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9940 572 462



6381 907 438



ijirset@gmail.com



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# Literature Survey on Design of Exhaust Ducting System for the Multi-Storey Building

Mr. B. Phanindra Kumar<sup>1</sup>, B. Naveen<sup>2</sup>, R. Saitarun<sup>3</sup>, V. Chandu<sup>4</sup>

Assistant Professor, Department of Mechanical Engineering, Guru Nanak Institute of Technology, Khanapur,  
Telangana, India<sup>1</sup>

U.G. Student, Department of Mechanical Engineering, Guru Nanak Institute of Technology, Khanapur,  
Telangana, India<sup>2,3,4</sup>

**ABSTRACT:** Earlier the usage of cooling for comfort object was seen as expensive, yet as of now daily, it has been a requirement for everyone. Window constrained air frameworks, split environment control frameworks are used in little designs, work environments, etc. However, when the cooling load required is astoundingly high like enormous constructions, multiplex, multi-story structures, crisis facilities, etc. In Heat Ventilation and Air Conditioning Technology Ventilation through exhaust ducting framework for the multistorey structure is proficient and successful for the expulsion of hotness air and overabundance stickiness content and foul smell and should keep up with sterile climate in rooms or shut space. In a completely closed room of a design, air can with huge exertion leave the room, causing air defilements to remain and increase in the room. Ventilation is basic for debilitating and dislodging these air poisons. Presently a day as a piece of being lessening the space of development of structures and condos because of little accessibility, the multistorey structures are become clogged. The air in the room becomes hot and change in moistness rate is likewise expanding as indicated by the room accessibility. For the most part ventilation is needed for machine rooms, washrooms, stopping basement. Lift machine room, apparatus spaces that contain the activity or movement regulator for lift activity are needed to be furnished with an autonomous ventilation or cooling framework to ensure against the overheating of the electrical. To keep up with solace and sterile climate exhaust ducting innovation supportive. Revit programming is utilized to make 3D model of exhaust ducting framework for multistorey structure.

**KEYWORDS:** Ventilation, Exhaust Duct, Revit Software, Air conditioner.

## I. INTRODUCTION

The principal motivation behind the HVAC framework is to change and change the outside cools to the ideal states of involved structures for accomplishing warm solace of tenants. Outside air is drawn inside the structures and either warmed or cooled relying upon the open-air condition.

Ventilation is the purposeful presentation of open air into a space. Ventilation is for the most part used to control indoor air quality by weakening and dislodging indoor contaminations; it can likewise be utilized to control indoor temperature, stickiness, and air movement to help warm contact, fulfilment with different parts of indoor climate, or different destinations.

Normal Ventilation is the purposeful aloof progression of open air into a structure through arranged openings (like louvers, entryways, and windows). Regular ventilation doesn't need mechanical frameworks to move open air. All things considered, it depends totally on detached actual peculiarities, for example, wind pressure or the stack impact. Regular ventilation openings might be fixed, or flexible. Movable openings might be controlled consequently (mechanized), constrained by tenants (operable), or a blend of both Cross ventilation is a peculiarity of regular ventilation.

