



Republic of the Philippines

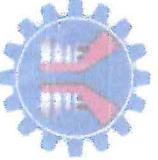
GLIEZA E. CACERES
BAC - Chairperson

Warranty : _____
Price Validity : _____

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Printed Name/Signature/Date

Tel No. / Cellphone No. / E-mail Address

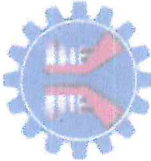
	Department of Public Works and Highways CENTRAL OFFICE		Issue Date : January 10, 2023
	Standard Technical Specifications for Laboratory Apparatus, Equipment and Supplies – Laboratory Oven and Furnace		Doc. Code MTF-ESGO-02
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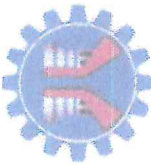
Name of Equipment: LABORATORY OVEN and FURNACE

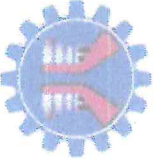
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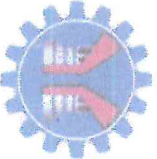
Used for drying, heating, and tests that requires specific and/or control temperature above ambient conditions.

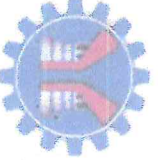
Main Equipment Components	Specification
1. Regular Gravity Convection Oven	- Gravity convection type (no fan to move the air inside the oven) - Electrically heated - Digital temperature display - Thermostatically controlled - Stainless Steel interior material - Automatic over-temperature alarm - At least two (2) removable stainless-steel grating type laboratory oven shelves having a minimum distributed load of 5 kg - Minimum of 60 Liters chamber volume - Temperature range: 75°C to 250°C or wider range 220-240 V - With local calibration showing temperature uniformity of $\pm 5^{\circ}\text{C}$ or better throughout testing chamber at 110°C, 163°C, 200°C and 250°C
2. Accurate Gravity Convection Oven	- Gravity convection type (no fan to move the air inside the oven) - Electrically heated - Digital temperature display - Thermostatically controlled - Stainless Steel interior material - Automatic over-temperature alarm - At least two (2) removable stainless-steel grating type laboratory oven shelves having a minimum distributed load of 5 kg - Minimum of 60 Liters chamber volume - Temperature range: 75°C to 250°C or wider range 220-240 V - With local calibration showing temperature uniformity of $\pm 2^{\circ}\text{C}$ or better throughout testing chamber at 110°C, 163°C, 200°C and 250°C
3. Regular Forced Ventilation Oven	- Forced ventilation or forced air type (with fan to move the air inside the oven) - Electrically heated - Digital temperature display - Thermostatically controlled - Stainless Steel interior material - Automatic over-temperature alarm

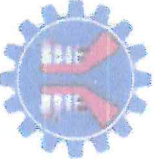
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		• At least two (2) removable stainless-steel grating type laboratory oven shelves having a minimum distributed load of 5 kg • Minimum of 60 Liters chamber volume • Temperature range: 75°C to 250°C or wider range • 220-240 V • With local calibration showing temperature uniformity of $\pm 2.5^{\circ}\text{C}$ or better throughout testing chamber at 110°C, 163°C, 200°C and 250°C		
4. Accurate Forced Ventilation Oven		• Forced ventilation or forced air type (with fan to move the air inside the oven) • Electrically heated • Digital temperature display • Thermostatically controlled • Stainless Steel interior material • Automatic over-temperature alarm • At least two (2) removable stainless-steel grating type laboratory oven shelves having a minimum distributed load of 5 kg • Minimum of 60 Liters chamber volume • Temperature range: 75°C to 250°C or wider range • 220-240 V • With local calibration showing temperature uniformity of $\pm 1^{\circ}\text{C}$ or better throughout testing chamber at 110°C, 163°C, 200°C and 250°C		
5. Rotating Shelf Thin-Film Oven		• Forced ventilation or forced air type (with fan to move the air inside the oven) • Electrically heated • Digital temperature display • Thermostatically controlled • Stainless Steel interior material • Automatic over-temperature alarm • Temperature range: 75°C to 180°C or wider range • 220-240 V • With local calibration showing temperature uniformity of $\pm 5^{\circ}\text{C}$ or better throughout testing chamber at 110°C, 163°C, 200°C and 250°C • Rectangular interior • Minimum internal dimensions (excluding heating element): 330 x 330 x 330 mm • Front opening is the same interior height and width of the oven • Front opening has a tightly fitted hinged door with a minimum 100 x 100 mm (4 x 4 in.) window composed of 2 sheets of glass separated by an air space positioned to allow reading of a vertical thermometer without opening the door		

