Railvolution

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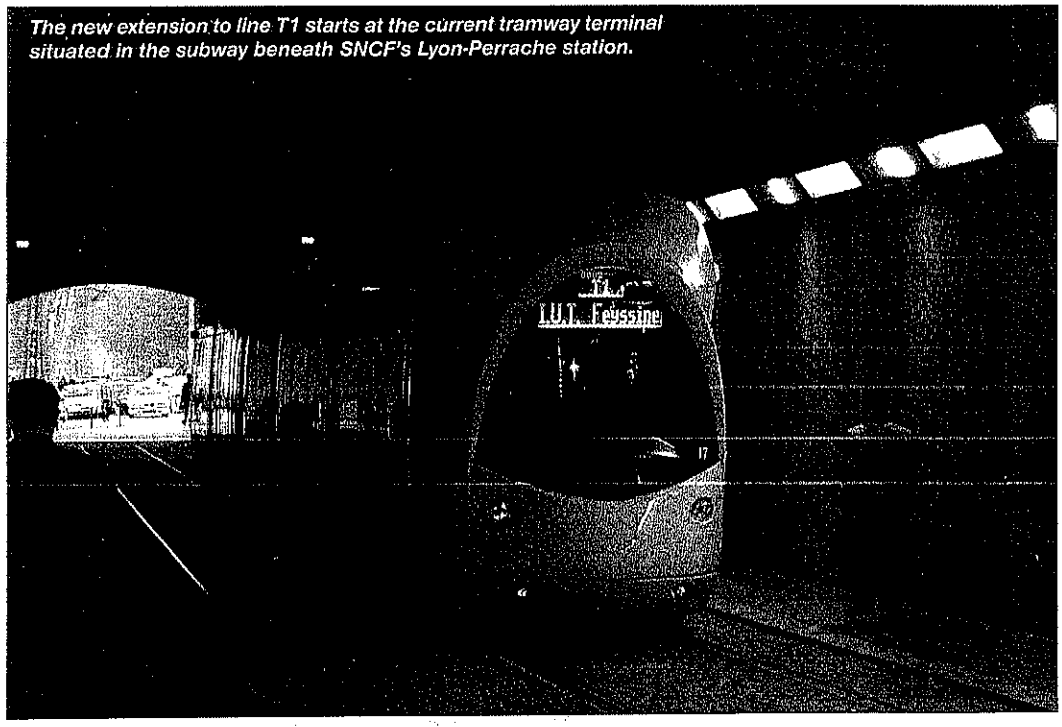
Extension de la ligne T1 du tramway de Lyon et construction de la voie.

The demise of Lyon's urban tramway network came about shortly after the Second World War. However, in 1990 the first line of a new network was inaugurated, and in October 2005 line T1 will be extended by four stops. Among the construction subcontractors are several of Czech companies, who became involved in a race against the clock to build a rather unique tramway/road crossing.



The new extension to line T1 starts at the current tramway terminal situated in the subway beneath SNCF's Lyon-Perrache station.

Track Construction On Lyon's T1 Tramway Extension

The first line of Lyon's original tramway **network** was inaugurated in 1893. During the air raids of 1944 much of the system was destroyed, though the surviving fragments of the urban network struggled on until 1947. One suburban line remained in use for a further decade, succumbing to road transport in 1957. The 1950s and '60s saw the expansion of the trolleybus network, which at its maximum extent boasted no fewer than 22 lines. In 1973 construction of the metro commenced. There are now four metro lines, one fully automated, and one with a rack section - Lyon is a city built on steep hills overlooking the confluence of the Rhône and Saône.

