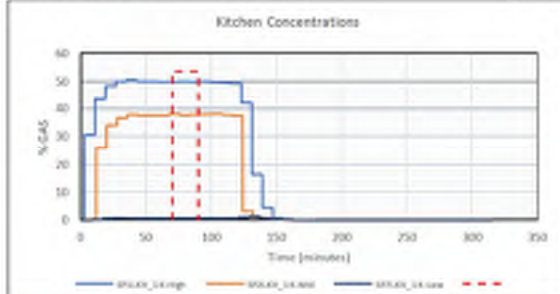
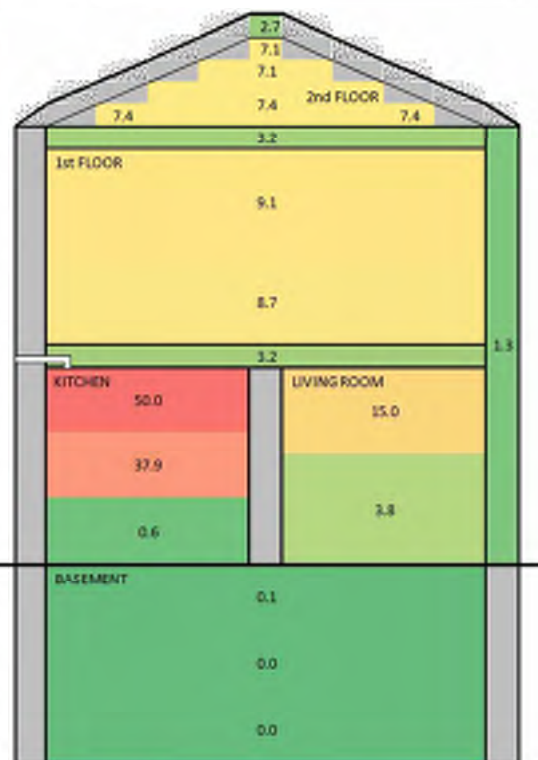
L3-A09 RESULT

Hy4Heat WP7 Test Result

| | |
|---|----------------|
| MTP ID: L3-A9 | |
| Hole Size: 15 mm | |
| kitchen boiler cupboard with 100cm ² ceiling vent. | |
| Location: with cupboard vents | |
| Gas: hydrogen | |
| Date: 24/04/2020 | Time: 09:25:00 |
| Averaging Period Start: 70 min | End: 90 min |

Notes: Similar release rate with no ceiling or cupboard vents gave ~72% at kitchen ceiling high point but only 30% at kitchen mid point

| Sensor | Average | Max | Min | STDEV | units |
|-------------------------|---------|--------|--------|-------|---------|
| SP11KV_1 K-High | 50.0 | 50.1 | 49.9 | 0.1 | %vol |
| SP21KV_1 K-Mid | 37.9 | 38.2 | 37.7 | 0.2 | %vol |
| SP31KV_1 Cup-high-back | 53.6 | 53.8 | 53.3 | 0.2 | %vol |
| SP41KV_1 Cup-Low | 50.5 | 50.8 | 50.2 | 0.3 | %vol |
| SP51KV_1 Cup-High-Front | 53.6 | 53.8 | 53.5 | 0.2 | %vol |
| SP61KV_1 cup-mid | 48.8 | 49.0 | 48.6 | 0.1 | %vol |
| SP71KV_1 K-Low | 0.6 | 0.6 | 0.6 | 0.0 | %vol |
| SP81KV_1 LR-High | 15.0 | 15.4 | 14.4 | 0.4 | %vol |
| SP91KV_1 LR-Mid | 3.8 | 3.9 | 3.7 | 0.1 | %vol |
| SP10KV_2 H-High | 16.8 | 17.3 | 16.4 | 0.3 | %vol |
| SP11KV_2 H-Mid | 3.9 | 3.9 | 3.8 | 0.0 | %vol |
| SP12KV_2 FF-High | 9.1 | 9.8 | 7.8 | 0.5 | %vol |
| SP13KV_2 FF-Mid | 8.7 | 9.6 | 7.6 | 0.5 | %vol |
| SP14KV_2 AT-High | 7.1 | 8.0 | 6.2 | 0.5 | %vol |
| SP15KV_2 AT-Mid | 7.4 | 8.4 | 6.5 | 0.5 | %vol |
| SP16KV_2 BM-High | 0.1 | 0.1 | 0.1 | 0.0 | %vol |
| SP17KV_2 BM-Mid | 0.0 | 0.0 | 0.0 | 0.0 | %vol |
| SP18KV_2 BM-Low | 0.0 | 0.0 | 0.0 | 0.0 | %vol |
| SP19KV_2 NWALL-Cav | 1.3 | 1.8 | 1.0 | 0.3 | %vol |
| SP20KV_2 STUD-Cav | 2.8 | 2.9 | 2.7 | 0.0 | %vol |
| SP21KV_2 FF-Void | 3.2 | 4.1 | 2.6 | 0.4 | %vol |
| SP22KV_2 SF-Void | 3.2 | 3.6 | 1.8 | 0.5 | %vol |
| SP23KV_2 ROOF-Void | 2.7 | 2.9 | 2.3 | 0.3 | %vol |
| OUTLET PRESSURE | 0.3790 | 0.382 | 0.375 | 0.003 | bar |
| LOWFLOWMETER | 1.9474 | 1.955 | 1.933 | 0.005 | g/s |
| OUTLET TEMP | 21.6 | 22.2 | 21.2 | 0.2 | degC |
| Volume Flow Rate | 1314.4 | 1319.1 | 1304.7 | 3.7 | LPM |
| Energy Flow Rate | 233.5 | 234.3 | 231.8 | 0.7 | kW |
| External Wind Speed | 2.1 | | | | m/s |
| External Wind Direction | 87.2 | | | | bearing |



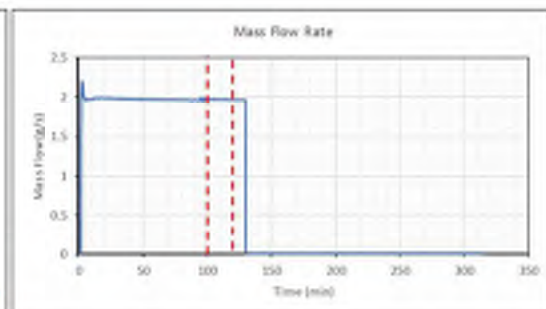
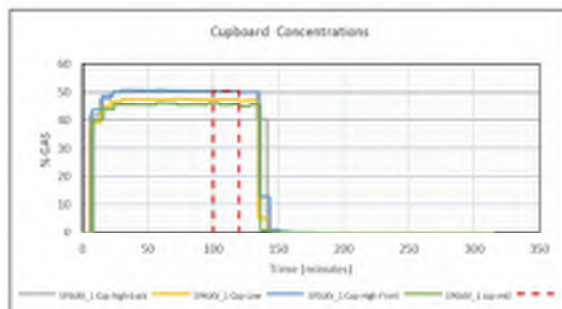
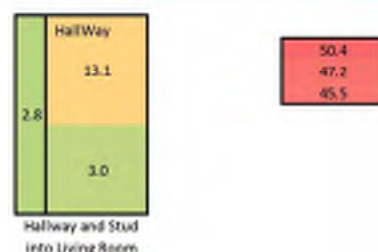
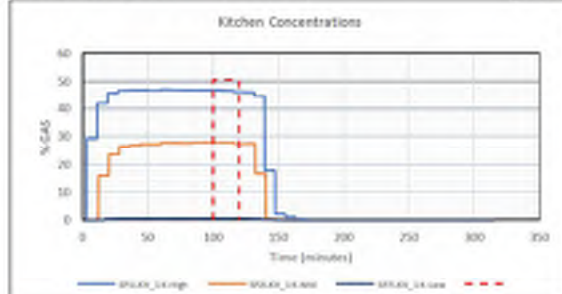
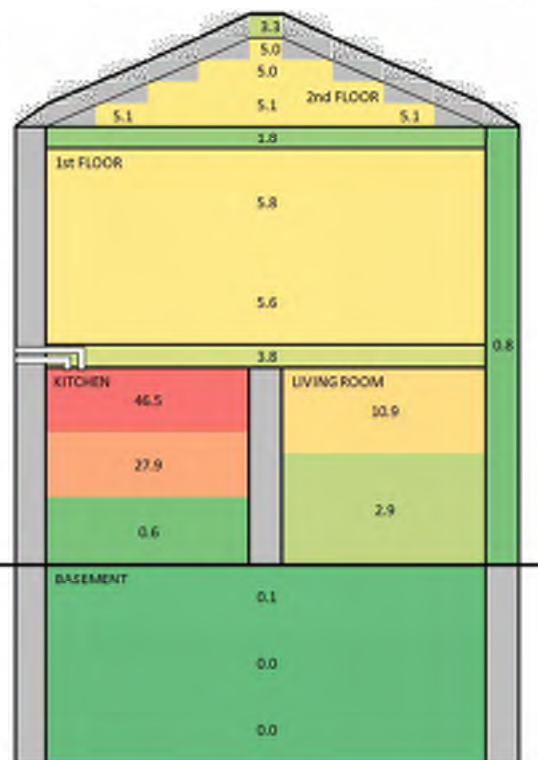
L3-A10 RESULT

Hy4Heat WP7 Test Result

| | |
|---|----------------|
| MTP ID: L3-A10 | |
| Hole Size: 15 mm | |
| Location: kitchen boiler cupboard with 200cm ² ceiling vent. | |
| Gas: hydrogen | |
| Date: 24/04/2020 | Time: 06:07:00 |
| Averaging Period Start: 100 min | End: 120 min |

Notes: Similar setup but smaller ceiling vent gave 50% at kitchen ceiling and 38% at kitchen mid point

| Sensor | Average | Max | Min | STDEV | units |
|-------------------------|---------|--------|--------|-------|---------|
| SP11KV_1 K-High | 46.5 | 46.8 | 46.2 | 0.2 | %vol |
| SP21KV_1 K-Mid | 27.9 | 28.0 | 27.4 | 0.2 | %vol |
| SP31KV_1 Cup-high-back | 50.4 | 50.5 | 50.1 | 0.1 | %vol |
| SP41KV_1 Cup-Low | 47.2 | 47.3 | 46.9 | 0.1 | %vol |
| SP51KV_1 Cup-High-Front | 50.4 | 50.6 | 50.0 | 0.1 | %vol |
| SP61KV_1 cup-mid | 45.5 | 46.0 | 45.3 | 0.3 | %vol |
| SP71KV_1 K-Low | 0.6 | 0.6 | 0.6 | 0.0 | %vol |
| SP81KV_1 LR-High | 10.9 | 11.0 | 10.7 | 0.1 | %vol |
| SP91KV_1 LR-Mid | 2.9 | 3.0 | 2.8 | 0.1 | %vol |
| SP10KV_2 H-High | 13.1 | 13.3 | 12.8 | 0.1 | %vol |
| SP11KV_2 H-Mid | 3.0 | 3.0 | 2.9 | 0.0 | %vol |
| SP12KV_2 FF-High | 5.8 | 6.0 | 5.6 | 0.1 | %vol |
| SP13KV_2 FF-Mid | 5.6 | 5.8 | 5.4 | 0.1 | %vol |
| SP14KV_2 AT-High | 5.0 | 5.0 | 4.8 | 0.1 | %vol |
| SP15KV_2 AT-Mid | 5.1 | 5.2 | 5.0 | 0.1 | %vol |
| SP16KV_2 BM-High | 0.1 | 0.1 | 0.1 | 0.0 | %vol |
| SP17KV_2 BM-Mid | 0.0 | 0.1 | 0.0 | 0.0 | %vol |
| SP18KV_2 BM-Low | 0.0 | 0.1 | 0.0 | 0.0 | %vol |
| SP19KV_2 NWALL-Cav | 0.8 | 1.0 | 0.7 | 0.1 | %vol |
| SP20KV_2 STUD-Cav | 2.8 | 2.9 | 2.8 | 0.0 | %vol |
| SP21KV_2 FF-Void | 3.8 | 3.9 | 3.7 | 0.1 | %vol |
| SP22KV_2 SF-Void | 1.8 | 1.8 | 1.7 | 0.0 | %vol |
| SP23KV_2 ROOF-Void | 3.3 | 3.4 | 3.1 | 0.1 | %vol |
| OUTLET_PRESSURE | 0.3754 | 0.373 | 0.368 | 0.003 | bar |
| LOWFLOWMETER | 1.9599 | 1.968 | 1.955 | 0.003 | g/s |
| OUTLET_TEMP | 10.8 | 11.5 | 9.8 | 0.5 | degC |
| Volume Flow Rate | 1322.7 | 1328.2 | 1319.1 | 1.9 | LPM |
| Energy Flow Rate | 235.0 | 236.0 | 234.3 | 0.3 | kW |
| External Wind Speed | 2.2 | | | | m/s |
| External Wind Direction | 54.5 | | | | bearing |



