Saraswati College of Engineering
Department of Mechanical Engineering

16 Feb 2021

FIELD TRIP
TO
AIRVISION
TECHNOLOGIES
Pvt.Ltd

Introduction of the Company

Airvision manufactured products are widely used by the client for their compact construction, durability, long service life and fine finish.

Owing to their easy installation, optimum functionality and resistance to corrosion, these products are highly appreciated among their customers like Consumer goods/ Personal care, Automobile, Specialty Chemical Industries, Foods and Beverages, Pharmaceutical and Healthcare, Bio-Laboratories, Hospitals, Engineering Industries and Ventilation System, etc. across the country. The company has developed a sound and sophisticated infrastructure that is installed with modern equipment as well as machines to carry out effective production process to offer only the finest quality range of products.

Systematically constructed and segregated, unit helps in streamlining all the business activities such as manufacturing, quality testing, research, storage and others. The team members work with client-centric approach, which help to ensure complete satisfaction of their clients. They are well versed with clean room standards as per ISO, USFDA, WHO, GMP, MHRA and other standards, also offer testing/validation service as per this standard.

They have a full-fledged sales and design office with after sales service facilities which have extended through the subordinates and associates.

Air vision Technologies Pv. Ltd.

About the Field Trip

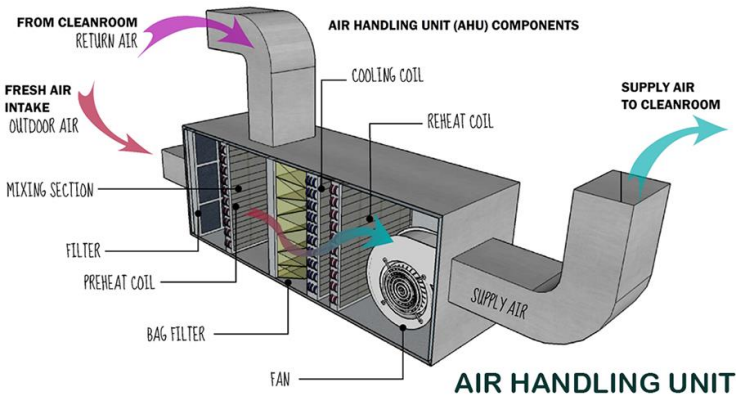
An Field Trip to **Airvision Technologies Pvt Ltd**, at Vasai was organized by the Ishrae Committee of Saraswati College of Engineering, Kharghar on 16th February 2021. There were twenty students who visited the industry to gain knowledge about Air Conditioning, Air Handling Units and much more. The Field Trip was explained by Mr. Ronit Sir starting from the basics of thermodynamics to the making and working of AHU system.

The following are the points covered in the IV:

1. Introduction to AHU system
2. Components used inside the AHU
3. Materials used for making the AHU

Introduction to AHU system: An air handler, or air handling unit (often abbreviated to AHU), is a device used to regulate and circulate air as part of a heating, ventilating, and air-conditioning (HVAC) system. An air handler is usually a large metal box containing a blower, heating or cooling elements, filter racks or chambers, sound attenuators, and dampers. Air handlers usually connect to a ductwork ventilation system that distributes the conditioned air through the building and returns it to the AHU. Sometimes AHUs discharge (supply) and admit (return) air directly to and from the space served without ductwork

Small air handlers, for local use, are called terminal units, and may only include an air filter, coil, and blower; these simple terminal units are called blower coils or fan coil units. A larger air handler that conditions 100% outside air, and no recirculated air, is known as a makeup air unit (MAU) or fresh air handling unit (FAHU). An air handler designed for outdoor use, typically on roofs, is known as a packaged unit (PU), heating and cooling unit (HCU), or rooftop unit (RTU).



Air Handling Unit

Components used inside the AHU:

1. **Grills:** Grills are used to stop the waste from entering the inlet of AHU system.

2. **Dampers:** Dampers are the device used to control the amount of outdoor air that enters the AHU system. The types of dampers are,

a. **Bypass Damper:** It is installed between the supply and return duct to the supply air into room according to the situation of the room.
b. **Fire Smoke Damper:** It is a device which is connected to smoke detector. As smoke detector sense smoke inside room, it sends signal to the fire smoke damper and the damper removes all the smoke from the room into the outdoor atmosphere.
c. **Volume Control Damper:** It is a device which helps to control or adjust the air flow volume to the other part of the duct system.

