



**FACULTY OF ENGINEERING  
CHULALONGKORN UNIVERSITY  
FIRE SAFETY RESEARCH CENTER**




- TYPE OF TEST** : DETERMINATION OF THE FIRE RESISTANCE OF NON-LOADBEARING ELEMENTS OF CONSTRUCTION
- TEST SPECIMEN** : **INNOWALL**  
The specimen is a 3.5 m x 3.5 m vertical construction of 10-cm thick expandable polystyrene (EPS) concrete sandwich panels. The sandwich panels comprise expandable polystyrene concrete sandwich panel as the core and a single layer of 4-mm thick smart boards on both the exposed and unexposed sides. Cement fire grout is used to seal the joints between the concrete sandwich panel and the perimeter frame along all edges. The details of the specimen are shown in Appendix C. The specimen was provided and installed by the client.
- CLIENT** : **GREEN BUILD INNOWALL CO., LTD.**  
8/2 Moo.14 Lamlukka Sub-district, Lumlukka District  
Pathumthani 12150, Thailand
- DATE OF TEST** : November 27, 2014
- TEST MACHINE** : Large-scale vertical furnace at the Fire Safety Research Center (FSRC), Department of Civil Engineering, Chulalongkorn University in Saraburi province, Thailand. The furnace is capable of producing a standard temperature-time relationship according to BS 476 Part 20: 1987.
- TEST METHOD** : The testing procedures follow the British Standard BS 476: Fire tests on building materials and structures  
BS 476 Part 20: 1987: Method for determination of the fire resistance of elements of construction (general principles)  
BS 476 Part 22: 1987: Methods for determination of the fire resistance of non-loadbearing elements of construction Section 5: Determination of the fire resistance of partitions.
- TEST RESULTS** : The non-loadbearing element of construction described above has the fire resistance of each criterion for the period stated:  
(The test results are good only for the specimen tested.)

Criteria	Fire Resistance (hr:min)	Remarks
Insulation	3:26	Integrity failed.
Integrity	3:26	The specimen had a passage of flame or gases hot enough to ignite the cotton pad.

Date: December 11, 2014

Tested by:   
(Associate Prof. Dr. Thanyawat Pothisiri)

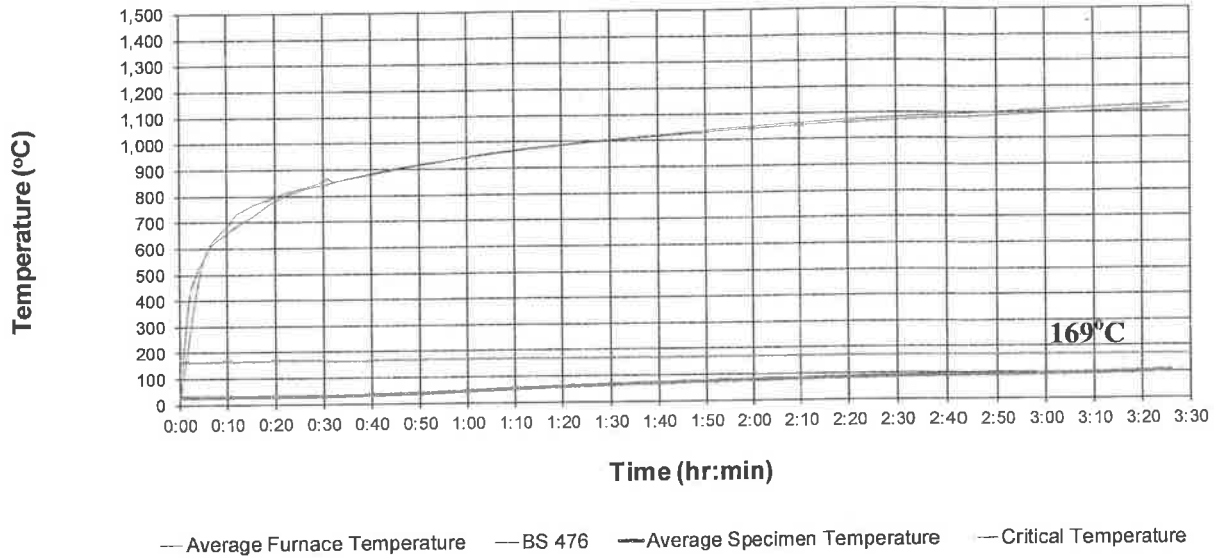
  
(Associate Prof. Dr. Tirawat Boonyatee)  
On Behalf of Head of Civil Engineering Department



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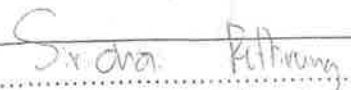
### FURNACE TEMPERATURE



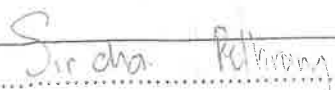
*Sirichai Pethrung*  
.....  
(Mr. Sirichai Pethrung)  
Authorized Testing Officer

**APPENDIX A: TEMPERATURE OF THE FURNACE AND THE SPECIMEN**

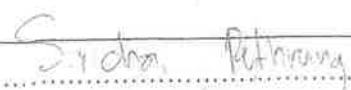
Time (hr:min:sec)	Furnace Temperature(°C)																	Time (hr:min:sec)	BS 476 (°C)
	P1	P2	P3	P4	P5	P6	P7	P8	P9	P10	P11	P12	P13	P14	P15	P16	Average		
0:00:00	41	35	33	32	40	35	32	31	31	33	32	31	44	44	42	33	35	0:00	20
0:01:00	279	280	247	115	301	325	248	185	86	224	244	180	296	296	280	115	231	0:05	555
0:02:00	446	456	417	269	438	511	477	415	257	397	437	375	450	450	452	274	408	0:10	655
0:03:00	495	510	486	328	503	564	549	486	373	498	498	460	512	512	505	360	477	0:15	715
0:04:00	525	522	542	395	548	593	591	522	458	522	545	521	540	540	533	413	519	0:20	761
0:05:00	581	533	599	404	615	650	573	428	540	608	595	542	623	623	581	434	558	0:25	821
0:06:00	642	599	614	397	672	712	595	476	615	674	610	582	657	657	601	459	598	0:30	842
0:07:00	650	647	643	402	680	718	678	592	653	696	635	630	656	656	610	486	627	0:35	855
0:08:00	650	669	656	457	683	723	727	631	669	702	663	620	658	658	644	543	647	0:40	895
0:09:00	663	681	685	496	697	736	742	647	680	711	684	654	654	654	666	600	666	0:45	922
0:10:00	679	696	707	527	711	749	756	682	692	734	707	680	672	672	688	637	687	0:50	919
0:11:00	695	714	728	560	727	763	775	711	708	755	726	703	691	691	712	651	707	0:55	922
0:12:00	720	733	757	594	751	784	798	738	729	780	752	728	714	714	736	675	731	1:00	945
0:13:00	728	735	767	576	761	794	798	724	750	790	764	741	736	736	744	705	740	1:05	957
0:14:00	733	739	805	626	765	802	778	727	763	796	778	748	742	742	763	706	751	1:10	968
0:15:00	737	745	815	700	766	805	784	732	775	802	787	750	756	756	768	707	762	1:15	979
0:16:00	743	756	823	708	774	813	792	739	782	807	796	757	761	761	776	719	769	1:20	983
0:17:00	749	763	825	720	778	819	794	747	789	816	806	768	773	773	783	719	776	1:25	997
0:18:00	755	776	832	724	786	820	808	758	795	817	808	771	775	775	787	730	782	1:30	1006
0:19:00	767	787	811	698	798	824	844	812	797	830	804	772	774	774	791	737	789	1:35	1014
0:20:00	775	802	820	707	806	837	840	821	801	833	811	787	781	781	797	745	796	1:40	1022
0:21:00	780	810	820	719	812	842	846	827	808	842	820	785	791	791	807	749	803	1:45	1029
0:22:00	783	819	831	734	816	849	857	831	817	843	826	791	797	797	808	763	810	1:50	1036
0:23:00	791	816	833	743	823	852	865	848	821	855	831	799	802	802	817	761	816	1:55	1043
0:24:00	794	815	837	765	828	853	873	853	827	860	836	812	802	802	823	760	821	2:00	1049
0:25:00	798	818	845	769	832	857	875	860	831	864	838	822	804	804	825	769	826	2:05	1055
0:26:00	804	824	848	771	837	862	879	871	836	870	844	826	813	813	831	769	831	2:10	1061
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0:28:00	816	832	854	778	848	871	891	875	846	876	855	840	821	821	841	781	840	2:20	1072
0:29:00	825	837	861	782	856	880	897	881	852	883	861	847	828	828	847	787	847	2:25	1077
0:30:00	836	848	867	785	868	891	905	889	862	893	870	854	839	839	855	798	856	2:30	1082
0:31:00	845	859	880	801	877	900	913	897	871	902	879	864	848	848	865	804	866	2:35	1087
0:32:00	830	847	869	800	861	881	899	892	867	888	866	854	835	835	854	799	855	2:40	1092
0:33:00	832	847	872	802	863	884	900	893	863	889	869	856	835	835	855	802	856	2:45	1097
0:34:00	835	850	874	805	866	886	902	892	864	890	871	862	840	840	857	802	858	2:50	1101
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0:37:00	847	862	886	811	876	898	914	899	874	901	880	867	852	852	865	819	869	3:05	1114
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0:43:00	871	885	903	835	902	919	935	915	899	923	903	890	877	877	889	840	891		
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0:49:00	896	910	929	858	925	944	957	930	920	942	925	913	901	901	909	829	912		
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0:59:00	926	938	954	889	953	969	982	957	950	967	952	943	932	932	937	860	940		