The Second Generation Tramway Network

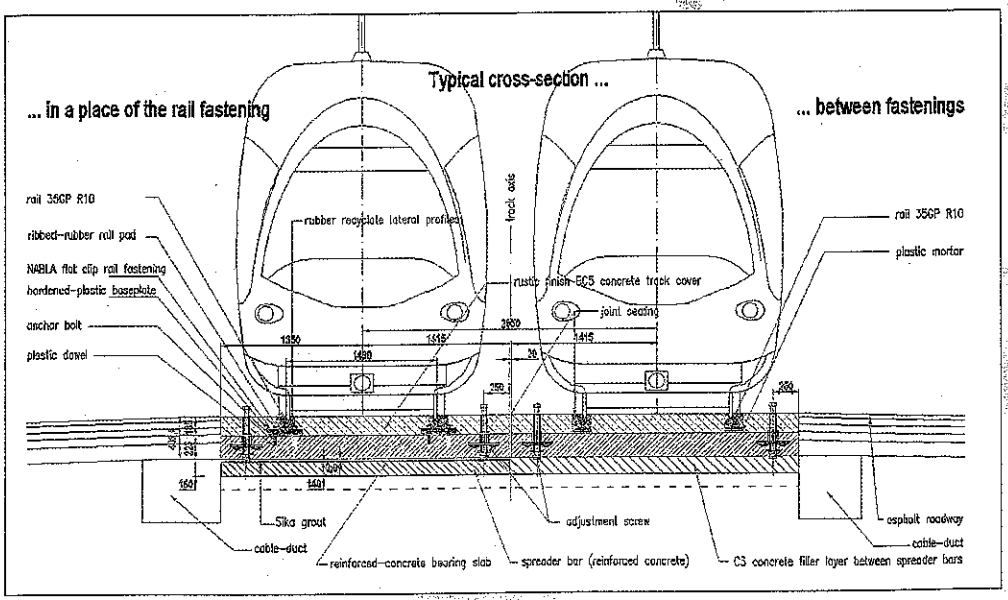
Cost constraints put an end to metro expansion in 1990, at least for the time being. It was decided that future urban lines would be built as mainly surface tramways, and the first two were inaugurated early in 2001. T1 runs from Lyon-Perrache SNCF station to Feyssine; 8.7 km with 19 stops. T2 runs from Perrache to Porte des Alpes, a distance of 15 km with 20 stops. The **two lines** are operated by 44 ALSTOM-built Citadis TGA302 trams, the service running from 05.00 to midnight with intervals of between 7 and 13 minutes between trams depending on the time of day. Average operating speed is 22 km/h, and the network carries around 110,000 passengers daily.

The Perrache - Confluences Extension

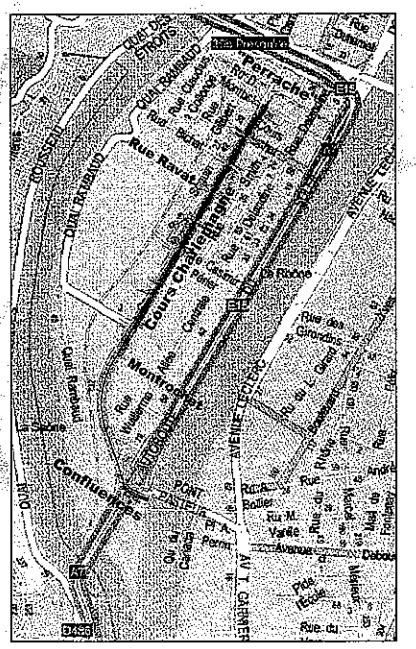
Work started in 2003 on extending T1 southwards from Perrache through Montrochet to Confluences, along the narrow strip of land between the two great rivers, as part of a major programme to revitalise this quarter of the city. Forming the **axis** for this urban regeneration is the Boulevard Cours Charlemagne, an attractive tree-lined thoroughfare passing through a district of older housing. This street has been provided with a broad centre reservation of between nine and ten metres in width, along which runs the new tramway. On either side of the centre reservation are a three-metre carriageway for motorised traffic, a cycle lane, parking bays among lines of trees, and finally the pavements, which are five metres wide.

The tramway **extension** is 1,841 m in length, double track, with a spacing of 2.85 m between track centres. It connects with the existing network inside the subway underneath Lyon-Perrache, where there is a cross-over. To the south of the subway there are two curves, which take the line onto the Boulevard Cours Charlemagne, which is arrow-straight as it heads southwest all the way to Montro-

