



**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** : **S K C FIRE RETARDANT / FIRE PROOF ROLLER SHUTTER DOOR**
 The specimen is a doorset consisting of a rolling shutter door and a steel door frame. The height of the shutter door including the enclosure box is 2450 mm and the clear width of the shutter door between the steel frame is 1200 mm. The shutter door is constructed of 1.2-mm thick galvanized steel curtain slats with 115 mm slat pitch. The specimen was mounted in a 15-cm thick reinforced concrete wall, which was installed on the 3 m x 3 m testing frame. The rolling shutter door was locked with the door frame by a lockset. The details of the specimen are shown in Appendix C. The specimen was provided and installed by the client.
- CLIENT** : **S K C (THAILAND) CO., LTD.**
 72 Phetkasem 48 Yak 16, Bangduan, Phasi Charoen
 Bangkok 10160, Thailand
- DATE OF TEST** : August 20, 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 for the doorset follow the British Standard BS 476: Fire tests on building materials and structures (with no temperature measurements on the unexposed surface and the integrity criteria specified for the curtain slat area in accordance with the client's request)
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 8: Determination of the fire resistance of uninsulated doorsets and shutter assemblies.
Integrity criteria for the shutter curtain slat area: no sustained flaming on the unexposed surface of the specimen for a period of more than 10 seconds and no loss of impermeability (no through gap measured with a 6 mm diameter gap gauge and a 25 mm diameter gap gauge).
- 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
Integrity	2:00	The test was terminated by the client. All integrity criteria were fulfilled.

Tested by:
 (Associate Prof. Dr. Jaroon Rungamornrat)

Date: September 3, 2019

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 (Professor Dr. Thanyawat Pothisiri)

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 (Associate Prof. Dr. Tirawat Boonyatee)

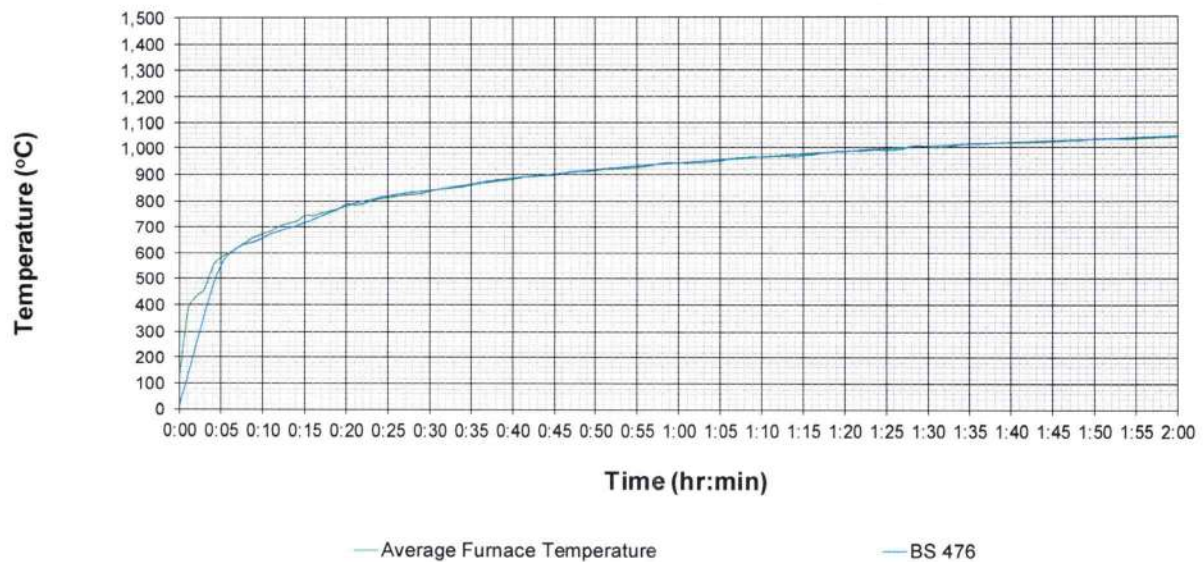
On Behalf of Head of Civil Engineering Department



