

## **Evaluation of 12.7 mm Gypsum Wallboard as a Protective Covering for the "NUDURA™ Wall System"**

A Report To: **NUDURA Corporation**  
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Submitted By: Fire Testing

Report No. 06-02-140  
5 Pages + Appendix

Date: March 21, 2006

**ACCREDITATION** Standards Council of Canada, Registration #1.

**REGISTRATION** ISO 9001:2000, registered by QMI, Registration #001109.

### **SPECIFICATIONS OF ORDER**

Evaluate the protective covering of a wall system in accordance with CAN4-S124 "Standard Method of Test for the Evaluation of Protective Coverings for Foamed Plastic", as per Bodycote Proposal No. 05-02-04379 and Nudura P.O. No. 41364.

**SAMPLE IDENTIFICATION** *(BMTC sample identification number 06-02-S0140)*

NUDURA™ Integrated Building Technology Wall Forming System comprising of expanded-polystyrene modular units filled with concrete and an attached protective cover of 12.7 mm thick gypsum wallboard. See Appendix for wall construction details.

### **SAMPLE CONDITIONING**

The wall system was conditioned to constant mass at a temperature of 23°C and a relative humidity of 50% prior to testing.

### **SUMMARY OF TEST PROCEDURE**

The composite panel, approximately 1090 mm x 1090 mm, is placed with the protective gypsum wallboard covering facing down, on top of a computer-controlled furnace. The furnace, having an exposed area of 1000 x 1000 mm, is programmed to follow the standard time-temperature curve specified in CAN/ULC-S101.

The temperatures at the interface of the protective covering and the foamed plastic are sensed by five thermocouples. The thermocouples are located at the centre of the specimen and at the centre of each quadrant (see Figure 1). Thermocouples are scanned at 30 second intervals.

Results are expressed in terms of a classification rating. The best performance is represented by Classification A and the poorest by Classification D. Classifications B and C are intermediate but not necessarily sequential.

#### **CLASSIFICATION A**

If the temperature rise at the interface of the protective cover and the foamed plastic at the end of 15 minutes has not exceeded 140 C° average or 180 C° at any one of the thermocouple locations, the protective cover shall be accorded a Classification of A.

#### **CLASSIFICATION B**

If the temperature rise at the interface of the protective cover and the foamed plastic at the end of 10 minutes has not exceeded 140 C° average or 180 C° at any one of the thermocouple locations, the protective cover shall be accorded a Classification of B.