3. **Filters:** The filters are used in AHU system are to stop the dirt, pollutant or any waste to enter the AHU system. The types of filters are as follows,
   a. **Primary Filters:** These are used to stop the dust, pollutants from entering into the system.
   b. **Secondary Filters:** They are used to stop the other harmful micro-organism or bacteria from entering into the system.

4. **Heating and Cooling Coils:** It is a device which changes the temperature of the air passing through heating/cooling coils into hot/cold air. The heat exchanging medium flowing inside the heating/cooling coil is water if it is connected to chiller system and its refrigerant if its connected to VRV system.

5. **Humidifier:** Humidification is often necessary in colder climates where continuous heating will make the air drier, resulting in uncomfortable air quality and increased static electricity. Various types of humidification may be used:

a. **Evaporative**: dry air blown over a reservoir will evaporate some of the water. The rate of evaporation can be increased by spraying the water onto baffles in the air stream.
b. **Vaporizer**: steam or vapor from a boiler is blown directly into the air stream.
c. **Spray mist:** water is diffused either by a nozzle or other mechanical means into fine droplets and carried by the air.
d. **Ultrasonic:** A tray of fresh water in the airstream is excited by an ultrasonic device forming a fog or water mist.
e. **Wetted medium:** A fine fibrous medium in the airstream is kept moist with fresh water from a header pipe with a series of small outlets. As the air passes through the medium, it entrains the water in fine droplets. This type of humidifier can quickly clog if the primary air filtration is not maintained in good order.

6. **Mixing Chamber:** In order to maintain indoor air quality, air handlers commonly have provisions to allow the introduction of outside air into, and the exhausting of air from

the building. In temperate climates, mixing the right amount of cooler outside air with warmer return air can be used to approach the desired supply air temperature. A mixing chamber is therefore used which has dampers controlling the ratio between the return, outside, and exhaust air.

7. **Blower/Fan:** Air handlers typically employ a large squirrel cage blower driven by an AC induction electric motor to move the air. The blower may operate at a single speed, offer a variety of set speeds, or be driven by a variable-frequency drive to allow a wide range of air flow rates. Flow rate may also be controlled by inlet vanes or outlet dampers on the fan. Some residential air handlers in USA (central "furnaces" or "air conditioners") use a brushless DC electric motor that has variable speed capabilities. Air handlers in Europe and Australia and New Zealand now commonly use backward curve fans without scroll or "plug fans". These are driven using high efficiency EC (electronically commutated) motors with built in speed control.

   Multiple blowers may be present in large commercial air handling units, typically placed at the end of the AHU and the beginning of the supply ductwork (therefore also called "supply fans"). They are often augmented by fans in the return air duct ("return fans") pushing the air into the AHU.

Materials used for making the AHU:

1. **AHU metallic body** made by SS304 or SS316 for pharma company and galvanized iron (GI) used for commercial purposes, hospitals, etc.

2. **Filters:** The material for filters used are synthetic materials, HOPE mesh.

3. **Insulation materials:**

a. **AHU Insulation:** Eco Puff, Rock wool, Glass wool.
b. **Duct Insulation:** Nitrite rubber, Glass wool

The above insulation materials are used to stop the leakage of air and refrigerant or other heat exchanging mediums.

Overview of Industrial Visit

Student's interaction and doubt solving during the IV.

Machines and components at the industry.

