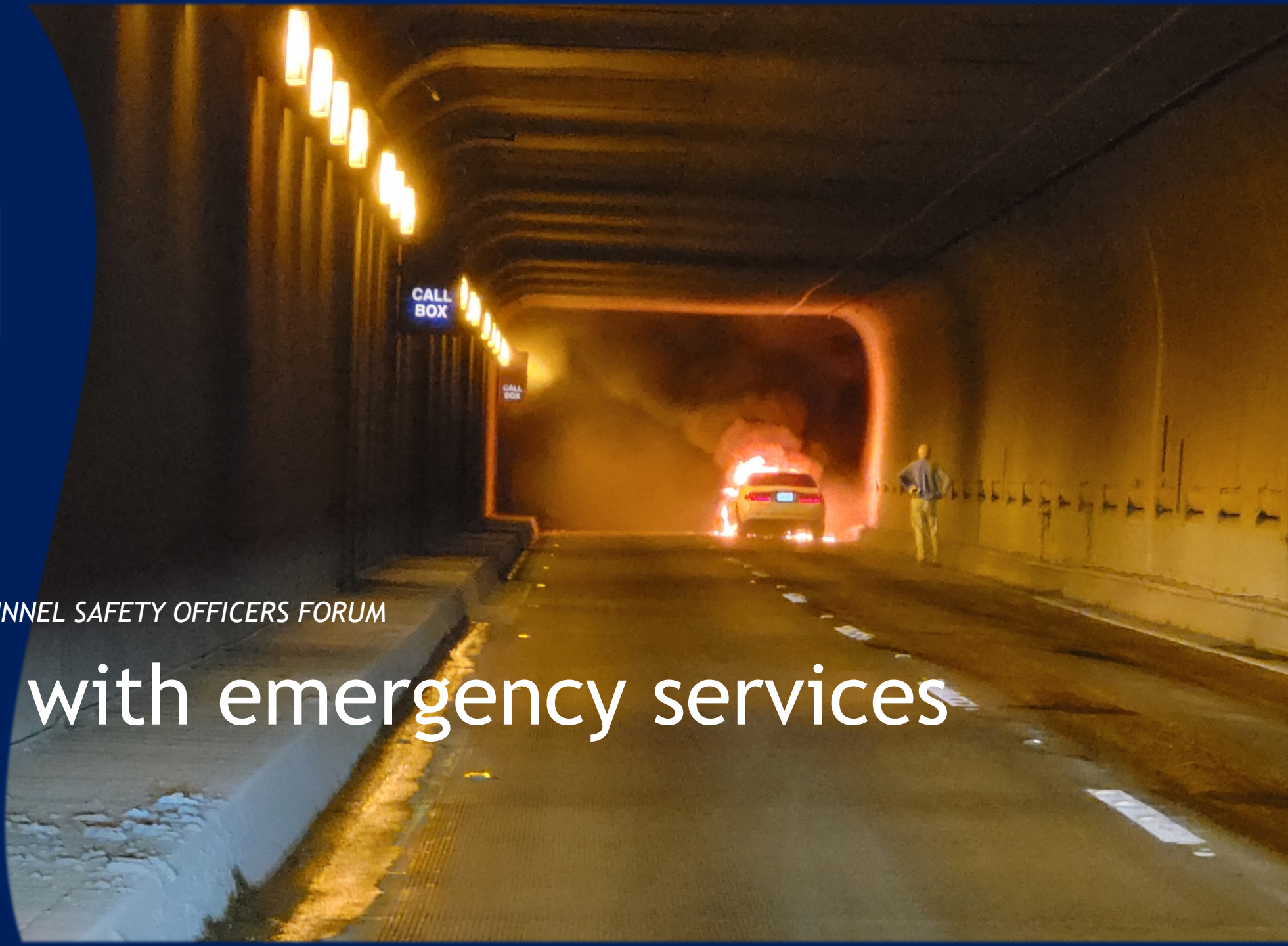


7TH EDITION EUROPEAN TUNNEL SAFETY OFFICERS FORUM

Relations with emergency services



SPEAKER'S PRESENTATION

SANTIAGO VILARIÑO PÁEZ (1980, MADRID)

QUEMICAL ENGINEER FROM THE UNIVERSIDAD AUTÓNOMA DE MADRID.

HE WAS TUNNEL SAFETY OFFICER FOR THE M30 TUNNELS IN MADRID FROM 2008 TO 2021. THE M30 TUNNELS ARE AN UNDERGROUND NETWORK OF TUNNELS APPROXIMATELY 44 KM LONG, THROUGH WHICH 400,000 VEHICLES PASS EVERY DAY AT SOME POINTS.