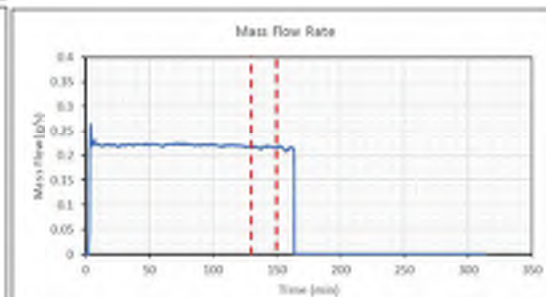
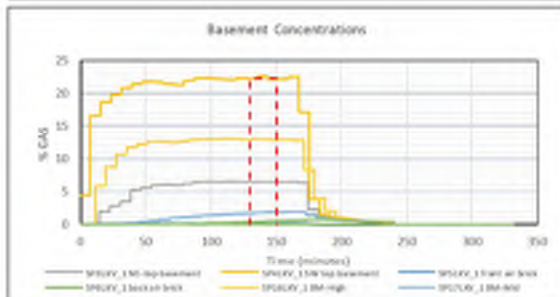
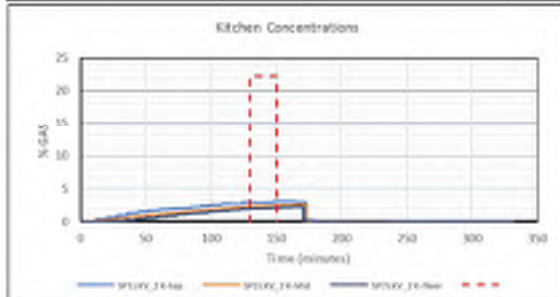
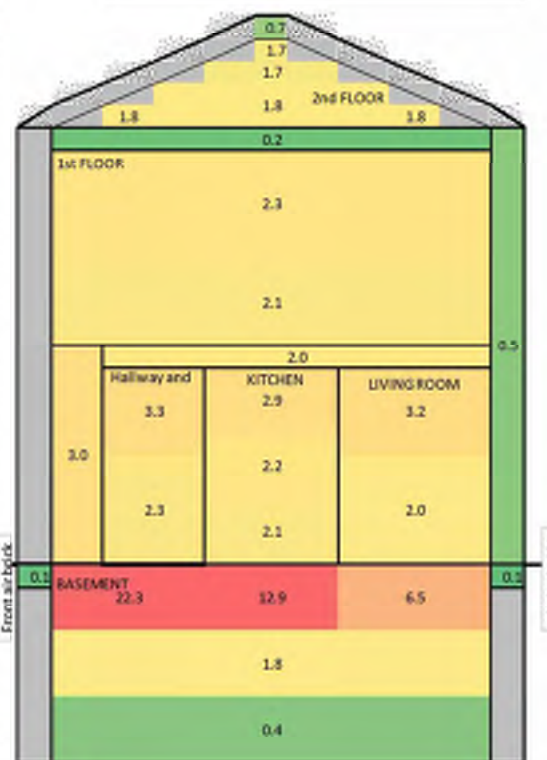
L3-A11 RESULT

Hy4Heat WP7 Test Result

| | |
|--|----------------|
| MTP ID: L3-A11 | |
| Hole Size: 5mm | |
| Location: Basement with 200cm ² vent area | |
| Gas: hydrogen | |
| Date: 15/04/2020 | Time: 08:10:00 |
| Averaging Period Start: 130 min | End: 150 min |

Notes: 3 x air bricks open, funnels over sealed vents, concentrations very similar to like test with no vents (L3-067)

| Sensor | Average | Max | Min | STDEV | Units |
|--------------------------|---------|--------|-------|-------|---------|
| SP11KV_2 K-top | 2.9 | 3.0 | 2.9 | 0.0 | %vol |
| SP21KV_2 K-Mid | 2.2 | 2.4 | 2.2 | 0.0 | %vol |
| SP31KV_1 NE-top basement | 6.5 | 6.5 | 6.4 | 0.0 | %vol |
| SP41KV_1 SW top basement | 22.3 | 22.6 | 22.1 | 0.2 | %vol |
| SP51KV_1 front air brick | 0.1 | 0.1 | 0.1 | 0.0 | %vol |
| SP61KV_1 back air brick | 0.1 | 0.1 | 0.1 | 0.0 | %vol |
| SP71KV_2 K-floor | 2.1 | 2.2 | 1.9 | 0.1 | %vol |
| SP81KV_2 LR-high | 3.2 | 3.3 | 3.0 | 0.0 | %vol |
| SP91KV_1 LR-Mid | 2.0 | 2.1 | 1.9 | 0.1 | %vol |
| SP10KV_2 H-high | 3.3 | 3.4 | 3.1 | 0.1 | %vol |
| SP11KV_2 H-Mid | 2.3 | 2.4 | 2.2 | 0.0 | %vol |
| SP12KV_2 FF-high | 2.3 | 2.3 | 2.2 | 0.1 | %vol |
| SP13KV_2 FF-Mid | 2.1 | 2.2 | 2.1 | 0.0 | %vol |
| SP14KV_2 AT-high | 1.7 | 1.8 | 1.7 | 0.0 | %vol |
| SP15KV_2 AT-Mid | 1.8 | 1.8 | 1.6 | 0.0 | %vol |
| SP16KV_1 RM-High | 12.9 | 13.0 | 12.9 | 0.1 | %vol |
| SP17KV_1 RM-Mid | 1.8 | 1.8 | 1.7 | 0.0 | %vol |
| SP18KV_1 RM-Low | 0.4 | 0.5 | 0.3 | 0.1 | %vol |
| SP19KV_2 NWALL-Cav | 0.5 | 0.7 | 0.4 | 0.1 | %vol |
| SP20KV_2 STUD-Cav | 3.0 | 3.1 | 2.9 | 0.0 | %vol |
| SP21KV_2 FF-Void | 2.0 | 2.1 | 1.9 | 0.1 | %vol |
| SP22KV_2 SF-Void | 0.2 | 0.2 | 0.2 | 0.0 | %vol |
| SP23KV_2 ROOF-Void | 0.7 | 0.7 | 0.6 | 0.0 | %vol |
| RELEASEPRESSURE | 0.0098 | 0.0100 | 0.009 | 0.000 | bar |
| LOWFLOWMETER | 0.2178 | 0.221 | 0.213 | 0.002 | g/s |
| OUTLET_TEMP | 9.5 | 10.0 | 8.9 | 0.3 | degC |
| Volume Flow Rate | 147.0 | 149.3 | 143.6 | 1.1 | SUPM |
| Energy Flow Rate | 26.1 | 26.5 | 25.5 | 0.2 | kW |
| External Wind Speed | 3.4 | | | | m/s |
| External Wind Direction | 256.2 | | | | bearing |



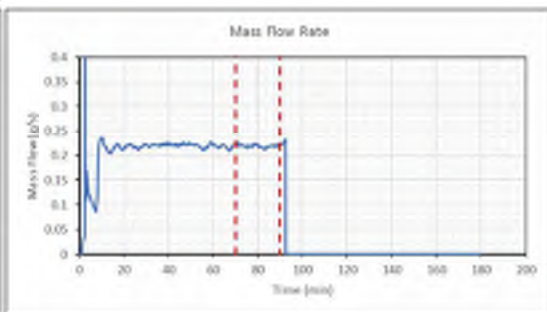
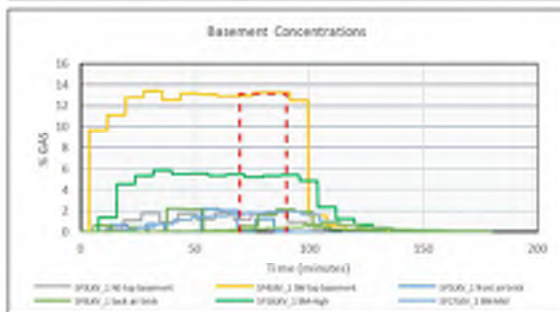
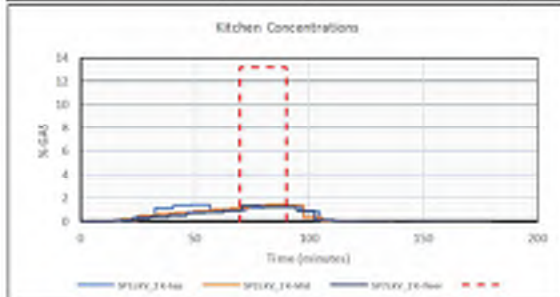
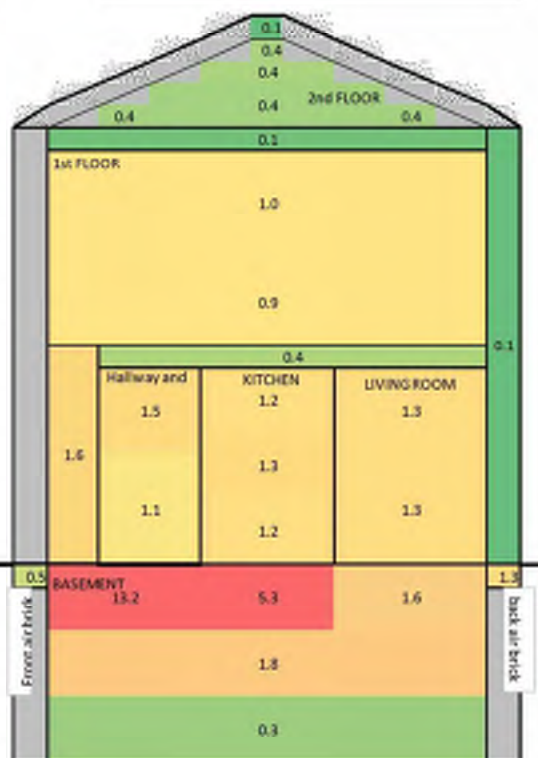
L3-A12 RESULT

Hy4Heat WP7 Test Result

| | |
|--|----------------|
| MTP ID: L3-A12 | |
| Hole Size: 5mm | |
| Location: Basement with 400cm ² vent area | |
| Gas: hydrogen | |
| Date: 17/04/2020 | Time: 11:57:00 |
| Averaging Period Start: 70 min | End: 90 min |

Notes: Six airbricks open. Similar release in three brick case gave ~22% and 13% in the high points in the basement

| Sensor | Average | Max | Min | STDEV | Units |
|--------------------------|---------|--------|-------|-------|---------|
| SP11KV_2 K-top | 1.2 | 1.3 | 1.0 | 0.1 | %vol |
| SP21KV_2 K-Mid | 1.3 | 1.4 | 1.1 | 0.1 | %vol |
| SP31KV_1 NE-top basement | 1.6 | 1.8 | 1.2 | 0.3 | %vol |
| SP41KV_1 SW top basement | 13.2 | 13.2 | 13.0 | 0.1 | %vol |
| SP51KV_1 front air brick | 0.5 | 1.3 | 0.1 | 0.6 | %vol |
| SP61KV_1 back air brick | 1.3 | 2.1 | 0.5 | 0.7 | %vol |
| SP71KV_2 K-floor | 1.2 | 1.3 | 0.9 | 0.1 | %vol |
| SP81KV_2 LR-high | 1.3 | 1.4 | 1.1 | 0.1 | %vol |
| SP91KV_2 LR-Mid | 1.3 | 1.3 | 1.2 | 0.1 | %vol |
| SP10KV_2 H-high | 1.5 | 1.7 | 1.4 | 0.1 | %vol |
| SP11KV_2 H-Mid | 1.1 | 1.1 | 1.0 | 0.0 | %vol |
| SP12KV_2 FF-high | 1.0 | 1.0 | 0.9 | 0.1 | %vol |
| SP13KV_2 FF-Mid | 0.9 | 1.0 | 0.9 | 0.1 | %vol |
| SP14KV_2 AT-high | 0.4 | 0.4 | 0.3 | 0.0 | %vol |
| SP15KV_2 AT-Mid | 0.4 | 0.5 | 0.3 | 0.1 | %vol |
| SP16KV_1 BM-High | 5.3 | 5.4 | 5.2 | 0.1 | %vol |
| SP17KV_2 BM-Mid | 1.8 | 1.9 | 1.7 | 0.1 | %vol |
| SP18KV_2 BM-Low | 0.3 | 0.5 | 0.2 | 0.1 | %vol |
| SP19KV_2 NWALL-Cav | 0.1 | 0.1 | 0.1 | 0.0 | %vol |
| SP20KV_2 STUD-Cav | 1.6 | 1.7 | 1.6 | 0.1 | %vol |
| SP21KV_2 FF-Void | 0.4 | 0.5 | 0.3 | 0.1 | %vol |
| SP22KV_2 SF-Void | 0.1 | 0.2 | 0.1 | 0.0 | %vol |
| SP23KV_2 ROOF-Void | 0.1 | 0.1 | 0.1 | 0.0 | %vol |
| RELEASEPRESSURE | 0.0093 | 0.0100 | 0.008 | 0.000 | bar |
| LOWFLOWMETER | 0.2190 | 0.226 | 0.211 | 0.008 | g/s |
| OUTLET_PRESSURE | 0.0177 | 0.020 | 0.015 | 0.001 | bar |
| OUTLET_TEMP | 16.8 | 17.1 | 16.1 | 0.3 | degC |
| Volume Flow Rate | 147.8 | 152.6 | 142.7 | 1.8 | SUPM |
| Energy Flow Rate | 26.3 | 27.1 | 25.4 | 0.3 | kW |
| External Wind Speed | 4.5 | | | | m/s |
| External Wind Direction | 86.6 | | | | bearing |



