Ventilating the Basement Garages in the Games Village

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Developed on the eastern bank of the river Yamuna near the Akshardham Temple in New Delhi, the Commonwealth Games Village was built from scratch to cater to the living needs of more than 8000 athletes and team officials from 71 countries from 3rd to 14th October 2010. It is Delhi's only purpose-built self-contained premier residential complex designed by an American firm of architects.

The residential complex is spread over 27 acres and is bordered by a dense green cover. It has 34 seven-storied towers with 1168 apartments, 27 water play areas, central social spaces, club house, gym, sports facilities, convenience shops, solar external lighting, state-of-art security system, wi-fi/DTH enabled, 100% power backup and treated water supply.

Design of the Ventilation System

Both basements are primarily used for car parking and in addition there are common service facilities such as two DG rooms, three Pump rooms and eleven electric substtaions. The ventilation facilities comprise:

- Mechanical ducted extraction systems for car park areas.
- Air cooling systems for the two DG rooms.
- Fresh air supply and exhaust systems for substtions and pump houses.

The natural fresh air intake and ducted mechanical smoke exhaust systems are designed to achieve 12 air changes per hour for **normal exhaust** of polluted air and 30 air changes per hour for **emergency exhaust**, as specified by the Delhi Fire Services.

The DG rooms have been with designed with mechanical supply of cooled air and exhaust systems. The pump rooms and substations have been provided with supply of fresh air and mechanical exhaust systems.

Ventilation for Car Parking

The total basement parking area is about 97,000m^2 and for achieving the desired 12 air changes per hour, 60. DIDW fans of 40,000 cfm capacity each with GI ducting and exhaust grills have been strategically located all over the basement areas. The locations have been selected for effective suction of polluted air so that there are no dead spots for fumes and smoke to stagnate and collect. These fans are designed for continuous operation.

In addition, 120 axial flow (tube axial) fans of 30,000 cfm capacity each have also been provided for effective suction and clearance of smoke generated in case of any fire. To take care of smoke exhaust, the entire stilt and lower basements have been divided into several zones and fans for each zone will operate after getting a signal from the smoke detectors.

Each DIDW centrifugal fan has been placed inside an independent plant room located in the parking area. The fan room,

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in turn is connected with a network of suction air GI ducting so that the polluted air from nearby areas is effectively extracted by means of a DIDW fan and exhausted to outdoor ambient through a masonry shaft. Axial fans are also mounted inside the fan rooms in such a manner that the smoke and fumes generated in the areas near the fan rooms are extracted and connected directly to a common masonry shaft for exhaust of smoke and fumes.

Adequate fresh air intake louvers/ cut outs have also been designed and provided at ground floor level in non-tower areas. DIDW fans are designed with adequate static pressure so that the fresh air enters the basement area through a fresh air shaft, passes through the basement areas, enters the fan room through the suction grills mounted on GI ducting and finally exhausted through masonry exhaust shaft.

A typical layout showing fan room, fresh air intake cut outs, with suction air grills and exhaust shaft is shown in *Figure 1*.

