## Fire resistance tests of non-insulated walls with parallel and perpendicular orientation of gypsum board

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# Fire Resistance Tests of Non-Insulated Walls with Parallel and Perpendicular Orientation of Gypsum Board

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**Abstract**

This report presents the results of six fire resistance tests of non-insulated loaded and unloaded wall assemblies constructed with the gypsum wallboard applied parallel to the framing members in two of the assemblies and perpendicular to the framing in the other four assemblies. The objective of the tests was to determine the significance of the orientation of the gypsum board (parallel versus perpendicular) to the studs on the fire resistance of both loaded and unloaded walls.

The average fire resistance of unloaded walls with a parallel orientation of the gypsum boards was found to be 28 min and that of walls with perpendicular orientation was 30 min. The fire resistance of loaded wall assemblies was 23 min for parallel orientation and 26 min for perpendicular orientation of gypsum boards. These results show that the orientation of the gypsum board had a minimal effect on the fire resistance. The cracked sections of gypsum board tended to fall off earlier in the walls with gypsum boards applied parallel to the studs, resulting in slightly reduced fire resistance and a greater extent of charring.

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# Fire Resistance of Non-Insulated Walls with Parallel and Perpendicular Orientation of Gypsum Board

by

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## 1 INTRODUCTION

Six full-scale standard fire-resistance tests were conducted to determine the fire resistance of non-insulated loaded and unloaded wall assemblies, which are typically used as interior partitions. Two types of assemblies were tested: the first type (Type 1) were constructed with the gypsum wallboard applied so that the joints between the boards were parallel to the vertical framing members and the second type (Type 2) were constructed with gypsum wallboard applied so that the joints were perpendicular to the vertical framing members. The objective of these tests was to study the effect of the orientation of the gypsum wallboard (parallel or perpendicular) on the fire resistance since none of the previous tests[1-4] conducted at the National Research Council (NRC) of Canada, Institute for Research in Construction (IRC) included walls with gypsum board applied perpendicular to the framing. In practice the perpendicular of gypsum boards is popular for non-fire rated walls because of the belief that horizontal joints are less conspicuous as the first joint is located below eye level at a height of 1.2 m, and the continuous horizontal joints are easier to tape than vertical ones[5].

Measurements of the depth of the char layer were also taken for up to three studs from each wall assembly that was tested.

## 2 THE WALL ASSEMBLIES

Table 1 lists the governing product and application standards. The wall assemblies tested were constructed by the same workers using a single layer of 12.7 mm thick ProRoc™ (previously branded Westroc) regular lightweight gypsum board with an approximate weight per unit area of 7.8 kg/m$^2$. The gypsum board was screwed to the wood framing using *Type S* drywall screws of a length of 31.8 mm (1-1/4 in.). The framing was constructed with wood studs 38 mm x 89 mm (nominal 2 in. x 4 in.) SPF No. 1 spaced at 400 mm on centre. All the fastener heads were covered with joint compound and all the joints were covered with tape and joint compound.

The dimensions of the full-scale wall assemblies and the spacing of the fasteners are shown in Figure 1.

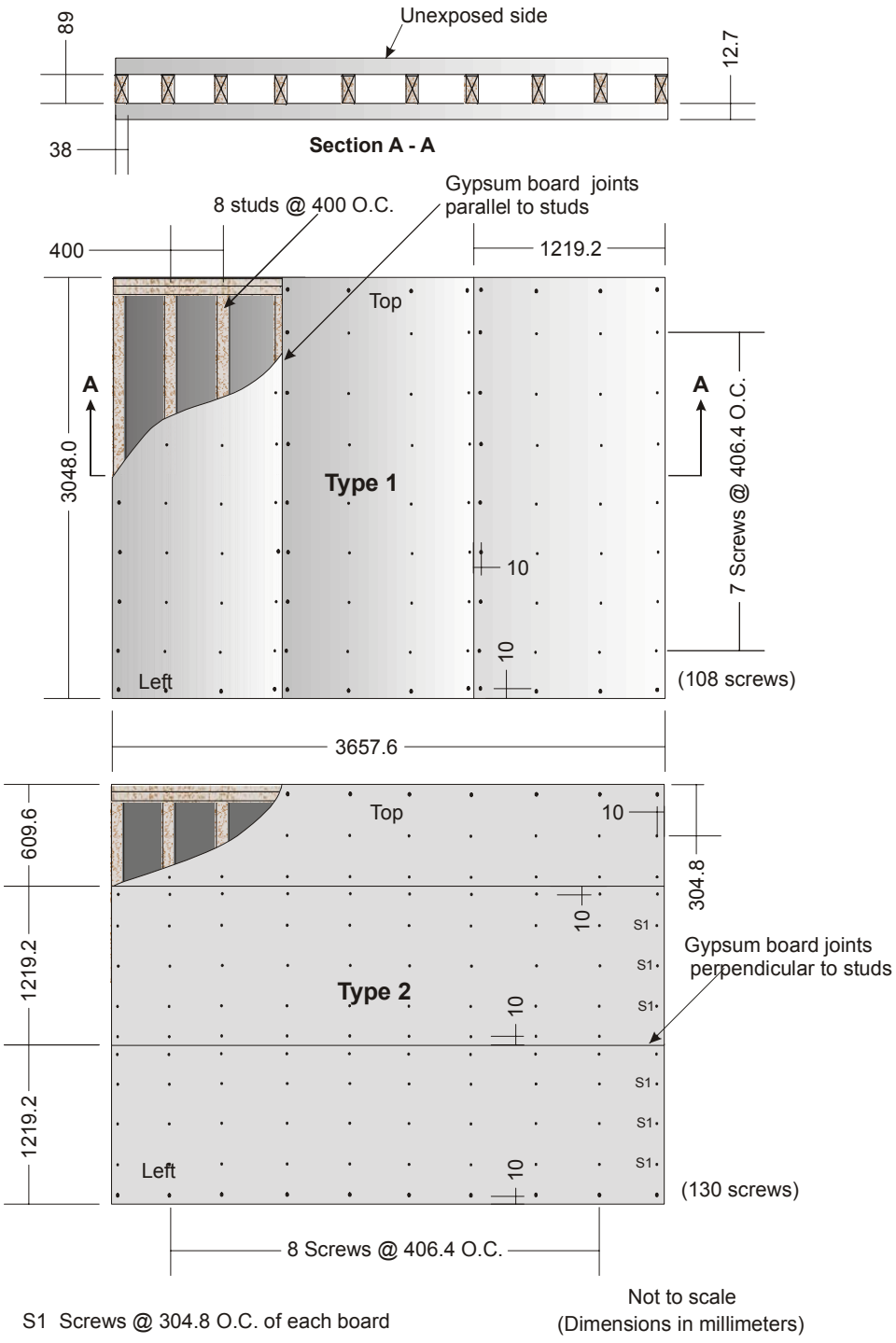


**Figure 1.** Dimensions and layout of wall assemblies (fire-exposed side shown)

The wall assemblies were mounted in a concrete frame designed for testing loaded and unloaded wall assemblies.

Table 1. Applicable standards for the wall assemblies

| Item | Product/Application Standard |
|---|---|
| Wall assembly | CAN/CSA-A82.31-M91 |
| Gypsum board | CAN/CSA-A82.27-M91[6]/ASTM C 1396 |
| Studs | CAN/CSA-0141 |
| Nails | CSA B111 |
| Screws | ASTM C 1002 |
| Joint finishing materials (compound and fibre tape) | ASTM C 475 |

## 3 TEST FACILITY

The apparatus used in the tests was the vertical full-scale propane-fired wall furnace, which has been adequately described in previous NRC publications[1,3,4]. The furnace temperature is automatically controlled using the average temperature of nine shielded chromel-alumel (Type-K) 20 gauge thermocouples, as required by the CAN/ULC-S101-M89 standard test method[7].

The loading system consisted of a steel frame, in which the assembly was placed, and eight hydraulic jacks fitted at the top to simulate vertical structural loads.

### 3.1 Instrumentation and Data Acquisition

All temperatures were measured with Type-K thermocouples. In accordance with the standard method[8], a minimum of nine shielded thermocouples was attached under insulating pads at prescribed positions on the unexposed side of the wall, as shown in Figure 2. In addition to the nine mandatory thermocouples, 46 additional thermocouples were installed — 40 at various locations inside the assembly and six on the unexposed surface, as shown in Figure 3. The additional temperature data was intended for future analytical studies.

In the case of load-bearing assemblies, deflection measurements were taken at the nine locations shown in Figure 4 using electro-mechanical gauges.

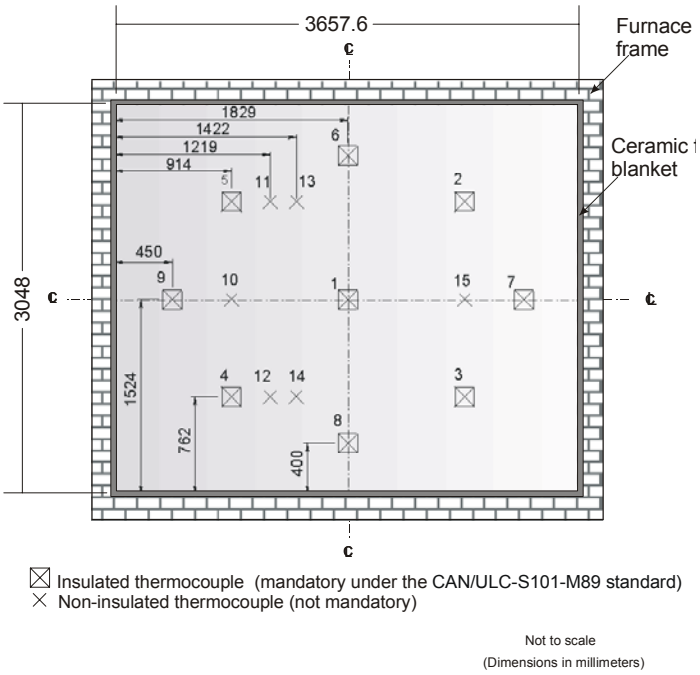


**Figure 2.** Location of thermocouples on the unexposed surface of an unloaded assembly.

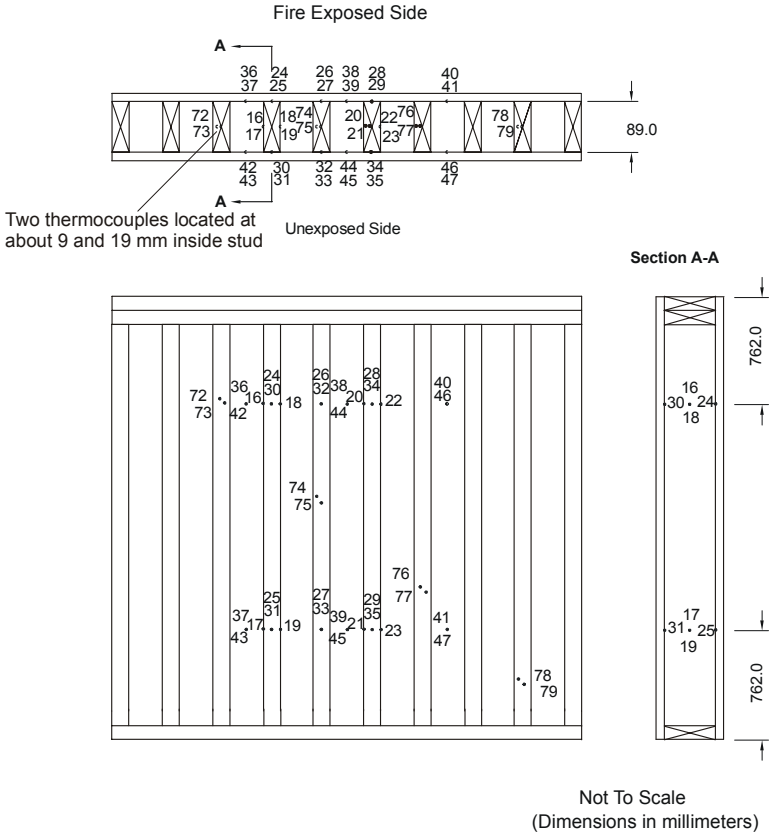


**Figure 3.** Location of additional non-mandatory thermocouples inside the wall assemblies.

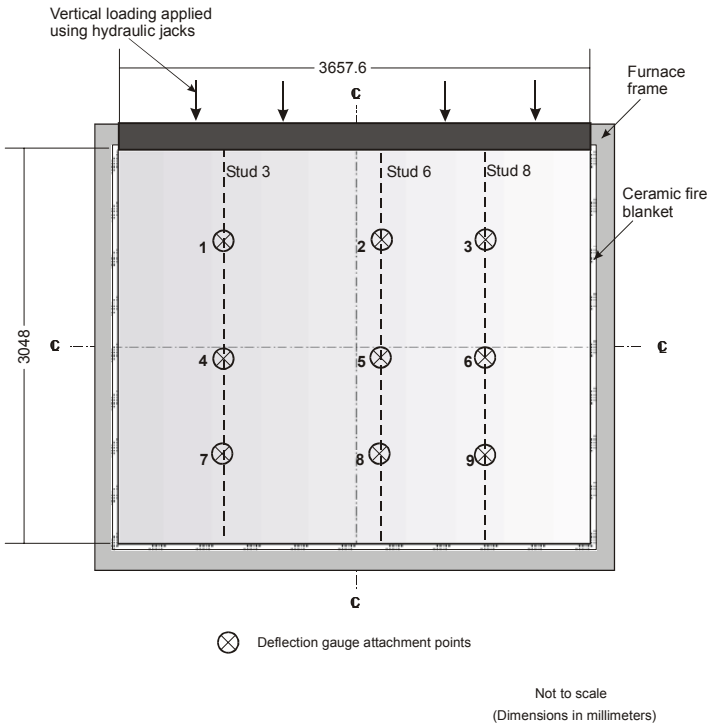


**Figure 4.** Deflection measurement points for full-scale wood stud loaded wall assemblies.

A computer-based data logging system was used to record the temperature, furnace pressure and deflection data directly to a computer hard disk at one-minute intervals.

Three video cameras were used to film the tests; one was directed at the unexposed surface and the other two at the fire exposed side.

## 4 TEST PROCEDURE

The tests were conducted in conformity to the CAN/ULC-S101-M89 test specification[8], which is similar to the ASTM E119 standard[9].

### 4.1 Failure Criteria

The fire resistance of non-load-bearing wall assemblies is judged by the integrity or insulation criteria. These criteria are intended to test the ability of a wall assembly to prevent a fire from spreading to adjacent rooms. Therefore, the appearance of visible cracks or fissures, which permit smoke or hot gases to penetrate the unexposed surface of the assembly, constitutes failure under the integrity criteria. According to the test specification, the temperature of the unexposed surface should not rise high enough to ignite cotton waste attached to the surface. The insulation criteria requires that the temperature of the unexposed side of the assembly, as measured by the nine mandatory thermocouples, does not experience an average

temperature increase of 140 $^{o}$C above ambient and that the maximum temperature rise at any single thermocouple (single-point) on this surface does not exceed 180 $^{o}$C above ambient.

In the case of load-bearing walls, an additional stability criterion also applies – the assembly must perform its load-bearing function and carry the applied loads for the duration of the test, without structural collapse. The CAN/ULC-S101-M89 limits the maximum deflection, at any one point, to 150 mm.

In all of the tests in which insulation failure occurred first, the furnace was not shut down until flames appeared on the unexposed surface so as to collect additional temperature data that will be used in future analyses.

## 5 RESULTS AND DISCUSSION

The fire resistance of each of the six wall assemblies is given in Table 2. The temperatures recorded during the tests are given in Tables A - 3 to A - 20 and the deflection measurements for tests 5 and 6 are given in Tables A - 21 and A - 22, respectively. The applied load in tests 5 and 6 was selected from values used in previous tests at NRC[1].

Table 2. Results of the fire tests

| Test number | Wall type[1] | Applied load (kN) | Gypsum board Joint opening / crack formation / fall out times ( min)[2] | Fire resistance (min) | Failure mode |
|---|---|---|---|---|---|
| 1 | 1 // | - | 15 / 17 / 19 | 28 | Insulation[3] |
| 2 | 2 ⊥ | - | 15 / 18 / > 26 | 26 | Insulation |
| 3 | 2 ⊥ | - | 15 / 20 / 32 | 34 | Insulation |
| 4 | 2 ⊥ | - | 15 / 16 /29 | 30 | Insulation |
| 5 | 1 // | 68.8 | 14 / 16 / 18 | 23 | Integrity |
| 6 | 2 ⊥ | 68.8 | 15 / 16 /23 | 26 | Integrity |

[1] Orientation of gypsum board: Type 1 – parallel (//); Type 2- perpendicular (⊥)

[2] Observed times to the nearest minute

[3] Single-point insulation failure

The average fire resistance of the three unloaded Type 2 wall tests is 30 min. Test 4 was a repeat test necessitated by the large discrepancy between the fire resistance

obtained in tests 2 and 3. This result is not significantly different from the fire resistance of 28 min, which was obtained in test 1 (Type 1 wall).

In the tests with unloaded wall assemblies (tests 1 to 4), insulation failure was a result of the rapid rise in temperature, which occurred after sections of cracked gypsum board fell off and permitted flames to enter the wall cavity. The difference in failure times is related to falling-off times of cracked pieces of gypsum board – failure is precipitated by early fall-off times.

In previous tests at NRC[1], a loaded Type 1 specimen, of identical construction and loading, achieved a fire resistance rating of 26 min. Therefore, the results of tests 5 and 6 with loaded assemblies show that the orientation of gypsum board has no significant impact on fire resistance. An examination of gypsum falling-off times for the two tests reveals that cracked sections of gypsum fell off earlier in test 5 (Type 2 wall) than in test 6 (Type 1 wall), thereby precipitating failure.

### 5.1 Extent of Charring

The average dimensions of uncharred wood for selected stud cross-sections taken at mid-height are given in Table 3.

**Table 3.** Mean dimensions (length x width) of uncharred wood for selected stud cross-sections taken at mid-height

| Test # | Wall type[2] | Dimensions of remaining uncharred cross section (mm)[1] | | |
|---|---|---|---|---|
| | | Stud 5 | Stud 6 | Stud 7 |
| 1 | 1 // | NA | 45 x 9 | 78 x 30 |
| 2 | 2 ⊥ | 72 x 25 | 78 x 23 | 78 x 25 |
| 3 | 2 ⊥ | 70 x 13 | 64 x 17 | 69 x 19 |
| 4 | 2 ⊥ | 83 x 29 | 83 x 32 | 79 x 30 |
| 5 | 1 // | 65 x 16 | 66 x 20 | 62 x 12 |
| 6 | 2 ⊥ | 82 x 28 | 83 x 27 | 79 x 22 |

[1] Nominal dimensions of virgin studs are 89 mm x 38 mm

[2] Orientation of gypsum board: Type 1 – parallel (//); Type 2- perpendicular (⊥)

NA: Measurement was not taken.

The unloaded Type 1 (test 1) wall experienced the highest degree of charring, and a portion of stud 6 was completely charred. The charring patterns for selected stud cross-sections taken at mid-height are given in Table A - 2. The differences in charring rates can be attributed to the orientation of the joint between the gypsum boards and the fall-off times of cracked pieces of gypsum board. In Type 1 walls, the studs at which the joints were formed experience a greater exposure to the fire than those in Type 2 walls.

