Hy4Heat
demonstrating
hydrogen for heat

Department for
Business, Energy
& Industrial Strategy

WORK PACKAGE 7

Safety Assessment:

Experimental Testing – Cupboard 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.

DNV·GL

HY4HEAT WP7 LOT2: PHASE 1 AND 2

Cupboard Level Leakage and Accumulation Data Report

Department for Business, Energy & Industrial Strategy

Report No.: 630650, Rev. 3 FINAL
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Project name:	Hy4Heat WP7 Lot2: Phase 1 and 2	GL Industrial Services UK Ltd.
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1819/02/2019 Hy4Heat – WP7 – Safety assessments for the suitability of hydrogen in existing buildings: Lot 2

Objective:

Convey experimental configuration and results from experiments in Hy4Heat WP7 Lot2.

Prepared by:	Verified by:	Approved by:
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3	2020-08-03	FINAL inc. Phase 2 experiments	Gemma Simpson	Dan Allason	Mike Johnson

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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 2, providing experimental data to allow the comparison of the movement and accumulation of hydrogen and methane released within confined spaces such as kitchen cupboards in a typical domestic property. Experiments were carried out with both hydrogen and methane. 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 cupboard and the kitchen.

In the first phase (Phase 1); a programme of 73 experiments was conducted involving 39 releases of hydrogen and 34 of methane into kitchen cupboards and an inset meter box. Releases were from holes ranging from 0.6 mm to 7.2 mm diameter with a pressure of 0.020 bar at the release point. This pressure is typical of the pressure downstream of the meter in a domestic property. Releases through 0.3mm hole diameters were originally specified but later replaced by additional experiments in other configurations due to the low hydrogen concentrations observed.

The second phase, Phase 2, consisted of an additional set of 11 experiments (10 hydrogen and 1 methane) involving some higher release rates and variations in combinations of vent openings in the cupboard and the kitchen wall.

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

Some general observations are given below:

- Both hydrogen and methane formed layers of nominally uniform concentration above the point of the release.
- As a check on data consistency, the concentration in these layers could be explained in general terms by comparison with a simple accumulation model. Although no detailed analysis of the air ingress rates in the rooms was carried out, the air change rates required to reproduce the observed steady state concentrations in the simple model were reasonable for a domestic kitchen.
- In all releases of hydrogen and methane into the meter box, flammable concentrations were only observed in the wall and floor cavities. No flammable concentrations of either gas were observed in the rooms of the house.
- Releases of both methane and hydrogen generally formed high level layers in the kitchen with relatively homogeneous concentration. The layers generally extended from the tops of the cupboards to the kitchen ceiling.
- The highest release rates considered with methane in Phase 1 (6.4 $m^3.hr^{-1}$ through a 7.2 mm hole) resulted in steady state concentrations in a high level layer in the kitchen that was above the upper flammability limit for methane, albeit passing through the flammable range in the early parts of the release.
- For all release positions, the release with methane giving the concentration closest to stoichiometric in the kitchen layer was the 3.6 mm, 1.6 $m^3.hr^{-1}$ case.
- With hydrogen, the highest release rate in Phase 1 (7.2 mm, 18.6 $m^3.hr^{-1}$) produced highly reactive concentrations above 30%vol within a high level layer in the kitchen.

- 20 %vol hydrogen concentrations exhibit laminar burning velocities[1] 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.
- Addition of a single 100 mm diameter vent above the kitchen door into the hallway in the largest hydrogen release rate case had the effect of reducing the concentration in the kitchen layer by about one third from ~30 %vol to ~20 %vol with only small increases observed in other areas of the house.
- Addition of 4 x 100 mm vent holes in the bottom and 4 x 100 mm vent holes in the side of the kitchen base cupboard in the largest release case with hydrogen had the effect of reducing the concentration measured in the cupboard from nominally 40 %vol to approximately 25-30 %vol. There was no significant effect on the concentrations in the bulk volume of the kitchen.
- 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 involving vents to the outside or the hallway showed lower kitchen ceiling concentration than the unvented case.
    - At the highest flow rate in Phase 2 (78.6 $m^3.hr^{-1}$), the venting (with either size of vent) had the effect of reducing the kitchen ceiling concentration from a rich mixture (~60 %vol) to that of a more reactive fuel : air ratio (~40 %vol, around the maximum burning velocity for hydrogen mixtures).
    - Use of the ceiling vents considerably reduced the measured concentrations in the ceiling void above the kitchen.

  It should be noted that no consideration has been made for changes in atmospheric wind conditions between experiments in making these comparisons. It is considered that this would not materially affect the conclusions.

[1] HySafe Website: http://www.hysafe.net/wiki/BRHS/DependenceOfBurningVelocityOnHydrogenConcentrationPressureAndTemperature

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.

This report provides the results from Lot 2, providing experimental data to allow the comparison of the movement and accumulation of hydrogen and methane released within confined spaces such as kitchen cupboards in a typical domestic property. Experiments were carried out with both hydrogen and methane. This report provides the results from two distinct phases in Lot 2, providing experimental data to allow the comparison of the movement and accumulation of hydrogen and methane released within confined spaces such as kitchen cupboards in a typical domestic property. Experiments were carried out with both hydrogen and methane. The second phase of experiments was commissioned after completion of the first phase and involved iterations of different vent arrangements applied to the cupboard and the kitchen. Methane was used as a surrogate for natural gas for simplicity of both supply and gas analysis.

In the first phase (Phase 1) a programme of 73 experiments was conducted involving 39 releases of hydrogen and 34 of methane into kitchen cupboards and an inset meter box. Releases were from holes ranging from 0.6 mm to 7.2 mm diameter with a pressure of 0.020 bar at the release point. This pressure is typical of the pressure downstream of the meter in a domestic property. Releases through 0.3mm hole diameters were originally specified but later replaced by additional experiments in other configurations due to the low hydrogen concentrations observed.

The second phase (Phase 2) consisted of an additional set of 11 experiments (10 hydrogen and 1 methane) involving some higher release rates and variations in combinations of vents in the cupboard and the kitchen wall.

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

2 EXPERIMENTAL ARRANGEMENT

Hy Street 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 DNV GL 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. 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 and identification of the kitchen cupboards are included in Figure 2 - Figure 12. 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 4. Similarly, 8 x 100 mm diameter vent openings were introduced into the kitchen base cupboard late in the programme (4 low and 4 high as indicated in Figure 5).

In Phase 2, ceiling vents were installed to provide some variation in ventilation to the kitchen. 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 6.

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 where fitted to remotely control the windows (Figure 13) allowing ventilation of the houses following a test. For the purpose of Lot 2 tests, the door to the basement of the house was wedged closed and sealed with tape.

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 fireplace in the living room sealed and with this arrangement, the results confirmed that the houses meet current building regulations for air tightness. Test results are included in Appendix C.

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 14 and in the photograph in Figure 15. 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 by the test engineer or through an automatic control system to maintain a required outlet pressure or flow rate. This was connected to a PE service pipe which feeds into the house. Internally, 22 mm copper pipe was used to route the gas to the cupboard into which the release was to be conducted. Gas was then released though a 0.6 mm, 0.9 mm, 1.8 mm, 2.5 mm, 3.6 mm, 5.1 mm or 7.2 mm diameter holes at the required location. In Phase 2, 3 releases were conducted through a 15 mm diameter hole.

2.2 Instrumentation arrangement

The gas supply system was 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, the pressure transducer 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.

The release point pressure transducer was used as the setpoint for the flow control valve. The flow control valve would therefore automatically adjust to maintain the release pressure at 0.020 bar. In Phase 2, the flow meter was used to maintain a specific mass flow rate.

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. In the case of the 0.6 mm diameter release sizes, the flow rate was generally below that measurable within the resolution of the flowmeter and SCADA system. In these cases, the flow can be said to have been below 0.1 SLPM. 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 simple orifice 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 16) and then onward to one of three analysers. Analyser one and two both handled eight sample points each and analyser three handled seven. A stream selection system was used to cycle through the sample points by operation of 2-way solenoids. (Figure 17) 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, 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-point and / or 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. The sample point locations recorded were consistent across tests depending on the location of the release.

Releases were carried out in a range of kitchen cupboards. The concentration within the cupboards was measured with four moveable sample points (SP 3- SP 6). The locations of these are shown in Table 4 and the following figures:

- Under sink cupboard, Figure 18 and Figure 19.
- Kitchen wall cupboard, Figure 20 and Figure 21.
- Kitchen base cupboard, Figure 22.
- Behind kitchen base cupboard, Figure 23.

Releases were also carried out into an inset meter cupboard on the external wall of the property. Sample point locations for these tests are shown in Figure 24, Figure 25 and Table 4. Two sample points were located within the meter box and two were drilled into the cavity wall from inside the house, one the ground floor and one on the first floor. (Figure 26)

The remaining sample points in the house stayed constant for all kitchen cupboard releases and are detailed in Figure 27 - Figure 29 and Table 3.

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 valves as well as monitoring of the instrumentation on the rig. Figure 30 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 could be operated to allow remote venting of the houses following a test. The flowrate through each analyser and its alarm status could also be monitored.

Analyser set up was carried out using the SCADA system, which also allowed remote recalibration if required mid-test. Figure 31 shows the control screen. This arrangement allowed all calibration gases to be routed to the analysers and the flowrate to the analysers to be monitored. Individual sensors could be isolated for calibration and the auto-function reinstated when a test was started. The auto-

function 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 32 shows the sample point monitoring system which indicates which sample point each analyser is sampling from at a given time. The graphs in the lower part of this figure 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 LKV at the location, this value remains constant until the next time the sample position is used.

3 MASTER TEST PLAN (MTP)

The MTP (Table 1) details the 73 experiments carried out in Phase 1 with Table 2 providing details of the 11 experiments carried out in Phase 2. The following notes confirm the test arrangements and amendments which were made to the program:

- For all tests in Lot 2, the basement was excluded from the test volume by wedging closed the door to the basement and sealing it with tape.
- 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 airbricks were sealed for all tests but the internal airbricks in the basement were open to the wall cavity.
- For all tests the kitchen door was wedged closed but not sealed with tape. Later in the Phase 1 test programme a 100 mm diameter circular vent was added above the kitchen door. This is indicated in the MTP.
- For all tests the cupboard door where the release was located remained closed. Later in the test programme, the door of an adjacent cupboard was left open and a set of 4 x 100 mm diameter circular holes were created at high level and low level to mimic ventilation. This is indicated in the MTP and these vents were also used in some of the experiments in Phase 2.
- Releases through 0.3 mm hole diameters were originally specified but later replaced by additional experiments in other configurations due to the low concentrations observed

4 EXPERIMENTAL PROCEDURE

The experiments in the test program were carried out in accordance with DNV GL 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 cupboard being used along with the pipework required to monitor the release point pressure. 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 over an area extending 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 remote 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 release pressure was achieved.

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

The release was then monitored from the control room until the required conditions were achieved. For releases into any kitchen cupboard with no vent above the kitchen door this criterion was steady state within the kitchen. When the vent above the kitchen door was included the criterion became steady state in the whole house. Experiments involving releases into the inset meter box, the release was continued until nominally steady state conditions were reached in the cavity and the general house.

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 experiment, the gas flow to the house was stopped by closing the actuated valve and the windows were opened remotely to allow ventilation of the building. The 200 m exclusion zone could be removed once the concentration in all locations within the house were below the lower flammable limit (LEL), but access to the inside of the house was not permitted until the gas concentration was less than 10 % LEL. Entry was then first carried out 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 2 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 an experiment, 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.

One experiment, L2-053 was reconstructed from the log-book notes pertaining to the experiment. This was due to a failure of the acquisition system immediately after the experiment and subsequent loss of data.

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 a cross check on the orifice size, confirming that the correct fitting had been 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

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

Where C is the concentration in %vol, Q_g is gas flow rate ($m^3.hr^{-1}$), Q_a is air flow rate ($m^3.hr^{-1}$), 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 and 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 experiment 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 33 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 33 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 5 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..

6 DISCUSSION

Whilst not within the scope of the project to perform detailed analysis of the data, some general observations are given below:

- Both hydrogen and methane formed layers of nominally uniform concentration above the point of the release.
- As a check on data consistency, the concentration in these layers could be explained in general terms by comparison with a simple accumulation model. Although no detailed analysis of the air ingress rates in the rooms was carried out, the air change rates required to reproduce the observed steady state concentrations in the simple model were reasonable for a domestic kitchen.
- In all releases of hydrogen and methane into the meter box, flammable concentrations were only observed in the wall and floor cavities. No flammable concentrations of either gas were observed in the rooms of the house.
- Releases of both methane and hydrogen generally formed high level layers in the kitchen with relatively homogeneous concentration. The layers generally extended from the tops of the cupboards to the kitchen ceiling.
- The highest release rates considered with methane in Phase 1 (6.4 $m^3.hr^{-1}$ through a 7.2 mm hole) resulted in steady state concentrations in a high level layer in the kitchen that was above the upper

flammability limit for methane, albeit passing through the flammable range in the early parts of the release.

- For all release positions, the release with methane giving the concentration closest to stoichiometric in the kitchen layer was the 3.6 mm, 1.6 $m^3.hr^{-1}$ case.
- With hydrogen, the highest release rate in Phase 1 (7.2 mm, 18.6 $m^3.hr^{-1}$) produced highly reactive concentrations above 30%vol within a high level layer in the kitchen.
- 20 %vol hydrogen concentrations exhibit laminar burning velocities[2] 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.
- Addition of a single 100 mm diameter vent above the kitchen door into the hallway in the largest hydrogen release rate case had the effect of reducing the concentration in the kitchen layer by about one third from ~30 %vol to ~20 %vol with only small increases observed in other areas of the house.
- Addition of 4 x 100 mm vent holes in the bottom and 4 x 100 mm vent holes in the side of the kitchen base cupboard in the largest release case with hydrogen had the effect of reducing the concentration measured in the cupboard from nominally 40 %vol to approximately 25-30 %vol. There was no significant effect on the concentrations in the bulk volume of the kitchen.
- 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. The chart in Figure 34 shows this comparison for the kitchen ceiling measured concentration:
    - All vent combinations involving vents to the outside or the hallway showed lower kitchen ceiling concentration than the unvented case.
    - At the highest flow rate in Phase 2 (78.6 $m^3.hr^{-1}$), the venting (with either size of vent) had the effect of reducing the kitchen ceiling concentration from a rich mixture (~60 %vol) to that of a more reactive fuel : air ratio (~40 %vol, around the maximum burning velocity for hydrogen mixtures).
    - Use of the ceiling vents considerably reduced the measured concentrations in the ceiling void above the kitchen.

It should be noted that no consideration has been made for changes in atmospheric wind conditions between experiments in making these comparisons. It is considered that this would not materially affect the conclusions.

[2] HySafe Website: http://www.hysafe.net/wiki/BRHS/DependenceOfBurningVelocityOnHydrogenConcentrationPressureAndTemperature

7 FIGURES

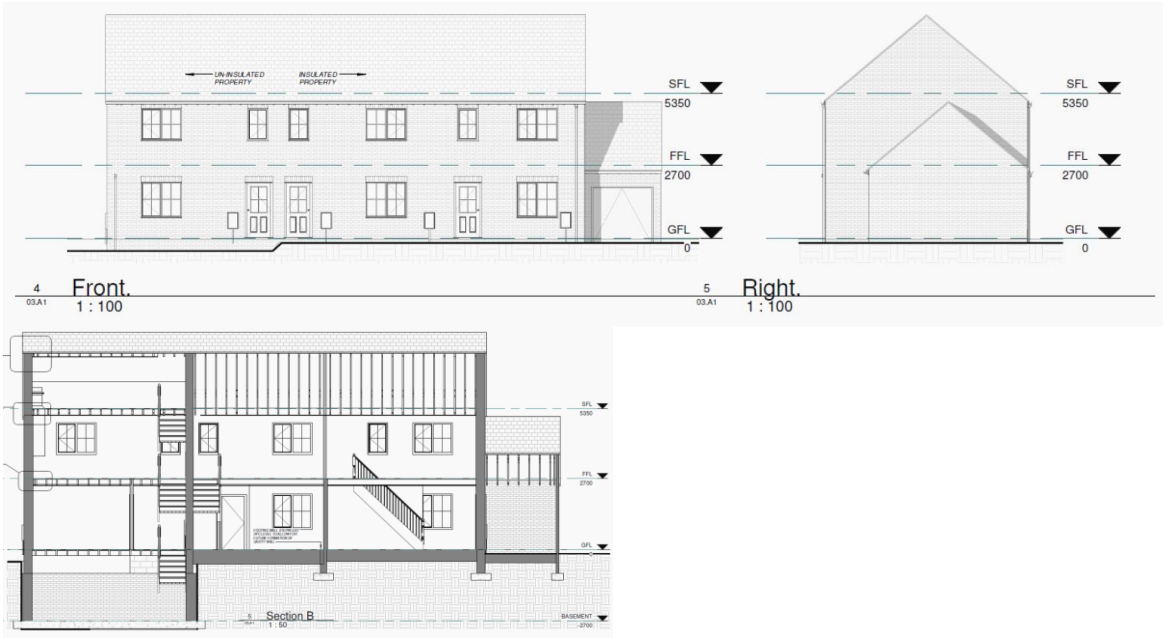


Figure 1: HyStreet drawings

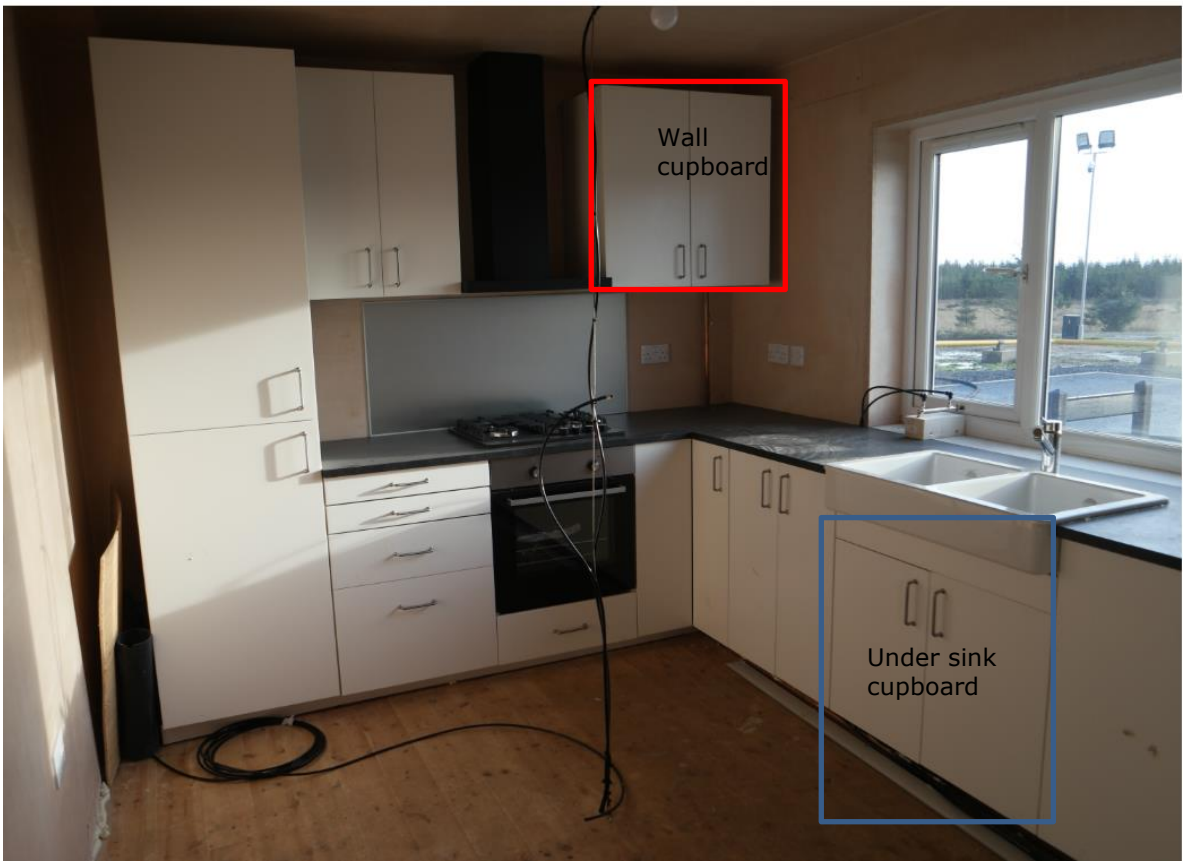


Figure 2: Kitchen layout (1)

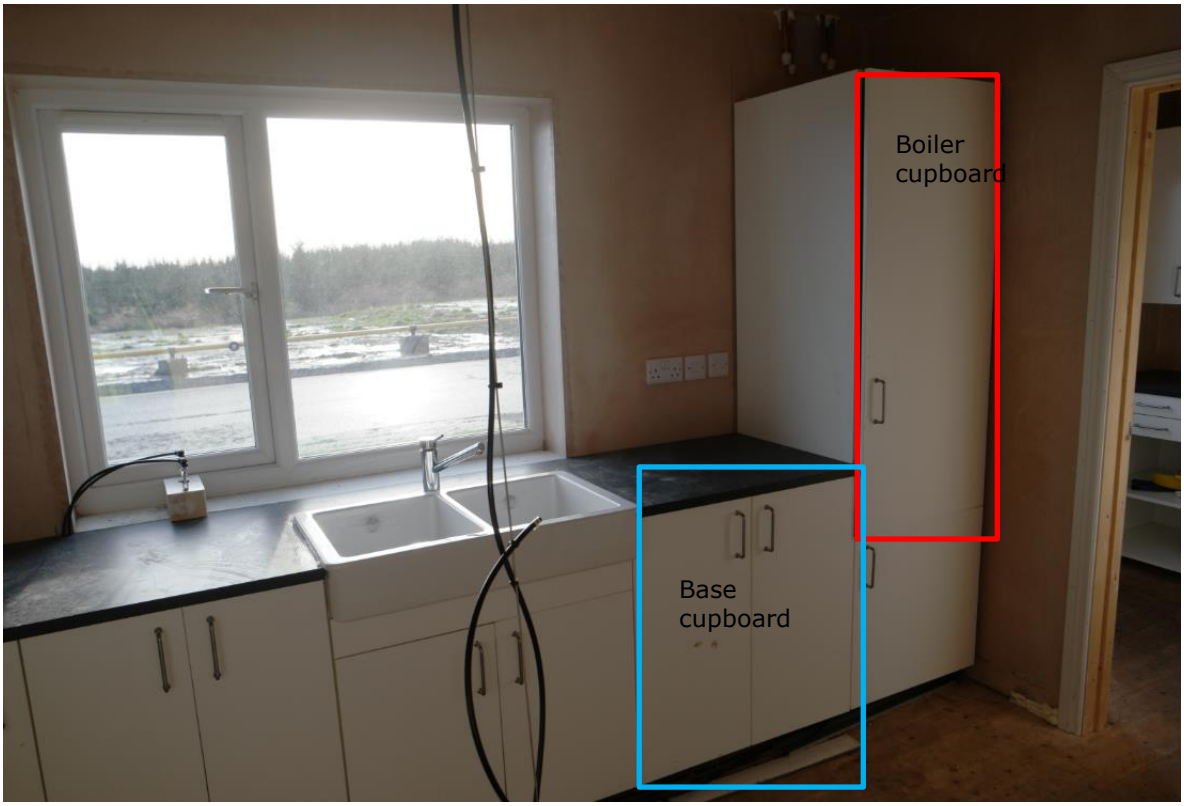


Figure 3: Kitchen layout (2)

Figure 4: 100 mm diameter vent opening above kitchen door into hallway

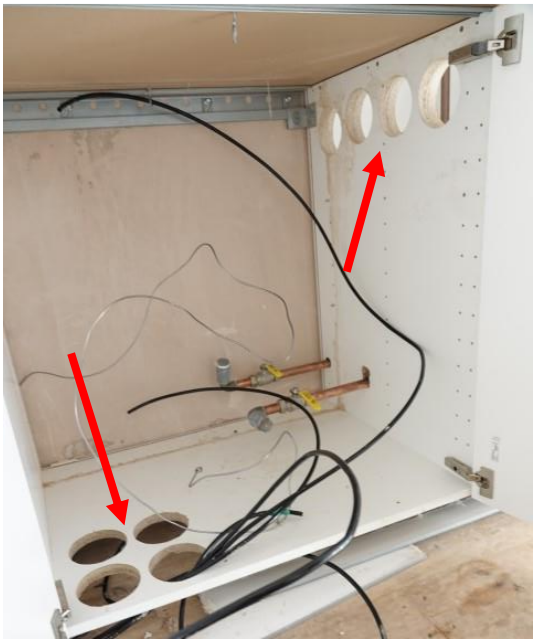


Figure 5: 8 x 100 mm diameter vent openings in kitchen base cupboard

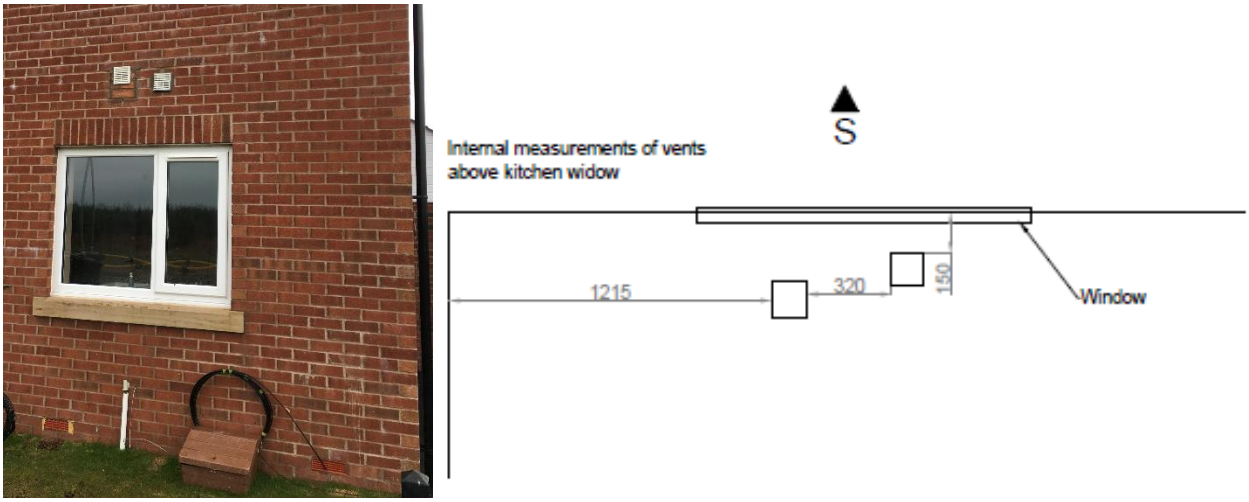


Figure 6: 78 cm^2 and 141 cm^2 ducted ceiling vents in kitchen

Figure 7: External meter box (1)

Figure 8: External meter box (2)

Figure 9: Living room

Figure 10: Hallway

Figure 11: 1st floor

Figure 12: Attic

Figure 13: Pneumatically operated window ram

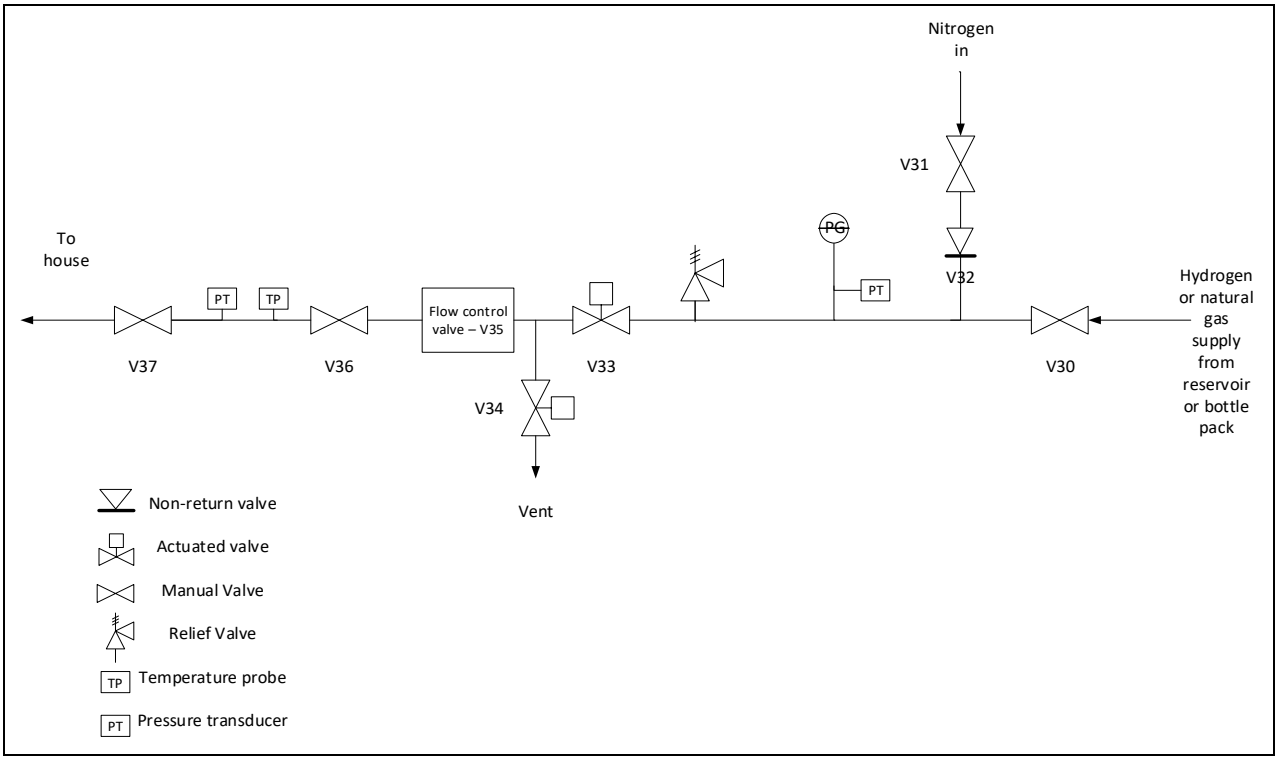


Figure 14: Pipework and valve layout diagram

Figure 15: Release control arrangement

Figure 16: Sampling panel

Figure 17: Stream selection and analysers

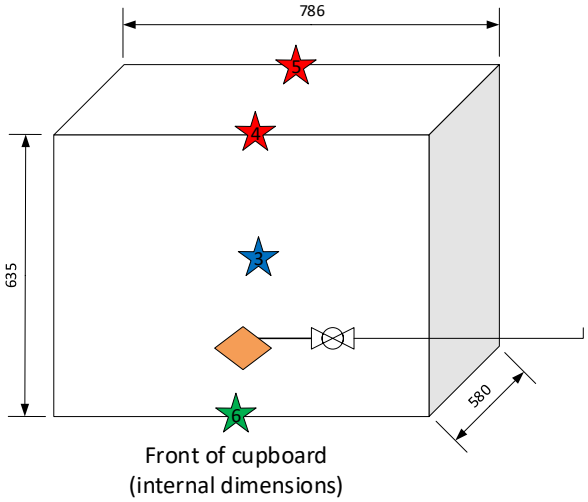


Figure 18: Sample point locations for releases into under sink cupboard

Figure 19: Under sink cupboard

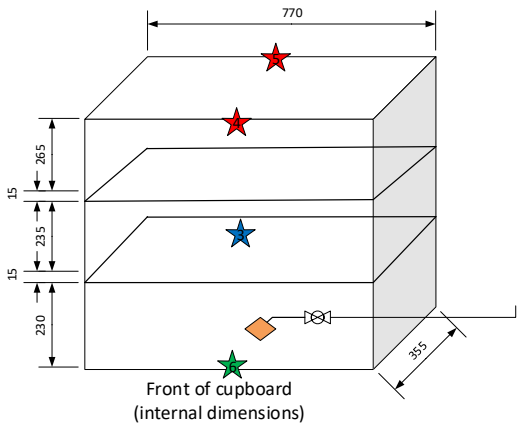


Figure 20: Sample point locations for releases into kitchen wall cupboard

Figure 21: Kitchen wall cupboard

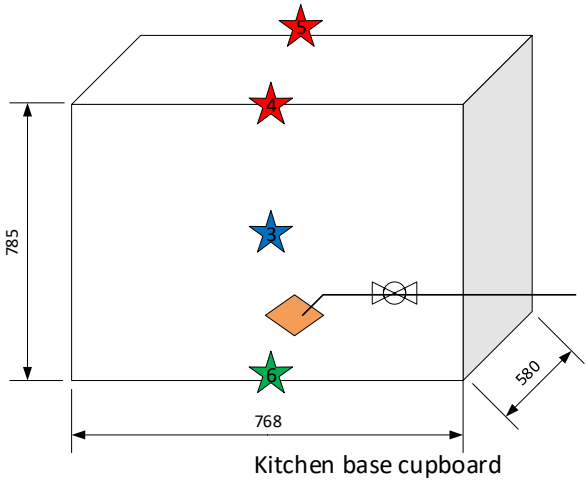


Figure 22: Sample point locations for releases into kitchen base cupboard

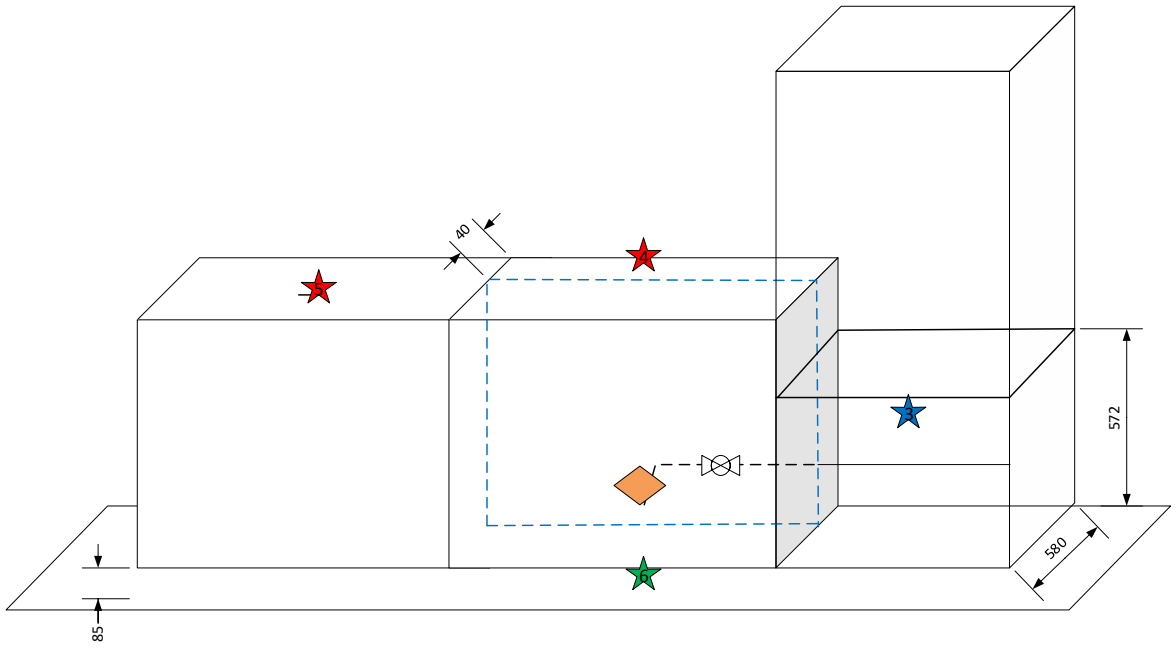


Figure 23: Sample point locations for releases behind kitchen base cupboard

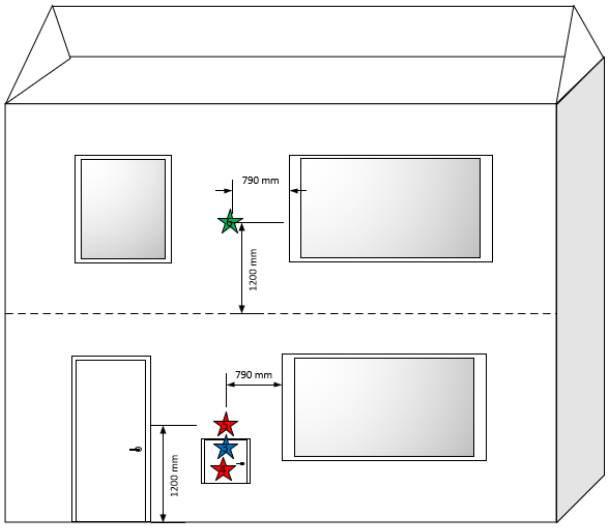


Figure 24: Sample point locations for meter cupboard releases

Figure 25: Meter box

Figure 26: Cavity wall sample point on 1st floor

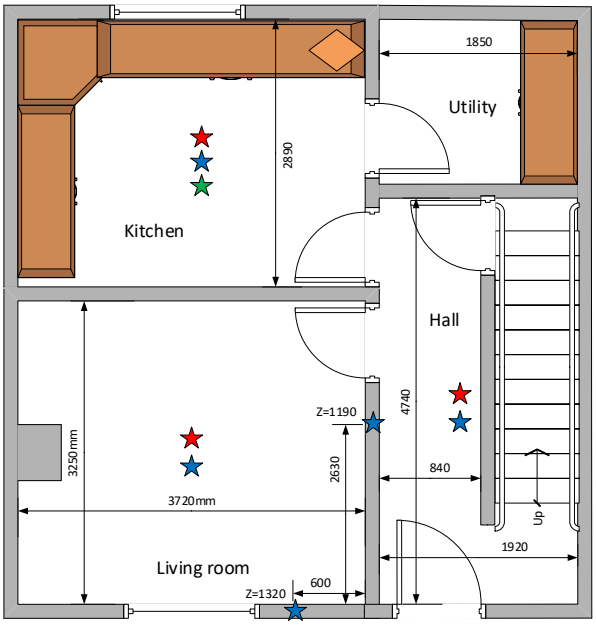


Figure 27: Sample point locations on the ground floor

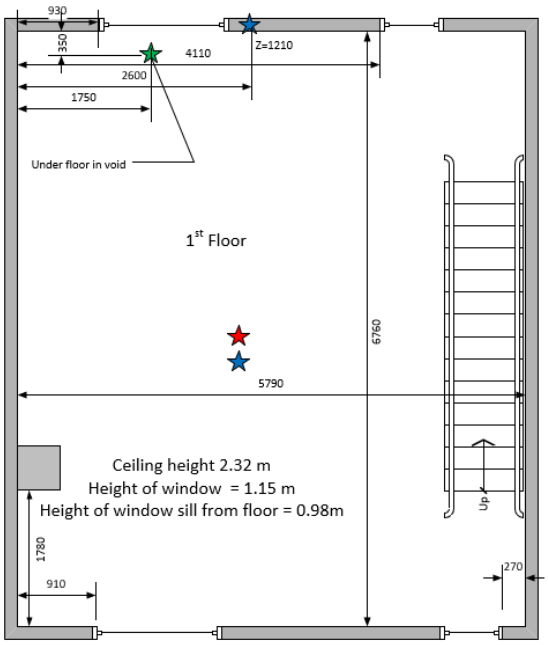
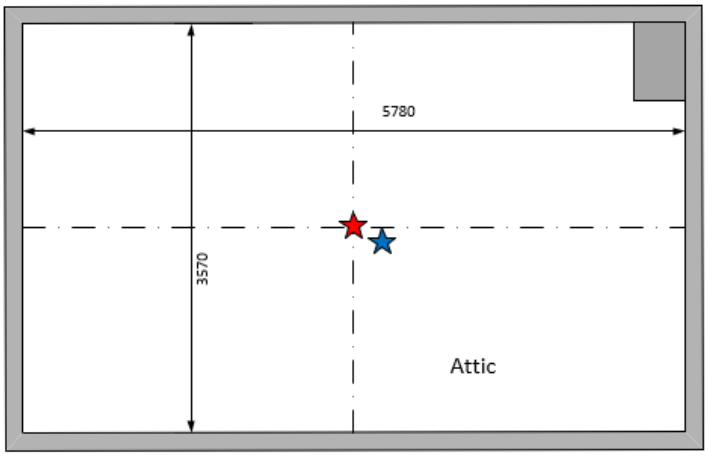


Figure 28: Sample point locations on the 1st floor



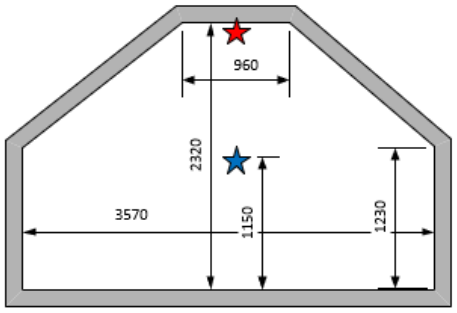


Figure 29: Sample point locations in the attic

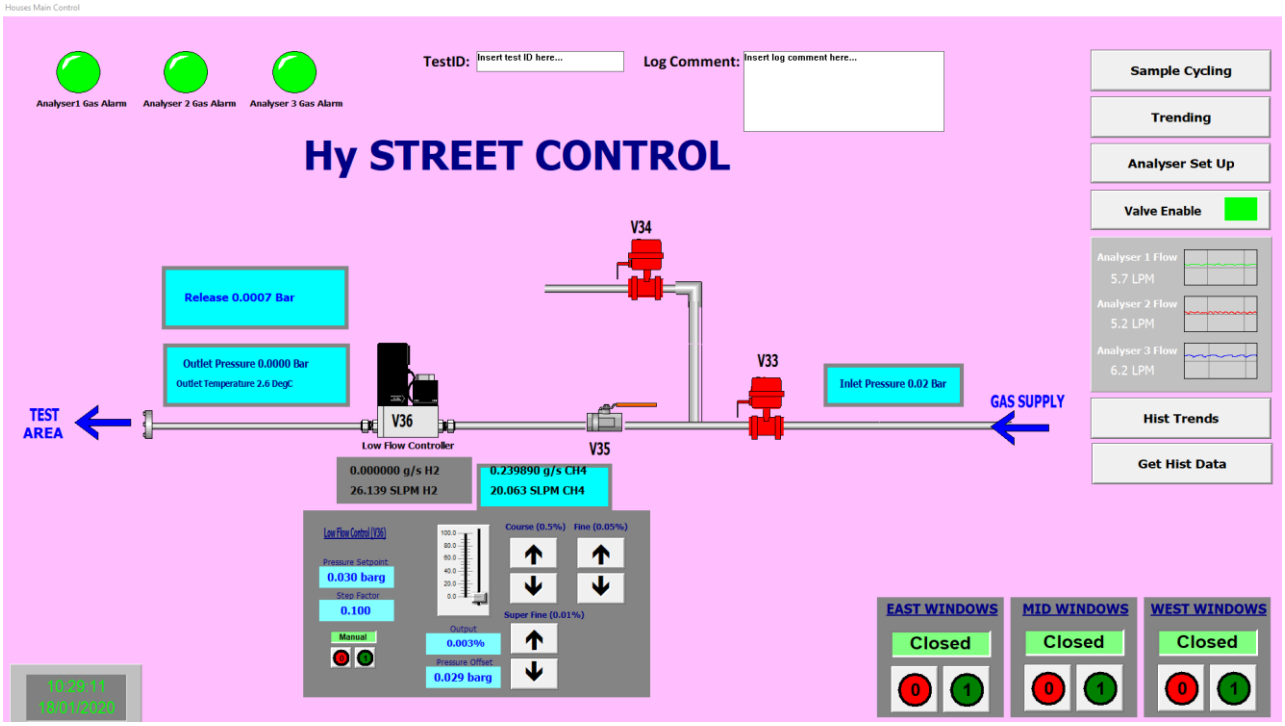


Figure 30: Hy Street SCADA control system

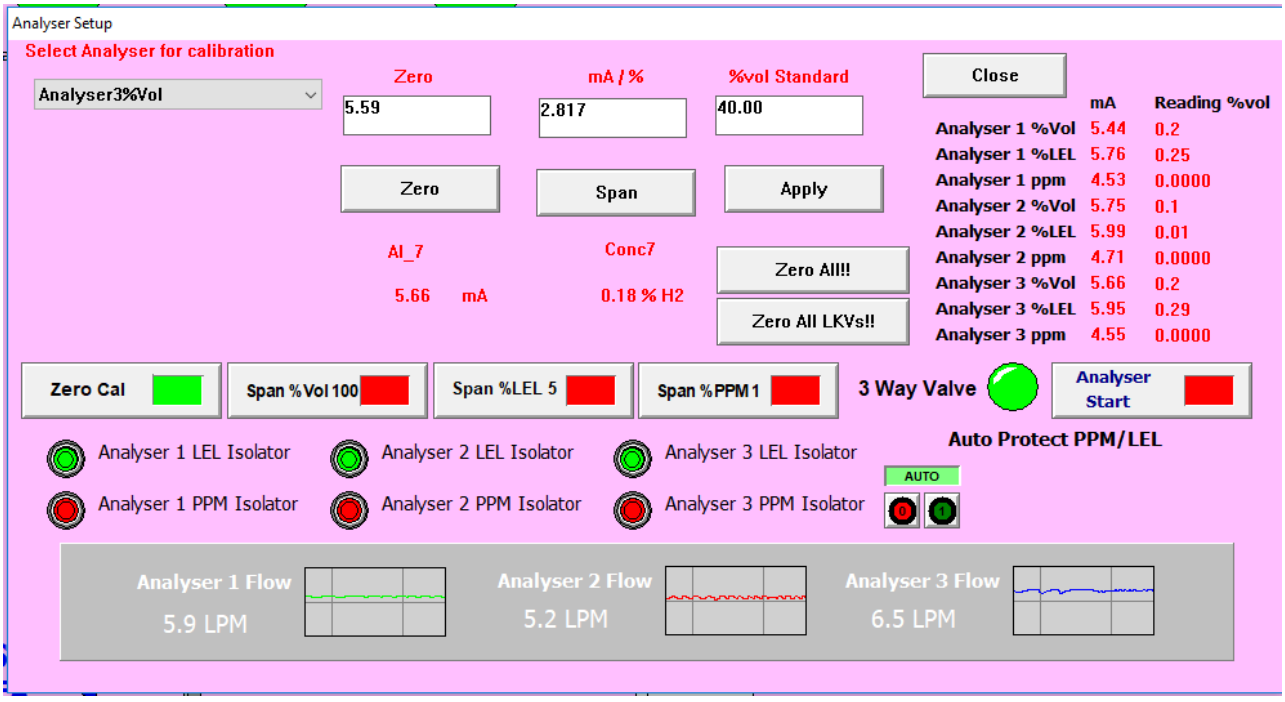


Figure 31: Hy Street SCADA system for analyser set up

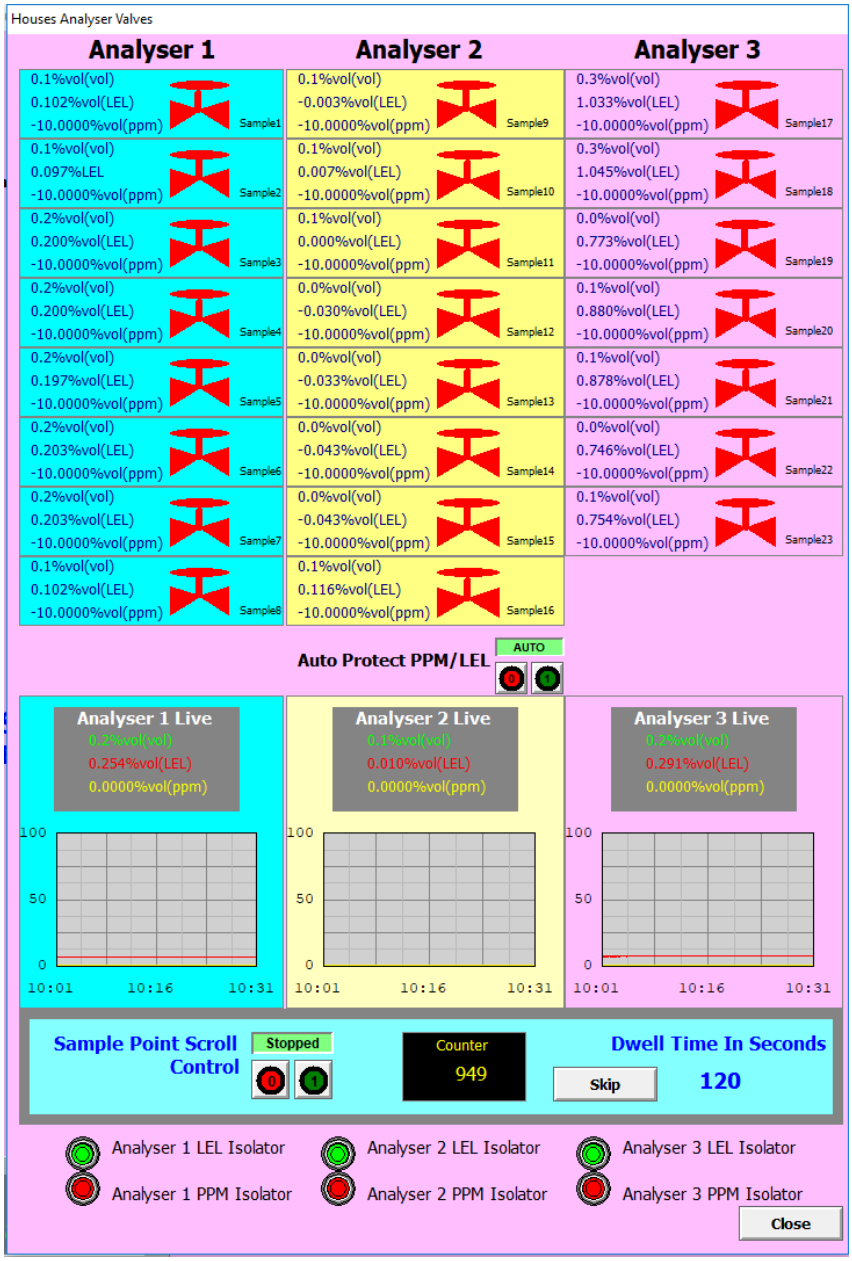


Figure 32: Hy Street SCADA screen for sample point monitoring and last known values

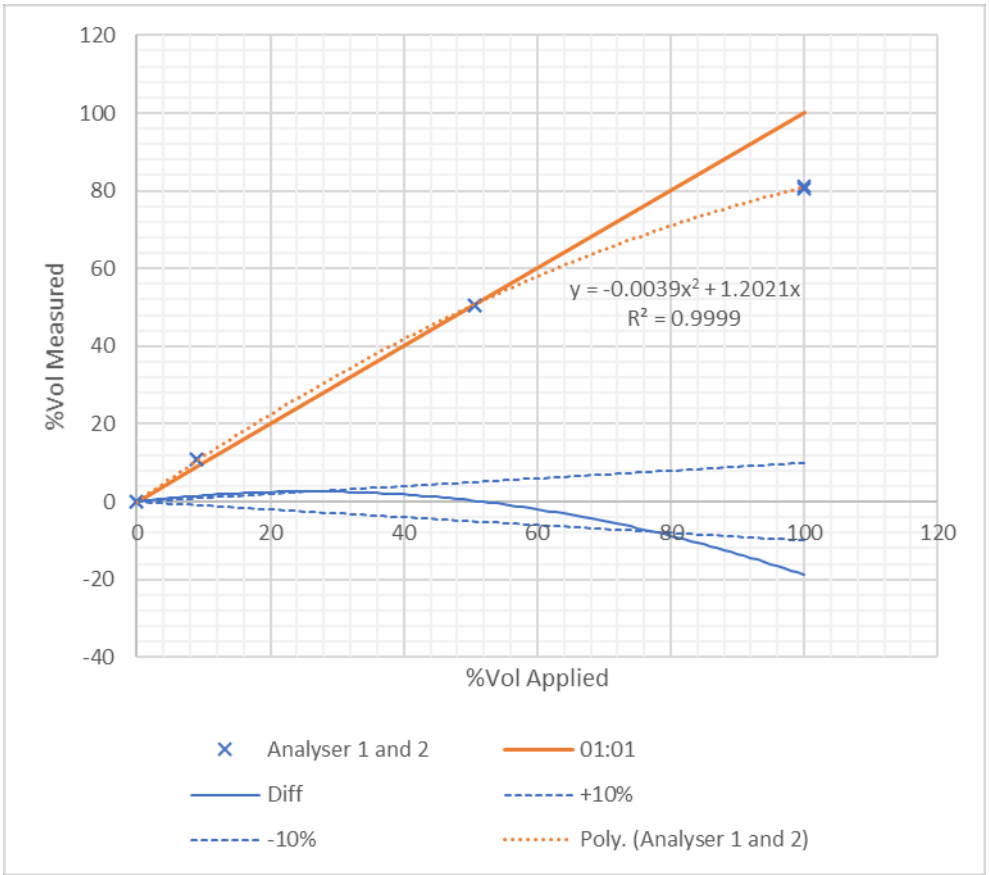


Figure 33: Volumetric sensor linearity

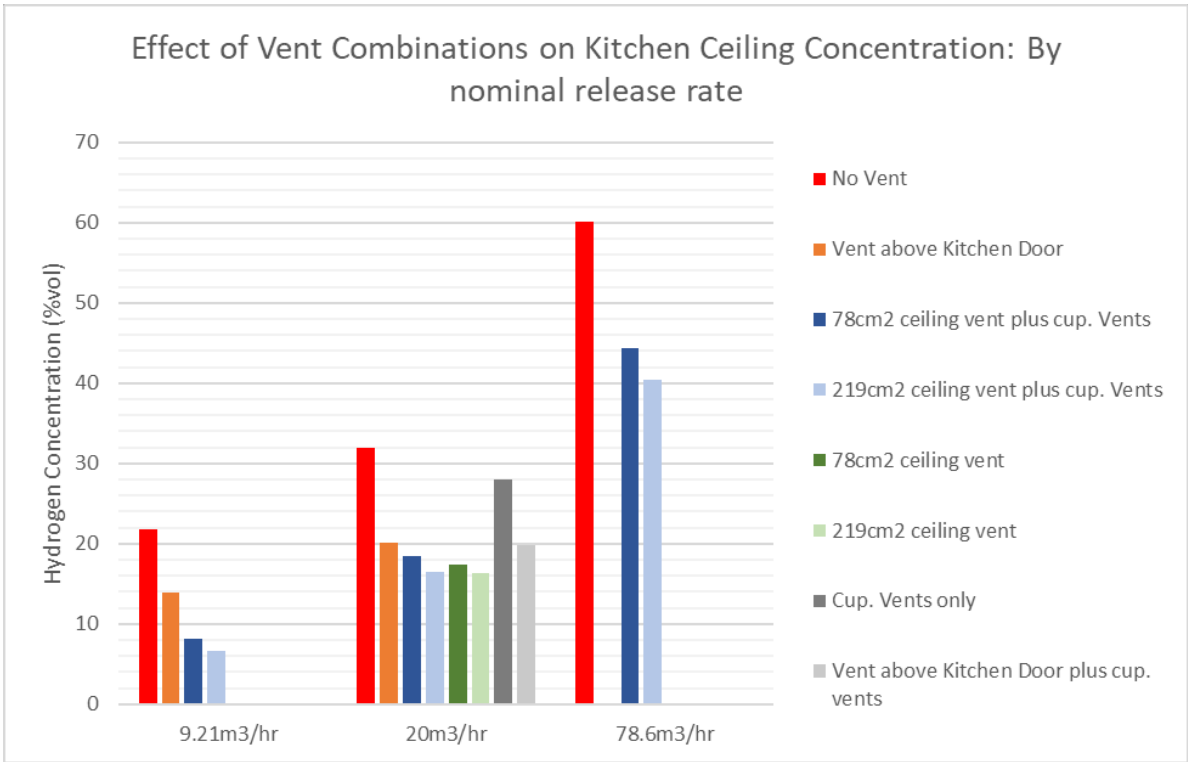


Figure 34: Observations of kitchen ceiling concentration with vent combinations

8 TABLES

Table 1: Master test plan (MTP)

Exp. ID	Fuel	Target Release Pressure (mbarg)	Hole Size (mm)	Nominal Release Rate (m3/hr)	Source	Orientation / Location	Enclosure	Area	Sealing
L2-002	Methane	20	3.6	4.59	Copper Pipe	Horizontal / Mid Height	'Inset Meter Box'	'House 3 South Wall'	Meter box door closed, standard penetration
L2-003	Methane	20	5.1	9.21	Copper Pipe	Horizontal / Mid Height	'Inset Meter Box'	'House 3 South Wall'	Meter box door closed, standard penetration
L2-004	Methane	20	7.2	18.36	Copper Pipe	Horizontal / Mid Height	'Inset Meter Box'	'House 3 South Wall'	Meter box door closed, standard penetration
L2-005	Methane	20	3.6	4.59	Copper Pipe	Horizontal / Mid Height	'Inset Meter Box'	'House 3 South Wall'	Meter box door closed, 20mm hole into wall
L2-006	Methane	20	5.1	9.21	Copper Pipe	Horizontal / Mid Height	'Inset Meter Box'	'House 3 South Wall'	Meter box door closed, 20mm hole into wall
L2-007	Methane	20	7.2	18.36	Copper Pipe	Horizontal / Mid Height	'Inset Meter Box'	'House 3 South Wall'	Meter box door closed, 20mm hole into wall
L2-010	Methane	20	0.6	0.04	Copper Pipe	Horizontal / Mid Height	'Kitchen Wall Cupboard'	'House 3 Kitchen'	Cupboard Door, closed
L2-011	Methane	20	0.9	0.1	Copper Pipe	Horizontal / Mid Height	'Kitchen Wall Cupboard'	'House 3 Kitchen'	Cupboard Door, closed
L2-012	Methane	20	1.8	0.4	Copper Pipe	Horizontal / Mid Height	'Kitchen Wall Cupboard'	'House 3 Kitchen'	Cupboard Door, closed
L2-013	Methane	20	2.5	0.8	Copper Pipe	Horizontal / Mid Height	'Kitchen Wall Cupboard'	'House 3 Kitchen'	Cupboard Door, closed
L2-014	Methane	20	3.6	1.6	Copper Pipe	Horizontal / Mid Height	'Kitchen Wall Cupboard'	'House 3 Kitchen'	Cupboard Door, closed
L2-015	Methane	20	5.1	3.2	Copper Pipe	Horizontal / Mid Height	'Kitchen Wall Cupboard'	'House 3 Kitchen'	Cupboard Door, closed
L2-016	Methane	20	7.2	6.4	Copper Pipe	Horizontal / Mid Height	'Kitchen Wall Cupboard'	'House 3 Kitchen'	Cupboard Door, closed
L2-018	Methane	20	0.6	0.04	Copper Pipe	Horizontal / Mid Height	'Kitchen Base Cupboard'	'House 3 Kitchen'	Cupboard Door, closed

Exp. ID	Fuel	Target Release Pressure (mbarg)	Hole Size (mm)	Nominal Release Rate (m3/hr)	Source	Orientation / Location	Enclosure	Area	Sealing
L2-019	Methane	20	0.9	0.1	Copper Pipe	Horizontal / Mid Height	'Kitchen Base Cupboard'	'House 3 Kitchen'	Cupboard Door, closed
L2-020	Methane	20	1.8	0.4	Copper Pipe	Horizontal / Mid Height	'Kitchen Base Cupboard'	'House 3 Kitchen'	Cupboard Door, closed
L2-021	Methane	20	2.5	0.8	Copper Pipe	Horizontal / Mid Height	'Kitchen Base Cupboard'	'House 3 Kitchen'	Cupboard Door, closed
L2-022	Methane	20	3.6	1.6	Copper Pipe	Horizontal / Mid Height	'Kitchen Base Cupboard'	'House 3 Kitchen'	Cupboard Door, closed
L2-023	Methane	20	5.1	3.2	Copper Pipe	Horizontal / Mid Height	'Kitchen Base Cupboard'	'House 3 Kitchen'	Cupboard Door, closed
L2-024	Methane	20	7.2	6.4	Copper Pipe	Horizontal / Mid Height	'Kitchen Base Cupboard'	'House 3 Kitchen'	Cupboard Door, closed
L2-026	Methane	20	0.6	0.04	Copper Pipe	Horizontal / Mid Height	'Behind Kitchen Base Cupboard'	'House 3 Kitchen'	Cupboard Door, closed
L2-027	Methane	20	0.9	0.1	Copper Pipe	Horizontal / Mid Height	'Behind Kitchen Base Cupboard'	'House 3 Kitchen'	Cupboard Door, closed
L2-028	Methane	20	1.8	0.4	Copper Pipe	Horizontal / Mid Height	'Behind Kitchen Base Cupboard'	'House 3 Kitchen'	Cupboard Door, closed
L2-029	Methane	20	2.5	0.8	Copper Pipe	Horizontal / Mid Height	'Behind Kitchen Base Cupboard'	'House 3 Kitchen'	Cupboard Door, closed
L2-030	Methane	20	3.6	1.6	Copper Pipe	Horizontal / Mid Height	'Behind Kitchen Base Cupboard'	'House 3 Kitchen'	Cupboard Door, closed
L2-031	Methane	20	5.1	3.2	Copper Pipe	Horizontal / Mid Height	'Behind Kitchen Base Cupboard'	'House 3 Kitchen'	Cupboard Door, closed
L2-032	Methane	20	7.2	6.4	Copper Pipe	Horizontal / Mid Height	'Behind Kitchen Base Cupboard'	'House 3 Kitchen'	Cupboard Door, closed
L2-034	Methane	20	0.6	0.04	Copper Pipe	Horizontal / Mid Height	'Undersink cupboard'	'House 3 Kitchen'	Cupboard Door, closed
L2-035	Methane	20	0.9	0.1	Copper Pipe	Horizontal / Mid Height	'Undersink cupboard'	'House 3 Kitchen'	Cupboard Door, closed

Exp. ID	Fuel	Target Release Pressure (mbarg)	Hole Size (mm)	Nominal Release Rate (m3/hr)	Source	Orientation / Location	Enclosure	Area	Sealing
L2-036	Methane	20	1.8	0.4	Copper Pipe	Horizontal / Mid Height	'Undersink cupboard'	'House 3 Kitchen'	Cupboard Door, closed
L2-037	Methane	20	2.5	0.8	Copper Pipe	Horizontal / Mid Height	'Undersink cupboard'	'House 3 Kitchen'	Cupboard Door, closed
L2-038	Methane	20	3.6	1.6	Copper Pipe	Horizontal / Mid Height	'Undersink cupboard'	'House 3 Kitchen'	Cupboard Door, closed
L2-039	Methane	20	5.1	3.2	Copper Pipe	Horizontal / Mid Height	'Undersink cupboard'	'House 3 Kitchen'	Cupboard Door, closed
L2-040	Methane	20	7.2	6.4	Copper Pipe	Horizontal / Mid Height	'Undersink cupboard'	'House 3 Kitchen'	Cupboard Door, closed
L2-043	Hydrogen	20	3.6	4.59	Copper Pipe	Horizontal / Mid Height	'Inset Meter Box'	'House 3 South Wall'	Meter box door closed, standard penetration
L2-044	Hydrogen	20	5.1	9.21	Copper Pipe	Horizontal / Mid Height	'Inset Meter Box'	'House 3 South Wall'	Meter box door closed, standard penetration
L2-045	Hydrogen	20	7.2	18.36	Copper Pipe	Horizontal / Mid Height	'Inset Meter Box'	'House 3 South Wall'	Meter box door closed, standard penetration
L2-046	Hydrogen	20	3.6	4.59	Copper Pipe	Horizontal / Mid Height	'Inset Meter Box'	'House 3 South Wall'	Meter box door closed, 20mm hole into wall
L2-047	Hydrogen	20	5.1	9.21	Copper Pipe	Horizontal / Mid Height	'Inset Meter Box'	'House 3 South Wall'	Meter box door closed, 20mm hole into wall
L2-048	Hydrogen	20	7.2	18.36	Copper Pipe	Horizontal / Mid Height	'Inset Meter Box'	'House 3 South Wall'	Meter box door closed, 20mm hole into wall
L2-050	Hydrogen	20	0.6	0.13	Copper Pipe	Horizontal / Mid Height	'Kitchen Wall Cupboard'	'House 3 Kitchen'	Cupboard Door, closed
L2-051	Hydrogen	20	0.9	0.29	Copper Pipe	Horizontal / Mid Height	'Kitchen Wall Cupboard'	'House 3 Kitchen'	Cupboard Door, closed
L2-052	Hydrogen	20	1.8	1.15	Copper Pipe	Horizontal / Mid Height	'Kitchen Wall Cupboard'	'House 3 Kitchen'	Cupboard Door, closed
L2-053	Hydrogen	20	2.5	2.2	Copper Pipe	Horizontal / Mid Height	'Kitchen Wall Cupboard'	'House 3 Kitchen'	Cupboard Door, closed

Exp. ID	Fuel	Target Release Pressure (mbarg)	Hole Size (mm)	Nominal Release Rate (m3/hr)	Source	Orientation / Location	Enclosure	Area	Sealing
L2-054	Hydrogen	20	3.6	4.59	Copper Pipe	Horizontal / Mid Height	'Kitchen Wall Cupboard'	'House 3 Kitchen'	Cupboard Door, closed
L2-055	Hydrogen	20	5.1	9.21	Copper Pipe	Horizontal / Mid Height	'Kitchen Wall Cupboard'	'House 3 Kitchen'	Cupboard Door, closed
L2-056	Hydrogen	20	7.2	18.36	Copper Pipe	Horizontal / Mid Height	'Kitchen Wall Cupboard'	'House 3 Kitchen'	Cupboard Door, closed
L2-058	Hydrogen	20	0.6	0.13	Copper Pipe	Horizontal / Mid Height	'Kitchen Base Cupboard'	'House 3 Kitchen'	Cupboard Door, closed
L2-059	Hydrogen	20	0.9	0.29	Copper Pipe	Horizontal / Mid Height	'Kitchen Base Cupboard'	'House 3 Kitchen'	Cupboard Door, closed
L2-060	Hydrogen	20	1.8	1.15	Copper Pipe	Horizontal / Mid Height	'Kitchen Base Cupboard'	'House 3 Kitchen'	Cupboard Door, closed
L2-061	Hydrogen	20	2.5	2.2	Copper Pipe	Horizontal / Mid Height	'Kitchen Base Cupboard'	'House 3 Kitchen'	Cupboard Door, closed
L2-062	Hydrogen	20	3.6	4.59	Copper Pipe	Horizontal / Mid Height	'Kitchen Base Cupboard'	'House 3 Kitchen'	Cupboard Door, closed
L2-063	Hydrogen	20	5.1	9.21	Copper Pipe	Horizontal / Mid Height	'Kitchen Base Cupboard'	'House 3 Kitchen'	Cupboard Door, closed
L2-064	Hydrogen	20	7.2	18.36	Copper Pipe	Horizontal / Mid Height	'Kitchen Base Cupboard'	'House 3 Kitchen'	Cupboard Door, closed
L2-066	Hydrogen	20	0.6	0.13	Copper Pipe	Horizontal / Mid Height	'Behind Kitchen Base Cupboard'	'House 3 Kitchen'	Cupboard Door, closed
L2-067	Hydrogen	20	0.9	0.29	Copper Pipe	Horizontal / Mid Height	'Behind Kitchen Base Cupboard'	'House 3 Kitchen'	Cupboard Door, closed
L2-068	Hydrogen	20	1.8	1.15	Copper Pipe	Horizontal / Mid Height	'Behind Kitchen Base Cupboard'	'House 3 Kitchen'	Cupboard Door, closed
L2-069	Hydrogen	20	2.5	2.2	Copper Pipe	Horizontal / Mid Height	'Behind Kitchen Base Cupboard'	'House 3 Kitchen'	Cupboard Door, closed
L2-070	Hydrogen	20	3.6	4.59	Copper Pipe	Horizontal / Mid Height	'Behind Kitchen Base Cupboard'	'House 3 Kitchen'	Cupboard Door, closed

Exp. ID	Fuel	Target Release Pressure (mbarg)	Hole Size (mm)	Nominal Release Rate (m3/hr)	Source	Orientation / Location	Enclosure	Area	Sealing
L2-071	Hydrogen	20	5.1	9.21	Copper Pipe	Horizontal / Mid Height	'Behind Kitchen Base Cupboard'	'House 3 Kitchen'	Cupboard Door, closed
L2-072	Hydrogen	20	7.2	18.36	Copper Pipe	Horizontal / Mid Height	'Behind Kitchen Base Cupboard'	'House 3 Kitchen'	Cupboard Door, closed
L2-074	Hydrogen	20	0.6	0.13	Copper Pipe	Horizontal / Mid Height	'Undersink cupboard'	'House 3 Kitchen'	Cupboard Door, closed
L2-075	Hydrogen	20	0.9	0.29	Copper Pipe	Horizontal / Mid Height	'Undersink cupboard'	'House 3 Kitchen'	Cupboard Door, closed
L2-076	Hydrogen	20	1.8	1.15	Copper Pipe	Horizontal / Mid Height	'Undersink cupboard'	'House 3 Kitchen'	Cupboard Door, closed
L2-077	Hydrogen	20	2.5	2.2	Copper Pipe	Horizontal / Mid Height	'Undersink cupboard'	'House 3 Kitchen'	Cupboard Door, closed
L2-078	Hydrogen	20	3.6	4.59	Copper Pipe	Horizontal / Mid Height	'Undersink cupboard'	'House 3 Kitchen'	Cupboard Door, closed
L2-079	Hydrogen	20	5.1	9.21	Copper Pipe	Horizontal / Mid Height	'Undersink cupboard'	'House 3 Kitchen'	Cupboard Door, closed
L2-080	Hydrogen	20	7.2	18.36	Copper Pipe	Horizontal / Mid Height	'Undersink cupboard'	'House 3 Kitchen'	Cupboard Door, closed
L2-062A	Hydrogen	20	3.6	4.59	Copper Pipe	Horizontal / Mid Height	'Kitchen Base Cupboard'	'House 3 Kitchen'	Cupboard Door, closed. + 100mm vent above kitchen door
L2-063A	Hydrogen	20	5.1	9.21	Copper Pipe	Horizontal / Mid Height	'Kitchen Base Cupboard'	'House 3 Kitchen'	Cupboard Door, closed. + 100mm vent above kitchen door
L2-064A	Hydrogen	20	7.2	18.36	Copper Pipe	Horizontal / Mid Height	'Kitchen Base Cupboard'	'House 3 Kitchen'	Cupboard Door, closed. + 100mm vent above kitchen door
L2-064B	Hydrogen	20	7.2	18.36	Copper Pipe	Horizontal / Mid Height	'Kitchen Base Cupboard'	'House 3 Kitchen'	Cupboard Door, closed + Cupboard vent holes + 100mm vent above kitchen door
L2-064C	Hydrogen	20	7.2	18.36	Copper Pipe	Horizontal / Mid Height	'Kitchen Base Cupboard'	'House 3 Kitchen'	Cupboard Door, closed + Cupboard vent holes

Table 2: Phase 2 Experimental Programme

ID	Injection Location	Gas	Hole size	Nominal Injection rate	Vent Type	Vent size (cm^2)	Vents in cupboard?
L2-A1	Kitchen Base Cupboard	Hydrogen	7.2mm	20m3/hr	ceiling vent with pipe to external wall	78	no
L2-A2	Kitchen Base Cupboard	Hydrogen	7.2mm	20m3/hr	ceiling vent with pipe to external wall	219	no
L2-A3	Kitchen Base Cupboard	Hydrogen	5.1mm	9.21m3/hr	ceiling vent with pipe to external wall	78	yes
L2-A4	Kitchen Base Cupboard	Hydrogen	5.1mm	9.21m3/hr	ceiling vent with pipe to external wall	219	yes
L2-A5	Kitchen Base Cupboard	Hydrogen	7.2mm	20m3/hr	ceiling vent with pipe to external wall	78	yes
L2-A6	Kitchen Base Cupboard	Hydrogen	7.2mm	20m3/hr	ceiling vent with pipe to external wall	219	yes
L2-A7	Kitchen Base Cupboard	Hydrogen	7.2mm	20m3/hr	no vent	n/a	no
L2-A8	Kitchen Base Cupboard	methane	7.2mm	20m3/hr	no vent	n/a	no
L2-A9	Kitchen Base Cupboard	Hydrogen	15mm	78.6m3/hr	ceiling vent with pipe to external wall	78	yes
L2-A10	Kitchen Base Cupboard	Hydrogen	15mm	78.6m3/hr	ceiling vent with pipe to external wall	219	yes
L2-A11	Kitchen Base Cupboard	Hydrogen	15mm	78.6m3/hr	no vent	n/a	no

Table 3: Sample point locations in house for kitchen 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 4 5 6	Centre Top front centre Top back centre Bottom back centre
Living room	8, 9	High and mid - centre
Hall	10, 11	High and mid - centre
1st 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 1st floor	21	Living room ceiling
Void 1st floor to Attic	22	1st floor ceiling
Void attic ceiling to roof	23	Attic ceiling

Table 4: Sample point locations inside cupboards

Cupboard	Sample point on analyser	Location
Under sink cupboard	3	Centre
	4	Top front centre
	5	Top back centre
	6	Bottom back centre
Wall cupboard	3	Centre – between the cupboard shelves
	4	Top front centre
	5	Top back centre
	6	Bottom back centre
Base cupboard	3	Centre
	4	Top front centre
	5	Top back centre
	6	Bottom back centre
Behind base cupboard	3	Lower part of boiler cupboard
	4	Behind cupboard – in the same section as the release
	5	Under sink cupboard – high
	6	Under cupboard – behind kickboard
Meter cupboard	3	Inside meter box – top
	4	Inside meter box – bottom
	5	Cavity wall above release location on ground floor
	6	Cavity wall above release location on 1st floor

Table 5: 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

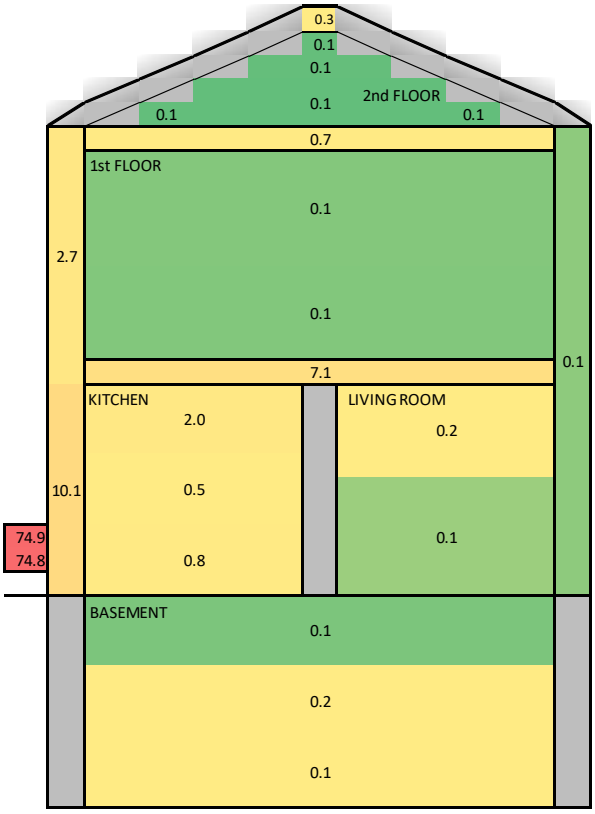
L2-002 RESULT

Hy4Heat WP7 Test Result

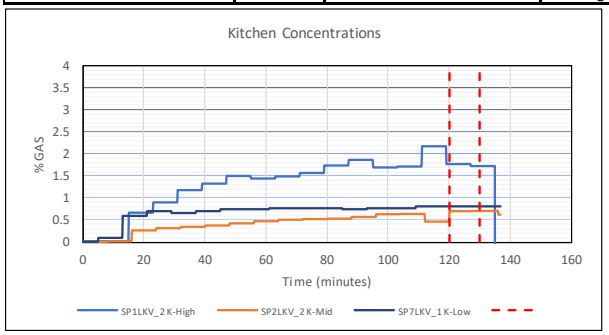
MTP ID: L2-002
Hole Size: 3.6 mm
Location: meter box
Gas: Methane
Date: 11/12/2019 **Time:** 13:20:00
Averaging Period Start: 120 min **End:** 130 min

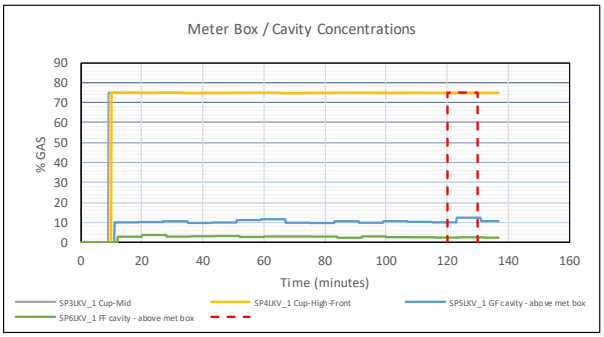
Notes: Suspect that VOL sensor has topped out in meter box

