HEARING BEFORE THE CITY COUNCIL
COMMITTEE ON HOUSING AND BUILDINGS
PROPOSED NEW YORK CITY CONSTRUCTION CODES
TESTIMONY OF HELEN GITELSON, EXECUTIVE DIRECTOR FOR CODE RELATIONS
JUNE 20, 2007

Good morning, Chairperson Dilan and members of the Committee on Housing and Buildings. I am Helen Gitelson, Executive Director for Code Relations at the Department of Buildings. I am the principal manager of the Department's environmental review of the proposed legislation before you today. I am joined by Fatma Amer, the Department's Deputy Commissioner for Technical Affairs and Chief Code Engineer, Phyllis Arnold, Deputy Commissioner for Legal Affairs and Chief Code Counsel, and Benjamin Jones, Assistant Commissioner of the Model Code Program. I'm also joined by the Department's project managers, architects, engineers, lawyers, and other experts from our Model Code team. Thank you for this opportunity to testify regarding the environmental assessment for Intro 578A, the proposed new NYC Construction Codes. Along with the Council, our co-lead agency, we have conducted a careful, thoughtful analysis and I am pleased to share with your our process and the conclusions it produced -- that enactment of the proposed legislation before you will not have any significant adverse environmental impacts.

The City Environmental Quality Review, or "CEQR", is a process by which agencies of the City of New York review proposed discretionary actions for the purpose of identifying the effect those actions may have on the environment. As a discretionary action, development of new construction codes for New York City is subject to City Environmental Quality Review. An analysis of a proposed action pursuant to CEQR compares the future without the proposed action -- the baseline condition -- to the future with the proposed action and assesses that difference to determine if it will result in significant adverse impacts. In this instance, the baseline condition assumes that construction, development and building alteration continue to be regulated by the current New York City Building Code, Reference Standards, and associated Policy and Procedure Notices, Agency Directives, Agency Memoranda, and Agency Rules. The future with the proposed action assumes that Intro 578A is approved and that future construction of new development is regulated by the new construction codes. Additionally both the baseline condition and the future with the proposed action assume that all other city, state and federal laws, rules and regulations are in effect and unchanged.

Development in New York City is controlled primarily by two laws: the New York City Zoning Resolution, which regulates building size, population density and land use through zoning, and the New York City Building Code, which sets minimum standards for and regulates how buildings and structures must be built. A developer may build a structure "as-of-right" if the Department is satisfied that the structure complies with the provisions of the Zoning Resolution and the Building Code. Once a developer files plans with the Department that demonstrate such compliance, the Department issues a building permit pursuant to which construction may begin.

Approval of the proposed action would result in the adoption of new construction codes under which construction of new buildings would be regulated. The proposed action does not require zoning changes, or involve a specific development site or a specific construction project. Furthermore, the proposed action does not change or otherwise affect other applicable city, state, or federal regulations that govern construction activities, including, but not limited to the New York City Noise Code, the New York State Energy Conservation Construction Code, and Occupational Safety and Health Administration (OSHA) Construction Safety Regulations.

The Department conducted a comprehensive assessment of the bill before you. The first step subjected every section and subsection in every chapter in each of the proposed codes to a screening assessment utilizing the assessment procedures described in the *CEQR Technical Manual.* That analysis was designed to identify and thus eliminate from further review those sections whose changes would not exceed impact thresholds in any of the impact areas described in the *CEQR Technical Manual.* Most of the sections reviewed fell into that category. This screening assessment identified the remaining sections as those where further assessment and/or analyses were required in order to determine whether the changes proposed in each would exceed impact thresholds in any of the impact areas described in the *CEQR Technical Manual.* In addition to the considerations outlined in the *CEQR Technical Manual* and because of the unique type of action under review, the environmental assessment considered the following:

- Land Use, Zoning, and Public Policy

  Because of the nature and purpose of the construction codes, consideration of public safety was included when considering impacts of the proposed action on public policy.

- Socioeconomic Conditions

  Socioeconomics, under CEQR consideration, is not related to cost-benefit. Rather, it is related to potential effects on an industry, or changes to a cluster of concentrated uses that would affect the character of a neighborhood. Relevant questions include:

- Does a particular proposed code revision have the potential to change existing installation/ operation/ demolition processes in a way that could adversely affect a specific industry as a whole? For example, does it have the potential to phase out certain types of specialized workers?
- Would a proposed code revision affect an existing occupancy group in a way that could pose a hardship for certain users that could result in a change to the character of a neighborhood? For example, could compliance with the new code affect the potential viability of a new restaurant/retail use among an established strip whose character is defined by such a business cluster (i.e., lighting retailers along Bowery Street, or restaurants along 47th Street "Restaurant Row")?

- Urban Design/Visual Resources

Would the proposed code revisions to the required materials or installation procedures change the visual context of a neighborhood?

- Air Quality

Would the proposed code revisions involve installation or demolition processes that could potentially emit air pollutants exceeding regulatory limits?

- Noise

Would the proposed code revisions involve use of new materials that would significantly decrease the current attenuation requirements for interior ambient noise levels?

- Construction Impacts

Would the proposed code result in changes to existing installation or demolition activities that could affect construction schedule, delivery procedures, noise levels, lane/sidewalk closures, etc?

The screening assessments were conducted by teams that included Department CEQR staff, senior level Department architects and engineers responsible for drafting the text, and documentation staff, responsible for summarizing and recording the assessment results on spreadsheets. In addition, we retained the services of a leading environmental consulting firm, to assist in the assessments and analyses.

The Department developed a uniform set of assessment options in order to insure consistency among reviewers and sections when conducting the screening. These options identified if further work was needed in order to make a determination or to explain why there was no adverse impact. The spreadsheets were also used to record the results of the additional assessments, whose process I'll discuss further in a moment. These sheets reflected the "life" of every proposed code section under CEQR review. From time to time, during the course of the screening assessment, inconsistencies or errors in the text were identified. These were noted, the text was revised and then re-assessed, and the results were then recorded on the spreadsheets. Occasionally, at the time the screening assessment of a chapter was being conducted, one section or issue may not have been finalized. This was also noted. The finalized text was then submitted to the original CEQR assessment team to conduct screening of the finalized or revised text. All changes to assessed text were re-examined to insure that the initial determination was still appropriate and valid.

Sections that required further work to assess potential for adverse impacts were subject to planning or scoping meetings in which staff developed a plan for additional analysis and assessment. The complexity or magnitude of work effort varied greatly, depending on the issue of concern. Examples of the additional work items included:

- Comparison of federal, current city and proposed requirements regarding van accessible parking to determine if the proposed codes would potentially impact compliance with minimum parking requirements, particularly for constrained sites;
- Applying tabular limits with other requirements, limitations and allowances, comparing the resulting construction classifications in relation to the height or area of buildings under the current and proposed codes;
- Comparison of current and proposed codes' minimum requirements concerning structure-borne and air-borne sound transmission; and
- Comparison of current and proposed codes' minimum stair width requirements. This analysis included consideration of the potential for environmental impacts of adoption or rejection of a text amendment to the New York City Zoning Resolution that, if adopted, would exempt the additional required stair width from the

calculation of zoning floor area in high-rise residential occupancies and thus offset any reduction in floor area resulting from the proposed code change.

In addition to assessing specific changes between the current New York City Building Code and sections of the proposed construction codes, adoption of the proposed codes will result in changes of a more systemic nature or that derive from more than one particular section of the text. The Department reviewed these kinds of proposed changes independently. They included:

- Changes in occupancy classifications
- Changes in construction type classifications
- Changes in height and area limitations
- Changes in accessibility requirements
- Changes in stair tread and riser requirements
- Changes in sprinkler requirements
- Changes in definition of high rise buildings
- Changes in approving materials for use (MEA)
- Updated national standards
- Calculations of occupancy loads (net vs. gross)

In addition to the CEQR assessments described above, we also reviewed the proposed codes' consistency with the City's Waterfront

Revitalization Program. Although the codes would not in and of themselves spur any new development, they would apply citywide, including structures and/or sites located within the boundaries of the Coastal Zone.

The Department has examined the proposed action by analyzing all of its components, singly and in combination. The provisions were carefully reviewed with respect to their potential to result in significant adverse impacts. The results of the assessment indicated that implementation of the proposed action would not result in significant adverse impacts.

Undertaking this CEQR review of the proposed New York City Construction Codes has been one of the more challenging tasks I've faced in twenty years of conducting CEQR assessments for City agencies, including the City Council, DEP, HPD and DCAS. Because the proposed action does not require zoning changes, or involve a specific development site or a specific construction project, but consists of construction standards that may be applied in innumerable ways, we have had to apply CEQR's requirements in a way that respects and accounts for those possibilities. With the help of an extraordinarily talented staff, we have comprehensively taken the required "hard look" at the potential environmental consequences of the proposed action and are satisfied that it will not result in any significant adverse environmental impacts.

Once again, thank you for holding this hearing and allowing me to testify. We would be happy to answer any questions now.

HEARING BEFORE THE NEW YORK CITY COUNCIL
COMMITTEE ON HOUSING AND BUILDINGS
INTRO NUMBERS 34, 550-A, AND 4-A
TESTIMONY OF PHYLLIS ARNOLD, DEPUTY COMMISSIONER FOR LEGAL AFFAIRS AND CHIEF CODE COUNSEL, DEPARTMENT OF BUILDINGS
JUNE 20, 2007

Good morning, Chairperson Dilan and members of the Committee on Housing and Buildings. I am Phyllis Arnold, Deputy Commissioner for Legal Affairs and Chief Code Counsel, New York City Department of Buildings. I am before you today to testify on three Introductions: (1) No. 34, regarding illegal residential conversions in manufacturing zoning districts; (2) No. 550-A, regarding the filing schedule for reports of façade inspections; and (3) No. 4-A, concerning sprinklering student housing. I am joined by Fatma Amer, the Department's Deputy Commissioner for Technical Affairs and Chief Code Engineer.

Intro 34

Intro 34 proposes to amend the Administrative Code to create a new infraction and increased penalties for illegal residential conversion of buildings approved for manufacturing use. It is a response to the proliferation of such conversions in a way that threatens the stability of the manufacturing sector of the City's economy.

The Department supports this bill. We believe the enactment of this prohibition with the daily penalties authorized by the bill adds a tool to our enforcement arsenal that will help us combat the residential conversion of manufacturing buildings. By helping to make such conversions unprofitable, the proposed amendment seems properly aimed at the critical incentive for the occupancy pattern it covers. We thus support its passage.

Intro 550-A

Intro 550-A proposes to amend the Administrative Code to direct the Department to promulgate rules no later than January 1, 2009 establishing staggered inspection cycles for façade inspections. Again, the Department supports this concept. Under current law, façade inspection reports are due roughly every five years on a cycle that results in a real crunch to hire the professionals required to get the inspections done and to secure the necessary equipment, such as sidewalk sheds, to make sure there is adequate protection for pedestrians. This bill addresses that crunch and we thus support it.

Intro 4-A

By contrast, although we and the universities generally support the concept of sprinklering student housing, the Department cannot support Intro 4-A. This bill proposes to amend the Administrative Code to require the sprinklering of student housing, both prospectively and retroactively. The bill distinguishes between buildings that are owned or controlled by an educational institution and used for student housing and those in which such an institution leases space for student housing. In each case, the bill requires both that new student housing be sprinklered and that existing student housing be sprinklered within 10 years. Because the bill is highly problematic and inconsistent with the Department's approach to the issue of sprinklers in student housing, we respectfully oppose it.

As a threshold matter, the bill's definitions make its provisions easily capable of being circumvented. The sprinkler requirement would apply to portions of buildings leased to a school for a period of at least four years to house students when at least 75% of the building's units are occupied by students under the age of 22. It would be far too easy to evade this requirement by limiting leases to just under four years or just under 75% of a building's units. And the age provision poses intractable enforcement challenges. The leasehold provisions of intro 4-A thus may be practically meaningless.

The prospective provisions of the bill, as applied to both institutionally-controlled buildings and leased units, are not adequate to address the fire safety needs of student residents and are inconsistent with the Department's approach to this problem as reflected in the proposed new construction codes.

First, the new codes create protections for newly constructed student housing that are more comprehensive than those here proposed:

- We've created an occupancy called "student apartments" that is a function of the new definitions of dwelling unit and family. We have classified it like apartments generally. That means every unit used as a student apartment will be fully sprinklered.
- The new codes provide protections beyond sprinklers:
  - Classic dormitory housing (without kitchens in the units) will be classified like hotels. In addition to sprinklers, these occupancies will be required to have all the bells and whistles that are required in such transient occupancies, including manual and automatic fire alarms, both inside and outside the unit, smoke detectors within the units, and notification mechanisms.
  - Student apartments - where a building's dominant use is student apartments, the occupancies will be treated like a classic dormitory.

- In the lease-type situation, if a building contains more than 15 student apartments, it must have, in addition to sprinklers, manual fire alarms in public corridors and in student-related uses such as recreational rooms, lounges, and laundries. These buildings will also have automatic fire alarms in public corridors, in areas with student-related uses, and inside certain mechanical spaces. They will also have smoke alarms in all student apartment units.

The proposed new construction codes thus address regulation of fire safety in student occupancies more comprehensively than Intro 4-A.

The retroactive provisions of Intro 4-A are even more troublesome. They not only suffer from the same deficiencies as the prospective provisions, but they threaten to undercut an ongoing and proven process for producing meaningful code change. We do not by any means claim a monopoly on this type of dialogue. But we recognize that retrofitting existing buildings is a costly proposition no matter what the particular provision. As a result, the Department has given over to its Model Code Program the overall task of developing an existing building code to cover building alterations. Student occupancies is one of the many issues we will there address.

We have consciously made the decision to separate code development for new versus existing buildings. In proposing the construction codes for new construction this session, the Department determined generally to allow existing buildings to comply with the 1968 code as a first step in transitioning from the 1968 code to a new set of standards for all buildings. Once the codes regarding new construction are in place, we will turn to the development of an existing building code for the City.

The process of developing a code governing alterations of existing building will reflect the same committee-based, consensus-building approach we used to develop the codes for new construction. We expect to use the next two to three years to bring all stakeholders to the table and work out methodically how we can successfully achieve the desired result. Obviously, the educational institutions will be a critical part of that process on the sprinklering and other issues. Indeed, we began those discussions with the higher education institutions over a year ago, recognizing that the matter of retrofitting for sprinklers is a particularly costly but important item. These discussions can and will address any appropriate interim fire protection measures.

Intro 4-A undercuts that ongoing process. By doing so, it threatens to impose a set of provisions on these institutions that they simply cannot live with as a practical matter. And it threatens the credibility of a process that has served this City well – by delivering a new Electrical Code in 2001 with periodic updates since then and by this year delivering the first comprehensive revision of our Building Code in 40 years.

Because of its shortcomings and its less than comprehensive approach to the issue of sprinklering student housing, the Department opposes Intro 4-A and urges the Committee to reject it.

Thank you for hearing my testimony.

chip

FOR THE RECORD

COMMUNITY HOUSING IMPROVEMENT PROGRAM, INC.

COMMUNITY HOUSING IMPROVEMENT PROGRAM
TESTIMONY
INTRO # 550A
INSPECTION CYCES FOR EXTERIOR ALLS

THIS TESTIMONY IS SUBMITTED BY PATRICK SICONOLFI, EXECUTIVE DIRECTOR OF THE COMMUNITY HOUSING IMPROVEMENT PROGRAM (CHIP). CHIP IS AN ASSOCIATION OF MEDIUM AND SMALL OWNERS OF RESIDENTIAL RENTAL PROPERTY. AMONG THE SERVICES CHIP PROVIDES ARE PROGRAMS DESIGNED TO AID OWNERS IN ACHIEVING AND MAINTAINING COMPLIANCE WITH APPLICABLE LAWS AND REGULATIONS.

CHIP SUPPORTS THE PASSAGE OF INTRO 550A, WHICH PROVIDES FOR STAGGERED FAÇADE INSPECTIONS CYCLES FOR OWNERS OF BUILDINGS COVERED BY SECTION 27-129 OF THE NEW YORK CITY ADMINISTRATIVE CODE, AS AMENDED BY LOCAL LAW 11 OF 1998.

THE LAW CURRENTLY REQUIRES OWNERS TO GET A CRITICAL EXAMINATION OF THEIR BUILDING'S EXTERIOR WALLS AND APPURTENANCES PERFORMED BY A LICENSED ARCHITECT OR ENGINEER, MAKE ANY REQUIRED REPAIRS, AND FILE AN INSPECTION REPORT WITH THE DEPARTMENT OF BUILDINGS (DOB) EVERY FIVE YEARS. ALL OWNERS ARE GIVEN A SET TWO-YEAR PERIOD TO MEET THESE REQUIREMENTS. THE MOST RECENT TWO-YEAR CYCLE (CYCLE 6) ENDED ON FEBRUARY 21, 2007. AS BECAME APPARENT DURING CYCLE 6, ALL AFFECTED OWNERS END UP SCRAMBLING TO TAKE THE REQUIRED STEPS BY THE DEADLINE. HOWEVER, THERE ARE A LIMITED AMOUNT OF LICENSED ARCHITECTS AND ENGINEERS AVAILABLE WHO CAN PERFORM THE NECESSARY INSPECTIONS. AND, IF REPAIRS ARE NEEDED TO FIX UNSAFE CONDITIONS, OWNERS MUST ALSO FIND AVAILABLE CONTRACTORS WHO MUST THEN ERECT SIDEWALK SHEDS AND PERFORM THE REPAIR WORK. AGAIN, THERE ARE A LIMITED NUMBER OF AVAILABLE CONTRACTORS AND A LIMITED ABILITY TO BUILD SIDEWALK SHEDS.

AS A RESULT, MANY OWNERS ARE UNABLE TO MEET THE DEADLINE. AT THE REQUEST OF OWNERS' ORGANIZATIONS, THE DOB CREATED AN ALTERNATIVE FILING PROGRAM, TO GIVE

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CERTAIN OWNERS MORE TIME TO FILE. BUT THAT PROGRAM DIDN'T GO FAR ENOUGH, BECAUSE IT ONLY APPLIED TO BUILDINGS WITH OUTSTANDING CYCLE 5 SAFE WITH A REPAIR AND MAINTENANCE PROGRAM (SWARMP) CONDITIONS. BY STAGGERING THE DEADLINE, THE CITY WILL ENSURE THAT ALL OWNERS WILL HAVE THE NECESSARY RESOURCES TO COMPLY WITH THE LAW.

STAGGERING THE DEADLINE FOR FAÇADE INSPECTIONS WILL ALSO HELP LIMIT THE NUMBER OF SIDEWALK SHEDS THAT MUST BE PUT IN THE CITY AT ANY ONE TIME. SINCE THE DEADLINES WILL BE STAGGERED, THE REPAIRS WILL ALSO BE STAGGERED. THIS PROVIDES A SAFER ENVIRONMENTAL FOR ALL NEW YORKERS.

AGAIN, CHIP SUPPORTS PASSAGE OF #550A.

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WEST HARLEM ENVIRONMENTAL ACTION

June 7, 2007

Erik Martin Dilan
City Council Member
City Hall
New York, NY 10007

FOR THE RECORD

Dear Councilmember Dilan,

I am writing to discuss the importance of protecting the health of New Yorkers by including provisions related to mold in indoor environments in the New York City Department of Buildings' (DOB) code revisions.

WE ACT is a non-profit, community based, environmental justice organization dedicated to improving environmental health, protection, and policy in communities of color. A major part of our mission is to address the environmental health concerns associated with poor housing conditions. As you know, the older housing stocks and subsidized and public housing in which our low-income communities reside are the most vulnerable to mold infestations. As a result, our residents, who are already exposed to high environmental health risks from other urban sources (evidenced by some of the highest asthma and respiratory disease incidence in the country), must also suffer some of the highest levels of mold-related health concerns.

Both the New York City Department of Health and Mental Hygiene (DOHMH) and the Department of Housing Preservation and Development (HPD) have reported that the number of reported mold cases and complaints have increased in New York City since 1999. According to HPD, 21,121 mold complaints were filed last year—over 4000 more complaints than in 2005. Mold is largely found where the basic conditions needed for mold growth exist: water (humidity, moisture, oxygen) and an organic surface (plaster, sheetrock, carpet). Mold grows more easily on certain materials such as sheetrock, plaster, wood and carpet, and in areas with chronic leaking of pipes, roofs, and radiators such as those found in bathrooms, kitchens and basements. Unfortunately mold can spread for months without showing visible signs.

Despite the prevalence of mold complaints in several communities such as Northern Manhattan and Central Brooklyn, there are few mechanisms currently in place to address the emerging issue. Inadequate standards for building materials and construction practices leave far too many residents exposed to mold and could lead to a public health crisis if left unattended.

Incorporating green building practices into the building code will reduce the occurrence of mold in indoor environments by, for example, phasing out or reducing the use of materials that promote mold growth in new constructions, renovation, or expansion projects. Chapter 12 (Interior Environment) of the draft revisions does not include language that would ensure protection of public health as it relates to mold growth and exposure. However, there is an opportunity to incorporate such language in Section BC 1210 (Surrounding Materials), in order to strengthen the code and safeguard the health of New Yorkers and the sustainability of New York City buildings.

WEST HARLEM ENVIRONMENTAL ACTION

I have included several recommendations from WE ACT and our partners (please see attachment). Moisture control and monitoring of indoor humidity is essential to preventing mold growth in indoor environments. However, phasing out the use of construction and building materials that promote mold growth; requiring treatment of target mold-prone areas; and "greening" construction practices and building designs also play a significant role. These provisions will help avoid the cost of structural repairs in the future as well as reducing the public health costs related to mold exposures.

If you have any questions, please contact Julien Terrell, Housing and Health Campaign Coordinator at (212) 961-1000 extension 319, should you need any additional information. Thank you.

Sincerely,

Peggy Shepard
Executive Director

Attachments: Recommendations for building code revisions related to mold resistive materials.

cc:

Counc. Tony Avella
Counc. Maria Baez
Counc. Leroy Comrie Jr.
Counc. Lewis A.Fidler
Counc. Dennis P.Gallagher
Counc. Robert Jackson
Counc. Rosie Mendez
Counc. James S.Oddo
Counc. Joel Rivera
Counc. Thomas White Jr.

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WEST HARLEM ENVIRONMENTAL ACTION

Recommendations for building code revisions related to mold resistive materials

1) Modify building codes to phase out the use of construction materials that promote mold growth and require treatment of target areas, such as crawl space or basement walls and on the floor deck below the first floor, with an approved mold barrier spray.

2) Installation of water resistive barriers behind all facades to prevent vapor permeation to materials behind the wall.

3) Eliminate the use of sheetrock and other materials which promote mold growth in the following areas:
   - Basements and other below grade rooms
   - Mechanical rooms
   - Interior surfaces (rear walls) of fan-coil type convector units
   - Ceilings beneath cold water pipes
   - Ceilings beneath air handlers housed in ceiling plenums
   - Ceilings beneath uninsulated air conditioning supply ducts
   - Bathroom ceilings
   - Plumbing and electrical chases
   - Laundry rooms
   - Walls beneath kitchen sinks

4) Phase out the use of sheetrock and substitute it with sheetrock which does not contain organic materials that support mold growth; including:

   - Non-paper faced gypsum board (fiberglass matt finished gypsum board)
     Newer version does not require skin coating before painting
     Same fire rating as standard gypsum wallboard

   - Cement board
     Requires skim coating before painting
     Not for use on fire rated walls

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William Shuzman
Executive Director

Gary Higbee AIA
Director of Industry Development

6/20/2007 TESTIMONY OF GARY HIGBEE BEFORE
NEW YORK CITY COUNCIL IN SUPPORT OF INTRO 578(A)
ON BEHALF OF THE STEEL AND THE ORNAMENTAL METAL INSTITUTES OF NEW YORK

Submitted by: Gary B. Higbee AIA
Director of industry development
The Steel Institute of New York /
The Ornamental Metal Institute of New York
211 East 43rd Street
Suite 804
New York, NY 10017

I'm speaking in support of Intro 578 and its companion amendment bill on behalf of The Steel Institute of New York and the Ornamental Metal Institute of New York. The Institutes are organizations whose members are contractors engaged in the erection of structural steel, pre-cast concrete, and architectural, ornamental, and miscellaneous metal used in building projects located throughout the five boroughs of New York City.

Members of the Institutes contribute to the vitality of the city by annually employing some 4,000 structural and ornamental iron workers. Their work is showcased in the city's famous skyline, its stadiums, its transportation centers, and is evident everyday throughout the five boroughs on building projects seemingly going on at every street corner.

My remarks are to request that the Council pass without delay Int. No. 578(A), which continues the initiative of replacing the city's present construction code with one based on the *International Building Code* (IBC). The bill contains requirements that directly impact our industry. Specifically, to the extent that implementation of this bill is timely, it will facilitate the use of modern materials, design formulas and methods of construction, to the advantage of builders and ultimately building occupants.

Failure to pass Intro 578 with the amendment bill will only delay this essential code modernization in New York City and prevent the building construction industry from taking advantage of the material innovations afforded to jurisdictions elsewhere in the State and, in fact, across the country. Adoption of the code and continuing modernization is as important to regulatory streamlining as the noteworthy efforts of the Department of Buildings with respect to the administering of permits and inspections.

The development of this bill represents a significant effort and intense personal commitment by not only the city but more than 400 industry leaders and technical experts representing design, construction, labor, real estate, fire service and city agency stakeholders called upon to help adapt a modern, model building code to unique city conditions. As a consequence, the bill enjoys broad support among stakeholders in the city's vigorous and highly regarded construction industry, from developers and community groups that start the ball rolling, to designers and builders that get the shovel in the ground and help turn aspirations into reality.

Like other groups, the steel construction industry did not find the code incorporating all the provisions it believes would benefit designers and builders, but it did find a department and process willing to fairly respond to its principal concerns. And we are hopeful this process will be ongoing. At a time when the nation's design and construction industry, product manufacturers and enforcement community are increasingly familiar with the format and content of the IBC, and with other jurisdictions in the surrounding Northeast region using or about to use the IBC—including the adjacent counties of Nassau, Suffolk and Westchester—adopting the IBC represents an extraordinary opportunity to modernize our construction requirements, advance building safety, and simplify the regulatory process.

I therefore request that you support Int. Bill No. 578(A).

Respectfully submitted,

Gary B. Higbee, AIA
Member, Mayor's Model Code Task Force
(Construction Requirements Committee)

Testimony of
Russell Unger, Executive Director
U.S. Green Building Council, New York Chapter

Before the New York City Council Committee on Housing & Buildings

June 20, 2007

Good morning Chairperson Dilan and members of the Committee, my name is Russell Unger and I am the Executive Director of the behalf of the New York Chapter of the U.S. Green Building Council. I am pleased to express the Chapter's strong support for Int. 578.

For those of you who are not familiar with the New York Chapter, as our name implies we are the local chapter of a national organization. Like USGBC national, we are working to advance buildings that are environmentally responsible, profitable, and healthy places to live and work. Our membership includes many of the city's top developers and builders, building product manufacturers and the country's foremost architects and engineers.

Int. 578 incorporates many important sustainability provisions, which you undoubtedly heard about in detail from Commissioner Lancaster last week. I am not going to repeat what she would have already gone over but will instead explain why it's important that this code contains environmental provisions and highlight some examples.

If you live in New York and care about the environment, you should care about buildings. This is because buildings account for 79% of this city's greenhouse gas emissions, 95% of its electricity use and 85% of its water use. Whether you are concerned with climate change, loss of biodiversity, air pollution or protecting our watershed, in New York it comes down to buildings.

Int. 578 includes many provisions that will improve the environmental and health performance of this city's buildings. For instance, there are rebates on Department of Building fees for building that undertake certain green measures. Other provisions of Int. 578 just require or permit common sense green building techniques. For example, under the bill, new and renovated rooftops must be painted white. There is absolutely no reason why people are not doing this already. A black rooftop attracts heat and means the building has to spend more money and use more energy for cooling. In contrast, white reflects sun and heat.

Another example is the provisions in Int. 578 requiring buildings to demonstrate compliance with the State energy code. This may not sound like much but to the present day compliance has been based strictly on the honor system.

One of the questions I've been asked many times is whether this bill goes far enough in greening the building code. The short answer is "no, of course not." There is much, much more that can and must be done to improve the building code. However, Int. 578 has never been held out as the final word on greening the building code. Instead, it's a down payment, an important first step towards filling New York City with green buildings.

Well before the environment was nearly as popular an issue as it is today, this Council took the lead in passing countless groundbreaking environmental laws, including the city's landmark green building law. I hope that the Council will build upon these past environmental successes by approving Int. 578 and moving on to the next steps for greening the city's building code.

I am happy to answer any questions that you may have.

Alexander Hamilton U.S. Custom House, One Bowling Green, Suite 419, New York, NY 10004

CNYC

Council of New York Cooperatives & Condominiums
INFORMATION, EDUCATION AND ADVOCACY

250 West 57 Street • Suite 730 • New York, NY 10107-0700

Testimony before the City Council
Committee on Housing & Buildings
June 20, 2007

In Support of Proposed Intro 550A

My name is Mary Ann Rothman. I am the Executive Director of the Council of New York Cooperatives & Condominiums, a membership organization of more than 2300 housing cooperatives and condominiums located throughout the five borough of New York City and beyond. For three decades, CNYC has provided education, information and advocacy to our members, and has tried to bring their needs to the attention of lawmakers and of government agencies. Today I speak in strong d support of proposed Intro 550A, which will authorize the Department of Buildings to spread across time compliance with Local Law 11 of 1998, rather than forcing all affected buildings to file at the same time once every five years.

This important initiative will greatly improve the ability of CNYC's members to comply with the law while still obtaining work and materials of high quality. This will be so, simply because everyone will no longer be scrambling for the same services at the same time. And, with one fifth of all buildings required to file a Local Law 11 report each year, architects and engineers, contractors and suppliers will no longer have to cope with periods of overwhelming demand, followed by periods of relative drought, which occur under the present system.

Assured of a steady stream of clients, contractors will be able to train and maintain a better qualified staff, rather than filling in at busy times with unskilled temporary laborers. The demand for sidewalk sheds, scaffolding, custom replacement bricks, terra cotta, synthetic replications, decorative stonework, etc. will also be spread more evenly over time, so that materials will be more readily available and prices could even be relatively reasonable.

Finally, the Department of Buildings itself will be better able to deploy staff in timely review of Local Law 11 filings, rather than being inundated with filings every five years and digging slowly out of the backlog.

I applaud this important improvement that Council member Garodnick and his colleagues have proposed for the enforcement of facade safety in our City. I urge 9 the City Council to vote proposed Intro 550A into law.

Phone 212 496-7400 • Fax 212 580-7801 • e-mail info@CNYC.coop • Website: www.CNYC.coop

Good Morning, Members of the City Council Housing and Buildings Committee.

I am Theresa Scavo, Chairperson of Community Board 15 in Brooklyn.

As per the City Charter, the jurisdiction of the waterfont whether it be for development, operation, maintenance or regulation lies in the hands of the Department of Small Business Services. The Commissioner is given the duty to oversee 571 miles of our cities waterfront. The Dockmaster Unit, which is part of the Department of Small Business Services, is responsible for carrying out this task. The unit is comprised of several devoted individuals who work feverously to inspect and maintain the integrity of our coastline.

My community is a waterfront area comprising Sheepshead Bay, Gerritsen Beach, Plumb Beach and Kingsborough Beach. Recently several problems have arisen along the waterfront. In Sheepshead Bay we have eroding Bulkheads, in Gerritsen Beach there is also a Bulkhead problem and a myriad of sunken vessels. On Plumb Beach as well as Kingsborough Beach, there are sand bars forming which are narrowing the boat channels. I am far from being an expert on bulkheads or dredging but it was my pleasure to contact the Dockmaster at Small Business for help.

Once I realized the Unit existed I have reached out innumerable times for help in my community. Mr. Frank Carnesi is extremely knowledgeable and goes above and beyond to help find a solution to a problem. His unit runs like a well oiled machine.

I am here today to ask the question "if it is not broke why fix it?" Why move the Dockmaster's Unit from the umbrella of the Small Business Services to the Department of Buildings. This unit functions undaunted in its present location. We are all aware of the problems that plague the Buildings Department and the chain of command from plan inspectors to field inspectors. Where does this unit fit in? Inspecting a building foundation is far from inspecting a bulkhead. This is a specialized unit that enforces city codes on our waterfront and is unencumbered by the bureaucratic red tape. Please leave the Dockmaster's Unit where it is and help keep our waterfront safe.

American Iron and Steel Institute

45 South Main Street, Suite 312
West Hartford, CT 06107-2402

P.O. Box 270008
West Hartford, CT 06127-0008
Phone 860.231.7520
Fax 860.231.0003

20 June 2007

Honorable Erik Martin Dilan
Honorable members of the Committee on Housing and Buildings
City of New York
City Hall
New York, NY 10007

Re: City Council Hearing on Intro 578
Enacting the New York City Construction Codes

Dear Chairperson Dilan and Committee Members:

I am the Regional Director for the American Iron and Steel Institute, an Institute that represents the steel mills of Canada, Mexico and the United States. The Institute's member companies represents approximately 75% of both US and North American steel capacity.

We are writing to announce our support for the proposal to integrate and update the Building Code of the City of New York. This is a momentous and positive approach for the City of New York, and it potentially presents an opportunity for New York City to see tremendous growth. This proposal also represents the next logical step in the ongoing efforts by the Department of Buildings to make more efficient and cost effective the Building Code. As a result, we therefore encourage the members of the Council to act favorably towards Intro 578.

The Institute looks forward to our continued work with the City of New and the Department of Buildings to promote the use of, and awareness in the design and construction markets with, this updated Building Code of the City of New York.

Respectfully submitted,

Jonathan Humble, AIA
Regional Director

Representing steel producers
in Canada, Mexico and the United States

NATIONAL
FIRE
SPRINKLER
ASSOCIATION, INC.

NORTHEAST REGIONAL OFFICE
629 Plank Road, Suite 250 • Clifton Park, NY 12065 • (518) 373-9392 • FAX (518) 383-3950
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Committee on Housing & Buildings
The City of New York
City Hall
New York, NY 10007

20 Jun 2007

RE: Intro 578A

Honorable Chair~

Thank you for the opportunity to speak on this very important topic. The National Fire Sprinkler Association fully supports New York City in the move to adopt a version of a modern series of model codes.

As a former firefighter, I would like to highlight the Residential Fire Sprinkler issue for dwellings. My hope is that New York City will consider adding a mandate for automatic fire sprinkler systems to be installed in <u>all</u> new construction of one- and two-family homes. The proposed section 903.2.7 excluding homes of three stories or less above grade plane will not address the residential fire problem.

According to the National Fire Protection Association (NFPA) and the United States Fire Administration (USFA);

"U.S. fire departments responded to an average of 375,200 reported home structure fires per year during the five-year-period of 2000-2004. These fires caused an estimated average of 2,970 civilian deaths, 14,390 civilian injuries, and $5.6 billion in direct property damage per year. Three-quarters (75%) of the reported home structure fires and 87% of the fatal home fire injuries occurred in one- and two-family dwellings (including manufactured homes). The remainder occurred in apartments or similar properties." "Twenty-four percent of all home fire deaths were caused by fires that started in the living room, family room or den; 23% resulted from fires originating in the bedroom. Although smoke alarms operated in 49% of the reported home fires, no working smoke alarm was present in 65% of the home fire deaths."*

Automatic fire sprinklers designed under the standard of NFPA 13D are a "life safety" device designed to hold unwanted fires in check allowing the occupants enough time to evacuate. In more than 90% of reported cases however, the fire has been totally extinguished and in other incidents the fire is at least held to the room of origin. There has never been a fire fatality in a home with an automatic fire sprinkler system.

I hope you will consider adding this to the Residential sections of the proposed building code.

Most sincerely,

Dominick G. Kasmauskas, CFPS

*- These estimates are based on data from the U.S. Fire Administration's (USFA's) National Fire Incident Reporting System (NFIRS) and the National Fire Protection Association's (NFPA's) annual fire department experience survey.

NATIONAL
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Committee on Housing & Buildings
The City of New York
City Hall
New York, NY 10007

20 Jun 2007

RE: Intro 4A

Honorable Chair~

The National Fire Sprinkler Association is glad to support New York City in the move to address the need for automatic fire sprinkler systems in student housing. As a former firefighter of 32 years, I personally commend the Council members who authored Intro 4A in tackling this very important life safety issue.

However, a significant amount of off campus housing stock in New York City will continue to lack the benefits of automatic fire suppression as Intro 4A is presently written. It is in hopes that now or in the near future the Council of the City of New York will consider including other categories of student housing to the list. As noted by *Campus Firewatch*, nationwide it is the off campus student housing where 81% of the student fire deaths have occurred since January 2000. Beyond the fatality issue, after a tragic fire, one must also consider that there are dozens of injuries and the lives of many friends and family negatively affected forever. The school and surrounding business community will also suffer through economic disruption and in the end, we all pay for this in some way.

A parent sending their child away to any school should have the confidence that their child will not fall victim to the ravages of fire. Without the benefit of automatic fire sprinklers in all residential environments, parents cannot obtain that confidence.

Thank you for moving forward with Intro 4A to help make the living environment of students safer.

Most sincerely,

Dominick G. Kasmauskas, CFPS

Inclusions:

- Exhibit A~ *Campus Firewatch* Information Sheet.

CAMPUS FIRE SAFETY INFORMATION SHEET

Updated Saturday, April 21, 2007

CAMPUS Firewatch

Annual number of fatalities by academic year

2000-2001	17
2001-2002	14
2002-2003	14
2003-2004	11
2004-2005	14
2005-2006	11
2006-2007	20

Fatal fires 2006-2007 academic year

University of Pittsburgh	Pittsburgh, Pennsylvania	1 killed in an off-campus fire
Nebraska Wesleyan University	Lincoln, Nebraska	1 killed in a fraternity fire
University of Missouri – St. Louis	St. Louis, Missouri	1 killed in a fraternity fire
University of Nebraska – Lincoln	Lincoln, Nebraska	2 killed in an off-campus fire
Marshall University	Huntington, West Virginia	5 killed in an off-campus fire
University of Mississippi-Meridian	Linwood, Mississippi	3 killed in an off-campus fire
Halifax Community College	Weldon, North Carolina	1 killed in an off-campus fire
Boston University	Boston, Massachusetts	2 killed in an off-campus fire
Longwood University	Farmville, Virginia	2 killed in an off-campus fire
Boston University	Boston, Massachusetts	1 killed in an off-campus fire
Cincinnati State	Cincinnati, OH	1 killed in an off-campus fire
Academic year-to-date total		**20**

NOTE: Two of the victims at the Marshall University fire were not students. However, they were visiting a student's apartment at the time of the fire and are therefore included as campus-related fire deaths. In the University of Nebraska-Lincoln fire, the victim was due to deliver her baby on the day she was killed and the fire department classified this as two victims. Two of the victims in the University of Mississippi fire were the spouse and daughter of the student. The victim in the second Boston University off-campus fire was a visitor to a student's apartment. The victim in Cincinnati was taking the spring semester off but remaining in off-campus student housing.