Conclusion

The students of Saraswati College of Engineering had successfully completed the industrial visit at Airvision Technologies Pvt.Ltd on 16th Feb 2021. The students gained a lot of knowledge regarding the HVAC industry, complete AHU system and much more related to HVAC. All the doubts and questions of the students were cleared during the Field Trip

Group Photo in industry

Saraswati College of Engineering Kharghar Navi Mumbai-410210

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ISHRAE Registeration 20-21

Timestamp	Name of Student	Division	Roll No	Mobile No	Email ID	ISHRAE Membership No
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INTERNSHIP REPORT

A Report Submitted in partial fulfillment of the
Requirement for the award of the

BACHELOR'S DEGREE (B.E) IN CIVIL ENGINEERING,

Submitted by

Zende Rajani & Borkar Sakshi

Conferred by

UNIVERSITY OF MUMBAI

DEPARTMENT OF CIVIL ENGINEERING
SARASWATI EDUCATION SOCIETY'S
SARASWATI COLLEGE OF ENGINEERING
KHARGHAR, NAVI MUMBAI-410210

(2020-2021)

Acknowledgements

This is not included only to complete the formalities as per tradition because everything is important in life, can be achieved only as a result of team work or collective efforts perseverance. Inspiration and motivation have always played a key role in success of any venture.

It is great sense of accomplishment to express our sincere gratitude to our respected Internship coordinator **Prof. Deepali Phadatare & Prof. Manoj Pillai** for their constant interest, encouragement and valuable guidance during completion of internship.

We would like to extent our gratitude to **Prof. Roshni John** HOD Civil Engg. Dept. (Shift-I) and **Dr. Manjusha Deshmukh** Principal who gave us valuable suggestion and all the required facilities for internship and to everyone who in their own special way helped us in our internship.

Finally we express our sincere thanks to all those people who offered valuable time, suggestions and assistance directly or indirectly to us to achieve our aim.

NAME OF STUDENTS:-

Mr. Zende Rajani

Mr. Borkar Sakshi

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CHAPTER:-1
INTRODUCTION

Migration from rural to urban area has caused unplanned urbanization and poor quality building stock. To overcome these problems mass housing was introduced. The basic concept of mass housing is speedy construction which is a major advantage of precast technology and cost is reduced if similar construction work can be grouped and techniques can be employed in precast at a location where skilled labor is available, while congestion at the assembly site, which wastes time, can be reduced. The method finds application particularly where the structure is composed of repeating units or forms, or where typically same basic structure are being constructed.

CHAPTER:-2
SCHEME DETAILS

For promoting fast rate growth, The Building Materials and Technology Promotion Council (BMTC) under the Ministry of Housing and Urban Affairs (MOHUA) has been supporting innovative housing technologies for affordable housing. About 1.2 million houses are being constructed with such innovative technologies in India under PMAY (U) and other state-run schemes. Pradhan Mantri Awaz Yojana (PMAY) is an initiative taken by Government of India in which affordable housing will be provided to the poor with a target of building 20 million affordable houses by 31 March 2022.

Three Phases of PMAY considered starting and completing the house construction work as follows:

PMAY Phase-1 from April 2015 to March 2017 to roof 100 cities..

PMAY Phase-2 from April 2017 to March 2019 to envelope additional 200 cities.

In NAVI MUMBAI, under Pradhan Mantri Awas Yojana (PMAY), The City and Industrial Development Corporation of Maharashtra (CIDCO) has already initiated the construction of residential buildings. It is approved by Maharashtra RERA and built to cover LIG and EWS housing units with all modern amenities. The location of the project is Taloja, spanning across 21.32 Acres with 64 towers, the project offers 4194 housing units.