## 6 SUMMARY

The fire resistance of the unloaded Type 1 wall (parallel orientation) was found to be 28 min and that of Type 2 walls (perpendicular orientation) was an average of 30 min. These limited tests showed that the orientation of the gypsum board did not have a significant effect on the fire resistance of unloaded wall assemblies. However, a close examination of the charred studs revealed that the studs in Type 1 (parallel) walls experienced a greater extent of charring than Type 2 (perpendicular) walls.

The fire resistance of the loaded Type 1 wall was found to be 23 min and that of the Type 2 wall was 26 min. The fire resistance of the Type 1 wall is slightly lower because the joints between the gypsum boards opened along a stud and cracked pieces of gypsum board fell off earlier.

The failure of all of the wall assemblies was generally precipitated by the opening of the joints and cracking of the gypsum board, which is a result of shrinkage and calcination.

## 7 ACKNOWLEDGEMENTS

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## 8 REFERENCES

1. Sultan, M. A., Lougheed, G. D., Denham, E. M. A., Monette, R. C., and MacLaurin, J. W., "Temperature Measurements in Full-Scale Fire Resistance Tests on Non-Insulated Regular Gypsum Board Wall Assemblies", NRC Internal Report, Vol. No. 674, December 199.
2. Alfawakhiri, F. and Sultan, M. A., "Fire Resistance of Load-bearing Steel-Stud Walls Protected with Gypsum Board: a Review", Fire Technology, Vol. 35(4), November 1999, pp.308-335
3. Sultan, M. A., "Correlation of Small- and Full-Scale Fire Resistance on Insulated and Non-

Insulated Lightweight Frame Gypsum Board Wall Assemblies,", Interflam '96, 7th International Fire Science and Engineering Conference, St. John's College, Cambridge, England , April 1996, pp.933-937

4. Sultan, M. A., "Effect of Insulation in the Wall Cavity on the Fire Resistance Rating of Full-Scale Asymmetrical (1x2) Gypsum Board Protected Wall Assemblies", International Conference on Fire Research and Engineering, Orlando, Florida, USA, September 1995, pp.545-550
5. Canada Mortgage and Housing Corporation, C., Canadian Wood-Frame House Construction, CMHC, Ottawa, Ontario, Canada, 1997.
6. CAN/CSA-A82.27-M91, "Gypsum Board-Building Materials and Products", Canadian General Standards Board, Ottawa, Ontario, Canada, 1986
7. Sultan, M. A., Bénichou, N., and Min, B. Y., "Heat Exposure in Fire Resistance Furnaces: Full-Scale Vs. Intermediate-Scale", Fire and Materials, San Francisco, U.S.A, January 2003
8. CAN/ULC-S101-M89, “Standard Methods of Fire Endurance Tests of Building Construction and Materials”, Canadian General Standards Board, Ottawa, Ontario, Canada, 1989
9. ASTM E119-00a, “Standard Test Method for Fire Tests of Building Construction and Materials”, ASTM International, West Conshohocken, PA, USA, 2000.

## APPENDIX A: TABLES

Table A - 1. Mass of wood frame and gypsum board.

| Test Number | Wall Type | Mass of gypsum board (kg) | Mass of wood frame (kg) | Mean wood moisture content (%) | Total mass (kg) |
|---|---|---|---|---|---|
| 1 | 1 // | NA | NA | NA | NA |
| 2 | 2 ⊥ | 211.0 | 69.6 | 9.2 | 280.6 |
| 3 | 2 ⊥ | 208.8 | 69.2 | 9.0 | 278.0 |
| 4 | 2 ⊥ | NA | NA | NA | NA |
| 5 | 1 // | 199.0 | NA | NA | NA |
| 6 | 2 ⊥ | 206.8 | 65.2 | 10.5 | 272.0 |

NA: Data not available

Orientation of gypsum board: Type 1 – parallel (//); Type 2- perpendicular (⊥)

Table A - 2. Charring patterns

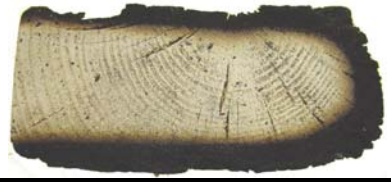
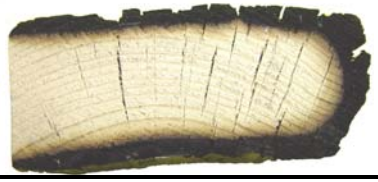
| Test # | Stud no. 5 | Stud no. 6 | Stud no. 7 |
|---|---|---|---|
| 1 | - |  |  |
| 2 |  |  |  |
| 3 |  |  |  |
| 4 |  |  |  |
| 5 |  |  |  |
| 6 |  |  |  |

Table A - 3. Temperatures measured on the unexposed side of the assembly in Test 1

| Time | | | Thermocouple number on unexposed side | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| (min) | S101 | Favg | **1** | **2** | **3** | **4** | **5** | **6** | **7** | **8** | **9** | **10** | **11** | **12** | **13** | **14** | **15** |
| 0 | 20 | 24 | 22 | 23 | 21 | 21 | 23 | 23 | 22 | 21 | 22 | 20 | 21 | 19 | 22 | 20 | 21 |
| 1 | 124 | 41 | 22 | 23 | 21 | 21 | 23 | 23 | 22 | 21 | 22 | 21 | 21 | 19 | 22 | 20 | 21 |
| 2 | 227 | 183 | 22 | 23 | 21 | 21 | 23 | 23 | 22 | 20 | 22 | 21 | 21 | 19 | 22 | 20 | 21 |
| 3 | 331 | 346 | 25 | 26 | 23 | 23 | 27 | 26 | 24 | 22 | 24 | 23 | 22 | 20 | 24 | 22 | 23 |
| 4 | 434 | 372 | 31 | 35 | 28 | 29 | 35 | 35 | 29 | 25 | 29 | 29 | 23 | 21 | 30 | 26 | 28 |
| 5 | 538 | 510 | 36 | 42 | 33 | 33 | 42 | 42 | 33 | 29 | 34 | 33 | 24 | 22 | 34 | 29 | 33 |
| 6 | 571 | 587 | 41 | 48 | 38 | 38 | 47 | 48 | 37 | 33 | 39 | 35 | 26 | 23 | 37 | 32 | 35 |
| 7 | 604 | 577 | 47 | 54 | 43 | 43 | 53 | 54 | 42 | 37 | 44 | 37 | 27 | 24 | 40 | 34 | 39 |
| 8 | 638 | 646 | 51 | 58 | 47 | 47 | 57 | 58 | 46 | 41 | 48 | 39 | 29 | 25 | 41 | 36 | 41 |
| 9 | 671 | 653 | 55 | 61 | 50 | 51 | 61 | 62 | 49 | 45 | 52 | 40 | 30 | 27 | 43 | 38 | 41 |
| 10 | 704 | 712 | 59 | 64 | 54 | 54 | 64 | 65 | 53 | 48 | 56 | 42 | 31 | 28 | 44 | 40 | 42 |
| 11 | 715 | 719 | 62 | 66 | 57 | 57 | 66 | 67 | 56 | 52 | 59 | 44 | 32 | 29 | 44 | 41 | 44 |
| 12 | 726 | 721 | 65 | 68 | 60 | 60 | 68 | 69 | 59 | 55 | 62 | 45 | 33 | 30 | 45 | 42 | 45 |
| 13 | 738 | 742 | 67 | 70 | 62 | 63 | 69 | 71 | 61 | 58 | 65 | 45 | 35 | 32 | 47 | 43 | 47 |
| 14 | 749 | 746 | 69 | 71 | 64 | 65 | 71 | 72 | 63 | 61 | 67 | 46 | 35 | 32 | 47 | 45 | 48 |
| 15 | 760 | 752 | 72 | 74 | 67 | 68 | 72 | 73 | 66 | 63 | 69 | 47 | 37 | 33 | 48 | 46 | 48 |
| 16 | 767 | 769 | 74 | 76 | 69 | 70 | 74 | 75 | 69 | 66 | 71 | 49 | 38 | 35 | 48 | 48 | 50 |
| 17 | 774 | 779 | 80 | 81 | 72 | 72 | 78 | 80 | 72 | 69 | 73 | 51 | 38 | 36 | 53 | 49 | 55 |
| 18 | 781 | 781 | 84 | 84 | 77 | 79 | 82 | 84 | 78 | 72 | 77 | 57 | 41 | 37 | 55 | 54 | 58 |
| 19 | 788 | 781 | 88 | 88 | 82 | 83 | 85 | 87 | 82 | 79 | 81 | 60 | 42 | 39 | 60 | 59 | 58 |
| 20 | 795 | 796 | 93 | 92 | 84 | 86 | 88 | 93 | 84 | 84 | 83 | 61 | 45 | 41 | 61 | 60 | 60 |
| 21 | 800 | 804 | 97 | 96 | 87 | 88 | 92 | 97 | 87 | 87 | 85 | 63 | 49 | 43 | 62 | 61 | 62 |
| 22 | 805 | 801 | 101 | 101 | 90 | 92 | 97 | 103 | 92 | 91 | 87 | 64 | 50 | 45 | 66 | 62 | 63 |
| 23 | 811 | 813 | 105 | 107 | 93 | 97 | 101 | 110 | 96 | 96 | 89 | 65 | 50 | 47 | 74 | 64 | 63 |
| 24 | 816 | 820 | 109 | 113 | 97 | 101 | 105 | 116 | 100 | 99 | 93 | 65 | 51 | 48 | 81 | 65 | 64 |
| 25 | 821 | 815 | 112 | 118 | 101 | 104 | 109 | 122 | 104 | 103 | 97 | 67 | 53 | 48 | 86 | 67 | 67 |
| 26 | 825 | 831 | 115 | 122 | 104 | 108 | 112 | 126 | 107 | 105 | 101 | 68 | 55 | 48 | 93 | 69 | 71 |
| 27 | 830 | 830 | 118 | 127 | 107 | 110 | 115 | 137 | 110 | 107 | 106 | 71 | 57 | 50 | 103 | 71 | 71 |
| 28 | 834 | 834 | 120 | 135 | 110 | 114 | 118 | 193 | 112 | 109 | 111 | 77 | 59 | 53 | 140 | 72 | 75 |

Favg = Mean furnace temperature ($^{O}$C); S101 = CAN/ULC-S101 standard temperature ($^{O}$C)

Table A - 4. Temperatures measured inside the upper half section of the assembly in Test 1

| Time | | | Thermocouple number inside upper half section (even numbers) | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| (min) | S101 | Favg | **16** | **18** | **20** | **22** | **24** | **26** | **28** | **30** | **32** | **34** | **36** | **38** | **40** | **42** | **44** | **46** | **72** | **74** | **76** | **78** |
| 0 | 20 | 24 | 23 | 23 | 24 | 24 | 24 | 24 | 24 | 23 | 23 | 23 | 21 | 24 | 23 | 23 | 23 | 23 | n/a | n/a | n/a | n/a |
| 1 | 124 | 41 | 24 | 24 | 24 | 24 | 30 | 29 | 29 | 23 | 23 | 23 | 21 | 29 | 28 | 24 | 24 | 24 | n/a | n/a | n/a | n/a |
| 2 | 227 | 183 | 68 | 69 | 63 | 69 | 99 | 87 | 89 | 24 | 23 | 25 | 26 | 79 | 78 | 73 | 64 | 69 | 25 | 25 | 24 | 22 |
| 3 | 331 | 346 | 70 | 71 | 68 | 70 | 93 | 86 | 85 | 25 | 24 | 27 | 27 | 79 | 77 | 69 | 66 | 69 | 30 | 28 | 27 | 24 |
| 4 | 434 | 372 | 65 | 65 | 63 | 64 | 89 | 79 | 78 | 26 | 25 | 29 | 26 | 76 | 75 | 64 | 61 | 64 | 34 | 30 | 29 | 25 |
| 5 | 538 | 510 | 72 | 73 | 72 | 72 | 99 | 90 | 87 | 29 | 27 | 30 | 30 | 88 | 85 | 73 | 70 | 72 | 37 | 32 | 31 | 26 |
| 6 | 571 | 587 | 76 | 76 | 75 | 75 | 101 | 92 | 88 | 31 | 30 | 32 | 30 | 99 | 95 | 76 | 73 | 75 | 41 | 36 | 34 | 28 |
| 7 | 604 | 577 | 74 | 75 | 74 | 73 | 105 | 96 | 93 | 34 | 33 | 35 | 30 | 106 | 101 | 78 | 73 | 77 | 44 | 38 | 37 | 30 |
| 8 | 638 | 646 | 78 | 79 | 79 | 77 | 111 | 102 | 101 | 36 | 36 | 38 | 31 | 111 | 105 | 83 | 78 | 82 | 47 | 41 | 39 | 32 |
| 9 | 671 | 653 | 80 | 83 | 83 | 78 | 120 | 106 | 105 | 40 | 39 | 41 | 33 | 115 | 109 | 86 | 82 | 85 | 50 | 43 | 42 | 34 |
| 10 | 704 | 712 | 83 | 86 | 86 | 81 | 133 | 110 | 109 | 43 | 43 | 44 | 35 | 119 | 112 | 89 | 84 | 88 | 53 | 46 | 45 | 36 |
| 11 | 715 | 719 | 87 | 90 | 89 | 83 | 155 | 114 | 113 | 46 | 46 | 47 | 37 | 123 | 117 | 91 | 87 | 91 | 56 | 48 | 47 | 39 |
| 12 | 726 | 721 | 92 | 93 | 91 | 86 | 177 | 120 | 118 | 50 | 49 | 51 | 38 | 133 | 128 | 95 | 89 | 95 | 59 | 51 | 49 | 41 |
| 13 | 738 | 742 | 103 | 103 | 99 | 93 | 213 | 127 | 127 | 58 | 53 | 54 | 39 | 168 | 167 | 106 | 97 | 108 | 61 | 53 | 52 | 43 |
| 14 | 749 | 746 | 121 | 120 | 116 | 112 | 257 | 155 | 153 | 68 | 56 | 58 | 41 | 219 | 212 | 128 | 114 | 135 | 64 | 55 | 54 | 46 |
| 15 | 760 | 752 | 149 | 150 | 141 | 140 | 327 | 206 | 197 | 70 | 60 | 63 | 44 | 264 | 254 | 161 | 145 | 172 | 67 | 58 | 57 | 49 |
| 16 | 767 | 769 | 186 | 184 | 174 | 179 | 394 | 254 | 237 | 66 | 64 | 70 | 48 | 310 | 303 | 198 | 179 | 207 | 72 | 61 | 61 | 52 |
| 17 | 774 | 779 | 216 | 217 | 200 | 208 | 536 | 296 | 276 | 76 | 67 | 70 | 52 | 334 | 329 | 222 | 197 | 227 | 80 | 67 | 67 | 55 |
| 18 | 781 | 781 | 241 | 238 | 222 | 237 | 652 | 326 | 309 | 77 | 68 | 71 | 56 | 337 | 390 | 249 | 226 | 282 | 90 | 73 | 74 | 60 |
| 19 | 788 | 781 | 263 | 521 | 497 | 434 | 701 | 751 | 638 | 83 | 71 | 76 | 63 | 881 | 509 | 274 | 517 | 417 | 101 | 81 | 82 | 67 |
| 20 | 795 | 796 | 282 | 726 | 705 | 787 | 790 | 833 | 807 | 128 | 114 | 224 | 70 | 856 | 531 | 303 | 809 | 564 | 111 | 93 | 90 | 79 |
| 21 | 800 | 804 | 310 | 758 | 765 | 814 | 782 | 811 | 812 | 277 | 297 | 565 | 78 | 842 | 546 | 352 | 818 | 582 | 119 | 109 | 98 | 89 |
| 22 | 805 | 801 | 358 | 775 | 819 | 833 | 794 | 840 | 836 | 400 | 503 | 694 | 87 | 864 | 575 | 414 | 847 | 617 | 128 | 126 | 107 | 97 |
| 23 | 811 | 813 | 408 | 869 | 859 | 843 | 873 | 903 | 838 | 801 | 715 | 767 | 99 | 882 | 608 | 467 | 870 | 646 | 141 | 146 | 117 | 103 |
| 24 | 816 | 820 | 447 | 805 | 833 | 809 | 807 | 851 | 807 | 773 | 763 | 763 | 105 | 842 | 636 | 501 | 834 | 651 | 163 | 171 | 125 | 110 |
| 25 | 821 | 815 | 489 | 850 | 847 | 821 | 849 | 866 | 823 | 839 | 794 | 787 | 118 | 856 | 896 | 544 | 846 | 841 | 180 | 188 | 134 | 117 |
| 26 | 825 | 831 | 521 | 831 | 893 | 825 | 832 | 877 | 867 | 819 | 832 | 811 | 158 | 865 | 821 | 579 | 904 | 824 | 214 | 208 | 146 | 125 |
| 27 | 830 | 830 | 631 | 830 | 884 | 807 | 870 | 861 | 824 | 823 | 826 | 780 | 262 | 856 | 797 | 684 | 877 | 795 | 521 | 232 | 250 | 131 |
| 28 | 834 | 834 | 877 | 878 | 883 | 826 | 869 | 922 | 781 | 896 | 910 | 798 | 333 | 921 | 800 | 882 | 900 | 819 | 852 | 815 | 304 | 137 |

Favg = Mean furnace temperature ($^{O}$C); S101 = CAN/ULC-S101 standard temperature ($^{O}$C)

