NIST Special Publication 1000-5

June 2004
Progress Report on the Federal Building and Fire Safety Investigation of the World Trade Center Disaster

Volume 4
Contains Appendices G, H, and I

NIST National Institute of Standards and Technology • Technology Administration • U.S. Department of Commerce

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U.S. Department of Commerce
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Technology Administration
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National Institute of Standards and Technology Special Publication 1000-5
Natl. Inst. Stand. Technol. Spec. Publ. 1000-5, 1,054 pages (June 2004)
CODEN: NSPUE2

U.S. GOVERNMENT PRINTING OFFICE
WASHINGTON: 2004

For sale by the Superintendent of Documents, U.S. Government Printing Office
Internet: bookstore.gpo.gov — Phone: (202) 512-1800 — Fax: (202) 512-2250
Mail: Stop SSOP, Washington, DC 20402-0001

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LIST OF ACRONYMS AND ABBREVIATIONS

AAPOR	American Association of Public Opinion Research
ABC	American Broadcasting Company
ACI	American Concrete Institute
AISC	American Institute of Steel Construction
AISI	American Iron and Steel Institute
ALE	Arbitrary-Lagrangian-Evlerian
AMCBO	Association of Major City/County Building Officials
ANSI	American National Standards Institute
ANSYS	finite element model
ARA	Applied Research Associates, Inc.
ASCE	American Society of Civil Engineers
ASHRAE	American Society of Heating, Refrigerating and Air-Conditioning Engineers, Inc.
ASME	American Society of Mechanical Engineers
ASTM	ASTM International
AWS	American Welding Society
BOCA	Building Officials and Code Administrators
BOCA/BBC	BOCA Basic Building Code
BPAT	Building Performance Assessment Team
BPS	Building Performance Study
BSI	British Standards Institution
C/F	cancer free
CATI	computer-assisted telephone interviews
CBR	chemical, biological, and radiological
CBS	Columbia Broadcasting System
CERF	Civil Engineering Research Foundation
CFD	computational fluid dynamics
CIB	International Council for Research and Innovation in Building and Construction
CII	Construction Industry Institute
CNN	Cable News Network

CPP	Cermak Peterka Peterson, Inc.
CPU	central processing unit
CRT	cathode-ray tube
CTB&UH	Council on Tall Buildings and Urban Habitat
CTE	coefficients of thermal expansion
DC/F	BlazeShield DC/F fire protective insulation
DL	dead load
DTAP	dissemination and technical assistance program
EMS	Emergency Medical Service
EMT	Emergency Medical Team
ER&S	Emory Roth & Sons
FBI	Federal Bureau of Investigation
FCA	Flux cored arc
FDNY	New York City Fire Department
FDS	Fire Dynamics Simulator
FE	finite element
FEA	finite element analysis
FEM	finite element model
FEMA	Federal Emergency Management Agency
FMRC	Factory Mutual Research Corp.
FSI	Fire-Structure Interface
FVM	Finite Volume Method
GFI	Government Furnished Information
GG	glass over glass
GHz	gigahertz
GMS, LLP	Gilsanz Murray Steficek, LLP
HAZ	heat affected zone
HNSE	Hugo Nue Schnutzer East
HRR	heat release rate
HVAC	heating, ventilating, and air conditioning
IAQ	indoor air quality
IBC	International Building Code

ICBO	International Conference of Building Officials
ICC	International Code Council
IMTI	Integrated Manufacturing Technology
JFK	John F. Kennedy International Airport
JIS	Japan Industrial Standard
LERA	Leslie E. Robertson Associates
LES	Large Eddy Simulation
LL	live load
LSTC	Livermore Software Technology Corporation
MBC	BOCA National Building Code
MCC	Municipal Code of Chicago
MPI	Message Passing Interface
NBC	National Broadcasting Company
NBFU	National Board of Fire Underwriters
NCSBCS	National Conference of States on Building Codes & Standards, Inc.
NCST	National Construction Safety Team
NEMA	National Electrical Manufacturers Association
NFPA	National Fire Protection Association
NIBS	National Institute of Building Sciences
NIST	National Institute of Standards and Technology
NYC	New York City
NYCBC	New York City Building Code
NYCDOB	New York City Department of Buildings
NYPD	New York City Police Department
NYSBC	New York State Building Construction Code
P.L.	Public Law
PANYNJ	Port Authority of New York and New Jersey
PAPD	Port Authority Police Department
PC&F	Pacific Car and Foundry
PDM	Pittsburg-Des Moines
PONYA	Port of New York Authority
R&D	research and development

RWDI	Rowan Williams Davis and Irwin, Inc.
SBCCI	Southern Standard Building Code
SDL	superimposed dead load
SDO	standards development organization
SEAoNY	Structural Engineers Association of New York
SFPE	Society of Fire Protection Engineering
SFRM	spray-on fire resistant material or sprayed fire resistive materials
SHCR	Skilling, Helle, Christiansen, & Robertson
SI	metric
SLB	short legs back-to-back
SMA	Shielded Metal Arc
SOD	Special Operations Division
SOM	Skidmore, Ownings & Merrill
SPH	Smoothed Particle Hydrodynamics
SQL	Structured Query Language
SWMB	Skilling, Ward, Magnussen, and Barkshire
TL	Truss Lower Chord
TM	Truss Middle Chord
TU	Truss Upper Chord
UBC	Uniform Building Code
UL	Underwriters' Laboratories, Inc.
USC	United States Code
USM	United States Mineral Products Co.
VCBT	Virtual Cybernetic Building Testbed
WABC	WABC-TV New York
WCBS	WCBS-TV New York
WF	wide flange (a type of structural steel shape now usually called a W-shape). ASTM A 6 defines them as "doubly-symmetric, wide-flange shapes with inside flange surfaces that are substantially parallel."
WNBC	NBC4 New York
WNYW	FOX5 New York
WPIX	WPIX-TV New York
WTC	World Trade Center

WTC 1	World Trade Center Tower 1
WTC 2	World Trade Center Tower 2
WTC 7	World Trade Center Building 7

Abbreviations

×	by
±	plus or minus
°C	degrees Celsius
°F	degrees Fahrenheit
μm	micrometer
2D	two dimensional
3D	three dimensional
cm	centimeter
ft	foot
ft^2	square foot
F_y	yield strength (AISC usage)
g	acceleration (gravity)
g	gram
gal	gallon
h	hour
in.	inch
kg	kilogram
kip	a stress unit equal to 1,000 pounds
kJ	kilojoule
kN	kilonewton
kPa	kilopascal
klb	1,000 pounds
ksi	1,000 pounds per square inch
kW	kilowatt
kW/m^2	kilowatts per square meter
L	liter
lb	pound
m	meter
m^2	square meter
mm	millimeter
m/s	meters per second

min	minute
MJ	megajoule
MPa	megapascal
mph	miles per hour
ms	microsecond
Msi	millions pounds per square inch
MW	megawatt
N	newton
Pa	pascal
pcf	pounds per cubic foot
plf	pounds per linear foot
psf	pounds per square foot
psi	pounds per square inch
s	second

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METRIC CONVERSION TABLE

To convert from	to	Multiply by
AREA AND SECOND MOMENT OF AREA		
square foot (ft^2)	square meter (m^2)	9.290 304 E-02
square inch (in^2)	square meter (m^2)	6.4516 E-04
square inch (in^2)	square centimeter (cm^2)	6.4516 E+00
square yard (yd^2)	square meter (m^2)	8.361 274 E-01
ENERGY (includes WORK)		
kilowatt hour (kW * h)	joule (J)	3.6 E+06
quad (1015 BtuIT)	joule (J)	1.055 056 E+18
therm (U.S.)	joule (J)	1.054 804 E+08
ton of TNT (energy equivalent)	joule (J)	4.184 E+09
watt hour (W * h)	joule (J)	3.6 E+03
watt second (W * s)	joule (J)	1.0 E+00
FORCE		
dyne (dyn)	newton (N)	1.0 E-05
kilogram-force (kgf)	newton (N)	9.806 65 E+00
kilopond (kilogram-force) (kp)	newton (N)	9.806 65 E+00
kip (1 kip=1000 lbf)	newton (N)	4.448 222 E+03
kip (1 kip=1000 lbf)	kilonewton (kN)	4.448 222 E+00
pound-force (lbf)	newton (N)	4.448 222 E+00
FORCE DIVIDED BY LENGTH		
pound-force per foot (lbf/ft)	newton per meter (N/m)	1.459 390 E+01
pound-force per inch (lbf/in)	newton per meter (N/m)	1.751 268 E+02
HEAT FLOW RATE		
calorieth per minute (calth/min)	watt (W)	6.973 333 E-02
calorieth per second (calth/s)	watt (W)	4.184 E+00
kilocalorieth per minute (kcalth/min)	watt (W)	6.973 333 E+01
kilocalorieth per second (kcalth/s)	watt (W)	4.184 E+03

To convert from	to	Multiply by
LENGTH		
foot (ft)	meter (m)	3.048 E-01
inch (in)	meter (m)	2.54 E-02
inch (in)	centimeter (cm)	2.54 E+00
micron (m)	meter (m)	1.0 E-06
yard (yd)	meter (m)	9.144 E-01
MASS and MOMENT OF INERTIA		
kilogram-force second squared per meter (kgf * s^2/m)	kilogram (kg)	9.806 65 E+00
pound foot squared (lb * ft^2)	kilogram meter squared (kg * m^2)	4.214 011 E-02
pound inch squared (lb * in^2)	kilogram meter squared (kg * m^2)	2.926 397 E-04
ton, metric (t)	kilogram (kg)	1.0 E+03
ton, short (2000 lb)	kilogram (kg)	9.071 847 E+02
MASS DIVIDED BY AREA		
pound per square foot (lb/ft^2)	kilogram per square meter (kg/m^2)	4.882 428 E+00
pound per square inch (*not* pound force) (lb/in^2)	kilogram per square meter (kg/m^2)	7.030 696 E+02
MASS DIVIDED BY LENGTH		
pound per foot (lb/ft)	kilogram per meter (kg/m)	1.488 164 E+00
pound per inch (lb/in)	kilogram per meter (kg/m)	1.785 797 E+01
pound per yard (lb/yd)	kilogram per meter (kg/m)	4.960 546 E-01
PRESSURE or STRESS (FORCE DIVIDED BY AREA)		
kilogram-force per square centimeter (kgf/cm^2)	pascal (Pa)	9.806 65 E+04
kilogram-force per square meter (kgf/m^2)	pascal (Pa)	9.806 65 E+00
kilogram-force per square millimeter (kgf/mm^2)	pascal (Pa)	9.806 65 E+06
kip per square inch (ksi) (kip/in^2)	pascal (Pa)	6.894 757 E+06
kip per square inch (ksi) (kip/in^2)	kilopascal (kPa)	6.894 757 E+03
pound-force per square foot (lbf/ft^2)	pascal (Pa)	4.788 026 E+01
pound-force per square inch (psi) (lbf/in^2)	pascal (Pa)	6.894 757 E+03
pound-force per square inch (psi) (lbf/in^2)	kilopascal (kPa)	6.894 757 E+00
psi (pound-force per square inch) (lbf/in^2)	pascal (Pa)	6.894 757 E+03
psi (pound-force per square inch) (lbf/in^2)	kilopascal (kPa)	6.894 757 E+00

To convert from	to	Multiply by
TEMPERATURE		
degree Celsius (°C)	kelvin (K)	T/K = t/ °C + 273.15
degree centigrade	degree Celsius (°C)	t/ °C ≈ t /deg. cent.
degree Fahrenheit (°F)	degree Celsius (°C)	t/ °C = (t/ °F 2 32)/1.8
degree Fahrenheit (°F)	kelvin (K)	T/K = (t/ °F + 459.67)/1.8
kelvin (K)	degree Celsius (°C)	t /°C = T/ K 2 273.15
TEMPERATURE INTERVAL		
degree Celsius (°C)	kelvin (K)	1.0 E+00
degree centigrade	degree Celsius (°C)	1.0 E+00
degree Fahrenheit (°F)	degree Celsius (°C)	5.555 556 E-01
degree Fahrenheit (°F)	kelvin (K)	5.555 556 E-01
degree Rankine (°R)	kelvin (K)	5.555 556 E-01
VELOCITY (includes SPEED)		
foot per second (ft/s)	meter per second (m/s)	3.048 E-01
inch per second (in/s)	meter per second (m/s)	2.54 E-02
kilometer per hour (km/h)	meter per second (m/s)	2.777 778 E-01
mile per hour (mi/h)	kilometer per hour (km/h)	1.609 344 E+00
mile per minute (mi/min)	meter per second (m/s)	2.682 24 E+01
VOLUME (includes CAPACITY)		
cubic foot (ft^3)	cubic meter (m^3)	2.831 685 E-02
cubic inch (in^3)	cubic meter (m^3)	1.638 706 E-05
cubic yard (yd^3)	cubic meter (m^3)	7.645 549 E-01
gallon (U.S.) (gal)	cubic meter (m^3)	3.785 412 E-03
gallon (U.S.) (gal)	liter (L)	3.785 412 E+00
liter (L)	cubic meter (m^3)	1.0 E-03
ounce (U.S. fluid) (fl oz)	cubic meter (m^3)	2.957 353 E-05
ounce (U.S. fluid) (fl oz)	milliliter (mL)	2.957 353 E+01

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Appendix G
INTERIM REPORT ON SIGNIFICANT FIRES IN WTC 1, 2, AND 7 PRIOR TO SEPTEMBER 11, 2001

Fires occurred in World Trade Center (WTC) 1, 2, and 7 prior to September 11, 2001. This appendix documents the facts of significant fires in the building after first occupancy as they relate to the performance of the automatic sprinkler, manual suppression, fire detection, and smoke purge systems. The ultimate goal of this review was to identify from New York City Fire Department (FDNY) records significant but not well known fires for further study.

G.1 BACKGROUND

The fire protection engineering department of the Port Authority of New York and New Jersey (PANYNJ) maintained records of all significant fire events in the WTC buildings. These records were lost in the collapse of the towers.

Two significant fire events involving WTC 1 are well known. On February 14, 1975, a fire started on the 11th floor of WTC 1. Workers reported the fire to WTC police headquarters. When police reached the fire floor, they reported a serious fire and ordered the heating, ventilating, and air conditioning (HVAC) system be placed into the smoke purge mode. Fire spread through unprotected floor openings in utility closets. Fire damage occurred on floor 10 through floor 19. Approximately 800 m^2 (9,000 ft^2) of the floor 11 contents were destroyed or damaged. At that time, sprinklers had not been installed in the office spaces. However, fire barriers divided the floor into quadrants. The fire on floor 11 was confined to the southeast quadrant. Fire damage on other floors was confined to the utility closets. The fire was extinguished by FDNY. More details about this fire incident can be found in Powers (1975), Lathrop (1975), and a report that is being prepared for the National Institute of Standards and Technology (NIST) by Hughes Associates.

At 12:18 PM on February 26, 1993, a bomb exploded in an underground parking garage of the WTC complex. The explosion occurred on the B2 level in the area of the garage under WTC 3 and adjacent to WTC 1. The explosion resulted in a loss of normal electric power in WTC 1 and WTC 2. HVAC systems shut down. Smoke spread throughout WTC 1 and to a lesser extent in WTC 2. More details about this fire can be found in Isner and Klein (1993a, 1993b). The only historic record of smaller fire incidents in WTC 1, 2, and 7 known to this investigation are the fire reports and fire investigation reports prepared by the FDNY. These reports were provided to NIST by FDNY for use in this investigation.

G.2 FDNY FIRE REPORTS AND FIRE INVESTIGATION REPORTS

The FDNY released 397 Bureau of Operations Fire Reports and 112 Bureau of Fire Investigation Records (Fire Marshals' Reports) which served as the basis for a summary of the fire history in the WTC 1, 2, and 7. NIST obtained reports of fires for the period of 1970–2001 and fire investigation records between 1977 and 2001 for WTC 1, 2, and 7, which in total, consisted of over 500 documents on which to report.

These records included all responses to fires in buildings 1, 2, and 7 by the FDNY. All of these records consist of standardized forms that may be supplemented with other materials. Many were for minor fire events, such as fires that were extinguished by occupants before FDNY arrival. These were not of interest for this investigation. The records of significant fires were identified.

Significant fire incidents were those that exercised the fire suppression systems, specifically multiple sprinklers or multiple standpipes (with or without the activation of at least one sprinkler). These fires will be discussed individually, organized by the building in which they occurred. In addition to these fires, generalized facts relating to those fires involving the use of one standpipe line and one sprinkler and the use of one standpipe line will be provided throughout this report. As an aside, the majority of fire records for significant fires documented the performance of the detectors and sprinkler systems, but almost all reports lacked information about the performance of the smoke purge system.

G.2.1 Fire Record Forms

Depending upon the type and date of the incident, a specific fire report form was used by the FDNY to document the incident. For each type of emergency responded to by the FDNY, responders either completed a form that would describe a structural fire (BF–24) or a form that would describe any other type of emergency (BF–25), such as a nonstructural fire, transportation fire, and/or any other non-fire emergency. For this historical summary, only those events logged and organized under the structural fire form, 345 documents total, were of interest and used. A structural fire form is a one-page document (unless additional information is recorded on separate sheets) that gives valuable information about the fire event on various subjects, including:

- Alarm–the date and time of the received alarm
- Injuries and casualties–the numbers of each for the incident
- Extinguishment–details of the sprinkler and standpipe performance
- Ignition–information on the equipment involved in ignition, the form of the ignition source, the material type and form that was ignited, and the ignition factor (cause)
- Structure–information on the class of construction, the use of the building, and its status (vacant, occupied, under construction, etc.)
- Fire origin–the fire location and classification
- Fire extension–the means of fire extension and number of buildings/vehicles involved
- Damage–information on the damage done by flame, smoke, and water
- Detectors–the type, power source and performance of the detectors in the fire area

Each subject of the incident is given a set of codes or numbers that correspond to any incident, and in order to read the fire records successfully, an understanding of the codes is necessary (see

Attachments G-A.1, G–A.2 and G–A.3). For the nonstructural B-25 record forms, the only fire related subjects included are the injury and casualty numbers, ignition, and structure information.

Depending upon the date of the fire incident, certain information is lacking from the structural fire form. Before 1980, a different record form for structural fire incidents was used which left out the following subjects: fire extension, damage, detectors, and portions of the ignition data. Because of this, detection data are not available for the majority of the fires occurring before 1980.

G.2.2 Overview of Fire Incidents 1970–2001 from FDNY Records

Table G–1 contains the categorization of all structural fire incidents contained in the FDNY records for WTC buildings 1, 2, and 7 available to this investigation. The table contains information on the category of fire incident (whether or not the detection and/or sprinkler systems activated), the time period over which the fires occurred, the numbers of records in that category, and a descriptive statement about the category.

Table G–1. Categorization of WTC 1, 2, and 7 fires from FDNY records.

WTC 1			
Category	**Dates**	**Number**	**Generalization of Incidents**
No detection, no sprinkler	1980–2001	66	Unattended food/appliances, overheated elevator equipment, discarded material, welding operations, electrical failure and suspicious fires
No detection information and no sprinklers	1970–1979	79	Trash can fires, discarded material, food on stove, electrical failure, overheated equipment
Detection, no sprinklers	1980–2000	57	Unattended food/appliances, overheated elevator equipment, discarded material, welding operations, electrical failure
[Detection] and sprinklers	1977–1999	18	Suspicious, electrical failure, discarded material
WTC 2			
Category	**Dates**	**Number**	**Generalization of Incidents**
No detection, no sprinkler	1980–1999	37	Discarded material, welding too close, overheated equipment, suspicious, elevator motor
No detection information and no sprinklers	1975–1979	40	Discarded material, fire in office furniture, trash can fires
Detection, no sprinklers	1981–1999	40	Food on stove, small elevator fire, electrical failure, suspicious, overheated equipment
[Detection] and sprinklers	1977–2000	5	Mechanical failure, suspicious
WTC 7			
Category	**Dates**	**Number**	**Generalization of Incidents**
No detection, no sprinkler	2000	1	Trash can fire/discarded material
Detection, no sprinklers	1990	1	Electrical switch on floor – explosion
[Detection] and sprinklers	1988	1	Suspicious

All FDNY records provided to NIST, unless the records were not readable, contained relevant information about the type and performance of the suppression system. Because of this, reports of incidents in which the sprinkler system activated can range from 1970 to 2001. When the table lists "[detection]" in brackets, this is meant to symbolize that either detection was present or no information on detector performance was included on the form (as is the case with the older records). An attempt was made to compare all investigation records with the fire reports, especially those which activated the suppression system. Looking at the records in Table G–1, it is clear that only 24 fires activated the sprinkler system from 1970–2001 from all three buildings. Many of the other structural fires without sprinkler activation were labeled as suspicious, trash can fires, electrical failures, unattended food/appliances, or overheated equipment.

In order to report on significant structural fires occurring in WTC 1, 2, and 7, the FDNY records had to be reviewed for those incidents that activated sprinklers, detectors, or were extinguished by hose line and those smaller fires that self-extinguished or could be extinguished using a fire extinguisher. The structural fire incidents without detection information (before 1980), had to be reviewed to locate any fires that activated the sprinkler system.

The retrofit installation of sprinklers into WTC buildings 1 and 2 was accomplished in two phases. During the first phase in 1976, sprinkler risers/mains were installed throughout WTC 1 and WTC 2. Sprinklers were installed to protect corridors, storage rooms, lobbies, and certain tenant/PANYNJ spaces. In the second phase of the retrofit from 1983 to 2001, sprinklers were installed in all remaining places in the complex (PACO 2002; shown in Attachment G–B). Prior to the retrofit only the sub-grade areas and selected hazard areas were protected by automatic sprinklers. This retrofit proceeded throughout the buildings as much as practical when other renovations of the office spaces were underway, such as when change of tenants occurred.

After the installation of the sprinkler risers in 1976, tenants had the option of providing sprinklers or compartmentation for fire protection in compliance with Local Law 5. It was therefore possible that during the period of time when retrofit installation of sprinklers was under way, a fire that occurred may or may not have been in an area protected by automatic sprinklers.

The forms used by the FDNY after 1987 give a detailed description of the event and whether or not a system was present at the time of the fire; however, a fire recorded before 1987 will give data only on the number of sprinklers opened. Because of this, an effort was made to look through all reports, especially those that mentioned detection performance, in order to identify fires involving the use of standpipe lines by the FDNY as an alternate indication of a significant fire.

The next section of the report will highlight significant fires occurring in WTC 1, 2, and 7. The significant fires will be described individually by WTC building, and organized by the date on which they occurred in the building. In addition to these significant fires, (1) the fires that activated one sprinkler head and involved the use of one standpipe and (2) the fires that involved the use of only one standpipe, due to the number of incidents, will be generalized as to the nature of the incidents and the procedures followed by the FDNY.

G.2.3 Fire Incidents Occurring in WTC 1

After reviewing all the FDNY records of fire incidents in WTC building 1 since 1970, the significant fires were selected. There were 12 significant fires found for WTC 1, and the fire reports are included in Attachment G–A.4. Table G–2 provides a summary of the fire incident information from FDNY records, which is followed by individual paragraphs about each incident.

Table G–2. Significant fires in WTC 1 extinguished by sprinklers and/or multiple standpipe lines.

Significant Fire	Incident Date	Fire Location	# Sprinklers Activated	# Standpipes Used	Cause of Fire	Material Ignited
1	9/9/77	B-6 level storage room	2	0	None listed	Not listed
2	9/23/77	Dumpster on B-4 level	2	0	Not classified	Trash/waste
3	10/16/81	19th floor office area	-	2	Discarded material	Furniture
4	12/23/83	2 dumpsters on B-4 level	2	1	Suspicious	Trash/waste
5	1/27/85	Office space on mezzanine level (Floor 2)	2	1	Incendiary	Trash/waste
6	9/10/85	Garbage dumpster in service elevator lobby on floor 43	2	1	Suspicious	Trash/waste
7	11/1/85	Storage closet on B-4 level	3	1	Suspicious	Supplies/ stock
8	6/7/86	Dumpster fire on floor 106, compactor room on floor 107	2	1	None listed	Trash/waste
9	9/30/91	Office on B-4 level	≥1	2	Discarded material	Trash/waste
10	11/19/91	Electrical closet on floor 93	0	2	Short circuit	Electrical wire or cable insulation
11	7/23/92	Level B-5 at the power distribution panel	0	2	Electrical failure	Electrical wire or cable insulation
12	11/10/99	Computer room on floor 104	3	≥1	None listed	Plastics, electronic equip

Key: ≥ symbol denotes that at least one of the units of the suppression system was used (and not specifically identified by the fire report); - indicates that the report acknowledges 0 sprinklers open; however, due to the date of the fire, the space may not have had a sprinkler system installed.

Significant Fire #1

On September 9, 1977, at 11:04 p.m., the FDNY received an alarm for a fire in the B-6 level storage room at the address of WTC 1. The fire activated two sprinklers, and was noted to be extinguished before the FDNY's arrival.

Significant Fire #2

Another fire occurred on September 23, 1977, at 11:48 p.m., in a dumpster on the B-4 level of WTC 1. This fire also activated two sprinklers, and the FDNY noted that the fire had been extinguished prior to their arrival.

In both cases, no injuries or casualties resulted from these fires, and the damage was confined to the area of origin.

Significant Fire #3

Six years later, on October 16, 1981, at 7:12 p.m., a fire occurred on floor 19 of WTC 1. The FDNY noted that they used two standpipe lines to extinguish the fire and that one person was evacuated from the scene. Again, the fire report notes that no sprinklers opened, but does not note whether or not sprinklers were present at the time of the fire. Given the date of the incident, sprinklers are not expected to be located on floor 19. The fire was caused by discarded material and involved furniture in an office area of the floor.

Significant Fire #4

Six years later on December 23, 1983, at 2:50 a.m., the FDNY responded to an alarm of fire and heavy smoke conditions on the B-4 level of WTC 1. The FDNY found two dumpsters fully involved in separate locations on the same floor and noted that the two activated sprinklers extinguished a major portion of the fire. The FDNY extinguished the rest of the flames by stretching hose from the standpipe system. Again, no injuries or casualties resulted from this fire. The cause noted on the report was suspicious and the damage was confined to the origin of the fire.

Significant Fire #5

On January 27, 1985, at 8:53 p.m., the FDNY was called for a fire located in an unoccupied office on the mezzanine level of WTC 1. Two sprinklers contained the incendiary (involving arson) fire consuming trash paper/waste. When the FDNY arrived, they extinguished the remaining fire with one standpipe line. Building and content damage was confined to less than 15 percent of the space. Also, no injuries or casualties were reported.

Significant Fire #6

Eight months later on September 10, 1985, at 4:05 p.m., the Port Authority Police informed the FDNY on arrival of a sprinkler flow and smoke condition on floor 43. A medium smoke condition was report by the FDNY on floor 43, where a fire was extinguished by two sprinklers. The fire report notes the use of one standpipe line; however, this was used during the overhaul process. This fire originated suspiciously in a garbage dumpster in a service elevator lobby. There was no building or content damage as well as no injuries or casualties reported.

Significant Fire #7

On November 1, 1985, at 4:05 a.m., the FDNY was called for another suspicious fire producing heavy smoke on the B-4 level under WTC 1 and WTC 2. This fire occurred in a storage closet of the men's bathroom, and the FDNY noted that three sprinklers activated to keep the fire under control until their arrival. Upon arrival, the FDNY extinguished the remaining fire in the closet area with one standpipe line. Again, the damage was noted to be confined to the area of origin.

Significant Fire #8

Less than a year later, on June 7, 1986, at 9:49 a.m., the FDNY received an alarm for a heavy smoke condition on floor 110. For this call, fires were burning in two separate places; a garbage dumpster on floor 106 and the compactor room on floor 107. Sprinklers were noted in operation in both locations and seemed to control the fires, until the FDNY could complete extinguishment with one standpipe line on floor 106. There was no report of injuries or casualties for the previous two fires.

Significant Fire #9

An additional fire occurred in WTC 1 where multiple standpipe lines were used along with the activation of the sprinkler system. This fire occurred on September 30, 1991, at 6:32 p.m., in an office on the B4 level. The fire report noted that the sprinkler system operated; however, there is no mention of how many sprinklers or even their activation in the Operations/Comments section of the report. Two 1 3/4 in. or larger hose lines were used by the FDNY to extinguish this fire. The cause of the fire was abandoned material (cigarette) igniting boxes/carton material in an office. The fire damage was confined to the area of origin and smoke damage was confined to the floor. There was one uniformed officer injured and no civilian injuries or casualties.

Significant Fire #10

A fire occurred on November 19, 1991, at 6:27 pm., and two 2 1/2 in. standpipe hose lines were used by the FDNY. The FDNY responded to WTC 1 for this fire due to a report of fire and smoke condition in electrical closets on possibly four floors (floors 93–96) and an alarm transmitted from floors 93–98. According to the fire report, the sprinklers were in service, but did not operate for this fire. The noted cause of this fire was a short circuit and the material that was ignited was electrical wire or cable insulation. The fire and smoke damage was confined to its area of origin (electrical closet). Two occupants were removed from stalled elevators during this incident, and occupants were evacuated from the scene, although an exact number is not given. Also, two occupants were injured and required first aid.

Significant Fire #11

The FDNY responded to WTC 1 on July 23, 1992, at 10:02 p.m., due to a transformer fire on the 5th sub basement level. Firefighters found a fire situation in a large power distribution panel, where a firefighter was knocked unconscious by a shock blast from the panel. Similar to the fire in November of 1991, two 2-1/2 in. standpipe hose lines were used by the FDNY on this fire. The cause of the fire was an electrical failure and the material ignited was electrical wire or cable insulation. No appreciable damage is noted. As mentioned earlier, one firefighter was injured as well as three civilians.

Significant Fire #12

The final fire associated with WTC 1 was one that occurred on November 10, 1999, at 11:01 p.m., in a computer room on floor 104. The FDNY noted that the fire was "knocked down" by three sprinklers when they arrived and they completed extinguishment with a line extended from the standpipe. The flame damage was confined to the area of origin and computer equipment was involved in fueling the fire. There was one injury and no casualties reported in the FDNY record for this fire.

Table G–2 presents the 12 significant fires in WTC 1. Five of the 12 fires occurred on the basement levels and two occurred on the upper levels (above floor 100). The causes of these significant fires include suspicious, discarded materials, and electrical failures.

G.2.4 Fire Incidents Occurring in WTC 2

Table G–3 presents the significant fire occurring in WTC 2. There were three significant fires found for WTC 2, and the fire reports are included in Attachment G–A.5. Table G–3 provides a summary of the fire incident information from FDNY records, which is followed by individual paragraphs about each incident.

Table G–3. Significant fires in WTC 2 extinguished by sprinklers and/or multiple standpipe lines.

Significant Fire	Incident Date	Fire Location	# Sprinklers Activated	# Standpipes Used	Cause of Fire	Material Ignited
1	5/19/75	Floor 32	-	3	Incendiary	Trash/waste
2	4/12/77	Duct work over grill in restaurant on floor 107	2	0	None listed	Duct work
3	3/22/93	Fan motor room on floor 108	2	0	Mechanical failure	Not classified

- Indicates that the report acknowledges 0 sprinklers open, however due the date of the fire, the space may not have had a sprinkler system installed.

Significant Fire #1

A fire occurred on May 19, 1975, at 9:38 p.m., on floor 32 of WTC 2. The FDNY noted that they used three standpipe lines to extinguish the fire and that the Port Authority reported occupants trapped on floors 31 and 32. The fire report notes that no sprinklers opened, but does not note whether or not sprinklers were present at the time of the fire. Given the date of the incident, sprinklers are not expected to be located on floors 31 and 32. The fire was labeled as incendiary and involved trash/waste. The FDNY stated that the fire involved the core area of the floor and was confined to that area. Over 20 people (civilians and uniformed personnel) were injured by this incident.

Significant Fire #2

On April 4, 1977, at 1:15 p.m., the FDNY was called to WTC 2 for a fire in the duct work over the grills in a restaurant on floor 107. The FDNY record on this fire noted that the fire was extinguished prior to its arrival. The damage was confined to the area of origin, and the fire caused no injuries or casualties.

Significant Fire #3

The second fire occurred on March 22, 1993, at 8:39 a.m., and caused a smoke condition on floor 108. The fire activated two sprinklers due to an overheated bearing in a fan motor room on floor 108. The damage to the area did not exceed 15 percent of the space, and there were no injuries or casualties reported.

Table G–3 presents the three significant fires in WTC 2. No fires were discovered in WTC 2 where multiple sprinklers or standpipes were used with another suppression system. Two of the three fires occurred on the upper levels (above floor 100) and the other occurred on floor 32. The causes of these significant fires included incendiary and mechanical failures.

G.2.5 Additional Fires Involving the Deployment of Standpipe Lines in WTC 1 and 2

The fires described in this section (31 in total) involve the use of one standpipe, with and without the activation of one sprinkler for WTC 1 and WTC 2. Four of the 31 reports describe fires that were extinguished with one sprinkler and one standpipe line (see Attachment G–A.6.1). Three of these fires were located in WTC 1 between the years of 1986–1991 and the other in WTC 2 in 1981. Two of these fires occurred in basement levels, one occurred on floor 106 of WTC 1, and the last on floor 5 in WTC 1. In some of the fire reports, the FDNY noted that the sprinkler controlled the fire, and the standpipe was used to actually extinguish the remaining fire. Half of the fires were labeled as incendiary/suspicious, one was an electrical failure, and the last was unknown.

In addition, 27 of the 31 fire reports describe fires that were extinguished using one standpipe line (see Attachment G–A.6.2). Twenty of these fires occurred in WTC 1 and the other seven occurred in WTC 2. A majority of these fires (19) are labeled as incendiary/suspicious or unknown, while the other causes of the fires are attributed to short circuits, abandoned material/cigarette, welding close to combustibles, and a mechanical failure. The dates of occurrence for these fires range from 1973–1999, with a majority (23) occurring between the years of 1973–1985. These fire incidents did not result in any casualties, but five civilians and one uniformed officer were injured.

Two of the 27 fires involved a 300 person (April 19, 1980) and a 1,500 person (April 17, 1981) evacuation. These will be described in further detail. On April 19, 1980, at 2:06 p.m., the FDNY received reports of an activated smoke detector in the return air duct on floor 106 of WTC 1. The FDNY also received reports of heavy smoke on floor 106, light smoke on floor 109, and heavy odor of smoke in stairways A and B. The report notes that while only one standpipe was used, approximately 300 people were evacuated from the Windows on the World restaurant on floor 107 via stairway C (which was clear of smoke). The fire cause was labeled as abandoned or discarded material and involved plastic material. This fire did not cause any injuries or casualties.

On April 17, 1981, at 9:18 a.m., the FDNY was informed of a fire on floor 7 and a smoke condition on floors 7 through 11 of WTC 1. The FDNY hooked up one standpipe and extinguished the fire located in an air conditioning unit in the "MER" room on floor 7. The cause of this fire was labeled as a mechanical failure. The fire report notes that the Port Authority personnel reported an evacuation of approximately 1,500 people from floors 9 through 23. However, no injuries or casualties were reported from this fire.

G.2.6 Fire Incidents Occurring in WTC 7.

Table G–4 presents the significant fire occurring in WTC 7. There was one significant fire found for WTC 7, and the fire report is included in attachment G–A.7. Table 4 provides a summary of the fire incident information from FDNY records, which is followed by an individual paragraph on the incident.

Table G–4. Significant fires in WTC 7 extinguished by sprinklers and/or multiple standpipe lines.

Significant Fire	Incident Date	Fire Location	# Sprinklers Activated	# Standpipes Used	Cause of Fire	Material Ignited
1	5/20/88	Construction shanties on floor 3	Multiple, # not listed	1	Suspicious	Shanties

Significant Fire #1

In WTC 7, a fire occurred on May 20, 1988, at 12:38 a.m., in the construction shanties on floor 3. Although the fire report does not specifically note the number of sprinklers that activated, the operations notes state that Ladder Truck 10 found the sprinklers (noting more than one) in operation and shut them down. The FDNY had to complete the extinguishment by stretching a line from the standpipe to the fire source. This fire is noted by the report as being suspicious in nature and the flame damage was confined to the area of origin.

It is possible that the fire incidents that were not specifically highlighted, especially those in the areas without sprinklers, involved other methods of extinguishment before FDNY arrival, such as a WTC houseline (pre-connected standpipe hose), hand extinguisher, or bucket of water, as noted on some of the FDNY reports. All other fires, the majority, included in other categories were either self-extinguished, extinguished prior to FDNY arrival (by staff, etc.), or a hand extinguisher was used by the FDNY.

G.3 SUMMARY

In summary, 16 significant fires occurred in WTC 1, 2, and 7, with 12 occurring in WTC 1, three in WTC 2, and one in WTC 7. In addition to these, 31 fires occurred in WTC 1 and WTC 2, which involved the use of one standpipe (with or without the activation of one sprinkler). Of these additional 31 fires, 23 occurred in WTC 1 and eight occurred in WTC 2. The following paragraphs will summarize findings from the 16 significant fires that occurred in all three buildings.

After reviewing the 16 significant fires, trends developed relating to the time of day that the fires occurred. Overall, 12 of the 16 fires occurred between the hours of 6 p.m. and 4 a.m. The fires that occurred during office hours (between 7 a.m. and 6 p.m.) included a dumpster fire in the floor 43 elevator lobby (WTC 1), a dumpster fire on floor 106 (WTC 1), a kitchen fire on floor 107 (WTC 2), and a bearing overheating in the fan motor room on floor 108 (WTC 2). Almost all of the incendiary (arson) and suspicious fires (5 out of 6 fires) and unclassified or unlisted fires (4 out of 5 fires) occurred after business hours (before 7 a.m. and after 6 p.m.).

In addition to the time of day of the fire, trends in the cause of the fire and the materials involved in the fire can be highlighted. Of the 16 fires and their causes, five were labeled as unlisted or unclassified, six as suspicious or incendiary, two as discarded material, and three as an electrical failure or mechanical failure. For the material involved in the fire, eight reports noted trash, waste, and supplies; two reported not listed or not classified; one reported furniture; three reported electrical equipment; one reported duct work; and one reported shanties were the material involved in the fire.

Lastly, the location of the fires throughout the buildings was of interest. Of the 16 fires, four fires were concentrated above floor 100 or and six fires were located in the basement. The others (6 fires) were spread throughout the rest of the building.

G.4 ATTACHMENTS TO THIS FIRE HISTORY

Attachments G–A.1 through G–A.7 are included as a supplement to this report. The first three sections, G–A.1 through G–A.3 are explanations of the numeric codes used in the fire reports by the FDNY. Attachment G–A.1 is included to explain the codes for the fire reports produced prior to and including 1980, Attachment G–A.2 is included to explain the fire reports produced from 1981 to May 31, 1987, and Attachment G–A.3 is included to explain the fire reports produced from June 1, 1987, to the present. The report code explanations are divided into the same sections as the fire report and give short descriptions for the numbers used in the fire report under each section. For example, if the ignition factor for a fire occurring in 1990 was given a number code of 54, the reader can find that the cause of the fire was a "short circuit, ground fault."

Attachments G–A.4 through G–A.7 include the actual fire reports produced by the FDNY on the significant fires highlighted in the sections above. The reader can use Attachments G–A.1 through G–A.3 (depending upon the date of the fire) to read the fire reports in more detail than what is provided in this fire history report.

G.5 CONCLUSIONS

From the information contained in FDNY fire reports and fire investigation records provided to NIST, 47 fires occurred in WTC building 1, 2, and 7 that were of sufficient size and duration to activate multiple sprinklers or were estimated by NIST to be capable of doing so, over the time period the buildings were occupied. This total does not include the major 1975 office fire in WTC 1 or the 1993 bombing.

The records indicate that in areas protected by automatic sprinklers, no fire activated more than 3 sprinklers. Three sprinklers would provide coverage for a floor area of approximately 63 m^2 (675 ft^2). This area is much smaller than the 800 m^2 (9,000 ft^2) damaged by the 1975 fire in an office space unprotected with automatic sprinklers.

Many of the fires that occurred were recorded as suspicious or unknown in cause, occurred during off-peak work hours, and involved materials such as trash or paper-based supplies. In cases where sprinklers were activated, the FDNY records indicated that the sprinklers either extinguished the fire completely or aided in controlling the spread.

G.6 REFERENCES

Isner, M. S., and T. J. Klem. 1993a. Explosion and fire disrupt World Trade Center. *NFPA Journal.* National Fire Protection Association. 91-104.

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PACO Group. 2002. *World Trade Center General Description of All Building Systems and the Capital Program.* August.

Powers, W. R. 1975. *One World Trade Center Fire New York, N.Y., February 13, 1975.* National Fire Protection Association. Boston, MA. 1-15.

Attachment G-A.1

Explanation of Numeric Codes Used on Fire and Emergency Reports - Prior to 1980

CLASSIFICATION OF BUILDING BY USE

COMMERCIAL

01	Bank
.02	Brewery
03	Coal Pocket
04	Department Store
05	Electric Power Plant
06	Factory:Multi occupancy
07	Factory: Single Occupancy
08	Foundry
09	Freight Depot
10	Garage: Non-Storage
11	" " Storage
12	Gas Works
13	Lumber Yard
14	Motor Vehicle Repair Shop
15	Office Building
16	Oil Selling Station
17	Oil Storage Plant
18	Pier, Wharve, Dock, Bulkhead Building
19	Restaurant, Diner
20	Shed, Newsstand, Shanty
21	Shipyard, Drydock
22	Stable
23	Steam Generating plant
24	Store Building, Taxpayer
25	Warehouse, Storehouse
26	Store Building & Private Dwelling
39	Other Commercial

PUBLIC

40	Airport Building
41	Asylum
42	Bridge
43	Bus Terminal
44	Church, Synagogue
45	Dance Hall, Banquet Hall
46	Dispensary, Clinic
47	Ferry Terminal
	Government Building (Not otherwise classified);
48	City
49	Intersate
50	Federal
51	Foreign
52	State
53	Hospital, Infirmary
54	Nursing Home
55	Railroad Station
56	School; College, University
57	" Private High
58	" Public High
59	" Public Junior High
60	" Private Elementary
61	School: Public Elementary
62	" Children's Nursery
63	" Other
64	Television Studio
65	Theatre, Legitimate
66	Theatre, Motion Picture
67	Transit System - Station Structure
68	Tunnel
69	Other Public

RESIDENTIAL

80	Apartment Hotel "A"
81	Apartment House "A"
82	Boarding House, Rooming House "B"
83	Convent, Rectory, Monastery, etc.
84	Dormitory-School Club, Lodge
85	Hotel "B"
86	Lodging House "B"
87	Motel
88	Pvt. Dwelling: 1 Family
89	" Two Family
90	Tenement: New Law "A"
91	" Old Law "A"
92	Converted Dwelling "A"
99-	Other Residential

BUILDING STATUS

1	Occupied
2	Partly Occupied, Good Condition
3	Partly Occpuied, Deteriorating
4	Vacant
5	Under Demolition
6	Under Construction

DAMAGE(to Building or Contents)

0	None-No Appreciable
1	Light 0-15%
2	Medium 16%-49%
3	Heavy 50% & Greater

AREA FIRE ORGIN -FLOOR

00	Outside Building
01	1st Floor
to	
94	94th and Higher
95	Attic
96	Roof
97	Basement
98	Cellar
99	Sub-cellar

AREA FIRE ORGIN-ROOM OR AREA

10	Area Not in Building
11	Attic
12	Awning
13	Balcony
14	Basement
15	Bathroom Toilet
16	Bedroom,Sleeping Area
17	Ceiling
18	Cellar
19	Chimney
20	Classroom Lecture Area
21	Closet
22	Cockloft
23	Court-Exterior
24	Court-Interior
25	Dining Room, Dining Area
26	Duct-Air Conditioning
27	Duct-Exhaust
28	Flooring
29	Furnace Room
30	Hallway-Private
31	Hallway-Public
32	Incinerator Closet or Room
33	Kitchen, Cooking Area
34	Living Room
35	Lobby
36	Machinery Room
37	Office Area
38	Operating Laboratory Area
39	Partition
40	Porch
41	Projection Booth
42	Recreation Area
43	Roof
44	Sales Showroom Display Area
45	Shaft-Duct, Pipe
46	Shaft-Dumbwaiter
47	Shaft-Elevator
48	Shaft-Exterior Light
49	Shaft-Interior Light
50	Shaft-Vent
51	Shipping Receiving Loading Area
52	Stage
53	Stairway
54	Storage Room Area
55	Vacant-Room, Apartment or area
56	Work Area Workroom
57	Other Areas, Not Classified (State area)

AREA FIRE ORIGIN-OCCUPANCY CLASSIFICATION

COMMERCIAL

	Factory:
00	Chemicals
	Clothing:
01	Dresses
02	Undergarment
03	Other (State Type)
04	Dry Cleaning Laundry
05	Electrical Products
06	Food & Drink Products
07	Furniture
08	Furs,Fur Goods
	Hats:
09	Men's
10	Women's
11	Leather, Leather Products
12	Machine Shop Metal works
13	Paints
14	Paper Products
15	Petroleum Products
16	Plastics, Rubber
17	Printing&Allied Industries
18	Shoes
19	Textiles
20	Toy or Doll
21	Woodworking
22	Other Factories not classified(state type)
	Store:
23	Auto Accessories
24	Bakery
25	Butcher
26	Candy, Cigar, Stationery
27	Clothing
28	Department, large
29	Department, small(5&10)
30	Dry Cleaner & Tailor
31	Drug
32	Electrical Appliances
33	Fruit & Vegetables
34	Furniture
35	Grocery,Dairy,Delicatessen
36	Haberdashery
37	Ladies Accessories
38	Laundry
39	Paint Hardware

(2)

40	Restaruant Luncheonette
41	Shoe
42	Shoe Repair
43	Super Market
44	Tavern
45	Other Stores not classified(state type)
	Garages:
46	Non Storage
47	Storage
48	Oil Selling Station
49	Motor Vehicle Repair Shop
50	Office Building
	Warehouse:
51	Film
52	Paper, Rags,Fibre
53	Other(state type)
54	Freight Depot
55	Pier
56	Shipyard
57	Lumber Yard
58	Shed, Newstand, Shanty,etc.
59	Other Commericial Building Occupancies, not classified(state type)

RESIDENTIAL

60	Apartment Hotel, Multiple Dwelling"A"
61	Apartment House, Multiple Dwelling"A"
62	Boarding House, Rooming House Multiple Dwelling "B"
63	Hotel, Multiple Dwelling "B"
64	Lodging House,Multiple Dwelling"B"
65	Private Dwelling
66	Rectory,Convent, Monastery
67	Tenement House, New Law, Multiple Dwelling "A"
68	Tenement House, Old Law, Multiple Dwelling "A"
69	Other Residential, not classified (state type)

PUBLIC

70	Airport
71	Cabaret, Banquet Hall
72	Church
73	Dance Hall
74	Hospital
75	Motion Picture Theatre
76	N.Y. Transit System-Station
77	Passenger Depot
78	School
79	Theatre
80	T.V. Studio
81	Other Public, not classified (state type)

MANNER EXTENSION

00	Confined to area of origin
01	Cockloft
02	Door or opening between rooms
03	Floor
04	Hall Stairway
05	Partition
06	Pipe Recess
07	Shaft-Dumbwaiter
08	Shaft-Elevator
09	Shaft-Air,Light, Chute,Duct, etc.
10	Ceiling
11	Window
12	Other (state how)

CLASSIFICATION BY TYPE FIRE OR EMERGENCY

TRANSPORTATION FIRES

87	Ship, Vessel
88	Motor Vehicle
89	Other Transportation (state type).

NON-STRUCTURAL FIRES

86	ADV (Abandoned/ Derelict Motor Vehicle)
90	Bonfire
91	Brush, Grass
92	Demolition Wood, Building Site
93	Dump, Land Fill
94	Rubbish-Outside Building
95	Manhole
96	N.Y. Transit System-Yard Roadway, Ties, etc.
97	Railroad-Yard, Roadway, Ties, etc.
98	Tunnel, Bridge
99	Other Non-Structural, not classified (state type)

EMERGENCY

02	Chimney
03	Elevator, Escalator
04	Explosives Escort
05	First Aid - Assist Person(s)
06	First Aid - Resucitation
07	Marine
08	Precarious Condition Signs, Trees,etc.
09	Subway-Railroad
10	Water Leak
11	Bomb-Unexploded, Scare
12	Collapse-Cave in
13	Collision-Vehicular Incident
14	Controlled Fire, Permitted
15	Flood Condition-Broken Water Main
16	Incinerator
17	Leak-Fuel Oil, Gasoline etc.
18	Leak-Illum, Gas, Flam, Vapor
19	Lightning
20	Oil Burner
21	Person Locked in, Locked out
22	Power - Electrical
23	Pressure Rupture
24	Refrigerant Leak
25	Smoke Condition, Odor, Fumes
26	Sprinkler
27	Steam Discharge
28	Other

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Attachment G-A.2

Explanation of Numeric Codes Used on Fire and Emergency Reports - From 1981 to May 31, 1987

Type of Report

1 Structural.
2 Transportation Fire.
3 Non Structural Fire.
4 Emergency Response.
5 False Alarm.
6 Additional data (for BF 24A)

How Reported

1 Street Box Manual.
2 Telephone.
3 Verbal.
4 Class 3—Manual. PFA.
5 Class 3—Valve. PFA.
6 Class 3—Other Automatic PFA.
7 Class 3—ERS.
8 Street Box—ERS.
9 Class 3—Manual. FDNY.
10 Pre-recorded Alarm.

Initial Alarm

0 Special Call Other Than Engine Only—No Chief.
1 Box (Street or Class 3).
5 Special Call Engine Only—No Chief.
8 Special Call (Chief Operated).
9 Still

Highest Alarm

0 Initial Alarm
1 More then the Initial Alarm & less than 3 Engine & 2 Ladder Co. at work.
2 2nd Alarm.
3 3rd Alarm.
4 4th Alarm
5 5th Alarm
6 Simultaneous
7 Signal 7-5.

How Extinguished

0 Before Arrival
1 Hand Extinguishers.
2 Sprinkler Heads (State Number).
3 Booster Stream.
4 Low Pressure Hydrant Stream.
5 One 1½" or larger hoseline from a pumping unit or a standpipe outlet, regardless of fire termination (Controlling Nozzle, Deckpipe, Stang Multi Versal, Ladder Pipe, T/L, Foam Nozzle, etc.).
6 Two-1½" or larger hoselines as above.
7 Three-1½" or larger hoselines as above.
8 Four or more 1½" or larger hoselines as above.
9 Other (State How).

Ignition Stage—Termination Stage

2 Smolder Stage, before any flame.
3 Flame Stage.
0 Undetermined or not reported

EQUIPMENT INVOLVED IN IGNITION

Heating Systems

11 Central heating unit.
12 Water heater.
13 Fixed, stationary local heating unit
14 Indoor fireplace.
15 Portable local heating unit.
16 Chimney, gas vent flue
17 Chimney connector, vent connector.
18 Heat transfer system.
19 Heating systems not classified above.
10 Heating system, undetermined.

Cooking Equipment

21 Fixed, stationary surface unit.
22 Fixed, stationary oven.
23 Fixed, stationary food warming appliance.
24 Deep fat fryer.
25 Portable cooking, warming unit.
26 Open fire grill.
27 Grease hood, duct.
29 Cooking equipment not classified above.
20 Cooking equipment, undetermined.

Air Conditioning, Refrigeration Equipment

31 Central air conditioning, refrigeration equipment.
32 Water cooling device, tower.
33 Fixed, stationary local refrigerator unit.
34 Fixed, stationary local air conditioning unit.
35 Portable air conditioning, refrigeration unit
39 Air conditioning, refrigeration equipment not classified above.
30 Air conditioning, refrigeration equipment, undetermined.

Electrical Distribution Equipment

41 Fixed wiring.
42 Transformer, associated overcurrent or disconnect equipment.
43 Meter, meter box.
44 Power switch gear, overcurrent protection devices.
45 Switch, receptacle, outlet.
46 Lighting fixture, lampholder, ballast, sign.
47 Cord, plug.
48 Lamp, light bulb.
49 Electrical distribution equipment, not classified above.
40 Electrical distribution equipment, undetermined.

Appliances, Equipment

51 Television, radio, phonograph.
52 Dryer.
53 Washing machine
54 Floor care equipment.
55 Separate motor, generator.
56 Hand tools.
57 Portable appliance designed to produce controlled heat.
58 Portable appliance designed not to produce heat.
59 Appliances, equipment not classified in 51 through 58.
50 Appliances, equipment, undetermined.

Special Equipment

61 Electronic equipment.
62 Vending machine, drinking fountain
63 Office machine.
64 Biomedical equipment device.
65 Separate pump, compressor.
66 Combustion engine.
67 Conveyor.
68 Printing press.
69 Special equipment, not classified above
60 Special equipment, undetermined.

Processing equipment

71 Furnace, oven, kiln.
72 Casting, molding, forging equipment.
73 Heat treating equipment.
74 Working, shaping machine.
75 Coating machine.
76 Painting equipment.
77 Chemical process equipment.
78 Waste recovery equipment.
79 Processing equipment, not classified above.
70 Processing equipment, undetermined.

Service, Maintenance Equipment

81 Incinerator.
82 Bearing, brake.
83 Rectifier, charger.
84 Tarpot, tar kettle.
85 Arc, oil lamp
86 Elevator.
87 Torches.
89 Service, maintenance equipment, not classified above.
80 Service, maintenance equipment, undetermined.

Other Object, Exposure Fire

91 Separate, removed exposure.
92 Separate, detached exposure.
93 Separate, adjoining exposure.
94 Attached, protected exposure.
95 Attached, unprotected exposure.
96 Vehicle.
98 No equipment involved—
99 Other object, exposure fire not classified above.
90 Other object, exposure fire.
00 Equipment involved in ignition undetermined or not reported.

FORM OF HEAT OF IGNITION

Heat from Fuel-Fired, Fuel Powered Object

11 Spark, ember, flame escaping from gas fueled equipment.
12 Heat from gas fueled equipment.
13 Spark, ember, flame escaping from liquid fueled equipment.
14 Heat from liquid fueled equipment.
15 Spark, ember, flame escaping from solid fueled equipment.
16 Heat from solid fueled equipment.
17 Spark, ember, flame escaping from equipment: fuel not known.
18 Heat from equipment; fuel not known.
19 Heat from fuel-fired, fuel powered object not classified above.
10 Heat from fuel-fired, fuel-powered object, undetermined.

Heat from Electrical Equipment Arcing, Overloaded

21 Water caused short circuit arc.
22 Short circuit arc from mechanical damage.
23 Short circuit arc from defective, worn insulation.
24 Unspecified short circuit arc.
25 Arc from faulty contact, loose connection, broken conductor
26 Arc, spark from operating equipment or switch
27 Heat from overloaded equipment
28 Fluorescent light ballast.
29 Heat from electrical equipment arcing overloaded, not classified above.
20 Heat from electrical equipment arcing, overloaded undetermined.

Heat from Smoking Material

31 Cigarette.
32 Cigar.
33 Pipe.
39 Heat from smoking material, not classified above.
30 Heat from smoking material, undetermined

Heat from Open Flame, Spark

41 Cutting torch operation.
42 Welding torch operation.
43 Torch operation, other than cutting and welding.
44 Candle, taper
45 Match.
46 Lighter.
47 Open fire
48 Backfire from internal combustion engine.
49 Heat from open flame, spark, not classified above.
40 Heat from open flame, spark, undetermined

Heat from Hot Object

51 Heat, spark from friction
52 Molten, hot material.
53 Hot ember, ash.
54 Electric lamp.
55 Rekindle, reignition.
56 Heat from properly operating electrical equipment.
57 Heat from improperly operating electrical equipment.
59 Heat from hot object, not classified above
50 Heat from hot object, undetermined.

Heat from Explosive, Fireworks

61 Explosive
62 Blasting agent.
63 Fireworks.
64 Paper cap, party popper.
65 Model rocket, not amateur rocketry.
66 Incendiary device.
69 Heat from explosive, fireworks, not classified above.
60 Heat from explosive, fireworks, undetermined.

2

Heat from Natural Source

71 Sun's heat.
72 Spontaneous ignition, chemical reaction.
73 Lightning discharge
74 Static discharge
79 Heat from natural source, not classified above.
70 Heat from natural source, undetermined.

Heat Spreading from Another Hostile Fire (Exposure)

81 Heat from direct flame, convection currents.
82 Radiated heat.
83 Heat from flying brand, ember, spark
84 Conducted heat
89 Heat spreading from another hostile fire, not classified above.
80 Heat spreading from another hostile fire, undetermined.

Other Form of Heat of Ignition

97 Multiple forms of heat of ignition.
99 Other form of heat of ignition.
00 Form of heat of ignition undetermined

TYPE OF MATERIAL IGNITED

Gas

11 Natural gas.
12 LP-city gas (LP and air mix).
13 Manufactured gas
14 LP gas.
15 Anesthetic gas
16 Acetylene
17 Specialty gas other than anesthetic.
19 Gas not classified above.
10 Gas.

Flammable, Combustible Liquid

21 Class IA flammable liquid
22 Class IB flammable liquid
23 Gasoline
24 Class IC flammable liquid.
25 Class II combustible liquid.
26 Class IIIA combustible liquid.
27 Class IIIB combustible liquid
29 Flammable, combustible liquid, not classified above
20 Flammable, combustible liquid, undetermined

Volatile Solid, Chemical

31 Fat, grease (food)
32 Grease (nonfood).
33 Polish
34 Adhesive, resin, tar
35 Applied paint, varnish
36 Combustible metal
37 Solid chemical (specify type)
38 Radioactive material
39 Volatile solid, chemical, not classified above
30 Volatile solid, chemical, undetermined.

Plastic

41 Polyurethane.
42 Polystyrene.
43 Polyvinyl
44 Polyacrylic.
45 Polyester.
46 Polyolefin
49 Plastic, not classified above
40 Plastic, undetermined

Natural Product

51 Rubber.
52 Cork
53 Leather
54 Grass, leaves, hay, straw
55 Grain, natural fiber
56 Coal, coke, briquettes, peat
57 Food starch
58 Tobacco
59 Natural product, not classified above
50 Natural product, undetermined.

Wood, Paper

61 Growing wood.
62 Felled but unsawn wood
63 Sawn wood.
64 Wood shavings.
65 Hardboard, plywood.
66 Fiberboard (low density material), wood pulp
67 Paper, untreated, uncoated
68 Cardboard.
69 Wood, paper, not classified above.
60 Wood, paper, undetermined

Fabric, Textile, Fur

71 Man-made fabric, fiber, finished goods.
72 Cotton, rayon, cotton fabric, finished goods.
73 Wool, wool mixture fabric, finished goods.
74 Fur, silk, other fabric, finished goods.
75 Wig.
76 Human hair.
79 Fabric, textile, fur, not classified above.
70 Fabric, textile, fur, undetermined.

Material Compounded with Oil

81 Linoleum.
82 Oil cloth
83 Treated and/or coated paper.
84 Waterproof canvas
85 Oily rags.
86 Asphalt treated material.
89 Material compounded with oil, not classified above
80 Material compounded with oil, undetermined.

Other Type of Material Ignited

97 Multiple types of material first ignited.
98 Type of material not applicable.
99 Type of material not classified above.
00 Type of material undertermined or not reported.

FORM OF MATERIAL IGNITED

Structural Component, Finish

11 Exterior roof covering, surface, finish.
12 Exterior sidewall covering, surface, finish
13 Exterior trim, appurtenances.
14 Floor covering, surface
15 Interior wall covering, surface items permanently affixed to wall and door surface.
16 Ceiling covering, surface
17 Structural member, framing
18 Thermal, acoustical insulation within wall, partition, or floor/ceiling space
19 Structural component, finish, not classified above.
10 Structural component, finish, undetermined.

Furniture

21 Upholstered sofa, chair, vehicle seats.
22 Nonupholstered chair, bench.
23 Cabinetry
24 Ironing board.
25 Appliance housing or casing.
29 Furniture not classified above.
20 Furniture, undetermined.

Soft Goods, Wearing Apparel

31 Mattress, pillow.
32 Bedding, blanket, sheet, comforter.
33 Linen, other than bedding
34 Wearing apparel not on a person.
35 Wearing apparel on a person.
36 Curtain, blind, drapery, tapestry
37 Goods not made up.
38 Luggage
39 Soft goods, wearing apparel, not classified above.
30 Soft goods, wearing apparel, undetermined

Adornment, Recreational Material

41 Christmas tree
42 Decoration for special event.
43 Book
44 Magazine, newspaper, writing paper
45. Toy, game
46 Awning, canopy.
47 Tarpaulin, tent.
49 Adornment, recreational material not classified above.
40 Adornment, recreational material, undetermined

Supplies, Stock

51 Box, carton, bag
52 Basket, barrel.
53 Pallet, skid (not in use)
54 Rope, cord, twine, yarn.
55 Packing, wrapping material.
56 Bale storage.
57 Bulk storage.
58 Cleaning supplies.
59 Supplies, stock not classified above
50 Supplies, stock, undetermined.

Power Transfer Equipment, Fuel

61 Electrical wire, cable insulation.
62 Transformer.
63 Conveyor belt, drive belt, V-belt.
64 Tire.
65 Fuel.
69 Power transfer equipment, fuel, not classified above
60 Power transfer equipment, fuel, undetermined.

General Form

71 Agricultural product.
72 Fence, pole.
73 Fertilizer.
74 Growing, living form
75 Rubbish, trash, waste
76 Cooking materials.
77 Sign.

Special Form

81 Dust, fiber, lint
82 Pyrotechnics, explosives
83 Atomized, vaporized liquid.
84 Chips
85 Palletized material, material stored on pallets
86 Gas or liquid in or from pipe or container
87 Rolled material.
88 Adhesive.

Other Form of Material

97 Multiple form of material ignited
98 Form of material not applicable.
99 Form of material not classified above
00 Form of material undetermined or not reported

IGNITION FACTOR

Incendiary

11 Incendiary, not during civil disturbance
12 Incendiary, during civil disturbance

Suspicious

21 Suspicious, not during civil disturbance
22 Suspicious, during civil disturbance.

Misuse of Heat of Ignition

31 Abandoned, discarded material.
32 Thawing
33 Falling asleep.
34 Inadequate control of open fire.
35 Cutting, welding too close to.
36 Children with, child playing.
37 Unconscious, mental, physical impairment
39 Misuse of heat of ignition not classified above
30 Misuse of heat of ignition, undetermined.

Misuse of Material Ignited

41 Fuel spilled, released accidentally
42 Improper fueling techniques.
43 Flammable liquid used to kindle fire.
44 Washing part, cleaning, refinishing, painting.
45 Improper container.
46 Combustible too close to heat.
47 Improper storage
48 Children with, child playing
49 Misuse of material ignited not classified above
40 Misuse of material ignited, undetermined.

Mechanical Failure, Malfunction

51 Part failure, leak, break.
52 Automatic control failure.
53 Manual control failure.
54 Short circuit, ground fault.
55 Other electrical failure.
56 Lack of maintenance, worn out.
57 Backfire.
59 Mechanical failure, malfunction not classified above.
50 Mechanical failure, malfunction, undetermined.

Design, Construction, Installation Deficiency

61 Design deficiency.
62 Construction deficiency.
63 Installed too close to combustibles.
64 Other installation deficiency.
65 Property too close to.
69 Design, construction, installation deficiency not classified above.
60 Design, construction, installation deficiency, undetermined.

Operational Deficiency

71 Collision, overturn, knockdown.
72 Accidentally turned on, not turned off.
73 Unattended.
74 Overloaded.
75 Spontaneous heating
76 Improper startup, shutdown procedures.
79 Operational deficiency not classified above.
70 Operational deficiency, undetermined.

Natural Condition

81 High wind.
82 Earthquake.
83 High water, including floods.
84 Lightning.
89 Natural condition not classified above.
80 Natural condition, undetermined.

Other Ignition Factor

91 Animal.
92 Rekindled from a previous fire.
99 Other ignition factor not classified above.
00 Ignition factor undetermined or not reported.

Construction Class

0 No Building Involved.
1 Fireproof Structure
2 Fire Protected Structure.
3 Non-fireproof Structure.
4 Wood Frame Structure.
5 Metal Structure
6 Heavy Timber Structure.

Classification of Building By Use—Commercial

01 Bank.
02 Brewery.
03 Coal Pocket.
04 Department Store
05 Electrical Power Plant.
06 Factory: Multi Occupancy.
07 Factory: Single Occupancy.
08 Foundry.
09 Freight Depot.
10 Garage: Non-Storage.
11 Garage: Storage.
12 Gas Works.
13 Lumber Yard.
14 Motor Vehicle Repair Shop.
15 Office Building.
16 Oil Selling Station.
17 Oil Storage Plant.
18 Pier, Wharve, Dock, Bulkhead Building.
19 Restaurant, diner.
20 Shed, Newsstand, Shanty.
21 Shipyard, Drydock.
22 Stable.
23 Steam Generating Plant.
24 Store Building, Taxpayer.
25 Warehouse, Storehouse.
26 Store Building & Private Dwelling.
39 Other Commercial.

Classification of Building By Use—Public

40 Airport Building.
41 Asylum.
42 Bridge.
43 Bus Terminal.
44 Church, Synagogue.
45 Dance Hall, Banquet Hall.
46 Dispensary, Clinic.
47 Ferry Terminal.
Government Buildings—(Not otherwise classified):
48 City.
49 Interstate.
50 Federal.
51 Foreign.
52 State.
53 Hospital, Infirmary.
54 Nursing Home.
55 Railroad Station.
56 School: College, University.
57 School: Private High.
58 School: Public High.
59 School: Public Jr. High.
60 School: Private Elementary.
61 School: Public Elementary.
62 School: Children's Nursery.
63 School: Other.
64 Television Studio.
65 Theatre, Legitimate.
66 Theatre, Motion Picture.
67 Transit System—Station Structure.
68 Tunnel.
69 Other Public.

Residential

80 Apartment Hotel "A."
81 Apartment House "A."
82 Boarding House, Rooming House "B."
83 Convent, Rectory, Monastery, etc.
84 Dormitory—School, Club, Lodge.
85 Hotel "B."
86 Lodging House "B."
87 Motel.
88 Private Dwelling: One Family.
89 Private Dwelling: Two Family.
90 Tenement: New Law "A."
91 Tenement: Old Law "A."
92 Converted Dwelling "A."
99 Other Residential.

Building Status

1 Occupied.
2 Partly Occupied, Good Condition.
3 Partly Occupied, Deteriorating.
4 Vacant.
5 Under Demolition.
6 Under Construction.

Damage (to Building or Contents)

0 None.
1 1 to 15%.
2 16 to 49%.
3 50% or Greater.

Area Fire Origin—Floor

00 Outside Building
01 1st Floor.
to
94 94th and Higher.
95 Attic.
96 Roof.
97 Basement.
98 Cellar.
99 Sub-cellar.

Area Fire Origin—Room or Area

10 Area Not in Building.
11 Attic.
12 Awning.
13 Balcony.
14 Basement.
15 Bathroom Toilet.
16 Bedroom, Sleeping Area.
17 Ceiling.
18 Cellar.
19 Chimney.
20 Classroom Lecture Area.
21 Closet.
22 Cockloft.
23 Court—Exterior.
24 Court—Interior.
25 Dining Room, Dining Area.
26 Duct—Air Conditioning.
27 Duct—Exhaust.
28 Flooring.
29 Furnace Room.
30 Hallway—Private.
31 Hallway—Public.
32 Incinerator Closet or Room.
33 Kitchen, Cooking Area.
34 Living Room.
35 Lobby.
36 Machinery Room.
37 Office Area.
38 Operating Laboratory Area.
39 Partition.
40 Porch.
41 Projection Booth.
42 Recreation Area
43 Roof.
44 Sales Showroom Display Area.
45 Shaft—Duct, Pipe.
46 Shaft—Dumbwaiter.
47 Shaft—Elevator.
48 Shaft—Exterior Light
49 Shaft—Interior Light
50 Shaft—Vent.
51 Shipping Receiving Loading Area.
52 Stage.
53 Stairway.
54 Storage Room Area.
55 Vacant—Room, Apartment or Area.
56 Work Area, Workroom.
57 Other Areas, Not Classified (state area).

Area Fire Origin—Occupancy Classification—Commercial

Factory:

99 Chemicals.

Clothing:

01 Dresses.
02 Undergarment.
03 Other (state type).
04 Dry Cleaning Laundry.
05 Electrical Products.
06 Food & Drink Products
07 Furniture.
08 Furs, Fur Goods.

Hats:

09 Men's.
10 Women's.
11 Leather, Leather Products.
12 Machine Shop Metal Works.
13 Paints.
14 Paper Products.
15 Petroleum Products.
16 Plastics, Rubber.
17 Printing & Allied Industries.
18 Shoes.
19 Textiles.
20 Toy or Doll.
21 Woodworking.
22 Other Factories Not Classified (state type).

Store:

23 Auto Accessories.
24 Bakery.
25 Butcher.

Area Fire Origin—Occupancy Classification— (continued)

Store:

26 Candy, Cigar, Stationery.
27 Clothing.
28 Department, Large.
29 Department, Small (5&10).
30 Dry Cleaner & Tailor.
31 Drug.
32 Electrical Appliances.
33 Fruit & Vegetables.
34 Furniture.
35 Grocery, Dairy, Delicatessen.
36 Haberdashery.
37 Ladies Accessories.
38 Laundry.
39 Paint Hardware.
40 Restaurant Luncheonette.
41 Shoe.
42 Shoe Repair.
43 Super Market.
44 Tavern.
45 Other Stores Not Classified (state type).

Garages:

46 Non Storage.
47 Storage.
48 Oil Selling Station.
49 Motor Vehicle Repair Shop.
50 Office Building.

Warehouse:

51 Film.
52 Paper, Rags, Fibre.
53 Other (state type).
54 Freight Depot.
55 Pier.
56 Shipyard.
57 Lumber Yard.
58 Shed, Newsstand, Shanty, etc.
59 Other Commercial Building Occupanices, Not Classified (state type).

Residential

60 Apartment Hotel, Multiple Dwelling "A."
61 Apartment House, Multiple Dwelling "A."
62 Boarding House, Rooming House, Multiple Dwelling "B."
63 Hotel, Multiple Dwelling "B."
64 Lodging House, Multiple Dwelling "B."
65 Private Dwelling.
66 Rectory, Convent, Monastery, etc.
67 Tenement House, New Law, Multiple Dwelling "A."
68 Tenement House, Old Law, Multiple Dwelling "A."
69 Other Residential, Not Classified (state type)

Public

70 Airport.
71 Cabaret, Banquet Hall
72 Church.
73 Dance Hall
74 Hospital.
75 Motion Picture Theatre
76 N.Y. Transit System—Station.
77 Passenger Depot.
78 School
79 Theatre.
80 T.V. Studio.
81 Other Public, Not Classified (state type).

Manner Extension

00 Confined to area of origin.
01 Cockloft.
02 Door or Opening Between Rooms.
03 Floor.
04 Hall Stairway.
05 Partition.
06 Pipe Recess.
07 Shaft-Dumbwaiter.
08 Shaft—Elevator.
09 Shaft—Air, Light, Chute, Duct, etc.
10 Ceiling.
11 Window.
12 Other (state how).

Number of Occupancies

01 1 Occupancy.
02 2 Occupancies.
99 99 or more Occupancies.

Buildings

0 did not spread beyond building of origin.
1 1 structure or vehicle.
9 9 or more buildings or vehicles.

Note: Form BF 24A must be submitted for each building or vehicle listed in this coded space.

Smoke Detector

0 No detector present.
1 Ionization type, power disconnected or battery removed by occupant.
2 Ionization type, provided early warning.
3 Ionization type, failed to operate, battery powered.
4 Ionization type, failed to operate, line voltage power
5 Photoelectric type, power disconnected or battery removed by occupant.
6 Photoelectric type, provided early warning.
7 Photoelectric type, failed to operate, battery powered.
8 Photoelectric type, failed to operate, line voltage power.
9 Not possible to determine if detector operated or not.

Classification by Type Fire or Emergency

Transportation Fires

87 Ship, Vessel.
88 Motor Vehicle
89 Other Transportation (state type)

Non Structural Fires

86 ADV (Abandoned/Derelict Motor Vehicle).
90 Bonfire
91 Brush Grass.
92 Demolition Wood, Building Site.
93 Dump, Land Fill.
94 Rubbish—Outside Building
95 Manhole.
96 N.Y. Transit System—Yard, Roadway, Ties, etc.
97 Railroad—Yard Roadway, Ties, etc.
98 Tunnel, Bridge.
99 Other Non-Structural, Not Classified (state type).

Emergency

02 Chimney.
03 Elevator, Escalator.
04 Explosives Escort.
05 First Aid—Assist Person(s).
06 First Aid—Resuscitation.
07 Marine.
08 Precarious Condition—Signs, Trees, etc.
09 Subway—Railroad.
10 Water Leak.
11 Bomb—Unexploded, Scare.
12 Collapse—Cave In.
13 Collision—Vehicular Incident.
14 Controlled Fire, Permitted.
15 Flood Condition—Broken Water Main.
16 Incinerator.
17 Leak—Fuel Oil, Gasoline, etc..
18 Leak—Illum. Gas, Flam. Vapor.
19 Lightning.
20 Oil Burner.
21 Person Locked In, Locked Out.
22 Power—Electrical.
23 Pressure Rupture.
24 Refrigerant Leak.
25 Smoke Condition, Odor, Fumes.
26 Sprinkler.
27 Steam Discharge.
28 Defective Alarm Device (other than Sprinkler).
29 Smoke Detector.
30 Other.

Power for Equipment

01 1 23 volts A.C.
02 24 volts A.C.
11 1 6 volts D.C.
12 7-12 volts D.C.
15 115 volts A.C.
28 208 volts A.C.
30 220-230 volts A.C.
33 231-330 volts A.C.
34 331 or higher volts AC.
50 25 50 volts A.C.
61 Butane.
62 Coal, Coke, Charcoal, Peat.
63 Fuel Oil, No. 1 or No. 2.
64 Fuel Oil, No. 3 or No. 4.
65 Fuel Oil, No. 5 or No. 6.
66 Gasoline.
67 Kerosene.
68 LN gas (stored as liquid)
69 LP gas (stored as liquid).
70 Natural or illuminating gas (as a gas).
71 Paper.
72 Propane.
99 Other.

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Attachment G-A.3

Explanation of Numeric Codes Used on Fire and Emergency Reports - From June 1, 1987 to present

MO3-1 H1-911/68-5-R25-115

FIRE RECORD CODE LIST

1

14.1 TYPE OF REPORT

Code No.
1 Structural
2 Transportation Fire
3 Non-Structural Fire
4 Emergency Response
5 False Alarm
6 Additional data (BF-24A)

14.2 HOW REPORTED

Code No.
10 Telephone
20 Street — Manual
21 Class 3 — Manual
30 Class 3 — P.F.A.
31 Class 3 Valve, Sprinkler — P.F.A.
32 Class 3, Other Automatic — P.F.A.
40
50 Verbal
60 Pre Recorded Telephone Alarm
70 Tie Line (Direct Line to Dispatcher — Pipeline Com.)
80 Street Box — ERS
81 Class 3 — ERS
90 Cable Television Link

Note. 1. P.F.A. stands for Private Fire Alarm. These are received using the 3-Box-Terminal Designation

2. If the alarm was encountered while responding to or returning from another alarm, it is considered a verbal alarm.

3. A pre-recorded telephone alarm (PRTA) is used to designate those telephone alarms received from recording or pre-dialed machines, whether directly to 911, 7-digit telephone or an alarm service.

14.3 INITIAL ALARM

Code No.
0 Special Call Other Than Engine Only — No Chief
1 Box (Street or Class 3)
5 Special Call Engine Only — No Chief
6 Special Call (Chief Operated)
9 Still

14.4 HIGHEST ALARM

Code No.
0 Initial Alarm
1 More than the Initial Alarm & Less than 3 Engines & 2 Ladder Cos. at work.
2 2nd Alarm
3 3rd Alarm
4 4th Alarm
5 5th Alarm
6 Simultaneous
7 Signal 7-5

14.5 BOROUGHS

Code No.
1 Manhattan
2 Bronx
3 Staten Island
4 Brooklyn
5 Queens

14.6 HAZARDOUS MATERIALS

14.6.1 Class to be obtained from D.O.T. required labels or placard or from shipping papers or other documents

Code No.
00 No Hazardous Materials Involved
11 Class A Explosives
12 Class B Explosives
13 Class C Explosives
15 Blasting Agents
21 Flammable Gases
22 Non-Flammable Gases
23 Poison Gases
24 Chlorine
25 Oxygen
31 Flammable Liquids, flashpoint 100 degrees or less
33 Combustible Liquids, flashpoint greater than 100 degrees
41 Flammable Solids
42 Spontaneously Combustible Materials
43 Materials Dangerous when Wet
51 Oxidizers
52 Organic Peroxides
61 Poisons
62 Etiologic (Infectious) Substances
63 Irritants
71 Radioactive I Materials
72 Radioactive II Materials
73 Radioactive III Materials
81 Corrosives
88 Multiple Classes (More than one hazardous material)
99 Other

14.6.2 Amount & Unit — the letter designating the unit of measurement shall follow the two digits indicating the amount. Example, 3000 gals. of gasoline would be correctly coded as 07G in the "Amount" field

000 No Hazardous Material Involved

01 Less than 1	F Cubic feet, for gases only
02 1-9	G Gallon
03 10-49	M Multiple Units — Ex: a spill involves a liquid and a solid
05 100-499	P Pound
06 500-999	T Ton
07 1,0000-4,999	
08 5,000-9,999	
09 10,000-49,999	
10 50,000-99,999	
11 100,000 and more	

14.7 HEATING EQUIPMENT INVOLVED— TYPE OF FUEL USED

Code No.
1. Kerosene
2. L.P.G.
3. Electric
4. Wood
5. Coal
6. Oil
7. Natural Gas
8. Gasoline
9. Other
0. No Heating Equipment involved

14.8 HOW EXTINGUISHED

Code No.
0 Before Arrival
1 Hand Extinguishers
2 Sprinkler Heads (State Number of heads that operated in Operations Section)
3. Booster Stream
4. Low Pressure Hydrant Stream
5. One 1¾" or larger hoseline from a pumping unit or a standpipe outlet, regardless of line termination (Controlling Nozzle, Deckpipe, Stang, Multi Versal, Ladder Pipe, T/L, Foam Nozzle, etc.)
6. Two 1¾" or larger hoselines as above.
7. Three 1¾" or larger hoselines as above.
8. Four or more 1¾" or larger hoselines as above.
9. Other (State How).

14.9 SPRINKLER PERFORMANCE—If sprinklers were present or a factor in this operation, record their performance

1. Equipment Operated
2. Equipment in service, did not operate
3. Equipment present, fire to small to operate
4. Equipment operated, did not extinguish fire
8. No equipment present
9. Equipment present, not in service. (Record action taken in Operations Section)

14.10 STANDPIPE PERFORMANCE—If a standpipe system was present or used in this operations, record its performance

1. Standpipe serviceable and used
2. Standpipe present but not used
8. No standpipe present
9. Equipment present, not in service. (Record action taken in Operations Section)

14.11 CONDITION ON ARRIVAL CODES

0 No indication of fire
1 Overheat
2 Smoldering
3 Open Flame
8 Out on Arrival

14.12 EQUIPMENT INVOLVED IN IGNITION

1. HEATING SYSTEMS

10. Solar panel.
11. Central heating unit, furnace
12. Water heater.
13. Woodstove, wall furnaces, fixed local heating unit
14. Indoor fireplace
15. Portable heating unit
16. Chimney, gas vent flue
17. Chimney vent connector
18. Heat transfer system, ducts, pipes.
19. Not classified above

2. COOKING EQUIPMENT

21. Fixed, stationary surface unit, stove
22. Fixed, stationary oven
23. Fixed, stationary food warming applicance
24. Deep fat fryer
25. Portable cooking, warming unit
26. Open fired grill
27. Grease hood, duct.
29. Not classified above

3. AIR CONDITIONING, REFRIGERATION EQUIPMENT

31. Central air conditioning, refrigeration equipment
32. Water Cooling device, tower
33. Cold boxes, freezers, refrigerators.
34. Fixed, stationary local air conditioning unit
35. Portable air conditioning, regrigeration unit, dehumidifier.
39. Not classified above

4. ELECTRICAL DISTRIBUTION EQUIPMENT

41. Fixed Wiring, power lines, junction boxes.
42. Transformer, overcurrent or disconnect equipment.
43. Meter, meter box.
44. Power Switch gear, fused, circuit breakers.
45. Switch, receptacle outlet.
46. Lighting fixture, lamp-holder ballast, sign.
47. Cord, plug
48. Lamp, light bulb.
49. Not classified above.

5. APPLIANCES EQUIPMENT

50. Dishwasher.
51. Television, radio, sound or picture.
52. Clothes dryers.
53. Washing machine.
54. Floor care equipment, vacuum.
55. Separate motor, generator.
56. Hand tools, soldering irons, drills
57. Controlled heat appliance, electrical blankets, steam irons, heat tapes.
58. Electrical razors, can openers.
59. Not classified above.

6. SPECIAL EQUIPMENT

61. Electronic equipment, radar, x-rays, computer, telephone, transmitter equipment.
62. Vending machine, drinking fountain
63. Office machines
64. Biomedical equipment, device.
65. Separate pump, compressor, sump pump.
66. Internal combustion engine.
67. Conveyor
68. Printing press.
69. Not classified above.

7. PROCESSING EQUIPMENT
71. Furnace, oven, kiln.
72. Casting, molding, forging.
73. Heat treating, quench tank.
74. Working, shaping, machine saws, grinders, sanders, etc.
75. Coating machine, asphalt saturating, rubber spreading machines.
76. Painting, dipping, spraying.
77. Chemical process, distilling.
78. Waste recovery
79. Not classified above.

8. SERVICE, MAINTENANCE EQUIPMENT
81. Incinerator.
82. Bearing, brake.
83. Rectifier, charger, battery.
84. Tarpot, tar kettle.
85. Arc, oil lamp, gas mantles.
86. Elevator.
87. Torches, bunsen burners.
88. Not classified above.

9. OTHER OBJECTS, EXPOSURE FIRE
96. Vehicle, exhaust systems, vehicle parts.
98. No equipment involved.
99. Other object, Exposure Fire not classified above.

14.13 FORM OF HEAT IGNITION

1. HEAT FROM FUEL-FIRED, FUEL-POWERED OBJECT

The difference between subdivision 11 and subdivision 12 is whether a spark, ember or flame actually escaped from the equipment, or whether it was simply overheating of outside surface of the equipment (or its internal heat) causing the ignition of nearby combustibles.

11. Spark, ember, flame escaping from gas fueled equipment
12. Heat from gas fueled equipment, pilot lights, normal flames.
13. Spark, ember, flame escaping from liquid fueled equipment.
14. Heat from liquid fueled equipment, pilot lights.
15. Spark, ember, flame escaping from solid fueled equipment.
16. Heat from solid fueled equipment.
17. Spark, ember, flame escaping from equipment, fuel not known.
18. Heat from equipment; fuel not known.
19. Not classified above.

2. HEAT FROM ELECTRICAL EQUIPMENT ARCING, OVERLOADED.
21. Water caused short circuit arc.
22. Short circuit arc from mechanical damage
23. Short circuit arc from defective, worn insulation.
24. Unspecified short circuit arc.
25. Arc from faulty contact, loose connection, broken conductor.
26. Arc, spark from operating equipment or switch.
27. Heat from overloaded equipment, wires, motors.
28. Fluorescent light ballast.
29. Not classified above

3. HEAT FROM SMOKING MATERIAL
31. Cigarette.
32. Cigar.
33. Pipe.
39. Not classified above

4. HEAT FROM OPEN FLAME, SPARK
41. Cutting torch operation (separating metals).
42. Welding torch operation (joining metals).
43. Blow torches, plumbers torches, Bunsen Burners, soldering, paint stripping
44. Candle, taper.
45. Match.
46. Lighter (flame type)
47. Campfires, bonfires, warning flares, rubbish fires
48. Backfire from internal combustion engine.
49. Not classified above

5. HEAT FROM HOT OBJECT
51. Heat, spark from friction, overheated tires
52. Molten metal, hot forging and hot glass.
53. Hot ember, ash.
54. Electric lamp, light bulbs.
55. Rekindle, reignition.
56. Heat from properly operating electrical.
57. Heat from improperly operating electrical equipment.
59. Not classified above.

6. HEAT FROM EXPLOSIVES, FIREWORKS
61. Explosives, bombs, ammunition.
62. Blasting agent.
63. Fireworks, sparklers.
64. Paper cap, party popper.
65. Model rocket, not amateur rocketry.
66. Incendiary device.
67. Not classified above.

7. HEAT FROM NATURAL SOURCE
71. Sun's heat.
72. Spontaneous ignition, chemical reaction.
73. Lightning discharge.
74. Static discharge.
79. Not classified above.

8. HEAT SPREADING FROM ANOTHER HOSTILE FIRE (EXPOSURE)
81. Heat from direct flame, convection currents.
82. Radiated heat.
83. Heat from flying brand, ember, spark.
84. Conducted heat.
89. Not classified above.

9. OTHER FORM OF HEAT OF IGNITION
97. Multiple forms of heat of ignition.
99. Not classified above.

14.14 TYPE OF MATERIAL IGNITED

1. GAS
11. Natural gas.
12. LP-City Gas (LP and air mix).
13. Manufactured gas.
14. LP-Gas.
15. Anesthetic gas.
16. Acetylene.
17. Specialty gas other than anesthetic.
19. Not classified above

2. FLAMMABLE, COMBUSTIBLE LIQUID
21. Ethyl ether, pentane and ethylene oxide (Class 1A).
22. Acetone, ethyl alcohol, JP-4 jet fuel and methyl ethyl ketone,
    (Class 1B)
23. Gasoline.
24. Butyl alcohol, propyl alcohol styrene and turpentine. (Class IC).
25. Kerosene, Fuel Oil 1, 2, 4, 5 and Diesel Fuel
26. No. 6 fuel oil, cottonseed oil and creosote oil, (Class IIIA).
27. Cooking oil, transformer and lubicating oil. (Class IIIB)
29. Not classified above.

3. VOLATILE SOLID, CHEMICAL
31. Fat, grease (food).
32. Grease (nonfood), petroleum jellies.
33. Polish, paraffin, wax.
34. Creosote, pitch, adhesive, resin, tar, gelatin, rosin, asphalt.
35. Applied paint, varnish.
36. Combustible metal magnesium titanium and zirconium.
37. Solid chemical, explosives.
38. Radioactive material.
39. Not classified above

4. PLASTIC
41. RIGID PLASTICS
    Included are molded plastics such as appliance cases, floor tile, decorative kitchen laminates
42. RIGID FOAM PLASTICS
    Included are rigid thermal foam insulation for walls and refrigerators.
43. FLEXIBLE PLASTICS
    Included is electrical wire insulation.
44. FLEXIBLE FOAMPLASTICS
    Included are mattresses, furniture interior foam and carpet pads.
45. FILM PLASTICS
    Included are polyethylene trash bags, photographic film and coated wallpaper
49. Plastic not classified above.

5. NATURAL PRODUCTS
51. Rubber.
52. Cork.
53. Leather.
54. Grass, leaves, hay and straw
55. Grain, feathers, felt, kapok, hemp, jute, cotton, before processing.
56. Coal, coke, briquettes, peat.
57. Food, starch, excluding fat and grease.
58. Tobacco
59. Not classified above.

6. WOOD, PAPER
61. Growing wood, tree.
62. Felled but unsawn wood.
63. Finished lumber, finished wood.
64. Wood shavings, sawdust excelsior.
65. Hardboard, plywood.
66. Fiberboard, wood pulp, press board.
67. Paper, untreated, uncoated.
68. Cardboard.
69. Not classified above.

7. FABRIC, TEXTILE, FUR
71. Man-made fabric, fiber, finished goods
72. Cotton, rayon, cotton fabric.
73. Wool, wool mixture, fabric.
74. Fur, silk, other fabric.
75. Wig.
76. Human hair.
79. Not classified above.

8. MATERIAL COMPOUNDED WITH OIL
81. Linoleum.
82. Oil cloth.
83. Treated and/or coated paper, wax paper.
84. Waterproof canvas.
85. Oily rags.
86. Asphalt treated material.
89. Not classified above.

9. OTHER TYPE OF MATERIAL IGNITED
97. Multiple types of material first ignited.
99. Not classified above.

14.15 FORM OF MATERIAL IGNITED

1. STRUCTURAL COMPONENT, FINISH
11. Exterior roof covering, surface, finish.
12. Exterior sidewall, covering surface, finish, eaves
13. Doors, porches and platforms.
14. Tile, carpet, rug flooring and stairs.
15. Interior wall covering.
16. Ceiling covering surface.
17. Structural member, framing.
18. Thermal, acoustical insulation, within wall or ceiling.
19. Not classified above.

2. FURNITURE
21. Upholstered sofa, chair, vehicle seats.
22. Nonupholstered chair, bench.
23. Cabinetry, filing cabinets, pianos, dressers, desks, tables and bookcases.
24. Ironing board.
25. Appliance housing or casing.
29. Not classified above.

3. SOFT GOODS, WEARING APPAREL
31. Mattress, pillow
32. Bedding, blanket, sheet, comforter, heating pad.
33. Linen, towels, tablecloths.
34. Wearing apparel not on a person
35. Wearing apparel on a person.
36. Curtain, blind, drapery, tapestry.
37. Fabrics, yard goods.
38. Luggage.
39. Not classified above.

4. ADORNMENT, RECREATIONAL MATERIAL
41. Christmas tree.
42. Decoration for special event.
43. Book.
44. Magazine, newspaper, writing paper, files.
45. Toy, game.
46. Awning, canopy.
47. Tarpaulin, tent.
49. Not classified above.

5. SUPPLIES, STOCK
51. Box, carton, bag
52. Basket, barrel.
53. Pallet, skid.
54. Rope, cord, twine, yarn.
55. Packing, wrapping material.
56. Bale storage
57. Bulk storage.
58. Brooms, brushes, mops, cleaning cloths, cleaning supplies.
59. Not classified above.

6. POWER TRANSFER EQUIPMENT, FUEL
61. Electrical wire, cable insulation.
62. Transformer.
63. Conveyor belt, drive belt, v-belt.
64. Tire.
65. Fuel.
69. Not classified above.

7. GENERAL FORM
71. Agricultural product.
72. Fence, pole.
73. Fertilizer.
74. Forests, brush and grass.
75. Film, creosote, rubbish, trash, waste.
76. Cooking materials.
77. Sign.

8. SPECIAL FORM
81. Dust, fiber, lint, sawdust
82. Pyrotechnics, explosives.
83. Atomized, vaporized liquid
84. Chips.
85. Material stored on pallets.
86. Accelerants.
87. Rolled material.
88. Adhesive

9. OTHER FORM OF MATERIAL
97. Multiple form of material ignited.
99. Not classified above.

14.16 IGNITION FACTOR (CAUSE)

1. INCENDIARY
11. Incendiary.
12. Incendiary, during civil disturbance.

2. SUSPICIOUS
21. Suspicious.
22. Suspicious, during civil disturbance.

3. MISUSE OF HEAT OF IGNITION
31. Abandoned, discarded material, cigarette, etc.
32. Thawing
33. Falling asleep.
34. Inadequate control of open fire.
35. Cutting, welding too close to.
36. Children with matches, lighter, etc.
37. Unconscious, mental, physical impairment
39. Not classified above

4. MISUSE OF MATERIAL IGNITED
41. Fuel spilled, released accidentally
42. Improper fueling technique.
43. Flammable liquid used to kindle fire.
44. Washing part, cleaning, refinishing, painting.
45. Improper container.
46. Combustible too close to heat
47. Improper storage.
49. Not classified above.

5. MECHANICAL FAILURE, MALFUNCTION
51. Part failure, leak, break
52. Automatic control failure.
54. Short circuit, ground fault.
55. Other electrical failure.
56. Lack of maintenance, worn out, failure to clean.
57. Backfire.
59. Not classified above.

6. DESIGN, CONSTRUCTION, INSTALLATION DEFICIENCY
61. Design deficiency, catalytic converter failure.
62. Construction deficiency.
63. Installed too close to combustibles.
64. Other installation deficiency.
65. Property too close to. Included are exposure fires.
69. Not classified above.

7. OPERATIONAL DEFICIENCY
71. Collision, overturn, knockdown.
72. Accidentally turned on, not turned off.
73. Unattended.
74. Overloaded.
75. Spontaneous heating
76. Improper startup, shutdown procedures.
79. Not classified above.

8. NATURAL CONDITION
81. High wind.
82. Earthquake.
83. High water, including floods.
84. Lightning
89. Not classified above.

9. OTHER IGNITION FACTORS
91. Animal.
92. Rekindled from a previous fire.
99. Not classified above.
00. No Fire.

14.17 JUVENILE INVOLVED IN IGNITION

0. Juvenile Not Involved in Ignition or No information that a Juvenile was involved.
1. Juvenile Involved in Ignition.

14.18 CONSTRUCTION CLASS

Code No.
0. No building Involved.
1. Fireproof Structure.
2. Fire Protected Structure.
3. Non Fireproof Structure.
4. Wood Frame Structure.
5. Metal Structure.
6. Heavy Timber Structure.

14.19 CLASSIFICATION OF BUILDING BY USE

COMMERCIAL
592 Bank
723 Brewery
895 Coal Storage.
561 Department Store.
615 Electrical Power Plant.
708 Factory: Multi Occupancy.
709 Factory: Single Occupancy.
771 Foundry.
894 Freight Depot.
882 Garage: Non-Storage.
889 Garage: Storage.
767 Gas Works, Natural Gas Plant.
851 Lumber Yard.
573 Motor Vehicle Repair Shop, Paint Shop.
591 Office Building, State, City, Federal or Commercial
571 Oil Selling Station.
841 Oil Storage Plant.
898 Pier, Wharf, Dock, Bulkhead Building.
161 Restaurant, Diner
925 Shed, Newstand, Shanty.
781 Shipyard, Drydock.
815 Stable.
614 Steam Generating Plant.
539 Storebuilding, Taxpayer.
891 Warehouse Storehouse.
410 Store Building & Private Dwelling.
599 Other Commercial.

PUBLIC
171 Airport Building.
351 Asylum.
921 Bridge.
173 Bus Terminal.
133 Church, Synagogue.
121 Dance Hall, Banquet Hall.
334 Dispensary, Clinic.
177 Ferry Terminal.
331 Hospital, Infirmary.
311 Nursing Home.
174 Railroad Station, Street Level.
175 Railroad Station, Below Grade.
176 Railroad Station, Above Grade
241 School: College, University.
215 School: High School.
214 School: Junior High.
213 School: Elementary.
211 School: Children's Nursery.
210 School: Other.
185 Television Studio.
181 Theatre, Legitimate.
163 Theatre, Motion Picture.
170 Transit System—Station Structure.
922 Tunnel.
119 Other Public.

RESIDENTIAL
469 Apartment Hotel "A".
429 Apartment House "A".
439 Boarding House, Rooming House "B".
465 Convent, Rectory, Monastery, etc.
461 Dormitory—School, Club, Lodge.
449 Hotel "B".
430 Lodging House "B".
440 Motel.
411 Private Dwelling: One Family.
414 Private Dwelling: Two Family.
420 Tenement; New Law "A".
423 Tenement; Old Law "A".
432 Converted Dwelling "A".
400 Other Residential.

SPECIAL PROPERTIES
972 Airport Runway.
934 Cemetery.
951 Construction Site.
932 Dump, Landfill.
931 Open Land, Fields.
965 Parking Area, Lot.
963 Pipeline, Power Line Right-of-Way
962 Public Street.
952 Railroad Switching Yard, marshalling yard.
936 Vacant Lots.
939 Outdoor Property Not Classified.

14.20 BUILDING STATUS CODE

Code	Description
1	Occupied: The building is normally fully occupied or is intended to be fully occupied. A few vacant areas, which are rentable, may exist
2	Partly Occupied: The building is in good condition and more than 25 percent of the areas are vacant.
3	Partly Occupied, Deteriorating: The building has some vacant areas and these are expected to remain vacant until demolition or alteration because of the condition of the building or its surroundings.
4	Vacant: The building is entirely vacant. (Even if squatters are present.)
5	Under Demolition: The building is in the process of being torn down.
6	Under Construction: The building is under construction and does not have any occupants.
7	Under Construction: The building is partially occupied, whether under a temporary certificate of occupancy or not.
	Note: The status code applies to the building, not the fire area. Therefore, codes 1, 2 and 3 may be used whether the fire itself occurred in a vacant or occupied area, and code 1 may apply even if the fire occurred in a vacant area (for example, a fire in a vacant apartment being repainted for a new tenant). The occupied or vacant status of the fire area is now recorded on the "Area of Origin" Code. (see Paragraph 2.19.2)

4

14.21 COMPLEX

11. PUBLIC RECREATION COMPLEX
Included are zoos, amusement parks and general recreation parks.
12. STADIUM, EXHIBITION HALL COMPLEX
Included ballparks, racetracks, sports gardens and armories.
14 CLUB COMPLEX
Included are golf clubs, tennis clubs and country clubs.
20. EDUCATIONAL COMPLEX
Included are schools, colleges and universities.
33. MEDICAL CARE COMPLEX
Included are Hospitals, Medical Centers, Mental Institutions.
34. PRISON COMPLEX
40. BUSINESS WITH RESIDENTIAL COMPLEX
Included are apartments over stores.
41. DWELLING COMPLEX (ONE AND TWO-FAMILY)
42. APARTMENT COMPLEX
44. HOTEL COMPLEX
Included are motels, inns and lodges.
47. MOBILE HOME PARK COMPLEX
58. SHOPPING COMPLEX
Included are department stores malls, discount houses and shopping centers. Also included are groups of business and commercial establishments which may contain theaters and other places of assembly.
59. OFFICE COMPLEX
Included are non-military government office complexes.
61. POWER PRODUCTION COMPLEX
63. MILITARY RESERVATION DEFENSE COMPANY
65. FARM COMPLEX
70. INDUSTRIAL PLANT, MANUFACTURING COMPLEX
80. WAREHOUSE, STORAGE COMPLEX
91. CONSTRUCTION COMPLEX
Included are demolition operations.
93. CAMPSITE COMPLEX
94 WATERFRONT COMPLEX
Included are marinas.
95. RAILROAD TRANSPORT COMPLEX
96 ROAD COMPLEX
Included are highways, streets and all public ways.
97. AIRPORT COMPLEX
98. NO COMPLEX
If other properties meeting the definition for a complex as defined above are identified, they may be indicated by Complex Code 99.

