

東京理科大学「火災安全科学研究拠点」

■研究成果概要報告書

研 究 課 題		A Comparison Study of International Fire Test Method for Façade(ISO 13785-2 Calibration Method)	実 施 年 度 平成 26 年度
研究代表者	所属	Korea Institute of Civil Engineering and Building Technology (Fire Research Institute)	
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受入担当責任者	氏名	大宮 喜文	
<p>1. 研究の背景および目的</p> <p>As high rise building acts as the landmark function with urban symbol, it has an advantage maximizing land use. For this high rise building, various exterior materials are used for the external aesthetics and in particular, energy saving function is focused on. Therefore, it has been increased to use non-combustible materials. As shown in the cases for fire accidents of exterior materials, fire of high rise building leads to a lot of damages for human as well as asset. Although there is an international test method to evaluate fire safety on exterior materials, there is no experience that the comparison tests are carried out among counties. Therefore, evaluation on the applicability has not been enough carried out. Thus, evaluation test for fire safety performance using Façade Test Facility which is owned only by TUS is carried out in the study and then it is to be compared with the Korean test result and analyzed.</p>			
<p>2. 利用施設及び利用日</p> <ul style="list-style-type: none"> ・ Façade Fire Tester(ISO 13785-2)装置 TUS (2014 年 11 月 12 日 ～ 11 月 14 日) ・ Façade Fire Tester(ISO 13785-2)装置 KICT (2015 年 3 月 30 日 ～ 3 月 31 日) 			

3. 実験方法・研究成果、および考察（申請時の計画に対する達成度合いも含む）
 ※継続課題の場合は、前年度との関係性、進展度合いについても記載すること。

In JFY 2014, the following items were planned as the first year trial.

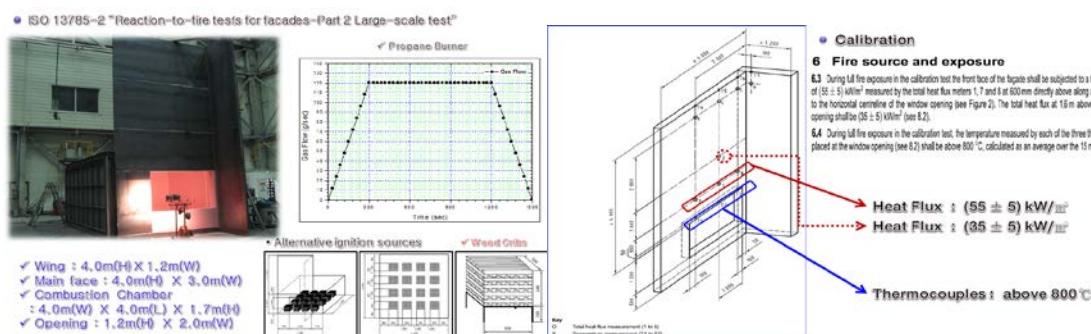
1. To make the correlative analysis of the Façade test method between Korean and Japan
2. To make the calibration test by gas burner and wooden crib by ISO 13785-2
3. To compare the calibration results in terms of heat flux meter and thermocouple
4. To report test results

For fulfilling the above plan in JFY 2014,

Façade tests based on ISO 13785-2 were successfully conducted in TUS by the calibration method of gas burner and wooden crib. The results from heat flux meter and thermocouple were obtained and compared with the preliminary test results which were performed in TUS. For analyzing a series of heat flux and temperature from calibrating, Collaborators(Mr. Kye-Won Park, Dr. Yoshihiko Hayashi), Head(Dr. Hideki Yoshioka) of Japanese delegation in ISO TC92 SC1, and Prof. Yoshifumi Ohmiya have made the technical meeting so that we were able to focus on the meaningful issues on pursuing the reasonable calibration progress.





Furthermore, for the purpose of the precise comparison of Japan's TUS with Korea's KICT, a series of calibration tests are scheduled to conduct in March, 2015. After then, Finally it is considered that the draft on ISO 13785-2's revision will be proposed to ISO TC92 SC1 WG7 by delegation of Korea and Japan.

Test devices for building exterior materials are owned only by 'Tokyo University of Science' in Japan. Real scale-based research through TUS's great façade test facility will be a good chance to meet the demands on fire safety study of exterior safety. In addition, as the result of the internationally comparing test could be provided as beneficial information to the ISO TC92 SC1, it will be positively contributed for the purpose of the advance of international standard.

