



**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** : **"SPR" Steel Frame with Glass Vision Size 1100x2300 mm**
 The specimen is a fixed lighting panel consisting of a glazed element and a steel frame. The glazed element is made of FireLite ceramic glass (5 mm) having clear dimensions of 1100 mm x 2300 mm installed in a steel frame with the overall dimensions of 1200 mm x 2400 mm. The specimen was mounted on a 15-cm thick reinforced concrete wall, which was installed on a 3 m x 3 m testing frame. The glazed element was fixed with the steel frame by using M4 screws. Intumescent fire seal was installed between the glazed element and the steel frame around the inner perimeter of the frame. The details of the specimen are shown in Appendix C. The specimen was provided and installed by the client.
- CLIENT** : **SUPA RICH CO., LTD.**
 27 Ramintra Soi 48, Ramintra Road, Kannayao
 Kannayao, Bangkok 10230, Thailand
- DATE OF TEST** : November 11, 2019
- TEST MACHINE** : Large-scale vertical furnace (Fire Tester III) at the Fire Safety Research Center (FSRC), Department of Civil Engineering, Chulalongkorn University (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 10: Determination of the fire resistance of glazed elements.
- 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	0:03	The average temperature of the unexposed face of the specimen exceeded 140°C above its initial value of 42°C.
Integrity	2:00	The test was terminated by the client. During the test, all integrity criteria were fulfilled (no sustained flaming and no through gap such that the 6 mm diameter gap gauge could penetrate).

Date: November 25, 2019

Tested by:
 (Professor Dr. Thanyawat Pothisiri)

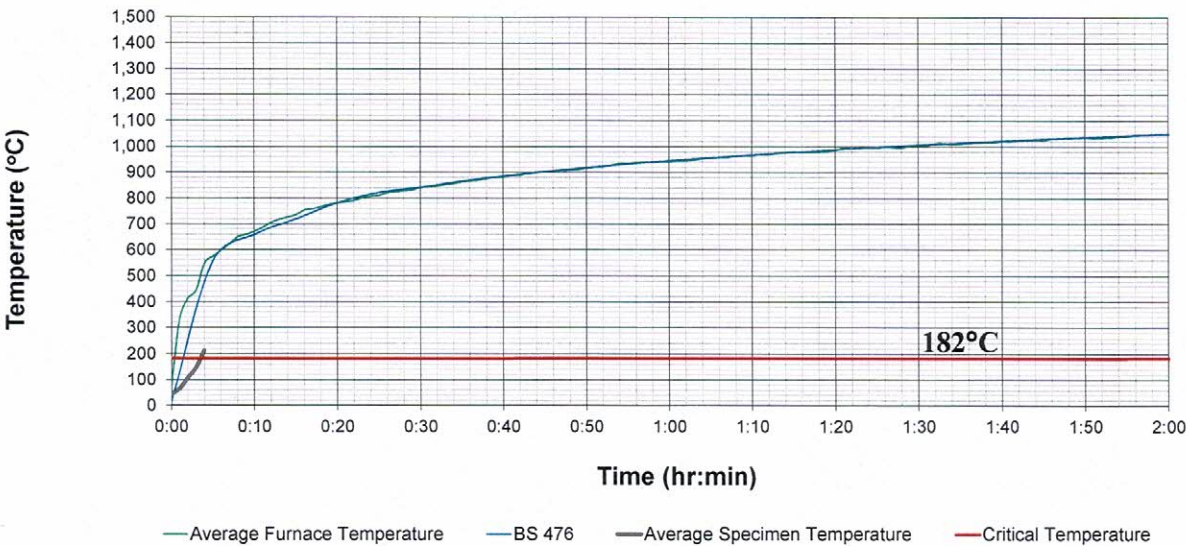
.....
 (Associate Prof. Dr. Tirawat Boonyatee)
 On Behalf of Head of Civil Engineering Department



