



TRACKWORKS



A VAST EXPERIENCE IN TRACK DESIGN



The **MM Trackworks** team owns an in-depth knowledge of any track system and in many years has developed and implemented solutions through innovation and valuable technology. MM Spa has been responsible for the design and implementation of the various trackforms in Milan, since the 60's of the last century.

Among many recent projects, we can list the following: Trackworks Design Controller for Metro Line 4 and 5 in Milan; General Track Advisor for Riyadh Metro for Women University; Full design process and developer of track asset technical strategy for Metro Line 1 in Thessaloniki; Designer of various track systems for different metro extensions in Milan.

MM Spa has got wide knowledge and experience in new build, upgrading and maintenance of existing track infrastructure. The specialist designers in MM Spa are able to:

- Provide a comprehensive survey and design service for track renewal, maintenance and upgrading works to meet the technical, safety and quality requirements of the Business.
- Supporting complete design process from feasibility to site mark-up and supervising when required.
- Responsible for producing track design (delivery) through liaison with other Engineers.
- Provide support to the Asset and Field Engineers on design issues and failure reporting.
- Advise on special conditions and technical specifications for track standards.

- Preparation and/or checking of feasibility studies, detail design and other written documents.
- Production of design concepts, drawings, general arrangements, material specifications and technical reports.

MM's experts have exercised great passion and confidence in their work, continuing to hone their skills and knowledge in every category and phase of track works.

They always provided the technical expertise to any client, carrying out checks and balances in terms of compliance, assurance and managing risk. Also they led the development and introduction of company standards, processes and training for the track disciplines.

Sometimes they acted as trouble-shooters at some rapid degradation cases or sudden failures, providing on-site inspections and brief precise reports to identify the underlying issues and to review existing processes and compliance.

MM Spa actively supports the collaborative relationships between academia and the railway track industry, boasting successful collaborations with several universities and institute of research. This has always been a rich source of training, upgrade and inspiration, bringing to design outputs with higher and higher degree of safety and durability.

MM's expertise has been also recognised as a valid operator for training and mentoring of young engineers.



KNOWLEDGE OF VARIOUS TRACKFORMS



Ballasted track is the most widespread trackform around the world. However, the use of alternative trackforms is increasing as railways search for improved whole-life costs and reduced maintenance requirements and MM Spa has been working with many of them.

BALLASTLESS TRACK

Direct-fixation track has won acceptance as a cost-effective measure in reducing tunnel and aerial structure construction costs.

It has been promoted further for reducing track maintenance, stray current and ground-borne vibrations. The aggregation of attributes has spawned an array of direct-fixation fastener products and parallel concepts, now generally termed “ballastless track.”



Ballastless track now includes also embedded block track and embedded rail track as parallel categories to direct-fixation track.

When faced with various claims for performance characteristics among competing ballastless track products and a history of expensive implementations based upon the recommendations of specialist consultants, many operators expressed their desire for objective information on direct-fixation characteristics to allow independent judgment.

MM's expertise is the good choice to provide such independent judgement, because it owns the knowledge on lots of different and referenced track systems but it does not own any patent on some particular trackform.

MM Spa is able to operate in different track design fields: railways and metros, as well as tramways.



MAINTENANCE-ORIENTED TRACK DESIGN



Rail infrastructures are assets that represent a high investment. They are designed to work in very demanding safety conditions and must display a very low occurrence of failures. Rail tracks are components that are subject to the development of defects such as head checks, corrugations, cracking, broken bolts, settlements, etc. These failures depend on the characteristics of infrastructure, construction procedures and cares, train traffic and maintenance plans used. Maintenance plans must be devised and forecasting of failures is needed in order to keep them within an acceptable level.

RAMS TECHNIQUES

Reliability, Availability, Maintainability and Safety (RAMS) techniques have been extensively applied to the electrotechnical engineering field. They have a high potential for application in the rail infrastructure management field. RAMS techniques allow reliability engineers to forecast failures from the observation of operational field data.

MM Spa owns the expertise to carry out all the possible applications of RAMS techniques to the case of track maintenance management, focusing on the rail components.

The factor here of paramount importance, on which MM Spa can be a valuable partner for proper management, is that major track failures can be prevented by careful design of the track structure and of the corresponding operational strategy.

In recent years, several researchers have presented modelling activities or design approaches intended to understand the long-term behaviour of track, suggesting that integrated design is possible, by combining existing approaches rather than developing new ones. MM Spa has got the correct specialisation to push these boundaries in order to provide any rail business with new tools and improve their predictive capabilities, supplementing the general engineering judgement and enhancing track design.





WORKING ALSO
FOR VIBRATION
MITIGATION



When urban rail transit planning is conducted, it is inevitable to take certain structures into account, like hospitals, museums, theatres, and so on, which need special requirements to meet the environmental vibration standard.

Therefore, it is necessary to have measures of vibration reduction and isolation, so that these public buildings can fulfil their functions.

DESIGN OF THE TRACK AS A MITIGATION MEASURE

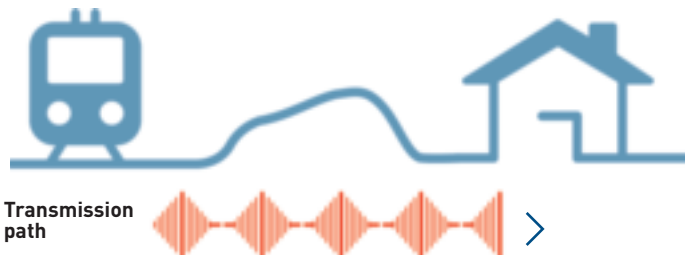
In accordance with the vibration isolation theory of a single degree-of-freedom system, any vibration isolator will only work when the excited frequency is more than 2 times the natural frequency and in most cases the track is that kind of case. Therefore, a basic principle that is generally followed in the vibration isolation design - when applied to track design - is to reduce the natural frequency of the system, either by decreasing the dynamic stiffness or by increasing the floating mass.

MM Spa has got also the in-house expertise to carry out such kind of tuning of the track, seen as a dynamic system.



Vibration source

Receiver



WHO IS MM?

MM Spa

is the leading engineering company in Italy in the design and construction of public transport infrastructure and urban requalification works aimed at the sustainable development of the area in which it operates.

Set up in Milan in 1955, MM constructed the city's entire underground railway network – 108 stations along its route of over 100 km – and major road and hydraulic engineering works.

The experience gained in this field has enabled the company to transfer its know-how all over Italy, taking part, for example, in the construction of the underground systems of Naples, Rome, Brescia and Turin, the rapid surface transit systems of Padua and Venice and the BreBeMi A35 motorway; and overseas in the underground systems of Copenhagen and Thessaloniki.

The services offered by MM Spa range from the planning of operations to technical and economic assessments, from preliminary investigations to works management, from design validation to tests, final inspections and quality control.

Today, MM is a business partner working alongside the institutions in the execution of major public works, which, due to the complexity of their design and the size of their financial commitment, require consolidated management capabilities and support in the technical and administrative fields.

Since 2003 MM has also managed the Water Service of Milan, handling groundwater withdrawal, purification, distribution, wastewater collection and treatment and, in general, the maintenance and investment plan of the water supply and wastewater networks.

On 1st December 2014, MM Spa took over the management of the real estate of the City of Milan, which consists of over 38,000 items of property including council houses, garages and other buildings. To this aim, MM set up the new organisational unit called "MM Casa", which will work alongside the other company facilities already operating in the management of the city's services.

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