

List of composition

calculation of U value

$$U = 1/R[W/(m^2*K)]$$

$$R = d/\lambda[m^2*K/W]$$

Air transmission

$$R_e = 0,13m^2*K/W$$

$$R_i = 0,09m^2*K/W$$

$$R_c = 0,22m^2*K/W$$

R = thermal resistance [m²*K/W] λ = thermal conductivity [W/m²K]

nr = not required

outside compositions		U [W/(m ² *K)]	required U
underground floor composition - H5			0,45
underground perimeter wall - V2			0,45
perimeter wall - V1		0,13	0,25
flat roof - H3		0,14	0,16
inside compositions			
floor section UL to 1L - H1		0,29	1,2
general floor section - H2		0,78	1,45
partition - V3		nr	nr

Outside composition

UNDERGROUND FLOOR SECTION

type	H5				
Requirements	Un[W/m2K]	no requirements			
	Rw[dB]	no requirements			
	Lw[dB]	no requirements			
Material	thickness[mm]	λ [W/m2K]	R [m2K/W]	γ [kg/m3]	g [kN/m2]
Finishing of flooring	20				
Reinforced waterproofing concrete	100	1,5	0,07		
Geotextile 2xPE	100				
Underlayng concrete leyer C16/20	20				
sum	240		0,07		

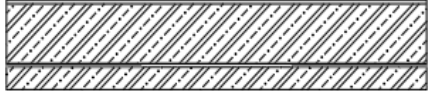
final check

U

U < Un

OK

Autocad detail

GROUND FLOOR SECTION-H4	SELFWEIGHT	t [mm]	kN/m2	
-FINISH OF FLOORING - PALETTE KNIFE	15 kg/m2		0.15	
-REINFORCED WATERPROOFING CONCRETE	2500 kg/m3	250	6,25	
-GEOTEXTILE 2xPE				
-UNDERLAYING CONCRETE LAYER C16/20	2400 kg/m3	100	2.4	
		350	8.7	

Underground perimeter wall

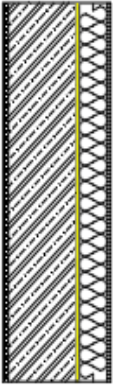
Type	V2					
requirement	Un[W/m2K]	0,45		height of wall (mm)		3200
	Rw[dB]	no requirements				
	Lw[dB]	no requirements				
Material	thickness[mm]	λ [W/m2K]	R [m2K/W]	γ [kg/m3]	g [kN/m]	
Inner plaster	15					
Reinforced concrete wall	300	1,5	0,20	2500	24	
XPS boards- protection of water proofing	80	0,04	2,00			
NOP foil						
sum	395		2,20			

final check

U
U < Un

0,45
OK

Autocad detail

PERIMETER WALL – UNDERGROUND LEVEL – V3	t [mm]	
<ul style="list-style-type: none"> -INNER PLASTER - DUSTFREE INTERNAL PAINT -REINFORCED WATERPROOFING CONCRETE WALL -XPS BOARDS -NOP FOIL 	15 300 80 15	

Perimeter wall - reinforced concrete

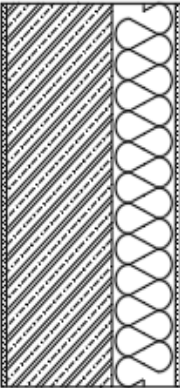
Type	V1					
requirements	Un[W/m2K]	0,25		height of wall		3200
	Rw[dB]	41				
	Lw[dB]	no requirements				
Material	thickness[mm]	λ [W/m2K]	R [m2K/W]	γ [kg/m3]	γ [kg/m]	g [kN/m]
Inner plaster	15			2000	96	0,96
massonry heluz family 2in1grinded brick	200	1,5	0,13	850	544	5,44
EPS	160	0,04	4,00			
outer plaster	15			2000	96	0,96
Sum	450		4,13			7,36

final check

U
U < Un

0,24
OK

Autocad detail

PERIMETER WALL REINFORCED CONCRETE - V2	t [mm]	
-INNER PLASTER - DOUBLE LAYER LIMCEMENT PLASTER -REINFORCED CONCRETE WALL -THERMAL INSULATION SYSTEM - ETICS - EPS70F -OUTER PLASTER - SYLICON	15 200 160 15	

