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Your ref

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## **Reasoned opinion - Minimum safety requirements for tunnels in the Trans-European Road Network**

Reference is made to the reasoned opinion of 3 December 2020 from the EFTA Surveillance Authority ("the Authority") concerning the fulfilment of Directive 2004/54/EC of the European Parliament and of the Council of 29 April 2004 on minimum safety requirements for tunnels in the Trans-European Road Network, OJ L 167, 30.4.2004, p. 39 ("the Directive"). As notified in the Norwegian Government's reply of 13 April 2021, we hereby submit further details concerning the TERN tunnels' compliance with the Directive, additional information concerning risk-reduction measures and the results from the Storting's recent consideration of the Government's National Transport Plan 2022-2033.

### **1. Compliance with the safety requirements in Annex I**

There are 182 tunnels in the TERN that fall within the scope of the Directive:

- 57 tunnels have opened after 1 December 2006 ("new tunnels")
- 76 tunnels will be refurbished by the end of 2021
- 49 tunnels are still to be refurbished after 2021

The new tunnels and the refurbished tunnels naturally comply with the Directive, while the 49 remaining tunnels still have a number of deficiencies. The attached tables are meant to give an approximate overview over the compliance with the minimum requirements of the Directive in Annex I.

The most specific safety requirements stipulated in point 1.2 "*Minimum requirements*" in Annex I to the Directive are listed below, as well as in the columns of the attached tables.

Some requirements are mandatory for all tunnels longer than 500 meters, while other requirements are mandatory for tunnels above a certain length and average daily traffic.

The attached tables do not show the supplementary safety measures that might be implemented after a consideration of certain characteristics the tunnel might have according to point 1.1 "Safety parameters" of Annex I.

Each point from Annex I in the Directive is further explained and commented below.

#### 1.1.1 Lighting

Point 2.8.1. *"Normal lighting shall be provided so as to ensure appropriate visibility day and night for drivers in the entrance zone as well as in the interior of the tunnel."*

All the tunnels that remain to be refurbished are equipped with normal lighting, though some of them do not fully comply with the Norwegian Public Roads Administrations (NPRA) specification<sup>1</sup> [N 500](#) "Road Tunnels" for light level in tunnels. The compliance with the Directive as described in the tables only shows if the lighting is to be found in the tunnel, but does not show the functionality or capacity of the devices, nor their technical condition, cf. comments under chapter 1.2 "Assumptions when reading the tables" below.

Point 2.8.2. *"Safety lighting shall be provided to allow a minimum visibility for tunnel users to evacuate the tunnel in their vehicles in the event of a breakdown of the power supply."*

Most of the remaining tunnels are equipped with safety lighting, though some of them do not fully comply with NPRAs N500 specifications for light level and/or functionality. The compliance with the Directive as described in the tables, only shows if the safety lighting is to be found in the tunnel, but does not show the functionality or capacity of the devices, nor their technical condition, cf. comments under chapter 1.2 "Assumptions when reading the tables" below.

Point 2.8.3. *"Evacuation lighting, such as evacuation marker lights, at a height of no more than 1,5 metres, shall be provided to guide tunnel users to evacuate the tunnel on foot, in the event of emergency."*

Many of the TERN tunnels that remain to be refurbished do not have evacuation lighting.

#### 1.1.2 Ventilation

Point 2.9.2. *"A mechanical ventilation system shall be installed in all tunnels longer than 1 000 metres with a traffic volume higher than 2 000 vehicles per lane."*

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<sup>1</sup> The NPRA specifications are requirement documents that are based on regulations pursuant to section 13 of the Public Roads Act for the construction of all public roads.

All of the tunnels in the TERN have mandatory ventilation. The compliance to this requirement has been confirmed in the attached table with either “yes”, which means that the tunnel is equipped with mechanical ventilation, or “no, *not mandatory*”, which means that the tunnel does not have both a length over 1000m and a traffic volume higher than 2000 vehicle per lane.

None of the tunnels that remain to be refurbished are required by the Directive to be equipped with ventilation. However, the NPRAs N500 requires ventilation for tunnels longer than 1000m with a traffic volume higher than 1000 vehicles per lane.

#### 1.1.3 Emergency stations

Point 2.10.2. *"Emergency stations can consist of a box on the sidewall or preferably a recess in the sidewall. They shall be equipped with at least an emergency telephone and two fire extinguishers."*

Point 2.10.3. *"Emergency stations shall be provided near the portals and inside at intervals which for new tunnels shall not exceed 150 metres and which in existing tunnels shall not exceed 250 metres."*

Emergency stations are mandatory in all tunnels. The compliance to this requirement has been confirmed in the attached table with either “yes”, which means that there are stations with a distance that does not exceed 250 m, or “no” when there are emergency stations in these tunnels, but the distance between stations exceeds 250 m.

#### 1.1.4 Water supply

Point 2.11 *"A water supply shall be provided for all tunnels. Hydrants shall be provided near the portals and inside at intervals which shall not exceed 250 metres. If a water supply is not available, it is mandatory to verify that sufficient water is provided otherwise."*

When water supply is provided in the tunnel, the compliance to this requirement has been confirmed in the attached table with “yes”, otherwise “*not in the tunnel*”. Sufficient water is ensured by the use of external water tanks at the emergency services.

