Concessionaria per la progettazione, realizzazione e gestione del collegamento stabile tra la Sicilia e il Continente Organismo di Diritto Pubblico
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PONTE SULLO STRETTO DI MESSINA

PROGETTO DEFINITIVO

EUROLINK S.C.p.A.

IMPREGILO S.p.A. (MANDATARIA)
SOCIETÀ ITALIANA PER CONDOTTE D'ACQUA S.p.A. (MANDANTE)
COOPERATIVA MURATORI E CEMENTISTI - C.M.C. DI RAVENNA SOC. COOP. A.R.L. (MANDANTE)
SACYR S.A.U. (MANDANTE)
ISHIKAWAJIMA - HARIMA HEAVY INDUSTRIES CO. LTD (MANDANTE)
A.C.I. S.C.P.A. - CONSORZIO STABILE (MANDANTE)

IL PROGETTISTA	IL CONTRAENTE GENERALE	STRETTO DI MESSINA	STRETTO DI MESSINA
COWI Ing. E.M. Veje Dott. Ing. E. Pagani Ordine Ingegneri Milano n° 15408	Project Manager (Ing. P.P. Marcheselli)	Direttore Generale e RUP Validazione (Ing. G. Fiammenghi)	Amministratore Delegato (Dott. P. Ciucci)

Unità Funzionale	OPERA DI ATTRAVERSAMENTO	PG0031_F0
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Opera - tratto d'opera - parte d'opera	Operation and Maintenance	
Titolo del documento	Preliminary Operation and Emergency Manual, Progetto Definitivo, Annex	

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INDICE

Abbreviations

ANAS	-	Azienda Nazionale Autonoma delle Strade
ARD		European Agreement concerning the International Carriage of Dangerous Goods by Road
BMS	-	Bridge Management System
EDMS	-	Electronic Document Management System
H&S	-	Health and Safety
I&M	-	Inspection and Maintenance
LCC	-	Life Cycle Costs
M&E	-	Mechanical and Electrical Systems
OCC	-	Operational Control Centre
O&E	-	Operation and Emergency
O&M	-	Operation and Maintenance
ORA	-	Operational Risk Analysis
RCM	-	Reliability Centred Maintenance
RDS-TMC		Radio Data System - Traffic Message Channel
RFI	-	Rete Feroviaria Italiana
RID		Reglement concernant le transport International ferroviare des merchandises Dangereuses par chemin de fer
SCADA	-	Supervision, Control and Data Acquisition
SdM	-	Stretto di Messina
TETRA	-	Terrestrial Trunked Radio
VMS	-	Variable Message Sign
VTS	-	Variable Text Sign

1 Executive Summary

The report presents the preliminary O&E Manual with examples of procedures and instructions. As the elaboration of procedures and instruction progress, the preliminary manual will be succeeded by the final O&E Manual at the end of the final design phase. It has been chosen to let the O&E Manual include the general O&M organisation and the interaction between Operation & Emergency (O&E) and Inspection & Maintenance (I&M). For technical procedures and instructions regarding inspection and maintenance confer the *Inspection & Maintenance Manual (CG1000-P-MI-D-P-GE-A9-00-00-00-00-01-A)*

A basis for the O&E Manual has been elaborated in Progetto Definitivo *Operation & Emergency, Basis for Manual (CG1000-P-RG-D-P-GE-M7-00-00-00-00-01-A)*. This acts as basis for elaboration of the manual and its procedures and instructions.

1.1 Scope

The scope of the Operation and Emergency (O&E) Manual is to provide a system of procedures and instructions for efficient and safe operation of the suspension bridge and its traffic.

The O&E Manual will provide the SdM organization as well as external agencies, authorities and SdM subcontractors with procedures and instructions for carrying out tasks to take care of normal, abnormal or emergency operational events for the suspension bridge.

The O&E Manual is based on the tender specifications and the tender design accepted by SdM. The O&E Manual will exclude the description of the organisation and procedures for railway operational management, which is assumed to be the responsibility of RFI. However, interfaces of and interaction with RFI will be defined, described and handled in the context of the O&E Manual.

Physical elements contained in scope of O&E Manual are within the physical marked area on: *Drawing PG-2D-B0-106-_3N120 no. 1, rev. 0* and *Drawing f PG-2D-B0-106-_3N121 no. 1, rev. 0.* O&E procedures regarding specific physical elements (structures and systems), which are not contained in the suspension bridge design will be outside scope of the present O&E Manual. Description of O&E procedures comprises operation associated with traffic and works on bridge together with tasks of toll works and O&E works in the Operational Control Centre (OCC).

The O&E Manual for the suspension bridge forms together with the equivalent manuals for the SdM Land Works, the SdM basis for the operation of the Messina Link. The coordination of the present O&E Manual with the Operation & Emergency planning of the Calabria and Sicily Land Works is not contained in the scope of the present manual.