AREA FIRE ORIGIN

14.22 FLOOR CODE NO.

00 OUTSIDE BUILDING
01 1st Floor
to to
94 94th and Higher
95 Attic
96 Roof
97 Basement
98 Cellar
99 Sub-Cellar

14.23 AREA FIRE ORIGIN — OCCUPANCY CLASSIFICATION

00 NOT IN BUILDING

COMMERCIAL

Factory:
99 Chemicals
01 Dresses
02 Undergarment
03 Other (state type)
04 Dry Cleaning Laundry
05 Electrical Products
06 Food and Drink Products
07 Furniture
08 Furs, Fur Goods
09 Men's Hats
10 Women's Hats
11 Leather, Leather Products
12 Machine Shop Metal Works
13 Paints
14 Paper Products
15 Petroleum Products
16 Plastics, Rubber
17 Printing and Allied Industries
18 Shoes
19 Textiles
20 Toy or Doll
21 Woodworking
22 Other Factories not classified (state type)

Store:
23 Auto Accessories
24 Bakery
25 Butcher
26 Candy, Cigar, Stationary
27 Clothing
28 Department, large
29 Department, small (5 & 10)
30 Dry Cleaner & Tailor
31 Drug
32 Electrical Appliance
33 Fruits and Vegetables
34 Furniture
35 Grocery, Dairy, Delicatessan
36 Haberdashery
37 Ladies Accessories
38 Laundry
39 Paint, Hardware
40 Restaurant Luncheonette
41 Shoe
42 Shoe Repair
43 Supermarket
44 Tavern
45 Other Stores not classified (state type)

Garages:
46 Non storage
47 Storage
48 Oil Selling Station
49 Motor Vehicle Repair Shop
50 Office Building

Warehouse:
51 Film
52 Paper, Rags, Fibre
53 Other (state type)
54 Freight Depot
55 Pier
56 Shipyard
57 Lumber yard
58 Shed, Newstand, Shanty, etc.
59 Other Commercial Building Occupancies, not classified (state type)

Residential:
60 Apartment, Hotel, Multiple Dwelling "A"
61 Apartment House, Multiple Dwelling "A"
62 Boarding House, Rooming House, Multiple Dwelling "B"
63 Hotel, Multiple Dwelling "B"
64 Lodging House, Multiple Dwelling "B"
65 Private Dwelling
66 Rectory, Convent, Monastery, etc.
67 Tenement House, New Law, Multiple Dwelling "A"
68 Tenement House, Old Law, Multiple Dwelling "A"
69 Other Residential, not classified (state type)

Public:
70 Airport
71 Cabaret, Banquet Hall
72 Church
73 Dance Hall
74 Hospital
75 Motion Picture Theatre
76 N.Y. Transit System Station
77 Passenger Depot
78 School
79 Theatre
80 TV. Studio
81 Other Public, not classified (state type)

14.24 AREA OF FIRE ORIGIN

0. MEANS OF EGRESS
01. Hallway, corridor, mall.
02. Exterior stairway.
03. Interior stairway.
04. Escalator.
05. Lobby, entrance way.
09. Not classified above.

1. ASSEMBLY AREA
11. Fixed seats (100 or more persons).
12. Without fixed seats (100 or more persons).
13 With or without fixed seats. (less than 100 persons)
14. Living room, family room, lounge area.
15 Sales, showroom area.
16. Library, art galleries, exhibit
17. Swimming pool area.
19. Not classified above.

2. FUNCTION AREAS
21. Bedrooms, patient rooms, cells, lockups.
22. Wards, dormitories, barracks.
23. Dining area, lunchroom, cafeteria.
24. Kitchen, cooking area, cloakroom.
26 Laundry area.
28 Health clubs, massage parlors, barber, beauty.

3. FUN AREAS (continued)
31. Laboratrory.
32. Printing or photographic room.
33. First aid, treatment room.
34. Operating room.
35. Electronic, computer, telephone room, telephone booth.
36. Performance, stage area, indoor sports.
37. Projection room, stage light.
38. Process, manufacturing area.
39 Not classified above.

4. STORAGE AREAS
41. Tank, bin, product storage room.
42. Closet.
43. Supply room.
44. Records storage room, vault.
45. Shipping, receiving, loading mail room.
46 Trash or rubbish container, compactor.
47. Garage, carport, vehicle storage.
49 Not classified above.

5. SERVICE FACILITIES
51. Elevator, dumbwaiter.
52. Electrical, plumbing, ventilation shaft
53 Light shaft.
54. Laundry or mail chute.
55. Duct.
56. Display window.
57. Chimney, flue, stovepipe.
58. Conveyor.
59. Not classified above.

6. SERVICE, EQUIPMENT AREA
61. Machinery room
62. Heating equipment, water heater area.
63. Switchgear area, transformer vault.
64. Incinerator room area.
65 Maintenance shop, workshop, paint shop, welding shop.
66. Test cell.
67. Enclosure with pressurized air.
68. Enclosure with enriched oxygen atmosphere.
69. Not classified above.

7. STRUCTURAL AREAS, NON-FUNCTIONAL
71. Crawl space, cellar, substructural area.
72. Exterior balcony, open porch.
73. Floor and ceiling assembly concealed floor/ceiling space
74. Roof and ceiling assembly. concealed roof/ceiling space.
75 Wall assembly. concealed wall space.
76. Exterior wall surface.
77. Exterior roof surface.
78. Awning, overhang.
79. Not classified above

8. TRANSPORTATION, VEHICLE AREAS

81. Passenger area.
82. Trunk, load carrying area.
83. Engine, running gear, wheel area.
84. Fuel tank, fuel line.
85. Operating, control area, cab, cockpit.
86. Exterior exposed surface.
89. Not classified above.

9. OTHER AREAS OF ORIGIN

91. On or near railroad right of way, embankment.
92. On or near highway, public way, street.
93. Terrace, patio, courtyard.
94. Lawn, field, open area, vacant lot.
95. Wildland area, woods.
97. Multiple location.
98. Vacant room, apartment or area.
99. Not classified above.

14.25 MANNER OF EXTENSION

Code No.

00 Confined to area of origin.
01 Cockloft.
02 Door or opening between rooms.
03 Floor.
04 Hall, Stairway.
05 Partition.
06 Pipe Recess.
07 Shaft-dumbwaiter.
08 Shaft-Elevator.
09 Shaft-air, Light, Chute, Duct, etc.
10 Ceiling.
11 Window.
12 Other (state type).

14.26 NUMBER OF OCCUPANCIES

Codes	Description
01	1 occupancy
02	2 occupancies
•	•
•	•
•	•
99	99 or more occupancies

14.27 BUILDINGS

Code: 0 to 9

0— did not spread beyond building of origin
1—1 structure or vehicles
• •
• •
• •
9—9 or more buildings or vehicles

NOTE: Form BF-24A must be submitted for each building or vehicle listed in this coded space.

14.28 DAMAGE CODES

14.28.1 Percentage Codes
- 0 No appreciable damage
- 1 From 1 through 15%
- 2 From 16 through 49%
- 3 50% or greater

14.28.2 Extent of Damage Codes: To be used in the Damage Category Boxes "Flame, Smoke and Water".
- 1. Confined to object or origin.
- 2. Confined to part of room or area of origin.
- 3. Confined to room of origin.
- 4. Confined to fire-rated compartment of origin.
- 5. Confined to floor of origin.
- 6. Confined to structure of origin.
- 7. Extended beyond the structure of origin.
- 9. No damage of this type.

14.29 SMOKE AND HEAT DETECTOR CODES

14.29.1 Present
- 1 Present
- 0 Not Present

14.29.2 Type
- 1. Smoke
- 2. Heat

14.29.3 Power Source
- 1. Battery
- 2. A/C

14.29.4 Performance
- 1. In room of fire; operated
- 2. Not in room of fire; operated
- 3. In room of fire; did not operate
- 4. Not in room of fire; did not operate
- 5. In room; fire too small to operate
- 6. Did not operate; power source removed
- 9. Not classified

14.30 POWER FOR EQUIPMENT

01 1-23 volts A.C.
02 24 volts A.C.
11 1-6 volts D.C.
12 7-12 volts D.C.
15 115 volts A.C.
28 208 volts A.C.
30 220-230 volts A.C.
33 231-330 volts A.C.
34 331 or higher volts A.C.
50 25-50 volts A.C.
61 Butane
62 Coal, Coke, Charcoal, Peat
63 Fuel Oil, No. 1 or No. 2
64 Fuel Oil, No. 3 or No. 4
65 Fuel Oil, No. 5 or No. 6
66 Gasoline
67 Kerosene
68 LN gas (stored as liquid)
69 LP gas (stored as liquid)
70 Natural or Illuminating gas (as a gas)
71 Paper
72 Propane
99 Other

14.31 CODE FOR TYPE OF ACTION TAKEN

1. Extinguishment
2. Rescue
3. Investigation
4. Remove Hazard
5. Standby
6. Salvage
7. First Aid
9. Cancelled Enroute

14.32 CLASSIFICATION BY TYPE FIRE OR EMERGENCY

TRANSPORTATION

Code No.

87 Ship, Vessel
88 Motor Vehicle
89 Other Transportation (state type)

NON-STRUCTURAL FIRES

Code No.

84 Explosion, no after fire
85 Outside Spill/Leak with Fire
86 ADV (Abandoned/Derelict Motor Vehicle)
90 Bonfire
91 Brush, Grass
92 Demolition Wood, Building Site
93 Dump, Land Fill
94 Rubbish—Outside Building
95 Manhole
96 N.Y. Transit System—Yard, Roadway, Ties, etc.
97 Railroad Yard, Roadway, Ties, etc.
98 Tunnel, Bridge
99 Other Non-Structural, not classified (state type)

EMERGENCY

Code No.

03 Elevator, Escalator
04 Explosives Escort
05 First Aid—Assist Person(s)
06 First Aid—Resuscitation
07 Marine
08 Precarious Condition—Signs, Trees, etc.
09 Subway, Railroad
10 Water Leak
11 Bomb—Unexploded, Scare
12 Collapse—Cave In
13 Collision—Vehicular Incident
14 Controlled Fire, Permitted
15 Flood Condition—Broken Water Main
16 Incinerator
17 Leak—Fuel Oil, Gasoline, etc.
18 Leak—Illuminating Gas, Flammable Vapor
19 Lightning
20 Oil Burner
21 Person Locked In, Locked Out
22 Power Electrical
23 Pressure Rupture
24 Refrigerant Leak
25 Smoke Condition, Odor, Fumes
26 Sprinkler—Leak, Water Discharge, Damaged Head, etc.
27 Steam Discharge
28 Defective Alarm Device (other then Sprinkler)
29 Smoke Detector
30 Defective Alarm (Sprinkler)—Surge, Work on System, etc.
31 Other

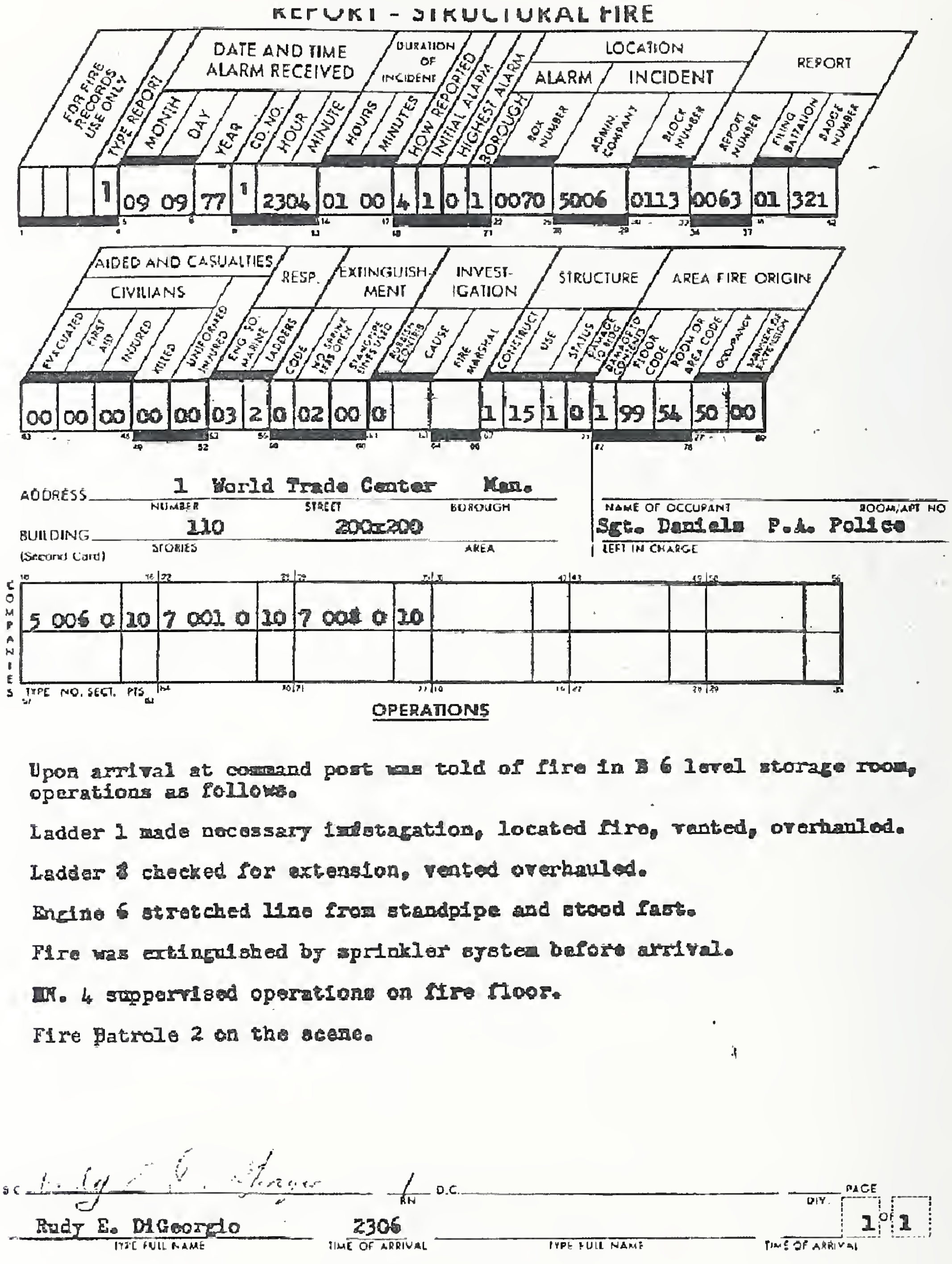
14.33 MOBILE PROPERTY TYPE CODES

11 Automobile
12 Bus
13 Motorcycle, Snowmobile
14 Motorhome
15 Travel Trailer
17 Mobile Home
20 Freight, Road Transport
30 Rail Transport
40 Water Transport
50 Air Transport
60 Heavy Equipment
70 Special Vehicles, Containers
99 Other Mobile Property Types

Attachment G-A.4

Significant fire incidents occurring in WTC 1 (12)

Significant Fire	Incident Date	Fire Location	# Sprinklers Activated	# Standpipes Activated	Cause of Fire	Material Ignited
1	9/9/77	B-6 level storage room	2		None listed	Not listed
2	9/23/77	Dumpster on B-4 level	2		Not classified	Trash/waste
3	10/16/81	19th floor office area	-	2	Discarded material	Furniture
4	12/23/83	2 dumpsters on B-4 level	2	1	Suspicious	Trash/waste
5	1/27/85	Office space on mezzanine level (Floor 2)	2		Incendiary	Trash/waste
6	9/10/85	Garbage dumpster in service elevator lobby on floor 43	2	1	Suspicious	Trash/waste
7	11/1/85	Storage closet on B-4 level	3	1	Suspicious	Supplies/stock
8	6/7/86	Dumpster fire on floor 106, compactor room on floor 107	2	1	None listed	Trash/waste
9	9/30/91	Office on B-4 level	≥1	2	Discarded material	Trash/waste
10	11/19/91	Electrical closet on floor 93	0	2	Short circuit	Electrical wire or cable insulation
11	7/23/92	Level B-5 at the power distribution panel	0	2	Electrical failure	Electrical wire or cable insulation
12	11/10/99	Computer room on floor 104	3	≥1	None listed	Plastics, electronic equip



REPORT - STRUCTURAL FIRE

FOR FIRE RECORDS USE ONLY			TYPE REPORT	DATE AND TIME ALARM RECEIVED						DURATION OF INCIDENT		HOW REPORTED	INITIAL ALARM	HIGHEST ALARM	BOROUGH	LOCATION ALARM	LOCATION INCIDENT		REPORT		
				MONTH	DAY	YEAR	CD. NO.	HOUR	MINUTE	HOURS	MINUTES					BOX NUMBER	ADMIN. COMPANY	BLOCK NUMBER	REPORT NUMBER	FILING BATTALION	BADGE NUMBER
			1	09	09	77	1	2304		01	00	4	1	0	1	0070	5006	0113	0063	01	321

AIDED AND CASUALTIES CIVILIANS					RESP.		EXTINGUISHMENT				INVESTIGATION		STRUCTURE					AREA FIRE ORIGIN			
EVACUATED	FIRST AID	INJURED	KILLED	UNIFORMED INJURED	ENG. SO. MARINE	LADDERS	CODE	NO. SPRINK. HEADS OPEN	STANDPIPE LINES USED	RUBBISH CONTAINERS	CAUSE	FIRE MARSHAL	CONSTRUCT	USE	STATUS	DAMAGE TO BLDG.	DAMAGE TO CONTENTS	FLOOR CODE	ROOM OR AREA CODE	OCCUPANCY	MANNER OF EXTENSION
00	00	00	00	00	03	2	0	02	00	0			1	15	1	0	1	99	54	50	00

ADDRESS 1 World Trade Center Man.
NUMBER STREET BOROUGH

BUILDING 110 200x200
STORIES AREA
(Second Card)

NAME OF OCCUPANT ROOM/APT NO
Sgt. Daniels P.A. Police
LEFT IN CHARGE

COMPANIES

TYPE NO. SECT.	PTS										
5 006 0	10	7 001 0	10	7 008 0	10						

OPERATIONS

Upon arrival at command post was told of fire in B 6 level storage room, operations as follows.

Ladder 1 made necessary imfstagation, located fire, vented, overhauled.

Ladder 8 checked for extension, vented overhauled.

Engine 6 stretched line from standpipe and stood fast.

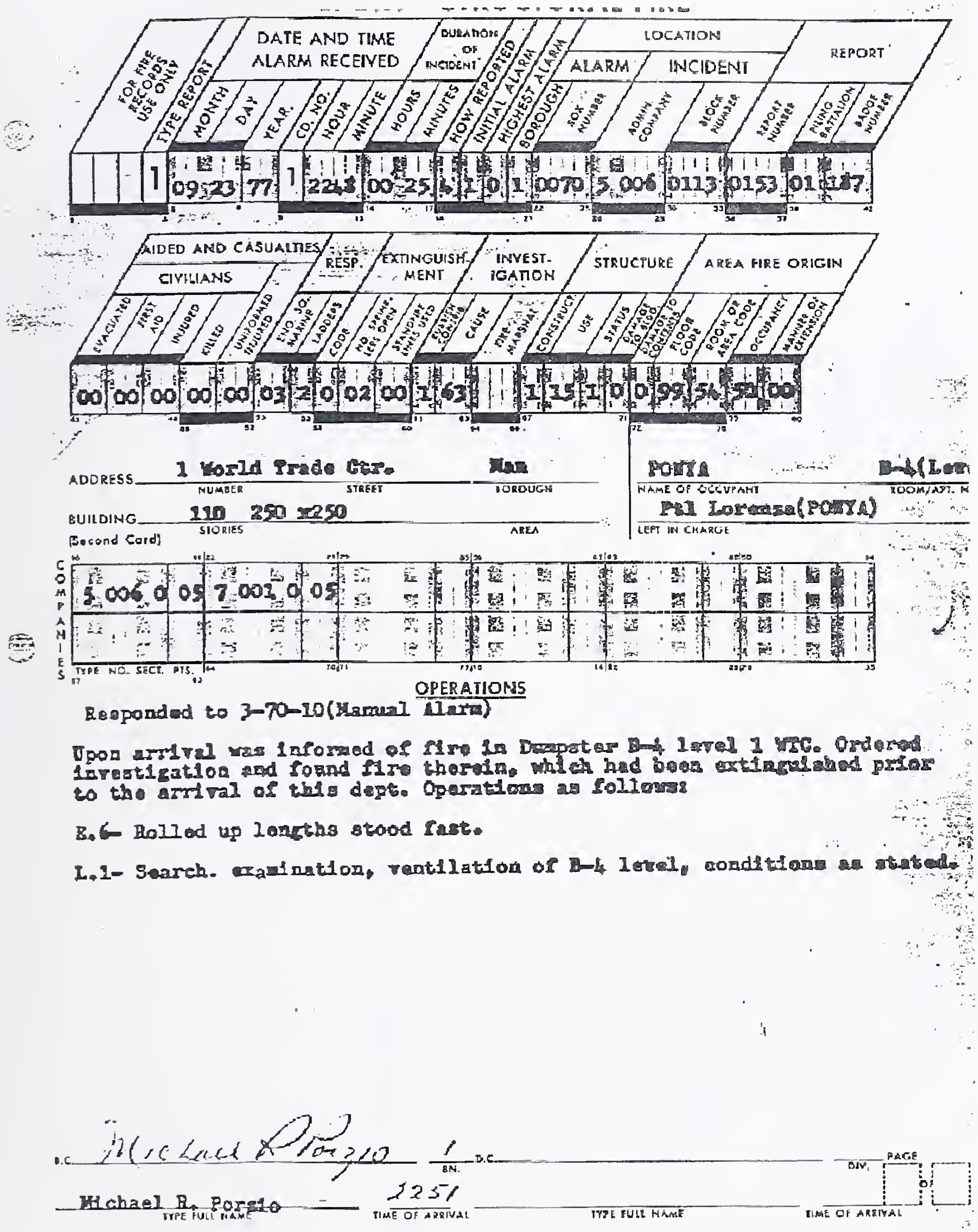
Fire was extinguished by sprinkler system before arrival.

BN. 4 suppervised operations on fire floor.

Fire Patrole 2 on the scene.

S.C. ______ / BN D.C. ______ DIV. PAGE 1 of 1

Rudy E. DiGeorgio 2306
TYPE FULL NAME TIME OF ARRIVAL TYPE FULL NAME TIME OF ARRIVAL



FOR FIRE RECORDS USE ONLY	TYPE REPORT	MONTH	DAY	YEAR	CO. NO.	HOUR	MINUTE	HOURS	MINUTES	HOW REPORTED	INITIAL ALARM	HIGHEST ALARM	BOROUGH	BOX NUMBER	ADMIN. COMPANY	BLOCK NUMBER	REPORT NUMBER	FILING BATTALION	BADGE NUMBER
	1	09	23	77	1	22	48	00	25	4	1	0	1	0070	5 006	0113	0153	01	187

DATE AND TIME ALARM RECEIVED — DURATION OF INCIDENT — LOCATION: ALARM / INCIDENT — REPORT

EVACUATED	FIRST AID	INJURED	KILLED	UNIFORMED INJURED	ENG. SQ. MARINE	LADDERS	CODE	NO. SPRINKLERS OPEN	STANDPIPE LINES USED	EXTINGUISH CONTROL	CAUSE	FIRE MARSHAL	CONSTRUCT.	USE	STATUS	DAMAGE TO BLDG.	DAMAGE TO CONTENTS	FLOOR CODE	ROOM OR AREA CODE	OCCUPANCY	MANNER OF EXTENSION
00	00	00	00	00	03	2	0	02	00	1	63		1	15	1	0	0	99	54	50	00

AIDED AND CASUALTIES — CIVILIANS — RESP. — EXTINGUISHMENT — INVESTIGATION — STRUCTURE — AREA FIRE ORIGIN

ADDRESS 1 World Trade Ctr. (NUMBER, STREET) Man (BOROUGH)

POWYA (NAME OF OCCUPANT) B-4(Lev (ROOM/APT. N

BUILDING 110 (STORIES) 250 x250 (AREA)

Pal Lorenza(POWYA) (LEFT IN CHARGE)

(Second Card)

COMPANIES

TYPE	NO.	SECT.	PTS.	TYPE	NO.	SECT.	PTS.
5	006	0	05	7	001	0	05

OPERATIONS

Responded to 3-70-10(Manual Alarm)

Upon arrival was informed of fire in Dumpster B-4 level 1 WTC. Ordered investigation and found fire therein, which had been extinguished prior to the arrival of this dept. Operations as follows:

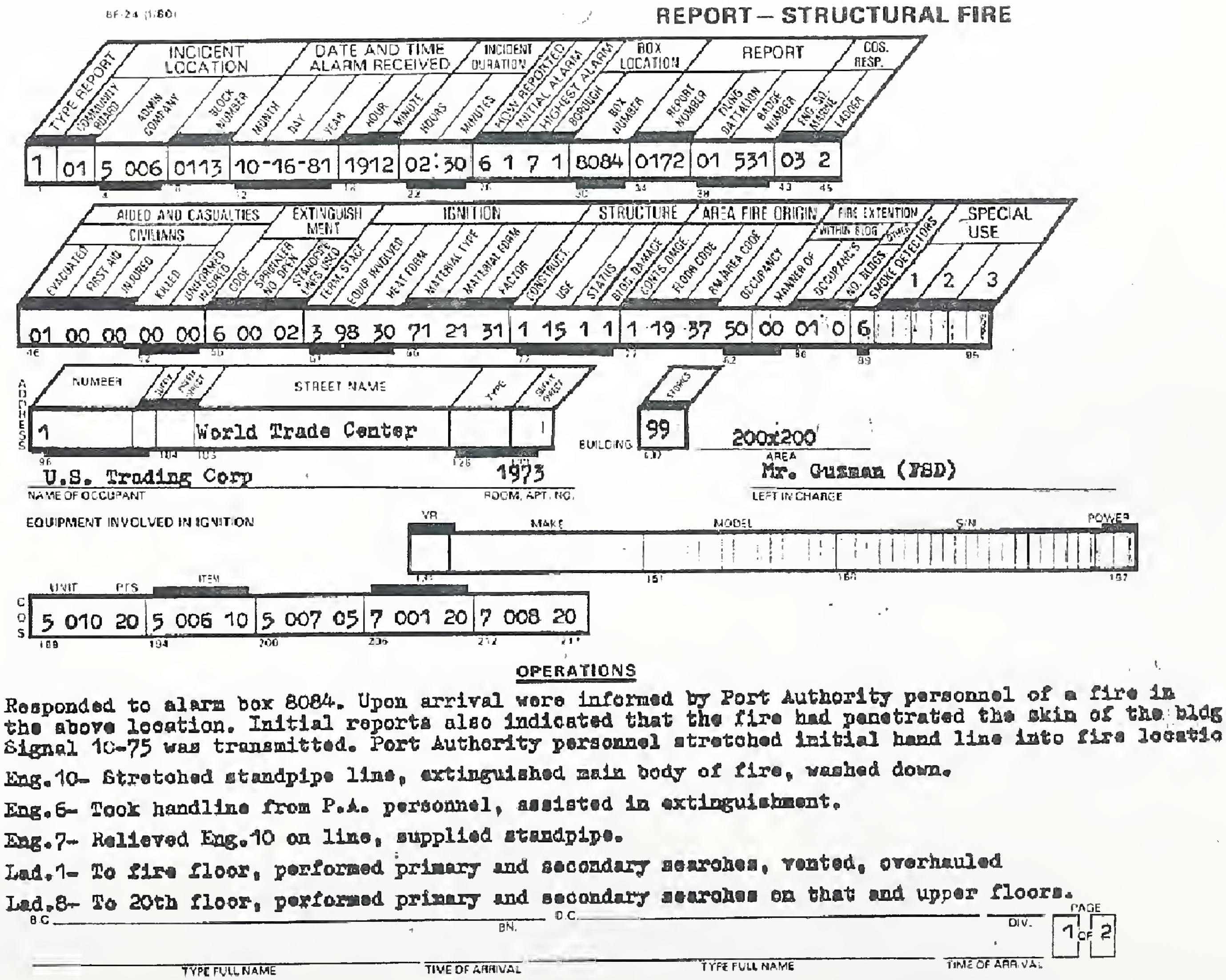
E.6- Rolled up lengths stood fast.

L.1- Search. examination, ventilation of B-4 level, conditions as stated.

B.C. Michael R. Porzio 1 BN. D.C. ______ DIV. ______ PAGE ☐ OF ☐

Michael R. Porzio (TYPE FULL NAME) 2251 (TIME OF ARRIVAL) ______ (TYPE FULL NAME) ______ (TIME OF ARRIVAL)

ADMINISTRATIVE COMPANY



BF-24 (1/80)

REPORT — STRUCTURAL FIRE

TYPE REPORT	INCIDENT LOCATION			DATE AND TIME ALARM RECEIVED		INCIDENT DURATION		BOX LOCATION	REPORT		COS. RESP.
	COMMUNITY BOARD	ADMIN COMPANY	BLOCK NUMBER	MONTH DAY YEAR	HOUR MINUTE	HOURS MINUTES	HOW REPORTED INITIAL ALARM HIGHEST ALARM BOROUGH	BOX NUMBER	REPORT NUMBER	FILING BATTALION BADGE NUMBER	ENG. SQ. MARINE LADDER
1	01	5 006	0113	10-16-81	1912	02:30	6 1 7 1	8084	0172	01 531	03 2

AIDED AND CASUALTIES	EXTINGUISH MENT	IGNITION	STRUCTURE	AREA FIRE ORIGIN	FIRE EXTENTION	SPECIAL USE
CIVILIANS: EVACUATED, FIRST AID, INJURED, KILLED, UNIFORMED INJURED	CODE, SPRINKLER NO. OPEN, STANDPIPE LINES USED	TERM. STAGE, EQUIP INVOLVED, HEAT FORM, MATERIAL TYPE, MATERIAL FORM, FACTOR	CONSTRUCT., USE, STATUS, BLDG. DAMAGE	CONTS. DMGE., FLOOR CODE, RM./AREA CODE, OCCUPANCY	WITHIN BLDG: MANNER OF, OCCUPANC'S; OTHER: NO. BLDGS; SMOKE DETECTORS	1 2 3
01 00 00 00 00	6 00 02	3 98 30 71 21 31	1 15 1 1	1 19 37 50	00 01 0 6	

ADDRESS

NUMBER	SUFFIX	PREFIX DIRECT	STREET NAME	TYPE	SUFFIX DIRECT
1			World Trade Center		1

BUILDING STORIES 99

200x200'
AREA

U.S. Trading Corp
NAME OF OCCUPANT

1973
ROOM, APT. NO.

Mr. Gusman (FSD)
LEFT IN CHARGE

EQUIPMENT INVOLVED IN IGNITION

YR	MAKE	MODEL	S/N	POWER

COS

UNIT PTS ITEM				
5 010 20	5 006 10	5 007 05	7 001 20	7 008 20

OPERATIONS

Responded to alarm box 8084. Upon arrival were informed by Port Authority personnel of a fire in the above location. Initial reports also indicated that the fire had penetrated the skin of the bldg Signal 10-75 was transmitted. Port Authority personnel stretched initial hand line into fire locatio

Eng.10- Stretched standpipe line, extinguished main body of fire, washed down.

Eng.6- Took handline from P.A. personnel, assisted in extinguishment.

Eng.7- Relieved Eng.10 on line, supplied standpipe.

Lad.1- To fire floor, performed primary and secondary searches, vented, overhauled

Lad.8- To 20th floor, performed primary and secondary searches on that and upper floors.

B.C. BN. D.C. DIV.

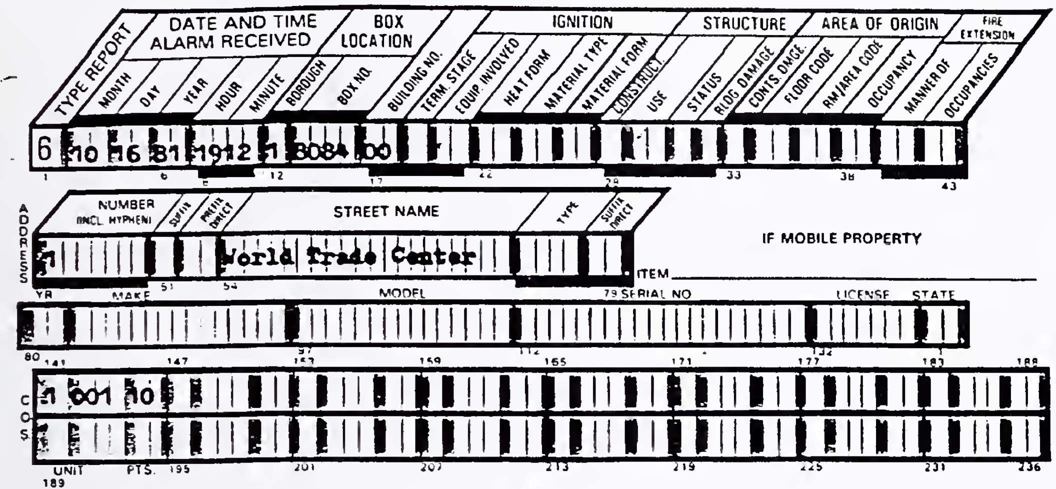
TYPE FULL NAME TIME OF ARRIVAL TYPE FULL NAME TIME OF ARRIVAL

PAGE 1 OF 2

ADMINISTRATIVE COMPANY

REPORT — ADDITIONAL DATA

STRUCTURAL FIRE, TRANSPORTATION FIRE, NON-STRUCTURAL FIRE OR EMERGENCY



TYPE REPORT	MONTH	DAY	YEAR	HOUR	MINUTE	BOROUGH	BOX NO.	BUILDING NO.
6	10	16	81	19	12	1	8084	00

IGNITION: TERM. STAGE, EQUIP. INVOLVED, HEAT FORM, MATERIAL TYPE, MATERIAL FORM

STRUCTURE: CONSTRUCT., USE, STATUS, BLDG. DAMAGE, CONTS. DMGE.

AREA OF ORIGIN: FLOOR CODE, RM/AREA CODE, OCCUPANCY

FIRE EXTENSION: MANNER OF, OCCUPANCIES

1

ADDRESS

NUMBER (INCL. HYPHEN)	SUFFIX	PREFIX DIRECT	STREET NAME	TYPE	SUFFIX DIRECT
1			World Trade Center		

IF MOBILE PROPERTY

ITEM

YR MAKE MODEL SERIAL NO LICENSE STATE

COS

1 001 10

UNIT PTS.

OPERATIONS

Lad.8 (cont.)- Forced door to Office room#2073

Res.1- Checked vent ducts and stairways on and above fire floor, secured passenger elevators serving fire floor.

Patrol#1- On scene, salvage work on 16th and 17th floors.

Patrol#2- On scene, salvage work on 18th floor.

Div.1- D.C. Rossi on scene, in charge of Department operations upon arrival.

B.C. 1 BN

James J. McKenna TYPE FULL NAME

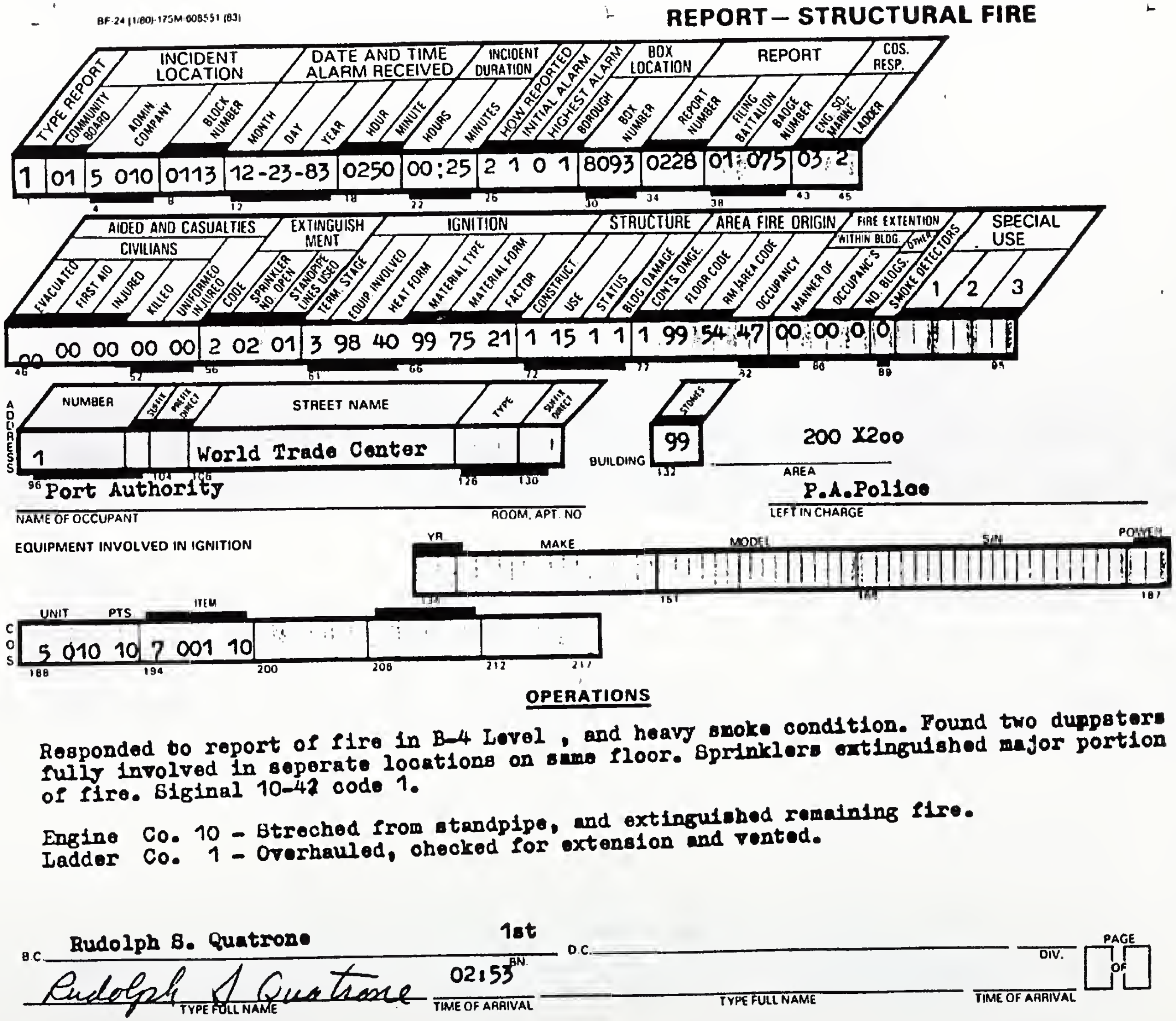
1916 TIME OF ARRIVAL

D.C. 1 DIV.

John D. Rossi TYPE FULL NAME

TIME OF ARRIVAL

PAGE 2 OF 2



BF-24 (1/80)-175M-008551 (83)

REPORT — STRUCTURAL FIRE

TYPE REPORT	INCIDENT LOCATION			DATE AND TIME ALARM RECEIVED					INCIDENT DURATION						BOX LOCATION	REPORT			COS. RESP.	
TYPE REPORT	COMMUNITY BOARD	ADMIN COMPANY	BLOCK NUMBER	MONTH	DAY	YEAR	HOUR	MINUTE	HOURS	MINUTES	HOW REPORTED	INITIAL ALARM	HIGHEST ALARM	BOROUGH	BOX NUMBER	REPORT NUMBER	FILING BATTALION	BADGE NUMBER	ENG. SQ. MARINE	LADDER
1	01	5 010	0113	12	23	83	02	50	00	25	2	1	0	1	8093	0228	01	075	03	2

AIDED AND CASUALTIES						EXTINGUISHMENT		IGNITION						STRUCTURE				AREA FIRE ORIGIN				FIRE EXTENTION				SPECIAL USE		
CIVILIANS																						WITHIN BLDG.		OTHER				
EVACUATED	FIRST AID	INJURED	KILLED	UNIFORMED INJURED	CODE	SPRINKLER NO. OPEN	STANDPIPE LINES USED	TERM. STAGE	EQUIP. INVOLVED	HEAT FORM	MATERIAL TYPE	MATERIAL FORM	FACTOR	CONSTRUCT.	USE	STATUS	BLDG DAMAGE	CONTS DMGE.	FLOOR CODE	RM/AREA CODE	OCCUPANCY	MANNER OF	OCCUPANC'S	NO. BLDGS.	SMOKE DETECTORS	1	2	3
00	00	00	00	00	2	02	01	3	98	40	99	75	21	1	15	1	1	1	99	54	47	00	00	0	0			

ADDRESS

NUMBER	SUFFIX	PREFIX DIRECT	STREET NAME	TYPE	SUFFIX DIRECT
1			World Trade Center		

BUILDING STORIES 99

AREA 200 X2oo

NAME OF OCCUPANT Port Authority

ROOM, APT. NO

LEFT IN CHARGE P.A.Police

EQUIPMENT INVOLVED IN IGNITION

YR	MAKE	MODEL	S/N	POWER

COS

UNIT	PTS	ITEM				
5 010	10	7 001	10			

OPERATIONS

Responded to report of fire in B-4 Level , and heavy smoke condition. Found two duppsters fully involved in seperate locations on same floor. Sprinklers extinguished major portion of fire. Siginal 10-42 code 1.

Engine Co. 10 - Streched from standpipe, and extinguished remaining fire.
Ladder Co. 1 - Overhauled, checked for extension and vented.

B.C. Rudolph S. Quatrone — TYPE FULL NAME — 1st BN. — TIME OF ARRIVAL 02:53

Rudolph S Quatrone

D.C. ______ TYPE FULL NAME — DIV. ______ TIME OF ARRIVAL

PAGE ☐ OF ☐

BF-24 (1/80)

REPORT — STRUCTURAL FIRE

TYPE REPORT	INCIDENT LOCATION			DATE AND TIME ALARM RECEIVED					INCIDENT DURATION		HOW REPORTED	INITIAL ALARM	HIGHEST ALARM	BOX LOCATION		REPORT			COS. RESP.	
	COMMUNITY BOARD	ADMIN COMPANY	BLOCK NUMBER	MONTH	DAY	YEAR	HOUR	MINUTE	HOURS	MINUTES				BOROUGH	BOX NUMBER	REPORT NUMBER	FILING BATTALION	BADGE NUMBER	ENG. SQ. MARINE	LADDER
1	01	5 010	0137	01	27	85	20	53	01	00	2	1	1	1	8084	0293	01	113	02	2

8000787

AIDED AND CASUALTIES					EXTINGUISHMENT			IGNITION						STRUCTURE					AREA FIRE ORIGIN			FIRE EXTENTION				SPECIAL USE		
CIVILIANS																						WITHIN BLDG.		OTHER				
EVACUATED	FIRST AID	INJURED	KILLED	UNIFORMED INJURED	CODE	SPRINKLER NO. OPEN	STANDPIPE LINES USED	TERM. STAGE	EQUIP. INVOLVED	HEAT FORM	MATERIAL TYPE	MATERIAL FORM	FACTOR	CONSTRUCT	USE	STATUS	BLDG DAMAGE	CONTS. DMGE.	FLOOR CODE	RM/AREA CODE	OCCUPANCY	MANNER OF	OCCUPANC'S	NO. BLDGS.	SMOKE DETECTORS	1	2	3
00	00	00	00	00	2	01	00	3	96	66	60	75	11	1	15	1	1	1	02	59	59	00	00	0	0			

ADDRESS

NUMBER	SUFFIX	PREFIX DIRECT	STREET NAME	TYPE	SUFFIX DIRECT
1			World Trade Center		I

BUILDING: STORIES 110

AREA: 200x200

NAME OF OCCUPANT: New York ~~????~~ Port Authority NY,NJ

ROOM, APT. NO.:

LEFT IN CHARGE: Sgt. Doubraski, PA Police

EQUIPMENT INVOLVED IN IGNITION

YR.	MAKE	MODEL	S/N	POWER

COS

UNIT	PTS.	ITEM			
5 006 05	7 001 05	7 010 05			

OPERATIONS

On arrival, found two sprinkler heads containing fire in unoccupied office occupancy on mezzanine level. Units assigned as follows:

Eng. 6: Stretched line, stood fast.
Lad. 1: Located fire, searched, extinguished remaining fire. Shut down sprinkler system.
Lad. 10: Checked for extension.

10-41 signal (code 1) transmitted.

AUG 28 2003
JRL

1

B.C. John J Spillane BN. 1 D.C. DIV.

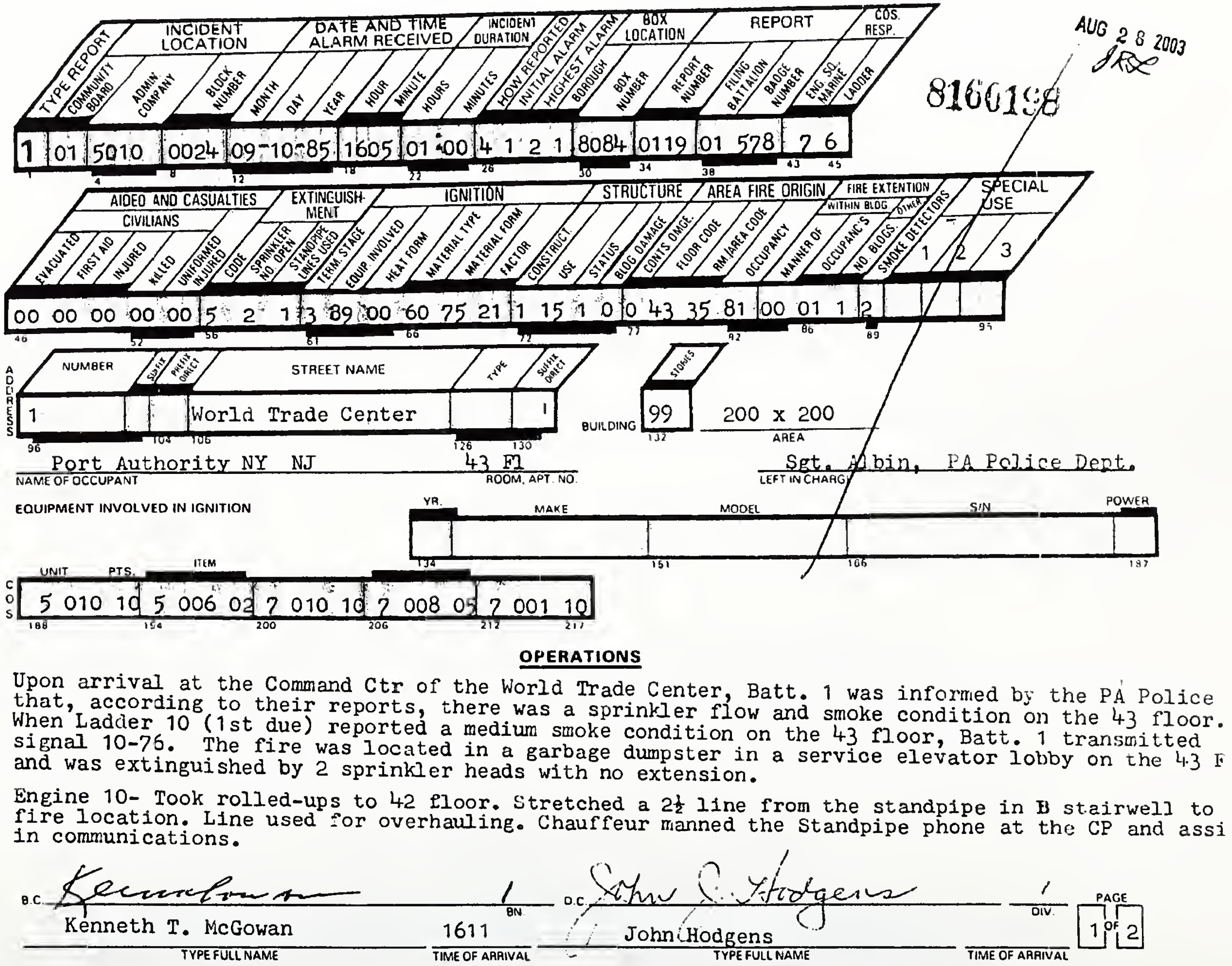
John J. Spillane
TYPE FULL NAME

2055
TIME OF ARRIVAL

TYPE FULL NAME

TIME OF ARRIVAL

PAGE OF



AUG 28 2003

8160198

TYPE REPORT	INCIDENT LOCATION			DATE AND TIME ALARM RECEIVED					INCIDENT DURATION		HOW REPORTED	INITIAL ALARM	HIGHEST ALARM	BOX LOCATION		REPORT			COS. RESP.	
	COMMUNITY BOARD	ADMIN COMPANY	BLOCK NUMBER	MONTH	DAY	YEAR	HOUR	MINUTE	HOURS	MINUTES				BOROUGH	BOX NUMBER	REPORT NUMBER	FILING BATTALION	BADGE NUMBER	ENG. SQ. MARINE	LADDER
1	01	5010	0024	09	10	85	16	05	01	00	4	1	2	1	8084	0119	01	578	7	6

AIDED AND CASUALTIES					EXTINGUISHMENT			IGNITION						STRUCTURE					AREA FIRE ORIGIN			FIRE EXTENTION				SPECIAL USE		
CIVILIANS																						WITHIN BLDG		OTHER				
EVACUATED	FIRST AID	INJURED	KILLED	UNIFORMED INJURED	CODE	SPRINKLER NO. OPEN	STANDPIPE LINES USED	TERM. STAGE	EQUIP. INVOLVED	HEAT FORM	MATERIAL TYPE	MATERIAL FORM	FACTOR	CONSTRUCT.	USE	STATUS	BLDG DAMAGE	CONTS DMGE.	FLOOR CODE	RM./AREA CODE	OCCUPANCY	MANNER OF	OCCUPANC'S	NO. BLDGS.	SMOKE DETECTORS	1	2	3
00	00	00	00	00	5	2	1	3	89	00	60	75	21	1	15	1	0	0	43	35	81	00	01	1	2			

ADDRESS

NUMBER	SUFFIX	PREFIX DIRECT	STREET NAME	TYPE	SUFFIX DIRECT
1			World Trade Center		1

BUILDING

STORIES	AREA
99	200 x 200

NAME OF OCCUPANT: Port Authority NY NJ

ROOM, APT. NO.: 43 Fl

LEFT IN CHARGE: Sgt. Albin, PA Police Dept.

EQUIPMENT INVOLVED IN IGNITION

YR.	MAKE	MODEL	S/N	POWER

COS

UNIT	PTS.	ITEM		
5 010 10	5 006 02	7 010 10	7 008 05	7 001 10

OPERATIONS

Upon arrival at the Command Ctr of the World Trade Center, Batt. 1 was informed by the PA Police that, according to their reports, there was a sprinkler flow and smoke condition on the 43 floor. When Ladder 10 (1st due) reported a medium smoke condition on the 43 floor, Batt. 1 transmitted signal 10-76. The fire was located in a garbage dumpster in a service elevator lobby on the 43 F and was extinguished by 2 sprinkler heads with no extension.

Engine 10- Took rolled-ups to 42 floor. Stretched a 2½ line from the standpipe in B stairwell to fire location. Line used for overhauling. Chauffeur manned the Standpipe phone at the CP and assi

B.C. Kenneth McGowan 1 BN

Kenneth T. McGowan

TYPE FULL NAME

1611

TIME OF ARRIVAL

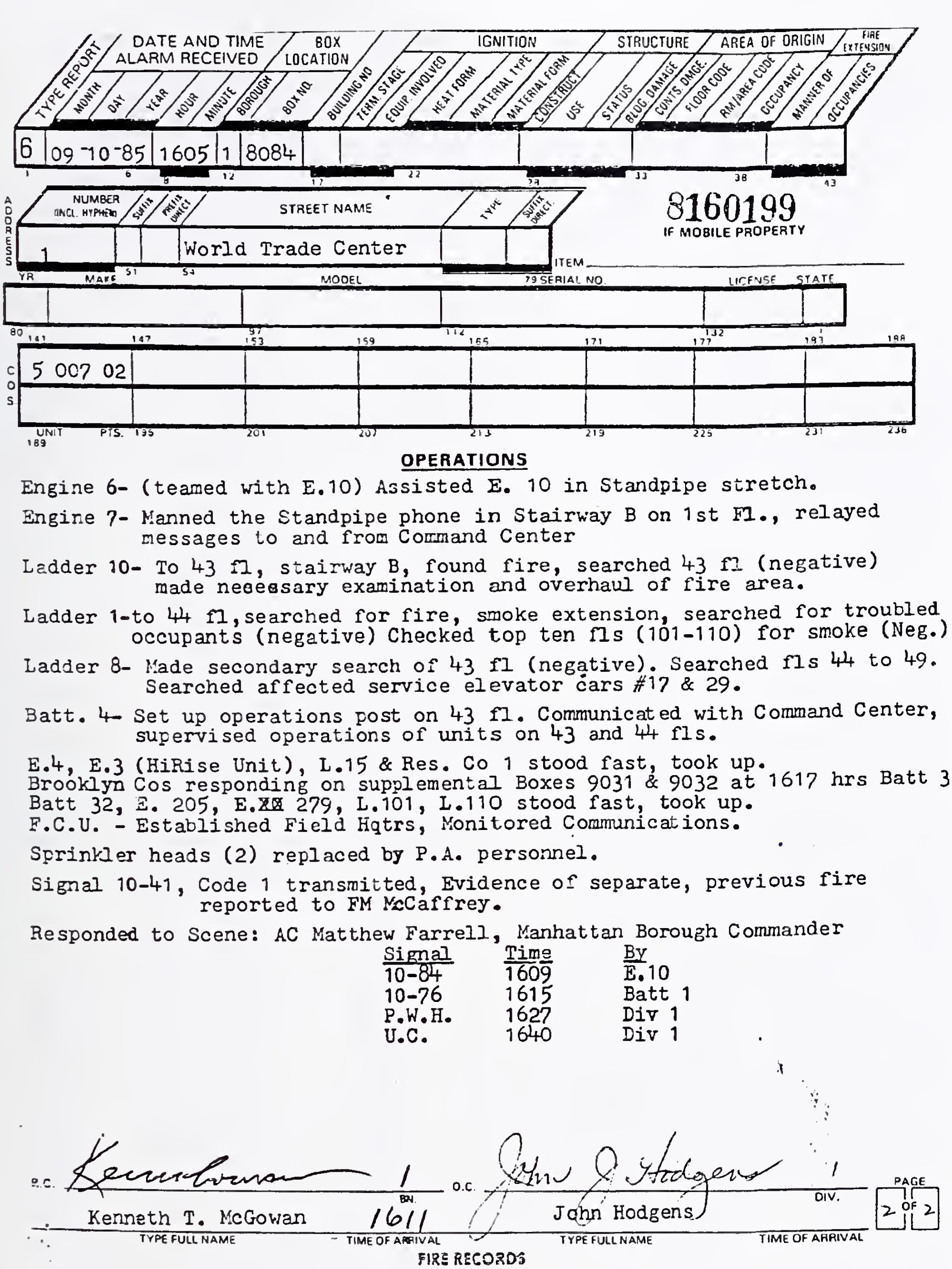
D.C. John J. Hodgens 1 DIV.

John Hodgens

TYPE FULL NAME

TIME OF ARRIVAL

PAGE 1 OF 2



TYPE REPORT	MONTH	DAY	YEAR	HOUR	MINUTE	BOROUGH	BOX NO.	BUILDING NO.
6	09	10	85	16	05	1	8084	

DATE AND TIME ALARM RECEIVED · BOX LOCATION · IGNITION: TERM STAGE, EQUIP INVOLVED, HEAT FORM, MATERIAL TYPE, MATERIAL FORM · STRUCTURE: CONSTRUCT, USE, STATUS, BLDG DAMAGE, CONTS DMGE · AREA OF ORIGIN: FLOOR CODE, RM/AREA CODE, OCCUPANCY · FIRE EXTENSION: MANNER OF, OCCUPANCIES

NUMBER (INCL. HYPHEN)	SUFFIX	PREFIX DIRECT.	STREET NAME	TYPE	SUFFIX DIRECT.
1			World Trade Center		

8160199

IF MOBILE PROPERTY

ITEM

YR MAKE MODEL SERIAL NO. LICENSE STATE

COS

UNIT	PTS.
5 007 02	

OPERATIONS

Engine 6- (teamed with E.10) Assisted E. 10 in Standpipe stretch.

Engine 7- Manned the Standpipe phone in Stairway B on 1st Fl., relayed messages to and from Command Center

Ladder 10- To 43 fl, stairway B, found fire, searched 43 fl (negative) made neeessary examination and overhaul of fire area.

Ladder 1-to 44 fl,searched for fire, smoke extension, searched for troubled occupants (negative) Checked top ten fls (101-110) for smoke (Neg.)

Ladder 8- Made secondary search of 43 fl (negative). Searched fls 44 to 49. Searched affected service elevator cars #17 & 29.

Batt. 4- Set up operations post on 43 fl. Communicated with Command Center, supervised operations of units on 43 and 44 fls.

E.4, E.3 (HiRise Unit), L.15 & Res. Co 1 stood fast, took up.
Brooklyn Cos responding on supplemental Boxes 9031 & 9032 at 1617 hrs Batt 31, Batt 32, E. 205, E.XX 279, L.101, L.110 stood fast, took up.
F.C.U. - Established Field Hqtrs, Monitored Communications.

Sprinkler heads (2) replaced by P.A. personnel.

Signal 10-41, Code 1 transmitted, Evidence of separate, previous fire reported to FM McCaffrey.

Responded to Scene: AC Matthew Farrell, Manhattan Borough Commander

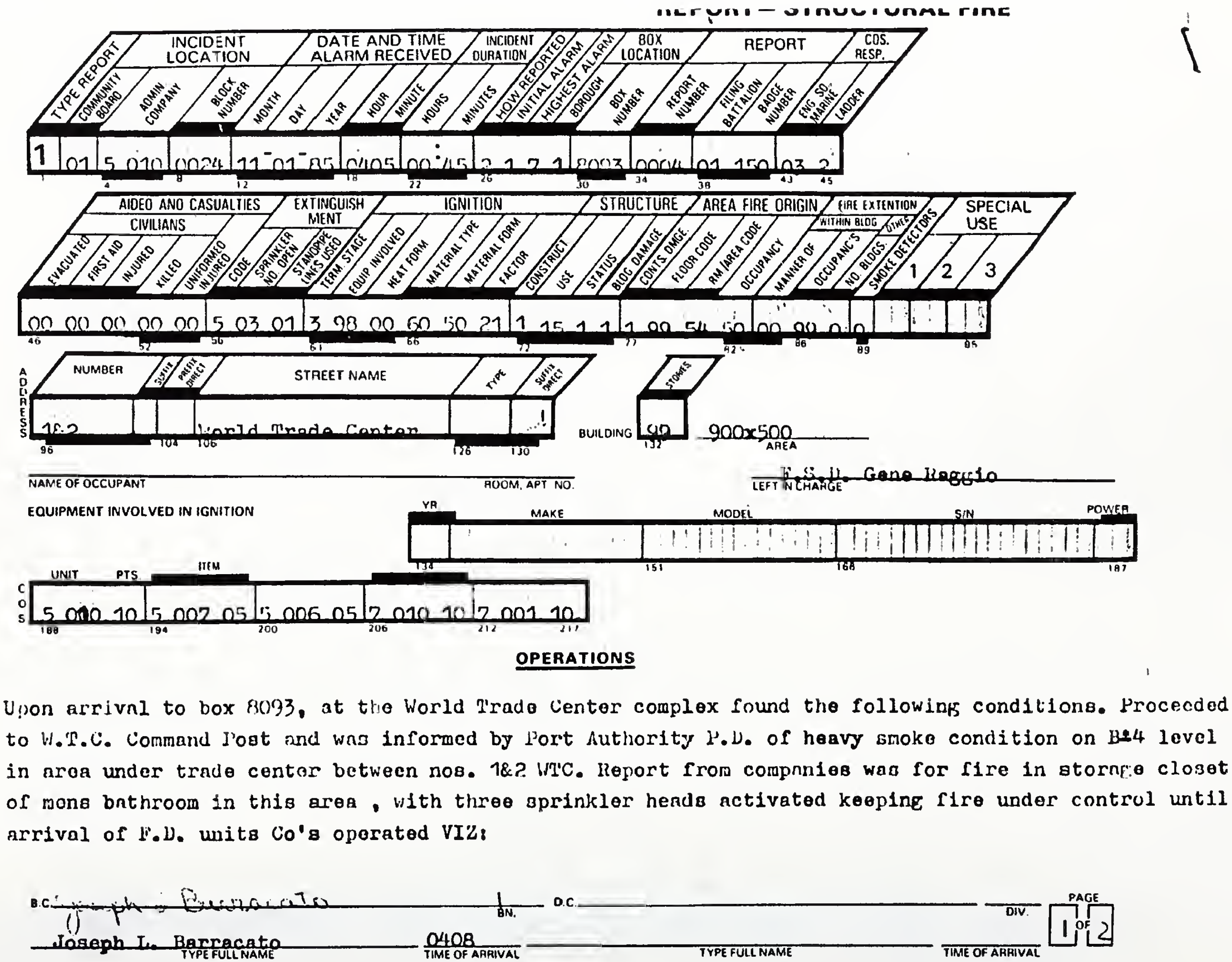
Signal	Time	By
10-84	1609	E.10
10-76	1615	Batt 1
P.W.H.	1627	Div 1
U.C.	1640	Div 1

B.C. Kenneth T. McGowan 1 BN.
Kenneth T. McGowan 1611
TYPE FULL NAME — TIME OF ARRIVAL

D.C. John J. Hodgens 1 DIV.
John Hodgens
TYPE FULL NAME — TIME OF ARRIVAL

PAGE 2 OF 2

FIRE RECORDS



REPORT — STRUCTURAL FIRE

TYPE REPORT	COMMUNITY BOARD	ADMIN COMPANY	BLOCK NUMBER	MONTH	DAY	YEAR	HOUR	MINUTE	HOURS	MINUTES	HOW REPORTED	INITIAL ALARM	HIGHEST ALARM	BOROUGH	BOX NUMBER	REPORT NUMBER	FILING BATTALION	BADGE NUMBER	ENG SQ. MARINE	LADDER
1	01	5 010	0024	11	01	85	04	05	00	45	2	1	7	1	8093	0004	01	150	03	2

INCIDENT LOCATION / DATE AND TIME ALARM RECEIVED / INCIDENT DURATION / BOX LOCATION / REPORT / COS. RESP.

EVACUATED	FIRST AID	INJURED	KILLED	UNIFORMED INJURED	CODE	SPRINKLER NO. OPEN	STANDPIPE LINES USED	TERM. STAGE	EQUIP INVOLVED	HEAT FORM	MATERIAL TYPE	MATERIAL FORM	FACTOR	CONSTRUCT	USE	STATUS	BLDG DAMAGE	CONTS. DMGE.	FLOOR CODE	RM/AREA CODE	OCCUPANCY	MANNER OF	OCCUPANC'S	NO. BLDGS.	OTHER	SMOKE DETECTORS	1	2	3
00	00	00	00	00	5	03	01	3	98	00	60	50	21	1	15	1	1	1	99	54	50	00	99	0	0	0			

AIDED AND CASUALTIES — CIVILIANS / EXTINGUISHMENT / IGNITION / STRUCTURE / AREA FIRE ORIGIN / FIRE EXTENTION — WITHIN BLDG / SPECIAL USE

ADDRESS

NUMBER	SUFFIX	PREFIX DIRECT	STREET NAME	TYPE	SUFFIX DIRECT
1&2			World Trade Center		

BUILDING: STORIES 99 — 900x500 AREA

NAME OF OCCUPANT — ROOM, APT. NO.

F.S.D. Gene Reggio
LEFT IN CHARGE

EQUIPMENT INVOLVED IN IGNITION: YR — MAKE — MODEL — S/N — POWER

COS

UNIT	PTS				
5 010	10	5 007 05	5 006 05	7 010 10	7 001 10

OPERATIONS

Upon arrival to box 8093, at the World Trade Center complex found the following conditions. Proceeded to W.T.C. Command Post and was informed by Port Authority P.D. of heavy smoke condition on B-4 level in area under trade center between nos. 1&2 WTC. Report from companies was for fire in storage closet of mens bathroom in this area , with three sprinkler heads activated keeping fire under control until arrival of F.D. units Co's operated VIZ:

B.C. Joseph L. Barracato — BN. 1 — D.C. — DIV. — PAGE 1 OF 2

Joseph L. Barracato
TYPE FULL NAME — 0408 TIME OF ARRIVAL — TYPE FULL NAME — TIME OF ARRIVAL

REPORT — ADDITIONAL DATA

STRUCTURAL FIRE, TRANSPORTATION FIRE, NON-STRUCTURAL FIRE OR EMERGENCY

	DATE AND TIME ALARM RECEIVED					BOX LOCATION		IGNITION					STRUCTURE				AREA OF ORIGIN			FIRE EXTENSION	
TYPE REPORT	MONTH	DAY	YEAR	HOUR	MINUTE	BOROUGH	BOX NO.	BUILDING NO.	TERM. STAGE	EQUIP. INVOLVED	HEAT FORM	MATERIAL TYPE	MATERIAL FORM	CONSTRUCT.	USE	STATUS	BLDG. DAMAGE	CONTS. DMGE.	FLOOR CODE	RM/AREA CODE	OCCUPANCY	MANNER OF	OCCUPANCIES
6	11	01	85	04	05	1	8093																

ADDRESS

NUMBER (INCL. HYPHEN)	SUFFIX	PREFIX DIRECT	STREET NAME	TYPE	SUFFIX DIRECT
1&2			WTC		

IF MOBILE PROPERTY . ITEM

YR	MAKE	MODEL	SERIAL NO	LICENSE	STATE

COS

UNIT	PTS							

OPERATIONS

E-10 stretched line into fire area from standpipe and extinquished all remaining in closet area

E-7 Stretched line from opposite side of fire and stood fast

E-6 assisted E10 in stretching line and relieved on line and then washdown

L-10 found fire and performed necessary VES and overhaul in area, made primary and secondary search , then up

L-1 performed necessary VES and checked for possible extension in surrounding areas

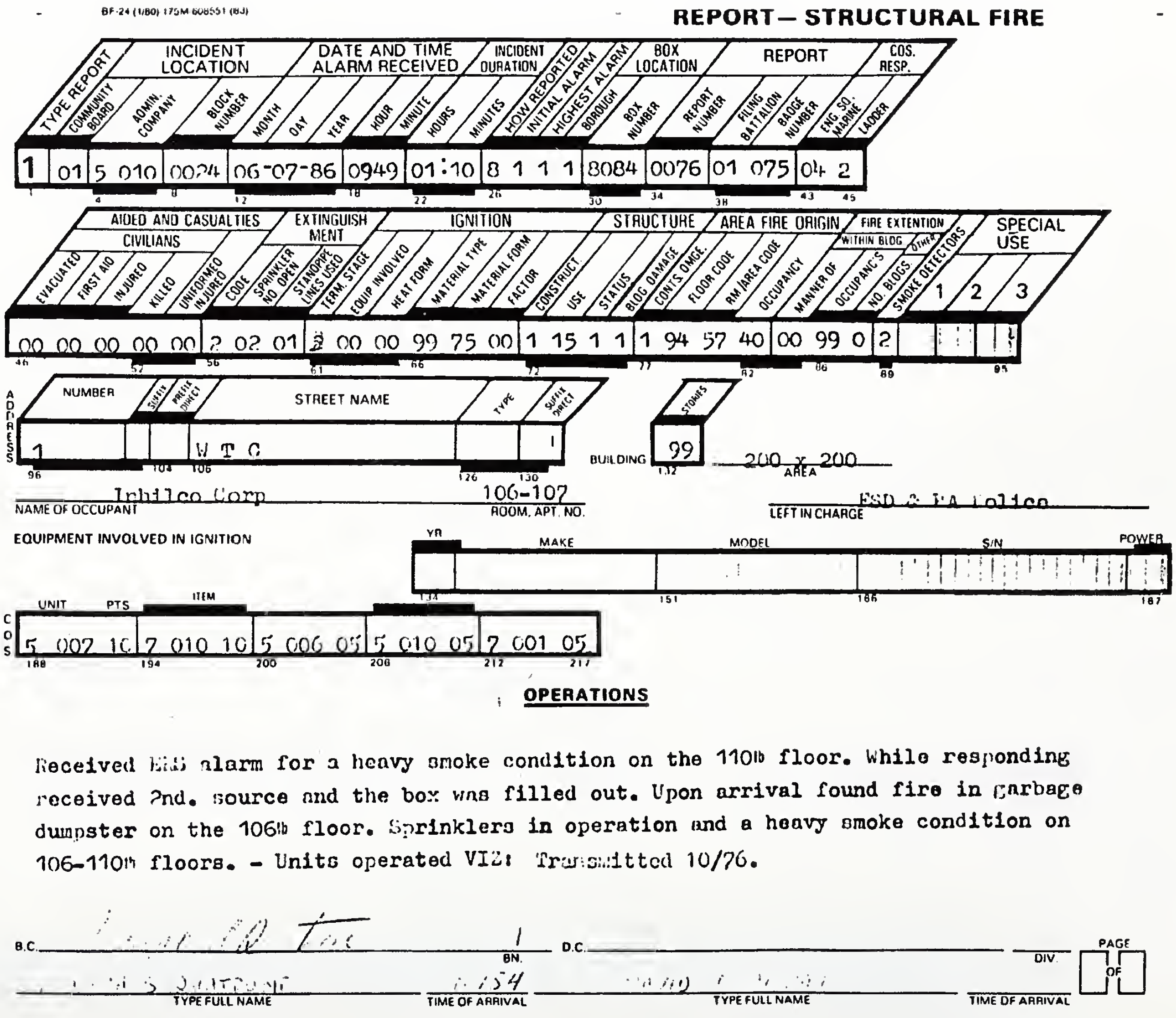
Times: 10-84 0408
10-75 0410
All Hands 0425
10-41-1 0425

B.C. Joseph L. Barracato | BN. D.C. DIV.

Joseph L. Barracato 0408
TYPE FULL NAME — TIME OF ARRIVAL — TYPE FULL NAME — TIME OF ARRIVAL

ADMINISTRATIVE COMPANY

PAGE 2 OF 2



BF-24 (1/80) 175M 608551 (83)

REPORT — STRUCTURAL FIRE

TYPE REPORT	INCIDENT LOCATION			DATE AND TIME ALARM RECEIVED					INCIDENT DURATION					BOX LOCATION		REPORT			COS. RESP.	
	COMMUNITY BOARD	ADMIN. COMPANY	BLOCK NUMBER	MONTH	DAY	YEAR	HOUR	MINUTE	HOURS	MINUTES	HOW REPORTED	INITIAL ALARM	HIGHEST ALARM	BOROUGH	BOX NUMBER	REPORT NUMBER	FILING BATTALION	BADGE NUMBER	ENG. SQ. MARINE	LADDER
1	01	5 010	0024	06	07	86	09	49	01	10	8	1	1	1	8084	0076	01	075	04	2
1		4	8	12			18		22		26			30		34	38		43	45

AIDED AND CASUALTIES					EXTINGUISHMENT			IGNITION						STRUCTURE				AREA FIRE ORIGIN				FIRE EXTENTION				SPECIAL USE		
CIVILIANS																						WITHIN BLDG		OTHER				
EVACUATED	FIRST AID	INJURED	KILLED	UNIFORMED INJURED	CODE	SPRINKLER NO OPEN	STANDPIPE LINES USED	TERM. STAGE	EQUIP INVOLVED	HEAT FORM	MATERIAL TYPE	MATERIAL FORM	FACTOR	CONSTRUCT.	USE	STATUS	BLDG DAMAGE	CONTS DMGE.	FLOOR CODE	RM/AREA CODE	OCCUPANCY	MANNER OF	OCCUPANC'S	NO. BLDGS.	SMOKE DETECTORS	1	2	3
00	00	00	00	00	2	02	01	2	00	00	99	75	00	1	15	1	1	1	94	57	40	00	99	0	2			
46			52		56			61		66				72			77		82			86		89				95

ADDRESS

NUMBER	SUFFIX	PREFIX DIRECT	STREET NAME	TYPE	SUFFIX DIRECT
1			W T C		1
96	104	106		126	130

BUILDING STORIES 99 132

200 x 200 AREA

Inhilco Corp NAME OF OCCUPANT

106-107 ROOM, APT. NO.

ESD & PA Police LEFT IN CHARGE

EQUIPMENT INVOLVED IN IGNITION

YR	MAKE	MODEL	S/N	POWER
134		151	166	187

COS

UNIT PTS ITEM				
5 007 10	7 010 10	5 006 05	5 010 05	7 001 05
188	194	200	206	212 217

OPERATIONS

Received EMS alarm for a heavy smoke condition on the 110th floor. While responding received 2nd. source and the box was filled out. Upon arrival found fire in garbage dumpster on the 106th floor. Sprinklers in operation and a heavy smoke condition on 106-110th floors. - Units operated VIZ: Transmitted 10/76.

B.C. ______ 1 BN. D.C. ______ DIV.

[illegible] TYPE FULL NAME [illegible]54 TIME OF ARRIVAL [illegible] TYPE FULL NAME ______ TIME OF ARRIVAL

PAGE ☐ OF ☐

REPORT — ADDITIONAL DATA

STRUCTURAL FIRE, TRANSPORTATION FIRE, NON-STRUCTURAL FIRE OR EMERGENCY

TYPE REPORT	DATE AND TIME ALARM RECEIVED					BOX LOCATION			IGNITION					STRUCTURE				AREA OF ORIGIN				FIRE EXTENSION	
	MONTH	DAY	YEAR	HOUR	MINUTE	BOROUGH	BOX NO.	BUILDING NO.	TERM. STAGE	EQUIP. INVOLVED	HEAT FORM	MATERIAL TYPE	MATERIAL FORM	CONSTRUCT.	USE	STATUS	BLDG. DAMAGE	CONTS. DMGE.	FLOOR CODE	RM/AREA CODE	OCCUPANCY	MANNER OF	OCCUPANCIES
6	06	07	86	09	49	1	8084	0	3'00	00	99	75		1	15	1	1	1	94	57	40	00	99

ADDRESS NUMBER (INCL. HYPHEN)	SUFFIX	PREFIX DIRECT.	STREET NAME	TYPE	SUFFIX DIRECT.
1			WTC		

IF MOBILE PROPERTY

ITEM

YR	MAKE	MODEL	SERIAL NO	LICENSE	STATE

COS UNIT / PTS.							
1 001 05	5 003 02						

OPERATIONS

L.7- Upon arrival reported to 106 th floor and stretched from standpipe to fire and extinguished same. Fire in dumpster Assisted L.10 in making search of area. Negative

E.6 Reported to 106th floor. Ordered to stand fast. Then up.

E.10 Reported to 106th Floor. Ordered to stand fast. Then up.

L.10 Reported to 107th Floor. Found fire in compactor room. Sprinkler in operation. Forced entry to sprinkler shut-off room. Shut same. Made necessary search and examination. Then up.

L.1 Reported to 107th Floor. Assisted Ladder 10 in search and examination. Negative searc. Then up.

R-1 Searched floors above fire. Light smoke. Negative. Then up.

R.3/Hi-Rise Unit: Ordered to 10-2

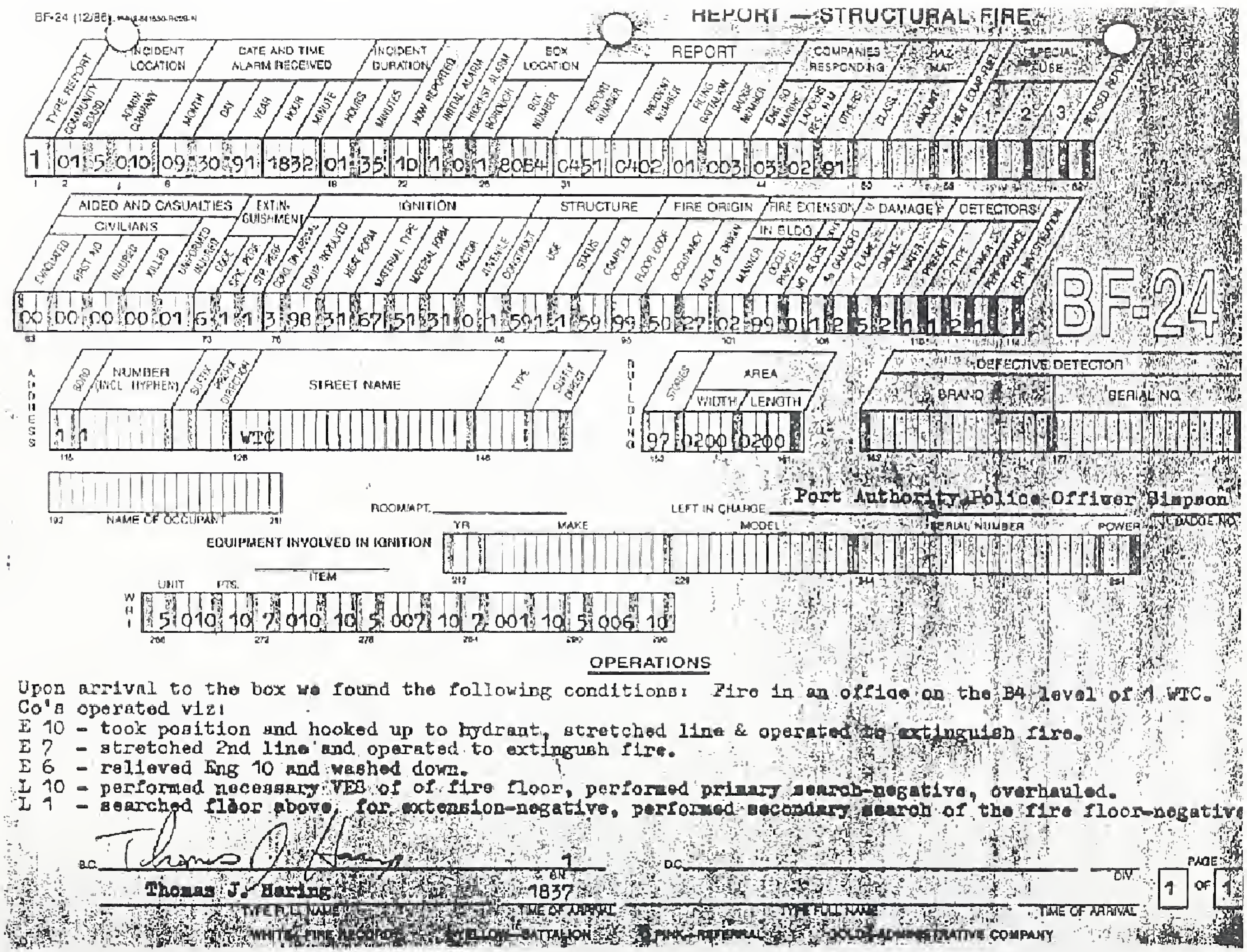
Field Comm Unit: - Ordered to 10-2

Batt. 4: Supervised operations on 106-110 floors. Units L.7, L.10 L.1 and R-1. Then up.

B.C. ________ BN. D.C. ________ DIV. PAGE ☐ OF ☐

TYPE FULL NAME — TIME OF ARRIVAL — TYPE FULL NAME — TIME OF ARRIVAL

ADMINISTRATIVE COMPANY



BF-24 (12/86)

REPORT — STRUCTURAL FIRE

INCIDENT LOCATION · DATE AND TIME ALARM RECEIVED · INCIDENT DURATION · BOX LOCATION · REPORT · COMPANIES RESPONDING · HAZ. MAT · SPECIAL USE

TYPE REPORT · COMMUNITY BOARD · ADMIN COMPANY · MONTH · DAY · YEAR · HOUR · MINUTE · HOURS · MINUTES · HOW REPORTED · INITIAL ALARM · HIGHEST ALARM · BOROUGH · BOX NUMBER · REPORT NUMBER · INCIDENT NUMBER · FILING BATTALION · BADGE NUMBER · ENG. SQ MARINE · LADDERS RES. H-M · OTHERS · CLASS · AMOUNT · HEAT COMP FUEL · 1 · 2 · 3 · REVISED REPORT

1 01 5 010 09 30 91 1832 01 35 10 1 0 1 8064 0451 0402 01 003 03 02 01

AIDED AND CASUALTIES · CIVILIANS · EXTINGUISHMENT · IGNITION · STRUCTURE · FIRE ORIGIN · FIRE EXTENSION · IN BLDG · DAMAGE · DETECTORS

EVACUATED · FIRST AID · INJURED · KILLED · UNIFORMED INJURED · CODE · SPR. PERF · STP. PERF · COND ON ARRIVAL · EQUIP. INVOLVED · HEAT FORM · MATERIAL TYPE · MATERIAL FORM · FACTOR · JUVENILE · CONSTRUCT · USE · STATUS · COMPLEX · FLOOR CODE · OCCUPANCY · AREA OF ORIGIN · MANNER · OCCU-PANCIES · NO. BLDGS · % DAMAGED · FLAME · SMOKE · WATER · PRESENT · TYPE · POWER · PERFORMANCE · FOR INVESTIGATION

00 00 00 00 01 6 1 1 3 98 31 67 51 51 0 1 591 1 59 99 50 27 02 99 0 1 2 5 2 1 1 2 1

BF-24

ADDRESS: BORO · NUMBER (INCL. HYPHEN) · SUFFIX · PREFIX DIRECTION · STREET NAME · TYPE · SUFFIX DIRECT

1 1 WTC

BUILDING: STORIES · AREA · WIDTH · LENGTH

97 0200 0200

DEFECTIVE DETECTOR: BRAND · SERIAL NO.

NAME OF OCCUPANT

ROOM/APT. ________

LEFT IN CHARGE Port Authority Police Offiver Simpson

BADGE NO.

EQUIPMENT INVOLVED IN IGNITION: YR · MAKE · MODEL · SERIAL NUMBER · POWER

ITEM

W H I: UNIT · PTS.

5 010 10 7 010 10 5 007 10 7 001 10 5 006 10

OPERATIONS

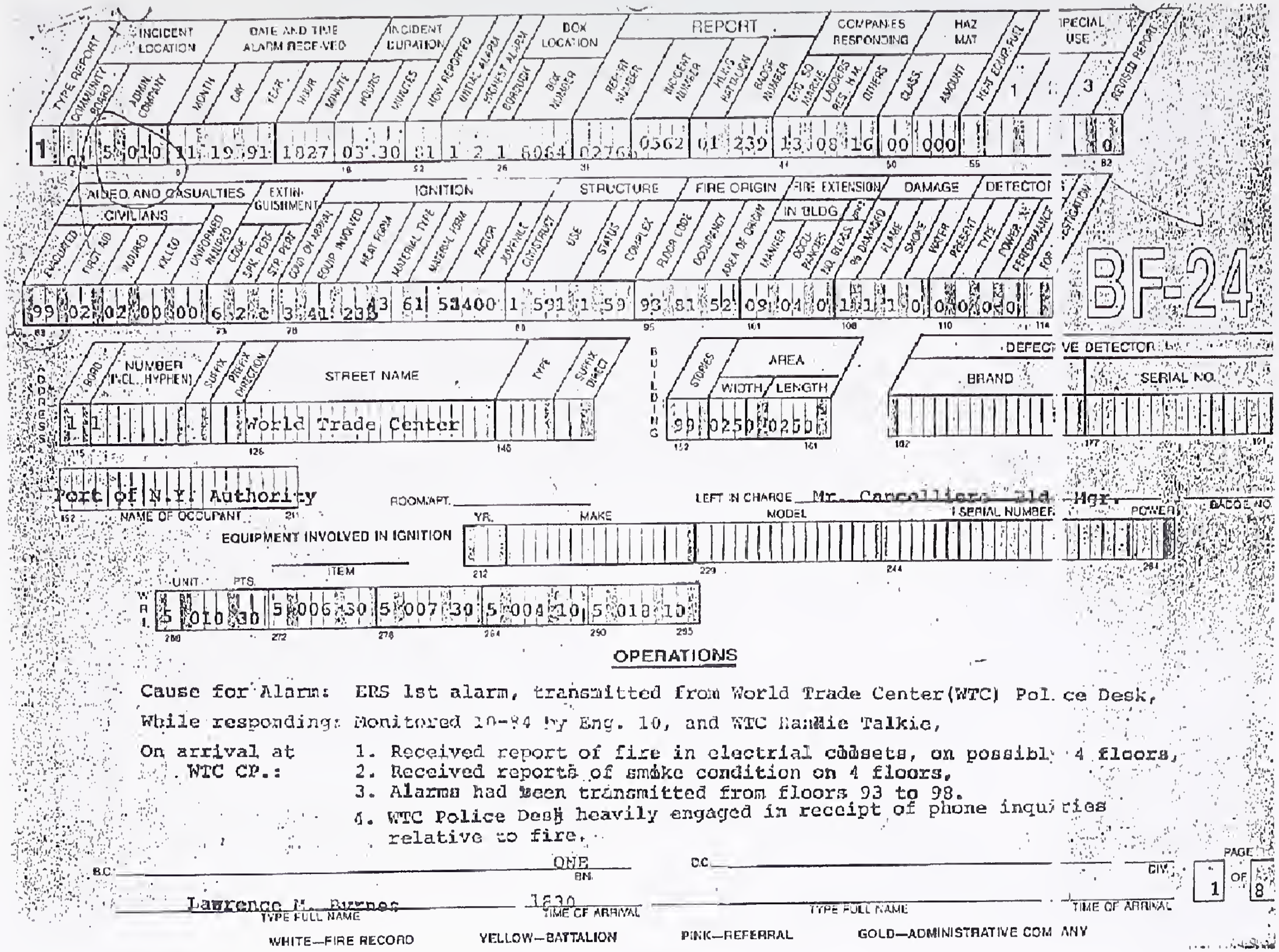
Upon arrival to the box we found the following conditions: Fire in an office on the B4 level of 1 WTC.
Co's operated viz:
E 10 - took position and hooked up to hydrant, stretched line & operated to extinguish fire.
E 7 - stretched 2nd line and operated to extinguish fire.
E 6 - relieved Eng 10 and washed down.
L 10 - performed necessary VES of of fire floor, performed primary search-negative, overhauled.
L 1 - searched floor above, for extension-negative, performed secondary search of the fire floor-negative

B.C. Thomas J. Haring 1 BN.
Thomas J. Haring 1837
TYPE FULL NAME · TIME OF ARRIVAL

DC ________ DIV.
TYPE FULL NAME · TIME OF ARRIVAL

PAGE 1 OF 1

WHITE—FIRE RECORDS · YELLOW—BATTALION · PINK—REFERRAL · GOLD—ADMINISTRATIVE COMPANY



BF-24

TYPE REPORT / INCIDENT LOCATION (COMMUNITY BOARD, ADMIN. COMPANY) / DATE AND TIME ALARM RECEIVED (MONTH, DAY, YEAR, HOUR, MINUTE) / INCIDENT DURATION (HOURS, MINUTES) / HOW REPORTED / INITIAL ALARM / HIGHEST ALARM / BOX LOCATION (BOROUGH, BOX NUMBER) / REPORT (REPORT NUMBER, INCIDENT NUMBER, HQ'S BATTALION, BADGE NUMBER) / COMPANIES RESPONDING (ENG. SQ. MARINE, LADDERS RES. H.M., OTHERS) / HAZ MAT (CLASS, AMOUNT) / HEAT EQUIP. FUEL / SPECIAL USE / REVISED REPORT

1 | 0 | 5 010 | 11 19 91 | 1827 | 03 30 | 81 | 1 | 2 | 1 6064 | 0276 | 0562 | 01 239 | 13 08 16 | 00 | 000 | 1 | 3 | 0

AIDED AND CASUALTIES – CIVILIANS (EVACUATED, FIRST AID, INJURED, KILLED), UNIFORMED INJURED / EXTINGUISHMENT (CODE, SPK. PERF., STP. PERF.) / IGNITION (COND. ON ARRIVAL, EQUIP. INVOLVED, HEAT FORM, MATERIAL TYPE, MATERIAL FORM, FACTOR, JUVENILE, CONSTRUCT.) / STRUCTURE (USE, STATUS, COMPLEX, FLOOR CODE, OCCUPANCY) / FIRE ORIGIN (AREA OF ORIGIN) / FIRE EXTENSION IN BLDG (MANNER, OCCUPANCIES, NO. BLDGS.) / DAMAGE (% DAMAGED, FLAME, SMOKE, WATER) / DETECTORS (PRESENT, TYPE, POWER, PERFORMANCE) / FOR INVESTIGATION

99 | 02 | 02 | 00 | 00 | 6 2 2 | 3 41 233 | 61 | 53400 | 1 591 | 1 59 | 93 | 81 | 52 | 09 | 04 | 0 | 1 1 1 | 0 | 0 0 0 0

ADDRESS: BORO, NUMBER (INCL. HYPHEN), SUFFIX, PREFIX DIRECTION, STREET NAME, TYPE, SUFFIX DIRECT.

1 | 1 | World Trade Center

BUILDING: STORIES, AREA (WIDTH, LENGTH)

99 | 0250 | 0250

DEFECTIVE DETECTOR: BRAND, SERIAL NO.

NAME OF OCCUPANT: Port of N.Y. Authority

ROOM/APT. ____

LEFT IN CHARGE: Mr. Cancelliere, Bld. Mgr.

EQUIPMENT INVOLVED IN IGNITION: ITEM, YR., MAKE, MODEL, SERIAL NUMBER, POWER

BADGE NO.

W.R.I. UNIT, PTS.: 5 010 30 | 5 006 30 | 5 007 30 | 5 004 10 | 5 018 10

OPERATIONS

Cause for Alarm: ERS 1st alarm, transmitted from World Trade Center(WTC) Police Desk,

While responding: Monitored 10-84 by Eng. 10, and WTC Handie Talkie,

On arrival at WTC CP.:

1. Received report of fire in electrial closets, on possibly 4 floors,
2. Received reports of smoke condition on 4 floors,
3. Alarms had been transmitted from floors 93 to 98.
4. WTC Police Desk heavily engaged in receipt of phone inquiries relative to fire.

B.C. ____ BN. ONE

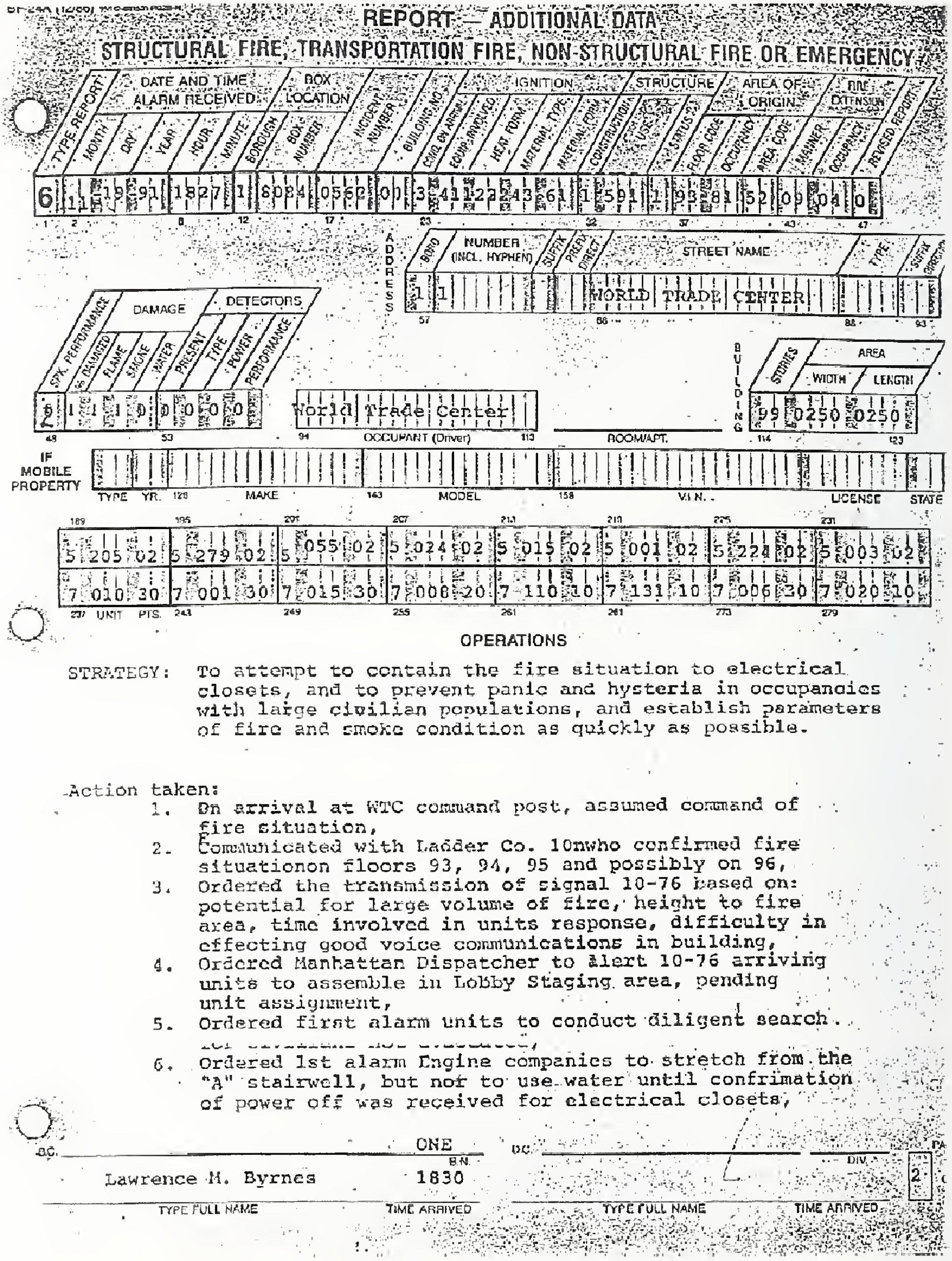
Lawrence M. Burnes (TYPE FULL NAME) — TIME OF ARRIVAL 1830

D.C. ____ DIV. ____

TYPE FULL NAME ____ TIME OF ARRIVAL ____

PAGE 1 OF 8

WHITE—FIRE RECORD YELLOW—BATTALION PINK—REFERRAL GOLD—ADMINISTRATIVE COMPANY



REPORT — ADDITIONAL DATA

STRUCTURAL FIRE, TRANSPORTATION FIRE, NON-STRUCTURAL FIRE OR EMERGENCY

TYPE REPORT / DATE AND TIME ALARM RECEIVED: MONTH, DAY, YEAR, HOUR, MINUTE / BOX LOCATION: BOROUGH, BOX NUMBER / INCIDENT NUMBER / BUILDING NO. / COND. ON ARRIVAL / IGNITION: EQUIP. INVOLVED, HEAT FORM, MATERIAL TYPE, MATERIAL FORM / STRUCTURE: CONSTRUCTION, USE, STATUS / AREA OF ORIGIN: FLOOR CODE, OCCUPANCY, AREA CODE / FIRE EXTENSION: MANNER, OCCUPANCY / REVISED REPORT

6 | 11 19 91 | 1827 | 1 | 6084 | 0562 | 01 | 3 41 12 22 43 61 | 1 59 1 | 1 93 81 52 | 09 04 | 0

1 · 2 · 8 · 12 · 17 · 23 · 32 · 37 · 43 · 47

ADDRESS: BORO 1 · NUMBER (INCL. HYPHEN) 1 · SUFFIX · PREFIX DIRECT · STREET NAME WORLD TRADE CENTER · TYPE · SUFFIX DIRECTION

57 · 66 · 88 · 93

SPK. PERFORMANCE · DAMAGE: % DAMAGED, FLAME, SMOKE, WATER · DETECTORS: PRESENT, TYPE, POWER, PERFORMANCE

5 | 1 1 1 0 | 0 0 0 0

48 · 53

World Trade Center

94 OCCUPANT (Driver) 113 · ROOM/APT.

BUILDING: STORIES 99 · AREA: WIDTH 0250 · LENGTH 0250

114 · 123

IF MOBILE PROPERTY: TYPE · YR. · 128 MAKE · 143 MODEL · 158 V.I.N. · LICENSE · STATE

189	195	201	207	213	219	225	231
5 205 02	5 279 02	5 055 02	5 024 02	5 015 02	5 001 02	5 224 02	5 003 02
7 010 30	7 001 30	7 015 30	7 008 20	7 110 10	7 131 10	7 006 30	7 020 10
237 UNIT PTS.	243	249	255	261	261	273	279

OPERATIONS

STRATEGY: To attempt to contain the fire situation to electrical closets, and to prevent panic and hysteria in occupancies with large civilian populations, and establish parameters of fire and smoke condition as quickly as possible.

Action taken:

1. On arrival at WTC command post, assumed command of fire situation,
2. Communicated with Ladder Co. 10nwho confirmed fire situationon floors 93, 94, 95 and possibly on 96,
3. Ordered the transmission of signal 10-76 based on: potential for large volume of fire, height to fire area, time involved in units response, difficulty in effecting good voice communications in building,
4. Ordered Manhattan Dispatcher to alert 10-76 arriving units to assemble in Lobby Staging area, pending unit assignment,
5. Ordered first alarm units to conduct diligent search. [illegible]
6. Ordered 1st alarm Engine companies to stretch from the "A" stairwell, but nor to use water until confrimation of power off was received for electrical closets,

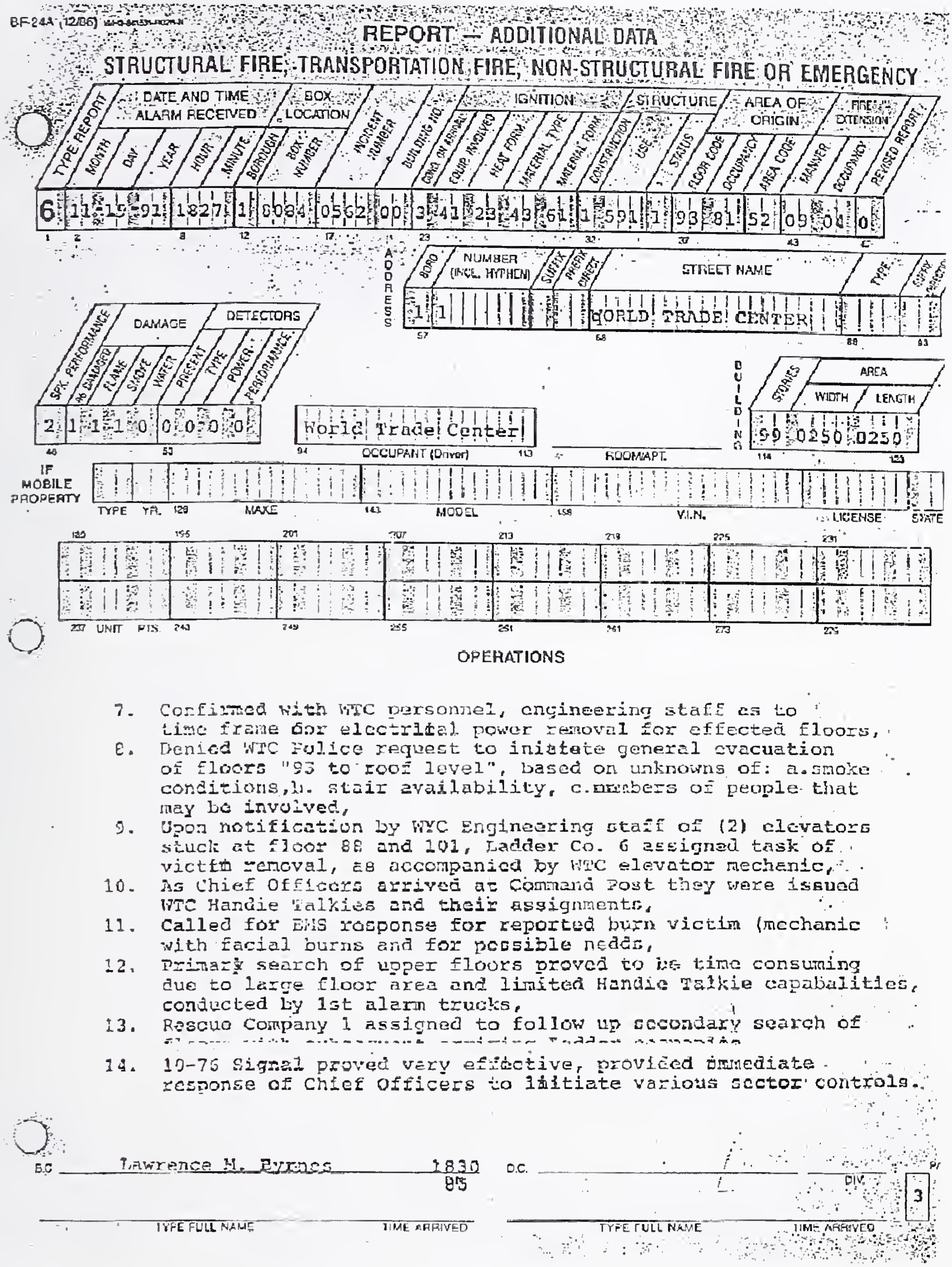
B.C. ONE · B.N.