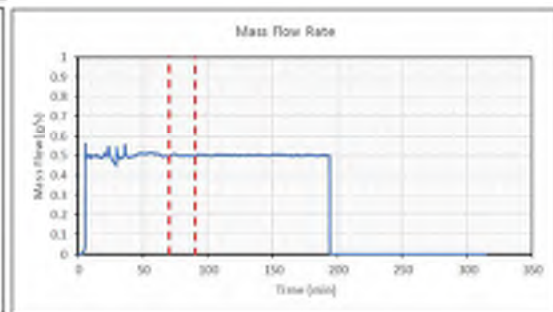
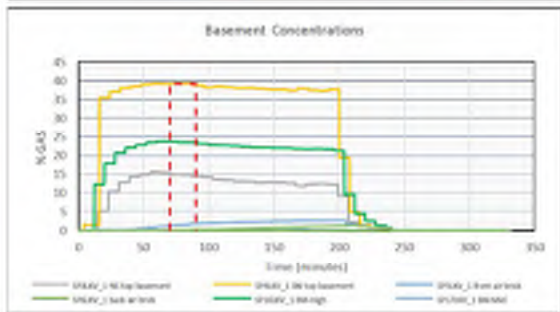
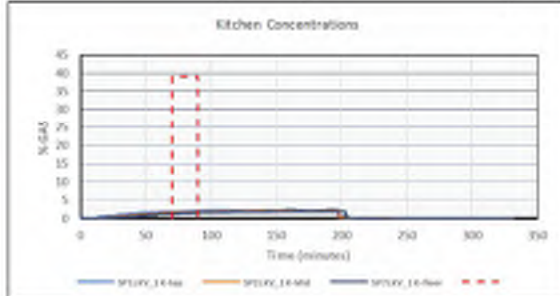
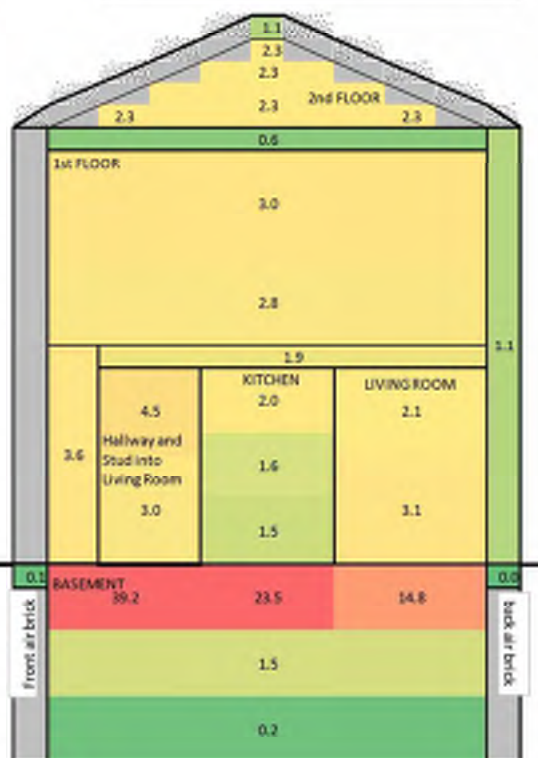
L3-A13 RESULT

Hy4Heat WP7 Test Result

| | |
|--|----------------|
| MTP ID: L3-A13 | |
| Hole Size: 10 mm | |
| Location: Basement with 200cm ² vent area | |
| Gas: hydrogen | |
| Date: 14/04/2020 | Time: 08:40:00 |
| Averaging Period Start: 70 min | End: 90 min |

Notes: 3x airbricks open. Both airbricks sealed at locations with funnels. No vent case shows (L3-A15) lower concentrations in high point in basement but generally lower throughout rest of house. L3-A15 was conducted in higher wind conditions.

| Sensor | Average | Max | Min | STDEV | Units |
|--------------------------|---------|-------|-------|-------|---------|
| SP11KV_1 K-top | 2.0 | 2.2 | 1.9 | 0.1 | %vol |
| SP21KV_1 K-Mid | 1.6 | 1.7 | 1.4 | 0.1 | %vol |
| SP31KV_1 NE-top basement | 14.8 | 15.4 | 14.5 | 0.2 | %vol |
| SP41KV_1 SW top basement | 39.2 | 39.3 | 38.8 | 0.1 | %vol |
| SP51KV_1 front air brick | 0.1 | 0.1 | 0.1 | 0.0 | %vol |
| SP61KV_1 back air brick | 0.0 | 0.1 | 0.0 | 0.0 | %vol |
| SP71KV_1 K-floor | 1.5 | 1.6 | 1.3 | 0.1 | %vol |
| SP81KV_1 LR-high | 2.1 | 2.2 | 2.1 | 0.1 | %vol |
| SP91KV_1 LR-Mid | 3.1 | 3.5 | 2.8 | 0.3 | %vol |
| SP10KV_1 H-high | 4.5 | 4.8 | 4.3 | 0.2 | %vol |
| SP11KV_1 H-Mid | 3.0 | 3.4 | 2.4 | 0.3 | %vol |
| SP12KV_1 FF-high | 3.0 | 3.4 | 2.5 | 0.3 | %vol |
| SP13KV_1 FF-Mid | 2.8 | 3.3 | 2.3 | 0.3 | %vol |
| SP14KV_1 AT-high | 2.3 | 2.5 | 1.9 | 0.2 | %vol |
| SP15KV_1 AT-Mid | 2.3 | 2.6 | 2.0 | 0.2 | %vol |
| SP16KV_1 RM-High | 23.5 | 23.7 | 23.4 | 0.1 | %vol |
| SP17KV_1 RM-Mid | 1.5 | 1.8 | 1.3 | 0.2 | %vol |
| SP18KV_1 RM-Low | 0.2 | 0.3 | 0.1 | 0.0 | %vol |
| SP19KV_2 NWALL-Cav | 1.1 | 1.2 | 0.8 | 0.1 | %vol |
| SP20KV_1 STUD-Cav | 3.6 | 3.9 | 3.2 | 0.2 | %vol |
| SP21KV_1 FF-Void | 1.9 | 2.3 | 1.6 | 0.2 | %vol |
| SP22KV_2 SF-Void | 0.6 | 0.6 | 0.4 | 0.1 | %vol |
| SP23KV_2 ROOF-Void | 1.1 | 1.3 | 0.9 | 0.1 | %vol |
| RELEASEPRESSURE | 0.0045 | 0.005 | 0.004 | 0.000 | bar |
| LOWFLOWMETER | 0.4679 | 0.506 | 0.490 | 0.004 | g/s |
| OUTLET_PRESSURE | 0.0319 | 0.034 | 0.029 | 0.001 | bar |
| OUTLET_TEMP | 9.8 | 10.2 | 9.4 | 0.2 | degC |
| Volume Flow Rate | 336.1 | 341.6 | 330.9 | 2.5 | SUPM |
| Energy Flow Rate | 59.7 | 60.7 | 58.8 | 0.5 | kW |
| External Wind Speed | 3.2 | | | | m/s |
| External Wind Direction | 255.7 | | | | bearing |



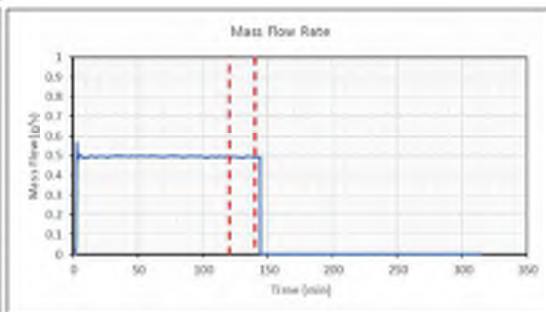
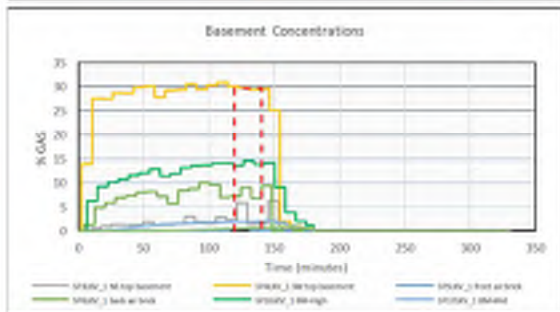
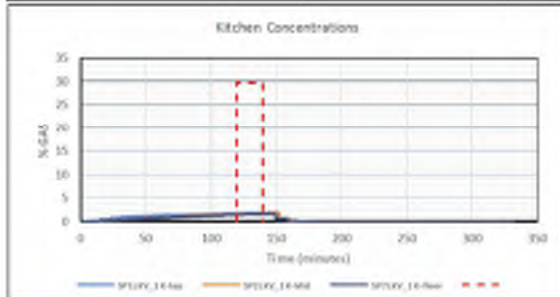
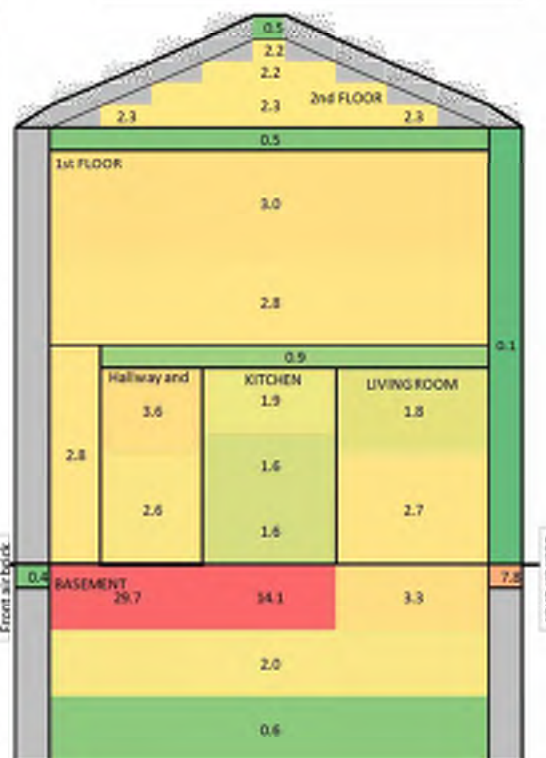
L3-A14 RESULT

Hy4Heat

| | |
|--|----------------|
| MTP ID: L3-A14 | |
| Hole Size: 10 mm | |
| Location: Basement with 400cm ² vent area | |
| Gas: hydrogen | |
| Date: 17/04/2020 | Time: 06:37:00 |
| Averaging Period Start: 120 min | End: 140 min |

Notes: 6x air bricks open, very similar result to no vent case (L3-A15)

| Sensor | Average | Max | Min | STDEV | Units |
|--------------------------|---------|-------|-------|-------|---------|
| SP11KV_1 K-top | 1.9 | 1.9 | 1.8 | 0.0 | %vol |
| SP21KV_1 K-Mid | 1.6 | 1.6 | 1.5 | 0.0 | %vol |
| SP31KV_1 NE-top basement | 3.3 | 5.9 | 1.5 | 2.1 | %vol |
| SP41KV_1 SW top basement | 29.7 | 30.1 | 29.4 | 0.2 | %vol |
| SP51KV_1 front air brick | 0.4 | 0.6 | 0.1 | 0.2 | %vol |
| SP61KV_1 back air brick | 7.8 | 9.0 | 6.8 | 1.0 | %vol |
| SP71KV_1 K-floor | 1.6 | 1.6 | 1.5 | 0.1 | %vol |
| SP81KV_1 LR-high | 1.8 | 1.9 | 1.8 | 0.0 | %vol |
| SP91KV_1 LR-Mid | 2.7 | 2.8 | 2.5 | 0.1 | %vol |
| SP10KV_1 H-high | 3.6 | 3.7 | 3.2 | 0.1 | %vol |
| SP11KV_1 H-Mid | 2.6 | 2.7 | 2.3 | 0.1 | %vol |
| SP12KV_2 FF-high | 3.0 | 3.1 | 2.8 | 0.1 | %vol |
| SP13KV_2 FF-Mid | 2.8 | 3.0 | 2.6 | 0.1 | %vol |
| SP14KV_2 AT-high | 2.2 | 2.3 | 2.1 | 0.1 | %vol |
| SP15KV_2 AT-Mid | 2.3 | 2.4 | 2.2 | 0.1 | %vol |
| SP16KV_1 RM-High | 14.1 | 14.6 | 13.6 | 0.4 | %vol |
| SP17KV_1 RM-Mid | 2.0 | 2.0 | 2.0 | 0.0 | %vol |
| SP18KV_1 RM-Low | 0.6 | 0.7 | 0.6 | 0.1 | %vol |
| SP19KV_2 NWALL-Cav | 0.1 | 0.1 | 0.0 | 0.0 | %vol |
| SP20KV_1 STUD-Cav | 2.8 | 3.0 | 2.6 | 0.1 | %vol |
| SP21KV_2 FF-Void | 0.9 | 1.1 | 0.8 | 0.1 | %vol |
| SP22KV_2 SF-Void | 0.5 | 0.7 | 0.3 | 0.2 | %vol |
| SP23KV_2 ROOF-Void | 0.5 | 0.6 | 0.4 | 0.1 | %vol |
| RELEASEPRESSURE | 0.0045 | 0.005 | 0.004 | 0.000 | bar |
| LOWFLOWMETER | 0.4908 | 0.495 | 0.484 | 0.002 | g/s |
| OUTLET_PRESSURE | 0.0298 | 0.033 | 0.028 | 0.001 | bar |
| OUTLET_TEMP | 8.4 | 8.8 | 8.1 | 0.2 | degC |
| Volume Flow Rate | 332.2 | 333.8 | 326.7 | 1.7 | SUPM |
| Energy Flow Rate | 58.8 | 59.3 | 58.0 | 0.3 | kW |
| External Wind Speed | 3.5 | | | | m/s |
| External Wind Direction | 79.1 | | | | bearing |



