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# Electrical Underfloor Heating Systems for Football Fields



February 2011, Istanbul / Turkey

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## Why Electrical Underfloor Heating Systems for Football Fields?

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- UEFA has plans to enforce the implementation of heated fields for football clubs in the near future.
  - Underground heating systems can be applied in stadiums, golf fields, running tracks and various other sports fields, especially in regions with rough winter conditions.
  - Heating cables enable the prevention of frost in grass grounds and help keep the “grass” alive.
  - During winter, even if there is a heavy snow during the football match, won't be any icing problem with no doubt.
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## The benefits of underground heating systems in grass fields

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- Warming the earth before spring to accelerate the growth of grass and helping the season to start earlier
- Warming the earth in the fall season to prevent the grass from being affected by cold weather conditions and extending the season
- Lowering the preparation costs
- Melting the snow and preventing frost and ice.

## The stadiums are heated with underground electrical heating

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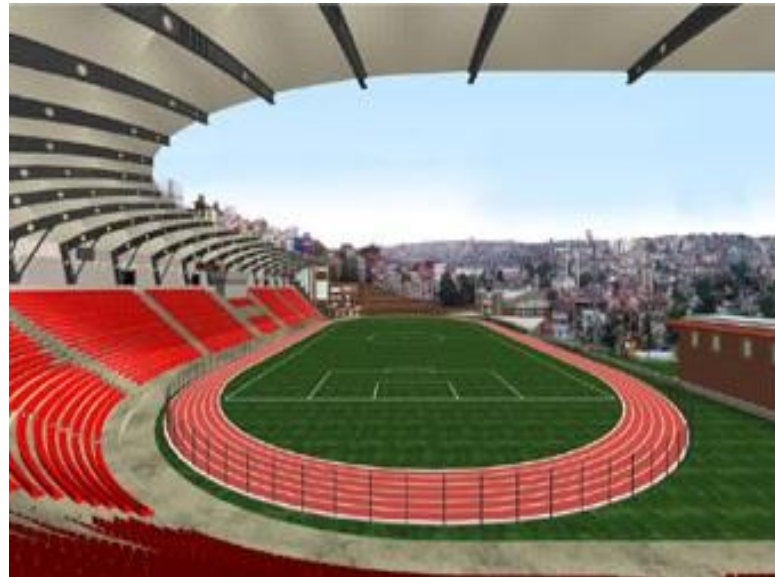
- For instance in Europe, the electrical underground heating system of the WEMBLEY Stadium was installed in 1960.
- In Turkey, one of the first applications of this system was installed in the Sivas Sports Club Training Fields and Sivas 4 Eylul Stadium in 2008-2009.



## The stadiums are heated with underground electrical heating

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- And another application has been done in Istanbul in Turkey at Kasimpasa Stadium in 2010.



# Application of Electrical Underground Heating Systems

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There are 2 types of application of electrical underground heating systems for the football fields;

A- Application of the system during the grass renewal phase

B- Application of the system in an existing grass field

## A- Application of the system during the grass renewal phase

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- In this type of application, the existing grass layer to be renewed is removed. If the ground and drainage systems are not damaged during this removal phase, the earth is leveled and then the electrical heating cables are laid on the field ground.
- The distance between the cables varies depending on the installed capacity per square meter. In general, heating cables are laid with a distance of 18 cm to 40 cm.



## A- Application of the system during the grass renewal phase

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- The installed capacity of the electrical underground heating systems may show variations based on the geographical region, the type of soil and seasonal conditions.
- Under normal conditions, the installed capacity is determined by using values between 50 W and 100 W/m<sup>2</sup>.
- In international measurements of football fields (max. 70 x 110 m.) the typical installed capacity of an application is 400 – 750 kW (50 – 100 W/m<sup>2</sup>).



## A- Application of the system during the grass renewal phase

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For instance: KASIMPASA STADIUM;

- Based on the dimensions of a football field of 72 x 110 meters and taking into consideration the regional climate conditions in the Istanbul province, the installed capacity required would be 85 watts/m<sup>2</sup>.
- Total m<sup>2</sup> x w/m<sup>2</sup>  
7.920 x 85 = 673.200 Watts (674 kW) is the calculated installed capacity.

