

CF98-1-11

National Association of State Fire Marshals

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June 16, 1998

Sadye E. Dunn
Secretary
U.S. Consumer Product Safety Commission
Washington, D.C. 20207

Re: Flame Retardant Chemicals

Dear Ms. Dunn:

Enclosed is additional information that was requested by Chairman Brown and Commissioners Moore and Gall at the hearing on Flame Retardant Chemicals, May 5-6, 1998:

- The fire incident report from the January 23, 1998, small-open-flame upholstered furniture fire in the District of Columbia that took the life of an infant girl. This report is being shared with the knowledge and permission of the Washington, D.C., Fire Marshal, who asked that any identifying names be blacked-out on the report, out of respect for the family of the victim.
- Four reports in response to your request for background data on the rise in fires in Europe after manufacturers started making TV sets without fire-retarded housing in the early 1990s:
 - excerpts from a January 1998 report, "Fire Safety of TV-Sets and PC-Monitors," prepared for the European Brominated Flame Retardants Industry Panel and the European Flame Retardants Association, in which data show that new TV sets purchased in Germany are much more likely to ignite, and to burn quicker, than old sets purchased in Germany and old or new sets purchased in the U.S. and Japan;

Ms. Dunn
June 16, 1998
Page 2

— “TV Set Enclosure Materials Fire Safety: Survey of European Statistics,” an unpublished paper prepared by researchers at Albemarle and Robinson Linton Associates which observes that, since the early 1990s, TV set fire rates have stopped decreasing and are even increasing in European countries such as the UK and Sweden. The paper speculates that the increase may be related to less stringent flammability standards for TV set enclosures in the European Union than are found in the United States and Japan;

— “Consumer Safety Research,” a March 1996 report from the U.K. Department of Trade and Industry, which provides country-by-country information on TV set fires and related issues in Europe.

— “Television Fires: Final Report,” an April 1995 report compiled by the Market Surveillance Board of the Danish Electrical Equipment Control Office, which recommends that methods be found to make plastic materials used in TV sets more fire-resistant.

Please do not hesitate to let us know if we can provide the Commission with additional information.

Sincerely,

A handwritten signature in black ink that reads "Thomas R. Brace". The signature is written in a cursive style with a small flourish at the end.

Thomas R. Brace

Enclosures



DISTRICT OF COLUMBIA FIRE DEPARTMENT

INCIDENT REPORT

FD-204 (Rev. 1-7-73)

Entries contained in this report are intended for the sole use of the fire marshal. Estimations and evaluations made herein represent most likely and most probable cause and effect. Therefore, any representation as to validity or accuracy of reported conditions outside the fire marshal's office is neither intended nor implied.

Submitted by Tel. Due Company Only

1 Delete, 2 Change

FDID: 11411040481010012398, INCIDENT NO.: 11040481010012398, DAY: Sunday, YEAR: 1988, ALARM TIME: 082708, ARRIVAL TIME: 082811, BACK IN SER: 1100

SITUATION FOUND (P. 17): 11 Structure fire, 12 Outside with value, 13 Vehicle fire, 14 Brush/grass, 15 Trash/no value, 16 Explosion/no after fire, 17 Outside spill w/leak, 22 Gas leak. Other: 14 Chemical spill, 15 Hazardous condition, 16 Lock out, 17 Water removal, 18 Smoke removal, 19 Animal rescue, 20 Assist police, 21 Other service calls.

ACTION TAKEN (page 19): 1 Extinguishment, 2 Rescue or assistance, 3 Investigation only. MUTUAL AID (page 20): N/A. CENSUS TRACT: 010135010

FIXED PROPERTY USE (Occupancy) (page 27): 1411. IGNITION FACTOR (page 44): 00: Not a fire. Other: 1316

CORRECT ADDRESS: 2719 Sherman Ave. QUADRANT: XNW 1 NE. ZIP CODE: 20101. OWNERSHIP CODE: X PVT 2 FED J 1 DC

OCCUPANT NAME (Last, First, MI): [Redacted]. TELEPHONE: 483-6458. ROOM or APT: N/A

OWNER NAME (Last, First, MI): [Redacted]. ADDRESS: 241-B Lanitona Ln., Hampton VA. TELEPHONE: unknown

METHOD OF ALARM (P. 53): 2 Municipal Alarm, 3 Private Alarm System. CO INSPECTION DISTRICT: E1014. PLATOON: 4. NO ALARMS: 11

NO FIRE PERSONNEL RESPONDED: 101416. NO ENGINES RESPONDED: 101015. NO AERIAL APPARATUS RESPONDED: 101012. NO OTHER VEHICLES RESPONDED: 10112

NUMBER OF INJURIES: FIRE SERVICE 01000, OTHER 01013. NUMBER OF FATALITIES: FIRE SERVICE 01010, OTHER 01011

COMPLEX (P. 61): 11 Public Recreation/Parks, 12 Stadium, Sports, Exhibition Hall, 14 Golf, Tennis - Club, 20 Educational, 33 Medical Care, 34 Prison, 40 Business W/ Residential, 41 Dwelling (1 & 2 Family). MOBILE PROPERTY TYPE (Page 63): US X Not applicable

AREA OF ORIGIN (P. 66): 41 Storage room, 42 Closet, 46 Trash area, 47 Garage, 57 Chimney, 62 Heating equipment room, 64 Incinerator room, 71 Crawl space, 73 Floor/ceiling. ROOM: Living Room. EQUIPMENT INVOLVED IN IGNITION (P. 70): 11 Central heating, 27 Grease duct, 31 TV/radio, 32 Water heater, 33 Refrigerator, 34 Dryer, 35 Fireplace, 41 Fixed wiring, 53 Wash Machine, 44 Elec. paneling, 81 Incinerator, 45 Switch/outlet, 90 Vehicle, 46 Lighting fixture, 98 No equipment, 47 Cord/plug, 99 Other, 48 Lamp/light bulb

FORM OF HEAT OF IGNITION (P. 74): 11 Flame, gas fuel equipment, 14 Heat, liquid fuel equipment, 15 Flame, solid fuel equipment, 16 Heat, solid fuel equipment, 22 Short from damage, 23 Short - worn, 24 Unspecified short, 28 Fluorescent light damage, 31 Cigarette, 41 Torch. TYPE OF MATERIAL IGNITED (P. 75): 11 Natural gas, 23 Gasoline, 25 Kerosene/fuel oil, 31 Fat/grease, 34 Pitch/tar/creosote, 35 Paint/Varnish, 40 Plastic, 51 Rubber, 54 Grass/leaves/hay. FORM OF MATERIAL IGNITED (P. 80): 11 Exterior roof, 12 Exterior wall, 14 Tile/carpet, 15 Interior wall, 17 Structural member, 21 Upholstered furniture/vehicle seats, 23 Cabinets, 31 Mattress/pillow, 32 Bedding, 34 Wearing apparel (not on). SOFA BED

METHOD OF EXTINGUISHMENT (P. 83): 1 Self Extinguished, 2 Make Shift Aides, 3 Portable Extinguishers, 4 Automatic Extinguishing System, 5 Pre Connected hose Link, 6 Pre Connected hose/hydrant, 7 Hand Mose Line/Hydrant Standpipe, 8 Master Streams. LEVEL OF ORIGIN (P. 84): 1 Grade to +9', 2 10' to 19', 3 20' to 29', 4 30' to 49', 5 50' to 70', 6 over 70', 7 Objects in flight, 8 Below ground, 9 Undetermined. ESTIMATED TOTAL LOSS - CONTENTS AND STRUCTURE (Dollars Only) (P. 85): 10000200000000

NUMBER OF STORIES (P. 88): 2 Stories. CONSTRUCTION TYPE (P. 89): 5 Protected Ordinary, 6 Unprotected Ordinary, 7 Protected Wood Frame, 8 Unprotected Wood Frame, 9 Not Classified, 0 Undetermined

EXTENT OF DAMAGE (P. 90): 1 Confined to object of origin, 2 Confined to area of origin, 3 Confined to extent of damage, 4 Confined to fire - extent of damage. FRAME, SMOKE, DETECTION, SPRINKLER PERFORMANCE (P. 100)

DISTRICT OF COLUMBIA FIRE DEPARTMENT FIRE INVESTIGATION REPORT

1. <input checked="" type="checkbox"/> Fire/Bombing <input type="checkbox"/> Investigation Only <input type="checkbox"/> Other		2. Incident Number 048100		3. Date 12-23-98		4. FDID	
5. Method of Alarm 911		Time of Alarm 0827		Arrival Time		In-Service Time	
6. Address Of Incident 2719 SHERMAN AVE. N.W.				<input checked="" type="checkbox"/> Occupied <input type="checkbox"/> Unoccupied		Zip Code 20001	
7. Type of Occupancy <input checked="" type="checkbox"/> PVT <input type="checkbox"/> FED <input type="checkbox"/> DC		Described Occupancy 2-Story Brick End Row Dwelling				Damage Est. \$20,000.00	
8. Occupant [REDACTED]		Sex F	Race B	DOB ---	SSN ---	Telephone No.(s) 483-6458	
9. Owner of Property [REDACTED]		Address 241 LANITAWA LA, HAMPTON VA.				Telephone No.(s) UNK	
10. Auto Fire		Make N/A	Model N/A	Tag# N/A	Serial Number N/A		
11. Insurance Information UNK							
12. Smoke Detector		<input type="checkbox"/> Yes <input type="checkbox"/> No	Operated UNDETERMINED	<input type="checkbox"/> Yes <input type="checkbox"/> No	Equipment Involved: N/A		
EXPOSURE DAMAGE							
13. Occupant		Address		Telephone		Estimate	
1. N/A		1. N/A		1. N/A		1. N/A	
2. N/A		2. N/A		2. N/A		2. N/A	
INJURED PERSON(S)							
14. Name		Sex/Race/DOB		Type Inj./Fatality		Hospital	
1. SER MAIN REPORT		1. ---		1. ---		1. ---	
2. ---		2. ---		2. ---		2. ---	
15. Narrative: SEE ATTACHED REPORT;							
<div style="font-size: 2em; font-family: cursive; transform: rotate(-15deg);"> Alexander Bullock Jr. Fire Investigator </div>							

Over

16. Origin Living Room		Cause Child Playing with matches		Determination Accidental	
17. Complaint #		Forensic Tech		Other Agency MPD Homicide	
18. Reporting Investigator MICHAEL TRACY		2nd Investigator DONALD GILLISPIE, GREG THOMAS (ATF)		Supervisor Sgt. Adam Young, CFEI	

Alexander Bullock Jr.

Origin and Cause Determination

ATF Case Number: 742204-98-0033
DCFD Incident: 048100

SYNOPSIS OF THE INCIDENT:

On January 23, 1998, at about 8:27AM fatality fire occurred at 2719 Sherman Av. NW, apartment B, Washington, D.C. On this same date Special Agent [REDACTED] participated in a cause and origin examination of this fire scene.

PARTICIPATING FIRE INVESTIGATORS:

The following investigators participated in the investigation, and fire scene examination, Fire Investigator [REDACTED], Washington, D.C., Fire Department, Bureau of Fire Investigations, ATF CFI/SA [REDACTED]. Due to the fact that this was a fatality fire this fire scene was worked conjointly with the Washington D.C. Police Department, Homicide Unit and Crime Scene Unit. The names of these individuals will be forwarded upon receipt.

WITNESS REPORTS:

Lt. [REDACTED] Engine 4, Platoon 4, Washington, D.C. Fire Department, was interviewed by S/A [REDACTED]. [REDACTED] said that he and his company were the first in fire fighters. [REDACTED] said that upon arrival he saw fire coming through both the front window and front door. [REDACTED] said that upon entry he saw that the front door had burnt away. [REDACTED] said on entry he found the front room fully involved in fire. [REDACTED] said that the contents in this room were extinguished and he moved to the hallway. After working his way to the hallway Waller said that fire erupted behind him. [REDACTED] said he then had the hose trained on the couch against the east wall under the front window. [REDACTED] said upon extinguishing this couch the all of the fire in this residence was out. [REDACTED] said that the entire fire had been contained to the front living room.

Ms. [REDACTED] 2719 Sherman Ave. NW, Washington, D.C., telephone number 202/483-6458, was interviewed by WFD, Fire Investigator [REDACTED]. Ms. [REDACTED] said she had been in the kitchen and started through the apartment. Ms. [REDACTED] said she saw smoke in the hallway and went to investigate. Ms. [REDACTED] said as she got to the living room she saw the sofa/bed against the east wall on fire. Ms. [REDACTED] said that when she saw the sofa/bed on fire it was burning at the end by the front door. Ms. [REDACTED] said she tried to put the fire out by slapping it with her open handsbut was unsuccessful. Ms. [REDACTED] said as the fire got bigger she ran out the front door.

The Washington, D. C. Police Department, Homicide Unit conducted interviews with the occupants of this residence. Investigators from the homicide unit said during the interviews with the children that one of the children admitted to playing with matches next to the sofa/bed and

it catching fire. The assigned detective was not available and his notes and records were locked away. The on duty detective could only supply the jest of the interviews and not any of the specifics. Reports of these interviews will be forwarded upon receipt.

BUILDING CONSTRUCTION:

The involved structure is a two story brick, with basement multiunit apartment house. This apartment house had a flat roof covered with asphalt shingles. This apartment house had undergone remodeling in the past and the second floor apartment had at one time been part of apartment B. Apartment B the involved apartment is a one bedroom, one bath, apartment on the first floor. This apartment faces west on the east side of Sherman Av. NW. Entry to the apartment is made through a steel gated 32 inch wood door, located on the south side of the west wall. This front door opens into the living room. This living room has a carpeted wood floor on floor joist. A blocked fireplace is located on the south wall. This fireplace is blocked with a sheet of plywood. A console television is directly in front of the fireplace. Due to the remodeling that had occurred to this apartment the exterior brick wall is approximately 12 ft. 6 in. long north to south while the interior north to south wall is approximately 12 ft. 10 in. long. This room is approximately 12 ft. 4 in. wide east to west. A six foot couch is located against the east wall of the living room. A thirty-two inch door entry to the hallway is located in the east wall in the northeast corner of the living room. There are two upholstered chairs and a magazine table located against the north wall. The electrical panel to the residence is located in a wood box built into the northwest corner of the north wall. The west exterior wall contains a three foot seven inch by five foot ten inch window. This window was also covered with steel bars. The bottom section of the window housed an air conditioner. The interior walls of this residence were covered with both lathe and plaster as well as gypsum wall board. The west wall contained one electrical outlet located on the north end of the wall. The gas service to this residence entered up through the floor in the southwest corner of the living room just behind the front door. The gas service meter was attached at ceiling level in this area. The hallway ran from east to west. The only bedroom to this apartment was located next to the living room, and entry to this room was made from the hallway. The bathroom is the next room east of the bedroom. The dining room was located at the end of the hallway, and entry to the kitchen was made through a door at the south end of the room. This apartment had both electric and natural gas services.

SCENE PROCESSING:

During an exterior examination of this address it was observed that fire had vented through both the front door and front window. Examination to the rear of the apartment revealed light smoke damage and no flame or heat damage. An interior examination disclosed that the kitchen area had suffered smoke and heat damage approximately five foot down from the ceiling. A smoke/heat layer approximately seven foot down from the ceiling was observed in the dining room. This smoke/heat layer descended to within two foot of the floor in the hallway. This smoke layer pointed back toward the living room area. An examination of the entry opening to the hallway from the living room revealed charring to the wood molding around the opening. This charring extended down the opening to within approximately two foot from the floor. This charring decreased in severity the closer it got to the floor. It was also observed that the entry door to the bedroom exhibited charring to the

top exterior north corner section. The charring in this position indicated that this door was in the open position. It was observed that the bedroom exhibited a smoke/heat layer approximately three foot off of the floor. It was observed that plastic products on the dresser exhibited melting. It was also observed that cloth material above four foot from the floor had suffered some charring, but no ignition of pyrolyzed gases had occurred. Examination of the living room revealed that this room was the room of origin. It was observed that the natural aluminum shelled gas meter located at ceiling level behind the front door had suffered melting, due to the upper layer temperatures, and fallen to the floor. It was also observed that two chairs located against the north wall exhibited deep charring on the west side of their frames. The upper frame members of these chairs had burnt away on the west side of both chairs. It was also observed that the west chair exhibited more severe charring on the its west side than the chair on the east. The seat cushion in the west chair had been burnt away while the east chair cushion had suffered heat and fire damage on its west side. The couch located against the east wall exhibited charring and burning from the top down. The console television located in front of the fireplace against the south wall exhibited an arrow pattern pointing back to the west toward the sofa/bed against the west wall. After removal of debris from the interior of the living room an examination of the carpet was made. It was observed that the carpet throughout the living room had good survivability except for an area around the southeast corner of the sofa/bed. An examination of this sofa/bed revealed that deeper charring was exhibited on the inside of the wood frame in comparison to the exterior of the frame. It was also observed that the southeast corner of the sofa/bed frame exhibited heavy charring in comparison to the other three corners. It was also observed that the carpet under the south end of the sofa/bed had burnt away and some charring to the wood floor in this area had occurred. This charring to the floor under the sofa/bed decreased in severity as it progressed north. It was also observed that the farther north away from the southeast corner of the sofa/bed the remains of carpet survived in better condition. It was also observed that the west wall baseboard exhibited deeper charring to the south section decreasing in severity toward the north. While examining the west wall baseboard the electrical outlet in the wall was examined. It was observed that an electrical power cord was still plugged in this outlet. Upon close examination of the outlet and cord remnants it was observed that all the damage to this artifact was caused by external heat and was not an ignition source for this fire.

Upon removal of the debris in the living room a reconstruction of the room was conducted. The living room furniture was replaced in their original positions. In this position it was observed that all of the burn patterns indicated that this fire originated in the southeast corner of the sofa/bed.

It was observed that the window had failed during this fire. With this in mind an examination was made to determine if the damage to the sofa/bed could have been caused by the fire venting through this window. From the position of the other furniture in the room and their close proximity to the sofa/bed it was determined that if the fire venting through the window had greatly contributed to the destruction of the sofa/bed it should have also caused the same type of damage to the other near by furniture. This damage was not observed. It was determined that this venting did not greatly contribute to the destruction of the sofa/bed.

FIRE PROGRESSION TO OTHER STRUCTURES:

There was no fire progression to other structures.

CONCLUSION:

This fire originated in the southeast section of the sofa/bed in the living room. This fire was ignited by a child playing with matches. This was an accidental fire.

NUMBER OF FATALITIES AND/OR INJURIES

██████████, b/f, dob 112497, 2719 Sherman Ave. NW, Washington, D.C. died of smoke inhalation.

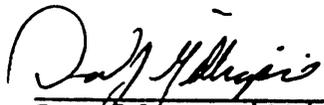
██████████, b/m, 5 years old, 2719 Sherman Ave. NW, Washington, D.C. was admitted to the Children's Hospital for smoke inhalation.

██████████, b/m, 27 years old, 2719 Sherman Ave. NW, Washington, D.C. was admitted to the George Washington Hospital for smoke inhalation.

██████████, b/f, 64 years old, 2719 Sherman Ave. NW, Washington, D.C. was admitted to the George Washington Hospital for smoke inhalation.

ESTIMATED VALUE OF LOSS:

\$20,000


Donald J. Gillispie
Special Agent, ATF



Pro Hospital

FIRE SAFETY OF TV-SETS AND PC-MONITORS

Preliminary report

Prepared for:

**European Brominated Flame Retardants Industry Panel
European Flame Retardants Association
January 1998**

By:

**Dr. Jürgen H. Troitzsch
Fire Protection Service
Wiesbaden, Germany**

Table 3: Identification of flame retardants in the samples from TV-sets backplates, TV-sets and PC-monitors.

Sample Identification	Sb [%]	Br [%]	Cl [%]	P [%]	Extractable Melamine + Derivatives [%]	ICP Scan Results
Old TV-sets from consumer electronics collection point						
OLD TV-BP01	0.5	<0.1	8.0	<0.1	---	Zn,Pb,Mn,Fe,Al,Na
OLD TV-BP02	3.5	11.0	<0.1	<0.1	---	Fe, Ti, Al
OLD TV-BP03	3.0	8.0	<0.1	<0.1	---	Zn
OLD TV-BP04	<0.1	2.5	<0.1	<0.1	---	Zn, Fe, Ba
OLD TV-BP05	1.0	3.5	<0.1	<0.1	---	
OLD TV-BP06	4.0	<0.1	12.0	<0.1	---	
OLD TV-BP07	<0.1	<0.1	<0.1	<0.1	---	Ba, Ti, Fe, Zn, Cd
OLD TV-BP08	3.0	6.5	<0.1	<0.1	---	
OLD TV-BP10	5.0	<0.1	6.5	<0.1	---	
TV-Sets and old spare backplates purchased in Germany						
TV01-28*	<0.1	3.0/<0.1	<0.1	<0.1/0.4	---/<2	Zn
TV01-28-BP91	2.5	9.5	<0.1	<0.1	---	
TV02-25	<0.05	<0.1	<0.1	0.4	<2	P, <Ti, Zn
TV02-25-BP90	4.0	<0.1	12.0	<0.1	---	
TV03-25	<0.1	<0.1	<0.1	<0.1	---	
TV03-25-BP90	<0.05	<0.1	<0.1	<0.1	---	Ti, Zn
TV04-25	<0.1	<0.1	<0.1	<0.1	---	Zn, <Ti
TV04-25-BP90	3.5	11.5	<0.1	<0.1	---	
TV05-25	2.0	11.0	<0.1	<0.1	---	Zn, Ba
TV05-25-BP91	2.5	10.5	<0.1	<0.1	---	
TV06-14	0.1	<0.1	<0.1	0.2	<2	Zn
TV06-14-BP89	3.0	9.0	<0.1	<0.1	---	Zn
TV-Sets purchased in the USA and in Japan						
TV07-25-US	2.0	10.0	<0.1	<0.1	---	Zn
TV08-25-US	2.5	9.5	<0.1	<0.1	---	Zn
TV09-25-JAP	1.5	9.0	<0.1	<0.1	---	Ti, Si, Zn, Mg
PC-Monitors purchased in Germany						
PC 1	1.5	9.5	<0.1	<0.1	---	B, Ti, Al
PC 2	<0.1	<0.1	<0.1	0.8	---	P, Ti
PC 3	<0.1	<0.1	<0.1	1.0	---	P, Ti
PC 4	<0.1	<0.1	<0.1	1.0	---	P, Ti, Cd, Al
PC 5	<0.1	<0.1	45.0	<0.1	(0.3%Sn)	P

TV01-28*: The analytical results for new backplates of the TV-set were different. Reason unknown

BP: BackPlate

Table 5: Fire tests with ignition sources of increasing intensity with old TV-sets backplates, old TV-sets and old PC-monitors

Sample Identification	Ignition source					Isopropanol 200 ml
	Methenamine Tablet	Small Candle	Household Candle	Isopropanol Cloth on top	Isopropanol Cloth below	
Old TV-BP 01	— (extin.)	—	— (extin.)		— (extin.)	n.d.
Old TV-BP 02	— (extin.)	— (extin.)	— (extin.)		+	
Old TV-BP 03	— (extin.)	— (extin.)	— (extin.)		— (extin.)	n.d.
Old TV-BP 04	+	(after 70s)				
Old TV-BP 05	+	(slow)				
Old TV-BP 06	— (extin.)	—	n.d.	n.d.	n.d.	n.d.
Old TV-BP 07	+					
Old TV-BP 08	— (extin.)	— (extin.)	— (extin.)	— (extin.)	— (extin.)	n.d.
Old TV-BP 09	— (extin.)	— (extin.)	— (extin.)	— (extin.)	— (extin.)	n.d.
Old TV-BP 10	— (extin.)	— (extin.)	— (extin.)	n.d.	n.d.	n.d.

Table 6: Fire tests with ignition sources of growing intensity with new and spare old TV-sets backplates, new TV-sets and new PC-monitors

Sample Identification	Ignition source					Isopropanol 200 ml
	Methenamine Tablet	Small Candle	Household Candle	Isopropanol Cloth on top	below	
New and spare old backplates purchased in Germany						
TV1-28-BP91	—	—	—	—	—	n.d.
TV1-28-BP97	+ (slow)					
TV2-25-BP90	—	—	—	—	+	
TV2-25-BP97	+					
TV3-25-BP90	—	+				
TV3-25-BP97	+					
TV4-25-BP90	—	—	—	—	—	n.d.
TV5-25-BP91	—	—	—	—	—	n.d.
TV6-14-BP89	—	—	—	—	—	--
TV6-14-BP97	+ (quick)					
New TV-sets purchased in Germany						
TV1-28	+ (quick)					
TV2-25	+ (quick)					
TV3-25	+ (quick)					
TV4-25	+ (quick)					
TV5-25	—	—	—	—	—	n.d.
TV6-14	+ (quick)					
New TV-sets purchased in the USA and Japan						
TV7-25-US	—	—	—	—	—	---
TV8-25-US	—	—	—	—	—	---
TV9-25-JAP	—	—	—	—	—	n.d.
New PC-monitors purchased in Germany						
PC1	—	—	—	—	+	
PC2	—	—	—	—	—	+
PC3	—	—	—	—	—	+
PC4	—	—	—	—	—	(+)
PC5	—	—	—	—	+	

—: no sustained burning

+: sustained burning leading to fully developed fire

n.d.: not determined

TV Set Enclosure Materials Fire Safety Survey of European Statistics

Dr. M. De Poortere, Albemarle S.A., B-1348 Louvain-la-Neuve Sud, Belgium
C. Schonbach, Robinson Linton Associates S.A., B-1000 Brussels, Belgium

Abstract: The composition of enclosure materials used in many TV sets for the European market has changed significantly since the early 1990s, resulting in a drop in actual fire safety performance. To determine the potential future impact on TV fire safety, a literature review of European and US TV set fires statistics was carried out. TV set fires can have internal electrical causes due to faults not apparent at the time of manufacture or simply wear and tear, or a variety of external causes due to misuse. One third or more fires are due to external causes. Available data suggests that while the rate of TV set fires has dropped significantly, in Europe since the early 1990s this trend has tended to level off, or even to increase again in countries such as the UK and, in particular, Sweden. The range of TV set fires in Europe is 12 to 100 fires per million TV sets per year, an order of magnitude higher than in the US where the fire safety ratings for TV set enclosure materials has been historically high. TV set fires can have a dramatic impact on life and property. To avoid a possible future general increase in TV set fires, fire safety requirements in standards may have to be increased, not weakened.

1. Introduction

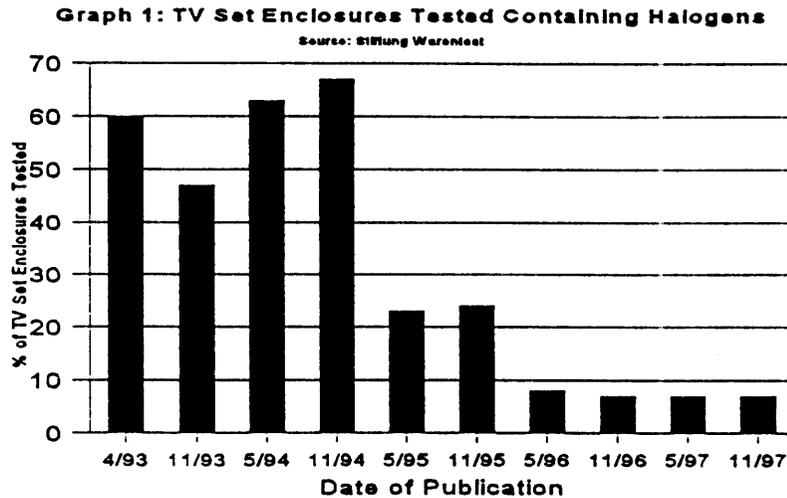
Since the 1970s the materials used for TV sets enclosures have changed significantly. In older models, the box shaped "housing" was made of wood covered with a layer of natural or synthetic veneer, and the "backplate" cover was generally made of particle board or plywood. When plastic materials were introduced, it became possible to use other designs, and the backplate shape became more complex.

Concern about a high number of fires in TV sets during the same period of time led to the adoption of plastic materials containing highly effective halogenated flame retardant additives. The performance of the materials is measured against the V0, V1 or V2 ratings of the UL 94 standard, in which a vertical test specimen must not sustain combustion after being contacted with the flame of a gas burner. However, the international standard IEC 65 which specifies "safety requirements for mains operated electronic and related apparatus for household and similar general use" merely says that housing materials should meet the requirements of the HB (Horizontal Burning) materials fire performance rating. In critical locations higher performing materials must be used. In the HB test, the flame travelling between two marks on a horizontal test specimen must not burn faster than 40 mm/min. In contrast to V materials which are ignition-resistant, HB materials burn quite easily, although at a slower rate than materials without either V or HB ratings.

In practice, however, many TV set manufacturers have continuously used V materials for the enclosures, especially in the USA (housings and backplates) where the UL 1410 standard for TV sets specifies V0 enclosure materials, and in Japan (especially backplates). In Europe, manufacturers are free to limit compliance to meeting the IEC65 standard, or to voluntarily

adopt a higher materials fire performance standard for the enclosures. A Danish¹ study has shown that many TV sets taken at random from the European market will burn fiercely when ignited, suggesting that at least in Europe, many enclosure materials only comply to the lowest material fire standards.

In the early 1990s, the anti-halogen stance of some environmentalist groups in Europe saw a number of legislative proposals² aimed at restricting the use of certain halogenated flame retardants. This was amplified by certain consumer test magazines which analysed TV set enclosures and downgraded those containing halogenated flame retardant additives (chlorinated or brominated). Monitoring of the results reported by these magazines³ shows a strong trend away from the use of halogenated plastic enclosure additives (Graph 1).



Meanwhile, numerous studies⁴ were carried out showing that brominated flame retardants can be safely used by society to provide needed protection by fire⁵. All the legislative proposals were withdrawn in favour of an OECD risk reduction programme adopted in the form of a Voluntary Industry Commitment.

The consumer test magazines cited above do not test for the fire safety performance of the enclosure. Had they done so, their final ratings might have been different.

This has created a situation where the fire safety of new TV sets marketed in Europe now relies essentially on the design of internal electrical components, and on the avoidance of potential misuse by the consumer. Meanwhile, consumers, quite naturally, tend to believe that higher safety performance goes hand in hand with technological progress. By its weight and high surface to volume ratio a TV set enclosure would be expected to contribute strongly to the spread of fire after ignition if its fire performance is low. The current approach of a standard like IEC 65 is quite understandably to prevent flame spread from taking place if an electrical fault occurs. However, if the source of fire is due to another cause, or if the design is not totally fail-safe, the fire performance of the enclosure must then be considered.

The object of this survey is to study reports on statistics of fires involving TV sets, to identify the relative importance of fires from both internal and external sources, and by implication the impact of enclosure materials fire performance on the occurrence and spread of fires. A comparison between the statistics from various countries gives an opportunity to draw general conclusions which would be difficult to reach if each country were considered in isolation.

2. Fire Sources

A. Internal

A recent and very thorough study commissioned by the UK Department of Trade and Industry (DTI)⁶ identified the following causes of TV set fires, based on the historical record.

- Solder joints ageing causing arcing
- Mains switch, worn contacts
- Electromechanical stress in "heavy" components
- Overheating due to circuit component imbalances
- Capacitor failure (one design)
- Line output transformer
- Poor design of circuit layout (early TVs)
- Cathode ray tube (CRT)
- Mains lead
- Standby function, especially in old sets

In summary, there can be many potential opportunities for malfunction that can be offset by proper design. However, as the evidence shows, no design is totally safe. When the manufacturers discover faults they have recalled sets so that they can be repaired (Table I).

Table I. Examples of TV Set Recalls, 1992-1997

Country	Manufacturer	Year of Recall	Period of Manufacture	Number of Sets
Denmark ⁶	N/A	1992/3	N/A	40,000
France ⁷	Philips	1993	1983-87	40,000
Germany ⁶	N/A	1989	N/A	200,000
Netherlands ⁸	Philips	1993	1983-87	300,000
Sweden ⁹	Philips	1993	1983-87	75,000
UK ¹⁰	Sony	1989	1985-86	N/A
UK ⁶	A	1993	1983-86	21 models
UK ⁶	B	N/A	1986-88	1 model
UK ⁶	C	1993	N/A	7 models
UK ⁶	D	N/A	>1992	2 models
UK ⁶	F	1993	>1992	2 models
UK ⁶	W	1993	1983-86	1 model
UK ¹¹	Dixons/Matsui	1997	1993	"1,000s"

This table is indicative as no systematic record of TV set recalls is kept in any countries, but the UK example suggests that recalls are not uncommon.

In one study¹, 35 used TV sets (aged 3 to 20 years) were examined for signs of damage increasing the likelihood of fire. They represented a cross-section of sets collected from customers after rental or the purchase of a new TV set. Nearly one-third showed signs of incipient damage which the authors believed reduced the level of safety over a longer period: cracks in electric cables, deficient solder joints, signs of breakdown of components, signs of increased heat development, and significant dust accumulation. A majority showed signs of damage: 40% showed interior damage, not visible from the outside and 26% showed visible minor damage.

In conclusion, over time faults that are not apparent at the time of manufacture, or simply inevitable wear and tear can become a fire hazard.

B. External

Statistics usually exclude TV set fires if they are not clearly at the origin of the fire. The following external sources of TV set fires were identified in previous studies^{6,12}:

- Night-lights left burning without stands or candlesticks
- Christmas decorations
- Candles falling on the top or standing next to the set
- Lightning

The use of candles is particularly popular in Nordic countries. There is plenty of anecdotal evidence that consumers do not realise the danger of placing a naked flame near a TV set, and when a fire occurs, the actual cause does not find its way into the statistics. One article¹³ tells the story of a fire in a flat where the television had caught fire, but among the debris of the burnt television, traces of two tinned candles (“flambeaux”) were found. The person who lived in the flat had not said a word about them when he explained how the television had “suddenly” burst into flames. A slight seasonal increase in TV set fires in December⁶ might be due to this tradition of setting naked lights (candles, paraffin lamps, etc) on top or close to TV sets.

Like any other piece of furniture, TV sets can potentially contribute to the amount of fuel available to fire originating from another source, such as burning furniture, a sofa, or curtains.

C. Fires due to consumer misuse

Manufacturers and fire brigades inform consumers about the safe use of TV sets. They are warned against using the top of the TV set as a shelf, for supporting vases, candles, or a cloth that could reduce ventilation. The consumer is warned about inadequate ventilation if the set is placed inside furniture¹⁴. Nevertheless, there is evidence¹⁵ that most consumers do not read the manual of their TV sets, least of all the safety precautions.

Fire brigades^{1, 6, 12} indicate the following causes of fire due to consumer misuse:

- Lack of ventilation, especially when the TV sets are “boxed in” furniture
- Lack of maintenance, to remove accumulated dust (dampness can lead to electrical failure in case of dust accumulation)
- Extensive use of the standby function, especially in families with children

3. TV Set Fire Statistics

A. Definitions

The criteria under which TV set fires are counted can vary significantly from one country or from one statistics collecting organisation to another.

To compare statistics, Sambrook⁶ have defined a TV set fire as follows:

“A TV fire is a fire where the first point of ignition is from within the structure of the TV or ancillary equipment that forms a part of the TV, [such as] a video recorder or satellite system. [...] The resultant fire will have breached the envelope of the TV [...]. Specifically excluded are acts of vandalism, criminal damage, ignition caused by the use of accelerants and electrocution as a result of tampering.”

The Swedish National Electrical Safety Board (SEMKO) counts a TV set fire only when the fire “should have also caused damage outside the electric appliance or arrangement where it

began”¹⁶, or “electrical fires caused by the evolution of heat or an electric arc from a high voltage installation or an appliance connected to such an installation”. “This means that if a component overheats or begins burning but does not cause a fire outside the device (i.e., the fire self-extinguishes), an electrical fire has not occurred. What has happened is that the device has broken in a correct and permissible manner”.

B. European Statistics

These definitions tend to narrow down statistics to fires of specifically electrical origin, to the exclusion of other causes and will exclude fires that are contained within the enclosure. In addition, the definition excludes external causes such as candles. It also implies that the enclosure is the last barrier preventing an electrical fire from spreading outside the television set.

Fire brigades and insurance companies, on the other hand, tend to report higher figures due to a broader definition of TV set fires which include fires initiated externally.

Sambrook⁶ thus adjusted the reported rate of TV set fires in Denmark by subtracting 35-45% to take into account fires involving candles, as well as to take account of the lower rate of TV fires in smaller towns, when extrapolating from the statistics of larger cities, and then by a further 25% to take account of small fires that self-extinguish. Similar adjustments were made for France (-15% and -25%), Germany (-34%), Italy (-33%), the Netherlands (-15%), Sweden (-20%), and in the UK (-24%). The conclusions of the Sambrook survey suggest that about two thirds of the total number of TV set fires reported are due to internal/electrical causes and about one third to external causes.

In the UK, the TV industry perceives based on their own internal investigations that TVs are not in themselves the main cause of the fire, except for known product recalls. Only 1 fire in 10 was the fault of the TV¹⁷. Does this imply that according to the TV industry, 90% of TV set fires are due to external causes?

