# 4. Catenary

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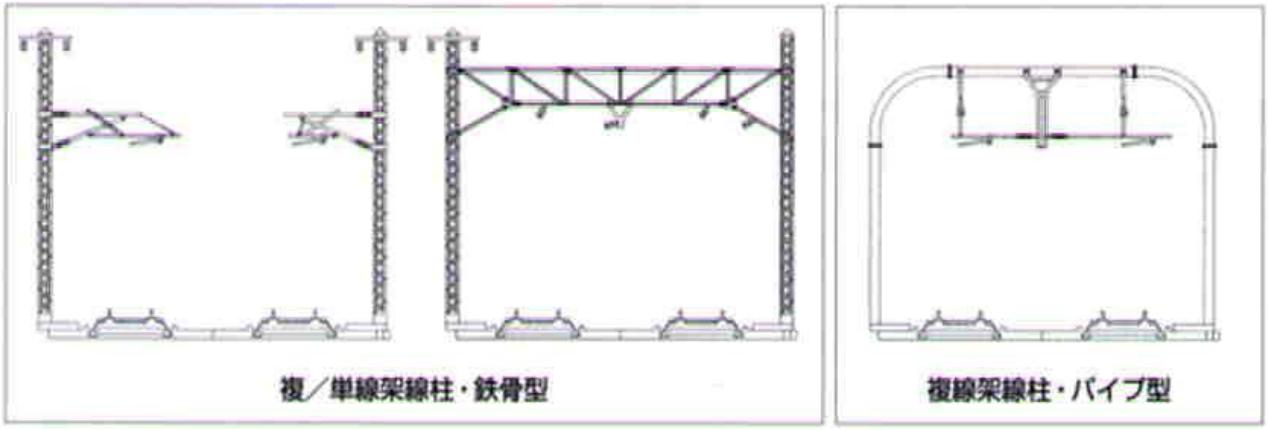
## 4.1 Catenary introduction

Electric trains need some form of power supply to provide the energy needed to run the train. After years of experiments, two systems of supplying electric power became common. For lower voltages, up to 750V, a third rail can be used. 3rd rail systems are common with mainly urban and suburban railways all over the world, but in England 3rd rail power supply became widespread in the area south of London. For safety reasons, many railways choose overhead wires, because these are out of reach for most humans. Overhead wires can safely carry voltages up to 25kV (25,000 volts) without becoming too dangerous for people, horses and high road vehicles, in the USA and in South Africa there are even lines electrified with 50kV (50,000 Volts!), these lines are isolated from other electrified lines.

## 4.2 Japanese electrification

A few Japanese railways are electrified with 3rd rail systems, normally at 600V DC, these railways are mainly underground systems, but in earlier years a few 'normal' railways have been electrified with 3rd rail as well. A good example is the Usui pass section of the Shin-Etsu line, which had rack locos running on 3rd rail. In 1963 the Shin-Etsu line became electrified througout, this time with 1500V DC coming from overhead wires. Most of Japan's electric lines are electrified at 1500V DC from overhead wires, but other voltages are common as well. Trams use the more or less universal 600V DC system from a single wire, this voltage is also used by many narrow-gauge feeder lines. In the early years of electric trams, many tram systems in Japan used a douple-pole catenary, as per a trolleybus line. Later electrifications in Japan are mainly done with 20kV AC at 50 or 60 Hz, depending on the local mains. Shinkansen trains use 25kV at 60Hz west of Tokyo and 25kV at 50Hz north of Tokyo. Catenary supports vary a lot in Japan. On the JR Japanese-gauge lines, many different styles are intermixed with each other. The arch style is a recent development and mainly used on a few routes around Tokyo (Chuo line, certain sections of the Yamanote line)




*A few styles of catenary supports offered by Tomix*

Tomix offers the most common styles used in Japan today. Other styles can be scratchbuilt with not too much effort. It is important that you maintain the distance between track centres (37mm for Tomix track) and it is even more important to maintain the correct height between the registration arms and railtop level.Tomix offers more styles than shown in the picture above. Please use the Kato or NMRA gauges to determine the minimum height for the catenary supports. Please be careful with the use of the pipe style catenary gantry, pictured right. These gantries are a bit lower than other Tomix catenary supports and should be raised a little to maintain the correct loading gauge. Please check with gauge.

### 4.3 Catenary on J-Modules

On the J-Modules we decided to use the Tomix (or similar) types of supports without the use of a contact wire. Main reason to do so was to achieve a typical Japanese look, ease of use and cost reasons (The Japanese supports are the cheapest available). Those who want a contact wire are free to do so, but should take great care not to foul any pantograph. Please use a Kato or NMRA gauge for measuring contact wire

height. Take care to spread your catenary supports evenly over the length of your module. Please do not place any catenary support within 12 cms from the module end to allow for some handling room to fit the connecting track pieces. Observe curves and pointwork. I recommend to do some reading on catenary, and the Sommerfeldt catenary manual is thourougly recommended. This publication is a multi-lingual one and has its text in German, English and French. Name of this booklet is 'Mit Oberleitungen fahren wie beim Vorbild', ref. # 002, available from good model shops. Your author has a copy and could supply photocopies of relevant pages. There is also good information in the JRS 'Bullet-In', in particular in Bullet-In number 27 and 28 (article '*Danger - Overhead live wires'* by Peter Bird).


Kato gauge, can be used to determine catenary wire height.