FACULTY OF ENGINEERING
CHULALONGKORN UNIVERSITY
FIRE SAFETY RESEARCH CENTER



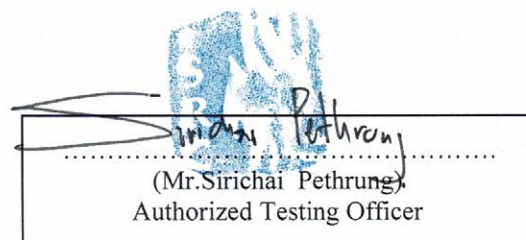
FURNACE TEMPERATURE



(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	Average		
0:00:00	118	72	53	83	82	50	91	90	90	81	0:00	20
0:01:00	312	367	270	335	419	141	272	448	466	336	0:05	556
0:02:00	370	426	473	382	444	334	341	467	479	413	0:10	659
0:03:00	416	465	479	427	470	399	390	481	468	444	0:15	718
0:04:00	498	527	614	529	581	518	493	599	568	547	0:20	781
0:05:00	535	573	597	569	602	535	536	632	588	574	0:25	821
0:06:00	568	612	606	602	620	554	567	642	610	598	0:30	842
0:07:00	590	631	658	624	636	584	592	656	628	622	0:35	865
0:08:00	621	656	674	655	668	611	625	680	656	650	0:40	885
0:09:00	638	664	661	670	677	623	641	696	662	659	0:45	902
0:10:00	650	674	690	679	683	633	652	703	672	671	0:50	918
0:11:00	666	691	709	697	698	651	668	712	687	686	0:55	932
0:12:00	681	702	730	713	717	668	688	732	707	704	1:00	945
0:13:00	695	711	737	725	730	683	702	743	722	716	1:05	957
0:14:00	707	721	759	732	735	690	712	749	725	725	1:10	968
0:15:00	716	731	759	742	745	698	719	764	737	734	1:15	979
0:16:00	732	755	789	754	761	716	734	773	760	753	1:20	988
0:17:00	740	769	790	756	761	720	741	785	758	758	1:25	997
0:18:00	752	780	789	765	769	724	748	792	773	766	1:30	1006
0:19:00	763	797	814	773	772	732	755	792	779	775	1:35	1014
0:20:00	770	803	814	778	779	740	760	803	786	781	1:40	1022
0:21:00	775	809	813	782	782	746	765	800	793	785	1:45	1029
0:22:00	777	818	834	783	785	753	770	801	794	791	1:50	1036
0:23:00	789	827	830	796	796	759	777	820	804	800	1:55	1043
0:24:00	795	830	851	799	800	769	785	816	814	806	2:00	1049
0:25:00	795	834	850	801	805	780	787	820	819	810		
0:26:00	811	847	855	813	815	781	800	830	829	820		
0:27:00	815	852	852	821	821	784	805	844	832	825		
0:28:00	819	854	860	821	822	788	809	840	841	828		
0:29:00	822	855	862	824	825	793	812	842	841	831		
0:30:00	830	866	874	830	835	803	821	855	854	841		
0:31:00	835	865	880	836	840	805	826	860	852	844		
0:32:00	835	870	880	836	837	811	830	853	863	846		
0:33:00	846	878	889	845	846	816	834	863	854	852		
0:34:00	850	884	894	847	849	818	837	867	863	856		
0:35:00	852	885	896	854	855	824	844	874	870	861		
0:36:00	861	892	899	857	856	828	846	876	878	866		
0:37:00	862	896	896	860	861	831	850	879	883	869		
0:38:00	870	905	910	867	864	839	858	883	879	875		
0:39:00	873	901	911	871	870	841	861	891	894	879		
0:40:00	875	907	908	872	872	846	862	894	898	882		
0:41:00	883	909	922	876	878	849	868	901	899	887		
0:42:00	882	912	918	876	879	851	871	900	907	888		
0:43:00	890	915	926	884	888	860	878	905	914	896		
0:44:00	898	924	932	888	893	862	882	908	907	899		
0:45:00	894	919	925	893	896	864	888	919	913	901		
0:46:00	899	925	932	892	896	867	891	917	925	905		
0:47:00	901	926	934	895	898	867	890	928	919	906		
0:48:00	905	928	942	897	899	872	892	922	916	908		
0:49:00	908	936	946	899	901	873	897	917	920	911		
0:50:00	912	940	943	902	907	880	902	928	925	915		
0:51:00	916	944	948	907	911	883	903	933	934	920		
0:52:00	916	941	945	908	909	883	906	939	941	921		
0:53:00	921	947	963	913	918	891	912	940	942	928		
0:54:00	930	949	965	920	926	899	921	951	951	934		
0:55:00	930	955	967	920	923	899	921	942	955	935		
0:56:00	933	953	969	924	929	900	921	951	955	937		
0:57:00	935	957	973	925	926	903	925	945	956	938		
0:58:00	935	961	967	926	929	904	928	949	948	939		
0:59:00	937	959	975	926	932	906	928	952	957	941		



 (Mr. Sirichai Pethrun)

