

Urban Track



NEWSLETTER N° 3 OCTOBER 2008

Low costs modular new track systems & fast installation methods

■ Installation test of REMS in the Metro de Madrid network

The development of the **Removable Embedded Metro System** has reached another milestone. A 54 m long track section of the new rail system was recently installed in the Metro de Madrid network.

REMS is an extension of the CDM Prefarails technology. It uses special rubber jackets and a key based locking concept, to allow the easy rail replacement of an embedded rail system. This Urbantrack development aims the application of embedded resiliently supported rails in metro tunnel, where a fast evacuation in case of emergency over a flat track surface has become a major concern for metro operators.

REMS is another example in accordance with the Urbantrack objective to functionally develop track systems while keeping life cycle cost in mind. The easy and fast replacement of worn down embedded

rail is the main technological challenge addressed by REMS.

The installation of 54 meter of test track in Madrid is the initial part of the validation process of REMS. Practical installation issues, speed of execution and rail replacement were tested, preparing the larger scale validation foreseen in the Metro de Madrid network during the second half of the Urbantrack project.



Figure 1 : Jacketing of rail, positioning of rails before concreting, finished REMS track.



Figure 2 : Unlocking of jacket, rail removal, rail re-insertion and track operation.

www.urbantrack.eu

For more info :
andre.vanleuven@d2sint.com




SIXTH FRAMEWORK
PROGRAMME





Tests on a test circuit and hydro-pulse-facility for embedded tracks

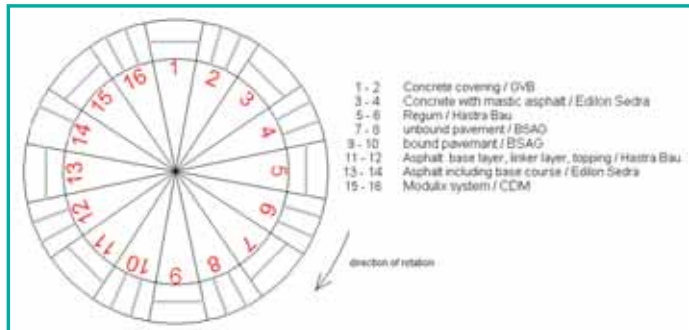


Figure 1: Overview of the arrangement of the 16 test bodies in the test circuit

Tracks embedded in roads are subject to stress both from tram vehicles themselves and from heavy goods traffic (buses and lorries), exerting stress on the tracks both crosswise and lengthwise. Since repairs can be very costly and may even sometimes require temporary road closures, solutions should be sought to prevent damage and, if this is not possible, ensure that it occurs only after a lengthy period of use.

At STUVA's facility, various tests were carried out simulating the load exerted on track surfaces by buses and lorries over a period of ten years. A total of 16 different track types were tested: eight with a firm carriageway surface and eight with a 'green' one capable of being driven over in an emergency (six with granulate for sedum and two with artificial turf on top of concrete bodies).



Figure 2: Displacements on test bodies 7 and 8 at 30°C during the first cycle

Regarding the tests' results of the eight firm carriageway surfaces (two variants of asphalt, three of pavement and three of concrete), with the exception of the pavement structure comprising natural stones secured with an elastic joint-sealing compound (test bodies 7 and 8), all test bodies withstood the load more or less well. All surfaces of the individual test bodies were 'deformed' in various ways by the wheel crossings. Most severely affected was the unbound pavement (test bodies 7 and 8), followed by the asphalt base courses (test bodies 11 and 12). By contrast, after the tests, the concrete bodies remained largely unaffected. In summary, the tests revealed that all test bodies with a concrete structure up to the surface, including a structure of natural pavement with a backfilling of concrete, withstood the tests well. This structure is to be recommended for heavy loads exerted by buses and lorries.

The green tracks studied, which should be capable of being driven over by emergency vehicles, yielded different results. These tests were performed with a lower axle load, at a slower speed and over shorter test duration. The solutions using artificial turf on a concrete solid body withstood the loads well without sustaining any significant damage. By contrast, all test bodies designed for planting with sedum failed when subjected to a load for only a short period. A renewed construction of these test bodies yielded considerably better results.

