



India Chapter

# ASHRAE INDIA CHAPTER

For the HVAC&R Industry

## BULLETIN

Volume 20 Issue 1

Editor : K.K. Mitra, Associate Editor : Dinesh Rawat

AIC had a very hectic passage of six months tenure of the present BOG. Number of activities happened during the period covering conferences, DL visits, Student Chapters organized events on Specific topics, Training Programs etc. All Ashrae Chapters co-ordination meeting happened in August at Bangalore to discuss, various activities and selection of office bearers and planning for CRC. This time a record number 18 members (including spouses) attended CRC meeting at Antalya. There was a lecture by Dr. Om Taneja at CRC amongst the selected few. A series of lectures under the banner 'Myths and Reality of HVAC' was organized, which had lots of interest from participants. A mega event titled 'Emerging Trends in Green & Efficient Rail Transit Systems' was organized partnering DMRC, attended by a large number of delegates. We will have further events coming up in the period January to June 2019. Dr. Ahmed Alaa, DRC, RAL ASHRAE had visited the Chapter in December. Members will be attending 2019 ASHRAE Winter Conference & AHR ExpoAtlanta, GA, January 12-16, 2019.



Duct Heaters



Hot Air Blower



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## AGM 2018



The Annual General Meeting was held on 6th July, 2018 at Magnolia, India Habitat Center, Lodhi Road New Delhi. The installation of New BOG was also held during the function. Grundfos Pumps India Pvt Ltd. supported the event as Co-principal partners.



The ASHRAE India Chapters Coordination meeting was held on Aug 3 & 4, 2018 at The Chancery, Bangalore

ASHRAE India Chapter (AIC) and Indian Chamber of Commerce jointly organized "Refrigeration Tech Conclave 2018" on 24th August 2018 at Hotel NOVOTEL, Kolkata. The theme of the conference was 'Energy Efficient and Green Technology of Air Conditioning and Refrigeration'.



Mr. Indrajit Bhattacharya, President, AIC, Mr. Priyank Garg, Immediate Past President, AIC and Mr. Nirjhar Chakraborty, President ASHRAE Kolkata Section addressed the delegates. The speakers deliberated on the topics of Energy Conservation Building Code (ECBC), indoor air quality, cold chain and use of envelope insulation. The programme was attended by more than 100 participants from state government departments, refrigeration industry and academia. AIC members organized an interactive session with young minds of new student chapter from Trident Academy of Technology, Bhubaneswar.



MoU to be signed between ASSOCHAM GEM and ASHRAE India Chapter on 29th Aug., 2018 at Hotel Le Meridien, New Delhi



## ASHRAE Distinguish Lecture

ASHRAE Distinguish Lecture on "Facing the Realities and Challenges of Urbanization, Smart Cities, Smart Infrastructure & Smart Buildings for Greater Sustainability & Resilience' by Dr. Om Taneja at Sharda University was held on 7th Aug., 2018. The

programme was attended by over 50 student and faculty members. Participants were also encouraged to become ASHRAE members and benefits of membership was explained to the students



ASHRAE Distinguish Lecture on "Facing the Realities and Challenges of Urbanization, Smart Cities, Smart Infrastructure & Smart Buildings for Greater Sustainability & Resilience'



by Dr. Om Taneja at IIT Roorkee was held on 30<sup>th</sup> Aug., 2018. The programme was appreciated by the students and faculty members. Participants

were also encouraged to become ASHRAE members and benefits of membership was explained to the students. A new student chapter was formed at the institute.



Workshop on 'Overview of 90.1 Energy Modeling' by Mr. Sam Mason, PE, LEED® AP BD+C, BEMP , ASHRAE Course Instructor was held on 28th Aug., 2018 at Saidullajab, New Delhi. and on Aug, 23, 2018 at Hotel Leisure Inn Grand Chankya, Jaipur. The events were well attended and appreciated by the participants.



Seminar on Green Building was conducted at Poornima College of Engineering, Jaipur on Sep 3, 2018

Lecture on Scope of Refrigeration & Air-Conditioning in India and various benefits to students to become ASHRAE Student Members and also to faculty members was given by Dr. Rajinder Singh on 5th Sept., 2018 at DAV University, Jalandhar.





Workshop on 'The Myth and Reality of Parking and Basement Ventilation' was held 28th Sept., 2018 at Paharpur Business Centre, Nehru Place, New Delhi. The speakers for the workshop were Mr. K D Singh, Mr. Mohammed Adnan and Mr. Abhishek Jain. M/s Airflow supported the event



Workshop by Mr. Rajesh K Jain on ECS and TVS at underground Metro Station of Delhi Metro held on 20th Oct., 2018 at Poornima Engineering College.