  
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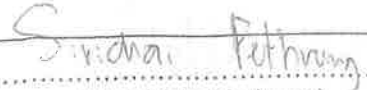
Time (hr:min:sec)	Furnace Temperature(°C)																Average
	P1	P2	P3	P4	P5	P6	P7	P8	P9	P10	P11	P12	P13	P14	P15	P16	
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1:01:00	932	942	958	894	958	974	987	962	956	972	958	947	936	936	943	866	945
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1:03:00	937	947	967	899	963	980	995	963	960	976	962	955	939	939	946	873	950
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1:06:00	945	954	970	907	970	986	999	970	968	984	969	961	948	948	954	880	957
1:07:00	947	956	973	908	973	988	1002	971	970	985	970	961	949	949	954	883	959
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1:09:00	951	960	976	913	976	992	1005	973	974	990	974	965	955	955	958	888	963
1:10:00	954	963	980	917	979	995	1007	980	976	992	976	968	957	957	961	891	966
1:11:00	956	964	982	919	981	996	1011	978	978	993	980	971	958	958	963	893	968
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1:13:00	961	970	986	924	985	1000	1012	988	983	997	983	972	964	964	968	898	972
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1:36:00	1003	1010	1025	969	1025	1037	1031	1003	1025	1036	1022	1013	1007	1007	1008	948	1011
1:37:00	1007	1012	1026	970	1029	1041	1031	1003	1027	1037	1025	1015	1009	1009	1010	950	1013
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1:42:00	1014	1020	1033	980	1035	1047	1031	1003	1035	1046	1033	1021	1016	1016	1018	960	1019
1:43:00	1016	1020	1034	980	1037	1049	1031	1003	1037	1047	1035	1027	1018	1018	1019	961	1021
1:44:00	1016	1021	1035	981	1037	1049	1031	1003	1038	1047	1034	1028	1018	1018	1019	964	1021
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1:56:00	1035	1038	1053	999	1055	1065	1031	1003	1056	1064	1051	1043	1036	1036	1036	983	1036
1:57:00	1035	1039	1052	1002	1055	1065	1031	1003	1057	1064	1052	1041	1037	1037	1037	1020	1039
1:58:00	1034	1039	1054	1003	1054	1065	1031	1003	1056	1063	1051	1041	1037	1037	1036	1022	1039
1:59:00	1035	1040	1055	1003	1055	1066	1031	1003	1055	1064	1052	1042	1038	1038	1038	1023	1040

  
 (Mr. Sirchai Pethrung)  
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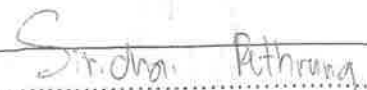
Time (hr:min:sec)	Furnace Temperature(°C)																Average
	P1	P2	P3	P4	P5	P6	P7	P8	P9	P10	P11	P12	P13	P14	P15	P16	
2:00:00	1037	1042	1055	1005	1057	1067	1031	1003	1057	1066	1055	1047	1040	1040	1039	1029	1042
2:01:00	1037	1042	1054	1007	1057	1068	1031	1003	1058	1065	1057	1046	1039	1039	1042	1026	1042
2:02:00	1039	1043	1057	1007	1058	1069	1031	1003	1059	1066	1058	1050	1041	1041	1043	1032	1044
2:03:00	1040	1045	1056	1010	1060	1071	1031	1003	1061	1069	1058	1053	1044	1044	1043	1031	1045
2:04:00	1041	1046	1059	1011	1061	1071	1031	1003	1062	1071	1060	1051	1044	1044	1046	1030	1046
2:05:00	1043	1046	1059	1012	1062	1072	1031	1003	1063	1071	1061	1052	1046	1046	1046	1032	1047
2:06:00	1044	1048	1060	1013	1064	1073	1031	1003	1065	1073	1063	1054	1046	1046	1048	1034	1048
2:07:00	1045	1049	1062	1015	1065	1074	1031	1003	1066	1074	1062	1057	1046	1046	1047	1036	1049
2:08:00	1046	1050	1062	1017	1066	1074	1031	1003	1067	1073	1063	1060	1048	1048	1048	1039	1050
2:09:00	1047	1051	1064	1019	1067	1076	1031	1003	1068	1074	1066	1061	1049	1049	1050	1040	1051
2:10:00	1048	1052	1064	1021	1068	1077	1031	1003	1069	1076	1066	1058	1051	1051	1052	1039	1052
2:11:00	1051	1055	1065	1022	1070	1080	1031	1003	1070	1079	1069	1060	1052	1052	1055	1040	1053
2:12:00	1052	1057	1068	1023	1071	1081	1031	1003	1071	1080	1071	1061	1054	1054	1057	1041	1055
2:13:00	1052	1056	1068	1026	1071	1081	1031	1003	1072	1080	1070	1060	1054	1054	1055	1041	1055
2:14:00	1054	1058	1072	1027	1073	1082	1031	1003	1073	1082	1071	1066	1057	1057	1057	1044	1057
2:15:00	1055	1059	1070	1029	1074	1083	1031	1003	1075	1083	1072	1065	1057	1057	1058	1046	1057
2:16:00	1056	1060	1072	1030	1075	1085	1031	1003	1076	1083	1073	1066	1058	1058	1059	1046	1058
2:17:00	1057	1062	1075	1031	1076	1086	1031	1003	1077	1084	1074	1072	1060	1060	1060	1050	1060
2:18:00	1059	1063	1073	1034	1078	1087	1031	1003	1078	1085	1077	1068	1060	1060	1062	1048	1060
2:19:00	1060	1063	1075	1035	1079	1088	1031	1003	1079	1087	1077	1072	1062	1062	1062	1050	1061
2:20:00	1061	1064	1076	1037	1079	1088	1031	1003	1080	1088	1078	1071	1062	1062	1063	1051	1062
2:21:00	1062	1066	1078	1039	1080	1089	1031	1003	1082	1089	1079	1074	1064	1064	1063	1054	1063
2:22:00	1062	1067	1079	1041	1080	1090	1031	1003	1082	1090	1079	1073	1064	1064	1065	1054	1064
2:23:00	1063	1067	1077	1043	1082	1091	1031	1003	1083	1091	1080	1072	1066	1066	1066	1053	1065
2:24:00	1065	1069	1079	1045	1083	1092	1031	1003	1084	1092	1081	1075	1067	1067	1066	1056	1066
2:25:00	1065	1070	1082	1049	1083	1093	1031	1003	1085	1093	1083	1075	1068	1068	1069	1057	1067
2:26:00	1066	1070	1080	1048	1084	1094	1031	1003	1086	1093	1084	1079	1068	1068	1069	1058	1068
2:27:00	1067	1072	1082	1049	1086	1095	1031	1003	1087	1094	1084	1076	1069	1069	1071	1057	1068
2:28:00	1068	1073	1084	1051	1087	1096	1031	1003	1089	1097	1085	1082	1071	1071	1071	1061	1070
2:29:00	1068	1074	1087	1053	1086	1096	1031	1003	1089	1097	1087	1079	1072	1072	1073	1060	1070
2:30:00	1071	1074	1085	1053	1089	1098	1031	1003	1090	1097	1087	1082	1073	1073	1072	1061	1071
2:31:00	1071	1074	1088	1055	1089	1099	1031	1003	1091	1097	1088	1086	1073	1073	1073	1064	1072
2:32:00	1073	1076	1087	1056	1091	1099	1031	1003	1092	1099	1089	1083	1074	1074	1075	1064	1073
2:33:00	1074	1077	1088	1057	1092	1101	1031	1003	1093	1101	1091	1083	1077	1077	1077	1064	1074
2:34:00	1075	1079	1090	1058	1093	1102	1031	1003	1095	1102	1091	1086	1078	1078	1078	1070	1075
2:35:00	1077	1079	1091	1061	1094	1103	1031	1003	1096	1102	1093	1086	1079	1079	1079	1067	1076
2:36:00	1076	1080	1092	1060	1094	1103	1031	1003	1096	1102	1091	1088	1078	1078	1078	1070	1076
2:37:00	1078	1082	1092	1062	1096	1104	1031	1003	1098	1104	1095	1088	1080	1080	1080	1070	1078
2:38:00	1079	1081	1093	1063	1097	1104	1031	1003	1098	1105	1096	1088	1081	1081	1082	1069	1078
2:39:00	1080	1083	1096	1064	1097	1106	1031	1003	1099	1105	1096	1092	1082	1082	1082	1072	1079
2:40:00	1081	1084	1096	1065	1098	1107	1031	1003	1100	1106	1096	1094	1083	1083	1082	1075	1080
2:41:00	1081	1085	1097	1066	1099	1108	1031	1003	1100	1108	1098	1094	1084	1084	1083	1076	1081
2:42:00	1082	1085	1096	1067	1100	1108	1031	1003	1101	1108	1099	1092	1084	1084	1085	1075	1081
2:43:00	1084	1087	1098	1069	1101	1110	1031	1003	1103	1110	1100	1094	1086	1086	1086	1074	1083
2:44:00	1085	1088	1098	1068	1102	1111	1031	1003	1103	1109	1101	1095	1086	1086	1088	1077	1083
2:45:00	1085	1089	1102	1069	1103	1111	1031	1003	1105	1111	1102	1093	1088	1088	1089	1078	1084
2:46:00	1086	1090	1100	1071	1104	1112	1031	1003	1106	1112	1103	1094	1088	1088	1089	1078	1085
2:47:00	1088	1091	1102	1071	1105	1113	1031	1003	1106	1112	1102	1099	1089	1089	1088	1082	1086
2:48:00	1088	1091	1102	1072	1105	1114	1031	1003	1107	1113	1103	1097	1090	1090	1090	1082	1086
2:49:00	1089	1092	1102	1073	1106	1115	1031	1003	1108	1115	1106	1098	1090	1090	1092	1080	1087
2:50:00	1090	1093	1104	1074	1107	1115	1031	1003	1109	1114	1106	1100	1092	1092	1091	1082	1088
2:51:00	1091	1095	1106	1075	1108	1117	1031	1003	1110	1116	1105	1105	1093	1093	1091	1088	1089
2:52:00	1092	1095	1107	1077	1109	1118	1031	1003	1110	1117	1108	1104	1094	1094	1094	1085	1090
2:53:00	1093	1097	1107	1078	1109	1119	1031	1003	1111	1117	1107	1105	1095	1095	1094	1088	1091
2:54:00	1094	1096	1108	1080	1111	1120	1031	1003	1112	1119	1111	1103	1095	1095	1097	1085	1091
2:55:00	1095	1098	1108	1082	1111	1120	1031	1003	1113	1119	1109	1105	1096	1096	1096	1086	1092
2:56:00	1096	1099	1109	1081	1112	1121	1031	1003	1114	1120	1110	1105	1097	1097	1097	1089	1092
2:57:00	1096	1100	1110	1083	1113	1122	1031	1003	1115	1121	1111	1107	1098	1098	1098	1091	1093
2:58:00	1098	1100	1111	1085	1114	1122	1031	1003	1115	1122	1112	1107	1099	1099	1098	1090	1094
2:59:00	1097	1101	1111	1086	1114	1122	1031	1003	1116	1122	1112	1107	1099	1099	1098	1092	1094

