tyco / Fire & Security

NFPA 101 Life Safety Code Seminar
5th ~ 6th November 2002

Tyco Fire & Security - An Overview

Tyco Fire & Security (TFS), one of the major business units of Tyco International Ltd, designs, manufactures, installs and services electronic security systems and fire protection, detection and suppression systems. With $10 billion in annual sales and more than 100,000 employees, Tyco Fire & Security includes more than 60 brands which are represented in over 100 countries. Our products are used to safeguard firefighters, prevent and fight fires, deter thieves and protect people and property.

In Asia, Tyco Fire & Security Asia (TFS Asia) offers governments, businesses, and individuals with total solutions to their business, protection and security requirements. We supply a wide range of fire, security and safety products. TFS Asia also provides maintenance and support services, helping customers protect and secure their assets and investments.

We have an extensive network of operational and business units in the region with over 15 business units in Singapore alone. Among them are Indeco Engineers, Tyco Integrated Systems and Tyco Services Singapore.

Indeco Engineers

Indeco Engineers is a premier name in facilities and vehicles management services. Established in 1983, Indeco Engineers was the first facilities and vehicles maintenance and management service provider to the Civil Aviation Authority of Singapore at the Changi International Airport.

Today, the Singapore based company has branch offices in Brunei, India and Thailand. The company is certified under the ISO Quality Scheme, and provides a comprehensive range of maintenance management services for buildings and complexes and vehicles and equipment.

With Tyco's recent acquisition of Shanthi Electromaintenance Ltd, a long standing property and facilities management company in India, Indeco's operation in the country further spans Bangalore, Chennai, Hyderbad, Cochin, New Delhi, Mumbai, Pondicherry, Kolkata and Pune.

Indeco has technical expertise in services such as consultation and management, engineering services, general housekeeping, security (automated), energy management, amusement ride equipment, indoor air quality management, maintenance audit, automotive engineering and specialist equipment engineering.,

Fast Facts
(Singapore & Brunei Operations)

Sales Turnover		(S$)
FY2002	:	96.6 million
Organization		
No. of employees	:	750

Furthermore, Indeco has the capability to develop and implement a tailored facilities and vehicles management service package for its clients, helping them to realize key corporate objectives such as cost reduction and performance improvement. The company enhances its services by utilizing an in-house developed software - Indeco Maintenance Management System (IMMS) - to support its operations. The system defines the maintenance standards, procedures, resource and spares management and engineering analysis.

Some of Indeco's ongoing projects are:

Facilities Management – Changi Airport Terminal 1 Headquarter Buildings of Singapore Tourism Board; Ministries of Education, Foreign Affairs and Home Affairs; SATS' Air freight Terminal 5 & 6; Temasek Polytechnic, over 3,000 military buildings under North and South zones

Vehicle & Equipment Maintenance – Fire engines; hovercrafts; aircraft refuellers; ambulances; military vehicles; police patrol cars; taxis; team park rides; etc.

Tyco Integrated Systems

Tyco Integrated Systems (TIS) was known as Philips Projects prior to joining the Tyco family in July 2000. TIS specializes in the design and installation of integrated electronics solutions especially in the areas of communications, traffic, integrated security systems, and environment control. The company's turnkey capabilities allow it to oversee major projects from evaluation and design to implementation and installation to operation and maintenance.

TIS's expertise lies in its capability to implement total solutions for complex security requirements. The company has been providing major governmental agencies and corporate institutions with complete security management systems. These are fully network integrated security systems encompassing access control, digital video recording, CCTVs, etc. that helps these organizations protect lives and assets and secure valuable information and data.

TIS is also uniquely equipped to provide a full range of traffic management solutions and services. The company's complete motorway management systems help cities' traffic management authorities to maintain smooth flow of traffic and ensure safety of motorists. Some of these solutions are electronic road pricing, urban traffic management and control systems, highway emergency telephone systems, over-height vehicle detection systems, automatic vehicle location systems, car park management, traffic controller, environment monitoring and variable message signs.

Fast Facts

		(S$)
Sales Turnover		
FY2002	:	60 million
Organization		
No. of employees	:	120

An ISO 9001 certified company, TIS is outfitted with the technology, experience, plus research and development support to bring to you tomorrow's safety and transport solutions today.

Tyco Services Singapore

Tyco Services Singapore (TSS) was established in 1969, under the name of Fire Control (Asia). In 1972, the name was changed to Wormald International to reflect its new owners and the company's international ties. Tyco acquired Wormald in 1994 and in August 1999, the company was officially named Tyco Services Singapore to reflect its goal to become the leading fire and security service provider in Singapore.

TSS offers total service solutions and turnkey packages in fire protection, detection, security, mechanical, electrical and instrumentation services. The company is able to draw upon Tyco's global capabilities, experience and resources to tackle large scale, complex projects such as total fire and security protection for offshore platforms, resource plants or high-rise developments.

The experience gained from having taken on a diverse range of major projects has earned TSS the reputation of being a market leader in fire and security solutions.

TSS's major markets lies in petrochemical, industrial, power generation, offshore, marine, airports, aircraft hangers, government bodies, hotels, residential buildings, shopping complexes and retrofits.

Fast Facts

Sales Turnover		**(S$m)**
Maintenance	:	9,331
ACMV	:	.6,500
Fire	:	26,000
Marine	:	5,000
Products	:	15,000
Total	:	**48,331**

Organization		**(No. of staff)**
Engineers/Foreman	:	165
Technical Support	:	35
Admin Support	:	32
Service & Maintenance Engineers & Technicians	:	130

- ##### -



International Standards:

LPCB

Factory Mutual System

UL Working for a safer world

NFPA® INTERNATIONAL

tyco / Fire & Security
Tyco Fire & Security Asia
www.tycoasia.com

Country: **ASIA**

Fire Extinguishers & Products

Fire Products

Fire Extinguishers
- Test, Rag & Tag
- Sell
- Rent
- Manufacture / Tyco brand by 3rd Party

Pre Engineered System
- Hood / Restaurant / Kitchen / Bus / Vehicle
- System Sales
- Test / Maintenance
- Hood Cleaning

Safety Products

Emergency Lights/Signs
- Sales
- Test / Maintenance

Safety Equipment
- Sales
- Maintenance / Test
- Manufacture / Tyco brand by 3rd Party

Electrical Products
- Electrical Products

Fire Protection

Special Hazard

Gas Extinguisher System
- Inergen
- High Pressure CO2 / Low Pressure CO2
- FM200
- Nitrogen
- Argon

Special Protection
- AFFF / Protein / Alcohol Resist Foam System
- High Expansion Foam System
- Dry Chemical System

Fire Sprinkler/Wet Systems

Wet Systems
- Sprinkler / Wet / Preaction / Dry
- Deluge / Spray
- LPG / LNG Sphere Protection
- Residential
- Watermist

Hydrants/Hosereel/Stand Pipe/ Risers

Fire Alarm & Detection

Fire Alarm

Fire Alarm & Detection
- Residential
- Addressable
- Conventional
- Release Panel
- Network System
- Linear Heat / Fiber Optic
- Gas
- Heat / Smoke / Flame / CO2
- VESDA
- Pull Station / Callpoints
- Ancilliaries
- Voice Alarm

Data / Structural Cabling

Leak Detection (Trace Tech)
- Heat Tracing

Nurse Call System
- Nurse Call System

Transportation

Traffic Control

Urban Traffic Control
- SCATS
- Controllers (PSC / Data)
- Count Down Indicator
- Traffic Data Collection Classification
- Speed & Red Light Enforcement Camera
- Zebra Crossing Equipment
- LED Traffic Lantern

Parking System

Electronic Road Pricing

Information Display System (IDS)
- FIDS
- Variable Message Sign
- Terminal System
- Smart Bus Priority System

Motorway Management System
- Emergency Telephone
- Overweight Vehicle Detection
- Weigh in Motion
- Tolling
- Static Weighing
- Video Incident Detection
- Surveillance Systems
- Automatic Vehicle Location
- Variable Message Signs

Tunnel Management System
- Plant Monitoring & Control
- Air Monitoring
- Ventilation Control
- Lighting Control
- Control System (SCADA)

Public Lighting
- Apron Lighting
- Tunnel Lighting
- High Mast Lighting
- Stadium Lighting

Integrated

Access Control
- Access Control

Video Network (CCTV)

Video Network Solution
- CCTV
- MATV
- Video Wall
- Video Detector
- AutoScan (Apartment, Office, Fireman)

Commercial Burglar Alarm
- Perimeter / Border Protection

Public Address/Communication
- Public Address
- Conference Systems
- Sound Reinforcement Systems
- PABX
- Microwave Link System

Others - TIS

X-Ray Screening
- Industrial X-Ray

Control System
- Building Automation
- DCS / SDS / FSG Systems

Security

Event Monitoring (ANSC) *
- Burglar / Intrusion
- Fire
- ATM Machines
- Freeze / Heat
- Leak
- Two-way voice
- Key Holding
- Video
- Tagging (Baby, Goods)
- Panic Buttons
- Duress
- Medical Emergency
- Critical Condition
- Flood Detection
- Temperature
- Industrial Process
- GPS (Vehicle Tracking)

Commercial Security (O/S or ADSC) *
- Commercial Security

Article Surveillance
- Electronic Article Surveillance
- Radio Frequency Identification
- Point of Sales Surveillance
- Source Tagging

Cash Transit
- Cash in Transit

Cash Processing
- Cash Collection
- Foreign Currency
- Coin Collection / Sorting
- ATM Service

Guarding
- Manguarding / Alarm Response / Patrol

*** These are commercial security.**

Mechanical & Electrical

Electrical

Electrical & Instrumentation
- Lighting
- Fibre Optic Splicing & Terminal
- Telephone / Data
- Generator Installation / Service
- HV Overhead Transmission
- Thermographic Inspection
- Calibration Service
- HT/LT Transformers
- Switch Yard
- Tray and Racking
- Earthing & Equipotential Earthing
- UPS System
- Analyser Housing
- Motor Starters
- Underground Ductbanks

Special Protection
- Lightning Protection
- Cathodic Protection

Mechanical
- HVAC
- Plumbing
- AC Equipment Service
- Gas Turbine Compressor
- Boiler Management System
- All Rotary Equipment
- All Static Equipment

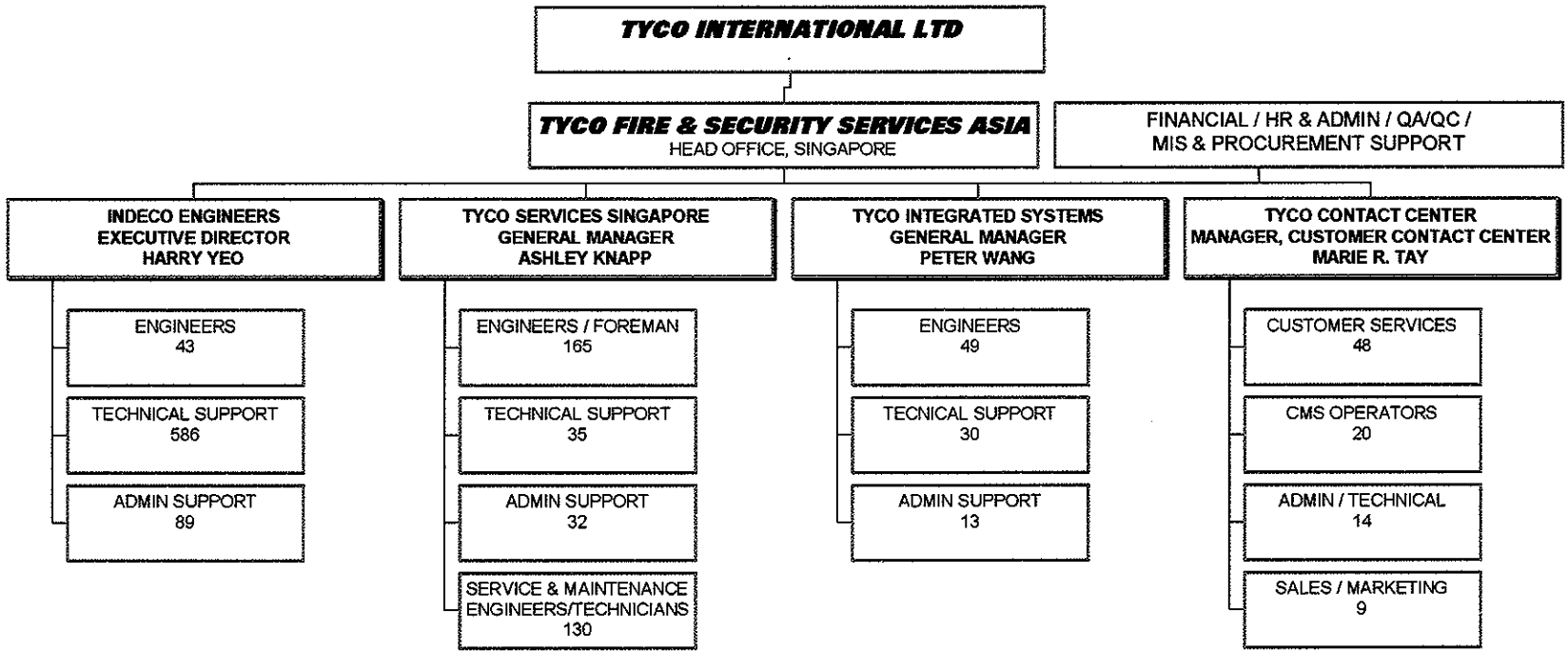
Facility Management

Facility Management

Access Control
CCTV
Electrical & Mechanical
General Maintenance
HVAC
Specialised Services
Vehicle Fleet Management
Vehicle Fleet Maintenance
Building Maintenance
Civil Engineering Works
Plumbing & Sanitary Systems
Fire Detection & Protection
Biomedical Equipment
Janitorial Services
Security Services
Waste Disposal Services
Landscaping
Car Park Management
Specialist Vehicle Retrofitment
Specialist Equipment Fabrication
Amusement Rides O&M
Computerised Maintenance Management
Airport Crash Trucks
Domestic Fire Trucks
Fire Crew Apparels
Golf Course Maintenance Equipment
Golf Course Buggies
Golf Course Lighting
Light Trucks & Vans
Ambulances
Alarm Monitoring System
Control Room Management
Instrumentation Maintenance
MATV
Master Clock System
Parking System
X-ray Systems
Analytical Systems
Electron Microscopes
HT/LT/Gen
PABX
Stadiums
Conference System
Intercommunication System

TYCO SINGAPORE

Organisation Chart



1 November 2002

tyco SINGAPORE SERVICES PTE LTD

SCHEDULE OF COMPLETED PROJECTS FOR THE LAST THREE YEARS - ELECTRICAL WORKS

	NAME OF PROJECT AND LOCATION : SINGAPORE	FULL NAME AND ADDRESS OF CLIENT	NATURE OF CONTRACT	CONTRACT VALUE	PERIOD OF CONTRACT
1	Package 1 Nanyang Polytechnic Project - Ang Mo Kio Ave 8	JDC-Kim Seng Heng J V 173B Thomson Road, S'pore	Electrical Works	S$14.5M	Jun 96 - Feb 99
2	Package 4 Suntec City Office Towers 1 & 2, Temasek Boulevard	Hyundai-Ssanyong Engineering 800 Thomson Road. S'pore	Electrical Works	S$26.10M	Jun 92 - Sep 95
3	Package 3B Office Towers 5, Suntec City, CEC and Retail Podium	Hyundai-Ssanyong Engineering 800 Thomson Road. S'pore	Electrical Works	S$54.5M	Jun 92 - Dec 94
4	Package 5 Suntec City Tower 3 & 4 Temasek Boulevard	Hyundai-Ssanyong Engineering 800 Thomson Road. S'pore	Electrical Works	S$23.3M	May 95 - May 97
5	JTC Factory IBM 2 Project - Cleanroom Eunos Link / Kaki Bukit Ave 1	Meissner & Wurst (S) Pte Ltd 25 International Business Park #02-01 German Centre S609916	Electrical Works	S$2.5M	Sep 96 - Jan 97
6	Instrumentation Works - B241 Varg-Field Development	Far East Levingston Shipbuilding Ltd, 50 Gul Road, S'pore 629351	Instrumentation Works	S$1.2M	Mar 97 to Oct 97
7	Electrical & Instrumentation Works - B244 Vessel Conversion Keppel Fels. 31 Shipyard Road, Singapore	Far East Levingston Shipbuilding Ltd, 50 Gul Road, S'pore 629352	Electrical & Instrumentation Works	S$0.97M	Sep 98 to Dec 99
8	Meark Supply Vessels H228, 233 and 234	Keppel Singmarine Dockyard P.L. 55 Gul Road, S'pore 629353	Electrical & Instrumentation Works	S$2.2M	Mar 99 to Dec 99
9	Merk Project Singapore	Andover Controls	Electrical, Fire Protection & Instrumentation Works	S$3.2M	Sep 98 to Dec 00
10	Mobil Refinery	Asia Badger	Elecrical & Instrumentation Works	S$12.0M	1993 to 1994

tyco *SINGAPORE SERVICES PTE LTD*

SCHEDULE OF COMPLETED PROJECTS OVER THE LAST THREE YEARS - FIRE PROTECTION

SN	TYPE OF PROJECT	SUBCONTRACT VALUE	PROJECT NAME	CONSULTANT	CLIENT/CONTACT NO.	COMMENCEMENT /COMPLETION DATE FROM	TO
1	FIRE FIGHTING AND FIRE ALARM SYSTEM	S$2.0M	SASCO	DESIGN TEAM	KOH BROTHERS BUIDLING TEL: 742 2242	Apr-93	Oct-97
2	FIRE FIGHTING AND FIRE ALARM SYSTEM	S$6.0M	NEW KK HOSPITAL	-	SSANGYONG ENGINEERING & CONSTRUCTION TEL:3361255 PARK YONG CHANG	Aug-94	Jul-97
3	AUTOMATED FIRE ALARM AND SPRINKLER SYSTEM	S$7.0M	TAN TOCK SENG HOSPITAL	-	SSANGYONG - GUAN HO JV TEL:336 1255/PARK YONG CHANG	May-95	Dec-97
4	FIRE PROTECTION SYSTEM	S$2.0M	TECH SEMICONDUCTOR WAFER PLANT PHASE II	-	M & W ZANDER (S) PTE LTD EL:562 9500	Nov-95	Mar-98
5	FIRE FIGHTING AND PROTECTION INSTALLATION	S$1.0M	CARGO AGENTS BLDG "E"	PARSONS BRINCKERHOFF TEL:5339595	SINGAPORE PILING & CIVIL ENGINEERING PTE LTD TEL: 235 5088/CHI KEAT SUNG	Aug-96	Dec-97
6	SPRINKLER SYSTEM	S$3.0M	KRANJI RACECOURSE	INDECO CONSULTANTS TEL:299 7166/LEK SIANG HWA	SSANGYONG - GUAN HO JV GUAN HO CONSTRUCTION TEL: 3361255/PARK YONG TCHANG	Apr-97	Dec-99
7	FIRE PROTECTION SYSTEM	S$3.3M	MEGA EXHIBITION	OVE ARUP & PARTNERS TEL:298 3033/CLARA CHOO	HYUNDAI ASIAN TECHNICS TEL:250 0583/ T M PARK	Dec-98	Sep-99
8	FIRE PROTECTION SYSTEM	S$1.1M	CUPPAGE CENTRE	SQUIRE MECH TEL: 334 6233/ALFRED CHENG	SATO KOGYO CO LTD TEL:336 7333/TAN POH TECK	Jan-97	Sep-99
9	FIRE PROTECTION SYSTEM	S$1.2M	BEDOK WAREHOUSE	-	OHIN CONSTRUCTION TEL: 454 1055/DAVID LEE	Oct-97	Oct-99
10	FIRE PROTECTION AND FIRE ALARM SYSTEM	S$1.7M	TUAS 'A' BOILER POWER STATION	-	ASIA PROJECTS ENGRG PTE LTD TEL: 268 9511/M. T. LIM	Apr-97	Sep-00
11	FIRE SPRINKLERS	S$ 6.1M	TERMINAL 1 RETROFIT	CIVIL AVIATION AUTHORITY OF S'PORE TENG KOK HENG/Tel: 541 2193	CIVIL AVIATION AUTHORITY OF S'PORE TENG KOK HENG/Tel: 541 2193	Feb-98	Aug-00
12	DELUGE, ALARMS	S$ 1.4M	RIFILE RANGE	-	MINISTRY OF DEFENCE JOHNSON LIM M.K/Tel: 373 3586	Feb-99	Sep-00
13	FM-200 SYSTEMS	S$0.072M	TERMINAL 1, S'PORE CHANGI AIRPORT	-	CIVIL AVIATION AUTHORITY OF S'PORE TENG KOK HENG/Tel: 541 2193	Aug-00	Jan-01
14	SPRINKLERS, ALARMS, AND VESDA SYSTEM	S$0.42M	MCI WORLDCOM SWITCH NO..2	DSCO 400 Orchard Road, #22-05 Orchard Towers, S'pore 238875 Tel: 738 0116	MKI INTERNATIONAL PROJECT MANAGEMENT PTE LTD	Sep-00	Feb-01
15	INERGEN SYSTEM	S$0.27M	TIGER BREWERIES	-	ASIA PACIFIC BREWERIES 459 JLN AHMAD IBRAHIM, S'PORE 639934, PSA BUILDING TAN ENG CHUAN/Tel: 861 8200	Aug-00	Jul-01
16	ALARMS, BAS, SECURITY	S$2.0 M	MERCK PROJECT SINGAPORE	SQUIRE MECH PTE LTD Tel:334 6233	ANDOVER CONTROLS CORP. ABDUL RASHID KARYEO Tel : 792 5255	Sep-98	Feb-01
17	FIRE ALARM AND PROTECTION SYSTEM	S$0.34M	SMRT - DIESEL POWERED LOCOMOTIVES AND RAIL TRACK MAINTENANCE	-	Singapore MRT Ltd **Wong Yong Siew/Tel:459 3366**	Apr-00	Apr-01
18	INERGEN SYSTEM	S$0.064M	HONGKONG SHANGHAI BANK CORPN AT 182 CLEMENCEAU AVENUE	-	DELUGE FIRE PROTECTION (S.E.A) PTE LTD No.3 Joo Koon Crescent S'pore 629008 William Chan/Tel: 862 3688	May-01	Jun-01

INDECO ENGINEERS (PTE) LTD
EXPERIENCE AND TRACK RECORD OF CONTRACTOR
CURRENT CONTRACTS - FACILITIES MAINTENANCE

Description of contract	Name & Address of Organization/client	Value of Contract	Contract Period (Commencement & Completion Date)
Maintenance, minor works, servicing and repair of mechanical and electrical systems and facilities at Seletar Airport, Lorads Complex, Cargo Agents Complex, Pualu Tekong Kechil, Pulau Ubin and St John Island and Ancillary buildings at Singapore Changi Airport	**Civil Aviation Authority of Singapore**	$24.5M	01-Sep-97 to 31-Aug-2003
Maintenance, minor works,servicing and repair of mchanical and electrical systems and facilities at Terminal 1, Control Tower, Electrical Substations, Singapore Changi Airport	**Civil Aviation Authority of Singapore**	$33.5M	01-Sep-97 to 31-Aug-2003
Maintenance of M & E systems at Parliament House	**CPG Facilities Management Pte Ltd**	$2.4M	10-Oct-02 to 09-Oct-05
Maintenance, repair and minor works of M&E services, building and other facilities management at SIA Training Centre & Computer Centre	**SIA Properties Ltd**	$2.1M	01-Jul-2000 to 30-Apr-03
Term contract for the maintenance services of Mindef Controlled Properties in North Area Zone B of Singapore	**Defence Science & Technology Agency**	$13.8M	01-July -00 to 30-Jun-03
Sub-contract for the management and control of SAF Training Land in North Area Zone A of Singapore	**Esmaco Pte Ltd**	$1.1M	01-Jul-2000 to 30-Jun-03
Term contract for the maintenance and electrical systems at the Ministry of Education Building at North Buona Vista Road	**PWD EMS Pte Ltd**	$1.74M	29-Aug-2000 to 28-Aug-03
Term contract for the Maintenance of the systems and facilities of Tourism Court	**Singapore Tourism Board**	$2.1M	01-Jan-2001 to 31-Dec-03
Term contract for the maintenance of mechanical and electrical systems at the Ministry of Foreign Affairs Building	**PWD EMS Pte Ltd**	$1.68M	01-May-2001 to 30-Apr-04
Term contract for the maintenance services of Mindef Controlled Properties in South Zone of Singapore	**Defence Science & Technology Agency**	$27.85M	01-May-2001 to 30-Apr-04
Term contract for the maintenance of mechanical and electrical systems at the Ministry of Home Affairs Headquarters (Sector A)	**Singapore Police Force**	$2.28M	23-Jul-2001 to 22-Jul-04
Term contract for Maintenance of Mechanical & Electrical Systems at The Health Promotion Board for a period of 3 years	**PWD EMS Pte Ltd**	$2.85M	01-Mar-02 to 28-Feb-05
Maintenance, repairs and minor work of mechanical and electrical services and building and other facilities management for SATS Airfreight Terminal 5 & 6	**SATS Airport Services Pte Ltd**	$5.28M	1-Apr-02 to 31-Mar-05
Three Year Term Contract for the Maintenance of Power Distribution System At Sengkang & Punggol LRT Stations & Depot.	**SBS Transit Ltd**	$2.5M	23-Aug-02 to 22-Aug-05
Three Year Term Contract For the Maintenance of Electrical System At Sengkang & Punggol LRT Stations & Depot.	**SBS Transit Ltd**	$1.4M	23-Aug-02 to 22-Aug-05

NAME OF COMPANY : TYCO INTEGRATED SYSTEMS (Division of Tyco Building Services Pte Ltd)

TRACK RECORD - LIST OF COMPLETED PROJECTS

OWNER/CLIENT	ARCHITECT / CONSULTANTS	NAME OF PROJECT	DISCIPLINE	CONTRACT VALUE	REMARKS
Immigration Department	Singapore Police	Optical Character Recognition & Automated Vehicular Screen System for New Woodlands & Tuas Checkpoint	Automated Vehicular Screen System	S$7.5M	Completed in 1999/2000
Ministry of Home Affairs		Supply & Installation of Integrated Security Systems for the MFA HQ Complex	Integrated Security System	S$1.1M	Completed in Feb 2001
Keppel Engineering / Land Transport Authority		Bukit Panjang LRT Communication and Data Transmission System	Communication & Data Transmission System	S$7.1M	Completed in Nov 2001
Civil Aviation Authority of Singapore		Enhanced Airport Surface Detection System	Airport Surface Detection System	S$5.0M	Completed in Dec 2000
Ministry of Home Affairs		Supply & Installation of Integrated Security System for Cantonment Complex	Integrated Security System	S$3.9M	Completed in Aug 2002
Information & Arts		Supply & Installation of Public Address & MATV Systems for Esplanade Theatres on the Bay	Public Address & MATV Systems	S$1.3M	Completed in Aug 2002
Civil Aviation Authority of Singapore		Supply & Installation of Public Address System for the Construction of Two Finger Buildings at Terminal One, Singapore Changi Airport	Public Address System	S$2.5M	Completed in Sept 2002
Changi Prison Department	WSS Worldwide Security Solutions, Golden Engineering, CPG and PM Link	Supply & Installation of Integrated Security System for Changi Prison Complex	Design, Supply, Installation , Integration and Commissioning of an Integrated Security System	S$28M	Expected to complete by June 2003
Land Transport Authority		Upgrade of GLIDE Computer Hardware & Software for Regions 3 to 14	Upgrade of all SCATS region to run on SCATS 6.1	S$3.2M	Expected to completed by May 2003
Land Transport Authority	Parsons Brinckerhoff Company	Integrated Traffic and Plant Management System for Kallang and Paya Lebar Expressway	Integrated Traffic and Plant Monitoring System	S$43.523M	Expected to complete by Sep. 2006

NAME OF COMPANY : TYCO SERVICES SINGAPORE PTE LTD

TRACK RECORD - LIST OF COMPLETED PROJECTS

OWNER/CLIENT	ARCHITECT/CONSULTANTS	NAME OF PROJECT	DISCIPLINE	YEAR AWARDED	CONTRACT VALUE	REMARKS
PUBLIC UTILITIES BOARD	DEVELOPMENT RESOURCES	PULAU SERAYA POWER STATION	SECURITY	1995	$2.5M	
FAR EAST ORGANISATION	TECHNICS DESIGN	BANYAN CONDOMINIUM	SECURITY	1989	$700K	
KEPPEL LAND	DOMESTIC SUB-CON	VILLA VERDE @ CHUA CHU KANG	SECURITY	1998	$510K	AUTOGATE
BAN HIN LEONG GROUP	CONTEEM ENGINEERS	CHANGI HEIGHTS (BUNGALOWS) 102 UNITS	SECURITY	1995	$500K	
MERCK SHARPE & DOHME	KVAERNER RJ BROWN	MERCK SHARPE & DOHME	SECURITY	1995	$500K	
THOMAS DE LA RUE	THOMAS DE LA RUE	THOMAS DE LA RUE	SECURITY	1984	$420K	
STANDARD CHARTERED BANK	PT ARCHITECTS	STANDARD CHARTERED BANK, HEAD OFFICE	SECURITY	1982	$470K	
CENTREPOINT PROPERTIES	PCR CONSULTANTS	ANCHORAGE CONDOMINIUM	SECURITY	1995	$420K	
DBS LAND	JRP CONSULTANTS	ASPEN HEIGHTS CONDOMINIUM	SECURITY	1997	$400K	
WING TAI CORPORATION	PCR CONSULTANTS	BLOSSOMVALE CONDOMINIUM	SECURITY	1996	$350K	
APPLIED MATERIALS	BOVIS LEND LEASE	APPLIED MATERIALS	SECURITY	2001	$375K	

NAME OF COMPANY :TYCO SERVICES SINGAPORE

TRACK RECORD - LIST OF COMPLETED PROJECTS

OWNER/CLIENT	NAME OF PROJECT	DISCIPLINE	YEAR AWARDED	CONTRACT VALUE
Land Transport Authority	Maintenance of MRT NEL Station	Fire protection	2002	$7.7 M
SUNTEC	Maintenance of Suntec City	Fire protection, Electrical, ACMV	1997	$5.0 M
Marine Port Authority	Maintenance	Fire Protection, ACMV, electrical	2002	$260K
SIA	Maintenance of SIA Hangar 1& 2	Fire Protection	2001	$240K
Gleneagle Medical Centre	Maintenance of GMC	cleaning, fire protection, electrical and ACMV	2002	$600K
Merck Sharp &Dohme	Maintenance	Fire Protection	2001	$99K
Mapletree investment	Maintenance	ACMV	2001	$77K
Ministry of National Development	Maintenance	Fire Alarm	2001	$130K
NTU	Maintenance	Fire Alarm	2001	$100K
Caltex House	Maintenance	ACMV	2001	$162K

NAME OF COMPANY : SIMPLEX FIRE & SECURITY SERVICES PTE LTD

TRACK RECORD - LIST OF COMPLETED PROJECTS

OWNER/CLIENT	ARCHITECT / CONSULTANTS	NAME OF PROJECT	DISCIPLINE	YEAR AWARDED	CONTRACT VALUE	REMARKS
National Unviersity Of Singapore (NTU)	Indeco	Architectual, Sport Hall and workshop II	Fire Alarm	1995	S$1.0M	
Nanyang Technological University	Formerly Indeco Now CPG	NTU buildings	Fire Alarm	From 1996	S$ 3.0 M	
Land Transport Authority	Parson	North East Line MRT	Fire Alarm	1998	S$ 1.0 M	
Jurong Town Concil	JTC	JTC Woodland PI & II	Fire Alarm	2000	S$ 900K	
MSD	Squire Mech	Meck Pharmacetical Plant	Fire Alarm	2000	S$ 1.0 M	
Advance Mirco Devices	JM Pang & Seah	AMD @ Chai Chee	Fire & SEC	2001	S$ 900K	In Progress

tyco

FAST FACTS

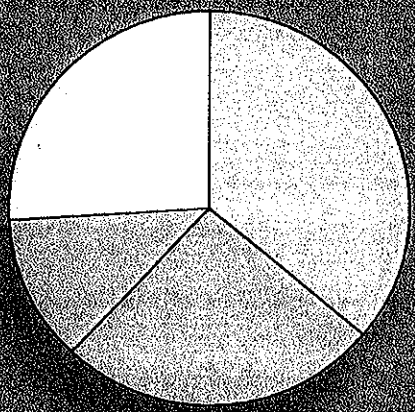
A GUIDE TO TYCO TODAY • SEPTEMBER 2002

TYCO AT A GLANCE

Tyco has built world-class businesses and brands in each of its industries. We produce thousands of products critical to safety, security, health and the way people communicate in the modern world. Our management approach - a commitment to innovation, an entrepreneurial style, a strong discipline on costs - ensures we continue to develop and lead in our chosen markets.

TYCO'S FISCAL 2001 REVENUES WERE: $34,000*

IN MILLIONS



HEALTHCARE & SPECIALTY PRODUCTS
26%
$8,800

ELECTRONICS
40%
$13,600

ENGINEERED PRODUCTS & SERVICES
12%
$4,200

FIRE & SECURITY SERVICES
22%
$7,400

* EXCLUDES CIT GROUP

TYCO BUSINESSES

- **Tyco Electronics** is the world's largest designer, manufacturer and marketer of a broad range of electronic, electrical, wireless and electro-optic devices. Its active and passive components are behind virtually every electronic or electrical product in the areas of consumer electronics, automotive and aerospace electronics, industrial machinery and equipment, and telecommunications.
- **Tyco Healthcare & Specialty Products** is a world leader in the manufacturing of a wide range of disposable medical products and medical instruments for the professionally delivered healthcare market and private label retail customers. Healthcare & Specialty Products also makes a wide range of products used in packaging, including polyethylene films, laminated and coated products, tapes, adhesives, and plastic garment hangers.
- **Tyco Fire & Security Services** is the largest provider of security solutions to residential, business and governmental customers and is the world's largest fire protection company. Working across a wide range of industries and customers, Fire & Security products and services help safeguard firefighters, fight fires, deter thieves and protect people and property.
- **Tyco Engineered Products & Services** is the world's largest industrial valve and controls manufacturer, as well as a leading producer of steel tubing, electrical raceway products, fire sprinklers, specialty valves, fittings and couplings used in fire protection systems and is a leading provider of engineering, design, consulting and construction management services for the water, wastewater, environmental and transportation industries.

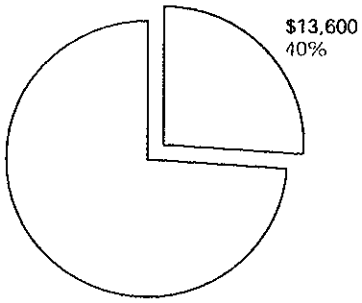
STRATEGIES

- **Market Leadership.** As a low cost producer, Tyco maintains a strong market position in all of its companies.
- **Operational Focus.** Tyco consistently dedicates resources for improving product design and customer service while reducing production costs and improving cash flow.
- **Diversification.** Tyco's diversified mix of businesses and geographic locations provide recurring and non-cyclical revenue which enable growth in all economic environments.
- **Strong Organic Growth.** Through product innovation, superior service, and geographic expansion Tyco strives to drive organic revenue growth.
- **Return on Capital.** Going forward, Tyco will put a greater emphasis on generating higher returns on capital as well as continuing to focus on EPS and free cash flow growth.

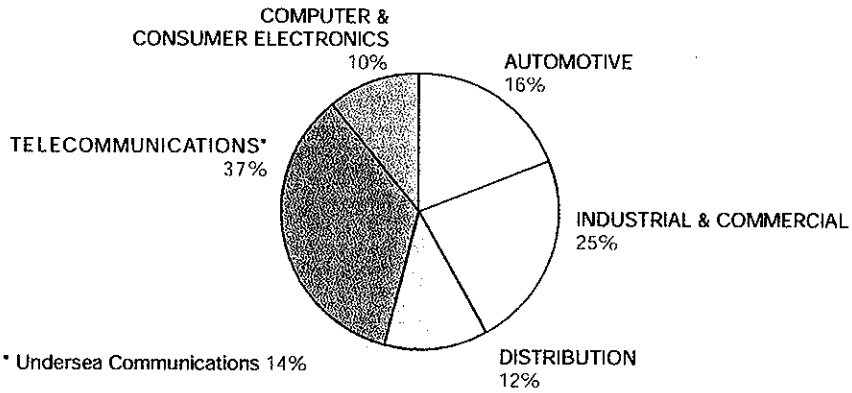
ELECTRONICS

PO Box 3608
Harrisburg, PA 17105-3608
Telephone: (717) 564-0100
www.tycoelectronics.com

FISCAL 2001 REVENUES
IN MILLIONS



FISCAL 2001 REVENUES BY END MARKET
IN MILLIONS



* Undersea Communications 14%

OPERATIONAL FACTS

- One of the world's largest electronic component suppliers, and number one in passive components, including: connectors/interconnects, switches, relays, circuit protection devices, magnetics, resistors, wire and cable, also a leader in fiber-optic and wireless components.
- World's largest and only fully integrated designer, producer, installer, servicer and owner of undersea fiber optic telecommunication networks.
- Leading US manufacturer of electronic power system products and services.
- Leader in electronic commerce; over 170,000 parts and supporting documentation in on-line catalog.
- 79,000 employees in 51 countries.

BRANDS & MARKETS

- Key Brands: AMP, Raychem, M/A-COM, Elo TouchSystems, Potter & Brumfield, Critchley, Fisk.
- Automotive - including automobile, trucks and off-highway vehicles.
- Telecommunications - including Communication Equipment, Telecom Outside Plant/Service Providers, Premises Cabling Systems for Buildings.
- Computer & Consumer Electronics - including computers and peripheral equipment, and consumer devices.
- Industrial & Commercial - including aerospace & defense, instrumentation, industrial machinery, household appliances, rail.
- Distribution - unparalleled global distribution network increases access to customers and provides broader product coverage and service.

AREAS OF EXPERTISE/KEY CAPABILITIES

- Broad product offering - providing customers with the comprehensive, one-stop service they require.
- Low cost manufacturing - one of the lowest-cost producers in the industry, with facilities worldwide.
- Rapid Time-to-Market (TTM) and Time-to-Volume (TTV) - able to quickly convert concept to tangible product and rapidly ramp-up volume manufacturing through modular and scalable processes.
- Aggressive development of new products - a leader in innovative solutions.
- Superior customer service - global sales force supported by world-class customer service teams.

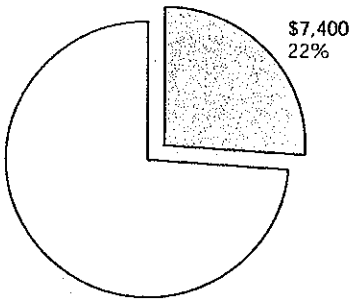
BUSINESS DEVELOPMENT

- Established as a manufacturer of high end, quick turn, complex printed circuit boards.
- April 1999: acquisition of AMP further diversified Tyco's product offerings and market reach.
- August 1999: acquisition of Raychem expanded offering to include high performance products in two end markets - Electronics OEM and TEI.
- November 1999: Siemens Electromechanical Components added product lines in area of electromechanical relays, connectors, sensors, hybrids and micro modules.
- December 2000: Lucent Power Systems added product lines to serve communication service providers, telecommunications and computer OEM markets.

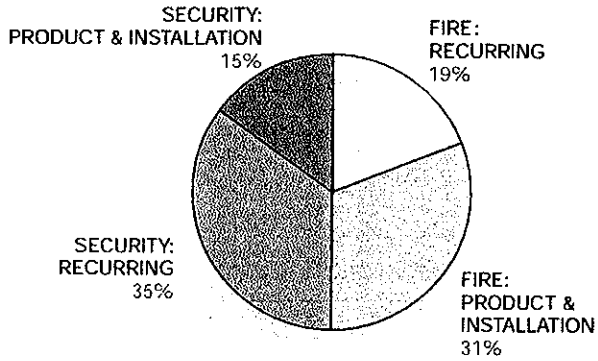
FIRE & SECURITY SERVICES

One Town Center Road
Boca Raton, Florida 33483
Telephone: (561) 988-7200
www.tycofireandsecurity.com

FISCAL 2001 REVENUES
IN MILLIONS



FISCAL 2001 REVENUES BY END MARKET
IN MILLIONS



OPERATIONAL FACTS

- World's largest provider of fire and security solutions for residential, business and governmental customers.
- Over 7.5 million customers worldwide rely on ADT security monitoring systems.
- More than 80% of the world's top 100 retailers use Sensormatic security systems.
- Over 65% of all U.S. fire departments depend on Scott protective equipment.
- Every day Tyco Fire & Security produces: 1,000 video surveillance systems; 4,000 fire detectors and sensors; 12,000 fire extinguishers; 30,000 intrusion alarm devices; 17 million security tags and labels.
- Over 100,000 employees serve customers in 100 countries.

BRANDS & MARKETS

- Literally all market segments require fire and security products and services.
- Key Brands: ADT, Scott, Sensormatic, SimplexGrinnell, Ansul, Total Walther, Wormald.
- Markets: retail, residential, commercial

AREAS OF EXPERTISE/KEY CAPABILITIES

- Life safety services- providing life safety products, installation, servicing and "24 x 7" monitoring for homes and businesses.
- Layers of protection- specializes in integrated systems to protect people and property.
- Global provider- products and services that help protect residential and industrial customers around the world.
- Quality- most respected brands in the industry with market leading positions in all product categories served.
- Low-cost producer- 24 factories produce a wide range of protection products.
- Recurring revenue- worldwide base of recurring monitoring and services revenue.
- Innovative new product development- significant focus on advancing technology to meet customers' changing needs.

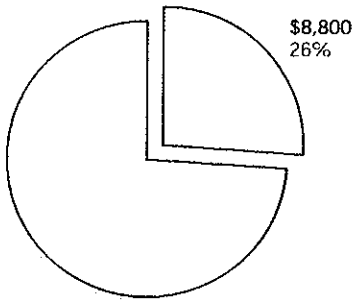
BUSINESS DEVELOPMENT

- January 1986: Tyco Fire & Security was formed when Grinnell, a producer and distributor of fire protection and flow control products, was added to the Tyco family.
- August 1990: Wormald was acquired, making Tyco a global player in the fire protection field.
- July 1997: ADT greatly expanded the company's commercial offerings, added residential security and provided a strong base of recurring revenue.
- January 2000: Simplex Time Recorder added market leading products in fire alarm, business communications and software solutions.
- May 2001: Scott Health & Safety added respiratory systems and other life-saving devices for fire fighters.
- November 2001: Sensormatic added anti-shoplifting, video surveillance and access control product lines.

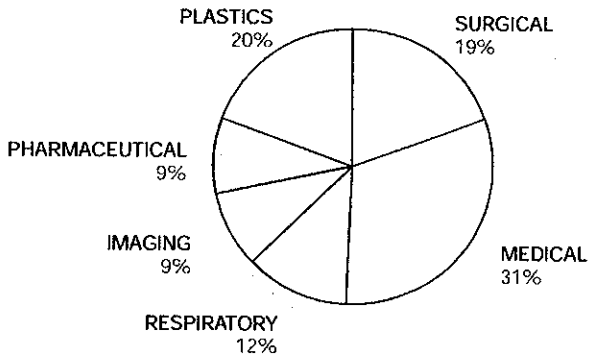
HEALTHCARE & SPECIALTY PRODUCTS

15 Hampshire Street
Mansfield, MA 02048
Telephone: (508) 261-8000
www.tycohealthcare.com

FISCAL 2001 REVENUES
IN MILLIONS



FISCAL 2001 REVENUES BY END MARKET
IN MILLIONS



OPERATIONAL FACTS

- One of the largest medical device and disposables companies in the world.
- A leader in oximetry, compression devices, adult incontinence products, needles and syringes, wound closures, disposable imaging reagents, ventilators, electro-surgical devices, minimally invasive surgical instruments and wound care.
- Tyco Plastics & Adhesives Group is a leading manufacturer and maker of plastic film, molded products, special adhesive products and laminates.
- Over 51,000 employees in more than 50 countries worldwide.

BRANDS & MARKETS

- Key Brands: Kendall, US Surgical, Auto Suture, Valleylab, Radionics, Mallinckrodt, Nellcor, Puritan Bennett, Ruffies, Polyken.
- Medical, surgical, electro-surgical, respiratory products therapy, imaging, are supplied to:
  - Acute care facilities such as hospitals
  - Long term care facilities such as nursing homes and rehab centers
  - Physician offices
  - Group purchasing organizations and distributors
- Tyco Plastics serves clients in the retail, industrial, automotive, housing and food packaging markets.
- Retail/Private label products are sold to large retail chains and mass merchandisers.
- Tyco Healthcare also provides pharmaceuticals chemical compounds to bulk and unit dose customers.

AREAS OF EXPERTISE/KEY CAPABILITIES

- Broad line medical disposables offering creates single-source economies for healthcare customers.
- Market leadership in key product areas provides a platform for new product.
- High quality products with brand names known around the globe provide the basis for ongoing customer relationships.
- State-of-the-art manufacturing capabilities and highly trained sales forces deliver world-class products, worldwide.

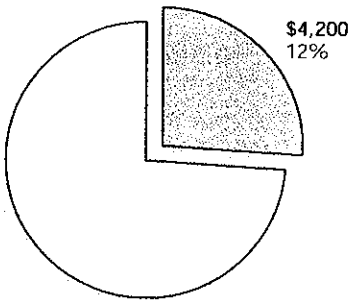
BUSINESS DEVELOPMENT

- October 1994: Acquisition of The Kendall Company significantly expanded product line and added geographic diversity.
- September 1996-The acquisition of Carlisle Plastics expanded domestic and international market penetration in packaging materials with a broader product offering within the disposable and specialty products division.
- March 1998: Acquisition of Sherwood Davis & Geck doubled the size of the medical business, providing additional disposable product platforms such as needles and syringes.
- October 1998: Acquisition of United States Surgical added important surgical platforms including minimally invasive surgical instrumentation, wound closures and electro-surgical devices and expanded the international market presence dramatically.
- October 2000: Acquisition of Mallinckrodt opened new markets in monitoring, respiratory therapy and imaging as well as providing a pharmaceutical component.
- January 2002: Acquisition of Paragon Trade Brands further strengthened our leadership position in the retail business, making us one of the largest providers of private label health and hygienic products.