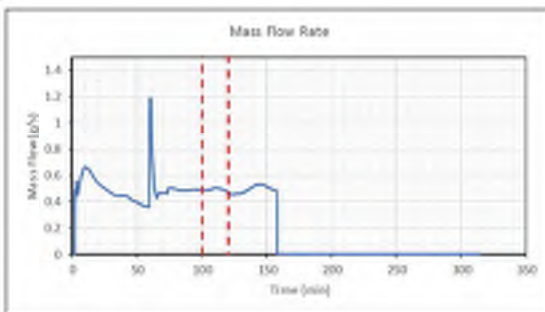
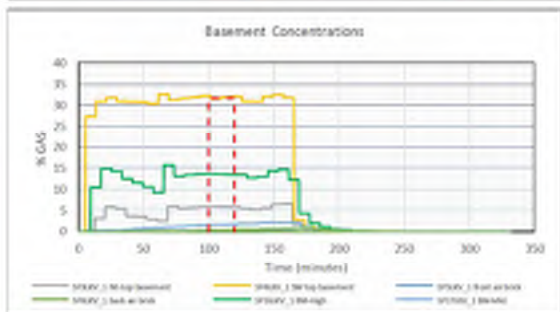
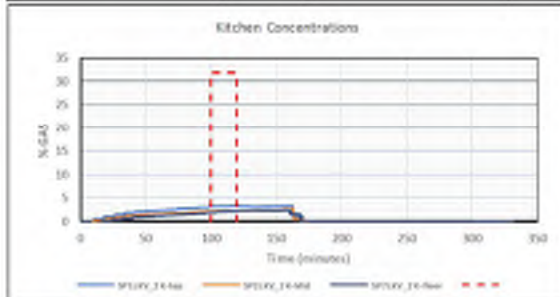
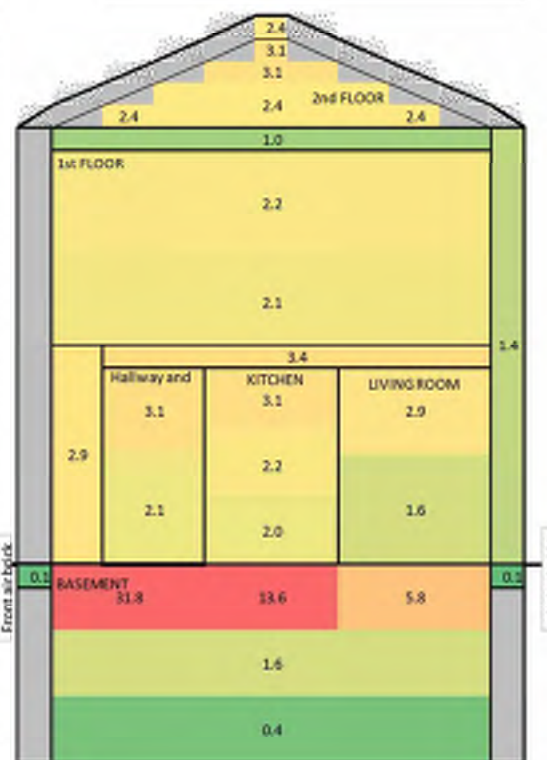
L3-A15 RESULT

Hy4Heat WP7 Test Result

| | |
|------------------------------------|----------------|
| MTP ID: L3-A15 | |
| Hole Size: 10 mm | |
| Location: Basement, no added vents | |
| Gas: hydrogen | |
| Date: 02/04/2020 | Time: 09:32:00 |
| Averaging Period Start: 100 min | End: 120 min |

Notes: Base line test in basement with no vents at ~20m3/hr, moderate

| Sensor | Average | Max | Min | STDEV | Units |
|--------------------------|---------|-------|-------|-------|---------|
| SP11KV_2 K-top | 3.1 | 3.2 | 3.1 | 0.0 | %vol |
| SP21KV_2 K-Mid | 2.2 | 2.2 | 2.2 | 0.0 | %vol |
| SP31KV_1 NE-top basement | 5.8 | 5.9 | 5.7 | 0.1 | %vol |
| SP41KV_1 SW-top basement | 31.8 | 32.2 | 31.6 | 0.2 | %vol |
| SP51KV_1 front air brick | 0.1 | 0.1 | 0.1 | 0.0 | %vol |
| SP61KV_1 back air brick | 0.1 | 0.1 | 0.1 | 0.0 | %vol |
| SP71KV_2 K-floor | 2.0 | 2.1 | 1.9 | 0.1 | %vol |
| SP81KV_2 LR-high | 2.9 | 3.0 | 2.9 | 0.1 | %vol |
| SP91KV_1 LR-Mid | 1.6 | 1.7 | 1.6 | 0.0 | %vol |
| SP10KV_1 H-high | 3.1 | 3.1 | 3.1 | 0.0 | %vol |
| SP11KV_2 H-Mid | 2.1 | 2.2 | 2.0 | 0.1 | %vol |
| SP12KV_2 FF-high | 2.2 | 2.3 | 2.0 | 0.1 | %vol |
| SP13KV_2 FF-Mid | 2.1 | 2.2 | 2.0 | 0.1 | %vol |
| SP14KV_2 AT-high | 3.1 | 3.2 | 2.9 | 0.1 | %vol |
| SP15KV_2 AT-Mid | 2.4 | 2.4 | 2.3 | 0.0 | %vol |
| SP16KV_1 RM-High | 13.6 | 13.7 | 13.5 | 0.1 | %vol |
| SP17KV_1 RM-Mid | 1.6 | 1.7 | 1.6 | 0.1 | %vol |
| SP18KV_1 RM-Low | 0.4 | 0.4 | 0.3 | 0.0 | %vol |
| SP19KV_2 NWALL-Cav | 1.4 | 1.5 | 1.2 | 0.1 | %vol |
| SP20KV_2 STUD-Cav | 2.9 | 3.0 | 2.8 | 0.1 | %vol |
| SP21KV_2 FF-Void | 3.4 | 3.5 | 3.3 | 0.1 | %vol |
| SP22KV_2 SF-Void | 1.0 | 1.1 | 0.9 | 0.1 | %vol |
| SP23KV_2 ROOF-Void | 2.4 | 2.9 | 2.0 | 0.4 | %vol |
| RELEASEPRESSURE | 0.0062 | 0.007 | 0.006 | 0.000 | bar |
| LOWFLOWMETER | 0.4894 | 0.499 | 0.467 | 0.007 | g/s |
| OUTLET_PRESSURE | 0.0303 | 0.035 | 0.028 | 0.001 | bar |
| OUTLET_TEMP | 11.2 | 11.8 | 10.9 | 0.2 | degC |
| Volume Flow Rate | 330.3 | 337.1 | 315.2 | 5.0 | SUPM |
| Energy Flow Rate | 58.7 | 59.9 | 56.0 | 0.9 | kW |
| External Wind Speed | 7.1 | | | | m/s |
| External Wind Direction | 264.8 | | | | bearing |



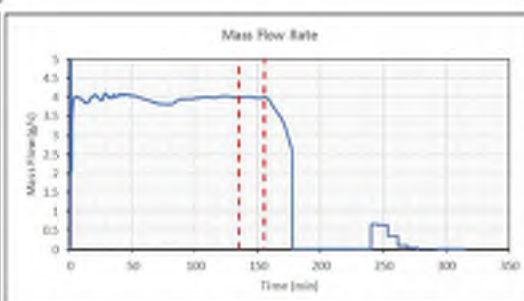
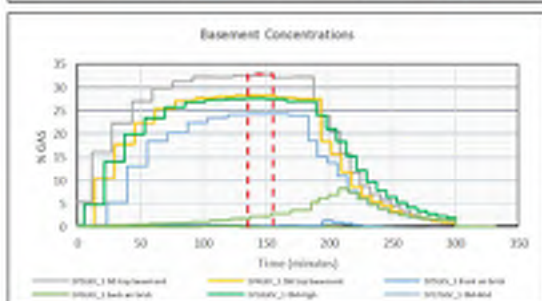
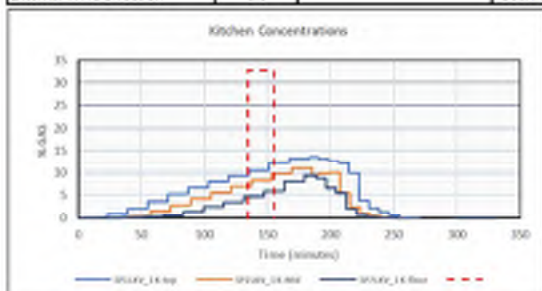
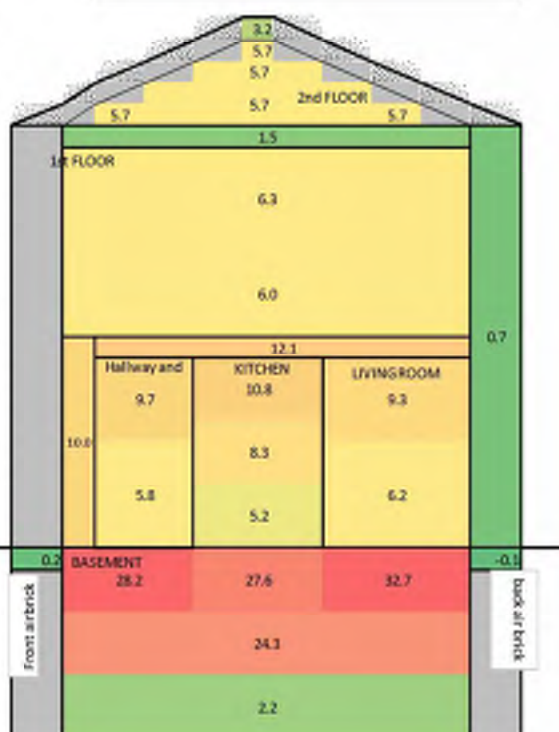
L3-A16 RESULT

Hy4Heat WP7 Test Result

| | |
|---------------------------------|----------------|
| MTP ID: L3-A16 | |
| Hole Size: 30 mm | |
| Location: Basement, no vent | |
| Gas: Methane | |
| Date: 11/03/2020 | Time: 07:34:00 |
| Averaging Period Start: 135 min | End: 155 min |

Notes: Base release, no vents open

| Sensor | Average | Max | Min | STDEV | units |
|--------------------------|---------|-------|-------|-------|---------|
| SP10KV_1E-top | 10.8 | 12.2 | 9.3 | 0.7 | %vol |
| SP20KV_1E-Mid | 8.3 | 9.9 | 7.1 | 0.6 | %vol |
| SP30KV_1NE-top basement | 32.7 | 32.8 | 32.5 | 0.1 | %vol |
| SP40KV_1SW-top basement | 28.2 | 28.3 | 28.2 | 0.0 | %vol |
| SP50KV_1 front air brick | 0.2 | 0.2 | 0.1 | 0.0 | %vol |
| SP60KV_1 back air brick | -0.1 | -0.1 | -0.2 | 0.1 | %vol |
| SP70KV_1E:floor | 5.2 | 5.9 | 4.8 | 0.6 | %vol |
| SP80KV_1LR-high | 9.3 | 9.9 | 9.1 | 0.4 | %vol |
| SP90KV_1LR-Mid | 6.2 | 7.1 | 5.2 | 0.5 | %vol |
| SP10KV_1H-High | 9.7 | 9.8 | 9.1 | 0.2 | %vol |
| SP11KV_1H-Mid | 5.8 | 6.0 | 5.3 | 0.3 | %vol |
| SP12KV_1FF-High | 6.3 | 6.5 | 5.8 | 0.3 | %vol |
| SP13KV_1FF-Mid | 6.0 | 6.4 | 5.6 | 0.4 | %vol |
| SP14KV_1AT-High | 5.7 | 6.0 | 5.4 | 0.3 | %vol |
| SP15KV_1AT-Mid | 5.7 | 6.1 | 5.4 | 0.3 | %vol |
| SP16KV_18M-High | 27.6 | 27.6 | 27.5 | 0.1 | %vol |
| SP17KV_18M-Mid | 28.3 | 24.4 | 24.1 | 0.0 | %vol |
| SP18KV_18M-Low | 2.2 | 2.8 | 1.7 | 0.3 | %vol |
| SP19KV_1N-WALL-Cav | 0.7 | 0.9 | 0.7 | 0.1 | %vol |
| SP20KV_1STUD-Cav | 10.0 | 10.3 | 9.3 | 0.4 | %vol |
| SP21KV_1FF-Void | 12.1 | 12.5 | 11.5 | 0.5 | %vol |
| SP22KV_1SF-Void | 1.5 | 1.8 | 1.2 | 0.3 | %vol |
| SP23KV_1ROOF-Void | 3.2 | 4.0 | 2.8 | 0.5 | %vol |
| RELEASEPRESSURE | 0.0325 | 0.034 | 0.033 | 0.000 | bar(g) |
| LOWFLOWMETERCH4 | 1.964 | 4.004 | 3.963 | 0.013 | bar(g) |
| OUTLET TEMP | 6.8 | 7.2 | 6.4 | 0.2 | degC |
| Volume Flow Rate | 333.2 | 334.9 | 331.4 | 1.1 | SLPM |
| Energy Flow Rate | 199.2 | 200.2 | 198.1 | 0.7 | kW |
| External Wind Speed | 1.5 | | | | m/s |
| External Wind Direction | 0.0 | | | | bearing |