Campus Fire Safety Month

In 2006, thirty-one states issued proclamations recognizing September as Campus Fire Safety Month.

Alabama
Alaska
Colorado
Connecticut
Hawaii
Illinois
Indiana
Kansas
Kentucky
Louisiana
Maine
Maryland
Massachusetts
Michigan
Mississippi
Missouri
Nebraska
New Jersey
New Mexico
New York
North Carolina
Oklahoma
Oregon
Pennsylvania
Rhode Island
South Carolina
Texas
Utah
Vermont
Virginia
Wisconsin

In addition, the U.S. House of Representatives pass a resolution recognizing September as Campus Fire Safety Month in 2006 and resolutions have been introduced in Congress in 2007.

Current Legislation in Congress

The following bills have been introduced in Congress. More information is available on Campus Firewatch's RESOURCE page at www.campus-firewatch.com.

- Campus Fire Safety Month Resolutions (HRes 95. Senate Res 105)
- Campus Fire Safety Right-to-Know Act (HR 592 and S 354)
- College Fire Prevention Act (HR 642)
- Collegiate Housing and Infrastructure Act (HR 643 and s 638)
- Fire Sprinkler Incentive Act (HR 1742 and S 582)

P.O. Box 1046, Belchertown, MA • 01007 • 1-413-323-6002 (tel) • 1-413-460-0092 (fax)
www.campus-firewatch.com • ecomeau@campus-firewatch.com

CAMPUS FIRE SAFETY INFORMATION SHEET

Updated Saturday, April 21, 2007

CAMPUS Firewatch

The following information has been compiled by Campus Firewatch. Please note that much of this information is gathered by monitoring the wire services so the actual number of fatal fires, especially in off-campus occupancies, may be higher.

Common Factors

According to information compiled by Campus Firewatch, 81% of the campus-related fire fatalities across the nation since January 2000 have occurred in off-campus housing. Four common factors in a number of these fires include:

- Lack of automatic fire sprinklers
- Missing or disabled smoke alarms
- Careless disposal of smoking materials
- Impaired judgment from alcohol consumption

Catastrophic, multiple-fatality fires

Since January 2000, approximately 12% of the fires have killed 43% of the victims. In other words, a small percentage of the fires, which are classified by Campus Firewatch as catastrophic, multiple-fatality fires, are killing a large number of the victims. Many, but not all, of these fires were off-campus.

1/19/00	Seton Hall University	3
3/19/00	Bloomsburg University	3
8/20/00	Berkeley, California	3
11/2/01	Virginia Commonwealth Univ.	3
2/15/02	Univ. of NC-Greensboro	4
4/13/03	Ohio State University	5
9/20/03	Univ. of Minnesota-Twin Cities	3
5/22/04	Indiana University	3
8/27/04	University of Mississippi	3
4/10/05	Miami University	3
6/7/05	Cons. of Recording and Arts	3
1/13/07	Marshall University	5
2/3/07	MS State Univ.-Meridian	3

Campus-related fire fatalities from January 2000 to April 21, 2007

Occupancy	Deaths	% of total
Off-campus	88	81%
Residence Hall	10	9%
Greek housing	10	9%
Other	1	1%
Total	**109**	

According to the U.S. Department of Education, there are approximately 17,000,000 students enrolled in 4,100 colleges and universities across the country. Approximately 2/3 of the students live in off-campus housing.

Geographic distribution of fire fatalities

Ohio	13
North Carolina	10
West Virginia	8
Indiana	7
Pennsylvania	7
Massachusetts	6
Mississippi	6
Kansas	5
Virginia	5
California	4
Illinois	4
Texas	4
Minnesota	3
Nebraska	3
New Jersey	3
New York	3
Alaska	2
Georgia	2
Kentucky	2
Maryland	2
Missouri	2
DC	1
Iowa	1
Louisiana	1
Michigan	1
Oklahoma	1
Oregon	1
Rhode Island	1
Tennessee	1

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UNIFORMED
FIRE DEPARTMENT, CITY OF NEW YORK
FIRE OFFICERS
LOCAL 854, INTERNATIONAL ASSN. OF FIRE FIGHTERS, AFL-CIO
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225 BROADWAY ☆ NEW YORK, NY 10007 ☆ SUITE 401
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TESTIMONY OF
BATTALION CHIEF JOHN J. MCDONNELL, PRESIDENT
UNIFORMED FIRE OFFICERS ASSOCIATION
ON INT 4 AND INT 578
BEFORE THE COMMITTEE ON HOUSING AND BUILDINGS
June 20, 2007

Good morning Committee Chair Dilan and Committee members of Housing and Buildings. My name is Lt. Edward Boles and I am speaking on behalf of President Jack McDonnell of the Uniformed Fire Officers Association (UFOA) representing the Lieutenants, Captains, Battalion Chiefs, Deputy Chiefs, Supervising Fire Marshals, and Medical Officers of the FDNY.

I am here to support Intro# 4 and the installation of sprinkler systems in student housing. The UFOA's position is quite clear: "Sprinklers Save Lives." One could never put a cost on human life and if this City Council can implement a law that will help ensure the safety and preservation of human life from the ravage of fire, then our advice is DO IT! Being in the fire service and in the business of saving lives, we know that if you tinker with building codes or take the cheapest route that life may be jeopardized. According to recent studies done by the United States Fire Administration on Dormitory Fires, "each year there are approximately 1,300 documented fires in school and college dormitories in the United States and from 1994 to 2000, 27 students died and 94 students were injured in campus housing fires." Again, if this committee and the City Council can pass a bill that will require student housing to have a sprinkler system, than you would be providing an immeasurable safety standard for our young New York citizens.

We would also like to comment on the recent construction code amendments. After a long, exhaustive process of revising the construction codes done by the Department of Buildings, under the leadership of Commissioner Lancaster, and many agencies and labor groups, new codes are being considered. The UFOA appreciates Commissioner Lancaster and her staff for providing our union the opportunity to have an active role in the process, especially on the "Black Iron" issue. However, we would like this committee and the Council to keep in mind that as building materials become lighter and lighter the structural integrity of a building under fire conditions becomes compromised.

Unfortunately, the practice of using lightweight construction materials has manifested itself in the recent deaths of nine firefighters in Charleston, South Carolina. It is our hope that New York City continues its vigilance in authoring construction and building codes that preclude the use of inferior materials.

I appreciate the opportunity to testify this morning and I am available for any questions from the committee.

6/20/07 Testimony for housing hearing on Intro 578

Good Morning, my name is Raphael Rivas and I am an advocate for the Brooklyn Center for Independence of the Disabled.

The Brooklyn Center for Independence of the Disabled (BCID) is a Non-Profit community based, consumer directed center which advocates on behalf of the disability community and provides services to promote independence and community participation.

Thank you for allowing me to testify in regard to Intro 578 which deals with the Building Code

Entrances and exits to buildings need to be accessible for people with all types of disabilities. Doors to enter or exist a building should either be power doors or be opened with the push of a button so that people with physical disabilities can enter and exit easily. Ramps need to be at least 36 inches wide and should have a proper incline rate for ease of use. The Entrances of buildings should have something tactual so that blind or visually impaired people know they are entering a building.

Hallways inside of building need to be wide enough for wheelchairs to use without the inconvenience of getting in the way of others trying to pass because the hallway is to narrow.

Bathrooms in all buildings should be accessible for all people with all types of disabilities. Proper lighting is needed for visually impaired individuals and grab bars are needed for wheelchair users.

Adjustable countertops should be provided within a reasonable time once requested by a person with a physical disability who needs these countertops to live a quality of life like everyone else.

All laundry equipment in all buildings has to be accessible to all people with disabilities. The control panel on all laundry equipment needs to be accessible for all people with disabilities.

Service elevators along with regular passenger elevators need to be accessible for all people with disabilities. This way when the regular use elevator is taken out of service the service elevator can be used by all people with disabilities in its place.

All signage in all buildings need to be clear and visible to visual impaired people. No one should get lost in a building or not know where they are going because of inappropriate signage

In conclusion, Intro 578 needs to be improved and these are among the key areas. Once again I would like to thank you for your time and for allowing me to speak to you all here today.

Raphael Rivas
Advocate at BCID

Fire Safety Directors Association
of Greater New York

website: www.fsdany.org email: president@fsdany.org

INT. 578-2007 ENACTING THE NEW YORK CITY CONSTRUCTION CODES
NEW YORK CITY COUNCIL – COMMITTEE ON HOUSING AND BUILDINGS
PUBLIC HEARING JUNE 20, 2007

Testimony by: Joseph C. Razza, P.E., President
Fire Safety Directors Association

Good Morning; my name is Joseph Razza. I am a Fire Protection Engineering Consultant with the firm Rolf Jensen & Associates and the Associate Engineering Manager of the firm's New York office. Rolf Jensen & Associates is engaged exclusively in fire protection engineering, life safety and security consulting and is recognized as one of the world's leading fire protection engineering consulting firms.

My primary responsibilities include the analysis, review, design and specification of Fire Protection and Life Safety Systems and code consulting services on projects involving the New York City, New York State and International Building and Fire Codes.

I was appointed to serve on the New York City Model Code Program's Fire Protection Technical Committee, Construction Requirements Technical Committee and the Risk & Security Advisory Committee.

I am testifying today as President of the Fire Safety Directors Association of New York. The Association was formed over 30 years ago after Local Law 5 of 1973 caused the first of several significant amendments of the fire protection and life safety provisions of the 1968 Building Code, which is still in effect today.

The Fire Safety Directors Association has over 400 members, with most active members employed in high-rise office buildings and hotels. In accordance with the By-Laws of the Association, the purposes of this organization are:

(a) to preserve life and property.

(b) to create and maintain the safest possible environment in which all personnel can conduct their various business endeavors.

(c) to maintain an overview of planning, construction, maintenance and management of all life safety systems designed and installed to protect life and property.

(d) to further the interchange and interaction between the association members, professional organizations, and government agencies for the purpose of disseminating and expanding upon the principles and concepts of safety.

Several members of the Fire Safety Directors Association have been represented on various Model Code Program Technical Committees and Advisory Committees. The Fire Safety Directors Association supported the Department of Buildings organization and management of the Model Code Program.

The Fire Safety Directors Association supports a code that achieves a balance of safety, savings, and innovation.

The Fire Safety Directors Association supports fire protection and life safety enhancements for all buildings and occupancies, specifically high-rise buildings.

In closing, the Fire Safety Directors Association supports the adoption of Intro. 578-A 2007 in relation to enacting the new Construction Codes and we urge the Council to set the Construction Codes on a three-year revision cycle so the City will never again have a Building Code that is 40 years old patched by layers of Local Laws.

Respectfully Submitted:

Joseph C. Razza

Joseph C. Razza, P.E.
President

for the Record

To The Members of the Housing and
Buildings Committee of the City Council:

14 June 2007

As representatives of the student body at the Columbia University School of Public Health, we find it imperative to present a statement to the Committee on this important issue.

Acute exposure to smoke can have both minor and significant impacts upon the health of individual persons. While smoke detectors are effective at providing a timely notice of the apparent threat and are imminent to the ability of individuals and officials to respond in a manner that is both effective and appropriate, concomitant fire sprinklers can reduce this threat and minimize its damaging consequences.

According to research published by top universities, acute exposure to smoke can irritate the nose, eyes, and throat. It can induce bronchitis, wheezing, and asthma attacks. Additionally, it can create the need for pharmaceutical prescriptions and physician visits. Respiratory systems abound in indoor fires like those within university-affiliated dormitories and apartments. The threat posed by human exposure to indoor smoke is significant and recognizable.

The benefits of a quality, functional fire sprinkler system are well documented. They often succeed in extinguishing fires, as well as minimizing the scale of those fires that stay burning in spite of the sprinklers. In addition to the benefits these provide to the maintenance of the building structures, there are likely health benefits, as well. The absence of smoke will undoubtedly prevent all of the aforementioned symptoms. The respiratory complications, the bronchitis, irritations, etc. could all be eliminated as the sprinkler systems eliminate the smoke from the fires, and/or the fires altogether. A fire sprinkler system mandate for university owned and affiliated housing would undoubtedly provide commendable health benefits in the event of a fire.

It is counter-intuitive to allow the housing units owned and operated by New York City's various colleges and universities to continue on without these fire sprinklers. We find it imperative that the Council act swiftly to promote the safety of residents of university housing.

Sincerely,

Patrick Callahan
University Senator
School of Public Health
Columbia University

All Executive Officers
Student Government Association
School of Public Health
Columbia University

GRAY PANTHERS
Gray Panthers, NYC Network
244 Madison Ave. #396, New York, NY 10016
Tel: 212-799-7572, www.graypanthersNYC.org

Housing and Buildings Committee Hearing - June 20, 2007- Council Chamber, City Hall

I'm Anne Emerman member of GP, DIA, DNNYC. I'm not an expert on most aspects of the Code, but I know about accessibility. I'm a New Yorker and a wheelchair user since 1944. I've experienced many positive changes, and participated with comrades to make them happen. Since the federal disability civil rights laws were enacted in the 1970's, the disability community ran with them. We forced access to public transportation, polling sites, pedestrian ramps, and accessibility in building codes. Finally, disabled folks could go where everyone else goes. With fellow civil rights warriors the community did whatever it had to do: petition government, work with elected officials, file lawsuits, hold demonstrations, when necessary engage in civil disobedience and get arrested.

And here we go again: While updated on materials and technology, Intro 578 is **less stringent on accessibility. It's exceptions, exemptions, opportunities for developer interpretation, and loopholes can and must be eliminated. NYC can do better.** We urge this Committee and the Council to step back, take time, and strive for optimum accessibility. There's public money in all the planned developments in Manhattan and the boroughs: site preparation, direct subsidies, and/or tax exemptions. Powerful real estate and business interests controlled this process, and got concessions. We expect the Council to uphold the publics' and your constituents' interest. Close the loopholes. There should be no impediment to this city having the best possible accessible building code law.

The following examples give me hope:
1) In today's *NYT* article – low tech, very doable, relatively inexpensive mats, to finally provide access to city beach waterfronts. Seventeen years after Congress passed the ADA, DPR largely ignored its mandates, and ignored advocates, until State Comptroller Hevesi issued a report late 2005, and Council Parks Committee Chair exerted pressure. Voila!
2) Three weeks ago, some of us went to a meeting in EDC offices with DOT, and maritime architects/engineers, who got the city contract to re-do ten NYC ferry piers. In 2002 when the city was spending hundreds of millions to provide ferry service after Sept. 11th, it ignored accessibility. CM Lopez introduced the "Ferry bill" and met fierce opposition from City Hall, DOT, EDC, DOL, the industry (NYWaterway), and the City Council. NYW was getting $2 million a month in operating subsidies, and complained the law was going to bankrupt them! The subsidies ended, and LL68/2005 passed. Opposition has melted away, and the ferry business thrives. Do the right thing, pass a stringent Code, provide oversight, and make NYC the most accessible city in this country.

FOR THE RECORD

Testimony
To
Members of the New York City Council
Housing & Buildings
Committee

June 20, 2007

Thank you for the opportunity to submit comments from the perspective of a person with a vision impairment. I believe I represent a segment of the local population which is rapidly expanding. More and more New Yorkers in that bulging Baby Boomer demographic, are remaining active as they age in spite of losing visual acuity. It is very important that our buildings are designed to permit them to remain independent as they move in and out of office and commercial establishments, and within their own residential facilities.

Design requirements for vision impaired users are often cost-neutral, that is, making a building element very usable can be simply making better choices about how that element appears. I offer below, not a comprehensive survey, but some illustrations. I urge that there be an opportunity for this group, as well as all populations with special needs, to have substantial input as a better code is "built".

All major household appliances should be "accessible"- usable by a person with limited reach, operable by a person with limited dexterity and grasp strength, and, informative to a person with limited or no sight. Likewise, thermostats and other climate controls should have non-visual (tactile/audible) interface capability.

The grab bar in a bathroom should be conspicuous by high visual contrast (not just color contrast) from its immediate surroundings.

Wall switch plates and convenience outlet covers, need to be highly contrasted from the wall, that is, dark on light or light on dark. Many pleasing combinations can accomplish this high visibility, a chocolate brown switch plate on a beige wall, or navy blue on a powder blue wall, for example. A light switch operated by a rocker panel is friendlier than a toggle switch that must be grasped too.

Both in residential and commercial buildings stairways should have high visual contrast on each step nose, and, elevator cabins with dual control panels should present one panel low for users with limited reach as is now required by federal regulation, and the second panel high enough for a person who must look closely or read its Braille feature.

The exterior building number on both multi-unit residential and all commercial buildings should be presented in large high contrast numerals located where they are approachable by someone who needs to look close; and, they must have proper nighttime illumination; and, be sited to be away from confounding images such as occurs where the numerals are placed on an above-entry glass panel with "busy"visual imagery behind it.

Where it is architecturally feasible during retrofitting of a retail establishment with a one-step entrance, it should receive interior ramping rather than a ramp on the sidewalk outside. Many vision impaired pedestrians follow the street wall, and all intrusions into this preferred travel route create obstacles to comfortable and safe movement.

The now ubiquitous sidewalk sheds badly need more regulation. Both their specific placement on sidewalks, and their design, have significant impact on the usability of those sidewalks by pedestrians with vision impairments and, of course, people with mobility disabilities.

Public restrooms can be more considerate of vision impaired users also. High visual contrast between a wash basin and its surrounding counter, and between a urinal and its mounting wall are very helpful design choices. And, consistency of placement and visibility of flush controls in toilet booths, are recommended. The booth door latch should be easy to find visually and tactually.

Respectfully submitted,

Kenneth L. Stewart, President
Metropolitan Council of Low Vision Individuals
cclvi@yahoo.com
212-664-1038

Testimony to the New York City Council

Committee on Housing & Buildings

Wednesday, June 20th, 2007

Re: Intro 0578-2007 Proposed Model Code for NYC

Edith M Prentiss

President, 504 Democratic Club
1st Vice President, Disabled In Action of Metropolitan New York

I am Edith Prentiss; the 1st Vice President of Disabled In Action, President of the 504 Democratic Club, and a member of the Disabilities Network of New York City. I would like to thank the Housing and Buildings Committee and especially Chairman Erik Martin Dilan for the opportunity to express my opinion on Intro 0578-2007 Proposed Model Code for NYC.

Housing is incredibly important in the disability community, in fact two of the DNNYC's four Priority Issues are Housing and Building Codes. People with disabilities face considerable obstacles in obtaining and retaining housing. The lack of accessible housing and the barriers, structural and financial, land many people with disabilities in nursing home or other institutional facilities. We need not look any further than Roosevelt Island's Coler-Goldwater Specialty Hospital and Nursing Facility, with over 2,000 beds.

In 1987, Local Law 58 was enacted but has it ever really been enforced? Self-certification is anti-theoretical to any code. Mr. Architect, do you avow that your plans are compliant with the laws and access requirement of New York City, New York State and the United States of America? Exactly how many architects do we expect to say, well to be honest, no? Given the problems we see in new building, can we really believe that the Department of Building randomly checks 50% of the plans submitted? Why haven't Department of Buildings inspectors and plan evaluators protecting the interest of all New Yorkers, not just those of developers and the industry?

What really happens when after a building is up, and it is found to be in violation? I personally believe one of the strongly things we need is to eliminate self-certification. For years we have called for increased enforcement of Local Law 58 of 1987, which was hailed one of the strongest accessibility law in the country. However, when New York City allows architects to self-certify that their plans meet all local, state and federal laws, we have found the local law 58 to be greatly ineffectual. Why haven't Department of Building's inspectors and plan evaluators ensured that local law 58 is enforced?

My concern is that the potential good, never realized, of Local Law 58 will disappear and be replaced by a code that does not serve New Yorkers well. And it is unlikely that many people with disabilities will be living in building built under the proposed model code as we are usually priced out of new construction.

It seems as if the Stakeholder process was strongly weighted to the developer-industry perspective and their fiscal bottom line. What about the bottom line of every New Yorker? How will the proposed changes affect our live and our bottom lines? What impact will the code have on future buildings in New York City?

While it is refreshing that Intro 578 includes reviewing the code every 3 years, a bad code will negatively impact the lives of all New Yorkers for years to come. We believe that Intro 578 should be held in abeyance until all New Yorkers have an opportunity to review and understand the broad general aspects of the code.

I'd like to point out how hard it is to even find the code. If you read the Intro on the Council's web site, the attachment Chapter sections don't open. Go back to nyc.gov and click on Building. Find the Model Code and open up the chapter you're interested in reading. In addition to Chapter 11 (Accessibility) I've only managed to read approximately 100 of the Intro's 200 pages, skipping the permit cost tables, but believe with the technical assistance of the Building Department we might be able to get through a bit more.

Chapter 11 is particularly interesting in some of its base assumptions. In the accessible route section it seems to assume that people with disabilities are the general public it does not seem to consider the fact that people with disabilities might be employees. Why exempt bed & breakfasts which are the homes of the proprietor's from accessibility requirements? It may be their home, but it is a business. By not requiring press boxes to be on an accessible route, are you saying people with disabilities can't be members of the 3rd Estate? Tell that to Chris O'Donnell and John Hockenberry. When private bathrooms accessed through private offices are exempt from accessibility requirements, is the assumption that the employee will not be a person with a disability?

There are broad concepts that I hope we could all agree upon, these include basic accessibility of building through a main entry, apartments or offices, kitchens and bathrooms, etc. Visitability should be an easy concept for everyone to understand. If that's too complex a concept, simply mandate these accessibility standards! If landlords are required to made modification for disabled tenants, how many of us do you think will ever find an apartment?

My Testimony

My testimony today will deal with intro law 578,sections 1103 to1110, and Section E 107.2 on tactile signage:

Intro578 A of the building code shouldn"t be rushed: There are still some things That need fixing:

For example,employee work areas, that are intended to be used as residences, Equipment spaces, and connected spaces: The department of Buildings has to determine When an elevator service in a work area is provided for the sole purpose of complying With Sections 1107.7.1 of the building codes, as well as sections 1107.7.3 for type B Units:

New units of housing are being built, in order to gain accessibility of ground floor Units in smaller R 3"s, which are very problematic:

Very narrow passageways should not be exempt from accessibility: They"re just Too narrow:

As I stated in my last testimony, disabled bathrooms in apartment buildings, have To be widened in the doorways, and the toilet seats lowered: All bathrooms have to Follow the requirements of appendix P, unless a unit that"s built only has one type A Bathroom, for a mobility impaired parent:

Within 10 days of the date that the request is made by a person with physical Disabilities, countertops in all kitchens must be adjusted or replaced, at the time that that Physically disabled person takes over the unit:

Currently, all laundry equipment in common areas that have R2 occupancies, Have to have accessible controls:

Thirty six inch wide stairways, still should be allowed for internal passage

Between floors in multi-level dwellings: Sunken and raised floors, are currently only Allowed, if connected by an accessible route, usually a ramp: Areas smaller than a Minumum area of 80 squae feet, or less than 8 feet in both dimensions are inaccessible: However, there is an exception in the accessible route mandate, that"s made, and allowed For in the proposed code for roof terraces above residential units (Section 1107.4)

There has to be a requirement in the draft code, that all service entrances have to Be accessible:

Holding cells, and visiting areas in courtrooms, still need to have only one Accessible element, or cell of each type, for people that have various limitations, as well As lifts for accessible routes for Judges,Jurors,witnesses:ETC:

Tactile signs have to be limited: There"s also no signage required for single Parking spaces, and there really needs to be some sort of signage in place, regarding that:

Thanks for the opportunity to testify today:

Statement of

Daniel Madrzykowski
Fire Protection Engineer

Fire Research Division
Building and Fire Research Laboratory
National Institute of Standards and Technology
Technology Administration
U.S. Department of Commerce

Before

the
Council of the City of New York
Infrastructure Division

New York, New York

June 20, 2007

Good morning. My name is Daniel Madrzykowski. I am a fire protection engineer with the National Institute of Standards and Technology (NIST) Building and Fire Research Laboratory in Gaithersburg, MD. NIST is a non-regulatory federal research agency that has been specializing in measurements and standards, including fire research, for more than a century. During my 21 years at NIST I have been involved in several research programs involving automatic fire sprinklers. I was also the chair of the National Fire Protection Association (NFPA) Technical Committee on Residential Sprinkler Systems from 1996 through 2006.

Council Member Avella requested that NIST provide information on sprinkler research that it has conducted, especially research results that would be relevant to college dormitories and student housing. I am here representing NIST as a result of that request.

According to Campus Firewatch, an organization that collects fire data specific to college students from news accounts, the academic year 2006-2007 was the deadliest year on record with 20 fatalities caused by fire. Since 2000, 108 students have been lost due to fire.

Automatic fire sprinkler systems have been used successfully to protect industrial and commercial buildings for more than 100 years. In 1973, the Report of the National Commission on Fire Prevention and Control, entitled *America Burning*, changed the focus of sprinkler research from protecting the building and its contents to protecting the occupants of the building. Since that time, NIST has been using measurements and analysis to develop methods to predict automatic sprinkler response and fire suppression effectiveness.

In its most basic form, an automatic fire sprinkler system consists of a water supply, piping to deliver the water from the supply to the sprinklers, and thermally activated sprinklers. Each sprinkler has a temperature sensitive link. Therefore, water is only discharged in the area where the gases from the fire have become hot enough to activate the sprinkler.

NIST has conducted studies using full-scale fire experiments to examine the impact of automatic sprinklers in terms of fire control and life safety. These studies have included health care occupancies, office occupancies, medical laboratory occupancies, residential occupancies, and dormitories. In all of these studies, sprinklers installed in accordance with the appropriate NFPA sprinkler installation standard (NFPA 13, 13D or 13R), were shown to be effective in preventing flashover, controlling the fire and in many cases completely extinguishing the fire.

As an aside, flashover is the transition from a fire condition that is limited to one portion of a room to a fire condition where the entire room and contents are burning. Even fire fighters in protective clothing can not survive under these conditions.

Since the amount of heat and toxic gases produced by the fire is reduced by the sprinklers, the environment in areas adjacent to the fire room and in many cases in the fire room itself remains tenable for building occupants.

During my career at NIST I have examined many fire tragedies. As with most fatal incidents, there is typically more than one item or action that leads to a catastrophic failure. Therefore, fire safety relies on multiple components to provide a complete system to improve a person's chances of surviving a fire. The building fire safety system should include: compartmentation of spaces within a building, smoke alarms, automatic sprinklers, an adequate and well marked egress path out of the building, and occupant training.

For example, a fire starts on a bed. The smoke from the fire rises until it contacts the ceiling and then contacts the walls and a smoke layer begins to develop. If the door to the bedroom is closed, the smoke will continue to collect in the bedroom but the spread of smoke to other areas of the building will be limited by the closed door, i.e. compartmentation. If a smoke alarm is located in the bedroom, it will activate when the level of smoke exceeds its detection threshold. This provides an early warning to occupants that can hear the alarm. As the fire continues to grow, it is releasing more energy, which results in hotter combustion gases. If there is an automatic fire sprinkler in the room, when the combustion gases exceed the temperature threshold, typically 165 °F, the sprinkler will activate and control the fire. If the building occupants have been trained to recognize the sound of the fire alarm system and how to respond to it, then they can take the required actions and follow the exit markings to make their way safely out of the building. When the fire department arrives, they would have a fire that has not spread beyond the room of origin and can be suppressed easily. With all of the systems in place and functioning, this scenario would result in no life loss either to building occupants or to fire fighters.

It is important to recognize that any of the building systems could fail due to lack of maintenance, human error, or for other reasons. That is why it is important to have all of the safety system components in place. The automatic sprinkler system, however, is the only component of the system whose function is to control the fire and mitigate the hazard in terms of the generation of heat and toxic gases.

In February 2003, a fire in an un-sprinklered night club in Rhode Island resulted in the death of 100 people. The NIST study examining that fire concluded that an automatic sprinkler system would have controlled the fire, reduced the amount of heat produced, reduced the amount of toxic gases produced, and improved visibility when compared to the fire with no sprinklers. In fact, no untenable conditions were created in the sprinklered experiment, while in the un-sprinklered experiment the environment became untenable, by all measures, within 90 seconds of the start of the fire.

In conclusion, NIST's research along with other studies conducted by the United States Fire Administration, and Underwriters Laboratories have demonstrated time and again that properly installed, maintained and operating sprinklers will reduce the hazard from a fire. Given the choice between a sprinklered building and an un-sprinklered building, the sprinklered building will save lives.

I am attaching a copy of the NIST report - Impact of Sprinklers on the Fire Hazard in Dormitories: Day Room Fire Experiments (NISTIR 7120).

Thank you and I am happy to answer any questions the Council members may have.

NISTIR 7120

Impact of Sprinklers on the Fire Hazard in Dormitories: Day Room Fire Experiments

Daniel Madrzykowski
David W. Stroup
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NIST

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Technology Administration, U.S. Department of Commerce

NISTIR 7120

Impact of Sprinklers on the Fire Hazard in Dormitories: Day Room Fire Experiments

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Impact of Sprinklers on the Fire Hazard in Dormitories: Day Room Fire Experiments

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Abstract

As part of a U.S. Fire Administration (USFA) initiative to improve fire safety in college housing, the National Institute of Standards and Technology (NIST) conducted two series of full-scale fire experiments in abandoned dormitory buildings. The objective of the study is to compare the levels of hazard created by room fires in a dormitory building with and without automatic fire sprinklers in the room of fire origin.

One series of experiments was conducted with the fires initiated in a dormitory sleeping room. These experiments were conducted by NIST in cooperation with the University of Arkansas and the Fayetteville Fire Department. The results of these experiments will be provided in a separate report.

This report describes a series of experiments where fires are initiated in a day room area open to the corridor of the dormitory. These experiments were conducted by NIST in cooperation with the Myrtle Beach Air Force Base Redevelopment Authority, the Myrtle Beach Fire Department, and the Bureau of Alcohol, Tobacco and Firearms (ATF).

This paper will provide a description of the experimental conditions including a description of the building construction, the fuel load in the day rooms, and the location of the instrumentation used to measure temperature and heat flux in the day room and the adjacent corridor. Smoke alarm activation and sprinkler activation times are also reported. The results from the experiments comparing the sprinklered and non-sprinklered day room are presented. The results from these experiments demonstrate the life safety benefits of smoke alarms and automatic fire sprinkler systems in college dormitories.

For further information on the USFA College Campus Fire Safety Program contact: www.usfa.fema.gov/publications.

Key Words:
corridor tests; dormitories; fire data; heat flux; large scale fire tests; sprinklers; temperature measurements

Introduction

Each year there are approximately 1,300 documented fires in school and college dormitories in the United States [1]. Tragic fatal fires occur in these occupancies every year [2]. Buildings with an automatic sprinkler system have had excellent fire safety records. The chances of a fire causing or resulting in a fatality are significantly reduced with automatic fire sprinklers installed [3]. Yet the majority of the dormitories in this country, where a fire has occurred, did not have an automatic sprinkler system installed [3].

The U.S. Fire Administration (USFA) has made a commitment to increase the level of knowledge that campus officials and students have about the importance of sprinklers as part of their campus fire safety program. Several fire events in campus housing over the past 10 years have provided the motivation for this program. During the period from 1994 to 2000, 27 students died and 94 students were injured in campus housing fires [2]. The most common area of origin is a sleeping room, which accounts for almost 25 % of the fires. Approximately 22 % of the fires originate in hallways, corridors and lounge areas [2]. Paper is the leading material ignited in dormitory fires, accounting for approximately 32 % [1, 2] of the fires. "One- third of the dormitory fires are reported as arson (incendiary/suspicious)" and this is the leading reported cause of dormitory fires [1].

As part of the U.S. Fire Administration (USFA) initiative to improve fire safety in college housing, the National Institute of Standards and Technology (NIST) conducted two series of full-scale fire experiments in abandoned dormitory buildings. The objective of the study is to compare the levels of hazard created by room fires in a dormitory building with and without automatic fire sprinklers in the room of fire origin.

Based on the fire incident data, one series of experiments was designed with the fires starting in a dormitory sleeping room. These experiments were conducted by NIST in cooperation with the University of Arkansas and the Fayetteville Fire Department. The results of these experiments will be provided in a separate report.

The series of experiments, presented in this report, were designed with the fires starting in a day room or lounge area open to the corridor of the dormitory. These experiments were conducted by NIST in cooperation with the Myrtle Beach Air Force Base Redevelopment Authority, the Myrtle Beach Fire Department, and the Bureau of Alcohol, Tobacco and Firearms (ATF).

This paper documents experiments conducted to examine the fire development, the spread of hot gases down the corridors, and the effectiveness of an automatic sprinkler system in suppressing the fire. Three fire experiments were conducted: 1) sprinklered, 2) un-sprinklered with limited ventilation, and 3) un-sprinklered with increased ventilation. The experiments were conducted in an abandoned dormitory building in Myrtle Beach, SC. The 3-story, concrete, building was configured with a day room centrally located on each floor.

Experimental Configuration

The experiments were conducted on the first floor of a three-story building. A photograph of a building similar to the building used for the experiments is shown in Figure 1. The building was formerly used as a military dormitory. The building construction consisted of poured concrete floor and ceiling deck with concrete block walls. The vertical distance between the floor and the concrete ceiling was 2.60 m (8 ft 6 in). No floor covering was installed. The building was made available to NIST by agreement with the Myrtle Beach Air Force Base Redevelopment Authority.

The test area consisted of a corridor down the center of the first floor and a day room area which was located near the center of the building on the south side of the corridor, see Figure 2. The corridor was 59.64 m (195 ft 8 in) long, 1.35 m (4 ft 5 in) wide, with a finished ceiling height of 2.08 m (6 ft 10 in). The corridor had walls constructed from concrete block with 29 doorways connecting other rooms on either side of the corridor. Except as noted in the experiment descriptions, the doors to the rooms were kept closed. There are 24 sleeping rooms, 12 on the west end and 12 on the east end of the building.

The north side of the day room is open to the adjacent corridor as shown in Figures 2 and 3. The east and west walls of the day room were covered with gypsum board. The south wall of the day room had consisted of a block wall with windows. The wall and the windows were covered with 12 mm (0.5 in) gypsum board. A drop ceiling, composed of fire resistant-aspen wood fiber tiles, was installed in the day room and corridor areas. Each ceiling tile was approximately 0.61 m (2 ft) by 1.22 m (4 ft) and 25 mm (1 in) thick (Figure 4). The day room was approximately 7.67 m (25 ft 2 in) by 5.26 m (17 ft 3 in) with a finished ceiling height of 2.23 m (7 ft 4 in).

In all three experiments, there was a vent on the west end of the corridor. The vent was 1.35 m (4 ft 5 in) wide, the full width of the corridor, with the opening extending from the floor to 0.61 m (2 ft) above the floor.

The east end of the corridor was closed with the exception of an open window with dimensions 0.80 m x 0.29 m or 0.23 m^2 of clear area, and a sill height of 1.02 m above the floor. Also in experiments 1 and 2, 4 windows of the same dimension were open on the northeast portion of the corridor in rooms with the doors closed to the corridor.

In test 3, 5 sleeping room doors were left open on the east end of the corridor. Moving east from the day room, sleeping rooms N4, N3, and N1 on the north side of the corridor and sleeping rooms S5 and S2 on the south side. Each of these rooms had windows open to the outside. The window openings are be defined by the amount of clear open area. On the north side, room three, 0.35 m^2, room four, 0.46 m^2, room six, 0.92 m^2. On the south side, room two, 0.11 m^2, and room five, 0.39 m^2. Each open doorway is 0.78 m wide by 2.02 m high.

Furnishings

Each experiment utilized three sofas. Each of the sofas used for the site of ignition were similar in construction. Each was manufactured with an exposed wood frame and fabric covered polyurethane foam cushions (Figure 5). The mass of each sofa was approximately 89 kg (195.8 lb). The ends of the sofa were composed of solid wood measuring 0.76 m (30 in) wide, 0.58 m (23 in) high and 44 mm (1.75 in) thick. The ends of the sofa were attached together with front and back solid wood supports. Each sofa has three back cushions and three seat cushions. The polyurethane was covered with a thin layer of polyester batting which was covered with a textile material. The back cushions were approximately 0.61 m (24 in) wide, 0.38 m (15 in) high and 0.18 m (7 in) thick. The seat cushions were approximately 0.61 m (24 in) wide, 0.53 m (21 in) deep, and 0.20 m (8 in) thick.

In test 1, the ignition sofa was of similar construction as the sofas used in tests 2 and 3 however two different types of upholstered sofas were used as "target" fuels in test 1. The "target" sofas were built with a wood frame and had seat cushions filled with polyurethane foam and back cushions filled with polyester batting, see Figure 6. In tests 2 and 3, all three sofas used in each experiment were similar.

The sofa used for the ignition site was located on the west wall of the day room, 0.91 m (3 ft) from the south wall. The second sofa was located on the south wall, 1.83 m (6 ft) from the west wall. The front face of the third sofa was located 3.2 m (10 ft 6 in) north of the south wall and the west side of the sofa was positioned 2.6 m (8 ft 6 in) from west wall, see Figure 7.

A bulletin board was located above the sofa on the west wall. The dimensions of the bulletin board were 2.44 m (8 ft) wide by 1.22 m (4 ft) high. The bulletin board material was a medium density fiberboard. It was 12mm (0.5 in) thick, had a mass of 8.1 kg (17.82 lb) and was attached directly to the wall. The bulletin board material was framed with wood molding approximately 63.5 mm (2.5 in) wide by 12 mm (0.5 in) thick. The wood molding had a mass of 1.6 kg (2.86 lb). Two sheets of craft paper were partially pulled down from the bulletin board and draped across the sofa (figure 8). Each piece of paper was approximately 2.33 m (7 ft 7.75 in) wide by 0.91 m (3 ft) high. The total mass of the two layers of paper used was 0.3 kg (0.66 lb). In test 1 the paper was attached directly to the gypsum board wall, no bulletin board was in place.