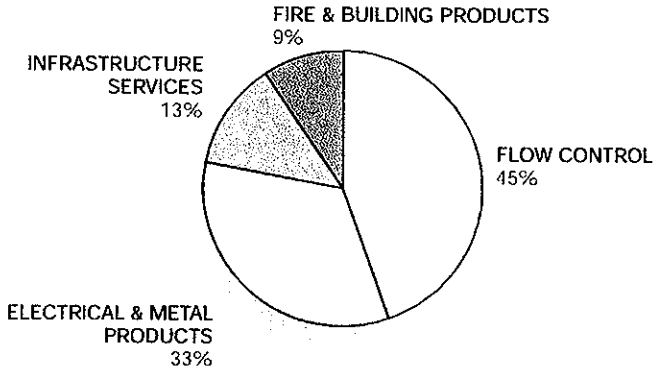
ENGINEERED PRODUCTS & SERVICES

Three Tyco Park
Exeter, NH 03833
Telephone: (603) 778-9200
www.tycoflow.com

FISCAL 2001 REVENUES
IN MILLIONS



FISCAL 2001 REVENUES BY END MARKET
IN MILLIONS



OPERATIONAL FACTS

- Number one producer of valves, actuation controls, heat tracing, and thermal control systems in the world.
- A global leader in water management, transportation, engineering technology and environmental services, providing comprehensive design/ build/finance/operate services providing cities worldwide with clean drinking water, transportation improvements, engineering technology and environmental services.
- One of the largest manufacturers of steel tubular products in North America.
- Global manufacturer of water based fire suppression system components.
- Over 31,000 employees in 41 countries.

BRANDS & MARKETS

- Key Brands: Allied, Earth Tech, Grinnell, Keystone, and Tracer.
- Tyco Engineered Products & Services manufactures and provides service to companies in the following industries:
  - Fire Protection
  - Construction
  - Process Industrial
  - Water/Wastewater
  - Electrical

AREAS OF EXPERTISE/KEY CAPABILITIES

- Tyco Flow Control maintains a seamless worldwide selling and distribution network providing sales and service for the industry's most comprehensive package of valves, process controls and thermal control systems for a wide variety of applications in major growth markets.
- Tyco Electrical & Metal Products converts over one million tons of steel annually into tubing, electrical conduit, armored cable, pipe, fence products and steel support systems utilizing the most efficient manufacturing process in the industry.
- Tyco Fire & Building Products utilizes advanced technology, research and development to produce over twenty million fire sprinkler heads per year together with the specialty valves, pipe and other system components needed for use in commercial, industrial, residential and special hazard fire protection systems.
- Tyco Infrastructure Services provides a comprehensive package of services to a worldwide list of private and public sector clients in the fast growing area of water management. These include Design/Build/Finance/Operate services for water and wastewater systems, water resources analysis, planning and management and O&M services. Full spectrum services are also provided in the areas of Transportation (airports, roads, bridges, transit, rail), Environmental and Engineering Technology.

BUSINESS DEVELOPMENT

- August 1987: The acquisition of Allied Tube & Conduit introduced Tyco into the steel tube market.
- January 1996: The acquisition of Earth Tech established Tyco in the water management, environmental services and engineering technology business in North America.
- August 1997: The acquisition of Keystone International helped Tyco become a larger worldwide player in the valve market and greatly expanded its product line.
- August 1999: The acquisition of Central Sprinkler broadened Tyco's fire system components product line and channels of distribution.
- August 1999: The acquisition of Raychem Heat Tracing Systems provided the platform to form Tyco Thermal Controls, a leading provider of heat tracing and thermal controls equipment and systems.

KEY COMPANY MANAGEMENT

Tyco, Chief Executive Officer and Chairman of the Board, Ed Breen joined Tyco in July 2002. Mr. Breen is the former President and Chief Operating Officer of Motorola and prior to that he served as Chairman and CEO of General Instruments Corporation.

Tyco Electronics, President, Juergen Gromer. Dr. Gromer has over 19 years experience in operations, sales and regional company management positions and senior management positions. Dr. Gromer joined Tyco through the acquisition of AMP and was named President of Tyco Electronics in 1999.

Tyco Healthcare & Specialty Products, President, Rich Meelia was named president of Tyco Healthcare in 1995. Mr. Meelia has 29 years of experience in the healthcare industry working for companies such as American Hospital Supply and Pfizer.

Tyco Fire & Security Service, President, Jerry Boggess, a 40 year veteran of the fire protection and electronic security industries, was named president of Tyco Fire & Security in 1995. Mr. Boggess joined Tyco in 1968 as a contracting engineer for Grinnell Fire Protection Systems and since that time he has held various management positions including becoming President of Grinnell.

Tyco Engineered Products & Services, President, Bob Mead has over 25 years of experience in a variety of roles with Tyco International and its subsidiaries. Prior to his present position of President of Tyco Engineered Products & Services, Bob served in the positions of vice President, Finance for Grinnell Corporation, Managing Director for Tyco's Asia-Pacific Region, and Vice President, Manufacturing for all North American flow control operations.

TYCO CONTACT DETAILS

CORPORATE & CUSTOMER INFORMATION

Tel: (603) 778-9700
Fax: (603) 778-7330
www.tyco.com

INVESTOR RELATIONS

Kathy Manning
Tel: (603) 778-9700
Fax: (603) 778-7330

MEDIA RELATIONS

Tel: (212) 424-1300

SHAREHOLDER SERVICES

Mellon Investor Services, L.L.C.
Tel: toll free in US - (800) 685-4509
Tel: outside of US - (201) 329-8810
Fax: (201) 329-8367
Email: shrrelations@melloninvestor.com

SHARES TRADED

New York Stock Exchange: TYC
Bermuda Stock Exchange: TYC
London Stock Exchange: TYI

THE ZURICH CENTRE
2ND FLOOR
90 PITTS BAY ROAD
PEMBROKE HM 08
BERMUDA
WWW.TYCO.COM

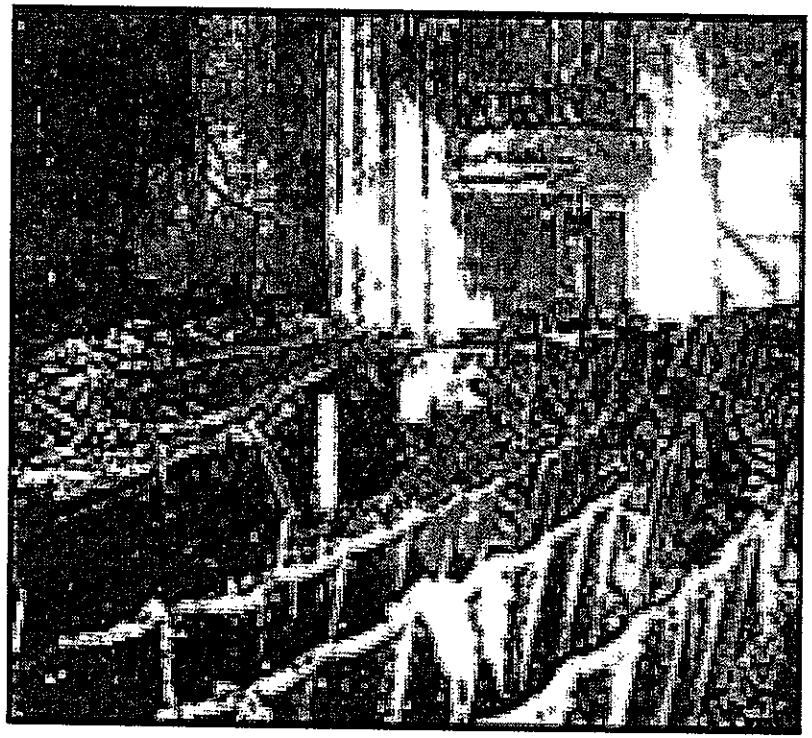
Fundamentals of Life Safety

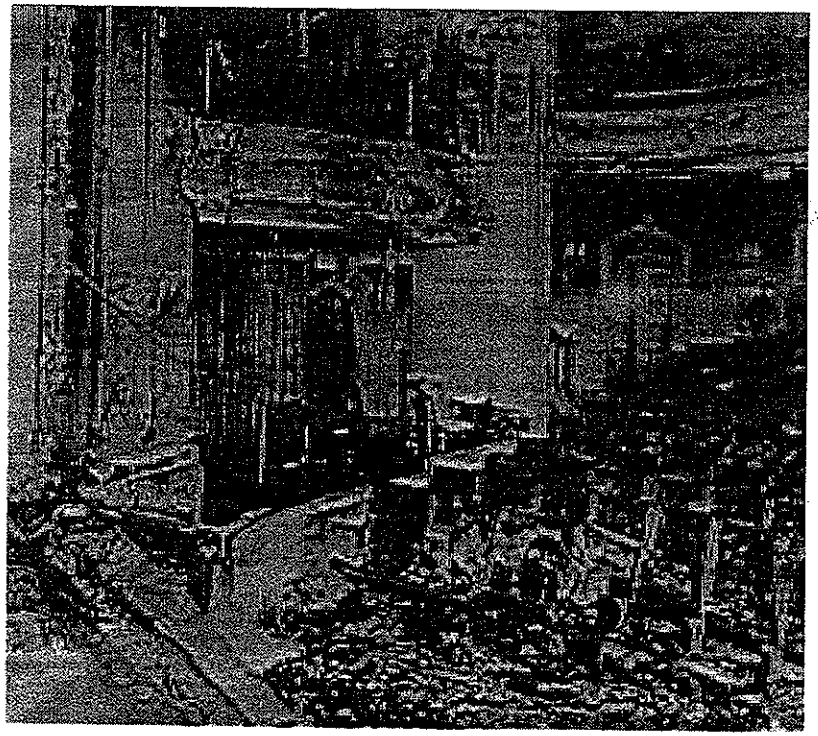
Case Studies of Significant Fires Affecting NFPA 101

James D. Lake
Senior Fire Protection Specialist
NFPA International



Iroquois Theater - 1904



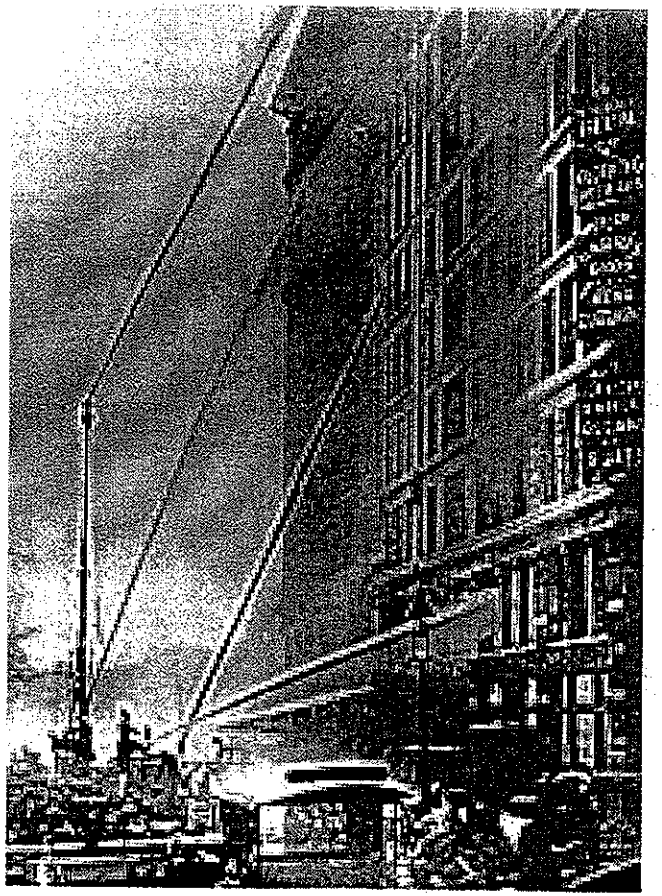


Triangle Shirtwaist Factory
1911

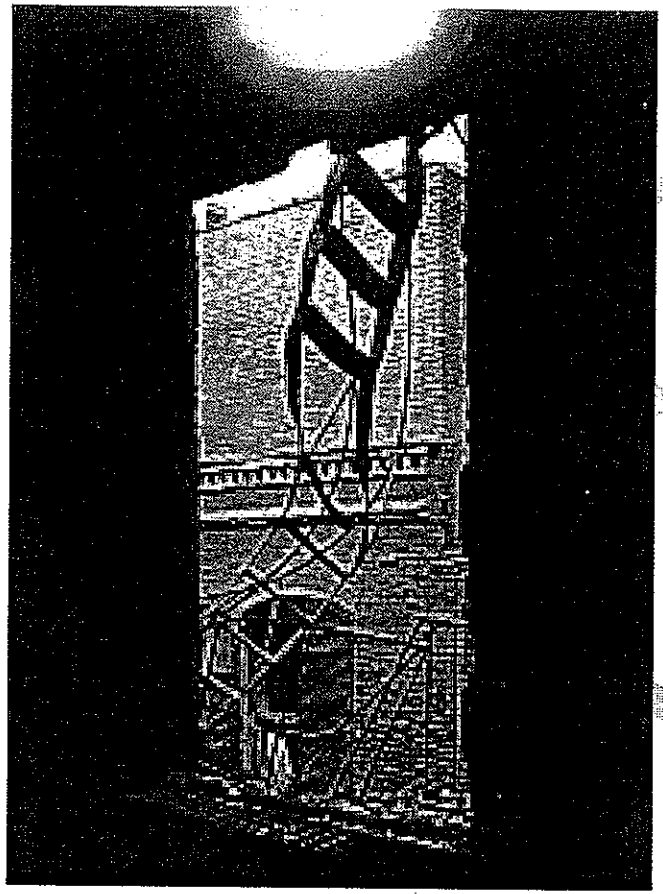




High Rise Buildings



Exits



General Requirements

- Goals
- Objectives
- Assumption
- Compliance Options
- Fundamental Requirements



Goals

- **Fire and Similar Emergency**
- **Crowd Movement**



Objectives

- Occupant Protection
- Structural Integrity
- Systems Effectiveness



Assumption

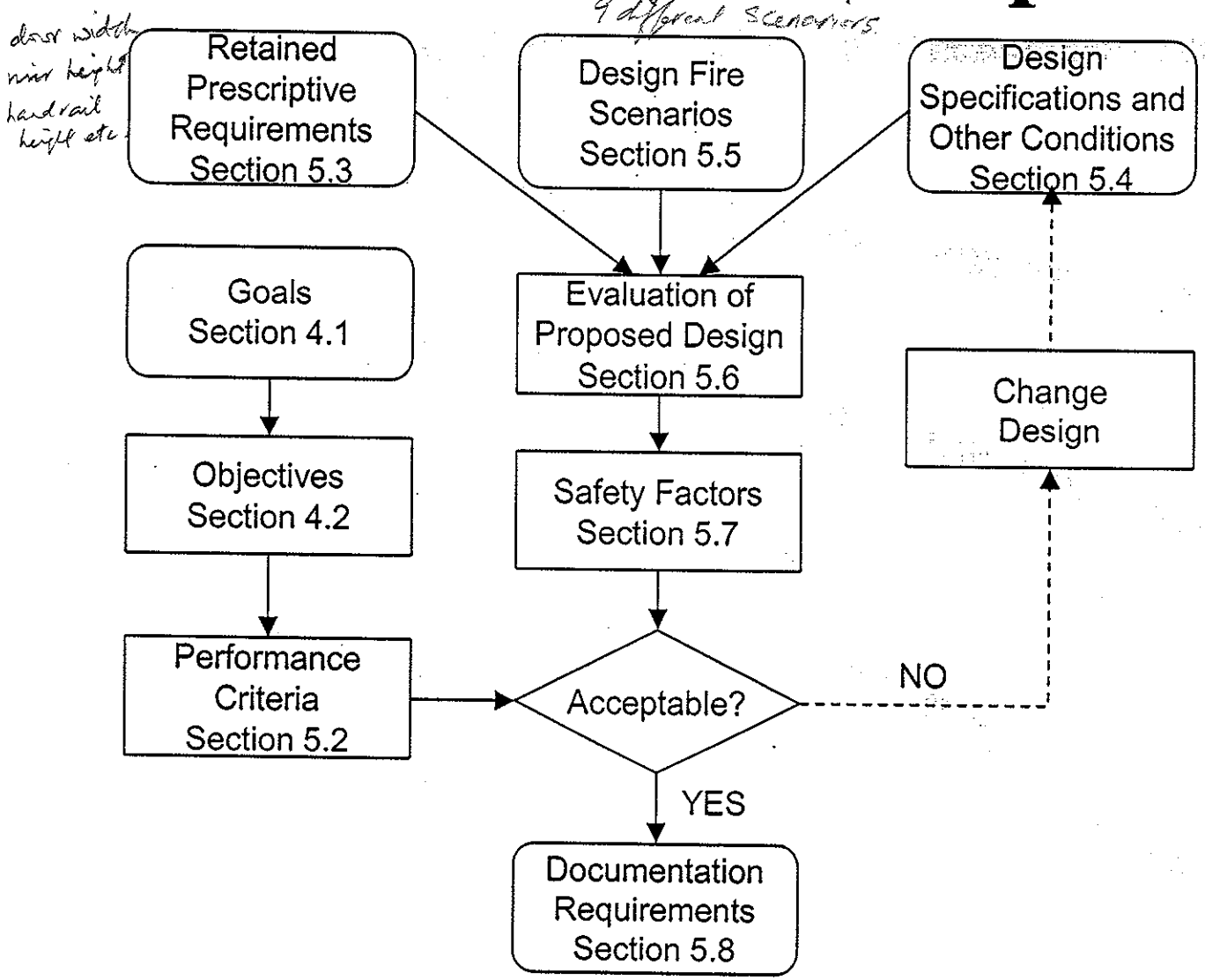
- Single Fire Source
- Additional Assumptions

Compliance Options

- **Prescriptive Requirements Option**
- **Performance-Based Option**



Performance-Based Option



Fundamental Requirements

- Multiple Safeguards
- Appropriate Safeguards
- Means of Egress
- Occupant Notification
- Vertical Openings
- System Design and Installation
- Maintenance



Multiple Safeguards

- Not one safeguard
- Human Failures
- System Failures



Appropriateness of Safeguards

- Character of the occupancy
- Capabilities of the occupants
- Number of persons exposed
- Fire protection available
- Height and type of construction
- Other factors



