SKID

Technical Brochure
for Snow Melting & Ice Prevention

Advanced Solutions ®

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Riscaldamento Elettrico

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Chapter 1

Introduction

1.1 Scope

AS is for **Advanced Solutions** ®, the Santoni srl brand which means research, innovation and advanced technology solutions.

AS currently supplies two families of Snow-and-Ice Melting products:

- Outdoor Underground Heating Ribbons normally at 250-500 watts/m^2. Higher outputs can be easily achieved by controlling the spacing between ribbon runs on the ground.
- Pipe and Gutter Freeze Protection / Heat Tracing Ribbons.

Both product families are based on a unique design of fully grounded heat-tracing cables (Heating element) made of amorphous metallic ribbons enclosed in a mechanically strong but flexible enclosure.

The heating element is designed per IEEE 515.1 standard for underground and outdoor-exposed applications.

This manual covers AS's first product family of Snow-and-Ice Melting products − Outdoor Underground Heating Ribbons.
The manual provides general information on these products, and specifies the installation procedures for the field technician.

1.2 Manual Organization

The manual is divided into three chapters:

Chapter 1 – Introduction
This chapter outlines the purpose and structure of this manual and gives a general outline of the AS Snow-and-Ice Melting System.

Chapter 2 – AS System Description and Main Characteristics
This chapter provides a general description of AS's Outdoor Underground Heating Ribbons, describes the Heating element, which is the building block of these systems and gives the main features and specifications of the Heating Ribbons.

Chapter 3 – Installation Procedure
This chapter provides the field technician with detailed instructions on installing the AS's Heating Ribbons.

1.3 AS System General Overview

The AS Systems are high quality heating devices designed for melting ice and snow covering road and sidewalk surfaces, gutters and ice and snow mounted on top of roofs during dark and freezing-cold winter days (see Figure 1-1). The AS System is based on a unique and patented amorphous metal heating technology, specifically developed to solve safety hazards caused by harsh cold weather conditions. This product has significant advantages over any other type of hydronic or electrical cables.

The main advantages are as follows:

- Greater surface contact with cold ground or ice
- Innovative design of the heating cable
- Reaching working temperature fast
- Generating heat evenly.
- Energy savings
- Less costly
- Reliable and durable.
- **Installation is extremely simple and easy.**
- **Perfectly safe against electric shock hazards.**

Figure 1-1. Typical Use of AS Heating Systems during Cold Winter

Chapter 2

SKID System Description

2.1 General

This chapter provides a general description of AS's Outdoor Underground Heating Ribbons, describes the Heating element, which is the building block of these systems and gives the main features and specifications of the Heating Ribbons and Mats.

2.2 AS Heating Element 2.2.1

Heating Element Components

The Heating element consists of the following components (see Figure 2-1):

- Coated amorphous ribbon
- Internal coating
- Return lead
  (one or two leads according to the application)
- Aluminum Sheath
- Grounding lead
- External coating
- Flame retardant

2.2.1.1 Coated Amorphous Ribbon

The Heating element is made of amorphous ribbons, with a nominal thickness of about 20-30 µm.

2.2.1.2 Internal Coating

The internal coating consists of a double-layer (class 2) linear low-density polyethylene with a nominal thickness of 0.5-1.0 mm on each side of the metallic ribbon.

2.2.1.3 Return Lead

According to the application, the heating element may have one or two 1.5 mm^2 leads.
The conductor is made of bare copper, insolated by HDPE of width 0.41± 0.06 mm.

2.2.1.4 Aluminum Sheath

The grounding sheath is made of 50 µm aluminum foil coated with 12 µm polyester at a total thickness of 62 µm. The aluminum side faces outward and fully covers the coated amorphous ribbon and return leads.

2.2.1.5 Grounding Lead

The grounding lead is made of a 1.5 mm^2 tinned copper conductor. The conductor is in full contact with the aluminum foil.

