

## 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><b>1. 研究の背景および目的</b></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><b>2. 利用施設及び利用日</b></p> <ul style="list-style-type: none"> <li>・ Façade Fire Tester(ISO 13785-2)装置 TUS (2014 年 11 月 12 日 ~ 11 月 14 日)</li> <li>・ Façade Fire Tester(ISO 13785-2)装置 KICT (2015 年 3 月 30 日 ~ 3 月 31 日)</li> </ul>			

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.

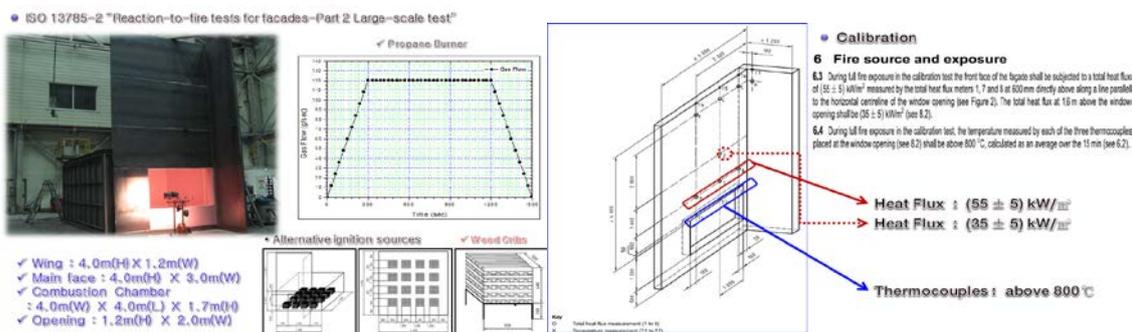
1. To make the correlative analysis of the Façade test method between Korean and Japan
2. To make the calibration test by gas burner and wooden crib by ISO 13785-2
3. To compare the calibration results in terms of heat flux meter and thermocouple
4. To report test results

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.