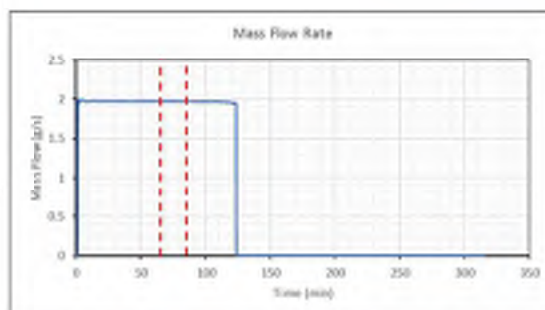
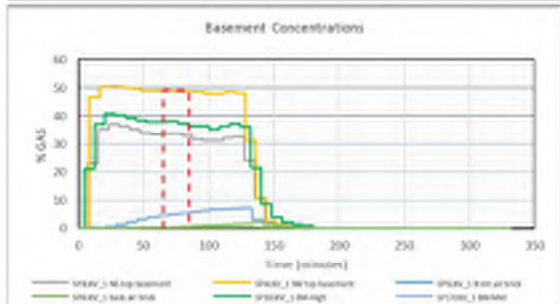
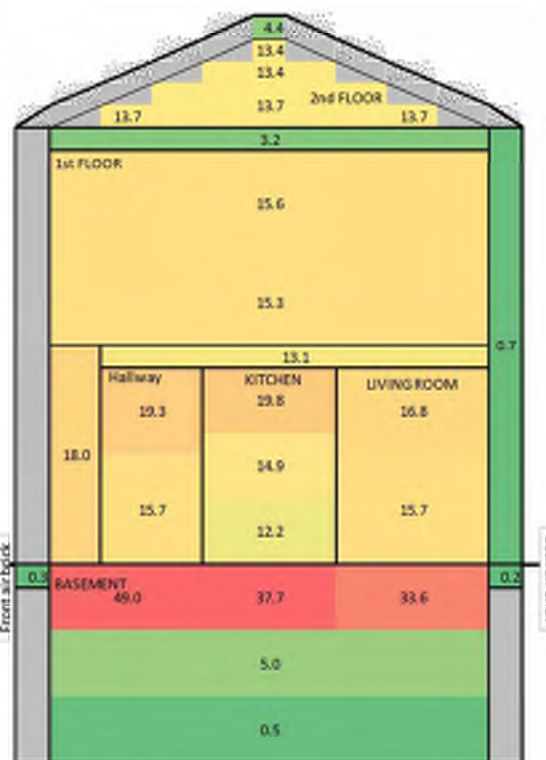
L3-A17 RESULT

Hy4Heat WP7 Test Result

| | |
|--|----------------|
| MTP ID: L3-A17 | |
| Hole Size: 15 mm | |
| Location: Basement with 200cm ² vent area | |
| Gas: hydrogen | |
| Date: 16/04/2020 | Time: 06:14:00 |
| Averaging Period Start: 65 min | End: 85 min |

Notes: 3x airbricks open. Funnels are at sealed airbricks.
Concentrations generally lower across whole house compared with similar no-vent case (L3-056).

| Sensor | Average | Max | Min | STDEV | Units |
|--------------------------|---------|--------|--------|-------|---------|
| SP11KV_1 K-top | 19.8 | 20.1 | 19.4 | 0.2 | %vol |
| SP21KV_1 K-Mid | 14.9 | 15.1 | 14.4 | 0.3 | %vol |
| SP31KV_1 NE-top basement | 33.6 | 33.8 | 33.1 | 0.3 | %vol |
| SP41KV_1 SW top basement | 49.0 | 49.2 | 48.7 | 0.2 | %vol |
| SP51KV_1 front air brick | 0.3 | 0.3 | 0.3 | 0.0 | %vol |
| SP61KV_1 back air brick | 0.2 | 0.2 | 0.1 | 0.0 | %vol |
| SP71KV_1 K-floor | 12.2 | 12.4 | 11.9 | 0.2 | %vol |
| SP81KV_1 LR-High | 16.8 | 17.2 | 16.1 | 0.4 | %vol |
| SP91KV_1 LR-Mid | 15.7 | 15.9 | 15.3 | 0.3 | %vol |
| SP10KV_1 H-High | 19.3 | 19.5 | 19.0 | 0.2 | %vol |
| SP11KV_1 H-Mid | 15.7 | 16.1 | 15.4 | 0.3 | %vol |
| SP12KV_1 FF-High | 15.6 | 15.8 | 15.2 | 0.3 | %vol |
| SP13KV_1 FF-Mid | 15.3 | 15.5 | 14.1 | 0.3 | %vol |
| SP14KV_1 AT-High | 13.4 | 13.7 | 12.4 | 0.3 | %vol |
| SP15KV_1 AT-Mid | 13.7 | 14.0 | 12.7 | 0.4 | %vol |
| SP16KV_1 RM-High | 37.7 | 38.1 | 36.5 | 0.4 | %vol |
| SP17KV_1 RM-Mid | 5.0 | 5.4 | 4.4 | 0.3 | %vol |
| SP18KV_1 RM-Low | 0.5 | 0.6 | 0.3 | 0.1 | %vol |
| SP19KV_2 NWALL-Cav | 0.7 | 1.8 | 0.0 | 0.7 | %vol |
| SP20KV_1 STUD-Cav | 18.0 | 18.2 | 17.9 | 0.1 | %vol |
| SP21KV_1 FF-Void | 13.1 | 13.3 | 11.8 | 0.3 | %vol |
| SP22KV_2 SF-Void | 3.2 | 3.6 | 2.6 | 0.3 | %vol |
| SP23KV_1 ROOF-Void | 4.4 | 5.0 | 3.6 | 0.4 | %vol |
| RELEASEPRESSURE | 0.0122 | 0.053 | 0.012 | 0.000 | bar |
| LOWFLOWMETER | 1.9712 | 1.973 | 1.969 | 0.001 | g/s |
| OUTLET_PRESSURE | 0.3095 | 0.311 | 0.306 | 0.001 | bar |
| OUTLET_TEMP | 6.9 | 7.4 | 6.5 | 0.3 | degC |
| Volume Flow Rate | 1330.4 | 1331.5 | 1329.0 | 0.7 | SUPM |
| Energy Flow Rate | 236.3 | 236.5 | 236.1 | 0.1 | kW |
| External Wind Speed | 3.0 | | | | m/s |
| External Wind Direction | 41.8 | | | | bearing |



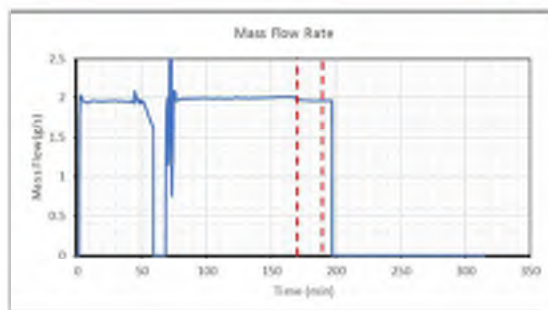
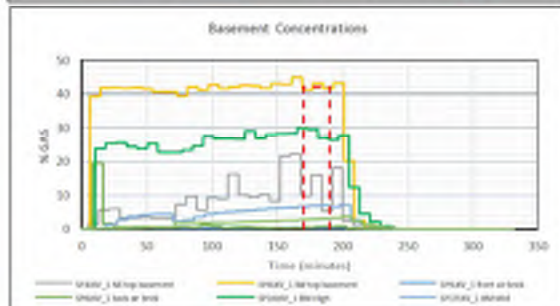
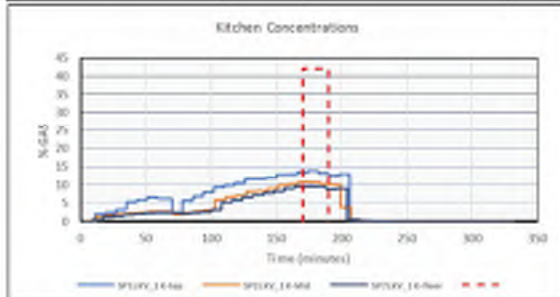
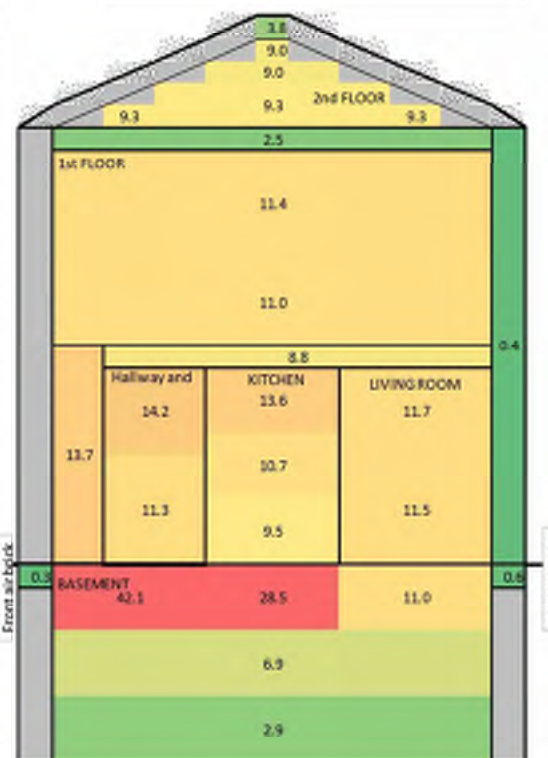
L3-A18 RESULT

Hy4Heat WP7 Test Result

| | |
|--|----------------|
| MTP ID: L3-A18 | |
| Hole Size: 15 mm | |
| Location: Basement with 400cm ² vent area | |
| Gas: hydrogen | |
| Date: 16/04/2020 | Time: 09:31:00 |
| Averaging Period Start: 170 min | End: 190 min |

Notes: Concentrations generally less throughout house than no vent Case (L3-056) and 200cm² vent case (L3-A17).

| Sensor | Average | Max | Min | STDEV | Units |
|--------------------------|---------|--------|--------|-------|---------|
| SP11KV_1 K-top | 13.6 | 13.9 | 13.2 | 0.3 | %vol |
| SP21KV_1 K-Mid | 10.7 | 10.9 | 10.4 | 0.2 | %vol |
| SP31KV_1 NE-top basement | 11.0 | 16.1 | 5.3 | 4.5 | %vol |
| SP41KV_1 SW top basement | 42.1 | 43.2 | 41.3 | 0.9 | %vol |
| SP51KV_1 front air brick | 0.3 | 0.4 | 0.3 | 0.0 | %vol |
| SP61KV_1 back air brick | 0.6 | 0.7 | 0.4 | 0.2 | %vol |
| SP71KV_1 K-floor | 9.5 | 9.6 | 8.8 | 0.2 | %vol |
| SP81KV_1 LR-High | 11.7 | 12.0 | 11.4 | 0.2 | %vol |
| SP91KV_1 LR-Mid | 11.5 | 11.5 | 11.5 | 0.0 | %vol |
| SP10KV_1 H-High | 14.2 | 14.2 | 14.1 | 0.1 | %vol |
| SP11KV_1 H-Mid | 11.3 | 11.5 | 11.1 | 0.2 | %vol |
| SP12KV_1 FF-High | 11.4 | 11.6 | 11.3 | 0.2 | %vol |
| SP13KV_1 FF-Mid | 11.0 | 11.2 | 10.5 | 0.2 | %vol |
| SP14KV_1 AT-High | 9.0 | 9.3 | 8.4 | 0.2 | %vol |
| SP15KV_1 AT-Mid | 9.3 | 9.5 | 8.8 | 0.2 | %vol |
| SP16KV_1 RM-High | 28.5 | 29.9 | 26.6 | 1.3 | %vol |
| SP17KV_1 RM-Mid | 6.9 | 7.0 | 6.7 | 0.1 | %vol |
| SP18KV_1 RM-Low | 2.9 | 3.0 | 2.8 | 0.1 | %vol |
| SP19KV_2 NWALL-Cav | 0.4 | 0.6 | 0.2 | 0.2 | %vol |
| SP20KV_1 STUD-Cav | 13.7 | 14.0 | 13.1 | 0.4 | %vol |
| SP21KV_2 FF-Void | 8.8 | 9.1 | 8.2 | 0.2 | %vol |
| SP22KV_2 SF-Void | 2.5 | 2.9 | 1.7 | 0.4 | %vol |
| SP23KV_2 ROOF-Void | 3.8 | 4.0 | 3.3 | 0.2 | %vol |
| RELEASEPRESSURE | 0.0120 | 0.013 | 0.012 | 0.000 | bar |
| LOWFLOWMETER | 1.9575 | 1.967 | 1.953 | 0.004 | g/s |
| OUTLET_PRESSURE | 0.3106 | 0.332 | 0.307 | 0.001 | bar |
| OUTLET_TEMP | 13.8 | 14.2 | 13.6 | 0.2 | degC |
| Volume Flow Rate | 1321.2 | 1327.4 | 1318.3 | 2.8 | SUPM |
| Energy Flow Rate | 234.7 | 235.8 | 234.2 | 0.5 | kW |
| External Wind Speed | 5.8 | | | | m/s |
| External Wind Direction | 84.1 | | | | bearing |



