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CONFIDENTIAL: Technical Report

Project FPD0006 Fire test Utilising the general principals of ASFP TGD19 (Nov 2017). Assessing a Tenmat Ventilertat Brandstop Eaves Barrier with mesh spark arrester on non-fire side of the barrier	
Report Date	4/12/2020
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Date and time of test

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Summary

In-house testing of a Tenmat Ventilertat Brandstop Eaves Barrier, an open state fire barrier product, this incorporated an aluminium spark arresting mesh placed at the non- fire side of the barrier.

Fitted within a simple roof construction housed within an aerated concrete supporting test frame.

The purpose of this testing is to prove concept as to the suitability of Tenmat open state Ventilertat Brandstop eaves barriers, when fitted with a mesh spark arrester.

The Tenmat Ventilertat Brandstop eaves barrier product started to react within the initial 60 seconds of the test, and closed off the air gap well within the time (5 minute) as required by the TGD 19 test standard, proving the suitability of the eaves barrier when fitted in the construction with a mesh spark arrester.

The inclusion of the mesh did not appear to impede the closure time of the product

The test was run for 64 minutes at which time the timber wall plate under the barrier lost integrity and active flaming was observed.

See pictures at end of report.

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Test Specimen – Summary of test specimen

The wall assembly had overall dimensions of 675mm long x 675mm wide. It consisted of a framework of angle iron, placed into this was the test rig, constructed from aerated concrete blocks and timber roof section.

The test sample was fitted into a test rig comprising of a 630mm x 210mm x 100mm aerated concrete blocks to form a 430mm x 100mm wall cavity, two end blocks 100mm x 100mm x 215mm were placed as infill at the end to close off the remaining furnace opening, into and over this cavity was a section of timber roof, it comprised of 145mm x 35mm supporting timber bearers clad with 20mm tongue and groove (T&G) boarding this was over drawn with 15mm fire line board to prevent the exposed sections of the roof burning through and subsequently stopping the test prematurely, this was all housed and supported by the angle iron frame holding the test rig in place on the furnace, also preventing any movement of the blocks during the test.

A cavity size at the eaves of the roof of 50mm high x 450mm wide incorporating a sample of eaves barrier with a remaining air gap of 46mm from the top of the barrier on the wall plate to the underside of the T&G boarding, on the unexposed side of the Ventilert Brandstop fire barrier, an aluminium spark arresting mesh was fitted to the non-fire side of the wall plate, this mesh measured 150mm high x 450mm wide, stapled into place using 10mm galvanised steel staples

Test purpose

The test has been designed to replicate the conditions found in the existing Tenmat Ventilert Brandstop test reports used to support this product commercially, and to compare the closure time and the char strength, ascertaining if any negative differences between the existing test results and this test, when a spark arrester is fitted and incorporating a larger cavity of 50mm than the 25mm in the previous test reports.

Integrity

It is required that the specimen retains its separating function without:

- Causing ignition of a cotton pad when applied
- Permitting the penetration of a gap gauge as specified in BS EN 1363-1:2012
- Sustained flaming on the unexposed surface

Except that any failure before 5 minutes shall be disregarded unless any area of any surfaces exhibits sustained flaming above the seal within that period.

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These requirements were satisfied for the periods shown below:

- Sustained flaming – sustained flaming occurred after 63 minutes
- Gap gauge - N/A
- Cotton pad – deemed to have failed due to visible sustained flaming being observed. test terminated at 64 minutes.

Insulation

Transmission of heat through the test construction shall not raise any one of the thermocouple temperatures of the unexposed surface of the test specimen more than 180 K above its initial temperature. However, any failure before 5 minutes shall be disregarded.

Note: the 'suspended' thermocouples may exceed 180 K rise in advance of the effective closure of the 'open-state' cavity barrier test specimen. This shall also be disregarded.

These requirements were satisfied for the period shown below:

- Insulation 64 minutes when test was terminated

Closure

Closure is deemed to have occurred when there is no visible gap, and the suspended thermocouple temperature is less than 180K rise above initial ambient temperature.

- Closure time observed 1minute 50 seconds
- Thermocouple readings below 192 degrees - 4 minute 39 seconds

Test Conditions

Witnesses to test and their interest

Present – Ian Hainsworth – Tenmat – running the test.

Standard

ASFP Technical Guidance Document – TGD19: (November 2017) Fire Resistance Test for Open State Cavity Barriers used in the external envelope or fabric of buildings.