Perimeter wall - masonry

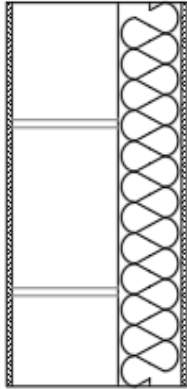
Type	V1					
requirements	Un[W/m2K]	0,25		height of wall		3200
	Rw[dB]	41				
	Lw[dB]	no requirements				
Material	thickness[mm]	λ [W/m2K]	R [m2K/W]	γ [kg/m3]	γ [kg/m]	g [kN/m]
Inner plaster	15			2000	96	0,96
massonry porotherm 19AKU	200	0,7	0,29	850	544	5,44
EPS	160	0,04	4,00			
outer plaster	15			2000	96	0,96
Sum	450		4,29			7,36

final check

U
U < Un

0,23
OK

Autocad detail

PERIMETER WALL MASONRY – V1	t [mm]	
<ul style="list-style-type: none"> -INNER PLASTER - DOUBLE LAYER LIMCEMENT PLASTER -MASONRY POROTHERM 19AKU -THERMAL INSULATION SYSTEM - ETICS - EPS70F -OUTER PLASTER - SYLICON 	15 200 160 15	

Flat roof


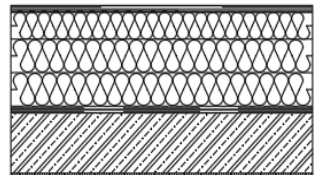
discription	R1					
requirement	Un[W/m2K]	0,16				
	Rw[dB]	no requirment				
	Lw[dB]	no requirment				
Material	thickness[mm]	λ [W/m2K]	R [m2K/W]	γ [kg/m3]	γ [kg/m2]	g [kN/m2]
Waterproofing Asphalt sheets	50			1680	84	0,84
Thermal insulation in slope 3%	240	0,04	6	120	28,8	0,288
Vapor barrier	1,5					0,025
Penetration	1,5					0,025
Reinforced concrete slab	180	1,5	0,12	2500	450	4,5
plaster	3					
sum	465		6,12			5,68

1,18

final check

R transition 0,22
R 6,34
U 0,16
U < Un **ok**

Autocad detail

FLAT ROOF - R1 	self weight	t [mm]	kN/m2	
-WATERPROOFING - 2xMODIFIED ASPHALT SHEETS	1650 kg/m3	100	0.825	
-THERMAL INSULATION IN SLOPE 3%	10 kg/m2	1,5	0.1	
-VAPOUR BARRIER	10 kg/m2	1,5	0.1	
-PENETRATION	70 kg/m3	280	0.2	
-REINFORCED CONCRETE SLAB	10 kg/m2	1,5	0.1	
-PLASTER	25 kN/m3	30	0.75	
		660	7.2	

Flat roof

discription	R4					
requirement	Un[W/m2K]	0,16				
	Rw[dB]	no requirment				
	Lw[dB]	no requirment				
Material	thickness[mm]	λ [W/m2K]	R [m2K/W]	γ [kg/m3]	γ [kg/m2]	g [kN/m2]
Vegatation layer substrate	50			1680	84	0,84
Filtration layer	240	0,04	6	120	28,8	0,288
Drainage and water accumulating layer - pe pholie	1,5					0,025
Protection layer - synthetic textile	1,5					0,025
Waterproofing asphalt sheets	180	1,5	0,12	2500	450	4,5
Pentration paint	3					
Reinforced concrete slab in slope 2%						
Plaster						
sum	465		6,12			5,68