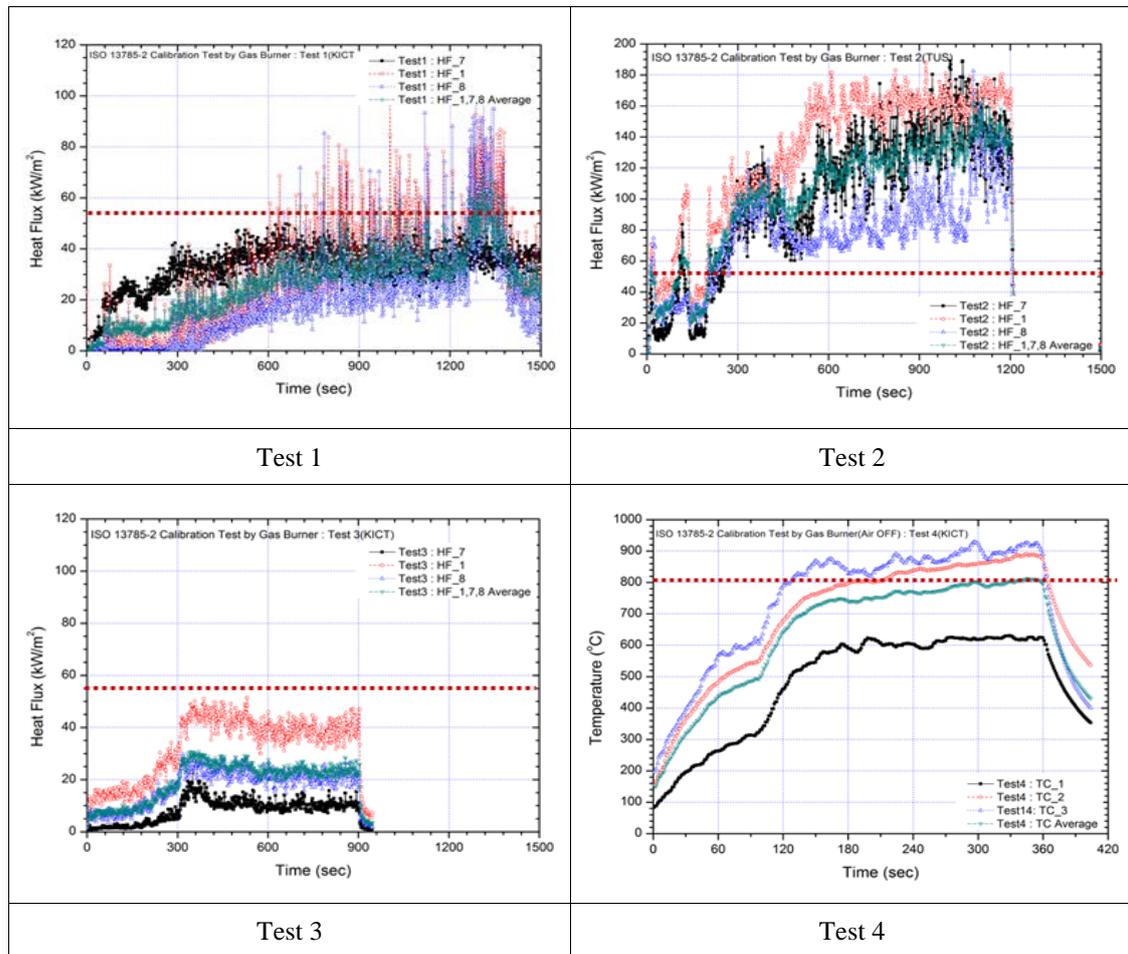


<Façade Test(ISO 13785-2) & Calibration Method>

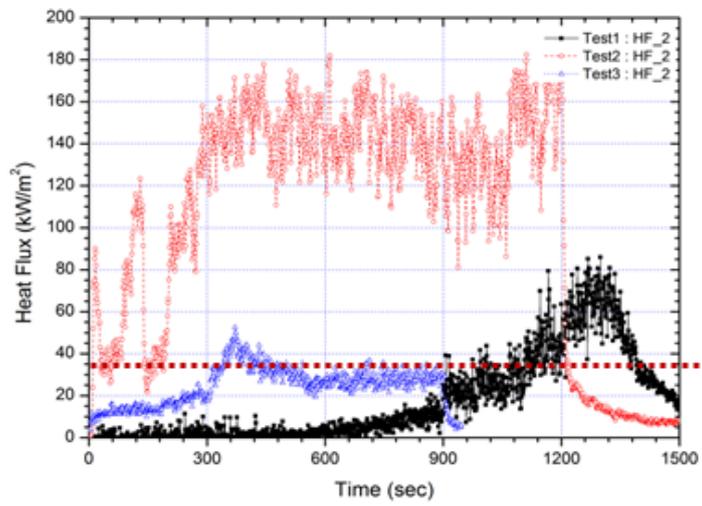
□ ISO 13785-2 Calibration Test Case(Gas Burner)

	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				

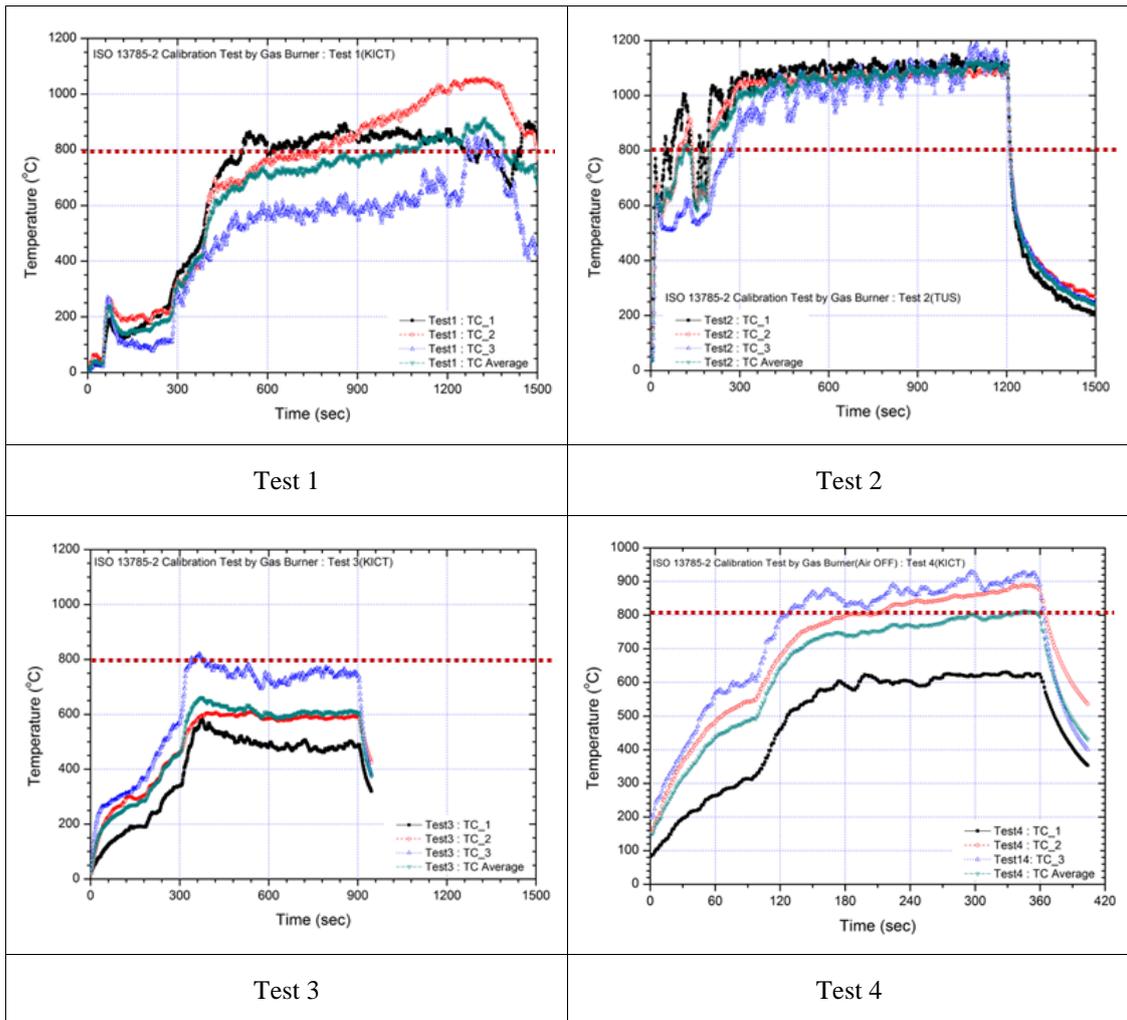
- Calibration Test Results for Gas Burners(Total Heat Flux meter at 0.6m above the opening)