ASHRAE Distinguished Lecture on 'Operations & Maintenance Measures for Improving Performance of HVAC Systems & Chiller plants' by Dr. Om Taneja held on 10th and 11th Sept., 2018 at DAV Engineering & Technology college and Lovely Professional University, Jalandhar.



Meeting with Dr. Ahmed Alaa Eldin Mohamed, Director & Regional Chair, Region At Large, with ASHRAE India Chapters on 21st Dec., 2018 at Le Meridien Hotel, New Delhi



The 2018 RAL CRC was hosted by Turkey at Antalya between the dates of 4th – 7th October.



The industrial visit of students of Delhi Technological University student branch was organised at Johnson Control Hitachi Excellence Center is scheduled on 27th Oct., 2018. The student appreciated the visit.



**Upcoming Mega Event:**

•AIC Tech Conference , Conference Date : 18<sup>th</sup> Jan., 2019,Conference Venue : India Habitat Center ,Theme : Sustainability in Practice – Building Sustainable Hospitals'

\*ASHRAE India Jaipur Sub-chapter participated in URJAVARAN Jaipur on 15/12/2018 and a Technical lecture was given by Mr. K.K. Mitra.



Heat Recovery units



Kitchen Exhaust Fan



Acoustic Inline



Air Purifier

## Conference on Emerging Trends in Green and Efficient Rail Transit Systems

ASHRAE India Chapter in association with Delhi Metro Rail Corporation (DMRC) and in collaboration with Ventconf(Delhi Chapter of ISHRAE) had organized this versatile and unique 2 days conference on December 20-21, 2018 at hotel Le Meridien, New Delhi. The Conference was mainly targeted for the Railway Industry and Metro Rail in particular. The conference attempted to bring together experts from all sectors with sessions covering topics like Railway Station Design, Ventilation of Building & Stations, Railway Tunnels, Environmental Control System, IAQ Solution in Metro Stations, O& M in Metro Stations etc. In the 2 days conference there were approximately 39, presentations including International speakers. The program was inaugurated with 3 key note addresses by Dr. Mangu Singh-MD,DMRC, Sh. Sanjeev Kumar Lohia-MD & CEO, IRSDC & Sh. Abhay Bakre-DG,BEE. The program was graced by Dr. Ahmad Alaa- DRC, ASHRAE RAL and Mr. Nitin Naik, SRC.

There was a key note address by motivational master speaker Poojya Sukhabodhananda on Sustainability and Life. It was a very interesting and energetic lecture. This lecture was attended by houseful audience.

There was a vibrant panel discussion on VRF Vs. Chilled Water Systems in Mass Transit System Moderated by Mr. Ashish Rakheja. The panelists were from the Manufacturing Industry, Contractor, Metro Services, There were record number of 365 delegates from all over the country. There was specific participation from Metro Rail Corporation all over India. The program was supported by various Industry Partners, Associates Media Partners like Hitachi, Blue Star, Edgetech, Air Flow, Humidin, Daikin, LG, Lloyd Insulations, Advance Valves, Mandev Tubes, Greenheck, Sterling Wilson, Nicotra India, Voltas, Witt India, Rajnigandha, Honeywell, Kelley, AIACRA, IGBC, ICC, TERI-GRIHA, CCSI, IAPMO, FSAI, IPA, DIPM, BEE, Metro Rail News and Rail Analysis.

Another unique feature of this conference was Research Promotion fund collection from all delegates. There was a record collection of Rs. 63,500.00 from the audience and a lucky draw for 3 prizes. Out of this 750 US \$ was deposited to Ashrae US Research Promotion fund.

We are sure that there will be lot of intakes from this 2 day conference and will build the roadmap for the next level of conference of Mass Transit System in the coming years.





# Conference on Emerging Trends in Green and Efficient Rail Transit System



# Conference on Emerging Trends in Green and Efficient Rail Transit System



In September we lost ASHRAE India Chapter founder Dr. Prem C. Jain, who left for heaven. We convey our sincere respect to the departed soul. AIC will participate in Prem Jain Memorial Trust (PJMT) program titled 'Harit Prem Bharat Week' from 21 to 28 January by organizing Painting competition, Planting tree saplings and initiating a sustainable program.

We also lost some more respected professionals in the HVAC and Building Industry – Sh. Anil Maheshwari, Prof. P.L. Ballaney and Sh. A.K. Gupta. We convey our sincere respect to the departed soul.

