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INLAND TRANSPORT COMMITTEE

Working Party on Transport Trends and Economics
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EVALUATION OF INLAND TRANSPORT INFRASTRUCTURE PROJECTS

Phased Approach to Transport Infrastructure Development

Transmitted by the TEM and TER Project Central Offices

The Working Party during its thirteenth session considered, inter alia, a phased-approach to transport infrastructure developments and agreed that a phased strategy to transport infrastructure development, although limited to very specific conditions, could play a positive role to upgrade some critical sections of the existing networks under the present budgetary constraints (TRANS/WP.5/28, paras. 25-26).

In this context, the Working Party invited the Project Central Office (PCO) of the Trans-European North-South Motorway (TEM) and the Trans-European Railway (TER) to undertake an analysis with a view to identifying: (i) acceptable intermediate standards and (ii) those sections in the TEM and TER transport infrastructure networks where such standards could be applied.

In order to promote further investigations in the above-mentioned two areas the Working Party also invited the TEM and TER Project Central Offices to consider the possibility of convening a Workshop on a phased strategy to transport infrastructure development and to report thereon subsequently to the secretariat.

This note reproduces the information that has been provided to the secretariat by the TEM and TER Project Central Offices for consideration by the Working Party.

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1. TEM

The results of the TEM PCO analysis with a view to identifying the acceptable intermediate standards regarding the phased approach to motorway construction and the TEM network sections where such standards could be applied.

First of all, in order to define the intermediate standards, the decision as to the appropriate way of the stage (phased) construction has to be taken. The chosen stage construction option should bring about substantial construction costs savings in the first phase and at the same time it should not considerably decrease the motorway's level of service and also not result in greater deterioration of traffic safety both during the intermediate period and in the course of the delayed construction of the final motorway stage. Further criteria to be taken into account are that this final stage should be relatively easy to materialize and that the total (undiscounted) costs of both phases should not be too high in comparison to the costs of construction of fullfledged motorway (both stages) at once.

In most cases, the only feasible phased approach is to construct one carriageway only (with at least overpasses ready for both carriageways). In case of relatively low traffic volumes in the first years of operation of the motorway, the impact of this solution on traffic safety is not pronounced. At the same time, the construction of the second carriageway in the future is relatively easy and related traffic disturbances are limited.

All other stage construction options, such as lowering the design speed in the first phase, deletion of shoulders or construction of temporary at-grade intersections, etc. do not provide substantial savings, result in high second-stage costs (changes of horizontal alignment parameters related to subsequent increase of design speed) or in increased accident rates both during the intermediate period and during the construction of the second stage (at-grade intersections, deleted shoulders).

Therefore, the TEM Standards and Recommended Practice (currently under revision) deal practically with this type of phased motorway construction only. The other phased solutions, i.e. either one two-way (1x2) carriageway with level crossings or 2 one-way carriageways with level crossings, being also taken into account by these Standards are, however, not recommended.

The Standards in its Chapter 1.2 (Stages of Construction) comprize the basic elements to be taken into account by the phased motorway construction design, covering also the possibilities of reduced motorway cross section and its future extension by additional traffic lanes.

The respective other Chapters of the Standards deal inter alia with the phased motorway design level of service (Chapter 2.1), traffic factors to be considered (Chapter 2.2), motorway horizontal, vertical and cross section elements (Chapters 3.1 and 3.2), traffic control and provisions for traffic diversion (Chapter 4.9) and design of bridges and tunnels (Chapters 7 and 8).

As far as the TEM motorway network sections where a phased construction could be applied are considered, the main criteria for their selection are the present and/or future traffic

volumes and existing road capacity limits. In accordance with the ITC WP.5 document "Methodological basis for the definition of common criteria regarding bottlenecks, missing links and quality of service of infrastructure networks" (TRANS/WP.5/R.60), the construction of fullfledged motorway may be considered necessary when and where the respective traffic flow exceeds 20,000 PCU/24 hrs.

Furthermore, the above-mentioned (revised) TEM Standards and Recommended Practice stipulate in paragraph 1.2.0.2 (b) that the initial construction stage should guarantee the pre-established level of service for the traffic forecast in the first 10 years of motorway operations. The respective levels of service for the initial motorway construction stage (Table 2b of the Standards) are annexed to this paper.

Taking these indicators and values into account and assuming that the road traffic volumes increase in average by 5% annually, the stage construction could generally be considered with regard to all TEM Corridor (road) sections having the annual average daily traffic in 2000 less than about 12,000 PCU/day.

Nevertheless, a detailed assessment of advantages/disadvantages of the phased approach is always necessary, since each case is different (type of terrain, price levels, number of big bridges and tunnels, traffic volumes and traffic flow composition, accident rates, etc.). Users' costs and accident costs not taken into account, the average saving when constructing one carriageway only is about 30% of the standard (both carriageways) motorway construction costs. The total nominal costs of such a stage construction are of course higher (about 120-130% of the "at once" approach), but real (discounted) costs are almost always much lower, the difference depending on the time space between the first and second construction phase and on the rate of inflation.