HE HAS BEEN A TRAINER FOR THE TRAINING ACADEMIES OF THE MADRID FIRE DEPARTMENT, LOCAL POLICE, NATIONAL POLICE AND EMERGENCY MEDICAL SERVICES OF MADRID. HE HAS ALSO BEEN A TRAINER FOR THE MILITARY EMERGENCY UNIT OF THE SPANISH ARMY.

HE IS CURRENTLY A TUNNEL ENGINEER AT THE SPANISH ENGINEERING COMPANY SENER, IN THE AREA OF MECHANICAL INSTALLATIONS AND FIRE AND LIFE SAFETY IN TUNNELS AND UNDERGROUND INFRASTRUCTURES.

AT SENER HE HAS WORKED ON THE FOLLOWING PROJECTS:

- LAMIAKO SUBFLUVIAL TUNNEL. URBAN TUNNEL OF 3.5 KM THAT WILL CIRCULATE UNDER THE ESTUARY IN THE CITY OF BILBAO (SPAIN).
- COFFS HARBOUR TUNNELS. THREE ROAD TUNNELS IN THE CITY OF COFFS HARBOUR (AUSTRALIA).
- REVIEWER OF THE PROJECTS OF THE RAILWAY INFRASTRUCTURE AUTHORITY (SPANISH STATE-OWNED PUBLIC COMPANY ADIF) IN SAFETY AND SECURITY MATTERS.
- TRES OLIVOS TUNNEL. URBAN TUNNEL OF 700 METERS BIDIRECTIONAL IN THE CITY OF MADRID WITH SEMI-TRANSVERSE VENTILATION SYSTEM.

OUTSIDE TUNNELS.

- FOURTH BRIDGE OVER THE PANAMA CANAL. RESPONSIBLE FOR FIRE PROTECTION DESIGN AND COORDINATION WITH THE PANAMA FIRE DEPARTMENT.
- AUTHOR OF THE ENERGY EFFICIENCY STRATEGY FOR ROADS AND TUNNELS OF THE MINISTRY OF TRANSPORT OF THE GOVERNMENT OF SPAIN.



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TOOLS USED FOR RELATIONS
WITH EMERGENCY SERVICES

MADRID

SECURITY AND EMERGENCY ORGANIZATION



DELEGACIÓN
DEL GOBIERNO
EN MADRID



National Police depends on the government of Spain. Its function is to ensure law and order in cities with more than 10,000 citizens. Prevent the commission of criminal acts.

To investigate crimes in order to discover and arrest the presumed culprits, to secure the instruments, effects and evidence of the crime, placing them at the disposal of the competent Judge or Court, and to prepare the appropriate technical and expert reports.

6,122 national police officers



Local Police 5,200 local police officers

Facilitate citizen and neighborhood coexistence. Prevent and respond to citizen security problems and attend to victims. Attention to accidents (including traffic), management of vehicle traffic in the city, sanctioning of traffic offenders.



Firefighters 536 Firefighters **210** Firefighter-Drivers

Save people, animals and property at risk. Fighting fires. Properly care for victims and affected persons..



SAMUR-Civil Protection (Medical Services)

Emergency health care on public roads and premises in the city of Madrid. Coordination and health care in case of catastrophes or incidents with multiple victims.

Health coverage in situations of foreseeable risk.

881 doctors, nurses and health technicians

1,100 civil protection volunteers

MADRID

TUNNELS

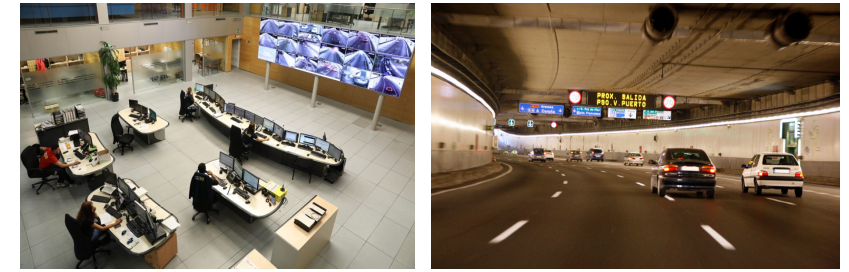
Madrid is the capital of Spain. The city is home to 3,305,408 citizens. It is the second most populous city after Berlin.