This test method is only intended to evaluate the fire resistance performance of the open-state cavity barrier against fire exposure from below, in terms of the time from ignition necessary to effectively seal the cavity, and to maintain that seal.

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For this test, the principals of the TGD19 test standard were utilised, however, heat was introduced into the roof eaves from the side as if a fire had occurred in a cavity spreading into the roof space, as opposed to being directly underneath as per the test standard

Ambient Temperature

The laboratory ambient temperature in the vicinity of the test construction was 12.0°C at the start of the test with a maximum variation of + 1°C during the test.

Relative humidity

The laboratory humidity in the vicinity of the test construction was 57%

Conditioning of materials

The specimens' storage, construction, and test preparation took place in the test facility over a total, combined time of 10 days. Throughout this period both the temperature and the humidity of the laboratory were measured and recorded as being within a range of from 8.4°C to 15.1°C and 57% to 90% humidity, respectively.

Furnace

The furnace was controlled so that its mean temperature complied with the requirements of BS EN 1363-1: 2012 using one probe thermometer 500mm below the underside of the assembly.

Thermocouples

Thermocouples were provided to monitor both the unexposed surface of the specimens and exposed surface over the barrier.

The output of all instrumentation was recorded at no less than one-minute intervals.

The unexposed surface and suspended thermocouples were placed at the following locations: -

1. Surface – on rear of the wall plate left hand side, quarter of the distance in.
2. Surface – on rear of the wall plate right hand side, quarter of the distance in.
3. Surface – on underside of the roof boards left hand side, quarter of the distance in.
4. Surface – on underside of the roof boards right hand side, quarter of the distance in.
5. Suspended in the air cavity non-fire side, left hand side, quarter of the distance in and 25mm back from the mesh

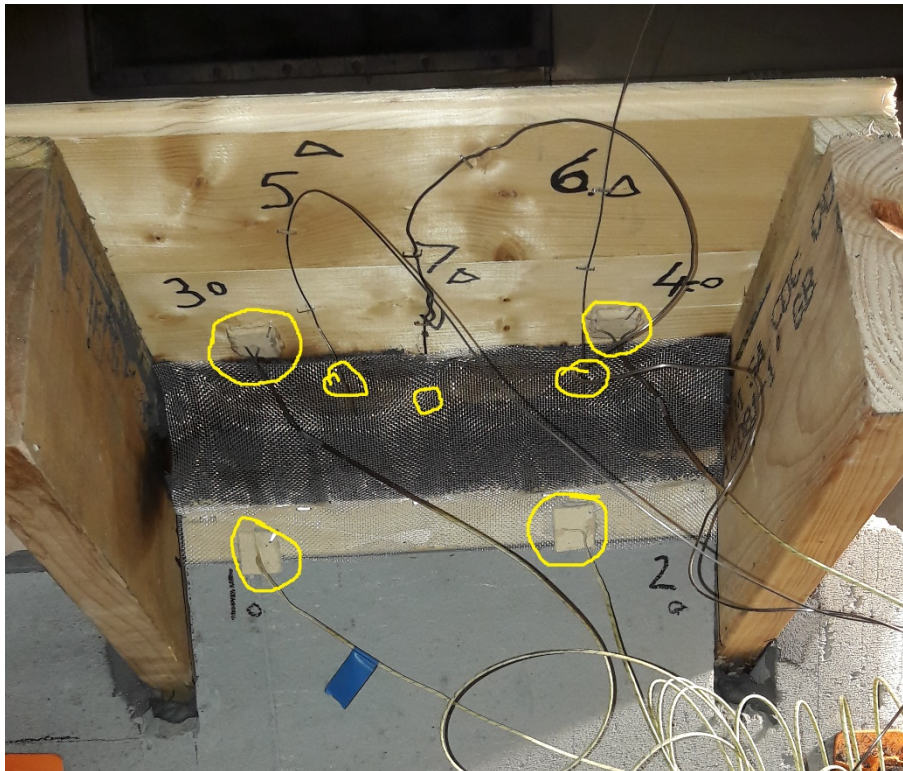
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6. Suspended in the air cavity non-fire side, left hand side, quarter of the distance in and 25mm back from the mesh
7. Suspended in the air cavity fire side, centrally positioned over the intumescent material, 10mm back from the fire side edge.
8. Furnace thermocouple

One extra suspended external thermocouple (No 7) placed at the upper central section of the barrier pad to monitor the temperature at the top of the intumescent it was placed 10mm from the fire side of the material, this thermocouple is additional to the requirements of the test standard, and as such will play no part in the integrity or insulation results expressed in the findings of this test report.

