

Requirements for a safe and well-functioning tube rail system

Based on ISSO Publication 86: Quality Requirements for Horticultural Greenhouses

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Due to the increasing height of greenhouses, higher demands are being placed on the stability of tube rail systems. To reduce the risk of tipping and tilting, the guidelines from the occupational health and safety requirements for the agricultural and green sector apply. This document describes the requirements for the soil, the tube rail system, and the tube rail trolleys.

After installation of the tube rail system, it must be determined whether the tube rail trolley is sufficiently stable under practical operating conditions. This assessment forms part of the initial commissioning of the system.

Soil requirements

A safe and reliable tube rail system starts with a firm substrate. The soil must have sufficient load-bearing capacity to support the tube rail supports and trolleys without sinking or becoming tilted. If it is not clear whether the soil is strong enough, the load-bearing capacity must be determined by means of a soil investigation, for example using a cone penetration test. If the soil is too wet or saturated, it may temporarily have insufficient load-bearing capacity, making the tube rail system unsafe to use.

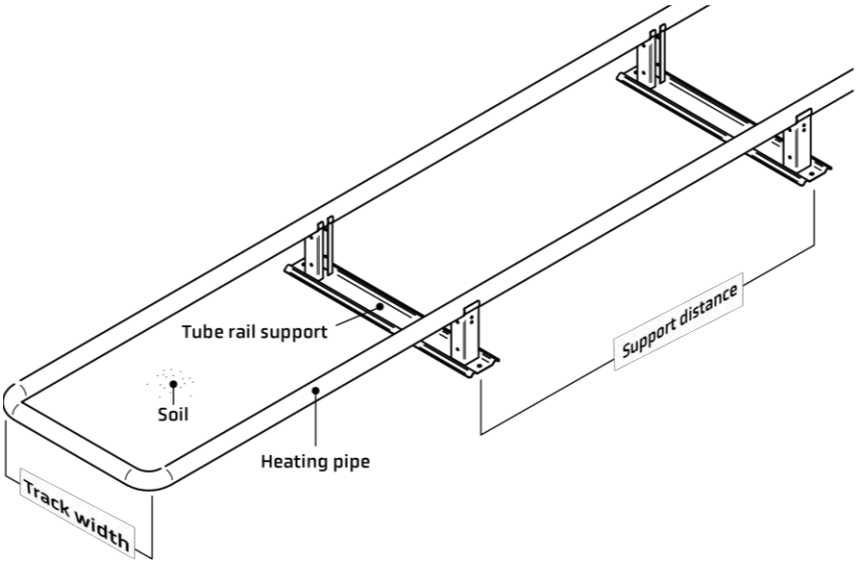


Figure 1: Overview of tube rail system components

In addition to load-bearing capacity, the levelness of the soil is also very important. A tube rail system that is not level may cause instability and increase the risk of tube rail trolleys tipping over. Therefore, the inclination of the system under load must not exceed 2°. Table 1 provides an overview of the maximum height difference per track width.

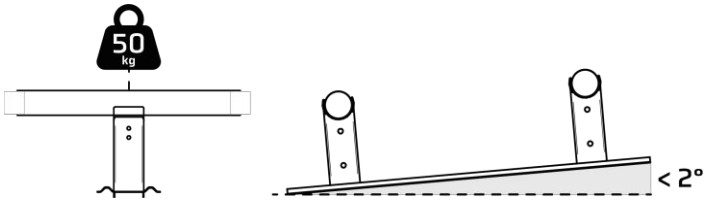


Figure 2: Requirements for tube rail

Track width	Height difference
425 mm	15 mm
500 mm	17 mm
550 mm	19 mm
600 mm	21 mm

Table 1: Maximum height difference

Tube rail system requirements

The tube rail system must be constructed using suitable materials and in accordance with the manufacturer's guidelines. The minimum dimensions and requirements for the supports are shown in Figure 3. The tubes must be securely attached to the supports and fixed in both the longitudinal and transverse directions so that they cannot shift under load. For several prescribed combinations of tube diameter, wall thickness, and support spacing, maximum axle loads have been established, as shown in Table 2. For non-standard configurations, these must be calculated during the design phase. These values must be followed to ensure safe loading.

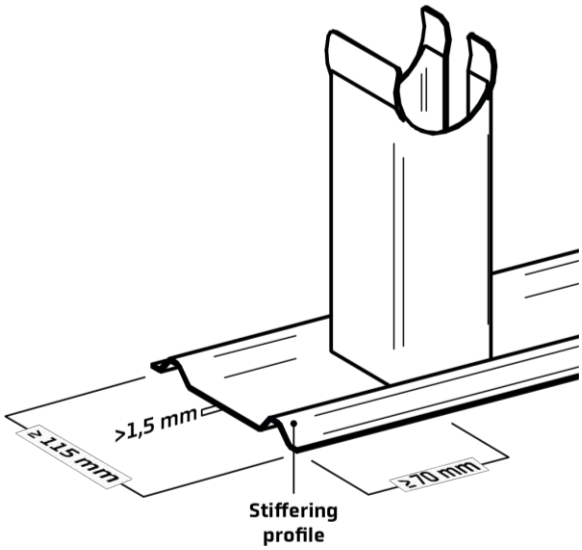


Figure 3: Requirements for tube rail

				Max. permitted axle load at			
Cat.	**Track width [mm]**	**Tube diameter / wall thickness [mm]**	**Support spacing [mm]**	**c.t.c. 420 mm [kg]**	**c.t.c. 500 mm [kg]**	**c.t.c. 550 mm [kg]**	**c.t.c. 600 mm [kg]**
1	420–1000	51 / 2.25	Max. 1000	507	548	573	593
2	420–600	51 / 2.25	Max. 1250	406	438	458	475
3	420–600	45 / 2	Max. 1000	345	372	372	403
4	420–600	45 / 2	Max. 1250	276	276	276	323

*Table 2: Maximum permitted axle loads**

*When using P235TR1, P235TR2, or P235GH steel. When using P195T steel, reduce the axle load by a factor of 0.83. Wheelbase 62.5%–125% of the support spacing; otherwise, reduce the permitted axle load by a factor of 0.77.

Tube rail trolley requirements

Tube rail trolleys must be supplied with tilt warning equipment that alerts the user when the trolley is at risk of tipping, as well as an EC declaration.

Tube rail trolleys must be fitted with guardrails with a top rail along the long sides at least 90 cm above the platform, with an intermediate rail halfway up. The guardrails on the short sides of the platform must be 110 cm high.

Tube rail trolleys must be marked with the maximum permitted loads in kilograms and the maximum number of persons. If tube rail trolleys are designed to carry additional loads, such as packaging and harvested product, up to a limited lifting height, this must also be indicated.