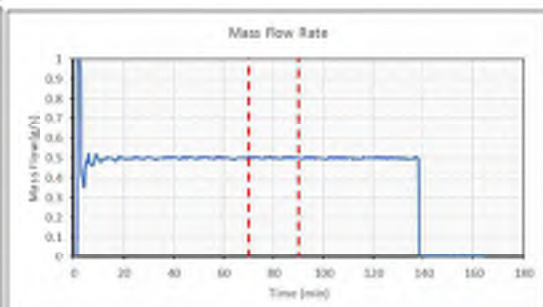
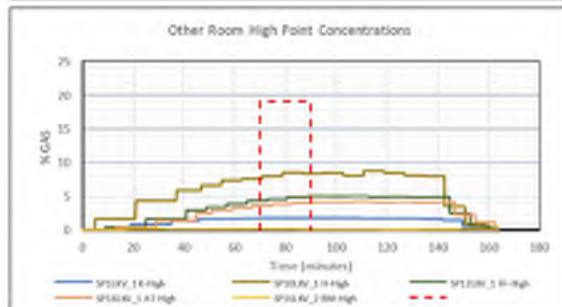
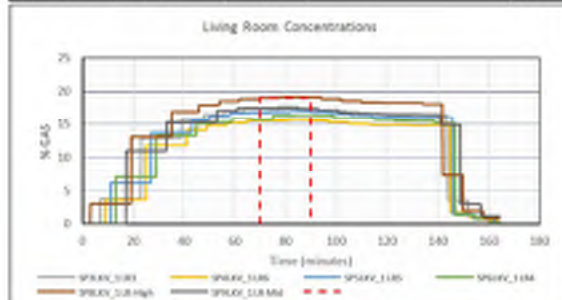
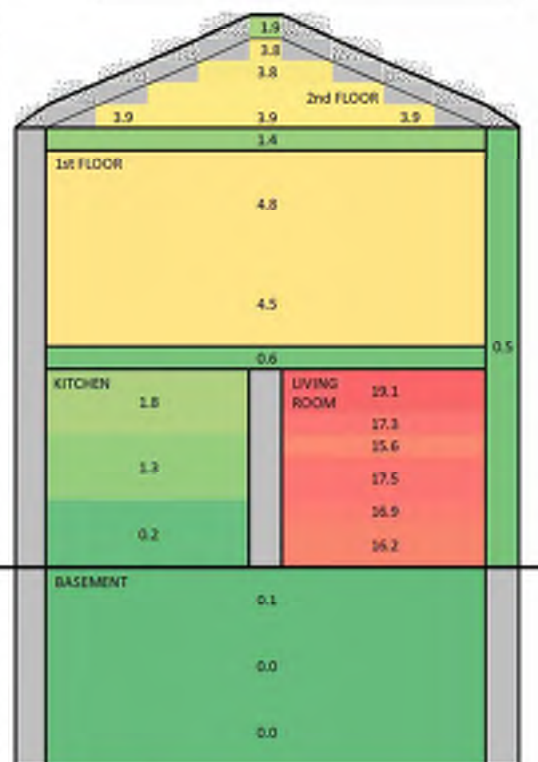
L3-A19 RESULT

Hy4Heat WP7 Test Result

| | |
|---|----------------|
| MTP ID: L3-A19 | |
| Hole Size: 10 mm | |
| Location: living room with 300cm ² vent above door | |
| Gas: hydrogen | |
| Date: 29/04/2020 | Time: 06:42:00 |
| Averaging Period Start: 70 min | End: 90 min |

Notes: No no-vent case for comparison - this test shows marginally higher concentrations to L3-A20 which had a larger vent above the living room door.

| Sensor | Average | Max | Min | STDEV | Units |
|-------------------------|---------|-------|-------|-------|---------|
| SP1KLV_1 K-High | 1.8 | 1.8 | 1.8 | 0.0 | %vol |
| SP2KLV_1 K-Mid | 1.3 | 1.4 | 1.2 | 0.0 | %vol |
| SP3KLV_1 LR3 | 17.3 | 17.4 | 17.2 | 0.1 | %vol |
| SP4KLV_1 LR6 | 15.6 | 15.7 | 15.5 | 0.1 | %vol |
| SP5KLV_1 LR5 | 16.9 | 17.0 | 16.7 | 0.1 | %vol |
| SP6KLV_1 LR4 | 16.2 | 16.3 | 15.7 | 0.3 | %vol |
| SP7KLV_1 K-Low | 0.2 | 0.2 | 0.2 | 0.0 | %vol |
| SP8KLV_1 LR-High | 19.1 | 19.2 | 19.0 | 0.1 | %vol |
| SP9KLV_1 LR-Mid | 17.5 | 17.6 | 17.4 | 0.1 | %vol |
| SP10KLV_1 H-High | 8.3 | 8.6 | 7.6 | 0.3 | %vol |
| SP11KLV_1 H-Mid | 4.0 | 4.2 | 3.7 | 0.1 | %vol |
| SP12KLV_1 FF-High | 4.8 | 5.1 | 4.4 | 0.2 | %vol |
| SP13KLV_1 FF-Mid | 4.5 | 4.9 | 4.2 | 0.2 | %vol |
| SP14KLV_1 AT-High | 3.8 | 4.0 | 3.6 | 0.2 | %vol |
| SP15KLV_1 AT-Mid | 3.9 | 4.1 | 3.7 | 0.2 | %vol |
| SP16KLV_2 BM-High | 0.1 | 0.1 | 0.1 | 0.0 | %vol |
| SP17KLV_2 BM-Mid | 0.0 | 0.0 | 0.0 | 0.0 | %vol |
| SP18KLV_2 BM-Low | 0.0 | 0.0 | 0.0 | 0.0 | %vol |
| SP19KLV_2 NWALL-Cav | 0.5 | 0.7 | 0.3 | 0.2 | %vol |
| SP20KLV_2 STUD-Cav | 9.8 | 10.1 | 9.3 | 0.2 | %vol |
| SP21KLV_2 FF-Void | 0.6 | 0.7 | 0.5 | 0.0 | %vol |
| SP22KLV_2 SF-Void | 1.4 | 1.6 | 1.2 | 0.2 | %vol |
| SP23KLV_2 ROOF-Void | 1.9 | 2.0 | 1.7 | 0.2 | %vol |
| OUTLET PRESSURE | 0.0379 | 0.039 | 0.034 | 0.001 | bar |
| LOWFLOWMETER | 0.5001 | 0.506 | 0.495 | 0.003 | g/s |
| OUTLET TEMP | 6.6 | 6.8 | 6.4 | 0.1 | degC |
| Volume Flow Rate | 337.5 | 341.2 | 333.8 | 1.9 | SLPM |
| Energy Flow Rate | 60.0 | 60.6 | 59.3 | 0.3 | kW |
| External Wind Speed | 2.8 | | | | m/s |
| External Wind Direction | 76.1 | | | | bearing |



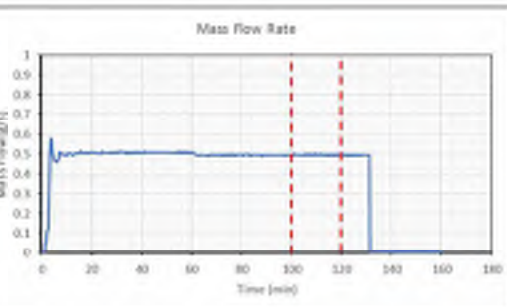
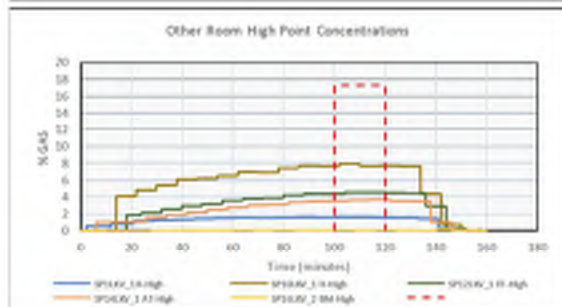
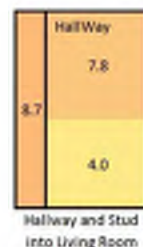
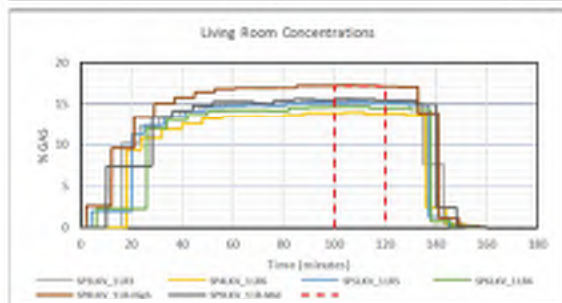
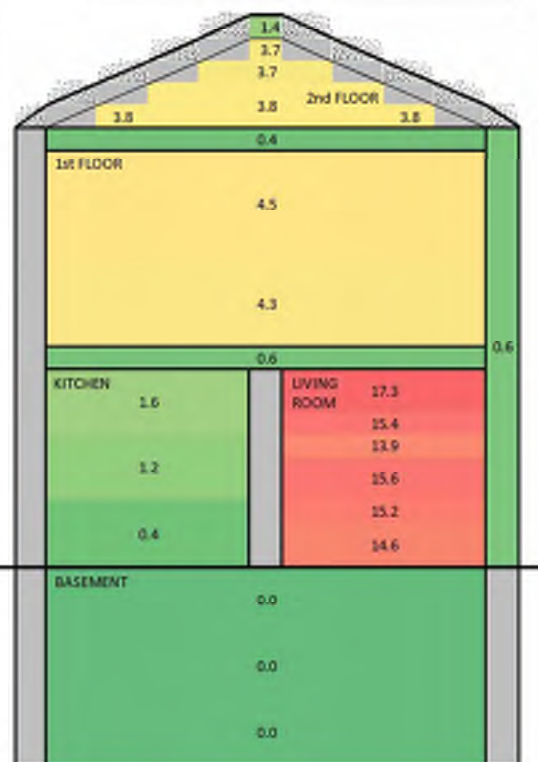
L3-A20 RESULT

Hy4Heat WP7 Test Result

| | |
|--|----------------|
| MTP ID: L3-A20 | |
| Hole Size: 10 mm | |
| Location: Living Room Test with 200cm ² vent above door | |
| Gas: hydrogen | |
| Date: 29/04/2020 | Time: 10:30:00 |
| Averaging Period Start: 300 min | End: 120 min |

Notes: Marginally lower living room and rest of house concentrations than L3-A19 which had a smaller vent above the living room door.

| Sensor | Average | Max | Min | STDEV | Units |
|-------------------------|---------|-------|-------|-------|---------|
| SP1KV_1 K-High | 1.6 | 1.6 | 1.5 | 0.0 | %vol |
| SP2KV_1 K-Mid | 1.2 | 1.2 | 1.2 | 0.0 | %vol |
| SP3KV_1 LR3 | 15.4 | 15.5 | 15.4 | 0.1 | %vol |
| SP4KV_1 LR6 | 13.9 | 14.0 | 13.8 | 0.1 | %vol |
| SP5KV_1 LR5 | 15.2 | 15.3 | 15.1 | 0.1 | %vol |
| SP6KV_1 LR4 | 14.6 | 14.7 | 14.5 | 0.1 | %vol |
| SP7KV_1 K-Low | 0.4 | 0.4 | 0.3 | 0.0 | %vol |
| SP8KV_1 LR-High | 17.3 | 17.3 | 17.2 | 0.0 | %vol |
| SP9KV_1 LR-Mid | 15.6 | 15.7 | 15.5 | 0.1 | %vol |
| SP10KV_1 H-High | 7.8 | 8.0 | 7.7 | 0.1 | %vol |
| SP11KV_1 H-Mid | 4.0 | 4.0 | 3.9 | 0.0 | %vol |
| SP12KV_1 FF-High | 4.5 | 4.5 | 4.3 | 0.1 | %vol |
| SP13KV_1 FF-Mid | 4.3 | 4.4 | 4.2 | 0.1 | %vol |
| SP14KV_1 AT-High | 3.7 | 3.7 | 3.6 | 0.1 | %vol |
| SP15KV_1 AT-Mid | 3.8 | 3.9 | 3.8 | 0.0 | %vol |
| SP16KV_2 BM-High | 0.0 | 0.0 | 0.0 | 0.0 | %vol |
| SP17KV_2 BM-Mid | 0.0 | 0.0 | 0.0 | 0.0 | %vol |
| SP18KV_2 BM-Low | 0.0 | 0.1 | -0.1 | 0.1 | %vol |
| SP19KV_2 NWALL-Cav | 0.6 | 0.9 | 0.5 | 0.2 | %vol |
| SP20KV_1 STUJ-Cav | 8.7 | 8.8 | 8.6 | 0.1 | %vol |
| SP21KV_2 FF-Void | 0.6 | 0.6 | 0.4 | 0.1 | %vol |
| SP22KV_2 SF-Void | 0.4 | 0.5 | 0.3 | 0.1 | %vol |
| SP23KV_2 ROOF-Void | 1.4 | 1.6 | 1.1 | 0.2 | %vol |
| OUTLET PRESSURE | 0.0381 | 0.039 | 0.036 | 0.001 | barg |
| LOWFLOWMETER | 0.4940 | 0.501 | 0.490 | 0.003 | g/s |
| OUTLET TEMP | 8.7 | 8.8 | 8.6 | 0.1 | degC |
| Volume Flow Rate | 232.4 | 237.9 | 230.9 | 1.8 | SLPM |
| Energy Flow Rate | 59.2 | 60.0 | 58.8 | 0.3 | kW |
| External Wind Speed | 3.2 | | | | m/s |
| External Wind Direction | 112.7 | | | | bearing |





APPENDIX C: AIR LEAKAGE REPORT: BASEMENT INCLUDED



Air Leakage Test Report

In compliance with ATTMA TSL1 and TSL2

Northern Air Tightness Testing Services Ltd

Building Address: East House
MCO 5
Brampton, Cumbria
England

Performed for:

Performed by: Phil Ramshaw
Test date: 2019-10-14
Associated Test file: East House Whole House
Report Number: 0000
Unique Property ID Number:

Summary


| | | |
|---|---|--|
|  FanTestk | version: 5.11.46 | licensed to: Northern Air Tightness Testing Services Ltd |
| Test date: 2019-10-14 | By: Phil Ramshaw | |
| Customer: | | |
| Building Lot Number: | | |
| Building address: | East House Excluding Cellar MOD 5 Brampton, Cumbria England | |

| Building and Test Information | |
|---|--------------------------|
| Test file name: | East House - Whole House |
| Building volume [m ³]: | 345 |
| Envelope Area [m ²]: | 309 |
| Floor Area [m ²]: | 37.7 |
| Building Height [from ground to top] [m]: | 0 |

| Results | |
|---|--------|
| Air flow at 50 Pa, Q ₅₀ [m ³ /h] | 1725.5 |
| Air changes, n ₅₀ | 5.00 |
| Equivalent leakage area at 50 Pa [cm ²] | 271.0 |
| Permeability at 50 Pa [m ³ /h/m ²] | 5.584 |

Compliance

If you are not happy with my service, please contact me: Phil Ramshaw, or the Scheme Manager at BINOT.