Lawrence M. Byrnes · 1830

TYPE FULL NAME · TIME ARRIVED

D.C. · DIV. · PA 2

TYPE FULL NAME · TIME ARRIVED



BF-24A (12/86)

REPORT — ADDITIONAL DATA

STRUCTURAL FIRE, TRANSPORTATION FIRE, NON-STRUCTURAL FIRE OR EMERGENCY

TYPE REPORT	DATE AND TIME ALARM RECEIVED MONTH	DAY	YEAR	HOUR	MINUTE	BOX LOCATION BOROUGH	BOX NUMBER	INCIDENT NUMBER	BUILDING NO.	IGNITION COND. ON ARRIVAL	EQUIP. INVOLVED	HEAT FORM	MATERIAL TYPE	MATERIAL FORM	STRUCTURE CONSTRUCTION	USE	STATUS	AREA OF ORIGIN FLOOR CODE	OCCUPANCY	AREA CODE	FIRE EXTENSION MANNER	OCCUPANCY	REVISED REPORT
6	11	19	91	18	27	1	0084	0562	00	3	41	23	43	61	1	591	1	93	81	52	09	04	0

ADDRESS

BORO	NUMBER (INCL. HYPHEN)	SUFFIX	PREFIX DIRECT.	STREET NAME	TYPE	SUFFIX DIRECTION
1	1			WORLD TRADE CENTER		

SPK. PERFORMANCE	DAMAGE % DAMAGED	FLAME	SMOKE	WATER	DETECTORS PRESENT	TYPE	POWER	PERFORMANCE
2	1	1	1	0	0	0	0	0

OCCUPANT (Driver): World Trade Center

ROOM/APT.:

BUILDING

STORIES	AREA WIDTH	LENGTH
99	0250	0250

IF MOBILE PROPERTY

TYPE	YR.	MAKE	MODEL	V.I.N.	LICENSE	STATE

UNIT PTS.

OPERATIONS

7. Confirmed with WTC personnel, engineering staff as to time frame dor electrital power removal for effected floors,
8. Denied WTC Police request to iniatete general evacuation of floors "93 to roof level", based on unknowns of: a.smoke conditions,b. stair availability, c.mmbers of people that may be involved,
9. Upon notification by WYC Engineering staff of (2) elevators stuck at floor 88 and 101, Ladder Co. 6 assigned task of victim removal, as accompanied by WTC elevator mechanic,
10. As Chief Officers arrived at Command Post they were issued WTC Handie Talkies and their assignments,
11. Called for EMS response for reported burn victim (mechanic with facial burns and for possible nedds,
12. Primary search of upper floors proved to be time consuming due to large floor area and limited Handie Talkie capabalities, conducted by 1st alarm trucks,
13. Rescue Company 1 assigned to follow up secondary search of floors with subsequent arriving Ladder companies
14. 10-76 Signal proved very effective, provided immediate response of Chief Officers to initiate various sector controls.

B.C. Lawrence M. Byrnes 1830
85

TYPE FULL NAME TIME ARRIVED

D.C.

TYPE FULL NAME TIME ARRIVED

DIV. 3

BF-24A (12/86)

REPORT — ADDITIONAL DATA

STRUCTURAL FIRE, TRANSPORTATION FIRE, NON-STRUCTURAL FIRE OR EMERGENCY

	DATE AND TIME ALARM RECEIVED					BOX LOCATION				IGNITION					STRUCTURE			AREA OF ORIGIN			FIRE EXTENSION		
TYPE REPORT	MONTH	DAY	YEAR	HOUR	MINUTE	BOROUGH	BOX NUMBER	INCIDENT NUMBER	BUILDING NO.	COND. ON ARRIVAL	EQUIP. INVOLVED	HEAT FORM	MATERIAL TYPE	MATERIAL FORM	CONSTRUCTION	USE	STATUS	FLOOR CODE	OCCUPANCY	AREA CODE	MANNER	OCCUPANCY	REVISED REPORT
6	11	19	91	18	27	1	2084	0562	00	3	41	23	43	61	1	591	1	93	81	52	09	04	0
1	2			8		12		17		23					32			37			43		47

ADDRESS

BORO	NUMBER (INCL. HYPHEN)	SUFFIX	PREFIX DIRECT	STREET NAME	TYPE	SUFFIX DIRECTION
1	1			WORLD TRADE CENTER		
57				68	88	93

	DAMAGE				DETECTORS			
SPK. PERFORMANCE	% DAMAGED	FLAME	SMOKE	WATER	PRESENT	TYPE	POWER	PERFORMANCE
2	1	1	1	0	0	0	0	0
48					53			

94 World Trade Center 113
OCCUPANT (Driver)

ROOM/APT.

BUILDING

STORIES	AREA	
	WIDTH	LENGTH
99 ~~00~~	0250	0250
114		123

IF MOBILE PROPERTY

TYPE YR. 128 MAKE 143 MODEL 158 V.I.N. LICENSE STATE

189 195 201 207 213 219 225 231

237 UNIT PTS. 243 249 255 261 261 273 279

OPERATIONS

Chief Officers at scene:

DAC. E. Butler,,,	CW Duty,
DC. H. Meyers	Div. 1,
DC. V. Dunn	Div. 3,
B.C. L. Byrnes	Batt. ONE,
B.C. R. Ardisson	Batt. 2
B.C, Davison	Batt. 4,
B.C. Roche	Batt. 6,
B.C. Shelley	Batt. 31,
B.C. Wagner	Batt. 32,
B.C. Dawe	Batt. 7,
B.C. Cesark	Safety Battalion.

Personnel Present at Scene:

R. Schhirer	Fire Comm. Laison,
D.C. Basile	EMS Supervisor,
P.O. Jim #1210	WTC Police [illegible]
Lt. Valle	NYPD Pct. 1 supervisor,
Mr. T. Cancelliere	WTC Bldg Mgr.,

(2) Representatiive of Salvation Army.

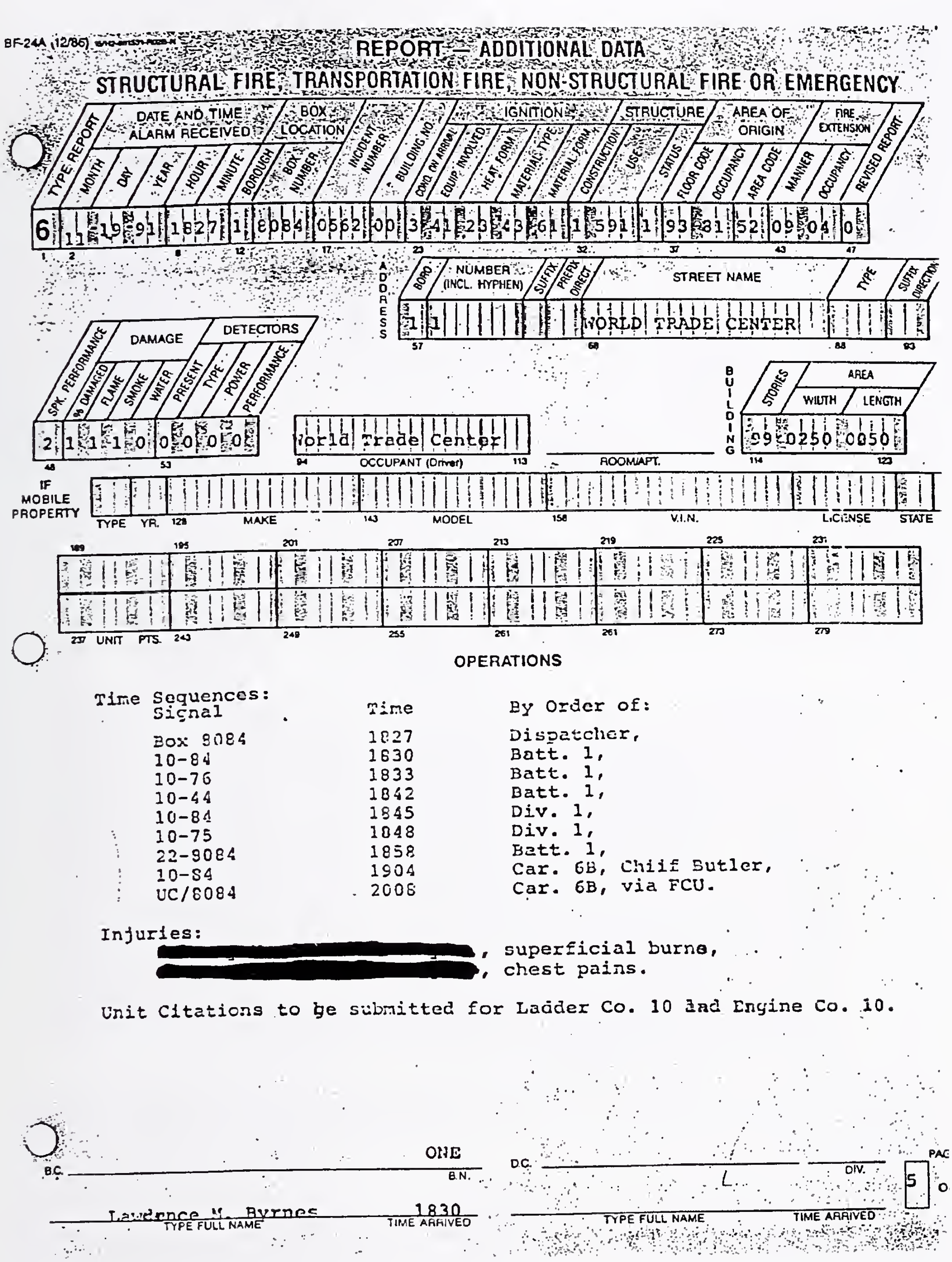
B.C. ____________ ONE
B.N.

D.C. ____________ DIV.

4

Lawrence M. Byrnes — TYPE FULL NAME
1830 — TIME ARRIVED

TYPE FULL NAME
TIME ARRIVED



BF-24A (12/86)

REPORT — ADDITIONAL DATA

STRUCTURAL FIRE, TRANSPORTATION FIRE, NON-STRUCTURAL FIRE OR EMERGENCY

TYPE REPORT	DATE AND TIME ALARM RECEIVED: MONTH	DAY	YEAR	HOUR	MINUTE	BOX LOCATION: BOROUGH	BOX NUMBER	INCIDENT NUMBER	BUILDING NO.	IGNITION: COND. ON ARRIVAL	EQUIP. INVOLVED	HEAT FORM	MATERIAL TYPE	MATERIAL FORM	STRUCTURE: CONSTRUCTION	USE	STATUS	AREA OF ORIGIN: FLOOR CODE	OCCUPANCY	AREA CODE	FIRE EXTENSION: MANNER	OCCUPANCY	REVISED REPORT
6	11	19	91	18	27	1	8084	0562	00	3	41	23	43	61	1	591	1	93	81	52	09	04	0

ADDRESS

BORO	NUMBER (INCL. HYPHEN)	SUFFIX	PREFIX DIRECT.	STREET NAME	TYPE	SUFFIX DIRECTION
1	1			WORLD TRADE CENTER		

SPK. PERFORMANCE	DAMAGE: % DAMAGED	FLAME	SMOKE	WATER	DETECTORS: PRESENT	TYPE	POWER	PERFORMANCE
2	1	1	1	0	0	0	0	0

OCCUPANT (Driver): World Trade Center

ROOM/APT.:

BUILDING

STORIES	AREA: WIDTH	LENGTH
99	0250	0050

IF MOBILE PROPERTY: TYPE | YR. | MAKE | MODEL | V.I.N. | LICENSE | STATE

UNIT | PTS.

OPERATIONS

Time Sequences: Signal	Time	By Order of:
Box 8084	1827	Dispatcher,
10-84	1830	Batt. 1,
10-76	1833	Batt. 1,
10-44	1842	Batt. 1,
10-84	1845	Div. 1,
10-75	1848	Div. 1,
22-8084	1858	Batt. 1,
10-84	1904	Car. 6B, Chiif Butler,
UC/8084	2008	Car. 6B, via FCU.

Injuries:
[redacted], superficial burns,
[redacted], chest pains.

Unit Citations to be submitted for Ladder Co. 10 and Engine Co. 10.

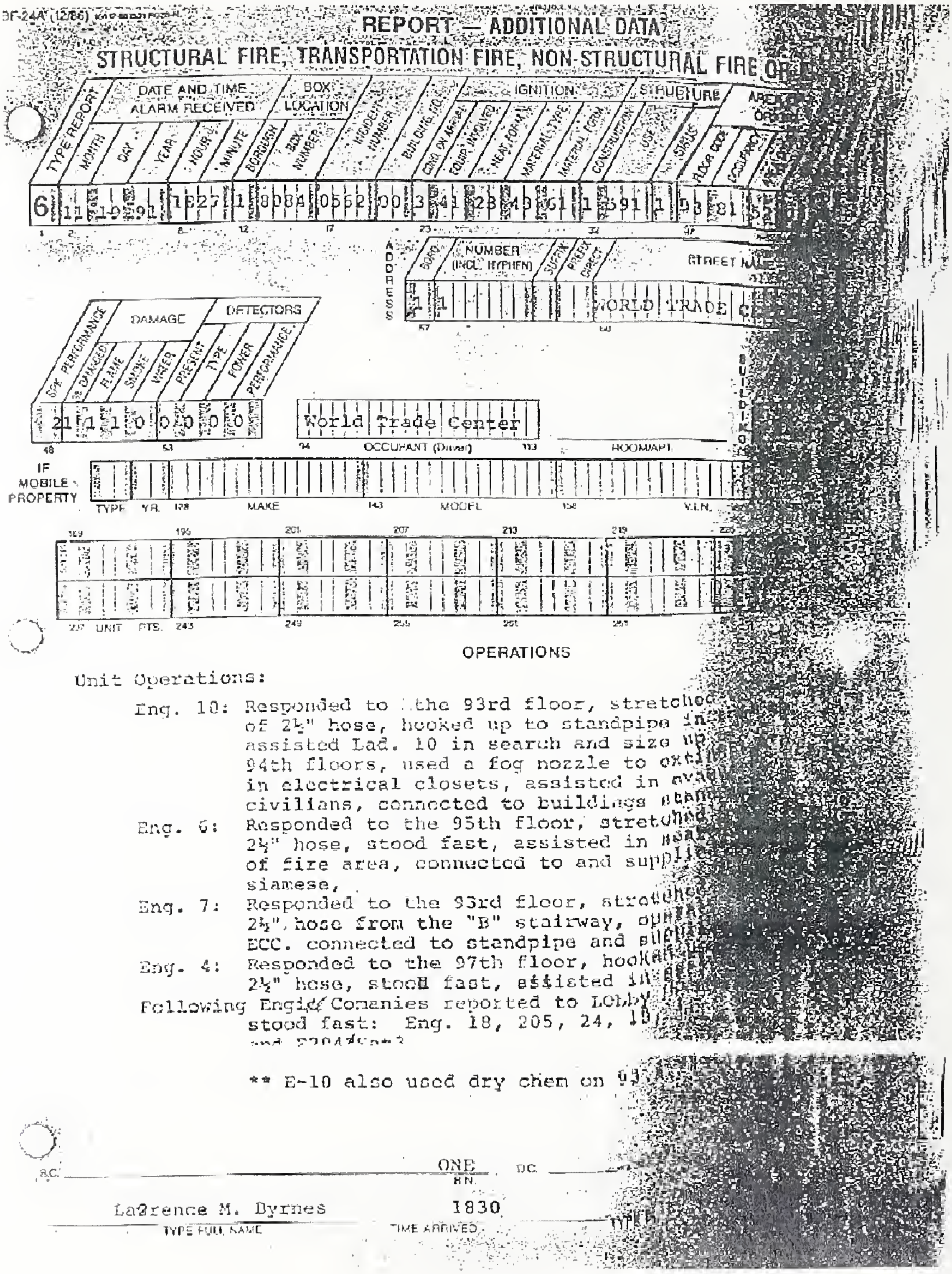
B.C. ______ ONE B.N.

Lawrence M. Byrnes TYPE FULL NAME 1830 TIME ARRIVED

DC. ______ DIV.

TYPE FULL NAME ______ TIME ARRIVED

PAG 5 O



BF-24A (12/86)

REPORT — ADDITIONAL DATA

STRUCTURAL FIRE, TRANSPORTATION FIRE, NON-STRUCTURAL FIRE OR

TYPE REPORT | DATE AND TIME ALARM RECEIVED: MONTH, DAY, YEAR, HOUR, MINUTE | BOX LOCATION: BOROUGH, BOX NUMBER | INCIDENT NUMBER | BUILDING CODE | IGNITION: CONS. OR AERIAL, EQUIP. INVOLVED, HEAT FORM, MATERIAL TYPE, MATERIAL FORM | STRUCTURE: CONSTRUCTION, USE, STATUS, FLOOR CODE, OCCUPANCY | AREA OF ORIGIN

6 11 19 91 18 27 1 0084 0552 00 3 41 23 43 61 1 391 1 53 81 55

ADDRESS: BORO, NUMBER (INCL. HYPHEN), SUFFIX, PREFIX DIRECT., STREET NAME

1 1 WORLD TRADE C

SPK PERFORMANCE	DAMAGE: DAMAGED	FLAME	SMOKE	WATER	DETECTORS: PRESENT	TYPE	POWER	PERFORMANCE
2	1	1	1	0	0	0	0	0

OCCUPANT (Owner): World Trade Center

ROOM/APT.

IF MOBILE PROPERTY: TYPE, YR., MAKE, MODEL, V.I.N.

UNIT, PTS.

OPERATIONS

Unit Operations:

Eng. 10: Responded to the 93rd floor, stretched of 2½" hose, hooked up to standpipe in assisted Lad. 10 in search and size up 94th floors, used a fog nozzle to ext in electrical closets, assisted in eva civilians, connected to buildings stan

Eng. 6: Responded to the 95th floor, stretched 2½" hose, stood fast, assisted in sea of fire area, connected to and suppli siamese,

Eng. 7: Responded to the 93rd floor, stretche 2½" hose from the "B" stairway, ope ECC. connected to standpipe and su

Eng. 4: Responded to the 97th floor, hook 2½" hose, stood fast, assisted in

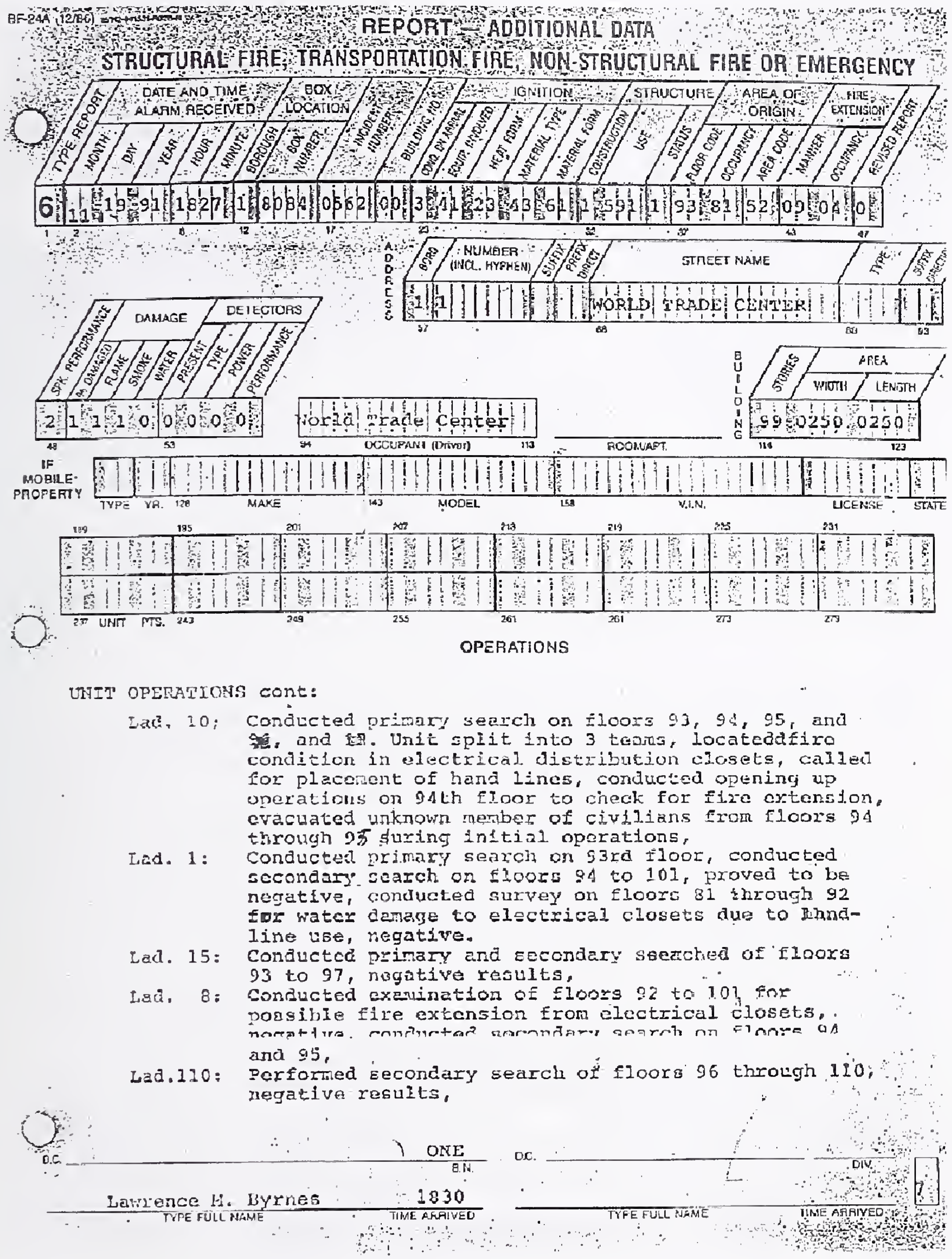
Following Engi~~d~~ Comanies reported to LOBBY stood fast: Eng. 18, 205, 24, 1 and [illegible]

** E-10 also used dry chem on 93

B.C.
ONE
BN.
DC.

La?rence M. Byrnes
TYPE FULL NAME

1830
TIME ARRIVED



BF-24A (12/86)

REPORT — ADDITIONAL DATA

STRUCTURAL FIRE, TRANSPORTATION FIRE, NON-STRUCTURAL FIRE OR EMERGENCY

TYPE REPORT	DATE AND TIME ALARM RECEIVED: MONTH	DAY	YEAR	HOUR	MINUTE	BOX LOCATION: BOROUGH	BOX NUMBER	INCIDENT NUMBER	BUILDING NO.	IGNITION: COND. ON ARRIVAL	EQUIP. INVOLVED	HEAT FORM	MATERIAL TYPE	MATERIAL FORM	STRUCTURE: CONSTRUCTION	USE	STATUS	AREA OF ORIGIN: FLOOR CODE	OCCUPANCY	AREA CODE	FIRE EXTENSION: MANNER	OCCUPANCY	REVISED REPORT
6	11	19	91	18	27	1	8084	0562	00	3	41	23	43	61	1	591	1	93	81	52	09	04	0

1 2 6 12 17 23 32 37 43 47

ADDRESS

BORO	NUMBER (INCL. HYPHEN)	SUFFIX	PREFIX DIRECT.	STREET NAME	TYPE	SUFFIX DIRECTION
1	1			WORLD TRADE CENTER		

57 68 88 93

SPK. PERFORMANCE	DAMAGE: % DAMAGED	FLAME	SMOKE	WATER	DETECTORS: PRESENT	TYPE	POWER	PERFORMANCE
2	1	1	1	0	0	0	0	0

48 53

OCCUPANT (Driver): World Trade Center

94 113

ROOM/APT.

BUILDING

STORIES	AREA: WIDTH	LENGTH
99	0250	0250

114 123

IF MOBILE PROPERTY: TYPE YR. 128 MAKE 143 MODEL 158 V.I.N. LICENSE STATE

189 195 201 207 213 219 225 231

237 UNIT PTS. 243 249 255 261 261 273 279

OPERATIONS

UNIT OPERATIONS cont:

Lad. 10; Conducted primary search on floors 93, 94, 95, and [illegible], and [illegible]. Unit split into 3 teams, locateddfire condition in electrical distribution closets, called for placement of hand lines, conducted opening up operations on 94th floor to check for fire extension, evacuated unknown member of civilians from floors 94 through 95 during initial operations,

Lad. 1: Conducted primary search on 93rd floor, conducted secondary search on floors 94 to 101, proved to be negative, conducted survey on floors 81 through 92 for water damage to electrical closets due to hand-line use, negative.

Lad. 15: Conducted primary and secondary seazched of floors 93 to 97, negative results,

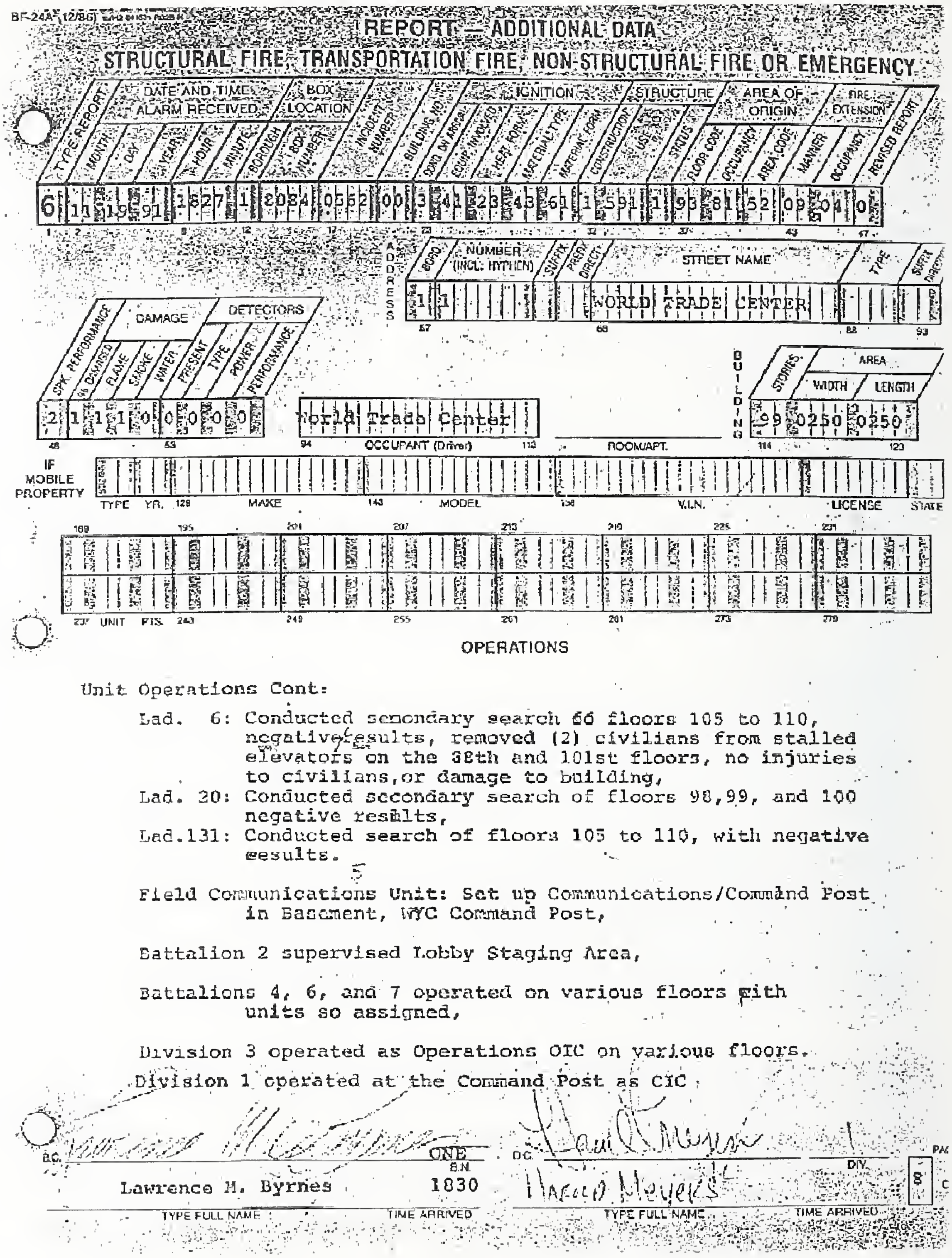
Lad. 8: Conducted examination of floors 92 to 101 for possible fire extension from electrical closets, negative, conducted secondary search on floors 94 and 95,

Lad.110: Performed secondary search of floors 96 through 110, negative results,

D.C. ONE B.N. D.C. DIV. 7

Lawrence H. Byrnes — TYPE FULL NAME — 1830 TIME ARRIVED

TYPE FULL NAME — TIME ARRIVED



BF-24A (12/86)

REPORT — ADDITIONAL DATA

STRUCTURAL FIRE, TRANSPORTATION FIRE, NON-STRUCTURAL FIRE OR EMERGENCY

TYPE REPORT	DATE AND TIME ALARM RECEIVED: MONTH	DAY	YEAR	HOUR	MINUTE	BOX LOCATION: BOROUGH	BOX NUMBER	INCIDENT NUMBER	BUILDING NO.
6	11	19	91	18	27	1	2084	0552	00

IGNITION: COND. ON ARRIVAL / EQUIP. INVOLVED / HEAT FORM / MATERIAL TYPE / MATERIAL FORM	STRUCTURE: CONSTRUCTION / USE / STATUS	AREA OF ORIGIN: FLOOR CODE / OCCUPANCY / AREA CODE	FIRE EXTENSION: MANNER / OCCUPANCY	REVISED REPORT
3 41 23 43 61	1 59 1	1 93 81 52	09 04	0

ADDRESS

BORO	NUMBER (INCL. HYPHEN)	SUFFIX	PREFIX DIRECT.	STREET NAME	TYPE	SUFFIX DIRECT.
1	1			WORLD TRADE CENTER		

SPK. PERFORMANCE	DAMAGE: % DAMAGED	FLAME	SMOKE	WATER	DETECTORS: PRESENT	TYPE	POWER	PERFORMANCE
2	1	1	1	0	0	0	0	0

OCCUPANT (Driver): World Trade Center

ROOM/APT.:

BUILDING: STORIES	AREA: WIDTH	LENGTH
9	0250	0250

IF MOBILE PROPERTY: TYPE YR. MAKE MODEL V.I.N. LICENSE STATE

UNIT FIS.

OPERATIONS

Unit Operations Cont:

Lad. 6: Conducted secondary search 66 floors 105 to 110, negative results, removed (2) civilians from stalled elevators on the 38th and 101st floors, no injuries to civilians, or damage to building,

Lad. 20: Conducted secondary search of floors 98,99, and 100 negative results,

Lad.131: Conducted search of floors 105 to 110, with negative eesults.

5

Field Communications Unit: Set up Communications/Command Post in Basement, WTC Command Post,

Battalion 2 supervised Lobby Staging Area,

Battalions 4, 6, and 7 operated on various floors with units so assigned,

Division 3 operated as Operations OIC on various floors.

Division 1 operated at the Command Post as CIC

B.C. ONE B.N.

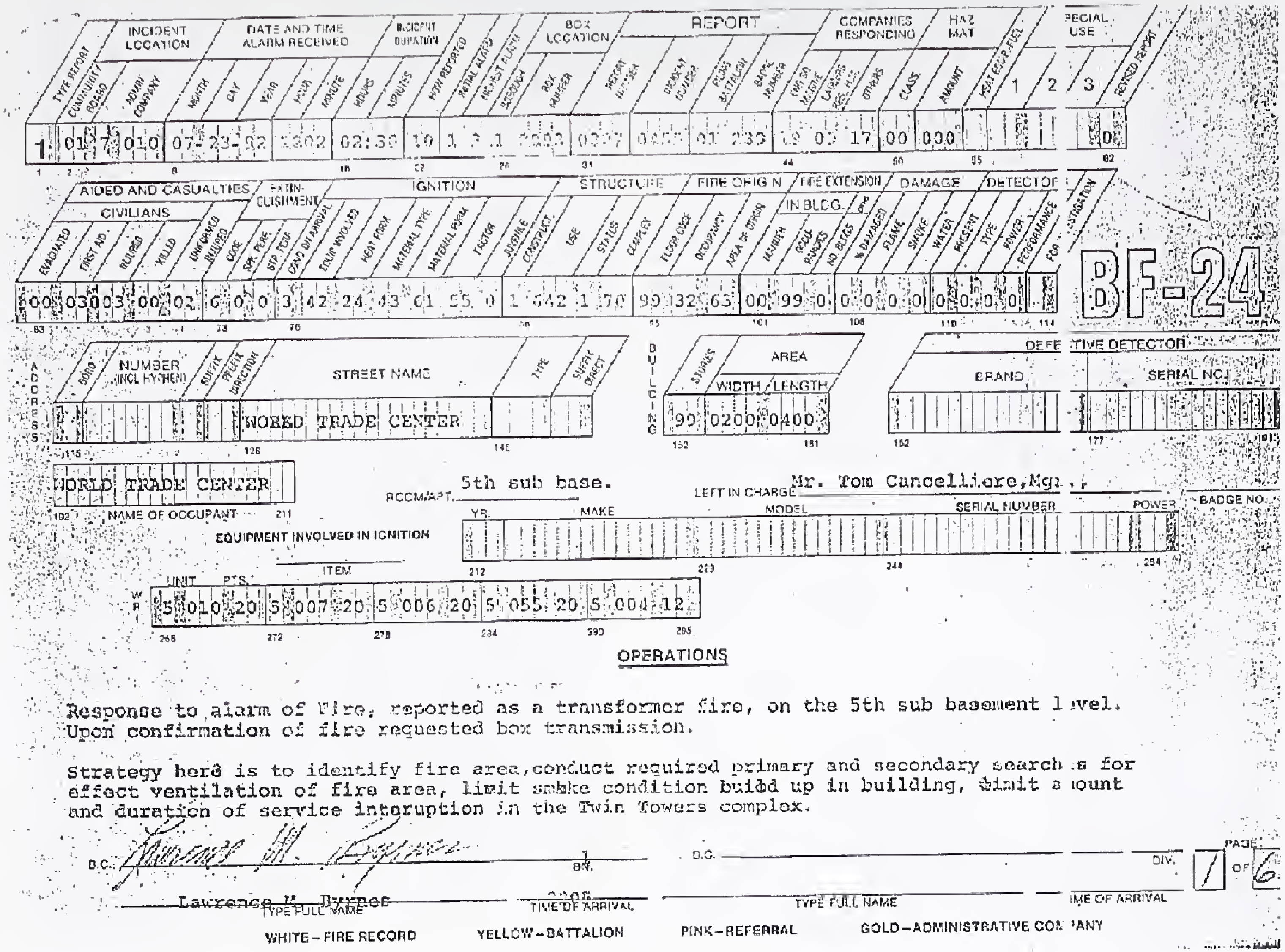
Lawrence M. Byrnes — TYPE FULL NAME

1830 — TIME ARRIVED

D.C. DIV. 8

Harold Meyers — TYPE FULL NAME

TIME ARRIVED



BF-24

TYPE REPORT	INCIDENT LOCATION (COMMUNITY BOARD / ADMIN COMPANY)	DATE AND TIME ALARM RECEIVED (MONTH / DAY / YEAR / HOUR / MINUTE)	INCIDENT DURATION (HOURS / MINUTES)	HOW REPORTED	INITIAL ALARM / HIGHEST ALARM / BOROUGH	BOX LOCATION (BOX NUMBER)	REPORT (REPORT NUMBER / DEPUTY DIVISION / PLUS BATTALION / BADGE NUMBER)	COMPANIES RESPONDING (ENG. / LADDERS / OTHERS)	HAZ MAT (CLASS / AMOUNT)	HEAT EQUIP. FUEL	SPECIAL USE 1 / 2 / 3	REVISED REPORT
1	01 7 010	07-23-92 2302	02:30	10	1 3 1 [illegible]	0227	0455 01 230	[illegible] 05 17	00 000			0

AIDED AND CASUALTIES — CIVILIANS (EVACUATED / FIRST AID / INJURED / KILLED / UNIFORMED INJURED)	EXTINGUISHMENT (CODE / SPR. PERF. / STP. TEST / COND ON ARRIVAL)	IGNITION (EQUIP. INVOLVED / HEAT FORM / MATERIAL TYPE / MATERIAL FORM / FACTOR / JUVENILE)	STRUCTURE (CONSTRUCT. / USE / STATUS / COMPLEX)	FIRE ORIGIN (FLOOR CODE / OCCUPANCY / AREA OF ORIGIN)	FIRE EXTENSION IN BLDG. (MANNER / OCCUPANTS / NO. BLDGS)	DAMAGE (% DAMAGED / FLAME / SMOKE / WATER)	DETECTOR (PRESENT / TYPE / POWER / PERFORMANCE)	FOR INVESTIGATION
00 03 003 00 02	6 0 0 3	42 24 43 01 55 0	1 642 1 70	99 132 63	00 99 0	0 0 0 0	0 0 0 0	

ADDRESS: BORO	NUMBER (INCL HYPHEN)	SUFFIX	PREFIX DIRECTION	STREET NAME	TYPE	SUFFIX DIRECT
				WORLD TRADE CENTER		

BUILDING: STORIES	AREA WIDTH	AREA LENGTH
99	0200	0400

DEFECTIVE DETECTOR: BRAND ______ SERIAL NO. ______

NAME OF OCCUPANT: WORLD TRADE CENTER

ROOM/APT. 5th sub base.

LEFT IN CHARGE Mr. Tom Cancelliere,Mgr.

EQUIPMENT INVOLVED IN IGNITION: ITEM ______ YR. ______ MAKE ______ MODEL ______ SERIAL NUMBER ______ POWER ______ BADGE NO. ______

W R	UNIT	PTS.	UNIT	PTS.	UNIT	PTS.	UNIT	PTS.	UNIT	PTS.
	5 010	20	5 007	20	5 006	20	5 055	20	5 004	12

OPERATIONS

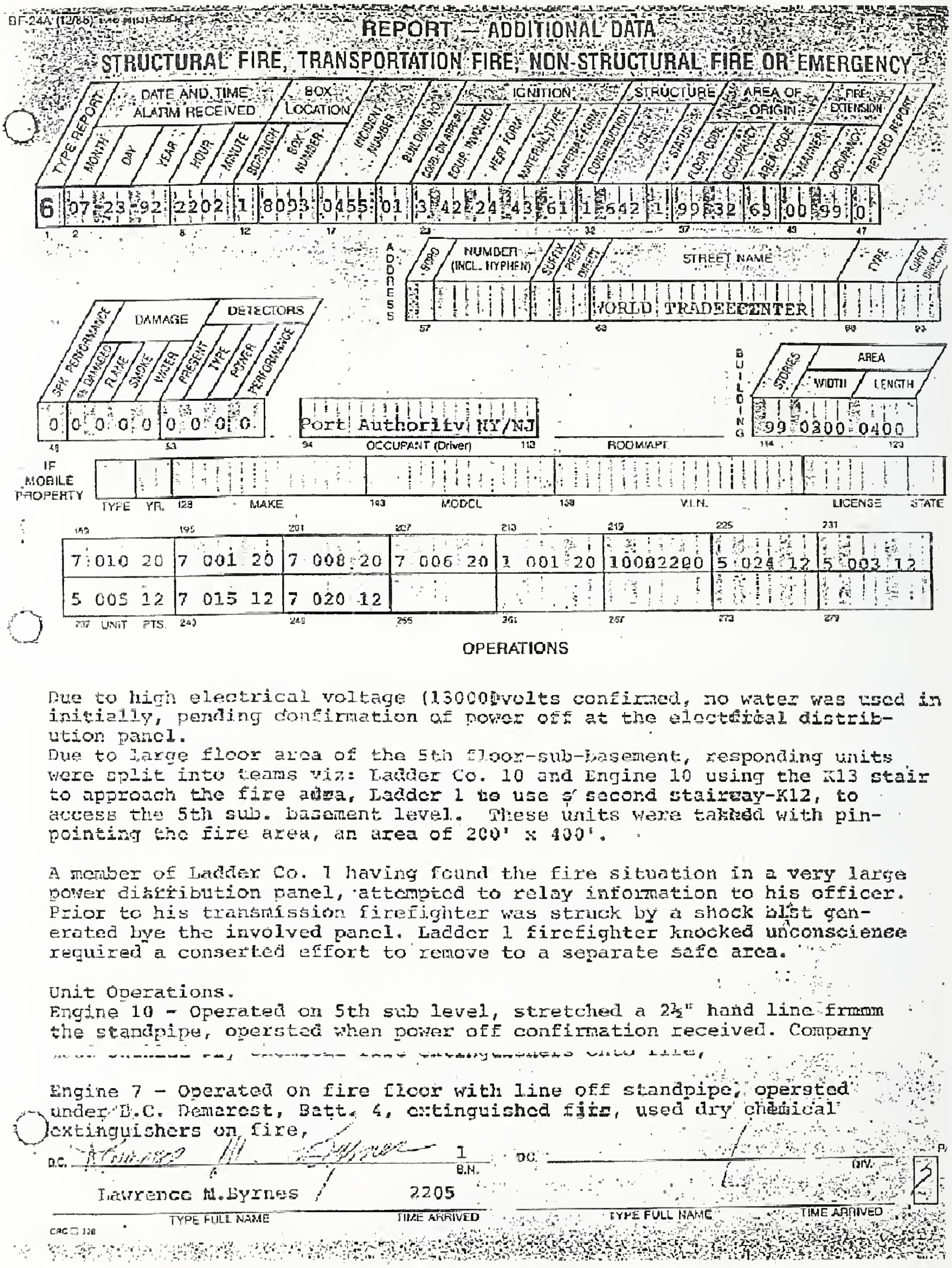
Response to alarm of Fire, reported as a transformer fire, on the 5th sub basement level. Upon confirmation of fire requested box transmission.

Strategy here is to identify fire area, conduct required primary and secondary searches for effect ventilation of fire area, limit smoke condition build up in building, limit amount and duration of service interuption in the Twin Towers complex.

B.C. Lawrence M. Byrnes BN. 1 D.C. ______ DIV. ______ PAGE 1 OF 6

Lawrence M. Byrnes (TYPE FULL NAME) 0105 (TIME OF ARRIVAL) ______ (TYPE FULL NAME) ______ (TIME OF ARRIVAL)

WHITE – FIRE RECORD YELLOW – BATTALION PINK – REFERRAL GOLD – ADMINISTRATIVE COMPANY



BF-24A (12/86)

REPORT — ADDITIONAL DATA

STRUCTURAL FIRE, TRANSPORTATION FIRE, NON-STRUCTURAL FIRE OR EMERGENCY

TYPE REPORT	DATE AND TIME ALARM RECEIVED					BOX LOCATION		INCIDENT NUMBER	BUILDING NO.	IGNITION					STRUCTURE			AREA OF ORIGIN			FIRE EXTENSION		REVISED REPORT
	MONTH	DAY	YEAR	HOUR	MINUTE	BOROUGH	BOX NUMBER			COND. ON ARRIVAL	EQUIP. INVOLVED	HEAT FORM	MATERIAL TYPE	MATERIAL FORM	CONSTRUCTION	USE	STATUS	FLOOR CODE	OCCUPANCY	AREA CODE	MANNER	OCCUPANCY	
6	07	23	92	22	02	1	8093	0455	01	3	42	24	43	61	1	642	1	99	32	63	00	99	0

1 2 8 12 17 23 32 37 43 47

ADDRESS

BORO	NUMBER (INCL. HYPHEN)	SUFFIX	PREFIX DIRECT.	STREET NAME	TYPE	SUFFIX DIRECTION
				WORLD TRADEEECENTER		

57 63 89 93

SPK. PERFORMANCE	DAMAGE				DETECTORS			
	% DAMAGED	FLAME	SMOKE	WATER	PRESENT	TYPE	POWER	PERFORMANCE
0	0	0	0	0	0	0	0	0

48 53

OCCUPANT (Driver): Port Authority NY/NJ

94 113

ROOM/APT.

BUILDING

STORIES	AREA	
	WIDTH	LENGTH
99	0300	0400

114 123

IF MOBILE PROPERTY

TYPE	YR.	MAKE	MODEL	V.I.N.	LICENSE	STATE

129 143 158

189	195	201	207	213	219	225	231
7 010 20	7 001 20	7 008 20	7 006 20	1 001 20	10082200	5 024 12	5 003 12
5 005 12	7 015 12	7 020 12					
237 UNIT PTS.	240	249	255	261	267	273	279

OPERATIONS

Due to high electrical voltage (13000@volts confirmed, no water was used in initially, pending donfirmation of power off at the electdrical distribution panel.
Due to large floor area of the 5th floor-sub-basement, responding units were split into teams viz: Ladder Co. 10 and Engine 10 using the K13 stair to approach the fire adea, Ladder 1 to use s' second stairway-K12, to access the 5th sub. basement level. These units were takked with pin-pointing the fire area, an area of 200' x 400'.

A member of Ladder Co. 1 having found the fire situation in a very large power diffribution panel, attempted to relay information to his officer. Prior to his transmission firefighter was struck by a shock blst generated bye the involved panel. Ladder 1 firefighter knocked unconscience required a conserted effort to remove to a separate safe area.

Unit Operations.
Engine 10 - Operated on 5th sub level, stretched a 2½" hand line frmmm the standpipe, opersted when power off confirmation received. Company
[illegible]

Engine 7 - Operated on fire floor with line off standpipe, opersted under B.C. Demarest, Batt. 4, extinguished fire, used dry chemical extinguishers on fire,

D.C.   1 B.N.   DC   DIV.

Lawrence M.Byrnes 2205

TYPE FULL NAME   TIME ARRIVED   TYPE FULL NAME   TIME ARRIVED

CRC ☐ 128

BF-24A (12/86)

REPORT — ADDITIONAL DATA

STRUCTURAL FIRE, TRANSPORTATION FIRE, NON-STRUCTURAL FIRE OR EMERGENCY

TYPE REPORT	DATE AND TIME ALARM RECEIVED					BOX LOCATION		INCIDENT NUMBER	BUILDING NO.	IGNITION					STRUCTURE			AREA OF ORIGIN			FIRE EXTENSION		REVISED REPORT	
	MONTH	DAY	YEAR	HOUR	MINUTE	BOROUGH	BOX NUMBER			COND. ON ARRIVAL	EQUIP. INVOLVED	HEAT-FORM	MATERIAL TYPE	MATERIAL FORM	CONSTRUCTION	USE	STATUS	FLOOR CODE	OCCUPANCY	AREA CODE	MANNER	OCCUPANCY		
6	07	23	92	22	02	1	8093	0455	01	3	42	24	43	61	1	642	b1	99	32	63	00	99	0	
1	2			8		12		17		23					32			37		43			47	

ADDRESS	BORO	NUMBER (INCL. HYPHEN)	SUFFIX	PREFIX DIRECT	STREET NAME	TYPE	SUFFIX DIRECTION
					WORLD TRADE CENTER		
	57				68	88	93

	DAMAGE				DETECTORS			
SPK. PERFORMANCE	% DAMAGED	FLAME	SMOKE	WATER	PRESENT	TYPE	POWER	PERFORMANCE
0	0	0	0	0	0	0	0	0
48					53			

OCCUPANT (Driver) (94–113): Poet Authority NY/NJ

ROOM/APT.: 5th sub. base.

BUILDING	STORIES	AREA	
		WIDTH	LENGTH
	99	0200	0400
	114		123

IF MOBILE PROPERTY: TYPE YR. 128 MAKE 143 MODEL 158 V.I.N. LICENSE STATE

189 195 201 207 213 219 225 231

237 UNIT PTS. 243 249 255 261 267 273 279

OPERATIONS

Operation cont:
Engine 6 - Assisted Eng 7 in stretch of and operation of a 2½" line into fire area, performed search of area, overhauled as neceesary,

Engine 55 - Operated with and relieved Eng. 7 on hand line on fire floor, took up hose lines,

Engine 4 - Under supervision of BC. Turnee,B2, transported injured member of Lad. 1 to ambulance on the B1 level of the fire building,relieved Eng. 10 on a hand line, oberhauled, took up hand line,

Engine 24 - Transported Air Cylindees fire area under supervision of BC. Jackson,

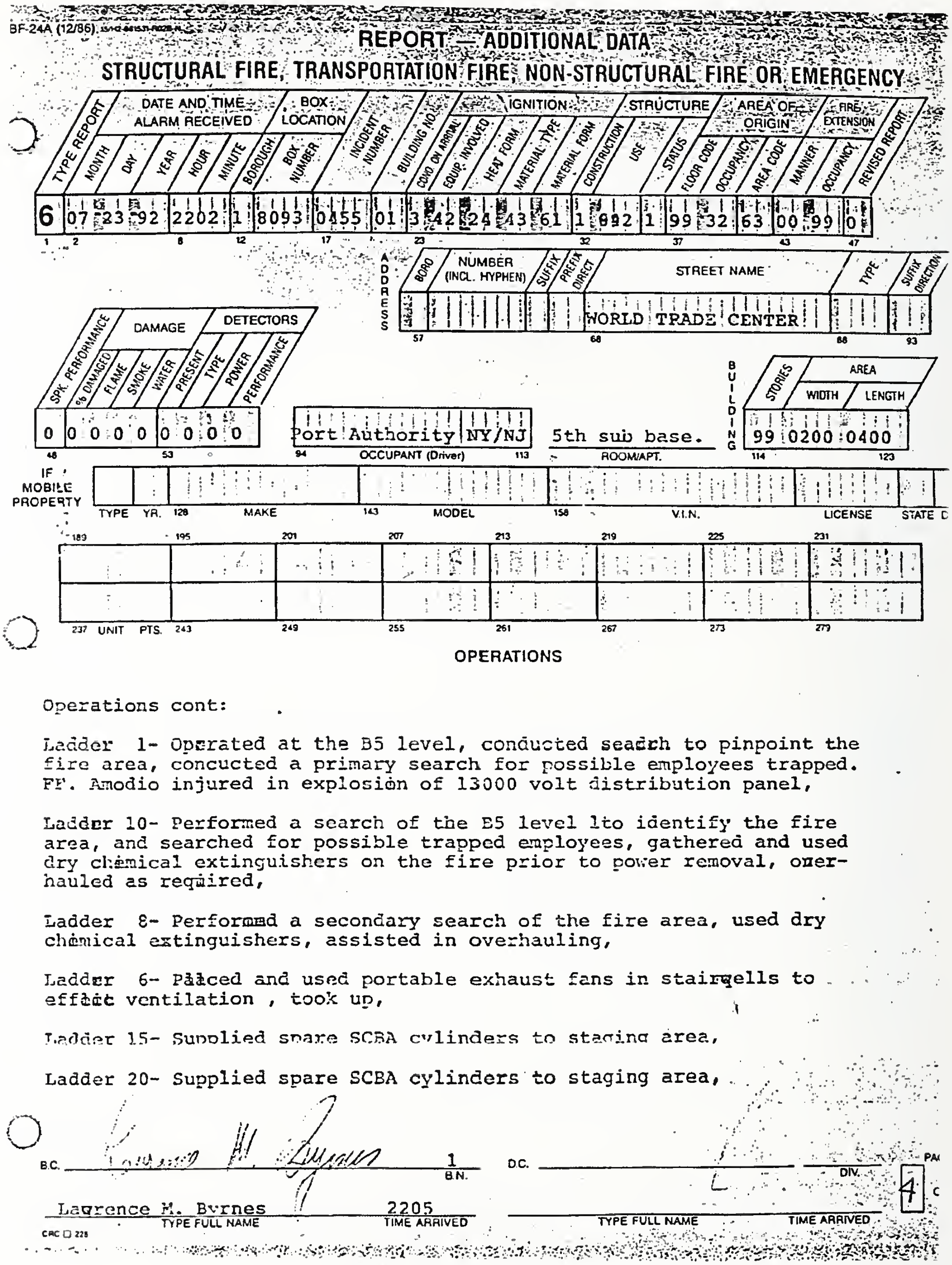
Engine 3 - Ordered to and did provide air cylingers to operating units of the B5 level.
Engin
Engine 5 - Operated as Command Post Company

Stood Fast - Eng9Sat1, Engines 15, 28. 33, 34, 207/Maxi, 284/Sat.3,

B.C. 1   1 B.N.   D.C.   DIV. 3

Lawrence M. Byrnes   2205

TYPE FULL NAME   TIME ARRIVED   TYPE FULL NAME   TIME ARRIVED



BF-24A (12/86)

REPORT — ADDITIONAL DATA

STRUCTURAL FIRE, TRANSPORTATION FIRE, NON-STRUCTURAL FIRE OR EMERGENCY

TYPE REPORT	DATE AND TIME ALARM RECEIVED: MONTH DAY YEAR	HOUR MINUTE	BOX LOCATION: BOROUGH	BOX NUMBER	INCIDENT NUMBER	BUILDING NO.	IGNITION: COND. ON ARRIVAL, EQUIP. INVOLVED, HEAT FORM, MATERIAL TYPE, MATERIAL FORM	STRUCTURE: CONSTRUCTION, USE	STATUS	AREA OF ORIGIN: FLOOR CODE, OCCUPANCY	AREA CODE	FIRE EXTENSION: MANNER, OCCUPANCY	REVISED REPORT
6	07 23 92	2202	1	8093	0455	01	3 42 24 43 61	1 892	1	99 32	63	00 99	0
1	2	8	12		17		23	32		37		43	47

ADDRESS

BORO	NUMBER (INCL. HYPHEN)	SUFFIX	PREFIX DIRECT	STREET NAME	TYPE	SUFFIX DIRECTION
				WORLD TRADE CENTER		
57				68	88	93

SPK. PERFORMANCE	DAMAGE: % DAMAGED, FLAME, SMOKE, WATER	DETECTORS: PRESENT, TYPE, POWER, PERFORMANCE
0	0 0 0 0	0 0 0 0
48		53

OCCUPANT (Driver)		ROOM/APT.
Port Authority	NY/NJ	5th sub base.
94	113	

BUILDING

STORIES	AREA: WIDTH	AREA: LENGTH
99	0200	0400
114		123

IF MOBILE PROPERTY

TYPE	YR.	MAKE	MODEL	V.I.N.	LICENSE	STATE
		128	143	158		

189	195	201	207	213	219	225	231
237 UNIT PTS.	243	249	255	261	267	273	279

OPERATIONS

Operations cont:

Ladder 1- Oprrated at the B5 level, conducted seadrh to pinpoint the fire area, concucted a primary search for possible employees trapped. FF. Amodio injured in explosion of 13000 volt distribution panel,

Laddrr 10- Performed a search of the B5 level lto identify the fire area, and searched for possible trapped employees, gathered and used dry chemical extinguishers on the fire prior to power removal, oner-hauled as reqüired,

Ladder 8- Performmd a secondary search of the fire area, used dry chemical extinguishers, assisted in overhauling,

Laddrr 6- Pääced and used portable exhaust fans in stairqells to effëct ventilation , took up,

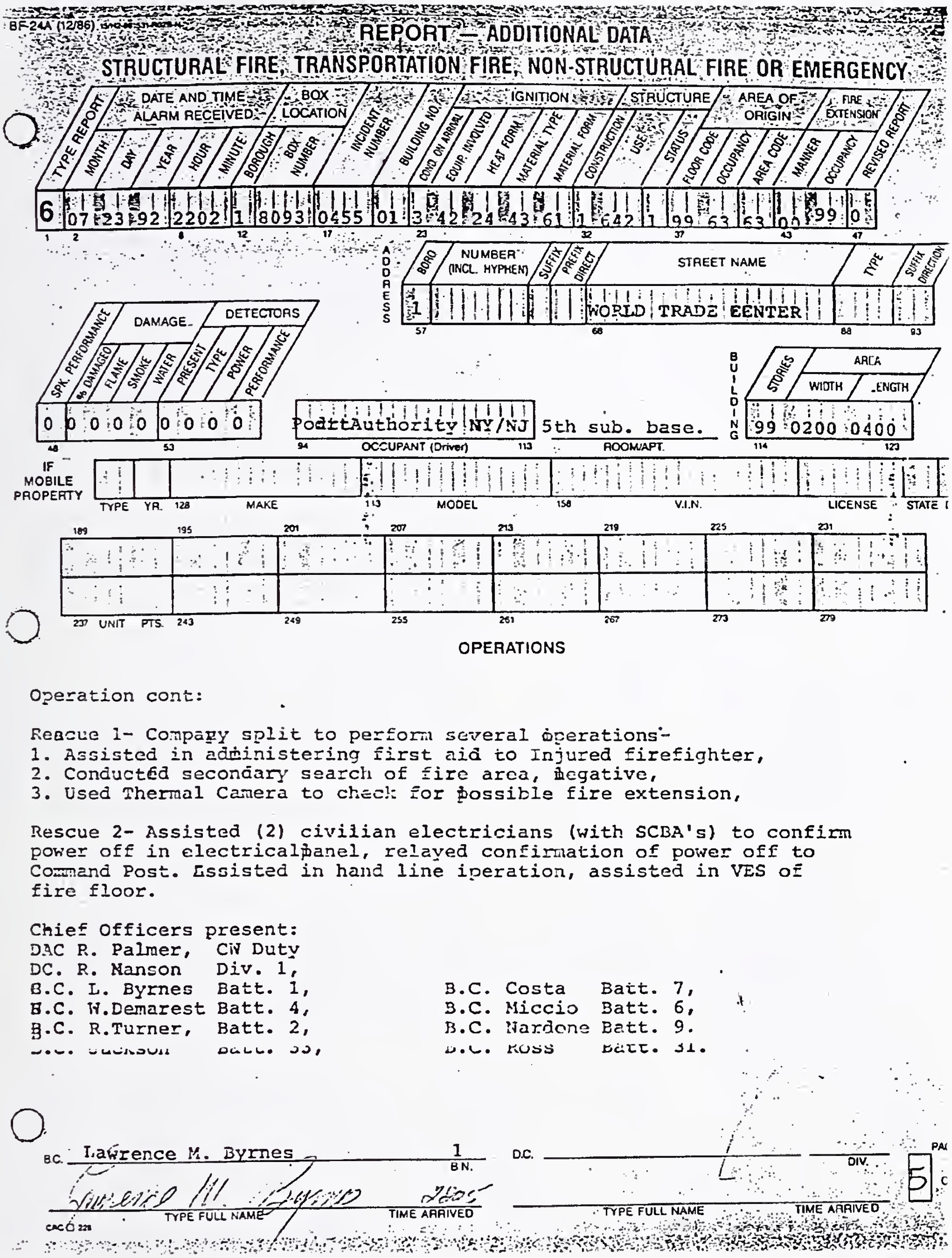
Ladder 15- Supplied spare SCBA cylinders to staging area,

Ladder 20- Supplied spare SCBA cylinders to staging area,

B.C. Lawrence H. Byrnes 1 B.N. D.C. ______ DIV. ______ 4

Lawrence M. Byrnes 2205
TYPE FULL NAME TIME ARRIVED TYPE FULL NAME TIME ARRIVED

CRC ☐ 228



BF-24A (12/86)

REPORT — ADDITIONAL DATA

STRUCTURAL FIRE, TRANSPORTATION FIRE, NON-STRUCTURAL FIRE OR EMERGENCY

TYPE REPORT	DATE AND TIME ALARM RECEIVED					BOX LOCATION		INCIDENT NUMBER	BUILDING NO.	IGNITION					STRUCTURE			AREA OF ORIGIN		FIRE EXTENSION			REVISED REPORT
	MONTH	DAY	YEAR	HOUR	MINUTE	BOROUGH	BOX NUMBER			COND ON ARRIVAL	EQUIP. INVOLVED	HEAT FORM	MATERIAL TYPE	MATERIAL FORM	CONSTRUCTION	USE	STATUS	FLOOR CODE	OCCUPANCY	AREA CODE	MANNER	OCCUPANCY	
6	07	23	92	22	02	1	8093	0455	01	3	42	24	43	61	1	642	1	99	63	63	00	99	0

1 2 8 12 17 23 32 37 43 47

ADDRESS

BORO	NUMBER (INCL. HYPHEN)	SUFFIX	PREFIX DIRECT	STREET NAME	TYPE	SUFFIX DIRECTION
1				WORLD TRADE EENTER		

57 68 88 93

SPK. PERFORMANCE	DAMAGE				DETECTORS			
	% DAMAGED	FLAME	SMOKE	WATER	PRESENT	TYPE	POWER	PERFORMANCE
0	0	0	0	0	0	0	0	0

48 53

PodrtAuthority NY/NJ
94 OCCUPANT (Driver) 113

5th sub. base.
ROOM/APT.

BUILDING

STORIES	AREA	
	WIDTH	LENGTH
99	0200	0400

114 123

IF MOBILE PROPERTY

TYPE	YR.	MAKE	MODEL	V.I.N.	LICENSE	STATE

128 143 158

189 195 201 207 213 219 225 231

237 UNIT PTS. 243 249 255 261 267 273 279

OPERATIONS

Operation cont:

Reacue 1- Compagy split to perform several operations-
1. Assisted in administering first aid to Injured firefighter,
2. Conducted secondary search of fire area, negative,
3. Used Thermal Camera to check for possible fire extension,

Rescue 2- Assisted (2) civilian electricians (with SCBA's) to confirm power off in electricalpanel, relayed confirmation of power off to Command Post. Essisted in hand line iperation, assisted in VES of fire floor.

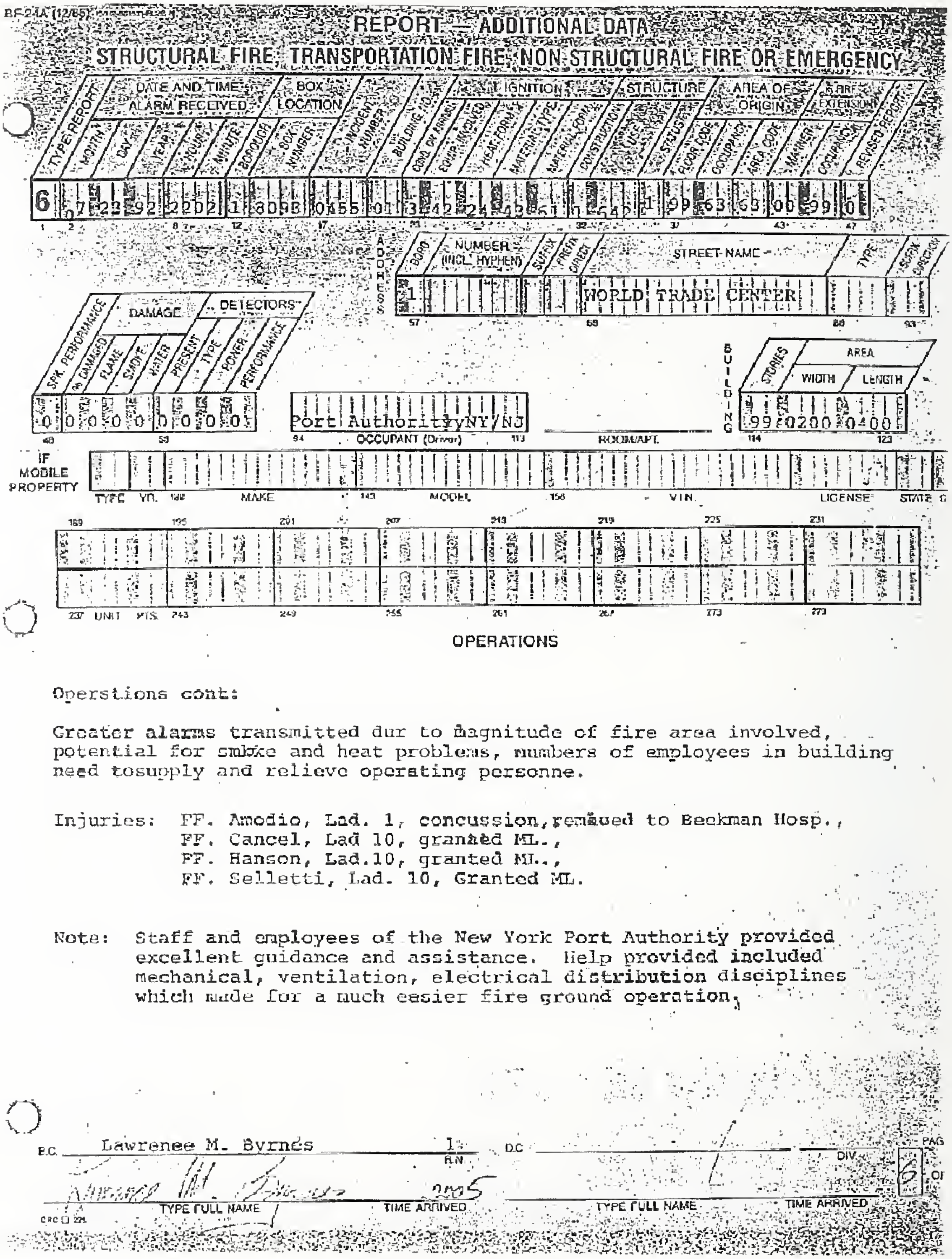
Chief Officers present:
DAC R. Palmer, CW Duty
DC. R. Nanson Div. 1,
B.C. L. Byrnes Batt. 1,
B.C. W.Demarest Batt. 4,
B.C. R.Turner, Batt. 2,
B.C. Jackson Batt. 35,
B.C. Costa Batt. 7,
B.C. Miccio Batt. 6,
B.C. Nardone Batt. 9.
B.C. Ross Batt. 31.

B.C. Lawrence M. Byrnes 1
B.N.
TYPE FULL NAME 2205
TIME ARRIVED

D.C.
DIV.
TYPE FULL NAME
TIME ARRIVED

5

CAC 228



BF-24A (12/65)

REPORT — ADDITIONAL DATA

STRUCTURAL FIRE, TRANSPORTATION FIRE, NON STRUCTURAL FIRE OR EMERGENCY

TYPE REPORT: 6

DATE AND TIME ALARM RECEIVED (MONTH, DAY, YEAR, HOUR, MINUTE): 07 23 92 22 02

BOX LOCATION (BOROUGH, BOX NUMBER): 1 3093

INCIDENT NUMBER: 0455

BUILDING NO.: 01

IGNITION (COND. OR ARRIVAL, EQUIP. INVOLVED, HEAT FORM, MATERIAL TYPE, MATERIAL FORM): 3 42 24 43 61

STRUCTURE (CONSTRUCTION, USE, STATUS): 7 54 2 1

AREA OF ORIGIN (FLOOR CODE, OCCUPANCY, AREA CODE): 99 63 63

FIRE EXTENSION (MANNER, OCCUPANCY): 00 99

REVISED REPORT: 0

ADDRESS: BORO 1; NUMBER (INCL. HYPHEN); SUFFIX; PREFIX DIRECT; STREET NAME: WORLD TRADE CENTER; TYPE; SUFFIX DIRECTION

SPK. PERFORMANCE: 0

DAMAGE (% DAMAGED, FLAME, SMOKE, WATER): 0 0 0 0

DETECTORS (PRESENT, TYPE, POWER, PERFORMANCE): 0 0 0 0

OCCUPANT (Driver): Port AuthorityyNY/NJ

ROOM/APT.

BUILDING (STORIES, AREA: WIDTH, LENGTH): 99 0200 0400

IF MOBILE PROPERTY: TYPE, YR., MAKE, MODEL, VIN., LICENSE, STATE

237 UNIT PTS.

OPERATIONS

Operstions cont:

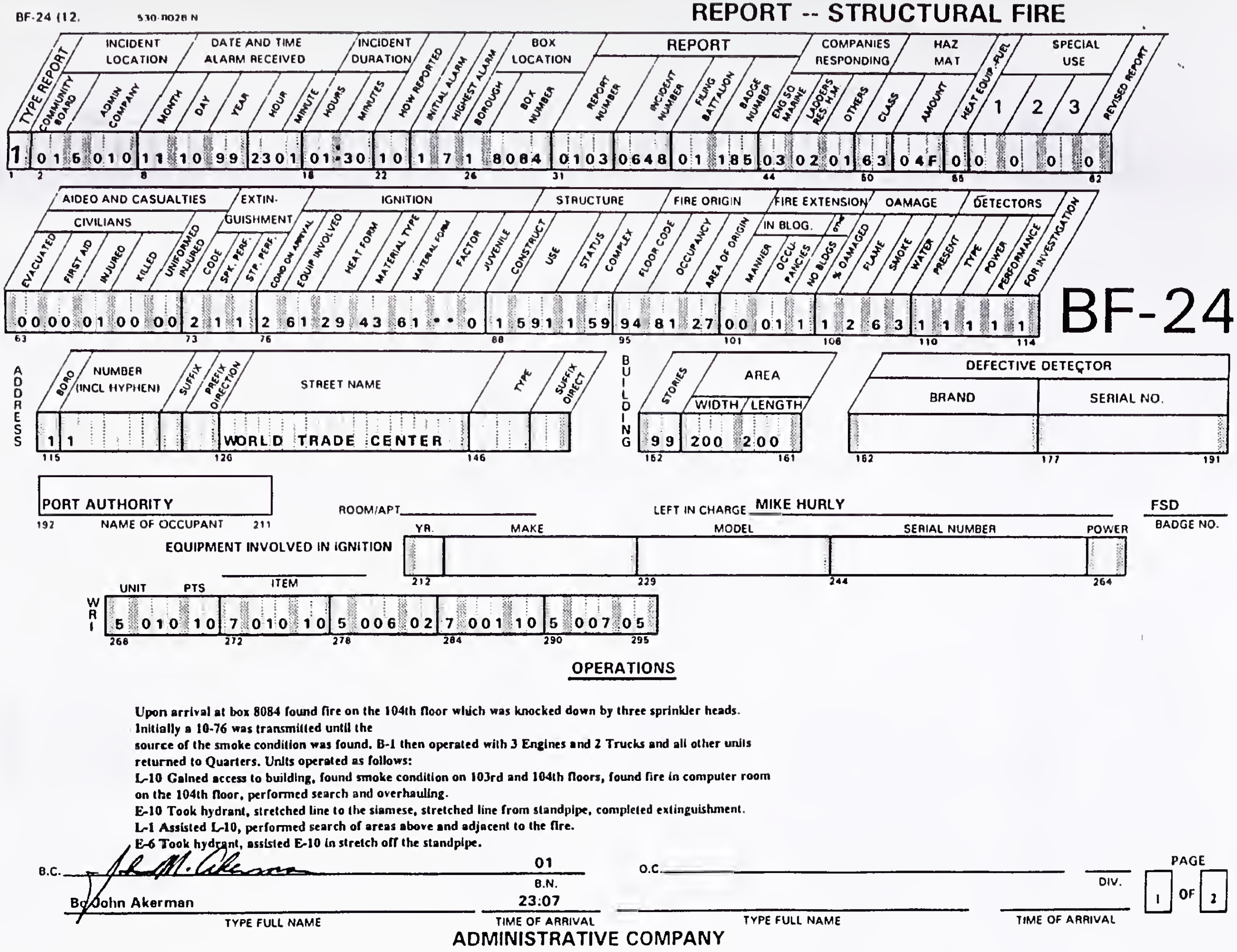
Greater alarms transmitted dur to magnitude of fire area involved, potential for smoke and heat problems, numbers of employees in building need tosupply and relieve operating personne.

Injuries: FF. Amodio, Lad. 1, concussion, removed to Beekman Hosp.,
FF. Cancel, Lad 10, granted ML.,
FF. Hanson, Lad.10, granted ML.,
FF. Selletti, Lad. 10, Granted ML.

Note: Staff and employees of the New York Port Authority provided excellent guidance and assistance. Help provided included mechanical, ventilation, electrical distribution disciplines which made for a much easier fire ground operation.

B.C. Lawrenee M. Byrnes 1 B.N.
TYPE FULL NAME 2005 TIME ARRIVED

D.C.
TYPE FULL NAME TIME ARRIVED
DIV. PAG 6 OF



BF-24 (12. 530-0026 N

REPORT -- STRUCTURAL FIRE

TYPE REPORT | INCIDENT LOCATION: COMMUNITY BOARD, ADMIN COMPANY | DATE AND TIME ALARM RECEIVED: MONTH, DAY, YEAR, HOUR, MINUTE | INCIDENT DURATION: HOURS, MINUTES | HOW REPORTED | INITIAL ALARM | HIGHEST ALARM | BOX LOCATION: BOROUGH, BOX NUMBER | REPORT: REPORT NUMBER, INCIDENT NUMBER, FILING BATTALION, BADGE NUMBER | COMPANIES RESPONDING: ENG SQ MARINE, LADDERS RES. H.M., OTHERS | HAZ MAT: CLASS, AMOUNT | HEAT EQUIP.-FUEL | SPECIAL USE: 1, 2, 3 | REVISED REPORT

1 | 0 1 6 0 1 0 | 1 1 1 0 9 9 | 2 3 0 1 | 0 1 • 3 0 | 1 0 | 1 7 1 8 0 8 4 | 0 1 0 3 | 0 6 4 8 | 0 1 1 8 5 | 0 3 0 2 0 1 | 6 3 | 0 4 F | 0 | 0 0 0 0

1 2 8 18 22 26 31 44 50 55 62

AIDEO AND CASUALTIES: CIVILIANS: EVACUATED, FIRST AID, INJUREO, KILLED; UNIFORMED INJURED | EXTIN-GUISHMENT: CODE, SPK. PERF., STP. PERF. | IGNITION: COND ON ARRIVAL, EQUIP INVOLVEO, HEAT FORM, MATERIAL TYPE, MATERIAL FORM, FACTOR, JUVENILE | STRUCTURE: CONSTRUCT, USE, STATUS, COMPLEX | FIRE ORIGIN: FLOOR CODE, OCCUPANCY, AREA OF ORIGIN | FIRE EXTENSION: IN BLOG.: MANNER, OCCU-PANCIES; OTHER: NO BLDGS | OAMAGE: % OAMAGED, FLAME, SMOKE, WATER | DETECTORS: PRESENT, TYPE, POWER, PERFORMANCE | FOR INVESTIGATION

0 0 0 0 0 1 0 0 0 0 | 2 1 1 | 2 6 1 2 9 4 3 6 1 • • 0 | 1 5 9 1 1 5 9 | 9 4 8 1 2 7 | 0 0 0 1 1 | 1 2 6 3 | 1 1 1 1 1

63 73 76 88 95 101 106 110 114

BF-24

ADDRESS: BORO | NUMBER (INCL HYPHEN) | SUFFIX | PREFIX DIRECTION | STREET NAME | TYPE | SUFFIX DIRECT

1 | 1 | | | WORLD TRADE CENTER | |

115 120 146

BUILDING: STORIES | AREA: WIDTH / LENGTH

9 9 | 200 | 200

152 161

DEFECTIVE DETECTOR: BRAND | SERIAL NO.

162 177 191

PORT AUTHORITY

192 NAME OF OCCUPANT 211

ROOM/APT________

LEFT IN CHARGE MIKE HURLY

FSD

BADGE NO.

EQUIPMENT INVOLVED IN IGNITION: YR. | MAKE | MODEL | SERIAL NUMBER | POWER

212 229 244 264

WRI: UNIT | PTS | ITEM

5 010 10 | 7 010 10 | 5 006 02 | 7 001 10 | 5 007 05

268 272 278 284 290 295

OPERATIONS

Upon arrival at box 8084 found fire on the 104th floor which was knocked down by three sprinkler heads.
Initially a 10-76 was transmitted until the
source of the smoke condition was found. B-1 then operated with 3 Engines and 2 Trucks and all other units
returned to Quarters. Units operated as follows:
L-10 Gained access to building, found smoke condition on 103rd and 104th floors, found fire in computer room
on the 104th floor, performed search and overhauling.
E-10 Took hydrant, stretched line to the siamese, stretched line from standpipe, completed extinguishment.
L-1 Assisted L-10, performed search of areas above and adjacent to the fire.
E-6 Took hydrant, assisted E-10 in stretch off the standpipe.

B.C. ________ 01 B.N. O.C. ________ DIV.

BC John Akerman — TYPE FULL NAME — 23:07 TIME OF ARRIVAL — TYPE FULL NAME — TIME OF ARRIVAL

PAGE 1 OF 2

ADMINISTRATIVE COMPANY

F-24A (12/86) 15M2-861531-R028-N

REPORT -- ADDITIONAL DATA

STRUCTURAL FIRE, TRANSPORTATION FIRE, NON-STRUCTURAL FIRE OR EMERGENCY

TYPE REPORT	DATE AND TIME ALARM RECEIVED					BOX LOCATION		INCIDENT NUMBER	BUILDING NO.	IGNITION						STRUCTURE			AREA OF ORIGIN			FIRE EXTENSION		REVISED REPORT
	MONTH	DAY	YEAR	HOUR	MINUTE	BOROUGH	BOX NUMBER			COND. ON ARRIVAL	EQUIP. INVOLVED	HEAT FORM	MATERIAL TYPE	MATERIAL FORM	CONSTRUCTION	USE	STATUS	FLOOR CODE	OCCUPANCY	AREA CODE	MANNER	OCCUPANCY		
6	11	10	99	23	01	1	8084	0648	00															

1 2 8 12 17 23 32 37 43 47

ADDRESS: BORO	NUMBER (INCL HYPHEN)	SUFFIX	PREFIX DIRECT	STREET NAME	TYPE	SUFFIX DIRECTION
1	1			WORLD TRADE CENTER		

57 68 86 93

SPK. PERFORMANCE	DAMAGE				DETECTORS			
	% DAMAGE	FLAME	SMOKE	WATER	PRESENT	TYPE	POWER	PERFORMANCE

48 53

94 OCCUPANT (Driver) 113

ROOM/APT.

BUILDING: STORIES	AREA	
	WIDTH	LENGTH

114 123

IF MOBILE PROPERTY: TYPE YR. 128 MAKE 143 MODEL 158 V.I.N. LICENSE STATE DM

189 195 201 207 213 219 225 231

237 UNIT PTS. 243 249 255 261 261 273 279

OPERATIONS

E-7 Stretched precautionary line from standpipe.
F.S.D. for World Trade Center - Mr. Mike Hurly.
O.E.M. Lt. Wilson.
[redacted]
F.M. Kregler #361 responded on BFI's own knowledge of prior suspicious activity. Job #11201.

B.C. 01
B.N.

Bc John Akerman 23:07
TYPE FULL NAME TIME ARRIVED

D.C. DIV.

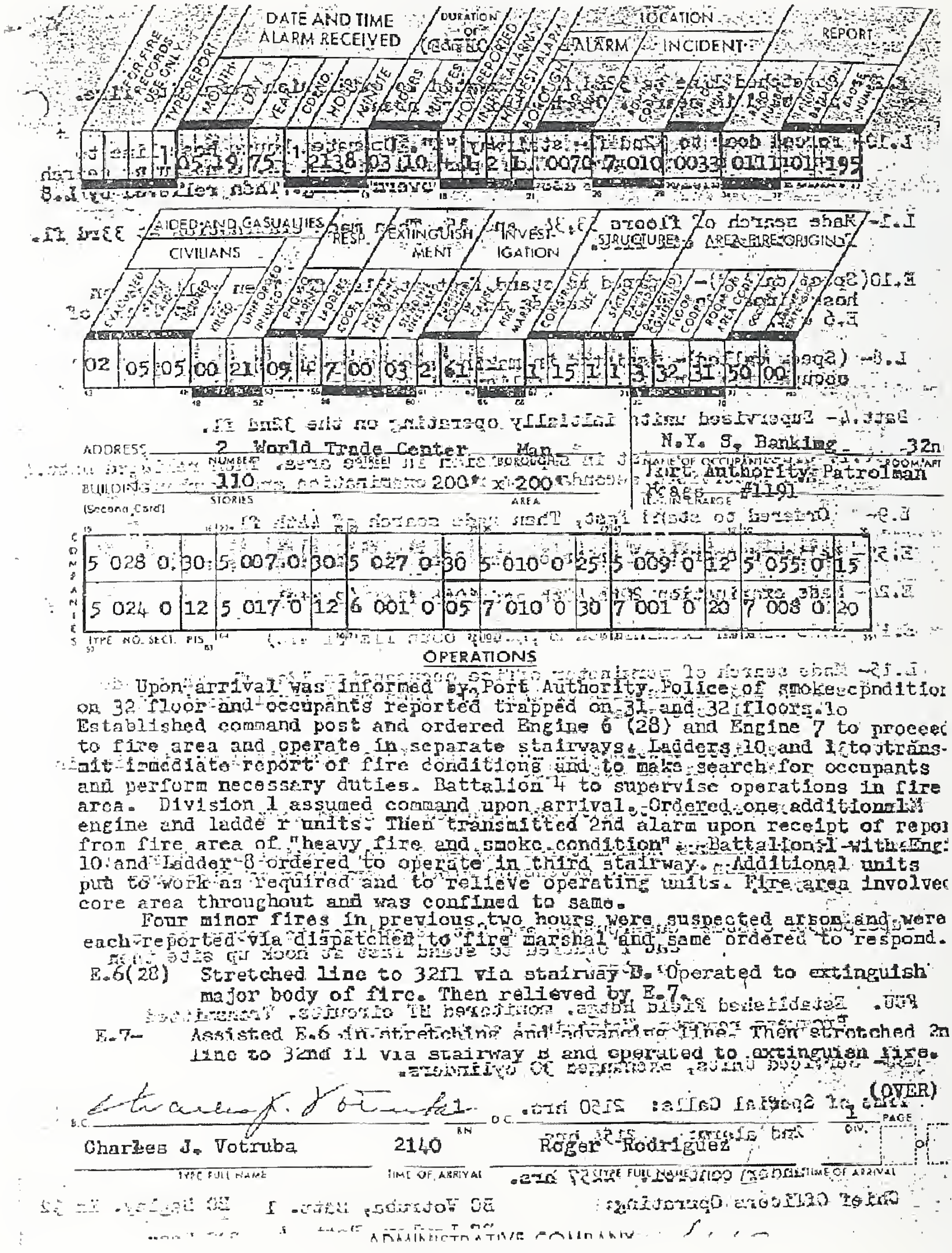
TYPE FULL NAME TIME ARRIVED

PAGE 2 OF

Attachment G-A.5

Significant fire incidents occurring in WTC 2 (3)

Significant Fire	Incident Date	Fire Location	# Sprinklers Activated	# Standpipes Activated	Cause of Fire	Material Ignited
1	5/19/75	Floor 32	-	3	Incendiary	Trash/waste
2	4/12/77	Duct work over grill in restaurant on floor 107	2		None listed	Duct work
3	3/22/93	Fan motor room on floor 108	2		Mechanic al failure	Not classified



FOR FIRE RECORDS USE ONLY
TYPE REPORT
DATE AND TIME ALARM RECEIVED
MONTH DAY YEAR CORNO. HOUR MINUTE
DURATION OF
HOURS MINUTES
HOW REPORTED
INITIAL ALARM
HIGHEST ALARM
LOCATION
ALARM
INCIDENT
BOROUGH
REPORT
BATTALION
EXPOSURE NUMBER

1	05 19	75	1	2138	03 10	2	1	0070	7 010	0033	0111	01 195

AIDED AND CASUALTIES
CIVILIANS
RESP.
EXTINGUISHMENT
INVESTIGATION
STRUCTURES
AREA FIRE ORIGINATED
EVACUATED
FIRST AID
RESCUED
KILLED
UNIFORMED INJURED
PHOTOS MARINE
LADDERS
CODE
CAUSE
FIRE MARSHAL
CONSTRUCTION
STRUCTURAL DAMAGE
FLOOR CODE
ROOM OR AREA CODE
MANNER OF EXTENSION

02	05	05	00	21	09	4	7	00	03	2	61	[illegible]	1	15	1	1	3	32	31	50	00

ADDRESS 2 World Trade Center Man.
NUMBER STREET BOROUGH
N.Y. S. Banking 32n
NAME OF OCCUPANT ROOM/APT
BUILDING 110 STORIES 200' x 200' AREA
Port Authority Patrolman [illegible] #1191
IN CHARGE
(Second Card)

COMPANIES

5 028 0	30	5 007 0	30	5 027 0	30	5 010 0	25	5 009 0	12	5 055 0	15
5 024 0	12	5 017 0	12	6 001 0	05	7 010 0	30	7 001 0	20	7 008 0	20

TYPE NO. SECT. PIS

OPERATIONS

Upon arrival was informed by Port Authority Police of smoke conditio on 32 floor and occupants reported trapped on 31 and 32 floors. Established command post and ordered Engine 6 (28) and Engine 7 to proceec to fire area and operate in separate stairways. Ladders 10 and 1 to transmit immediate report of fire conditions and to make search for occupants and perform necessary duties. Battalion 4 to supervise operations in fire area. Division 1 assumed command upon arrival. Ordered one additional engine and ladder units. Then transmitted 2nd alarm upon receipt of repo from fire area of "heavy fire and smoke condition". Battalion 1 with Eng 10 and Ladder 8 ordered to operate in third stairway. Additional units put to work as required and to relieve operating units. Fire area involvec core area throughout and was confined to same.

Four minor fires in previous two hours were suspected arson and were each reported via dispatcher to fire marshal and same ordered to respond.

E.6(28) Stretched line to 32fl via stairway B. Operated to extinguish major body of fire. Then relieved by E.7.

E.7- Assisted E.6 in stretching and advancing line. Then stretched 2n line to 32nd fl via stairway B and operated to extinguish fire.

(OVER)

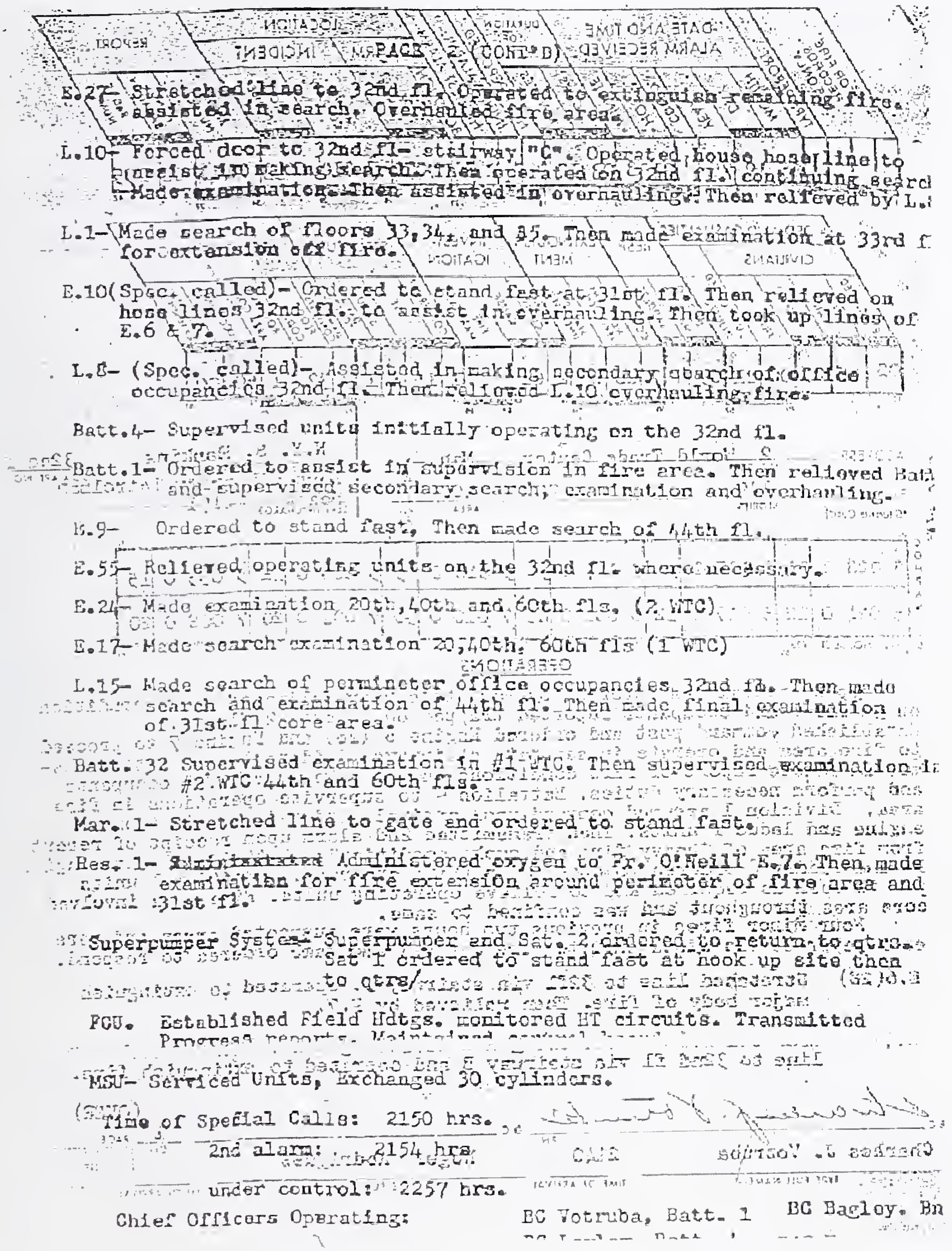
Charles J. Votruba

B.C. BN D.C. DIV. 1 PAGE of

Charles J. Votruba 2140 Roger Rodriguez

TYPE FULL NAME TIME OF ARRIVAL TYPE FULL NAME TIME OF ARRIVAL

ADMINISTRATIVE COMPANY



PAGE 2 (CONT'D)

E.27- Stretched line to 32nd fl. Operated to extinguish remaining fire. assisted in search. Overhauled fire area.

L.10- Forced door to 32nd fl- stairway "C". Operated house hose line to assist in making search. Then operated on 32nd fl. continuing search Made examination. Then assisted in overhauling. Then relieved by L.

L.1- Made search of floors 33,34, and 35. Then made examination at 33rd f for extension of fire.

E.10(Spec. called)- Ordered to stand fast at 31st fl. Then relieved on hose lines 32nd fl. to assist in overhauling. Then took up lines of E.6 & 7.

L.8- (Spec. called)- Assisted in making secondary search of office occupancies 32nd fl. Then relieved L.10 overhauling fire.

Batt.4- Supervised units initially operating on the 32nd fl.

Batt.1- Ordered to assist in supervision in fire area. Then relieved Batt and supervised secondary search, examination and overhauling.

E.9- Ordered to stand fast, Then made search of 44th fl.

E.55- Relieved operating units on the 32nd fl. where necessary.

E.24- Made examination 20th,40th and 60th fls. (2 WTC)

E.17- Made search examination 20,40th, 60th fls (1 WTC)

L.15- Made search of perimeter office occupancies 32nd fl. Then made search and examination of 44th fl. Then made final examination of 31st fl core area.

Batt. 32 Supervised examination in #1 WTC. Then supervised examination i #2 WTC 44th and 60th fls.

Mar. 1- Stretched line to gate and ordered to stand fast.

Res. 1- ~~Administrated~~ Administered oxygen to Fr. O'Neill E.7. Then made examination for fire extension around perimeter of fire area and 31st fl.

Superpumper System- Superpumper and Sat. 2 ordered to return to qtrs. Sat 1 ordered to stand fast at hook up site then to qtrs/

FCU. Established Field Hdtgs. monitored HT circuits. Transmitted Progress reports. Maintained

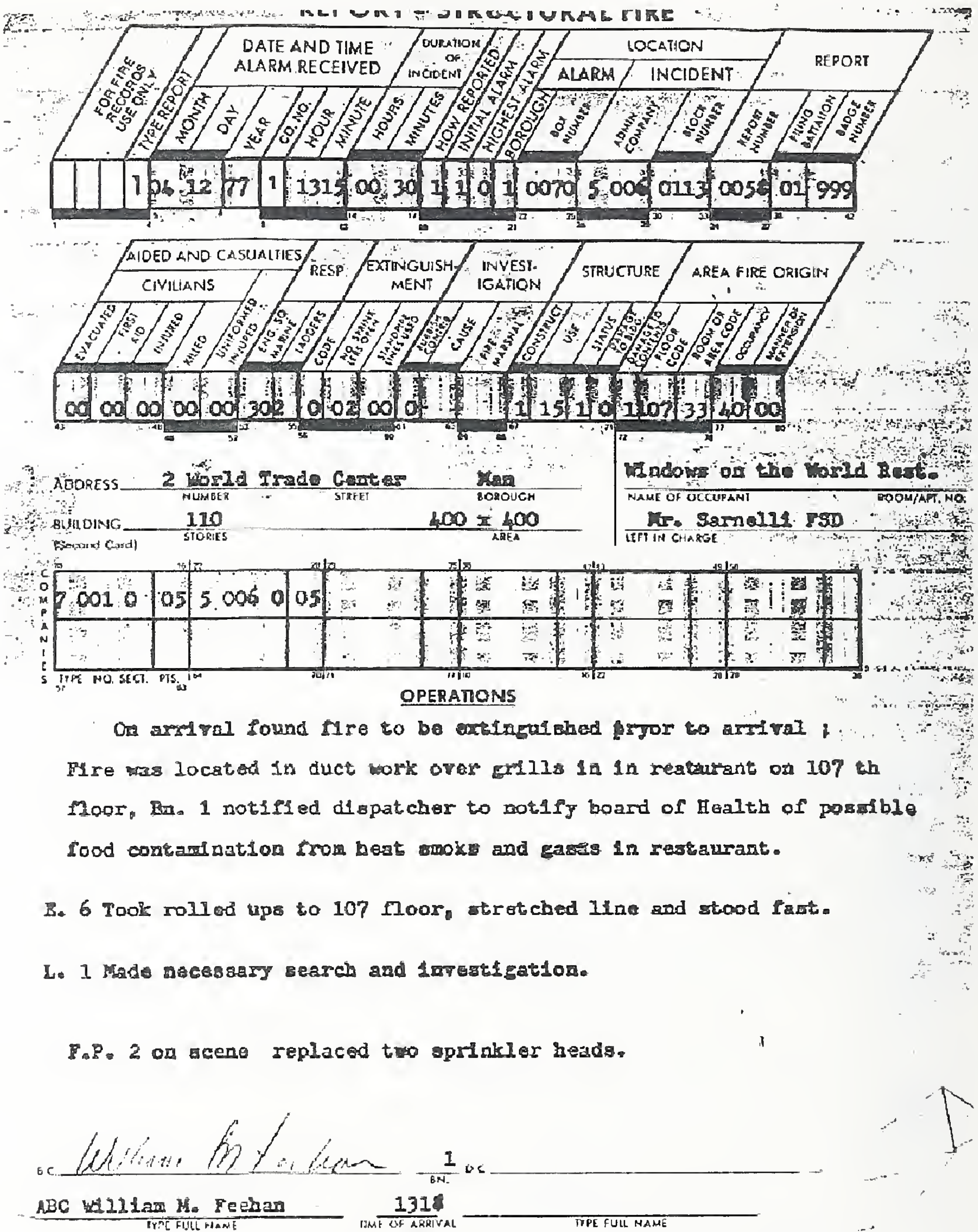
MSU- Serviced Units, Exchanged 30 cylinders.

Time of Special Calls: 2150 hrs.

2nd alarm: 2154 hrs.

under control: 2257 hrs.

Chief Officers Operating: BC Votruba, Batt. 1 BC Bagley. Bn



REPORT OF STRUCTURAL FIRE

FOR FIRE RECORDS USE ONLY				DATE AND TIME ALARM RECEIVED						DURATION OF INCIDENT						LOCATION ALARM	LOCATION INCIDENT		REPORT		
			TYPE REPORT	MONTH	DAY	YEAR	CO. NO.	HOUR	MINUTE	HOURS	MINUTES	HOW REPORTED	INITIAL ALARM	HIGHEST ALARM	BOROUGH	BOX NUMBER	ADMIN. COMPANY	BLOCK NUMBER	REPORT NUMBER	FIRING BATTALION	BADGE NUMBER
			1	04	12	77	1	1315		00	30	1	1	0	1	0070	5 006	0113	0056	01	999

AIDED AND CASUALTIES CIVILIANS					RESP.		EXTINGUISHMENT				INVESTIGATION		STRUCTURE					AREA FIRE ORIGIN			
EVACUATED	FIRST AID	INJURED	KILLED	UNIFORMED INJURED	ENG. SQ. MARINE	LADDERS	CODE	NO. SPRINK. HDS. OPEN	STANDPIPE LINES USED	[illegible]	CAUSE	FIRE MARSHAL	CONSTRUCT	USE	STATUS	DAMAGE TO BLDG.	DAMAGE TO CONTENTS	FLOOR CODE	ROOM OR AREA CODE	OCCUPANCY	MANNER OF EXTENSION
00	00	00	00	00	302		0	02	00	0			1	15	1	0	1	107	33	40	00

ADDRESS 2 World Trade Center (NUMBER, STREET) Man (BOROUGH)

BUILDING 110 (STORIES) 400 x 400 (AREA)

(Second Card)

Windows on the World Rest. (NAME OF OCCUPANT) (ROOM/APT. NO.)

Mr. Sarnelli FSD (LEFT IN CHARGE)

COMPANIES

TYPE	NO.	SECT.	PTS.				
7	001	0	05	5	006	0	05

OPERATIONS

On arrival found fire to be extinguished pryor to arrival ; Fire was located in duct work over grills in in restaurant on 107 th floor, Bn. 1 notified dispatcher to notify board of Health of possible food contamination from heat smoke and gases in restaurant.