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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	202	137	73	151	113	64	149	135	158	131	0:00	20
0:01:00	390	476	349	340	345	208	396	447	509	384	0:05	558
0:02:00	440	511	401	384	403	295	448	499	532	435	0:10	659
0:03:00	483	535	445	428	435	356	472	503	504	462	0:15	718
0:04:00	561	648	574	511	533	450	538	569	568	550	0:20	781
0:05:00	589	688	609	544	563	497	568	606	590	584	0:25	821
0:06:00	613	690	622	571	586	522	587	621	610	602	0:30	842
0:07:00	641	693	646	599	593	557	607	643	632	624	0:35	865
0:08:00	659	708	661	627	622	581	637	669	653	646	0:40	885
0:09:00	680	718	682	643	635	601	643	688	670	662	0:45	902
0:10:00	683	743	688	658	643	612	657	694	685	674	0:50	918
0:11:00	696	735	716	671	655	632	667	710	690	686	0:55	932
0:12:00	713	754	723	693	675	645	694	728	716	704	1:00	945
0:13:00	717	780	742	701	685	655	702	734	722	715	1:05	957
0:14:00	742	773	741	712	694	664	706	744	742	724	1:10	968
0:15:00	740	805	764	742	717	683	735	773	762	747	1:15	979
0:16:00	748	794	757	738	715	685	735	775	770	746	1:20	988
0:17:00	762	799	769	747	721	694	742	782	775	754	1:25	997
0:18:00	769	803	776	755	727	705	749	789	785	762	1:30	1006
0:19:00	786	820	788	759	735	709	757	798	782	770	1:35	1014
0:20:00	788	824	799	784	756	726	789	822	817	789	1:40	1022
0:21:00	789	818	793	783	754	727	783	823	806	786	1:45	1029
0:22:00	798	832	798	785	759	733	786	821	799	790	1:50	1036
0:23:00	806	834	810	798	768	744	798	831	822	801	1:55	1043
0:24:00	814	847	820	805	777	751	808	842	832	811	2:00	1049
0:25:00	816	855	822	810	781	758	814	844	839	815		
0:26:00	823	844	831	820	787	761	823	855	837	820		
0:27:00	831	853	842	823	785	765	822	851	851	825		
0:28:00	831	860	833	823	791	767	825	857	852	827		
0:29:00	836	861	833	831	794	772	829	861	858	830		
0:30:00	845	867	847	835	802	782	837	871	872	840		
0:31:00	855	878	856	845	807	784	847	871	875	847		
0:32:00	850	887	859	848	813	789	851	881	877	851		
0:33:00	867	889	853	855	815	791	855	882	881	854		
0:34:00	864	888	861	856	816	794	857	885	884	856		
0:35:00	879	893	875	864	826	800	865	892	878	863		
0:36:00	876	902	873	869	828	811	872	901	887	869		
0:37:00	878	908	878	872	831	809	870	901	899	872		
0:38:00	883	901	882	870	834	816	876	909	901	875		
0:39:00	892	903	876	879	837	816	877	904	907	877		
0:40:00	892	911	895	883	845	820	881	909	900	882		
0:41:00	893	923	899	890	847	830	893	920	904	889		
0:42:00	898	923	900	893	853	832	897	919	914	892		
0:43:00	905	918	901	894	854	836	895	920	912	893		
0:44:00	910	922	906	897	856	835	898	923	909	895		
0:45:00	904	919	904	900	856	840	901	929	927	898		
0:46:00	921	931	913	908	863	845	910	938	932	907		
0:47:00	929	943	909	913	872	848	913	943	937	912		
0:48:00	923	933	911	915	874	854	919	948	945	914		
0:49:00	928	937	921	917	877	857	922	951	908	913		
0:50:00	924	938	917	919	881	857	921	952	944	917		
0:51:00	926	946	928	918	879	860	925	951	947	920		
0:52:00	924	947	927	927	878	862	927	946	945	920		
0:53:00	932	940	932	924	880	865	929	949	953	923		
0:54:00	930	951	928	927	881	863	932	955	954	925		
0:55:00	938	953	935	930	886	867	934	956	951	928		
0:56:00	943	952	933	935	891	872	937	959	958	931		
0:57:00	947	957	943	941	894	878	946	962	968	937		
0:58:00	961	974	940	946	901	883	947	970	972	944		
0:59:00	953	963	955	951	904	888	952	979	970	946		