Assumptions and warnings

While FanTestic software may calculate air leakage results based on user input, use of this software does not in any way guarantee these results.

Building Information

Building Measurements

| | |
|--|-----|
| Building Volume [m ³]: | 345 |
| Envelope Area (A _v) [m ²]: | 309 |
| Building Height (from ground to top) [m]: | 0 |

Heating/Ventilation System

HVAC Systems Present:

None

Pictures

Test Method

Carried out in accordance with the following standards:

- ATTMA T51 Issue 2 – Measuring Air Permeability of Building Envelopes
- BS EN13829:2001 Thermal Performance of Buildings
- BINDT – Quality Procedures and Explanatory Notes for Air Tightness Testing

The building was tested using the equipment listed in the equipment appendix.

Openings and Temporary Sealing

cellar

Deviations from Standard Methods:

none

Large Building Setup Notes:

Tester Complaints:

House 3

Discussion of Results

Combined Test Data (Tested in one direction only)

| | Results | Uncertainty |
|---|---------|-------------|
| Air flow at 50 Pa, Q ₅₀ [m ³ /h] | 1725.5 | ±/− 3.7% |
| Air changes, n ₅₀ | 5.00 | ±/− 3.7% |
| Equivalent leakage area at 50 Pa [cm ²] | 271.0 | ±/− 3.7% |
| Permeability at 50 Pa [m ³ /h/m ²] | 5.584 | ±/− 3.7% |

Air Leakage Test Data Appendix-

Depressurize Data Set

Test Dataset Date: 2019-10-14

Start time: 13:00:00

Test was carried out under Method B (method A, B or C)

(add notes here)

| Environmental Conditions | | |
|--------------------------|---------------------|-------------------------|
| Wind speed: | 0 | from the |
| Operator Location: | inside the building | |
| Initial Bias Pressure: | 0.18 Pa | |
| Final Bias Pressure: | 0.20 Pa | |
| Average Bias Pressure: | 0.19 Pa | |
| Initial Temperature: | indoors: 15 C | outdoors: 13 C |
| Final Temperature: | indoors: 15 C | outdoors: 13 C |
| Barometric Pressure | 98 kPa | from Direct measurement |

| Test Analysis | | | |
|--|---------|-----------------------|---------|
| Coefficient of Determination, r^2 : | 0.9863 | 95% confidence limits | |
| Slope, n : | 0.761 | 0.65810 | 0.86450 |
| Intercept, C_{50} [$m^3/h/Pa^n$]: | 87.965 | 60.23 | 128.5 |
| | Results | Uncertainty | |
| Air flow at 50 Pa, Q_{50} [m^3/h] | 1725.6 | ±/3.7% | |
| Air changes, n_{50} : | 5.002 | ±/3.7% | |
| Equivalent leakage area at 50 Pa [cm^2] | 270.8 | ±/3.7% | |
| Permeability at 50 Pa, AP_{50} [$m^3/h/m^2$] | 5.5868 | ±/3.7% | |

| Measured pressure [Pa] | | -25.0 | -30.0 | -35.0 | -40.0 | -45.0 | -50.0 | -55.0 | | | | | |
|-------------------------------|-------------------|---------|---------|---------|---------|---------|---------|---------|--|--|--|--|--|
| Induced Pressure [Pa] | | -25.2 | -30.2 | -35.2 | -40.2 | -45.2 | -50.2 | -55.2 | | | | | |
| #1, Range CB | Fan Pressure [Pa] | 52.0 | 80.0 | 89.0 | 110.0 | 130.0 | 157.0 | 177.0 | | | | | |
| | Flow [m^3/h] | 988.0 | 1230 | 1298 | 1446 | 1574 | 1733 | 1842 | | | | | |
| Total Flow, Q_u [m^3/h] | | 987.957 | 1229.91 | 1298.42 | 1446.10 | 1574.51 | 1732.67 | 1841.81 | | | | | |
| Corrected | | 995.610 | 1239.45 | 1308.48 | 1457.30 | 1586.51 | 1746.29 | 1856.08 | | | | | |

| | | | | | | | | | | | | | |
|---|--|-------|------|-------|-------|-------|------|-------|--|--|--|--|--|
| Flow, Q _{avg} (m ³ /h) | | | | | | | | | | | | | |
| Error (%) | | -2.9% | 5.3% | -3.1% | -0.5% | -0.9% | 0.7% | -0.4% | | | | | |

11 induced pressures each taken for 0 of the required 20 seconds.

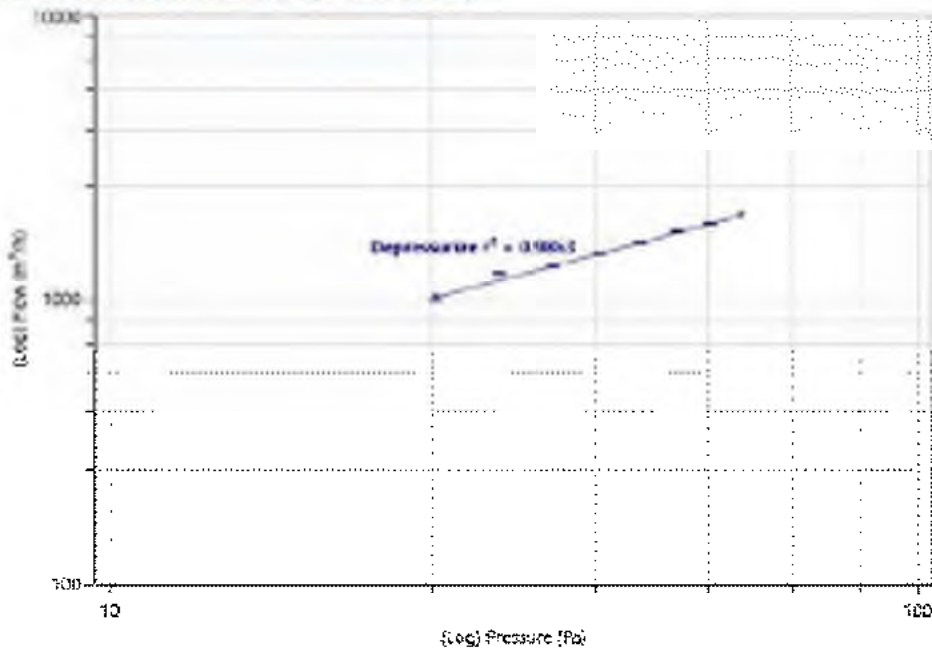
12 baseline pressures each taken for 0 of required 10 seconds.

Average baseline, ΔP: 0.19 Pa

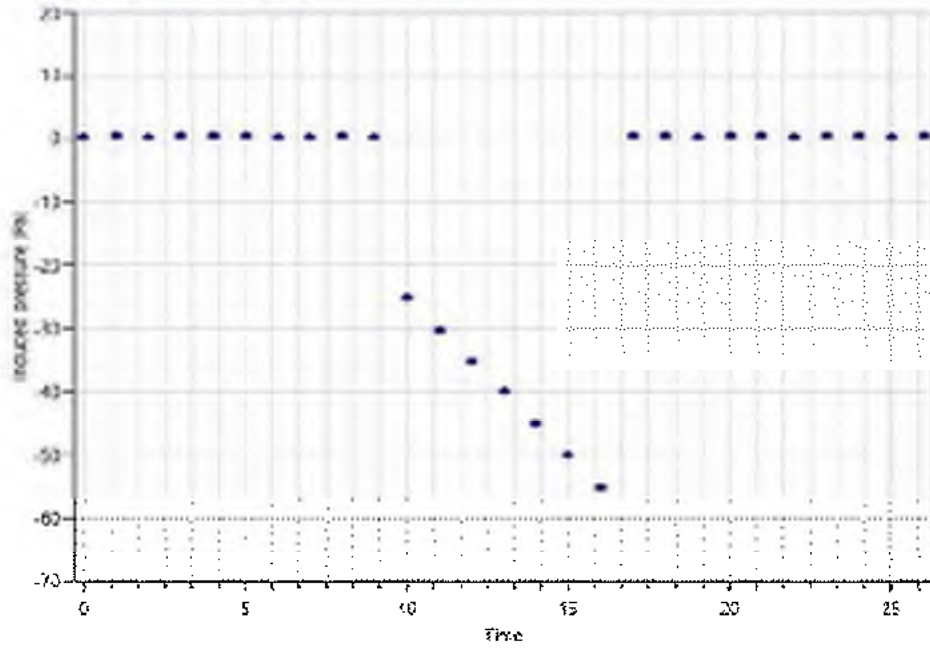
| | | | |
|---------------------------|-----------|------------|------------|
| Static Pressure Averages: | | | |
| Average baseline [Pa] | ΔP 0.19 | | |
| initial [Pa] | ΔP01 0.18 | ΔP01- 0.00 | ΔP01+ 0.18 |
| final [Pa] | ΔP02 0.20 | ΔP02- 0.00 | ΔP02+ 0.20 |

| | | | | | | | | | | | | |
|------------------------|------|------|------|------|------|------|------|------|------|------|--|--|
| Baseline, initial [Pa] | 0.10 | 0.20 | 0.10 | 0.30 | 0.40 | 0.20 | 0.10 | 0.10 | 0.20 | 0.10 | | |
| Baseline, final [Pa] | 0.30 | 0.20 | 0.10 | 0.20 | 0.30 | 0.10 | 0.30 | 0.20 | 0.10 | 0.20 | | |

Flow vs Induced Pressure (Depressurize Set)



Building Gauge Pressure (Depressurize Set)



Test Equipment

The following test equipment was used in the performance of the air leakage tests.

| | Fan | Fan serial | Fan location | Gauge | Gauge serial | Gauge Calibration |
|----|---------------|------------|--------------|-------|--------------|-------------------|
| #1 | Retrotec 1000 | 1fn002401 | | OM32 | 401295 | |

Fan Calibration Certificate Retrotec 1000:

| Retrotec 1000 1fn002401 Fan last calibrated: 2018-08-30 (Flow Equation Parameters - (-)) . Change. m ³ /s | | | | | | | |
|---|--------|------------|-------|-----|------------|----|-----|
| Range | n | K | K1 | K2 | K3 | K4 | MF |
| Oper(22) | 0.512 | 0.2486 | 0 | 0.8 | 0 | 1 | 8.6 |
| A | 0.5016 | 0.1302 | 0 | 1 | 0 | 1 | 12 |
| B | 0.4341 | 0.0853 | 0 | 0.3 | 0 | 1 | 10 |
| C8 | 0.5085 | 0.0368 | 0 | 0.5 | 0 | 1 | 10 |
| C6 | 0.5071 | 0.0282 | 0 | 0.5 | 0 | 1 | 10 |
| C4 | 0.5186 | 0.0187 | 0 | 0.5 | 0 | 1 | 10 |
| C2 | 0.5085 | 0.0103 | 0 | 0.5 | 0 | 1 | 10 |
| C1 | 0.5472 | 0.0047 | 0 | 0.4 | 0 | 1 | 10 |
| L4 | 0.43 | 0.00193475 | 0.003 | 1 | 0.00000019 | 1 | 10 |
| L2 | 0.502 | 0.00097589 | 0 | 0.5 | 0.00000005 | 1 | 10 |
| L1 | 0.4925 | 0.00054812 | 0.1 | 0.5 | 0.00000005 | 1 | 10 |

Fan Pressure (FP) is the measured fan pressure when using a self-referenced fan or when Room Pressure (RP) is negative. If using a fan which is not self-referenced, and Room Pressure is positive, Fan Pressure is calculated by subtracting the measured Room Pressure from the Absolute Value of the Fan Pressure.

If $PrA > 0$ and fan is not self-referencing: $FP = |PrB| - PrA$

If $PrA < 0$ or fan is self-referencing: $FP = PrB$

Flow calculations are not valid if Fan Pressure is less than either M^2 or $(K2 \times \{RP\})$.

Flow in m^3/s using the above coefficients is calculated as follows for standard Ranges:

$$Flow = (FP - (RP \times K2))^{0.5} \times (K1 + (K3 \times FP))$$



APPENDIX D: AIR LEAKAGE REPORT: BASEMENT EXCLUDED




Air Leakage Test Report

In compliance with ATTMA TSL1 and TSL2

Northern Air Tightness Testing Services Ltd

| | |
|----------------------------|---|
| Building Address: | East House Excluding Cellar MOD 5 Brampton, Cumbria England |
| Performed for: | |
| Performed by: | Phil Ramsdell |
| Test date: | 2019-10-14 |
| Associated Test file: | East House - Excluding Cellar (2) |
| Report Number: | 0000 |
| Unique Property ID Number: | |

Summary

| | | |
|---|---|--|
|  | version: 5.11.46 | licensed to: Northern Air Tightness Testing Services Ltd |
| Test date: 2019-09-14 | By: Phil Ramshaw | |
| Customer: | | |
| Building Lot Number: | | |
| Building address: | East House Excluding Cellar MOO 5 Brampton, Cumbria England | |

| Building and Test Information | |
|---|-----------------------------------|
| Test file name: | East House - Excluding Cellar (2) |
| Building volume [m ³]: | 247 |
| Envelope Area [m ²]: | 245.3 |
| Floor Area [m ²]: | 37.7 |
| Building Height (from ground to top) [m]: | 0 |

| Results | |
|---|--------|
| Air flow at 50 Pa, Q ₅₀ [m ³ /h] | 1048.5 |
| Air changes, n ₅₀ | 4.23 |
| Equivalent leakage area at 50 Pa [cm ²] | 198.0 |
| Permeability at 50 Pa [m ³ /h/m ²] | 4.259 |

Compliance

If you are not happy with my service, please contact me: Phil Ramshaw, or the Scheme Manager at EIMOT.