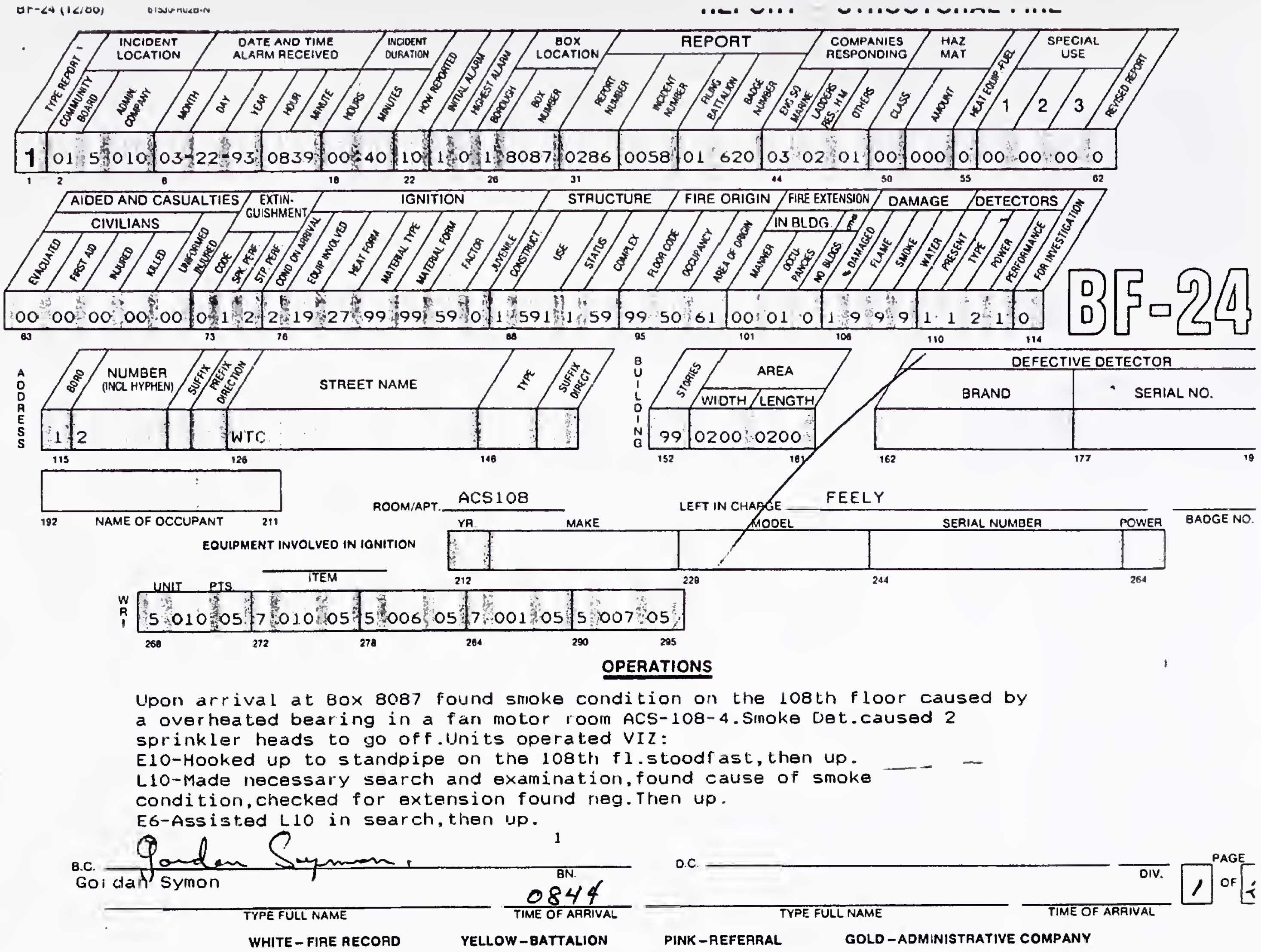
E. 6 Took rolled ups to 107 floor, stretched line and stood fast.

L. 1 Made necessary search and investigation.

F.P. 2 on scene replaced two sprinkler heads.

B.C. William M. Feehan 1 BN. D.C. ________

ABC William M. Feehan (TYPE FULL NAME) 1318 (TIME OF ARRIVAL) ________ (TYPE FULL NAME)



BF-24 (12/86)

BF-24

TYPE REPORT	COMMUNITY BOARD	ADMIN COMPANY	MONTH	DAY	YEAR	HOUR	MINUTE	HOURS	MINUTES	HOW REPORTED	INITIAL ALARM	HIGHEST ALARM	BOROUGH	BOX NUMBER	REPORT NUMBER	INCIDENT NUMBER	FILING BATTALION	BADGE NUMBER	ENG SQ MARINE	LADDERS RES. H.M	OTHERS	CLASS	AMOUNT	HEAT EQUIP-FUEL	1	2	3	REVISED REPORT
1	01	5 010	03	22	93	08	39	00	40	10	1	0	1	8087	0286	0058	01	620	03	02	01	00	000	0	00	00	00	0

(INCIDENT LOCATION; DATE AND TIME ALARM RECEIVED; INCIDENT DURATION; BOX LOCATION; REPORT; COMPANIES RESPONDING; HAZ MAT; SPECIAL USE)

EVACUATED	FIRST AID	INJURED	KILLED	UNIFORMED INJURED	CODE	SPK. PERF.	STP. PERF.	COND ON ARRIVAL	EQUIP INVOLVED	HEAT FORM	MATERIAL TYPE	MATERIAL FORM	FACTOR	JUVENILE	CONSTRUCT.	USE	STATUS	COMPLEX	FLOOR CODE	OCCUPANCY	AREA OF ORIGIN	MANNER	OCCUPANCIES	NO BLDGS	% DAMAGED	FLAME	SMOKE	WATER	PRESENT	TYPE	POWER	PERFORMANCE	FOR INVESTIGATION
00	00	00	00	00	0	1	2	2	19	27	99	99	59	0	1	591	1	59	99	50	61	00	01	0	1	9	9	9	1	1	2	1	0

(AIDED AND CASUALTIES – CIVILIANS; EXTINGUISHMENT; IGNITION; STRUCTURE; FIRE ORIGIN; FIRE EXTENSION – IN BLDG.; DAMAGE; DETECTORS)

ADDRESS

BORO	NUMBER (INCL HYPHEN)	SUFFIX	PREFIX DIRECTION	STREET NAME	TYPE	SUFFIX DIRECT
1	2			WTC		

BUILDING

STORIES	AREA WIDTH	AREA LENGTH
99	0200	0200

DEFECTIVE DETECTOR

BRAND	SERIAL NO.

NAME OF OCCUPANT

ROOM/APT. ACS108

LEFT IN CHARGE FEELY

BADGE NO.

EQUIPMENT INVOLVED IN IGNITION

YR	MAKE	MODEL	SERIAL NUMBER	POWER

WRI

UNIT	PTS.	ITEM							
5 010	05	7 010	05	5 006	05	7 001	05	5 007	05

OPERATIONS

Upon arrival at Box 8087 found smoke condition on the 108th floor caused by a overheated bearing in a fan motor room ACS-108-4.Smoke Det.caused 2 sprinkler heads to go off.Units operated VIZ:
E10-Hooked up to standpipe on the 108th fl.stoodfast,then up.
L10-Made necessary search and examination,found cause of smoke condition,checked for extension found neg.Then up.
E6-Assisted L10 in search,then up.

1

B.C. Gordon Symon
Goi dan Symon
TYPE FULL NAME

BN. 0844
TIME OF ARRIVAL

D.C.
TYPE FULL NAME

DIV.
TIME OF ARRIVAL

PAGE 1 OF

WHITE – FIRE RECORD YELLOW – BATTALION PINK – REFERRAL GOLD – ADMINISTRATIVE COMPANY

F-24A (12/86) 15/H2-661531-R02B-N

REPORT — ADDITIONAL DATA

STRUCTURAL FIRE, TRANSPORTATION FIRE, NON-STRUCTURAL FIRE OR EMERGENCY

TYPE REPORT	DATE AND TIME ALARM RECEIVED MONTH	DAY	YEAR	HOUR	MINUTE	BOX LOCATION BOROUGH	BOX NUMBER	INCIDENT NUMBER	BUILDING NO.	IGNITION COND ON ARRIVAL	EQUIP. INVOLVED	HEAT FORM	MATERIAL TYPE	MATERIAL FORM	STRUCTURE CONSTRUCTION	USE	STATUS	AREA OF ORIGIN FLOOR CODE	OCCUPANCY	AREA CODE	FIRE EXTENSION MANNER	OCCUPANCY	REVISED REPORT
6	03	22	93	08	39	1	8087	0058	00														

1 2 8 12 17 23 32 37 43 47

ADDRESS BORO	NUMBER (INCL HYPHEN)	SUFFIX	PREFIX DIRECT	STREET NAME	TYPE	SUFFIX DIRECTION
1	2			WTC		

57 68 88 93

SPK. PERFORMANCE	DAMAGE % DAMAGED	FLAME	SMOKE	WATER	DETECTORS PRESENT	TYPE	POWER	PERFORMANCE

48 53

94 OCCUPANT (Driver) 113

ROOM/APT.

BUILDING: STORIES — AREA: WIDTH / LENGTH (114–123)

IF MOBILE ROPERTY

TYPE	YR.	128 MAKE	143 MODEL	158 V.I.N.	LICENSE	STATE	DM

189 195 201 207 213 219 225 231

237 UNIT PTS 243 249 255 261 261 273 279

OPERATIONS

E7-Assisted E10 in stretching line,then up.
L1-Assisted L10 in search,then up.

1

B.C. Gordon Symon 1st
Gordan Symon
B.N.
TYPE FULL NAME
TIME ARRIVED 0844

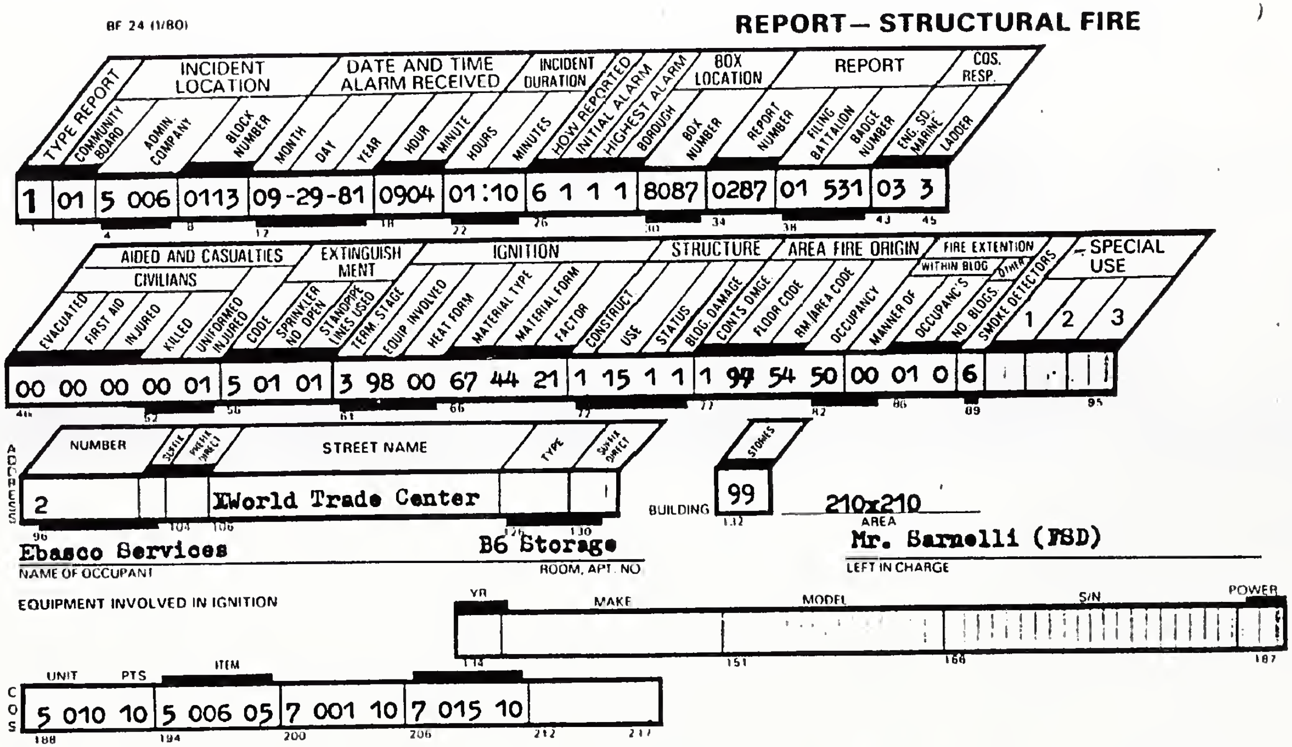
D.C.
DIV.
TYPE FULL NAME
TIME ARRIVED

PAGE 2 OF 2

Attachment G-A.6.1

Additional fire incidents involving the deployment of standpipe lines in WTC 1 and WTC 2 –

- Fires involving the use of one standpipe line and the activation of one sprinkler (4 in total)



BF 24 (1/80)

REPORT — STRUCTURAL FIRE

TYPE REPORT	INCIDENT LOCATION: COMMUNITY BOARD	ADMIN. COMPANY	BLOCK NUMBER	DATE AND TIME ALARM RECEIVED: MONTH DAY YEAR	HOUR MINUTE	INCIDENT DURATION: HOURS MINUTES	HOW REPORTED INITIAL ALARM HIGHEST ALARM BOROUGH	BOX LOCATION: BOX NUMBER	REPORT: REPORT NUMBER	FILING BATTALION BADGE NUMBER	COS. RESP.: ENG. SQ. MARINE LADDER
1	01	5 006	0113	09-29-81	0904	01:10	6 1 1 1	8087	0287	01 531	03 3

1 4 8 12 18 22 26 30 34 38 43 45

AIDED AND CASUALTIES — CIVILIANS: EVACUATED FIRST AID INJURED KILLED; UNIFORMED INJURED	EXTINGUISHMENT: CODE SPRINKLER NO OPEN STANDPIPE LINES USED	IGNITION: TERM. STAGE EQUIP INVOLVED HEAT FORM MATERIAL TYPE MATERIAL FORM FACTOR	STRUCTURE: CONSTRUCT USE STATUS BLDG. DAMAGE	CONTS DMGE FLOOR CODE RM/AREA CODE OCCUPANCY	AREA FIRE ORIGIN / FIRE EXTENTION: MANNER OF, WITHIN BLDG OCCUPANC'S, OTHER NO. BLDGS	SMOKE DETECTORS	SPECIAL USE 1	2	3
00 00 00 00 01	5 01 01	3 98 00 67 44 21	1 15 1 1	1 97 54 50	00 01 0	6			

46 52 56 61 66 72 77 82 86 89 95

ADDRESS: NUMBER	SUFFIX	PREFIX DIRECT	STREET NAME	TYPE	SUFFIX DIRECT
2			XWorld Trade Center		I

96 104 106 126 130

BUILDING: STORIES 99 (132)

210x210
AREA

Ebasco Services
NAME OF OCCUPANT

B6 Storage
ROOM, APT. NO.

Mr. Sarnelli (FSD)
LEFT IN CHARGE

EQUIPMENT INVOLVED IN IGNITION

YR	MAKE	MODEL	S/N	POWER

114 151 166 187

COS: UNIT PTS	ITEM			
5 010 10	5 006 05	7 001 10	7 015 10	

188 194 200 206 212 217

OPERATIONS

Responded to alarm box 8087. Upon arrival found light fire, medium smoke conditions in storage room (office records) at above address and location. Transmitted signal 10-75. Fire had activated 1 sprinkler head. Fire was confined to and extinguished in said room.

Eng.10- Stretched standpipe line, extinguished fire, washed down.

Eng.6- Relieved Eng.10 on line.

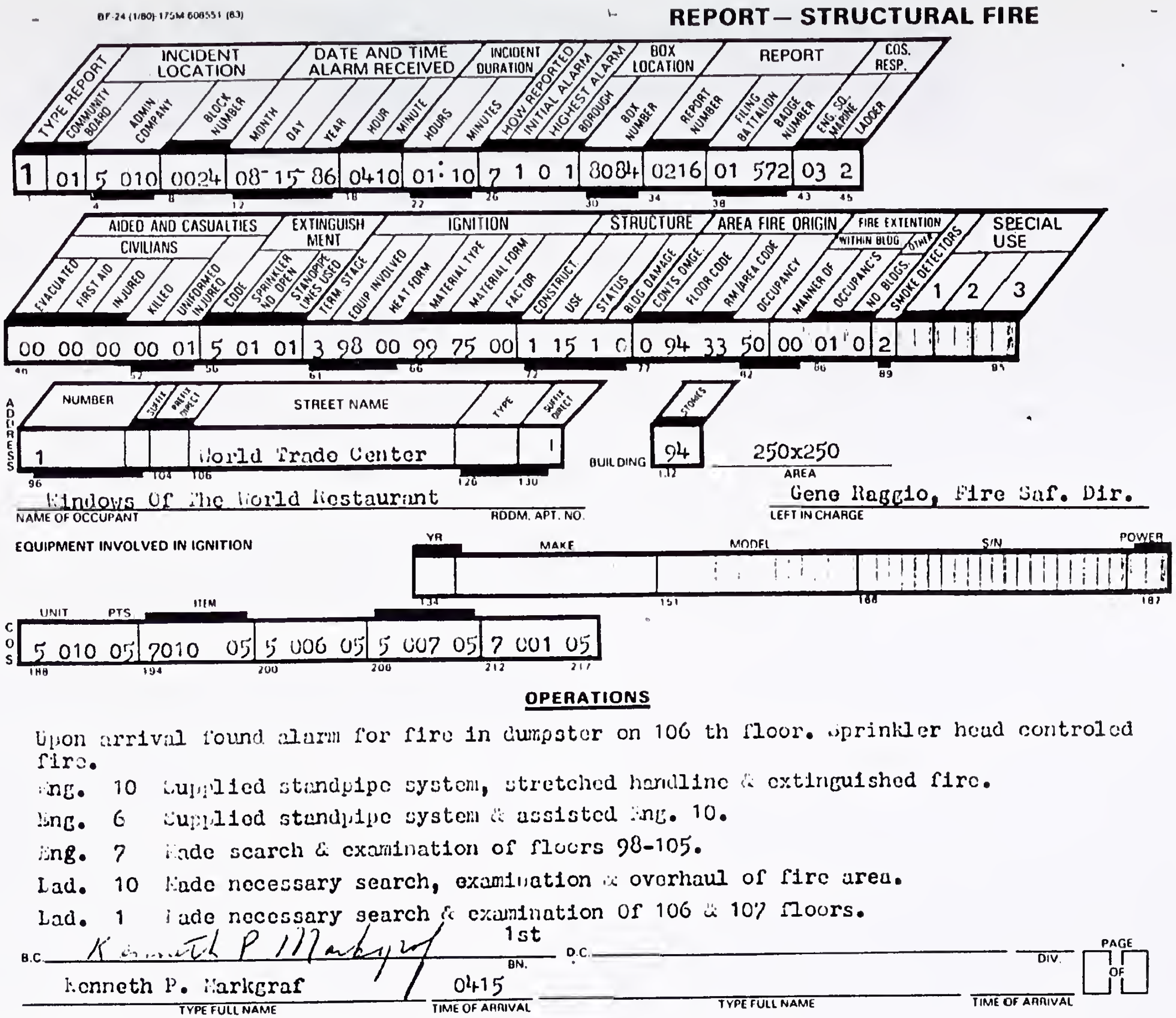
Lad.1- Searched, found fire, shut down sprinkler system, reactivated system, checked for extension, overhauled.

B.C. ______ BN. ______ D.C. ______ DIV ______

TYPE FULL NAME ______ TIME OF ARRIVAL ______ TYPE FULL NAME ______ TIME OF ARRIVAL ______

PAGE 1 OF 2

ADMINISTRATIVE COMPANY



BF-24 (1/80) 175M 608551 (83)

REPORT — STRUCTURAL FIRE

TYPE REPORT	COMMUNITY BOARD	INCIDENT LOCATION ADMIN COMPANY	BLOCK NUMBER	DATE AND TIME ALARM RECEIVED MONTH DAY YEAR	HOUR MINUTE	INCIDENT DURATION HOURS MINUTES	HOW REPORTED INITIAL ALARM HIGHEST ALARM BOROUGH	BOX LOCATION BOX NUMBER	REPORT REPORT NUMBER	FILING BATTALION BADGE NUMBER	COS. RESP. ENG. SQ. MARINE LADDER
1	01	5 010	0024	08-15-86	0410	01:10	7 1 0 1	8084	0216	01 572	03 2

AIDED AND CASUALTIES CIVILIANS EVACUATED FIRST AID INJURED KILLED UNIFORMED INJURED	EXTINGUISHMENT CODE SPRINKLER NO OPEN STANDPIPE LINES USED	IGNITION TERM STAGE EQUIP INVOLVED HEAT FORM MATERIAL TYPE MATERIAL FORM FACTOR	STRUCTURE CONSTRUCT. USE STATUS BLDG DAMAGE	AREA FIRE ORIGIN CONTS DMGE. FLOOR CODE RM/AREA CODE OCCUPANCY	FIRE EXTENTION WITHIN BLDG MANNER OF OCCUPANC'S OTHER NO BLDGS.	SMOKE DETECTORS	SPECIAL USE 1 2 3
00 00 00 00 01	5 01 01	3 98 00 99 75 00	1 15 1 0	0 94 33 50	00 01 0	2	

ADDRESS NUMBER	SUFFIX	PREFIX DIRECT	STREET NAME	TYPE	SUFFIX DIRECT
1			World Trade Center		I

BUILDING STORIES: 94

AREA: 250x250

NAME OF OCCUPANT: Windows Of The World Restaurant

ROOM, APT. NO.:

LEFT IN CHARGE: Gene Raggio, Fire Saf. Dir.

EQUIPMENT INVOLVED IN IGNITION

YR	MAKE	MODEL	S/N	POWER

COS UNIT PTS	ITEM			
5 010 05	7010 05	5 006 05	5 007 05	7 001 05

OPERATIONS

Upon arrival found alarm for fire in dumpster on 106 th floor. Sprinkler head controled fire.

Eng. 10 Supplied standpipe system, stretched handline & extinguished fire.

Eng. 6 Supplied standpipe system & assisted Eng. 10.

Eng. 7 Made search & examination of floors 98-105.

Lad. 10 Made necessary search, examination & overhaul of fire area.

Lad. 1 Made necessary search & examination Of 106 & 107 floors.

B.C. Kenneth P Markgraf BN. 1st D.C. DIV.

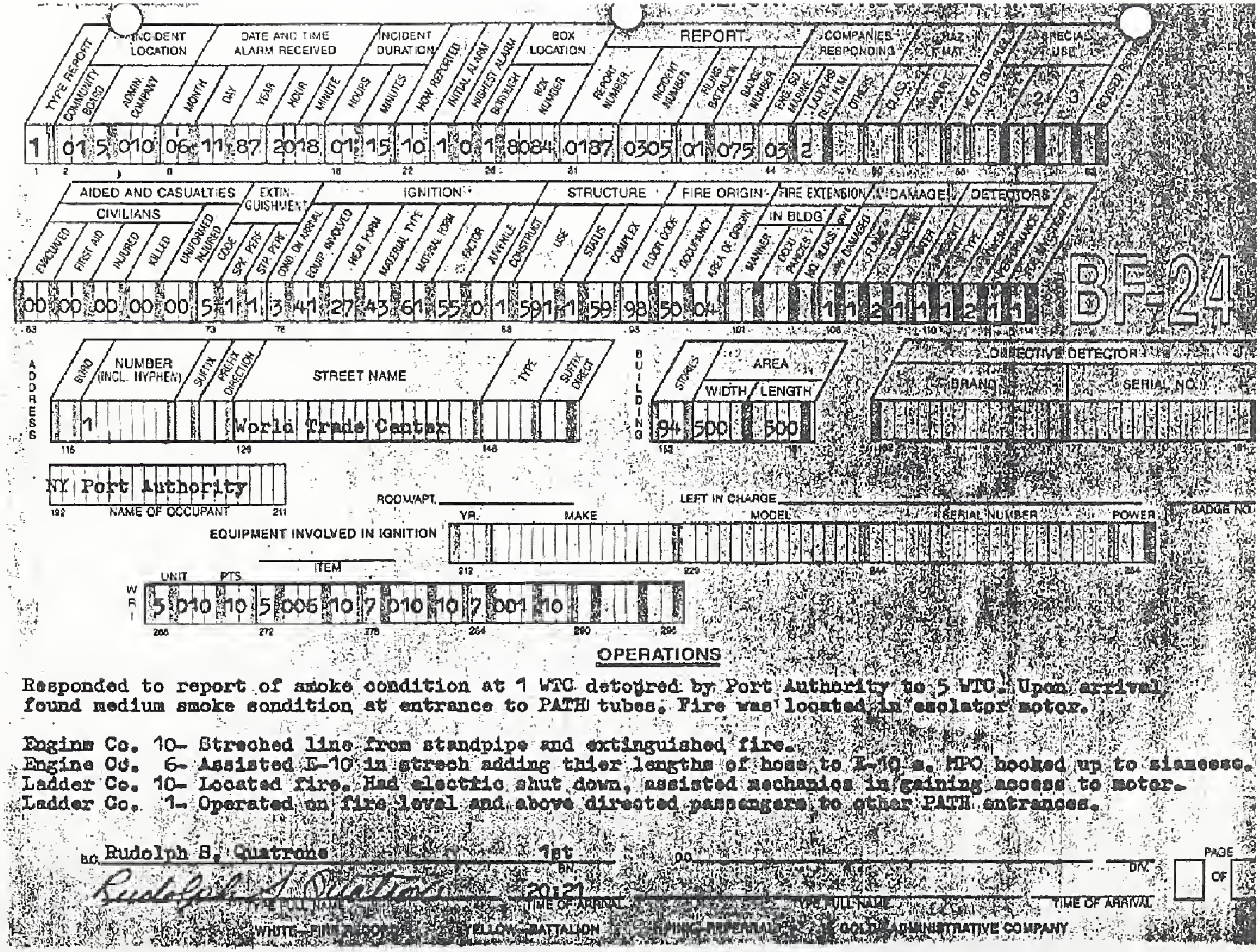
Kenneth P. Markgraf — TYPE FULL NAME

TIME OF ARRIVAL: 0415

TYPE FULL NAME

TIME OF ARRIVAL

PAGE OF



TYPE REPORT | INCIDENT LOCATION: COMMUNITY BOARD, ADMIN COMPANY | DATE AND TIME ALARM RECEIVED: MONTH, DAY, YEAR, HOUR, MINUTE | INCIDENT DURATION: HOURS, MINUTES | HOW REPORTED | INITIAL ALARM | HIGHEST ALARM | BOX LOCATION: BOROUGH, BOX NUMBER | REPORT: REPORT NUMBER, INCIDENT NUMBER, RUNG BATTALION, BADGE NUMBER | COMPANIES RESPONDING: ENG. SQ. MARINE, LADDERS RES. H.M., OTHERS | HAZ. MAT. | SPECIAL USE | REASON REPORT

1 | 01 | 5 010 | 06 | 11 | 87 | 20 | 18 | 01 | 15 | 10 | 1 | 0 | 1 | 8084 | 0187 | 0305 | 01 | 075 | 03 | 2 | 1

AIDED AND CASUALTIES: CIVILIANS: EVACUATED, FIRST AID, INJURED, KILLED; UNIFORMED INJURED | EXTINGUISHMENT: CODE, SPK. PERF., STP. PERF. | IGNITION: COND. ON ARRIVAL, EQUIP. INVOLVED, HEAT FORM, MATERIAL TYPE, MATERIAL FORM, FACTOR, JUVENILE | STRUCTURE: CONSTRUCT, USE, STATUS, COMPLEX, FLOOR CODE | FIRE ORIGIN: OCCUPANCY, AREA OF ORIGIN | FIRE EXTENSION: IN BLDG: MANNER, OCCUPANCIES, NO. BLDGS. | DAMAGE | DETECTORS

00 | 00 | 00 | 00 | 00 | 5 | 1 | 1 | 3 | 41 | 27 | 43 | 61 | 55 | 0 | 1 | 591 | 1 | 59 | 98 | 50 | 04 | 1 | 1 | 2 | 1 | 1 | 1 | 2 | 1 | 1

BF-24

ADDRESS: BORO | NUMBER (INCL. HYPHEN) | SUFFIX | PREFIX DIRECTION | STREET NAME | TYPE | SUFFIX DIRECT

1 | World Trade Center

BUILDING: STORIES | AREA: WIDTH, LENGTH

94 | 500 | 500

DEFECTIVE DETECTOR: BRAND | SERIAL NO.

NAME OF OCCUPANT: NY Port Authority

ROOM/APT. ______

LEFT IN CHARGE ______ BADGE NO.

EQUIPMENT INVOLVED IN IGNITION: YR. | MAKE | MODEL | SERIAL NUMBER | POWER

ITEM ______

W R I: UNIT | PTS.

5 | 010 | 10 | 5 | 006 | 10 | 7 | 010 | 10 | 7 | 001 | 10

OPERATIONS

Responded to report of smoke condition at 1 WTC detoured by Port Authority to 5 WTC. Upon arrival found medium smoke condition at entrance to PATH tubes. Fire was located in escalator motor.

Engine Co. 10- Streched line from standpipe and extinguished fire.
Engine Co. 6- Assisted E-10 in strech adding thier lengths of hose to E-10 s. MPO hooked up to siamese.
Ladder Co. 10- Located fire. Had electric shut down, assisted mechanics in gaining access to motor.
Ladder Co. 1- Operated on fire level and above directed passengers to other PATH entrances.

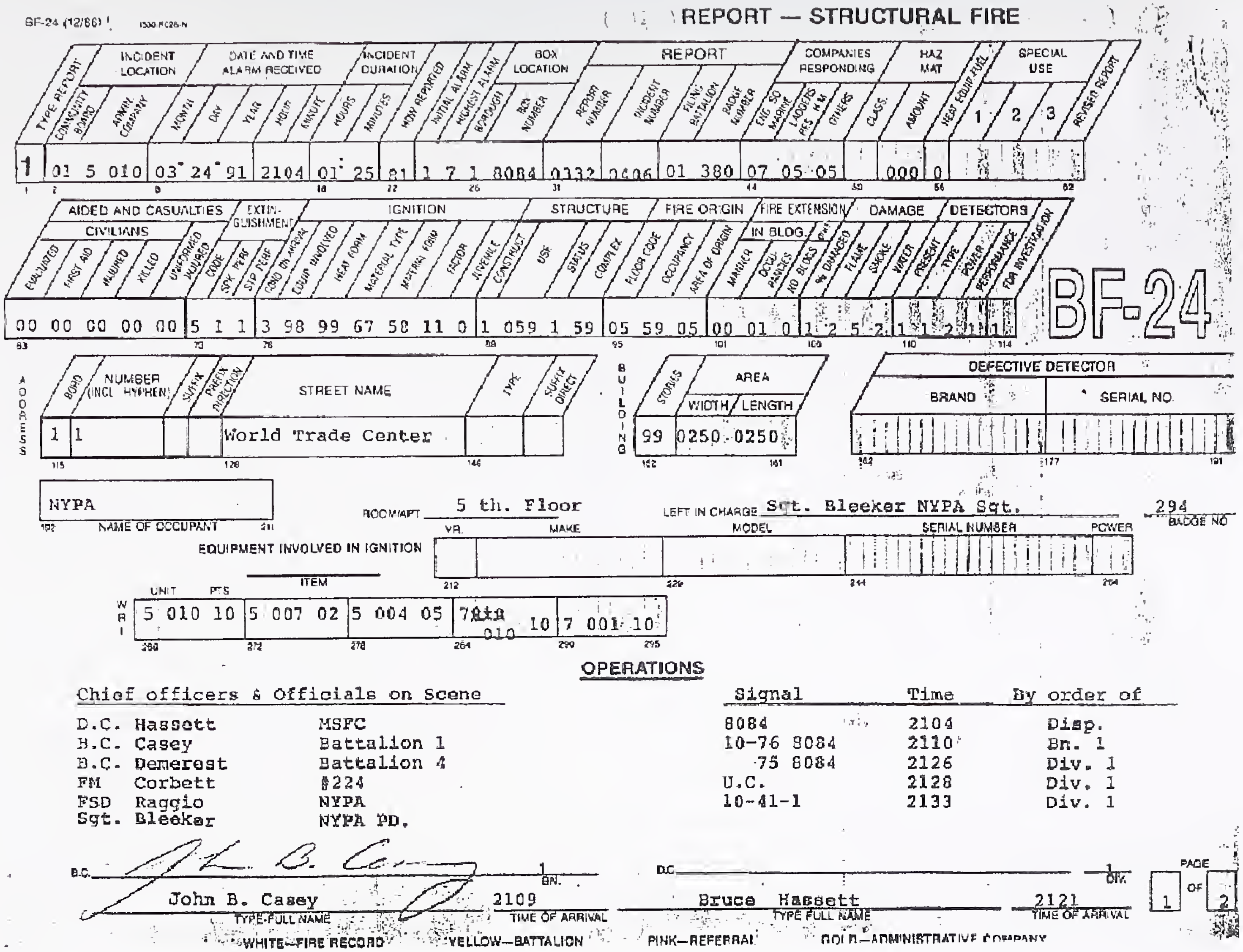
BC Rudolph S. Quatrone 1st BN. DC ______ DIV.

Rudolph S. Quatrone 20:21

TYPE FULL NAME TIME OF ARRIVAL TYPE FULL NAME TIME OF ARRIVAL

PAGE ☐ OF ☐

WHITE—FIRE RECORDS YELLOW—BATTALION PINK—DIVISION GOLD—ADMINISTRATIVE COMPANY



BF-24 (12/86) 1500 FC26-N

REPORT — STRUCTURAL FIRE

TYPE REPORT	INCIDENT LOCATION COMMUNITY BOARD / ADMIN. COMPANY	DATE AND TIME ALARM RECEIVED MONTH / DAY / YEAR	HOUR / MINUTE	INCIDENT DURATION HOURS / MINUTES	HOW REPORTED	INITIAL ALARM / HIGHEST ALARM / BOROUGH / BOX LOCATION BOX NUMBER	REPORT NUMBER	INCIDENT NUMBER	FILING BATTALION / BADGE NUMBER	COMPANIES RESPONDING ENG SQ MARINE / LADDERS PES H M / OTHERS	HAZ MAT CLASS	AMOUNT	HEAT EQUIP FUEL	SPECIAL USE 1 / 2 / 3	REVISED REPORT
1	01 5 010	03 24 91	2104	01 25	81	1 7 1 8084	0332	0406	01 380	07 05 05		000	0		

AIDED AND CASUALTIES CIVILIANS: EVACUATED / FIRST AID / INJURED / KILLED / UNIFORMED INJURED	EXTINGUISHMENT CODE / SPK PERF / STP PERF	IGNITION COND ON ARRIVAL / EQUIP INVOLVED / HEAT FORM / MATERIAL TYPE / MATERIAL FORM / FACTOR / JUVENILE	STRUCTURE CONSTRUCT / USE / STATUS / COMPLEX	FIRE ORIGIN FLOOR CODE / OCCUPANCY / AREA OF ORIGIN	FIRE EXTENSION IN BLDG.: MANNER / OCCUPANCIES / NO BLDGS	DAMAGE % DAMAGED / FLAME / SMOKE / WATER	DETECTORS PRESENT / TYPE / POWER / PERFORMANCE / FOR INVESTIGATION
00 00 00 00 00	5 1 1	3 98 99 67 58 11 0	1 059 1 59	05 59 05	00 01 0	1 2 5 2	1 1 2 1 1

BF-24

ADDRESS

BORO	NUMBER (INCL. HYPHEN)	SUFFIX	PREFIX DIRECTION	STREET NAME	TYPE	SUFFIX DIRECT
1	1			World Trade Center		

BUILDING

STORIES	AREA WIDTH	AREA LENGTH
99	0250	0250

DEFECTIVE DETECTOR

BRAND	SERIAL NO.

NAME OF OCCUPANT: NYPA

ROOM/APT: 5 th. Floor

LEFT IN CHARGE: Sgt. Bleeker NYPA Sgt.

BADGE NO: 294

EQUIPMENT INVOLVED IN IGNITION

YR.	MAKE	MODEL	SERIAL NUMBER	POWER

WRI

UNIT / PTS	ITEM				
5 010 10	5 007 02	5 004 05	7 010	10	7 001 10

OPERATIONS

Chief officers & Officials on Scene	
D.C. Hassett	MSFC
B.C. Casey	Battalion 1
B.C. Demerest	Battalion 4
FM Corbett	#224
FSD Raggio	NYPA
Sgt. Bleeker	NYPA PD.

Signal	Time	By order of
8084	2104	Disp.
10-76 8084	2110	Bn. 1
75 8084	2126	Div. 1
U.C.	2128	Div. 1
10-41-1	2133	Div. 1

B.C. J. B. Casey 1 BN.

John B. Casey — TYPE FULL NAME — 2109 TIME OF ARRIVAL

D.C. 1 DIV.

Bruce Hassett — TYPE FULL NAME — 2121 TIME OF ARRIVAL

PAGE 1 OF 2

WHITE—FIRE RECORD YELLOW—BATTALION PINK—REFERRAL GOLD—ADMINISTRATIVE COMPANY

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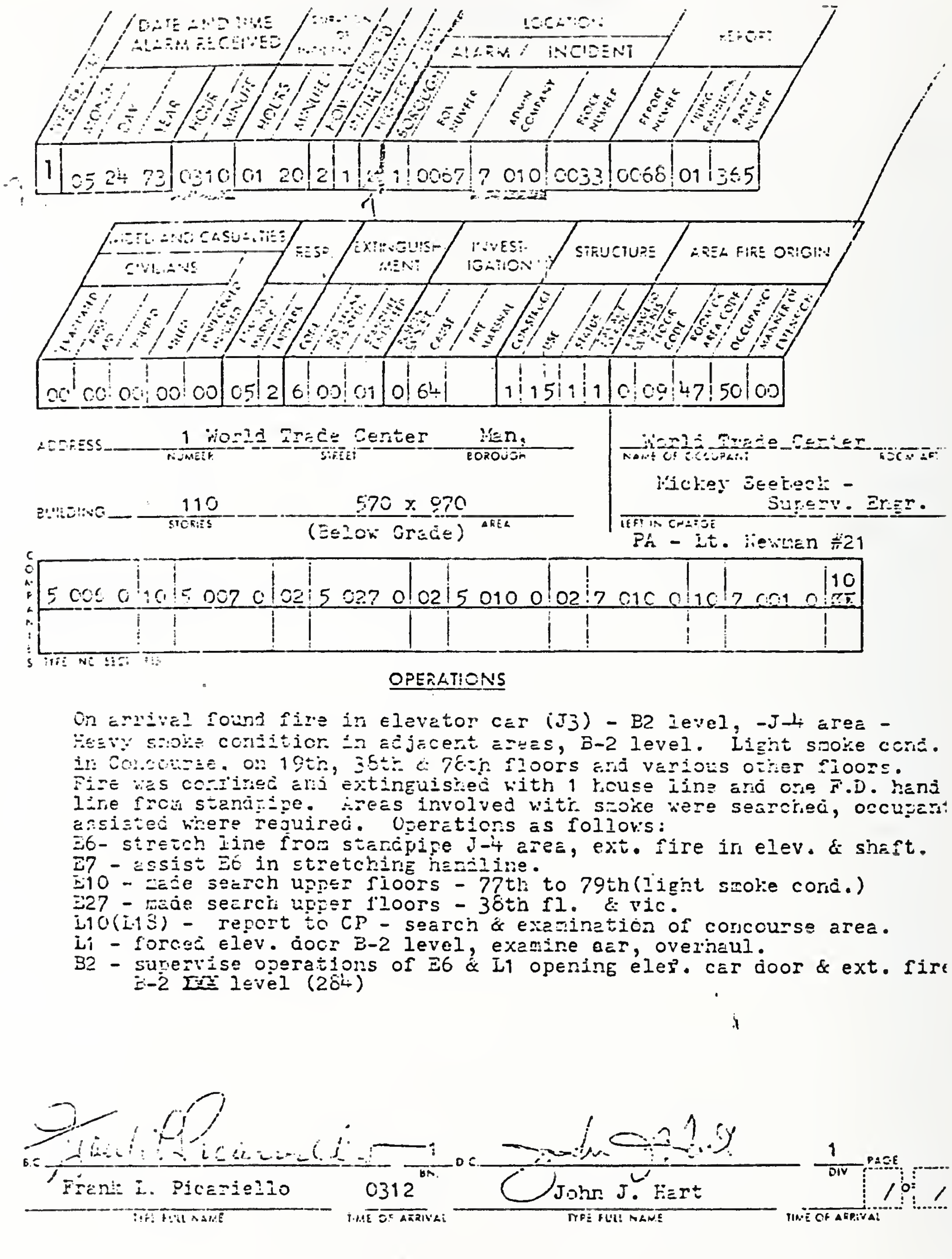
Attachment G-A.6.2

Additional fire incidents involving the deployment of standpipe lines in WTC 1 and WTC 2 –

- Fires involving the use of one standpipe line (27 in total)



DATE AND TIME ALARM RECEIVED — LOCATION ALARM / INCIDENT — REPORT

1	05 24 73	0310	01 20	2	1	4	1	0067	7 010	0033	0068	01	365

CASUALTIES CIVILIANS — RESP. — EXTINGUISHMENT — INVESTIGATION — STRUCTURE — AREA FIRE ORIGIN

00	00	00	00	00	05	2	6	00	01	0	64		1	1	5	1	1	1	0	09	47	50	00

ADDRESS 1 World Trade Center (NUMBER, STREET) Man. (BOROUGH)

World Trade Center (NAME OF OCCUPANT)

BUILDING 110 (STORIES) 570 x 970 (AREA)

(Below Grade)

Mickey Seebeck - Superv. Engr.

LEFT IN CHARGE PA - Lt. Newman #21

COMPANIES

5 006 0	10	5 007 0	02	5 027 0	02	5 010 0	02	7 010 0	10	7 001 0	10

TYPE NO. SECT.

OPERATIONS

On arrival found fire in elevator car (J3) - B2 level, -J-4 area - Heavy smoke condition in adjacent areas, B-2 level. Light smoke cond. in Concourse. on 19th, 38th & 78th floors and various other floors. Fire was confined and extinguished with 1 house line and one F.D. hand line from standpipe. Areas involved with smoke were searched, occupant assisted where required. Operations as follows:

E6- stretch line from standpipe J-4 area, ext. fire in elev. & shaft.
E7 - assist E6 in stretching handline.
E10 - made search upper floors - 77th to 79th(light smoke cond.)
E27 - made search upper floors - 38th fl. & vic.
L10(L18) - report to CP - search & examination of concourse area.
L1 - forced elev. door B-2 level, examine car, overhaul.
B2 - supervise operations of E6 & L1 opening elev. car door & ext. fire
B-2 ~~XX~~ level (284)

B.C. Frank L. Picariello

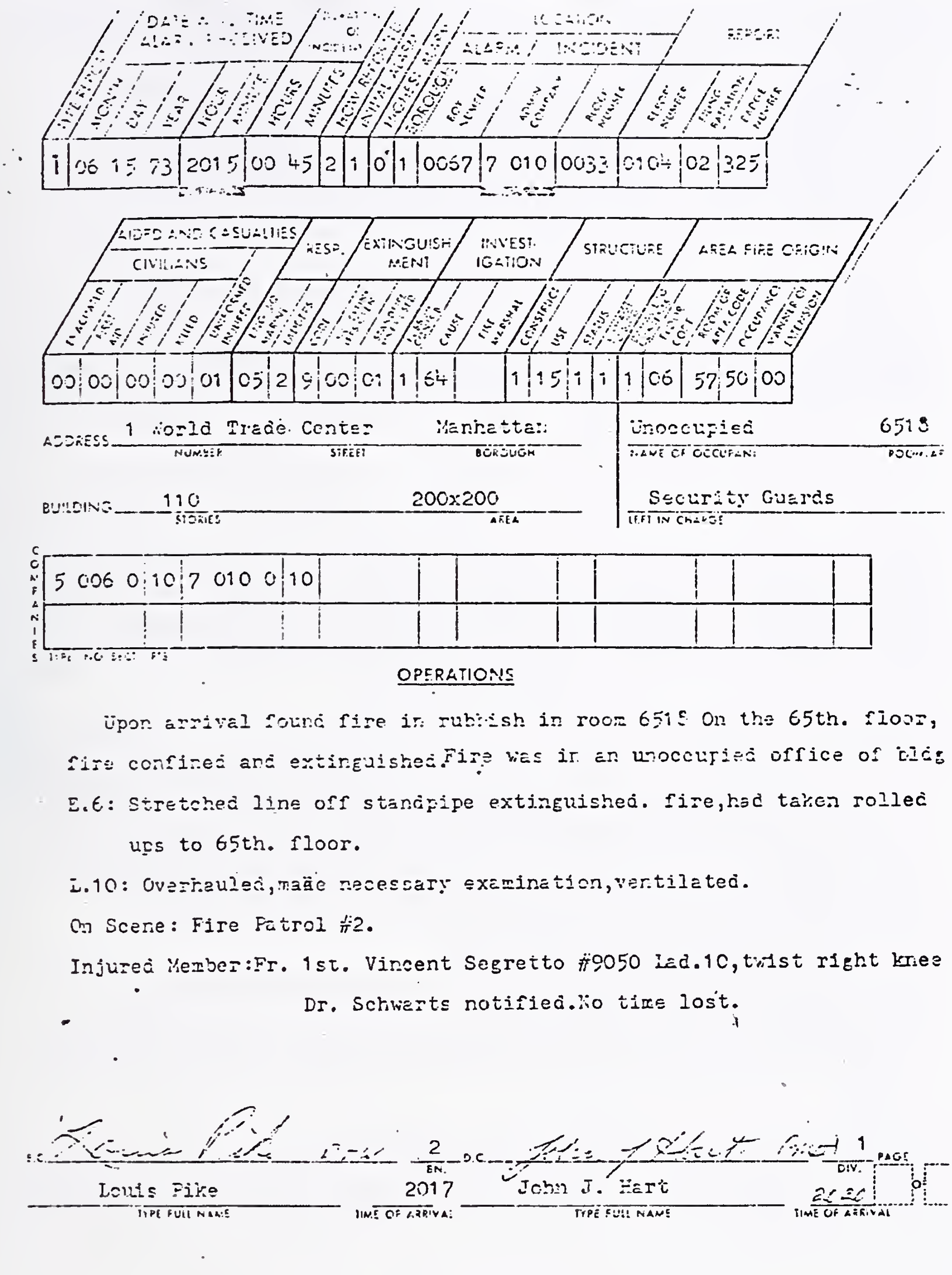
Frank L. Picariello (TYPE FULL NAME) 0312 (TIME OF ARRIVAL) BN.

D.C. John J. Hart

John J. Hart (TYPE FULL NAME) TIME OF ARRIVAL

1 DIV

PAGE 1 OF 1



Type Report	Date and Time Alarm Received					Duration of Incident		How Received	Initial Alarm	Incidents	Borough	Location Alarm / Incident			Report		
	Month	Day	Year	Hour	Minute	Hours	Minutes					Box Number	Admin Company	Block Number	Floor Number	Fire Battalion	Engine Number
1	06	15	73	20	15	00	45	2	1	0	1	0067	7 010	0033	0104	02	325

Aided and Casualties					Resp.		Extinguishment			Investigation			Structure					Area Fire Origin			
Civilians																					
Evacuated	First Aid	Injured	Killed	Unconfirmed Injuries	[illegible]	Minutes	Code	[illegible]	[illegible]	Class	Cause	Fire Marshal	Construction	Use	Status	[illegible]	[illegible]	Floor	Room or Area Code	Occupancy	Vehicle or Extension
00	00	00	00	01	05	2	9	00	01	1	64		1	15	1	1	1	06	57	50	00

ADDRESS 1 World Trade Center Manhattan
NUMBER STREET BOROUGH

Unoccupied 6515
NAME OF OCCUPANT POC...

BUILDING 110 200x200
STORIES AREA

Security Guards
LEFT IN CHARGE

COMPANIES

5 006 0	10	7 010 0	10												

TYPE NO. SECT. PTS

OPERATIONS

Upon arrival found fire in rubbish in room 6515 On the 65th. floor, fire confined and extinguished. Fire was in an unoccupied office of bldg

E.6: Stretched line off standpipe extinguished. fire,had taken rolled ups to 65th. floor.

L.10: Overhauled,made necessary examination,ventilated.

On Scene: Fire Patrol #2.

Injured Member:Fr. 1st. Vincent Segretto #9050 Lad.10,twist right knee

Dr. Schwarts notified.No time lost.

B.C. 2 EN. D.C. 1 DIV. PAGE

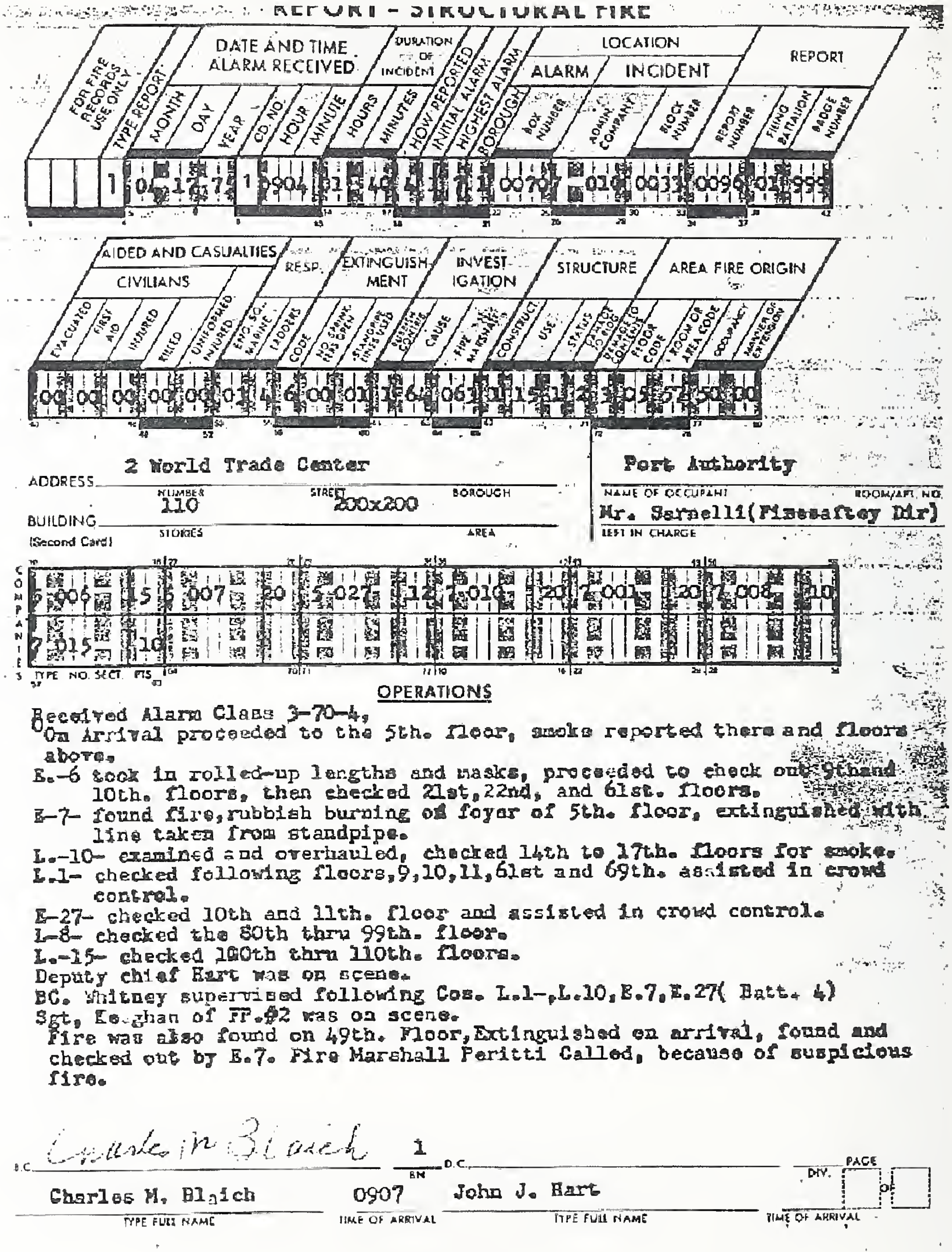
Louis Pike
TYPE FULL NAME

2017
TIME OF ARRIVAL

John J. Hart
TYPE FULL NAME

2020
TIME OF ARRIVAL

FIRE RECORDS



REPORT – STRUCTURAL FIRE

1 04 12 74 1 0904 01 54 40 4 1 1 1 00707 010 0033 0096 01 999

00 00 00 00 00 01 4 6 00 01 1 64 06 1 1 15 1 2 3 05 57 50 00

ADDRESS 2 World Trade Center
NUMBER STREET BOROUGH

BUILDING 110 200x200
STORIES AREA
(Second Card)

Port Authority
NAME OF OCCUPANT ROOM/APT. NO.

Mr. Sarnelli(Firesaftey Dir)
LEFT IN CHARGE

COMPANIES
TYPE NO. SECT. PTS.

6 006 15 5 007 20 5 027 12 7 010 20 7 001 20 7 008 10

7 015 10

OPERATIONS

Received Alarm Class 3-70-4,

On Arrival proceeded to the 5th. floor, smoke reported there and floors above.

E.-6 took in rolled-up lengths and masks, proceeded to check out 9th and 10th. floors, then checked 21st, 22nd, and 61st. floors.

E-7- found fire, rubbish burning on foyer of 5th. floor, extinguished with line taken from standpipe.

L.-10- examined and overhauled, checked 14th to 17th. floors for smoke.

L.1- checked following floors, 9, 10, 11, 61st and 69th. assisted in crowd control.

E-27- checked 10th and 11th. floor and assisted in crowd control.

L-8- checked the 80th thru 99th. floor.

L.-15- checked 100th thru 110th. floors.

Deputy chief Hart was on scene.

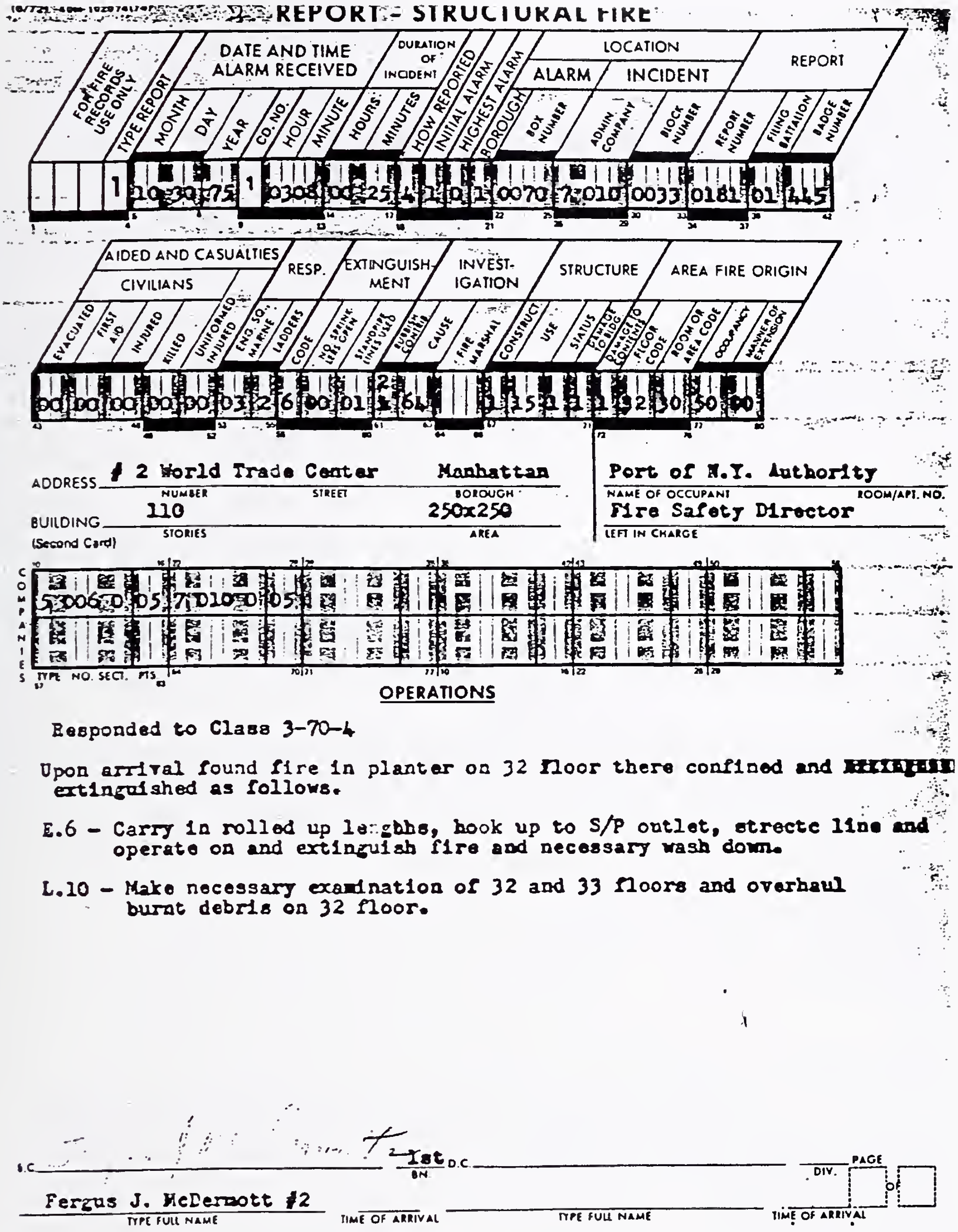
BC. Whitney supervised following Cos. L.1-, L.10, E.7, E.27(Batt. 4)

Sgt, Keoghan of FP.#2 was on scene.

Fire was also found on 49th. Floor, Extinguished on arrival, found and checked out by E.7. Fire Marshall Peritti Called, because of suspicious fire.

B.C. Charles M. Blaich 1 BN D.C. DIV. PAGE ☐ OF ☐

Charles M. Blaich 0907 John J. Hart
TYPE FULL NAME TIME OF ARRIVAL TYPE FULL NAME TIME OF ARRIVAL



REPORT - STRUCTURAL FIRE

FOR FIRE RECORDS USE ONLY	TYPE REPORT	DATE AND TIME ALARM RECEIVED: MONTH	DAY	YEAR	CD. NO.	HOUR	MINUTE	DURATION OF INCIDENT: HOURS	MINUTES	HOW REPORTED	INITIAL ALARM	HIGHEST ALARM	BOROUGH	LOCATION: ALARM: BOX NUMBER	INCIDENT: ADMIN. COMPANY	BLOCK NUMBER	REPORT: REPORT NUMBER	FILING BATTALION	BADGE NUMBER
	1	10	30	75	1	03	08	00	25	4	1	0	1	0070	7010	0033	0181	01	445

AIDED AND CASUALTIES: CIVILIANS: EVACUATED	FIRST AID	INJURED	KILLED	UNIFORMED INJURED	RESP.: ENG. SQ. MARINE	LADDERS	EXTINGUISHMENT: CODE	NO. SPRINKLERS OPEN	STANDPIPE LINES USED	RUBBISH CONTAINER	INVESTIGATION: CAUSE	FIRE MARSHAL	STRUCTURE: CONSTRUCT	USE	STATUS	DAMAGE TO BLDG	DAMAGE TO CONTENTS	AREA FIRE ORIGIN: FLOOR CODE	ROOM OR AREA CODE	OCCUPANCY	MANNER OF EXTENSION
00	00	00	00	00	03	2	6	00	01	2 1	64		1	15	1	1	1	32	30	50	00

ADDRESS # 2 World Trade Center Manhattan
NUMBER STREET BOROUGH

Port of N.Y. Authority
NAME OF OCCUPANT ROOM/APT. NO.

BUILDING (Second Card) 110 250x250
STORIES AREA

Fire Safety Director
LEFT IN CHARGE

COMPANIES

TYPE	NO.	SECT.	PTS.
5	006	0	05
7	010	0	05

OPERATIONS

Responded to Class 3-70-4

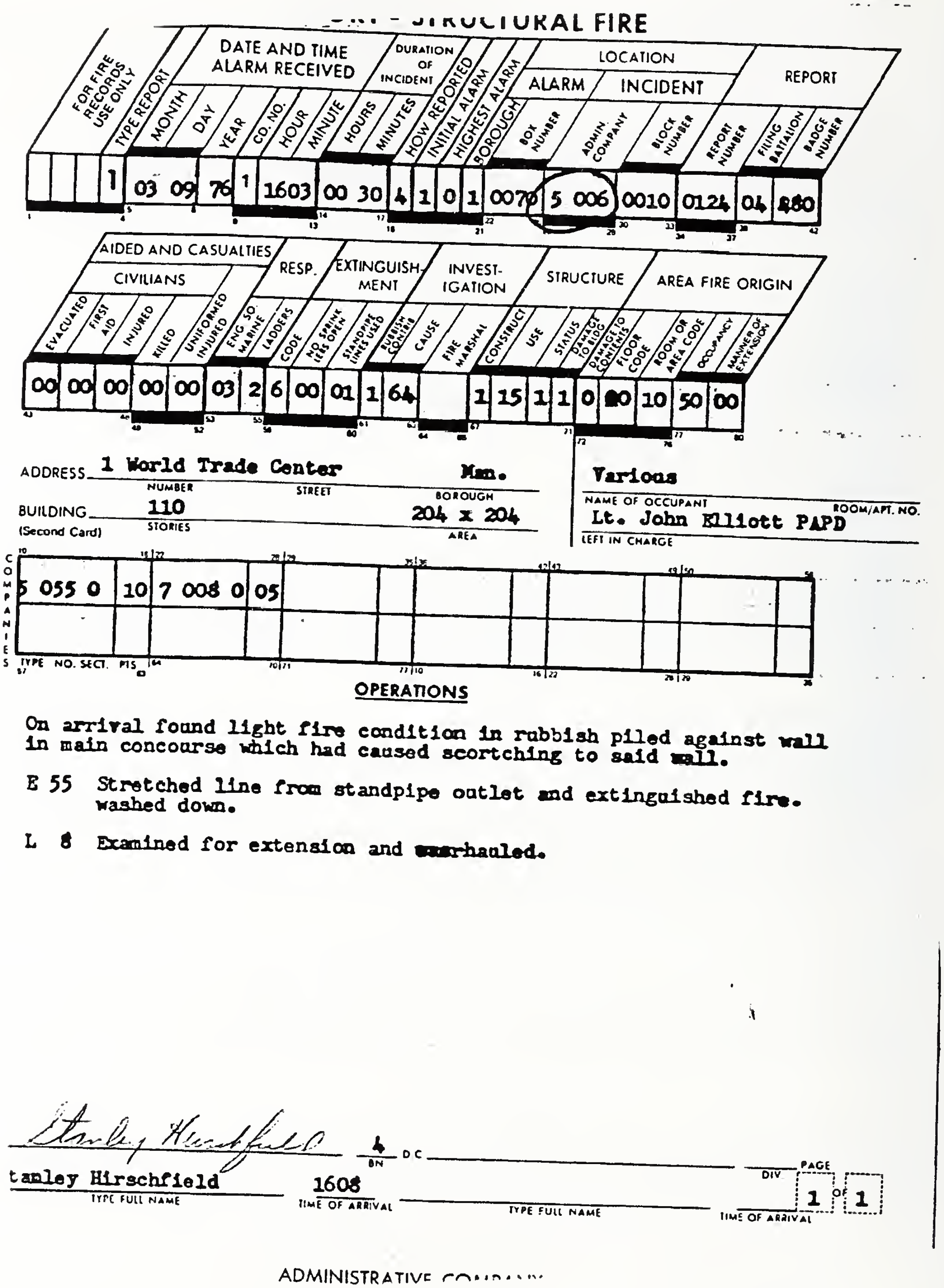
Upon arrival found fire in planter on 32 Floor there confined and [illegible] extinguished as follows.

E.6 - Carry in rolled up lengths, hook up to S/P outlet, strecte line and operate on and extinguish fire and necessary wash down.

L.10 - Make necessary examination of 32 and 33 floors and overhaul burnt debris on 32 floor.

B.C. 1st BN. D.C. DIV. PAGE ☐ of ☐

Fergus J. McDermott #2
TYPE FULL NAME TIME OF ARRIVAL TYPE FULL NAME TIME OF ARRIVAL



STRUCTURAL FIRE

FOR FIRE RECORDS USE ONLY			TYPE REPORT	DATE AND TIME ALARM RECEIVED MONTH	DAY	YEAR	CO. NO.	HOUR	MINUTE	DURATION OF INCIDENT HOURS	MINUTES	HOW REPORTED	INITIAL ALARM	HIGHEST ALARM	BOROUGH	LOCATION ALARM BOX NUMBER	LOCATION INCIDENT ADMIN. COMPANY	BLOCK NUMBER	REPORT NUMBER	REPORT FILING BATTALION	BADGE NUMBER
			1	03	09	76	1	1603		00	30	4	1	0	1	0070	5 006	0010	0124	04	880

AIDED AND CASUALTIES CIVILIANS EVACUATED	FIRST AID	INJURED	KILLED	UNIFORMED INJURED	RESP. ENG SQ. MARINE	LADDERS	EXTINGUISHMENT CODE	NO SPRINKLERS OPEN	STANDPIPE LINES USED	RUBBISH CONTAINER	INVESTIGATION CAUSE	FIRE MARSHAL	STRUCTURE CONSTRUCT	USE	STATUS	DAMAGE TO BLDG	DAMAGE TO CONTENTS	AREA FIRE ORIGIN FLOOR CODE	ROOM OR AREA CODE	OCCUPANCY	MANNER OF EXTENSION
00	00	00	00	00	03	2	6	00	01	1	64		1	15	1	1	0	80	10	50	00

ADDRESS 1 World Trade Center (NUMBER, STREET) Mnn. (BOROUGH)

BUILDING 110 (STORIES) 204 x 204 (AREA)

(Second Card)

Various

NAME OF OCCUPANT ROOM/APT. NO.

Lt. John Elliott PAPD

LEFT IN CHARGE

COMPANIES

TYPE NO. SECT.	PTS.		
5 055 0	10	7 008 0	05

OPERATIONS

On arrival found light fire condition in rubbish piled against wall in main concourse which had caused scortching to said wall.

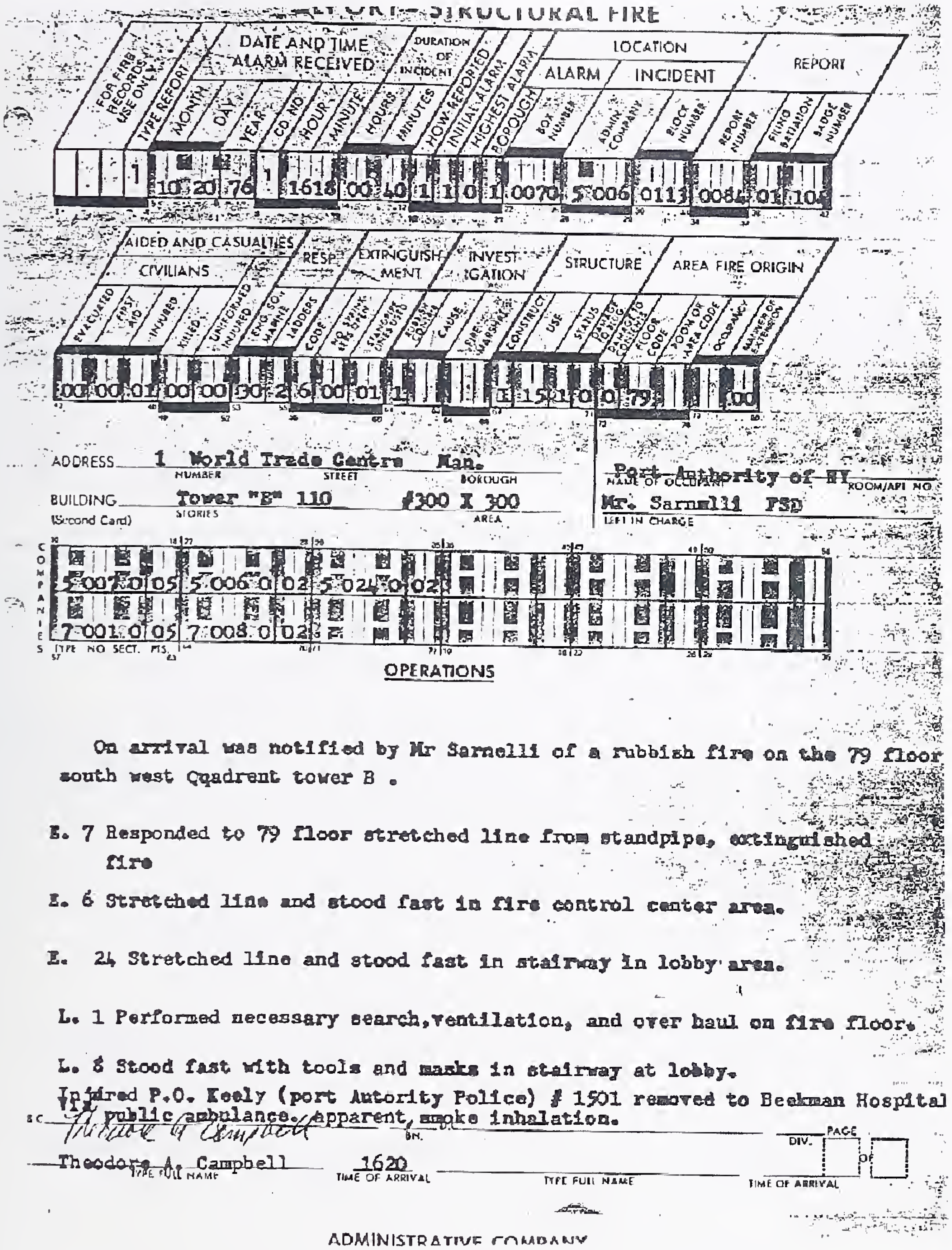
E 55 Stretched line from standpipe outlet and extinguished fire. washed down.

L 8 Examined for extension and overhauled.

Stanley Hirschfield 4 (BN) D C

tanley Hirschfield (TYPE FULL NAME) 1608 (TIME OF ARRIVAL) (TYPE FULL NAME) (TIME OF ARRIVAL) DIV PAGE 1 OF 1

ADMINISTRATIVE COMPANY



STRUCTURAL FIRE

		DATE AND TIME ALARM RECEIVED						DURATION OF INCIDENT						LOCATION				REPORT	
														ALARM	INCIDENT				
FOR FIRE RECORDS USE ONLY	TYPE REPORT	MONTH	DAY	YEAR	CD. NO.	HOUR	MINUTE	HOURS	MINUTES	HOW REPORTED	INITIAL ALARM	HIGHEST ALARM	BOROUGH	BOX NUMBER	ADMIN. COMPANY	BLOCK NUMBER	REPORT NUMBER	FILING BATTALION	BADGE NUMBER
	1	10	20	76	1	16	18	00	40	1	1	0	1	0070	5 006	0113	0084	01	104

AIDED AND CASUALTIES					RESP.		EXTINGUISHMENT			INVESTIGATION			STRUCTURE					AREA FIRE ORIGIN			
CIVILIANS																					
EVACUATED	FIRST AID	INJURED	KILLED	UNIFORMED INJURED	ENG. CO. MARINE	LADDERS	CODE	NO SPRINK. HDS OPEN	STANDPIPE LINES USED	[illegible]	CAUSE	FIRE MARSHAL	CONSTRUCT	USE	STATUS	DAMAGE TO BLDG.	DAMAGE TO CONTENTS	FLOOR CODE	ROOM OR AREA CODE	OCCUPANCY	MANNER OF EXTENSION
00	00	01	00	00	30	2	6	00	01	1			1	15	1	0	0	79			00

ADDRESS 1 World Trade Centre Man.
NUMBER STREET BOROUGH

~~Port Authority of NY~~
NAME OF OCCUPANT ROOM/APT. NO.

BUILDING (Second Card) Tower "B" 110 #300 X 300
STORIES AREA

Mr. Sarnelli FSD
LEFT IN CHARGE

COMPANIES

TYPE	NO.	SECT.	PTS.								
5	007	0	05	5	006	0	02	5	024	0	02
7	001	0	05	7	008	0	02				

OPERATIONS

On arrival was notified by Mr Sarnelli of a rubbish fire on the 79 floor south west Quadrent tower B .

E. 7 Responded to 79 floor stretched line from standpipe, extinguished fire

E. 6 Stretched line and stood fast in fire control center area.

E. 24 Stretched line and stood fast in stairway in lobby area.

L. 1 Performed necessary search, ventilation, and over haul on fire floor.

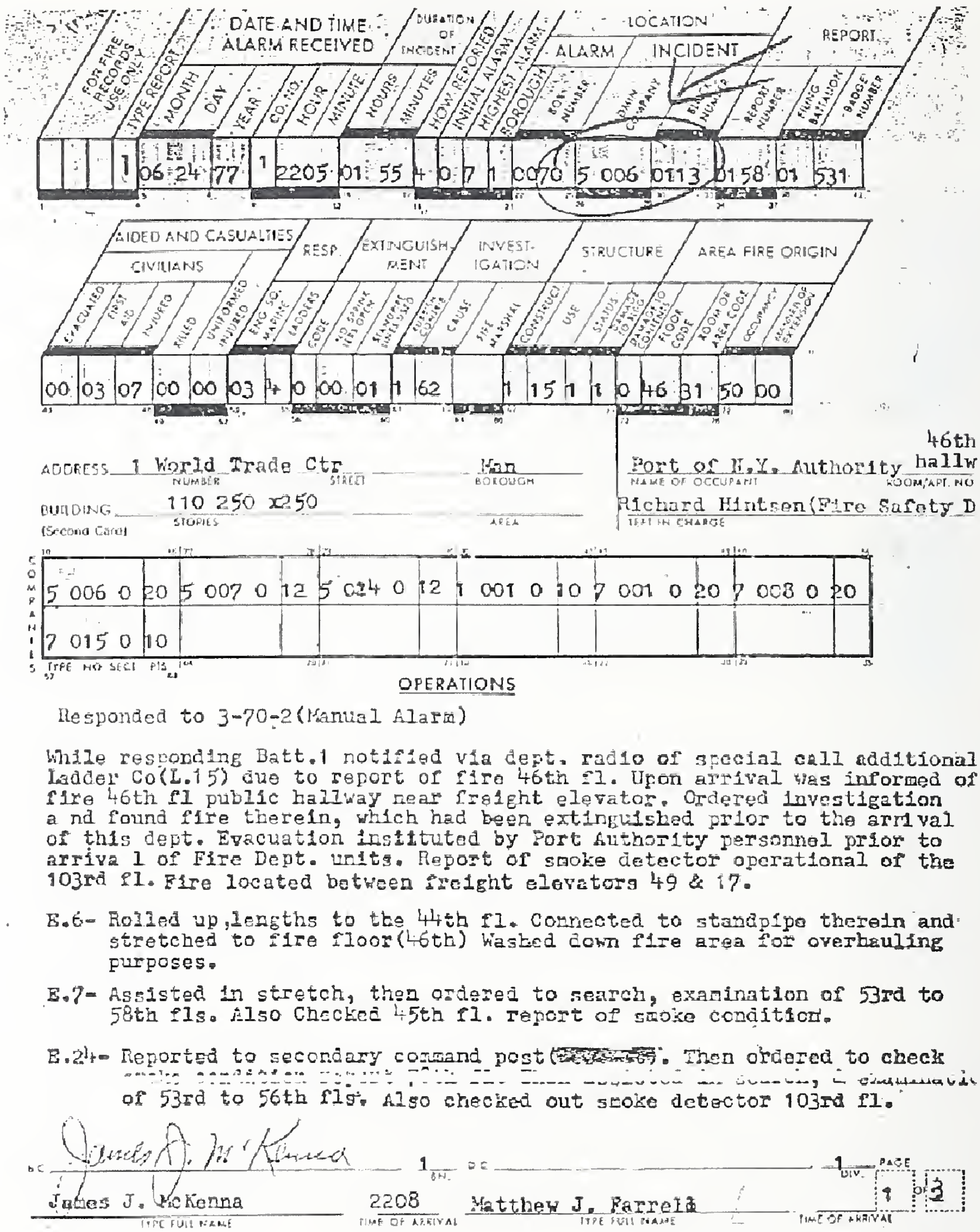
L. 8 Stood fast with tools and masks in stairway at lobby.

Injured P.O. Keely (port Autority Police) # 1501 removed to Beekman Hospital via public ambulance. apparent, smoke inhalation.

BC Theodore A. Campbell BN. DIV. PAGE ☐ OF ☐

Theodore A. Campbell 1620
TYPE FULL NAME TIME OF ARRIVAL TYPE FULL NAME TIME OF ARRIVAL

ADMINISTRATIVE COMPANY



FOR FIRE RECORDS USE ONLY			TYPE REPORT	MONTH	DAY	YEAR	CO. NO.	HOUR MINUTE	HOURS	MINUTES	HOW REPORTED	INITIAL ALARM	HIGHEST ALARM	BOROUGH	BOX NUMBER	ADMIN COMPANY	BLOCK NUMBER	REPORT NUMBER	FIRING BATTALION	BADGE NUMBER
			1	06	24	77	1	2205	01	55	4	0	7	1	0070	5 006	0113	0158	01	531

AIDED AND CASUALTIES					RESP.		EXTINGUISHMENT			INVESTIGATION		STRUCTURE					AREA FIRE ORIGIN				
CIVILIANS																					
EVACUATED	FIRST AID	INJURED	KILLED	UNIFORMED INJURED	ENG. SQ. MARINE	LADDERS	CODE	NO. SPRINK. HEADS OPEN	[illegible]	[illegible]	CAUSE	FIRE MARSHAL	CONSTRUCT.	USE	STATUS	DAMAGE TO BLDG.	DAMAGE TO CONTENTS	FLOOR CODE	ROOM OR AREA CODE	OCCUPANCY	STAGES OF EXTENSION
00	03	07	00	00	03	4	0	00	01	1	62		1	15	1	1	0	46	31	50	00

ADDRESS 1 World Trade Ctr (NUMBER, STREET) Man (BOROUGH)

Port of N.Y. Authority (NAME OF OCCUPANT) 46th hallw (ROOM/APT. NO)

BUILDING 110 250 x250 (STORIES) (AREA)

(Second Card)

Richard Hintsen(Fire Safety D (PERSON IN CHARGE)

COMPANIES

5 006 0	20	5 007 0	12	5 024 0	12	1 001 0	10	7 001 0	20	7 008 0	20
7 015 0	10										

TYPE NO SECT PTS

OPERATIONS

Responded to 3-70-2(Manual Alarm)

While responding Batt.1 notified via dept. radio of special call additional Ladder Co(L.15) due to report of fire 46th fl. Upon arrival was informed of fire 46th fl public hallway near freight elevator. Ordered investigation a nd found fire therein, which had been extinguished prior to the arrival of this dept. Evacuation instituted by Port Authority personnel prior to arriva l of Fire Dept. units. Report of smoke detector operational of the 103rd fl. Fire located between freight elevators 49 & 17.

E.6- Rolled up,lengths to the 44th fl. Connected to standpipe therein and stretched to fire floor(46th) Washed down fire area for overhauling purposes.

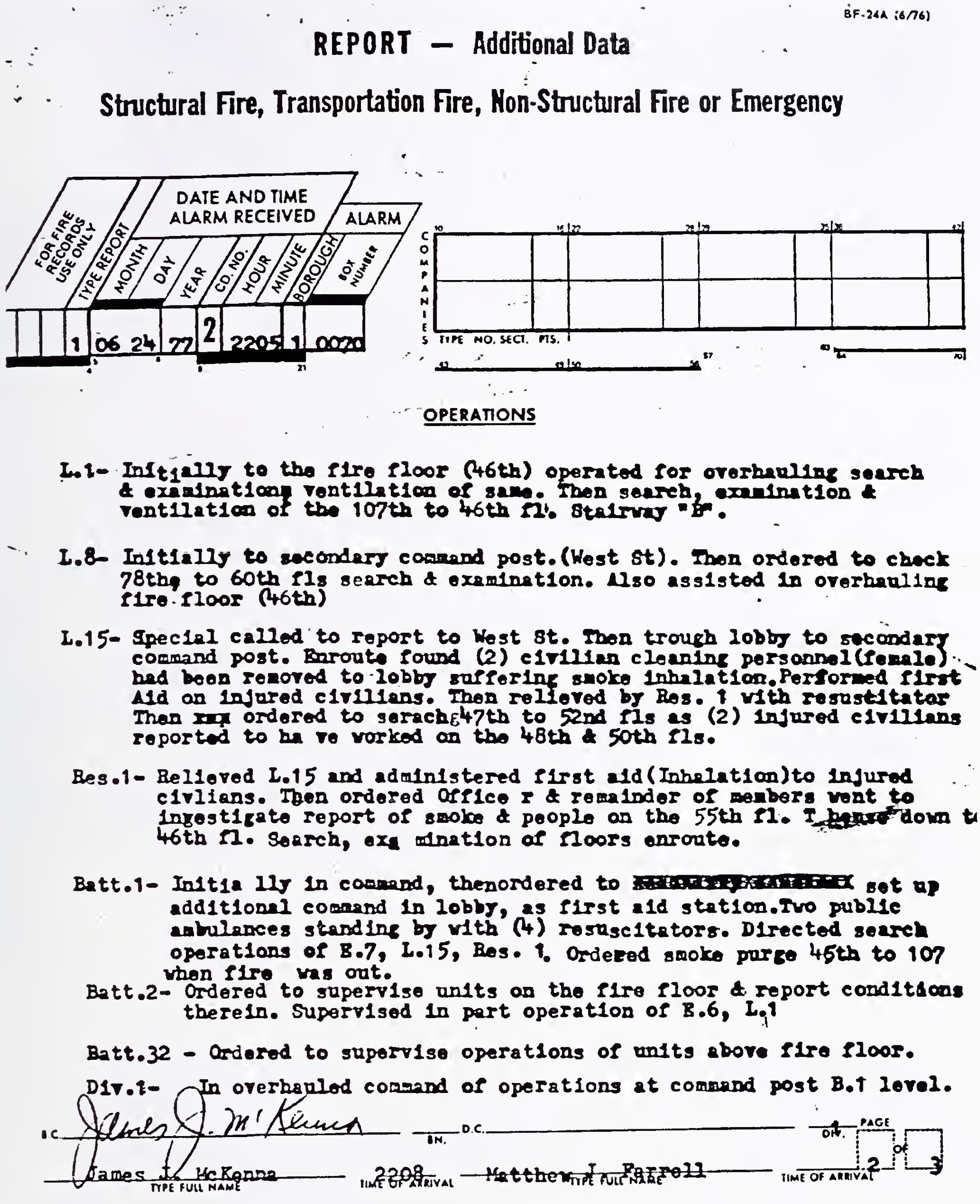
E.7- Assisted in stretch, then ordered to search, examination of 53rd to 58th fls. Also Checked 45th fl. report of smoke condition.

E.24- Reported to secondary command post([illegible]. Then ordered to check [illegible] of 53rd to 56th fls. Also checked out smoke detector 103rd fl.

B.C. James J. McKenna 1 (BN.) D.C. 1 (DIV.) PAGE 1 OF 3

James J. McKenna (TYPE FULL NAME) 2208 (TIME OF ARRIVAL) Matthew J. Farrell (TYPE FULL NAME) (TIME OF ARRIVAL)

ADMINISTRATIVE COMPANY



BF-24A (6/76)

REPORT — Additional Data

Structural Fire, Transportation Fire, Non-Structural Fire or Emergency

FOR FIRE RECORDS USE ONLY	TYPE REPORT	MONTH	DAY	YEAR	CO. NO.	HOUR	MINUTE	BOROUGH	BOX NUMBER
	1	06	24	77	2	22	05	1	0020

DATE AND TIME ALARM RECEIVED

ALARM

COMPANIES

TYPE NO. SECT. PTS.

OPERATIONS

L.1- Initially to the fire floor (46th) operated for overhauling search & examination ventilation of same. Then search, examination & ventilation of the 107th to 46th fl. Stairway "B".

L.8- Initially to secondary command post.(West St). Then ordered to check 78th to 60th fls search & examination. Also assisted in overhauling fire floor (46th)

L.15- Special called to report to West St. Then trough lobby to secondary command post. Enroute found (2) civilian cleaning personnel(female) had been removed to lobby suffering smoke inhalation.Performed first Aid on injured civilians. Then relieved by Res. 1 with resustitator Then xxx ordered to serach 47th to 52nd fls as (2) injured civilians reported to ha ve worked on the 48th & 50th fls.

Res.1- Relieved L.15 and administered first aid(Inhalation)to injured civlians. Then ordered Office r & remainder of members went to ingestigate report of smoke & people on the 55th fl. Thence down t 46th fl. Search, exa mination of floors enroute.

Batt.1- Initia lly in command, thenordered to [illegible] set up additional command in lobby, as first aid station.Two public ambulances standing by with (4) resuscitators. Directed search operations of E.7, L.15, Res. 1. Ordered smoke purge 45th to 107 when fire was out.

Batt.2- Ordered to supervise units on the fire floor & report conditions therein. Supervised in part operation of E.6, L.1

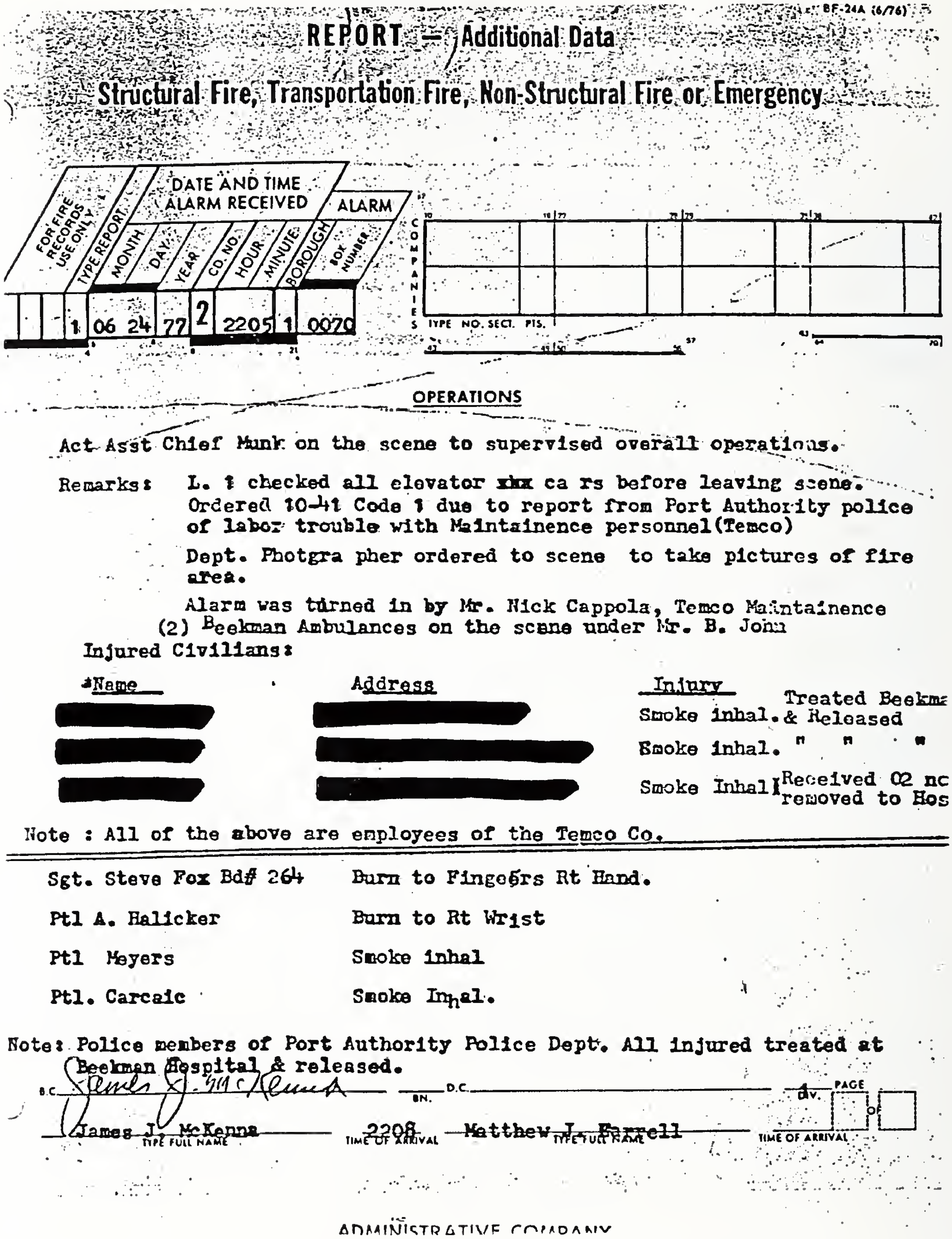
Batt.32 - Ordered to supervise operations of units above fire floor.

Div.1- In overhauled command of operations at command post B.1 level.

B.C. James J. M'Kenna BN. 2208 D.C. DIV. 1 PAGE 2 of 3

James J. McKenna TYPE FULL NAME 2208 TIME OF ARRIVAL Matthew J. Farrell TYPE FULL NAME TIME OF ARRIVAL

ADMINISTRATIVE COMPANY



BF-24A (6/76)

REPORT — Additional Data

Structural Fire, Transportation Fire, Non-Structural Fire or Emergency

FOR FIRE RECORDS USE ONLY	TYPE REPORT	MONTH	DAY	YEAR	CO. NO.	HOUR	MINUTE	BOROUGH	BOX NUMBER
	1	06	24	77	2	22	05	1	0070

DATE AND TIME ALARM RECEIVED — ALARM

COMPANIES — TYPE NO. SECT. PTS.

OPERATIONS

Act Asst Chief Munk on the scene to supervised overall operations.

Remarks: L. 1 checked all elevator xxx ca rs before leaving scene. Ordered 10-41 Code 1 due to report from Port Authority police of labor trouble with Maintainence personnel(Temco)

Dept. Photgra pher ordered to scene to take pictures of fire area.

Alarm was turned in by Mr. Nick Cappola, Temco Maintainence
(2) Beekman Ambulances on the scene under Mr. B. John

Injured Civilians:

Name	Address	Injury	
[redacted]	[redacted]	Smoke inhal.	Treated Beekma & Released
[redacted]	[redacted]	Smoke inhal.	" " "
[redacted]	[redacted]	Smoke Inhal	Received 02 nc removed to Hos

Note : All of the above are employees of the Temco Co.

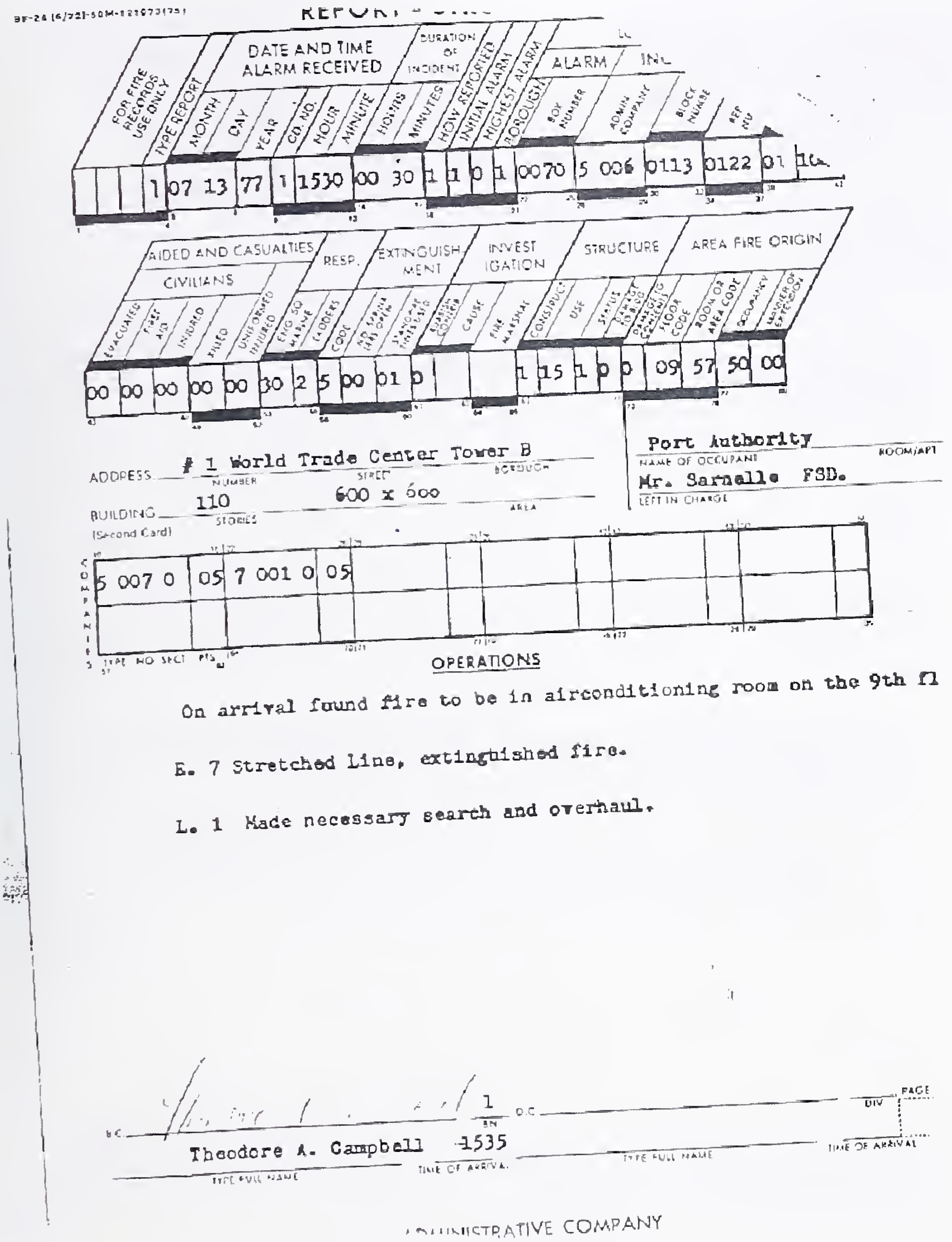
Sgt. Steve Fox Bd# 264	Burn to Fingers Rt Hand.
Ptl A. Halicker	Burn to Rt Wrist
Ptl Meyers	Smoke inhal
Ptl. Carcaic	Smoke Inhal.

Note: Police members of Port Authority Police Dept. All injured treated at Beekman Hospital & released.

B.C. James J. McKenna ______ BN. ______ D.C. ______ 1 DIV. PAGE ☐ OF ☐

James J. McKenna — TYPE FULL NAME — 2208 TIME OF ARRIVAL — Matthew J. Farrell — TYPE FULL NAME — TIME OF ARRIVAL

ADMINISTRATIVE COMPANY



BF-24 (6/72)-50M-121973(75)

REPORT

FOR FIRE RECORDS USE ONLY			TYPE REPORT	DATE AND TIME ALARM RECEIVED: MONTH	DAY	YEAR	CO. NO.	HOUR	MINUTE	DURATION OF INCIDENT: HOURS	MINUTES	HOW REPORTED	INITIAL ALARM	HIGHEST ALARM	BOROUGH	ALARM: BOX NUMBER	ADMIN COMPANY	BLOCK NUMBER	REP NO		
			1	07	13	77	1	15	30	00	30	1	1	0	1	0070	5 006	0113	0122	01	1c

AIDED AND CASUALTIES, CIVILIANS: EVACUATED	FIRST AID	INJURED	KILLED	UNIFORMED INJURED	RESP.: ENG SQ MARINE	LADDERS	EXTINGUISHMENT: CODE	AUTO SPRINK. HDS OPEN	STANDPIPE PRESSURE	INVESTIGATION: RUBBISH CONFINED	CAUSE	FIRE MARSHAL	STRUCTURE: CONSPICU.	USE	STATUS	DAMAGE TO BLDG	DAMAGE TO CONTENTS	AREA FIRE ORIGIN: FLOOR CODE	ROOM OR AREA CODE	OCCUPANCY	MANNER OF EXTENSION
00	00	00	00	00	30	2	5	00	01	0			1	15	1	0	0	09	57	50	00

ADDRESS # 1 World Trade Center Tower B
NUMBER STREET BOROUGH

BUILDING 110 600 x 600
STORIES AREA
(Second Card)

Port Authority
NAME OF OCCUPANT ROOM/APT

Mr. Sarnelle FSD.
LEFT IN CHARGE

COMPANIES

TYPE NO SECT	PTS										
5 007 0	05	7 001 0	05								

OPERATIONS

On arrival found fire to be in airconditioning room on the 9th fl

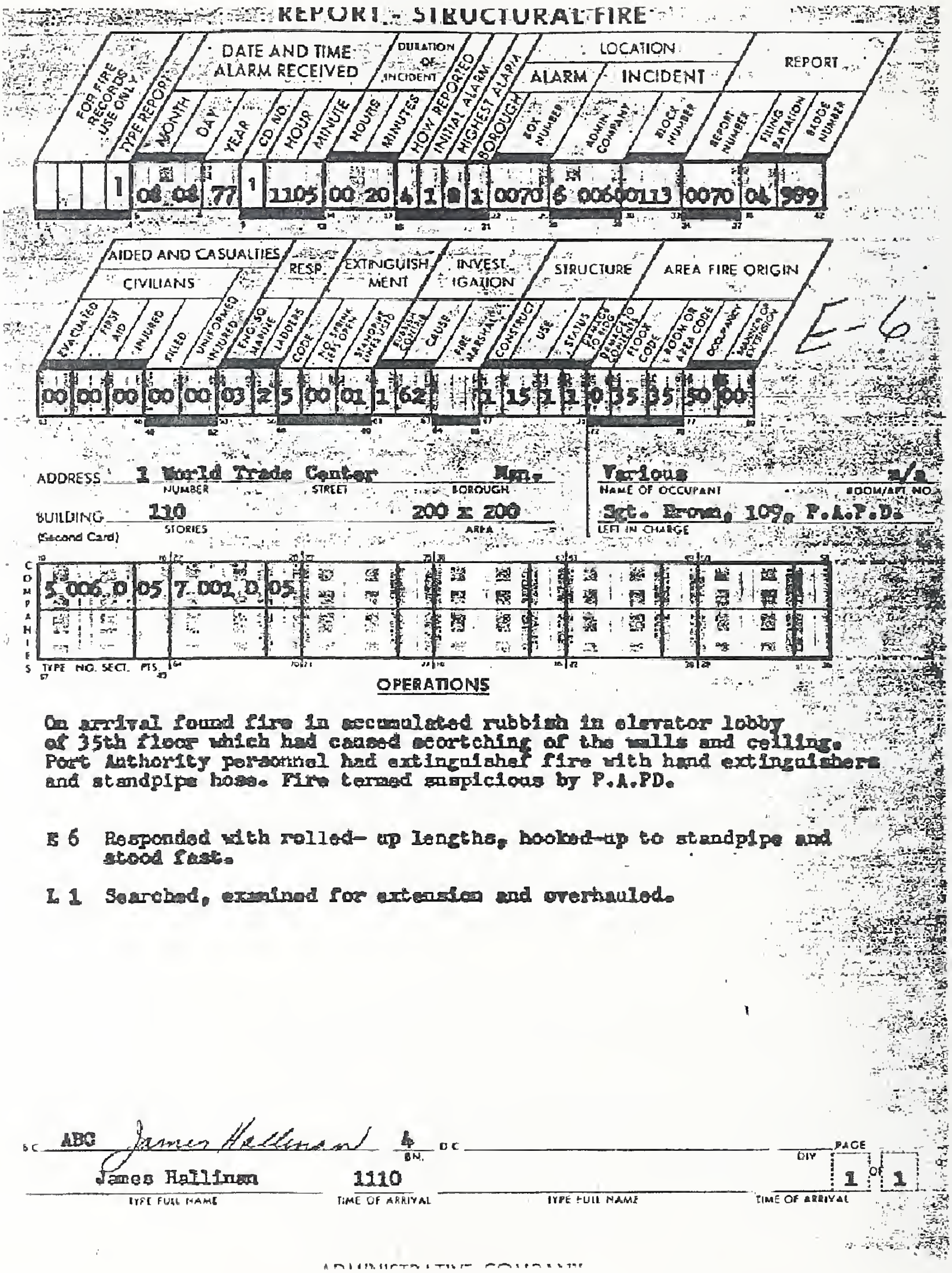
E. 7 Stretched Line, extinguished fire.

