

STATEMENT OF WORKS FOR

REPLACEMNET OF EXTACT FAN WITH DRY SCUBBER AND EXHAUST HOOD OF CHANCERY CANTEEN

1.0 BRIEF DESCRIPTION OF WORKS:

The United States Embassy, New Delhi has requirement for replacement of extract fans, dry scrubber, exhaust hood and associated duct works of the chancery canteen kitchen.

1.1 **GENERAL GUIDELINES:**

- a. Contractors are advised to go thru the attached drawing, detailed statement of works and specifications. Contractor shall provide all the materials, labor, and tools to execute the project as per scope, specifications and to the satisfaction of the COR.
- b. The contractor is advised to conduct re-check and re- measure the dimensions provided in the general statement of work during the walk thru before quoting, as per the site condition.
- c. Contractor shall provide a detailed time schedule of activities involved in the project within five working days of the award of contract. The main frame work and filters can be fabricated at contractor's factory and deliver the same to the site once ready for site installation.
- d. The contractor shall deploy a full time engineer/supervisor at site during the installation at site.
- e. Contractor shall barricade the work area to protect the area.
- f. The total duration of the project shall be one month including the factory fabrication and site installation.

2.0 <u>DETAILED STATEMENT SUPLIES AND WORKS:</u>

EXTRACT FAN SECTION:

The contractor shall supply, Install, Test and Commission approved make fan section for extract air complete with floor standing backward curved DIDW centrifugal fan, MS base frame, IE-02 TEFC squirrel cage induction motor with 2 hour fire rating & class "H" insulation, drive package and vibration isolation arrangement including spring isolators, rubber grommets etc. as called for in working drawings & specifications. Fan section casing shall be of double skin sheet metal construction, double skin panels with 25mm thick injected PUF of density not less than $40 \, \text{kg/cuM}$. Fan shall be suitable for operation on $415 \pm 10\%$ volts, $50 \, \text{Hz}$ 3 phase AC power supply. Fan motor for kitchen fan, shall be enclosed in GI sheet enclosure in hot air stream free area. Fan outlet velocity shall not exceed $1800 \, \text{FPM}$ ($9.1 \, \text{MPS}$) for ceiling suspended & $2000 \, \text{FPM}$ ($10.1 \, \text{MPS}$) for floor mounted Units. Extract fan section shall be suitable for floor installation .The kitchen fan motor shall be outside hot air stream. The fan characteristics shall be as follows:

Fan No.	Capacity (Cfm)	S.P (mmWG)	Motor Rating (HP)	Type	
EFS	9000	70	7.5	FM	

EXTRACT FAN SECTION:

The scope of this section comprises of supply, installation, testing and commissioning of packaged type Extract Fan Sections (EFS) of specific capacity. The housing/casing of the EFS shall be of double skin construction. The housing shall be so constructed that it can be delivered at site in total/semi knock down conditions depending upon size of the EFS, location & access available.

The framework shall be extruded aluminum hollow sections filled with preformed insulation section. Frames shall be assembled using mechanical joints to make a sturdy and strong framework for various sections.

Double skin panels (each not exceeding 750mm wide) shall be made out of 24 gauge pre-painted galvanized steel sheet on outside and 24 gauge plain galvanized sheets inside with 25 mm thick injected PU foam insulation in between. These panels shall be bolted from inside on to the frame work with soft rubber gasket in between to make the joints air tight.

Frame work for each section shall be bolted together with soft rubber gasket in between to make the joints air tight. Suitable doors with pressure die cast aluminum hinges and latches shall be provided for access to various panels for maintenance. The entire housing shall be mounted on galvanized steel channel frame work.

Marine light with switch, view window and proximity switch to be provided in the casing of each EFS. Factory Fabricated Plenums shall be provided as shown in design drawings.

