

courtesy translation – only the Italian language is authentic

Attachment 1 – Part I (Formulas referred to in Measure 8-bis(6))

1. The reimbursement R_p referred to in Measure 8-bis(3) shall be calculated in accordance with the following formula:

$$R_p = r_p + r_{p,cant}$$

where:

$$R_p \leq P_p$$

with:

r_p = component of the reimbursement R_p attributable to the impact of roadworks on the user's route p ;

$r_{p,cant}$ = component of the reimbursement R_p attributable to the roadwork-related time deviation on the user's route p ;

P_p = total toll paid by the user for route p .

The **component r_p** of the reimbursement R_p , attributable to the impact of roadworks, shall be calculated as follows:

$$r_p = \sum_{c=1}^C r_p^c = \sum_{c=1}^C \sum_{m=1}^{M_c} r_{m,p}$$

where:

r_p^c = share of the component r_p attributable to concessionaire c ;

$r_{m,p}$ = reimbursement accrued for elementary section m , managed by the concessionaire, included in the user's route p that is wholly or partially affected by roadworks;

C = number of motorway concessionaires included in the user's route p ;

M_c = number of elementary sections, managed by concessionaire c , included in the user's route p .

The **component $r_{p,cant}$** of the reimbursement R_p , attributable to the roadwork-related time deviation, shall be calculated as follows:

$$r_{p,cant} = CI_{p,cant} * r_p$$

where:

$CI_{p,cant}$ = incremental component of the reimbursement r_p , determined based on the roadwork-related time deviation on the user's route p ;

r_p = component of the reimbursement R_p attributable to the impact of roadworks on the user's route p .

2. The **reimbursement** R_p^c relating to each concessionaire c included in the user's route p , shall be calculated as follows:

$$R_p^c = r_p^c + r_{p,cant}^c$$

where:

$$R_p^c \leq P_p^c$$

with:

r_p^c = share of r_p (component attributable to the impact of roadworks) allocated to concessionaire c ;

$r_{p,cant}^c$ = share of $r_{p,cant}$ (component attributable to the roadworks-related time deviation) allocated to concessionaire c . Concessionaires shall define the method to identify the time deviation caused by roadworks that is attributable to each concessionaire;

P_p^c = toll paid by the user for the part of the network falling within the remit of concessionaire c included in the user's route p .

3. The **time deviation** $\bar{s}_p$, referring to the user's route p in time band h , as referred to in Measure 8-bis.4 (a), shall be calculated, for each concessionaire c involved, as the sum of the deviations associated with aggregations of contiguous elementary sections falling within its remit and included in route p , in accordance with the following relationship:

$$\bar{s}_p = \sum_{c=1}^C \bar{s}_p^c$$

where for each concessionaire c :

$$\bar{s}_p^c = \sum_{a=1}^{A_c} \bar{T}_{eff,a} - T_{VR,a}$$

with:

$\bar{T}_{eff,a}$ = actual average travel time of the aggregation a of contiguous elementary sections, included in route p and managed by concessionaire c ;

$T_{VR,a}$ = travel time at reference speed, by vehicle type (light/heavy vehicles, or by the vehicle class relevant for toll charging), of the aggregation a of contiguous elementary sections, included in route p and managed by concessionaire c ;

C = number of motorway concessionaires whose networks are included in the user's route p ;

A_c = number of aggregations of contiguous elementary sections managed by concessionaire c and included in the user's route p .

All times and deviations referred to in the formula shall be calculated by reference to time band h , defined as the interval of consecutive whole hours, or fractions thereof of not less than 15 minutes, which fully covers the period of travel of route p by the user.

4. The **reimbursement** $r_{m,p}$ for each elementary section m included in the user's route p that is wholly or partially affected by roadworks, as referred to in Measure 8-bis.4 (b), shall be calculated in accordance with the following formula:

$$r_{m,p} = IC_{m,p}^* * toll_m$$

where:

$IC_{m,p}^*$ = aggregated impact of roadworks on the user's route p ;

$toll_m$ = per-kilometre toll applicable to elementary section m .