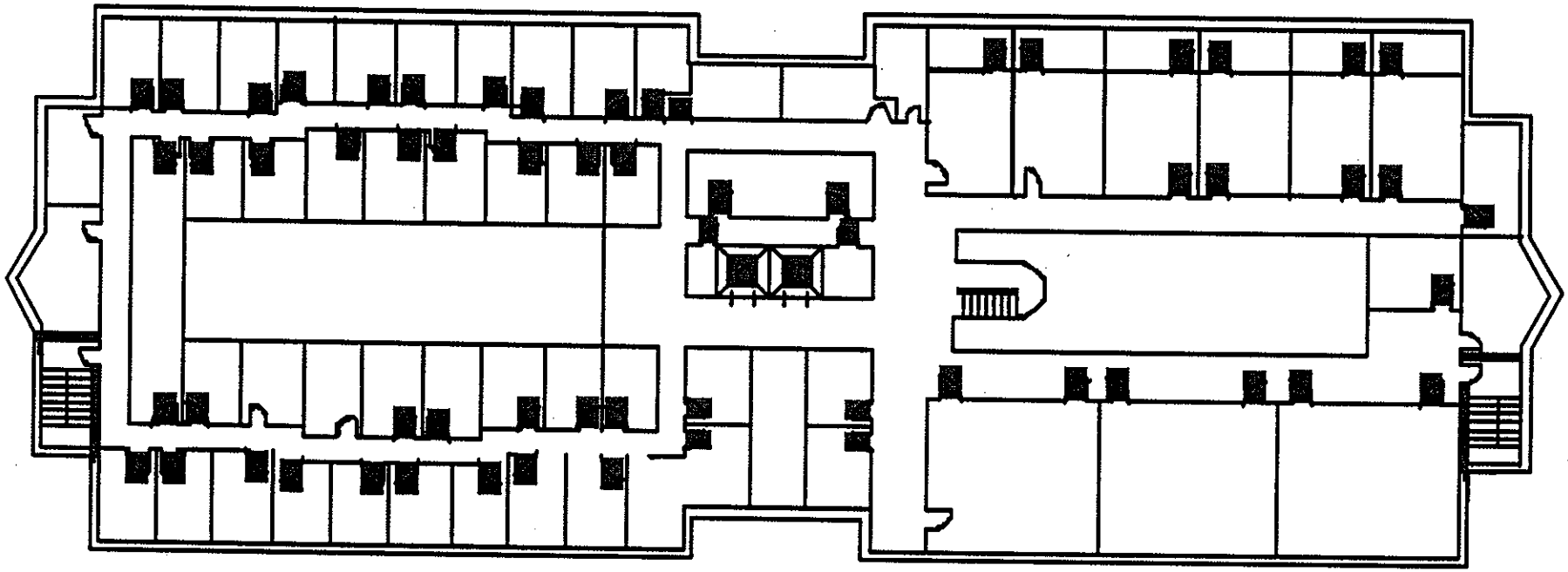
Means of Egress

- Number of MOE
- Unobstructed Egress
- Awareness of Egress
- Lighting

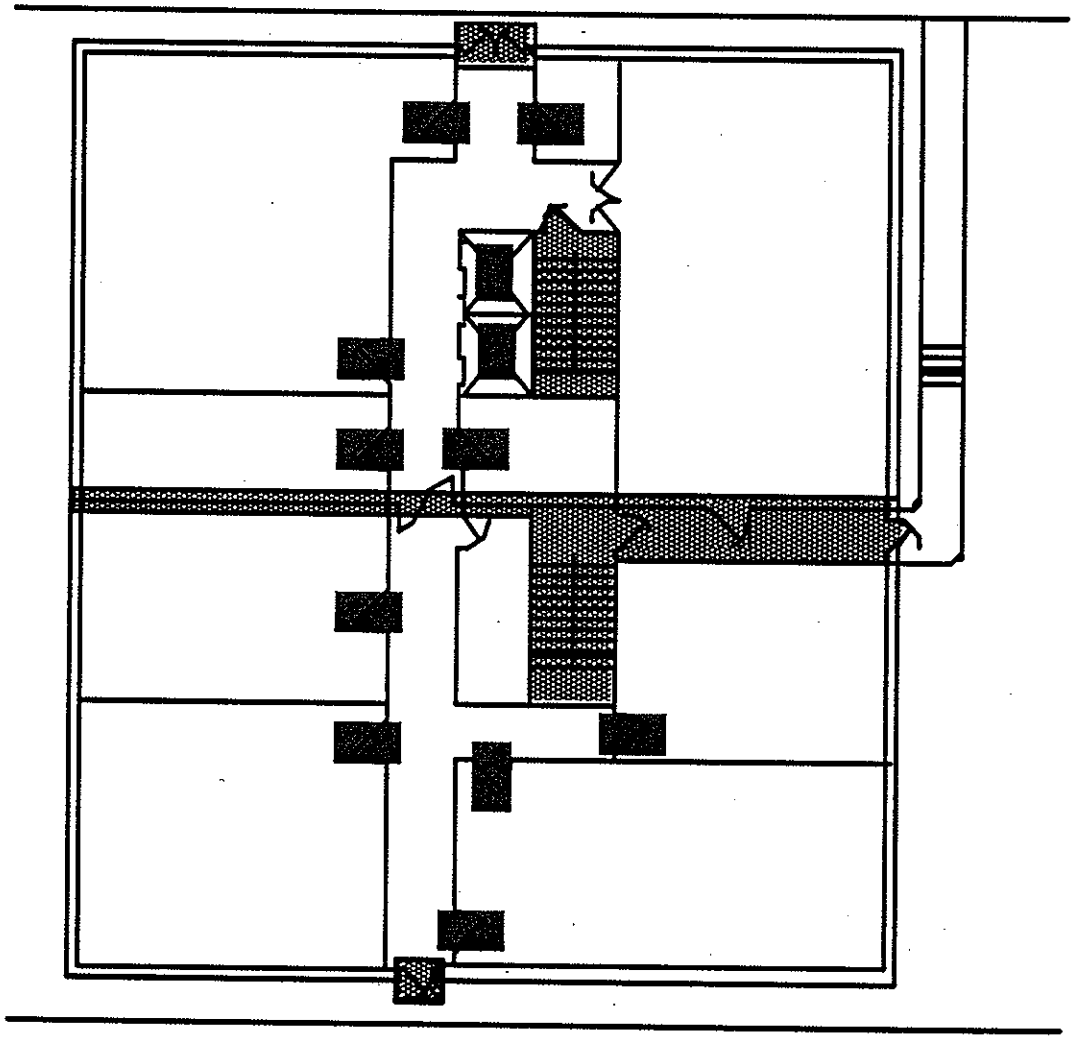
Cocoanut Grove Nightclub
1942



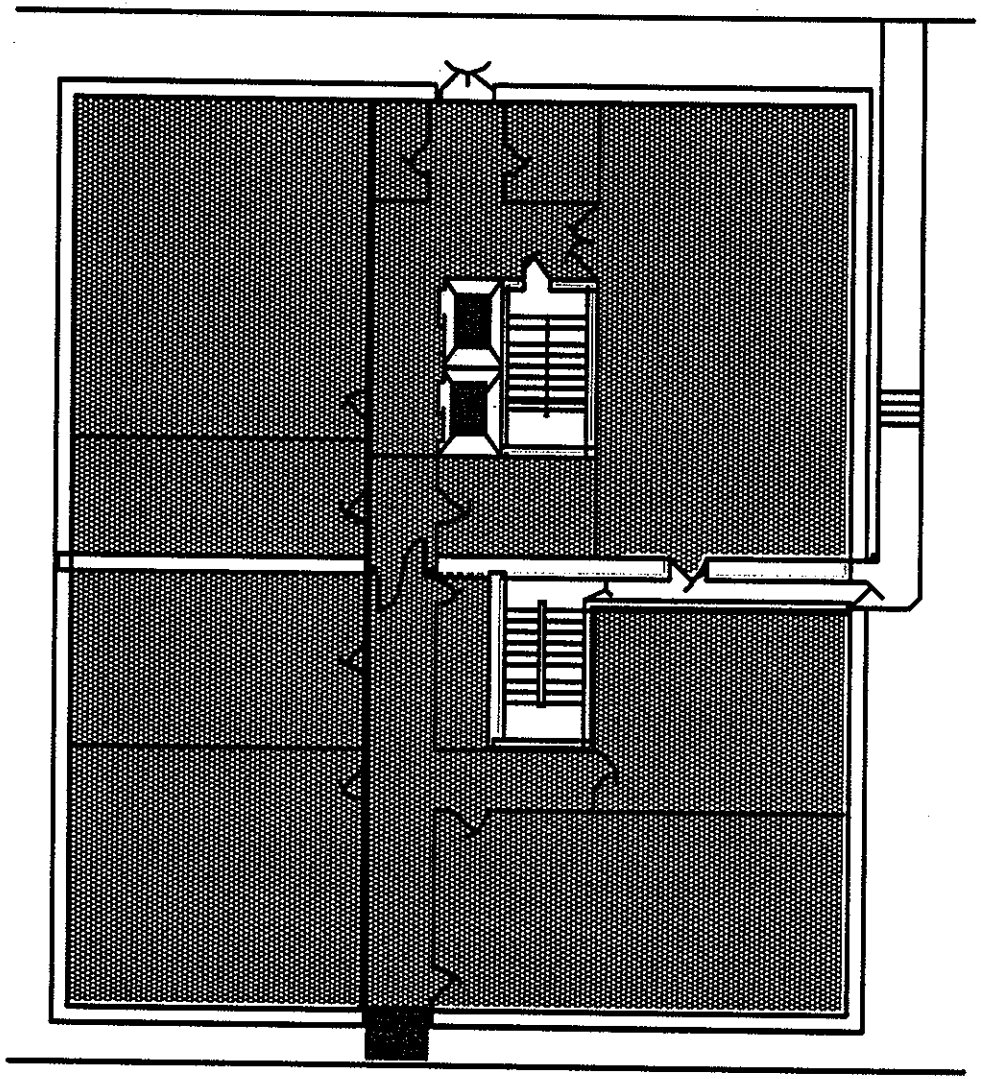
Means of Egress



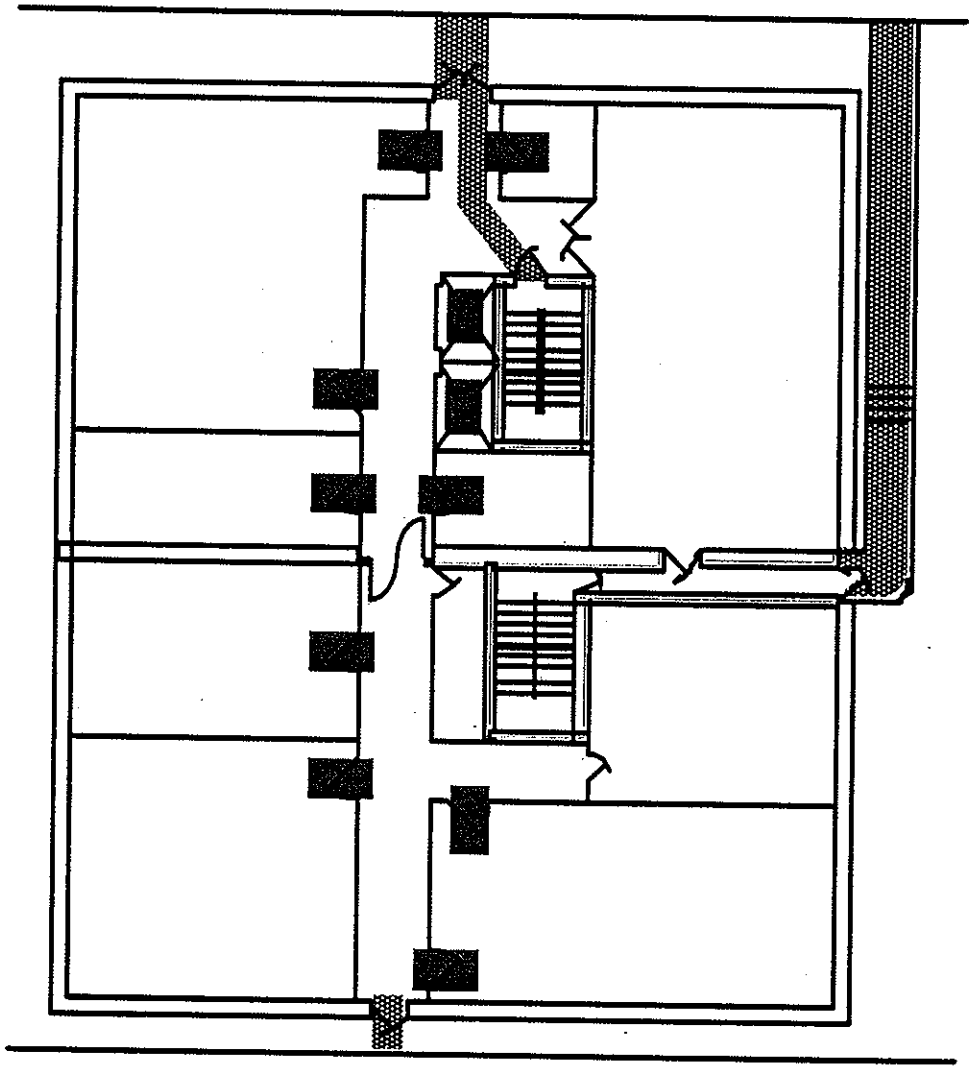
Exit



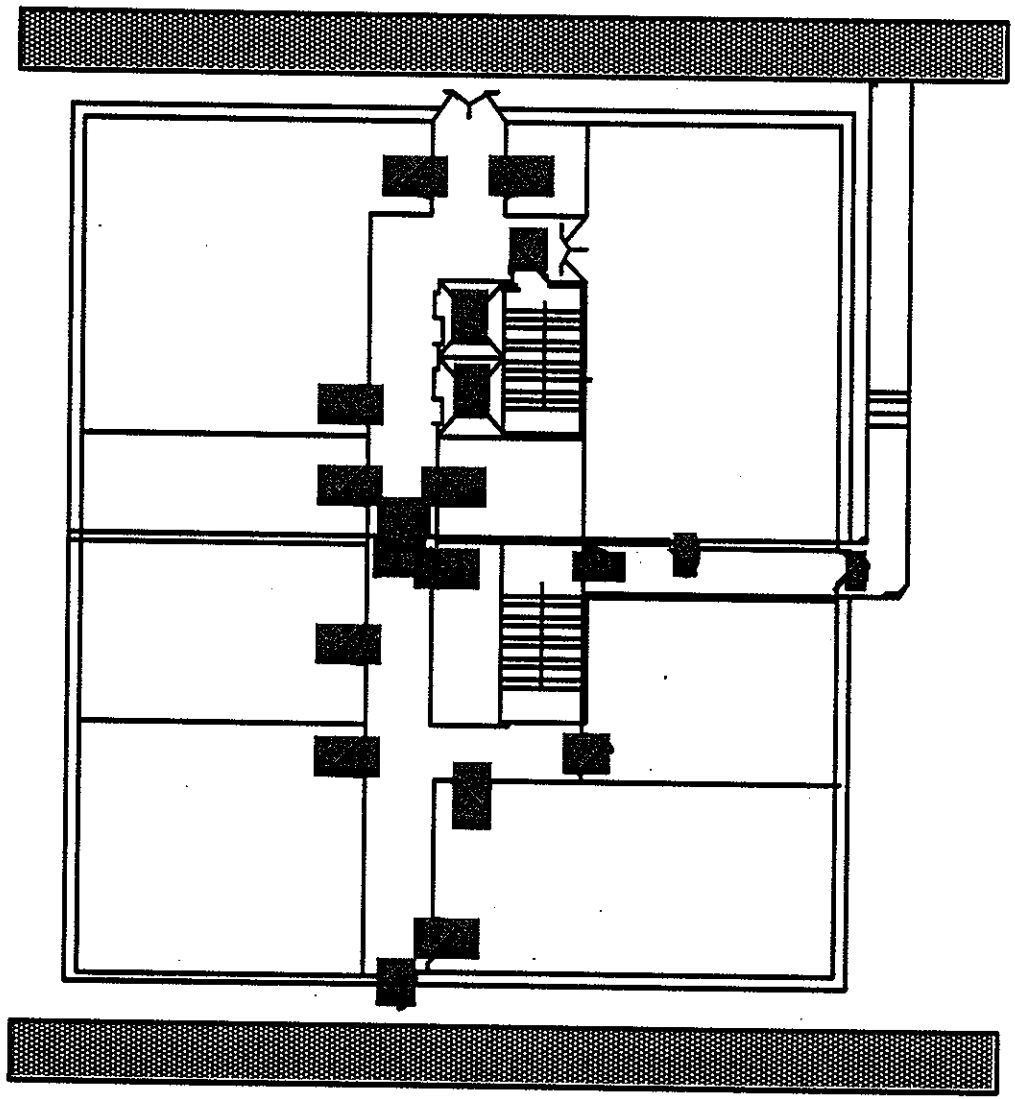
Exit Access



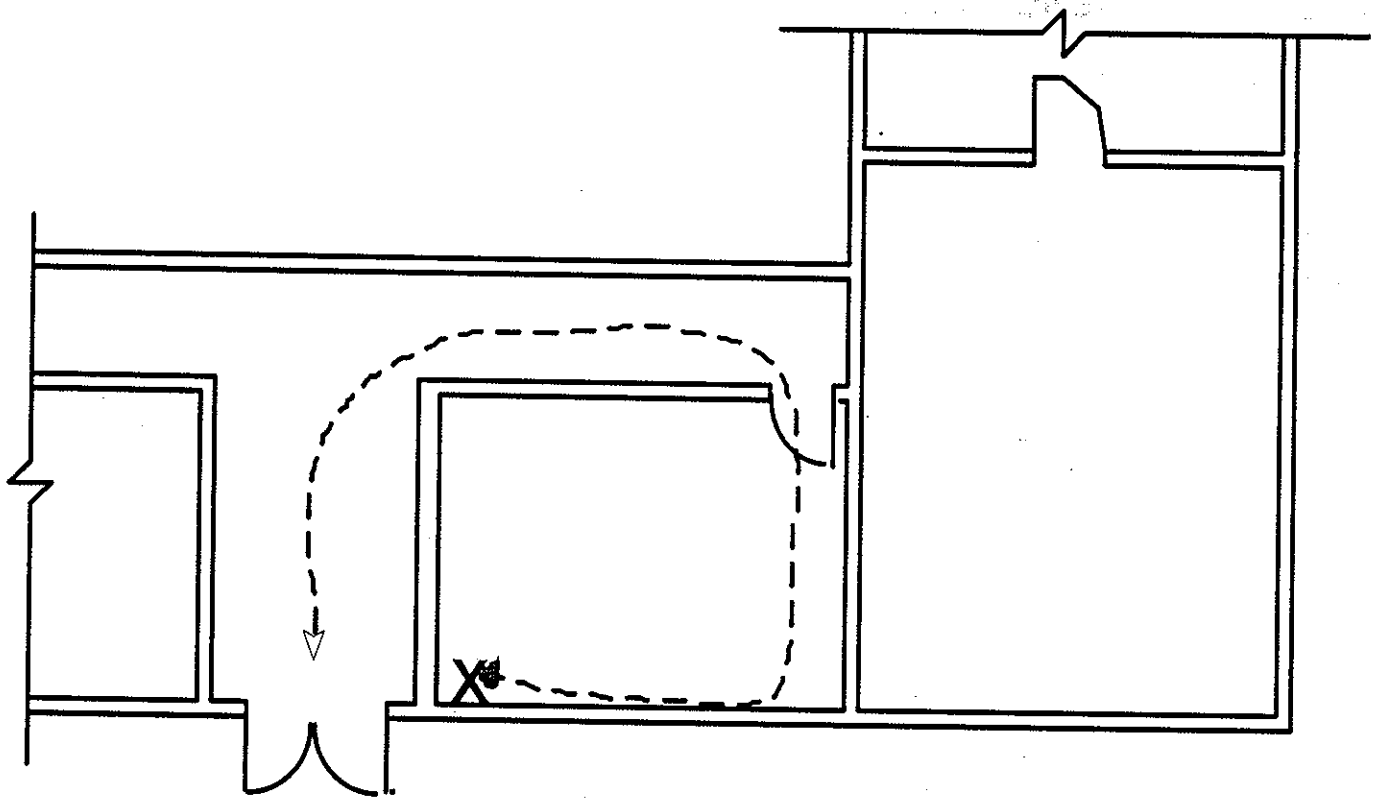
Exit Discharge



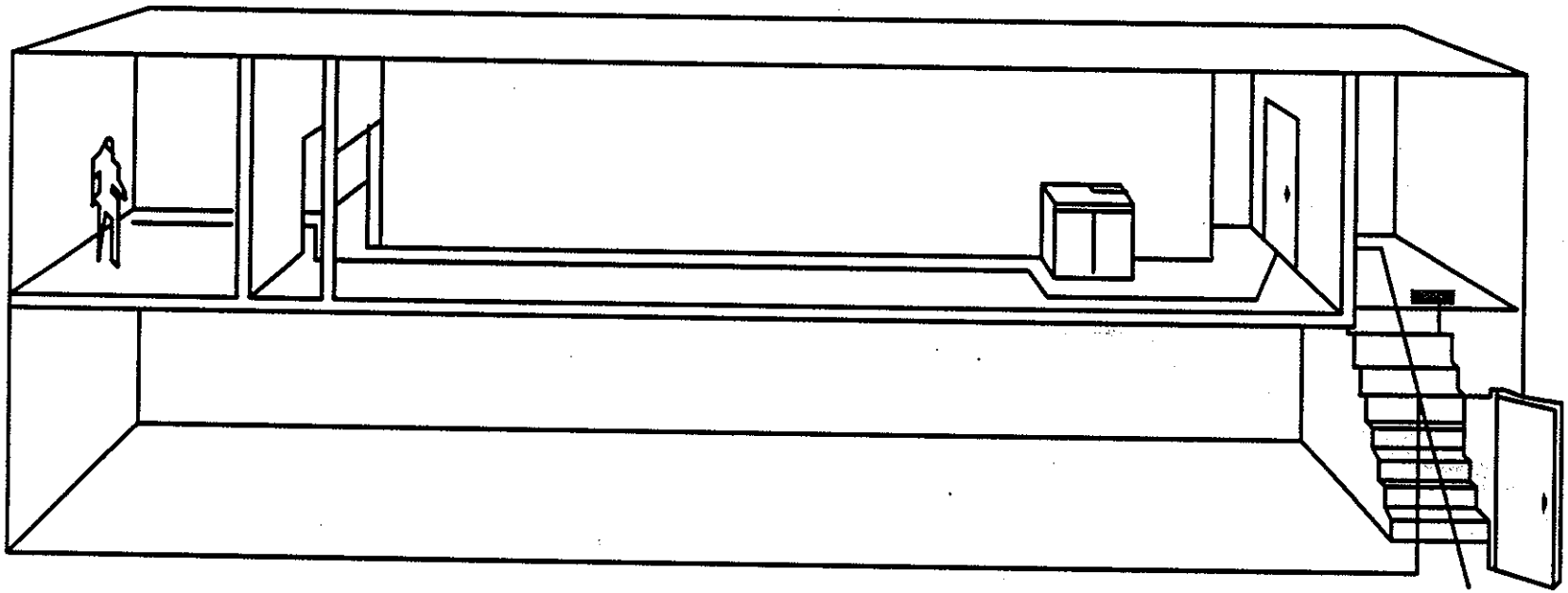
Public Way



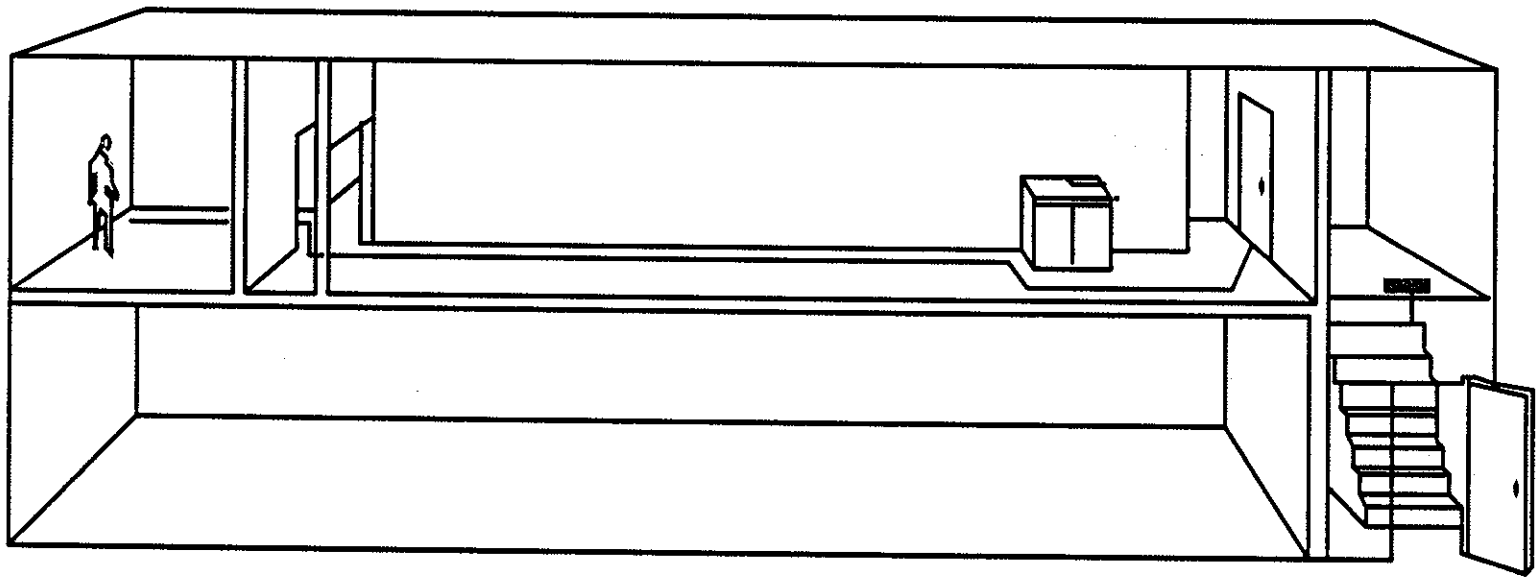
Travel Distance



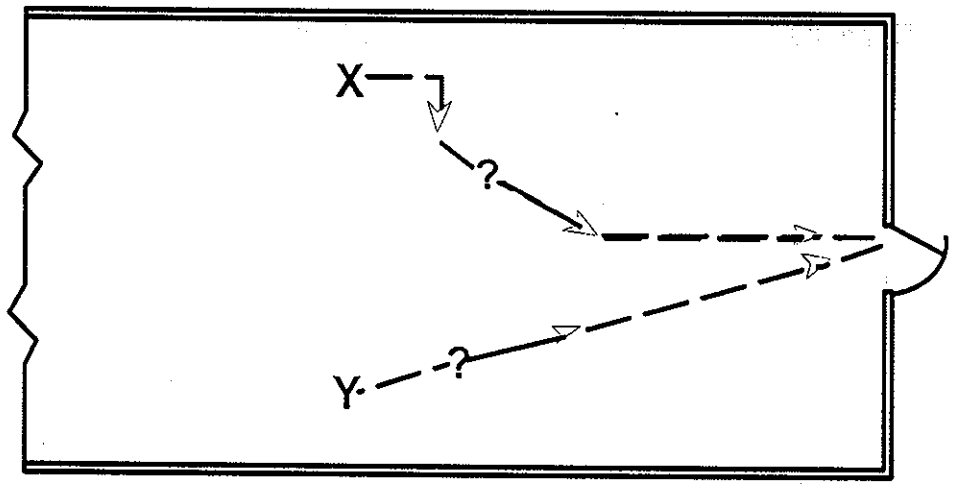
Measuring Travel Distance—Open Stair

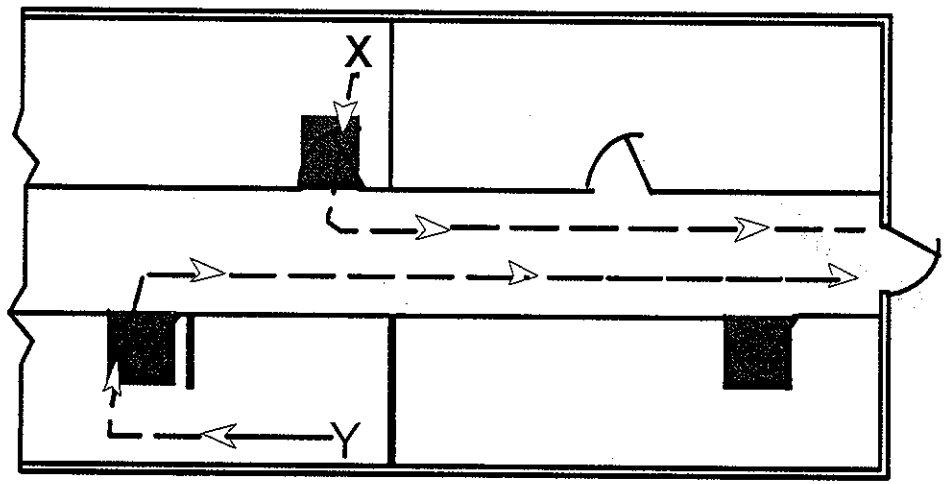


Measuring Travel Distance—Exit Stair

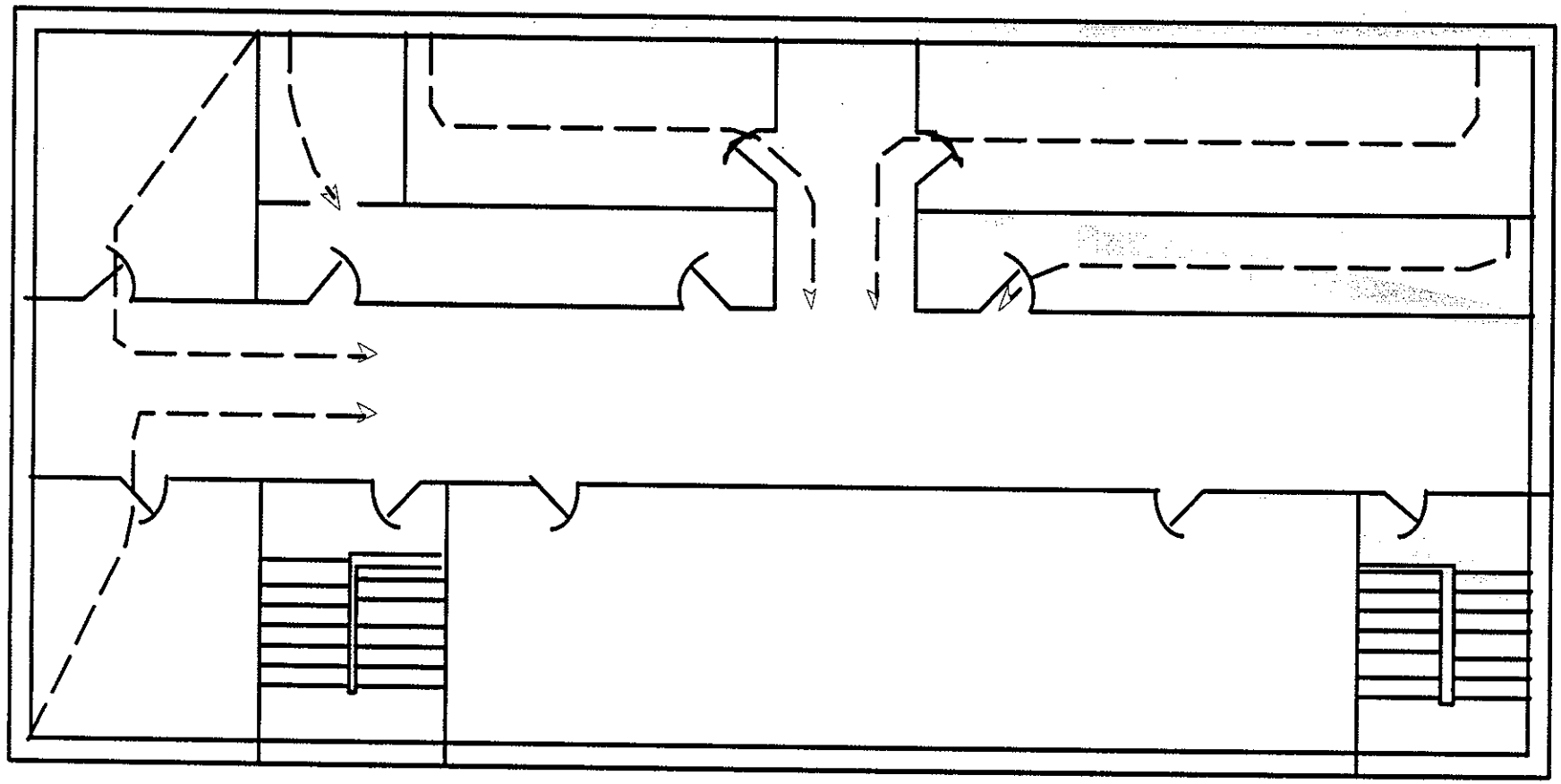


Travel Distance Along Available Path

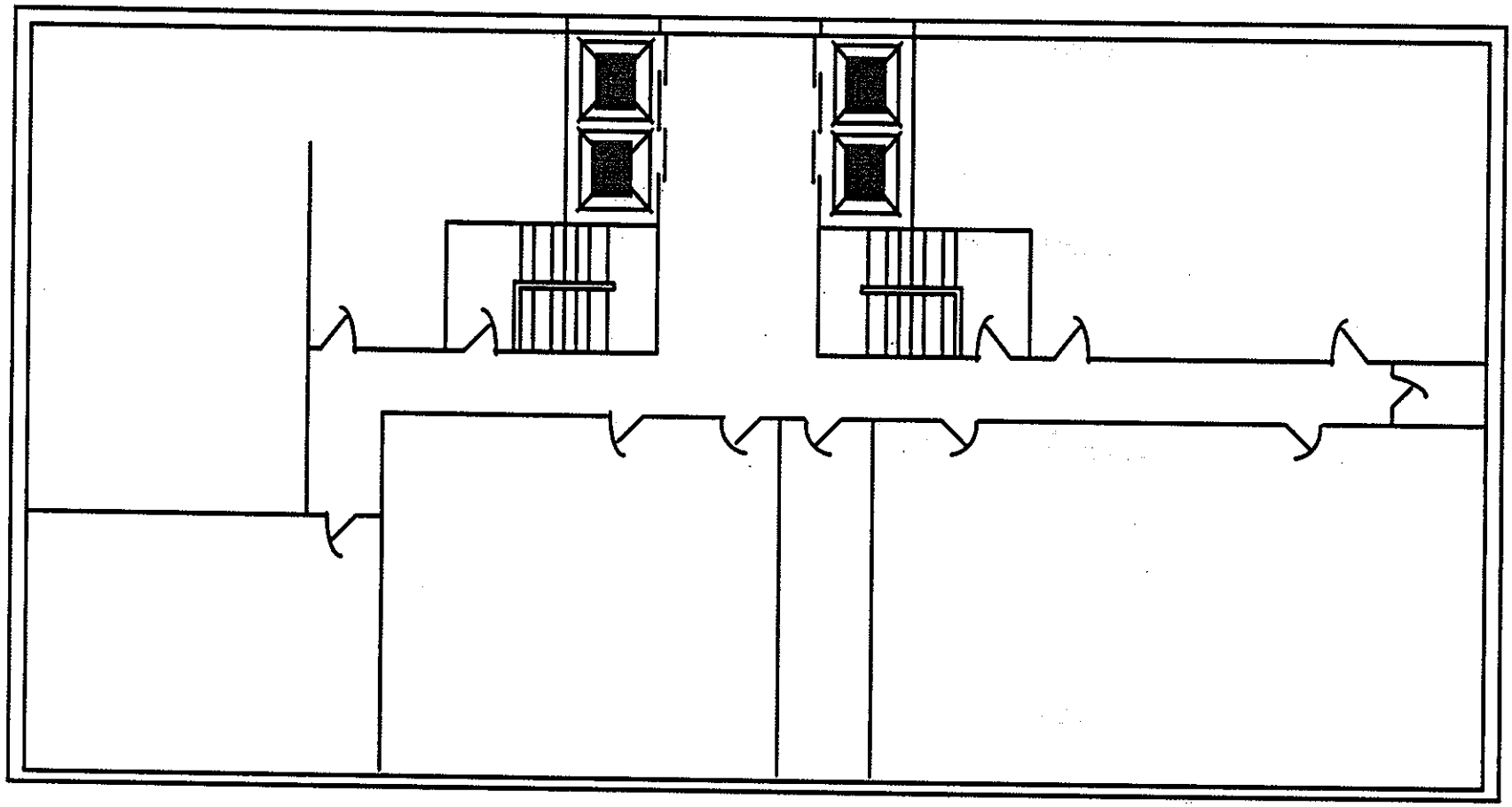




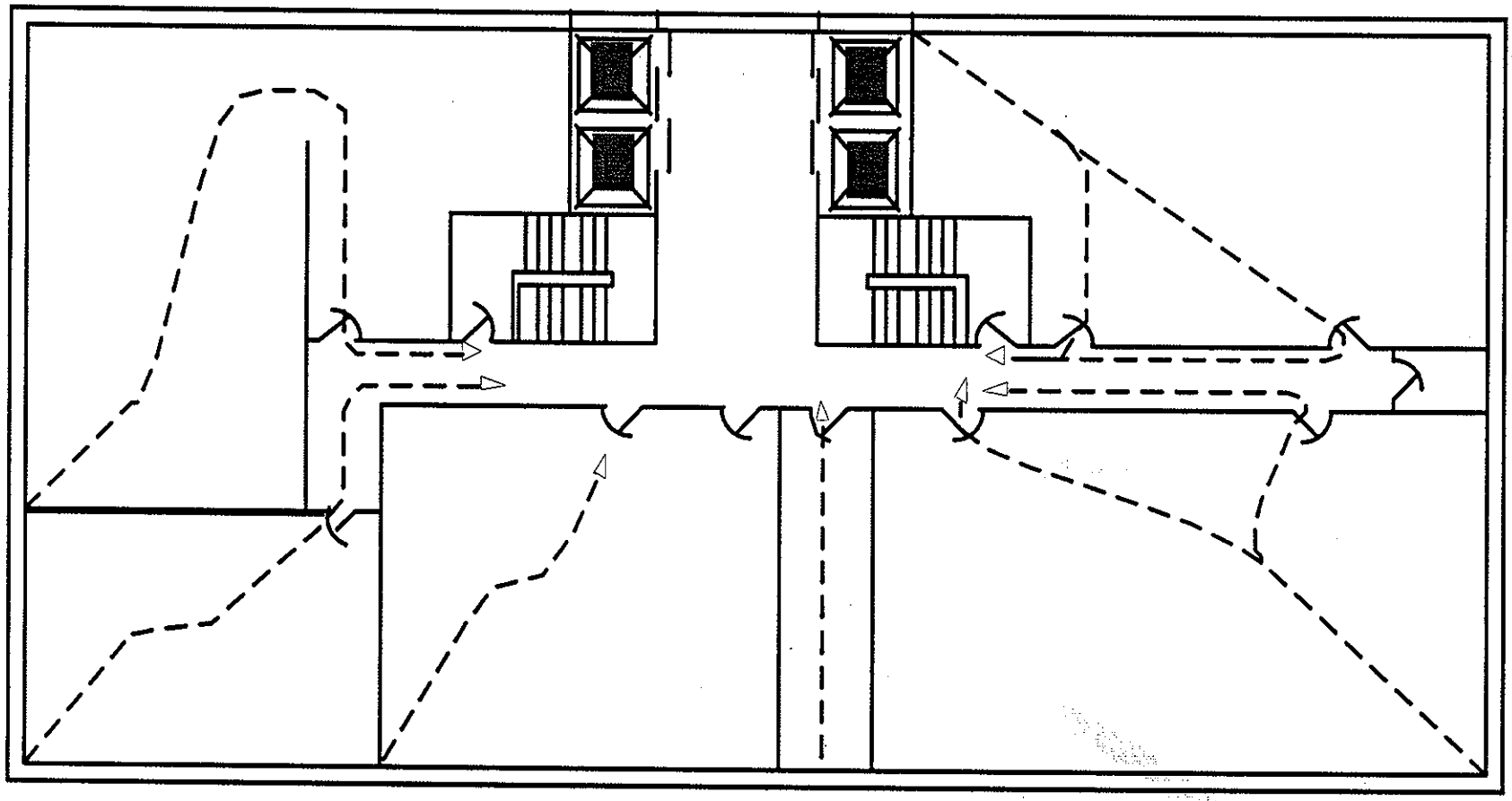
Common Path of Travel



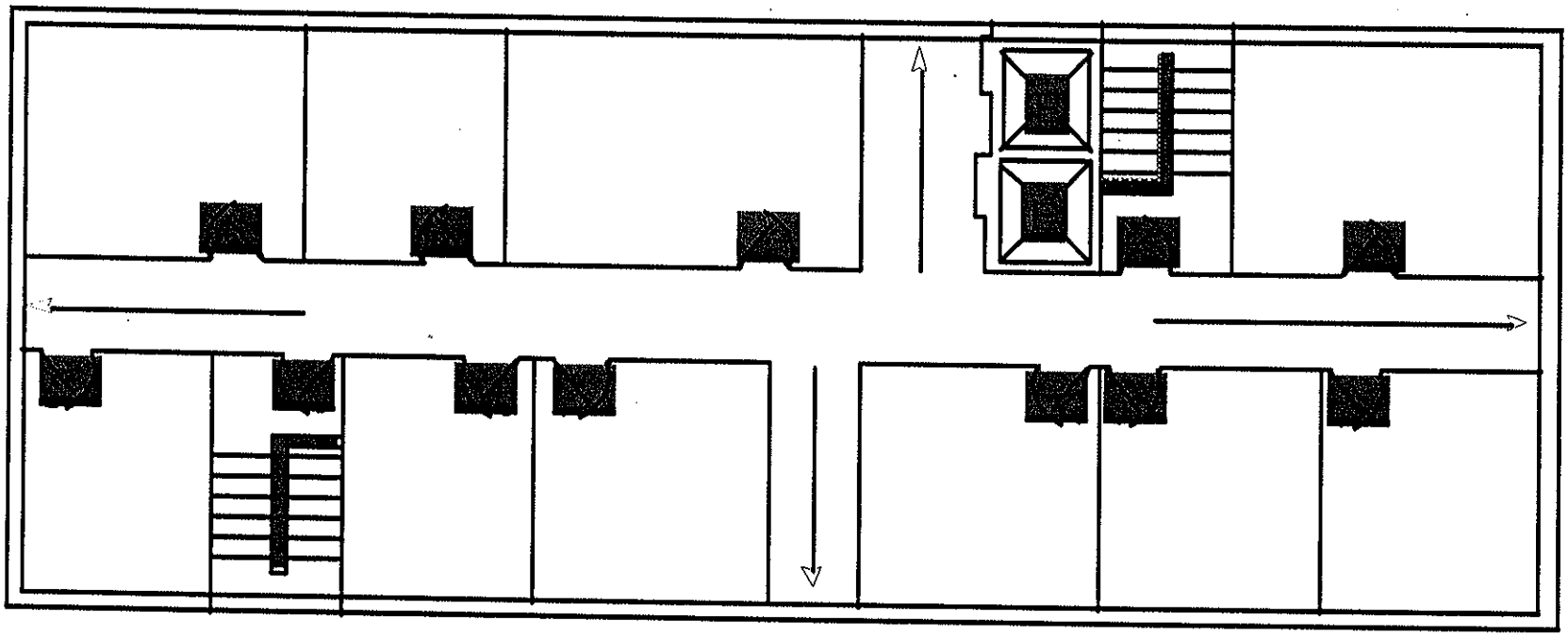
Rault Building Fire



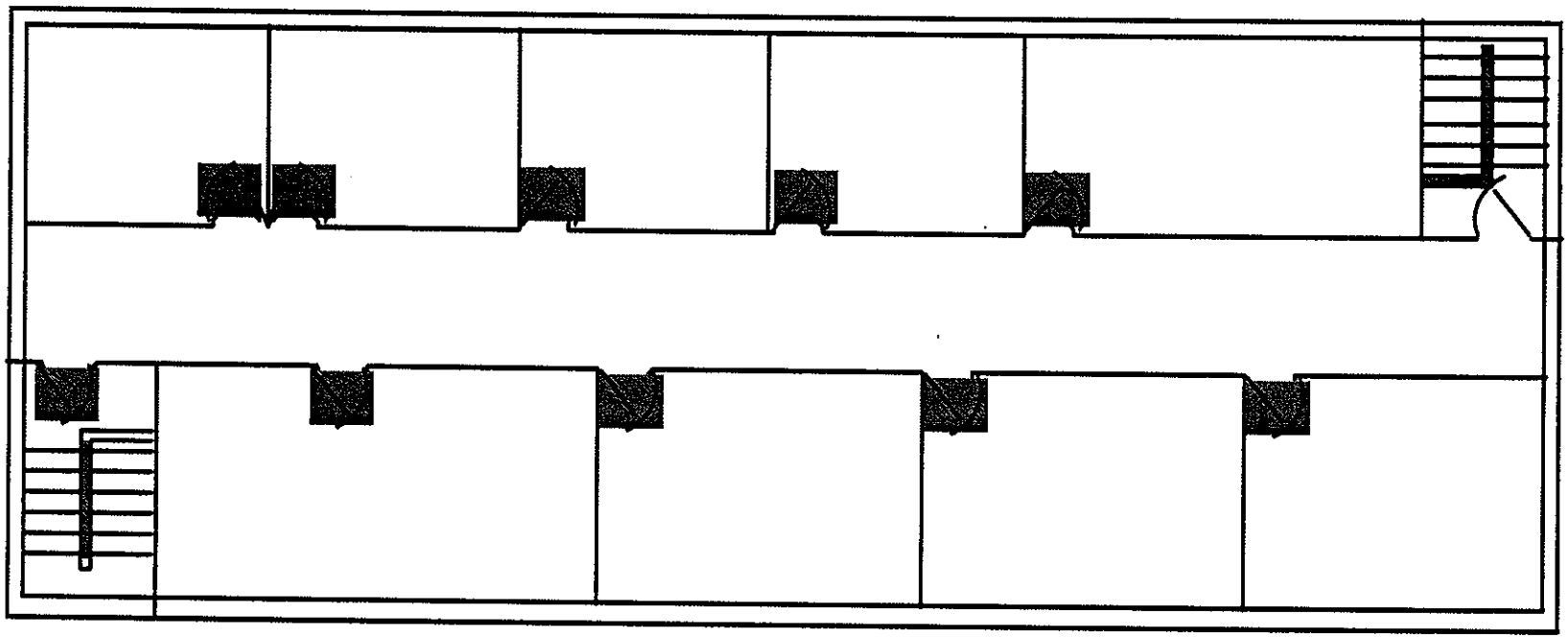
Rault Building Fire



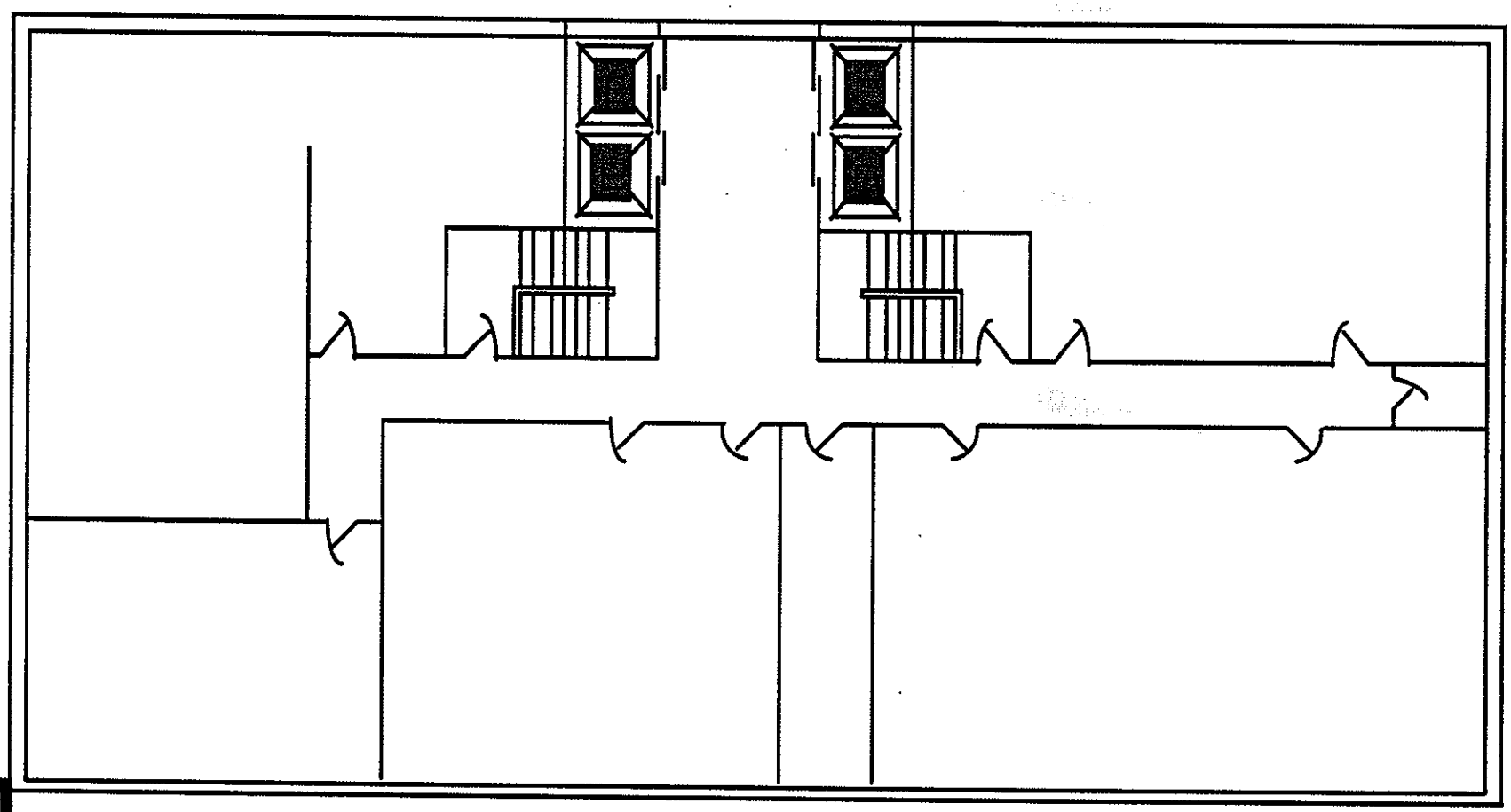
Dead End Corridors



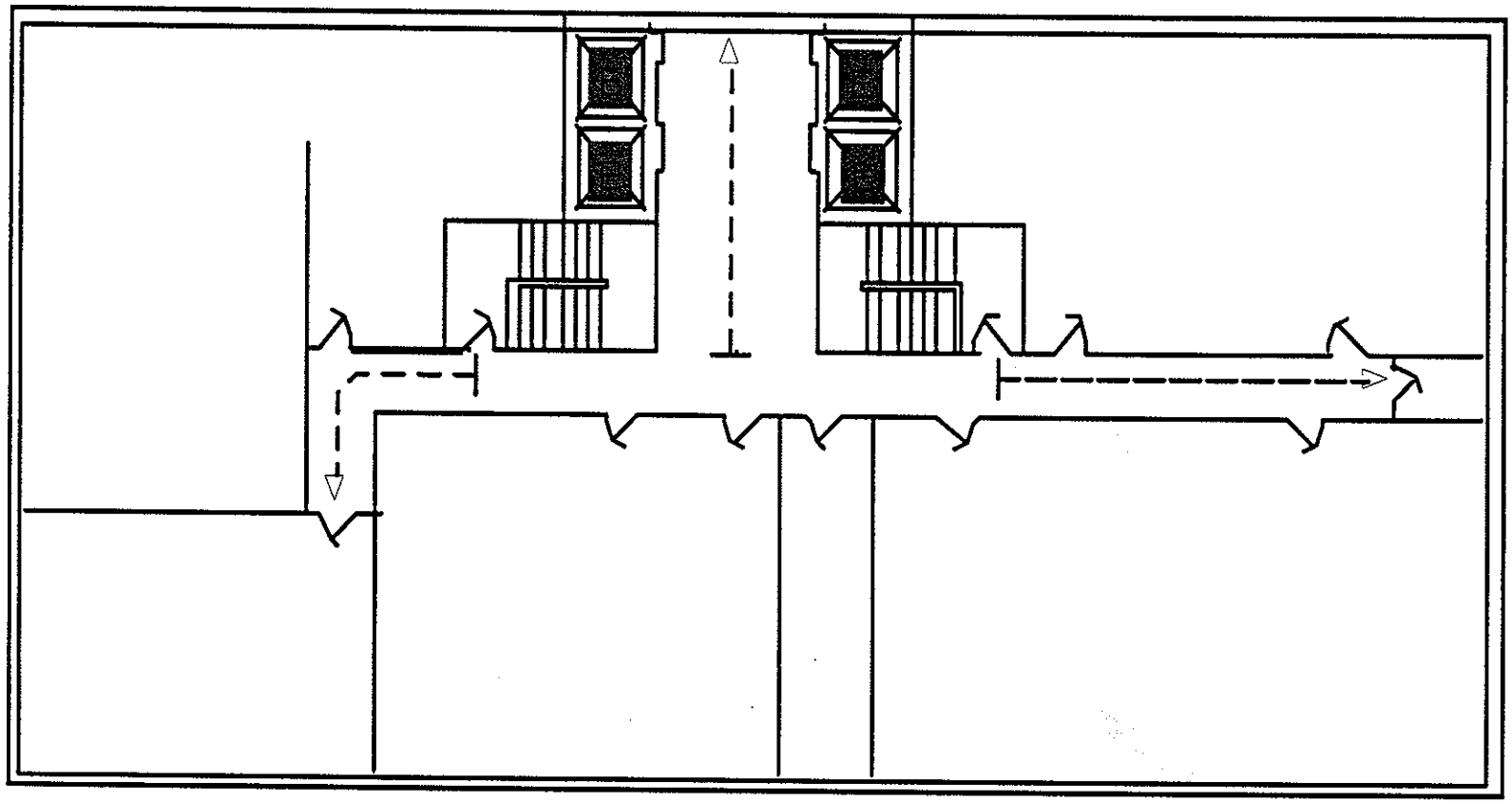
No Dead End Corridors



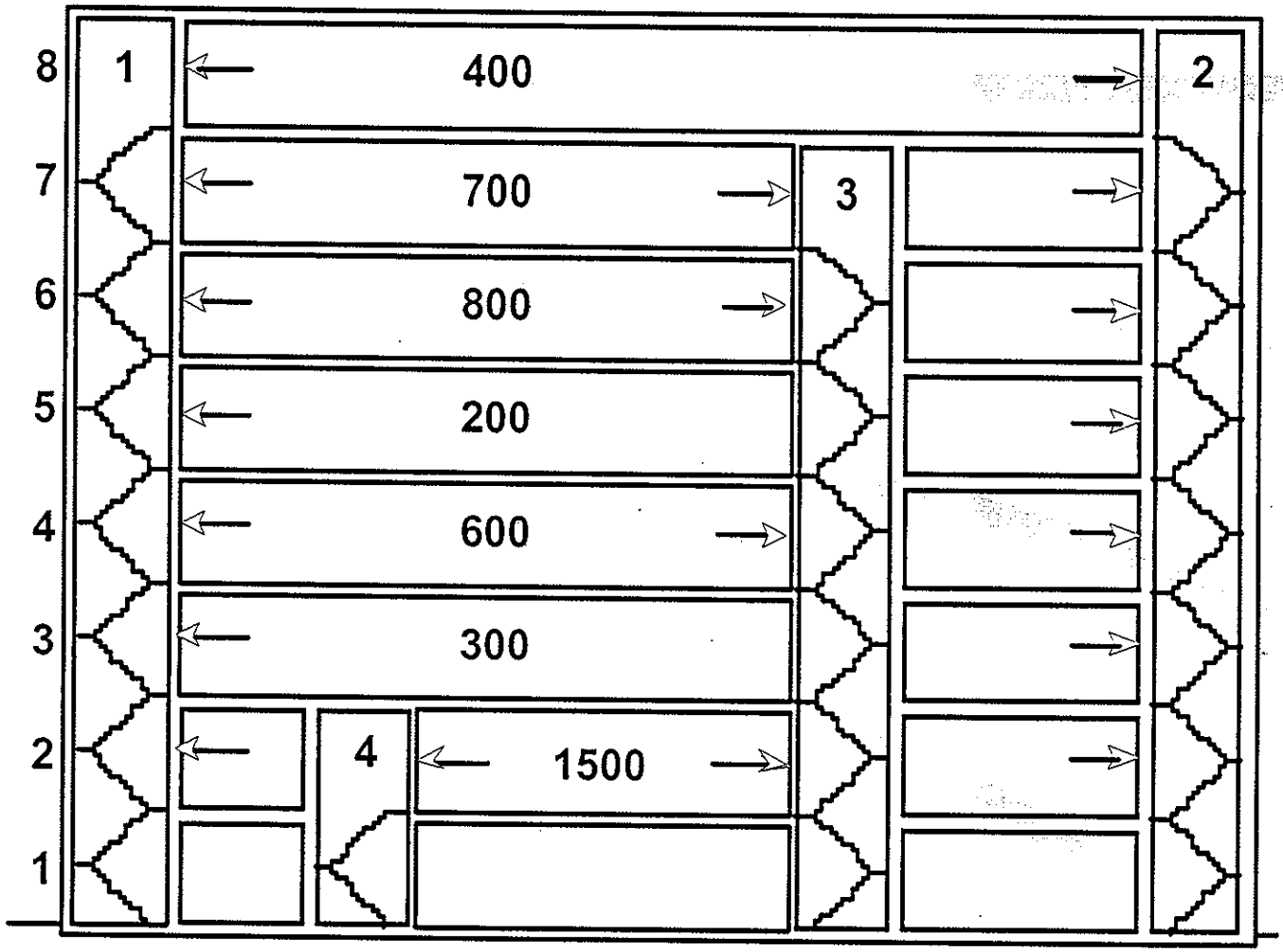
Dead End Corridors



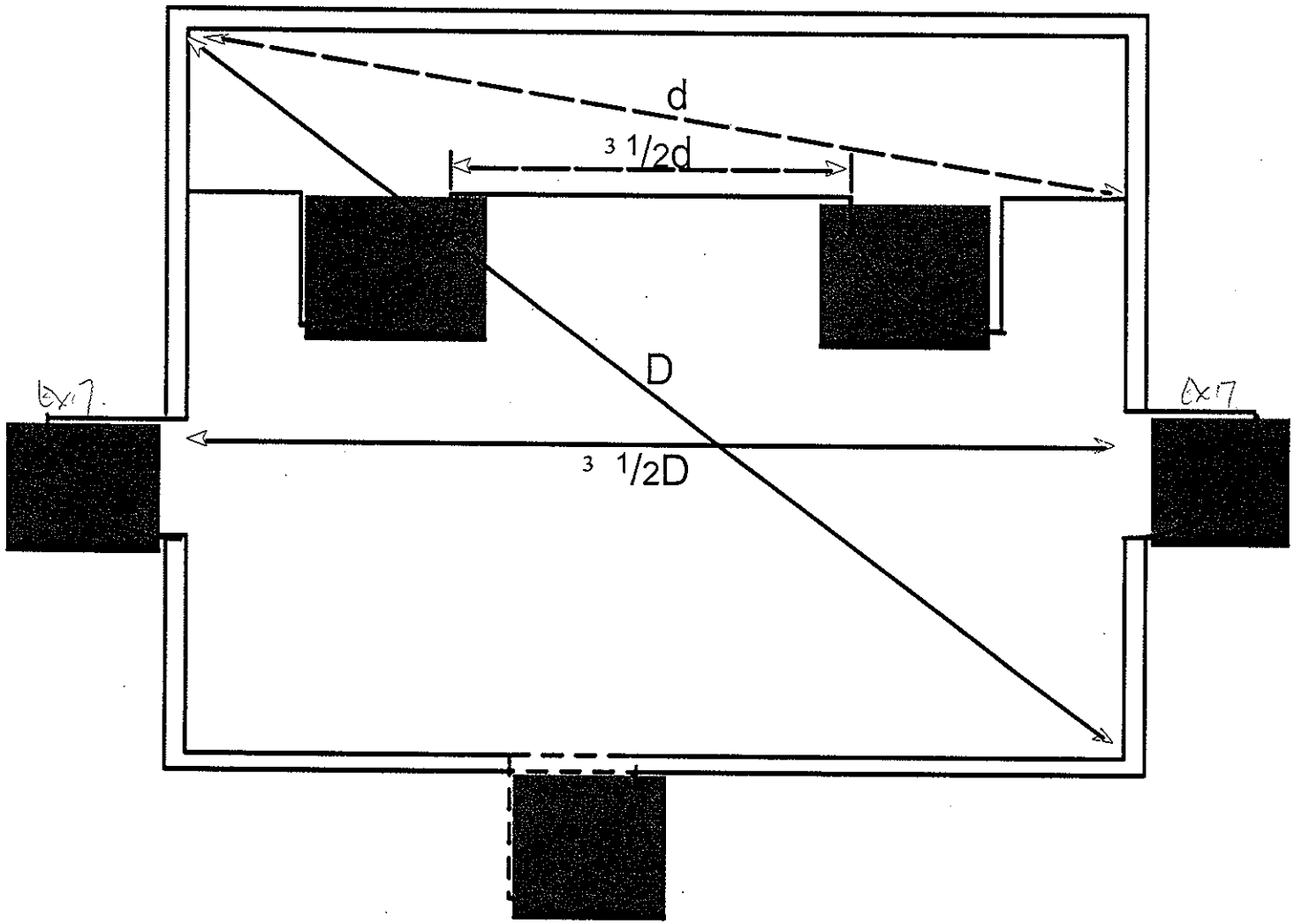
Dead End Corridors



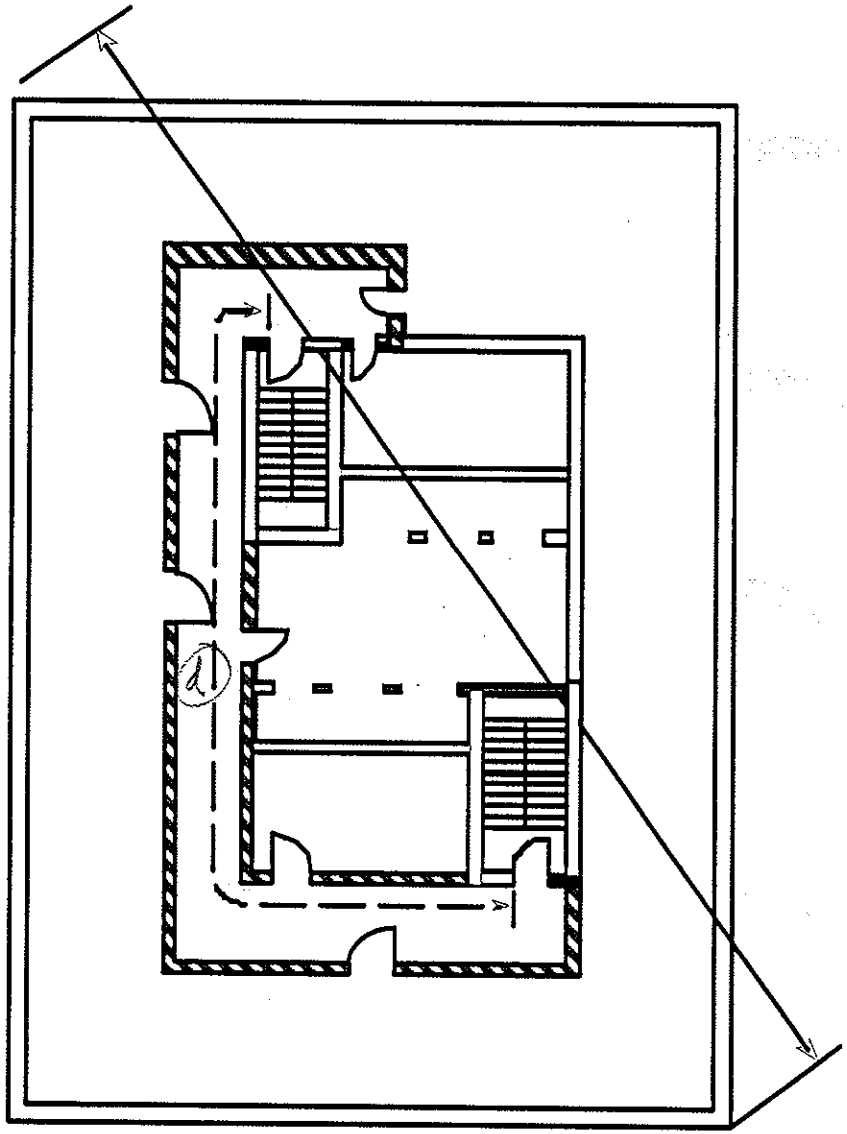
Number of Means of Egress



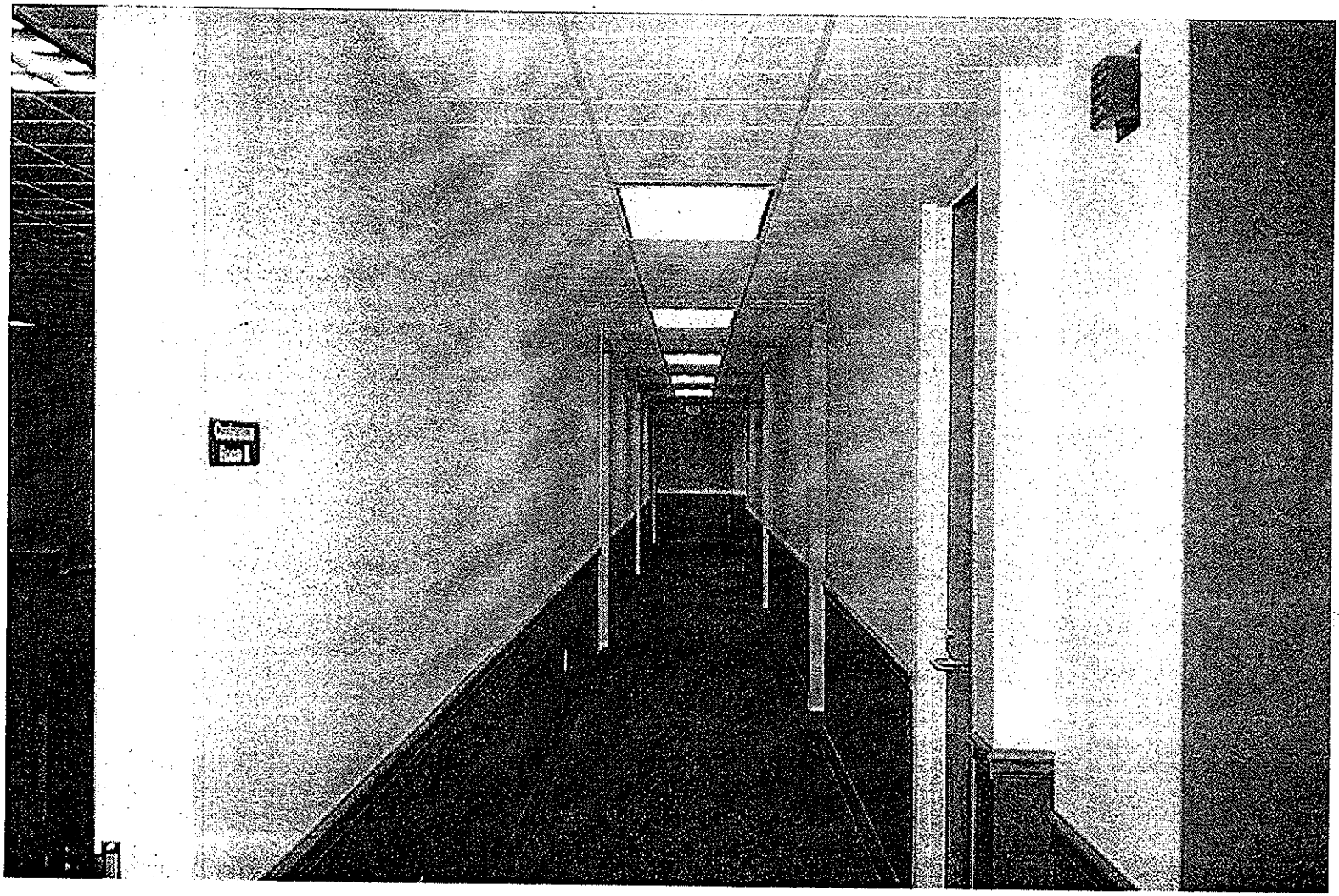
Determining Remoteness



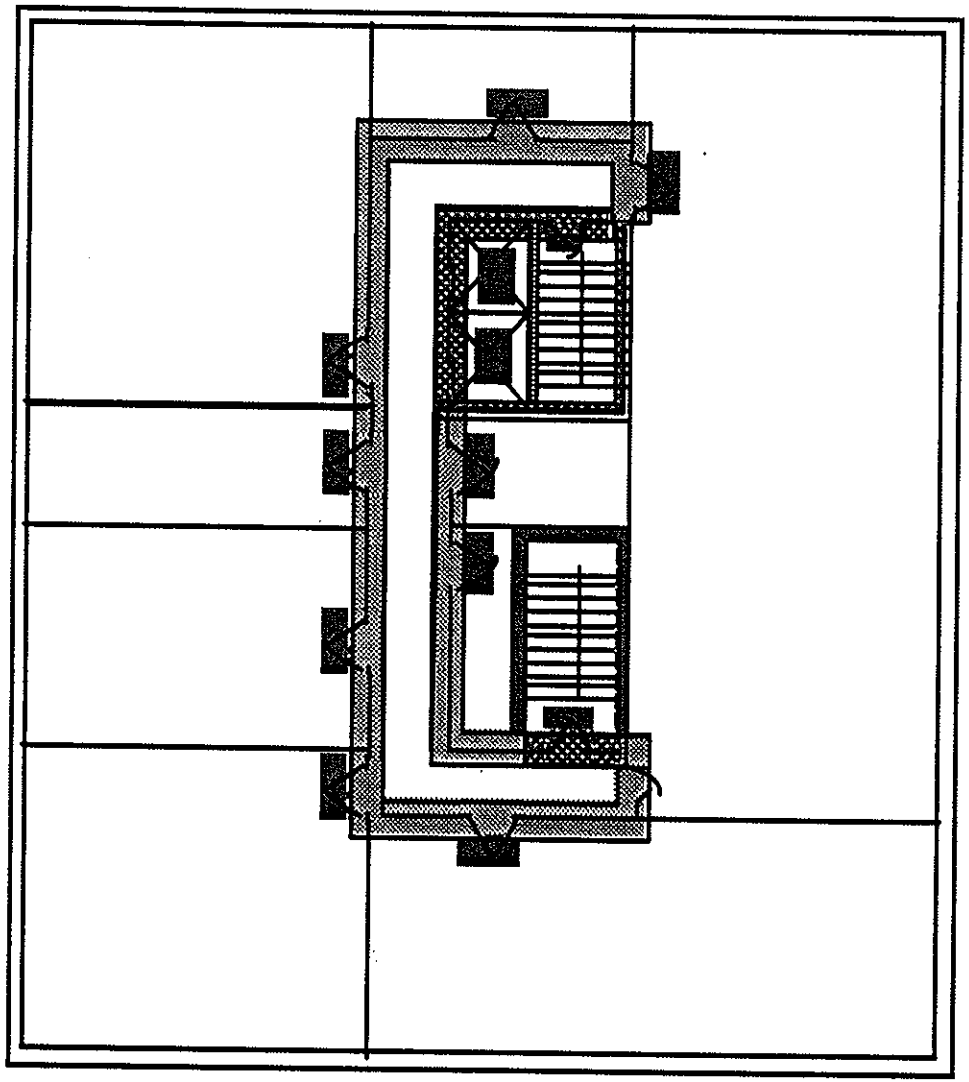
Remoteness Using Corridor



Exit Access Corridors



Exit Access Corridor



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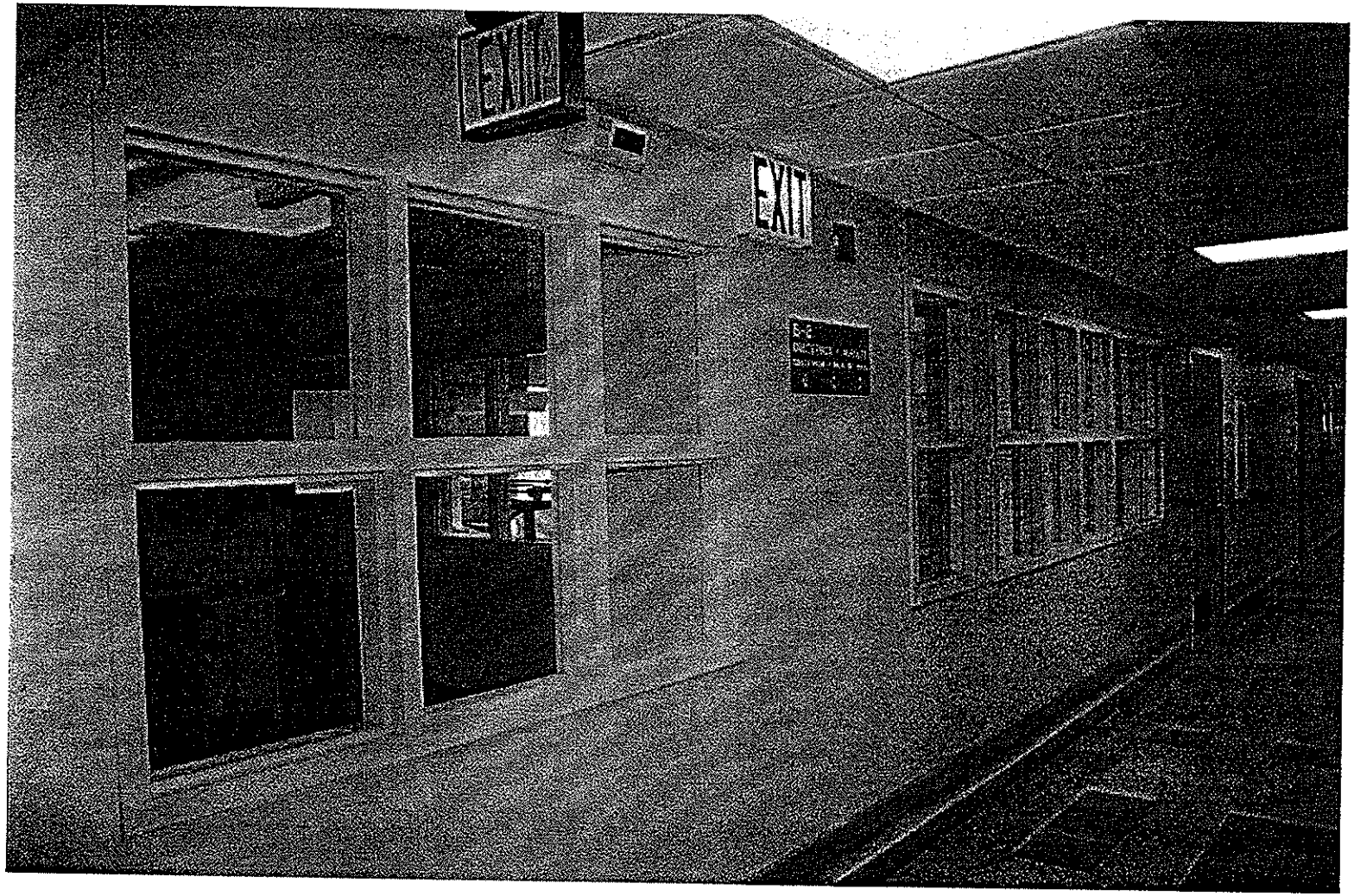
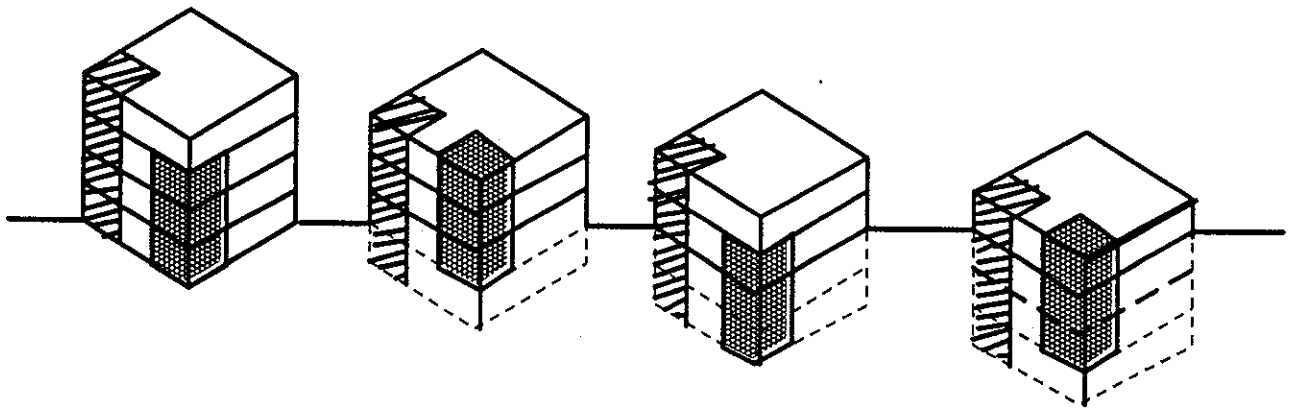
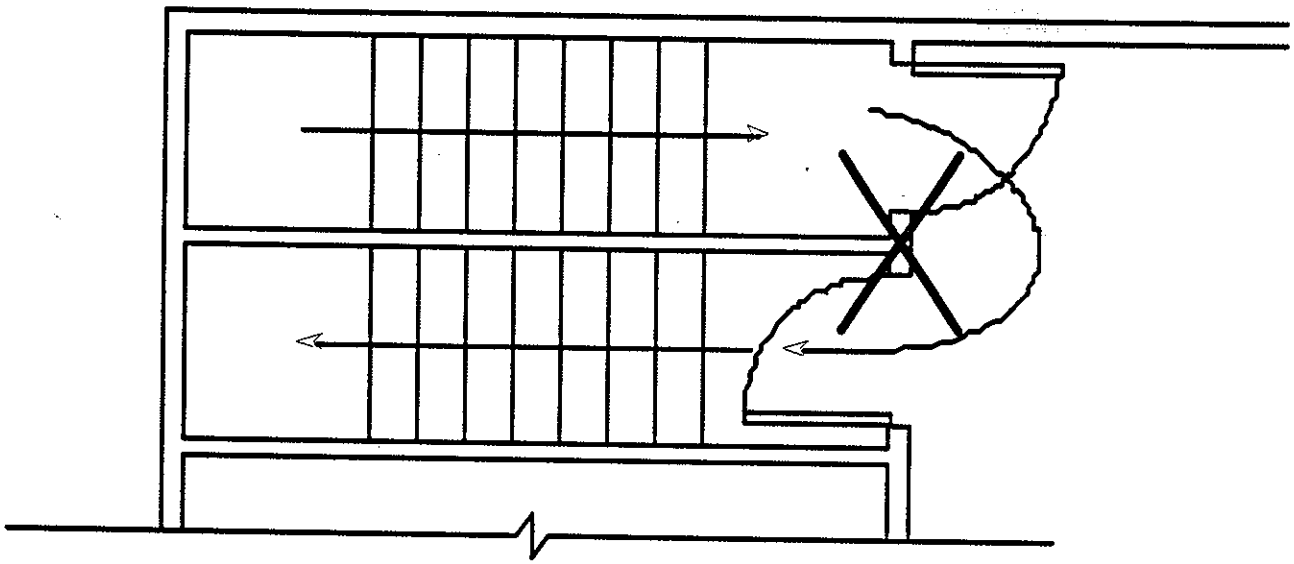