- 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

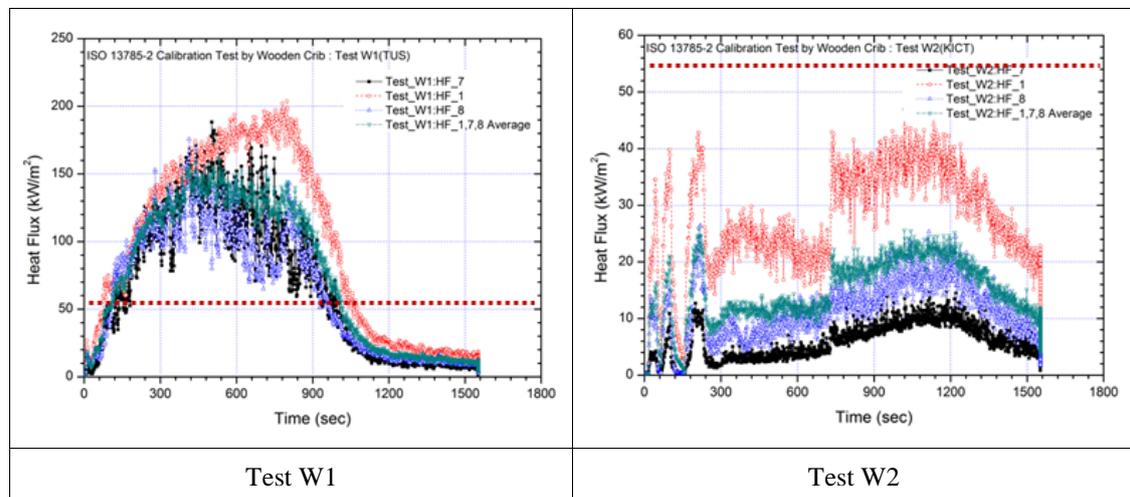
Test 3

Test 4

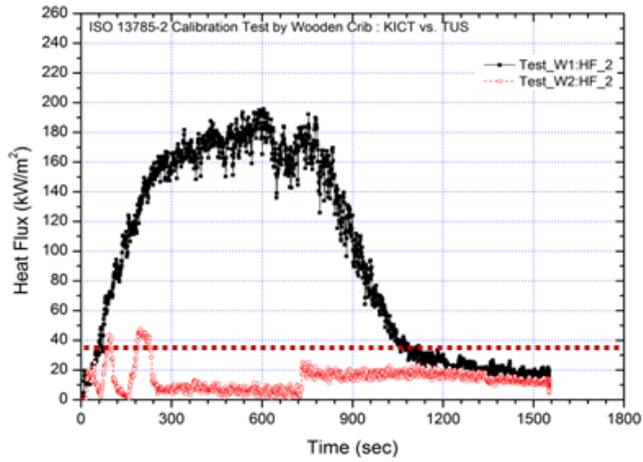
ISO 13785-2 Calibration Test Case(Wooden Cribs)

