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CHT-17: HEAT RECOVERY IN AIR CONDITIONING SYSTEMS FOR OFFICE BUILDINGS

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FINAL ABSTRACT This paper investigates the best strategies to reduce the energy requirements of air conditioning systems for office buildings by using two different types of technology: Air-to-Air (AAHX) and/or Earth-to-Air (EAHX) heat exchangers.
The AAHX considered is a static type of heat recovery with partition wall, which allows recovering both sensible and latent heat by means of convection and conduction mechanisms via partition wall.
Referring to EAHX, this technology exploits the capability of the ground as energy storage, through a system of earthed air ducts laid horizontally. In summer, the ground usually presents temperatures lower than outside ventilation air temperatures, while in winter it could have, in some hours/days, a temperature higher than the outside air.
In the examined case, the air conditioning system is based on fan-coils and primary air, and the EAHX (or the AAHX) is installed upstream of the primary air-handling unit.
The performance of the two examined technologies are analysed for three European cities with different climates: Palermo (Southern Italy), with mild winters and very hot summers; Milan (Northern Italy), with cold winters and hot summers; Berlin (Germany), with very cold winters and quite hot summers. The analysis is performed by means of EnergyPlus, a dynamic building energy simulation software, with reference to the same designed new office building with or without heat recovery systems. The research shows that, for all the analysed climates, in winter the use of the AAHX reduces the energy requirement much more than the EAHX, while in summer the EAHX is preferable. Moreover, the annual analysis shows that the use of the EAHX is more convenient in hot climates. The case of coupled heat exchangers (AAHX+EAHX) is also investigated.
A further analysis is performed on the benefits that the two analysed technologies allow in different seasons.