(Mr. Sirichai Pethrung)
Authorized Testing Officer

Time (hr:min:sec)	Furnace Temperature(°C)									
	P1	P2	P3	P4	P5	P6	P7	P8	P9	Average
1:00:00	957	960	951	951	903	888	953	975	973	946
1:01:00	953	965	945	949	904	882	951	974	971	944
1:02:00	953	967	957	949	902	888	950	978	969	946
1:03:00	957	963	952	953	903	888	955	979	971	947
1:04:00	960	970	962	956	908	891	958	976	974	951
1:05:00	969	983	958	956	913	894	964	983	958	953
1:06:00	971	985	959	964	918	898	969	995	995	962
1:07:00	967	983	970	969	922	905	973	996	992	964
1:08:00	975	983	964	972	925	907	977	995	996	966
1:09:00	975	990	968	973	927	907	978	1005	998	969
1:10:00	972	986	976	973	928	910	979	1002	983	968
1:11:00	973	985	975	974	927	911	981	1002	996	969
1:12:00	975	991	974	976	926	912	980	1006	995	971
1:13:00	985	990	964	977	926	909	983	1003	1003	971
1:14:00	978	990	973	974	929	910	981	1004	982	969
1:15:00	984	993	981	980	931	917	986	1004	1001	975
1:16:00	986	995	979	981	932	918	987	1007	1006	977
1:17:00	988	1008	989	985	935	921	993	1008	1010	982
1:18:00	997	1008	994	988	943	928	995	1015	992	984
1:19:00	996	1008	995	991	946	929	998	1020	1009	988
1:20:00	998	1009	995	995	946	930	1000	1017	1011	989
1:21:00	997	1011	999	995	945	931	1002	1020	1018	991
1:22:00	1004	1014	995	994	948	932	999	1025	999	990
1:23:00	1001	1015	990	996	950	930	1004	1023	1023	992
1:24:00	1001	1013	1000	995	948	933	1004	1023	1023	993
1:25:00	1000	1007	992	999	951	934	1008	1028	1015	993
1:26:00	1003	1007	999	998	947	937	1006	1023	1020	993
1:27:00	1009	1018	1003	1002	954	938	1010	1025	1021	998
1:28:00	1020	1027	1008	1012	963	944	1017	1040	1030	1007
1:29:00	1016	1029	1007	1012	963	947	1022	1041	1039	1009
1:30:00	1012	1015	1010	1009	958	946	1017	1034	1025	1003
1:31:00	1010	1014	1009	1005	957	945	1018	1026	1022	1001
1:32:00	1013	1016	1004	1010	957	945	1016	1033	1030	1003
1:33:00	1019	1030	999	1012	964	947	1019	1038	1034	1007
1:34:00	1027	1040	1015	1019	968	954	1024	1042	1039	1014
1:35:00	1025	1037	1012	1021	971	957	1026	1044	1043	1015
1:36:00	1025	1027	1025	1021	973	961	1029	1049	1032	1016
1:37:00	1025	1030	1024	1023	973	959	1031	1043	1042	1017
1:38:00	1032	1041	1021	1022	971	958	1031	1047	1047	1019
1:39:00	1028	1034	1027	1025	973	962	1032	1050	1046	1020
1:40:00	1027	1035	1027	1024	975	964	1035	1052	1039	1020
1:41:00	1031	1038	1016	1026	977	962	1037	1050	1050	1021
1:42:00	1031	1034	1029	1026	978	964	1037	1050	1039	1021
1:43:00	1034	1036	1026	1029	981	964	1033	1057	1046	1023
1:44:00	1033	1038	1031	1028	981	965	1038	1052	1048	1024
1:45:00	1036	1041	1035	1029	981	969	1041	1059	1046	1026
1:46:00	1042	1047	1036	1033	981	967	1040	1056	1043	1027
1:47:00	1039	1048	1035	1035	984	970	1044	1058	1054	1030
1:48:00	1047	1050	1034	1036	986	972	1039	1053	1057	1030
1:49:00	1047	1048	1041	1039	990	977	1045	1060	1061	1034
1:50:00	1054	1055	1042	1043	990	978	1048	1059	1064	1037
1:51:00	1052	1049	1047	1043	994	983	1049	1064	1063	1038
1:52:00	1052	1052	1043	1043	994	983	1050	1064	1065	1038
1:53:00	1059	1063	1031	1044	991	978	1051	1058	1068	1038
1:54:00	1055	1057	1040	1046	991	980	1050	1067	1056	1038
1:55:00	1054	1049	1042	1043	994	983	1053	1063	1062	1038
1:56:00	1053	1058	1050	1047	995	985	1051	1069	1066	1041
1:57:00	1056	1061	1052	1049	999	987	1053	1069	1054	1042
1:58:00	1062	1056	1055	1050	997	989	1052	1069	1071	1044
1:59:00	1060	1064	1053	1051	1000	988	1055	1069	1067	1045
2:00:00	1066	1066	1050	1052	1002	988	1056	1071	1071	1047



