DBI

Examination of test standards on fire protection of cooking equipment

ISO 15371:2000/2009

CEN/TS 14972:2011

Danish Institute of Fire and Security Technology

Standards

Standard	ISO 15371:2000	ISO 15371:2009	CEN/TS 14972:2011 Annex A.4
Title	Ships and marine technology – Fire extinguishing systems for protection of galley deep-fat cooking equipment – Fire tests	Ships and marine technology – Fire extinguishing systems for protection of galley cooking equipment	Test protocol for the firefighting performance in commercial kitchen of type deep fat fryers

Scopes and hazards

Standard	ISO 15371:2000	ISO 15371:2009	CEN/TS 14972:2011 Annex A.4
Scope	Performance of pre-engineered fire extinguishing system	Design, testing and operation of pre-engineered fire extinguishing system	Performance of pre-engineered water mist fire extinguishing system
Cooking appliance hazards	Deep fat fryer - Multiple vat - Split vat	Deep fat fryer - Multiple vat - Split vat Griddle Range top Gas radiant char-broiler Electric char-broiler Lava, Pumice or synthetic rock char-broiler Natural charcoal broiler Mesquite wood char-broiler Upright broiler Chain broiler Wok	Deep fat fryer - Multiple vat - Split vat
Full scale test	N/A	Plenum Hood and duct	Filters Hood and duct

DFF and measurements

Standard	ISO 15371:2000	ISO 15371:2009	CEN/TS 14972:2011 Annex A.4
DFF	Commercial electric, Depth >= 230 mm, Max. dim.		Max. dimensions
Heating rate, Cooling rate	Min. 7 °C/min, Max. 3 °C/min		
Temperature measurements	25 mm below grease surface		25 mm below grease surface 25 mm above the bottom of the deep fat fryer
Measurements of system	Discharge rate Discharge pressure Agent temperature	Discharge rate Discharge pressure Agent temperature Amount of agent used	Discharge rate Discharge pressure Agent temperature
Additional measurements	-	-	Oxygen >= 20 % at system discharge

The fire source medium

Standard	ISO 15371:2000	ISO 15371:2009	CEN/TS 14972:2011 Annex A.4
Cooking grease type	Vegetable shortening incorporating an antifoaming agent		
Cooking grease auto-ignition	Not less than 363 °C	Not less than 358 °C	Not stated
Cooking oil	N/A	N/A	Flash point 230°C-280°C Auto-ignition: 330°C-445°C

Cooking appliance tests

Standard	ISO 15371:2000	ISO 15371:2009	CEN/TS 14972:2011 Annex A.4
Cooking appliance tests	Fire test and Splash test		
Free burn duration	1 minute after auto-ignition/or after manually ignition [363°C]	2 minutes after passing 363 °C grease temperature	2 minutes after auto-ignition [330-445 °C]
Internal heating source	Shut off 1 minute after freeburn for fire test Shut off 1 after auto-ignition for splash test	Shut off 2 minute after freeburn	Shut off 2 minute after freeburn

Fire test compliance

	ISO 15371:2000	ISO 15371:2009	CEN/TS 14972:2011 Annex A.4
Compliance with fire test	Completely extinguished No re-ignition for 20 min or T<= Ta - 34 °C Which ever longer	Completely extinguished <= 1 min. No re-ignition for 20 min or T<= Ta – 33,3 °C Which ever longer Not to cause a fireball larger than the initial fire, in first 10 sec.	Completely extinguished <= 2 min. No re-ignition for 20 min or T<= Ta – 34 °C Which ever longer

Splash tests compliance

Standard	ISO 15371:2000	ISO 15371:2009	CEN/TS 14972:2011 Annex A.4
Criteria for compliance with splash test	Fire to be completely extinguished and cause no splashing of grease	Fire to be completely extinguished and no burning droplets of grease	Fire to be completely extinguished and cause no splashing of burning oil
Criteria for compliance with cooking temperature splash test	N/A	No splash of grease droplets in excess of 5 mm	N/A