The fan shall be forward/backward curved, floor standing, double inlet double width type. The wheel and housing shall be fabricated from heavy gauge galvanized steel. The fan impeller shall be mounted on a solid shaft supported to housing with angle iron frame/spider and self-lubricated sealed eccentric type ball bearings.

The impeller and fan shaft shall be statically and dynamically balanced. The fan outlet velocity shall not be more than 2000 FPM (10.1 MPS). Fan housing with motor shall be mounted on a common steel base inside the air handling housing on anti-vibration spring mounts or rubber mounts. The fan outlet shall be connected to casing with the help of fire retardant canvass.

Fans shall be driven by an electric motor as specified in the schedule of quantities. Motor ratings are only tentative and where a fan requires a higher capacity motor, the contractor shall clearly point out the requirement and make his offer accordingly. Motor ratings shall be at least 20% over limit load plus transmission losses. Fan motors shall be suitable for operation on 415+10% volts, 50 Hz, 3 phase, AC power supply and shall be **EFF1**, TEFC squirrel cage induction type totally enclosed, fan cooled with IP-55 protection. Motors shall be especially designed for quiet operation and motor speed shall not exceed 1440 RPM. Drive to fan shall be provided through belt-drive arrangement. Belts shall be of the oil-resistant type. Provisions of separate GI sheet enclosure to locate the motor in hot air stream free area to be made (applicable for kitchen extract fan sections only).

FILTERS:

Viscous Metallic Filters:

Viscous metal filter shall be all metal, washable type. The filter media shall be composed of layers of crimped GI wire mesh. The velocity over face of filter shall not exceed 90 MPM and pressure drop shall not exceed 5mm for 50mm thick filter. The filter shall be of GI and suitable for mounting as required at site.

Synthetic Fiber Filters (EU-3)

Synthetic fiber filter shall be constructed out of 50mm deep non-woven synthetic fiber replaceable media secured with anodized ductile aluminum mesh on one side & 40 sieve HDPE mesh on the other side. All the layers to be duly stitched together & to be housed in 18G Aluminum anodized frame. The filter element shall have 11 folds/Rft. The filter shall have an efficiency of 90% down to 10 microns when tested as per BS: 2831 standard. It shall be suitable for operation under 100%

Relative Humidity & 120 degree C temperature conditions. The velocity over the face of filter shall not exceed 105 MPM and the pressure drop across the filter shall not exceed 3 mm WG for 50mm thick filter. The filter frame shall be suitable for mounting in air handling unit as required at site.

Microvee Filters: (EU-7)

Fine filters shall be designed to remove particles down to 3 microns as per BS: 6540 standard. Filter shall comprise of aluminum sheet duly anodized. Filter element shall be made out of non-woven synthetic supported by anodized ductile aluminum mesh on one side & HDPE mesh not less than 40 sieve size on the other side with 11 folds/Rft of filtration area. All the layers to be dully stitched together. All sides to be sealed with ductile epoxy resin and filters shall be cleanable type using water/detergent. Rubber gaskets to be provided on the flange. Filter element shall be specially treated with antifungal and bacterial reagent to prevent growth of micro-organisms shall be screwed into the frame by means of an aluminum clamp Patti and brass screws. They shall comprise of housing made from MS angles/flats epoxy coated of size suitable to receive the required number of filters to handle specified Cfm for each AHU. All filters shall be installed in same plane. No zigzagging shall be allowed by means of threaded bolts.

HEPA Filter:

These filters shall remove particles greater than 0.3 microns with an efficiency of 99.99% when tested with cold DOP test. Filter shall comprise of specially treated glass fiber media, aluminum media separators housed in an aluminum sheet frame provided with double turned flanges and dosed cell neoprene gaskets. The housing shall be designed to install the hepa filter in the terminal location in RCC slab ceiling. It shall be suitable for mounting the HEPA filter. Housing assembly shall comprise of:

- a) Bottom MS tee frame.
- b) Top MS angle frame.
- c) Clamping device for filter tightening.
- d) Provision for connecting manometer across the filter.
- e) Provision for top flexible PVC based connector.