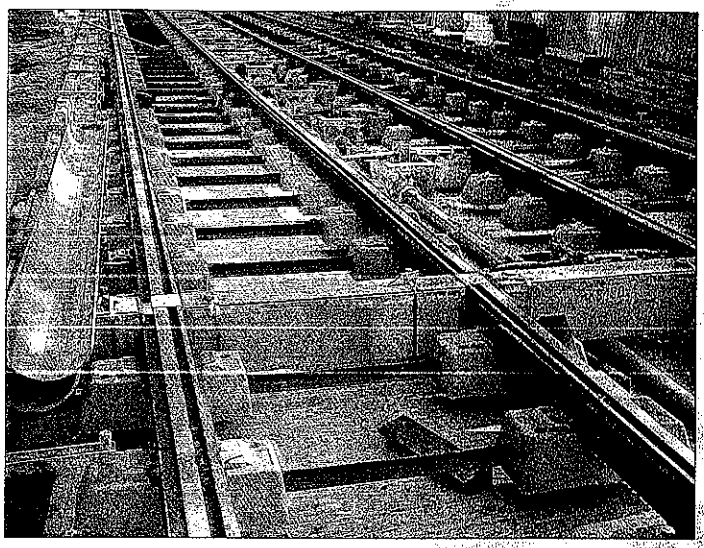
Line T1 Extension: Contractors	
Clients	City of Lyon and SYTRAL
General Project Designer	SEMALY
Working Plans Contractor	DIPRO
Partner For Architectural Projects	AABD
Construction Contractor	EUROVIA
Track Superstructure Contractor	SSŽ, Division 4, Praha
Tracklaying Contractor	Vossloh-Cogifer
Rail Curving	Elektrothermit, Essen



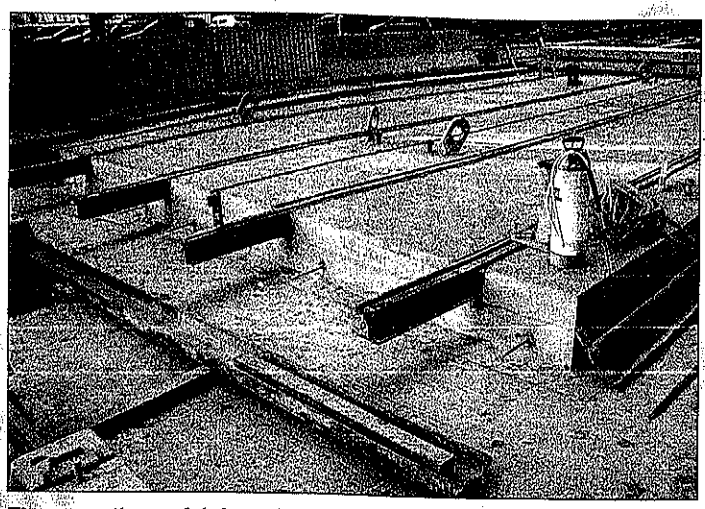
Cross-section of the T1 extension where it crosses Rue Ravat.



Route of the T1 extension.



Tracklaying in progress on Cours Chalemagne.



These are the prefabricated sections of track used where the tramway crosses Rue Ravat, prior to being swung into position. Note the lifting hooks and the adjustable screws (two at either end of each panel).

chet. This is where the double track temporarily comes to an end, and there are two cross-overs here enabling trams to change tracks. Beyond lies a 538 m section of single track, which will be doubled once the centre of the street is sufficiently cleared to permit this. There are four stops southwest of Perrache - Suchet, Sainte-Blandine, Montrochet, and Confluences.

Construction of the extension started in autumn 2003 with the re-routing where necessary of water, gas, electricity and other public supply lines under Cours Charlemagne. The trackbed for the tramway was then prepared, this work being completed during the first half of 2004. Tracklaying started in April 2004, the work being realised by Division 4 of SSŽ Praha, this company forming part of the Eurovia-led consortium.