(Mr. Sirichai Pethrung)
Authorized Testing Officer

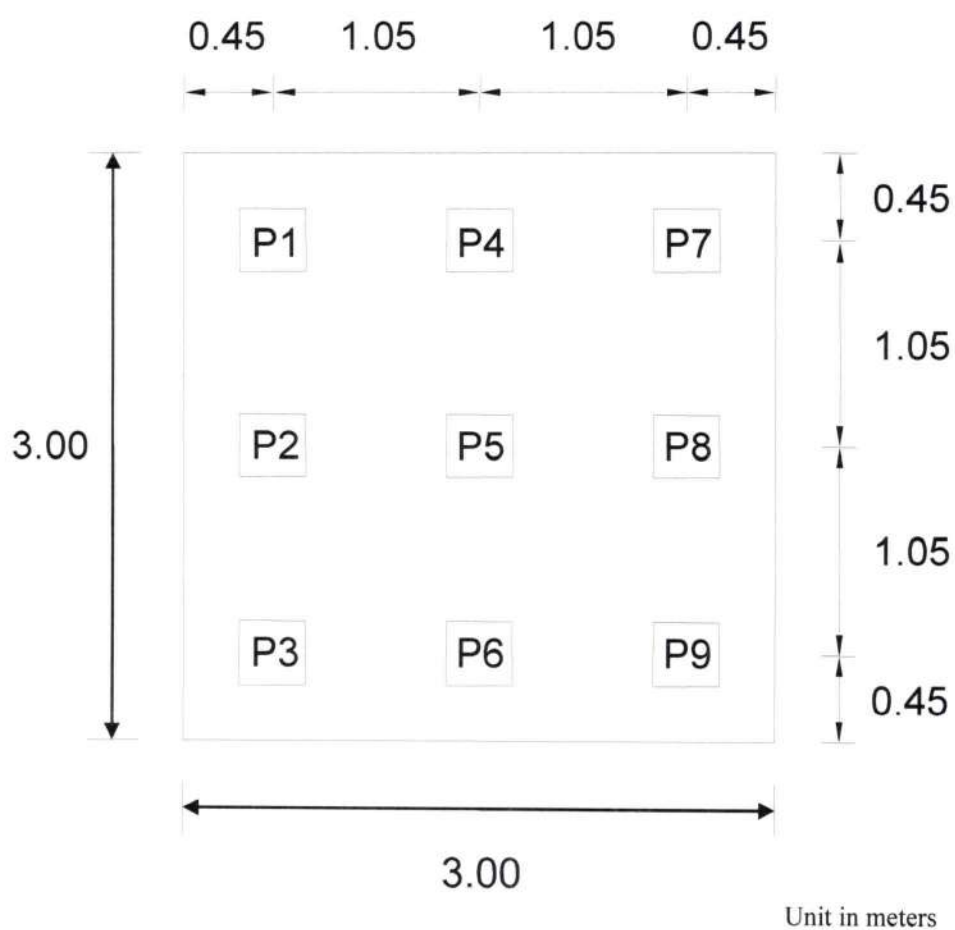
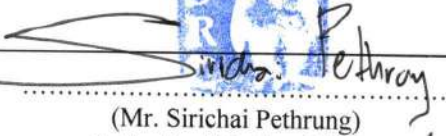
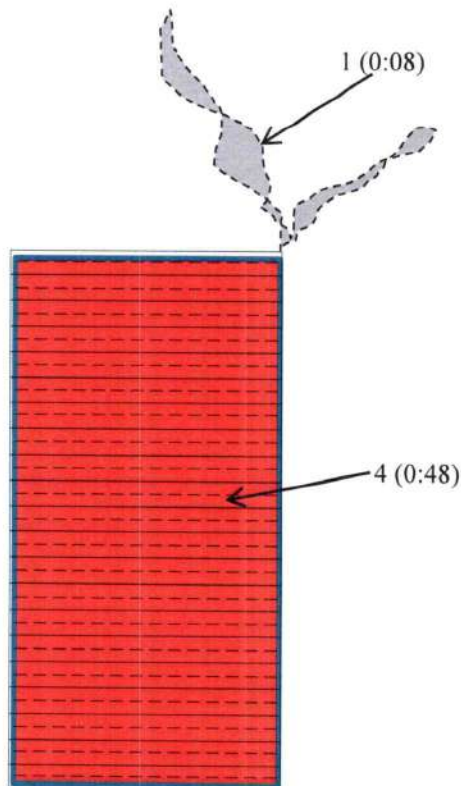