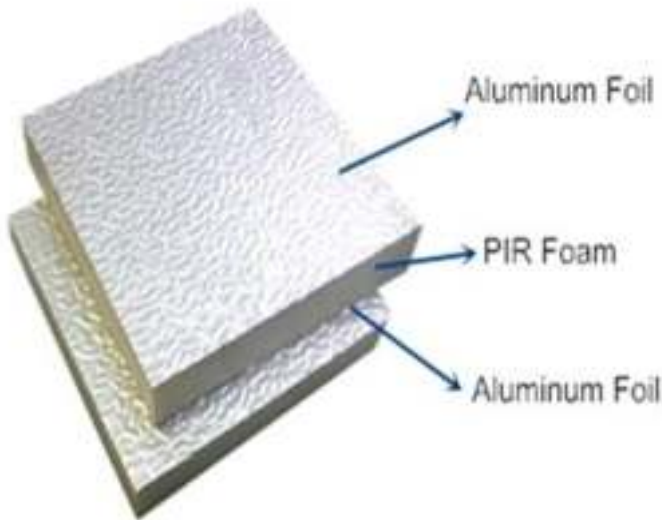




# PIR panels for ducts



Dr Sunil Bajaj  
AIC BOG Member



Pre-Insulated duct system is an innovative technology for ACMV or Air Conditioning and Mechanical Ventilation System ductwork. Rigid Polyisocyanurate panel is used as an alternative of traditional GI ducts with insulation for operation such as fresh air, supply, return and exhaust air ductwork for ACMV system.

These panels feature a unique sandwich construction that is the result of Rigid polyisocyanurate(PIR) foam slabs as the core material laminated with aluminum facing on both sides. These panels are suitable for the construction of air distribution ducts in air-conditioning and heating systems.

The material's main characteristics are superior thermal conductivity K value of 0.21 W/mK at 10°C mean temperature, a high level of rigidity (40-45 kg/m<sup>3</sup> density), environmentally friendly aspects being CFC, HCFC free and Zero ODP category, lightness, antimicrobial treatment surface, extremely easy to handle and install. The panel also conforms to class 0 rating and protects the surface from the spread of flames and limits the amount of heat released from the surface during a fire.

Pre-Insulated Duct System is specially developed for use in residential, commercial and industrial

units of ACMV duct system to satisfy the thermal, airflow, fire and easy to installation requirement.

GI makes greater demands in terms of transportation to site, site storage facilities and requires the use of service lifts, hoists and heavy scaffolding. Pre-insulated ductwork – being site fabricated and installed – minimizes storage area requirements and only calls for lightweight handling equipment. Panels and accessories are moved and fabricated into ducts at the actual workplace itself (such as at various floors of a multi-storey building). Installation of GI ductwork also require a bigger workforce and a longer time frame for completion compared to its polyisocyanurate counterpart that offer faster completion with a smaller workforce. A large workforce translates into added costs.

When installed, PIR ductwork is almost 50 per cent lighter than its GI counterpart. When in place, PIR ductwork offer the advantages of reduced heat losses as it has low 'U' value as compared to GI ductwork. Thanks to the reduced energy losses, pre-insulated panels offer energy savings and supports energy conservation programmed / environmental protection.

In the case of GI ductwork, the slightest damage to the aluminium foil vapour barrier over insulation results in condensation on the duct surface and consequential damages to ceilings/finishes with the damp areas being susceptible to mildew/ fungal growth. In PIR, being a (>90%) closed cell product minimizes water absorption as confirmed by a water immersion test. If the aluminium laminate of PIR panels is damaged, it can be locally repaired. Hence the chances of vapour condensation and water drip-off are practically nonexistent, thereby eliminating the risk of consequential damages to ceilings/finishes.

Pre-insulated panels also scores in terms of its longevity.

The joints of Preinsulated ducts have scientifically designed plastic fixtures ensuring air tight jointing arrangements. All the fixtures are fixed efficiently.

Polyisocyanurate foam panels technology is set to revolutionize the fabrication of ducts given its numerous advantages over galvanized iron duct work.

# CASE STUDY ON BORLAUG INSTITUTE OF SOUTH ASIA, LUDHIANA



Mr. Money Khanna  
AIC BOG Member



Borlaug Institute for South Asia is an upcoming administrative and research building at BISA Farm, Ladhawal, Ludhiana. The total plot area is 512 acres. Total built-up area of the project is around 58,901 ft<sup>2</sup>. The building is of two floors i.e. G+1 type and conditioned area 33,320 ft<sup>2</sup>.

The building has a simple yet efficient architectural design and the shape is rectangular shape with two floors. The wall, roof and fenestration are designed so as to comply Punjab ECBC.