  
 (Mr. Sirichai Pethrung)  
 Authorized Testing Officer

Time (hr:min:sec)	Furnace Temperature(°C)																
	P1	P2	P3	P4	P5	P6	P7	P8	P9	P10	P11	P12	P13	P14	P15	P16	Average
3:00:00	1099	1102	1112	1086	1115	1123	1031	1003	1117	1123	1114	1107	1102	1102	1101	1093	1096
3:01:00	1100	1104	1115	1086	1116	1126	1031	1003	1118	1124	1114	1111	1102	1102	1100	1096	1097
3:02:00	1101	1104	1113	1088	1117	1125	1031	1003	1119	1124	1116	1111	1103	1103	1102	1095	1097
3:03:00	1102	1104	1114	1087	1118	1127	1031	1003	1119	1126	1117	1112	1103	1103	1103	1094	1098
3:04:00	1102	1106	1117	1089	1118	1128	1031	1003	1120	1126	1117	1110	1104	1104	1104	1096	1098
3:05:00	1104	1106	1116	1090	1120	1128	1031	1003	1121	1127	1118	1114	1106	1106	1104	1095	1099
3:06:00	1104	1107	1117	1090	1120	1128	1031	1003	1121	1128	1119	1113	1105	1105	1105	1097	1100
3:07:00	1105	1108	1118	1091	1121	1130	1031	1003	1123	1129	1119	1117	1107	1107	1105	1101	1101
3:08:00	1107	1108	1118	1091	1122	1130	1031	1003	1124	1129	1119	1118	1108	1108	1105	1102	1101
3:09:00	1107	1109	1119	1090	1123	1131	1031	1003	1124	1128	1120	1120	1108	1108	1106	1103	1102
3:10:00	1108	1110	1119	1093	1124	1133	1031	1003	1125	1131	1124	1117	1110	1110	1110	1101	1103
3:11:00	1108	1112	1122	1093	1124	1133	1031	1003	1126	1132	1121	1119	1112	1112	1109	1104	1104
3:12:00	1109	1112	1122	1094	1126	1134	1031	1003	1127	1134	1124	1117	1111	1111	1111	1102	1104
3:13:00	1110	1113	1121	1095	1125	1135	1031	1003	1128	1133	1125	1118	1112	1112	1111	1102	1105
3:14:00	1111	1114	1122	1096	1127	1135	1031	1003	1129	1134	1126	1118	1114	1114	1112	1103	1106
3:15:00	1112	1115	1124	1098	1128	1136	1031	1003	1130	1134	1126	1121	1114	1114	1112	1103	1106
3:16:00	1111	1114	1125	1099	1127	1135	1031	1003	1130	1135	1125	1120	1115	1115	1113	1105	1106
3:17:00	1113	1116	1126	1098	1128	1137	1031	1003	1131	1135	1124	1123	1115	1115	1113	1110	1107
3:18:00	1114	1117	1126	1099	1130	1137	1031	1003	1132	1136	1128	1126	1116	1116	1114	1109	1108
3:19:00	1115	1117	1127	1101	1131	1138	1031	1003	1133	1138	1129	1122	1118	1118	1116	1107	1109
3:20:00	1116	1118	1128	1100	1131	1139	1031	1003	1133	1138	1128	1127	1117	1117	1115	1109	1109
3:21:00	1117	1119	1127	1102	1132	1140	1031	1003	1134	1139	1130	1125	1119	1119	1117	1109	1110
3:22:00	1117	1120	1128	1103	1133	1141	1031	1003	1135	1140	1132	1125	1120	1120	1119	1110	1111
3:23:00	1118	1120	1131	1104	1133	1142	1031	1003	1136	1140	1131	1127	1121	1121	1118	1109	1112
3:24:00	1119	1121	1131	1104	1134	1142	1031	1003	1137	1140	1131	1127	1121	1121	1118	1114	1112
3:25:00	1120	1122	1133	1105	1135	1143	1031	1003	1138	1142	1133	1125	1123	1123	1121	1112	1113
3:26:00	1120	1123	1132	1107	1135	1143	1031	1003	1138	1142	1133	1129	1123	1123	1120	1114	1114

  
 (Mr. Sirichai Pethrung)  
 Authorized Testing Officer

Time (hr:min:sec)	Specimen Temperature(°C)										Max. (A-J)	Average (A-E)
	A	B	C	D	E	F	G	H	I	J		
0:00:00	29	30	30	28	29	29	29	29	30	29	30	29
0:01:00	29	30	30	28	29	30	29	29	30	29	30	29
0:02:00	29	30	30	28	29	30	29	29	30	29	30	29
0:03:00	29	30	30	28	29	30	29	29	30	29	30	29
0:04:00	29	30	30	28	29	30	29	29	30	29	30	29
0:05:00	29	30	30	28	29	30	29	29	30	29	30	29
0:06:00	29	30	30	28	29	30	30	29	30	29	30	29
0:07:00	29	30	30	28	29	30	29	29	30	29	30	29
0:08:00	29	30	30	28	29	30	29	29	30	29	30	29
0:09:00	29	30	30	28	29	30	30	29	30	29	30	29
0:10:00	29	30	30	28	29	30	30	29	30	29	30	29
0:11:00	29	30	30	29	29	30	30	29	30	29	30	29
0:12:00	29	30	30	29	29	30	30	29	30	29	30	29
0:13:00	29	30	30	29	29	30	30	29	30	29	30	29
0:14:00	29	30	30	29	29	30	30	29	30	29	30	29
0:15:00	29	30	30	29	29	30	30	29	30	29	30	29
0:16:00	29	30	30	29	29	30	30	29	30	29	30	29
0:17:00	29	30	30	29	29	30	30	29	30	29	30	29
0:18:00	29	30	30	29	29	30	30	29	30	29	30	29
0:19:00	29	30	30	29	29	30	30	29	30	29	30	29
0:20:00	29	30	30	29	29	30	30	29	30	29	30	30
0:21:00	29	30	31	29	29	30	30	29	30	30	31	30
0:22:00	29	30	31	29	29	30	30	29	30	30	31	30
0:23:00	29	30	31	29	29	30	30	29	30	30	31	30
0:24:00	29	31	31	29	29	30	30	29	30	30	31	30
0:25:00	30	31	31	29	29	30	30	29	31	30	31	30
0:26:00	30	31	31	29	30	30	30	29	31	30	31	30
0:27:00	30	31	31	29	30	31	31	30	31	30	31	30
0:28:00	30	31	31	30	30	31	31	30	31	30	31	30
0:29:00	30	31	31	30	30	31	31	30	31	30	31	30
0:30:00	30	31	31	30	30	31	31	30	31	30	31	31
0:31:00	30	32	32	30	30	31	31	30	31	31	32	31
0:32:00	31	32	32	30	31	31	31	31	31	31	32	31
0:33:00	31	32	32	30	31	32	31	31	32	31	32	31
0:34:00	31	32	32	31	31	32	32	31	32	31	32	32
0:35:00	31	33	33	31	31	32	32	31	32	32	33	32
0:36:00	32	33	33	32	32	33	32	32	32	32	33	32
0:37:00	32	33	33	32	32	33	32	32	33	32	33	32
0:38:00	32	34	34	32	33	33	33	32	33	33	34	33
0:39:00	33	34	34	33	33	34	33	33	33	33	34	33
0:40:00	33	35	35	33	33	34	34	33	34	34	35	34
0:41:00	33	35	35	34	34	34	34	34	34	34	35	34
0:42:00	34	36	36	34	35	35	34	34	35	35	36	35
0:43:00	34	36	36	35	35	35	35	35	35	35	36	35
0:44:00	35	37	37	35	36	36	35	35	36	36	37	36
0:45:00	35	37	37	36	36	36	36	36	36	36	37	36
0:46:00	35	38	38	37	37	37	36	36	37	37	38	37
0:47:00	36	38	39	37	37	37	37	37	37	37	39	37
0:48:00	36	39	39	38	38	38	38	38	38	38	39	38
0:49:00	37	39	40	39	39	39	38	38	38	39	40	39
0:50:00	37	40	41	40	39	39	39	39	39	39	41	39
0:51:00	38	41	41	40	40	40	39	39	39	40	41	40
0:52:00	38	41	42	41	41	40	40	40	41	41	42	41
0:53:00	39	42	43	42	41	41	41	41	41	41	42	41
0:54:00	39	43	43	42	42	41	41	41	41	42	43	42
0:55:00	40	43	44	43	43	42	42	42	42	43	44	43
0:56:00	40	44	45	44	44	43	43	43	43	44	45	43
0:57:00	41	45	46	45	44	43	43	43	44	45	46	44
0:58:00	41	45	46	46	45	44	44	44	44	45	46	45
0:59:00	42	46	47	46	46	45	45	45	45	46	47	45