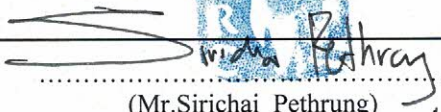
 Authorized Testing Officer

Time (hr:min:sec)	Furnace Temperature(°C)									
	P1	P2	P3	P4	P5	P6	P7	P8	P9	Average
1:00:00	937	959	966	931	931	907	931	949	964	942
1:01:00	938	960	969	932	934	909	931	958	965	944
1:02:00	940	964	973	930	933	909	932	955	968	945
1:03:00	944	967	979	934	937	913	934	963	962	948
1:04:00	949	972	978	939	941	919	940	965	978	953
1:05:00	954	979	989	943	943	921	942	961	967	955
1:06:00	955	975	993	943	948	923	944	973	967	958
1:07:00	956	979	993	943	945	924	947	968	970	958
1:08:00	962	984	1003	949	950	931	950	972	968	963
1:09:00	963	986	1003	952	954	931	952	975	979	966
1:10:00	964	988	1001	953	952	934	954	972	979	966
1:11:00	967	993	1005	955	954	934	956	973	992	970
1:12:00	967	989	1012	955	954	936	957	976	981	970
1:13:00	974	995	1005	961	962	939	962	985	999	976
1:14:00	974	992	1006	963	968	942	968	994	1002	979
1:15:00	978	1000	1011	965	964	946	967	984	1005	980
1:16:00	976	996	1012	964	968	944	969	990	996	979
1:17:00	977	998	1013	963	967	945	969	985	1001	980
1:18:00	979	1003	1014	965	969	946	969	992	990	981
1:19:00	980	999	1015	969	970	950	973	990	991	982
1:20:00	983	1005	1021	970	973	953	976	996	1005	987
1:21:00	990	1012	1033	977	981	961	985	1006	1002	994
1:22:00	989	1011	1026	976	980	960	981	1001	998	991
1:23:00	992	1010	1031	978	983	962	983	1005	1010	995
1:24:00	992	1012	1029	977	979	962	987	1005	1016	995
1:25:00	993	1014	1023	980	984	962	987	1005	1007	995
1:26:00	994	1015	1032	981	982	962	986	1007	1019	998
1:27:00	994	1017	1034	979	986	963	987	1005	1005	997
1:28:00	993	1014	1034	978	981	964	990	1001	1004	996
1:29:00	1001	1019	1037	985	986	967	989	1010	1021	1002
1:30:00	1000	1021	1039	987	988	971	992	1011	1022	1003
1:31:00	1000	1022	1040	988	991	972	994	1012	1007	1003
1:32:00	1009	1028	1048	996	998	982	1000	1021	1025	1012
1:33:00	1010	1031	1049	997	998	981	1001	1020	1032	1013
1:34:00	1008	1029	1043	995	992	981	1001	1018	1017	1009
1:35:00	1008	1028	1045	996	998	980	1001	1023	1025	1011
1:36:00	1008	1030	1048	994	994	982	1000	1022	1039	1013
1:37:00	1011	1030	1047	999	997	983	1005	1022	1035	1014
1:38:00	1014	1033	1056	1000	999	986	1008	1029	1021	1016
1:39:00	1015	1036	1056	1002	1003	987	1007	1024	1019	1016
1:40:00	1018	1042	1060	1002	1003	989	1010	1026	1037	1021
1:41:00	1019	1040	1064	1005	999	990	1010	1021	1032	1020
1:42:00	1021	1045	1064	1006	1004	991	1013	1029	1034	1023
1:43:00	1022	1044	1064	1007	1005	994	1013	1030	1045	1025
1:44:00	1025	1047	1068	1008	1008	993	1015	1029	1044	1026
1:45:00	1022	1042	1056	1011	1009	992	1017	1036	1038	1025
1:46:00	1032	1052	1073	1013	1012	996	1018	1034	1041	1030
1:47:00	1028	1050	1072	1016	1013	1001	1023	1036	1044	1031
1:48:00	1033	1054	1081	1017	1017	1006	1023	1041	1038	1035
1:49:00	1035	1054	1069	1018	1017	1002	1022	1044	1054	1035
1:50:00	1035	1053	1075	1018	1016	1004	1023	1042	1056	1036
1:51:00	1033	1053	1076	1018	1014	1004	1024	1040	1040	1033
1:52:00	1035	1056	1081	1017	1016	1006	1024	1036	1040	1035
1:53:00	1034	1053	1078	1019	1016	1003	1024	1041	1053	1036
1:54:00	1038	1056	1078	1023	1018	1007	1026	1045	1057	1039
1:55:00	1041	1061	1084	1022	1020	1009	1028	1045	1052	1040
1:56:00	1043	1062	1084	1027	1027	1013	1034	1051	1072	1046
1:57:00	1047	1068	1089	1027	1023	1015	1036	1046	1056	1045
1:58:00	1047	1065	1079	1029	1026	1015	1035	1053	1066	1046
1:59:00	1048	1066	1087	1031	1031	1016	1037	1057	1066	1049
2:00:00	1047	1066	1091	1031	1030	1019	1037	1053	1060	1048