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

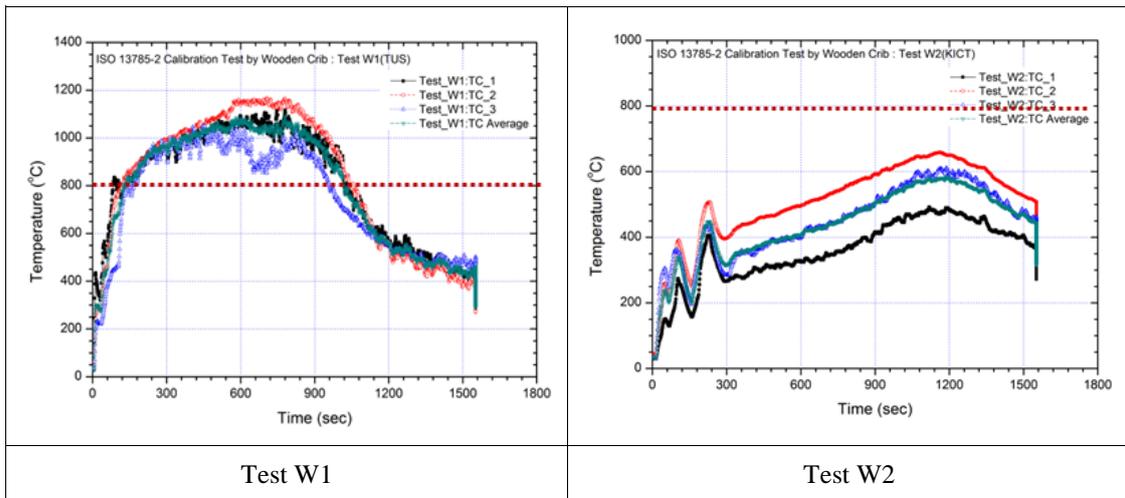
- Calibration Test Results for Gas Burners(Total Heat Flux meter at 0.6m above the opening)



- 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)



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/m<sup>2</sup>'.

: 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. 28<sup>th</sup>, 2014 , 2014 SSS Autumn Conference
- “A Experimental Study of Calibration Method for High-Rise Building Vertical Spread”, Feb. 25<sup>th</sup>, 2015 , 2015 Proceeding of Korea Society of Hazard Mitigation
- ISO TC92 SC1 meeting in Paris(Oct. 7<sup>th</sup> ~ 10<sup>th</sup>, 2014) / in London(April. 7<sup>th</sup> ~ 10<sup>th</sup>, 2015)

2014년 표준학회 추계학술대회 2014 SSS Autumn Conference



# 2014년 표준학회 추계 학술대회

일시 2014년 11월 20일(금) 10:00~17:30  
장소 서울 코엑스컨벤션 4층  
주최 SSS(사)표준학회 / F&E 한국방재학회  
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SESSION 01 학술편집 \*\* 5

## 건축물 외장재 화염확산평가를 위한 표준시험법(ISO 13785-2) 개정 연구<sup>1)</sup>

유용호, 박계원<sup>2)</sup>  
한국건설기술연구원, 방재시험연구원

### A Revision Study on the International Standard(ISO 13785-2) for Flame Spread of Facade Fire

Yoo, Yong-Ho · Park, Kye-Won<sup>3)</sup>  
Korea Institute of Civil Engineering and Building Technology, Fire Insurers Laboratories of Korea<sup>4)</sup>

**ABSTRACT**

A high rise building, various exterior materials are used for the external aesthetics and energy saving function is focused on. In the cases for fire accidents of exterior materials on BUSAN, facade fire of high rise building leads to a lot of damages for human as well as asset. In the study, the mockup fire test is performed by applying the international fire test standard(ISO 13785-2), to evaluate the vertical fire spread function of exterior finishing materials of buildings and to apply to the future vertical spread function standard. As the experience with real scale facade fire tests, it is necessary to clarify and revision some specific items(Hot-Fluxmeter and temperature) with the calibration procedure.

