

Industrial Safety : Precaution for Thermic Fluid Heaters

SAFETY AUDIT OF THERMIC FLUID HEATERS

vasudev Kulkarni

**(UNDER RULE 73-ZA OF THE MAHARASHTRA FACTORIES RULES -1963) (RULES
PRESCRIBED UNDER, READ WITH SECTION 112 OF THE FACTORIES ACT, 1948)**

Introduction :

Due to various technical reasons and advantages, a trend of uses of Thermic Fluid Heaters in the factories, in various manufacturing processes are on increase. However, the Thermic Fluid Heaters are prone to certain dangers and therefore rules are prescribed, to ensure safety under rules 73-za Maharashtra Factories Rules

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1963; read with section 112 of The Factories Act, 1948.

Taking into account various provisions, a ready reckoner - check list, is prepared for the guidance, simplifying the complexity of provisions. This is tabulated and can be used for safety audit of Thermic Fluid Heaters, as under:

Check list and synopsis of provisions under Rule 73-Za of The Maharashtra Factories Rules -1963; for Thermic Fluid Heaters, as tabulated under.

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A Research Paper / Article on, Industrial Safety : Precaution for Thermic Fluid Heaters

SAFETY AUDIT OF THERMIC FLUID HEATERS

(RULE 73-ZA OF MAHARASHTRA FACTORIES RULES -1963)

CHECK LIST AND SYNOPSIS OF PROVISIONS UNDER RULE 73-ZA OF THE MAHARASHTRA FACTORIES RULES 1963										
OF THERMIC FLUID HEATERS										
SR. NO.	SYNOPSIS	PROVISION AS PER RULE (1)	AUDIT / PRESENT STATUS	REMARKS						
1)	Construction of Coil (Type of Coil : Removable)	(i)all heater shall be of such construction that, the coils shall be removable for periodic cleaning, visual inspection & hydraulic test	Coil <table style="display: inline-table; vertical-align: middle;"> <tr> <td style="border: none;">—</td> <td style="border: none;">Removable</td> <td style="border: 1px solid black; width: 40px; height: 20px;"></td> </tr> <tr> <td style="border: none;">—</td> <td style="border: none;">Not Removable</td> <td style="border: 1px solid black; width: 40px; height: 20px;"></td> </tr> </table>	—	Removable		—	Not Removable		
—	Removable									
—	Not Removable									

2)	Cooling System of Furnace (When power failure)	(ii) suitable arrangements shall be made for cooling the furnace effectively in case of power failure to the heater	Effective cooling system <input type="checkbox"/> Provided <input type="checkbox"/> Not Provided	
3)	Purging System (Before restarting)	iii) before restarting the furnace of heater it shall be effectively purged.	Purging <input type="checkbox"/> Done <input type="checkbox"/> Not Done	
4)	Expansion Cum Deaerator Tank and its Location (outside the shed)	(iv) the Thermic fluid used for heater shall be circulated in a closed circuit formation with an expansion cum deaerator tank. This tank shall be located outside the shed where the heater is installed.	Expansion tank <input type="checkbox"/> Done <input type="checkbox"/> Not Done Location of Tank <input type="checkbox"/> Outside Shed <input type="checkbox"/> Other (In side shed)	

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5)	Flame Failure	(v) every oil or gas fired	Photo Resister <input type="checkbox"/> Provided	
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	<p>indication & Automatic Bumer cut off system (For Oil & Gas fired heaters)</p>	<p>heater shall be provided with a photo-resistor actuated audio visual alarm to indicate flame failure and automatic burner cut off.</p>	<p>Actuated visual alarm (For Flame Failure) <input type="checkbox"/></p> <p>Audio Not Provided <input type="checkbox"/></p> <p>Automatic Burner cut off System (After Flame failure) <input type="checkbox"/></p> <p>Automatic <input type="checkbox"/></p> <p>Manually <input type="checkbox"/></p>	
<p>6)</p>	<p>Stack temperature Monitor cum Controller (Audio / Visual)</p> <p>(Where outlet temperature exceeds)</p>	<p>(vi) the stack temperature monitor cum controller with audio visual alarm shall be provided to the heater so as to warn the operator in case the outlet temperature exceeds the specified minimum.</p>	<p>Stack Temp. Monitor <input type="checkbox"/></p> <p>Controller <input type="checkbox"/></p> <p>Audio Visual Alarm <input type="checkbox"/></p> <p>Not Provided <input type="checkbox"/></p> <p>Provided <input type="checkbox"/></p> <p>Not Provided <input type="checkbox"/></p> <p>Provided <input type="checkbox"/></p> <p>Not Provided <input type="checkbox"/></p>	