1.1.1 Intended Use of O&E Manual

The O&E Manual contains the agreed procedures & instructions to be applied for the bridge by the operational staff and external parties solving tasks in bridge operation and handling emergencies on the bridge. It is anticipated that the O&E Manual will be used in the following way:

- As a basis for training of personnel.
- As source for reading forms and instructions as check-lists and basis for specific tasks.
- As reference for occasional look-up on procedures which are rarely used or are complicated.
- As a basis for audits and drills.
- As a written documentation which can be cross-checked for consistency with respect to other documents handling operation and emergency (operational concept and safety concept).

At least all emergency instructions and procedures shall be implemented as on-line instructions in the SCADA system as action card type of commands in the user-interface display or by electronic links to the appropriate procedure or instruction (for instance stored as a pdf file).

1.2 Overall Structure of O&M Manuals

The O&E Manual and I&M Manual form the overall O&M manuals of the suspension bridge. The O&E Manual for the suspension bridge shall be seen in conjunction with the I&M Manual for the suspension bridge and the two manuals shall have documents common to the extent they are the same. O&M manuals comprise:

- O&E Manual.
- I&M Manual - for list of contents confer to I&M Manual, cf. *CG1000-P-MI-D-P-GE-A9-00-00-00-00-01-A.*
- O&M Common manuals with supplementary information.

1.2.1 O&E Manual

The O&E Manual has the following list of contents:

1 Indices

2 Scope

3 Management Principles and Organisation

4 Operational Plan

5 Emergency Plan

6 Operational Procedures

7 Emergency Procedures

8 Instructions

9 Appendices.

The following common O&M Manuals exist as a basis for the O&E and I&M manuals, respectively:

1 Guide to Bridge access (common position system)

2 Drawings (cf. Bridge Management System (BMS) where all drawings will be available)

3 System manuals (/computer accessible system manuals)

4 Design Basis

5 ORA Results

6 RBI and RCM Results

7 LCC Results

8 BMS manual (/computer accessible system manuals)

9 Emergency procedures of external parties (cf. annex of this manual)

10 Safety Concept, *CG1000-P-RG-D-P-SB-00-00-00-00-00-02-A*

2 Indices of O&E Procedures and Instructions

The following list of O&E procedures and instructions represent the anticipated list with a preliminary number system. Procedures will be numbered *O&E-ProXXXX* and instructions *O&E-InsXXXX*, where *XXXX* is a dedicated number according to the list.

The list will be modified during the elaboration of procedures and instructions in the final design phase. The elaboration of procedures and instructions will reveal the need for fewer or more procedures and instructions. I&M Manual contains the technical procedures and instructions.

A stand-alone instruction will exist when there is a need to describe tasks to be carried out in response to a certain event. The instruction gives a detailed step-by-step guidance to solve a specific task. The instruction is dedicated to a personnel supposed to carry out the actions described in the instruction. Dedicated manuals or user interfaces for a certain system or piece of equipment may replace the need for an instruction.

A procedure will exist when a certain event required instructions and interaction between several personnel/parties involved in the response on a certain event. A procedure may contain several built-in instructions with step-by-step guidance to solve the required tasks.

Section 4.4 describes the basis for elaboration of procedures and instructions, and Section 7. 8 and 9 provide draft examples.

Number	Type	Title
1000	**O&E Administration Works**	
1100	**Planning**	
1101	Procedure	Work planning of O&E tasks
1102	Procedure	Visitor request for bridge
1200	**Operational reporting**	
1201	Instruction	Report from OCC shift
1202	Instruction	Daily weather and traffic forecast
1203	Instruction	Monthly traffic report
1204	Procedure	Monthly technical report

1205	Procedure	Monthly safety logging report
1206	Procedure	Monthly security report
1300	**Long-term updates**	
1301	Procedure	Review of O&E documents
1302	Procedure	Education and training *(outside scope)*
1303	Procedure	Safety induction
1304	Procedure	Emergency drills
1500	**O&E Operational Works**	
1501	Instruction	Daily routines
1502	Instruction	Emergency/Security Call to OCC
1700	**Control of M&E Systems**	
1701	Procedure	Management system operation
1702	Instruction	Technical alarms
1703	Instruction	Structural alarms
1900	**Work on Bridge**	
1901	Instruction	Request for caretaking/maintenance
2100	**General Emergencies**	
2001	Procedure	Security threat or action (terrorism, violent crime).
2002	Procedure	Fire/explosion/toxic gas or fluid on bridge
2003	Procedure	Earthquake damages
2004	Instruction	Evacuation/closure of bridge
2005	Instruction	Evacuation of building *(outside scope)*
2006	Instruction	Fire in building *(outside scope)*
2200	**Bridge safety & security process**	
2201	Instruction	Intruder alarms
2202	Procedure	Surveillance daily routines
2203	Procedure	Intruder alarm follow-up
2500	**Toll works**	
2501	Procedure	Operation of toll system
2501	Procedure	Vehicle queue
2502	Procedure	Vehicle incidence
2503	Instruction	Toll emergency request for assistance