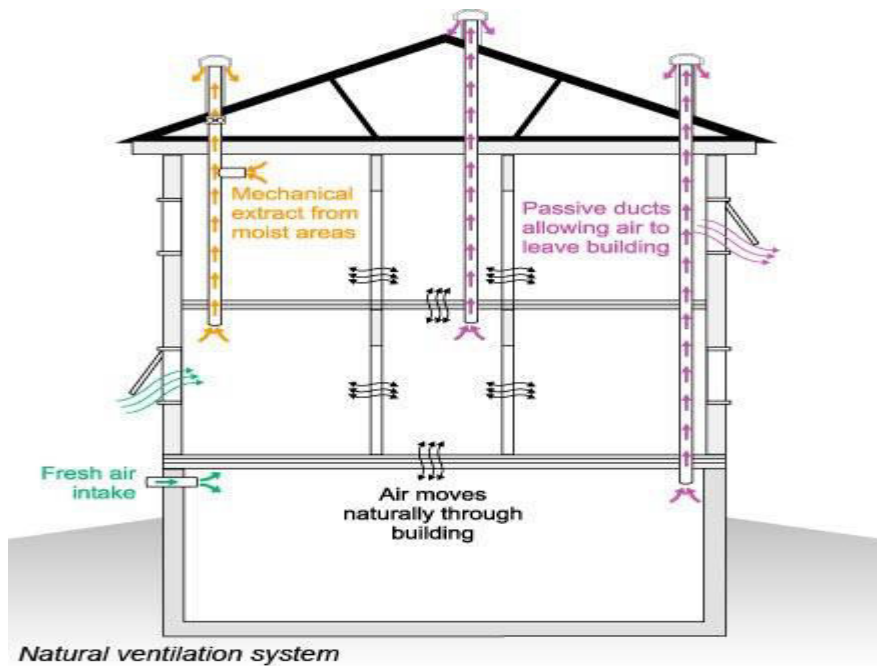


Fig 1: Natural Ventilation System

Mechanical ventilation is the purposeful fan driven progression of outside air into a structure. Mechanical ventilation frameworks might incorporate stock fans (which drive open air into a structure), exhaust fans (which coax air out of building and subsequently cause equivalent ventilation stream into a structure), or a blend of both. Mechanical ventilation is frequently given by gear that is likewise used to hotness and cool a space.

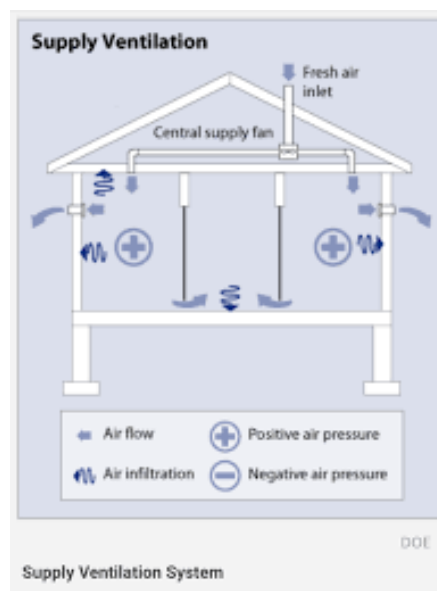


Fig 2: Mechanical Ventilation

Ventilation is an interaction to persistently change the ventilation framework on schedule, and alternatively by area, to give the ideal IAQ benefits while limiting energy utilization, service bills and other non-IAQ costs (like warm distress or clamour). A savvy ventilation framework changes ventilation rates on schedule or by area in a structure to be receptive to at least one of the accompanying: inhabitancy, outside warm and air quality conditions, power lattice needs, direct detecting of impurities, activity of other air moving and air cleaning frameworks. What's more, savvy ventilation frameworks can give data to building proprietors, inhabitants, and directors on functional energy utilization and indoor air quality just as sign when frameworks need support or fix. Being receptive to inhabitancy implies that a shrewd

ventilation framework can change ventilation relying upon request like lessening ventilation assuming the structure is vacant. Shrewd ventilation can time-shift ventilation to periods when a) indoor-open air temperature contrasts are more modest (and away from top open-air temperatures and dampness), b) when indoor-outside temperatures are fitting for ventilative cooling, or c) when open air quality is satisfactory. Being receptive to power framework needs implies giving adaptability to power interest (counting direct signals from utilities) and joining with electric matrix control techniques. Savvy ventilation frameworks can have sensors to recognize wind stream, frameworks tensions, or fan energy use so that frameworks disappointments can be identified and fixed, just as when framework parts need upkeep, like channel substitution.

Supply Ventilation Systems-Hot or Mixed Climates. Outside air is drawn in through an air "utilization" vent and scattered to many rooms by a fan and line structure. A fan and set of conductors committed only to ventilation can be used, or an outer air affirmation can be related with the essential return air channel, allowing the warming and cooling structure's fan and lines to pass outwardly air. The upside of interacting with the return air pipe is that outside can be cooled or dehumidified before it is brought into the home. Since supply systems reliably present outdoors, a home can end up being to some degree packed. In this manner, these systems are routinely not fitting for cold conditions where a risk of warmed indoor air is being pushed through any extra openings and breaks in the improvement get together where it could show up at cold external surfaces, unite, and cause soggy issues.

### Design of Ventilation System

The originator of a ventilation framework has basically three strategies that can be used to plan the framework: adjusted framework configuration, impact entryway plan, and plenum plan. As a rule, where a framework is intended to eliminate poisonous materials, the fair framework configuration is liked. At the point when increments and changes to a current framework are important, the impact entryway configuration is utilized. In situations where huge development is normal or when irregular tasks are connected to the framework, the plenum configuration is awesome. When planning a ventilation framework, the originator should move toward the issue sensibly. This includes gathering data to portray the issue and imperatives, deciding the plan strategy to be utilized, choosing the air cleaner to be utilized, spreading out the framework, planning the hoods required, playing out the plan estimations, choosing, and measuring the air mover, looking at the computations, and contrasting different choices, getting ready itemized shop drawings, and introducing the framework, and playing out a checkout of the framework.