ECBC Prescribed Wall is with maximum U-value of the overall assembly should be 0.440 W/m<sup>2</sup>K. Actual Wall comprised of 4.5" brick wall + 55 mm Rockwool Insulation + 4.5" perforated brick wall, which makes an overall U- value of 0.567 W/m<sup>2</sup>K which is quite high.

ECBC Prescribed Roof should be of maximum U-value of the overall roof assembly 0.409 W/m<sup>2</sup>K. The actual proposed roof construction comprise of 50mm cement screed + 4 coats of water proofing + 4.5" RCC slab + polyurethane water proofing layer + 70mm Rockwool Insulation + 12.5mm wire mesh + 300mm air gap + 12.5mm gypsum board false ceiling, which makes an overall U-value of 0.244 W/m<sup>2</sup>K which seems fine and lower than the prescribed requirement.

ECBC Prescribed Fenestration with glass shall be with maximum U-value of 3.3 W/m<sup>2</sup>.K and maximum SHGC of 0.25. Vertical fenestration area is limited to a maximum of 60% of the gross wall area. The actual fenestration followed with glass has 0.24 SHGC and 3 W/m<sup>2</sup>K U- value, which is lower. The building has 23.59% WWR which is adequate.

ECBC Prescribed HVAC Minimum efficiency requirements for VRF Air Conditioners for ECBC building with size greater than 70 KWR is 3.02 EER. The actual HVAC of the building is with

highly efficient VRF Systems of EER 3.9 with some Fan coil Units, Cassette Units and a Treated Fresh Air Unit. The total cooling capacity of the VRF systems is 170 Tons.

VRF units shall be Heat Pump type and shall be capable of providing both cooling/heating as per specifications installed in both the floors.

Outdoor Supply units equipped with highly efficient scroll/Rotary compressors, with all Inverter Scroll/rotary type compressors, special acryl precoated heat exchanger, low noise condenser fan, auto check function for connection error etc., centralize controller for individual control complete as per

Total electricity consumption in proposed case	376.05*1000 kWh/year
Total electricity generation through solar rooftop plant	767.66*1000 kWh/year
Actual Energy consumption of the building through Grid	106.40*1000 kWh/year
Total electricity consumption in baseline case	479.60*1000 kWh/year
Total electricity consumption in conventional case	915.60*1000 kWh/year
Total Energy Savings of the Building as compared to Baseline Case	77.39%
Total Energy Savings of the Building as compared to Conventional Case	88.19%
Built-up area of the Building	58901 ft <sup>2</sup> i.e. 5474 m <sup>2</sup>
EPI of the Proposed Building	19.80 kWh/m <sup>2</sup> /year
EPI of the Baseline Building	57.61 kWh/m <sup>2</sup> /year
EPI of the Conventional Building	167.81 kWh/m <sup>2</sup> /year

OEM specifications. The EER at AHRI conditions shall be 3.9 and the maximum operating temperature would be 48°C.

Indoor units shall be either ceiling mounted cassette type or Hi wall unit. The indoor unit shall have independent electronic control valve to control the refrigerant flow rate respond to variations of the air-conditioning load of the room. The fan shall be aerodynamically designed turbo multiblade type. Statically and dynamically balanced to ensure lowest noise. The cooling



coil shall be made of seamless copper tube. The tube shall be hydraulically or mechanically expanded and tested for 21 kg/cm<sup>2</sup>. Indoor units shall have a wired remote control. They shall be operated through the wired remote control from the respective rooms.

The Project is using energy efficient LED fixtures in the whole building. The lighting power density has been taken as 9.7 W/m<sup>2</sup>.

The average energy load for equipments shall be 2.7 W/m<sup>2</sup> and no savings have been claimed in the equipments load.

The building is having a roof area of 32568 ft<sup>2</sup> which is exposed to sun and a 160 kW solar rooftop plant is installed on the roof surface producing 267.688\*1000 kWh per year. Therefore the building is generating a very good amount of solar power through its solar rooftop plant which is ultimately reducing the load of electricity requirement of the building.

The major power consumption of the building is lighting which is consuming approximately 145.72\*1000 kWh and the second major consumption of the building is in space cooling which is 115.64\*1000 kWh. The third major consumption is of ventilation fans which is 66.85\*1000 kWh.

### Conclusion

The building is a Punjab ECBC Compliance Building. The total investment cost of the building has increased as compared to the conventional case to Rs 4,64,56,620 from Rs 2,89,50,180. Extra Rs 1,75,06,440 has been invested in the project for energy efficient Products and systems. Though, after energy efficiency interventions there has been a total saving of 8,10,200 kWh per year. Taking electricity tariff at Rs. 7.3 per unit for Ludhiana city, there will be a saving of Rs 59,14,460 per year. As a result, there will be 445 tones reduction in the CO<sub>2</sub> emission. From the savings in electricity bills, the project will be able to get the return of investment within 2.3 years of operation.