Table A - 5. Temperatures measured inside the lower half section of the assembly in Test 1

| Time | | | Thermocouple number inside lower half section (odd numbers) | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| (min) | S101 | Favg | **17** | **19** | **21** | **23** | **25** | **27** | **29** | **31** | **33** | **35** | **37** | **39** | **41** | **43** | **45** | **47** | **73** | **75** | **77** | **79** |
| 0 | 20 | 24 | 22 | 22 | 22 | 22 | 22 | 22 | 22 | 21 | 21 | 21 | 22 | 22 | 21 | 21 | 21 | 22 | n/a | n/a | n/a | n/a |
| 1 | 124 | 41 | 22 | 22 | 22 | 22 | 26 | 26 | 27 | 21 | 21 | 21 | 22 | 24 | 22 | 22 | 22 | 25 | n/a | n/a | n/a | n/a |
| 2 | 227 | 183 | 63 | 57 | 55 | 54 | 99 | 80 | 91 | 21 | 21 | 21 | 59 | 48 | 64 | 68 | 57 | 76 | 29 | 31 | 25 | 23 |
| 3 | 331 | 346 | 60 | 58 | 58 | 58 | 93 | 84 | 86 | 22 | 21 | 22 | 59 | 47 | 61 | 61 | 58 | 71 | 36 | 42 | 33 | 26 |
| 4 | 434 | 372 | 55 | 54 | 54 | 53 | 89 | 77 | 79 | 23 | 22 | 24 | 55 | 46 | 55 | 56 | 53 | 68 | 38 | 43 | 34 | 27 |
| 5 | 538 | 510 | 65 | 63 | 62 | 61 | 98 | 90 | 90 | 24 | 23 | 26 | 63 | 53 | 65 | 66 | 63 | 80 | 41 | 47 | 37 | 29 |
| 6 | 571 | 587 | 67 | 66 | 65 | 64 | 102 | 92 | 92 | 25 | 24 | 28 | 66 | 59 | 67 | 67 | 65 | 89 | 44 | 52 | 40 | 32 |
| 7 | 604 | 577 | 66 | 66 | 65 | 63 | 107 | 96 | 94 | 27 | 26 | 31 | 66 | 68 | 66 | 68 | 66 | 96 | 47 | 54 | 42 | 34 |
| 8 | 638 | 646 | 71 | 70 | 70 | 68 | 125 | 104 | 101 | 29 | 27 | 34 | 70 | 80 | 72 | 76 | 73 | 102 | 49 | 57 | 45 | 37 |
| 9 | 671 | 653 | 75 | 72 | 73 | 69 | 146 | 108 | 106 | 32 | 29 | 36 | 72 | 90 | 77 | 80 | 78 | 106 | 52 | 60 | 47 | 39 |
| 10 | 704 | 712 | 79 | 74 | 77 | 73 | 182 | 114 | 112 | 34 | 31 | 40 | 75 | 92 | 80 | 84 | 82 | 110 | 54 | 62 | 50 | 42 |
| 11 | 715 | 719 | 82 | 78 | 81 | 75 | 226 | 121 | 117 | 37 | 34 | 44 | 78 | 92 | 84 | 88 | 86 | 116 | 57 | 65 | 53 | 44 |
| 12 | 726 | 721 | 86 | 82 | 83 | 77 | 261 | 125 | 123 | 39 | 36 | 48 | 79 | 86 | 85 | 89 | 88 | 121 | 59 | 67 | 56 | 47 |
| 13 | 738 | 742 | 93 | 87 | 87 | 79 | 262 | 133 | 130 | 42 | 39 | 52 | 82 | 106 | 92 | 96 | 93 | 140 | 61 | 69 | 59 | 49 |
| 14 | 749 | 746 | 108 | 96 | 97 | 82 | 278 | 149 | 146 | 46 | 41 | 58 | 86 | 148 | 107 | 115 | 108 | 183 | 63 | 70 | 62 | 51 |
| 15 | 760 | 752 | 130 | 111 | 116 | 88 | 339 | 188 | 190 | 49 | 44 | 67 | 96 | 140 | 134 | 139 | 133 | 222 | 66 | 72 | 65 | 55 |
| 16 | 767 | 769 | 167 | 137 | 143 | 107 | 372 | 224 | 229 | 51 | 47 | 72 | 119 | 154 | 172 | 174 | 167 | 266 | 72 | 80 | 69 | 59 |
| 17 | 774 | 779 | 212 | 172 | 176 | 134 | 451 | 260 | 264 | 55 | 51 | 74 | 155 | 313 | 212 | 215 | 197 | 339 | 81 | 94 | 76 | 62 |
| 18 | 781 | 781 | 251 | 198 | 197 | 165 | 605 | 300 | 301 | 59 | 54 | 75 | 193 | 368 | 228 | 246 | 217 | 382 | 90 | 107 | 80 | 69 |
| 19 | 788 | 781 | 273 | 225 | 226 | 194 | 660 | 321 | 344 | 65 | 58 | 77 | 226 | 293 | 253 | 268 | 245 | 391 | 101 | 122 | 87 | 78 |
| 20 | 795 | 796 | 287 | 252 | 250 | 226 | 700 | 354 | 382 | 76 | 63 | 80 | 249 | 300 | 270 | 293 | 268 | 390 | 112 | 152 | 94 | 91 |
| 21 | 800 | 804 | 301 | 273 | 272 | 259 | 646 | 380 | 428 | 80 | 68 | 84 | 272 | 379 | 289 | 321 | 290 | 405 | 124 | 182 | 103 | 104 |
| 22 | 805 | 801 | 322 | 296 | 296 | 301 | 660 | 404 | 470 | 83 | 72 | 85 | 294 | 399 | 310 | 344 | 313 | 420 | 137 | 213 | 111 | 112 |
| 23 | 811 | 813 | 349 | 324 | 317 | 330 | 664 | 430 | 494 | 84 | 77 | 87 | 318 | 415 | 337 | 380 | 336 | 436 | 153 | 256 | 119 | 117 |
| 24 | 816 | 820 | 388 | 346 | 340 | 362 | 648 | 456 | 521 | 85 | 81 | 88 | 356 | 440 | 359 | 425 | 363 | 451 | 169 | 305 | 126 | 124 |
| 25 | 821 | 815 | 472 | 370 | 365 | 417 | 685 | 482 | 543 | 87 | 85 | 90 | 401 | 461 | 387 | 493 | 389 | 472 | 185 | 342 | 134 | 130 |
| 26 | 825 | 831 | 543 | 401 | 400 | 513 | 699 | 499 | 670 | 91 | 89 | 132 | 488 | 492 | 411 | 549 | 427 | 482 | 202 | 393 | 145 | 138 |

Favg = Mean furnace temperature ($^{O}$C); S101 = CAN/ULC-S101 standard temperature ($^{O}$C)

Table A - 6. Temperatures measured on the unexposed side of the assembly in Test 2

| Time | | | Thermocouple number on unexposed side | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| (min) | S101 | Favg | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 |
| 0 | 20 | 21.5 | 21.3 | 21.5 | 21.2 | 21.3 | 21.5 | 21.5 | 21.4 | 21.2 | 21.5 | 21.3 | 21.5 | 21.3 | 21.5 | 21.3 | 21.5 |
| 1 | 124 | 37.6 | 21.4 | 21.5 | 21.2 | 21.3 | 21.5 | 21.5 | 21.4 | 21.2 | 21.5 | 21.3 | 21.5 | 21.3 | 21.5 | 21.3 | 21.5 |
| 2 | 227 | 233.2 | 21.5 | 21.7 | 21.3 | 21.4 | 21.7 | 21.6 | 21.5 | 21.2 | 21.6 | 21.3 | 21.6 | 21.4 | 21.7 | 21.4 | 21.6 |
| 3 | 331 | 384.9 | 24.8 | 25.4 | 23.5 | 23.6 | 25.6 | 26.0 | 23.9 | 22.6 | 25.0 | 24.3 | 22.1 | 21.7 | 25.3 | 23.2 | 24.7 |
| 4 | 434 | 394.4 | 30.9 | 32.4 | 27.5 | 27.4 | 32.5 | 34.2 | 28.5 | 25.6 | 30.9 | 28.5 | 23.6 | 22.9 | 30.8 | 26.1 | 29.7 |
| 5 | 538 | 536.7 | 35.7 | 37.9 | 30.9 | 30.5 | 37.6 | 40.3 | 32.2 | 28.3 | 35.5 | 30.6 | 25.6 | 24.2 | 33.7 | 28.0 | 32.4 |
| 6 | 571 | 591.8 | 40.3 | 43.0 | 34.3 | 33.7 | 42.5 | 46.0 | 35.6 | 30.9 | 39.8 | 33.0 | 27.4 | 25.3 | 36.5 | 30.2 | 35.0 |
| 7 | 604 | 574.7 | 45.0 | 48.2 | 38.0 | 37.1 | 47.5 | 51.6 | 39.2 | 34.0 | 44.5 | 33.7 | 30.0 | 27.6 | 38.8 | 32.3 | 37.4 |
| 8 | 638 | 639.8 | 48.4 | 51.9 | 41.1 | 39.9 | 50.9 | 55.1 | 41.9 | 36.8 | 47.9 | 35.1 | 31.9 | 28.7 | 40.2 | 33.6 | 38.5 |
| 9 | 671 | 652.8 | 51.4 | 55.0 | 44.0 | 42.5 | 53.9 | 58.0 | 44.5 | 39.7 | 50.9 | 35.4 | 34.1 | 31.0 | 41.6 | 35.3 | 39.8 |
| 10 | 704 | 700.3 | 54.1 | 57.6 | 46.6 | 44.9 | 56.4 | 60.5 | 46.8 | 42.4 | 53.5 | 36.8 | 36.1 | 31.4 | 42.7 | 35.2 | 40.9 |
| 11 | 715 | 723.6 | 56.6 | 60.0 | 49.2 | 47.2 | 58.7 | 62.7 | 49.0 | 45.2 | 56.1 | 37.5 | 38.2 | 33.7 | 43.3 | 38.0 | 41.9 |
| 12 | 726 | 707.3 | 58.6 | 61.9 | 51.5 | 49.4 | 60.7 | 64.4 | 51.0 | 47.9 | 58.2 | 38.2 | 40.2 | 35.5 | 44.2 | 39.4 | 42.8 |
| 13 | 738 | 751.3 | 60.5 | 63.7 | 53.6 | 51.5 | 62.3 | 65.8 | 52.8 | 50.3 | 60.1 | 38.6 | 41.6 | 37.0 | 45.6 | 40.1 | 44.1 |
| 14 | 749 | 732.1 | 62.1 | 65.7 | 55.6 | 53.4 | 63.8 | 67.0 | 54.4 | 52.0 | 61.7 | 39.7 | 42.2 | 37.7 | 46.1 | 41.0 | 44.9 |
| 15 | 760 | 770.7 | 64.7 | 68.5 | 58.3 | 56.1 | 66.2 | 68.8 | 56.5 | 53.0 | 63.9 | 41.1 | 42.3 | 37.6 | 48.1 | 42.3 | 46.8 |
| 16 | 767 | 762.4 | 67.6 | 71.5 | 61.7 | 59.6 | 68.9 | 71.2 | 59.4 | 54.1 | 66.8 | 43.9 | 42.6 | 37.0 | 49.9 | 42.5 | 48.5 |
| 17 | 774 | 779.0 | 72.0 | 77.4 | 65.3 | 63.0 | 72.9 | 75.1 | 63.2 | 56.6 | 70.0 | 45.2 | 43.2 | 39.6 | 53.5 | 45.2 | 53.1 |
| 18 | 781 | 773.4 | 79.4 | 87.8 | 70.6 | 68.6 | 80.4 | 81.8 | 69.6 | 59.5 | 75.6 | 52.2 | 44.7 | 40.1 | 58.4 | 47.7 | 58.5 |
| 19 | 788 | 794.8 | 83.6 | 88.6 | 79.0 | 77.5 | 83.9 | 84.9 | 76.8 | 61.5 | 80.5 | 56.0 | 47.4 | 40.8 | 62.3 | 53.5 | 65.6 |
| 20 | 795 | 796.1 | 85.9 | 90.9 | 83.0 | 80.5 | 86.1 | 86.8 | 80.5 | 66.7 | 82.9 | 55.8 | 50.7 | 43.6 | 64.0 | 54.2 | 67.7 |
| 21 | 800 | 789.0 | 88.4 | 99.8 | 85.2 | 82.6 | 89.4 | 90.1 | 82.3 | 75.7 | 84.3 | 57.9 | 52.7 | 47.5 | 63.4 | 55.0 | 67.6 |
| 22 | 805 | 800.2 | 92.6 | 110.7 | 89.0 | 86.7 | 94.2 | 94.6 | 83.5 | 81.6 | 85.9 | 57.0 | 55.1 | 50.2 | 63.4 | 55.1 | 68.2 |
| 23 | 811 | 821.2 | 97.1 | 118.7 | 93.6 | 91.1 | 99.2 | 98.9 | 85.5 | 86.2 | 89.2 | 56.9 | 57.8 | 53.1 | 64.4 | 55.8 | 69.6 |
| 24 | 816 | 815.8 | 101.3 | 124.3 | 98.0 | 94.9 | 103.6 | 103.5 | 89.3 | 90.6 | 93.6 | 58.2 | 60.1 | 53.7 | 66.7 | 59.0 | 73.0 |
| 25 | 821 | 809.7 | 104.9 | 130.4 | 102.7 | 98.1 | 107.4 | 107.4 | 93.6 | 94.5 | 98.1 | 60.1 | 61.7 | 55.8 | 71.0 | 59.5 | 82.1 |
| 26 | 825 | 829.5 | 107.7 | 142.4 | 106.2 | 100.8 | 110.6 | 110.8 | 97.6 | 97.7 | 102.1 | 61.7 | 62.3 | 58.1 | 74.3 | 61.8 | 87.7 |
| 27 | 830 | 832.5 | 110.2 | 205.8 | 109.8 | 104.1 | 113.2 | 113.5 | 101.3 | 102.2 | 105.5 | 62.2 | 63.0 | 59.2 | 76.7 | 61.8 | 90.2 |
| 28 | 834 | 823.3 | 112.6 | 299.8 | 113.2 | 106.5 | 115.6 | 115.6 | 104.5 | 105.8 | 108.3 | 63.5 | 64.4 | 61.9 | 79.1 | 66.0 | 93.8 |

Favg = Mean furnace temperature ($^{O}$C); S101 = CAN/ULC-S101 standard temperature ($^{O}$C)

Table A - 7. Temperatures measured inside the upper half section of the assembly in Test 2

| Time | | | Thermocouple number inside upper half section (even numbers) | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| (min) | S101 | Favg | **16** | **18** | **20** | **22** | **24** | **26** | **28** | **30** | **32** | **34** | **36** | **38** | **40** | **42** | **44** | **46** | **72** | **74** | **76** | **78** |
| 0 | 20 | 22 | 22 | 22 | 22 | 22 | 22 | 22 | 22 | 22 | 22 | 22 | 22 | 22 | 21 | 21 | 21 | 21 | 21 | 21 | 21 | 21 |
| 1 | 124 | 38 | 22 | 22 | 22 | 22 | 26 | 26 | 25 | 22 | 22 | 22 | 25 | 25 | 30 | 22 | 22 | 22 | 22 | 21 | 21 | 21 |
| 2 | 227 | 233 | 68 | 71 | 69 | 65 | 88 | 90 | 83 | 23 | 23 | 34 | 83 | 84 | 86 | 67 | 73 | 64 | 40 | 38 | 45 | 24 |
| 3 | 331 | 385 | 63 | 67 | 65 | 62 | 80 | 79 | 75 | 34 | 42 | 50 | 76 | 76 | 78 | 63 | 67 | 63 | 45 | 43 | 46 | 27 |
| 4 | 434 | 394 | 57 | 63 | 60 | 59 | 74 | 74 | 71 | 37 | 43 | 48 | 71 | 71 | 72 | 58 | 61 | 58 | 46 | 43 | 44 | 28 |
| 5 | 538 | 537 | 66 | 71 | 70 | 67 | 86 | 88 | 82 | 40 | 46 | 53 | 83 | 85 | 85 | 67 | 71 | 66 | 49 | 48 | 50 | 30 |
| 6 | 571 | 592 | 68 | 73 | 70 | 70 | 86 | 85 | 78 | 49 | 59 | 62 | 88 | 93 | 96 | 69 | 70 | 68 | 50 | 52 | 53 | 32 |
| 7 | 604 | 575 | 65 | 70 | 68 | 68 | 92 | 91 | 84 | 52 | 59 | 61 | 100 | 102 | 105 | 70 | 70 | 67 | 50 | 52 | 53 | 32 |
| 8 | 638 | 640 | 70 | 74 | 72 | 71 | 99 | 98 | 91 | 56 | 63 | 64 | 106 | 108 | 112 | 76 | 81 | 71 | 52 | 54 | 56 | 33 |
| 9 | 671 | 653 | 70 | 76 | 72 | 73 | 104 | 103 | 95 | 60 | 66 | 67 | 110 | 112 | 116 | 79 | 85 | 76 | 54 | 56 | 57 | 35 |
| 10 | 704 | 700 | 73 | 80 | 75 | 75 | 108 | 109 | 102 | 63 | 70 | 70 | 114 | 116 | 120 | 82 | 88 | 79 | 57 | 59 | 60 | 36 |
| 11 | 715 | 724 | 74 | 82 | 76 | 76 | 113 | 113 | 107 | 66 | 72 | 72 | 119 | 120 | 125 | 85 | 92 | 81 | 58 | 60 | 61 | 37 |
| 12 | 726 | 707 | 76 | 85 | 78 | 77 | 117 | 117 | 111 | 68 | 73 | 74 | 125 | 125 | 133 | 88 | 95 | 84 | 60 | 62 | 63 | 39 |
| 13 | 738 | 751 | 78 | 89 | 79 | 79 | 119 | 116 | 114 | 64 | 73 | 74 | 140 | 140 | 170 | 93 | 99 | 90 | 62 | 63 | 64 | 40 |
| 14 | 749 | 732 | 86 | 102 | 84 | 83 | 152 | 148 | 136 | 63 | 74 | 74 | 192 | 193 | 229 | 113 | 121 | 109 | 64 | 65 | 68 | 41 |
| 15 | 760 | 771 | 102 | 120 | 100 | 108 | 187 | 187 | 176 | 63 | 75 | 74 | 233 | 235 | 277 | 139 | 148 | 138 | 66 | 67 | 70 | 43 |
| 16 | 767 | 762 | 142 | 157 | 132 | 144 | 231 | 234 | 216 | 65 | 77 | 76 | 286 | 286 | 345 | 182 | 190 | 185 | 71 | 74 | 76 | 46 |
| 17 | 774 | 779 | 184 | 191 | 176 | 186 | 267 | 265 | 255 | 63 | 79 | 79 | 350 | 345 | 392 | 227 | 232 | 226 | 85 | 88 | 94 | 50 |
| 18 | 781 | 773 | 220 | 276 | 207 | 221 | 323 | 329 | 298 | 65 | 76 | 80 | 387 | 375 | 570 | 274 | 264 | 440 | 106 | 105 | 116 | 56 |
| 19 | 788 | 795 | 247 | 430 | 240 | 302 | 370 | 361 | 343 | 70 | 80 | 81 | 407 | 405 | 664 | 303 | 309 | 668 | 125 | 121 | 140 | 62 |
| 20 | 795 | 796 | 272 | 508 | 269 | 391 | 420 | 388 | 381 | 76 | 83 | 84 | 430 | 431 | 705 | 327 | 338 | 710 | 143 | 137 | 160 | 69 |
| 21 | 800 | 789 | 293 | 553 | 297 | 481 | 465 | 410 | 415 | 84 | 85 | 85 | 446 | 449 | 709 | 348 | 358 | 723 | 158 | 151 | 175 | 77 |
| 22 | 805 | 800 | 326 | 620 | 324 | 623 | 505 | 439 | 432 | 94 | 89 | 88 | 468 | 476 | 710 | 384 | 389 | 771 | 178 | 162 | 191 | 88 |
| 23 | 811 | 821 | 355 | 665 | 355 | 638 | 554 | 472 | 454 | 118 | 90 | 98 | 493 | 490 | 714 | 419 | 409 | 783 | 203 | 174 | 207 | 99 |
| 24 | 816 | 816 | 379 | 658 | 367 | 633 | 591 | 501 | 494 | 127 | 91 | 104 | 504 | 492 | 706 | 436 | 415 | 767 | 226 | 186 | 226 | 107 |
| 25 | 821 | 810 | 401 | 641 | 385 | 629 | 624 | 522 | 518 | 370 | 93 | 108 | 518 | 504 | 686 | 457 | 431 | 772 | 245 | 201 | 213 | 113 |
| 26 | 825 | 830 | 415 | 669 | 386 | 637 | 635 | 521 | 535 | 353 | 93 | 115 | 526 | 500 | 686 | 470 | 438 | 794 | 264 | 219 | 240 | 118 |

Favg = Mean furnace temperature ($^{O}$C); S101 = CAN/ULC-S101 standard temperature ($^{O}$C)