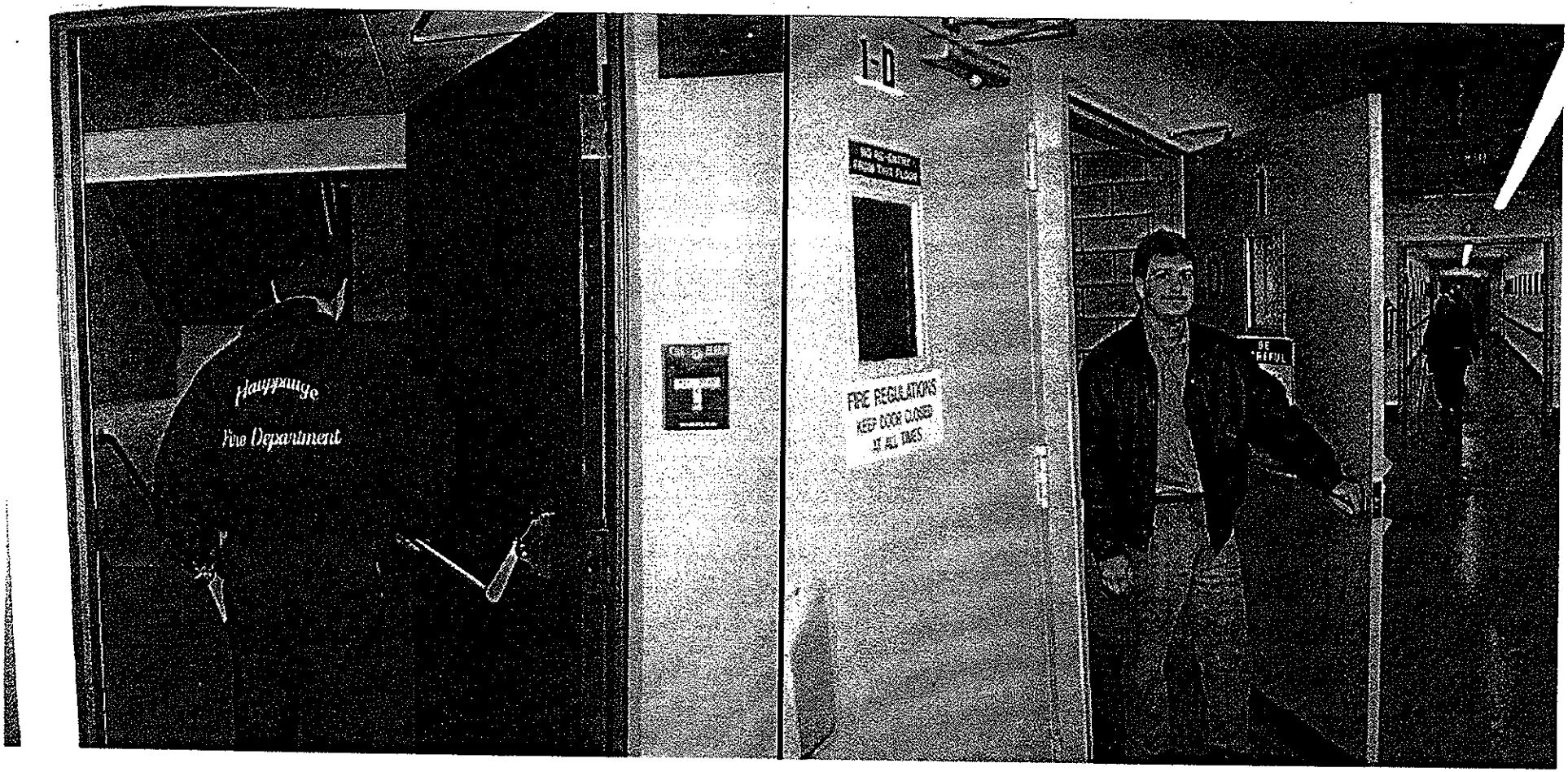
Exit Enclosure



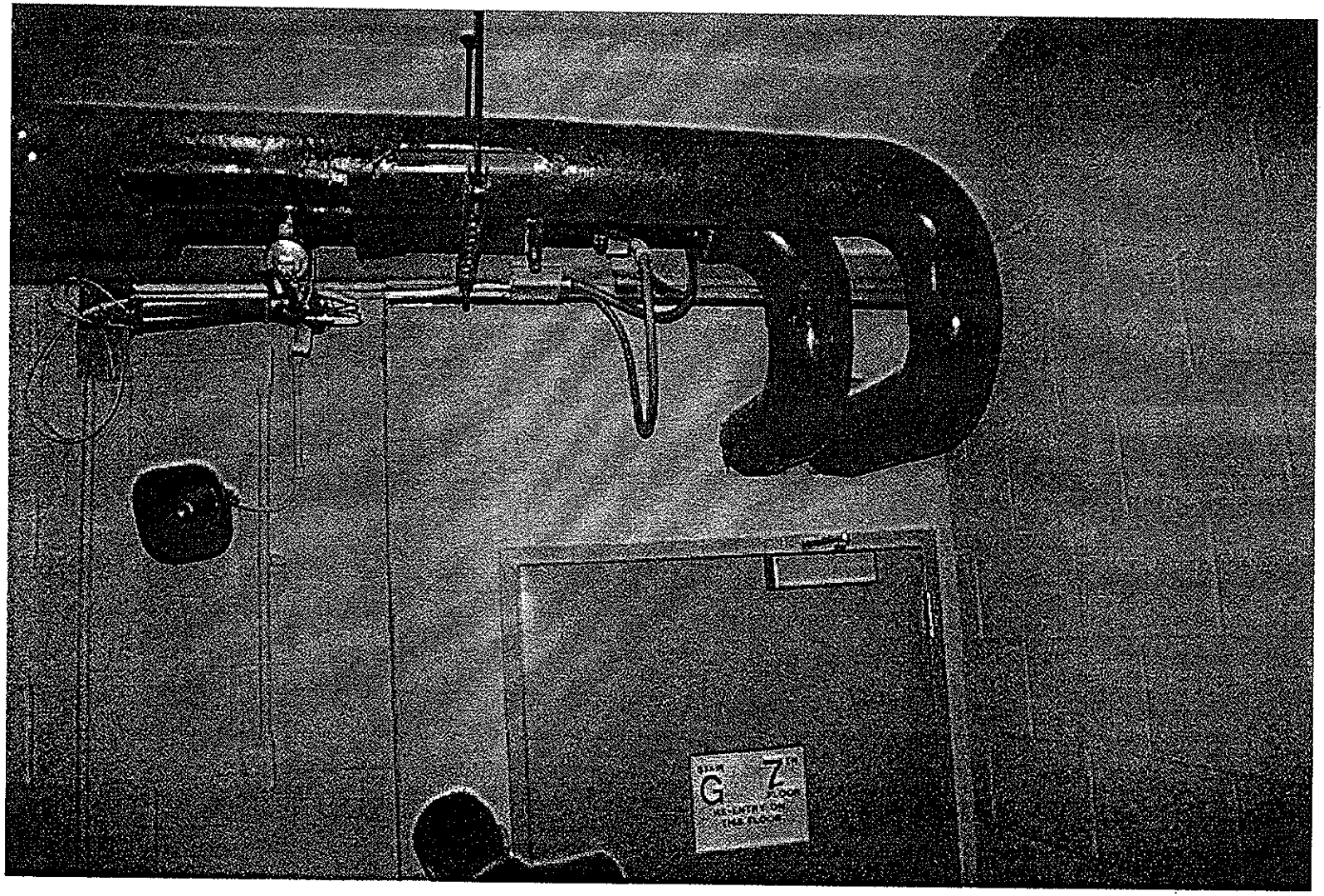
Unacceptable Exit Stair Enclosure



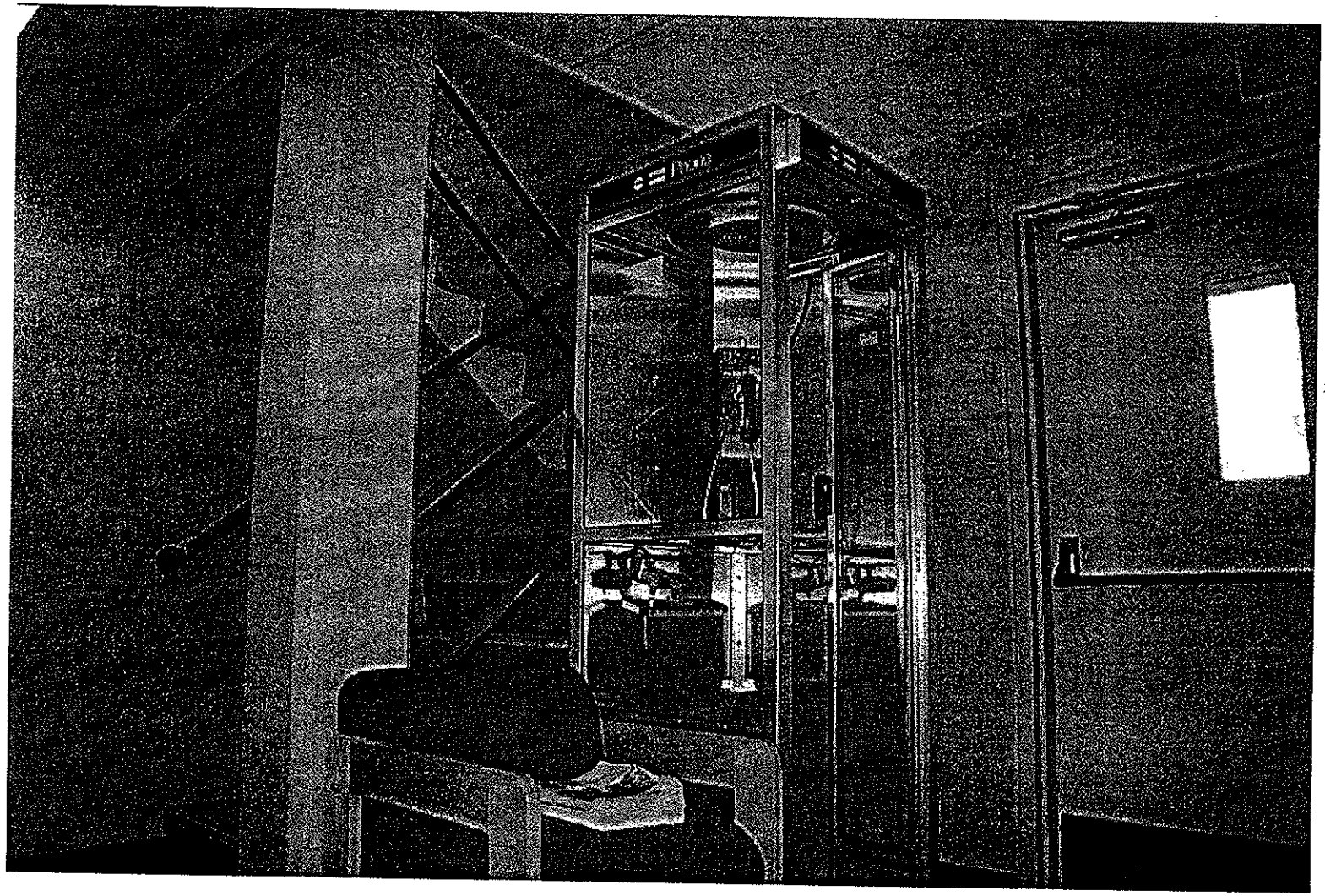
Exit Enclosure Openings



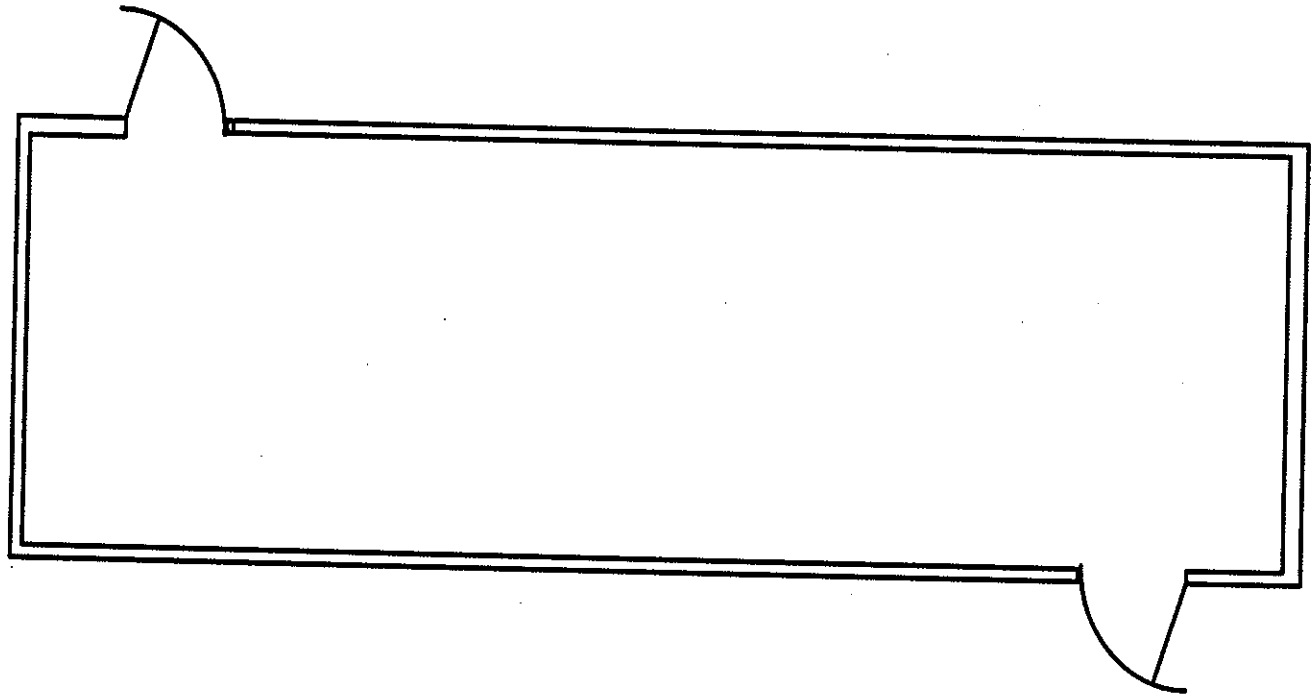
Exit Enclosure Penetrations



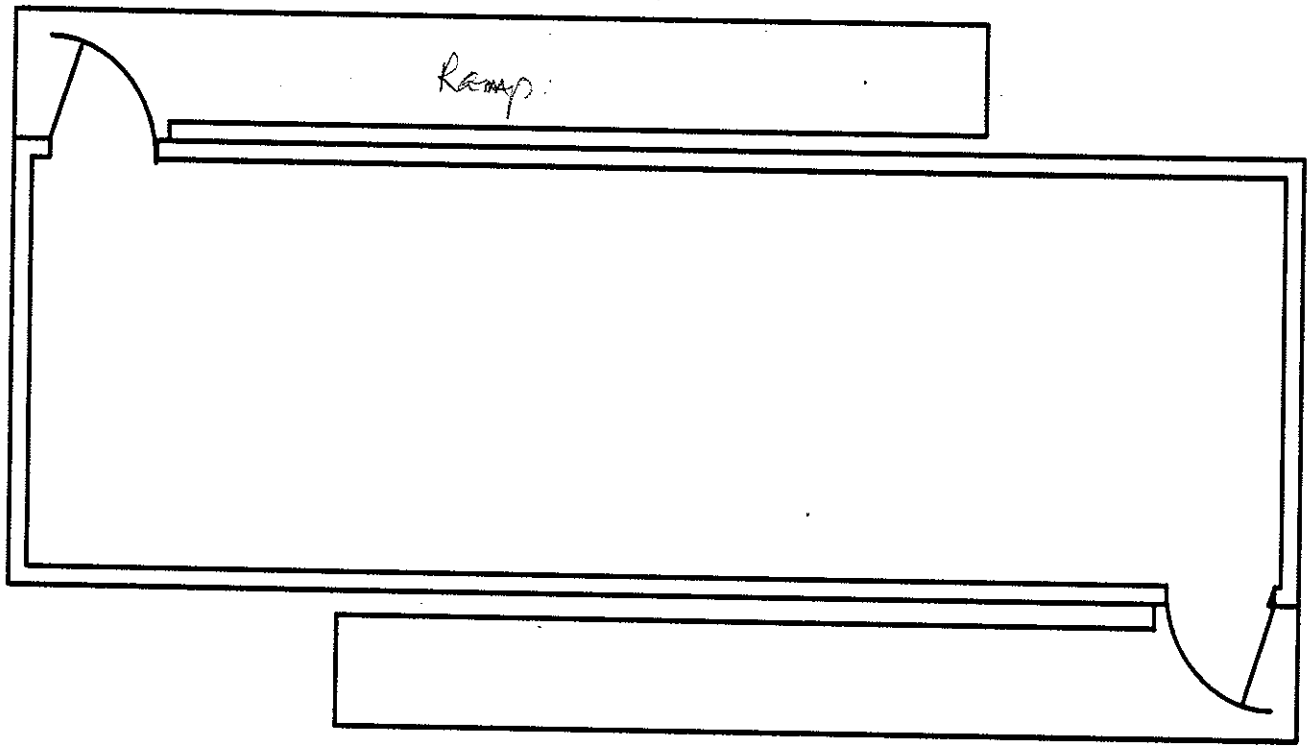
Exit Enclosure Use



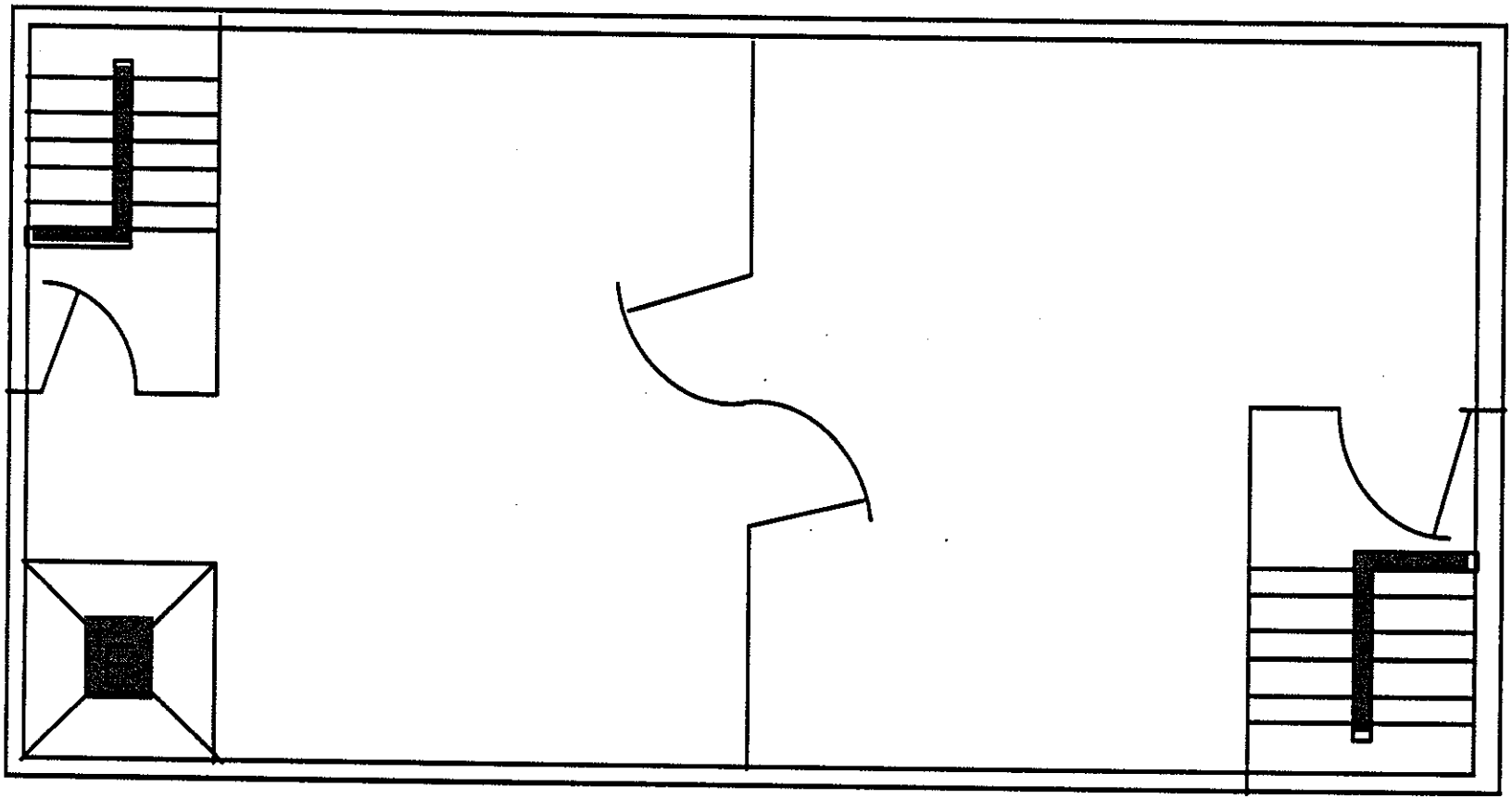
Accessible Means of Egress—LED



Accessible Means of Egress With Ramps



Areas of Refuge



Calculating Capacity

Step 1: Determine occupant load



Occupant Load

Actual maximum number of occupants, but not less than

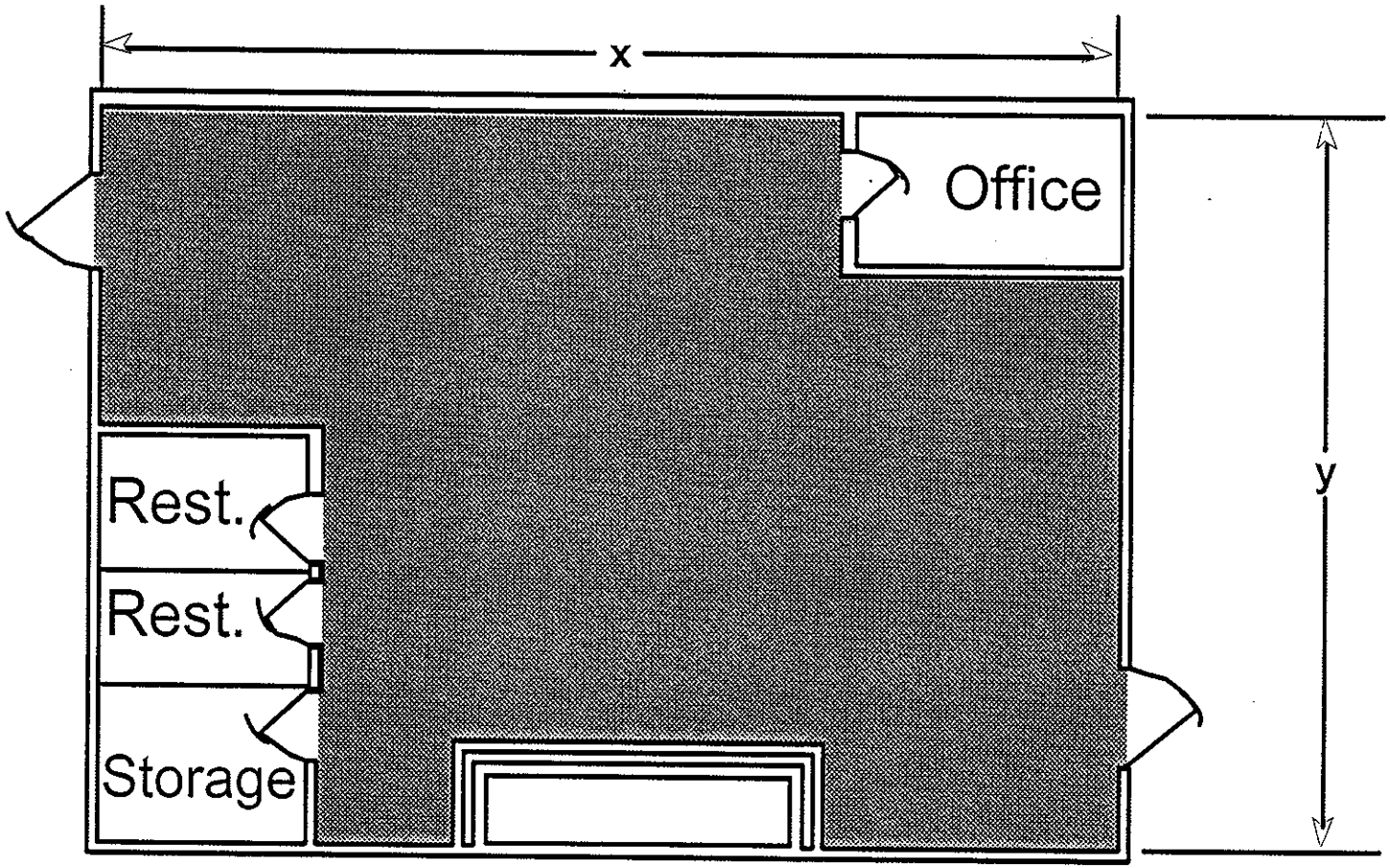
$$\frac{\text{Floor area}}{\text{Occupant Load Factor}}$$



Common Occupant Load Factors

Use	m^2
Assembly	
Less concentrated use without fixed seating	**1.4 net**
Concentrated use without fixed seating	**0.65 net**
Mercantile	
Street floor and sales basement	**2.8 gross**
Other floors	**5.6 gross**
Storage shipping	**27.9 gross**
Educational	
Classroom area	**1.9 net**
Shops and other vocational areas	**4.6 net**
Business (offices), industrial	**9.3 gross**
Hotel and apartment	**18.6 gross**
Health care	
Sleeping departments	**11.1 gross**
Inpatient treatment departments	**22.3 gross**
Detention and correctional	**11.1 gross**
Day care	**3.3 net**

Gross and Net Floor Area



Determine Occupant Load

- 60 m x 45 m floor
- Two 30 m^2 conference rooms
- Remainder used as offices



Determine Occupant Load

$$\frac{\text{Net Area}}{\text{Use factor}} + \frac{\text{Gross area - Net area}}{\text{Use Factor}}$$

$$\frac{60\ m^2}{1.4\ m^2/\text{person}} + \frac{2700\ m^2 - 60\ m^2}{9.3\ m^2/\text{person}}$$

$$43 + 284 = 327 \text{ persons}$$

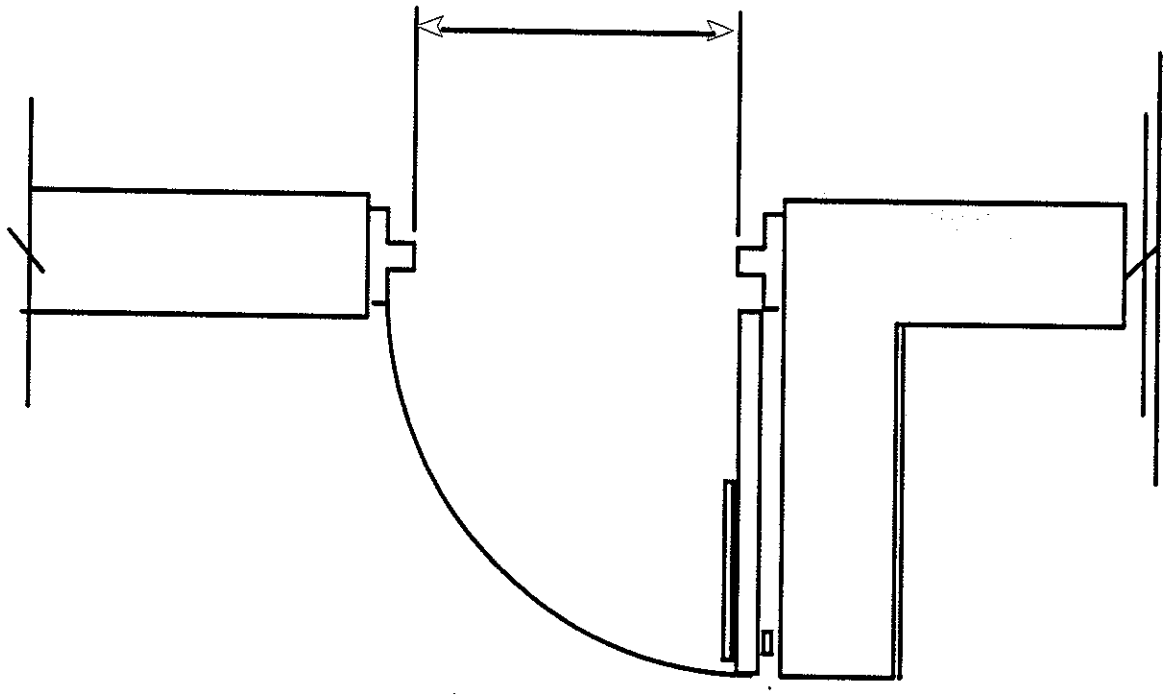
Calculating Capacity

- **Step 1: Determine occupant load**
- **Step 2: Determine clear width of components**

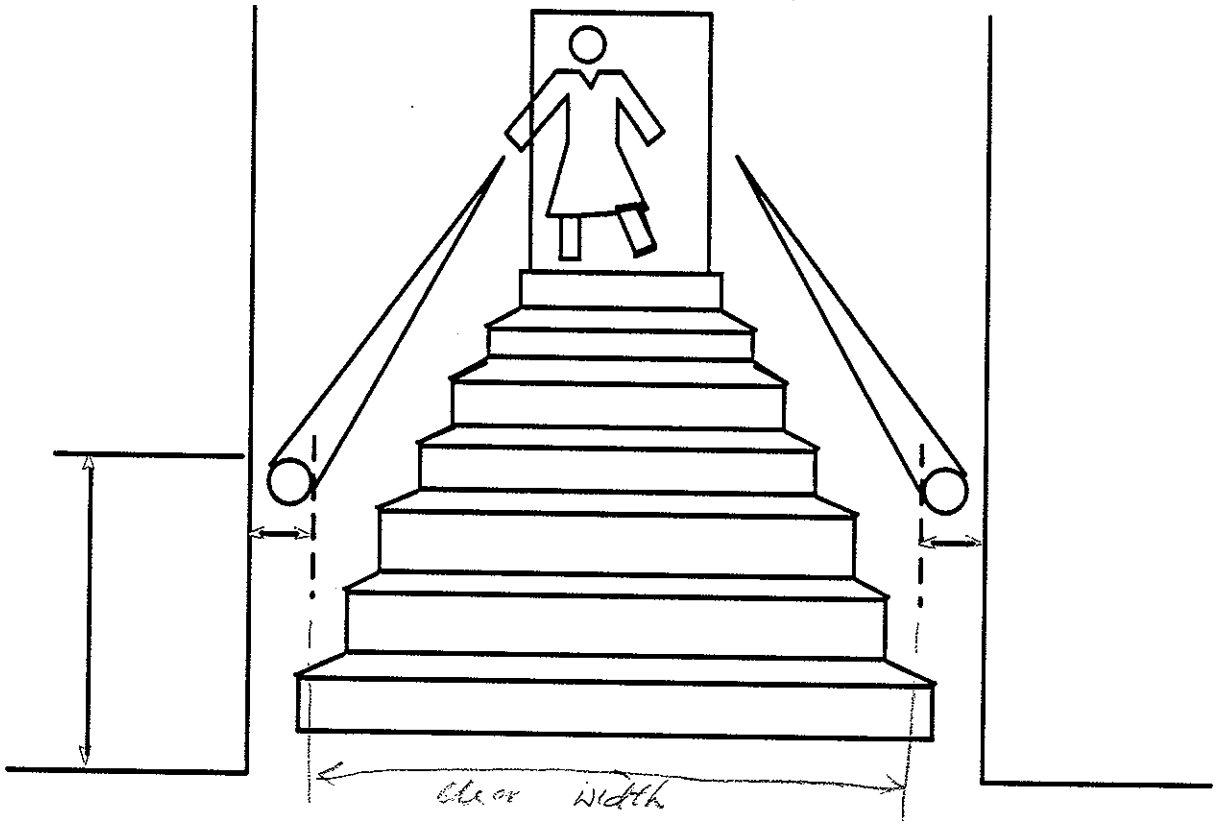


Determine Clear Width

- Corridors
- Doors



Projections



Calculating Capacity

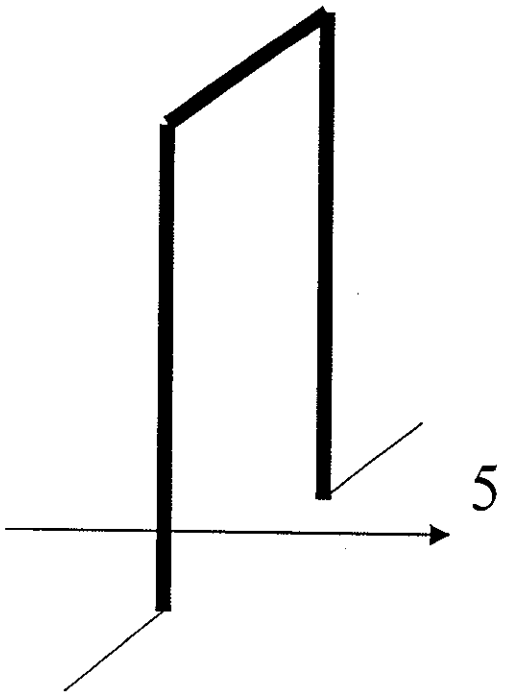
- Step 1: Determine occupant load
- Step 2: Determine clear width of components
- Step 3: Determine capacity of components

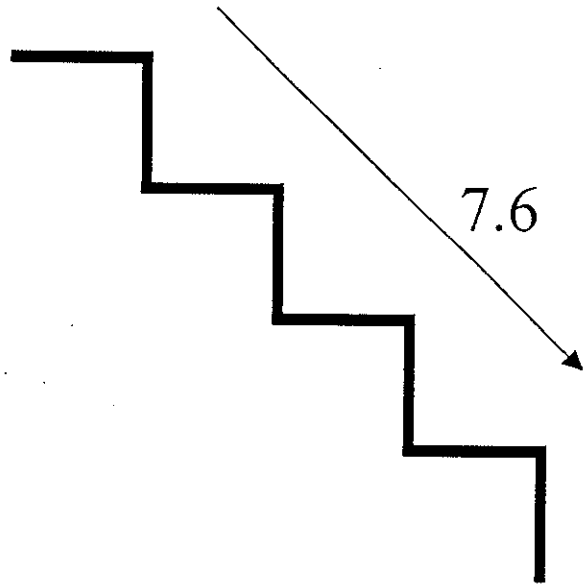


Component Capacity

$$\frac{\text{Clear Width}}{\text{Capacity factor}}$$

Capacity Factors





Component Capacity

- 1120-mm width stair

Component Capacity

$$= \frac{1120 \text{ mm}}{7.6 \text{ mm / person}}$$

$$= 147 \text{ persons}$$

Component Capacity

- 915-mm width door

providing 815-mm clear width

Component Capacity

$$= \frac{815 \text{ mm}}{5 \text{ mm / person}}$$

$$= 163 \text{ persons}$$



Calculating Capacity

- Step 1: Determining occupant load
- Step 2: Determine clear width of components
- Step 3: Determine capacity of components
- Step 4: Determine most restrictive component

Determine Most Restrictive Component

- Corridor—1525 mm clear
- Door to stair enclosure—815 mm clear
- Stair—1120 mm clear
- Door to outside—815 mm clear
- Sidewalk to public way—1220 mm clear



Determine Most Restrictive Component

Component	Clear Width (mm)	Capacity Factor (mm / person)	Capacity (persons)
Corridor	1525		
Door to stair	815		
Stair	1120		
Door to outside	815		
Sidewalk	1220		

Determine Most Restrictive Component

Component	Clear Width (mm)	Capacity Factor (mm / person)	Capacity (persons)
Corridor	1525	5	
Door to stair	815	5	
Stair	1120	7.6	
Door to outside	815	5	
Sidewalk	1220	5	

Determine Most Restrictive Component

Component	Clear Width (mm)	Capacity Factor (mm / person)	Capacity (persons)
Corridor	1525	5	305
Door to stair	815	5	163
Stair	1120	7.6	147
Door to outside	815	5	163
Sidewalk	1220	5	244

Determine Most Restrictive Component

- Component that provides least capacity is stair—147 people
- Capacity of this means of egress—147 people

Calculating Capacity

- Step 1: Determine occupant load
- Step 2: Determine clear width of components
- Step 3: Determine capacity of components
- Step 4: Determine most restrictive component

- Step 5: Determine if egress capacity is sufficient



Capacity Sufficiency

- Capacity [3] maximum occupant load
  - Occupant load of 327
  - 2 means of egress—each with capacity of 147



Capacity Sufficiency

- 2 means of egress x 147 people each = 294
- Egress capacity ^{3} occupant load
- Egress capacity = 294
- Occupant load = 327
- Egress capacity is NOT adequate

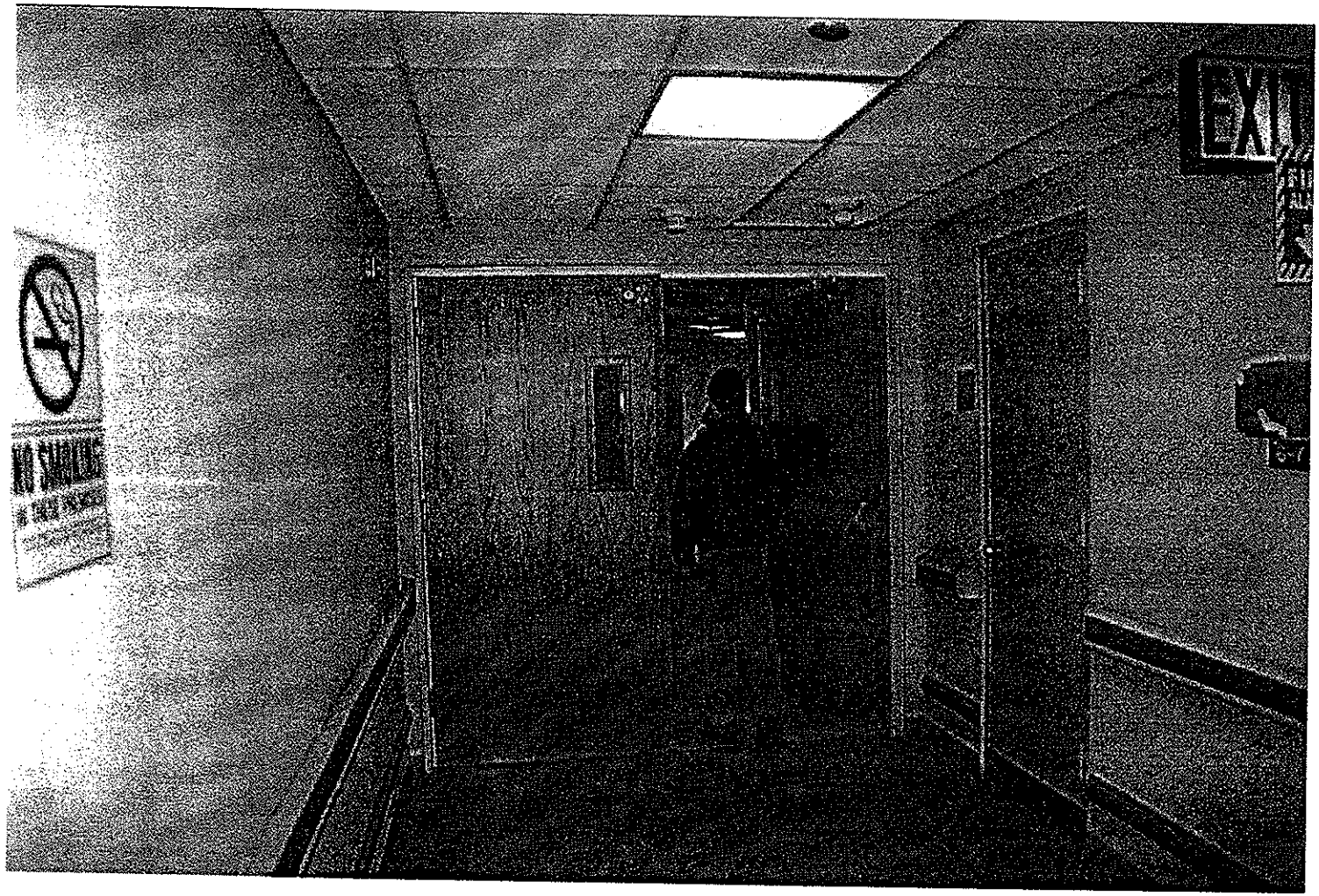
Capacity Sufficiency

With 2 means of egress, how wide must the stairs be so together they handle 327 people?