## A- Application of the system during the grass renewal phase

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- When the installation is made according to the total installed capacity as indicated above, the estimated temperature of the ground - about 10 cm below, in the areas close to the roots - will be 6-10 degrees Celsius.
- The most important point in the electrical underground heating systems in areas like football fields is to place the heating cables at a depth of 20-25 cm below the ground level. The reason for laying the heating cables at this depth is to prevent possible damages during sports events like javelin and pole vault, in addition to biannual aeration of the soil.



## B- Application of the system in an existing grass fields

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- The heating cables can be laid by removing the existing grass using the special equipment designed and manufactured by our team of engineers.
- This machine creates a crevice to enable of the cable. The application is again carried out by a special machine and on the reel is lowered into the ground. The heating cables do not harm the grass.
- After the installation of the electrical heating system without removing the grass, depending on the weather conditions the grass will be completely ready for use within 15 to 20 days.



## Defrosting snow, ice and preventing from icing the truck fields

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- It is also important for track fields as football fields because the melting snow and ice may overflow from water channels. The water from melted snow would find its way to the running track and cause frost and ice on the track.
- As a result of such an incident, the track field will not be fit for races or passage from the track to the football field will impose danger for people. Taking into consideration such conditions, the running track should also be fitted with electrical underground heating systems. Heating all the drainage and water ducts around the field is also very important.



## The electrical heating application in the track field

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- In the application of electrical underground heating in the track field, the installed capacity should be equal to the installed capacity of the football field. For example, if the installed capacity per  $\text{m}^2$  of the football ground is applied as  $85 \text{ W/m}^2$  the calculations and application for the running track should be made based on  $85 \text{ W/m}^2$  installed capacity.



## The electrical heating application in the track field

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- In the application phase in the running track, the heating cables should be laid 10-15 cm below the ground level. After adding 4cm of sand over the cables, the ground should be covered with gravel and then the surface cover is laid.
- Fenix electrical underground heating cables are resistant to 2 kN (2000 N) mechanical impacts.

## The electrical heating application in the water drainage ducts

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- In the water drainage ducts, the electrical heating application should be made using the installed capacity ratio of the water channel dimensions.
- As an example, for an 8 cm wide, 5 cm high and 400 meters long water channel, depending on the weather conditions an installed capacity varying between 35 W/m and 60 W/m should be applied.



## System automation control in football fields

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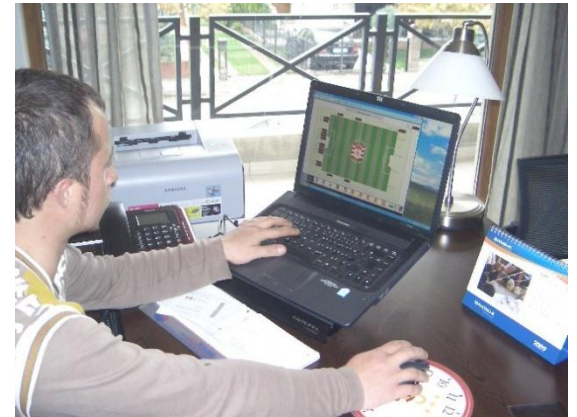
- One of the most important issues to be addressed in the application of electrical underground heating systems in football fields is the ‘automation panel’ that controls and operates the system.
- Automation control panel is installed in an area that would not impose any danger in the stadium for the people and property and that would enable easy and swift access in emergency situations.
- For safety reasons and to avoid any risks for people and property in case of floods, etc, it is placed in a covered compartment that can only be accessed by authorized personnel.



## System automation features

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- The automation panel is designed according to IP54 protection class of EA norms and it is 100 % water proof.
- The system is controlled and operated by special software developed by our company.
- Electronic thermal magnetic switch, integrated phase and voltage protection, excess current circuit breaker, lightning rod.
- Emergency shut down, electronic network analyzer, automatic power shutdown when the inner valves open and short circuit default protection.



## System automation features

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- Remote viewing of the field, ground, water temperatures and outer weather temperatures. With sensors placed between in 15-20 different points, it can track the temperature in the area of each sensor and control (raise/lower the temperature) the settings.
- It is possible to activate or deactivate each independent heating group. With zone control, it can manage the 4 individual zones and activate/deactivate the selected zones.
- If required, heating systems of the football field, running track and water channels can be activated at the same time or the selected ones can be turned on and the others off.