7)	Indicating Devices and their efficient maintenance	(vii) all heater shall be provided with following devices and the same shall be maintained in efficient working order.	<div style="display: flex; justify-content: space-between; align-items: center;"> <div style="border: 1px solid black; width: 20px; height: 20px; margin-right: 5px;"></div> <div style="text-align: center;"> <p>Level Indicator in expansion tank</p> <p>Provided</p> <p>Not Provided</p> </div> <div style="border: 1px solid black; width: 20px; height: 20px; margin-right: 5px;"></div> <div style="border: 1px solid black; width: 20px; height: 20px; margin-right: 5px;"></div> </div>	
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		<p>(a) level indicator in the expansion tank</p> <p>(b) temperature indicator of thermic fluid.</p> <p>(c) different pressure switch across the inlet and the outlet line of the hearter tubes, and</p> <p>(d) temperature control devices for the fuel supply to the burner.</p>	<div style="display: flex; justify-content: space-between; align-items: center;"> <div style="border: 1px solid black; width: 20px; height: 20px; margin-right: 5px;"></div> <div style="text-align: center;"> <p>Temp. Indicator of Thermic Fluid</p> <p>Provided</p> <p>Not Provided</p> </div> <div style="border: 1px solid black; width: 20px; height: 20px; margin-right: 5px;"></div> </div> <div style="display: flex; justify-content: space-between; align-items: center;"> <div style="border: 1px solid black; width: 20px; height: 20px; margin-right: 5px;"></div> <div style="text-align: center;"> <p>Separate Switches across inlet & outlet of tubes</p> <p>pressure</p> <p>Not Provided</p> </div> <div style="border: 1px solid black; width: 20px; height: 20px; margin-right: 5px;"></div> </div> <div style="display: flex; justify-content: space-between; align-items: center;"> <div style="border: 1px solid black; width: 20px; height: 20px; margin-right: 5px;"></div> <div style="text-align: center;"> <p>Temp. Controller of fuel</p> <p>Provided</p> </div> <div style="border: 1px solid black; width: 20px; height: 20px; margin-right: 5px;"></div> </div>	
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			supply of the burner Not Provided	
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8)	Inter locking of Indicating devices	(viii)all devices mentioned in clause above for oil or gas fired heater shall have inter locking arrangement with burner so that in case of any predetermined limits being crossed the supply of fuel and air to burner shall automatically be cut-off.	<div style="display: flex; justify-content: space-between;"> <div style="width: 40%;"> <p><input type="checkbox"/></p> <p><input type="checkbox"/></p> <p><input type="checkbox"/></p> <p><input type="checkbox"/></p> <p><input type="checkbox"/></p> <p><input type="checkbox"/></p> </div> <div style="width: 55%;"> <p>Provided</p> <p>Inter locking with Burner level Indicator</p> <p>Not Provided</p> <p>Provided</p> <p>Temp. indicator of Thermic fluid</p> <p>Not Provided</p> <p>Provided</p> <p>To pressure switches</p> <p>Not Provided</p> </div> </div>	
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9)	Audio Visual Alarm (of all safety inter locks)	(ix) all safety inter-locks when operated shall be indicated or on the control panel of the heater by a suitable audio visual alarm.	All Inter locks, indicators By Audio visual alarm Yes <input type="checkbox"/> No <input type="checkbox"/>	
10)	Electrical Panel (Location)	(x) electrical Panel for the heater shall be located near the heater but not so close as to be exposed to spilling or leaking oil.	Near Location Panel heater of Close to heater (Spilling / Leaking oil) <input type="checkbox"/> <input type="checkbox"/>	
11)	Segregation of Heater (From other Mfg. Activities)	(xi) te heater shall be located in a place segregated from other manufacturing activities.	Segregate from other Manufacturing Activities.No Yes <input type="checkbox"/> <input type="checkbox"/>	
12)	Explosion Vent (Safe location)	(xii) explosion vent for heater shall be installed that the release takes place at safe location.	Location ofYes Release of Explosion Vent is at safe place No <input type="checkbox"/> <input type="checkbox"/>	