L. 1 Made necessary search and overhaul.

B.C. 1 D.C. DIV PAGE
BN

Theodore A. Campbell 1535
TYPE FULL NAME TIME OF ARRIVAL TYPE FULL NAME TIME OF ARRIVAL

ADMINISTRATIVE COMPANY



REPORT - STRUCTURAL FIRE

FOR FIRE RECORDS USE ONLY			TYPE REPORT	DATE AND TIME ALARM RECEIVED					DURATION OF INCIDENT		HOW REPORTED	INITIAL ALARM	HIGHEST ALARM	BOROUGH	LOCATION				REPORT	
				MONTH	DAY	YEAR	CD NO.	HOUR MINUTE	HOURS	MINUTES					ALARM BOX NUMBER	ADMIN. COMPANY	INCIDENT BLOCK NUMBER	REPORT NUMBER	FILING BATTALION	BLDG. NUMBER
			1	08	08	77	1	1105	00	20	4	1	[illegible]	1	0070	6 006	0113	0070	04	989

AIDED AND CASUALTIES					RESP.		EXTINGUISHMENT			INVESTIGATION			STRUCTURE					AREA FIRE ORIGIN			
CIVILIANS																					
EVACUATED	FIRST AID	INJURED	KILLED	UNIFORMED INJURED	ENG. SQ. MARINE	LADDERS	CODE	NO. SPRINK. HEADS OPEN	STANDPIPE LINES USED	RUBBISH CONTAINER	CAUSE	FIRE MARSHAL	CONSTRUCT	USE	STATUS	DAMAGE TO BLDG	DAMAGE TO CONTENTS	FLOOR CODE	ROOM OR AREA CODE	OCCUPANCY	MANNER OF EXTENSION
00	00	00	00	00	03	2	5	00	01	1	62		1	15	1	1	0	35	35	50	00

E-6

ADDRESS 1 World Trade Center Mn.
NUMBER STREET BOROUGH

Various n/a
NAME OF OCCUPANT ROOM/APT. NO.

BUILDING 110 200 x 200
(Second Card) STORIES AREA

Sgt. Brown, 109, P.A.P.D.
LEFT IN CHARGE

COMPANIES

TYPE	NO.	SECT.	PTS.	TYPE	NO.	SECT.	PTS.
5	006	D	05	7	001	D	05

OPERATIONS

On arrival found fire in accumulated rubbish in elevator lobby of 35th floor which had caused scortching of the walls and ceiling. Port Authority personnel had extinguishef fire with hand extinguishers and standpipe hose. Fire termed suspicious by P.A.PD.

E 6 Responded with rolled- up lengths, hooked-up to standpipe and stood fast.

L 1 Searched, examined for extension and overhauled.

BC ABC James Hallinan 4 BN. DC
James Hallinan 1110
TYPE FULL NAME TIME OF ARRIVAL TYPE FULL NAME TIME OF ARRIVAL

DIV PAGE 1 OF 1

FOR FIRE RECORDS USE ONLY			TYPE REPORT	DATE AND TIME ALARM RECEIVED MONTH	DAY	YEAR.	CD. NO.	HOUR	MINUTE	DURATION OF INCIDENT HOURS	MINUTES	HOW REPORTED	INITIAL ALARM	HIGHEST ALARM	BOROUGH	LOCATION ALARM BOX NUMBER	LOCATION INCIDENT ADMIN. COMPANY	BLOCK NUMBER	REPORT NUMBER	REPORT FILING BATTALION	BADGE NUMBER
			1	11	03	77	1	18	45	00	30	4	1	0	1	8085	5 006	0113	0015	04	480

AIDED AND CASUALTIES CIVILIANS EVACUATED	FIRST AID	INJURED	KILLED	UNIFORMED INJURED	RESP. ENG. SQ., MARINE	LADDERS	EXTINGUISHMENT CODE	NO. SPRINKLERS OPEN	STANDPIPE LINES USED	RUBBISH CONTRIB.	INVESTIGATION CAUSE	FIRE MARSHAL	STRUCTURE CONSTRUCT	USE	STATUS	DAMAGE TO BLDG.	DAMAGE TO CONTENTS	AREA FIRE ORIGIN FLOOR CODE	ROOM OR AREA CODE	OCCUPANCY	MANNER OF EXTENSION
00	00	00	00	00	03	2	5	00	01	1	62		1	15	1	1	0	58	21	50	00

ADDRESS # 1 World Trade Center Tower 1 Man.
NUMBER STREET BOROUGH

BUILDING 110 300 X 300
(Second Card) STORIES AREA

Closet N.A.
NAME OF OCCUPANT ROOM/APT. NO

Sgt. Fox P.A.
LEFT IN CHARGE

COMPANIES

5 006 0	10	7 001 0	05								
TYPE NO. SECT.	PTS.										

OPERATIONS

On arrival found cause of alarm to be fire in janatorial closet in volving rags and rubbish. Batt 4 requested a 10-41 Codel Fire caused searing of paint on walls and ceiling.

E-6 Stretched rolled up lengths and hooked up to standpipe outlet and extinguished fire.

L-1 Made examination of walls and ceiling and ventilated as necessary.

B.C. Stanley Hirschfield 4th BN. D.C. DIV. PAGE 1 OF 1

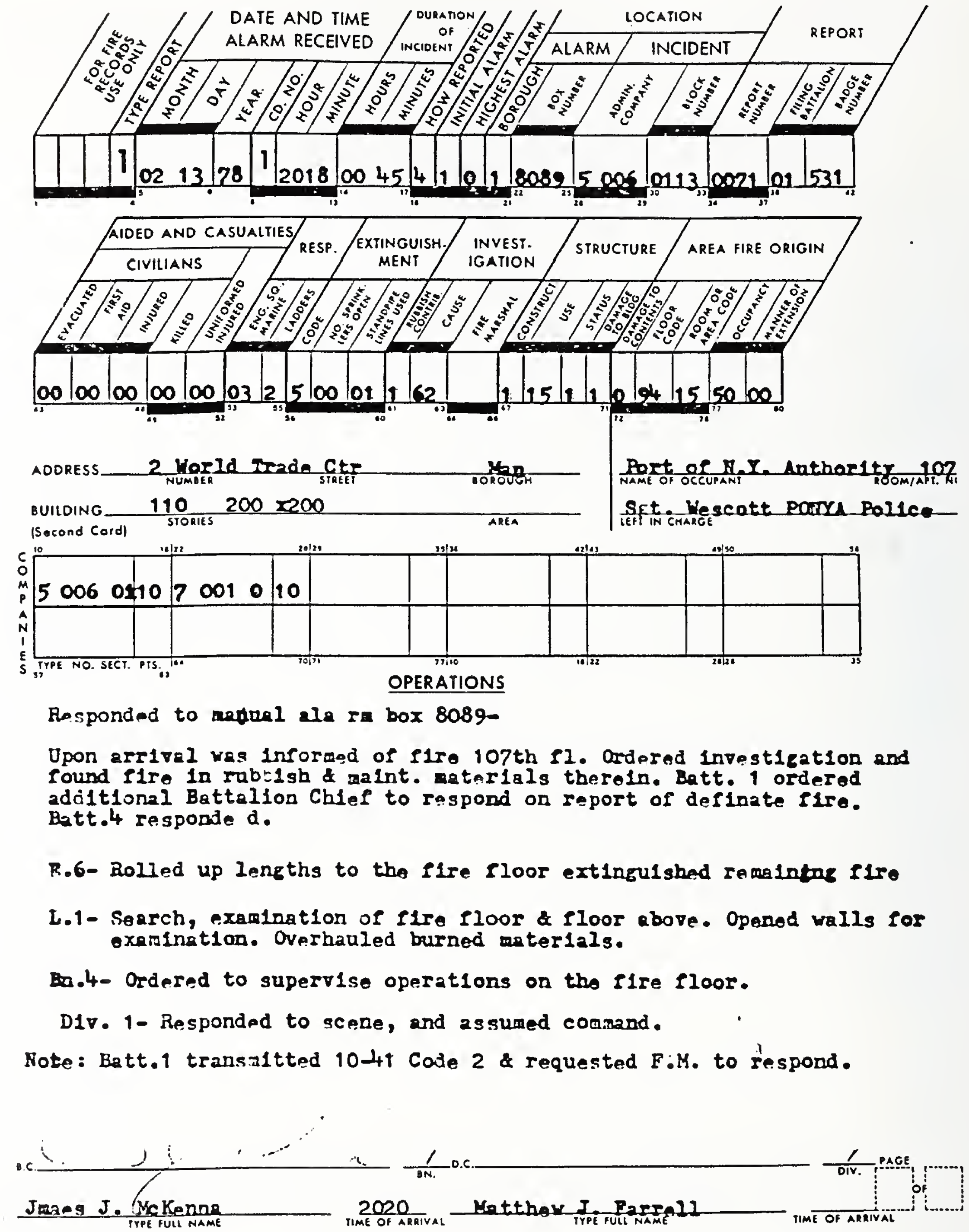
Stanley Hirschfield
TYPE FULL NAME

1850
TIME OF ARRIVAL

TYPE FULL NAME

TIME OF ARRIVAL

ADMINISTRATIVE COMPANY



FOR FIRE RECORDS USE ONLY				TYPE REPORT	DATE AND TIME ALARM RECEIVED						DURATION OF INCIDENT		HOW REPORTED	INITIAL ALARM	HIGHEST ALARM	BOROUGH	LOCATION			REPORT		
					MONTH	DAY	YEAR	CD. NO.	HOUR	MINUTE	HOURS	MINUTES					ALARM BOX NUMBER	INCIDENT ADMIN. COMPANY	BLOCK NUMBER	REPORT NUMBER	FILING BATTALION	BADGE NUMBER
				1	02	13	78	1	20	18	00	45	4	1	0	1	8089	5 006	0113	0071	01	531

AIDED AND CASUALTIES CIVILIANS					RESP.		EXTINGUISH-MENT			INVEST-IGATION			STRUCTURE				AREA FIRE ORIGIN				
EVACUATED	FIRST AID	INJURED	KILLED	UNIFORMED INJURED	ENG. SQ. MARINE	LADDERS	CODE	NO. SPRINKLERS OPEN	STANDPIPE LINES USED	RUBBISH CONTRIB.	CAUSE	FIRE MARSHAL	CONSTRUCT	USE	STATUS	DAMAGE TO BLDG	DAMAGE TO CONTENTS	FLOOR CODE	ROOM OR AREA CODE	OCCUPANCY	MANNER OF EXTENSION
00	00	00	00	00	03	2	5	00	01	1	62		1	15	1	1	0	94	15	50	00

ADDRESS 2 World Trade Ctr (NUMBER, STREET) Man (BOROUGH)

Port of N.Y. Anthority (NAME OF OCCUPANT) 107 (ROOM/APT. N)

BUILDING 110 (STORIES) 200 x200 (AREA)

(Second Card)

Sgt. Wescott PONYA Police (LEFT IN CHARGE)

COMPANIES

TYPE NO. SECT. PTS.															
5 006 01	10	7 001 0	10												

OPERATIONS

Responded to manual ala rm box 8089-

Upon arrival was informed of fire 107th fl. Ordered investigation and found fire in rubbish & maint. materials therein. Batt. 1 ordered additional Battalion Chief to respond on report of definate fire. Batt.4 responde d.

E.6- Rolled up lengths to the fire floor extinguished remaining fire

L.1- Search, examination of fire floor & floor above. Opened walls for examination. Overhauled burned materials.

Bn.4- Ordered to supervise operations on the fire floor.

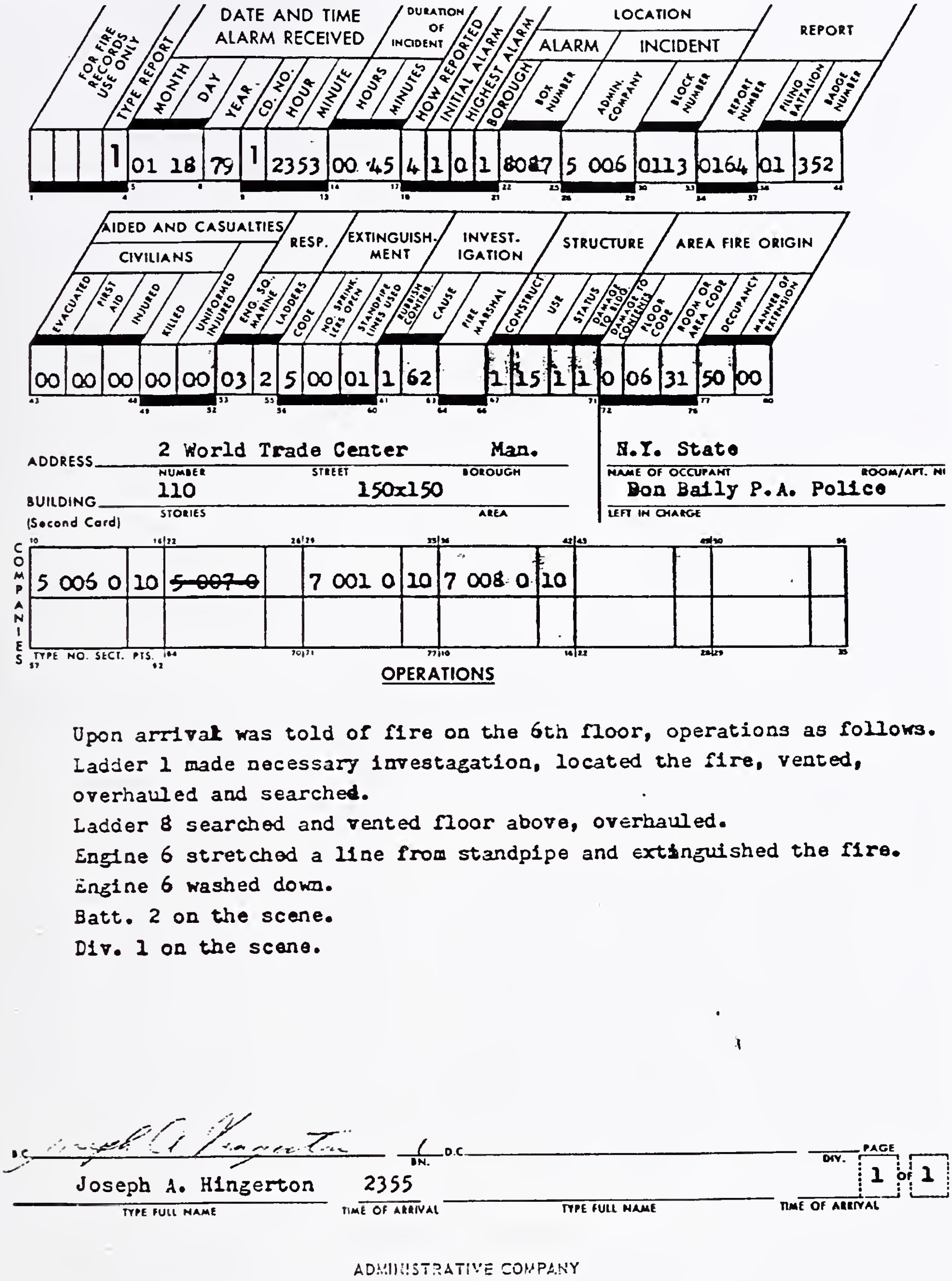
Div. 1- Responded to scene, and assumed command.

Note: Batt.1 transmitted 10-41 Code 2 & requested F.M. to respond.

B.C. ______ 1 BN. D.C. ______ 1 DIV. PAGE ☐ OF ☐

Jmaes J. McKenna (TYPE FULL NAME) 2020 (TIME OF ARRIVAL) Matthew J. Farrell (TYPE FULL NAME) ______ (TIME OF ARRIVAL)

ADMINISTRATIVE COMPANY



FOR FIRE RECORDS USE ONLY			TYPE REPORT	DATE AND TIME ALARM RECEIVED MONTH	DAY	YEAR	CD. NO.	HOUR	MINUTE	DURATION OF INCIDENT HOURS	MINUTES	HOW REPORTED	INITIAL ALARM	HIGHEST ALARM	BOROUGH	LOCATION ALARM BOX NUMBER	INCIDENT ADMIN. COMPANY	BLOCK NUMBER	REPORT REPORT NUMBER	FILING BATTALION	BADGE NUMBER
			1	01	18	79	1	23	53	00	45	4	1	0	1	8087	5 006	0113	0164	01	352

AIDED AND CASUALTIES CIVILIANS EVACUATED	FIRST AID	INJURED	KILLED	UNIFORMED INJURED	RESP. ENG. SQ. MARINE	LADDERS	EXTINGUISHMENT CODE	NO. SPRINKLERS OPEN	STANDPIPE LINES USED	RUBBISH CONTRIB.	INVESTIGATION CAUSE	FIRE MARSHAL	STRUCTURE CONSTRUCT.	USE	STATUS	DAMAGE TO BLDG.	DAMAGE TO CONTENTS	AREA FIRE ORIGIN FLOOR CODE	ROOM OR AREA CODE	OCCUPANCY	MANNER OF EXTENSION
00	00	00	00	00	03	2	5	00	01	1	62		1	15	1	1	0	06	31	50	00

ADDRESS 2 World Trade Center (NUMBER, STREET) Man. (BOROUGH)

BUILDING (Second Card) 110 (STORIES) 150x150 (AREA)

N.Y. State (NAME OF OCCUPANT) ROOM/APT. N

Don Baily P.A. Police (LEFT IN CHARGE)

COMPANIES (TYPE NO. SECT. PTS.)

5 006 0	10	~~5 007 0~~		7 001 0	10	7 008 0	10			

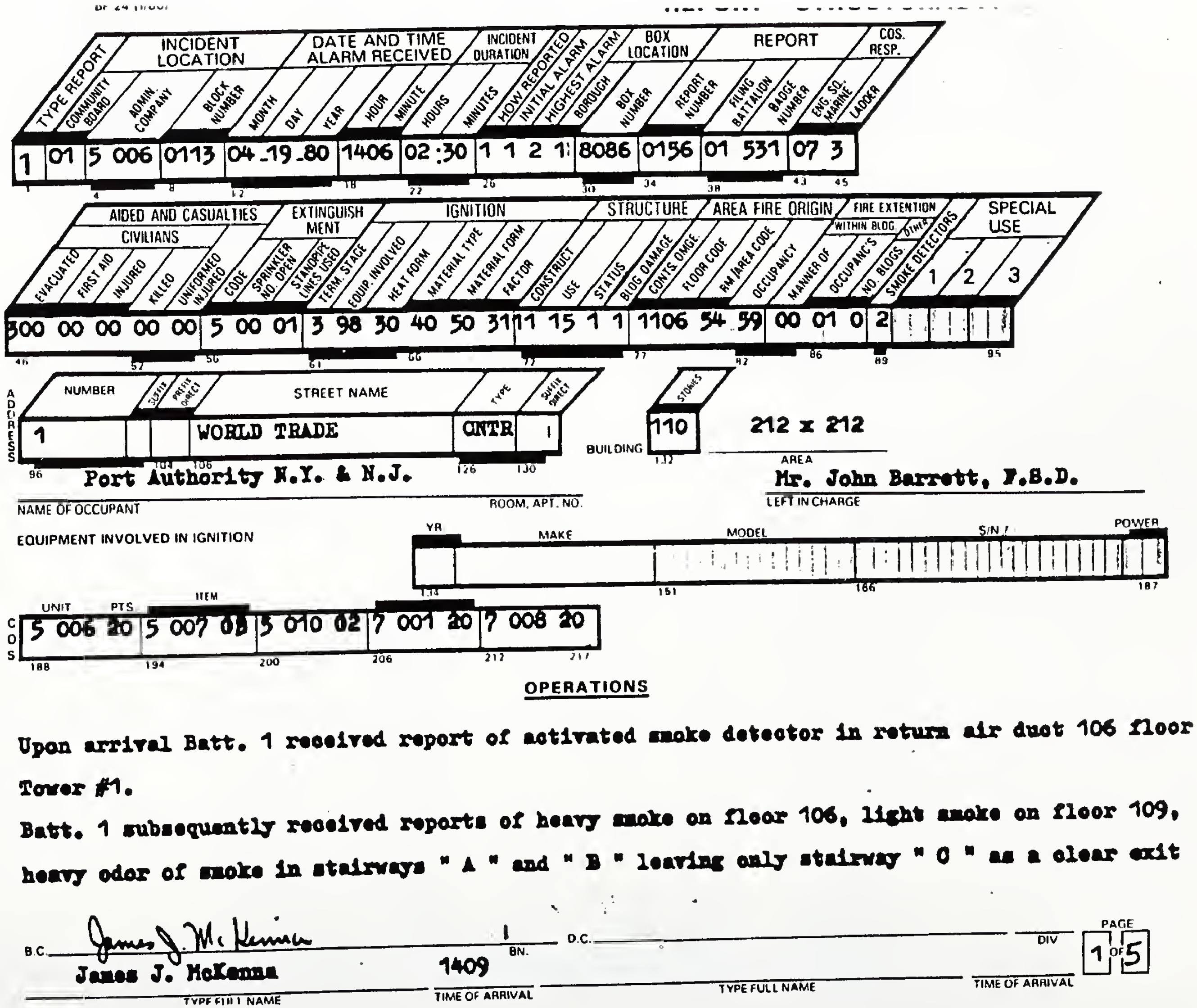
OPERATIONS

Upon arrival was told of fire on the 6th floor, operations as follows.
Ladder 1 made necessary investagation, located the fire, vented, overhauled and searched.
Ladder 8 searched and vented floor above, overhauled.
Engine 6 stretched a line from standpipe and extinguished the fire.
Engine 6 washed down.
Batt. 2 on the scene.
Div. 1 on the scene.

B.C. Joseph A. Hingerton BN. 1 D.C. DIV. PAGE 1 OF 1

Joseph A. Hingerton (TYPE FULL NAME) 2355 (TIME OF ARRIVAL) (TYPE FULL NAME) (TIME OF ARRIVAL)

ADMINISTRATIVE COMPANY



TYPE REPORT	COMMUNITY BOARD	ADMIN. COMPANY	BLOCK NUMBER	MONTH	DAY	YEAR	HOUR	MINUTE	HOURS	MINUTES	HOW REPORTED	INITIAL ALARM	HIGHEST ALARM	BOROUGH	BOX NUMBER	REPORT NUMBER	FILING BATTALION	BADGE NUMBER	ENG. SQ. MARINE	LADDER
		INCIDENT LOCATION		DATE AND TIME ALARM RECEIVED					INCIDENT DURATION						BOX LOCATION	REPORT			COS. RESP.	
1	01	5 006	0113	04	19	80	14	06	02	30	1	1	2	1	8086	0156	01	531	07	3

1 4 8 12 18 22 26 30 34 38 43 45

AIDED AND CASUALTIES — CIVILIANS: EVACUATED, FIRST AID, INJURED, KILLED; UNIFORMED INJURED

EXTINGUISHMENT: CODE, SPRINKLER NO. OPEN, STANDPIPE LINES USED

IGNITION: TERM. STAGE, EQUIP. INVOLVED, HEAT FORM, MATERIAL TYPE, MATERIAL FORM, FACTOR

STRUCTURE: CONSTRUCT, USE, STATUS, BLDG DAMAGE, CONTS. DMGE.

AREA FIRE ORIGIN: FLOOR CODE, RM/AREA CODE, OCCUPANCY

FIRE EXTENTION: WITHIN BLDG: MANNER OF, OCCUPANC'S; OTHER: NO. BLDGS; SMOKE DETECTORS

SPECIAL USE: 1, 2, 3

300 00 00 00 00 | 5 00 01 | 3 98 30 40 50 31 | 11 15 1 1 | 1106 54 59 | 00 01 0 | 2 | | |

46 52 56 61 66 72 77 82 86 89 95

ADDRESS

NUMBER	SUFFIX	PREFIX DIRECT	STREET NAME	TYPE	SUFFIX DIRECT
1			WORLD TRADE	CNTR	1

96 104 106 126 130

BUILDING STORIES: 110

132

AREA: 212 x 212

NAME OF OCCUPANT: Port Authority N.Y. & N.J.

ROOM, APT. NO.:

LEFT IN CHARGE: Mr. John Barrett, F.S.D.

EQUIPMENT INVOLVED IN IGNITION

YR	MAKE	MODEL	S/N	POWER

134 151 166 187

COS

UNIT	PTS	ITEM		
5 006 20	5 007 06	5 010 02	7 001 20	7 008 20

188 194 200 206 212 217

OPERATIONS

Upon arrival Batt. 1 received report of activated smoke detector in return air duct 106 floor Tower #1.

Batt. 1 subsequently received reports of heavy smoke on floor 106, light smoke on floor 109, heavy odor of smoke in stairways " A " and " B " leaving only stairway " C " as a clear exit

B.C. James J. McKenna   1 BN.

James J. McKenna — TYPE FULL NAME

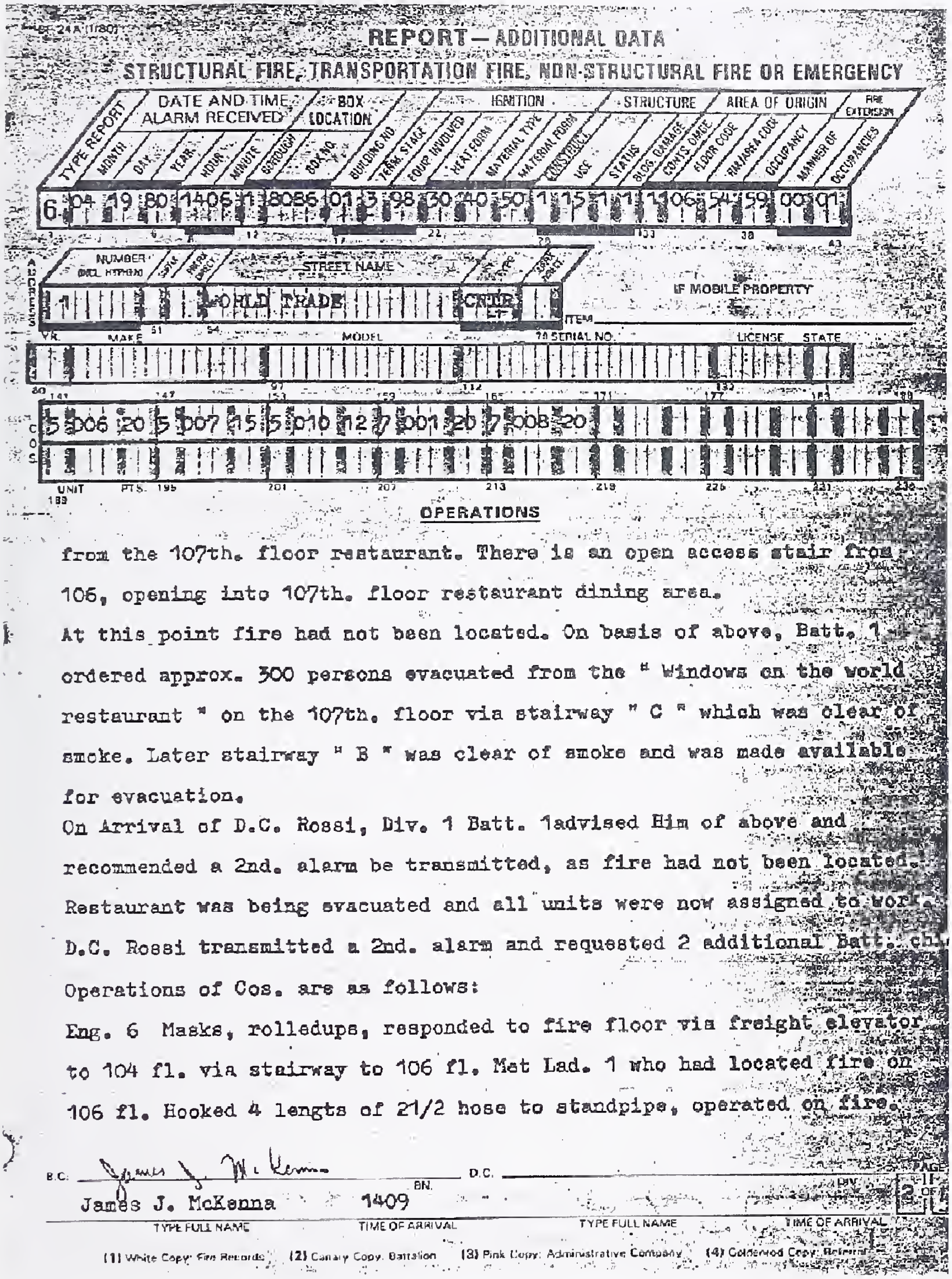
1409 — TIME OF ARRIVAL

D.C. ______ DIV ______

TYPE FULL NAME ______ TIME OF ARRIVAL ______

PAGE 1 OF 5

ADMINISTRATIVE COMPANY



BF-24 A (1/80)

REPORT — ADDITIONAL DATA

STRUCTURAL FIRE, TRANSPORTATION FIRE, NON-STRUCTURAL FIRE OR EMERGENCY

	DATE AND TIME ALARM RECEIVED					BOX LOCATION			IGNITION					STRUCTURE					AREA OF ORIGIN			FIRE EXTENSION	
TYPE REPORT	MONTH	DAY	YEAR	HOUR	MINUTE	BOROUGH	BOX NO.	BUILDING NO	TERM. STAGE	EQUIP INVOLVED	HEAT FORM	MATERIAL TYPE	MATERIAL FORM	CONSTRUCT.	USE	STATUS	BLDG. DAMAGE	CONTS DMGE	FLOOR CODE	RM/AREA CODE	OCCUPANCY	MANNER OF	OCCUPANCIES
6	04	19	80	14	06	1	8085	01	3	98	30	40	50	1	15	1	1	1	106	54	59	00	01

NUMBER (INCL. HYPHEN)	SFX	PREFIX DIRCT.	STREET NAME	TYPE	SUFFIX DIRCT.
1			WORLD TRADE	CNTR.	

IF MOBILE PROPERTY

ITEM

YR.	MAKE	MODEL	SERIAL NO.	LICENSE	STATE

	UNIT	PTS.	UNIT	PTS.	UNIT	PTS.	UNIT	PTS.	UNIT	PTS.
COS	5 006	20	5 007	15	5 010	12	7 001	20	7 008	20

OPERATIONS

from the 107th. floor restaurant. There is an open access stair from 106, opening into 107th. floor restaurant dining area.

At this point fire had not been located. On basis of above, Batt. 1 ordered approx. 300 persons evacuated from the " Windows on the world restaurant " on the 107th. floor via stairway " C " which was clear of smoke. Later stairway " B " was clear of smoke and was made available for evacuation.

On Arrival of D.C. Rossi, Div. 1 Batt. 1advised Him of above and recommended a 2nd. alarm be transmitted, as fire had not been located. Restaurant was being evacuated and all units were now assigned to work. D.C. Rossi transmitted a 2nd. alarm and requested 2 additional Batt. ch

Operations of Cos. are as follows:

Eng. 6 Masks, rolledups, responded to fire floor via freight elevator to 104 fl. via stairway to 106 fl. Met Lad. 1 who had located fire on 106 fl. Hooked 4 lengts of 21/2 hose to standpipe, operated on fire.

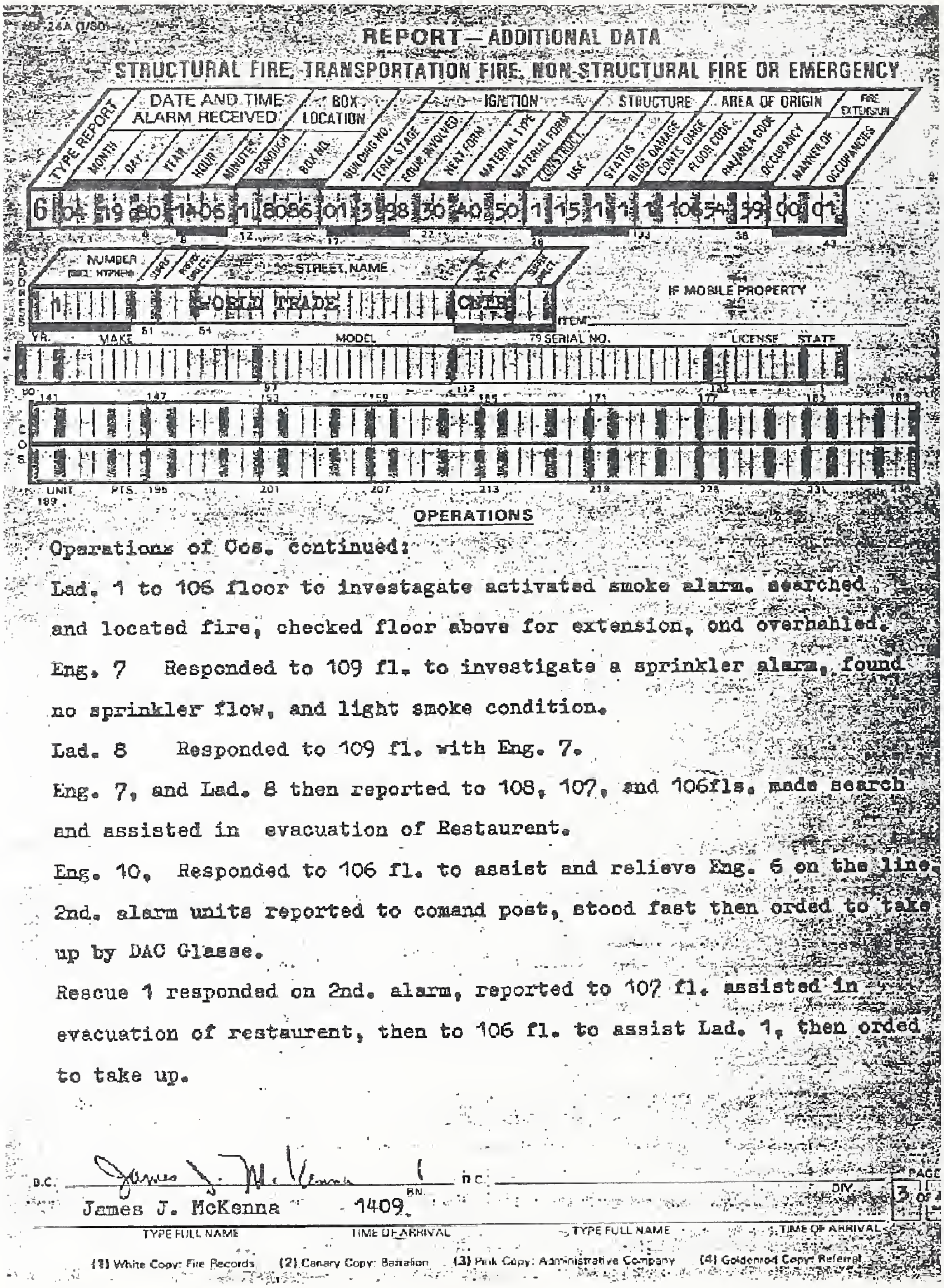
B.C. James J. McKenna D.C.

James J. McKenna 1409 BN. DIV.

TYPE FULL NAME TIME OF ARRIVAL TYPE FULL NAME TIME OF ARRIVAL

PAGE 2 OF

(1) White Copy: Fire Records (2) Canary Copy: Battalion (3) Pink Copy: Administrative Company (4) Goldenrod Copy: Referral



BF-24A (1/80)

REPORT—ADDITIONAL DATA

STRUCTURAL FIRE, TRANSPORTATION FIRE, NON-STRUCTURAL FIRE OR EMERGENCY

TYPE REPORT · DATE AND TIME ALARM RECEIVED: MONTH, DAY, YEAR, HOUR, MINUTES · BOX LOCATION: BOROUGH, BOX NO. · BUILDING NO. · IGNITION: TERM. STAGE, EQUIP. INVOLVED, HEAT FORM, MATERIAL TYPE, MATERIAL FORM · STRUCTURE: CONSTRUCT., USE, STATUS, BLDG. DAMAGE, CONTS. DAMGE · AREA OF ORIGIN: FLOOR CODE, FAN/AREA CODE, OCCUPANCY · FIRE EXTENSION: NUMBER OF OCCUPANCIES

6 04 19 80 14 06 1 8086 01 3 98 30 40 50 1 15 1 1 1 106 54 59 00 01

ADDRESS: NUMBER (INCL. HYPHEN) · STREET NAME: WORLD TRADE · TYPE: CNTR

IF MOBILE PROPERTY · ITEM

YR. · MAKE · MODEL · SERIAL NO. · LICENSE · STATE

COS.

UNIT · PTS.

OPERATIONS

Operations of Cos. continued:

Lad. 1 to 106 floor to investagate activated smoke alarm. searched and located fire, checked floor above for extension, ond overhalled.

Eng. 7 Responded to 109 fl. to investigate a sprinkler alarm, found no sprinkler flow, and light smoke condition.

Lad. 8 Responded to 109 fl. with Eng. 7.

Eng. 7, and Lad. 8 then reported to 108, 107, and 106fls. made search and assisted in evacuation of Restaurent.

Eng. 10, Responded to 106 fl. to assist and relieve Eng. 6 on the line.

2nd. alarm units reported to comand post, stood fast then orded to take up by DAC Glasse.

Rescue 1 responded on 2nd. alarm, reported to 107 fl. assisted in evacuation of restaurent, then to 106 fl. to assist Lad. 1, then orded to take up.

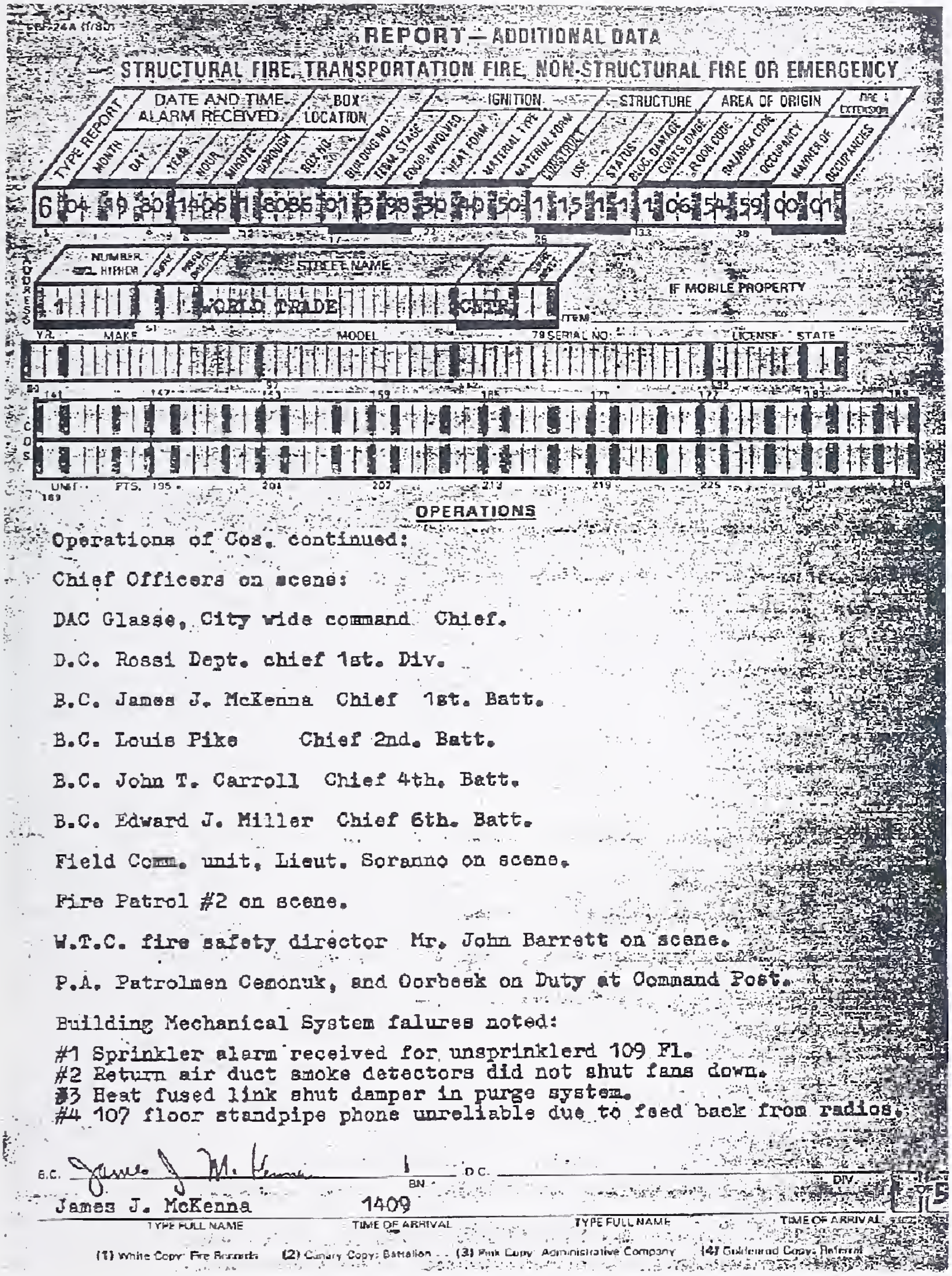
B.C. James J. McKenna · BN. 1 · D.C.

James J. McKenna · 1409 · DIV.

TYPE FULL NAME · TIME OF ARRIVAL · TYPE FULL NAME · TIME OF ARRIVAL

PAGE 3 OF

(1) White Copy: Fire Records (2) Canary Copy: Battalion (3) Pink Copy: Administrative Company (4) Goldenrod Copy: Referral



BF-24A (1/80)

REPORT — ADDITIONAL DATA

STRUCTURAL FIRE, TRANSPORTATION FIRE, NON-STRUCTURAL FIRE OR EMERGENCY

	DATE AND TIME ALARM RECEIVED					BOX LOCATION			IGNITION						STRUCTURE				AREA OF ORIGIN			FIRE EXTENSION	
TYPE REPORT	MONTH	DAY	YEAR	HOUR	MINUTE	BOROUGH	BOX NO.	BUILDING NO.	TERM. STAGE	EQUIP. INVOLVED	HEAT FORM	MATERIAL TYPE	MATERIAL FORM	CONSTRUCT.	USE	STATUS	BLDG. DAMAGE	CONTS. DMGE.	FLOOR CODE	RM/AREA CODE	OCCUPANCY	MANNER OF	OCCUPANCIES
6	04	19	80	14	06	1	8086	01	3	98	30	40	50	1	15	1	1	1	06	54	59	00	01

ADDRESS

NUMBER: 1

STREET NAME: WORLD TRADE CETR

IF MOBILE PROPERTY

ITEM

YR. MAKE MODEL SERIAL NO. LICENSE STATE

COS

UNIT PTS.

OPERATIONS

Operations of Cos. continued:

Chief Officers on scene:

DAC Glasse, City wide command Chief.

D.C. Rossi Dept. chief 1st. Div.

B.C. James J. McKenna Chief 1st. Batt.

B.C. Louis Pike Chief 2nd. Batt.

B.C. John T. Carroll Chief 4th. Batt.

B.C. Edward J. Miller Chief 6th. Batt.

Field Comm. unit, Lieut. Soranno on scene.

Fire Patrol #2 on scene.

W.T.C. fire safety director Mr. John Barrett on scene.

P.A. Patrolmen Cemonuk, and Oorbeek on Duty at Command Post.

Building Mechanical System falures noted:

#1 Sprinkler alarm received for unsprinklerd 109 Fl.
#2 Return air duct smoke detectors did not shut fans down.
#3 Heat fused link shut damper in purge system.
#4 107 floor standpipe phone unreliable due to feed back from radios.

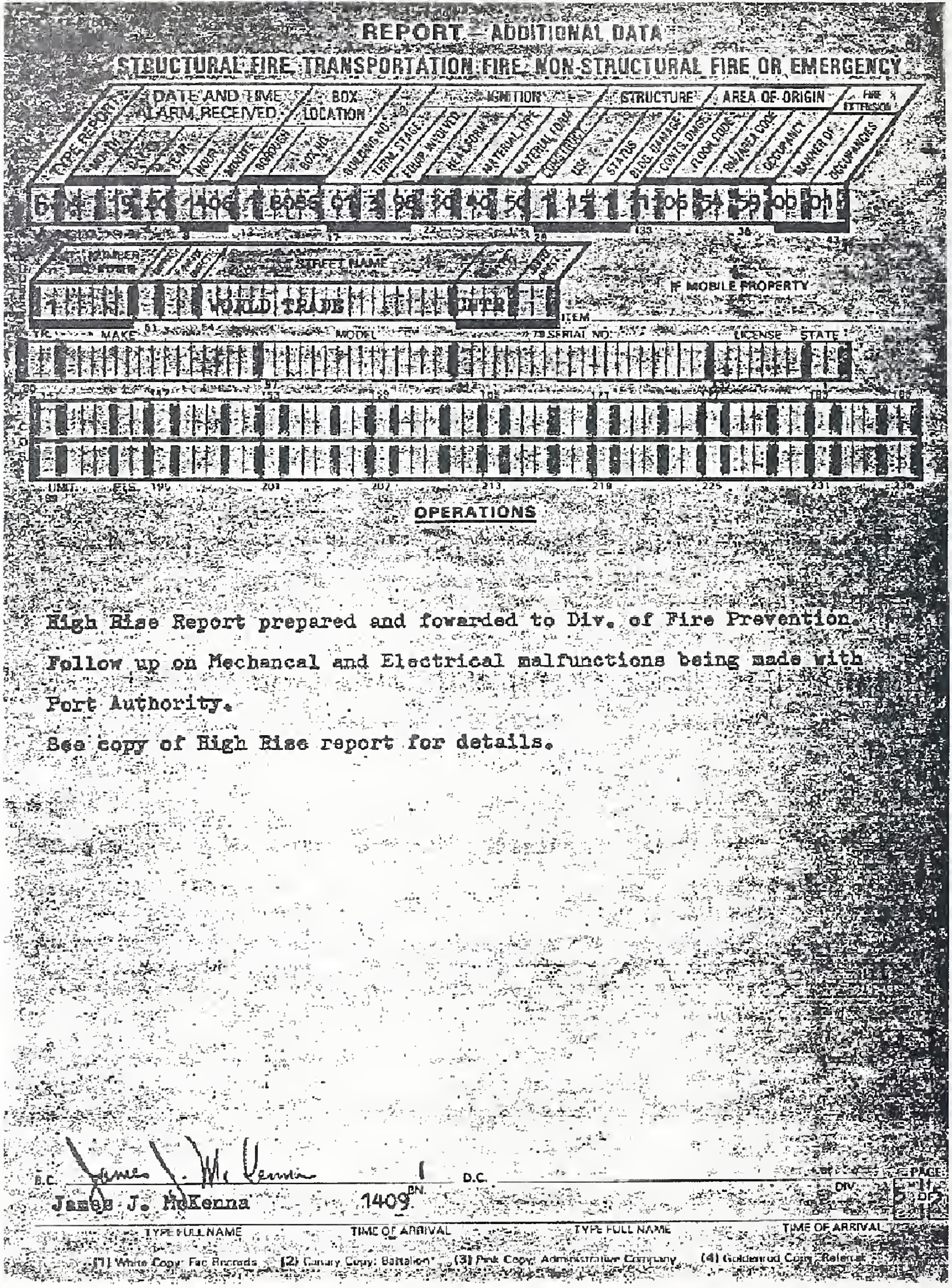
B.C. James J. McKenna BN. 1 D.C. DIV.

James J. McKenna 1409

TYPE FULL NAME TIME OF ARRIVAL TYPE FULL NAME TIME OF ARRIVAL

OF 5

(1) White Copy: Fire Records (2) Canary Copy: Battalion (3) Pink Copy: Administrative Company (4) Goldenrod Copy: Referral



REPORT — ADDITIONAL DATA

STRUCTURAL FIRE TRANSPORTATION FIRE NON-STRUCTURAL FIRE OR EMERGENCY

TYPE REPORT · DATE AND TIME ALARM RECEIVED · BOX LOCATION · BUILDING NO. · IGNITION · STRUCTURE · AREA OF ORIGIN · FIRE & EXTENSION

STREET NAME: WORLD TRADE CNTR

IF MOBILE PROPERTY

ITEM · MAKE · MODEL · SERIAL NO. · LICENSE · STATE

UNIT · PTS.

OPERATIONS

High Rise Report prepared and fowarded to Div. of Fire Prevention. Follow up on Mechancal and Electrical malfunctions being made with Port Authority.

See copy of High Rise report for details.

B.C. James J. McKenna

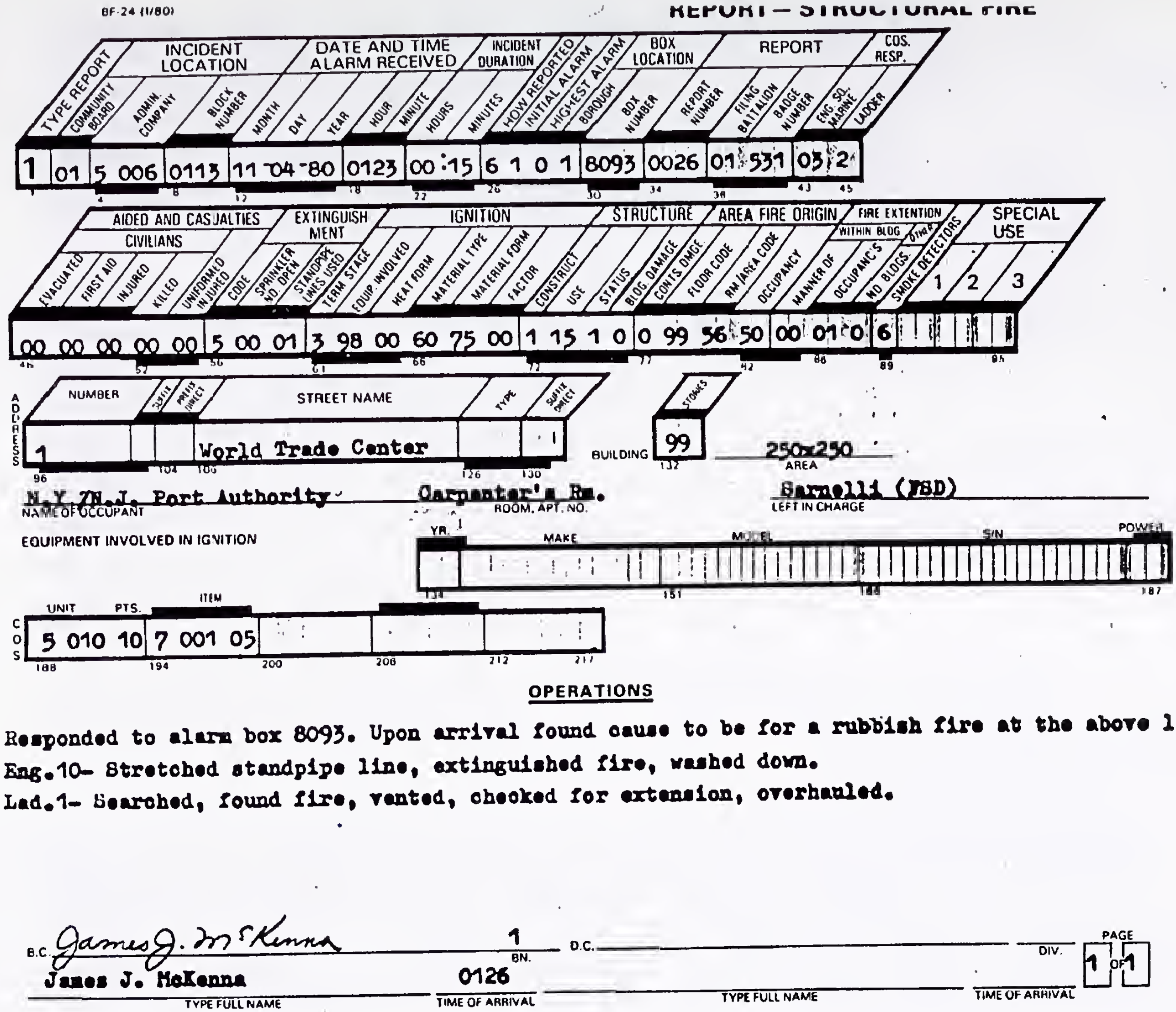
James J. McKenna — TYPE FULL NAME

1409 BN. — TIME OF ARRIVAL

D.C. — TYPE FULL NAME — TIME OF ARRIVAL

DIV. · PAGE OF

(1) White Copy: Fac Records (2) Canary Copy: Battalion (3) Pink Copy: Administrative Company (4) Goldenrod Copy: Referral



BF-24 (1/80)

REPORT — STRUCTURAL FIRE

TYPE REPORT	INCIDENT LOCATION			DATE AND TIME ALARM RECEIVED					INCIDENT DURATION						BOX LOCATION	REPORT			COS. RESP.	
	COMMUNITY BOARD	ADMIN. COMPANY	BLOCK NUMBER	MONTH	DAY	YEAR	HOUR	MINUTE	HOURS	MINUTES	HOW REPORTED	INITIAL ALARM	HIGHEST ALARM	BOROUGH	BOX NUMBER	REPORT NUMBER	FILING BATTALION	BADGE NUMBER	ENG. SQ. MARINE	LADDER
1	01	5 006	0113	11	04	80	01	23	00	15	6	1	0	1	8093	0026	01	531	05	2

AIDED AND CASUALTIES					EXTINGUISHMENT			IGNITION						STRUCTURE				AREA FIRE ORIGIN				FIRE EXTENTION				SPECIAL USE		
CIVILIANS																						WITHIN BLDG		OTHER				
EVACUATED	FIRST AID	INJURED	KILLED	UNIFORMED INJURED	CODE	SPRINKLER NO. OPEN	STANDPIPE LINES USED	TERM STAGE	EQUIP INVOLVED	HEAT FORM	MATERIAL TYPE	MATERIAL FORM	FACTOR	CONSTRUCT	USE	STATUS	BLDG DAMAGE	CONTS DMGE	FLOOR CODE	RM/AREA CODE	OCCUPANCY	MANNER OF	OCCUPANC'S	NO BLDGS.	SMOKE DETECTORS	1	2	3
00	00	00	00	00	5	00	01	3	98	00	60	75	00	1	15	1	0	0	99	56	50	00	01	0	6			

ADDRESS							
NUMBER	SUFFIX	PREFIX DIRECT	STREET NAME	TYPE	SUFFIX DIRECT	BUILDING STORIES	AREA
1			World Trade Center		1	99	250x250

N.Y./N.J. Port Authority — NAME OF OCCUPANT

Carpenter's Rm. — ROOM, APT. NO.

Sarnelli (FSD) — LEFT IN CHARGE

EQUIPMENT INVOLVED IN IGNITION

YR.	MAKE	MODEL	S/N	POWER

COS					
UNIT	PTS.	ITEM			
5 010 10	7 001 05				

OPERATIONS

Responded to alarm box 8093. Upon arrival found cause to be for a rubbish fire at the above location.

Eng.10- Stretched standpipe line, extinguished fire, washed down.

Lad.1- Searched, found fire, vented, checked for extension, overhauled.

B.C. James J. McKenna — 1 BN. — D.C. — DIV.

James J. McKenna — TYPE FULL NAME

0126 — TIME OF ARRIVAL

TYPE FULL NAME — TIME OF ARRIVAL

PAGE 1 OF 1

ADMINISTRATIVE COMPANY

TYPE REPORT	INCIDENT LOCATION			DATE AND TIME ALARM RECEIVED					INCIDENT DURATION					BOX LOCATION			REPORT		COS. RESP.	
TYPE REPORT	COMMUNITY BOARD	ADMIN COMPANY	BLOCK NUMBER	MONTH	DAY	YEAR	HOUR	MINUTE	HOURS	MINUTES	HOW REPORTED	INITIAL ALARM	HIGHEST ALARM	BOROUGH	BOX NUMBER	REPORT NUMBER	FILING BATTALION	BADGE NUMBER	ENG. SQ. MARINE	LADDER
1	01	5 006	0113	02	17	81	08	59	00	40	4	1	0	1	8084	0141	01	531	03	2

AIDED AND CASUALTIES					EXTINGUISHMENT			IGNITION						STRUCTURE				AREA FIRE ORIGIN				FIRE EXTENTION				SPECIAL USE		
CIVILIANS EVACUATED	FIRST AID	INJURED	KILLED	UNIFORMED INJURED	CODE	SPRINKLER NO OPEN	STANDPIPE LINES USED	TERM. STAGE	EQUIP. INVOLVED	HEAT FORM	MATERIAL TYPE	MATERIAL FORM	FACTOR	CONSTRUCT	USE	STATUS	BLDG. DAMAGE	CONTS DMGE / FLOOR CODE	RM/AREA CODE	OCCUPANCY	MANNER OF	WITHIN BLDG OCCUPANC'S	OTHER NO BLDGS	SMOKE DETECTORS		1	2	3
00	00	00	00	00	5	00	01	2	31	42	99	99	46	1	15	1	1	0108	10	81	00	99	0	2				

ADDRESS NUMBER	SUFFIX	PREFIX DIRECT	STREET NAME	TYPE	SUFFIX DIRECT
1			World Trade Center		

BUILDING STORIES: 110

AREA: 300x300

NAME OF OCCUPANT: Port Authority N.Y. , N.J.

ROOM, APT. NO.:

LEFT IN CHARGE: Mr. Barnelli F.S.D.

EQUIPMENT INVOLVED IN IGNITION

YR.	MAKE	MODEL	S/N	POWER

COS	UNIT	PTS.	ITEM			
	5 010	05	7 001	05		

OPERATIONS

Upon arrival at box 8084, found fire in air condition duct and filters on 108 floor

Eng. 10 Used house line, and extinguished fire.

Lad. 1 Overhauled and checked for extention.

B.C. James J. McKenna

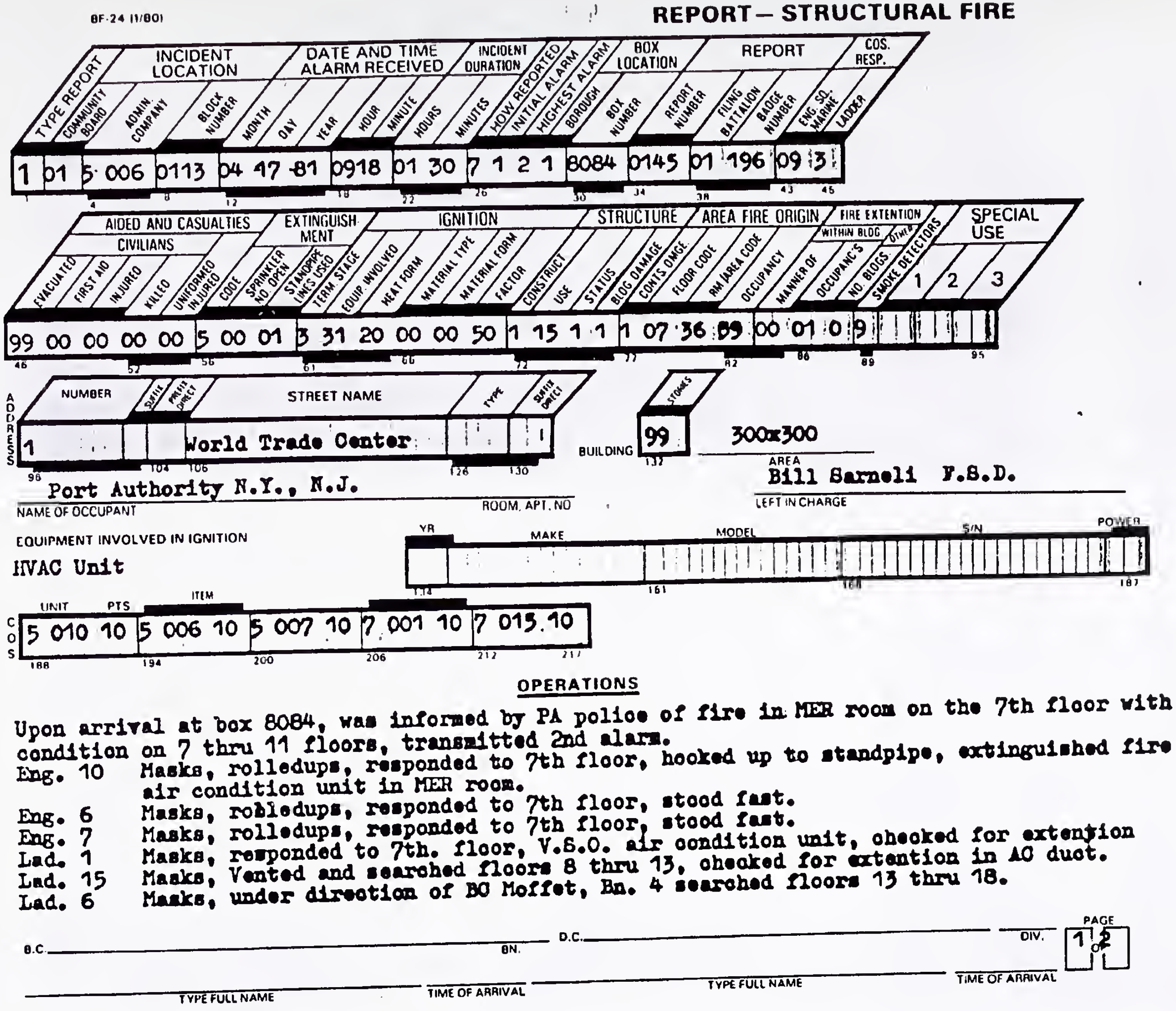
James J. McKenna
TYPE FULL NAME

0900
TIME OF ARRIVAL

BN.

D.C. ______ DIV. ______
TYPE FULL NAME
TIME OF ARRIVAL

PAGE ☐ OF ☐



BF-24 (1/80)

REPORT — STRUCTURAL FIRE

TYPE REPORT	INCIDENT LOCATION			DATE AND TIME ALARM RECEIVED					INCIDENT DURATION		HOW REPORTED	INITIAL ALARM	HIGHEST ALARM	BOX LOCATION		REPORT			COS. RESP.	
	COMMUNITY BOARD	ADMIN. COMPANY	BLOCK NUMBER	MONTH	DAY	YEAR	HOUR	MINUTE	HOURS	MINUTES				BOROUGH	BOX NUMBER	REPORT NUMBER	FILING BATTALION	BADGE NUMBER	ENG. SQ. MARINE	LADDER
1	01	5 006	0113	04	17	81	09	18	01	30	7	1	2	1	8084	0145	01	196	09	3

AIDED AND CASUALTIES					EXTINGUISHMENT			IGNITION						STRUCTURE					AREA FIRE ORIGIN			FIRE EXTENTION				SPECIAL USE		
CIVILIANS																						WITHIN BLDG		OTHER				
EVACUATED	FIRST AID	INJURED	KILLED	UNIFORMED INJURED	CODE	SPRINKLER NO. OPEN	STANDPIPE LINES USED	TERM. STAGE	EQUIP. INVOLVED	HEAT FORM	MATERIAL TYPE	MATERIAL FORM	FACTOR	CONSTRUCT	USE	STATUS	BLDG DAMAGE	CONTS DMGE.	FLOOR CODE	RM/AREA CODE	OCCUPANCY	MANNER OF	OCCUPANC'S	NO. BLDGS.	SMOKE DETECTORS	1	2	3
99	00	00	00	00	5	00	01	3	31	20	00	00	50	1	15	1	1	1	07	36	89	00	01	0	9			

ADDRESS

NUMBER	SUFFIX	PREFIX DIRECT	STREET NAME	TYPE	SUFFIX DIRECT
1			World Trade Center		

BUILDING STORIES 99

AREA 300x300

NAME OF OCCUPANT Port Authority N.Y., N.J.

ROOM, APT. NO

LEFT IN CHARGE Bill Sarneli F.S.D.

EQUIPMENT INVOLVED IN IGNITION HVAC Unit

YR / MAKE / MODEL / S/N / POWER

COS

UNIT	PTS	ITEM				
5 010 10	5 006 10	5 007 10	7 001 10	7 015 10		

OPERATIONS

Upon arrival at box 8084, was informed by PA police of fire in MER room on the 7th floor with smoke condition on 7 thru 11 floors, transmitted 2nd alarm.

Eng. 10	Masks, rolledups, responded to 7th floor, hooked up to standpipe, extinguished fire in air condition unit in MER room.
Eng. 6	Masks, rolledups, responded to 7th floor, stood fast.
Eng. 7	Masks, rolledups, responded to 7th floor, stood fast.
Lad. 1	Masks, responded to 7th. floor, V.S.O. air condition unit, checked for extention
Lad. 15	Masks, Vented and searched floors 8 thru 13, checked for extention in AC duct.
Lad. 6	Masks, under direction of BC Moffet, Bn. 4 searched floors 13 thru 18.

B.C. ______ BN. ______ D.C. ______ DIV. ______ PAGE 1 of 2

TYPE FULL NAME ______ TIME OF ARRIVAL ______ TYPE FULL NAME ______ TIME OF ARRIVAL ______

ADMINISTRATIVE COMPANY

REPORT — Additional Data

Structural Fire, Transportation Fire, Non-Structural Fire or Emergency

FOR FIRE RECORDS USE ONLY	TYPE REPORT	DATE AND TIME ALARM RECEIVED						ALARM	
		MONTH	DAY	YEAR	CD. NO.	HOUR	MINUTE	BOROUGH	BOX NUMBER
	1	04	17	81	2	09	18	1	8084

COMPANIES

TYPE NO. SECT. PTS.

OPERATIONS
continued

Rescue 1   Masks, searched floors 18 thru 23.

2nd. alarm units:

Engs. 24, 15, 55, 9, 241, and Marine 1 were orded to stand fast at there assigned locations.

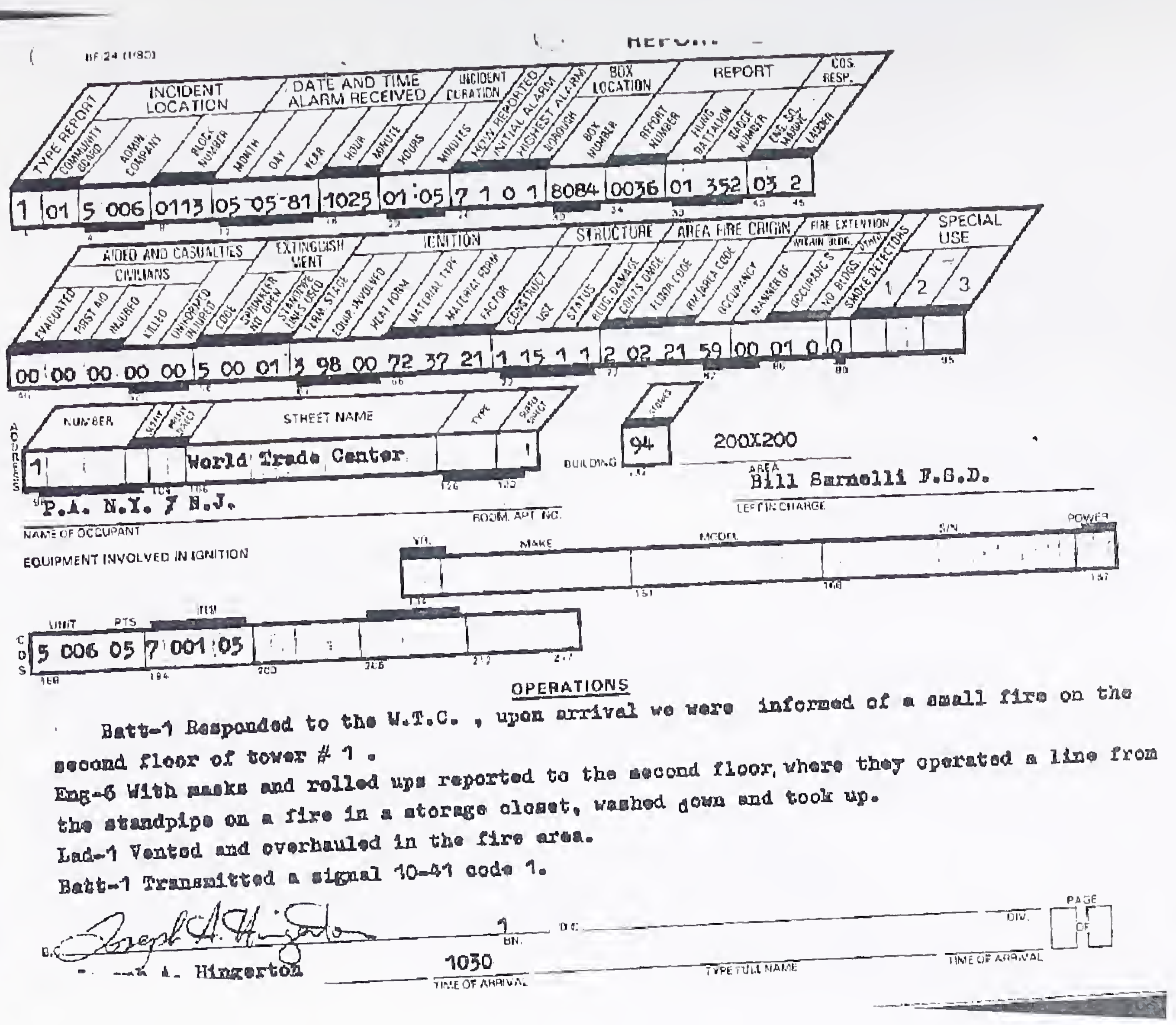
Div. 1, D.C. DeCaprio responded and supervised opperations
Chiefs Gormley, Bishop, and Farrell also on scene.
P.A. personell reported evacuation of aprox, 1,500 persons from floors 9 thru 23.
F.C. unit on scene
F.P. 2 on scene.

TIMES

Box	0918
2-2	0928
U/C	0959

B.C. Peter Costello
Peter Costello — TYPE FULL NAME
BN. 1
0920 — TIME OF ARRIVAL
D.C. Angelo DeCaprio — TYPE FULL NAME
DIV. — TIME OF ARRIVAL
PAGE 2 of 2

ADMINISTRATIVE COMPANY



BF 24 (1/80)

REPORT

TYPE REPORT	COMMUNITY BOARD	ADMIN COMPANY	BLOCK NUMBER	MONTH	DAY	YEAR	HOUR MINUTE	HOURS	MINUTES	HOW REPORTED	INITIAL ALARM	HIGHEST ALARM	BOROUGH	BOX NUMBER	REPORT NUMBER	HDQS BATTALION	BADGE NUMBER	ENG. SQ. MARINE	LADDER
		INCIDENT LOCATION		DATE AND TIME ALARM RECEIVED				INCIDENT DURATION					BOX LOCATION		REPORT			COS. RESP.	
1	01	5 006	0113	05	05	81	1025	01	05	7	1	0	1	8084	0036	01	352	03	2

EVACUATED	FIRST AID	INJURED	KILLED	UNIFORMED INJURED	CODE	SPRINKLER NO OPEN	STANDPIPE LINES USED	TERM STAGE	EQUIP INVOLVED	HEAT FORM	MATERIAL TYPE	MATERIAL FORM	FACTOR	CONSTRUCT	USE	STATUS	BLDG DAMAGE	CONTS DAMAGE	FLOOR CODE	RM/AREA CODE	OCCUPANCY	MANNER OF	OCCUPANCY S	NO BLDGS	SMOKE DETECTORS	1	2	3
AIDED AND CASUALTIES					EXTINGUISHMENT			IGNITION						STRUCTURE					AREA FIRE ORIGIN				FIRE EXTENTION			SPECIAL USE		
CIVILIANS																							WITHIN BLDG.	OTHER				
00	00	00	00	00	5	00	01	3	98	00	72	37	21	1	15	1	1	2	02	21	59	00	01	0	0			

	NUMBER			STREET NAME	TYPE		STORIES
ADDRESS	1			World Trade Center		1	94

BUILDING 94

AREA 200X200

LEFT IN CHARGE Bill Sarnelli F.S.D.

NAME OF OCCUPANT P.A. N.Y. & N.J.

ROOM, APT NO.

EQUIPMENT INVOLVED IN IGNITION

YR.	MAKE	MODEL	S/N	POWER

	UNIT	PTS					
CODES	5 006 05	7 001 05					

OPERATIONS

Batt-1 Responded to the W.T.C. , upon arrival we were informed of a small fire on the second floor of tower # 1 .

Eng-6 With masks and rolled ups reported to the second floor, where they operated a line from the standpipe on a fire in a storage closet, washed down and took up.

Lad-1 Vented and overhauled in the fire area.

Batt-1 Transmitted a signal 10-41 code 1.

B.C. Joseph A. Hingerton BN. 1 D.C. DIV.

PAGE OF

…k A. Hingerton

TYPE FULL NAME

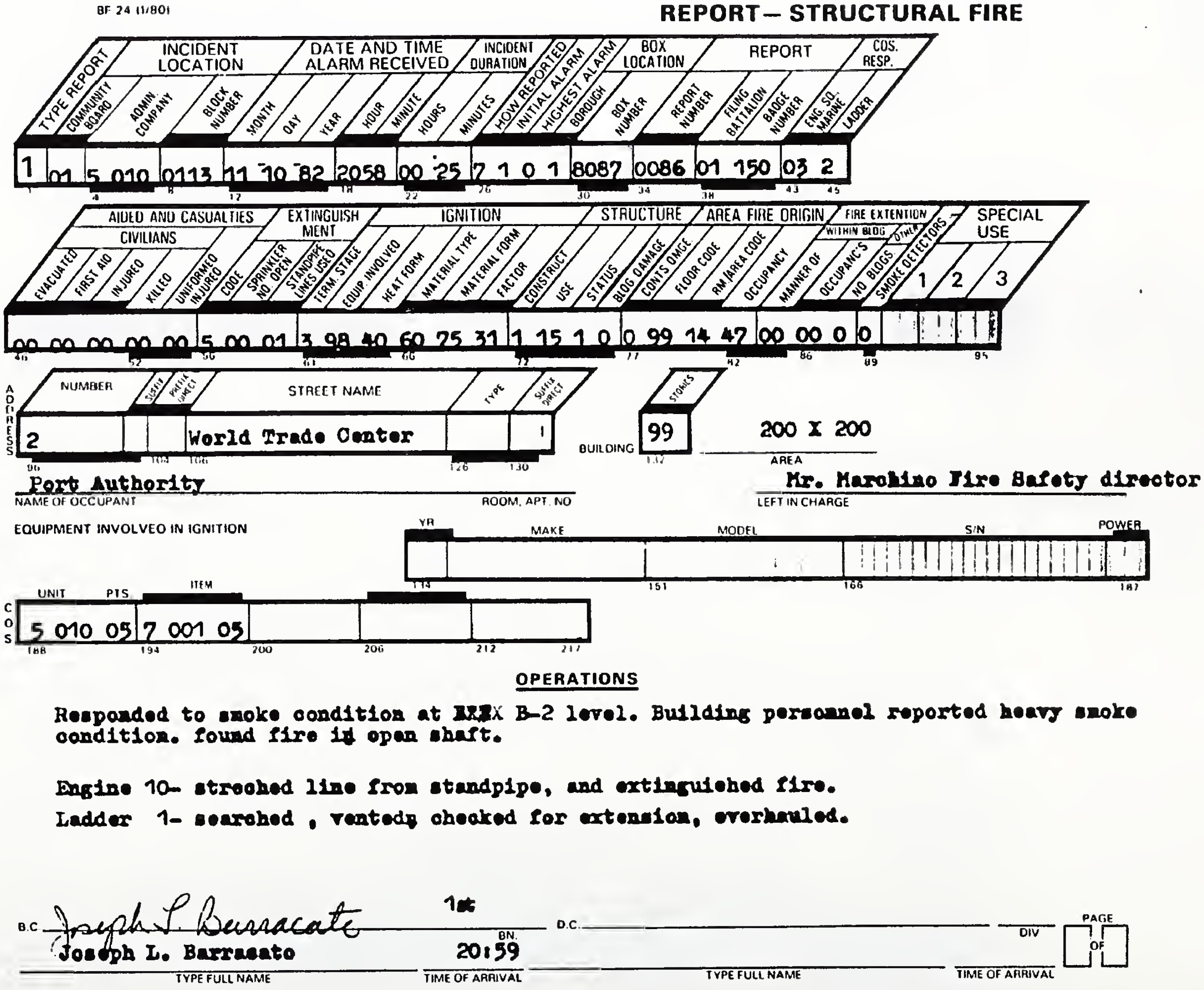
1030

TIME OF ARRIVAL

TYPE FULL NAME

TIME OF ARRIVAL

ADMINISTRATIVE COMPANY



BF 24 (1/80)

REPORT— STRUCTURAL FIRE

TYPE REPORT	INCIDENT LOCATION			DATE AND TIME ALARM RECEIVED					INCIDENT DURATION					BOX LOCATION		REPORT			COS. RESP.	
	COMMUNITY BOARD	ADMIN. COMPANY	BLOCK NUMBER	MONTH	DAY	YEAR	HOUR	MINUTE	HOURS	MINUTES	HOW REPORTED	INITIAL ALARM	HIGHEST ALARM	BOROUGH	BOX NUMBER	REPORT NUMBER	FILING BATTALION	BADGE NUMBER	ENG. SQ. MARINE	LADDER
1	01	5 010	0113	11	10	82	2058		00	25	7	1	0	1	8087	0086	01	150	03	2

AIDED AND CASUALTIES					EXTINGUISHMENT			IGNITION						STRUCTURE					AREA FIRE ORIGIN			FIRE EXTENTION				SPECIAL USE		
CIVILIANS																						WITHIN BLDG		OTHER				
EVACUATED	FIRST AID	INJURED	KILLED	UNIFORMED INJURED	CODE	SPRINKLER NO. OPEN	STANDPIPE LINES USED	TERM. STAGE	EQUIP. INVOLVED	HEAT FORM	MATERIAL TYPE	MATERIAL FORM	FACTOR	CONSTRUCT	USE	STATUS	BLDG DAMAGE	CONTS DMGE.	FLOOR CODE	RM./AREA CODE	OCCUPANCY	MANNER OF	OCCUPANC'S	NO. BLDGS.	SMOKE DETECTORS	1	2	3
00	00	00	00	00	5	00	01	3	98	40	60	75	31	1	15	1	0	0	99	14	47	00	00	0	0			

ADDRESS

NUMBER	SUFFIX	PREFIX DIRECT	STREET NAME	TYPE	SUFFIX DIRECT
2			World Trade Center		1

BUILDING STORIES: 99

AREA: 200 X 200

NAME OF OCCUPANT: **Port Authority**

ROOM, APT. NO:

LEFT IN CHARGE: **Mr. Marchino Fire Safety director**

EQUIPMENT INVOLVED IN IGNITION

YR	MAKE	MODEL	S/N	POWER

COS

UNIT PTS	ITEM			
5 010 05	7 001 05			

OPERATIONS

Responded to smoke condition at XXX B-2 level. Building personnel reported heavy smoke condition. found fire in open shaft.

Engine 10- streched line from standpipe, and extinguished fire.
Ladder 1- searched , vented, checked for extension, overhauled.

B.C. Joseph L Barracato 1st BN. D.C. DIV

Joseph L. Barracato
TYPE FULL NAME

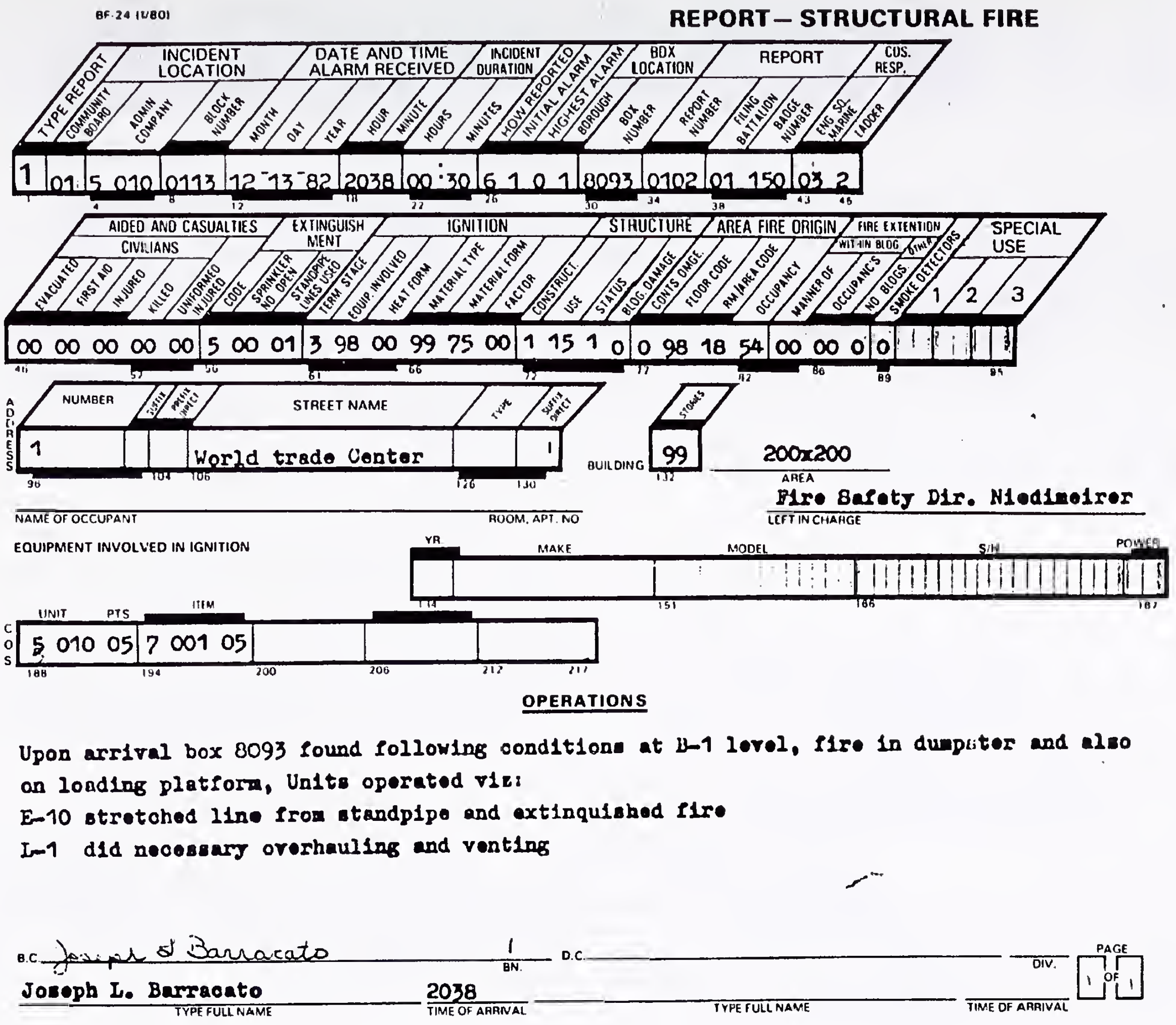
20:59
TIME OF ARRIVAL

TYPE FULL NAME

TIME OF ARRIVAL

PAGE ☐ OF ☐

ADMINISTRATIVE COMPANY



BF-24 (1/80)

REPORT — STRUCTURAL FIRE

	INCIDENT LOCATION			DATE AND TIME ALARM RECEIVED					INCIDENT DURATION						BOX LOCATION		REPORT			CUS. RESP.	
TYPE REPORT	COMMUNITY BOARD	ADMIN COMPANY	BLOCK NUMBER	MONTH	DAY	YEAR	HOUR	MINUTE	HOURS	MINUTES	HOW REPORTED	INITIAL ALARM	HIGHEST ALARM	BOROUGH	BOX NUMBER	REPORT NUMBER	FILING BATTALION	BADGE NUMBER	ENG SQ. MARINE	LADDER	
1	01	5 010	0113	12	13	82	20	38	00	30	6	1	0	1	8093	0102	01	150	03	2	
1		4	8	12			18		22		26				30	34	38		43	46	

AIDED AND CASUALTIES					EXTINGUISHMENT			IGNITION						STRUCTURE					AREA FIRE ORIGIN				FIRE EXTENTION				SPECIAL USE		
CIVILIANS																							WITHIN BLDG		OTHER				
EVACUATED	FIRST AID	INJURED	KILLED	UNIFORMED INJURED	CODE	SPRINKLER NO OPEN	STANDPIPE LINES USED	TERM STAGE	EQUIP. INVOLVED	HEAT FORM	MATERIAL TYPE	MATERIAL FORM	FACTOR	CONSTRUCT.	USE	STATUS	BLDG. DAMAGE	CONTS DMGE.	FLOOR CODE	RM/AREA CODE	OCCUPANCY	MANNER OF	OCCUPANC'S	NO BLDGS.	SMOKE DETECTORS	1	2	3	
00	00	00	00	00	5	00	01	3	98	00	99	75	00	1	15	1	0	0	98	18	54	00	00	0	0				
46			57		56			61			66			72				77			82		86		89			95	

ADDRESS NUMBER	SUFFIX	PREFIX DIRECT	STREET NAME	TYPE	SUFFIX DIRECT
1			World trade Center		1
96	104	106		126	130

BUILDING STORIES: 99 (132)

AREA: 200x200

NAME OF OCCUPANT:

ROOM, APT. NO:

LEFT IN CHARGE: Fire Safety Dir. Niedimeirer

EQUIPMENT INVOLVED IN IGNITION

YR	MAKE	MODEL	S/N	POWER
114		151	166	187

COS UNIT PTS	ITEM			
5 010 05	7 001 05			
188	194	200	206	212 217

OPERATIONS

Upon arrival box 8093 found following conditions at B-1 level, fire in dumpster and also on loading platform, Units operated viz:

E-10 stretched line from standpipe and extinquished fire

L-1 did necessary overhauling and venting

B.C. Joseph L Barracato 1 BN. D.C. DIV.

PAGE 1 OF 1

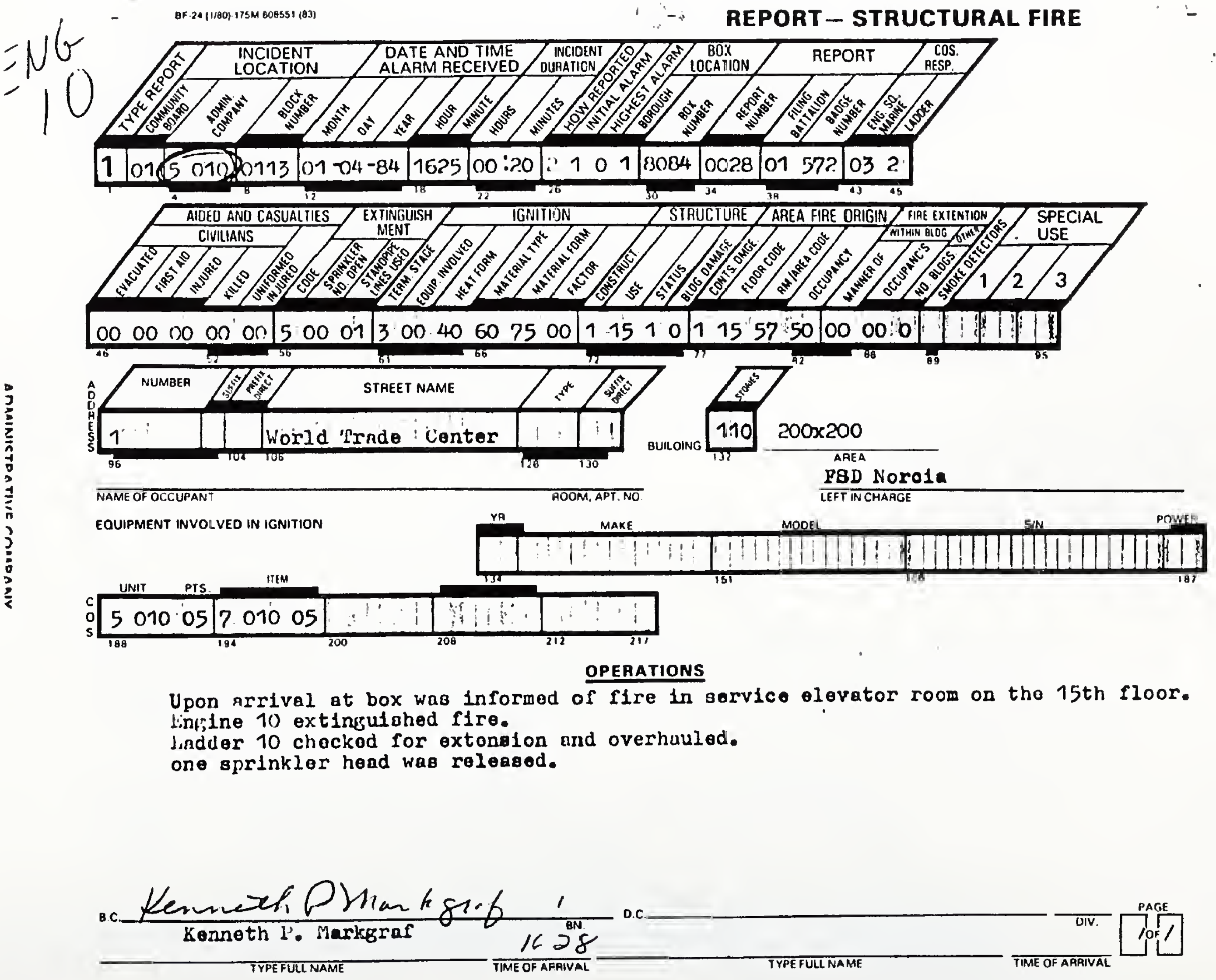
Joseph L. Barracato — TYPE FULL NAME

2038 — TIME OF ARRIVAL

TYPE FULL NAME

TIME OF ARRIVAL

ADMINISTRATIVE COMPANY



ENG 10

BF-24 (1/80)-175M 608551 (83)

REPORT — STRUCTURAL FIRE

INCIDENT LOCATION				DATE AND TIME ALARM RECEIVED		INCIDENT DURATION		BOX LOCATION		REPORT		COS. RESP.
TYPE REPORT	COMMUNITY BOARD	ADMIN. COMPANY	BLOCK NUMBER	MONTH DAY YEAR	HOUR MINUTE	HOURS MINUTES	HOW REPORTED INITIAL ALARM HIGHEST ALARM BOROUGH	BOX NUMBER	REPORT NUMBER	FILING BATTALION BADGE NUMBER	ENG. SQ. MARINE LADDER	
1	01	5 010	0113	01 -04 -84	1625	00 :20	2 1 0 1	8084	0028	01 572	03 2	

1 4 8 12 18 22 26 30 34 38 43 45

AIDED AND CASUALTIES CIVILIANS					EXTINGUISHMENT			IGNITION						STRUCTURE				AREA FIRE ORIGIN				FIRE EXTENTION WITHIN BLDG		OTHER		SPECIAL USE		
EVACUATED	FIRST AID	INJURED	KILLED	UNIFORMED INJURED	CODE	SPRINKLER NO. OPEN	STANDPIPE LINES USED	TERM. STAGE	EQUIP. INVOLVED	HEAT FORM	MATERIAL TYPE	MATERIAL FORM	FACTOR	CONSTRUCT.	USE	STATUS	BLDG DAMAGE	CONTS. DMGE.	FLOOR CODE	RM/AREA CODE	OCCUPANCY	MANNER OF	OCCUPANC'S	NO. BLDGS.	SMOKE DETECTORS	1	2	3
00	00	00	00	00	5	00	01	3	00	40	60	75	00	1	15	1	0	1	15	57	50	00	00	0				

46 52 56 61 66 72 77 82 88 89 95

ADDRESS

NUMBER	SUFFIX	PREFIX DIRECT	STREET NAME	TYPE	SUFFIX DIRECT
1			World Trade Center		

96 104 106 126 130

BUILDING STORIES 110 (132)

200x200
AREA

NAME OF OCCUPANT

ROOM, APT. NO.

FSD Norcia
LEFT IN CHARGE

EQUIPMENT INVOLVED IN IGNITION

YR	MAKE	MODEL	S/N	POWER

134 151 168 187

COS

UNIT	PTS.	ITEM			
5 010 05	7 010 05				

188 194 200 208 212 217

OPERATIONS

Upon arrival at box was informed of fire in service elevator room on the 15th floor.
Engine 10 extinguished fire.
Ladder 10 checked for extension and overhauled.
one sprinkler head was released.

B.C. Kenneth P Markgraf
Kenneth P. Markgraf
TYPE FULL NAME

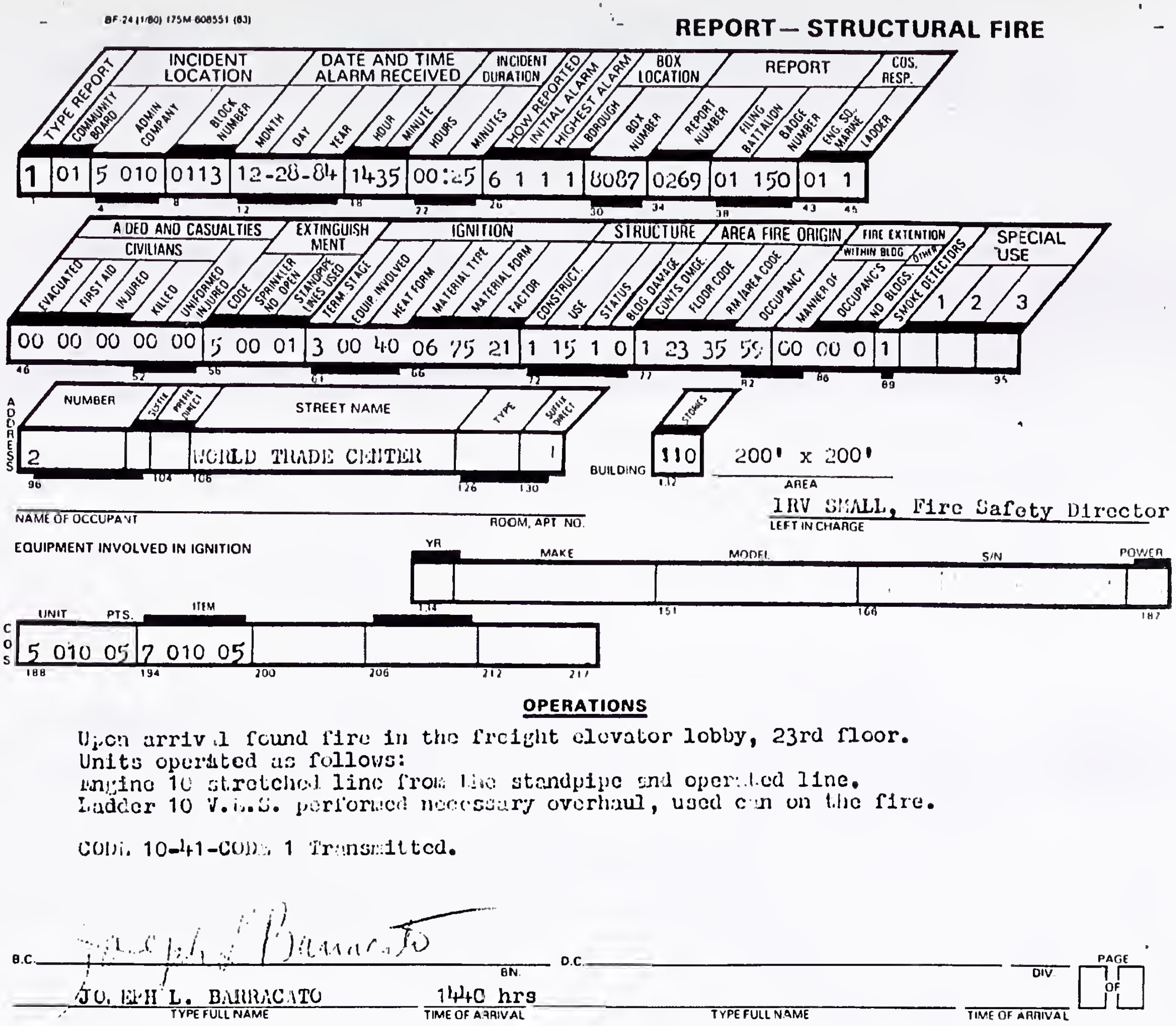
BN. 1
1628
TIME OF ARRIVAL

D.C.
TYPE FULL NAME

DIV.
TIME OF ARRIVAL

PAGE 1 OF 1

ADMINISTRATIVE COMPANY



BF-24 (1/80) 175M 608551 (83)

REPORT — STRUCTURAL FIRE

TYPE REPORT		INCIDENT LOCATION		DATE AND TIME ALARM RECEIVED		INCIDENT DURATION		BOX LOCATION		REPORT	COS. RESP.
	COMMUNITY BOARD	ADMIN COMPANY	BLOCK NUMBER	MONTH DAY YEAR	HOUR MINUTE	HOURS MINUTES	HOW REPORTED INITIAL ALARM HIGHEST ALARM BOROUGH	BOX NUMBER	REPORT NUMBER	FILING BATTALION BADGE NUMBER	ENG. SQ. MARINE LADDER
1	01	5 010	0113	12-28-84	1435	00:25	6 1 1 1	8087	0269	01 150	01 1
1		4	8	12	18	22	26	30	34	38	43 45

AIDED AND CASUALTIES	EXTINGUISHMENT	IGNITION	STRUCTURE	AREA FIRE ORIGIN	FIRE EXTENTION		SPECIAL USE		
CIVILIANS: EVACUATED FIRST AID INJURED KILLED UNIFORMED INJURED	CODE SPRINKLER NO OPEN STANDPIPE LINES USED	TERM. STAGE EQUIP. INVOLVED HEAT FORM MATERIAL TYPE MATERIAL FORM FACTOR	CONSTRUCT. USE STATUS BLDG DAMAGE	CNTS DMGE. FLOOR CODE RM/AREA CODE OCCUPANCY	WITHIN BLDG: MANNER OF OCCUPANC'S OTHER: NO BLDGS.	SMOKE DETECTORS	1	2	3
00 00 00 00 00	5 00 01	3 00 40 06 75 21	1 15 1 0	1 23 35 59	00 00 0	1			
46 52	56	61 66	72	77 82	86	89			95

ADDRESS

NUMBER	SUFFIX	PREFIX DIRECT	STREET NAME	TYPE	SUFFIX DIRECT
2			WORLD TRADE CENTER		1
96	104	106		126	130

BUILDING STORIES 110 (132)

AREA 200' x 200'

NAME OF OCCUPANT ______ ROOM, APT NO. ______

LEFT IN CHARGE: IRV SMALL, Fire Safety Director

EQUIPMENT INVOLVED IN IGNITION

YR	MAKE	MODEL	S/N	POWER
134	151	166		187

COS UNIT PTS.	ITEM			
5 010 05	7 010 05			
188	194	200	206	212 217

OPERATIONS

Upon arrival found fire in the freight elevator lobby, 23rd floor.
Units operated as follows:
Engine 10 stretched line from the standpipe and operated line.
Ladder 10 V.E.S. performed necessary overhaul, used can on the fire.