1,18

final check

R transition 0,22
 R 6,34
 U 0,16
 U < Un **ok**

Autocad detail

GARDENS ABOVE UL – R4	self weight	t [mm]	kN/m2	
-VEGETATION LAYER, SUBSTRATE	1650 kg/m3	100	0.825	
-FILTRATION LAYER - SYNTHETIC TEXTILE	10 kg/m2	1,5	0.1	
-DRAINAGE AND WATER ACCUMULATING LAYER - PE PHOLIE	10 kg/m2	1,5	0.1	
-PROTECTION LAYER - SYNTHETIC TEXTILE	70 kg/m3	280	0.2	
-WATERPROOFING - 2xMODIFIED ASPHALT SHEETS	10 kg/m2	1,5	0.1	
-PENETRATION PAINT	25 kN/m3	30	0.75	
-REINFORCED CONCRETE SLAB IN SLOPE 2% -PLASTER		660	7.2	

Terace with concrete tiles above UL

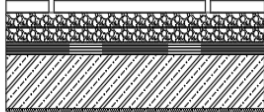
discription	R3					
requirement	Un[W/m2K]	0,16				
	Rw[dB]	no requirment				
	Lw[dB]	no requirment				
Material	thickness[mm]	λ [W/m2K]	R [m2K/W]	γ [kg/m3]	γ [kg/m2]	g [kN/m2]
Concrete tiles	50			1680	84	0,84
Gravel 4-6mm	240	0,04	6	120	28,8	0,288
Gravel	1,5					0,025
Geotextile polypropylen	240	0,04	6	120	28,8	0,288
Drainage pe with profilation						
Waterproofing asphalt sheets	3					
Penteration paint - asphalt						
Reinforced concrete slab	180	1,5	0,12	2500	450	4,5
Plaster						
sum	465		12,00			1,44

-3,06

final check

R transition 0,22
R 12,22
U 0,08
U < Un **ok**

Autocad detail

TERACE WITH CONCRETE TILES ABOVE UL – R3	self weight	t [mm]	kN/m2	
-CONCRETE TILES 400- x400x50				
-GRAVEL 4-6mm				
-GRAVEL				
-GEOTEXTILE - POLYPROPYLEN	1650 kg/m3	100	0.825	
-DRAINAGE PE WITH PROFILATION	10 kg/m2	1,5	0.1	
-WATERPROOFING - 2xMODIFIED ASPHALT SHEETS	10 kg/m2	1,5	0.1	
-PENETRATION PAINT - ASPHALT	70 kg/m3	280	0.2	
-REINFORCED CONCRETE SLAB	10 kg/m2	1,5	0.1	
-PLASTER	25 kN/m3	30	0.75	
		660	7.2	

Flat roof - terrace with concrete tiles

discription	R2					
requirement	Un[W/m2K]	0,16				
	Rw[dB]	no requirment				
	Lw[dB]	no requirment				
Material	thickness[mm]	λ [W/m2K]	R [m2K/W]	γ [kg/m3]	γ [kg/m2]	g [kN/m2]
Concrete tiles	50			1680	84	0,84
Hight adjusted stands	240	0,04	6	120	28,8	0,288
Waterproofing asphalt sheets	1,5					0,025
Thermal insulation	240	0,04	6	120	28,8	0,288
Vapor barrier						
Penteration	3					
Reinforced concrete slab	180	1,5	0,12	2500	450	4,5
Plaster						
sum	465		12,00			1,44

-3,06

final check

R transition 0,22
R 12,22
U 0,08
U < Un **ok**

Autocad detail

FLAT ROOF – TERRACE WITH CONCRETE TILES – R2	self weight	t [mm]	kN/m2	
-CONCRETE TILES 400- x400x50				
-HIGHT ADJUSTED STANDS				
-WATERPROOFING - 2xMODIFIED ASPHALT SHEETS	1650 kg/m3	100	0.825	
-THERMAL INSULATION IN SLOPE 3%	10 kg/m2	1,5	0.1	
-VAPOUR BARRIER	10 kg/m2	1,5	0.1	
-PENETRATION	70 kg/m3	280	0.2	
-REINFORCED CONCRETE SLAB	10 kg/m2	1,5	0.1	
-PLASTER	25 kN/m3	30	0.75	
		660	7.2	