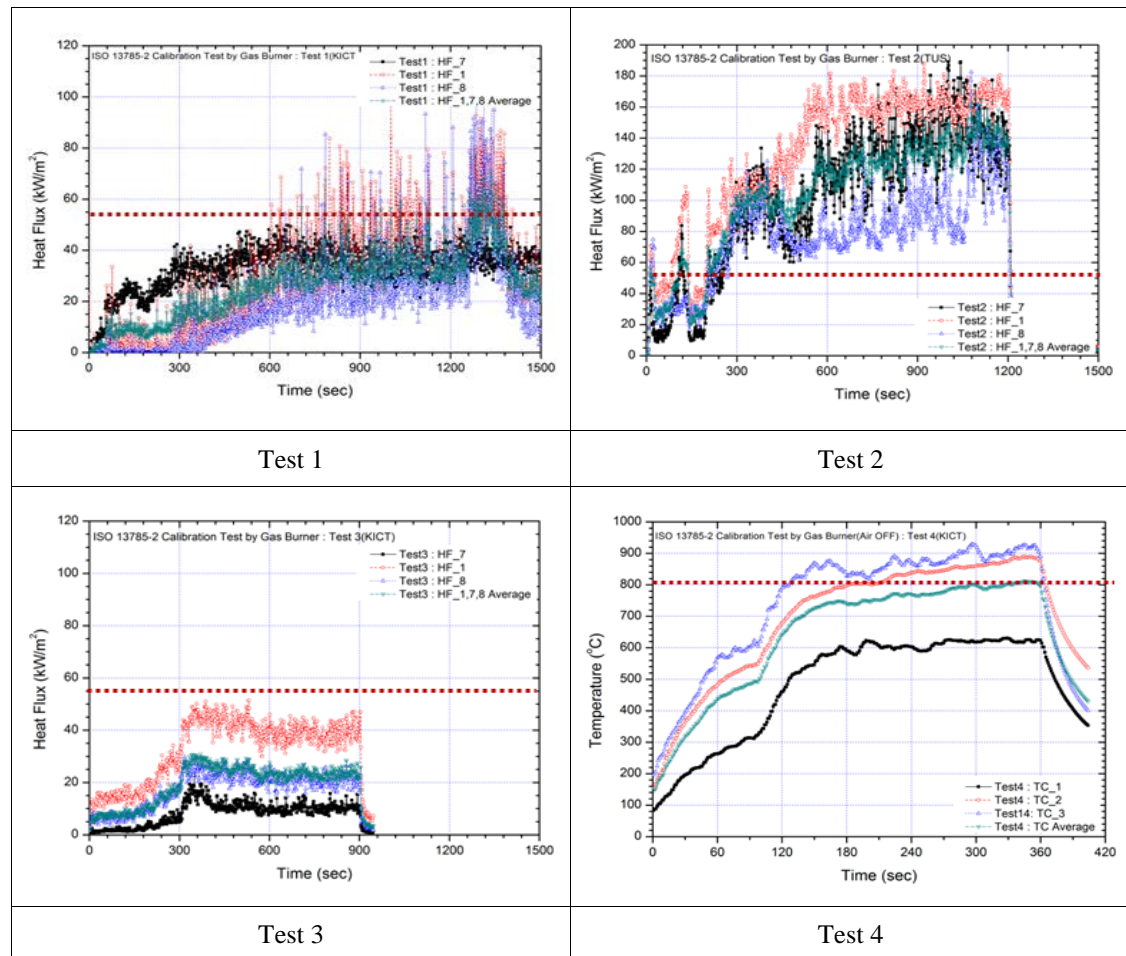


<Façade Test(ISO 13785-2) & Calibration Method>

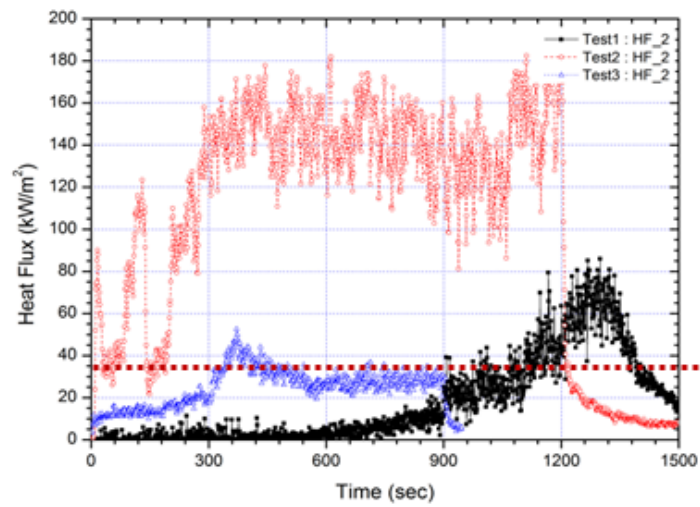
□ ISO 13785-2 Calibration Test Case(Gas Burner)