Based on their purposely conservative definition of TV set fires, Sambrook concludes by stating that “there are an estimated 2208 fires in Europe per year. In relation to the number of TV sets this is equivalent to 12.2 TV fires per million TV sets”, or 18 fires per million if all causes are included.

C. The Case of Sweden

Swedish fire statistics have been the subject of a recent debate^{13,16}. The Swedish Insurance Federation reported nearly 5,000 electrical fires in Swedish private homes (5,231 in 1994). A significant proportion of these fires (47.2% in 1994, or 2,471 fires, i.e. more than that reported by Sambrook for the whole of Europe!) were reported to be due to TV sets. As the TV set ownership in Sweden is about 6.5 million, the annual rate would be 380 TV set fires per million TV sets, or 30 times the rate independently reported for Europe by using the most conservative estimates! The Electrical Safety Board (SEMKO) indicated to Sambrook that they thought a rate of 70-100 fires per year for the whole of Sweden was more reasonable¹⁸.

In a more recent publication¹³ SEMKO put the figure at 150 to 250 TV set fires per year in Sweden counting only those fires where the TV set is proven to be the point of ignition. Such differences are explained by "frequent mistakes made by insurance companies when they classify damages"¹³. Again, the differences could be explained, at least in part, by on the one hand, the total number of fires involving a TV set (the insurances figure) and on the other, the number of fires where the set itself is the source (SEMKO).

A detailed study called the Vällingby Project, was conducted in the western suburb of Stockholm from 1995 to early 1996. Based on the results of this study, the Swedish Insurance Federation figures were cut in half to 600-900 TV sets fires per year (the total number of fires of electrical origin was reduced to 2,400-3,500 fires in Sweden in 1994). The rate of fires (based on a total number of between 7 and 8 million TV sets during that period) then becomes 100 per million TV sets. This is still about an order of magnitude greater than the European average reported by Sambrook.

D. Conclusions

Usually only the most severe TV set fires find their way into electrical safety board or fire brigade statistics. Perhaps the Vällingby project results, because of the thoroughness of the methodology, are more representative of a wider European reality, assuming that the distribution of TV set brands in the market is more or less representative of the European average. Furthermore, consumers would be expected to have a financial incentive to report minor TV set fires to insurance companies so it is perhaps not surprising that the Vällingby data is closer to insurance company data. Only in the event of a major fire would the consumer call the fire brigade, and thus would it be reported in the statistics of fire protection agencies. Similarly, electrical safety boards are presumably only interested by fires of clearly electrical origin, to the exclusion of other causes, including those that might be related with the fire performance of enclosure materials. Any interpretation of statistics must take account of such possible bias. Until further studies are done, we thus have to assume that TV set fires in Europe are in the range of 12 (Sambrook estimate - electrical only) to 100 per million per year (all causes).

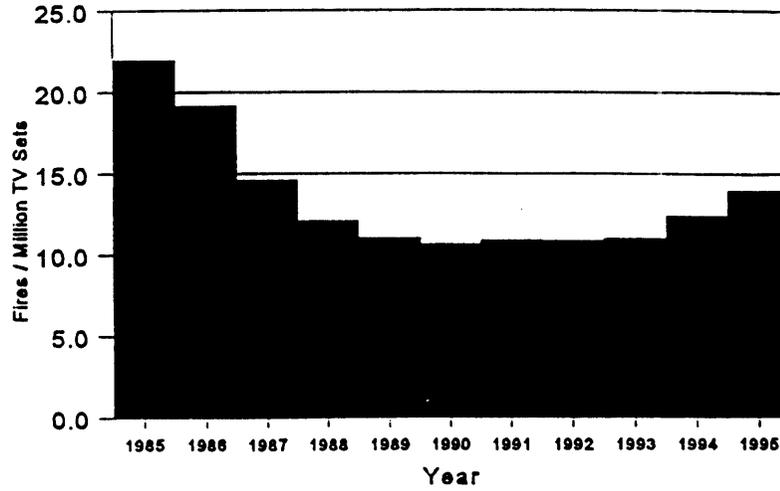
In conclusion, while the most conservative criteria are useful to identify fires of electrical origin, it seems that the higher insurance company estimates, or those collected by specific studies are more relevant in assessing true fire risk. Furthermore, there is evidence that external fire sources are as or more prevalent than sources of internal origin.

4. Trends

Overall, between the mid 1980s and the mid-1990s, the number of TV set fires has fallen by up to 50%⁶. The trend coincides with improvements in design leading to decreased power consumption, and the more widespread use of effective flame retardant additives in the materials used in the enclosures¹⁹. In Graphs 2 to 4, to enable cross-country comparisons where recent data is available, the number of TV set fires reported is normalised to the number of fires per million TV sets.

Graph 2: TV Set Fire Trends

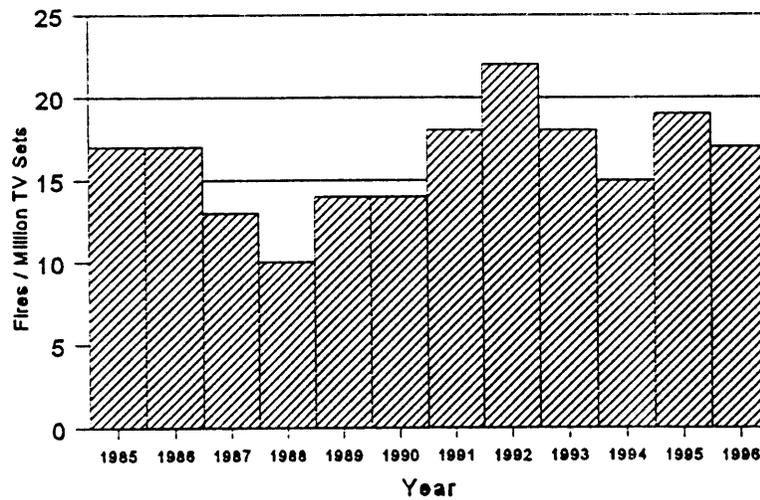
United Kingdom



Source: Home Office Statistical Bulletin; Summary Fire Statistics UK 1995, p.54, normalised

Graph 3: TV Set Fire Trends

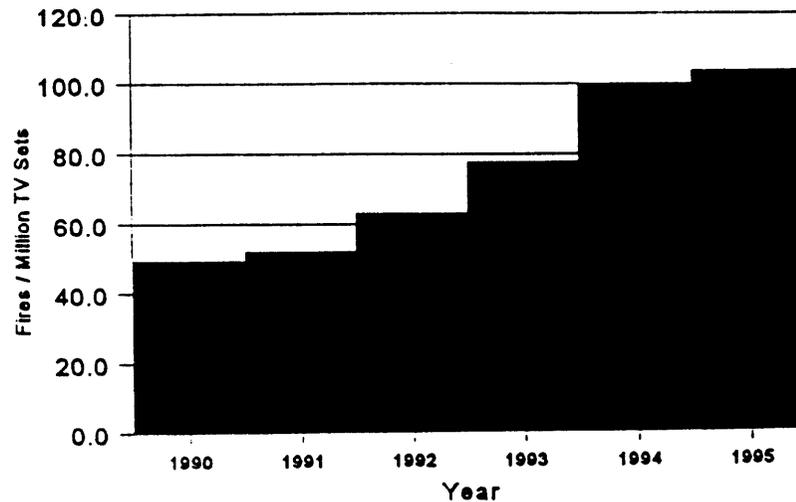
Netherlands



Source: CBS Brandweerstatistiek (normalised)

Graph 4: TV Set Fire Trends

Sweden



Source: Vållinckh: 1994 data (normalised) and Swedish Insurance Federation trend

To make certain that the most conservative figures are used, the 1994 Vällingby data is taken as a reference, and the trend reported by the Swedish Insurance Federation²⁰ is applied. The two sets of data, as discussed above, set the limits of the range of TV set fires per million sets reported in Europe. The increase in the rate of TV set fires observed in the UK (+39%) and in Sweden (+101%) during the 5 year period after the mid-1990s "valley" is disturbing. The number of TV set fires reported by the Dutch fire brigades is in the same range than in the UK. The data is slightly more erratic from year to year due to the lower statistical base, but there again, there seems to be an upward trend starting in 1989.

5. US TV Set Fires Statistics

Although the methods of collection of fire data in the US are probably different than in Europe, a comparison with European statistics can be expected to give an insight about the effect of voluntary high enclosure materials fire performance standards.

US statistics combine all home entertainment equipment such as TVs, tape recorders, VCRs and CD players. According to a recent study²¹, during the 1990-94 period "there were an average of 29 civilian deaths, 162 civilian injuries and \$34.5 million in direct property damage per year resulting from the estimated 2,200 home structure fires per year associated with this equipment". Of this total, 1,600 fires (71%) were due to a short circuit, a ground fault or to other electrical failure, and only 400 (18%) fires per year are reported when the "appliance housing or casing" is the form of material first ignited. Assuming that about 70% of these fires are due to TV sets (this is the percentage of TV set fires relative to TV+sound+video in other countries where detailed statistics are kept), after a correction is made the number of fires becomes respectively 1,120 and 280. In relation to the total number of TV sets in the U.S.: 113.5 million²², the range of 280 to 1,120 fires corresponds to 2.5 to 10 "TV set" fires per million per year, apparently an order of magnitude lower than in Europe, i.e. 12 to 100 TV set fires per million per year.

This is evidence that the higher fire safety ratings typical of US-made TV set enclosures does have a positive impact on fire safety.

6. Severity of TV set fires

As discussed above, there is a relationship between the severity of a TV set fire and its likelihood of being reported to the different organisations who collect statistics. Consumers will tend to report more fires if they have a financial incentive, which might explain why the number of TV set fires reported by insurance companies is one order of magnitude greater than that reported by fire brigades or by electrical safety boards. As long as the damage is limited to the TV set itself, the maximum cost will be the value of the TV set itself. On the other hand, fires that begin to spread outside of the TV set will most generally prompt the consumer to call the fire brigade. Depending on the speed of intervention (more than 60% of fires were estimated by firemen to have been discovered within 5 minutes of the first ignition²³), the damage to the furniture, the room in which the TV set was located or the entire dwelling, will vary. Fortunately, only a small percentage of TV set fires totally destroys dwellings, but such cases nevertheless tend to attract much media attention, possibly

suggesting that public opinion does not consider them to be an acceptable risk associated with modern technology.

Detailed information was collected in Denmark, Germany, the Netherlands, Sweden and the UK about the severity of TV set fires⁶, but the data are difficult to compare due to differences in methodology. The German statistics (Table III) are probably a representative example²⁴:

Severity	Frequency(%)	Cost of Damage (DEM)
Fire restricted to the TV	30-40	2,000
Fire spread beyond the TV and causing damage to the property	40-60	10,000-50,000
Fire causing severe damage to the room and property	<5	150,000
Fire causing major damage to the entire dwelling	<5	500,000
Fire completely destroying the building	<2	500,000-1,000,000

Assuming an exponential relation between cost and the distribution of fires according to severity, the total cost to Germany of TV set fires is approximately DEM 25 million. In addition to the cost to the owner of the TV set and the dwelling, there is an associated minimum cost to society of DEM 1,400-2,000 per call-out for the fire brigade, raising to DEM 50,000 for large fires⁶. Based on 574 TV fires in Germany in 1994, the corresponding cost for intervention is about DEM 1 million. By comparison, in the UK the annual cost to society of TV set fires is estimated to be less than DEM 3 million per year²⁵ based on 333 cases. The difference with Germany is probably due to accounting methods. The estimations for Germany and the UK give an idea of the magnitude of the issue.

Once the fire spreads to the furniture, flashover (i.e. the rapid spread of the fire to the entire room) can occur within minutes taking occupants by surprise. Some deaths in retirement homes have been reported, suggesting that persons of impaired mobility such as elderly people are often unable to raise alarm, or to escape during the development of the fire. In 1991, four people died as a result of a TV set fire in a retirement home people in Belgium²⁶. Two women aged 84 and 96 died in 1996 in a retirement home as a result of a TV set fire again in Belgium²⁷. In the UK, 13% and 36% of persons either killed or injured in a TV set fire were less than 5 years old, or more than 60 years old²⁸ respectively. Sambrook⁶ report an average of 16 deaths per year in Europe due to TV set fires. The Swedish figures of fire deaths due to TV set fires are even higher at 5-10 per year²⁹ relative to the estimated 7-8 million TV sets in that country. Again, this might indicate that TV set fires are under-reported in other countries.

In conclusion, the severity of TV set fires cannot be underestimated, both in terms of cost

and of lives. Once a TV set has caught fire, there is little time left to intervene before catastrophic spread to furniture and the dwelling.

7. Conclusions

All accidents are preventable. Fires are not inevitable happenings. After a drop since the early 1980s, TV set fire rates have stopped decreasing, or are even increasing in some countries such as the UK and Sweden. The European CE mark requires compliance to the local equivalent of the IEC65 standard, EN 60065, where the HB materials fire rating for enclosures is specified rather than the far more stringent UL94 V0 standard. The low fire safety rating HB may not be sufficient to protect consumers, in particular those most vulnerable, such as children and elderly people - and their property - against manufacturing defects, misuse, external causes or the effect of ageing and normal deterioration.

Other countries such as Japan or the USA actually require higher fire safety ratings, so the ability to meet these standards exist. The fact that in Europe many manufacturers recently stopped requiring V0 rated materials containing halogens under pressure from environmental perceptions, raises the question whether fire safety is sufficiently taken into consideration in order to achieve an appropriate balance between fire risks and environmental perceptions for optimal consumer protection. Based on the results of this survey, it would seem imperative to use again materials with a high fire safety performance.

Acknowledgement

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22/12/98 STATPAP5.WPD

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Bilag 2 ⁱⁱⁱ

*TV-brande, afsluttende rapport

Detailresultater af undersøgelsen af ældre TV-apparater

*Results from the
Investigation of older
TV-sets*

Explanation of Table

Forklaring til skema

På abscissen er TV - apparaterne afbildet med numre fra 1 til 35.

På ordinaten er afbildet diverse prøver TV - apparaterne har gennemgået.

De steder hvor der står: "Ikke opgivet" skyldes det, at mærkepladen på TV - apparatet ikke har været mærket med pågældende information.

De steder hvor der står: "NA" har det ikke været muligt at fremskaffe pågældende oplysning.

Er mærkeeffekten eksempelvis ikke opgivet, kan der ikke udregnes en afvigelse fra mærkeværdi.

De nederste 2 kolonner refererer til brandprøven udført af DEMKO Prøvning og Certificering efter Stærkstrømsbekendtgørelsens afsnit 101, 6. udgave svarende til IEC 65 6. udgave. Hvis brandprøven er bestået, vil det fremgå ved et "OK" i kolonnen, er brandprøven ikke bestået, vil brandhastigheden af TV - apparatet fremgå, er TV - apparatet selvslukkende, vil der i kolonnen stå et "S".

Apparat	25	26	27	23	29	30
Spænding	220	220 - 240	220 - 240	220	220	220
Effekt	Ikke opgivet					
Effekt	84	63	75	Ikke opgivet	Ikke opgivet	Ikke opgivet
Netalder	9	9	8	5	8	7 - 8
Materialer i kabinet og bagklædning	Træ, plastic	Plastic, Plastic				
Apparatets umiddelbare stand	OK	OK	OK	OK	OK	OK
Sløvet	Meget	Meget	Meget	Lidt	Meget	Lidt
Tilsmudset	Meget	Meget	Meget	Lidt	Meget	Lidt
Er der i apparatet tegn på at driftningsskaller er tilsmudset	Nej	Nej	Nej	Nej	Ja	Nej
Har pkt. 6 - 9 sikkerhedsmæssig betydning	Nej	Nej	Nej	Nej	Ja	Nej
Strøm		0,42	0,56	0,55	0,597	0,413
Spænding	220	220	240	230	230	230
Effektforbrug	84	59	83,5	86	93,8	61,8
Afvigelse fra mærkeværdi	0	-	8,5	NA	NA	NA
Afvigelse fra mærkeværdi i	NA	-6,35%	11,33%	NA	NA	NA
Virker apparatet	Nej	Ja	Ja	Ja	Ja	Ja
Kan der på prøvebilledet om apparatet har en defekt	NA	Nej	Nej	Nej	Nej	Ja
Er apparatets evt. indfylder beskadiget	Nej	Nej	Nej	Nej	Nej	Nej
Er apparatets stikprop skadet	Nej	Nej	Nej	Nej	Nej	Nej
Er apparatets netledning skadet ved stikproppens stning	Nej	Nej	Nej	Nej	Nej	Nej
Er ledningen beskadiget ved apparatets indførselsåbning og stning? (ledningen åbnes for inspektion af skader/brænd af	Nej	Nej	Ja	Ja	Nej	Ja
Er der på apparatet skader, der har sikkerhedsmæssig betydning (berørbare elførende dele etc.)	Nej	Nej	Nej	Nej	Nej	Nej
Er der tegn på reparation af apparatet	Nej	Nej	Ja	Ja	Ja	Ja
Har en eventuel reparation betydning på apparatets sikkerhedsmæssige tilstand	NA	NA	Nej	Nej	Nej	Nej
Er der dårlige eller kolde ledninger på print	Nej	Nej	Ja	Ja	Ja	Nej
Er der tegn på øget varmestruelse i apparatet (særligt i mærke områder)	Nej	Nej	Nej	Nej	Nej	Nej
Er der tegn på nedbrydning af komponenter mekanisk såvel som elektrisk, hvis ja angiv hvilke komponenter	Nej	Nej	Nej	Nej	Nej	Nej
Indre, bagklædning:	S	S	S	OK	OK	OK
Indre, ramme:	S	S	S	S	S	OK

Spørgsmål	220	220	220 - 240	220	220	220 - 240
	Ikke opgivet	Ikke opgivet	Ikke opgivet	Ikke opgivet	Ikke opgivet	Ikke opgivet
	150	115	114	45	165	140
Testalder	6	9	7	4 - 5	17	5
Udvalgte typer materiale kabinet og bagklædning	Plastic, plastic	Træ, masonit	Træ, plastic	Plastic, plastic	Træ, plastic	Plastic, Plastic
Apparatets umiddelbare	OK	OK	OK	OK	Dårlig	OK
	Lidt	Lidt	Meget	Lidt	Meget	Lidt
Mudset	Lidt	Lidt	Meget	Lidt	Meget	Lidt
Er i apparatet tegn på at omhuller er tilsmudset	Ja	Ja	Nej	Ja	Nej	Ja
Udvalgte sikkerhedsmæssig betydning	Nej	Nej	Ja	Nej	Ja	Nej
	0,79	0,63	0,511	0,436	0,47	0,812
Prøvetid	220	220	240	220	220	240
Prøvetid forbrug	125	100	78,3	51,2	87	129
Ændring fra mærkeværdi	-25	-15	-35,7	6,2	-78	-11
Ændring fra mærkeværdi i	-16,67%	-13,04%	-31,32%	13,78%	-47,27%	-7,86%
Er apparatet	Ja	Nej	Nej	Ja	Nej	Ja
Er der på prøvebilledet apparaten har en defekt	Nej	Ja	Ja	Nej	Ja	Ja
Apparatets evt. ydelser beskadiget	Nej	Nej	Nej	Nej	Nej	Nej
Apparatets sikrop beskadiget	Nej	Nej	Ja	Nej	Nej	Nej
Apparatets netledning beskadiget ved sikrop beskadigelse	Nej	Nej	Nej	Nej	Nej	Nej
Netledningen beskadiget ved apparatets indførelsesåbning og lukning? (ledningen åbnes for inspektion af skader/brand af	Nej	Nej	Ja	Nej	Ja	Nej
Er der på apparatet skader, der er sikkerhedsmæssig betydning (berørbare elførende dele osv.)	Nej	Nej	Nej	Nej	Nej	Nej
Er der tegn på reparation af apparatet	Nej	Nej	Ja	Ja	Ja	Ja
Er der en eventuel reparation på apparatets sikkerhedsmæssige tilstand	NA	NA	Nej	Nej	Nej	Nej
Er der dårlige eller kolde temperaturer på print	Nej	Nej	Ja	Nej	Ja	Ja
Er der tegn på øget afsætning i apparatet (mærke områder)	Nej	Nej	Nej	Nej	Nej	Nej
Er der tegn på nedbrydning af komponenter mekanisk såvel elektrisk, hvis ja angiv komponenter	Nej	Billedrør	Nej	Nej	Nej	Nej
Prøve, bagklædning:	OK	OK	OK	43	OK	OK
Prøve, ramme:	OK	S	OK	S	S	OK

Spænding	220	220	220	220 - 240	220	220
Strøm	Ikke opgivet	Ikke opgivet	Ikke opgivet	Ikke opgivet	Ikke opgivet	Ikke opgivet
Effekt	Ikke opgivet	Ikke opgivet	Ikke opgivet	Ikke opgivet	62	Ikke opgivet
Andet alder	6 - 7	13	6	5	5	10
Af hvilke typer materiale står kabinet og bagklædning	Plastic, plastic	Træ, plastic	Træ, plastic	Plastic, plastic	Træ, plastic	Træ, plastic
Apparatets umiddelbare stand	OK	OK	OK	OK	OK	OK
Stavet	Meget	Lidt	Lidt	Meget	Lidt	Lidt
Tilsmudset	Meget	Lidt	Lidt	Meget	Lidt	Lidt
Er der i apparatet tegn på at slutførelseshuller er tilsmudset	Ja	Ja	Nej	Nej	Nej	Nej
1. Har pkt. 6 - 9 sikkerhedsmæssig betydning	Nej	Nej	Nej	Nej	Nej	Nej
1. Strøm	0,41	0,62	0,582	0,481	0,435	NA
2. Spænding	230	220	230	240	220	220
3. Effektforbrug	62,3	90	91	74,6	61	NA
4. Afvigelse fra mærkeværdi	NA	NA	NA	NA	-1	NA
5. Afvigelse fra mærkeværdi i	NA	NA	NA	NA	-1,61%	NA
6. Virker apparatet	Ja	Ja	Ja	Ja	Ja	Nej
7. Kan der på prøvebilledet ses om apparatet har en defekt	Nej	Nej	Ja	Nej	Nej	NA
8. Er apparatets evt. statorfylder beskadiget	Nej	Nej	Nej	Nej	Nej	Nej
9. Er apparatets stikprop beskadiget	Nej	Nej	Nej	Nej	Nej	Nej
10. Er apparatets ledning beskadiget ved stikproppens fastsættelse	Nej	Nej	Nej	Nej	Nej	Nej
11. Er ledningen beskadiget ved apparatets indførelsesåbning og fastsættelse? (ledningen åbnes for inspektion af skader/brand af	Ja	Nej	Ja	Ja	Nej	Nej
12. Er der på apparatet skader, som har sikkerhedsmæssig betydning (børerbare elførende dele etc.)	Nej	Nej	Nej	Nej	Nej	Nej
13. Er der tegn på reparation af apparatet	Nej	Nej	Nej	Nej	Nej	Ja
14. Har en eventuel reparation betydning på apparatets sikkerhedsmæssige tilstand	NA	NA	NA	NA	NA	Nej
15. Er der dårlige eller kolde ledninger på print	Ja	Nej	Nej	Ja	Nej	Nej
16. Er der tegn på øget varmeafsætning i apparatet (rune/mørke områder)	Nej	Nej	Ja	Nej	Nej	Nej
17. Er der tegn på nedbrydning af komponenter mekanisk såvel som elektrisk, hvis ja angiv hvilke komponenter	Isolationsmateriale	Nej	Nej	Nej	Nej	Nej
18. Andrerøve, oagkædning:	OK	S	OK	OK	S	S
19. Andrerøve, ramme:	OK	S	S	OK	S	S

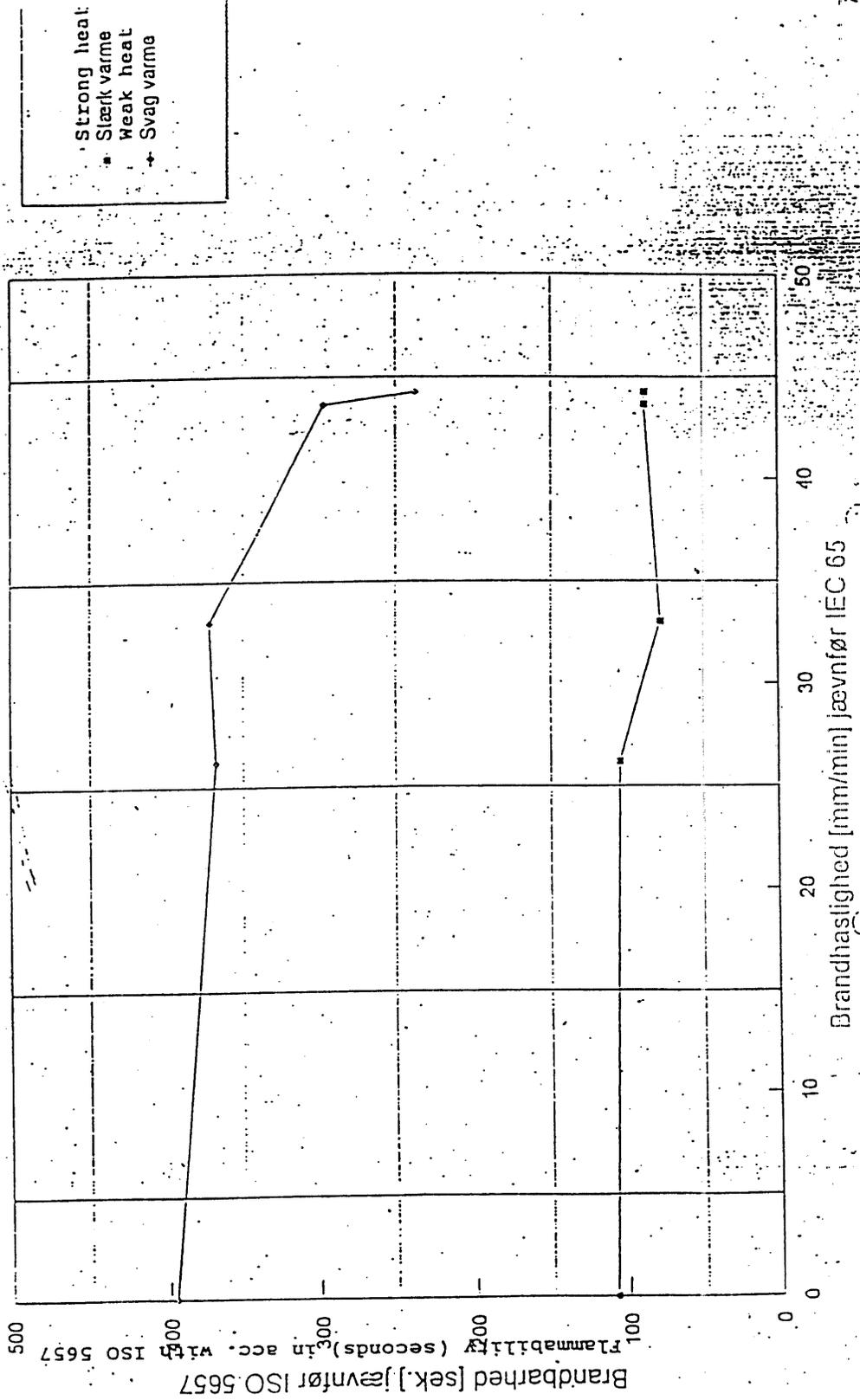
Spørgsmål	220	220	220 - 240	220	220	220
Strøm	Ikke opgivet	Ikke opgivet	Ikke opgivet	Ikke opgivet	Ikke opgivet	Ikke opgivet
Effekt	92	Ikke opgivet	60	Ikke opgivet	Ikke opgivet	Ikke opgivet
Antal år	3	17	3	10	8	8
Materialer	Træ, plastic	Plastic, plastic	Træ, plastic	Træ, plastic	Træ, plastic	Træ, plastic
Apparatets umiddelbare tilstand	OK	OK	OK	OK	OK	OK
Udseende	Rent	Lidt	Lidt	Meget	Lidt	Lidt
Smuds	Lidt	Lidt	Lidt	Meget	Lidt	Lidt
Er der tegn på at ledningen er tilsmudset	Nej	Ja	Nej	Nej	Nej	Nej
Er der tegn på sikkerhedsmæssig betydningsfuld	Nej	Nej	Nej	Nej	Nej	Nej
Strøm	0,717	0,6	0,437	0,69	0,525	0,658
Effekt	230	230	240	220	220	220
Effektforbrug	108	90	64,8		74	100
Udgangspunkt fra mærkeværdi	16	NA	4,8	NA	NA	NA
Udgangspunkt fra mærkeværdi i %	17,39%	NA	8,00%	NA	NA	NA
Er apparatet defekt	Nej	Ja	Ja	Ja	Ja	Ja
Kan der på prøvebilledet ses tegn på at apparatet har en defekt	Ja	Nej	Nej	Nej	Nej	Nej
Er apparatets evt. trykknapper beskadiget	Nej	Nej	Nej	Nej	Nej	Nej
Er apparatets stikprop defekt	Nej	Nej	Nej	Nej	Nej	Nej
Er apparatets netledning defekt ved stikproppens indførelse	Ja	Nej	Nej	Nej	Nej	Nej
Er ledningen beskadiget ved apparatets indførelse og afmontering? (ledningen åbnes for inspektion af skader/brand af ledningen)	Nej	Nej	Nej	Nej	Nej	Nej
Er der tegn på apparatet skader, eller sikkerhedsmæssig betydningsfuld skade (berørbare el-førende etc.)	Nej	Nej	Nej	Nej	Nej	Nej
Er der tegn på reparation af apparatet	Ja	Nej	Ja	Nej	Nej	Nej
Er der tegn på en eventuel reparation eller udskiftning af apparatets komponenter	Nej	NA	Nej	NA	NA	NA
Er der tegn på dårlige eller kolde ledninger på print	Nej	Nej	Ja	Nej	Nej	Nej
Er der tegn på øget varmestruklighed i apparatet (varmestruklighed/mørke områder)	Nej	Nej	Nej	Nej	Nej	Nej
Er der tegn på nedbrydning af komponenter mekanisk såvel som elektrisk, hvis ja angiv hvilke komponenter	Nej	Nej	Nej	Nej	Nej	Nej
Prøve, bagklædning:	OK	S	S	S	S	OK
Prøve, ramme:	OK	OK	S	S	S	S

	220	220 - 240	220 - 240	220 - 2400	220	Ikke opgivet
Spænding	220	220 - 240	220 - 240	220 - 2400	220	Ikke opgivet
Strøm	Ikke opgivet	Ikke opgivet	Ikke opgivet	Ikke opgivet	Ikke opgivet	Ikke opgivet
Effekt	180	65 - 130	70 - 160	65-130	Ikke opgivet	Ikke opgivet
Netalder	20	12	12	12	16	15
Af hvilke typer materiale står kabinet og bagklædning	Træ, plastic	Plastic, plastic	Plastic, plastic	Træ, plastic	Træ, plastic	Træ, plastic
Apparatets umiddelbare stand	OK		OK	OK	OK	OK
Sløvet	Meget	Lidt	Meget	Lidt	Meget	Lidt
Tilsmudset	Meget	Lidt	Meget	Lidt	Lidt	Lidt
Er der i apparatet tegn på at luftningshuller er tilsmudset	Ja	Nej	Nej	Nej	Ja	Nej
Har pkt. 6 - 9 kerhedsmæssig betydning	Nej	Nej	Nej	Nej	Ja	Nej
Strøm	1,58	NA	NA	0,55	0,268	0,485
Spænding	220	NA	NA	220 - 240	230	230
Effektforbrug	130	NA	NA	75	38	70
Afvigelse fra mærkeværdi	-50	NA	NA	15 - (-55)	NA	NA
Afvigelse fra mærkeværdi i	-27,78%	NA	NA	NA	NA	NA
Virker apparatet	Ja	Nej	Nej	Ja	Nej	Ja
Kan der på prøvebilledet ses om apparatet har en defekt	Ja	Nej	NA	Nej	Nej	Nej
Er apparatets evt. tilføjelse beskadiget	Nej	Nej	Nej	Nej	Nej	Nej
Er apparatets søkprop skadiget	Nej	Nej	Nej	Nej	Nej	Nej
Er apparatets netledning skadiget ved søkproppens åbning	Nej	Nej	Nej	Nej	Nej	Nej
Er ledningen beskadiget ved apparatets indføringsåbning og åbning? (ledningen åbnes for inspektion af skader/brand af	Nej	Nej	Nej	Nej	Nej	Nej
Er der på apparatet skader, som har sikkerhedsmæssig betydning (berørbare elførende dele etc.)	Nej	Nej	Nej	Nej	Nej	Nej
Er der tegn på reparation af apparatet	Ja	Nej	Nej	Nej	Nej	Nej
Har en eventuel reparation betydning på apparatets kerhedsmæssige tilstand	Nej	NA	NA	NA	NA	NA
Er der dårlige eller kolde ledninger på print	Nej	Nej	Nej	Nej	Nej	Nej
Er der tegn på øget smuds i apparatet (søkningsområder)	Nej	Nej	Nej	Nej	Nej	Ja
Er der tegn på nedbrydning af elektriske komponenter mekanisk såvel som elektrisk, hvis ja angiv hvilke komponenter	Nej	Nej	Nej	Nej	Nej	Nej
Indrør, bagklædning:	S	OK	OK	OK	S	OK
Indrør, ramme:	S	OK	OK	OK	S	S

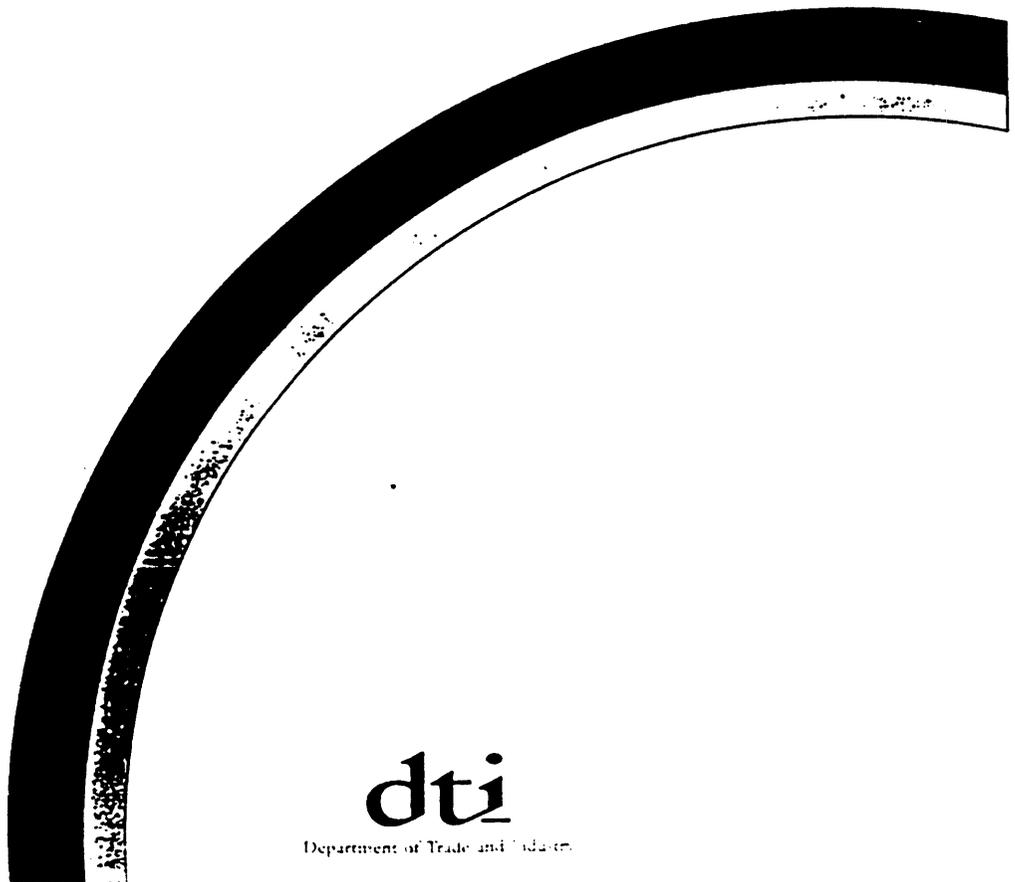
Annex 2

TV-SET	31	32	33	34	35
1. VOLTAGE					
2. CURRENT					
3. WATT					
4. AGE					
5. TYPE OF MATERIAL OF CABINET AND BACK COVER					
6. THE CONDITION OF THE SET					
7. DUSTY					
8. DIRTY					
9. ARE THERE ANY SIGNS THAT THE AIRGABS OF THE SETS ARE DIRTY					
10. DOES ITEM 6-9 INVOLVE ANY SAFETY RISK					
11. CURRENT					
12. VOLTAGE					
13. POWER CONSUMPTION					
14. DEVIATION FROM THE RATED CURRENT					
15. DEVIATION FROM THE RATED CURRENT IN PERCENTAGE					
16. DOES THE SET FUNCTION					
17. DOES THE DEFECT APPEAR FROM THE TEST PICTURE					
18. ANY DAMAGE ON THE MAINS SWITCH OF THE SET					
19. ANY DAMAGE ON THE MAINS PLUG OF THE SET					
20. ANY DAMAGE ON THE STRAIN RELIEF OF THE MAINS CORD					
21. ANY DAMAGE AT THE INLET OPENING OF THE MAINS CORD					
22. ANY DAMAGE AT THE SET WHICH CAN AFFECT SAFETY					
23. ANY SIGN OF REPAIR AT THE SET					
24. IF YES, WILL THE REPAIR AFFECT THE SAFETY OF THE SET					
25. ARE THERE ANY BAD/COLD WELDINGS ON PRINTCARDS					
26. ANY SIGN OF INCREASED HEATING ON THE SET BROWN/DARK FIELDS					
27. ANY SIGN OF DETERIOATION OF COMPONENTS. MECHANICALLY, AS WELL AS ELECTRICALLY, IF YES WHAT COMPONENTS					
BACK COVER					
FIRETEST, FLAME					