13)	<p>Pressure Testing (Period) (once/12 Months) (Max. test Pressure ≥ 2 O. P.</p>	<p>(viii) the heater coil including the coil connected to it in the user's equipment shall be tested by competent person once at least in every 12 months. The test pressure shall not be less than twice the operating pressure.</p>	<p>Heater Coil Testing by Competent every 12 months. (Carried out) Yes <input type="checkbox"/> No <input type="checkbox"/></p> <p>Coil connected to user's equipment Yes <input type="checkbox"/> No <input type="checkbox"/></p> <p>(Test by competent every 12 months)</p>	
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14)	Repairs	<p>(xiv)if repairs are carried out to the heater, coil including coil connected it in users equipment shall be got examined from competent person before taking it into use.</p>	<p>Examination of Heater Coil & users competent before into use Yes <input type="checkbox"/> No <input type="checkbox"/></p> <p>Coil by taking <input type="checkbox"/></p>													
15)	<p>Temperature of Thermic Fluid (Max. temp. as per Mfg's</p> <ul style="list-style-type: none"> • Specifications) • Other test : • Acidity • Suspended • 	<p>(xv) maximum temperature of thermic fluid in the heating of heater coil shall not exceed the figure specified by the manufacturer. The thermic fluid used in heater, shall conform to the specifications prescribed by the</p>	<p>Max. Temp. of T. F. -</p> <p>a)Recommended by mfgrs :-</p> <p>b)Actual Working Temp :-</p> <p>T. F. Specification Prescribed</p> <table border="1"> <thead> <tr> <th></th> <th>Mfgrs</th> <th>Present</th> <th>Remark</th> </tr> </thead> <tbody> <tr> <td></td> <td></td> <td></td> <td></td> </tr> <tr> <td>a) Acidity</td> <td></td> <td></td> <td></td> </tr> </tbody> </table>		Mfgrs	Present	Remark					a) Acidity				
	Mfgrs	Present	Remark													
a) Acidity																

	Matter Ash Contents Viscosity Flash Point (once in 3 months)	manufacturer & shall be tested by competent person for suitability at least once in every three months period. Such test shall include test for acidity, suspended matter, ash contents, viscosity and flash Point	<table border="1"> <tr> <td>b) Suspended</td> <td></td> <td></td> <td></td> </tr> <tr> <td>Mater</td> <td></td> <td></td> <td></td> </tr> <tr> <td>c) Ash Contents</td> <td></td> <td></td> <td></td> </tr> <tr> <td>d) Viscosity</td> <td></td> <td></td> <td></td> </tr> <tr> <td>e) Fast Point</td> <td></td> <td></td> <td></td> </tr> <tr> <td colspan="4">Frequency of test- (Once in 3 months)</td> </tr> </table>	b) Suspended				Mater				c) Ash Contents				d) Viscosity				e) Fast Point				Frequency of test- (Once in 3 months)			
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Frequency of test- (Once in 3 months)																											
16)	<p>Cleaning of Heater</p> <ul style="list-style-type: none"> • Internal surface • Removing soot • Check up refractory / • / month • Cleaning of surface of Coil / 6 months • Cleaning of Burner Nozzels 	(xvi)cleaning of the internal surface of the heater for removing soot & check up the refractory surface on the inside shall be carried out every month, or as often as required depending upon working conditions. The coils of heater shall be removed & surface of the coil cleaned	<p>Cleaning - of Internal surface of Heater (Frequency) : Every Month)Not Done</p> <p>Check up of RefractorySurface (Per Month) Done</p> <p>Not Done</p>																								