5. The **aggregated impact of roadworks** $IC_{m,p}^*$, referred to in Measure 8-bis.4 (c), shall be calculated, for each elementary section m forming part of the user's route p that is wholly or partially affected by roadworks, in accordance with the following methodology:

$$IC_{m,p}^* = \left[\sum_{n=1}^N \left(\sum_{i=1}^S IC_{n,i} * LC_{n,i} \right) * \Delta C_n^h \right]$$

where:

$IC_{n,i}$ = impact of segment i of roadworks n carried out on the elementary section m ;

$LC_{n,i}$ = length of segment i of roadworks n carried out on the elementary section m ;

S = number of segments i of roadworks n carried out on the elementary section m ;

N = number of roadworks n on the elementary section m ;

ΔC_n^h = coefficient reflecting the duration of the roadworks within time band h , corresponding to the user's travel period.

6. The **impact** $IC_{n,i}$ of segment i of roadworks n , referred to in Measure 8-bis(4) (d), shall be calculated in accordance with the following formula:

$$IC_{n,i} = \frac{\max(0, NC_{n,i}^{occ} - (\rho_d * nc_{n,i}^d) + (\lambda_c * nc_{n,i}^l) + k_{ce})}{NC_i^{disp} + \delta_{ce}}$$

where:

$NC_{n,i}^{occ}$ = number of traffic lanes occupied by segment i of roadworks n and/or by road traffic originating from the opposite carriageway;

ρ_d = coefficient of traffic diversion to the opposite carriageway, equal to 0.6;

δ_{ce} = coefficient of emergency lane usage, equal to 0.5 where the emergency lane is open to road traffic, and 0 in all other cases;

k_{ce} = coefficient of emergency lane closure, equal to 0.3 where the emergency lane is closed due to roadworks, and 0 in all other cases.

$nc_{n,i}^d$ = number of traffic diversion lanes to the opposite carriageway in segment i of roadworks n ;

λ_c = coefficient for the reduction in running lane width in the presence of roadworks (equal to 0 in the case of standard-width lanes and to 0.2 in the case of reduced-width lanes);

$nc_{n,i}^l$ = number of reduced-width running lanes in segment i of roadworks n ;

NC_i^{disp} = number of running lanes available to traffic, in the absence of roadworks, for segment i .

7. The **coefficient** ΔC_n^h representing the duration of roadworks n in time band h , corresponding to the user's travel period, referred to in Measure 8-bis(4) (e), shall be calculated in accordance with the following formula:

$$\Delta C_n^h = \left(\frac{TC_n^h}{T^h} \right)$$

where:

TC_n^h = actual duration of roadworks n , in minutes, in time band h corresponding to the user's travel period;

T^h = total availability, in minutes, in time band h corresponding to the user's travel period;

h = time interval consisting of consecutive whole hours or fractions of hours not shorter than 15 minutes, which fully covers the travel period of the user's route p .

8. The **incremental component** $CI_{p,cant}$, referred to in Measure 8-bis(4)(f), shall be calculated in accordance with the following formula:

$$CI_{p,cant} = \frac{\bar{s}_{p,cant}}{\sum_{c=1}^C \sum_{m=1}^{M_c} T_{VR,m}}$$

where:

$\bar{s}_{p,cant}$ = roadworks-related time deviation for the user's route p .

$T_{VR,m}$ = travel time at the reference speed, by vehicle type (light/heavy vehicles or by vehicle class relevant for toll charging purposes), for elementary section m , included in the user's route p , affected, in whole or in part, by one or more roadworks, calculated in time band h ;

C = number of motorway concessionaires included in the user's route p ;

M_c = number of elementary sections m , managed by concessionaire c , that are wholly or partially affected by roadworks, which are included in the user's route p .