**SUMMARY OF TEST PROCEDURE (Cont..)**

**CLASSIFICATION C**

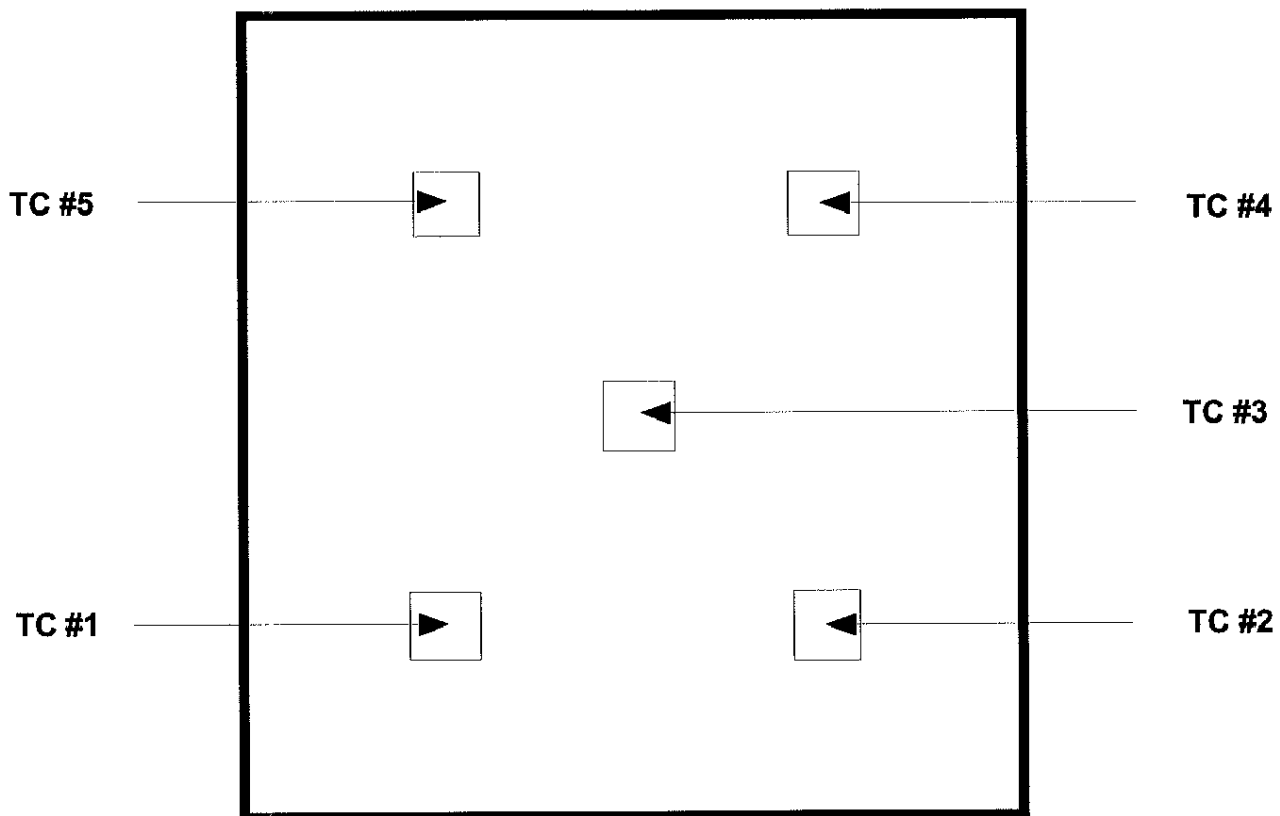
If the temperature rise at the interface of the protective cover and the foamed plastic at the end of 15 minutes has not exceeded 195 C° average or 250 C° at any one of the thermocouple locations, the protective cover shall be accorded a Classification of C.

**CLASSIFICATION D**

If the temperature rise at the interface of the protective cover and the foamed plastic at the end of 10 minutes has not exceeded 195 C° average or 250 C° at any one of the thermocouple locations, the protective cover shall be accorded a Classification of D.

**THERMOCOUPLE LOCATIONS**

The temperature increases are illustrated graphically in Figure 2. Complete temperature data are provided in the Appendix. Furnace accuracy at the end of the test (16 minutes) was 99.7% of nominal. The furnace time/temperature curve is also given in the Appendix.