Inside composition

Floor structure between underground and 1st floor

discription	H1							
requirement	Un[W/m2K]	1,45						
	Rw[dB]	57						
	Lw[dB]	53						
Material	thinkness[mm]	λ [W/m2K]	R[m2K/W]	Rw'	Lw'	γ [kg/m3]	γ [kg/m2]	g [kN/m2]
surface crimac - carpet	5						5	0,05
glue layer								0,01
concrete layer	50	1,5	0,075			2500	125	1,25
suppration foil								0,01
acoustic insulation	40	0,037	1,35			120	4,8	0,048
reinforced concrete	170	1,5	0,113			2500	425	4,25
gypsum board	20	0,17	0,12			2000	40	0,4
sum	365							6,018
								1,768

airborn resistance check

$$Rw < Rw' - k$$

$$k = 3dB$$

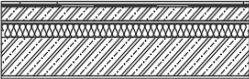
$$52dB < 56 - 3 = 53dB$$

ok

$$R \quad 1,9$$

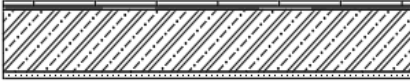
$$U \quad 0,53$$

$$U < Un \quad \text{ok}$$

FLOOR SECTION UL TO 1L-H1	self weight	t [mm]	kN/m2	
-SURFACE: CAERPET / CERAMIC	15 kg/m2	5-15	0.15	
-GLUE LAYER	5 kg/m2		0.05	
-CONCRETE LEVELING LAYER	2500 kg/m3	50	1.25	
-SEPARATION FOIL	5 kg/m2		0.05	
-ACCUSTIC INSULATION	70 kg/m3	40	0.03	
-REINFORCED CONCRETE SLAB	2500 kg/m3	200	5	
-PLASTER	1400 kg/m3	15	0.28	
			7	

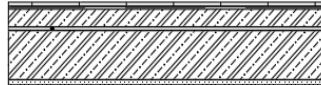
Staircase flights

types	H3							
requirements	Un[W/m2K]	no requirement						
	Rw[dB]							
	Lw[dB]							
Material	thickness[mm]	λ [W/m2K]	R [m2K/W]	Rw'	Lw'	γ [kg/m3]	γ [kg/m2]	g [kN/m2]
Ceramic surface layer embeded in glue layer	20					1000	20	0,2
Reinforced concrete slab	160	1,5	0,11			2500	400	4
Limecement plaster	3							
sum	180							4,20

STAIRCASE FLIGHTS–H3	SELFWEIGHT	t [mm]	kN/m2	
-CERAMIC SURFACE LAYER EMBEDED IN GLUE LAYER	15 kg/m2	15	0.15	
-REINFORCED CONCRETE SLAB	2500 kg/m3	160	4.0	
-LIMECEMENT PLASTER	1800 kg/m3	3	0.05	
			4.2	

Staircase intermediate landing

types	H2							
requirements	Un[W/m2K]	no requirement						
	Rw[dB]							
	Lw[dB]							
Material	thickness[mm]	λ [W/m2K]	R [m2K/W]	Rw'	Lw'	γ [kg/m3]	γ [kg/m2]	g [kN/m2]
Ceramic surface layer embeded in glue layer	20					1000	20	0,2
Concrete Leveling layer	50	1,5	0,075			2500	125	1,25
Ethafoam PE inner Layer								0,01
Reinforced concrete slab	190	1,5	0,13			2500	475	4,75
Gypsum plaster	3							
sum	263							6,21

STAIRCASE INTERMEDIATE LANDING – H2	SELFWEIGHT	t [mm]	kN/m2	
-CERAMIC SURFACE LAYER EMBEDDED IN GLUE LAYER	15 kg/m2	15	0.15	
-CONCRETE LEVELING LAYER	2500 kg/m3	35	0,9	
-ETHAFOAM PE INNER LAYER	5 kg/m2	10	0.05	
-REINFORCED CONCRETE SLAB	2500 kg/m3	190	4,75	
-GYPSUM PLASTER	1800 kg/m3	3	0.05	
		250	5,9	