Economic Assessment - Life cycle cost (LCC) calculation

After significant efforts for the development of the LCC model, Urban Track's SP 4 Team has finalised the specification of the software tool and the software tool itself, which is a web-based solution easily accessible to partners across Europe and the world. Initial ideas had been discussed in-depth with European operators and within the Urban Track consortium. A first LCC calculation workshop has been held in Frankfurt in June 2008 where the partners from Sub Projects 1 and 2, in particular, were taught how to feed their data into the software and how to calculate their LCC. First calculations have then been carried out, especially by Sub Project 1 in time for the last reporting period in August 2008. Obviously, this tool could also be of interest to other operators across Europe wanting to carry out some comparative LCC calcu-



Figure 1: Screen shots of software tool LCC-UrbanTrack (www.urbantrack-sp4.eu)

lations using a relatively simple and accessible tool, free of charge. In this sense, the new software tool is a world first, as it provides the opportunity to carry out LCC calculations easily accessible from the web, including an assessment of the impacts of various changes, e.g. to maintenance regimes or infrastructure.



For the track characteristics :

UrbanTrack SP5 : Functional requirements		Draft								
Track Characteristics		Comments to Si Hai MAI and Frédéric LE-CORRE								
No.	Network	Type	Line feature	Track geometry	Track components	Stiffness	Others			
1	Straman		Length of the reference line (km)	Minimum line curve radius (m)	Rail profile	Rail pad stiffness				
			Number of stations/ stops	Maximum track cant (mm)	Rail hardness (H)	Static (kN/mm)				
			Distance between stations (average)	Maximum cant deficiency (mm)	Continuous welded rail (N)	Rail pad stiffness				
			% of length of curves 50m<R<100m	Maximum twist (mm/m)	Normal fasteners spacing (mm)	Dynamic (kN/mm)				
			% of length of curves R<50m	Track gauge in tangent track (mm)	Other fasteners spacing (mm)	Resilient fastening stiffness				
			Number of SAC	Gauge widening in curve (mm)	Wooden sleepers	Static (kN/mm)				
			% of track length in tunnel	Steepest slope (%)	Mono-bloc concrete site	Resilient fastening stiffness				
			% of track length at grade		Two-bloc concrete sleepers	Dynamic (kN/mm)				
			% of track length on bridge and viaduct	Rail inclination	DFP-Direct Fastening Fasteners	Under sleeper pads stiffness				
			Exploitation time (number of year)	Alignment (downward) (mm)	Other (Concrete panel 386x200x20cm)	Static (kN/mm)				
	Surface downward (mm)	Ballast	Under sleeper pads stiffness							
		Concrete panel	Dynamic (kN/mm)							
		Floating slab								
		Other								
		Fastening type								
2	Bino	Tramway	Length of the reference line (km)	13.89	Minimum line curve radius (m)	25	Rail profile		Rail pad stiffness	
			Number of stations/ stops	26	Maximum track cant (mm)	135	Rail hardness (H)	7	Static (kN/mm)	7
			Distance between stations (average)	4.518	Maximum cant deficiency (mm)	3	Continuous welded rail (N)	100	Rail pad stiffness	
			% of length of curves 50m<R<100m	4.5	Maximum twist (mm/m)	2.5	Normal fasteners spacing (mm)	7	Dynamic (kN/mm)	7
			% of length of curves R<50m	2.5	Track gauge in tangent track (mm)	1435	Other fasteners spacing (mm)	*	Resilient fastening stiffness	
			Number of SAC	7	Gauge widening in curve (mm)	20	Wooden sleepers	15	Static (kN/mm)	7
			% of track length in tunnel	1.2	Steepest slope (%)	50	Mono-bloc concrete site	78	Resilient fastening stiffness	7
			% of track length at grade	93		0.6	Rail support (N)	0	Dynamic (kN/mm)	
			% of track length on bridge and viaduct	5.8	Rail inclination	1.26	DFP-Direct Fastening Fasteners	0	Under sleeper pads stiffness	
			Exploitation time (number of year)	7	Alignment (downward) (mm)	*	Other (Concrete panel 386x200x20cm)	15	Static (kN/mm)	48
		Surface downward (mm)	7	Ballast	75	Under sleeper pads stiffness				
			7	Concrete panel	25	Dynamic (kN/mm)	48			
				Floating slab	0					
				Other	0					
				Fastening type						

In addition to the generic definition of track and vehicle, the degradation observed were examined.

The main track degradation that could be identified are :

- ✓ Rail Corrugation
- ✓ Rail wear
- ✓ RCF