#### 1.1.5 Control Centre

Point 2.13.1 *"A control center shall be provided for all tunnels longer than 3 000 metres with a traffic volume higher than 2 000 vehicles per lane."*

Point 2.13.2. *"Surveillance of several tunnels may be centralised at a single control center."*

Norwegian national road tunnels are connected to a regional control center, the NPRA's "Vegtrafikksentral", independently of their length or traffic, as soon as they are equipped with emergency stations.

#### 1.1.6 Monitoring systems

Point 2.14.1 *"Video monitoring systems and a system able to automatically detect traffic incidents (such as stopping vehicles) and/or fires shall be installed in all tunnels with a control centre."*

Video monitoring systems are installed in tunnels longer than 3 000 metres with a traffic volume higher than 2 000 vehicles per lane. None of the tunnels in the TERN lack mandatory video monitoring.

#### 1.1.7 Tunnel-closing equipment

Point 2.15.1 *"In all tunnels longer than 1 000 metres, traffic signals shall be installed before the entrances so that the tunnel can be closed in case of an emergency. Additional means, such as variable message signs and barriers, can be provided to ensure that instructions are obeyed."*

The requirement has been divided in two columns in the attached table: "Barriers" and "Traffic signals". The compliance to this requirement has been confirmed with either "yes", which means that the tunnel is equipped with barriers or signals, or "no, not mandatory" when the tunnel is shorter than 1000m.

#### 1.1.8 Communication systems

Point 2.16.1. *"Radio re-broadcasting equipment for emergency service use shall be installed in all tunnels longer than 1 000 metres with a traffic volume higher than 2 000 vehicles per lane."*

Point 2.16.2. *"Where there is a control centre, it must be possible to interrupt radio re-broadcasting of channels intended for tunnel users, if available, in order to give emergency messages."*

The compliance to this requirement has been confirmed in the attached table with either "yes" or "no", which indicates if the tunnel is equipped with radio re-broadcasting equipment for emergency service use, or "no, not mandatory", which means that the tunnel is shorter than 1000m.

### 1.1.9 Power supply and electrical circuits

Point 2.17.1. *"All tunnels shall have an emergency power supply capable of ensuring the operation of safety equipment indispensable for evacuation until all users have evacuated the tunnel."*

Point 2.17.2. *"Electrical, measurement and control circuits shall be designed in such a way that a local failure, such as one due to a fire, does not affect unimpaired circuits."*

The compliance to these requirements have been confirmed in the attached table with either "yes" or "no", which indicates if the tunnel is equipped with Uninterrupted Power Supply (UPS).

### 1.2 Assumptions when reading the tables

The attached tables illustrate the compliance with the most specific safety requirements laid down in Annex I, 1.2. *Minimum requirements* to the Directive, as well as deficiencies to those minimum requirements.

The compliance as described in the tables, only shows if the devices or systems are to be found, but does not show the functionality or capacity of the devices, nor their technical condition, for example:

- Where ventilation is in place, it generally does not comply with the requirements in N500 for new tunnels. As the Directive does not give specific requirements on ventilation capacity, the tunnel managers generally must rely on national rules to evaluate ventilation capacity.
- Where lighting is in place, it generally does not comply with the requirements in N500 in terms of lighting level. Evacuation lighting in place may have a distance between lights which exceeds the maximum required in N500 in a new tunnel.
- Where emergency power supply is in place, it does not necessarily provide energy to the devices in the lapse of time according to the requirements in N500 for new tunnels.

The requirements in point 1.1. *"Safety parameters"*, Annex I, introduce the need of a broader approach to tunnel safety.

1.1.1. *"Safety measures to be implemented in a tunnel shall be based on a systematic consideration of all aspects of the system composed of the infrastructure, operation, users and vehicles."*

1.1.2. *"The following parameters shall be taken into account:*

- *tunnel length,*
- *number of tubes,*
- *number of lanes,*
- *cross-sectional geometry,*

- vertical and horizontal alignment,
- type of construction,
- uni-directional or bi-directional traffic,
- traffic volume per tube (including its time distribution),
- risk of congestion (daily or seasonal),
- access time for the emergency services,
- presence and percentage of heavy goods vehicles,
- presence, percentage and type of dangerous goods traffic,
- characteristics of the access roads,
- lane width,
- speed considerations,
- geographical and meteorological environment."

1.1.3. *"Where a tunnel has a special characteristic as regards the aforementioned parameters, a risk analysis shall be carried out in accordance with Article 13 to establish whether additional safety measures and/or supplementary equipment is necessary to ensure a high level of tunnel safety. This risk analysis shall take into consideration possible accidents, which clearly affect the safety of road users in tunnels and which might occur during the operating stage and the nature and magnitude of their possible consequences."*

Point 1.1.2 of Annex I of the Directive gives parameters which shall be taken into account, but does not give any indication of the threshold for the definition of *"special characteristic"*. Moreover, it does not give any indication of to what extent such characteristics will influence the minimum requirements. As a consequence, this involves a level of subjective assessment which cannot be presented in tabular form.