Sammenhæng mellem brændeprøver og brandbarhed jævnfør IEC 65 og ISO 5657
 Connection between fire tests and flammability in acc. with IEC65 and ISO5657



Consumer Safety Research



dti

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Contents

1. TV FIRES - EUROPEAN SUMMARY	1
1.1 Summary	1
1.1.1 Definition of a TV fire	1
1.1.2 Definition of other terms in the report	1
1.1.3 Legislation	1
1.1.4 A note on the research findings achieved	2
1.1.5 Ownership of TVs and future trends	3
1.1.6 The severity of TV fires	3
1.1.7 The number of deaths and personal injuries caused by TV fires	3
1.1.8 Timing of TV fires	3
1.1.9 Trends in TV fires and accident rates	4
1.1.10 The main causes of TV fires	4
1.1.11 Availability of test information	5
1.1.12 Recent safety measures and future trends	5
2. BACKGROUND, OBJECTIVES, AND RESEARCH METHOD	6
2.1 Background, objectives of the research, method and sample	6
2.1.1 Background	6
2.1.2 Research objectives	6
2.1.3 Research method	6
2.1.4 Sample Achieved.	7
2.1.5 A note on the research findings achieved	7
2.2 AUSTRIA	8
2.2.1 Legislation	8
2.2.2 The number of TV fires	8
2.2.3 Known safety measures	8
2.3 BELGIUM	9
2.3.1 Legislation	9
2.3.2 The number of TV fires	9
2.3.3 Known safety measures	9
2.4 DENMARK	10
2.4.1 Legislation	10
2.4.2 Ownership of TVs, sales and related trends	10
2.4.3 The number of TV fires and associated fatal/non-fatal accidents	12
2.4.4 Trends in TV fires and accident rates	15
2.4.5 Nature and severity of TV fires	16
2.4.6 Severity of non-fatal injuries caused by TV fires	16
2.4.7 The key factors affecting the frequency and severity of TV fires	16
2.4.8 Main components causing TV fires	17
2.4.9 Known recalls of TV or associated appliances	19
2.4.10 Recent safety measures and future trends	19
2.5 EIRE	20
2.5.1 Legislation	20

2.5.2 The number of TV fires	20
2.5.3 Known safety measures	20
2.6 FINLAND	
2.6.1 Legislation	21
2.6.2 The number of TV fires	21
2.6.3 Known safety measures	21
2.7 FRANCE	
2.7.1 Legislation	22
2.7.2 Ownership of TVs, sales and related trends	22
2.7.3 The number of TV fires and associated fatal/non-fatal accidents	22
2.7.4 Trends in TV fires and accident rates	23
2.7.5 Nature and severity of incidents	26
2.7.6 The key factors affecting the frequency and severity of TV fires	26
2.7.7 Main components causing TV fires	26
2.7.8 Known recalls of TV or associated appliances	26
2.7.9 Recent safety measures	27
2.8 GERMANY	
2.8.1 Legislation	29
2.8.2 Ownership of TVs, sales and related trends	29
2.8.3 The number of TV fires and associated fatal/non-fatal accidents	29
2.8.4 Trends in TV fires and accident rates	31
2.8.5 Nature and severity of fires	33
2.8.6 The key factors affecting the frequency and severity of TV fires	36
2.8.7 Main components causing TV fires	36
2.8.8 Known recalls of TV or associated appliances	37
2.8.9 Recent safety measures and future trends	38
2.9 GREECE	
2.9.1 Legislation	41
2.9.2 The number of TV fires	41
2.9.3 Known safety measures	41
2.10 ITALY	
2.10.1 Legislation	42
2.10.2 Ownership of TVs, sales and related trends	42
2.10.3 The number of TV fires and associated fatal/non-fatal accidents	42
2.10.4 Trends in TV fires and accident rates	43
2.10.5 Nature and severity of TV fires	45
2.10.6 The key factors affecting the frequency and severity of TV fires	45
2.10.7 Main components causing TV fires	46
2.10.8 Known recalls of TV or associated appliances	46
2.10.9 Recent safety measures and future trends	47
2.11 LUXEMBOURG	
2.11.1 Legislation	48
2.11.2 The number of TV fires	48
2.11.3 Known safety measures	48
2.12 NETHERLANDS	
2.12.1 Legislation	49
2.12.2 Ownership of TVs, sales and related trends	49
2.12.3 The number of TV fires and associated fatal/non-fatal accidents	49
2.12.4 Trends in TV fires and accident rates	50
2.12.5 Nature and severity of accidents	53
2.12.6 The key factors affecting the frequency and severity of TV fires	53
2.12.7 Main components causing TV fires	54
2.12.8 Known recalls of TV or associated appliances	55

2.12.9 Recent safety measures and future trends	55
2.13 PORTUGAL	57
2.13.1 Legislation	57
2.13.2 The number of TV fires	57
2.13.3 Known safety measures	57
2.14 SPAIN	58
2.14.1 Legislation	58
2.14.2 The number of TV fires	58
2.14.3 Known safety measures	58
2.15 SWEDEN	59
2.15.1 Legislation	59
2.15.2 Ownership of TVs sales and related trends	59
2.15.3 The number of TV fires and associated fatal/non-fatal accidents	61
2.15.4 Trends in accident rates	63
2.15.5 Nature and severity of accidents	64
2.15.6 The key factors affecting the frequency and severity of TV fires	64
2.15.7 Main components causing TV fires	64
2.15.8 Known recalls of TVs and associated appliances	65
2.15.9 Recent safety measures and future trends	66
2.16 UK	67
2.16.1 Legislation and safety measures	67
2.16.2 Ownership of TVs, sales and related trends	67
2.16.3 Incidences of fire involving TVs and ancillary equipment	72
2.16.4 The number of non-fatal and fatal injuries and trends	74
2.16.5 Other circumstances relating to the TV fires	76
2.16.6 The level and cost of damage	78
2.16.7 The main manufacturers/brands involved, main causes	79
3. APPENDICES	83
3.1 Details of respondents contacted/interviewed during the project	83
3.2 An overview of the population of TVs in Europe	87
3.2.1 Trends in TV and video recorder sales and ownership	88
3.3 Specific report on the former DDR (East Germany) Länder	89
3.4 UK sources of information	91
3.5 London Fire Brigade	93
3.6 UK - known TV recalls	97
3.7 Summary of TV fire literature search	98

1. TV FIRES - EUROPEAN SUMMARY

1.1 Summary

There are an estimated 2208 TV fires in Europe per year. In relation to the number of TV sets this is equivalent to 12.2 TV fires per million TV sets.

1.1.1 Definition of a TV fire

A TV fire is a fire where the first point of ignition is from within the structure of the TV or ancillary equipment that forms a part of the TV. This can be a video recorder or satellite system. The first ignition may be smouldering, a flame, explosion (implosion in the case of the tube) or accidental damage that causes the equipment to cease functioning. The resultant fire will have breached the envelope of the TV, or emitted noxious fumes, or produced molten droplets that breached the envelope of the TV. Specifically excluded are acts of vandalism, criminal damage, ignition caused by the use of accelerants (alcohol, petrol etc.), and electrocution as a result of tampering. Only consumer accidents in the home and pursuing leisure activities are included.

Accurate data corresponding precisely to this definition of a TV fire was not available, so adjustments have been made, where appropriate, to allow for the exclusion of incidents that do not come within this definition.

1.1.2 Definition of other terms in the report

For the purposes of this report the following explanations of voltage are given:

Extra low voltage is regarded as less than 20 volts and generally associated with the signal amplification side of the TV circuit.

Mains voltage is the standard supply to a dwelling 200-250 volts a.c.

High voltage is any voltage above 1.5Kv, usually associated with the projection of the image on a TV screen.

In interviews with TV manufacturers, the term high voltage was often used to cover both mains voltage and high voltage as described above.

1.1.3 Legislation

Over the last 25-30 years countries within Europe have moved closer towards common legislation with appropriate testing procedures. On 19 February 1973, the Council of Ministers adopted the European Commission Directive 73/23/EEC, the 'Low Voltage Directive', relating to electrical equipment designed for use within certain voltage limits. The supplementary amendment 93/68/EEC, the 'CE Marking Directive', was adopted on 22 July 1993. These directives apply to TVs and ancillary electrical equipment. The directives embody a number of principles:

- a) only electrical equipment which does not jeopardise the safety of people, domestic animals and property shall be placed on the market.
- b) only electrical equipment that satisfies the CE marking requirements will be taken as complying with the requirements of the modified Low Voltage Directive and is thereby entitled to free circulation throughout the European Economic Area (EEA).
- c) electrical equipment is not required to be tested or marked for approval by an independent third party.
- d) enforcement is the responsibility of each Member State within its jurisdiction.

The harmonised standard against which TV's are tested, is EN 60065. A similar standard has existed in the UK for over 40 years, under the original BS 415.

The Low Voltage Directive, which has been amended to require CE marking, becomes fully implemented on 1st January 1997, when all TV equipment (i.e. product, packaging, instructions or guarantee) marketed in the EC will have to carry the CE mark. Full compliance requires:

- a) a manufacturer's declaration of conformity.
- b) associated documentation demonstrating compliance.
- c) an assurance of internal production control.
- d) a CE conformity marking placed on the product or its packaging.

No specific reference to the TV's resistance to fire is required.

1.1.4 A note on the research findings achieved

A high level of co-operation was experienced throughout Europe, and the Consumer Safety Unit, together with Sambrook Research International would like to acknowledge the time and effort spent by the many people that assisted on this complex study.

A clear picture was established in all the countries concerning the practices and policies regarding the good use of TV sets. However the quality and depth of accident data obtained and the degree of detail available, varied greatly. Some countries had accurate, consistent data available, sometimes supported by independent research. Other countries had little or no data available and the research team has made estimates of the level of accidents, based on the limited information available.

It is unlikely that further research would have yielded more data, as the team was repeatedly advised in some countries that statistics on TV fires were simply not available. Despite the availability of EHLASS statistics in some countries, the data from this source often did not provide the level of detail needed to confirm the source of the fire. To go further would require a disproportionate amount of work in an area which was generally

considered, in those countries, to result in very few accidents compared to other consumer activities.

Therefore, careful attention is required in interpreting the data and direct comparisons of accident levels should be considered very difficult.

1.1.5 Ownership of TVs and future trends

Approximately 217 million TVs are used in 140 million household throughout the EC. The population of black and white sets is declining rapidly. Nearly all new TV sets are colour with remote control and standby facilities. The current rate of sales of 22-23 million TVs per annum is increasing at about 1-2% per annum.

1.1.6 The severity of TV fires

30-40% of fires are thought to be restricted to the TV although smoke damage extends beyond the immediate environment of the set. The largest proportion of TV fires (40-60%) cause moderate damage to the fabric of the dwelling but not the structure. Relatively few fires are thought to result in severe damage that includes, occasionally, the total destruction of the dwelling.

1.1.7 The number of deaths and personal injuries caused by TV fires

In the EC it is estimated that 16 deaths per year result from TV fires; i.e. 0.07 per million TVs. The number of injuries sustained in TV fires is estimated to be 197 per year; i.e. 0.9 per million TVs. Most of the injuries appear to be minor, since 90% involve inhalation of smoke or toxic gases, and less than 5% are caused by burns.

1.1.8 Timing of TV fires

Time of TV fire	% range
00.01 - 06.00	5-16%
06.01 - 12.00	15-24%
12.01 - 18.00	25-32%
18.01 - 24.00	24-55%

TV fires occur most frequently in the evening between 18.00 and midnight, when up to 55% of all TV fires are thought to start. The fewest fires start in the period 00.01-06.00, but fires starting at this time are more likely to result in personal injury and cause more extensive damage because of the delay between ignition and discovery of the fire.

1.1.9 Trends in TV fires and accident rates

The overall trend has been downward since the mid 1980s, with the number of TV fires having fallen by up to 50% in the last 10-15 years. The UK figures have stabilised around the 333 fires per year over the last 5 years. This trend coincides with the general decrease in power consumption of TV sets which came with improvements in design. The UK average of 8.2 TV fires per million TVs is lower than the European average but the downward trend in Europe is more pronounced in falling to this general average.

In the future short term, higher levels of power consumption are required to support additional features in products at the high quality end of the market that offer stereo audio, 100 Hz flicker-free screens, data handling systems like teletext, and control of signal reception from satellite and cable stations. Using conventional technology this trend in power consumption may slightly increase the associated fire risk. However it is expected that liquid crystal display (LCD) technology will offer a commercially attractive, alternative low power solution for screen displays, possibly within the next 5-10 years. This would then replace the conventional high powered cathode ray tube (CRT). TV fires should then continue to fall further as the older sets (more than 10 years old) are replaced.

1.1.10 The main causes of TV fires

The key sources of TV fires were identified as follows, all of which were common to the 7 countries studied in depth.

- Solder joints ageing, crystallising, and being subject to mains and high voltage/high current that subsequently cause arcing. Solutions included double soldering and use of double connections to critical components.
- Mains switch. Worn contacts led to arcing in TVs made in the mid 1980s.
- 'Heavy' components (more than 10 grams) being subject to mains and high voltages, and electromechanical stress.
- Overheating caused by an imbalance in the thermal coefficients of circuit components.

There were also a number of other causes of secondary importance.

- Mains filter (capacitor). This capacitor has been known to break down in certain conditions, where the power supply was thought to have been unstable. The solution was to use a higher specification component.
- Line output transformer. In Russian supplied TVs in the 1970/80s this component was identified as the source of TV fires, particularly in the former East Germany.
- Cathode ray tube, including the coil and high voltage cap.
- Mains lead.

Standby in old sets was also mentioned. The power consumption used to be relatively high (30 watts or more). Since standby circuit power consumption has been reduced to less than 10 watts this is now perceived as less of a problem. The standby unit was mentioned by

several respondents, and fire brigades said that in attending some fires, where the occupants were away, the TVs were discovered in stand-by mode. It should be noted however that test houses KEMA (Netherlands) and DEMKO (Denmark), said that results from their investigations did not support standby units being a major cause of fires.

1.1.11 Availability of test information

A number of national test houses, that undertake the type testing of products to establish the conformity of TVs to the EN 60065 standard, have investigated TV fires to evaluate components thought to be in the high risk category. KEMA and DEMKO, in particular, have completed studies that the CSU may find useful. Although attempts at reproducing failures under laboratory conditions have not been particularly successful, contact with these, and other test houses may nonetheless be beneficial in determining:

- a) What further tests might be required.
- b) What direction would provide the most productive results.

1.1.12 Recent safety measures and future trends

The main factors that have contributed to the reduction of TV fires are those introduced by manufacturers by way of product improvement.

1. Improvements in soldering techniques.
2. Reduction in power consumption levels; both operating and stand-by modes.
3. Reduction of the number of potential sources of ignition. This has been achieved by reducing the number of components in the high voltage side of the circuit board, and minimising the number of connections between critical components.
4. Increasing the distance between critical components to reduce the risk of fire spreading if ignition occurs.

Future changes being proposed by the IEC are expected to deal with resistance to fire.

“The apparatus shall be so designed that the start and spread of fire is prevented as far as possible, and shall not give rise to danger of fire to the surroundings of the apparatus. This is achieved as follows:

by using good engineering practice in the design and production of the apparatus to avoid POTENTIAL IGNITION SOURCES,

and

by using materials of low flammability for internal parts in the vicinity of POTENTIAL IGNITION SOURCES,

and

by using FIRE ENCLOSURES to limit the spread of fire.”

2. BACKGROUND, OBJECTIVES, AND RESEARCH METHOD

2.1 Background, objectives of the research, method and sample

The Consumer Safety Unit of the Department of Trade and Industry commissioned a study to provide a clear understanding of the frequency and nature of incidents caused by fires in TVs, and where appropriate, ancillary equipment, throughout the European Union.

2.1.1 Background

TVs are used in most homes in Europe, and many homes have more than one TV. It has been noted for several years that there have been instances of domestic fires caused by TVs.

Statistics for fire incidents caused by TVs are not readily available in many European countries. However, it is clearly important to establish the facts on how many such incidents occur in different EC member states and the reasons why they occur, and to ensure that they are compared on a like for like basis, with as many substantiated facts as possible. This in turn will help ensure that fully enlightened discussions take place, so that sound policies are agreed to enable consumers throughout the community to purchase TVs that are as safe as is practically possible.

2.1.2 Research objectives

The Consumer Safety Unit (CSU) of the Department of Trade and Industry therefore commissioned an independent market research study in order to provide essential information on the similarities and differences that exist throughout Europe.

The key objective was to assess the level of incidents due to TV fires in the different EC states and how this varies, together with the trends and reasons for the incidents, supported by as much substantiated fact as possible.

2.1.3 Research method

A key element of this project is the careful analysis of the statistical data and reports gathered by the research team from European states. Care was taken to ensure that data was compatible, and as complete as possible.

Telephone interviews were an essential means of gathering information and checking data. Some of the telephone contacts consisted of short discussions (5-15 minutes) to identify if data is available, or to check the assumptions and validity of data and reports already received. In some instances, personal letters and faxes were sent formally requesting information. Longer interviews (30-60 minutes) were also conducted, covering a wider range of issues.

In-depth face-to-face interviews were also carried out within 7 EC member states selected for a more focused analysis, to obtain an estimate of fire incident levels and to highlight the different trends relating to incidents caused by fires in TVs and ancillary equipment. These interviews lasted 1-3 hours.

2.1.4 Sample Achieved.

The table below shows how many respondents were contacted (see appendix for details of respondents interviewed).

EC States	In-depth face-to-face interviews	In-depth telephone interviews /tel contacts	Total contacts/interviews
Austria	0	3	3
Belgium	0	4	4
Denmark	9	8	17
Eire	0	2	2
Finland	0	1	1
France	9	6	15
Germany	19	7	26
Greece	0	1	1
Italy	4	9	13
Luxembourg	0	1	1
Netherlands	8	3	11
Portugal	0	5	5
Spain	0	8	8
Sweden	11	8	19
UK	4	23	27
Total contacts/interviews	64	89	153

2.2 AUSTRIA

2.2.1 Legislation

Austria has implemented the Low Voltage Directive 73/23/EEC in full under the ordinance Niederspannungsgeräteverordnung with no special conditions applied. ÖVE is an active participant in the CENELEC committee and is party to the adopted European norms and legislation. There is no awareness of any specific plans to introduce further legislation to reduce the risk of TV fires and fires in ancillary equipment beyond that already referred to in EN 60065.

2.2.2 The number of TV fires

Not available from preliminary work. Further research would be required.

2.2.3 Known safety measures

None known.

2.3 BELGIUM

2.3.1 Legislation

Belgium has implemented the Low Voltage Directive 73/23/EEC in full with no special conditions applied to cover any exceptional circumstance relating to fire risk in TVs. CEBEC (Belgium), and KEMA (Netherlands) work very closely in implementing the standards and certification of electrical products. Since there are understood to be no manufacturing plants for TVs in the Netherlands, CEBEC has taken on the role of certification for this product group which is then by arrangement, applicable to the Netherlands. There is no awareness of any specific plans to introduce further legislation to reduce the risk of TV fires beyond that already covered EN 60065.

2.3.2 The number of TV fires

A search of 3,958 EHLASS records (1989-1993) yielded 5 accidents involving TV sets. None involved TV fires (all involved falls). The conclusion is that non-fatal injuries caused by TV fires are apparently rare in Belgium.

2.3.3 Known safety measures

None known.

2.4 DENMARK

2.4.1 Legislation

The Danish Standards contain a few minor deviations from the EN 60065 standard, and none are considered relevant to the factors that affect fire risk of TVs. Areas that are being considered for discussion in any new legislation to improve safety are:

- a) Limiting the maximum power rating of the standby circuit.
- b) Changing some materials to reduce flammability.

It is thought that new legislation is likely to require all plastic parts within a TV to have a degree of flammability resistance, using a 'graduated system' of fire risk. Plastic material parts next to or near electrical components of 'higher fire risk' such as mains and high voltage transformers, etc., should be made of high flame resistant materials, and sited away from other plastic materials.

Fire experts believe that the fire hazard of TVs could be further reduced if all plastic materials used in the construction of a TV were made of material with a higher flammability resistance, rather than just limiting the higher flammability resistance to, or near, certain 'high risk' components. Independent research in Denmark by DEMKO shows that TVs that are ignited by external ignition sources can burn very rapidly, because many of the plastic components used in the construction of TVs are combustible.

2.4.2 Ownership of TVs, sales and related trends

2.4.2.1 TV ownership and sales volumes

About 300,000 TV sets and 200,000 video sets are sold each year in Denmark. However, the market has experienced dramatic change over the last 10 years, following the successful introduction, about 6-7 years ago, of cable TV to large parts of Denmark. The population of TVs grew rapidly as a result.

	1985	1995	2000
Estimated population of TV sets	2.0m	4.0m	4.5m
Estimated population of video sets	0.5m	1.7m	2.0m

Source: Manufacturer

The rapid growth in TV sets was stimulated by the addition of a second channel about 7 years ago, followed soon after by the rapid introduction of cable TV. Over half the homes in Denmark now have cable TV, and about 5% have satellite TV. The additional choice meant that many people bought a second TV, putting the new TV in the living room and using the old TV in the children's bedroom, guest room or garden room/summer house. The TV population is expected to grow more slowly to about 4.5m TVs by the year 2000.

The population of videos has more than trebled over the last 10 years, from 0.5m to 1.7m. but is expected to grow more slowly to about 2.0m by the year 2000. Videos may even decline in the long term (2000-2010) as alternative multimedia recording equipment such as PC systems become available.

2.4.2.2 Location of TVs in the household

Room	Estimated number of TVs millions	% of all TVs in the room	Comment
Living room	2.1	50-55%	The traditional location
Children's room	0.7	15-20%	Has grown in last 5 years
Caravan/boat/summer house	0.85	20-25%	Grown rapidly last 10 years
Bedroom (adult)	0.25	5-10%	Static/slow growth
Kitchen	0.1	2-5%	No breakfast TV in Denmark
Total	4.0	100%	

Denmark has a high percentage of second and third TV ownership. Whilst only 50-55% of all TVs are in the living room, this equates to well over 90% of households having a TV in that room.

Most new TVs are used intensively (20-30 hours a week) during the first 5-10 years of their life, and thereafter relegated to the summer house, the children's room or guest room. If the TV fails during this second period, it is usually thrown away, as the cost of repair is not normally considered to be justifiable. About 65-75% of TVs in living rooms are linked to a video, and about 10-20% of TVs in childrens' rooms are linked to a video.

70-80% of people operate the TV to watch a specific programme, or series of programmes. whilst a further 10-25% have the TV permanently on in the background. This trend is increasing as music TV (MTV) becomes more popular amongst younger people.

An estimated 90% of all TVs currently sold have standby functions and more 90% of people are thought to use standby in preference to the on/off switch.

The average viewing time is about 2½-3 hours per day. This is growing slowly but some people are becoming more selective in what they watch, controlling their viewing by the use of video.

It is estimated that videos are used about on average ½ - 1 hour per day, with about one third of the usage being to record programmes when the equipment is unattended.

2.4.2.3 Sales of TVs and future trends

Size of TV screen	1985	1995	Future growth rates
14"-15"	5%-10%	10%-15%	slow growth
20"	30%-35%	15%-20%	further decline
24"-26"	50%	25%-30%	further decline
28"	10%	30%-40%	further growth
30"+	0%	2-3%	slow growth
Total	100%	100%	

Source: Manufacturer

There has been a strong trend towards larger TV sets (especially the 28") as well as some growth in the smaller 14"-15" TVs. Most large TVs sold today are thought to have NICAM stereo sound, which became popular about 5-6 years ago, but few small TVs (14"-15") have it.

There is a slow trend towards 'wide screen' TVs and this is expected to accelerate over the next 3-5 years. It is thought that consumers prefer this format because it is better suited to the viewing of movies (on the TV). One leading manufacturer has conducted consumer tests that indicate it to be ergonomically more comfortable to watch a wide screen.

In the long term (10-15 years) it is thought likely that flat screens (based on current forms of liquid crystal displays) will be developed and produced on a large scale at economical prices. These would then replace the cathode ray tube (CRT) in future TVs.

2.4.3 The number of TV fires and associated fatal/non-fatal accidents

2.4.3.1 TV fires and fatal/non-fatal accidents

	Estimated number of accidents per annum (1994)	Number of accidents per annum per million TVs
Total TV fires per annum	70	17.5
Non-fatal accidents per annum (6-year average)	19.5	4.9
Fatal accidents per annum (4-year average)	1.25	0.3

All the fires in the above table are TV fires. No fires are known to have been caused by videos, satellite equipment or cabling (for cable TV), and the level of risk of these products is thought to be very low, i.e. similar to that of audio equipment.

2.4.3.2 Total TV fires

	Population	Estimated population of TVs	Number of house fires per annum	TV fires per annum (per million TVs)
Copenhagen Fire Brigade	470,000	320,000	1,050	25 (20-30) (78)
Århus Fire Brigade	270,000	180,000	d/k	11 (61)
Odense Fire Brigade	180,000	120,000	500	10 (83)

Source 1 - fire brigades. Three fire brigades were interviewed in the three largest cities in Denmark, and estimates were given of the number of TV fires each year. They average out at 74 fires per million TVs, which would equate to almost 300 TV fires a year for the whole of Denmark. This is considered to be a high over estimate, mainly because fire officers reports include fires that are thought to be initiated in close proximity to the TV and spreading to it (hence the TV is one of the items mainly responsible for the development of the fire), as well as fires initiated within the TV itself.

A figure of about 150 fires initiating in TVs is considered more realistic. This then needs to be reduced by a further 35-45% to take into account:

- a) the frequency of electrical fires outside of major cities which is often a little lower, as there are less social problems in smaller towns.
- b) fires involving candles, as candles are very popular in Denmark, especially near Christmas.

This would then suggest a level of 90 TV fires per annum for the whole of Denmark. A further reduction of 20-25% from the earlier figure has been made, being attributed to very small fires that self extinguish, or lie outside the definition given at the beginning of the report. This results in an estimate of 70 bona fide TV fires per annum, which is used for this section of the report. The likely error band is -10% to +50%.

Source 2 - Electricity Council/DEMKO/Dansk Brandteknisk Institut (DBI). DEMKO receives regular reports from Copenhagen Fire Brigade of any fires where the cause of the fire is identified and the cause is an electrical appliance (including TVs). It also receives sporadic reports from other fire brigades and some police departments. Over the last 10 years DEMKO (together with the DBI which investigates the cause of these fires) has positively identified about 10 TV fires a year (+/- 1 fire). These 10 TV fires per annum are acknowledged to be the minimum number of 'bona fide' TV fires, as most of these are more serious fires (hence they are called out to investigate). DEMKO/DBI believe that an overall level of 75-150 TV fires per annum attended by fire brigades, including many that are minor fires, is realistic and consistent with the 10 TV fires a year that they identify as genuine TV fires. A reduction of 20-25% to cover very small fires outside the definition

used in this report gives an expected range of about 60-120 fires and correlates with findings in source 1 above.

2.4.3.3 Total fatal/non-fatal accidents

	1991	1992	1993	1994	Average
Fatal accidents caused by TV fires	1	2	2	0	1.25
Number of deaths per million TVs	0.25	0.50	0.25	0	0.31

The Danish Institute of Fire Technology collects and records fire incidents involving fatalities from newspaper cuttings. The following figures will therefore be the minimum number of fatal accidents. However, since accidents involving fatalities are usually well publicised by the press, the error is likely to be low. The total number of fatal accidents identified between 1991 and 1993 is given above. The accident rates per million TVs are based on a current TV population of 4.0 million TVs.

	Non-fatal accidents EHLASS (1989-1994)						
	1989	1990	1991	1992	1993	1994	Average
Non-fatal injuries EHLASS	4	0	2	0	6	5	2.8

notes: 1) EHLASS figures represents 14.3% of the Danish population.

2) These 17 injuries involved 12 TV fires, 3 incidents injuring 2 people and 1 incident injuring 3.

Source: EHLASS.

The Danish Board of Health instigated a search of its EHLASS system, to identify any accidents caused by TV fires. During the 6-year period of 1989-1994, there were 17 accidents caused by TV fires. None were caused by videos. This gives an average of 2.8 non-fatal accidents per annum. The EHLASS hospitals in Denmark cover 14.3% of the total Danish population, hence in all Denmark there are an estimated 19.5 non-fatal accidents per annum. Given 4.0 million TV sets in Denmark, the accident rate is 4.9 non-fatal injuries per annum per million TVs.

Age and sex of non-fatal injuries. 65% of the non-fatal injuries happened to males, 35% to females. 6% of the non-fatal accidents happened to children under 18 years old (a baby less than 1 year old), 41% of victims were aged 18-30, 35% were aged 31-44, 6% aged 45-64 and 12% aged 65 years or older.

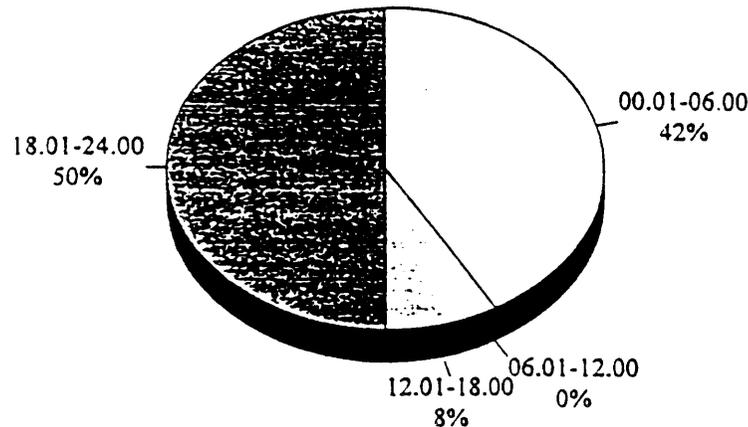
2.4.3.4 Timing of TV fires and non-fatal injuries

TV fires are spread throughout the year, with a slight increase in December. However, the small number of the sample means that the above table is only indicative of the time of year, and more incidents would be required to allow accurate view of any seasonal trends.

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
1	0	1	1	2	0	0	3	0	0	0	4	12

Time of year when incidents involving non-fatal injuries occurred - EHLASS.

No data was available about the timing of TV fires. The 12 EHLASS reports recorded incidents involving non-fatal injuries which showed a concentration in the evening and early hours of the morning; 33% (midnight to 03.00), 25% (18.00 to 21.00), 25% (22.00 to 24.00). The record of these incidents that involved injuries is shown in the table below:



Time at which TV fires involving non-fatal injuries occurred

2.4.4 Trends in TV fires and accident rates

The total number of TV fires is thought to have been static over the last 5-10 years, according to Fire Brigades such as Copenhagen, which has not seen the number of TV fires attended rise, but has noticed the increase in media attention given to TV fires in recent years. This is confirmed by DEMKO which has assessed and analysed about 10 (+/- 1) serious TV fires per annum reported to it over the last 10 years. There was a step rise to 19-20 TV fires brought to its attention in 1993/94, which is thought to be a direct consequence of strong media interest in TV fires at that time. In 1995 media interest has waned, and the number of serious TV fires reported has likewise fallen.

The overall number of TV fires is considered constant (70 per annum), over the last 10 years and since the number of TVs has grown from about 2.0 million to 4.0 million, it is concluded that the number of TV fires per million TV's has fallen by up to half. The manufacturers' views would support this on the basis that the ambient temperatures generated in TVs over the last 15 years has fallen significantly from about 90°C to 40°C-50°C and power consumption has like wise fallen from 300-400 watts to 75-100 watts, thereby reducing the risk of fire.

In addition, the standby power consumption has steadily fallen, from 15 watts for TV and 55 watts for videos to below 5 watts. Future targets are to reduce the standby power consumption to below 3 watts, the main reason being pressure for stand-by functions generally to be 'environmentally green' and use as little power as possible.

2.4.5 Nature and severity of TV fires

Severity of fire	% of all fires	average cost per incident
Minor fire limited to the TV set	25-40%	2-3,000 Kroner
Fire spread beyond the TV set causing minor damage to property	35-50%	3-10,000 Kroner (mostly painting)
Serious fire causing major damage to the room or dwelling	5-10%	50-60,000+ Kroner (usually a whole room)

Source - interviews with fire brigades

2.4.6 Severity of non-fatal injuries caused by TV fires

The following data is based on 17 non-fatal injuries caused in 12 TV fires (EHLASS 1989-1994). 82% of the injuries involved inhalation of smoke and 18% involved minor burns to the hand/fingers. Two people (12%) were admitted to hospital, one for 1 day and one for 2 days, both suffering from the effects of smoke inhalation. 88% of the injured victims were released the same day.

2.4.7 The key factors affecting the frequency and severity of TV fires

The frequency of TV fires in relation to the number of TVs in Denmark was considered to be higher 15-20 years ago, mainly because of the older tube technology which was used at the time. Working temperatures were considerably higher, and material knowledge was poorer, for example the plastic coatings on wires were more liable to become brittle over time. The other factor that contributes to the total number of TV fires has been the rapid growth in the population of TVs, which is estimated to have doubled over the last 10 years.

The flammability of TV sets is thought to have remained high, once the TV is ignited. Despite moves to improve the flammability resistance of materials near high risk components, other parts of TV sets contain readily flammable plastics, and independent tests by DEMKO have shown that most TVs sold today 'burn rapidly' once ignited.

It is estimated that about 5-10% of TV fires occur within the first year after purchase, about 20-30% in years 1-5, and 50-70% in TVs over 5 years old, with some (5-10%) to TV sets over 10 years old. Analysis of these figures together with estimates of the age of the 4.0 million TV sets in Danish households suggests that the level of risk per million TVs is low for TVs up to 5 years old, and rises significantly as they get older.

The socio-economic status of households is also thought to have a small but positive effect on the frequency of TV fires. It is estimated that the level of risk is possibly 10-15% greater in low socio-economic households, mainly because the level of dust (which is liable to ignite if present in conjunction with an electrical fault) is higher.

Lack of ventilation was also mentioned. Copenhagen fire brigade has noticed that a significant number of TV fires occur where the TV is boxed in, within built-in bookshelves

or cupboards. It is thought that poor ventilation to the TV has probably caused overheating to these TV sets, which in turn has contributed to the start of a TV fire.

Many TVs are used in summer houses, that are quite common in Denmark. These sets are often cold and a little damp when they are turned on for the first time in the year. It is thought that this often causes TV failures, and may be the start of problems within the TV that could develop into a TV fire later on. However, this is speculation on the part of TV fire experts, and not proven.

2.4.8 Main components causing TV fires

Some TV fires, especially the more serious ones, are reported to the electricity council (Elraadet) and in turn to the DBI (Dansk Brandteknisk Institut) which investigates the fire in order to determine the cause. One of the problems that the DBI faces is that many of the TV fires that it is asked to investigate are serious fires where the TV is severely damaged or completely destroyed. However, based on the qualitative assessment of the findings of about 60 investigations carried out DBI over the last 5 years and joint discussions with Elraadet, DBI and DEMKO (a specialist fire test house) it is thought that two key areas are mainly responsible for TV fires:

- a) the mains and high voltage transformers.
- b) power connections.

The two manufacturers interviewed had little direct experience of TV fires of their own products sold in Denmark (one supplier mentioned 2 genuine cases out of about 10 reported to the company over the last 5 years, and one supplier was aware of none). However, their views were in broad agreement with those given by Elraadet, DBI and DEMKO.

Solder joints subject to mains and high voltages. Over a period of time, these solder joints can become brittle and deteriorate. This can result in arcing between the wire and the copper board. The problem is thought to have been much greater in older TV sets, especially those manufactured 15-20 years ago, when the operating temperatures were substantially higher.

Mains and high voltage transformers. It is thought that loose connections to mains and high voltage components are the most likely and most frequent causes of TV fires. The energy imparted at such voltages during arcing could be high enough to cause ignition.

Although no video fires are known to have happened in Denmark, one manufacturer mentioned a fire caused by a video in France. The subsequent investigation showed that the main transformer in the video was the probable cause of the fire.