Instrumentation

The temperatures were measured with 0.51 mm (0.02 in) nominal diameter bare bead, Type K thermocouples. Ten arrays of thermocouples were installed over the length of the corridor as shown in Figure 9 and two thermocouple arrays were installed in the day room area. The arrays are identified by number in Figures 10 and 11. The locations of the arrays are given in Table 1. Each thermocouple array has a thermocouple located 25 mm (1 in), 0.305 m (1 ft), 0.610 m (2 ft), 0.910 m (3 ft), 1.22 m (4 ft), 1.52 m (5 ft), and 1.83 m (6 ft) below the ceiling. Thermocouple arrays in the corridor are along centerline of corridor. The arrays are spaced on

7.62 m (25 ft) intervals, with the exception of the arrays near the east and west ends of the corridor.

Three pairs of Gardon type heat flux gauges are installed near TC arrays 4, 5, 6. The heat flux gauges that were positioned closest to the day room, adjacent to TC array 6, had a design heat flux level of 227 kW/m^2 (20 Btu/ft^2 s). The next pair of heat flux gauges positioned to the west, adjacent to TC array 5, had a design heat flux level of 114 kW/m^2 (10 Btu/ft^2 s). The last pair of heat flux gauges, installed adjacent to TC array 4, had a design heat flux level of 57 kW/m^2 (5 Btu/ft^2 s). Each pair of gauges consists of one gauge facing the ceiling and the other gauge is facing the day room. The height of the gauges facing the ceiling was approximately 0.91 m (3 ft) above the corridor floor or 1.17 m (3 ft 10 in) below the suspended ceiling. The height of the gauges positioned horizontally toward the fire were approximately 0.86 m (2 ft 10 in) above the corridor floor or 1.22 m (4 ft) below the suspended ceiling.

Commercially available ionization smoke alarms were used. The alarms were mounted under the suspended ceiling at the locations shown in Figures 10 and 11. Each alarm was separately connected to the data acquisition system. The voltage change, as measured across the battery terminals at its alarm point, served as the data marker for the alarm time. New smoke alarms were used for each experiment.

Experimental Procedure

Prior to ignition in each experiment, a computerized data acquisition system was started to collect the temperature, heat flux and smoke detector data. Data were collected from each instrument every 4 s. Video cameras recording the experiment were also started at this time.

After at least 60 s of background data were collected, a matchbook ignition was used to ignite the bulletin board paper at a location approximately over the center of the intersection of the left and middle sofa seat cushion. In test 1, the ignition was triggered remotely. At the request of ATF, the ignition was modified for the remaining experiments. In tests 2 and 3, an ATF engineer, in a complete structural fire fighting protective ensemble, ignited the bulletin board paper with a single paper match at approximately the same location.

After ignition, the researcher left the room and exited to the outside of the building via a door in the corridor adjacent to the room. The door was closed and remained closed until the start of suppression activities. The fire growth was observed via monitors connected to the video cameras.

In test 1 fire suppression would begin automatically with the activation of the sprinkler system. Four standard response sprinklers, with activation temperatures of 74 °C (165 °F) were located under the drop ceiling of the day room, as shown in Figure 3. With one sprinkler flowing the system maintained a pressure of 2.4 bars (35 psi) at the inlet to the building and a flow rate of 1.7 L/s (27 gpm). The water supply maintained a static pressure of approximately 3.4 bars

(50 psig). In tests 2 and 3, manual fire suppression activities were planned to start at approximately 15 minutes after ignition.

Tests 2 and 3 are identical with the exception of the corridor ventilation. The differences in vent arrangement occur on the portion of the corridor to the east of the fire room as described in the test arrangement section.

All of the fire experiments were conducted in the same space. After each experiment, the day room and the adjoining corridor were dried out. Broken or wet ceiling tiles were replaced and the wall surfaces were patched or repaired as needed. Furnishings, thermocouple arrays in the dayroom and smoke detectors were also replaced before each experiment.

Each experiment was documented using thermally protected video cameras. As shown in Figure 11, two video cameras were capturing an east to west and a north to south view of the day room. Both cameras were installed close to the floor. A third camera was installed, on the floor, in the vent at the west end of the corridor looking east.

Results

The results of the experiments include experiment timelines, smoke alarm and sprinkler activation times, temperature measurements, heat flux measurements, photographs and videos.

Experiment Timelines

The timelines are developed from observations made during the experiment, review of the video of the experiment, and review of the data. The timelines for experiments 1, 2, and 3 are given in Tables 2, 3, and 4 respectively. Post test photographs of the day room are presented in Figures 12 through 14.

Smoke Alarm and Sprinkler Activation Times

The smoke alarm activation and sprinkler activation times are given in Table 5 for experiment 1. The smoke alarm activation times are given in Table 6 for experiment 2 and Table 7 for experiment 3.

Temperature Data

The temperature measurements are given in Figure 17 through 28 for experiment 1, Figures 29 through 40 for experiment 2 and in Figures 41 through 52 for experiment 3. The temperature measurements have been plotted on scales that optimize the separation of the data points for clarity. Certain data will be re-plotted on similar scales for comparison purposes later in the paper. Reviewing the times at which the temperatures begin to increase provides some sense of how rapidly the smoke is spreading down the corridor.

In experiment 1, the sprinklered case, temperatures near the ceiling in the day room, thermocouple array 7, approach 245 °C (473 °F) just prior to sprinkler activation at 137 s, Figure 23. In the corridor adjacent to the day room, thermocouple array 6, the temperature near the ceiling exceeds 120 ° C (248 °F) for approximately 10 s prior to sprinkler activation. At approximately 1.5 m (5 ft) above the floor in the corridor, the maximum temperature is approximately 50 °C (122 °F), Figure 22. The temperatures then decrease rapidly at the corridor positions to the east and west of the day room. At the west end of the corridor, the maximum temperature increase just below the ceiling is 20 °C (68 °F), Figure 28. At the east end of the corridor, the temperature increase is approximately 10 °C (50 °F), Figure17. The thermocouple located 1.83 m below the ceiling in TC array 8, was not functioning and therefore is not shown in Figure 24.

The temperature measurements for experiment 2, the first un-sprinklered case are overall significantly higher than the temperatures recorded during experiment 1. The peak temperatures near the ceiling range from 780 °C (1436 °F) at thermocouple array 7, Figure 35, to 120 °C (248 °F), at thermocouple array 1 near the east end of the corridor, Figure 29. The maximum temperature at the west end of the corridor is 170 °C (338 °F), Figure 40. Figure 40 also shows that the peak temperature at approximately 1.5 m (5 ft) above the floor is 140 °C (284 °F).

In experiment 3, the second un-sprinklered experiment, the ventilation to the test area was increased. This resulted in increased temperatures relative to experiment 2. The peak temperatures near the ceiling range from 900 °C (1652 °F) at thermocouple array 7, Figure 47, to 240 °C (464 °F), at thermocouple array 1 near the east end of the corridor, Figure 41. The maximum temperature at the west end of the corridor is 230 °C (446 °F), Figure 52. Figures 41 and 52 also show that the peak temperatures at approximately 1.5 m (5 ft) above the floor exceed 170 °C (338 °F) at both ends of the corridor remote from the day room. After 400 s, the temperatures at TC array 7 decrease in a manner that is inconsistent with TC array 6 and TC array 8. During this time, portions of the suspended ceiling in the day room are collapsing which displaced the TC array. This coupled with potential burn through on the TC insulation may have lead to the inconsistent behavior. It should be noted that the data for experiment 3 ends abruptly because the data acquisition system had to be removed from the building due to heavy smoke conditions.

Heat Flux Data

In experiment 1, the heat flux gauge facing the ceiling had a peak reading of 0.9 kW/m^2, prior to sprinkler activation. All of the other heat flux readings were less than 0.2 kW/m^2, indistinguishable from background values.

The heat flux data from experiment 2 is presented in Figures 52 through 55. The data associated with the "V" legend is measured with the gauge aimed at the ceiling. The data associated with the "H" legend is measured with the gauge aimed horizontally in the direction of the fire. The maximum heat flux adjacent to TC array 6 is approximately 10 kW/m^2 and occurs at approximately 375 s. There are a few readings of higher magnitude later in the fire, this may be attributed to brief flame contact in the area of the heat flux sensor facing the day room. At the heat flux location adjacent to TC array 4, approximately15.24 m (50 ft) west of TC array 6, the maximum heat flux was approximately 1.5 kW/m^2.

The heat flux data from experiment 3 is given in Figures 56 through 58. The peak heat flux, adjacent to the day room, is in excess of 60 kW/m^2. The peak heat flux at 7.62 m (25 ft) and 15.24 m (50 ft) to the west is approximately 20 kW/m^2 and 3 kW/m^2, respectively.

Uncertainty Analysis

There are different components of uncertainty in the temperatures and total heat flux reported here. Uncertainties are grouped into two categories according to the method used to estimate them. Type A uncertainties are evaluated by statistical methods, and Type B are evaluated by other means [4]. Type B analysis of systematic uncertainties involves estimating the upper (+ a) and lower (- a) limits for the quantity in question such that the probability that the value would be in the interval (± a) is essentially 100 percent. After estimating uncertainties by either Type A or B analysis, the uncertainties are combined in quadrature to yield the combined standard uncertainty. Multiplying the combined standard uncertainty by a coverage factor of two, results in the total expanded uncertainty that corresponds to an approximate 95 percent confidence interval (2σ).

Components of uncertainty are tabulated in Table 8. Some of these components, such as the zero and calibration elements, are derived from instrument specifications. Other components, such as soot deposition or radiative cooling/heating include past experience with thermophoretic deposition on cool surfaces and thermocouples in high temperature fuel rich environments. The uncertainty in the gas temperature measurements includes radiative cooling in the each of the tests series, but also includes radiative heating for thermocouple located in the lower layer of the full-scale tests. Small diameter thermocouples were used to limit the impact of radiative heating and cooling. This resulted in an estimate of ±15 % total expanded uncertainty.

The potential for soot deposition on the face of the water-cooled total heat flux gauges contributed significant uncertainty to the heat flux measurements. Calibration of heat flux gauges was completed at lower fluxes and then extrapolated to higher values and this resulted in a higher uncertainty in the flux measurement. Combining all of component uncertainties for total heat flux resulted in a total expanded uncertainty of – 24 % to + 13 % for the flux measurements.

Discussion

The life safety hazards generated by a fire include; heat, toxic gases, and loss of visibility. In these experiments only quantitative measures of heat were made and some qualitative measures of visibility were made with the video cameras.

Heat can be transferred by conduction, convection and radiation. Burn injuries caused by the combustion products (smoke), can be caused by convection and/or radiant heat transfer. Here we are not considering contact burn injuries due to touching hot surfaces.

As presented in the SFPE Handbook of Fire Protection Engineering, estimated limits for tenability due to convected heat suggest a thermal tolerance of 120 °C (248 °F). Above this limit, the onset of pain is rapid and burns can develop within a few minutes or less. The estimated tenability limit due to heat flux is 2.5 kW/m^2. At this level, the time to burn unprotected skin is 20 s or less [5].

These limits are not absolute limits since clothing, humidity, skin composition etc, can mitigate or exacerbate the impact of the thermal energy for a given heat level and exposure time. These values will be used as bench marks for the discussion presented here. It is also important to note that as the fire grows, the temperatures in some areas of the day room and corridor increase rapidly and quickly bypass the benchmark thresholds making concerns over uncertainty in the tenability limits a minor point.

Since this discussion is focused on tenability, the temperatures at approximately 1.5 m (5 ft) above the floor are of the most interest. Therefore, the temperature data will be reduced to the measurement locations at 0.61 m (2 ft) below the ceiling. This yielded a height above the floor of 1.62 m (5.3 ft) in the day room and a height above the floor of 1.47 m, (4.8 ft) in the corridor.

Two temperature graphs for each experiment have been prepared (see Figures 59 through 64). Each graph presents the temperatures starting at TC array 6, the corridor array nearest the day room, and incorporates the rest of the corridor TC arrays moving either to the east or the west. These graphs show how the temperature time histories, at 0.61 m (2 ft) below the ceiling, change as the distance between the fire and the measurement array increases.

Figures 59 and 60 show the temperatures for experiment 1 in the west and east sides of the corridor respectively. At no time during experiment 1, at any of the TC array positions in the corridor, does the temperature exceed 120 °C (248 °F) at 0.61m below the ceiling or lower.

For the un-sprinklered experiments, 2 (Figures 61 and 62) and 3 (Figures 63 and 64), most of the temperature histories exceed 120 °C (248 °F). The exception is in experiment 2, the TC arrays 1 and 2, which are 30.5 m (100 ft) or more west of TC array 6, were over 100 °C (212 °F), but did not exceed 120 °C (248 °F).

In experiment 2 the tenability benchmark is exceeded at approximately 3 minutes after ignition at TC array 6. It takes approximately 2 minutes more for the fire to grow to the extent needed to generate temperatures in excess of 120 °C (248 °F) at the end of the east corridor.

In Figures 63 and 64, note that the peak temperatures at TC array 6 were clipped off in order to have a *y* axis with a smaller temperature range so that some separation could be seen at the TC arrays to the east and to the west. In experiment 3, the temperature at TC array 6 exceeds 120 °C (248 °F) at approximately 3½ minutes. Again it takes approximately 2 additional minutes for similar temperature conditions to exist 26.9 m (88 ft) down the east corridor. At approximately 6 minutes after ignition, temperatures above 120 °C (248 °F) are measured 32.4 m (106 ft) down the corridor to the west.

The temperature comparisons at TC array 7, the closest array to the ignition sofa, are given in Figure 65. It shows the temperature for experiment 2 increase the fastest, rising above 120 °C (248 °F) in less than 3 minutes after ignition. The fire in experiment 3 developed a little slower, requiring another 30 s to reach the same temperature. Again the temperatures in the sprinklered experiment, Day Room 1, remain in the tenable range for the duration of the experiment.

Referring back to Figures 52 through 58, it can be seen that the reduction in measured heat flux is significant at positions remote from the day room. For example, in experiment 3, the peak heat flux from the hot gas layer exceeds 65 kW/m^2 at the position adjacent to TC array 6, then decreases to approximately 20 kW/m^2, 7.62 m (25 ft) to the west, near TC array 5. Looking at the data from a position adjacent to TC array 4, which is another 7.62 m (25 ft) to the west, the peak heat flux has been reduced to approximately 3 kW/m^2.

Conclusions

Three full-scale fire experiments were conducted in an abandoned dormitory to examine the impact of sprinklers on reducing the thermal hazards generated by a day room fire. The fire scenario was designed to represent a realistic fire hazard, based on school dormitory fire incident statistics. The recommended thermal tenability levels from the SFPE Handbook of Fire Protection Engineering, 120 °C (248 °F) for temperature and 2.5 kW/m^2 for heat flux were used to compare the data against.

In the un-sprinklered experiments, the temperature tenability limits were exceeded in the corridor at locations remote from the fire, 22.9 m (75 ft) or more. Untenable conditions due to heat flux were also generated in the corridor in the un-sprinklered fire experiments. The untenable conditions began in the corridor as early as 3 minutes after ignition and spread through the corridor within another 3 minutes.

In the sprinklered experiment at no time did the temperatures in the day room or in the corridor exceed 120 °C (248 °F) at the 1.5 m (5 ft) level above the floor or below. No significant increases in heat flux above ambient conditions were measured in the corridor. The experiments demonstrate the significant improvement to life safety that an automatic sprinkler system can provide.

Acknowledgements

The authors would like to thank the Myrtle Beach Air Force Base Redevelopment Authority and the Myrtle Beach Fire Department for supporting the conduct of the experiments and providing logistical and fire fighting support. The authors would also like to acknowledge Gerald Haynes of the Bureau of Alcohol, Tobacco and Firearms, for his guidance in the design of the experiments and his assistance in the conduct of the experiments. The authors would like to recognize, Dr. Glenn Forney, Mr. Laurean DeLauter, Mr. Jack Lee, Mr. Jay McElroy, Mr. Gary Roadarmel, Mr. William Twilley, and Mr. Robert Vettori of the Building and Fire Research Laboratory at NIST, for the invaluable support that they provided during this series of experiments. Finally, the authors express gratitude to the United States Fire Administration and Mr. Larry Maruskin for their sponsorship and support of this important research program.

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[2] Rohr, Kimberly, D., *School, College, and University Dormitories, and Fraternity and Sorority House Fires in the United States, 1994-1998 Annual Averages*. National Fire Protection Association, Quincy, MA, June 2001.

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[4] Taylor, B.N. and Kuyatt, C.E., "Guidelines for Evaluating and Expressing the Uncertainty of NIST Measurement Results," NIST TN 1297, National Institute of Standards and Technology, Gaithersburg, MD, January 1994.

[5] Purser, D.A., *Toxicity Assessment of Combustion Products*. SFPE Handbook of Fire Protection Engineering, 3rd ed.. DiNenno, P.J., et. al. (eds). NFPA Quincy, MA, 2002.

Table 1. Thermocouple Array (TC) and Smoke Alarm (SA) Locations

Thermocouple Array (TC)	Location from west end of corridor
1	0.15 m (6 in) from west end of corridor
2	2.11 m (6 ft 11in) from west end of corridor
3	9.73 m (31 ft 11) from west end of corridor
4	17.35 m (56 ft 11 in) from west end of corridor
5 (SA 4, 0.93 m (1 ft 9 in) to the west)	24.96 m (81 ft 11 in) from west end of corridor
6 (SA 1)	32.59 m (106 ft 11 in) from west end of corridor
7 (SA 3)	2.89 m (9 ft 6 in) from west day room wall, 1.83 m (6 ft) from south wall
8 (SA 2)	5.38 m (17 ft 8 in) from west day room wall, 1.83 m (6 ft) from south wall
9 (SA 5, 8 ft to the east)	40.21 m (131 ft 11 in) from west end of corridor
10	47.83 m(156 ft 11 in) from west end of corridor
11	55.45 m (181 ft 11 in) from west end of corridor
12	59.49 m (195 ft 2 in) from west end of corridor

Table 2. Timeline for Experiment Number 1

Time	Observation
0 s	Ignition
15 s	Flames spreading up the paper to the point attached to the wall
20 s	Day room, west side, smoke alarm (SA3) activated
25 s	Flames involving most of the paper, flames near ceiling
25 s	East Corridor, SA5 activated
35 s	Paper burning and falling, fire decreasing
45 s	West Corridor, SA4 activated
60 s	Fire on sofa cushion, small flames on paper still attached to wall, paper burning on floor
60 s	Day room corridor SA1 activated
90 s	Smoke plume from center of sofa has gotten darker, more visible, fire increasing in size, most of center cushion involved in fire
105 s	Visible smoke layer across day room ceiling
120 s	Flames to ceiling, smoke layer getting thicker
137 s	SW sprinkler activated
150 s	Small flames visible on sofa
165 s	Flames no longer visible, appear to be out
180 s	Smoke visible, one end of north sofa visible
210 s	Visibility continues to decrease
265 s	Sprinkler turned off
350 s	Fire fighters enter building
360 s	Visibility improving
380 s	Turned off light in fire area
Post-Test	Fire damage limited to ignition sofa and the wall behind the sofa. Soot marks on ceiling tile. Other sofas were not involved in fire.

Table 3. Timeline for Experiment Number 2

Time	Observation
0 s	Ignition
12 s	West day room SA3 activated
28 s	East day room SA2 activated
30 s	Paper fully involved
32 s	Day room corridor SA1 activated
44 s	East corridor SA5 activated
56 s	West corridor SA4 activated
60 s	Fire decreasing in size, small flames on bulletin board, small fire on sofa
120 s	Flames from sofa and bulletin board to ceiling
150 s	Flames reaching across west wall near ceiling
185 s	Sofa on south wall starts pyrolizing
200 s	Ignition sofa fully involved
220 s	Sofa centered in room begins to pyrolize
245 s	Smoke is filling the day room, fire "darkening down"
285 s	Visibility from cameras is lost
930 s	Fire fighters enter building
Post Test	Most of the foam on the ignition sofa is burned away. A small amount of burning occurred on the target sofas, most of the foam cushions remain. Fire damage on upper portions of walls adjacent to ignition sofa. Ceiling damage limited to area close to ignition sofa.

Table 4. Timeline for Experiment Number 3

Time	Observation
0 s	Ignition
40 s	East day room SA2 activated
40 s	West day room SA3 activated
44 s	Dayroom Corridor SA1 activated
45 s	Paper fully involved, flames to ceiling
56 s	East corridor SA5 activated
60 s	Fire decreased in size, small flames on bulletin board, small fire on sofa
165 s	Flames from sofa and bulletin board extend to ceiling
180 s	Flames spread across west wall near ceiling
225 s	Ignition sofa fully involved
235 s	Sofa on south wall started pyrolizing
275 s	Sofa centered in room began to pyrolize
325 s	Sofa on south wall ignited
350 s	Sofa centered in room ignited
920 s	Firefighters entered building
960 s	Fire is extinguished

Post Test All of the ceiling tile is burned or down on the floor with the exception of a row of tiles on the east end of the day room. All of the foam cushions have burned away completely. Significant burn damage to walls. Burn line in day room on east and south walls stops approximately 0.5 m above the floor. Fire damage (evidence of burning) in corridor limited to area across from day room with some extension to the east and west.

Table 5. Day Room Experiment 1, Smoke Alarm Activation and Sprinkler Activation Times

Smoke Alarm	Location	Time (s)
1	Dayroom Corridor	60
2	Dayroom, east side	*
3	Dayroom, west side (ign)	20
4	West Corridor	45
5	East Corridor	25
Sprinkler Activation		
1	Dayroom SW	137
2	Dayroom NW	Did not activate
3	Dayroom NE	Did not activate
4	Dayroom SE	Did not activate

* The device activation time was not recorded due to an instrumentation malfunction.

Table 6. Day Room Experiment 2, Smoke Alarm Activation Times

Smoke Alarm	Location	Time (s)
1	Dayroom Corridor	32
2	Dayroom, east side	28
3	Dayroom, west side (ign)	12
4	West Corridor	56
5	East Corridor	44

Table 7. Day Room Experiment 3, Smoke Alarm Activation Times

Smoke Alarm	Location	Time (s)
1	Dayroom Corridor	44
2	Dayroom, east side	40
3	Dayroom, west side (ign)	40
4	West Corridor	*
5	East Corridor	56

* Device activation time was not recorded due to an instrumentation malfunction.

Table 8. Estimated Uncertainty in Full Scale Experimental Data.

	Component Standard Uncertainty	Combined Standard Uncertainty	Total Expanded Uncertainty
Gas Temperature		- 8 % to + 8 %	- 15 % to + 15 %
Calibration	± 1 %		
Radiative Cooling	- 5 % to + 0 %		
Radiative Heating	- 0 % to + 5 %		
Repeatability [1]	± 5 %		
Random [1]	± 3 %		
Total Heat Flux		- 12 % to + 7 %	- 24 % to + 13 %
Calibration	± 3 %		
Zero	- 2 % to + 2 %		
Soot Deposition	- 10% to + 0 %		
Repeatability [1]	± 5 %		
Random [1]	± 3 %		

Notes: 1. Random and repeatability evaluated as Type A, other components as Type B.

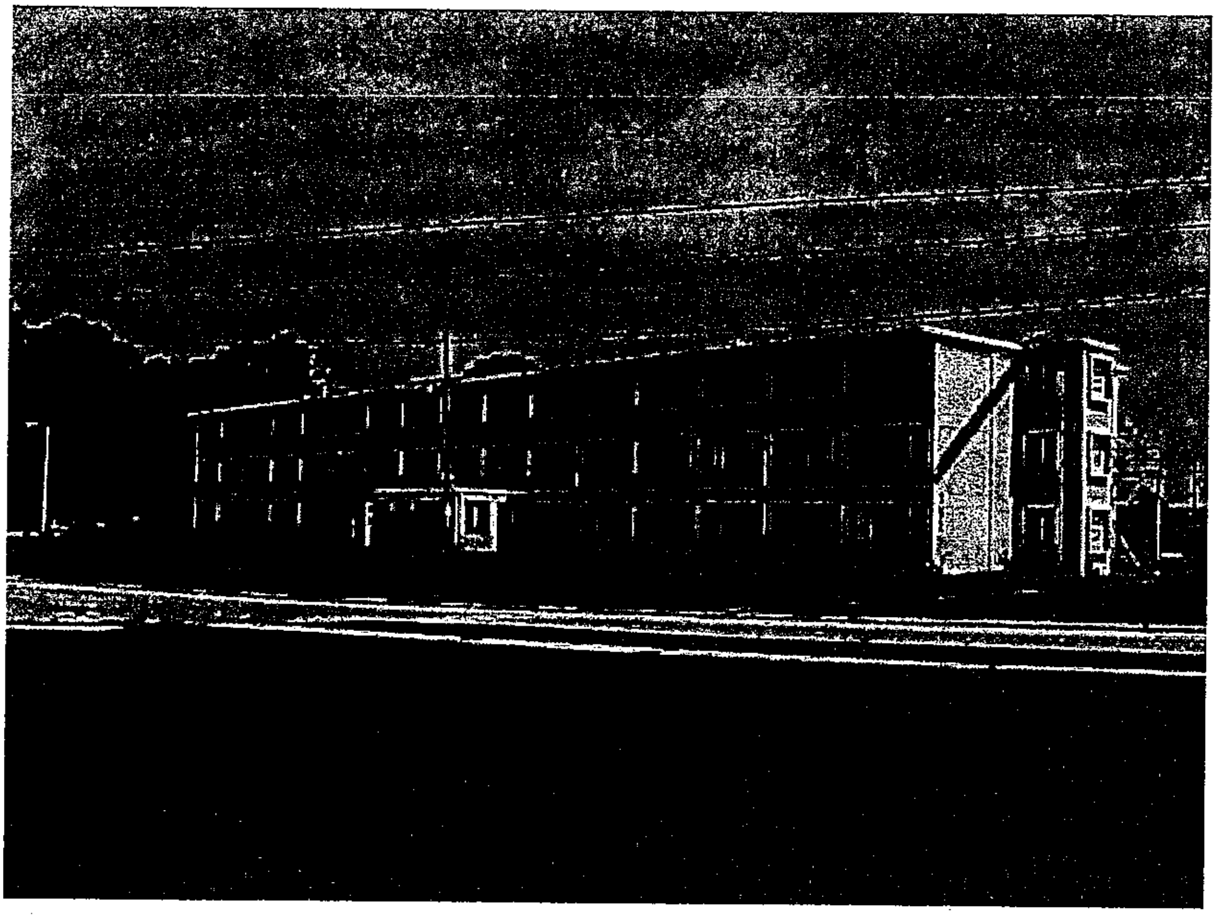


Figure 1. Photograph of dormitory building, similar to the test structure.

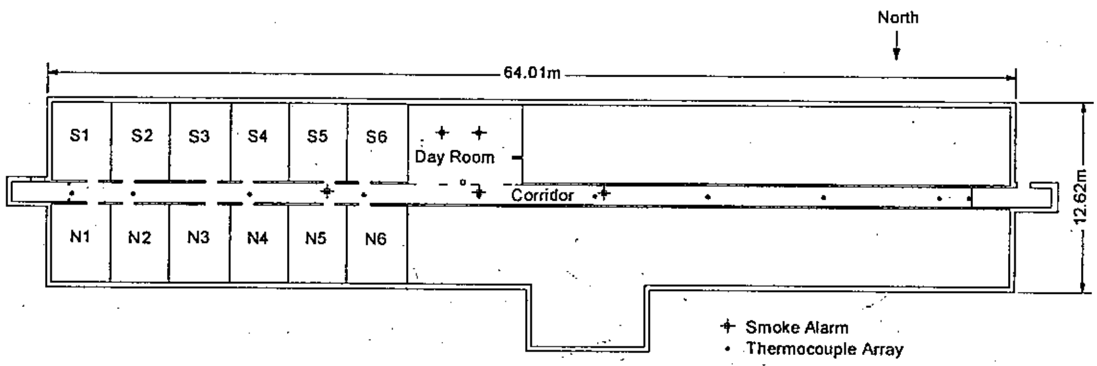


Figure 2. Arrangement of the dormitory building, 1st floor.

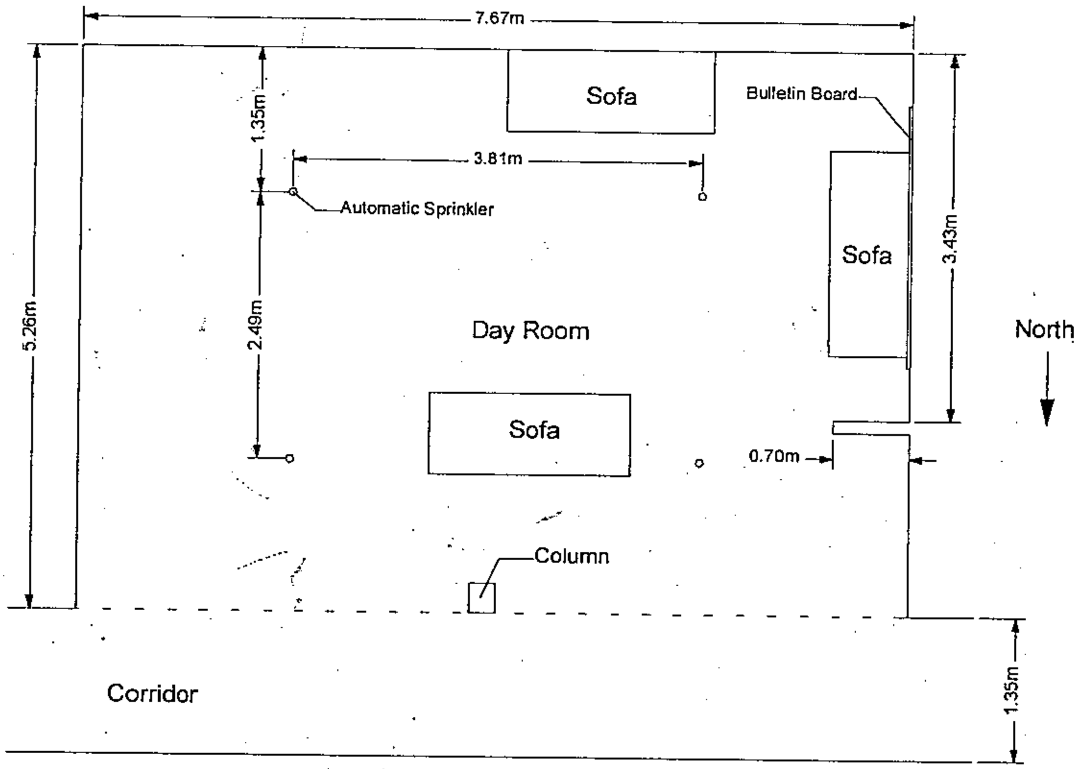


Figure 3. Plan view of Day Room with sprinkler locations.

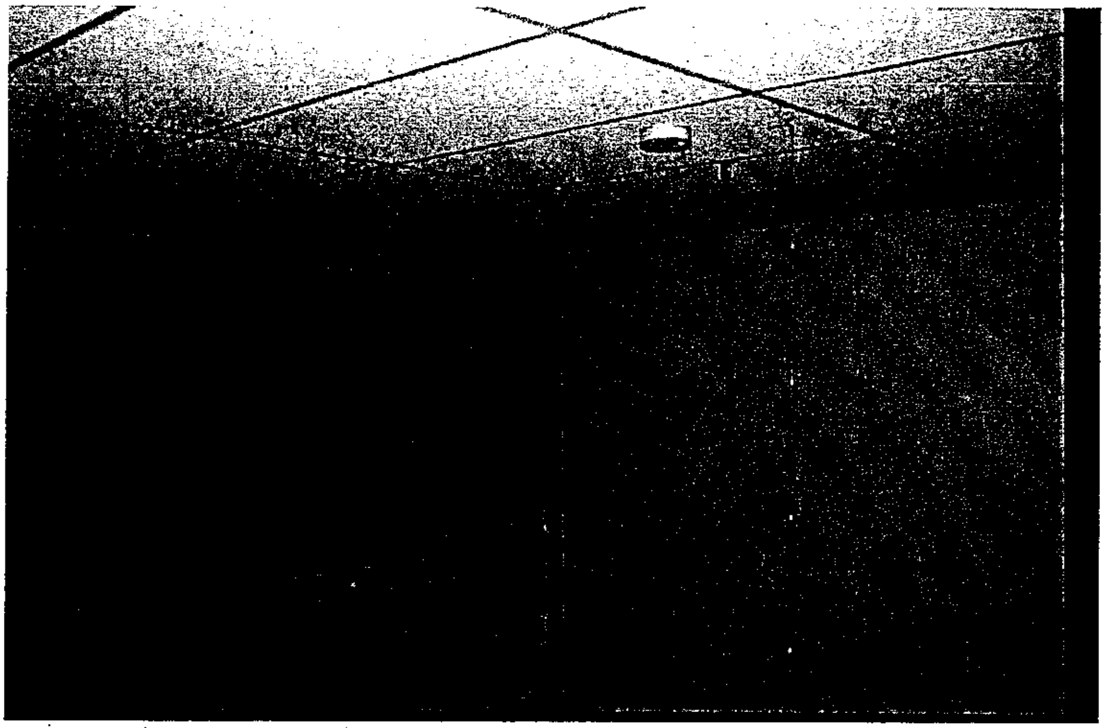


Figure 4. Photograph showing ceiling tile

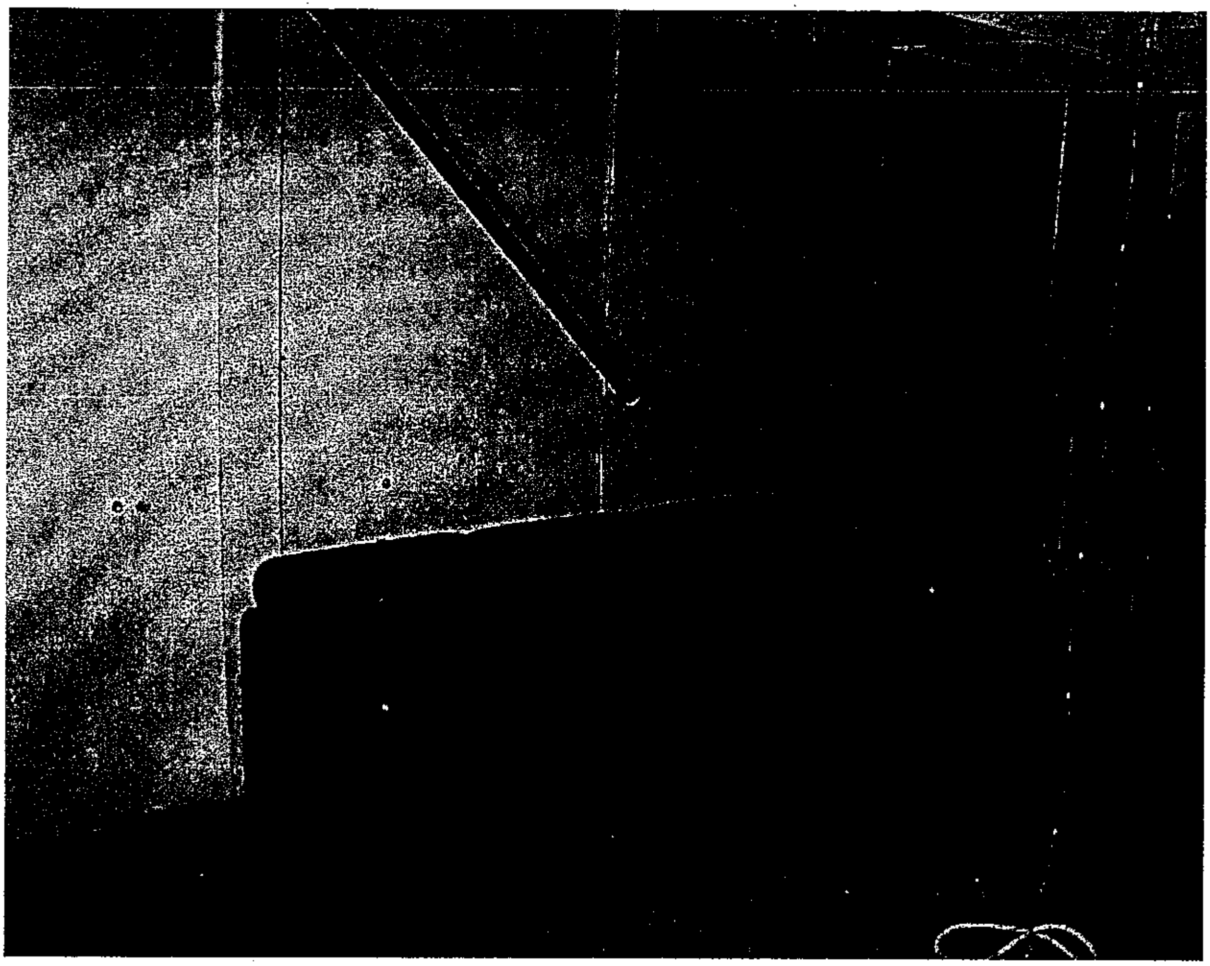


Figure 5. Photograph of the type of sofa used for ignition in all of the experiments and used as "target" sofas in experiments 2 and 3.

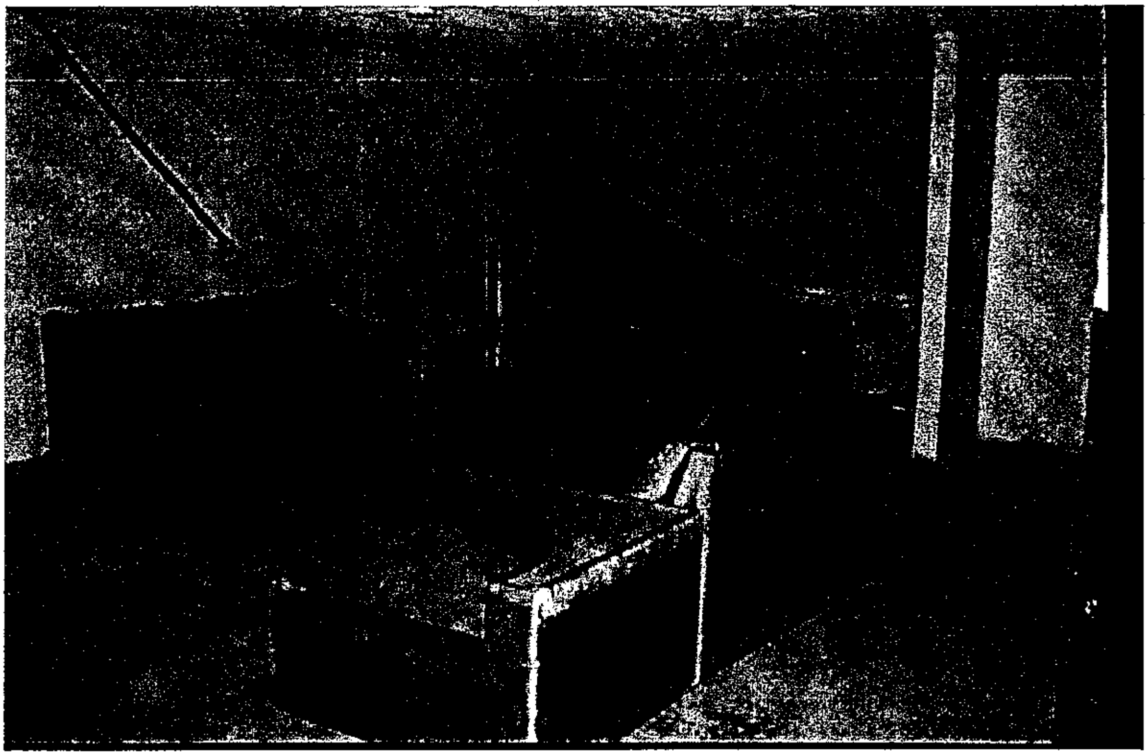


Figure 6. Photograph showing the fuel arrangement for the day room in experiment 1.

