## Contents

	Contents	2
	List of figures	4
	List of tables	6
	Keywords	6
	Acknowledgement	6
	A note of appreciation	7
	Preface	8
1.	Introduction	9
2.	Experimental methods for determination of field variables in laboratory conditions	ions
		10
2.1	Moisture content	10
	2.1.1 Direct methods	10
	2.1.2 Indirect methods	11
2.2	Relative humidity	16
2.3	Temperature measurements	20
2.4	Capillary pressure measurements	22
3.	Determination of thermal and hygric material properties in laboratory condition	ns
		23
3.1	Hygric properties	23
3.2	Thermal properties	24
4.	Computational analysis of hygrothermal performance of building structures	25
5.	Experimental investigation of hygrothermal performance of building struct	ures
(bu	ilding envelopes) in situ and the test house measurements	25
6.	Semi-scale measuring system for testing the hygrothermal performance of m	ulti
laye	ered building envelope systems in conditions of difference climate	27
6.1	Design of a semi-scale measuring system for testing the hygrothermal performance	ce o
	building envelopes – basic principles	28
	6.1.1 Climatic chamber system	30
	6.1.2 Liquid moisture and temperature monitoring devices	34
	6.1.3 Relative humidity, heat flux, air flow and temperature monitoring devices	36
6.2	2 The NONSTAT measuring technology	38
	6.2.1 Probe calibration	38

6.2.2 Measuring and data acquisition	40
7. Functionality test of the NONSTAT system and its application in design o	f new
interior thermal insulation system	41
7.1 First validation test of newly designed interior thermal insulation system applied	on the
brick wall	41
7.1.1 Measuring technology, sample arrangement	41
7.1.2 Tested building envelope and basic material properties	43
7.1.3 Measurements	45
7.2 Second application of NONSTAT system, validation test of designed interior the	nermal
insulation system applied on the calcareous marly limestone wall	52
7.3 Third application of NONSTAT system, semi-scale testing of the final version of	of new
thermal insulation system as a basis for computational analysis (inverse modeling)	63
Conclusions	78
References	80