

Friday, 23 February 2018, 14:00-17:00 IST

Cassia Hall, Conference Centre, BIEC, Bengaluru

Designing healthy nearly Zero Energy schools

School is the place where students and teachers stay for most of their day and hence a comfortable and healthy environment is necessary to safeguard their well-being indoor and to make sure they make the most out of their learning opportunities. If we include in the picture the right of young people for a sustainable future, the challenge is clear. **Next generation school buildings must warrant healthy indoor environment and very low energy consumption.**

This REHVA-ISHRAE seminar faces the task of designing healthy nearly Zero Energy schools, with European and Indian experts taking the floor to explain how the HVAC industry can support and benefit from this challenge.

AGENDA

13:30 *Registration*

14:00 **Welcome and introduction: the REHVA-ISHRAE Task Force**

Vishal KAPUR, ISHRAE President

14:10 **Status quo about IEQ in schools, health & learning performance effects**

Atze BOERSTRA, REHVA Vice-president

14:30 **Thermal comfort in schools**

Jyotirmay MATHUR, Indian thermal comfort specialist, ISHRAE member

14:50 **An Indian school's perspective on energy use and indoor climate in schools**

Kavita GUPTA SABHARWAL, NEEV Academy, Bengaluru

15:10 *Coffee break*

15:30 **Improving energy & IEQ performance in practice**

Maija VIRTÁ, CEO at Santrupti Engineers, REHVA fellow and ISHRAE member

15:50 **High performance ventilation systems for schools**

Eric FOUCHEROT, Director International Affairs at Eurovent Certita Certification

16:10 **Energy performance of schools: past, present, future**

Nitin DEODHAR, ISHRAE Research Chair

16:30 **Open discussion**

16:50 **Closing remarks**

Chandrasekaran SUBRAMANIAM, ISHRAE President Elect

the REHVA-ISHRAE concept paper

Indoor Environmental Quality (IEQ) is an important determinant of health and wellbeing. This is true for adults, but even more so for **children**. Children are continuously developing their lungs and other organs, which explains why they are more susceptible to e.g. air pollution. Traditionally, research and policy have been focusing on the environmental quality *outdoors*, while missing to address the fact that most people, including children, spend most of their time indoors. The two dominant indoor environments for children are the **home environment** and the **school environment**. In this seminar we focus on the latter one.

According to the World Health Organisation everybody has the **right to breath in healthy air** indoors¹. In the last decade a lot of attention has been paid to health problems and indoor climate complaints of those working indoor. As a result, in recent years many office buildings have been transformed from 'sick' to 'healthy' buildings. However, similar interventions are still missing in school buildings, where scholars are often not consulted with regard of their satisfaction about indoor comfort conditions. Without intervention, fine particles and CO₂ concentrations in schools could be higher (even three times or more) than in offices. Similarly, indoor temperatures in classrooms are often uncomfortably warm or cold and lighting conditions are far from optimal, while office buildings have well-filtered, airconditioned, well-illuminated and acoustically insulated spaces.

Several studies have shown that poor IEQ reduces children's **learning performances**. Furthermore, we know that suboptimal air quality in classrooms can have severe health consequences, like the development of chronic **respiratory diseases** and (indoor climate-related) allergies. In many European countries more than 20% of children have developed such diseases by the age of 12. This number in India is probably similar or even higher.

To warrant a healthy indoor environment, especially at school, we need to use energy for heating, cooling, ventilation or lighting of classrooms. **Energy performance** of schools should be optimized ensuring proper air quality, thermal, acoustic and visual comfort as mandatory goals. To have a proper balance between the initial investment and the recurring energy bills, the comprehensive approach of carefully designed school envelope and HVAC system should be followed, and not only reducing the delivered services to save energy. Another reason to minimize energy use in schools is of course to fight global warming. European countries as well as India have decided to ratify the Paris Agreement on Climate Change, which implies that all buildings, including schools, should be optimized, not just in terms of IEQ but also in terms of energy performance.

School is the place where young people stay for most of their day: a comfortable and healthy environment is necessary to safeguard their well-being indoor and to make sure they make the most out of their learning opportunities. Therefore, such indoor environments should be designed/redesigned with the health of children (and teachers) in mind, while making sure that the energy use of the schools is as low as reasonably achievable. Ideally, such energy use should be at the **Net Zero Energy level** with respect to non-renewable energy. Existing schools, all around the world, often do *not* meet neither the energy performance nor the IEQ criteria that children (and other school building users) are entitled to, as prescribed in standards and building codes. This is not acceptable because children are our future and we must take care of them as we must take care of the environment. Hence, **immediate action is needed**.

As a first step to make this happen, REHVA and ISHRAE are committed to **develop a comprehensive guidebook** that describes how to design a school building with high IEQ and energy performance levels, promoting increased learning performance by enhancing climatization, ventilation and lighting systems. A team of European and Indian experts from ISHRAE and REHVA is currently working on this guidebook, whose publication is foreseen in early 2019. The contents build upon an existing REHVA guidebook² and will be organized in two parts; Part I will cover the necessity of good IEQ and energy sustainability, basic principles of healthy building design and reduction of energy use. Reference to the distinct life cycle stages that a school building goes through will be presented. Part II will present practical examples from European and Indian case studies, where technical solutions enable the designer to achieve the expected goals in terms of health and energy performance.

Besides the guidebook, other actions are needed, for example, at the policy and school funding level. REHVA and ISHRAE are committed to teaming-up with governmental institutions, national and international organisations that are as motivated as we are to invest in **future generations** and to improve the Indoor Environmental Quality and Energy Performance of schools wherever they are placed, with the end objective as: healthy, energy efficient schools for all.