  
 (Mr.Sirichai Pethrung)  
 Authorized Testing Officer

Time (hr:min:sec)	Specimen Temperature(°C)										Max. (A-J)	Average (A-E)
	A	B	C	D	E	F	G	H	I	J		
1:00:00	42	47	48	47	47	45	45	45	46	47	48	46
1:01:00	43	47	49	48	48	46	46	46	47	48	49	47
1:02:00	44	48	49	49	48	47	47	47	47	48	49	48
1:03:00	44	49	50	50	49	47	47	48	48	49	50	48
1:04:00	44	50	51	51	50	48	48	48	49	50	51	49
1:05:00	45	50	52	51	50	48	49	49	49	51	52	50
1:06:00	45	51	52	52	51	49	50	50	50	52	52	50
1:07:00	46	52	53	53	52	50	50	50	51	52	53	51
1:08:00	47	52	54	54	53	51	51	51	52	53	54	52
1:09:00	47	53	55	55	54	51	52	52	52	54	55	53
1:10:00	48	54	55	55	54	52	53	53	53	55	55	53
1:11:00	48	54	56	56	55	52	53	53	54	55	56	54
1:12:00	49	55	57	57	56	53	54	54	55	56	57	55
1:13:00	49	56	58	58	57	54	55	55	55	57	58	55
1:14:00	50	56	58	58	57	54	55	55	56	58	58	56
1:15:00	50	57	59	59	58	55	56	56	57	58	59	57
1:16:00	51	58	60	60	59	56	57	57	57	59	60	57
1:17:00	51	58	60	60	59	56	57	57	58	60	60	58
1:18:00	52	59	61	61	60	57	58	58	59	60	61	59
1:19:00	52	60	62	62	61	57	59	59	59	61	62	59
1:20:00	53	60	62	63	62	58	59	59	60	62	63	60
1:21:00	54	61	63	63	62	59	60	60	61	63	63	61
1:22:00	54	62	64	64	63	59	61	60	61	63	64	61
1:23:00	54	62	64	65	63	60	61	61	62	64	65	62
1:24:00	55	63	65	65	64	60	62	62	63	64	65	62
1:25:00	55	63	66	66	65	61	62	62	63	65	66	63
1:26:00	56	64	66	66	65	61	63	63	64	65	66	63
1:27:00	56	64	67	67	66	62	63	63	64	66	67	64
1:28:00	57	65	67	68	66	62	64	64	65	67	68	64
1:29:00	57	65	68	68	67	63	65	65	65	67	68	65
1:30:00	58	66	69	69	67	63	66	65	66	68	69	66
1:31:00	58	67	69	69	68	64	66	66	67	68	69	66
1:32:00	59	67	69	70	68	65	67	66	67	69	70	67
1:33:00	59	68	70	71	69	65	67	67	67	69	71	67
1:34:00	60	68	71	71	69	65	68	67	68	70	71	68
1:35:00	60	68	71	71	70	66	68	68	68	70	71	68
1:36:00	61	69	72	72	70	66	69	68	69	71	72	69
1:37:00	61	69	72	73	70	67	70	69	70	71	73	69
1:38:00	62	70	73	73	71	67	70	69	70	72	73	69
1:39:00	62	70	73	73	71	68	70	70	70	72	73	70
1:40:00	62	71	74	74	71	68	71	70	71	73	74	70
1:41:00	63	71	74	74	72	69	71	71	71	73	74	71
1:42:00	63	72	75	75	72	69	72	71	72	74	75	71
1:43:00	64	72	75	75	72	69	73	71	72	74	75	72
1:44:00	64	73	76	76	73	70	73	72	73	75	76	72
1:45:00	65	73	76	76	73	70	73	72	73	75	76	73
1:46:00	65	74	77	76	74	71	74	73	73	75	77	73
1:47:00	66	74	77	77	74	71	74	73	74	76	77	73
1:48:00	66	74	77	77	74	72	75	74	74	76	77	74
1:49:00	67	75	78	78	75	72	75	74	74	77	78	74
1:50:00	67	75	78	78	75	72	76	74	75	77	78	75
1:51:00	67	75	79	78	75	72	76	75	75	77	79	75
1:52:00	68	76	79	79	76	73	77	75	76	78	79	75
1:53:00	68	76	80	79	76	74	77	75	76	78	80	76
1:54:00	69	77	80	80	76	74	77	76	77	79	80	76
1:55:00	69	77	80	80	77	74	78	76	77	79	80	77
1:56:00	69	77	81	80	77	75	78	77	77	80	81	77
1:57:00	70	78	81	81	77	75	79	77	78	80	81	77
1:58:00	70	78	82	81	77	75	79	77	78	80	82	78
1:59:00	71	78	82	82	78	76	79	77	78	81	82	78

Sirichai Pethrung

(Mr. Sirichai Pethrung)  
Authorized Testing Officer



Time (hr:min:sec)	Specimen Temperature(°C)										Max. (A-J)	Average (A-E)
	A	B	C	D	E	F	G	H	I	J		
2:00:00	71	79	82	82	78	76	80	78	79	81	82	78
2:01:00	71	79	83	82	79	76	80	78	79	81	83	79
2:02:00	72	79	83	83	79	77	80	78	79	81	83	79
2:03:00	72	80	84	83	79	77	81	79	80	82	84	79
2:04:00	72	80	84	83	79	77	81	79	80	82	84	80
2:05:00	73	80	84	84	79	78	81	79	80	82	84	80
2:06:00	73	80	85	84	80	78	82	80	81	83	85	80
2:07:00	73	81	85	84	80	78	82	80	81	83	85	81
2:08:00	74	81	85	85	81	79	82	80	81	83	85	81
2:09:00	74	81	85	85	81	79	82	81	81	83	85	81
2:10:00	74	81	86	85	81	80	83	81	82	84	86	81
2:11:00	75	82	86	86	81	80	83	81	82	84	86	82
2:12:00	75	82	86	86	82	80	83	81	82	84	86	82
2:13:00	75	82	87	87	82	81	84	82	82	84	87	83
2:14:00	76	83	87	87	83	81	84	82	83	85	87	83
2:15:00	76	83	88	88	83	81	84	82	83	85	88	83
2:16:00	77	83	88	95	83	82	85	83	83	85	95	85
2:17:00	77	84	88	89	83	82	85	83	84	85	89	84
2:18:00	77	84	88	88	83	83	85	83	84	86	88	84
2:19:00	78	84	89	89	84	83	86	84	84	86	89	85
2:20:00	78	85	89	89	83	83	86	84	85	86	89	85
2:21:00	78	85	90	90	84	84	86	84	85	87	90	85
2:22:00	79	85	90	90	85	84	87	85	86	87	90	86
2:23:00	79	85	90	90	85	85	87	85	86	87	90	86
2:24:00	79	86	91	91	85	85	87	85	86	87	91	86
2:25:00	80	86	91	91	85	85	88	86	87	88	91	87
2:26:00	80	86	92	91	86	86	88	86	87	88	92	87
2:27:00	80	86	92	92	86	86	88	86	87	88	92	87
2:28:00	80	87	92	92	86	86	88	86	88	88	92	87
2:29:00	81	87	93	92	87	87	88	87	88	89	93	88
2:30:00	81	87	93	93	87	87	89	87	88	89	93	88
2:31:00	81	88	93	93	87	88	89	87	88	89	93	88
2:32:00	81	88	94	93	87	88	89	88	89	90	94	89
2:33:00	82	88	94	93	88	88	89	88	89	90	94	89
2:34:00	82	88	94	93	88	88	90	88	90	90	94	89
2:35:00	82	89	94	94	88	89	90	89	90	90	94	89
2:36:00	83	89	95	94	89	89	90	89	90	90	95	90
2:37:00	83	89	95	94	89	89	90	89	91	91	95	90
2:38:00	83	89	95	95	90	90	91	90	91	91	95	90
2:39:00	84	89	96	95	90	89	91	90	91	91	96	91
2:40:00	84	90	96	95	89	90	91	90	91	91	96	91
2:41:00	85	90	96	95	90	90	92	90	92	91	96	91
2:42:00	85	90	97	95	90	90	92	91	92	91	97	91
2:43:00	85	90	97	96	89	90	92	91	92	91	97	91
2:44:00	85	91	97	96	89	90	92	91	92	91	97	91
2:45:00	85	91	97	96	89	90	92	91	92	91	97	92
2:46:00	85	91	97	96	89	90	92	91	92	91	97	92
2:47:00	85	91	98	96	89	90	92	92	92	91	98	92
2:48:00	86	91	98	96	90	90	92	92	92	91	98	92
2:49:00	86	91	98	96	90	91	92	92	92	91	98	92
2:50:00	86	91	98	96	90	91	92	92	92	91	98	92
2:51:00	87	92	98	96	89	91	92	92	92	91	98	93
2:52:00	87	92	98	97	90	91	92	92	92	91	98	93
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2:54:00	87	92	99	97	90	91	92	92	92	91	99	93
2:55:00	87	92	100	98	90	91	92	92	92	92	100	93
2:56:00	88	92	100	98	90	91	88	92	92	92	101	94
2:57:00	88	92	101	98	90	91	88	92	92	92	101	94
2:58:00	88	92	101	99	90	91	89	92	92	92	101	94
2:59:00	89	92	102	99	91	91	92	92	93	92	102	95

Sirichai Pethrung

(Mr.Sirichai Pethrung)  
Authorized Testing Officer

Time (hr:min:sec)	Specimen Temperature(°C)										Max. (A-J)	Average (A-E)
	A	B	C	D	E	F	G	H	I	J		
3:00:00	89	93	103	100	91	92	92	93	93	93	103	95
3:01:00	89	93	103	100	91	92	93	93	93	93	103	95
3:02:00	89	93	103	100	91	92	92	93	94	93	103	95
3:03:00	89	93	103	100	92	92	93	93	94	94	103	96
3:04:00	90	93	104	101	91	92	94	93	94	94	104	96
3:05:00	90	93	104	101	91	92	93	94	94	95	104	96
3:06:00	90	93	104	101	92	92	94	94	95	96	104	96
3:07:00	90	93	104	101	93	92	94	95	95	96	104	96
3:08:00	91	93	104	101	94	92	95	95	96	97	104	97
3:09:00	91	94	104	102	94	93	95	96	96	97	104	97
3:10:00	91	94	105	102	94	94	94	96	97	98	105	97
3:11:00	91	95	105	103	94	94	95	96	97	99	105	97
3:12:00	92	95	105	103	94	95	95	97	98	100	105	98
3:13:00	91	95	105	104	95	95	96	98	99	101	105	98
3:14:00	91	95	106	105	96	94	96	98	99	101	106	98
3:15:00	92	96	106	105	96	95	96	99	99	101	106	99
3:16:00	92	96	107	106	95	97	96	99	101	101	107	99
3:17:00	92	96	107	106	96	96	98	100	101	101	107	100
3:18:00	92	97	107	107	97	96	92	100	101	102	107	100
3:19:00	93	97	108	108	97	96	93	101	102	102	108	101
3:20:00	93	97	108	109	97	96	96	101	102	102	109	101
3:21:00	93	98	109	110	98	97	98	102	103	102	110	102
3:22:00	95	98	109	111	99	97	99	102	104	102	111	102
3:23:00	95	98	110	112	99	97	100	103	104	102	112	103
3:24:00	95	99	110	113	98	98	99	104	104	103	113	103
3:25:00	96	99	111	114	98	99	100	104	105	103	114	103
3:26:00	96	98	112	116	99	99	101	105	106	103	116	104

