

Installation of floor heating film for ceramic tiles, granite and other stone or composite flooring

The list of necessary materials before starting the installation of floor heating:

1. Infrared heating film standard width of 19 3/4" (50 cm), 31 1/2" (80 cm) or 39 3/4" (1m);
2. Electrical wire. US standard:
 - a) 12AWG, Stranded, THHN (to make connections from thermostat to heating film);
 - b) 12-2 NM cable (to make connection from thermostat to breaker);For Europe and other countries: recommended parameters of conductors: Copper - section - not less than 1.5 mm²;
3. Clamp Connectors and Mastic insulator.
4. Floor Insulation material. Using a heat insulator with a metallic coating is not recommended;
5. Plastic film thickness of not less than 0.1 mm, to use as vapor barrier;
6. Plastic mesh with sections of 3/8" X 3/8" (1x1 cm);
7. Screws;
8. Scotch-tape;
9. Thermostat with temperature sensor.

List of required tools before starting the installation of floor heating:

1. Screwdriver;
2. Pliers;
3. Scissors;
4. Knife assembly;
5. Wire cutters;
6. Hammer;
7. Punch;
8. Drill Bit (6 X 120) etc.

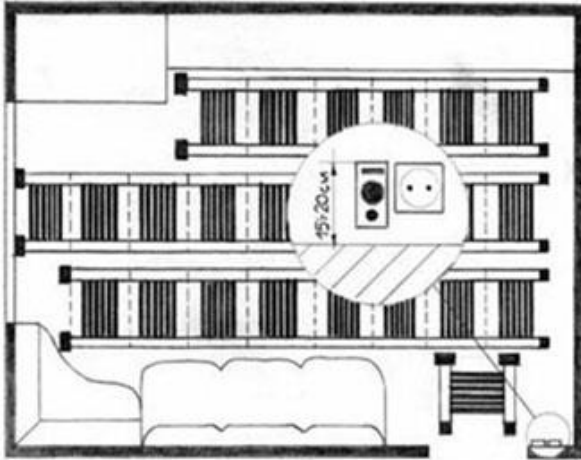
Before Installation:

- Make sure floor is free of dirt, stones, debris and water and has a smooth surface;
- For thermo- and vapor barrier is used conventional materials;
- If sufficiently thick material is used for insulation (for example: polystyrene) to layer on top of the heating film you need to apply a cement layer. Laying ceramic tiles need to be addressed after the curing of the cement layer;
- Do not use thermal insulation with a metallic surface;
- Laying heating film is recommended by the length of the room, thus avoiding unnecessary joints. The joints should be placed above the wall (the most optimal location - near or under the skirting);
- Cut the film is only on specially designated places. It is prohibited to cut the film in any other areas. The length of one section of the film is 9 5/6" (25 cm);
- Do not allow crossing of the film or overlap one on another;
- Do not damage the film with obstacles.

Step by step instructions for the installation

1. Layout of electric underfloor heating systems

Sketch a plan showing how the film will be installed. In drawing up a plan, should take into account that the organization of the main floor heating is necessary to cover at list 70% of the usable space. Do not install film under built-in cabinets, stationary design elements, appliances, in small closets (walk-ins are okay), or under other structures that do not have air circulation space under them. To arrange comfortable heating it must be covered for at least 40% of the surface aria.



Leave a space and padding around the perimeter of the room size from 4"-15"(10 to 40 cm) spacing between the strips of film - not more than 2" (5 cm) and no less than 1" (2,5 cm)

Not allowed: overlapping film on a film

When planning the placement, should take into account that the heating film is cut into sections at designated places specially designed for cutting. The length of a single section is 9 5/6" (25 cm).

2. Calculations capacity of the heating system, as well as the definition of the required number of thermostats and electrical power capabilities

The maximum power consumption of infrared heating film is 232 W/m². Given this fact and the amount of space covered by heating film, electrical current can be calculated by the following formula:

$$I=P/U,$$

Where: I - Current;

P - Required heating capacity;

U - Voltage.

The amount of current required for selection of appropriate gauge wiring, and to select the thermostat model.

The cross sections of electric wire	Current Rating, Copper	Current Rating, Aluminum
1.5 sq mm	16A	10A
2.5 sq mm	25A	16A
4.0 sq mm	32A	25A

Consider this calculation on a specific example. For example, the room allocated for installation of floor heating has a total area of 215 sq ft (20 sq m), the type of heating - basic flooring - laminate. Excluding the area cluttered with furniture and other design elements, a useful area or the area of the film coating will be 129 sq ft (12 sq m).