2.2.1.6 External Jacket

The external jacket is made of a black Liner Low-Density Polyethylene (LLDPE), has a nominal thickness of 1 mm (at least 0.9 mm) and a UV additive as required by the application. For outdoor-exposed applications, an FR additive is added to the coating material.

2.2.1.7 Flame Retardant

A PE Flame Retardant concentrate is added to all applications in order to provide self-extinguishing properties. The Flame Retardant meets UL94 requirements.

Note:
Both internal coating and external jacket are characterized by:

- High melting temperature (approximately 120°C)
- Low friction coefficient
- Good abrasion resistance
- Good petroleum-jelly resistance
- Low water absorption
- Well-dispersed, highly effective UV stabilizer in sufficient amount to ensure excellent weathering resistance

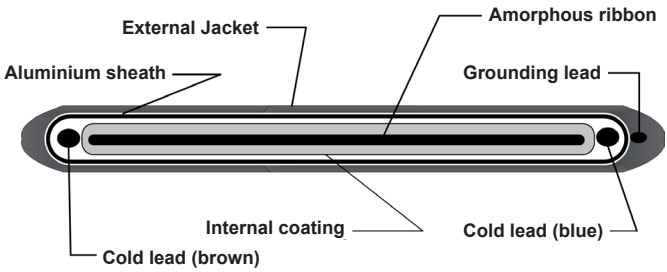

Figure 2-1. AS Heating Cable Components

2.2.2 Heating Element Performance

The heating element possess a fixed power per meter length. Thus, different length of the element, one can easily set the required output

power per linear meter. The upper limit for the heating element is 62 watts per meter. This limit corresponds to 5A on a single unit. The heating element can be driven by various AC or DC power sources: 220-240, 400 and 600 Volts, as long as the current limit is met.

The heating element's upper working temperature limit is 70°C.

2.3 AS Heating Ribbon 2.3.1

Purpose and Use

The Outdoor Underground Heating Ribbon is designed to be laid beneath concrete, asphalt, paving stones, or gravel surfaces, and provides a safe solution against hazards caused by harsh-cold weather conditions in the following sites:

- Pedestrian crossings.
- Driveways in front of garages.
- Bus and tram stops.
- Any other place where the safe walking and entrance to buildings should be maintained

2.3.2 Heating System Description

The Outdoor Underground Heating System is composed of one or more heating elements connected in parallel. The heating elements are either straight or bent, according to site conditions.

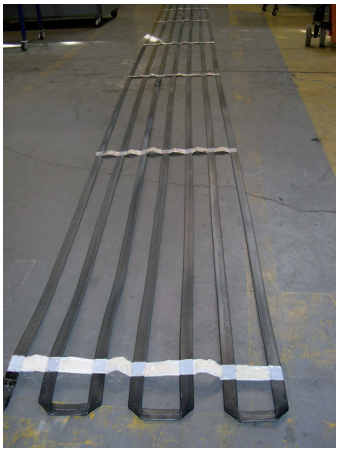

Figure 2-2. AS Heating mat

Each heating ribbon is individually connected to a voltage source through a single cold-lead cable (consisting of three leads: power, neutral and ground, and shielded if it local codes require so). The cable is routed to an electrical connection box.

Chapter 3

Installation Procedure

3.1 General

This chapter provides the field technician with detailed instructions on installing the AS's Heating Ribbons and Mats, including the recommended construction profiles used in the design of open courts, tools and materials required to execute the installation

3.2 Design of Open Courts – Construction Profiles

3.2.1 Under Cold Asphalt

The construction profile of the AS heating element installed under cold asphalt should be as shown in Figure 3-1.

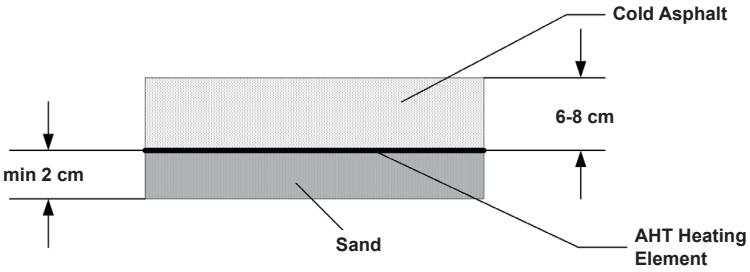

Figure 3-1. Construction Profile Under Cold Asphalt

3.2.2 Under Concrete

The construction profile of the AS heating element installed under concrete should be as shown in Figure 3-2.