CODE 10-41-CODE 1 Transmitted.

B.C. Joseph L. Barracato BN. ______ D.C. ______ DIV ______

JOSEPH L. BARRACATO — TYPE FULL NAME; 1440 hrs — TIME OF ARRIVAL; ______ TYPE FULL NAME; ______ TIME OF ARRIVAL

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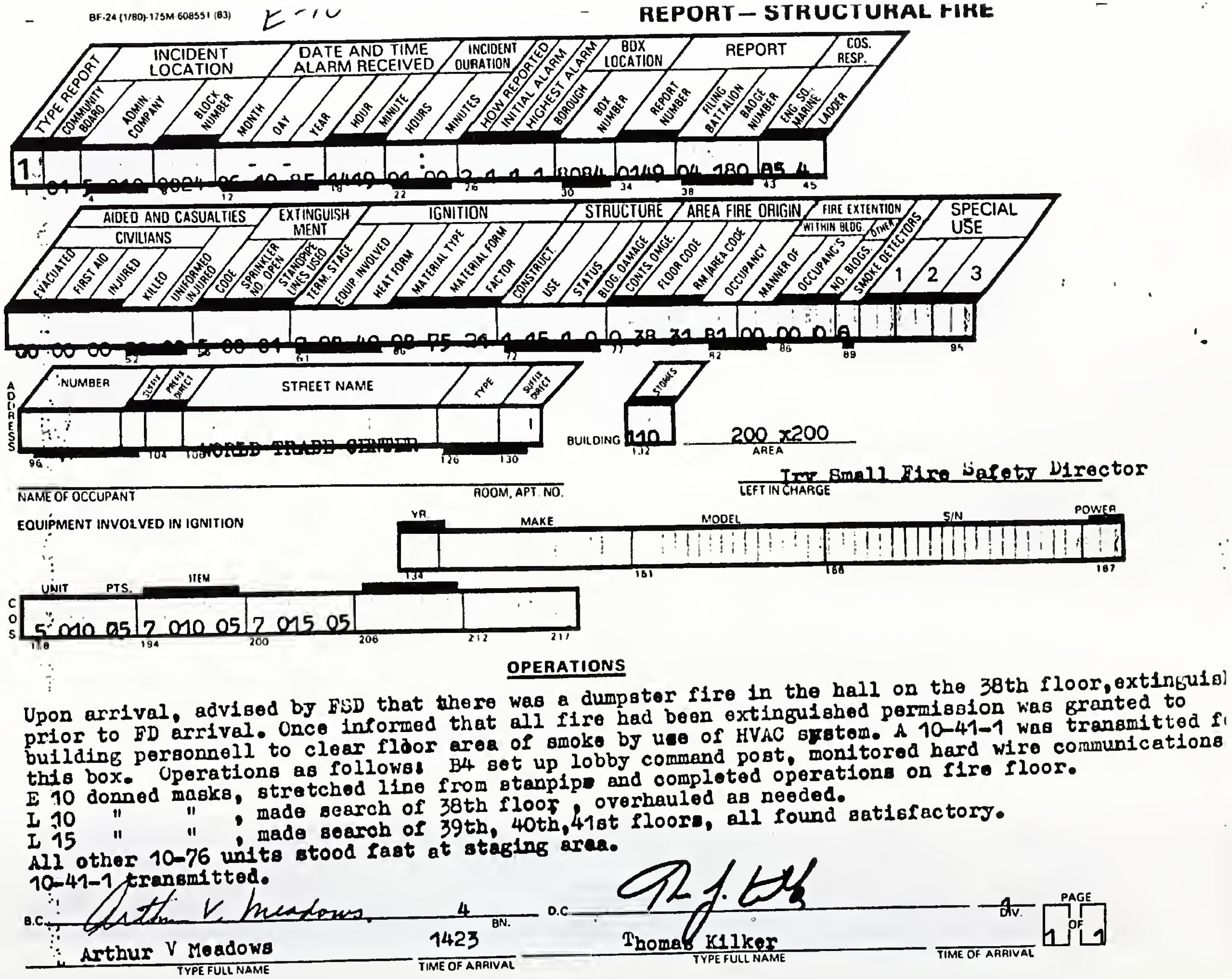

BF-24 (1/80)-175M 608551 (83) E-10

REPORT — STRUCTURAL FIRE

TYPE REPORT | INCIDENT LOCATION: COMMUNITY BOARD, ADMIN COMPANY, BLOCK NUMBER | DATE AND TIME ALARM RECEIVED: MONTH, DAY, YEAR, HOUR, MINUTE | INCIDENT DURATION: HOURS, MINUTES | HOW REPORTED | INITIAL ALARM | HIGHEST ALARM | BOX LOCATION: BOROUGH, BOX NUMBER | REPORT: REPORT NUMBER, FILING BATTALION, BADGE NUMBER | COS. RESP.: ENG. SQ. MARINE, LADDER

1 01 5 010 0024 06 10 85 1449 01 00 2 1 1 1 8084 0149 04 180 85 4

1 4 12 18 22 26 30 34 38 43 45

AIDED AND CASUALTIES: CIVILIANS: EVACUATED, FIRST AID, INJURED, KILLED; UNIFORMED INJURED | EXTINGUISHMENT: CODE, SPRINKLER NO. OPEN, STANDPIPE LINES USED | IGNITION: TERM. STAGE, EQUIP. INVOLVED, HEAT FORM, MATERIAL TYPE, MATERIAL FORM, FACTOR | STRUCTURE: CONSTRUCT., USE, STATUS, BLDG. DAMAGE, CONTS. DMGE. | AREA FIRE ORIGIN: FLOOR CODE, RM./AREA CODE, OCCUPANCY | FIRE EXTENTION: WITHIN BLDG.: MANNER OF, OCCUPANC'S; OTHER: NO. BLDGS. | SMOKE DETECTORS | SPECIAL USE: 1, 2, 3

00 00 00 00 00 5 00 01 0 00 40 08 75 26 4 45 1 0 0 38 31 81 00 00 0 6

52 56 61 66 72 77 82 86 89 95

ADDRESS: NUMBER | SUFFIX | PREFIX DIRECT | STREET NAME | TYPE | SUFFIX DIRECT

WORLD TRADE CENTER 1

96 104 108 126 130

BUILDING: STORIES 110 132

200 x200
AREA

NAME OF OCCUPANT

ROOM, APT. NO.

Trr Small Fire Safety Director
LEFT IN CHARGE

EQUIPMENT INVOLVED IN IGNITION: YR | MAKE | MODEL | S/N | POWER

134 151 168 187

COS: UNIT PTS. ITEM

5 010 05 | 7 010 05 | 7 015 05

188 194 200 206 212 217

OPERATIONS

Upon arrival, advised by FSD that there was a dumpster fire in the hall on the 38th floor,extinguisl prior to FD arrival. Once informed that all fire had been extinguished permission was granted to building personnell to clear flöor area of smoke by use of HVAC system. A 10-41-1 was transmitted fı this box. Operations as follows: B4 set up lobby command post, monitored hard wire communications from stanpipe and completed operations on fire floor.

E 10 donned masks, stretched line from stanpipe and completed operations on fire floor.

E 10 donned masks, stretched line to 38th floor, overhauled as needed.

L 10 " " , made search of 38th floor, overhauled as needed.

L 15 " " , made search of 39th, 40th,41st floors, all found satisfactory.

All other 10-76 units stood fast at staging area.

10-41-1 transmitted.

B.C. Arthur V. Meadows 4 BN. D.C. 1 DIV.

Arthur V Meadows
TYPE FULL NAME

1423
TIME OF ARRIVAL

Thomas Kilker
TYPE FULL NAME

TIME OF ARRIVAL

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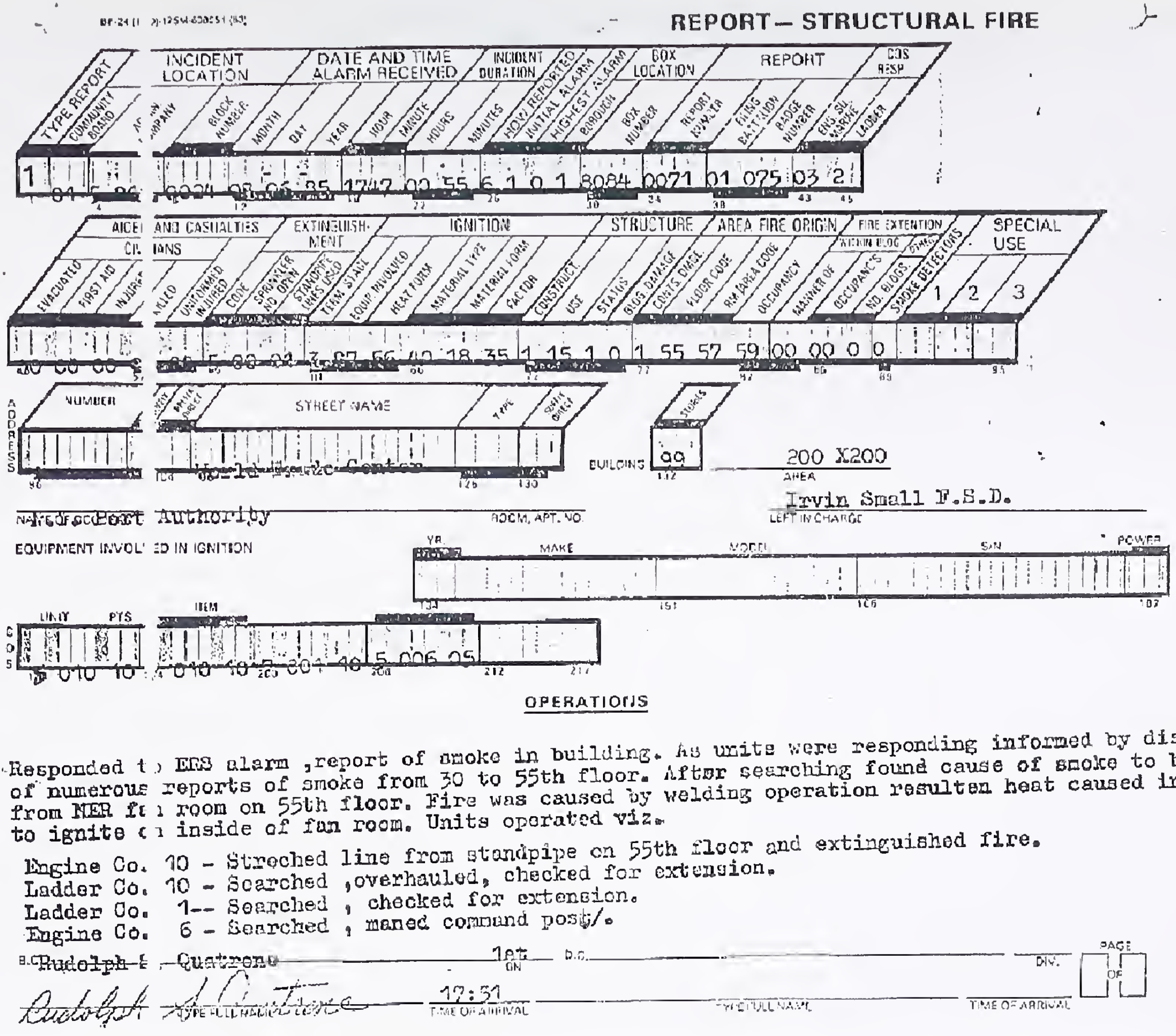


BF-24 (1 ...) 125M-600051 (83)

REPORT – STRUCTURAL FIRE

TYPE REPORT / COMMUNITY BOARD / INCIDENT LOCATION (BLOCK NUMBER) / DATE AND TIME ALARM RECEIVED (MONTH, DAY, YEAR, HOUR, MINUTE) / INCIDENT DURATION (HOURS, MINUTES) / HOW REPORTED / INITIAL ALARM / HIGHEST ALARM / BOX LOCATION (BOROUGH, BOX NUMBER) / REPORT (REPORT NUMBER, FIRING BATTALION, BADGE NUMBER, ENG. SU. MARINE) / COS RESP (LADDER)

1 01 5 06 0024 08 06 85 1747 00 55 6 1 0 1 8084 0071 01 075 03 2

AIDED AND CASUALTIES — CIVILIANS (EVACUATED, FIRST AID, INJURED, KILLED, UNIFORMED INJURED) / EXTINGUISHMENT (CODE, SPRINKLER NO OPEN, STANDPIPE LINES USED, TERM. STAGE) / IGNITION (EQUIP. INVOLVED, HEAT FORM, MATERIAL TYPE, MATERIAL FORM, FACTOR) / STRUCTURE (CONSTRUCT., USE, STATUS, BLDG. DAMAGE, CONTS. DMGE.) / AREA FIRE ORIGIN (FLOOR CODE, RM/AREA CODE, OCCUPANCY) / FIRE EXTENTION (WITHIN BLDG, MANNER OF, OCCUPANCY'S, OTHER NO. BLDGS.) / SMOKE DETECTORS / SPECIAL USE 1 2 3

00 00 00 00 5 00 01 3 87 56 40 18 35 1 15 1 0 1 55 57 59 00 00 0 0

ADDRESS: NUMBER / STREET NAME / TYPE / SUFFIX DIRECT — World Trade Center

BUILDING STORIES: 99

AREA: 200 X200

NAME OF OCC. Port Authority

ROOM, APT. NO.

LEFT IN CHARGE: Irvin Small F.S.D.

EQUIPMENT INVOLVED IN IGNITION — YR. / MAKE / MODEL / S/N / POWER

CODES: UNIT / PTS / ITEM — 010 10 010 10 5 201 40 5 006 05

OPERATIONS

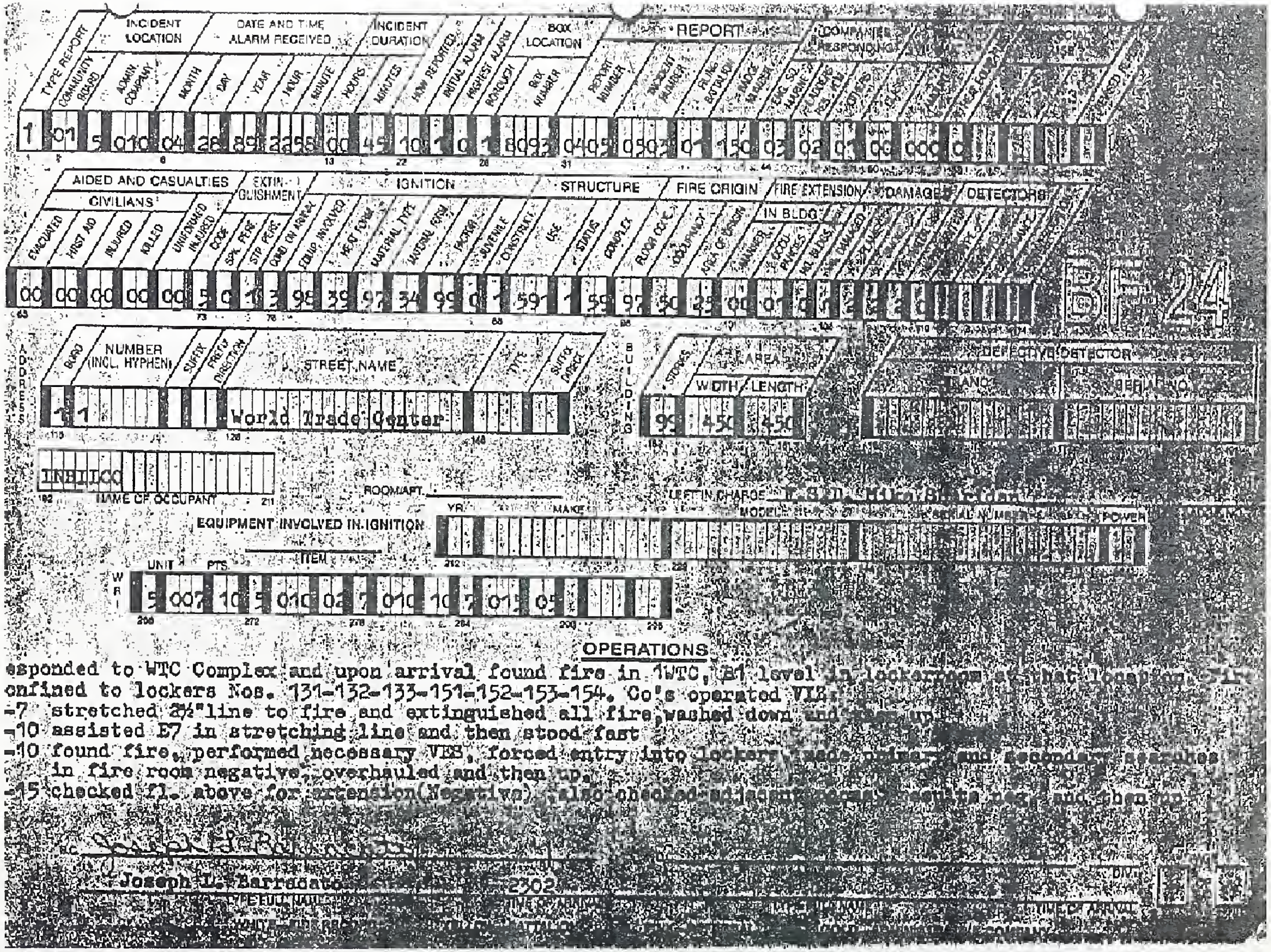
Responded to EBS alarm ,report of smoke in building. As units were responding informed by dispatcher of numerous reports of smoke from 30 to 55th floor. After searching found cause of smoke to be comir from MER fan room on 55th floor. Fire was caused by welding operation resulten heat caused insulatic to ignite on inside of fan room. Units operated viz.

Engine Co. 10 - Streched line from standpipe on 55th floor and extinguished fire.
Ladder Co. 10 - Searched ,overhauled, checked for extension.
Ladder Co. 1-- Searched , checked for extension.
Engine Co. 6 - Searched , maned command post.

B.C. ~~Rudolph~~ – Quatrone 1st DIV. D.C. DIV. PAGE OF

Rudolph Quatrone — TYPE FULL NAME — 17:51 TIME OF ARRIVAL — TYPE FULL NAME — TIME OF ARRIVAL

ADMINISTRATIVE COMPANY



TYPE REPORT	COMMUNITY BOARD	ADMIN. COMPANY	MONTH	DAY	YEAR	HOUR	MINUTE	HOURS	MINUTES	HOW REPORTED	INITIAL ALARM	HIGHEST ALARM	BOROUGH	BOX NUMBER	REPORT NUMBER	INCIDENT NUMBER	FIRING BATTALION		ENG. SQ. MARINE	LADDERS RES. RESC.				
1	01	5 010	04	28	89	22	58	00	45	10	1	0	1	8093	0405	0503	01	150	03	02	01	00	000	0

EVACUATED	FIRST AID	INJURED	KILLED	UNIFORMED INJURED	CODE	SPL. PERS.	STP PERS.	CMD ON ARRIVAL	EQUIP. INVOLVED	HEAT FORM	MATERIAL TYPE	MATERIAL FORM	FACTOR	JUVENILE	CONSTRUCT.	USE	STATUS	COMPLEX	FLOOR OCC.	OCCUPANCY	AREA OF ORIGIN	MANNER	
00	00	00	00	00	5	0	1	3	98	39	97	34	99	0	1	591	1	59	97	90	25	00	01

BF-24

BORO	NUMBER (INCL. HYPHEN)	SUFFIX	PREFIX DIRECTION	STREET NAME	TYPE	SUFFIX DIRECT.
1	1			World Trade Center		

STORIES	WIDTH	LENGTH
99	450	450

NAME OF OCCUPANT: INBILCO

ROOM/APT.

LEFT IN CHARGE

EQUIPMENT INVOLVED IN IGNITION

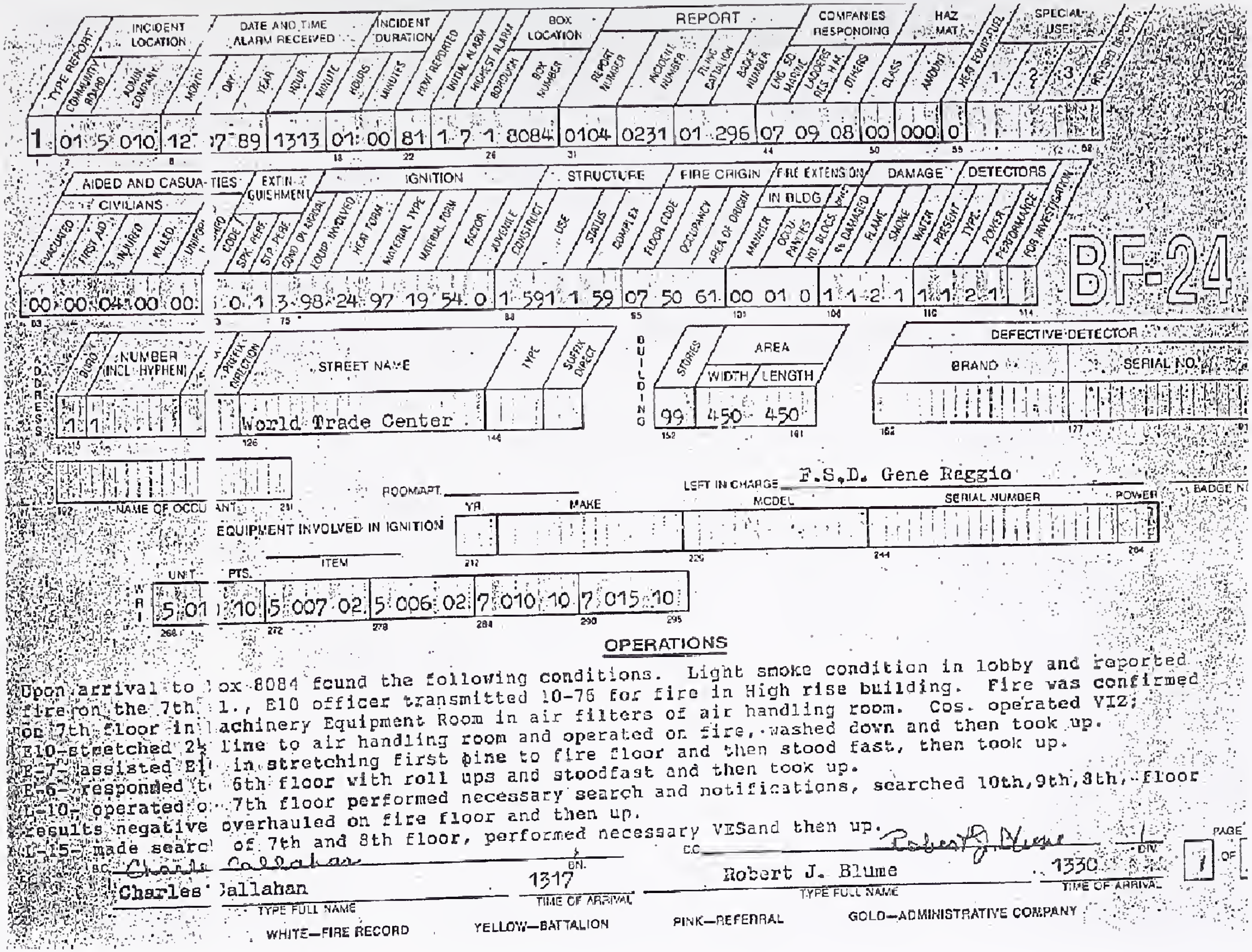
ITEM

5	007	10	5	010	02	7	010	10	7	015	05

OPERATIONS

esponded to WTC Complex and upon arrival found fire in 1WTC, B1 level in lockerroom at that location. Fire
onfined to lockers Nos. 131-132-133-151-152-153-154. Co's operated VIZ:
-7 stretched 2½"line to fire and extinguished all fire,washed down and took up.
-10 assisted E7 in stretching line and then stood fast
-10 found fire, performed necessary VES, forced entry into lockers, made primary and secondary searches
in fire room negative, overhauled and then up.
-15 checked fl. above for extension(Negative), also checked adjacent areas, results neg. and then up.

Joseph L. Barradato 2302



BF-24

TYPE REPORT | INCIDENT LOCATION: COMMUNITY BOARD, ADMIN. COMPANY | MONTH | DATE AND TIME ALARM RECEIVED: DAY, YEAR, HOUR, MINUTE | INCIDENT DURATION: HOURS, MINUTES | HOW REPORTED | INITIAL ALARM | HIGHEST ALARM | BOX LOCATION: BOROUGH, BOX NUMBER | REPORT: REPORT NUMBER, INCIDENT NUMBER, FILING BATTALION, BADGE NUMBER | COMPANIES RESPONDING: ENG SQ MARINE, LADDERS RES. H.M., OTHERS | HAZ MAT: CLASS, AMOUNT | HEAT EQUIP./FUEL | SPECIAL USE: 1, 2, 3 | REVISED REPORT

1 01 5 010 12 7 89 1313 01 00 81 1 7 1 8084 0104 0231 01 296 07 09 08 00 000 0

AIDED AND CASUALTIES: CIVILIANS: EVACUATED, FIRST AID, INJURED, KILLED; UNIFORMED | EXTINGUISHMENT: CODE, SPK. PERF., STP. PERF. | IGNITION: COND. ON ARRIVAL, EQUIP. INVOLVED, HEAT FORM, MATERIAL TYPE, MATERIAL FORM, FACTOR, JUVENILE | STRUCTURE: CONSTRUCT, USE, STATUS, COMPLEX | FIRE ORIGIN: FLOOR CODE, OCCUPANCY, AREA OF ORIGIN | FIRE EXTENSION: IN BLDG: MANNER, OCCUPANCIES; NO. BLDGS. | DAMAGE: % DAMAGED, FLAME, SMOKE, WATER | DETECTORS: PRESENT, TYPE, POWER, PERFORMANCE | FOR INVESTIGATION

00 00 04 00 00 0 1 3 98 24 97 19 54 0 1 591 1 59 07 50 61 00 01 0 1 1 2 1 1 1 2 1

ADDRESS: BORO 1 | NUMBER (INCL. HYPHEN) 1 | PREFIX DIRECTION | STREET NAME World Trade Center | TYPE | SUFFIX DIRECT

BUILDING: STORIES 99 | AREA: WIDTH 450, LENGTH 450

DEFECTIVE DETECTOR: BRAND | SERIAL NO.

NAME OF OCCUPANT

ROOM/APT.

LEFT IN CHARGE F.S.D. Gene Reggio

BADGE N

EQUIPMENT INVOLVED IN IGNITION: ITEM | YR | MAKE | MODEL | SERIAL NUMBER | POWER

UNIT | PTS.

5 01 10 5 007 02 5 006 02 7 010 10 7 015 10

OPERATIONS

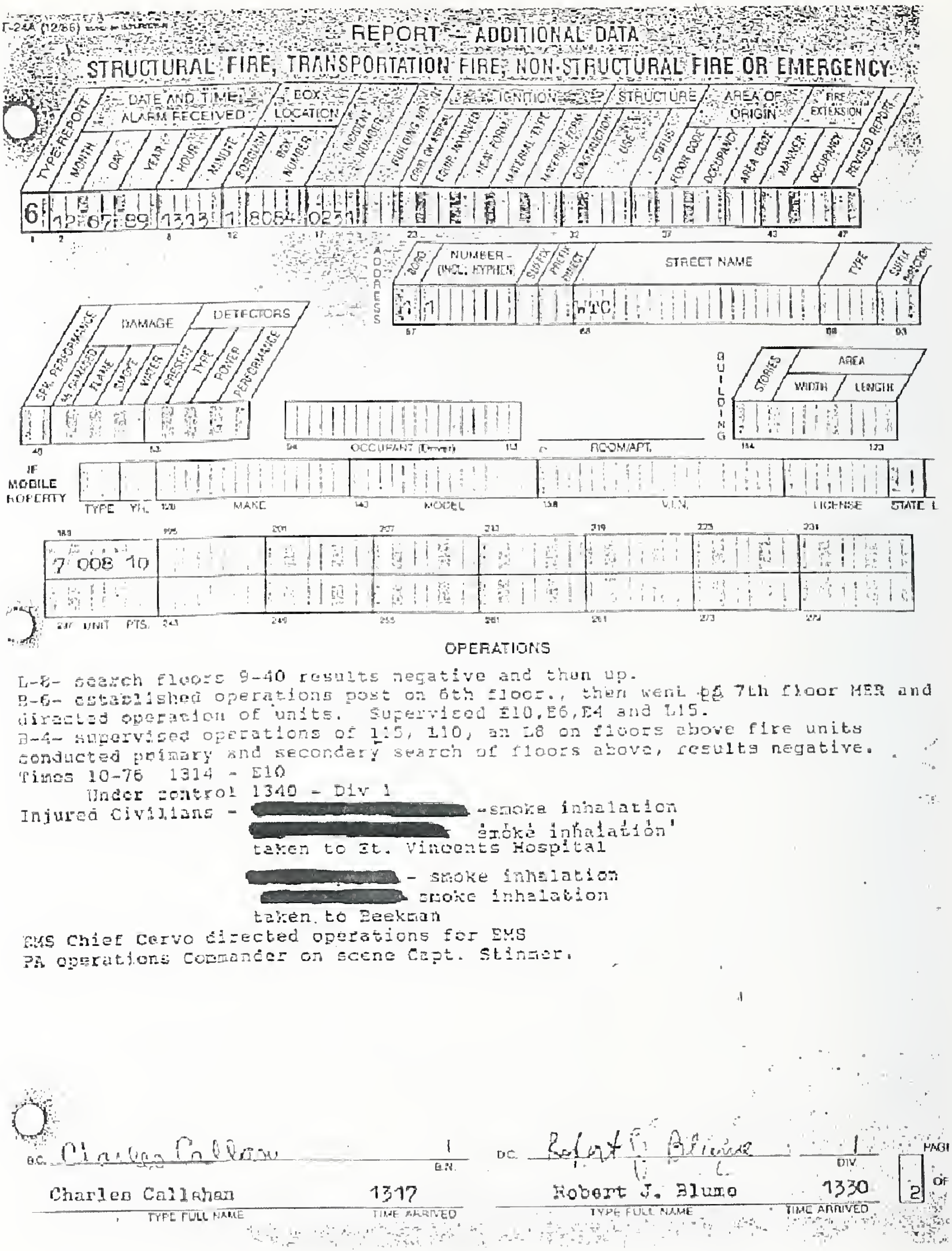
Upon arrival to ox 8084 found the following conditions. Light smoke condition in lobby and reported fire on the 7th 1., E10 officer transmitted 10-76 for fire in High rise building. Fire was confirmed on 7th floor in achinery Equipment Room in air filters of air handling room. Cos. operated VIZ;
E10 stretched 2½ line to air handling room and operated on fire, washed down and then took up.
E-7- assisted E in stretching first line to fire floor and then stood fast, then took up.
E-6- responded t 6th floor with roll ups and stoodfast and then took up.
L-10- operated o 7th floor performed necessary search and notifications, searched 10th,9th,8th, floor results negative overhauled on fire floor and then up.
L-15- made searc of 7th and 8th floor, performed necessary VESand then up.

BC Charl Callahan
Charles allahan
TYPE FULL NAME
BN. 1317
TIME OF ARRIVAL

DC
Robert J. Blume
TYPE FULL NAME
DIV. 1
1330
TIME OF ARRIVAL

PAGE 1 OF

WHITE—FIRE RECORD YELLOW—BATTALION PINK—REFERRAL GOLD—ADMINISTRATIVE COMPANY



F-24A (12/86)

REPORT — ADDITIONAL DATA

STRUCTURAL FIRE, TRANSPORTATION FIRE, NON-STRUCTURAL FIRE OR EMERGENCY

TYPE REPORT: 6

DATE AND TIME ALARM RECEIVED: MONTH 12 DAY 67 YEAR 89 HOUR/MINUTE 1313

BOX LOCATION: BOROUGH 1 BOX NUMBER 8084

INCIDENT NUMBER: 023[illegible]

ADDRESS: BORO 1 NUMBER (INCL. HYPHEN) 1 STREET NAME WTC

7 008 10

OPERATIONS

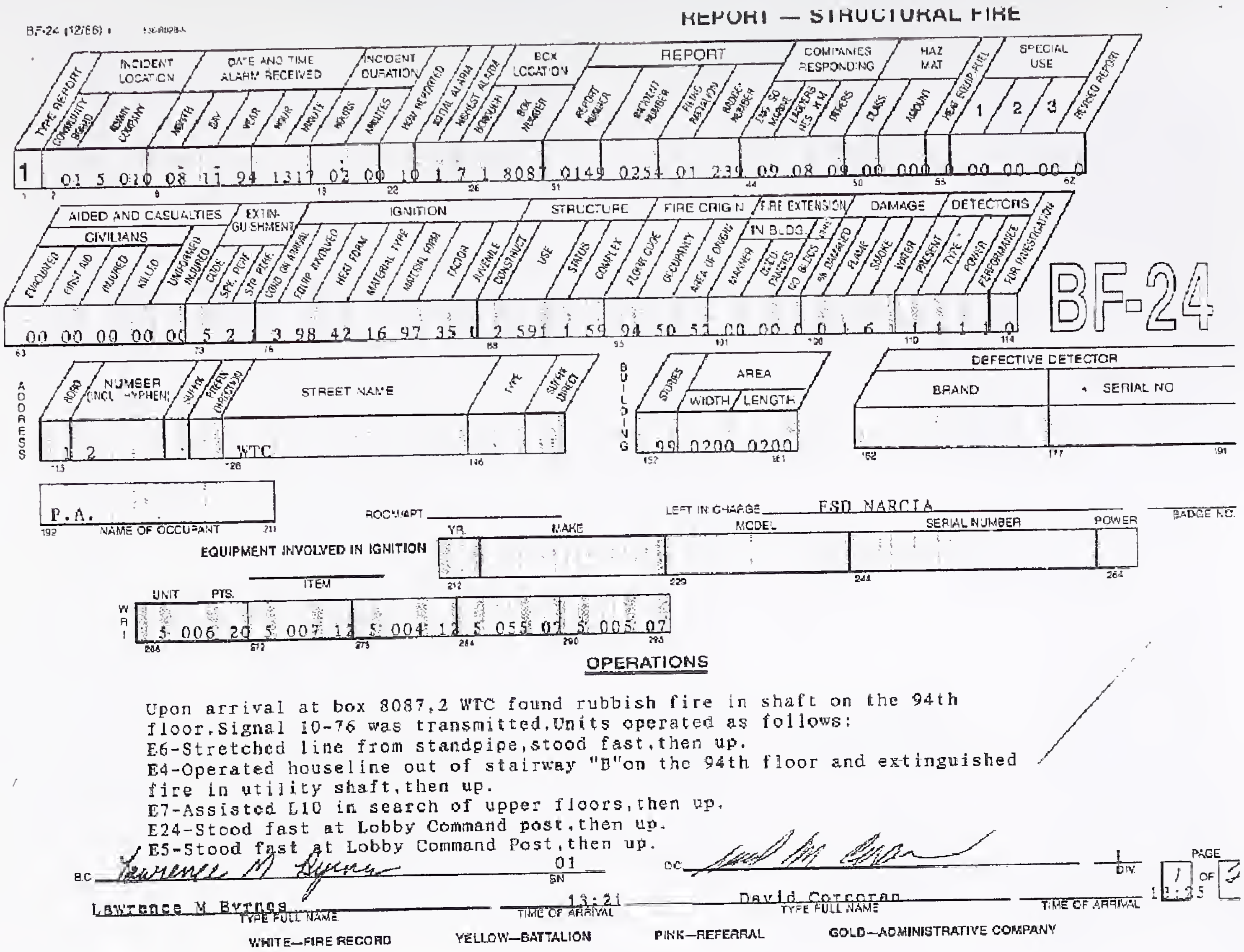
L-8- search floors 9-40 results negative and then up.
B-6- established operations post on 6th floor., then went ~~to~~ 7th floor MER and directed operation of units. Supervised E10,E6,E4 and L15.
B-4- supervised operations of L15, L10, an L8 on floors above fire units conducted primary and secondary search of floors above, results negative.
Times 10-76 1314 - E10
Under control 1340 - Div 1
Injured Civilians - [redacted] -smoke inhalation
[redacted] smoke inhalation'
taken to St. Vincents Hospital

[redacted] - smoke inhalation
[redacted] smoke inhalation
taken to Beekman
EMS Chief Cervo directed operations for EMS
PA operations Commander on scene Capt. Stinmer.

B.C. Charles Callahan 1 B.N.
Charles Callahan 1317
TYPE FULL NAME TIME ARRIVED

D.C. Robert J. Blume 1 DIV.
Robert J. Blume 1330
TYPE FULL NAME TIME ARRIVED

PAGE 2 OF



BF-24 (12/66)

REPORT — STRUCTURAL FIRE

BF-24

TYPE REPORT | INCIDENT LOCATION: COMMUNITY BOARD, ADMIN COMPANY | DATE AND TIME ALARM RECEIVED: MONTH, DAY, YEAR, HOUR, MINUTE | INCIDENT DURATION: HOURS, MINUTES | HOW REPORTED | TOTAL ALARM | HIGHEST ALARM | BOX LOCATION: BOROUGH, BOX NUMBER | REPORT: REPORT NUMBER, INCIDENT NUMBER, FILING BATTALION, BADGE NUMBER | COMPANIES RESPONDING: ENG. SQ. M.CASE, LADDERS RES. H.M., OTHERS | HAZ MAT: CLASS, AMOUNT | HEAT EQUIP FUEL | SPECIAL USE: 1, 2, 3 | REVISED REPORT

1 01 5 010 08 11 94 1317 02 00 10 1 7 1 8087 0149 0254 01 239 09 08 09 00 000 0 00 00 00 0

AIDED AND CASUALTIES: CIVILIANS: EVACUATED, FIRST AID, INJURED, KILLED; UNIFORMED INJURED | EXTINGUISHMENT: CODE, SPL. PCM, STP PERF. | IGNITION: COND ON ARRIVAL, EQUIP INVOLVED, HEAT FORM, MATERIAL TYPE, MATERIAL FORM, FACTOR, JUVENILE | STRUCTURE: CONSTRUCT, USE, STATUS, COMPLEX, FLOOR CODE | FIRE ORIGIN: OCCUPANCY, AREA OF ORIGIN | FIRE EXTENSION: IN BLDG.: MANNER, OCCU. PANCIES; TO BLDGS | DAMAGE: % DAMAGED, FLAME, SMOKE, WATER | DETECTORS: PRESENT, TYPE, POWER, PERFORMANCE | FOR INVESTIGATION

00 00 00 00 00 5 2 1 3 98 42 16 97 35 0 2 591 1 59 94 50 52 00 00 0 0 1 6 1 1 1 1 0

ADDRESS: BORO, NUMBER (INCL. HYPHEN), SUFFIX, PREFIX DIRECTION, STREET NAME, TYPE, SUFFIX DIRECT

1 2 WTC

BUILDING: STORIES, AREA: WIDTH / LENGTH

99 0200 0200

DEFECTIVE DETECTOR: BRAND, SERIAL NO

P.A.

NAME OF OCCUPANT

ROOM/APT

LEFT IN CHARGE FSD NARCIA

BADGE NO.

EQUIPMENT INVOLVED IN IGNITION: YR., MAKE, MODEL, SERIAL NUMBER, POWER

WRI: UNIT, PTS., ITEM

5 006 20 5 007 12 5 004 12 5 055 07 5 005 07

OPERATIONS

Upon arrival at box 8087,2 WTC found rubbish fire in shaft on the 94th floor.Signal 10-76 was transmitted.Units operated as follows:

E6-Stretched line from standpipe,stood fast,then up.

E4-Operated houseline out of stairway "B"on the 94th floor and extinguished fire in utility shaft,then up.

E7-Assisted L10 in search of upper floors,then up.

E24-Stood fast at Lobby Command post,then up.

E5-Stood fast at Lobby Command Post,then up.

B.C. Lawrence M Byrnes

Lawrence M Byrnes — TYPE FULL NAME

01 — BN

13:21 — TIME OF ARRIVAL

D.C. David Corcoran

David Corcoran — TYPE FULL NAME

1 — DIV.

13:25 — TIME OF ARRIVAL

PAGE 1 OF 2

WHITE—FIRE RECORD YELLOW—BATTALION PINK—REFERRAL GOLD—ADMINISTRATIVE COMPANY

24A (12/86)

REPORT — ADDITIONAL DATA

STRUCTURAL FIRE, TRANSPORTATION FIRE, NON-STRUCTURAL FIRE OR EMERGENCY

TYPE REPORT	DATE AND TIME ALARM RECEIVED					BOX LOCATION		INCIDENT NUMBER	IGNITION						STRUCTURE			AREA OF ORIGIN			FIRE EXTENSION		
	MONTH	DAY	YEAR	HOUR	MINUTE	BOROUGH	BOX NUMBER		BUILDING NO.	COND. OR ARRANG.	EQUIP. INVOLVED	HEAT FORM	MATERIAL TYPE	MATERIAL FORM	CONSTRUCTION	USE	STATUS	FLOOR CODE	OCCUPANCY	AREA CODE	MANNER	OCCUPANCY	REVISED REPORT
6	08	11	94	13	17	1	8087	0254	00														

1 2 8 12 16 23 32 37 43 47

ADDRESS

BORO	NUMBER (INCL. HYPHEN)	SUFFIX	PREFIX DIRECT.	STREET NAME	TYPE	SUFFIX DIRECTION
1	2			WTC		

57 68 88 93

SFX PERFORMANCE	DAMAGE				DETECTORS			
	% DAMAGED	FLAME	SMOKE	WATER	PRESENT	TYPE	POWER	PERFORMANCE

46 53 94

OCCUPANT (Driver) 113

ROOM/APT.

BUILDING	AREA	
STORIES	WIDTH	LENGTH

114 123

IF MOBILE PROPERTY

TYPE	YR	MAKE	MODEL	V.I.N.	LICENSE	STATE	DM

120 143 158

189 195 201 207 213 219 225 231

5 224 02	5 024 07	5 028 02	5 003 02	7 010 20	7 001 20	7 015 20	7 008 20
7 101 10	7 003 07	7 005 07	7 018 07	1 001 20			

237 UNIT PTS 243 249 255 261 261 273 279

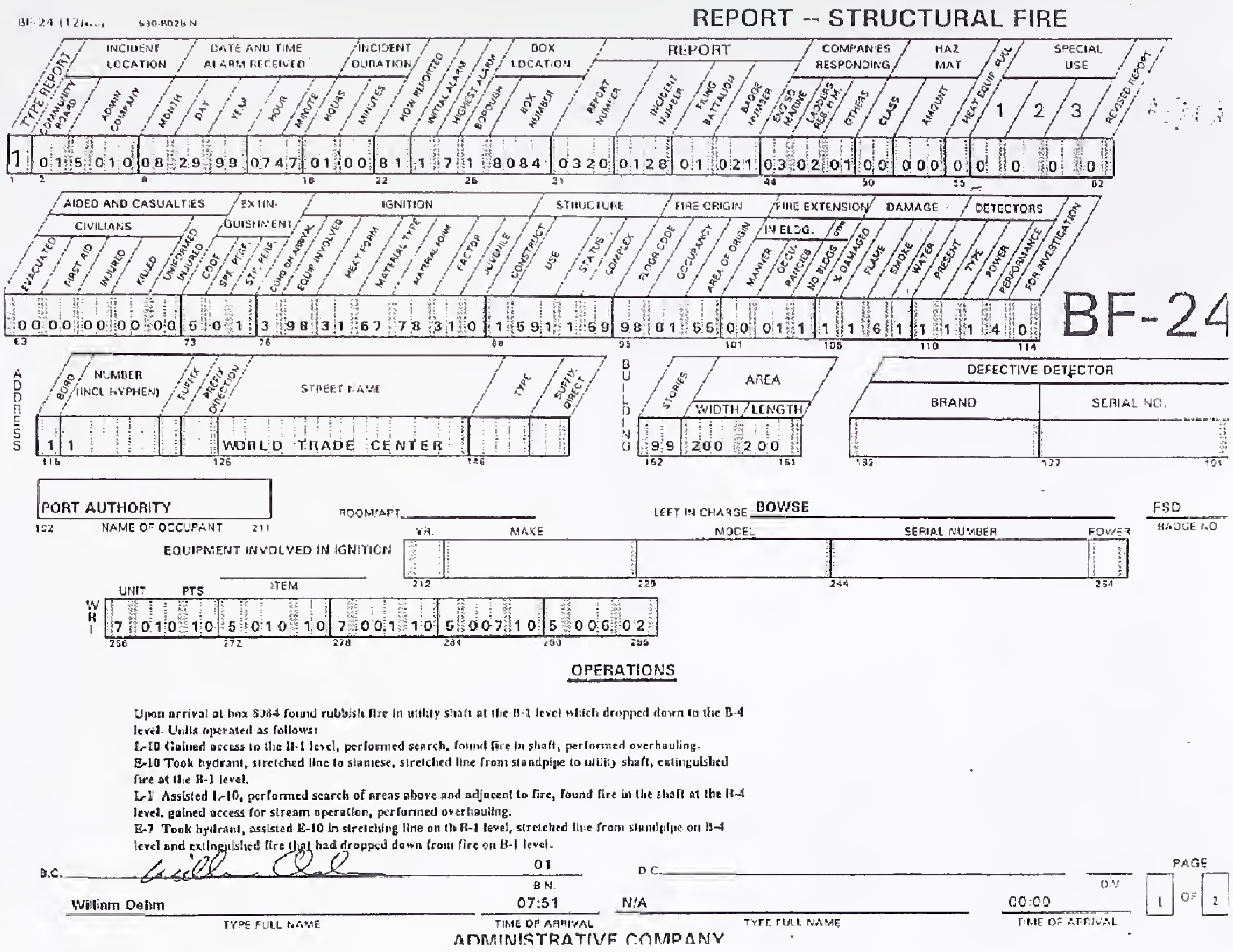
OPERATIONS

E3-Stood fast at the Lobby Command Post,then up.
E55-Stood fast at Lobby Command post,then up.
L10-Poerated on the 107th floor,opened various walls and doors,finding no fire or extention,then up.
L15-Assisted R1 in opening up a wall exposing fire in shaft,made necessary search and exam from 94 thru 99th floor(Termination point of shaft)Negative.
L8-Made necessary search and exam of floors 100 thru 106,found negatine.
L5-Stood fast at the Lobby Command Post,then up.
L18-Stood fast at the Lobby Command Post,then up.
L101-Searsh 75,91 and 92nd floor,found negative,then up.
L1-Made necessary search and exam of floors 104 thru 106,then up.
E224-Stood fast at the Lobby Command Post,then up.
R1-Used Thermal-Imaging camera and located fire in shaft on the 94th floor.
Batt4-Supervised operation on the fire floor,then up.
Batt8-Supervised operations on 107 and 74 floors,then up.
Batt2-Stood fast,then up.
FCU-Monitored handi-talkie circuit,progress reports,then up.

B.C. Lawrence M Byrnes 01 B.N.
Lawrence M Byrnes 13:21
TYPE FULL NAME TIME ARRIVED

D.C. 1 DIV.
David Corcoran 13:25
TYPE FULL NAME TIME ARRIVED

PAGE 2 of 2



BF-24 (12/...) 630-8026 N

REPORT -- STRUCTURAL FIRE

BF-24

TYPE REPORT / INCIDENT LOCATION: COMMUNITY BOARD, ADMIN COMPANY / DATE AND TIME ALARM RECEIVED: MONTH, DAY, YEAR, HOUR, MINUTE / INCIDENT DURATION: HOURS, MINUTES / HOW REPORTED / INITIAL ALARM / HIGHEST ALARM / BOX LOCATION: BOROUGH, BOX NUMBER / REPORT: REPORT NUMBER, INCIDENT NUMBER, FILING BATTALION, BADGE NUMBER / COMPANIES RESPONDING: ENG SQ MARINE, LADDERS RES. H.M., OTHERS / HAZ MAT: CLASS, AMOUNT / HEAT EQUIP FUEL / SPECIAL USE: 1, 2, 3 / REVISED REPORT

1 | 0 1 5 0 1 0 | 0 8 2 9 9 9 | 0 7 4 7 | 0 1 0 0 | 8 1 | 1 7 1 8 0 8 4 | 0 3 2 0 | 0 1 2 8 | 0 1 0 2 1 | 0 3 0 2 0 1 | 0 0 | 0 0 0 | 0 | 0 0 0 0

1 2 8 18 22 26 31 44 50 55 62

AIDED AND CASUALTIES: CIVILIANS: EVACUATED, FIRST AID, INJURED, KILLED; UNIFORMED INJURED / EXTINGUISHMENT: COOF, SPK. PERF., STP. PERF. / IGNITION: COND ON ARRIVAL, EQUIP INVOLVED, HEAT FORM, MATERIAL TYPE, MATERIAL FORM, FACTOR, JUVENILE / STRUCTURE: CONSTRUCT, USE, STATUS, COMPLEX / FIRE ORIGIN: FLOOR CODE, OCCUPANCY, AREA OF ORIGIN / FIRE EXTENSION: IN BLDG.: MANNER, OCCUPANCIES; OTHER: NO BLDGS / DAMAGE: % DAMAGED, FLAME, SMOKE, WATER / DETECTORS: PRESENT, TYPE, POWER, PERFORMANCE / FOR INVESTIGATION

0 0 0 0 0 0 0 0 0 0 | 5 0 1 | 3 9 8 3 1 6 7 7 8 3 1 0 | 1 5 9 1 1 5 9 | 9 8 0 1 5 5 | 0 0 0 1 1 | 1 1 6 1 | 1 1 1 4 0

63 73 76 88 95 101 106 110 114

ADDRESS: BORO / NUMBER (INCL HYPHEN) / SUFFIX / PREFIX DIRECTION / STREET NAME / TYPE / SUFFIX DIRECT.

1 | 1 | WORLD TRADE CENTER

116 126 146

BUILDING: STORIES / AREA: WIDTH / LENGTH

9 9 | 2 0 0 | 2 0 0

152 161

DEFECTIVE DETECTOR: BRAND / SERIAL NO.

162 177 191

PORT AUTHORITY

192 NAME OF OCCUPANT 211

ROOM/APT. ________

LEFT IN CHARGE BOWSE

FSD

BADGE NO

EQUIPMENT INVOLVED IN IGNITION: YR. / MAKE / MODEL / SERIAL NUMBER / POWER

212 220 244 254

W R I — UNIT / PTS / ITEM

7 0 1 0 1 0 | 5 0 1 0 1 0 | 7 0 0 1 1 0 | 5 0 0 7 1 0 | 5 0 0 6 0 2

256 272 278 284 290 295

OPERATIONS

Upon arrival at box 8084 found rubbish fire in utility shaft at the B-1 level which dropped down to the B-4 level. Units operated as follows:

L-10 Gained access to the B-1 level, performed search, found fire in shaft, performed overhauling.

E-10 Took hydrant, stretched line to siamese, stretched line from standpipe to utility shaft, extinguished fire at the B-1 level.

L-1 Assisted L-10, performed search of areas above and adjacent to fire, found fire in the shaft at the B-4 level, gained access for stream operation, performed overhauling.

E-7 Took hydrant, assisted E-10 in stretching line on th B-1 level, stretched line from standpipe on B-4 level and extinguished fire that had dropped down from fire on B-1 level.

B.C. ________ 01 B.N.

William Dehm — TYPE FULL NAME

07:51 — TIME OF ARRIVAL

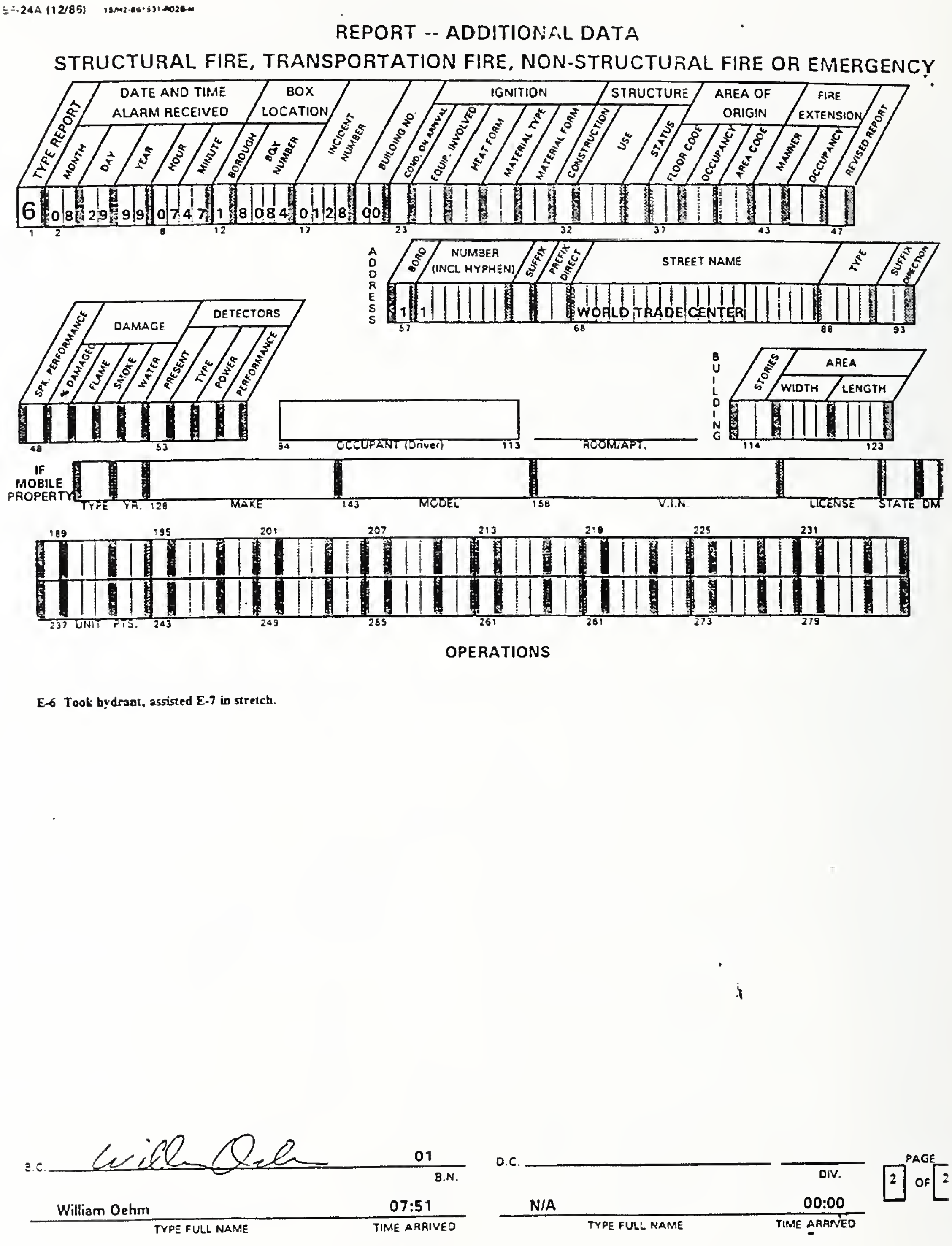
D.C. ________ DIV.

N/A — TYPE FULL NAME

00:00 — TIME OF ARRIVAL

PAGE 1 OF 2

ADMINISTRATIVE COMPANY



BF-24A (12/86) 15M2-86*531-A02B-N

REPORT -- ADDITIONAL DATA

STRUCTURAL FIRE, TRANSPORTATION FIRE, NON-STRUCTURAL FIRE OR EMERGENCY

TYPE REPORT	DATE AND TIME ALARM RECEIVED: MONTH	DAY	YEAR	HOUR	MINUTE	BOX LOCATION: BOROUGH	BOX NUMBER	INCIDENT NUMBER	BUILDING NO.	COND. ON ARRIVAL	IGNITION: EQUIP. INVOLVED	HEAT FORM	MATERIAL TYPE	MATERIAL FORM	STRUCTURE: CONSTRUCTION	USE	STATUS	AREA OF ORIGIN: FLOOR CODE	OCCUPANCY	AREA CODE	FIRE EXTENSION: MANNER	OCCUPANCY	REVISED REPORT
6	08	29	99	07	47	1	8084	0128	00														

1 2 8 12 17 23 32 37 43 47

ADDRESS

BORO	NUMBER (INCL HYPHEN)	SUFFIX	PREFIX DIRECT	STREET NAME	TYPE	SUFFIX DIRECTION
1	1			WORLD TRADE CENTER		

57 68 88 93

SPK. PERFORMANCE	DAMAGE: % DAMAGED	FLAME	SMOKE	WATER	DETECTORS: PRESENT	TYPE	POWER	PERFORMANCE

48 53

54 OCCUPANT (Driver) 113

ROOM/APT.

BUILDING

STORIES	AREA: WIDTH	LENGTH

114 123

IF MOBILE PROPERTY: TYPE YR. 128 MAKE 143 MODEL 158 V.I.N LICENSE STATE DM

189 195 201 207 213 219 225 231

237 UNIT PTS. 243 249 255 261 261 273 279

OPERATIONS

E-6 Took hydrant, assisted E-7 in stretch.

B.C. William Oehm 01 B.N.

William Oehm
TYPE FULL NAME

07:51
TIME ARRIVED

D.C.

DIV.

N/A
TYPE FULL NAME

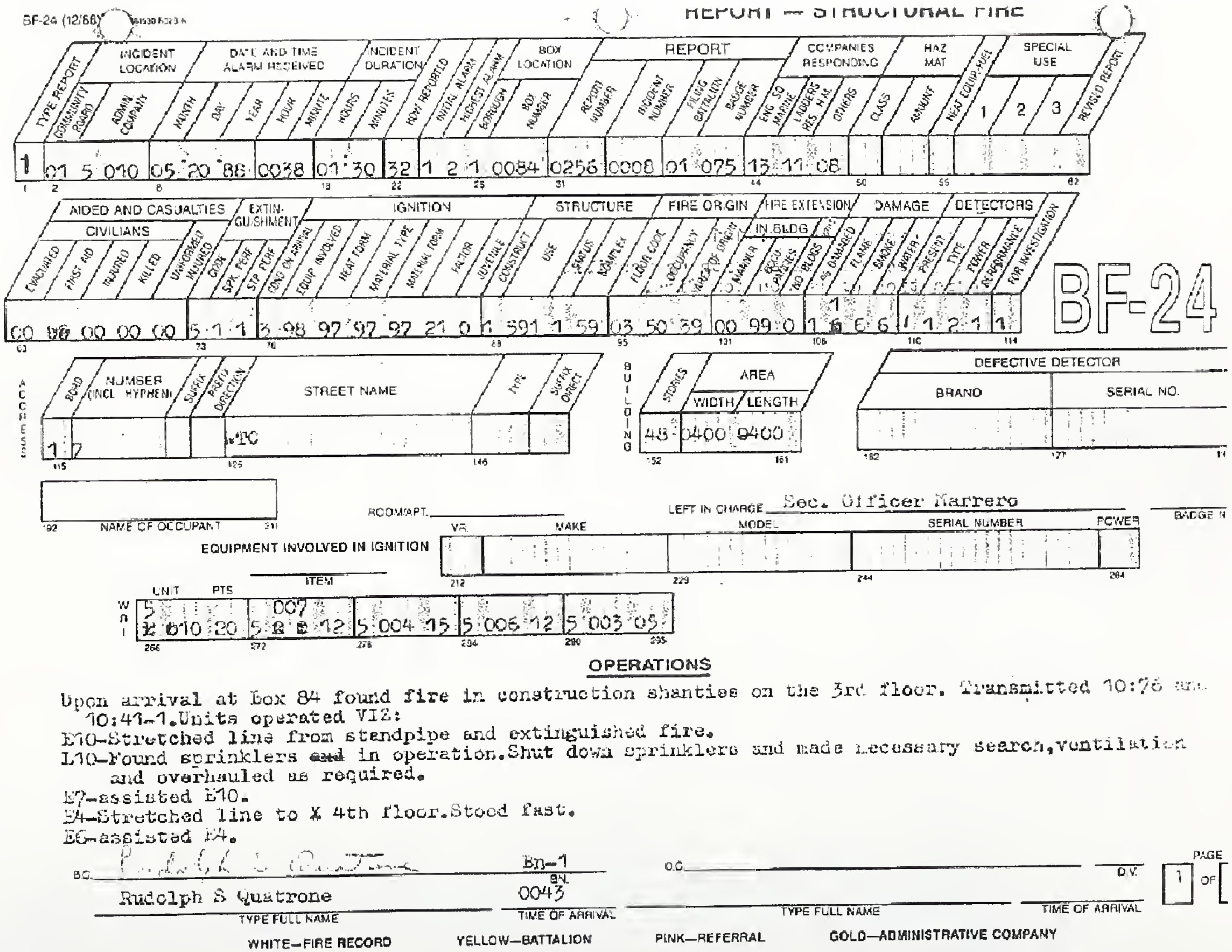
00:00
TIME ARRIVED

PAGE 2 OF 2

Attachment G-A.7

Significant fires occurring in WTC 7 (1)

Significant Fire	Incident Date	Fire Location	# sprinklers activated	# standpipes activated	Cause of fire	Material Ignited
1	5/20/88	Construction shanties on floor 3	Multiple, # not listed	1	Suspicious	Shanties



BF-24 (12/66)

REPORT — STRUCTURAL FIRE

TYPE REPORT	INCIDENT LOCATION		DATE AND TIME ALARM RECEIVED					INCIDENT DURATION							BOX LOCATION	REPORT				COMPANIES RESPONDING			HAZ MAT			SPECIAL USE			
	COMMUNITY BOARD	ADMIN. COMPANY	MONTH	DAY	YEAR	HOUR	MINUTE	HOURS	MINUTES	HOW REPORTED	INITIAL ALARM	HIGHEST ALARM	BOROUGH	BOX NUMBER	REPORT NUMBER	INCIDENT NUMBER	FILING BATTALION	BADGE NUMBER	ENG SQ MARINE	LADDERS RES. H.M.	OTHERS	CLASS	AMOUNT	HEAT EQUIP-FUEL	1	2	3	REVISED REPORT
1	01	5 010	05	20	88	00	38	01	30	32	1	2	1	0084	0256	0008	01	075	13	11	08							
1	2		8					18		22			25		31				44			50		55				62

AIDED AND CASUALTIES					EXTINGUISHMENT			IGNITION							STRUCTURE				FIRE ORIGIN			FIRE EXTENSION			DAMAGE				DETECTORS				
CIVILIANS																						IN BLDG		OUT									
EVACUATED	FIRST AID	INJURED	KILLED	UNIFORMED INJURED	CODE	SPK. PERF	STP PERF	COND ON ARRIVAL	EQUIP INVOLVED	HEAT FORM	MATERIAL TYPE	MATERIAL FORM	FACTOR	JUVENILE	CONSTRUCT	USE	STATUS	COMPLEX	FLOOR CODE	OCCUPANCY	AREA OF ORIGIN	MANNER	OCCUPANCIES	NO. BLDGS	FLRS DAMAGED	FLAME	SMOKE	WATER	PRESENT	TYPE	POWER	PERFORMANCE	FOR INVESTIGATION
00	88	00	00	00	5	1	1	3	98	97	97	97	21	0	1	591	1	59	03	50	39	00	99	0	1	6	6	6	/	1	2	1	1
63					73			76							88				95			101			106				110				114

BF-24

ADDRESS						
BORO	NUMBER (INCL. HYPHEN)	SUFFIX	PREFIX DIRECTION	STREET NAME	TYPE	SUFFIX DIRECT
1	7			WTC		
115				125	146	

BUILDING		
STORIES	AREA	
	WIDTH	LENGTH
45	0400	0400
152		161

DEFECTIVE DETECTOR	
BRAND	SERIAL NO.

NAME OF OCCUPANT

ROOM/APT. ______

LEFT IN CHARGE Sec. Officer Marrero

BADGE #

EQUIPMENT INVOLVED IN IGNITION	YR.	MAKE	MODEL	SERIAL NUMBER	POWER
ITEM					
	212	229	244	264	

UNIT PTS				
5 2 010 20	007 5 8 8 12	5 004 15	5 006 12	5 003 05
266	272	278	284	290 295

OPERATIONS

Upon arrival at Box 84 found fire in construction shanties on the 3rd floor. Transmitted 10:76 at 10:41-1.Units operated VIZ:
E10-Stretched line from standpipe and extinguished fire.
L10-Found sprinklers ~~and~~ in operation.Shut down sprinklers and made necessary search,ventilation and overhauled as required.
E7-assisted E10.
E4-Stretched line to ~~X~~ 4th floor.Stood fast.
E6-assisted E4.

B.C. Rudolph S Quatrone — Bn-1 BN.

Rudolph S Quatrone — TYPE FULL NAME

0043 — TIME OF ARRIVAL

O.C. ______ D.V. ______

TYPE FULL NAME ______ TIME OF ARRIVAL ______

PAGE 1 OF

WHITE—FIRE RECORD YELLOW—BATTALION PINK—REFERRAL GOLD—ADMINISTRATIVE COMPANY

BF-24A (12/86)

REPORT — ADDITIONAL DATA

STRUCTURAL FIRE, TRANSPORTATION FIRE, NON-STRUCTURAL FIRE OR EMERGENCY

TYPE REPORT	DATE AND TIME ALARM RECEIVED: MONTH	DAY	YEAR	HOUR	MINUTE	BOX LOCATION: BOROUGH	BOX NUMBER	INCIDENT NUMBER	BUILDING NO.	IGNITION: COND ON ARRIVAL	EQUIP. INVOLVED	HEAT FORM	MATERIAL TYPE	MATERIAL FORM	STRUCTURE: CONSTRUCTION	USE	STATUS	AREA OF ORIGIN: FLOOR CODE	OCCUPANCY	AREA CODE	FIRE EXTENSION: MANNER	OCCUPANCY	REVISED REPORT
6	05	20	85	00	38	1	0084	0008		3	98	97	97	97	1	591	1	03	50	39	00	99	
1	2			8		12		17		23					32			37			43		47

ADDRESS

BORO	NUMBER (INCL. HYPHEN)	SUFFIX	PREFIX DIRECT	STREET NAME	TYPE	SUFFIX DIRECTION
1	7			WTC.		
57				68	88	93

SPK. PERFORMANCE	DAMAGE: % DAMAGED	FLAME	SMOKE	WATER	DETECTORS: PRESENT	TYPE	POWER	PERFORMANCE
1	1	1	6	6	1	1	2	1
48					53			

OCCUPANT (Driver) 94 113

ROOM/APT.

BUILDING

STORIES	AREA: WIDTH	LENGTH
48	0400	0400
114		123

IF MOBILE PROPERTY

TYPE	YR.	MAKE	MODEL	V.I.N.	LICENSE	STATE
		128	143	158		

189	195	201	207	213	219	225	231
7 010 20	7 001 20	7 008 20					
237 UNIT PTS.	243	249	255	261	261	273	279

OPERATIONS

Operations as follows;

L8-Assisted L10 Made primary and secendory search of 5-10,11,12.Then up.

L1-Made search and examination of the 4th floor.Then assisted L8 in the examination of upper floors.Then up.

Batt 4-Supervised E10 and L10 on fire floor.

Batt 2-Supervised E4 and E6 and L1 on floors above fire.

FCU- SOP

MSU- SOP

E3- Stood fast.

Batt 6- Stood fast.

B.C. ______ Bn-1 B.N.

Rudolph S Quatrone — TYPE FULL NAME

0043 — TIME ARRIVED

D.C. ______ DIV.

______ TYPE FULL NAME ______ TIME ARRIVED

PA

2 O

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Attachment G-B

PACO 2002 Report: World Trade Center General Description of All Building Systems and the Capital Program. Extracted page.

Miscellaneous Life Safety Improvements and Sprinklerization Program

12. Miscellaneous Life Safety Improvements and Sprinklerization Program

12.1 Description of the Program

The initial base building provided for Fire Standpipe (FSP) protection in the Towers and Plaza Buildings and no sprinkler system installation (except in the sub-grade Levels). In response to the enactment of Local Law 5 and other NYC Building Code Local Law enactments related to the fire protection of high rise office towers built after 1973 the Port Authority voluntarily retrofitted the WTC complex to comply with the new NYC Building Code Requirements supplemented by PA imposed life safety requirements unique to the WTC. These requirements provided tenants the option of achieving fire protection compliance by a compartmentalization or a sprinklerization option. The Scope of miscellaneous life safety and sprinkler system upgrades/improvements, other than certain fire alarm, concourse circulation and blast recovery improvements discussed elsewhere, included but was not limited to:

12.2 Scope of Fire Life Safety Improvements

Architectural Modifications - On all floors:

- Upgraded core wall construction to provide for a 2 hour rated fire separation from one side of a tower floor to the opposite side (Where core wall were already 2 hour rated, such as in elevator shafts, upgraded where not previously required).
- Installed a double acting set of rated HM fire doors in the core corridors where the above 2 hour rated fire separation crossed the corridor (This enabled one half of a typical tower floor to serve as a horizontal fire refuge for the other.) Doors included special magnetic hold open hardware and closures linked to smoke detectors in floor return air ducts.
- Restored all ceilings in corridors and lobbies affected by fire protection Installations.
- Provided slab-to-slab 1hour fire rated walls to enable a maximum of 10,000 gross square foot compartmentalization on each side of the 2 hour rated fire separations.

Sprinkler System Installation

- The entire WTC complex was fully sprinklered. The Sprinkler System was Installed in three basic phases. Phase 1: Sub-grade areas for the Initial building construction; Phase 2: Sprinkler riser/main installation throughout 1 & 2 WTC including the sprinklerization of corridors, storage rooms, lobbies and certain tenant/PA spaces in 1976 in compliance with Local Law 5 to provide tenants with a compartmentation or sprinkler fire protection option; Phase 3: The full sprinklerization of the entire complex for all remaining places from 1983 to the 2001(including 1993 blast recovery and ongoing up-grades/improvements and replacements).
- The Tower sprinkler systems were fed in the various zones from the gravity feed fire reserve tanks located on the 20th, 41st,75th and 110th Floors through a 4" vertical sprinkler riser located in the Janitor Closet on each floor of each building in the WTC complex.

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Appendix H
INTERIM REPORT ON EVOLUTION OF WTC FIRES, SMOKE, AND DAMAGE BASED ON IMAGE ANALYSIS

H.1 COLLECTION AND ANALYSIS OF VISUAL MATERIAL

Photographic and video images of damage and fires in the World Trade Center (WTC) towers and WTC 7 are critical for guiding the investigation led by the National Institute of Standards and Technology (NIST). The conditions of the towers immediately following the plane strikes, the rates of fire development and spread through the buildings, and indications as to the floors on which the structural collapses may have begun and their causes are examples of issues that are being addressed using imagery. Observations discussed below demonstrate the importance of such visual evidence.

This appendix is designed to provide an update on NIST efforts to collect and analyze visual material available for the WTC disaster. This effort is part of Project 5, Reconstruction of Thermal and Tenability Environment, and this is the focus of the material presented. It is important to recognize that the effort is coordinated with the other projects that form the NIST-led WTC Investigation, and the visual material is being used as the basis for additional analysis in these projects.

The amount of visual material recorded on September 11, 2001, was extraordinary. The terrorist attacks occurred in an area that is the national home base of several news organizations, has several major newspapers, and is the center of the fashion industry. As a result, there were likely hundreds of professional photographers and videographers equipped with excellent equipment and the knowledge to use it in the immediate area. New York City is also a major tourist destination, and visitors often carry cameras to record their visits.

The WTC towers (WTC 1 and WTC 2) were immense, and they dominated the New York City skyline. When WTC 1 was struck by American Airlines Flight 11 around 8:46 a.m., the approach of the plane was captured by at least two videographers who were coincidentally filming nearby. Other photographers and videographers in the vicinity began recording within a few seconds of the impact. As fires grew in the tower, smoke pouring from the building formed a plume that could be seen for miles in all directions in the clear air of September 11, 2001. People in Manhattan, Brooklyn, Queens, and New Jersey began to turn their cameras toward the WTC complex. The major news organizations began coverage almost immediately and began moving professionals into position to cover the event. Numerous other videographers and photographers, both professional and amateur, started moving toward the WTC in order to create their own visual records.

At the time United Airlines Flight 175 struck WTC 2, around 9:03 a.m., the approach and collision of the aircraft were recorded by numerous cameras from a variety of directions. Many people continued to record images until WTC 2 collapsed, around 9:59 a.m. Following this collapse, the amount of visual material decreased markedly as people rushed to escape the area and the huge dust clouds generated by the collapse obscured the site. This situation was only exacerbated by the collapse of WTC 1, around

10:28 a.m. The visual record between the period following the collapse of WTC 1 and the collapse of WTC 7, around 5:21 p.m., is much less complete, but there is still a substantial amount of material.

Even as the disaster unfolded, it was clear that a large amount of visual material was being recorded that was being used to inform the public, demonstrate the immensity of the disaster, and to chronicle the associated human suffering. It is now clear that the imagery of September 11, 2001, is the most extensive ever recorded of such a single tragic event. The resulting visual record offers an unparalleled opportunity to contribute to the technical understanding of the tragedy of September 11. Even though it was clear that an extensive visual record of the events of September 11 existed, approaches for obtaining access to photographs and videos and cataloging the material had to be developed. These critical aspects of the task have required a great deal of time and effort.

H.1.1 Sources

Potential sources of visual material have been identified in a number of ways. Recordings of newscasts from September 11, 2001, and afterwards, documentaries and other remembrances, provided information directly, but also pointed toward other potential sources of material. The major photo clearinghouses, such as AP, Reuters, and Corbis, have World Wide Web sites that were reviewed for material related to September 11. Several members of the media suggested sources. Several collections of visual material have been assembled for charitable or historical purposes. Collections from the *Here is New York City* exhibition and the *September 11 Digital Archive* were reviewed. Many photographs and videos began appearing on the Web as early as September 11. These could often be identified by Web searches, and in many cases contact information was provided. Public appeals for visual material were made during Investigation news conferences and updates. News accounts of these events led many to contact NIST using the toll-free number or the Investigation Web site. Frequently, a new source would provide information about other potential sources.

NIST hired a visual media consultant, Mr. Valentine Junker, to act as its representative in the New York City area. In addition to interacting with a number of individuals, his efforts were particularly valuable in interfacing with the major television networks and local New York City stations as well as the major photographic news services.

H.1.2 Procedures

The identification of sources was only the first step in the collection process. It was then necessary to contact the source, request the material, and make arrangements for its transfer. Special considerations such as copyright and privacy issues often needed to be addressed. Once an agreement was reached, arrangements were made to review and transfer copies of the material to NIST.

In the collection process, emphasis has been placed on obtaining material in a form that is as close as possible to the original in order to maintain as much spatial and timing information as possible. In the case of digital photographs and videos this implies a direct digital copy. For film or slide photographs, it would be a high-resolution digitized version of the original media, and for analog video, a direct copy from the original source. While it was not always possible to maintain this standard, the majority of material ultimately collected was handled in this manner.

H.1.3 Contents

Significant progress has been made in collecting visual material related to September 11, 2001. Thus far, in excess of 150 hours of video have been assembled. At the time of preparation of this update, video footage has been provided by NBC, CBS, ABC, CNN and local New York City stations WABC, WCBS, WNBC, WPIX, WNYW and New York City One. In many cases, the videos provided not only include material broadcast (known as air checks), but also material that was recorded but not broadcast (known as outtakes). Additionally, videotapes recorded by more than 20 individuals have been received.

Photographs have been provided by a number of sources dominated by commercial photo services, the New York City Police Department (NYPD), the New York City Fire Department (FDNY), and individuals. Well in excess of 6,000 photographs, representing more than 185 photographers, have been received. Professional news organizations that have provided material include AP, Corbis, Reuters, the *New York City Times*, the *Daily News*, and the *Star Ledger*. As for the videos, many of these organizations have provided access to unpublished photographs. The majority of photographs have come from individual photographers, both professional and amateur.

It is difficult to estimate the actual amount of relevant visual material recorded on September 11, 2001, and thus to estimate how complete the collection efforts have been. There is certainly material that has not been identified and collected. However, NIST believes that the extraordinarily large collection of video material that it possesses is sufficient for the Investigation.

H.2 DATABASING AND CATALOGING

It would be impossible to effectively use the vast amount of visual material collected for the Investigation without some means of organizing and cataloging the material.

H.2.1 Digital Storage

Very early in the task, the decision was made to save all material in digital format on large digital data storage devices. This approach has several advantages. Because the material is in digital form, it can be assessed quickly. It is not necessary to search for a particular photographic collection or videotape, and no special equipment is required to display it. Because most material is received in other forms, the digital storage is in effect a backup system for the original. Additional redundancy is provided by backing up the entire digital storage system at regular intervals. Because videos are saved digitally, they can be analyzed using a variety of commercially available editing software.

Various storage solutions were considered. An approach was finally adopted in which a central server along with two 325 gigabyte and one 160 gigabyte external hard drives were connected with eight personal computers equipped with 70 gigabyte hard drives. The personal computers not only provide additional disk storage, but also serve as workstations for data entry and analysis. All of the systems are connected by high-speed ethernet to form a single network configured such that the entire system becomes, in effect, a single mass storage device. The total amount of storage available is roughly 1.4 terabytes.

Due to security concerns related to the sensitive nature of some of the visual material and copyright issues, the computer network has been set up with its own dedicated connections and is isolated from the internet backbone of NIST. Policies have been adopted that require all viewing and analysis of the material to be done in secured rooms using secured networks.

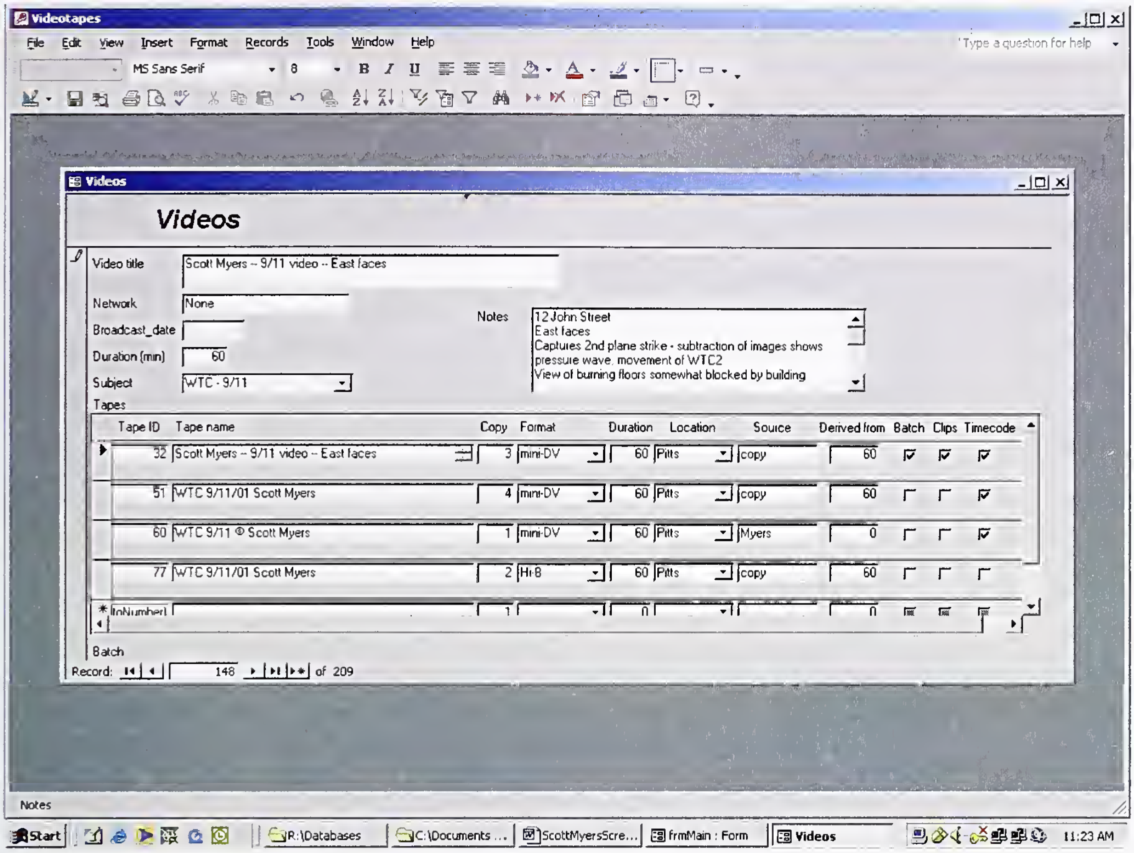
H.2.2 Digitizing Techniques

When new visual material is received at NIST, it is stored digitally on the dedicated system. If the material is already in digital form this simply means copying and saving it on the system. Analog material must be first digitized in some manner. For instance, a photograph might be scanned and digitized, or a video might be converted to a digital video format (typically mini-DV) and then copied to a hard disk.

Each arriving video is logged into VideoList, a Microsoft Access database written specifically for this application. There it is assigned a unique identification number. Pertinent information concerning the tape is recorded, including its duration, the network and broadcast date if applicable, its physical format (e.g., VHS, Hi-8, or mini-DV), where the tape is stored, whether the tape is an original or a copy, its source, whether it has been digitized, whether it contains embedded timecode, and general notes on its content. Figure H–1 shows an example of the entry sheet for the VideoList database. Videos to be stored digitally are copied onto mini-DV media, and each copy is also logged into the database. VideoList also contains a calculator for assisting in the calculation of clip timing that is described in H.3.1. Selected video material is then transferred to hard disk for storage. Video material is often found to have natural breaks, such as when the camera is turned off and on (e.g., by an individual videographer) or when multiple cameras are used (e.g., during a newscast). It is advantageous to treat each of these breaks as the end of an individual video. This is accomplished by a process known as “clipping.” By using Adobe Premiere software and a personal computer to control the video player, it is possible to identify and note such breaks in a “clip file.” The clip file can also contain notes related to the material. Once a clip file has been generated for an entire tape, the software goes through and automatically generates multiple data files containing the video material. The material is stored in “avi” format, which maintains all of the digital information. The maximum video file size that can be handled by this system is 1 gigabyte. This corresponds to slightly more than 4 1/2 min of avi video. Longer continuous video segments are broken into lengths having roughly this period. Breaking longer videos up in this manner also makes them easier to search and catalog.

H.2.3 Searchable Database

As noted earlier, a vast amount of visual material has been collected and saved digitally as part of the investigation. Without some organization, it would be impossible to use this material effectively. A commercial database program written specially for organizing visual material, Cumulus, was chosen for this purpose. This software is designed to collect individual “assets” in specified catalogs and to allow the assets to be characterized with a variety of attributes. It is possible to generate specific attributes and include these in specially designed forms for data entry. Once a catalog has been assembled, it is possible to search for assets having a specific attribute or combinations of attributes. Quite sophisticated searches can be created. It is also possible to order assets based on a particular attribute. As an example, when dates and times are assigned, the assets can be ordered in chronological order.



Videos

Video title: Scott Myers -- 9/11 video -- East faces

Network: None

Broadcast_date:

Duration (min): 60

Subject: WTC - 9/11

Notes: 12 John Street
East faces
Captures 2nd plane strike - subtraction of images shows pressure wave, movement of WTC2
View of burning floors somewhat blocked by building

Tapes

Tape ID	Tape name	Copy	Format	Duration	Location	Source	Derived from	Batch	Clips	Timecode
32	Scott Myers -- 9/11 video -- East faces	3	mini-DV	60	Pitts	copy	60	☑	☑	☑
51	WTC 9/11/01 Scott Myers	4	mini-DV	60	Pitts	copy	60	☐	☐	☑
60	WTC 9/11 © Scott Myers	1	mini-DV	60	Pitts	Myers	0	☐	☐	☑
77	WTC 9/11/01 Scott Myers	2	Hi-8	60	Pitts	copy	60	☐	☐	☐
ioNumber)		1		0			0	☐	☐	☐

Batch

Record: 148 of 209

Figure H–1. An example of the VideoList data entry sheet for video assets.

Two separate catalogs, one for photographs and one for video clips, have been created for visual materials collected as part of the Investigation. Each catalog has a similar set of attributes that is used to characterize the assets that are included. These attributes were chosen based on the needs of this task dealing with fire conditions within WTC 1, 2, and 7 and by consultation with members of other project teams. Tables H–1 and Table H–2 list the attributes used for photographic and video catalogs, respectively. A description of each attribute is provided along with details on how information concerning the attribute is input into the worksheet. Figure H–2 shows an example of the first screen for the photographic data entry form.

Cumulus allows thumbnails of entire catalogs or selected subsets to be displayed. This makes it possible to review large numbers of photographs and video clips quickly and to decide which are most likely to be useful for a particular purpose. A variety of asset characteristics can also be shown simultaneously. Typically, the asset name and the time the asset was recorded are displayed. Figure H–3 shows an example of thumbnails taken from the video database.

Table H–1. Attributes for photographic assets.

Attribute	Definition	Entry Choice
Asset Reference	Location of photograph in file system	Set by Cumulus
Categories	List of categories under which the photograph is listed, typically the photographer's name or source	Set by Cumulus
Record Name	File name of photograph	Set by Cumulus
Photographer	Photographer's name	Text
Received from	Where photograph was obtained ("Other" may refer to a third party, for example)	Photographer WWW Other
Original Source	How photograph was added to the collection	Digital Copy of Original Digital Copy from Program Digitized Slide or Negative Digitized Photograph Uploaded from Web
Use Limited	Photographer has requested that use of the photograph be limited	Checkbox
Copyright	A copyright exists	Checkbox
Copyright Agreement	Usage agreement with NIST	Text
Shot From	Location of photographer	Text
Date Recorded	Date and time of shot	Date and time
Time Uncertainty (s)	Number of seconds uncertainty in the time assigned	Integer
View Direction	Location of photographer with respect to the WTC	North Northeast East Southeast South Southwest West Northwest
WTC Faces WTC 1 North Face WTC 1 East Face WTC 1 South Face WTC 1 West Face WTC 2 North Face WTC 2 East Face WTC 2 South Face WTC 2 West Face WTC 7 North Face WTC 7 East Face WTC 7 South Face WTC 7 West Face	Building face(s) visible in the photograph	Checkbox for each choice

Attribute	Definition	Entry Choice
Distance Near Medium Far	Clarity of the photograph Near = Can make out details in windows Medium = Can count windows Far = Unable to count windows	Checkbox for each choice
Building WTC 1 WTC 2 WTC 7 Other Building	Building(s) visible in photograph	Checkbox for each choice
1st Plane Strike	Photograph shows the plane strike on WTC 1	Checkbox
2nd Plane Strike	Photograph shows the plane strike on WTC 2	Checkbox
WTC 1 Collapse	Photograph shows the collapse of WTC 1	Checkbox
WTC 2 Collapse	Photograph shows the collapse of WTC 2	Checkbox
WTC 7 Collapse	Photograph shows the collapse of WTC 7	Checkbox
Street	Street scene, or a street is visible in the photograph	Checkbox
Debris Aircraft Debris Collapse Debris Debris Inside Building Street Debris	Debris is visible in the photograph Type of debris: Aircraft = Can be identified as plane debris (e.g., tires, engines) Collapse = Resulting from collapse Inside Building = Visible through windows or openings Street = On street	Checkbox for each choice
Fireball	Initial fireball from plane strike is visible	Checkbox
Thermal	The thermal is a tall region of the smoke plume that results from the lift caused by the hot gases of the initial fireball	Checkbox
Plume	Smoke plume generated by the fires within the towers and blown downwind. This marker is checked if the smoke plume in the photograph extends farther than a single tower width.	Checkbox
Flames Visible	Flames are visible in the photograph	Checkbox
People Inside Falling Outside	The photograph includes people Inside = People inside the buildings, at the windows or climbing down Outside = People on the street	Checkbox for each choice
Falling building component	The photograph shows a building component falling (e.g., aluminum cladding)	Checkbox
Streamers Falling	The photograph shows a streamer, an object that emits smoke as it falls and leaves a trail	Checkbox
Dripping	Molten material dripping from WTC 2 is visible	Checkbox
Hanging Floor	A sagging or hanging object suggesting a floor is visible within the windows	Checkbox

Attribute	Definition	Entry Choice
Building Core	Photograph shows the core of WTC 1 or WTC 2 — both remained standing briefly during collapse before falling	Checkbox
FDNY FDNY Apparatus FDNY Personnel	FDNY personnel or vehicles are visible, including EMTs, fire trucks, and ambulances	Checkbox for each choice
NYPD NYPD Apparatus NYPD Personnel	NYPD personnel or vehicles are visible, also includes FBI and other police officials	Checkbox for each choice
Impact Aircraft	Photograph shows aircraft approaching WTC 1 or WTC 2 before or during the strike	Checkbox
Other Aircraft	Aircraft other than the impact aircraft are included in the photograph, such as helicopters or fighter jets	Checkbox
Good for Analysis	Mark photograph for possible window-by-window analysis	Checkbox
Analyzed	The photograph has been used for window-by-window analysis	Checkbox
Notes	Notes, including a description of how the photograph was timed	Checkbox

Not all collected visual material is incorporated into the two catalogs. Photographs and videos judged not to contain information directly relevant to the Investigation are not included. Even so, the number of photographs and clips included in the catalogs is huge. At the time of writing, the photographic catalog includes 6,759 assets and the video catalog includes 6,911 assets.

H.3 TIMING OF PHOTOGRAPHS AND VIDEO CLIPS

Since one of the major goals of this task is the development of time lines for fire growth and spread in WTC 1, 2, and 7, it is important to assign times of known accuracy to assets included in the two catalogs. This task is complicated by the absence of accurate times for the majority of visual materials collected.

H.3.1 Digital Timestamps

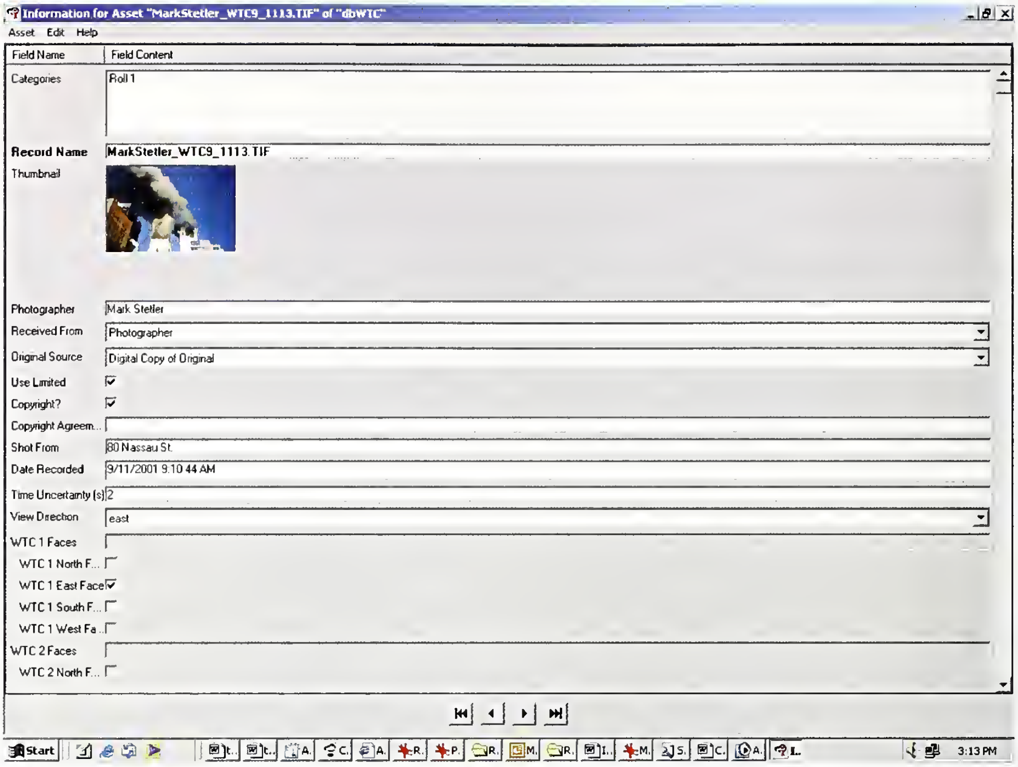
Modern photographic and video digital cameras often record camera clock times as part of their output. For photographs, this information is usually stored as an integral part of the image in a header known as an Exif file. Similarly, digital video cameras often embed a variety of information, including the camera clock time, as part of what is known as meta data. Software is available for reading these clock times from Exif and other meta data media file formats. While a great help, these times usually still require some adjustment because people do not generally set their camera clocks accurately. In some cases, camera clocks were off by days or even years. Even so, the relative times over the short time period of the events of September 11, 2001, are quite accurate.

Table H–2. Attributes for video assets.

Attribute	Definition	Entry Choice
Asset Reference	Location of video clip in the file system	Set by Cumulus
Categories	List of categories under which the video clip is listed, typically the photographer's name or source	Set by Cumulus
Record Name	File name of video clip	Set by Cumulus
Photographer	Photographer's name	Text
Content	Content of video clip WTC 9/11 Footage = Events before collapse of WTC 7 Street Scene (no timing) Debris field = Ground Zero after WTC 7 collapse Construction = Construction of WTC towers from documentary Normal Operation = Normal operation of building, usually from documentary Animation = Animation of 9/11 events from documentary Still(s) = Photographs contained within documentary Interview = Clip only shows interview	WTC 9/11 Footage Street scene (no timing) Debris field Construction Normal operation Animation Still(s) Interview
Use Limited	Videographer has requested that use of the videotape be limited	Checkbox
Copyright	A copyright exists	Checkbox
Copyright Agreement	Usage agreement arrangements with NIST	Text
Shot From	Location of videographer	Text
Date Recorded	Date and time of beginning of video clip	Date and time
End Recording	Date and time of end of video clip	Date and time
Duration	Number of minutes:seconds contained in clip	Real number
Time Uncertainty (s)	Number of seconds uncertainty in the time recorded / end recording	Integer
View Direction	Location of videographer with respect to the WTC	North Northeast East Southeast South Southwest West Northwest

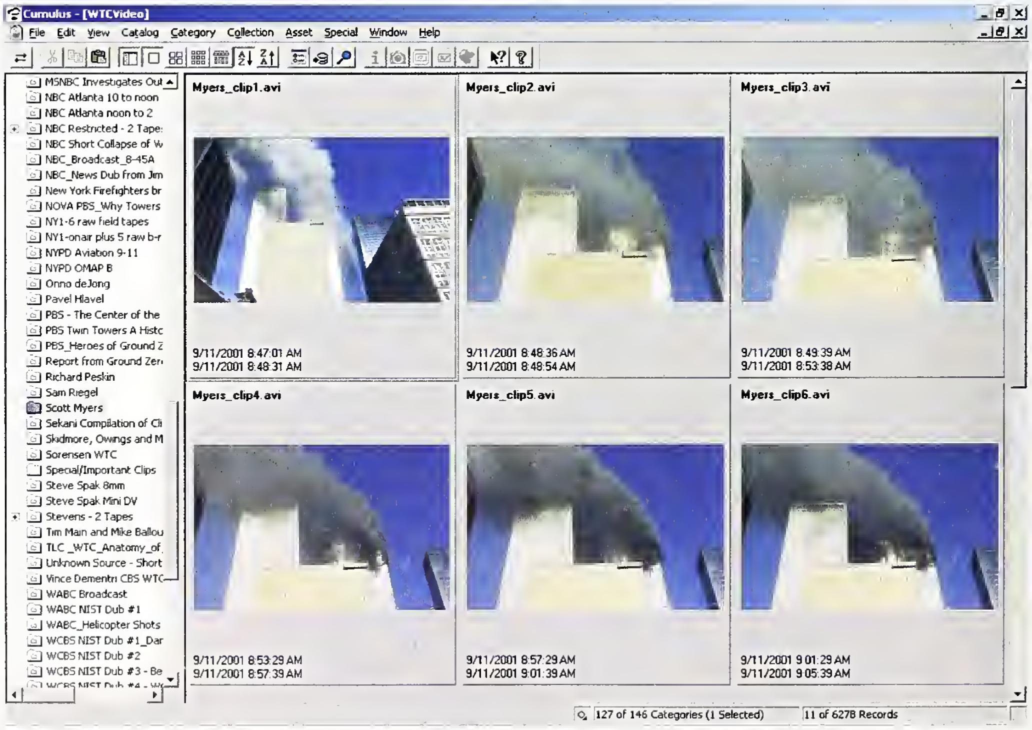
Attribute	**Definition**	**Entry Choice**
WTC Faces WTC 1 North Face WTC 1 East Face WTC 1 South Face WTC 1 West Face WTC 2 North Face WTC 2 East Face WTC 2 South Face WTC 2 West Face WTC 7 North Face WTC 7 East Face WTC 7 South Face WTC 7 West Face	Building face(s) visible in the video clip	Checkbox for each choice
Distance Near Medium Far	Clarity of the video clip Near = Can make out details in windows Medium = Can count windows Far = Unable to count windows	Checkbox for each choice
Building WTC 1 WTC 2 WTC 7 Other Building	Building(s) visible in video clip	Checkbox for each choice
1st Plane Strike	Clip shows the plane strike on WTC 1	Checkbox
2nd Plane Strike	Clip shows the plane strike on WTC 2	Checkbox
WTC 1 Collapse	Clip shows the collapse of WTC 1	Checkbox
WTC 2 Collapse	Clip shows the collapse of WTC 2	Checkbox
WTC 7 Collapse	Clip shows the collapse of WTC 7	Checkbox
Street	Street scene, or a street is visible in the video clip	Checkbox
Debris Aircraft Debris Collapse Debris Debris Inside Building Street Debris	Debris is visible in the video clip Type of debris: Aircraft = Can be identified as plane debris (e.g., tires, engines) Collapse = Resulting from collapse Inside Building = Visible through windows Street = On street	Checkbox for each choice
Fireball	Initial fireball from plane strike is visible	Checkbox
Thermal	The thermal is a tall region of the smoke plume that results from the lift caused by the hot gases of the initial fireball	Checkbox
Plume	Smoke plume generated by the fires within the towers and blown downwind. This marker is checked if the smoke plume in the video clip extends farther than a single tower width.	Checkbox
Flames Visible	Flames are visible in the video clip	Checkbox

Attribute	Definition	Entry Choice
People Inside Falling Outside	The video clip includes people Inside = People inside the buildings, at the windows, or climbing down Outside = People on the street	Checkbox for each choice
Falling building component	The video clip shows a building component falling (e.g., aluminum cladding)	Checkbox
Streamers Falling	The video clip shows a streamer, an object that emits smoke as it falls and leaves a trail	Checkbox
Dripping	Molten material dripping from WTC 2 is visible	Checkbox
Hanging Floor	A sagging object suggesting a floor is visible within the windows	Checkbox
Building Core	Video clip shows the core of WTC 1 or WTC 2 – both remained standing briefly during collapse before falling	Checkbox
FDNY FDNY Apparatus FDNY Personnel	FDNY personnel or vehicles are visible, including EMTs, fire trucks, and ambulances	Checkbox for each choice
NYPD NYPD Apparatus NYPD Personnel	NYPD personnel or vehicles are visible, also includes FBI and other police officials	Checkbox for each choice
Aircraft Impact Aircraft Other Aircraft	Aircraft are visible in the video clip Impact: Shows aircraft approaching WTC 1 or WTC 2 before or during the strike Other: Helicopters or fighter jets	Checkbox for each choice
Major Change Major Fire Change Major Smoke Change Windows Opened	One of the following events takes place in the video clip: Major Fire Change: Fire flares up, dies down, or spreads to a new region Major Smoke Change: Smoke bursts, dies down, or spreads to a new region Windows Opened: Window breaks open, either due to fire or to people	Checkbox for each choice
Good for Analysis	Mark video clip for possible window-by-window analysis	Checkbox
Analyzed	The video clip has been used for window-by-window analysis	Checkbox
Notes	Notes, including a description of how the video clip was timed	Text



Field Name	Field Content
Categories	Roll 1
Record Name	MarkStetler_WTC9_1113.TIF
Thumbnail	
Photographer	Mark Stetler
Received From	Photographer
Original Source	Digital Copy of Original
Use Limited	☑
Copyright?	☑
Copyright Agreem...	
Shot From	80 Nassau St.
Date Recorded	9/11/2001 9:10:44 AM
Time Uncertainty (s)	2
View Direction	east
WTC 1 Faces	
WTC 1 North F...	☐
WTC 1 East Face	☑
WTC 1 South F...	☐
WTC 1 West Fa...	☐
WTC 2 Faces	
WTC 2 North F...	☐

Figure H–2. An example of the first page of the Cumulus data entry sheet for photographic assets. Thumbnail © 2001 Mark Stetler.