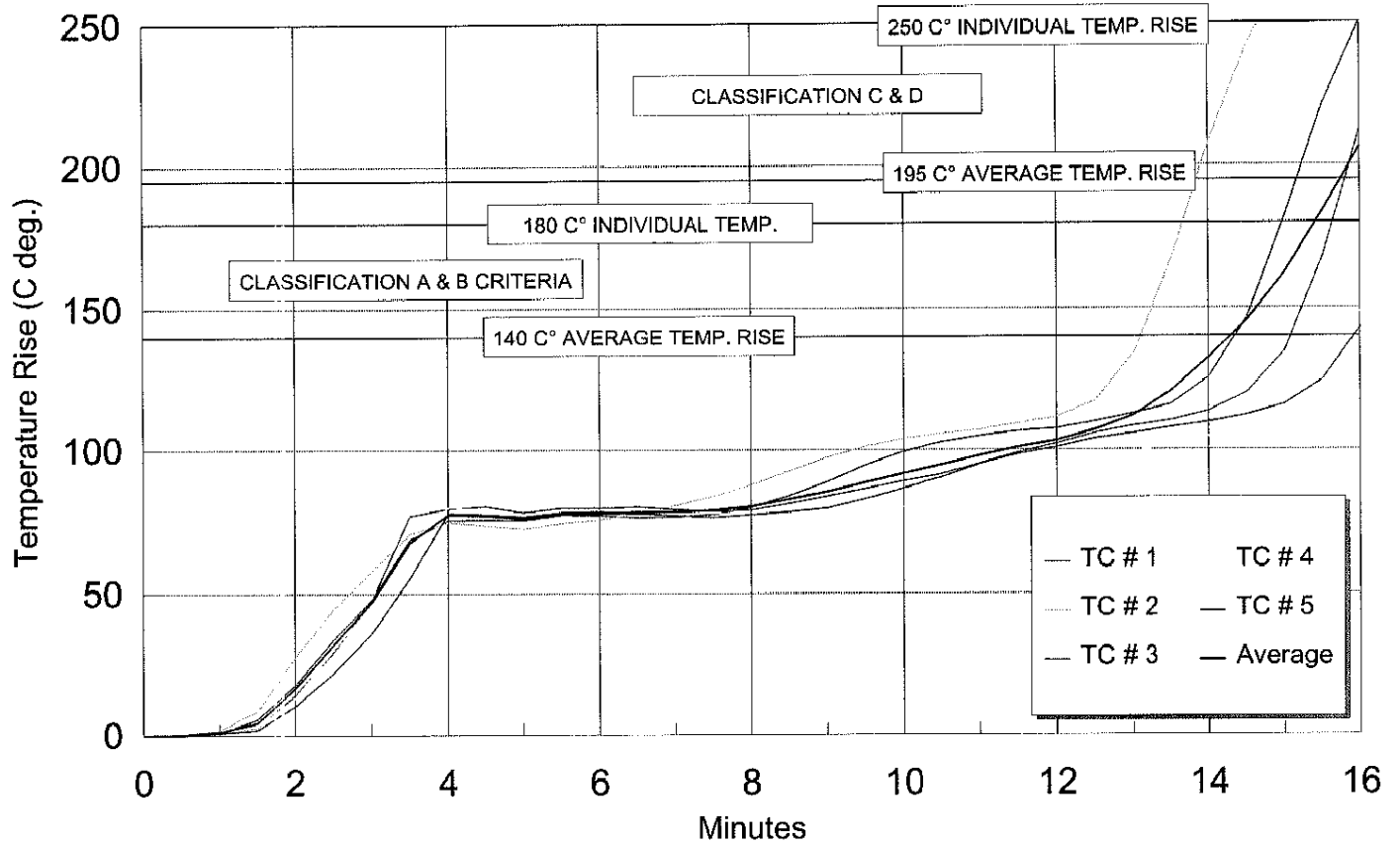


Front of furnace

Note: not to scale

**Figure 1 - Thermocouple locations**

**TEST RESULTS** Sample No. 06-02-S0140



Elapsed Time (min)	TC1 Rise (C°)	TC2 Rise (C°)	TC3 Rise (C°)	TC4 Rise (C°)	TC5 Rise (C°)	Average Rise (C°)
1	1	2	1	1	1	1
2	18	28	14	13	10	17
3	48	58	48	46	36	47
4	76	75	80	80	78	78
5	76	73	78	78	77	76
6	77	76	80	79	79	78
7	77	81	79	79	77	79
8	80	88	79	77	77	80
9	89	97	84	77	80	85
10	99	104	89	80	87	92
11	105	107	95	88	95	98
12	107	112	102	94	101	103
13	113	134	108	99	106	112
14	125	208	113	105	110	132
15	182	266	134	112	116	162
16	251	276	213	149	143	206

**Figure 2** Temperatures at interface of gypsum wall board and foam. Sample No. 06-02-S0140


## **OBSERVATIONS**


A slight amount of white smoke began to issue from the right side edge of the wall system after approximately 5 minutes exposure. After approximately 8 minutes, small amounts of smoke were issuing from all four edges. At approximately 13 minutes, thermocouple #2, which was located in the right front quadrant began to rise at a quicker rate than the other four thermocouples. At 14 minutes, thermocouple # 2 had exceeded the individual rise criteria of 180 C° for Classifications A & B. The test was continued until the temperature increases for Classifications C & D had been achieved and then the test was terminated at the 16 minute mark.