Thus, we determine the maximum capacity of the system as a whole:

$$P = 12 \text{ m}^2 \cdot 232 \text{ W} = 2784 \text{ W},$$

$$I = 2784 \text{ W}/220\text{V} = 12.7 \text{ A}$$

We select on the table above, the necessary cross-section area wires etc. We find copper wire with a cross section of 1.5 sq mm.

For the thermostat selection it should be guided by the following data:

$$3 \text{ kW} = 139.93 \text{ sq ft (13 sq m)};$$

$$3.5 \text{ kW} = 161 \text{ sq ft (15 sq m)};$$

$$4 \text{ kW} = 182 \text{ sq ft (17 sq m)};$$

$$6 \text{ kW} = 269 \text{ sq ft (25 sq m)}.$$

If the area of the floor heating is larger than presented above, it would be necessary to use more powerful thermostat or seek help from qualified professionals.

3. Select location of the thermostat, the point of connection to the electrical outlet and temperature sensor.

Thermostat location can be set at any convenient position for the user on the wall. It should take into account that the most optimal and recommended place is at a height of 6" - 8" (15-20 cm) from the floor and close to electrical outlet. The connection is made via a fixed connection or hidden connection using the same cable. Consider the presence of other devices connected to this outlet. Installation wires and sensors for a more aesthetic look to be hidden in a wall or close to special decorative boxes. If the power system is more than 3 kW, it is recommended that you connect through a separate circuit breaker.

4. Prepare the floor (planning, cleaning). Spread out the Plastic film "vapor barrier" on the floor and thermal insulator (you can use a vapor barrier film with reinforced glass fiber, film with a heat reflecting surface or a solid insulator).
5. Remove shoes and work in stocking feet when installing film. Be careful not to drop objects on the film. Roll out the film with the bright copper strips facing

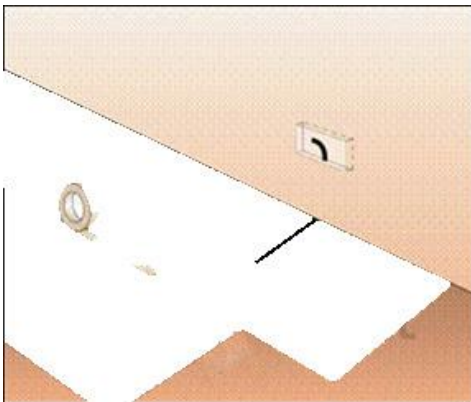
down. Start at one side of the room rolling out the underfloor heating film from the non-connection end of each line (end with no connection tails), ideally towards the wall the underfloor heating thermostat is located.

6. Cut out the heating film according to the scheme planned and put on the prepared surface, secure with adhesive tape. Each heating film line can be held in place by using a suitable adhesion tape such as duct tape along the ends and side of the film. Between heating film's strips must be a space of 2 ¼"-3 ½" (6-9 cm) for further reinforcement.



7. Underfloor Heating Thermostat Floor Sensor Installation

Install the underfloor heating thermostat floor sensor supplied with the under floor heating thermostat. Cut a small channel into the underfloor insulation layer to allow the thermostat floor sensor/probe to be laid into, so that the sensor and its wires are below the level of the pad. Run the wire from the sensor to the thermostat and tape it to the pad and the floor. The channel should be located under one of the underfloor heating film. Position the floor sensor under the heating film clear area, not under black carbon heating strips.





8. Connecting the heating film strips to the thermostat and electrical connections are made only in a parallel manner.

- a) Strip the insulation from one end of a 14 gauge stranded THHN wire. If the wire is double insulated—be sure to strip both layers of insulation.



- b) Insert the barrel of the connector into the crimping tool so that the “W” of the tool presses on the split side of the barrel. The tool will not release until there is sufficient pressure on the crimp. After crimping, test the wires to be sure they are tight in the connector. If only one wire is to be crimped in the connector, strip 1/2 inch

of insulation and double the wire over into a “U” shape before crimping. If two wires are to be crimped together, strip 1/4 inch of insulation from each wire and insert them into the connector together. After crimping, test the wires to be sure they are tight in the connector.

- c) Place the connector over the copper strip on a corner of the film and crimp it so that the teeth on the connector bite into the copper strip.



9. The contact points, clamp connectors and free ends of the film insulated by an insulation tape.

- a) Cut 2-inch-wide mastic insulating tape into 2-inch squares. Apply a square of tape to both the top and bottom side of each wire connection and press them together firmly to form a tight seal.