Power connections. Loose connections in the mains circuit (at 230 volts) can also cause high energy arcing, which could result in ignition within TV sets. Power cord connections to the appliance can also be the cause of a fire if not suitably protected by a fuse.

Other causes of TV fires mentioned

Some TVs with faulty on-off switches are thought to have entered Denmark in the mid 1980s. However, this is not thought to have been a serious problem.

Wiring/solder joints on the printed circuit boards were also mentioned by suppliers of TVs and DEMKO. However, the level of risk is thought to be very low, as the energy levels are usually very low and not high enough to initiate a fire. Functions that are included within this group are standby functions, text modules, remote controls, statistical modules (for assessing viewing trends) and high definition TVs.

Stand-by units (when prompted) were thought to cause very few fires, and extensive testing has shown these components do not appear to present a higher level of risk than that of other similar components used in TVs.

2.4.8.1 Findings of TV fire tests carried out by DEMKO

DEMKO tested 54 TV sets (using a wide variety of brands), many of them very old and in very dirty, dusty conditions, and issued a report on 1st June 1995 entitled 'TV-brände'. DEMKO found it very difficult to ignite any of these TV sets in the normal mode of operation. The TV sets were thus set alight by an external ignition source (similar to a fire lighter). It concluded that no specific components (including remote/standby functions which were of special focus in the study) were found to present particularly high risk. Dust was present in many TV sets and when ignited, the dust burnt very rapidly (i.e. 'whoosh'), but the heat generated was not adequate for the TV sets to continue burning. The main conclusions were as follows.

1. It was very difficult to ignite the TVs in their normal mode of action, i.e. switched on, and create fires from internal ignition within the TVs. External ignition sources were required to ignite the TVs.
2. Once ignited, all but one TV burned rapidly and in a similar manner. It is thought that the TV set that burned slowly contained plastics that were inherently flame retardant.
3. Plastic materials used in modern TVs burns more easily than wooden framed sets.
4. No one component was found to present a higher level of fire risk than any other.
5. TVs imported from the Far East have the same flammability characteristics as TVs made in Europe.

In addition, DEMKO believes that dust plus high levels of humidity can result in malfunction. If sets that have been stored in summer houses or basements over the Winter are then switched on in the Spring, parts of the TV warm up rapidly, while other components are still cold, which can result in condensation. There is then a risk of malfunction due to short circuiting. It is thought that the combination of dust plus high humidity could cause possible flash-overs.

2.4.8.2 Manufacturers suggestions to overcome potential fire risk problems

The following views were given by manufacturers, on how they aim to minimise the level of fire risk in TVs. It should also be noted that these measures are likely to increase the production costs of TVs.

Solder joints. Where solder joints are subjected to high voltages and currents or where there is a likelihood of heavy mechanical stressing, an elliptical weld could increase the probability of achieving a 'good' weld. These solder shapes are also a little larger than normal. It is estimated that about 5% of the soldered joints in a TV would benefit from this alternative soldering method, the remaining 95% only require normal soldering.

Design philosophy. If a component is known or thought to present an above average fire risk it can be 'down rated'. Either more components are used in the design to 'spread the load' or components of higher specification are used. Components are stressed less, are more reliable and last longer, thus reducing the risk of failure in the long term.

2.4.9 Known recalls of TV or associated appliance

One manufacturer recalled 40,000 units in 1992/93 as part of a Europe-wide recall programme. No other product recalls were known to respondents during the last five years.

2.4.10 Recent safety measures and future trends

No extensive safety measures are known to have been instigated in Denmark. However, one respondent recalled seeing some advice to consumers on the TV, advising them to remove the plug from the mains when the TV was not in use.

There has been extensive media coverage over the last 2 years, including several TV programmes and several hundred newspaper articles about TV fires, which has raised public awareness of the potential risk of TV fires. Some articles have stated that TVs are dangerous, and others have stated that TVs left in standby are more likely to ignite, although this has not been proven by records of TV fires (such as they exist) or tests.

Following the publication of its report on TV fires in June this year, DEMKO issued a press release advising consumers that if any small malfunction problem occurs (i.e. sound or picture) in an old TV set, it is advisable to have the TV serviced by an authorised workshop, as these 'minor' problems can develop into a more serious internal fault. DEMKO has also made recommendations to TV manufacturers, based on its findings.

2.5 EIRE

2.5.1 Legislation

Legislation in Eire is covered by the low voltage directives 73/23/EEC and 93/68/EEC. Electrical products are tested to the European standard EN 60065. As with other member countries Eire is working through the transition period. Implementing EN 60065 and the amended directive, that requires full CE marking, will come into force on 1st January 1997. There is no awareness of any further legislation that is required or being discussed that would affect the number of TV fires in Eire.

2.5.2 The number of TV fires

No details known

2.5.3 Known safety measures

None known.

2.6 FINLAND

2.6.1 Legislation

Finland has adopted and implemented the Low Voltage Directives 73/23/EEC and 93/68/EEC in full with no special conditions. Electrical products are tested to the European standard EN 60065. Prior to 1994 Finland operated its own legislation and test procedures which are now fully superseded by the European standards. As with other member countries Finland is working through the transition period, and the full CE marking will come into force on 1st January 1997. There is no awareness of any further legislation that is required or being discussed that would affect the number of TV fires and the intention is to follow European directives in the future.

2.6.2 The number of TV fires

No details known.

2.6.3 Known safety measures

None known.

2.7 FRANCE

2.7.1 Legislation

France has followed the European directives and fully implemented the Low Voltage Directive 73/23/EEC and the amendment 93/68/EEC. The directive 'Directive Base Tension' has been adopted under decree no. 75-848 of 26 August 1975, modified by no. 81-1237 of 30 December 1981; the decree covering amendment 93/68/EEC being adopted in line with Community requirements. There are no special variations in force regarding safety beyond those contained in EN 60065, France's NFC 92130. There are no special additions or amendments for reducing fire risks in TVs. It should be noted that in the 1980s the use of fire retardants was an acceptable way of preventing the spread of fire, but now the C.E.I. (Comité Electronique Internationale) considers recyclability as a key issue and the development of alternatives to these materials is now being strongly considered. The tendency is to move away from fire retardants and promote solutions based on the development of 'green TVs' using the following policy guidelines:

- a) Reduce the number of fire sources of ignition within a TV.
- b) Increase the distance of components from identified potential sources of ignition.
- c) Provide an additional barrier against fire where the above becomes impracticable.

2.7.2 Ownership of TVs, sales and related trends

2.7.2.1 Ownership of TVs and future trends

97% of France's 22.1 million households have at least one TV, and there are about 33.1 million TVs in the French market. Contrary to its larger neighbours (in terms of sales) the French market, whilst slowing down, is still growing at a rate of 1.8% with sales in 1994 of 3.7 million units. Over the last six years TV prices have fallen and expectations are for a further fall 1.5-2.0%, putting additional pressures on manufacturers to value engineer their products. But despite this there is an understanding by European suppliers that price reductions should not be achieved at the cost of compromising product safety.

The product life of a TV is thought to be in the region of 6-10 years, but when the growing population of TVs is compared to the sales, a figure of 12 years is probably a better guide. TV ownership is around 1.5 per household and will move slowly upwards towards 1.7 over the next five years.

2.7.2.2 Location of TVs in the household

The main TV in a household is a 25"-29", which accounts for 55% of sales. It is usually located in the *salle de sejour*, a large living room which often comprises a dining area.

Room	%
Salle de sejour/ living room	70-75%
Bedroom	15%
Kitchen	10%
Other	less than 5%

The use of remote control has become very important, and almost 100% of products manufactured have this feature. The standby function is gaining popularity and is frequently left on, all day and all night, only being switched off during long absences from the residence. 15 years ago TVs were switched off manually, whereas today 75% of TVs are operated from the standby position, and this trend is increasing.

2.7.2.3 Sales of TVs and future trends

Colour TV	% of retail sales	Trend
14"	30%	Increasing
20"-21"		Static
25"-29"	55%	Increasing
Other	15%	Declining
Total	100%	

Source: Manufacturer

Since 1991 TV sales have moved progressively upwards from 3.3 million per annum to 3.7 million per annum. The most popular products are the 25"-29" TVs in the standard screen dimension ratio 4:3. These account for 55% of all sales. 20"-21" and 14" portables account for a further 30%. Whilst sales of the larger of these sizes are static or falling the portable units are seen as a suitable second TV and overall sales of this size are increasing. The new 'cinema' format 16:9 TVs are still not significant in numbers, having a market share of under 0.5%.

The two market leaders are Philips 18-20%, and Thomson with 16-18%.

2.7.3 The number of TV fires and associated fatal/non-fatal accidents

2.7.3.1 TV fires and fatal/non-fatal accidents

	Estimated number of incidents per year	Number of incidents per million TV
Total TV fires	330	10.0
Non-fatal injuries	38	1.2
Fatal injuries	2 (0-6)	0.06

Source: Interviews with fire brigades, EHLASS - Ministère de la Santé.

2.7.3.2 Total TV fires

	Estimated population of appliances	Estimated frequency of fires per million appliances	Total estimated fires per annum
TVs	33.1 m	10.0	330
Videos.	15.5 m	n/a	n/a

Source: SIMAVELEC, interviews with fire brigades.

	Population covered by fire brigades	Households	Estimated number of TV sets	Average house fires per year	Average TV fires per year	Fires per million TV sets
Paris*	6,500,000	2,490,000	3,730,000	7505	64	17.16
Marseilles	1,000,000	400,000	600,000	900	11	18.33
Lyon	1,200,000	480,000	720,000	d/k	d/k	d/k
Lille	205,000	78,500	117,800	1840	1.7	14.40
Strasbourg	430,000	172,000	258,000	809	d/k	d/k

notes:

- 1) * includes the départements of Haut de Seine, Seine St. Denis, Val de Marne.
- 2) The number of TV fires is averaged over 1-10 years depending on the information available.
- 3) Where possible the average number of house fires is calculated over 5-10 years. (The trend is declining).

The central records of the fire brigades do not identify TV fires separately. However interviews with five fire brigades (Paris, including the three neighbouring départements, and the four provincial cities) indicated a projected figure for of 500 TV fires per annum.

This is thought to be an over estimate due to:

- a) electrical /TV fires in rural areas being less frequent than those in urban areas.
- b) some fires being assessed as TV fires when there was some doubt in attributing the cause.

An adjustment is therefore made to reduce the figures by 15%.

However, in addition an estimated 20-25% of these fires would not fall within this report's definition of a fire, being too small and/or emitting only small amounts of smoke or fumes. So a realistic, conservative total would be 330 fires per year. This figure is used in this section of the report, with an associated error of -15% +40%.

2.7.3.3 Total non-fatal/fatal accidents

There are no centrally held statistics for accidents involving TVs, figures have been estimated from fire brigade and EHLASS sources. Of the 518 hospitals in the public sector, 8 are in the EHLASS scheme, have emergency departments, and supply statistics to the scheme. There is also a large number of private hospitals and clinics that have specialist functions, but these are less likely to deal with any injuries caused in TV fires. The Ministère de la Santé said that the composition of the contributing hospitals has varied over the years, but currently 8 hospitals, all of which are outside the Paris region, cover 3.9-5% of the population. The conservative figure of 5% is used in the estimates.

There were 17 cases of injury reported in the last 9 years (1.9 per annum), and 1 death (0.1 per annum). The estimated figures for France, based on this representing 5% of the population, are therefore, 38 non-fatal injuries per annum, and 2 deaths per annum.

	Estimated number of TVs	TV fires per year (per million TVs)	Non-fatal accidents (per million TVs)	Fatal accidents (per million TVs)
Paris*	3,730,000	64 (17.16)	20 (5.36)	0 (0.0)
Lille	117,800	1.7 (14.4)	0 (0.0)	0.1 (0.8)
Lyon	720,000	d/k	d/k	d/k
Marseilles	600,000	11 (18.33)	0 (0.0)	0 (0.0)
Strasbourg	280,000	d/k	d/k	d/k

Note:

- 1) Number of TVs relates to the populations said to be covered by the fire brigades interviewed.
- 2) Number of TV fires averaged over 1-6 years according to data available.

Source: Interviews with fire brigades.

The responses from the fire brigades support this. The figure for Paris shows 20 recorded injuries but of these 4 were serious, and an estimated 70% of those recorded as slight did not receive hospital treatment. The data from the major cities indicates that the total number of injuries is less than 60 per annum. This is the same order of magnitude as the projection using EHLASS figures.

2.7.3.4 Timing of TV fires

No data was available to determine a pattern to the time of TV fires in France.

2.7.4 Trends in TV fires and accident rates

	1989	1990	1991	1992	1993	1994
Number of TV fires per annum	97	64	n/a	59	55	45

Source: Paris fire brigade.

The research indicates a decline in the number of TV fires over the last six years, which is reflected in the figures of the Paris fire brigade. Other respondents gave qualitative assessments supporting this position.

The Thomsen group acknowledges that TV fires do occur. The company shows a preference in design for identifying high risk areas and then designing component layout in such a way as to contain any potential fire that might occur. This is achieved in theory, by setting components apart from each other to prevent any fire spreading. The use of flame retardant materials is thought to be environmentally unfriendly and is now considered as a last option. The wide-spread implementation of this strategy should reduce the number of bona fide TV fires as defined in this report, but it should be noted that any fire started by an outside agent would not be stopped by any self extinguishing properties of the TV.

2.7.5 Nature and severity of incidents

	% of total TV fires
Fire restricted to the TV	30%
Fire extended to the environment and causing damage to property	70%

Source: Interview responses.

Approximately 30 % of TV fires were considered to have penetrated the outer casing or developed smoke or fumes, and 70% developed into larger fires damaging the surrounding furnishings or structure of the dwelling.

2.7.6 The key factors affecting the frequency and severity of TV fires

The respondents interviewed thought that TV fires were generally associated with older sets, probably more than 10 years old. The modern sets are thought to be more reliable and fires in these sets are not considered to be a major issue.

2.7.7 Main components causing TV fires

TV manufacturers identified several sources of TV fires. The major source of primary ignition was thought to be :

Solder joints The solder joints on the mains and high voltage parts of the circuit board were considered to be high risk areas. In particular, solder joints connecting the linearity coil were understood to have broken down and resulted in arcing. This high voltage

component (1.5Kv) operates at 16kHz or more and controls the line output transformer. The solution in this case was to use a larger physical connection, and increase the surface contact of the joint by double soldering.

Mains switches These components are known to have been a potential source of risk on some European sourced TVs. The domestic producers of TVs did not recall any incidence of TV fires caused by mains switches. It is nevertheless considered to be a high risk component, suspected in possibly up to 50% of incidents, and one that is regularly tested in order to ensure that any fire generated from within the switch is contained within the switch.

Other causes of fires were given as:

Anode cap One case was fully investigated where discharge (at 25-30kV) through a faulty anode cap ignited the surrounding cabinet. It was found that a strand of wire had been damaged during encapsulation into the cap and was therefore covered by an insufficient layer of insulating material. Subsequently under the action of high voltage stress the insulation broke down and arcing took place eventually igniting the cabinet. It was considered to be an isolated case.

Other areas that are considered to be high risk and therefore demand special quality control are power supplies, deflection/line output transformers, and any relatively heavy component (10 grams or more) that is subject to mains or high voltages and could be ruptured during movement of the TV.

2.7.8 Recalls of TV or associated appliances

Two recall programmes have been undertaken. These were understood to be preventative programmes under the initiative of the manufacturers and no incidents were said to have occurred at the consumer level. However certain rectifications have been made from time to time where necessary.

2.7.9 Recent safety measures

Manufacturers have sought to reduce the physical number of components that are connected by wires or links in order to reduce the number of points that are at risk from mains and high voltage. High risk components are located subject to minimum clearances from surrounding housings. 20mm is being considered as the minimum acceptable standard.

Manufacturers can use temperature mapping to identify potential sources of ignition. Identifying the relevant temperature gradients within the TV then allows design parameters to be set, and allow for the adjustment of the thermal coefficients of juxtaposed components to optimum levels.

Standby power consumption has decreased over the last 15 years, as has the power consumption when the TV is fully operational.

The following table shows the overall downward trend in power consumption levels.

	1970	1985	1995
Typical 26"-29" standby	30+ watts	15 watts	5-10 watts
Typical 26"-29" operational	200+ watts	200 watts	85-90 watts

source: manufacturers

However, additional specifications, like teletext, stereo hi-fi audio and 100 Hz screens require higher levels of power consumption in the fully operational mode, which could total as much as a further 100 watts.

A comment, made by two respondents, was that in their opinion there is no longer a need for a mains switch to be mounted in the TV set. With adequate fusing to safeguard the TV, the standby unit is all that is required to control the functioning of the TV.

2.7.9.1 Safety promotions

No special safety campaigns have been pursued in France according to the fire brigades and manufacturers because the operating instructions, "Notices d'utilisation", that are supplied with TVs, are considered by respondents to provide sufficient information to instruct and inform the owner about correct installation.

2.8 GERMANY

2.8.1 Legislation

In Germany legislation is based on the Gerätesicherheitsgesetz (product safety legislation). As with other members of the EC it is the Low Voltage Directive 73/23/EEC (Niederspannungsrichtlinie), and the supplementary amendment 93/68/EEC (the CE marking directive), that has been translated into German Law. According to this legislation the equipment must be so designed and manufactured as to be safe to be brought onto the German market.

The 'CE' mark is the visible mark that shows that the manufacturer claims to fulfil the directive and this will be a fundamental requirement for any products marketed in Germany from 1st January 1997. The 'CE' mark is not in itself a test approval like the VDE (Verein der Deutscher Elektrotechniker) mark. This latter mark would show type approval for the TV according to the basic standard, European Norm EN 60065 independently verified by an authorised test house.

Before 1992 the TV industry in Germany manufactured to DIN standards. Changes in legislation and the ratification of EN 60065 in 1993 have not affected the safety aspects of TVs manufactured in Germany, since the European standard was substantially the same as the preceding German standard VDE0860. The safety standards incorporated in the two were the same. The adoption of a new identity for the standard has not affected the safety of products manufactured and supplied to the new standard.

2.8.2 Ownership of TVs, sales and related trends

2.8.2.1 Ownership of TVs and future trend

There are considered to be 52.9 million TVs in Germany. This is based on 35.3 million households having 1 TV, 35% of households having 2 TVs and 12% covering subsequent units. Fifteen to twenty years ago the life of a TV set was thought to be 5-7 years, but today however 10-15 years is more realistic. The reason for this improvement is two-fold. Firstly overall quality of the units has increased, and secondly TVs manufactured within the last 10 years have been better performers, available with options such as stereo, video text, scart sockets etc. so that there is hardly any reason, on the basis of technical functionality, for a customer to substitute a piece of equipment that is working. The consumer is more likely just to add a second or even a third unit.

The product life of a TV has increased since the early 1970s when it was thought to average 6 years. Currently sales in Germany are 5.48 million per annum and declining at a rate of 2% per annum. However overall TV ownership is increasing at around 1 million units per annum mainly because consumers keep their existing TV sets longer and 20% of purchases are adding to the population of TVs in a household. Hence the average ownership/usage of TVs in Germany currently thought to be about 1.5 per household, is expected to increase to 1.8 per household over the next to five years.

2.8.2.2 Location of TV's in the household

The main TV in a household is generally a 27"-29" model located in the living room. Older TVs used in smaller living rooms are 20"-21", and additional TVs, usually the smaller 14" portables, are used in other rooms. The most common rooms for viewing are:

Room	Estimated number of TV's millions	%	Comment
Living room	31.8	60%	Traditional location
Children's room/TV room	7.9	15%	Increasing
Bedroom	7.9	15%	Rapid growth in 5 years
Other- 'summer house', kitchen	5.3	10%	Old/used TV's
Total	52.9	100%	

Changes in consumer taste have meant that fewer TV's are built into tight fitting cabinets and sideboards, thereby reducing the potential fire risk caused by inadequate ventilation leading to overheating. The current situation has come about through improved awareness campaigns run by insurance companies and fire brigades, and the inclusion of safety instructions in with the manufacturers' operating instructions.

2.8.2.3 Sales of TV's and future trends

TV sales for 1994 stood at 5,480,000 which was down (-5%) from 5,750,000 units in 1992. The free-standing 27"-29" and the portable 14" markets are growing slowly (1-2% per year). The 20"-21" market is static, whilst "others" is declining. Sales of black and white TV's are negligible. 27"-29" TV's are used solely in the living room (which is generally a large room), as too are most of the 20"-21" units. The 14" portable is preferred for bedrooms etc. Shown below are percentage sales June 1994 - May 1995.

Colour TV	% of retail sales	Trend
14"	24.3	Increasing
20"-21"	27.2	Static
27"-29"	32.4	Increasing
Other	16.1	Decreasing
Total	100.0	

Colour TV	% of retail sales	Trend
Normal screen	38.7	Static
Flatter squarer screen	60.0	Static
Other	1.3	Static
Total	100.0	

Colour TV	% of retail sales	Trend
Mono	47.9	Static
Stereo	52.1	Static
Total	100.0	

Source: Gesellschaft für Konsumer- Handel- und Absatzwirtschaftsforschung (GfK), manufacturer

2.8.3 The number of TV fires and associated fatal/non-fatal accidents

2.8.3.1 TV fires and fatal/non-fatal accidents

	Estimated number of accidents per year	Number of accidents per million TV
Total TV fires	574	10.9
Non-fatal injuries	15 (10-50)	0.3
Fatal injuries	3 (2-4)	0.06

Source: Interviews with fire brigades.

2.8.3.2 Total TV fires

The depth and quality of information held by individual fire brigades or police departments varied significantly, but the following table seeks to cover representative areas of Germany.

City	Population	Households	Estimated number of TVs	House fires per annum	TV fires per annum	TV fires per million TVs
Berlin	3,400,000	1,490,000	2,235,000	3,654	41	18.34
Düsseldorf	570,000	249,000	373,500	550	4	10.71
Frankfurt	659,000	293,000	439,500	720	8*	18.20
Hamburg	1,640,000	716,000	1,074,000	1,700	n/a	n/a
Hannover	550,000	240,000	360,000	410	4	11.11
Karlsruhe	270,000	120,000	180,000	300	3	16.67
Köln	1,000,000	437,000	655,500	2,240	13	19.83
Magdeburg	276,000	121,000	181,000	790	2	11.02
Munich	1,300,000	568,000	852,000	900	don't know	don't know
Nürnberg	482,000	214,000	321,000	480	don't know	don't know
Stuttgart	570,000	249,000	373,500	304	don't know	don't know
Wuppertal	380,000	166,000	249,000	290	don't know	don't know

Notes:

- 1) *Frankfurt gave a very high figure indicating 40 TV fires (91 fires per million TVs), but this fire brigade tended to record all fires where a TV was seen to be damaged, rather than to positively identify the source of the fire, hence it is thought that a total of 8 TV fires per year is more realistic (i.e. about a fifth of the number given).
- 2) The number of TV fires is an average over the last 1-5 years depending upon the periods for which information was available.
- 3) TV fires are ones where the source of ignition was the TV as defined at the beginning of the report.

Source: Face to face, and telephone interviews with fire brigades.

	Estimated population (million)	Estimated frequency of fires per million units	Total estimated TV fires per annum
TVs	52.9	10.9	574
Videos	24.0	n/a	n/a

Source: Face-to-face interviews with fire brigades, GfK.

The estimated total number of TV fires, based on interviews with fire brigades was 870, but of these it is thought 20-30% are due to candles or other accelerants, or caused by an external source that then spread to the TV. In addition 40-50 % were said to be small fires and possibly 30% of these small fires would have been extinguished within the set without releasing flames or noxious smoke out into the immediate environment. The original figure of 870 was therefore adjusted down to 574; i.e. 10.9 TV fires per million TVs, and these figures are used in this section of the report. No information was available on videos, but there was a consistent view that video fires are infrequent (less than 2% of TV fires). The associated error is -15% +30%.

2.8.3.3 Total non-fatal/fatal accidents

	Estimated number of TVs	TV fires per year (per million TVs)	Non-fatal accidents (per million TVs)	Fatal accidents (per million TVs)
Berlin	2,235,00	41 (18.34)	5.25 (2.35)	0.4 (0.18)
Düsseldorf	373,500	4 (11.11)	0 (0)	0 (0)
Magdeburg	181,500	2 (11.02)	0 (0)	0 (0)

Note: The estimated number of 'TV fires per year' in this table were those given or estimated by the fire brigades. These should be reduced by 15% to meet the report's definition of a TV fire and correlate with the figures used in this section of the report.

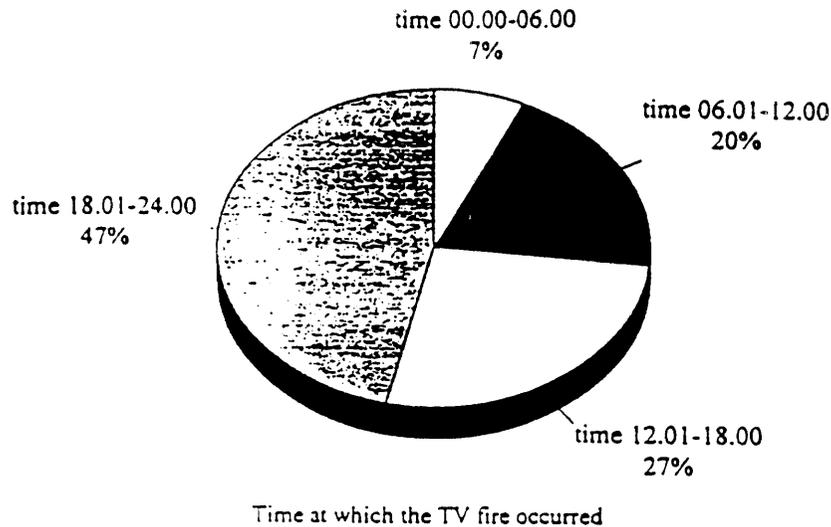
Source: Face to face interviews with fire brigades.

Figures for deaths and injuries are not held centrally. However Berlin fire brigade provided data, which covers 4% of the national population. The average of 5.25 non-fatal injuries per year if used to project a national figure indicates a maximum number of injuries in TV fires of 124. When taking into account Düsseldorf and Magdeburg which showed zero positive the figure falls to 99. The minimum figure for Germany has to be at least that recorded by Berlin alone, which is 5.25. The realistic figure is probably 10-50 non-fatal injuries per year, and 15 is used to ensure that the estimates are conservatively low.

Similarly fatal accidents occurred in Berlin on average 0.4 per year (4 deaths in 10 years). Applied to the national picture this would indicate 9.5 deaths per year. If Düsseldorf and Magdeburg, which indicated zero positive, are included in the basis for the estimation, the figure falls to 7.5. The realistic figure is expected to be in the region of 2-4 fatal injuries per year, and 3 is used.

2.8.3.4 Timing of TV fires

The following pie chart shows the frequency of fires within certain time zones.

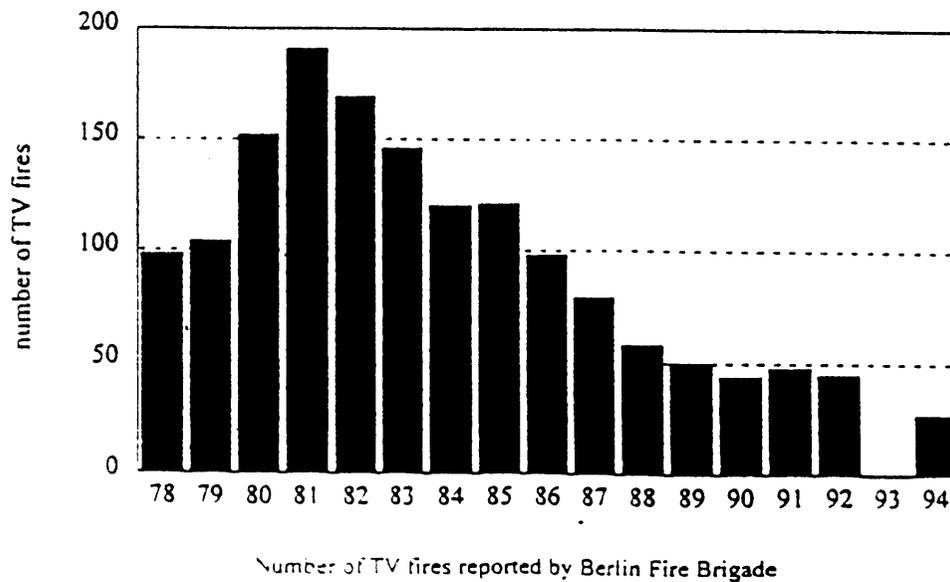


Source: interviews with fire brigades

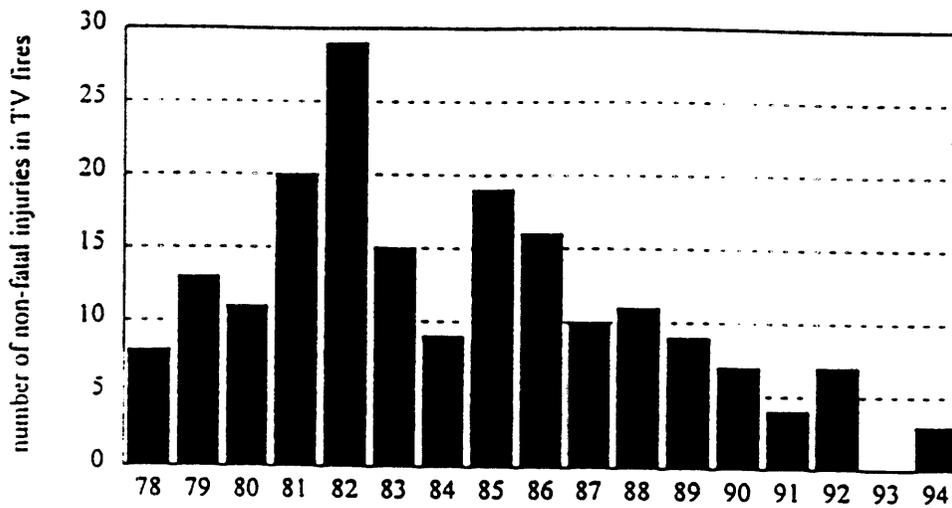
47% of fires occurred in the evenings between 18.00 and midnight.

2.8.4 Trends in TV fires and accident rates

The research clearly indicates that the number of TV fires in Germany has fallen steadily over the last thirteen years. There has been a similar decline in the number of non-fatal and fatal injuries. The following chart (for Berlin) shows that since 1981 there has been a steady fall in TV fires from the peak of 191, in 1981. The rise in 1991 is due to statistics for East and West Berlin being combined after unification. No data was available for 1993.

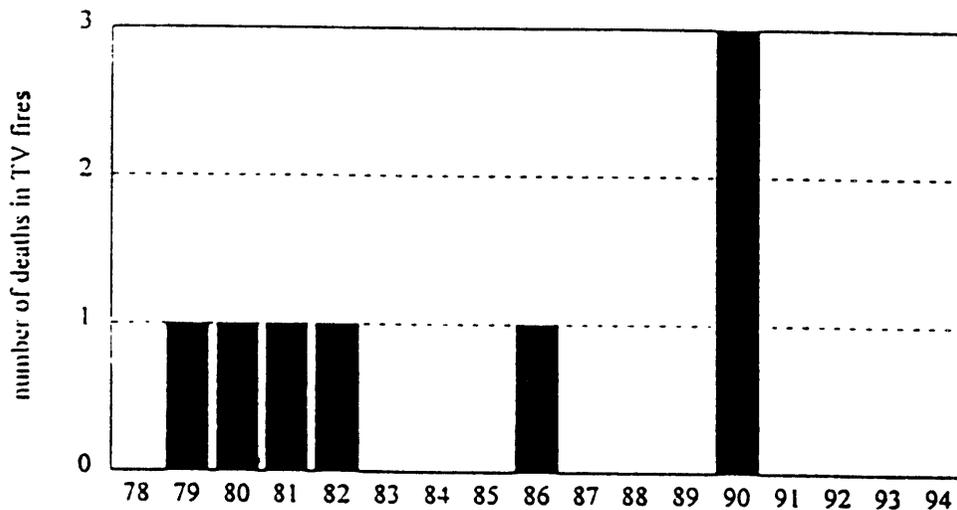


The information on injury and death corresponding to TV fire statistics is shown below.



Number of non-fatal injuries in TV fires reported by Berlin Fire Brigade

The trend for injuries follows that of the incidence of TV fires, i.e. declining. Since 1990 5% of injuries have been as a result of burns, 95% were from smoke and gas inhalation.



Number of deaths in TV fires reported by Berlin Fire Brigade/ Berlin Police

Since 1982 the number of confirmed deaths in TV fires in Berlin has declined, with the exception of 1990. The three deaths in that year occurred in two separate incidents; one an old lady and a baby in separate apartments, and the second an elderly lady alone. Independent assessors considered the two fires to be TV related, but this was not supported by the police investigations.

The underlying trend in TV fires and accidents in TV fires is downward.

The table below, based on Berlin's figures, shows this decline in non-fatal and fatal injuries, averaged over three consecutive five year periods. This recorded data is considered to be representative of discussions held with fire brigades, where such detailed data was not available over such an extended time frame.

	Estimated number of accidents per annum (per million TVs)			
	1980-1984	1985-1989	1990-1994	1994
TV fires	155 (106)	81 (45.9)	41 (19.8)	27 (12.0)
Non-fatal injuries	16.6 (11.4)	13.6 (7.4)	5.3 (2.6)	3 (1.3)
Fatal injuries	0.6 (0.41)	0.2 (0.11)	0.6 (0.36)	00 (0.0)

Source: Berlin fire brigade.

It should be noted that fifteen years ago the population of TVs would have been smaller, and adjusted figures representing the relative average and reflecting a linear growth in TV ownership has been applied, in order to reach the incidence rate per million TVs in the above table.

The rates of decline in TV fires and accidents can be clearly seen. The product-related reasons for the downward trend in TV fires are:

1. TV design has improved and component layout is better.
2. High voltage/high current/high frequency components have been segregated from the low voltage signal processing circuitry.
3. Failure in high risk componentry is better understood and handled at the design stage.
4. Power consumption in mains and high voltage circuits has been reduced.
5. Flame retardant materials have been selectively introduced to reduce the risk of ignition and the subsequent spread of fire.
6. Production techniques are being continually improved.
7. Safety instructions are included in the TV operating instructions. It is noted that manufacturers identify two preferred methods of imparting this information. Older people are more responsive to the written booklet, whilst the younger generation appear more responsive to interactive, on-screen data.

It should be noted that accidents caused by liquids, lighted candle etc. entering the TV under the general heading of misuse, persist but these are excluded from records of bona fide TV fires used in this analysis.

2.8.5 Nature and severity of fires

The following table shows the expected cost of TV related fires at various stages of the fires development.

Nature of fire	% of all fires	average cost per incident
Fire restricted to the TV	30-40%	DM2,000
Fire extended to the environment and causing damage to property	40-60%	DM10,000-50,000
Fire causing severe damage to the room and property	less than 5%	DM150,000
Fire causing major damage to the entire dwelling	less than 5%	DM500,000
Fire completely destroying the dwelling	less than 2%	DM500,000-1m

Source: Interviews with fire brigades and insurance companies

In addition to damage to buildings and property, which is estimated to be DM30-50m (£13-23m) per annum, there is an associated minimum cost of DM1,400-2,000 per call-out for the fire brigade. In the case of a large fire this could rise to DM50,000, a cost that is met by the German taxpayer.

2.8.6 The key factors affecting the frequency and severity of TV fires

It is thought by respondents interviewed that 75% of all incidents occur in TVs that are more than 10 years old.

Products manufactured in the early 1970's are considered to be more prone to technical failure than products brought on to the market today. At that time there was a combination of relatively poor circuit design and high power consumption in the high voltage side of the equipment which could have caused overheating and triggered ignition when subject to lack of ventilation. This occurred when TVs were built into cupboards and wall units. Overheating can start by arcing in crystallised solder joints, and in the presence of a build up of dust, ignition becomes a possibility, allowing fire to spread quickly to other inflammable materials, particularly if the TV is positioned close to or touching curtains.

10 years ago some units were failing in standby mode when premises were struck by lightning. Lightning was considered to be a frequent trigger to TV fires but this aspect of safety was not proven by laboratory tests. The problem has been reviewed by manufacturers who consider that lightning strikes through modern cable and satellite equipment can cause damage to sensitive electronic components in units that are connected in localised networks without extending to the ignition of a fire.

10 - 12 years ago it was confirmed that an interference filter (Entstörfilter) was the cause of a number of incidents of fire. TVs using this particular component were the subject of a recall programme. No subsequent reoccurrence of the problem has been noted since.

TV casings that are made of a combustible material will increase the rate of progress of the fire. Previously polyvinyl chloride (PVC) was used for this application. It was easily ignited, promoted the spread of flames and produced toxic gases. In Germany alternative plastics are now being used such as polyethylene (PE), polypropylene (PP), acrylonitrile-butadiene-styrene (ABS), but the use of fire retardant materials that cannot be recycled are generally resisted, as too are chemicals that release toxic gases when subjected to certain high temperature degradation.