Range top and wok

ISO 15371:2009				
	Fire source	Fire test	Splash test	Cooking temperature splash test
Range top	**25 mm grease in cast iron skillet** **100 mm grease in steel pot** **2 minutes freeburn**	**Same as for DFF**		
Wok	**Grease in smallest and largest wok** **At least 25 mm grease** **2 minutes freeburn**			

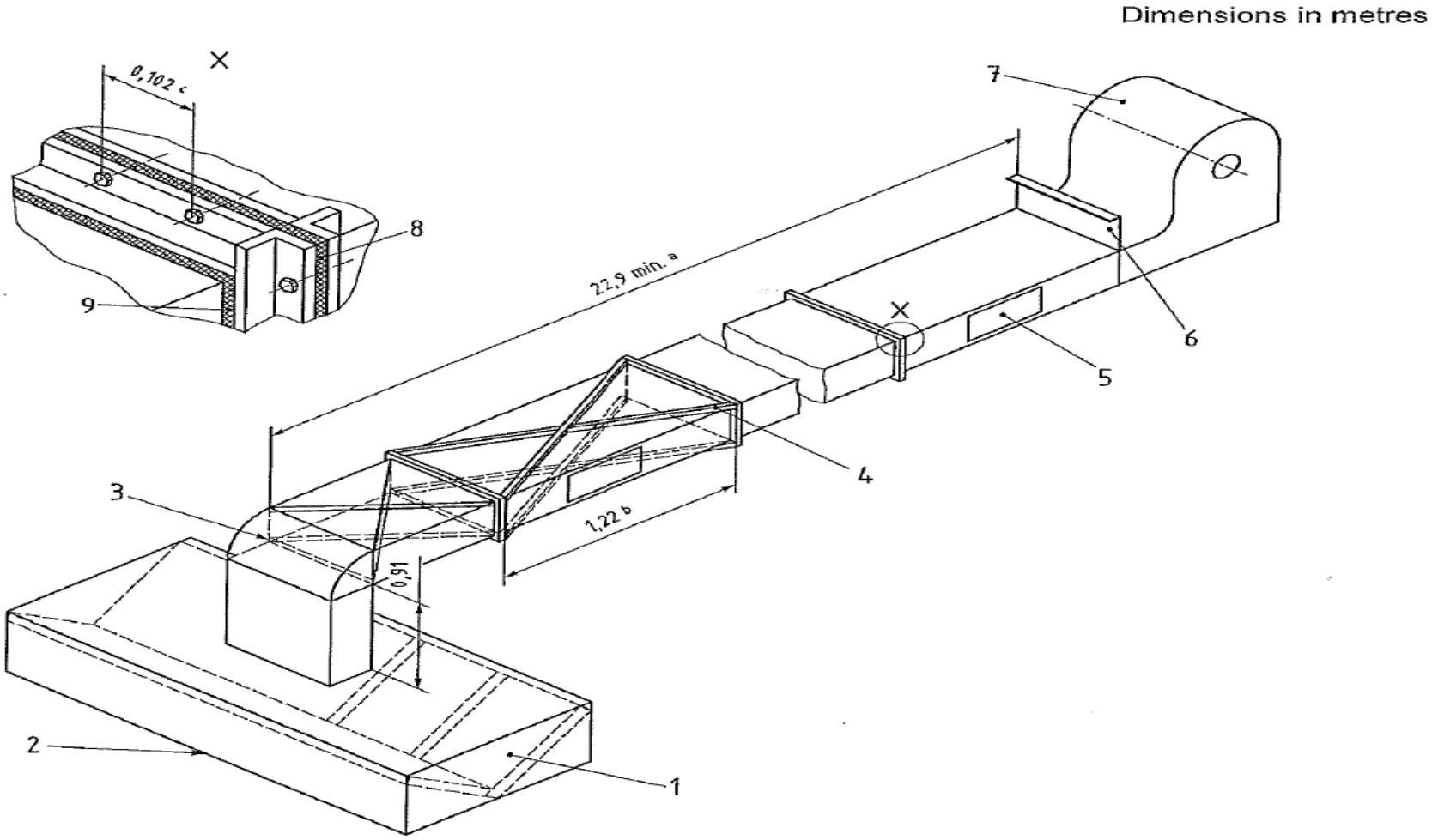
Griddle and char-broilers

ISO 15371:2009			
	Fire source	Fire condition	Extinguishment criteria
Griddle	6 mm grease	1 minute freeburn	Complete extinguishment <= 1 minute or less not to cause a fireball larger than the initial fire, in first 10 sec. No re-ignition for 5 minutes
Gas radiant char-broiler	Plastic sheet with 6 mm semi-solid grease and with low quality fatty beef steaks covering 80-90 % of the cooking area	1 minute freeburn and 900 mm flames height	
Electric char-broiler			
Lava, pumice or synthetic char-broiler			
Natural charcoal broiler		½ minute freeburn and 900 mm flames	
Mesquite wood char-broiler			

Upright- and chain broiler

ISO 15371:2009				
	Fire source 1	Fire source 2	Fire condition	Extinguishment criteria
Upright broiler	Drip pan filled with grease Inner surface on broiling chamber covered with 1,5 kg/m2 grease	80-90 % covering of grate low quality fatty beef steaks	30 – 60 sec. free burning after well involved flames	Complete extinguishment <= 1 minute or less not to cause a fireball larger than the initial fire, in first 10 sec. No re-ignition for 5 minutes
Chain broiler		80-90 % covering of grate of fatty hamburgers (70 % lean meat)		

Full scale test



Full scale hazards

2 hazards considered	Fire hazard	Criterion of hazard	Time of actuation
Filters /plenum	Ignition of filters/plenum Include ignited DFF (ISO)	30 sec. freeburn after ignition (CEN) Determined visually for maximum intensity (ISO)	