	Test 1	Test 2	Test 3	Test 4
Date	March. 2014	Nov. 2014	March. 2015	March. 2015
Institute	KICT(Korea)	TUS(Japan)	KICT(Korea)	KICT(Korea)
Fuel	Gas Burner(LPG)	Gas Burner (Urban Gas)	Gas Burner(LPG)	Gas Burner(LPG)
Condition	Air : 100CMM 80 mmAq	Air : No	Air : 100CMM 2,000 mmAq	Air : No
Photo				

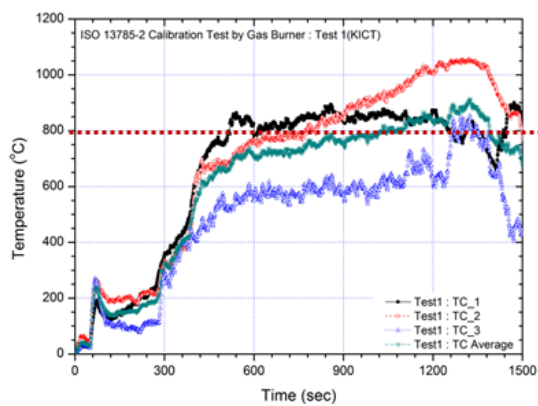
– Calibration Test Results for Gas Burners(Total Heat Flux meter at 0.6m above the opening)



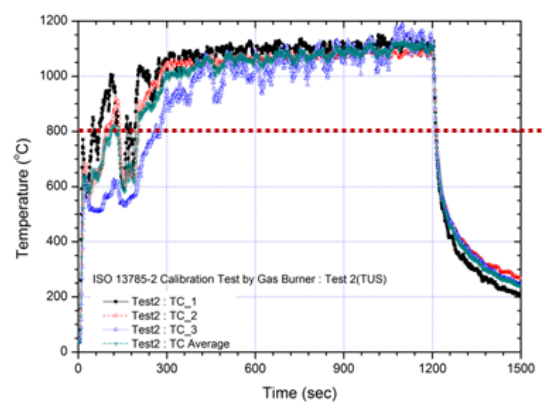
- Calibration Test Results for Gas Burners(Total Heat Flux meter at 1.6m above the opening)



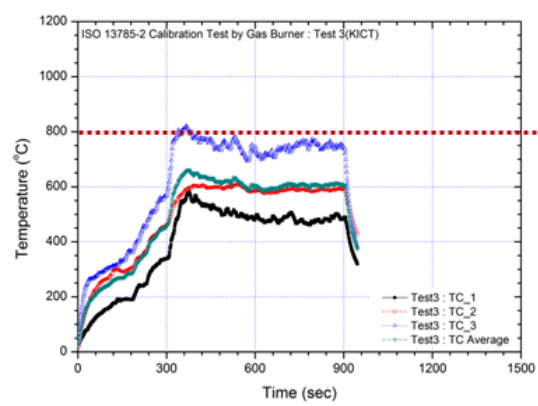
- Calibration Test Results for Gas Burners(Temperature at top of the opening)



