

DIN 1946-4:2018-09 (E)

Ventilation and air conditioning - Part 4: Ventilation in buildings and rooms of health care

Contents		Page
Foreword		5
1	Scope	6
2	Normative references	6
3	Terms and definitions, and abbreviated terms	8
3.1	Terms and definitions	8
3.2	Abbreviations	11
4	General principles	12
4.1	Participation of a hospital epidemiologist, hygiene engineer and safety engineer	12
4.2	Necessity of ventilation systems	12
4.3	Documenting deviations from this standard	12
5	Room classes and ventilation requirements	12
5.1	General	12
5.2	Classification of rooms used for medical purposes into room classes	13
5.3	Room class I	13
5.3.1	General	13
5.3.2	Room class Ia	14
5.3.3	Room class Ib	15
5.4	Room class II	15
5.5	Ventilation requirements	15
6	Requirements for VAC components	23
6.1	General requirements	23
6.1.1	General	23
6.1.2	Surfaces and materials within the air flow	23
6.1.3	Cleaning management plan	23
6.1.4	Labelling	23
6.2	Outdoor air intake, exhaust air outlets and surrounding area	24
6.3	Air ducts	25
6.3.1	General requirements	25
6.3.2	Outdoor air ducts	26
6.3.3	Supply air ducts	26
6.3.4	Smoke extraction ducts	26
6.3.5	Inspection openings	26
6.4	Dampers	27
6.4.1	General requirements	27
6.4.2	Outdoor air and exhaust air shut-off dampers	27
6.5	Air handling units (AHU)	27
6.5.1	General requirements	27
6.5.2	Location of components	28
6.5.3	Mechanical characteristics of the equipment casing	28
6.5.4	Outdoor air inlet	29
6.5.5	Basins and siphons	29
6.5.6	Dampers	29
6.5.7	Air filters	30
6.5.8	Heat exchangers	32
6.5.9	Heat recovery systems	33

6.5.10	Fans	33
6.5.11	Air humidifiers	33
6.5.12	Sound attenuators	34
6.5.13	Volume flow controllers	34
6.5.14	Monitoring equipment	34
6.6	HEPA filters	34
6.7	Air terminal devices	35
6.7.1	General requirements	35
6.7.2	Unidirectional (low-turbulence) flow outlet (LTF outlet)	35
6.7.3	Overflow openings	36
6.8	Space heating systems and cooled ceilings/cooling devices	36
6.9	Building automation and control systems (BACS)	36
6.10	Repairs, cleaning and disinfection	37
6.11	Operation and maintenance	37
7	System qualification and acceptance inspection	37
7.1	General	37
7.2	System qualification	38
7.2.1	Installation qualification	38
7.2.2	Functional qualification	38
7.2.3	Performance qualification	40
7.3	Technical acceptance inspection	40
7.4	Hygienic acceptance inspection	43
7.4.1	Basic requirements	43
8	Periodic inspection	45
8.1	General requirements	45
8.2	Technical inspection	45
8.3	Hygienic inspection	45
Annex A (informative) Guidance for the project-planning phase		47
A.1	Project phases and objectives	47
A.2	Analysis	48
A.2.1	Determine the as-is situation	48
A.2.2	Risk analysis for existing systems	48
A.2.3	Establish basic considerations	48
A.2.4	Declare general intent and draw up performance specifications	48
A.3	Project objectives	48
A.3.1	Prerequisites	48
A.3.2	Performance specifications	49
A.3.3	Conclusion of definition of objectives phase	49
A.4	Design	49
A.4.1	Prerequisites	49
A.4.2	Translation of specifications into design	50
A.4.3	Conclusion of design phase	50
A.5	Realization	50
A.5.1	Prerequisites	50
A.5.2	Using the performance specifications	51
A.5.3	System qualification	51
A.5.4	Documentation	51
A.5.5	Conclusion of realization phase	51
A.6	Operation	52
A.6.1	Prerequisites	52
A.6.2	Training of personnel	52
A.6.3	Updating system documentation	52
A.6.4	Building automation and control systems (BACS)	52
A.6.5	Maintenance management	52
A.6.6	Disposal of air filters	53
Annex B (normative) Preliminary test (flow visualization)		54

B.1	Objective	54
B.2	Outflow behaviour	54
B.2.1	LTF outlet and light lead-through	54
B.2.2	Surgical lights and satellites	55
B.3	Shielding of the protected area	55
B.3.1	Testing	55
B.3.2	Evaluation	55
Annex C (normative) Determining the degree of protection		56
C.1	Objective	56
C.2	Procedure	56
C.2.1	General	56
C.2.2	Reference particle load	56
C.2.3	Reference loads, reference load test set-up	57
C.2.4	Effect of protection against load entry from the outside	57
C.2.5	Effect of protection against load entry from the inside	57
C.2.6	Determining the boundaries of the protected area	60
C.2.7	Determining the degree of protection	60
C.2.8	Determining the protective effect	61
C.3	Requirements	61
Annex D (normative) Measuring turbulence intensity		62
D.1	Objective	62
D.2	Procedure	62
D.2.1	General	62
D.2.2	Measuring and marking test positions	63
D.2.3	Procedure for TI measurement	64
D.3	Requirements	65
D.3.1	Protected area	65
D.3.2	LTF outlet, separate (with temporary stabilizer surrounding outlet)	65
Annex E (informative) System test of surgical lights		66
E.1	Objective	66
E.2	Test framework conditions	66
E.3	Manufacturer's specifications	66
E.4	Minimum test conditions	66
E.4.1	General	66
E.4.2	Lights / satellites	66
E.5	Turbulence intensity measurement	67
E.5.1	General	67
E.5.2	Measuring and marking test positions	67
E.6	Requirements	67
Annex F (informative) Microbiological monitoring		68
F.1	Objective	68
F.2	Procedure	68
F.3	Requirements	68
F.4	Results and evaluation	68
F.5	Sedimentation plates (settle plates)	68
Bibliography		70