Figure A-1: Location of thermocouples inside the furnace


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APPENDIX B: OBSERVATIONS

No.	Time (hr:min)	Observations
1	0:08	Smoke leaking from the upper edge of the door.
2	0:15	No significant change was observed.
3	0:30	No significant change was observed.
4	0:48	The unexposed surface of the specimen turned red.
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.




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APPENDIX C: DRAWINGS & DETAILS OF THE SPECIMEN

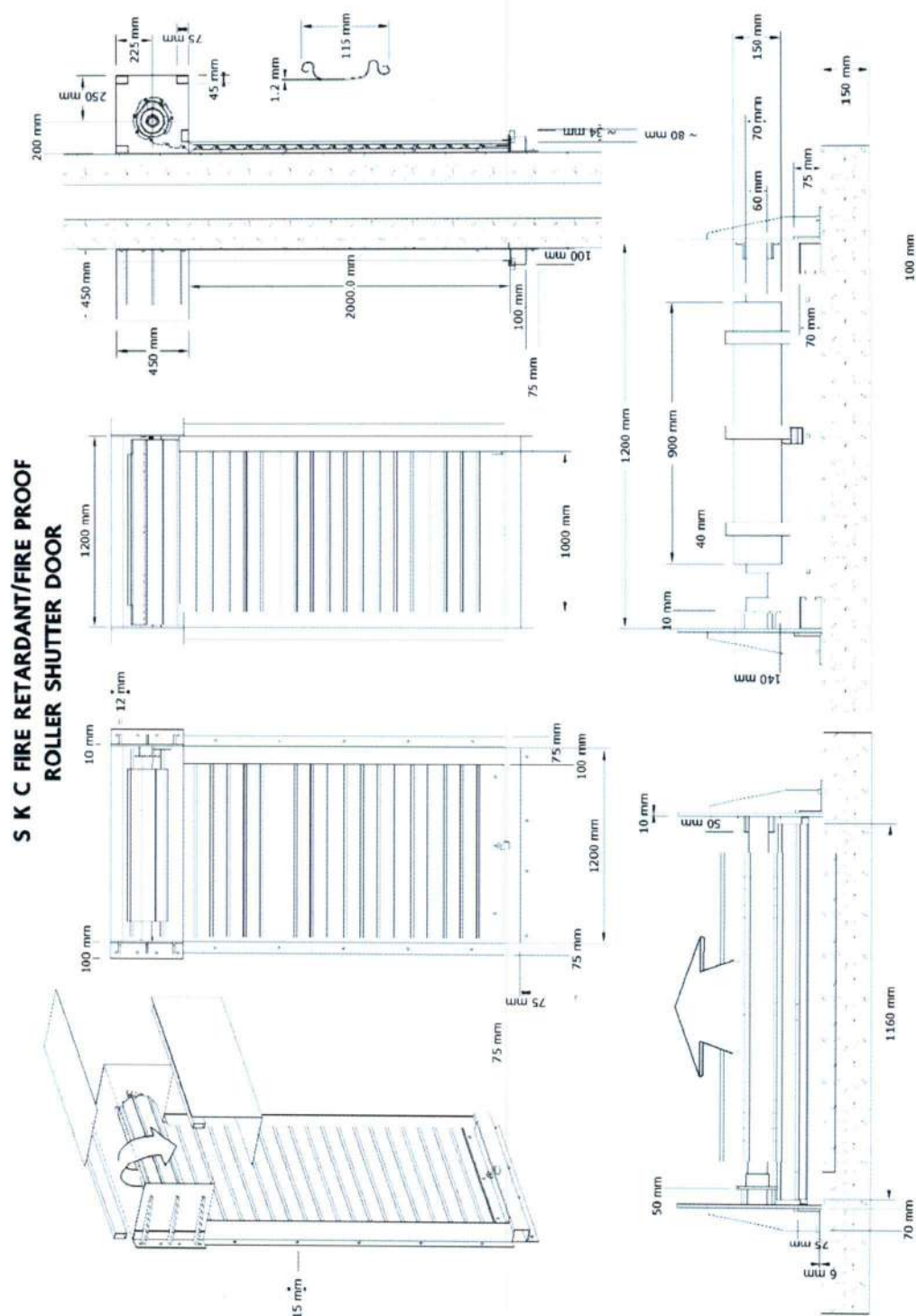


Figure C-1: Details of the specimen (as provided by the client)

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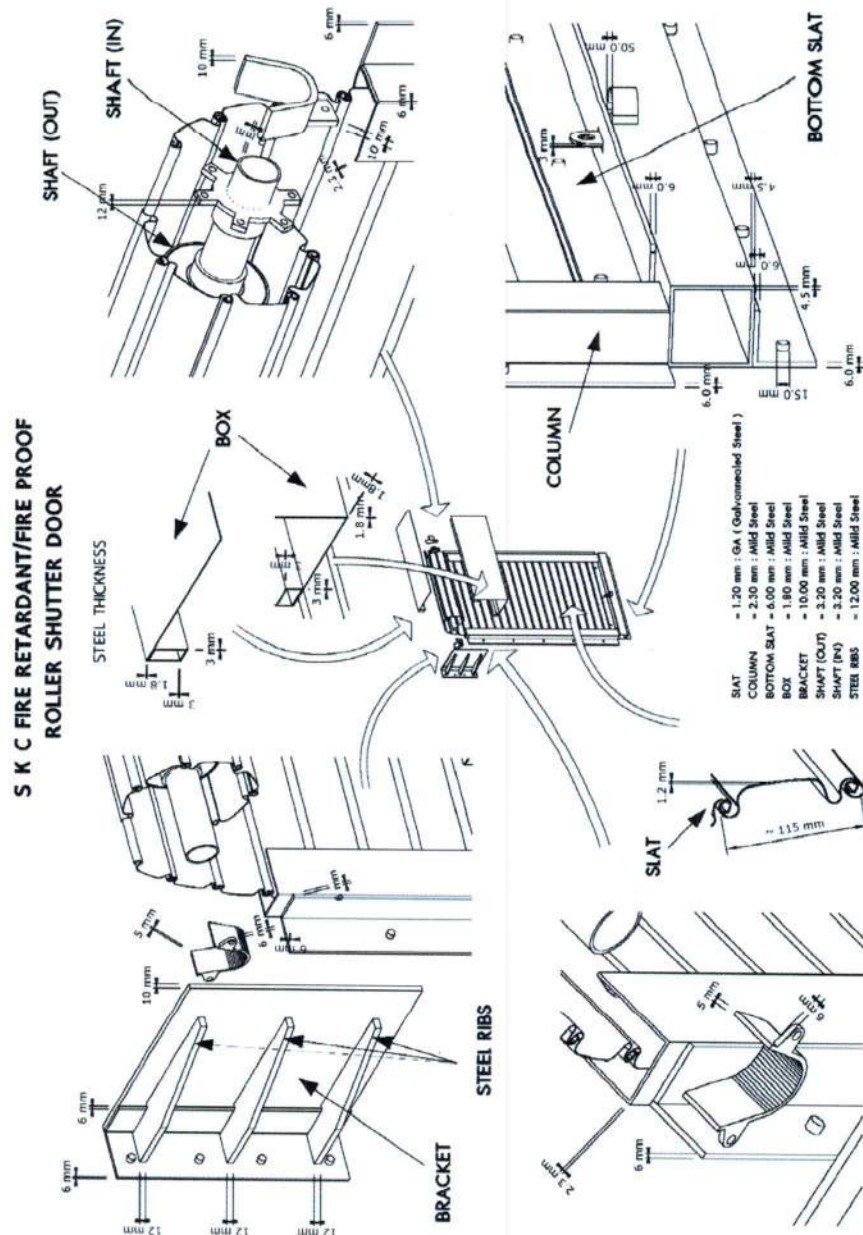