Sirichai Pethrung

(Mr. Sirichai Pethrung)  
Authorized Testing Officer

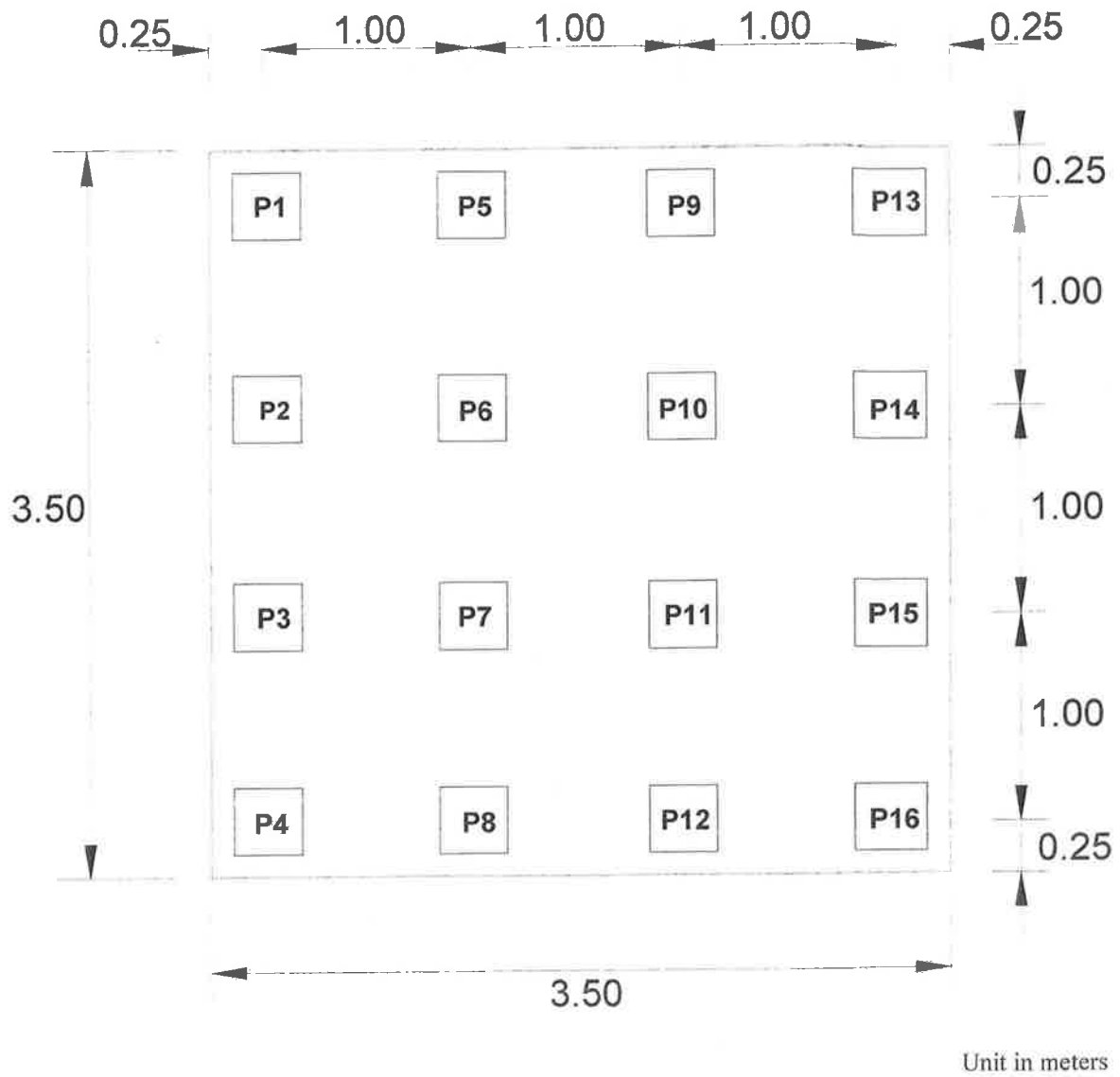


Figure A-1: Details of the furnace

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.....  
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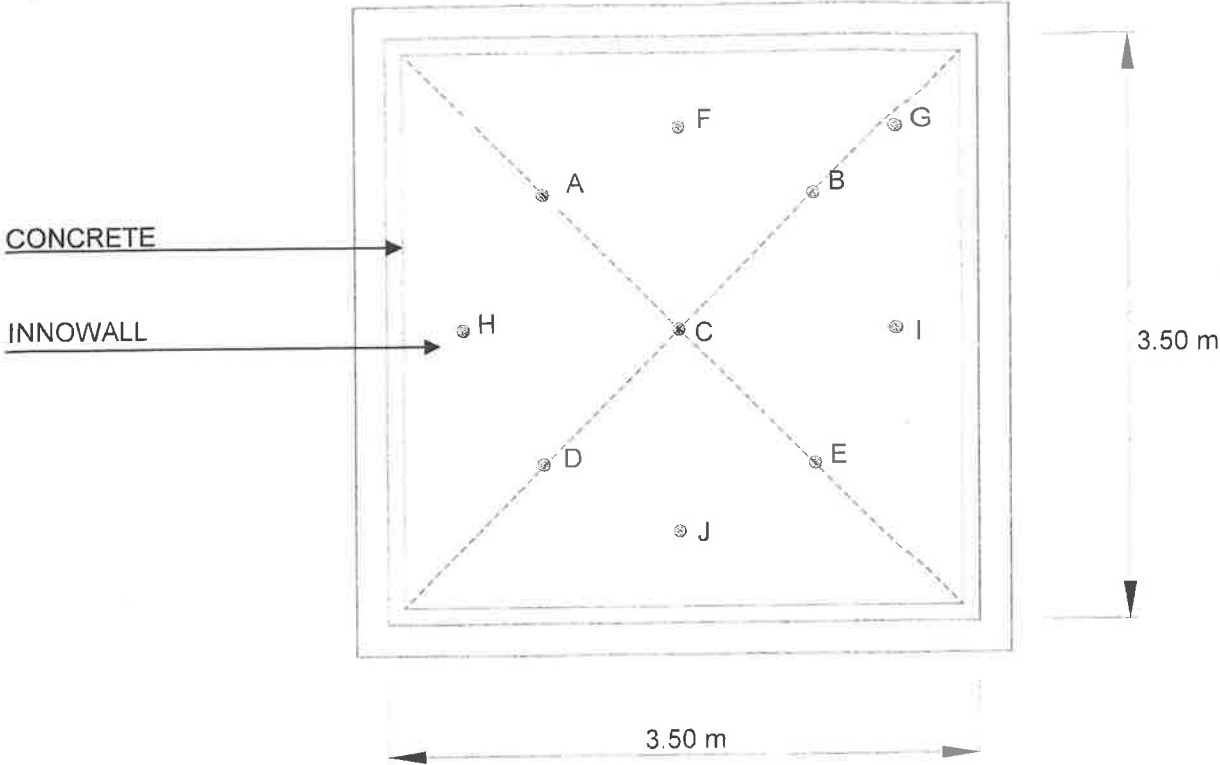
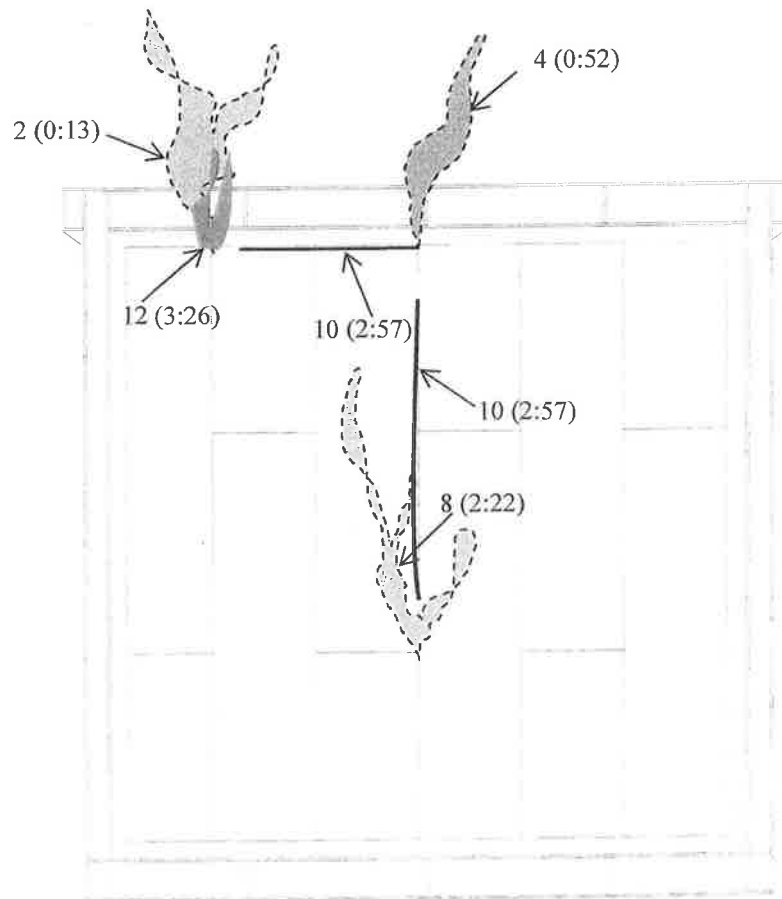


Figure A-2: Location of thermocouples on the specimen

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.....  
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**APPENDIX B: OBSERVATIONS**

No.	Time (hr:min)	Observations
1	0:03	Initiation of concrete spalling from the exposed face of the specimen
2	0:13	Smoke leaking from the upper edge of the specimen
3	0:30	No significant change was observed.
4	0:52	Smoke leaking from the upper edge of the specimen
5	1:00	No significant change was observed.
6	1:30	No significant change was observed.
7	2:00	No significant change was observed.
8	2.22	Smoke leaking from the middle part of the specimen
9	2.30	No significant change was observed.
10	2.57	Multiple cracks were observed at the joints between concrete panels.
11	3.00	No significant change was observed.
12	3.26	The specimen had a passage of flame or gases hot enough to ignite the cotton pad.
13	3:27	The test was terminated.