2.8.7 Main components causing TV fires

Fire brigades and police investigators tend to be of the opinion that the key sources of primary ignition stem from the standby units, on/off switches, and cathode ray tubes; accounting for 80% of cases.

The manufacturers and test houses take a differing view and stress that probably less than 5% of fires are caused by a technical defect. *Then what does cause them?*

From the manufacturing point of view there are about 10-15 components or assembly points in a TV that are considered to be worth special attention. All of these are in the mains and high voltage side of the circuit.

The 4 most significant causes are:

Solder joints subjected to mains and high voltage/high current/high frequency The key areas are where crystallisation of solder joints occur, giving the potential for arcing. This was the case with one widespread model manufactured by Grundig for Blaupunkt. Arcing across a solder joint caused a temperature build up in the gap between the board and the nearby plastic casing eventually causing it to ignite. The conclusion was that the distance from the joint to the casing was less than 10 mm, and this was too small. The solution was to increase the clearance to 20 mm, improve the connection quality by mechanical modification, and improve the soldering. Other areas, which were thought to be similarly at risk were likewise modified. Where it was not possible to increase clearances, flame retardant materials were incorporated into the design, although this is not always a popular solution in the German market due to the chemical nature of such materials. The changes in soldering technique are now 10 years old and manufacturers believe the resulting joints are longer lasting and more reliable.

In older TVs failures can develop at stressed joints where components and switches are connected by wire rather than directly built onto the circuit board, which is the case with new TVs. These failures rarely occur in less than 2 years, and more likely they take 4-6 years to develop. The solder on the joint crystallises and any mechanical stress contributes to the rupture of the joint. Arcing in close proximity to dust and fluff can lead to fire damage.

Remote/ standby unit Nearly all new models on the German market are supplied with remote control. This means that in standby at least the processor and the infra red receiver are powered up. No problems are thought to have occurred in the last 2-3 years in newer models, a period during which the stand-by power consumption has been reduced to levels that are now considered by test houses to be very low. However old models could still be in the market causing the occasional fire, which may account for the differing perceptions of fire brigades and manufacturers.

Mains switch The mains switch is a mechanical part that can wear out and could develop arcing. This component was the subject of a recall programme by Philips and Sony, throughout Europe the late 1980's. Some of these models, with potentially faulty switches, are probably still in the market causing the occasional fire, which may account for the differing perceptions of the fire brigades and manufacturers.

Line output transformer (Zeilentrafo) The former East German manufacturer used to use a 'Zeilentrafo' (line output transformer) that had a power consumption of more than 500 watts which was considered to be a risk area. New designs using western technology and components have considerably reduced power consumption and the associated level of risk in that area.

Other possible sources are:

Cathode Ray Tube In early colour TVs the coil around the cathode ray tube (CRT) which controlled the projection of the picture on the screen, used high levels of power and was prone to failure by short circuiting where solder points crystallised causing overheating, potential fire and eventual implosion of the tube. Successive changes in design that reduced power consumption, and attention soldering points have drastically reduced this.

Safety capacitors In old TVs of 20 years ago oil-filled capacitors mounted above mains transformers were also thought to provide a source of ignition and rapid acceleration for fires. This risk area has been designed out of modern TVs.

In addition to these other possible sources mentioned were the mains cord, mains filter, diode split transformer, safety resistors, and safety fuse resistors.

2.8.8 Known recalls of TV or associated appliances

In 1989 there was a recall on a number of manufacturers' products. The problem was overheating in the on/off switch which affected upwards of 200,000 units. The solution was to change the switch, redesign a new switch, and to change the supplier of the switch. Rectification was said by some manufacturers to have been carried out by their distributor network. It is not known what percentage of faults were rectified although it is likely that some units will have reached the consumer and were not returned for inspection and repair.

2.8.9 Recent safety measures and future trends

High volume manufacturers are under commercial pressure to keep costs down in a market place where the market prices at consumer level are static or falling. However consumer safety is considered as an important priority with German manufacturers and product improvements reflect this concern. Those at the top end of the price market can offer additional safety measures such as a metal chassis and ceramic circuit board, which reduce the risk of propagating fire still further by the incorporation of non-flammable material or materials with self extinguishing properties.

Generally European companies manufacturing TVs are certified to ISO 9002 or ISO 9001, or are in the process of being certified. The attention to establishing accountable levels of control in management supports the practice of achieving consistent levels of safety in the product, as required by the European Directives. Incidents involving the old TV's continue to fall year by year, but imported goods from outside the EC do not have to comply with the EC marking directive until 1st January 1997.

Testing by independent test houses brings not insignificant pressure to bear on manufacturers to improve the quality and performance of TV's. Engineers now believe that technical faults leading to fires are well less than 10% and probably less than 5% of all actual fires that are attributed to TVs.

Since the mid 1970s, when TVs required relatively high levels of power, there has been a downward trend in power consumption which has in turn reduced the risk of components overheating.

TVs from the 1970's can be compared to modern equipment as follows:

Remote control TV - on standby only

	1970s	1995
B & W (black and white)	20-30 watt	n/a
Colour	20-30 watt	1-10 watt

Source: Stiftungs Warentest.

Remote control TV - operational

	1970s	1995
B & W (black and white)	100-300 watt	obsolete
Colour 63 cm or bigger	500 watt	55-80 watt*
Colour less than 63 cm	n/a	30 watt

Note:

- 1) * - add 120-150 watts for 100 Hz 'no flicker' models.
- 2) Under test conditions the TV are run in 24 hour cycles, 19 hours standby mode followed by 5 hours fully operational. The power consumption in each part of the cycle is then established.

Source: Stiftungs Warentest.

Whilst not recent, the introduction, ten years ago, of double soldering combined with improved mechanical location of components significantly reduced the risk of failure at joints where mechanical or electrical stress was high. Areas such as power transistors transformers and switches benefited from these changes.

Major manufacturers have developed, and continue to develop 'intelligent switching' to close down circuits that develop faults.

The plastics that are being used in casings are no longer PVC but more suitable ABS, PE, PP compounds. Fire retardant materials are also regularly considered. In the USA there is a requirement for polybromide diphenylethene to be added to casing materials and circuit boards to act as a fire retardant. However this material contains chlorine which gives off small amounts of toxic gas when subjected to heating. This chemical is also considered to be unsuitable for conventional recycling. For these reasons its use is resisted in Germany.

A new innovation is currently being presented to the market via the manufacturers. This is a standby unit incorporating an automatic mains switch-off which is activated after a predetermined time, effectively removing the TV from its standby sequence and isolating it from the power source. In this condition the TV is no longer live.

Another new development is the wall mounted TV that does not use a conventional tube, and operates with very low power levels.

Since 1985 there has been a steady reduction in the number components mounted on chassis or circuit boards. In 1985 a typical TV required 2000 parts, by 1995 this had been reduced to a figure in the order of 600 parts.

Changes in cabinet design have also been made to improve the aesthetic qualities of the TV as a piece of furniture, blending with the lines of the tube (CRT). Coincidentally this has removed certain flat surface areas on which people tended to place flowerpots, drinks, and candles, thereby reducing potential risks from these accelerants.

2.8.9.1 Safety promotions

Safety promotions are organised on a regular basis by fire brigades in designated "Fire Weeks" but these generally cover all aspects of fire prevention in the home. Occasionally local governments run advertisements, but these are usually as a reaction to an event rather than as a planned programme. Additionally, programmes have been run in conjunction with insurance companies who sought to make the general public aware of the need to adequately ventilate areas around TVs, especially where they are built into cabinets and cupboards.

The VDE (Verein der Deutscher Elektrotechniker) is also thought to run awareness campaigns on electrical goods but details relating specifically to TV fires are not known.

2.9 GREECE

2.9.1 Legislation

Greece has adopted the Low Voltage Directive 73/23/EEC and subsequent amending directive 93/68/EEC covering the requirements for CE marking in full. These passed into Greek law under Ministerial Decree 470/85-04-04 and 16717/5052/94-12-23. No other special legislation has been adopted to enhance safety levels of TVs in Greece.

2.9.2 The number of TV fires

No details available.

2.9.3 Known safety measures

None known. There is no local manufacture of TVs. The legislation on safety applies to all imported sets.

2.10 ITALY

2.10.1 Legislation

Legislation is adequately covered by EEC agreements and directives. No additional proposals are on hand because the risk of TV fires is considered to be a low priority and the Brussels directives are suitable and satisfactory.

2.10.2 Ownership of TVs, sales and related trends

2.10.2.1 Ownership of TVs and future trend

The latest published census figures for Italy are 1991. These have been extrapolated to give a closer approximation to the current population in Italy. The Italian Association of Electrical and Electronic Product Suppliers (ANIE) calculates the population of TV sets to be 20.5 million based on 96% of households having 1 TV and 17% having more than one. This figure is thought to be very low when compared with figures from GfK-Italy, a specialist research company, and individual manufacturers who indicate that 28 million would be more accurate; i.e. approximately 1.4 per household. These latter figures are used in this section of the report.

2.10.2.2 Location of TVs in the household

Room	Estimated number of TVs millions	%	Comment
Living room	18.0	60-70%	most common location
Kitchen	3.1	10-15%	city flats including combined kitchen/living areas
Bedroom	3.1	10-15%	steady growth for 2nd TV
Summer house, boat	2.0	5-10%	more common in N. Italy
Child's room/TV room	1.8	5-10%	likely to increase
Total	28.0	100%	

Source: respondents views.

Most TVs are situated in the living room. In recent years there have been a high proportion of 14" portable TVs sold, peaking at about 50% of the total annual sales. However the trend now is towards larger TVs in the 25"-29" range, and the proportion of TVs in the living room that are less than 17" is declining from a level of 45%.

Italy is typical of southern European countries in that there are less soft furnishings in the living room compared with northern Europe. Climatic conditions tend to favour a greater use of tiles providing in general a less flammable environment in which to place a TV.

2.10.2.3 Sales TVs and future trends

Colour TV	% of retail sales	Trend
14"	36%	Static
20"-21"	18%	Increasing (mono), decreasing (stereo)
27"-29"	17%	Increasing
Other	29%	Decreasing
Total	100%	

Colour TV	% of retail sales	Trend
Normal screen	51%	20"/28" mono increasing, others decreasing
Flatter squarer screen	49%	Increasing
Total	100%	

Colour TV	% of retail sales	Trend
Mono	71%	Increasing
Stereo	29%	Decreasing
Total	100%	

Source: GfK Italy, manufacturers

The overall condition of the Italian market is static, but a growth in the sales of larger screen sets indicates a growth in the value of the market.

2.10.3 The number of TV fires and associated fatal/non-fatal accidents

2.10.3.1 TV fires and fatal/non-fatal accidents

	Estimated number of accidents per year	Number of accidents per million TV
Total TV fires	435	15.5
Non-fatal injuries	n/a	n/a
Fatal injuries	negligible	negligible

Source: Interviews with Turin polytechnic, fire brigades.

2.10.3.2 Total TV fires

	Estimated population millions	Total estimated fires per annum	Estimated fires per million units
TVs	28.0	435	15.5
Videos/satellites, etc.	8.3	n/a	n/a

Source: GfK-Italy, ANIE.

	Population	Estimated population of TVs	Number of house fires per annum	TV fires per annum(per million TVs)
Turin Fire Brigade	4,000,000	1,930,000	1019	45 (23.3)
Florence Fire Brigade	1,500,000	739,000	1163	23 (31.1)

Source: Fire brigades.

Turin Polytechnic issued a report in 1987 that analysed 17,000 call out reports by Turin Fire Brigade, of which 1,019 fires were in houses. 614 cases identified the cause (340 electrical and 405 non-electrical) and 405 did not identify the cause. 39 of the cases where the cause was identified, involved TVs and it is reasonable to assume that a similar proportion of the fires where the cause was not identified also involved TVs, which suggests an estimated 65 TV fires happen each year. The population of the Turin Region that was covered by the sample was about 4 million inhabitants, which represented 1.4 million households, and 1.7 million TVs (1.2 TVs per household).

Turin Polytechnic's view was that whilst no additional research had been undertaken since 1987 the trend in TV fires was likely to follow that of the rest of Europe (i.e. falling) since no special issues set the Italian market apart from other European countries.

Turin fire brigade considered that whilst there was no dramatic change in the overall number of house fires, TV fires were likely to have fallen in line with the rest of Europe. Currently the population of TVs in Italy is 28.0 million; i.e. 1.38 per household. The number of TVs in Turin is estimated at 1.93 million. Assuming the number of fires to have fallen in line with the rest of Europe, about 30%, since the original 1987 report was drafted, the expected number of TV fires is 45 per annum. Of these 45 fires 30-40% would be small fires that do not spread from the TV suggesting that the figure is 30 fires per year, i.e. 15.5 per million TVs for 1994.

Florence fire brigade has an average total number of call-outs of 14263 per annum, of which 3878 are fires. About 30% of these fires are house fires; i.e. 1163. Over the last 4 years an estimated 2% of house fires were considered to have been TV fires, i.e. an average of 23 TV fires per annum. The population of the Florence region covered by the fire brigade is 1,500,000. Using estimates of 2.8 persons per household and 1.38 TVs per household, 31 TV fires occur per million TVs per annum. However 30-40% of this figure is excluded because it is thought the primary source of ignition was not the TV, or the fires were small, not producing smoke and flames beyond the TV. The estimate is thus reduced to 20 TV fires per million TVs per annum.

The two cities identify about 16-20 TV fires per million TVs, and 15 TV fires per million TVs per annum is used in this analysis in order to remain slightly conservative which give an estimated 420 TV fires per annum with an associated error of -10% +50%.

2.10.3.3 Total non-fatal/fatal accidents

There is no central data held on non-fatal/fatal injuries and the available information held by fire brigades and manufacturers is considered insufficiently accurate to give meaningful estimates.

2.10.3.4 Timing of TV fires

No information was available.

2.10.4 Trends in TV fires and accident rates

The respondents' views were that the trend is downward and would tend to reflect the situation in the rest of Europe given that the market is dominated by 3 of the top 4 manufacturers to be found throughout Europe.

2.10.5 Nature and severity of TV fires

The Turin Polytechnic report notes that the fire can spread rapidly within the TV set due to the large amount of combustible materials used in TVs. Furthermore, the thermoplastic materials that are frequently used in the TV frame means that the fire can rapidly progress beyond the TV into the surrounding room, if the fire is not contained at its prime source of ignition.

16 of the fires in the Turin polytechnic report were investigated in depth, identifying the manufacturer, the type of equipment, and age of the TV. The key data is highlighted in the following table.

Manufacturer	Type of TV		Age in years	People present at time of fire		Est. damage to property £'s
	B&W	Colour				
Company A	yes		2	yes		£2,000
Company A		yes	dk	yes		£4,000
Company A		yes	5		no	£4,000
Company A		yes	dk	yes		£8,000
Company A		yes	5	yes		£2,000
Company A		yes	7	yes		£2,000
Company A		yes	10		no	£2,000
Company B		yes	6	yes		£30,000
Company B		yes	dk		no	£4,000
Company B		yes	10	yes		£8,000
Company C		yes	10		no	£4,000
Company D	yes	yes	15		no	£40,000
Company E		yes	10	yes		£20,000
Company F		yes	10	yes		£1,000
Company G		yes	6	yes		£4,000
Company H		yes	6		no	£1,000
Total	2	14		10	6	£136,000

Source: Turin Polytechnic report.

2.10.6 The key factors affecting the frequency and severity of TV fires

Italy like most southern European countries tend to use less soft furnishings in the home. This in turn means that TV fires are less likely to lead to extensive damage beyond the immediate surroundings of the TV.

2.10.7 Main components causing TV fires

TV manufacturers and suppliers in Italy suggest that solder joints in the power supply circuit, and the fly-back transformer (also known as the line output transformer), should be considered as high risk areas for potential sources of ignition. In line with measures taken throughout Europe, one local manufacturer is said to have made improvements through:

- a) the use of eyelets in the circuit board and better soldering techniques.
- b) the use of higher quality components in high risk situations. These components would have higher specifications than previously demanded.

Other causes of TV fires included the stand-by controls, which was thought to be a potential source of malfunction but this was not supported by any specific examples. Cathode ray tubes imploding within the TV were also mentioned. If the interrupter switch (also known as an overload protection switch), fails to operate, it is thought that a fire could develop, even with the TV switched off as long as it were connected to the mains.

2.10.8 Known recalls of TV or associated appliances

It is understood that certain TVs have been recalled within the last 5 years. The fault was in a mains switch.

2.10.9 Recent safety measures and future trends

One manufacturer in Italy expressed the view that the use of flame retardant materials was still an acceptable solution to counter the potential risk of fire in TVs. The issues of recyclability and emission of toxic gas during a fire was not considered important at this time.

2.10.9.1 Safety promotions

None known.

2.11 LUXEMBOURG

2.11.1 Legislation

There are no purely national standards for Luxembourg. Only European directives alone are implemented to cover TVs. The Low Voltage Directive and its amendment have been fully implemented in line with the time scale demanded. There is no requirement for additional safety legislation concerning any potential fire risk posed by TV fires in Luxembourg.

2.11.2 The number of TV fires

No details were available.

2.11.3 Known safety measures

None known.

2.12 NETHERLANDS

2.12.1 Legislation

The Netherlands has implemented the Low Voltage Directive 73/23/EEC and the amendment 93/68/EEC in full with no special conditions applied to cover any exceptional circumstances relating to fire risk in TVs. The certification authority KEMA in the Netherlands works very closely with CEBEC in Belgium, implementing the standards and certification of electrical products. Since there are no major manufacturing plants for TVs in the Netherlands, CEBEC has taken on role of type certification for this product group which is then, by arrangement, applicable to the Netherlands. There is no awareness of any specific plans to introduce further legislation to reduce the risk of TV fires and fires in ancillary equipment beyond that already covered by EN 60065.

2.12.2 Ownership of TVs, sales and related trends

2.12.2.1 Ownership of TVs and future trends

There are currently thought to be about 10.1 million TVs in the Netherlands. 6.3 million households have an estimated 1.6 TVs per household. Whilst in the Netherlands TV ownership per household is relatively high, it is unlikely to grow in the short term because, in the cities particularly, there is a growing tendency towards single-person dwellings. It is noted that in north Amsterdam the population has fallen from 90,000 to 80,000 but the corresponding number of households has increased by 5,000.

2.12.2.2 Location of TVs in the household

Room	%
Living room	60%
Bedroom	20%
Children's room/TV room	5%
Other - study, 'summer house', caravan, houseboats etc.	15%
Total	100%

Source: face-to-face interviews

60% of all TVs are thought to be located in the living room, i.e. more than 96% of household that own just one TV will site it in the living room.

2.12.2.3 Sales of TVs and future trends

TV sales in 1994 were estimated as being 892,000 which was up 5% on the 1993 figure. Since 1989 the annual sales turnover has grown by 15.8% or an average of 2.6% per annum, the total market being almost 100% colour TVs. The year-on-year increase in video recorders is 4.7%: total sales being 534,000 per year.

The percentage splits are as follows:

Colour TV	% of retail sales	Trend
14"	26.6%	decreasing 1%
20"-21"	33.5%	increasing 1-2%
27"-29"	13.8%	increasing 1-2%
Other	26.1%	decreasing 2%
Total	100.0	

Colour TV	% of retail sales	Trend
Normal screen	33.1%	decreasing 1%
Flatter squarer screen	66.9%	increasing 1%
Total	100.0	

Colour TV	% of retail sales	Trend
Mono	51.2%	decreasing 0.2%
Stereo	48.2%	increasing 0.2%
Total	100.0	

Source: Gesellschaft für Konsumer- Handel- und Absatzwirtschaftsforschung (GfK, Benelux)

2.12.3 The number of TV fires and associated fatal/non-fatal accidents

2.12.3.1 The number of TV fires and fatal/non-fatal accidents

	Estimated number of accidents per year	Number of accidents per million TV
Total TV fires	124	12.9
Non-fatal injuries	15	1.5
Fatal injuries	0.8	0.08

Source: Interviews with Central Bureau of Statistics and fire brigades.

Professional and volunteer fire brigades in the Netherlands cover 630 districts. Of these 590 participate in the data collection scheme on which this analysis is based.

2.12.3.2 Total TV fires

	Estimated population of appliances in 1994, in millions (Av. 1990-1994)	Total estimated TV fires in 1994 (Av. 1990-94)	Estimated frequency of fires in 1994 per million appliances (Av. 1990-1994)
TVs	10.1 (9.6)	110 (124)	10.9 (12.9)

Source: Interviews with Central Bureau of Statistics, GfK and fire brigades.

The statistics were compiled for 5 years between 1990-1994, during which period it is assumed that the population of TVs in the Netherlands has increased from 9.0 million in 1990 to 10.1 million in 1994, and the average is taken to be 9.6 million.

	1990	1991	1992	1993	1994	Average
Total number of house fires	7556	8139	7588	7750	7420	7691
House fires caused by TVs	110	153	181	158	130	146
Adjusted estimate (-15%)	94	130	154	134	110	124
Estimated number of TVs	9.0	9.3	9.6	9.9	10.1	9.6
TV fires per million TVs	12.2	16.5	18.8	15.9	12.9	15.2
Adjusted estimate (-15%)	10.4	14.0	16.0	13.5	11.0	12.9

Source: Central Bureau of Statistics.

The analysis is based on the statistics produced by the Central Bureau of Statistics (CBS). The data in turn has been collected from the Dutch district fire brigades. This data covers about 90% of all the 630 districts. Adjustments have been made to take into account:

- a) the shortfall of 10% in the area covered by the statistics.
- b) returns relating to TV fires are thought to be overestimated by approximately 15% with the inclusion of fires caused or developed by accelerants.

Also, in order to meet the definition of a TV fire, applicable to this report, the average figure is reduced by 10% to allow for small fires that self extinguish or do not encroach on the environment. The net overall reduction is therefore 15% and this is applied to the CBS figures to show the average number of TV fires as 124 per year, and the 1994 figure as being still lower at 110 TV fires per year. These figures are used in this section of the report and are shown in the table above. The associated error is -10% +10%.

The peak in 1992 coincided with KEMA's investigation into standby units on TVs and it is thought that publicity surrounding that study may have led to more TV fires than normal to be registered with the fire brigades at that time.

	1990	1991	1992	1993
Newspaper cuttings of TV fires	41	32	70	68

Source: Dutch Consumer Safety Unit

A specialist organisation, *Krantenknipselregistratie*, recorded a number of articles between 1990 and 1993 about TV fires and produced details for the Dutch Consumer Safety Unit. It is thought that the newspaper clipping service does well by collecting about 50% of all TV fires in the Netherlands, considering that nearly 90% of all TV fires are classified by the fire brigades as 'small'. This information indicates that there are about 100-110 TV fires per year; the same order of magnitude as the CBS data. The *Stichting Consument en Veiligheid* provided the 68 cuttings for 1993, which were analysed to give some useful information about the cause and severity of TV fires.

2.12.3.3 Total non-fatal/fatal accidents

	Average number of injuries 1990-1994	Number of injuries per million TVs
Non-fatal injuries recorded by CBS	18	1.8
Non-fatal injuries CBS (adjusted)	12.6	1.3
Non-fatal injuries recorded by PORS	3	0.3
Fatal injuries recorded by CBS	0.8	0.08
Fatal injuries CBS (adjusted)	0.6	0.06

Source: CBS, *Stichting Consument en Veiligheid*.

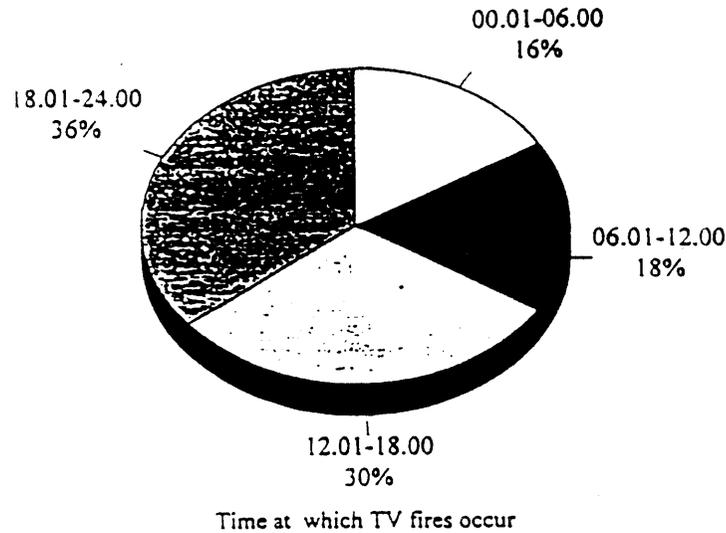
The Central Bureau of Statistics database showed 90 non-fatal injuries (18 per annum) over the last five years, and 4 deaths (0.8 per annum). It should be noted that the reports submitted by the fire brigades to CBS cover a period up to 48 hours after the attendance at the fire and therefore provide a reasonably reliable statistic regarding numbers of hospitalised injuries. However, included in these figures will be cases which may be the result of a TV fire or implosion, but where the primary source of the fire was something else. Also injuries sustained in non bona fide fires (i.e. those involving candles accelerants) may also be included. The CBS data is therefore adjusted down to take account of this, reducing the CBS figure by 30% to 12.6 per annum.

The *Stichting Consument en Veiligheid* (Consumer Safety Unit) conducted a search of its PORS database for the last 10 years. During last five years (1989-1994) there are no records of any injuries caused by TV fires in PORS, but 2 cases are recorded in the *Brandwondenregistratie* (which is data supplied by the 3 specialist burns units in the Netherlands). During the previous five years (1984-1988) there were 3 cases of injuries caused by TV fires registered by PORS. Hence over the 10 year period, the average number of injuries in TV fires is 0.3 per annum for the PORS hospitals. This equates to 3.0 per annum for the Netherlands as a whole, since the PORS hospitals represent about 10% of the country's hospitals with accident and emergency units. The reason why this figure is lower than the CBS estimate is probably due to the recording of TV fires under electrical appliances in PORS (there is no category for TV fires), whereas the fire brigades' reports have a specific section for TV fires.

By taking into account the two methods of arriving at the total numbers of injuries, Sambrook estimates that 12.6 non-fatal injuries per annum is realistic and possibly slightly

conservative. Applying the same process to fatal injuries, Sambrook estimates these as 0.6 per annum: i.e. 0.06 per million TVs per annum.

2.12.3.4 Timing of TV fires



Source: Central Bureau of Statistics.

36% of TV fires occurred between 18.00 and midnight, and 42% of injuries occurred during this same period. However 50% of the fatalities occurred in the six hours between midnight and 06.00, when only 16% of fires started.

2.12.4 Trends in TV fires and accident rates

The CBS data, adjusted by Sambrook, shows that there are on average 124 TV fires per year, having risen from about 94 TV fires in 1990 to a peak of 154 TV fires in 1992. The trend is downward with a fall of nearly 30% in the number of TV fires reported in the two years since the peak. However the level of injuries has remained fairly constant at about 15 per annum over the last four years, showing no sign of change in the short term.

2.12.5 Nature and severity of accidents

	Estimated number of incidents per annum	Number of incidents per million TV population	Estimated % of total TV fires
Fire restricted to the TV	37	3.85	30%
Fire extended to the environment and causing damage to property	75	7.80	60%
Fire extended beyond TV and causes extensive damage to the property	12	1.25	10%
Total	124	12.9	100%

Source: Central Bureau of Statistics (CBS), interviews with fire brigades.

The previous table shows the average incidents over the 5 years 1990-1994, when it was assumed that the average population of TVs was 9.6 million. The severity of fires is a qualitative estimate given by fire brigades. More than half of the fires are thought to spread beyond the TV set and cause damage to property surrounding the TV. However, all of these are still classified as 'small fires' by the fire brigades. Less than 10% are thought to be large fires spreading throughout the whole property and causing extensive damage, or occasionally, total destruction of the dwelling.

	1990	1991	1992	1993	1994	Average
Total number of TV fires	110	153	181	158	130	146
Total damage caused by all TV fires (Hfl millions)	4.15	4.72	5.57	5.49	4.29	4.84
Average cost of damage caused per TV fire					Hfl 33,150 (£12,750)*	

note: *£1 = Hfl 2.6

Source: Central Bureau of Statistics (CBS).

Over a 5-year period (1990-1994) there have been an average of 7,691 house fires per year, causing an average of Hfl 21,250 (£8,175) damage per house fire. During the same period, CBS recorded an average of 146 TV fires per annum (124 per annum Sambrook adjusted estimate), causing total damage of Hfl 4.84m per year; i.e. Hfl 33,150 (£12,750) per TV fire. This suggests that TV fires generally cause approximately 50% more damage than the average fire in a house. This is consistent with the fire brigades' view that once TVs catch fire, the flames can readily spread beyond the TV to the surrounding environment because the TVs are often close to flammable furnishings in the living room.

2.12.6 The key factors affecting the frequency and severity of TV fires

The key factors affecting the frequency of fires in the 1980s are thought to have been:

- a) Poor design of circuit layout in early TVs.
- b) Lack of complete understanding of the effects of electromechanical stress and ageing in solder joints as regards joint failure and arcing.
- c) Consumer ignorance, for example, having TVs built into wall units and cupboards, thereby restricting ventilation and increasing the risk of fire due to overheating.

The severity of fires was viewed in different ways by the fire brigades and manufacturers. The sequence of events that fire brigades describe in the development of a fire involves the ignition of dust which could have built up in older TVs over a number of years. The manufacturer, on the other hand, sees the potential risk coming from arcing in crystallised solder joints creating heat which in turn causes a breakdown in plastic components. This breakdown releases gases, which then ignite allowing the fire to take hold.

2.12.7 Main components causing TV fires

The main causes of TV fire is considered to be:

Solder connections Poor or crystallised solder connections in the high power side of the TV are considered to be the main sources of arcing, which can in turn lead to an ignition. Arcing in these joints is thought to account for possibly 60-80% of primary ignitions in TV sets that catch fire.

On/off switch Mains switches of 15 years ago gave rise to problems where the unit was connected to the circuit board by wires. Repairs were carried out at the time as and when failures occurred but the experience brought about a design change that incorporated the switch onto the main board.

Mains filter The mains filter has been known to break down under abnormal mains supply conditions. The solution was to use a higher specification component at this point in the circuit to cope with a wider range of conditions.

Standby unit/remote control within the TV The fire brigades and technical investigators developed the view in 1991/2 that an increasing number of TV fires was being caused by standby units in TVs igniting and setting fire to the TV housing. This led the test house KEMA, in early 1992, to undertake an investigation of the phenomena. KEMA received approximately 500 calls from the public for further information. About half of these callers reported a fire or primary ignition of some sort in the TV. 250 consumers were then sent a questionnaire to fill in, of which 180 were returned for analysis. In addition to this analysis KEMA also tested a number of products that were on the market, under laboratory conditions, in order to determine how such fires occurred. KEMA's conclusion was that the standby mode was not dangerous.

Manufacturers do not entirely rule out the possibility of standby units failing, and causing TVs to ignite, but they see other areas as presenting a higher risk and have developed programmes to reduce these levels to a minimum.

2.12.8 Known recalls of TV or associated appliances

One supplier is thought to have withdrawn product from the Dutch market, but there is no confirmation that a full and total recall programme was undertaken.

2.12.9 Recent safety measures and future trends

10 years ago the preferred solution to the problem of TV fires was to eliminate flammable material and introduce fire retardants to the areas of highest potential risk. This has now been recognised as only one of a number of alternatives. The current thinking by the International Electrotechnical Committee (IEC) is to reverse this trend and, under some pressure from the environmental lobby, form a policy that acknowledges the potential risk of fire, but that restricts the spread of fire by isolating components spatially within the structure of the TV.

Even given the increased power demands of the high quality, multi-functional TVs at the top end of the market, manufacturers see an overall downward trend in power consumption for standard TVs which is expected to result in an even lower risk of fire. In the fully powered state acceptable power levels are seen as being:

Type of TV	Power consumption
Portables	50 watts
Standard 50-54 cm (20"-21")	80-110 watts
Large screen 72 cm (29"+)	140-180 watts

and the associated standby levels being 5-15 watts.

There is also a better understanding of the relationship between the thermal coefficients of components and connectors which must be balanced in order to avoid a build up of energy i.e. heat in the circuit. This now appears to form an integral part of the thinking at the design stage of a TV.

Another comment that was made by one of the fire brigades was that it should not be too difficult, in product development, to incorporate a smoke alarm into the TV housing that would alert owners at a very early stage to the potential development of a TV fire.

2.12.9.1 Safety promotions

In 1994, Den Haag undertook a local PR exercise for the Den Haag citizens, following discussions with two other major fire brigades (Rotterdam and Amsterdam). The safety promotion consisted of PR promotion of TV news programmes, radio programmes, and articles in the newspapers. PR officers also talked to people that had experienced a TV fire. Over 1,000 people contacted the Den Haag fire brigade for information in a 2 year period, following the safety campaign.

2.13 PORTUGAL

2.13.1 Legislation

The Portuguese legislation concerning electrical safety for low voltage equipment (TVs) is covered by the Decree-Law 117/88 of the 12th April which put into force the European Low Voltage Directive 73/23/EEC. All manufacturers and importers of TV sets, remote controls, VCRs and other similar equipment must comply with EC norm EN 60065 and produce a signed letter with the certificate of compliance. Any future changes in legislation will be in line with EC directives.

2.13.2 The number of TV fires

No data, identifying the number of domestic fires caused by electronic consumer products, was identified, and respondents interviewed doubted if such data exists.

However, the Instituto do Consumidor was able to interrogate its EHLASS database, and identified 7 cases of injuries caused by TV fires for the 8 year period 1987-1994, i.e. an average of 0.9 non-fatal accidents per annum. The EHLASS hospitals in Portugal are thought to represent about 5% of the population, which would indicate that there are an estimated 18 non-fatal injuries per annum throughout Portugal. The number of accidents over the last 8 years has remained constant. This represents 4.0 non-fatal accidents per million TV sets, based on 3.0 million households having 1.5 TVs per household.

Although the database (7 cases) is very small, analysis of these cases shows the following.

57% of the victims were male, 43% were female. 4 accidents happened in the living room, 1 in the kitchen and 3 in the 'house' location not mentioned. Three of the cases stated that the TV exploded, and four cases stated that the TV caught fire.

Age	Number of victims (%)
0-17	0(0%)
18-30	3 (42%)
31-59	2 (29%)
60+	2 (29%)
Total	7 (100%)

Injury	Number of victims (%)
Burns	4 (58%)
Burns/fracture	1 (14%)
Smoke	1 (14%)
Cuts/abrasions	1 (14%)
Total	7 (100%)

Source - EHLASS.

Two of the victims were hospitalised (an 81 year old with burns and fractures from a fall, a 25 year old with burns from the imploding/exploding TV), one victim with burns was referred to an external consultant, three victims were given initial treatment and then discharged, and one victim was referred to her GP.

2.13.3 Known safety measures

None identified.

2.14 SPAIN

2.14.1 Legislation

Spain does not operate any systematic physical controls or checks on TVs, because fires and explosions in TV sets are not considered to be a problem area of any significance. The EEC directives and norms have been adopted and manufacturers and importers are required to comply with them.

2.14.2 The number of TV fires

No details available.

2.14.3 Known safety measures

None known.

2.15 SWEDEN

2.15.1 Legislation

On the 1 January 1995 a new Swedish inspection procedure for electrical equipment came into force in the form of the National Electrical Safety Board Regulations, ELSÄK-FS 1994:9. The inspection procedure is based on the EC Low Voltage Directive, LVD 73/23/EEC and the revision that was made through the general supplementary directive 93/68/EEC. In Swedish legislation the interpretation of the directives take the form of the Electricity Act, the electrical ordinance and the National Electrical Safety Board's electrical equipment regulation.

During the transitional period 1995 and 1996, the earlier ELSÄK-FS 1993:14 and the new ELSÄK-FS 1994:9 are alternatives for each other. However only one of the alternatives may be implemented and that must be implemented in full. After the 1st January 1997 only ELSÄK-FS 1994:9 will apply.

ELSÄK-FS 1994:9 requires a manufacturer's declaration of conformity and associated technical file, an assurance of internal production control, and CE conformity marking for a product to be placed on the market.

ELSÄK-FS 1993:14 (valid only until the end of 1996) requires a manufacturer's declaration of conformity and associated technical file assuring compliance, or SEMKO's 'S' mark, or certification from a notified body.

According to the Swedish electrical equipment ordinance all electrical equipment shall comply with *good engineering practice in safety matters in force within the EU/EEA*. Briefly, neither persons, nor domestic animals, nor property shall run the risk of being injured or damaged because correctly installed, operated and maintained electrical equipment proves to be dangerous. Danger shall not arise through the contact with live parts, inadequate insulation, mechanical defects, fire or the inability of the material to withstand the climate. A product shall also be capable of withstanding all predictable stresses to which it could be subjected, such as overloading, if other faults should occur.