General floor section								
types	H2							
requirements	Un[W/m2K]	1,45						
	Rw[dB]	52						
	Lw[dB]	58						
Material	thickness[mm]	λ [W/m2K]	R [m2K/W]	Rw'	Lw'	γ [kg/m3]	γ [kg/m2]	g [kN/m2]
surface: carpet/ceramic	20					1000	20	0,2
glue layer	5							0,01
optional waterproofing layer								
Concrete Leveling layer	50	1,5	0,075			2500	125	1,25
Separation foil								0,01
Accoustic insulation	80	0,037	1,08			120	9,6	0,096
Reinforced concrete	240	1,5	0,16			2500	600	6
Inner plaster	3					2000	6	0,06
sum	398							7,63

1,63

check of airborne resistance

R 1,32

Rw < Rw' - k

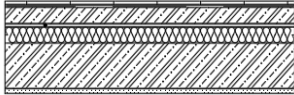
U 0,76

k = 3dB

U < Un ok

52dB ≤ 55 - 3 = 52dB

ok

GENERAL FLOOR SECTION-H1	SELFWEIGHT	t [mm]	kN/m2	
-SURFACE: CARPET/CERAMIC	15 kg/m2	10	0.15	
-GLUE LAYER	5 kg/m2		0.05	
-OPTIONAL (FOR WET AREAS-BATHROOMS) WATERPROOFING PLASTER FORTISOL WITH PENETRATION FORTE PENETRAL				
-CONCRETE LEVELING LAYER - ANHYDRIT WITH FLOOR HEATING	2500 kg/m3	40	1.0	
-SEPARATION FOIL	5 kg/m2		0.05	
-ACCUSTIC INSULATION	70 kg/m3	80	0.06	
-REINFORCED CONCRETE SLAB	2500 kg/m3	240	5.0	
-PLASTER	1800 kg/m3	3	0.05	
		360	6,4	

Partition 250mm

type	V3							
requirements	Un[W/m2K]	no requirements				massonry hight [mm]		3200
	Rw[dB]		42					
	Lw[dB]	no requirements						
Material	thickness[mm]	λ [W/m2K]	R [m2K/W]	Rw'	Lw'	γ [kg/m3]	γ [kg/m]	g [kN/m]
Inner plaster	15					2000	96	0,96
HELUZ AKU 25	250			47		850	680	6,8
	15					2000	96	0,96
sum	280							8,72

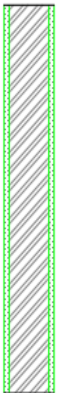
airborne resistance

$$R_w < R_w' - k$$

$$k = 3\text{dB}$$

$$42\text{dB} < 47 - 3 = 44\text{dB}$$

ok

NON-LOADBEARING WALLS – V3	t [mm]	
-INNER PLASTER - HELUZ	17.5	
-MASONRY HELUZ AKU 11.5	115	
-INNER PLASTER - HELUZ	17.5	

Partition 115mm

type	V3							
requirements	Un[W/m2K]	no requirements				massonry hight [mm]		3200
	Rw[dB]		42					
	Lw[dB]	no requirements						
Material	thickness[mm]	λ [W/m2K]	R [m2K/W]	Rw'	Lw'	γ [kg/m3]	γ [kg/m]	g [kN/m]
Inner plaster	15					2000	96	0,96
HELUZ AKU 11,5	115			47		850	312,8	3,128
outer plaster - POROTHERM UNIVERSAL	15					2000	96	0,96
total	145							5,05

airborne resistance

Rw < Rw' - k

k = 3dB

42dB < 47 - 3 = 44dB

ok

Underceiling - Halls

type	SDKP 1							
requirements	Un[W/m2K]	no requirements				massonry hight [mm]		3200
	Rw[dB]		42					
	Lw[dB]	no requirements						
Material	thickness[mm]	λ [W/m2K]	R [m2K/W]	Rw'	Lw'	Υ [kg/m3]	Υ [kg/m]	g [kN/m]
SDK Underceiling with thermal insulation - Knauf								
Thickness of thermal insulation = 40 mm								
Double layer aluminium GRID								
Fire resistance EI30								
Including lights								
total								