(Mr. Sirichai Pethrung)
Authorized Testing Officer

Time (hr:min:sec)	Specimen Temperature(°C)										
	A	B	C	D	E	F	G	H	I	Max. (A-I)	Average (A-E)
0:00:00	47	47	41	38	38	30	31	30	30	47	42
0:01:00	78	75	71	55	53	30	31	30	30	78	66
0:02:00	125	118	115	90	88	30	32	31	31	125	107
0:03:00	169	156	156	126	126	30	33	32	32	169	147
0:04:00	243	224	221	188	187	31	34	34	35	243	213



 (Mr. Sirichai Pethrung)
 Authorized Testing Officer

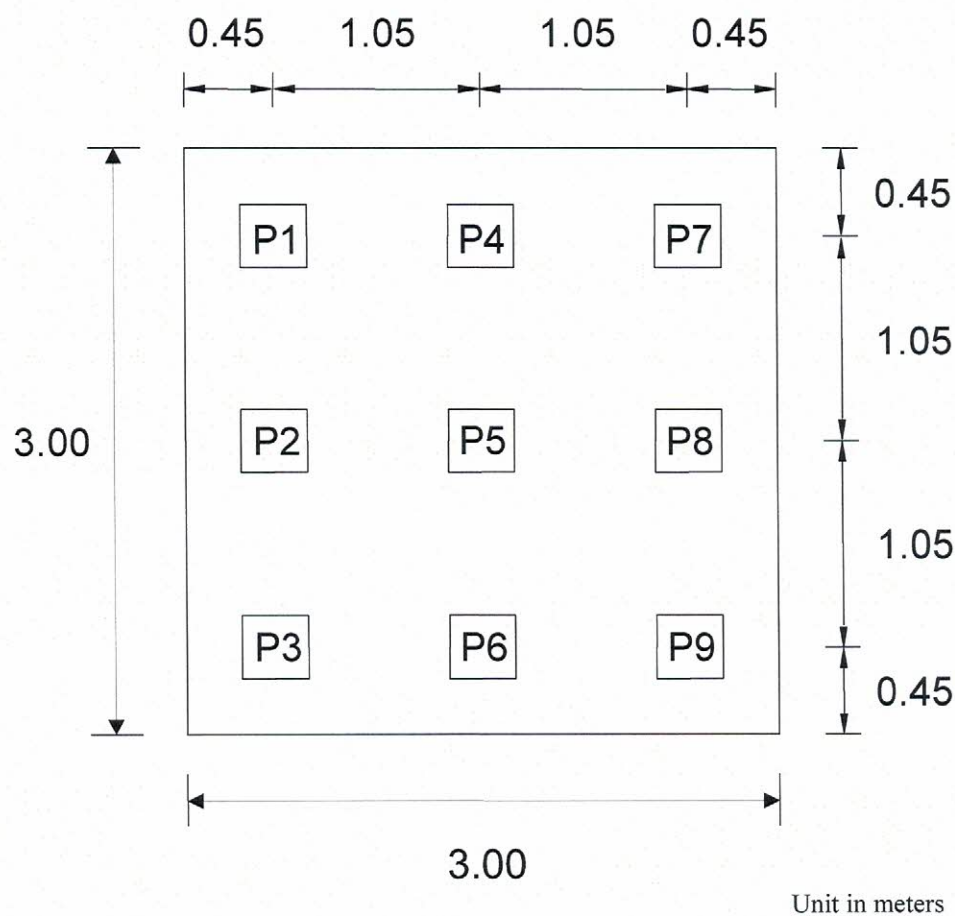


Figure A-1: Location of thermocouples inside the furnace


(Mr. Sirichai Pethrung)
Authorized Testing Officer

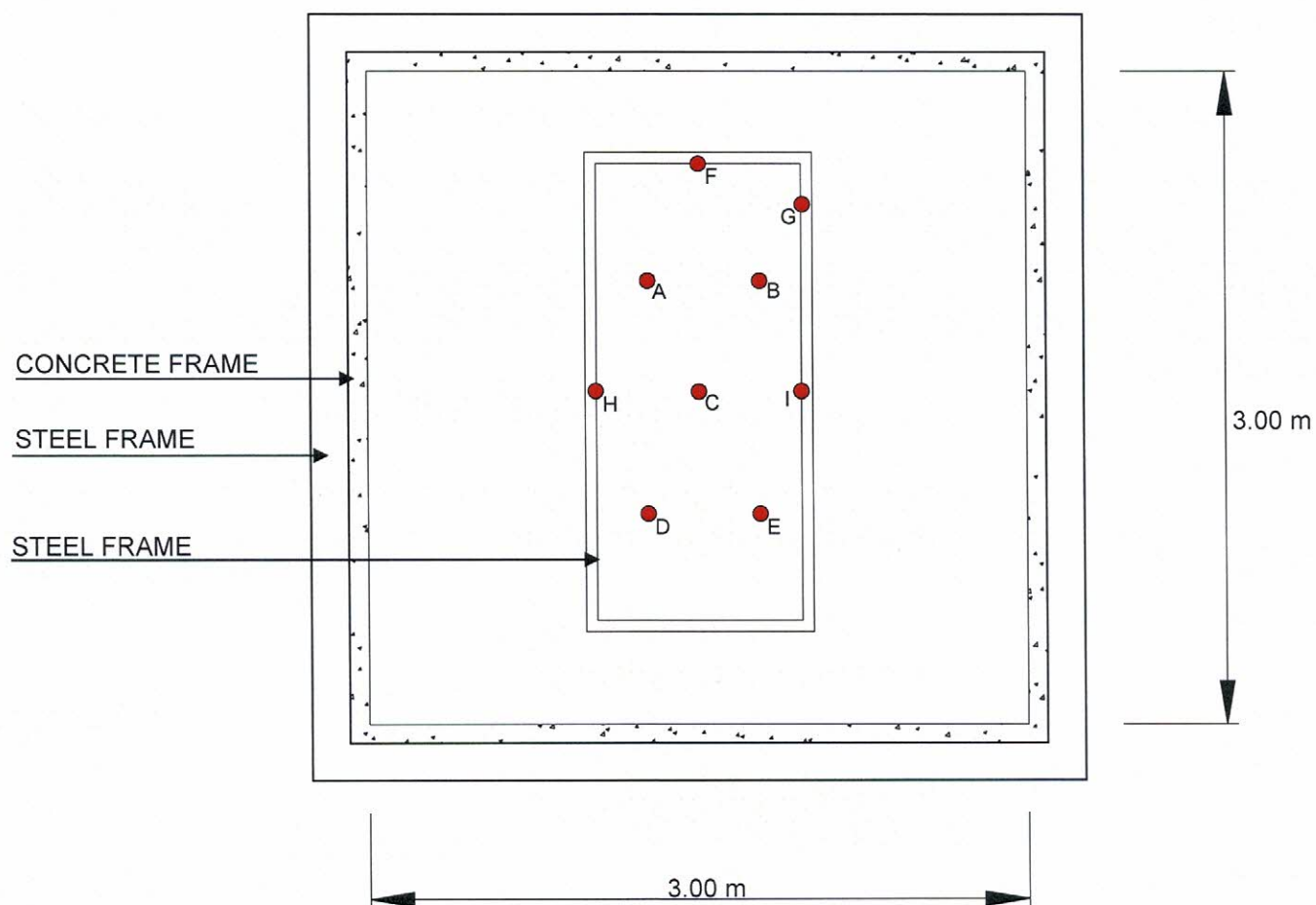
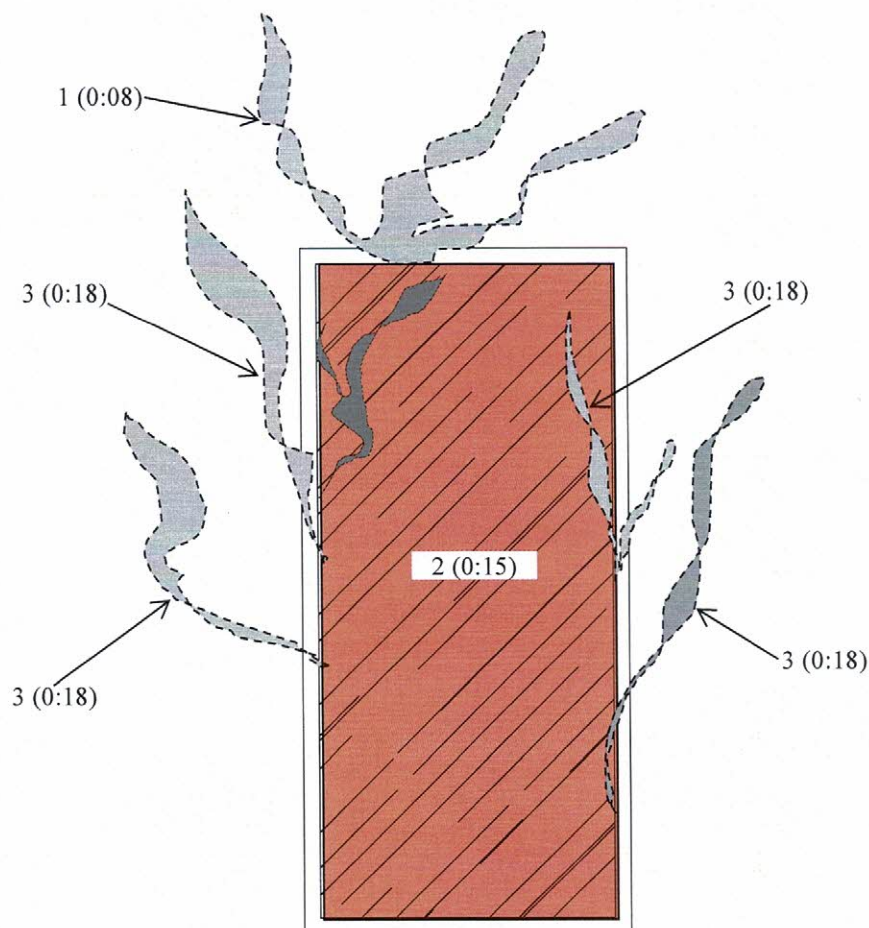