2.15.2 Ownership of TVs sales and related trends

2.15.2.1 Ownership of TVs

There are 6.5 million TV sets in Swedish households. The total population of TVs is probably around 7.5 million, if TV sets in hotels, airports, hospitals, jails and other institutions are included. There are 4.1 million households in Sweden having an average of 1.5 TV sets per household.

2.15.2.2 Location of TVs in the household

Room	%
Living room	65%
Children's room/TV room	10%
Bedroom	10%
Other - study, 'summer house', kitchen etc.	15%
Total	100%

Source: Interviews with respondents

Since the early 1990s there has been a reduction in the number of TVs located in confined spaces such as on bookshelves, or in cupboards, reducing the possibility of a fire caused by poor ventilation and consequent overheating.

2.15.2.3 Sales of TVs and future trends

Sales for 1994 were 550,000 units. The sales figure is increasing at 3-4% and it is envisaged that it will reach 600,000 per annum by the year 2000. The estimated life of a TV set is thought to be about 12 years. The sales figures show that TV ownership is therefore only growing very slowly.

The variety, selection, presentation and merchandising of TVs is considered to lag behind the UK. In the TV world Sweden is not considered a trend-setter but more a follower. However, Sweden is a leader in safety matters and ensures that TVs that enter its domestic market are suitable and reach the required levels of safety.

Consumers are purchasing more larger models per year as the main set, whilst sales of the smaller 14" portable models for the children's' room, kitchen, bedroom and the summer cottage, which is very important in Sweden, are static at about 25%.

Colour TV	% of retail sales	Trend
14"	25%	Static
20"-21"	30%	Static
27"-29"	35%	Increasing
Other	10%	Increasing
Total	100%	

Source: Manufacture estimates

2.15.3 The number of TV fires and associated fatal/non-fatal accidents

2.15.3.1 TV fires and fatal/non-fatal accidents

	Estimated number of accidents per year	Number of accidents per million TV
Total TV fires	80	12.3
Non-fatal injuries	20	3.1
Fatal injuries	1	0.15

Source: fire brigades, face to face interviews.

2.15.3.2 Total TV fires

	Estimated population (million)	Estimated frequency of fires per million units	Total estimated fires per annum
TV's	6.5	12.3	80
Videos/satellites, etc.	n/a	n/a	n/a

Source: Swedish Fire Protection Agency, fire brigades, Electrical Safety Board, SEMKO.

City	Population	Households	Estimated number of TVs	TV fires per year	TV fires per million TV sets
Stockholm	704,000	328,000	520,000	10	19.2
Gothenburg	425,000	198,000	314,000	4	12.7
Malmö	260,000	121,000	192,000	2	10.4

Source: Swedish Fire Protection Agency, fire brigades, Electrical Safety Board, SEMKO.

The Swedish Fire Protection Agency identified 16 fires caused by TVs in three major conurbations in Sweden. The population that is covered in these three cities is 1.4 million (16% of the total population). Using this figure of 16 TV fires as the basis, and extrapolating, the total number of TV fires for the whole of Sweden is 101. This is likely to be an over-estimate, because some TV fires are recorded when they are not the prime source of ignition, or self extinguish without developing beyond the TV. The figure is therefore reduced by 20%, to remain conservative, and the estimated number of TV fires is calculated to be 80. This correlates well with estimates given by the Electrical Safety Board and SEMKO who thought that 70-100 fires per year would be a reasonable estimate. The error band is probably -15%+25%.

From 1 January 1995 the Fire Brigades, Electrical Safety Board, SEMKO are seeking to identify TV fires separately. These statistics will become available in 1996, but currently the best estimate is used; 80 TV fires per year.

2.15.3.3 Total non-fatal/fatal injuries

Non-fatal injuries

City	Estimated number of TVs	TV fires per year	TV fires per million TV sets	Non-fatal injuries per year
Stockholm	520,000	10	19.2	7
Gothenburg	314,000	4	12.7	0
Malmö	192,000	2	10.4	0

Source: Swedish Fire Protection Agency, fire brigades.

Neither Gothenburg nor Malmö recorded any incident involving injury, but Stockholm indicated 7 injuries. If this figure is applied to the country as a whole the upper estimate would be 60 cases of non-fatal injury per year. However this figure is reduced by 50% to allow for possible overestimates by the Swedish Fire Protection Agency and the basis of the input is reduced to 2-4 per year, i.e. a total of 20 per year, -15%+70%, for all Sweden.

In more than 95% of cases injury is considered to be derived from the inhalation of toxic fumes, and less than 1%, from burns.

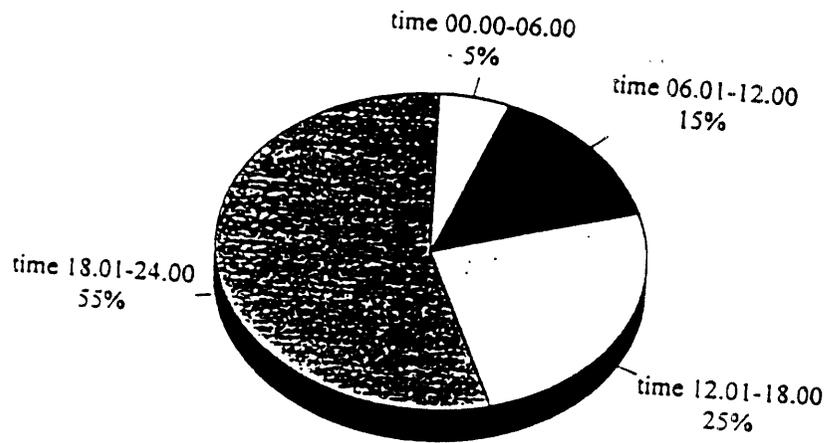
Fatal injuries

City	Estimated number of TVs	TV fires per year	TV fires per million TV sets	Fatal injuries per year
Stockholm	520,000	10	19.2	0
Gothenburg	314,000	4	12.7	0
Malmö	192,000	2	10.4	0

Source: Swedish Fire Protection Agency, fire brigades.

None of the fire brigades reported (through the Fire Protection Agency) any deaths in TV fires. Details of incidences reported in Sweden were taken from press reports. During 1993/4 two reporters from Svenska Dagbladet (the largest Swedish national daily) recorded 10 deaths that were attributed to TV fires, seven deaths in 1993, one incident claiming the lives of a man and his four sons, and they reported another three deaths in 1994. Further investigations indicated that, in each of these two years, only one death was likely to be as a direct result of a malfunction causing the TV fire. The more conservative figure of 1 per year is therefore used.

2.15.3.4 Timing of TV fires



Time at which the TV fire occurred

Source - Electrical Safety Board; SEMKO.

In the absence of precise information about the times of the fires, the previous data is based on respondents' qualitative estimates.

2.15.4 Trends in accident rates

The population of TVs is assumed to have grown between 1980-84 (5.0 million sets), 1985-89 (5.5 million sets), and 1994 (6.5 million sets).

Over this period the number of TV fires is thought to have decreased by about 50%. Since 1989 there has been a major reduction in the number of TV fires, because many of the problems, associated with soldering, were resolved.

Only in 1994 is there a hint that the trend may not be continuing. The new larger sets with additional features require higher levels of power. SEMKO says that the larger sets are using more power and therefore consideration should be given to any increase in potential risks associated with this increased power consumption.

As part of their programme the Electrical Safety Board, (in conjunction with the Fire Brigade, Police Department, Insurance Companies, and SEMKO), has established a model for studying TV fires, in a town called Wällingby. This model is representative of an area of Stockholm equivalent to 3.5% of the Swedish population. Within this area any incidents relating to TV fires is being carefully recorded and investigated. The 1995 report is expected to be produced in early 1996.

2.15.5 Nature and severity of accidents

Nature of fire	% of all fires	Average cost per incident
Fire restricted to the TV	30-40%	SEK10,000-12,000
Fire extended to the environment and causing damage to property	40-50%	SEK50,000-200,000
Fire causing severe damage to the room and property	less than 10%	SEK200,000-500,000
Fire causing major damage to the entire dwelling	less than 5%	SEK500,000-1,500,000
Fire completely destroying the dwelling	less than 5%	more than SEK1,500,000

Source: Fire Brigade, Electrical Safety Board, insurance companies.

When the TV is attended, incidents are most frequently stopped or contained by the viewer who sees, hears or smells the fire. In cases where it is recorded the majority of incidents involve minor damage to the set and surroundings, mostly smoke damage. Based on 80 fires per year the expected loss due to these fires could be set at about SEK 15m-30m (£1.4-2.9m).

2.15.6 The key factors affecting the frequency and severity of TV fires

It is thought by respondents that 70% of incidents occur in TVs more than 6 years old.

Ageing of the components can be a factor, but more particularly the soldered joints, which crystallise and break down are thought to be at fault. SEMKO points out that the life of a set would be twelve years (13,000 hours) under periods of normal use of several hours each day. However sets which are left on from seven in the morning until eleven at night are going to have accelerated ageing, and those sets which are left on stand-by twenty four hours a day could have their life further reduced, exposing themselves to a greater risk of failure.

Plastic casings can increase the rate of progress of a fire when ignited. They can also release toxic gases when burning. An investigation followed by *Svenske Dagbladet* showed that a TV set could turn into a roaring fire in just 2 minutes. Fire retardant materials are being used in TVs to inhibit the spread of fire, but the toxic gases produced when they do burn or char continue to cause an additional potential hazard.

It should be noted that SEMKO says that there is no evidence to suggest that stand-by, VCRs or satellite systems have any detrimental effects on a TV that could produce a fire, nor have they found that dust, in itself, can cause a fire. Also an observation in August 1994 showed that 80 TV sets were damaged by a lightning strike, but none resulted in a fire.

2.15.7 Main components causing TV fires

SEMKO is the organisation that is called to investigate and to discover the origin of all reported TV fires, but frequently the TVs are so badly damaged that it is not possible to

accurately determine the cause of ignition. SEMKO state that whilst several components are suspected, their findings, after investigating hundreds of TV sets, are inconclusive.

In the first six months of 1994 SEMKO investigated the remains of 28 TV sets involved in fires. Of these 28 TV sets:

- 11 were totally destroyed.
- 10 were not considered to be faults in the TV.
- 7 sets had a malfunction.

The most significant causes of fires were:

Solder Joints - SEMKO points out that although it appears that components are causing TV fires the real reason is probably related more to the quality of the soldering. Before 1989 there were cases of arcing between the cracks in soldered joints, and overheating in the power circuits. It is known that solder ages and there is a break down due to crystallisation beneath the surface of the solder, which can usually only be seen by X-ray. The exact reasons for this breakdown are still unclear, and soldering should still be considered a potential risk area. SEMKO suggested that improved soldered connections could be subject to special testing and certification.

Mains Switch - This is a part that can wear out and can develop arcing. The mains switch was the cause of a recall programme which affected some ranges of TVs sold in Sweden. The problem was resolved by replacing the switch in the then current models and introducing a new design. Normally this switch should withstand a slow burn test as specified in the norms. When there is a failure in the switch there should be no spread of fire. If the switch has been located close to heat sensitive plastic or wiring the potential for a fire exists. The positioning of this switch is now therefore carefully studied at the design stage of a new product.

Components subjected to high energy - SEMKO consider that most component related problems have been resolved, but that there is still a risk where high energy levels are present, e.g. in the larger modern TV sets.

Capacitors - The ITTs filter capacitors that were used from 1978-1984 were subsequently found to be unable to withstand the peaks in the mains supply and in the mid 1980s a Europewide recall of 150,000 sets from various manufacturers was undertaken. The problem was resolved by using a more robust component.

Other comments - An additional, non-specific, comment was that the quality of repairs made to ageing TVs might affect the incidence of fires but no data was available to make a quantifiable assessment.

2.15.8 Known recalls of TVs and associated appliances

There have not been any recalls of TV products specific to Sweden, but any Europewide recalls are also thought to have been carried out in Sweden as well.

2.15.9 Recent safety measures and future trends

It has been suggested that the only safe way to switch an unattended TV off is to remove the plug, but the action of plugging and unplugging may just transfer the problem to another component in the power supply chain.

Consumer safety is considered an important priority and all the authorities concerned, Fire Brigades, Electrical Safety Board, Auditing Committee for Electrical Fire Protection, and SEMKO, as well as manufacturers. The establishment of a controlled consumer model (at Wällingby), is expected to define and measure the problem of TV fires more accurately.

The development of wall mounted TVs is thought to offer an important alternative to the standard TV set. These sets do not require a conventional cathode ray tube and thereby avoid the use of certain high voltage componentry.

2.15.9.1 Safety promotions

Specific safety promotions covering TV fires have not been developed by the fire brigades nor by the Electrical Safety Board.

Public awareness of the problem of TV fires is confined basically to the manufacturers' operating instructions, and occasional articles appearing in the press.

2.16 UK

2.16.1 Legislation and safety measures

TVs are governed by standard safety measures across Europe based on EC Directive 73/23/EEC, which is the harmonisation of the laws of Member States relating to electrical equipment designed for use within certain voltage limits. TVs have to comply with this law. 73/23/EEC was amended in 1994 to introduce the CE marking, which is an absolute requirement from 1st January 1997. In addition TVs must conform with the EMC directive by the end of 1995.

Organisations and test houses approve TVs and TV components according to European standards and also carry out factory checks and product checks in the market place. Such bodies operate throughout Europe with reciprocal acceptance of approvals. Such type approval is undertaken by the manufacturers on a voluntary basis.

Non-approved products and components from third party suppliers tend to be cheaper in the UK market, because manufacturing costs do not involve the cost of obtaining test house approvals.

2.16.2 Ownership of TVs, sales and related trends

2.16.2.1 Ownership of TVs per household, location of TVs and their average life

Product	TV ownership by % households in the UK					
	1989	1990	1991	1992	1993	1994
1 TV	98%	98%	98%	98%	98%	98%
2 TVs	34%	32%	34%	35%	36%	36%
3+ TVs	13%	13%	13%	15%	17%	16%

Total number of TVs million	38.6	39.0	39.7	40.2	40.0	40.5
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Source : GfK Home Audit, BARB Establishment Survey March 1989-93, & June 1994

The average number of TVs is 1.8 per household, with growth of less than 1% per annum. The forecast for the next 5 years is similar.

The average life of a TV is estimated at 10 years. The industry believes that most consumers will buy a new set if something goes wrong rather than get it repaired.

2.16.2.2 Location of TVs in the household

About 70-80% of TVs are thought to be in the lounge/living room, with 15-20% in bedrooms and 10-15% in kitchens.

2.16.2.3 Number of colour and black & white TVs in the UK

	1989	1990	1991	1992	1993	1994
Colour TVs million	38.0	38.1	39.3	39.7	39.8	40.4
% households	95%	94%	96%	96%	97%	98%

Black/white TVs million	0.6	0.9	0.4	0.4	0.2	0.1*
% households	3%	4%	2%	2%	1%	<0.1%

Total TVs million	38.6	39.0	39.7	40.1	40.0	40.5
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Note: *The number of black and white TVs is estimated for 1994.

Source : GfK Home Audit, BARB Establishment Survey March 1989-93, & June 1994.

Colour TVs are dominant in the market. It is assumed that households which have a black and white TV have only one. Large screen black and white TVs are no longer available as they have not been made in the 1990s. Portable black and white TVs are still made, albeit in small numbers, and tend to be imported. The main market for black and white TVs now is for close circuit security systems.

2.16.2.4 Number of TVs with Teletext

	1989	1990	1991	1992	1993	1994
TVs with teletext million	5.8	6.9	7.4	8.8	10.7	11.7
% households	27%	32%	34%	40%	48%	52%
% growth per annum		19%	7%	19%	22%	10%

Note: Assumption - 1 TV per household has Teletext.

Source : BARB Establishment Survey March 1989-93, & June 1994.

The minimum number of TVs with Teletext in 1994 is about 11.7 million. The population of TVs with Teletext has risen by an average 15% per annum over the past 5 years.

2.16.2.5 Number of TVs with remote control

	1989	1990	1991	1992	1993	1994
TV + remote control million	15.0	16.5	17.8	19.7	21.7	23.7
% households	54%	59%	63%	69%	75%	81%
% growth per annum		10%	8%	11%	10%	9%

Note: It is estimated 1.3 TVs per household with remote control.

Source : BARB Establishment Survey March 1989-93, & June 1994.

In 1994 the population of TVs with remote control is estimated to be 23.7 million. The number of TVs with remote control has risen on average 10% per annum over the past 5 years.

The consumer rarely turns the TV off at the mains. Most are designed to be used on standby, and it is believed in the industry that many consumers now leave the TV on standby all the time.

2.16.2.6 The number of VCRs

	1989	1990	1991	1992	1993	1994
VCR (video)	11.5	12.7	13.5	14.3	16.0	16.7
% households	54%	59%	62%	65%	72%	74%
% growth per annum		10%	6%	6%	12%	4%

Note: Assumption - households with a VCR have at least one TV.

Source: BARB Establishment Survey March 1989-93, & June 1994.

There is a population of at least 16.6 million VCRs, that has been growing, on average 7.5% per annum over the past 5 years.

2.16.2.7 Cable TV

	1989	1990	1991	1992	1993	1994
All cable million	0.28	0.34	0.41	0.54	0.64	0.86
% households	1.3%	1.6%	1.9%	2.5%	2.9%	3.8%
% growth per annum		21%	21%	32%	19%	34%

Note : the above figures refer to households connected to cable, not homes which are passed by cable.

Source: BARB Establishment Survey March 1989-93, & June 1994.

Cable TV has increased by an average of 23% per annum, directly comparable to the increase in areas with access to cable.

2.16.2.8 Satellite TV

	1989 m	1990 m	1991 m	1992 m	1993 m	1994 m
Satellite	n/a	0.924	1.563	2.434	2.223	2.836
% households	n/a	4.3	7.2	11.1	10.0	12.6
% growth per annum	n/a		+ 69%	+ 56%	- 8%	+ 28%

Source: BARB/ITC.

The population of satellite systems has risen by an average of 36% per annum over the past 4 years.

2.16.2.9 The nature of the market for TVs in the UK

The market for TVs is pan-European with the same or similar models sold throughout Europe. Companies have rationalised their manufacturing plants, reducing the numbers wherever possible, whilst retaining consumer/technical services in each individual country.

Far East manufacturers also produce for European companies, and many of the multiple retail chains. Anti-dumping tariffs have led to a reduction in the proportion of imports from the Far East, although these still account for about 40-50% of the market.

Colour TVs with self tuning and remote control devices have become standard in the UK market incorporating several of the advances in micro-technology that were developed by the computer industry in the 1980s.

2.16.2.10 Current sales by size of TV, and trends

Size	TVs million (%)	% remote control	% Teletext
Small screen up to 17"/portable	1.40 (42%)	90%	80%
Large screen 20"- 25"+	1.46 (43%)	98%	5%
Large screen 26" +	0.5 (15%)		
Total 1994/5 sales (12 months)	3.36 (100%)	95% (3.18m)	36% (1.22m)

Source: GfK, manufacturers.

The market for TVs is considered to have matured, having never recovered from its peak of 4.4 million units sold in 1988, (which was also the period around which most TVs affected by product recalls were sold). Sales of small screen have fallen by 20% from 1.74m TVs in 1994, whilst sales of large screen have risen by 5.5%.

Sales tend to rise and fall with the economy and are forecast to rise by only 1-2% to 3.4 million sets by the year 2000.

Very large screen TVs (26" +) account for 15% of the market, 0.5 million sets per annum. About 25% of current sales are of stereo TVs. DPL (Dolby Pro-Logic) TVs are expected to take 5.5% of the market in 1995, nearly double 1994 sales. However its attraction is limited as many consumers dislike surround-sound TVs and, in particular, the need for extra speakers and cables.

2.16.2.11 The main manufacturers/suppliers

1.2-1.5 million (45%) TVs come from the Far East, e.g. from Malaysia, Thailand, China, Korea, Taiwan, taking at least 40% and perhaps as much as 50% of small screen and 21" sectors of the market. These tend to be cheaper models.

Total UK production approaches 6 million sets of which 60% is exported. The market leader in the UK has sales of about 500,000 TVs per annum. It's UK plant is considered the largest TV factory in Europe, manufacturing about 1 million sets per annum.

2.16.2.12 Future trends in the types of TV and associated products sold

- i) One touch tuning A growing number of manufacturers are now fitting auto-installation systems, or one touch tuning, such that the TV automatically tunes itself to all available stations, and also labels them in order, i.e. with BBC 1 on 1.
- ii) Digital broadcasting The BBC has committed itself to digital broadcasting. However the growth of this will depend on affordable product being developed, and manufacturers are unwilling to invest too greatly until they see it supported by the government, because of the technical, political and financial commitments involved.
- iii) Home cinema The industry hopes that home cinema will help to re-generate the market, although in a niche sector. More than one manufacturer is committed to home cinema TV with wide screen format, and it is predicted that over half of the new TVs will have 16:9 screen formats by the year 2000. One 16" model, selling for under £400, is targeted at the video game market. However the video game market is also in the doldrums, and newly launched consoles will not necessarily revive it sufficiently. Mid-size home cinema TVs are priced around £800-£1000, whilst the very large screen TVs are more expensive at £2000-£2800.
- iv) Wall hanging TVs 20"-50" wall hanging TVs for consumer use are planned for launch late 1996.
- v) Low voltage standby Some manufacturers are trying to reduce power consumption whilst the TV is in the standby mode.

2.16.3 Incidences of fire involving TVs and ancillary equipment

2.16.3.1 The number of TV fires and associated non-fatal/fatal accidents

	Estimated number of accidents per year	Number of accidents per million TVs
TV fires	333	8.2
Non-fatal casualties	25	0.62
Fatal casualties	3	0.07

Source : HASS/HADD records, FDR1 reports 1992.

The FDR1 reports record 436 TV fires per annum, resulting in approximately 25 non-fatal casualties and 3 fatalities. However to relate to the definition of a fire as used in this report the number of 'slight fires' has been taken into account, and the overall number reduced by 20-25% to 333, which is the figure used in this section of the report.

2.16.3.2 The number of TV fires

The overall number of TV fire incidents is rising very slowly. When normalised to give the number of fires per millions TVs, the number is reasonably static at an average of 333 per annum. This equates to about 8.2 fires per million TVs in the UK.

436 TV fires were identified in Home Office statistics/FDR1 1992. Examinations of 107 cases gave 5 where there were exclusions (1.1%) , and the number of fires (436) is reduced to 430. The Fire Statistics Office at Garston, Watford, confirmed that 430 is typical of the number of incidents involving TV fires each year. This was further reduced as described above to give a conservative figure of 333 TV fires per year.

The TV industry perceives that TVs are not the main cause of the fire, except for known product recalls. The industry believes that fire officers remember TVs as being the cause of fires in the past and continue to attribute the cause of fires to TVs, even though the products are considered less likely to catch fire. without an external source of ignition. Based on their own internal investigations of TVs which have caught fire, the TV industry believes that only 1 fire in 10 was actually the fault of the TV, i.e. about 30-40 fires per annum.

2.16.3.3 Trends in TV fires

	1989	1990	1991	1992	1993
Number of TV fires FDR1	421	411	428	430	436
TV fires Sambrook estimates	322	314	327	328	333
Population of TVs	38.6	39.0	39.7	40.2	40.0
Fires per million TVs (based on FDR1 reports)	11	10.5	10.8	10.7	10.9
Fires per million TVs (adjusted for bona fide fires)	8.3	8.1	8.2	8.2	8.3

Source : Home Office Fire Statistics, GfK Home Audit.

The FDR1 records show the number of TV fires is reasonably static at about 11 per million TVs. This figure is adjusted down by 20-25% to give a more conservative 8.2 TV fires per million TVs.

2.16.3.4 VCR fires

A print-out of the cases involving VCR fires for FDR1s 1992 showed a total of 25 VCR fires. 16 cases, (64%) were examined in detail, and 3 were excluded. Probably another 1 case would be excluded if all 25 fires were examined. This gives 21 genuine VCR fires. Only 1 of the actual fires caused non-fatal casualties, and there were no fatalities.

2.16.3.5 Comparison of the number of TV and VCR fires

	TVs	VCRs
Number of fires	430	21
Number of fires Sambrook estimate	333	16
Population of appliances millions	40.0	14.3
Fires per million appliances	10.7	1.5
Fires per million appliances Sambrook estimate	8.3	1.1

Source: FDR1 reports.

This compares the number of TV fires with the number of VCR fires from FDR1 reports and shows the result of adjusting numbers in line with Sambrook estimates.

2.16.4 The number of non-fatal and fatal injuries and trends

2.16.4.1 The number of non-fatal injuries and trends

Based on HASS and FDR1 reports there are at least 23 and possibly as many as 38 non-fatal casualties resulting from TV fires. 25 non-fatal casualties per annum is used in this report and may be slightly conservative.

Method 1 (HASS)

1982-1992	Non fatal injuries	*n.m.f.	Total non-fatal injuries HASS
11 year average	1	23.4	23.4 per annum

note: *n.m.f. is the national multiplier factor

Source: HASS.

The HASS data, which excludes malicious or criminal damage, house fires, accelerants, electrocution, over a 11 year period 1982 - 1992, provided a sample of 11 cases, i.e. 1 per annum. These figures were analysed by calendar year for ease of comparison. Multiplying by the national multiplier factor gives a total of non-fatal casualties of 23.4 per annum.

Method 2 (Home Office Fire Statistics)

Analysis of FDR1 cases involving non-fatal casualties in TV fires showed that there were 7 casualties known to have gone to hospital, and a further 21 people were involved in moderate and severe fires, and it is likely that some (but not all) may have gone to hospital, and 2 were unknown, so that as many as 38 non-fatal casualties, i.e. an average of 23.

It should be noted that the Home Office figures for 1992 indicated that there were 100 non-fatal casualties. 31% were excluded because TVs were not the cause of the fire, and a further 31% were excluded because they were not taken to hospital, declined treatment or were treated at the fire.)

	1989	1990	1991	1992	1993
Number of TV fires FDR1	421	411	428	430	436
Number of TV fires (adjusted)	322	314	327	328	333
Injuries given on FDR1	(76)	(117)	(101)	(100)	(146)
Injuries in bona fide TV fires FDR1	18	27	23	23	33
Non-fatal injuries per million TVs	0.5	0.7	0.6	0.6	0.8

Source: FDR1 reports.

The average number of injuries is 25, i.e. 0.62 per million TVs, but showing a slightly rising trend. The HASS data, however, was erratic and the number recorded was very low.

2.16.4.2 The number of fatal injuries and trends

Based on HADD and Fire Brigade statistics, there are between 2 and 4 fatal injuries per annum resulting from TV fires; 3 per annum is used.

Method 1 (HADD)

1983-1991	Fatal injuries HADD	Total fatal injuries UK
9 year average	1.7	1.8 per annum

Source: HADD.

HADD figures account for all deaths in England and Wales, representing 92% of the UK population. Therefore the HADD figure is increased by 8% for the whole of the UK.

Method 2 (Home Office Fire Statistics)

On average there are 4 fatalities per annum based on Home Office Fire Statistics. Examination of the three fatalities in 1992 showed that they were all genuine cases and involved severe or moderate damage to the property.

	1989	1990	1991	1992	1993
Fatal injuries	5	2	8	3	4

Source : Home Office Fire Statistics.

Examination of Home Office Fire Statistics from 1983 to 1991 indicated that fatalities are very erratic in frequency, and there are no discernible trends.

2.16.4.3 The age of persons with non-fatal and fatal injuries

Age	%
less than 5 years old	13.1%
5-13 years old	8.2%
14-17 years old	3.3%
18-59 years old	39.3%
60+ years old	36.1%
Total	100.0%

Source : FDR1 reports 1992.

There were insufficient numbers to give meaningful results per million population.

2.16.5 Other circumstances relating to the TV fires

2.16.5.1 Type of dwelling

Type of dwelling	%
Terrace	29%
Semi detached	25%
Flat	18%
Detached	14%
House type n/a	8%
Bungalow	4%
Unknown	2%
Total	100%

Source: FDR1 reports 1992, HASS.

47% of incidents occurred in terraced houses and flats.

2.16.5.2 Room in which fire occurred

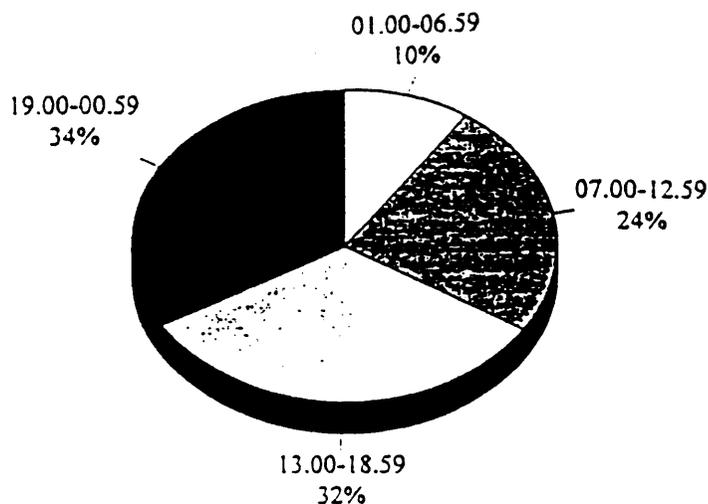
Room	%
Living room	73
Bedroom	16
Kitchen	4
Bedsit	5
Unknown	2
Total	100

Source: FDR1 reports 1992, London Fire Brigade, HASS.

The room of the fire closely reflects where the majority of TVs are located, i.e. in the living room.

2.16.5.3 Time of occurrence of the TV fire

Fire Brigade reports showed that incidents were spread fairly evenly throughout the year, with slightly more incidents in the months November to February. However it is noted that the highest number of incidents in a calendar month were recorded for August in both FDR1 reports for 1992 and the London Fire Brigade database (1993-1995), although no explanation for this was given during the fieldwork discussions.



Time of occurrence of TV fires

Time of day	01.00-06.59	07.00-12.59	13.00-18.59	19.00-01.00
Number of TV fires	17	43	57	59
% of total	10%	24%	32%	34%

Source : London Fire Brigade database, FDR1 records 1992.

Approximately 66% of fire occur between 1 p.m. and 1 a.m., when most people will watch TV at some point.

2.16.5.4 Time of discovery of TV fires

Time of discovery	Cases	%	Comments
Upon ignition	34	35%	4 non-fatal casualties/1 fatal (trying to put it out)
Within 5 minutes	28	29%	6 non-fatal casualties and 1 fatal
5 - 30 minutes	28	29%	12 non-fatal casualties
More than 30 mins	7	7%	3 non-fatal casualties and 1 fatal.
Total number of fires	97	100%	

Source : FDR1 reports 1992.

More than 60 % of fires were estimated by firemen to have been discovered within 5 minutes of the first ignition.

2.16.6 The level and cost of damage

2.16.6.1 The level of damage

	Slight	Moderate	Severe	Total
FDR1 Reports	127 (75%)	30 (18%)	12 (7%)	169 (100%)
Sambrook adjusted figure	89 (68%)	30 (23%)	12 (9%)	131 (100%)

Source : FDR1 reports 1992, London Fire Brigade, total 169 incidents.

The FDR1 reports record the majority of damage (75%) as being slight, although there may be some localised smoke damage. Because this figure possibly includes 30% of fires which do not match the definition of a TV fire used in this report, Sambrook has adjusted the figures as shown in the above table, in line with the adjustments made earlier in this section.

About 23% is then moderate damage and it is mainly limited to the room where the TV is sited, usually with both fire and smoke damage, and smoke damage may have spread for example to an adjoining hall or kitchen.

About 12% of incidents result in severe damage, where usually the whole dwelling or high proportion of it suffers from fire and smoke damage.

2.16.6.2 The cost of damage

The following table is based on 5 incidents plus respondents' views to give a projected total cost, adjusted in line with Sambrook estimates. The total cost to the consumer is thought to be less than £1m per annum.

Extent of damage	Cost to the consumer
Slight	£90,000
Moderate	£348,300
Severe	£451,500
Total	£889,800

The damage of a slight fire was estimated at £400, i.e. the cost of the TV. Based on a total of 333 incidents per annum, the 68% of cases, indicated as slight in the previous section, equates to a cost of £90,000 - £100,000 per annum to the consumer.

Moderate damage would require the replacement of the TV, often also a video unit, together with stand, furniture within the room and any adjacent furniture affected by smoke, carpets, and re-decoration of one, possibly two, rooms. Based on 18% of incidents resulting in moderate damage, estimated at £4000-£5000, this equates to costs of about £348,300 per annum to the consumer.

Severe damage requires extensive replacement and repair to the dwelling, and a figure of £15,000 is used here. Based on 7% of incidents resulting in severe damage, this equates to a cost of about £451,500 per annum to the consumer.

2.16.7 Types of TV involved in fires and the main causes of ignition

22 brands were found to be involved in TV fires. These were as recorded on the London Fire Brigade database, mentioned in interviews with manufacturers/importers, trading standards officers, and other interested parties. Details of TV types that were recorded are given in the appendices.

2.16.7.1 The size of TVs involved in fires

	Number of sets	%
12"/14"	10	6.5%
20"/22"	11	7%
Large screen (25", 28", 32")	3	2%
Unknown	130	84.5%
Total	154	100%

Source: London Fire Brigade database.

The first two numbers in a model number often relate to the size, and the table above shows the number of sets involved by screen size where known.

2.16.7.2 Operational condition of TV at time of fire

	Cases	%
TV set on	29	26%
On at mains	5	5%
On standby	1	1%
TV switched off	1	1%
Unknown	74	67%
Total	110	100%

Source: FDR1 reports 1992, London Fire Brigade.

The available data indicates that the standby unit is a less frequent cause of TV fires than a fully operational TV.

2.16.7.3 The main types of components causing fires in TVs

If a fire starts in a TV set, it was generally agreed by the industry that it would normally mean that a mains or high voltage component had overheated. The causes of fires are shown in the approximate order of importance.

The on/off switch tends to be the main cause of fire. This is the point where the power supply is interrupted. Over time the switch ages and wears, and this can lead to arcing across the contacts.

One leading company recognised a fault with the on/off switch used on its TVs sold in 1986-1988. The company undertook a product recall, but this was only partially effective because not all consumers knew about the recall. It is thought that the overall response covered about 90,000 TVs, which is 18% of the number of TVs thought to contain the particular on/off switch. The faulty switch, of European origin, is estimated to be a potential risk in about 1 in 1000 TVs, i.e. a potential risk of about 500 fires. It was discovered that if the switch was mounted in a certain way such that it was close to the plastic chassis and silicon grease was used as a lubricant, the plastic of the switch could get to a very high temperature (because of bad contact points on the switch). The result is that for a few seconds a very high temperature flame comes out of the side of the switch and punctures a pinprick size hole right through the plastic. If the switch is mounted on a metal platform or if the flame hit metal, nothing happens.

Components such as switches and transformers are tested in the standards to meet a burning requirement and should self-extinguish if they catch fire. However some experts in the industry suggested that other things in the TV may affect their performance, especially if there is greasy air around the TV, for example in a kitchen, or smoke, as these will eventually lay a coating on the switch. Also the lubricant in the switch itself may deteriorate with time.

Soldering of components can also cause potentially dangerous situations. One Trading Standards Office was made aware of a fire in a 14" colour portable TV purchased in December 1994. It was found that the solder on the circuit boards had been overfilled, causing the TV to short circuit. This gave rise to overheating and melting. The trigger switch, which is an overload cut-out switch, was activated to interrupt the power supply to the TV. The TV showed signs of scorching rather than fire, and the incident posed no danger to other items in the room. Similar incidents were noted by other Trading Standards Offices.

Eyelets on the circuit board Where there are mains and high voltage components on a circuit board, solder joints may be weak. One manufacturer includes an extra process for safety reasons, locating the component in a coated soldered eyelet so that the joint is also mechanically strong. This process is believed to be unique to Far Eastern TVs, and not one used by European manufacturers. It is believed that this avoids a potential problem of crystallisation and oxidation that could lead to arcing in the joint.

Relays/contacts These may be a source of potential ignition if left permanently on and where there is a danger of overheating. The PCB should not catch fire. However if the wiring insulation of the component overheats and there is a burning smell from the casing, it can become charred, and consumers may well become alarmed that the TV is about to catch fire. Leaving a TV on standby is not considered a risk by the industry as only a small part of the TV is energised. 5 or more years ago a greater part of the TV was energised in standby mode and consequently there was a higher risk involved.

Power supply unit These units are considered as potential sources of ignition. One major manufacturer has addressed the problem by locating the power supply under the flame

retardant back casing rather than at the front of the TV, where the casing was not fire resistant.

Other comments relating to the spread of fire were:

- a) Since the early 1980s the back casings have mainly been made of plastics, that were not considered to support combustion or the propagation of a fire. In the past casings were fibreboard or chipboard which were more likely to ignite than the plastics used.
- b) Dust is not considered, by the TV manufacturers interviewed, to be a risk factor in the cause of TV fires. Dust build-up was possibly more of a problem in valve sets, where high temperatures caused more significant air flows and movement of dust in the rear of the TVs. In the past there were also large resistors which used to get very hot. In the domestic situation, dust was drawn in onto the resistors, and in some cases the TV caught fire.