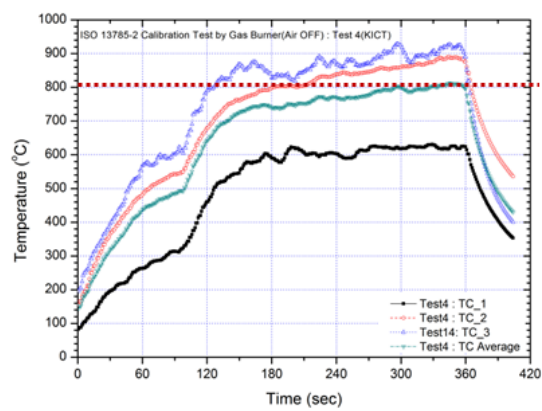
Test 1



Test 2



Test 3

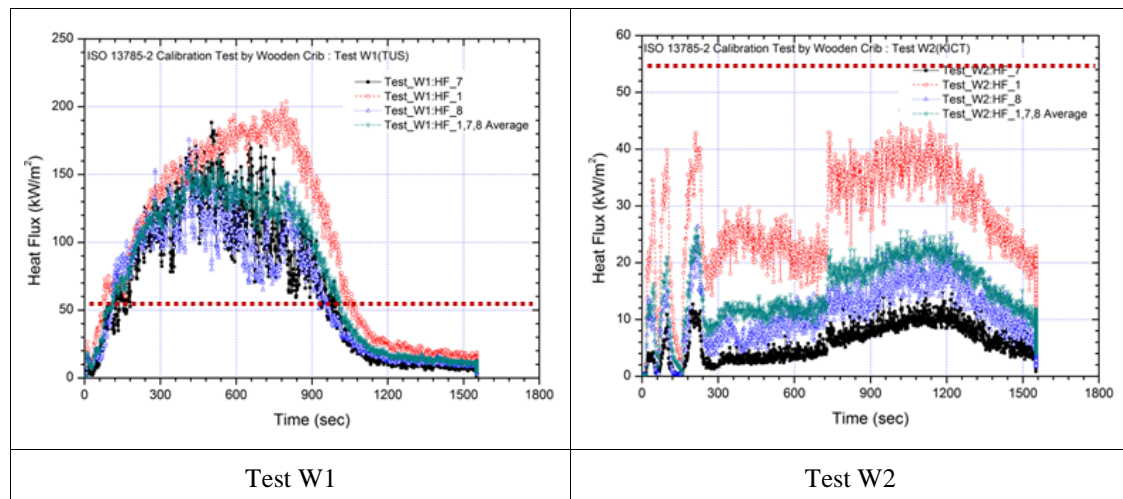


Test 4

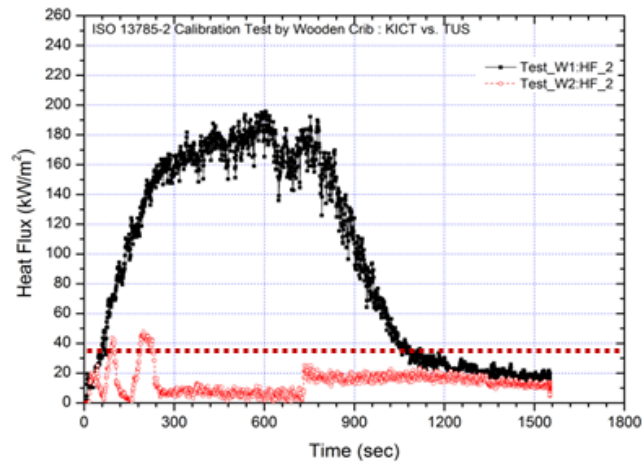
☐ ISO 13785-2 Calibration Test Case(Wooden Cribs)

	Test W1	Test W2
Date	Nov. 2014	March. 2015
Institute	TUS(Japan)	KICT(Korea)
Fuel	Wooden Crib	Wooden Crib
Photo		

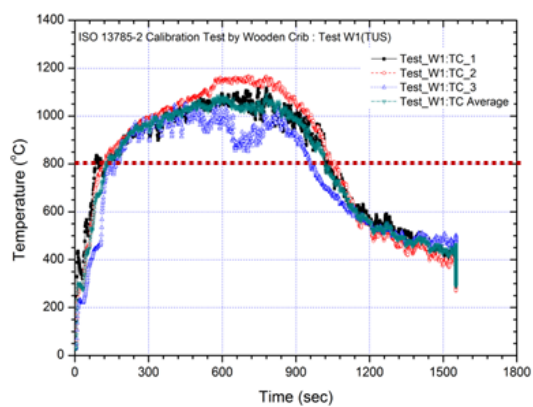
– Calibration Test Results for Gas Burners(Total Heat Flux meter at 0.6m above the opening)



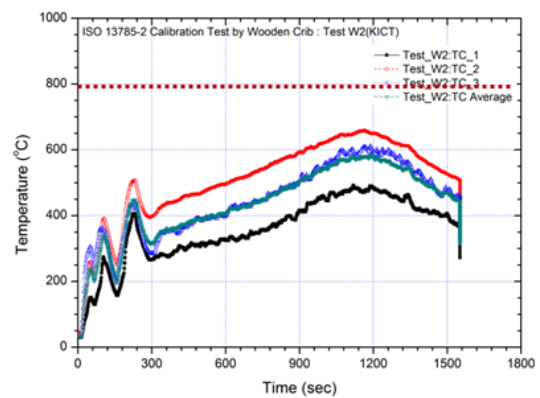
- Calibration Test Results for Gas Burners(Total Heat Flux meter at 1.6m above the opening)



- Calibration Test Results for Gas Burners(Temperature at top of the opening)



Test W1



Test W2

☐ Discussion

- As the calibration results, TUS measuring values(heat flux and temperature)are higher than KICT.