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	Oil filters / Pump	thoroughly once atleast in a period of six months. The burner, nozzles, oil filters & pumps shall be cleaned once a week during the period of	<p>Cleaning of Surface Coil (Frequency : Every 6 Months) Done</p> <p>Not Done</p>
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		use.	<p>Cleaning of</p> <ul style="list-style-type: none"> • Burners - Once a week <input type="checkbox"/> • Nozzels - Once a week <input type="checkbox"/> • oil filter - Once a week <input type="checkbox"/> • pumps - Once a week <input type="checkbox"/> • <input type="checkbox"/> 	
17)	<p>Maintence of Register/ Records of information for</p> <p>* Weekly Check (effectiveness of inter locks)</p> <p>* Weekly Check (All accessories are in good state of repairs)</p> <p>* Records of information regarding / every 4 Hrs.</p> <ul style="list-style-type: none"> - Fuel oil Temp. - Pressure - Thermic Fluid inlet / out let - Pressure & Temp. - Fuel gas temp. 	<p>(xvii)a separate register containing the following information for the heater shall be maintained</p> <p>(a) weekly check carried out confirming the effectiveness of the inter-lock;</p> <p>(b) weekly checks confirming in good of repairs; and (c) information regarding fuel oil temperature, Pressure, thermic fluid inlet/outlet pressure & temperature, fuel gas temperature, recorded at four hourly interval.</p>	<p>Registers <input type="checkbox"/> Maintained <input type="checkbox"/></p> <p style="text-align: center;">Not Maintained</p> <p>Weekly Checu up : <input type="checkbox"/></p> <p style="text-align: center;">Maintained</p> <p>(A) Effectiveness of inter locks Not Maintained</p> <p>(B) All accessories (In good state of repaires)</p> <p>Records</p> <p><input type="checkbox"/> Maintained <input type="checkbox"/></p> <p>Pressure Gauge</p> <p style="text-align: center;">Not Maintained</p>	

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					<input type="checkbox"/>
					<input type="checkbox"/>
					<input type="checkbox"/>
					<input type="checkbox"/>
					<input type="checkbox"/>
				Maintained	<input type="checkbox"/>
			Temp. Gauge	Not Maintained	
				Maintained	
			Pressure Switches		<input type="checkbox"/>
				Not Maintained	<input type="checkbox"/>
				Maintained Explosion Vent.	<input type="checkbox"/>
				Not Maintained	<input type="checkbox"/>
			(C) Records of following at four intervals.		<input type="checkbox"/>
				hourly	<input type="checkbox"/>
			Maintained 1) oil temp.	Fuel	<input type="checkbox"/>
				Not	<input type="checkbox"/>

			2) Fuel oil pressure 3) T. F. inlet pressure 4) T. F. outlet pressure	Maintained Maintained Not Maintained Maintained Not Maintained Maintained Not Maintained	
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			<p>5) T. F. inlet temperature</p> <p>Maintained <input type="checkbox"/></p> <p>Not Maintained <input type="checkbox"/></p> <p>6) T. F. outlet temperature</p> <p>Maintained <input type="checkbox"/></p> <p>Not Maintained <input type="checkbox"/></p> <p>7) Fuel gas temperature</p> <p>Maintained <input type="checkbox"/></p> <p>Not Maintained <input type="checkbox"/></p>	
18	Heater under trained Operator	(xviii.) the heater when in operation shall always be kept in charge of a trained operator.	<p>Incharge (Operator)</p> <p>Maintained <input type="checkbox"/></p> <p>Not Trained <input type="checkbox"/></p>	

(# Note : Any errors here, in provisions, to be ignored and to be referred to the original text of the rule.)

Researcher :

(Author)

V. G. Kulkarni

[A Research student (Law), SPPU, Pune]

vgkulkarni108@gmail.com