CHAPTER:-3

PRODUCTION OF PRECAST ELEMENTS

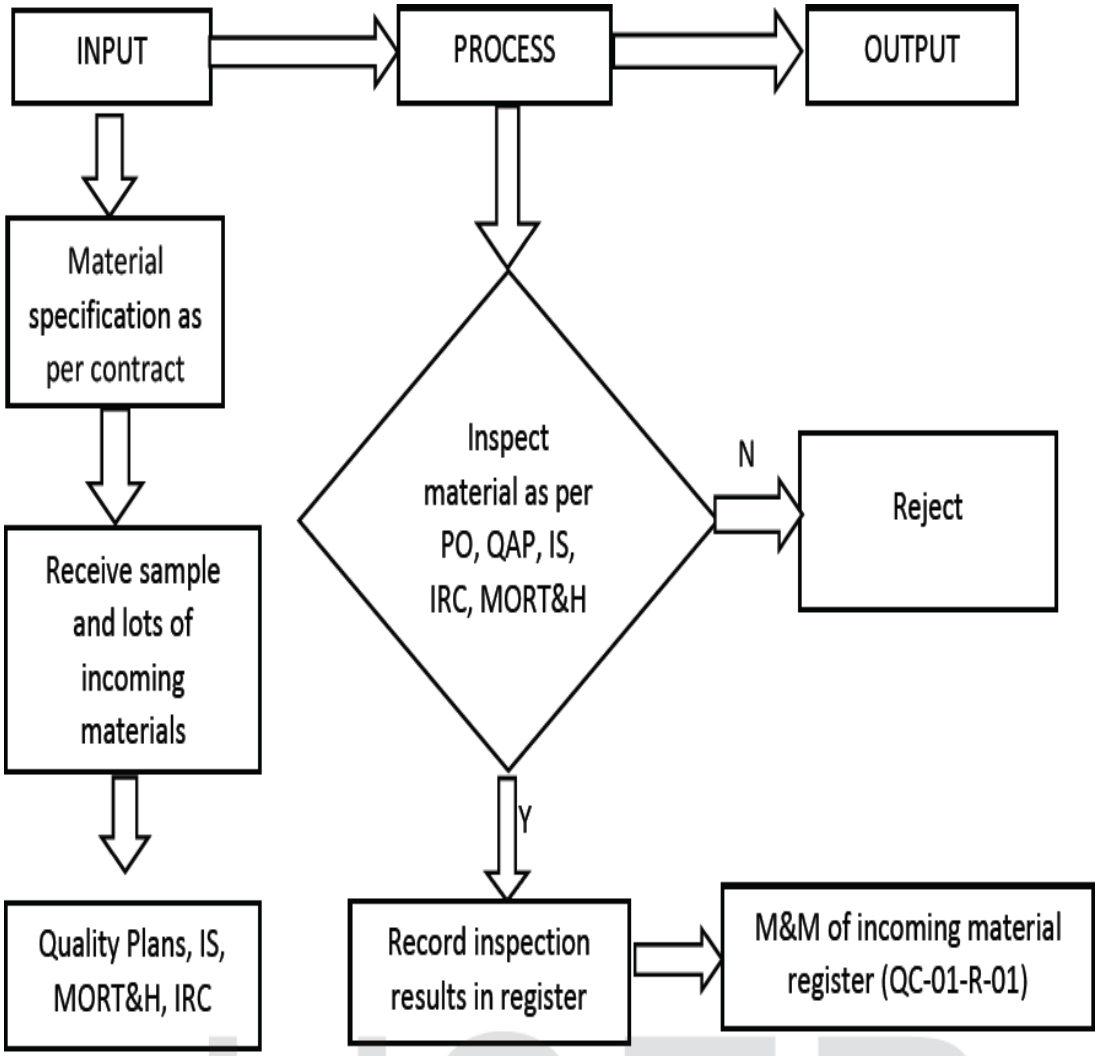
1.QUALITY OF MATERIAL

As soon the pre-production materials such as crushed sand, cement, coarse aggregate reaches the factory, these materials are monitored and measured as per the specification of contract. The inspection result is then recorded in the register. The test on these materials are conducted as per Indian Standard Codes. For this purpose a material testing laboratory is provided with the essential and required apparatus given in IS Codes.

Following are the quality control test:

 # Moisture Correction
 # Workability Testing
 # Cube Testing
 # Aggregate Testing
 # Silt Content Test
 # Water Test
 # Temperature Testing
 # Slump Cone Test
 # Fly Ash Testing
 # Cement Testing

Process Flow chart for monitoring and measurement of quality of materials



CHAPTER:-4

CASTING OF STRUCTURAL COMPONENTS

Each building in this project consists of their own prefabricated components and each has different specifications. The site engineer refers the plan of the required floor and determines the number of components required, this is then sent to the factory for the fabrication of the required component. As per the required specifications the moulds are constructed, these moulds are only allowed to be placed in factory if they are certified. Proper inspection is done. In the factory the engineers are provided with the schedule section and plan of the required component. With the help of these drawings the engineers construct the reinforcements which are then placed in the moulds, after which the concrete is poured with the help of bucket which is moved by gantry or overhead girders. After the component has gained the required strength it is then removed and undergoes proper curing. The partially prefabricated component is then transported to the specified building.