Table A - 8. Temperatures measured inside the lower half section of the assembly in Test 2

| Time | | | Thermocouple number inside lower half section (odd numbers) | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| (min) | S101 | Favg | **17** | **19** | **21** | **23** | **25** | **27** | **29** | **31** | **33** | **35** | **37** | **39** | **41** | **43** | **45** | **47** | **73** | **75** | **77** | **79** |
| 0 | 20 | 22 | 21 | 21 | 21 | 21 | 22 | 21 | 21 | 21 | 22 | 22 | 21 | 22 | 21 | 21 | 21 | 21 | 21 | 21 | 21 | 21 |
| 1 | 124 | 38 | 22 | 22 | 21 | 21 | 25 | 24 | 24 | 21 | 22 | 22 | 27 | 23 | 23 | 21 | 21 | 21 | 21 | 21 | 21 | 21 |
| 2 | 227 | 233 | 57 | 57 | 58 | 44 | 77 | 82 | 74 | 21 | 22 | 22 | 76 | 78 | 78 | 57 | 58 | 55 | 28 | 41 | 25 | 26 |
| 3 | 331 | 385 | 50 | 55 | 53 | 48 | 73 | 75 | 68 | 21 | 22 | 24 | 68 | 70 | 71 | 52 | 54 | 52 | 33 | 44 | 29 | 28 |
| 4 | 434 | 394 | 47 | 51 | 50 | 46 | 68 | 69 | 64 | 21 | 24 | 26 | 63 | 64 | 66 | 48 | 50 | 49 | 34 | 43 | 30 | 29 |
| 5 | 538 | 537 | 57 | 60 | 59 | 53 | 80 | 83 | 75 | 21 | 25 | 28 | 77 | 79 | 79 | 57 | 60 | 57 | 36 | 48 | 32 | 31 |
| 6 | 571 | 592 | 57 | 62 | 59 | 57 | 85 | 83 | 72 | 22 | 27 | 32 | 84 | 81 | 86 | 58 | 60 | 59 | 39 | 51 | 35 | 33 |
| 7 | 604 | 575 | 55 | 60 | 58 | 55 | 89 | 87 | 78 | 22 | 30 | 36 | 91 | 91 | 96 | 61 | 62 | 59 | 41 | 50 | 36 | 33 |
| 8 | 638 | 640 | 59 | 64 | 63 | 59 | 95 | 94 | 85 | 22 | 33 | 40 | 98 | 98 | 102 | 66 | 68 | 65 | 43 | 53 | 38 | 34 |
| 9 | 671 | 653 | 61 | 66 | 66 | 61 | 99 | 98 | 91 | 22 | 36 | 43 | 101 | 101 | 106 | 68 | 70 | 68 | 45 | 53 | 40 | 35 |
| 10 | 704 | 700 | 65 | 70 | 69 | 63 | 104 | 104 | 98 | 22 | 39 | 47 | 106 | 106 | 110 | 72 | 74 | 71 | 48 | 54 | 42 | 37 |
| 11 | 715 | 724 | 66 | 72 | 71 | 65 | 108 | 109 | 104 | 22 | 43 | 50 | 110 | 110 | 114 | 74 | 77 | 74 | 49 | 55 | 44 | 38 |
| 12 | 726 | 707 | 68 | 75 | 74 | 67 | 113 | 114 | 111 | 22 | 46 | 54 | 116 | 115 | 121 | 77 | 79 | 76 | 51 | 55 | 45 | 39 |
| 13 | 738 | 751 | 70 | 76 | 74 | 68 | 120 | 119 | 119 | 22 | 47 | 56 | 128 | 120 | 130 | 79 | 80 | 79 | 53 | 57 | 46 | 40 |
| 14 | 749 | 732 | 76 | 81 | 77 | 72 | 139 | 127 | 137 | 22 | 48 | 56 | 170 | 136 | 174 | 90 | 87 | 89 | 55 | 59 | 48 | 41 |
| 15 | 760 | 771 | 85 | 91 | 85 | 75 | 178 | 161 | 176 | 22 | 52 | 58 | 199 | 178 | 213 | 107 | 101 | 105 | 57 | 60 | 50 | 43 |
| 16 | 767 | 762 | 104 | 109 | 100 | 80 | 214 | 196 | 212 | 22 | 59 | 63 | 235 | 215 | 254 | 136 | 126 | 135 | 60 | 65 | 52 | 45 |
| 17 | 774 | 779 | 131 | 132 | 134 | 99 | 252 | 227 | 252 | 23 | 61 | 65 | 280 | 248 | 301 | 169 | 159 | 169 | 67 | 64 | 55 | 50 |
| 18 | 781 | 773 | 174 | 176 | 170 | 138 | 325 | 271 | 290 | 23 | 57 | 67 | 387 | 300 | 382 | 221 | 196 | 207 | 79 | 73 | 60 | 55 |
| 19 | 788 | 795 | 215 | 209 | 218 | 209 | 413 | 357 | 404 | 23 | 59 | 74 | 384 | 391 | 408 | 256 | 243 | 239 | 92 | 82 | 70 | 62 |
| 20 | 795 | 796 | 229 | 225 | 244 | 227 | 489 | 442 | 451 | 23 | 71 | 78 | 361 | 404 | 412 | 263 | 267 | 263 | 104 | 92 | 80 | 69 |
| 21 | 800 | 789 | 234 | 239 | 251 | 246 | 528 | 542 | 529 | 23 | 76 | 81 | 353 | 378 | 403 | 263 | 271 | 276 | 115 | 101 | 91 | 78 |
| 22 | 805 | 800 | 237 | 252 | 254 | 267 | 540 | 617 | 626 | 23 | 79 | 81 | 348 | 360 | 397 | 265 | 268 | 285 | 126 | 111 | 101 | 88 |
| 23 | 811 | 821 | 243 | 269 | 255 | 289 | 564 | 640 | 663 | 24 | 79 | 81 | 347 | 352 | 400 | 266 | 269 | 299 | 138 | 120 | 111 | 100 |
| 24 | 816 | 816 | 250 | 457 | 259 | 312 | 597 | 738 | 665 | 24 | 78 | 81 | 350 | 351 | 416 | 272 | 275 | 326 | 149 | 130 | 122 | 108 |
| 25 | 821 | 810 | 258 | 564 | 268 | 369 | 638 | 758 | 700 | 24 | 78 | 81 | 351 | 352 | 479 | 278 | 283 | 406 | 159 | 139 | 135 | 114 |
| 26 | 825 | 830 | 341 | 599 | 641 | 406 | 647 | 737 | 623 | 24 | 83 | 97 | 355 | 457 | 521 | 289 | 441 | 478 | 170 | 148 | 150 | 118 |

Favg = Mean furnace temperature ($^{O}$C); S101 = CAN/ULC-S101 standard temperature ($^{O}$C)

Table A - 9. Temperatures measured on the unexposed side of the assembly in Test 3

| Time | | | Thermocouple number on unexposed side | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| (min) | S101 | Favg | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 |
| 0 | 20 | 21 | 20 | 21 | 20 | 20 | 20 | 21 | 20 | 20 | 20 | 21 | 21 | 21 | 21 | 21 | 21 |
| 1 | 124 | 39 | 20 | 21 | 20 | 20 | 20 | 21 | 20 | 20 | 20 | 21 | 21 | 21 | 21 | 21 | 21 |
| 2 | 227 | 213 | 21 | 21 | 20 | 20 | 21 | 21 | 21 | 20 | 21 | 21 | 21 | 21 | 21 | 21 | 21 |
| 3 | 331 | 362 | 24 | 24 | 23 | 23 | 25 | 25 | 23 | 22 | 24 | 25 | 22 | 21 | 25 | 21 | 25 |
| 4 | 434 | 379 | 30 | 32 | 28 | 28 | 33 | 34 | 27 | 26 | 31 | 31 | 24 | 22 | 31 | 21 | 31 |
| 5 | 538 | 533 | 35 | 38 | 32 | 32 | 40 | 41 | 31 | 29 | 37 | 36 | 26 | 23 | 34 | 21 | 35 |
| 6 | 571 | 574 | 41 | 45 | 37 | 37 | 47 | 48 | 35 | 33 | 42 | 40 | 28 | 24 | 37 | 21 | 39 |
| 7 | 604 | 583 | 47 | 51 | 42 | 42 | 53 | 55 | 39 | 37 | 48 | 43 | 30 | 25 | 40 | 21 | 41 |
| 8 | 638 | 634 | 51 | 55 | 46 | 46 | 58 | 59 | 42 | 41 | 52 | 45 | 32 | 26 | 41 | 21 | 43 |
| 9 | 671 | 663 | 55 | 59 | 50 | 50 | 61 | 63 | 45 | 45 | 56 | 47 | 35 | 27 | 43 | 21 | 44 |
| 10 | 704 | 707 | 59 | 62 | 53 | 54 | 65 | 65 | 48 | 49 | 59 | 49 | 37 | 28 | 44 | 21 | 45 |
| 11 | 715 | 715 | 62 | 65 | 57 | 57 | 67 | 68 | 51 | 52 | 62 | 51 | 39 | 29 | 46 | 21 | 47 |
| 12 | 726 | 732 | 65 | 67 | 60 | 60 | 70 | 70 | 54 | 56 | 65 | 53 | 42 | 31 | 47 | 21 | 48 |
| 13 | 738 | 732 | 67 | 68 | 62 | 63 | 71 | 71 | 57 | 59 | 67 | 54 | 44 | 32 | 48 | 21 | 49 |
| 14 | 749 | 738 | 69 | 70 | 63 | 65 | 73 | 72 | 60 | 61 | 68 | 55 | 47 | 34 | 50 | 21 | 51 |
| 15 | 760 | 764 | 72 | 73 | 64 | 67 | 74 | 74 | 63 | 62 | 70 | 56 | 47 | 34 | 51 | 21 | 52 |
| 16 | 767 | 769 | 74 | 77 | 66 | 69 | 76 | 76 | 66 | 63 | 72 | 57 | 49 | 35 | 53 | 21 | 53 |
| 17 | 774 | 765 | 80 | 82 | 69 | 73 | 81 | 80 | 70 | 65 | 75 | 61 | 51 | 38 | 59 | 21 | 59 |
| 18 | 781 | 773 | 84 | 84 | 77 | 82 | 85 | 84 | 74 | 73 | 81 | 67 | 53 | 39 | 61 | 21 | 62 |
| 19 | 788 | 783 | 86 | 84 | 84 | 86 | 87 | 85 | 78 | 82 | 84 | 68 | 55 | 41 | 62 | 21 | 63 |
| 20 | 795 | 797 | 88 | 87 | 86 | 86 | 88 | 87 | 80 | 82 | 85 | 69 | 58 | 43 | 64 | 21 | 64 |
| 21 | 800 | 807 | 92 | 91 | 86 | 86 | 92 | 92 | 81 | 84 | 86 | 69 | 60 | 45 | 64 | 21 | 65 |
| 22 | 805 | 800 | 97 | 95 | 89 | 91 | 97 | 97 | 82 | 89 | 90 | 71 | 63 | 47 | 64 | 21 | 65 |
| 23 | 811 | 801 | 102 | 100 | 93 | 97 | 102 | 102 | 84 | 94 | 95 | 72 | 64 | 48 | 66 | 21 | 67 |
| 24 | 816 | 818 | 106 | 105 | 97 | 101 | 107 | 107 | 86 | 98 | 99 | 75 | 65 | 50 | 67 | 21 | 68 |
| 25 | 821 | 829 | 109 | 109 | 100 | 105 | 111 | 111 | 90 | 101 | 104 | 78 | 66 | 49 | 70 | 21 | 72 |
| 26 | 825 | 820 | 112 | 112 | 104 | 108 | 114 | 114 | 94 | 104 | 108 | 82 | 67 | 51 | 75 | 22 | 76 |
| 27 | 830 | 823 | 114 | 115 | 108 | 111 | 116 | 116 | 97 | 108 | 111 | 86 | 68 | 53 | 78 | 22 | 80 |
| 28 | 834 | 839 | 116 | 117 | 111 | 114 | 119 | 118 | 100 | 112 | 114 | 89 | 68 | 56 | 82 | 22 | 81 |
| 29 | 839 | 843 | 118 | 119 | 114 | 116 | 120 | 120 | 103 | 116 | 116 | 91 | 68 | 57 | 84 | 22 | 81 |
| 30 | 843 | 846 | 121 | 121 | 117 | 119 | 122 | 121 | 106 | 120 | 119 | 94 | 70 | 58 | 87 | 22 | 84 |
| 31 | 847 | 851 | 123 | 125 | 120 | 122 | 124 | 123 | 109 | 123 | 122 | 96 | 71 | 59 | 91 | 22 | 87 |
| 32 | 851 | 854 | 125 | 130 | 124 | 125 | 126 | 125 | 112 | 127 | 125 | 99 | 73 | 59 | 99 | 22 | 88 |
| 33 | 854 | 864 | 128 | 138 | 128 | 129 | 129 | 128 | 114 | 132 | 129 | 102 | 74 | 60 | 122 | 22 | 92 |
| 34 | 858 | 856 | 133 | 187 | 133 | 136 | 133 | 134 | 117 | 139 | 133 | 105 | 78 | 62 | 193 | 22 | 95 |

Favg = Mean furnace temperature ($^{O}$C); S101 = CAN/ULC-S101 standard temperature ($^{O}$C)

Table A - 10. Temperatures measured inside the upper half section of the assembly in Test 3

| Time | | | Thermocouple number inside upper half section (even numbers) | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| (min) | S101 | Favg | **16** | **18** | **20** | **22** | **24** | **26** | **28** | **30** | **32** | **34** | **36** | **38** | **40** | **42** | **44** | **46** | **72** | **74** | **76** | **78** |
| 0 | 20 | 21 | 21 | 21 | 21 | 21 | 21 | 21 | 21 | 21 | 21 | 21 | 21 | 21 | 21 | 20 | 21 | 21 | 21 | 21 | 20 | 20 |
| 1 | 124 | 39 | 21 | 21 | 21 | 21 | 26 | 26 | 26 | 21 | 21 | 21 | 24 | 22 | 25 | 21 | 27 | 21 | 21 | 21 | 20 | 20 |
| 2 | 227 | 213 | 68 | 66 | 69 | 68 | 80 | 80 | 87 | 21 | 22 | 21 | 80 | 69 | 82 | 73 | 86 | 68 | 30 | 26 | 27 | 21 |
| 3 | 331 | 362 | 68 | 67 | 68 | 67 | 76 | 74 | 80 | 26 | 43 | 22 | 76 | 66 | 75 | 70 | 78 | 66 | 37 | 32 | 34 | 24 |
| 4 | 434 | 379 | 63 | 62 | 63 | 62 | 73 | 71 | 76 | 30 | 42 | 23 | 73 | 62 | 72 | 65 | 74 | 62 | 38 | 33 | 35 | 25 |
| 5 | 538 | 533 | 73 | 71 | 73 | 73 | 85 | 84 | 89 | 31 | 41 | 27 | 83 | 73 | 83 | 75 | 87 | 72 | 39 | 32 | 38 | 27 |
| 6 | 571 | 574 | 75 | 73 | 75 | 74 | 82 | 79 | 88 | 40 | 58 | 29 | 89 | 74 | 91 | 76 | 94 | 73 | 41 | 33 | 41 | 29 |
| 7 | 604 | 583 | 74 | 72 | 73 | 73 | 84 | 81 | 91 | 44 | 58 | 34 | 97 | 73 | 101 | 75 | 107 | 73 | 43 | 35 | 40 | 31 |
| 8 | 638 | 634 | 78 | 76 | 78 | 78 | 91 | 85 | 96 | 49 | 63 | 38 | 106 | 77 | 109 | 78 | 115 | 77 | 45 | 37 | 41 | 34 |
| 9 | 671 | 663 | 79 | 78 | 79 | 79 | 95 | 96 | 100 | 54 | 67 | 44 | 111 | 78 | 114 | 82 | 120 | 82 | 48 | 40 | 43 | 36 |
| 10 | 704 | 707 | 82 | 81 | 81 | 84 | 101 | 101 | 105 | 59 | 71 | 50 | 115 | 81 | 118 | 89 | 123 | 86 | 50 | 42 | 46 | 36 |
| 11 | 715 | 715 | 83 | 83 | 83 | 85 | 109 | 106 | 110 | 64 | 74 | 56 | 118 | 86 | 124 | 91 | 128 | 88 | 53 | 44 | 48 | 37 |
| 12 | 726 | 732 | 84 | 86 | 83 | 87 | 113 | 115 | 115 | 68 | 74 | 67 | 123 | 89 | 134 | 94 | 135 | 91 | 55 | 46 | 50 | 39 |
| 13 | 738 | 732 | 84 | 91 | 84 | 91 | 119 | 124 | 121 | 67 | 74 | 71 | 136 | 92 | 176 | 101 | 151 | 104 | 57 | 48 | 52 | 41 |
| 14 | 749 | 738 | 90 | 98 | 90 | 100 | 158 | 154 | 146 | 64 | 74 | 66 | 169 | 102 | 230 | 117 | 211 | 130 | 59 | 50 | 53 | 43 |
| 15 | 760 | 764 | 107 | 123 | 104 | 126 | 201 | 198 | 184 | 67 | 77 | 63 | 221 | 123 | 294 | 147 | 261 | 176 | 61 | 52 | 55 | 46 |
| 16 | 767 | 769 | 154 | 178 | 144 | 171 | 241 | 241 | 223 | 66 | 79 | 63 | 292 | 166 | 347 | 201 | 324 | 212 | 64 | 55 | 57 | 47 |
| 17 | 774 | 765 | 186 | 208 | 177 | 194 | 268 | 279 | 258 | 68 | 80 | 65 | 333 | 200 | 366 | 231 | 362 | 237 | 71 | 59 | 61 | 49 |
| 18 | 781 | 773 | 207 | 235 | 196 | 214 | 288 | 293 | 274 | 70 | 81 | 65 | 358 | 222 | 373 | 252 | 376 | 262 | 79 | 64 | 69 | 51 |
| 19 | 788 | 783 | 230 | 281 | 222 | 239 | 316 | 301 | 297 | 71 | 80 | 70 | 386 | 251 | 415 | 279 | 370 | 303 | 88 | 70 | 80 | 53 |
| 20 | 795 | 797 | 256 | 324 | 254 | 272 | 345 | 328 | 327 | 73 | 79 | 74 | 411 | 284 | 479 | 313 | 386 | 357 | 102 | 77 | 92 | 56 |
| 21 | 800 | 807 | 281 | 364 | 287 | 306 | 375 | 355 | 361 | 77 | 80 | 77 | 436 | 319 | 518 | 341 | 411 | 402 | 116 | 84 | 105 | 61 |
| 22 | 805 | 800 | 305 | 400 | 317 | 337 | 403 | 388 | 391 | 81 | 84 | 80 | 457 | 351 | 550 | 369 | 436 | 441 | 131 | 91 | 117 | 69 |
| 23 | 811 | 801 | 333 | 438 | 354 | 368 | 434 | 414 | 418 | 85 | 87 | 84 | 475 | 387 | 571 | 398 | 457 | 472 | 144 | 102 | 126 | 77 |
| 24 | 816 | 818 | 360 | 478 | 391 | 397 | 467 | 435 | 445 | 87 | 89 | 87 | 492 | 418 | 589 | 420 | 483 | 501 | 158 | 112 | 135 | 84 |
| 25 | 821 | 829 | 382 | 523 | 407 | 407 | 504 | 452 | 461 | 92 | 90 | 88 | 508 | 433 | 586 | 438 | 497 | 515 | 172 | 122 | 145 | 90 |
| 26 | 825 | 820 | 402 | 556 | 406 | 410 | 527 | 465 | 470 | 116 | 91 | 89 | 521 | 435 | 582 | 457 | 496 | 522 | 185 | 132 | 158 | 95 |
| 27 | 830 | 823 | 414 | 575 | 409 | 421 | 539 | 476 | 476 | 119 | 91 | 89 | 527 | 442 | 602 | 467 | 497 | 521 | 197 | 142 | 229 | 99 |
| 28 | 834 | 839 | 452 | 565 | 428 | 438 | 538 | 494 | 493 | 123 | 93 | 90 | 582 | 468 | 636 | 476 | 507 | 540 | 208 | 152 | 230 | 102 |
| 29 | 839 | 843 | 503 | 631 | 460 | 465 | 555 | 543 | 517 | 197 | 96 | 93 | 577 | 514 | 640 | 495 | 524 | 572 | 220 | 164 | 256 | 106 |
| 30 | 843 | 846 | 506 | 712 | 499 | 503 | 646 | 583 | 553 | 471 | 103 | 95 | 573 | 545 | 664 | 515 | 557 | 618 | 235 | 176 | 282 | 111 |
| 31 | 847 | 851 | 564 | 748 | 567 | 584 | 737 | 684 | 644 | 623 | 121 | 100 | 610 | 607 | 706 | 532 | 627 | 687 | 265 | 190 | 307 | 116 |
| 32 | 851 | 854 | 640 | 801 | 779 | 820 | 791 | 798 | 870 | 772 | 195 | 505 | 694 | 778 | 817 | 621 | 783 | 740 | 330 | 217 | 351 | 122 |
| 33 | 854 | 864 | 834 | 811 | 849 | 872 | 838 | 856 | 880 | 838 | 868 | 840 | 823 | 843 | 807 | 849 | 860 | 808 | 837 | 823 | 501 | 130 |
| 34 | 858 | 856 | 869 | 823 | 804 | 826 | 849 | 866 | 823 | 872 | 863 | 818 | 813 | 802 | 796 | 793 | 854 | 776 | 780 | 878 | 700 | 138 |