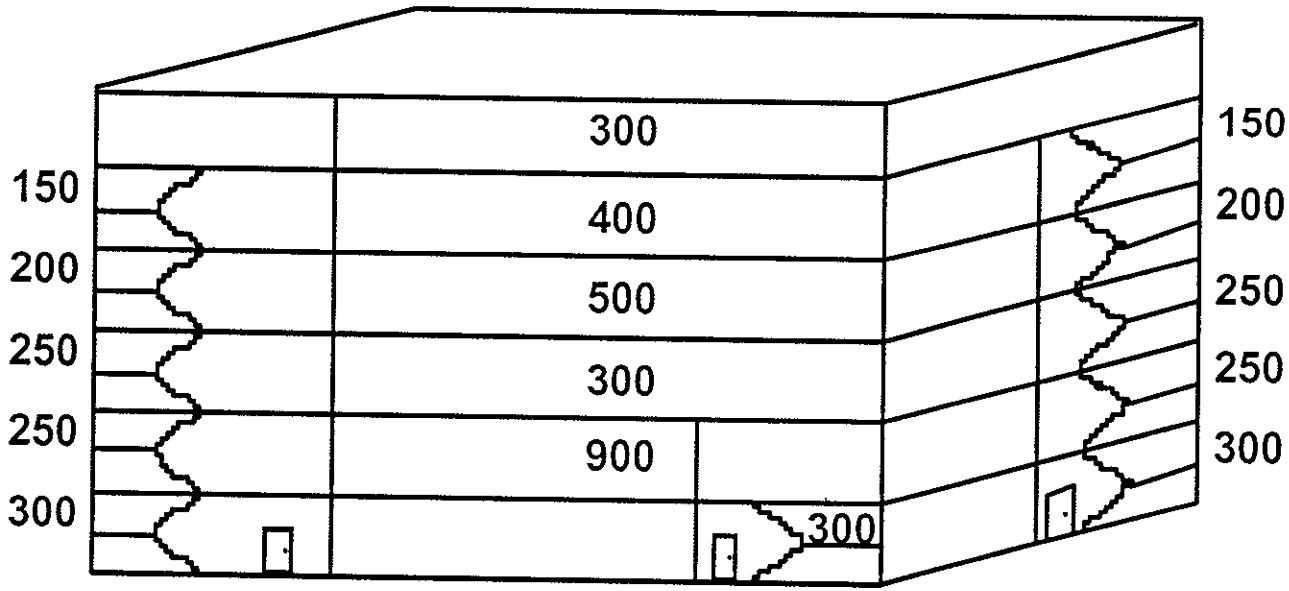
Capacity Sufficiency

- 327 people/2 stairs = 164 people per stair
- 164 people x 7.6 mm per person = 1250 mm