MSNBC Investigates Out
NBC Atlanta 10 to noon
NBC Atlanta noon to 2
NBC Restricted - 2 Tape:
NBC Short Collapse of W
NBC_Broadcast_8-45A
NBC_News Dub from Jim
New York Firefighters br
NOVA PBS_Why Towers
NY1-6 raw field tapes
NY1-onair plus 5 raw b-r
NYPD Aviation 9-11
NYPD OMAP B
Onno deJong
Pavel Hlavel
PBS - The Center of the
PBS Twin Towers A Histc
PBS_Heroes of Ground Z
Report from Ground Zer
Richard Peskin
Sam Riegel
Scott Myers
Sekani Compilation of Cli
Skidmore, Owings and M
Sorensen WTC
Special/Important Clips
Steve Spak 8mm
Steve Spak Mini DV
Stevens - 2 Tapes
Tim Main and Mike Ballou
TLC _WTC_Anatomy_of_
Unknown Source - Short
Vince Dementri CBS WTC
WABC Broadcast
WABC NIST Dub #1
WABC_Helicopter Shots
WCBS NIST Dub #1_Dar
WCBS NIST Dub #2
WCBS NIST Dub #3 - Be

Myers_clip1.avi
9/11/2001 8:47:01 AM
9/11/2001 8:48:31 AM

Myers_clip2.avi
9/11/2001 8:48:36 AM
9/11/2001 8:48:54 AM

Myers_clip3.avi
9/11/2001 8:49:39 AM
9/11/2001 8:53:38 AM

Myers_clip4.avi
9/11/2001 8:53:29 AM
9/11/2001 8:57:39 AM

Myers_clip5.avi
9/11/2001 8:57:29 AM
9/11/2001 9:01:39 AM

Myers_clip6.avi
9/11/2001 9:01:29 AM
9/11/2001 9:05:39 AM

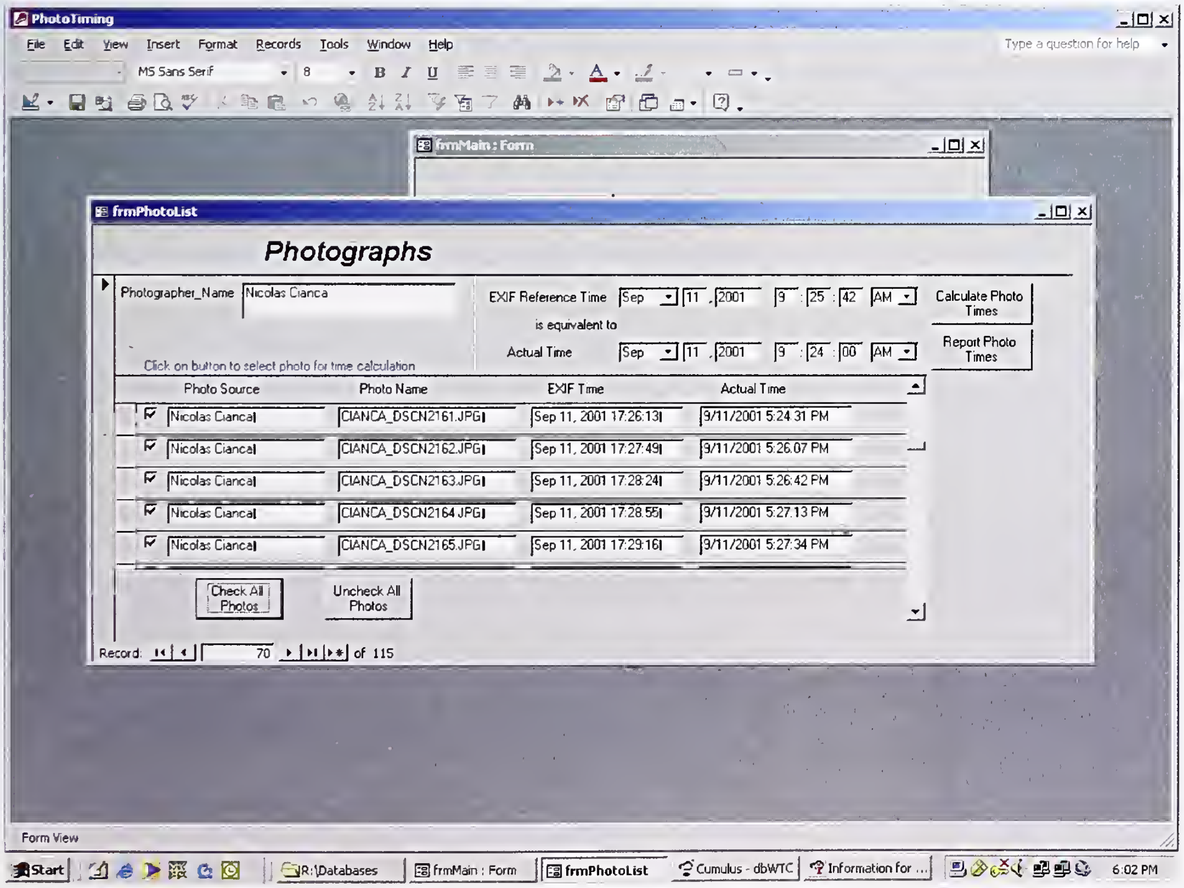
127 of 146 Categories (1 Selected)
11 of 6278 Records

Figure H–3. An example of a Cumulus asset screen display for the video database. Thumbnails are shown along with the time and dates when the recording started and ended. Thumbnails © 2001 Scott Meyers.

Occasionally analog photo and video cameras imprint a time stamp on their outputs that can provide relative times similar to Exif or meta data, but generally there is no time information available, and such material must be timed in some other way. Some of the approaches used are described later in this section.

Photograph Tools

In order to make the best use of the information embedded in digital photographs, software was required to retrieve the Exif file information and software to adjust the recorded clock times. The commercial software package CatDV is able to retrieve meta data embedded in a variety of media formats, including digital photographs and mini-DVs. The Access database PhotoTiming was written for the purpose of determining the actual times for a set of photographs given the Exif time for each and an accurate time reference. For a set of photographs sharing a common clock from the same digital camera, an accurate time for a single photograph is sufficient to set the times for the entire set. Figure H–4 shows a PhotoTiming data sheet for a selected photographer. A file generated by CatDV containing the Exif data for each photograph, if available, is read into PhotoTiming. The equivalent Exif and actual times are entered into the appropriate fields at the upper right of the data sheet. Selection of the Calculate Photo Times button fills the Actual Time column with the appropriate value for each Exif time. In this example, the Exif time was found to be off by 62 s.



Photographs

Photographer_Name: Nicolas Cianca

EXIF Reference Time: Sep 11, 2001 9:25:42 AM
is equivalent to
Actual Time: Sep 11, 2001 9:24:00 AM

Click on button to select photo for time calculation

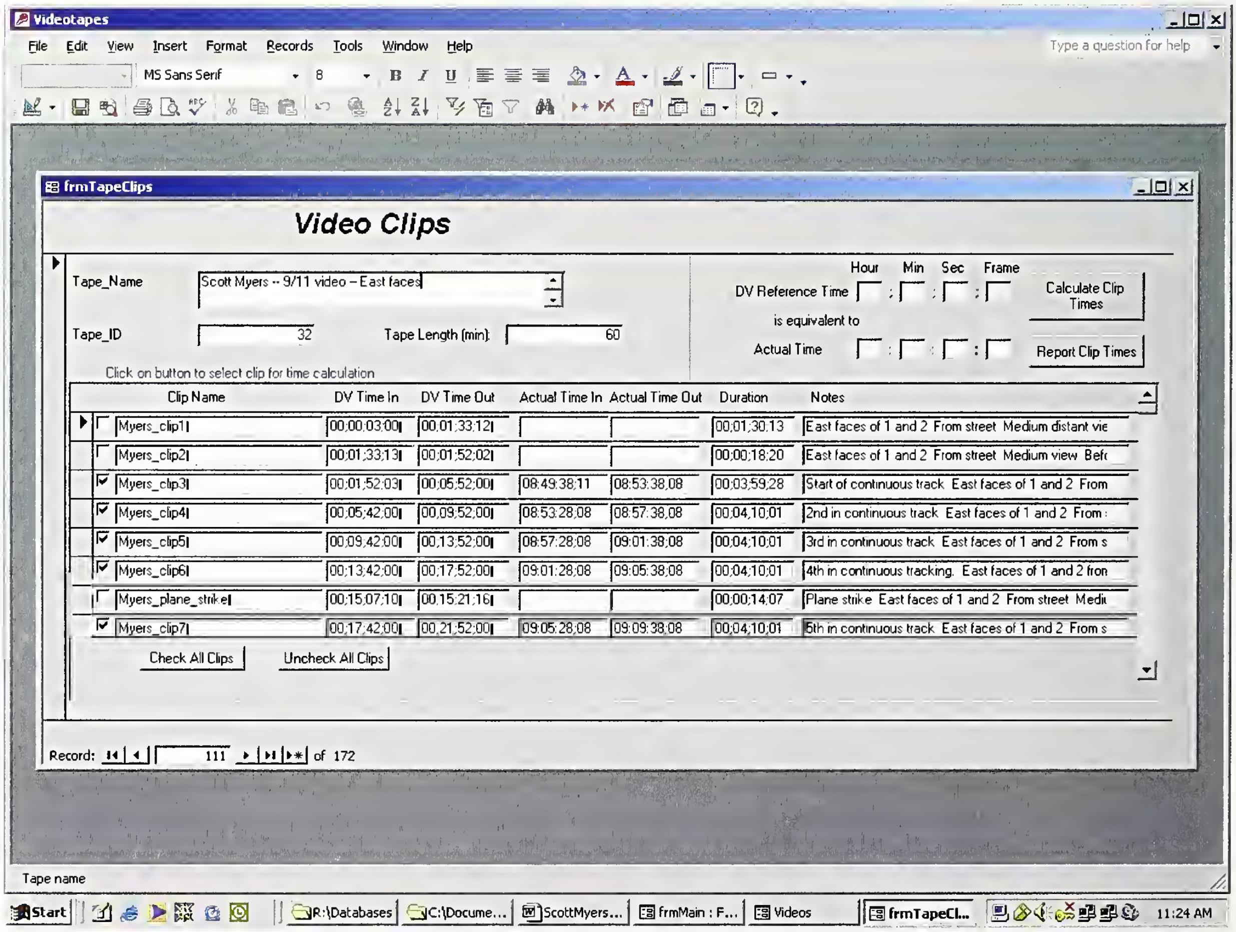
	Photo Source	Photo Name	EXIF Time	Actual Time
☑	Nicolas Cianca	CIANCA_DSCN2161.JPG	Sep 11, 2001 17:26:13	9/11/2001 5:24:31 PM
☑	Nicolas Cianca	CIANCA_DSCN2162.JPG	Sep 11, 2001 17:27:49	9/11/2001 5:26:07 PM
☑	Nicolas Cianca	CIANCA_DSCN2163.JPG	Sep 11, 2001 17:28:24	9/11/2001 5:26:42 PM
☑	Nicolas Cianca	CIANCA_DSCN2164.JPG	Sep 11, 2001 17:28:55	9/11/2001 5:27:13 PM
☑	Nicolas Cianca	CIANCA_DSCN2165.JPG	Sep 11, 2001 17:29:16	9/11/2001 5:27:34 PM

Record: 70 of 115

Figure H–4. An example of the PhotoTiming sheet for calculating times for photographs containing Exif meta data.

Video Tools

In addition to containing the video database described in Section H.2.3, VideoList also assists with timing the clips from a videotape. This function is similar to that in the PhotoTiming tool. For a broadcast video that was filmed in real time, the timing of every clip in the video, except for replays, can be set from knowing the time at a single point. An example is shown in Figure H–5. A clip file generated in Adobe Premiere for a specified video is read into VideoList. The mini-DV time of an event in the video whose timing is known, such as the moment of the second plane strike, is identified. Both times are entered into the fields at the upper right of the data sheet. Clips to be timed (excluding replays) are identified by a check mark, and the requested calculation results in the actual times in and out for each clip as shown in Figure H–5. This tool is also useful in calculating timings for continuous video segments broken into multiple clips.



Video Clips

Tape_Name: Scott Myers -- 9/11 video – East faces

Tape_ID: 32

Tape Length (min): 60

DV Reference Time (Hour : Min : Sec : Frame) ☐ : ☐ : ☐ : ☐

is equivalent to

Actual Time ☐ : ☐ : ☐ : ☐

Click on button to select clip for time calculation

	Clip Name	DV Time In	DV Time Out	Actual Time In	Actual Time Out	Duration	Notes
☐	Myers_clip1	00;00;03;00	00;01;33;12			00;01;30;13	East faces of 1 and 2 From street Medium distant vie
☐	Myers_clip2	00;01;33;13	00;01;52;02			00;00;18;20	East faces of 1 and 2 From street Medium view Befc
☑	Myers_clip3	00;01;52;03	00;05;52;00	08:49:38;11	08:53:38;08	00;03;59;28	Start of continuous track East faces of 1 and 2 From
☑	Myers_clip4	00;05;42;00	00;09;52;00	08:53:28;08	08:57:38;08	00;04;10;01	2nd in continuous track East faces of 1 and 2 From :
☑	Myers_clip5	00;09;42;00	00;13;52;00	08:57:28;08	09:01:38;08	00;04;10;01	3rd in continuous track East faces of 1 and 2 From s
☑	Myers_clip6	00;13;42;00	00;17;52;00	09:01:28;08	09:05:38;08	00;04;10;01	4th in continuous tracking. East faces of 1 and 2 fron
☐	Myers_plane_strike	00;15;07;10	00;15;21;16			00;00;14;07	Plane strike East faces of 1 and 2 From street Medit
☑	Myers_clip7	00;17;42;00	00;21;52;00	09:05:28;08	09:09:38;08	00;04;10;01	5th in continuous track East faces of 1 and 2 From s

Record: 111 of 172

Figure H–5. An example of the VideoList sheet for calculating clip times for video assets.

For each mini-DV video that contains meta data, CatDV is used to extract the clock times for the In and Out point for each clip. These values enable the timing of every clip in the video from a single reference time.

H.3.2 Reference Time

Faced with the timing considerations above, a timing scheme was developed in which all of the times in the databases are placed on a relative time scale tied to a single well-defined event. Due to the large number of different views available, the moment the second plane struck WTC 2 was chosen to be this time. This event was defined to have occurred at 9:02:54 a.m. based on times for major events included in the earlier Federal Emergency Management Agency (FEMA) report (McAllister 2002) describing the events of September 11, 2001.

H.3.3 Timing Techniques

Once the reference time was chosen, it was possible to place times on videos that showed the second plane strike. By matching other photographs and videos to these initially assigned videos, the assignments were extended to visual materials that did not include the primary event. By such a bootstrap process, it was possible to place photographs and videos extending over the entire period of the event on a single time line. Sets of photographs containing Exif times and video clips that either contained meta data or were continuous over relatively long periods were particularly useful for this purpose because a single time assignment would allow the entire series to be timed. Sets of photographs recorded on film or analog videos that were frequently turned on and off caused the most difficulty in timing, and individual matches were required for each photo or video clip.

Matching visual images and assigning times has turned out to be a demanding task requiring unique approaches. A variety of characteristics have been employed to match times in different photographs and videos. These include distinct shadows cast on the buildings by the smoke plumes, the appearance and locations of smoke and fire plumes, the occurrence of well-defined events such as a falling object or the sudden appearance of smoke, and a variety of other unlikely clues such as a clock being recorded in an image.

To assist in the timing process, relative times for the five major events of September 11, 2001: first plane strike, second plane strike, collapse of WTC 2, collapse of WTC 1, and collapse of WTC 7 have been determined with 1 second accuracy. These times are summarized in Table H–3. Note that the building collapse times are defined to be when the entire building is first observed to start to collapse. In the case of WTC 7, a penthouse on the roof sank into the building before the main collapse started.

Table H–3. Times for major events of September 11, 2001.

Event	Relative Time from Visual Analysis	Adjusted Time from Television Broadcasts	Time Reported in the FEMA Study
First plane strike	8:46:25 a.m.	8:46:30 a.m.	8:46:26 a.m.
Second plane strike	9:02:54 a.m.	9:02:59 a.m.	9:02:54 a.m.
Collapse of WTC 2	9:58:54 a.m.	9:58:59 a.m.	9:59:04 a.m.
Collapse of WTC 1	10:28:20 a.m.	10:28:25 a.m.	10:28:31 a.m.
Collapse of WTC 7	5:20:47 p.m.	5:20:52 p.m.	5:20:33 p.m.

It is not only important to assign relative times for photographs and videos, but also to estimate how accurately they are known. For this reason, timing uncertainties are estimated for each determination and are included in the databases.

The bootstrap timing process was initially quite difficult. However, team members' timing skills improved with practice at the same time as more visual material became available and the number of timed assets increased. At the present time, 3,032 of the 6,759 catalogued photographs and 2,673 of the 6,911 video clips in the databases are timed with assigned relative accuracies of 3 seconds or better.

H.3.4 Absolute Time Accuracy

Many of the news broadcasts on September 11, 2001, included small clocks, known in the industry as "bugs," imprinted on the screen. As such broadcasts were timed, it became apparent that there were small differences between times for the second plane strike based on these bugs and the time used as the basis for the database. Checks with several broadcasters indicated that the bugs should be quite close to the actual time because their clocks are regularly updated from highly accurate sources such as geopositioning satellites or the precise atomic-clock-based timing signals provided by NIST as a public service. Careful checks showed small time differences between different video recordings, but these were generally less than 1 second. These small discrepancies are likely due to variations in transmission times resulting from the different pathways that the video signals take to the sites where they are recorded. Based on four such video recordings, the time of the second plane impact is estimated as 9:02:59 a.m., or 5 seconds later than the time assumed in developing the database. The estimated uncertainty is 1 second. Table H–3 compares times for the major events taken from the database, adjusted to television time, and reported in the FEMA report (McAllister 2002). Possible explanations for the observed differences are still under investigation. Because times based on the television broadcasts appear to be accurate (i.e., those in column 3 of Table H–3), 5 seconds will be added to times included in the databases when precise times are reported for the Investigation.

H.4 ANALYSIS OF VISUAL IMAGES

Once the two visual databases became available, it was possible to use the images to begin characterizing the events of September 11, 2001. Some of the images are quite close up and can be used to learn specific details concerning the towers. As an example, Fig. H–6 shows an image of the east face of WTC 2 recorded at 9:26:20 a.m., and Fig. H–7 shows an enlarged portion of the same photograph. The photograph has been enhanced using Adobe Photoshop, and lettering has been added to indicate the floors and the numbering system used to identify specific windows in the tower. The amount of detail available is evident. For instance, large piles of debris are present on the north side of the tower on floors 80 and 81, and locations with fires visible or with windows missing are easily identified.

H.4.1 Window Numbering

The system used to describe window locations in the two towers and WTC 7 requires some elaboration. It is based on the outer-wall column numbering system used in plans for the buildings. First, consider the towers. In these structures individual windows were placed between two exterior columns. In order to refer to a particular window the designation for the column to the right as viewed from the outside is assigned to that window. These columns are numbered from 1 to 59 from right to left across a tower face, and windows are numbered from 1 to 58. Faces for the towers are also assigned numbers as follows; WTC 1—north: 1, east: 2, south: 3, and west: 4, and WTC 2—west: 1, north: 2, east: 3, and south: 4. By combining the floor number, the face number and a column number, a specific window on one of the

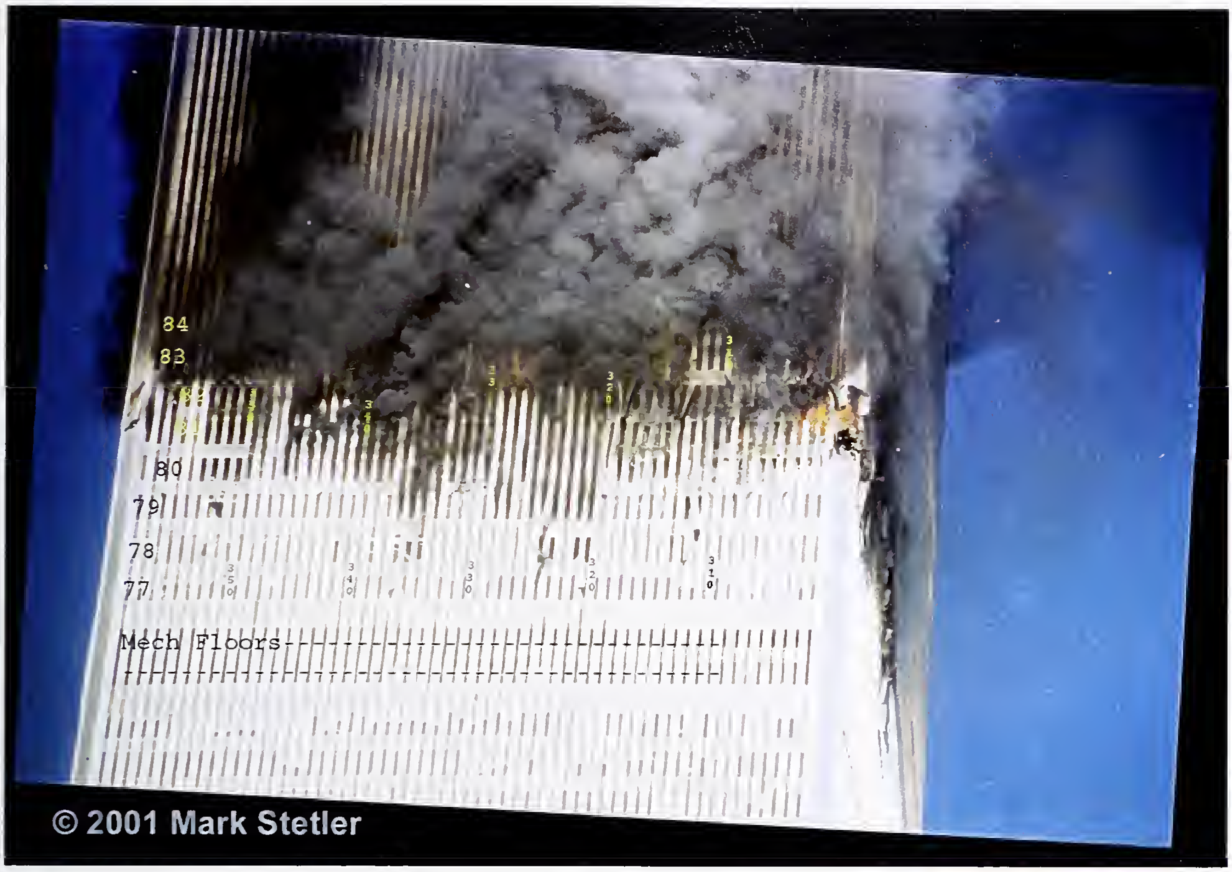


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Figure H–6. Photograph taken at 9:26:20 a.m. on September 11, 2001, showing the east face of WTC 2. It has been enhanced, and lettering indicating floors and columns has been added.

towers can be identified. As an example, for WTC 1, the number 94-214 refers to the fourteenth window from the right on the east face of floor 94.

The window numbering system is somewhat different for WTC 7. It is also based on the outside column numbers, but in this building the numbering of columns was continuous around the structure and ranged from 1 to 57. Column 1 was located at the northwest corner of the building, and the numbering proceeded counter clockwise around the building faces with columns 15, 28, and 42 located at the southwest, southeast, and northeast corners, respectively. Note that the total number of perimeter columns is actually 58. An extra column, numbered 14A, was included on the west face between columns 14 and 15. Unlike the towers, the number of windows to the right of a given column varied from one to five depending on location. In some cases, the windows are located in front of the column. Individual windows to the right of a column are assigned letters increasing from left to right as seen from the outside. As an example, 12-45c refers to a window on the north face of WTC 7 that is the third window to the right of column 45 on floor 12.

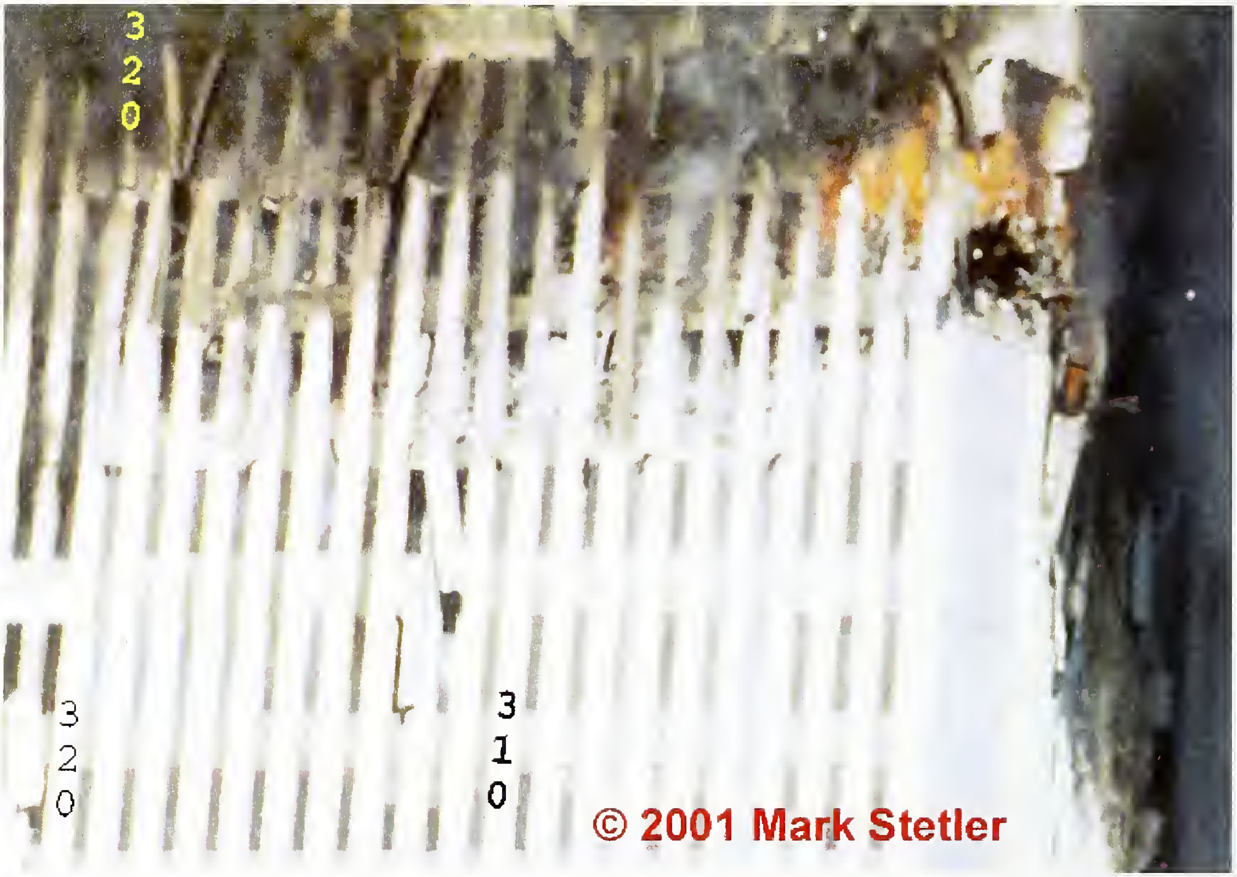


Figure H–7. This photograph is cropped from the image shown in Figure H–6. It was taken on September 11 and shows the east face of WTC 2 at the northeast corner from floor 77 to floor 82. Note the large piles of debris evident on floor 80 and floor 81.

H.4.2 Fire Properties

Photographs and video images have been used to characterize a number of properties relevant to fire growth and spread in the towers as a function of time. Specific properties addressed include whether or not fire and smoke are present and whether windows are still in place. When smoke and/or fire are present, additional details concerning their appearances are documented. A numbered coding system is used to describe these characteristics. The key for this numbering system is shown in Fig. H–8.

H.4.3 Window-by-Window Assessment

The key in Fig. H–8 is used as the basis for a window-by-window assessment of the towers. The results are coded in three separate data sheets using Microsoft Excel. The floor and window locations are identified using the numbering system described in the last section. Separate files containing the three data sheets are generated for each face of a tower and time analyzed. Figure H–9 shows a portion of such a data sheet describing fires (i.e., sheet one) on the east face of WTC 1 around 9:42 a.m.

KEY FOR ANALYSIS

Sheet #1: Fire Visible

0	No fire
1	Spot fire
2	Fire visible inside
3	External flaming
9	Not visible

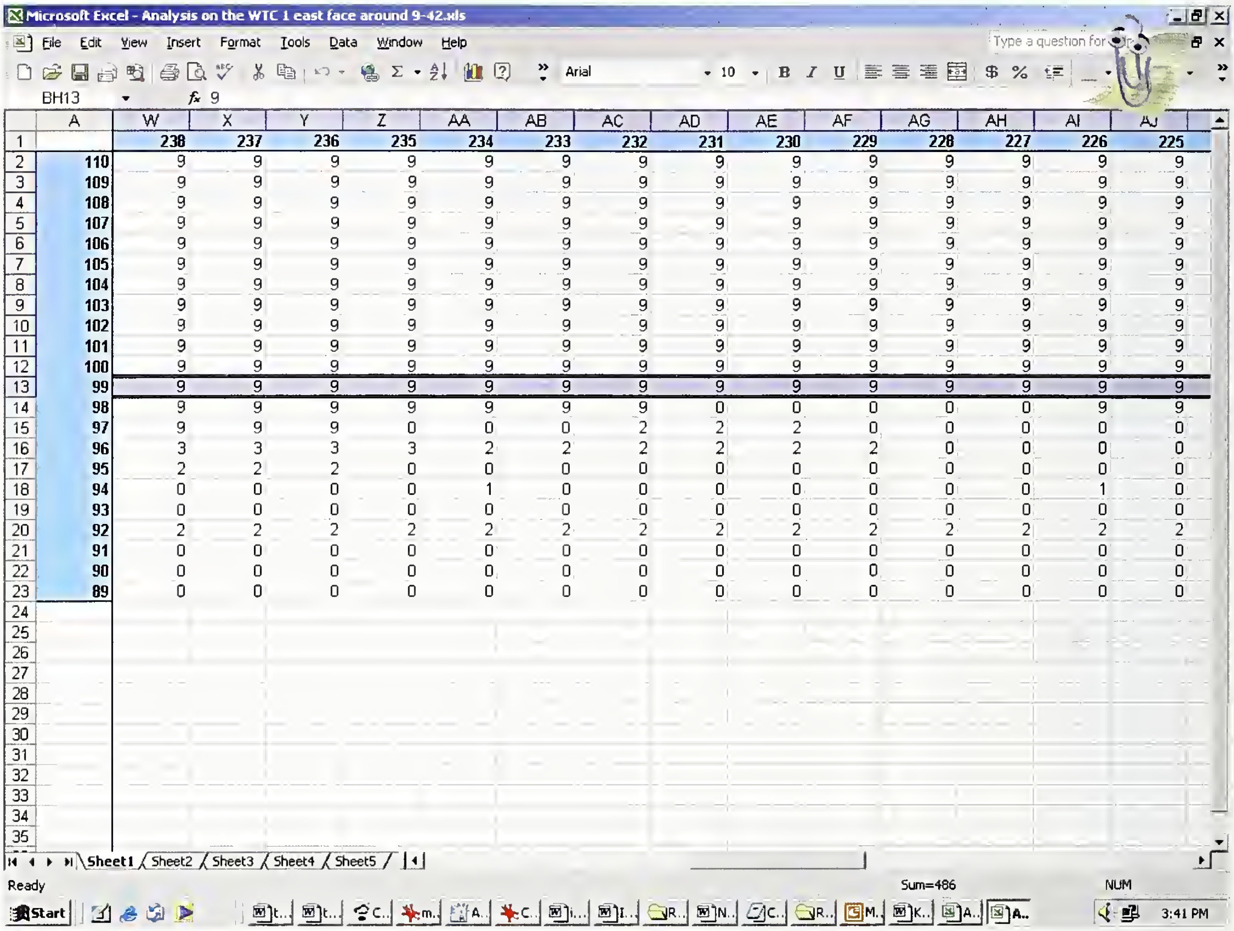
Sheet #2: Smoke

0	No smoke evident
1	"Light smoke"
2	"Heavy smoke"
9	Not visible

Sheet #3: Windows

0	Window open
1	Window in place
9	Not visible

Figure H–8. The key used to describe observations with regard to fire, smoke, and window breakage in Excel data files for individual windows in the two towers.



Microsoft Excel - Analysis on the WTC 1 east face around 9-42.xls

BH13 *fx* 9

	A	W	X	Y	Z	AA	AB	AC	AD	AE	AF	AG	AH	AI	AJ
1		238	237	236	235	234	233	232	231	230	229	228	227	226	225
2	110	9	9	9	9	9	9	9	9	9	9	9	9	9	9
3	109	9	9	9	9	9	9	9	9	9	9	9	9	9	9
4	108	9	9	9	9	9	9	9	9	9	9	9	9	9	9
5	107	9	9	9	9	9	9	9	9	9	9	9	9	9	9
6	106	9	9	9	9	9	9	9	9	9	9	9	9	9	9
7	105	9	9	9	9	9	9	9	9	9	9	9	9	9	9
8	104	9	9	9	9	9	9	9	9	9	9	9	9	9	9
9	103	9	9	9	9	9	9	9	9	9	9	9	9	9	9
10	102	9	9	9	9	9	9	9	9	9	9	9	9	9	9
11	101	9	9	9	9	9	9	9	9	9	9	9	9	9	9
12	100	9	9	9	9	9	9	9	9	9	9	9	9	9	9
13	99	9	9	9	9	9	9	9	9	9	9	9	9	9	9
14	98	9	9	9	9	9	9	9	0	0	0	0	0	9	9
15	97	9	9	9	0	0	0	2	2	2	0	0	0	0	0
16	96	3	3	3	3	2	2	2	2	2	2	0	0	0	0
17	95	2	2	2	0	0	0	0	0	0	0	0	0	0	0
18	94	0	0	0	0	1	0	0	0	0	0	0	0	1	0
19	93	0	0	0	0	0	0	0	0	0	0	0	0	0	0
20	92	2	2	2	2	2	2	2	2	2	2	2	2	2	2
21	91	0	0	0	0	0	0	0	0	0	0	0	0	0	0
22	90	0	0	0	0	0	0	0	0	0	0	0	0	0	0
23	89	0	0	0	0	0	0	0	0	0	0	0	0	0	0
24															
25															
26															
27															
28															
29															
30															
31															
32															
33															
34															
35															

Ready

Sum=486

NUM

3:41 PM

Figure H–9. A portion of the Excel spreadsheet describing fires on the east face of WTC 1 around 9:42 a.m. is shown. The numbers at the left refer to floors, and those at the top are the window numbers.

While the data sheets capture the desired behaviors, it is very difficult to use them to track changes without visualizing the results in some way. Two approaches have been developed for this purpose. The first employs a Web-based system that generates color-coded maps of the results contained in the data sheets. Figure H–10 shows such a map for the fire data included in the data sheet shown in Fig. H–9. The second approach uses the program Smokeview (Forney and McGrattan 2003; Forney, Madrzykowski, and McGrattan 2003) to generate a time-dependent visualization of the results. Smokeview was developed at NIST in order to display the results of fire dynamics calculations. In the current application, it is used to visualize the properties of interest on a three-dimensional representation of a tower façade as a function of time. Because Smokeview allows the point of view to be varied at will, this approach is a powerful means for investigating the temporal behavior of the fires on different faces of the tower. Figure H–11 shows a frame taken from a visualization in which results from the fire and windows data sheets for WTC 2 have been combined.

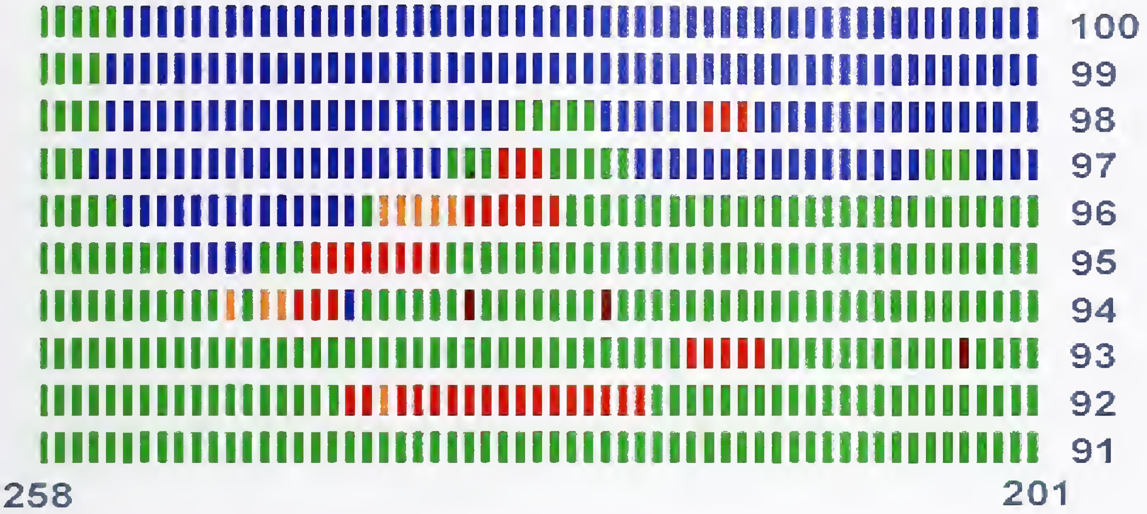


Figure H–10. A representation of fires for floors 91 to 100 on the east face of WTC 1 around 9:42 a.m. is shown. Results are taken from the Excel spreadsheet shown in Figure H–13. The color coding is based on the key shown. The color assignments are: 🟩 0-No fire, 🟥 1-Spot fire, 🟥 2-Fire visible inside, 🟧 3-External Flaming, and 🟦 9-Can't see.

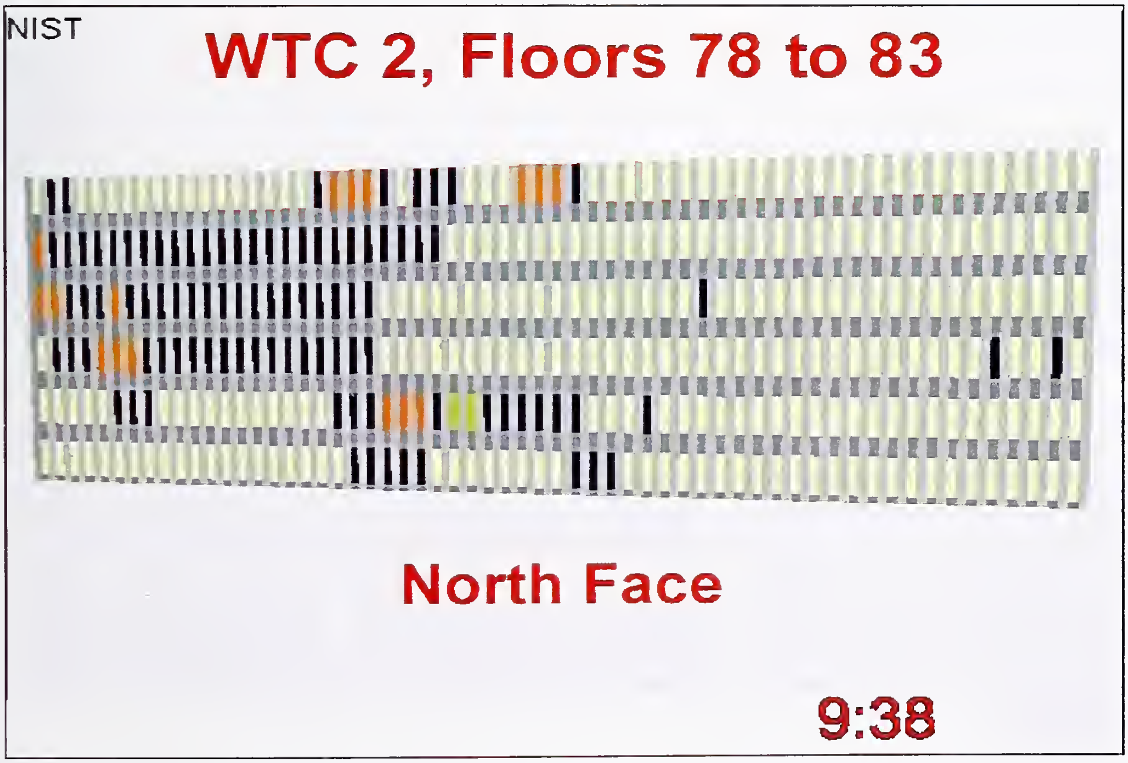


Figure H–11. A single frame from a time-dependent visualization generated by Smokeview is reproduced here. The frame is a three-dimensional representation of the condition of windows and fires on WTC 2 from the time the second tower was struck at 9:02:59 a.m. until it collapsed at 9:58:59 a.m. The color assignments are: ⬜ – window in place, ⬛ – missing window, 🟧 – external flaming, 🟨 – fire inside, and 🟨 – spot fire.

H.5 INITIAL DAMAGE PATTERNS ON WTC 1 AND WTC 2 DUE TO THE PLANE STRIKES

Close-up photographs and videos have been used to characterize the initial damage to the façades of the towers struck by the two planes along with precise determinations of the locations of the plane strikes. For WTC 2, analysis of videos has also been employed to estimate the speed of the airplane that struck the tower and to show that the tower swung back and forth for several minutes after it was struck. The period of the swinging has also been determined.

H.5.1 WTC 1

Damage Resulting from Plane Strike

A detailed drawing of the damage to the steel façade of WTC 1 was included in the FEMA *World Trade Center Building Performance Study* (McAllister 2002). A careful inspection using photographs and videos in the database confirmed the accuracy of this analysis. Figure H–12 shows a drawing that represents this damage. It is similar to that included in the FEMA report, but it incorporates several minor changes that better reflect the geometry of the north face of WTC 1 in the vicinity of the plane strike.

It was observed that the wing tips and the end of the vertical stabilizer at the plane's tail section damaged the aluminum column covers on the steel façade without cutting through the steel below or completely removing the covers. By inspection it was possible to map out locations on columns where the wingtips and the vertical stabilizer struck the tower. These locations were then transferred to the representation of the damaged steel façade shown in Fig. H–12 and are represented by dashed lines, with wings to the right and left and the vertical stabilizer in the center. The good agreement between the damage pattern and the wing tip locations is evident. It is reported in the FEMA report (McAllister 2002) and widely in the media that American Airlines Flight 11 struck floors 94 to 98 of WTC 1. The dotted horizontal lines on the left side of Fig. H–12 indicate the locations of concrete floors. It can be seen that while the tip of the left wing of the aircraft struck very close to the base of floor 94, the wing end marked column 153 at the very top of floor 93. It is evident from the figure that the right wing actually struck well up on floor 99 on column 109. The impacted floors therefore range from floor 93 to floor 99.

Fireballs and Missing Windows

Additional insights into the initial damage inflicted on the towers by the plane strikes can be obtained by considering locations where fireballs are observed immediately following the plane strikes as well as locations where windows are missing. Videos and photographs recorded during and immediately following the plane strike on WTC 1 show that significant fireballs formed at the plane strike location on the north face, as well as near the center of the east face and on the western side of the south face. Figure H–13 compares window damage for the four sides of WTC 1 immediately after the plane strike. The floors shown extend from 91 to 100. The missing windows on the north face are consistent with the plane strike location and strike angle. The plane struck very close to the center of the face. Interestingly, the damage on the east and west faces appears to be asymmetric with a much higher number of windows missing on the east face than on the west. This observation is consistent with the formation of a fireball on the east side of the tower and not on the west side. Areas obscured by smoke are also much larger on

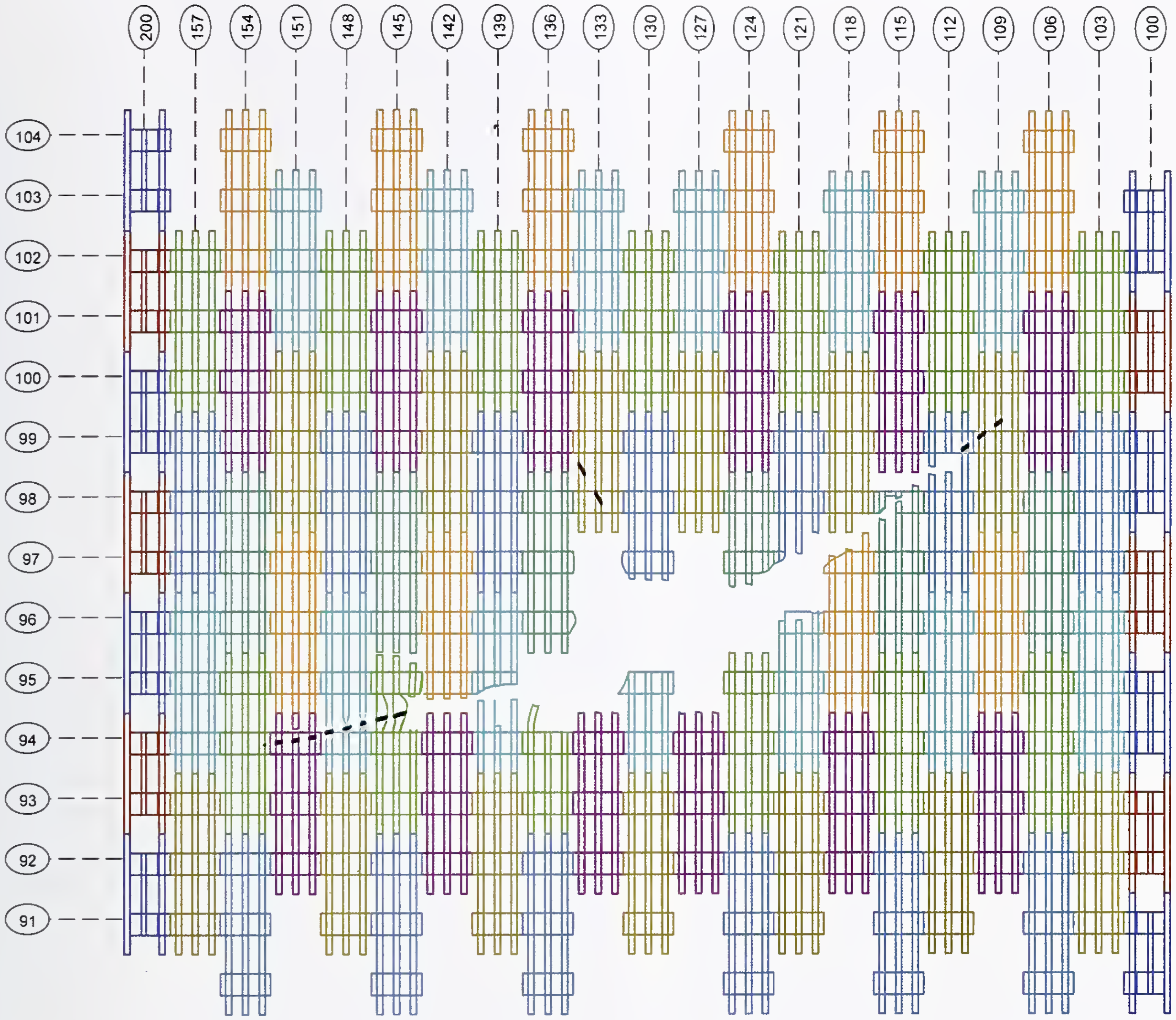


Figure H–12. A drawing of the damage to the steel façade of WTC 1. The dark dotted lines show locations where the airplane wings and vertical stabilizer marked the aluminum cladding on columns.

the east side suggesting that more fire is present on this face as well. An asymmetry is also apparent on the south face where only a single window is missing on the east side while numerous windows are missing and significant smoke is present on the west side. Taken together, these observations suggest that debris and fuel from the airplane as well as any building materials and contents tended to pass straight across the building on the west side, while material on the east side was somehow reflected and more heavily damaged the east face.

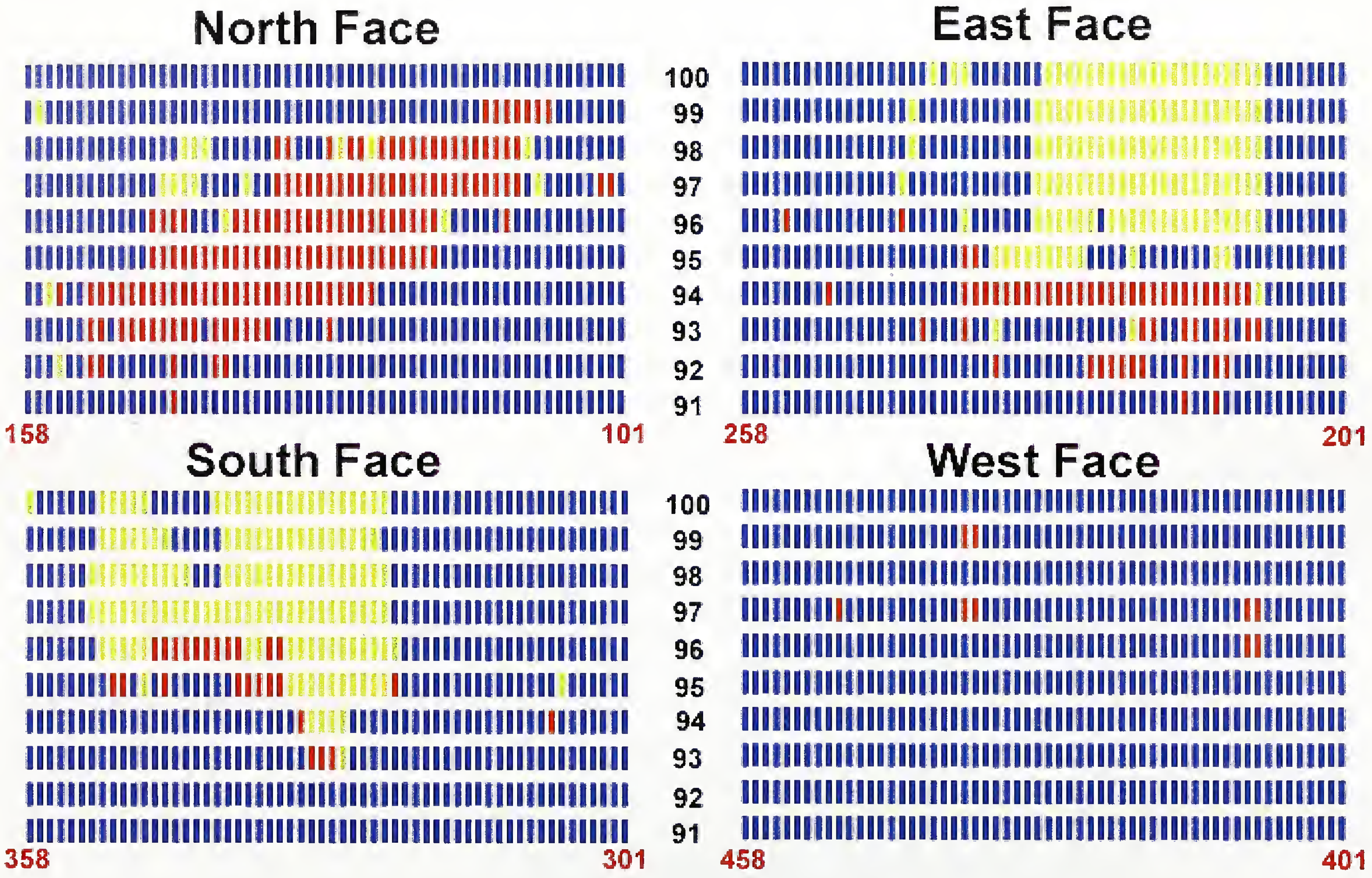


Figure H–13. The condition of windows is shown for the four faces of WTC 1 around 8:47 a.m. shortly after it was struck by American Airlines Flight 11. The colors represent 🟥 - window open, 🟦 - window in place, and 🟨 - not visible.

Panel Section in Street

A photograph supplied by the NYPD provided additional details with regard to the initial damage suffered by WTC 1. Figure H–14 shows a full three-story three-column-wide steel panel section lying on the corner of Cedar Street near its intersection with West Street. This location is to the south of and roughly 210 m from the south face of WTC 1. The photograph was taken prior to the collapse of either tower. Closer inspection shows that there is an aircraft wheel embedded in one of the windows. The most likely source location for this panel section has been identified as being near the center of the south face of WTC 1 (i.e., columns 329 to 331) and extending from the middle of floor 93 to the middle of floor 96. This conclusion remains tentative since, as indicated in Fig. H–13, the area is obscured by smoke in all of the close-up photographs of the area in NIST's possession. If the location is identified correctly, the wheel is stuck in window 95-329.

H.5.2 WTC 2

Calculation of Plane Speed

One of the videographers who provided material to the Investigation filmed from the top of his apartment building located to the east of the WTC complex. His camera was located on a tripod so that the images are very steady. One of the events he captured was United Airlines Flight 175 as it approached WTC 2. Figure H–15 is a series of cropped frames captured from this video that show the plane approaching the building.

The images included in Fig. H–15 have been used to determine the speed of the plane as it approached the tower. This is done by identifying the locations of the nose and tail of the airplane relative to a fixed point defined to be the point on the frame where the plane passes out of sight behind the corner of the building. The plane is very nearly level relative to this point, so it is appropriate to simply count the number of picture elements, pixels, between this location and the two measurement points on the aircraft.

This analysis, which presumes that the aircraft at this time travels in a straight path such that the nose and tail pass through the same point in space, has the advantage of being independent of the orientation of the flight path with respect to the line of sight of the observer.

Figure H–16 shows the locations of the two points as a function of time. Using linear least squares curve fits, the exact relative times when the nose and tail pass the reference location are estimated. The difference between these two times is the period required for the entire length of the aircraft to pass the reference location. The result is 0.1939 s. Since the length of the plane is known to be 155.0 ft, the speed can be determined simply by dividing this length by the passage time to give 155.0 ft/0.1939 s = 799 ft/s = 545 mph. An uncertainty estimate based solely on the uncertainty in the determined time difference yields a value of ±18 mph with 95 percent confidence.

Figure H–14. Photograph showing a full panel section lying in Cedar Street near its intersection with West Street. An aircraft wheel can be seen imbedded in one of the windows. The building behind the panel is Saint Nicholas Greek Orthodox Church and the lower section of WTC 2 can be seen across Liberty Street.

Note that the airplane speed and uncertainties are slightly different than listed in an earlier report (NIST 2003) due to a correction of the plane length to reflect the actual distance between the nose and the end of the body at the rear stabilizer and a math error in the uncertainty calculator. Uncertainties associated with aircraft motion that are not aligned with the aircraft body are judged to be less than the uncertainties in plane passage time.

Observation of WTC 2 Sway Following the Plane Strike

Close examination of the video revealed a perceptible movement of WTC 2 after it was struck by the aircraft. The building rocked back and forth much as a pendulum for at least 4 minutes. Image

Figure H–15. Series of sequential cropped frames taken from a video shot on September 11, 2001, showing the plane approaching WTC 2. The frames, ordered from left to right and top to bottom, are separated by 33.3 ms.

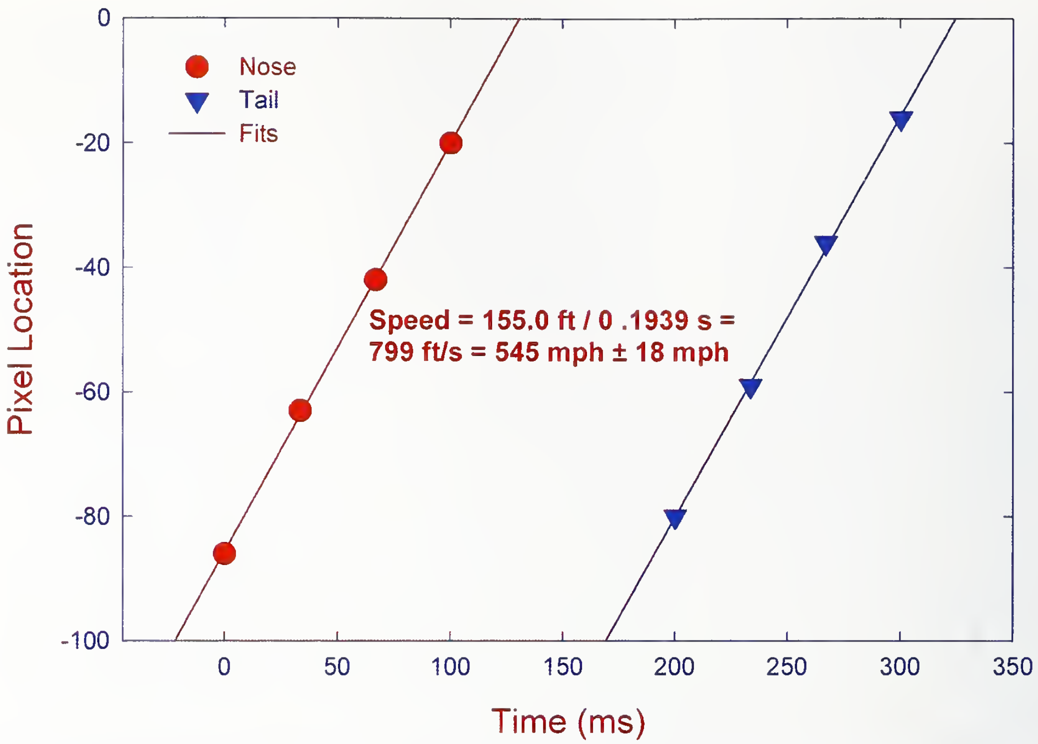
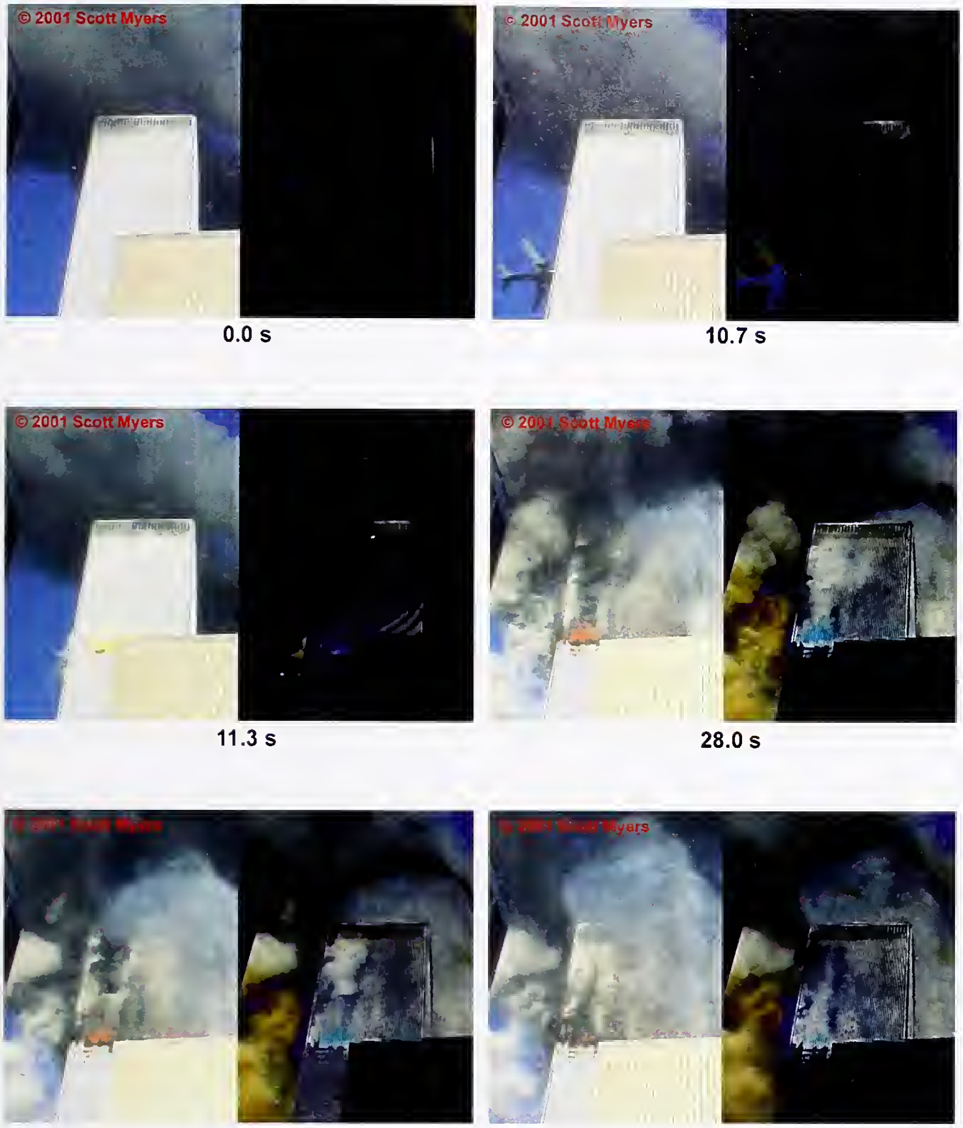


Figure H–16. Plots of pixel locations for the nose and tail of the plane that struck WTC 2 as a function of time taken from the images shown in Fig. H–15. Straight lines are the results of linear least squares curve fits to the data. Extrapolation of the lines to pixel 0 allows the time for the passage of the plane to be calculated.

analysis was used to enhance this motion and estimate the period required for the building to sway through one complete cycle. This was accomplished by creating a new video in which a single frame just prior to the plane strike was subtracted from subsequent frames. In this way, small differences between images can be identified. If the image is unchanged from the initial frame, the result should be a black image, but any changes in location or color will appear in the difference video. When this approach was applied to the video, a region of windows was observed on the building that seemed to appear and disappear. Figure H–17 shows several frames of a composite video formed by overlaying half frames of the original video and the difference video. In the initial frame (time = 0.0 seconds), the plane has not yet appeared and the difference frame is black. In the next frame (time = 10.7 seconds), the plane is approaching the building. The plane is evident in the difference frame since it represents a change in the frame. WTC 2 is still dark except near the top where changes due to smoke movement are apparent. In the third frame (time = 11.3 seconds), the plane has struck the building and dramatic changes in the appearance of the building façade in the difference frame occur. Careful inspection shows what appear to be curved lines running across the face of WTC 2. These curves result from an interaction between the straight lines formed by the windows on the tower and the straight lines of picture elements that make up the detector in the digital video camera. This well-known behavior is called the moiré effect. The moiré effect also provides a sensitive approach for determining the displacement of the building. Such an analysis is in progress and will be reported at a later time.



0.0 s

10.7 s

11.3 s

28.0 s

30.9 s

33.5 s

Figure H–17. Frames from a composite video are shown. The half frames on the left are taken from a video showing the plane strike on WTC 2, while the half frames on the right are generated by subtracting a frame recorded prior to the plane strike from all subsequent frames in the original video. Times refer to the period since the start of the difference video.

Following the plane strike, areas of the tower face above the strike floors become hidden by smoke, and it is difficult to see the moiré patterns in the difference frames. However, the area of the tower below the strike floors to the left of the building in the foreground continues to show a distinct difference pattern because it is not obscured by smoke. This pattern is apparent in the fifth frame (time = 30.9 seconds). On the other hand, frames 4 and 6 (times = 28.0 seconds and 33.5 seconds, respectively) have been chosen because they are near null points, and the area appears dark in the difference frame because the location of the building is essentially unchanged from its position before the plane struck. When the video is played, the moiré patterns in this area of the tower face alternately appear and disappear in the difference video.

Because the absence of color is easiest to identify, it is straightforward to determine times when the null points occur in the difference image. Figure H–18 shows a plot of time versus null point number obtained from the difference video. The points fall on a straight line having a slope of 5.647 seconds ± 0.008 seconds (95 percent confidence interval). Because the building passes through a null point twice during a single full oscillation, the period required for a single oscillation is 11.3 seconds.

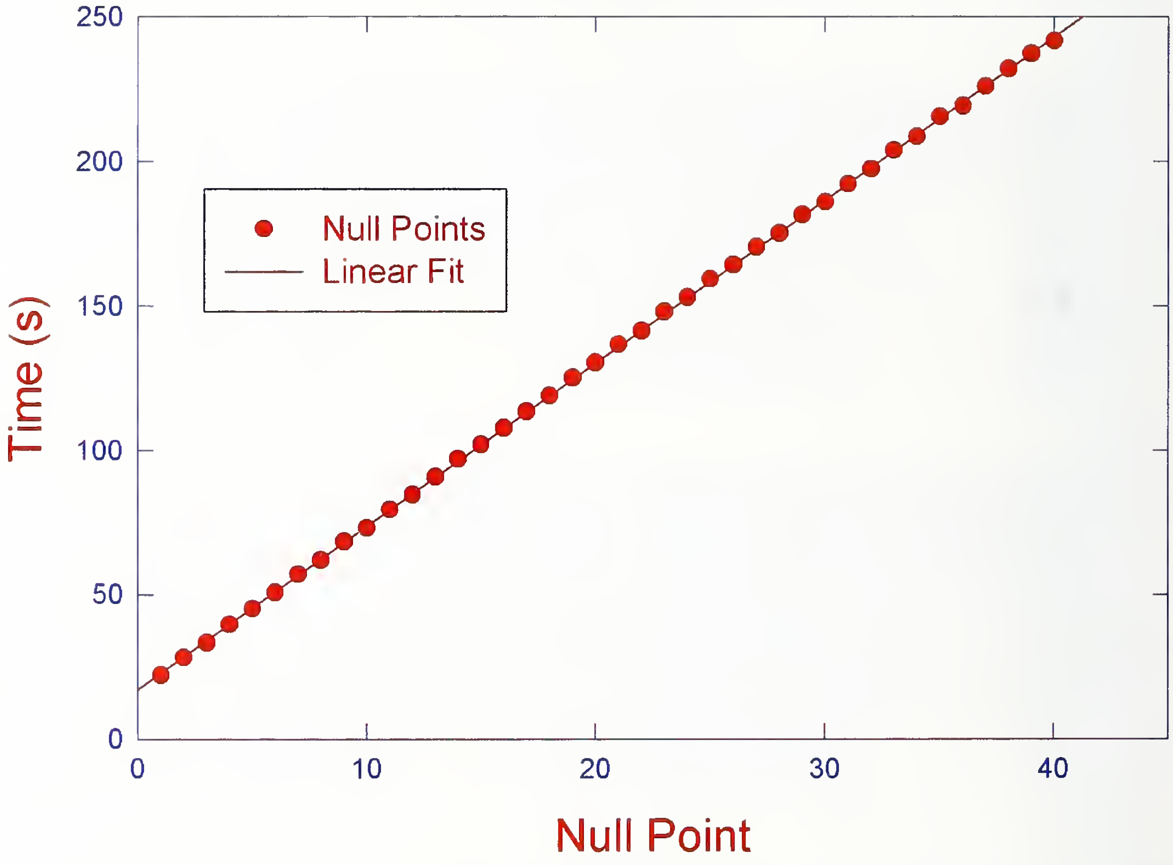
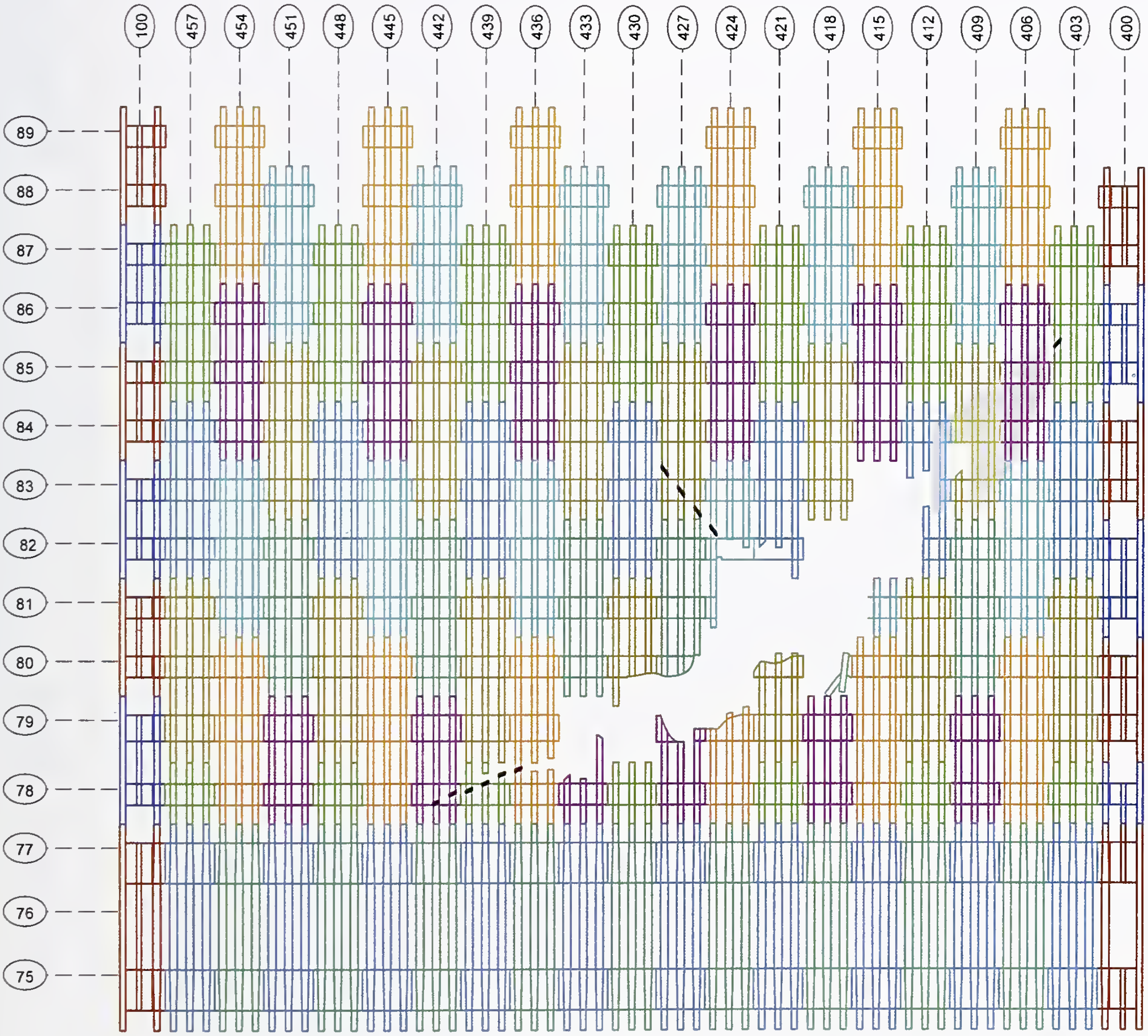


Figure H–18. The time when null points are observed in the difference video following the plane strike on WTC 2 are plotted versus the null point number. The points fall on a very good straight line having a slope of 5.647 seconds ± 0.008 seconds.

The measured oscillation period is consistent with measurements that are available from WTC 1 that yielded periods of 10.9 seconds in the east-west direction (averaged over a 9-year period that ended in 1993) and 11.6 seconds in the north-south direction (averaged over a 14-year period that also ended in 1993). The cores of the two towers were oriented perpendicular to each other so the motion monitored here should be comparable to the east-west direction of WTC 1.

Damage Resulting from the Plane Strike

The results of an analysis of the damage to the steel façade of the south face of WTC 2 are provided in Fig. H–19. Much of the steel damage pattern is revealed, but it should be noted, as indicated, that a portion of this face on the east side of the plane strike location was constantly obscured by smoke, and the detailed pattern could not be discerned. The FEMA report (McAllister 2002) also includes a figure describing the damage to the steel façade inflicted by United Airlines Flight 175. The pattern in Fig. H–19 differs somewhat from that provided in this earlier study. Some inconsistencies in façade dimensions have also been corrected in the current version.



Damage in shaded area cannot be accurately determined.

Figure H–19. A drawing of the damage to the steel facade of WTC 2. The dark dotted lines show locations where the airplane wings and tail marked the aluminum cladding on the columns. The area shaded in gray was hidden by smoke and could not be observed.

As was true for WTC 1, in areas of the façade struck by the wing tips and the upper portion of the vertical stabilizer the aluminum covering was marked, but the aluminum covers were not removed and the steel was not cut through. Measurements for the location of the left wing tip were mapped out as shown in Fig. H–19. As already noted, the area at the end of the right wing was obscured by heavy smoke. However, there were brief periods when the location of the last column struck by the wing tip could be observed. This location is indicated on column 404 of floor 95 in Fig. H–19. The center of the plane strike is clearly located towards the east side of the face. The left wing mark extends to the bottom of the spandrel located below floor 78. The actual location of the concrete floor is well above this point, which means the lowest point struck lies on floor 77. Thus, the plane strike location on WTC 2 extends from floor 77 to floor 85. This can be contrasted to the FEMA study (McAllister 2002) and most media sources that report the floors struck extended from floor 78 to floor 84.

Fireballs and Missing Windows

Intense fireballs were observed on the south, east, and north faces of WTC 2 following the plane strike. Figure H–20 compares missing windows on floor 77 to floor 86 for the four faces of WTC 2 shortly after the plane struck at 9:02:59 a.m.

The distribution of missing windows on the south face traces roughly the outline of the plane strike, with missing windows increasing in height from left to right. Recall that a portion of the east side of this face could not be observed due to smoke obscuration. The analysis indicates that a very large number of windows were removed on the east face by the collision and subsequent fireball. This is particularly true on floor 80 to floor 82. Photographs and videos show that extensive areas of the aluminum covering the façade and holding windows were removed, exposing the steel panels, as a result of the plane strike and fireballs. This damage is much more extensive than observed on the east face of WTC 1, consistent with the plane strike occurring closer to this face. In contrast to the extensive damage on the east face of the tower, no missing windows were found on the west face.

A large number of windows are also missing on the north face of WTC 2. A substantial area of the aluminum façade was also removed during the plane strike and subsequent fireball. The missing windows on this face almost appear to be a mirror image of the south face with damage towards the center being on lower floors than on the eastern edge. This suggests that a great deal of debris passed through the entire length of the building. This hypothesis is supported by close up images that show large piles of debris on the east side of the north face on floor 80 and floor 81, and on floor 79 near the center of the face. Figure H–21 includes a photograph showing these debris piles. Recall that piles of debris were also evident on floor 80 and floor 81 on the north side of the east face (see Fig. H–7).

H.6 FIRE BEHAVIORS IN THE TWO TOWERS

Analysis of the fire spread in the towers is ongoing as this update is being prepared, but sufficient information is available to allow some of the fire characteristics to be described.

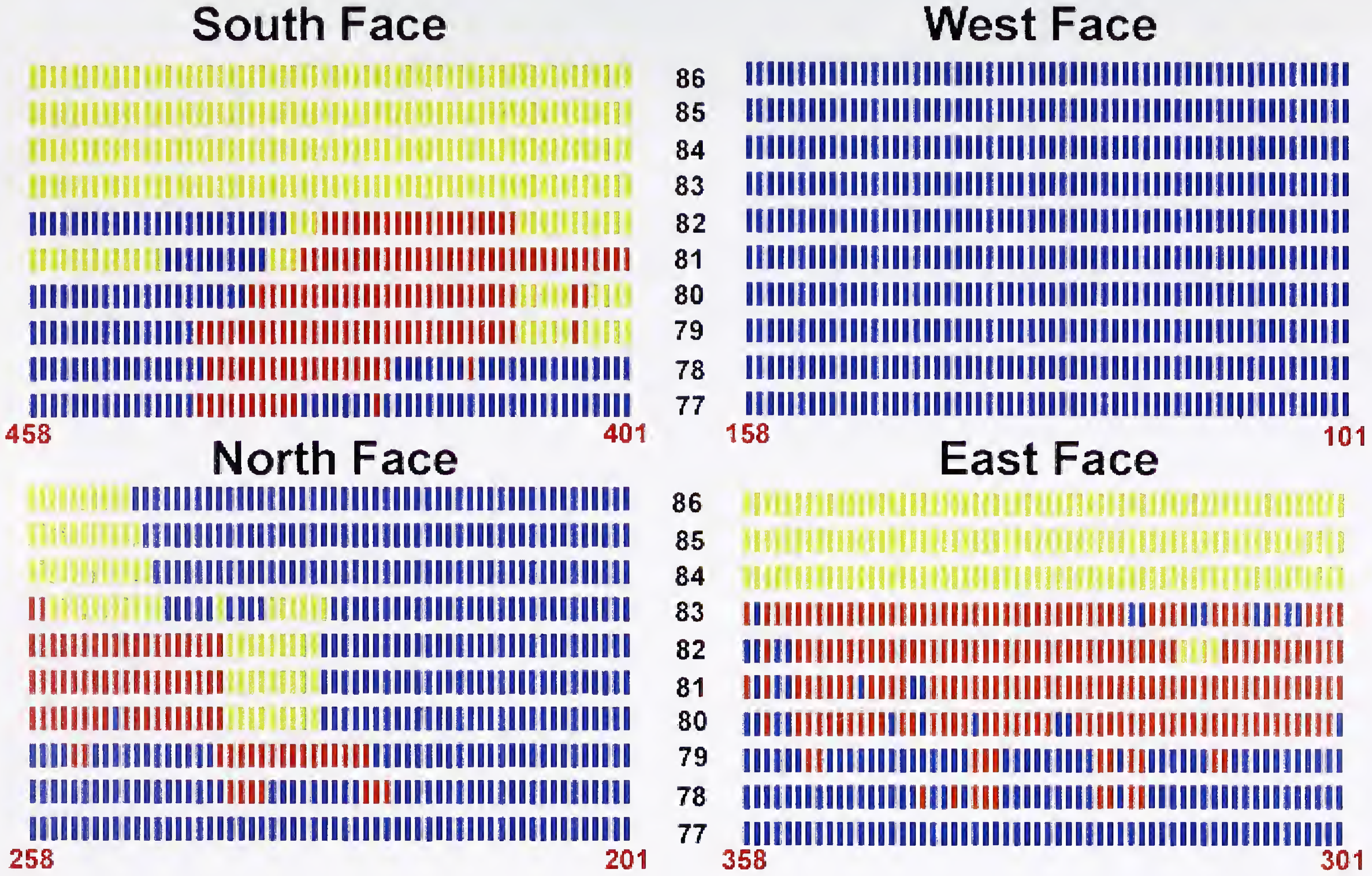


Figure H–20. The condition of windows is shown for the four faces of WTC 2 around 9:03 a.m. shortly after it was struck by United Airlines Flight 175. The colors represent 🟥 - window open, 🟦 - window in place, and 🟨 - not visible.

Figure H–21. An enhanced photograph of the north face of WTC 2 taken at 9:58 a.m. shows the east side of the north face. Piles of debris are evident on floor 80 and floor 81 on the northeast corner and on floor 79 to the right of column 230. The "cold" area extends over floor 80 to floor 82 from roughly column 229 to 240. There is a break in column 253 on floor 81, and the adjacent column, 254, is bent. Floors 80, 81, and 82 appear to be partially collapsed. It appears as if the collapsed floor 83 in the northeast corner has broken into sections.

H.6.1 WTC 1

It has already been mentioned that substantial fireballs formed on the north, east, and south faces immediately following the plane strike. A brief period of intense burning from openings on these faces was observed after the fireballs dissipated, but in a short period (on the order of 60 seconds) the fires seemed to "damp down" and very little flame and only light smoke was evident from the outside. This period of light burning lasted several minutes before fires began to reappear.

Rapid early fire growth was observed on the east side of the north face on floor 96 and floor 97, the center of the east face on floor 94 and floor 97, and the western side of the south face on floor 96. Even though relatively little initial damage was sustained by the west face, heavy smoke followed shortly by flame appeared around window 97-437 at 8:55 a.m. After this time, a very rapid fire spread was observed across the west face on this floor. Within a couple of minutes, over half of the windows were emitting smoke, and flames were visible in many. Even though floor 92 was not directly struck by the airplane, fire appeared on the east side of the tower on this floor shortly after 9:00 a.m.

Following the initial development of large fires, fire spread continued until WTC 1 collapsed around 10:28 a.m. At times the fires displayed the systematic, relatively slow spread expected for fire growth in a typical building. For instance, after the initial rapid growth phase, fires on floors 92, 94, 96, and 97 on the east face began to move deliberately toward the south. As they spread, the fires would burn intensely at a given location for a while before dying down. As a result, these fires developed the appearance of a wave moving slowly across the building.

There were also certain times and locations during which fire appeared to spread quite rapidly. Some of these episodes were clearly connected with rapid fire growth and likely flashover in rooms. During the first half hour, significant fires were observed toward the centers of floors 92, 94, 96, and 97 on the east face that were spreading towards the north. Each of these fires eventually reached a certain point where further fire spread was inhibited for many minutes. A review of building plans showed that walls of offices or meeting rooms were presented at the locations where fire spread was inhibited.

Apparently, these walls served as effective fire breaks that protected against further fire spread. However, for each of these floors fire and smoke eventually appeared at one of the windows beyond the walls, and after one of these windows was broken fire growth was extremely rapid and robust across the remaining windows. These observations are consistent with the occurrence of flashover within an enclosed space.

At other times, unusually rapid fire growth apparently occurred in areas that are believed to have been relatively open and not constrained by walls. One of these episodes occurred around 9:54 a.m. on the north face. Fire suddenly appeared on floor 96, a location to the west of the damage inflicted by the airplane. Within a very short period of time, fire could be seen in roughly 10 windows covering a distance of more than 30 ft.

Another example of very rapid fire growth appeared to take place on floor 98. In the early period of the fire, this floor did not appear to be heavily involved, and this remained true for quite a while. However, after 9:30 a.m., fire began to appear on this floor and by 10:00 a.m., fires were observed over significant lengths on all four faces of the tower.

One of the more unusual fire spread episodes in WTC 1 occurred just after the collapse of WTC 2 around 9:59 a.m. Within a couple of minutes, a large intense fire suddenly appeared on the south side of the west face on floor 104 in an area well above any other apparent fire. This unusual jump in fire location is difficult to explain, but is likely associated with vertical shafts located in the core of the tower.

For most of the time following the plane strike, no fire was observed on any of the floors on the south face over lengths extending from the eastern edge of the tower to near the center of the face. Fires were not observed in this region of the building until around 10:00 a.m. By the time this tower collapsed roughly 25 minutes later, intense fires extending over significant lengths of the originally uninvolved area were burning on floor 94 to floor 98 in this area.

A final example of rapid fire spread and growth in WTC 1 was described previously in the *May 2003 Progress Report* for the Investigation (NIST 2003). In this case, a line of smoke appeared suddenly over a significant length of floor 92 on the north face of WTC 1 at 10:18:48 a.m., or roughly 9 minutes before the collapse of the tower. Puffs of smoke were observed simultaneously on the north face from floors 94, 95, and 97. More isolated puffs were seen at the same time from floor 92 and floor 95 on the west face and from floor 92 on the south face. Very shortly (seconds) after the appearance of the smoke, a localized fire on floor 95 to the west of the plane strike location grew very rapidly and flames erupted from windows. Following the smoke release, a large fire began to spread rapidly across the western side of floor 92 on the north face. Previous to the appearance of the smoke, only small fires were evident on this floor. By the time the tower collapsed, this fire had spread across most of the floor and had reached the western wall. This fire was responsible for the large burst of flame from the north face observed when this tower collapsed.

H.6.2 WTC 2

The fire behavior observed in WTC 2 was qualitatively different than occurred in WTC 1. Intense fireballs were created by the released jet fuel on the south, east, and north faces immediately after the airplane struck the building. As observed for WTC 1, the fireballs were followed by a brief period (on the order of a minute) of intense flaming from windows over a large area of the building. Most of these flames then "damped down" as observed in WTC 1, but two regions of intense burning remained. One of these areas was located on floor 81 and floor 82 at the northeast corner of the tower. Flames were evident from windows on either side of the corner as well as the corner itself, which had become exposed by removal of the corner facing during the plane strike. This area is in the vicinity of large piles of debris formed during the plane strike. The second fire was located primarily on floor 79 just to the left of the center (roughly from windows 79-231 to 79-238) of the north face. This is in the area of the second debris pile described earlier. Both of these fires died slowly with time when compared to fires at other locations in WTC 1 and WTC 2. Both were still burning lightly when the tower fell 56 minutes after the plane strike.

A curious aspect of the fire behavior is the existence of an area of the building façade between these two fire locations on the north face where very little fire and/or smoke was observed before the tower collapsed. This area is roughly rectangular in shape, covering floor 80 to floor 82 and extending across windows 249 to 239. Infrared images recorded shortly following the plane strike showed that this region was quite cool relative to other sections close to the fires. This area will be referred to as the "cold spot." Spreading fires seemed to move around this cold spot.

In general, the fires in WTC 2 appeared to be less active than those observed in WTC 1. The fires covered a smaller area of the façade and did not spread as quickly. This is true even when the shorter time between the plane strike and collapse for WTC 2 (1 hour 42 minutes for WTC 1 and 56 minutes for WTC 2) is taken into account. Nevertheless, there was significant fire spread, and instances of rapid fire growth similar to those seen in WTC 1 did take place.

Around 9:29 a.m., large flames and heavy smoke erupted from an area on the north face just to the right of the cold spot (around window 83-236) on floor 83. Four minutes and forty-one seconds later, flames suddenly appeared at a separate location on the same floor further to the right near window 83-226. Another area of fire formed just to the right of the cold spot on floor 82 around 9:54 a.m. or 5 minutes before the collapse. The fires on floor 79 of the north face also spread towards the west, approaching the western edge of the tower just prior to the collapse.

Initial fire growth on the east face was on floor 82. Around 9:12 a.m., flames could be seen in nearly half of the windows on this floor, and heavy smoke was pouring from additional windows. Only limited fire was evident on lower floors at this time. The fires on floor 82 grew smaller after this time, and most were no longer visible when the tower collapsed. Around 9:35 a.m., heavy flames and smoke appeared over large areas of floor 79 and floor 80. These fires abruptly died down 45 seconds later, before growing back slowly during the remainder of the time before the tower collapsed.

In the early period following the plane strike, fire growth on the south face was seen primarily on floor 81 with active fires present on both sides of the airplane strike location. Smaller isolated fires were present on other floors around the area damaged by the airplane. These fires were relatively quiet and stationary until just prior to the collapse. At 9:56 a.m., there was a sudden release of smoke along much of floor 80 extending from the area of the plane strike to near the western edge. During the next 2 minutes, an intense fire developed covering approximately windows 81-441 to 81-454.

No smoke or fire was observed near the floors struck by the airplane on the west face of WTC 2. Some smoke was apparent at windows higher on the face. This was most likely coming from windows broken by occupants located on these floors.

H.7 EVIDENCE FOR COLLAPSED FLOORS IN WTC 2

H.7.1 Hanging Objects

In the *May 2003 Investigation Progress Report* (NIST 2003), a photograph was shown in which there appeared to be a floor draped across a number of windows extending roughly from 310 to 342 across the east face of floor 82 of WTC 2. Figure H–22 compares an image taken shortly after the plane strike at 9:03 a.m. and one taken at 9:55 a.m. shortly before the tower collapsed. At the earlier time, the hanging object is already present, but is seen through the windows draped much higher on the floor 82. An interpretation consistent with these observations is that floor 83 along the east side of WTC 2 was partially collapsed over a significant fraction of its length by the passage of the plane through the building. At the later time the floor has sagged further. By reviewing a number of photographs and videos, it has been determined that the change in floor position occurred between 9:34 a.m. and 9:38 a.m.

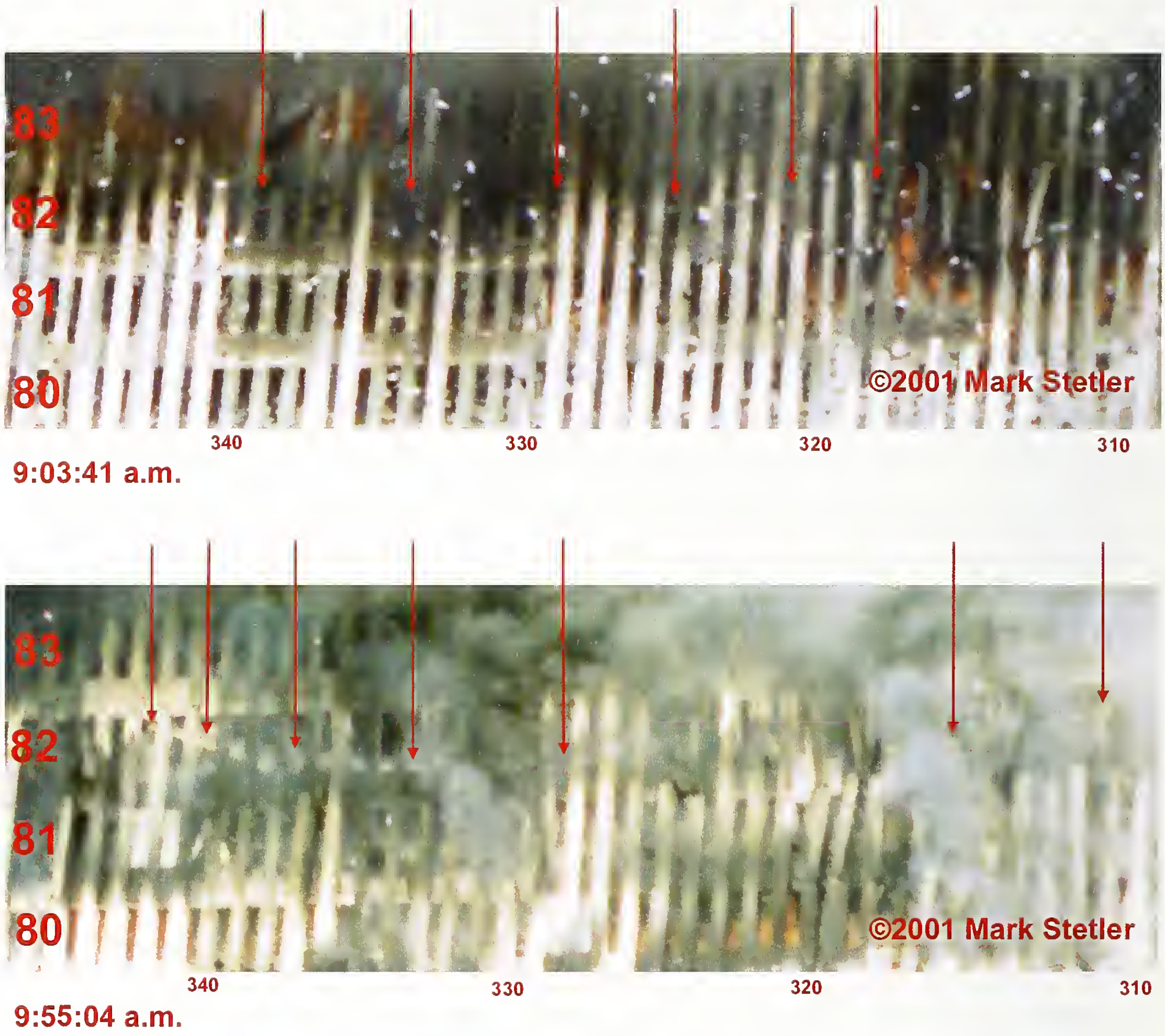


Figure H–22. Images of the east face of WTC 2 taken shortly after the plane struck and shortly before the tower collapse are shown. An object that is most likely a floor can be seen through windows on floor 82 as indicated by the arrows. The object has dropped lower between the times the two photographs were taken.

Very similar objects, albeit of shorter length, are seen hanging in windows in images taken from the north. These objects are apparent in Fig. H–21 hanging below floors 81, 82, and 83. As seen through windows on floor 82 (corresponding to the floor 83), the floor appears to have split into at least two sections.

H.7.2 Molten Material

It has been reported in the FEMA report (McAllister 2002) as well as in the media that what appeared to be molten metal was observed pouring from the north face near the northeast corner. This is the area where the sustained fires were seen. Video records and photographs indicate that the material first appeared at 9:51:52 a.m. and continued to pour intermittently from the building until the time of collapse. Some of the material can be seen falling in Fig. H–21. Close-up video and photographs of the area where the material is pouring from have been examined and show that it is falling from near the top of window 80-256. The most likely explanation for this observation is that the material had originally pooled on the floor above, that is, floor 81, and that it was allowed to pour out of the building when this floor either pulled away from the outer spandrel or sank down to the point where the window was exposed. The fact that the material appears intermittently over a several minute period suggests that the floor was giving way bit by bit.

The composition of the flowing material can only be the subject of speculation, but its behavior is consistent with it being molten aluminum. Visual evidence suggests that significant wreckage from the plane passed through the building and came to rest in the northeast corner of the tower in the vicinity of the location where the material is observed. Much of the structure of the Boeing 767 is formed from two aluminum alloys that have been identified as 2024 and 7075 and closely related alloys. These alloys do not melt at a single temperature, but melt over a temperature range from the lower end of the range to the upper as the fraction of liquid increases. The Aluminum Association handbook (Aluminum Association 2003) lists the melting point ranges for the alloys as roughly 500 °C to 638 °C and 475 °C to 635 °C for alloys 2024 and 7075, respectively. These temperatures are well below those characteristic of fully developed fires (ca. 1,000 °C), and any aluminum present is likely to be at least partially melted by the intense fires in the area.

H.8 PROGRESS ON COLLECTION OF IMAGES AND ANALYSIS FOR WTC 7

Visual material is also required to characterize the initial damage to, fire spread in, and collapse behavior of WTC 7. Considerable useful material has been collected, but the visual record for times between the collapses of WTC 1 and WTC 7 is much less complete than those for the two towers. The reasons for this are easy to understand. Following the collapses of the towers, most people were focused on escape or rescue. A large dust cloud was formed by the collapses, and fires developed that generated large amounts of smoke. Both tended to obscure views of WTC 7, particularly from the south due to the northwesterly wind direction on September 11, 2001.

Both photographs and videos have been included in the database that show fires and damage to the east, north, and west faces of WTC 7. Some of this material has been timed, but in general the record is insufficient to allow generation of a complete time line of fire behavior for the relevant period. Numerous images show the upper portion of WTC 7 from the south, but the actual face of the building is generally obscured by smoke. No clear images of the lower portion of the south face have been obtained despite a careful search and repeated appeals for the public's help. This is particularly unfortunate since most of the damage caused by the collapses of the towers, and particularly WTC 1, should have occurred on this face.

There is considerable interest in images showing the collapse of WTC 7. Currently, there are at least four videos in the database that include the collapse, primarily from northerly directions, as well as several photographs. While not ideal, these are providing adequate information for characterizing the collapse sequence, and some progress along these lines has been made.

An effort has begun to map out the same information concerning fires, smoke, and windows as in the towers using visual material in the database. This effort will continue with a goal of mapping out as much of the fire time line as possible based on the material in the database.

H.9 SUMMARY WITH KEY FINDINGS

This section provides a brief summary of progress on the collection and analysis of visual data along with key findings.

The approaches used to identify and obtain visual material related to the WTC disaster are described along with the approaches employed by NIST to archive and catalog the material. Material is either saved in its original digital format or digitized and saved, and a commercial software package has been used to provide data entry, a searchable database, and ready access to assets for review. The large numbers of attributes used to characterize the photographs and videos are included.

Separate databases are provided for photographic and video materials. A major effort has focused on assigning accurate times to the material, and the approaches used are summarized. In excess of 6,700 photographs and 6,900 video clips have been included in the databases and 45 percent and 39 percent, respectively, of these have assigned times accurate to 3 seconds or better.

Major events timed to an accuracy of 1 second are:

- First plane strike on WTC 1: 8:46:30 a.m.
- Second plane strike on WTC 2: 9:02:59 a.m.
- Collapse of WTC 2: 9:58:59 a.m.
- Collapse of WTC 1: 10:28:25 a.m.
- Collapse of WTC 7: 5:20:52 p.m.

An approach has been developed to characterize the observed fire behaviors at the periphery of the buildings on a window-by-window basis by determining whether windows are open or closed and whether smoke and/or fire are observed. If smoke is present, it is characterized as “light” or “heavy”, and fires are characterized as “spot” (a small local fire), “fire inside,” and “external flaming.” The observations are coded in separate electronic spreadsheets for each building, façade, and time.

Two approaches are used to visualize the fire-related parameters. The first is a Web-based application that displays single sides of the towers at a single time. The second is a time-dependent three-dimensional representation based on Smokeview (Forney and McGrattan 2003; Forney, Madrzykowski, McGrattan, and Sheppard 2003).

Photographs and videos have been used to characterize several aspects related to the plane strikes on the towers and the distribution of damage on the external faces. For WTC 1, locations where the ends of the wings and vertical stabilizer of the tail section struck the north face and the damage to the steel façade are mapped. The behavior of fireballs generated by the release of fuel as a result of the collision of the aircraft with the tower and initial tower damage as reflected in broken windows is used to characterize the distribution of damage to the facades of the tower. In addition, it has been shown that an exterior panel section from the south face was dislodged and landed on the ground. It contained an aircraft wheel that passed through the tower.

The following conclusions are reached concerning the immediate effects of the plane strike on WTC 1:

- The airplane struck columns on the north face ranging from 109 to 152 and covering floor 93 to floor 99.
- Damage and initial fire growth were greater on the east face of the tower than on the west. Significant damage and early fire growth occurred on the west side of the south face, but not on the east side.
- A three-story panel section was knocked from the south side of the tower and had an aircraft wheel lodged in window 95-329.