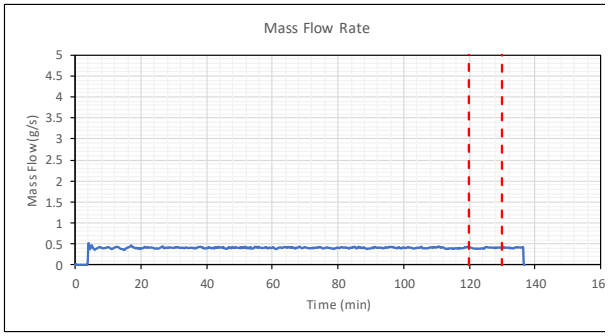
Sensor	Average	Max	Min	STDEV	units
SP1LKV_2 K-High	2.0	2.2	1.7	0.2	%vol
SP2LKV_2 K-Mid	0.5	0.6	0.5	0.1	%vol
SP3LKV_1 Cup-Mid	74.8	74.8	74.8	0.0	%vol
SP4LKV_1 Cup-High-Front	74.9	74.9	74.8	0.0	%vol
SP5LKV_1 GF cavity - above met	10.1	10.2	9.9	0.1	%vol
SP6LKV_1 FF cavity - above met	2.7	2.7	2.5	0.1	%vol
SP7LKV_1 K-Low	0.8	0.8	0.8	0.0	%vol
SP8LKV_1 LR-High	0.2	0.3	0.2	0.0	%vol
SP9LKV_2 LR-Mid	0.1	0.1	0.1	0.0	%vol
SP10LKV_2 H-High	0.1	0.1	0.1	0.0	%vol
SP11LKV_2 H-Mid	0.1	0.1	0.1	0.0	%vol
SP12LKV_2 FF-High	0.1	0.1	0.1	0.0	%vol
SP13LKV_2 FF-Mid	0.1	0.1	0.1	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_2 BM-High	0.1	0.1	0.1	0.0	%vol
SP17LKV_1 BM-Mid	0.2	0.2	0.1	0.0	%vol
SP18LKV_1 BM-Low	0.1	0.1	0.1	0.0	%vol
SP19LKV_1 NWALL-Cav	0.1	0.1	0.0	0.0	%vol
SP20LKV_1 STUD-Cav	0.1	0.1	0.1	0.0	%vol
SP21LKV_1 FF-Void	7.1	7.1	7.0	0.0	%vol
SP22LKV_1 SF-Void	0.7	0.7	0.7	0.0	%vol
SP23LKV_1 ROOF-Void	0.3	0.3	0.3	0.0	%vol
RELEASEPRESSURE	0.0196	0.0	0.0	0.0	barg
LOWFLOWMETERCH4	0.4	0.4	0.4	0.0	g/s
OUTLET_TEMP	2.9	2.9	2.8	0.0	degC
Volume Flow Rate	34.6	0.0	0.0	0.0	SLPM
Energy Flow Rate	20.7	0.0	0.0	0.0	kW
External Wind Speed	2.9				m/s
External Wind Direction	242.5				bearing



Hallway and Stud into Living Room







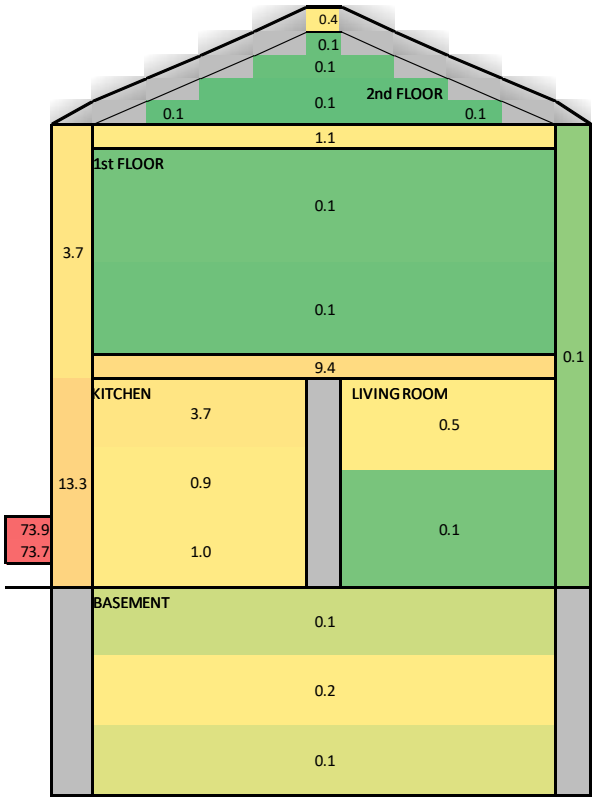
L2-003 RESULT

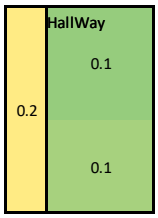
Hy4Heat WP7 Test Result

MTP ID: L2-003
Hole Size: 5.1 mm
Location: meter box
Gas: Methane
Date: 11/12/2019 **Time:** 16:50:00
Averaging Period Start: 120 min **End:** 130 min

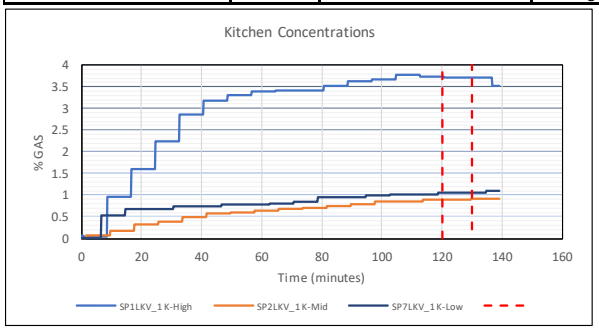
Notes: Suspect VOL sensor 'topped out' in meter box sampling

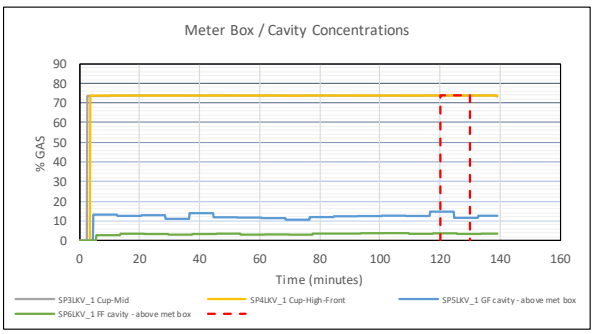
Sensor	Average	Max	Min	STDEV	units
SP1LKV_1 K-High	3.7	3.8	3.7	0.0	%vol
SP2LKV_1 K-Mid	0.9	0.9	0.9	0.0	%vol
SP3LKV_1 Cup-Mid	73.7	73.7	73.6	0.0	%vol
SP4LKV_1 Cup-High-Front	73.9	73.9	73.9	0.0	%vol
SP5LKV_1 GF cavity - above met	13.3	14.9	12.7	1.0	%vol
SP6LKV_1 FF cavity - above met	3.7	4.0	3.6	0.1	%vol
SP7LKV_1 K-Low	1.0	1.1	1.0	0.0	%vol
SP8LKV_1 LR-High	0.5	0.5	0.5	0.0	%vol
SP9LKV_2 LR-Mid	0.1	0.1	0.1	0.0	%vol
SP10LKV_2 H-High	0.1	0.1	0.1	0.0	%vol
SP11LKV_2 H-Mid	0.1	0.1	0.1	0.0	%vol
SP12LKV_2 FF-High	0.1	0.1	0.1	0.0	%vol
SP13LKV_2 FF-Mid	0.1	0.1	0.1	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	0.1	0.1	0.1	0.0	%vol
SP17LKV_1 BM-Mid	0.2	0.2	0.2	0.0	%vol
SP18LKV_1 BM-Low	0.1	0.2	0.1	0.0	%vol
SP19LKV_1 NWALL-Cav	0.1	0.1	0.1	0.0	%vol
SP20LKV_1 STUD-Cav	0.2	0.2	0.2	0.0	%vol
SP21LKV_1 FF-Void	9.4	9.4	9.4	0.0	%vol
SP22LKV_1 SF-Void	1.1	1.1	1.0	0.0	%vol
SP23LKV_1 ROOF-Void	0.4	0.4	0.2	0.1	%vol
RELEASEPRESSURE	0.0200	0.0	0.0	0.0	barg
LOWFLOWMETERCH4	0.9	0.9	0.9	0.0	g/s
OUTLET_TEMP	1.5	1.6	1.4	0.1	degC
Volume Flow Rate	72.9	0.0	0.0	0.0	SLPM
Energy Flow Rate	43.6	0.0	0.0	0.0	kW
External Wind Speed	4.0				m/s
External Wind Direction	230.5				bearing

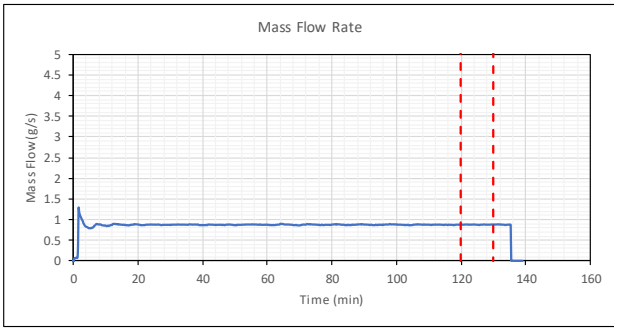




Hallway and Stud into Living Room







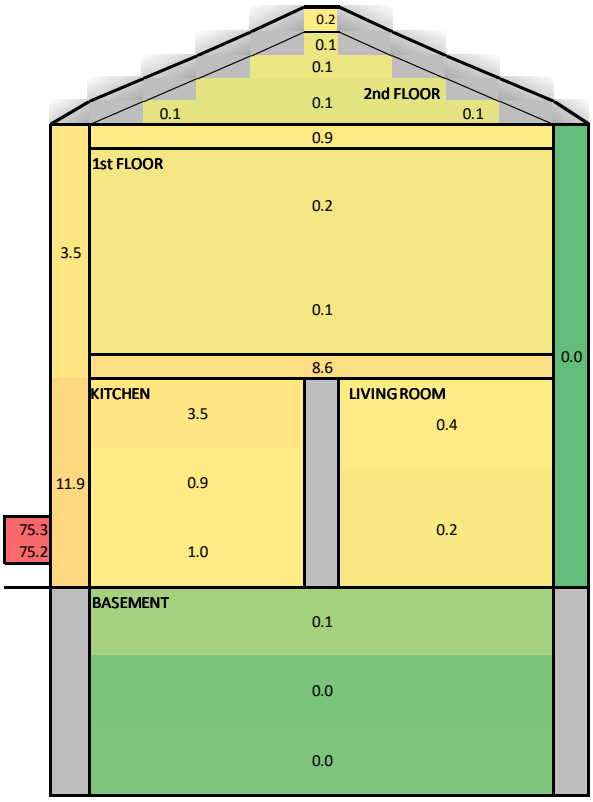
L2-004 RESULT

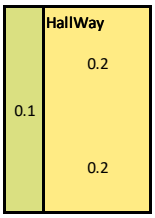
Hy4Heat WP7 Test Result

MTP ID: L2-004
Hole Size: 7.2 mm
Location: meter box
Gas: Methane
Date: 11/12/2019 **Time:** 20:50:00
Averaging Period Start: 240 min **End:** 250 min

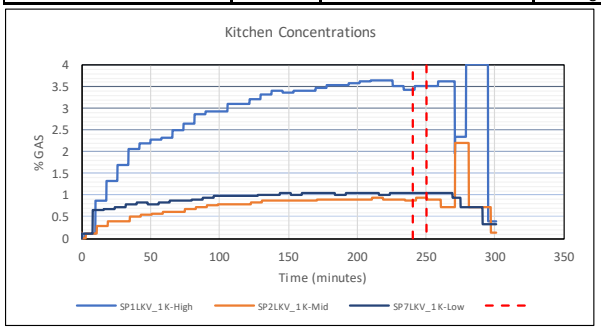
Notes: Suspect VOL sensor "topped out" in meter box

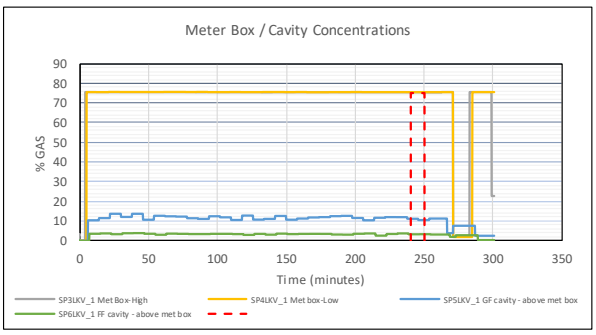
Sensor	Average	Max	Min	STDEV	units
SP1LKV_1 K-High	3.5	3.5	3.4	0.0	%vol
SP2LKV_1 K-Mid	0.9	0.9	0.9	0.0	%vol
SP3LKV_1 Met Box-High	75.2	75.2	75.2	0.0	%vol
SP4LKV_1 Met box-Low	75.3	75.3	75.3	0.0	%vol
SP5LKV_1 GF cavity - above met	11.9	11.9	11.9	0.0	%vol
SP6LKV_1 FF cavity - above met	3.5	3.6	3.4	0.1	%vol
SP7LKV_1 K-Low	1.0	1.0	1.0	0.0	%vol
SP8LKV_1 LR-High	0.4	0.4	0.4	0.0	%vol
SP9LKV_2 LR-Mid	0.2	0.2	0.2	0.0	%vol
SP10LKV_2 H-High	0.2	0.2	0.2	0.0	%vol
SP11LKV_2 H-Mid	0.2	0.2	0.2	0.0	%vol
SP12LKV_2 FF-High	0.2	0.2	0.1	0.0	%vol
SP13LKV_2 FF-Mid	0.1	0.2	0.1	0.0	%vol
SP14LKV_2 AT-High	0.1	0.2	0.1	0.0	%vol
SP15LKV_2 AT-Mid	0.1	0.1	0.1	0.0	%vol
SP16LKV_1 BM-High	0.1	0.1	0.1	0.0	%vol
SP17LKV_1 BM-Mid	0.0	0.0	0.0	0.0	%vol
SP18LKV_1 BM-Low	0.0	0.1	0.0	0.0	%vol
SP19LKV_1 NWALL-Cav	0.0	0.0	0.0	0.0	%vol
SP20LKV_1 STUD-Cav	0.1	0.1	0.1	0.0	%vol
SP21LKV_1 FF-Void	8.6	9.1	8.4	0.3	%vol
SP22LKV_1 SF-Void	0.9	0.9	0.9	0.0	%vol
SP23LKV_1 ROOF-Void	0.2	0.2	0.1	0.1	%vol
RELEASEPRESSURE	0.0202	0.0209	0.0196	0.0003	barg
LOWFLOWMETERCH4	1.6	1.7	1.6	0.0	degC
OUTLET_TEMP	2.4	2.5	2.3	0.1	degC
Volume Flow Rate	137.1	139.7	134.7	1.2	SLPM
Energy Flow Rate	81.9	83.5	80.5	0.7	kW
External Wind Speed	2.9				m/s
External Wind Direction	236.6				bearing

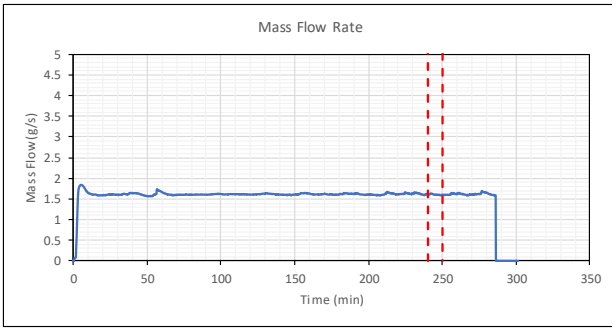




Hallway and Stud into Living Room







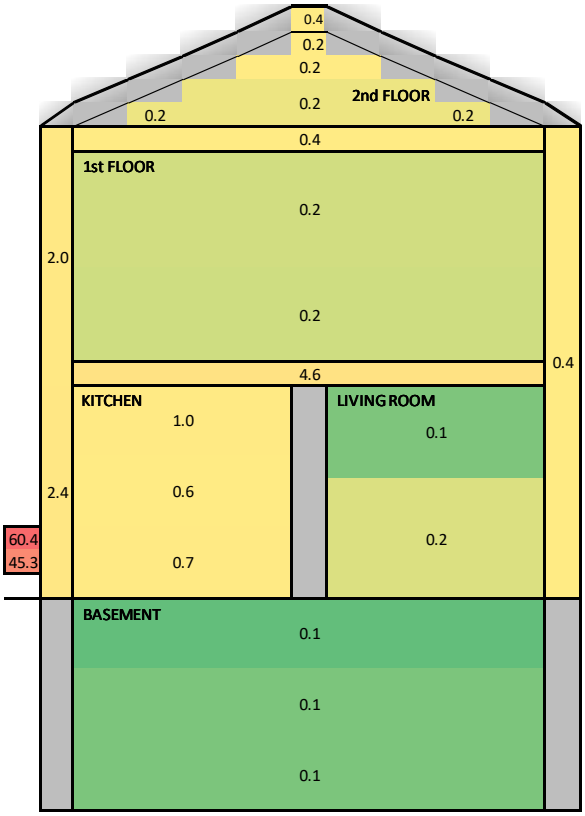
L2-005 RESULT

Hy4Heat WP7 Test Result

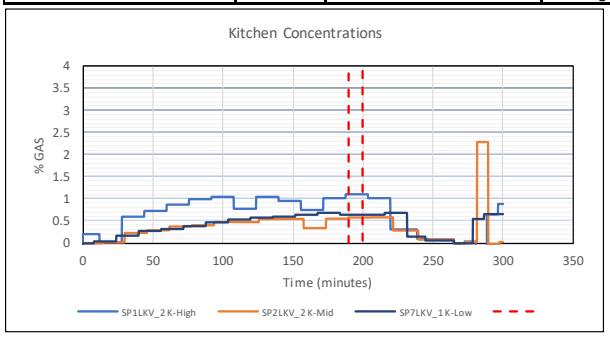
MTP ID: L2-005
Hole Size: 3.6 mm
Location: meter cupboard with 20 mm vent into cavity
Gas: methane
Date: 12/12/2019 **Time:** 03:40:00
Averaging Period Start: 190 min **End:** 200 min

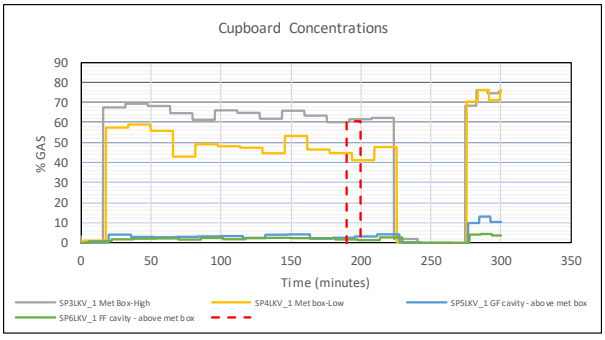
Notes:

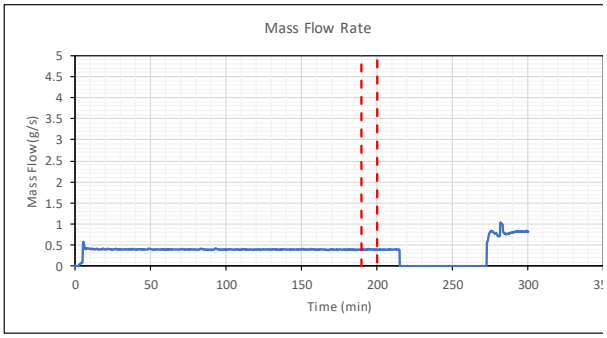
Sensor	Average	Max	Min	STDEV	units
SP1LKV_2 K-High	1.0	1.0	1.0	0.0	%vol
SP2LKV_2 K-Mid	0.6	0.6	0.6	0.0	%vol
SP3LKV_1 Met Box-High	60.4	63.6	60.3	0.4	%vol
SP4LKV_1 Met box-Low	45.3	46.7	44.9	0.7	%vol
SP5LKV_1 GF cavity - above met	2.4	2.6	2.1	0.2	%vol
SP6LKV_1 FF cavity - above met	2.0	2.2	1.6	0.3	%vol
SP7LKV_1 K-Low	0.7	0.7	0.6	0.0	%vol
SP8LKV_2 LR-High	0.1	0.1	0.1	0.0	%vol
SP9LKV_2 LR-Mid	0.2	0.2	0.2	0.0	%vol
SP10LKV_2 H-High	0.2	0.2	0.2	0.0	%vol
SP11LKV_2 H-Mid	0.2	0.2	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	0.2	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_1 BM-Mid	0.1	0.1	0.1	0.0	%vol
SP18LKV_1 BM-Low	0.1	0.1	0.1	0.0	%vol
SP19LKV_1 NWALL-Cav	0.4	0.8	0.4	0.0	%vol
SP20LKV_1 STUD-Cav	0.2	0.2	0.2	0.0	%vol
SP21LKV_1 FF-Void	4.6	4.7	4.5	0.1	%vol
SP22LKV_1 SF-Void	0.4	0.4	0.3	0.1	%vol
SP23LKV_1 ROOF-Void	0.4	0.4	0.4	0.0	%vol
RELEASEPRESSURE	0.0199	0.0	0.0	0.0	barg
LOWFLOWMETERCH4	0.397	0.405	0.390	0.004	g/s
OUTLET_TEMP	1.0	1.2	0.9	0.1	degC
Volume Flow Rate	33.2	33.9	32.6	0.4	SLPM
Energy Flow Rate	19.9	20.2	19.5	0.2	kW
External Wind Speed	1.8				m/s
External Wind Direction	190.3				bearing



Hallway and Stud into Living Room







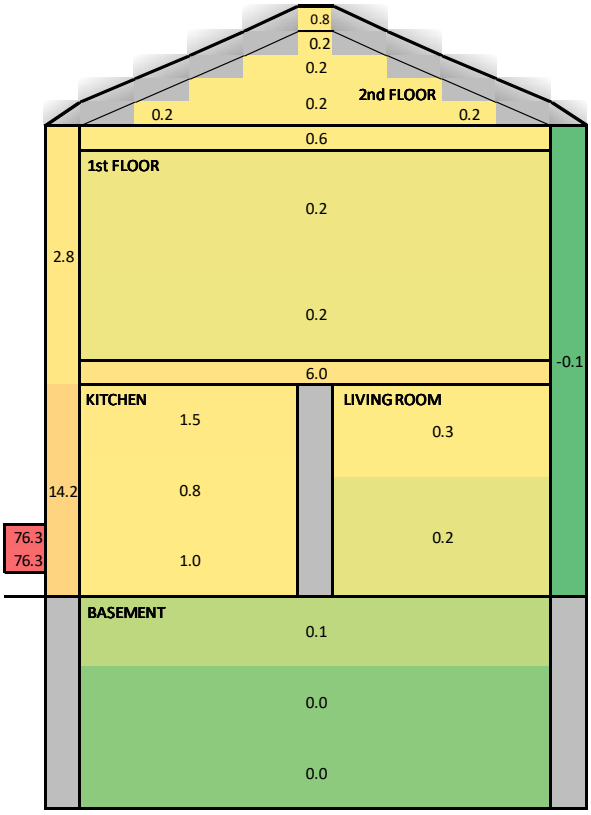
L2-006 RESULT

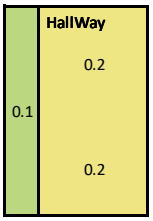
Hy4Heat WP7 Test Result

MTP ID: L2-006
Hole Size: 5.1 mm
Location: meter cupboard with 20 mm vent into cavity
Gas: methane
Date: 12/12/2019 **Time:** 08:15:00
Averaging Period Start: 160 min **End:** 170 min

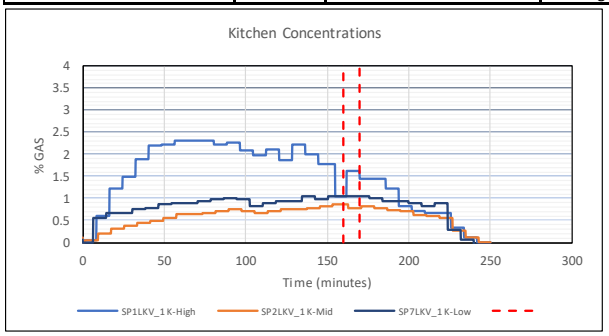
Notes: Suspect VOL sensor 'topped out' for meter box sample points

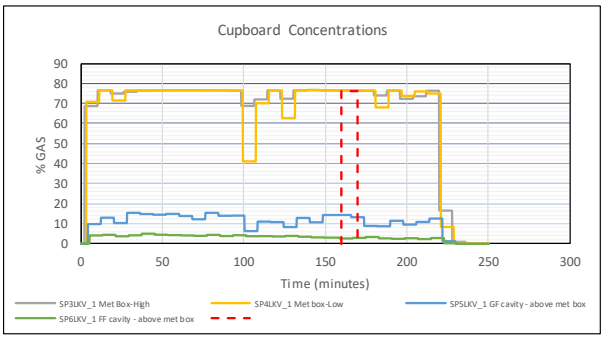
Sensor	Average	Max	Min	STDEV	units
SP1LKV_1 K-High	1.5	1.8	1.0	0.4	%vol
SP2LKV_1 K-Mid	0.8	0.9	0.8	0.0	%vol
SP3LKV_1 Met Box-High	76.3	76.4	76.3	0.0	%vol
SP4LKV_1 Met box-Low	76.3	76.3	76.3	0.0	%vol
SP5LKV_1 GF cavity - above met	14.2	14.2	10.6	0.5	%vol
SP6LKV_1 FF cavity - above met	2.8	2.9	2.8	0.0	%vol
SP7LKV_1 K-Low	1.0	1.0	1.0	0.0	%vol
SP8LKV_1 LR-High	0.3	0.3	0.3	0.0	%vol
SP9LKV_1 LR-Mid	0.2	0.2	0.2	0.0	%vol
SP10LKV_2 H-High	0.2	0.2	0.2	0.0	%vol
SP11LKV_2 H-Mid	0.2	0.2	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	0.2	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	0.0	0.0	0.0	0.0	%vol
SP18LKV_2 BM-Low	0.0	0.0	0.0	0.0	%vol
SP19LKV_1 NWALL-Cav	-0.1	-0.1	-0.1	0.0	%vol
SP20LKV_1 STUD-Cav	0.1	0.2	0.1	0.0	%vol
SP21LKV_1 FF-Void	6.0	6.6	5.9	0.1	%vol
SP22LKV_1 SF-Void	0.6	0.7	0.6	0.0	%vol
SP23LKV_1 ROOF-Void	0.8	0.9	0.7	0.1	%vol
RELEASEPRESSURE	0.0199	0.0	0.0	0.0	barg
LOWFLOWMETERCH4	0.8	0.8	0.8	0.0	g/s
OUTLET_TEMP	2.3	2.4	2.2	0.1	degC
Volume Flow Rate	66.1	67.1	65.2	0.5	SLPM
Energy Flow Rate	39.5	40.1	39.0	0.3	kW
External Wind Speed	1.2				m/s
External Wind Direction	68.3				bearing

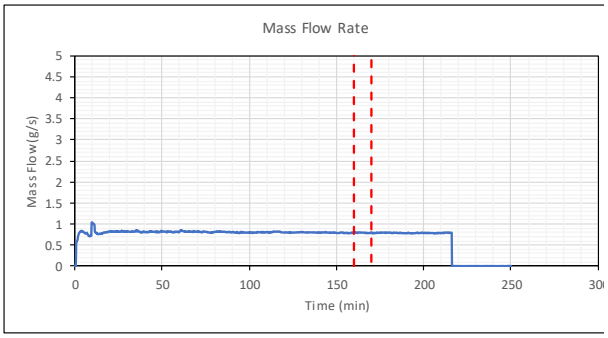




Hallway and Stud into Living Room







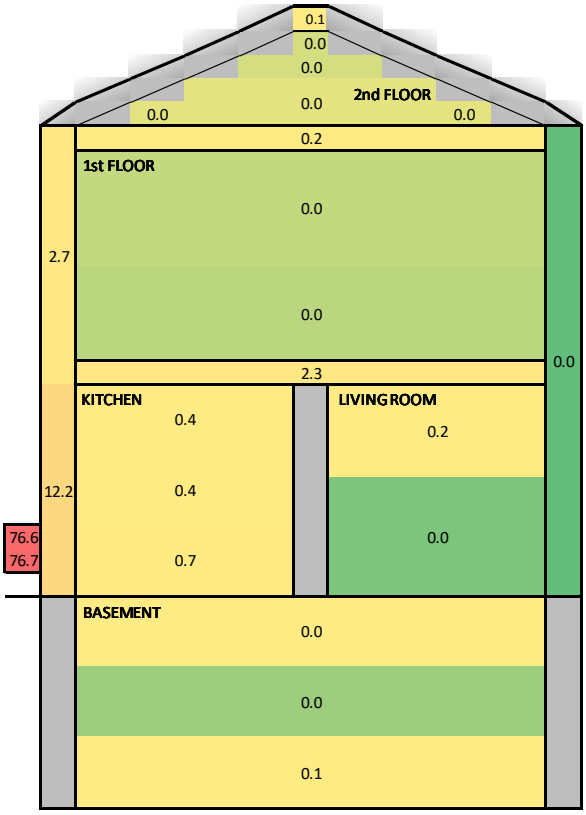
L2-007 RESULT

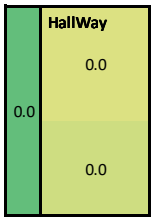
Hy4Heat WP7 Test Result

MTP ID: L2-007
Hole Size: 7.2 mm
Location: meter cupboard with 20 mm vent into cavity
Gas: methane
Date: 12/12/2019 **Time:** 12:40:00
Averaging Period Start: 80 min **End:** 90 min

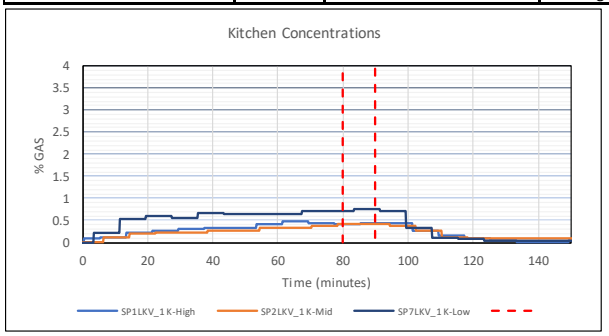
Notes: Suspect VOL sensor 'topped out' in meter box sampling. Flow rate hard to control and steady state achieved quicker than other tests

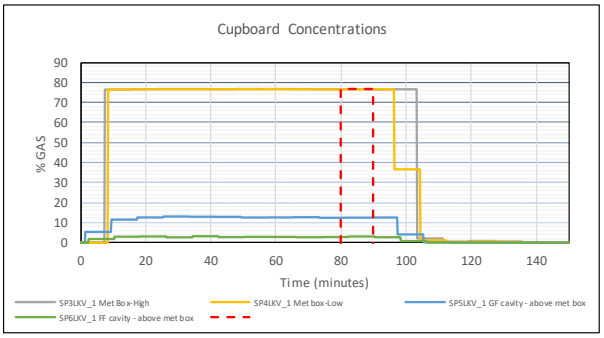
Sensor	Average	Max	Min	STDEV	units
SP1LKV_1 K-High	0.4	0.4	0.4	0.0	%vol
SP2LKV_1 K-Mid	0.4	0.4	0.3	0.0	%vol
SP3LKV_1 Met Box-High	76.6	76.7	76.6	0.0	%vol
SP4LKV_1 Met box-Low	76.7	76.8	76.7	0.0	%vol
SP5LKV_1 GF cavity - above met	12.2	12.4	12.1	0.1	%vol
SP6LKV_1 FF cavity - above met	2.7	2.7	2.6	0.1	%vol
SP7LKV_1 K-Low	0.7	0.7	0.7	0.0	%vol
SP8LKV_1 LR-High	0.2	0.2	0.2	0.0	%vol
SP9LKV_1 LR-Mid	0.0	0.0	0.0	0.0	%vol
SP10LKV_2 H-High	0.0	0.0	0.0	0.0	%vol
SP11LKV_2 H-Mid	0.0	0.0	0.0	0.0	%vol
SP12LKV_2 FF-High	0.0	0.0	0.0	0.0	%vol
SP13LKV_2 FF-Mid	0.0	0.0	0.0	0.0	%vol
SP14LKV_2 AT-High	0.0	0.0	0.0	0.0	%vol
SP15LKV_2 AT-Mid	0.0	0.0	0.0	0.0	%vol
SP16LKV_2 BM-High	0.0	0.0	0.0	0.0	%vol
SP17LKV_1 BM-Mid	0.0	0.1	0.0	0.0	%vol
SP18LKV_1 BM-Low	0.1	0.1	0.1	0.0	%vol
SP19LKV_1 NWALL-Cav	0.0	0.0	0.0	0.0	%vol
SP20LKV_1 STUD-Cav	0.0	0.0	0.0	0.0	%vol
SP21LKV_1 FF-Void	2.3	2.5	2.2	0.2	%vol
SP22LKV_1 SF-Void	0.2	0.2	0.2	0.0	%vol
SP23LKV_1 ROOF-Void	0.1	0.1	0.1	0.0	%vol
RELEASEPRESSURE	0.0184	0.0	0.0	0.0	barg
LOWFLOWMETERCH4	1.3	1.3	1.2	0.0	g/s
OUTLET_TEMP	1.7	1.9	1.6	0.1	degC
Volume Flow Rate	105.7	107.2	103.8	1.0	SLPM
Energy Flow Rate	63.2	64.1	62.0	0.6	kW
External Wind Speed	2.9				m/s
External Wind Direction	75.2				bearing

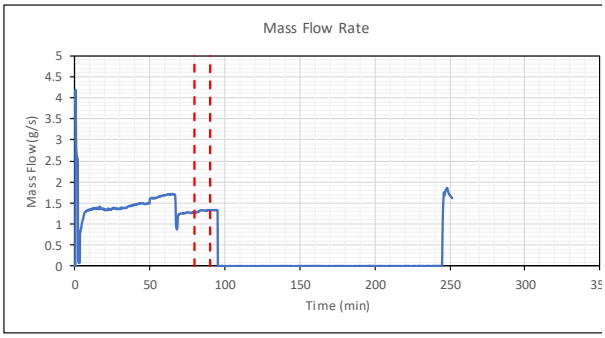




Hallway and Stud into Living Room







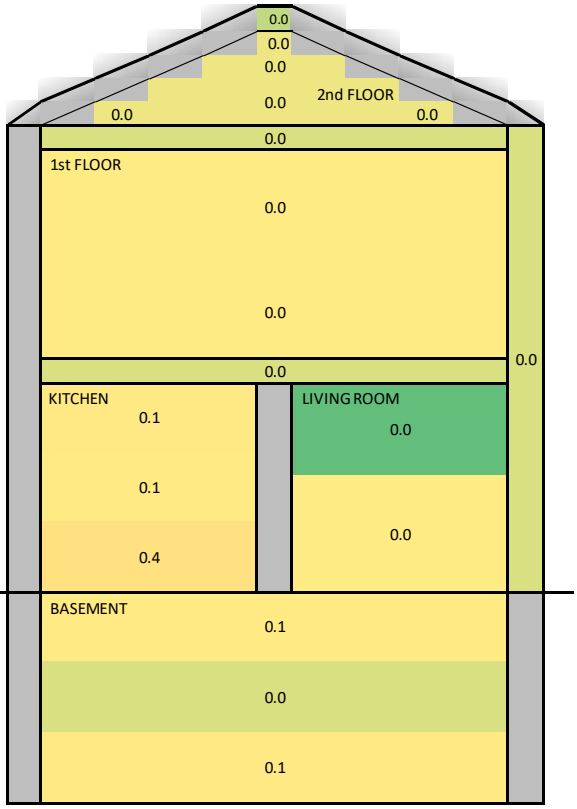
L2-010 RESULT

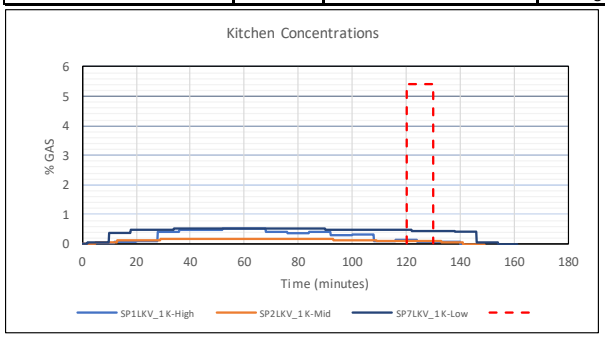
Hy4Heat WP7 Test Result

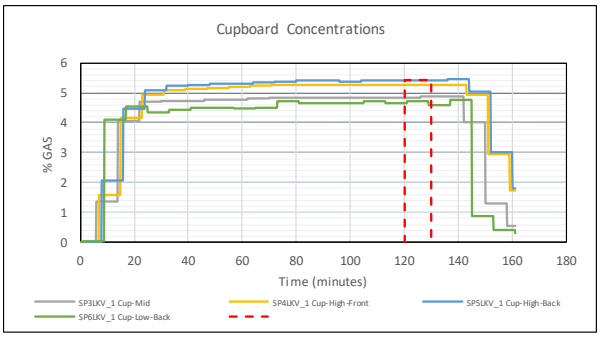
MTP ID: L2-010
Hole Size: 0.6 mm
Location: Kitchen wall cupboard, doors closed
Gas: Methane
Date: 10/12/2019 **Time:** 01:19:00
Averaging Period Start: 120 min **End:** 130 min

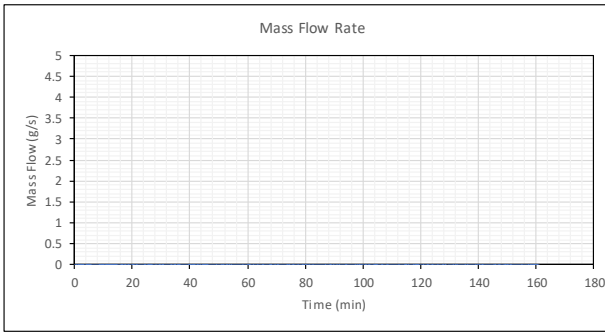
Notes: Note that Kitchen low point reports higher than kitchen mid and high. Perhaps to do with gap under kitchen door. Flammable mixtures inside cupboard only

Sensor	Average	Max	Min	STDEV	units
SP1LKV_1 K-High	0.1	0.2	0.1	0.0	%vol
SP2LKV_1 K-Mid	0.1	0.1	0.1	0.0	%vol
SP3LKV_1 Cup-Mid	4.8	4.9	4.8	0.0	%vol
SP4LKV_1 Cup-High-Front	5.3	5.3	5.3	0.0	%vol
SP5LKV_1 Cup-High-Back	5.4	5.4	5.4	0.0	%vol
SP6LKV_1 Cup-Low-Back	4.7	4.7	4.6	0.0	%vol
SP7LKV_1 K-Low	0.4	0.5	0.4	0.0	%vol
SP8LKV_2 LR-High	0.0	0.0	0.0	0.0	%vol
SP9LKV_2 LR-Mid	0.0	0.0	0.0	0.0	%vol
SP10LKV_2 H-High	0.0	0.0	0.0	0.0	%vol
SP11LKV_2 H-Mid	0.0	0.0	0.0	0.0	%vol
SP12LKV_2 FF-High	0.0	0.0	0.0	0.0	%vol
SP13LKV_2 FF-Mid	0.0	0.0	0.0	0.0	%vol
SP14LKV_2 AT-High	0.0	0.0	0.0	0.0	%vol
SP15LKV_2 AT-Mid	0.0	0.0	0.0	0.0	%vol
SP16LKV_2 BM-High	0.1	0.1	0.1	0.0	%vol
SP17LKV_2 BM-Mid	0.0	0.0	0.0	0.0	%vol
SP18LKV_1 BM-Low	0.1	0.1	0.1	0.0	%vol
SP19LKV_2 NWALL-Cav	0.0	0.0	0.0	0.0	%vol
SP20LKV_2 STUD-Cav	0.0	0.0	0.0	0.0	%vol
SP21LKV_2 FF-Void	0.0	0.0	0.0	0.0	%vol
SP22LKV_1 SF-Void	0.0	0.0	0.0	0.0	%vol
SP23LKV_1 ROOF-Void	0.0	0.0	0.0	0.0	%vol
RELEASEPRESSURE	0.0199	0.0	0.0	0.0	barg
LOWFLOWMETERCH4	0.0	0.0	0.0	0.0	g/s
OUTLET_TEMP	4.8	4.9	4.7	0.1	degC
Volume Flow Rate	-0.1	0.0	0.0	0.0	SLPM
Energy Flow Rate	0.0	0.0	0.0	0.0	kW
External Wind Speed	4.0				m/s
External Wind Direction	199.4				bearing









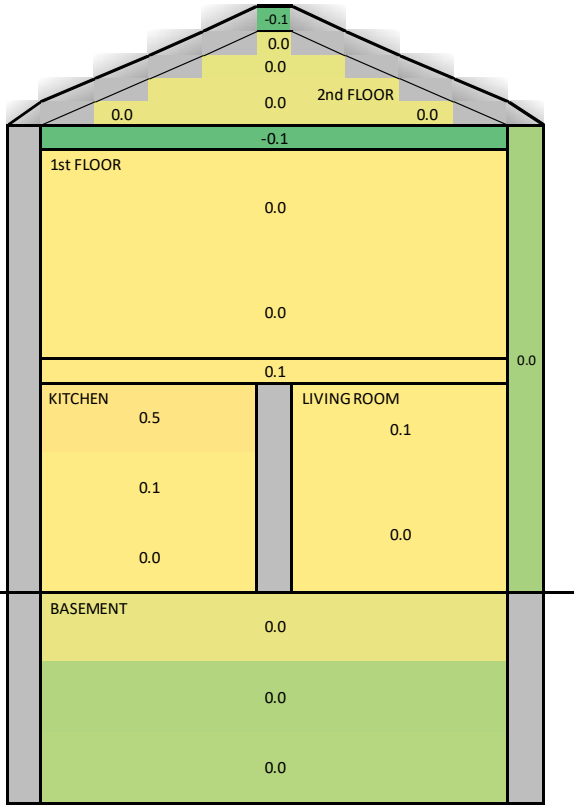
L2-011 RESULT

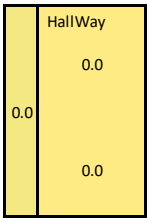
Hy4Heat WP7 Test Result

MTP ID: L2-011
Hole Size: 0.9 mm
Location: Kitchen wall cupboard, doors closed
Gas: Methane
Date: 10/12/2019 **Time:** 06:24:10
Averaging Period Start: 130 min **End:** 140 min

Notes: 0.1% offset removed from SP17-SP23 (analyser 3, vol sensor)

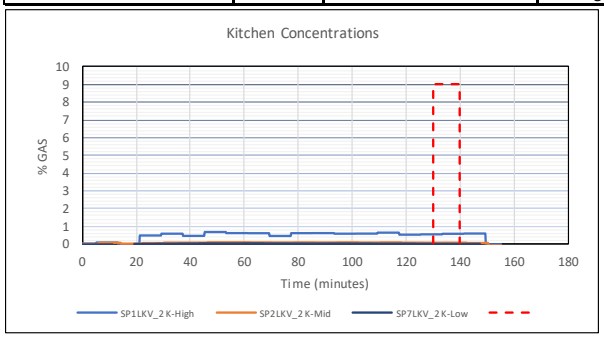
Sensor	Average	Max	Min	STDEV	units
SP1LKV_2 K-High	0.5	0.6	0.5	0.0	%vol
SP2LKV_2 K-Mid	0.1	0.1	0.1	0.0	%vol
SP3LKV_1 Cup-Mid	7.9	7.9	7.9	0.0	%vol
SP4LKV_1 Cup-High-Front	8.6	8.6	8.6	0.0	%vol
SP5LKV_1 Cup-High-Back	8.8	8.8	8.8	0.0	%vol
SP6LKV_1 Cup-Low-Back	9.0	9.0	8.9	0.0	%vol
SP7LKV_2 K-Low	0.0	0.0	0.0	0.0	%vol
SP8LKV_1 LR-High	0.1	0.1	0.0	0.0	%vol
SP9LKV_2 LR-Mid	0.0	0.0	0.0	0.0	%vol
SP10LKV_2 H-High	0.0	0.0	0.0	0.0	%vol
SP11LKV_2 H-Mid	0.0	0.0	0.0	0.0	%vol
SP12LKV_2 FF-High	0.0	0.0	0.0	0.0	%vol
SP13LKV_2 FF-Mid	0.0	0.0	0.0	0.0	%vol
SP14LKV_2 AT-High	0.0	0.0	0.0	0.0	%vol
SP15LKV_2 AT-Mid	0.0	0.0	0.0	0.0	%vol
SP16LKV_2 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	0.0	0.0	0.0	0.0	%vol
SP21LKV_1 FF-Void	0.1	0.1	0.1	0.0	%vol
SP22LKV_1 SF-Void	-0.1	0.0	-0.1	0.0	%vol
SP23LKV_1 ROOF-Void	-0.1	-0.1	-0.1	0.0	%vol
RELEASEPRESSURE	0.0200	0.0	0.0	0.0	barg
LOWFLOWMETERCH4	0.0	0.0	0.0	0.0	g/s
OUTLET_TEMP	5.3	5.4	5.2	0.1	degC
Volume Flow Rate	-0.1	0.0	0.0	0.0	SLPM
Energy Flow Rate	0.0	0.0	0.0	0.0	kW
External Wind Speed	4.3				m/s
External Wind Direction	190.3				bearing

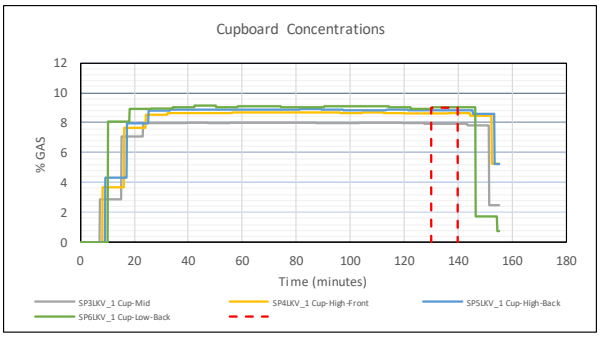


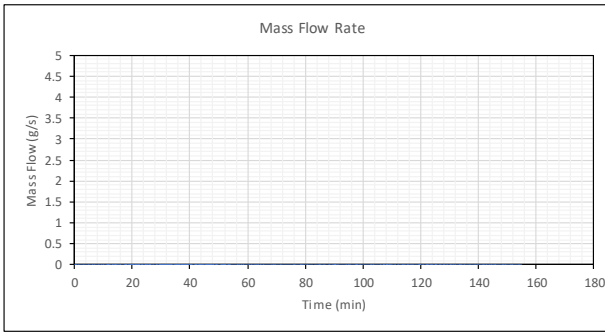


Hallway and Stud into Living Room

Cupboard (top is average of SP4 and SP5







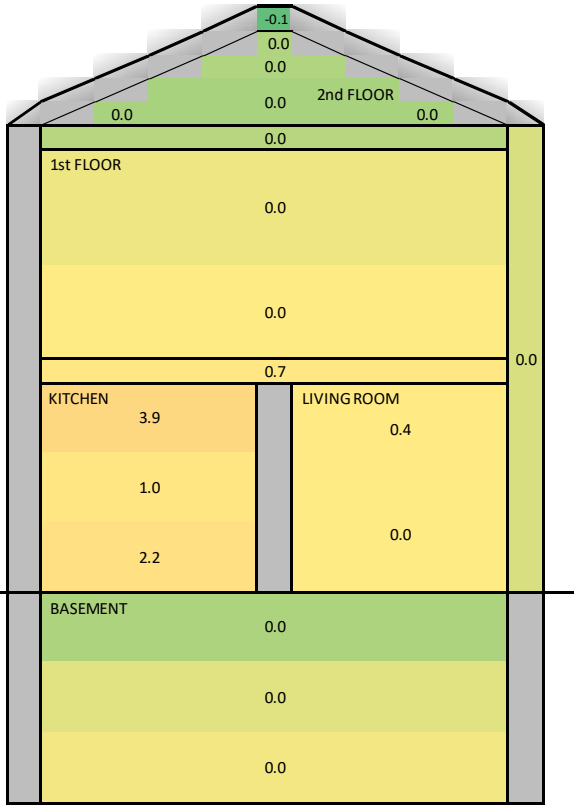
L2-012 RESULT

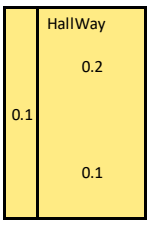
Hy4Heat WP7 Test Result

MTP ID: L2-012
Hole Size: 1.8 mm
Location: Kitchen wall cupboard, doors closed
Gas: Methane
Date: 10/12/2019 **Time:** 10:15:00
Averaging Period Start: 120 min **End:** 130 min

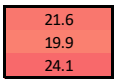
Notes: Offset on analyser 3 (SP17-SP23) removed of -0.248% for analys

Sensor	Average	Max	Min	STDEV	units
SP1LKV_1 K-High	3.9	3.9	3.8	0.0	%vol
SP2LKV_1 K-Mid	1.0	1.0	1.0	0.0	%vol
SP3LKV_1 Cup-Mid	19.9	19.9	19.9	0.0	%vol
SP4LKV_1 Cup-High-Front	21.4	21.4	21.4	0.0	%vol
SP5LKV_1 Cup-High-Back	21.8	21.8	21.8	0.0	%vol
SP6LKV_1 Cup-Low-Back	24.1	24.2	23.9	0.1	%vol
SP7LKV_1 K-Low	2.2	2.2	2.1	0.0	%vol
SP8LKV_1 LR-High	0.4	0.4	0.4	0.0	%vol
SP9LKV_1 LR-Mid	0.0	0.0	0.0	0.0	%vol
SP10LKV_2 H-High	0.2	0.2	0.1	0.0	%vol
SP11LKV_2 H-Mid	0.1	0.1	0.1	0.0	%vol
SP12LKV_2 FF-High	0.0	0.0	0.0	0.0	%vol
SP13LKV_2 FF-Mid	0.0	0.0	0.0	0.0	%vol
SP14LKV_2 AT-High	0.0	0.0	0.0	0.0	%vol
SP15LKV_2 AT-Mid	0.0	0.0	0.0	0.0	%vol
SP16LKV_2 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	0.1	0.0	0.0	%vol
SP19LKV_1 NWALL-Cav	0.0	0.0	0.0	0.0	%vol
SP20LKV_1 STUD-Cav	0.1	0.1	0.1	0.0	%vol
SP21LKV_1 FF-Void	0.7	0.8	0.7	0.0	%vol
SP22LKV_1 SF-Void	0.0	0.0	0.0	0.0	%vol
SP23LKV_1 ROOF-Void	-0.1	-0.1	-0.1	0.0	%vol
RELEASEPRESSURE	0.0200	0.0	0.0	0.0	barg
LOWFLOWMETERCH4	0.1	0.1	0.1	0.0	g/s
OUTLET_TEMP	8.8	8.9	8.6	0.1	degC
Volume Flow Rate	8.0	0.0	0.0	0.0	SLPM
Energy Flow Rate	4.8	0.0	0.0	0.0	kW
External Wind Speed	4.7				m/s
External Wind Direction	187.5				bearing

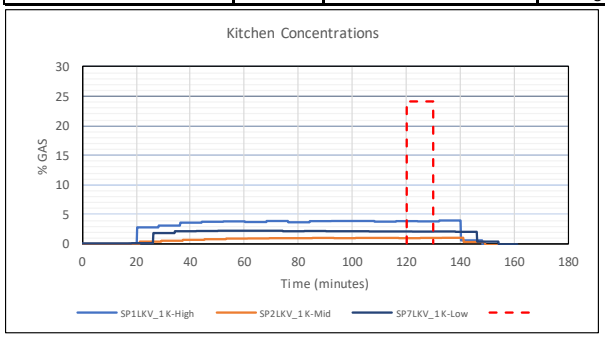


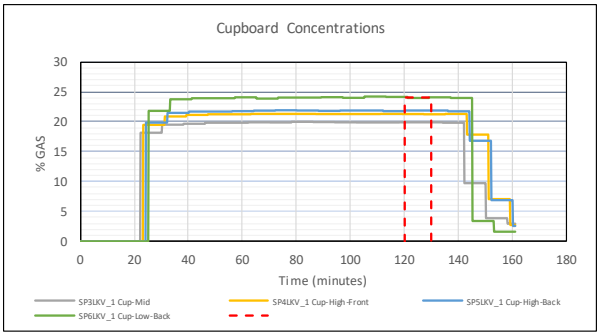


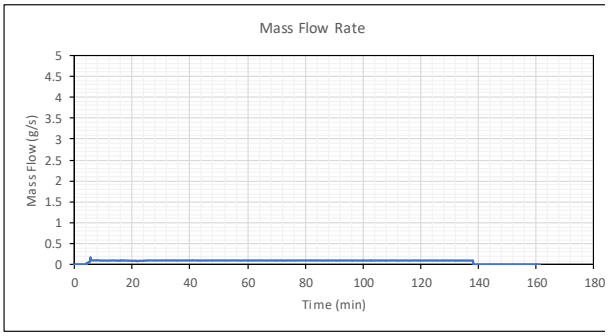
Hallway and Stud into Living Room



Cupboard (top is average of SP4 and SP5







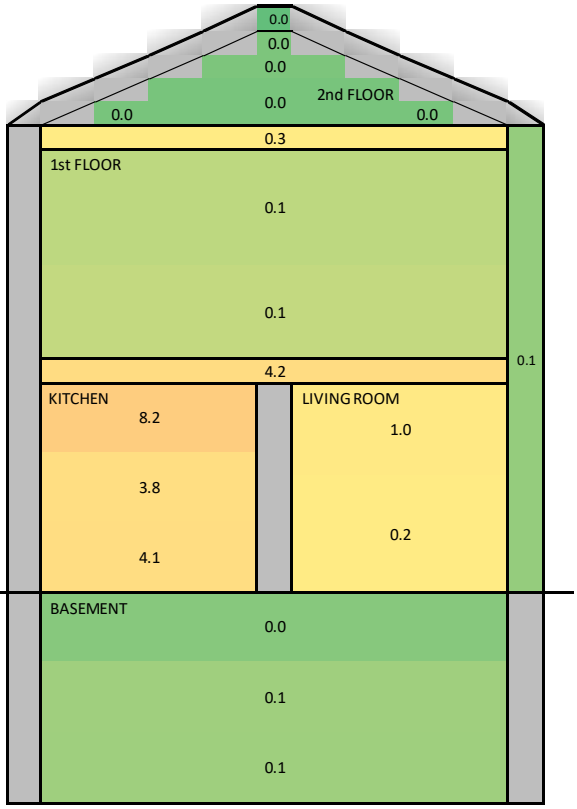
L2-013 RESULT

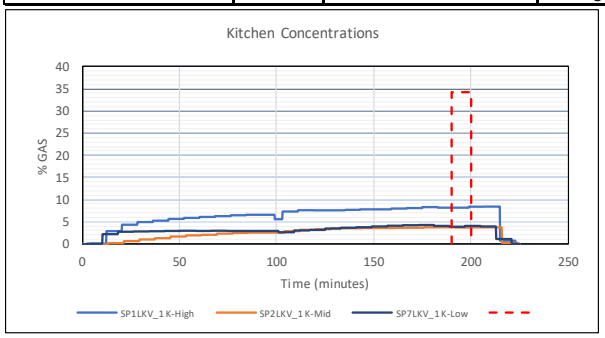
Hy4Heat WP7 Test Result

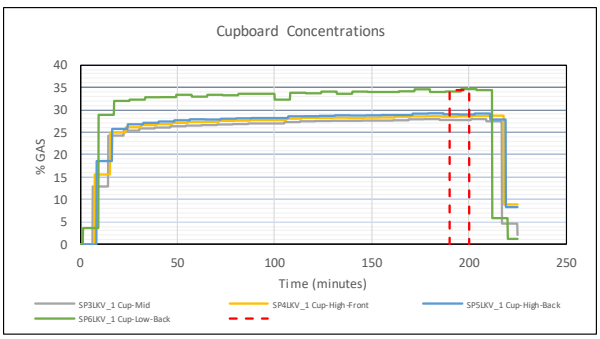
MTP ID: L2-013
Hole Size: 2.5 mm
Location: Kitchen wall cupboard, doors closed
Gas: Methane
Date: 10/12/2019 **Time:** 14:15:00
Averaging Period Start: 190 min **End:** 200 min

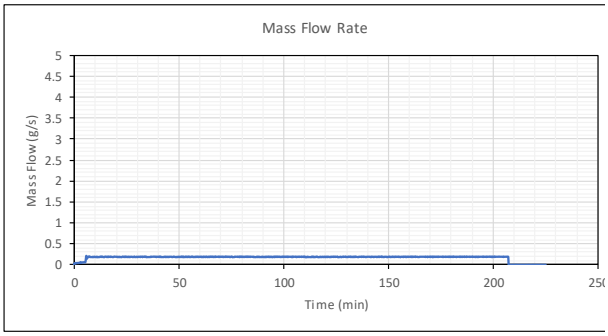
Notes: -0.2% offset applied to analyer3 (SP17-23) for volumetric sensor drift. LEL sensor non-functioning in this experiment

Sensor	Average	Max	Min	STDEV	units
SP1LKV_1 K-High	8.2	8.2	8.1	0.1	%vol
SP2LKV_1 K-Mid	3.8	3.8	3.7	0.0	%vol
SP3LKV_1 Cup-Mid	28.0	28.0	27.8	0.1	%vol
SP4LKV_1 Cup-High-Front	28.6	28.6	28.6	0.0	%vol
SP5LKV_1 Cup-High-Back	29.1	29.1	29.1	0.0	%vol
SP6LKV_1 Cup-Low-Back	34.3	34.7	34.1	0.3	%vol
SP7LKV_1 K-Low	4.1	4.2	4.0	0.1	%vol
SP8LKV_1 LR-High	1.0	1.0	1.0	0.0	%vol
SP9LKV_1 LR-Mid	0.2	0.3	0.2	0.0	%vol
SP10LKV_2 H-High	0.6	0.6	0.5	0.0	%vol
SP11LKV_2 H-Mid	0.4	0.4	0.3	0.0	%vol
SP12LKV_2 FF-High	0.1	0.1	0.1	0.0	%vol
SP13LKV_2 FF-Mid	0.1	0.2	0.1	0.0	%vol
SP14LKV_2 AT-High	0.0	0.0	0.0	0.0	%vol
SP15LKV_2 AT-Mid	0.0	0.0	0.0	0.0	%vol
SP16LKV_2 BM-High	0.0	0.0	0.0	0.0	%vol
SP17LKV_1 BM-Mid	0.1	0.1	0.1	0.0	%vol
SP18LKV_1 BM-Low	0.1	0.1	0.1	0.0	%vol
SP19LKV_1 NWALL-Cav	0.1	0.1	0.0	0.0	%vol
SP20LKV_1 STUD-Cav	0.4	0.4	0.4	0.0	%vol
SP21LKV_1 FF-Void	4.2	4.5	4.1	0.2	%vol
SP22LKV_1 SF-Void	0.3	0.3	0.3	0.0	%vol
SP23LKV_1 ROOF-Void	0.0	0.0	0.0	0.0	%vol
RELEASEPRESSURE	0.0198	0.0	0.0	0.0	barg
LOWFLOWMETERCH4	0.2	0.2	0.2	0.0	g/s
OUTLET_TEMP	6.5	6.8	6.2	0.1	degC
Volume Flow Rate	16.5	0.0	0.0	0.0	SLPM
Energy Flow Rate	9.9	0.0	0.0	0.0	kW
External Wind Speed	4.2				m/s
External Wind Direction	233.3				bearing









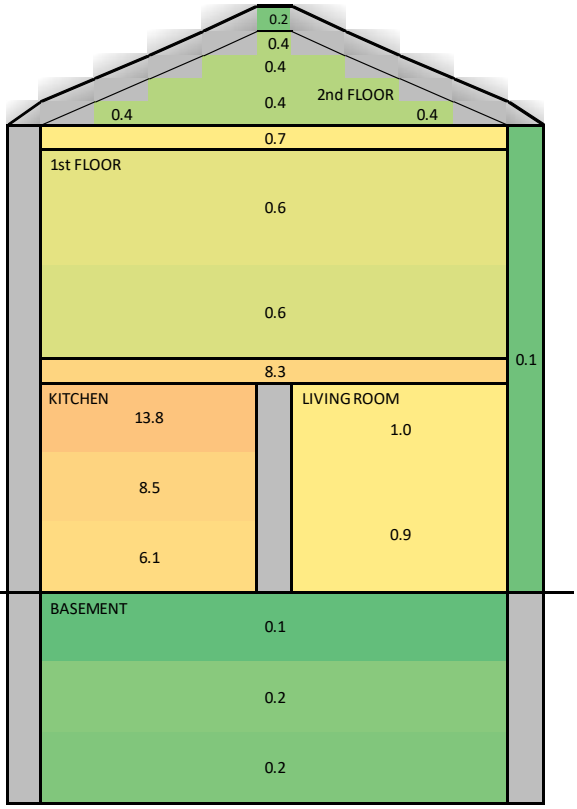
L2-014 RESULT

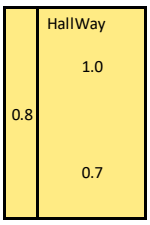
Hy4Heat WP7 Test Result

MTP ID: L2-014
Hole Size: 3.6 mm
Location: Kitchen wall cupboard, doors closed
Gas: Methane
Date: 10/12/2019 **Time:** 18:40:00
Averaging Period Start: 200 min **End:** 210 min

Notes:

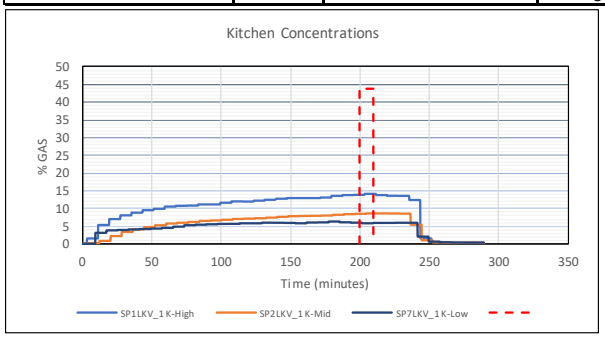
Sensor	Average	Max	Min	STDEV	units
SP1LKV_1 K-High	13.8	13.8	13.8	0.0	%vol
SP2LKV_1 K-Mid	8.5	8.6	8.5	0.1	%vol
SP3LKV_1 Cup-Mid	37.0	37.2	37.0	0.1	%vol
SP4LKV_1 Cup-High-Front	36.8	36.8	36.7	0.0	%vol
SP5LKV_1 Cup-High-Back	37.3	37.3	37.3	0.0	%vol
SP6LKV_1 Cup-Low-Back	43.8	44.0	43.7	0.1	%vol
SP7LKV_1 K-Low	6.1	6.1	6.0	0.1	%vol
SP8LKV_2 LR-High	1.0	1.0	0.9	0.0	%vol
SP9LKV_1 LR-Mid	0.9	0.9	0.9	0.0	%vol
SP10LKV_2 H-High	1.0	1.1	1.0	0.1	%vol
SP11LKV_2 H-Mid	0.7	0.7	0.7	0.0	%vol
SP12LKV_2 FF-High	0.6	0.6	0.6	0.0	%vol
SP13LKV_2 FF-Mid	0.6	0.6	0.5	0.0	%vol
SP14LKV_2 AT-High	0.4	0.4	0.4	0.0	%vol
SP15LKV_2 AT-Mid	0.4	0.4	0.4	0.0	%vol
SP16LKV_2 BM-High	0.1	0.1	0.1	0.0	%vol
SP17LKV_1 BM-Mid	0.2	0.2	0.2	0.0	%vol
SP18LKV_1 BM-Low	0.2	0.2	0.2	0.0	%vol
SP19LKV_1 NWALL-Cav	0.1	0.1	0.1	0.0	%vol
SP20LKV_1 STUD-Cav	0.8	0.8	0.8	0.0	%vol
SP21LKV_1 FF-Void	8.3	8.4	8.3	0.0	%vol
SP22LKV_1 SF-Void	0.7	0.8	0.7	0.0	%vol
SP23LKV_1 ROOF-Void	0.2	0.2	0.2	0.0	%vol
RELEASEPRESSURE	0.0196	0.0	0.0	0.0	barg
LOWFLOWMETERCH4	0.4	0.4	0.4	0.0	g/s
OUTLET_TEMP	4.7	4.8	4.7	0.0	degC
Volume Flow Rate	34.3	0.0	0.0	0.0	SLPM
Energy Flow Rate	20.5	0.0	0.0	0.0	kW
External Wind Speed	5.4				m/s
External Wind Direction	227.4				bearing

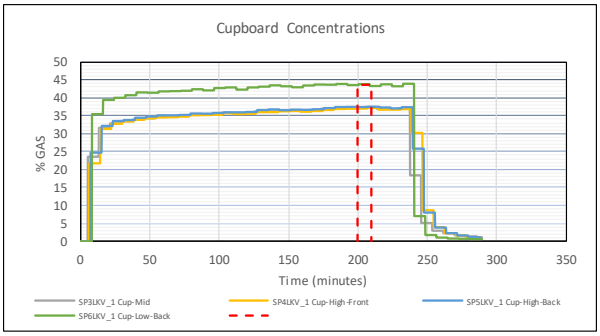


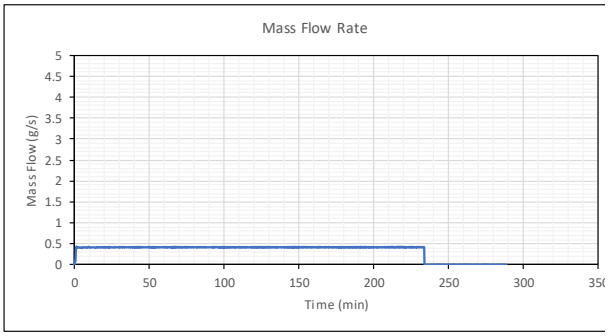


Hallway and Stud into Living Room

Cupboard (top is average of SP4 and SP5







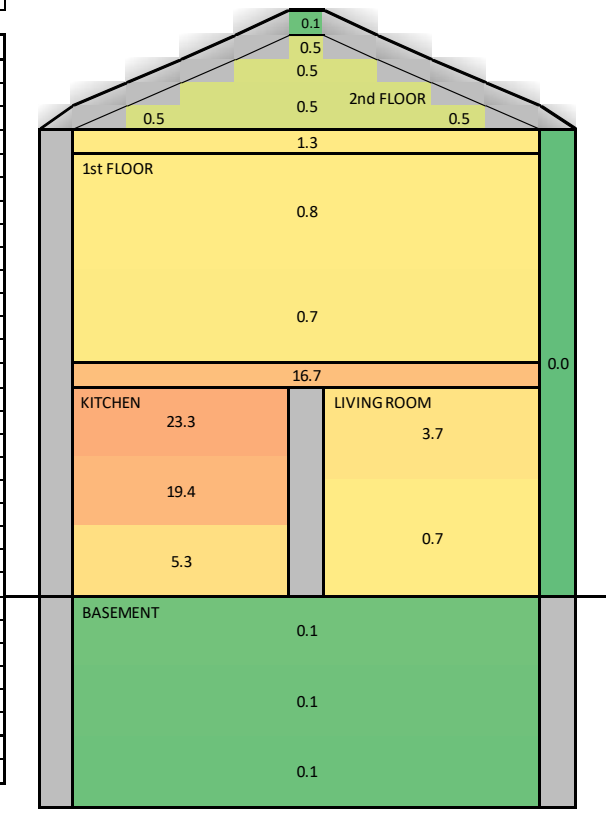
L2-015 RESULT

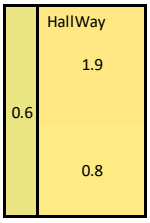
Hy4Heat WP7 Test Result

MTP ID: L2-015
Hole Size: 5.1 mm
Location: Kitchen wall cupboard
Gas: methane
Date: 11/12/2019 **Time:** 00:50:00
Averaging Period Start: 135 min **End:** 145 min

Notes:

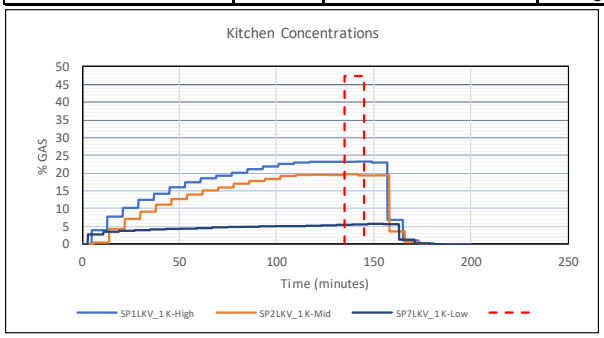
Sensor	Average	Max	Min	STDEV	units
SP1LKV_1 K-High	23.3	23.3	23.3	0.0	%vol
SP2LKV_1 K-Mid	19.4	19.4	19.4	0.0	%vol
SP3LKV_1 Cup-Mid	42.3	42.3	42.2	0.1	%vol
SP4LKV_1 Cup-High-Front	32.2	32.4	31.8	0.2	%vol
SP5LKV_1 Cup-High-Back	31.8	32.0	31.8	0.0	%vol
SP6LKV_1 Cup-Low-Back	47.5	47.6	47.4	0.1	%vol
SP7LKV_1 K-Low	5.3	5.3	5.2	0.1	%vol
SP8LKV_1 LR-High	3.7	3.7	3.6	0.1	%vol
SP9LKV_1 LR-Mid	0.7	0.8	0.7	0.1	%vol
SP10LKV_2 H-High	1.9	1.9	1.9	0.0	%vol
SP11LKV_2 H-Mid	0.8	0.8	0.8	0.0	%vol
SP12LKV_2 FF-High	0.8	0.9	0.7	0.0	%vol
SP13LKV_2 FF-Mid	0.7	0.8	0.6	0.0	%vol
SP14LKV_2 AT-High	0.5	0.6	0.5	0.0	%vol
SP15LKV_2 AT-Mid	0.5	0.6	0.5	0.0	%vol
SP16LKV_2 BM-High	0.1	0.1	0.1	0.0	%vol
SP17LKV_1 BM-Mid	0.1	0.1	0.1	0.0	%vol
SP18LKV_1 BM-Low	0.1	0.1	0.1	0.0	%vol
SP19LKV_1 NWALL-Cav	0.0	0.0	0.0	0.0	%vol
SP20LKV_1 STUD-Cav	0.6	0.7	0.6	0.0	%vol
SP21LKV_1 FF-Void	16.7	16.8	16.5	0.0	%vol
SP22LKV_1 SF-Void	1.3	1.3	1.3	0.0	%vol
SP23LKV_1 ROOF-Void	0.1	0.1	0.1	0.0	%vol
RELEASEPRESSURE	0.0200	0.0	0.0	0.0	barg
LOWFLOWMETERCH4	0.9	0.9	0.9	0.0	g/s
OUTLET_TEMP	4.3	4.5	4.2	0.1	degC
Volume Flow Rate	76.0	0.0	0.0	0.0	SLPM
Energy Flow Rate	45.5	0.0	0.0	0.0	kW
External Wind Speed	4.7				m/s
External Wind Direction	219.4				bearing

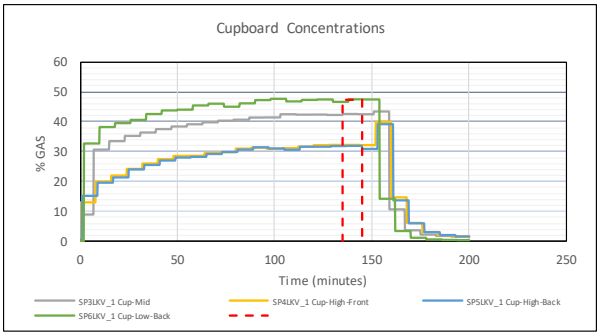


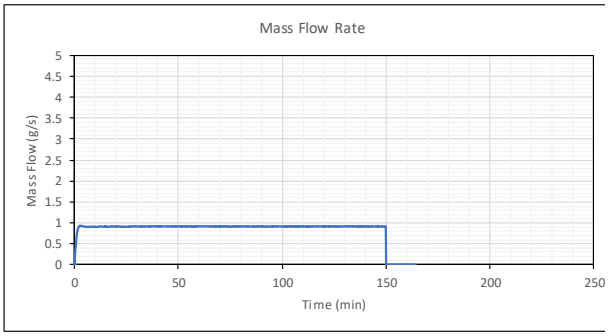


Hallway and Stud into Living Room

Cupboard (top is average of SP4 and SP5







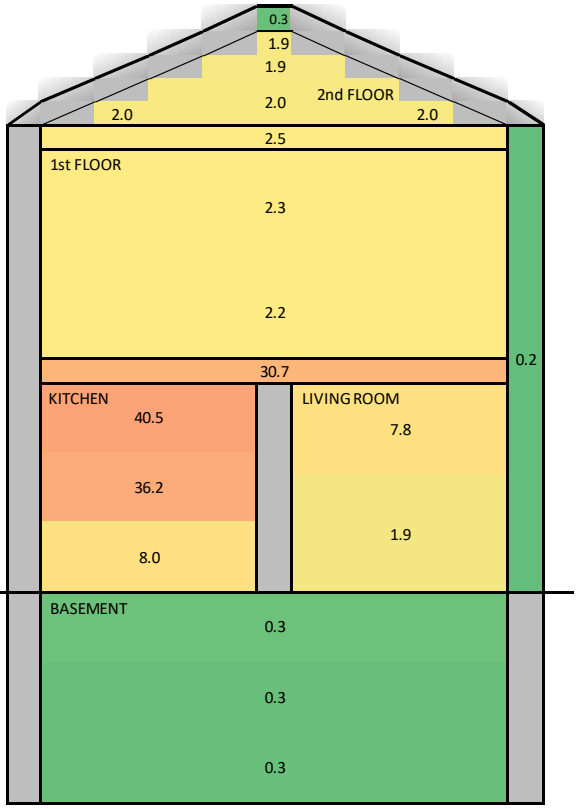
L2-016 RESULT

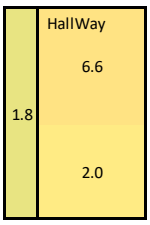
Hy4Heat WP7 Test Result

MTP ID: L2-016
Hole Size: 7.2 mm
Location: kitchen wall cupboard
Gas: methane
Date: 11/12/2019 **Time:** 06:45:00
Averaging Period Start: 160 min **End:** 170 min

Notes:

Sensor	Average	Max	Min	STDEV	units
SP1LKV_1 K-High	40.5	40.8	40.0	0.4	%vol
SP2LKV_1 K-Mid	36.2	36.2	36.2	0.0	%vol
SP3LKV_1 Cup-Mid	65.1	65.3	64.9	0.2	%vol
SP4LKV_1 Cup-High-Front	52.0	52.7	51.7	0.5	%vol
SP5LKV_1 Cup-High-Back	52.2	52.5	50.5	0.3	%vol
SP6LKV_1 Cup-Low-Back	71.7	71.7	71.3	0.1	%vol
SP7LKV_1 K-Low	8.0	8.0	8.0	0.0	%vol
SP8LKV_1 LR-High	7.8	7.9	7.7	0.1	%vol
SP9LKV_1 LR-Mid	1.9	1.9	1.9	0.0	%vol
SP10LKV_1 H-High	6.6	6.6	6.5	0.0	%vol
SP11LKV_2 H-Mid	2.0	2.1	2.0	0.1	%vol
SP12LKV_2 FF-High	2.3	2.4	2.3	0.1	%vol
SP13LKV_2 FF-Mid	2.2	2.3	2.0	0.1	%vol
SP14LKV_2 AT-High	1.9	2.0	1.8	0.1	%vol
SP15LKV_2 AT-Mid	2.0	2.0	1.9	0.0	%vol
SP16LKV_2 BM-High	0.3	0.3	0.3	0.0	%vol
SP17LKV_1 BM-Mid	0.3	0.3	0.3	0.0	%vol
SP18LKV_1 BM-Low	0.3	0.3	0.3	0.0	%vol
SP19LKV_1 NWALL-Cav	0.2	0.3	0.1	0.1	%vol
SP20LKV_1 STUD-Cav	1.8	1.8	1.8	0.0	%vol
SP21LKV_1 FF-Void	30.7	31.3	29.8	0.3	%vol
SP22LKV_1 SF-Void	2.5	2.6	2.5	0.0	%vol
SP23LKV_1 ROOF-Void	0.3	0.3	0.3	0.0	%vol
RELEASEPRESSURE	0.0189	0.0202	0.0181	0.0007	barg
LOWFLOWMETERCH4	1.9416	2.0019	1.9116	0.0320	g/s
OUTLET_TEMP	2.2	2.4	2.0	0.1	degC
Volume Flow Rate	162.4	167.4	159.9	2.7	SLPM
Energy Flow Rate	97.1	100.1	95.6	1.6	kW
External Wind Speed	2.3				m/s
External Wind Direction	221.8				bearing