## 8 Summary of the Building

Following is a quick summary of the building-

S. No.	Category	Conventional Case	Baseline Case (ECBC)	Proposed Case (Actual)
1	Wall (W/m <sup>2</sup> /K)	9" Thick Brick Wall (U Value = 3.4)	9" Thick Brick Wall + 70 mm RockWool Insulation + 4.5" Red Brick Wall (U value = 0.44)	4.5" perforated brick wall + 55 mm Rockwool Insulation + 4.5" perforated brick wall (U value = 0.56)
	Wall Area (m <sup>2</sup> )	2404	2404	2404
	Cost Per Sqm	2490	3340	2880
	Total Cost (Rs.)	5985960	8029360	6923520
2	Roof (W/m <sup>2</sup> /K)	4" thick brick and plaster + 5" thick RCC + Brick Bat Coba + Water Proofing (U-value = 3.33)	150 mm R.C.C Slab + 50 mm insulation + 50 mm Cement Screed + 12 mm Tiles (U-value = 0.409)	50mm cement screed + 4 coats of water proofing + 4.5" RCC slab + polyurethane water proofing layer + 70mm Rockwool Insulation + 12.5mm wire mesh + 300mm air gap + 12.5mm gypsum board
	Roof Area (m <sup>2</sup> )	3026	3026	3026
	Cost Per Sqm	5010	5730	6930
	Total Cost (Rs.)	15160260	17338980	20970180
3	Fenestration	Single Clear Glass (6 mm thick) (SHGC = 0.8)	Double Glazed Glass (6mm Glass + 12mm Air Gap + 6mm Glass) (SHGC = 0.25)	Double Glazed Unit (6 mm Glass + 12 mm Air gap + 6 mm Glass) (SHGC = 0.24)
	Window Area (m <sup>2</sup> )	742	742	742
	Cost Per Sqm	1000	2500	2700
	Total Cost (Rs.)	742000	1855000	2003400
4	HVAC	Split AC (2 Star, EER = 2.8)	Packaged Single Zone Systems (3 Star, EER = 3.2)	Variable Refrigerant Flow Systems (VRF) (EER = 3.9)
	Quantity Tonnes (TR)	170	170	170
	Cost Per Tonne (TR)	28000	34290	53010
	Total Cost (Rs.)	4760000	5829300	9011700
5	Lighting (W/m <sup>2</sup> )	CFL Lights (LPD = 15.1)	LED Fixtures (LPD = 10.8)	LED Fixture (LPD = 9.7)
	No. of Fixtures	1122	1122	1122

Following table describes the overall summary of the 3 cases with comparison to the conventional case:

S. No.	Description	Conventional Case	ECBC Case	Actual Case
1	Energy Consumption (kWh*1000)	918.6	479.6	108.4
2	Energy Savings in Building (kWh*1000)	-	439	810.2
3	% Savings in Energy	-	47.79%	88.20%
7	Reduction in CO <sub>2</sub> Emissions (Tonnes)	-	241.45	445.61
8	Return on Investment (ROI in years)	-	2.3	3.0

# International Conference on Sustainability in Practice



India Chapter

## KEY SPEAKERS

## Building Sustainable Hospitals



**Dr. Stephanie H. Taylor MD**  
CEO, Taylor Healthcare Consulting  
And ASHRAE Distinguished Lecturer



**Ms. Maija Virta**  
Founder and Director of Sanrupti  
Engineers Pvt Ltd



**Prof. (Dr.) R. CHANDRASHEKHAR**  
Chairman IGBC Green Healthcare Rating  
Consultant - World Bank  
Consultant - UIH (Indo UK Institute of Health)  
Former Chief Architect with Ministry of Health  
& F W, Govt. of India, Vice President RFHHA  
(Research foundation of Hospital & Healthcare Administration)



**Mr. Sandeep Goel**  
Founder Director of Proion Consultants

## Panel Discussion among all Stakeholders

## AIC Tech 2019

Full Day Conference

9.30 AM to 6.00 PM

on 18th Jan., 2019

at India Habitat Centre,  
Lodhi Road, New Delhi

### Participation Fee

₹1500/-

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FREE**

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For any query, please contact :  
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### Upcoming Events :

- AIC TECH 2019 conference on Sustainability in Practice – Building Sustainable Hospitals : 18th Jan., 2019
- Conference on Integrating Solar Energy with Chilled Beams : Feb., 2019
- Conference on Cold storage : March, 2019