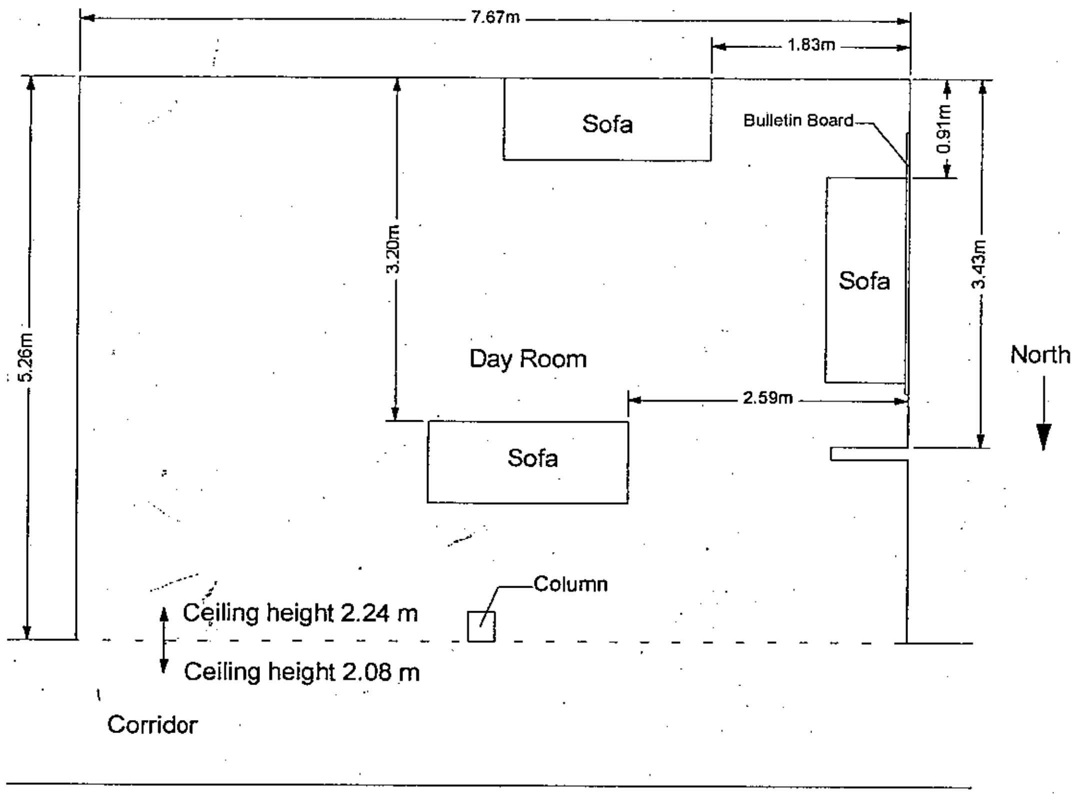


Figure 7. Diagram of day room showing sofa arrangement.

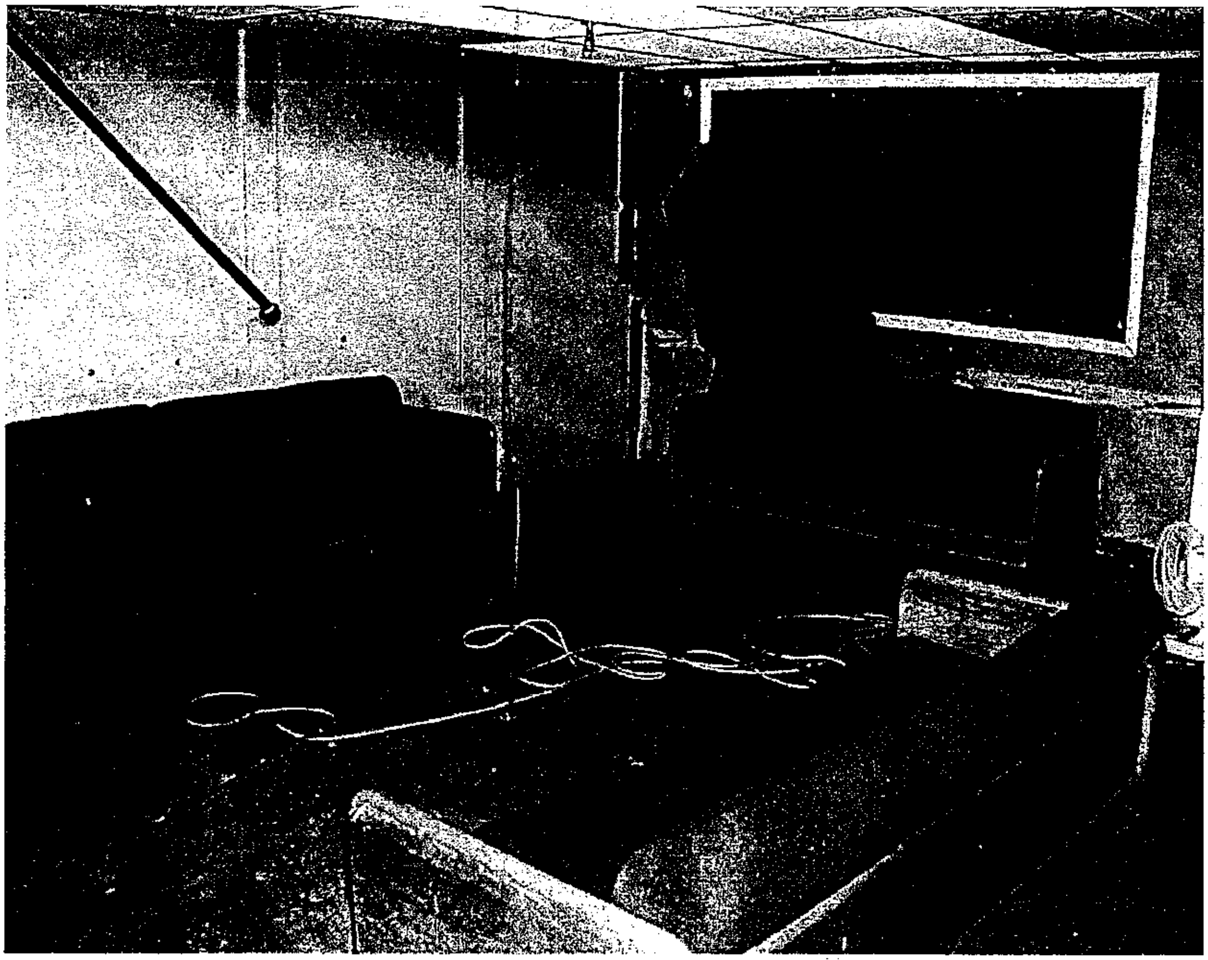


Figure 8. Photograph showing dayroom arrangement for experiment 2, with sofas, bulletin board and paper.

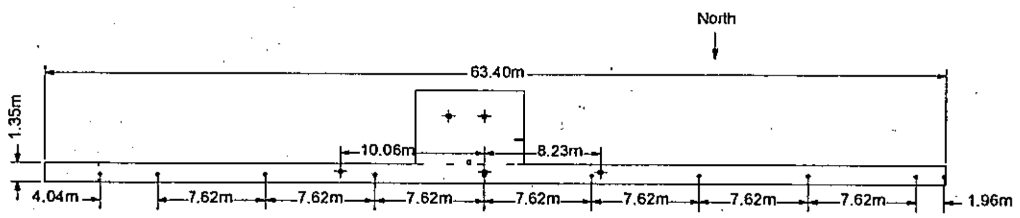


Figure 9. Locations of thermocouple arrays in corridor.

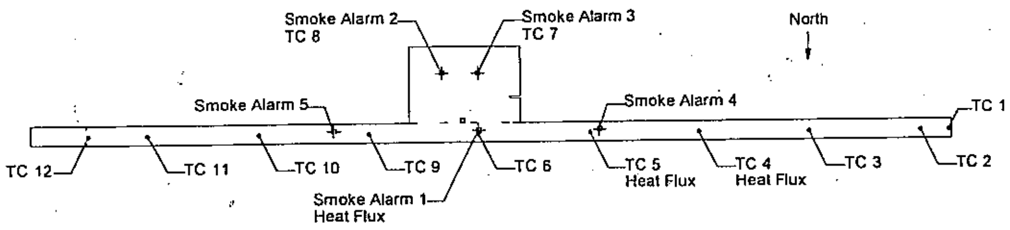


Figure 10. Diagram with instrumentation locations identified

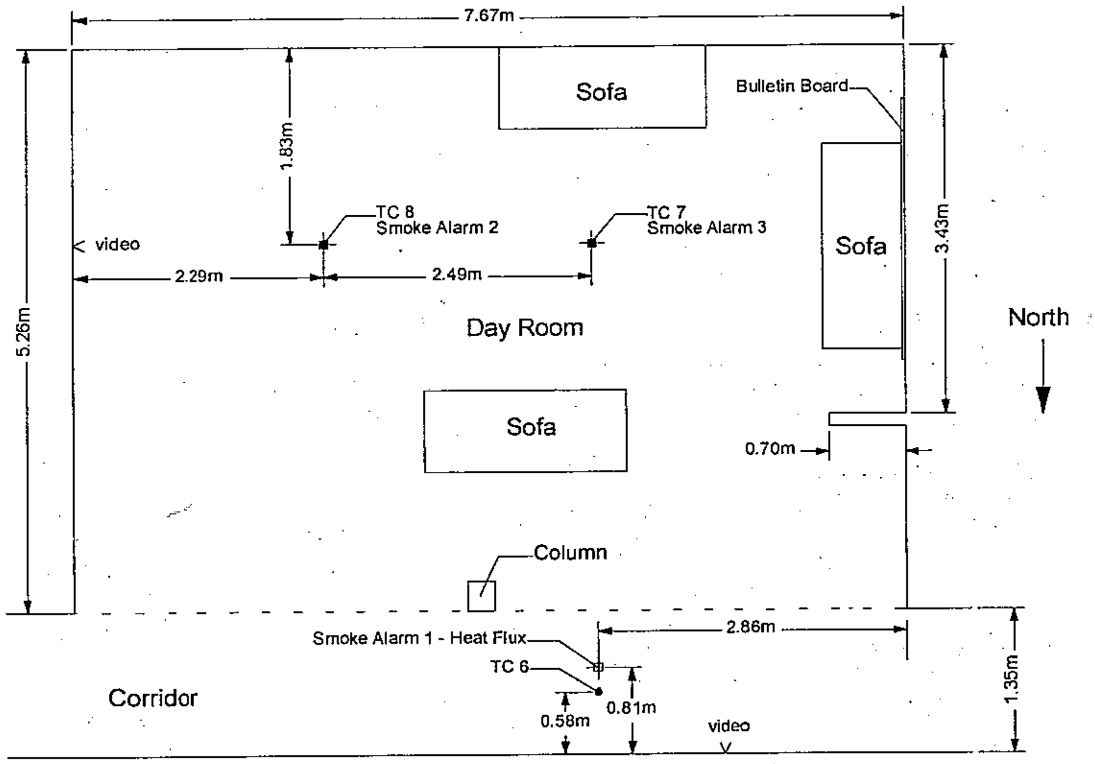


Figure 11. Diagram with instrumentation locations identified in day room area.

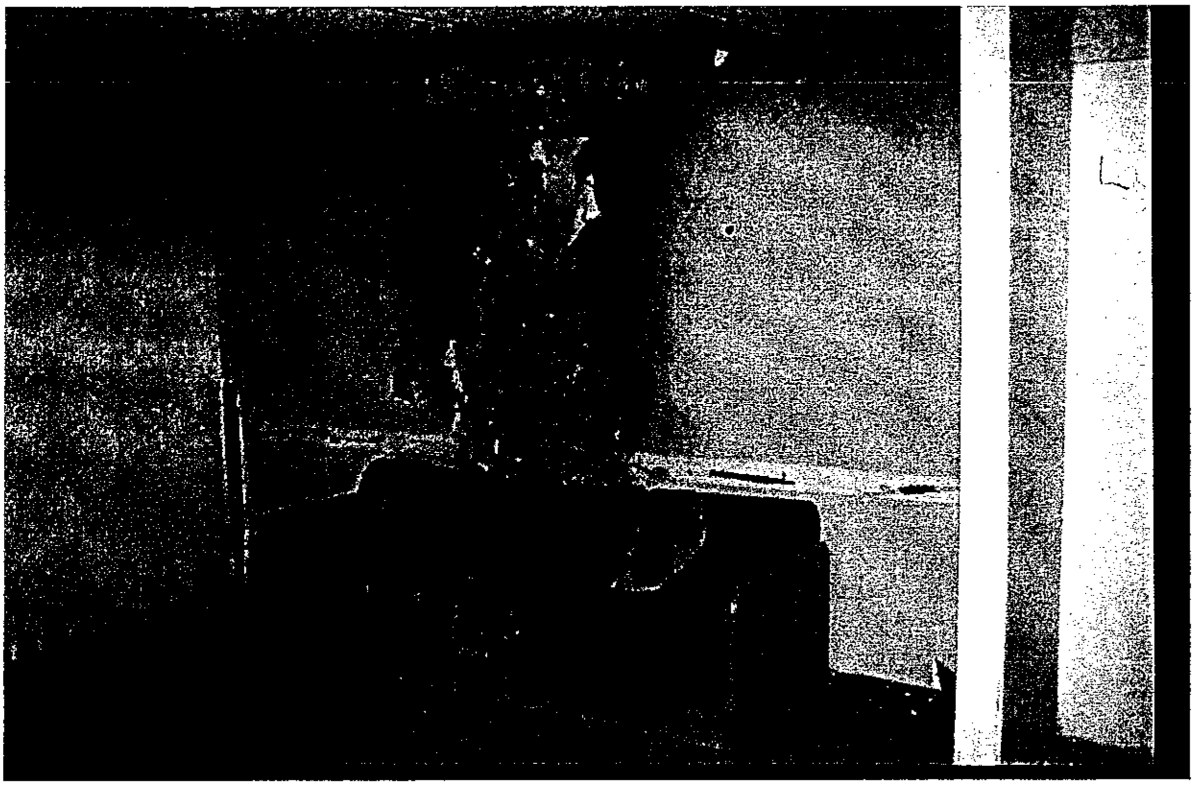


Figure 12. Photograph of day room after experiment 1.

Figure 13. Photograph showing the day room after experiment 2.

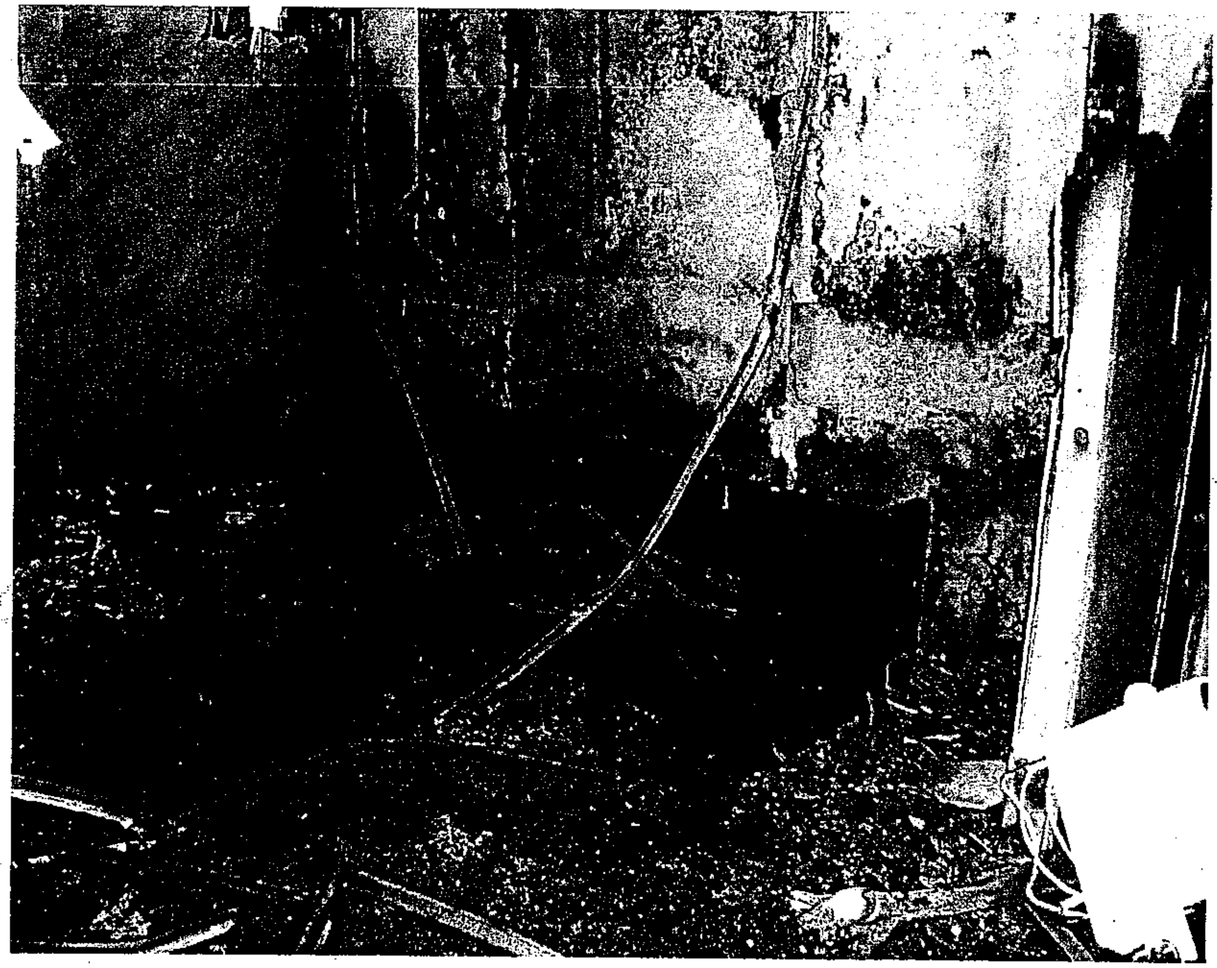


Figure 14. Photograph showing the ignition sofa after experiment 3.

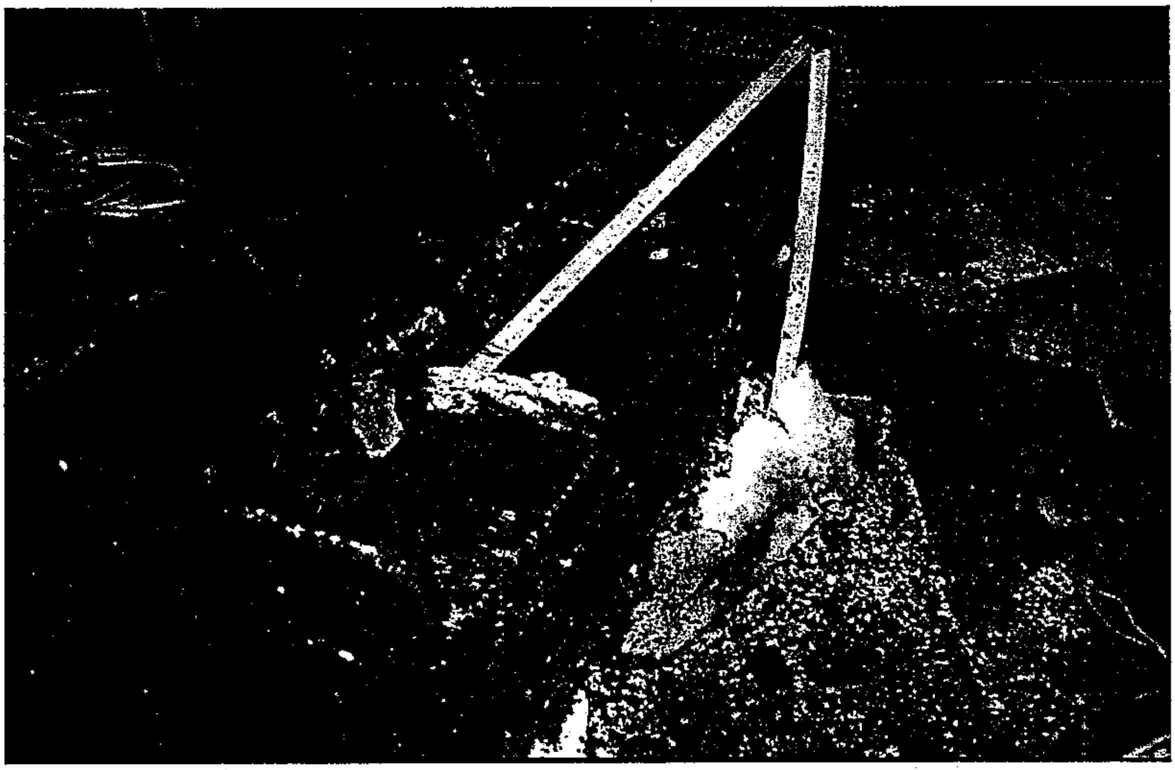


Figure 15. Photograph of north sofa after experiment 3.

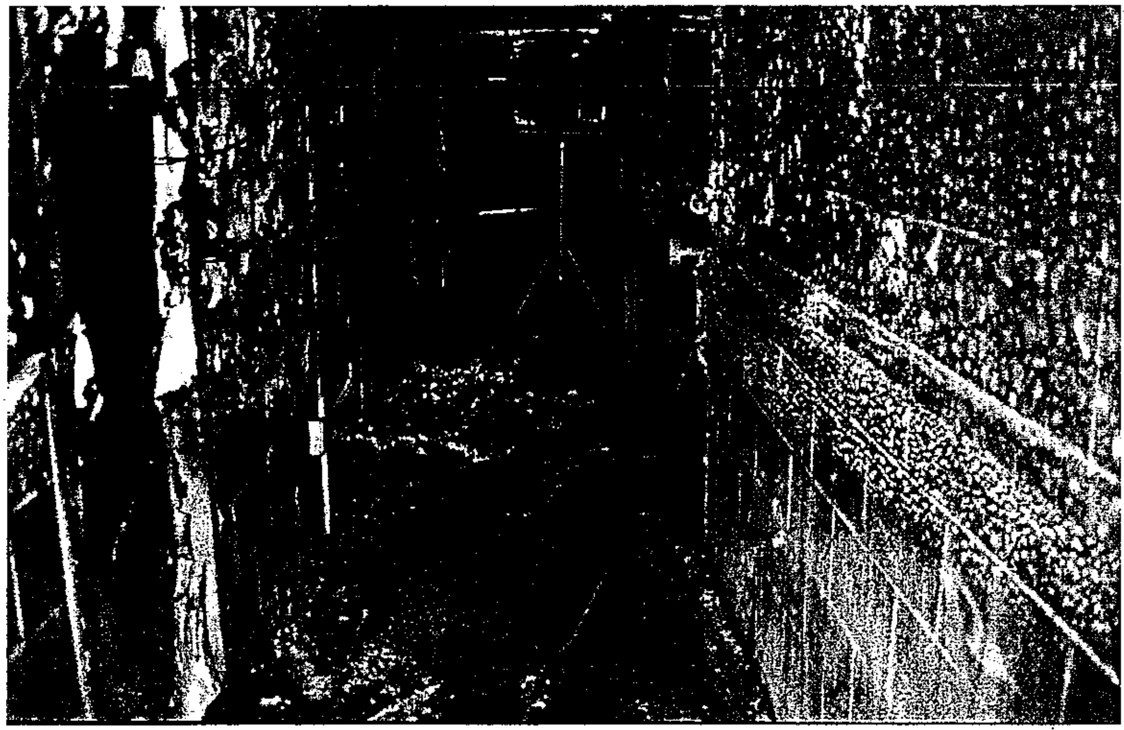
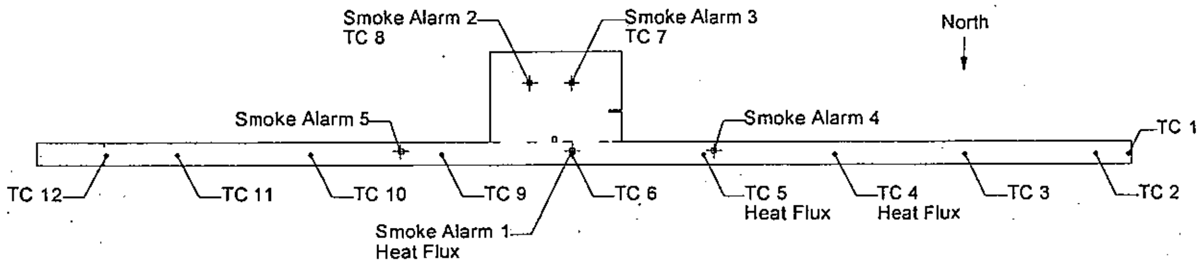


Figure 16. Photograph of corridor from the west approaching day room on right, after experiment 3.



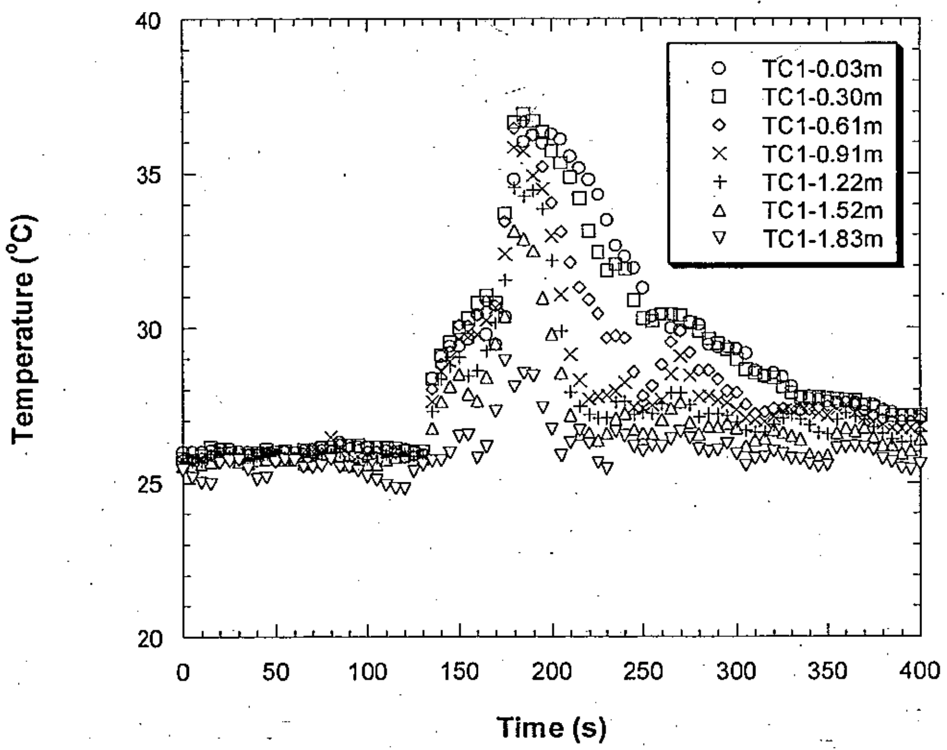
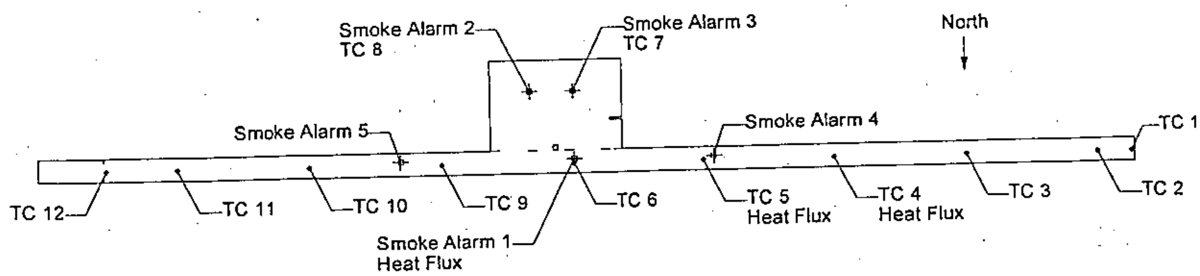


Figure 17 Experiment 1, corridor temperatures, TC array 1



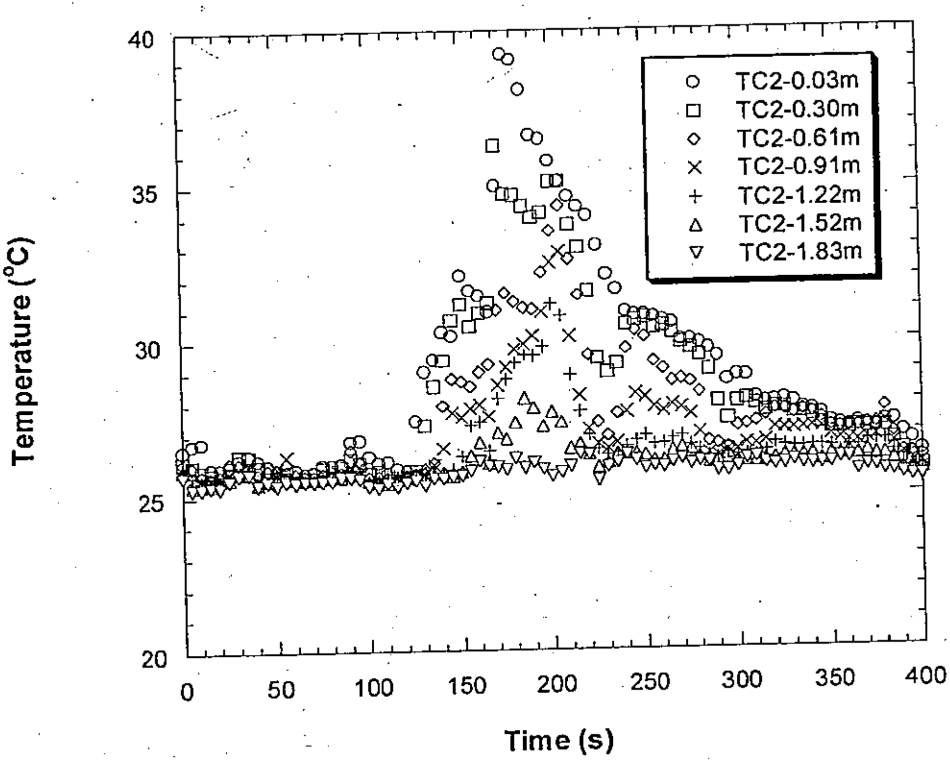
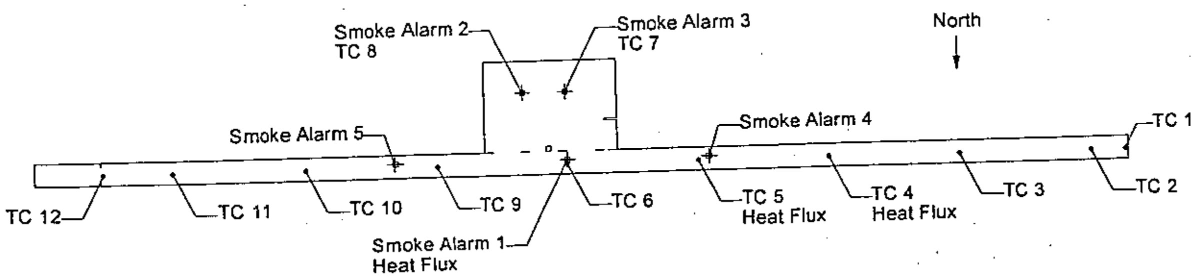


Figure 18 Experiment 1, corridor temperatures, TC array 2



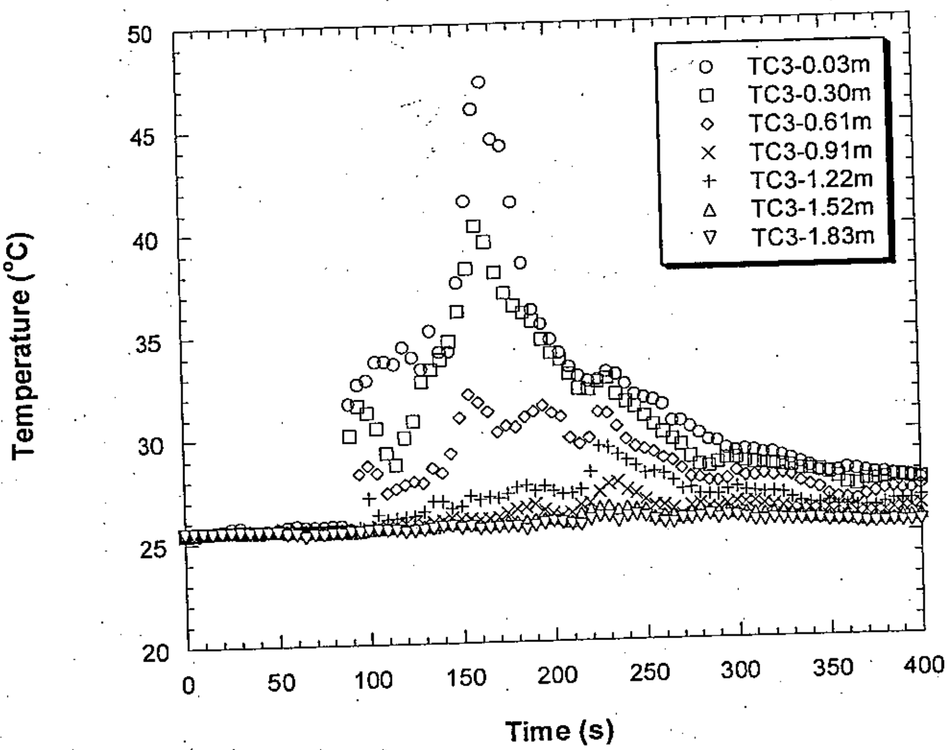
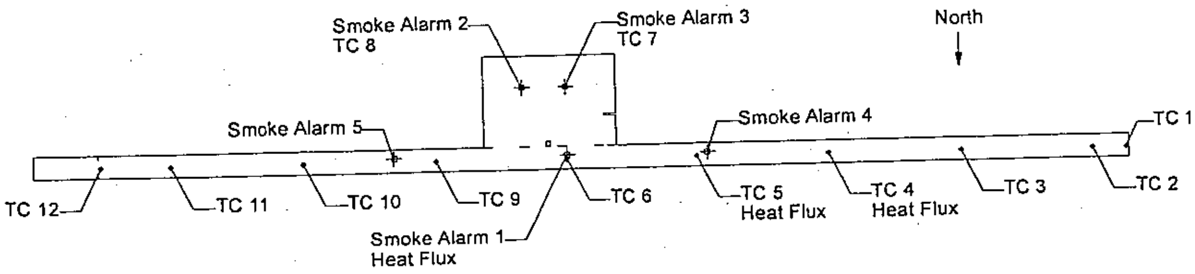


Figure 19 Experiment 1, corridor temperatures, TC array 3



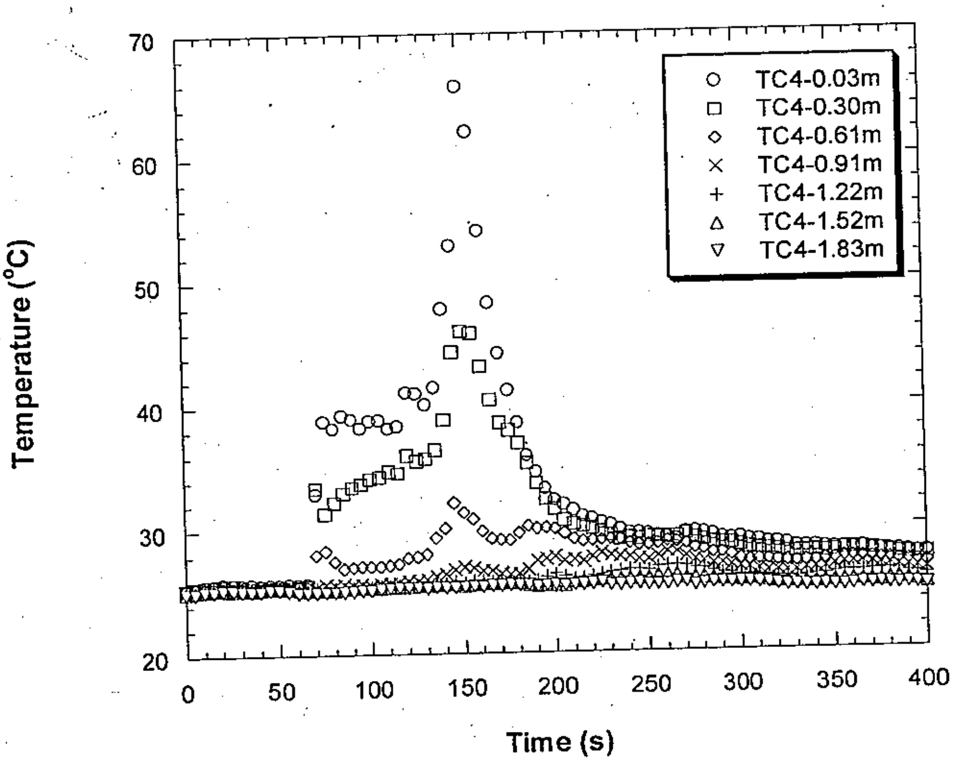
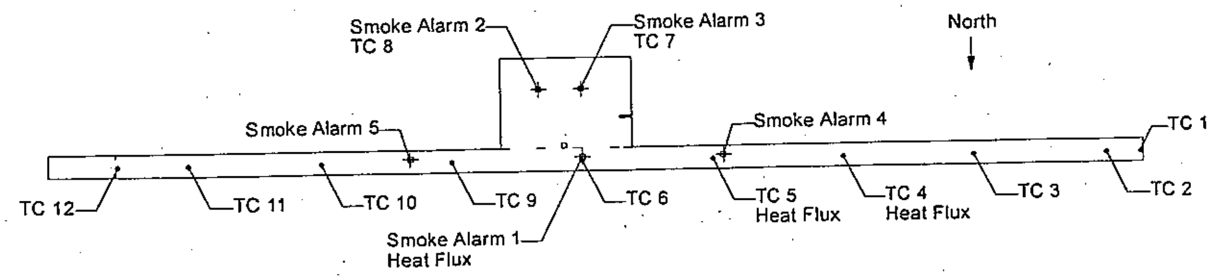