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		• with openings for the entrance of air and for the exit of heated air and vapors • with a single vertical shaft centered with respect to the horizontal interior dimensions of the oven and has provisions for suspending a rotating shelf vertically as close to the center of the oven as permitted • with mechanical means of rotating the vertical shaft and attached Rotating Shelf at the rate of 5.5 ± 1.0 r/min • upon reaching 163°C and 2 sample pans are introduced, the oven is capable of returning to 162°C within 15 minutes • with provision for supporting the thermometer from the shaft of the circular shelf in a vertical position at a point equidistant from the center and outer edge of the shelf and the bottom of the thermometer bulb is approximately 6.4 mm ($\frac{1}{4}$ in.) above the top of the shelf • Includes certificate(s) from the manufacturer showing conformance to AASHTO T 179 with the certificate containing the specific brand, model and serial number of the oven.		
6. Rolling Thin-Film Oven		• Forced ventilation or forced air type (with fan to move the air inside the oven) • Electrically heated • Double-walled • internal dimensions (HxWxD): $381 \times 483 \times 445 \pm 13$ mm ($15 \times 19 \times 17\frac{1}{2} \pm \frac{1}{2}$ in.) • door has a symmetrically located window 305-330 mm (12-13 in.) wide by 203-229 mm (8-9 in.) high containing 2 sheets of heat-resistant glass separated by an air space and permitting unobstructed view of interior • heating element shall be located below the oven floor and adequate to maintain the required temperature • vented at the top [symmetrically arranged in the upper part with an open area of 9.3 ± 0.45 cm² (1.45 ± 0.07 in.2)] and bottom [located symmetrically to supply incoming air around the heating elements and have an open area of 15.0 ± 0.7 cm² (2.31 ± 0.11 in.2)] • have an air plenum covering the side walls and ceiling, the air space being 38.1 ± 4.8 mm ($1\frac{1}{2} \pm 3/16$ in.) deep from the walls and ceiling • At a midpoint in the width of the oven and 152 mm (6 in.) from the face of the circular metal carriage to its axis, a squirrel cage-type fan 133.4 mm ($5\frac{1}{4}$ in.) outside diameter by 73 mm ($2\frac{7}{8}$ in.) wide shall be turned at 1725 r/min by an externally mounted motor		

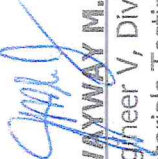
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	• The squirrel cage fan turns in an opposite direction to its vanes • The air flow characteristics of the fan-plenum system shall be suctioned from the floor of the oven through the wall plenums with the air exiting through the fan • Equipped with a proportional temperature controller capable of maintaining a temperature of $163 \pm 1.0^{\circ}\text{C}$ • The temperature controller shall be capable of bringing the fully loaded oven back to the test temperature within a 10-min period after insertion of the samples in a preheated oven • Provision for hanging or affixing a thermometer to a mounting in the ceiling, 51 mm (2 in.) from the right side of the oven at a midpoint in the depth of the oven so that the bulb or the tip of the thermometer is within 25 mm (1 in.) of an imaginary line level to the shaft of the circular metal carriage • Provided with a 305-mm (12-in.) diameter vertical circular metal carriage provided with suitable openings and clips for firmly holding eight glass containers in a horizontal position and mechanically driven through a 19-mm ($\frac{3}{4}$-in.) diameter shaft at a speed of 15 ± 0.2 r/min. • Equipped with an air jet • positioned to blow heated air into each container at its lowest point of travel • have an outlet orifice 1.02 mm (0.04 in.) in diameter (No. 60 drill) connected to a 7.6-m (25-ft) length of 7.9-mm (5/16-in.) O.D. refrigeration copper tubing, coiled to lie flat on the bottom of the oven, exposed to the plenum of the oven, not be covered by aluminum foil or other material and lead to a source of fresh-dried, dust-free, regulated air. • With flowmeter capable of measuring the airflow at a rate of 4000 ± 100 mL/min.; located downstream of all regulating devices, upstream of the copper coil and positioned so it is maintained at approximately room temperature. • With container and hoses of sufficient size to hold the Activated Silica Gel and allow removal of moisture from the air going into the Rolling Thin-Film Oven • 220-240 V • With local calibration showing temperature uniformity of $\pm 1^{\circ}\text{C}$ or better throughout testing chamber at 110°C and 163°C • Includes certificate(s) from the manufacturer showing conformance to AASHTO T 240 with the certificate containing the specific brand, model and serial number of the oven.		