¹ WHO, 2000. Right to good healthy indoor air. World Health Organisation (WHO), Bilthoven, The Netherlands.

² d'Ambrosio F.R. (ed.) et al, 2010. Indoor environment and energy efficiency in schools - Part 1 Principles, summary of the key contents of REHVA Guidebook no 13. Federation of European Heating, Ventilation and Air Conditioning Associations (REHVA), Brussels, Belgium

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SPEAKERS

14:00-15:10

Vishal KAPUR



Mechanical Engineer from IIT - Roorkee, 1991 and MBA from FMS, Delhi 1993. 47 years of age and engaged with the HVAC industry for the last 21 years. Managing Director of Meho-HCP Air Systems Pvt Ltd, which is a large HVAC contracting company based out of Kolkata & Delhi and doing projects all over East & North India. The group employs approx. 450 people and is one of the Country's largest Exclusive Channel Partner of Carrier Air-conditioning & Refrigeration Ltd, handling the whole spectrum from Splits to Package to VRF to Chillers and also Fire Protection services. Vishal has served ISHRAE in the capacity of: President - Kolkata Chapter, Regional Director - East, Convener - Comfex 2007, Member P.I.C - 3 Years, Member Finance Committee - 2013-15, Trustee - I.I.E. - 2013-15, National Treasurer - 2015-16.

Atze BOERSTRA



Founder and Managing Director of BBA Indoor Environmental Consultancy, a Dutch consultancy company specialized in indoor air quality, thermal comfort and healthy buildings. He has a background in Mechanical Engineering and had a PhD degree in building science from the Eindhoven University of Technology. Atze has over 20 years of experience with the investigation of 'sick' buildings and has been involved in the design of >100 above average comfortable & healthy buildings. He is REHVA fellow, honorary member of the Dutch chapter of ISIAQ (International Society of Indoor Air Quality and Climate) and REHVA Vice-president.

Jyotirmay MATHUR



Dr.-Ing. Jyotirmay Mathur is Professor in Mechanical Engineering at Malaviya National Institute of Technology, Jaipur (India). Dr. Mathur has published 70 research papers in referred international journals and has presented more than 150 papers/talks international seminars/conference, authored 6 books and supervised 20 doctoral candidates. He works in the field of energy planning and modeling, energy conservation in buildings, renewable energy system optimization, codes and standards related to building energy efficiency, Indoor Environment Quality, and HVAC equipment. Dr. Mathur has been part of many National and international committees, and has been part of several International research projects. Currently he is also the Dean of Research and Consultancy at MNIT Jaipur.

Kavita GUPTA SABHARWAL



Kavita has a Masters Degree in Biotechnology from Mumbai University. She completed part of the MBA program at Harvard University before returning to restructure the family business, as head of India's largest publicly listed Pharmaceutical firm. She switched to education after frustrations with pre-school education for her own children - starting Neev in 2005 with a vision to strike the right balance for overall early childhood development. She continuously develops her knowledge of teaching practise, besides working with training professionals from around the world for regular in-house training.

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Maija VIRTA



Founder and Director of Santrupti engineers Private Limited. She has 25 years of experience in construction and HVAC-industry. Her chief areas of expertise are indoor environmental quality, energy efficiency of buildings as well as sustainable building policies and technologies. During her career she has been involved in developing many technologies for sustainable buildings as well as user-centric IEQ measurement, verification and post-occupancy evaluation processes. She has over 5 years of experience of onsite work to improve IAQ both in Europe and in India. Before moving to India, Maija was CEO of the Green Building Council Finland.

Eric FOUCHEROT



Eric Foucherot joined Eurovent Certita Certification in 2017 to support International Development. After dual studies (Mechanical & Automation plus Business school), Eric started in ABB Group (early 80's) as manager of regional Service Workshops then France Operation Director, dedicated to rotating machines repair for all type of Industries & Utilities. In 90's, Eric started ABB service activities in North Africa, Middle East and Sub-Sahara, for Big Industry, Oil&Gas, Power Generation sectors, concluding innovative Maintenance & Retrofit solutions, adapted to local constraints, including technology transfers and Joint-Venture creation. Until 2016, Eric entered Food & Pharma Industries Productivity Investments, as MD of the Business Unit End of Lines Automation for Le Mans Process Agro.

Nitin DEODHAR



Nitin graduated with Honors in Mechanical Engineering from REC, Bhopal. After joining as Management Trainee in Voltas, he was in a leadership position at Pune and was exposed to Finance, HR, and Total Quality Management. Presently, Nitin and his team of dedicated Engineers provide Design Consultancy for various Pharma, IT, Power, Process, Hospitals, Malls, & Multiplexes projects and have designed several LEED projects. His focus is Energy Conscious Air Conditioning Designs which are sustainable for Owners as well as Users. He has earned his Doctorate from IIT Bombay and is associated with NEERI Nagpur for research in IAQ.

Chandrasekaran SUBRAMANIAM



Chandrasekaran Subramaniam is Mechanical Engineer from IIT, Madras, and he is a LEED Accredited Professional in Building Design and Construction. Chandrasekaran is director at SSS Consultants offering design consultancy services in the field of IBMS, HVAC Systems and Green Buildings and has an experience of over 34 years in the field of Air Conditioning and Controls. Had served in Trane for 20 years and Voltas Ltd for seven years prior to starting his own venture. Is a member of ISHRAE, ASHRAE, IGBC and IAQA. He has held various positions in ISHRAE and ASHRAE Chapters and is currently the National President Elect for ISHRAE.