Favg = Mean furnace temperature ($^{O}$C); S101 = CAN/ULC-S101 standard temperature ($^{O}$C)

Table A - 11. Temperatures measured inside the lower half section of the assembly in Test 3

| Time | | | Thermocouple number inside lower half section (odd numbers) | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| (min) | S101 | Favg | **17** | **19** | **21** | **23** | **25** | **27** | **29** | **31** | **33** | **35** | **37** | **39** | **41** | **43** | **45** | **47** | **73** | **75** | **77** | **79** |
| 0 | 20 | 21 | 21 | 21 | 21 | 21 | 21 | 21 | 21 | 21 | 21 | 21 | 21 | 21 | 20 | 20 | 20 | 20 | 21 | 20 | 20 | 20 |
| 1 | 124 | 39 | 21 | 21 | 21 | 21 | 25 | 24 | 26 | 21 | 21 | 21 | 26 | 24 | 24 | 21 | 21 | 21 | 21 | 21 | 20 | 20 |
| 2 | 227 | 213 | 59 | 55 | 57 | 56 | 76 | 79 | 81 | 21 | 21 | 21 | 78 | 77 | 79 | 60 | 55 | 61 | 24 | 23 | 29 | 21 |
| 3 | 331 | 362 | 57 | 56 | 55 | 54 | 73 | 76 | 76 | 21 | 21 | 21 | 71 | 70 | 71 | 57 | 55 | 57 | 29 | 27 | 36 | 22 |
| 4 | 434 | 379 | 53 | 52 | 52 | 52 | 68 | 71 | 71 | 22 | 22 | 22 | 69 | 66 | 67 | 54 | 52 | 53 | 31 | 28 | 37 | 23 |
| 5 | 538 | 533 | 63 | 63 | 63 | 63 | 79 | 87 | 83 | 23 | 23 | 23 | 82 | 80 | 81 | 64 | 62 | 65 | 33 | 29 | 41 | 24 |
| 6 | 571 | 574 | 64 | 64 | 64 | 64 | 78 | 85 | 82 | 24 | 24 | 24 | 91 | 85 | 86 | 65 | 64 | 65 | 37 | 32 | 45 | 26 |
| 7 | 604 | 583 | 64 | 64 | 64 | 65 | 80 | 87 | 85 | 26 | 26 | 26 | 100 | 96 | 97 | 66 | 64 | 65 | 40 | 33 | 46 | 28 |
| 8 | 638 | 634 | 69 | 69 | 69 | 70 | 85 | 92 | 85 | 28 | 28 | 27 | 107 | 104 | 105 | 75 | 72 | 74 | 43 | 36 | 47 | 30 |
| 9 | 671 | 663 | 71 | 71 | 71 | 72 | 87 | 94 | 87 | 30 | 31 | 30 | 111 | 109 | 109 | 78 | 76 | 77 | 45 | 38 | 48 | 32 |
| 10 | 704 | 707 | 74 | 75 | 74 | 77 | 92 | 98 | 90 | 32 | 33 | 32 | 116 | 113 | 114 | 82 | 81 | 82 | 48 | 40 | 50 | 34 |
| 11 | 715 | 715 | 76 | 76 | 76 | 79 | 95 | 103 | 95 | 34 | 36 | 34 | 121 | 116 | 118 | 85 | 83 | 84 | 50 | 42 | 52 | 36 |
| 12 | 726 | 732 | 78 | 78 | 78 | 83 | 100 | 109 | 100 | 37 | 38 | 37 | 126 | 120 | 122 | 88 | 86 | 85 | 53 | 44 | 53 | 39 |
| 13 | 738 | 732 | 77 | 80 | 78 | 83 | 107 | 113 | 108 | 39 | 41 | 41 | 135 | 126 | 128 | 88 | 87 | 85 | 55 | 46 | 55 | 41 |
| 14 | 749 | 738 | 79 | 84 | 79 | 89 | 126 | 120 | 138 | 42 | 45 | 44 | 178 | 145 | 152 | 93 | 91 | 88 | 57 | 48 | 57 | 44 |
| 15 | 760 | 764 | 85 | 90 | 85 | 104 | 168 | 155 | 180 | 44 | 49 | 46 | 224 | 198 | 201 | 109 | 108 | 102 | 59 | 50 | 58 | 46 |
| 16 | 767 | 769 | 100 | 112 | 96 | 136 | 202 | 201 | 212 | 47 | 54 | 48 | 287 | 250 | 254 | 143 | 140 | 134 | 61 | 53 | 60 | 47 |
| 17 | 774 | 765 | 151 | 165 | 134 | 185 | 257 | 245 | 238 | 50 | 63 | 54 | 397 | 329 | 351 | 208 | 196 | 188 | 65 | 56 | 65 | 49 |
| 18 | 781 | 773 | 196 | 205 | 180 | 218 | 298 | 278 | 273 | 53 | 65 | 57 | 435 | 400 | 411 | 265 | 246 | 244 | 71 | 60 | 73 | 51 |
| 19 | 788 | 783 | 227 | 235 | 216 | 244 | 334 | 318 | 306 | 58 | 67 | 60 | 429 | 418 | 434 | 288 | 288 | 283 | 77 | 66 | 83 | 53 |
| 20 | 795 | 797 | 248 | 254 | 244 | 258 | 369 | 384 | 341 | 63 | 71 | 64 | 404 | 425 | 425 | 293 | 310 | 298 | 87 | 71 | 92 | 56 |
| 21 | 800 | 807 | 261 | 269 | 259 | 274 | 403 | 487 | 373 | 67 | 77 | 69 | 403 | 391 | 404 | 299 | 306 | 296 | 98 | 79 | 102 | 61 |
| 22 | 805 | 800 | 273 | 288 | 268 | 286 | 435 | 636 | 400 | 71 | 81 | 75 | 402 | 378 | 393 | 312 | 305 | 296 | 106 | 86 | 115 | 70 |
| 23 | 811 | 801 | 282 | 304 | 274 | 296 | 464 | 686 | 423 | 75 | 82 | 79 | 395 | 368 | 384 | 313 | 301 | 293 | 114 | 94 | 127 | 77 |
| 24 | 816 | 818 | 288 | 314 | 279 | 304 | 492 | 707 | 446 | 78 | 83 | 82 | 391 | 366 | 381 | 315 | 302 | 294 | 121 | 102 | 136 | 84 |
| 25 | 821 | 829 | 296 | 338 | 289 | 317 | 520 | 720 | 472 | 80 | 82 | 85 | 395 | 369 | 384 | 321 | 309 | 301 | 128 | 110 | 147 | 91 |
| 26 | 825 | 820 | 308 | 486 | 390 | 335 | 565 | 614 | 501 | 91 | 86 | 84 | 404 | 615 | 437 | 334 | 507 | 330 | 134 | 118 | 161 | 98 |
| 27 | 830 | 823 | 419 | 506 | 464 | 364 | 572 | 575 | 518 | 117 | 89 | 87 | 598 | 642 | 578 | 594 | 599 | 549 | 141 | 125 | 240 | 103 |
| 28 | 834 | 839 | 542 | 515 | 527 | 390 | 587 | 584 | 535 | 114 | 92 | 92 | 621 | 688 | 652 | 591 | 641 | 652 | 148 | 132 | 231 | 109 |
| 29 | 839 | 843 | 594 | 528 | 564 | 412 | 609 | 595 | 549 | 115 | 93 | 98 | 634 | 692 | 658 | 598 | 660 | 679 | 156 | 140 | 254 | 112 |
| 30 | 843 | 846 | 577 | 541 | 580 | 457 | 612 | 616 | 564 | 127 | 96 | 100 | 660 | 691 | 675 | 647 | 686 | 682 | 165 | 149 | 283 | 115 |
| 31 | 847 | 851 | 625 | 557 | 597 | 502 | 627 | 630 | 584 | 141 | 102 | 101 | 663 | 701 | 686 | 634 | 689 | 690 | 178 | 174 | 304 | 119 |
| 32 | 851 | 854 | 668 | 593 | 634 | 535 | 627 | 644 | 597 | 172 | 111 | 103 | 694 | 720 | 703 | 667 | 707 | 705 | 224 | 210 | 343 | 124 |
| 33 | 854 | 864 | 801 | 789 | 819 | 809 | 849 | 859 | 966 | 309 | 154 | 113 | 834 | 861 | 779 | 838 | 821 | 753 | 848 | 807 | 458 | 130 |
| 34 | 858 | 856 | 823 | 831 | 825 | 853 | 859 | 903 | 835 | 782 | 603 | 135 | 792 | 883 | 779 | 800 | 828 | 763 | 794 | 831 | 664 | 131 |

Favg = Mean furnace temperature ($^{O}$C); S101 = CAN/ULC-S101 standard temperature ($^{O}$C)

Table A - 12. Temperatures measured on the unexposed side of the assembly in Test 4

| Time | | | Thermocouple number on unexposed side | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| (min) | S101 | Favg | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 |
| 0 | 20 | 19 | 20 | 20 | 20 | 19 | 20 | 20 | 20 | 19 | 20 | 20 | 21 | 20 | 21 | 20 | 20 |
| 1 | 124 | 36 | 20 | 20 | 20 | 19 | 20 | 20 | 20 | 19 | 20 | 20 | 21 | 20 | 21 | 20 | 20 |
| 2 | 227 | 195 | 20 | 20 | 20 | 20 | 20 | 21 | 20 | 19 | 20 | 20 | 21 | 20 | 21 | 20 | 20 |
| 3 | 331 | 354 | 24 | 24 | 22 | 23 | 26 | 26 | 23 | 21 | 22 | 20 | 23 | 20 | 25 | 21 | 24 |
| 4 | 434 | 371 | 32 | 33 | 28 | 29 | 35 | 36 | 29 | 25 | 28 | 22 | 27 | 21 | 33 | 25 | 31 |
| 5 | 538 | 498 | 38 | 40 | 33 | 34 | 41 | 43 | 35 | 29 | 33 | 23 | 28 | 22 | 37 | 28 | 33 |
| 6 | 571 | 587 | 43 | 46 | 37 | 38 | 47 | 49 | 40 | 32 | 37 | 24 | 29 | 23 | 40 | 30 | 35 |
| 7 | 604 | 574 | 48 | 51 | 42 | 43 | 53 | 55 | 45 | 36 | 42 | 25 | 30 | 24 | 43 | 33 | 37 |
| 8 | 638 | 645 | 52 | 55 | 46 | 46 | 56 | 59 | 49 | 40 | 46 | 27 | 31 | 25 | 44 | 34 | 38 |
| 9 | 671 | 655 | 56 | 58 | 50 | 50 | 59 | 62 | 52 | 44 | 49 | 28 | 33 | 26 | 45 | 36 | 39 |
| 10 | 704 | 712 | 59 | 61 | 53 | 53 | 62 | 64 | 55 | 48 | 52 | 30 | 33 | 27 | 47 | 38 | 40 |
| 11 | 715 | 708 | 62 | 63 | 56 | 56 | 64 | 66 | 58 | 52 | 54 | 31 | 35 | 28 | 48 | 39 | 41 |
| 12 | 726 | 727 | 64 | 65 | 59 | 59 | 66 | 68 | 61 | 55 | 57 | 32 | 36 | 30 | 49 | 40 | 42 |
| 13 | 738 | 736 | 66 | 67 | 62 | 61 | 68 | 70 | 64 | 58 | 59 | 34 | 37 | 31 | 50 | 42 | 43 |
| 14 | 749 | 741 | 69 | 69 | 64 | 63 | 70 | 72 | 66 | 61 | 61 | 35 | 37 | 32 | 51 | 43 | 44 |
| 15 | 760 | 766 | 71 | 72 | 67 | 66 | 72 | 73 | 68 | 63 | 63 | 37 | 38 | 33 | 51 | 44 | 46 |
| 16 | 767 | 765 | 75 | 77 | 69 | 68 | 75 | 78 | 71 | 66 | 65 | 38 | 38 | 34 | 55 | 45 | 48 |
| 17 | 774 | 765 | 81 | 81 | 73 | 70 | 80 | 82 | 76 | 69 | 67 | 39 | 39 | 36 | 60 | 46 | 53 |
| 18 | 781 | 777 | 84 | 86 | 79 | 75 | 84 | 86 | 81 | 72 | 73 | 40 | 42 | 37 | 66 | 51 | 58 |
| 19 | 788 | 791 | 87 | 88 | 83 | 81 | 87 | 90 | 83 | 79 | 78 | 43 | 44 | 40 | 67 | 54 | 59 |
| 20 | 795 | 798 | 91 | 92 | 86 | 84 | 92 | 93 | 85 | 83 | 81 | 45 | 47 | 43 | 65 | 56 | 59 |
| 21 | 800 | 803 | 96 | 98 | 91 | 88 | 97 | 99 | 87 | 85 | 83 | 48 | 49 | 44 | 67 | 59 | 60 |
| 22 | 805 | 797 | 101 | 103 | 95 | 92 | 101 | 104 | 89 | 88 | 85 | 50 | 50 | 46 | 67 | 59 | 60 |
| 23 | 811 | 805 | 105 | 109 | 100 | 97 | 105 | 109 | 93 | 92 | 89 | 53 | 52 | 48 | 71 | 59 | 61 |
| 24 | 816 | 817 | 109 | 113 | 104 | 102 | 109 | 113 | 97 | 96 | 93 | 56 | 54 | 46 | 77 | 61 | 62 |
| 25 | 821 | 818 | 112 | 116 | 107 | 106 | 112 | 116 | 101 | 100 | 96 | 57 | 55 | 48 | 83 | 62 | 64 |
| 26 | 825 | 827 | 115 | 120 | 110 | 110 | 114 | 119 | 105 | 103 | 100 | 60 | 55 | 51 | 87 | 64 | 69 |
| 27 | 830 | 831 | 118 | 126 | 112 | 114 | 117 | 121 | 109 | 106 | 104 | 60 | 56 | 52 | 91 | 65 | 72 |
| 28 | 834 | 826 | 120 | 140 | 114 | 118 | 119 | 124 | 113 | 109 | 107 | 63 | 57 | 52 | 97 | 69 | 73 |
| 29 | 839 | 837 | 123 | 184 | 116 | 121 | 121 | 129 | 117 | 111 | 110 | 63 | 56 | 55 | 104 | 72 | 75 |
| 30 | 843 | 847 | 125 | 246 | 118 | 124 | 123 | 136 | 120 | 113 | 114 | 65 | 61 | 51 | 118 | 76 | 78 |
| 31 | 847 | 854 | 131 | 321 | 120 | 127 | 127 | 164 | 122 | 115 | 117 | 67 | 63 | 54 | 166 | 76 | 80 |
| 32 | 851 | 853 | 141 | 417 | 122 | 134 | 132 | 262 | 125 | 117 | 119 | 68 | 65 | 52 | 195 | 78 | 84 |
| 33 | 854 | 847 | 196 | 490 | 124 | 144 | 144 | 396 | 129 | 119 | 122 | 69 | 69 | 52 | 213 | 81 | 87 |
| 34 | 858 | 854 | 302 | 547 | 129 | 188 | 201 | 517 | 133 | 121 | 125 | 71 | 74 | 54 | 221 | 83 | 91 |