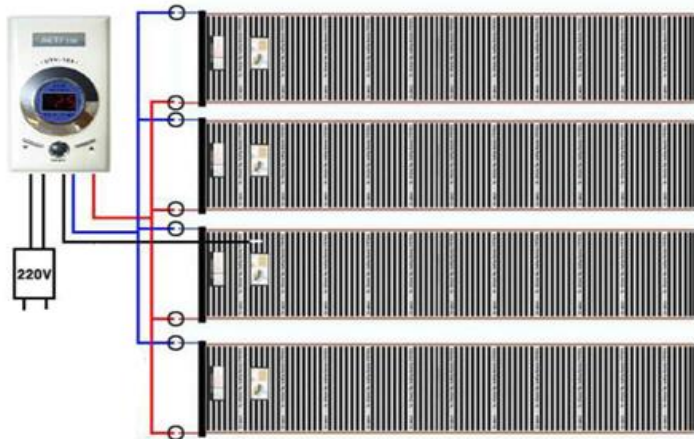


- b) In the same way, use the mastic tape to cover all of the bare ends of each copper strip that do not have wire connections.

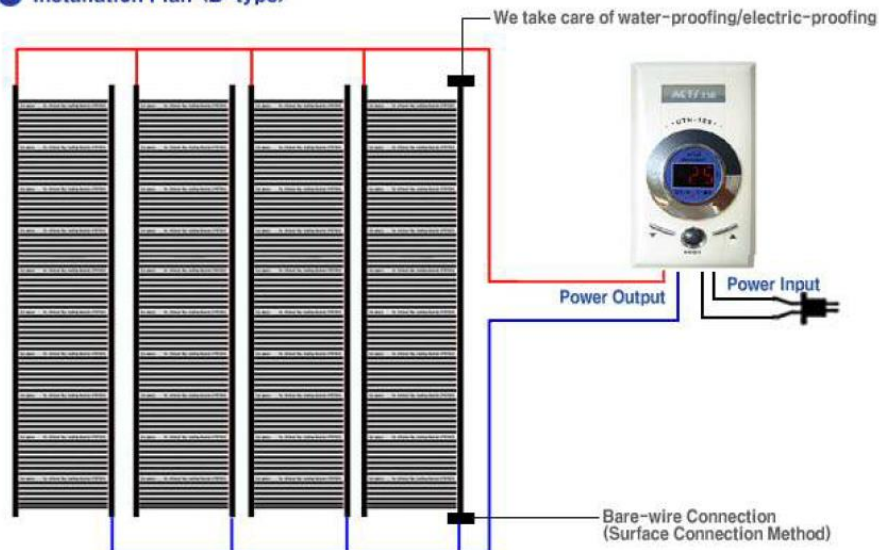


10. Once the underfloor heating mats have been laid and fixed in place over the floor the connection tails should be run back to the underfloor heating thermostat or junction box location. The diagram below shows the two ways underfloor heating mats can be connected back to the underfloor heating thermostat. (Underfloor heating mats must always be connected in parallel never in series).

● Installation Plan <A-type>



● Installation Plan <B-type>



11. The cold ends can be laid in grooves cut in to the insulation for convenience and ease of fitting, the cold ends should not cross under or over the heating film. It is advisable to label and identify the individual cold tails to the heating film for ease of wiring (the heating film do not have a polarity).



12. The connection ends and cold tails can be pressed into the underfloor insulation by scoring the underfloor insulation and firmly pressing the tails / ends into the scored underfloor insulation. It is advisable to tape over the connection tails and cold ends to keep the underfloor heating mats held in place during the instillation of your wood / laminate floor.



13. Infrared heating film is covered by plastic vapor barrier with elements overlapping by 40” (100 mm). If necessary the vapor barrier can be taped around the edges to hold it in place.