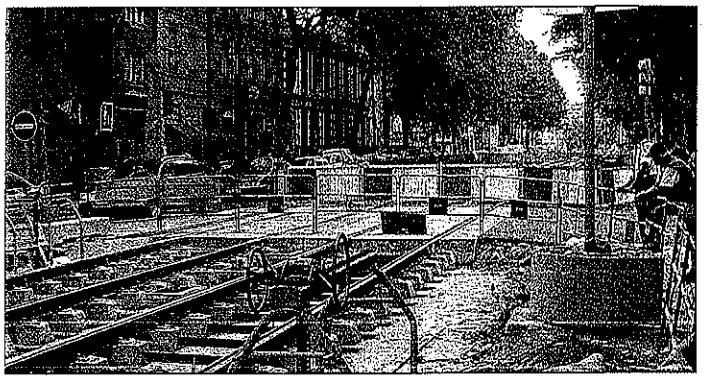
Permanent way construction on the double track section involves a 100 mm thick layer of ballast chippings being laid on the compacted hardcore, followed by a 190 mm thick coating of concrete. The VAX concrete sleepers are embedded in 243 mm thick BC5 concrete slabs. No track ballast is used. The 35GPR10 rails are mounted on the sleepers by means of base-mounted NABLA flat clips together with SEDRA flexible ribbed rubber base pads and recycled rubber side-pads. Once the track is in position a final layer of scrubbed BC5 concrete is poured over the permanent way.

On the temporary single track section a much simpler technique is employed. Although the rails and fastenings are of the same type as on the permanent track, they are mounted in stone ballast laid on a geotextile insulation matting. Fine crushed gravel is used to cover the track to a level of 30 mm below the rail head. Ballastless track will be laid when this section is doubled.

The SSŽ contract also involved mounting various longitudinal and transverse crash barriers, creating shafts for the checking of the trackbed, ensuring correct drainage, and mounting buffer stops. Rails to be used on curves of less than 150 m radius, including transition curves, were coated with two layers of machine welded overlays prior to being curved for mounting. This was done both to prevent rail and wheel flange wear, and to eliminate flange squeal as trams traverse curves.

Traversing Rue Ravat

Special conditions were laid down in the construction contract regarding the point where the tramway crosses Rue Ravat. SSŽ's Division 4 and DIPRO were requested to develop a project which would enable the crossing to be laid during a road **closure period** of no longer than 48 hours. The road crossing is on the double track section, and about 10.5 m in width. The surface



The completed Rue Ravat crossing.

on the crossing had to be suitable for road vehicles. Moreover, the load-bearing capacity of the crossing base and its rigidity, would have to be similar to those obtained on adjacent sections of ballastless tramway track.

Given these **constraints**, the use of loose materials such as layers of gravel chippings as a bedding for the track was ruled out. Neither was it deemed appropriate to construct the crossing using a „jigsaw" of numerous prefabricated panels. Such panels are not available on the market, and creating a special production run would be extremely costly. Moreover, such a solution would demand a high level of precision in positioning the component parts, to ensure that the huge number of joints involved were perfectly flush.

DIPRO came up with an **alternative** proposal. The whole crossing would be manufactured as just two prefabricated panels - one for each track. The panels would be prepared on site to avoid transportation complications.

The construction principles employed were essentially the same as those applied to tracklaying elsewhere on the tramway. Instead of pouring concrete over the sleepers when in position, they would be embedded within a reinforced concrete slab. This slab would have to be of sufficient rigidity to support itself without collapsing in the middle while being lifted by crane from its point of manufacture to the road crossing. The rails would be fastened to the sleepers by means of baseplates of toughened plastic, using anchor bolts in dowels. In that way NABLA flexible flat clips could be employed for rail fastening, as elsewhere on the line. Once the rails and lateral track fastening pads were fixed in position, the surface of the prefabricated crossing would be given a final coating of scrubbed concrete, so that it would blend in with the rest of the road.

One task is creating a prefabricated crossing of this type. Another is locating it precisely with respect to the track on either side of it, both in terms of height and position. To ensure a **precise fit**, a set of four adjustable screws passing through nuts set into the reinforced concrete was provided in each prefabricated panel. Detachable lifting hooks were also fitted, so that the panels could be manoeuvred into position. SSŽ contributed to the design of the construction of the crossing by developing a system of spreader bars to transfer the weight of the panels onto their housing until the concrete base becomes sufficiently set and rigid to support its own weight. Once the concrete base is set, grout infilling of the gap between the concrete base and the prefabricated units can start, with the unit only being supported by the adjusting screws. The prefabricated sections were created in frames situated adjacent to the crossing itself, and positioning only took place once the concrete had become completely hardened.