Thermocouples shown in the picture below, indicated by the yellow circles.



Furnace Pressure

After the first five minutes of testing and for the remainder of the test, the furnace atmospheric pressure was controlled so that it complied with the requirements of BS EN 1363-1: 2012. The calculated pressure differential relative to the laboratory atmosphere 100mm below the soffit of the specimen was 20 (+or- 5) Pa between 5 and 10 minutes and 20 (+or- 3) Pa thereafter.

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Test Observations of VFB Sample

Time

- 00 The test commences.
Plastic cover melts and shrinks away 15 seconds – FF107 starts to react 50 seconds
- 01 FF102 intumescent material starting to react to a greater extent within the assembly, char being trapped by the mesh effectively closing off the openings in the mesh.
- 02 Fully closed off visually, 1minute 50 seconds
- 03 Slight smoke from the test rig
- 04 No Change
- 05 No Change
- 06 No Change
- 07 No Change
- 08 No Change
- 09 No Change
- 10 No Change
- 11 No Change
- 12 No Change
- 13 No Change
- 14 No Change
- 15 No Change
- 16 No Change
- 17 No Change
- 18 No Change
- 19 No Change
- 20 Hole in the union between T&G boards and the support timber below the fire barrier, starting to burn through, fire cement applied to allow the test to continue. This is remote from the fire stop and did not affect the outcome of the test
- 21 No Change
- 22 No Change
- 23 No Change
- 24 No Change
- 25 Board below the fire barrier starting to fail
- 26 No Change
- 27 No Change
- 28 No Change
- 29 No Change
- 30 Increased smoke at side of fire test rig below the fire barrier
- 31 No Change
- 32 No Change
- 33 No Change
- 34 No Change
- 35 No sign of failure of the rig above the fire barrier, red glow on the support joist where it leaves the fire side wall.
- 36 Increased smoke from bottom and side of test rig below the fire barrier
- 37 No Change
- 38 No Change

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- 39 No Change
- 40 Slight smoke through mesh at junction of wall plate and fire barrier
- 41 No Change
- 42 No Change
- 43 No Change
- 44 No Change
- 45 No Change
- 46 No Change
- 47 Slight discolouring of top centre of wall plate
- 48 No Change
- 49 No Change
- 50 No Change
- 51 No Change
- 52 No Change
- 53 No Change
- 54 No Change
- 55 No Change
- 56 Red glow on wall plate increasing - cotton pad applied – no ignition
- 57 Red glow on wall plate still increasing
- 58 No Change
- 59 Red glow increasing - cotton pad applied – no ignition
- 60 No Change
- 61 No Change
- 62 No Change
- 63 No Change
- 64 Sudden ignition of wall plate, vapours released at fire point, active flaming on non-fire side of fire barrier occurred – Integrity Failure
- 65 Test terminated

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Pictures of the test rig, pictures taken during the test and test sample deconstruction following the test.

Images of the sample pre test



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Images from the test



Test Sample Deconstruction



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Temperature Readings Taken During the Test