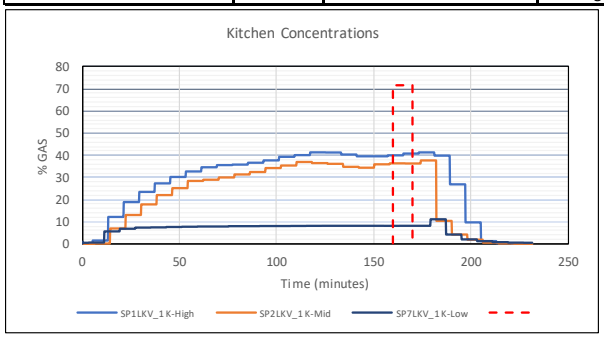


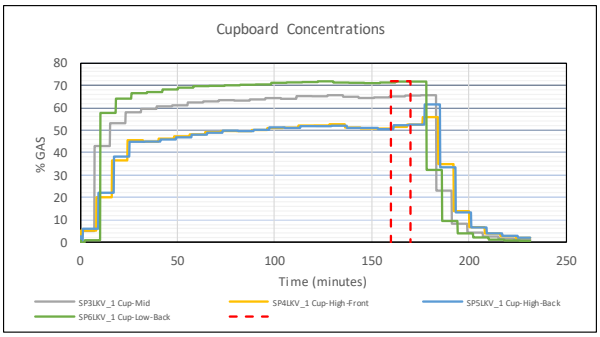


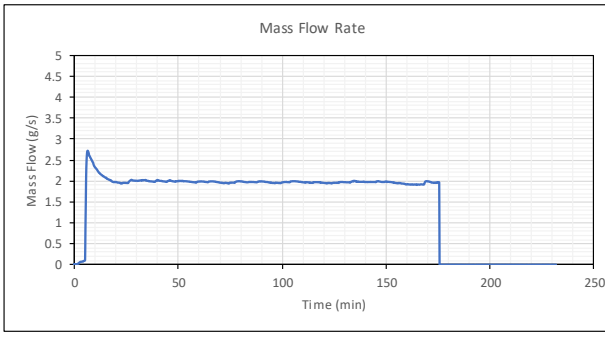
Hallway and Stud into Living Room

52.1
65.1
71.7

Cupboard (top is average of SP4 and SP5







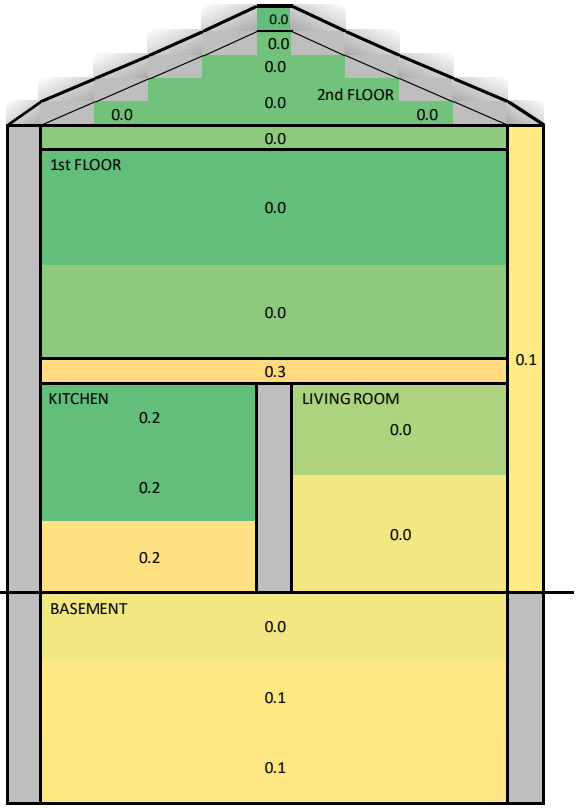
L2-018 RESULT

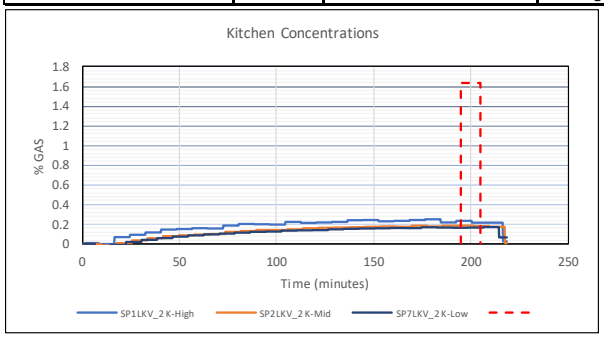
Hy4Heat WP7 Test Result

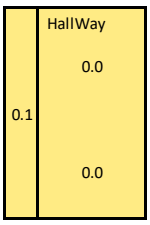
MTP ID: L2-018
Hole Size: 0.6 mm
Location: Kitchen base cupboard, doors closed
Gas: Methane
Date: 07/12/2019 **Time:** 02:15:00
Averaging Period Start: 195 min **End:** 205 min

Notes: Flow rate below measurable range on flow meter, calculated at approx 1 SLPM

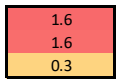
Sensor	Average	Max	Min	STDEV	units
SP1LKV_2 K-High	0.2	0.3	0.2	0.0	%vol
SP2LKV_2 K-Mid	0.2	0.2	0.2	0.0	%vol
SP3LKV_2 Cup-Mid	1.6	1.6	1.6	0.0	%vol
SP4LKV_2 Cup-High-Front	1.6	1.6	1.6	0.0	%vol
SP5LKV_2 Cup-High-Back	1.6	1.6	1.6	0.0	%vol
SP6LKV_2 Cup-Low-Back	0.3	0.3	0.3	0.0	%vol
SP7LKV_2 K-Low	0.2	0.2	0.2	0.0	%vol
SP8LKV_2 LR-High	0.0	0.0	0.0	0.0	%vol
SP9LKV_2 LR-Mid	0.0	0.0	0.0	0.0	%vol
SP10LKV_2 H-High	0.0	0.1	0.0	0.0	%vol
SP11LKV_2 H-Mid	0.0	0.0	0.0	0.0	%vol
SP12LKV_2 FF-High	0.0	0.0	0.0	0.0	%vol
SP13LKV_2 FF-Mid	0.0	0.0	0.0	0.0	%vol
SP14LKV_2 AT-High	0.0	0.0	0.0	0.0	%vol
SP15LKV_2 AT-Mid	0.0	0.0	0.0	0.0	%vol
SP16LKV_2 BM-High	0.0	0.0	0.0	0.0	%vol
SP17LKV_1 BM-Mid	0.1	0.1	0.1	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	0.1	0.1	0.1	0.0	%vol
SP21LKV_1 FF-Void	0.3	0.3	0.3	0.0	%vol
SP22LKV_1 SF-Void	0.0	0.1	0.0	0.0	%vol
SP23LKV_1 ROOF-Void	0.0	0.0	0.0	0.0	%vol
RELEASEPRESSURE	0.0196	0.0	0.0	0.0	barg
LOWFLOWMETERCH4	0.0	0.0	0.0	0.0	g/s
OUTLET_TEMP	7.2	7.4	7.1	0.1	degC
Volume Flow Rate	0.0	0.0	0.0	0.0	SLPM
Energy Flow Rate	0.0	0.0	0.0	0.0	kW
External Wind Speed	4.8				m/s
External Wind Direction	247.6				bearing



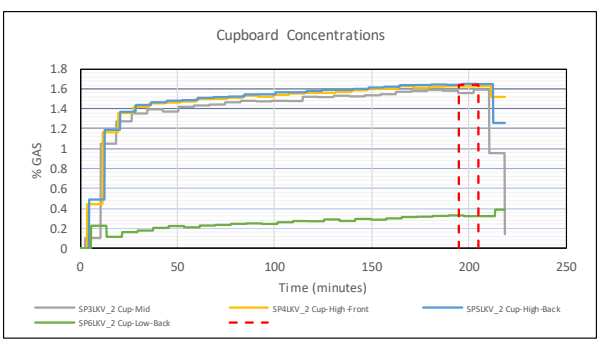


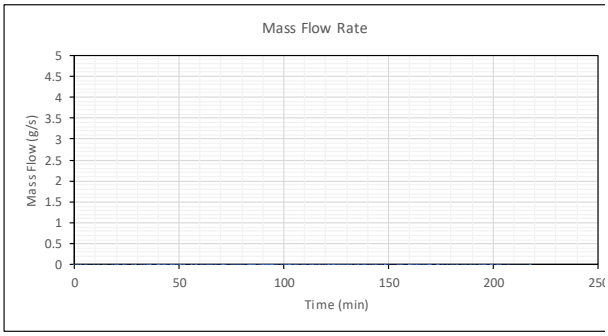


Hallway and Stud into Living Room



Cupboard (top is average of SP4 and SP5





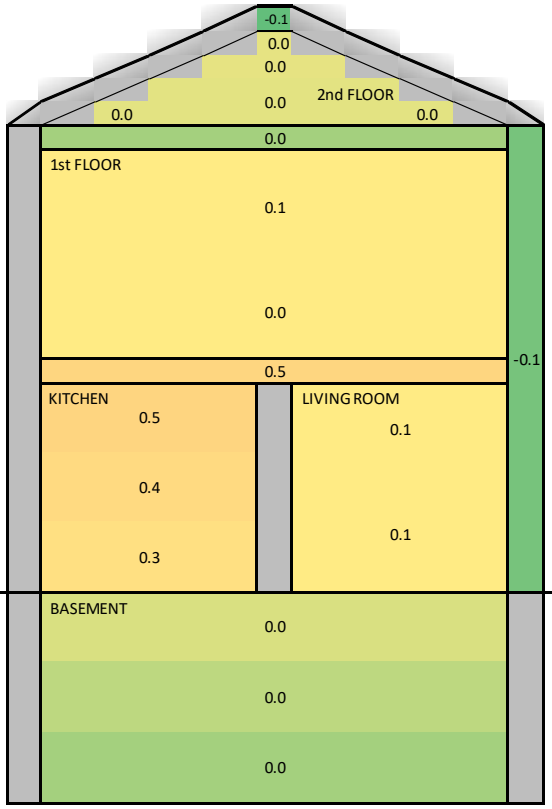
L2-019 RESULT

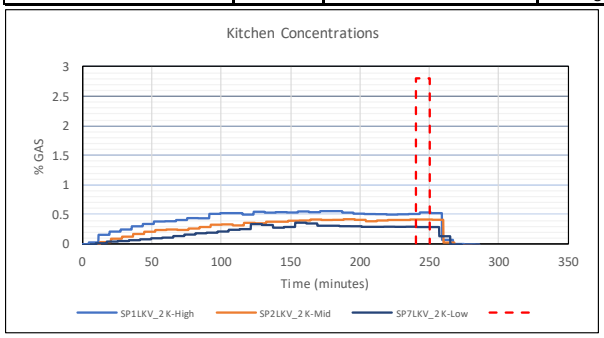
Hy4Heat WP7 Test Result

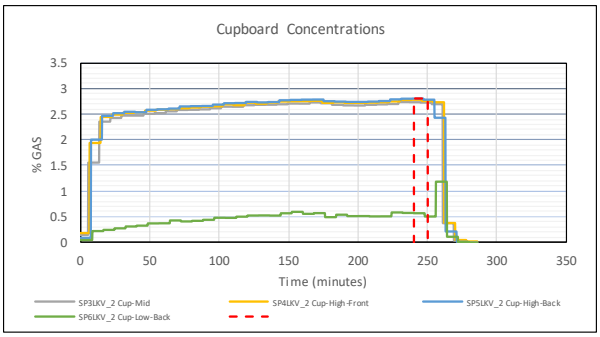
MTP ID: L2-019
Hole Size: 0.9 mm
Location: Kitchen base cupboard, doors closed
Gas: Methane
Date: 07/12/2019 **Time:** 06:30:00
Averaging Period Start: 240 min **End:** 250 min

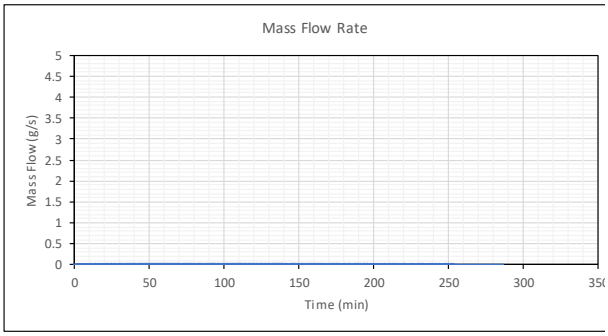
Notes: No flammable observations in cupboard

Sensor	Average	Max	Min	STDEV	units
SP1LKV_2 K-High	0.5	0.5	0.5	0.0	%vol
SP2LKV_2 K-Mid	0.4	0.4	0.4	0.0	%vol
SP3LKV_2 Cup-Mid	2.7	2.7	2.7	0.0	%vol
SP4LKV_2 Cup-High-Front	2.8	2.8	2.7	0.0	%vol
SP5LKV_2 Cup-High-Back	2.8	2.8	2.8	0.0	%vol
SP6LKV_2 Cup-Low-Back	0.6	0.6	0.6	0.0	%vol
SP7LKV_2 K-Low	0.3	0.3	0.3	0.0	%vol
SP8LKV_2 LR-High	0.1	0.1	0.1	0.0	%vol
SP9LKV_2 LR-Mid	0.1	0.1	0.1	0.0	%vol
SP10LKV_2 H-High	0.1	0.1	0.1	0.0	%vol
SP11LKV_2 H-Mid	0.1	0.1	0.1	0.0	%vol
SP12LKV_2 FF-High	0.1	0.1	0.1	0.0	%vol
SP13LKV_2 FF-Mid	0.0	0.0	0.0	0.0	%vol
SP14LKV_2 AT-High	0.0	0.0	0.0	0.0	%vol
SP15LKV_2 AT-Mid	0.0	0.0	0.0	0.0	%vol
SP16LKV_2 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	-0.1	0.0	-0.1	0.0	%vol
SP20LKV_1 STUD-Cav	0.0	0.0	0.0	0.0	%vol
SP21LKV_1 FF-Void	0.5	0.5	0.5	0.0	%vol
SP22LKV_1 SF-Void	0.0	0.0	0.0	0.0	%vol
SP23LKV_1 ROOF-Void	-0.1	-0.1	-0.1	0.0	%vol
RELEASEPRESSURE	0.0195	0.0	0.0	0.0	barg
LOWFLOWMETERCH4	0.0	0.0	0.0	0.0	g/s
OUTLET_TEMP	7.2	7.3	7.1	0.1	degC
Volume Flow Rate	1.3	0.0	0.0	0.0	SLPM
Energy Flow Rate	0.8	0.0	0.0	0.0	kW
External Wind Speed	2.7				m/s
External Wind Direction	269.4				bearing









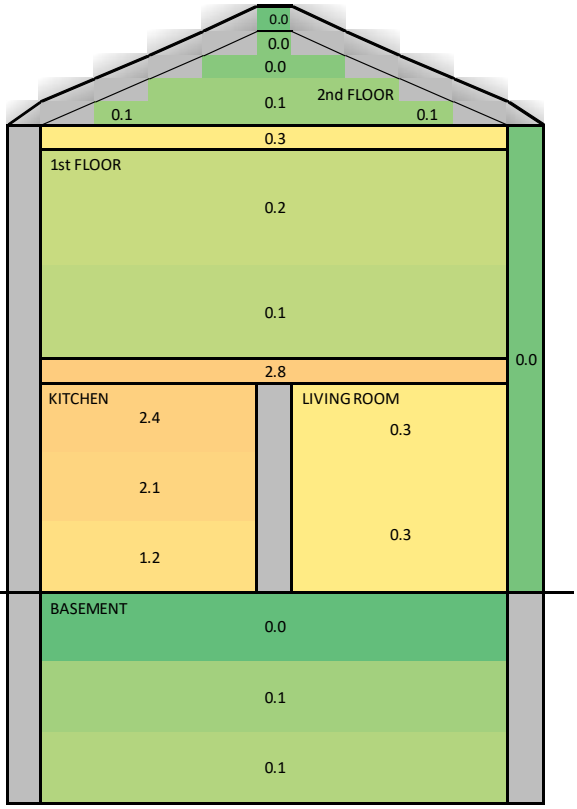
L2-020 RESULT

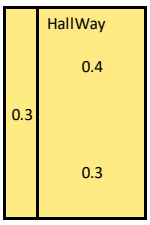
Hy4Heat WP7 Test Result

MTP ID: L2-020
Hole Size: 1.8 mm
Location: Kitchen base cupboard, doors closed
Gas: Methane
Date: 07/12/2019 **Time:** 13:40:00
Averaging Period Start: 200 min **End:** 210 min

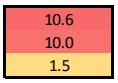
Notes: -0.2% offset removed from analyser 3 (SP17-23)

Sensor	Average	Max	Min	STDEV	units
SP1LKV_2 K-High	2.4	2.5	2.4	0.1	%vol
SP2LKV_2 K-Mid	2.1	2.1	2.0	0.0	%vol
SP3LKV_1 Cup-Mid	10.0	10.0	10.0	0.0	%vol
SP4LKV_1 Cup-High-Front	10.5	10.6	10.5	0.0	%vol
SP5LKV_1 Cup-High-Back	10.7	10.7	10.6	0.0	%vol
SP6LKV_2 Cup-Low-Back	1.5	1.6	1.5	0.1	%vol
SP7LKV_2 K-Low	1.2	1.2	1.2	0.0	%vol
SP8LKV_2 LR-High	0.3	0.3	0.3	0.0	%vol
SP9LKV_2 LR-Mid	0.3	0.3	0.2	0.0	%vol
SP10LKV_2 H-High	0.4	0.4	0.4	0.0	%vol
SP11LKV_2 H-Mid	0.3	0.3	0.3	0.0	%vol
SP12LKV_2 FF-High	0.2	0.2	0.1	0.0	%vol
SP13LKV_2 FF-Mid	0.1	0.2	0.1	0.0	%vol
SP14LKV_2 AT-High	0.0	0.1	0.0	0.0	%vol
SP15LKV_2 AT-Mid	0.1	0.1	0.1	0.0	%vol
SP16LKV_2 BM-High	0.0	0.0	0.0	0.0	%vol
SP17LKV_1 BM-Mid	0.1	0.1	0.1	0.0	%vol
SP18LKV_1 BM-Low	0.1	0.1	0.1	0.0	%vol
SP19LKV_1 NWALL-Cav	0.0	0.0	0.0	0.0	%vol
SP20LKV_1 STUD-Cav	0.3	0.3	0.3	0.0	%vol
SP21LKV_1 FF-Void	2.8	2.8	2.6	0.0	%vol
SP22LKV_1 SF-Void	0.3	0.3	0.3	0.0	%vol
SP23LKV_1 ROOF-Void	0.0	0.0	0.0	0.0	%vol
RELEASEPRESSURE	0.0200	0.0	0.0	0.0	barg
LOWFLOWMETERCH4	0.1	0.1	0.1	0.0	g/s
OUTLET_TEMP	9.4	9.5	9.2	0.1	degC
Volume Flow Rate	8.4	0.0	0.0	0.0	SLPM
Energy Flow Rate	5.0	0.0	0.0	0.0	kW
External Wind Speed	3.1				m/s
External Wind Direction	217.8				bearing

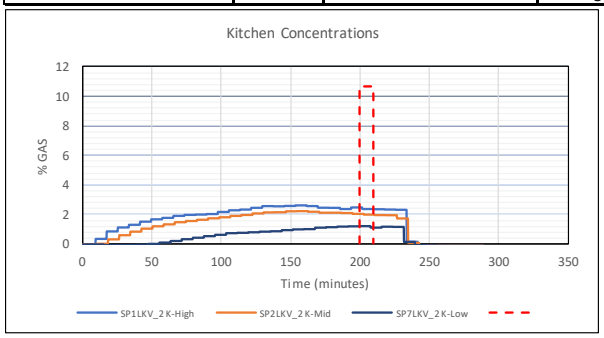


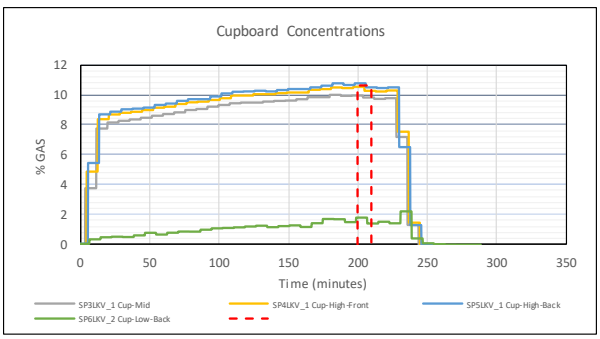


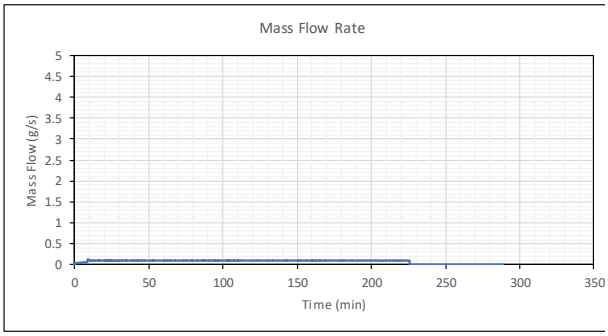
Hallway and Stud into Living Room



Cupboard (top is average of SP4 and SP5







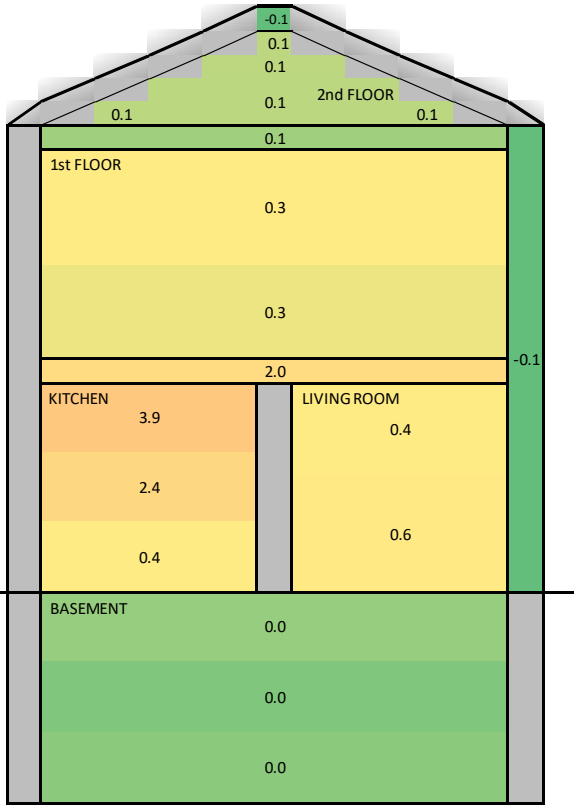
L2-021 RESULT

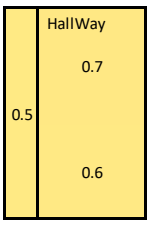
Hy4Heat WP7 Test Result

MTP ID: L2-021
Hole Size: 2.5 mm
Location: Kitchen base cupboard, doors closed
Gas: Methane
Date: 07/12/2019 **Time:** 19:00:00
Averaging Period Start: 150 min **End:** 160 min

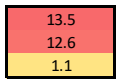
Notes: Cupboard now rich, high point in kitchen hearing flammable

Sensor	Average	Max	Min	STDEV	units
SP1LKV_1 K-High	3.9	3.9	3.8	0.1	%vol
SP2LKV_2 K-Mid	2.4	2.4	2.3	0.0	%vol
SP3LKV_1 Cup-Mid	12.6	12.6	12.5	0.1	%vol
SP4LKV_1 Cup-High-Front	13.4	13.4	13.3	0.0	%vol
SP5LKV_1 Cup-High-Back	13.6	13.6	13.6	0.0	%vol
SP6LKV_2 Cup-Low-Back	1.1	1.3	1.0	0.1	%vol
SP7LKV_2 K-Low	0.4	0.4	0.3	0.0	%vol
SP8LKV_2 LR-High	0.4	0.4	0.3	0.0	%vol
SP9LKV_1 LR-Mid	0.6	0.6	0.5	0.0	%vol
SP10LKV_2 H-High	0.7	0.7	0.6	0.0	%vol
SP11LKV_2 H-Mid	0.6	0.6	0.6	0.0	%vol
SP12LKV_2 FF-High	0.3	0.4	0.3	0.0	%vol
SP13LKV_2 FF-Mid	0.3	0.3	0.3	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_2 BM-High	0.0	0.0	0.0	0.0	%vol
SP17LKV_1 BM-Mid	0.0	0.0	-0.1	0.0	%vol
SP18LKV_1 BM-Low	0.0	0.0	0.0	0.0	%vol
SP19LKV_1 NWALL-Cav	-0.1	-0.1	-0.1	0.0	%vol
SP20LKV_1 STUD-Cav	0.5	0.5	0.5	0.0	%vol
SP21LKV_1 FF-Void	2.0	2.1	2.0	0.0	%vol
SP22LKV_1 SF-Void	0.1	0.1	0.1	0.0	%vol
SP23LKV_1 ROOF-Void	-0.1	-0.1	-0.1	0.0	%vol
RELEASEPRESSURE	0.0195	0.0	0.0	0.0	barg
LOWFLOWMETERCH4	0.2	0.2	0.2	0.0	g/s
OUTLET_TEMP	9.1	9.2	9.1	0.0	degC
Volume Flow Rate	16.9	0.0	0.0	0.0	SLPM
Energy Flow Rate	10.1	0.0	0.0	0.0	kW
External Wind Speed	7.1				m/s
External Wind Direction	211.4				bearing

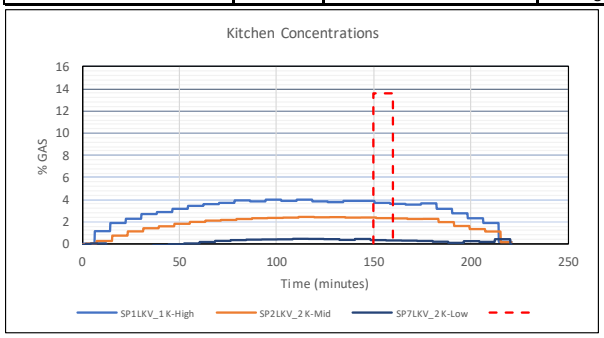


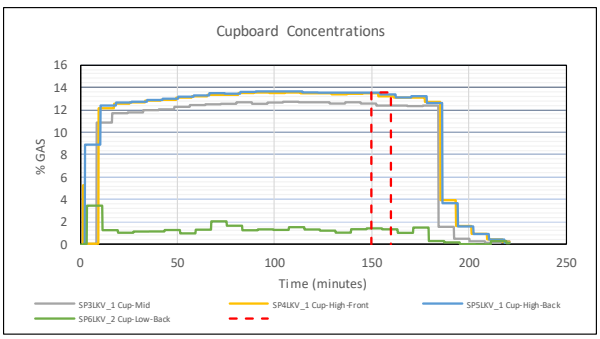


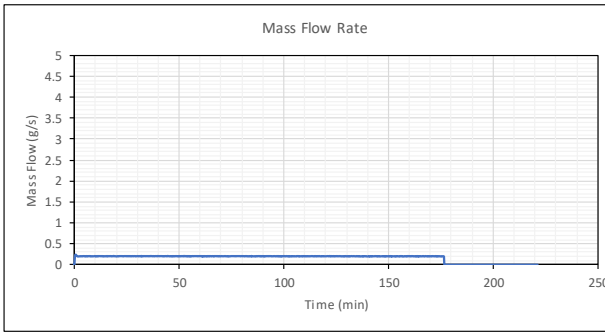
Hallway and Stud into Living Room



Cupboard (top is average of SP4 and SP5







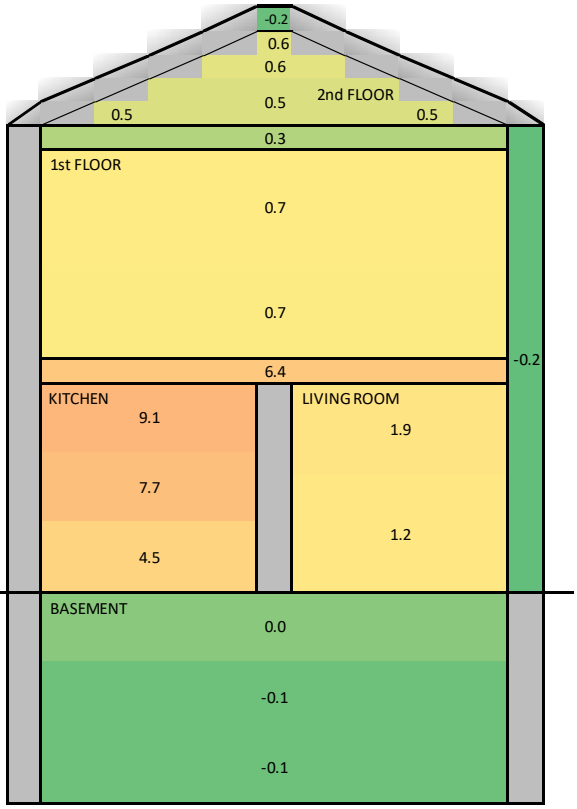
L2-022 RESULT

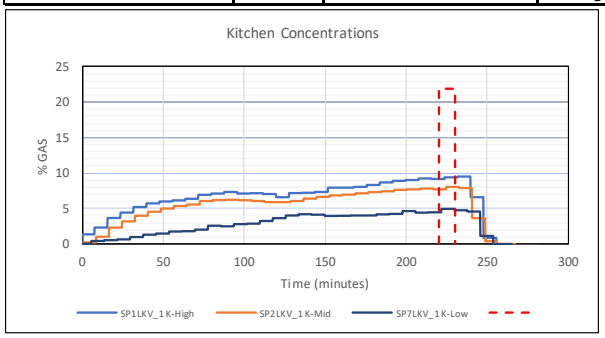
Hy4Heat WP7 Test Result

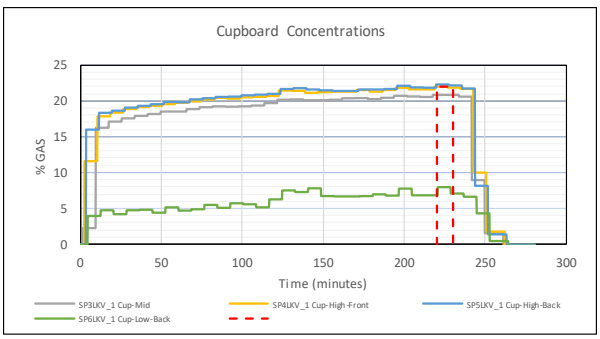
MTP ID: L2-022
Hole Size: 3.6 mm
Location: Kitchen base cupboard, doors closed
Gas: Methane
Date: 07/12/2019 **Time:** 23:15:00
Averaging Period Start: 220 min **End:** 230 min

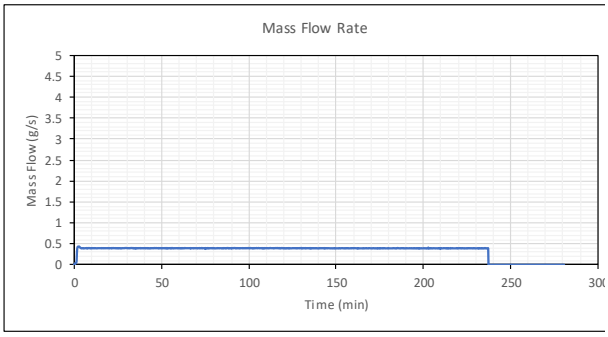
Notes: Above UFL in cupboard, near stoichometric at ceiling in kitchen

Sensor	Average	Max	Min	STDEV	units
SP1LKV_1 K-High	9.1	9.3	9.1	0.1	%vol
SP2LKV_1 K-Mid	7.7	7.8	7.7	0.1	%vol
SP3LKV_1 Cup-Mid	20.6	20.7	20.6	0.0	%vol
SP4LKV_1 Cup-High-Front	21.6	21.8	21.6	0.1	%vol
SP5LKV_1 Cup-High-Back	21.9	22.1	21.8	0.1	%vol
SP6LKV_1 Cup-Low-Back	7.1	7.8	6.8	0.4	%vol
SP7LKV_1 K-Low	4.5	4.7	4.4	0.1	%vol
SP8LKV_1 LR-High	1.9	1.9	1.9	0.0	%vol
SP9LKV_1 LR-Mid	1.2	1.2	1.2	0.0	%vol
SP10LKV_2 H-High	1.4	1.4	1.4	0.0	%vol
SP11LKV_2 H-Mid	1.0	1.1	0.9	0.0	%vol
SP12LKV_2 FF-High	0.7	0.8	0.7	0.0	%vol
SP13LKV_2 FF-Mid	0.7	0.7	0.7	0.0	%vol
SP14LKV_2 AT-High	0.6	0.6	0.5	0.0	%vol
SP15LKV_2 AT-Mid	0.5	0.5	0.5	0.0	%vol
SP16LKV_2 BM-High	0.0	0.0	0.0	0.0	%vol
SP17LKV_1 BM-Mid	-0.1	-0.1	-0.1	0.0	%vol
SP18LKV_1 BM-Low	-0.1	-0.1	-0.1	0.0	%vol
SP19LKV_1 NWALL-Cav	-0.2	-0.2	-0.2	0.0	%vol
SP20LKV_1 STUD-Cav	0.9	1.0	0.9	0.0	%vol
SP21LKV_1 FF-Void	6.4	6.4	6.3	0.0	%vol
SP22LKV_1 SF-Void	0.3	0.3	0.3	0.0	%vol
SP23LKV_1 ROOF-Void	-0.2	-0.2	-0.2	0.0	%vol
RELEASEPRESSURE	0.0196	0.0	0.0	0.0	barg
LOWFLOWMETERCH4	0.4	0.4	0.4	0.0	g/s
OUTLET_TEMP	8.3	8.4	8.1	0.1	degC
Volume Flow Rate	33.6	0.0	0.0	0.0	SLPM
Energy Flow Rate	20.1	0.0	0.0	0.0	kW
External Wind Speed	3.6				m/s
External Wind Direction	229.6				bearing









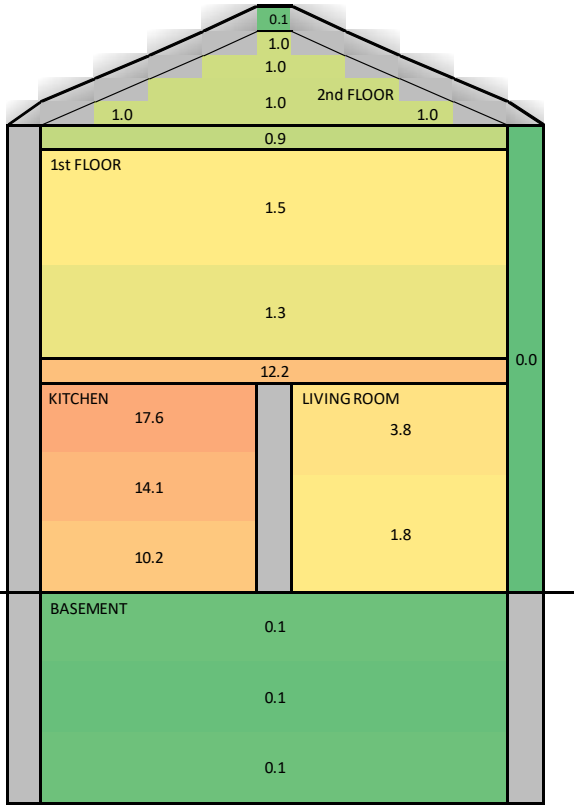
L2-023 RESULT

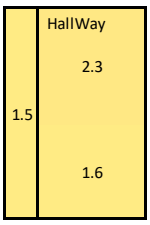
Hy4Heat WP7 Test Result

MTP ID: L2-023
Hole Size: 5.1 mm
Location: Kitchen base cupboard, doors closed
Gas: Methane
Date: 08/12/2019 **Time:** 04:10:00
Averaging Period Start: 150 min **End:** 160 min

Notes: Above UFL at kitchen ceiling, near UFL mid-height kitchen, kitchen ceiling show flammable mixture but nowhere else. 0.1% offset on analyser 3, volumetric sensor removed (SP17-23)

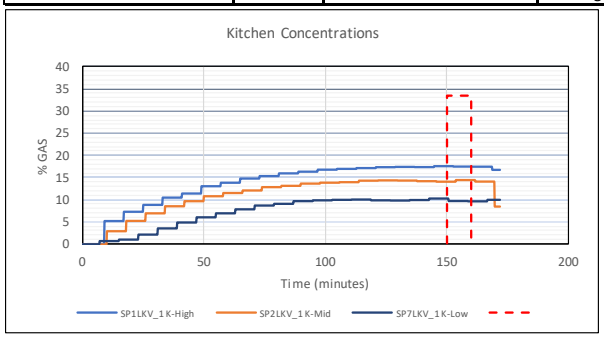
Sensor	Average	Max	Min	STDEV	units
SP1LKV_1 K-High	17.6	17.7	17.5	0.1	%vol
SP2LKV_1 K-Mid	14.1	14.1	14.0	0.1	%vol
SP3LKV_1 Cup-Mid	31.7	31.9	31.5	0.2	%vol
SP4LKV_1 Cup-High-Front	33.2	33.4	33.0	0.2	%vol
SP5LKV_1 Cup-High-Back	33.5	33.6	33.2	0.2	%vol
SP6LKV_1 Cup-Low-Back	18.8	19.1	18.1	0.4	%vol
SP7LKV_1 K-Low	10.2	10.3	9.8	0.2	%vol
SP8LKV_1 LR-High	3.8	3.9	3.7	0.0	%vol
SP9LKV_1 LR-Mid	1.8	1.8	1.7	0.0	%vol
SP10LKV_2 H-High	2.3	2.3	2.2	0.1	%vol
SP11LKV_2 H-Mid	1.6	1.7	1.6	0.0	%vol
SP12LKV_2 FF-High	1.5	1.5	1.4	0.0	%vol
SP13LKV_2 FF-Mid	1.3	1.3	1.3	0.0	%vol
SP14LKV_2 AT-High	1.0	1.1	1.0	0.0	%vol
SP15LKV_2 AT-Mid	1.0	1.1	0.9	0.0	%vol
SP16LKV_2 BM-High	0.1	0.1	0.1	0.0	%vol
SP17LKV_1 BM-Mid	0.1	0.1	0.1	0.0	%vol
SP18LKV_1 BM-Low	0.1	0.1	0.1	0.0	%vol
SP19LKV_1 NWALL-Cav	0.0	0.0	0.0	0.0	%vol
SP20LKV_1 STUD-Cav	1.5	1.6	1.5	0.1	%vol
SP21LKV_1 FF-Void	12.2	12.3	12.2	0.1	%vol
SP22LKV_1 SF-Void	0.9	0.9	0.9	0.0	%vol
SP23LKV_1 ROOF-Void	0.1	0.1	0.1	0.0	%vol
RELEASEPRESSURE	0.0195	0.0	0.0	0.0	barg
LOWFLOWMETERCH4	0.9	0.9	0.9	0.0	g/s
OUTLET_TEMP	5.5	5.7	5.4	0.1	degC
Volume Flow Rate	71.8	0.0	0.0	0.0	SLPM
Energy Flow Rate	42.9	0.0	0.0	0.0	kW
External Wind Speed	6.7				m/s
External Wind Direction	228.6				bearing

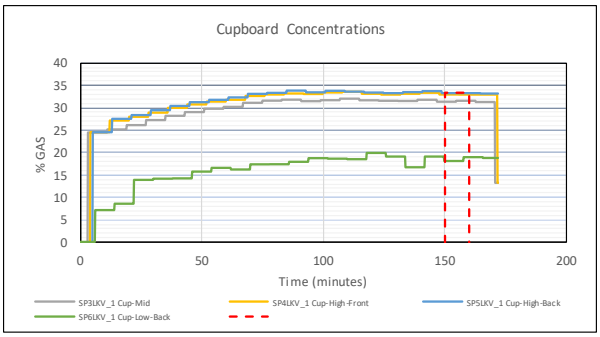


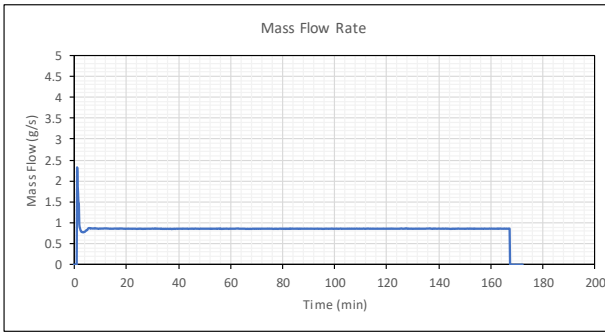


Hallway and Stud into Living Room

Cupboard (top is average of SP4 and SP5







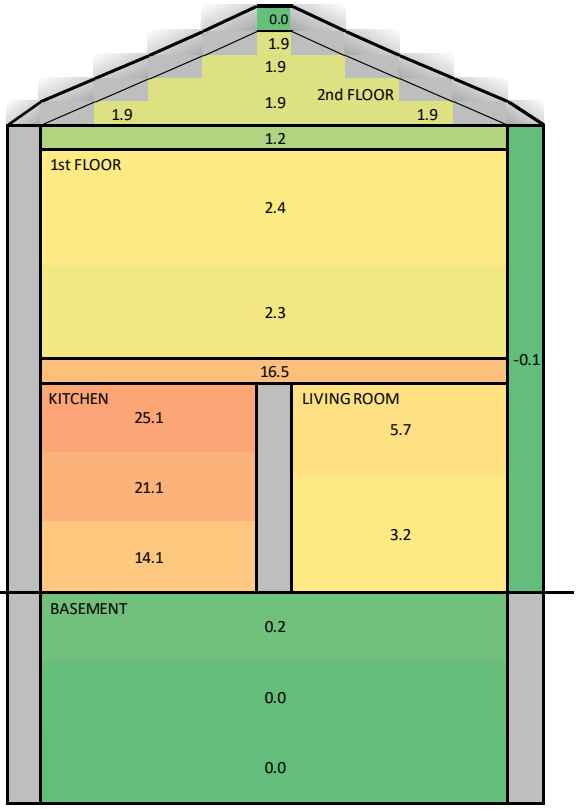
L2-024 RESULT

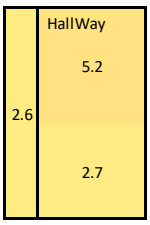
Hy4Heat WP7 Test Result

MTP ID: L2-024
Hole Size: 7.2 mm
Location: Kitchen base cupboard, doors closed
Gas: Methane
Date: 08/12/2019 **Time:** 08:30:00
Averaging Period Start: 160 min **End:** 170 min

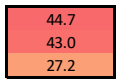
Notes: Above UFL in most of kitchen by end, just flammable in hall / living room

Sensor	Average	Max	Min	STDEV	units
SP1LKV_1 K-High	25.1	25.6	25.1	0.2	%vol
SP2LKV_1 K-Mid	21.1	21.3	21.0	0.1	%vol
SP3LKV_1 Cup-Mid	43.0	43.4	42.8	0.3	%vol
SP4LKV_1 Cup-High-Front	44.4	44.5	44.4	0.1	%vol
SP5LKV_1 Cup-High-Back	45.0	45.0	45.0	0.0	%vol
SP6LKV_1 Cup-Low-Back	27.2	27.9	26.8	0.5	%vol
SP7LKV_1 K-Low	14.1	14.2	14.0	0.1	%vol
SP8LKV_1 LR-High	5.7	5.8	5.7	0.0	%vol
SP9LKV_1 LR-Mid	3.2	3.4	3.0	0.1	%vol
SP10LKV_1 H-High	5.2	5.2	5.1	0.1	%vol
SP11LKV_2 H-Mid	2.7	2.7	2.7	0.0	%vol
SP12LKV_2 FF-High	2.4	2.5	2.4	0.1	%vol
SP13LKV_2 FF-Mid	2.3	2.3	2.2	0.1	%vol
SP14LKV_2 AT-High	1.9	2.0	1.9	0.1	%vol
SP15LKV_2 AT-Mid	1.9	2.0	1.9	0.0	%vol
SP16LKV_2 BM-High	0.2	0.2	0.2	0.0	%vol
SP17LKV_1 BM-Mid	0.0	0.0	0.0	0.0	%vol
SP18LKV_1 BM-Low	0.0	0.0	-0.1	0.0	%vol
SP19LKV_1 NWALL-Cav	-0.1	-0.1	-0.1	0.0	%vol
SP20LKV_1 STUD-Cav	2.6	2.6	2.5	0.1	%vol
SP21LKV_1 FF-Void	16.5	16.8	16.3	0.3	%vol
SP22LKV_1 SF-Void	1.2	1.2	1.2	0.0	%vol
SP23LKV_1 ROOF-Void	0.0	0.0	0.0	0.0	%vol
RELEASEPRESSURE	0.0192	0.0196	0.0187	0.0002	barg
LOWFLOWMETERCH4	1.6	1.6	1.6	0.0	g/s
OUTLET_TEMP	5.0	5.2	4.8	0.1	degC
Volume Flow Rate	131.9	0.0	0.0	0.0	SLPM
Energy Flow Rate	78.8	0.0	0.0	0.0	kW
External Wind Speed	4.8				m/s
External Wind Direction	220.5				bearing

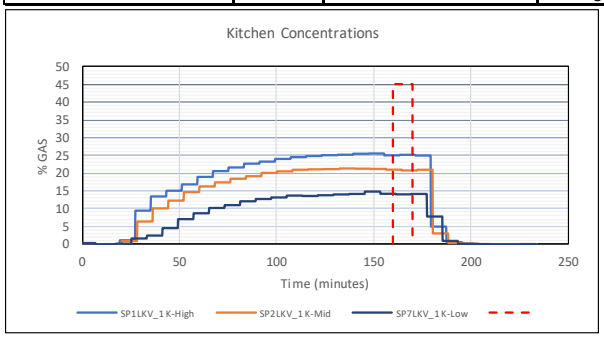


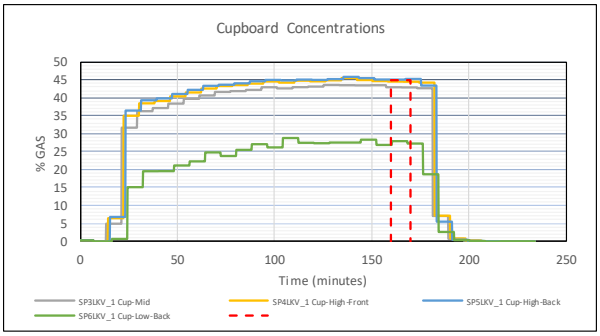


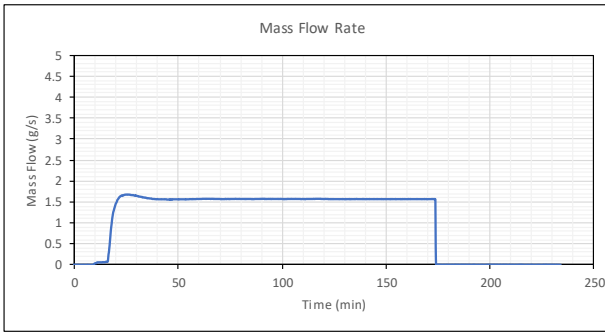
Hallway and Stud into Living Room



Cupboard (top is average of SP4 and SP5







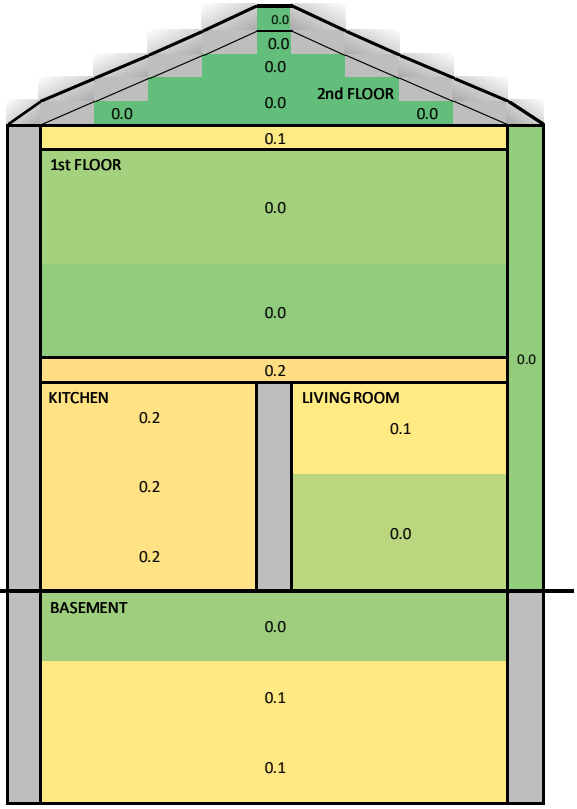
L2-026 RESULT

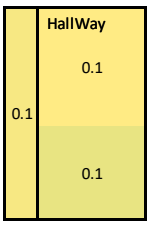
Hy4Heat WP7 Test Result

MTP ID: L2-026
Hole Size: 0.6 mm
Location: Behing kitchen base cupboard, doors closed
Gas: Methane
Date: 08/12/2019 **Time:** 12:30:00
Averaging Period Start: 170 min **End:** 180 min

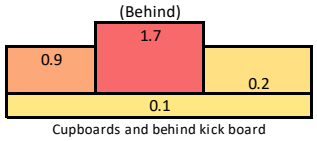
Notes: Basement showing very low concentration 'hangover' from previous higher flow test, not removed. No flammable concentrations recorded throughout house and experiment.

Sensor	Average	Max	Min	STDEV	units
SP1LKV_2 K-High	0.2	0.2	0.2	0.0	%vol
SP2LKV_2 K-Mid	0.2	0.2	0.2	0.0	%vol
SP3LKV_2 Boil-Cup-Bottom-Hi	0.2	0.2	0.2	0.0	%vol
SP4LKV_2 Behind-Cup-High	2.5	2.5	2.4	0.0	%vol
SP5LKV_2 Sink-Cup-Hi	0.9	0.9	0.8	0.0	%vol
SP6LKV_2 Under-Cupboards	0.1	0.1	0.1	0.0	%vol
SP7LKV_2 K-Low	0.2	0.2	0.2	0.0	%vol
SP8LKV_2 LR-High	0.1	0.1	0.1	0.0	%vol
SP9LKV_2 LR-Mid	0.0	0.0	0.0	0.0	%vol
SP10LKV_2 H-High	0.1	0.1	0.1	0.0	%vol
SP11LKV_2 H-Mid	0.1	0.1	0.1	0.0	%vol
SP12LKV_2 FF-High	0.0	0.0	0.0	0.0	%vol
SP13LKV_2 FF-Mid	0.0	0.0	0.0	0.0	%vol
SP14LKV_2 AT-High	0.0	0.0	0.0	0.0	%vol
SP15LKV_2 AT-Mid	0.0	0.0	0.0	0.0	%vol
SP16LKV_2 BM-High	0.0	0.0	0.0	0.0	%vol
SP17LKV_1 BM-Mid	0.1	0.1	0.1	0.0	%vol
SP18LKV_1 BM-Low	0.1	0.1	0.1	0.0	%vol
SP19LKV_1 NWALL-Cav	0.0	0.1	0.0	0.0	%vol
SP20LKV_1 STUD-Cav	0.1	0.1	0.0	0.0	%vol
SP21LKV_1 FF-Void	0.2	0.3	0.2	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	0.0192	0.020	0.019	0.000	barg
LOWFLOWMETERCH4	0.0	0.004	0.000	0.002	g/s
OUTLET_TEMP	5.0	5.2	4.9	0.1	degC
Volume Flow Rate	0.1	0.0	0.0	0.0	SLPM
Energy Flow Rate	0.1	0.0	0.0	0.0	kW
External Wind Speed	6.5				m/s
External Wind Direction	217.5				bearing

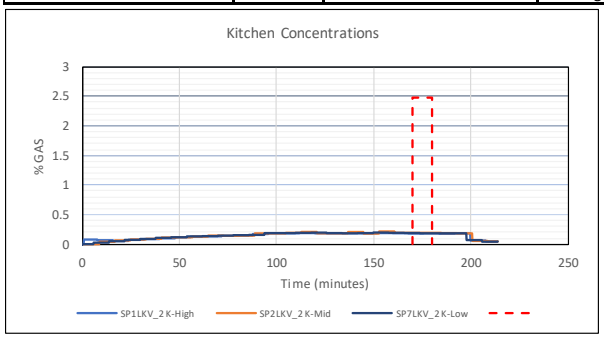


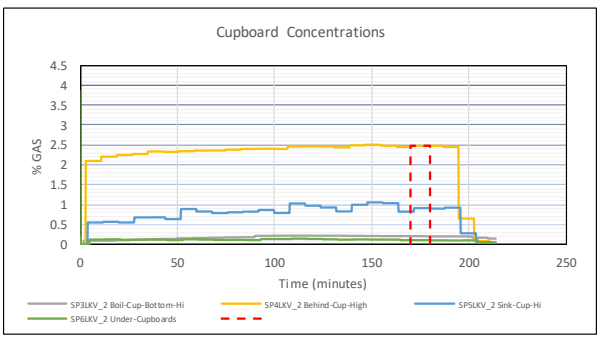


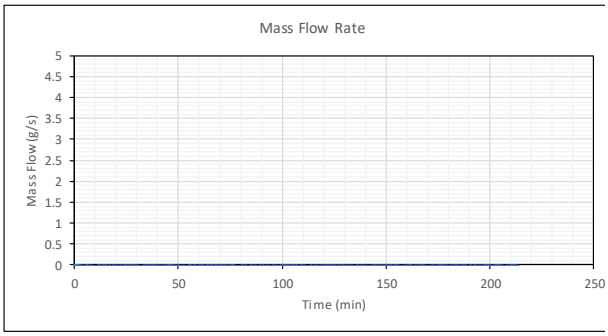
Hallway and Stud into Living Room



Cupboards and behind kick board







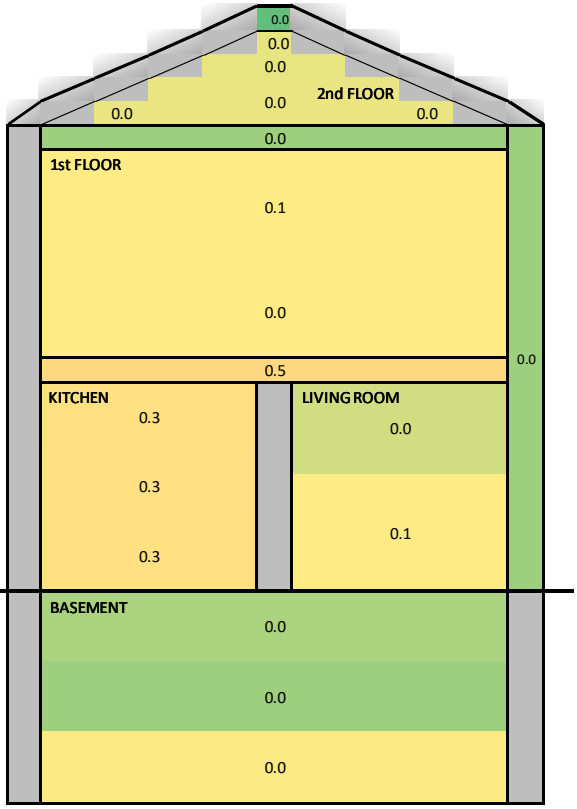
L2-027 RESULT

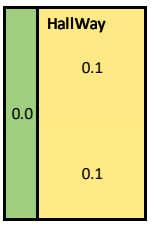
Hy4Heat WP7 Test Result

MTP ID: L2-027
Hole Size: 0.9 mm
Location: Behind kitchen base cupboard
Gas: methane
Date: 08/12/2019 **Time:** 17:00:00
Averaging Period Start: 180 min **End:** 190 min

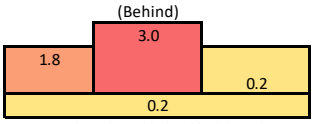
Notes: No flammable observations anywhere in property throughout experiment

Sensor	Average	Max	Min	STDEV	units
SP1LKV_2 K-High	0.3	0.3	0.3	0.0	%vol
SP2LKV_2 K-Mid	0.3	0.3	0.3	0.0	%vol
SP3LKV_2 Boil-Cup-Bottom-Hi	0.2	0.2	0.2	0.0	%vol
SP4LKV_1 Behind-Cup-High	4.2	4.2	4.1	0.0	%vol
SP5LKV_2 Sink-Cup-Hi	1.8	2.0	1.8	0.1	%vol
SP6LKV_2 Under-Cupboards	0.2	0.3	0.1	0.1	%vol
SP7LKV_2 K-Low	0.3	0.3	0.3	0.0	%vol
SP8LKV_2 LR-High	0.0	0.0	0.0	0.0	%vol
SP9LKV_2 LR-Mid	0.1	0.1	0.1	0.0	%vol
SP10LKV_2 H-High	0.1	0.1	0.1	0.0	%vol
SP11LKV_2 H-Mid	0.1	0.1	0.1	0.0	%vol
SP12LKV_2 FF-High	0.1	0.1	0.1	0.0	%vol
SP13LKV_2 FF-Mid	0.0	0.0	0.0	0.0	%vol
SP14LKV_2 AT-High	0.0	0.0	0.0	0.0	%vol
SP15LKV_2 AT-Mid	0.0	0.0	0.0	0.0	%vol
SP16LKV_2 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	0.1	0.0	0.0	%vol
SP19LKV_2 NWALL-Cav	0.0	0.0	0.0	0.0	%vol
SP20LKV_2 STUD-Cav	0.0	0.0	0.0	0.0	%vol
SP21LKV_1 FF-Void	0.5	0.5	0.5	0.0	%vol
SP22LKV_1 SF-Void	0.0	0.0	0.0	0.0	%vol
SP23LKV_1 ROOF-Void	0.0	0.0	0.0	0.0	%vol
RELEASEPRESSURE	0.0195	0.020	0.019	0.000	barg
LOWFLOWMETERCH4	0.0100	0.015	0.004	0.004	g/s
OUTLET_TEMP	5.4	5.4	5.3	0.0	degC
Volume Flow Rate	0.8	0.0	0.0	0.0	SLPM
Energy Flow Rate	0.5	0.0	0.0	0.0	kW
External Wind Speed	6.9				m/s
External Wind Direction	246.8				bearing

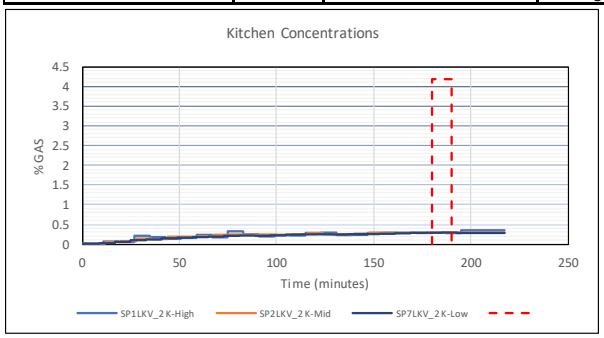


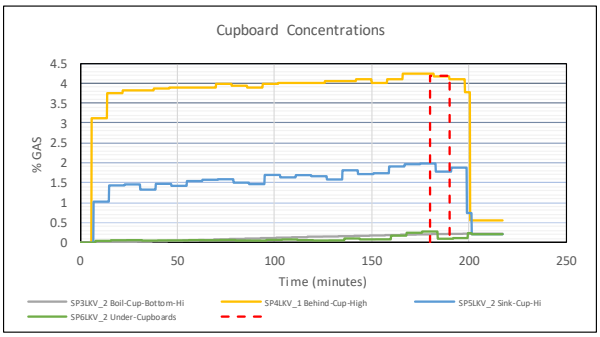


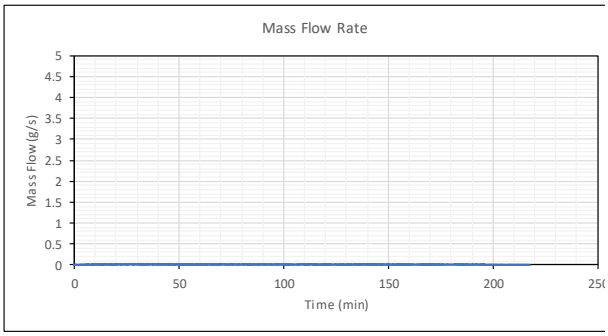
Hallway and Stud into Living Room



Cupboards and behind kick board







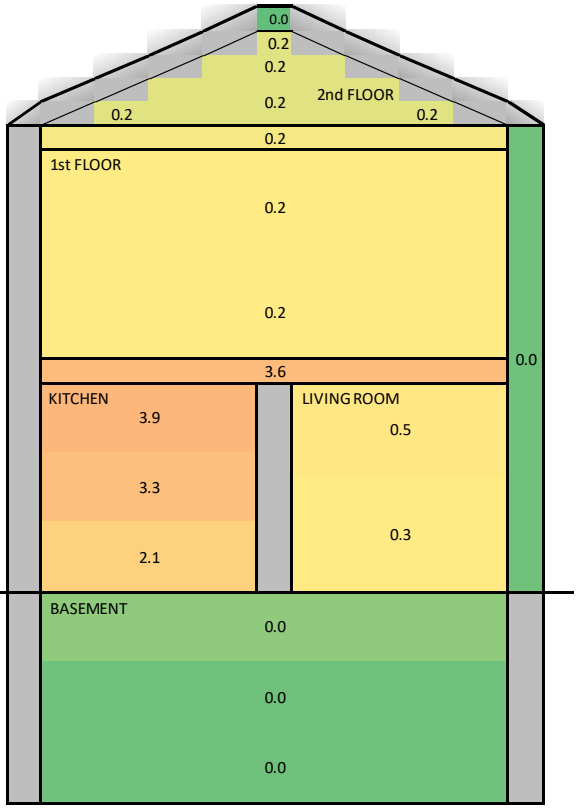
L2-028 RESULT

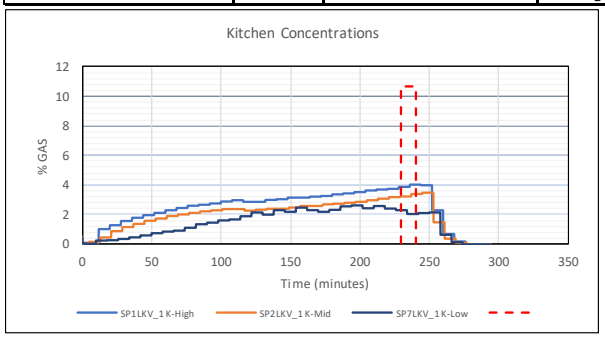
Hy4Heat WP7 Test Result

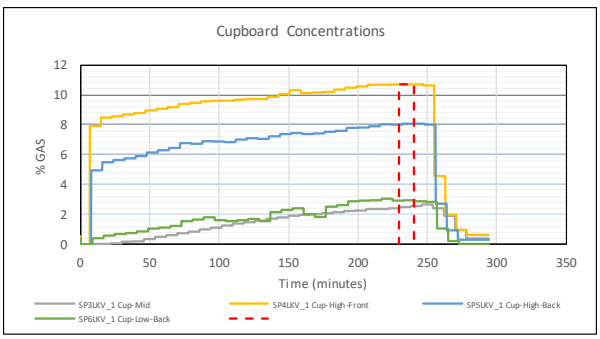
MTP ID: L2-028
Hole Size: 1.8 mm
Location: behind kitchen base cupboard
Gas: methane
Date: 08/12/2019 **Time:** 21:15:00
Averaging Period Start: 230 min **End:** 240 min

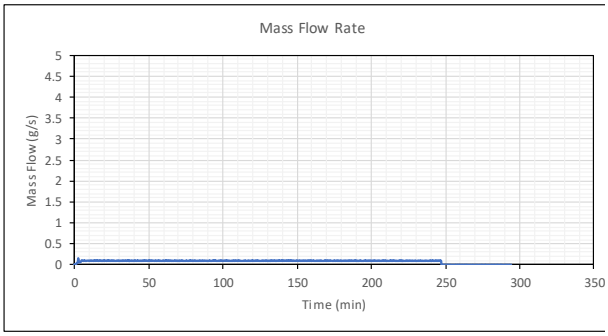
Notes:

Sensor	Average	Max	Min	STDEV	units
SP1LKV_1 K-High	3.9	4.0	3.8	0.1	%vol
SP2LKV_1 K-Mid	3.3	3.4	3.2	0.1	%vol
SP3LKV_1 Cup-Mid	2.5	2.6	2.5	0.0	%vol
SP4LKV_1 Cup-High-Front	10.7	10.7	10.7	0.0	%vol
SP5LKV_1 Cup-High-Back	8.1	8.1	8.0	0.0	%vol
SP6LKV_1 Cup-Low-Back	3.0	3.0	3.0	0.0	%vol
SP7LKV_1 K-Low	2.1	2.3	2.0	0.1	%vol
SP8LKV_1 LR-High	0.5	0.5	0.5	0.0	%vol
SP9LKV_1 LR-Mid	0.3	0.3	0.3	0.0	%vol
SP10LKV_2 H-High	0.4	0.4	0.4	0.0	%vol
SP11LKV_2 H-Mid	0.3	0.3	0.3	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	0.2	0.2	0.2	0.0	%vol
SP15LKV_2 AT-Mid	0.2	0.2	0.2	0.0	%vol
SP16LKV_2 BM-High	0.0	0.0	0.0	0.0	%vol
SP17LKV_2 BM-Mid	0.0	0.0	0.0	0.0	%vol
SP18LKV_2 BM-Low	0.0	0.0	0.0	0.0	%vol
SP19LKV_2 NWALL-Cav	0.0	0.0	0.0	0.0	%vol
SP20LKV_2 STUD-Cav	0.0	0.0	0.0	0.0	%vol
SP21LKV_1 FF-Void	3.6	3.6	3.4	0.0	%vol
SP22LKV_1 SF-Void	0.2	0.2	0.2	0.0	%vol
SP23LKV_1 ROOF-Void	0.0	0.0	-0.1	0.0	%vol
RELEASEPRESSURE	0.0200	0.0206	0.0196	0.0002	barg
LOWFLOWMETERCH4	0.1033	0.1087	0.1012	0.0034	g/s
OUTLET_TEMP	5.1	5.2	5.1	0.0	degC
Volume Flow Rate	8.6	9.1	8.5	0.3	SLPM
Energy Flow Rate	5.2	5.4	5.1	0.2	kW
External Wind Speed	3.9				m/s
External Wind Direction	238.5				bearing









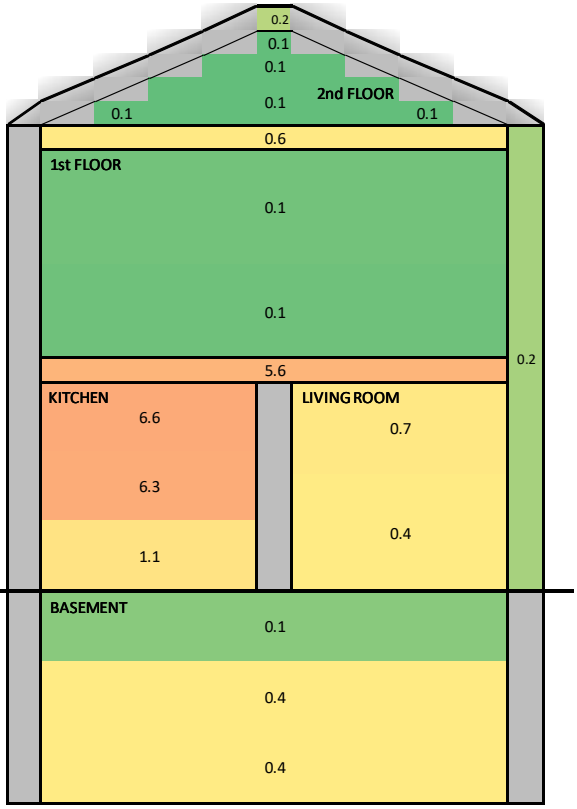
L2-029 RESULT

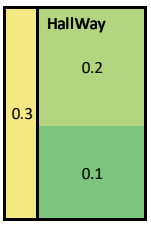
Hy4Heat WP7 Test Result

MTP ID: L2-029
Hole Size: 2.5 mm
Location: Behind kitchen base cupboard
Gas: methane
Date: 09/12/2019 **Time:** 02:15:00
Averaging Period Start: 190 min **End:** 200 min

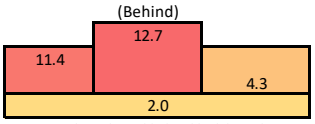
Notes: Flammable observations in cupboard and kitchen. Cannot see any reason the basement concentrations are not valid. Offset not observed on other SP's on same analyser

Sensor	Average	Max	Min	STDEV	units
SP1LKV_1 K-High	6.6	6.7	6.5	0.1	%vol
SP2LKV_1 K-Mid	6.3	6.4	6.3	0.0	%vol
SP3LKV_1 Boil-Cup-Bottom-Hi	4.3	4.3	4.3	0.0	%vol
SP4LKV_1 Behind-Cup-High	14.0	14.0	13.9	0.1	%vol
SP5LKV_1 Sink-Cup-Hi	11.4	11.6	11.3	0.0	%vol
SP6LKV_1 Under-Cupboards	2.0	2.1	1.9	0.1	%vol
SP7LKV_1 K-Low	1.1	1.1	1.1	0.0	%vol
SP8LKV_1 LR-High	0.7	0.7	0.7	0.0	%vol
SP9LKV_1 LR-Mid	0.4	0.4	0.4	0.0	%vol
SP10LKV_2 H-High	0.2	0.2	0.2	0.0	%vol
SP11LKV_2 H-Mid	0.1	0.1	0.1	0.0	%vol
SP12LKV_2 FF-High	0.1	0.1	0.1	0.0	%vol
SP13LKV_2 FF-Mid	0.1	0.1	0.1	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_2 BM-High	0.1	0.1	0.1	0.0	%vol
SP17LKV_1 BM-Mid	0.4	0.4	0.4	0.0	%vol
SP18LKV_1 BM-Low	0.4	0.4	0.4	0.0	%vol
SP19LKV_1 NWALL-Cav	0.2	0.2	0.2	0.0	%vol
SP20LKV_1 STUD-Cav	0.3	0.4	0.3	0.0	%vol
SP21LKV_1 FF-Void	5.6	5.6	5.6	0.0	%vol
SP22LKV_1 SF-Void	0.6	0.6	0.6	0.0	%vol
SP23LKV_1 ROOF-Void	0.2	0.3	0.2	0.0	%vol
RELEASEPRESSURE	0.0201	0.020	0.020	0.000	barg
LOWFLOWMETERCH4	0.207	0.210	0.202	0.002	g/s
OUTLET_TEMP	4.1	4.2	4.0	0.1	degC
Volume Flow Rate	17.3	0.0	0.0	0.0	SLPM
Energy Flow Rate	10.3	0.0	0.0	0.0	kW
External Wind Speed	2.8				m/s
External Wind Direction	321.7				bearing

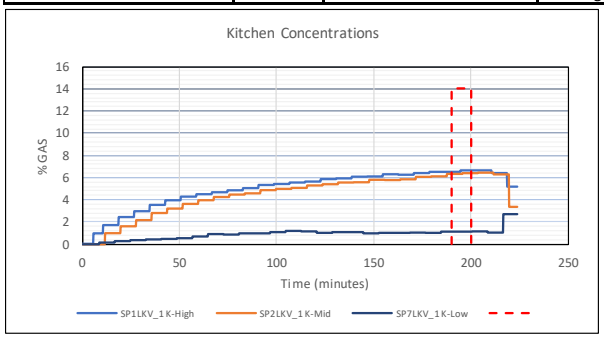


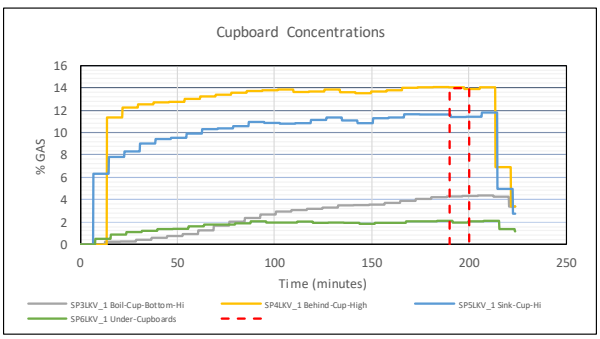


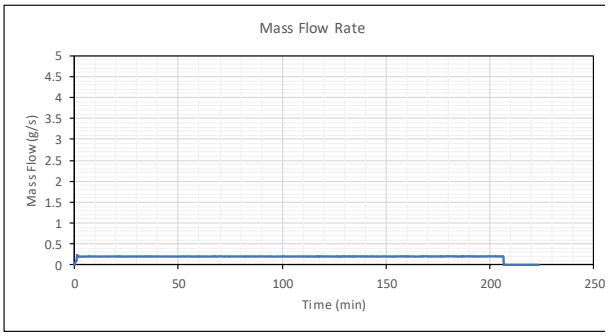
Hallway and Stud into Living Room



Cupboards and behind kick board







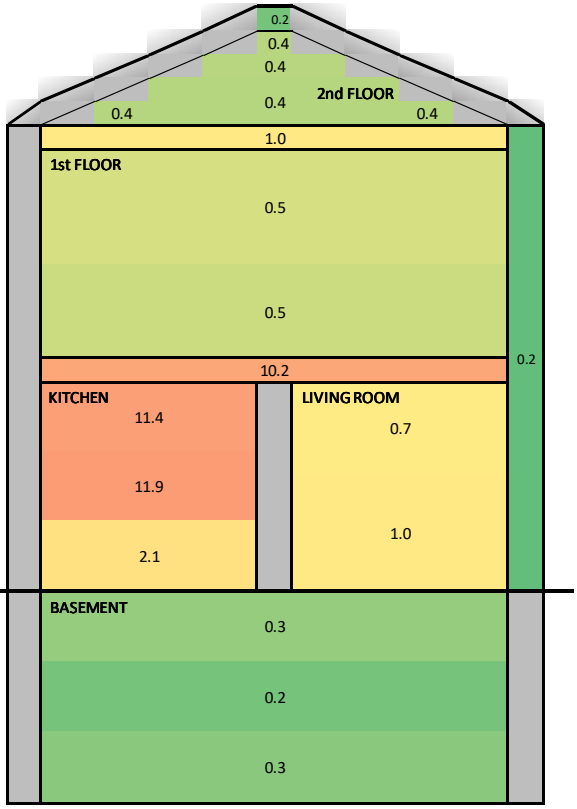
L2-030 RESULT

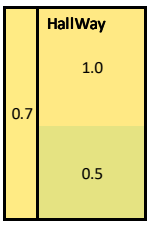
Hy4Heat WP7 Test Result

MTP ID: L2-030
Hole Size: 3.6 mm
Location: Behind kitchen base cupboard
Gas: methane
Date: 09/12/2019 **Time:** 06:30:00
Averaging Period Start: 200 min **End:** 210 min

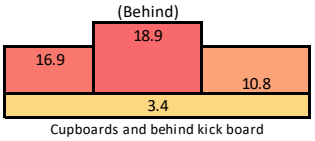
Notes: 0.2% offset on Analyser3 (SP17-23) removed. Rich but flammable concentrations in kitchen at end of experiment

Sensor	Average	Max	Min	STDEV	units
SP1LKV_1 K-High	11.4	11.5	11.3	0.1	%vol
SP2LKV_1 K-Mid	11.9	11.9	11.5	0.1	%vol
SP3LKV_1 Boil-Cup-Bottom-Hi	10.8	11.0	10.6	0.1	%vol
SP4LKV_1 Behind-Cup-High	21.0	21.0	21.0	0.0	%vol
SP5LKV_1 Sink-Cup-Hi	16.9	17.0	16.8	0.1	%vol
SP6LKV_1 Under-Cupboards	3.4	3.5	3.4	0.0	%vol
SP7LKV_1 K-Low	2.1	2.1	2.0	0.1	%vol
SP8LKV_2 LR-High	0.7	0.7	0.7	0.0	%vol
SP9LKV_1 LR-Mid	1.0	1.0	1.0	0.0	%vol
SP10LKV_2 H-High	1.0	1.0	0.9	0.0	%vol
SP11LKV_2 H-Mid	0.5	0.6	0.5	0.0	%vol
SP12LKV_2 FF-High	0.5	0.5	0.5	0.0	%vol
SP13LKV_2 FF-Mid	0.5	0.5	0.4	0.0	%vol
SP14LKV_2 AT-High	0.4	0.4	0.4	0.0	%vol
SP15LKV_2 AT-Mid	0.4	0.4	0.4	0.0	%vol
SP16LKV_1 BM-High	0.3	0.4	0.3	0.0	%vol
SP17LKV_1 BM-Mid	0.2	0.2	0.2	0.0	%vol
SP18LKV_1 BM-Low	0.3	0.3	0.3	0.0	%vol
SP19LKV_1 NWALL-Cav	0.2	0.2	0.2	0.0	%vol
SP20LKV_1 STUD-Cav	0.7	0.7	0.7	0.0	%vol
SP21LKV_1 FF-Void	10.2	10.2	10.2	0.0	%vol
SP22LKV_1 SF-Void	1.0	1.0	0.9	0.0	%vol
SP23LKV_1 ROOF-Void	0.2	0.2	0.2	0.0	%vol
RELEASEPRESSURE	0.0191	0.020	0.019	0.000	barg
LOWFLOWMETERCH4	0.415	0.420	0.409	0.004	g/s
OUTLET_TEMP	4.7	5.0	4.5	0.1	degC
Volume Flow Rate	34.7	0.0	0.0	0.0	SLPM
Energy Flow Rate	20.8	0.0	0.0	0.0	kW
External Wind Speed	2.4				m/s
External Wind Direction	286.8				bearing