Hood and duct	Fully evolved fire in duct Include ignited DFF	CEN and ISO : Ignition criteria: Either 871 °C at 3,6 m or 649 °C at 6,1 m (It is also added in CEN that ignition occur when all thermocouples are > 870 °C ?)	ISO: 30 sec. Freeburn - if the temperature at 6,1 m are 482°C or increasing. CEN: 30 sec. freeburn

Hood and duct specifications

	ISO 15371:2009	CEN/TS 14972:2011
Size of hood	Max. as specified At least 1,2 m wide At least 1,2 m long	Extending the appliance
Length of duct	6,1 m, 15,2 m or 22,9 m Or any intermediate length as stated by the manufacturer	Max. spacing of 2 nozzles as stated by the manufacturer Min. length 6,1 m
Cross sectional area or perimeter of duct	Rectangular ducts: Fixed perimeters from 1,24 m to 7,62 m or more Round ducts: Fixed diameter from 0,61 m to 2,4 m or more	Max. duct cross sectional area as specified – round or rectangular

Fuel loading

Fuel loading	ISO 15371:2009	CEN/TS 14972:2011
Filters	3,7 kg/m² grease	
Duct	1,5 kg/m² grease	Not stated how much

Air flow conditions

ISO 15371:2009	CEN/TS 14972:2011
3 cases: a.) Open duct no exhaust assistance after ignition b.) Closed duct just before system actuation c.) Open duct with 150 m/min to 300 m/min assistance (Plenum test)	2 possible cases: Standard case: Open duct without exhaust blower Design case: Open duct with connected exhaust blower. Airspeed ? Defined by manufacturer ?

Full scale compliance

ISO 15371:2009 and CEN/TS 14972:2011
Complete extinguishment
Hood, filters and duct are examined for the presence of grease, in order to prove that the remaining grease could sustain the fire if the fire was not extinguished

Conclusion

The revised ISO standard is by far the most severe test standard of the 3

The revised ISO standard covers with a few additional measurements the CEN standard

The CEN test protocol text is unclear and ambiguous on certain places

A revision would be welcome