**Materials**

1. **Casing** – The silencer casing shall be made of 1.2 mm thick stainless steel sheet SUS304/SUS316 (choose one) and accurately pre-punched with appropriate holes for assembly of splitters, flanges, and adjacent modules. According to the casing, the splitter frame, inlet, and outlet fairings shall be made of the same thickness stainless steel sheet.
2. **Splitter Protection Lining** – Perforated plate made of 0.8 mm thick SUS304/SUS316 (choose one) stainless steel sheet perforated with 3.0 mm diameter holes arranged at 5 mm triangular pitches shall be used to enhance low-frequency sound attenuation and prevent infill erosion.
3. **Glass Cloth Fabric** – The cloth fabric shall be combined with the perforated plate to maximize protection against infill erosion. The material shall be not more than 1.0 mm in thickness and shall be non-combustible.
4. **Infill** – Acoustic infill shall be fiber-free, made of fire-retardant acoustic foam. The use of fiberglass or mineral wool with polyester film protection is not acceptable.
5. **Angle frame** – The angle frame and flange shall be made of SUS304/SUS316 (choose one) stainless steel sheet. For a single module silencer, the angle frame shall be made of 40mm x 40mm x 2.5mm. For multiple module silencers, the angle frame shall be construction 50mm x 50mm x 5mm thick angles.

**Construction**

1. The silencer shall be constructed of a casing, splitters, and connecting flanges. The casing shall have snap-lock corner joints angle-reinforced to give it strength. The joints shall be filled with silicone sealant to prevent air leakage to a minimum pressure of 2000 Pascals.
2. The splitter shall consist of a die-formed bullnose fairing, a stainless steel frame constructed of cold-formed angles, glass cloth fabric and perforated plate linings, and acoustic foam infilled. The glass cloth and perforated sheet lining shall be fastened to the splitter frame with 3.175mm diameter stainless steel rivets; tack or spot welding shall not be allowed. These parts shall be assembled to form an aerodynamic shape splitter. When assembled within the casing, the splitters form bell-mouth entrance and taper discharge for uni-direction airflow. The aerodynamic splitter design with selected infill and lining perforation shall meet the specified sound attenuation with less airflow resistance and lower generated noise.
3. Splitters shall be fastened to the casing with 4.75 mm diameter high-quality SUS304 rivets. No tack or spot welding shall be allowed.

**Performance**

The subcontractor shall submit the brand, the manufacturer name, the type of silencer, size, acoustic, and aerodynamic performance for approval. Test reports of silencer shall be submitted for approval before ordering. The silencer with glass cloth and perforated plate protection linings should have been tested in an accredited laboratory for pressure loss, static and dynamic sound insertion loss (SIL and DIL), and generated noise in a duct-reverberation chamber according to ASTM standard E477-99. For the DIL, the silencer shall be tested with airflow in the forward and reverse direction in relation to the noise source.

The pressure loss across the silencer shall not exceed the values specified for each cooling tower in the silencer schedule.

The fan manufacturer shall submit accurate fan sound power levels for the silencer manufacturer to perform noise analysis to determine the dynamic insertion loss required to achieve the specified ambient noise level. Noise analysis and resultant silencer selection and pressure loss shall be submitted for approval before proceeding to manufacture. The fan manufacturer shall adjust the fan static to compensate for the silencer pressure loss.

The silencer shall be similar to OLSON Acoustics Model CR33 as manufactured by OLS Manufacturing Co. Pte Ltd or equivalent.