Contents

1 Introduction .............................................. 1
   1.1 Thermal Comfort ...................................... 2
   References ................................................ 12

2 Radiators in Hydronic Heating Installations. Historical Outline, Types and Structure ................................... 15
   2.1 Historical Outline ...................................... 15
   2.2 Current Realizations of the Concept of a Radiator Intended for a Hydronic Heating Installation ………………… 19
      2.2.1 Segment (Column) Radiators ………………… 19
      2.2.2 Panel Radiators …………………………… 21
      2.2.3 Convector Radiators ……………………… 24
      2.2.4 Canal Radiators …………………………… 26
      2.2.5 Tube Radiators …………………………… 27
      2.2.6 Surface Radiators …………………………… 29
   References ................................................ 45

3 Radiator Thermal Characteristic ............................. 49
   3.1 Introduction ……………………………………… 49
   3.2 The Radiator Static Thermal Characteristic Assuming Constant Surface Film Conductance from the Radiator Wall External Surface ………………… 50
   3.3 The Radiator Static Thermal Characteristic Taking Account of Variable Surface Film Conductance from the Radiator Wall External Surface ………………… 53
   3.4 The Radiator Static Thermal Characteristic Taking Account of the Variability in Surface Film Conductance to the Radiator Wall Internal Surface ………………… 65
   3.5 The Radiator Dynamic ThermalCharacteristic ………………… 88
      3.5.1 The Convector Radiator Dynamic Thermal Characteristic ………………… 89
4 Methods of the Radiator Heat Output Control

4.1 The Convector Radiator Heat Output Control

4.2 The Surface Radiator Heat Output Control

4.2.1 The Underfloor Radiator Temperature Control System with a One-Way Thermostatic Valve

4.2.2 The Underfloor Radiator Temperature Control System with a Two-Way Thermostatic Valve on the Return Pipe

4.2.3 The Underfloor Radiator Temperature Control System with a Two-Way Thermostatic Valve on the Supply Pipe

4.2.4 The Underfloor Radiator Temperature and the Room Temperature Control System with a Thermostatic Control Valve

4.2.5 The Underfloor Radiator and the Room Temperature Control System with an Electric Regulator

4.2.6 The Underfloor Radiator and the Room Temperature Control System with an Electronic Regulator

4.2.7 Control System of a Surface Heating Installation with Numerous Heating Loops

4.2.8 The Underfloor Radiator Temperature Control System Using the Return Water Temperature Limiter

4.3 The Impact of the Radiator Connection Method on the Heat Output

References

5 The Sizing of Surface Radiators

5.1 The Underfloor Radiator Thermal Calculations and Sizing

5.1.1 Equivalent Resistance Method (Trapezoidal Rule)

5.1.2 The Method According to Standard EN 1264

References

6 Selection of Radiators for Heating Installations Computational Examples

References
Radiators in Hydronic Heating Installations  
Structure, Selection and Thermal Characteristics  
Muniak, D.P.  
2017, XVI, 251 p. 109 illus., 72 illus. in color., Hardcover  
ISBN: 978-3-319-55241-5