The factory unit consists of manufacturing prefab segments as follows;

A) PRECAST BEAMS:

As per the requirement of the building the various types of beam such as chajja beam, roof beam, floor beam, plinth beam, are manufactured in the provided section of the factory. The construction of the beams initiate by arranging the reinforcements as per the designs. After this the cover is attached to the reinforcements and then placed in to the certified moulds. The mould is oiled from inside before the placement of the reinforcements. After placing the reinforcement the concrete is poured in the mould. The slump of the concrete is 70mm. To eliminate the voids which are present in the concrete, compaction is done by vibration either manually or hydraulical arrangement. The period of 15 hours is provided so that the concrete gains its required strength, after which the mould is dismantled and beam is lifted with the

help of gantry cranes, placed on the trailer truck and transported to the stacking yard. For identification purpose marking on side face of the beam is done. In stacking yard, proper curing is done for 15 days and dispatched for erection purpose at site. The total

Figure 3.Chajja Beam

Figure 4.Manual Casting

capacity of the beam unit is 165 beams per day.

Figure 1. Hydraulic Mould

Figure 2.Beam Reinforcement

B) RECAST COLUMNS:-

The columns are manufactured in the factory as per the requirements includes single core and multi-core columns. The construction of the columns initiated by arranging the reinforcements as per the design. Before placing the reinforcement the pallet should be oiled properly. These columns reinforcement is placed on the pallet along with the plates at the end to provide opening for the notches.After this, the pallet is moved forward with the help of lorry. The core is then inserted hydraulically. This is followed by pouring of concrete in the pallet with the help of bucket. The capacity of bucket is 1.5 cubic meters. The concrete in bucket is poured from the adjacent batching plant. Two buckets are required to fill one single pallet.

After pouring, uniform spreading of concrete is done manually. For removing the voids hydraulic vibrators are provided below the pallet. Core is taken out after the setting of the concrete. Proper surface finish is achieved with the help of floater machine. Further, the pallet is moved forward with the help of lorry and the entire pallet is covered with the plastic, so as to use the moisture generated by the heat of concrete is for curing. For identification purpose the columns are marked and then moved further for curing in the stacking yard. Before dispatching the concrete 7 day curing is done. The total capacity of this unit is 40 columns in 24 hours**.**

Figure 5. Reinforcement with notch plate

Figure 6. Concrete Pouring

Figure 7. Finishing with floater machine

Figure 8. Casted Column

C) PRECAST SLAB

The slabs are also constructed as per the requirement. Before placing the reinforcement the pallet should be oiled properly. The reinforcement of the slab consists of a mesh and lattice girder. The mesh and the lattice girder are manufactured with the help of machines. These are the tied manually. After this the covers are provided and electrical conduits are placed. These reinforcement are placed on the pallet and moved forward with the help of lorry. The concrete is poured with the help of bucket having capacity of 3 cubic meters. The slump of concrete maintained is 55mm. For removing the voids hydraulic vibrators areprovided below the pallet. For a single pallet 4 vibrators are provided. After pouring, uniform spreading of concrete is done manually. After the concrete is compacted the pallet is moved forward in the curing chamber for thermal curing for a period of 24 hours. For identification purpose the slabs are marked and then moved further for curing in the stacking yard. Before dispatching the concrete 7 day during is done. The total capacity of this unit is 160 columns in 24 hours. The slab is also casted manually, the only difference is that curing is done conventionally instead of thermal curing. The total capacity this unit is 30 slabs per day.

Figure 9. Reinforcements with electrical conduits

Figure 10. Uniform Spreading

Figure 11. Stacking

D) PRECAST STAIRCASE (RACKERS)

The pre-casted staircase consists two flights which includes floor landing to mid landing and mid landing to floor landing. According to design the reinforcements are arranged and while placing the reinforcements the moulds are oiled. The mould is designed in such a way that 2 flights staircase are casted at a time. The reinforcements are inserted in the mould manually. After this concrete is poured from the bucket with the help of remote control cranes. After 24 hours the moulds are removed and then lifted with the help of cranes and placed in the stacking yard. Curing is done for 7 days for dispatching the batch for erection to site. The total capacity of this unit is 40 rackers per day. Water leakage problem is eliminated by providing sleeves.

