

Contents

1	Building Envelope and Thermal Balance	1
1.1	Building Thermal Balance	1
1.1.1	Heat Flow from Envelope	2
1.1.2	Ventilation	3
1.1.3	Internal Heat Sources	3
1.1.4	Solar Gain Through the Transparent Elements	4
1.2	Heat Transfer Through Building Elements	4
1.2.1	Steady-State Analysis	5
1.2.2	Transient Analysis	8
1.2.3	Steady-State Versus Transient Prediction	14
	References	19
2	Approximating Dynamic Thermal Behaviour of the Building Envelope	21
2.1	Heat Transmittance Correction Values	21
2.1.1	Mass Factor	21
2.1.2	Effective U-Value	22
2.2	Temperature Difference Correction Values	23
2.2.1	Total Equivalent Temperature Differential (TETD)	23
2.2.2	Cooling Load Temperature Difference (CLTD)	24
2.2.3	Overall Thermal Transfer Value (OTTV)	24
2.2.4	Fictitious Ambient Temperature	25
2.3	Applications	27
2.3.1	M Factor	28
2.3.2	CLTD	28
2.3.3	FAT	30
2.3.4	Lessons Learned	31
	References	32

3	Implications of the Assumptions in Assessing Building Thermal Balance	35
3.1	European Standard for Assessing the Building Thermal Behaviour	35
3.2	Comparison Between Simplified Method and Detailed Simulation	36
3.2.1	Input Parameters Selection: The Effect on the Thermal Balance	42
	References	45
4	Thermal Comfort Approaches and Building Performance	47
4.1	The Standard Approach	47
4.2	The Adaptive Approach	52
4.2.1	ASHRAE Equation	53
4.2.2	ACA Equation	53
4.2.3	ATG Equation	54
4.2.4	CEN Equation	54
4.3	Approaches Application on a Case Study	54
4.4	Building Performance Implications	57
	References	59
5	Defining Representative Building Energy Models	61
5.1	Definition of the Basis Building Model	61
5.1.1	Building Shape	62
5.1.2	Internal Heat Loads	62
5.1.3	Air Change Rate	63
5.2	Definition of the Characterizing Parameters	65
5.2.1	Building Locations	66
5.2.2	Building Constructions	67
	References	77
6	Energy Performance Analysis of Typical Buildings	79
6.1	The Set of the Simulations	79
6.1.1	Passive Cooling Strategies	81
6.1.2	Indoor Set-Point Temperature	82
6.2	Comparison of Buildings Performances	85
6.2.1	Winter Week	85
6.2.2	Summer Week, Basis	87
6.2.3	Summer Week, with External Shading	89
6.2.4	Summer Week, with Night Ventilation	89
6.2.5	Summer Week, with External Shading and Night Ventilation	92

- 6.3 Effect of a Climate-Connected Set-Point to the Seasonal Cooling Needs 92
- References 98
- 7 Climate-Related Assessment of Building Energy Needs. 99**
 - 7.1 Assessing Building Energy Needs. 99
 - 7.2 Climate-Related Analysis. 100
 - 7.3 Data Sheets of the Case-Studies Results 110
 - References 118
- 8 Buildings Performance Comparison: From Energy Need to Energy Consumption 119**
 - 8.1 HVAC Systems and Primary Energy Consumption 119
 - 8.2 Application on Case Studies 121
 - 8.2.1 Energy Performances Comparison 122
 - References 126

Building Energy Performance Assessment in Southern
Europe

Ferrari, S.; Zanotto, V.

2016, XI, 127 p. 83 illus., 76 illus. in color., Softcover

ISBN: 978-3-319-24134-0