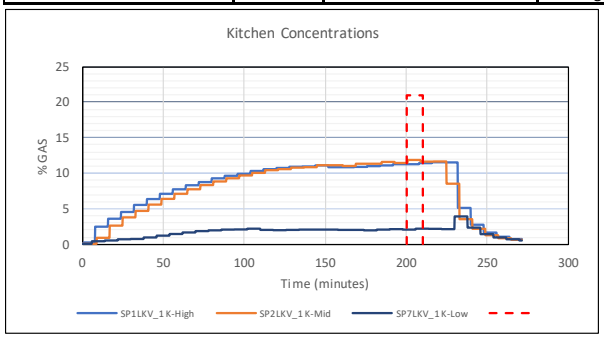


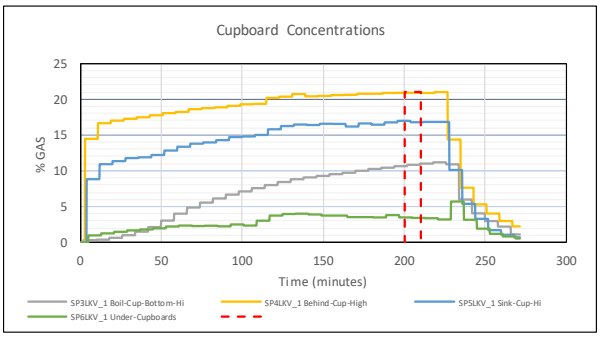


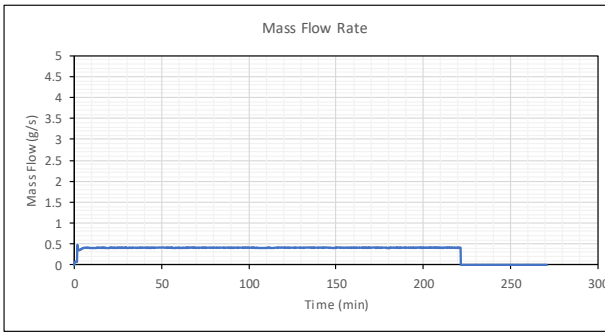
Hallway and Stud into Living Room



Cupboards and behind kick board







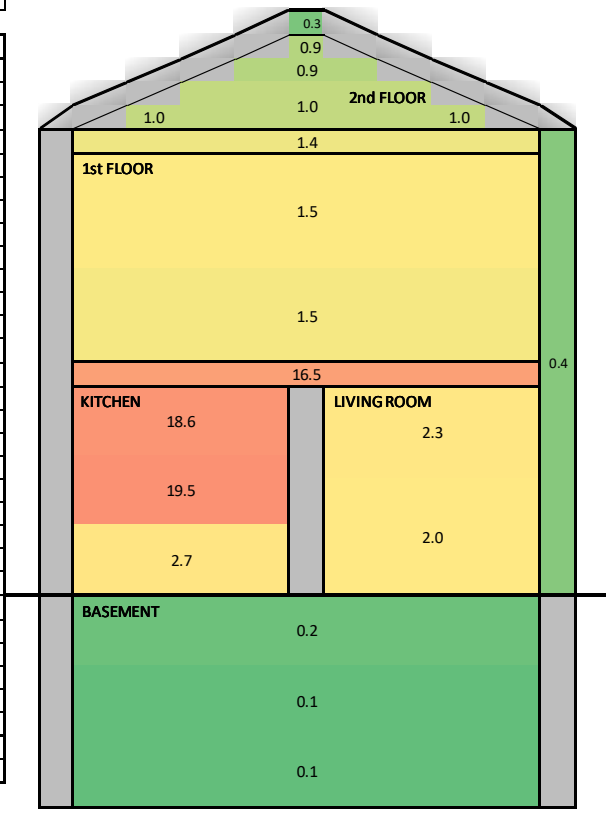
L2-031 RESULT

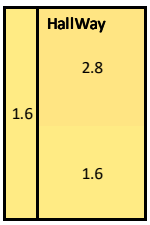
Hy4Heat WP7 Test Result

MTP ID: L2-031
Hole Size: 5.1 mm
Location: Behind kitchen base cupboard
Gas: methane
Date: 09/12/2019 **Time:** 12:15:00
Averaging Period Start: 190 min **End:** 200 min

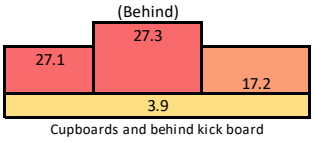
Notes: 0.1% offset removed from Analyser3 (SP17-23). Some gas concentration 'hangover' in basement evident, overcome by averaging period. >UFL in most of kitchen and cupboard, <LFL elswhere

Sensor	Average	Max	Min	STDEV	units
SP1LKV_1 K-High	18.6	18.7	18.6	0.0	%vol
SP2LKV_1 K-Mid	19.5	19.5	19.3	0.1	%vol
SP3LKV_1 Boil-Cup-Bottom-Hi	17.2	17.3	17.1	0.1	%vol
SP4LKV_1 Behind-Cup-High	27.5	27.5	27.5	0.0	%vol
SP5LKV_1 Sink-Cup-Hi	27.1	27.1	27.1	0.0	%vol
SP6LKV_1 Under-Cupboards	3.9	4.0	3.8	0.1	%vol
SP7LKV_1 K-Low	2.7	2.8	2.7	0.0	%vol
SP8LKV_2 LR-High	2.3	2.4	2.3	0.0	%vol
SP9LKV_1 LR-Mid	2.0	2.0	1.9	0.0	%vol
SP10LKV_2 H-High	2.8	2.9	2.7	0.0	%vol
SP11LKV_2 H-Mid	1.6	1.6	1.5	0.0	%vol
SP12LKV_2 FF-High	1.5	1.5	1.5	0.0	%vol
SP13LKV_2 FF-Mid	1.5	1.5	1.4	0.0	%vol
SP14LKV_2 AT-High	0.9	0.9	0.8	0.0	%vol
SP15LKV_2 AT-Mid	1.0	1.0	1.0	0.0	%vol
SP16LKV_2 BM-High	0.2	0.2	0.2	0.0	%vol
SP17LKV_1 BM-Mid	0.1	0.1	0.1	0.0	%vol
SP18LKV_1 BM-Low	0.1	0.1	0.1	0.0	%vol
SP19LKV_1 NWALL-Cav	0.4	0.5	0.3	0.1	%vol
SP20LKV_1 STUD-Cav	1.6	1.7	1.5	0.1	%vol
SP21LKV_1 FF-Void	16.5	16.5	16.5	0.0	%vol
SP22LKV_1 SF-Void	1.4	1.4	1.4	0.0	%vol
SP23LKV_1 ROOF-Void	0.3	0.3	0.3	0.0	%vol
RELEASEPRESSURE	0.0199	0.020	0.019	0.000	barg
LOWFLOWMETERCH4	0.872	0.881	0.862	0.005	g/s
OUTLET_TEMP	2.8	3.2	2.4	0.2	degC
Volume Flow Rate	73.0	0.0	0.0	0.0	SLPM
Energy Flow Rate	43.6	0.0	0.0	0.0	kW
External Wind Speed	1.2				m/s
External Wind Direction	257.5				bearing

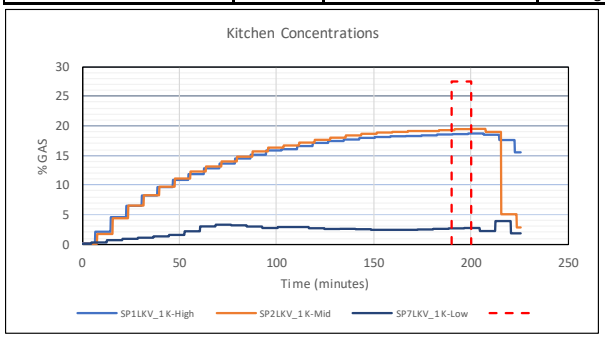


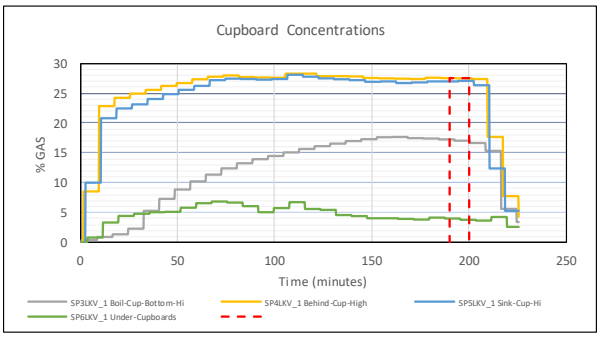


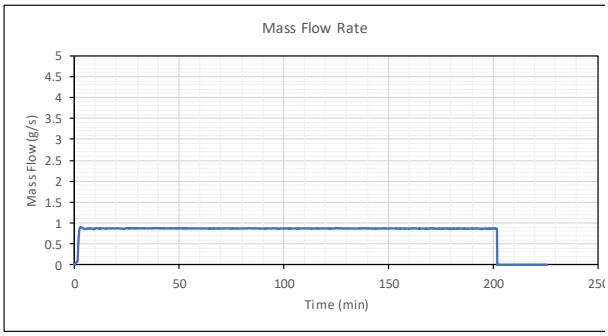
Hallway and Stud into Living Room



Cupboards and behind kick board







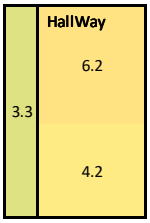
L2-032 RESULT

Hy4Heat WP7 Test Result

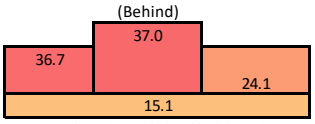
MTP ID: L2-032
Hole Size: 7.2 mm
Location: Behind kitchen base cupboard
Gas: methane
Date: 09/12/2019 **Time:** 17:30:00
Averaging Period Start: 250 min **End:** 260 min

Notes: 0.2% offset removed from SP17-23 for analyser drift. >UFL in most of kitchen, some >LFL observed in hallway and living room

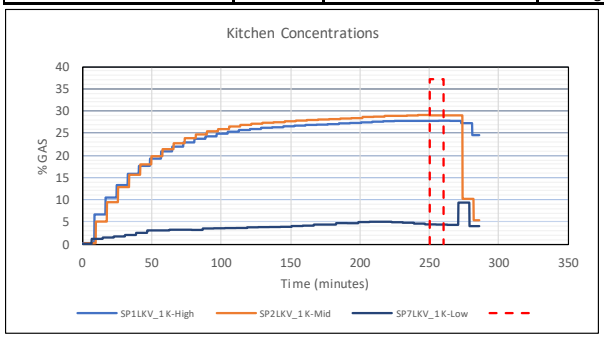
Sensor	Average	Max	Min	STDEV	units
SP1LKV_1 K-High	27.8	27.9	27.8	0.0	%vol
SP2LKV_1 K-Mid	29.1	29.1	29.1	0.0	%vol
SP3LKV_1 Boil-Cup-Bottom-Hi	24.1	24.4	23.8	0.2	%vol
SP4LKV_1 Behind-Cup-High	37.3	37.4	37.1	0.0	%vol
SP5LKV_1 Sink-Cup-Hi	36.7	36.7	36.7	0.0	%vol
SP6LKV_1 Under-Cupboards	15.1	15.2	15.0	0.1	%vol
SP7LKV_1 K-Low	4.4	4.4	4.4	0.0	%vol
SP8LKV_1 LR-High	7.1	7.1	7.0	0.0	%vol
SP9LKV_1 LR-Mid	3.6	3.6	3.6	0.0	%vol
SP10LKV_1 H-High	6.2	6.3	6.2	0.0	%vol
SP11LKV_1 H-Mid	4.2	4.3	4.2	0.0	%vol
SP12LKV_1 FF-High	4.4	4.4	4.3	0.0	%vol
SP13LKV_1 FF-Mid	4.2	4.2	4.2	0.0	%vol
SP14LKV_1 AT-High	3.9	3.9	3.8	0.0	%vol
SP15LKV_1 AT-Mid	3.9	4.0	3.8	0.1	%vol
SP16LKV_2 BM-High	0.1	0.2	0.1	0.0	%vol
SP17LKV_1 BM-Mid	0.4	0.4	0.4	0.0	%vol
SP18LKV_1 BM-Low	0.3	0.3	0.3	0.0	%vol
SP19LKV_1 NWALL-Cav	0.8	0.8	0.7	0.1	%vol
SP20LKV_1 STUD-Cav	3.3	3.3	3.2	0.0	%vol
SP21LKV_1 FF-Void	23.7	23.7	23.7	0.0	%vol
SP22LKV_1 SF-Void	2.5	2.6	2.5	0.1	%vol
SP23LKV_1 ROOF-Void	0.8	0.9	0.8	0.0	%vol
RELEASEPRESSURE	0.0192	0.0	0.0	0.0	barg
LOWFLOWMETERCH4	1.6	1.6	1.6	0.0	g/s
OUTLET_TEMP	0.5	0.6	0.3	0.1	degC
Volume Flow Rate	133.3	0.0	0.0	0.0	SLPM
Energy Flow Rate	79.7	0.0	0.0	0.0	kW
External Wind Speed	1.1				m/s
External Wind Direction	222.4				bearing

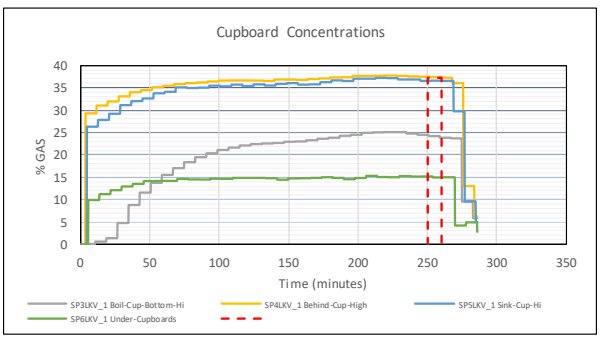


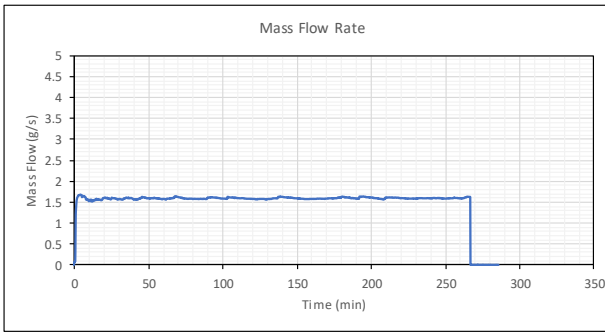
Hallway and Stud into Living Room



Cupboards and behind kick board







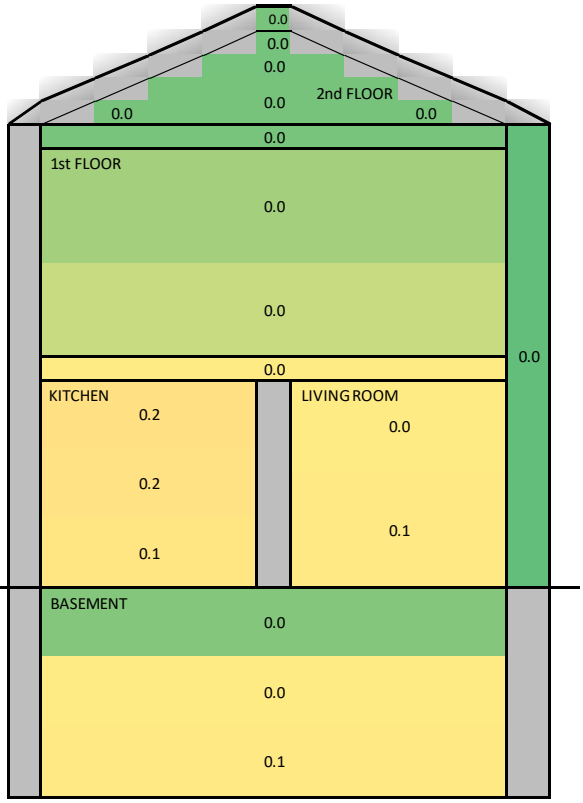
L2-034 RESULT

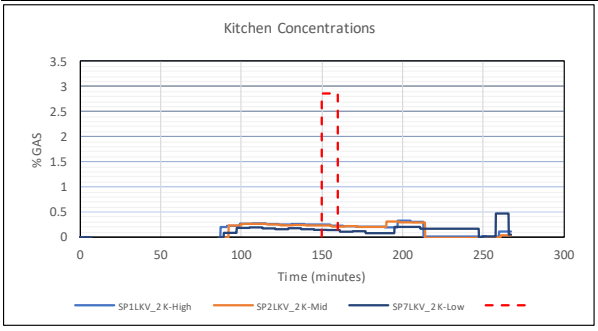
Hy4Heat WP7 Test Result

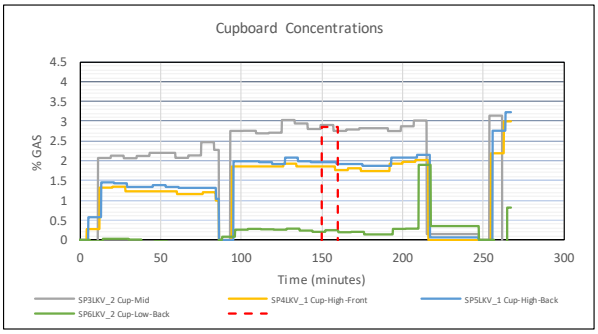
MTP ID: L2-034
Hole Size: 0.6 mm
Location: Under sink cupboard
Gas: methane
Date: 05/12/2019 **Time:** 18:00:00
Averaging Period Start: 150 min **End:** 160 min

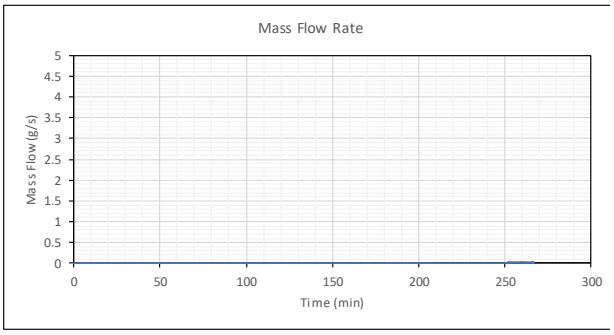
Notes: 0.2% offset removed from SP17-23 for analyser drift. Suspected a

Sensor	Average	Max	Min	STDEV	units
SP1LKV_2 K-High	0.2	0.3	0.2	0.0	%vol
SP2LKV_2 K-Mid	0.2	0.2	0.2	0.0	%vol
SP3LKV_2 Cup-Mid	2.9	2.9	2.8	0.1	%vol
SP4LKV_1 Cup-High-Front	1.8	1.9	1.8	0.0	%vol
SP5LKV_1 Cup-High-Back	2.0	2.0	1.9	0.0	%vol
SP6LKV_2 Cup-Low-Back	0.2	0.2	0.2	0.0	%vol
SP7LKV_2 K-Low	0.1	0.1	0.1	0.0	%vol
SP8LKV_2 LR-High	0.0	0.0	0.0	0.0	%vol
SP9LKV_2 LR-Mid	0.1	0.1	0.1	0.0	%vol
SP10LKV_2 H-High	0.1	0.1	0.1	0.0	%vol
SP11LKV_2 H-Mid	0.1	0.1	0.1	0.0	%vol
SP12LKV_2 FF-High	0.0	0.0	0.0	0.0	%vol
SP13LKV_2 FF-Mid	0.0	0.0	0.0	0.0	%vol
SP14LKV_2 AT-High	0.0	0.0	0.0	0.0	%vol
SP15LKV_2 AT-Mid	0.0	0.0	0.0	0.0	%vol
SP16LKV_2 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	0.1	0.1	0.1	0.0	%vol
SP19LKV_1 NWALL-Cav	0.0	0.0	-0.1	0.0	%vol
SP20LKV_1 STUD-Cav	0.0	0.0	0.0	0.0	%vol
SP21LKV_1 FF-Void	0.0	0.0	0.0	0.0	%vol
SP22LKV_1 SF-Void	0.0	0.0	0.0	0.0	%vol
SP23LKV_1 ROOF-Void	0.0	0.0	0.0	0.0	%vol
RELEASEPRESSURE	0.0200	0.0	0.0	0.0	barg
LOWFLOWMETERCH4	0.0	0.0	0.0	0.0	g/s
OUTLET_TEMP	10.6	10.7	10.5	0.0	degC
Volume Flow Rate	0.2	0.0	0.0	0.0	SLPM
Energy Flow Rate	0.1	0.0	0.0	0.0	kW
External Wind Speed	6.0				m/s
External Wind Direction	254.6				bearing









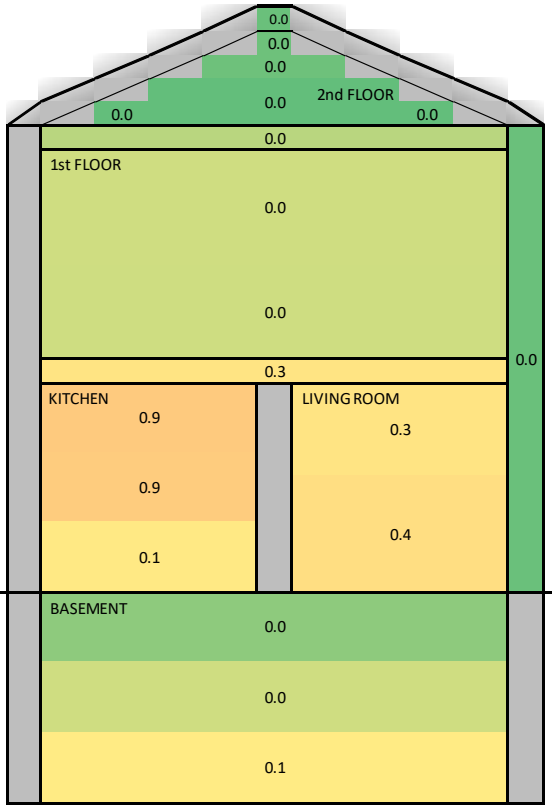
L2-035 RESULT

Hy4Heat WP7 Test Result

MTP ID: L2-035
Hole Size: 0.9 mm
Location: Under sink cupboard
Gas: methane
Date: 05/12/2019 **Time:** 22:30:00
Averaging Period Start: 180 min **End:** 190 min

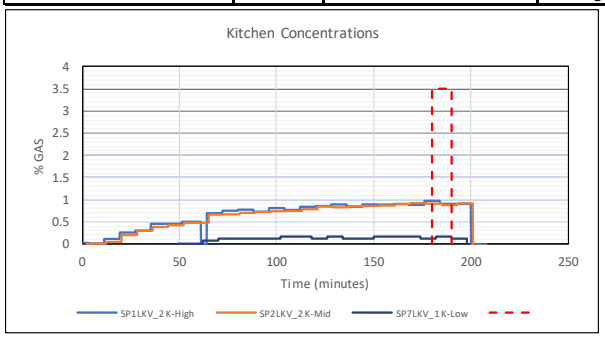
Notes: -0.1% offset removed from SP17-23. No flammable concentratio

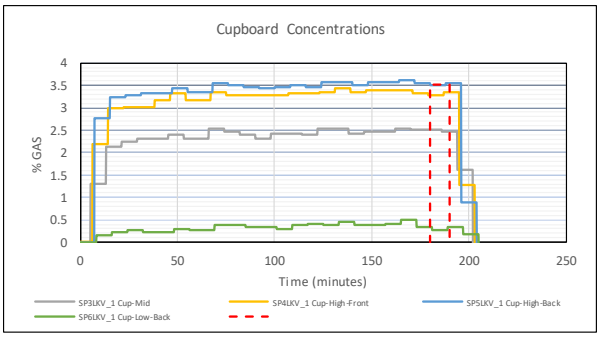
Sensor	Average	Max	Min	STDEV	units
SP1LKV_2 K-High	0.9	1.0	0.9	0.0	%vol
SP2LKV_2 K-Mid	0.9	0.9	0.9	0.0	%vol
SP3LKV_1 Cup-Mid	2.5	2.5	2.5	0.0	%vol
SP4LKV_1 Cup-High-Front	3.3	3.3	3.3	0.0	%vol
SP5LKV_1 Cup-High-Back	3.5	3.5	3.5	0.0	%vol
SP6LKV_1 Cup-Low-Back	0.3	0.3	0.3	0.0	%vol
SP7LKV_1 K-Low	0.1	0.2	0.1	0.0	%vol
SP8LKV_2 LR-High	0.3	0.4	0.2	0.1	%vol
SP9LKV_2 LR-Mid	0.4	0.4	0.4	0.0	%vol
SP10LKV_2 H-High	0.4	0.4	0.4	0.0	%vol
SP11LKV_2 H-Mid	0.5	0.5	0.5	0.0	%vol
SP12LKV_2 FF-High	0.0	0.0	0.0	0.0	%vol
SP13LKV_2 FF-Mid	0.0	0.0	0.0	0.0	%vol
SP14LKV_2 AT-High	0.0	0.0	0.0	0.0	%vol
SP15LKV_2 AT-Mid	0.0	0.0	0.0	0.0	%vol
SP16LKV_2 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	0.1	0.1	0.0	0.0	%vol
SP19LKV_1 NWALL-Cav	0.0	0.0	0.0	0.0	%vol
SP20LKV_1 STUD-Cav	0.1	0.1	0.1	0.0	%vol
SP21LKV_1 FF-Void	0.3	0.3	0.3	0.0	%vol
SP22LKV_1 SF-Void	0.0	0.0	0.0	0.0	%vol
SP23LKV_1 ROOF-Void	0.0	0.0	0.0	0.0	%vol
RELEASEPRESSURE	0.0200	0.0	0.0	0.0	barg
LOWFLOWMETERCH4	0.0152	0.0187	0.0075	0.0022	g/s
OUTLET_TEMP	10.7	10.9	10.7	0.1	degC
Volume Flow Rate	1.3	0.0	0.0	0.0	SLPM
Energy Flow Rate	0.8	0.0	0.0	0.0	kW
External Wind Speed	5.3				m/s
External Wind Direction	225.5				bearing

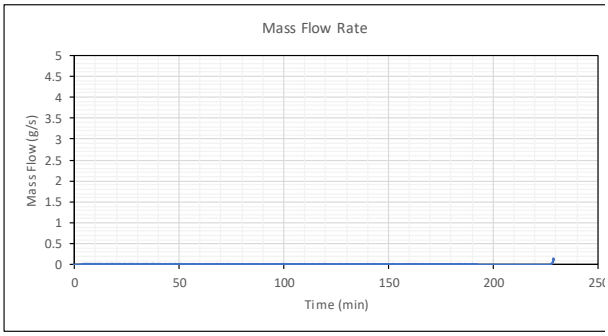


Cupboard (top is average of SP4 and SP5

Hallway and Stud into Living Room







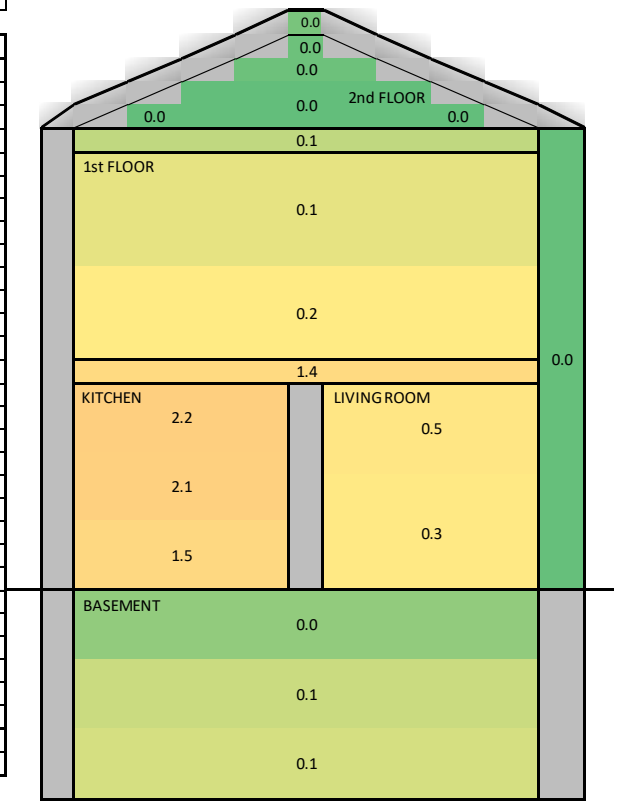
L2-036 RESULT

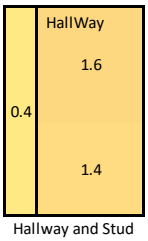
Hy4Heat WP7 Test Result

MTP ID: L2-036
Hole Size: 1.8 mm
Location: Under sink cupboard
Gas: methane
Date: 06/12/2019 **Time:** 02:00:00
Averaging Period Start: 120 min **End:** 130 min

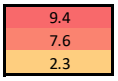
Notes: -0.2% offset on SP17-23 removed. >LFL observed in cupboard only

Sensor	Average	Max	Min	STDEV	units
SP1LKV_1 K-High	2.2	2.3	2.2	0.0	%vol
SP2LKV_1 K-Mid	2.1	2.2	2.1	0.0	%vol
SP3LKV_1 Cup-Mid	7.6	7.7	7.6	0.0	%vol
SP4LKV_1 Cup-High-Front	9.1	9.1	9.1	0.0	%vol
SP5LKV_1 Cup-High-Back	9.8	9.8	9.8	0.0	%vol
SP6LKV_1 Cup-Low-Back	2.3	2.4	2.1	0.1	%vol
SP7LKV_1 K-Low	1.5	1.5	1.5	0.0	%vol
SP8LKV_1 LR-High	0.5	0.5	0.5	0.0	%vol
SP9LKV_1 LR-Mid	0.3	0.3	0.3	0.0	%vol
SP10LKV_2 H-High	1.6	1.6	1.5	0.0	%vol
SP11LKV_2 H-Mid	1.4	1.5	1.2	0.1	%vol
SP12LKV_2 FF-High	0.1	0.1	0.1	0.0	%vol
SP13LKV_2 FF-Mid	0.2	0.2	0.2	0.0	%vol
SP14LKV_2 AT-High	0.0	0.0	0.0	0.0	%vol
SP15LKV_2 AT-Mid	0.0	0.0	0.0	0.0	%vol
SP16LKV_2 BM-High	0.0	0.0	0.0	0.0	%vol
SP17LKV_1 BM-Mid	0.1	0.1	0.1	0.0	%vol
SP18LKV_1 BM-Low	0.1	0.1	0.1	0.0	%vol
SP19LKV_1 NWALL-Cav	0.0	0.0	0.0	0.0	%vol
SP20LKV_1 STUD-Cav	0.4	0.4	0.4	0.0	%vol
SP21LKV_1 FF-Void	1.4	1.4	1.3	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	0.0200	0.0	0.0	0.0	barg
LOWFLOWMETERCH4	0.1	0.1	0.1	0.0	g/s
OUTLET_TEMP	10.9	10.9	10.8	0.0	degC
Volume Flow Rate	9.1	0.0	0.0	0.0	SLPM
Energy Flow Rate	5.4	0.0	0.0	0.0	kW
External Wind Speed	5.3				m/s
External Wind Direction	232.4				bearing

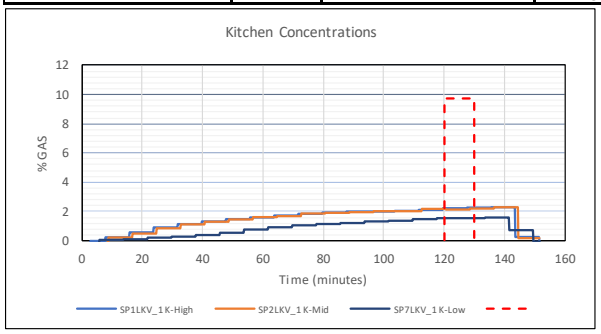


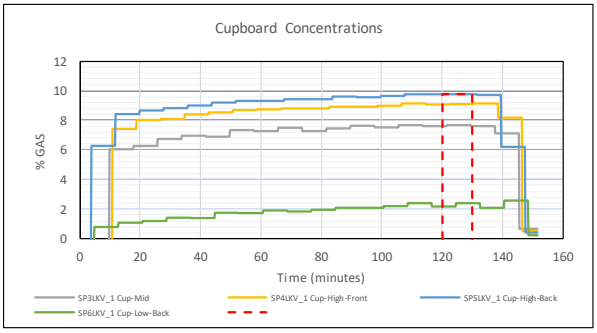


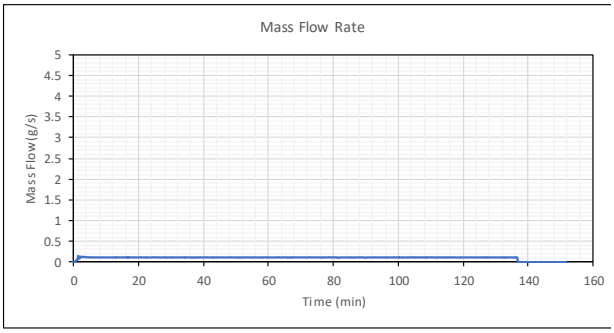
Hallway and Stud into Living Room



Cupboard (top is average of SP4 and SP5







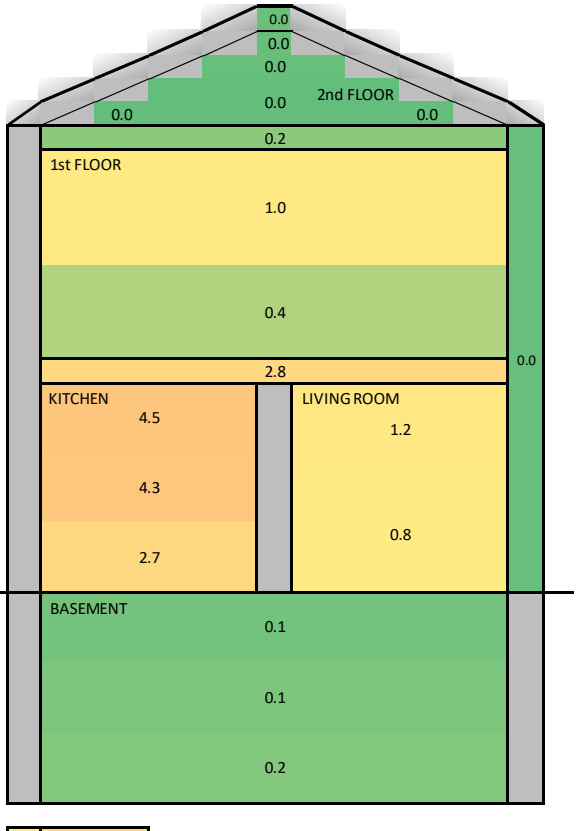
L2-037 RESULT

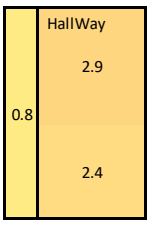
Hy4Heat WP7 Test Result

MTP ID: L2-037
Hole Size: 2.5 mm
Location: Under sink cupboard
Gas: methane
Date: 06/12/2019 **Time:** 05:15:00
Averaging Period Start: 140 min **End:** 150 min

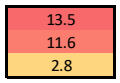
Notes: -0.2% offset removed from SP17-23. Approaching LFL concentrations observed in the kitchen

Sensor	Average	Max	Min	STDEV	units
SP1LKV_1 K-High	4.5	4.5	4.4	0.0	%vol
SP2LKV_1 K-Mid	4.3	4.3	4.3	0.0	%vol
SP3LKV_1 Cup-Mid	11.6	11.7	11.6	0.1	%vol
SP4LKV_1 Cup-High-Front	13.2	13.2	13.2	0.0	%vol
SP5LKV_1 Cup-High-Back	13.9	13.9	13.8	0.0	%vol
SP6LKV_1 Cup-Low-Back	2.8	2.9	2.8	0.1	%vol
SP7LKV_1 K-Low	2.7	2.7	2.6	0.0	%vol
SP8LKV_1 LR-High	1.2	1.3	1.2	0.0	%vol
SP9LKV_1 LR-Mid	0.8	0.8	0.7	0.0	%vol
SP10LKV_2 H-High	2.9	2.9	2.8	0.1	%vol
SP11LKV_2 H-Mid	2.4	2.5	2.2	0.2	%vol
SP12LKV_2 FF-High	1.0	1.2	0.9	0.1	%vol
SP13LKV_2 FF-Mid	0.4	0.4	0.3	0.0	%vol
SP14LKV_2 AT-High	0.0	0.0	0.0	0.0	%vol
SP15LKV_2 AT-Mid	0.0	0.0	0.0	0.0	%vol
SP16LKV_2 BM-High	0.1	0.1	0.1	0.0	%vol
SP17LKV_1 BM-Mid	0.1	0.1	0.1	0.0	%vol
SP18LKV_1 BM-Low	0.2	0.2	0.1	0.0	%vol
SP19LKV_1 NWALL-Cav	0.0	0.0	0.0	0.0	%vol
SP20LKV_1 STUD-Cav	0.8	0.8	0.7	0.1	%vol
SP21LKV_1 FF-Void	2.8	2.8	2.8	0.0	%vol
SP22LKV_1 SF-Void	0.2	0.2	0.2	0.0	%vol
SP23LKV_1 ROOF-Void	0.0	0.0	0.0	0.0	%vol
RELEASEPRESSURE	0.0200	0.0	0.0	0.0	barg
LOWFLOWMETERCH4	0.2	0.2	0.2	0.0	g/s
OUTLET_TEMP	10.7	10.8	10.6	0.0	degC
Volume Flow Rate	17.5	0.0	0.0	0.0	SLPM
Energy Flow Rate	10.5	0.0	0.0	0.0	kW
External Wind Speed	2.9				m/s
External Wind Direction	235.3				bearing

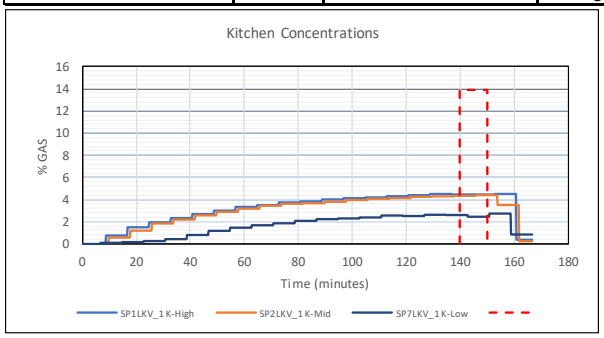


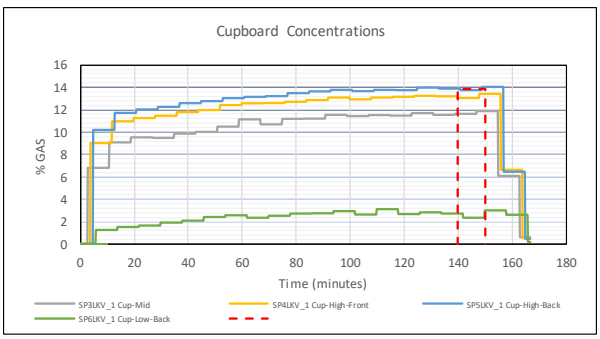


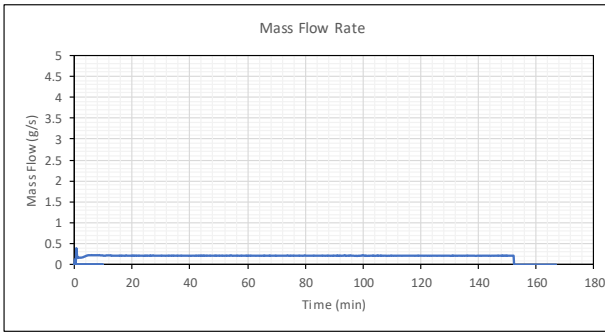
Hallway and Stud into Living Room



Cupboard (top is average of SP4 and SP5







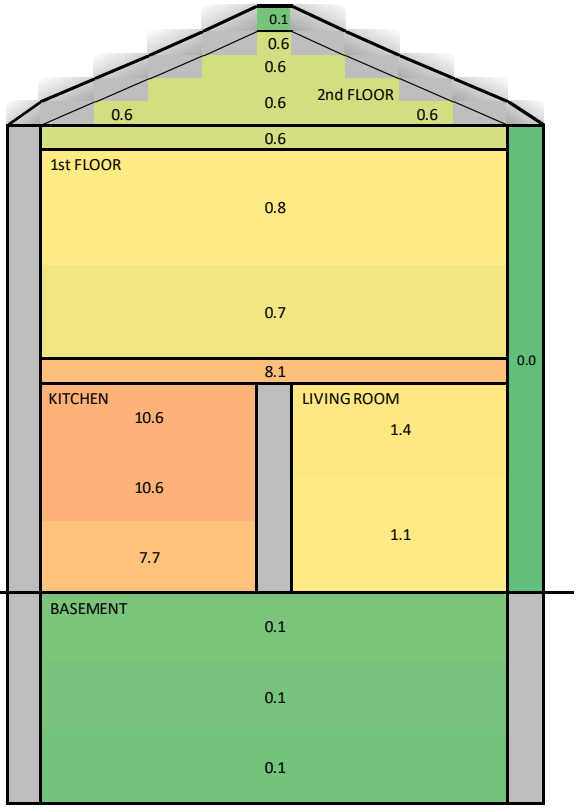
L2-038 RESULT

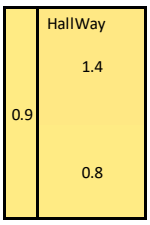
Hy4Heat WP7 Test Result

MTP ID: L2-038
Hole Size: 3.6 mm
Location: Under sink cupboard
Gas: methane
Date: 06/12/2019 **Time:** 10:30:00
Averaging Period Start: 220 min **End:** 230 min

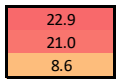
Notes: -0.1% offset removed from SP17-23.

Sensor	Average	Max	Min	STDEV	units
SP1LKV_1 K-High	10.6	10.7	10.6	0.0	%vol
SP2LKV_1 K-Mid	10.6	10.6	10.6	0.0	%vol
SP3LKV_1 Cup-Mid	21.0	21.0	20.9	0.1	%vol
SP4LKV_1 Cup-High-Front	23.0	23.0	22.9	0.1	%vol
SP5LKV_1 Cup-High-Back	22.8	22.9	22.6	0.1	%vol
SP6LKV_1 Cup-Low-Back	8.6	9.2	7.5	0.8	%vol
SP7LKV_1 K-Low	7.7	7.8	7.7	0.0	%vol
SP8LKV_2 LR-High	1.4	1.5	1.4	0.0	%vol
SP9LKV_1 LR-Mid	1.1	1.1	1.0	0.0	%vol
SP10LKV_2 H-High	1.4	1.4	1.4	0.0	%vol
SP11LKV_2 H-Mid	0.8	0.8	0.8	0.0	%vol
SP12LKV_2 FF-High	0.8	0.8	0.8	0.0	%vol
SP13LKV_2 FF-Mid	0.7	0.7	0.7	0.0	%vol
SP14LKV_2 AT-High	0.6	0.6	0.5	0.0	%vol
SP15LKV_2 AT-Mid	0.6	0.6	0.6	0.0	%vol
SP16LKV_2 BM-High	0.1	0.1	0.1	0.0	%vol
SP17LKV_1 BM-Mid	0.1	0.1	0.1	0.0	%vol
SP18LKV_1 BM-Low	0.1	0.1	0.0	0.0	%vol
SP19LKV_1 NWALL-Cav	0.0	0.0	0.0	0.0	%vol
SP20LKV_1 STUD-Cav	0.9	0.9	0.9	0.0	%vol
SP21LKV_1 FF-Void	8.1	8.3	8.0	0.2	%vol
SP22LKV_1 SF-Void	0.6	0.6	0.5	0.0	%vol
SP23LKV_1 ROOF-Void	0.1	0.1	0.0	0.0	%vol
RELEASEPRESSURE	0.0200	0.0	0.0	0.0	barg
LOWFLOWMETERCH4	0.4	0.4	0.4	0.0	g/s
OUTLET_TEMP	8.2	8.2	8.1	0.1	degC
Volume Flow Rate	35.2	0.0	0.0	0.0	SLPM
Energy Flow Rate	21.1	0.0	0.0	0.0	kW
External Wind Speed	2.3				m/s
External Wind Direction	248.7				bearing

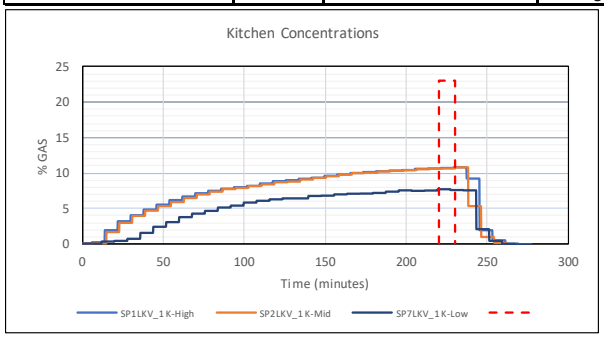


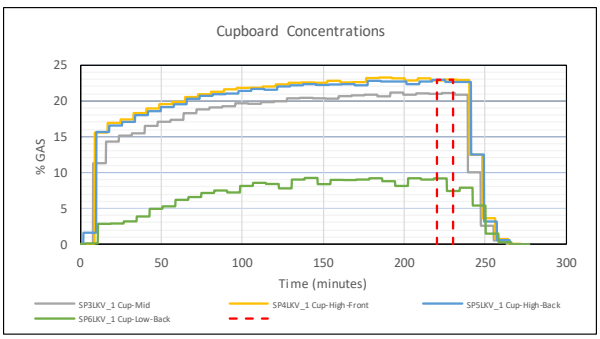


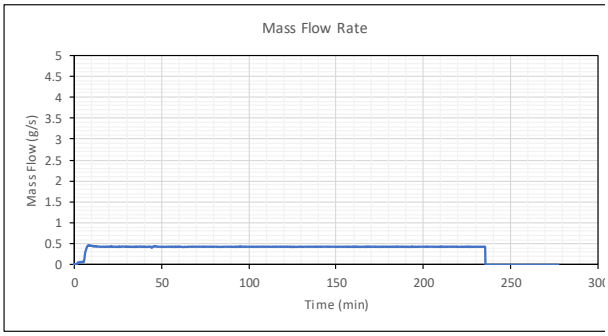
Hallway and Stud into Living Room



Cupboard (top is average of SP4 and SP5







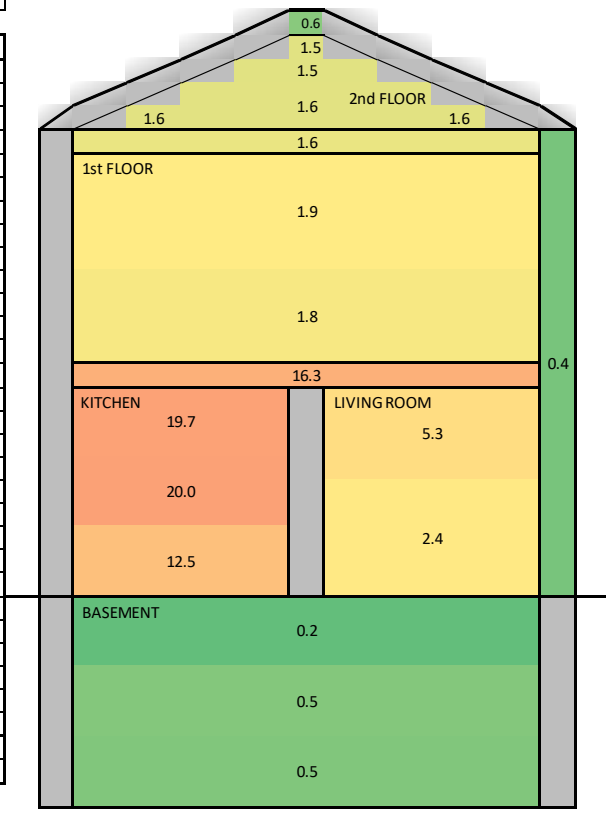
L2-039 RESULT

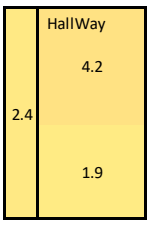
Hy4Heat WP7 Test Result

MTP ID: L2-039
Hole Size: 5.1 mm
Location: Under sink cupboard
Gas: methane
Date: 06/12/2019 **Time:** 15:45:00
Averaging Period Start: 225 min **End:** 235 min

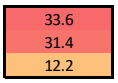
Notes:

Sensor	Average	Max	Min	STDEV	units
SP1LKV_1 K-High	19.7	19.8	19.6	0.0	%vol
SP2LKV_1 K-Mid	20.0	20.2	20.0	0.0	%vol
SP3LKV_1 Cup-Mid	31.4	31.6	31.3	0.1	%vol
SP4LKV_1 Cup-High-Front	33.9	34.0	33.8	0.1	%vol
SP5LKV_1 Cup-High-Back	33.3	33.3	33.3	0.0	%vol
SP6LKV_1 Cup-Low-Back	12.2	12.2	12.1	0.1	%vol
SP7LKV_1 K-Low	12.5	12.6	12.5	0.1	%vol
SP8LKV_1 LR-High	5.3	5.4	5.3	0.0	%vol
SP9LKV_1 LR-Mid	2.4	2.5	2.3	0.0	%vol
SP10LKV_1 H-High	4.2	4.3	4.2	0.0	%vol
SP11LKV_2 H-Mid	1.9	1.9	1.8	0.0	%vol
SP12LKV_2 FF-High	1.9	1.9	1.9	0.0	%vol
SP13LKV_2 FF-Mid	1.8	1.8	1.8	0.0	%vol
SP14LKV_2 AT-High	1.5	1.6	1.5	0.0	%vol
SP15LKV_2 AT-Mid	1.6	1.6	1.5	0.0	%vol
SP16LKV_2 BM-High	0.2	0.2	0.2	0.0	%vol
SP17LKV_1 BM-Mid	0.5	0.5	0.5	0.0	%vol
SP18LKV_1 BM-Low	0.5	0.5	0.5	0.0	%vol
SP19LKV_1 NWALL-Cav	0.4	0.4	0.4	0.0	%vol
SP20LKV_1 STUD-Cav	2.4	2.4	2.4	0.0	%vol
SP21LKV_1 FF-Void	16.3	16.4	16.2	0.1	%vol
SP22LKV_1 SF-Void	1.6	1.7	1.6	0.0	%vol
SP23LKV_1 ROOF-Void	0.6	0.6	0.6	0.0	%vol
RELEASEPRESSURE	0.0200	0.0203	0.0196	0.0002	barg
LOWFLOWMETERCH4	0.918	0.926	0.915	0.002	g/s
OUTLET_TEMP	6.9	7.0	6.9	0.0	degC
Volume Flow Rate	76.8	0.0	0.0	0.0	SLPM
Energy Flow Rate	45.9	0.0	0.0	0.0	kW
External Wind Speed	2.6				m/s
External Wind Direction	252.5				bearing

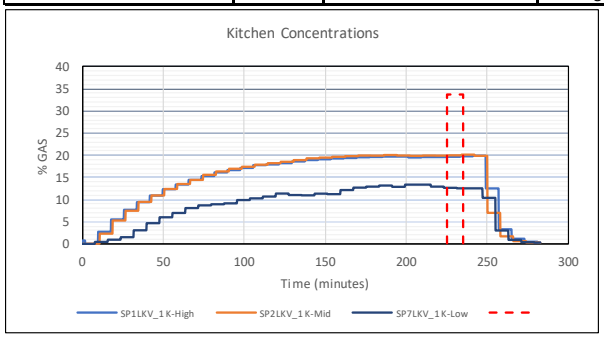


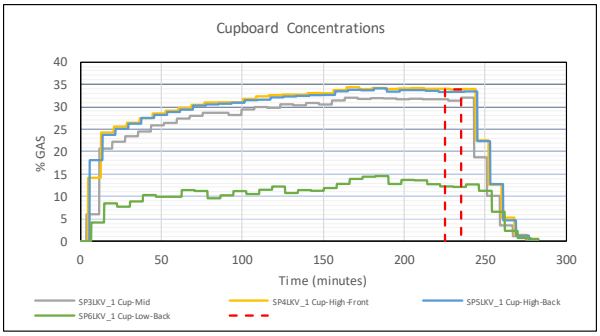


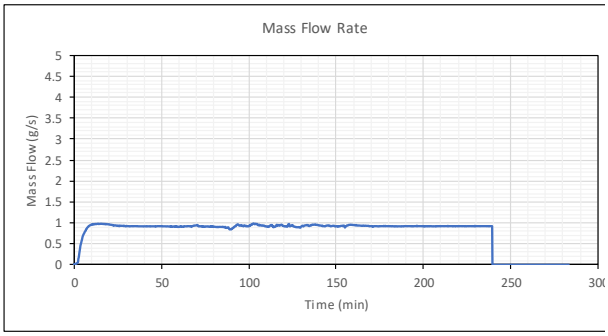
Hallway and Stud into Living Room



Cupboard (top is average of SP4 and SP5







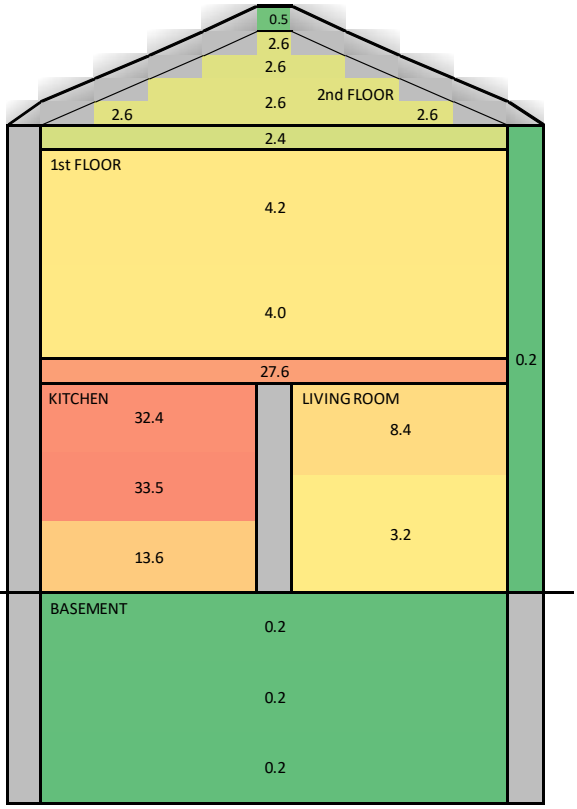
L2-040 RESULT

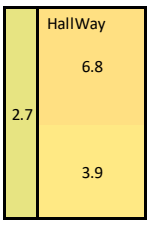
Hy4Heat WP7 Test Result

MTP ID: L2-040
Hole Size: 7.2 mm
Location: Under sink cupboard
Gas: methane
Date: 06/12/2019 **Time:** 21:00:00
Averaging Period Start: 160 min **End:** 170 min

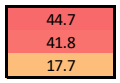
Notes:

Sensor	Average	Max	Min	STDEV	units
SP1LKV_1 K-High	32.4	32.4	32.3	0.0	%vol
SP2LKV_1 K-Mid	33.5	33.6	33.5	0.0	%vol
SP3LKV_1 Cup-Mid	41.8	42.0	41.6	0.2	%vol
SP4LKV_1 Cup-High-Front	44.7	44.9	44.3	0.3	%vol
SP5LKV_1 Cup-High-Back	44.7	44.9	44.4	0.2	%vol
SP6LKV_1 Cup-Low-Back	17.7	19.8	16.1	1.8	%vol
SP7LKV_1 K-Low	13.6	14.8	13.1	0.8	%vol
SP8LKV_1 LR-High	8.4	8.7	8.4	0.1	%vol
SP9LKV_1 LR-Mid	3.2	3.4	3.0	0.1	%vol
SP10LKV_1 H-High	6.8	7.1	6.7	0.1	%vol
SP11LKV_1 H-Mid	3.9	3.9	3.7	0.1	%vol
SP12LKV_1 FF-High	4.2	4.2	4.1	0.1	%vol
SP13LKV_1 FF-Mid	4.0	4.1	3.8	0.1	%vol
SP14LKV_2 AT-High	2.6	2.6	2.6	0.0	%vol
SP15LKV_2 AT-Mid	2.6	2.7	2.6	0.1	%vol
SP16LKV_2 BM-High	0.2	0.3	0.2	0.0	%vol
SP17LKV_1 BM-Mid	0.2	0.3	0.2	0.0	%vol
SP18LKV_1 BM-Low	0.2	0.2	0.2	0.0	%vol
SP19LKV_1 NWALL-Cav	0.2	0.2	0.2	0.0	%vol
SP20LKV_1 STUD-Cav	2.7	2.8	2.6	0.1	%vol
SP21LKV_1 FF-Void	27.6	27.7	27.5	0.1	%vol
SP22LKV_1 SF-Void	2.4	2.4	2.4	0.0	%vol
SP23LKV_1 ROOF-Void	0.5	0.5	0.4	0.0	%vol
RELEASEPRESSURE	0.020	0.020	0.020	0.000	barg
LOWFLOWMETERCH4	2.011	2.017	2.002	0.002	g/s
OUTLET_TEMP	6.1	6.3	6.0	0.1	degC
Volume Flow Rate	168.2	0.0	0.0	0.0	SLPM
Energy Flow Rate	100.6	0.0	0.0	0.0	kW
External Wind Speed	2.8				m/s
External Wind Direction	225.5				bearing

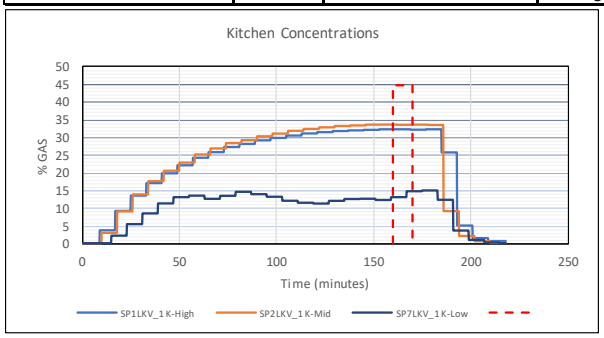


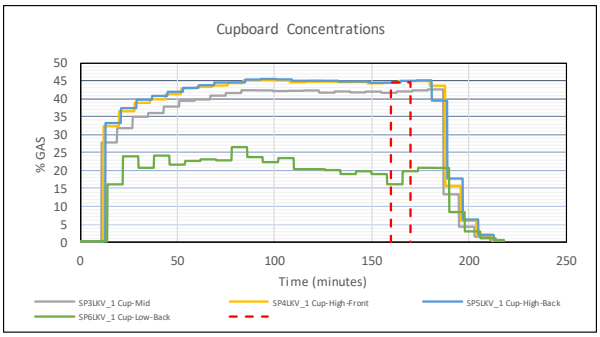


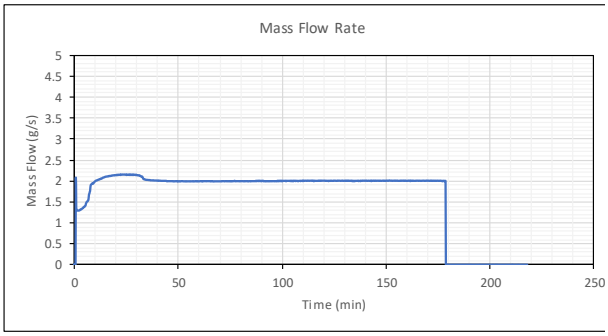
Hallway and Stud into Living Room



Cupboard (top is average of SP4 and SP5







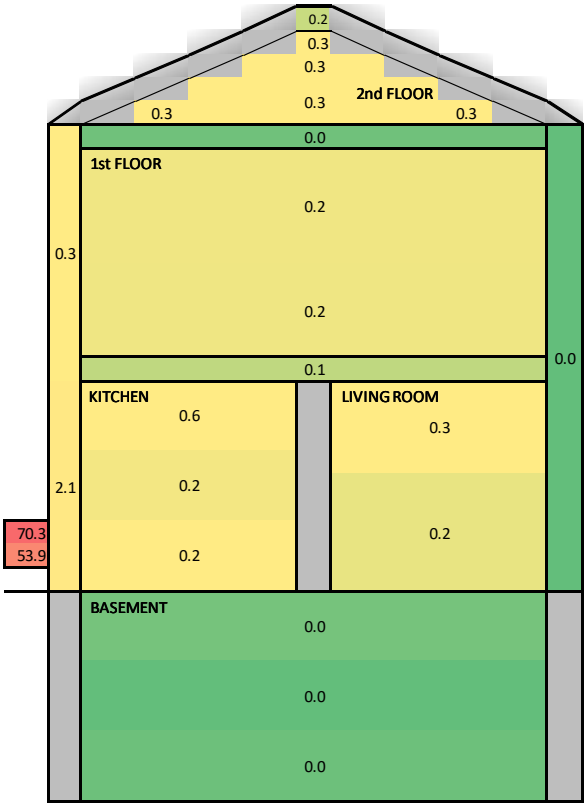
L2-043 RESULT

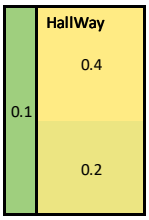
Hy4Heat WP7 Test Result

MTP ID: L2-043
Hole Size: 3.6 mm
Location: Meter box
Gas: Hydrogen
Date: 24/11/2019 **Time:** 15:15:00
Averaging Period Start: 230 min **End:** 240 min

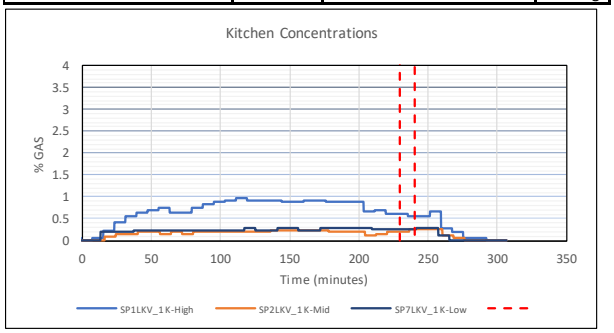
Notes:

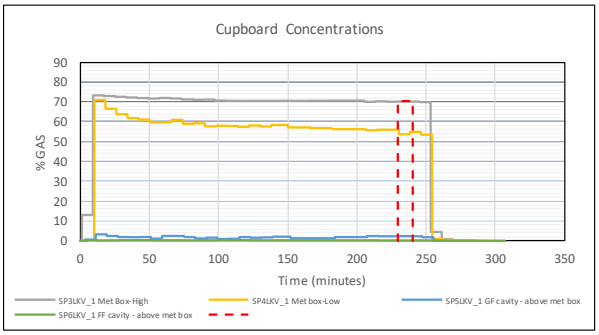
Sensor	Average	Max	Min	STDEV	units
SP1LKV_1 K-High	0.6	0.6	0.6	0.0	%vol
SP2LKV_1 K-Mid	0.2	0.2	0.2	0.0	%vol
SP3LKV_1 Met Box-High	70.3	70.3	70.3	0.0	%vol
SP4LKV_1 Met box-Low	53.9	55.8	53.6	0.6	%vol
SP5LKV_1 GF cavity - above met	2.1	2.1	2.1	0.0	%vol
SP6LKV_1 FF cavity - above met	0.3	0.3	0.2	0.0	%vol
SP7LKV_1 K-Low	0.2	0.2	0.2	0.0	%vol
SP8LKV_1 LR-High	0.3	0.3	0.3	0.0	%vol
SP9LKV_2 LR-Mid	0.2	0.2	0.2	0.0	%vol
SP10LKV_2 H-High	0.4	0.4	0.4	0.0	%vol
SP11LKV_2 H-Mid	0.2	0.2	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	0.3	0.3	0.3	0.0	%vol
SP15LKV_2 AT-Mid	0.3	0.3	0.3	0.0	%vol
SP16LKV_2 BM-High	0.0	0.0	0.0	0.0	%vol
SP17LKV_2 BM-Mid	0.0	0.0	0.0	0.0	%vol
SP18LKV_3 BM-Low	0.0	0.0	0.0	0.0	%vol
SP19LKV_2 NWALL-Cav	0.0	0.0	0.0	0.0	%vol
SP20LKV_1 STUD-Cav	0.1	0.1	0.1	0.0	%vol
SP21LKV_1 FF-Void	0.1	0.2	0.1	0.0	%vol
SP22LKV_1 SF-Void	0.0	0.0	0.0	0.0	%vol
SP23LKV_1 ROOF-Void	0.2	0.2	0.1	0.0	%vol
RELEASEPRESSURE	0.0200	0.0203	0.0192	0.0003	barg
LOWFLOWMETER	0.1537	0.1547	0.1516	0.0008	g/s
OUTLET_TEMP	7.6	7.6	7.5	0.1	degC
Volume Flow Rate	103.7	104.4	102.3	0.5	SLPM
Energy Flow Rate	18.4	18.5	18.2	0.1	kW
External Wind Speed	2.1				m/s
External Wind Direction	29.6				bearing

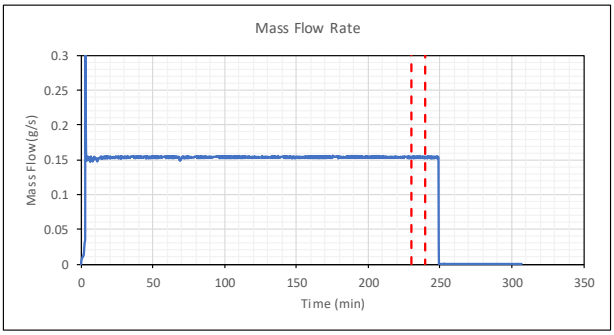




Hallway and Stud into Living Room







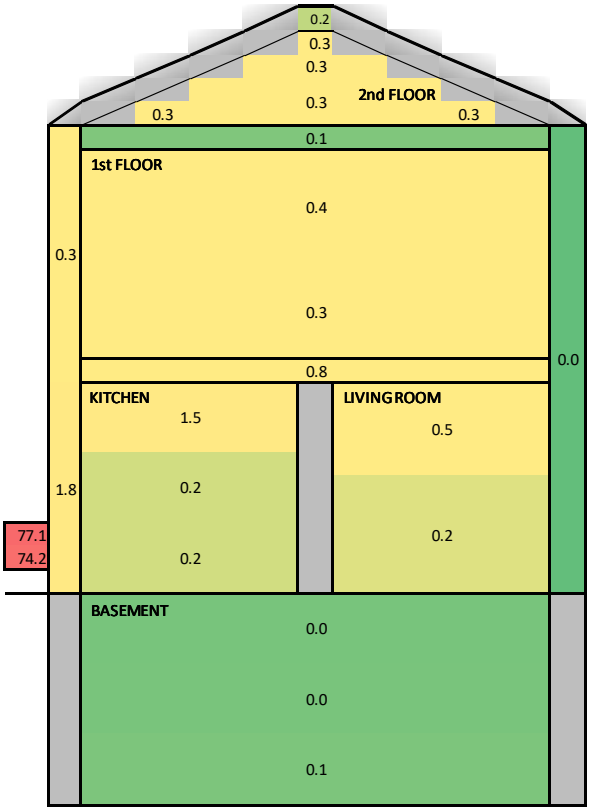
L2-044 RESULT

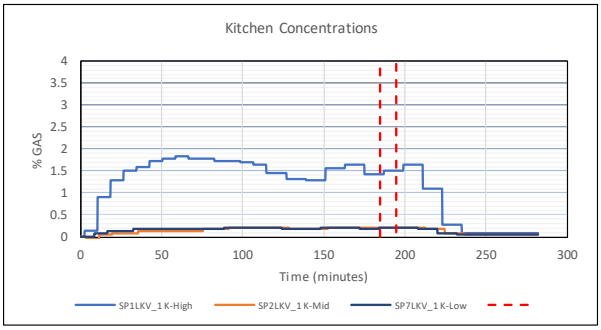
Hy4Heat WP7 Test Result

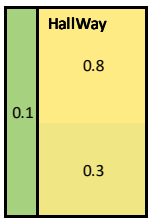
MTP ID: L2-044
Hole Size: 5.1 mm
Location: Meter box
Gas: Hydrogen
Date: 24/11/2019 **Time:** 20:45:00
Averaging Period Start: 185 min **End:** 195 min

Notes:

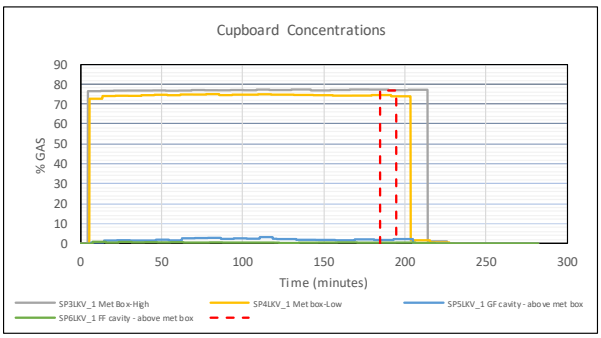
Sensor	Average	Max	Min	STDEV	units
SP1LKV_1 K-High	1.5	1.5	1.4	0.0	%vol
SP2LKV_1 K-Mid	0.2	0.2	0.2	0.0	%vol
SP3LKV_1 Met Box-High	77.1	77.2	76.9	0.1	%vol
SP4LKV_1 Met box-Low	74.2	74.4	73.8	0.3	%vol
SP5LKV_1 GF cavity - above met	1.8	2.1	1.7	0.2	%vol
SP6LKV_1 FF cavity - above met	0.3	0.4	0.3	0.0	%vol
SP7LKV_1 K-Low	0.2	0.2	0.2	0.0	%vol
SP8LKV_1 LR-High	0.5	0.5	0.5	0.0	%vol
SP9LKV_1 LR-Mid	0.2	0.2	0.2	0.0	%vol
SP10LKV_2 H-High	0.8	0.8	0.8	0.0	%vol
SP11LKV_2 H-Mid	0.3	0.3	0.3	0.0	%vol
SP12LKV_2 FF-High	0.4	0.4	0.4	0.0	%vol
SP13LKV_2 FF-Mid	0.3	0.3	0.3	0.0	%vol
SP14LKV_2 AT-High	0.3	0.4	0.3	0.0	%vol
SP15LKV_2 AT-Mid	0.3	0.3	0.3	0.0	%vol
SP16LKV_2 BM-High	0.0	0.0	0.0	0.0	%vol
SP17LKV_1 BM-Mid	0.0	0.1	0.0	0.0	%vol
SP18LKV_1 BM-Low	0.1	0.1	0.1	0.0	%vol
SP19LKV_1 NWALL-Cav	0.0	0.0	0.0	0.0	%vol
SP20LKV_1 STUD-Cav	0.1	0.1	0.1	0.0	%vol
SP21LKV_1 FF-Void	0.8	1.3	0.7	0.3	%vol
SP22LKV_1 SF-Void	0.1	0.1	0.1	0.0	%vol
SP23LKV_1 ROOF-Void	0.2	0.2	0.1	0.0	%vol
RELEASEPRESSURE	0.0200	0.0206	0.0196	0.0003	barg
LOWFLOWMETER	0.3124	0.3160	0.3099	0.0018	g/s
OUTLET_TEMP	7.3	7.4	7.2	0.1	degC
Volume Flow Rate	210.9	213.3	209.2	1.2	SLPM
Energy Flow Rate	37.5	37.9	37.2	0.2	kW
External Wind Speed	0.7				m/s
External Wind Direction	54.0				bearing

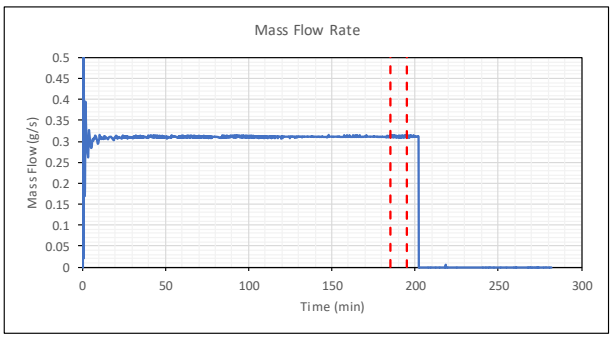






Hallway and Stud into Living Room





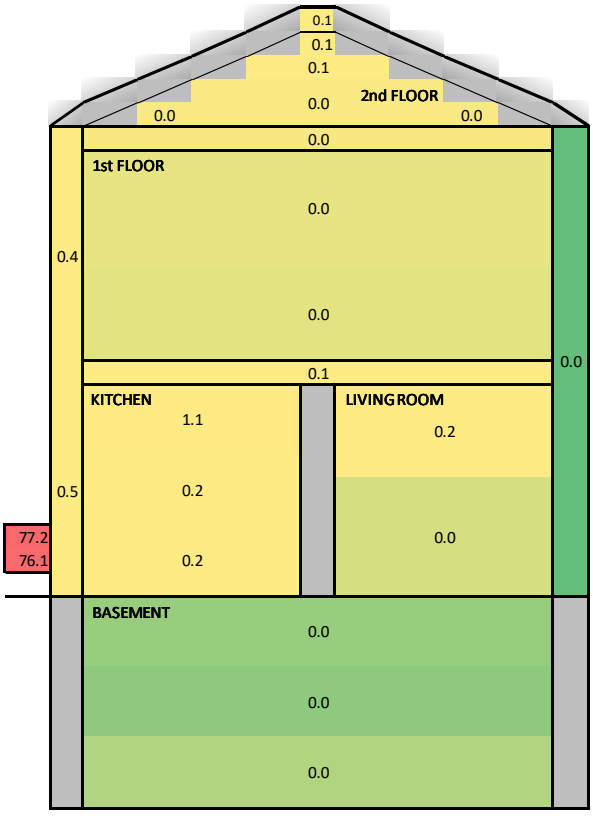
L2-045 RESULT

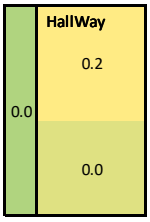
Hy4Heat WP7 Test Result

MTP ID: L2-045
Hole Size: 7.2 mm
Location: meter box
Gas: hydrogen
Date: 25/11/2019 **Time:** 01:45:00
Averaging Period Start: 340 min **End:** 350 min

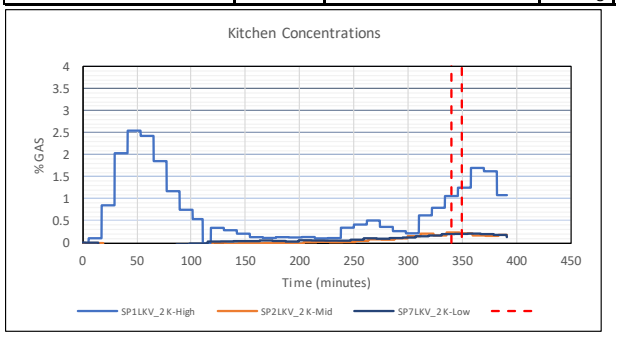
Notes:

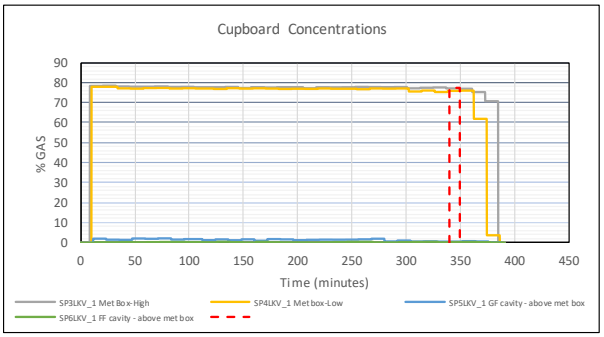
Sensor	Average	Max	Min	STDEV	units
SP1LKV_2 K-High	1.1	1.3	1.1	0.1	%vol
SP2LKV_2 K-Mid	0.2	0.2	0.2	0.0	%vol
SP3LKV_1 Met Box-High	77.2	77.2	77.0	0.0	%vol
SP4LKV_1 Met box-Low	76.1	76.1	76.1	0.0	%vol
SP5LKV_1 GF cavity - above met	0.5	0.5	0.5	0.0	%vol
SP6LKV_1 FF cavity - above met	0.4	0.4	0.3	0.1	%vol
SP7LKV_2 K-Low	0.2	0.2	0.2	0.0	%vol
SP8LKV_2 LR-High	0.2	0.2	0.2	0.0	%vol
SP9LKV_2 LR-Mid	0.0	0.0	0.0	0.0	%vol
SP10LKV_2 H-High	0.2	0.2	0.2	0.0	%vol
SP11LKV_2 H-Mid	0.0	0.0	0.0	0.0	%vol
SP12LKV_2 FF-High	0.0	0.0	0.0	0.0	%vol
SP13LKV_2 FF-Mid	0.0	0.0	0.0	0.0	%vol
SP14LKV_2 AT-High	0.1	0.1	0.1	0.0	%vol
SP15LKV_2 AT-Mid	0.0	0.0	0.0	0.0	%vol
SP16LKV_2 BM-High	0.0	0.0	0.0	0.0	%vol
SP17LKV_1 BM-Mid	0.0	0.0	-0.1	0.0	%vol
SP18LKV_1 BM-Low	0.0	0.0	0.0	0.0	%vol
SP19LKV_1 NWALL-Cav	0.0	0.0	-0.1	0.0	%vol
SP20LKV_1 STUD-Cav	0.0	0.0	0.0	0.0	%vol
SP21LKV_1 FF-Void	0.1	0.1	0.0	0.0	%vol
SP22LKV_1 SF-Void	0.0	0.1	0.0	0.0	%vol
SP23LKV_1 ROOF-Void	0.1	0.1	0.1	0.0	%vol
RELEASEPRESSURE	0.0174	0.0189	0.0162	0.0007	barg
LOWFLOWMETER	0.5296	0.5483	0.5116	0.0112	g/s
OUTLET_TEMP	7.8	7.9	7.6	0.1	degC
Volume Flow Rate	357.4	370.1	345.3	7.6	SLPM
Energy Flow Rate	63.5	65.7	61.3	1.3	kW
External Wind Speed	1.5				m/s
External Wind Direction	93.3				bearing

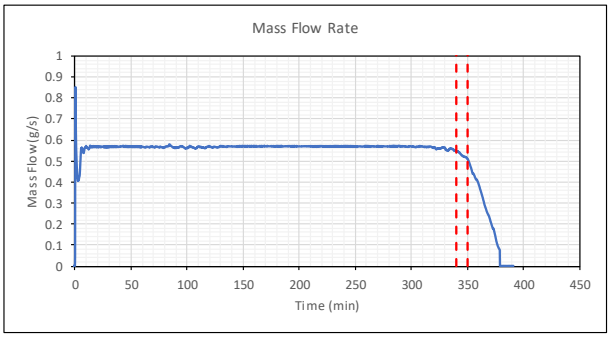




Hallway and Stud into Living Room







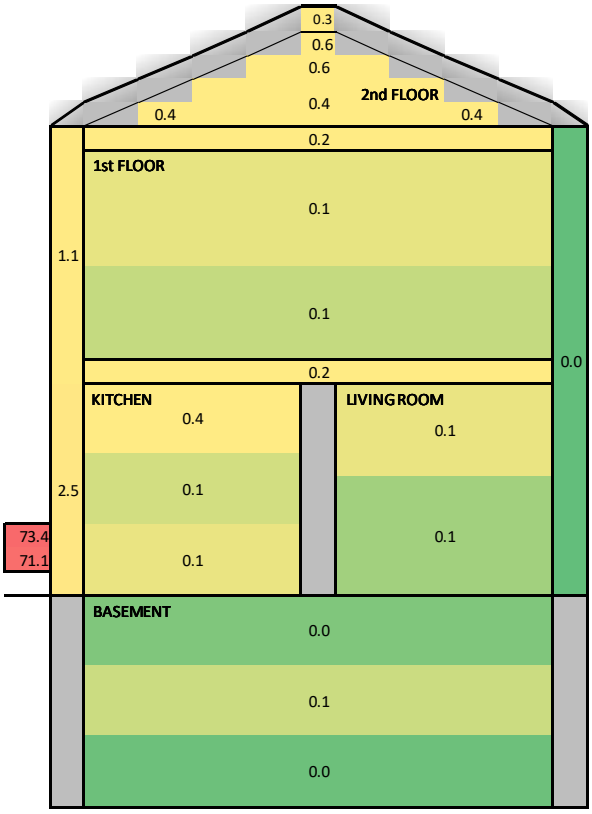
L2-046 RESULT

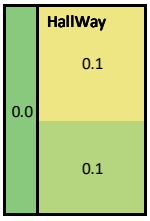
Hy4Heat WP7 Test Result

MTP ID: L2-046
Hole Size: 3.6 mm
Location: meter box with 20 mm hole into cavity wall
Gas: hydrogen
Date: 25/11/2019 **Time:** 15:35:00
Averaging Period Start: 150 min **End:** 160 min