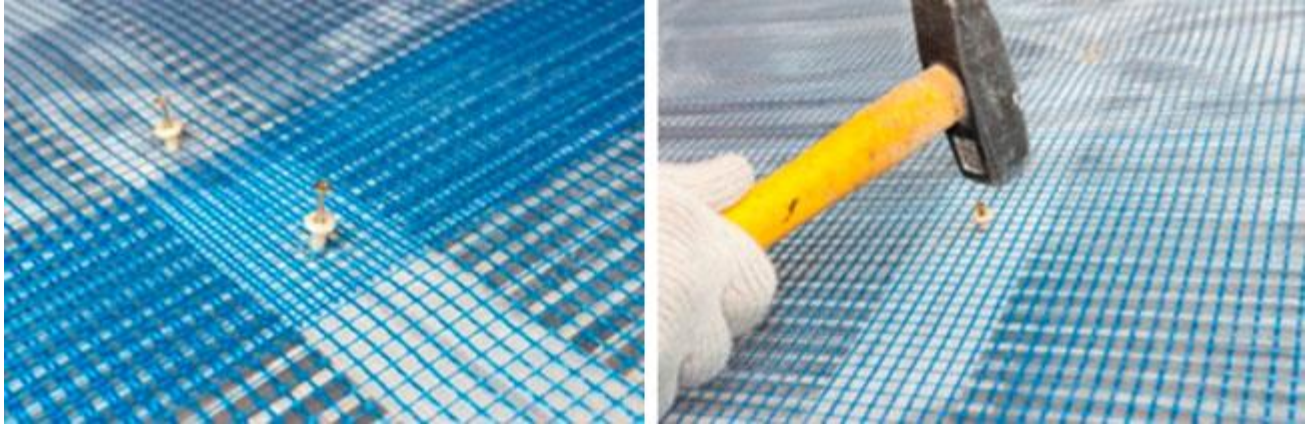
14. The next step is overlapping plastic mesh by 20" – 28" (50-70 mm) and overlap vapor barrier by 20" – 28" (50-70 mm)



15. In the space left 2 ¼"-3 ½" (6-9 cm) between the heating film strips, drill right through the layers of plastic vapor barrier and thermal insulation and plastic mesh. Drill holes every 6"-8" (15-20 cm) then drive screws into the holes securing plastic mesh and providing reinforcement of tile adhesive to the concrete subfloor.

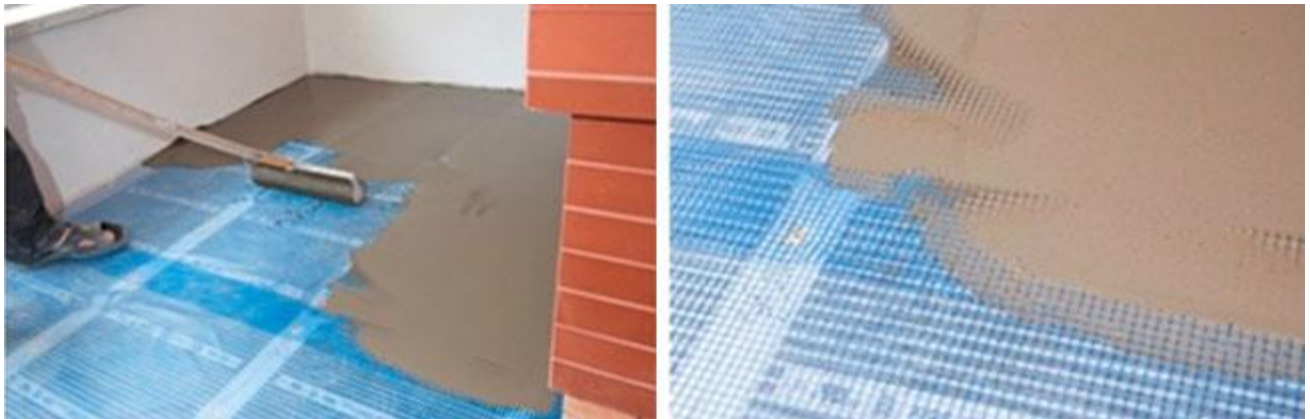
Caution:

- Use extreme caution when drilling. Do not damage the surface of the heating film;
- Before drilling make sure to verify the absence of any obstruction under the floor surface (pipes, wires) to avoid their damage.



16. After installation of heating film, isolation of all the contacts and connecting thermostat. It is necessary to carry out the verification step. First, carefully visually inspect all joints for exposed contacts and any damage done during installation. Second, make a trial run of the system for 15-20 minutes. To check the operation.

17. Recommended to the entire surface of the heated floor to apply a self-leveling mortar or cement not less than 3/8" (8 mm) on top of the plastic mesh.



18. The final stage of installation is laying flooring (tile, ceramic, etc.). Tile glue has to be applied not less than 3/8" (8 mm).

- You cannot include underfloor heating system until complete hardening of cement layer or tile adhesive. The average time spent on this phase is 28 days;
- In case of water spill or leakage, you cannot run a heating system until its complete dry.