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7. Large Capacity Gravity Convection Oven			- Forced ventilation or forced air type - Electrically heated - Digital temperature display - Thermostatically controlled - Stainless Steel interior material - Automatic over-temperature alarm - At least one (1) removable stainless-steel grating type laboratory oven shelves having a minimum distributed load of 20 kg - Minimum length = 800 mm - Minimum depth = 600 mm - Temperature range: 70°C to 250°C or wider range - Temperature uniformity: ±2.5°C or better - Rate of ventilation of testing chamber (air changes per hour): 50 to 200 - With local calibration showing temperature uniformity of ±2.5°C or better throughout testing chamber at 110°C and 163°C 220-240 V	
8. Muffle Furnace			- Temperature range: 300°C to 1200°C or wider range - Electrically heated - Digital temperature display - Thermostatically controlled 220-240 V - With local calibration showing accuracy to be within ±25°C at 750, 850 and 1100°C	
Accessories			Specification	
1. Rotating Shelf (Rotating Shelf Thin-Film Oven) - (required for complete set during initial purchase; may be purchased separately if Rotating Shelf Thin-Film Oven is already available)			- Circular - Metal - minimum diameter of 280 mm (11.0 in.) - flat surface for support of the containers without blocking all air circulation through the shelf when the containers are in place - has provisions for attaching to the vertical shaft of the Rotating Shelf Thin-Film Oven vertically as close to the center. 2 – 140 mm (5 ½ in.) diameter marked sample container positions located symmetrical with respect to the shaft and to any holes in the shelf	
2. Container (Rotating Shelf Thin-Film Oven) - (required for complete set during initial purchase; may be purchased separately if Rotating Shelf Thin-Film Oven is already available)			- cylindrical pan 140 mm (5½ in.) inside diameter 9.5 mm (3/8 in.) deep - flat bottom - made of stainless steel - thickness 0.6 mm (0.024 in.) or greater	

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3. Circular Metal Carriage (Rolling Thin-Film Oven) - (required for complete set during initial purchase; may be purchase separately if Rolling Thin-Film Oven is already available)	• 305-mm (12-in.) diameter • with suitable openings and clips for firmly holding eight glass containers in a horizontal position • has provision to be attached to a 19-mm (¾-in.) diameter horizontal shaft allowing it to rotate at a speed of 15 ± 0.2 r/min • compatible with the Rolling Thin-Film Oven (specify brand and model available in the laboratory) • Includes certificate(s) from the manufacturer showing conformance to AASHTO T 240			
4. Activated Silica Gel (Rolling Thin-Film Oven) - (required for complete set during initial purchase; may be purchase separately if Rolling Thin-Film Oven is already available)	• treated with an indicator to show if it is already saturated with moisture • In original container and not repacked • Container had GHS Compliant labelling			
5. Container and Hoses (Rolling Thin-Film Oven) - (required for complete set during initial purchase; may be purchase separately if Rolling Thin-Film Oven is already available)	• sufficient size to hold the Activated Silica Gel and allow removal of moisture from the air going into the Rolling Thin-Film Oven • compatible with the Rolling Thin-Film Oven (specify brand and model available in the laboratory)			
6. Flowmeter (Rolling Thin-Film Oven) - (required for complete set during initial purchase; may be purchase separately if Rolling Thin-Film Oven is already available)	• any suitable type capable of measuring the airflow at a rate of 4000 ± 100 mL/min. • can be positioned downstream of all regulating devices, upstream of the copper coil and maintained at approximately room temperature at the Rolling Thin-Film Oven (specify brand and model available in the laboratory) • compatible with the Rolling Thin-Film Oven (specify brand and model available in the laboratory)			
7. Thermometer 13C (Rolling Thin-Film Oven) - (required for complete set during initial purchase; may be purchase separately if Rolling Thin-Film Oven is already available)	• Refer to "Doc Code: MTF-ESGO-04 - DPWH Specification for Laboratory Apparatus, Equipment and Supplies - Thermohygrometers, Barometers and Thermometers"			
8. Sample Container (Rolling Thin-Film Oven) - (required for complete set during initial purchase; may be purchase separately if Rolling Thin-Film Oven is already available)	• heat-resistant glass • smooth interior • borosilicate Glass • cylindrical type glassware • partially covered at the top with a minimum of 15.0 mm (0.59 inch) length from the edge of the glass to the edge of the opening and inclined downwards towards the opening at 1.5 ± 0.8 mm (0.06 ± 0.03 inch)			

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• 31.8 ± 1.5 mm (1.25 ± 0.06 inches) top opening diameter • 64 ± 1.2 mm (2.52 ± 0.047 inches) outer diameter • 139.7 ± 1.5 mm (5.5 ± 0.06 inches) height • 2.4 mm ± 0.3 mm wall thickness • Glass may be treated (e.g., frosted) on its exterior for handling purposes. • Includes certificate(s) from the manufacturer showing conformance to AASHTO T 240	
9. Sample Pan (Large Capacity Gravity Convection Oven) - required for complete set during initial purchase; may be purchase separately if Large Capacity Gravity Convection Oven is already available.	• Stainless steel • with handles • at least 500x400x100 mm (LxWxH) (depth and length may be increased based on the depth and length of Large Capacity Gravity Convection Oven) • 2 mm thick (thickness may be increased to extend service life of Stainless-steel pan)
Additional Notes:	

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