Figure C-2: Details of the specimen (as provided by the client)


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 Authorized Testing Officer

APPENDIX D: PHOTOGRAPHS

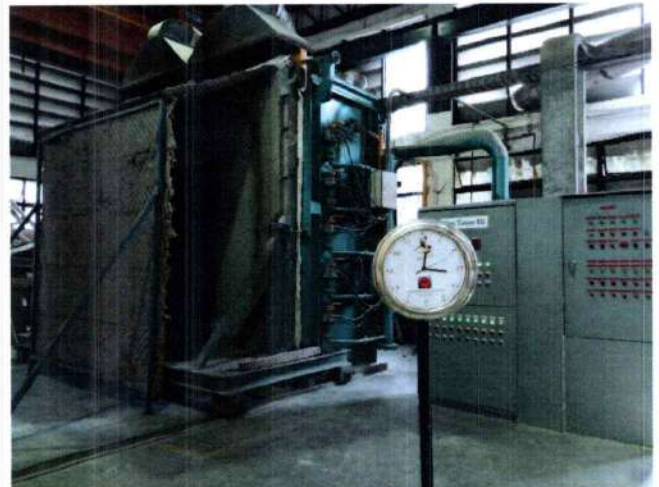


Figure D-1: Specimen preparation prior to the test


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(a) 0:00 hr



(b) 0:16 hr



(c) 0:30 hr



(d) 0:45 hr



(e) 1:00 hr



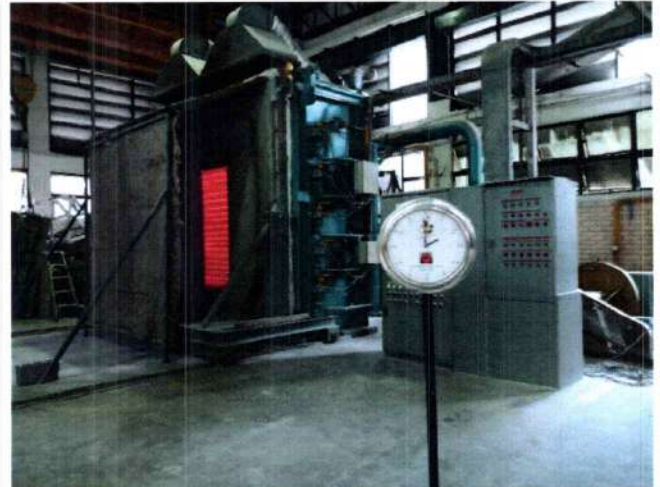
(f) 1:15 hr

Figure D-2: The specimen during the test


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(g) 1:30 hr



(h) 2:00 hr

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

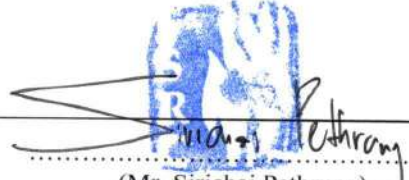

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Figure D-3: The specimen after the test


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