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APPENDIX C: DRAWINGS & DETAILS OF THE SPECIMEN

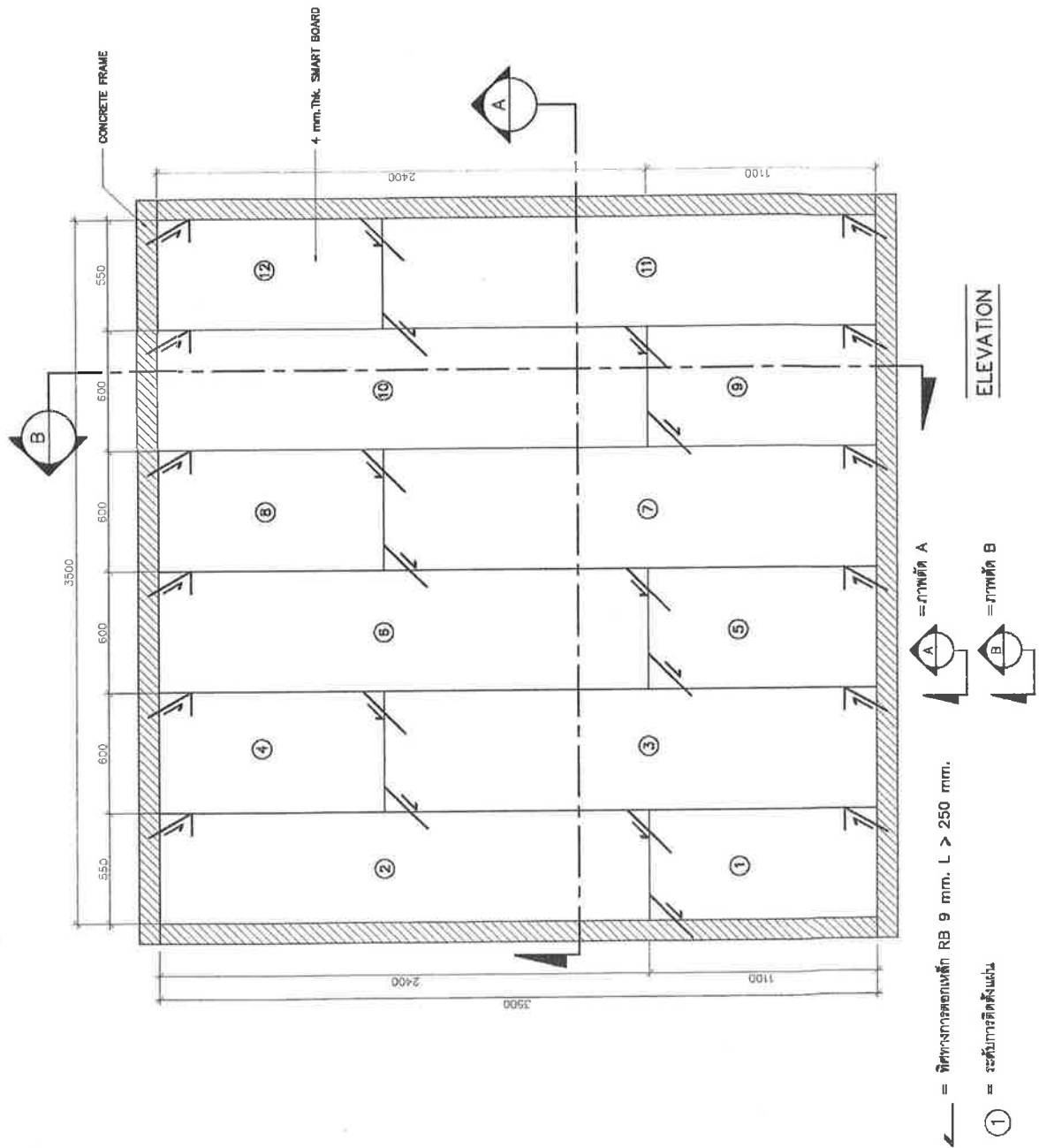
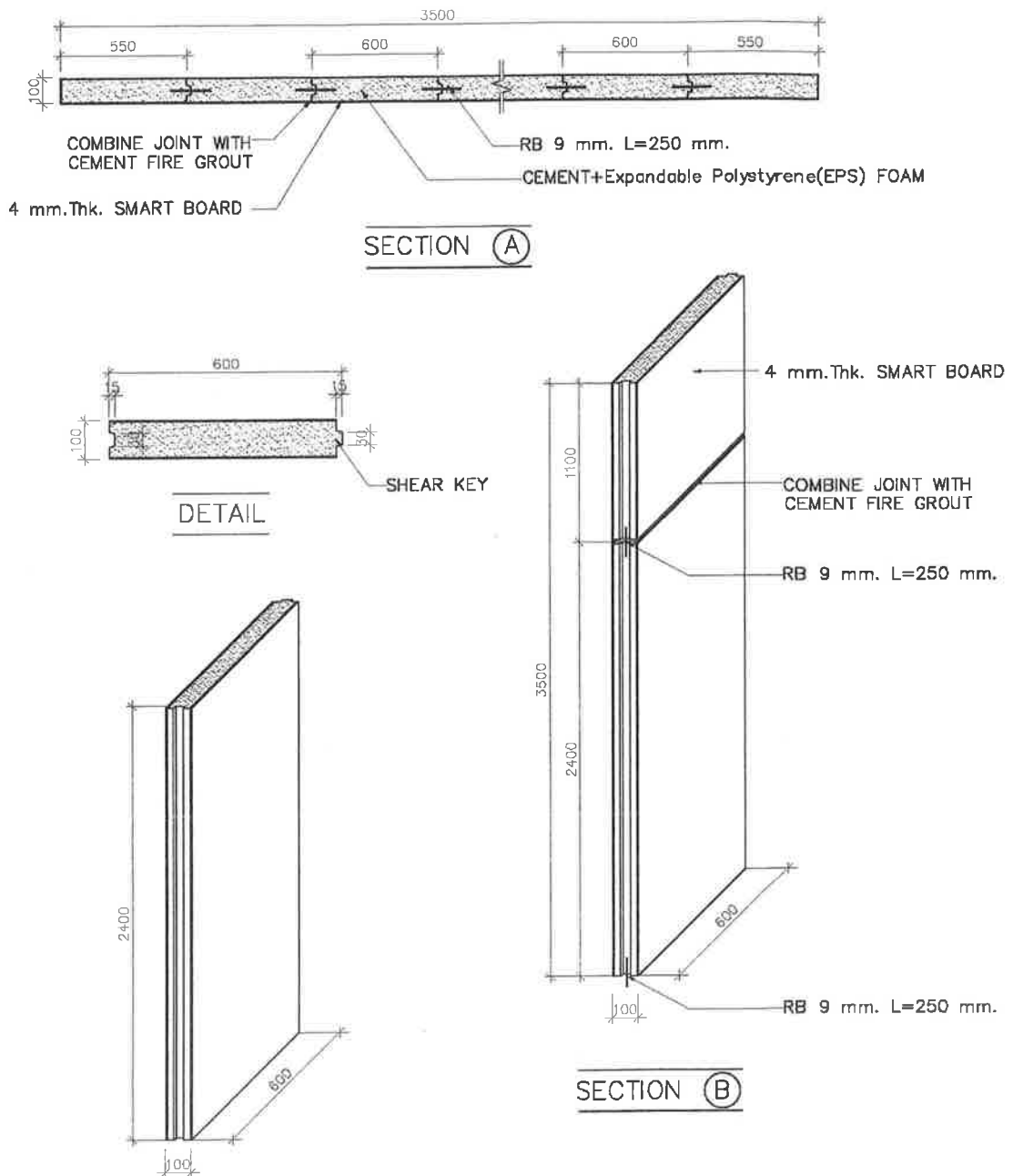


Figure C-1: Details of the specimen (as provided by the client)

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TYPICAL STANDARD SIZE (ONE PIECE)

Figure C-2: Details of the specimen (as provided by the client)

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 (Mr.Sirichai Pethrung)  
 Authorized Testing Officer