Figure A-2: Location of thermocouples on the specimen


(Mr. Sirichai Pethrung)
Authorized Testing Officer

APPENDIX B: OBSERVATIONS

No.	Time (hr:min)	Observations
1	0:08	Smoke leaking from the upper edge of the glazed element.
2	0:15	The glazed area turned red.
3	0:18	Smoke leaking from the side edges of the glazed element.
4	0:30	No significant change was observed.
5	1:00	No significant change was observed.
6	1:30	No significant change was observed.
7	2:00	The test was terminated by the client. During the test, all integrity criteria were fulfilled (no sustained flaming and no through gap such that the 6 mm diameter gap gauge could penetrate).




 (Mr. Sirichar Pethrung)
 Authorized Testing Officer

APPENDIX C: DRAWINGS & DETAILS OF THE SPECIMEN

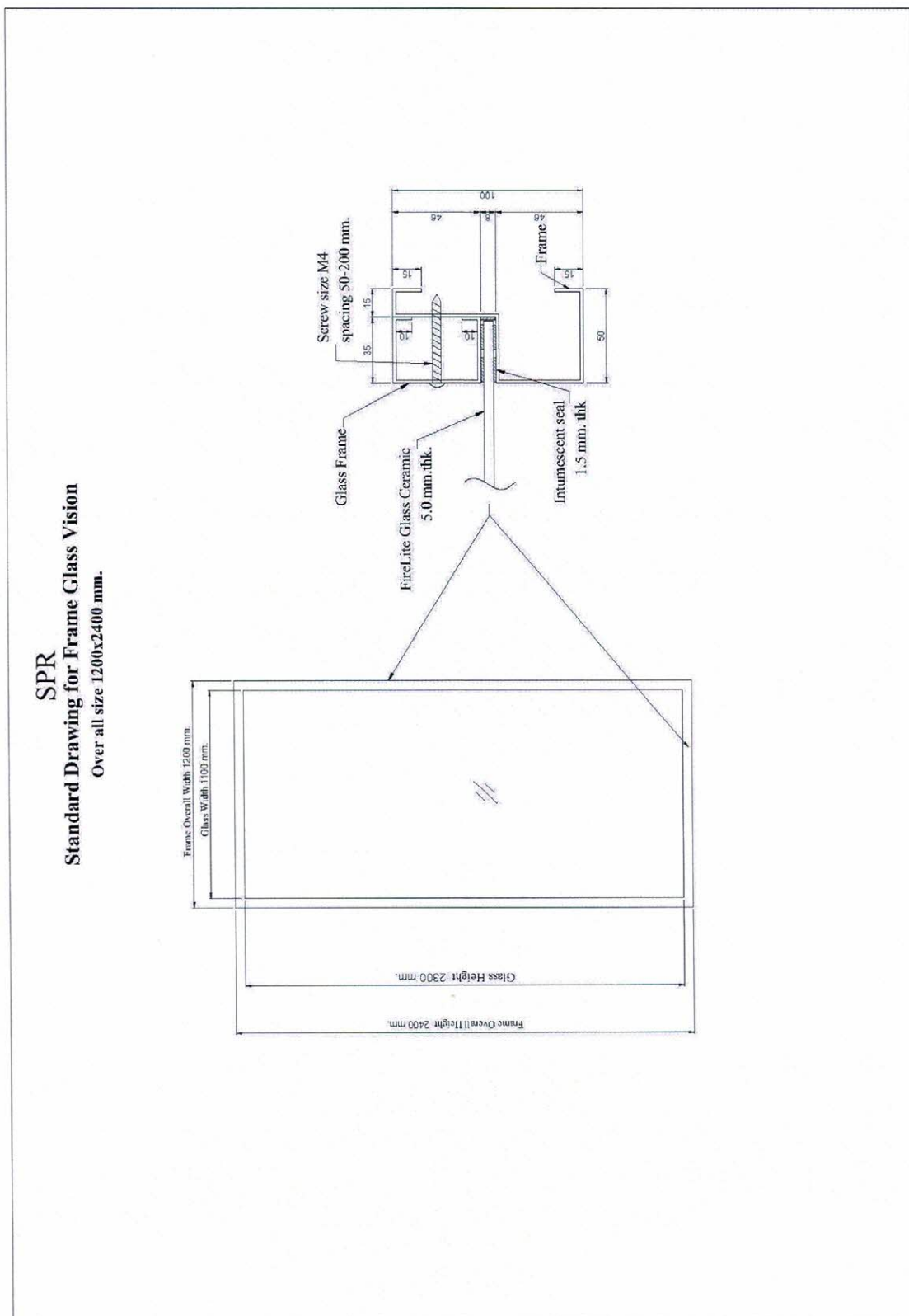
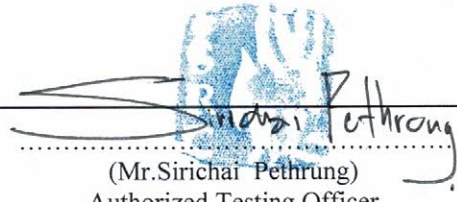


Figure C-1: Details of the specimen (as provided by the client)