Visual evidence related to the plane strike on the south face of WTC 2 is more extensive than for WTC 1. This has allowed additional analyses beyond the mapping of damage on the plane strike face and façade damage to the remaining faces. The following conclusions have been reached concerning the immediate effects of the plane strike on WTC 2:

- The aircraft struck the tower with a measured speed of 545 miles per hour ± 18 miles per hour.
- The collision of the aircraft caused a measurable sway of the tower that lasted more than 4 minutes. The period of oscillation was 11.3 seconds.
- The airplane struck columns on the south face ranging from 404 to 443 and covering floor 77 to floor 85.
- Large areas of the façade were removed and/or damaged along the east face of the tower and on the eastern side of the north face. No façade damage or window breakage was evident on the west face.
- Debris piles are observed in the northeast corner of the tower primarily on floors 80 and 81. Debris is also evident towards the center of the north face on the floor 79.
- Column 253 on the north face is broken on the floor 81 and the column 254 is severely distorted.

Detailed maps for fire behavior are currently being made. This update characterizes general fire behaviors for the two towers and notes some particularly interesting observations. For WTC 1, the following observations are highlighted.

- Extensive fires observed immediately following the plane strikes and which are most likely associated with released jet fuel damped down after roughly 60 seconds.

- In the period following the plane strikes fires tended to reappear over a period of many minutes. Initial fire growth was principally observed on floor 96 and floor 97 on the north face, floor 94 and floor 97 on the east face, floor 96 on the south face, and floor 97 on the west face.

- Observed fire spread rates were quite variable. Examples of both relatively slow and very rapid apparent fire spread are described.

- Interior walls at several locations were inferred to protect areas of the towers for a period of many minutes, though they were typically eventually breached by nearby fires.

- Following the collapse of WTC 2, a large fire appeared and grew rapidly on the west face at floor 104.

- There was an extensive area of the façade on the eastern side of the south face for which no fire was observed until at least 1 hour following the plane strike. When fires finally did appear in this area their growth was rapid over multiple floors.

- A large amount of smoke was suddenly released from floor 92 on the north face at 10:18:40 a.m. Smoke was expelled simultaneously from other floors and faces. Immediately after the smoke release rapid fire growth was observed at an isolated location on floor 95 and across much of the west side of the north face on floor 92.

Observed fire behaviors for WTC 2 were somewhat different than for WTC 1. This is true even when the differences in times between plane strikes and collapses (1 hour and 42 minutes for WTC 1 and 56 minutes for WTC 2) are considered. The following observations concerning fire behavior in WTC 2 are emphasized:

- Extensive fires observed immediately following the plane strikes and most likely associated with released jet fuel damped down after roughly 60 seconds.

- Two regions of intense fire remained following the initial fire period due to jet fuel burning. These fires were located on floor 81 and floor 82 in the northeast corner and towards the center of the north face on floor 79. These fires burned for longer periods than observed elsewhere in WTC 1 and WTC 2. They are located in regions of the tower where debris piles are observed.

- No large fires were observed in a multi-floor region on the north face located between the two fire areas described in the last bullet.

- Initial fire growth in areas away from the sustained fires was along the east face of floor 82. Large fires did not appear on lower floors of this face until later and were sporadic in space and time.

- Prior to the tower collapse, fire spread primarily from east to west was observed on floors 79, 82, and 83 of the north face.

- A sudden release of smoke from windows on the west side of the south face on floor 80 occurred at 9:56:37 a.m. This was followed very shortly by the appearance of heavy fire.

A number of photographs and videos show what appears to be floor 83 hanging across window openings over a large fraction of floor 82 on the east face of WTC 2. This object is observed very shortly after the plane strike and is found to drop lower prior to the tower collapse. On the north face, shorter lengths of what appear to be floors 81, 82, and 83 are seen hanging through the windows below.

Starting around 9:52 a.m., a molten material began to pour from the top of window 80-256 on the north face of WTC 2. The material appears intermittently until the tower collapses at 9:58:59 a.m. The observation of piles of debris in this area combined with the melting point behaviors of the primary aluminum alloys used in the Boeing 767 suggest that the material is molten aluminum derived from aircraft debris located on floor 81.

The visual record for the period following the collapses of the two towers is much less complete than prior to this time. In addition to the general chaos caused by the collapses, significant dust and smoke from fires started by the collapses obscured the site. As a result, it has not been possible to identify clear visual images showing the damage to the south face of WTC 7 caused by the collapses of WTC 1 and WTC 2. The number of videos and photographs showing fires on the east, north, and west faces of WTC 7 is limited and sporadic. The images that are available are being used to generate an approximate time line for fire growth and spread.

H.10 REFERENCES

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Appendix I
INTERIM REPORT ON ASSESSMENT OF SPRAYED FIREPROOFING IN THE WTC TOWERS—METHODOLOGY

I.1 INTRODUCTION

The structural steel in the World Trade Center (WTC) towers was "fireproofed" with sprayed fire resistive materials (SFRMs). These materials are packaged as dry ingredients, and water is added by a pressurized system as the materials are sprayed onto the steel. The water mixes with the cementitious materials and provides "stickiness" that allows the SFRM to adhere weakly to the steel. With time, the cementitious materials harden, and excess water evaporates. When dry, SFRMs provide an insulation barrier to reduce the vulnerability of the steel to excessive temperature rise during a fire.

Analysis of the effects of the fires on the structural capacity of the damaged WTC towers as a function of time requires knowledge about the condition of fireproofing on the various structural components, namely, the exterior columns, the spandrel beams, the floor trusses, and the core columns. Because of the method of application, sprayed fireproofing will have variable thickness, especially when applied to long, thin elements such as the diagonals and chords of the floor trusses. In addition, fireproofing was dislodged during the impact, either from direct impact by debris or from vibrations of the members. The thermal properties of the fireproofing also need to be known as a function of temperature.

The thermal-structural analysis of the WTC towers focused on two objectives: (1) analysis of the undamaged buildings exposed to postulated fires, and (2) analysis of damaged buildings exposed to the fires that occurred after impact. In order to reduce the uncertainties in the calculated thermal histories of various structural elements, the condition of the sprayed fireproofing as it existed on September 11, 2001, needs to be estimated as accurately as possible. In addition, reasonable estimates of the extent of fireproofing dislodged by the aircraft are needed. This appendix discusses the approach that will be used for this purpose.

To gain an understanding of the effect of fireproofing thickness and its variability on the steel temperature during exposure to fire, a simple finite-element model was used for a sensitivity study. The information gained from that study is reviewed first. A brief summary of the construction history of the sprayed fireproofing in WTC 1 and WTC 2 is presented. This is followed by a quantitative assessment of in-place thickness and its variability based on available data. The rationale for the thickness of fireproofing to be used in the structural fire endurance analyses is presented. The tests conducted to determine the thermal properties of fireproofing materials similar to those used in the WTC towers are reviewed. The approach used to gain an understanding of the inherent fragility of sprayed fireproofing is discussed, and the scheme for estimating the extent of damage during impact is summarized.

I.2 SENSITIVITY OF THERMAL RESPONSE TO FIREPROOFING GEOMETERY

The fireproofing thickness has a great effect on the thermal response of the structural elements for a given fire condition. While others have considered the effect of thickness of fireproofing, the effect of the variation of thickness along the length of a member is not well known. A sensitivity study using finite element modeling of heat transfer was conducted to investigate the sensitivity of steel temperature to the variability in fireproofing thickness.

The simplified model that was used is shown in Fig. I–1. A 1 in. thick, 60 in. long steel plate (cyan color) was coated with fireproofing material (purple color) and subjected to the uniform radiative flux arising from a 1,100 °C fire. As shown in Fig. I–1 (b), the fireproofing is modeled with a layer of finite elements (0.125 in. thick and 0.6 in. long) having the thermal properties of fireproofing (purple). A parametric study was conducted with average thickness of fireproofing varying from 0 in. to 2 in. in increments of 1/4 in. The effect of variability in thickness was modeled by imposing a normal probability distribution on the fireproofing thickness along the length of the steel plate. The assumed standard deviation varied from 0 in. (uniform thickness) to 1 in. A psuedo-random number generator was employed to determine the thickness at each cross section based on the assumed average thickness and standard deviation. The layer representing fireproofing was taken to be twice the average thickness, and the thickness of fireproofing at any cross section was modeled by assigning a low heat capacity and a high thermal conductivity to those elements that do not provide fireproofing. Figure I–1 (c) shows an example of variable thickness fireproofing; in this case, the average thickness is 1 in. and the standard deviation is 3/8 in.

When the model in Fig. I–1 is exposed to the thermal flux representing an 1,100 °C fire, the surface of the insulation heats up quickly to the gas temperature (1,100 + 273 = 1,373 K). Numerical simulation was performed over a 2-h period, and the steel temperature at five locations was recorded at 30 min, 60 min, 90 min, and 120 min of exposure. The temperature recording locations are 6 in. from each end and at 12 in. intervals, which are shown as numbers 1 to 5 in Fig. I–1 (a). The initial temperature of the model is 300 K.

Figure I–2 shows temperature contours (in K) through the fireproofing and steel at 60 min after initial exposure for the model shown in Fig. I–1 (a). The fireproofing surface temperature is close to the gas temperature of 1,373 K, while the steel temperature is 311 K. If the fireproofing were of uniform thickness, the isotherms would be a series of lines parallel to the plate. It is seen that, when the thickness of fireproofing is variable, the isotherms follow the shape of the fireproofing surface contour. Thus, the temperature history at any point in the steel depends on the loc al thickness of the fireproofing.

Figure I–3 shows the steel temperature at the far sensor #1 (6 in. from the end) as a function of time for various insulation thicknesses ranging from 0 in. to 2 in. (the thickness is indicated by the numbers on the curves). For the case in Fig. I–3 (a), the fireproofing is of uniform thickness, and for the cases in Fig. I–3 (b), the thickness varies with a standard deviation of 1 in. The time to reach a temperature of 600 °C is used as a measure of relative performance. It is seen that the presence of high variability in thickness has a detrimental effect of the protection provided by the fireproofing. For example, for a uniform thickness of 0.5 in., it takes about 60 min for the steel at point #1 to reach 600 °C; but when the standard deviation of the thickness is 1 in., the average thickness has to be 1.75 for the same level of thermal protection.

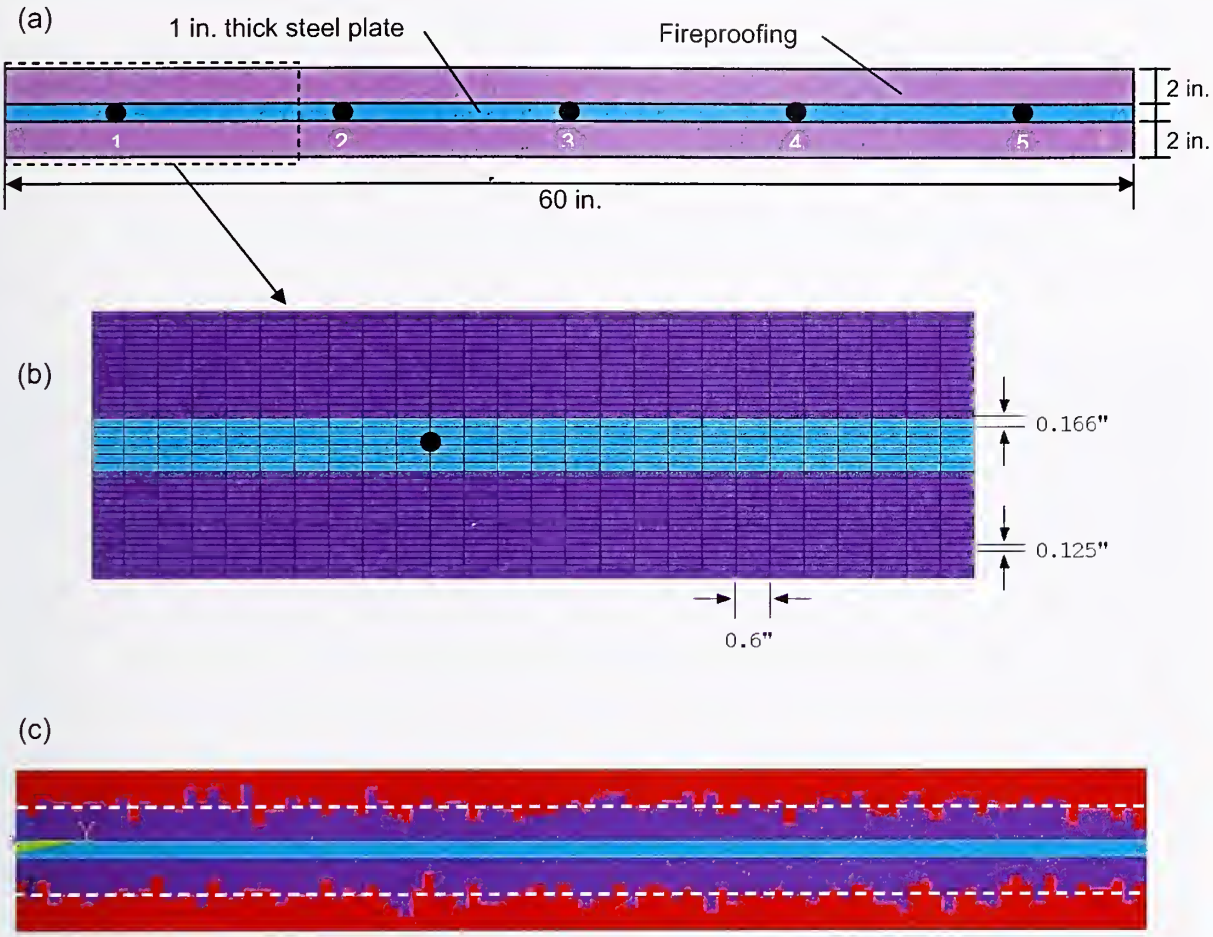

Figure I–1. Model used to study effects of fireproofing thickness and variability of thickness on steel temperature: (a) physical model used in analyses (points 1 to 5 are locations where temperatures are monitored), (b) finite element mesh used to represent physical model, and (c) finite element model to represent variable thicknessof fireproofing (purple) (the elements in red represent material of high thermal conductivity).

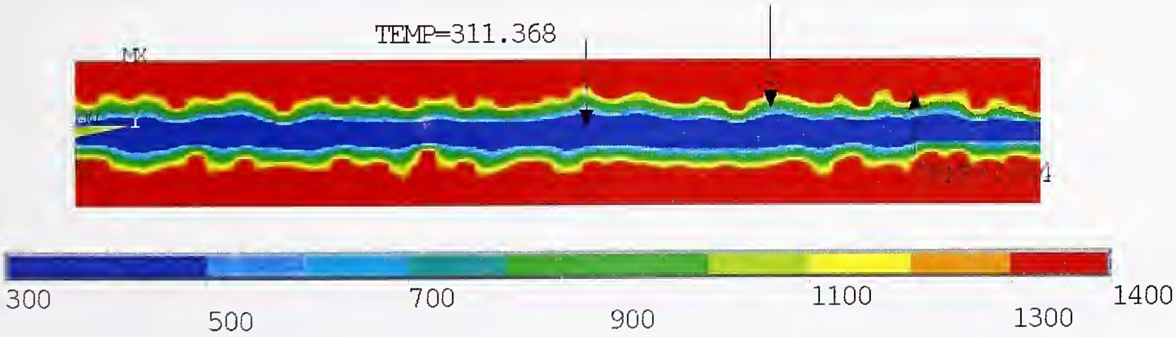

Figure I–2. Temperature distribution after 1 h of exposure to gas temperature of 1,100 °C (1,373 K).

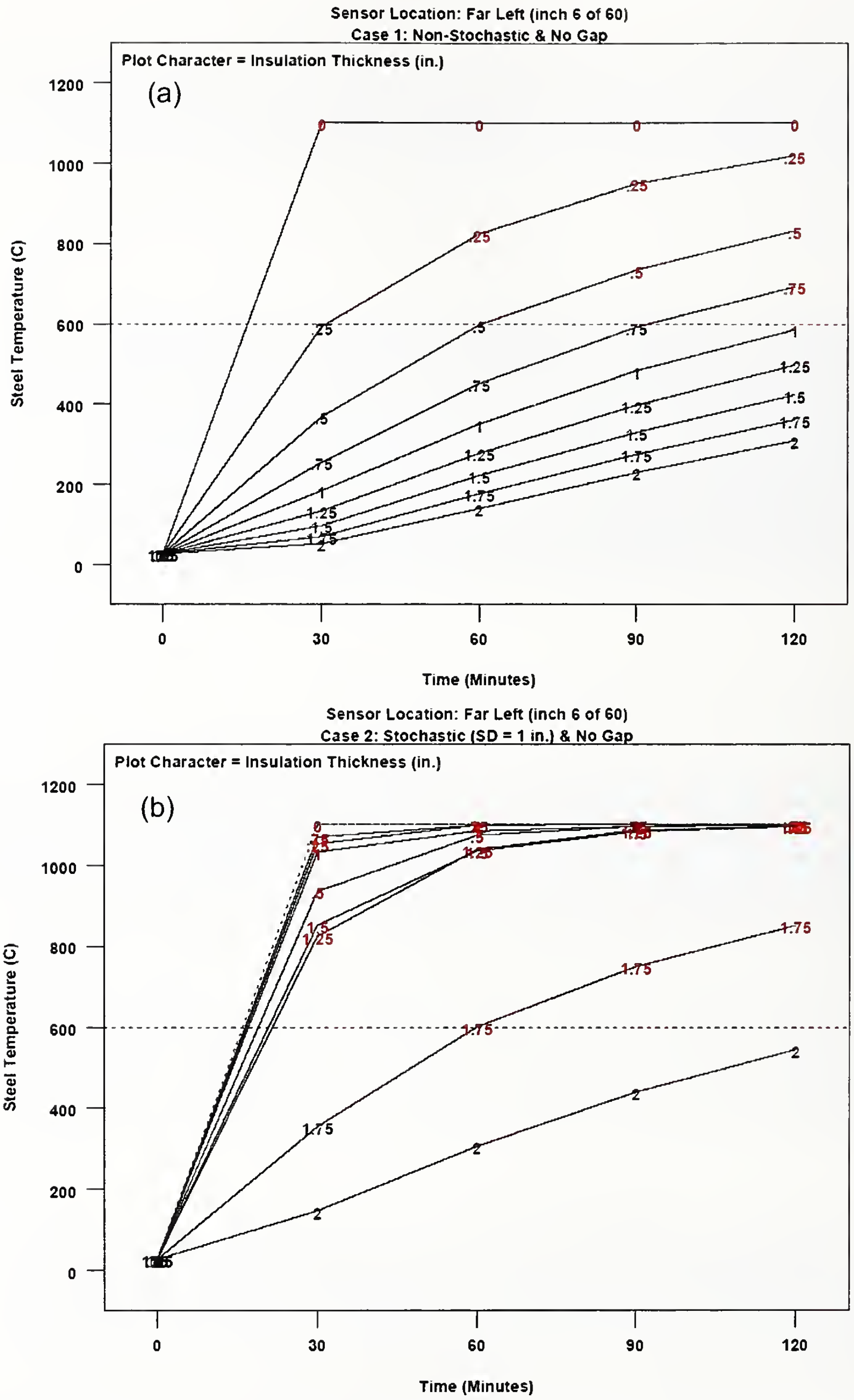

Figure I–3. Variation of steel temperature (at a point 6 in. from end of plate) with time for different average thicknesses of fireproofing (shown as numbers on the curves): (a) uniform thickness, and (b) variable thickness with a standard deviation of 1 in.

In addition to the effect of variation in thickness, it is important to understand the effect of missing fireproofing over a portion of a member. As an example, Fig. I–4 shows missing fireproofing from a diagonal of a bridging truss of the WTC towers floor system. Figure I–5 (a) shows an example of a numerical model with missing fireproofing. In this case, there is 12 in. of missing fireproofing on the steel plate, which is otherwise protected by 2 in. of uniform thickness fireproofing. Figure I–5 (b) shows the temperature contours (isotherms) at time 50 min. For comparison, Fig. I–5 (c) shows isotherms at the same time in a plate with no gap in the fireproofing. As expected, the bare steel at the missing fireproofing is at the gas temperature, but more importantly the "gap" in fireproofing leads to a "leakage" of heat into the interior steel.

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Figure I–4. Example of "gap" in fireproofing on diagonal member of a bridging floor truss.

The combined effects of variation in thickness of the fireproofing and length of missing fireproofing were examined by a factorial study with the following factors:

- Average thickness of fireproofing varying from 0 in. to 2.0 in. in 1/4 in. increments;
- Standard deviation of fireproofing thickness of 0 in., 0.25 in., 0.5 in., 0.75 in. and 1.0 in.; and
- Length of missing fireproofing varying from 0 in. to 30 in., in 6 in. increments.

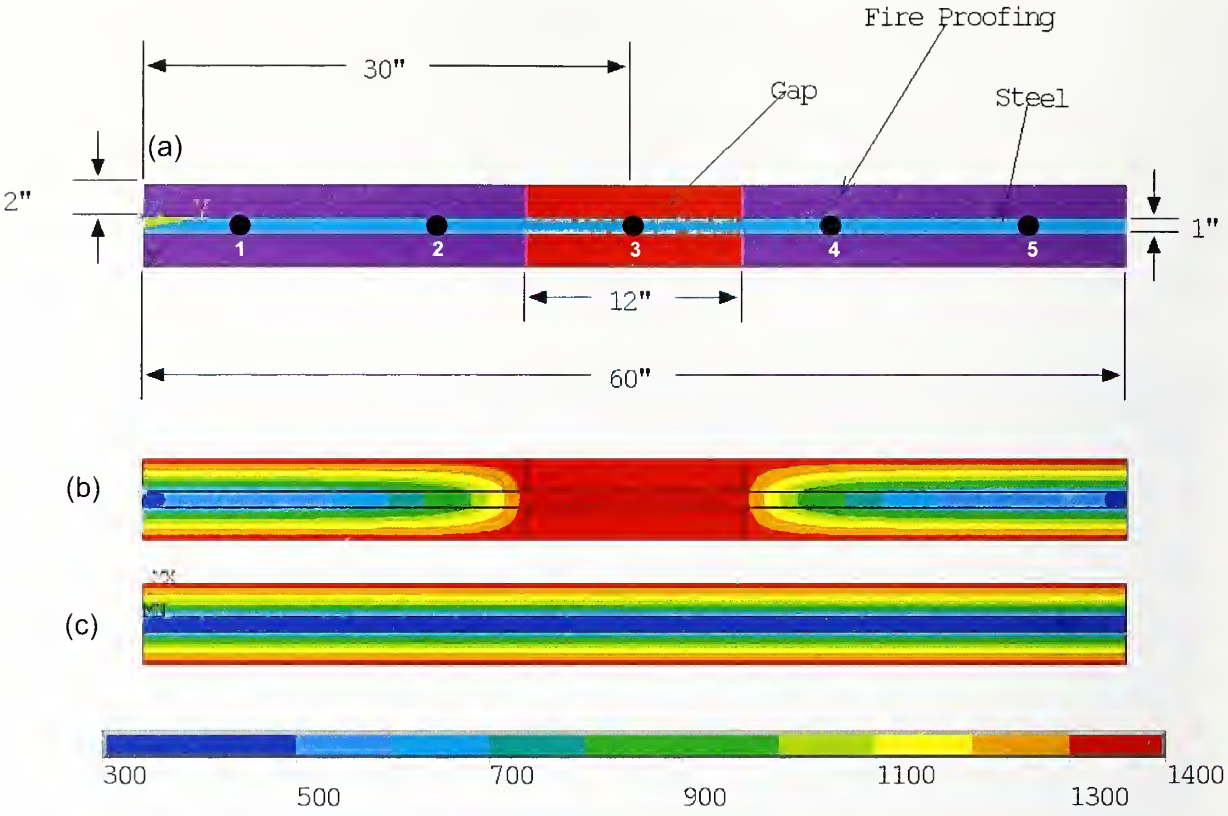

Figure I–5. Effects of gap in fireproofing: (a) model of plate with fireproofing having 2 in. uniform thickness and 12 in. gap, (b) isotherms (K) at time = 50 min with 12 in. gap, and (c) isotherms without gap.

The results of the sensitivity study can be summarized in a series of plot matrices, which show the time histories of the steel temperature for different combinations of gap length and variability in fireproofing thickness. For example, Fig. I–6 shows the plot matrix for the temperature history at point #2 (18 in. from the end of the plate). Each plot contains a series of curves representing different average thickness of fireproofing, as in Fig. I–3. Each column of plots represents a constant value of thickness variability (standard deviation), and each row represents a constant gap length. The plot in the upper left corner represents the case of uniform thickness of fireproofing and no gap, which is the same plot as in Fig. I–3(a). (Note that for the case of uniform thickness and no gap, the steel temperature at any point in a cross section is the same along the length of the plate, as shown in Fig. I–5(c).) For gaps of 24 in. and 30 in., the temperature at point #2 rises rapidly because there is no fireproofing on the plate at that location. This explains the shapes of the curves in the two lower rows. In going from left to right in one of the top four rows it is seen that as variability of thickness increases, the time histories shift upward, thereby reducing the time to reach 600°C. This is the same observation as shown in Fig. I–3. Moving from the top to the bottom in any column shows the effects of increasing gap length. The effect of gap length depends, of course, on where the steel temperature is measured. At a point within the portion of steel that is bare, the temperature rises quickly. At points within the steel that are surrounded with fireproofing, the gap provides a path for heat flow, as shown in Fig. I–5 (b). As a result, points in the steel within the vicinity of the missing fireproofing will experience higher temperatures, as indicated by the rising trend of the curves in going downward from the top of a column in Fig. I–6. The National

Institute of Standards and Technology (NIST) does not have sufficient information to determine the frequency of occurrence of these gaps or their typical locations. Therefore, gaps in fireproofing will not be considered in the thermal modeling.

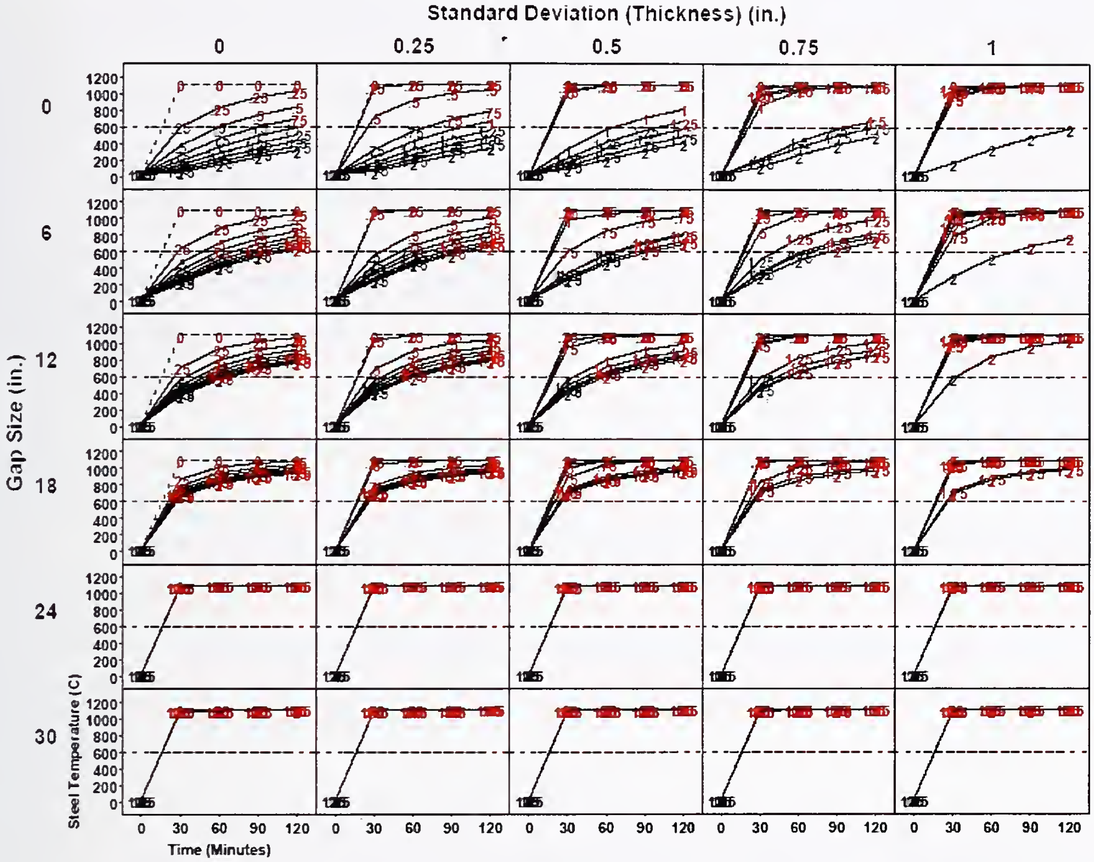

Figure I–6. Example of plot matrix from sensitivity study of the effects of missing fireproofing and variability of fireproofing thickness on steel temperature. Each graph is a temperature history of the steel at point #2 (see Fig. I–5) for different thicknesses of fireproofing.

I.3 IN-PLACE CONDITIONS OF FIREPROOFING BEFORE IMPACT

I.3.1 History of WTC Fireproofing

In Appendix 4 of the *May 2003 Progress Report* (NIST SP 1000-3), the history of the sprayed fireproofing, as reconstructed from available documentation, was reviewed. Basically, the following significant activities took place:

- 1969: Decision made to use 1/2 in. of CAFCO BLAZE-SHIELD Type D (asbestos fibers) sprayed fireproofing.

- 1970: Use of CAFCO BLAZE-SHIELD Type D was discontinued at the 38th floor of WTC 1; remaining fireproofing to use CAFCO BLAZE-SHIELD Type DC/F (mineral wool fibers).
- 1994: Thickness measurements of fireproofing on trusses of floors 23 and 24 of WTC 1.
- 1995: Port Authority performed study to establish sprayed fireproofing thickness for tenant alterations.
- 1999: Port Authority established guidelines for fireproofing repairs, replacement, and upgrades.
- Late 1990s: Floor truss fire protection upgraded to 1 1/2 in. during tenant alterations using CAFCO BLAZE-SHIELD Type II. In-place measurements of thickness, density, and bond strength recorded.

I.3.2 Specified Thickness of Fireproofing

WTC project specifications for spray-applied fireproofing do not provide required material thickness or hourly ratings. However, a letter dated October 30, 1969, from Robert J. Linn (manager, Project Planning, WTC) to Mr. Louis DiBono (Mario & DiBono Plastering Co., Inc.) states, in part:

> …Tower "A" columns that are less than 14WF228 will require 2 3/16″ thick of 'Cafco [B]laze-Shield Type D' spray-on Fireproofing. All Tower columns equal to or greater than 14WF228 will require 1 3/16″ of fireproofing…
>
> All Tower beams, spandrels and bar joists requiring spray-on fireproofing are to have a 1/2″ covering of "Cafco."

No reference is made in this letter to the required thickness of fireproofing of core box columns or exterior built-up columns.

Alcoa was the supplier of the aluminum cladding on the exterior columns (Contract WTC 400.00), and the following "Note 11" was included among the "General Notes" of their drawings:

> 11. Exterior column and spandrel fireproofing–CAFCO BLAZE SHIELD Type D Fireproofing. Interior column and spandrel fireproofing–Vermiculite plaster aggregate fireproofing with finished plaster coat on exposed areas of columns. (3 hr on spandrels, 4 hr on columns)

	Fireproofing Thickness	
Rating	**Cafco**	**Vermiculite Aggregate**
4 hr (heavy column)	1 3/16″	7/8″
3 hr (spandrels)	1/2″	1/2″

In 1995, the Port Authority performed a study to establish the requirements for applying spray-on fireproofing to the floor trusses in the case of new construction (alterations conducted when tenants vacated the space) in the towers. The study estimated the fireproofing requirements for the floor trusses of the towers based on "the fireproofing requirements for Design No. G805 contained in the Fire Resistance Directory" of Underwriters' Laboratories. The study concluded that 1 1/2 in. of spray-on mineral fiber fireproofing, "when applied directly to the chords and web members," was sufficient to achieve the required 2 h rating for the floor trusses. In the years between 1995 and 2001, fireproofing was upgraded in a number of the floors affected by the fires on September 11, 2001.

The specified fire protection is summarized in Table I–1.

Table I–1. Specified passive fire protection.

Structural Component	Member Size	Location	Material	Thickness (in.)
Floor trusses	All	NA	CAFCO DC/F	1/2
Interior columns[a]	< 14WF228	NA	CAFCO DC/F	2 3/16
	≥ 14WF228	NA	CAFCO DC/F	1 3/16
Exterior columns	"heavy"	Exterior faces	CAFCO DC/F	1 3/16
	"heavy"	Interior faces	Vermiculite aggregate	7/8
Spandrel beams	All	Exterior face	CAFCO DC/F	1/2
	All	Interior face	Vermiculite aggregate	1/2

a. No thicknesses specified for core beams and box columns.
Key: NA, not applicable.

In a letter dated July 25, 1966, from Emery Roth and Sons to the Port of New York Authority, it is stated "Since the deck is non-structural it will not be fire proofed." Photographs show that in some areas the underside of the metal deck was indeed not fireproofed, while in other areas fireproofing appears to be present but of undetermined thickness and possibly resulting from overspray. Photographs reveal that the dampers and damper saddles were not fireproofed. Additionally, it is unclear whether the bridging trusses were required to be fireproofed in all areas. Subsequent to the design and construction of the WTC towers, some information has been found that further describes the elements of the structural systems that were indeed fireproofed.

I.3.3 As-Applied Thickness and Variability

The actual thickness of a spray-applied fire protection material generally exceeds the specified thickness by some amount. Since both towers collapsed on September 11, 2001, and most of the fireproofing was either dislodged or abraded (or scraped) off in the collapse, no examples remain of the "as installed" condition of the fireproofing. To make an estimate of the as-applied thickness and variability in thickness, several sources of information have been employed, including measurements taken by the Port Authority, condition surveys and anecdotal information, and photographs and video clips showing the condition of the fireproofing in selected areas. Each of the structural components or systems is considered here separately.

Steel Truss-Supported Floor System

Qualitative information on the "as installed" fireproofing thickness for the floor system first appears in Sample Area Data Sheets from 1990, in which comments on the state of the in-place fireproofing were recorded. As an example, the data sheet for floor 29 of WTC 1 states the following for the South West quadrant of the floor:

> Fluffy spray-on fireproofing coating the support beams, joists, and deck above the ceiling. The thickness of the material on the beams and joists was consistently about 1/2″ Regarding the deck it ranged from very sparce [sic] in areas to 1/4″ other areas.

Similar statements were recorded for the remaining quadrants of the floor.

Information regarding quantitative inspection of existing fireproofing appears in documentation from 1994. That year, the Port Authority performed a series of thickness measurements of the existing fireproofing on floors 23 and 24 of WTC 1. Six measurements were taken from "both flanges and web" of each of 16 randomly chosen trusses on each floor at those locations where the fireproofing was not damaged or absent.

The averages of six measurements per joist that were recorded on the two floors are presented in Table I–2. Measured average thickness varied between 0.52 in. and 1.17 in. For the 32 measurements (16 on each floor), the overall average was 0.74 in. and the standard deviation of these averages was 0.16 in. Four of the 32 floor trusses, had an average thicknesses between 0.52 in. and 0.56 in. These measurements suggest that the minimum average thickness exceeded 1/2 in.

This same report stated that, on floor 23,

> ... truss members located adjacent to the outside walls (within 3 ft) are devoid of fireproofing material. Visual inspection on floor 24 was not possible, as this area still has a lowered ceiling in place.

The data in Table I–2 can be examined further to understand the variability of the fireproofing thickness in the non-upgraded locations. Figure I–7 (a) shows the average thicknesses measured on the floor trusses of floors 23 and 24. The values appear to be similar for the two locations in terms of overall average thicknesses and the variation in average thickness. A formal analysis of variance indeed indicated no statistically significant differences between the overall mean thicknesses for the two floors. Thus, the two groups of data can be combined into one. A question to be answered is whether the values of average thickness follow a normal distribution. To answer this question, histograms and normal probability plots are used. Figure I–7 (b) shows a histogram of the average thicknesses, and it appears to be non-symmetrical and skewed to the right, which is characteristic of a lognormal distribution.[1] Figure I–7(c) is the normal probability plot of the average thicknesses for the combined data. If the points fall approximately on a straight line, it indicates that the data are normally distributed. It is seen that there are systematic deviations of the data from the best-fit line. To examine whether the data are represented better by a lognormal distribution, the average thicknesses, in Table I–2 were transformed by taking their

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[1] In a lognormal distribution, the natural logarithms of the values of a variate have a normal distribution.

natural logarithm. Figure I–7 (d) is a histogram of the natural logarithms of thickness, and Fig. I–7(e) is the corresponding normal probability plot. It is seen that the data are less dispersed about the straighter line, and the correlation coefficient has increased form 0.97 to 0.99. Thus, there is some indication that the distribution of fireproofing thickness is lognormal in the non-upgraded floor trusses.

Table I–2. Average fireproofing thickness from six measurements taken in 1994 on each of 16 random floor trusses on floors 23 and 24 of WTC 1.

Fireproofing Thickness (in.)	
Floor 23	**Floor 24**
0.60	0.76
0.53	0.60
0.70	0.90
0.76	0.72
0.88	0.64
0.89	0.80
0.83	0.68
1.17	0.65
0.88	0.67
0.71	0.77
0.82	0.96
0.52	0.66
0.69	0.65
0.52	1.11
0.64	0.95
0.52	0.56

Source: Data provided by Port Authority of New York and New Jersey.

A lognormal distribution for the average thickness of the fireproofing on the non-upgraded floor trusses is explained as follows. It is expected that the thickness of fireproofing will be highly variable due to the difficulty in spraying the material on the relatively thin members. If the overall thickness is low and the variability is high, a normal distribution would require a fraction of the surfaces to have negative values of fireproofing. If the thickness distribution is lognormal, the thickness cannot be zero, and there is a low likelihood of having thickness close to zero. If the underlying distribution of fireproofing thickness is lognormal, the average thickness overestimates the thickness expected to be exceeded with 50 percent probability, and the median is the appropriate statistic for the 50 percentile value.

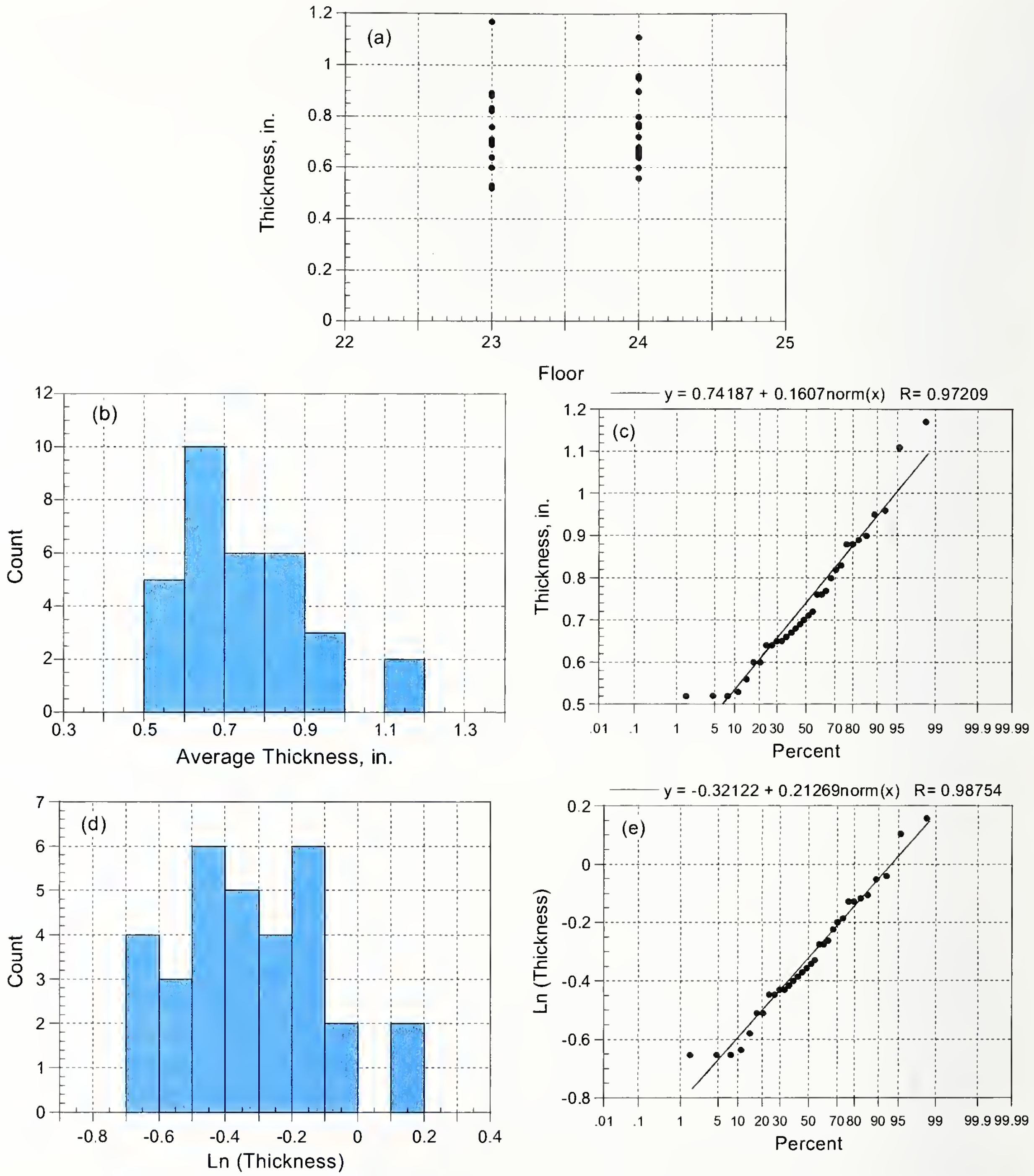

Figure I–7. (a) Dotplot of average thickness from floor trusses for floors 23 and 24, (b) histogram of average thickness, (c) normal probability plot of average thickness, (d) histogram of natural logarithm of average thickness, and (e) probability plot of natural logarithm of average thickness.

As stated, the standard deviation of the average thicknesses in Table I–2 is 0.16 in. Since each of the averages is based on six individual measurements, the variability in average thickness is less than the variability of the fireproofing thickness on a given element. If it is assumed that the true average thicknesses of fireproofing at the truss locations represented in Table I–2 are the same, it is possible to estimate the variability of individual measurements from the following well-known relationship:

$$S_{\overline{X}} = \frac{S}{\sqrt{n}} \tag{I.1}$$

where:

$S_{\overline{X}}$ = standard deviation of the average thicknesses

S = standard deviation of the individual thickness measurements

n = number of measurements to obtain the average thickness

Thus, an estimate of the standard deviation of the individual measurements is $0.16\sqrt{6} \approx 0.4$ in. Since it is unlikely that there is no difference in average fireproofing thickness at different cross sections, the standard deviation of 0.4 in. is an upper limit for the variability of fireproofing thicknesses in the non-upgraded floor trusses on the basis of the information provide in Table I–2.

Analysis of Photographs

Additional data regarding the thickness of fireproofing has been gathered by evaluating photographic evidence. Although photographic evidence of the state of the fireproofing is limited, two groups of photographs have been located and used for estimating fireproofing thickness.

The first group of photographs was provided to NIST by Morse Zehnter Associates and includes images of floor trusses from WTC 1 (floors 12, 22, 23, and 27) and WTC 2 (floor 26). From this group, only photographs from floors 22, 23, and 27 of WTC 1 were analyzed. Photographs provided by Morse Zehnter Associates were taken in the mid-1990s and illustrate the fireproofing conditions prior to the upgrade carried out by the Port Authority. Thus, fireproofing thickness on the photographed trusses should be at least 1/2 in. as specified by the Port Authority on October 1969.

The second group of photographs, taken in 1998, was provided by Gilsanz Murray Steficek (consulting engineers). This group illustrates the state of fireproofing after the upgrade program that was initiated in 1995. The photographs were of trusses for floor 31 and below in WTC 1.

Selection of which photographed trusses were used to estimate thickness of fireproofing was based on clarity of fireproofing edges and whether a feature of known dimensions was present. Thus, only photographs where reference measurements could be performed were used. The general approach to the analysis involved the estimation of distances based on the computed reference length per pixel. The procedure is summarized as follows:

- A feature of known dimension (based on construction drawings) that could be used as reference was located in the photograph. For example, the dimension of the bare vertical leg of a damper saddle was a dimension that could be obtained from shop drawings.

- In the photograph, the length of the reference dimension was measured in pixels.
- The scaling factor of length per pixel was computed by dividing the known dimension in inches by the number of pixels. For example, if the vertical leg of the damper saddle was measured as 48.2 pixels in the photograph, and it is known that the actual size of the leg was 3.13 in., the scaling factor would be 3.13 in./48.2 pixels = 0.065 in./pixel.
- Only truss webs or struts (diagonal bar at end of truss) located near and in the same plane as the reference object were selected for analysis. This selection was made to minimize error due to perspective.
- It was assumed that the fireproofing on web bars was applied evenly around the perimeter of the bar. Based on this assumption, a "virtual" centerline along the length of the bar was drawn in the photograph.
- Lines were drawn perpendicular to the "virtual" centerline. The number of pixels along the lines from the "virtual" centerline to the edge of the fireproofing was determined from the cursor positions indicated by the software. Measurements were made at regularly spaced intervals to avoid bias. Figure I–8 is an example of a series of measurements made on a strut.

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Figure I–8. Example of measurement procedure used to estimate fireproofing thickness from photographs.

- Each measurement in pixels was multiplied by the scaling factor (in./pixel) to estimate the bar radius plus fireproofing thickness.

- The radius of the bar was subtracted to provide the estimate of the fireproofing thickness.

It was observed that the estimated thickness of fireproofing in the non-upgraded floors tended to be larger for the webs of the main trusses. Hence estimates of fireproofing thickness were divided into three groups:

- Webs of main trusses,
- Webs of bridging trusses, and
- Diagonal strut at the exterior wall end of the truss.

No estimates of fireproofing thickness on top and bottom chords were possible using photographs. For the upgraded floors in WTC 1 that were included in the second group of photographs, only estimates of the thickness on the web bars of the main trusses were made. Figure I–9 (a) shows normal probability plots of the fireproofing thickness estimated from the photographs. It is seen that the points for the "upgraded" main trusses follow a generally linear trend, which indicates that the estimated thicknesses for the upgraded main trusses are approximately normally distributed. The estimated thicknesses from the non-upgraded floors, however, do not follow linear trends on the normal probability plot. Figure I–9 (b) shows normal probability plots of the natural logarithms of the thicknesses. The transformed values for the non-upgraded fireproofing now follow generally linear trends, which means that a lognormal distribution is more appropriate for the non-upgraded floors. This reinforces the observation noted in the previous section. Thus there is strong evidence that the original fireproofing thickness on the floor trusses follows a log normal distribution.

The average, standard deviation, and coefficient of variation were computed for the total number of measurements in each of these groups. The results are summarized as follows:

- Main trusses before upgrade: Average thickness 0.6 in., standard deviation = 0.3 in., and coefficient of variation = 0.5.
- Bridging trusses before upgrade: Average thickness 0.4 in., standard deviation = 0.25 in., and coefficient of variation = 0.6.
- Diagonal struts before upgrade: Average thickness 0.4 in., standard deviation = 0.2 in., and coefficient of variation = 0.5.
- Main trusses after upgrade: Average thickness 1.7 in., standard deviation = 0.4 in., and coefficient of variation = 0.2.

Port Authority Data on Upgraded Fireproofing on Trusses

As discussed in the *May 2003 Progress Report* (NIST SP 1000-3), the Port Authority provided information on fireproofing thickness from tenant alteration Construction Audit Reports prepared in 1997 to 1999. Those reports included average thicknesses of fireproofing at the "bottom of truss." In 2004, the Port Authority provided NIST reports of the individual measurements for many of the average thicknesses in the Construction Audit Reports. With the individual measurements, it is possible to investigate the

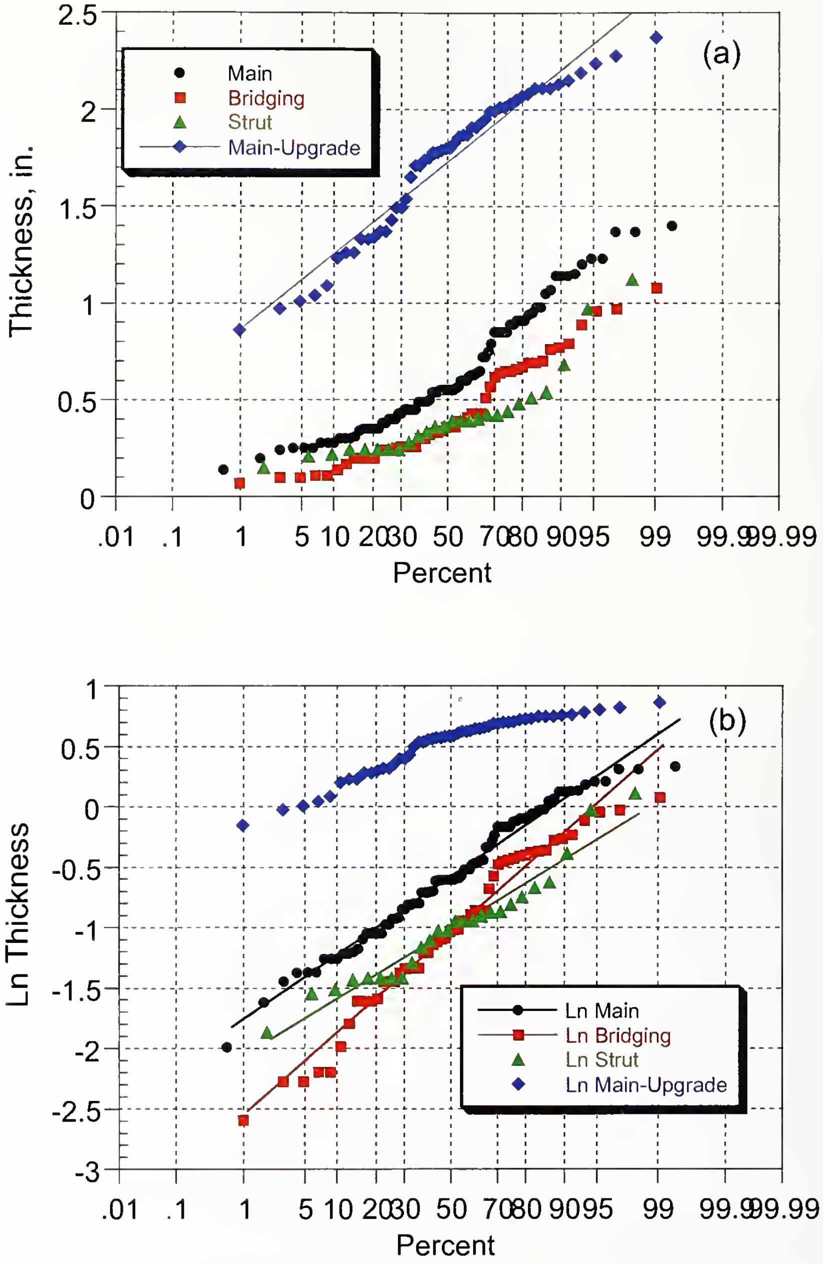


Figure I–9. (a) Normal probability plot of estimated fireproofing thickness based on photographs, and (b) normal probability plot of natural logarithms of thickness.

variation of thickness at a cross section of a truss member and the variation in average thickness from truss to truss. To permit such analyses, only those data having the same number of individual measurements at each cross section were used. This resulted in 18 data sets for WTC 1 (including floors 93, 95, 98, 99, and 100) and 14 data sets for WTC 2 (including floors 77, 78, 88, 89, and 92).

An analysis of the individual measurements was carried out to determine the underlying distribution for the measured thicknesses. Figure I–10 (a) is a dotplot of the individual measurements in WTC 1 (144 measurements) and in WTC 2 (112 measurements). It is observed that the central values and ranges are similar for the two towers, and the two groups of measurements were combined into one group. Figure I–10 (b) is the histogram of the individual measurements, and Fig. I–10 (c) is the corresponding normal probability plot. A straight line fit to the normal probability plot shows a tendency of the points to deviate from the line. Figure I–10 (d) is a histogram of the natural logarithms of the individual thickness values, and Fig. I–10 (e) is the corresponding lognormal probability plot. A comparison of the probability plots shows that natural logarithms fall closer to a straight line. Thus, it appears that the thickness of the upgraded fireproofing on the floor trusses is described by a lognormal distribution. This contradicts the observation based on analysis of photographs from lower floors discussed in the previous section. The overall average thickness of the 256 individual measurements is 2.5 in. with a standard deviation of 0.6 in. Thus, the average thickness on the upgraded upper floors appears to be greater than that estimated from photographs taken on upgraded lower floors.

The overall standard deviation of 0.6 in. includes two contributions: (1) the variation of thickness at the cross section (within-truss variability), and (2) the variation of average thickness between trusses (between-truss variability). Figure I–11 shows these two components of the thickness variability for the two towers. Figures I–11 (a) and (c) show the within-truss variability, and Figs. I–11 (b) and (d) show the variation of average thickness of each truss. From analysis of variance, it was found that the within-truss standard deviation is 0.4 in., and the between-truss standard deviation is also 0.4 in. The within-truss standard deviation of 0.4 in. is similar to the standard deviation of the estimated individual thickness obtained from analysis of the photographs of upgraded main trusses.

Column Fireproofing Thickness

NIST requested that the Port Authority provide available information on the thickness of fireproofing for the exterior and interior columns of the WTC towers. Specifically, the request included the following:

- The fireproofing material used and the thickness on the various plates comprising the exterior columns and spandrels.
- The fireproofing material used and the thickness on core columns.
- Confirmation that the wide flange column sections were protected with CAFCO BLAZESHIELD Type DC/F with specified thickness of 2 3/16 in. for sections smaller than 14WF228 and 1 3/16 in. for 14WF228 and larger.
- Information on in-place fireproofing thickness.

The Port Authority replied that, due to inaccessibility of exterior columns and core columns, there were no recent records of fireproofing thickness for these elements. The only available measurements of fireproofing thickness were for beams and columns accessible within elevator shafts. The most complete data set included measurements on beams and columns taken within shaft 14/15 in WTC 1. These measurements were taken in April 1999 and included measurements from floor 1 to floor 45. The thicknesses were recorded to the nearest 1/8 in., with a few thicknesses recorded to the nearest 1/16 in. The columns included 10 to 18 replicate measurements, and the beams included 11 to 16 replicate measurements.

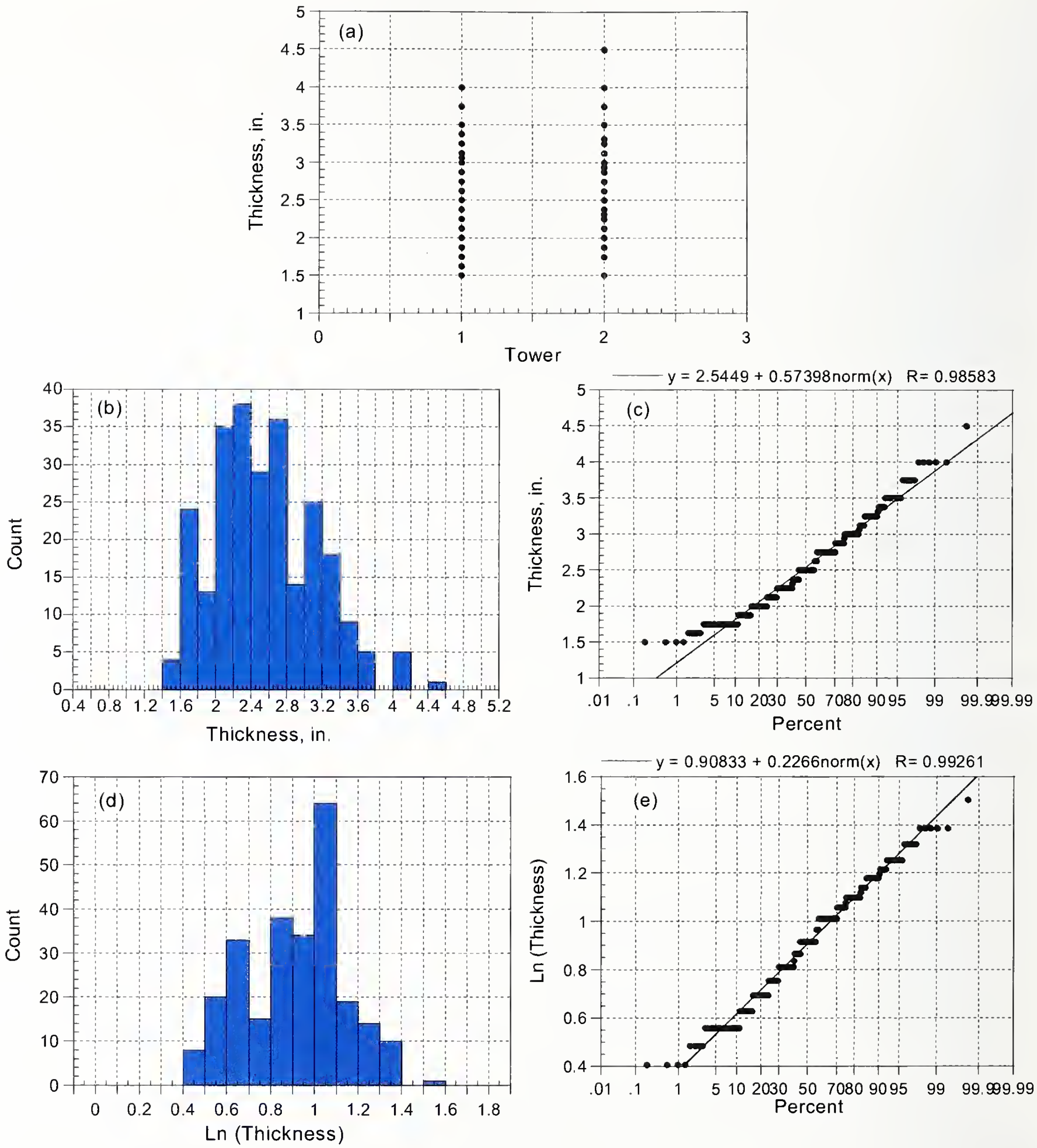


Figure I–10. (a) Dotplot of individual thickness measurements on floor trusses from Port Authority Construction Audit Reports, (b) histogram of thickness measurements, (c) normal probability plot of thickness measurements, (d) histogram of natural logarithms of thickness measurements, and (e) normal probability plot of natural logarithm of thickness measurements.

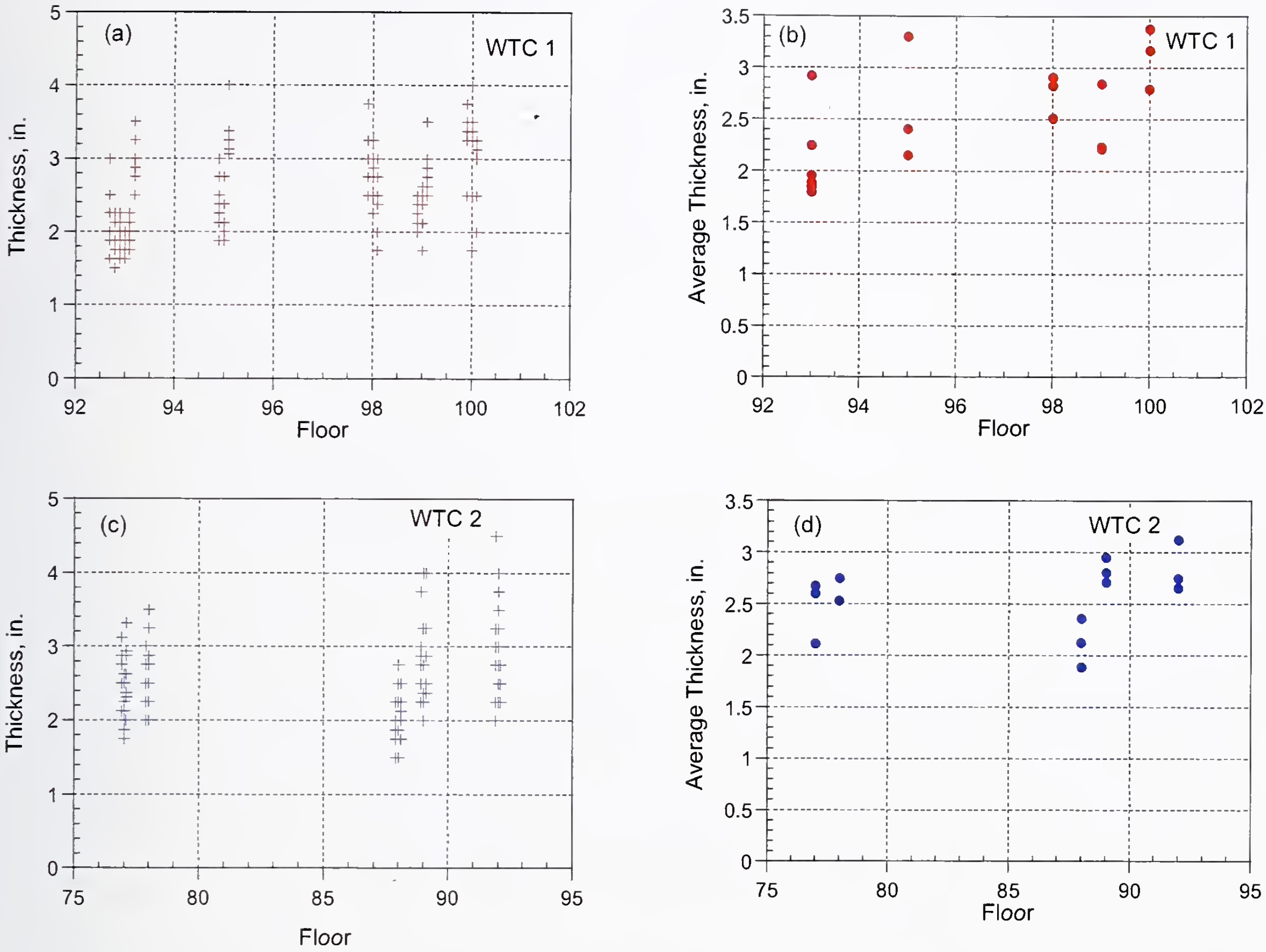


Figure I–11. Fireproofing thickness on floor trusses in upgraded portions of WTC towers: (a) individual measurements in WTC 1, (b) average thickness in WTC 1, (c) individual measurements in WTC 2, and (d) average thickness in WTC 2.

Figure I–12 (a) shows the individual and average fireproofing thickness on the core columns. Analysis of variance indicated no statistically significant differences among the average values and all data were pooled together. The average thickness for the columns is 0.82 in., the standard deviation is 0.20, and the coefficient of variation is 0.24. The information from the Port Authority indicated that the "minimum thickness required" for the columns was 0.5 in. Figure I–12 (b) is the normal probability plot of the individual thickness measurements. Because most of the thicknesses were reported to the nearest 1/8 in., the points are staggered instead of uniformly distributed. The plot, however, shows that the points follow a linear trend, and it appears that the thickness of the fireproofing on the core columns could be described by a normal distribution. Figures I–12 (c) and (d) shows the corresponding plots for the thickness of fireproofing on the beams. The average thickness for the beams is 0.97 in., the standard deviation is 0.21 in. and the coefficient of variation is 0.21. The information from the Port Authority indicated that the "minimum thickness required" for the beams was 0.75 in.

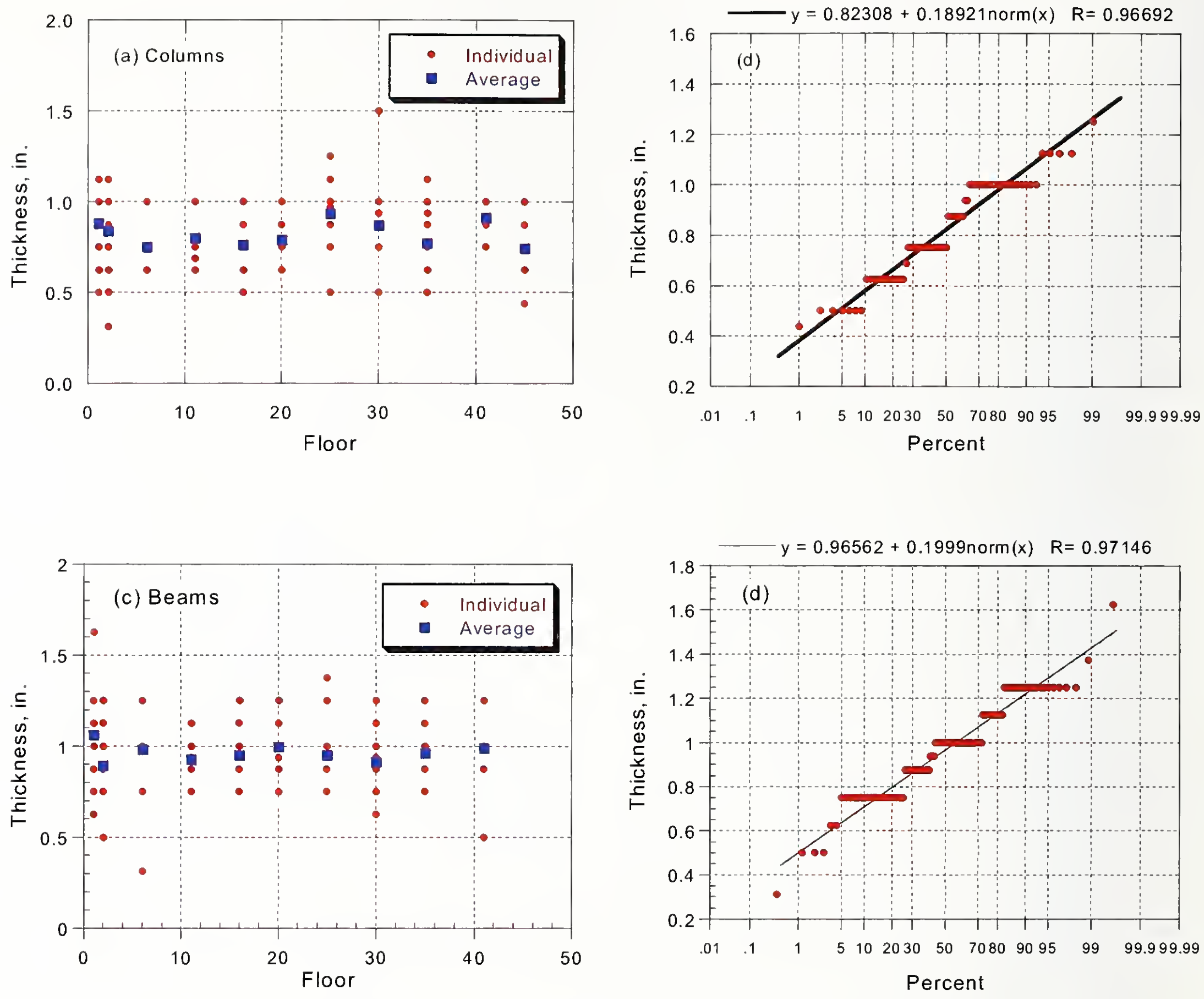


Figure I–12. (a) Individual and average thickness for core columns, (b) normal probability plot of individual measurements on columns, (c) individual and average thickness for core beams, and (d) normal probability plot of individual measurements on beams.

As might be expected, the variation in thickness of fireproofing for the beams and columns is lower than the variation observed in the floor trusses. The planar surfaces of the beams and columns result in more uniform application of the sprayed fireproofing than for the slender truss members. This results in reduced differences in the average thickness of fireproofing on different members and less variability within a member.

I.3.4 Equivalent Thickness

The sensitivity study summarized in Section I.2 indicated that variation in the thickness of fireproofing reduced the "effective thickness" of the fireproofing. It would be impractical to attempt to account for the variation in fireproofing thickness in the thermal modeling by introducing variable thickness fireproofing in the finite-element models. As an alternative, it was decided to attempt to determine the "equivalent uniform thickness" of fireproofing that would result in the same thermo-mechanical response of a member as variable thickness fireproofing. An approach similar to the methodology described in Section I.2 was used to model a 1 in. diameter by 60 in. long bar with fireproofing and subjected to the heat flux arising from a 1,100 °C fire. The bar was subdivided into 0.6 in. long elements, so that there were 100 elements along the length of the bar. The thermal history of the bar was calculated, and that history was used to calculate the length change of the unrestrained bar under a tensile stress of 12,500 psi. The bar was assumed to be similar to the steel used in the floor trusses, and the temperature dependence of the coefficient of thermal expansion and the modulus of elasticity were based on NIST measurements.

The fireproofing thickness in the models was based on the measurements summarized in the previous section for the web bars of main trusses in the original condition and after the upgrade. Specifically, the following target values were investigated:

- Original: average thickness = 0.75 in., standard deviation = 0.3 in., lognormal distribution.
- Upgrade: average thickness = 2.5 in., standard deviation = 0.6 in., lognormal distribution.

The variation of fireproofing thickness along the length of the bar was established by using a psuedo random number generator to select values from a lognormal distribution with central value and dispersion consistent with the above average values and standard deviation. Three sets of random data were generated for each condition.

When the randomly selected thicknesses of each element were applied to the bar, it resulted in sudden changes in fireproofing thickness along the length of the bar. This resulted in a "rough" surface texture as shown by the dotted thickness profile in Fig. I–13 (a). It was felt that this rough texture (see also Fig. I–1 (c) might not be representative of actual conditions, so an alternative approach was to use 5-point averaging to reduce the roughness of the fireproofing profile. The solid line in Fig. I–13 (b) shows such a "smooth" profile. The two profiles in Fig. I–13 (a) have approximately the same average value and standard deviation and have similar cumulative distribution of fireproofing thickness as shown in Fig. I–13 (b).

As stated, the calculated thermal histories of the bar elements were used to calculate the unrestrained length change of the bar due to thermal expansion and an applied stress of 12,500 psi. Work is currently underway to examine the performance of the bar under fully restrained conditions in which the induced stress history is computed. For comparison, the deformation of the bar with different but uniform thickness of fireproofing was calculated. The "equivalent thickness" was taken as the uniform thickness that resulted in similar deformation as under the variable thickness conditions. Figure I–13 (c) shows the results of these calculations for the original fireproofing. The three continuous curves are the deformation-time relationships for uniform thickness of 0.4 in., 0.5 in., and 0.6 in. The solid symbols represent the results for three cases with "rough" texture, and the open symbols are for the "smooth" texture. The following values summarize the six variable thickness profiles:

- Rough 1: average = 0.79 in., standard deviation = 0.29 in.
- Rough 2: average = 0.77 in., standard deviation = 0.27 in.
- Rough 3: average = 0.79 in., standard deviation = 0.31 in.

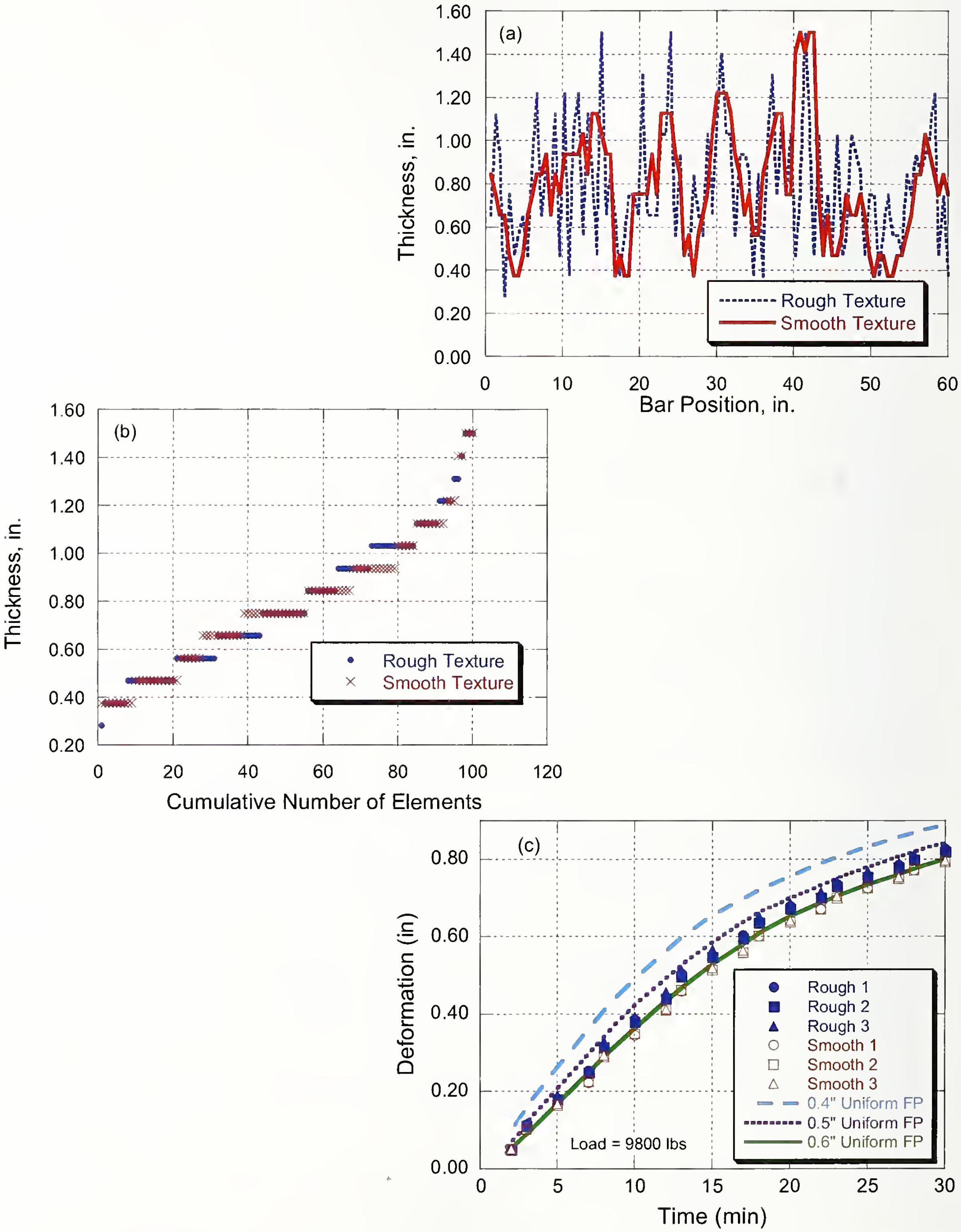


Figure I–13. (a) Randomly generated thickness profiles with average thickness of 0.75 in. and standard deviation of 0.3 in., (b) cumulative element size, and (c) deformation of 1 in. bar compared with deformation for uniform thickness of fireproofing.

- Smooth 1: average = 0.79 in., standard deviation = 0.28 in.
- Smooth 2: average = 0.78 in., standard deviation = 0.31 in.
- Smooth 3: average = 0.78 in., standard deviation = 0.32 in.

Figure I–13 (c) shows that the "rough" texture reduces the effectiveness of the fireproofing by a small amount compared with the "smooth" texture. As noted above, it is believed that the "smooth" texture is more representative of the actual conditions. On the basis of these analyses, it is concluded that fireproofing with an average thickness of 0.75 in. and a standard deviation of 0.3 in. provides equivalent protection to 0.6 in. of uniform thickness.

The results for the upgraded fireproofing are shown in Fig. I–14. Only the "smooth" texture was used, and the values for the three cases are as follows:

- Case 1: average = 2.50 in., standard deviation = 0.71 in.
- Case 2: average = 2.43 in., standard deviation = 0.51 in.
- Case 3: average = 2.55 in., standard deviation = 0.63 in.

Figure I–14 (a) shows the three profiles, and Fig. I–14 (b) shows the normal probability plots of thickness values. Because the three randomly generated profiles do not have the same averages and dispersions, the responses show more scatter than in Fig. I–13 (c). On the basis of these analyses, it is concluded that an average thickness of fireproofing of 2.5 in. with a standard deviation of 0.6 in. is equivalent to 2.2 in. of uniform thickness.

I.3.5 Thickness of SFRM for Use in Analyses

Analyses of available data on fireproofing thickness and thermal modeling revealed the following:

- From measurements of fireproofing thickness, the average values exceeded the specified thickness.
- Fireproofing thickness was variable, and the distribution of thickness in the floor trusses appears to be described best by a lognormal distribution.
- The standard deviation of fireproofing thickness on the trusses varied between about 0.3 in. to 0.6 in.
- The standard deviation of fireproofing on columns and beams from the core tended to be lower, with a value of 0.2 in. for the available data.
- No information is available on the fireproofing thickness on the exterior columns and spandrel beams.
- Variation in thickness reduces the effectiveness of fireproofing, and the equivalent uniform thickness is less than the average thickness.

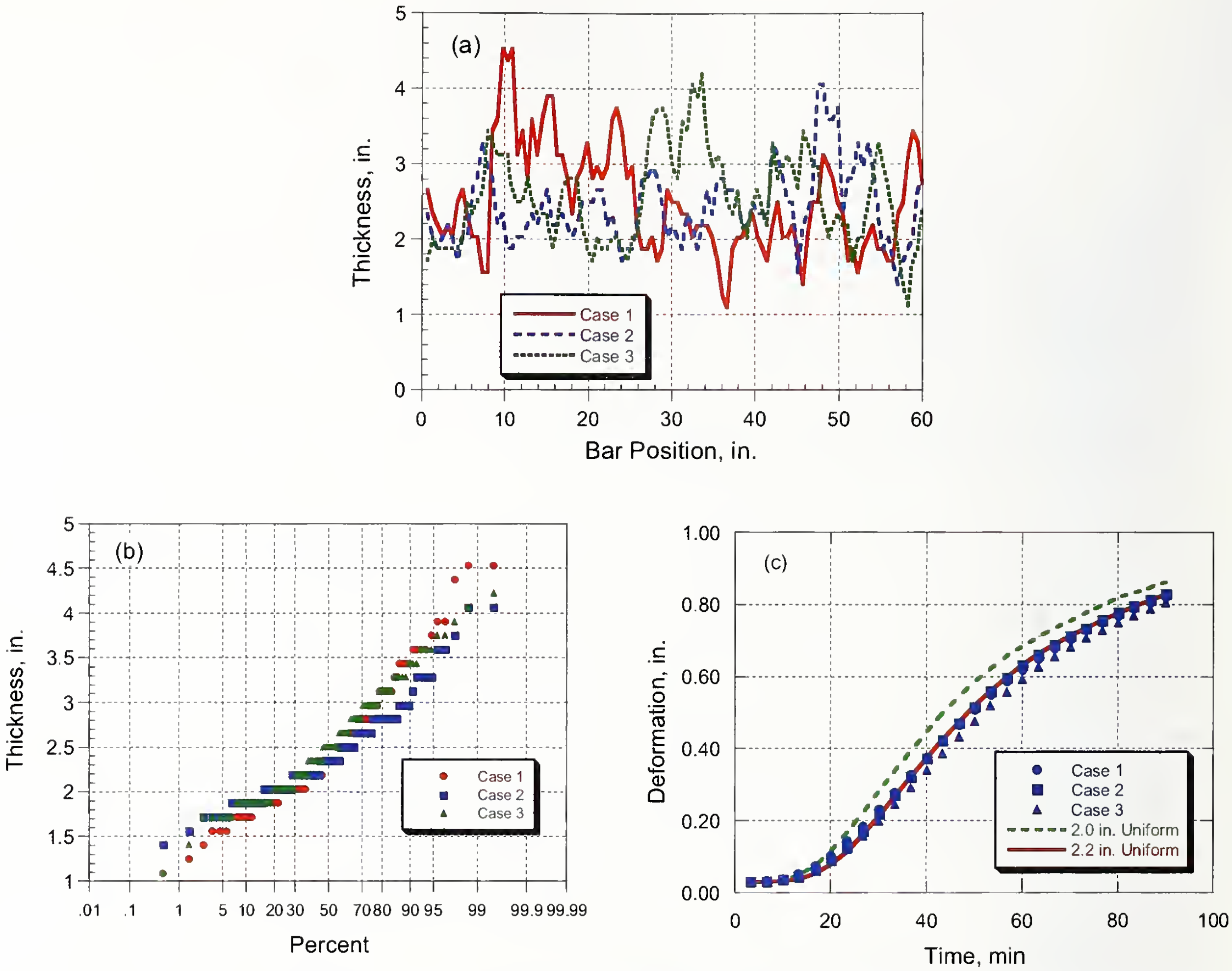


Figure I–14. (a) Randomly generated thickness profiles with average thickness of 2.5 in. and standard deviation of 0.6 in., (b) normal probability plots of thickness values, and (c) deformation of 1 in. bar compared with deformation for uniform thickness of fireproofing.

Based on the above findings, the following uniform thickness for the undamaged fireproofing will be used in calculating thermal response under various fire scenarios:

- Original fireproofing on floor trusses: 0.6 in.
- Upgraded fireproofing on floor trusses: 2.2 in.
- Fireproofing on other elements: the specified thickness.

The choice of specified thickness for those members lacking data is justified by offsetting factors as follows: (1) measured average thicknesses exceed specified values, and (2) variation in thickness reduces the effectiveness of fireproofing.

I.4 THERMAL PROPERTIES

Based on the information provided by the manufacturers, three SFRMs have been identified in WTC 1, 2, and 7: (1) CAFCO BLAZE-SHIELD Type DC/F, (2) CAFCO BLAZE-SHIELD Type II, and (3) Monokote MK-5. Of the three SFRMs, only CAFCO BLAZE-SHIELD Type II is currently sold in the U.S., and CAFCO BLAZE-SHIELD Type DC/F is sold in Canada.

CAFCO BLAZE-SHIELD Type DC/F is manufactured by Isolatek International (Stanhope, New Jersey) and was used in the interior columns, floor systems, and the exterior faces of the exterior columns of WTC 1 and WTC 2. CAFCO BLAZE-SHIELD Type II, also from Isolatek, was used in subsequent retrofit of WTC 1 floor systems. CAFCO BLAZE-SHIELD Type DC/F and Type II are portland cement-based products. Monokote MK-5 a gypsum-based SFRM, was manufactured by W.R. Grace and Co. (Cambridge, Massachusetts) and used in WTC 7. W.R. Grace stopped the production of Monokote MK-5 in the 1980s. In addition to these three SFRMs, vermiculite plasters, manufactured by W.R. Grace until the 1970s, were used on the interior faces of the exterior columns of WTC 1 and WTC 2.

To provide thermophysical property data for the modeling effort in fire-structure interaction, the thermal conductivity, specific heat and density of each SFRM were determined as a function of temperature up to 1200 °C. Tests were performed by Anter Laboratories, Inc. in Pittsburgh, PA through an open-bid contract. Anter Laboratories is an ISO 9002 certified company.

Samples of CAFCO BLAZE-SHIELD Type DC/F and Type II were prepared by Isolatek, Inc. in Stanhope, New Jersey, and sample of Monokote MK-5 were prepared by W.R. Grace and Co. in Cambridge, Massachusetts according to their respective application manuals. Since Monokote MK-5 is no longer on the market, it was specially manufactured by W.R. Grace according to the original MK-5 formulation. The samples were made from the same batch of raw material, shipped to NIST for examination and documentation, and sent to Anter Laboratories for testing. The sample is 9 in. long, 4.5 in. wide, and 3 in. thick. Three samples of each material were sent for testing. Two of them were used for the thermal conductivity measurements, and the third was used to prepare specimens for the other measurements involved.

I.4.1 Thermal Conductivity Measurements

The thermal conductivity measurements were performed according to ASTM C 1113 Test Method for Thermal Conductivity of Refractories by Hot Wire (Platinum Resistance Thermometer Technique). This test method is based on heating two specimens with a platinum wire placed between them. The thin platinum wire serves not only as a heater, but also as a temperature sensor, since the variation of its electrical resistance during the test is converted into variation of temperature. Thermal conductivity is calculated based on the rate of temperature increase of the wire and power input. It was reported that substantial shrinkage during the measurements occurred for the three materials. The two MK-5 specimens shrunk, exposing the platinum wire positioned between them. For this reason, no thermal conductivity measurement could be performed for this material at 1,200 °C. Figure I–15 (a) shows preliminary results for thermal conductivity as a function of temperature. The results show similar trends of increased thermal conductivity with increasing temperature; however, the Monokote MK-5 specimens had a different behavior than CAFCO BLAZE-SHIELD Type DC/F and Type II at temperatures above 500 °C.

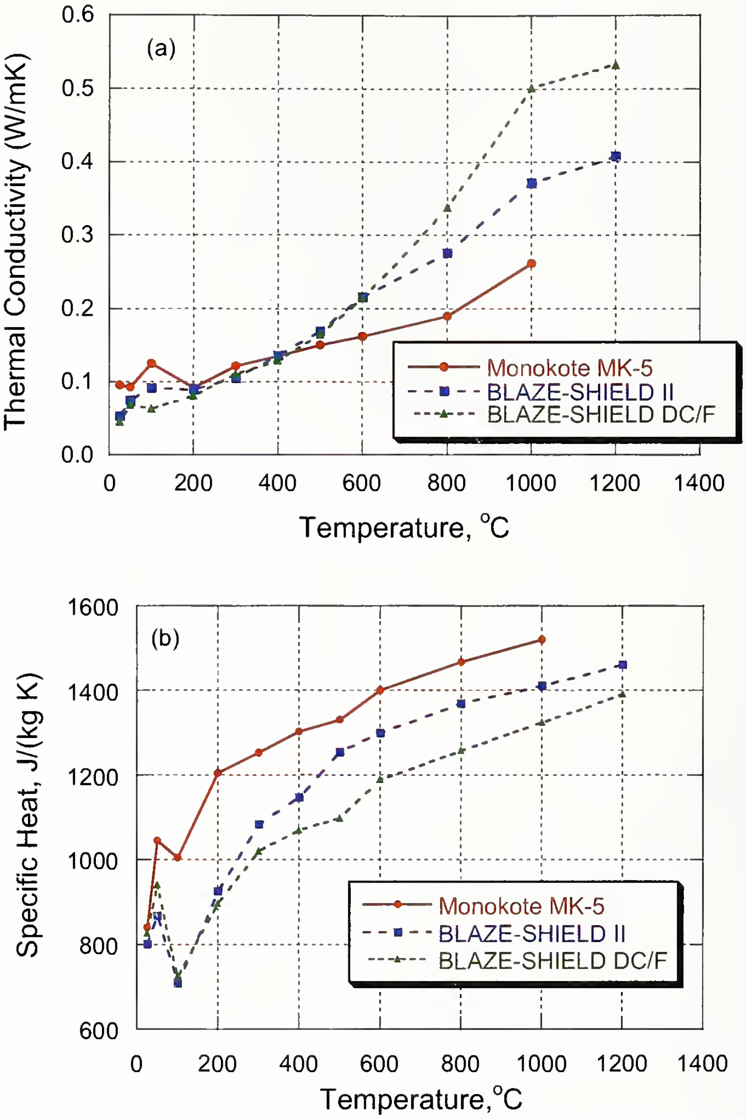


Figure I–15. Preliminary test results: (a) thermal conductivity as a function of temperature, and (b) specific heat as a function of temperature.

I.4.2 Specific Heat Measurements

For the specific heat capacity measurements, the same instrument (Unitherm Model QL-3141) was used with a slight modification. A thermocouple was added to the system and mounted on the specimen, parallel with the platinum wire at a known distance from the thermocouple. The test was performed in a similar manner as the thermal conductivity measurements, but from the thermocouple output the thermal diffusivity of the material was derived. Knowing the thermal conductivity, the thermal diffusivity, and the density calculated from the thermal expansion results and the thermogravimetric analysis, the specific heat of the material was calculated. Figure I–15 (b) shows preliminary results for specific heat as a function of temperature. It is seen that the materials had similar increasing trends with temperature, but the actual values differed.

I.4.3 Density Measurements

Densities of the samples were not measured directly (except at room temperature) but were calculated from TGA (thermal gravimetric analysis) and thermal expansion measurements. The TGA tests were performed according to ASTM Test Method E1131 using an Orton Model ST-736 TGA instrument. The thermal expansion tests were performed according to ASTM Test Method E228 using a Unitherm Model 1161 instrument. Since the materials were not isotropic, separate tests were performed for the X and Z orientations. It was assumed that the X and Y directions had the same thermal expansion. The Z direction was defined as the direction perpendicular to the fibrous strands in the specimens. The specimens were tested from room temperature to 1,200 °C at a heating rate of 2 °C/min. All of the specimens shrank during the tests and, in all cases, lost contact with the pushrod before reaching the maximum test temperature.

From the thermal expansion test results, the change in volume for each material was calculated at each temperature of interest. The density values were calculated from the results of the TGA and thermal expansion.

I.5 RESPONSE TO IMPACT

In order to estimate the extent of damage or loss of SFRM due to aircraft impact, the detailed finite element analysis of aircraft impact into the WTC towers, conducted within the framework of Project 2 of the investigation, will provide the following information:

Debris Field—A database and graphics of the major fragments of the aircraft and destroyed structural components of the towers, including their mass, approximate size, speed, and trajectory will be developed in the global analysis of aircraft impact into WTC 1 and WTC 2. The trajectory of each fragment will consist of the initial point of entry, point of exit or resting place. This debris field database will be used to estimate which areas within the impacted floors would likely have lost their fireproofing due to direct impact by debris.

Deformations and Accelerations—Estimates of accelerations and deformations, including localized effects, as a function of time on steel members in each of the two towers will be developed in the global analysis of the aircraft impact. Accelerations will be determined at representative locations on the floor truss systems and columns in the impact-affected zones of both towers (floors 93 to 98 of WTC 1 and floors 78 to 83 of WTC 2). These accelerations will be compared with the threshold values estimated from the adhesion and cohesion properties of SFRM developed in the experimental and analytical study presented below to estimate the likely extent of damage to the fireproofing on the columns and floor systems.

Preliminary results from the subassembly impact analysis of an aircraft engine into a strip of the towers with a width and height of single exterior panel (three exterior columns width and three floor height) extending all the way through the core indicate that the accelerations on the lower chords of floor trusses will need further analysis to account for high frequency vibrations and the short-duration sharp peaks in the computed acceleration time-histories and their effects on damage to SFRM. One possible approach is to low-pass filter the acceleration records to remove these high-frequency vibrations. Another approach is to develop "shock spectra" for a number of steel members with fireproofing configurations using finite element analysis to determine, for a given frequency, the acceleration amplitude that is needed to dislodge the fireproofing based on its adhesive and cohesive strength. The shock spectra will then be compared with spectra of the calculated acceleration time-histories to estimate the extent of damage to the fireproofing.

I.5.1 Mechanical Properties of SFRM

The purpose of these tests is to develop a rational basis for estimating the extent of loss of SFRM as a result of impact loads on protected members. Tests will (1) determine the mechanical properties of CAFCO BLAZE-SHIELD Type DC/F, and (2) verify models for estimating loss of fireproofing when a protected member is subjected to impact-induced vibration. The mechanical properties to be measured are:

- SFRM cohesive strength, and

- SFRM adhesive strength to steel substrates with and without primer.

The adhesive and cohesive strengths will be measured for static loads, as described below for Phase I tests. The tests will be done on 1/4 in. thick steel plate specimens, with and without primer (Tnemec Series 10 red primer), and for nominal SFRM thickness of 3/4 in. and 1 1/2 in. Specimens are fabricated and testing will be done during June and July, 2004.

From the measured strength properties, estimates will be made of the local accelerations required to damage or dislodge the SFRM, as described below. These estimates will be verified by impact tests of plates and bars covered with SFRM and instrumented with accelerometers, as described in the Phase II tests.

Phase I—Tensile Pull-off Test to Measure Adhesive Bond Strength and Cohesive Strength

Specimen—Steel plates (8 by 16 by 1/4 in.) with CAFCO BLAZE-SHIELD Type DC/F and nominal thickness of 3/4 in. and 1 1/2 in.

Pull-Off Test Procedure (see Fig. I–16)

- Using a fine-tooth saw, cut into SFRM applied to plate to obtain 2 3/4 in. square test specimens to ensure that the area resisting the applied load is well defined.

- Affix aluminum plates with two-component adhesive.

- Allow adhesive to cure.

- Measure force required to pull off the plate.

- Record load and note failure mode (cohesive, adhesive, mixed).

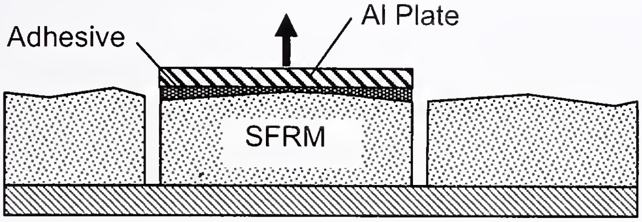


Figure I–16. Pull-off test of SFRM applied to steel plate.

If all failures are adhesive, the cohesive strength will be determined by bonding the SFRM block to a steel plate with adhesive and repeating the test.

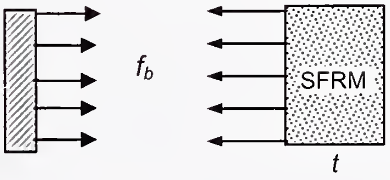
Phase II—Verification of Models to Predict Dislodgement of SFRM

Impact tests of plate and bar specimens will be done to determine the impact loads needed to produce different levels of accelerations. Plates and bars with SFRM will be subjected to different levels of impact until the SFRM is dislodged. Two simplified models will be used to estimate the relationships between material strengths and impact required to dislodge the SFRM. Model predictions will be compared with test results.

CASE 1: Planar Element

The simplified model considers the substrate and SFRM as rigid bodies. The SFRM would dislodge when the inertial force exceeds the smaller of the adhesive bond strength or cohesive strength. Figure I–17, shows the free body of the fireproofing being acted upon by its inertial force and the adhesive force. The acceleration to dislodge the SFRM is:

$$a = \frac{f_b}{\rho\, t} \qquad \text{(I.1)}$$



Inertial Force Equilibrium

$$F = m\, a$$

$$f_b A = \rho\, A\, t\, a$$

$$a = \frac{f_b}{\rho\, t}$$

A = area of SFRM

t = thickness of SFRM

ρ = density of SFRM

f_b = bond or adhesive strength

Figure I–17. Derivation of acceleration to dislodge SFRM from planar substrate.

where:

f_b = bond or adhesive strength

t = thickness of SFRM

ρ = density of SFRM

For example, for an SFRM with cohesive and adhesive strength of 150 psf, a density of 15 pcf, and an applied thickness t = 1 in., we would find that a = 119g, where g is the gravitational acceleration. This shows that acceleration on the order of 100g would be required to dislodge this SFRM from a planar surface.

CASE 2: Encased Round Element

Again, a rigid body model is used. In this case, the SFRM would mobilize its cohesive tensile strength, f_t, and adhesive bond strength, f_b. Figure I–18 shows the derivation for the relationship between material strengths and acceleration to dislodge the SFRM from a round bar. The required acceleration is as follows:

$$a = \frac{4 f_t (d_0 + (\alpha - 1) d_i)}{(d_0^2 - d_i^2) \rho \pi} \tag{I.2}$$

where:

f_t = cohesive tensile strength of SFRM

d_0 = outside diameter of SFRM

Inertial Force Equilibrium

$$\text{Mass} = m = \pi \frac{(d_o^2 - d_i^2)}{4} \rho$$

$$F = f_t (d_o - d_i) + f_b d_i$$

$$\text{Let} \quad f_b = \alpha \, f_t$$

$$F = f_t (d_o + (\alpha - 1) d_i) = \pi \frac{(d_o^2 - d_i^2)}{4} \rho \, a$$

$$a = \frac{4 f_t (d_o + (\alpha - 1) d_i)}{(d_o^2 - d_i^2) \rho \pi}$$

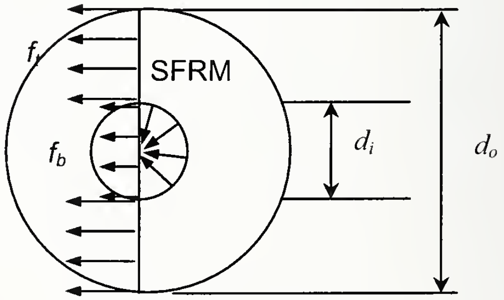


Figure I–18. Derivation of acceleration to dislodge SFRM surrounding a round bar.

d_i = steel bar diameter

α = Rrtio of bond strength to cohesive strength of SFRM

ρ = Ddnsity of SFRM

For example, if the steel bar has a diameter of $d_i = 1$ in., the SFRM has an outside diameter of $d_0 = 2$ in., a density $\rho = 15$ pcf, a cohesive tensile strength of $f_t = 300$ psf, and a bond strength to cohesive strength ratio of $\alpha = 0.5$, we would find that an acceleration of a = 152g is required to dislodge the SFRM from the bar.

I.6 SUMMARY

This appendix has focused on conditions of the fireproofing (or SFRM) in the WTC towers before and after aircraft impact. Results of simplified finite-element simulations of heat transfer under fire conditions have shown that variability in thickness of fireproofing reduces the effectiveness of the fireproofing so that protection is less than implied by the average thickness of the fireproofing. As a result, the NIST-led investigation sought available information on the in-place condition of the SFRM used in the WTC towers. Limited information was provided by the Port Authority in the form of thickness measurements taken at various times during the 1990s. Additional information was obtained from photographs of floor trusses provided to NIST. Analysis of the data indicated that fireproofing thickness was variable, as would be expected for application to floor truss members with small cross sections. Based on analyses of the available data, the following values were taken to be representative of the SFRM thickness on the floor trusses:

- Original SFRM: Average thickness of 0.75 in. with a standard deviation of 0.3 in. (coefficient of variation = 0.40)
- Upgraded SFRM: Average thickness of 2.5 in. with a standard deviation of 0.6 in. (coefficient of variation = 0.24)

Based on finite-element simulations of a 1 in. round bar covered with SFRM having lognormal distributions for thickness that are consistent with the above values, it is concluded that the original fireproofing on the floor trusses is equivalent to a uniform thickness of 0.6 in. and the upgraded fireproofing is equivalent to a uniform thickness of 2.2 in.

No information is available on in-place conditions of the fireproofing on the exterior columns and spandrel beams, and little information is available on the conditions of fireproofing on core beams and columns. In subsequent thermal analyses, the fireproofing on these elements will be taken to have uniform thicknesses equal to the specified values. This assumption is believed to be justified by the offsetting factors of measured average thicknesses tending to be greater than specified thicknesses and the reduced effectiveness of a given average thickness of fireproofing due to thickness variability.

Another objective of this appendix is to review the methodology that will be used to estimate how much of the SFRM may have dislodged as result of aircraft impact. Simple static models have been developed for an order of magnitude estimate of the acceleration that would be required to dislodge the SFRM. Based on these models and assumed, but representative, values of density and strength (adhesive and cohesive), it is estimated that acceleration on the order of 100g to 150g (where g is the acceleration due to gravity) would be needed dislodge the fireproofing. Additional analytical studies will be conducted to account for dynamic effects, and tests will be performed to verify these predictions.