### 1.3 Summary

The attached tables show that the Norwegian TERN tunnels generally comply with most of the specific safety requirements laid down in point 1. 2 in Annex I to the Directive. However, as the tunnels do not comply with the requirements in N500, the NPRA considers that the tunnels cannot fully comply with point 1.1 in Annex I before a complete refurbishment is carried out. Deficiencies will be compensated by provisory risk-reduction measures as described below.

Several of the safety requirements measures mentioned in recital 9 of the Preamble to the Directive is already in place in the non-compliant TERN tunnels. Still, the equipment in place in the remaining tunnels is reaching the end of its technical lifetime. There is no option to replace electrical equipment component by component. The legislation relating to electrical engineering, with appurtenant specifications and standards, trigger considerably more extensive requirements for tunnel refurbishments, such as changing everything from cabinets and fuses, to supplement cables and certain components in the electrical systems. Emergency power, which is a central requirement in the Directive, is established according to strict rules on, among other things, separation, which entails the construction of larger buildings with more rooms, sometimes also more buildings.

There is a large maintenance backlog in several tunnels, which has to be addressed in the refurbishment program in order to fully comply with the requirements for a minimum safety level required in N500. Moreover, it is important to note that any refurbishment work is planned on the basis of a systematic consideration of all aspects of the system and the consideration of special characteristics as regards mentioned parameters, in compliance with point 1.1. in Annex I.

## **2. Risk reduction measures**

The NPRA is currently preparing risk-reduction measures that may bring the remaining tunnels closer to the minimum requirements in the time period before the remaining refurbishment works are carried out. According to Article 3 (2) of the Directive, the Government hereby informs the Authority of the following risk reduction measures that are now in progress:

- *Emergency power supply, safety lighting and evacuation lighting:* The lack of safety lighting and evacuation lighting will be compensated by the installation of provisory evacuation lighting with own backup-battery. The evacuation lighting will combine both functions by keeping lighting on constantly (instead of being switched on in case of incident) so it will keep on lighting in case of power supply deficiency. This measure is under detailed planning and contracting is expected to occur in 2022.
- *The lack of emergency stations* will be compensated by the installation of supplementary emergency telephones in 2021-2022. This solution is to be provisory, since the emergency telephones have to be part of a coherent technical system (control, regulation and monitoring) from the specific component in the tunnel up to the OPC interface for the operators at the control center.
- *Tunnel closing equipment:* The *Raudhammar tunnel* will be equipped with traffic signals in 2021. Compensation for the lack for traffic signals for 2 remaining tunnels (*Kongenes* and *Marajøl*) is under consideration.
- *Radio:* Two tunnels (*Dalseid* and *Hysing*) that do not comply with the minimum requirements of the Directive concerning communication systems will get full radio re-broadcasting through a contract that will be sent out for tender in 2021. This contract will ensure the providing of re-broadcasting in several other tunnels than the ones where this is strictly mandatory.

At present, no further risk-reduction measures are planned. It is important to note that the legislation relating to electrical engineering and the requirements in the NPRAs [N601](#) "*Safety requirements for electrical installations in and along public roads*", makes it challenging to apply provisory electrical measures. These measures have to fully comply with statutory requirements to, among other things, separation, component safety, and system safety, which in turn may lead to an extensive refurbishment.

### **3. TERN tunnels in the National Transport Plan 2022- 2033**

Finally, the Government would like to report on the latest status regarding the Government's Report to the Storting concerning the National Transport Plan 2022-2033<sup>2</sup> (white paper). The refurbishment of the remaining tunnels in the TERN are given priority in the report, and as earlier communicated to the Authority, 20 of the remaining TERN tunnels will be replaced by new road infrastructure on new road sections. These new projects were all included in the *National Transport Plan 2022-2033*

This report to the Storting gives a thorough account of the Government's ten year investment plan for all modes of transport in Norway, but is not linked to a final proposal for a plenary resolution. On 14 and 15 June 2021 the Storting considered the report. Nine decisions were made, but none of these decisions concerned the refurbishment of the remaining tunnels in the TERN. This means that the Government's plan to give priority to the refurbishment of the remaining TERN tunnels and to start building the new road sections that will replace 20 of the remaining tunnels are included in the first six-year period of the National Transport Plan 2022-2033.

The final and binding decisions concerning the further progress of the upgrade of the TERN tunnels depend on annual National Budget adoptions. Upgrading or preparation for upgrading has been started in 28 tunnels in the TERN, based on the priorities in the National Budget of 2021. As regards the 29th tunnel, E39 Fløyfjelltunnelen, funds have been allocated for the preparation/planning of this measure in 2021, so that alternatives and costs may be more easily clarified.

The Government would be happy to facilitate any further needs for information that the Authority may have concerning the TERN tunnels in Norway.

Yours sincerely

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Deputy Director General

Sonja Lindqvist  
Senior Adviser

*This document is signed electronically and has therefore no handwritten signature*

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<sup>2</sup> Meld. St. 20 (2020-2021)



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