(Mr. Sirichai Pethrong)
Authorized Testing Officer

APPENDIX D: PHOTOGRAPHS



Figure D-1: Specimen preparation prior to the test

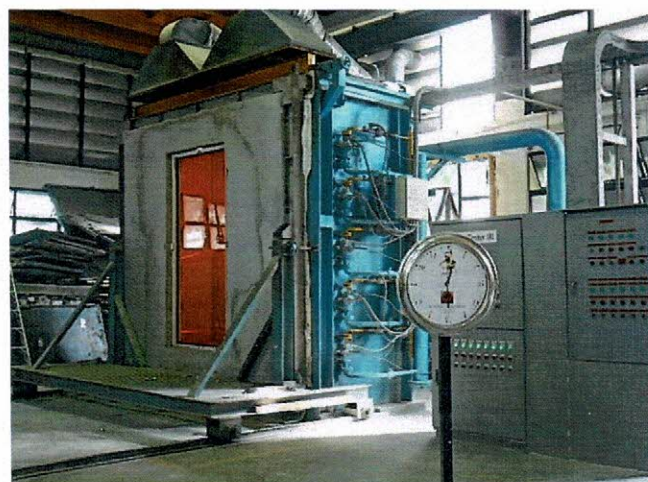

.....
(Mr. Sirichai Pethrung)
Authorized Testing Officer



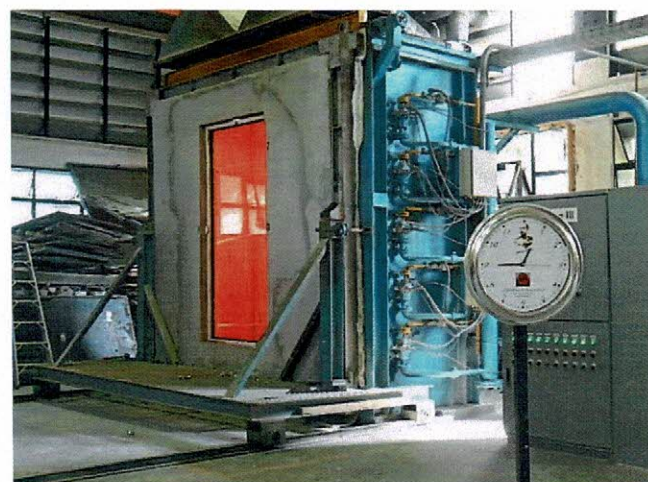
(a) 0:00 hr



(b) 0:15 hr



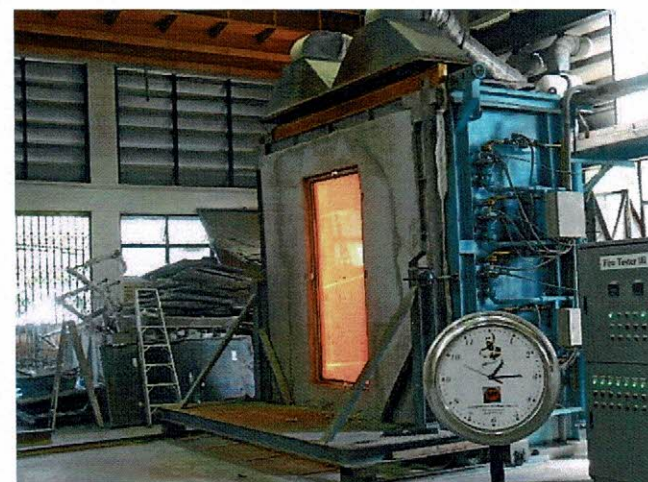
(c) 0:30 hr



(d) 0:45 hr



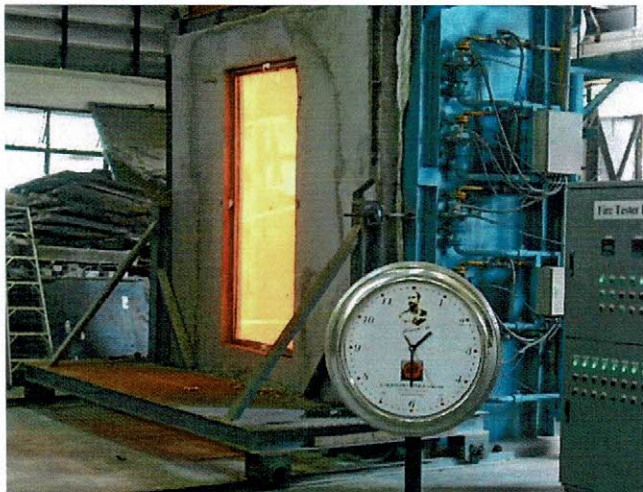
(e) 1:00 hr