In addition, also environmental and socio-economic impacts should be taken into consideration in the course of the decision-making process.

As for the present practice, there are two main strategies implemented by the TEM member countries with regard to motorway construction:

1. The Czech Republic, Italy (on TEM), Lithuania, Romania and Turkey do not implement the stage approach in motorway construction;

2. Austria, Bulgaria, Croatia, Hungary, Poland and Slovakia sometimes use the one carriageway first motorway stage, but Austria, Poland and Slovakia only in cases of long tunnels (Austria – Tauerntunnel, Karawankentunnel, Plabutschtunnel, Gleinalmtunnel, Arlbergtunnel, Bosrucktunnel, etc., Slovakia - Branisko tunnel) or big bridges (Poland, Torun bridge over Vistula river).

Other approaches (lower design speeds, no shoulders) are not followed. There is only one example of the "at-grade" first construction phase (Poland, section Piotrkow-Czestochowa) constructed about 30 years ago, which would not be repeated.

As to the invitation of the Working Party on Transport Trends and Economics to the TEM PCO to convene a workshop on a phased strategy to the TEM transport infrastructure development it should be noted that the TEM Steering Committee at its session in Trieste

(30 May-1 June 2001) agreed to envisage the holding of such workshop next year. On that occasion the Steering Committee also considered it desirable that members of the Working Party present at this worshop the experience gained in their respective countries on a phased strategy to transport infrastructure.

2. TER

The TER Project Manager will inform the Working Party on the developments of intermediate parameters agreed upon in the context of the TER project and which concern, in particular, the following:

Technical standards for the TER Network:

1. Vehicle loading gauge:	UIC/B
2. Minimum distance between track centres:	4.0 m
3. Nominal minimum speed:	120 Km/h
4. Authorised mass per axle:	
- Locomotives (200 km/h):	22.5 t
- Wagons (120 km/h):	20 t
(140 km/h):	18 t
5. Authorised mass per linear metre:	8 t
6. Test train (bridge design):	UIC 71
7. Minimum platform length in principal stations:	250 m
8. Minimum useful siding length:	500 m

Operation parameters for the TER Network:

1. Passenger transport
   To establish the system of execution of border control procedures (police, customs) on the moving train with short stops at the frontier station for technical/administrative reasons if necessary.

2. Freight transport
   a. To complete the system of common frontier stations in order to avoid the duplication of border controls.
   b. To rationalise the control procedures at the existing common frontier stations.
   c. To introduce the frontier control operations of block trains in terminals of neighbouring railways wherever possible.

3. Passenger and freight transport
   To introduce the frontier control operations of block trains in terminals of neighbouring railways wherever possible.

As to the sections of the TER railway network on which such standards could be applied the TER/PCO will include this item in the agenda of the relevant TER bodies and inform the Working Party of the outcome of the discussions in due course.

Annex

Table 2b – Source HCM 1997

LEVELS OF SERVICE FOR SINGLE TWO-LANE HIGHWAY (INITIAL MOTORWAY CONSTRUCTION STAGE) SEGMENTS

Level Of Service	% Time Delay	V/c RATIO (1)																			
		LEVEL TERRAIN							ROLLING TERRAIN							MOUNTAINOUS TERRAIN						
		AVG SPD(2) Km/h	PERCENT NO PASSING ZONES						AVG SPD (2) Km/h	PERCENT NO PASSING ZONES						AVG SPD (2) Km/h	PERCENT NO PASSING ZONES					
			0	20	40	60	80	100		0	20	40	60	80	100		0	20	40	60	80	100
A	30	93	0.15	0.12	0.09	0.07	0.05	0.04	92	0.15	0.10	0.07	0.05	0.04	0.03	90	0.14	0.09	0.07	0.04	0.02	0.01
B	45	88	0.27	0.24	0.21	0.19	0.17	0.16	87	0.26	0.23	0.19	0.17	0.15	0.13	87	0.25	0.20	0.16	0.13	0.12	0.10
C	60	83	0.43	0.39	0.36	0.34	0.33	0.32	82	0.42	0.39	0.35	0.32	0.30	0.28	79	0.39	0.33	0.28	0.23	0.20	0.16
D	75	80	0.64	0.62	0.60	0.59	0.58	0.57	79	0.62	0.57	0.52	0.48	0.46	0.43	72	0.58	0.50	0.45	0.40	0.37	0.33
E	>75	72	1.00	1.00	1.00	1.00	1.00	1.00	64	0.97	0.94	0.92	0.91	0.90	0.90	56	0.91	0.87	0.84	0.82	0.80	0.78
F	100	<72	-	-	-	-	-	-	<64	-	-	-	-	-	-	<56	-	-	-	-	-	-

(1) Ratio of flow rate to an ideal capacity of 2800 pc/h in both directions.
(2) These speeds are provided for information only and apply to roads with design speeds of 100km/h or higher.