## System automation features

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- Furthermore, the electrical underground heating system can be activated / deactivated manually. In manual operation, like the automated system, the field, running track and drainage systems can be turned on or off independent from each other.
- The technical documentation of the system can be produced daily, weekly, monthly and annually. Moreover, IP cameras placed in the stadium provide remote viewing.

# Technical Specifications of Electrical Underground Heating Systems

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Fenix heating cables on reels are used in applications.



# Technical Specifications of Electrical Underground Heating Systems

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## Technical Specifications

- Uninterrupted resistance wire, fluoropolymer and XLPE insulation,
  - Earth conductor, Metal outer sheath (Aluminum),
  - PVC inner sheath, Serial resistance,
  - Outer diameter: 5.5 mm,
  - Maximum continuous heat on the sheath: 65 °C,
  - Minimum cable flexing radius: 5 x cable radius,
  - Power tolerance of conductivity resistance: -5 / +10 %,
  - Maximum operating voltage: 300 / 500 V AC,
  - 100% water resistant,
  - Product life is at least 60 years.
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# Sivas 4 Eylül Stadium 2009 - 2010 Report of Energy Consumption

- Field Dimensions: 110 x 73 m = 8.030 m<sup>2</sup>
- Total Power System: 682 kW
- The average outdoor temperature: - 12 °C
- The average soil temperature: + 15°C

## Daily Consumption

Description	October	November	December	January	February	March
	Daily	Daily	Daily	Daily	Daily	Daily
Total Working Hours per day	6	7	9	11	11	5
Total Power ( Kw )	4092	4774	6138	7502	7502	3410

# Sivas 4 Eylül Stadium 2009 - 2010 Report of Energy Consumption

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## Monthly Consumption

Description	October	November	December	January	February	March
	for 30 days	for 30 days	for 30 days	for 30 days	for 30 days	for 30 days
Total Working Hours per month	180	210	270	330	330	150
Total Power ( Kw )	122760	143220	184140	225060	225060	102300



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# Winter Season Photographs

Sivasspor

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# Sivasspor

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## Temperature in winter in Sivas:

- Average temperature is  $-4^{\circ}\text{C}$ ,
- Minimum temperature is  $-36,4^{\circ}\text{C}$

# Sivasspor

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# Application & Testing Photographs

Kasimpasa Spor

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# Kasimpasa Spor - Application



**Temperature in winter  
in Istanbul:**

- Average temperature is 2-9 °C
- Minimum temperature is -14 °C



## Kasimpasa Spor - Testing

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The Field's Electrical Heating System is ON



The Field's Electrical Heating System is  
PARTLY OFF in Winter

The OFF lines are under snow

# Principles of Electrical and Water Ground Heating Systems

	Application of the Systems	Electrical System	Water System
1	Other Energy Requirements (Natural Gas, Coal, LPG, Diesel etc.)	None	Yes
2	Water Consumption (Initial requirement min. 29 tons)	None	Yes
3	Electricity Consumption	Yes	Yes
4	Chemical Additives to Prevent Water From Freezing (Initial requirement min. 15 tons)	None	Yes
5	Requirement of a Boiler Room (min. 80 m <sup>2</sup> )	None	Yes
6	Smoke Shaft and Ventilation	None	Yes
7	Human Resources Requirement for the Operation of the System	None	Yes
8	System Shut Down Risk (Freezing, Machine Breakdown, etc.)	None	Yes
9	Periodical Maintenance Requirement	None	Yes

# Principles of Electrical and Water Ground Heating Systems

	Application of the Systems	Electrical System	Water System
10	Environmental Pollution	None	Yes
11	Necessity for the System to Operate Continuously	None	Yes
12	Return of Consumed Energy	99%	68%
13	Installation Period of the System	30 Days	75 Days
14	Can the System be Applied in an Existing Field?	Yes	No
15	Homogenous on the Spot Heating	Min 100 %	Max 80 %
16	Installation Cost (boiler included in water system)	Low cost	Expensive
17	Warranty Period	10 Years	2 Years



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**Thank You**

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