Figure 20 Experiment 1, corridor temperatures, TC array 4



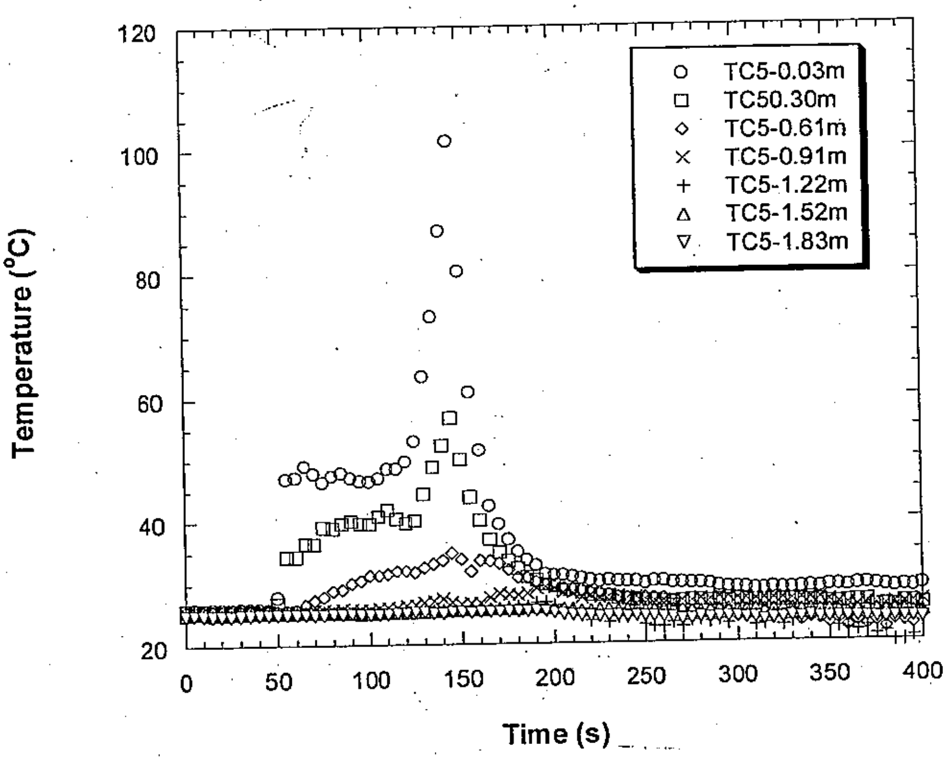
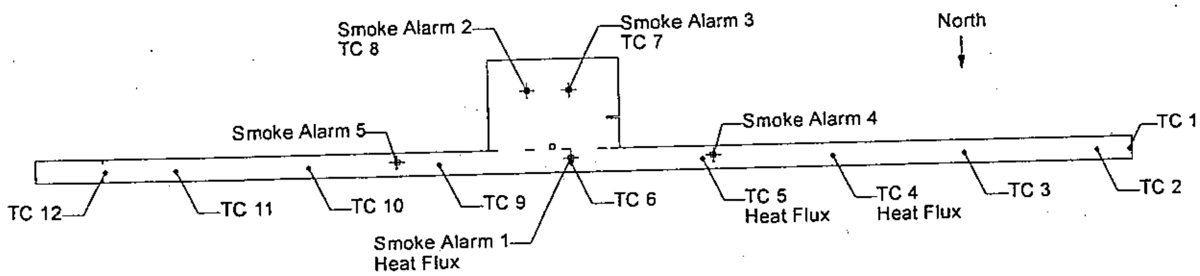


Figure 21 Experiment 1, corridor temperatures, TC array 5



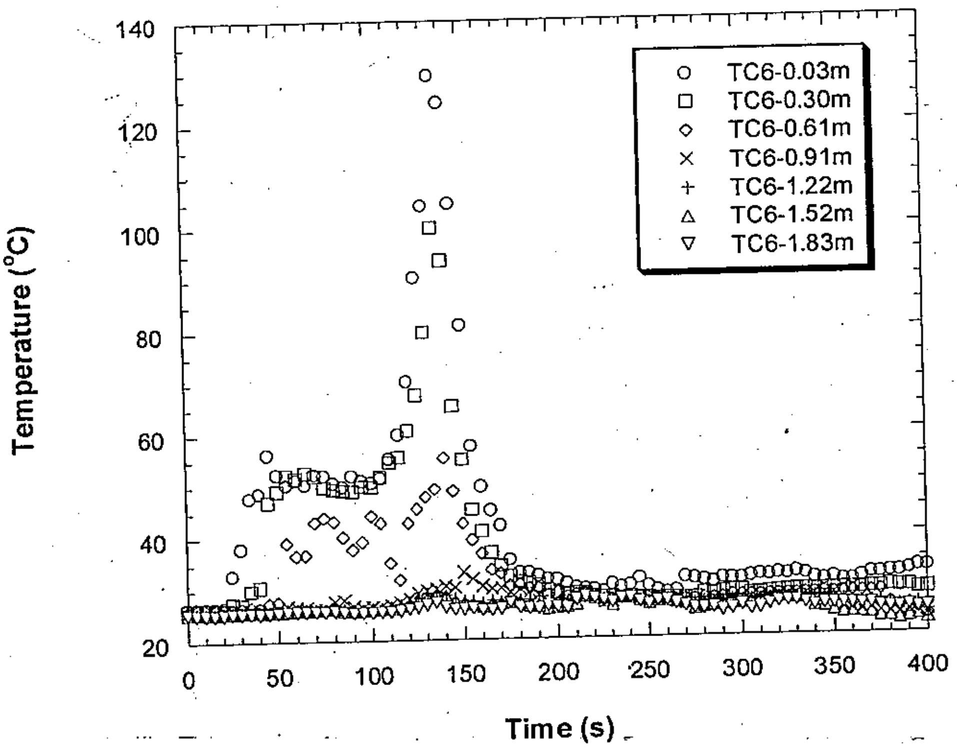
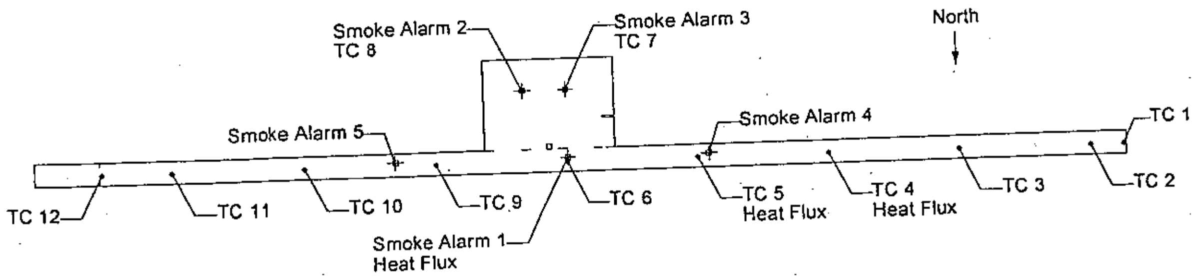


Figure 22 Experiment 1, corridor temperatures, TC array 6



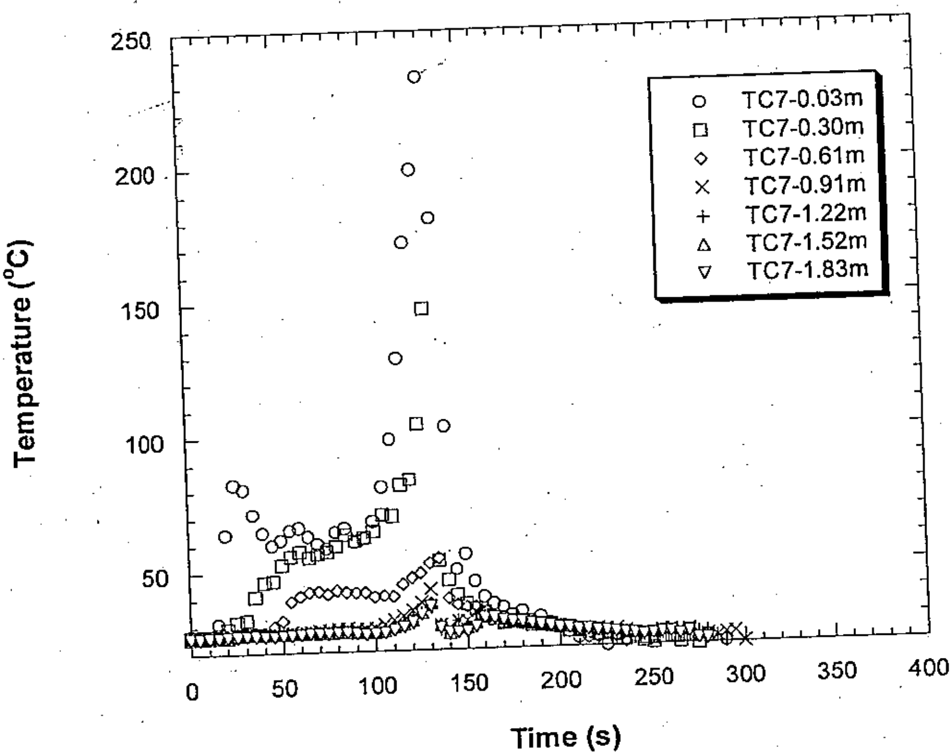
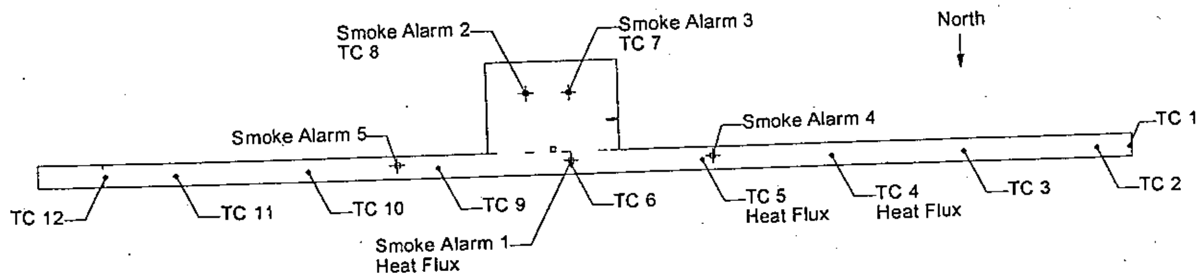


Figure 23 Experiment 1, dayroom temperatures, west side near ignition, TC array 7



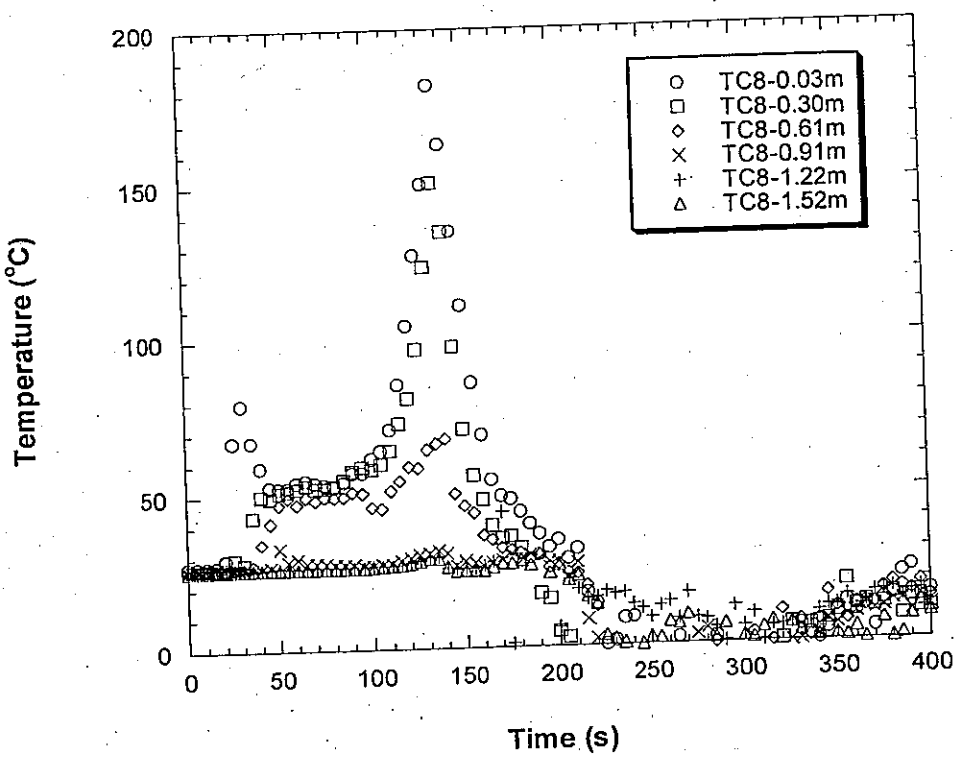
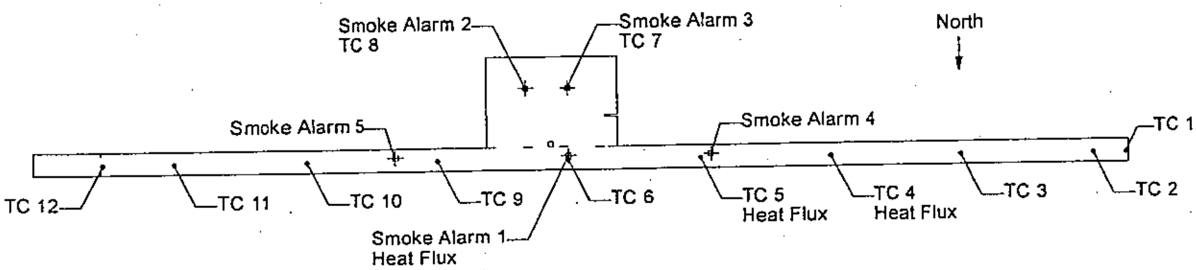


Figure 24 Experiment 1, dayroom temperatures, east side, TC array 8



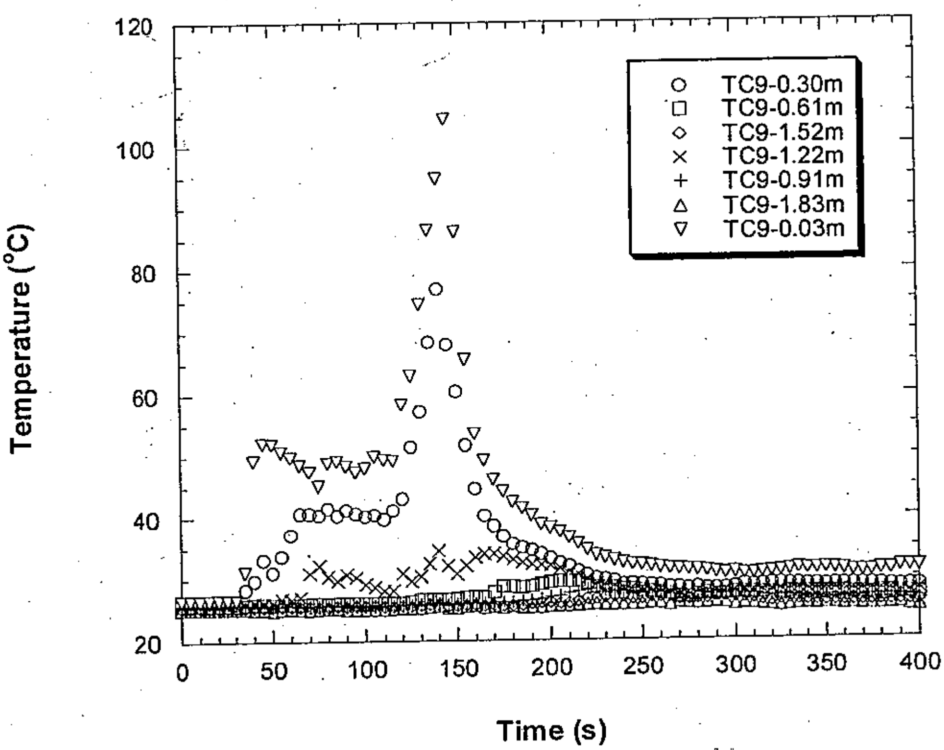
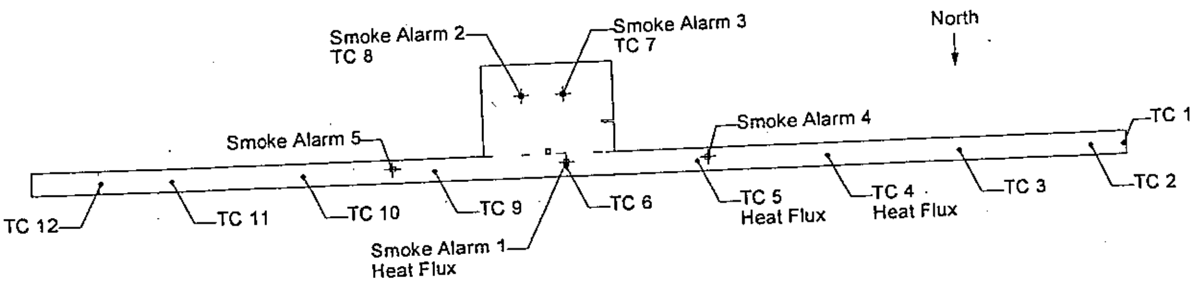


Figure 25 Experiment 1, corridor temperatures, TC array 9



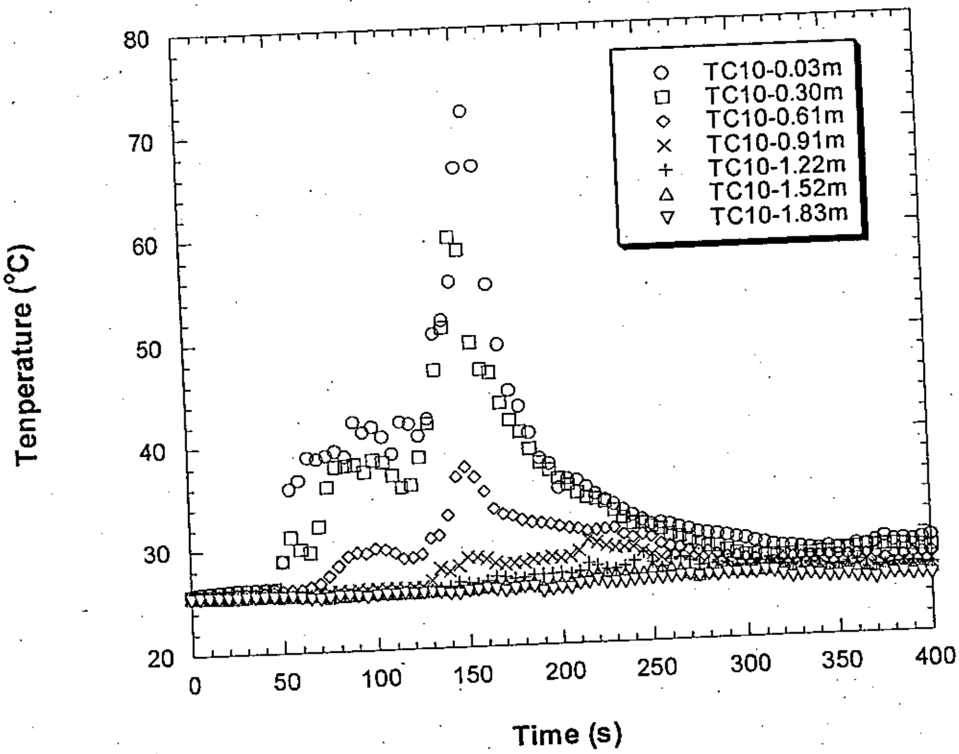


Figure 26 Experiment 1, corridor temperatures, TC array 10

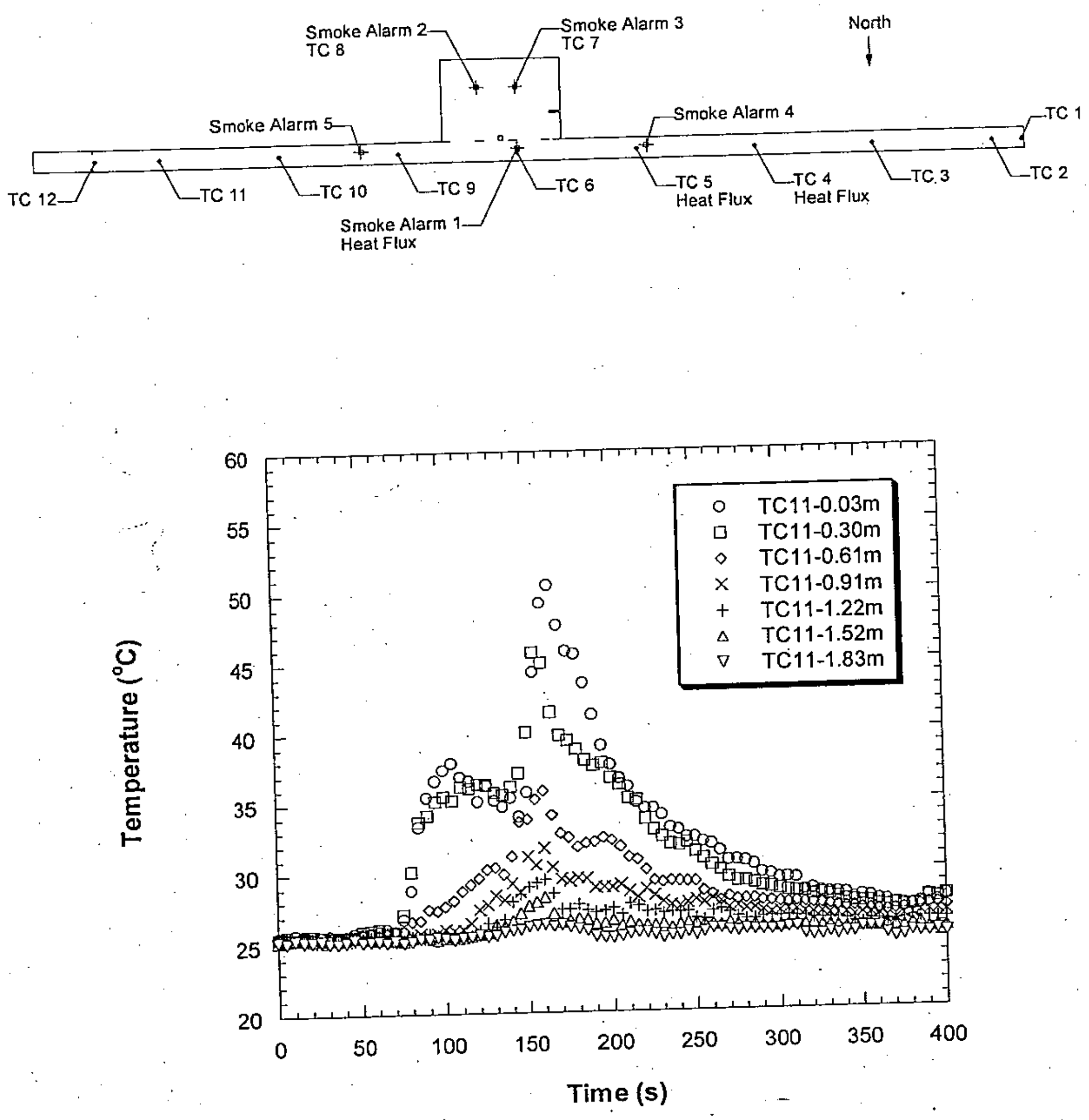
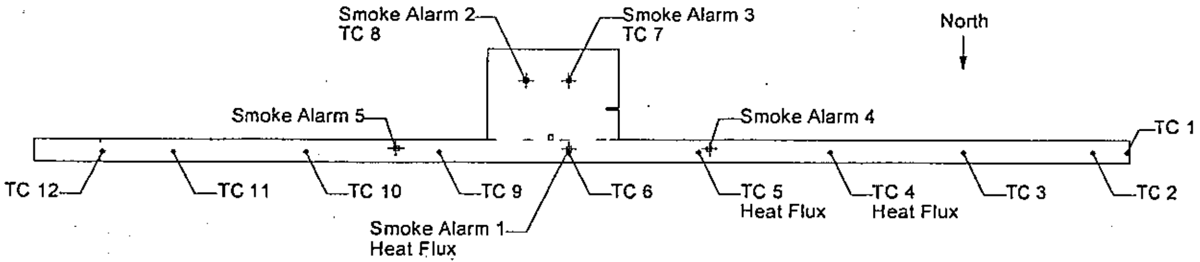


Figure 27 Experiment 1, corridor temperatures, TC array 11



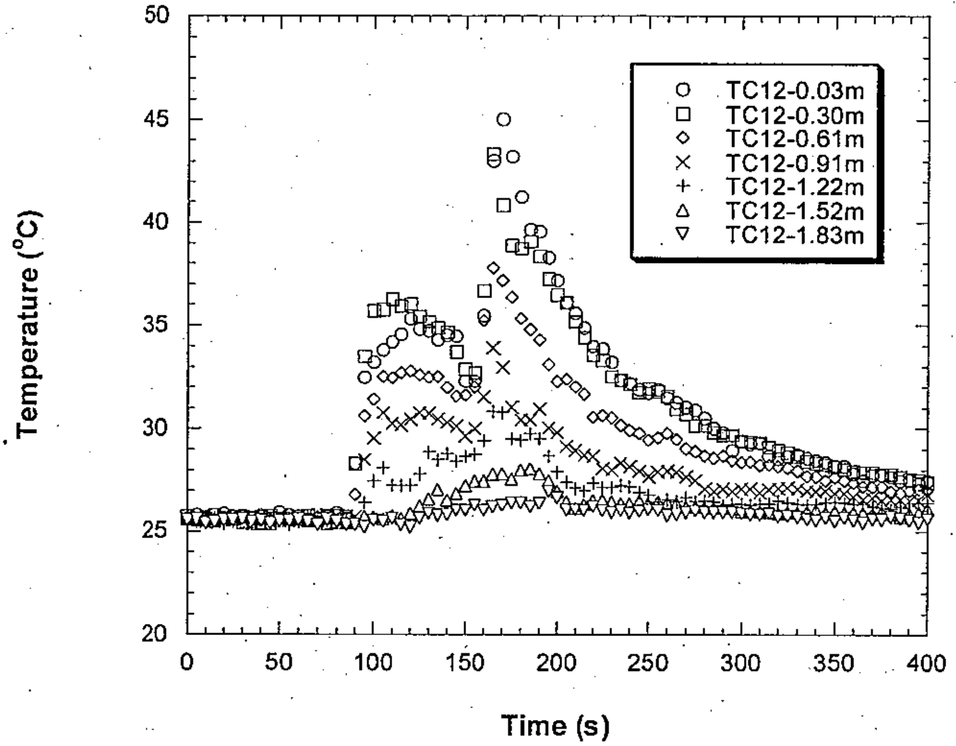
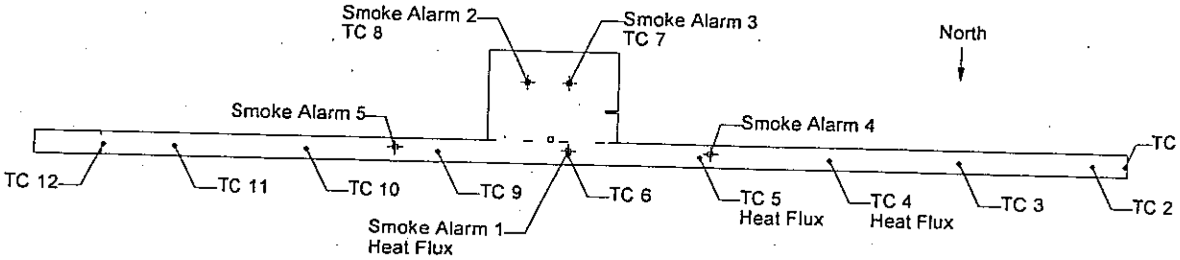


Figure 28 Experiment 1, corridor temperatures, TC array 12



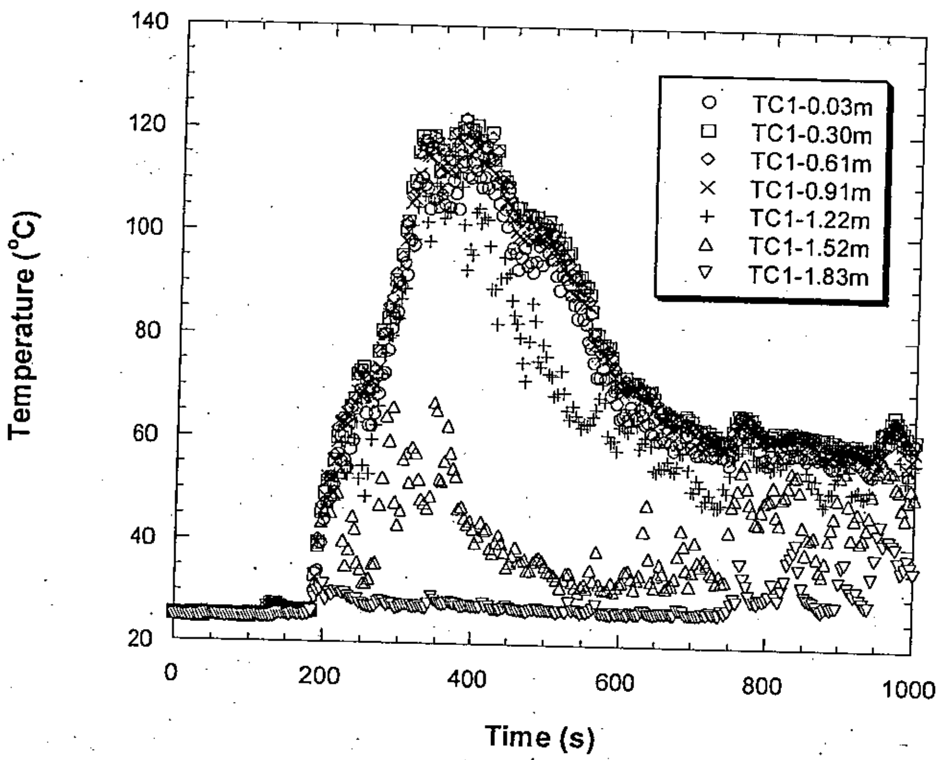
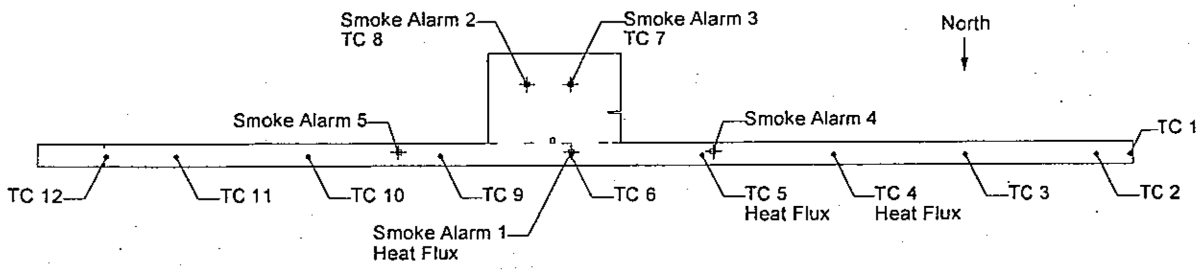


Figure 29 Experiment 2, corridor temperatures, TC array 1



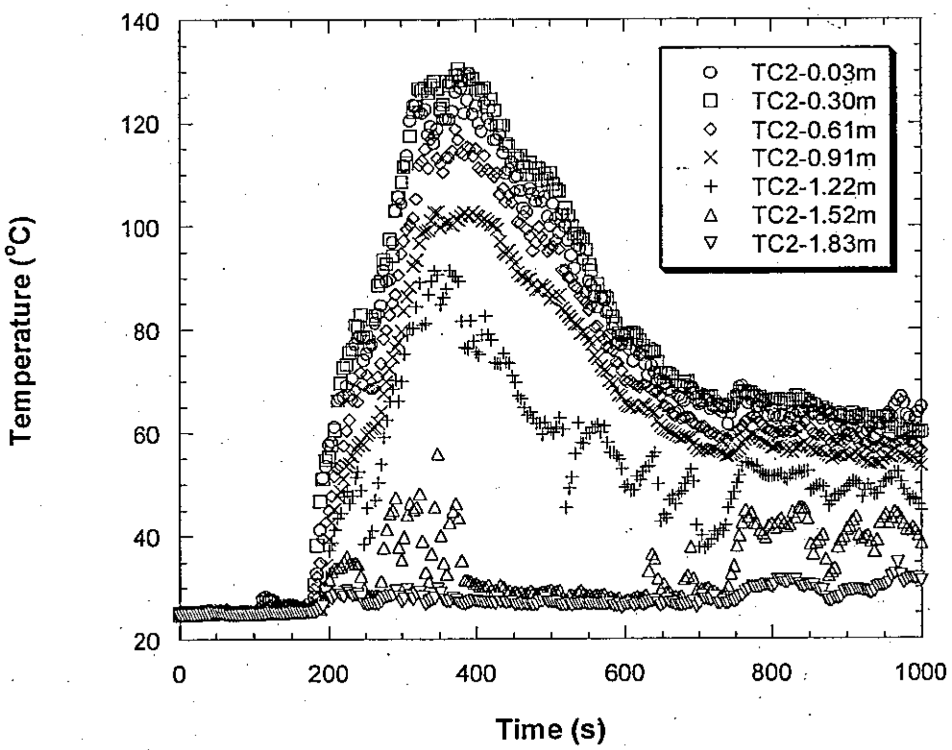
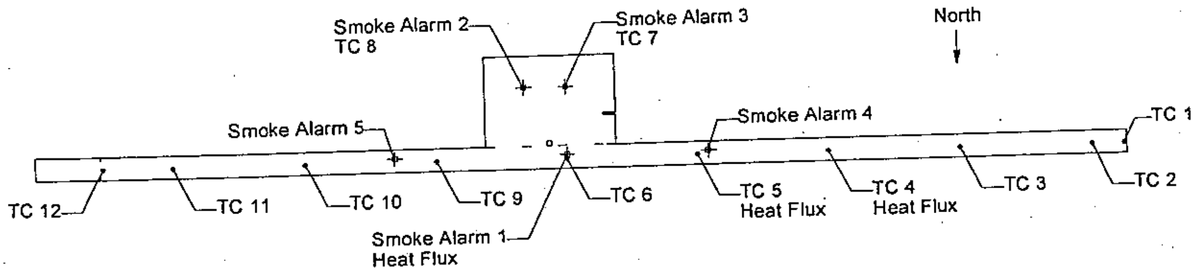


Figure 30 Experiment 2, corridor temperatures, TC array 2



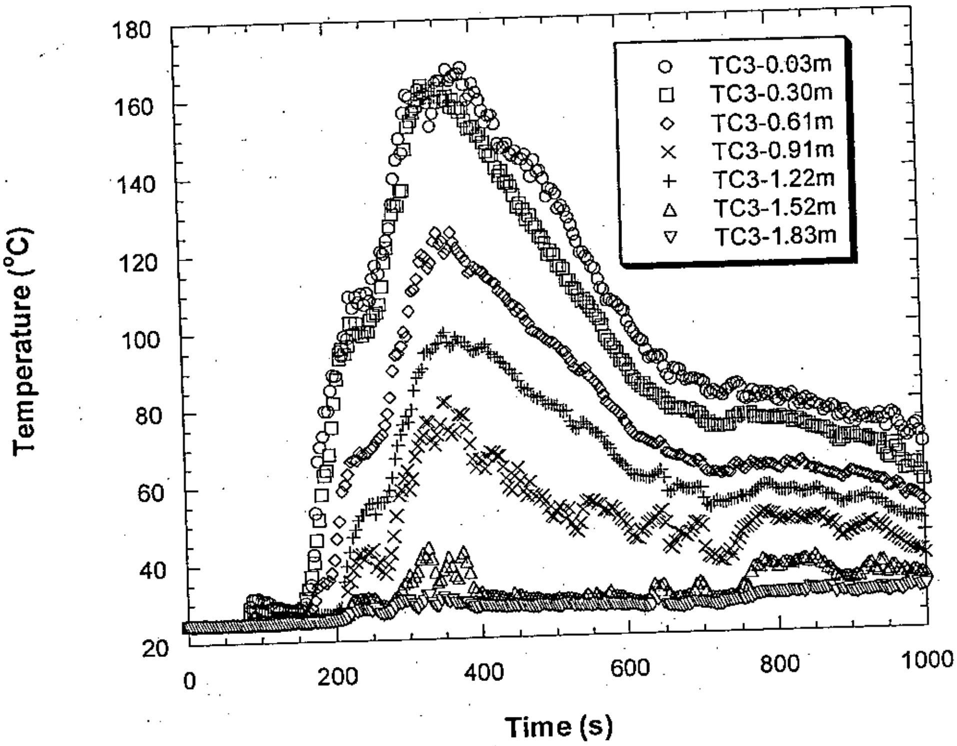
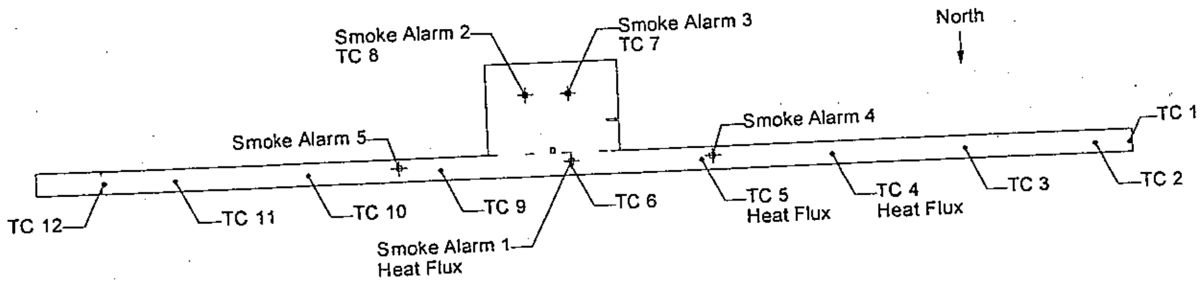