Fig 12. Precast staircase

CHAPTER:-

5 ERECTION

a) Erection

It is a process of the structure is erected in accordance with the sequential erection procedure, pre –assembly of member and the movement and location of heavy members are considered perior to installation**.**

(b) Overview of erection

An erection cycle is a series of operations for placing a component in its design position. The operations requiring an erecting crane and, therefore, consumption of machine time are as follows: slinging, lifting and delivering the component to a point of erection, guiding, positioning and placing it in design position, temporary fastening of components, unslinging and returning load-lifting hook to the initial position. The operations which require no cranes and are performed.

Fig 13 .Erection 1

Fig 14. Erection 2

CHAPTER:-6

SITE EXECUTION

The prefabricated components after the curing are dispatched with proper inspection and registration along with its date and time. These components are then transported to the specified building site for erection purpose. The erection and construction of the buildings are done according to the design.

For its perfect erection. In order to get no eccentricity in columns, these are temporarily attached to the slab below with the help of wire rope arrangement as shown. Then the dowel bars are inserted in these columns and grouting is done until the column is half filled with high strength self compacting concrete. Primary beams are then allowed to rest on these columns at the notches as shown below.

Construction of foundation is done using conventional cast-in-situ method. Isolated type of foundation is constructed resting on the hard strata. The precasted plinth beam is placed and erection of prefabricated hollow core column is done. The column is lifted with the help of tower cranes and then placed at their precise position according to the design. Small grooves are provided at bottom of the columns so as to make smaller arrangements.

In order to check the level of beam, level flushing is done in which, the floor to floor height is measured. If the level of beam is lower by significant amount then steel pads is used. After proper alignment, further four 20mm diameter steel bars are passed through the stirrups of beam with the lap length equal to (46*rod diameter) placed inside the core of the column.

Figure 15. Beam resting over column

Figure 16. Notch connection

Secondary beams if present are then placed keeping in view the location of notches. Similarly alignment is checked and then further reinforcements are tied. Then the prefabricated slabs are allowed to rest on the beams. Props are placed beneath so as to avoid formation of cracks due to self-weight. Further, reinforcements are provided which connects slab, beam, and columns together providing a stable and monolithic structure. This is followed by constructing shuttering for the entire floor and screeding is done in which the partially casted component attains there final dimensions.

Figure 17. Column to beam connection

Figure 18. Beam to beam connection

Figure 19.slab to slab connection

For the installation or erection of staircase, notches are made in the columns while casting in which the beams are allowed to rest. These beams are provided for supporting the mid-landing of the staircase. The beam should be arranged properly so that the level of mid landing is exactly at a distance equal the half of floor to floor height. After this the mid landing is allowed to rest on these beams and reinforcements are then provided. Then the prefabricated staircase are placed between floor landing to mid landing and then mid landing to floor landing.

CONCLUSIONS

- The fundamental objectives of the work have been accomplished.

- The aggregate cost and length have been resolved for both prefab and ordinary development And additionally we had thought about the focal points and detriments of both construction and traditional development by the overview directed.
- The examination shows there isn't a colossal cost contrast between the techniques (6%), prefab being . more temperate in tall structures when contrasted with regular. In the meantime the prefab development diminishes the undertaking length, lessened by 335 days when contrasted with the ordinary.
- Because of overview we had Study on Comparison between Prefabricated and Conventional Structures realized that the prefab development have more points of interest and obtainment in industrialized, substantial frameworks.
- Materials that have turned out to be profoundly particular, with specialist vacillations in cost and accessibility, can be accumulated at construction shops or processing plants. Moreover, the institutionalization of building segments makes it workable for development to occur where the crude material is minimum costly.
- To decide if construction is a decent choice you have to consider. Proper cost analysis and planning can help to achieve at an economical estimate for prefab construction. Educating student's trainers and even labourers more about prefabrication in depth will help provide more trained and educated work force for prefabrication.
- It can also change the conventional mindset of people and accept to try modern construction methods. Use of standardized elements from companies that have variety of options to choose from can help make structure unique.
- One time investment in good quality lifting machines and proper maintenance can help in further saving.

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