Minimum Width



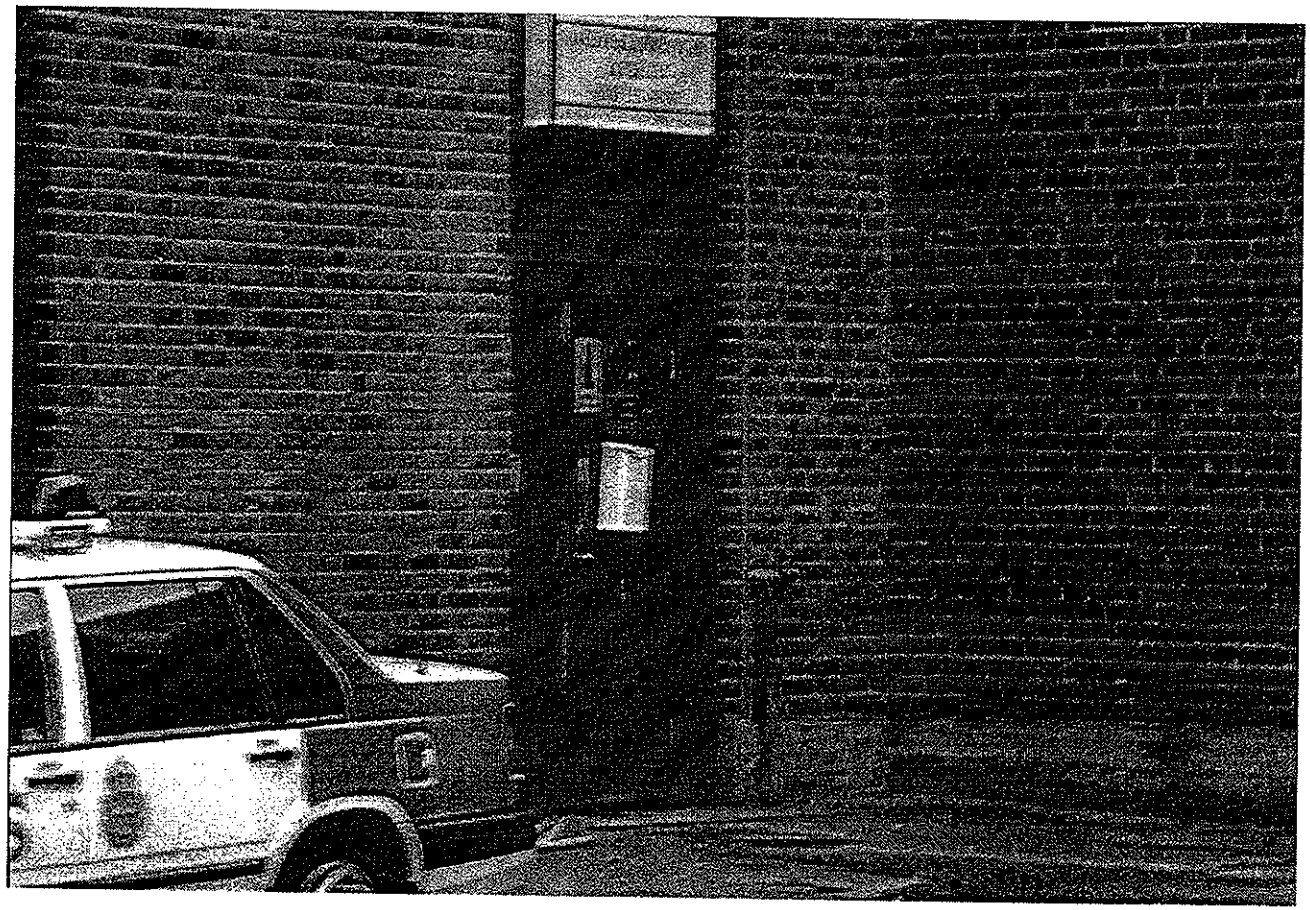
Determining Egress Capacity for Stair



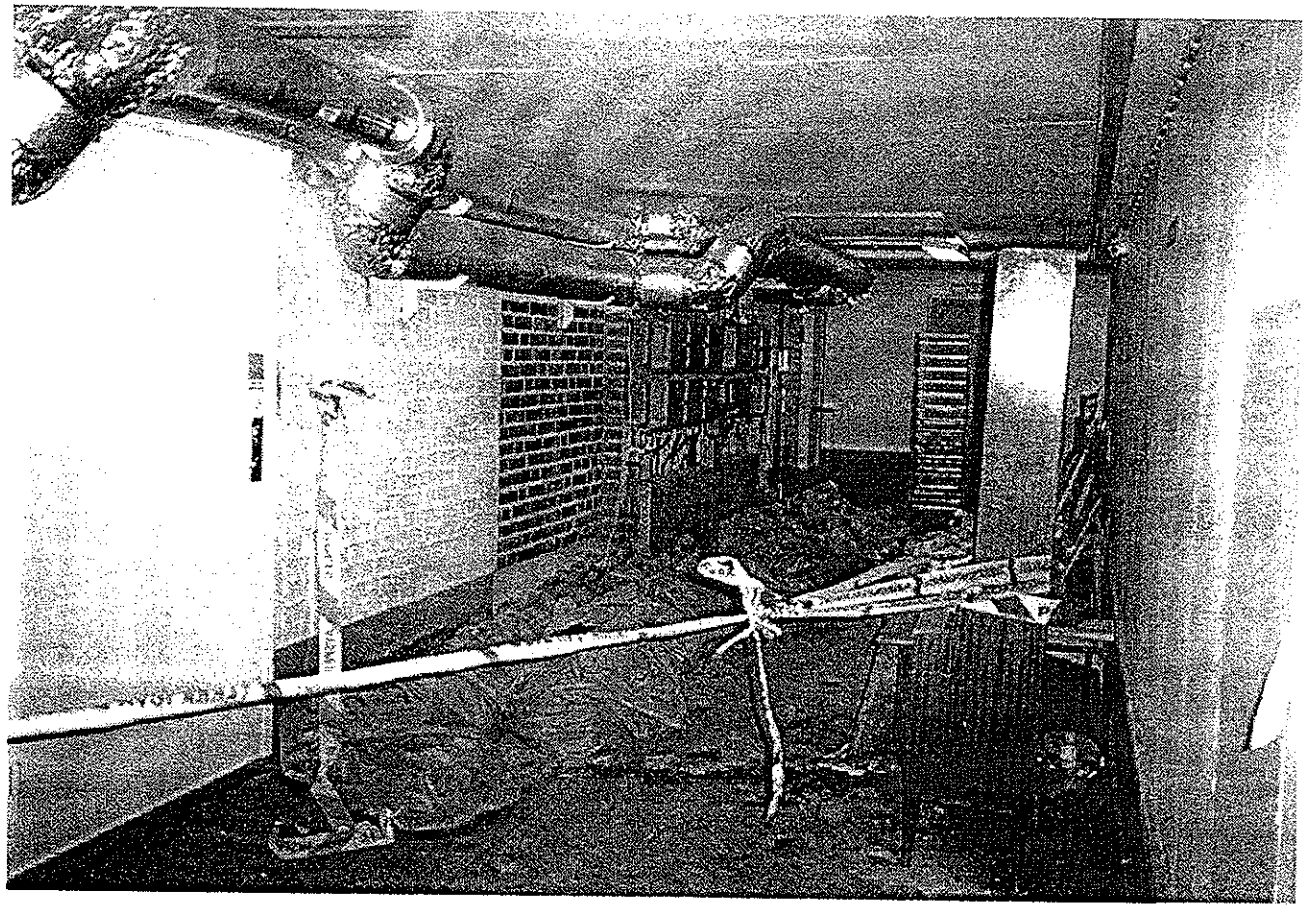
Gothenburg Disco - 1998



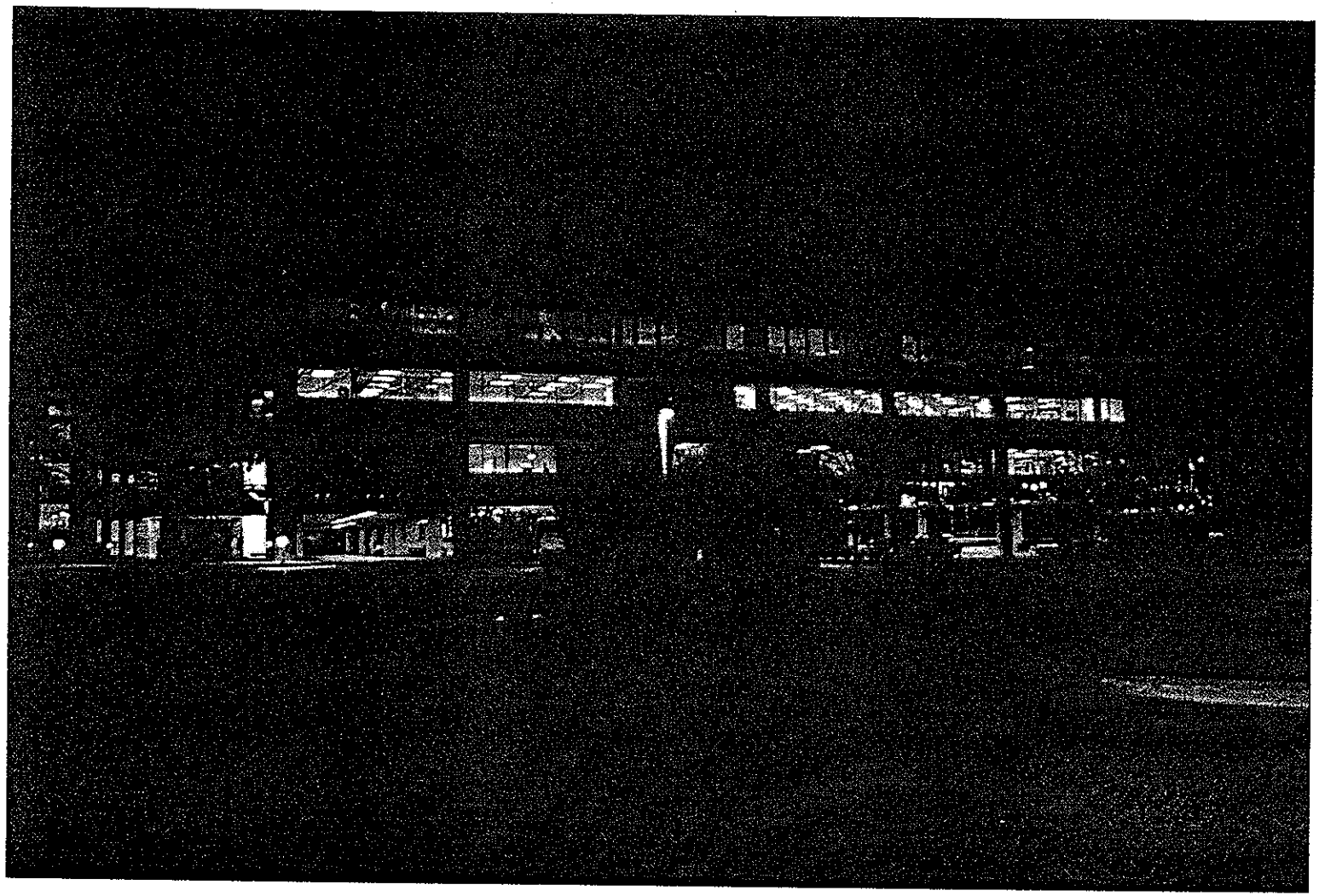
Insufficient Egress



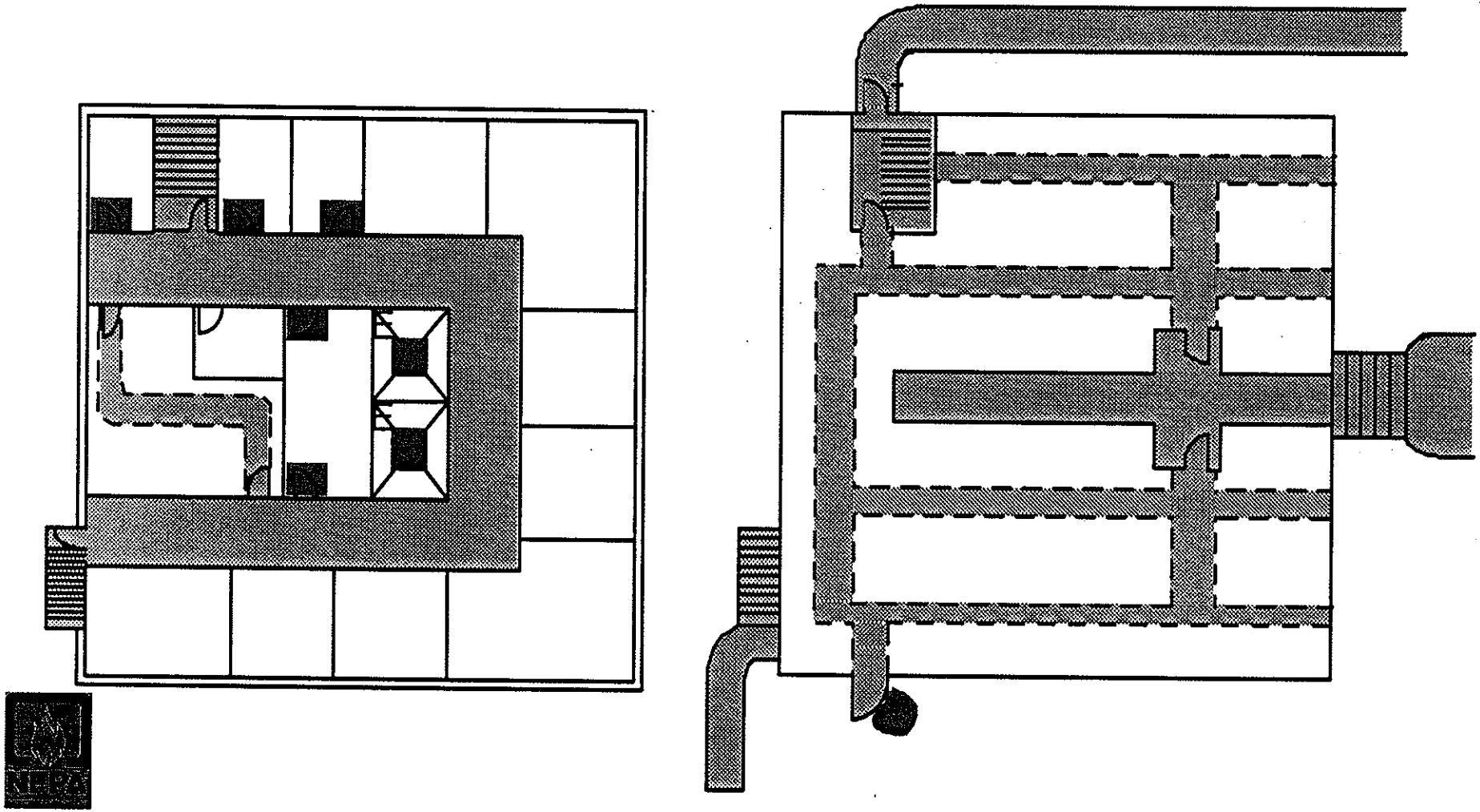
Obstructed Egress



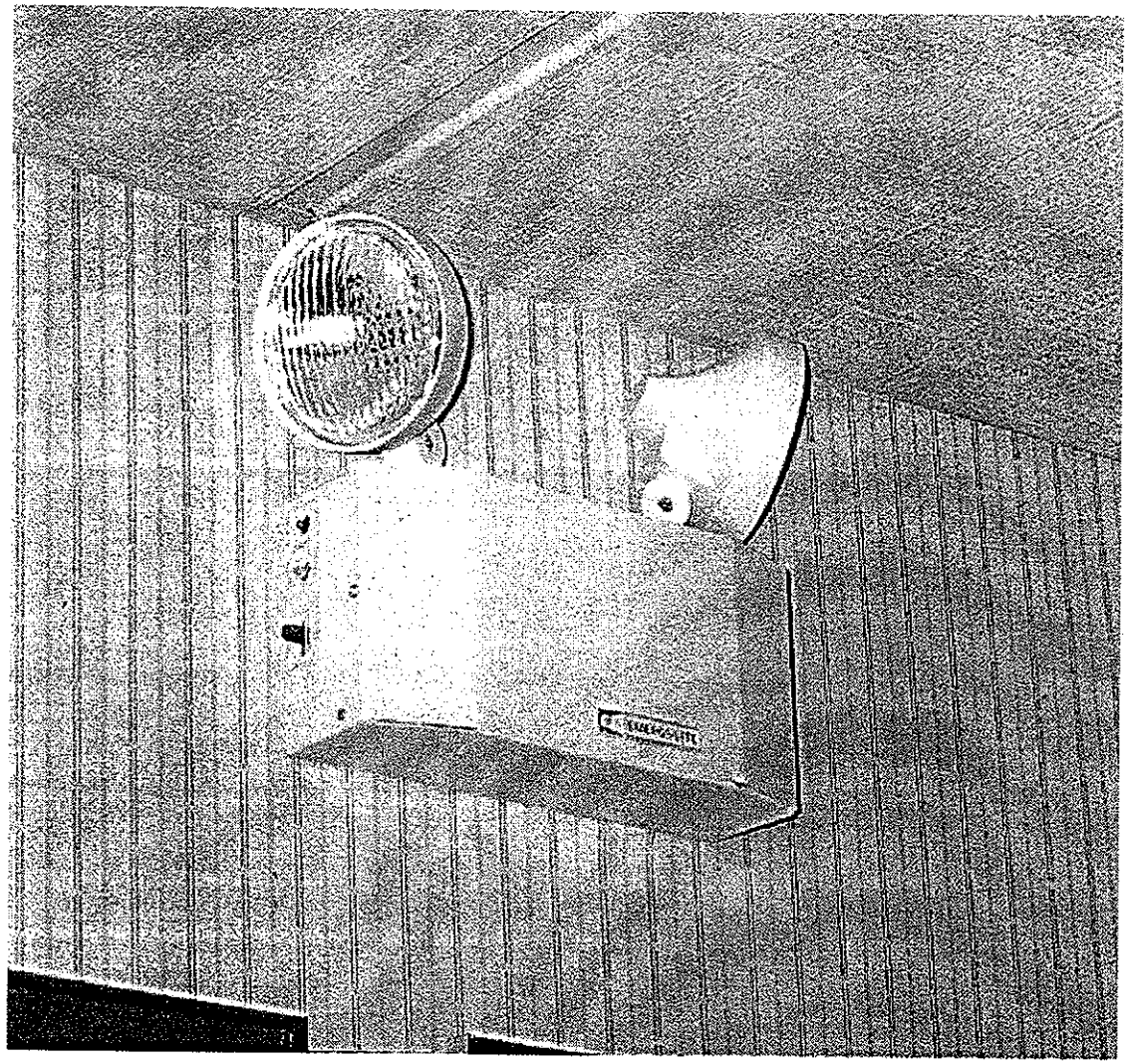
Illumination of Means of Egress



Designated Areas—Illumination



Emergency Lighting



Emergency Lighting



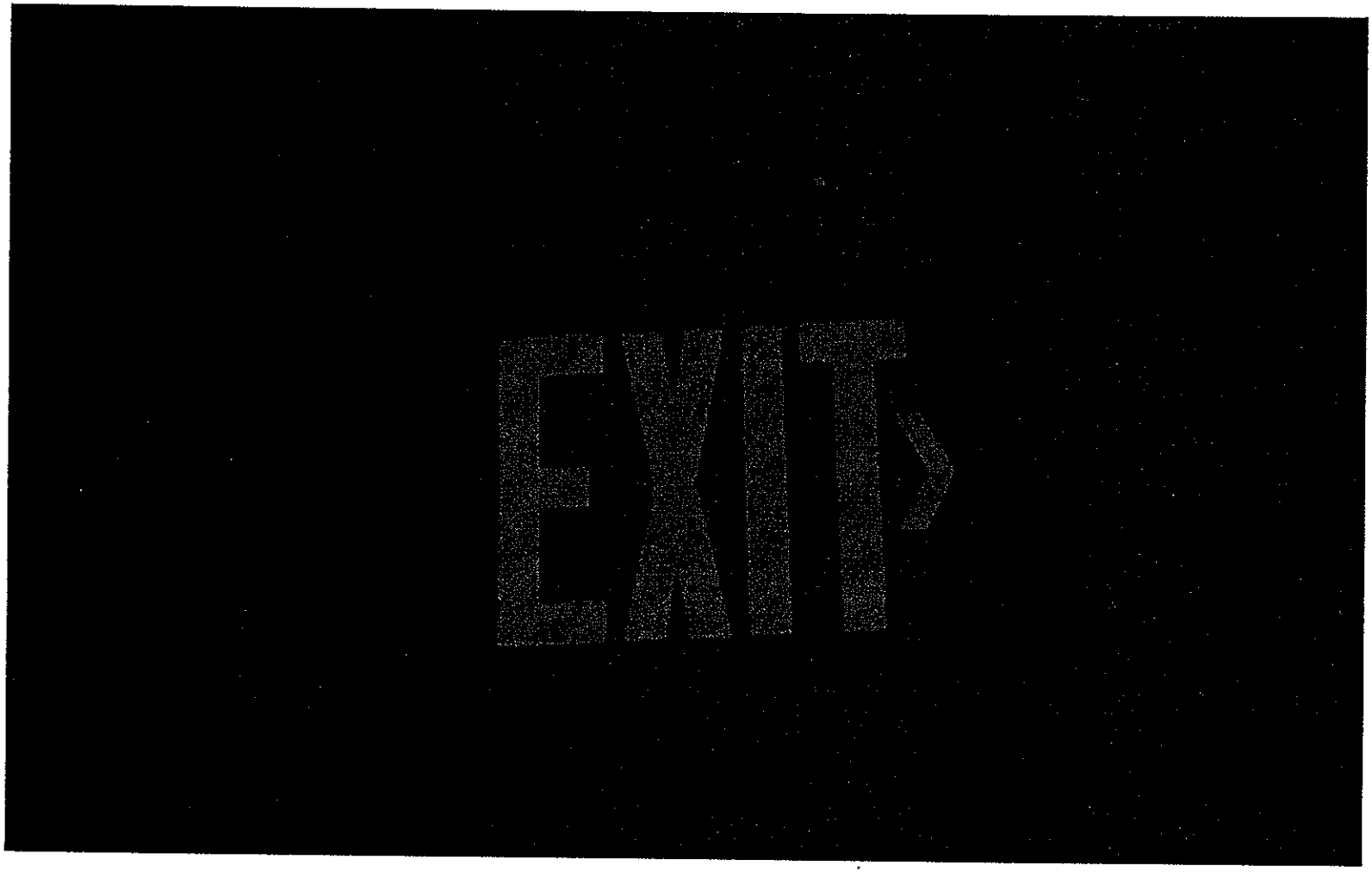
Marking of Means of Egress



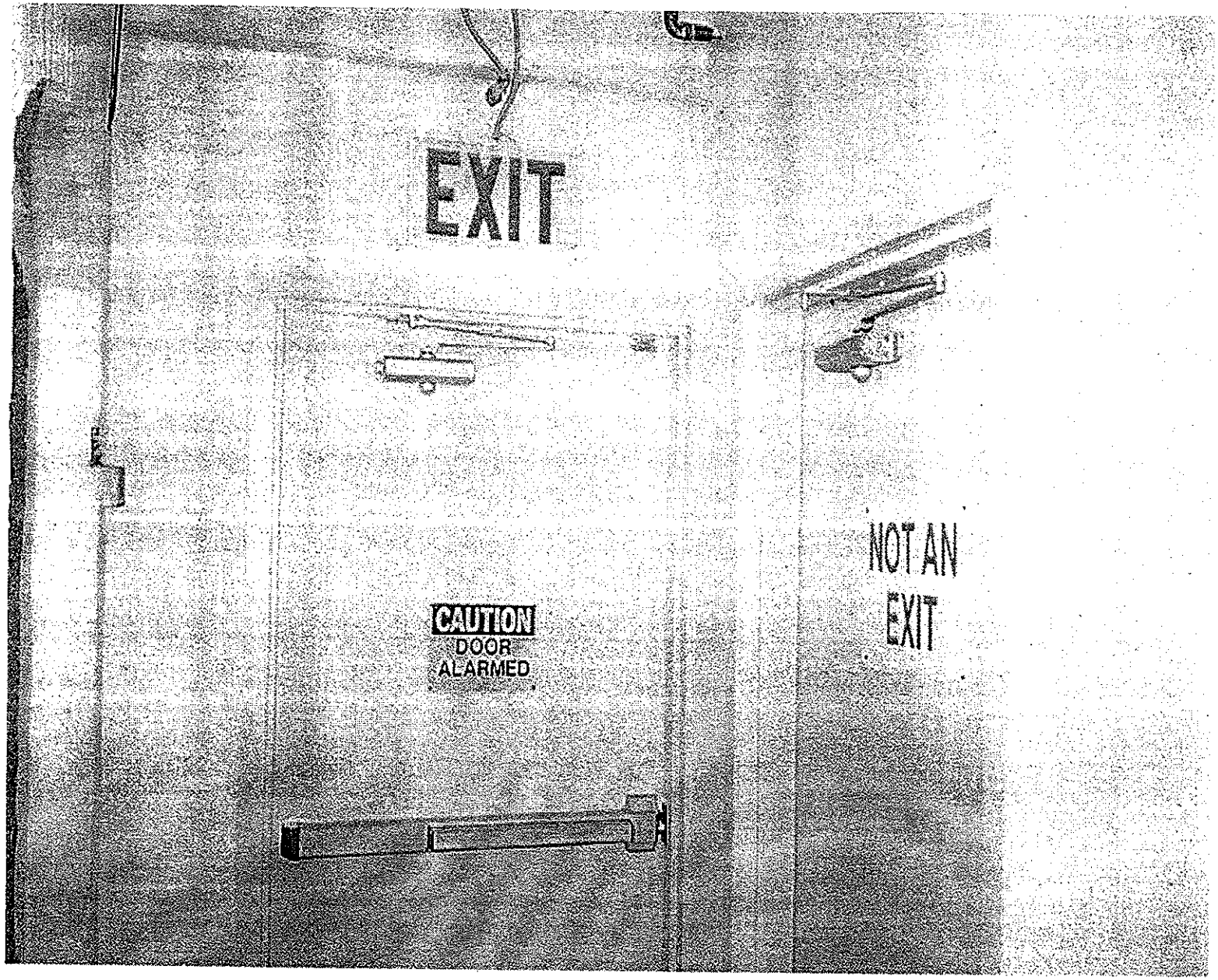
Exit Signs



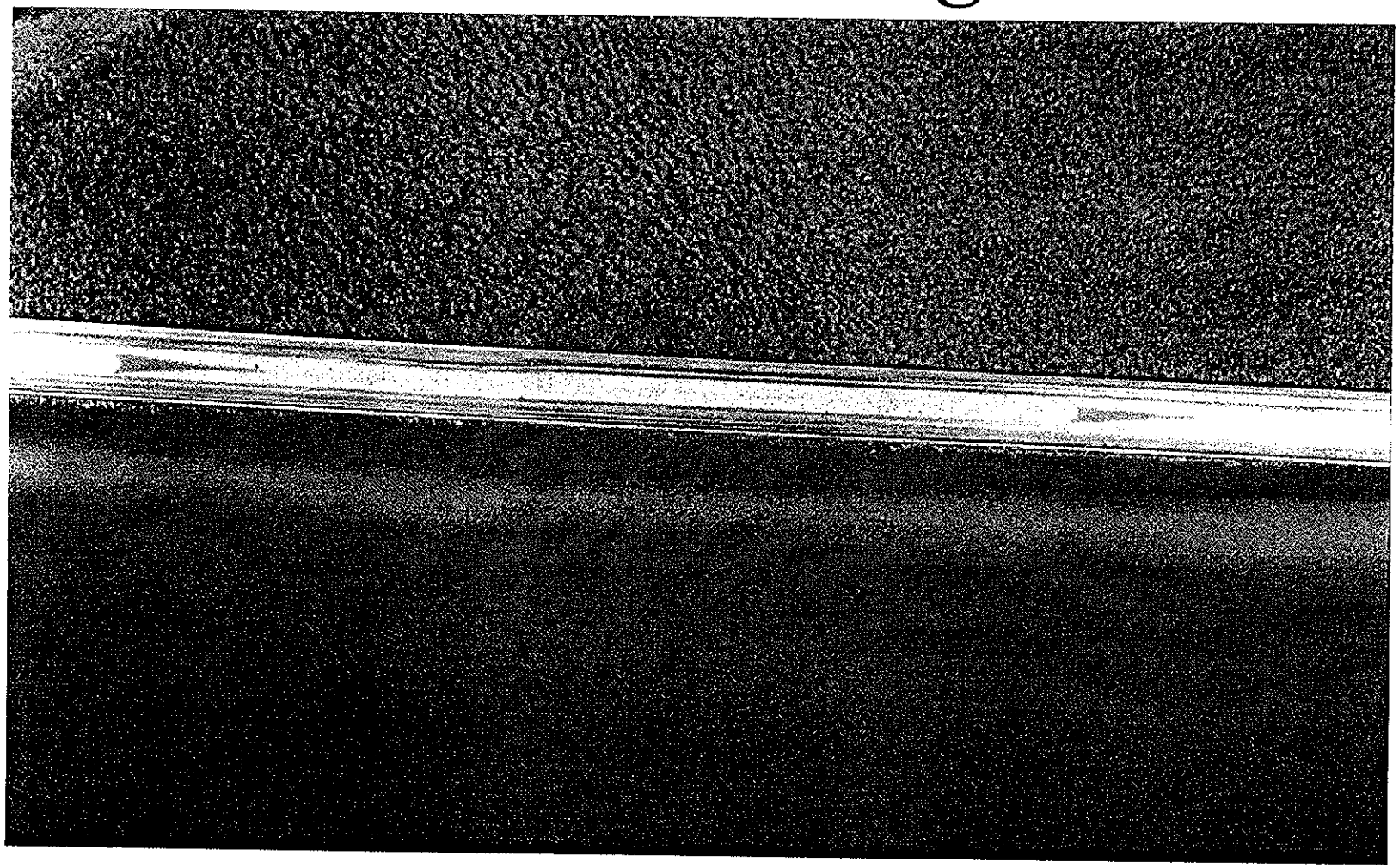
Directional Exit Sign



All "Exit" signs are to be readable at 10 feet away



Floor Proximity Egress Path Marking



External Sign Illumination



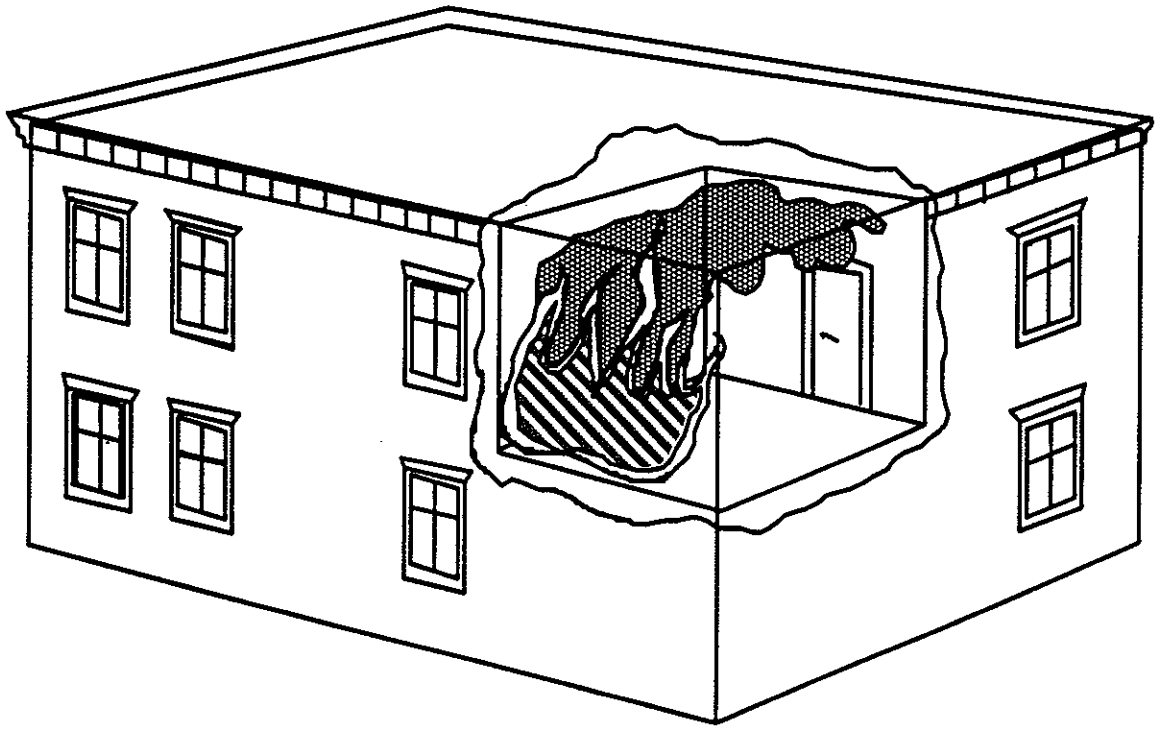
Internal Sign Illumination



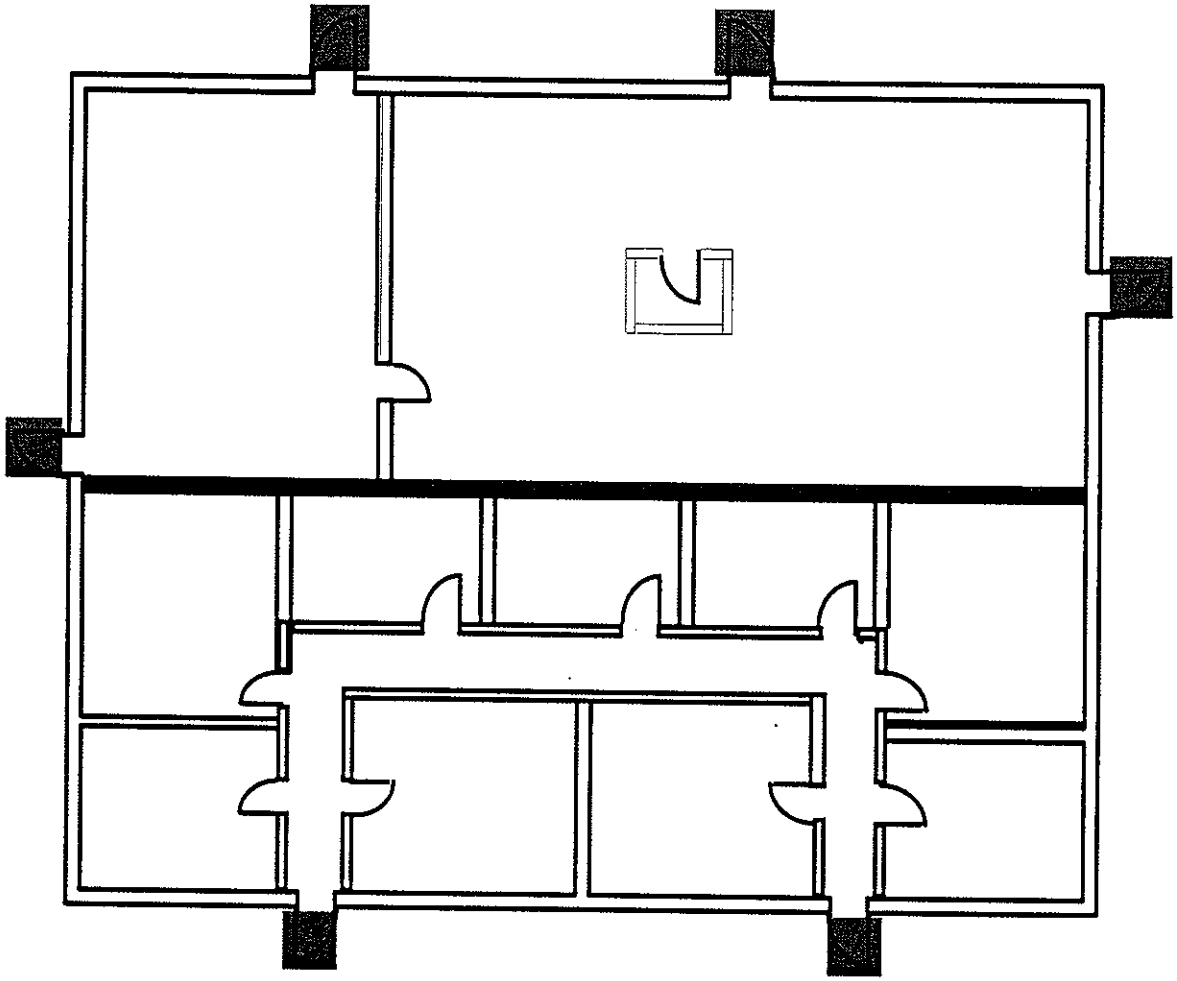
Vertical Openings



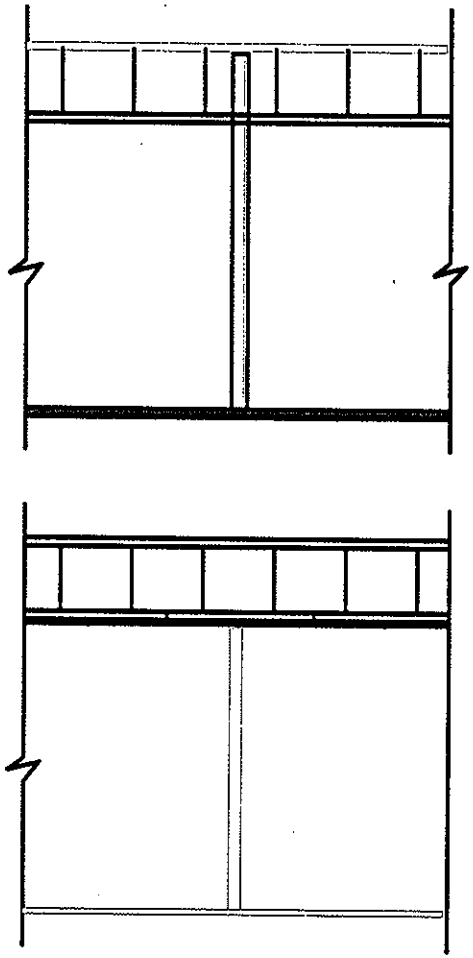
Fire Compartment



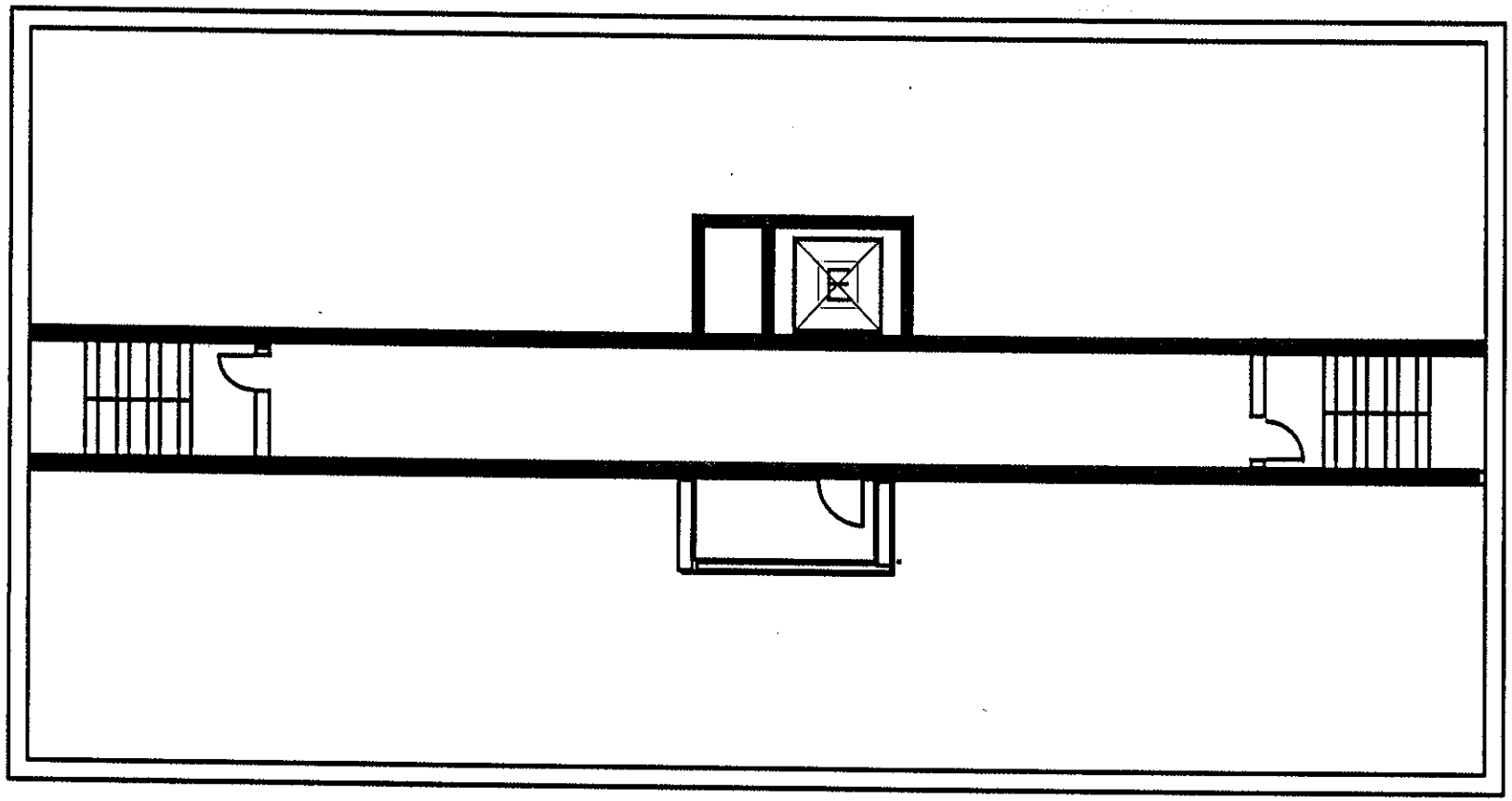
Fire Barriers—
Horizontal Continuity



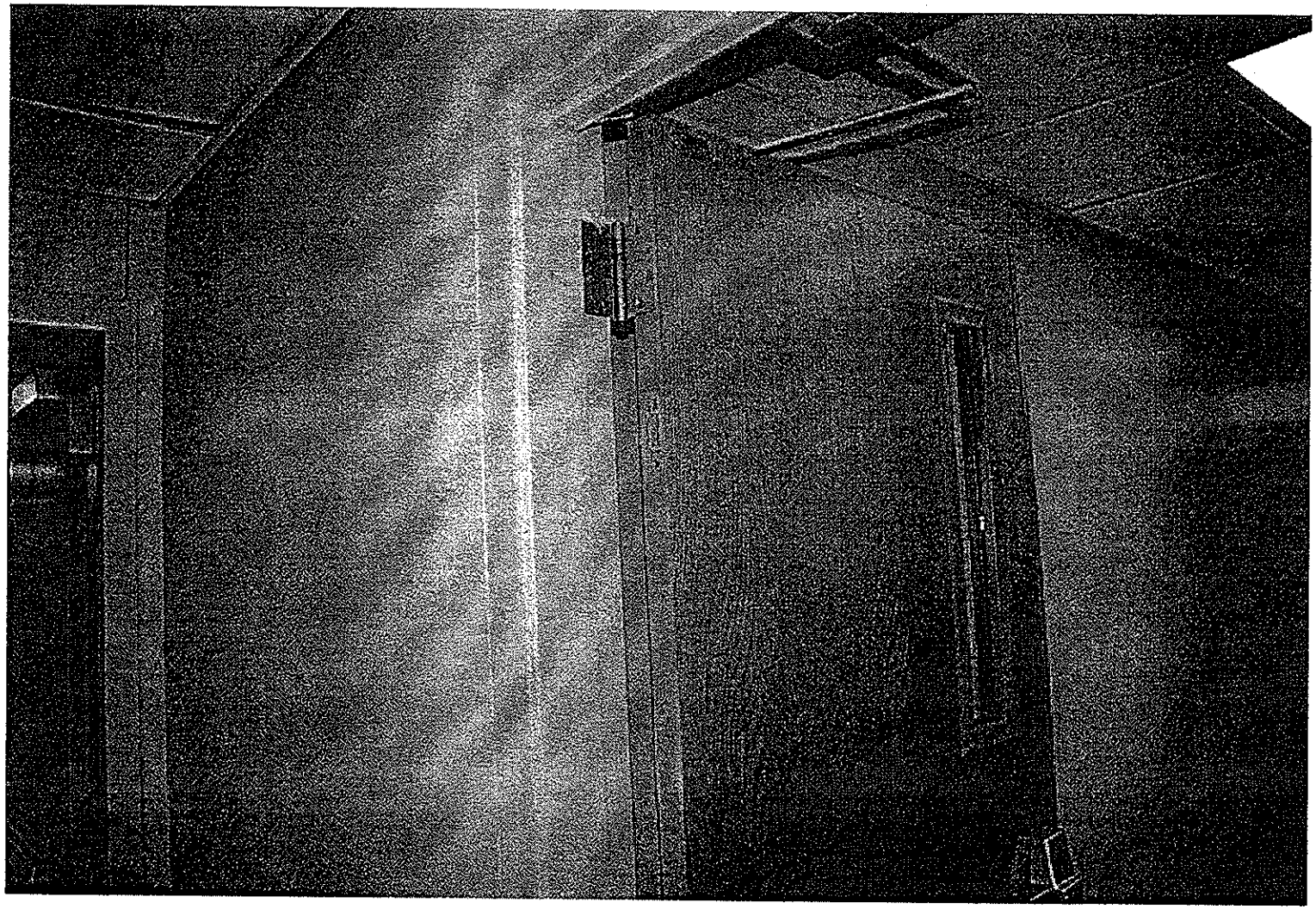
Fire Barriers—Vertical Continuity



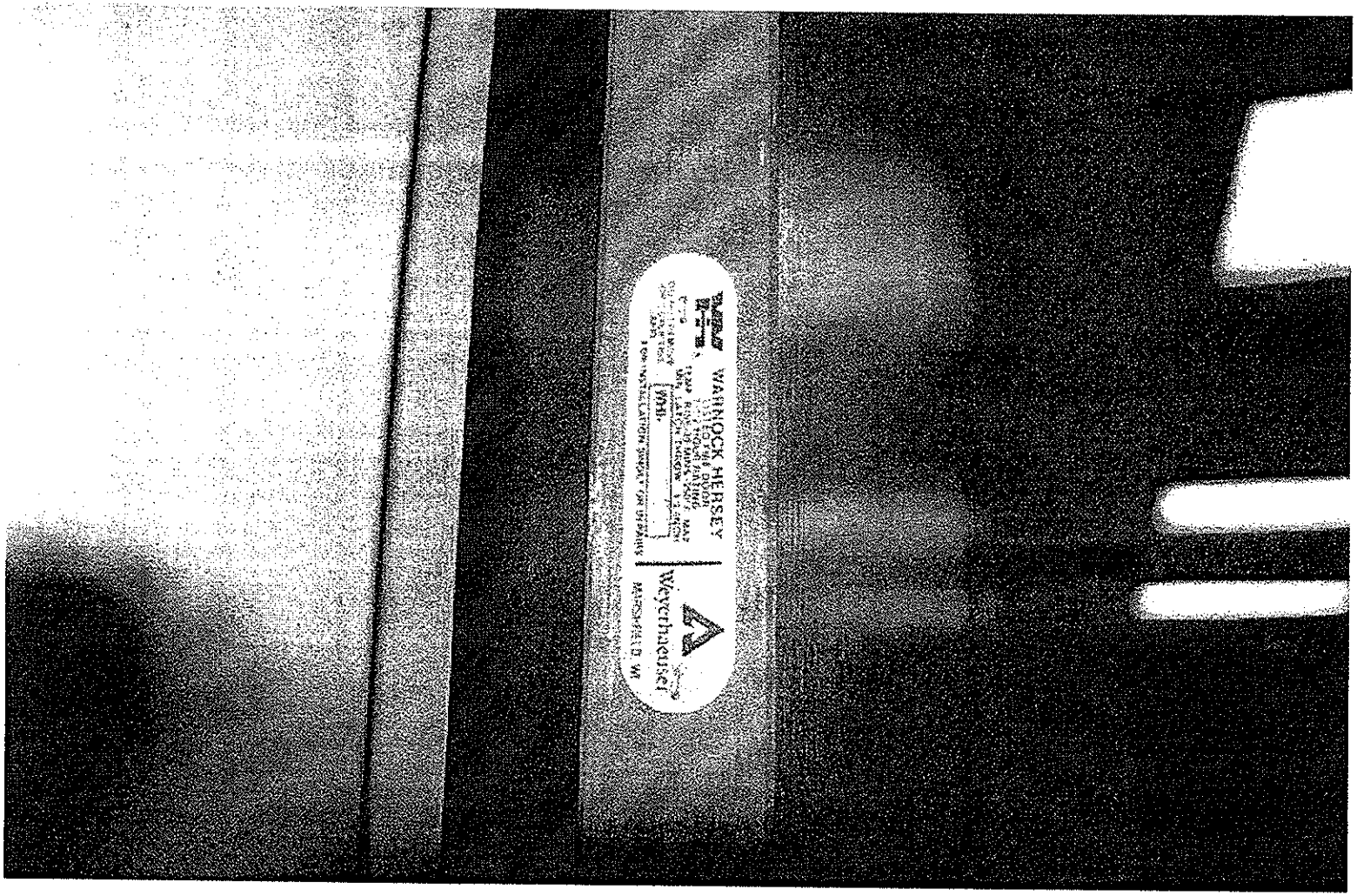
Fire Barrier Classification



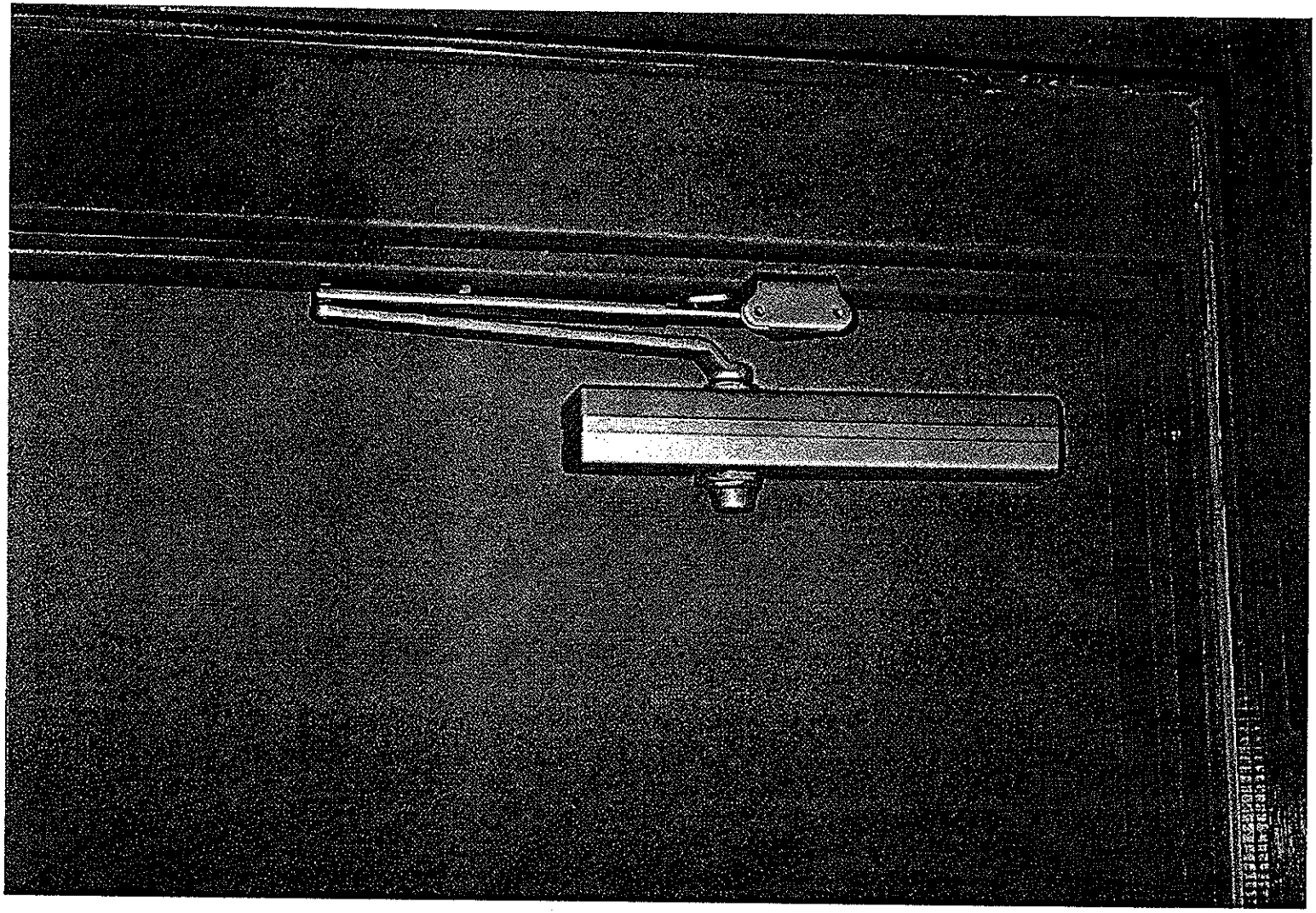
Doors in Fire Barriers



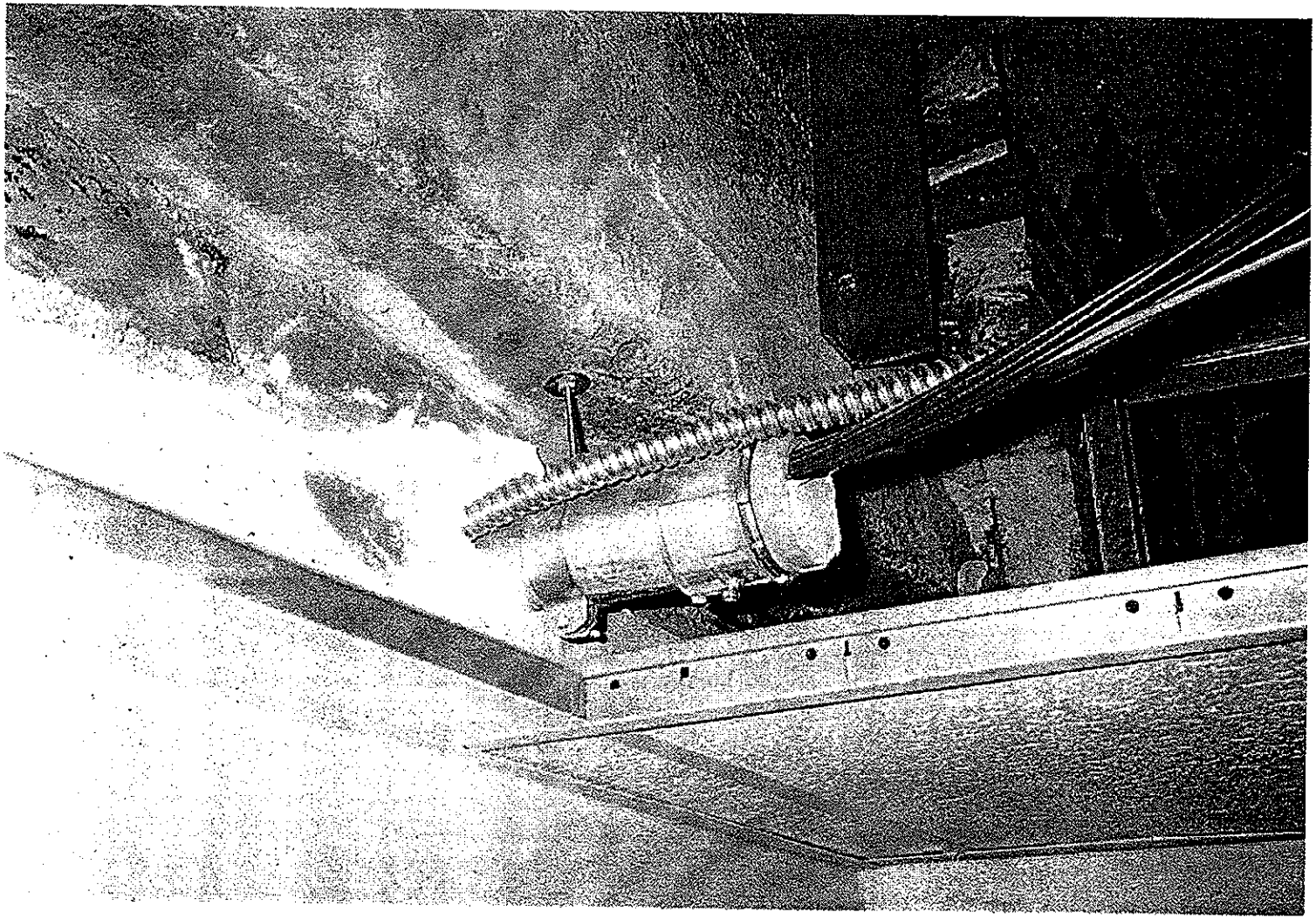
Fire Protection-Rated Door



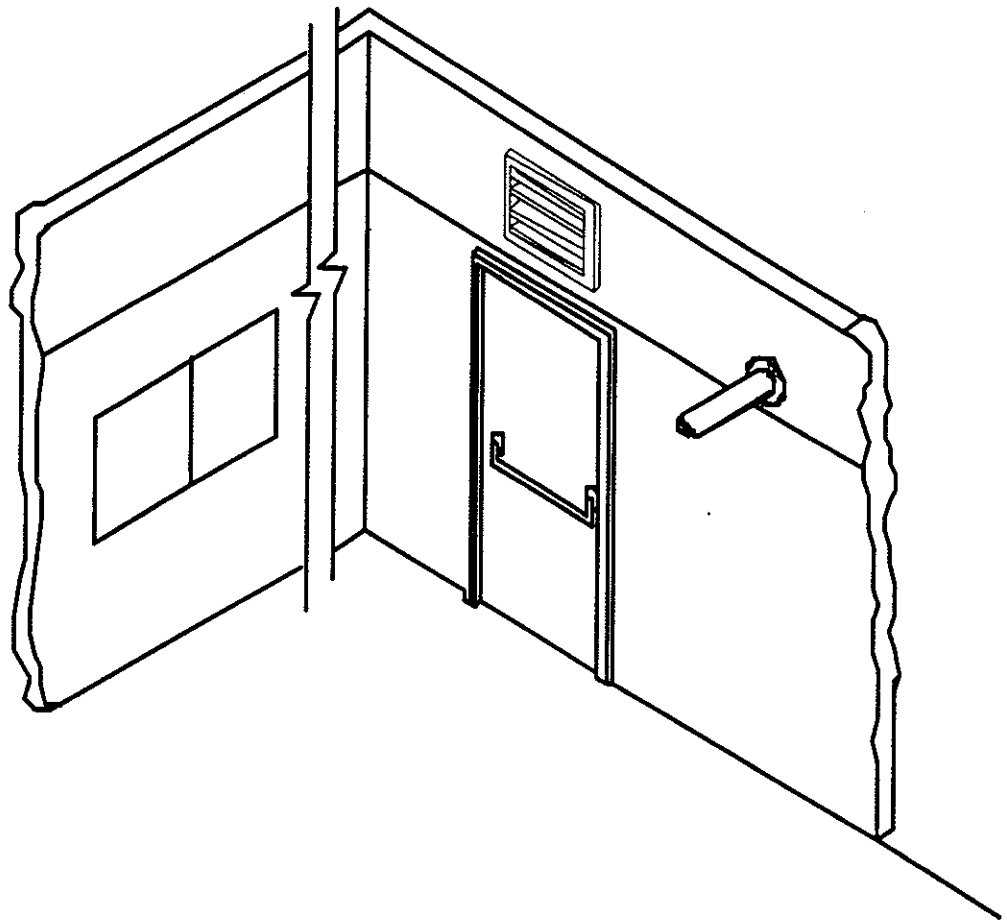
Self-Closing



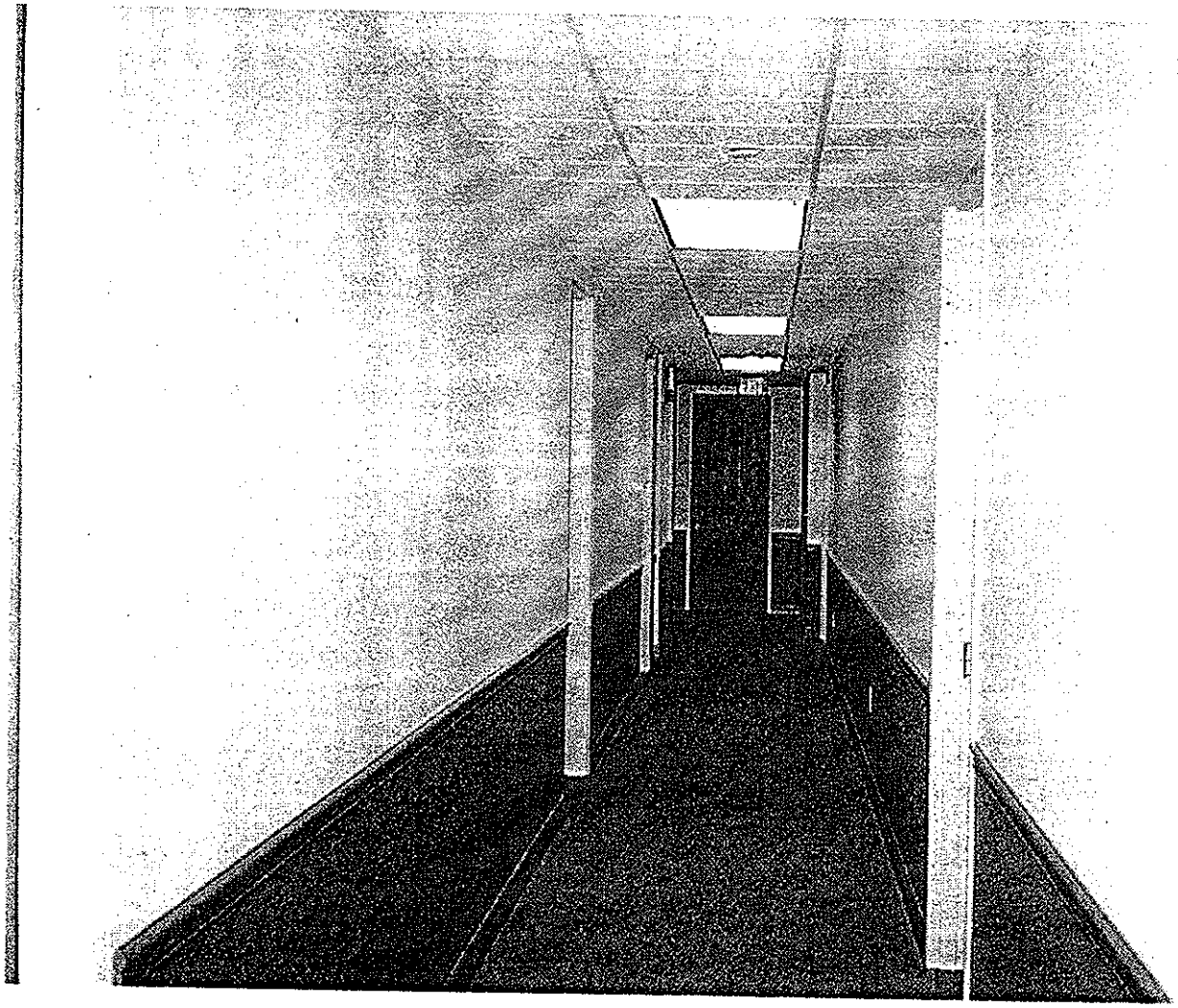
Penetrations in Fire Barriers



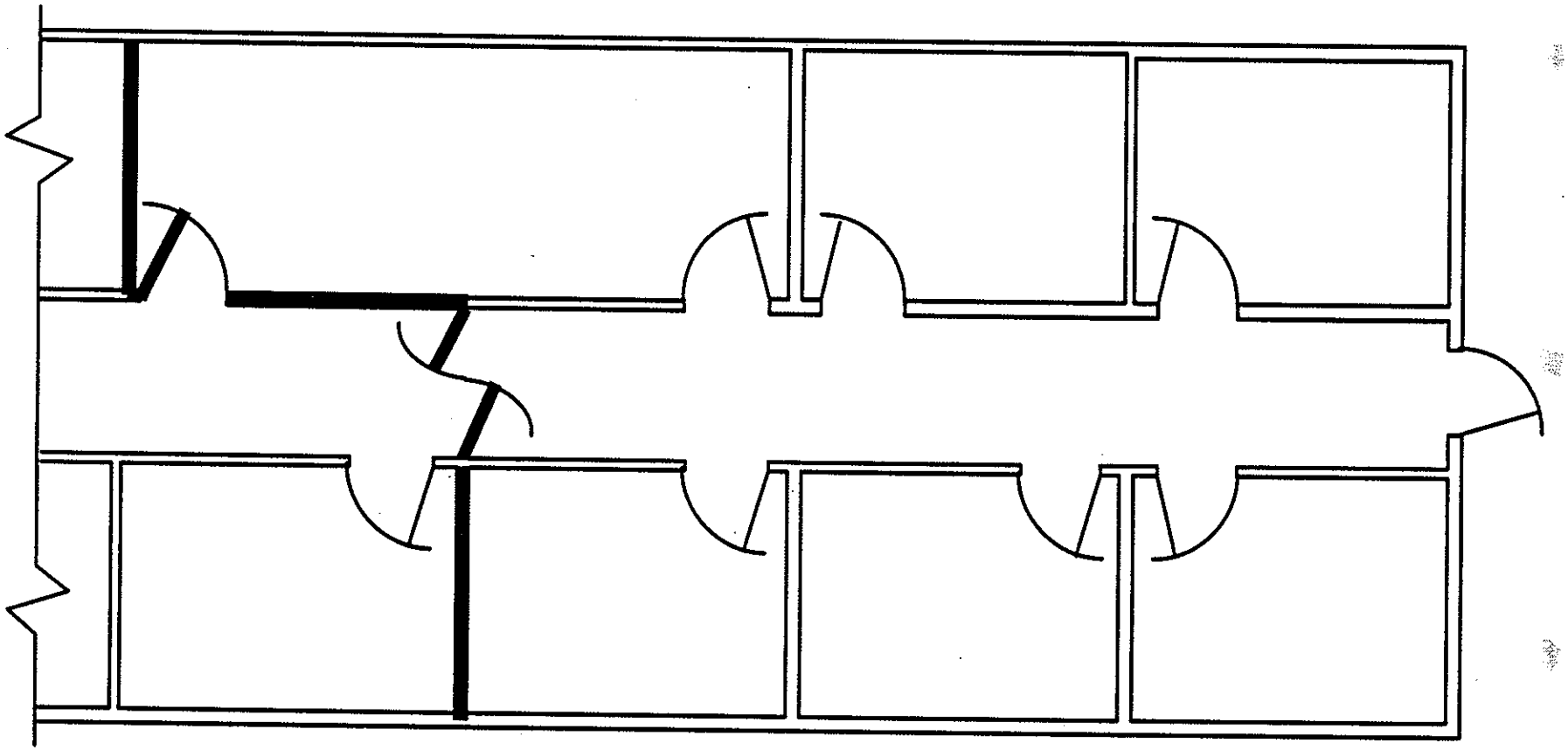
Penetrations in Fire Barriers



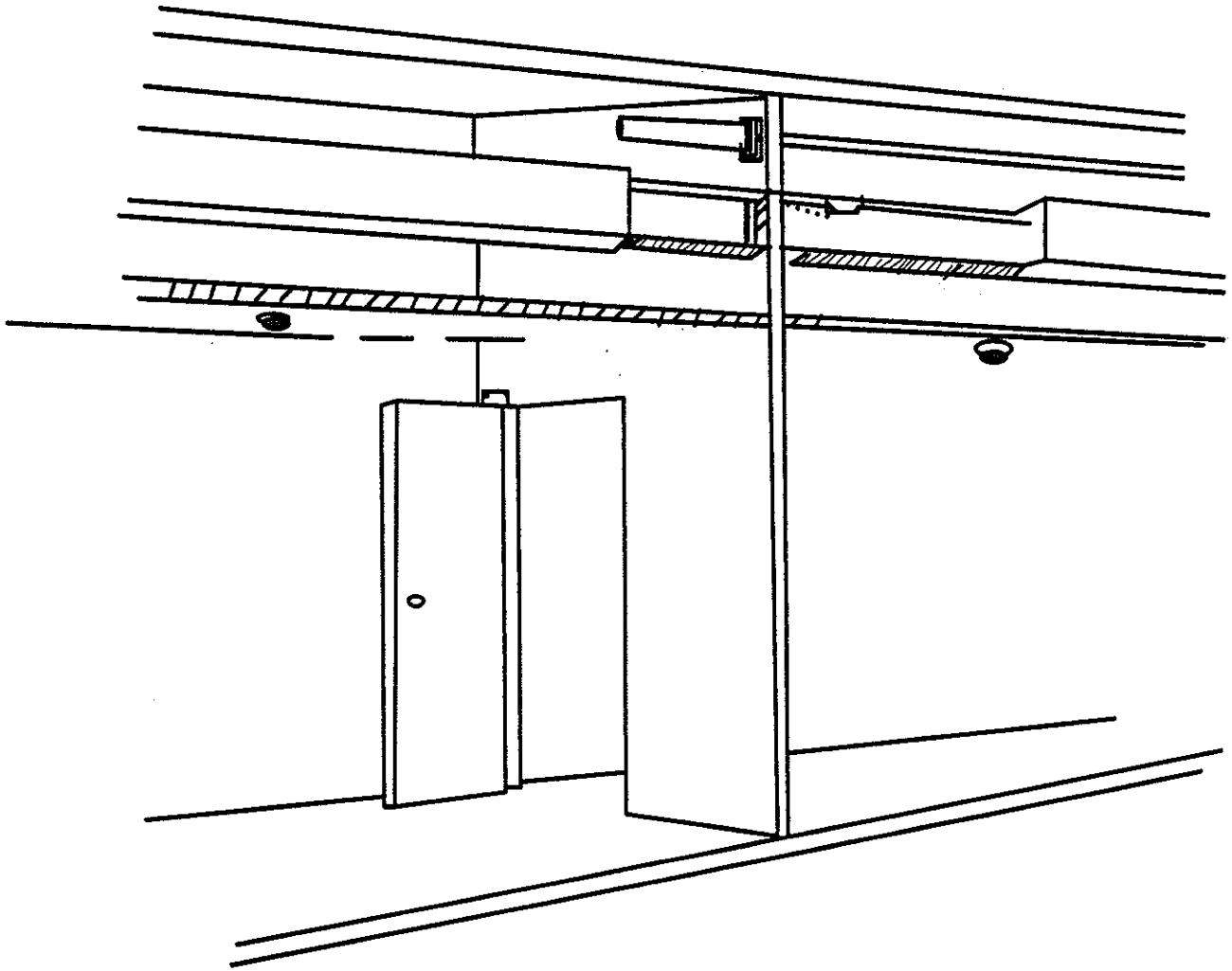
Smoke Partition