Assumptions and warnings

While FanTestic software may calculate air leakage results based on user input, use of this software does not in any way guarantee these results.

Building Information

Building Measurements:

| | |
|--|-------|
| Building Volume [m ³] | 247 |
| Envelope Area (A _e) [m ²]: | 245.2 |
| Building Height (from ground to top) [m] | 0 |

Heating/Ventilation System

HVAC Systems Present:

None

Pictures

Test Method

Carried out in accordance with the following standards:

- ASTM E1825 – Measuring Air Permeability of Building Envelopes
- BS EN13829:2001 Thermal Performance of Buildings
- BMDT – Quality Procedures and Explanatory Notes for Air Tightness Testing

The building was tested using the equipment listed in the equipment appendix.

Openings and Temporary Sealing

cellar

Deviations from Standard Methods:

none

Large Building Setup Notes:

Tester Complaints:

House 1

Discussion of Results

Combined Test Data (Tested in one direction only)

| | Results | Uncertainty |
|---|---------|-------------|
| Air flow at 50 Pa, Q ₅₀ [m ³ /h] | 1044.5 | ±/± 3% |
| Air changes, n ₅₀ | 4.23 | ±/± 3% |
| Equivalent leakage area at 50 Pa [m ²] | 198.0 | ±/± 3% |
| Permeability at 50 Pa [m ³ /h/m ²] | 4.259 | ±/± 3% |

Air Leakage Test Data Appendix-

Depressurize Data Set

Test Dataset Date: 2019-08-14

Start time: 12:06:00

Test was carried out under Method B (method A, B or C).

(add notes here)

| Environmental Conditions | | |
|--------------------------|---------------------|-------------------------|
| Wind speed: | 0 | from the |
| Operator Location: | inside the building | |
| Initial Bias Pressure: | 0.16 Pa | |
| Final Bias Pressure: | 0.16 Pa | |
| Average Bias Pressure: | 0.16 Pa | |
| Initial Temperature: | indoors: 15 C | outdoors: 13 C |
| Final Temperature: | indoors: 15 C | outdoors: 13 C |
| Barometric Pressure | 98 kPa | from Direct measurement |

| Test Analysis | | | |
|--|---------|-----------------------|---------|
| Coefficient of Determination, r^2 | 0.9944 | 95% confidence limits | |
| Slope, n | 0.719 | 0.65680 | 0.78097 |
| Intercept, C_{50} ($m^3/h/Pa^n$) | 62.884 | 50.07 | 78.97 |
| | Results | Uncertainty | |
| Air flow at 50 Pa, Q_{50} (m^3/h) | 1044.6 | +/-2.3% | |
| Air changes, n_{50} | 4.223 | +/-2.3% | |
| Equivalent leakage area at 50 Pa (cm^2) | 197.8 | +/-2.3% | |
| Permeability at 50 Pa, AP_{50} ($m^3/h/m^2$) | 4.2593 | +/-2.3% | |

| | | | | | | | | | | | | |
|-------------------------------|--|---------|---------|---------|---------|---------|---------|---------|--|--|--|--|
| Measured pressure [Pa] | | -25.0 | -30.0 | -35.0 | -40.0 | -45.0 | -50.0 | -55.0 | | | | |
| Induced Pressure [Pa] | | -25.2 | -30.2 | -35.2 | -40.2 | -45.2 | -50.2 | -55.2 | | | | |
| WL Range C4 Fan Pressure [Pa] | | 73.0 | 99.0 | 120.0 | 149.0 | 175.0 | 196.0 | 215.0 | | | | |
| Flow [m^3/h] | | 623.0 | 729.6 | 806.1 | 901.9 | 980.6 | 1040 | 1091 | | | | |
| Total Flow, Q_t [m^3/h] | | 622.965 | 729.593 | 806.134 | 901.900 | 980.356 | 1039.70 | 1090.80 | | | | |
| Corrected | | 627.190 | 745.245 | 812.379 | 908.887 | 987.950 | 1047.75 | 1099.25 | | | | |

| | | | | | | | | | | | | | |
|--|--|-------|------|------|------|------|-------|-------|--|--|--|--|--|
| Flow, Q_{ave} [m ³ /h] | | | | | | | | | | | | | |
| Error [%] | | -1.8% | 1.0% | 0.0% | 1.6% | 1.5% | -0.1% | -2.2% | | | | | |

11 induced pressures each taken for 0 of the required 20 seconds.

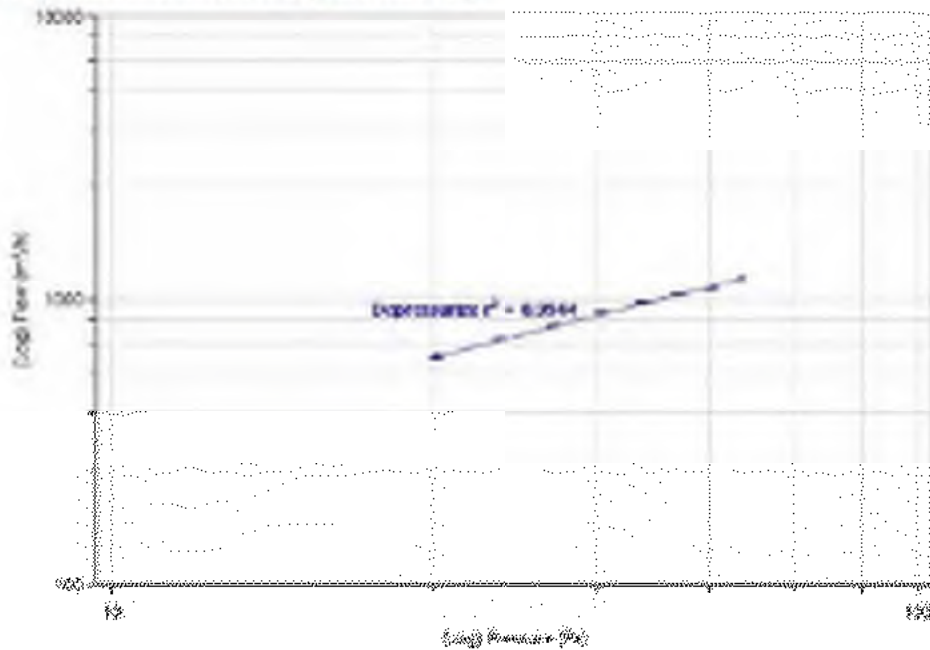
12 baseline pressures each taken for 0 of required 30 seconds.

Average Baseline, ΔP : 0.16 Pa

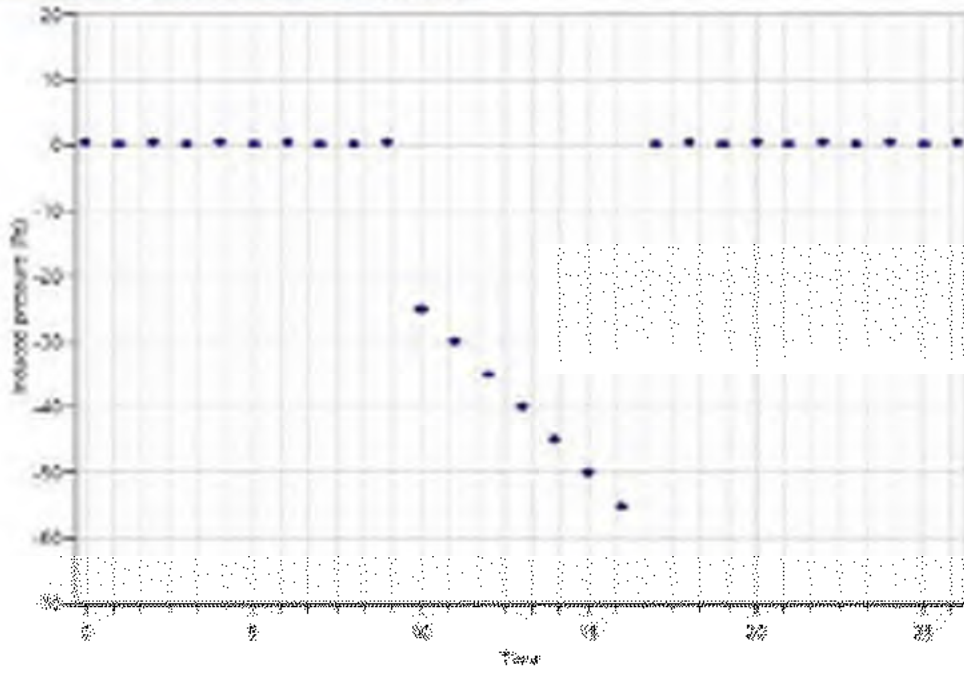
| | | | |
|---------------------------|-------------------|-------------------|--------------------|
| Static Pressure Averages: | | | |
| Average Baseline [Pa] | ΔP 0.16 | | |
| Initial [Pa] | $\Delta P01$ 0.16 | $\Delta P01$ 0.00 | $\Delta P01+$ 0.16 |
| Final [Pa] | $\Delta P02$ 0.16 | $\Delta P02$ 0.00 | $\Delta P02+$ 0.16 |

| | | | | | | | | | | | | |
|------------------------|------|------|------|------|------|------|------|------|------|------|--|--|
| Baseline, Initial [Pa] | 0.20 | 0.10 | 0.20 | 0.30 | 0.20 | 0.10 | 0.20 | 0.30 | 0.10 | 0.30 | | |
| Baseline, Final [Pa] | 0.10 | 0.20 | 0.30 | 0.30 | 0.10 | 0.30 | 0.10 | 0.20 | 0.10 | 0.20 | | |

Flow vs Induced Pressure (Depressurize Set)



Building Gauge Pressure (Depressurize Set)



Test Equipment

The following test equipment was used in the performance of the air leakage tests:

| | Fan | Fan serial | Fan location | Gauge | Gauge serial | Gauge Calibration |
|----|---------------|------------|--------------|-------|--------------|-------------------|
| #1 | Retrotec 1000 | 1fn002401 | | DM32 | 401293 | |

Fan Calibration Certificate Retrotec 1000:

| Retrotec 1000 1fn002401 Fan last calibrated: 2018-08-30 [How Equation Parameters - -] . | | | | | | | |
|--|--------|------------|-------|-----|------------|----|-----|
| Change: m ³ /s | | | | | | | |
| Range | n | K | K1 | K2 | K3 | K4 | M0 |
| Open(22) | 0.512 | 0.2486 | 0 | 0.8 | 0 | 1 | 8.6 |
| A | 0.5036 | 0.1302 | 0 | 1 | 0 | 1 | 12 |
| B | 0.4841 | 0.0853 | 0 | 0.3 | 0 | 1 | 10 |
| C0 | 0.5085 | 0.0368 | 0 | 0.5 | 0 | 1 | 10 |
| C6 | 0.5071 | 0.0282 | 0 | 0.5 | 0 | 1 | 10 |
| C4 | 0.5186 | 0.0187 | 0 | 0.5 | 0 | 1 | 10 |
| C2 | 0.5085 | 0.0303 | 0 | 0.5 | 0 | 1 | 10 |
| C1 | 0.5472 | 0.0047 | 0 | 0.4 | 0 | 1 | 10 |
| L4 | 0.48 | 0.00232475 | 0.003 | 1 | 0.00000015 | 1 | 10 |
| L2 | 0.502 | 0.00097569 | 0 | 0.5 | 0.00000005 | 1 | 10 |
| L1 | 0.4925 | 0.00054812 | 0.1 | 0.5 | 0.00000005 | 1 | 10 |

Fan Pressure (FP) is the measured fan pressure when using a self-referenced fan or when Room Pressure (RP) is negative. If using a fan which is not self-referenced, and Room Pressure is positive, Fan Pressure is calculated by subtracting the measured Room Pressure from the Absolute Value of the Fan Pressure.

If $P_{A \rightarrow Q}$ and fan is not self-referencing: $FP = |P_{VB}| - P_{VA}$

If $P_{A \rightarrow Q}$ or fan is self-referencing: $FP = P_{VB}$

Flow calculations are not valid if Fan Pressure is less than either MP or $(K2 \times [RP])$.

Flow in m^3/s using the above coefficients is calculated as follows for standard Ranges:

$$flow = (FP - (MP) \times K1)^2 \times (K + (K3 \times FP))$$



About DNV GL

DNV GL is a global quality assurance and risk management company. Driven by our purpose of safeguarding life, property and the environment, we enable our customers to advance the safety and sustainability of their business. We provide classification, technical assurance, software and independent expert advisory services to the maritime, oil & gas, power and renewables industries. We also provide certification, supply chain and data management services to customers across a wide range of industries. Operating in more than 100 countries, our experts are dedicated to helping customers make the world safer, smarter and greener.



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