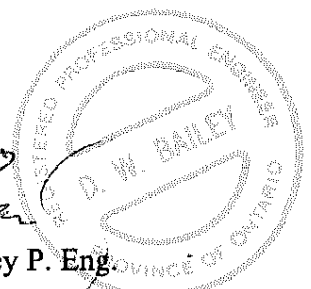
## **CONCLUSIONS AND COMMENTS**

The 12.7 mm gypsum wall board protective covering of the wall system identified in this report qualifies for a Classification B rating based on an average temperature rise of less than 140 C° and individual temperature rise less than 180 C° at the 10 minute mark of the test.

The sample just fails to meet the 15 minute Classification A criteria based upon an individual temperature rise greater than 180 C° at 14 minutes (TC#2 = 208 C°), followed by an average rise greater than 140 C° at 14.5 minutes (avg = 145 C°). If the readings from thermocouple #2 are disregarded, the sample would have achieved the Class A rating.

  
Richard J. Lederle,  
Manager, Fire Testing.  
Product Testing

  
David W. Bailey P. Eng.  
Business Development Manager  
Building Sciences



*Note: This report consists of 5 pages, including the cover page, that comprise the report "body". It should be considered incomplete if all pages are not present. Additionally, the Appendix of this report comprise a cover page, plus 4 pages.*

**Bodycote Materials Testing Canada Inc.**

*Evaluation of 12.7 mm Gypsum Wallboard as a Protective Covering for the "NUDURA™ Wall System"*

*For: NUDURA Corporation*

*Report No. 06-02-140*

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**APPENDIX**

(4 Pages)

**Sample Temperatures**

(1 pages)

**Furnace Temperatures**

(1 pages)

**Details of Wall Construction**

(2 pages - provided by NUTURA)

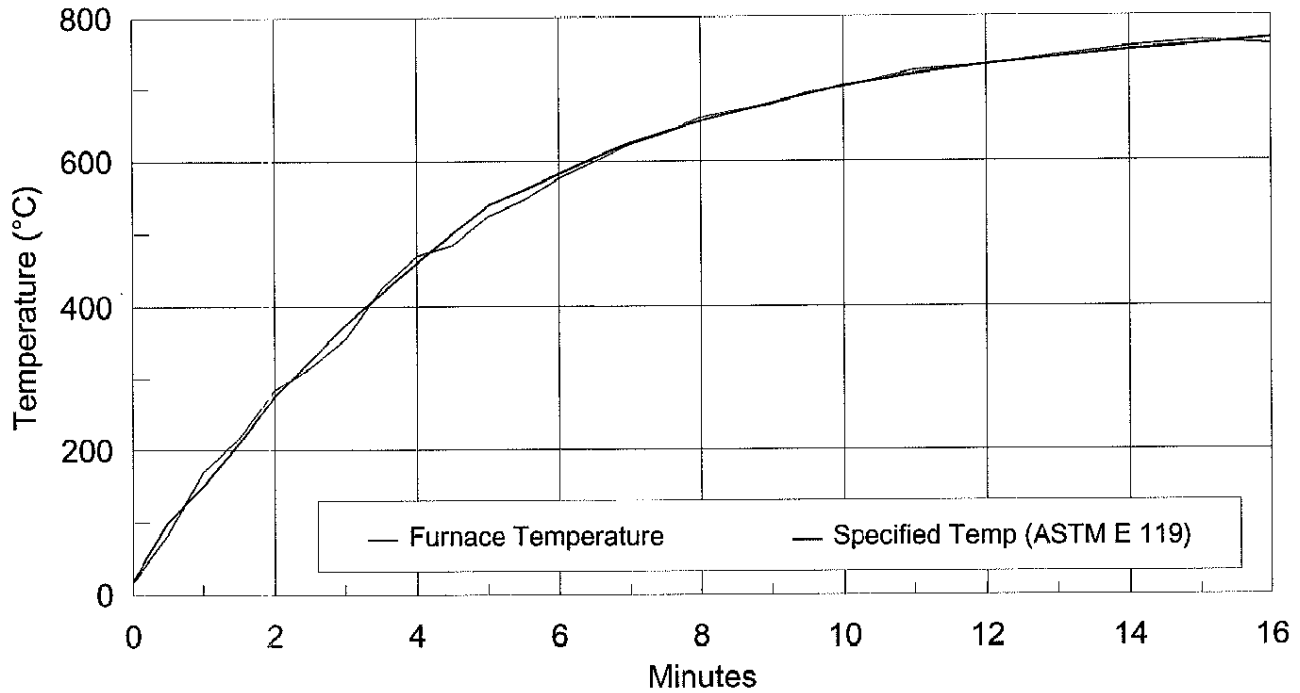
# Bodycote Materials Testing Canada Inc.