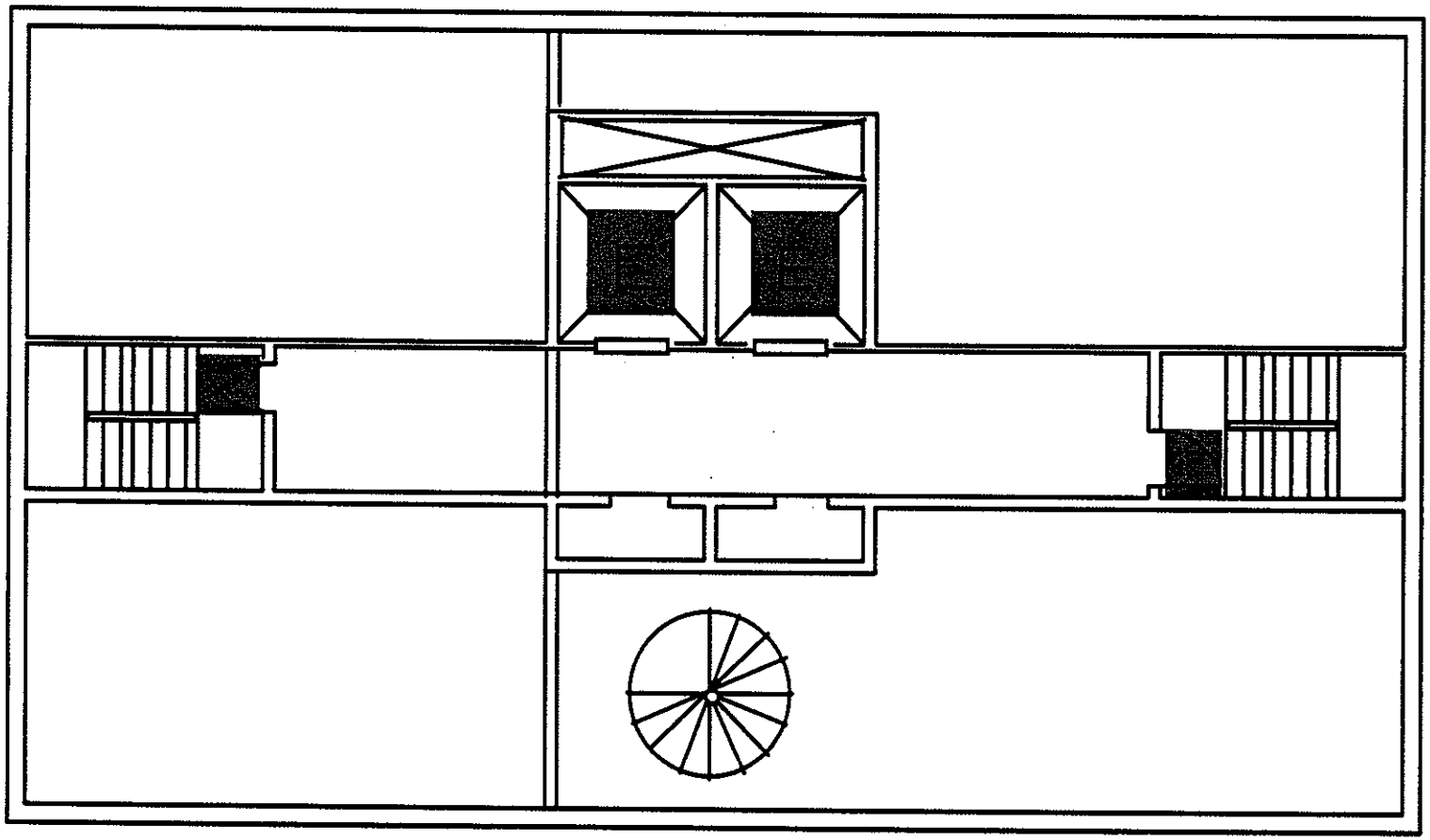
Smoke Barrier



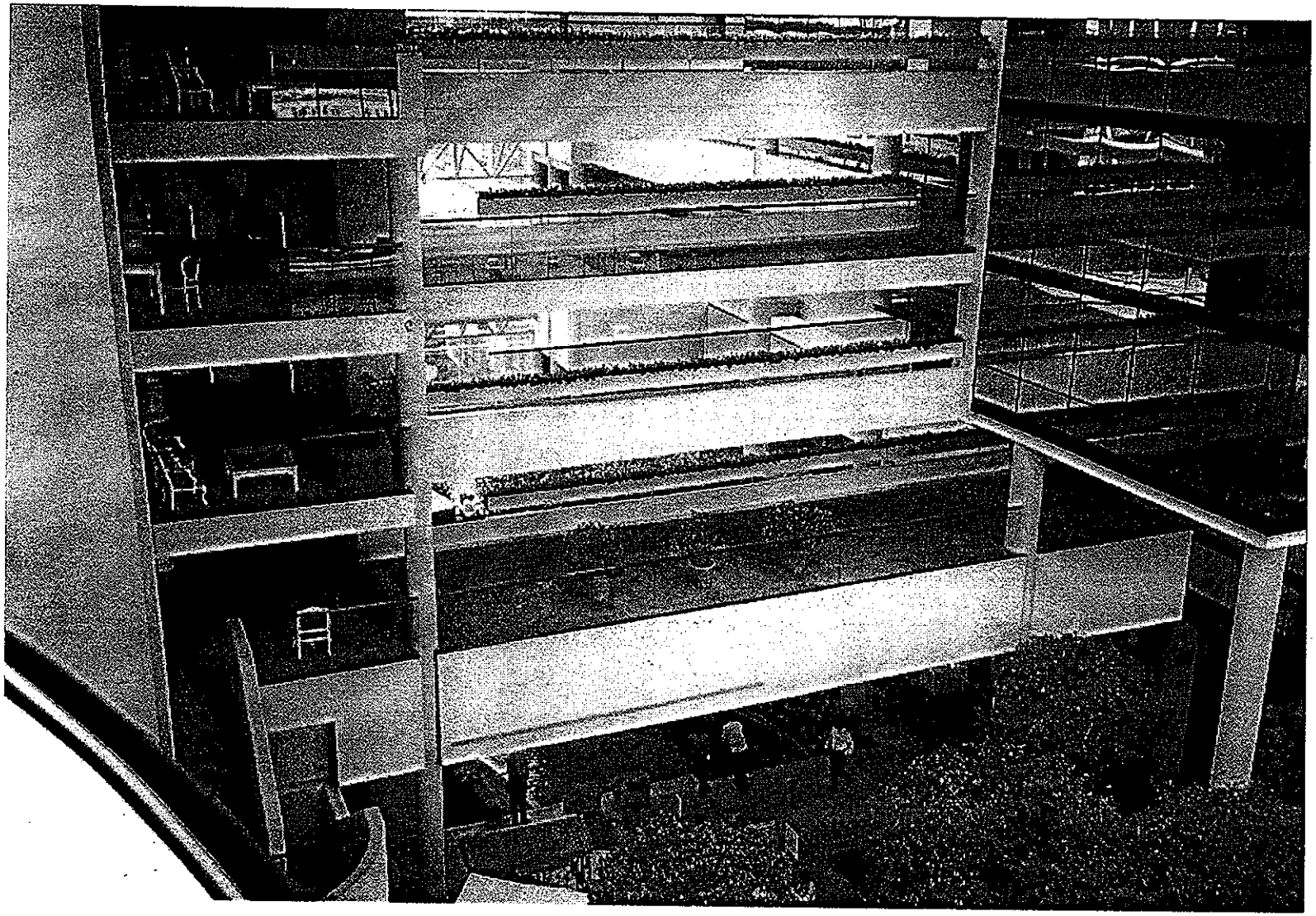
Smoke Barrier Penetrations



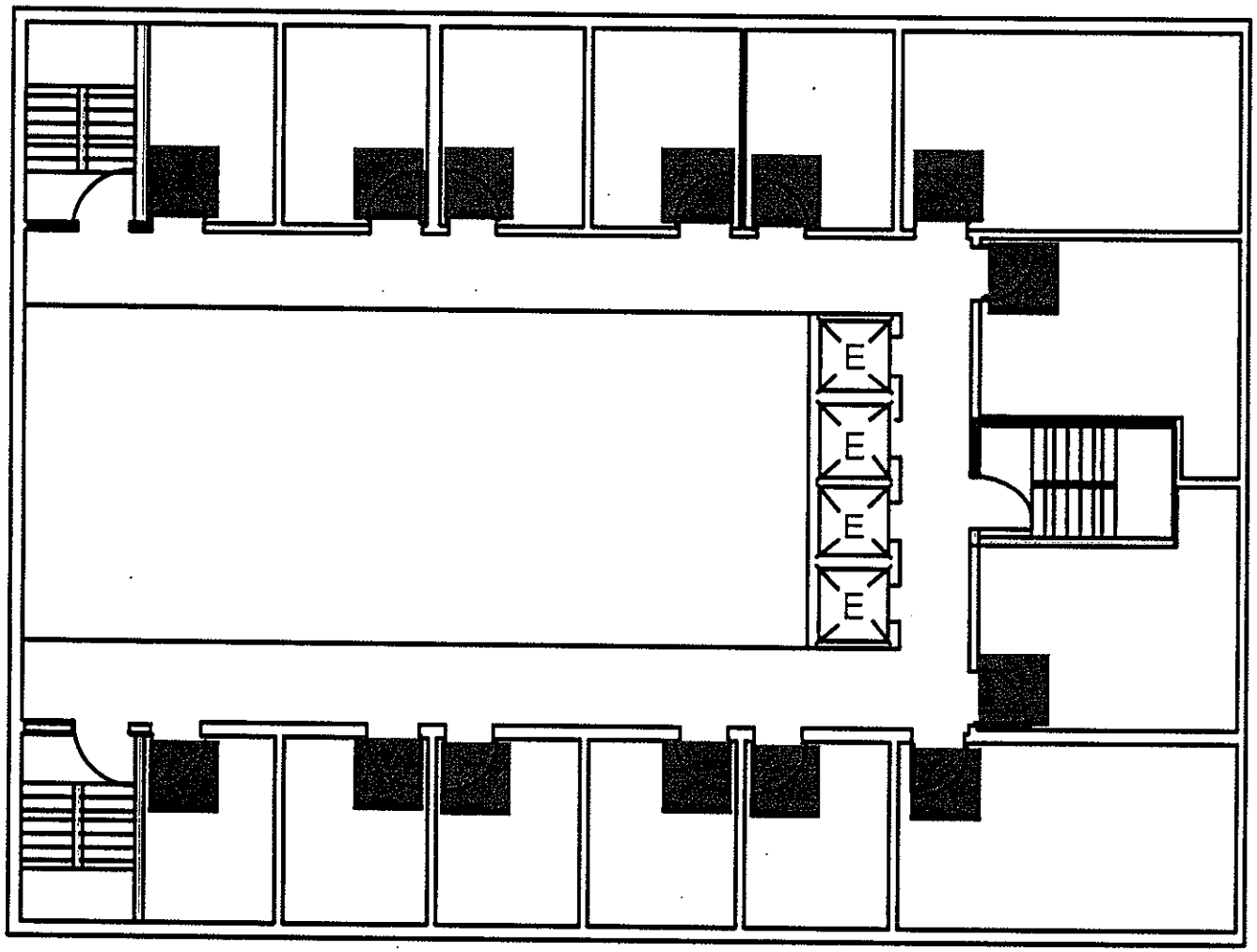
Vertical Openings



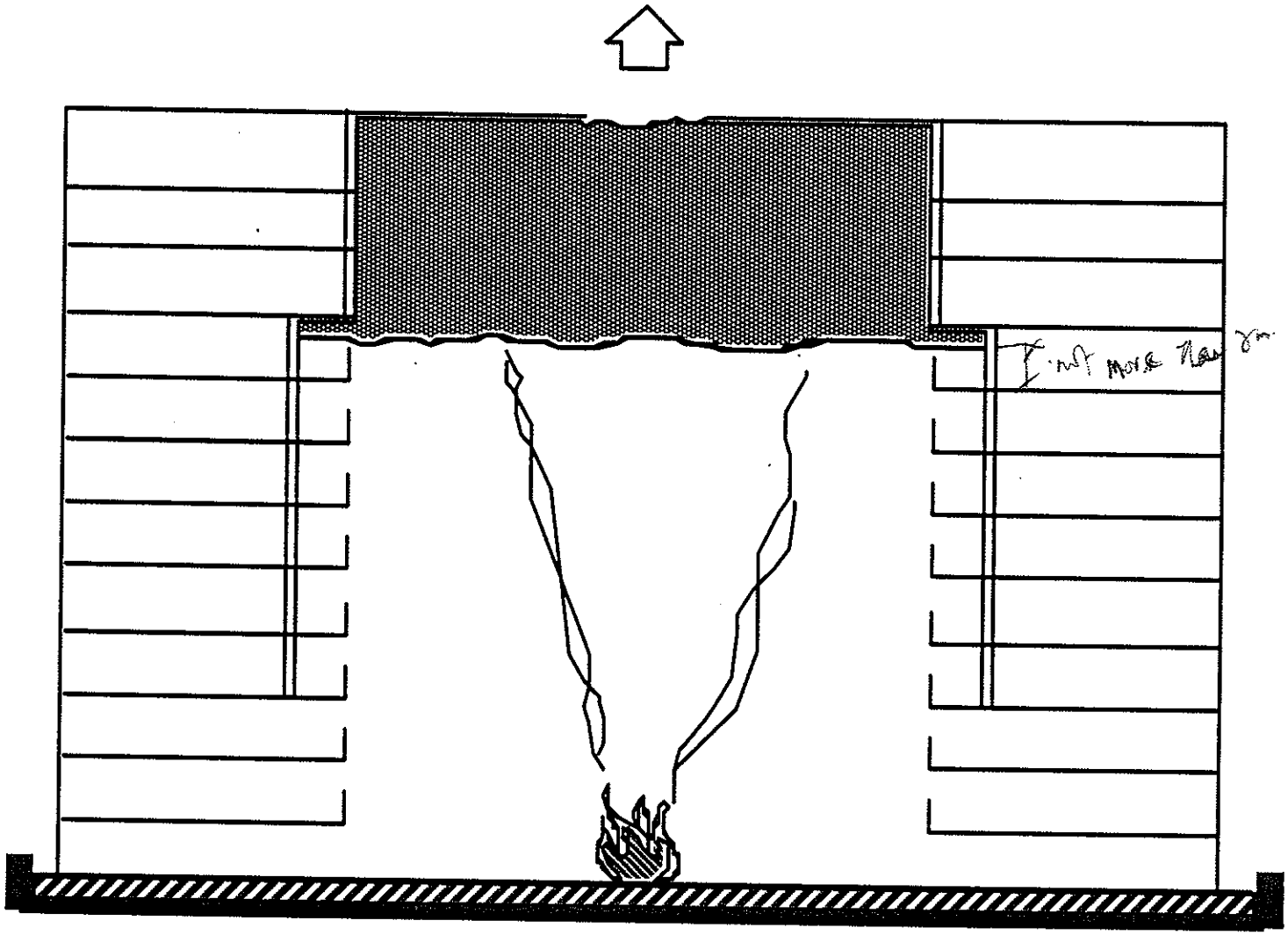
Atrium



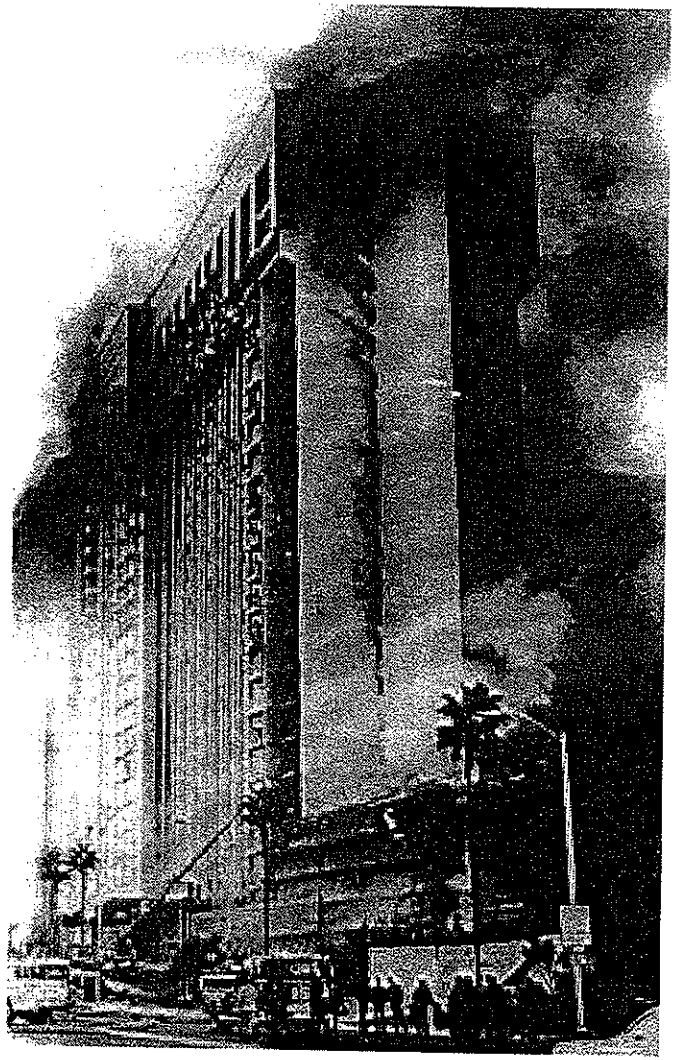
Atrium



Smoke Control for an Atrium



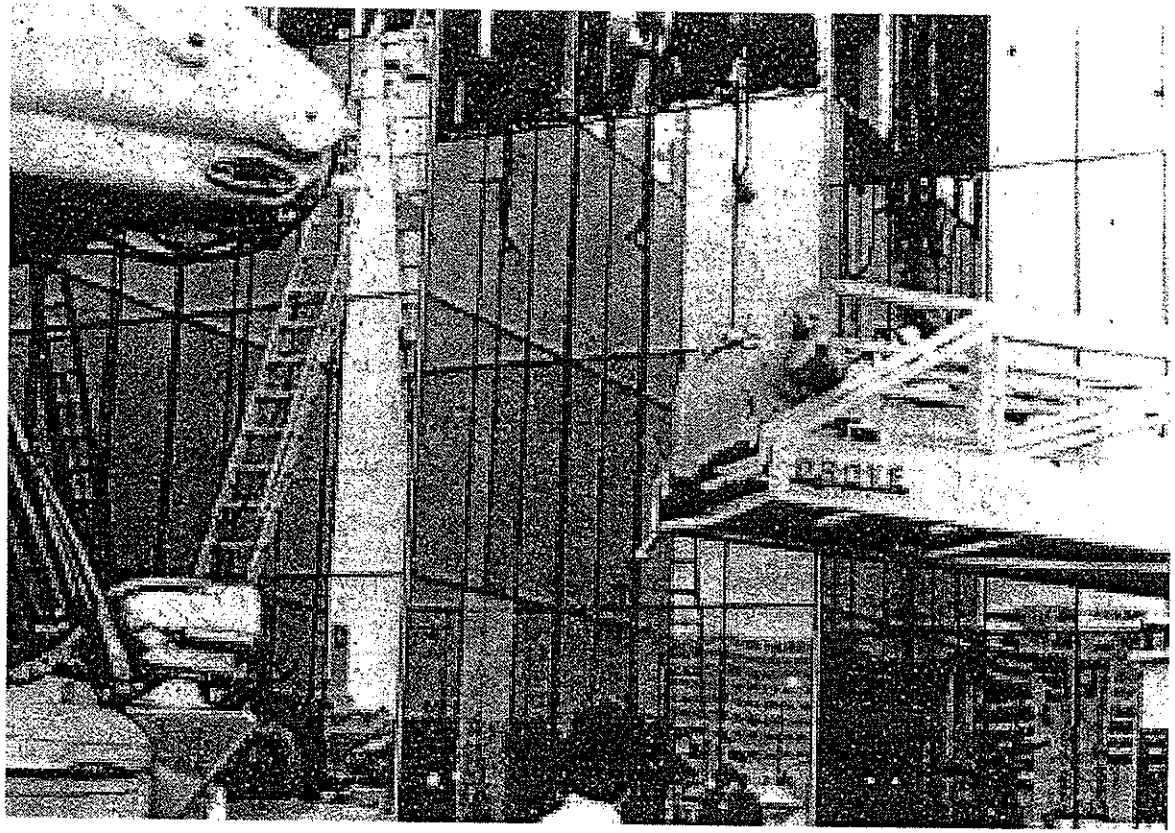
MGM Grand Hotel



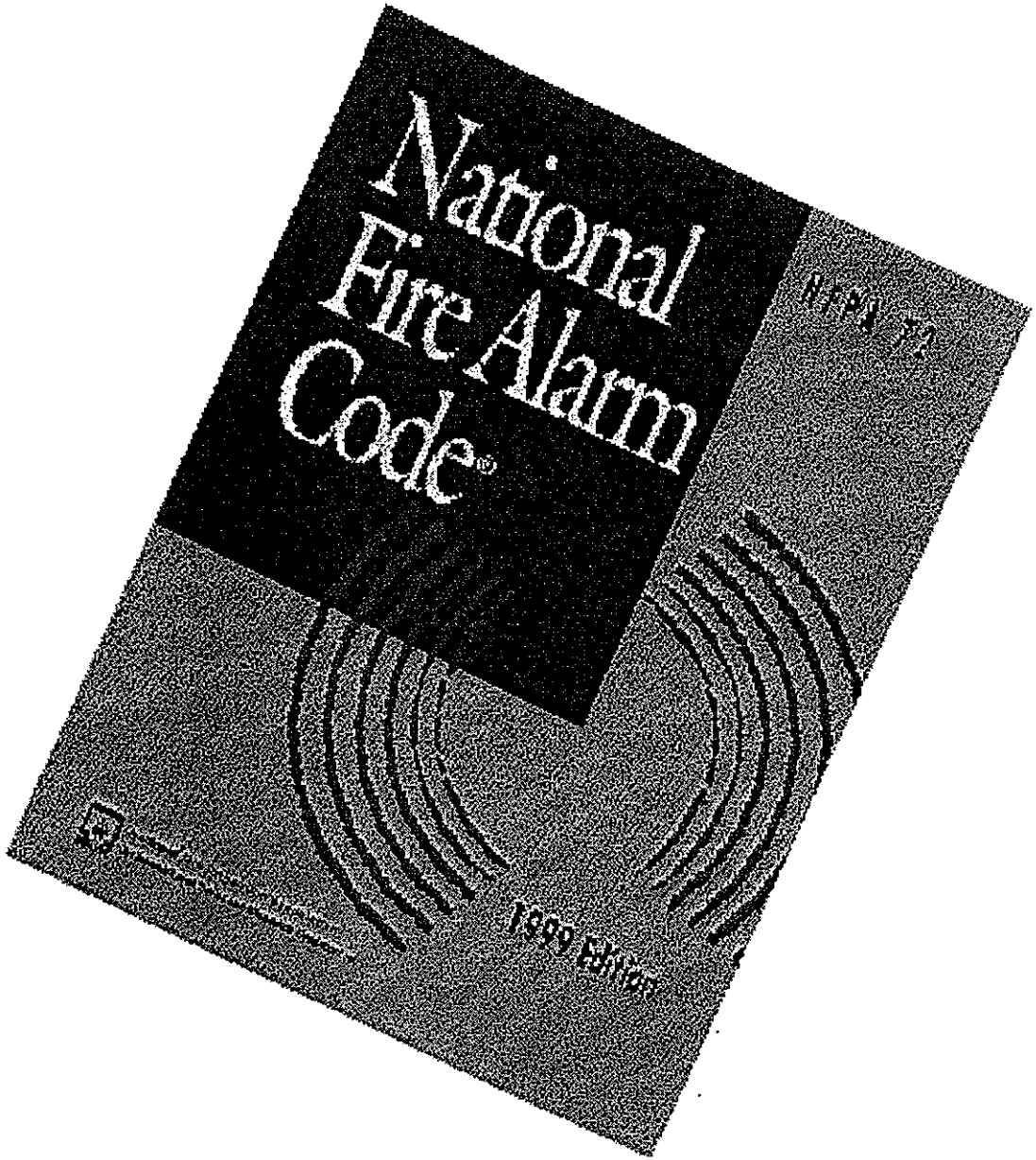
Occupant Notification



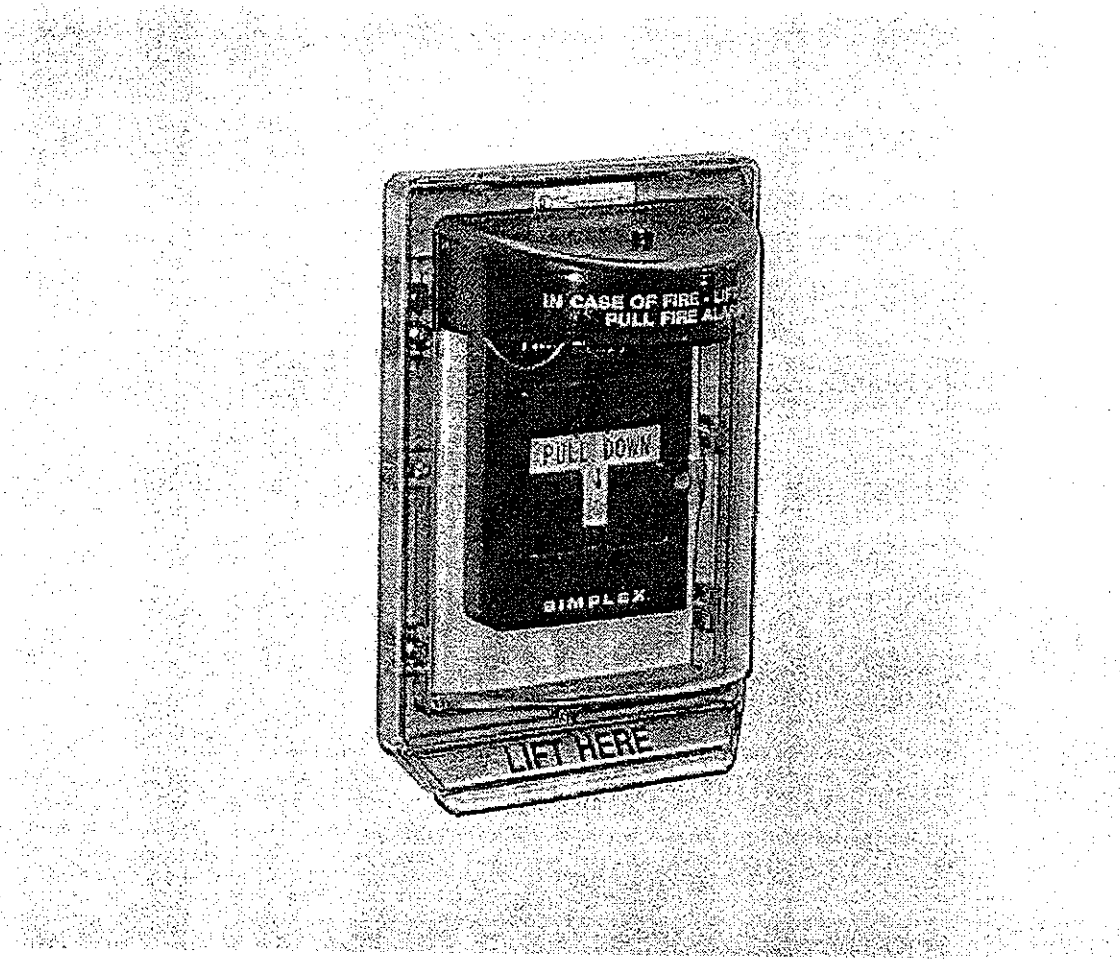
Westchase Hilton Hotel



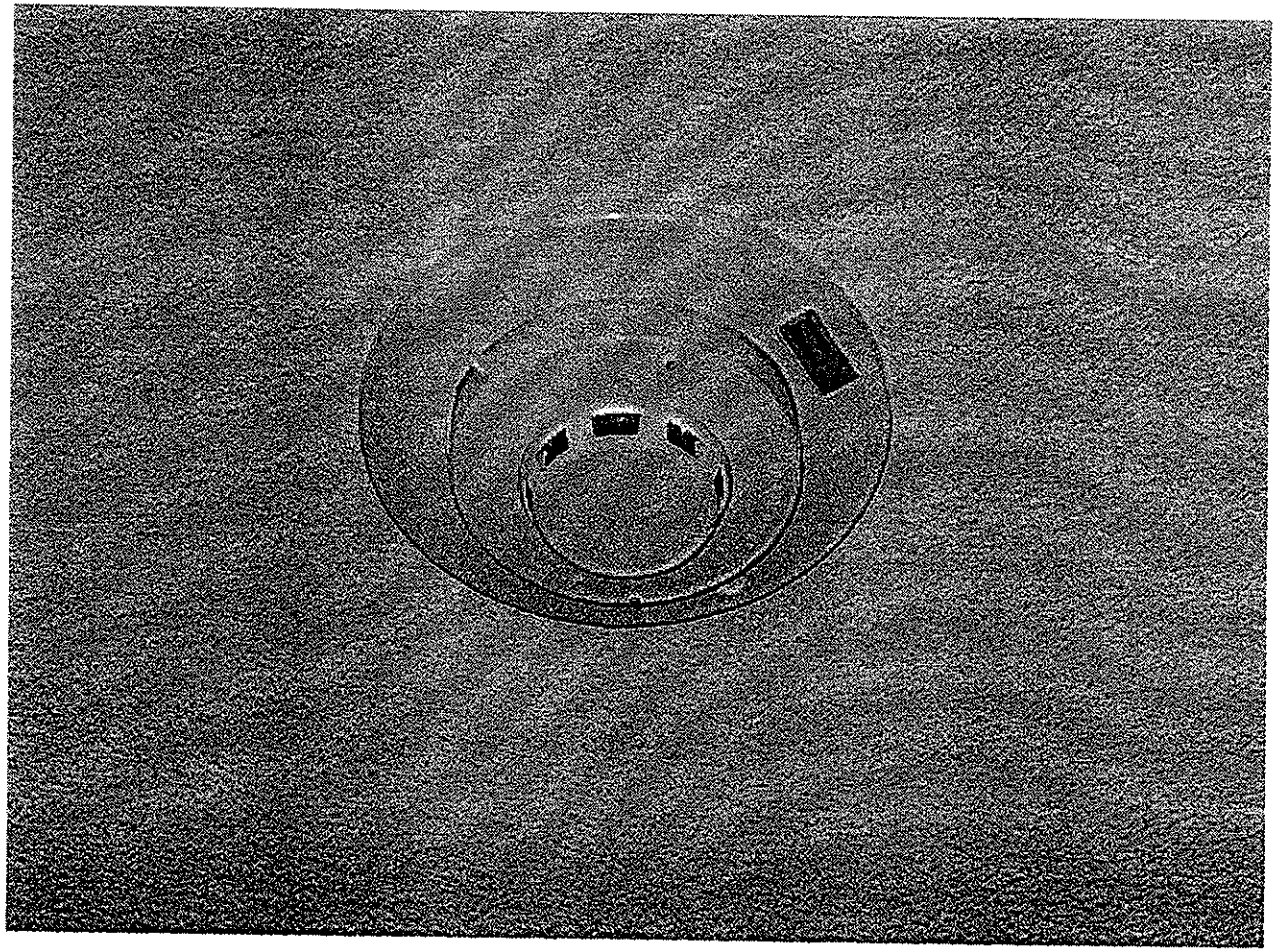
Alarm System — Installation



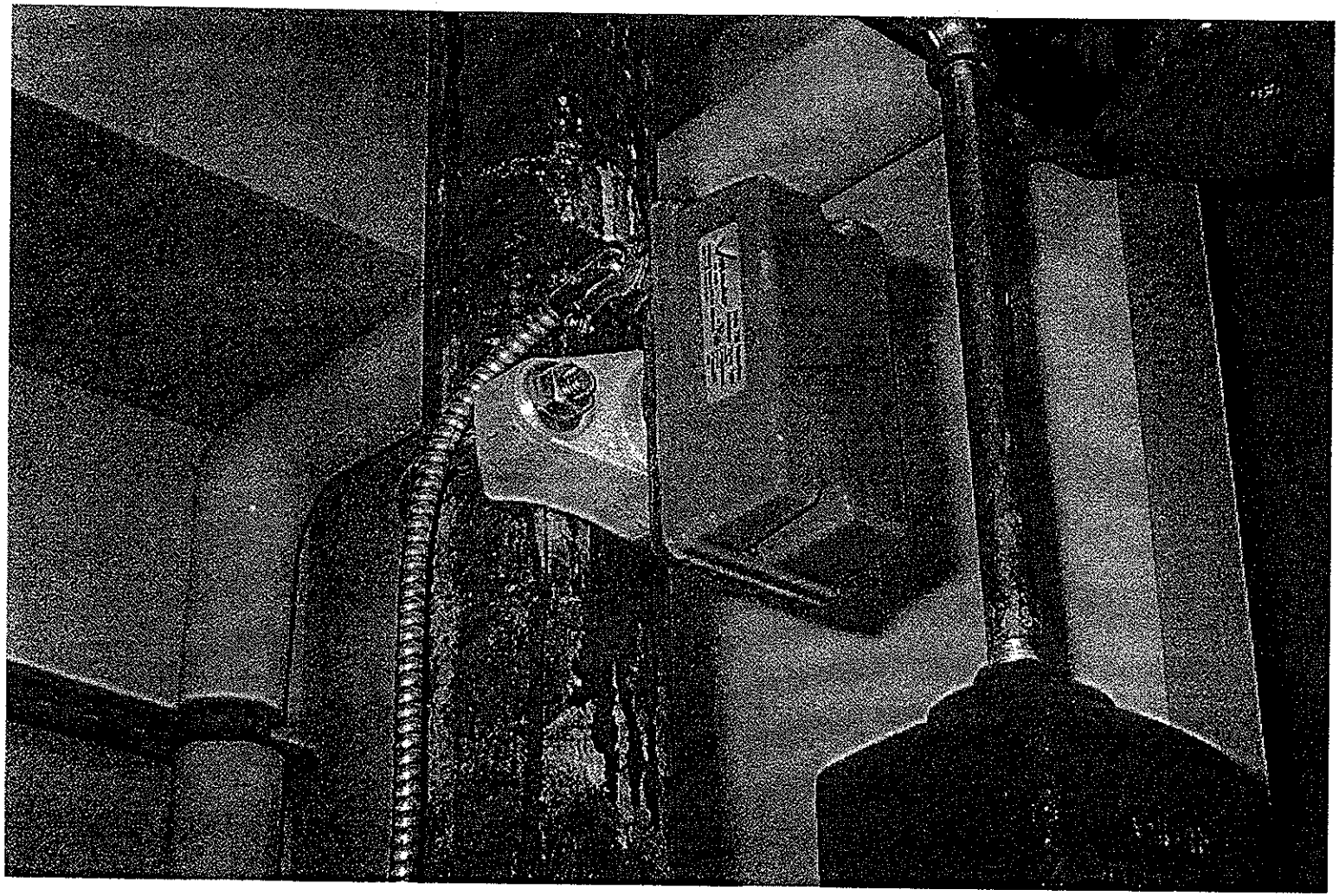
Signal Initiation—
Manual Pull Station



Signal Initiation—
Automatic Detection



Signal Initiation—
Sprinkler Water Flow



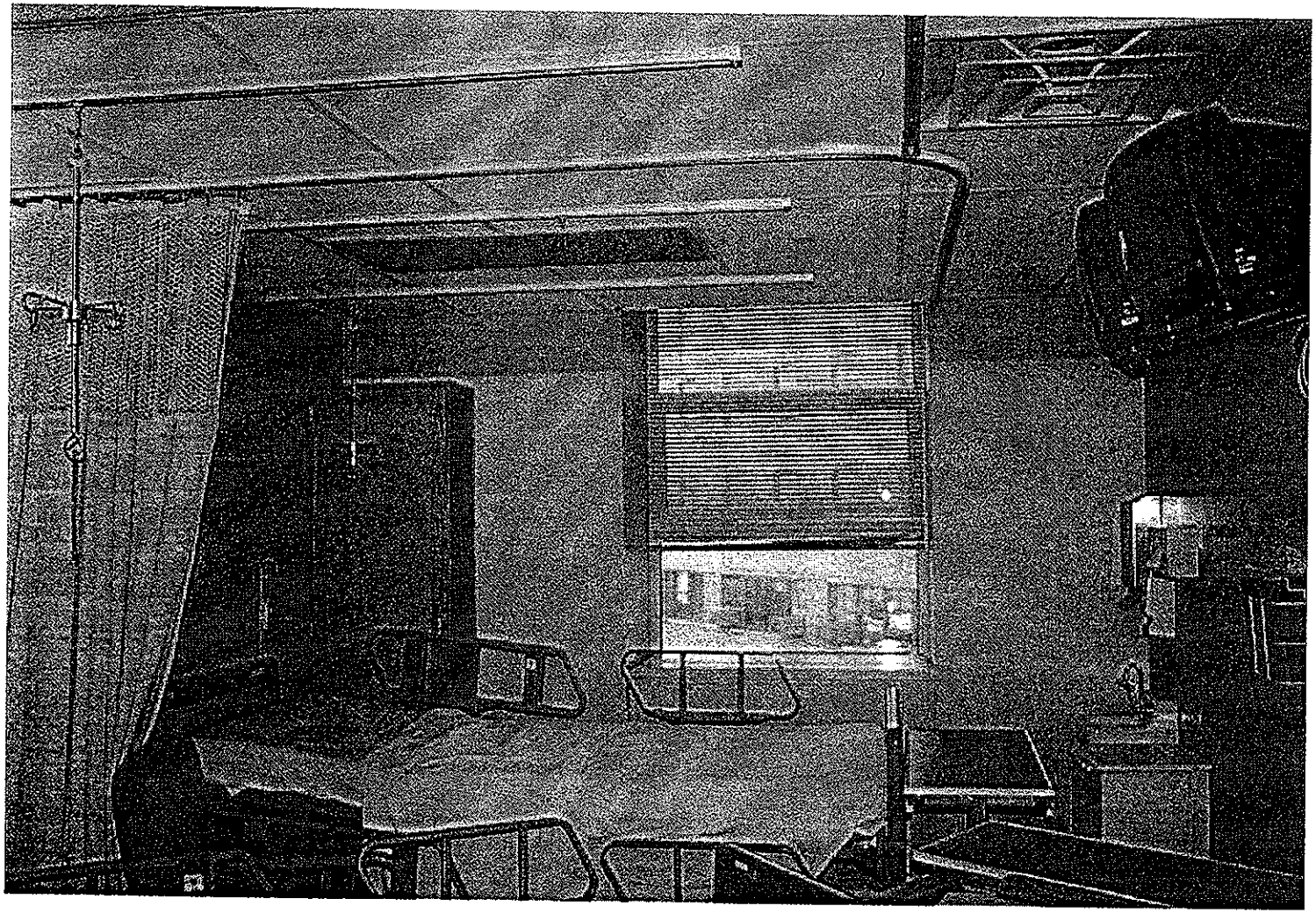
Occupant Notification



Selective Notification—Permitted



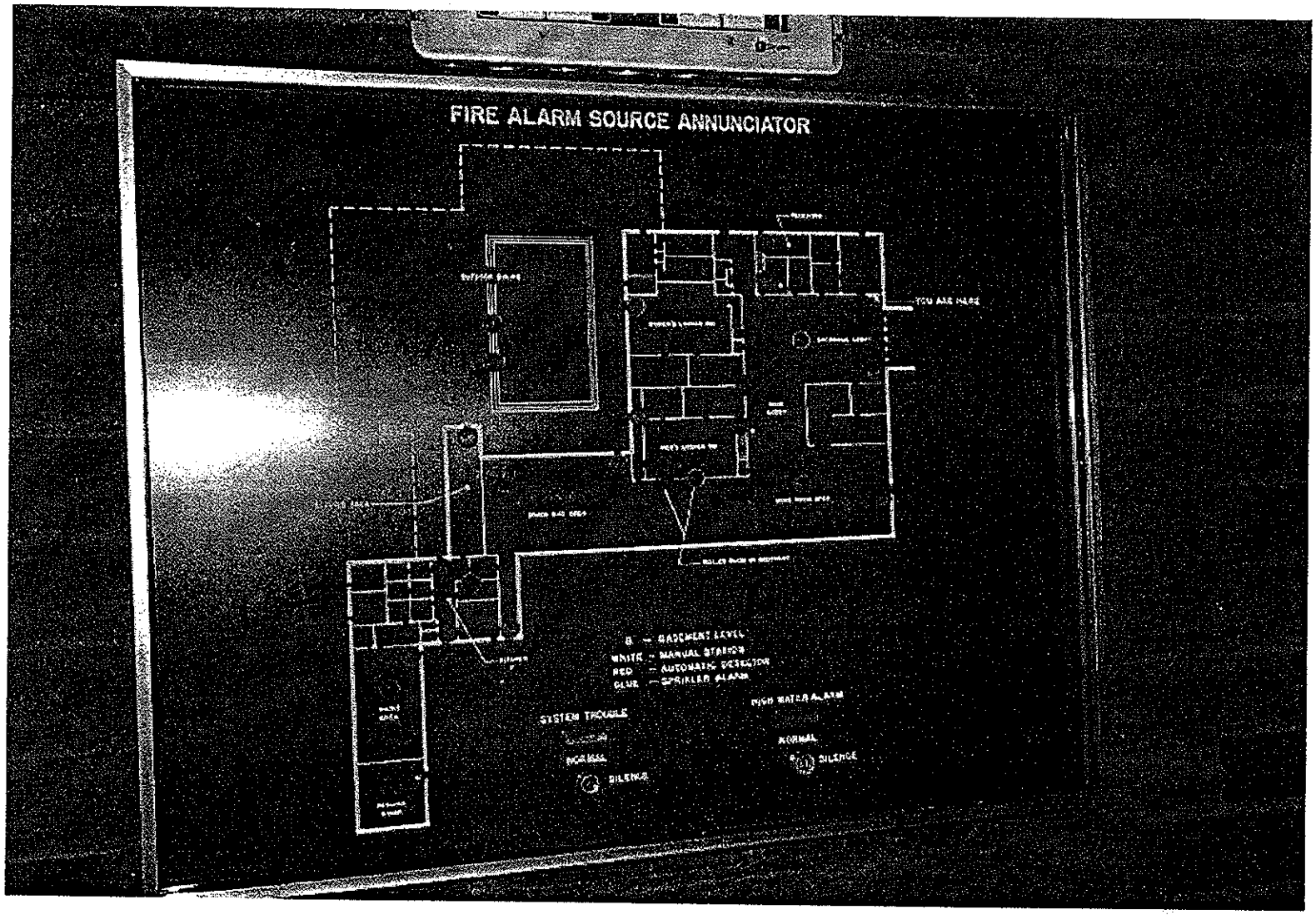
Private Operating Mode—Notification



Emergency Forces Notification



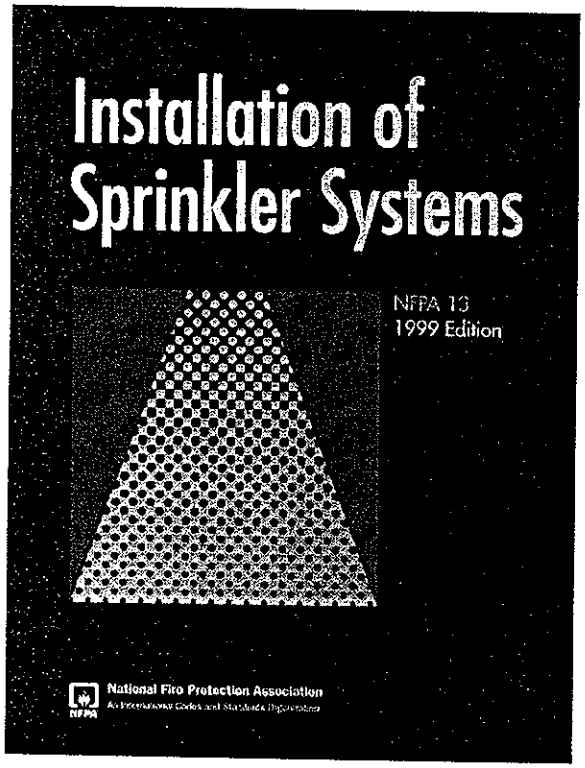
Alarm Annunciation

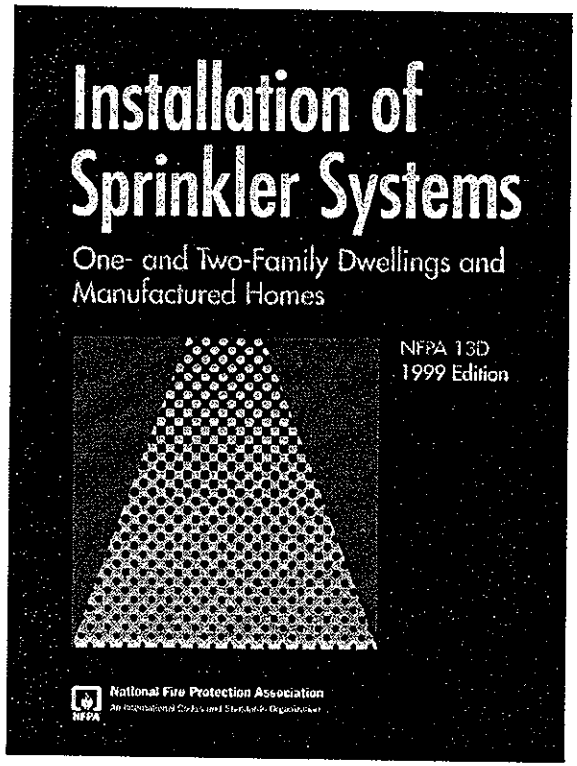


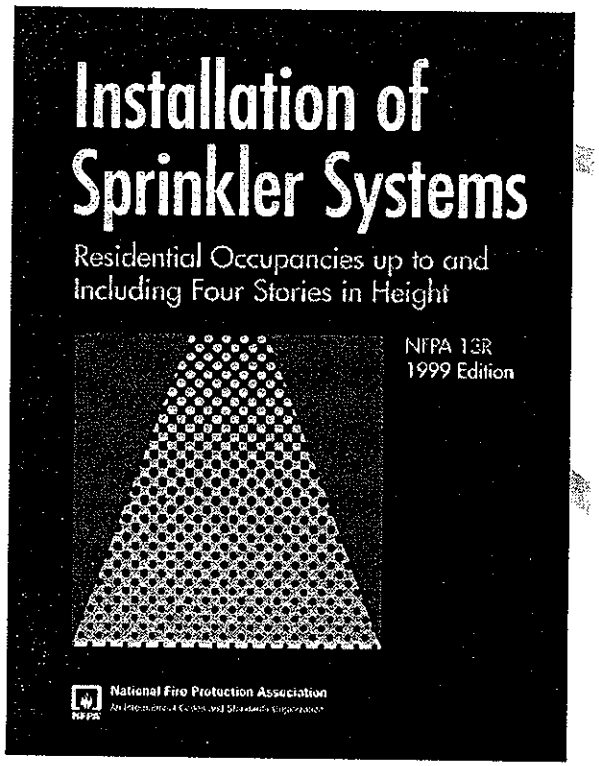
System Design and Installation



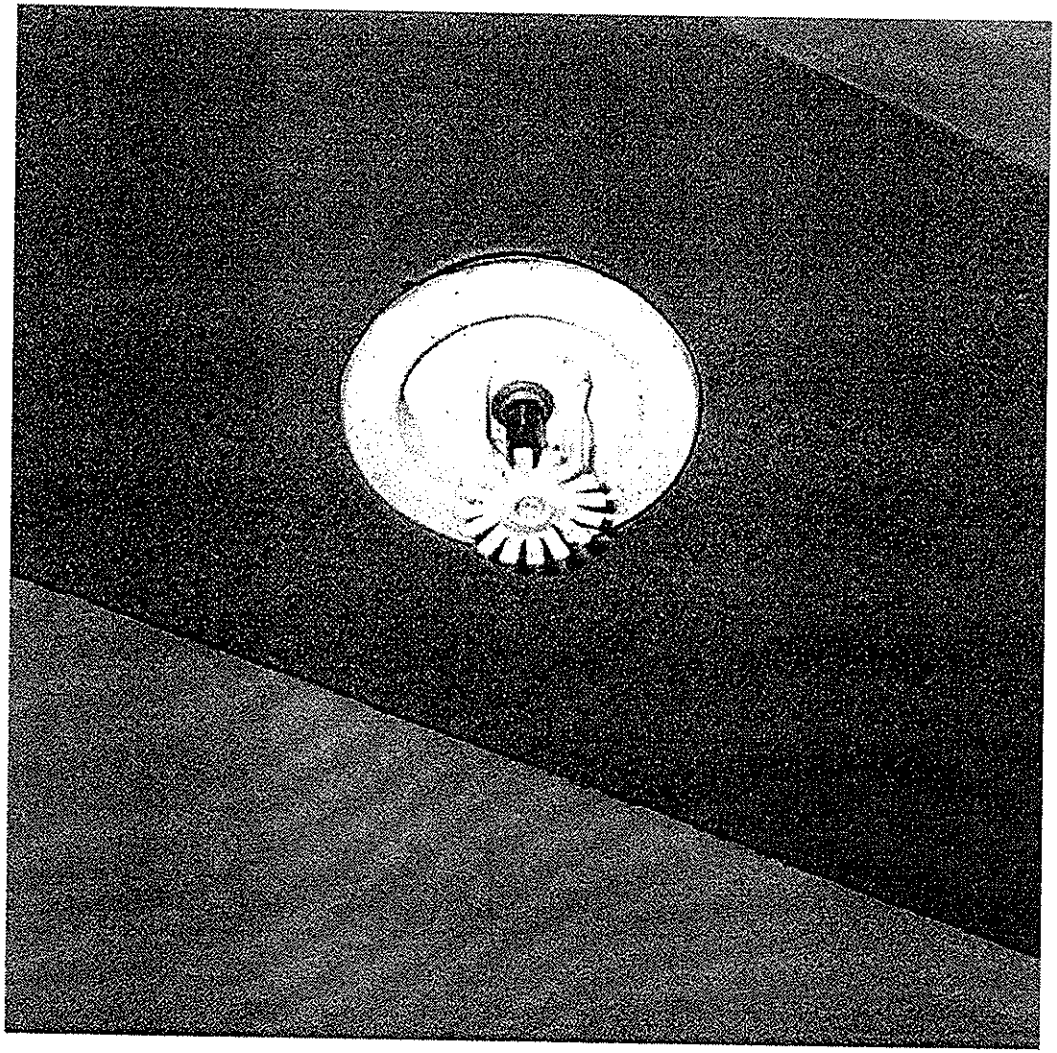
Automatic Sprinklers— Installation



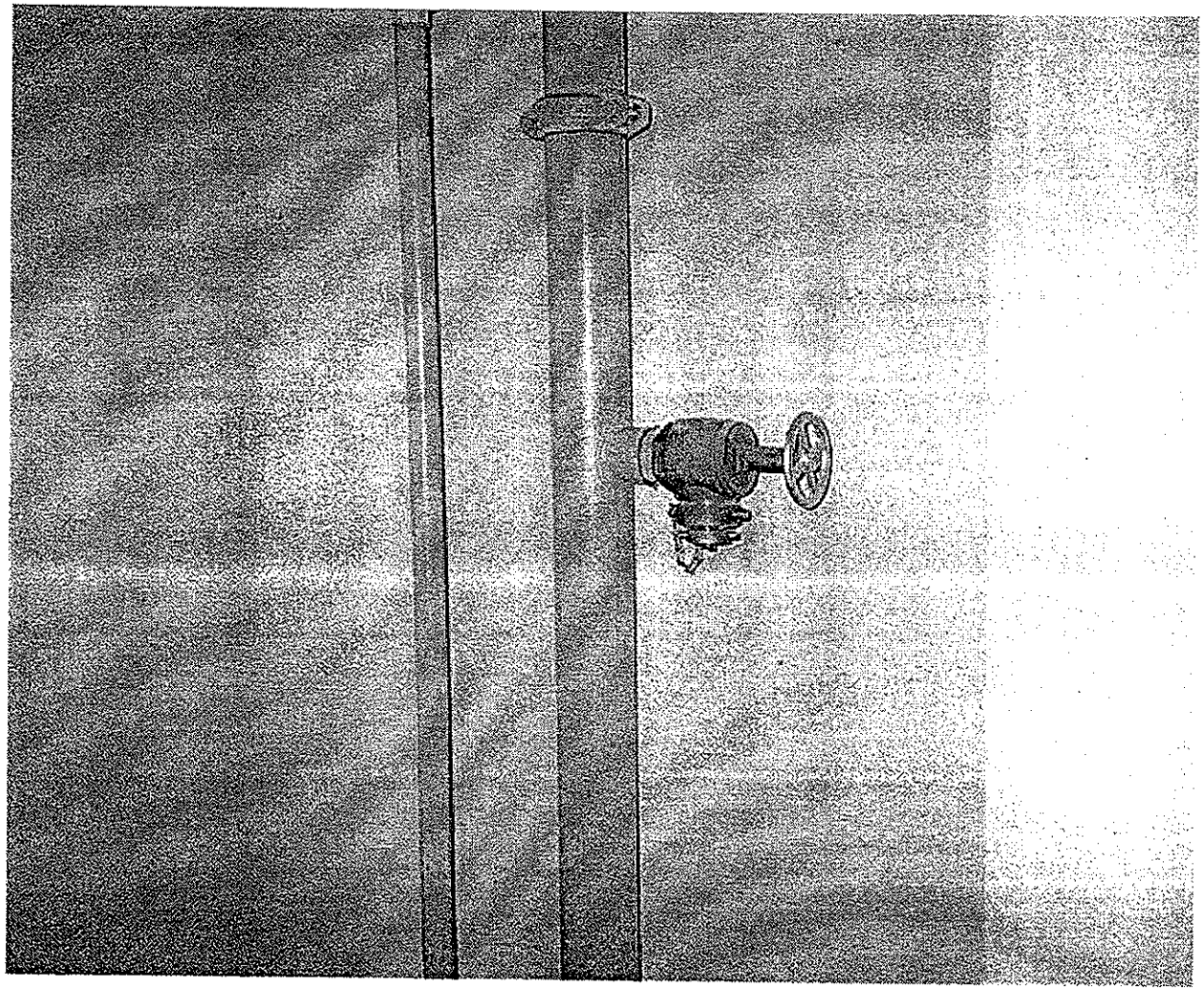




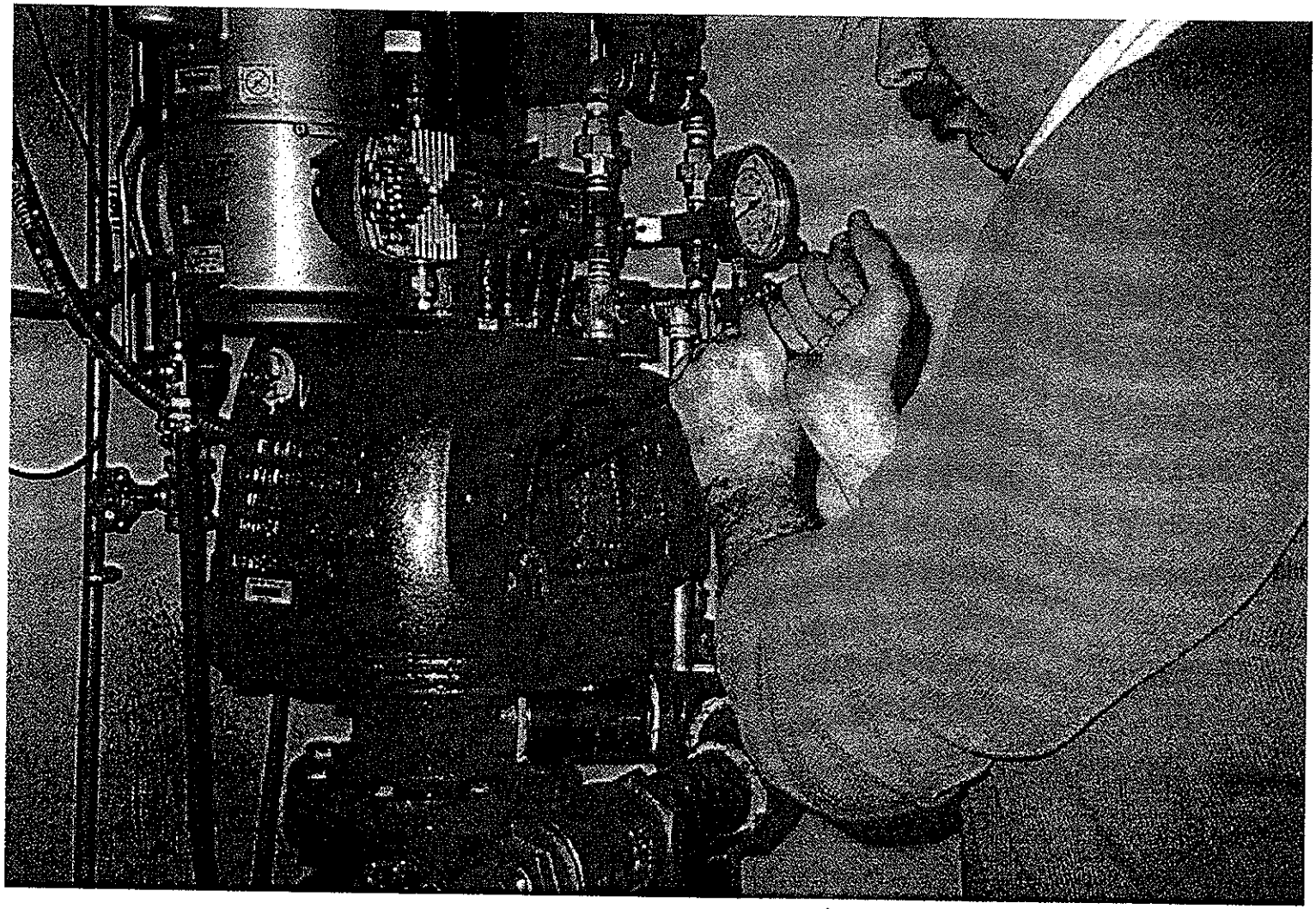
Automatic Sprinklers



Manual Extinguishing Equipment

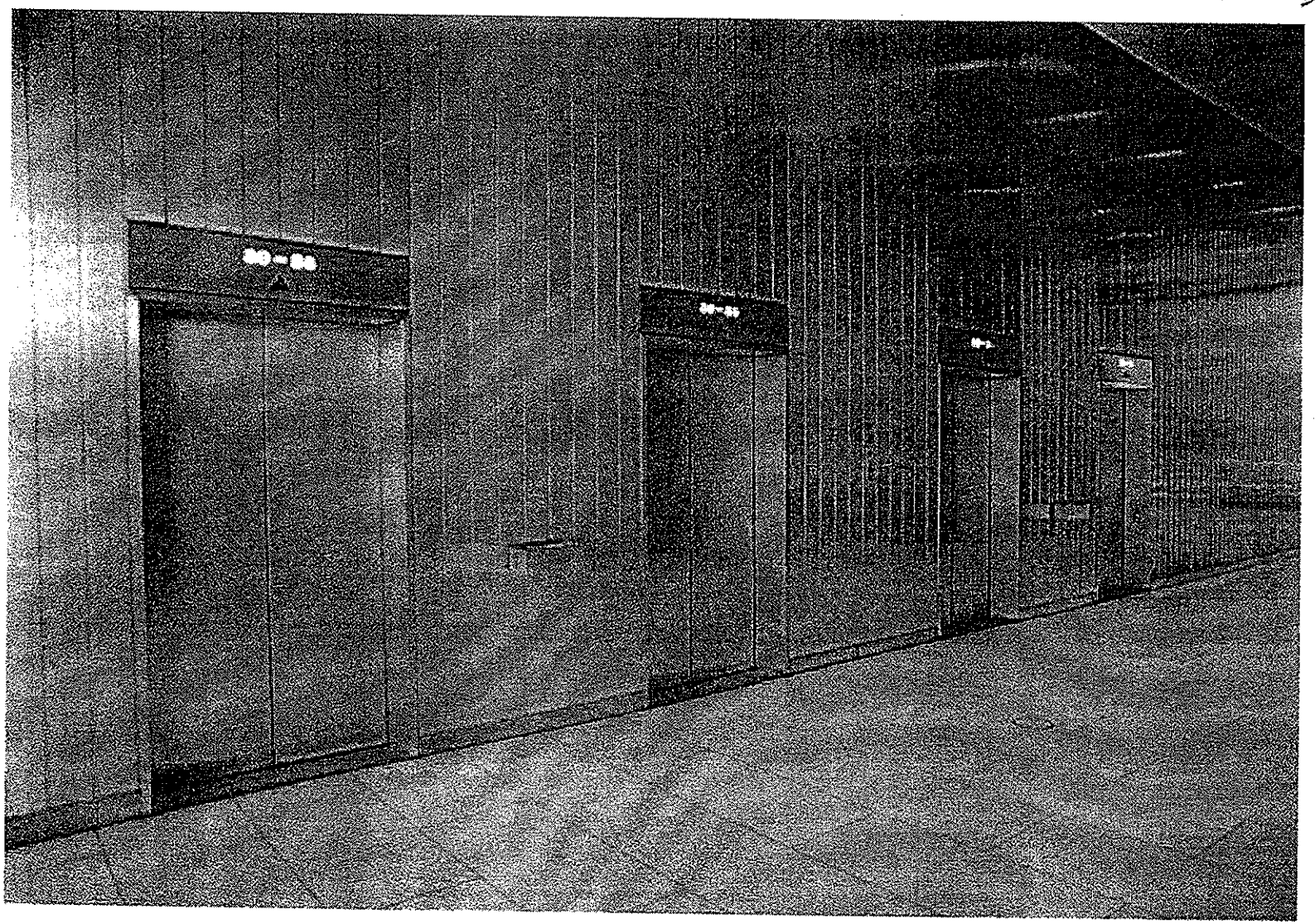


Maintenance and Testing

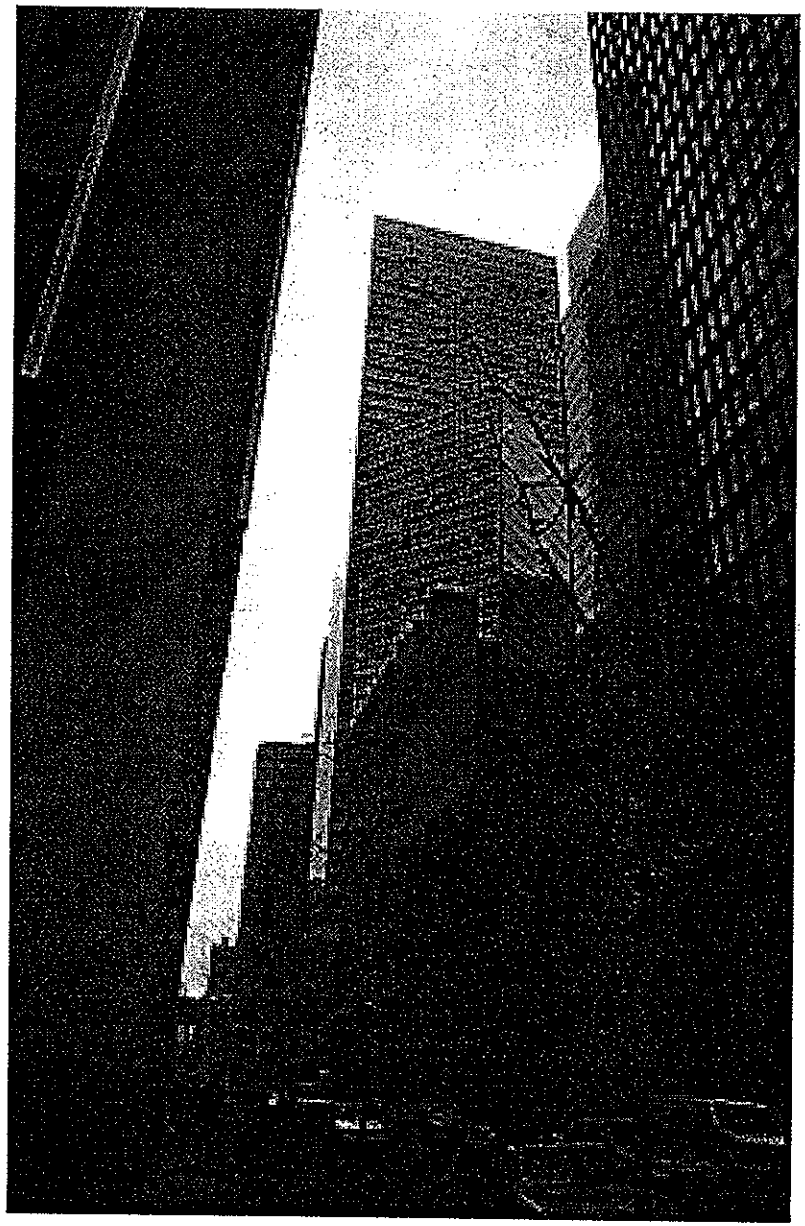


Elevators

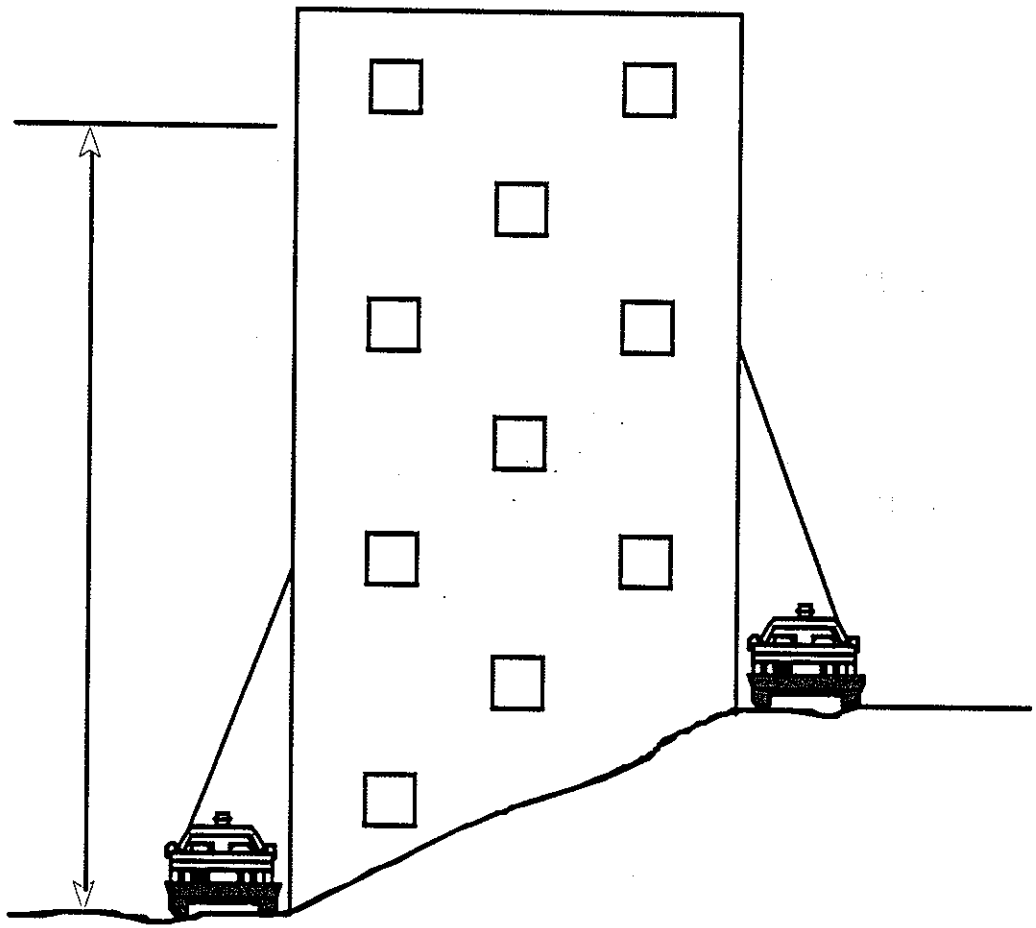
Not to be considered as an emergency Egress under the life safety Code.



