

City Talk

King's Cross railway station is virtually deserted after all train services are canceled due to the heat on July 19. Below: a couple are stuck in Euston station following a trackside fire.



HEAT WAVE LEAVES TRAVELERS COOLING HEELS

The past few weeks has seen fiery weather, especially in Europe, causing havoc to air and surface travel.



Nuts and bolts

Edmund Leung

For railways, which depend on the integrity of steel rails to support and guide the trains, hot weather exceeding design conditions would lead to excessive expansion.

For modern electric train traction using continuous rails without open joints, the extended length may cause the rail to bend or buckle, disrupting smooth and safe running. If not properly inspected, it may even lead to derailing in extreme cases.

High temperatures may also result in uneven expansion of the overhead power system suspended by a catenary.

The extended length of the suspension wires and the metal conductors will cause them to move out of their designed locations and foul the pantograph of the moving train, resulting in temporary loss of power supply and causing another possible reason for service disruption.

Similar power disruptions may occur with the third rail conductor system, used in many European railways in place of the overhead catenary power supply system.

For road traffic, as some roads are paved with tarmac for noise reduction and smooth rides, the tarmac's surface layer may dislodge from the sublevel and make the road surface uneven to the extent that they will require smoothing out or relaying to be safe for use.

Worse still are some steel bridges, which are subjected to larger thermal expansion compared to concrete.

The differential expansion of the tarmac covering with the steel structure below will cause the tarmac surface to dislodge and the bridge then becomes unsuitable for the passage of traffic.

For air travel, the tarmac surface of some runways will suffer a similar delamination phenomenon and timely

repairs will be necessary before they can be serviceable.

Luton Airport in London, and a few other airports with tarmac runway surface, have reported such failures, requiring urgent repairs to restore service, causing serious disruptions to air traffic.

Fortunately for Hong Kong, we are used to hot weather in summer and not only were these weather conditions catered for in the original design, but the material mix for the tarmac had been tested and proven to stay intact in adversely hot weather.

Designed for operation to above 70 degrees Celsius, we use a special material called polymer modified bitumen, which has much more stable physical properties at high temperatures.

The polymer compound glues and seals the bitumen particles to ensure they do not disintegrate up to about 76 degrees, providing a safe margin.

Such materials are now used widely in runways in tropical countries, including China, Australia, the United States and the Middle East.

With more suitable materials for construction, what we saw some decades ago of road surface buckling or breaking up is now an extremely rare sight.

Engineers design systems to cater for extreme temperatures anticipated with changing weather conditions and continue to improve their designs as new materials and systems become available.

This ensures that the systems as designed can be used under all conceivable conditions for our safety, convenience and comfort.

Veteran engineer Edmund Leung Kwong-ho casts an expert eye over features of modern life