Figure 31 Experiment 2, corridor temperatures, TC array 3



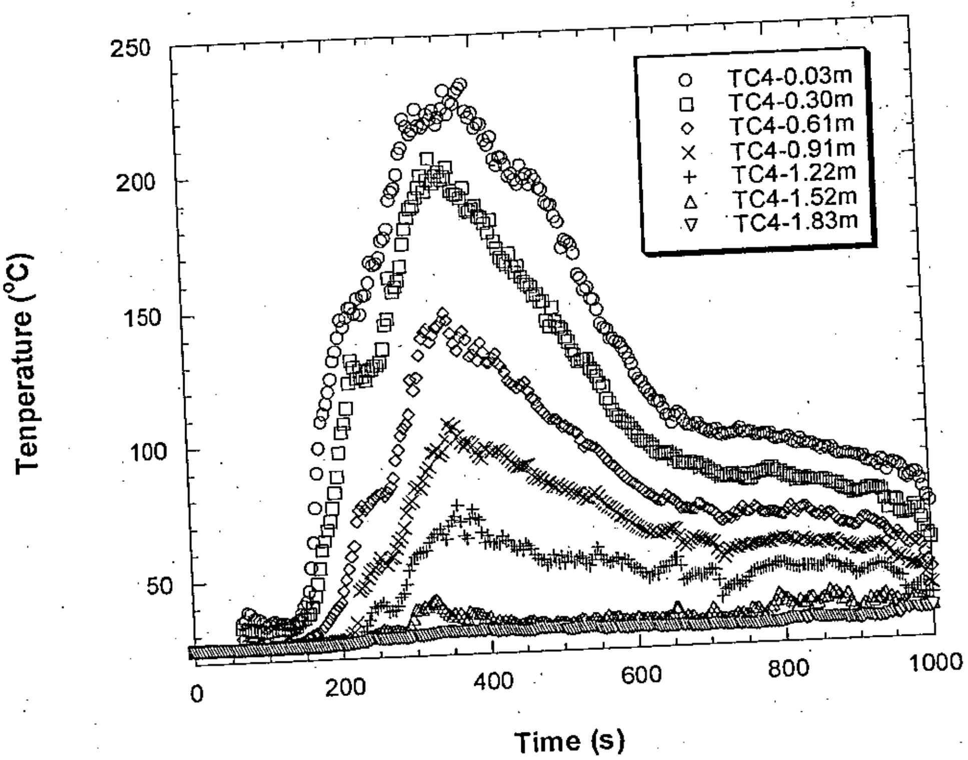
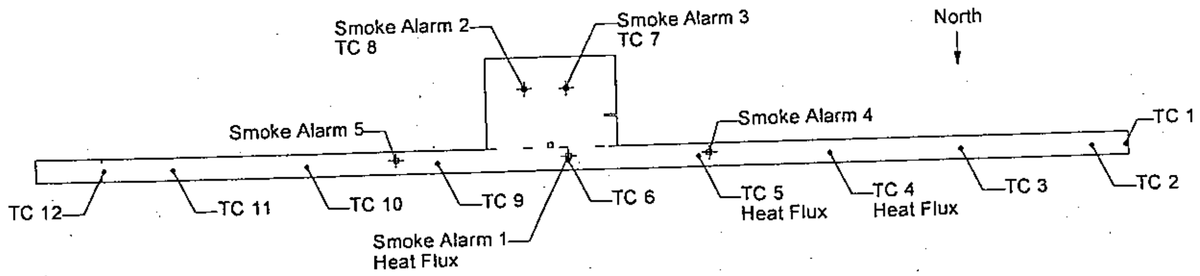


Figure 32 Experiment 2, corridor temperatures, TC array 4



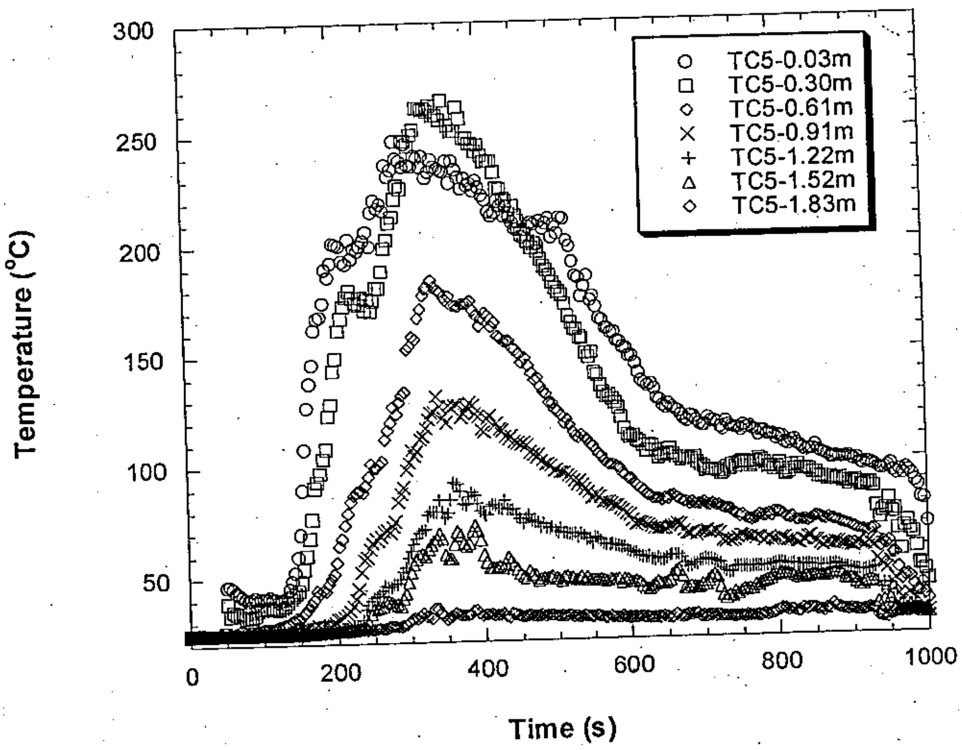
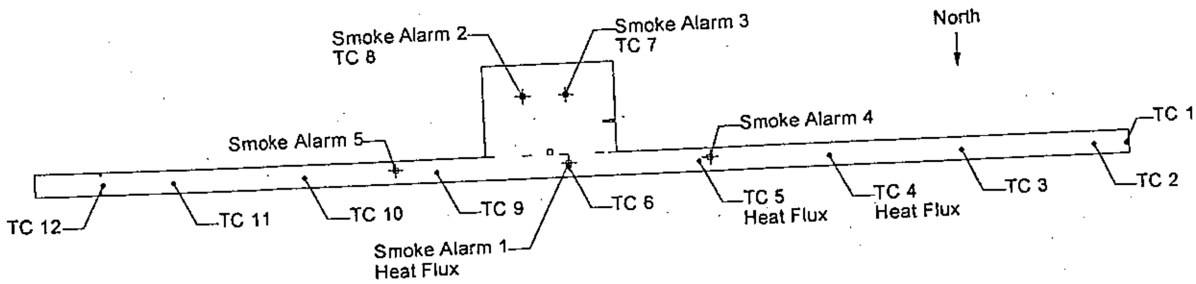


Figure 33 Experiment 2, corridor temperatures, TC array 5



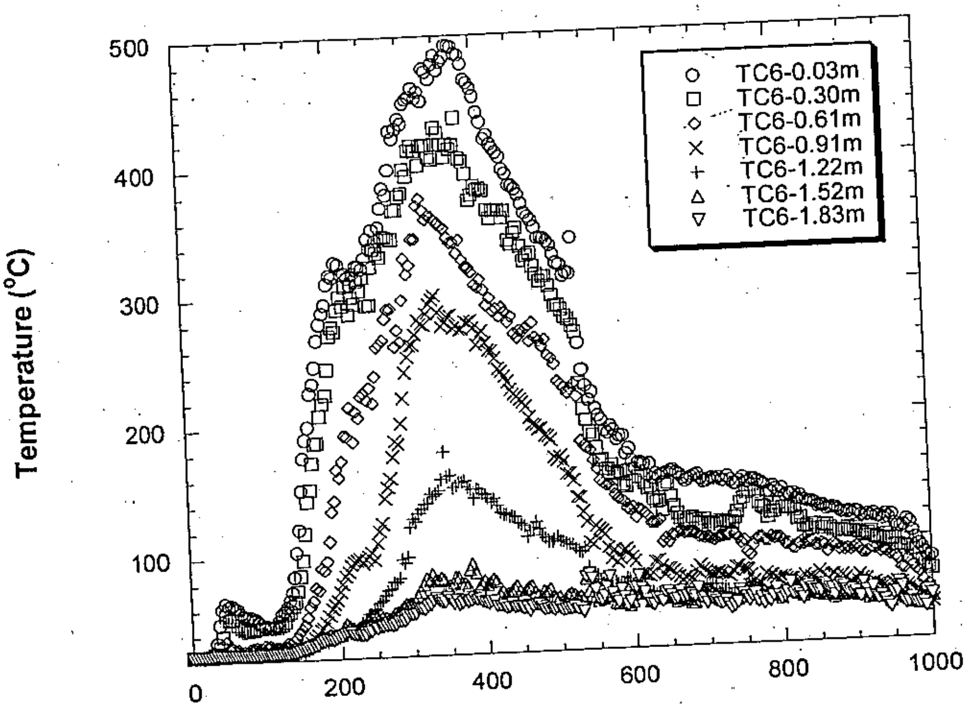
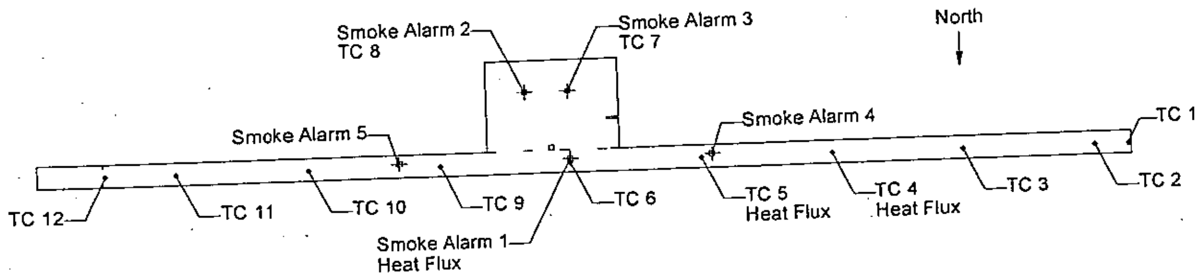


Figure 34 Experiment 2, corridor temperatures, TC array 6



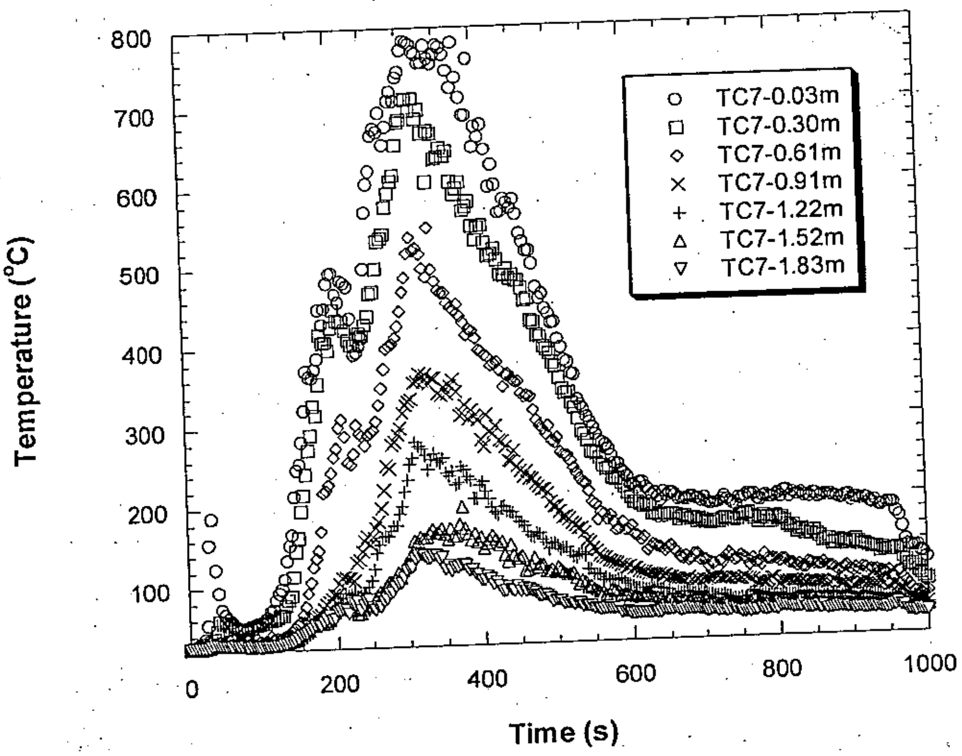
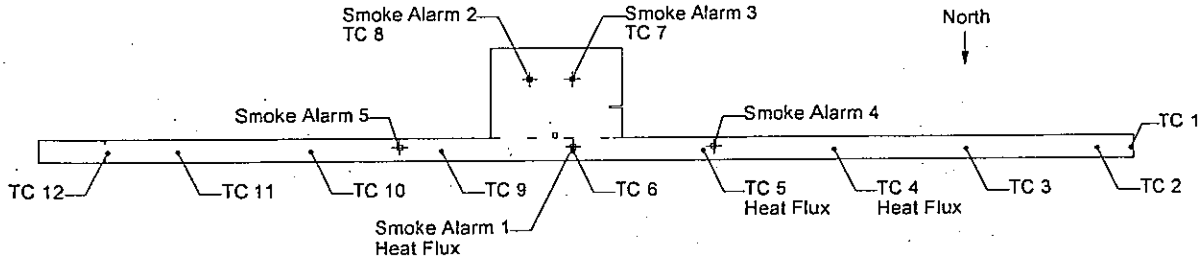


Figure 35 Experiment 2, day room temperatures, west side near ignition, TC array 7



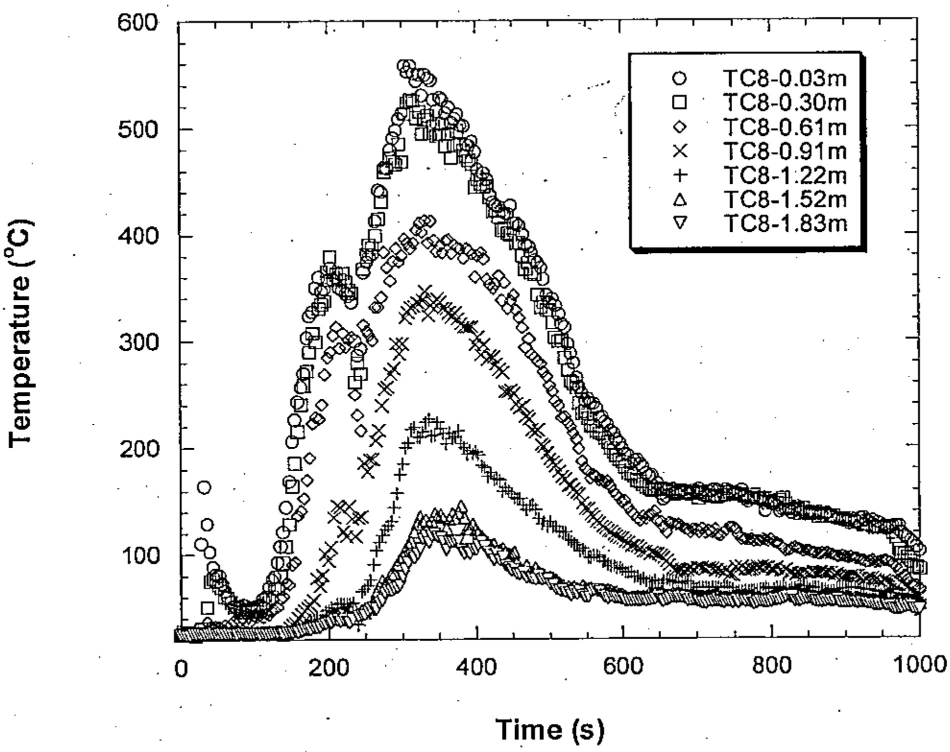
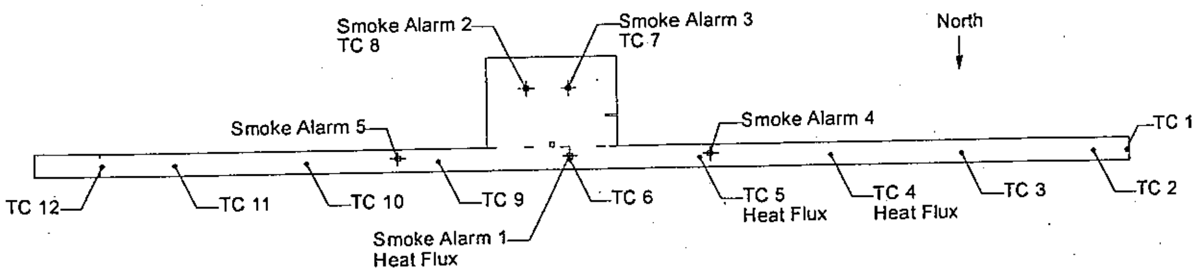


Figure 36 Experiment 2, dayroom temperature, east side, TC array 8



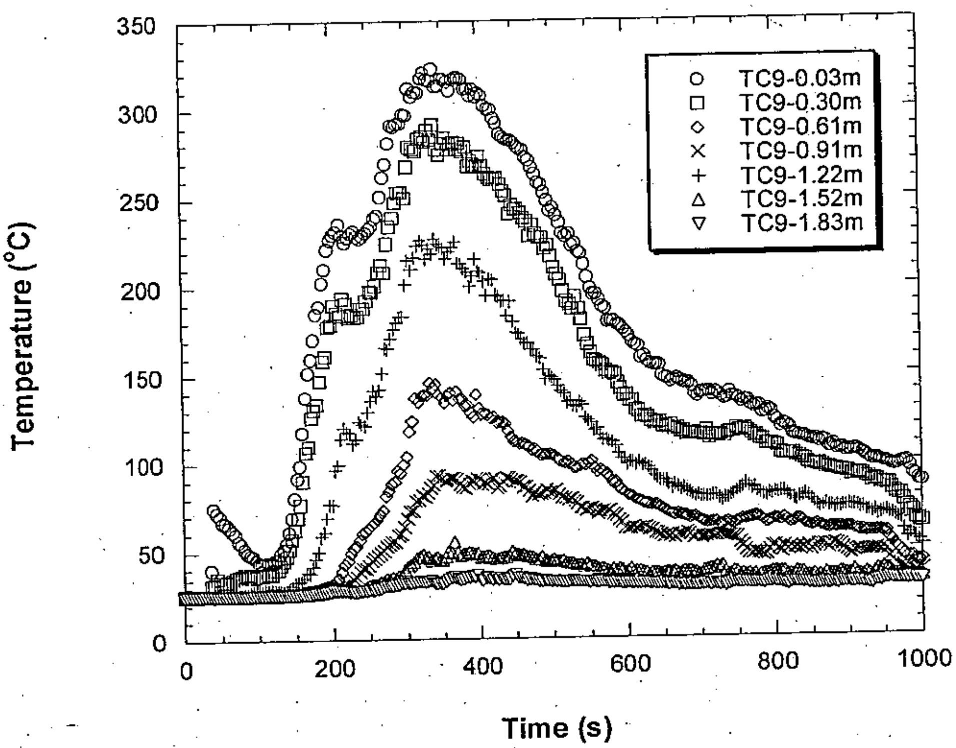
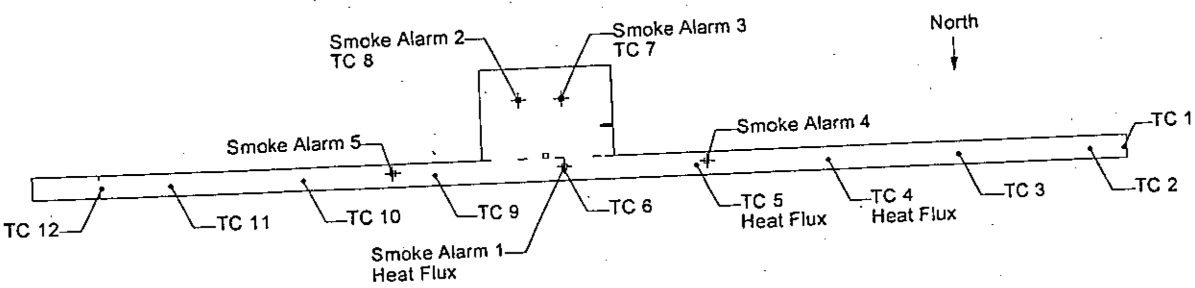


Figure 37 Experiment 2, corridor temperatures, TC array 9



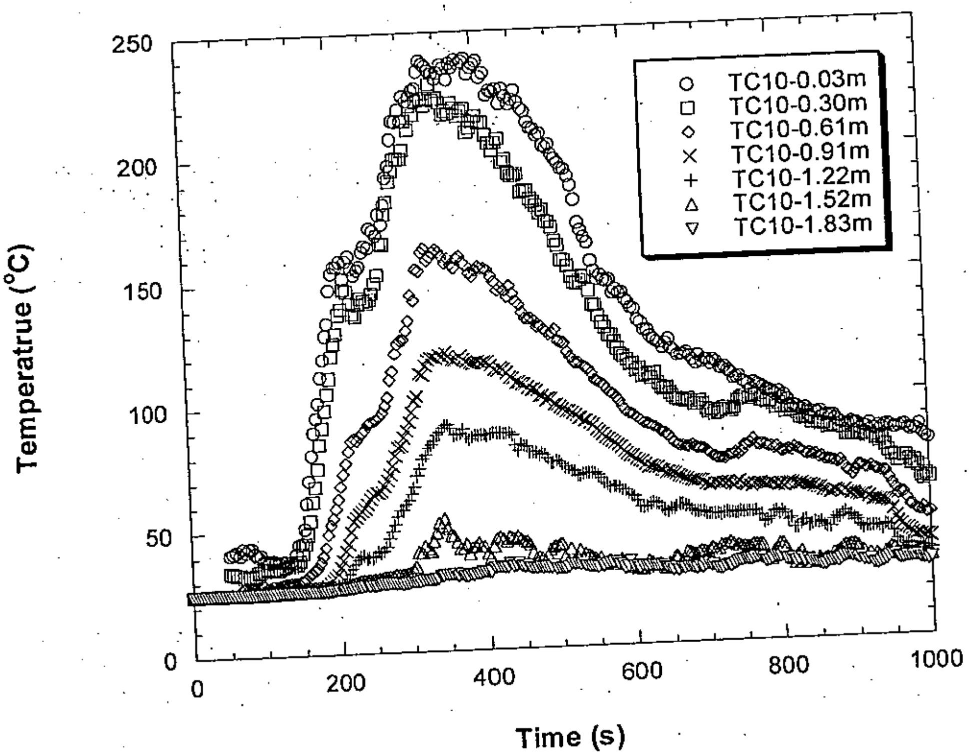
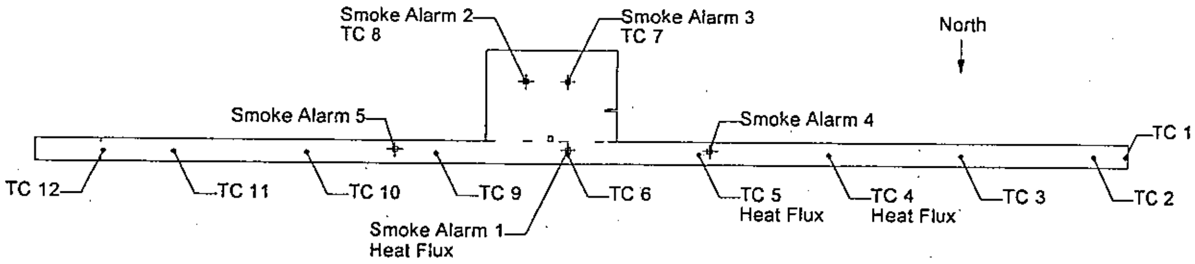


Figure 38 Experiment 2, corridor temperatures, TC array 10



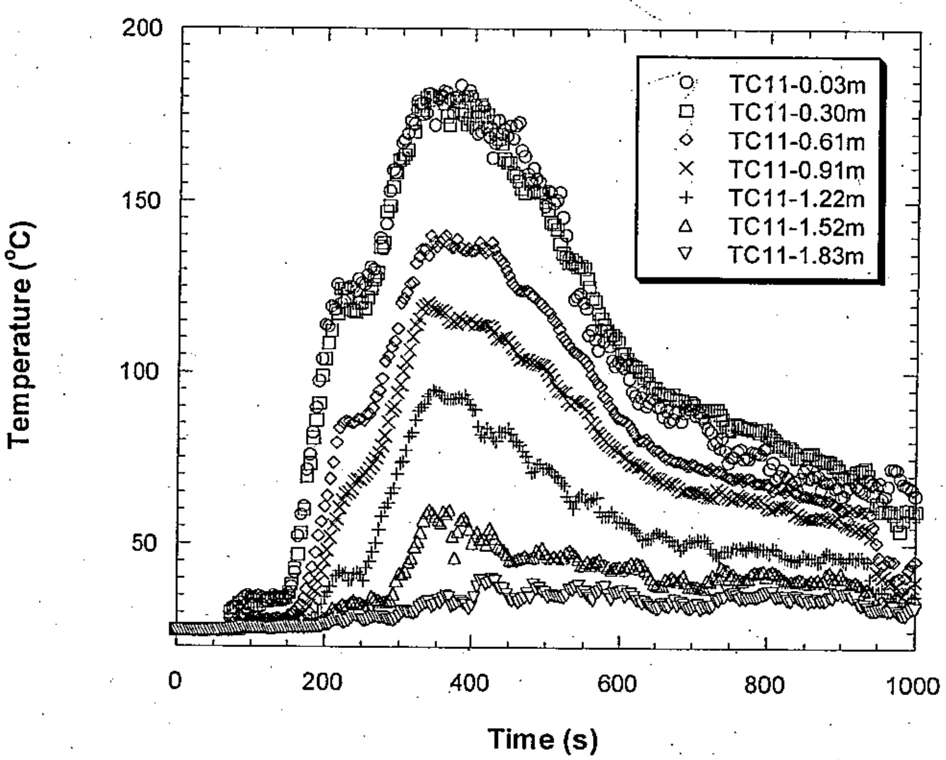
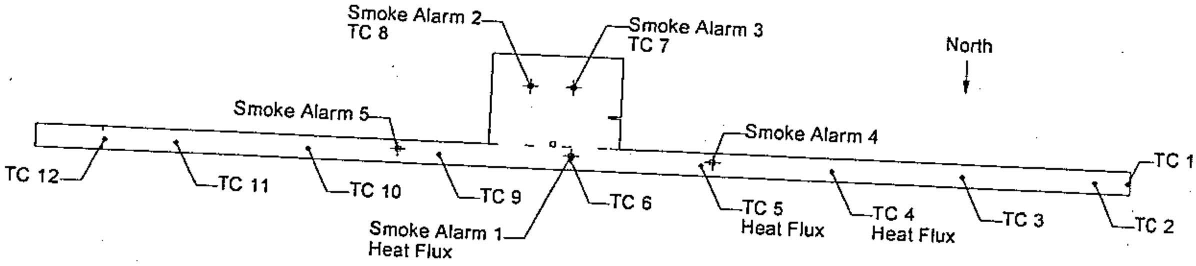


Figure 39 Experiment 2, corridor temperatures, TC array 11



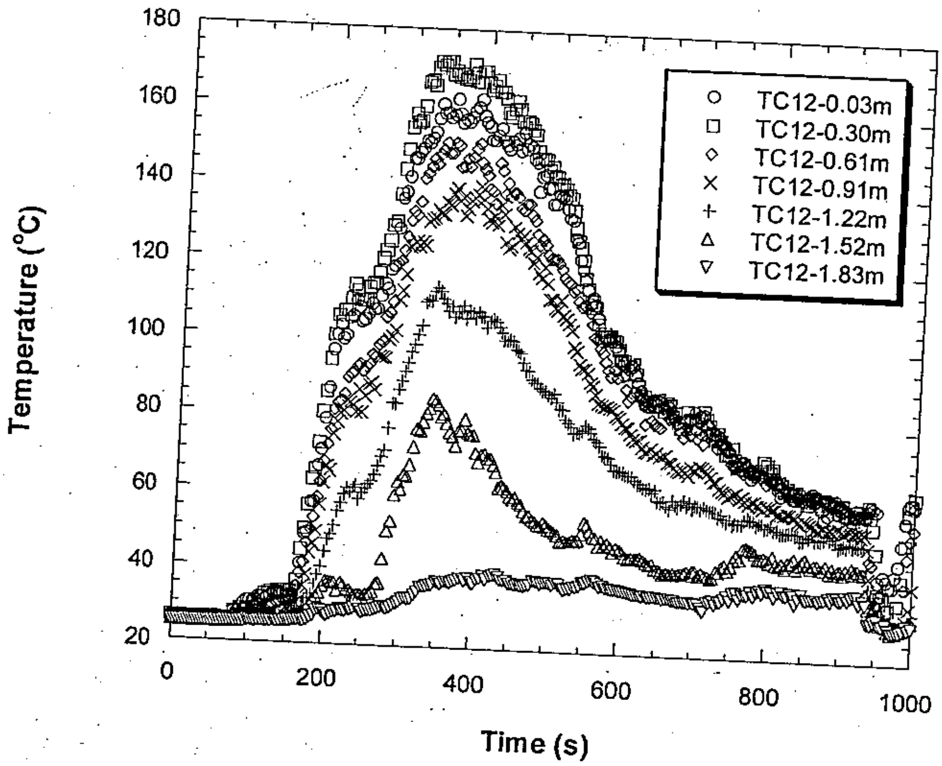
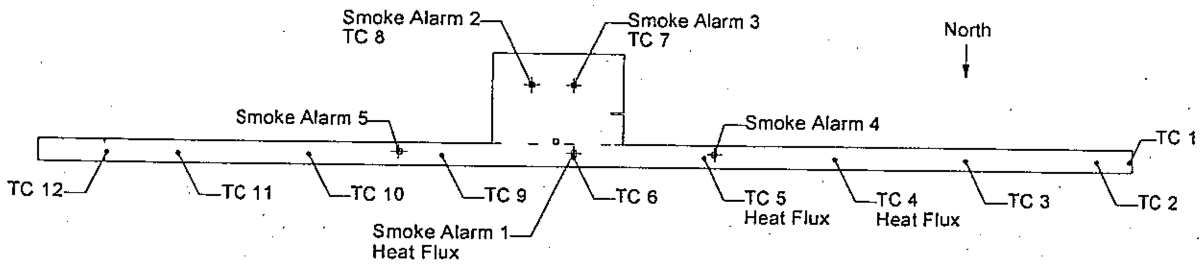


Figure 40 Experiment 2, corridor temperatures, TC array 12



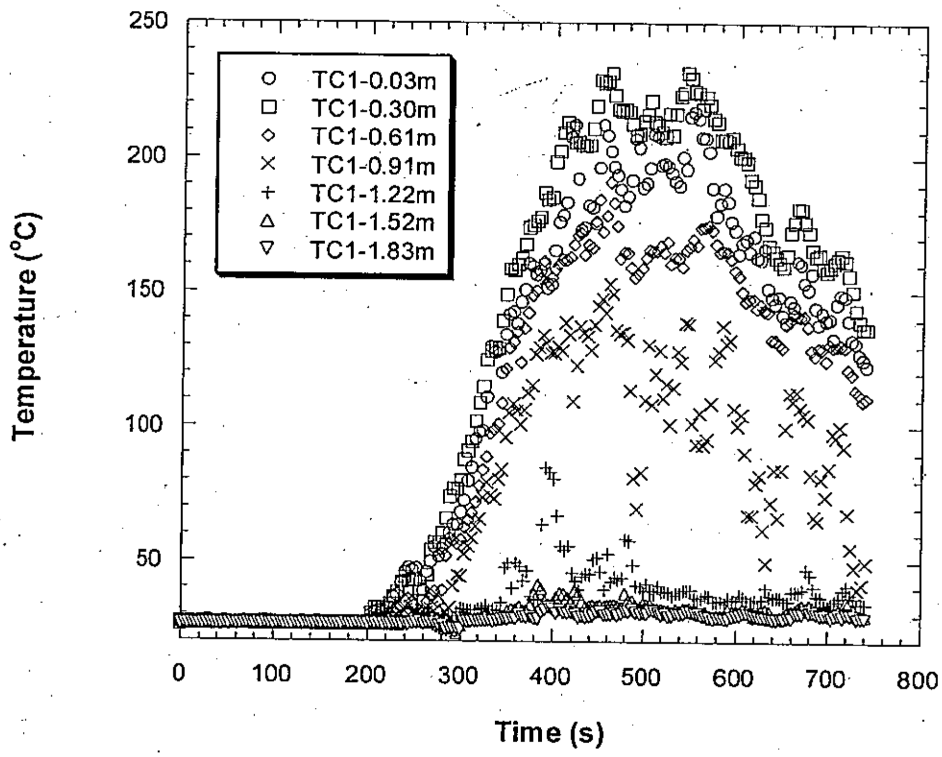
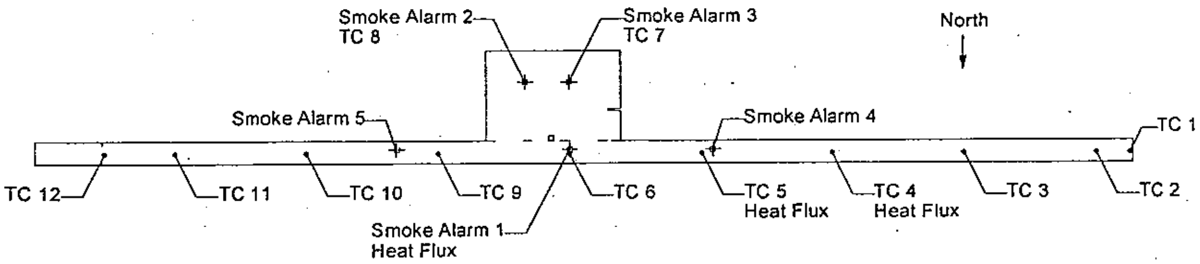


Figure 41 Experiment 3, corridor temperatures, TC array 1



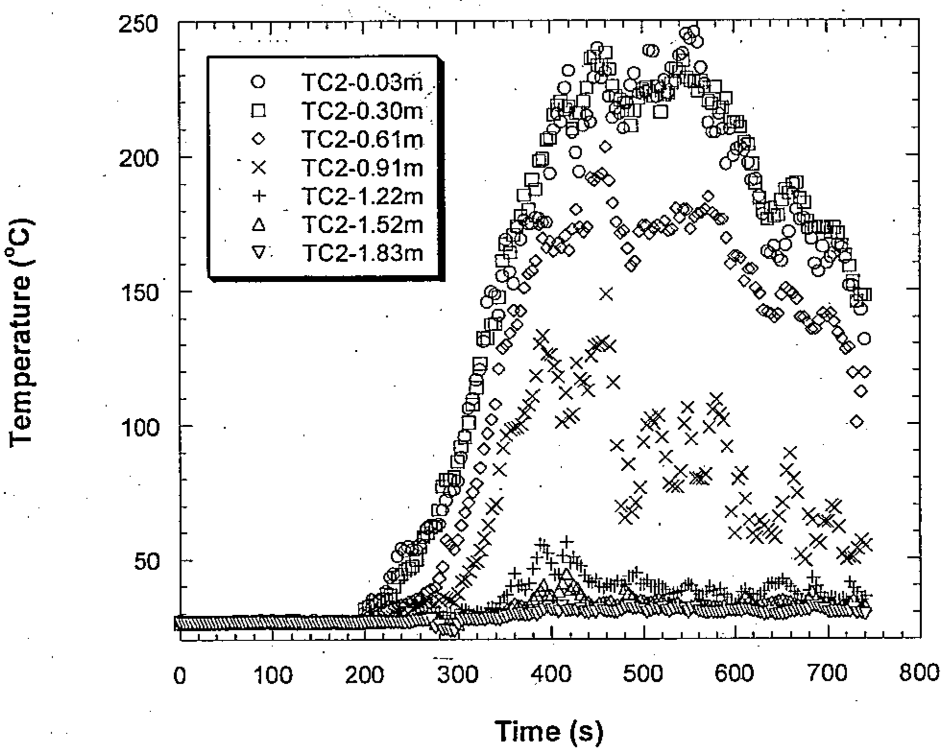
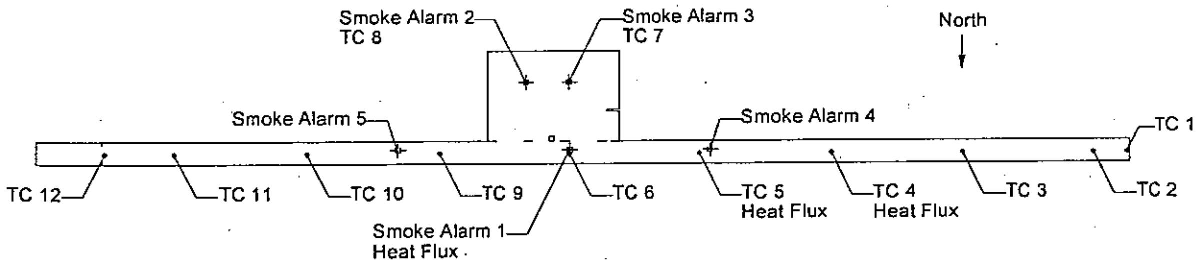