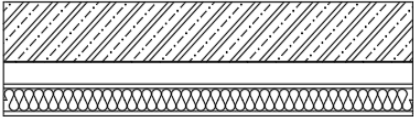
airborne resistance

$R_w < R_w' - k$

$k = 3\text{dB}$

$42\text{dB} < 47 - 3 = 44\text{dB}$

ok

HALLS – SDKP1	t [mm]	
-SDK UNDERCEILING WITH THERMAL INSULATION - KNAUF THICKNESS OF THERMAL INSULATION 40mm DOUBLE LAYER ALUMINIUM GRID FIRE RESISTANCE EI30 INCLUDING LIGHTS	in layouts	

Underceiling -unheated areas below apartments in 1pp								
type	SDKP 2							
requirements	Un[W/m2K]	no requirements				massonry hight [mm]		3200
	Rw[dB]		42					
	Lw[dB]	no requirements						
Material	thickness[mm]	λ [W/m2K]	R [m2K/W]	Rw'	Lw'	γ [kg/m3]	γ [kg/m]	g [kN/m]
sdk underceiling with thermal insulation knauf								
Thickness of thermal insulation = 80 mm								

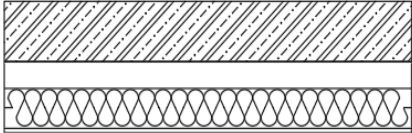
airborne resistance

$R_w < R_w' - k$

$k = 3\text{dB}$

$42\text{dB} < 47 - 3 = 44\text{dB}$

ok

UNHEATED AREAS BELOW APARTMENTS IN 1PP – SDKP2	t [mm]	
<p>-SDK UNDERCEILING WITH THERMAL INSULATION - KNAUF -THICKNESS OF THERMAL INSULATION 80mm</p>	120	

Underceiling -unheated areas below apartments in 1PP

type	SDKP 3							
requirements	Un[W/m2K]	no requirements				massonry hight [mm]		3200
	Rw[dB]	42						
	Lw[dB]	no requirements						
Material	thickness[mm]	λ [W/m2K]	R [m2K/W]	Rw'	Lw'	γ [kg/m3]	γ [kg/m]	g [kN/m]
KNAUF D - 112 with antihumidiy impregnation								
including lights								

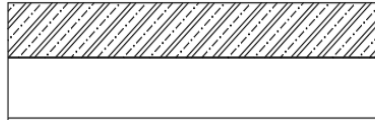
airborne resistance

$R_w < R_w' - k$

$k = 3\text{dB}$

$42\text{dB} < 47 - 3 = 44\text{dB}$

ok

BATHROOMS AND APARTMENT HALLS – SDKP3	t [mm]	
-KNAUF D - 112WITH ANTI HUMIDITY IMPREGNATION INCLUDING LIGHTS	in layouts	

Underceiling -entry hall

type	SDKP 4							
requirements	Un[W/m2K]	no requirements				massonry hight [mm]		3200
	Rw[dB]	42						
	Lw[dB]	no requirements						
Material	thickness[mm]	λ [W/m2K]	R [m2K/W]	Rw'	Lw'	γ [kg/m3]	γ [kg/m]	g [kN/m]
Knauf D1 - 112xGKF; 15 Certification EI 30								
Thickness of thermal insulation 80 mm								
Double layer aluminium grid								
Fire resistance EI30								
including lights								

airborne resistance

$R_w < R_w' - k$

$k = 3\text{dB}$

$42\text{dB} < 47 - 3 = 44\text{dB}$

ok

ENTRY HALL – SDKP 4	t [mm]	
-KNAUF D 1 - 112x GKF ; 15CERTIFIKATION EI 30WITH THICKNESS OF THERMAL INSULATION 80mm DOUBLE LAYER ALUMINIUM GRID FIRE RESISTANCE EI30 INCLUDING LIGHTS	120	