



BUILDING PROTECTION AGAINST
RADON GAS

RADON, CHARACTERISTICS AND HAZARDS

Radon is a noble gas occurring naturally from the decay of radium, which is developing in turn from the decay of uranium. Uranium might be found in plenty but however variable concentrations in the Earth crust, especially in the subsoil, volcanic rocks or metamorphic lithotypes. Being a gas, radon leaks from the porosity of sediments and from the cracks in the rocky agglomerates, spreading quickly in the atmosphere; at the same time it can easily accumulate in buildings, particularly in closed rooms then reaching living areas releasing harmful radiations. Colourless and odourless radon is considered extremely dangerous to the health if inhaled. After it has accumulated in buildings, it settles inside the breathing apparatus, radiating outward all bronchus-pulmonary system. Indeed, it has been discovered that these substances cause both lung cancers and many other severe pathologies.

HOW DOES IT GET INTO THE BUILDINGS

Being a noble gas, the radon atom is relatively free to move through hollows and soil porosities. Its diffusion through the soil and its breaking into buildings is driven by molecular diffusion and, above all, by convection, it means by the air transmission from the soil into the building. The main source of contamination is the soil, which radon propagates from through cracks, pipes, joints, or even directly through the floor. In closed rooms, the effects of radon have increasingly worsen in recent times also due to an extreme - and most of the times wrong - energy saving policy obtained by blocking all thermal bridges and particularly in winter allowing poor air change to prevent heat loss. By high gas concentrations even a frequent air change would be enough.

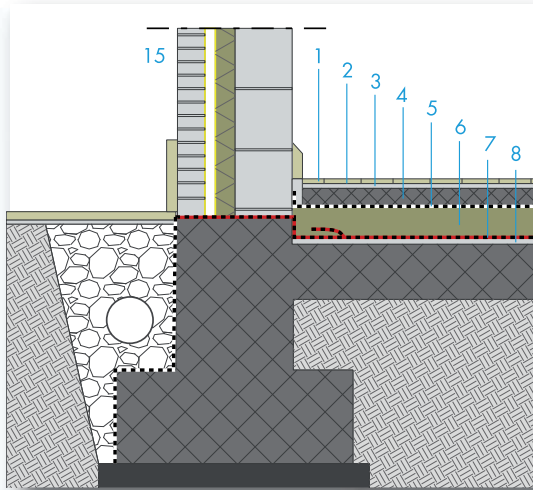
ANTIRADON MEMBRANES

It is possible to prevent radon leaking into buildings and houses choosing specialty products in combination with effective technical and functional solutions. The first barrier against radon has to be set where vertical walls come into the soil; therefore the technical configuration has a fundamental role to control radon gas diffusion and consequently for the quality of the air. Willing to assist from the design stage, NOVAGLASS developed two specialty products certified as radon barriers. Either in case of new waterproofing systems or refurbishment solutions, an appropriate anti-radon membrane has to be installed in foundations and vertical walls in all below and above ground situations (eg. cellars, basements, garages, etc.). In order to prevent gas accumulations, it is worthwhile to provide a way out installing an extractor system in the basement or alternatively a well ventilated crawlspace beneath the floor.

NOVALL-I A AND NOVATER S-A

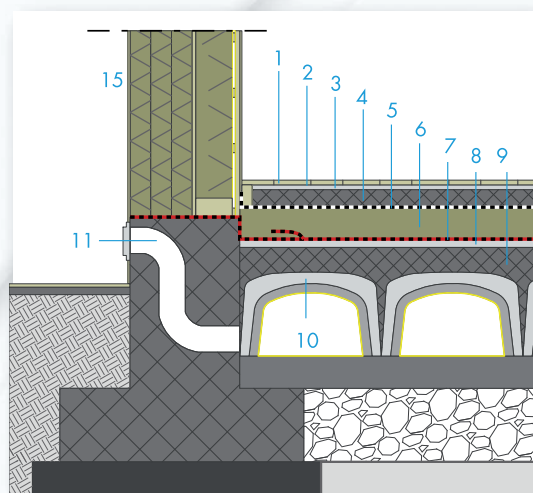
APP modified bitumen membranes are ideal for foundation waterproofing and to obtain a top protection against radon gas penetration. Particularly NOVALL-I A has a composite reinforcement comprising aluminium foil laminated with fibreglass mat, capable to grant both total resistance against radon transmission and high dimensional stability. The waterproofing mass, made of distilled bitumen modified with polypropylene, grants best characteristics of flexibility at low temperatures. A state-of-the-art production technology guarantees higher quality standards in comparison to common membranes available on the market.