## Temperatures at Protective Covering/Foam interface

Time (min)	TC #1 (°C)	TC #2 (°C)	TC #3 (°C)	TC #4 (°C)	TC #5 (°C)
0.0	15.8	15.5	15.6	15.5	15.8
0.5	15.8	15.7	15.9	15.6	16.0
1.0	16.6	17.4	17.0	16.9	16.7
1.5	21.5	24.2	18.4	18.5	17.7
2.0	33.6	43.3	30.0	28.8	26.2
2.5	49.7	60.1	45.2	45.9	37.9
3.0	63.8	73.6	63.2	61.9	51.9
3.5	84.7	86.2	92.8	82.9	71.2
4.0	91.5	90.4	95.3	95.7	93.8
4.5	91.6	89.2	96.0	94.5	93.4
5.0	91.4	88.1	93.9	93.4	92.6
5.5	93.3	90.0	95.4	94.6	94.1
6.0	93.0	91.3	95.5	94.7	94.4
6.5	92.5	93.8	95.9	94.3	93.8
7.0	92.7	96.4	95.1	94.1	93.1
7.5	93.4	99.5	94.3	93.9	92.5
8.0	95.9	103.4	94.8	92.9	93.3
8.5	99.9	108.3	97.0	93.8	94.3
9.0	104.7	113.0	99.5	92.9	95.5
9.5	110.6	116.9	102.3	93.2	98.9
10.0	115.2	119.5	105.0	95.7	102.5
10.5	118.4	121.2	107.2	99.3	106.3
11.0	120.7	122.6	110.9	103.5	110.9
11.5	122.3	124.9	114.6	106.7	114.3
12.0	123.2	127.1	117.8	109.5	116.6
12.5	125.7	132.9	121.5	112.9	119.8
13.0	128.4	149.6	123.9	114.8	121.5
13.5	131.6	182.0	125.8	116.8	123.4
14.0	141.2	223.5	129.1	120.2	125.3
14.5	162.2	257.2	135.5	121.9	128.0
15.0	197.5	281.9	150.0	127.1	131.6
15.5	236.7	295.7	183.6	141.3	140.3
16.0	266.3	291.9	228.3	164.5	158.8

