1 Foreword

2	General Requirements	5
2.1	Introduction	5
2.2	Effects on windows and external pedestrian doors in the external wall	7
2.3	Plane model and principles of a wall connection	13
2.4	Special features in existing buildings	17
2.5	Conclusion	20
3	Tasks for Planning	21
3.1	Execution Planning	21
	3.1.1 Interface to the wall connection3.1.2 Minimum specifications for planning3.1.3 Sample floor connection and sill formation3.1.4 Example of 2-step window installation with pre-assembly frames	21 26 34 44
3.2	Factory and installation planning by the contracting agency	47
	 3.2.1 Basic Principles 3.2.2 Impacts/codes of practice from neighbouring construction tasks/companies (trades) 3.2.3 Planning services by the contracting agency – Case of window replacement 2.2.4 Examples of connection 	47 51 51
	3.2.4 Examples of connection	52
4	Fundamentals of Building Physics	52 53
4 4.1		
	Fundamentals of Building Physics	53
	 Fundamentals of Building Physics Thermal insulation and protection against moisture 4.1.1 Surface temperatures and isothermal line 4.1.2 Moisture/Humidity 4.1.3 Thermal bridges 4.1.4 Air tightness 4.1.5 Minimum thermal insulation, thermal bridges 4.1.6 Preventing the formation of condensation or moulds 4.1.7 Avoiding thermal losses via thermal bridges 4.1.8 Examples for the linear thermal transmittance and temperature factor fRsi 4.1.9 Protection against driving rain (water tightness) 	53 53 54 56 57 59 60 64 68 83
4.1	 Fundamentals of Building Physics Thermal insulation and protection against moisture 4.1.1 Surface temperatures and isothermal line 4.1.2 Moisture/Humidity 4.1.3 Thermal bridges 4.1.4 Air tightness 4.1.5 Minimum thermal insulation, thermal bridges 4.1.6 Preventing the formation of condensation or moulds 4.1.7 Avoiding thermal losses via thermal bridges 4.1.8 Examples for the linear thermal transmittance □ and temperature factor fRsi 4.1.9 Protection against driving rain (water tightness) 4.1.10 Suitable installation planes for thermal and moisture-proof insulation 	53 53 54 56 57 59 60 64 68 83 83
4.1	 Fundamentals of Building Physics Thermal insulation and protection against moisture 4.1.1 Surface temperatures and isothermal line 4.1.2 Moisture/Humidity 4.1.3 Thermal bridges 4.1.4 Air tightness 4.1.5 Minimum thermal insulation, thermal bridges 4.1.6 Preventing the formation of condensation or moulds 4.1.7 Avoiding thermal losses via thermal bridges 4.1.8 Examples for the linear thermal transmittance □ and temperature factor fRsi 4.1.9 Protection against driving rain (water tightness) 4.1.10 Suitable installation planes for thermal and moisture-proof insulation Sound insulation 4.2.1 Requirements 4.2.2 Planning for the sound insulation of outdoor building components 	53 53 54 56 57 59 60 64 68 83 83 85 85

5	Fastening and load transfer	95
5.1	Fastening of windows and external pedestrian doors	96
	 5.1.1 Acting forces 5.1.2 Determination of fixing points (standard case 2) 5.1.3 Fastening with top elements, roller shutter boxes and profile extensions 5.1.4 Installation levels and types of loading on fasteners 5.1.5 Wall systems 5.1.6 Fastening systems, fasteners 	103 108 128 132 134 136
5.2	Corrosion protection of fasteners	140
5.3	Fastening building components with special characteristics	142
	5.3.1 Building components with burglary-resistant characteristics5.3.2 Building components with safety barrier characteristics5.3.3 Doors in escape routes and emergency exits5.3.4 Fire safety elements	142 144 146 146
6	Sealing	147
6.1	Constructive requirements	148
6.2	Sealing planes	148
6.3	Types of joints	150
	6.3.1 Special case: Structural joints6.3.2 Building component connecting joints, compensation for deformation as the determining factor	152 154
	6.3.3 Scale of the movements	156
6.4	Sealing systems	158
	 6.4.1 Gunnable joint sealants 6.4.2 Impregnated joint-sealing tapes made of cellular plastics 6.4.3 Multifunctional sealing tapes 6.4.4 Joint-sealing films 6.4.5 Sealing films 6.4.6 Plaster stop bead 	159 164 169 172 175 176
6.5	Water vapour diffusion performance of the sealing systems	178
6.6	Recommendations for sealing	178
6.7	Joint insulation	180
7	Practical execution	183
7.1	Duties of the person responsible for the installation	183
	 7.1.1 Preparatory actions, workshop and installation planning 7.1.2 Survey of installation situation 7.1.3 Tolerances and tolerance standards 7.1.4 Design documents 7.1.5 Accommodating building physics requirements in the construction 7.1.6 Detailed design of fastening and load transfer 7.1.7 Detailed design of sealing system 7.1.8 Measures to be carried out before execution 	183 186 191 195 197 203 205 209

7.2	Notes for the installer	210
	7.2.1 Fastening the elements for adequate load transfer7.2.2 Work sequence for joint insulation7.2.3 Correct use of insulation and sealing systems	210 212 213
7.3	Special care at transitions	224
7.4	Design of the exterior window sill (weatherboard)	231
7.5	Threshold design	240
8	Examples for execution	245
8.1	General remarks	245
8.2	Examples for new buildings	248
	 8.2.1 Monolithic external wall 8.2.2 Externally insulated external wall 8.2.3 Rear-ventilated external sandwich wall with heavyweight facing 8.2.4 Rear-ventilated external sandwich wall with low weight facing 8.2.5 Unventilated external sandwich wall 	248 252 254 256 258
8.3	Examples for replacement/refurbishment	264
	8.3.1 Monolithic external wall 8.3.2 Uninsulated external wall with air layer and heavyweight facing 8.3.3 Unventilated external sandwich wall 8.3.4 Timber framework	264 266 268 270
8.4	More examples	272
	8.4.1 uPVC windows in slab construction8.4.2 Timber-aluminium window in multi-skin wall system8.4.3 Timber window in frame (subframe)	272 274 276
9	Bibliography	279
9.1	Standards	279
9.2	Further literature	284