Figure 42 Experiment 3, corridor temperatures, TC array 2



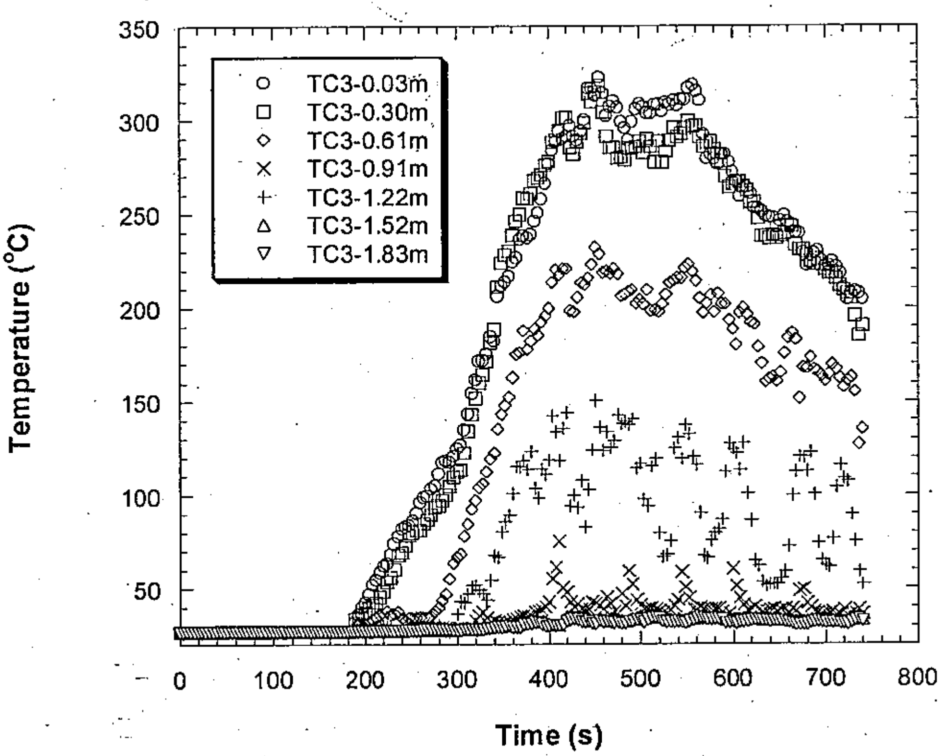
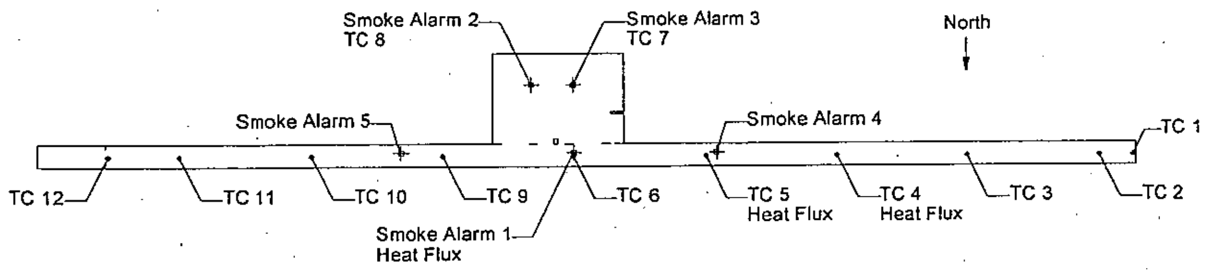


Figure 43 Experiment 3, corridor temperatures, TC array 3



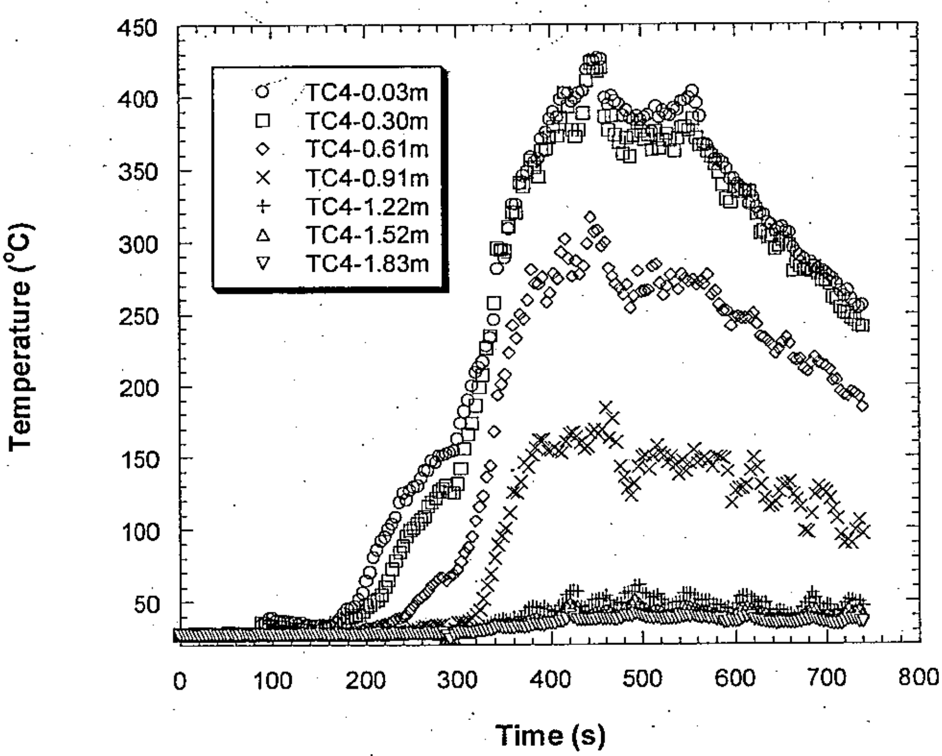
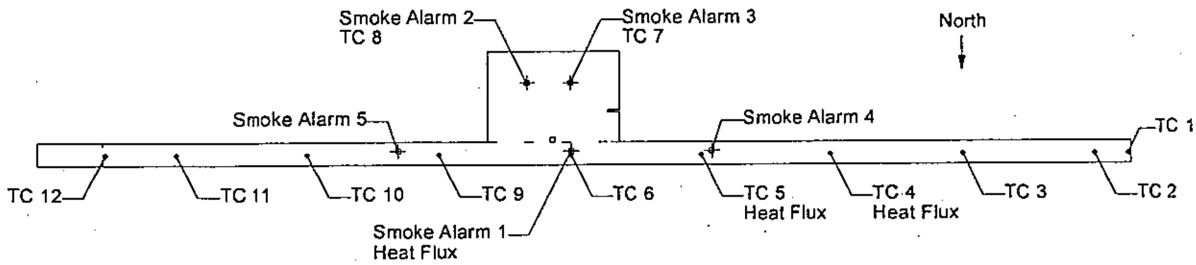


Figure 44 Experiment 3, corridor temperatures, TC array 4



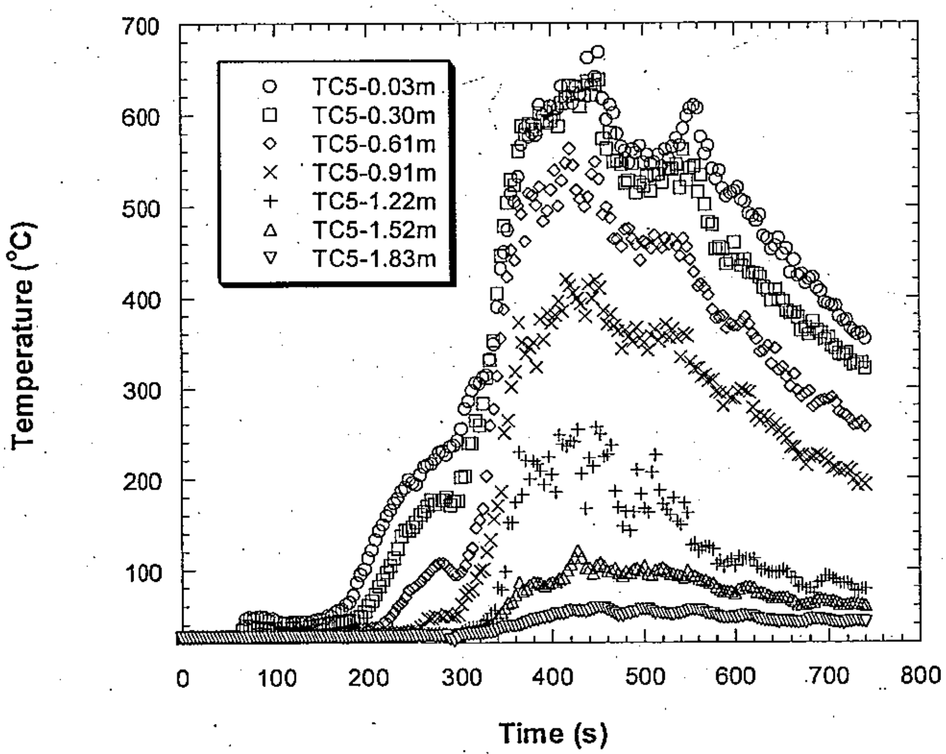
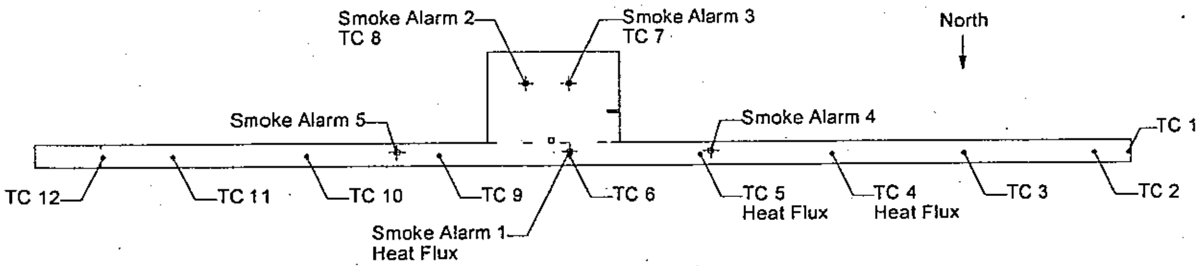


Figure 45 Experiment 3, corridor temperatures, TC array 5



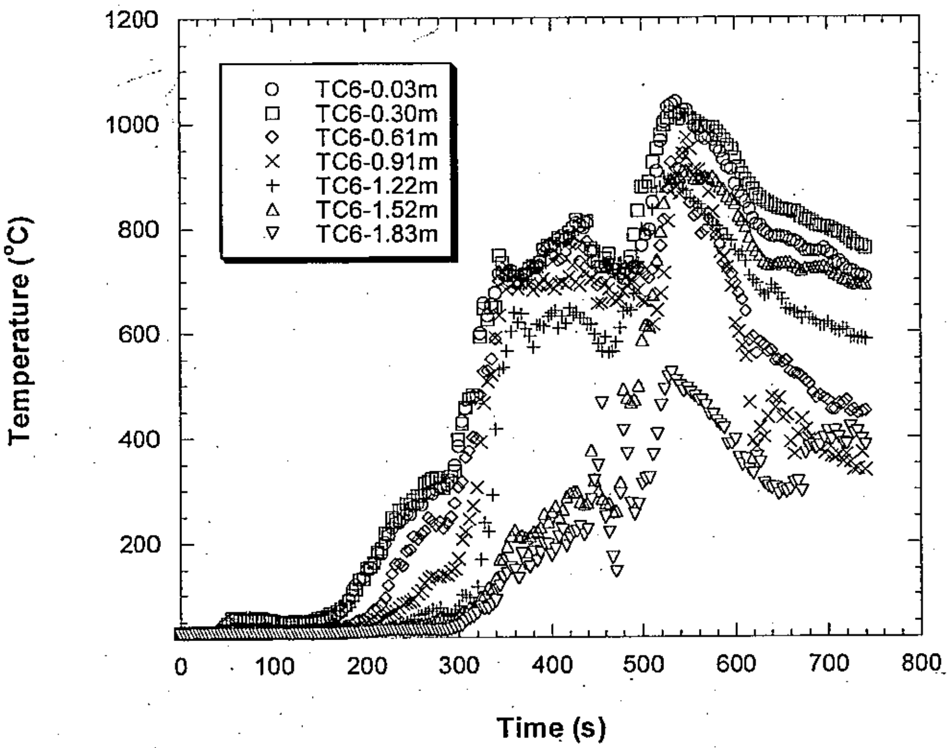
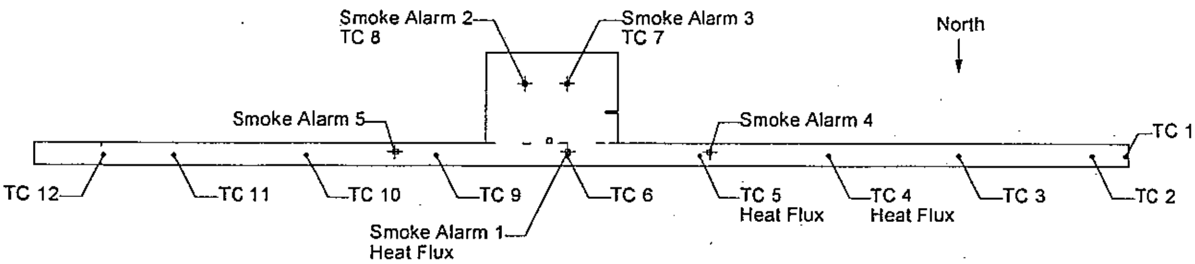


Figure 46 Experiment 3, corridor temperatures, TC array 6



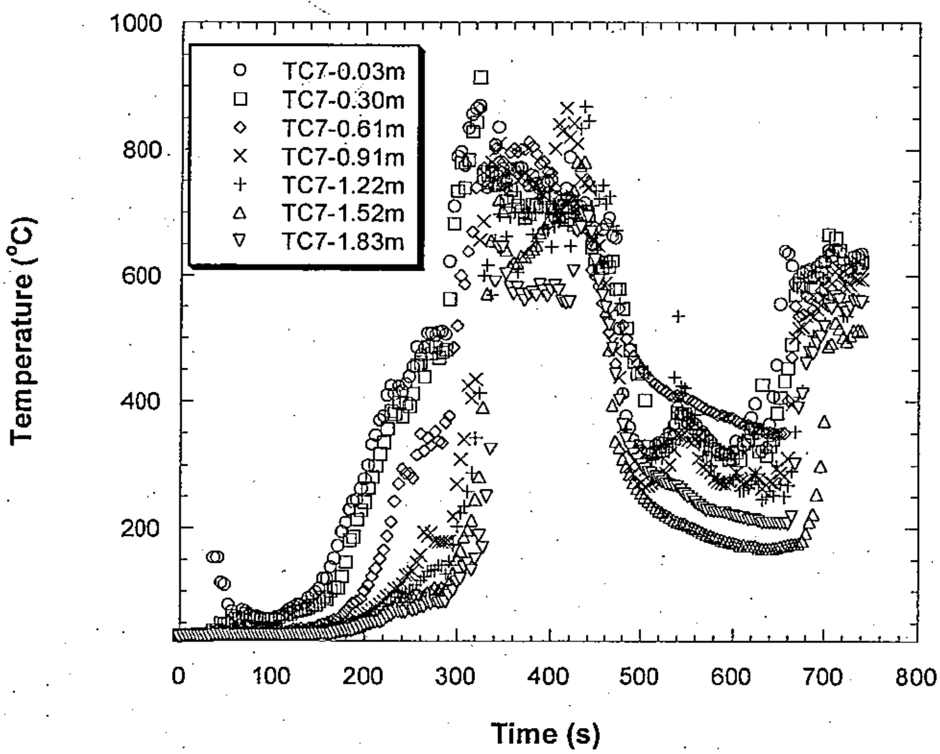
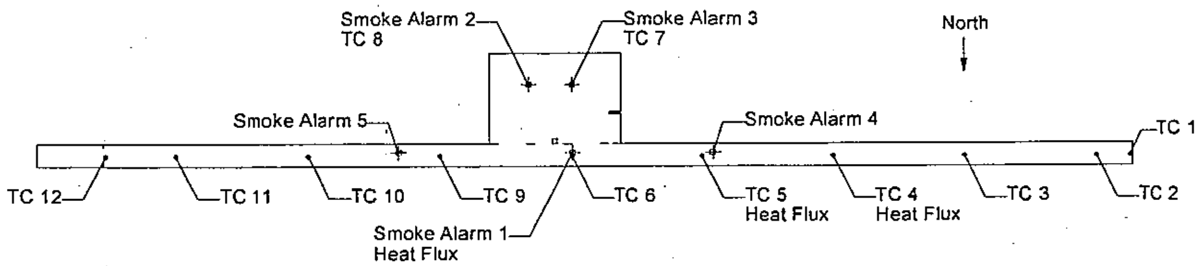


Figure 47 Experiment 3, dayroom temperatures, west side near ignition, TC array 7



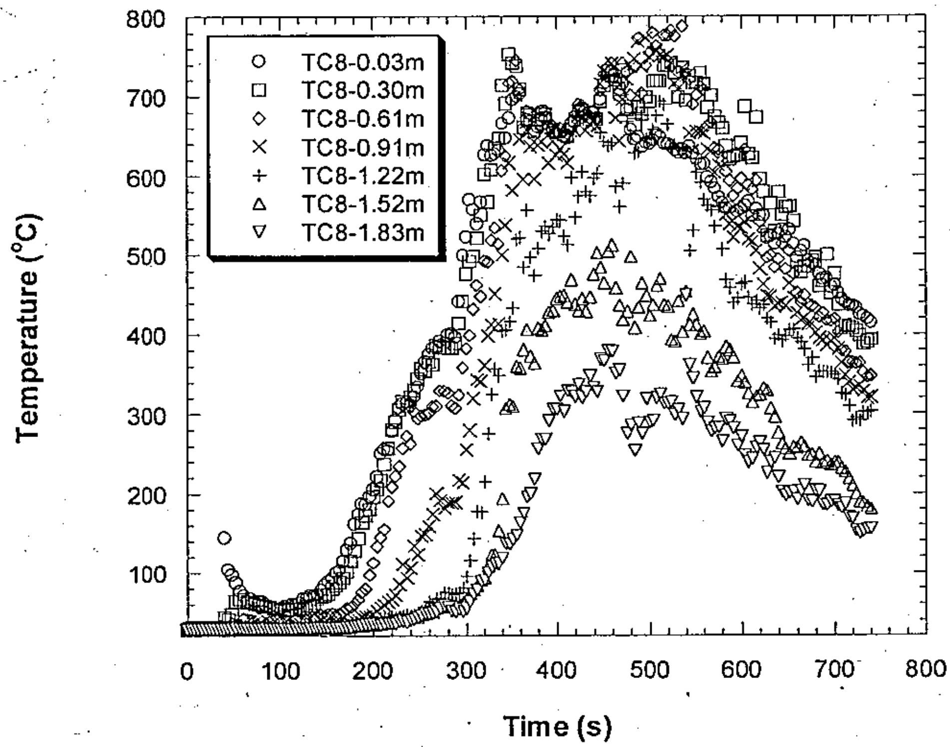
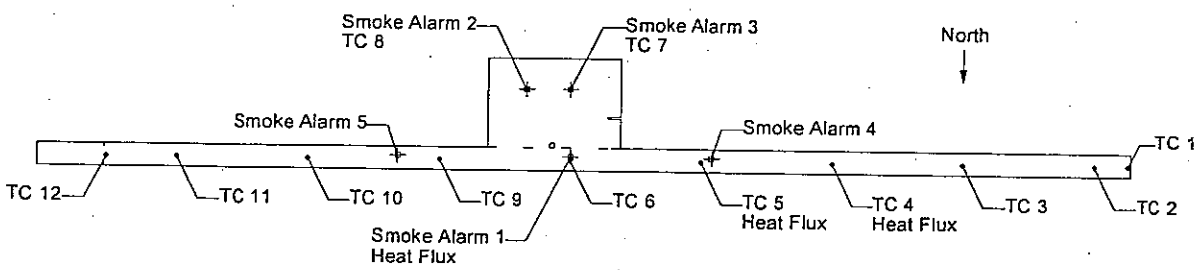


Figure 48 Experiment 3, dayroom temperatures, east side, TC array 8



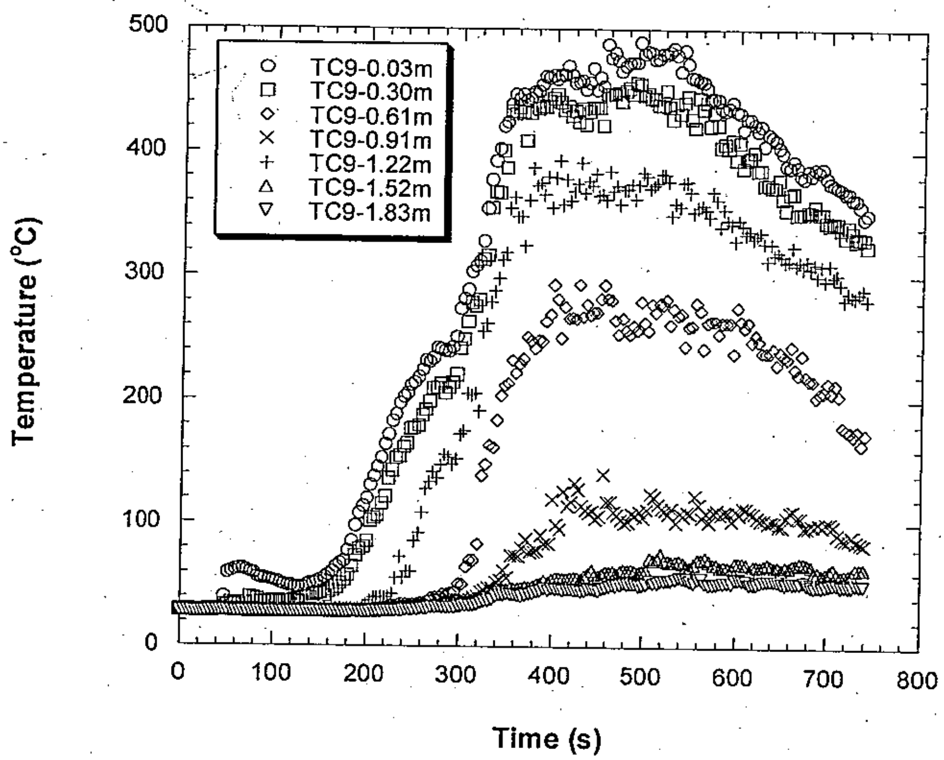
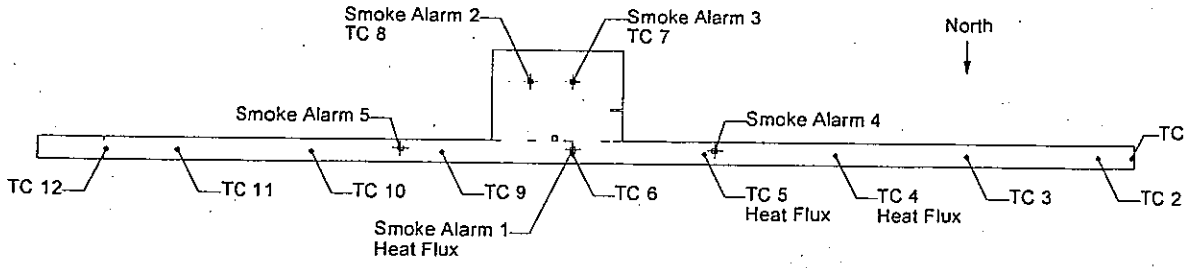


Figure 49 Experiment 3, corridor temperatures, TC array 9



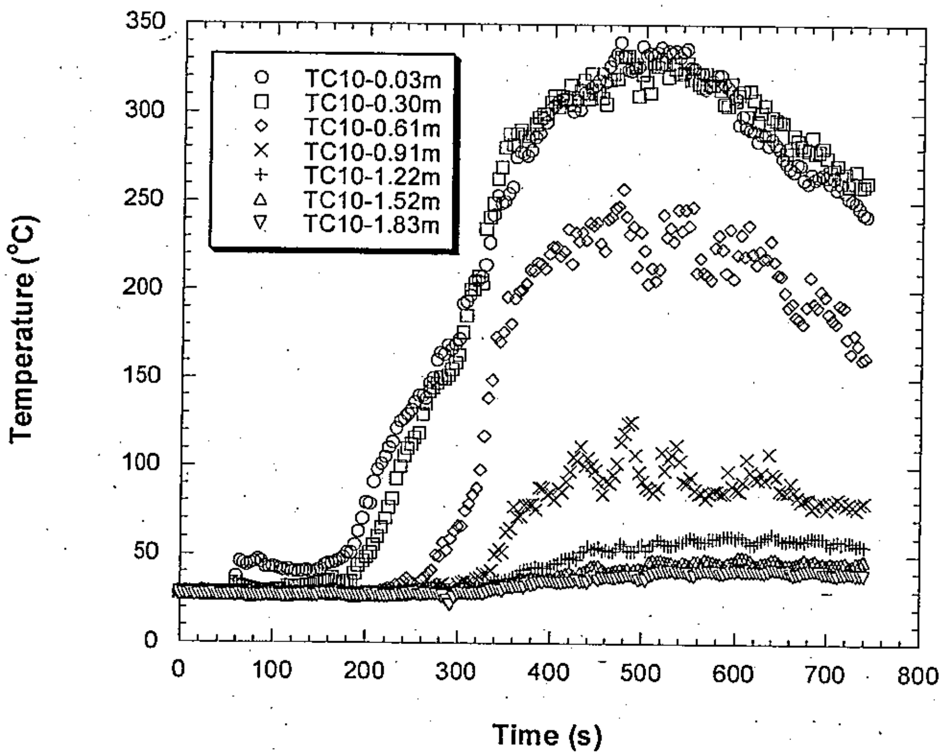
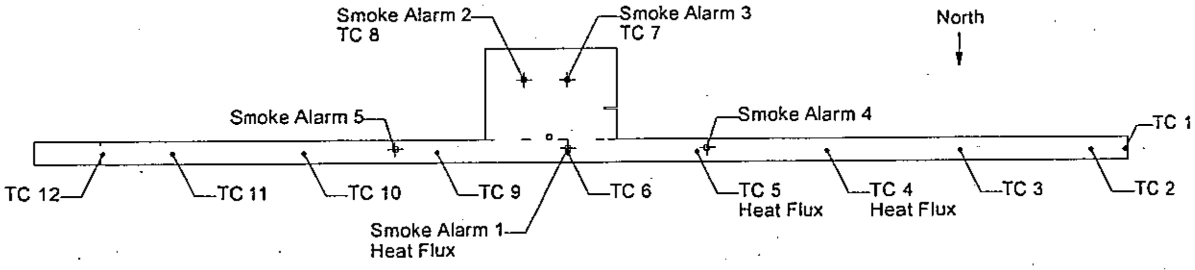


Figure 50 Experiment 3, corridor temperatures, TC array 10



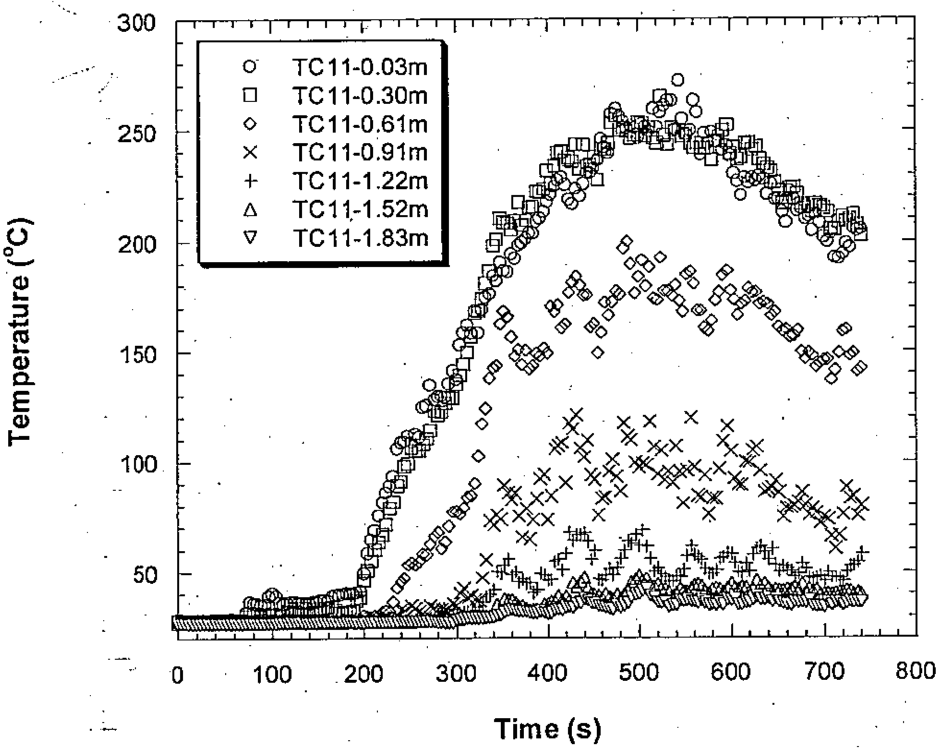


Figure 51 Experiment 3, corridor temperatures, TC array 11

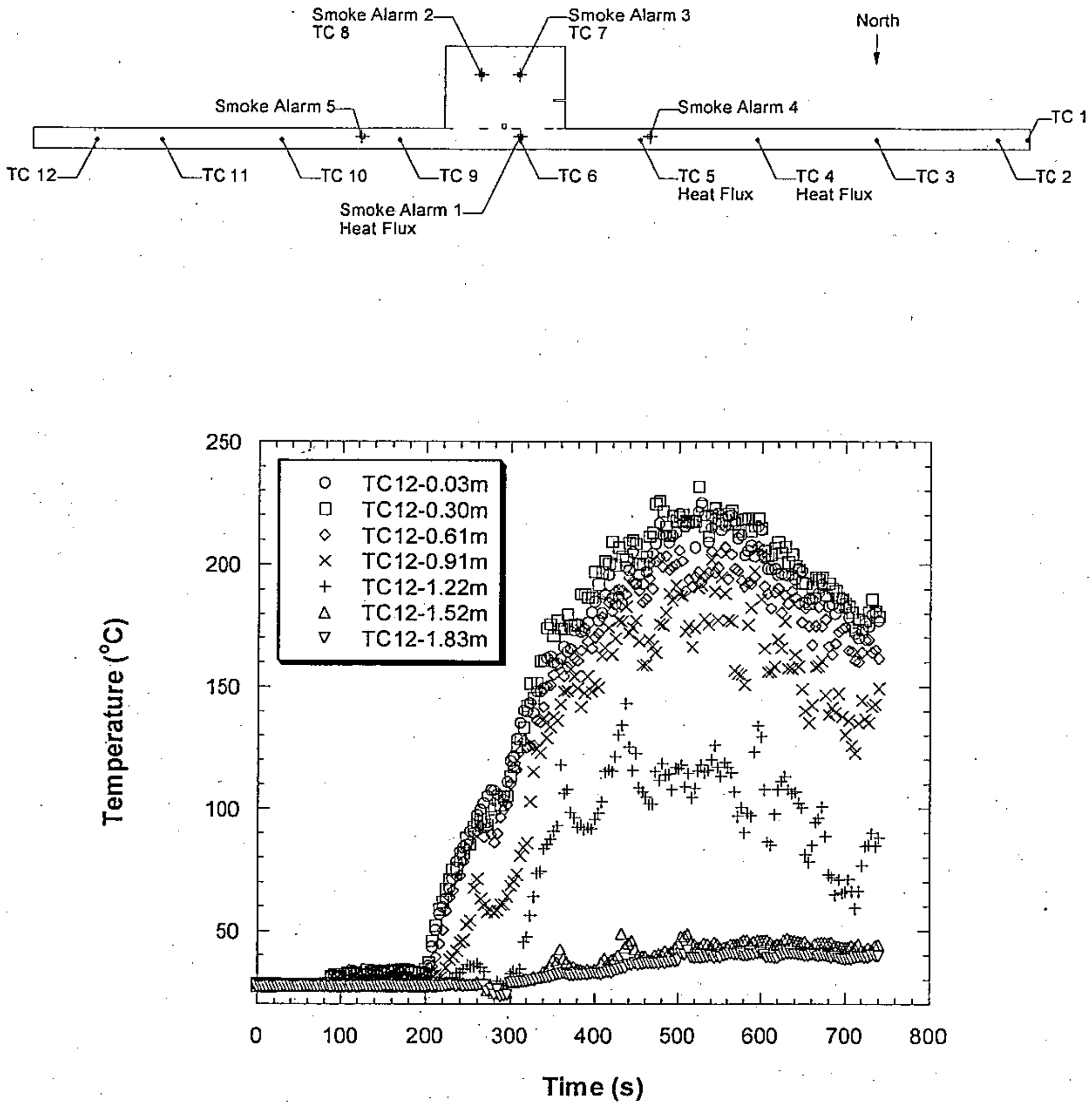
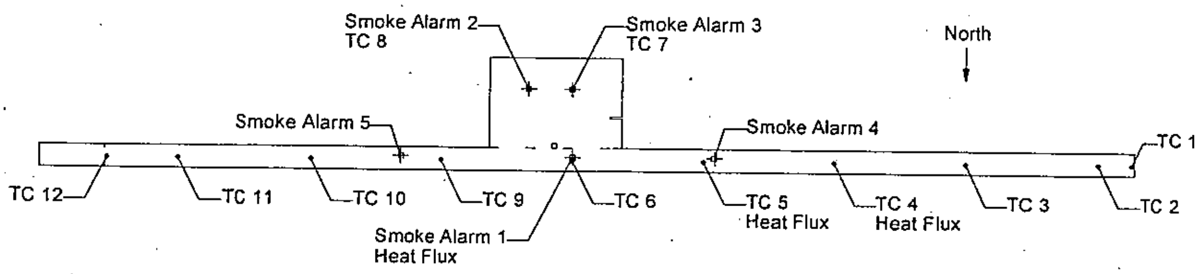


Figure 52 Experiment 3, corridor temperatures, TC array 12



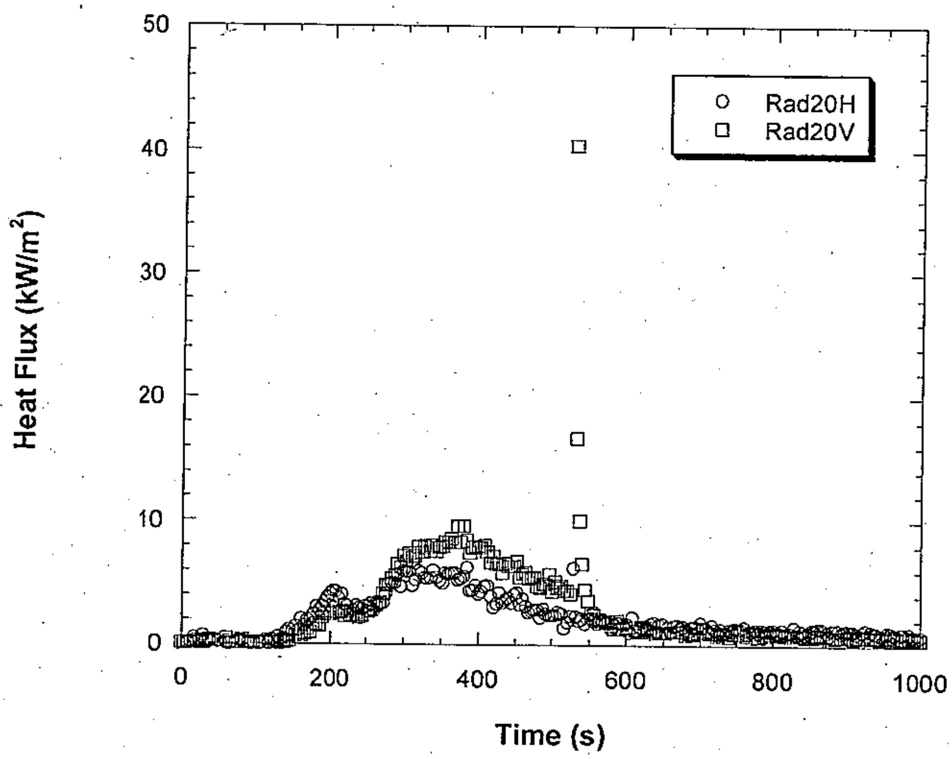
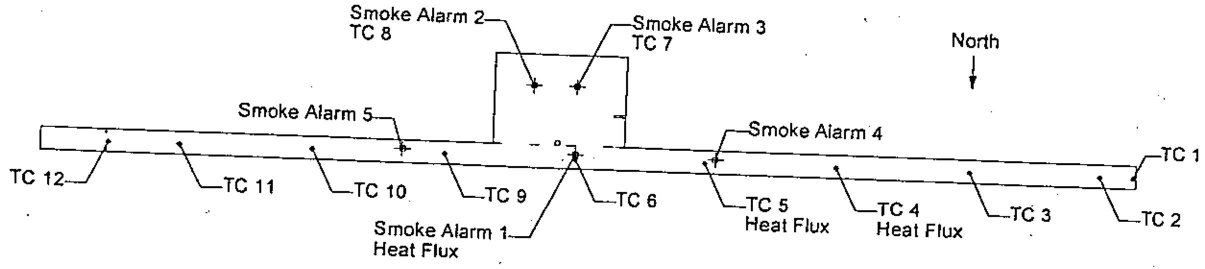


Figure 53 Experiment 2, total heat flux measured adjacent to TC array 6



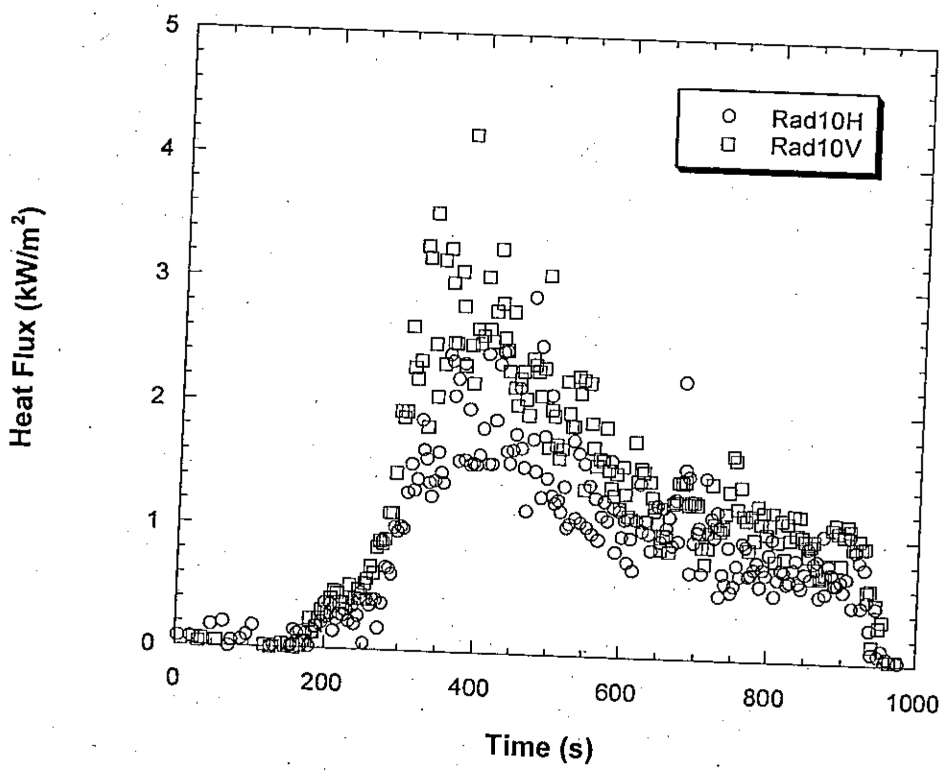
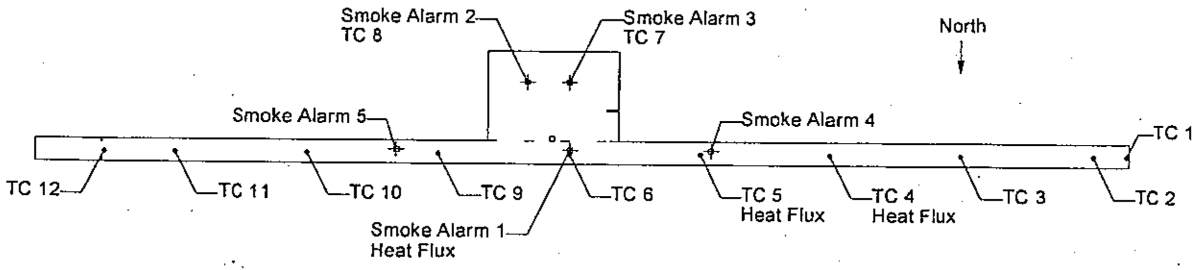