The main recorded causes of TV fires

Cause	Number of incidents	%
Short circuit	70	35%
Overheat	24	12%
Electrical fault	18	9%
Component failure	13	7%
Appliance fault	5	3%
Overloaded	3	1%
Insulation failure	3	1%
Unknown	65	32%
Total	201	100%

Source: FDR1 reports 1992, London fire Brigade database, HADD records.

The above table is based on information from FDR1 reports and the London Fire Brigade database along with the views of firemen. Any errors would be resulting from judgements based upon initial impressions at the scene of the fire, rather than the analysis of in-depth technical investigation. HASS records provided no additional information.

The records of the item first ignited

Item 1st ignited	Number of incidents	%
Insulation	65	36%
Component unknown	28	15%
Wiring	21	11%
TV	5	3%
On/off switch	3	2%
Dust	2	1%
Power cable/leads	2	1%
Tripler unit	1	½%
PCB	1	½%
Unknown	54	30%
Total	182	100%

Source : FDR1 reports 1992, London Fire Brigade database.

The above table is based on information from FDR1 reports and the London Fire Brigade database along with the views of firemen. Any errors would be resulting from judgements based upon initial impressions at the scene of the fire, rather than the analysis of in-depth technical investigation. HASS and HADD reports provided no additional information.

2.16.7.4 Safety promotions

Manufacturers technical literature contains safety information, although they have not conducted any safety promotions. An indication of the faults covered by recalls is given in the appendices.

3. APPENDICES

3.1 Details of respondents contacted/interviewed during the project

More than 153 organisations/respondents were contacted/interviewed throughout Europe. Several were contacted more than once to discuss the findings of the research.

Note - an asterisk (*) indicates a face-to-face interview.

Organisation	Contact	Country
FEEI	Mr Bartoschka	Austria
Grundig	Dr Sturtzenbecher	Austria
Grundig	Hr Weinzerl	Austria
ÖVE testing and certification	Mr Martin	Austria
Philips	Dr Resch	Austria
CEBEC	Mr Lana	Belgium
CEBEC certification	Mr Michel Nuyens	Belgium
EACEM	Mr G Nauwelaerts	Belgium
Ministry of Economic Affairs	Mr Herschbuhler	Belgium
Århus Fire Brigade	M Salomonsen	Denmark
Bang & Olufsen	F Wind*	Denmark
Bang & Olufsen	J Christiansen*	Denmark
Bang & Olufsen	K Bjerregaard*	Denmark
Copenhagen Fire Brigade	F Christiansen*	Denmark
Danish Health Board	H Bay-Nielsen	Denmark
Dansk Brandteknisk Institut	O Falkengaard*	Denmark
Dansk Brandteknisk Institut	C Andersen*	Denmark
DEMKO	Mr Stilling	Denmark
DEMKO	O Kristiansen	Denmark
DEMKO	F Andersen*	Denmark
ElectricitetsRaadet	N Rotne*	Denmark
ElectricitetsRaadet	K Jaarby	Denmark
Elektronik Industrie	Mr Gronveld	Denmark
Odense Fire Brigade	P Dansko	Denmark
Philips	J Bochov	Denmark
Sony	E Saaby*	Denmark
National Standards Authority	Mr J D F McKee	Eire
National Standards Authority	Mr Brian Cunningham	Eire
FIMKO	Mr Mattinen	Finland
Communauté urbaine de Lille	Lt. col. Parein	France
Federation National de Sapeur-Pompier	Commandant Schmidt*	France
INSERM	Mme Michel*	France
Marin-pompiers de Marseilles	Capt. Athimon	France
Marin-pompiers de Marseilles	M. Vitay	France
Ministère de l'Interieur, Sécurité Civil	M Huet*	France
Ministère de l'Interieur, Sécurité Civil	M Serviet Crouzat*	France
Ministère de la Santé	M Isnard	France
Ministère de la Santé	Mme C Duval	France
Sapeur-Pompiers. Paris	Capt. Chivot*	France

Organisation	Contact	Country
Sapeur-Pompiers, Lyon	M Joly	France
Sapeur-Pompiers, Strasbourg	Lt. Scherrer	France
SIMAVELEC	Mr Henri Anus	France
SIMAVELEC	Mr Le Ravallec*	France
Thomson Consumer Electronics	M Kreweras*	France
Thomson Consumer Electronics	M Pagot*	France
UTE Institute de Normalisation	Mr Canet	France
Amt für Brand und Katastrophenschutz	Hr Eckerbrech*	Germany
Amt für Brand und Katastrophenschutz	Hr Desenburg*	Germany
Amt für Brand und Katastrophenschutz	Fr Stadtler*	Germany
Berufsfeuerwehr Berlin	Hr Tredup*	Germany
Berufsfeuerwehr Berlin	Hr Siegler*	Germany
Berufsfeuerwehr Berlin	Hr Kassel*	Germany
Berufsfeuerwehr Düsseldorf	Hr Pradel*	Germany
Berufsfeuerwehr Frankfurt	Hr Szimeth*	Germany
Berufsfeuerwehr Hannover	Hr Stenzel*	Germany
EACEM	Dr Lytteke	Germany
Grundig GmbH	Hr Hökberg*	Germany
Grundig GmbH	Hr Rupprecht*	Germany
Institut der Feuerwehr Sachsen Anhalt	Dr Grabski	Germany
Institut der Feuerwehr Sachsen Anhalt	Hr Steinbach	Germany
Landeskriminalamt Berlin	Hr Birlem*	Germany
Polizei Tech. Untersuchungsstelle	Hr Pirsch	Germany
Sony	Hr Ziemann*	Germany
Sony	Fr Peterek*	Germany
Sony	Hr Limbach*	Germany
Statistisches Bundesamt	Hr Lerner	Germany
Statistisches Bundesamt	Hr Henrici	Germany
Stiftung Warentest	Hr Aulitzky*	Germany
Stiftung Warentest	Hr Schwirtz*	Germany
Thomson Television Germany	Hr Scharf*	Germany
Thomson Television Germany	Hr Müller*	Germany
VDE Prüf- und Zertifizierungsinstitut	Hr Disser	Germany
ELOT	Ms Catherine Lianas	Greece
ANIE	Dr Teli*	Italy
Altro Consumo	Ms G Difavire	Italy
Association of Italian Consumers	Mr Bandel	Italy
Association of Italian Consumers	Mr Gaza	Italy
Florence Fire Brigade	Mr M Malechi	Italy
Milan Fire Brigade	Mr Mariani*	Italy
Mivar	Mr Scarabelli	Italy
Servizi Statistici	Librarian*	Italy
Sony	Mr Buscemi	Italy
Turin Fire Brigade	Mr Marco	Italy
Turin Fire Brigade	Ing Inzaghi	Italy
Turin Polytechnic	Ing Tomasini*	Italy
Winterthur Insurance	Mr Tamburini	Italy
S.E.E.	Mr Jean Paul Hoffman	Luxembourg
Brandweer Amsterdam	Mr C Ronner*	Netherlands

Organisation	Contact	Country
Brandweer Amsterdam	Ing J Heukelom*	Netherlands
Brandweer Den Haag	Mr F Lek*	Netherlands
Central Bureau of Statistics Netherlands	Mr Marien de Wit*	Netherlands
GfK Marketing	Mr C Aarden*	Netherlands
Hulpverleningsregio Haaglanden	Ing Steenstra*	Netherlands
KEMA	Mr Kuiphof*	Netherlands
KEMA	Mr Dimmendaal	Netherlands
KEMA	Mr Van Vugt	Netherlands
Philips	Mr E Storm*	Netherlands
Stichting Consument en Veiligheid	Mr P van Ommeren	Netherlands
Institute of Quality Control	Ms Aline Cortez	Portugal
Institute of Quality Control	Mr Candido dos Santos	Portugal
Instituto do Consumidor	Ms Marie do Ceu Costa	Portugal
Ministry of Industry and Energy	Chief of the Cabinet	Portugal
National Institute of Statistics	Ms Emma Fernandez	Portugal
National Institute of Statistics	Ms Katarina Kuhna	Portugal
ANIEL Nat. Association Electronics Industry	Sr E Fernandez Puertolas	Spain
Ministry of Industry and Energy	Sr Portero	Spain
Ministry of Industry and Energy	Sr Reviriego	Spain
Ministry of Industry and Energy	Sr Manuel Lazaro	Spain
Ministry of Industry and Energy	Sr Luis Prieto	Spain
Ministry of Supply Dept of Consumer Rights, Industrial Services	Sr Antonio Muñoz	Spain
Ministry of Supply Dept of Consumer Rights, Safety Services	Sr Oscar Lopez	Spain
National Institute of Statistics	Sr Javier Soto	Spain
Board of Consumer Affairs	Ms Lotta Tanin*	Sweden
Board of Consumer Affairs	Mr Per Olaf Lindstrom*	Sweden
Folksam Insurance Co.	Ms Inge Niborg*	Sweden
National Electrical Safety Board	Mr Ingvar Enqvist*	Sweden
National Electrical Safety Board	Mr Stefan Villa*	Sweden
Nokia	Mrs Garpegard	Sweden
Panasonic Svenska AB	Mr Anders Junson	Sweden
Philips	Mr Lars Alåker*	Sweden
SEMKO	Mr Thorsten Falk*	Sweden
SEMKO	Mr Roger Wikstrom*	Sweden
SEMKO	Mr Fritz Panzer*	Sweden
Sony Sverige AB	Mr Bengt Sonderberg	Sweden
SRL - Suppliers Association	Mr Bo Ridin	Sweden
Stockholm Fire Brigade	Mr Muller	Sweden
Stockholm Fire Brigade	Mr Jan Jonson	Sweden
Svenska Dagbladet	Mr Hans Strandberg*	Sweden
Svenska Dagbladet	Mr Bjorn Hygstedt*	Sweden
Swedish Fire Protection Association	Mr Andreas Fernholm	Sweden
Thorn	Mr Robert Bohlin	Sweden
BEAB	Mr Powell	UK
BREMA	Mr Glover	UK
BREMA	Mr H Peltor	UK
BSI product certification	Mr Robin Tizzard	UK

Organisation	Contact	Country
Cheshire Trading Standards Office	Mrs V Griffiths	UK
Electrical Retailing Magazine	M Casey	UK
GfK Marketing Services	P Oakley	UK
Grundig International	D Bartram	UK
Home Office Fire Statistics Office	R Tomey*	UK
Inchcape Testing Services	M Johnson	UK
Institute of Trading Standards	Mrs B Byeford	UK
London Fire Brigade	Div. Off. C R Mardell*	UK
London Research Centre	Mrs A Davies*	UK
Matsushita Electric (UK)	C Leahy	UK
Mitsubishi Electric (UK)	W Steele	UK
Mitsubishi Electric (UK)	Mr Jacob*	UK
Panasonic (UK)	A Denham	UK
Panasonic (UK)	B Bovonsombat	UK
Sanyo	G Willett	UK
Sony Broadcast & Professional	K Feather	UK
Sony Broadcast & Professional	P Butler	UK
Sony Broadcast & Professional	H Marsh	UK
Staffs Trading Standards Office	I Richardson	UK
Toshiba Consumer Products	R Poppy	UK
West Glamorgan Trading Standards	D Thomas	UK
World fire statistics centre	Mr T Wilmot	UK
World Radio TV Handbook 1995	Mr A Senitt	UK

Interviews indicated by an asterisk (*) were carried out face-to-face. Telephone interviews lasted from 20-60 minutes.

3.2 An overview of the population of TVs in Europe

Country	Households with TV sets %	% of households with TV that also have the following			Average daily viewing (minutes)
		VCR	full cable service	teletext	
Austria	96	55	32	41	134
Belgium	98	41	92	19	168
Denmark	98	42	d/k	d/k	d/k
Eire Republic of Ireland	98	50	35	20	200
Finland	98	59	35	47	130
France	97	52	4	d/k	185
Germany	99	44	34	32	176
Greece	d/k	d/k	d/k	d/k	d/k
Italy	99	29	d/k	23	117
Luxembourg	d/k	d/k	d/k	d/k	d/k
Netherlands	98	57	88	60	143
Portugal	98	46	d/k	d/k	159
Spain	99	46	d/k	d/k	200
Sweden	94	64	38	59	104
United Kingdom	97	67	2	43	211

Source: Marketing pocket book 1995, GfK

3.2.1 Trends in TV and video recorder sales and ownership

	Total market sales 1000 units					
	1989	1990	1991	1992	1993	1994
Austria	410	460	465	480	457	500
Belgium	385	411	400	400	400	368
Denmark	n/a	n/a	n/a	n/a	n/a	300
France	3300	3422	3300	3490	3605	3670
Germany	4050	5050	5610	5750	5420	5480
Italy	2650	3126	2900	2800	2460	2700
Netherlands	770	820	790	866	850	892
Spain	1750	1984	2090	1888	1870	1840
Sweden	n/a	n/a	n/a	n/a	415	457
UK excl. rentals	3206	2692	2585	2813	2858	2937
UK incl. rentals	3750	3259	2962	3117	3285	3342

Total market sales per year - Colour TVs

Source: GfK in Europe.

	Total market sales 1000 units					
	1989	1990	1991	1992	1993	1994
Austria	353	360	320	300	245	255
Belgium	300	300	280	280	268	276
Denmark	n/a	n/a	n/a	n/a	n/a	200
France	1830	2192	2000	2105	2100	2100
Germany	2300	2855	3220	3230	3010	3090
Italy	1200	1493	1400	1250	1210	1230
Netherlands	425	467	513	522	510	534
Spain	850	760	700	722	675	760
Sweden	n/a	n/a	n/a	n/a	250	249
UK excl. rentals	1961	1748	1709	1838	1935	2044
UK incl. rentals	2290	2086	1915	1996	2180	2286

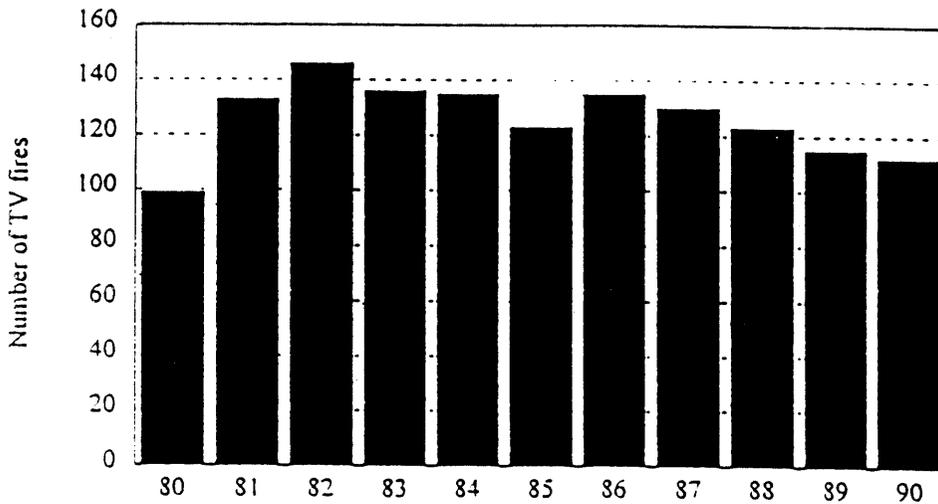
Total market sales per year - Video recorders

Source: GfK in Europe.

3.3 Specific report on the former DDR (East Germany) Länder

Interviews with fire brigades and organisations in the former DDR provided data which was specific to the period prior to unification with West Germany and was therefore suitable for separate analysis. The details provided below show a slower downward trend than for West Germany and a higher rate of occurrence of TV fires than for the EC as a whole.

In the early 1980s, the Institute of Fire Brigades in Sachsen-Anhalt, former East Germany, undertook a study of fires in TVs.



Number of TV fires reported by Institut der Feuerwehr (former DDR)

In the 11 years that records were analysed it can be seen that there was a peak in the number of fires in 1982 of 142 cases. The 15 months from January 1982 to March 1983 was researched as a project of special interest to the authorities. During this period there were very few imported TVs from the West on the market, and more than 98% of the incidents relate to products manufactured within the communist bloc and in particular sets made in the Soviet Union. The former DDR had a significant problem with colour TVs that persisted through the 1980s, but showed a tendency to decline by 1990. No data is available on deaths and injuries for that period, however today the situation is considered to be better and more in line with Germany as a whole, the reason being that the old unreliable sets had a relatively short life, less than 10 years, and are being replaced with more reliable sets that incorporate new technology. At that time the Institut der Feuerwehr analysed, by region, 154 cases which were considered to be bona fide TV fires. The results were as follows:

Regions	Population	Estimated population of all TVs	Estimated population of colour TVs	Number of TV fires	Number of TV fires per million TVs	Number of TV fires per million colour TVs
Berlin (east)	1,185,533	474,000	190,000	6	12.66	31.58
Cottbus	883,924	353,000	141,000	3	8.5	21.28
Dresden	1,796,347	718,000	287,000	60	83.57	209.06
Erfurt	1,238,628	495,000	198,000	2	4.04	10.10
Frankfurt/Oder	708,958	284,000	114,000	8	28.17	70.18
Gera	743,115	297,000	119,000	13	43.77	109.24
Halle	1,810,022	724,000	290,000	5	6.91	17.24
Karl-Marx-Stadt	1,902,973	761,000	304,000	16	21.02	52.63
Leipzig	1,392,858	557,000	222,000	9	16.16	40.54
Magdeburg	1,258,977	503,000	201,000	1	1.99	4.98
Neubrandenburg	620,979	248,000	99,000	9	36.29	90.90
Potsdam	1,121,900	448,000	179,000	4	8.93	22.35
Rostock	895,909	358,000	143,000	17	47.49	118.88
Schwerin	591,979	236,000	94,000	1	4.24	10.64
Suhl	549,685	220,000	88,000	0	0	0
DDR Total	16,701,787	6,676,000	2,669,000	154	23.01	57.70

Source: Institut der Feuerwehr, Statistisches Jahrbuch der DDR.

The estimated population of TVs in the early 1980s is based on 98% of households having one TV; less than 2% of households having a second TV. It is estimated that there were 2.5 people per household. 30-50% of TVs were colour. These were considered to be the source of TV fires. The remaining 50-70% of TVs were black and white, with no faults identified.

Cause of fire	%
High voltage parts	36.9%
Zeilentrafo (line output transformer)	21.0%
Other faults	9.5%
Undetermined/totally destroyed	32.6%
Total	100.0%

Source: Institut der Feuerwehr.

The causes of fires were established in nearly 70% of cases, and the major fault was in the line output transformer. It should be noted that the study only revealed faults in colour TVs and no black and white TVs were recorded as faulty. 98 (64%) of the 154 cases involved colour TVs that were less than 5 years old.

Since 1990 the total German market has opened up, and as such has benefited from the availability of new technology. For example one indigenous manufacturer is understood to use western technology and components in its current range to help meet the standards required in the European market as a whole.

3.4 UK sources of information

Home Office - Excellent statistics are available in the UK from the Home Office, showing the number of house fires, and details of how many were caused by TVs. In order to give a more accurate and detailed profile of the fires and equipment involved, FDR1 reports for 1992 involving TV fires with no casualties, with non-fatal injuries and with fatal injuries, were examined.

A search by video recorders (VCRs), satellite and cable TV systems was also made among 1992 FDR1 records. No satellite or cable system fires were found.

London Fire Brigade - the London Fire Brigade provided information from its database of incidents involving electrical and gas driven appliances, which proved most useful in many of the areas of interest in this study.

HASS/HADD - HASS records 1983-1993 and HADD records 1983-1992 were also analysed, although the information was less detailed in terms of the TV and the incident itself.

Face-to-face and telephone interviews The interviews were carried out with TV manufacturers/importers, trading standards officers, testing houses and others.

On-line database search - This was carried out using a word search based on TVs, fires, accidents, product recalls, and also scanning specific databases such as Paperchase. A number of reports on fires in domestic dwellings were found, although there were no individual reports on TV fires. Newspaper and magazine databases were also accessed, and product recalls were found. However these were already known to the Consumer Safety Unit. (A list of known product recalls in the UK is given towards the end of this section).

Sources did not necessarily provide information on all aspects of this study, and therefore the most detailed sources are used in the relevant sections with the source stated. For example most information on the level of damage was contained in the London Fire Brigade database and FDR1s, rather than HASS/HADD.

The following table outlines the number of cases of TV fire examined in each source, and the number of cases excluded, with a reason.

Source	Cases examined	Cases excluded	Reasons for exclusion from this study	Actual cases analysed
FDR1 TV fires 1992	74	0		74
London Fire Brigade	83	3	Deliberate act (2) Accelerant	80
FDR1 TV fires 1992 with casualties	30	5	Accelerant Cigarette Lightening Sheltered accommodation Insufficient detail/dubious	25

Source	Cases examined	Cases excluded	Reasons for exclusion from this study (number of cases excluded)	Actual cases analysed
FDR1 fatal '92	3	0		3
HASS 1983-1993	19	9	Candles (3)	10
			Chip pan (2)	
			Deliberate act	
			Furniture fire	
			Fire elsewhere	
			Insufficient detail/dubious	
HADD 1983-1992	42	23	Communal home (10)	19
			Unknown item ignited (5)	
			Insufficient detail/dubious (3)	
			Fall baby gate/fall (2)	
			Choked on food	
			Accelerant	
			Hot oil	
Total	257	46		211

Sources: FDR1, HASS, HADD reports

Fatalities 1992

Details of the three fatal injuries are given below.

Sex	Age	Time to call fire brigade	TV type	On/off	Item 1st ignited	Cause	Damage	Other
M	69	on ignition immediate	colour	on at set	wiring	insulation failure	severe	tried to put out
M	44	more than 30 minutes	don't know	don't know	wiring	short circuit	severe	
M	76	less than 5 minutes	don't know	don't know	wiring	short circuit	moderate	died before hospital

Source : FDR1 reports 1992.

VCR exclusions

Source	Cases examined	Cases excluded	Reasons for exclusion from this study	Actual cases
FDR1 VCR fires 1992	14	2	Accelerant	12
			Retail outlet	
FDR1 VCR fires '92 with casualties	2	1	Smoking materials	1
Total	16	3		13

Source : FDR1 reports 1992.

3.5 London Fire Brigade

London Fire Brigade database

This information is taken from the London Fire Brigade's records of fires caused by electrical and gas powered domestic appliances between January 1993 and June 1995. There were 80 incidents recorded by Fire Safety Officers involving TV fires and a further 3 incidents where the fires were deliberate (2) or involved an accelerant (1). These are thought to represent about a third of all TV fires attended by the Fire Brigade during that period.

Fatal/non-fatal casualties

There were no fatal or non-fatal casualties recorded during this period.

The main cause of the fire

Cause	Number	%
Overheated	12	15%
Short circuit	10	13%
Insulation fault	2	3%
PCB elec. flow	1	1%
Component fail	1	1%
Overloaded	1	1%
Unknown	53	66%
Total	80	100%

The first item ignited and fire severity

There were no details about the type of component involved. The insulation was usually described as being plastic or PVC. 88% of fires recorded were confined to the TV alone, 12% spread for example to the carpet, furniture, and household effects

Item ignited	Number of incidents	%
Component	17	21%
Insulation	8	10%
Wiring	3	4%
On/off switch	1	1%
Power cable	1	1%
Unknown	50	63%
Total	80	100%

Material responsible for the development of the fire

Material/component	Number of incidents	%
TV casing - plastic 17 - PVC 2 - ABS 1 - conti/fibre board 2 - unknown 1	23	29%
Component/insulation - component plastic 3 - component insul 1 - insulation PVC 2	6	7.5%
Furniture/furnishings	6	7.5%
Unknown	45	56%
Total	80	100%

The type of TV

TV type	Number of incidents	%
Colour	14	18%
Black and white	2	3%
Unknown	64	79%
Total	80	100%

TV size	Number of incidents	%
Portable	7	9%
Mini TV/cassette	1	1%
Unknown	72	90%
Total	80	100%

Three 14" TVs and one 12" TV were mentioned. One TV was noted as having Teletext.

TV switched on/standby/off

Condition of TV	Number of incidents	%
Set switched on	10	13%
On standby	2	3%
On at mains	1	1%
Unknown	67	83%
Total	80	100%

The age of the TV

Age of TV (in years)	1	2	3	4	5	6	7	8	9	10	11	12
Number of TVs	3	4	1	1	6	0	1	2	3	3	0	1

Where known, the age of the TVs that caused the fire was recorded. This varied from 1 year to 12 years, with an average age of 5.6 years. 36% of TVs were less than 5 years old, 48% 5-9 years old, and 16% more than 10 years old.

Details of recorded incidents

80 incidents were recorded and indicated, where possible, the attributed cause of the fire.

Model	Item 1st ignited	Cause	Mainly responsible for the further development of the fire
-------	------------------	-------	--

Company A - 10 incidents

TVs ages unknown 1 colour TV 9 unknown	unknown	insulation 2 component 1 electrics 1 wiring 1 unknown 5	electrical fault 2 short circuit 2 overheating 1 unknown 5	PVC insulation 3 Casing plastic 1 TV casing fibreboard 1 unknown 6
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Company B - 8 incidents

Colour TV	Model 1	unknown	unknown	unknown
Colour TV	Model 1	unknown	unknown	unknown
Colour TV 8 years	unknown	unknown	unknown	unknown
Colour TV	unknown	unknown	unknown	unknown
Colour TV 7 years	unknown	insulation plastic	electrical defect	plastic
Colour TV 10 years	unknown	TV PVC, ABS	insulation fail	beyond TV
unknown	portable	insulation	unknown	unknown
unknown	unknown	unknown	unknown	unknown

Company C - 8 incidents

Unknown 1 year old	Model 2	unknown	unknown	unknown
Colour	Model 3	unknown	unknown	unknown
Colour portable 14" 5 years old	14"	on/off switch	unknown	plastic casing
Colour 14" 2 years old	14"	standby unit ?	unknown	household item
unknown	unknown	plastic bag/grill	overheating	TV casing
unknown	unknown	unknown	unknown	unknown
unknown	unknown	unknown	unknown	unknown
unknown	unknown	unknown	unknown	unknown

Company D - 4 incidents

Unknown 1 year old	50 cm FST	unknown	unknown	unknown
Colour portable 14" 3 years old	Model 4	unknown	unknown	unknown
Colour 2 years old	Model 5	unknown	unknown	unknown
Unknown	unknown	unknown	unknown	unknown

Model	Item 1st ignited	Cause	Mainly responsible for the further development of the fire
-------	------------------	-------	--

Company E - 3 incidents

Unknown	unknown	component fail	overheating	plastic casing
Unknown	unknown	component fail	unknown	insulation
Unknown 1 year old	unknown	unknown	overheating	unknown

Company F - 3 incidents

TV on	Model 6	insulation PVC	PCB	unknown
	Model 7	internal fault	unknown	plastic casing
TV on 2 years old	unknown	mains surge	overheating	insulation

Company G - 2 incidents

Unknown	Model 8	short circuit	short circuit	contiboard casing
Unknown 10 years	Model 9	Insulation	unknown	ABS/plast case

Company - H - 2 incidents

Colour TV on and unattended	Model 10	component fail	short circuit	plastic component
Indiana	unknown	unknown	unknown	unknown

Company I - 2 incidents

Colour	unknown	abnormal electrics	overheating	plastic casing
Unknown	unknown	power cable	overheating	carpet, timber

Company J - 2 incidents

Unknown, left on	22"	abnormal electrics	short circuit	plastic casing
Unknown	unknown	unknown	unknown	carpet, timber

Other single incidents

Company K colour	12"	insulation	unknown	insulation
Company L colour	Model 11	unknown	unknown	unknown
Company M, TV on	unknown	insulation	overheating	insulation/comp
Company N portable	Model 12	unknown	unknown	unknown
Company O, TV on, 8 years old	unknown	unknown	overheating	insulation
Company P	Model 13	component insul	unknown	plastic casing
Company Q, 9 years old	Model 14	component fail	unknown	plastic casing
Company R	unknown	unknown	short circuit	insulation
Company S, colour, standby, 5 years old	Model 15	unknown	unknown	plastic casing
Company T	unknown	wiring in TV	short circuit	TV plastic
Company U 5 years	unknown	unknown	unknown	beyond TV
Company V, colour, left on, 5 years old	unknown	unknown	overheating	cabinet ABS

3.6 UK - known TV recalls

Make	Model/size	Type	Fault	Date
Company D	2 models	20" colour	overheating	sold after 07/92
Company C	1 model	20" probably	on/off switch	08/93 recall
Company C	1 model	20" probably	on/off switch	08/93 recall
Company C	1 model	20" probably	on/off switch	08/93 recall
Company C	1 model	20" probably	on/off switch	08/93 recall
Company C	1 model	23" probably	on/off switch	08/93 recall
Company C	1 model	23" probably	on/off switch	08/93 recall
Company C	1 model	23" probably	on/off switch	08/93 recall
Company D	1 model	25" colour	overheating	sold 05/89 to 05/91, recall 01/93
Company F	1 model	21"	gap in back cover	sold from August 1992, recall 05/93
Company F	1 model	21"	gap in back cover	sold from August 1992, recall 05/93
Company A	13 models	22" colour	soldered joints metal fatigue, risk of scorching	manufactured in 1983-1986, recall 02/93
Company A	9 models	26" and above colour	soldered joints metal fatigue, risk of scorching	manufactured in 1983-1986, recall 02/93
Company A/u	6 models	56 cm colour	soldered joints metal fatigue, risk of scorching	manufactured in 1983-1986, recall 02/93
Company A/u	4 models	66 cm colour	soldered joints metal fatigue, risk of scorching	manufactured in 1983-1986, recall 02/93
Company A	1 model	22" colour	soldered joints metal fatigue, risk of scorching	manufactured in 1983-1986, recall 02/93
Company A	1 model	26" and above colour	soldered joints metal fatigue, risk of scorching	manufactured in 1983-1986, recall 02/93
Company W	1 model	14" portable	on/off switch	sold October 83-86 recall 05/93
Company B	1 model		on/off switch mounting	sold 1986-1988

3.7 Summary of TV fire literature search

A literature search identified 8 sources of information on TV fires, a brief summary of which is given below.

1995 Sweden: SEMKO AB - Undersökning av TV apparate I standby läge. The report, only available in Swedish, covers the testing of a number of popular TVs in standby mode. The findings have been used in the main report

1995 Denmark: DEMKO - TV-Brande. A report written by DEMKO based on laboratory fire tests on 54 TV sets (using a wide variety of brands), many of them very old and in very dirty, dusty conditions. TV sets were set alight by an external ignition source (similar to a fire lighter). It concluded that no specific components (including remote/standby functions which were of special focus in the study) were found to present particularly high risk.

1990-1993 Netherlands: Kranteknipregistratie. The newspaper cutting service in the Netherlands provided, through the Stichting Consument en Veiligheid, records of 211 cuttings in the four year period. The 68 cuttings from 1993 are on record and were used in the study.

1992 Netherlands: KEMA Survey - Televisions on standby are not dangerous. The concern of the Dutch fire brigades regarding standby units was addressed by KEMA in a survey, and series of tests, that concluded that standby units in TVs were not dangerous.

1987 Italy: Turin Polytechnic Report. The report studied electrical fires, including TVs, in Italian households in the Turin area. The overall accident rate was considered to be 51.8 TV fires per million TVs. Based on 25 million TVs at that time the estimated figure was 1295 TV fires per annum. The report also considered data on the situation in Germany at that time.

1978 USA: Fire Incidence in Television Receivers. The report analyses the safety-related incidents reported by 9 manufacturers in the USA between 1970 and 1976. It was published in the Fire Journal - September 1978. The main findings were that the most frequent causes of fires were: i) High voltage power units; ii) Capacitors, cathode ray tubes and deflection circuits.

Netherlands: Fires caused by defective televisions, causes and prevention. A report by J Banke Technical Services, Amsterdam reviewed the possible causes of TV fires and some of the means of prevention. One of the findings of the author was that low price Chinese imports were a cause for concern and possibly as much as 20% of imports should be considered for being banned.

Germany: Literature/advice on avoidance of TV fires. Some German fire brigades, in conjunction with insurance companies have, from time to time, issued leaflets advising on the installation of TVs. The aim is to inform consumers of the dangers of installing a TV in a location that is inadequately ventilated.

CONSUMER SAFETY UNIT

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Television fires

final report

compiled by

The Market Surveillance Board

of

The Danish Electrical Equipment Control Office

Official Translation by DEMKO

(A video tape (VHS) is also available. Please ask for a copy if you need it. (VHS or 8mm!))

1	Introduction	1
2	Planning	2
3	Examination of new tv sets	2
	3.1 Findings of the examination	2
	3.2 Preparation and procedure in the study	3
4	Examination of older tv sets	3
	4.1 Results of the examination	3
	4.2 Preparation and procedure in the study	4
5	Investigations of incorrect usage of tv sets	5
6	Examinations of tv sets carried out by the Danish Fire Technology Institute, DBI	5
	6.1 Examination of outer casing components for fire qualities	6
	6.2 Comparison of fire qualities according to IEC-65 and ISO 5657	6
	6.3 Full-scale burning of tv sets	6
7	Examination of burnt tv sets	8
8	Foreign investigations	8
9	The SKAFOR study (SKAFOR is the insurance companies' organization)	10
10	Conclusions	10
	10.1 Tv sets are not the cause of many fires	10
	10.2 If tv sets catch fire, they can burn fiercely	11
	10.3 Tv sets are electrical appliances with a limited life	11
	10.4 How often do tv sets catch fire?	12
11	Recommendations	12
	11.1 What can the consumer do?	12
	11.2 What can the tv trade do?	13
	11.3 What can the authorities do?	13
12	Annexes	13

1 Introduction

"No explanation was found for the fire, since the house did not have electricity." That is a rather old-fashioned, but authentic quotation from a Norwegian fire investigation report; to judge by today's media, it will soon be possible to reformulate it: "No explanation was found for the fire, since the house did not have a tv set." It has become a widespread belief, found even among professionals, that tv sets are often the cause of fires. This belief is so widespread that perennial anecdotes of exploding tv sets are narrated almost as if the teller had actually experienced such an event.

The present report presents the results of the first major Danish investigation of tv fires. The principal findings of the investigation are:

- * It has not been found that the use of tv sets presents any particular risk of fire.
- * Tv sets burn ^{very} fiercely if they do catch fire.
- * It is possible, however, for consumers and the tv trade to reduce the risk of tv fires by using tv sets with care. A tv set is an electrical appliance and must be treated as such - not as an item of furniture. Do not stand candles or flowers on the set and do not cover it with a cloth.

Tv sets are to be found in almost every home in Denmark: In 1991 there were about 2.75 million tv sets in Denmark, and the average Dane spent more than 2½ hours a day watching tv. In Denmark there were about 0.54 tv sets per head of population. This figure reflects the situation in the rest of northern Europe, and it is exceeded only by the United States with about 0.81 sets per head (source: Danish Yearbook of Statistics, 1994). Tv is thus by far the most widespread and often used large electrical appliance in the normal home.

Fires in tv sets have for several years been the subject of scrutiny by the authorities. In the annual statistics of the National Danish Electricity Council concerning electrical fires, tv sets have for many years been listed among the 10 most frequent causes of fires involving electrical equipment. The Market Surveillance Board has previously conducted minor studies to find out whether for example the standby function in tv sets represents an increased risk of fire. There has also been some international interest in this field.

In none of these investigations has it been shown to be likely that there is any particular risk with regard to tv sets, either from a technical or from a statistical point of view.

This report gives an account of the first major Danish project concerning tv fires. The project was accepted by the Market Surveillance Committee of the National Danish Electricity Council on 10 June 1994. The aim of the project has been to elucidate whether tv sets catch fire more often than other electrical appliances and, if so, to find the causes of this. The project has been co-ordinated with NSS (The Nordic Committee for Co-ordination of Questions of Electrical Safety, appointed by the Nordic Council), where the Swedish Elsäkerhetsverket (Electrical Safety Board) together with SEMKO (Svenska Elektriska

Materielkontrollanstalten, the Swedish Board for Testing and Approval of Electrical Equipment), have conducted investigations forming a complement to the Danish ones. These have been studied, and the conclusions from the investigations have been included in the report.

2 Planning

The original project contained initially a survey of information already available from authorities, centres of knowledge etc, including the organization for the insurance companies, SKAFOR. It became apparent that there was a scarcity of information on tv fires in Danish and foreign authorities etc. The information available had been developed for some other purpose, and only casts restricted light on the subject of the present study. SKAFOR and the individual insurance companies do not record information on each fire in any degree of detail that could help to cast light on the subject of the present study. For this reason, a considerable number of new and older tv sets have been examined. There have also been contacts with various foreign laboratories.

After the above adjustments the project had the following content:

- * Random selection of new tv sets for testing.
- * Examinations of new tv sets.
- * Collection of information from foreign laboratories, authorities etc.
- * Collection of information from SKAFOR.