APPENDIX D: PHOTOGRAPHS

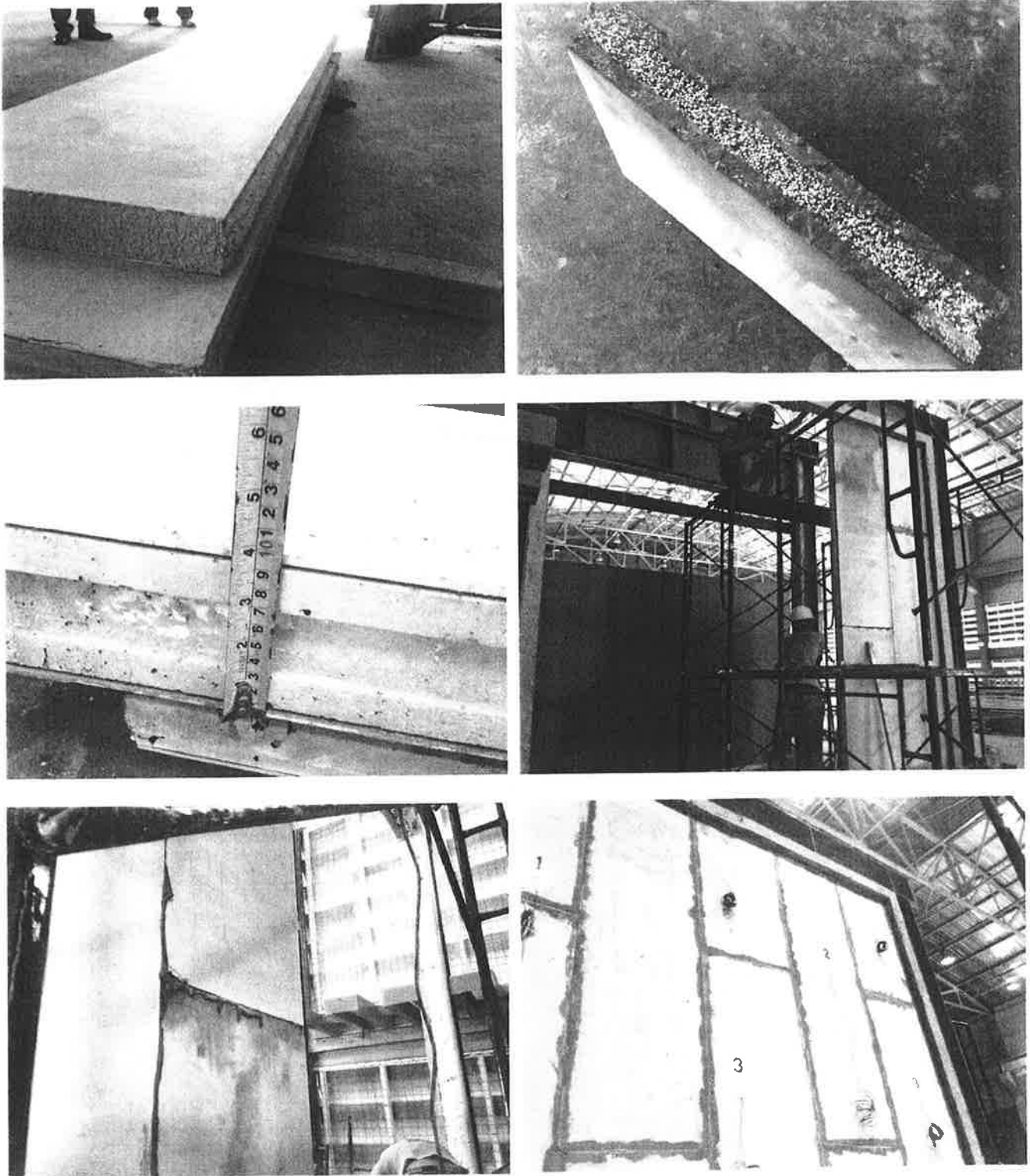
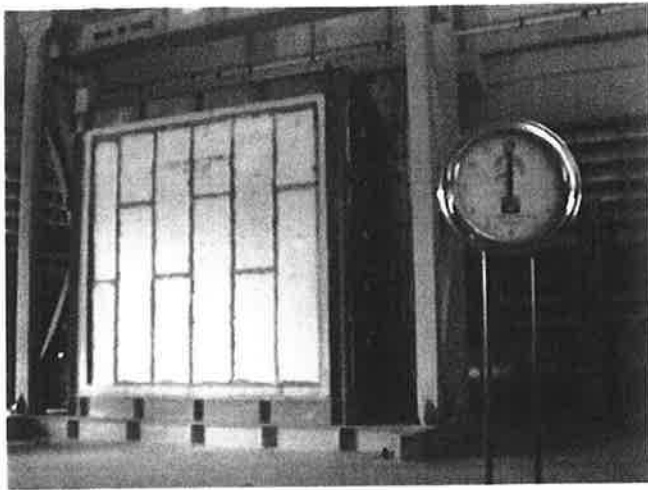


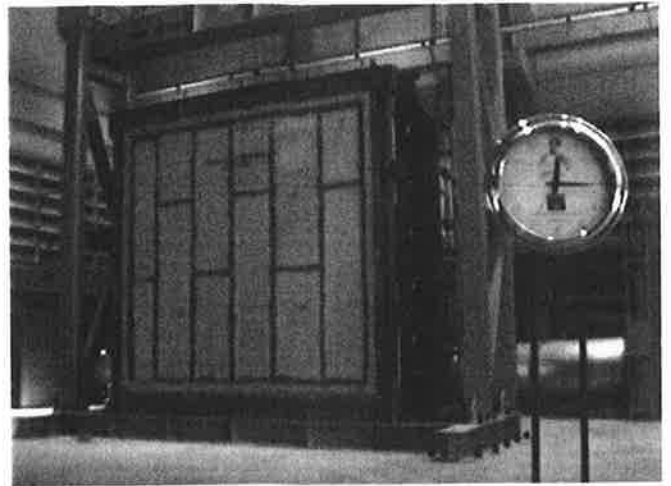
Figure D-1: Specimen preparation prior to the test

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.....  
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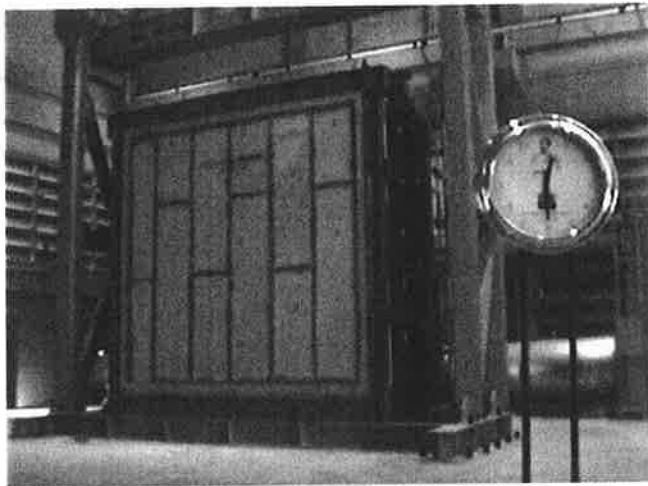




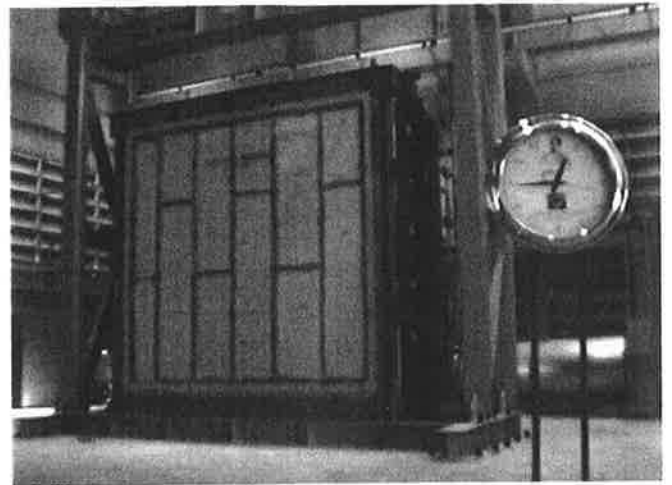
( a ) 0:00 hr



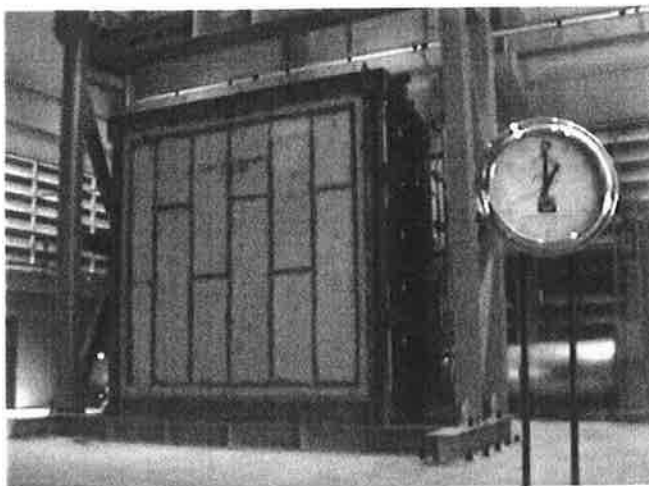
( b ) 0:15 hr



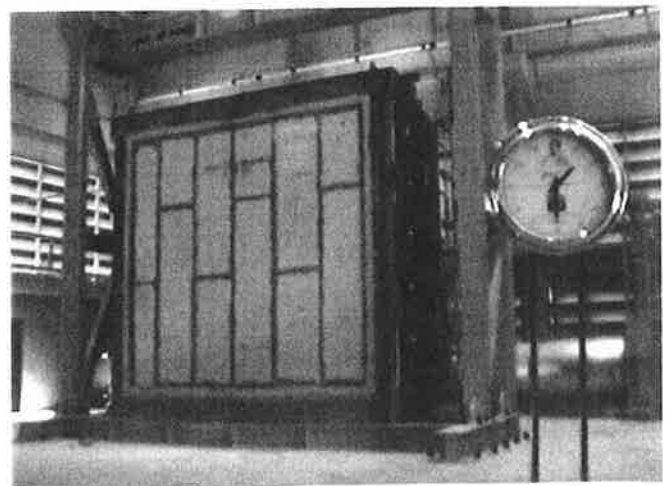
( c ) 0:30 hr



( d ) 0:45 hr



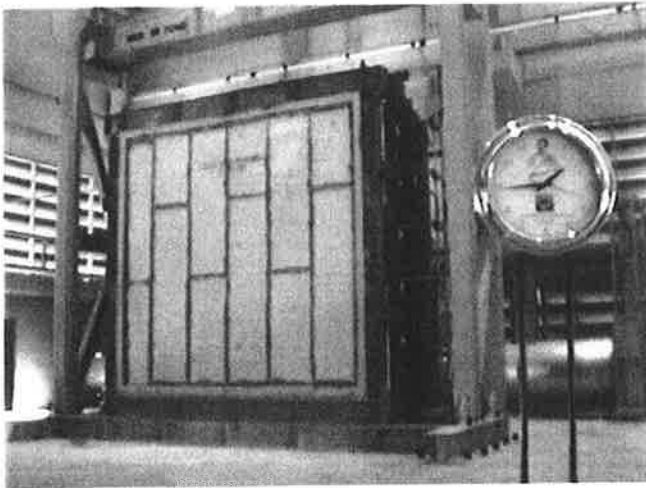
( e ) 1:00 hr



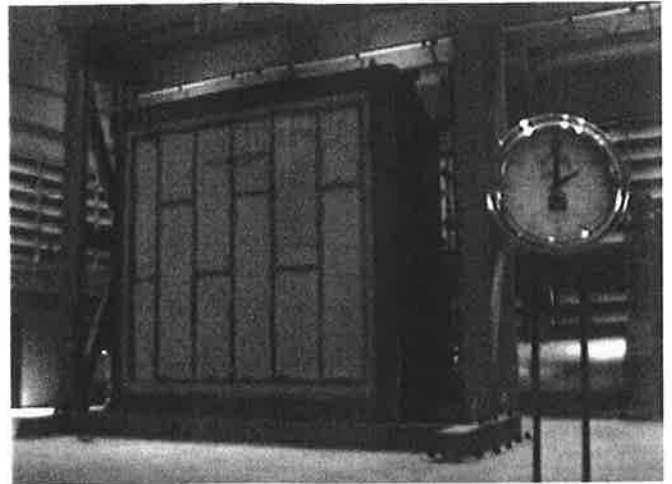
( f ) 1:30 hr

Figure D-2: The specimen during the test

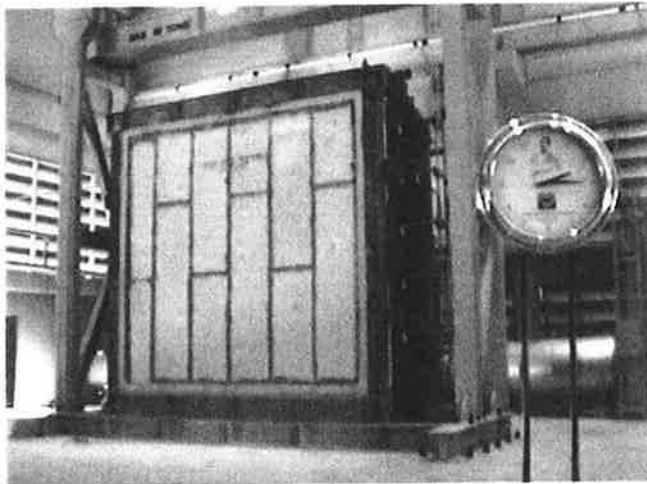
*Sirichai Pethrung*  
.....  
(Mr. Sirichai Pethrung)  
Authorized Testing Officer