9. For the cases referred to in Measure 8-bis(5), the incremental component $CI_{p,cant}$ of the reimbursement R_p shall be calculated as the sum of the weighted averages of the impacts $IC_{n,i}$ of segments i of each roadwork n , weighted by segment length i and multiplied by the roadworks duration coefficient:

$$CI_{p,cant} = \sum_{n=1}^N \frac{\sum_{i=1}^S IC_{n,i} * LC_{n,i}}{\sum_{i=1}^S LC_{n,i}} * \Delta C_n^h$$

where:

$IC_{n,i}$ = impact of segment i of roadworks n , located in whole or in part on the user's route p ;

$LC_{n,i}$ = length of segment i of roadworks n , located in whole or in part on the user's route p ;

S = number of roadworks segments i located in whole or in part on the user's route p ;
 N = number of roadworks n located in whole or in part on the user's route p ;
 ΔC_n^h = roadworks duration coefficient in time band h , corresponding to the user's travel period;
 h = time interval consisting of consecutive whole hours or fractions of hours not shorter than 15 minutes, which fully covers the travel period of the user's route p .

Where the concessionaire is unable to identify the time band h corresponding to the user's travel period on route p , the travel period shall be deemed to correspond to the full daily availability time band of that route, defined as the interval between 00:00 and 24:00 on the day on which the prevailing portion of the user's travel time occurs.

10. The **roadwork-related time deviation** $\bar{s}_{p,cant}$, referred to in Measure 8-bis(4) (g), shall be equal to the sum of the time deviations attributable to roadworks included in the user's route p in time band h , calculated by each concessionaire c involved, in accordance with the following formula:

$$\bar{s}_{p,cant} = \sum_{c=1}^C \bar{s}_{p,cant}^c$$

where for each concessionaire c :

$$\bar{s}_{p,cant}^c = \sum_{m=1}^{M_c} \bar{T}_{eff,m} - T_{VR,m}$$

with:

$\bar{T}_{eff,m}$ = average actual travel time on elementary section m , included in the user's route p , that is wholly or partially affected by roadworks in time band h ;

$T_{VR,m}$ = travel time at the reference speed, by vehicle type (light/heavy vehicles or by vehicle class relevant for toll charging purposes), relating to the same elementary section m , in time band h ;

C = number of motorway concessionaires included in the user's route p ;

M_c = number of elementary sections m , managed by concessionaire c , which are wholly or partially affected by roadworks, and are included in the user's route p .

Where the roadwork-related time deviation cannot be calculated, for concessionaire c it shall be assumed that $\bar{s}_{p,cant}^c = \bar{s}_p^c$.

Annex 1 - Part II (*Reference speed referred to in Measure 2.1 (kk)*)

11. The reference speed VR_m in time band h , for the elementary section m under the responsibility of concessionaire c , included in the user's route p , shall be calculated as follows:

$$VR_m = VFL_m * \alpha_{peak}$$

with:

VFL_m = free-flow speed for the elementary section m , differentiated by weather conditions where applicable:

- VFL_m^N under normal weather conditions;
 - VFL_m^{MT} under weather conditions that significantly affect ideal driving conditions;
- α_{peak} = corrective coefficient applied to the free-flow speed for areas predominantly characterised by commuter flows during peak hours.

12. The **corrective coefficient** α_{peak} for the free-flow speed may be applied to elementary sections falling, in whole or in part, within the territory of a municipality belonging to a Functional Urban Area (FUA), as defined by the National Institute of Statistics, with a total population exceeding 250,000 inhabitants, and is defined as follows:

$$\alpha_{peak} = \begin{cases} off - peak\ hours = 1 \\ peak\ hours = 0.9 \end{cases}$$

where peak hours shall mean the time bands between 06:00 and 09:00 and between 17:00 and 20:00, from Monday to Friday.