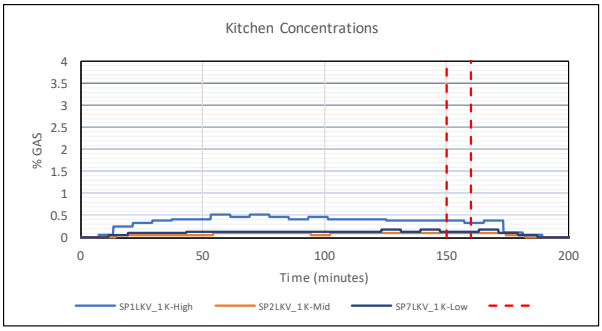
Notes: -0.1% offset removed from SP21

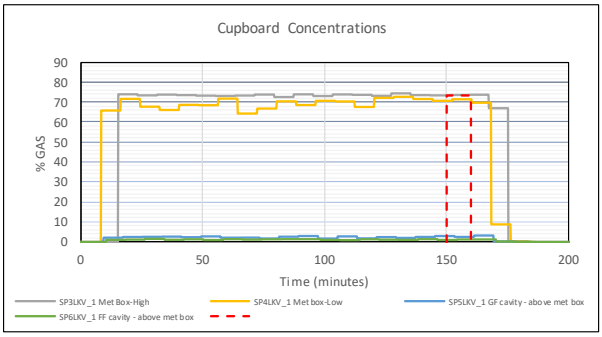
Sensor	Average	Max	Min	STDEV	units
SP1LKV_1 K-High	0.4	0.4	0.3	0.0	%vol
SP2LKV_1 K-Mid	0.1	0.1	0.1	0.0	%vol
SP3LKV_1 Met Box-High	73.4	73.6	73.2	0.1	%vol
SP4LKV_1 Met box-Low	71.1	71.3	70.5	0.3	%vol
SP5LKV_1 GF cavity - above met	2.5	2.8	2.4	0.2	%vol
SP6LKV_1 FF cavity - above met	1.1	1.2	1.0	0.1	%vol
SP7LKV_1 K-Low	0.1	0.1	0.1	0.0	%vol
SP8LKV_1 LR-High	0.1	0.1	0.1	0.0	%vol
SP9LKV_2 LR-Mid	0.1	0.1	0.1	0.0	%vol
SP10LKV_2 H-High	0.1	0.1	0.1	0.0	%vol
SP11LKV_2 H-Mid	0.1	0.1	0.1	0.0	%vol
SP12LKV_2 FF-High	0.1	0.1	0.1	0.0	%vol
SP13LKV_2 FF-Mid	0.1	0.1	0.1	0.0	%vol
SP14LKV_2 AT-High	0.6	0.6	0.6	0.0	%vol
SP15LKV_2 AT-Mid	0.4	0.4	0.4	0.0	%vol
SP16LKV_3 BM-High	0.0	0.0	0.0	0.0	%vol
SP17LKV_3 BM-Mid	0.1	0.1	0.1	0.0	%vol
SP18LKV_3 BM-Low	0.0	0.0	0.0	0.0	%vol
SP19LKV_3 NWALL-Cav	0.0	0.0	0.0	0.0	%vol
SP20LKV_3 STUD-Cav	0.0	0.0	0.0	0.0	%vol
SP21LKV_1 FF-Void	0.2	0.2	0.2	0.0	%vol
SP22LKV_3 SF-Void	0.2	0.2	0.2	0.0	%vol
SP23LKV_3 ROOF-Void	0.3	0.3	0.3	0.0	%vol
RELEASEPRESSURE	0.0200	0.0206	0.0196	0.0003	barg
LOWFLOWMETER	0.1537	0.1553	0.1522	0.0009	g/s
OUTLET_TEMP	8.3	8.4	8.2	0.0	degC
Volume Flow Rate	103.7	104.8	102.7	0.6	SLPM
Energy Flow Rate	18.4	18.6	18.2	0.1	kW
External Wind Speed	2.4				m/s
External Wind Direction	76.8				bearing

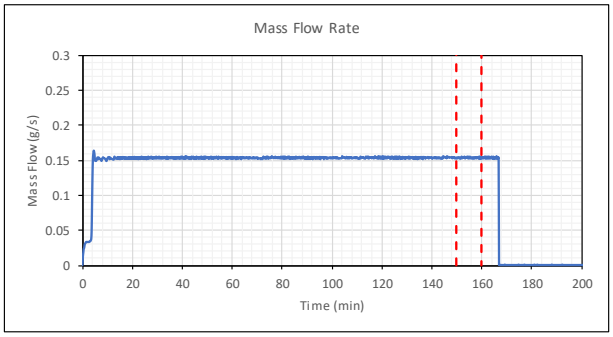




Hallway and Stud into Living Room







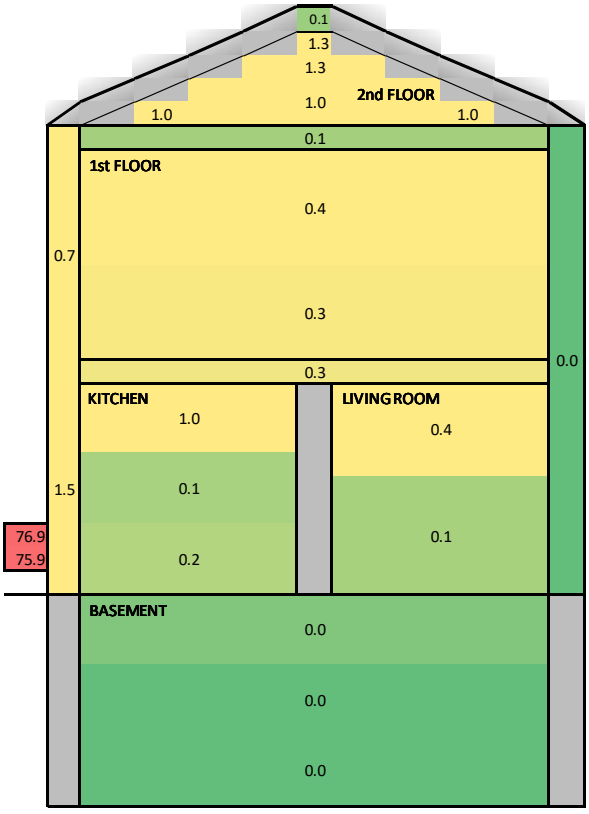
L2-047 RESULT

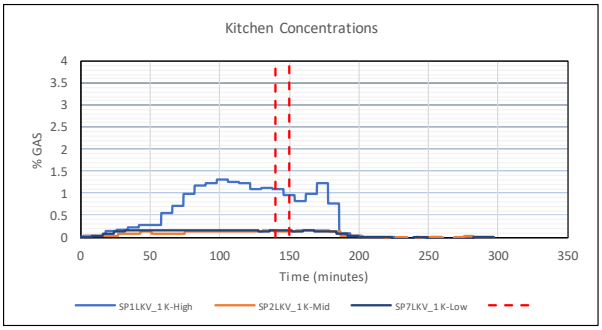
Hy4Heat WP7 Test Result

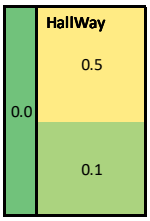
MTP ID: L2-047
Hole Size: 5.1 mm
Location: Meter box with 20 mm vent into cavity
Gas: Hydrogen
Date: 25/11/2019 **Time:** 20:00:00
Averaging Period Start: 140 min **End:** 150 min

Notes:

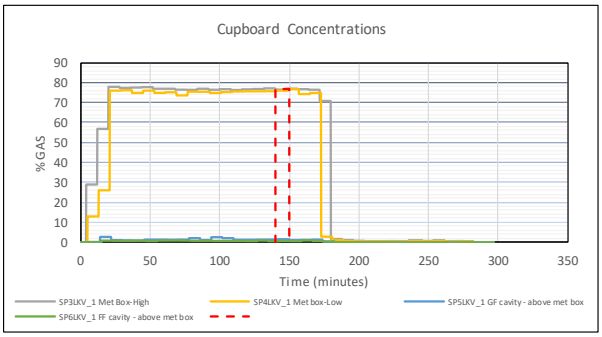
Sensor	Average	Max	Min	STDEV	units
SP1LKV_1 K-High	1.0	1.1	1.0	0.1	%vol
SP2LKV_1 K-Mid	0.1	0.1	0.1	0.0	%vol
SP3LKV_1 Met Box-High	76.9	77.2	76.8	0.2	%vol
SP4LKV_1 Met box-Low	75.9	76.5	75.5	0.3	%vol
SP5LKV_1 GF cavity - above met	1.5	1.5	1.2	0.1	%vol
SP6LKV_1 FF cavity - above met	0.7	0.8	0.7	0.0	%vol
SP7LKV_1 K-Low	0.2	0.2	0.2	0.0	%vol
SP8LKV_1 LR-High	0.4	0.4	0.4	0.0	%vol
SP9LKV_2 LR-Mid	0.1	0.1	0.1	0.0	%vol
SP10LKV_2 H-High	0.5	0.6	0.5	0.0	%vol
SP11LKV_2 H-Mid	0.1	0.2	0.1	0.0	%vol
SP12LKV_2 FF-High	0.4	0.4	0.4	0.0	%vol
SP13LKV_2 FF-Mid	0.3	0.3	0.3	0.0	%vol
SP14LKV_2 AT-High	1.3	1.3	1.2	0.0	%vol
SP15LKV_2 AT-Mid	1.0	1.0	1.0	0.0	%vol
SP16LKV_2 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	0.0	0.1	0.0	0.0	%vol
SP21LKV_1 FF-Void	0.3	0.4	0.1	0.1	%vol
SP22LKV_1 SF-Void	0.1	0.1	0.1	0.0	%vol
SP23LKV_1 ROOF-Void	0.1	0.1	0.1	0.0	%vol
RELEASEPRESSURE	0.0199	0.0203	0.0196	0.0002	barg
LOWFLOWMETER	0.3108	0.3136	0.3087	0.0007	g/s
OUTLET_TEMP	8.5	8.6	8.5	0.0	degC
Volume Flow Rate	209.8	211.6	208.3	0.5	SLPM
Energy Flow Rate	37.3	37.6	37.0	0.1	kW
External Wind Speed	2.2				m/s
External Wind Direction	60.6				bearing

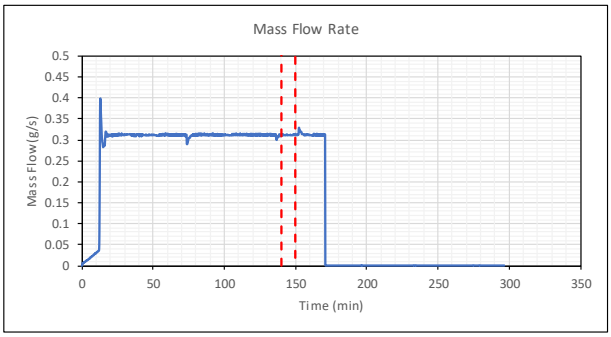






Hallway and Stud into Living Room





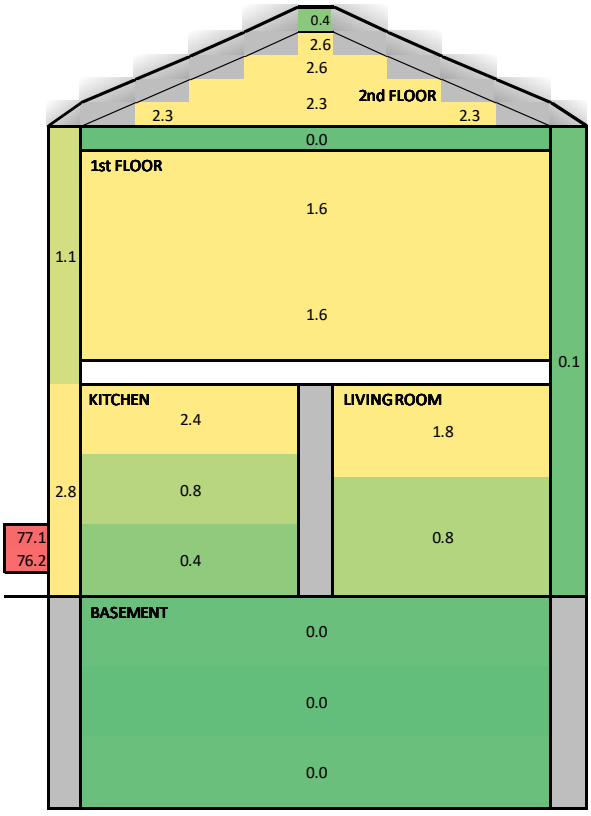
L2-048 RESULT

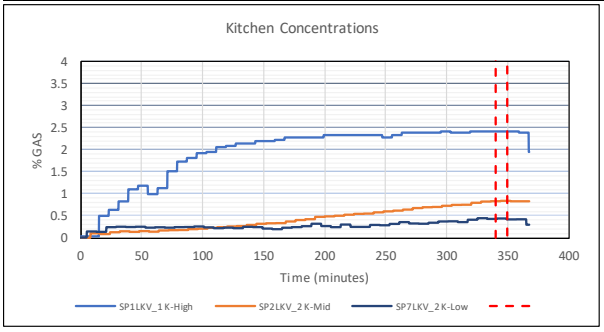
Hy4Heat WP7 Test Result

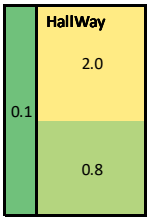
MTP ID: L2-048
Hole Size: 7.2 mm
Location: Meter box with 20 mm vent into cavity
Gas: Hydrogen
Date: 26/11/2019 **Time:** 00:45:00
Averaging Period Start: 340 min **End:** 350 min

Notes: SP21 removed - suspect blocked

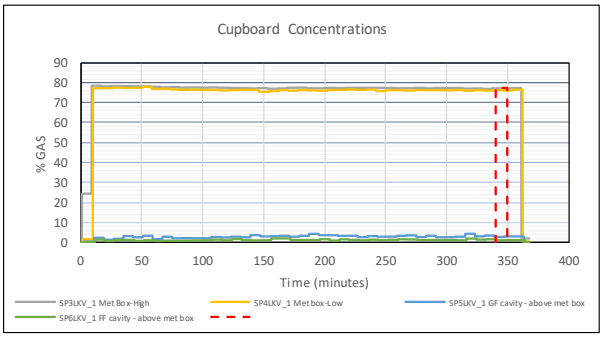
Sensor	Average	Max	Min	STDEV	units
SP1LKV_1 K-High	2.4	2.4	2.4	0.0	%vol
SP2LKV_2 K-Mid	0.8	0.8	0.8	0.0	%vol
SP3LKV_1 Met Box-High	77.1	77.1	77.1	0.0	%vol
SP4LKV_1 Met box-Low	76.2	76.3	76.2	0.1	%vol
SP5LKV_1 GF cavity - above met	2.8	2.9	2.7	0.1	%vol
SP6LKV_1 FF cavity - above met	1.1	1.2	1.1	0.0	%vol
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_1 LR-Mid	0.8	0.8	0.8	0.0	%vol
SP10LKV_2 H-High	2.0	2.0	2.0	0.0	%vol
SP11LKV_2 H-Mid	0.8	0.8	0.8	0.0	%vol
SP12LKV_2 FF-High	1.6	1.7	1.6	0.0	%vol
SP13LKV_2 FF-Mid	1.6	1.6	1.6	0.0	%vol
SP14LKV_2 AT-High	2.6	2.6	2.4	0.1	%vol
SP15LKV_2 AT-Mid	2.3	2.3	2.2	0.0	%vol
SP16LKV_3 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_3 BM-Low	0.0	0.0	0.0	0.0	%vol
SP19LKV_1 NWALL-Cav	0.1	0.1	0.1	0.0	%vol
SP20LKV_1 STUD-Cav	0.1	0.1	0.1	0.0	%vol
SP21LKV_1 FF-Void	0.0	0.0	0.0	0.0	%vol
SP22LKV_1 SF-Void	0.0	0.0	0.0	0.0	%vol
SP23LKV_1 ROOF-Void	0.4	0.7	0.3	0.2	%vol
RELEASEPRESSURE	0.0200	0.0206	0.0196	0.0002	barg
LOWFLOWMETER	0.5692	0.5734	0.5660	0.0016	g/s
OUTLET_TEMP	8.3	8.4	8.2	0.0	degC
Volume Flow Rate	384.2	387.0	382.0	1.1	SLPM
Energy Flow Rate	68.2	68.7	67.9	0.2	kW
External Wind Speed	1.8				m/s
External Wind Direction	74.8				bearing

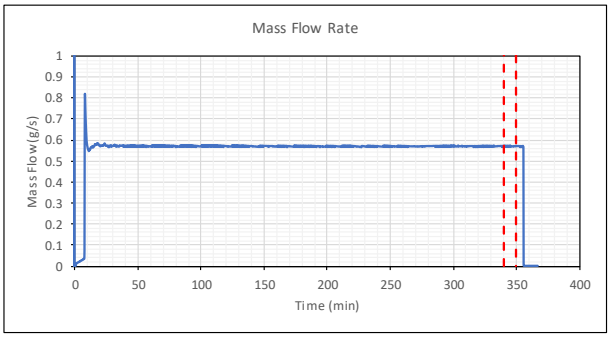






Hallway and Stud into Living Room





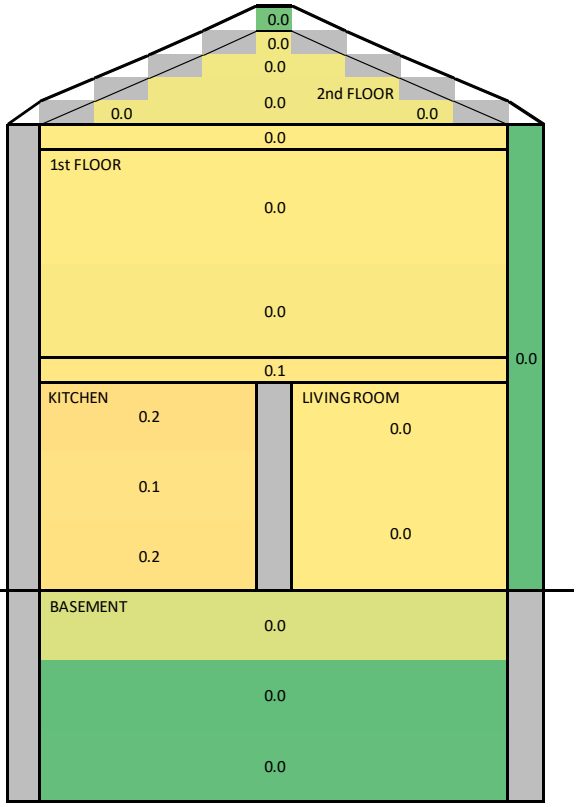
L2-050 RESULT

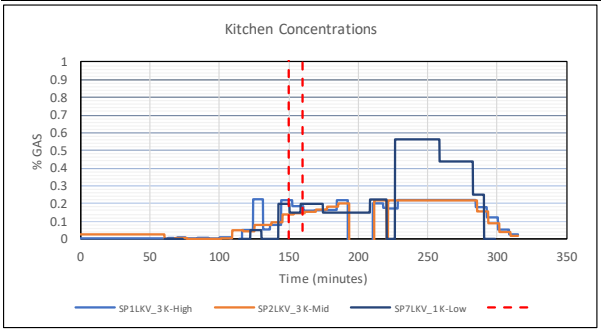
Hy4Heat WP7 Test Result

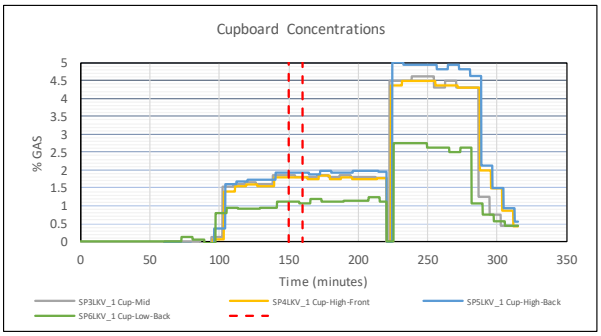
MTP ID: L2-050
Hole Size: 0.6 mm
Location: Wall Cupboard
Gas: Hydrogen
Date: 28/10/2019 **Time:** 14:30:00
Averaging Period Start: 150 min **End:** 160 min

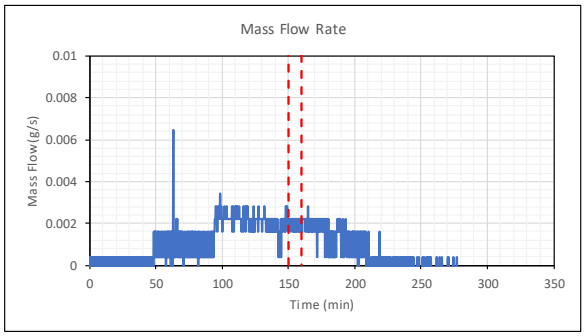
Notes:

Sensor	Average	Max	Min	STDEV	units
SP1LKV_3 K-High	0.2	0.2	0.2	0.0	%vol
SP2LKV_3 K-Mid	0.1	0.1	0.1	0.0	%vol
SP3LKV_1 Cup-Mid	1.8	1.9	1.8	0.0	%vol
SP4LKV_1 Cup-High-Front	1.8	1.8	1.8	0.0	%vol
SP5LKV_1 Cup-High-Back	1.9	1.9	1.9	0.0	%vol
SP6LKV_1 Cup-Low-Back	1.1	1.1	1.1	0.0	%vol
SP7LKV_1 K-Low	0.2	0.2	0.1	0.0	%vol
SP8LKV_1 LR-High	0.0	0.1	0.0	0.0	%vol
SP9LKV_3 LR-Mid	0.0	0.0	0.0	0.0	%vol
SP10LKV_3 H-High	0.0	0.0	0.0	0.0	%vol
SP11LKV_3 H-Mid	0.0	0.0	0.0	0.0	%vol
SP12LKV_3 FF-High	0.0	0.0	0.0	0.0	%vol
SP13LKV_3 FF-Mid	0.0	0.0	0.0	0.0	%vol
SP14LKV_3 AT-High	0.0	0.0	0.0	0.0	%vol
SP15LKV_3 AT-Mid	0.0	0.0	0.0	0.0	%vol
SP16LKV_3 BM-High	0.0	0.0	0.0	0.0	%vol
SP17LKV_3 BM-Mid	0.0	0.0	0.0	0.0	%vol
SP18LKV_3 BM-Low	0.0	0.0	0.0	0.0	%vol
SP19LKV_3 NWALL-Cav	0.0	0.0	0.0	0.0	%vol
SP20LKV_3 STUD-Cav	0.0	0.0	0.0	0.0	%vol
SP21LKV_2 FF-Void	0.1	0.1	0.1	0.0	%vol
SP22LKV_3 SF-Void	0.0	0.0	0.0	0.0	%vol
SP23LKV_3 ROOF-Void	0.0	0.0	0.0	0.0	%vol
RELEASEPRESSURE	0.0184	0.0189	0.0174	0.0003	barg
LOWFLOWMETER	0.0021	0.0022	0.0016	0.0002	g/s
0	#DIV/0!	0.0000	0.0000	#DIV/0!	g/s
OUTLET_TEMP	5.2	5.4	5.1	0.1	degC
Volume Flow Rate	1.4	1.5	1.1	0.2	SLPM
Energy Flow Rate	0.3	0.3	0.2	0.0	kW
External Wind Speed	2.7				m/s
External Wind Direction	17.9				bearing









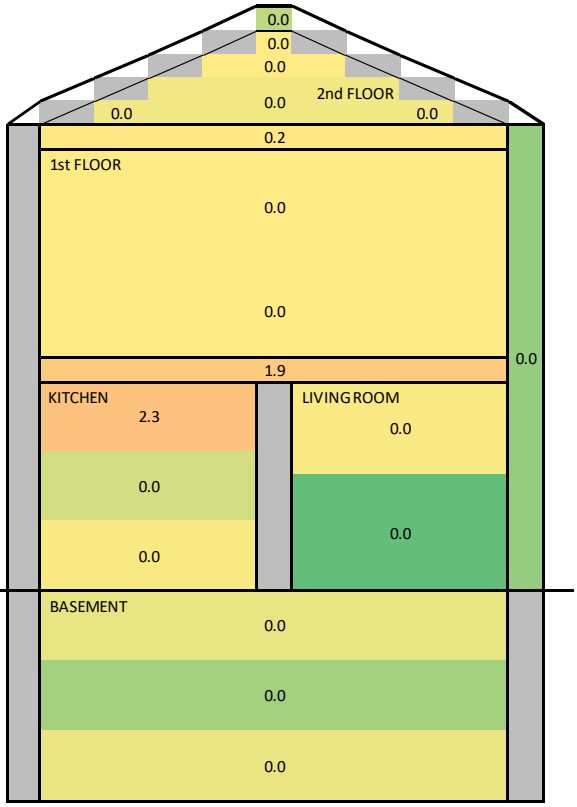
L2-051 RESULT

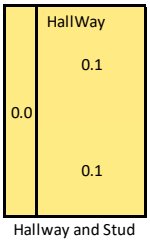
Hy4Heat WP7 Test Result

MTP ID: L2-051
Hole Size: 0.9 mm
Location: Wall Cupboard
Gas: Hydrogen
Date: 29/10/2019 **Time:** 16:00:00
Averaging Period Start: 120 min **End:** 130 min

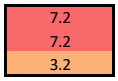
Notes:

Sensor	Average	Max	Min	STDEV	units
SP1LKV_2 K-High	2.3	2.3	2.3	0.0	%vol
SP2LKV_2 K-Mid	0.0	0.0	0.0	0.0	%vol
SP3LKV_1 Cup-Mid	7.2	7.2	7.2	0.0	%vol
SP4LKV_1 Cup-High-Front	7.0	7.0	7.0	0.0	%vol
SP5LKV_1 Cup-High-Back	7.4	7.4	7.4	0.0	%vol
SP6LKV_1 Cup-Low-Back	3.2	3.3	3.2	0.0	%vol
SP7LKV_2 K-Low	0.0	0.0	0.0	0.0	%vol
SP8LKV_2 LR-High	0.0	0.0	0.0	0.0	%vol
SP9LKV_2 LR-Mid	0.0	0.0	0.0	0.0	%vol
SP10LKV_3 H-High	0.1	0.1	0.1	0.0	%vol
SP11LKV_3 H-Mid	0.1	0.1	0.1	0.0	%vol
SP12LKV_3 FF-High	0.0	0.0	0.0	0.0	%vol
SP13LKV_3 FF-Mid	0.0	0.0	0.0	0.0	%vol
SP14LKV_3 AT-High	0.0	0.0	0.0	0.0	%vol
SP15LKV_3 AT-Mid	0.0	0.0	0.0	0.0	%vol
SP16LKV_3 BM-High	0.0	0.0	0.0	0.0	%vol
SP17LKV_3 BM-Mid	0.0	0.0	0.0	0.0	%vol
SP18LKV_3 BM-Low	0.0	0.0	0.0	0.0	%vol
SP19LKV_3 NWALL-Cav	0.0	0.0	0.0	0.0	%vol
SP20LKV_3 STUD-Cav	0.0	0.0	0.0	0.0	%vol
SP21LKV_2 FF-Void	1.9	1.9	1.8	0.0	%vol
SP22LKV_3 SF-Void	0.2	0.2	0.2	0.0	%vol
SP23LKV_3 ROOF-Void	0.0	0.0	0.0	0.0	%vol
RELEASEPRESSURE	0.0201	0.0203	0.0196	0.0002	barg
LOWFLOWMETER	0.0070	0.0073	0.0067	0.0003	g/s
0	#DIV/0!	0.0000	0.0000	#DIV/0!	g/s
OUTLET_TEMP	4.8	4.9	4.7	0.1	degC
Volume Flow Rate	4.7	5.0	4.5	0.2	SLPM
Energy Flow Rate	0.8	0.9	0.8	0.0	kW
External Wind Speed	4.6				m/s
External Wind Direction	90.0				bearing

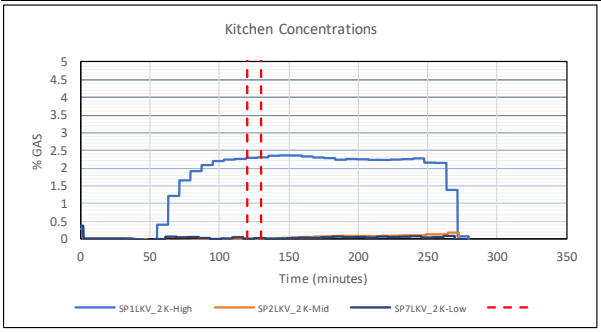


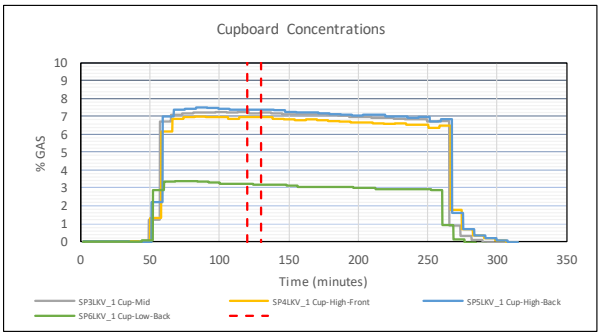


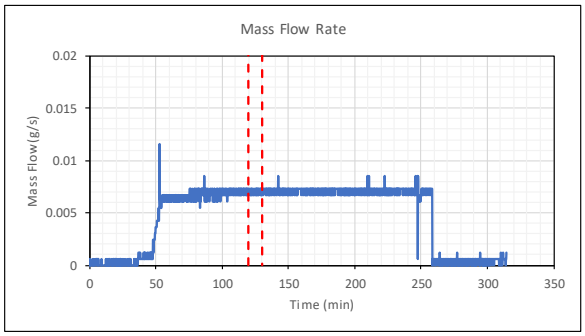
Hallway and Stud into Living Room



Cupboard (top is average of SP4 and SP5)







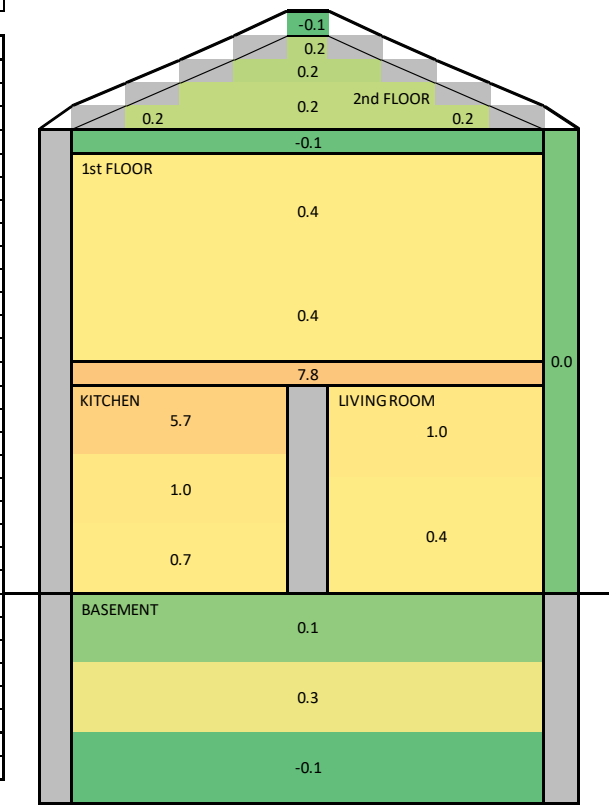
L2-052 RESULT

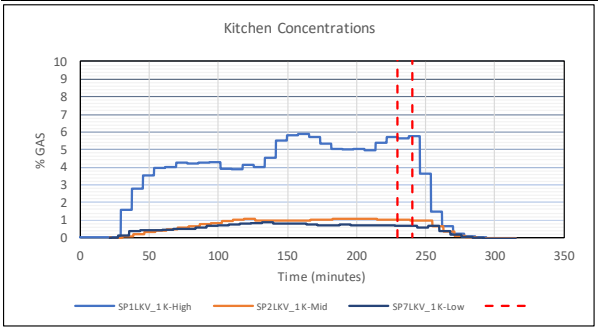
Hy4Heat WP7 Test Result

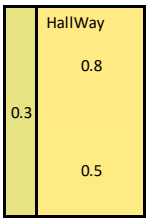
MTP ID: L2-052
Hole Size: 1.8 mm
Location: wall cupboard
Gas: Hydrogen
Date: 26/10/2019 **Time:** 13:00:00
Averaging Period Start: 230 min **End:** 240 min

Notes:

Sensor	Average	Max	Min	STDEV	units
SP1LKV_1 K-High	5.7	5.7	5.6	0.1	%vol
SP2LKV_1 K-Mid	1.0	1.0	1.0	0.0	%vol
SP3LKV_1 Cup-Mid	25.8	26.0	25.7	0.1	%vol
SP4LKV_1 Cup-High-Front	25.3	25.3	25.3	0.0	%vol
SP5LKV_1 Cup-High-Back	26.5	26.5	26.5	0.0	%vol
SP6LKV_1 Cup-Low-Back	20.3	20.5	20.0	0.3	%vol
SP7LKV_1 K-Low	0.7	0.7	0.7	0.0	%vol
SP8LKV_2 LR-High	1.0	1.1	1.0	0.0	%vol
SP9LKV_1 LR-Mid	0.4	0.4	0.4	0.0	%vol
SP10LKV_2 H-High	0.8	0.8	0.8	0.0	%vol
SP11LKV_2 H-Mid	0.5	0.5	0.5	0.0	%vol
SP12LKV_2 FF-High	0.4	0.4	0.4	0.0	%vol
SP13LKV_2 FF-Mid	0.4	0.4	0.4	0.0	%vol
SP14LKV_3 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	0.3	0.5	0.0	0.2	%vol
SP18LKV_1 BM-Low	-0.1	-0.1	-0.1	0.0	%vol
SP19LKV_2 NWALL-Cav	0.0	0.0	0.0	0.0	%vol
SP20LKV_3 STUD-Cav	0.3	0.3	0.3	0.0	%vol
SP21LKV_1 FF-Void	7.8	7.8	7.8	0.0	%vol
SP22LKV_1 SF-Void	-0.1	-0.1	-0.1	0.0	%vol
SP23LKV_1 ROOF-Void	-0.1	-0.1	-0.1	0.0	%vol
RELEASEPRESSURE	0.0213	0.0221	0.0206	0.0003	barg
LOWFLOWMETER	0.0423	0.0439	0.0415	0.0004	g/s
0	#DIV/0!	0.0000	0.0000	#DIV/0!	g/s
OUTLET_TEMP	6.6	6.9	6.4	0.1	degC
Volume Flow Rate	28.6	29.7	28.0	0.3	SLPM
Energy Flow Rate	5.1	5.3	5.0	0.0	kW
External Wind Speed	2.1				m/s
External Wind Direction	255.5				bearing

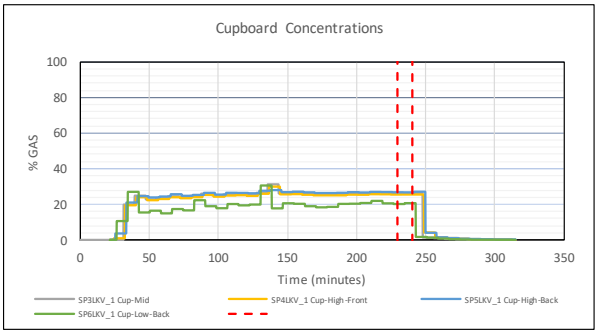


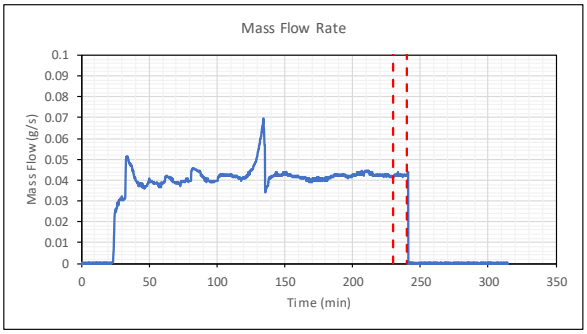




Hallway and Stud into Living Room

Cupboard (top is average of SP4 and SP5)





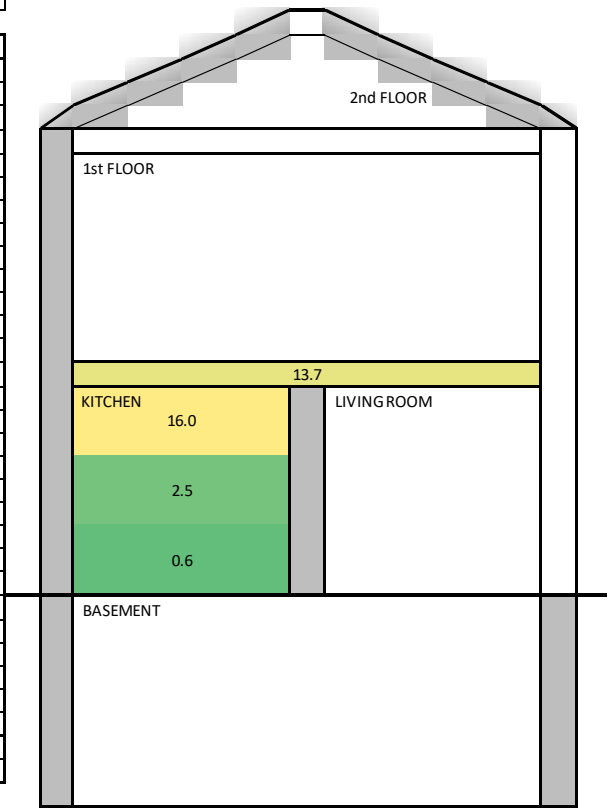
L2-053 RESULT

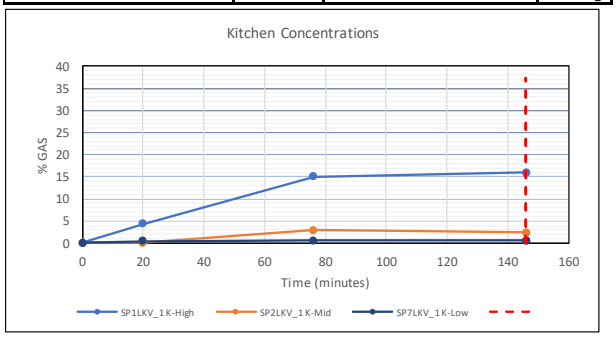
Hy4Heat WP7 Test Result

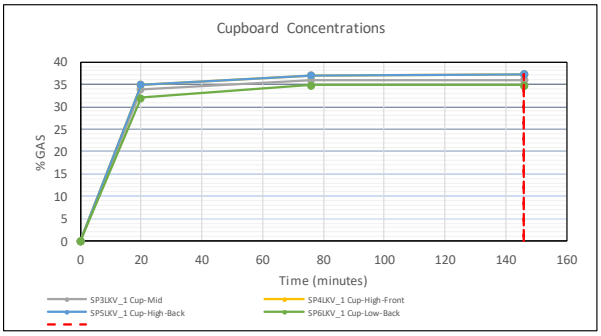
MTP ID: L2053
Hole Size: 2.5 mm
Location: wall cupboard
Gas: hydrogen
Date: 28/10/2019 **Time:** 16:25:00
Averaging Period Start: 146 min **End:** 146 min

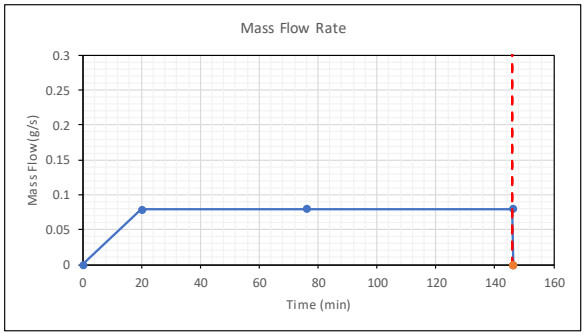
Notes: Data no present on SCADA system, below reproduced from Log Book notes

Sensor	Average	Max	Min	STDEV	units
SP1LKV_1 K-High	16.0				%vol
SP2LKV_1 K-Mid	2.5				%vol
SP3LKV_1 Cup-Mid	36.0				%vol
SP4LKV_1 Cup-High-Front	37.3				%vol
SP5LKV_1 Cup-High-Back	37.3				%vol
SP6LKV_1 Cup-Low-Back	34.8				%vol
SP7LKV_1 K-Low	0.6				%vol
SP8LKV_1 LR-High					%vol
SP9LKV_1 LR-Mid					%vol
SP10LKV_2 H-High					%vol
SP11LKV_2 H-Mid					%vol
SP12LKV_2 FF-High					%vol
SP13LKV_2 FF-Mid					%vol
SP14LKV_2 AT-High					%vol
SP15LKV_2 AT-Mid					%vol
SP16LKV_2 BM-High					%vol
SP17LKV_2 BM-Mid					%vol
SP18LKV_2 BM-Low					%vol
SP19LKV_3 NWALL-Cav					%vol
SP20LKV_2 STUD-Cav					%vol
SP21LKV_1 FF-Void	13.7				%vol
SP22LKV_2 SF-Void					%vol
SP23LKV_3 ROOF-Void					%vol
RELEASEPRESSURE	0.0202				barg
LOWFLOWMETER	0.0801				g/s
OUTLET_TEMP					degC
Volume Flow Rate	54.0				SLPM
Energy Flow Rate	9.6				kW
External Wind Speed	0.5				m/s
External Wind Direction	332.6				bearing









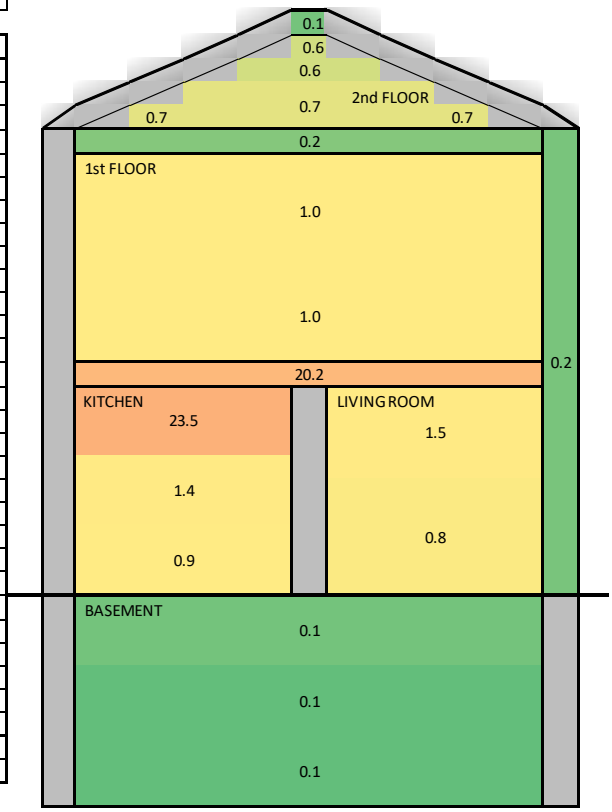
L2-054 RESULT

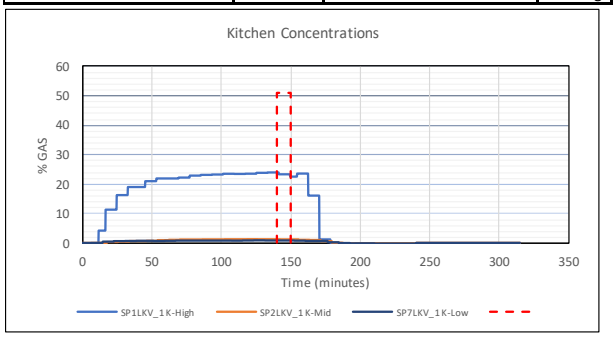
Hy4Heat WP7 Test Result

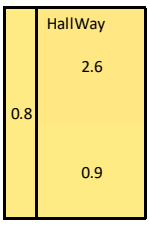
MTP ID: L2-054
Hole Size: 3.6 mm
Location: wall cupboard
Gas: Hydrogen
Date: 27/10/2019 **Time:** 10:30:00
Averaging Period Start: 140 min **End:** 150 min

Notes:

Sensor	Average	Max	Min	STDEV	units
SP1LKV_1 K-High	23.5	24.1	22.7	0.3	%vol
SP2LKV_1 K-Mid	1.4	1.5	1.4	0.0	%vol
SP3LKV_1 Cup-Mid	47.9	48.2	47.4	0.3	%vol
SP4LKV_1 Cup-High-Front	46.6	46.9	46.3	0.3	%vol
SP5LKV_1 Cup-High-Back	47.6	47.6	47.6	0.0	%vol
SP6LKV_1 Cup-Low-Back	50.8	50.8	50.8	0.0	%vol
SP7LKV_1 K-Low	0.9	0.9	0.9	0.0	%vol
SP8LKV_1 LR-High	1.5	1.6	1.5	0.0	%vol
SP9LKV_1 LR-Mid	0.8	0.8	0.8	0.0	%vol
SP10LKV_2 H-High	2.6	2.6	2.5	0.1	%vol
SP11LKV_2 H-Mid	0.9	1.0	0.9	0.0	%vol
SP12LKV_2 FF-High	1.0	1.0	1.0	0.0	%vol
SP13LKV_2 FF-Mid	1.0	1.0	1.0	0.0	%vol
SP14LKV_2 AT-High	0.6	0.6	0.6	0.0	%vol
SP15LKV_2 AT-Mid	0.7	0.7	0.7	0.0	%vol
SP16LKV_2 BM-High	0.1	0.1	0.1	0.0	%vol
SP17LKV_2 BM-Mid	0.1	0.1	0.0	0.0	%vol
SP18LKV_2 BM-Low	0.1	0.1	0.0	0.0	%vol
SP19LKV_3 NWALL-Cav	0.2	0.2	0.2	0.0	%vol
SP20LKV_2 STUD-Cav	0.8	0.8	0.8	0.0	%vol
SP21LKV_1 FF-Void	20.2	20.2	20.2	0.0	%vol
SP22LKV_2 SF-Void	0.2	0.2	0.2	0.0	%vol
SP23LKV_3 ROOF-Void	0.1	0.1	0.1	0.0	%vol
RELEASEPRESSURE	0.0209	0.0246	0.0184	0.0016	barg
LOWFLOWMETER	0.1677	0.1819	0.1581	0.0062	g/s
0	#DIV/0!	0.0000	0.0000	#DIV/0!	g/s
OUTLET_TEMP	11.4	11.6	11.0	0.2	degC
Volume Flow Rate	113.2	122.8	106.7	4.2	SLPM
Energy Flow Rate	20.1	21.8	19.0	0.7	kW
External Wind Speed	6.5				m/s
External Wind Direction	251.8				bearing

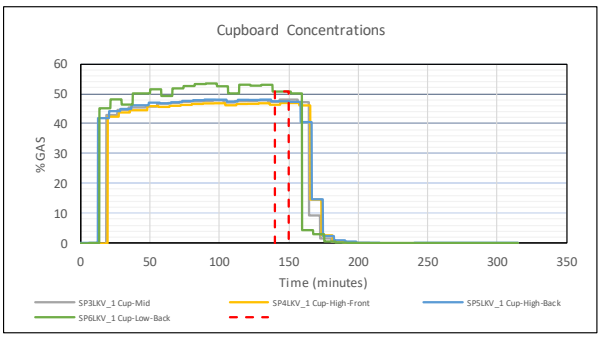


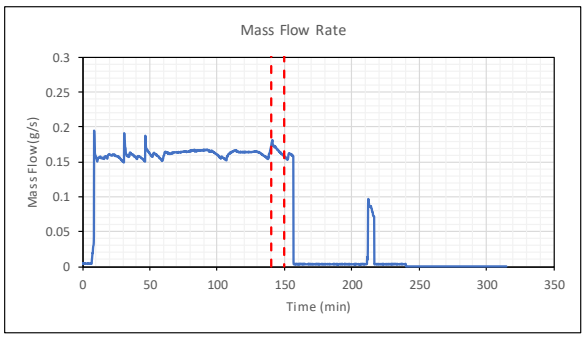




Hallway and Stud into Living Room

Cupboard (top is average of SP4 and SP5)





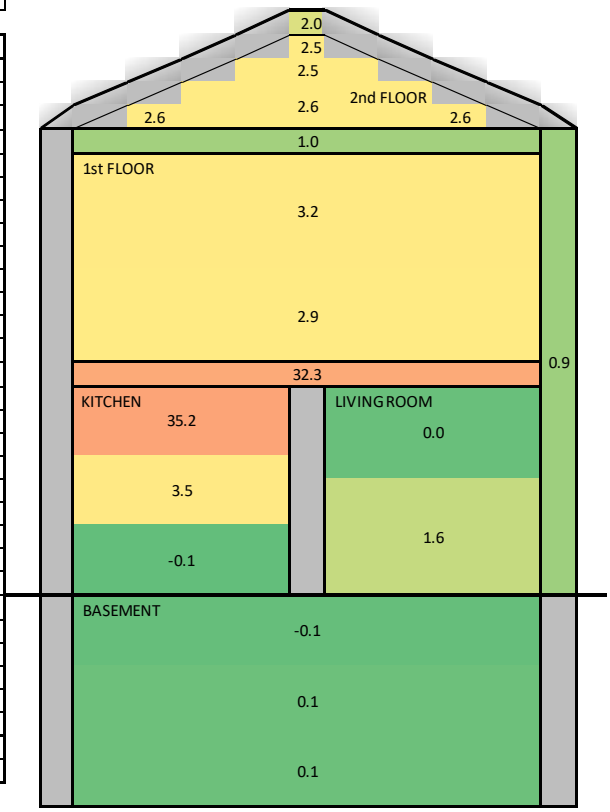
L2-055 RESULT

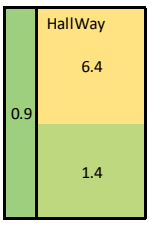
Hy4Heat WP7 Test Result

MTP ID: L2-055
Hole Size: 5.1 mm
Location: wall cupboard
Gas: Hydrogen
Date: 25/10/2019 **Time:** 18:50:10
Averaging Period Start: 180 min **End:** 190 min

Notes: SP8, living room high removed.

Sensor	Average	Max	Min	STDEV	units
SP1LKV_1 K-High	35.2	35.2	35.2	0.0	%vol
SP2LKV_2 K-Mid	3.5	4.7	-10.0	4.1	%vol
SP3LKV_1 Cup-Mid	59.1	59.1	59.1	0.0	%vol
SP4LKV_1 Cup-High-Front	57.4	57.4	57.4	0.0	%vol
SP5LKV_1 Cup-High-Back	58.9	58.9	58.9	0.0	%vol
SP6LKV_1 Cup-Low-Back	61.7	61.7	61.7	0.0	%vol
SP7LKV_2 K-Low	-0.1	0.0	-0.1	0.1	%vol
SP8LKV_1 LR-High					%vol
SP9LKV_1 LR-Mid	1.6	1.6	1.6	0.0	%vol
SP10LKV_1 H-High	6.4	6.4	6.4	0.0	%vol
SP11LKV_1 H-Mid	1.4	1.4	1.4	0.0	%vol
SP12LKV_1 FF-High	3.2	3.2	3.2	0.0	%vol
SP13LKV_2 FF-Mid	2.9	2.9	2.9	0.0	%vol
SP14LKV_2 AT-High	2.5	2.5	2.5	0.0	%vol
SP15LKV_2 AT-Mid	2.6	2.6	2.6	0.0	%vol
SP16LKV_2 BM-High	-0.1	-0.1	-0.1	0.0	%vol
SP17LKV_3 BM-Mid	0.1	0.1	0.1	0.0	%vol
SP18LKV_2 BM-Low	0.1	0.1	0.1	0.0	%vol
SP19LKV_2 NWALL-Cav	0.9	0.9	0.9	0.0	%vol
SP20LKV_2 STUD-Cav	0.9	0.9	0.9	0.0	%vol
SP21LKV_1 FF-Void	32.3	32.3	32.3	0.0	%vol
SP22LKV_2 SF-Void	1.0	1.0	1.0	0.0	%vol
SP23LKV_2 ROOF-Void	2.0	2.0	2.0	0.0	%vol
RELEASEPRESSURE	0.0204	0.0209	0.0202	0.0002	barg
LOWFLOWMETER	0.3374	0.3388	0.3369	0.0006	g/s
0	#DIV/0!	0.0000	0.0000	#DIV/0!	g/s
OUTLET_TEMP	4.0	4.1	4.0	0.0	degC
Volume Flow Rate	227.7	228.6	227.4	0.4	SLPM
Energy Flow Rate	40.5	40.6	40.4	0.1	kW
External Wind Speed	2.2				m/s
External Wind Direction	236.4				bearing

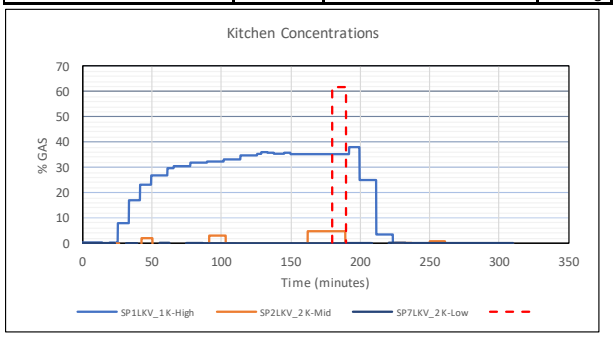


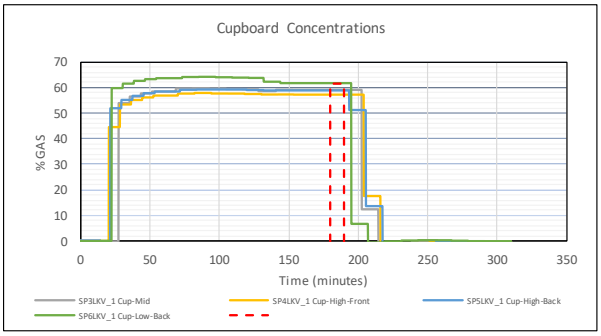


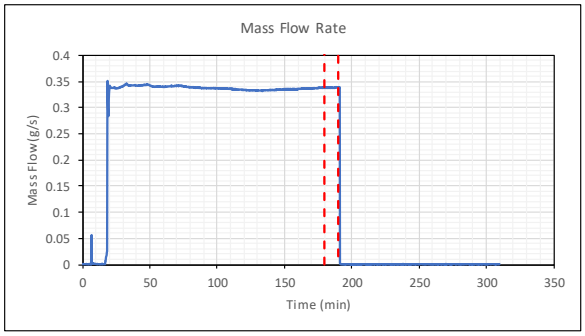
Hallway and Stud into Living Room

58.1
59.1
61.7

Cupboard (top is average of SP4 and SP5)







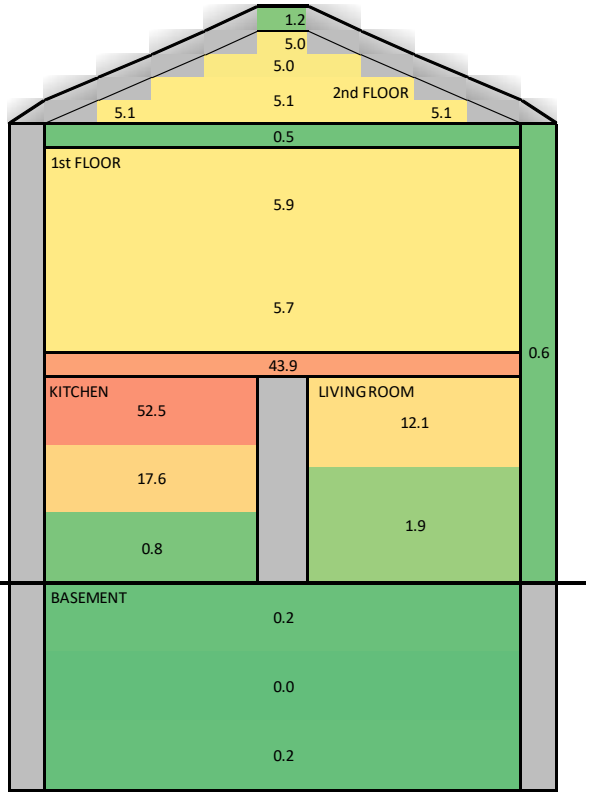
L2-056 RESULT

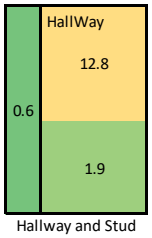
Hy4Heat WP7 Test Result

MTP ID: L2-056
Hole Size: 7.2 mm
Location: wall cupboard
Gas: Hydrogen
Date: 23/10/2019 **Time:** 15:00:00
Averaging Period Start: 180 min **End:** 200 min

Notes: SP17 removed

Sensor	Average	Max	Min	STDEV	units
SP1LKV_1 K-High	52.5	52.7	52.0	0.1	%vol
SP2LKV_1 K-Mid	17.6	17.8	17.1	0.3	%vol
SP3LKV_1 Cup-Mid	72.1	72.1	72.0	0.0	%vol
SP4LKV_1 Cup-High-Front	69.4	69.4	69.3	0.0	%vol
SP5LKV_1 Cup-High-Back	71.0	71.0	71.0	0.0	%vol
SP6LKV_1 Cup-Low-Back	73.9	73.9	73.8	0.1	%vol
SP7LKV_1 K-Low	0.8	0.9	0.8	0.0	%vol
SP8LKV_1 LR-High	12.1	12.2	11.9	0.1	%vol
SP9LKV_1 LR-Mid	1.9	2.0	1.8	0.0	%vol
SP10LKV_1 H-High	12.8	12.8	12.7	0.0	%vol
SP11LKV_1 H-Mid	1.9	2.0	1.9	0.0	%vol
SP12LKV_1 FF-High	5.9	6.1	5.8	0.1	%vol
SP13LKV_1 FF-Mid	5.7	5.8	5.7	0.1	%vol
SP14LKV_1 AT-High	5.0	5.1	4.9	0.1	%vol
SP15LKV_1 AT-Mid	5.1	5.1	4.8	0.1	%vol
SP16LKV_1 BM-High	0.2	0.3	0.2	0.0	%vol
SP17LKV_1 BM-Mid					%vol
SP18LKV_1 BM-Low	0.2	0.2	0.2	0.0	%vol
SP19LKV_1 NWALL-Cav	0.6	0.6	0.6	0.0	%vol
SP20LKV_1 STUD-Cav	0.6	0.7	0.6	0.0	%vol
SP21LKV_1 FF-Void	43.9	44.1	43.4	0.3	%vol
SP22LKV_1 SF-Void	0.5	0.5	0.4	0.0	%vol
SP23LKV_1 ROOF-Void	1.2	1.3	0.9	0.1	%vol
RELEASEPRESSURE	0.0190	0.0199	0.0184	0.0003	barg
LOWFLOWMETER	0.7104	0.7215	0.7038	0.0052	g/s
0	#DIV/0!	0.0000	0.0000	#DIV/0!	g/s
OUTLET_TEMP	9.4	9.7	9.1	0.2	degC
Volume Flow Rate	479.4	486.9	475.0	3.5	SLPM
Energy Flow Rate	85.2	86.5	84.4	0.6	kW
External Wind Speed	2.9				m/s
External Wind Direction	192.9				bearing

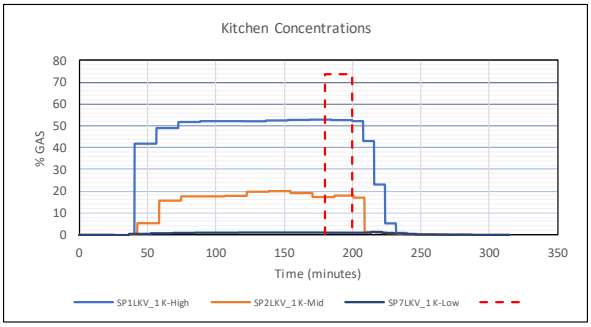


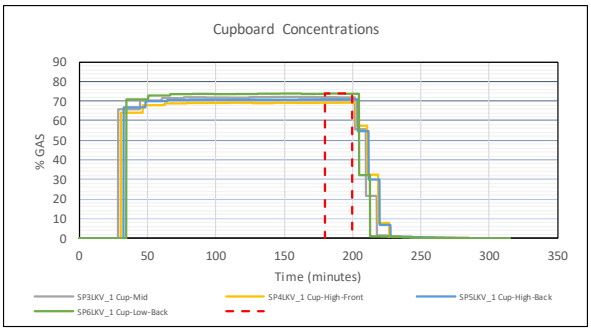


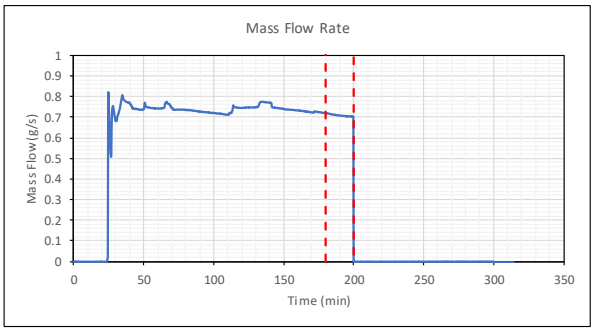
Hallway and Stud into Living Room

70.2
72.1
73.9

Cupboard (top is average of SP4 and SP5)







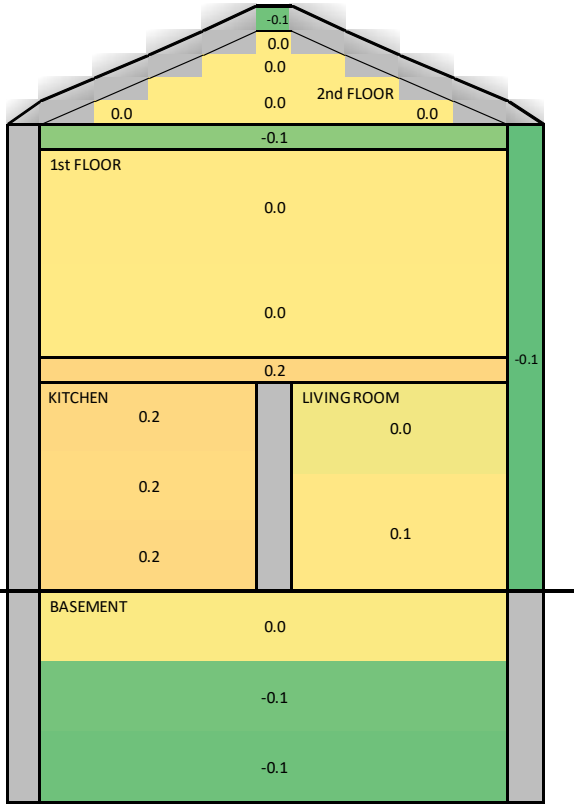
L2-058 RESULT

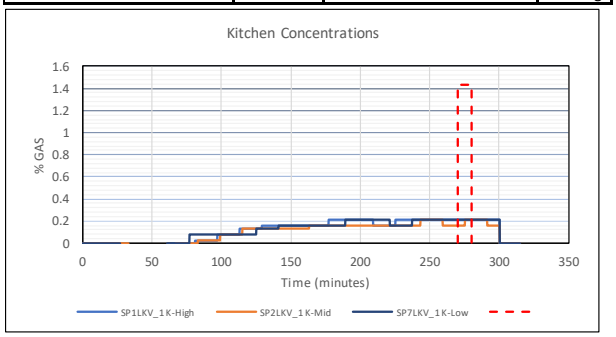
Hy4Heat WP7 Test Result

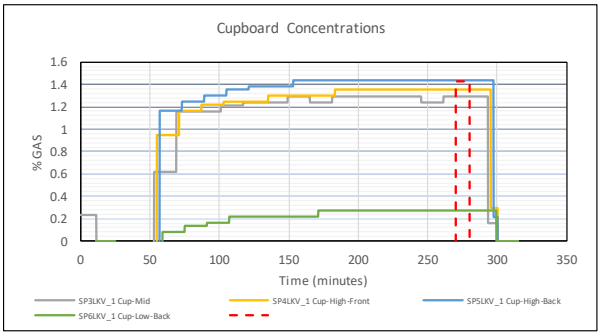
MTP ID: L2-058
Hole Size: 0.6 mm
Location: Kitchen Base cupboard
Gas: Hydrogen
Date: 11/11/2019 **Time:** 04:30:00
Averaging Period Start: 270 min **End:** 280 min

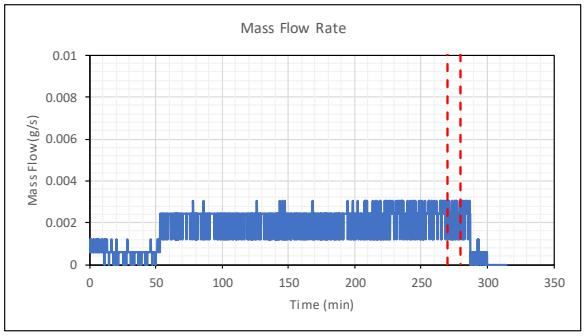
Notes:

Sensor	Average	Max	Min	STDEV	units
SP1LKV_1 K-High	0.2	0.2	0.2	0.0	%vol
SP2LKV_1 K-Mid	0.2	0.2	0.2	0.0	%vol
SP3LKV_1 Cup-Mid	1.3	1.3	1.3	0.0	%vol
SP4LKV_1 Cup-High-Front	1.4	1.4	1.4	0.0	%vol
SP5LKV_1 Cup-High-Back	1.4	1.4	1.4	0.0	%vol
SP6LKV_1 Cup-Low-Back	0.3	0.3	0.3	0.0	%vol
SP7LKV_1 K-Low	0.2	0.2	0.2	0.0	%vol
SP8LKV_1 LR-High	0.0	0.0	0.0	0.0	%vol
SP9LKV_2 LR-Mid	0.1	0.1	0.1	0.0	%vol
SP10LKV_2 H-High	0.1	0.1	0.1	0.0	%vol
SP11LKV_2 H-Mid	0.1	0.1	0.0	0.0	%vol
SP12LKV_2 FF-High	0.0	0.0	0.0	0.0	%vol
SP13LKV_2 FF-Mid	0.0	0.0	0.0	0.0	%vol
SP14LKV_2 AT-High	0.0	0.0	0.0	0.0	%vol
SP15LKV_2 AT-Mid	0.0	0.0	0.0	0.0	%vol
SP16LKV_2 BM-High	0.0	0.0	0.0	0.0	%vol
SP17LKV_2 BM-Mid	-0.1	-0.1	-0.1	0.0	%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_2 FF-Void	0.2	0.2	0.2	0.0	%vol
SP22LKV_2 SF-Void	-0.1	-0.1	-0.1	0.0	%vol
SP23LKV_2 ROOF-Void	-0.1	-0.1	-0.1	0.0	%vol
RELEASEPRESSURE	0.0200	0.0203	0.0196	0.0002	barg
LOWFLOWMETER	0.0022	0.0031	0.0012	0.0006	g/s
0	#DIV/0!	0.0000	0.0000	#DIV/0!	g/s
OUTLET_TEMP	3.6	3.6	3.5	0.0	degC
Volume Flow Rate	1.5	2.1	0.8	0.4	SLPM
Energy Flow Rate	0.3	0.4	0.1	0.1	kW
External Wind Speed	2.1				m/s
External Wind Direction	213.5				bearing









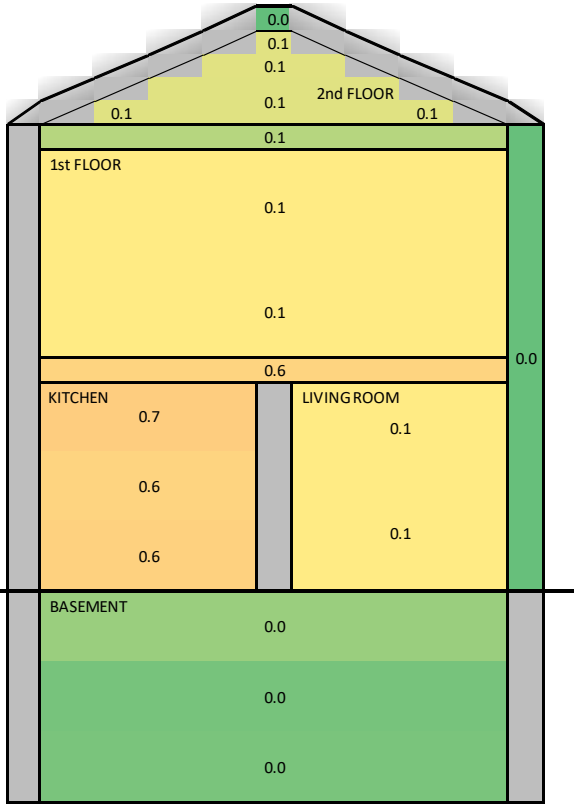
L2-059 RESULT

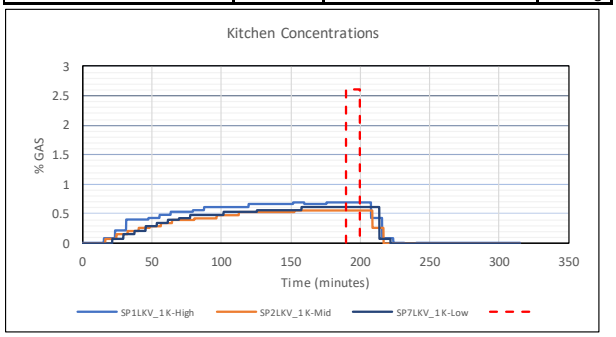
Hy4Heat WP7 Test Result

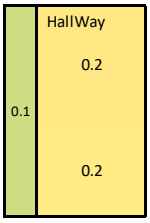
MTP ID: L2-059
Hole Size: 0.9 mm
Location: Kitchen Base cupboard
Gas: Hydrogen
Date: 11/11/2019 **Time:** 13:00:00
Averaging Period Start: 190 min **End:** 200 min

Notes:

Sensor	Average	Max	Min	STDEV	units
SP1LKV_1 K-High	0.7	0.7	0.7	0.0	%vol
SP2LKV_1 K-Mid	0.6	0.6	0.6	0.0	%vol
SP3LKV_1 Cup-Mid	2.5	2.5	2.5	0.0	%vol
SP4LKV_1 Cup-High-Front	2.5	2.5	2.5	0.0	%vol
SP5LKV_1 Cup-High-Back	2.6	2.6	2.6	0.0	%vol
SP6LKV_1 Cup-Low-Back	0.9	0.9	0.9	0.0	%vol
SP7LKV_1 K-Low	0.6	0.6	0.6	0.0	%vol
SP8LKV_1 LR-High	0.1	0.1	0.1	0.0	%vol
SP9LKV_1 LR-Mid	0.1	0.1	0.1	0.0	%vol
SP10LKV_2 H-High	0.2	0.2	0.2	0.0	%vol
SP11LKV_2 H-Mid	0.2	0.2	0.2	0.0	%vol
SP12LKV_2 FF-High	0.1	0.1	0.1	0.0	%vol
SP13LKV_2 FF-Mid	0.1	0.1	0.1	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_3 BM-High	0.0	0.0	0.0	0.0	%vol
SP17LKV_3 BM-Mid	0.0	0.0	0.0	0.0	%vol
SP18LKV_3 BM-Low	0.0	0.0	0.0	0.0	%vol
SP19LKV_3 NWALL-Cav	0.0	0.0	0.0	0.0	%vol
SP20LKV_3 STUD-Cav	0.1	0.1	0.1	0.0	%vol
SP21LKV_2 FF-Void	0.6	0.6	0.6	0.0	%vol
SP22LKV_3 SF-Void	0.1	0.1	0.1	0.0	%vol
SP23LKV_3 ROOF-Void	0.0	0.0	0.0	0.0	%vol
RELEASEPRESSURE	0.0200	0.0203	0.0196	0.0002	barg
LOWFLOWMETER	0.0066	0.0073	0.0061	0.0003	g/s
0	#DIV/0!	0.0000	0.0000	#DIV/0!	g/s
OUTLET_TEMP	4.4	4.5	4.3	0.0	degC
Volume Flow Rate	4.5	5.0	4.1	0.2	SLPM
Energy Flow Rate	0.8	0.9	0.7	0.0	kW
External Wind Speed	4.1				m/s
External Wind Direction	266.6				bearing

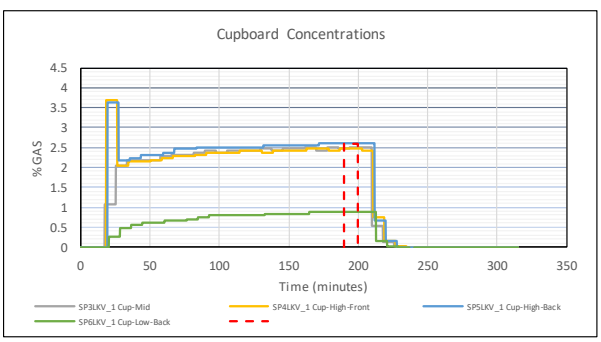


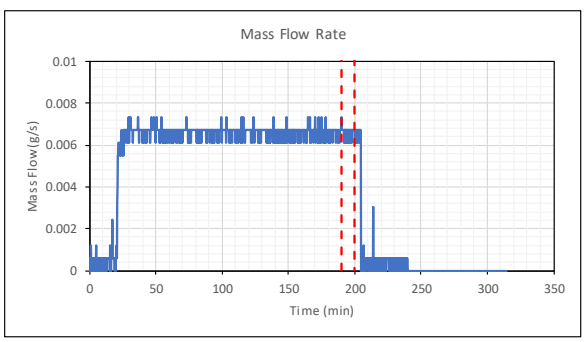




Hallway and Stud into Living Room

Cupboard (top is average of SP4 and SP5)





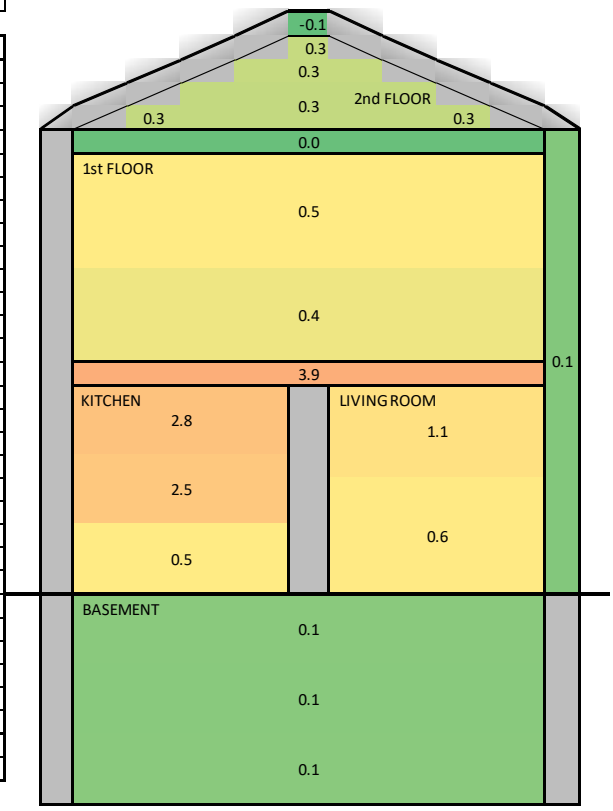
L2-060 RESULT

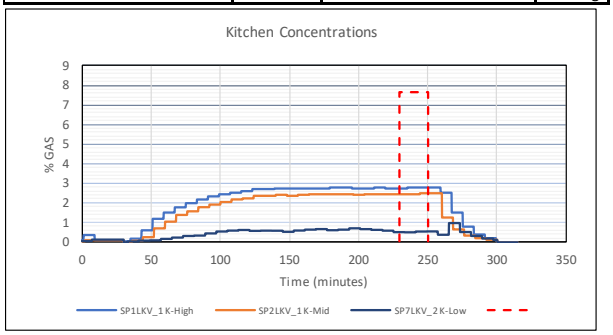
Hy4Heat WP7 Test Result

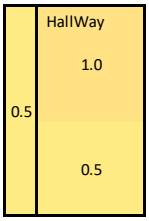
MTP ID: L2-060
Hole Size: 1.8 mm
Location: kitchen base cupboard
Gas: Hydrogen
Date: 31/10/2019 **Time:** 16:30:00
Averaging Period Start: 230 min **End:** 250 min

Notes:

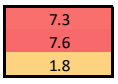
Sensor	Average	Max	Min	STDEV	units
SP1LKV_1 K-High	2.8	2.8	2.7	0.0	%vol
SP2LKV_1 K-Mid	2.5	2.5	2.4	0.0	%vol
SP3LKV_1 Cup-Mid	7.6	7.6	7.6	0.0	%vol
SP4LKV_1 Cup-High-Front	7.0	7.0	7.0	0.0	%vol
SP5LKV_1 Cup-High-Back	7.6	7.7	7.6	0.0	%vol
SP6LKV_1 Cup-Low-Back	1.8	1.8	1.8	0.0	%vol
SP7LKV_2 K-Low	0.5	0.5	0.5	0.0	%vol
SP8LKV_2 LR-High	1.1	1.1	1.1	0.0	%vol
SP9LKV_1 LR-Mid	0.6	0.6	0.6	0.0	%vol
SP10LKV_2 H-High	1.0	1.0	1.0	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	0.3	0.3	0.3	0.0	%vol
SP15LKV_2 AT-Mid	0.3	0.3	0.3	0.0	%vol
SP16LKV_2 BM-High	0.1	0.1	0.1	0.0	%vol
SP17LKV_2 BM-Mid	0.1	0.1	0.1	0.0	%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	0.5	0.5	0.5	0.0	%vol
SP21LKV_1 FF-Void	3.9	4.0	3.7	0.1	%vol
SP22LKV_2 SF-Void	0.0	0.0	-0.1	0.0	%vol
SP23LKV_2 ROOF-Void	-0.1	-0.1	-0.1	0.0	%vol
RELEASEPRESSURE	0.0200	0.0203	0.0192	0.0002	barg
LOWFLOWMETER	0.0412	0.0416	0.0397	0.0003	g/s
OUTLET_TEMP	6.6	6.7	6.5	0.0	degC
Volume Flow Rate	27.8	28.1	26.8	0.2	SLPM
Energy Flow Rate	4.9	5.0	4.8	0.0	kW
External Wind Speed	5.7				m/s
External Wind Direction	135.0				bearing



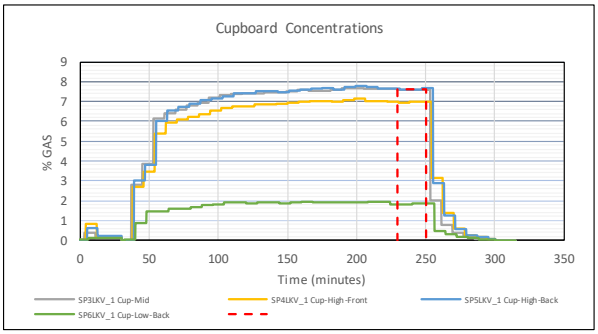


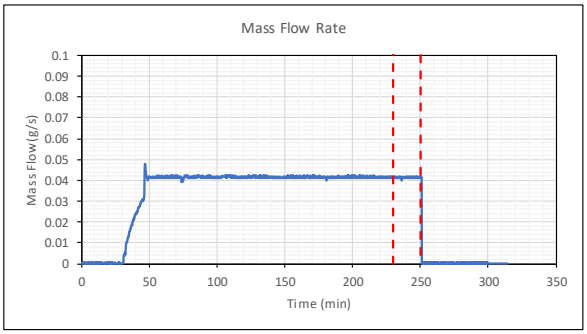


Hallway and Stud into Living Room



Cupboard (top is average of SP4 and SP5)





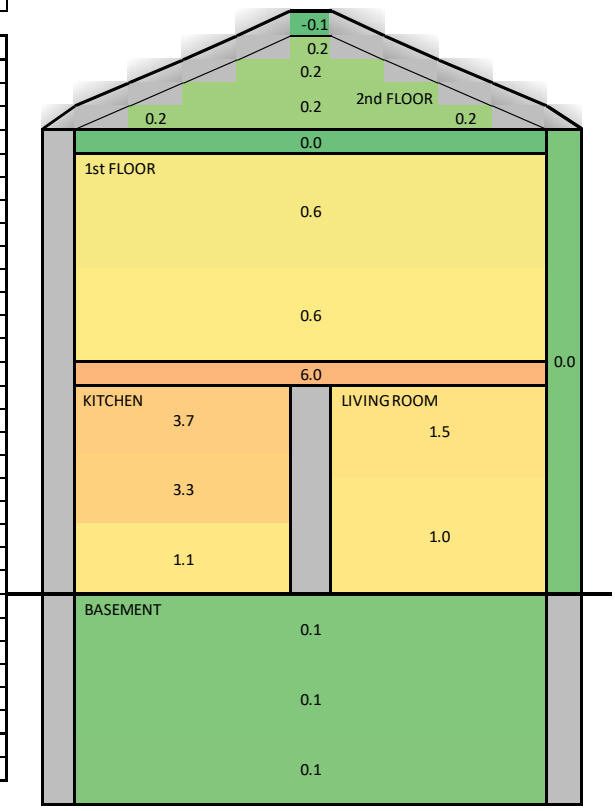
L2-061 RESULT

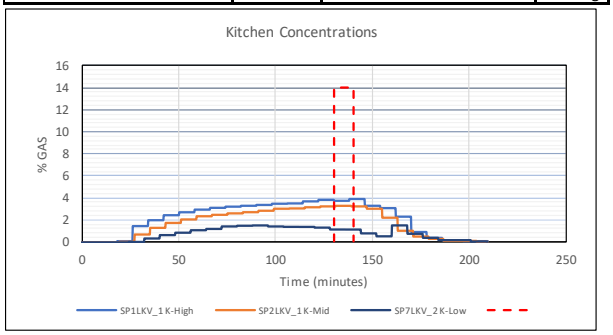
Hy4Heat WP7 Test Result

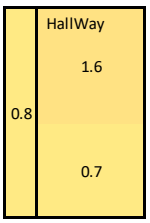
MTP ID: L2-061
Hole Size: 2.5 mm
Location: kitchen base cupboard
Gas: Hydrogen
Date: 31/10/2019 **Time:** 13:00:10
Averaging Period Start: 130 min **End:** 140 min

Notes:

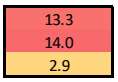
Sensor	Average	Max	Min	STDEV	units
SP1LKV_1 K-High	3.7	3.9	3.7	0.1	%vol
SP2LKV_1 K-Mid	3.3	3.3	3.3	0.0	%vol
SP3LKV_1 Cup-Mid	14.0	14.1	14.0	0.1	%vol
SP4LKV_1 Cup-High-Front	12.8	12.8	12.8	0.0	%vol
SP5LKV_1 Cup-High-Back	13.8	13.9	13.6	0.1	%vol
SP6LKV_1 Cup-Low-Back	2.9	2.9	2.9	0.0	%vol
SP7LKV_2 K-Low	1.1	1.1	1.1	0.0	%vol
SP8LKV_2 LR-High	1.5	1.5	1.5	0.0	%vol
SP9LKV_1 LR-Mid	1.0	1.0	0.9	0.0	%vol
SP10LKV_2 H-High	1.6	1.6	1.6	0.0	%vol
SP11LKV_2 H-Mid	0.7	0.7	0.7	0.0	%vol
SP12LKV_2 FF-High	0.6	0.6	0.6	0.0	%vol
SP13LKV_2 FF-Mid	0.6	0.7	0.6	0.1	%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	0.1	0.1	0.1	0.0	%vol
SP18LKV_2 BM-Low	0.1	0.1	0.1	0.0	%vol
SP19LKV_2 NWALL-Cav	0.0	0.0	0.0	0.0	%vol
SP20LKV_2 STUD-Cav	0.8	0.8	0.8	0.0	%vol
SP21LKV_1 FF-Void	6.0	6.0	6.0	0.0	%vol
SP22LKV_2 SF-Void	0.0	0.0	-0.1	0.0	%vol
SP23LKV_2 ROOF-Void	-0.1	-0.1	-0.1	0.0	%vol
RELEASEPRESSURE	0.0195	0.0228	0.0000	0.0057	barg
LOWFLOWMETER	0.0729	0.0831	0.0000	0.0218	g/s
0	#DIV/0!	0.0000	0.0000	#DIV/0!	g/s
OUTLET_TEMP	13.1	13.6	12.0	0.3	degC
Volume Flow Rate	49.2	56.1	0.0	14.7	SLPM
Energy Flow Rate	8.7	10.0	0.0	2.6	kW
External Wind Speed	6.7				m/s
External Wind Direction	135.0				bearing



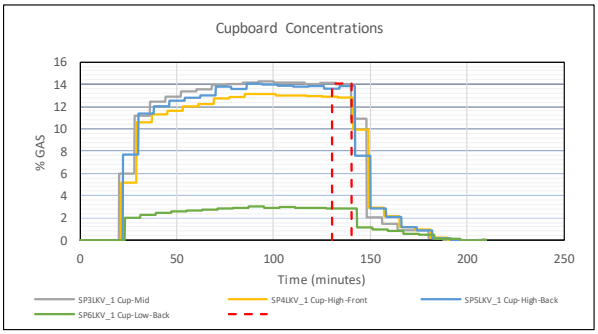


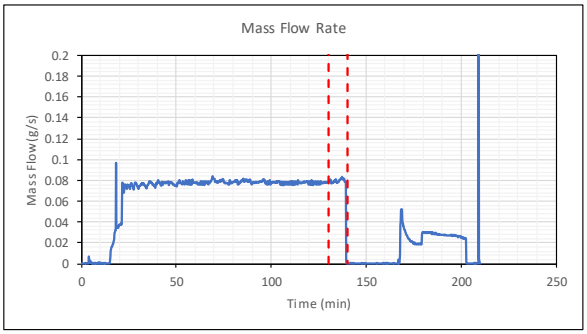


Hallway and Stud into Living Room



Cupboard (top is average of SP4 and SP5)





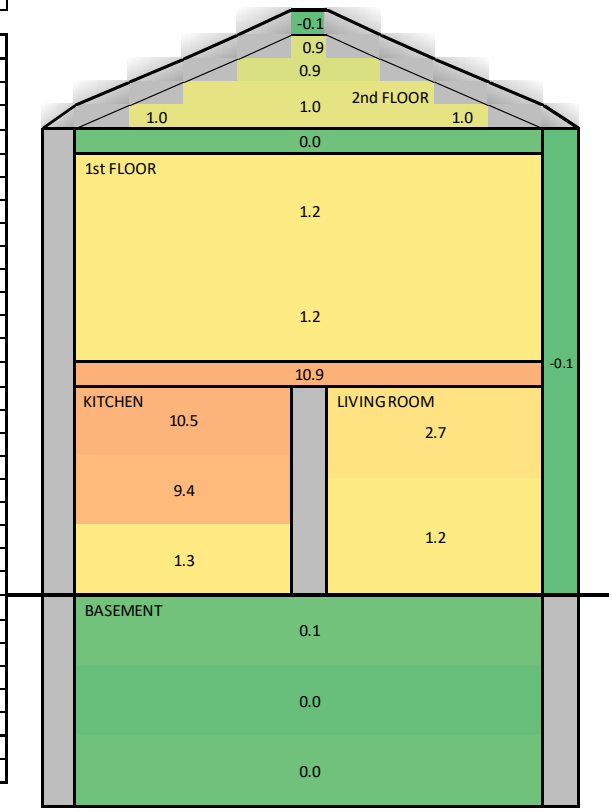
L2-062 RESULT

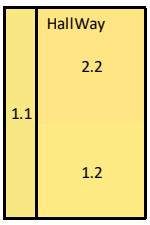
Hy4Heat WP7 Test Result

MTP ID: L2-062
Hole Size: 3.6 mm
Location: kitchen base cupboard
Gas: Hydrogen
Date: 31/10/2019 **Time:** 08:30:20
Averaging Period Start: 135 min **End:** 145 min

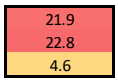
Notes:

Sensor	Average	Max	Min	STDEV	units
SP1LKV_1 K-High	10.5	10.5	10.5	0.0	%vol
SP2LKV_1 K-Mid	9.4	9.4	9.4	0.0	%vol
SP3LKV_1 Cup-Mid	22.8	22.8	22.8	0.0	%vol
SP4LKV_1 Cup-High-Front	21.4	21.5	21.3	0.0	%vol
SP5LKV_1 Cup-High-Back	22.5	22.6	22.4	0.0	%vol
SP6LKV_1 Cup-Low-Back	4.6	4.8	4.1	0.3	%vol
SP7LKV_2 K-Low	1.3	1.5	1.1	0.2	%vol
SP8LKV_2 LR-High	2.7	2.7	2.6	0.0	%vol
SP9LKV_1 LR-Mid	1.2	1.2	1.2	0.0	%vol
SP10LKV_2 H-High	2.2	2.4	2.1	0.1	%vol
SP11LKV_2 H-Mid	1.2	1.2	1.2	0.0	%vol
SP12LKV_2 FF-High	1.2	1.3	1.2	0.0	%vol
SP13LKV_2 FF-Mid	1.2	1.2	1.1	0.0	%vol
SP14LKV_2 AT-High	0.9	0.9	0.9	0.0	%vol
SP15LKV_2 AT-Mid	1.0	1.0	1.0	0.0	%vol
SP16LKV_3 BM-High	0.1	0.1	0.1	0.0	%vol
SP17LKV_1 BM-Mid	0.0	0.0	0.0	0.0	%vol
SP18LKV_3 BM-Low	0.0	0.0	0.0	0.0	%vol
SP19LKV_2 NWALL-Cav	-0.1	0.0	-0.1	0.0	%vol
SP20LKV_2 STUD-Cav	1.1	1.2	1.0	0.0	%vol
SP21LKV_1 FF-Void	10.9	11.4	10.8	0.2	%vol
SP22LKV_2 SF-Void	0.0	0.1	0.0	0.0	%vol
SP23LKV_2 ROOF-Void	-0.1	-0.1	-0.1	0.0	%vol
RELEASEPRESSURE	0.0199	0.0209	0.0189	0.0005	barg
LOWFLOWMETER	0.1584	0.1614	0.1553	0.0017	g/s
0	#DIV/0!	0.0000	0.0000	#DIV/0!	g/s
OUTLET_TEMP	10.8	11.2	10.5	0.2	degC
Volume Flow Rate	106.9	108.9	104.8	1.1	SLPM
Energy Flow Rate	19.0	19.3	18.6	0.2	kW
External Wind Speed	2.6				m/s
External Wind Direction	90.0				bearing

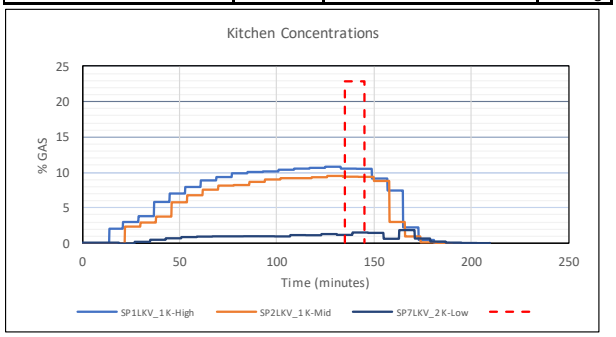


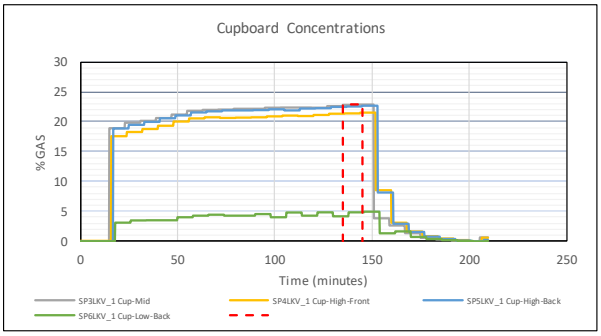


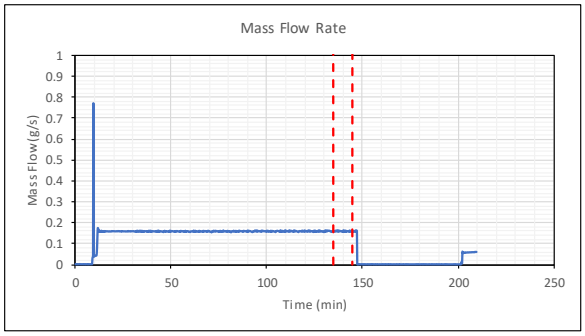
Hallway and Stud into Living Room



Cupboard (top is average of SP4 and SP5)







L2-062A RESULT

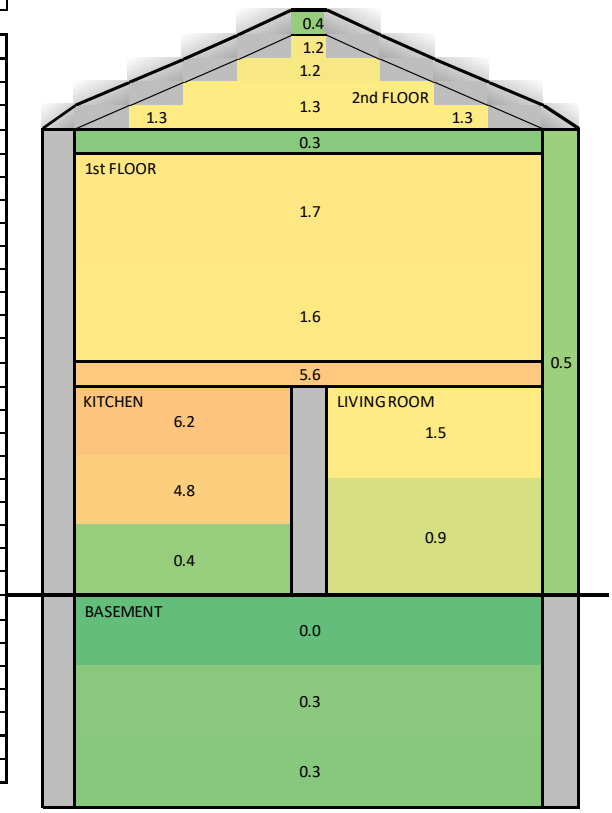
Hy4Heat WP7 Test Result

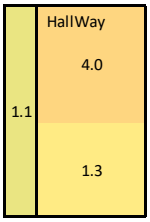
MTP ID: L2-062A
Hole Size: 3.6 mm

Location: kitchen base cupboard with vent above kitchen door
Gas: hydrogen
Date: 10/01/2020 **Time:** 11:30:00
Averaging Period Start: 95 min **End:** 105 min

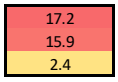
Notes:

Sensor	Average	Max	Min	STDEV	units
SP1LKV_1 K-High	6.2	6.2	5.9	0.1	%vol
SP2LKV_1 K-Mid	4.8	5.1	4.2	0.4	%vol
SP3LKV_1 Cup-Mid	15.9	16.0	15.8	0.1	%vol
SP4LKV_1 Cup-High-Front	17.0	17.5	16.5	0.5	%vol
SP5LKV_1 Cup-High-Back	17.4	17.7	16.9	0.4	%vol
SP6LKV_1 Cup-Low-Back	2.4	2.4	2.2	0.1	%vol
SP7LKV_2 K-Low	0.4	0.4	0.4	0.0	%vol
SP8LKV_1 LR-High	1.5	1.6	1.5	0.0	%vol
SP9LKV_1 LR-Mid	0.9	1.0	0.9	0.0	%vol
SP10LKV_2 H-High	4.0	4.0	4.0	0.0	%vol
SP11LKV_2 H-Mid	1.3	1.4	1.3	0.0	%vol
SP12LKV_2 FF-High	1.7	1.7	1.6	0.1	%vol
SP13LKV_2 FF-Mid	1.6	1.6	1.5	0.1	%vol
SP14LKV_2 AT-High	1.2	1.3	1.2	0.0	%vol
SP15LKV_2 AT-Mid	1.3	1.3	1.2	0.0	%vol
SP16LKV_2 BM-High	0.0	0.0	0.0	0.0	%vol
SP17LKV_2 BM-Mid	0.3	0.3	0.3	0.0	%vol
SP18LKV_2 BM-Low	0.3	0.3	0.3	0.0	%vol
SP19LKV_2 NWALL-Cav	0.5	0.5	0.5	0.0	%vol
SP20LKV_2 STUD-Cav	1.1	1.2	1.1	0.0	%vol
SP21LKV_1 FF-Void	5.6	5.7	5.6	0.1	%vol
SP22LKV_2 SF-Void	0.3	0.3	0.3	0.0	%vol
SP23LKV_2 ROOF-Void	0.4	0.4	0.4	0.0	%vol
RELEASEPRESSURE	0.0195	0.0211	0.0180	0.0011	barg
LOWFLOWMETER	0.1289	0.1400	0.1223	0.0054	g/s
OUTLET_TEMP	5.5	5.7	5.4	0.1	degC
Volume Flow Rate	87.0	94.5	82.5	3.6	SLPM
Energy Flow Rate	15.5	16.8	14.7	0.6	kW
External Wind Speed	2.1				m/s
External Wind Direction	236.6				bearing

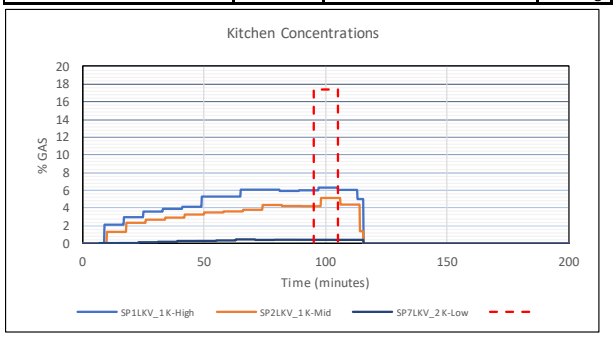


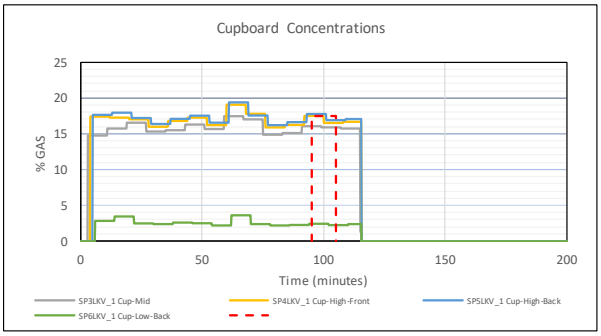


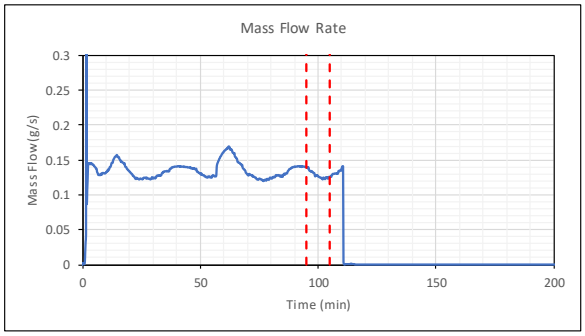
Hallway and Stud into Living Room



Cupboard (top is average of SP4 and SP5)







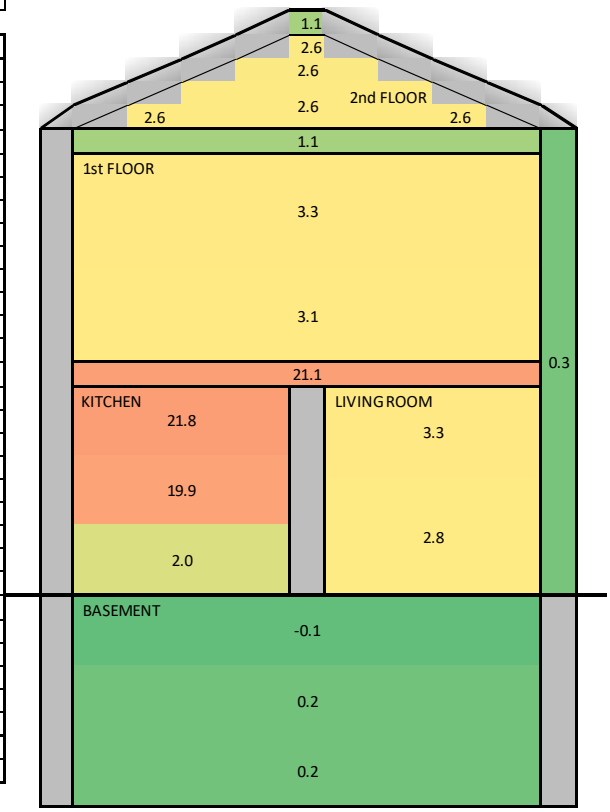
L2-063 RESULT

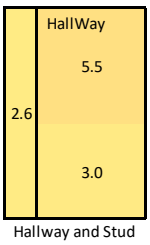
Hy4Heat WP7 Test Result

MTP ID: L2-063
Hole Size: 5.1 mm
Location: kitchen base cupboard
Gas: Hydrogen
Date: 30/10/2019 **Time:** 19:30:00
Averaging Period Start: 165 min **End:** 185 min

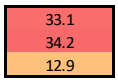
Notes:

Sensor	Average	Max	Min	STDEV	units
SP1LKV_1 K-High	21.8	21.8	21.8	0.0	%vol
SP2LKV_1 K-Mid	19.9	20.0	19.9	0.0	%vol
SP3LKV_1 Cup-Mid	34.2	34.3	34.1	0.1	%vol
SP4LKV_1 Cup-High-Front	32.4	32.5	32.3	0.0	%vol
SP5LKV_1 Cup-High-Back	33.7	33.7	33.6	0.1	%vol
SP6LKV_1 Cup-Low-Back	12.9	13.2	12.5	0.3	%vol
SP7LKV_2 K-Low	2.0	2.0	2.0	0.0	%vol
SP8LKV_1 LR-High	3.3	3.3	3.2	0.0	%vol
SP9LKV_1 LR-Mid	2.8	2.9	2.7	0.1	%vol
SP10LKV_1 H-High	5.5	5.6	5.4	0.1	%vol
SP11LKV_2 H-Mid	3.0	3.0	2.9	0.1	%vol
SP12LKV_2 FF-High	3.3	3.4	3.2	0.1	%vol
SP13LKV_2 FF-Mid	3.1	3.2	3.0	0.0	%vol
SP14LKV_2 AT-High	2.6	2.6	2.5	0.0	%vol
SP15LKV_2 AT-Mid	2.6	2.7	2.5	0.1	%vol
SP16LKV_2 BM-High	-0.1	-0.1	-0.1	0.0	%vol
SP17LKV_2 BM-Mid	0.2	0.2	0.2	0.0	%vol
SP18LKV_2 BM-Low	0.2	0.2	0.1	0.0	%vol
SP19LKV_2 NWALL-Cav	0.3	0.3	0.2	0.0	%vol
SP20LKV_2 STUD-Cav	2.6	2.7	2.5	0.0	%vol
SP21LKV_1 FF-Void	21.1	21.2	21.1	0.0	%vol
SP22LKV_2 SF-Void	1.1	1.2	1.0	0.1	%vol
SP23LKV_2 ROOF-Void	1.1	1.1	1.1	0.0	%vol
RELEASEPRESSURE	0.0200	0.0206	0.0194	0.0003	barg
LOWFLOWMETER	0.3176	0.3215	0.3148	0.0018	g/s
0	#DIV/0!	0.0000	0.0000	#DIV/0!	g/s
OUTLET_TEMP	2.8	3.0	2.6	0.1	degC
Volume Flow Rate	214.4	217.0	212.5	1.2	SLPM
Energy Flow Rate	38.1	38.6	37.7	0.2	kW
External Wind Speed	2.7				m/s
External Wind Direction	85.3				bearing

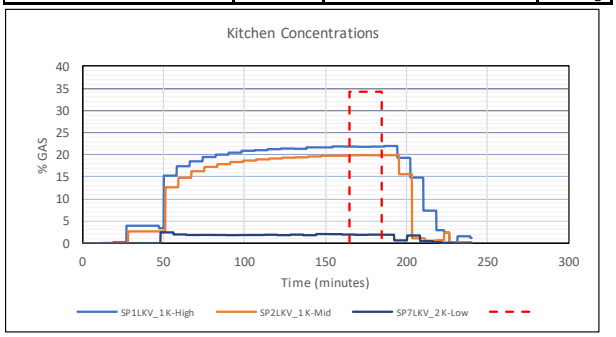


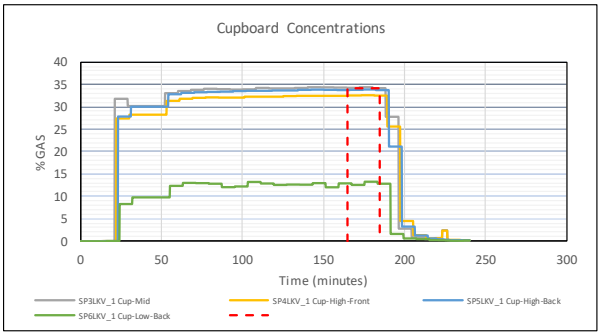


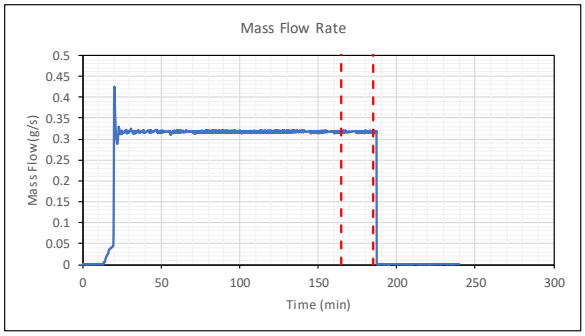
Hallway and Stud into Living Room



Cupboard (top is average of SP4 and SP5)







L2-063A RESULT

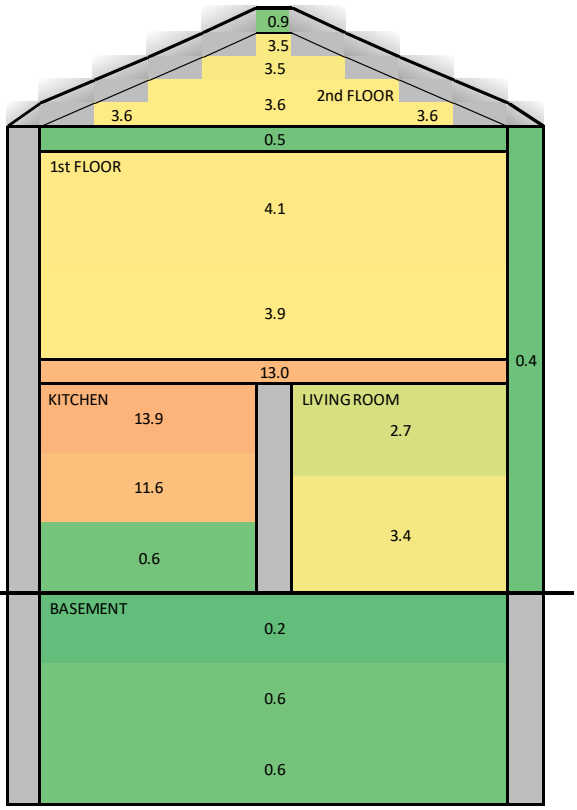
Hy4Heat WP7 Test Result

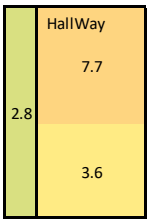
MTP ID: L2-063A
Hole Size: 5.1 mm

Location: kitchen base cupboard with vent above kitchen door
Gas: hydrogen
Date: 10/01/2020 **Time:** 14:45:00
Averaging Period Start: 175 min **End:** 185 min

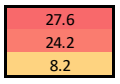
Notes:

Sensor	Average	Max	Min	STDEV	units
SP1LKV_1 K-High	13.9	14.0	13.7	0.1	%vol
SP2LKV_1 K-Mid	11.6	11.8	11.5	0.1	%vol
SP3LKV_1 Cup-Mid	24.2	24.4	23.9	0.3	%vol
SP4LKV_1 Cup-High-Front	27.5	27.5	27.5	0.0	%vol
SP5LKV_1 Cup-High-Back	27.7	27.8	27.7	0.1	%vol
SP6LKV_1 Cup-Low-Back	8.2	8.9	7.9	0.5	%vol
SP7LKV_1 K-Low	0.6	0.6	0.6	0.0	%vol
SP8LKV_1 LR-High	2.7	2.8	2.7	0.0	%vol
SP9LKV_1 LR-Mid	3.4	3.4	3.4	0.0	%vol
SP10LKV_1 H-High	7.7	7.9	7.7	0.1	%vol
SP11LKV_2 H-Mid	3.6	3.6	3.6	0.0	%vol
SP12LKV_1 FF-High	4.1	4.1	4.1	0.0	%vol
SP13LKV_1 FF-Mid	3.9	4.0	3.9	0.0	%vol
SP14LKV_2 AT-High	3.5	3.5	3.5	0.0	%vol
SP15LKV_2 AT-Mid	3.6	3.6	3.6	0.0	%vol
SP16LKV_2 BM-High	0.2	0.2	0.2	0.0	%vol
SP17LKV_2 BM-Mid	0.6	0.6	0.6	0.0	%vol
SP18LKV_2 BM-Low	0.6	0.6	0.6	0.0	%vol
SP19LKV_1 NWALL-Cav	0.4	0.4	0.4	0.0	%vol
SP20LKV_2 STUD-Cav	2.8	2.8	2.8	0.0	%vol
SP21LKV_1 FF-Void	13.0	13.1	13.0	0.0	%vol
SP22LKV_2 SF-Void	0.5	0.6	0.5	0.0	%vol
SP23LKV_1 ROOF-Void	0.9	0.9	0.8	0.0	%vol
RELEASEPRESSURE	0.0195	0.0202	0.0189	0.0002	barg
LOWFLOWMETER	0.2869	0.2910	0.2824	0.0020	g/s
OUTLET_TEMP	4.1	4.2	4.0	0.1	degC
Volume Flow Rate	193.6	196.4	190.6	1.3	SLPM
Energy Flow Rate	34.4	34.9	33.9	0.2	kW
External Wind Speed	2.9				m/s
External Wind Direction	228.7				bearing

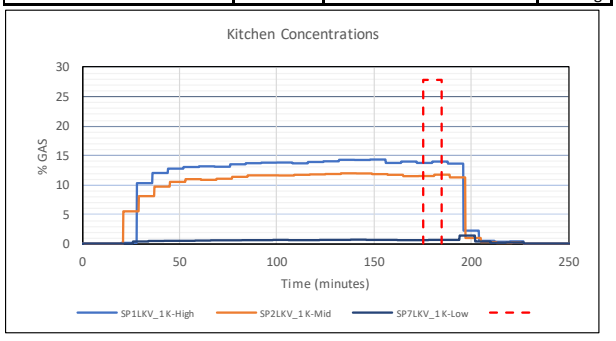


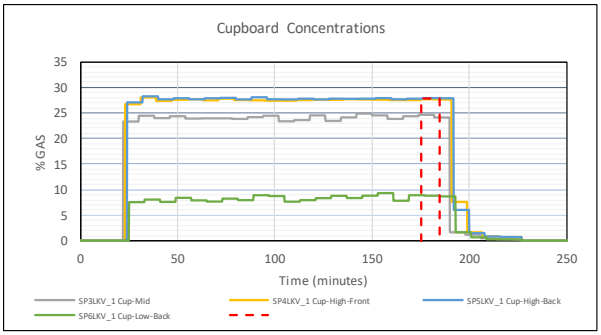


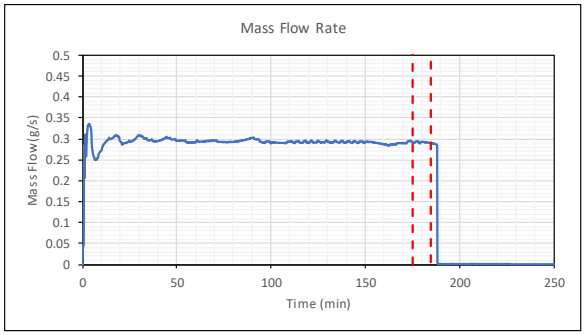
Hallway and Stud into Living Room



Cupboard (top is average of SP4 and SP5)







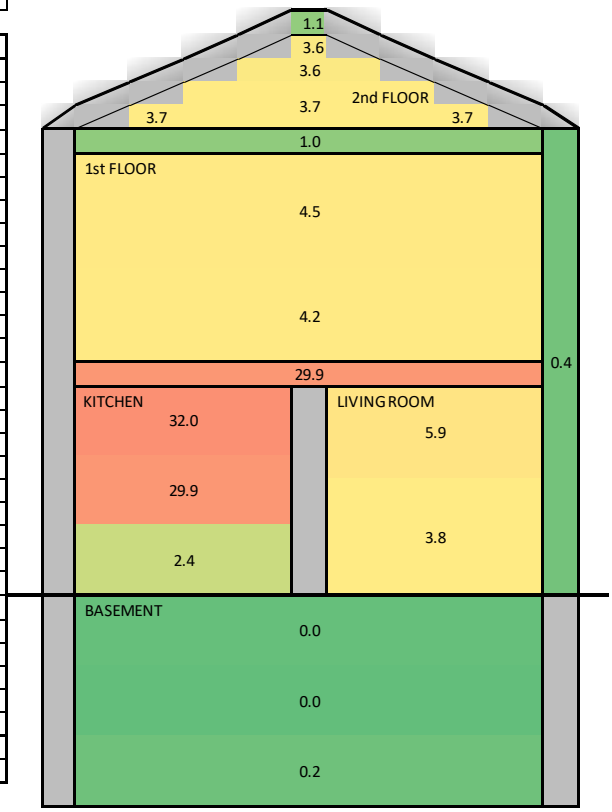
L2-064 RESULT

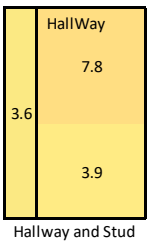
Hy4Heat WP7 Test Result

MTP ID: L2-064
Hole Size: 7.2 mm
Location: kitchen base cupboard
Gas: Hydrogen
Date: 30/10/2019 **Time:** 14:20:10
Averaging Period Start: 120 min **End:** 130 min

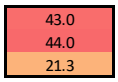
Notes:

Sensor	Average	Max	Min	STDEV	units
SP1LKV_1 K-High	32.0	32.1	31.9	0.1	%vol
SP2LKV_1 K-Mid	29.9	30.0	29.7	0.1	%vol
SP3LKV_1 Cup-Mid	44.0	44.1	44.0	0.0	%vol
SP4LKV_1 Cup-High-Front	42.4	42.4	42.3	0.0	%vol
SP5LKV_1 Cup-High-Back	43.7	43.7	43.6	0.1	%vol
SP6LKV_1 Cup-Low-Back	21.3	21.5	21.1	0.2	%vol
SP7LKV_2 K-Low	2.4	2.4	2.4	0.0	%vol
SP8LKV_1 LR-High	5.9	6.0	5.8	0.1	%vol
SP9LKV_1 LR-Mid	3.8	4.0	3.6	0.1	%vol
SP10LKV_1 H-High	7.8	8.1	7.7	0.1	%vol
SP11LKV_1 H-Mid	3.9	4.0	3.7	0.1	%vol
SP12LKV_1 FF-High	4.5	4.5	4.4	0.1	%vol
SP13LKV_1 FF-Mid	4.2	4.3	4.1	0.1	%vol
SP14LKV_1 AT-High	3.6	3.7	3.5	0.1	%vol
SP15LKV_1 AT-Mid	3.7	3.7	3.6	0.1	%vol
SP16LKV_3 BM-High	0.0	0.0	0.0	0.0	%vol
SP17LKV_1 BM-Mid	0.0	0.0	-0.1	0.0	%vol
SP18LKV_2 BM-Low	0.2	0.3	0.2	0.0	%vol
SP19LKV_2 NWALL-Cav	0.4	0.4	0.2	0.1	%vol
SP20LKV_2 STUD-Cav	3.6	3.6	3.5	0.1	%vol
SP21LKV_1 FF-Void	29.9	29.9	29.9	0.0	%vol
SP22LKV_1 SF-Void	1.0	1.2	0.9	0.1	%vol
SP23LKV_1 ROOF-Void	1.1	1.3	1.0	0.1	%vol
RELEASEPRESSURE	0.0203	0.0209	0.0196	0.0003	barg
LOWFLOWMETER	0.5885	0.5942	0.5838	0.0025	g/s
0	#DIV/0!	0.0000	0.0000	#DIV/0!	g/s
OUTLET_TEMP	7.7	8.1	7.4	0.2	degC
Volume Flow Rate	397.2	401.0	394.0	1.7	SLPM
Energy Flow Rate	70.6	71.2	70.0	0.3	kW
External Wind Speed	2.9				m/s
External Wind Direction	74.2				bearing

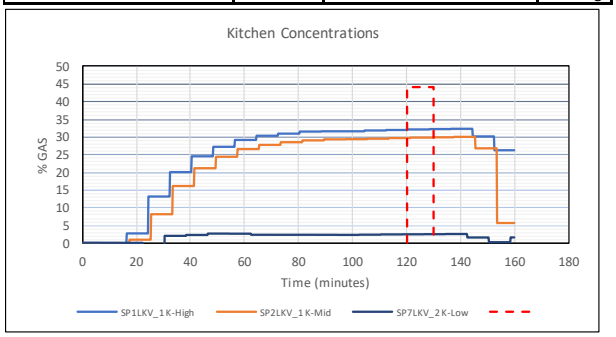


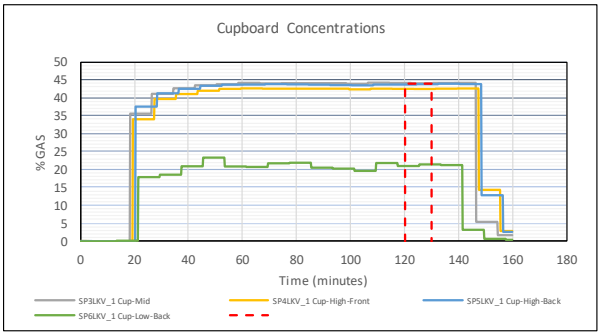


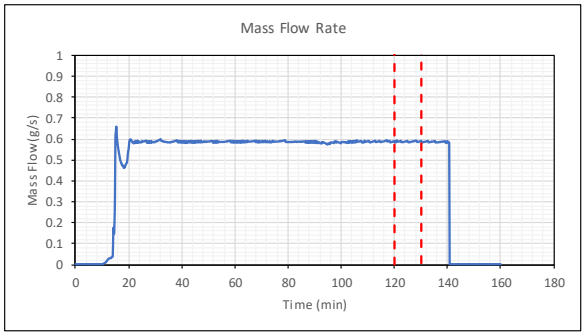
Hallway and Stud into Living Room



Cupboard (top is average of SP4 and SP5)







L2-064A RESULT

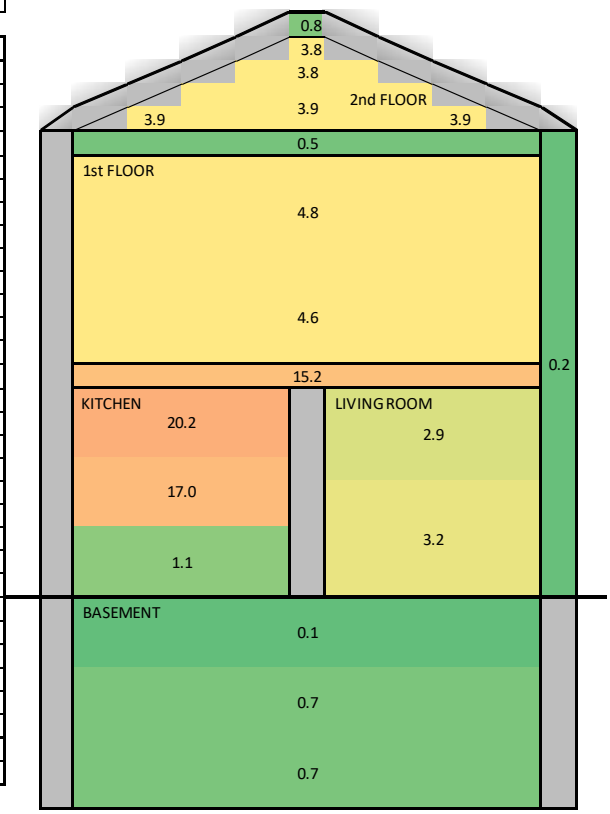
Hy4Heat WP7 Test Result

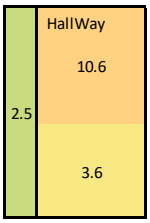
MTP ID: L2-064A
Hole Size: 7.2 mm

Location: kitchen base cupboard with vent above kitchen door
Gas: hydrogen
Date: 11/01/2020 **Time:** 09:00:00
Averaging Period Start: 140 min **End:** 150 min

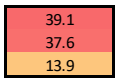
Notes:

Sensor	Average	Max	Min	STDEV	units
SP1LKV_1 K-High	20.2	20.3	20.1	0.1	%vol
SP2LKV_1 K-Mid	17.0	17.0	17.0	0.0	%vol
SP3LKV_1 Cup-Mid	37.6	38.2	35.5	1.1	%vol
SP4LKV_1 Cup-High-Front	39.2	39.6	37.0	0.8	%vol
SP5LKV_1 Cup-High-Back	38.9	39.6	36.2	0.5	%vol
SP6LKV_1 Cup-Low-Back	13.9	14.9	13.5	0.6	%vol
SP7LKV_1 K-Low	1.1	1.1	1.1	0.0	%vol
SP8LKV_1 LR-High	2.9	2.9	2.9	0.0	%vol
SP9LKV_1 LR-Mid	3.2	3.3	3.2	0.0	%vol
SP10LKV_1 H-High	10.6	10.7	10.6	0.1	%vol
SP11LKV_2 H-Mid	3.6	3.6	3.6	0.0	%vol
SP12LKV_1 FF-High	4.8	4.8	4.7	0.0	%vol
SP13LKV_1 FF-Mid	4.6	4.6	4.4	0.1	%vol
SP14LKV_1 AT-High	3.8	3.8	3.8	0.0	%vol
SP15LKV_1 AT-Mid	3.9	3.9	3.9	0.0	%vol
SP16LKV_2 BM-High	0.1	0.1	0.1	0.0	%vol
SP17LKV_2 BM-Mid	0.7	0.7	0.7	0.0	%vol
SP18LKV_2 BM-Low	0.7	0.7	0.7	0.0	%vol
SP19LKV_1 NWALL-Cav	0.2	0.3	0.2	0.0	%vol
SP20LKV_2 STUD-Cav	2.5	2.6	2.4	0.0	%vol
SP21LKV_1 FF-Void	15.2	15.9	14.8	0.2	%vol
SP22LKV_2 SF-Void	0.5	0.5	0.5	0.0	%vol
SP23LKV_2 ROOF-Void	0.8	0.8	0.8	0.0	%vol
RELEASEPRESSURE	0.0178	0.0185	0.0170	0.0004	barg
LOWFLOWMETER	0.5008	0.5446	0.4523	0.0279	g/s
OUTLET_TEMP	10.1	10.2	10.0	0.0	degC
Volume Flow Rate	338.0	367.6	305.3	18.8	SLPM
Energy Flow Rate	60.0	65.3	54.2	3.3	kW
External Wind Speed	15.4				m/s
External Wind Direction	215.0				bearing

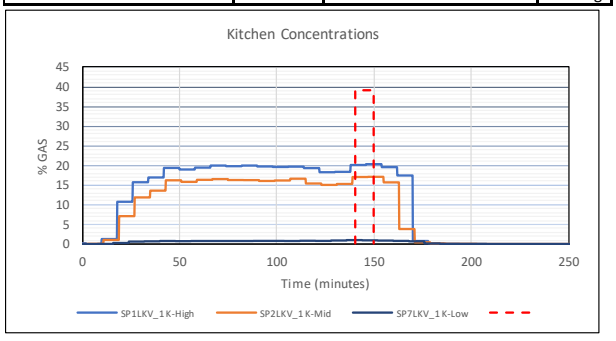


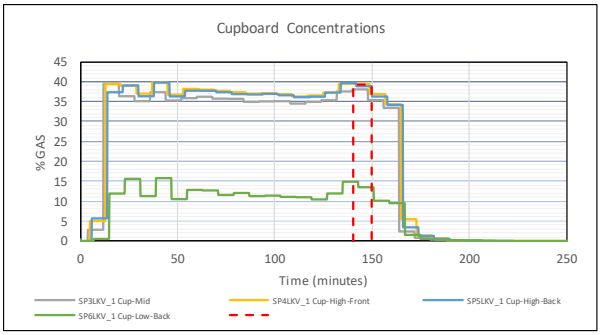


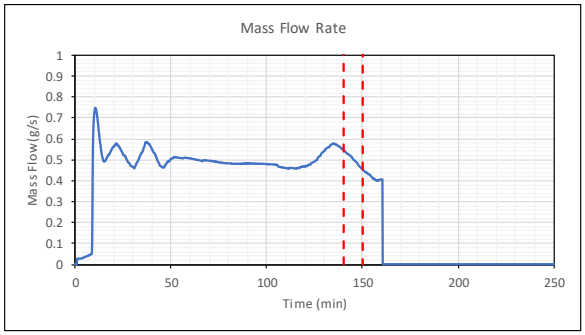
Hallway and Stud into Living Room



Cupboard (top is average of SP4 and SP5)







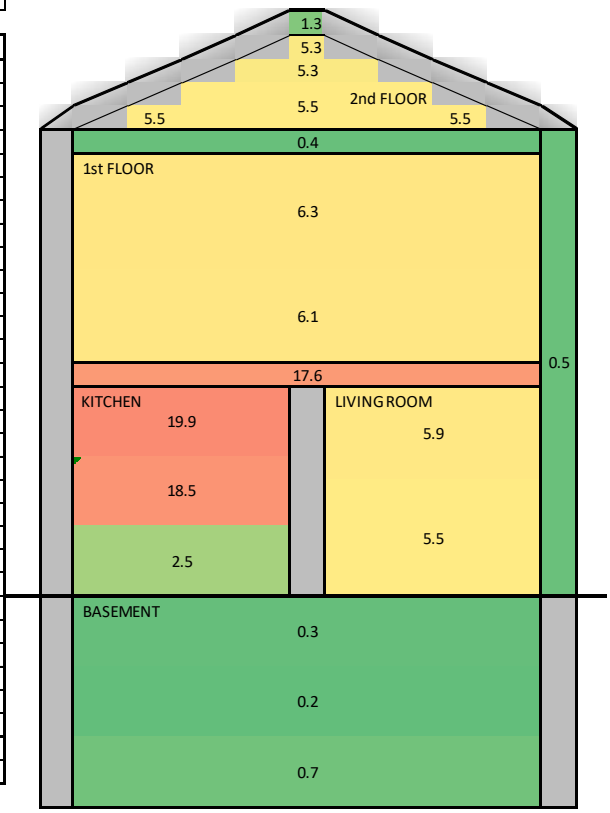
L2-064B RESULT

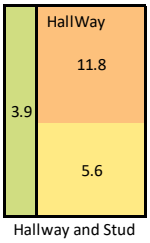
Hy4Heat WP7 Test Result

MTP ID: L2-064B
Hole Size: 7.2 mm
kitchen base cupboard with vent above kitchen door open and 4 x 100 mm holes in side and 4 x 100 mm
Location: holes in bottom of cupboard
Gas: hydrogen
Date: 11/01/2020 **Time:** 14:00:00
Averaging Period Start: 170 min **End:** 180 min

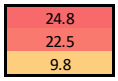
Notes:

Sensor	Average	Max	Min	STDEV	units
SP1LKV_1 K-High	19.9	20.2	19.7	0.2	%vol
SP2LKV_1 K-Mid	18.5	18.5	18.4	0.1	%vol
SP3LKV_1 Cup-Mid	22.5	22.8	22.1	0.4	%vol
SP4LKV_1 Cup-High-Front	24.2	24.4	23.9	0.3	%vol
SP5LKV_1 Cup-High-Back	25.4	25.5	25.2	0.2	%vol
SP6LKV_1 Cup-Low-Back	9.8	10.6	9.4	0.2	%vol
SP7LKV_1 K-Low	2.5	2.6	2.4	0.1	%vol
SP8LKV_1 LR-High	5.9	5.9	5.9	0.0	%vol
SP9LKV_1 LR-Mid	5.5	5.5	5.5	0.0	%vol
SP10LKV_1 H-High	11.8	11.9	11.7	0.1	%vol
SP11LKV_1 H-Mid	5.6	5.6	5.6	0.0	%vol
SP12LKV_1 FF-High	6.3	6.4	6.3	0.0	%vol
SP13LKV_1 FF-Mid	6.1	6.1	6.1	0.0	%vol
SP14LKV_1 AT-High	5.3	5.3	5.3	0.0	%vol
SP15LKV_1 AT-Mid	5.5	5.5	5.4	0.0	%vol
SP16LKV_2 BM-High	0.3	0.3	0.3	0.0	%vol
SP17LKV_1 BM-Mid	0.2	0.2	0.2	0.0	%vol
SP18LKV_2 BM-Low	0.7	0.7	0.7	0.0	%vol
SP19LKV_1 NWALL-Cav	0.5	0.5	0.4	0.0	%vol
SP20LKV_1 STUD-Cav	3.9	3.9	3.9	0.0	%vol
SP21LKV_1 FF-Void	17.6	17.6	17.4	0.1	%vol
SP22LKV_1 SF-Void	0.4	0.4	0.3	0.0	%vol
SP23LKV_1 ROOF-Void	1.3	1.4	1.1	0.1	%vol
RELEASEPRESSURE	0.0147	0.0152	0.0142	0.0002	barg
LOWFLOWMETER	0.4725	0.4853	0.4664	0.0050	g/s
OUTLET_TEMP	8.3	8.4	8.2	0.0	degC
Volume Flow Rate	318.9	327.6	314.8	3.4	SLPM
Energy Flow Rate	56.7	58.2	55.9	0.6	kW
External Wind Speed	2.6				m/s
External Wind Direction	208.5				bearing

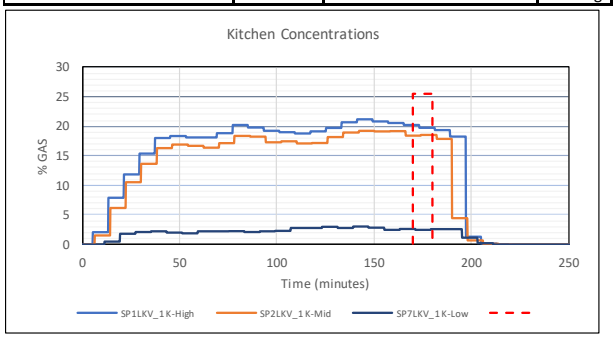


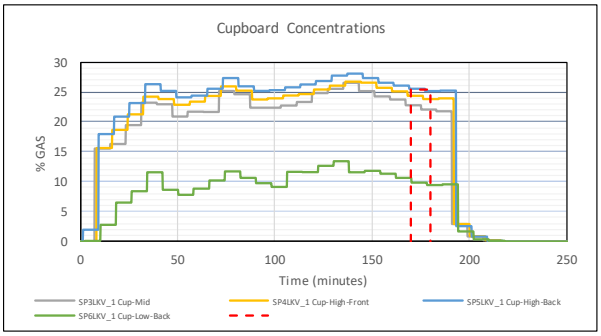


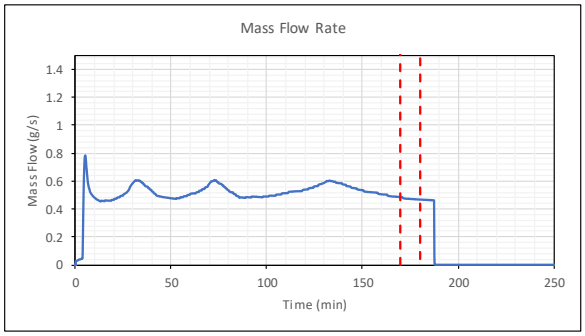
Hallway and Stud into Living Room



Cupboard (top is average of SP4 and SP5)







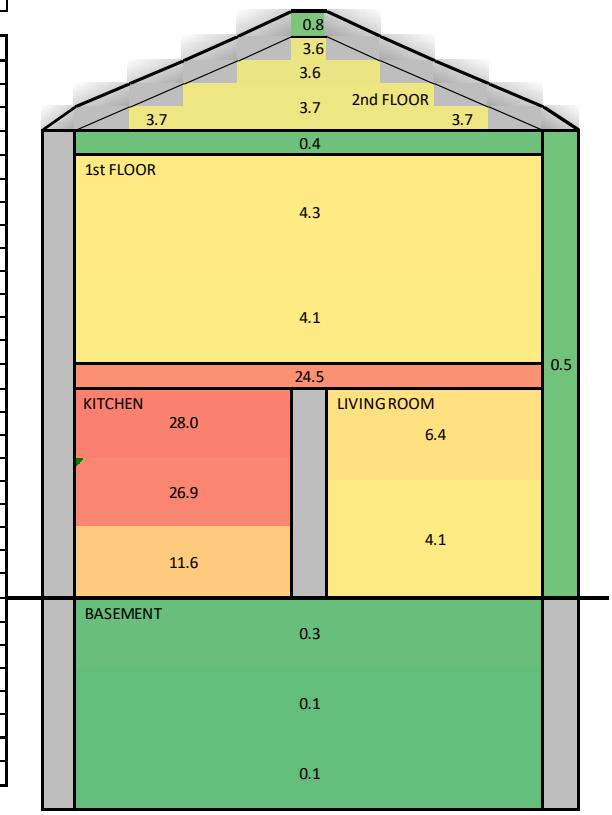
L2-064C RESULT

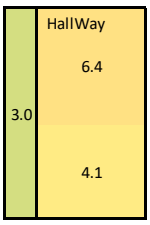
Hy4Heat WP7 Test Result

MTP ID: L2-064C
Hole Size: 7.2 mm
kitchen base cupboard with vent above kitchen door closed and 4 x 100 mm holes in side and 4 x 100 mm
Location: holes in bottom of cupboard
Gas: hydrogen
Date: 12/01/2020 **Time:** 08:45:00
Averaging Period Start: 145 min **End:** 155 min

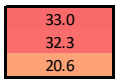
Notes:

Sensor	Average	Max	Min	STDEV	units
SP1LKV_1 K-High	28.0	28.1	27.9	0.1	%vol
SP2LKV_1 K-Mid	26.9	27.0	26.9	0.1	%vol
SP3LKV_1 Cup-Mid	32.3	32.8	31.9	0.5	%vol
SP4LKV_1 Cup-High-Front	32.8	33.0	32.6	0.2	%vol
SP5LKV_1 Cup-High-Back	33.3	34.3	33.0	0.6	%vol
SP6LKV_1 Cup-Low-Back	20.6	22.6	18.9	0.9	%vol
SP7LKV_1 K-Low	11.6	13.7	10.4	0.7	%vol
SP8LKV_1 LR-High	6.4	6.5	6.4	0.0	%vol
SP9LKV_1 LR-Mid	4.1	4.1	4.0	0.0	%vol
SP10LKV_1 H-High	6.4	6.4	6.4	0.0	%vol
SP11LKV_1 H-Mid	4.1	4.2	4.0	0.1	%vol
SP12LKV_1 FF-High	4.3	4.3	4.3	0.0	%vol
SP13LKV_1 FF-Mid	4.1	4.1	4.1	0.0	%vol
SP14LKV_1 AT-High	3.6	3.6	3.5	0.0	%vol
SP15LKV_1 AT-Mid	3.7	3.7	3.5	0.1	%vol
SP16LKV_1 BM-High	0.3	0.3	0.3	0.0	%vol
SP17LKV_1 BM-Mid	0.1	0.1	0.1	0.0	%vol
SP18LKV_1 BM-Low	0.1	0.1	0.1	0.0	%vol
SP19LKV_1 NWALL-Cav	0.5	0.6	0.5	0.1	%vol
SP20LKV_1 STUD-Cav	3.0	3.1	3.0	0.0	%vol
SP21LKV_1 FF-Void	24.5	24.5	24.4	0.0	%vol
SP22LKV_1 SF-Void	0.4	0.4	0.4	0.0	%vol
SP23LKV_1 ROOF-Void	0.8	0.9	0.8	0.1	%vol
RELEASEPRESSURE	0.0182	0.0203	0.0174	0.0008	barg
LOWFLOWMETER	0.5444	0.5917	0.4951	0.0282	g/s
OUTLET_TEMP	6.4	6.5	6.3	0.0	degC
Volume Flow Rate	367.4	399.4	334.2	19.1	SLPM
Energy Flow Rate	65.3	70.9	59.4	3.4	kW
External Wind Speed	6.0				m/s
External Wind Direction	249.1				bearing

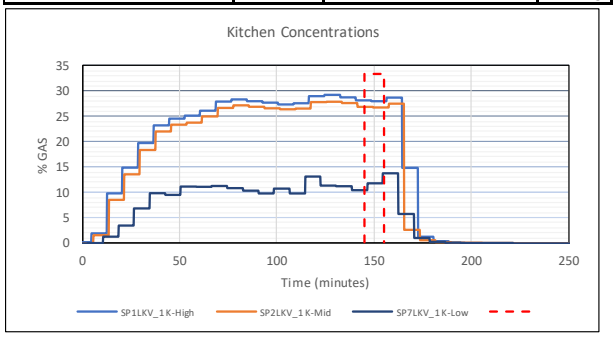


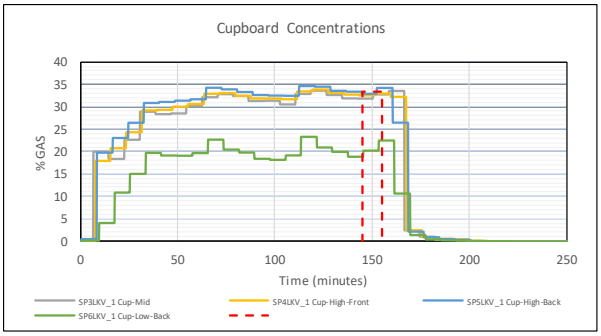


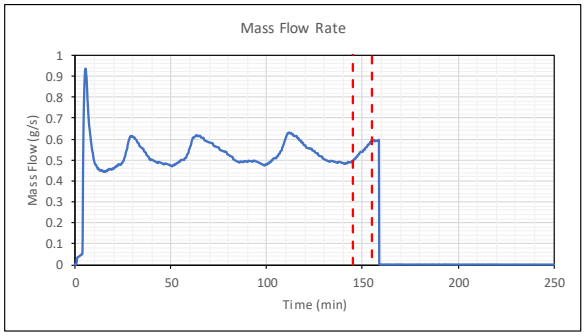
Hallway and Stud into Living Room



Cupboard (top is average of SP4 and SP5)







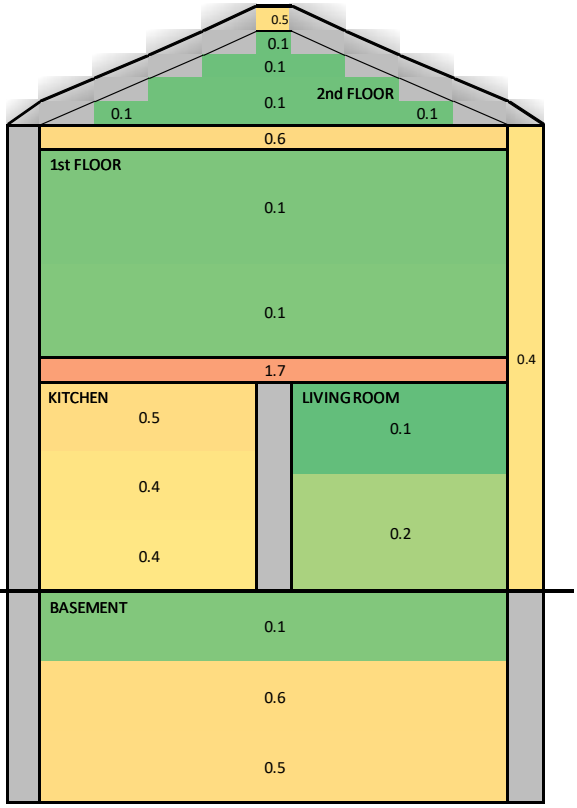
L2-066 RESULT

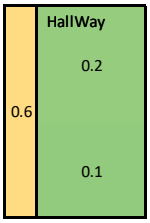
Hy4Heat WP7 Test Result

MTP ID: L2-066
Hole Size: 0.6 mm
Location: Behind kitchen base cupboard
Gas: Hydrogen
Date: 13/11/2019 **Time:** 13:00:00
Averaging Period Start: 200 min **End:** 210 min

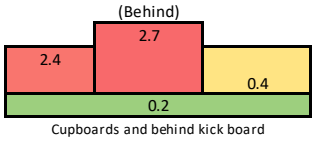
Notes: No flammable concentrations observed in cupboard or elsewhere

Sensor	Average	Max	Min	STDEV	units
SP1LKV_2 K-High	0.5	0.6	0.5	0.0	%vol
SP2LKV_2 K-Mid	0.4	0.4	0.4	0.0	%vol
SP3LKV_2 Boil-Cup-Bottom-Hi	0.4	0.4	0.4	0.0	%vol
SP4LKV_2 Behind-Cup-High	2.9	2.9	2.9	0.0	%vol
SP5LKV_2 Sink-Cup-Hi	2.4	2.5	2.4	0.0	%vol
SP6LKV_2 Under-Cupboards	0.2	0.2	0.2	0.0	%vol
SP7LKV_2 K-Low	0.4	0.4	0.3	0.0	%vol
SP8LKV_2 LR-High	0.1	0.1	0.1	0.0	%vol
SP9LKV_2 LR-Mid	0.2	0.2	0.2	0.0	%vol
SP10LKV_2 H-High	0.2	0.2	0.2	0.0	%vol
SP11LKV_2 H-Mid	0.1	0.2	0.1	0.0	%vol
SP12LKV_2 FF-High	0.1	0.1	0.1	0.0	%vol
SP13LKV_2 FF-Mid	0.1	0.1	0.1	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_2 BM-High	0.1	0.1	0.1	0.0	%vol
SP17LKV_2 BM-Mid	0.6	0.6	0.5	0.0	%vol
SP18LKV_2 BM-Low	0.5	0.5	0.5	0.0	%vol
SP19LKV_2 NWALL-Cav	0.4	0.4	0.4	0.0	%vol
SP20LKV_2 STUD-Cav	0.6	0.6	0.6	0.0	%vol
SP21LKV_2 FF-Void	1.7	1.7	1.6	0.0	%vol
SP22LKV_2 SF-Void	0.6	0.6	0.6	0.0	%vol
SP23LKV_2 ROOF-Void	0.5	0.5	0.5	0.0	%vol
RELEASEPRESSURE	0.0202	0.0209	0.0196	0.0003	barg
LOWFLOWMETER	0.0027	0.0031	0.0012	0.0006	g/s
0	#DIV/0!	0.0000	0.0000	#DIV/0!	g/s
OUTLET_TEMP	2.3	2.5	2.2	0.1	degC
Volume Flow Rate	1.8	2.1	0.8	0.4	SLPM
Energy Flow Rate	0.3	0.4	0.1	0.1	kW
External Wind Speed	1.9				m/s
External Wind Direction	51.2				bearing

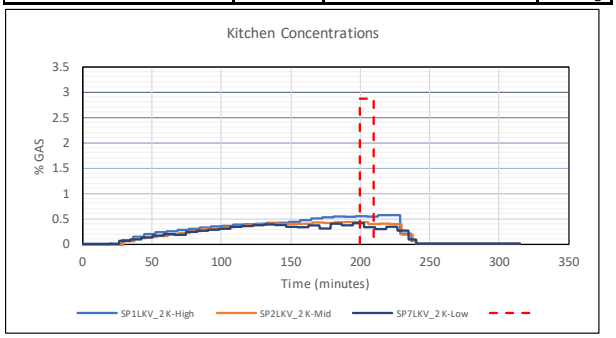


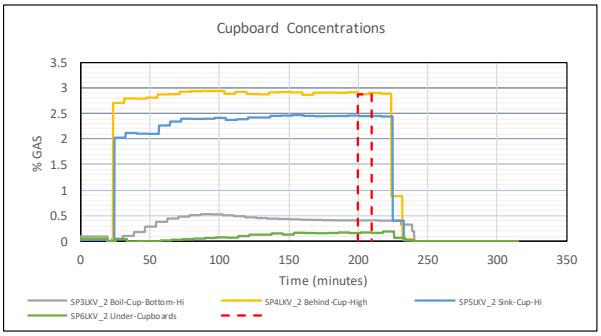


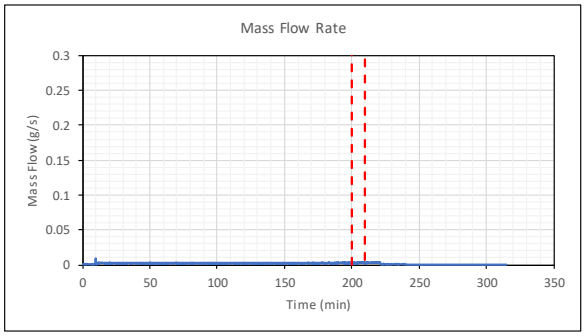
Hallway and Stud into Living Room



Cupboards and behind kick board







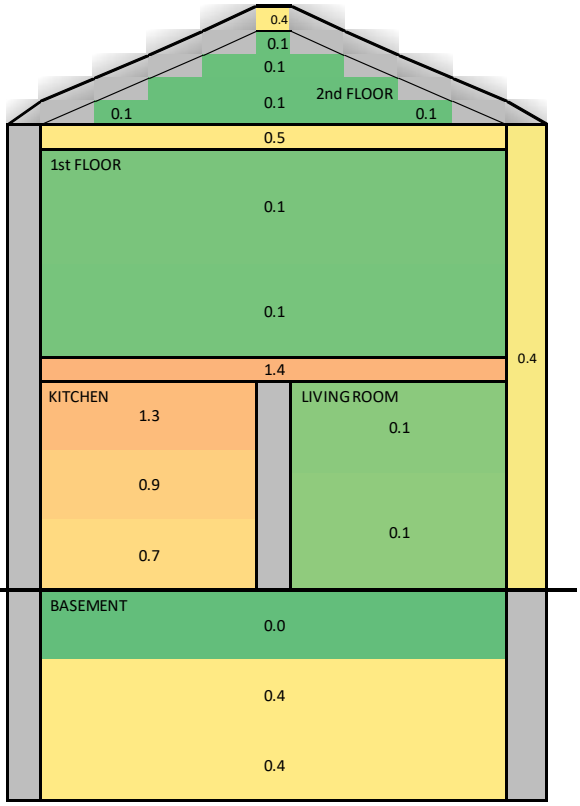
L2-067 RESULT

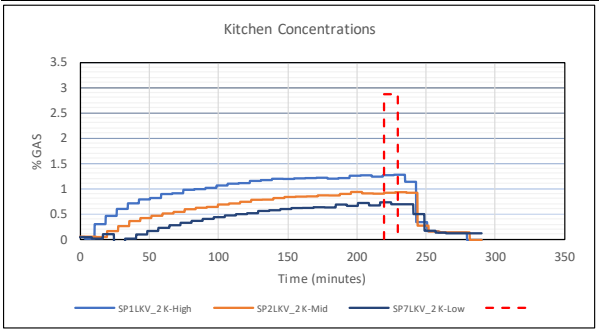
Hy4Heat WP7 Test Result

MTP ID: L2-067
Hole Size: 0.9 mm
Location: Behind kitchen base cupboard
Gas: Hydrogen
Date: 11/11/2019 **Time:** 19:55:10
Averaging Period Start: 220 min **End:** 230 min

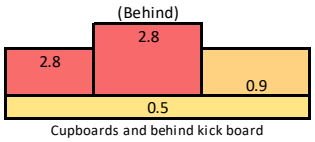
Notes:

Sensor	Average	Max	Min	STDEV	units
SP1LKV_2 K-High	1.3	1.3	1.3	0.0	%vol
SP2LKV_2 K-Mid	0.9	0.9	0.9	0.0	%vol
SP3LKV_2 Boil-Cup-Bottom-Hi	0.9	0.9	0.9	0.0	%vol
SP4LKV_1 Behind-Cup-High	2.9	2.9	2.9	0.0	%vol
SP5LKV_1 Sink-Cup-Hi	2.8	2.8	2.8	0.0	%vol
SP6LKV_2 Under-Cupboards	0.5	0.5	0.5	0.0	%vol
SP7LKV_2 K-Low	0.7	0.7	0.7	0.0	%vol
SP8LKV_1 LR-High	0.1	0.1	0.1	0.0	%vol
SP9LKV_2 LR-Mid	0.1	0.1	0.1	0.0	%vol
SP10LKV_2 H-High	0.2	0.2	0.2	0.0	%vol
SP11LKV_2 H-Mid	0.1	0.1	0.1	0.0	%vol
SP12LKV_2 FF-High	0.1	0.1	0.1	0.0	%vol
SP13LKV_2 FF-Mid	0.1	0.1	0.1	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_2 BM-High	0.0	0.0	0.0	0.0	%vol
SP17LKV_2 BM-Mid	0.4	0.4	0.4	0.0	%vol
SP18LKV_2 BM-Low	0.4	0.4	0.4	0.0	%vol
SP19LKV_2 NWALL-Cav	0.4	0.4	0.4	0.0	%vol
SP20LKV_2 STUD-Cav	0.5	0.5	0.5	0.0	%vol
SP21LKV_2 FF-Void	1.4	1.4	1.4	0.0	%vol
SP22LKV_2 SF-Void	0.5	0.5	0.4	0.0	%vol
SP23LKV_2 ROOF-Void	0.4	0.4	0.4	0.0	%vol
RELEASEPRESSURE	0.0200	0.0203	0.0196	0.0002	barg
LOWFLOWMETER	0.0067	0.0073	0.0061	0.0002	g/s
OUTLET_TEMP	4.2	4.2	4.1	0.0	degC
Volume Flow Rate	4.5	5.0	4.1	0.2	SLPM
Energy Flow Rate	0.8	0.9	0.7	0.0	kW
External Wind Speed	3.2				m/s
External Wind Direction	253.3				bearing

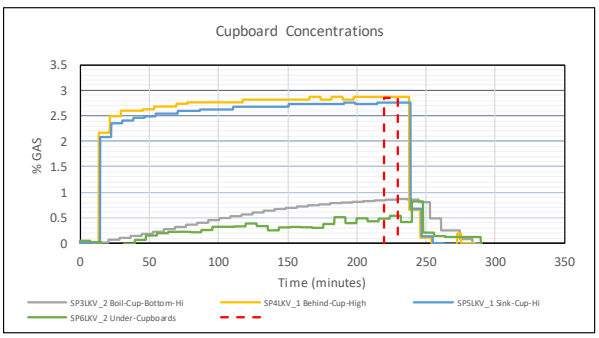


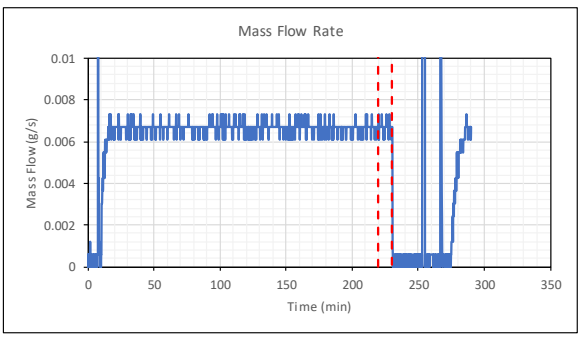


Hallway and Stud into Living Room



Cupboards and behind kick board





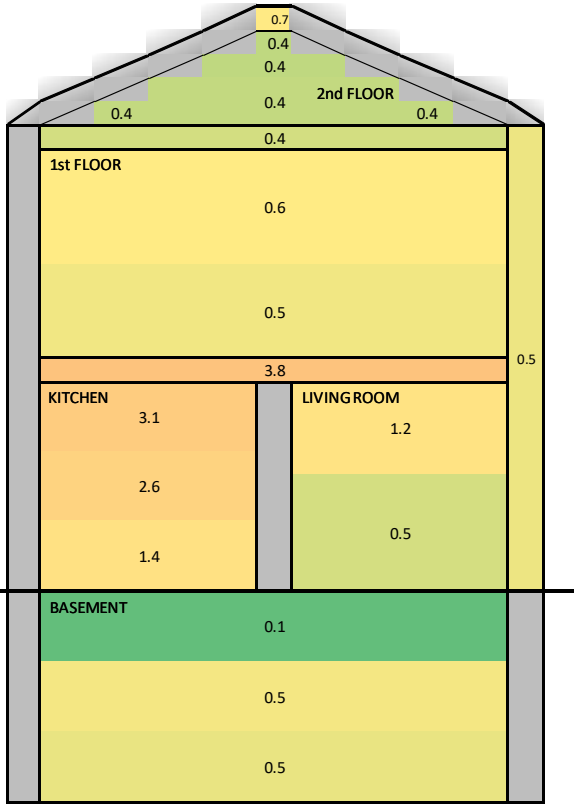
L2-068 RESULT

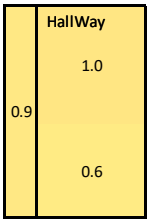
Hy4Heat WP7 Test Result

MTP ID: L2-068
Hole Size: 1.8 mm
Location: Behind kitchen base cupboard
Gas: Hydrogen
Date: 12/11/2019 **Time:** 01:45:00
Averaging Period Start: 210 min **End:** 220 min

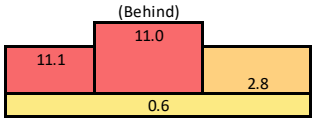
Notes:

Sensor	Average	Max	Min	STDEV	units
SP1LKV_1 K-High	3.1	3.1	3.0	0.0	%vol
SP2LKV_1 K-Mid	2.6	2.6	2.6	0.0	%vol
SP3LKV_2 Boil-Cup-Bottom-Hi	2.8	2.8	2.8	0.0	%vol
SP4LKV_1 Behind-Cup-High	11.0	11.0	11.0	0.0	%vol
SP5LKV_1 Sink-Cup-Hi	11.1	11.1	11.0	0.0	%vol
SP6LKV_2 Under-Cupboards	0.6	0.6	0.6	0.0	%vol
SP7LKV_2 K-Low	1.4	1.4	1.4	0.0	%vol
SP8LKV_2 LR-High	1.2	1.2	1.2	0.0	%vol
SP9LKV_1 LR-Mid	0.5	0.5	0.4	0.0	%vol
SP10LKV_2 H-High	1.0	1.0	1.0	0.0	%vol
SP11LKV_2 H-Mid	0.6	0.6	0.6	0.0	%vol
SP12LKV_2 FF-High	0.6	0.6	0.6	0.0	%vol
SP13LKV_2 FF-Mid	0.5	0.6	0.5	0.0	%vol
SP14LKV_2 AT-High	0.4	0.4	0.4	0.0	%vol
SP15LKV_2 AT-Mid	0.4	0.4	0.4	0.0	%vol
SP16LKV_2 BM-High	0.1	0.1	0.1	0.0	%vol
SP17LKV_2 BM-Mid	0.5	0.5	0.5	0.0	%vol
SP18LKV_2 BM-Low	0.5	0.5	0.5	0.0	%vol
SP19LKV_2 NWALL-Cav	0.5	0.5	0.5	0.0	%vol
SP20LKV_2 STUD-Cav	0.9	0.9	0.8	0.0	%vol
SP21LKV_2 FF-Void	3.8	3.8	3.8	0.0	%vol
SP22LKV_2 SF-Void	0.4	0.4	0.4	0.0	%vol
SP23LKV_2 ROOF-Void	0.7	0.7	0.7	0.0	%vol
RELEASEPRESSURE	0.0200	0.0202	0.0196	0.0002	barg
LOWFLOWMETER	0.0411	0.0416	0.0410	0.0003	g/s
OUTLET_TEMP	3.7	3.8	3.6	0.1	degC
Volume Flow Rate	27.7	28.1	27.6	0.2	SLPM
Energy Flow Rate	4.9	5.0	4.9	0.0	kW
External Wind Speed	2.6				m/s
External Wind Direction	260.6				bearing

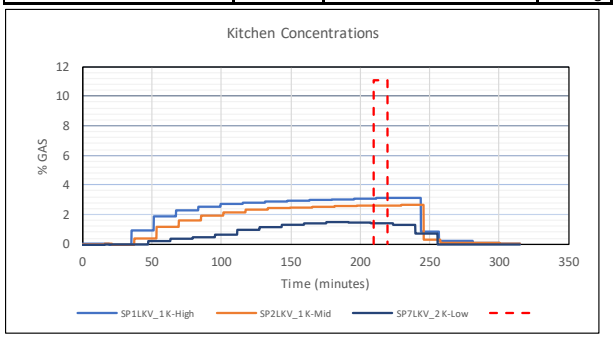


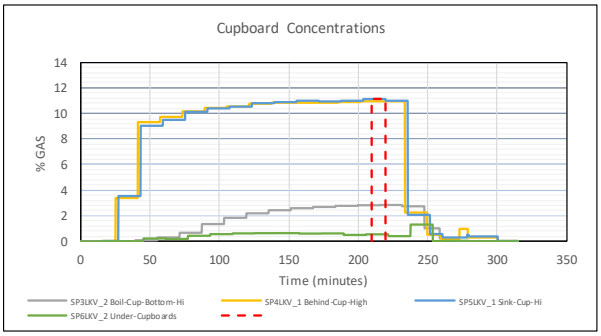


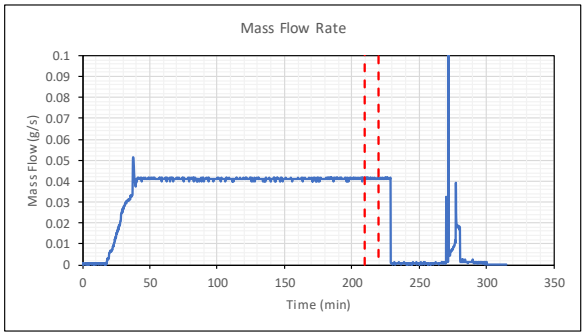
Hallway and Stud into Living Room



Cupboards and behind kick board







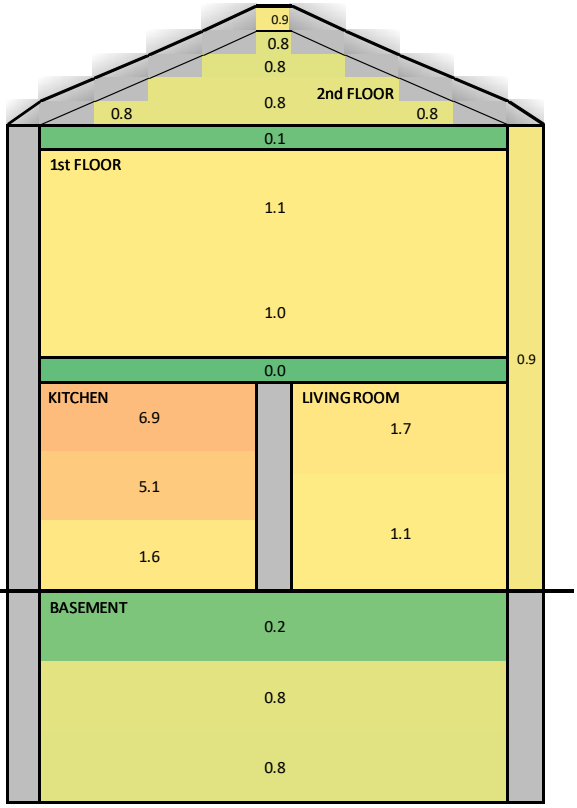
L2-069 RESULT

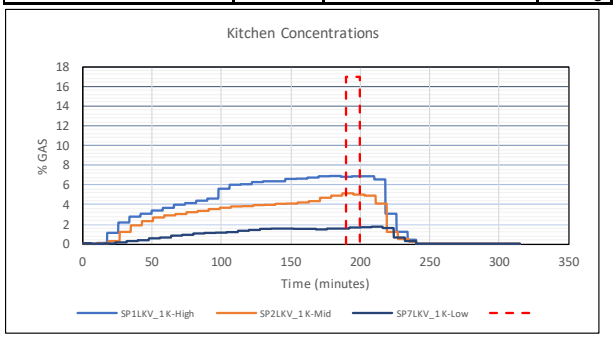
Hy4Heat WP7 Test Result

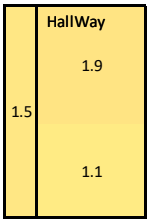
MTP ID: L2-069
Hole Size: 2.5 mm
Location: Behind kitchen base cupboard
Gas: Hydrogen
Date: 12/11/2019 **Time:** 07:00:00
Averaging Period Start: 190 min **End:** 200 min

Notes: SP21 removed

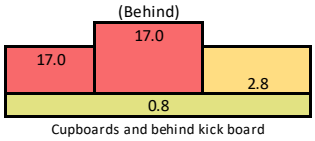
Sensor	Average	Max	Min	STDEV	units
SP1LKV_1 K-High	6.9	6.9	6.8	0.0	%vol
SP2LKV_1 K-Mid	5.1	5.2	5.1	0.1	%vol
SP3LKV_1 Boil-Cup-Bottom-Hi	2.8	2.8	2.8	0.0	%vol
SP4LKV_1 Behind-Cup-High	16.9	17.0	16.9	0.0	%vol
SP5LKV_1 Sink-Cup-Hi	17.0	17.1	17.0	0.1	%vol
SP6LKV_1 Under-Cupboards	0.8	0.8	0.8	0.0	%vol
SP7LKV_1 K-Low	1.6	1.7	1.5	0.0	%vol
SP8LKV_1 LR-High	1.7	1.7	1.7	0.0	%vol
SP9LKV_1 LR-Mid	1.1	1.1	1.0	0.0	%vol
SP10LKV_2 H-High	1.9	2.0	1.9	0.0	%vol
SP11LKV_2 H-Mid	1.1	1.1	1.1	0.0	%vol
SP12LKV_2 FF-High	1.1	1.1	1.1	0.0	%vol
SP13LKV_2 FF-Mid	1.0	1.1	1.0	0.0	%vol
SP14LKV_2 AT-High	0.8	0.8	0.8	0.0	%vol
SP15LKV_2 AT-Mid	0.8	0.9	0.8	0.0	%vol
SP16LKV_2 BM-High	0.2	0.2	0.2	0.0	%vol
SP17LKV_2 BM-Mid	0.8	0.8	0.8	0.0	%vol
SP18LKV_2 BM-Low	0.8	0.8	0.8	0.0	%vol
SP19LKV_2 NWALL-Cav	0.9	0.9	0.9	0.0	%vol
SP20LKV_2 STUD-Cav	1.5	1.5	1.5	0.0	%vol
SP21LKV_1 FF-Void					%vol
SP22LKV_2 SF-Void	0.1	0.1	0.1	0.0	%vol
SP23LKV_2 ROOF-Void	0.9	1.0	0.9	0.0	%vol
RELEASEPRESSURE	0.0199	0.0203	0.0196	0.0002	barg
LOWFLOWMETER	0.0758	0.0770	0.0746	0.0006	g/s
0	#DIV/0!	0.0000	0.0000	#DIV/0!	g/s
OUTLET_TEMP	4.2	4.4	4.1	0.1	degC
Volume Flow Rate	51.2	52.0	50.3	0.4	SLPM
Energy Flow Rate	9.1	9.2	8.9	0.1	kW
External Wind Speed	2.6				m/s
External Wind Direction	255.5				bearing



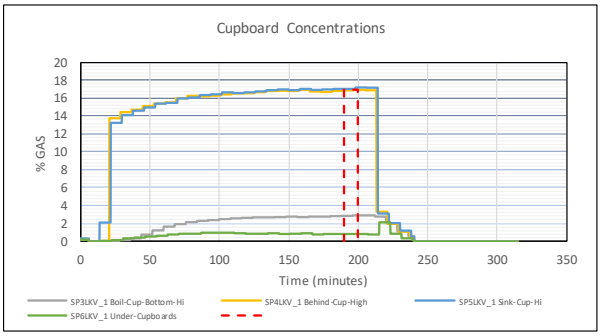


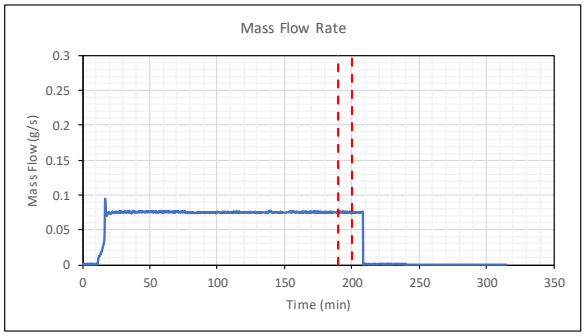


Hallway and Stud into Living Room



Cupboards and behind kick board





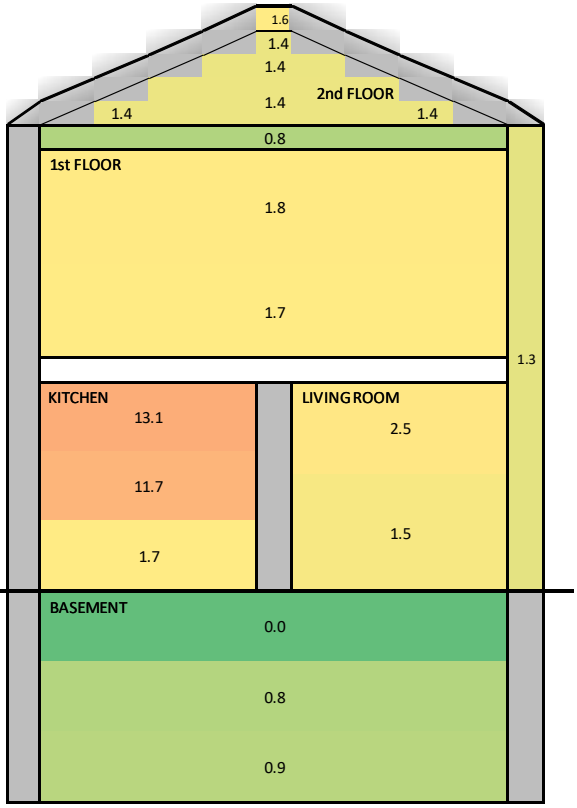
L2-070 RESULT

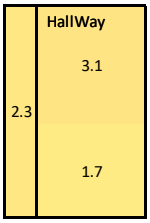
Hy4Heat WP7 Test Result

MTP ID: L2-070
Hole Size: 3.6 mm
Location: Behind kitchen base cupboard
Gas: Hydrogen
Date: 12/11/2019 **Time:** 16:30:00
Averaging Period Start: 180 min **End:** 190 min

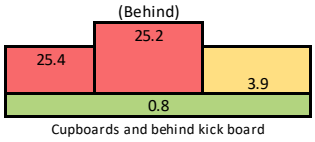
Notes: SP21 removed, spurious -ve offset

Sensor	Average	Max	Min	STDEV	units
SP1LKV_1 K-High	13.1	13.1	13.1	0.0	%vol
SP2LKV_1 K-Mid	11.7	11.7	11.6	0.1	%vol
SP3LKV_1 Boil-Cup-Bottom-Hi	3.9	3.9	3.9	0.0	%vol
SP4LKV_1 Behind-Cup-High	25.1	25.2	24.9	0.1	%vol
SP5LKV_1 Sink-Cup-Hi	25.4	25.4	25.2	0.1	%vol
SP6LKV_1 Under-Cupboards	0.8	0.9	0.8	0.0	%vol
SP7LKV_1 K-Low	1.7	1.7	1.7	0.0	%vol
SP8LKV_1 LR-High	2.5	2.5	2.4	0.0	%vol
SP9LKV_1 LR-Mid	1.5	1.6	1.5	0.1	%vol
SP10LKV_2 H-High	3.1	3.1	3.0	0.0	%vol
SP11LKV_2 H-Mid	1.7	1.7	1.7	0.0	%vol
SP12LKV_2 FF-High	1.8	1.9	1.8	0.0	%vol
SP13LKV_2 FF-Mid	1.7	1.8	1.7	0.0	%vol
SP14LKV_2 AT-High	1.4	1.5	1.4	0.0	%vol
SP15LKV_2 AT-Mid	1.4	1.4	1.4	0.0	%vol
SP16LKV_2 BM-High	0.0	0.0	0.0	0.0	%vol
SP17LKV_2 BM-Mid	0.8	0.9	0.8	0.0	%vol
SP18LKV_2 BM-Low	0.9	0.9	0.9	0.0	%vol
SP19LKV_2 NWALL-Cav	1.3	1.4	1.3	0.0	%vol
SP20LKV_2 STUD-Cav	2.3	2.4	2.3	0.0	%vol
SP21LKV_2 FF-Void					%vol
SP22LKV_2 SF-Void	0.8	0.9	0.7	0.0	%vol
SP23LKV_2 ROOF-Void	1.6	1.7	1.5	0.1	%vol
RELEASEPRESSURE	0.0200	0.0206	0.0194	0.0003	barg
LOWFLOWMETER	0.1547	0.1571	0.1522	0.0010	g/s
OUTLET_TEMP	5.1	5.2	5.1	0.0	degC
Volume Flow Rate	104.4	106.0	102.7	0.7	SLPM
Energy Flow Rate	18.5	18.8	18.2	0.1	kW
External Wind Speed	1.7				m/s
External Wind Direction	309.3				bearing

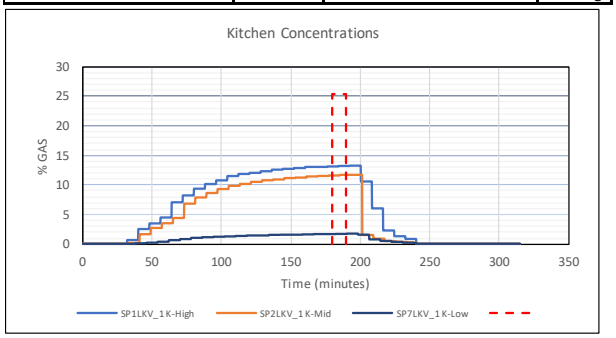


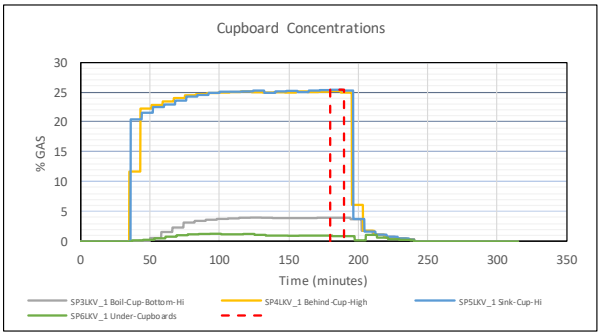


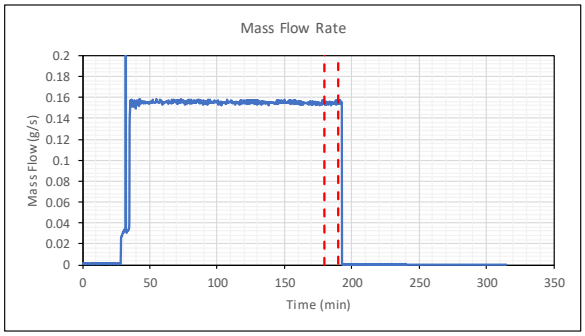
Hallway and Stud into Living Room



Cupboards and behind kick board







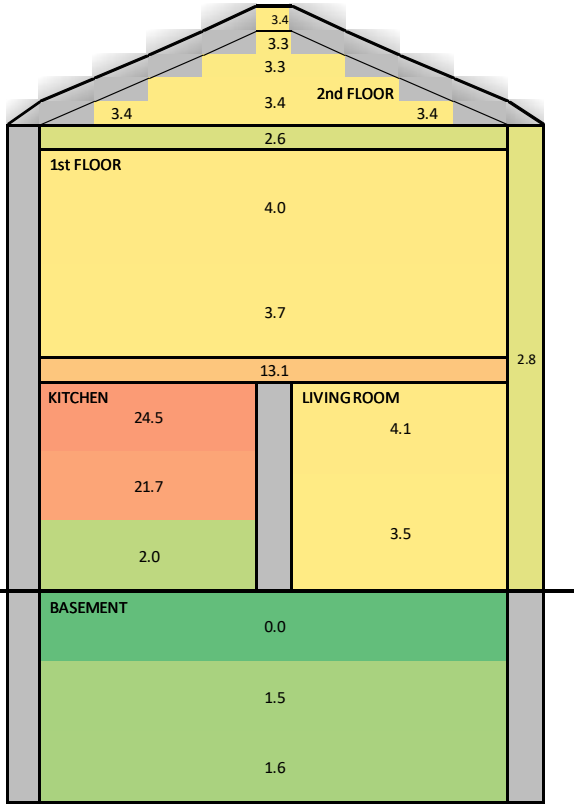
L2-071 RESULT

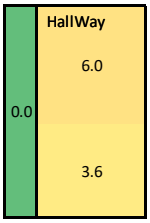
Hy4Heat WP7 Test Result

MTP ID: L2-071
Hole Size: 5.1 mm
Location: Behind kitchen base cupboard
Gas: Hydrogen
Date: 12/11/2019 **Time:** 22:30:00
Averaging Period Start: 180 min **End:** 190 min

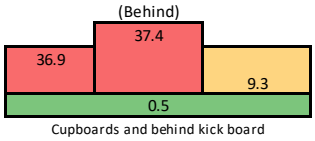
Notes: SP20 removed from this table. Data is good up until LEL goes off range circa 150 mins @ 3.8%

Sensor	Average	Max	Min	STDEV	units
SP1LKV_1 K-High	24.5	24.5	24.5	0.0	%vol
SP2LKV_1 K-Mid	21.7	21.8	21.7	0.0	%vol
SP3LKV_1 Boil-Cup-Bottom-Hi	9.3	9.4	9.2	0.1	%vol
SP4LKV_1 Behind-Cup-High	37.8	37.8	37.8	0.0	%vol
SP5LKV_1 Sink-Cup-Hi	36.9	37.0	36.7	0.1	%vol
SP6LKV_1 Under-Cupboards	0.5	0.5	0.5	0.0	%vol
SP7LKV_1 K-Low	2.0	2.0	2.0	0.0	%vol
SP8LKV_1 LR-High	4.1	4.1	4.1	0.0	%vol
SP9LKV_1 LR-Mid	3.5	3.5	3.5	0.0	%vol
SP10LKV_1 H-High	6.0	6.0	5.9	0.0	%vol
SP11LKV_2 H-Mid	3.6	3.7	3.5	0.1	%vol
SP12LKV_1 FF-High	4.0	4.1	4.0	0.1	%vol
SP13LKV_2 FF-Mid	3.7	3.8	3.7	0.1	%vol
SP14LKV_2 AT-High	3.3	3.5	3.3	0.1	%vol
SP15LKV_2 AT-Mid	3.4	3.4	3.4	0.0	%vol
SP16LKV_2 BM-High	0.0	0.0	0.0	0.0	%vol
SP17LKV_2 BM-Mid	1.5	1.5	1.5	0.0	%vol
SP18LKV_2 BM-Low	1.6	1.6	1.5	0.0	%vol
SP19LKV_2 NWALL-Cav	2.8	2.8	2.8	0.0	%vol
SP20LKV_2 STUD-Cav				0.0	%vol
SP21LKV_1 FF-Void	13.1	13.3	13.0	0.1	%vol
SP22LKV_2 SF-Void	2.6	3.2	2.5	0.2	%vol
SP23LKV_2 ROOF-Void	3.4	3.4	3.4	0.0	%vol
RELEASEPRESSURE	0.0199	0.0203	0.0187	0.0004	barg
LOWFLOWMETER	0.3110	0.3136	0.3020	0.0022	g/s
OUTLET_TEMP	-0.1	0.1	-0.2	0.0	degC
Volume Flow Rate	209.9	211.6	203.8	1.5	SLPM
Energy Flow Rate	37.3	37.6	36.2	0.3	kW
External Wind Speed	1.1				m/s
External Wind Direction	283.5				bearing

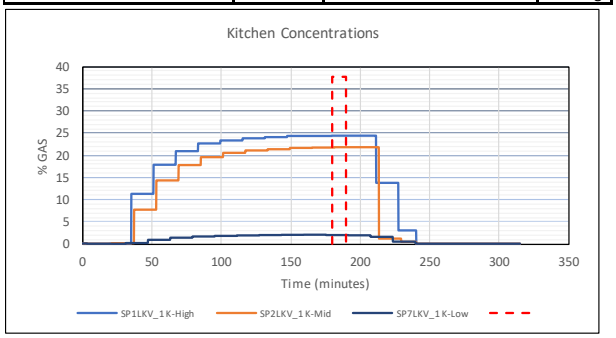


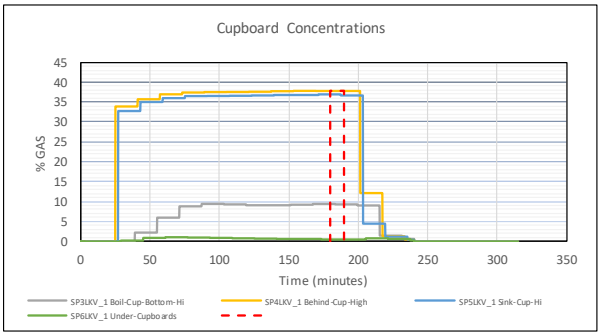


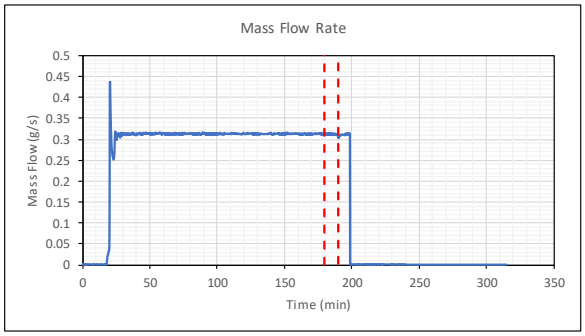
Hallway and Stud into Living Room



Cupboards and behind kick board







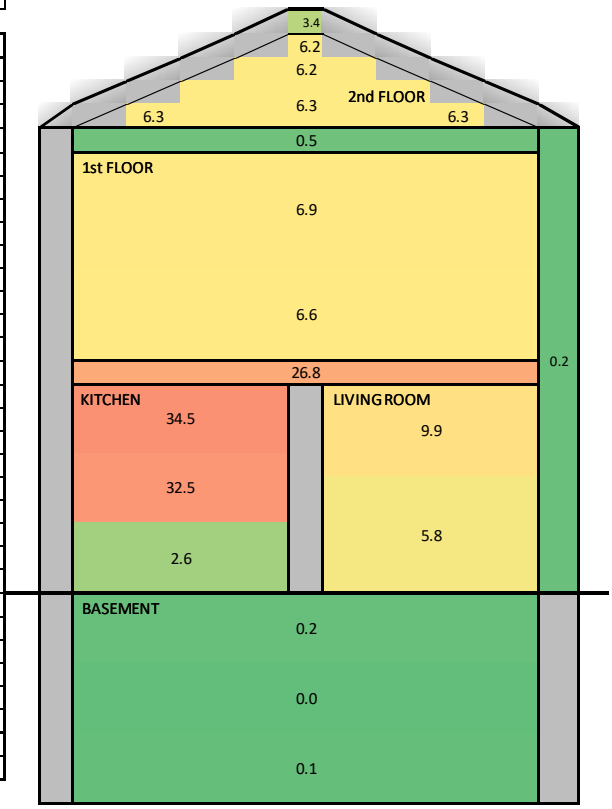
L2-072 RESULT

Hy4Heat WP7 Test Result

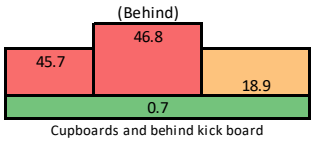
MTP ID: L2-072
Hole Size: 7.2 mm
Location: Behind kitchen base cupboard
Gas: Hydrogen
Date: 13/11/2019 **Time:** 05:15:00
Averaging Period Start: 180 min **End:** 190 min

Notes: -0.2% offset removed from SP17-23

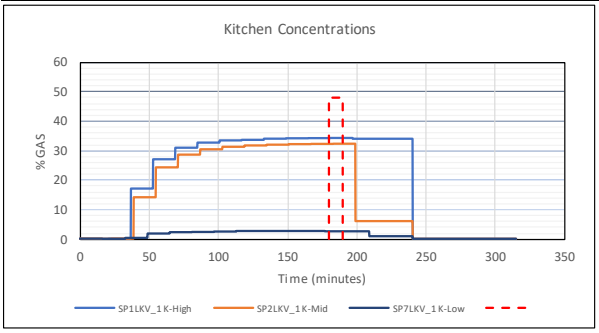
Sensor	Average	Max	Min	STDEV	units
SP1LKV_1 K-High	34.5	34.5	34.4	0.0	%vol
SP2LKV_1 K-Mid	32.5	32.5	32.5	0.0	%vol
SP3LKV_1 Boil-Cup-Bottom-Hi	18.9	19.0	18.9	0.0	%vol
SP4LKV_1 Behind-Cup-High	47.9	48.0	47.9	0.0	%vol
SP5LKV_1 Sink-Cup-Hi	45.7	45.8	45.7	0.0	%vol
SP6LKV_1 Under-Cupboards	0.7	0.7	0.7	0.0	%vol
SP7LKV_1 K-Low	2.6	2.6	2.6	0.0	%vol
SP8LKV_1 LR-High	9.9	9.9	9.9	0.0	%vol
SP9LKV_1 LR-Mid	5.8	5.9	5.6	0.1	%vol
SP10LKV_1 H-High	10.5	10.5	10.3	0.1	%vol
SP11LKV_1 H-Mid	6.2	6.3	6.1	0.1	%vol
SP12LKV_1 FF-High	6.9	7.0	6.8	0.1	%vol
SP13LKV_1 FF-Mid	6.6	6.9	6.6	0.1	%vol
SP14LKV_1 AT-High	6.2	6.2	6.2	0.0	%vol
SP15LKV_1 AT-Mid	6.3	6.3	6.3	0.0	%vol
SP16LKV_2 BM-High	0.2	0.2	0.2	0.0	%vol
SP17LKV_1 BM-Mid	0.0	0.0	0.0	0.0	%vol
SP18LKV_1 BM-Low	0.1	0.1	0.1	0.0	%vol
SP19LKV_1 NWALL-Cav	0.2	0.2	0.2	0.0	%vol
SP20LKV_1 STUD-Cav	3.4	3.4	3.4	0.0	%vol
SP21LKV_1 FF-Void	26.8	26.8	26.7	0.0	%vol
SP22LKV_1 SF-Void	0.5	0.5	0.5	0.0	%vol
SP23LKV_1 ROOF-Void	3.4	3.4	3.4	0.0	%vol
RELEASEPRESSURE	0.0198	0.0206	0.0192	0.0003	barg
LOWFLOWMETER	0.5717	0.5825	0.5660	0.0046	g/s
OUTLET_TEMP	0.8	0.9	0.7	0.1	degC
Volume Flow Rate	385.9	393.2	382.0	3.1	SLPM
Energy Flow Rate	68.5	69.8	67.9	0.6	kW
External Wind Speed	1.0				m/s
External Wind Direction	289.6				bearing

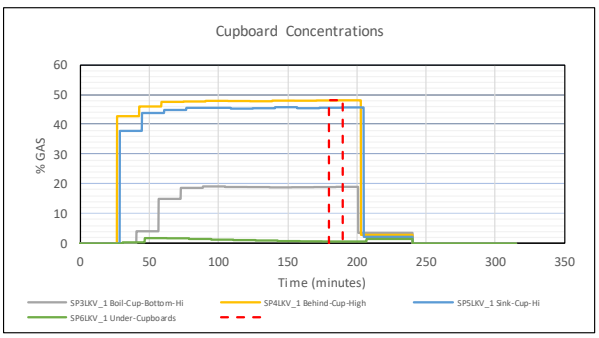


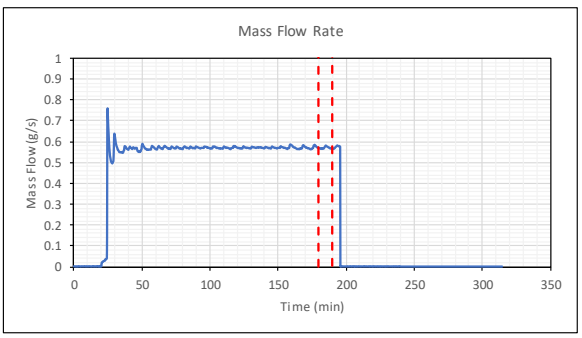
Hallway and Stud into Living Room



Cupboards and behind kick board







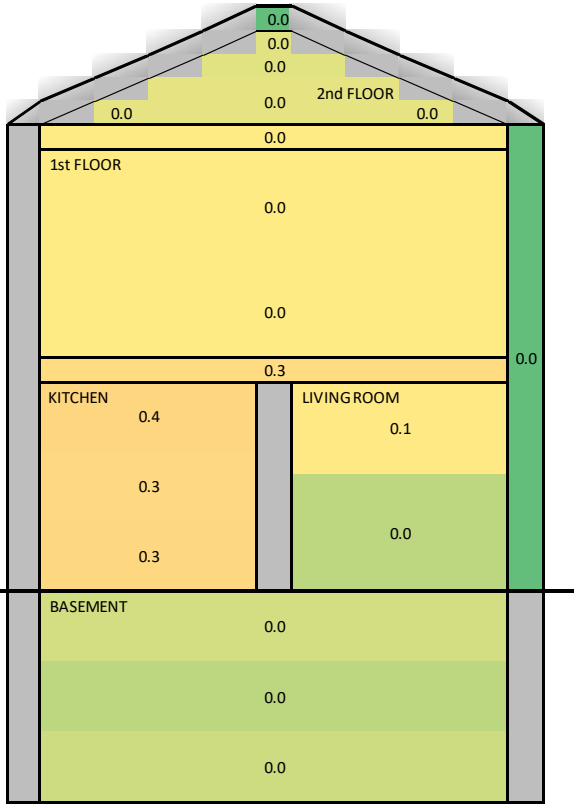
L2-074 RESULT

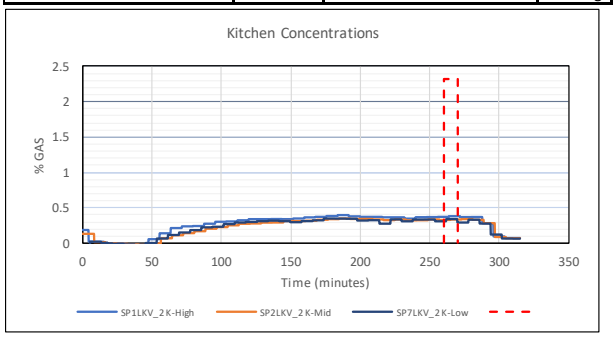
Hy4Heat WP7 Test Result

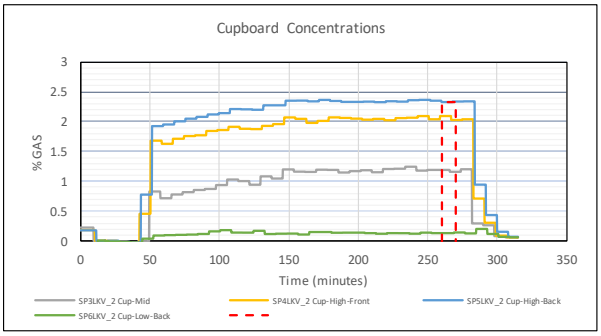
MTP ID: L2-074
Hole Size: 0.6 mm
Location: Undersink Cupboard
Gas: Hydrogen
Date: 10/20/19 **Time:** 08:45:20
Averaging Period Start: 260 min **End:** 270 min

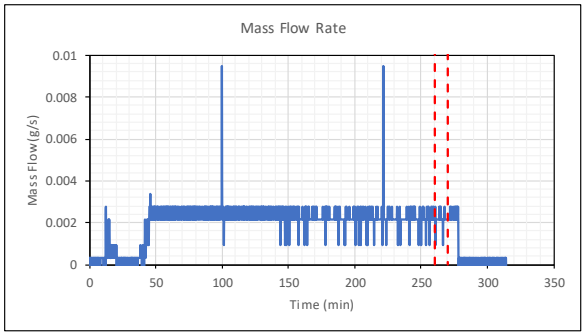
Notes:

Sensor	Average	Max	Min	STDEV	units
SP1LKV_2 K-High	0.4	0.4	0.4	0.0	%vol
SP2LKV_2 K-Mid	0.3	0.3	0.3	0.0	%vol
SP3LKV_2 Cup-Mid	1.2	1.2	1.2	0.0	%vol
SP4LKV_2 Cup-High-Front	2.1	2.1	2.0	0.0	%vol
SP5LKV_2 Cup-High-Back	2.3	2.3	2.3	0.0	%vol
SP6LKV_2 Cup-Low-Back	0.1	0.1	0.1	0.0	%vol
SP7LKV_2 K-Low	0.3	0.3	0.3	0.0	%vol
SP8LKV_3 LR-High	0.1	0.1	0.1	0.0	%vol
SP9LKV_3 LR-Mid	0.0	0.0	0.0	0.0	%vol
SP10LKV_3 H-High	0.0	0.0	0.0	0.0	%vol
SP11LKV_3 H-Mid	0.0	0.0	0.0	0.0	%vol
SP12LKV_3 FF-High	0.0	0.0	0.0	0.0	%vol
SP13LKV_3 FF-Mid	0.0	0.0	0.0	0.0	%vol
SP14LKV_3 AT-High	0.0	0.0	0.0	0.0	%vol
SP15LKV_3 AT-Mid	0.0	0.0	0.0	0.0	%vol
SP16LKV_3 BM-High	0.0	0.0	0.0	0.0	%vol
SP17LKV_3 BM-Mid	0.0	0.0	0.0	0.0	%vol
SP18LKV_3 BM-Low	0.0	0.0	0.0	0.0	%vol
SP19LKV_3 NWALL-Cav	0.0	0.0	0.0	0.0	%vol
SP20LKV_3 STUD-Cav	0.0	0.0	0.0	0.0	%vol
SP21LKV_2 FF-Void	0.3	0.3	0.3	0.0	%vol
SP22LKV_3 SF-Void	0.0	0.0	0.0	0.0	%vol
SP23LKV_3 ROOF-Void	0.0	0.0	0.0	0.0	%vol
RELEASEPRESSURE	0.0205	0.0209	0.0202	0.0002	barg
LOWFLOWMETER	0.0022	0.0027	0.0009	0.0003	g/s
0	#DIV/0!	0.0000	0.0000	#DIV/0!	g/s
OUTLET_TEMP	8.8	8.9	8.7	0.0	degC
Volume Flow Rate	1.5	1.9	0.6	0.2	SLPM
Energy Flow Rate	0.3	0.3	0.1	0.0	kW
External Wind Speed	0.0				m/s
External Wind Direction	25.0				bearing









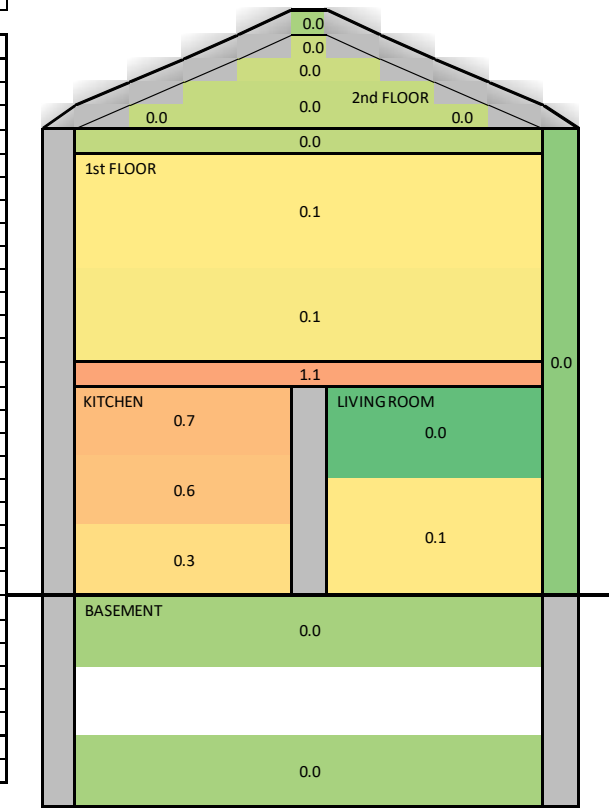
L2-075 RESULT

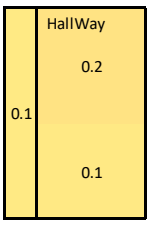
Hy4Heat WP7 Test Result

MTP ID: L2-075
Hole Size: 0.9 mm
Location: undersink cupboard
Gas: hydrogen
Date: 19/10/2019 **Time:** 15:00:00
Averaging Period Start: 290 min **End:** 300 min

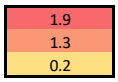
Notes: Analyser Zero's checked and re-applied circa 225 min and some drift corrected. SP17 removed.

Sensor	Average	Max	Min	STDEV	units
SP1LKV_1 K-High	0.7	0.7	0.7	0.0	%vol
SP2LKV_1 K-Mid	0.6	0.7	0.6	0.0	%vol
SP3LKV_1 Cup-Mid	1.3	1.3	1.2	0.0	%vol
SP4LKV_1 Cup-High-Front	1.8	1.8	1.7	0.0	%vol
SP5LKV_1 Cup-High-Back	2.0	2.0	2.0	0.0	%vol
SP6LKV_1 Cup-Low-Back	0.2	0.2	0.2	0.0	%vol
SP7LKV_1 K-Low	0.3	0.3	0.2	0.0	%vol
SP8LKV_2 LR-High	0.0	0.0	0.0	0.0	%vol
SP9LKV_2 LR-Mid	0.1	0.1	0.1	0.0	%vol
SP10LKV_2 H-High	0.2	0.2	0.2	0.0	%vol
SP11LKV_2 H-Mid	0.1	0.1	0.1	0.0	%vol
SP12LKV_2 FF-High	0.1	0.1	0.1	0.0	%vol
SP13LKV_2 FF-Mid	0.1	0.1	0.1	0.0	%vol
SP14LKV_2 AT-High	0.0	0.0	0.0	0.0	%vol
SP15LKV_2 AT-Mid	0.0	0.0	0.0	0.0	%vol
SP16LKV_2 BM-High	0.0	0.0	0.0	0.0	%vol
SP17LKV_2 BM-Mid					%vol
SP18LKV_2 BM-Low	0.0	0.0	0.0	0.0	%vol
SP19LKV_2 NWALL-Cav	0.0	0.0	0.0	0.0	%vol
SP20LKV_2 STUD-Cav	0.1	0.1	0.1	0.0	%vol
SP21LKV_2 FF-Void	1.1	1.1	1.1	0.0	%vol
SP22LKV_2 SF-Void	0.0	0.0	0.0	0.0	%vol
SP23LKV_2 ROOF-Void	0.0	0.0	0.0	0.0	%vol
RELEASEPRESSURE	0.0200	0.0203	0.0196	0.0002	barg
LOWFLOWMETER	0.0070	0.0073	0.0067	0.0003	g/s
OUTLET_TEMP	7.3	7.4	7.3	0.1	degC
Volume Flow Rate	4.7	4.9	4.5	0.2	SLPM
Energy Flow Rate	0.8	0.9	0.8	0.0	kW
External Wind Speed	0.0				m/s
External Wind Direction	261.2				bearing

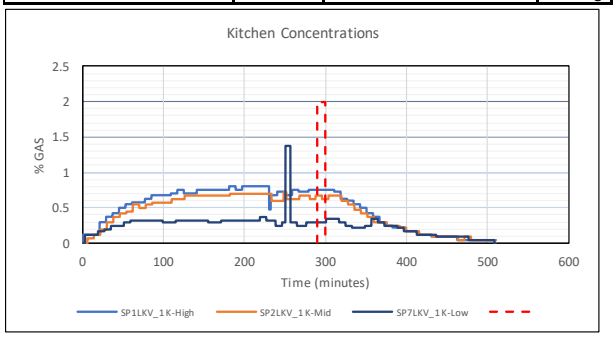


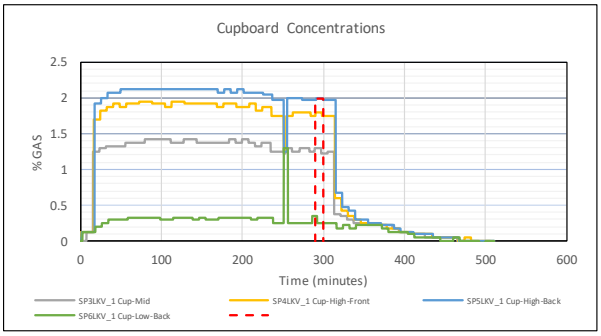


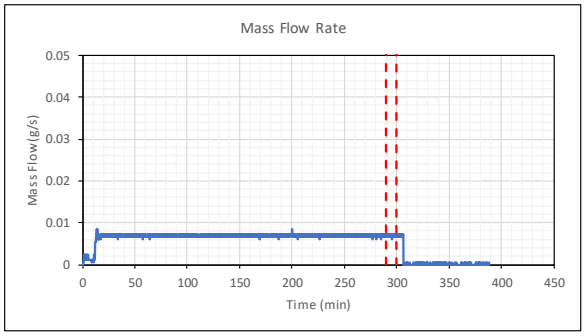
Hallway and Stud into Living Room



Cupboard (top is average of SP4 and SP5)







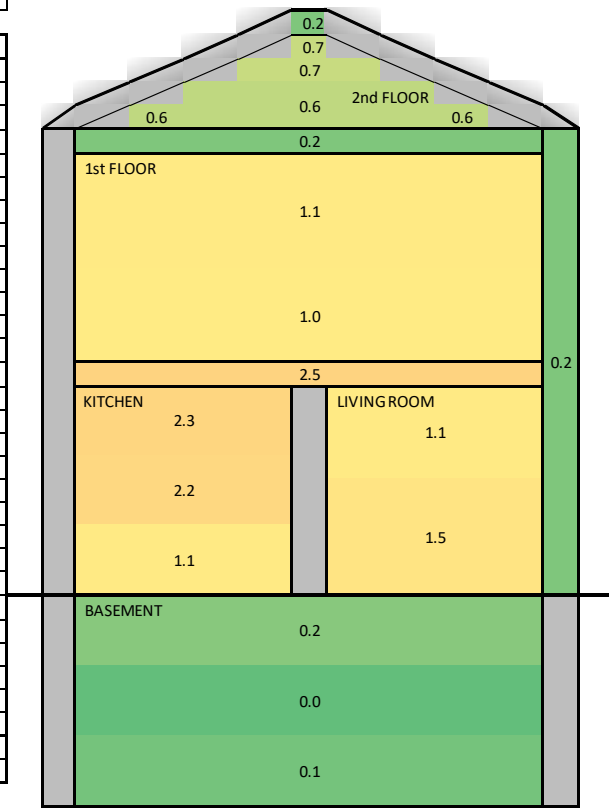
L2-076 RESULT

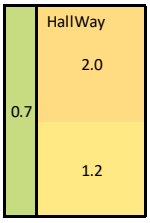
Hy4Heat WP7 Test Result

MTP ID: L2-076
Hole Size: 1.8 mm
Location: Undersink Cupboard
Gas: Hydrogen
Date: 10/21/19 **Time:** 15:50:30
Averaging Period Start: 240 min **End:** 250 min

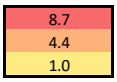
Notes:

Sensor	Average	Max	Min	STDEV	units
SP1LKV_1 K-High	2.3	2.3	2.3	0.0	%vol
SP2LKV_1 K-Mid	2.2	2.2	2.2	0.0	%vol
SP3LKV_1 Cup-Mid	4.4	4.5	4.4	0.0	%vol
SP4LKV_1 Cup-High-Front	8.1	8.1	8.0	0.0	%vol
SP5LKV_1 Cup-High-Back	9.4	9.4	9.4	0.0	%vol
SP6LKV_1 Cup-Low-Back	1.0	1.1	1.0	0.0	%vol
SP7LKV_1 K-Low	1.1	1.1	1.1	0.0	%vol
SP8LKV_1 LR-High	1.1	1.1	1.1	0.0	%vol
SP9LKV_1 LR-Mid	1.5	1.5	1.5	0.0	%vol
SP10LKV_1 H-High	2.0	2.0	2.0	0.0	%vol
SP11LKV_1 H-Mid	1.2	1.2	1.2	0.0	%vol
SP12LKV_1 FF-High	1.1	1.1	1.1	0.0	%vol
SP13LKV_1 FF-Mid	1.0	1.0	1.0	0.0	%vol
SP14LKV_1 AT-High	0.7	0.7	0.7	0.0	%vol
SP15LKV_1 AT-Mid	0.6	0.6	0.6	0.0	%vol
SP16LKV_1 BM-High	0.2	0.2	0.2	0.0	%vol
SP17LKV_1 BM-Mid	0.0	0.0	0.0	0.0	%vol
SP18LKV_1 BM-Low	0.1	0.1	0.1	0.0	%vol
SP19LKV_1 NWALL-Cav	0.2	0.2	0.2	0.0	%vol
SP20LKV_1 STUD-Cav	0.7	0.7	0.7	0.0	%vol
SP21LKV_1 FF-Void	2.5	2.5	2.5	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	0.0198	0.0203	0.0194	0.0002	barg
LOWFLOWMETER	0.0407	0.0415	0.0397	0.0006	g/s
LOWFLOWSLPM	30.8163	31.4520	30.1595	0.4058	g/s
OUTLET_TEMP	7.5	7.5	7.4	0.0	degC
Volume Flow Rate	27.5	28.0	26.8	0.4	SLPM
Energy Flow Rate	4.9	5.0	4.8	0.1	kW
External Wind Speed	1.9				m/s
External Wind Direction	256.2				bearing

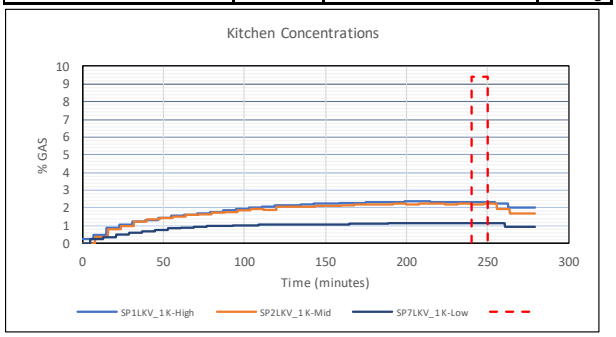


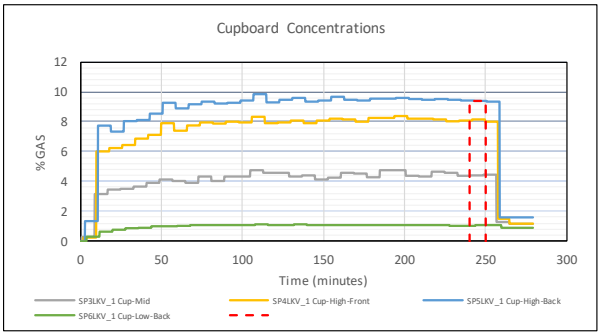


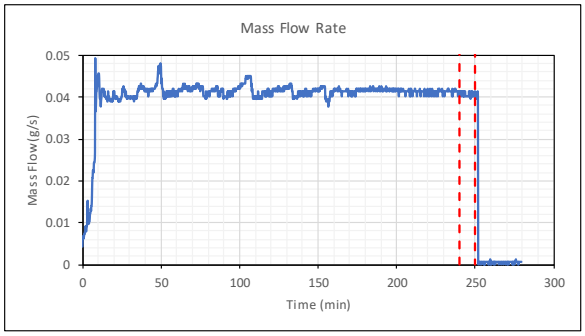
Hallway and Stud into Living Room



Cupboard (top is average of SP4 and SP5)







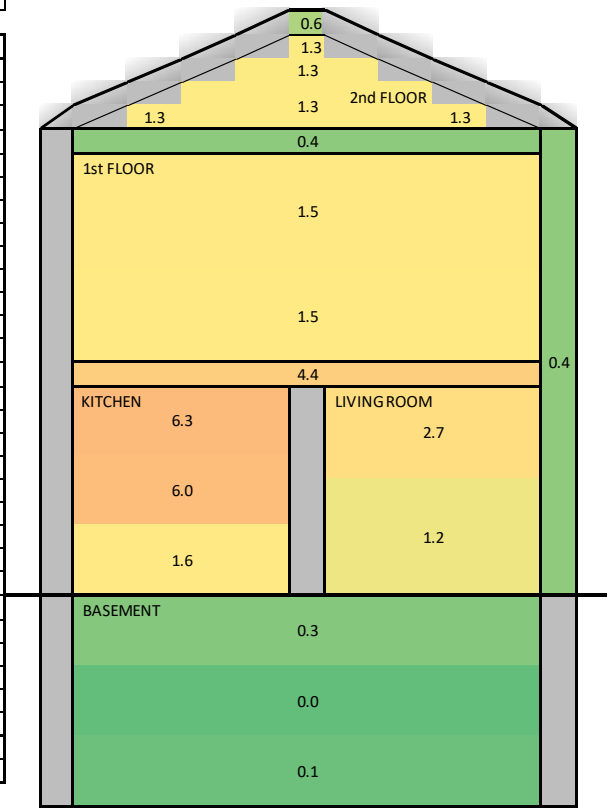
L2-077 RESULT

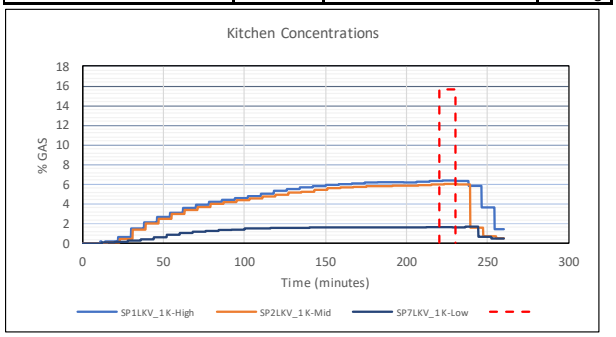
Hy4Heat WP7 Test Result

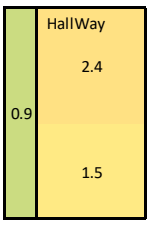
MTP ID: L2-077
Hole Size: 2.5 mm
Location: under-sink cupboard
Gas: Hydrogen
Date: 19/10/2019 **Time:** 08:40:10
Averaging Period Start: 220 min **End:** 230 min

Notes: SP17 removed

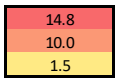
Sensor	Average	Max	Min	STDEV	units
SP1LKV_1 K-High	6.3	6.3	6.3	0.0	%vol
SP2LKV_1 K-Mid	6.0	6.0	6.0	0.0	%vol
SP3LKV_1 Cup-Mid	10.0	10.2	9.7	0.2	%vol
SP4LKV_1 Cup-High-Front	14.0	14.1	14.0	0.0	%vol
SP5LKV_1 Cup-High-Back	15.7	15.7	15.6	0.1	%vol
SP6LKV_1 Cup-Low-Back	1.5	1.5	1.5	0.0	%vol
SP7LKV_1 K-Low	1.6	1.6	1.6	0.0	%vol
SP8LKV_2 LR-High	2.7	2.7	2.6	0.0	%vol
SP9LKV_2 LR-Mid	1.2	1.2	1.1	0.0	%vol
SP10LKV_2 H-High	2.4	2.4	2.4	0.0	%vol
SP11LKV_2 H-Mid	1.5	1.5	1.5	0.0	%vol
SP12LKV_2 FF-High	1.5	1.5	1.5	0.0	%vol
SP13LKV_2 FF-Mid	1.5	1.5	1.5	0.0	%vol
SP14LKV_2 AT-High	1.3	1.3	1.3	0.0	%vol
SP15LKV_2 AT-Mid	1.3	1.3	1.2	0.0	%vol
SP16LKV_2 BM-High	0.3	0.3	0.3	0.0	%vol
SP17LKV_2 BM-Mid					%vol
SP18LKV_1 BM-Low	0.1	0.1	0.1	0.0	%vol
SP19LKV_1 NWALL-Cav	0.4	0.5	0.3	0.1	%vol
SP20LKV_1 STUD-Cav	0.9	0.9	0.8	0.0	%vol
SP21LKV_1 FF-Void	4.4	4.4	4.3	0.0	%vol
SP22LKV_1 SF-Void	0.4	0.4	0.3	0.1	%vol
SP23LKV_1 ROOF-Void	0.6	0.7	0.5	0.1	%vol
RELEASEPRESSURE	0.0193	0.0196	0.0187	0.0002	barg
LOWFLOWMETER	0.0743	0.0751	0.0726	0.0005	g/s
0	#DIV/0!	0.0000	0.0000	#DIV/0!	g/s
OUTLET_TEMP	8.5	8.8	8.3	0.2	degC
Volume Flow Rate	50.2	50.7	49.0	0.3	SLPM
Energy Flow Rate	8.9	9.0	8.7	0.1	kW
External Wind Speed	0.4				m/s
External Wind Direction	296.3				bearing



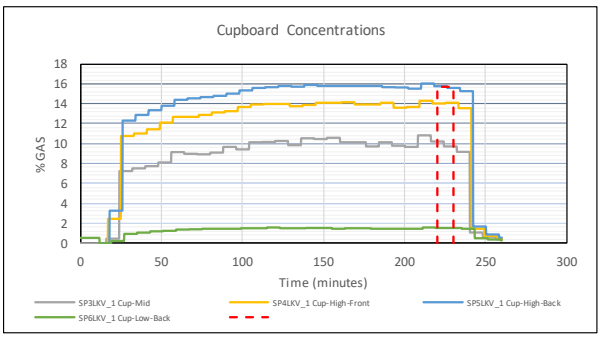


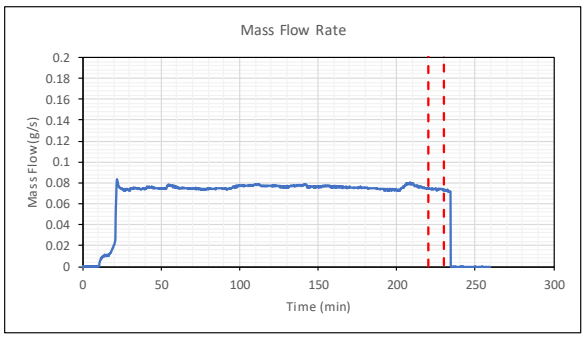


Hallway and Stud into Living Room



Cupboard (top is average of SP4 and SP5)





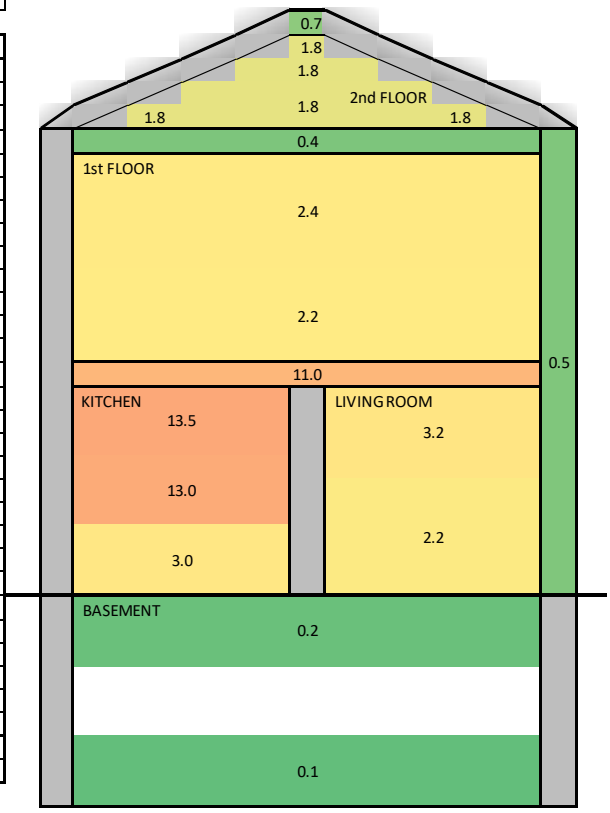
L2-078 RESULT

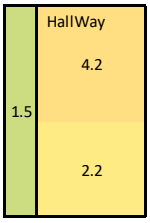
Hy4Heat WP7 Test Result

MTP ID: L2-078
Hole Size: 3.6 mm
Location: Undersick Cupboard
Gas: Hydrogen
Date: 17/10/2019 **Time:** 21:30:00
Averaging Period Start: 170 min **End:** 180 min

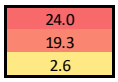
Notes: SP17 removed

Sensor	Average	Max	Min	STDEV	units
SP1LKV_1 K-High	13.5	13.5	13.4	0.1	%vol
SP2LKV_1 K-Mid	13.0	13.1	13.0	0.0	%vol
SP3LKV_1 Cup-Mid	19.3	19.4	19.1	0.1	%vol
SP4LKV_1 Cup-High-Front	22.8	22.8	22.8	0.0	%vol
SP5LKV_1 Cup-High-Back	25.3	25.3	25.1	0.1	%vol
SP6LKV_1 Cup-Low-Back	2.6	2.6	2.5	0.1	%vol
SP7LKV_1 K-Low	3.0	3.1	3.0	0.0	%vol
SP8LKV_1 LR-High	3.2	3.2	3.2	0.0	%vol
SP9LKV_1 LR-Mid	2.2	2.2	2.1	0.1	%vol
SP10LKV_1 H-High	4.2	4.3	4.2	0.1	%vol
SP11LKV_1 H-Mid	2.2	2.3	2.2	0.0	%vol
SP12LKV_1 FF-High	2.4	2.5	2.3	0.1	%vol
SP13LKV_1 FF-Mid	2.2	2.3	2.2	0.0	%vol
SP14LKV_1 AT-High	1.8	2.0	1.7	0.1	%vol
SP15LKV_1 AT-Mid	1.8	1.9	1.8	0.0	%vol
SP16LKV_1 BM-High	0.2	0.2	0.2	0.0	%vol
SP17LKV_1 BM-Mid					%vol
SP18LKV_1 BM-Low	0.1	0.1	0.1	0.0	%vol
SP19LKV_1 NWALL-Cav	0.5	0.5	0.5	0.0	%vol
SP20LKV_1 STUD-Cav	1.5	1.5	1.5	0.0	%vol
SP21LKV_1 FF-Void	11.0	11.0	10.8	0.0	%vol
SP22LKV_1 SF-Void	0.4	0.5	0.3	0.1	%vol
SP23LKV_1 ROOF-Void	0.7	0.7	0.6	0.1	%vol
RELEASEPRESSURE	0.0229	0.0233	0.0225	0.0002	barg
LOWFLOWMETER	0.1656	0.1672	0.1654	0.0005	g/s
0	#DIV/0!	0.0000	0.0000	#DIV/0!	g/s
OUTLET_TEMP	7.7	7.7	7.6	0.0	degC
Volume Flow Rate	111.8	112.9	111.6	0.3	SLPM
Energy Flow Rate	19.9	20.1	19.8	0.1	kW
External Wind Speed	0.0				m/s
External Wind Direction	170.5				bearing

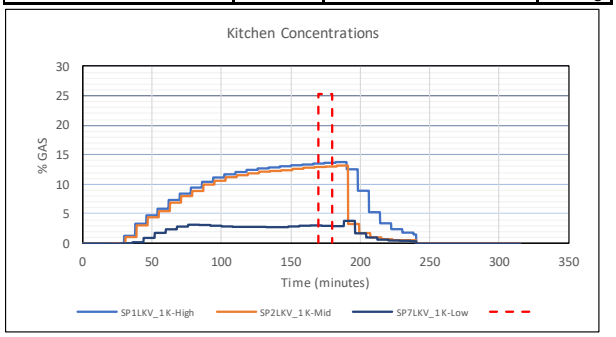


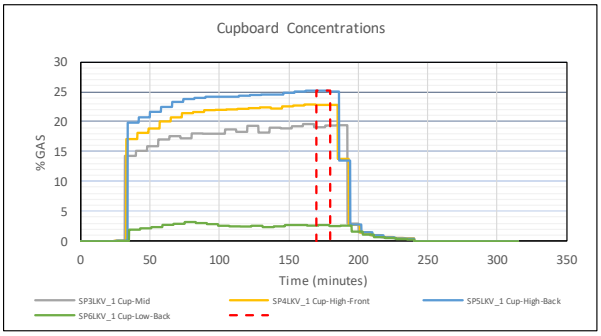


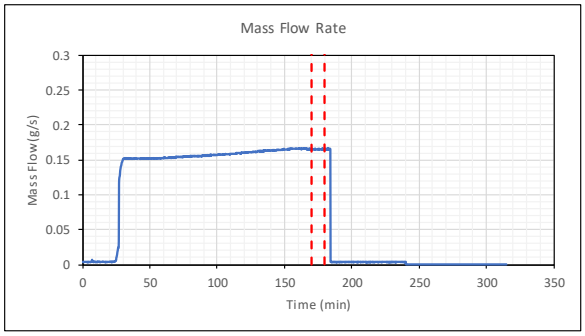
Hallway and Stud into Living Room



Cupboard (top is average of SP4 and SP5)







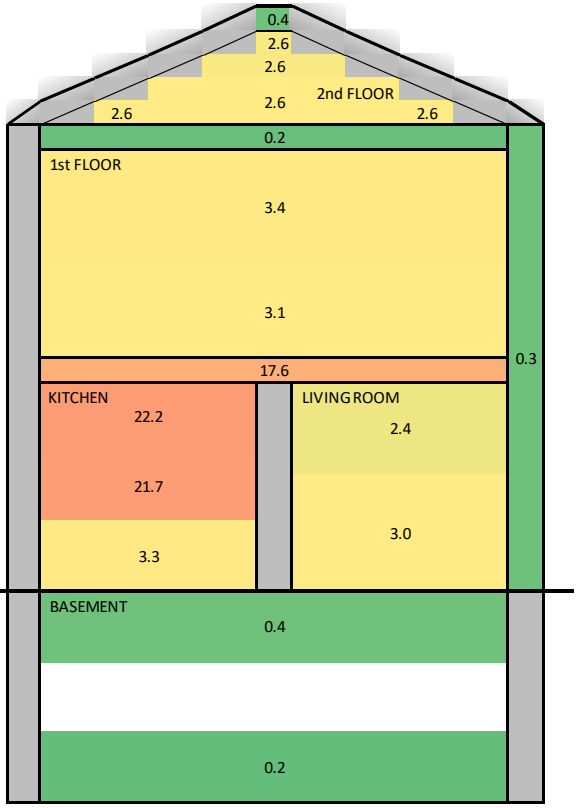
L2-079 RESULT

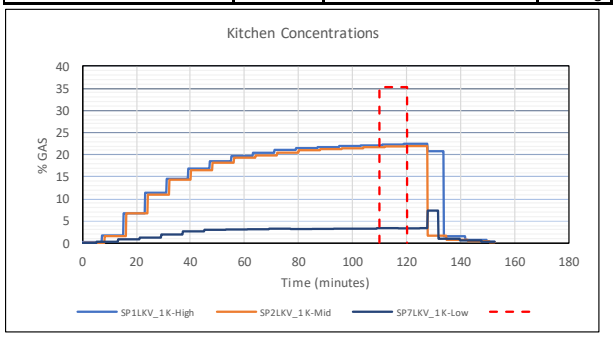
Hy4Heat WP7 Test Result

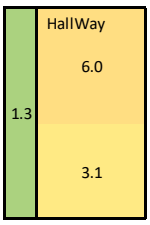
MTP ID: L2-079
Hole Size: 5.1 mm
Location: undersink cupboard
Gas: hydrogen
Date: 22/10/2019 **Time:** 21:30:00
Averaging Period Start: 110 min **End:** 120 min

Notes:

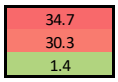
Sensor	Average	Max	Min	STDEV	units
SP1LKV_1 K-High	22.2	22.4	22.0	0.1	%vol
SP2LKV_1 K-Mid	21.7	21.8	21.6	0.1	%vol
SP3LKV_1 Cup-Mid	30.3	30.6	29.6	0.4	%vol
SP4LKV_1 Cup-High-Front	34.1	34.2	34.0	0.1	%vol
SP5LKV_1 Cup-High-Back	35.3	35.3	35.2	0.1	%vol
SP6LKV_1 Cup-Low-Back	1.4	1.5	1.3	0.1	%vol
SP7LKV_1 K-Low	3.3	3.4	3.3	0.0	%vol
SP8LKV_1 LR-High	2.4	2.5	2.2	0.1	%vol
SP9LKV_1 LR-Mid	3.0	3.1	2.8	0.1	%vol
SP10LKV_1 H-High	6.0	6.0	5.9	0.0	%vol
SP11LKV_1 H-Mid	3.1	3.1	3.0	0.1	%vol
SP12LKV_1 FF-High	3.4	3.4	3.3	0.0	%vol
SP13LKV_1 FF-Mid	3.1	3.2	3.0	0.1	%vol
SP14LKV_1 AT-High	2.6	2.7	2.5	0.1	%vol
SP15LKV_1 AT-Mid	2.6	2.8	2.6	0.1	%vol
SP16LKV_1 BM-High	0.4	0.4	0.4	0.0	%vol
SP17LKV_1 BM-Mid					%vol
SP18LKV_1 BM-Low	0.2	0.2	0.2	0.0	%vol
SP19LKV_1 NWALL-Cav	0.3	0.3	0.3	0.0	%vol
SP20LKV_1 STUD-Cav	1.3	1.3	1.3	0.0	%vol
SP21LKV_1 FF-Void	17.6	17.7	17.4	0.1	%vol
SP22LKV_1 SF-Void	0.2	0.3	0.2	0.0	%vol
SP23LKV_1 ROOF-Void	0.4	0.4	0.3	0.0	%vol
RELEASEPRESSURE	0.0201	0.0206	0.0196	0.0002	barg
LOWFLOWMETER	0.3417	0.3430	0.3400	0.0010	g/s
OUTLET_TEMP	9.4	9.5	9.3	0.0	degC
Volume Flow Rate	230.6	231.5	229.5	0.7	SLPM
Energy Flow Rate	41.0	41.1	40.8	0.1	kW
External Wind Speed	1.2				m/s
External Wind Direction	267.5				bearing



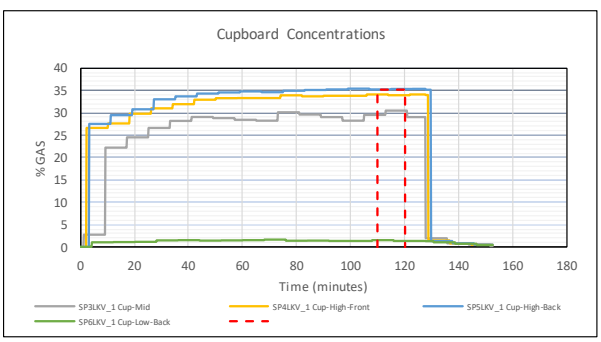


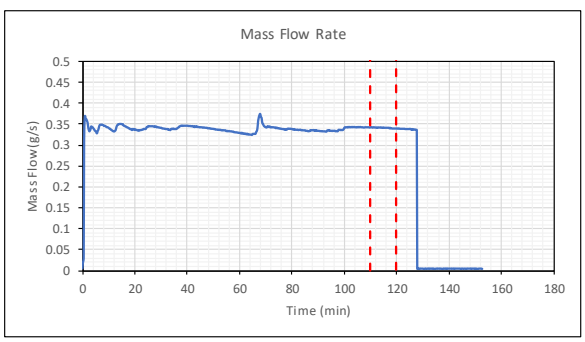


Hallway and Stud into Living Room



Cupboard (top is average of SP4 and SP5)





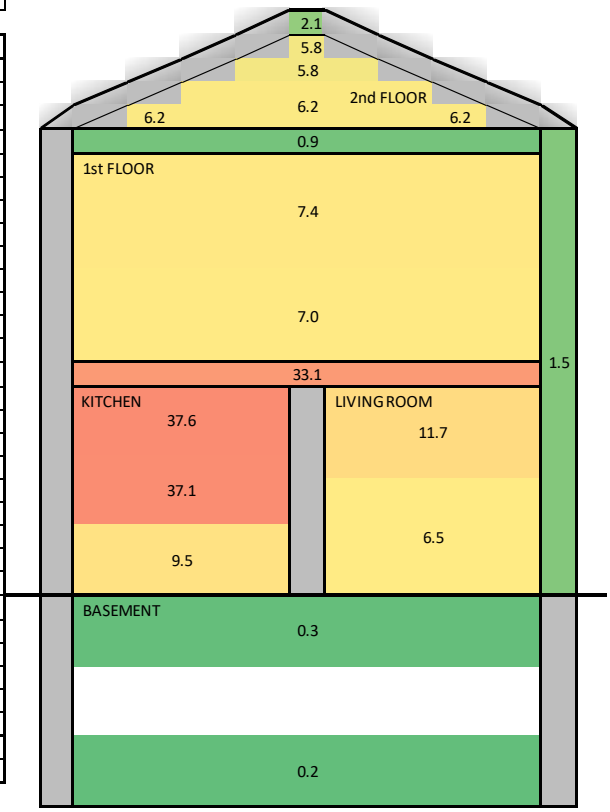
L2-080 RESULT

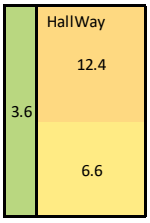
Hy4Heat WP7 Test Result

MTP ID: L2-080
Hole Size: 7.2 mm
Location: undersink cupboard
Gas: hydrogen
Date: 18/10/2019 **Time:** 19:56:00
Averaging Period Start: 80 min **End:** 90 min

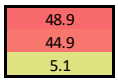
Notes: SP17 removed

Sensor	Average	Max	Min	STDEV	units
SP1LKV_1 K-High	37.6	37.7	37.5	0.1	%vol
SP2LKV_1 K-Mid	37.1	37.4	37.0	0.2	%vol
SP3LKV_1 Cup-Mid	44.9	45.4	44.4	0.3	%vol
SP4LKV_1 Cup-High-Front	47.6	48.3	47.0	0.3	%vol
SP5LKV_1 Cup-High-Back	50.1	50.2	50.0	0.1	%vol
SP6LKV_1 Cup-Low-Back	5.1	5.2	5.0	0.1	%vol
SP7LKV_1 K-Low	9.5	9.7	9.2	0.2	%vol
SP8LKV_1 LR-High	11.7	11.9	11.5	0.2	%vol
SP9LKV_1 LR-Mid	6.5	6.8	6.3	0.2	%vol
SP10LKV_1 H-High	12.4	12.8	12.3	0.2	%vol
SP11LKV_1 H-Mid	6.6	7.0	6.0	0.2	%vol
SP12LKV_1 FF-High	7.4	7.8	6.9	0.2	%vol
SP13LKV_1 FF-Mid	7.0	7.1	6.6	0.2	%vol
SP14LKV_1 AT-High	5.8	6.0	5.6	0.2	%vol
SP15LKV_1 AT-Mid	6.2	6.3	6.0	0.2	%vol
SP16LKV_1 BM-High	0.3	0.3	0.3	0.0	%vol
SP17LKV_1 BM-Mid					%vol
SP18LKV_1 BM-Low	0.2	0.2	0.2	0.0	%vol
SP19LKV_1 NWALL-Cav	1.5	1.5	1.5	0.0	%vol
SP20LKV_1 STUD-Cav	3.6	3.8	3.4	0.1	%vol
SP21LKV_1 FF-Void	33.1	33.2	33.1	0.0	%vol
SP22LKV_1 SF-Void	0.9	0.9	0.9	0.0	%vol
SP23LKV_1 ROOF-Void	2.1	2.2	2.0	0.1	%vol
RELEASEPRESSURE	0.0208	0.0221	0.0199	0.0007	barg
LOWFLOWMETER	0.7314	0.7459	0.7178	0.0093	g/s
OUTLET_TEMP	13.2	13.6	12.8	0.2	degC
Volume Flow Rate	493.6	503.4	484.5	6.3	SLPM
Energy Flow Rate	87.7	89.4	86.1	1.1	kW
External Wind Speed	2.1				m/s
External Wind Direction	135.0				bearing

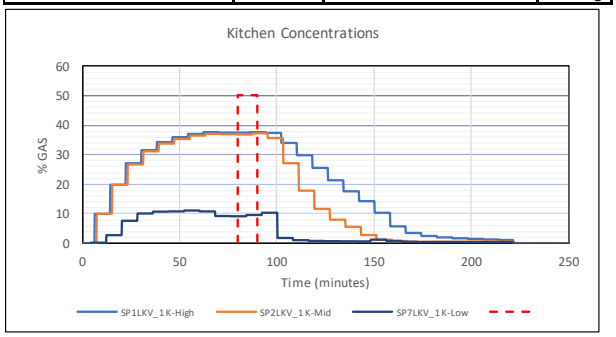


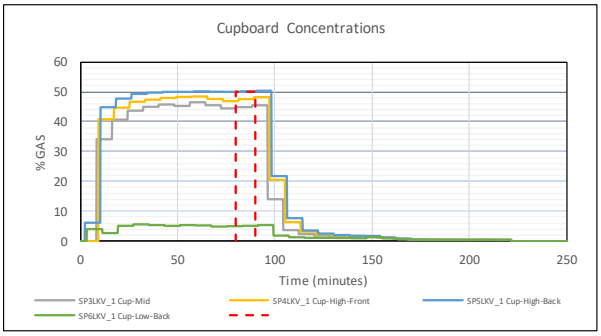


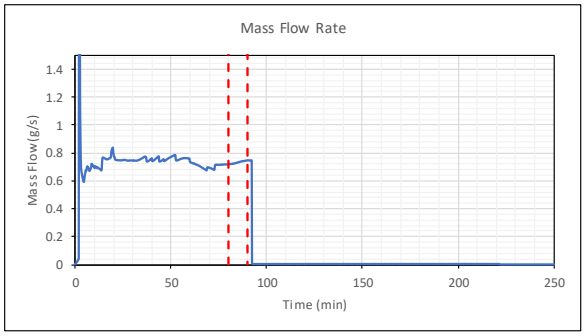
Hallway and Stud into Living Room



Cupboard (top is average of SP4 and SP5)







APPENDIX B: PHASE 2 RESULTS

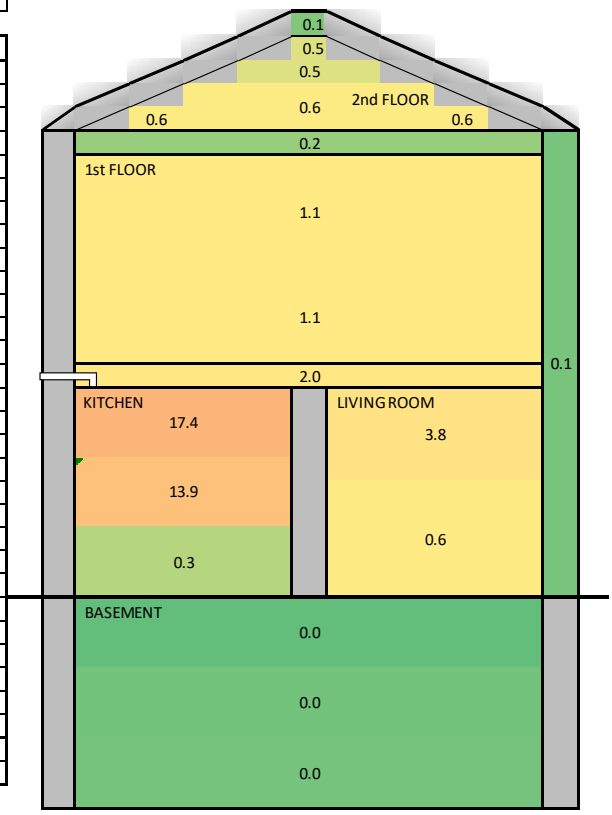
L2-A1 RESULT

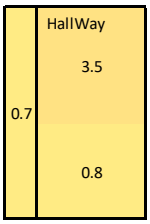
Hy4Heat WP7 Test Result

MTP ID: L2-A1
Hole Size: 7.2 mm
kitchen base cupboard with 100cm2 ceiling vent, no
Location: cupboard vents
Gas: hydrogen
Date: 20/04/2020 **Time:** 09:37:00
Averaging Period Start: 75 min **End:** 85 min