Table A - 13: Temperatures measured inside the upper half section of the assembly in Test 4

| Time | | | Thermocouple number inside upper half section (even numbers) | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| (min) | S101 | Favg | **16** | **18** | **20** | **22** | **24** | **26** | **28** | **30** | **32** | **34** | **36** | **38** | **40** | **42** | **44** | **46** | **72** | **74** | **76** | **78** |
| 0 | 20 | 20 | *** | 21 | 21 | 21 | 20 | 21 | 21 | 21 | 21 | 21 | 20 | 21 | 21 | 21 | 21 | 21 | 20 | 20 | 20 | 20 |
| 1 | 124 | 124 | *** | 21 | 21 | 21 | 26 | 25 | 25 | 21 | 21 | 21 | 25 | 23 | 27 | 21 | 21 | 22 | 20 | 20 | 20 | 20 |
| 2 | 227 | 227 | *** | 72 | 72 | 71 | 87 | 88 | 92 | 55 | 40 | 28 | 89 | 83 | 89 | 71 | 73 | 79 | 40 | 35 | 44 | 22 |
| 3 | 331 | 331 | *** | 72 | 72 | 72 | 84 | 84 | 86 | 37 | 31 | 26 | 81 | 79 | 84 | 69 | 72 | 76 | 52 | 46 | 53 | 26 |
| 4 | 434 | 434 | *** | 65 | 65 | 65 | 78 | 78 | 80 | 35 | 30 | 28 | 75 | 74 | 77 | 63 | 66 | 69 | 52 | 46 | 51 | 27 |
| 5 | 538 | 538 | *** | 72 | 72 | 72 | 85 | 88 | 89 | 43 | 34 | 31 | 85 | 83 | 87 | 69 | 72 | 75 | 54 | 49 | 55 | 29 |
| 6 | 571 | 571 | *** | 76 | 75 | 75 | 95 | 98 | 95 | 41 | 34 | 33 | 94 | 92 | 100 | 73 | 76 | 78 | 54 | 54 | 60 | 31 |
| 7 | 604 | 604 | *** | 74 | 74 | 74 | 99 | 99 | 98 | 41 | 37 | 36 | 105 | 100 | 108 | 72 | 74 | 85 | 55 | 55 | 59 | 33 |
| 8 | 638 | 638 | *** | 76 | 77 | 76 | 104 | 105 | 104 | 46 | 40 | 39 | 110 | 107 | 112 | 74 | 78 | 90 | 57 | 57 | 61 | 36 |
| 9 | 671 | 671 | *** | 79 | 79 | 79 | 110 | 110 | 108 | 49 | 43 | 42 | 115 | 112 | 118 | 77 | 84 | 94 | 60 | 59 | 62 | 39 |
| 10 | 704 | 704 | *** | 81 | 81 | 81 | 115 | 117 | 113 | 56 | 48 | 45 | 119 | 117 | 124 | 82 | 88 | 100 | 62 | 61 | 64 | 42 |
| 11 | 715 | 715 | *** | 84 | 84 | 83 | 125 | 138 | 118 | 60 | 51 | 49 | 125 | 122 | 134 | 86 | 93 | 108 | 64 | 64 | 66 | 44 |
| 12 | 726 | 726 | *** | 88 | 88 | 86 | 160 | 175 | 125 | 62 | 53 | 52 | 133 | 137 | 169 | 92 | 99 | 121 | 67 | 66 | 68 | 47 |
| 13 | 738 | 738 | *** | 97 | 99 | 102 | 205 | 217 | 165 | 63 | 54 | 56 | 170 | 182 | 222 | 103 | 114 | 151 | 69 | 67 | 70 | 50 |
| 14 | 749 | 749 | *** | 124 | 121 | 126 | 244 | 261 | 215 | 69 | 58 | 61 | 230 | 234 | 269 | 131 | 144 | 192 | 71 | 69 | 72 | 52 |
| 15 | 760 | 760 | *** | 156 | 156 | 157 | 268 | 332 | 273 | 65 | 69 | 65 | 280 | 292 | 315 | 169 | 188 | 233 | 74 | 74 | 75 | 52 |
| 16 | 767 | 767 | *** | 192 | 191 | 190 | 289 | 359 | 316 | 65 | 66 | 76 | 335 | 342 | 368 | 199 | 218 | 277 | 83 | 86 | 87 | 53 |
| 17 | 774 | 774 | *** | 282 | 235 | 241 | 343 | 398 | 345 | 73 | 67 | 71 | 378 | 382 | 533 | 235 | 265 | 674 | 97 | 103 | 111 | 55 |
| 18 | 781 | 781 | *** | 602 | 302 | 418 | 434 | 472 | 436 | 78 | 81 | 73 | 396 | 480 | 585 | 276 | 475 | 643 | 116 | 120 | 137 | 60 |
| 19 | 788 | 788 | *** | 664 | 390 | 500 | 562 | 544 | 544 | 88 | 88 | 88 | 420 | 565 | 639 | 321 | 610 | 715 | 137 | 139 | 162 | 67 |
| 20 | 795 | 795 | *** | 694 | 462 | 578 | 652 | 578 | 611 | 90 | 91 | 91 | 449 | 615 | 662 | 366 | 646 | 721 | 160 | 159 | 186 | 74 |
| 21 | 800 | 800 | *** | 708 | 520 | 610 | 683 | 601 | 640 | 92 | 92 | 93 | 467 | 639 | 682 | 396 | 676 | 696 | 185 | 181 | 209 | 83 |
| 22 | 805 | 805 | *** | 680 | 542 | 589 | 657 | 615 | 630 | 93 | 94 | 94 | 490 | 646 | 718 | 427 | 668 | 735 | 212 | 203 | 233 | 95 |
| 23 | 811 | 811 | *** | 700 | 588 | 620 | 677 | 643 | 643 | 93 | 101 | 99 | 505 | 668 | 740 | 456 | 695 | 723 | 238 | 226 | 259 | 106 |
| 24 | 816 | 816 | *** | 715 | 601 | 621 | 695 | 652 | 650 | 95 | 113 | 117 | 527 | 684 | 741 | 484 | 720 | 736 | 263 | 250 | 288 | 115 |
| 25 | 821 | 821 | *** | 727 | 606 | 614 | 716 | 704 | 685 | 108 | 127 | 269 | 535 | 693 | 764 | 495 | 722 | 695 | 326 | 272 | 317 | 123 |
| 26 | 825 | 825 | *** | 737 | 615 | 654 | 723 | 764 | 699 | 142 | 143 | 487 | 549 | 694 | 772 | 516 | 709 | 709 | 414 | 292 | 347 | 129 |
| 27 | 830 | 830 | *** | 736 | 603 | 711 | 733 | 746 | 729 | 205 | 158 | 630 | 570 | 664 | 782 | 545 | 655 | 727 | 469 | 312 | 366 | 139 |
| 28 | 834 | 834 | *** | 736 | 592 | 749 | 719 | 772 | 730 | 320 | 168 | 721 | 589 | 685 | 782 | 581 | 673 | 748 | 483 | 331 | 387 | 207 |
| 29 | 839 | 839 | *** | 765 | 601 | 755 | 732 | 808 | 735 | 404 | 180 | 746 | 617 | 722 | 792 | 613 | 698 | 779 | 516 | 351 | 410 | 243 |
| 30 | 843 | 843 | *** | 826 | 787 | 764 | 831 | 894 | 704 | 464 | 473 | 755 | 668 | 832 | 858 | 649 | 832 | 758 | 574 | 390 | 592 | 273 |
| 31 | 847 | 847 | *** | 771 | 828 | 763 | 769 | 840 | 727 | 416 | 786 | 770 | 673 | 861 | 905 | 660 | 809 | 745 | 597 | 446 | 662 | 314 |
| 32 | 851 | 851 | *** | 820 | 833 | 758 | 827 | 833 | 730 | 437 | 802 | 799 | 728 | 877 | 914 | 725 | 805 | 773 | 635 | 862 | 657 | 337 |
| 33 | 854 | 854 | *** | 825 | 873 | 767 | 858 | 827 | 764 | 510 | 829 | 775 | 717 | 818 | 898 | 730 | 831 | 782 | 704 | 776 | 699 | 357 |
| 34 | 858 | 858 | *** | 822 | 872 | 760 | 848 | 838 | 765 | 601 | 824 | 758 | 719 | 800 | 919 | 743 | 836 | 780 | 777 | 824 | 748 | 380 |

Table A - 14. Temperatures measured inside the lower half section of the assembly in Test 4

| Time | | | Thermocouple number inside lower half section (odd numbers) | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| (min) | S101 | Favg | **17** | **19** | **21** | **23** | **25** | **27** | **29** | **31** | **33** | **35** | **37** | **39** | **41** | **43** | **45** | **47** | **73** | **75** | **77** | **79** |
| 0 | 20 | 19 | 20 | 20 | 20 | 20 | 20 | 20 | 20 | 20 | 20 | 20 | 20 | 20 | 20 | 20 | 20 | 20 | 20 | 20 | 20 | 20 |
| 1 | 124 | 36 | 20 | 20 | 20 | 20 | 24 | 26 | 30 | 20 | 20 | 20 | 24 | 23 | 23 | 20 | 20 | 20 | 20 | 20 | 20 | 20 |
| 2 | 227 | 195 | 63 | 51 | 56 | 62 | 78 | 78 | 82 | 22 | 26 | 27 | 77 | 81 | 79 | 56 | 62 | 68 | 29 | 25 | 31 | 21 |
| 3 | 331 | 354 | 59 | 57 | 58 | 61 | 78 | 75 | 79 | 22 | 23 | 25 | 74 | 79 | 75 | 56 | 59 | 62 | 36 | 32 | 39 | 23 |
| 4 | 434 | 371 | 54 | 53 | 54 | 56 | 71 | 69 | 72 | 22 | 24 | 26 | 69 | 71 | 69 | 52 | 55 | 57 | 39 | 33 | 39 | 24 |
| 5 | 538 | 498 | 63 | 59 | 61 | 64 | 82 | 82 | 84 | 24 | 26 | 28 | 81 | 86 | 82 | 60 | 63 | 65 | 41 | 36 | 42 | 26 |
| 6 | 571 | 587 | 66 | 65 | 66 | 68 | 89 | 91 | 94 | 25 | 27 | 29 | 94 | 96 | 93 | 64 | 66 | 68 | 46 | 39 | 47 | 28 |
| 7 | 604 | 574 | 65 | 64 | 65 | 68 | 95 | 95 | 100 | 27 | 28 | 31 | 101 | 106 | 101 | 63 | 65 | 67 | 48 | 42 | 49 | 29 |
| 8 | 638 | 645 | 69 | 68 | 69 | 73 | 99 | 101 | 105 | 29 | 31 | 34 | 107 | 113 | 107 | 67 | 69 | 75 | 51 | 44 | 52 | 32 |
| 9 | 671 | 655 | 72 | 70 | 71 | 76 | 104 | 105 | 111 | 31 | 33 | 36 | 112 | 118 | 112 | 69 | 71 | 80 | 53 | 47 | 55 | 34 |
| 10 | 704 | 712 | 75 | 73 | 74 | 81 | 108 | 108 | 115 | 34 | 37 | 39 | 115 | 121 | 116 | 72 | 75 | 84 | 56 | 49 | 57 | 36 |
| 11 | 715 | 708 | 78 | 75 | 77 | 84 | 111 | 113 | 121 | 37 | 41 | 44 | 120 | 126 | 121 | 76 | 81 | 87 | 58 | 52 | 60 | 39 |
| 12 | 726 | 727 | 80 | 77 | 79 | 88 | 114 | 118 | 127 | 39 | 42 | 45 | 126 | 131 | 128 | 78 | 83 | 90 | 61 | 54 | 62 | 41 |
| 13 | 738 | 736 | 82 | 79 | 82 | 94 | 121 | 121 | 143 | 41 | 44 | 51 | 146 | 144 | 152 | 81 | 88 | 97 | 63 | 56 | 65 | 44 |
| 14 | 749 | 741 | 85 | 82 | 89 | 111 | 152 | 149 | 184 | 44 | 48 | 60 | 194 | 193 | 204 | 89 | 98 | 113 | 65 | 59 | 67 | 45 |
| 15 | 760 | 766 | 92 | 90 | 101 | 137 | 187 | 188 | 221 | 46 | 64 | 66 | 228 | 245 | 244 | 103 | 118 | 142 | 69 | 61 | 69 | 46 |
| 16 | 767 | 765 | 121 | 114 | 133 | 182 | 226 | 221 | 271 | 49 | 60 | 75 | 268 | 297 | 297 | 128 | 154 | 184 | 77 | 67 | 74 | 47 |
| 17 | 774 | 765 | 151 | 147 | 162 | 213 | 257 | 254 | 319 | 53 | 61 | 73 | 324 | 351 | 360 | 161 | 186 | 218 | 88 | 77 | 87 | 49 |
| 18 | 781 | 777 | 190 | 188 | 201 | 278 | 292 | 301 | 299 | 58 | 71 | 78 | 406 | 397 | 401 | 210 | 220 | 270 | 100 | 87 | 105 | 51 |
| 19 | 788 | 791 | 225 | 226 | 237 | 311 | 430 | 334 | 342 | 67 | 78 | 80 | 405 | 418 | 416 | 235 | 248 | 316 | 114 | 99 | 123 | 56 |
| 20 | 795 | 798 | 236 | 256 | 260 | 338 | 499 | 357 | 374 | 74 | 82 | 82 | 371 | 434 | 419 | 240 | 271 | 330 | 130 | 112 | 139 | 61 |
| 21 | 800 | 803 | 239 | 282 | 279 | 366 | 549 | 402 | 409 | 76 | 83 | 84 | 361 | 441 | 430 | 244 | 293 | 351 | 145 | 128 | 157 | 67 |
| 22 | 805 | 797 | 247 | 313 | 301 | 395 | 571 | 435 | 473 | 77 | 86 | 86 | 359 | 441 | 446 | 251 | 313 | 374 | 161 | 142 | 171 | 75 |
| 23 | 811 | 805 | 308 | 349 | 320 | 424 | 554 | 475 | 490 | 79 | 87 | 87 | 399 | 440 | 466 | 294 | 328 | 401 | 175 | 156 | 191 | 84 |
| 24 | 816 | 817 | 363 | 386 | 344 | 452 | 549 | 521 | 522 | 80 | 89 | 90 | 437 | 450 | 484 | 330 | 350 | 426 | 192 | 170 | 214 | 92 |
| 25 | 821 | 818 | 426 | 427 | 367 | 479 | 550 | 540 | 555 | 83 | 91 | 93 | 582 | 463 | 506 | 463 | 374 | 454 | 265 | 185 | 244 | 99 |
| 26 | 825 | 827 | 476 | 462 | 398 | 498 | 553 | 527 | 620 | 87 | 95 | 96 | 634 | 480 | 549 | 547 | 402 | 505 | 270 | 201 | 270 | 105 |
| 27 | 830 | 831 | 511 | 500 | 455 | 524 | 567 | 524 | 631 | 90 | 99 | 102 | 666 | 504 | 540 | 594 | 439 | 506 | 305 | 216 | 285 | 113 |
| 28 | 834 | 826 | 564 | 541 | 469 | 548 | 621 | 537 | 598 | 95 | 105 | 109 | 723 | 535 | 545 | 653 | 482 | 516 | 376 | 216 | 293 | 142 |
| 29 | 839 | 837 | 621 | 541 | 477 | 560 | 625 | 549 | 610 | 99 | 110 | 129 | 701 | 543 | 568 | 654 | 489 | 575 | 507 | 234 | 315 | 180 |
| 30 | 843 | 847 | 633 | 643 | 498 | 631 | 725 | 571 | 628 | 359 | 115 | 142 | 686 | 547 | 595 | 650 | 503 | 653 | 613 | 274 | 721 | 208 |
| 31 | 847 | 854 | 609 | 643 | 520 | 668 | 708 | 593 | 650 | 308 | 123 | 213 | 692 | 566 | 623 | 656 | 534 | 696 | 607 | 372 | 731 | 235 |
| 32 | 851 | 853 | 617 | 702 | 529 | 708 | 757 | 607 | 668 | 393 | 134 | 296 | 696 | 586 | 627 | 660 | 567 | 724 | 617 | 436 | 632 | 258 |
| 33 | 854 | 847 | 631 | 768 | 552 | 751 | 823 | 650 | 695 | 1071 | 167 | 275 | 709 | 613 | 642 | 674 | 592 | 715 | 718 | 725 | 643 | 276 |
| 34 | 858 | 854 | 663 | 783 | 573 | 766 | 836 | 671 | 709 | 1009 | 212 | 317 | 751 | 643 | 715 | 695 | 638 | 797 | 761 | 781 | 643 | 292 |

Table A - 15. Temperatures measured on the unexposed side of the assembly in Test 5

| Time | | | Thermocouple number on unexposed side | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| (min) | S101 | Favg | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 |
| 0 | 20 | 23 | 21 | 22 | 21 | 21 | 22 | 22 | 21 | 21 | 21 | 21 | 21 | 19 | 21 | 20 | 21 |
| 1 | 124 | 47 | 21 | 22 | 21 | 21 | 22 | 22 | 21 | 21 | 21 | 21 | 21 | 19 | 21 | 20 | 21 |
| 2 | 227 | 205 | 21 | 22 | 21 | 21 | 22 | 22 | 21 | 21 | 21 | 21 | 21 | 19 | 21 | 20 | 21 |
| 3 | 331 | 333 | 25 | 28 | 25 | 23 | 25 | 27 | 24 | 23 | 23 | 26 | 23 | 20 | 26 | 22 | 27 |
| 4 | 434 | 373 | 31 | 37 | 31 | 28 | 33 | 36 | 30 | 27 | 29 | 33 | 25 | 21 | 32 | 26 | 35 |
| 5 | 538 | 540 | 37 | 44 | 36 | 33 | 39 | 43 | 34 | 30 | 34 | 38 | 27 | 22 | 34 | 29 | 40 |
| 6 | 571 | 550 | 42 | 52 | 42 | 38 | 46 | 50 | 39 | 34 | 39 | 43 | 29 | 24 | 37 | 32 | 44 |
| 7 | 604 | 610 | 48 | 58 | 47 | 43 | 53 | 56 | 45 | 38 | 43 | 48 | 30 | 25 | 39 | 35 | 49 |
| 8 | 638 | 621 | 52 | 62 | 51 | 48 | 58 | 60 | 49 | 42 | 48 | 50 | 32 | 26 | 41 | 35 | 51 |
| 9 | 671 | 679 | 56 | 65 | 55 | 52 | 62 | 63 | 53 | 46 | 52 | 53 | 34 | 27 | 42 | 37 | 53 |
| 10 | 704 | 692 | 59 | 67 | 58 | 55 | 65 | 66 | 57 | 50 | 55 | 55 | 36 | 28 | 43 | 39 | 54 |
| 11 | 715 | 721 | 62 | 69 | 61 | 59 | 68 | 68 | 60 | 54 | 58 | 56 | 37 | 30 | 44 | 40 | 56 |
| 12 | 726 | 721 | 64 | 70 | 63 | 61 | 70 | 70 | 63 | 57 | 61 | 57 | 39 | 31 | 45 | 41 | 57 |
| 13 | 738 | 733 | 67 | 72 | 65 | 64 | 72 | 71 | 66 | 59 | 63 | 58 | 40 | 32 | 46 | 42 | 57 |
| 14 | 749 | 751 | 69 | 73 | 67 | 66 | 73 | 72 | 68 | 62 | 65 | 60 | 42 | 33 | 47 | 43 | 60 |
| 15 | 760 | 761 | 72 | 75 | 69 | 68 | 75 | 74 | 71 | 65 | 67 | 61 | 45 | 34 | 49 | 44 | 61 |
| 16 | 767 | 761 | 77 | 80 | 72 | 70 | 77 | 78 | 74 | 68 | 69 | 63 | 46 | 36 | 54 | 47 | 67 |
| 17 | 774 | 770 | 81 | 83 | 76 | 73 | 81 | 82 | 79 | 71 | 73 | 68 | 47 | 36 | 56 | 49 | 71 |
| 18 | 781 | 784 | 84 | 87 | 81 | 77 | 84 | 83 | 83 | 76 | 78 | 72 | 50 | 37 | 63 | 53 | 73 |
| 19 | 788 | 795 | 86 | 91 | 84 | 81 | 86 | 85 | 89 | 81 | 81 | 74 | 57 | 39 | 64 | 56 | 79 |
| 20 | 795 | 793 | 91 | 96 | 87 | 84 | 90 | 90 | 91 | 84 | 88 | 80 | 62 | 41 | 64 | 56 | 79 |
| 21 | 800 | 804 | 96 | 105 | 90 | 87 | 92 | 95 | 91 | 86 | 89 | 79 | 65 | 41 | 65 | 55 | 80 |
| 22 | 805 | 803 | 100 | 115 | 95 | 89 | 93 | 100 | 93 | 91 | 92 | 79 | 67 | 44 | 67 | 56 | 94 |
| 23 | 811 | 813 | 105 | 122 | 99 | 91 | 99 | 105 | 99 | 95 | 100 | 83 | 69 | 42 | 73 | 57 | 107 |
| 24 | 816 | 779 | 110 | 130 | 103 | 94 | 110 | 109 | 108 | 100 | 109 | 75 | 67 | 42 | 61 | 58 | 104 |