### Duct Material:

Material for ventilation work incorporates elastic, tempered steel, polyurethane, silicone, PVC, neoprene-plunged polyester texture. The best adaptable air channel conduit for business structures in outrageous environments are produced using silicone, PVC, elastic, and treated steel.

### Duct Shapes:

Ducts are commonly framed by collapsing sheet metal into the necessary shape. The most widely recognized shapes, around, rectangular, and oval pipes.



Fig 3: Rectangle Duct



Fig 4: Round Duct

## II. LITERATURE SURVEY

Huang et al., 2017, Many engineers use a rule of thumb for their pressure drop values in calculating their ductwork sizes. Uncertainty in HVAC system sizing exists as there is a lack of accurate information at the design stage to predict a building's peak load demand and not enough operational data to predict system operating cost and energy performance, so many engineers deal with this uncertainty by using a safety factor in their standardized sizing



procedure, which tends to lead to excessive oversizing of the system. This oversizing will cause significant life cycle costs to the building and should be minimized.[1]

Landsberger et al., 2008, One study did review the effect of ductwork design on a commercial HVAC system, specifically using a Variable-Air-Volume (VAV) system. This study looked at common variations in ductwork installations to try and determine the effects of those variations. An orthogonal test matrix was used, and it found that for square diffusers, the energy required to distribute air post VAV unit could be more than doubled by variations in the installation. Although this study did the most in terms of quantifying the energy usage, it focused on ductwork installation variation.[2]

Nyman and Simonson et al., 2004, Conversely there are studies that focus on selecting the proper fan for an HVAC system to maximize energy efficiency. One such study reviewed the life cycle assessment of the air-handling units for a building. The study concluded that a properly sized unit, even though it may be larger and require more material to create, will have less total energy consumption than a unit that is improperly sized (Nyman and Simonson, 2004). This is an interesting conclusion showing that a smaller unit may not be more efficient, but this study did not review any ductwork implications in their calculations.[3]

Stephen M Mickiewicz, US Paten concluded in his paper titled "A system is disclosed for conveying network identifications of HVAC master controllers within an HVAC communication network to their respective zone controllers. Each master controller addresses and transmits its network identification to zone controllers within a predefined range of network addresses unless it encounters another master controller. The network identifications are used by the zone controllers to identify messages from their respective master controllers [4].

Pham T, Borchardt LJ. A balanced mechanical ventilation system refers to the system maintained at either slightly positive or negative pressure, which is achieved by using slightly unequal supply or exhaust ventilation rates. To provide comfort and hygienic environment in living rooms, bathrooms, parking cellars and machine rooms by removing the contaminated air and excess humidity and heat. [5]

Anil Kumar L. The main purpose of an exhaust system is to discharge waste gases generated in the process outside the plant through the ductwork. If the air velocity is too low, solid granules may not be discharged, but instead, build up inside the ductwork and pose potential hazards. Thus, the air velocity inside the ductwork must be maintained above an allowable lower limit. On the other hand, air velocity that is too high might cause noise or vibration problems thus the designed velocity may not exceed an allowable upper limit.[6]

Ronak Shah, Trupti Rathod has described about Mechanical ventilation works by applying a positive pressure breath and is dependent on the compliance and resistance of the airway system, which is affected by how much pressure must be generated by the ventilator to provide a given tidal volume (TV). The TV is the volume of air entering the lung during inhalation.[7]

V Rama Narayana, in this paper, a control strategy for reduced acoustic noise and sensorless operation of a switched reluctance (SR) motor is proposed for heating, ventilation, and air conditioning (HVAC) application, where the magnitude of the dc-bus voltage is controlled as a function of speed and the motor is operated in a single-pulse mode for all speed range. [8]

Suresh Gopalakrishnan, from his journal Centralized HVAC system is a central hydronic air conditioning system used to provide indoor thermal comfort in multi-zone buildings. The system can be divided into two loops: primary and secondary loop. Primary loop is a water system which produces cooling/heating effect through chilled/hot water production and distributes it to secondary loop.[9]

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