**Keywords** Facade, International Standard, Fire, Flame Spread, Revision

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<sup>1)</sup> 본 연구는 한국건설기술연구원 거주구조연구소 건축기반 SW 개발 및 "A Comparison Study of International Fire Test Method for Facade"결과를 준거함

2014 SSS Autumn Conference

ISSN 2288-0097

Vol.14 February 2015 (통권 제14호)

# 2015 한국방재학회 학술발표대회 논문집

## 재난에 강한, 안전한 사회



일자 2015. 2. 25(수)~26(목)  
장소 한양대학교(서울)  
주최 한국방재학회  
후원 국민안전처

한국방재학회  
Korean Society of Hazard Mitigation

주최자 087

### 초고층빌딩 수직확산 평가를 위한 고정 시험 연구 A Experimental Study on Calibration Method for High-Rise Building Vertical Flame Spread

유용호<sup>1)</sup>, 박계원<sup>2)</sup>, Yoo, Yong-Ho, Park, Kye-Won<sup>3)</sup>, 김대환<sup>4)</sup>, 박승영<sup>5)</sup>  
Yoo, Yong-Ho, Park, Kye-Won, Kim, Dae-Hwan, Park, Seung-Young

요약 본 연구에서는 부산 해운대 화재사건(2012년)과 같은 고층 건축을 위해서, 화재 피상재 확산 수직확산확산 과정을 저감시키기 위하여 도입이 필요하다고 보고 있는 실험실 시험법의 고정 시험에 대한 연구를 수행하였다. 이를 위하여 일본 동경이과대학 화재안전연구소의 고정재 시험장치를 이용한 고정시험을 실시하였으며, 최종으로는 인공기를 이용한 경우와 대체재인 목재판 등을 제외한 경우와 대체의 시험을 실시하였다. 측정항목은 가파의 경우에 대하여 열방출량, 온도, 측정항목 고정 시험결과 두 경우 모두 표준시험법에 제시하고 있는 열유량 기준(55 kw/m2)보다 열유량 높은 150 kw/m2 측정기준으로, 온도 기준(900 ℃) 역시 1,000℃ 측정하는 결과를 나타내었다. 이는 표준시험법에 가스의 종횡양향을 관찰하고 있을 뿐 공기 공급량 및 실험시 후드의 높이 그리고 주변 기류 조건 등 기타 조건에 대한 영향 세부 조건이 제시되어 있지 않기는 문제로 판명된다. 따라서, 이와 같은 실험실 화재조건 구현이 이 분야의 기여를 것으로 판단되며, 특히 위험에서 수직확산 확산 정도를 평가하기에는 내부로 기류한 화재조건으로 평가되었다. 본 실험을 통해서 표준시험법의 보다 정확한 화재현황 파악 및 고층 빌딩 평가 개선을 위한 기초 자료를 수집하였으며, 이를 토대로 한 개정 시의 용역이 기대되어 될 것으로 평가되었다.

핵심어 초고층빌딩, 화재, 피상재, 표준시험법, 고정

참사서 갈 본 연구는 "초고층빌딩 수직확산연구(초고층 화재 안전기술 개발 및 "A comparison study of International Fire Test Method for Facade(ISO 13785-2) Calibration Method"의 일환으로 이루어졌습니다. 이에 감사드립니다.

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주최자 088

### 화재 시 승강기 카 내부의 화재안전성 향상에 관한 연구 A Study on Improving Fire Safety of the Interior of a Elevator Car in case of Fire

서희준<sup>1)</sup>, 최준수<sup>2)</sup>, 김대환<sup>3)</sup>, 박승영<sup>4)</sup>  
Seo, Hee-joon, Choi, Jun-soo, Kim, Dae-hwan, Park, Seung-Young

요약 일반적으로 화재 시에는 승강기의 승강기를 통한 열전달 및 연기유입으로 인해 승강기 및 승강기 카 내부의 화재안전성이 확보되지 못할 가능성이 크므로 승강기 카 승강기를 이용하여 피난하는 화재피난객이 증가하고 있다. 그러나, 초장편승은 일정 높이 이상층 건축에서의 인명피해를 최소화 및 화재진압을 위해 비상승강기를 사용하고 있으며, 특히 최근에는 건축에서도 유입 등 화재 안전과 관련된 고층 건축물에는 비상승강기를 설치하도록 되어 화재 시에는 승강기를 통한 화재의 확산이 피난의 시기에 이르러 화재 시 승강기 카 내부의 화재안전성 향상을 위해 화재 안전을 위한 기초자료를 제시하고자 하였다.

핵심어 승강기 카, 열유동, 승강기, 화재안전성, Mock-up 시험

요약의 줄 본 연구는 2012년 국토교통기술혁신연구사업에 관한 연구의 결과로써 연구자 최준수(연구번호: 12-11-00-04-000)에 의해 수행되었습니다. 이에 감사드립니다.

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2015 Proceeding of Korea Society of Hazard Mitigation

## 6. 経費の使用状況

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小計	0	小計	135,221	小計	0
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