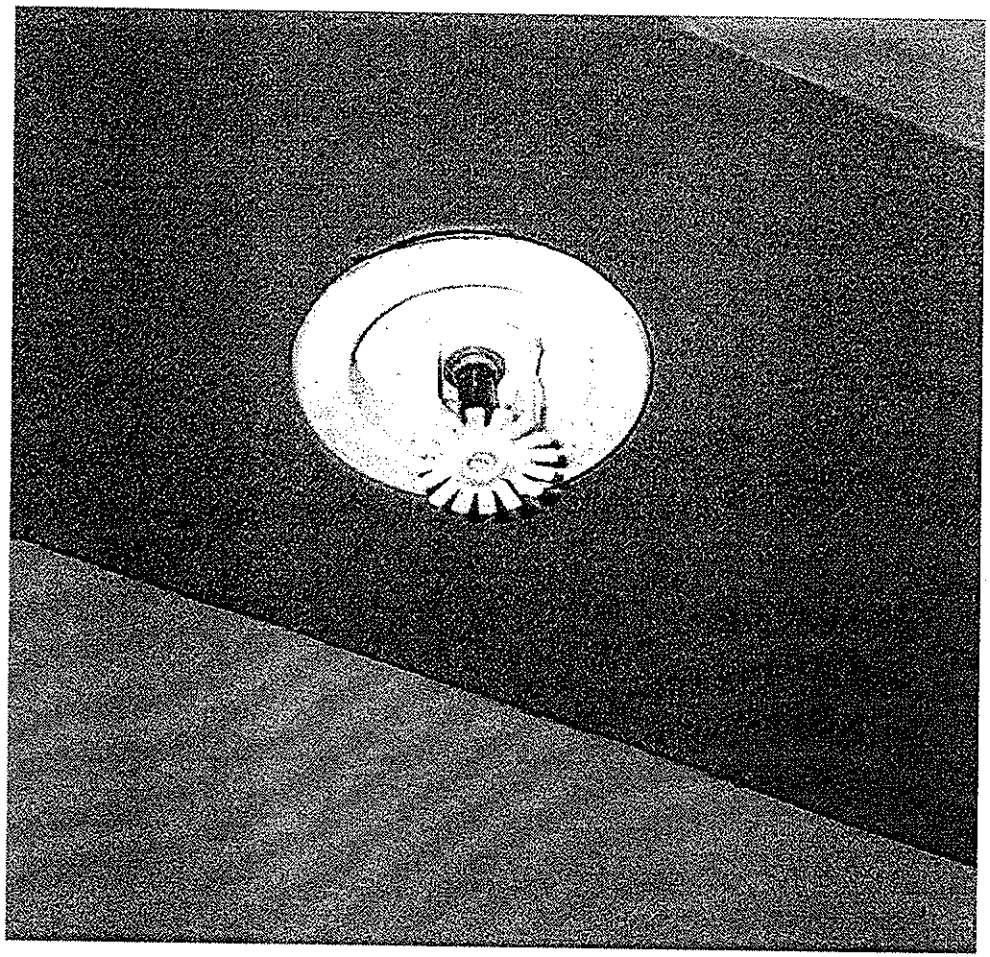
High-Rise Building



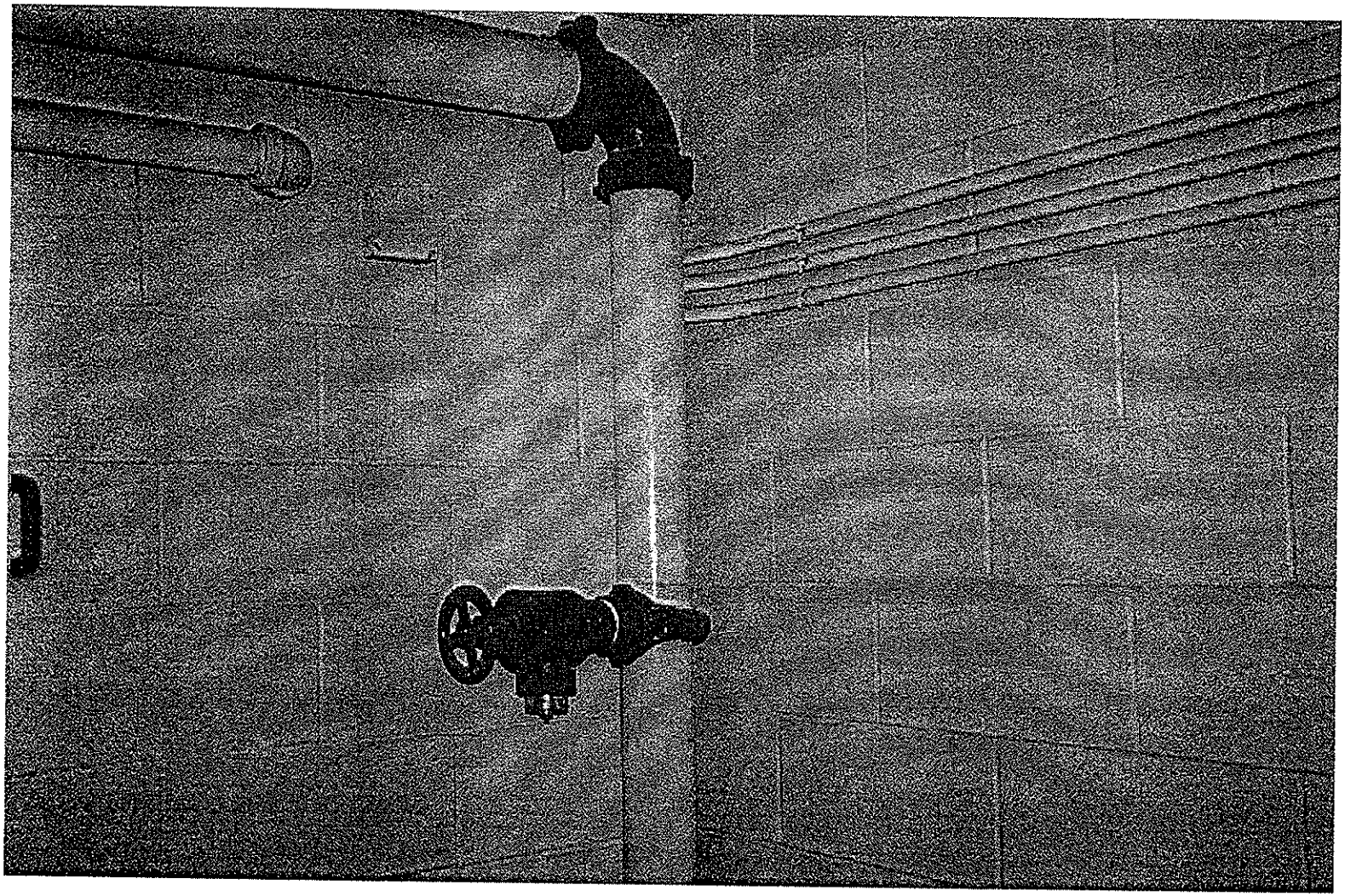
High-Rise Building



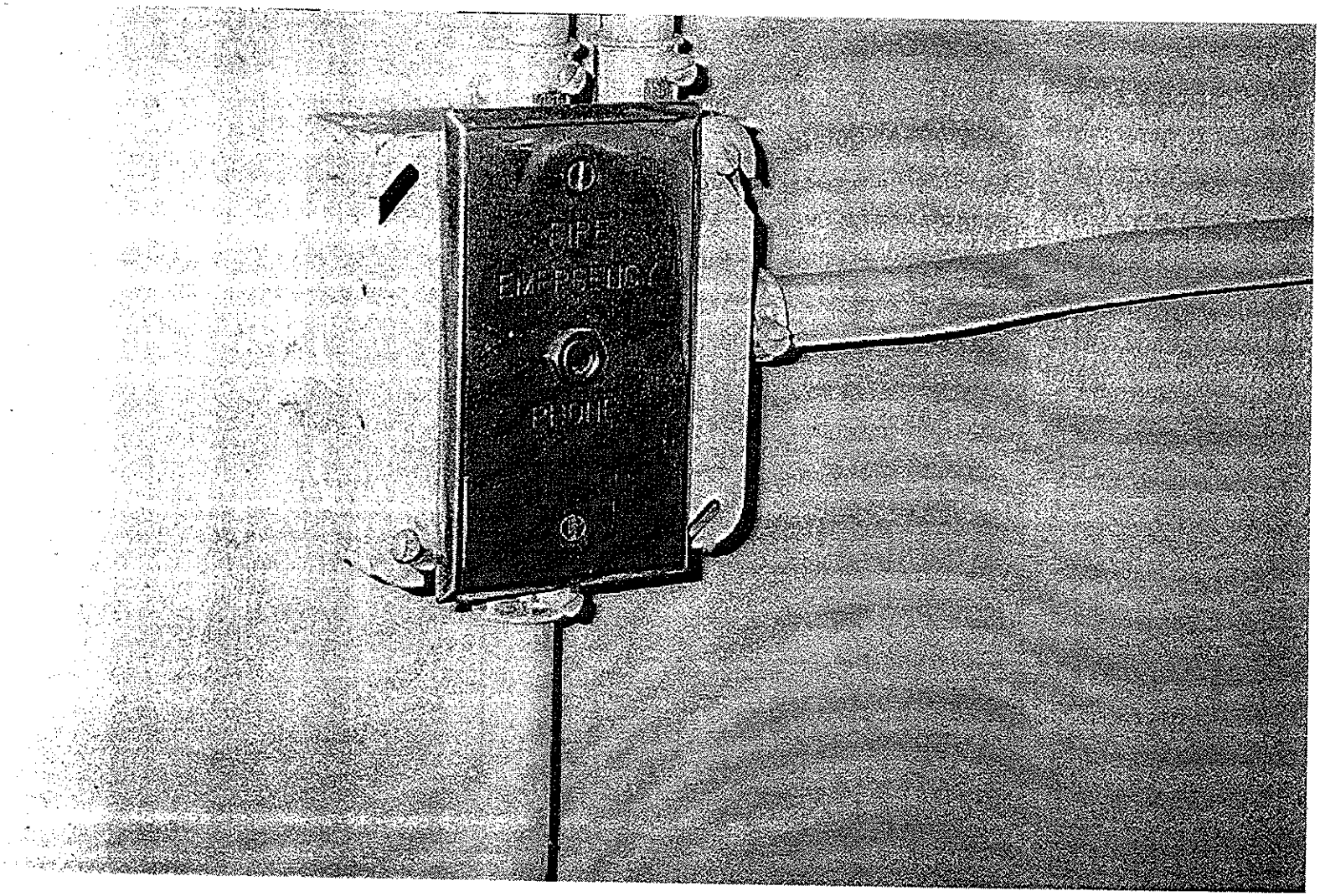
Sprinklers



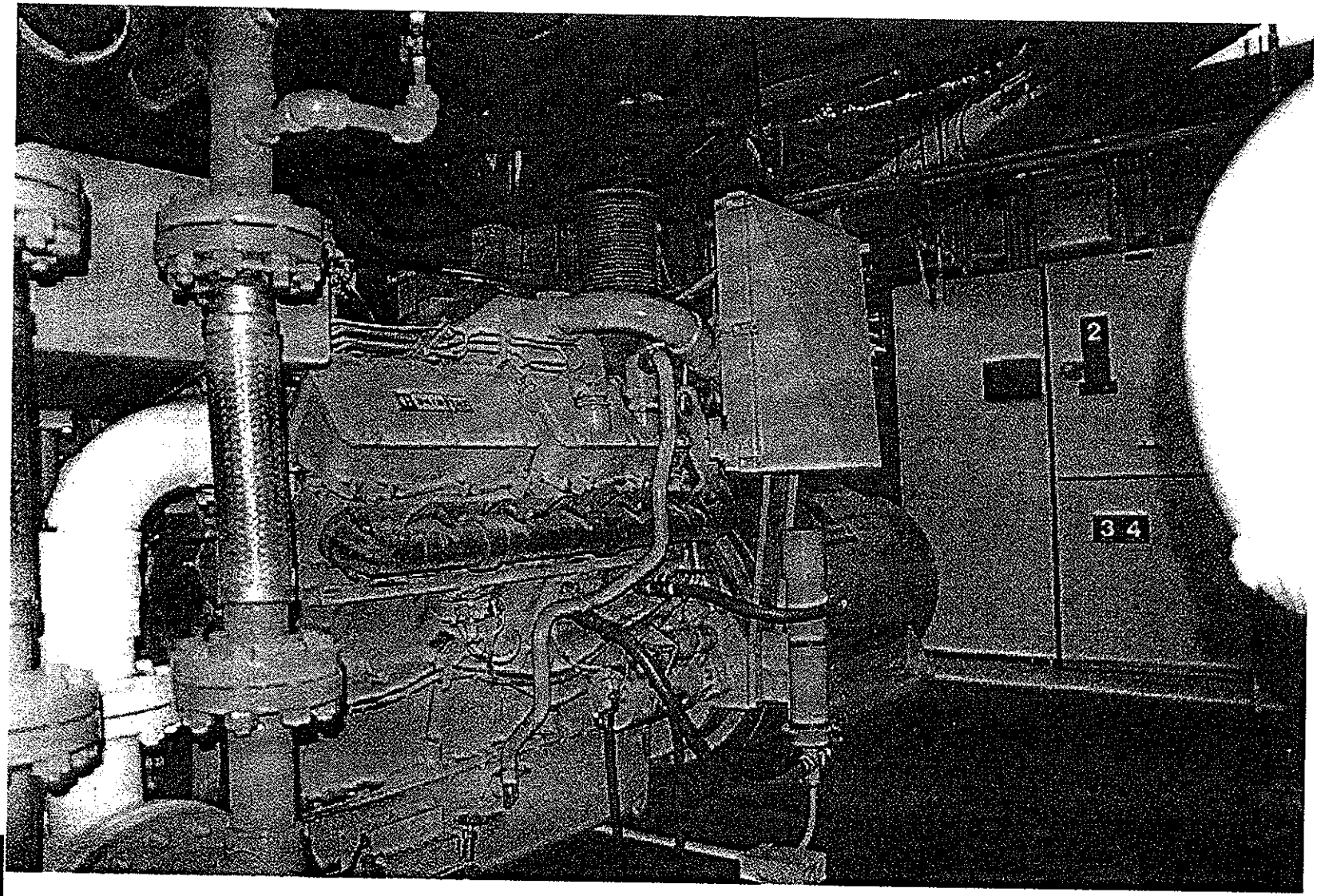
Standpipe



Alarm and Communications



Standby Power



Central Control Station



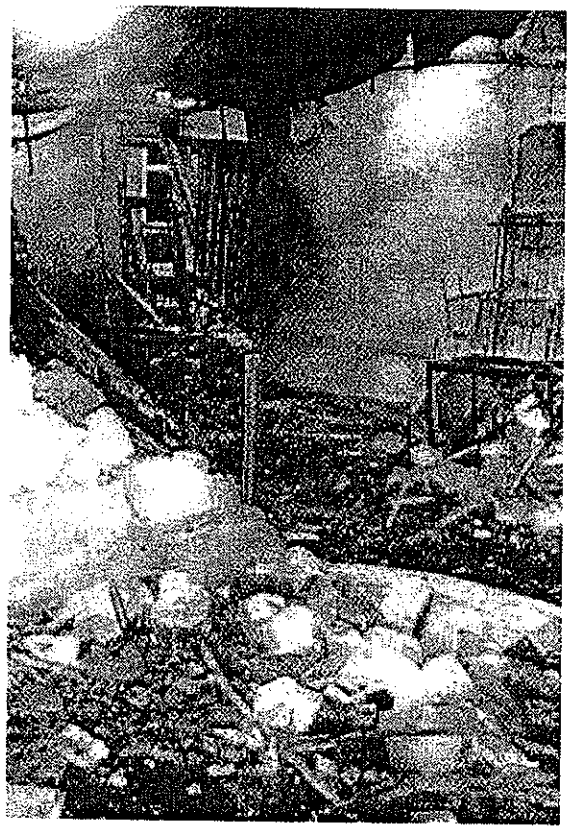
Maintenance



Other Fires

- Our Lady of Angels School
- Beverly Hills Supper Club
- Las Vegas Hilton Hotel
- Royal Jomtien Resort Hotel

Our Lady of Angels School
1958

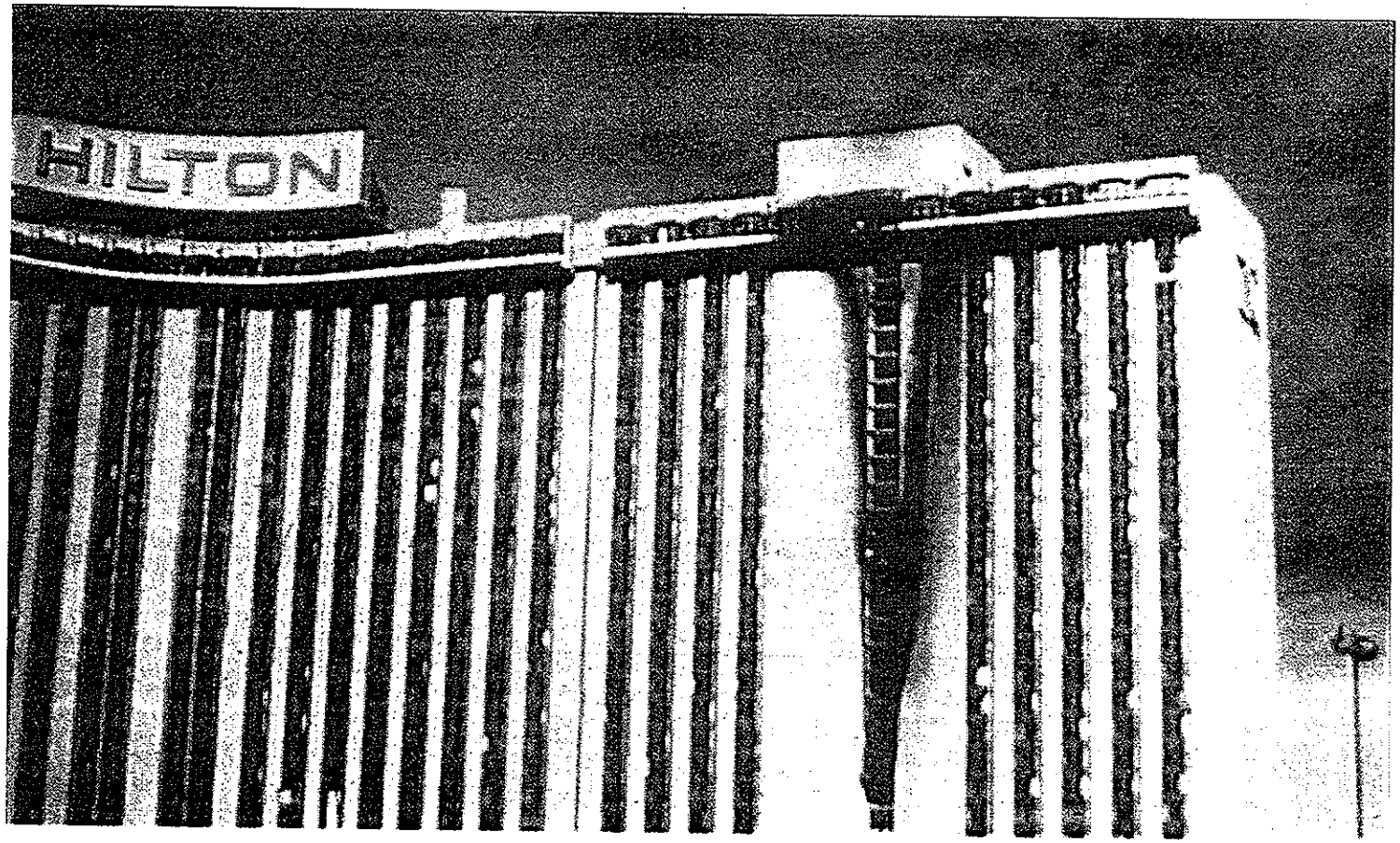


Beverly Hills Supper Club
1977

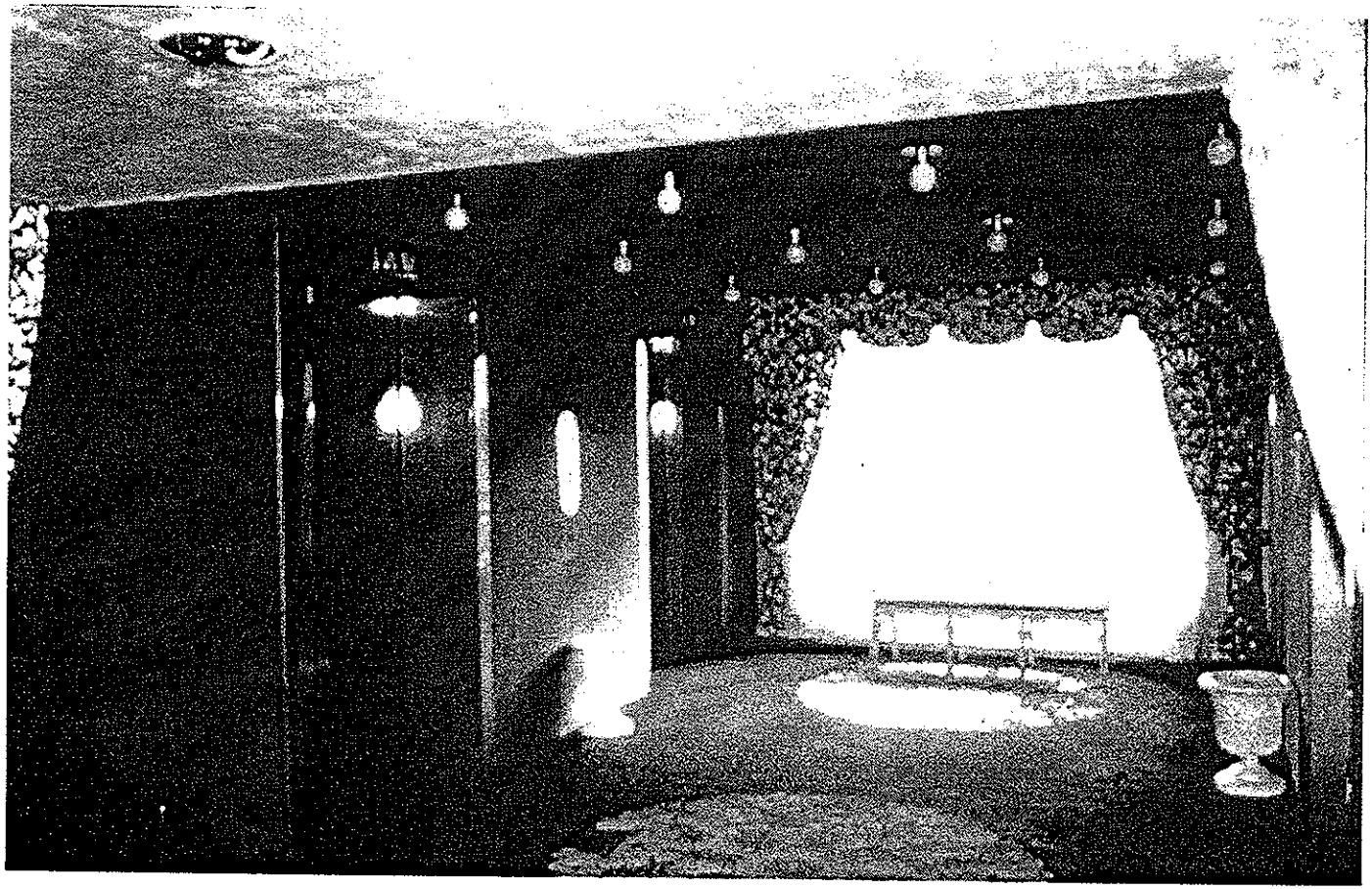




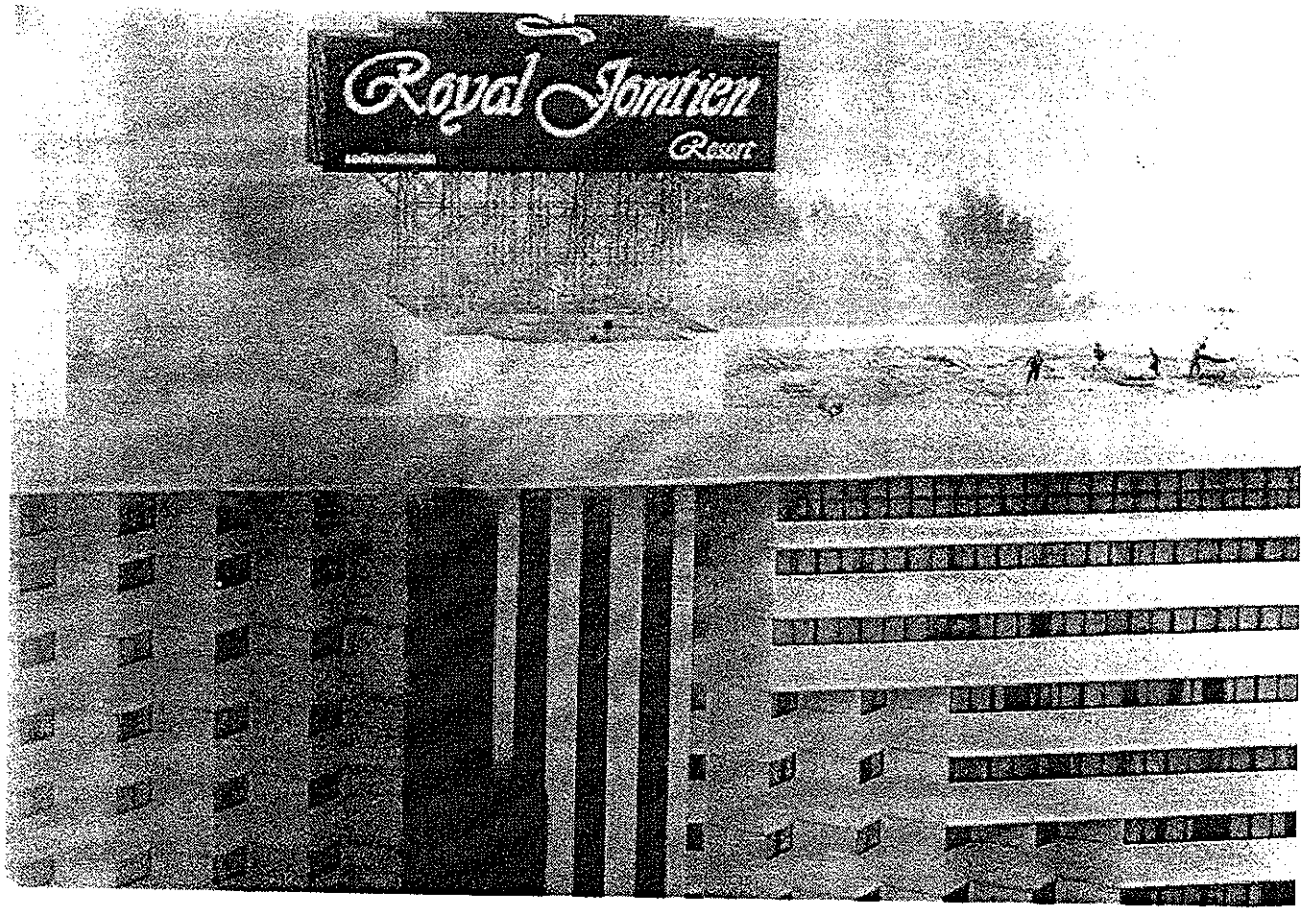
Las Vegas Hilton Hotel



Interior Finish



Royal Jomtien Hotel - 1997

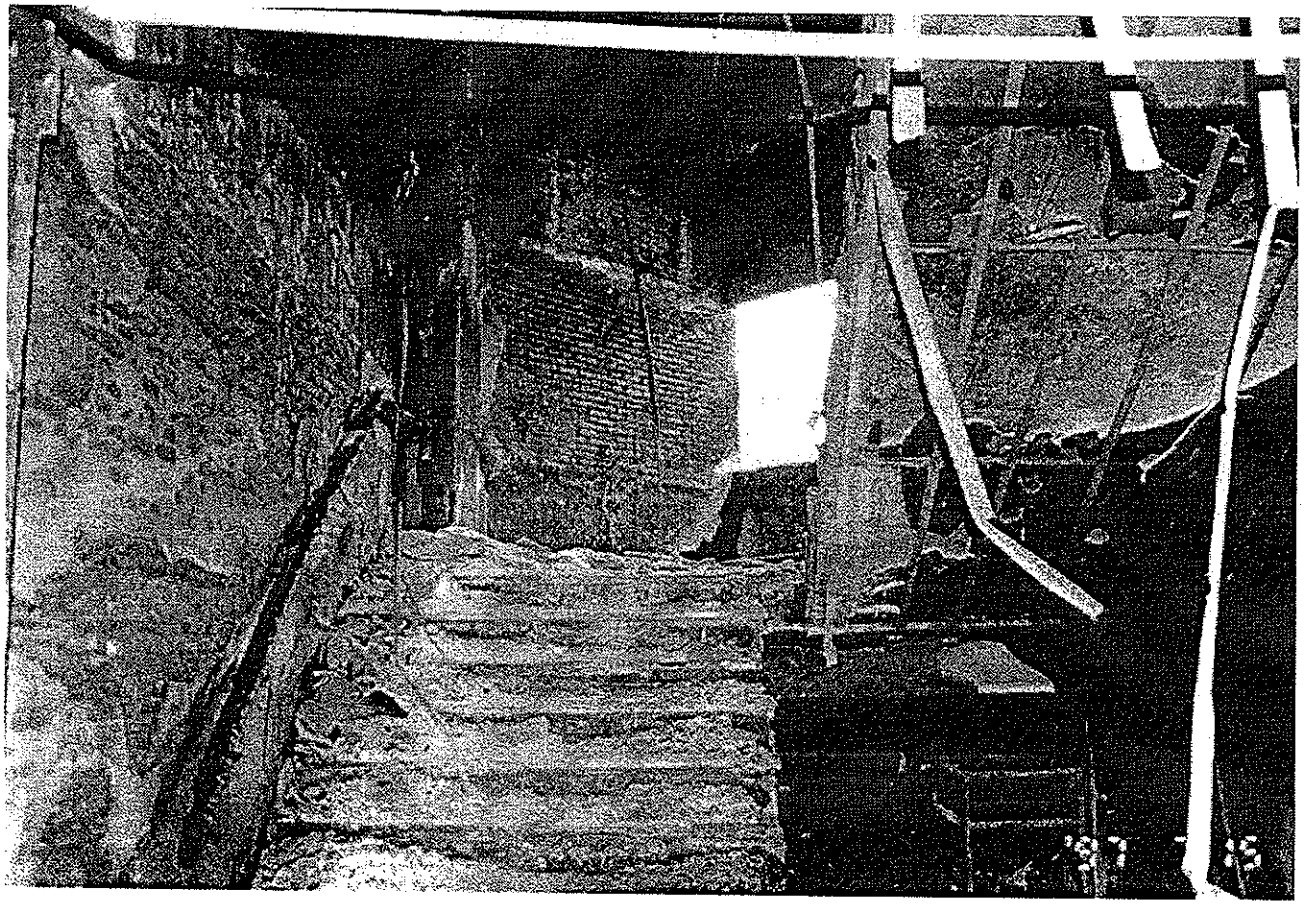


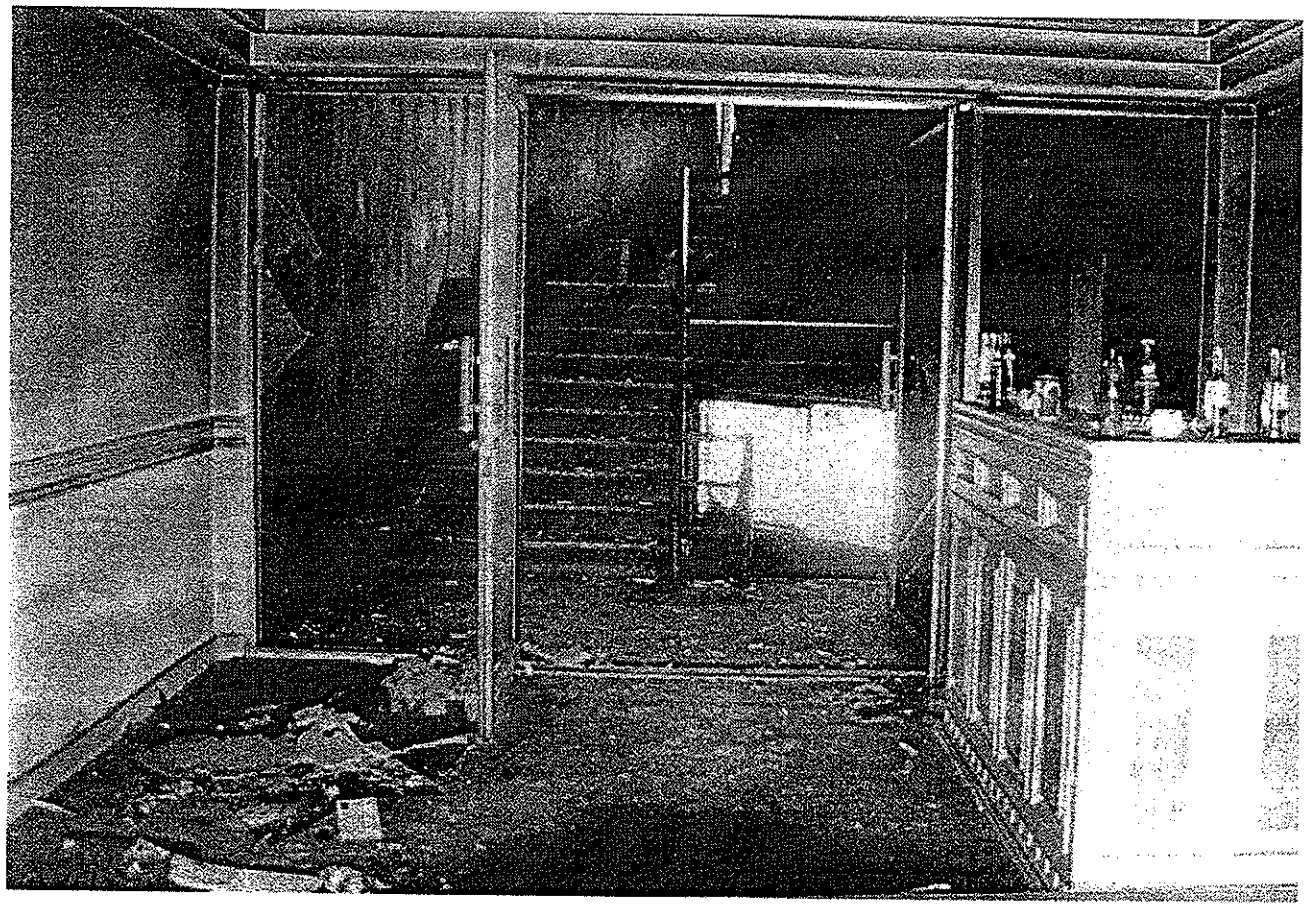

Royal Jonmen

Unprotected Vertical Opening

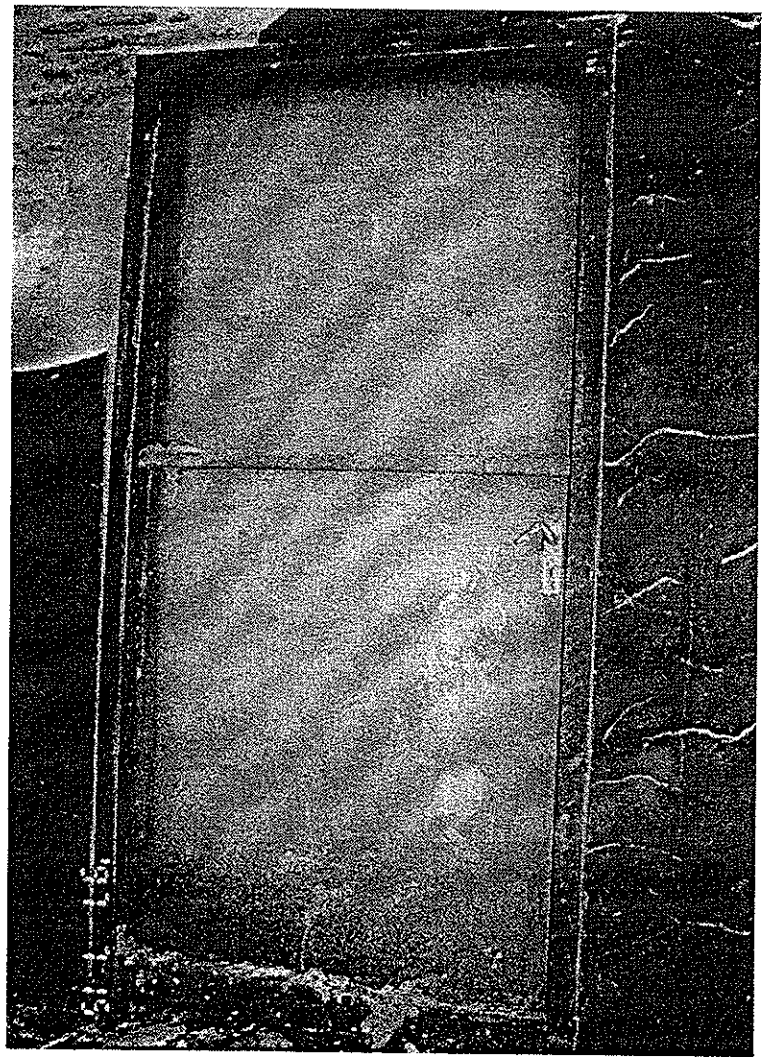
(Stairwell)



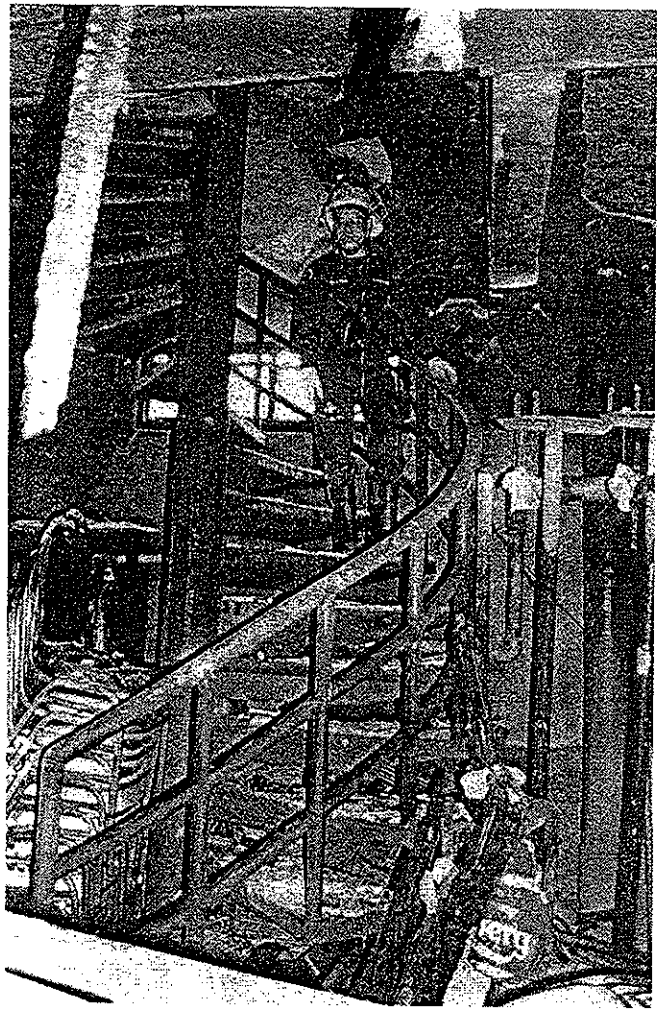


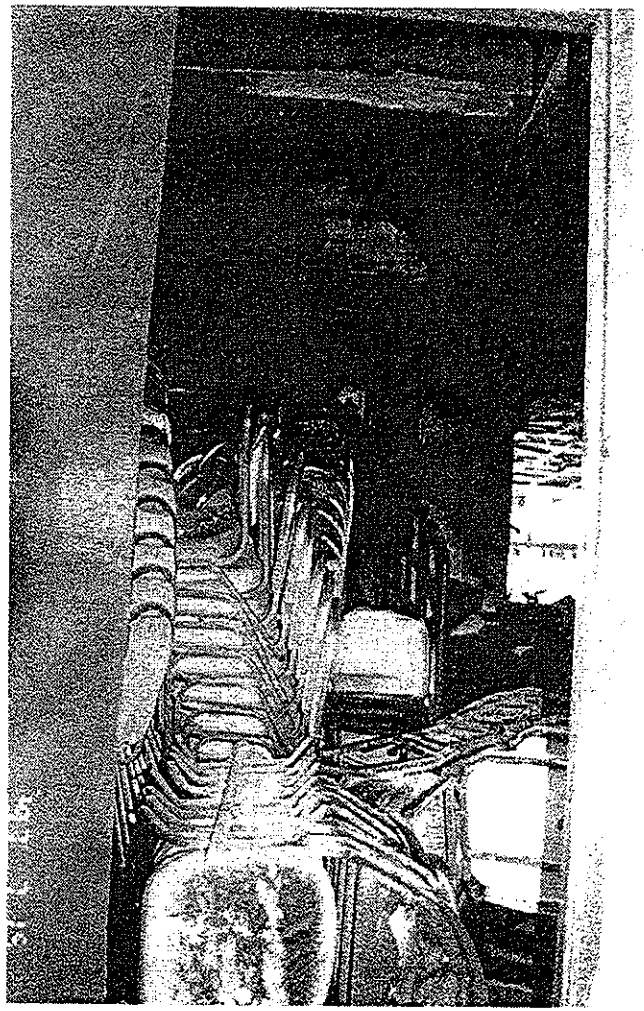


Locked Exits

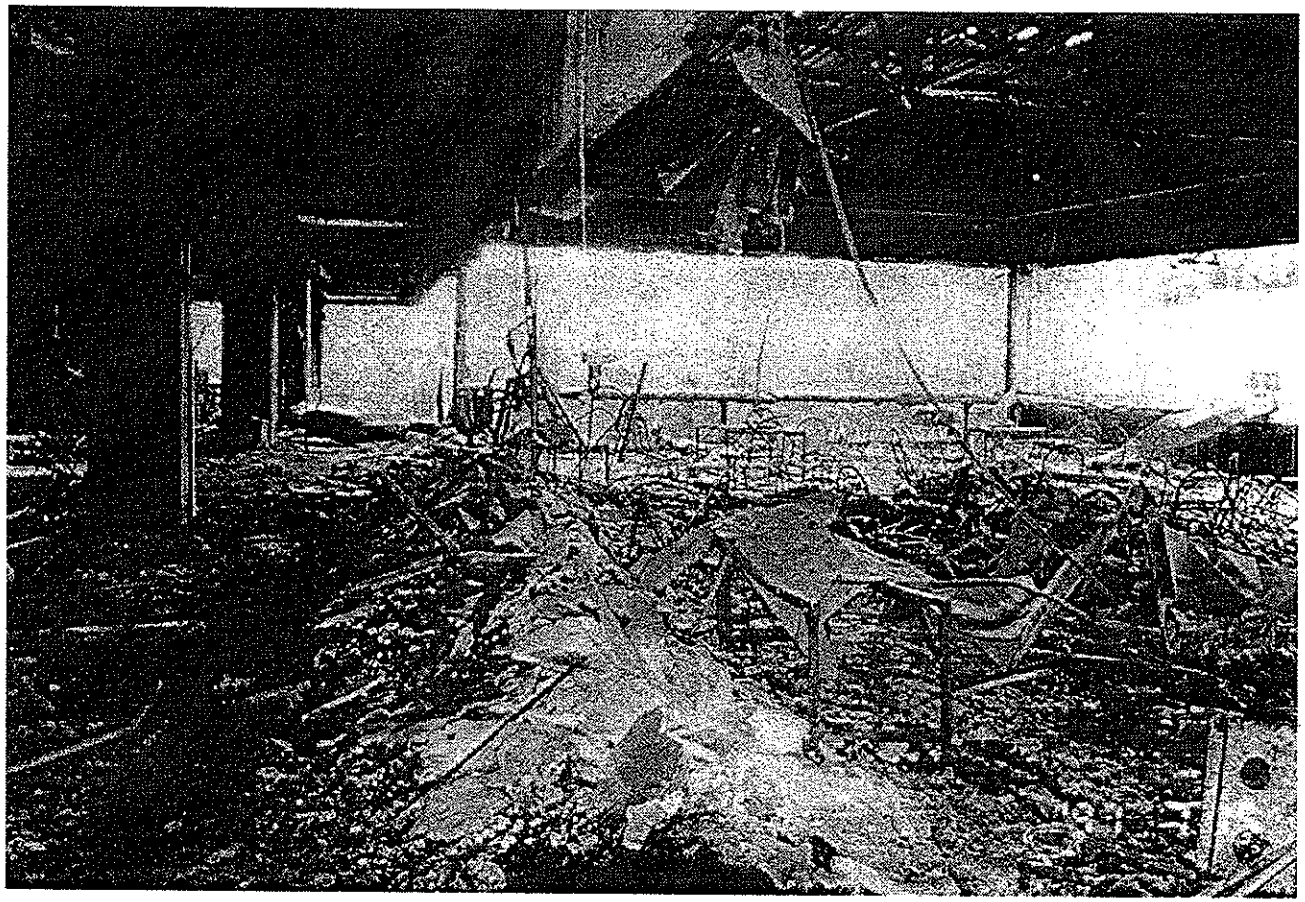


Blocked Exits





Interior Finish



Rule of History

- Those who do not learn from history are doomed to repeat it.