MS tee frame shall be mounted flush on the bottom surface of ceiling. It shall be securely welded at site to top MS angle frame which will be supported by brick masonry up stand all around the slab opening. The contractor shall ensure that the inner surface of the opening is smooth plaster finished and treated with epoxy paint by civil contractor. The top MS angle frame shall have provision to fix SS angle cleats by means of bolts. Cleats shall contain SS press down bolts with lock nuts. Flexible Rexene connectors shall be of suitable size to enable easy insertion and removal of HEPA filter into the terminal opening. The Rexene shall be screwed to supply air duct and MS angle frame in up stand by means of MS clamp patties. All MS components shall be epoxy painted.

Electrostatic Precipitator Section:

Electrostatic precipitator section shall be made of 16 gauge galvanized sheet, High bake epoxy powder coated, Washable type aluminum mesh pre-filter, Washable type aluminum mesh post filter, Stainless steel spiked ionizers to create high voltage DC field, aluminum collector plates which should be alternatively charged positive & negative with large collecting area with 14" deep cell, to work as magnet for charged smoke & oil particles.

An average efficiency of 90-95% in single pass as per DOP test method. Electrostatic Precipitator should be able to charge particles from 0.01 micron to 10 micron through solid state power supply. Collector cell should be of permanent type and slide out. Facility for easy removal for cleaning. Operating Voltage: 220V/1Ph/ 50Hz, Power consumption: 50 watts each unit. Ionizing Voltage: 12.5 – 13.0 kVDC, Collector Cell Voltage: 6.0 – 6.5 kVDC, System should be fitted with interlock switch for safety, the system should be able connected to a fan section to achieve airflow of 500 FPM across the air cleaner. The filter should have a constant pressure drop.

SCRUBBER

The contractor shall supply, Install, Test and Commission a scrubber comprising of extract air intake section, electrostatic precipitation technology, and dry type air cleaner to remove odor, smoke and fumes from Extract air. Electrostatic section shall be made of 16 gauge galvanized sheet, high bake epoxy powder coated, washable type aluminum mesh filters, stainless steel spiked ionizers to create high voltage DC field, aluminum collector plates which should be alternatively charged positive and negative with large collecting area with 14" deep cell, to work as magnet for charged smoke and oil particles.

Average efficiency of 90-95% in single pass as per DOP test method. Electrostatic Precipitator should be able to charge particles from 0.01 micron to 10 microns through solid state power supply. Collector cell should be of permanent type and incorporate slide out facility for easy removal for cleaning. The system should be fitted with interlock switch for safety. The system should allow connection to a fan section to achieve 500 FPM velocity across the air cleaner.

Operating Voltage: 220V, 50 Hz

Ionizing Voltage : 12.5 to 13 KVDC

Collector Cell Voltage: 6 to 6.5 KVDC

Power Consumption: 50 Watts

4500 CFM x 2 filters

EXTRACT HOOD

The contractor shall supply, Install, Test & Commission one extract hood constructed out of 1mm thick stainless steel material (SS-304) complete with outer casing/main body, supply air plenum, supply and extract air spigot connections with dampers, fluorescent/LED light fixture, nozzles, grease filters, perimeter drain channel, drain tap or collection tray, adjustment wires for supply air and hanging brackets. The filters shall be high efficiency and NSF/UL classified. The extract hood shall be supplied with factory fitted fluorescent/LED light.

Extract Air Quantity -- 9000 Cfm Maximum Pressure Drop across filters -- 20mm of wg Maximum permissible size of hood -- 8900 x 1500 x 560mm (H)

General: The kitchen exhaust hood shall be constructed from stainless steel (SS 304). The kitchen canopies shall be supplied complete with outer casing/main body, supply air plenum, pressure measurement taps, supply and extract air spigot connections with damper plates, fluorescent light fixture, nozzles, grease filters, perimeter drain channel, drain tap or collection tray, adjustment wires for supply air and hanging brackets.