Table A - 16. Temperatures measured inside the upper half section of the assembly in Test 5

| Time | | | Thermocouple number inside upper half section (even numbers) | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| (min) | S101 | Favg | **16** | **18** | **20** | **22** | **24** | **26** | **28** | **30** | **32** | **34** | **36** | **38** | **40** | **42** | **44** | **46** | **72** | **74** | **76** | **78** |
| 0 | 20 | 23 | 22 | 22 | 22 | 22 | 23 | 23 | 23 | 22 | 22 | 22 | 23 | 23 | 23 | 22 | 22 | 22 | 22 | 22 | 21 | 21 |
| 1 | 124 | 47 | 23 | 24 | 23 | 23 | 28 | 32 | 26 | 22 | 24 | 22 | 32 | 33 | 37 | 24 | 25 | 25 | 22 | 22 | 22 | 21 |
| 2 | 227 | 205 | 74 | 75 | 68 | 69 | 100 | 89 | 89 | 41 | 78 | 22 | 84 | 84 | 86 | 77 | 75 | 77 | 41 | 31 | 56 | 29 |
| 3 | 331 | 333 | 72 | 72 | 67 | 69 | 93 | 80 | 85 | 31 | 72 | 24 | 81 | 78 | 78 | 71 | 70 | 71 | 49 | 37 | 56 | 35 |
| 4 | 434 | 373 | 68 | 68 | 64 | 65 | 97 | 78 | 79 | 31 | 69 | 25 | 79 | 78 | 78 | 68 | 68 | 69 | 50 | 39 | 55 | 36 |
| 5 | 538 | 540 | 77 | 77 | 73 | 75 | 98 | 84 | 88 | 32 | 78 | 28 | 90 | 88 | 90 | 77 | 77 | 78 | 57 | 44 | 64 | 42 |
| 6 | 571 | 550 | 77 | 77 | 74 | 75 | 99 | 86 | 87 | 33 | 77 | 32 | 100 | 98 | 102 | 76 | 76 | 78 | 59 | 47 | 63 | 44 |
| 7 | 604 | 610 | 78 | 78 | 76 | 76 | 105 | 88 | 91 | 36 | 78 | 36 | 109 | 108 | 110 | 78 | 85 | 84 | 60 | 47 | 64 | 47 |
| 8 | 638 | 621 | 80 | 79 | 78 | 78 | 109 | 91 | 98 | 39 | 80 | 40 | 116 | 113 | 115 | 85 | 90 | 88 | 61 | 48 | 65 | 50 |
| 9 | 671 | 679 | 81 | 81 | 79 | 80 | 118 | 94 | 103 | 42 | 80 | 44 | 118 | 117 | 119 | 90 | 93 | 91 | 62 | 51 | 67 | 53 |
| 10 | 704 | 692 | 83 | 83 | 81 | 82 | 137 | 101 | 106 | 47 | 82 | 48 | 123 | 121 | 123 | 93 | 96 | 93 | 63 | 52 | 67 | 57 |
| 11 | 715 | 721 | 84 | 85 | 82 | 83 | 156 | 111 | 109 | 51 | 88 | 51 | 128 | 127 | 129 | 96 | 99 | 97 | 65 | 55 | 67 | 60 |
| 12 | 726 | 721 | 84 | 89 | 83 | 86 | 153 | 119 | 114 | 53 | 97 | 54 | 139 | 142 | 168 | 100 | 105 | 110 | 67 | 57 | 68 | 62 |
| 13 | 738 | 733 | 86 | 102 | 83 | 92 | 186 | 137 | 121 | 72 | 111 | 58 | 185 | 192 | 222 | 115 | 128 | 136 | 68 | 59 | 70 | 64 |
| 14 | 749 | 751 | 104 | 131 | 96 | 106 | 224 | 178 | 143 | 68 | 134 | 61 | 232 | 240 | 270 | 141 | 160 | 173 | 69 | 62 | 72 | 67 |
| 15 | 760 | 761 | 141 | 170 | 128 | 134 | 289 | 220 | 194 | 65 | 170 | 65 | 281 | 290 | 324 | 180 | 203 | 214 | 72 | 64 | 75 | 69 |
| 16 | 767 | 761 | 178 | 197 | 165 | 169 | 408 | 271 | 238 | 70 | 192 | 72 | 329 | 331 | 318 | 218 | 233 | 239 | 78 | 69 | 82 | 72 |
| 17 | 774 | 770 | 204 | 228 | 187 | 192 | 723 | 299 | 283 | 69 | 217 | 75 | 362 | 351 | 354 | 244 | 255 | 283 | 88 | 76 | 96 | 74 |
| 18 | 781 | 784 | 223 | 653 | 226 | 225 | 793 | 608 | 439 | 324 | 499 | 75 | 377 | 406 | 928 | 266 | 307 | 816 | 97 | 87 | 114 | 77 |
| 19 | 788 | 795 | 271 | 781 | 308 | 330 | 812 | 773 | 848 | 813 | 639 | 73 | 432 | 443 | 824 | 353 | 366 | 855 | 113 | 101 | 150 | 79 |
| 20 | 795 | 793 | 880 | 776 | 386 | 419 | 850 | 823 | 842 | 868 | 727 | 76 | 915 | 485 | 826 | 916 | 428 | 859 | 688 | 123 | 184 | 87 |
| 21 | 800 | 804 | 858 | 799 | 414 | 470 | 840 | 823 | 710 | 865 | 752 | 83 | 901 | 550 | 847 | 873 | 483 | 862 | 749 | 160 | 218 | 99 |
| 22 | 805 | 803 | 865 | 832 | 805 | 871 | 875 | 874 | 875 | 894 | 842 | 713 | 909 | 832 | 889 | 879 | 824 | 877 | 822 | 236 | 256 | 116 |
| 23 | 811 | 813 | 859 | 837 | 809 | 852 | 860 | 821 | 846 | 870 | 817 | 628 | 893 | 812 | 882 | 853 | 807 | 873 | 823 | 349 | 321 | 130 |
| 24 | 816 | 779 | 765 | 738 | 778 | 695 | 806 | 799 | 732 | 732 | 773 | 636 | 738 | 776 | 721 | 706 | 761 | 743 | 693 | 417 | 394 | 214 |

Table A - 17. Temperatures measured inside the lower half section of the assembly in Test 5

| Time | | | Thermocouple number inside lower half section (odd numbers) | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| (min) | S101 | Favg | **17** | **19** | **21** | **23** | **25** | **27** | **29** | **31** | **33** | **35** | **37** | **39** | **41** | **43** | **45** | **47** | **73** | **75** | **77** | **79** |
| 0 | 20 | 23 | 21 | 21 | 21 | 21 | 22 | 22 | 22 | 21 | 21 | 21 | 22 | 22 | 21 | 21 | 21 | 21 | 22 | 22 | 21 | 21 |
| 1 | 124 | 47 | 22 | 22 | 22 | 22 | 26 | 27 | 30 | 21 | 21 | 21 | 30 | 27 | 26 | 22 | 21 | 21 | 22 | 22 | 21 | 21 |
| 2 | 227 | 205 | 66 | 65 | 60 | 61 | 98 | 87 | 86 | 28 | 24 | 22 | 77 | 74 | 74 | 68 | 59 | 66 | 29 | 28 | 27 | 24 |
| 3 | 331 | 333 | 61 | 60 | 57 | 58 | 91 | 79 | 80 | 26 | 24 | 23 | 74 | 73 | 67 | 61 | 55 | 60 | 36 | 33 | 31 | 28 |
| 4 | 434 | 373 | 58 | 57 | 55 | 56 | 95 | 76 | 76 | 26 | 24 | 24 | 72 | 71 | 68 | 59 | 54 | 57 | 38 | 35 | 33 | 29 |
| 5 | 538 | 540 | 69 | 68 | 64 | 67 | 98 | 87 | 87 | 28 | 25 | 26 | 84 | 83 | 79 | 70 | 63 | 68 | 43 | 39 | 37 | 33 |
| 6 | 571 | 550 | 68 | 67 | 64 | 66 | 95 | 85 | 90 | 29 | 27 | 27 | 94 | 92 | 88 | 68 | 63 | 67 | 46 | 42 | 40 | 35 |
| 7 | 604 | 610 | 70 | 69 | 67 | 68 | 96 | 90 | 96 | 31 | 29 | 29 | 104 | 102 | 95 | 70 | 66 | 69 | 49 | 45 | 42 | 38 |
| 8 | 638 | 621 | 73 | 71 | 70 | 71 | 96 | 93 | 101 | 33 | 31 | 31 | 111 | 108 | 101 | 77 | 69 | 71 | 51 | 48 | 45 | 40 |
| 9 | 671 | 679 | 75 | 74 | 72 | 74 | 97 | 97 | 104 | 37 | 33 | 33 | 114 | 112 | 105 | 82 | 75 | 75 | 53 | 50 | 48 | 43 |
| 10 | 704 | 692 | 78 | 76 | 76 | 77 | 105 | 100 | 108 | 43 | 35 | 35 | 117 | 116 | 109 | 85 | 79 | 80 | 55 | 52 | 50 | 46 |
| 11 | 715 | 721 | 80 | 77 | 78 | 80 | 119 | 104 | 111 | 46 | 37 | 37 | 121 | 121 | 113 | 88 | 82 | 81 | 56 | 53 | 53 | 49 |
| 12 | 726 | 721 | 81 | 80 | 80 | 83 | 145 | 111 | 116 | 45 | 39 | 40 | 126 | 128 | 122 | 91 | 85 | 84 | 57 | 55 | 55 | 51 |
| 13 | 738 | 733 | 83 | 85 | 83 | 86 | 160 | 116 | 124 | 55 | 56 | 42 | 142 | 146 | 149 | 95 | 90 | 91 | 59 | 56 | 57 | 53 |
| 14 | 749 | 751 | 89 | 97 | 94 | 95 | 198 | 129 | 151 | 54 | 64 | 45 | 186 | 196 | 184 | 110 | 104 | 106 | 60 | 58 | 59 | 56 |
| 15 | 760 | 761 | 98 | 117 | 120 | 115 | 238 | 166 | 189 | 54 | 73 | 48 | 229 | 242 | 228 | 133 | 134 | 136 | 62 | 61 | 62 | 58 |
| 16 | 767 | 761 | 121 | 147 | 166 | 148 | 276 | 206 | 225 | 75 | 78 | 50 | 277 | 294 | 299 | 172 | 174 | 177 | 65 | 65 | 67 | 60 |
| 17 | 774 | 770 | 159 | 176 | 188 | 176 | 320 | 235 | 262 | 78 | 77 | 54 | 328 | 335 | 371 | 210 | 200 | 203 | 71 | 72 | 74 | 63 |
| 18 | 781 | 784 | 184 | 210 | 214 | 203 | 380 | 273 | 270 | 80 | 81 | 58 | 353 | 375 | 399 | 236 | 225 | 235 | 80 | 81 | 83 | 66 |
| 19 | 788 | 795 | 210 | 246 | 235 | 230 | 386 | 295 | 288 | 80 | 81 | 62 | 336 | 402 | 437 | 272 | 256 | 274 | 89 | 93 | 96 | 68 |
| 20 | 795 | 793 | 263 | 286 | 261 | 255 | 403 | 321 | 313 | 79 | 82 | 66 | 365 | 414 | 452 | 322 | 294 | 307 | 768 | 111 | 110 | 72 |
| 21 | 800 | 804 | 298 | 317 | 286 | 279 | 434 | 342 | 337 | 81 | 84 | 72 | 398 | 427 | 458 | 363 | 314 | 336 | 780 | 140 | 124 | 78 |
| 22 | 805 | 803 | 339 | 352 | 314 | 310 | 480 | 376 | 366 | 81 | 84 | 77 | 424 | 443 | 476 | 393 | 334 | 372 | 802 | 228 | 140 | 87 |
| 23 | 811 | 813 | 382 | 389 | 345 | 333 | 505 | 406 | 394 | 84 | 86 | 83 | 459 | 460 | 490 | 436 | 358 | 404 | 784 | 343 | 156 | 97 |
| 24 | 816 | 779 | 572 | 720 | 742 | 594 | 886 | 666 | 719 | 114 | 102 | 114 | 759 | 768 | 418 | 783 | 581 | 598 | 644 | 508 | 320 | 119 |

Table A - 18. Temperatures measured on the unexposed side of the assembly in Test 6

| Time | | | Thermocouple number on unexposed side | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| (min) | S101 | Favg | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 |
| 0 | 20 | 25 | 24 | 25 | 24 | 24 | 25 | 25 | 24 | 24 | 24 | 26 | 27 | 25 | 27 | 25 | 25 |
| 1 | 124 | 44 | 24 | 25 | 24 | 24 | 25 | 25 | 24 | 24 | 24 | 26 | 27 | 25 | 27 | 25 | 25 |
| 2 | 227 | 216 | 25 | 25 | 24 | 24 | 25 | 25 | 25 | 24 | 25 | 26 | 27 | 25 | 27 | 25 | 26 |
| 3 | 331 | 378 | 30 | 31 | 28 | 28 | 30 | 31 | 27 | 27 | 29 | 30 | 28 | 26 | 32 | 28 | 30 |
| 4 | 434 | 389 | 38 | 40 | 35 | 35 | 39 | 42 | 33 | 32 | 36 | 35 | 29 | 26 | 39 | 32 | 36 |
| 5 | 538 | 522 | 43 | 47 | 39 | 40 | 45 | 49 | 37 | 36 | 41 | 37 | 31 | 28 | 43 | 34 | 39 |
| 6 | 571 | 606 | 49 | 52 | 43 | 44 | 51 | 55 | 41 | 40 | 46 | 39 | 33 | 29 | 46 | 36 | 40 |
| 7 | 604 | 565 | 54 | 57 | 48 | 49 | 56 | 60 | 46 | 44 | 51 | 41 | 34 | 30 | 49 | 38 | 42 |
| 8 | 638 | 647 | 57 | 60 | 51 | 52 | 59 | 63 | 49 | 48 | 54 | 43 | 36 | 31 | 49 | 41 | 44 |
| 9 | 671 | 641 | 60 | 63 | 54 | 55 | 62 | 65 | 52 | 51 | 57 | 44 | 37 | 33 | 51 | 42 | 45 |
| 10 | 704 | 715 | 62 | 65 | 57 | 58 | 64 | 67 | 55 | 55 | 60 | 44 | 38 | 34 | 52 | 43 | 45 |
| 11 | 715 | 696 | 65 | 67 | 60 | 61 | 66 | 69 | 58 | 58 | 62 | 45 | 39 | 35 | 53 | 43 | 46 |
| 12 | 726 | 740 | 67 | 69 | 62 | 63 | 68 | 70 | 60 | 61 | 64 | 46 | 40 | 36 | 54 | 44 | 47 |
| 13 | 738 | 718 | 68 | 70 | 64 | 65 | 69 | 71 | 62 | 63 | 66 | 47 | 43 | 38 | 54 | 46 | 48 |
| 14 | 749 | 762 | 70 | 73 | 66 | 67 | 70 | 72 | 64 | 64 | 67 | 44 | 45 | 41 | 55 | 45 | 50 |
| 15 | 760 | 747 | 72 | 75 | 69 | 68 | 72 | 73 | 66 | 64 | 69 | 46 | 46 | 42 | 57 | 47 | 50 |
| 16 | 767 | 775 | 75 | 79 | 71 | 70 | 74 | 77 | 68 | 66 | 71 | 47 | 47 | 43 | 58 | 50 | 53 |
| 17 | 774 | 774 | 81 | 84 | 74 | 73 | 77 | 83 | 71 | 68 | 73 | 50 | 48 | 45 | 63 | 51 | 57 |
| 18 | 781 | 771 | 84 | 91 | 80 | 79 | 82 | 86 | 76 | 69 | 76 | 53 | 49 | 46 | 70 | 57 | 62 |
| 19 | 788 | 797 | 86 | 89 | 84 | 83 | 86 | 88 | 81 | 74 | 81 | 56 | 52 | 49 | 71 | 58 | 64 |
| 20 | 795 | 795 | 88 | 91 | 86 | 85 | 90 | 87 | 86 | 80 | 83 | 56 | 58 | 51 | 69 | 59 | 65 |
| 21 | 800 | 789 | 90 | 99 | 91 | 88 | 90 | 94 | 88 | 84 | 85 | 56 | 62 | 53 | 70 | 60 | 64 |
| 22 | 805 | 800 | 95 | 107 | 96 | 93 | 95 | 103 | 89 | 88 | 86 | 56 | 64 | 55 | 71 | 61 | 65 |
| 23 | 811 | 816 | 100 | 114 | 100 | 98 | 101 | 111 | 91 | 92 | 89 | 56 | 65 | 56 | 76 | 63 | 66 |
| 24 | 816 | 826 | 104 | 119 | 104 | 102 | 107 | 117 | 97 | 97 | 92 | 60 | 67 | 58 | 82 | 66 | 67 |
| 25 | 821 | 828 | 108 | 122 | 108 | 105 | 112 | 122 | 108 | 101 | 96 | 63 | 67 | 60 | 88 | 68 | 72 |
| 26 | 825 | 825 | 112 | 127 | 113 | 108 | 116 | 125 | 117 | 104 | 100 | 63 | 68 | 61 | 94 | 70 | 79 |