Flame Guard Test Eaves Barrier with a 50mm cavity. 4/12/2020 mesh on non-fire side of the rig								
Time	TC 8 Furnace	TC 1 Wall Plate Left	TC 2 Wall Plate Right	TC 3 Under T&G Boards Left	TC4 Under T&G Boards Right	TC 5 Suspend ed Left	TC6 Suspend ed Right	TC 7 Suspend ed over 107 Ctr
Minutes	°C	°C	°C	°C	°C	°C	°C	°C
0	-13.99	12.06	12.19	12.4	12.47	12.61	12.59	12.53
1	-9.3	12.14	12.25	16.53	15.7	182.88	177.96	162.41
2	122.76	16.21	17.6	65.32	58.35	335.14	325.25	408.88
3	352.84	26.15	27.78	95.34	84.62	246.34	235.33	320.61
4	470.12	31.76	30.58	105.21	94.03	201.74	212.39	293.64
5	534.57	35.12	30.79	110.92	107.61	189.7	178.9	266.08
6	558.09	35.78	29.81	114.97	122.32	176.4	61.98	239.66
7	565.42	34.88	28.81	119.74	134.78	151.88	40.85	234.94
8	582.71	33.58	28.08	123.45	144.11	38.65	33.15	245.48
9	616.55	32.32	27.61	125.35	149.64	26.98	28.3	259.75
10	635.02	31.16	27	125.01	151.63	25.24	25.89	259.39
11	649.23	30.72	26.77	124.2	150.54	26.29	26.13	261.43
12	671.89	30.74	26.62	121.86	146.96	25.54	23.44	262.57
13	675.09	30.46	26.59	119.46	140.9	25.41	23.9	261.29
14	676.24	30.41	26.78	116.97	136.39	24.68	23.06	263.15
15	692.66	30.46	27.06	114.64	134.41	25.39	23.58	267.34
16	704.33	30.39	27.96	115.28	130.62	24.87	25.79	270.85
17	706.64	30.69	29.09	111.24	126.96	23.55	23.3	267.92
18	714.51	30.27	29.35	104.03	124.29	23.43	23.64	261.26
19	729.61	30.49	29.57	97.05	123.36	23.45	21.63	261.53
20	737.62	31.04	29.79	90.46	122.93	25.89	24	263.22
21	740.59	32.17	30.37	84.46	122.63	25.24	23.62	265.44
22	750.69	32.76	31.03	80.46	121.49	25.66	23.87	269.36
23	763.88	33.91	31.72	76.4	120.84	26.09	24.5	274.96
24	772.69	34.56	32.42	73.9	119.31	25.32	24.99	281.5
25	778.52	35.03	33.33	72.95	115.79	25.73	25.17	289.36
26	784.23	35.82	34.19	70.78	113.7	26.45	26.8	298.3
27	792.49	36.67	35.07	68.75	111.44	24.86	26.3	309.89
28	803.3	36.16	36.64	71.26	104.47	23.49	26.62	327.32
29	811.69	37.89	37.26	68.12	104.9	27.06	27.65	347.27
30	818.55	39.45	38.5	66.39	102.19	28.49	31.93	360.59