Outer Casing/Main Body: Outer casing panels shall be constructed of 1mm thick stainless steel sheet to AISI 304 in brushed satin finish. The canopy shall be provided with a full perimeter condense channel and crush folded sloping edges which shall be properly deburred. The joint of lower edge are fully welded, avoiding harmful dripping of water.

Supply Plenum Area: The supply air plenum shall be insulated with glass wool slab of density 95Kg/m3 and shall be provided with access by removal of main casing perforated stainless steel front panels. The main supply air flow shall be distributed through this panel. A rotating knob shall be located inside the canopy on supply plenum face for the adjustment of the air throw pattern.

The plenum roof panels (supply and exhaust) shall also be constructed of stainless steel. Supply Air Nozzles: The supply air nozzles shall be constructed from ABS plastic and shall be adjustable to provide directional air flow.

High Efficiency Filters: The hood shall be designed with high efficiency filters to reduce the exhaust air flow volume required and increases the capture and containment efficiency of the canopy, while reducing energy use Grease Filters: The grease filters shall be supplied in modular size to suit the requirement and shall be removable via two folding handles. The grease filters shall be constructed from stainless steel to AISI 304 and shall be NSF and UL classified. High efficiency grease filters shall be suitable for removing 90% of grease particles and contaminants with a size equal or bigger than 8 microns.

Spigot Connections: The spigot connections for supply and extract air shall be constructed from stainless steel and shall be supplied with air flow balancing damper plate manufactured from stainless steel. The exhaust damper shall be adjustable; the supply air damper shall be adjustable via high tensile stranded wire cables

Factory Fitted Fluorescent Light Fixture: Each canopy shall be provided with fluorescent light fixture to provide approximately 500 lux at the cooking appliances work surface. The light fixture shall be suitable for single phase 230 V supply and shall be constructed to protection standard IP65. Ballast and capacitor shall be located within the light fixture housing. 3x1 mm², core electrical cable connecting the light fitting to the conduit box containing multiple connectors shall be provided.

- 2.1 WORK STANDARDS. The contractor shall be responsible for providing the workers proper tools and test equipments to accomplish each segment of this work statement. The entire work shall be carried out by professionally qualified and certified persons. The craftsmanship shall be professional and maintain the Indian standards or embassy standards with necessary fire and life safety precautions wherever required.
- 2.2 CLEANING OF THE WORK SITE. The contractor shall be responsible for cleaning of the work site during the installation. The contractor shall be responsible to dispose of the trash and debris and frame works.
- 2.3 SITE RESTORATION. The contractor shall ensure that all facilities receiving this work shall be left in a condition acceptable to COR and the site supervisor upon completion.
- 2.5 SAFETY. Safety is the highest priority. The contractor shall direct all of those under his charge to work safely. The safety concerns shall be brought to the attention of the COR. The contractor shall take all necessary measures and precautions to avoid interruptions of Government operations and delays. Contractor must provide and maintain work environment and procedures, which will safeguard the public and Government personnel, property, materials and equipment exposed to his operations and activities. The contractor's staff will take all safety precautions and comply with the standards issued by OSHA, local authorities, Embassy over occupational health and safety issues. All work should be carried in accordance with applicable safety regulations.
- 2.6 SECURITY REQUIREMENTS. The Embassy shall arrange for security clearances of the contractors' workers to be deployed at the Embassy. The contractor is required to provide the full names and completed security forms of personnel's those who are assigned to this specific task with in five working days after the award of the contract.
- 2.7 ALLOWANCES FOR MISCELLANEOUS TIME REQUIREMENTS. The contractor price proposal must allow for time delays that may be encountered in coordination for the

site installation. No additional funds will be provided to compensate for additional time requirements or delays that could have been reasonably anticipated.

Warranty:

The work and the product shall be warranted a period of minimum one year from the date of acceptance by the COR.