As the capital of Spain, it houses the headquarters of the Spanish Government and its Ministries, the Spanish Parliament (Congress and Senate), the Supreme Court and the Constitutional Court, as well as the official residence of the King and Queen of Spain and the President of the Government.

It has a nominal GDP of 133,129 million euros -12% of the national GDP- and a nominal GDP per capita of 41 600 € (2018), being the 1st Spanish metropolitan area in economic activity -19% of GDP.¹⁶ It is also the first in more hotel overnight stays.

Most of the road tunnels in the municipality of Madrid were built in the 1990s and early 2000s. The purpose of these tunnels was to replace the overpasses popularly known as "scalextrics" which disfigured the aesthetics of the city and represented an architectural barrier between different streets and districts.

In 2004, the Madrid City Council began construction of the M30 tunnels. These tunnels are located in the southern part of the city. The objective of their construction was the recovery of the banks of the Manzanares River. The tunnels were made by Cut & Cover and TBM in the area of the Bypass. They are an underground network of tunnels, with a total length of 44 km.



MADRID

M30 TUNNELS

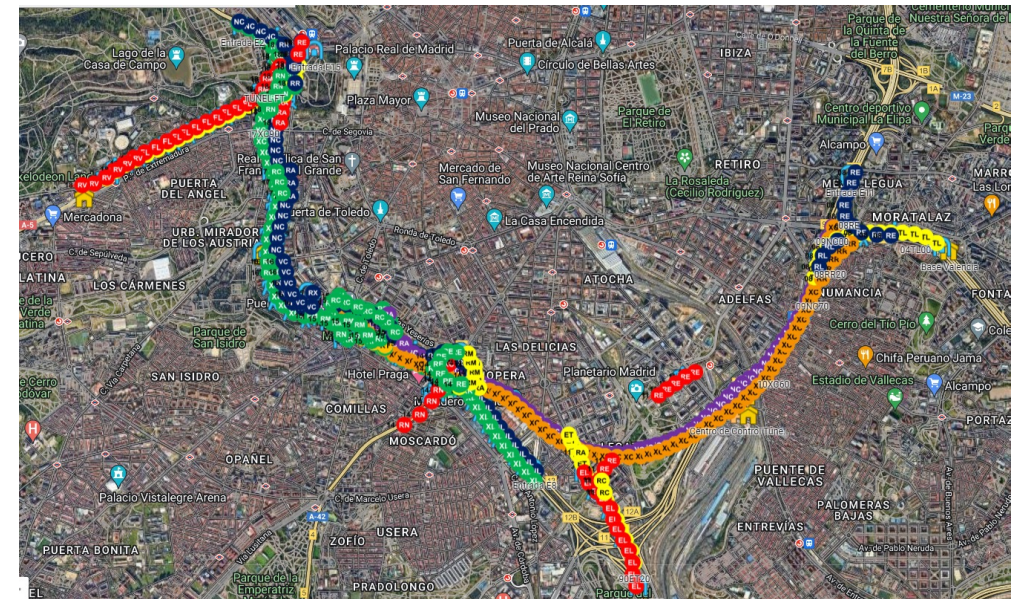
There are three main section in the tunnels.

1. Portugal tunnel.
2. River Tunnel.
3. Bypass Tunnel

There are 220 emergency exits, with different types. In Portugal Tunnel the evacuation route is shared with a parking lot above the tunnel. In the River Tunnel, the exits lead directly to an enclosed park with entrances to the park. In the Bypass (TBM), the emergency exits direct users to the emergency gallery of the opposite tunnel.

Having such a large infrastructure, the main problem was how to locate where an emergency is occurring.

We created a location code system for each tunnel position.



M30 TUNNELS GOOGLE MAPS

RELATIONS WITH EMERGENCY SERVICES

PERIOD WITHOUT TUNNEL SAFETY OFFICER

2004 The design and construction of the tunnels begins.
Firefighters are consulted on the tunnel design and tunnel emergency response needs.

2005 A working group is created to analyze and see what needs there are from the operational and human point of view to combat an emergency in the tunnel. Firefighters, SAMUR and municipal police are included. NO NATIONAL POLICE INCLUDED

2006-2007 M30 tunnels begin to open in sections

The installation of equipped fire hose systems every 25 meters is requested.



It is also requested that a fixed fire suppression system (FFFS) be installed in at-risk areas.

For tracking in smoke, sidewalk modifications are requested. One side will be smooth and the other rough



A specific protocol is created to deal with emergencies in the tunnel, based on experiences in mountain tunnels and without having a clear idea of how the tunnel will behave. It should be noted that the Montblanc fire is in the memory of all the members of the group.