A. Horizontal barrier below ground

“Inverted beam system” foundations in which the floor is directly laid onto the ground. Radon propagation is prevented by NOVALL-IA and NOVATER S-A antiradon membranes.

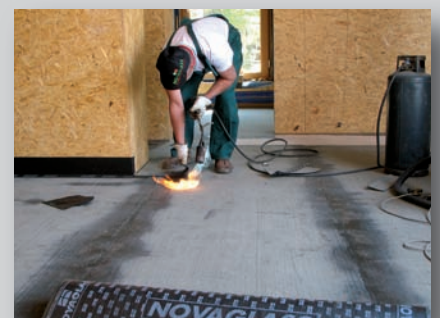
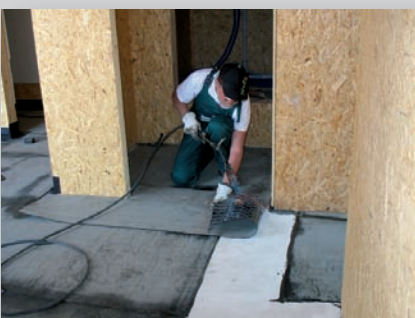


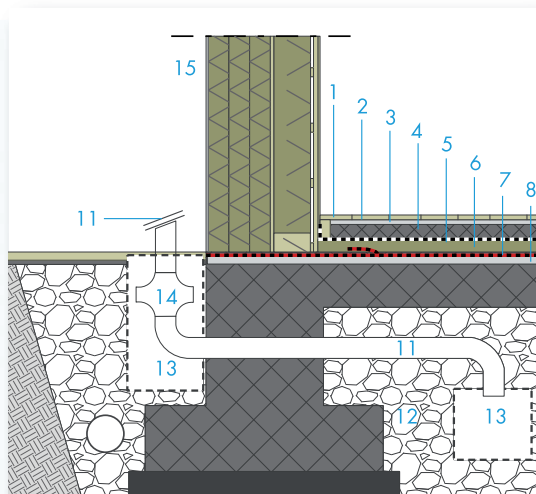
B. Horizontal barrier above ground, with ventilated crawlspace

“Stalls system” foundations with laying level prepared to fit igloo-shaped modules to obtain ventilated crawlspace. Air circulation is granted by installation of ducts alongside the perimeter, and letting radon exhaust; gas leaks are prevented by antiradon membranes.

Key

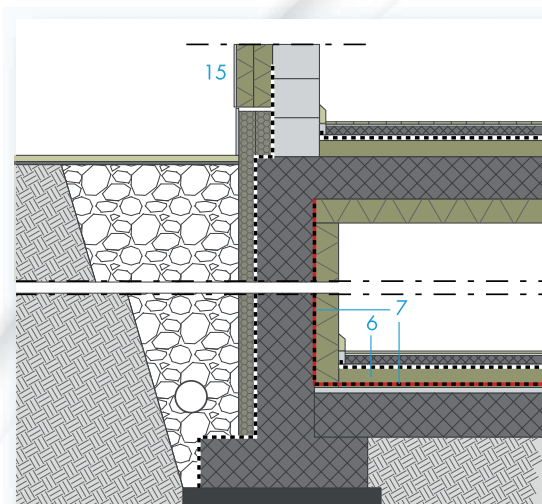
- 1. Rigid shell
- 2. Settlement layer
- 3. Cementitious levelling layer
- 4. Screed
- 5. Vapour control layer
- 6. High density thermal insulation layer
- 7. Antiradon polymer modified bitumen membrane
- 8. Levelling and smoothing layer onto the floor





C. Horizontal barrier below ground, with crawlspace

"Inverted beam system" foundations with crawlspace filled with gravel. Radon's exhaust is allowed by fitting a sump pump into the venting substrate, connected to discharge pipe. Radon leaks are prevented by antiradon membranes.