Table A - 19. Temperatures measured inside the upper half section of the assembly in Test 6

| Time | | | Thermocouple number inside upper half section (even numbers) | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| (min) | S101 | Favg | **16** | **18** | **20** | **22** | **24** | **26** | **28** | **30** | **32** | **34** | **36** | **38** | **40** | **42** | **44** | **46** | **72** | **74** | **76** | **78** |
| 0 | 20 | 25 | 25 | 25 | 25 | 25 | 24 | 25 | 25 | 25 | 25 | 25 | 25 | 25 | 25 | 25 | 25 | 25 | 24 | 24 | 24 | 24 |
| 1 | 124 | 44 | 25 | 25 | 25 | 26 | 33 | 33 | 32 | 26 | 25 | 25 | 30 | 31 | 37 | 26 | 26 | 27 | 24 | 24 | 24 | 24 |
| 2 | 227 | 216 | 76 | 73 | 73 | 75 | 87 | 90 | 84 | 30 | 27 | 51 | 88 | 87 | 87 | 79 | 74 | 80 | 28 | 32 | 36 | 27 |
| 3 | 331 | 378 | 73 | 72 | 72 | 73 | 80 | 81 | 78 | 29 | 28 | 38 | 81 | 81 | 80 | 75 | 72 | 76 | 38 | 39 | 41 | 31 |
| 4 | 434 | 389 | 67 | 66 | 66 | 67 | 74 | 74 | 71 | 30 | 30 | 37 | 75 | 75 | 77 | 69 | 66 | 70 | 41 | 40 | 42 | 32 |
| 5 | 538 | 522 | 74 | 72 | 72 | 73 | 87 | 88 | 81 | 32 | 32 | 42 | 86 | 86 | 88 | 75 | 72 | 76 | 44 | 43 | 45 | 34 |
| 6 | 571 | 606 | 77 | 76 | 76 | 76 | 89 | 87 | 84 | 34 | 34 | 41 | 96 | 97 | 101 | 78 | 76 | 79 | 47 | 47 | 49 | 36 |
| 7 | 604 | 565 | 74 | 74 | 74 | 74 | 90 | 88 | 83 | 36 | 36 | 43 | 107 | 107 | 110 | 75 | 74 | 83 | 50 | 48 | 49 | 38 |
| 8 | 638 | 647 | 77 | 76 | 76 | 78 | 96 | 90 | 94 | 38 | 39 | 45 | 113 | 112 | 114 | 83 | 76 | 88 | 52 | 50 | 50 | 40 |
| 9 | 671 | 641 | 79 | 78 | 79 | 84 | 99 | 94 | 99 | 41 | 42 | 47 | 117 | 116 | 119 | 88 | 77 | 92 | 55 | 52 | 52 | 43 |
| 10 | 704 | 715 | 80 | 80 | 80 | 85 | 103 | 97 | 103 | 43 | 45 | 54 | 119 | 120 | 123 | 90 | 82 | 96 | 57 | 54 | 54 | 45 |
| 11 | 715 | 696 | 82 | 82 | 82 | 88 | 108 | 107 | 106 | 45 | 48 | 60 | 125 | 125 | 129 | 94 | 86 | 100 | 59 | 56 | 56 | 48 |
| 12 | 726 | 740 | 83 | 83 | 82 | 91 | 111 | 108 | 109 | 51 | 50 | 59 | 132 | 133 | 146 | 97 | 88 | 107 | 61 | 58 | 58 | 50 |
| 13 | 738 | 718 | 84 | 84 | 85 | 103 | 119 | 124 | 124 | 59 | 69 | 61 | 155 | 163 | 203 | 108 | 98 | 132 | 63 | 60 | 60 | 52 |
| 14 | 749 | 762 | 93 | 92 | 91 | 120 | 143 | 159 | 156 | 57 | 63 | 75 | 209 | 221 | 253 | 131 | 117 | 168 | 65 | 62 | 62 | 55 |
| 15 | 760 | 747 | 110 | 118 | 119 | 149 | 185 | 201 | 190 | 57 | 61 | 73 | 259 | 277 | 323 | 166 | 152 | 218 | 67 | 64 | 63 | 57 |
| 16 | 767 | 775 | 153 | 165 | 157 | 185 | 219 | 238 | 213 | 60 | 64 | 70 | 305 | 327 | 366 | 205 | 197 | 259 | 71 | 67 | 66 | 59 |
| 17 | 774 | 774 | 195 | 208 | 186 | 214 | 259 | 279 | 238 | 61 | 69 | 72 | 350 | 370 | 502 | 236 | 222 | 455 | 80 | 74 | 74 | 62 |
| 18 | 781 | 771 | 228 | 341 | 270 | 289 | 288 | 336 | 282 | 65 | 71 | 77 | 385 | 439 | 670 | 272 | 356 | 679 | 92 | 83 | 86 | 66 |
| 19 | 788 | 797 | 422 | 492 | 422 | 431 | 436 | 415 | 418 | 80 | 78 | 86 | 519 | 547 | 711 | 559 | 499 | 688 | 100 | 95 | 97 | 72 |
| 20 | 795 | 795 | 557 | 571 | 466 | 512 | 523 | 466 | 469 | 92 | 83 | 90 | 575 | 588 | 714 | 577 | 540 | 696 | 105 | 108 | 113 | 80 |
| 21 | 800 | 789 | 583 | 624 | 510 | 558 | 620 | 520 | 535 | 131 | 88 | 91 | 583 | 611 | 764 | 548 | 569 | 784 | 113 | 122 | 129 | 89 |
| 22 | 805 | 800 | 584 | 690 | 539 | 590 | 721 | 568 | 558 | 372 | 92 | 93 | 581 | 623 | 753 | 542 | 581 | 753 | 144 | 134 | 147 | 97 |
| 23 | 811 | 816 | 635 | 673 | 559 | 616 | 670 | 603 | 578 | 347 | 96 | 95 | 653 | 623 | 741 | 560 | 582 | 682 | 178 | 147 | 170 | 104 |
| 24 | 816 | 826 | 663 | 672 | 787 | 816 | 671 | 902 | 835 | 362 | 124 | 123 | 679 | 849 | 742 | 584 | 832 | 693 | 215 | 161 | 201 | 112 |
| 25 | 821 | 828 | 691 | 691 | 788 | 843 | 693 | 875 | 833 | 403 | 187 | 222 | 711 | 829 | 813 | 612 | 811 | 833 | 245 | 176 | 299 | 118 |
| 26 | 825 | 825 | 703 | 694 | 769 | 785 | 698 | 868 | 803 | 443 | 254 | 280 | 722 | 798 | 802 | 620 | 787 | 823 | 261 | 194 | 429 | 122 |

Table A - 20. Temperatures measured inside the lower half section of the assembly in Test 6

| Time | | | Thermocouple number inside lower half section (odd numbers) | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| (min) | S101 | Favg | **17** | **19** | **21** | **23** | **25** | **27** | **29** | **31** | **33** | **35** | **37** | **39** | **41** | **43** | **45** | **47** | **73** | **75** | **77** | **79** |
| 0 | 20 | 25 | 24 | 24 | 24 | 24 | 24 | 24 | 24 | 25 | 24 | 24 | 24 | 24 | 24 | 25 | 24 | 24 | 24 | 24 | 24 | 24 |
| 1 | 124 | 44 | 25 | 25 | 25 | 25 | 29 | 32 | 25 | 25 | 24 | 24 | 33 | 25 | 29 | 25 | 29 | 25 | 24 | 24 | 24 | 24 |
| 2 | 227 | 216 | 69 | 68 | 69 | 69 | 80 | 85 | 62 | 25 | 25 | 50 | 84 | 69 | 80 | 67 | 84 | 64 | 31 | 28 | 36 | 30 |
| 3 | 331 | 378 | 63 | 64 | 63 | 64 | 77 | 79 | 64 | 25 | 25 | 35 | 76 | 63 | 73 | 62 | 78 | 62 | 37 | 33 | 43 | 37 |
| 4 | 434 | 389 | 59 | 59 | 59 | 60 | 72 | 72 | 60 | 26 | 26 | 34 | 72 | 59 | 70 | 58 | 72 | 58 | 38 | 34 | 44 | 38 |
| 5 | 538 | 522 | 66 | 65 | 67 | 66 | 81 | 81 | 65 | 28 | 27 | 39 | 86 | 66 | 81 | 65 | 86 | 64 | 41 | 36 | 47 | 41 |
| 6 | 571 | 606 | 63 | 70 | 69 | 69 | 86 | 83 | 70 | 29 | 29 | 38 | 99 | 69 | 92 | 68 | 98 | 68 | 44 | 39 | 52 | 45 |
| 7 | 604 | 565 | 65 | 68 | 68 | 68 | 88 | 81 | 69 | 31 | 30 | 38 | 106 | 68 | 99 | 67 | 107 | 68 | 47 | 41 | 53 | 48 |
| 8 | 638 | 647 | 69 | 71 | 72 | 72 | 91 | 87 | 72 | 33 | 32 | 40 | 110 | 72 | 105 | 73 | 111 | 71 | 49 | 44 | 55 | 51 |
| 9 | 671 | 641 | 71 | 73 | 74 | 74 | 92 | 87 | 75 | 35 | 34 | 42 | 115 | 79 | 109 | 77 | 116 | 74 | 51 | 46 | 58 | 54 |
| 10 | 704 | 715 | 75 | 76 | 76 | 77 | 94 | 89 | 77 | 38 | 37 | 50 | 118 | 82 | 112 | 80 | 119 | 75 | 54 | 48 | 59 | 57 |
| 11 | 715 | 696 | 78 | 78 | 79 | 80 | 95 | 92 | 80 | 40 | 39 | 57 | 124 | 86 | 117 | 83 | 124 | 78 | 56 | 51 | 60 | 60 |
| 12 | 726 | 740 | 78 | 79 | 79 | 82 | 104 | 93 | 81 | 44 | 41 | 54 | 133 | 88 | 124 | 85 | 131 | 79 | 58 | 53 | 60 | 62 |
| 13 | 738 | 718 | 79 | 80 | 79 | 83 | 119 | 108 | 83 | 48 | 46 | 55 | 173 | 90 | 154 | 89 | 152 | 81 | 60 | 55 | 61 | 64 |
| 14 | 749 | 762 | 80 | 83 | 81 | 88 | 152 | 149 | 88 | 48 | 48 | 72 | 215 | 99 | 189 | 99 | 203 | 83 | 62 | 57 | 63 | 66 |
| 15 | 760 | 747 | 82 | 93 | 88 | 98 | 196 | 184 | 100 | 50 | 50 | 69 | 259 | 120 | 232 | 119 | 249 | 88 | 63 | 59 | 65 | 69 |
| 16 | 767 | 775 | 96 | 112 | 108 | 132 | 227 | 214 | 134 | 53 | 52 | 65 | 288 | 151 | 278 | 148 | 282 | 109 | 66 | 62 | 68 | 71 |
| 17 | 774 | 774 | 141 | 159 | 143 | 180 | 270 | 250 | 201 | 57 | 53 | 72 | 365 | 186 | 341 | 184 | 340 | 143 | 71 | 67 | 73 | 74 |
| 18 | 781 | 771 | 190 | 207 | 187 | 219 | 321 | 314 | 252 | 64 | 63 | 77 | 405 | 234 | 353 | 220 | 357 | 178 | 78 | 75 | 83 | 78 |
| 19 | 788 | 797 | 216 | 235 | 211 | 248 | 383 | 391 | 275 | 66 | 70 | 81 | 406 | 259 | 400 | 238 | 379 | 214 | 88 | 84 | 95 | 87 |
| 20 | 795 | 795 | 241 | 256 | 230 | 276 | 408 | 441 | 314 | 68 | 74 | 82 | 400 | 271 | 423 | 256 | 374 | 254 | 109 | 94 | 114 | 99 |
| 21 | 800 | 789 | 260 | 279 | 240 | 297 | 443 | 473 | 341 | 72 | 78 | 84 | 388 | 277 | 452 | 269 | 366 | 345 | 128 | 106 | 132 | 114 |
| 22 | 805 | 800 | 267 | 317 | 247 | 317 | 484 | 499 | 366 | 74 | 80 | 84 | 383 | 279 | 468 | 274 | 358 | 359 | 147 | 118 | 150 | 124 |
| 23 | 811 | 816 | 280 | 541 | 256 | 340 | 524 | 539 | 397 | 78 | 83 | 84 | 390 | 287 | 483 | 284 | 358 | 372 | 166 | 128 | 173 | 131 |
| 24 | 816 | 826 | 300 | 535 | 272 | 370 | 543 | 578 | 425 | 82 | 84 | 84 | 409 | 296 | 531 | 305 | 364 | 467 | 185 | 138 | 204 | 137 |
| 25 | 821 | 828 | 326 | 531 | 296 | 456 | 550 | 608 | 432 | 84 | 86 | 87 | 435 | 320 | 599 | 331 | 383 | 477 | 201 | 144 | 325 | 142 |
| 26 | 825 | 825 | 356 | 559 | 320 | 487 | 565 | 610 | 642 | 87 | 88 | 91 | 463 | 349 | 662 | 363 | 409 | 565 | 220 | 151 | 462 | 146 |

Table A - 21: Deflection measurements in Test 5

| Time | Dfl[1]1 | Dfl2 | Dfl3 | Dfl4 | Dfl5 | Dfl6 | Dfl7 | Dfl8 | Dfl9 |
|---|---|---|---|---|---|---|---|---|---|
| min | cm | cm | cm | cm | cm | cm | cm | cm | cm |
| 0 | 0.03 | -0.05 | -0.07 | --- | -0.02 | -0.06 | -0.05 | -0.11 | -0.07 |
| 1 | -0.01 | -0.06 | -0.04 | --- | -0.05 | -0.08 | -0.05 | -0.11 | -0.08 |
| 2 | -0.01 | -0.06 | -0.08 | --- | -0.05 | -0.06 | -0.04 | -0.12 | -0.09 |
| 3 | -0.02 | -0.05 | -0.04 | --- | -0.06 | -0.08 | -0.06 | -0.09 | -0.09 |
| 4 | -0.02 | -0.06 | -0.03 | --- | -0.06 | -0.04 | -0.06 | -0.09 | -0.06 |
| 5 | -0.02 | -0.06 | -0.03 | --- | -0.06 | -0.06 | -0.06 | -0.10 | -0.06 |
| 6 | -0.01 | -0.06 | -0.01 | --- | -0.06 | -0.03 | -0.06 | -0.10 | -0.06 |
| 7 | -0.01 | -0.07 | -0.01 | --- | -0.05 | -0.02 | -0.06 | -0.10 | -0.05 |
| 8 | -0.01 | -0.06 | -0.01 | --- | -0.05 | 0.00 | -0.06 | -0.10 | -0.03 |
| 9 | 0.00 | -0.06 | 0.01 | --- | -0.04 | 0.01 | -0.05 | -0.09 | -0.02 |
| 10 | -0.02 | -0.07 | 0.03 | --- | -0.06 | 0.03 | -0.07 | -0.09 | 0.00 |
| 11 | -0.01 | -0.06 | 0.02 | --- | -0.05 | 0.04 | -0.07 | -0.06 | 0.00 |
| 12 | -0.01 | -0.04 | 0.06 | --- | -0.04 | 0.06 | -0.06 | -0.06 | 0.02 |
| 13 | -0.01 | -0.03 | 0.04 | --- | -0.03 | 0.09 | -0.09 | -0.04 | 0.04 |
| 14 | -0.01 | 0.00 | 0.07 | --- | -0.02 | 0.12 | -0.09 | -0.01 | 0.05 |
| 15 | -0.03 | 0.02 | 0.11 | --- | 0.00 | 0.13 | -0.06 | 0.00 | 0.07 |
| 16 | 0.01 | 0.05 | 0.18 | --- | 0.08 | 0.22 | -0.06 | 0.04 | 0.12 |
| 17 | 0.07 | 0.09 | 0.25 | --- | 0.17 | 0.32 | -0.06 | 0.12 | 0.19 |
| 18 | 0.17 | 0.18 | 0.35 | --- | 0.27 | 0.44 | 0.00 | 0.19 | 0.25 |
| 19 | 0.30 | 0.31 | 0.54 | --- | 0.49 | 0.62 | 0.06 | 0.31 | 0.35 |
| 20 | 0.49 | 0.60 | 0.80 | --- | 0.87 | 0.97 | 0.19 | 0.54 | 0.52 |
| 21 | 0.91 | 1.04 | 1.27 | --- | 1.47 | 1.46 | 0.37 | 0.91 | 0.78 |
| 22 | 1.92 | 2.14 | 2.20 | --- | 3.00 | 2.52 | 0.94 | 1.78 | 1.31 |
| 23 | 5.99 | 6.57 | 7.02 | --- | 9.05 | 8.35 | 4.37 | 5.33 | 4.48 |
| 24 | 10.93 | 15.96 | 20.70 | --- | 21.97 | 23.60 | 8.69 | 11.54 | 11.53 |

[1] Dfln: deflection

Table A - 22. Deflection measurements in Test 6.

| Time | DFL-01 | DFL-02 | DFL-03 | DFL-04 | DFL-05 | DFL-06 | DFL-07 | DFL-08 | DFL-09 |
|---|---|---|---|---|---|---|---|---|---|
| min. | cm | cm | cm | cm | cm | cm | cm | cm | cm |
| 0 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| 1 | -0.03 | -0.06 | -0.08 | -0.12 | -0.09 | -0.11 | -0.08 | -0.08 | -0.06 |
| 2 | -0.04 | -0.06 | -0.05 | -0.07 | -0.06 | -0.06 | -0.06 | -0.04 | -0.06 |
| 3 | 0.00 | -0.06 | 0.00 | 0.01 | -0.03 | 0.00 | 0.00 | -0.02 | -0.03 |
| 4 | 0.03 | -0.03 | 0.03 | 0.04 | 0.00 | 0.03 | 0.03 | -0.02 | 0.00 |
| 5 | 0.03 | -0.05 | 0.03 | 0.03 | -0.04 | 0.03 | 0.03 | -0.04 | 0.00 |
| 6 | 0.03 | -0.05 | 0.03 | 0.05 | -0.06 | 0.03 | 0.03 | -0.04 | 0.00 |
| 7 | 0.05 | -0.05 | 0.06 | 0.08 | -0.04 | 0.06 | 0.05 | -0.03 | 0.02 |
| 8 | 0.05 | -0.06 | 0.06 | 0.08 | -0.05 | 0.06 | 0.05 | -0.04 | 0.02 |
| 9 | 0.08 | -0.05 | 0.08 | 0.12 | -0.03 | 0.07 | 0.06 | -0.03 | 0.03 |
| 10 | 0.09 | -0.05 | 0.09 | 0.12 | -0.03 | 0.08 | 0.08 | -0.03 | 0.03 |
| 11 | 0.11 | -0.05 | 0.09 | 0.14 | -0.03 | 0.09 | 0.09 | -0.02 | 0.03 |
| 12 | 0.11 | -0.05 | 0.11 | 0.16 | -0.02 | 0.11 | 0.09 | -0.02 | 0.04 |
| 13 | 0.13 | -0.05 | 0.14 | 0.18 | -0.03 | 0.12 | 0.12 | -0.02 | 0.06 |
| 14 | 0.15 | -0.04 | 0.18 | 0.20 | 0.00 | 0.17 | 0.14 | 0.00 | 0.07 |
| 15 | 0.20 | 0.00 | 0.24 | 0.28 | 0.03 | 0.23 | 0.18 | 0.04 | 0.11 |
| 16 | 0.28 | 0.06 | 0.32 | 0.38 | 0.15 | 0.34 | 0.26 | 0.09 | 0.14 |
| 17 | 0.36 | 0.15 | 0.41 | 0.51 | 0.26 | 0.46 | 0.34 | 0.17 | 0.20 |
| 18 | 0.51 | 0.28 | 0.55 | 0.67 | 0.41 | 0.60 | 0.47 | 0.28 | 0.29 |
| 19 | 0.68 | 0.47 | 0.75 | 0.91 | 0.67 | 0.80 | 0.62 | 0.43 | 0.41 |
| 20 | 0.89 | 0.73 | 1.04 | 1.20 | 1.02 | 1.15 | 0.82 | 0.67 | 0.61 |
| 21 | 1.17 | 1.08 | 1.45 | 1.57 | 1.46 | 1.58 | 1.03 | 0.96 | 0.87 |
| 22 | 1.62 | 1.57 | 2.00 | 2.10 | 2.11 | 2.21 | 1.35 | 1.36 | 1.23 |
| 23 | 2.27 | 2.29 | 2.69 | 2.84 | 2.99 | 3.04 | 1.76 | 1.93 | 1.71 |
| 24 | 3.09 | 3.27 | 3.56 | 3.85 | 4.23 | 4.08 | 2.35 | 2.68 | 2.34 |
| 25 | 4.31 | 4.76 | 4.86 | 5.38 | 5.93 | 5.75 | 3.23 | 3.73 | 3.30 |
| 26 | 7.20 | 7.94 | 8.44 | 8.79 | 9.39 | 9.84 | 5.18 | 5.79 | 5.70 |