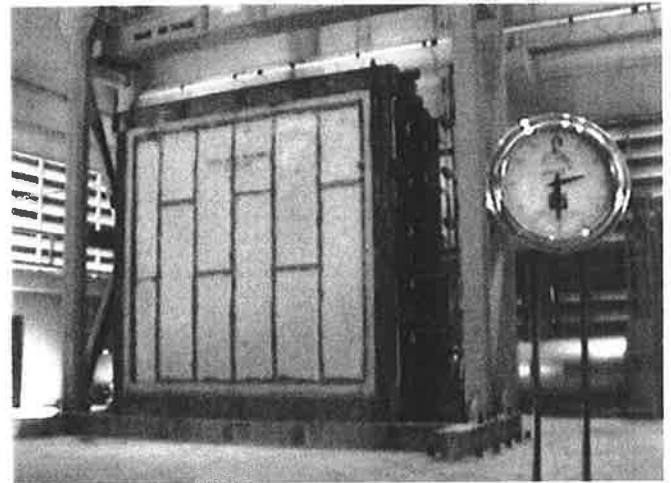
( g ) 1:45 hr



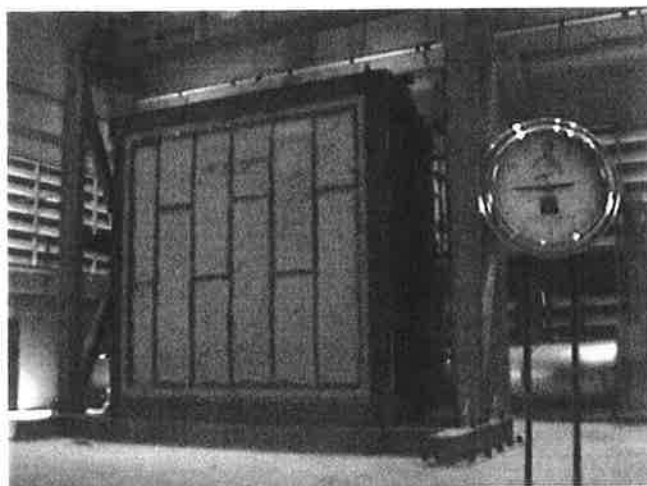
( h ) 2:00 hr



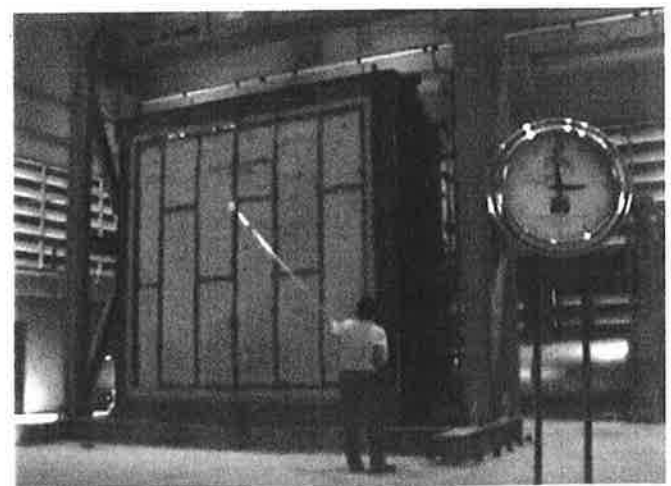
( i ) 2:15 hr



( j ) 2:30 hr



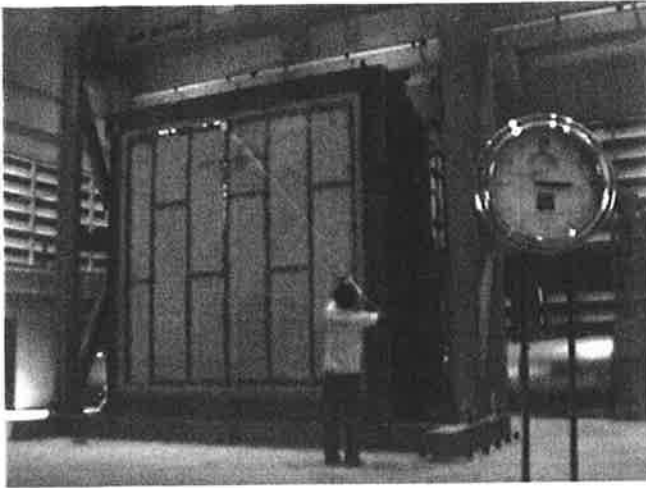
( k ) 2:45 hr



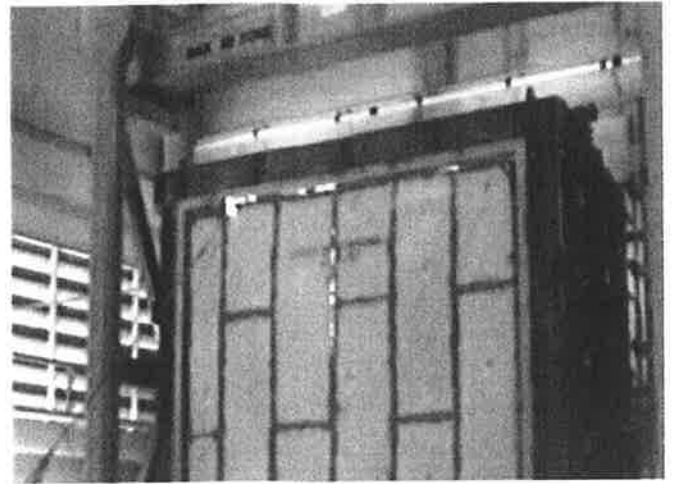
( l ) 3:00 hr

Figure D-2 (continued): The specimen during the test

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( m ) 3:15 hr



( n ) 3:26 hr

Figure D-2 (continued): The specimen during the test

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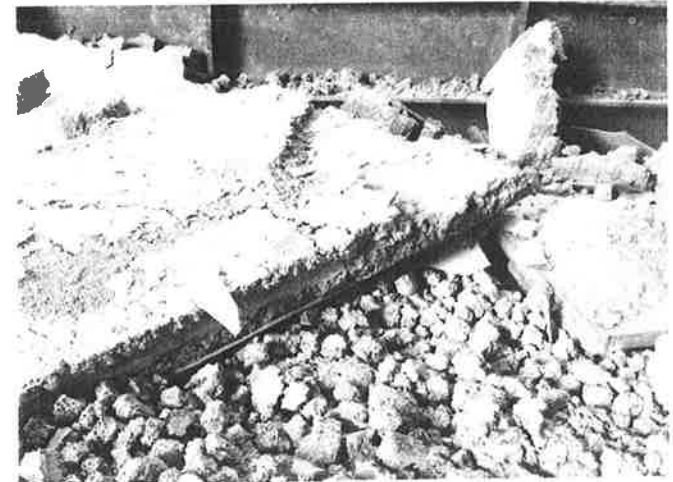
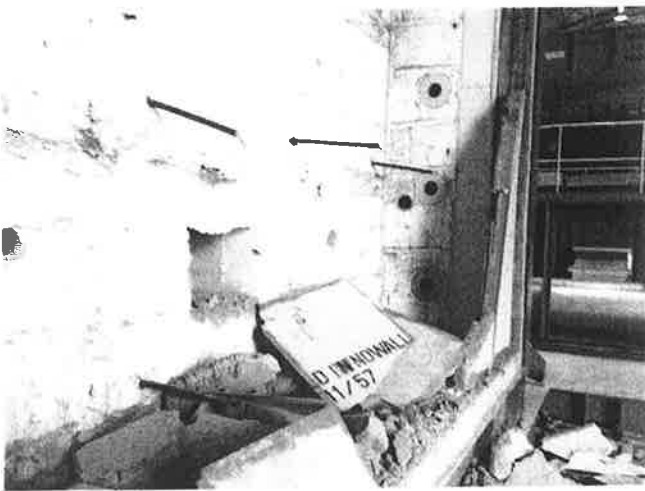
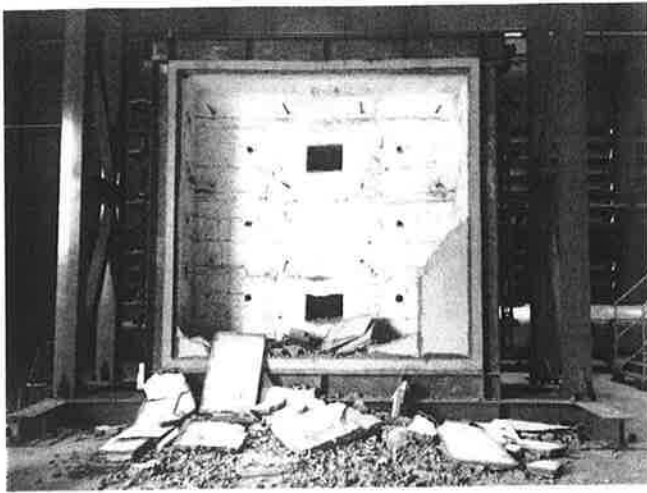


Figure D-3: The specimen after the test

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.....  
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