After discussion at the Market Surveillance Committee of the National Danish Electricity Council on 13 December 1994 it was resolved to expand the study to include the following:

- * Random selection of older tv sets for testing.
- * Examinations of older tv sets.

After discussion at the Market Surveillance Committee of the National Danish Electricity Council on 13 February 1995 it was resolved to expand the study to include the following:

- * Technical fire studies at the Danish Fire Technology Institute (DBI).
- * Full-scale burning of new and older tv sets at DBI.

Investigations have also been conducted with a view to evaluating the consequences of incorrect use of tv sets, for example covering them over and having candles in contact with them.

3 Examination of new tv sets

3.1 Findings of the examination

No faults or deficiencies were found that were of any real importance for safety, or by reference to current regulations.

A number of minor faults and deficiencies were found that were not of importance for safety, including labelling faults, in some of the sets. The suppliers were contacted about these so as to have the faults rectified.

In the investigation it was not found that the standby function of tv sets involves any greater safety risk than in other appliances in our homes which are connected to the mains 24 hours a day (refrigerators, freezers, heating appliances etc).

It was not found that tv sets from the Far East are more or less safe than European sets.

It was not found that cheaper tv sets are more or less safe than more expensive sets.

The detailed findings are enclosed as Annex 1.

Notes on the reproducibility in the tests in IEC 65, 6th edition, §20.2 are enclosed as Annex 6.

3.2 Preparation and procedure in the study

The study was conducted on 49 ordinary tv sets from 21" to 28". After a preliminary market examination the sets were chosen so that most of the makes normally in use were included. Sets were thus included that came from both Europe and the Far East. As far as possible, the sets that have been mentioned in the media as particularly unsafe and the sets that have been involved in fires during the time up to the start of the study have been included.

The sets were examined for their qualities with respect to the fire risk and the most important other qualities with regard to safety.

Before the random selection of tv sets for testing was begun, the tv trade was informed in the periodical Radiobranchen [The Radio Trade] and by articles in the daily newspapers. This helped to eliminate problems in the random selection of tv sets. The selection was mostly made at major tv retailers in Greater Copenhagen.

For the laboratory investigations a separate test report was produced, and this includes the most important qualities. The basic examination followed the lines of the Government Notice on High-Tension Current, Section 101, 6th edition, corresponding to IEC 65, 6th edition. An examination was furthermore carried out on the lines of the 7th edition, which contains individual improvements concerning the requirements for the standby circuits. The laboratory investigations were all conducted at the Testing and Certification Laboratory of DEMKO the Danish Board for Testing and Approval of Electrical Equipment.

4 Examination of older tv sets

4.1 Results of the examination

Apart from dust accumulations, the examination showed that the safety of the sets examined is at an acceptable level. It was, however, found that nearly one-third of the sets have signs of incipient damage, which over a longer period might reduce the level of safety when the sets are in use.

34 of the 35 sets showed accumulations of dust, 5 sets (14%) to an extent that might perhaps come to be significant from the point of view of safety, for example in damp conditions. Ten sets had cracks in the electric cables, 10 had deficient or "cold" soldered joints (bad connections), 3 had signs of incipient breakdown of components, and 2 sets had signs of increased heat development. None of the electrical faults that were found is considered, however, to be of any direct importance for the safety of the sets at the time of examination. The possibility cannot be excluded that the cases of damaged components, if the damage is allowed to develop further, may come to be of importance from the point of view of safety. 14 of the sets had previously been repaired, but the repairs had been carried out so that the level of safety was not reduced.

26% of the sets had visible minor damage and 40% had interior damage not visible to the general user. In general, sets with interior damage, not visible from the outside, also had visible exterior damage. Exterior damage can therefore to some extent be considered as an indicator, even if an uncertain one, for interior damage. A simple matter such as the test picture not being shown correctly was in half of the cases an indication of an incipient fault, though this was not yet dangerous.

The detailed results are shown in the overview in Annex 2.

4.2 Preparation and procedure in the study

The study material consisted of 35 ordinary older tv sets. The age of the sets was estimated as ranging from about 3 to about 20 years, but they were said by the dealers to be somewhat less old. The sets were selected from tv dealers in Greater Copenhagen. They represent a broad cross-section of the sets repurchased by the dealers from their customers, typically in conjunction with the customer's purchase of a new tv set, and sets that had been rented out. All the sets were at the time of the examination in exactly the condition in which they had come from the users, that is to say they had not been repaired or serviced in any other way, which means that some of the sets were not in full working order. The sets and their condition were representative of the older tv sets commonly in use by Danish people.

For the laboratory investigations a separate test report was produced. The investigations concentrated on estimating whether the sets had faults or incipient faults which might perhaps affect the safety of the sets. The sets were examined, for instance, for poor soldered joints, poorly made repairs, visible signs of abnormal heating or other visible signs of faults or defects. The accumulation of dust in the sets was also evaluated. The fire qualities of the outer cases were examined on the lines of IEC 65, 5th edition, §20.2, all parts of the outer cases being examined, where the standard only calls for testing of the rear cover. The laboratory investigations were all conducted at the Testing and Certification Laboratory of DEMKO the Danish Board for Testing and Approval of Electrical Equipment.

5. Investigations of incorrect usage of tv sets

Night-lights that have been left burning, overturned candles and Christmas decorations [see translator's note at end of text] can all set fire to tv sets. A number of tests were conducted to establish what is needed to set fire to a tv set. These tests showed that the following sources of fire can easily set fire to a tv set:

- * Night-lights and Christmas decorations if left burning on the top of the set without stands or candlesticks. [See translator's note at end of text.]
- * Christmas decorations left burning on top of the set.
- * Candles falling over on top of or standing next to the set.

Covering a tv set slowly destroys the electrical insulation inside the set and over a longer period may create a risk of fire or electric shock. Tests were conducted in which the tv sets were covered by a piece of fabric the equivalent of a cloth or similar. These tests showed that if the ventilation openings of the set are covered, temperatures develop inside the set that will reduce the electric insulation qualities. The same thing can happen if the set is too securely built in to a wall unit or similar. Over a long period, the insulation qualities will be reduced by the effects of heat, creating the risk of fire or electric shock. In no case did temperatures develop that were so high as to cause the set to catch fire as a direct result of the lack of ventilation.

Dust and other dirt may burn, but not so fiercely as to ignite the set. Investigations have shown that dust is very easily ignited, but that it does not normally develop combustion energy sufficient to ignite circuit cards or parts of the outer casing. Dust and dirt do, on the other hand, represent a hazard under damp conditions, where they may cause a short circuit with consequent risk of fire or electric shock.

6 Examinations of tv sets carried out by the Danish Fire Technology Institute, DBI

Examination was made of the technical fire qualities, and representative sets were also burned completely.

The examination of the technical fire qualities showed that good fire qualities have a favourable effect at a low degree of fire or heat. When great heat is applied, on the other hand, the good fire qualities are almost always destroyed.

The full-scale burnings showed that tv sets burn fiercely if they once catch fire, and that there is no great difference between the development of fire in different sets. It was established that if an outer casing consists of several materials with different fire qualities, the set itself will burn according to the material with the poorest fire qualities.

DBI has produced its own report of the examinations, given in Annex 4, and also taken a video film of the full-scale burnings. Below is a more subjective evaluation of the DBI examinations.

6.1 Examination of outer casing components for fire qualities

The outer casing components were examined by DBI on the lines of ISO 5657. The examinations were carried out under application of both great heat and less heat. The examinations with great heat showed that plastic components and plastic-covered wooden components easily burst into flames when great heat is applied. Wooden components such as chipboard and veneer board that are not plastic-covered burst into flames considerably later than those which are plastic-covered.

When lesser heat is applied, plastic components and plastic-covered wooden components which have been treated with fire-resistant substances do not so easily burst into flames as other plastic components. Once the components have begun to burn, the fire-resistant substances have little or no effect, but see the full-scale tests in Section 6.3.

6.2 Comparison of fire qualities according to IEC 65 and ISO 5657

IEC 65 / Studies of the Government Notice on High-Tension Current concerning the fire qualities of various materials are based on the possibility of an electrical fault in the appliance. The aim of the requirements is to ensure that any such fire does not develop and spread. The examinations carried out by DBI (the Danish Fire Technology Institute) have been carried out on the basis of ISO 5657, which is normally used for building and furnishing components. ISO 5657 is based on a greater heating effect, for example a fire that affects the material. The aim of the tests is to elucidate the extent to which the material catches fire and how this contributes to the total fire development, regardless of how the fire began.

A comparison of the fire qualities measured by ISO 5657 and the method in IEC 65 / the Government Notice on High-Tension Current shows that the 2 test methods to some extent give the same indication of the fireproof qualities. A material that in an IEC 65 test burns slowly will also ignite after a longer period of time by ISO 5657, though on condition that the heating effect is not too great. The two test methods will classify materials the same at a low heating effect. If, on the other hand, the material is subjected to a high heating effect, then it ignites at the same point in time measured by ISO 5657 regardless of the speed of the fire measured by IEC 65. IEC 65 and ISO 5657 will thus not classify the materials the same at a high heating effect. This impression is confirmed by the full-scale burnings: see below.

See also the detailed comparison in Annex 5.

6.3 Full-scale burning of tv sets

The aim of conducting full-scale burnings of the sets was to elucidate the development of the fire and to examine whether there is any connection between the fire qualities of the components of the outer casing and the total fire development.

The examinations showed in every case that tv sets burn fiercely and rapidly if they catch fire. The fire will quickly ignite other building and furniture components and will spread.

The fire tests took almost the same course for all the sets. During the first short period after ignition, there was no visible smoke development. At the first visible sign of smoke the fire was of a size to demand proper extinguishing with a hand extinguisher or similar. A few minutes after the first visible smoke, the fire was in all cases out of control. In every case, burning plastic dropped from the tv set down onto the underlying surface in quantities that would set fire to a flammable surface such as a carpet. In every case the fire burned fiercely.

Tv sets with outer casing components of self-extinguishing material, or slow-burning material, were harder to ignite than others, but once the fire had gained a hold on the material there was no noticeable difference in the course of the fire. Self-extinguishing qualities are thus only of importance for the earliest stages of the fire. This confirmed examinations of the materials in that the heating effect immediately after ignition was slight, the material retaining its possible good fire qualities at this stage. When the fire had taken hold, the heating effect was great, and the good fire qualities were destroyed.

The outer casing of one tv set consisted of two materials with very different qualities. One of these materials was similar to other equivalent materials, while the other material had particularly good qualities. The burnings showed that the "common" material contributed to the fire so that it spread almost as in other sets, and that the fire would have spread. The "good" material on the other hand was so good that it took a long time to catch fire. If the whole set had been manufactured in this material, it would hardly have been able to burn.

In two cases the picture tube of the sets imploded, in one case quite violently. In the other cases the tube cracked or split quite undramatically. There are regulations governing the violence with which a tube may implode. The tests deciding whether the requirements have been met are conducted by swinging a steel ball at the picture tube, and these cannot be directly compared with the effects of fire. It is considered certain, however, that one of the tubes at least did not meet the requirements. During the fire there were also small sharp reports from the electronic components, particularly condensers, as they were destroyed.

During the full-scale burnings the sets were ignited with a solid fuel pellet, which has a combustion energy of 4.5 kJ and burns for about 1 minute 50 seconds. The energy level corresponds in "ordinary" electrical units to about 40 W for 1 minute 50 seconds. By comparison, an electric arc in the electronic circuitry resulting from a loose connection may for example develop 10 W, while an arc in the high-tension part or the mains supply may develop 50 - 100 W. The temperature in the arc will be considerably higher than in the fuel pellet.

7 Examination of burnt tv sets

The Electricity Council and the Market Surveillance Board frequently receive burnt tv sets from the police and other sources. For some time the Marketing Surveillance Board has also actively sought the opportunity to examine sets that have been involved in fires. Generally speaking, fires are seldom thoroughly investigated so that the cause of fire can be established with reasonable certainty, and it is extremely seldom that the technical details of the cause of a fire are clarified.

Since 1990 the Market Surveillance Board has investigated 12 alleged tv fires. In 3 cases the investigations showed that there is some degree of probability that the tv set started the fire. In 5 cases there is nothing in the remnants examined to indicate that it was the set which started the fire, and in 4 cases it has not been possible to indicate any cause of fire with acceptable certainty. In no case has it been established that a fault in the standby circuit was the cause of the fire.

Particularly at Christmastime a number of alleged tv fires were investigated, and in these cases it may be presumed with a very great degree of certainty that candles were the real cause. The Market Surveillance Board subsequently undertook investigations, and these show that a lighted candle falling over on the top of a tv set will normally set fire to the set.

As has been made clear in the DBI investigations, tv sets burn quite fiercely, regardless of how the fire started. There is therefore some probability that a fire involving a tv set will burn fiercely near the set.

8 Foreign investigations

SEMKO (Svenska Elektriska Materielkontrollanstalten, the Swedish Board for Testing and Approval of Electrical Equipment) has for the Swedish Elsäkerhetsverket (Electrical Safety Board) carried out two investigations on tv fires and one questionnaire investigation:

1. Tv fire study for the period 1994-01-01 -- 1994-06-30
2. Examination of tv sets on standby, Parts I and II
3. The Elsäkerhetsverket has also questioned a number of foreign laboratories and similar institutions on their experience of tv fires.

1.

In the Tv fire study for the period 1994-01-01 -- 1994-06-30 28 reports of tv fires were studied. Of the 28 alleged tv fires, 17 were investigated at the SEMKO laboratory. It was established that in 7 cases it could be confirmed with certainty that the tv set was the cause of the fire, in 5 cases there was fire or smoke in the components but no risk of actual fire or spread of fire to the set itself or its surroundings. In 5 of the cases investigated by SEMKO and in the 11 cases in which fire

reports from other investigations were studied, the cause of fire cannot be established with certainty.

2.

The investigations of the standby function are based, according to this report, on the following:

"Tv sets are found in almost every home today. In the opinion of 'experts' who have been interviewed, the cause of tv fires may be that the set is connected to the mains in standby mode."

The study concentrated on electrical disturbance of the standby function in various ways including EMC (electromagnetic compatibility). We now quote from the conclusion of these studies:

"All the measurement data that have been collected suggest that the disturbances to which tv sets were subjected during the test do not affect them to such an extent that they become overheated and start to burn.

Neither is there anything to suggest that the sets constitute any risk when standing switched on in the 'standby' mode for any long period.

It is important to stress, however, that the investigations have been conducted on a limited number of sets, though these have been purchased on the market and have been selected at random."

3.

From the questions addressed to foreign laboratories and other places it can be stated that of the 18 laboratories questioned, 14 replied. Of these, 5 stated that they had experience of tv fires.

- * NEMKO (Norway) registered 54 tv fires in 1993, 5 of these being thoroughly investigated. In some cases bad soldered connections were found, but apart from this no further information is given.
- * The Central Electricity Inspectorate, Elinspektionscentralen (Finland), registered 10 tv fires in 1993. 3 of which were thoroughly investigated. Findings not stated.
- * KEMA (The Netherlands) conducted an investigation of the standby function without finding any problems.
- * MITI (Japan) registered 54 tv fires from 1990 to 1992. Improved registration has been introduced in Japan, as well as more stringent regulations for certain components in the sets. For the rest, no information on causes of fire.
- * CSA (Canada) registered 2 tv fires in 1977; no further information.

The variation in these sets of information probably reflects differences in reporting methods more than any difference in the actual circumstances.

The Danish Market Surveillance Board has had the opportunity to study the subject together with the United States approval company Underwriters Laboratories Inc. (USA), which is one of the world's largest laboratories in the sphere of electrical safety control. UL gave information that tv fires are not a problem in the United States. The standards of UL are not legally binding in the United States, but in practice they are adhered to by virtually all suppliers. The UL standards for tv sets have stringent requirements for the fire qualities in the components of the outer casing and other parts in plastic and similar materials. The electrical requirements are analogous to the European ones.

9 The SKAFOR study (SKAFOR is the insurance companies' organization)

The Market Surveillance Board and DEMKO have for several years been attempting to establish closer links with SKAFOR and the individual insurance companies with regard to burnt appliances, including tv sets. There has been some success in establishing co-operation with individual large companies, but the interest shown by SKAFOR has not been sufficiently great.

After being requested by DBI (and the Market Surveillance Board), SKAFOR commenced a minor study among the larger insurance companies with the aim of evaluating whether the latter consider tv fires to be a problem and, if so, how great the problem is.

The result of the SKAFOR study, which was given over the telephone, is that the insurance companies consider fires originating in tv sets to be "an interesting problem; but not a large one." See further the SKAFOR letter, Annex 3.

10 Conclusions

The principal conclusion of the study is that tv sets themselves are not the cause of more fires than other electrical appliances, but that they are capable of making an already burning fire worse.

It can also be concluded that, if an older tv set has exterior damage or is not functioning properly, this may indicate interior faults or the accumulation of dust, which may develop into a palpable but limited hazard.

When tv sets, particularly older ones, are being serviced, a professional can fairly easily see if the set is beginning to develop faults that may in the course of time come to be of importance for safety.

10.1 Tv sets are not the cause of many fires

The study did not reveal any technical circumstances or statistical information to suggest that tv sets are the cause of any unusual number of fires considering their widespread presence and use. None of the Danish or foreign centres of knowledge which contributed to this study or whose own studies are reported here provide any documentation to suggest that tv sets constitute any special fire hazard.

Neither has any of the studies established technical circumstances or statistical information suggesting that the standby function of the sets constitutes any special hazard. It has been established with considerable certainty that electrical disturbances (EMC) do not affect the safety of the tv sets and their standby function.

The study of foreign investigations has provided highly contradictory impressions of the frequency of fires in tv sets. The differences in these studies is due more to the methods chosen for the examinations and registration than to differences in the actual frequency of fires.

It cannot be excluded that the interest of the media in tv fires has contributed to an increase in the reporting of fires. If this is done through the police and similar channels, the information is then included in the statistics of the Electricity Council. Among the public, the interest shown by the media has created the impression that tv sets are often the cause of fires. This has without any doubt had a snowball effect, increasing in intensity until it masks the real situation.

10.2. If tv sets-catch fire, they can burn fiercely

It has been established that tv sets, once they catch fire, burn quite fiercely, which makes a considerable contribution to the total damage caused by the fire.

The requirements for the fire qualities of the rear cover are considered to be not sufficiently stringent. It is also a deficiency of the standard that there are no requirements for the fire qualities of the other components of the outer casing.

In the international standardization organ IEC, work is at present going on with a new proposal (IEC/039/CDV) for a standard for tv sets. This proposal contains at present requirements on the flammability of all plastic parts and also for a number of the other components of the set. The proposal, however, also contains modifications regarding the fire qualities of some components, and at the present point in time it cannot be estimated whether the proposal as a whole represents an improvement in safety.

10.3 Tv sets are electrical appliances with a limited life

It has been established that older tv sets start to develop faults which may eventually impair the safety of the appliance.

Like all electrical appliances, a tv set has a limited life. The components and materials deteriorate as the appliance ages. This deterioration takes place not only if the appliance is used a great deal but also (though more slowly) if it is used seldom or not at all.

It has been established that exterior visible damage and faulty functioning may be signs of interior damage that may develop so as to impair the safety of the appliance. A professional repair shop can often note incipient faults in older appliances.

10.4 How often do tv sets catch fire?

The Electricity Council receives accounts of burnt electrical appliances from the police, the Market Surveillance Board and the Danish Fire Technology Institute, DBI, who are obliged to report all fires of suspected electrical origin. In some years, from 10 to 20 reports of tv fires have been received during the year. Some of these fires are due to incorrect use or abuse of the appliance.

Every fire is, of course, unacceptable, and efforts must be made to prevent electrical fires. It is an aim of the Electricity Council to reduce the hazard that we bring into our daily lives with the electricity we use for modern conveniences and necessities, this aim to be achieved by influencing international standardization and by exercising a supervisory function as to the observance of the requirements of those standards.

11 Recommendations

11.1 What can the consumer do?

A tv set is, as mentioned, an electrical appliance, not a piece of furniture, and it must be used as an electrical appliance, that is to say with care.

It is not necessary, for reasons of safety, for consumers to turn the tv set off at the wall socket: it may be turned off by the remote control instead. Consumers who are nervous may if they wish turn the appliance off at its own switch. If a tv set stands unused for a long period, for example in a summer cottage or when the owners are away, it is a useful recommendation to switch it off at the wall socket, which will also save energy.

Do not place candles, lighted Christmas decorations or similar objects on the tv set or on a table close to the set. If a candle falls over or burns right down, the set may catch fire - and if a tv set once catches fire it may burn fiercely.

Do not lay any cloth or similar article on a tv set. Do not enclose the set in a tightly fitting wall unit. If the ventilation apertures in the set are covered over or if the set is unable for some other reason to dissipate its heat, it may eventually become a fire hazard or perhaps give an electric shock. Always read the supplier's recommendations in the user's manual.

1995-04-24
side 13 af 14

Check the condition of the set. If minor faults or malfunctionings are noticed, the set must be professionally overhauled and repaired. It is important to observe faulty functioning, an incorrect test picture, and signs of exterior damage to the controls, outer casing etc. Defective plugs and cords must immediately be replaced by a professional.

It may be a good idea to get a professional to go through the set if it is more than 5 or 6 years old and is to be moved to a summer cottage or other place where it will be standing without attention and perhaps be exposed to cold and damp.

Do not try to clean the inside of a tv set yourself, because this may be dangerous. The exterior of tv sets can be cleaned with ordinary cleaning agents. Avoid dampening any other places than the screen. Follow the manufacturer's instructions in the user's manual.

Consumers who buy a used tv set should ensure that the set has been overhauled by a professional.

11.2 What can the tv trade do?

The trade is asked to test all the sets which come in for repairs, which are sold as used sets, which are to be rented out, etc., to see if there is any incipient damage. The trade could perhaps establish a regular set of rules, by which the sets are overhauled according to a specially developed programme and a written declaration to that effect is issued.

11.3 What can the authorities do?

In conjunction with the ongoing revision of the requirements for tv sets (IEC 65), the Electricity Council may work through the regulations department of DEMKO the Danish Board for Testing and Approval of Electrical Equipment, to improve the requirements for the fire qualities of tv sets. Bearing in mind the fact that the risk of fire occurring in tv sets can never be completely eliminated, it would appear reasonable to improve the requirements restricting the spread of fire, regarding both consistency and absolute qualities. This has been done in the United States, for example, where problems with tv fires are unknown.

The substances used to render plastic materials fire-resistant are often damaging to the environment. However, other methods of making plastic materials more fire-resistant have now been developed, and these do not damage the environment. A future standardization should ensure that the solutions that are best from the point of view of both fire qualities and environment are given preference.

12 Annexes, not available in english

(will be translated by Tony Wardle)

Annex 1 Detailed results of the examination of new tv sets.

Annex 2 Detailed results of the examination of older tv sets with photo.

- Annex 3 Findings of the SKAFOR study.
- Annex 4 Report of the Danish Fire Technology Institute with photo.
- Annex 5 Comparison of fire qualities examined with reference to IEC 65, 5th and 6th editions and ISO 5657.
- Annex 6 Reproducibility of technical fire tests in IEC 65, 5th and 6th editions.

The Danish Electricity Council

Translator's note: A Danish Christmas decoration typically consists of several, small dried plants grouped around a large central candle.

Vedr. Efterkontrol af farve TV apparater i henhold til
Stærkstrømsbekendtgørelsens afsnit 101, 6. udgave

Annex TVE-02
7.3
WENDT

Side 1 af 5

Signatur forklaring <i>White fields</i> HVIDE FELTER + = Ingen fejl konstateret + = no faults detected 0 = Mindre fejl/mangler (RET FEIL) 0 = minor faults/defects detected	1	2	3	4	5	6	7	8	9	10
Materialiets egenskaber/brændhastighed: S = Selvslukkende - self-extinguishing A = Fra 10 - 19 mm/min Flow B = Fra 20 - 29 mm/min C = Fra 30 - 39 mm/min D = Fra 41 - 45 mm/min E = Fra 46 - 50 mm/min F = Fra 51 - 60 mm/min										
5. Mærkning - <i>Marking</i>	+	+	+	+	+	0	+	+	0	0
7. <i>ARBEJDE UNDER NORMALE BØJELSESFORHOLD</i> Opvarmning under normale forhold	+	+	+	+	+	+	+	+	+	+
9. <i>CONTACT PROTECTION UNDER NORMAL OPERATION</i> Berøringsbeskytt. under normal drift	+	+	+	+	+	+	+	+	+	+
11. Fejforhold - <i>FAULT CONDITIONS</i>	+	+	+	+	+	+	+	+	+	+
13. <i>TESTS IN CONNECTION WITH SUPPLY NETWORK</i> Dele, i forbindelse med forsyningsnet	+	+	+	+	+	+	+	+	+	+
13.1 <i>CREEPAGE DISTANCES</i> Krybe- og luftafstande	+	+	+	+	+	+	+	+	+	+
14.4 <i>HIGH VOLTAGE PARTS</i> Højspændingsenkeltdele og -eneder	+	+	+	+	+	+	+	+	+	+
14.4.1 <i>HIGH VOLTAGE TRAFFIC MULTIPLIER</i> Højspændingsstråle og -multiplikator	+	+	+	+	+	+	+	+	+	+
14.4.2 <i>ISOLATING PARTS</i> Isolerende dele	+	+	+	+	+	+	+	+	+	+
14.4.3 <i>CONNECTION WIRES</i> Forbindelsesledninger	+	+	+	+	+	+	+	+	+	+
14.5 <i>FUSES AND OVERCURRENT DEVICES</i> Sikringer og andre udløseindretninger	+	+	+	+	+	+	+	+	+	+
14.5.2 <i>FUSES</i> Finsikringer	+	+	0	+	+	+	+	+	+	+
14.6 Afbrydere <i>switches</i>	+	+	+	+	+	+	+	+	+	+
14.6.7 <i>SWITCH IDENTIFICATION</i> Afbryders identifikation	+	+	+	+	+	+	+	+	+	+
15. <i>CONNECTING PARTS</i> Tilslutningsdele	+	+	+	+	+	+	+	0	0	+
16. <i>OVERHEAD CABLES</i> Yare bøjelig ledning	+	+	+	+	+	+	+	+	+	+
18.1 <i>IDENTIFICATION OF PICKUP TUBE</i> Billearrørs identifikation	+	+	+	+	+	+	+	+	+	+
20. <i>THE DISSEMINATION OF TV SETS</i> Udsækket i TV apparater	+	+	+	0	0	+	+	+	+	0
20.1 Printkort - <i>PRINT CIRCUITS</i>	+	+	+	+	+	+	+	+	+	+
20.2 Kabinetter - <i>CABINETS</i>	+	+	+	0	0	+	+	+	+	0
20.2 <i>QUALITY OF MANUFACTURE</i> Egenskaber/brændhastighed	C	S	S	F	D	S	C	C	S	F

Vedr. Efterkontrol af farve TV apparater i henhold til
Stærkstrømsbekendtgørelsens afsnit 101, 6. udgave

Side 2 af 5

Signatur forklaring <u>HVIDE FELTER</u> + = Ingen fejl konstateret	1	1	1	1	1	1	1	1	1	2
Signatur forklaring <u>GRÅ FELTER</u> 0 = Mindre fejl/mangler (RET FEJL)	1	2	3	4	5	6	7	8	9	0
<u>Materialets egenskaber/brændhastighed:</u> S = Selvslukkende A = Fra 10 - 19 mm/min B = Fra 20 - 29 mm/min C = Fra 30 - 39 mm/min D = Fra 41 - 45 mm/min E = Fra 46 - 50 mm/min F = Fra 51 - 60 mm/min										
5. Mærkning	+	+	+	+	+	+	+	0	+	+
7. Opvarmning under normale forhold	+	+	+	+	+	+	+	+	+	+
9. Berøringsbeskyt. under normal drift	+	+	+	+	+	+	+	+	+	+
11. Fejlforhold	+	+	+	+	+	+	+	+	+	+
13. Dele, i forbindelse med forsyningsnet	+	+	+	+	+	+	+	+	+	+
13.1 Krybe- og luftafstande	+	+	+	+	+	+	+	-	+	+
14.4 Højspændingsenkeltdele og -enheder	+	+	+	+	+	+	+	+	+	+
14.4.1 Højspændingstrafo og -multiplikator	+	+	+	+	+	+	+	+	+	+
14.4.2 Tilhørende dele	+	+	+	+	+	+	+	+	+	+
14.4.3 Forbindelsesledninger	+	+	+	+	+	+	+	+	+	+
14.5 Sikringer og andre udløseindretninger	+	+	+	+	+	+	+	+	+	+
14.5.2 Finsikringer	+	+	+	+	+	+	+	0	+	+
14.6 Afbrydere	+	+	+	+	+	+	+	+	+	+
14.6.7 Afbryders identifikation	+	+	+	+	+	+	+	+	+	+
15. Tilslutningsdele	+	+	+	+	+	+	+	+	+	+
16. Ydre bøjelig ledning	+	+	+	+	+	+	+	+	+	+
18.1 Billedrørs identifikation	+	+	+	+	+	+	+	+	+	+
20. Ildsikkerhed i TV apparater	+	+	+	+	+	+	+	+	+	+
20.1 Prinkort	0	+	+	+	+	+	+	0	+	+
20.2 Kabinetter	+	+	+	+	+	+	+	+	+	+
20.2 Egenskaber/brændhastighed	A	S	S	S	B	S	S	C	C	C

Vedr. Efterkontrol af farve TV apparater i henhold til
Stærksrømsbekendtgørelsens afsnit 101, 6. udgave

Side 3 af 5

Signatur forklaring <u>HVIDE FELTER</u> + = Ingen fejl konstateret Signatur forklaring <u>GRÅ FELTER</u> 0 = Mindre fejl/mangler (RET FEJL)	2 1	2 2	2 3	2 4	2 5	2 6	2 7	2 8	2 9	3 0
<u>Materialets egenskaber/brændhastighed:</u> S = Selvslukkende A = Fra 10 - 19 mm/min B = Fra 20 - 29 mm/min C = Fra 30 - 39 mm/min D = Fra 41 - 45 mm/min E = Fra 46 - 50 mm/min F = Fra 51 - 60 mm/min										
5. Mærkning	+	+	+	+	0	+	0	+	+	+
7. Opvarmning under normale forhold	+	+	+	+	+	+	+	+	+	+
9. Berøringsbeskyt. under normal drift	+	+	+	+	+	+	+	+	+	+
11. Fejlforhold	+	+	+	+	+	+	+	+	+	+
13. Dele, i forbindelse med forsyningsnet	+	+	+	+	+	+	+	+	+	+
13.1 Krybe- og luftafstande	+	+	+	0	+	+	+	+	+	+
14.4 Højspændingsenkeltdele og -enheder	+	+	+	+	+	+	+	+	+	+
14.4.1 Højspændingstrafo og -multiplikator	+	+	+	+	+	+	+	+	+	+
14.4.2 Tilhørende dele	+	+	+	+	+	+	+	+	+	+
14.4.3 Forbindelsesledninger	+	+	+	+	+	+	+	+	+	+
14.5 Sikringer og andre udløseindretninger	+	+	+	+	+	+	+	+	+	+
14.5.2 Finsikringer	+	+	+	+	+	+	+	+	+	+
14.6 Afbrydere	+	+	+	0	+	+	+	+	0	+
14.6.7 Afbryders identifikation	+	+	+	+	0	+	+	+	+	+
15. Tilslutningsdele	+	+	+	+	+	+	+	+	+	+
16. Ydre bøjelig ledning	+	+	+	+	+	+	+	+	+	+
18.1 Billedrørs identifikation	+	+	+	+	+	+	0	+	+	+
20. Ildsikkerhed i TV apparater	+	+	+	+	+	+	+	+	+	+
20.1 Printkort	+	+	+	+	+	+	+	+	+	+
20.2 Kabinetter	+	+	+	0	+	+	+	+	+	+
20.2 Egenskaber/brændhastighed	S	S	C	D	B	S	C	C	S	B

Vedr. Efterkontrol af farve TV apparater i henhold til
Stærkstrømsbekendtgørelsens afsnit 101, 6. udgave

Side 4 af 5

Signatur forklaring <u>HVIDE FELTER</u>	3	3	3	3	3	3	3	3	3	4
+ = Ingen fejl konstateret	1	2	3	4	5	6	7	8	9	0
Signatur forklaring <u>GRÅ FELTER</u>										
0 = Mindre fejl/mangler (RET FEJL)										
<u>Materialets egenskaber/brændhastighed:</u>										
S = Selvslukkende										
A = Fra 10 - 19 mm/min										
B = Fra 20 - 29 mm/min										
C = Fra 30 - 39 mm/min										
D = Fra 41 - 45 mm/min										
E = Fra 46 - 50 mm/min										
F = Fra 51 - 60 mm/min										
5. Mærkning	+	+	0	+	+	0	-	+	+	+
7. Opvarmning under normale forhold	+	+	+	+	+	+	-	+	+	+
9. Berøringsbeskyt. under normal drift	+	+	+	+	+	+	-	+	+	+
11. Fejlforhold	+	+	+	+	+	+	-	+	+	+
13. Dele, i forbindelse med forsyningsnet	+	+	+	+	+	+	-	+	+	+
13.1 Krybe- og luftafstande	+	+	+	+	+	+	-	+	+	+
14.4 Højspændingsenkeltdele og -enheder	+	+	+	+	+	+	-	+	+	+
14.4.1 Højspændingstrafo og -multiplikator	+	+	+	+	+	+	-	+	+	+
14.4.2 Tilhørende dele	+	+	+	+	+	+	-	+	+	+
14.4.3 Forbindelsesledninger	+	+	+	+	+	+	-	+	+	+
14.5 Sikringer og andre udløseindretninger	+	+	+	+	+	+	-	+	+	+
14.5.2 Finsikringer	+	+	+	+	+	+	-	+	+	+
14.6 Afbrydere	+	+	+	+	+	+	-	+	+	+
14.6.7 Afbryders identifikation	+	+	+	+	+	+	-	+	+	+
15. Tilslutningsdele	+	+	+	+	+	+	-	+	+	+
16. Ydre bøjelig ledning	+	+	+	+	+	+	-	+	+	+
18.1 Billedrørs identifikation	+	+	+	+	+	+	-	+	+	+
20. Ildsikkerhed i TV apparater	+	+	+	+	+	+	-	+	+	+
20.1 Printkort	+	+	+	+	+	+	-	+	+	+
20.2 Kabineter	0	+	+	+	+	+	-	0	+	+
20.2 Egenskaber/brændhastighed	E	B	C	C	S	C	C	D	S	S

Vedr. Efterkontrol af farve TV apparater i henhold til
Stærkstrømsbekendtgørelsens afsnit 101, 6. udgave

Side 5 af 5

Signatur forklaring <u>HVIDE FELTER</u> + = Ingen fejl konstateret	4 1	4 2	4 3	4 4	4 5	4 6	4 7	4 8	4 9	5 0
Signatur forklaring <u>GRÅ FELTER</u> 0 = Mindre fejl/mangler (RET FEJL)										
<u>Materialets egenskaber/brændhastighed:</u> S = Selvslukkende A = Fra 10 - 19 mm/min B = Fra 20 - 29 mm/min C = Fra 30 - 39 mm/min D = Fra 41 - 45 mm/min E = Fra 46 - 50 mm/min F = Fra 51 - 60 mm/min										
5. Mærkning	0	+	+	+	+	+	+	+	+	
7. Opvarmning under normale forhold	+	+	+	+	+	+	+	+	+	
9. Berøringsbeskyt. under normal drift	+	+	+	+	+	+	+	+	+	
11. Fejlforhold	+	+	+	+	+	0	+	+	+	
13. Dele, i forbindelse med forsyningsnet	+	+	+	+	+	+	+	+	+	
13.1 Krybe- og luftafstande	+	+	+	+	+	+	+	+	+	
14.4 Højspændingsenkeltdele og -enheder	+	+	+	+	+	+	+	+	+	
14.4.1 Højspændingstrafo og -multiplikator	+	+	+	+	+	+	+	+	+	
14.4.2 Tilhørende dele	+	+	+	+	+	+	+	+	+	
14.4.3 Forbindelsesledninger	+	+	+	+	+	+	+	+	+	
14.5 Sikringer og andre udløseindretninger	+	+	+	+	+	+	+	+	+	
14.5.2 Finsikringer	+	+	+	+	+	+	+	+	+	
14.6 Afbrydere	+	+	0	+	0	+	+	+	+	
14.6.7 Afbryders identifikation	+	+	+	+	+	+	+	+	+	
15. Tilslutningsdele	+	+	+	+	+	+	+	+	+	
16. Ydre bøjelig ledning	+	+	+	+	+	+	+	+	+	
18.1 Billedrørs identifikation	+	+	+	+	+	+	+	+	+	
20. Ildsikkerhed i TV apparater	+	+	+	+	+	+	+	+	+	
20.1 Printkort	+	+	+	+	+	+	+	+	+	
20.2 Kabinetter	+	+	+	+	+	+	+	+	+	0
20.2 Egenskaber/brændhastighed	C	S	C	C	C	S	C	C	C	D