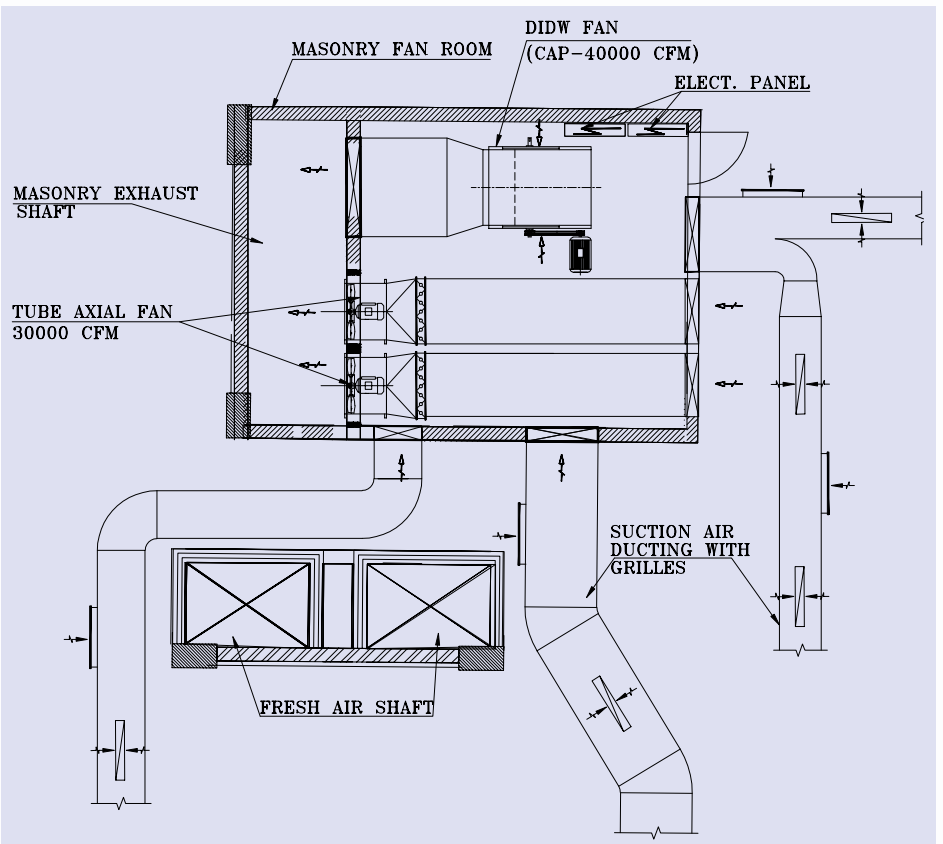

Figure 1: Typical fan room layout in basement

Air Cooling and Exhaust Ventilation of DG Rooms

As per system design, a total of eight cellulose-fill type air washers with associated water circulation system, electrics and GI ducting have been provided to meet the air cooling requirements of the two DG rooms.

An independent air washer system has been provided for each DG room. Five air washers complete with filters, DELdek pads, DIDW fan of 50,000 cfm capacity have been provided for the first DG room whereas three air washers have been provided for the second DG room.

The warm air is exhausted through a masonry tunnel by means of five DIDW exhaust fans of 60,000 cfm capacity each for the first DG room and three fans for the second DG room.

Supply and Exhaust Ventilation of Substations and Pump Rooms

The substations and pump rooms have been provided with supply and exhaust ventilation systems. Fresh air is supplied to each room by means of wall mounted in-line fans, GI ducting and supply air grills. Heated air is exhausted by means of in-line fans, GI ducting and exhaust air grills.

Project Management & Site Activities

The supply of equipment, ducting and associated electrics and accessories commenced in September, 2009 after approval of detailed engineering drawings by the client and the consultant and were completed within four months. The supply of equipment included:

76 DIDW fans, 120 axial flow (tube axial) fans, 20 in-line fans, 8 air washers, 41,000 sq. m of GI, factory fabricated ducting as per SMACNA standards, 2400 suction air grills and Cabling and earthing.

A technically competent, 15- member project team comprising designers, project managers, site engineers and supervisors was deputed to coordinate the site activities with other agencies and oversee the installation work on a day to day basis. In addition to the core team, more than 90 technicians, skilled and semi - skilled workers were deployed to carry out the erection work. Being a fast track project, close monitoring of the activities was done for timely completion of the project.

Trial Run & Commissioning

A trial run and commissioning was conducted for seven days for each exhaust and air cooling system. The technical parameters measured were:

- Air flow capacity of DIDW and axial fans in cfm.
- Suction velocity in ducting as well as air flow at suction grills.
- DB and WB temperatures of the outdoor ambient and DB temperature at outlet of CELdek cooling media of air washers.

The test results demonstrated that the performance parameters were well within the specified values.