Figure 54 Experiment 2, total heat flux measured adjacent to TC array 5



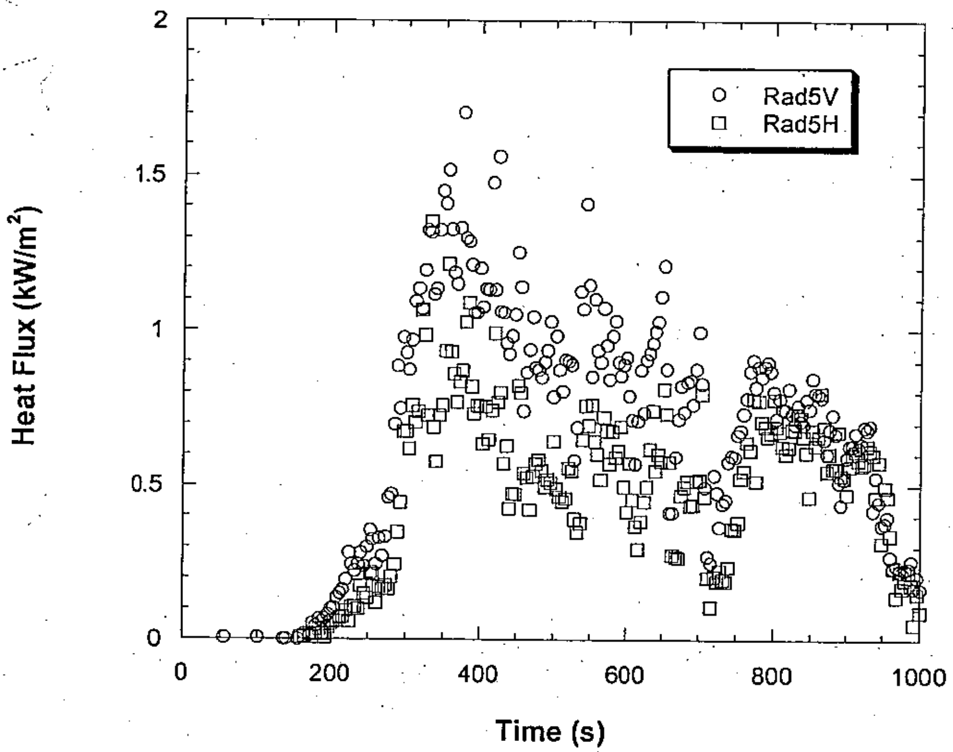
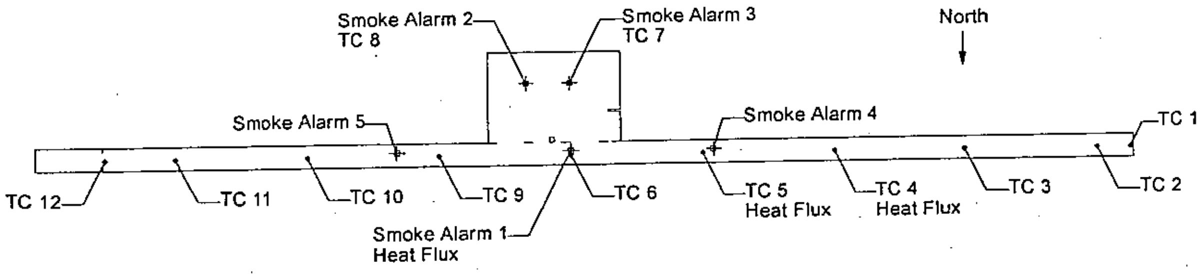


Figure 55 Experiment 2, total heat flux measured adjacent to TC array 4



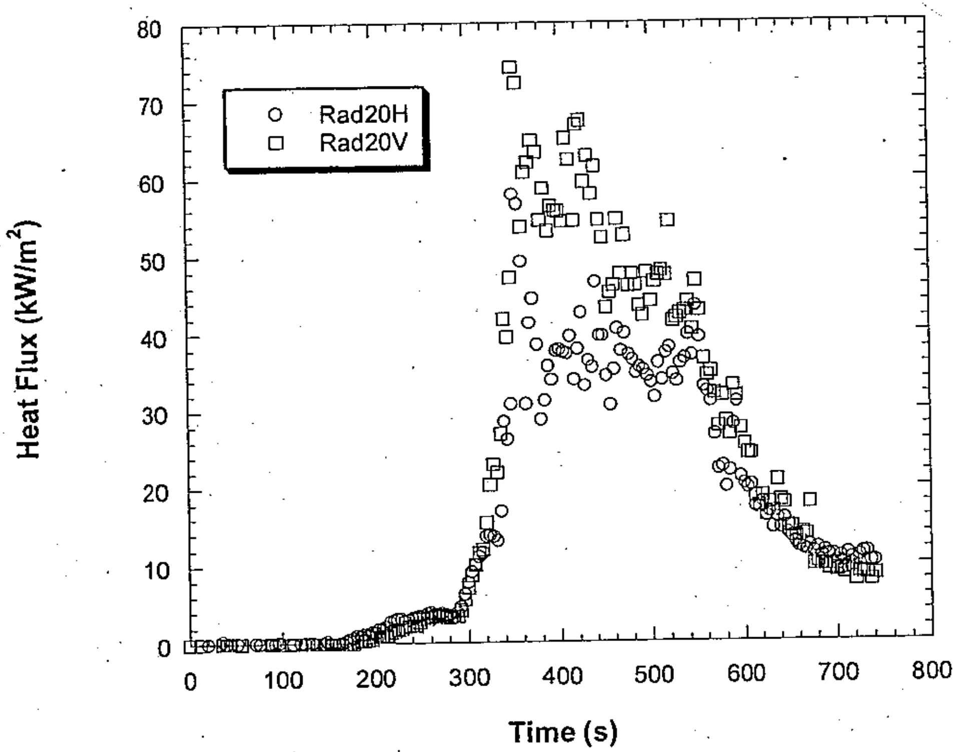
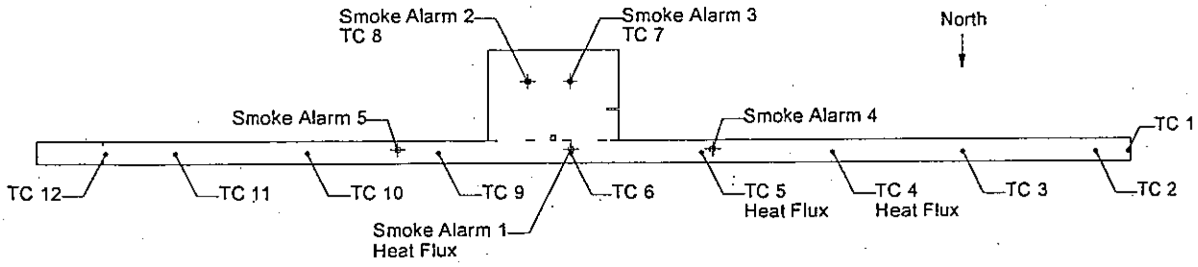


Figure 56 Experiment 3, total heat flux measured adjacent to TC array 6



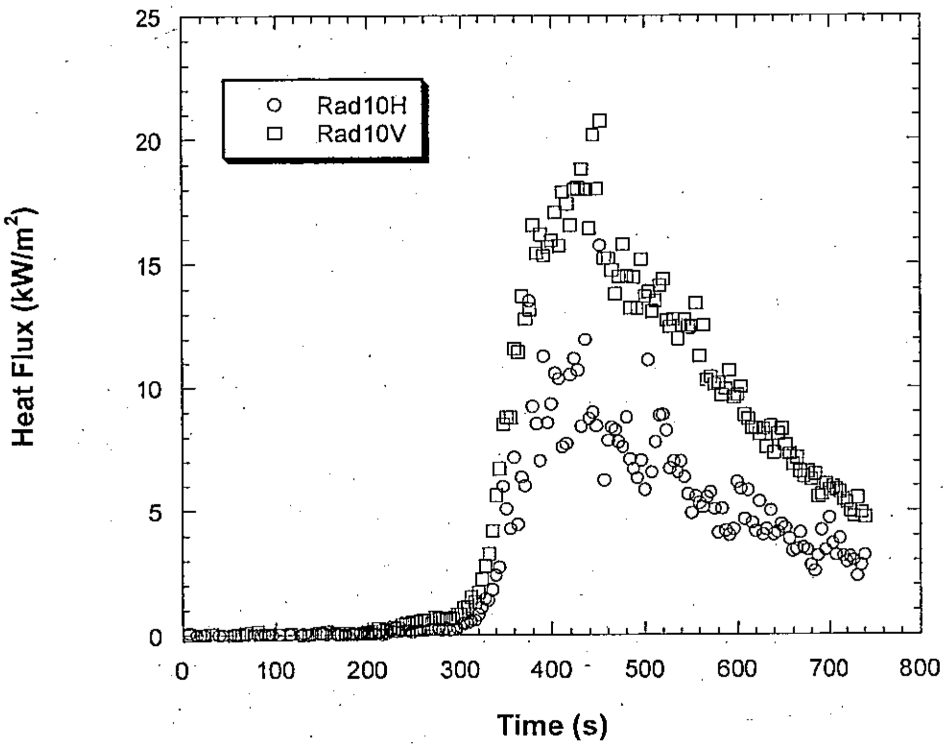
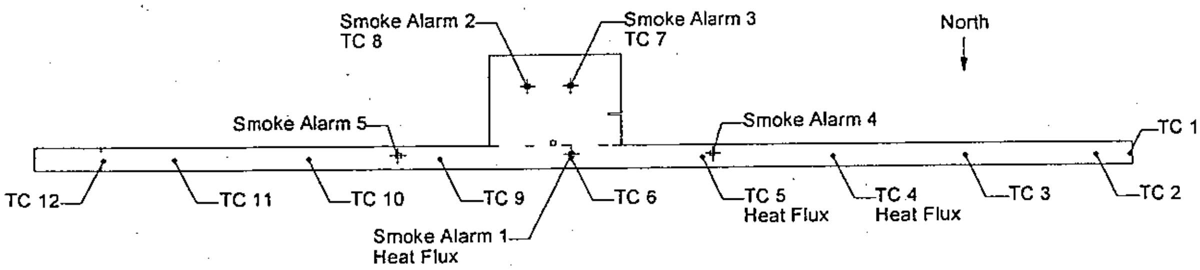


Figure 57 Experiment 3, total heat flux measured adjacent to TC array 5



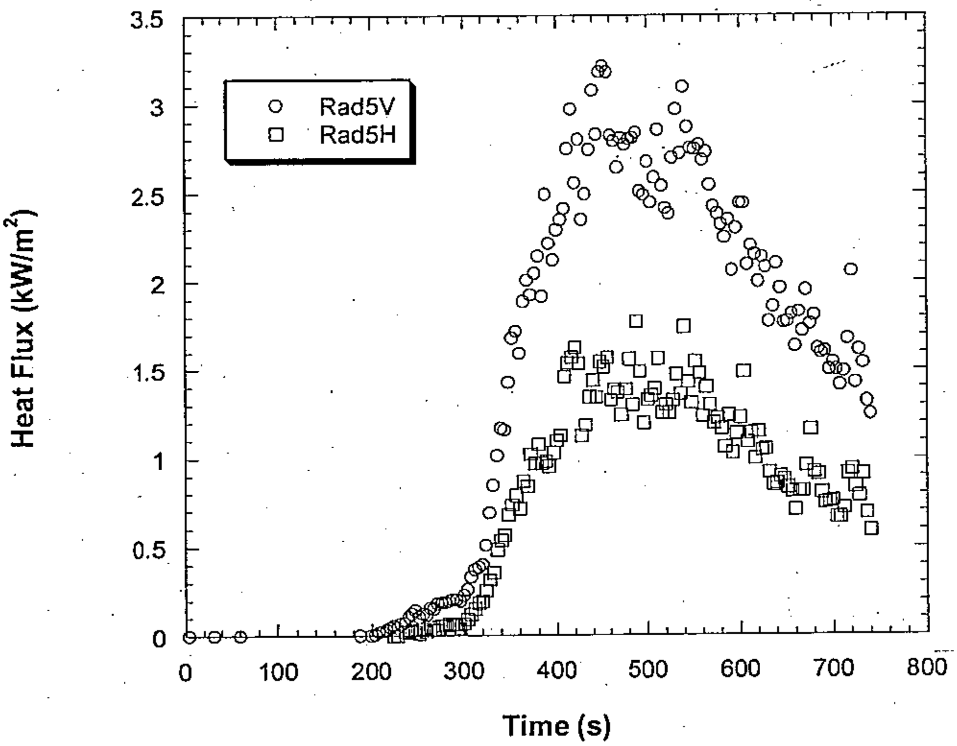
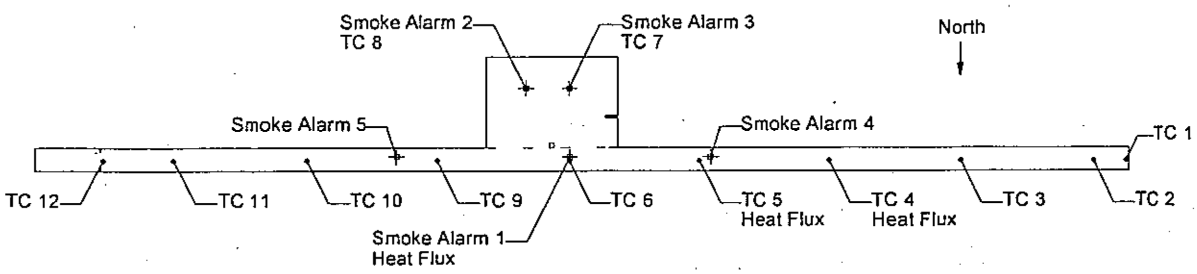


Figure 58 Experiment 3, total heat flux measured adjacent to TC array 4



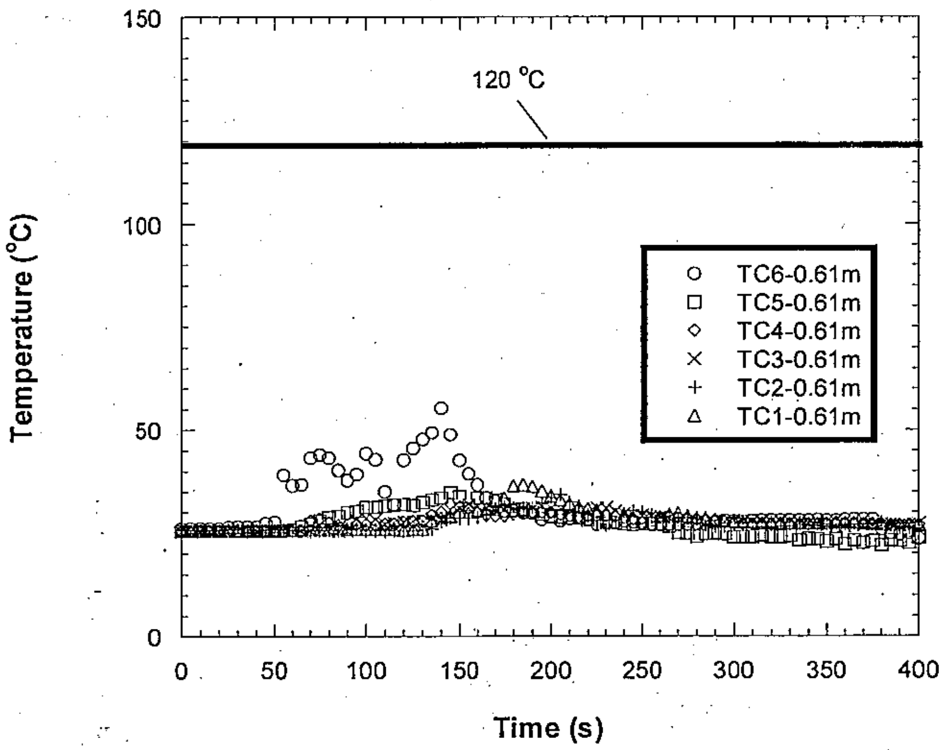


Figure 59 Experiment 1, temperatures in west corridor at 0.61m below ceiling

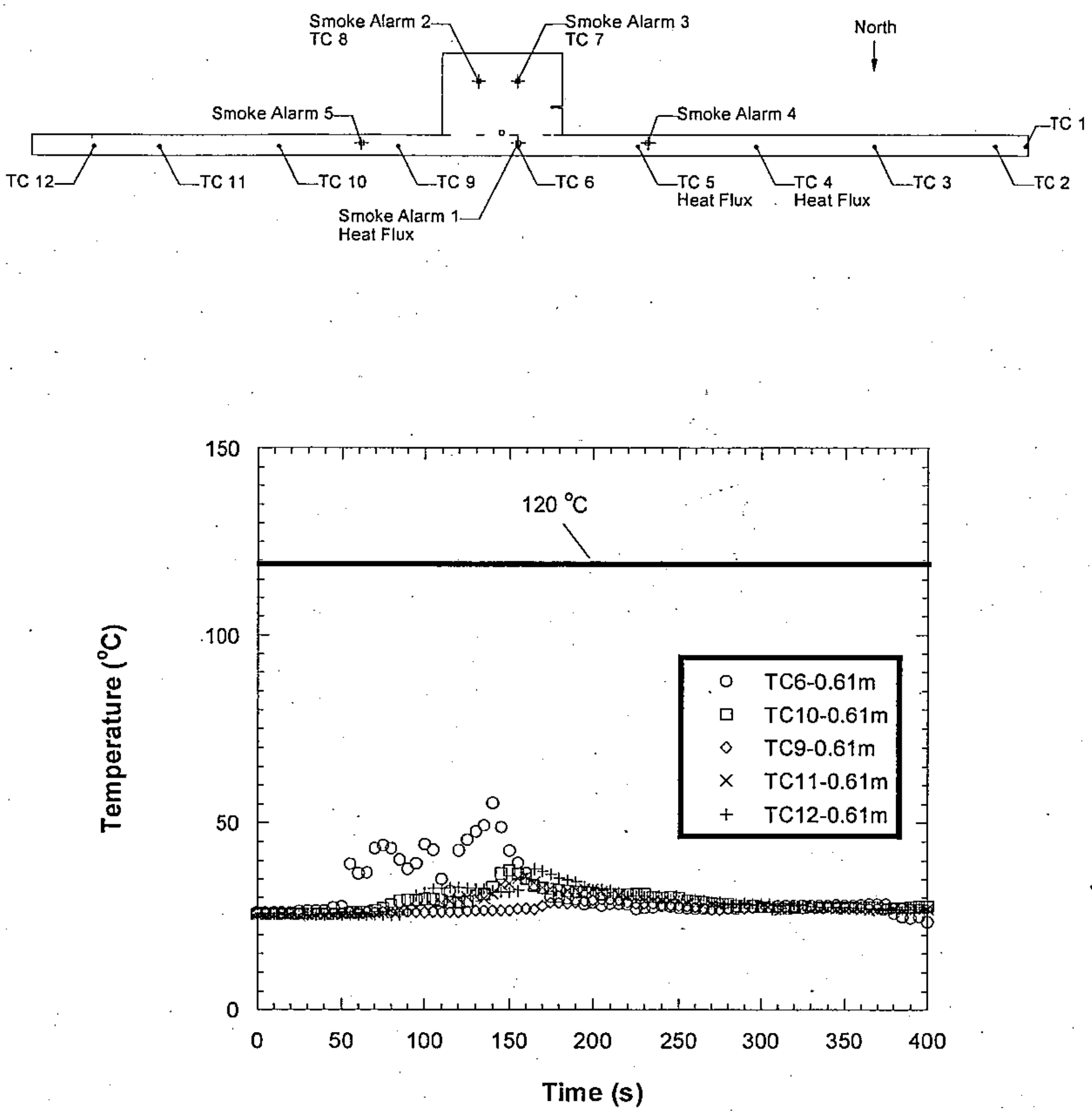


Figure 60 Experiment 1, temperatures in east corridor at 0.61 m below ceiling

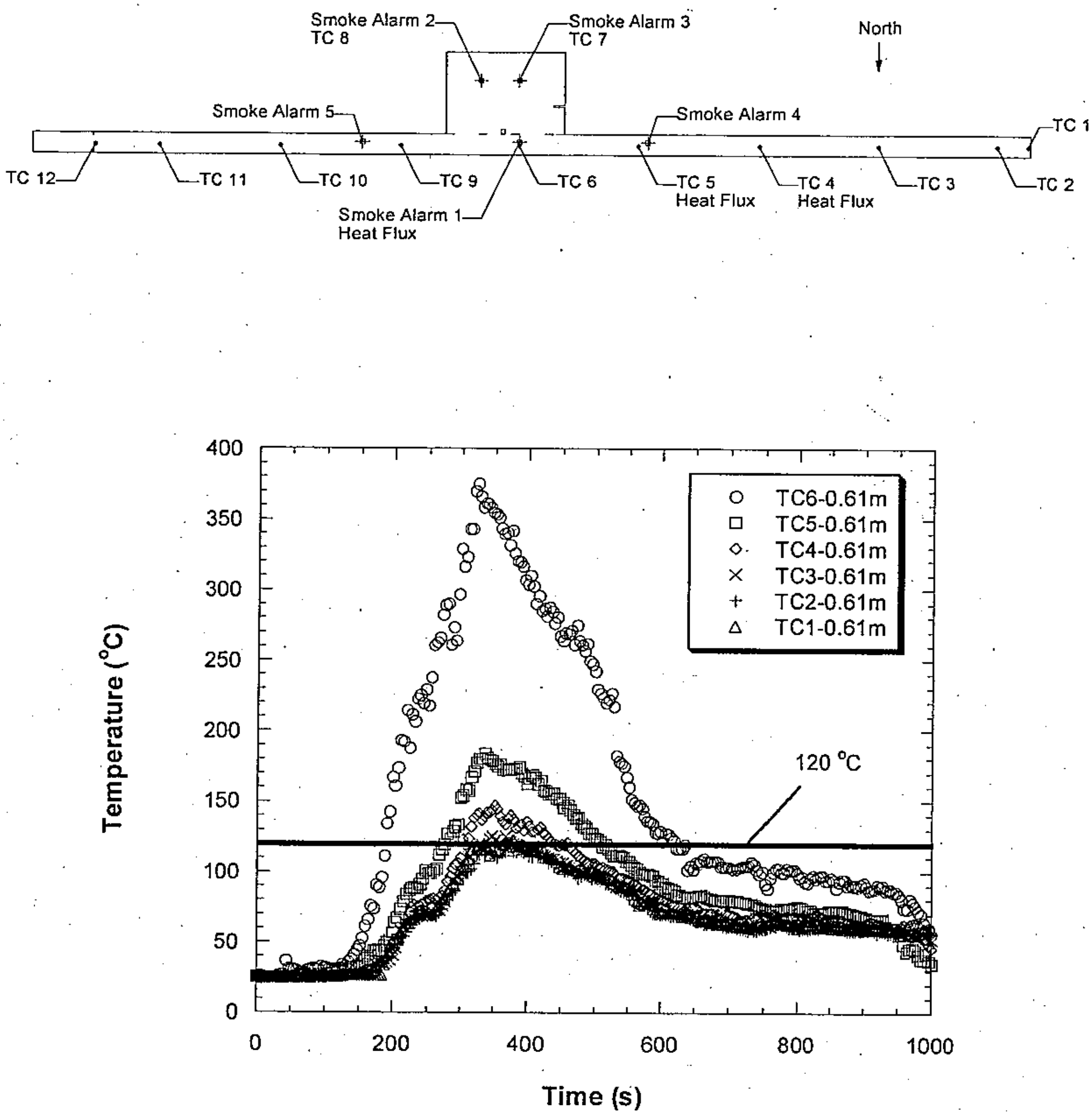
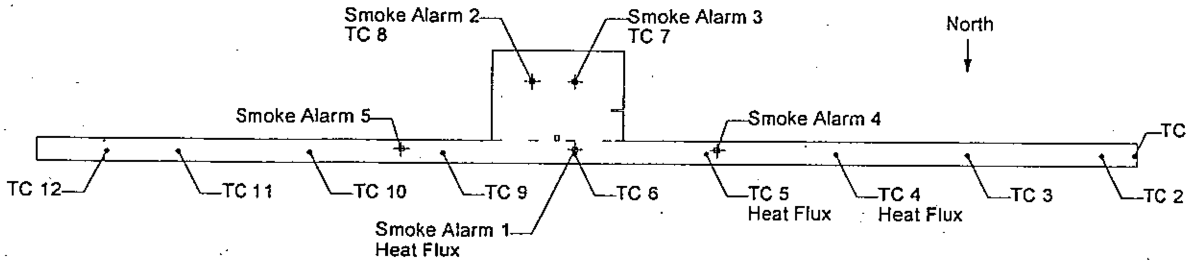


Figure 61 Experiment 2, temperatures in west corridor at 0.61 m below ceiling



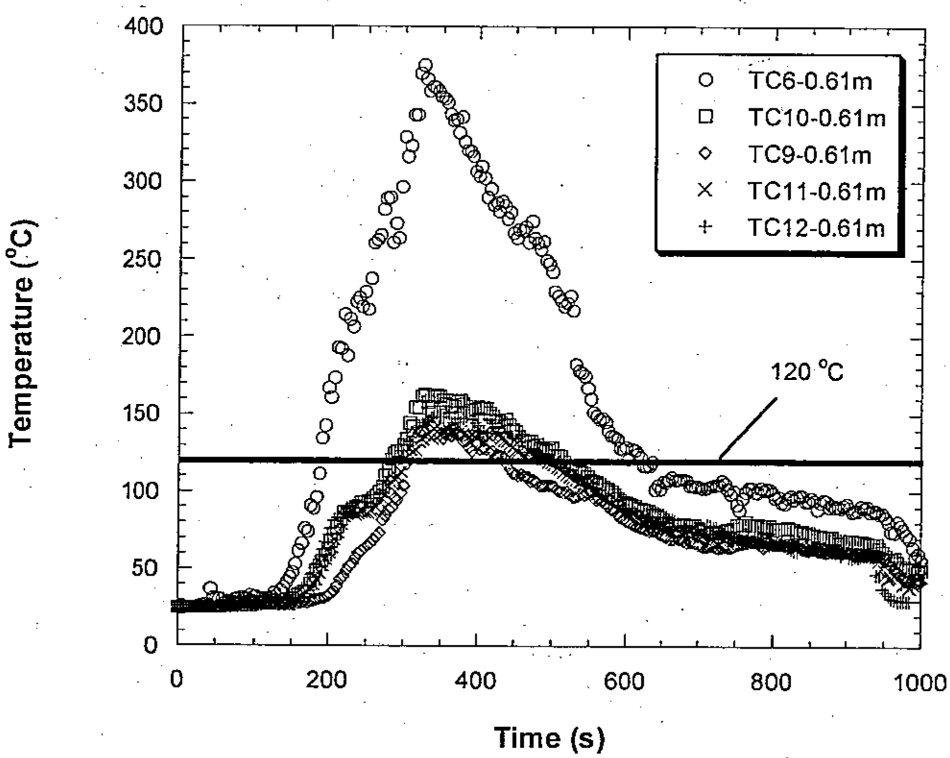
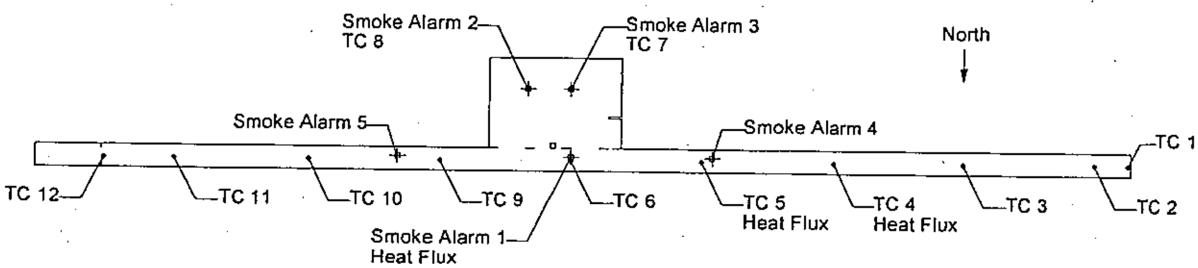


Figure 62 Experiment 2, temperatures in east corridor at 0.61 m below ceiling



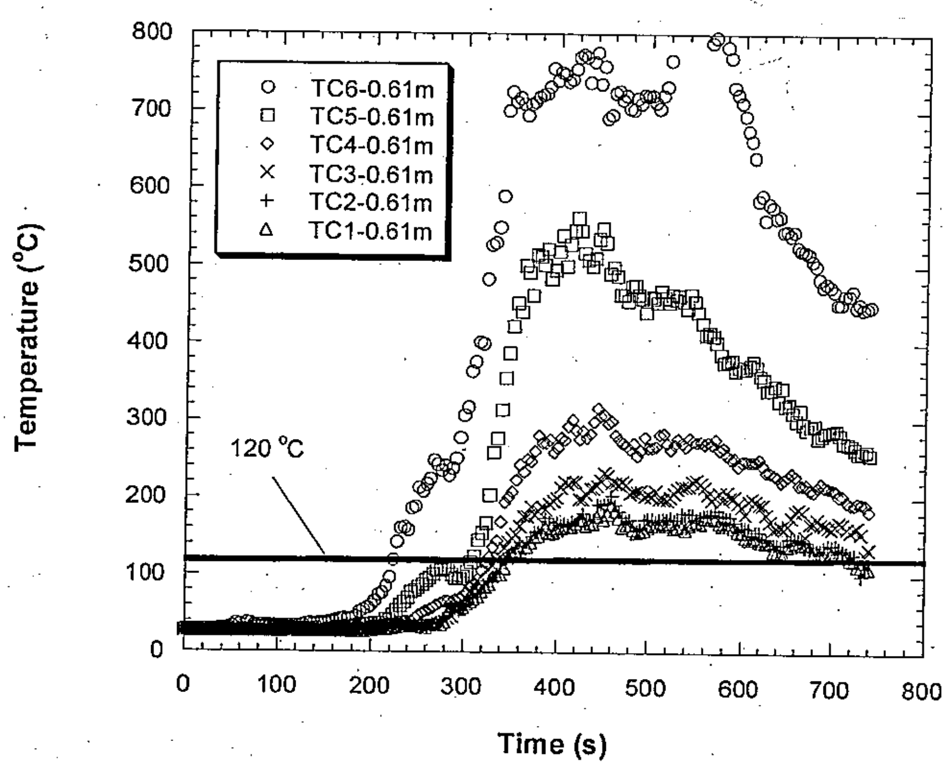
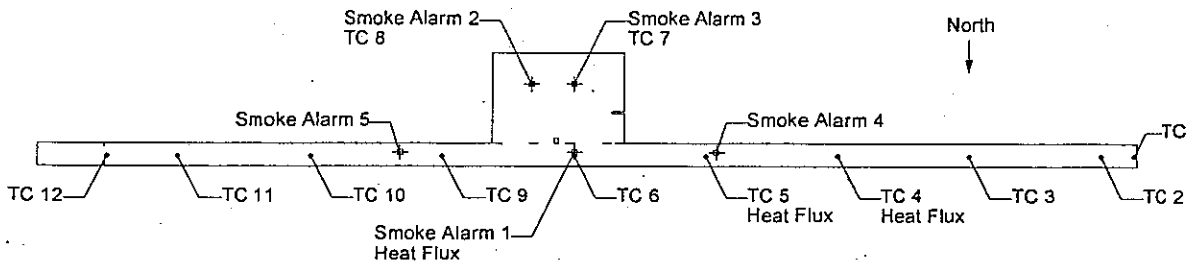


Figure 63 Experiment 3, temperatures in west corridor at 0.61 m below ceiling



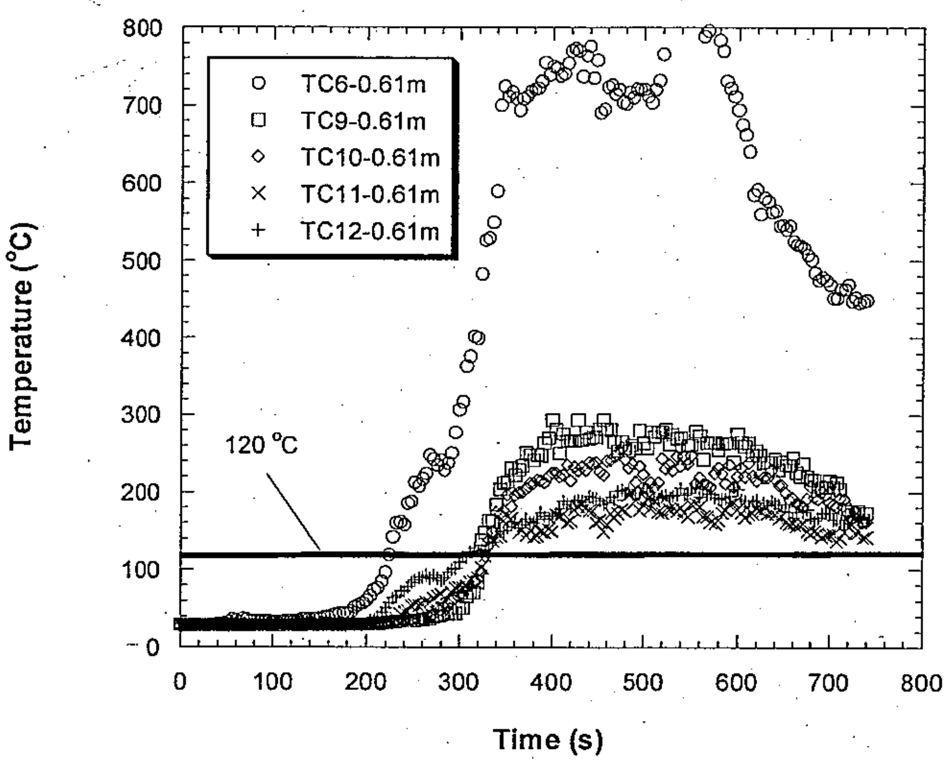
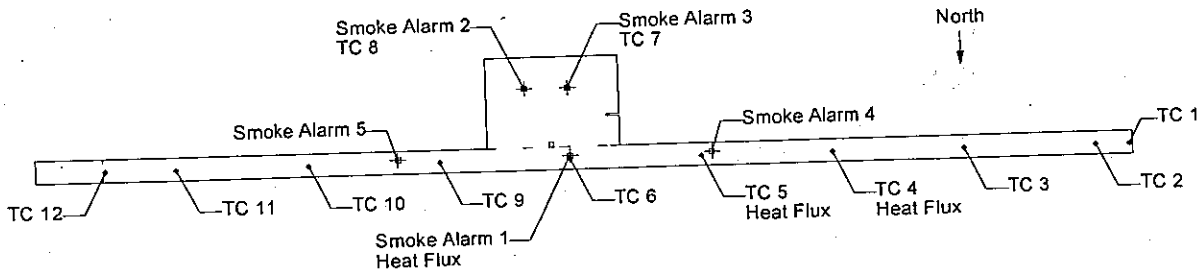


Figure 64 Experiment 3, temperatures in east corridor at 0.61 m below ceiling



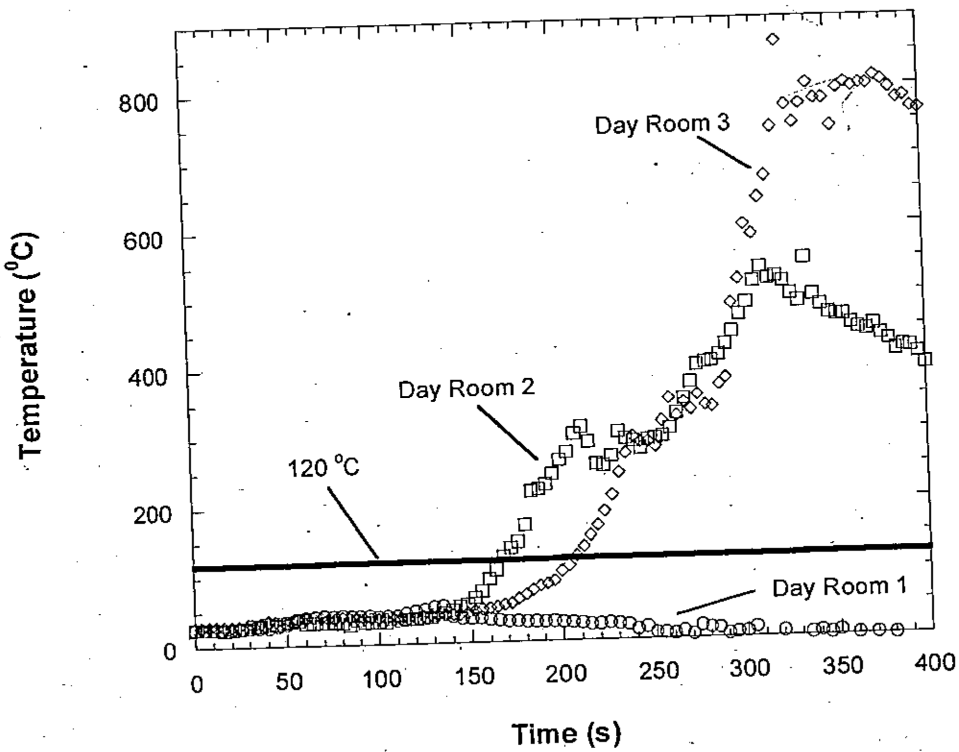


Figure 65 Day room temperature comparisons for experiments 1, 2, and 3 at 0.61 m below ceiling, TC array 7.