Notes: Similar test with no vents gave ~30% conc. in kitchen high point

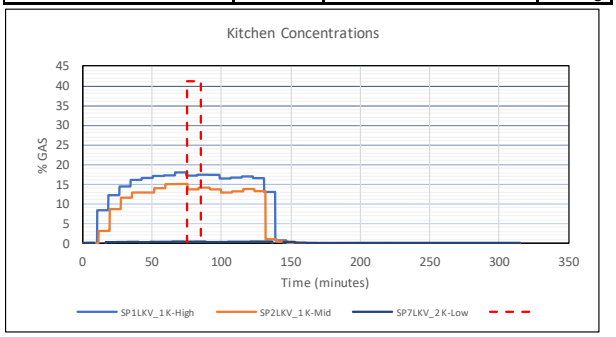
Sensor	Average	Max	Min	STDEV	units
SP1LKV_1 K-High	17.4	17.5	17.3	0.1	%vol
SP2LKV_1 K-Mid	13.9	15.1	13.7	0.4	%vol
SP3LKV_1 Cup-high-back	35.9	36.0	35.3	0.1	%vol
SP4LKV_1 Cup-High-Front	35.4	35.4	35.4	0.0	%vol
SP5LKV_1 cup-low	37.2	37.2	37.2	0.0	%vol
SP6LKV_1 cup-mid	41.2	41.3	41.1	0.1	%vol
SP7LKV_2 K-Low	0.3	0.3	0.3	0.0	%vol
SP8LKV_2 LR-High	3.8	3.8	3.7	0.0	%vol
SP9LKV_1 LR-Mid	0.6	0.7	0.6	0.0	%vol
SP10LKV_2 H-High	3.5	3.6	3.3	0.1	%vol
SP11LKV_2 H-Mid	0.8	0.9	0.7	0.0	%vol
SP12LKV_2 FF-High	1.1	1.2	1.1	0.0	%vol
SP13LKV_2 FF-Mid	1.1	1.1	1.0	0.0	%vol
SP14LKV_2 AT-High	0.5	0.5	0.5	0.0	%vol
SP15LKV_2 AT-Mid	0.6	0.6	0.6	0.0	%vol
SP16LKV_2 BM-High	0.0	0.0	0.0	0.0	%vol
SP17LKV_2 BM-Mid	0.0	0.0	0.0	0.0	%vol
SP18LKV_2 BM-Low	0.0	0.0	0.0	0.0	%vol
SP19LKV_2 NWALL-Cav	0.1	0.1	0.0	0.0	%vol
SP20LKV_2 STUD-Cav	0.7	0.7	0.6	0.0	%vol
SP21LKV_2 FF-Void	2.0	2.1	1.9	0.1	%vol
SP22LKV_2 SF-Void	0.2	0.2	0.2	0.0	%vol
SP23LKV_2 ROOF-Void	0.1	0.1	0.1	0.0	%vol
RELEASEPRESSURE	0.0230	0.025	0.021	0.001	barg
LOWFLOWMETER	0.4923	0.521	0.486	0.007	g/s
OUTLET_TEMP	17.0	17.1	16.9	0.1	degC
Volume Flow Rate	332.2	351.9	328.0	4.8	SLPM
Energy Flow Rate	59.0	62.5	58.3	0.9	kW
External Wind Speed	4.9				m/s
External Wind Direction	74.2				bearing

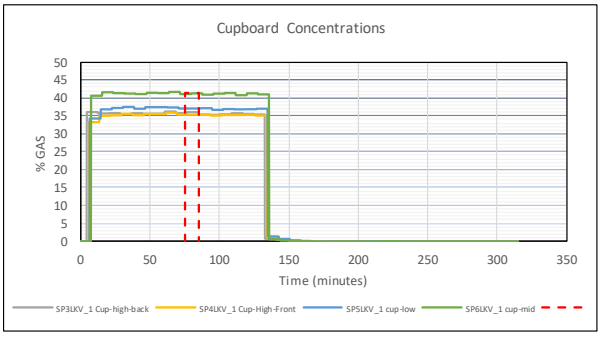


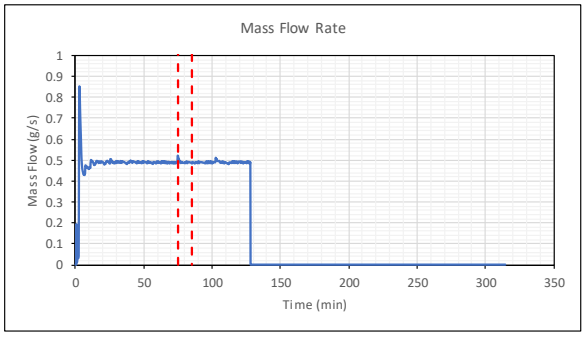


Hallway and Stud into Living Room

35.7
41.2
37.2







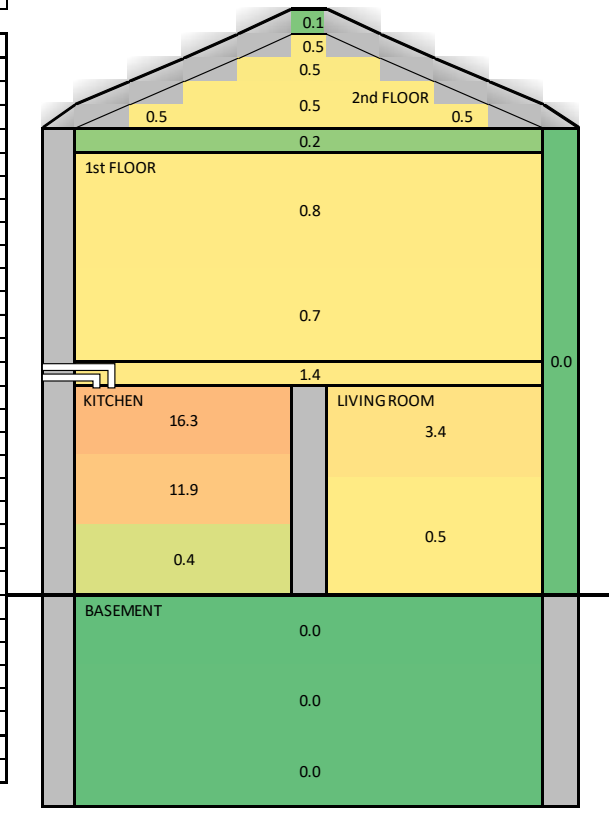
L2-A2 RESULT

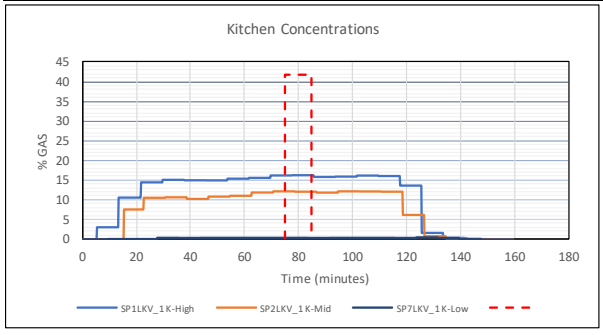
Hy4Heat WP7 Test Result

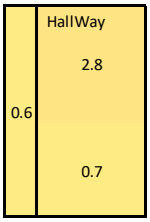
MTP ID: L2-A2
Hole Size: 7.2 mm
kitchen base cupboard with 200cm2 ceiling vent, no
Location: cupboard vents
Gas: hydrogen
Date: 20/04/2020 **Time:** 06:35:00
Averaging Period Start: 75 min **End:** 85 min

Notes: Similar no-vent test showed ~30% conc. at kitchen high point

Sensor	Average	Max	Min	STDEV	units
SP1LKV_1 K-High	16.3	16.3	16.2	0.0	%vol
SP2LKV_1 K-Mid	11.9	12.0	11.9	0.0	%vol
SP3LKV_1 Cup-high-back	36.4	36.4	36.4	0.0	%vol
SP4LKV_1 Cup-High-Front	36.2	36.3	36.0	0.1	%vol
SP5LKV_1 cup-low	37.9	38.0	37.6	0.2	%vol
SP6LKV_1 cup-mid	41.8	41.9	41.7	0.1	%vol
SP7LKV_1 K-Low	0.4	0.4	0.4	0.0	%vol
SP8LKV_2 LR-High	3.4	3.4	3.3	0.0	%vol
SP9LKV_1 LR-Mid	0.5	0.5	0.4	0.0	%vol
SP10LKV_2 H-High	2.8	2.8	2.8	0.0	%vol
SP11LKV_2 H-Mid	0.7	0.7	0.7	0.0	%vol
SP12LKV_2 FF-High	0.8	0.8	0.8	0.0	%vol
SP13LKV_2 FF-Mid	0.7	0.8	0.7	0.0	%vol
SP14LKV_2 AT-High	0.5	0.5	0.5	0.0	%vol
SP15LKV_2 AT-Mid	0.5	0.5	0.4	0.0	%vol
SP16LKV_2 BM-High	0.0	0.0	0.0	0.0	%vol
SP17LKV_2 BM-Mid	0.0	0.0	0.0	0.0	%vol
SP18LKV_2 BM-Low	0.0	0.0	0.0	0.0	%vol
SP19LKV_2 NWALL-Cav	0.0	0.0	0.0	0.0	%vol
SP20LKV_2 STUD-Cav	0.6	0.7	0.6	0.0	%vol
SP21LKV_2 FF-Void	1.4	1.4	1.4	0.0	%vol
SP22LKV_2 SF-Void	0.2	0.2	0.1	0.0	%vol
SP23LKV_2 ROOF-Void	0.1	0.1	0.1	0.0	%vol
RELEASEPRESSURE	0.0117	0.013	0.011	0.000	barg
LOWFLOWMETER	0.4998	0.504	0.494	0.003	g/s
					degC
OUTLET_TEMP	7.6	7.8	7.4	0.1	degC
Volume Flow Rate	337.4	339.9	333.3	1.7	SLPM
Energy Flow Rate	59.9	60.4	59.2	0.3	kW
External Wind Speed	4.4				m/s
External Wind Direction	72.9				bearing

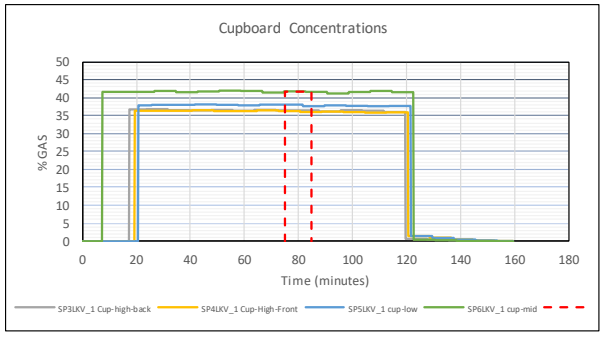


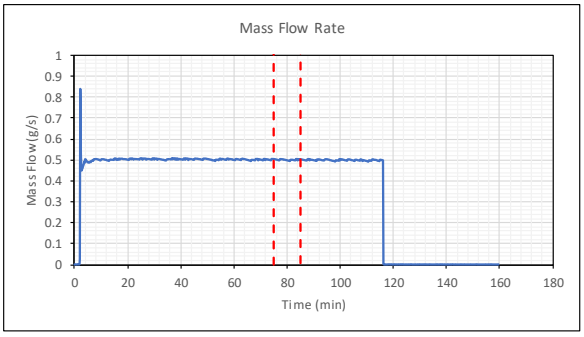




Hallway and Stud into Living Room

36.3
41.8
37.9





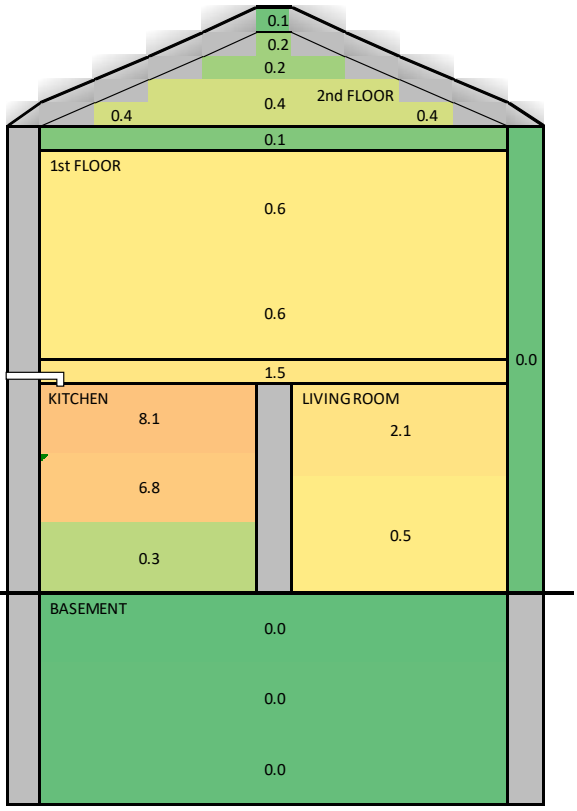
L2-A3 RESULT

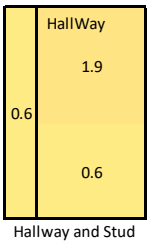
Hy4Heat WP7 Test Result

MTP ID: L2-A3
Hole Size: 5.1 mm
Location: kitchen base cupboard with 100cm2 ceiling vent, with cupboard vents
Gas: hydrogen
Date: 18/04/2020 **Time:** 09:08:00
Averaging Period Start: 100 min **End:** 120 min

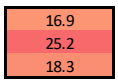
Notes: Similar flow rate, no-vent case registered ~22% conc. at kitchen high point

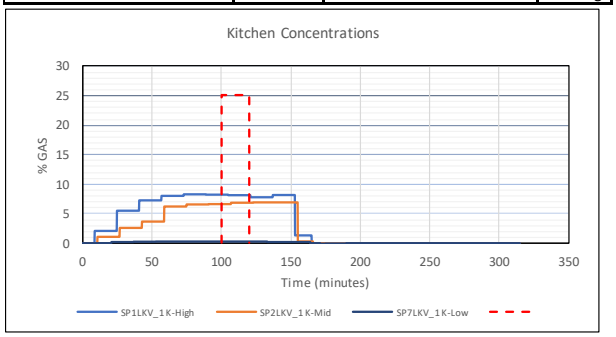
Sensor	Average	Max	Min	STDEV	units
SP1LKV_1 K-High	8.1	8.2	8.1	0.0	%vol
SP2LKV_1 K-Mid	6.8	6.9	6.7	0.1	%vol
SP3LKV_1 Cup-high-back	16.7	16.8	16.6	0.1	%vol
SP4LKV_1 Cup-High-Front	17.1	17.3	16.9	0.2	%vol
SP5LKV_1 cup-low	18.3	18.3	18.3	0.0	%vol
SP6LKV_1 cup-mid	25.2	25.2	25.0	0.1	%vol
SP7LKV_1 K-Low	0.3	0.3	0.3	0.0	%vol
SP8LKV_2 LR-High	2.1	2.2	2.0	0.0	%vol
SP9LKV_1 LR-Mid	0.5	0.5	0.4	0.0	%vol
SP10LKV_2 H-High	1.9	1.9	1.8	0.0	%vol
SP11LKV_2 H-Mid	0.6	0.6	0.5	0.0	%vol
SP12LKV_2 FF-High	0.6	0.6	0.6	0.0	%vol
SP13LKV_2 FF-Mid	0.6	0.6	0.5	0.0	%vol
SP14LKV_2 AT-High	0.2	0.2	0.2	0.0	%vol
SP15LKV_2 AT-Mid	0.4	0.4	0.3	0.0	%vol
SP16LKV_2 BM-High	0.0	0.0	0.0	0.0	%vol
SP17LKV_2 BM-Mid	0.0	0.0	0.0	0.0	%vol
SP18LKV_2 BM-Low	0.0	0.0	0.0	0.0	%vol
SP19LKV_2 NWALL-Cav	0.0	0.0	0.0	0.0	%vol
SP20LKV_2 STUD-Cav	0.6	0.6	0.5	0.0	%vol
SP21LKV_2 FF-Void	1.5	1.5	1.5	0.0	%vol
SP22LKV_2 SF-Void	0.1	0.1	0.1	0.0	%vol
SP23LKV_2 ROOF-Void	0.1	0.1	0.0	0.0	%vol
RELEASEPRESSURE	0.0222	0.025	0.019	0.001	barg
LOWFLOWMETER	0.2298	0.233	0.227	0.001	g/s
OUTLET_TEMP	12.5	13.1	12.1	0.3	degC
Volume Flow Rate	155.1	157.2	153.1	1.0	SLPM
Energy Flow Rate	27.6	27.9	27.2	0.2	kW
External Wind Speed	4.2				m/s
External Wind Direction	65.3				bearing

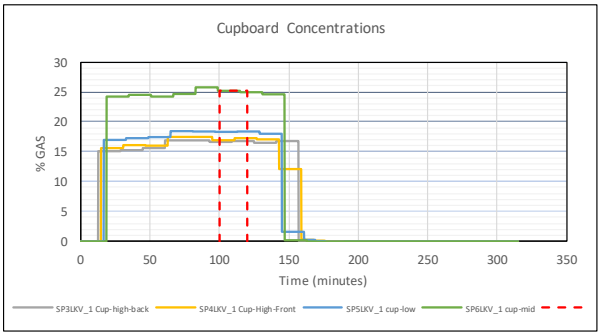


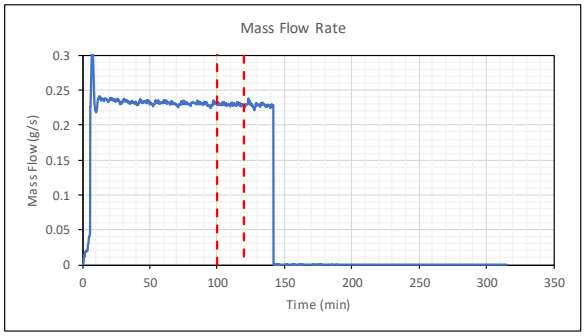


Hallway and Stud into Living Room









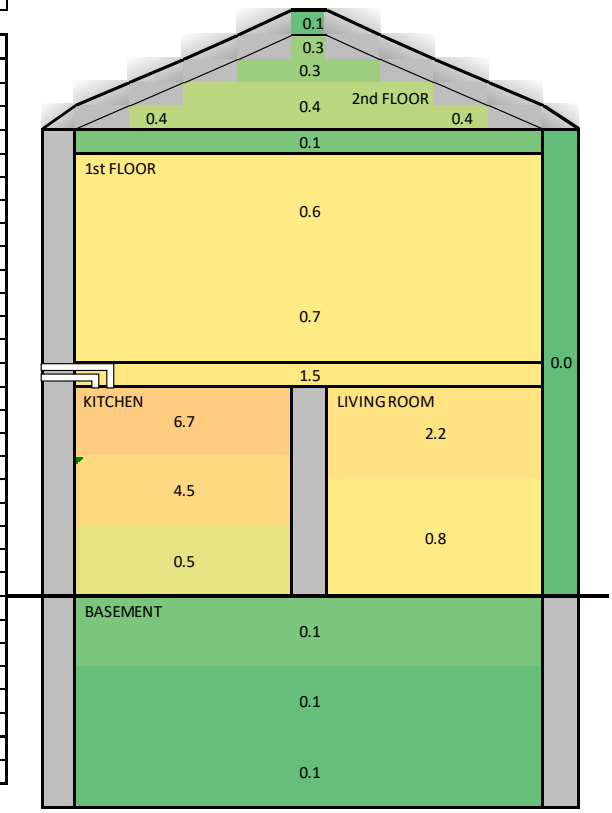
L2-A4 RESULT

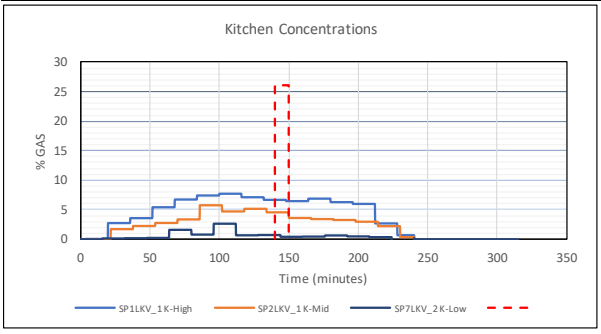
Hy4Heat WP7 Test Result

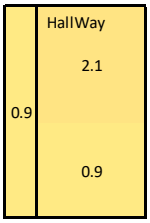
MTP ID: L2-A4
Hole Size: 5.1 mm
Location: kitchen base cupboard with 200cm2 ceiling vent, with cupboard vents
Gas: hydrogen
Date: 19/04/2020 **Time:** 12:15:00
Averaging Period Start: 140 min **End:** 150 min

Notes: Similar flow rate, no-vent test showed ~22% conc. at kitchen high point

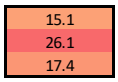
Sensor	Average	Max	Min	STDEV	units
SP1LKV_1 K-High	6.7	6.7	6.5	0.1	%vol
SP2LKV_1 K-Mid	4.5	4.6	3.6	0.1	%vol
SP3LKV_1 Cup-high-back	16.8	16.8	16.8	0.0	%vol
SP4LKV_1 Cup-High-Front	13.5	13.5	13.5	0.0	%vol
SP5LKV_1 cup-low	17.4	17.4	17.4	0.0	%vol
SP6LKV_1 cup-mid	26.1	26.5	26.0	0.2	%vol
SP7LKV_2 K-Low	0.5	0.7	0.4	0.1	%vol
SP8LKV_2 LR-High	2.2	2.3	2.2	0.0	%vol
SP9LKV_1 LR-Mid	0.8	0.8	0.8	0.0	%vol
SP10LKV_2 H-High	2.1	2.1	2.1	0.0	%vol
SP11LKV_2 H-Mid	0.9	0.9	0.9	0.0	%vol
SP12LKV_2 FF-High	0.6	0.6	0.6	0.0	%vol
SP13LKV_2 FF-Mid	0.7	0.7	0.7	0.0	%vol
SP14LKV_2 AT-High	0.3	0.3	0.2	0.0	%vol
SP15LKV_2 AT-Mid	0.4	0.4	0.4	0.0	%vol
SP16LKV_2 BM-High	0.1	0.1	0.1	0.0	%vol
SP17LKV_2 BM-Mid	0.1	0.1	0.0	0.0	%vol
SP18LKV_2 BM-Low	0.1	0.1	0.0	0.0	%vol
SP19LKV_2 NWALL-Cav	0.0	0.0	0.0	0.0	%vol
SP20LKV_2 STUD-Cav	0.9	0.9	0.9	0.0	%vol
SP21LKV_2 FF-Void	1.5	1.5	1.5	0.0	%vol
SP22LKV_2 SF-Void	0.1	0.1	0.1	0.0	%vol
SP23LKV_2 ROOF-Void	0.1	0.1	0.1	0.0	%vol
OUTLET_PRESSURE	0.0208	0.0235	0.0186	0.0012	barg
LOWFLOWMETER	0.2277	0.2353	0.2225	0.0025	g/s
OUTLET_TEMP	20.9	21.1	20.9	0.1	degC
Volume Flow Rate	153.7	158.8	150.2	1.7	SLPM
Energy Flow Rate	27.3	28.2	26.7	0.3	kW
External Wind Speed	4.6				m/s
External Wind Direction	86.3				bearing

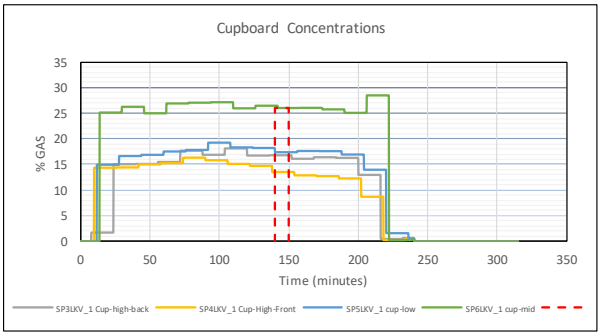


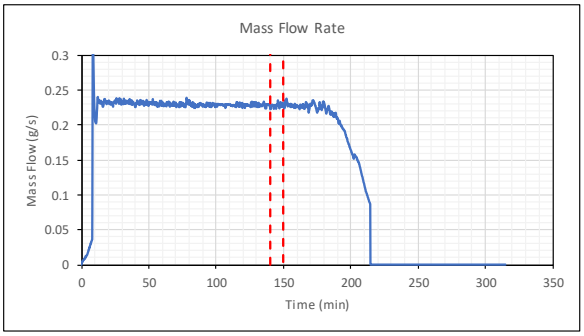




Hallway and Stud into Living Room







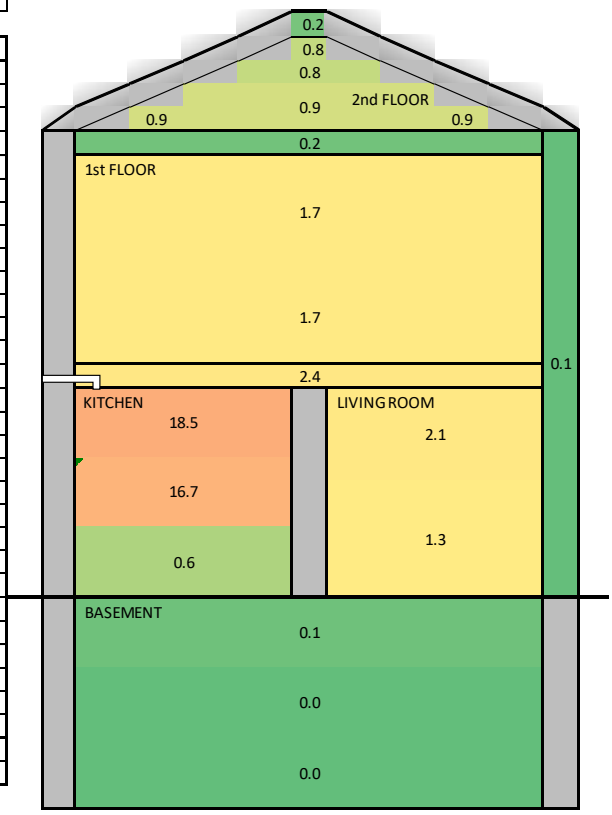
L2-A5 RESULT

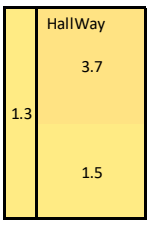
Hy4Heat WP7 Test Result

MTP ID: L2-A5
Hole Size: 7.2 mm
Location: kitchen base cupboard with 100cm2 ceiling vent, with cupboard vents
Gas: hydrogen
Date: 18/04/2020 **Time:** 12:25:00
Averaging Period Start: 80 min **End:** 100 min

Notes: Similar configuration (L2-064C) without ceiling vent registered ~28% at high point in kitchen

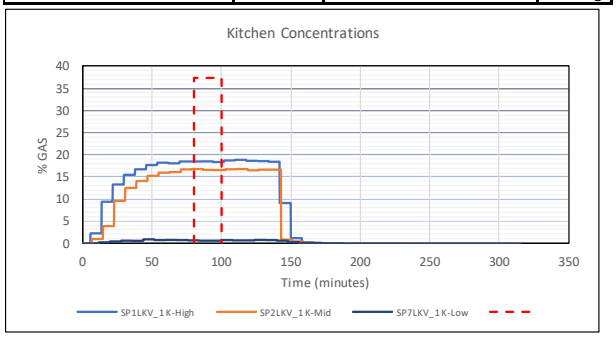
Sensor	Average	Max	Min	STDEV	units
SP1LKV_1 K-High	18.5	18.6	18.4	0.1	%vol
SP2LKV_1 K-Mid	16.7	16.9	16.6	0.1	%vol
SP3LKV_1 Cup-high-back	27.8	27.9	27.6	0.1	%vol
SP4LKV_1 Cup-High-Front	28.5	28.8	28.4	0.1	%vol
SP5LKV_1 cup-low	30.4	30.5	30.4	0.0	%vol
SP6LKV_1 cup-mid	37.4	38.1	37.2	0.3	%vol
SP7LKV_1 K-Low	0.6	0.7	0.6	0.0	%vol
SP8LKV_1 LR-High	2.1	2.1	2.1	0.0	%vol
SP9LKV_1 LR-Mid	1.3	1.4	1.2	0.1	%vol
SP10LKV_1 H-High	3.7	3.8	3.6	0.1	%vol
SP11LKV_2 H-Mid	1.5	1.6	1.4	0.0	%vol
SP12LKV_2 FF-High	1.7	1.9	1.5	0.1	%vol
SP13LKV_2 FF-Mid	1.7	1.9	1.5	0.1	%vol
SP14LKV_2 AT-High	0.8	0.9	0.7	0.0	%vol
SP15LKV_2 AT-Mid	0.9	1.1	0.8	0.1	%vol
SP16LKV_1 BM-High	0.1	0.2	0.1	0.0	%vol
SP17LKV_2 BM-Mid	0.0	0.0	0.0	0.0	%vol
SP18LKV_2 BM-Low	0.0	0.0	0.0	0.0	%vol
SP19LKV_2 NWALL-Cav	0.1	0.1	0.0	0.0	%vol
SP20LKV_2 STUD-Cav	1.3	1.4	1.2	0.0	%vol
SP21LKV_2 FF-Void	2.4	2.6	2.2	0.2	%vol
SP22LKV_2 SF-Void	0.2	0.3	0.1	0.1	%vol
SP23LKV_2 ROOF-Void	0.2	0.3	0.2	0.1	%vol
OUTLET_PRESSURE	0.0455	0.048	0.044	0.001	barg
LOWFLOWMETER	0.4876	0.493	0.484	0.002	g/s
OUTLET_TEMP	16.3	17.7	14.9	0.9	degC
Volume Flow Rate	329.1	332.9	326.7	1.3	SLPM
Energy Flow Rate	58.5	59.1	58.0	0.2	kW
External Wind Speed	3.6				m/s
External Wind Direction	77.7				bearing

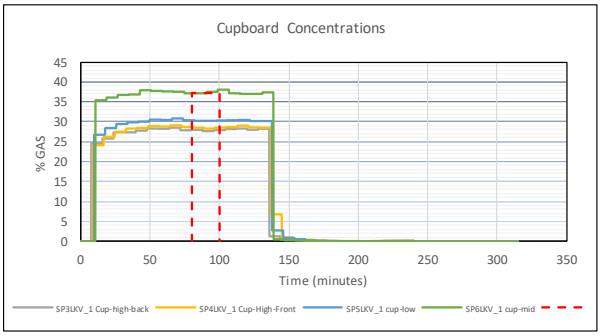


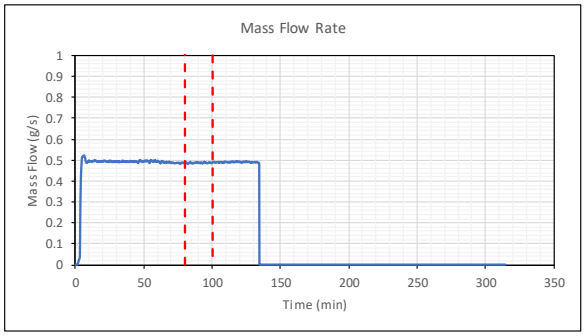


Hallway and Stud into Living Room

28.1
37.4
30.4







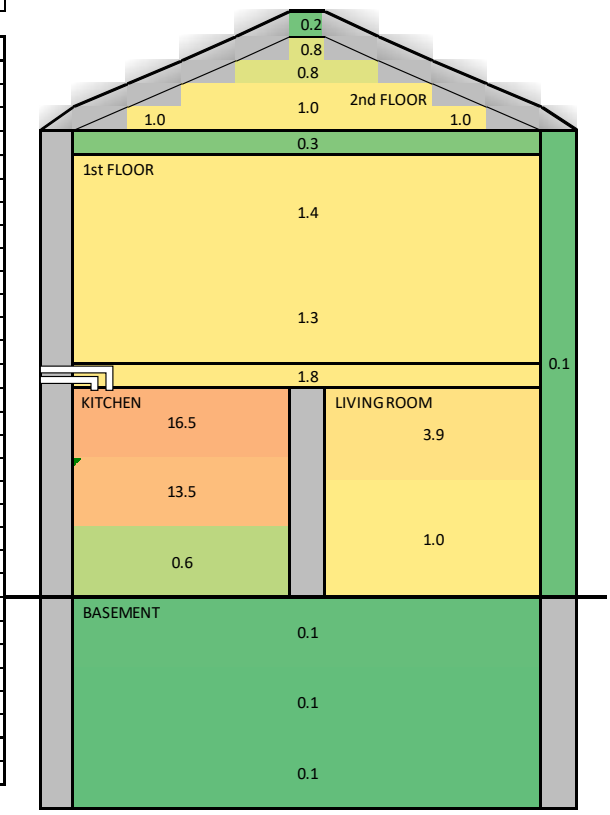
L2-A6 RESULT

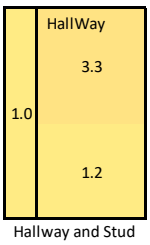
Hy4Heat WP7 Test Result

MTP ID: L2-A6
Hole Size: 7.2 mm
Location: kitchen base cupboard with 200cm2 ceiling vent, with cupboard vents
Gas: hydrogen
Date: 19/04/2020 **Time:** 08:49:00
Averaging Period Start: 120 min **End:** 140 min

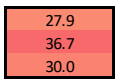
Notes: Similar arrangement and flow with no ceiling vent (L2-064C) registered ~28% conc at kitchen high point

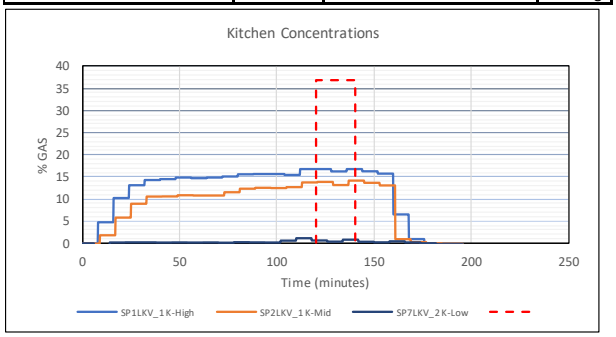
Sensor	Average	Max	Min	STDEV	units
SP1LKV_1 K-High	16.5	16.7	16.2	0.3	%vol
SP2LKV_1 K-Mid	13.5	14.1	13.1	0.4	%vol
SP3LKV_1 Cup-high-back	27.7	29.1	26.3	1.3	%vol
SP4LKV_1 Cup-High-Front	28.1	29.5	26.7	1.3	%vol
SP5LKV_1 cup-low	30.0	31.1	28.9	1.0	%vol
SP6LKV_1 cup-mid	36.7	36.8	36.7	0.1	%vol
SP7LKV_2 K-Low	0.6	0.8	0.4	0.2	%vol
SP8LKV_2 LR-High	3.9	4.0	3.9	0.0	%vol
SP9LKV_1 LR-Mid	1.0	1.1	1.0	0.0	%vol
SP10LKV_2 H-High	3.3	3.5	3.1	0.1	%vol
SP11LKV_2 H-Mid	1.2	1.3	1.1	0.1	%vol
SP12LKV_2 FF-High	1.4	1.5	1.3	0.1	%vol
SP13LKV_2 FF-Mid	1.3	1.4	1.3	0.1	%vol
SP14LKV_2 AT-High	0.8	0.9	0.8	0.0	%vol
SP15LKV_2 AT-Mid	1.0	1.1	1.0	0.0	%vol
SP16LKV_1 BM-High	0.1	0.1	0.1	0.0	%vol
SP17LKV_2 BM-Mid	0.1	0.1	0.1	0.0	%vol
SP18LKV_2 BM-Low	0.1	0.1	0.0	0.0	%vol
SP19LKV_2 NWALL-Cav	0.1	0.2	0.1	0.1	%vol
SP20LKV_2 STUD-Cav	1.0	1.1	1.0	0.0	%vol
SP21LKV_2 FF-Void	1.8	2.2	1.4	0.4	%vol
SP22LKV_2 SF-Void	0.3	0.4	0.1	0.1	%vol
SP23LKV_2 ROOF-Void	0.2	0.2	0.2	0.0	%vol
OUTLET_PRESSURE	0.0448	0.048	0.043	0.001	barg
LOWFLOWMETER	0.4884	0.492	0.484	0.002	g/s
OUTLET_TEMP	16.7	17.1	16.4	0.2	degC
Volume Flow Rate	329.6	332.1	326.7	1.2	SLPM
Energy Flow Rate	58.6	59.0	58.0	0.2	kW
External Wind Speed	4.1				m/s
External Wind Direction	90.6				bearing

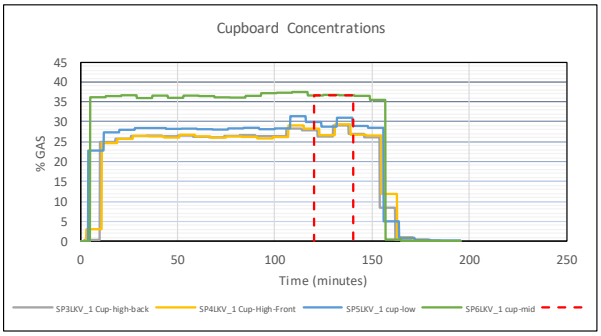


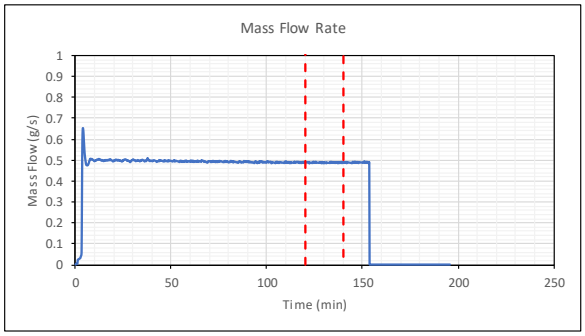


Hallway and Stud into Living Room









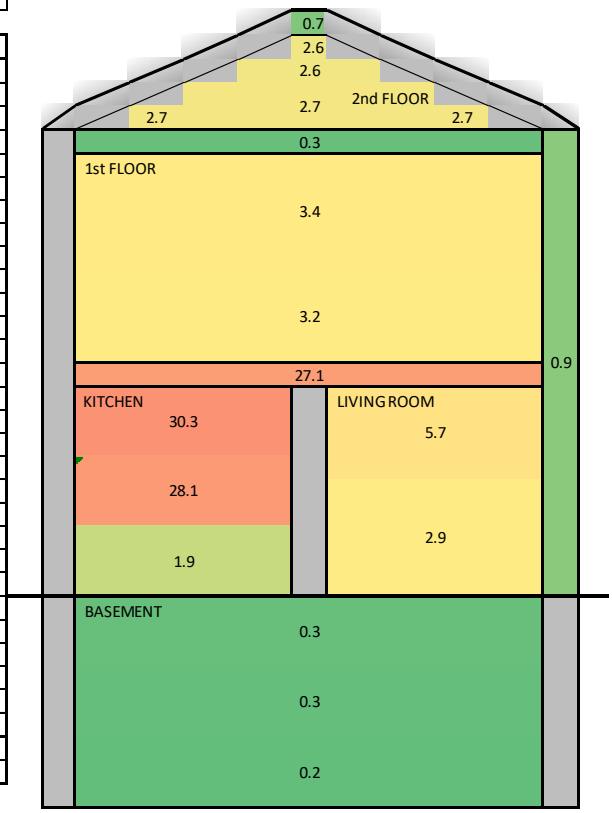
L2-A7 RESULT

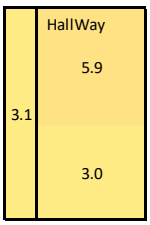
Hy4Heat WP7 Test Result

MTP ID: L2-A7
Hole Size: 7.2mm mm
Location: Kitchen base cupboard no vents
Gas: hydrogen
Date: 01/04/2020 **Time:** 10:41:00
Averaging Period Start: 100 min **End:** 120 min

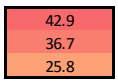
Notes: To be used as base case @20m3/hr, similar result to L2-064, 23.8m3/hr

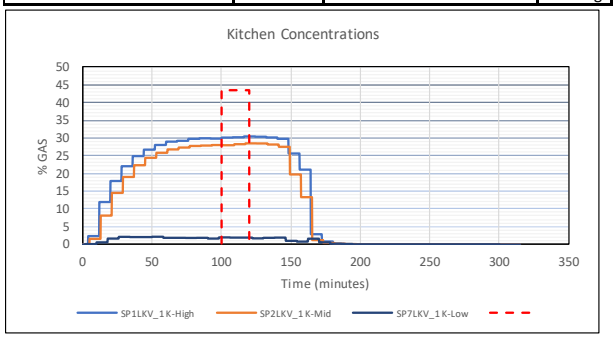
Sensor	Average	Max	Min	STDEV	units
SP1LKV_1 K-High	30.3	30.6	30.0	0.1	%vol
SP2LKV_1 K-Mid	28.1	28.5	27.9	0.2	%vol
SP3LKV_1 Cup-high-back	42.5	42.7	42.1	0.2	%vol
SP4LKV_1 Cup-High-Front	36.7	36.9	35.6	0.3	%vol
SP5LKV_1 cup-low	25.8	26.5	25.5	0.4	%vol
SP6LKV_1 cup-mid	43.4	43.5	43.2	0.1	%vol
SP7LKV_1 K-Low	1.9	2.0	1.9	0.0	%vol
SP8LKV_1 LR-High	5.7	5.9	5.7	0.1	%vol
SP9LKV_1 LR-Mid	2.9	3.1	2.5	0.1	%vol
SP10LKV_1 H-High	5.9	6.2	5.7	0.1	%vol
SP11LKV_1 H-Mid	3.0	3.2	2.8	0.1	%vol
SP12LKV_1 FF-High	3.4	3.6	3.1	0.1	%vol
SP13LKV_1 FF-Mid	3.2	3.3	3.0	0.1	%vol
SP14LKV_1 AT-High	2.6	2.8	2.5	0.1	%vol
SP15LKV_1 AT-Mid	2.7	2.8	2.5	0.1	%vol
SP16LKV_2 BM-High	0.3	0.4	0.3	0.0	%vol
SP17LKV_2 BM-Mid	0.3	0.3	0.2	0.0	%vol
SP18LKV_2 BM-Low	0.2	0.3	0.2	0.0	%vol
SP19LKV_2 NWALL-Cav	0.9	1.0	0.8	0.1	%vol
SP20LKV_2 STUD-Cav	3.1	3.4	2.8	0.1	%vol
SP21LKV_1 FF-Void	27.1	27.2	27.0	0.1	%vol
SP22LKV_1 SF-Void	0.3	0.4	0.3	0.1	%vol
SP23LKV_1 ROOF-Void	0.7	0.8	0.7	0.1	%vol
OUTLET_PRESSURE	0.0447	0.049	0.043	0.001	barg
LOWFLOWMETER	0.4977	0.512	0.486	0.005	g/s
OUTLET_TEMP	8.6	8.7	8.4	0.1	degC
Volume Flow Rate	335.9	345.7	328.0	3.6	SLPM
Energy Flow Rate	59.7	61.4	58.3	0.6	kW
External Wind Speed	3.1				m/s
External Wind Direction	257.2				bearing

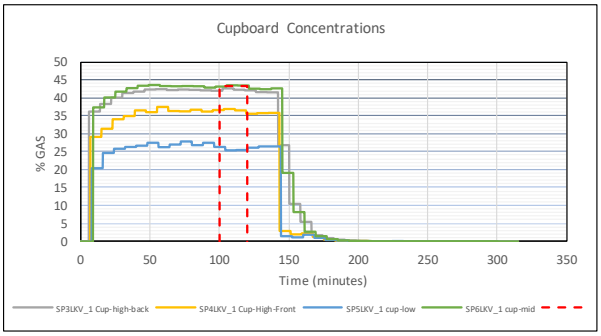


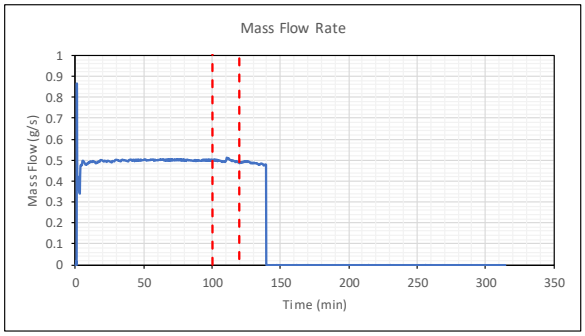


Hallway and Stud into Living Room









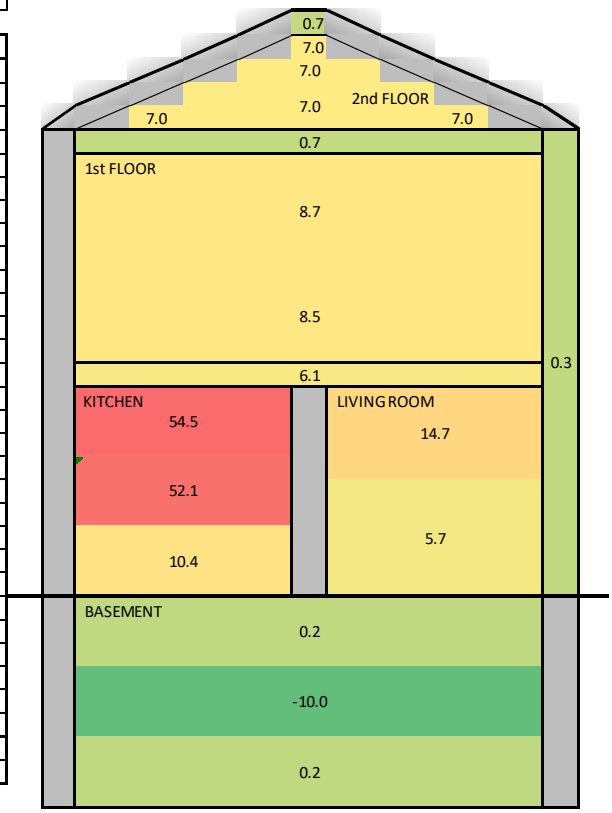
L2-A8 RESULT

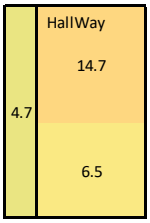
Hy4Heat WP7 Test Result

MTP ID: L2-A8
Hole Size: 7.2 mm
kitchen base cupboard with no vents and no ceiling
Location: vents
Gas: methane
Date: 28/04/2020 **Time:** 10:00:00
Averaging Period Start: 150 min **End:** 170 min

Notes: Analyser readings from cupboard over-range at ~55%, kitchen readings just in range. No comparison for this flow rate with methane, closest is L2-024 giving 25% in kitchen high point for 7.9m3/hr

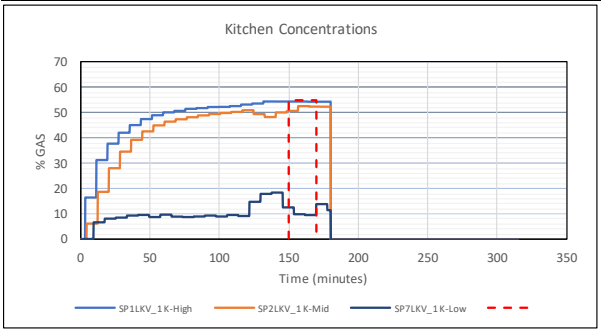
Sensor	Average	Max	Min	STDEV	units
SP1LKV_1 K-High	54.5	54.6	54.5	0.0	%vol
SP2LKV_1 K-Mid	52.1	52.8	50.9	0.9	%vol
SP3LKV_1 Cup-high-back	55.0	55.0	54.9	0.0	%vol
SP4LKV_1 Cup-Low	54.9	54.9	54.9	0.0	%vol
SP5LKV_1 Cup-High-Front	55.0	55.1	55.0	0.0	%vol
SP6LKV_1 cup-mid	55.0	55.1	55.0	0.0	%vol
SP7LKV_1 K-Low	10.4	14.0	9.6	1.2	%vol
SP8LKV_1 LR-High	14.7	14.8	14.6	0.1	%vol
SP9LKV_1 LR-Mid	5.7	6.0	5.6	0.2	%vol
SP10LKV_1 H-High	14.7	15.1	14.5	0.2	%vol
SP11LKV_1 H-Mid	6.5	6.6	6.4	0.1	%vol
SP12LKV_1 FF-High	8.7	9.1	8.3	0.3	%vol
SP13LKV_1 FF-Mid	8.5	9.0	7.9	0.3	%vol
SP14LKV_1 AT-High	7.0	7.5	6.3	0.3	%vol
SP15LKV_1 AT-Mid	7.0	7.4	6.5	0.3	%vol
SP16LKV_2 BM-High	0.2	0.2	0.2	0.0	%vol
SP17LKV_2 BM-Mid	-10.0	-10.0	-10.0	0.0	%vol
SP18LKV_2 BM-Low	0.2	0.2	0.2	0.0	%vol
SP19LKV_2 NWALL-Cav	0.3	0.5	0.3	0.1	%vol
SP20LKV_1 STUD-Cav	4.7	5.3	4.5	0.2	%vol
SP21LKV_1 FF-Void	6.1	7.1	5.3	0.8	%vol
SP22LKV_2 SF-Void	0.7	0.7	0.4	0.1	%vol
SP23LKV_2 ROOF-Void	0.7	0.9	0.5	0.2	%vol
RELEASEPRESSURE	0.0973	0.101	0.095	0.001	barg
LOWFLOWMETERCH4	3.9988	4.039	3.967	0.019	g/s
OUTLET_TEMP	14.0	15.8	13.1	0.9	degC
Volume Flow Rate	334.4	337.8	331.8	1.6	SLPM
Energy Flow Rate	199.9	201.9	198.3	0.9	kW
External Wind Speed	2.9				m/s
External Wind Direction	92.5				bearing

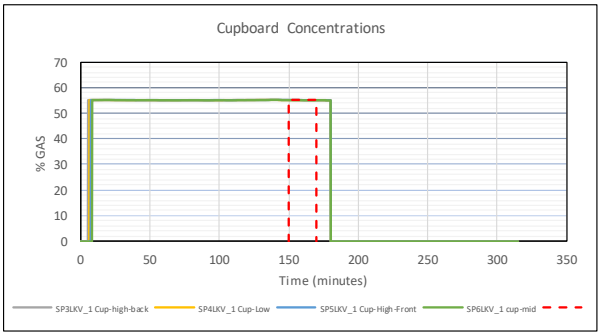


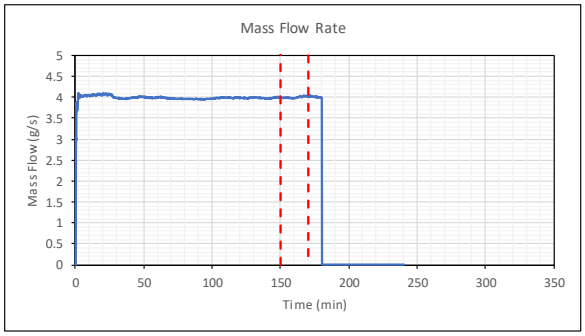


Hallway and Stud into Living Room

55.0
54.9
55.0







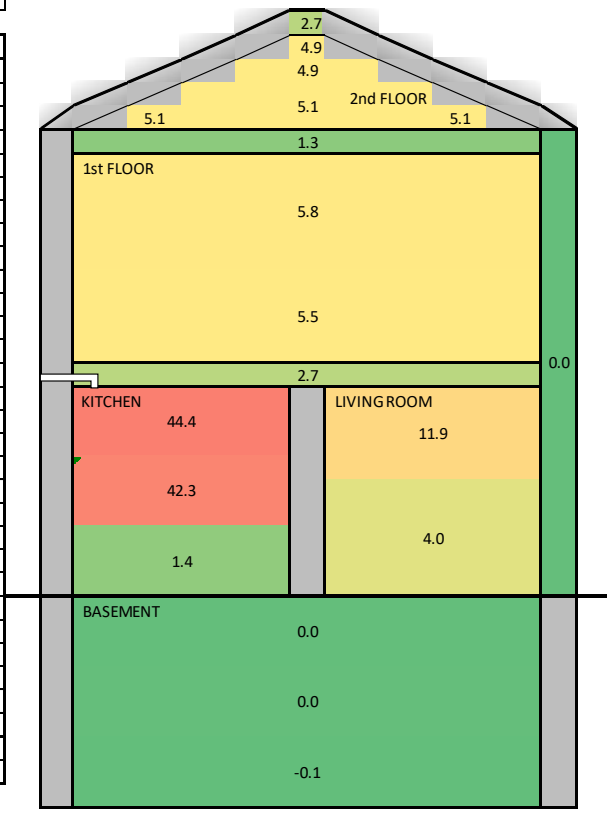
L2-A9 RESULT

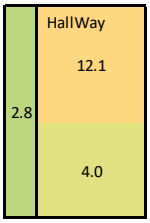
Hy4Heat WP7 Test Result

MTP ID: L2-A9
Hole Size: 15 mm
Location: kitchen base cupboard with 100cm2 ceiling vent, with cupboard vents
Gas: hydrogen
Date: 21/04/2020 **Time:** 06:05:00
Averaging Period Start: 90 min **End:** 96 min

Notes: Similar arrangement and flow rate in L2-A11 gives ~60% at kitchen high and mid

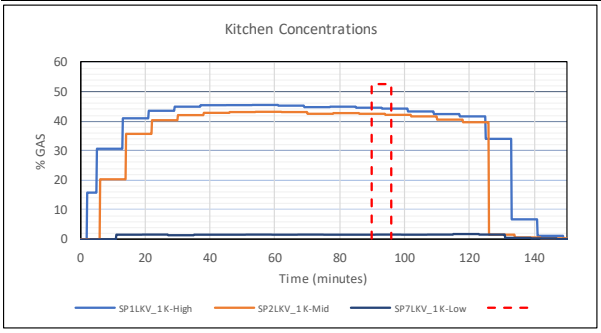
Sensor	Average	Max	Min	STDEV	units
SP1LKV_1 K-High	44.4	44.6	44.3	0.1	%vol
SP2LKV_1 K-Mid	42.3	42.4	42.1	0.2	%vol
SP3LKV_1 Cup-high-back	50.5	50.5	50.5	0.0	%vol
SP4LKV_1 Cup-High-Front	50.4	50.4	50.4	0.0	%vol
SP5LKV_1 cup-low	52.4	52.4	52.4	0.0	%vol
SP6LKV_1 cup-mid	48.5	48.5	48.3	0.0	%vol
SP7LKV_1 K-Low	1.4	1.4	1.4	0.0	%vol
SP8LKV_1 LR-High	11.9	12.0	11.8	0.1	%vol
SP9LKV_1 LR-Mid	4.0	4.0	3.9	0.0	%vol
SP10LKV_1 H-High	12.1	12.1	12.1	0.0	%vol
SP11LKV_1 H-Mid	4.0	4.1	4.0	0.1	%vol
SP12LKV_1 FF-High	5.8	5.8	5.8	0.0	%vol
SP13LKV_1 FF-Mid	5.5	5.5	5.5	0.0	%vol
SP14LKV_1 AT-High	4.9	4.9	4.7	0.0	%vol
SP15LKV_1 AT-Mid	5.1	5.1	5.0	0.1	%vol
SP16LKV_2 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_2 BM-Low	-0.1	-0.1	-0.1	0.0	%vol
SP19LKV_2 NWALL-Cav	0.0	0.0	0.0	0.0	%vol
SP20LKV_1 STUD-Cav	2.8	2.8	2.8	0.0	%vol
SP21LKV_1 FF-Void	2.7	2.7	2.7	0.0	%vol
SP22LKV_2 SF-Void	1.3	1.3	1.2	0.0	%vol
SP23LKV_2 ROOF-Void	2.7	2.7	2.6	0.0	%vol
OUTLET_PRESSURE	0.4508	0.482	0.428	0.019	barg
LOWFLOWMETER	1.9268	1.984	1.873	0.037	g/s
OUTLET_TEMP	7.5	7.7	7.4	0.1	degC
Volume Flow Rate	1300.4	1338.9	1264.3	24.7	SLPM
Energy Flow Rate	231.0	237.9	224.6	4.4	kW
External Wind Speed	2.8				m/s
External Wind Direction	46.6				bearing

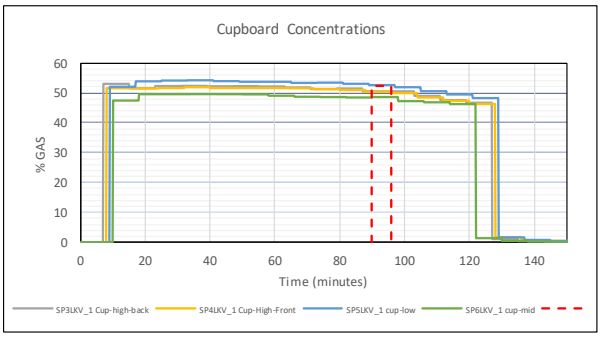


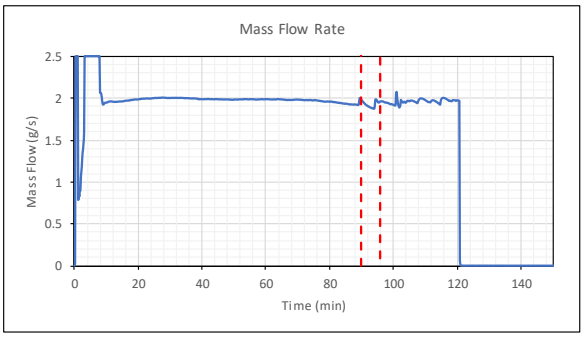


Hallway and Stud into Living Room

50.5
48.5
52.4







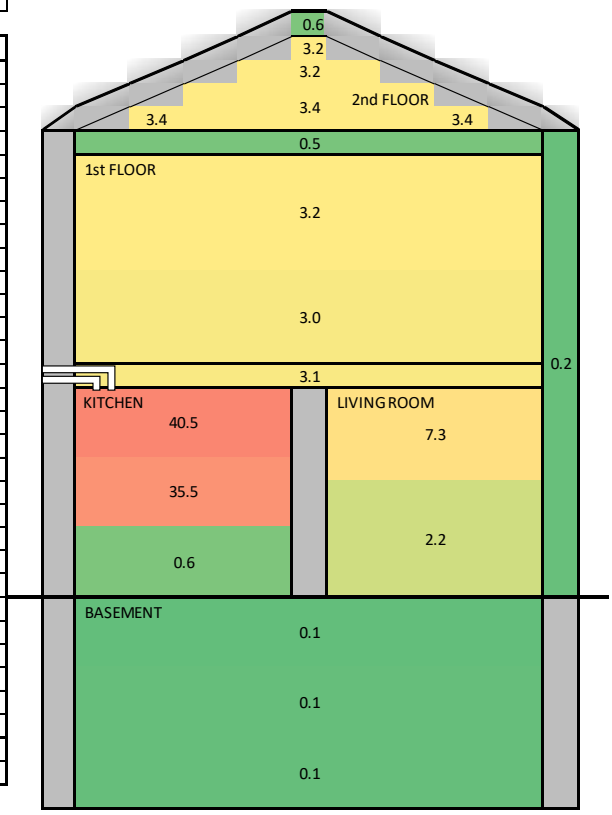
L2-A10 RESULT

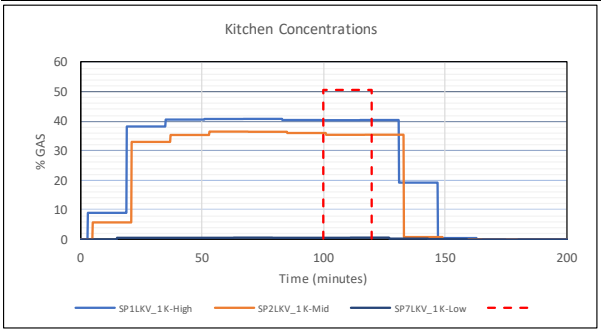
Hy4Heat WP7 Test Result

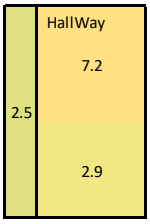
MTP ID: L2-A10
Hole Size: 15 mm
Location: kitchen base cupboard with 200cm2 ceiling vent, with cupboard vents
Gas: hydrogen
Date: 21/04/2020 **Time:** 09:06:00
Averaging Period Start: 100 min **End:** 120 min

Notes: Similar configuration and flow rate with no vents gives ~60% at kitchen mid and high points

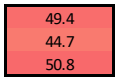
Sensor	Average	Max	Min	STDEV	units
SP1LKV_1 K-High	40.5	40.5	40.4	0.0	%vol
SP2LKV_1 K-Mid	35.5	36.1	35.5	0.1	%vol
SP3LKV_1 Cup-high-back	49.7	49.7	49.5	0.1	%vol
SP4LKV_1 Cup-High-Front	49.2	49.2	49.1	0.1	%vol
SP5LKV_1 cup-low	50.8	50.8	50.7	0.0	%vol
SP6LKV_1 cup-mid	44.7	44.8	44.6	0.1	%vol
SP7LKV_1 K-Low	0.6	0.6	0.6	0.0	%vol
SP8LKV_1 LR-High	7.3	7.4	7.3	0.0	%vol
SP9LKV_1 LR-Mid	2.2	2.3	2.2	0.0	%vol
SP10LKV_1 H-High	7.2	7.5	7.0	0.1	%vol
SP11LKV_2 H-Mid	2.9	3.0	2.9	0.1	%vol
SP12LKV_1 FF-High	3.2	3.2	3.2	0.0	%vol
SP13LKV_1 FF-Mid	3.0	3.0	3.0	0.0	%vol
SP14LKV_2 AT-High	3.2	3.2	3.2	0.0	%vol
SP15LKV_2 AT-Mid	3.4	3.4	3.4	0.0	%vol
SP16LKV_2 BM-High	0.1	0.1	0.1	0.0	%vol
SP17LKV_2 BM-Mid	0.1	0.1	0.1	0.0	%vol
SP18LKV_2 BM-Low	0.1	0.1	0.1	0.0	%vol
SP19LKV_2 NWALL-Cav	0.2	0.2	0.2	0.0	%vol
SP20LKV_2 STUD-Cav	2.5	2.6	2.4	0.1	%vol
SP21LKV_2 FF-Void	3.1	3.1	3.1	0.0	%vol
SP22LKV_2 SF-Void	0.5	0.6	0.5	0.1	%vol
SP23LKV_2 ROOF-Void	0.6	0.7	0.5	0.1	%vol
OUTLET_PRESSURE	0.3797	0.382	0.377	0.001	barg
LOWFLOWMETER	1.9644	1.970	1.958	0.002	g/s
OUTLET_TEMP	18.4	19.3	17.9	0.4	degC
Volume Flow Rate	1325.8	1329.5	1321.6	1.5	SLPM
Energy Flow Rate	235.5	236.2	234.8	0.3	kW
External Wind Speed	5.0				m/s
External Wind Direction	64.7				bearing

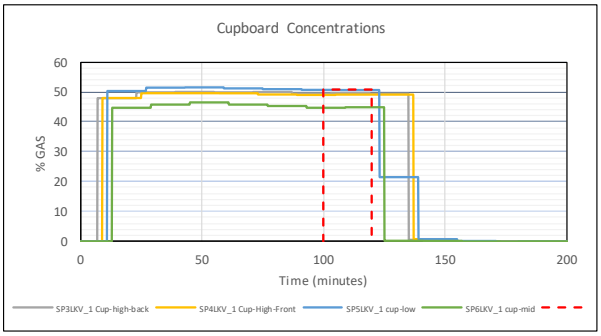


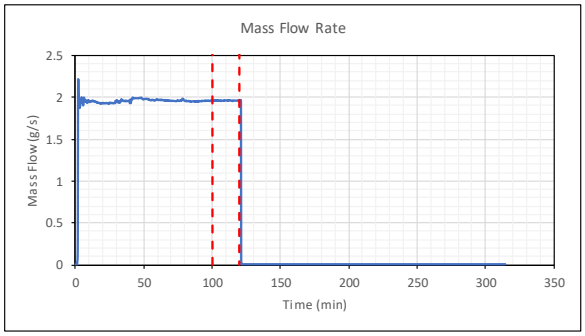




Hallway and Stud into Living Room







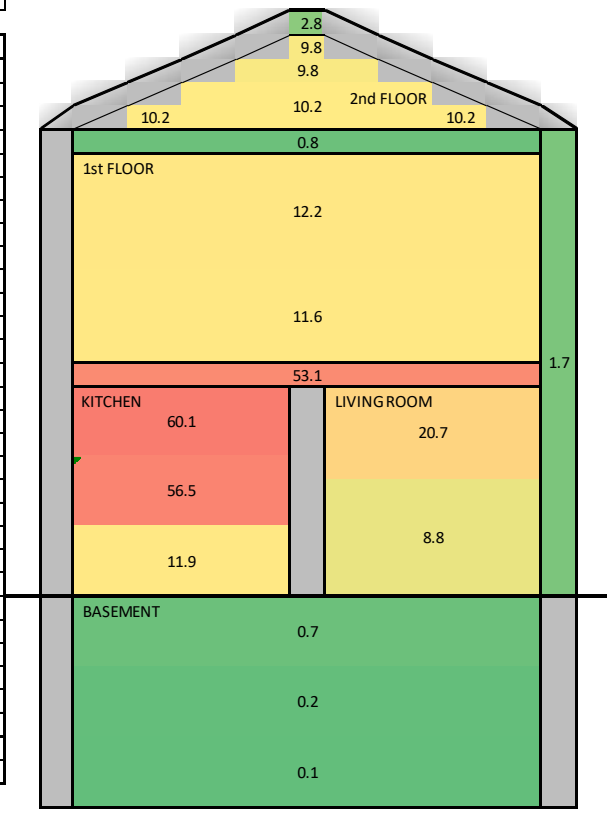
L2-A11 RESULT

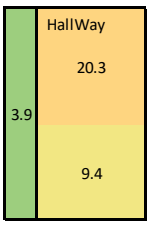
Hy4Heat WP7 Test Result

MTP ID: L2-A11
Hole Size: 15 mm
Location: Kitchen base cupboard no vents
Gas: hydrogen
Date: 02/04/2020 **Time:** 06:22:00
Averaging Period Start: 90 min **End:** 110 min

Notes: No equivalent configuration in past work, similar release with no vents into boiler cupboard produced 72% high and 36% mid height in the kitchen

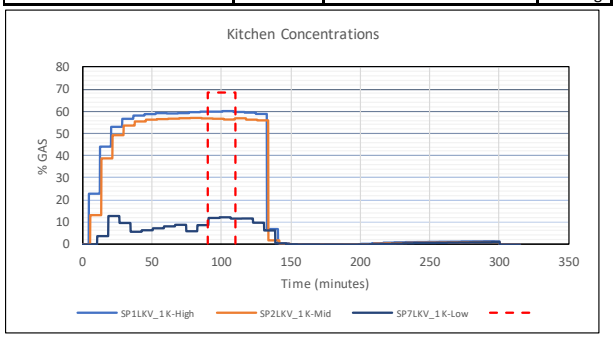
Sensor	Average	Max	Min	STDEV	units
SP1LKV_1 K-High	60.1	60.2	59.8	0.1	%vol
SP2LKV_1 K-Mid	56.5	56.9	56.3	0.2	%vol
SP3LKV_1 Cup-high-back	67.7	67.9	67.6	0.2	%vol
SP4LKV_1 Cup-High-Front	64.6	65.3	64.0	0.6	%vol
SP5LKV_1 cup-low	56.6	57.4	55.4	0.8	%vol
SP6LKV_1 cup-mid	68.6	68.7	68.4	0.1	%vol
SP7LKV_1 K-Low	11.9	12.3	8.7	0.7	%vol
SP8LKV_1 LR-High	20.7	20.8	20.5	0.1	%vol
SP9LKV_1 LR-Mid	8.8	9.1	8.4	0.2	%vol
SP10LKV_1 H-High	20.3	20.6	19.9	0.2	%vol
SP11LKV_1 H-Mid	9.4	9.6	9.1	0.2	%vol
SP12LKV_1 FF-High	12.2	12.6	11.7	0.4	%vol
SP13LKV_1 FF-Mid	11.6	12.0	11.4	0.2	%vol
SP14LKV_1 AT-High	9.8	10.1	9.5	0.2	%vol
SP15LKV_1 AT-Mid	10.2	10.5	9.5	0.2	%vol
SP16LKV_2 BM-High	0.7	0.8	0.7	0.0	%vol
SP17LKV_1 BM-Mid	0.2	0.2	0.2	0.0	%vol
SP18LKV_2 BM-Low	0.1	0.1	0.1	0.0	%vol
SP19LKV_2 NWALL-Cav	1.7	1.8	1.7	0.0	%vol
SP20LKV_1 STUD-Cav	3.9	4.0	3.8	0.1	%vol
SP21LKV_1 FF-Void	53.1	53.2	53.0	0.1	%vol
SP22LKV_1 SF-Void	0.8	0.8	0.7	0.0	%vol
SP23LKV_2 ROOF-Void	2.8	3.0	2.6	0.2	%vol
RELEASEPRESSURE	0.0075	0.008	0.007	0.000	barg
LOWFLOWMETER	1.9482	1.964	1.924	0.014	g/s
OUTLET_TEMP	6.4	6.6	6.3	0.1	degC
Volume Flow Rate	1314.9	1325.7	1298.5	9.4	SLPM
Energy Flow Rate	233.6	235.5	230.7	1.7	kW
External Wind Speed	5.1				m/s
External Wind Direction	235.3				bearing

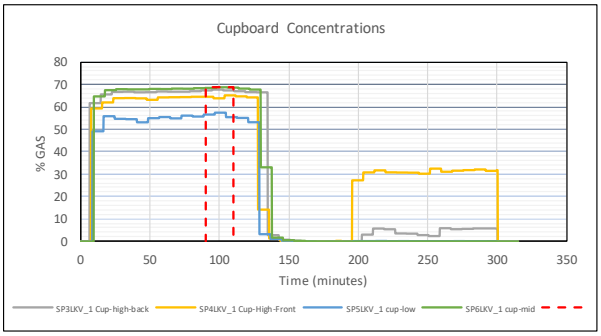


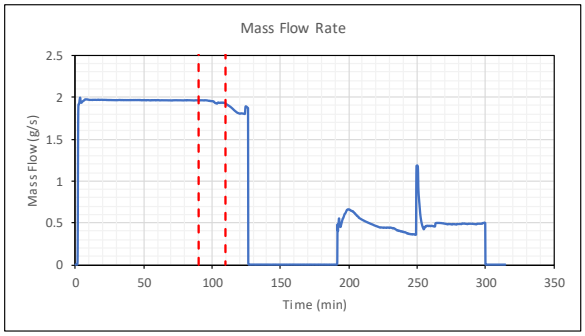


Hallway and Stud into Living Room

68.1
64.6
56.6







APPENDIX C: AIR TIGHTNESS TESTING REPORT

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 Ramshaw
Test date:	2019-10-14
Associated Test file:	East House Excluding Cellar (2)
Report Number:	0000
Unique Property ID Number:	

Summary

retrotec FanTestic	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 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]	**1044.5**
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 BINDT.

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 [m³]: 247

Envelope Area (A_T) [m²]: 245.3

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 TS1 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 1

Discussion of Results

Combined Test Data (Tested in one direction only)

	Results	Uncertainty
Air flow at 50 Pa, Q_{50} [m³/h]	1044.5	+/-2.3%
Air changes, n_{50}	4.23	+/-2.3%
Equivalent leakage area at 50 Pa [cm²]	198.0	+/-2.3%
Permeability at 50 Pa [m³/h/m²]	4.259	+/-2.3%

Air Leakage Test Data Appendix–

Depressurize Data Set

Test Dataset Date: 2019-10-14
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_{env} [$m^3/h/Pa^n$]:	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}:	4.229	+/-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					
#1, 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	980.4	1040	1091					
Total Flow, Q_L [m^3/h]		622.965	729.593	806.134	901.900	980.356	1039.70	1090.80					
Corrected		627.790	735.245	812.379	908.887	987.950	1047.75	1099.25					

Flow, Q_{env} [m³/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.

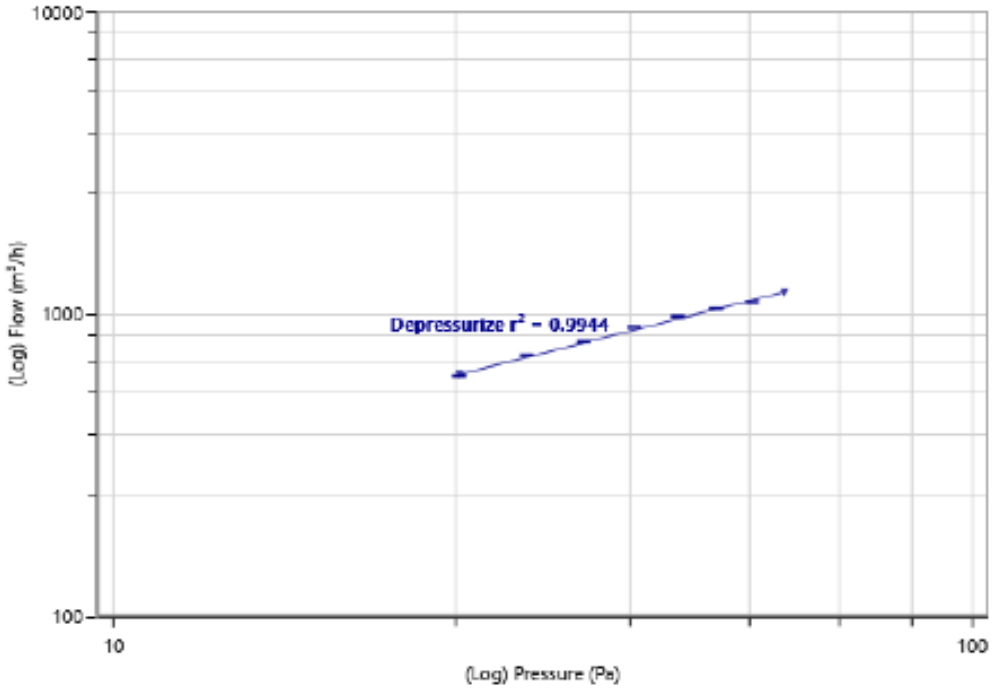
12 baseline pressures each taken for 0 of required 10 seconds.

Average Baseline, ΔP: 0.16 Pa

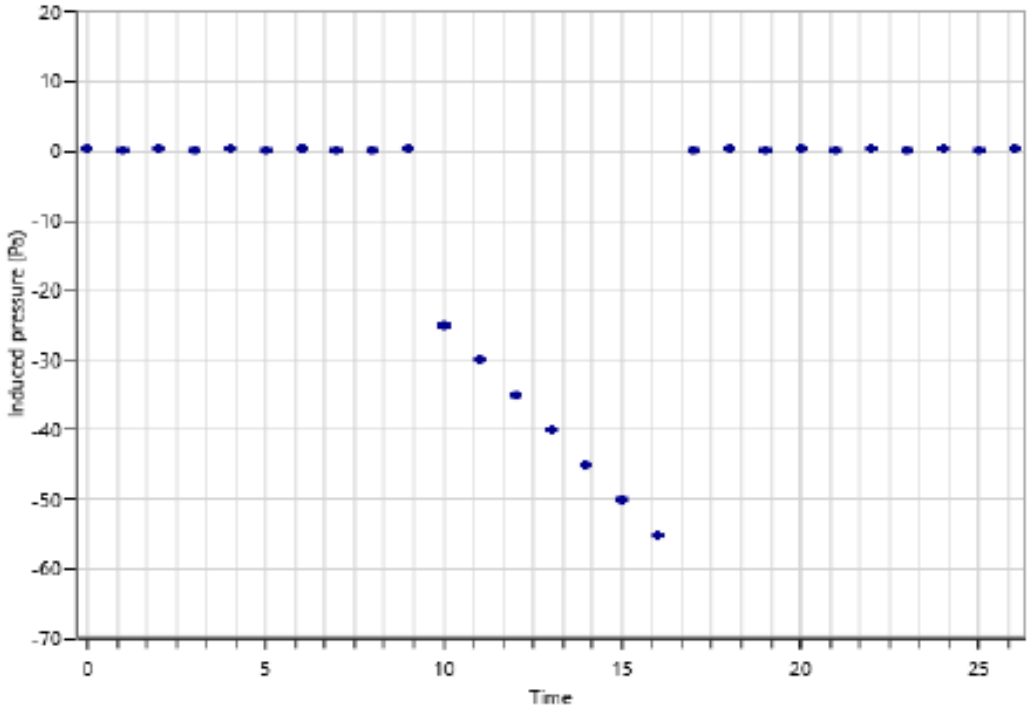
Static Pressure Averages:			
Average Baseline [Pa]	ΔP 0.16		
initial [Pa]	ΔP01 0.16	ΔP01- 0.00	ΔP01+ 0.16
final [Pa]	ΔP02 0.16	ΔP02- 0.00	ΔP02+ 0.16

Baseline, initial [Pa]	0.20	0.10	0.20	0.10	0.20	0.10	0.20	0.10	0.10	0.30		
Baseline, final [Pa]	0.10	0.20	0.10	0.20	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 (Flow Equation Parameters - (--)) . Change. m^3/s

Range	n	K	K1	K2	K3	K4	MF
Open(22)	0.512	0.2486	0	0.8	0	1	8.6
A	0.5016	0.1302	0	1	0	1	12
B	0.4841	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	0.48	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 MF or (K2 x |RP|).

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

$$flow = (FP - (|RP| \times K1))^N + (K + (K3 \times FP))$$

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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