It was decided to plan training and visits for the members of the emergency services. The training is internal and does not take into account the opinion of external experts.

The training was not received by all personnel and was only a very generic initial training based more on perceptions than on the reality of tunnel safety.

RELATIONS WITH EMERGENCY SERVICES

PERIOD WITHOUT TUNNEL SAFETY OFFICER

2007

The first exercise is organized and realized in the tunnel. The exercise is based on a fire accident involving two turismo vehicle

Once the tunnels were opened, the emergency services lost interest in the infrastructure. As a result, training courses and visits slowed down

2008

Madrid City Council decides to appoint a Safety Officer in accordance with Directive 2004/54/ on minimum safety requirements for tunnels and Real Decreto 635/2006 on minimum safety requirements for Spanish tunnels.



RELATIONS WITH EMERGENCY SERVICES

PERIOD WITH TUNNEL SAFETY OFFICER

Directive 2004/54

The Safety Officer shall perform the following tasks/functions:

- (a) ensure coordination with emergency services and take part in the preparation of operational schemes;
- (b) take part in the planning, implementation and evaluation of emergency operations;
- (c) take part in the definition of safety schemes and the specification of the structure, equipment and operation in respect of both new tunnels and modifications to existing tunnels;
- (d) verify that operational staff and emergency services are trained, and he shall take part in the organisation of exercises held at regular intervals;
- (e) give advice on the commissioning of the structure, equipment and operation of tunnels;
- (f) verify that the tunnel structure and equipment are maintained and repaired;
- (g) take part in the evaluation of any significant incident or accident as referred to in Article 5(3) and (4).

Real Decreto 635/2006

The Safety Officer shall perform the following tasks/functions:

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- (d) verify that operational staff and emergency services are trained, and he shall take part in the organisation of exercises held at regular intervals;
- (e) give advice on the commissioning of the structure, equipment and operation of tunnels;
- (f) verify that the tunnel structure and equipment are maintained and repaired;
- (g) take part in the evaluation of any significant incident or accident as referred to in Article 5(3) and (4).
- (h) Propose the closure or restriction of traffic if all safety measures are not complied with.

RELATIONS WITH EMERGENCY SERVICES

PERIOD WITH TUNNEL SAFETY OFFICER. EXERCISE AND TRAINING

Although both regulations established a minimum periodicity of one full-scale exercise every four years, the Madrid City Council decided that this periodicity should be one exercise every year in the contract with the O&M company.

In the 2007 exercise, approximately the following participated:

- Local Police: 20 persons
- SAMUR-Civil Protection: 50 persons.
- Firefighters: 20 persons
- National Police: 0 persons

In the 2007 training, approximately the following participated:

- Local Police: 100 persons.
- SAMUR-Civil Protection: 50 persons.
- Firefighters: 10 persons.
- National Police: 0 persons.

Was an annual exercise that exceeded European and Spanish regulations sufficient?

Was the number of people participating in the theoretical and on-site training each year sufficient?

RELATIONS WITH EMERGENCY SERVICES

PERIOD WITH TUNNEL SAFETY OFFICER. EXERCISE AND TRAINING

- **LOCAL POLICE:** 5,200 officers / (100 training+20 exercise) = **43 years**
- **FIREFIGHTERS:** 536 Firefighters 210 Firefighter-Drivers / (10 training + 20 exercise) = **25 years**
- **SAMUR-CIVIL PROTECCION :** 881 doctors, nurses and health technicians +1,100 civil protection volunteers / (50 training + 50 training) = **20 years**

I joined the fire department in 2006 and I am still waiting for my training or to see the M30.



RELATIONS WITH EMERGENCY SERVICES

PERIOD WITH TUNNEL SAFETY OFFICER. EXERCISE AND TRAINING

We had to do something to reduce those periods. What did we propose? To do more exercises in the tunnel.

But more exercise meant more expense. An expense that the O&M company was not going to assume. Besides, we could not shut down the traffic in the tunnel every night.

OK. We will do more exercise but without money and no inside the tunnel with traffic.

These exercises were called "arrival and coordination exercises" and their purpose is to establish a point within a tunnel with an incident, parameters that are only known by the Safety Manager beforehand, to which the emergency services personnel who are working must go according to the established procedures.

With this, it was achieved that the personnel had the notions of how to get to each point of the tunnel through the emergency exits that lead to the street and above all to work in areas that are not the usual ones for a user such as technical rooms, emergency exits, etc...