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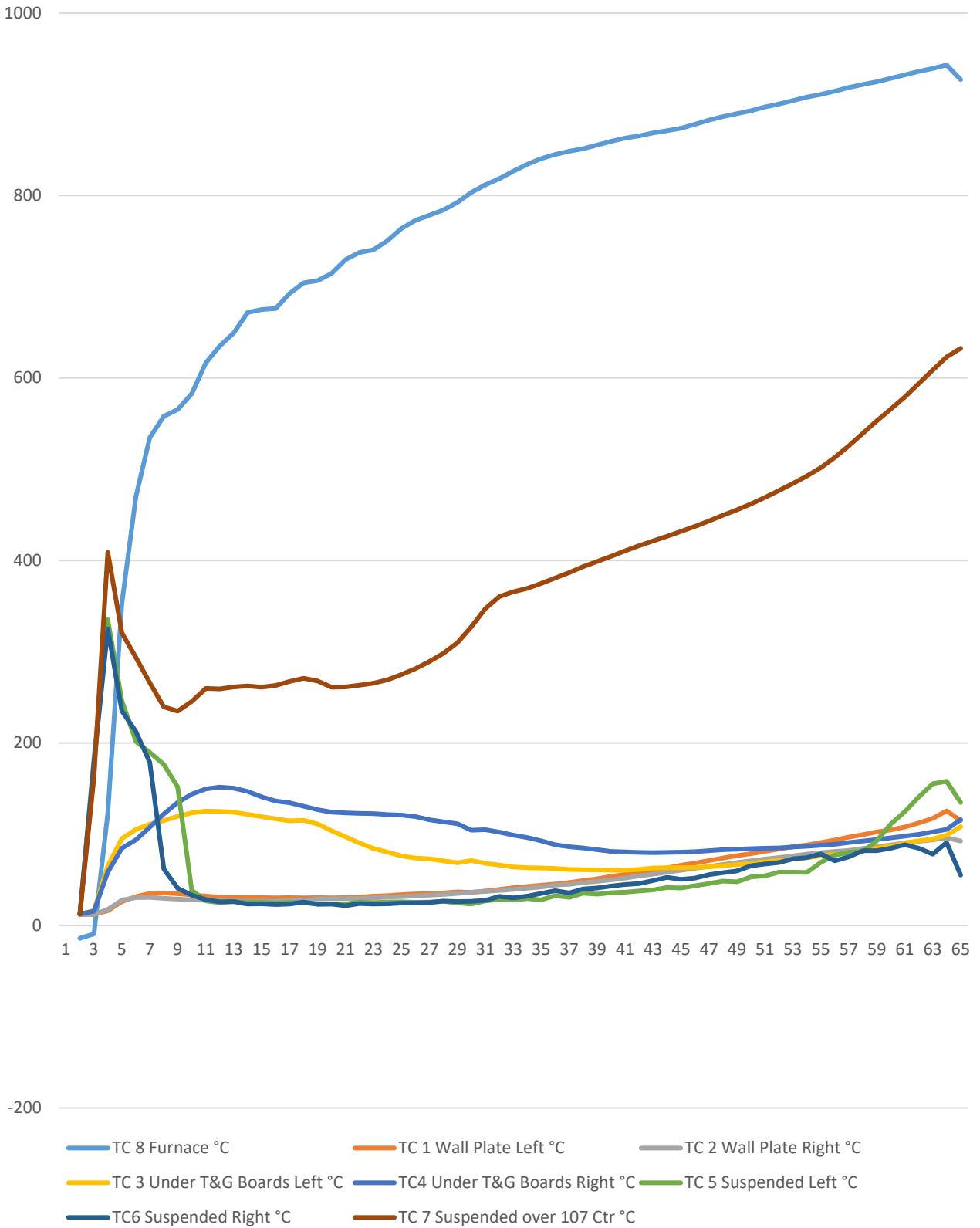
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31	826.7	41.33	39.57	64.2	99.16	27.9	30.39	365.57
32	834.29	42.75	40.76	63.29	96.42	29.55	32.2	369.42
33	840.38	43.97	42.25	63.11	92.71	28.21	35.23	374.91
34	845.07	45.4	44.28	62.63	88.5	32.85	38.07	380.76
35	848.59	47.19	45.22	61.44	86.37	30.91	35.8	386.77
36	851.41	49.11	47.05	61.25	84.84	35.31	39.94	393.23
37	855.37	51.26	48.49	60.92	83.15	34.39	41.13	399.08
38	859.47	53.9	50.04	60.54	81.25	35.93	43.19	404.67
39	862.9	55.89	52.01	60.54	80.66	36.43	44.82	410.74
40	865.35	57.95	54.42	61.37	79.97	37.92	45.9	416.29
41	868.47	60.04	56.35	62.98	79.82	39.01	49.17	421.5
42	871.17	62.97	58.32	63.21	80.07	41.56	52.76	426.63
43	873.85	66	60.49	63.41	80.32	41.07	50.73	431.94
44	878.15	68.52	62.67	63.67	80.83	43.59	52.03	437.52
45	882.62	71.19	64.79	64.36	81.9	45.92	55.83	443.37
46	886.54	73.93	66.91	65.45	82.95	48.58	57.81	449.64
47	889.61	76.46	69.06	66.89	83.75	47.81	59.82	455.67
48	893.02	78.62	70.98	68.24	84.22	53.24	65.39	461.95
49	897.1	81.3	72.8	69.74	84.68	54.27	67.41	469
50	900.23	83.87	74.46	71.15	85.04	58.49	69.05	476.57
51	903.96	86.26	76.25	72.82	85.99	58.52	73.05	484.46
52	907.81	88.31	78.1	74.55	86.95	58.24	74.53	492.67
53	910.76	90.86	79.86	76.21	88.08	69.31	78.35	501.71
54	914.37	93.7	81.05	77.95	89.11	77.1	71.01	512.96
55	918.32	96.8	82.35	79.25	91.06	80.25	75.1	525.78
56	921.72	99.63	84.52	81.68	92.46	81.07	81.98	539.37
57	924.76	102.48	86.39	84.67	94.28	92.7	81.93	553.02
58	928.54	104.85	88.1	86.79	96.16	111.22	84.79	566.06
59	932.24	108.06	90.67	90.34	97.93	124.79	88.5	579.19
60	935.98	112.38	92.3	92.91	99.88	140.84	84.59	593.77
61	939.23	117.46	93.91	94.81	102.58	155.34	78.33	608.72
62	943.02	125.63	96.12	99.01	105.31	158.18	90.97	623.17
63	926.94	115.04	92.46	108.36	116.03	134.71	55.26	632.58
64	804.11	67.12	73.21	77.37	77.01	50.98	32.48	566.51
65	669.67	62.83	67.82	67.07	62.96	38.29	29.67	515.34
Test Terminated at 63 minutes								

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FlameGuard Test 4/12/2020



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