D. Horizontal barrier below ground, with partial or full underground rooms (basement cellars)

"Inverted beam system" foundations, retaining walls and floors directly laid onto the soil. Antiradon membrane protects the entire surface of the floor, going up vertically up to the above ground floor. That is held and protected by an internal wall, possibly with a thermal insulation layer if it's a living area. Internal wall shall not be perforated by mechanical fastening or others.

- 9. Finishing concrete
- 10. Ventilated crawlspace with igloo shaped modules
- 11. Discharge pipe and radon outlet
- 12. Clean gravel drain layer

- 13. Sump pump and/or air exhaust ventilator
- 14. Exhaust fan
- 15. Examples of vertical barriers: fair-faced brickworks, wood plus organic fibre insulation (bio-architecture), external thermal coating and brickworks.





NOVATER S-A



NOVATER S-A is a plastomeric modified bitumen waterproofing ANTIRADON membrane (APP), industrially manufactured by impregnation of the reinforcement with the waterproofing compound based on distilled bitumen modified with special polyolefin polymers, very low permeability to noble gas, which gives to the compound high technical characteristics.

The composite reinforcement, made of nonwoven spunbond polyester in combination with fiberglass, conveys high mechanical characteristics, excellent dimensional stability and elastic performance and absolute impermeability against Radon.

Shaping of sheets, straightness, dimensional and surface uniformity are accomplished by hot calendaring of the mass at hot melt fluid state.

The upper surface is coated with anti-adhesive amorphous sand. The lower surface is coated with a thermo-fusibile polyolefin film.

Test method	Norm	Unit	Tolerance	Value	
Thickness	EN 1849-1 (1999)	mm	+/- 0,2	3-4-5	
Flexibility at low temperature (pliability)	EN 1109 (1999)	°C	<=	-10	
Heat flow resistance	EN 1110 (1999)	°C	>=	120	
				Long.	Transv.
Maximum tensile strength	EN 12311-1 (1999)	N/50 mm	-20%	700	600
Elongation at break	EN 12311-1 (1999)	%	-15	40	40
Resistance to tearing (nail shank)	EN 12310-1 (1999)	N	-30%	150	150
Water vapour transmission property	EN 1931-(2000)	μ	-	20.000	
Radon permeability Test	SP Tech. Res. Inst. Sweden	m ² /s	<	0,7x10 (e-12)	
Root resistance	EN 13948	-	passed	NPD	

ANTIRADON CERTIFICATED MEMBRANES



NOVALL-I A



NOVALL-I A is a plastomeric modified bitumen waterproofing ANTIRADON membrane (APP), industrially manufactured by impregnation of two reinforcements with the waterproofing compound based on distilled bitumen modified with special polyolefin polymers, very low permeability to noble gas, which gives to the compound high technical characteristics.

The two reinforcements are fiberglass and alluminium foil, impermeability against Radon and water vapour and thermal stability.

Shaping of sheets, straightness, dimensional and surface uniformity are accomplished by hot calendering of the mass at hot melt fluid state.

The upper surface is coated with anti-adhesive amorphous sand. The lower surface is coated with a thermo-fusibile polyolefin film.

Test method	Norm	Unit	Tolerance	Value	
Thickness	EN 1849-1 (1999)	mm	+/- 0,2	3	
Flexibility at low temperature (pliability)	EN 1109 (1999)	°C	<=	-10	
Heat flow resistance	EN 1110 (1999)	°C	>=	120	
				Long.	Transv.
Maximum tensile strength	EN 12311-1 (1999)	N/50 mm	-20%	700	400
Elongation at break	EN 12311-1 (1999)	%	≥	2	2
Resistance to tearing (nail shank)	EN 12310-1 (1999)	N	-30%	100	100
Water vapour transmission property	EN 1931-(2000)	μ	-	1.700.000	
Radon permeability Test	SP Tech. Res. Inst. Sweden	m ² /s	<	1,1x10 (e-12)	
Root resistance	EN 13948	-	supera	NPD	