RELATIONS WITH EMERGENCY SERVICES

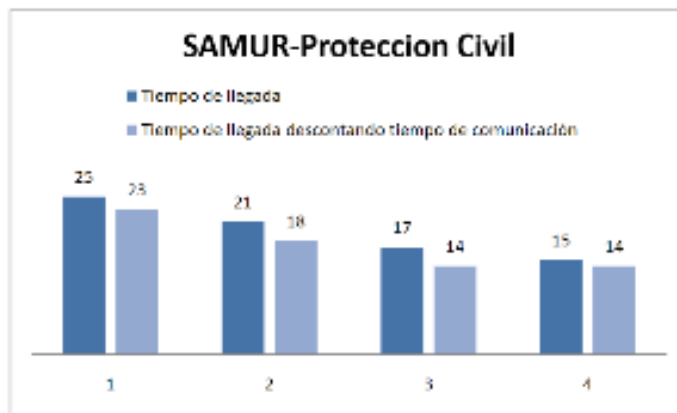
PERIOD WITH TUNNEL SAFETY OFFICER. EXERCISE AND TRAINING

TIME TO COMPLETE EVERYBODY HAS SOME KNOW ABOUT TUNNEL

- LOCAL POLICE: 5,200 officers / $(2 * 12 * 10 + 100 + 20) = 15$ years
- SAMUR-CIVIL PROTECCION: 4 years
- FIREFIGHTERS: 6 years

A 40% reduction in the time it takes for an external emergency responder to receive training and exercise was achieved.

In addition to achieving this knowledge, the result was a reduction in arrival times.



RELATIONS WITH EMERGENCY SERVICES

PERIOD WITH TUNNEL SAFETY OFFICER. EXERCISE AND TRAINING

The training was very generalist. It must be taken into account that tunnels in Spain are mainly short and located in mountain areas. The emergency services did not have an expert in the field of fires in road, railway or subway tunnels.

What did we do? We made a commitment to exchange training between the emergency services, the Tunnel Safety Officer and the O&M company.

The Tunnel Safety Officer and the O&M company staff would provide specific training on M30 tunnels safety: access, operation, procedures, evacuation of users... and the emergency services would provide training to the O&M company's emergency staff.

This would achieve two important things: Specific training and coordination among the members.



RELATIONS WITH EMERGENCY SERVICES

PERIOD WITH TUNNEL SAFETY OFFICER. EXERCISE AND TRAINING

By 2013, monthly arrival and coordination exercises and staff training had been consolidated. But we analyzed that it was complicated to consolidate the knowledge and the personnel required tools. These paper tools were tedious and complicated, due to their size and specialty.

We found a free tool that could guide anyone with a Smartphone: Google Maps. We created a map on Google Maps that included the tunnel's kilometer points, emergency exits and technical room locations. And this map was sent to the emergency services personnel.

Also in terms of training we started to provide information through the use of social networks such as: Twitter, Facebook and Youtube. This information was not only directed to the emergency services but also to the citizens of Madrid, who were informed about the emergencies that happened in the tunnel.



[M30 Tunnels Google Maps](#)



[\(258\) Madrid Calle30 - YouTube](#)



RELATIONS WITH EMERGENCY SERVICES

PERIOD WITH TUNNEL SAFETY OFFICER. EXERCISE AND TRAINING

And with the National Police? We have not yet collaborated with them.

In 2015. As well as repairing or starting up facilities, the Tunnel Safety Manager proposed a exercise in which the participation of the National Police was inevitable: Terrorist attack with a chemical agent inside the tunnel.



RELATIONS WITH EMERGENCY SERVICES

PERIOD WITH TUNNEL SAFETY OFFICER. EXERCISE AND TRAINING

As a result of this collaboration, the municipal emergency services invited the O&M personnel to assist as participants in the annual informative exercise that is prepared for the citizens of Madrid to check the means available to the city's emergency services.

It also participates in the exhibitions of material made by the emergency services so that the public can see and learn about the material available.



RELATIONS WITH EMERGENCY SERVICES

TOOLS USED FOR RELATIONS WITH EMERGENCY SERVICES

Never forget that infrastructures are used by people with names, who go to work, to school with their children, to hospitals, who come back from enjoying a few hours off.... That is why the infrastructures must be humanized and protected. With integrity, ethics and compromise to them





**THANK YOU FOR
LISTENING AND
FOR DEDICATING
PART OF YOUR LIFE
TO THESE
WONDERFUL
INFRASTRUCTURES**





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