**Bodycote Materials Testing Canada Inc.**

**Furnace Temperature**



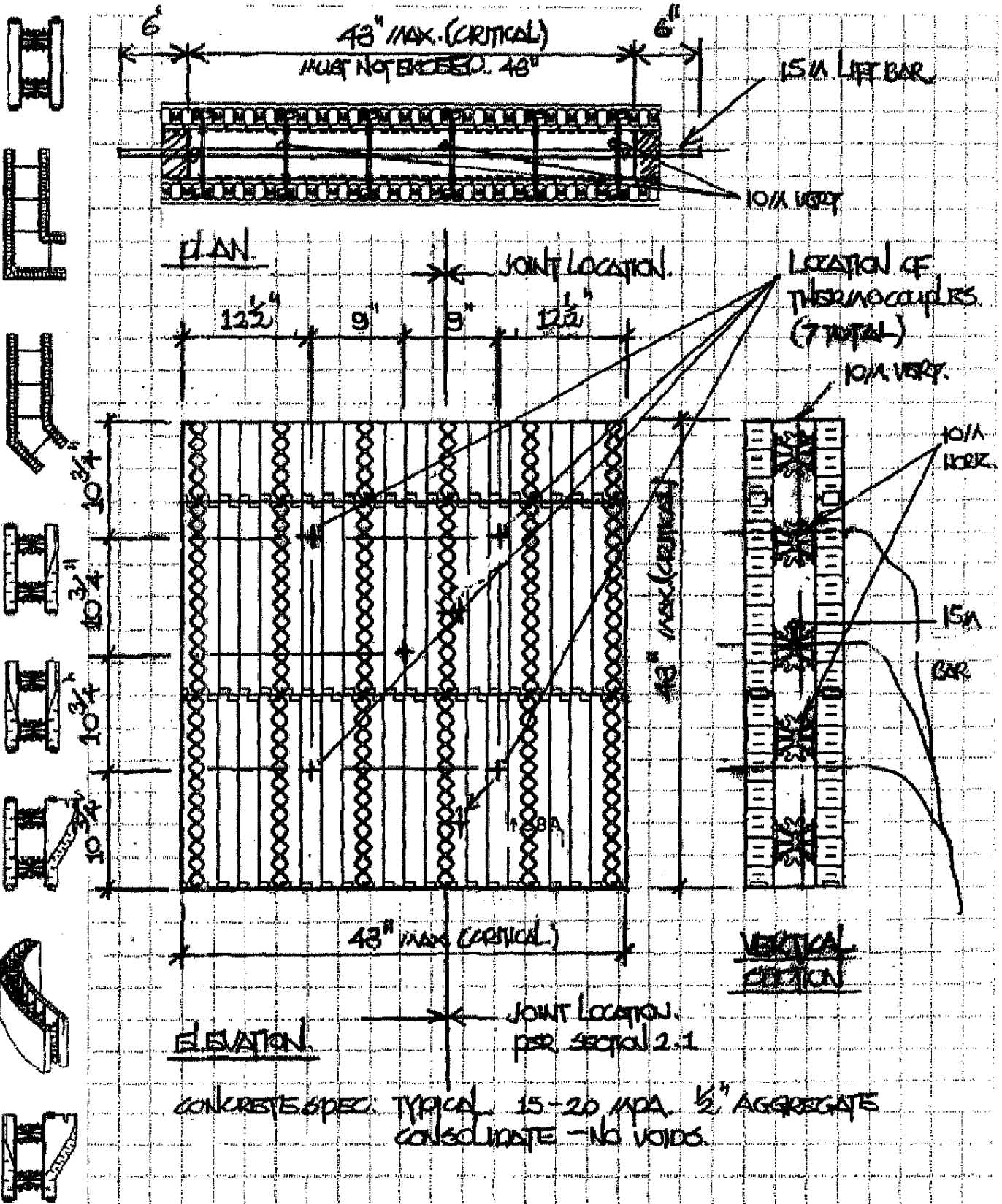
Time (min)	Furnace temp. °C	Specified temp. °C	Area under curve (°C·hr)		Comparative to Specified Area (%)
			Actual	Specified	
0.0	17	20	-	-	-
0.5	82	100	16	20	82.0
1.0	169	150	69	73	95.3
1.5	216	210	155	153	101.9
2.0	283	275	270	264	102.4
2.5	315	325	410	404	101.4
3.0	354	375	567	569	99.6
3.5	424	418	751	757	99.2
4.0	468	460	964	967	99.8
4.5	483	500	1192	1197	99.6
5.0	523	538	1433	1446	99.1
5.5	544	559	1690	1710	98.8
6.0	575	582	1960	1986	98.7
6.5	599	605	2243	2272	98.7
7.0	622	625	2538	2570	98.8
7.5	638	641	2844	2876	98.9
8.0	659	655	3158	3190	99.0
8.5	669	668	3480	3511	99.1
9.0	678	680	3807	3838	99.2
9.5	693	692	4140	4171	99.2
10.0	702	704	4478	4510	99.3
11.0	724	720	5171	5202	99.4
12.0	732	733	5880	5909	99.5
13.0	745	743	6598	6627	99.6
14.0	756	753	7329	7355	99.6
15.0	764	760	8069	8091	99.7
16.0	759	768	8810	8835	99.7