The big **operation started** on 8 September 2004 - a Wednesday. Rue Ravat was closed to traffic. The road surface was dug up. The underlying hardcore was levelled and compacted. A layer of gravel chippings was laid and tamped down. Two rows of 2,825 x 800 x 140 mm subgrade concrete spreader bars were positioned on top of the gravel. Concrete grouting was used to infill between these bars. All that occupied one morning.

In the afternoon, a heavy-lift crane arrived to transfer the two prefabricated crossing sections from their place of manufacture to the crossing itself. The adjusting screws were pre-set so that each section would initially come to rest 10 mm higher than its final level. Once the crossing panels had been lowered, the screws were turned until a perfect fit was obtained - to within an accuracy of 0.5 mm. Shuttering was then put in place to prevent the grout from seeping out.

Thursday 9 September was the big grouting day. A network of 30 mm diameter pipes was already prepared on each panel during their manufacture, each pipe spaced 750 mm from its neighbour. Now the SikaGrout 212 was mixed, then poured continually through two special funnels in the pipes until it covered the entire base of the two crossing panels to an average depth of 20 mm. The process took around four hours, and involved the mixing of 82 batches of grout. It was then a question of waiting for the grout to harden. After that, the lateral joint between the two crossing sections was sealed, and asphalt laid in the gaps between them and the rest of the road.

40 hours and 30 minutes after Rue Ravat had been closed off, traffic was flowing freely again. The job had been done - and in 7 h 30 less than the maximum time specified by the city council and SYTRAL!

Jiří Pejša, Pavol Ondovčák
Karel Hanzal, Jiří Srp

Photos: Pavol Ondovčák, Karel Hanzal

Diagrams: DIPRO s. r. o.

VRN Woos Car Users

Verkehrsverbund Rhein-Neckar (VRN) is employing novel tactics to persuade drivers to leave their cars in the station car park. After all, with fuel prices rising steeply, there should be every incentive for them to do so. The „VRN-Entdecker-Ticket", a monthly travelcard covering the whole VRN operating area, normally costs 136.00 EUR.

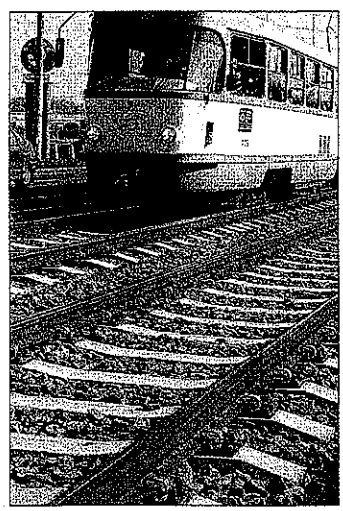
Anyone who travelled by VRN train or bus instead of using their car between 1 and 31 October 2005 was entitled to buy the ticket for a bargain 39.5 EUR. Consider the cost of tanking a medium-sized car in Germany nowadays... ***As for the adversising slogan, it translates as: „For anybody who does not have their own oil well"...***

VRN

Pandrol K-LOCK First For Czech Tramway

In August 2005 DP Ostrava undertook track renovation on a 445 m section of ballasted tramway track between Třebovice and Svinov stops. ***The new rails were secured in position using Pandrol's K-LOCK elastic clamps*** - the very first time that any tramway operator in the country has opted for this versatile product. Installation of the K-LOCK fasteners did not present any complications. Now they are being subjected to daily wear and tear, through the frequent passage of trams. Once their reliability is proven, there is every likelihood thatthis Pandrol product will in the future be employed widely on tramway track renovation projects in other Czech cities.

Tomáš Kuchta



On 23 September 2005 the Capital Metropolitan Transportation Authority Board of Directors in Austin, Texas unanimously approved a contract with Stadler Bussnang for six GTW articulated DMUs. The contract, worth 32.3 million USD, contains an option clause for 12 additional vehicles. The urban transport company is planning a new 32 mile (51 km) commuter service between Austin and Leander, scheduled to start up in January 2008. Stadler will deliver the first new train in autumn 2007 and the final one in spring 2008. Each DMU will be powered by two diesel-electric engines, and will have a capacity of 225 passengers, 108 seated and 117 standing. Spaces will be provided for bikes and wheelchairs.

Stadler