3.2.3 Under Pavement

The construction profile of the AS heating element installed under the street pavement should be as shown in Figure 3-3.

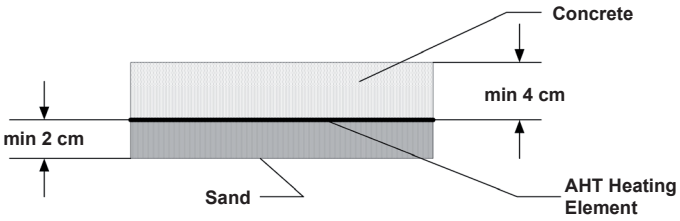

Figure 3-2. Construction Profile Under Concrete

3.2.4 Under Gravel

The construction profile of the AS heating element installed under gravel should be as shown in Figure 3-4.

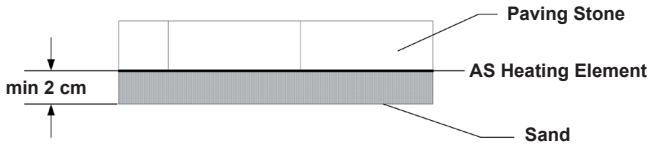

Figure 3-3. Construction Profile Under Pavement

3.3 Power Loadings

The following heat flux densities are recommended for ice and snow prevention in open areas:

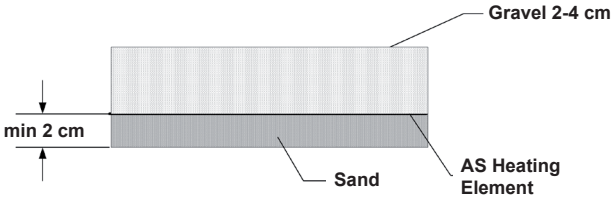

Figure 3-4. Construction Profile Under Gravel

- Parking Lots 250 – 350 W/m^2
- Driveways 250 – 300 W/m^2
- Sidewalks 250 – 300 W/m^2
- Doorsteps 300 – 375 W/m^2
- Bridges 300 – 400 W/m^2

These power restrictions depend on the weather conditions, such as ambient temperature, humidity, wind speed, snowfall rate and level of thermal insulation. The above values correspond to windless weather and typical snow melting rates between 6.35 and 12.7 mm per hour, when the corresponding air temperature ranges from -7°C to -2°C. To prevent ice and snow (melting), the covering surface temperature must be theoretically 0°C (in practice, we recommend 1-2°C). The time required to reach the melting temperature depends on the heat flux density of the heating element, the depth of the heating element below the covering surface, the thermal and physical properties of the covering surface, and the weather conditions.

3.4 Planning the Installation of the Heating Elements

- The standard distance between adjacent heating is 20cm, but this could be modified according to meet the required output per square meter, provided the upper limits of the heating cable specifications are not exceeded.

- The cables should not be energized until either the concrete has cured or the asphalt has cooled to ambient temperature.

3.4.1 Measuring the Project Site

Prior to installation, draw an installation plan showing the placement of the heating cable based on the power needed, and the connection boxes.

3.6.7 Step 7: Laying Out the Assembled Cables

Lay out the assembled cables as follows:

1. Verify the ground surface is flat and smooth with no sharp stones.
2. Lay the heating elements on the ground according to the construction profile (see Section 3.2).

Note:
Use a U-shaped hook for anchoring the cable where needed. Do not pierce the cable with any fastener (such as nails, screws, rivets, etc.).

3. Pull the cold wires out off the surface towards the connection box.

4. Make sure the connection box is installed according to local codes, and as close as possible to the installation area.

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