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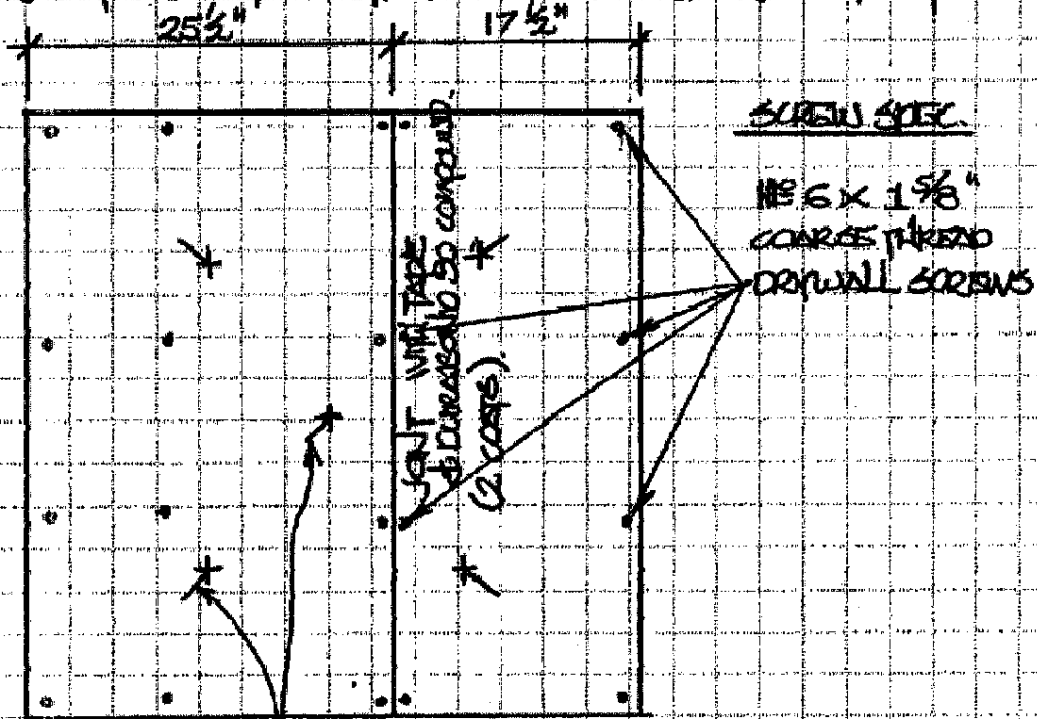
PROPOSED DRY WALL APPLICATION

NUDURA-CAN 4 S-124 TESTING

USE STD. NON-FIRE CODE: 1/2" (12.7mm) GYP. BOARD  
(GGC PREFERRED)

PROPOSED SCREW FASTENING PATTERN

(COMPLIES WITH SECTION 9.29.5.9 (MAX. 16" o/c SPACING))



NOTE: THERMOCOUPLE WIRES TO EXTEND 38 MM BEYOND FORM PENETRATION AS SHOWN AS PER SECTION 4.6 (PG 6) OF THE STANDARD.