It is predicted to air supply system and ventilation condition different.

- From experience with ISO 13785-2, it is necessary to clarify some specific items(ig. main and alternative ignition sources, ventilation condition) with the calibration procedure. But there are unclear things for calibrating process for conducting this standard as follows

- Heat-flux meter's specification would be specified :

- : A range of the heat-flux meter is '(0~100) kW/m²'.

- : But it should be extended or modified based on the experimental result of Korea and Japan.
It's not enough.

- : And also, the detailed specification of heat-flux should be considered whether it's proper or not.

- Ventilation Condition

- : It should be clarified that the ventilation condition(Height of Hood)

- In Alternative source of Annex

- : Liquid should be specified concerning the size of pan on heptane and acetone calculation from heat of combustion.

- : The environment temp. and humidity should be described.

- : Wooden cribs: It' impossible to be ignited within 1min. It should be revised as well.

- : The calibration process on Alternative sources should be mentioned.

4. 今後の展望（今後の発展性、見込み等についても記述）

In JFY 2015, the following items are proposed as the second year work.

1. To simulate the FDS based on ISO 13785-2 configuration in calibration for the purpose of comparison with experimental results done in JFY 2014.
2. To conduct small sample by ISO 5660-2 for checking the thermal property of wooden crib and repeat ISO 13785-2 calibration test for collecting the uncertainty components(ig. Air velocity of extraction hood, heat of combustion of wood, and etc) so as to make the calibration procedure more valid.
3. To make comparison on Heat Flux and Temperature results from real scale façade calibration test using gas burner(TUS and KICT) and FDS Simulation results
4. To apply the liquid fuel described in ISO 13785-2 as an alternative ignition source, and compare the other calibrating methods' results.

To reflect the final results into the draft of ISO 13785-2 revision, and propose our draft to the ISO TC92 SC1 WG7 in 2015.

Research Plan in 2015

- 1) By September 2015
 - Conduct the cone calorimeter test(ISO 5660) with wooden cribs
 - Numerical Simulation of Façade calibration model by city gas(JAPAN) and LPG(KOREA)
 - Analysis of calibration results(Simulation vs. Real Scale Test)
- 2) By January 2016
 - To Clarify to Alternative Ignition Source of the Façade test method(ISO 13785-2)
 - Correlation analysis Study on input airflow and ventilation condition(FDS Simulation)
- 3) By March 2015

Summary of research results and Revision ISO 13785-2 Calibration Methods

5. 成果の公表状況（学会への発表、学術誌への投稿等を記述。予定も含む）

- “A Revision Study on the International Standard(ISO 13785-2) for Flame Spread of Façade Fire”, Nov. 28th, 2014 , 2014 SSS Autumn Conference
- “A Experimental Study of Calibration Method for High-Rise Building Vertical Spread”, Feb. 25th, 2015 , 2015 Proceeding of Korea Society of Hazard Mitigation
- ISO TC92 SC1 meeting in Paris(Oct. 7th ~ 10th, 2014) / in London(April. 7th ~ 10th, 2015)

6. 経費の使用状況

消耗品費・会議費・印刷費等		旅費		人件費	
事 項	金額(円)	事 項	金額(円)	事 項	金額(円)
		共同研究者 旅費 2 名	135,221		
小計	0	小計	135,221	小計	0
東京理科大学 負担分 総計 135,221 円					
Korea Institute of Civil Engineering and Building Technology (Fire Research Institute) 負担分 総計 150,000 円					

※スペースが足りない場合はページを増やしても構いません。

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※本成果報告概要書と併せて、研究報告書を提出頂いても構いません。(フォーマットは問いません。)

※後日開催予定の成果講評会で使用されるプレゼンテーション用の電子ファイルについても提出願います。(学内での報告に使用)