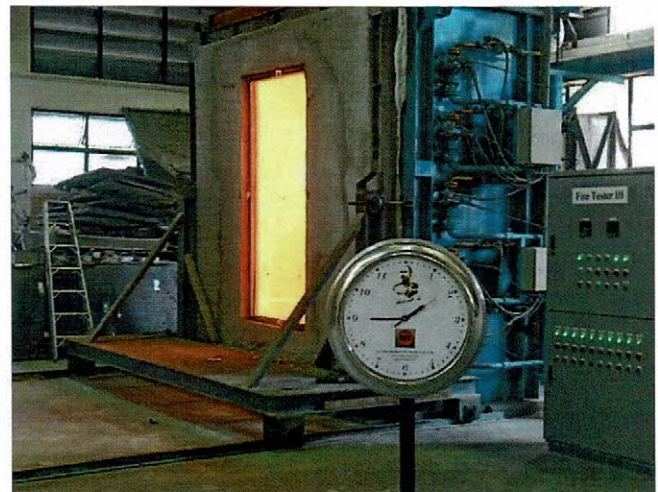
(f) 1:15 hr

Figure D-2: The specimen during the test


(Mr. Sirichai Pethrung)
Authorized Testing Officer



(g) 1:30 hr



(h) 1:45 hr



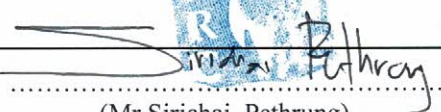
(i) 2:00 hr

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


(Mr. Sirichai Pethrung)
Authorized Testing Officer



Figure D-3: The specimen after the test


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