2600	**I&M works**	
2601	Procedure	Work Permit and Access
2602	Instruction	Accident Form
2800	**Environmental control works**	
2801	Procedure	Approval of chemical substances O&M
2802	Procedure	Pollution on bridge
3000	**Road traffic**	
3100	**General**	
3101	Instruction	Traffic management
3102	Instruction	Weight control of vehicles
3103	Procedure	Special road vehicles (dangerous goods, heavy/long/wide vehicles)
3200	**Traffic incidence**	
3201	Procedure	Object on road (garbage, dropped objects, spillage)
3202	Procedure	Maintenance work on road
3203	Procedure	Vehicle on halt/person on road
3500	**Emergencies**	
3501	Procedure	Illegal vehicle (wrong direction, illegal vehicle, vehicle threat)
3502	Procedure	Traffic accident
3503	Procedure	Vehicle fire/explosion/toxic gas
4000	**Train traffic**	
4001	Procedure	SdM Maintenance work close to railway
4002	Procedure	Railway maintenance
4003	Instruction	Interruption of Traction Power Supply
4200	**Emergencies**	
4201	Procedure	Train accident
4202	Procedure	Train evacuation
4203	Procedure	Train fire/explosion/toxic gas
5000	**Marine traffic**	
5001	Procedure	Marine traffic coordination
6000	**Airplane traffic**	
6001	Procedure	Airplane traffic coordination

3 Scope

The Operation and Emergency (O&E) Manual provides a system of procedures and instructions for efficient and safe operation of the bridge and its traffic.

The O&E Manual states the proposed SdM organization for operation and emergency as well as it outlines the corporation with external agencies, authorities and SdM subcontractors.

Procedures and instructions specify the basis for carrying out tasks to take care of normal, abnormal or emergency operational events.

The O&E Manual forms together with the O&M Manuals for the SdM Land Works the SdM basis for the operation of the Messina Link.

The O&E Manual intends to comply with the following criteria for success:

- O&E Manual shall be user-friendly, logical and easy to use in a way such that it earns the users natural respect and acceptance.
- O&E Manual shall be simple and robust with respect to failure of the operational conditions. This includes independency on specific persons and the presence of fallback alternatives in case of failure of technical systems and failure of communication lines.
- O&E Manual shall be adaptive to experiences and acquired data and changes within the organisations of SdM and external parties.

3.1 Limitation of Scope

The O&E Manual is based on the tender specifications and the tender design accepted by SdM.

The O&E Manual does not comprise description of the tasks of general SdM executive management, but does only consider the organisation and description of operational tasks of bridge operation and emergency.

The O&E Manual has be designed under the implicit assumption that SdM executive management process comprises a systematic management approach with application of a quality management system e.g. according to *ISO 9001: 2008*, a health and safety management e.g. according to *OHSAS 18001:2004* and a environmental management e.g. according to *ISO 14001*.

The O&E Manual excludes the description of the organisation and procedures for railway operational management, which is assumed to be the responsibility of RFI. RFI has the role as the railway infrastructure manager according to requirements of European legislation. However, interfaces of and interaction with RFI have been defined, described and handled in the context of the O&E Manual.

The O&E Manual does not consider special challenges related to outsourcing with application of subcontractors in the SdM organisation as the SdM subcontracting policy is not known. Subcontractors are assumed to act as being part of the SdM organisation.

Physical elements contained in scope of O&E Manual are within the physical marked area on:

Drawing PG-2D-B0-106-_3N120 no. 1, rev. 0

Drawing f PG-2D-B0-106-_3N121 no. 1, rev. 0.

O&E procedures regarding specific physical elements (structures and technological systems) of SdM which are not contained in the suspension bridge design of EUROLINK are outside the scope of the O&E Manual.

Figure 3-1 shows the anticipated O&E framework for the Sdm infrastructure network. Apart from the O&E Manual designed in present contract, the O&E framework consists of:

- An Operational Control Centre (OCC) with a control room, which is based on a design placed in another contract.
- A toll station, which is only included in the present scope with respect to procedures and instructions whereas the design is not contained in the present contract.
- Supportive technological systems. These comprise monitoring and management systems, which for the bridge is designed within the present contract, whereas the similar systems for the land works infrastructure are generally contained in other contracts with Eurolink. Eurolink coordinates the interaction between the systems.
- Electrical & mechanical systems and in particular road related to equipment for the bridge is designed within the present contract whereas the similar equipment for the land works infrastructure is contained in other contracts with Eurolink. Eurolink coordinates the application and interaction between systems and equipment.

Description of O&E procedures and instructions will comprise operation associated with the traffic and works on the bridge together with the tasks of toll works and the O&E works in the Operational Control Centre (OCC). The adjacent Land Works infrastructure and facilities, which are not contained in the above, will not be part of the scope and will not be described in the present O&E Manual. EUROLINK will coordinate the present O&E Manual with the operation & emergency documentation of the Land Works.

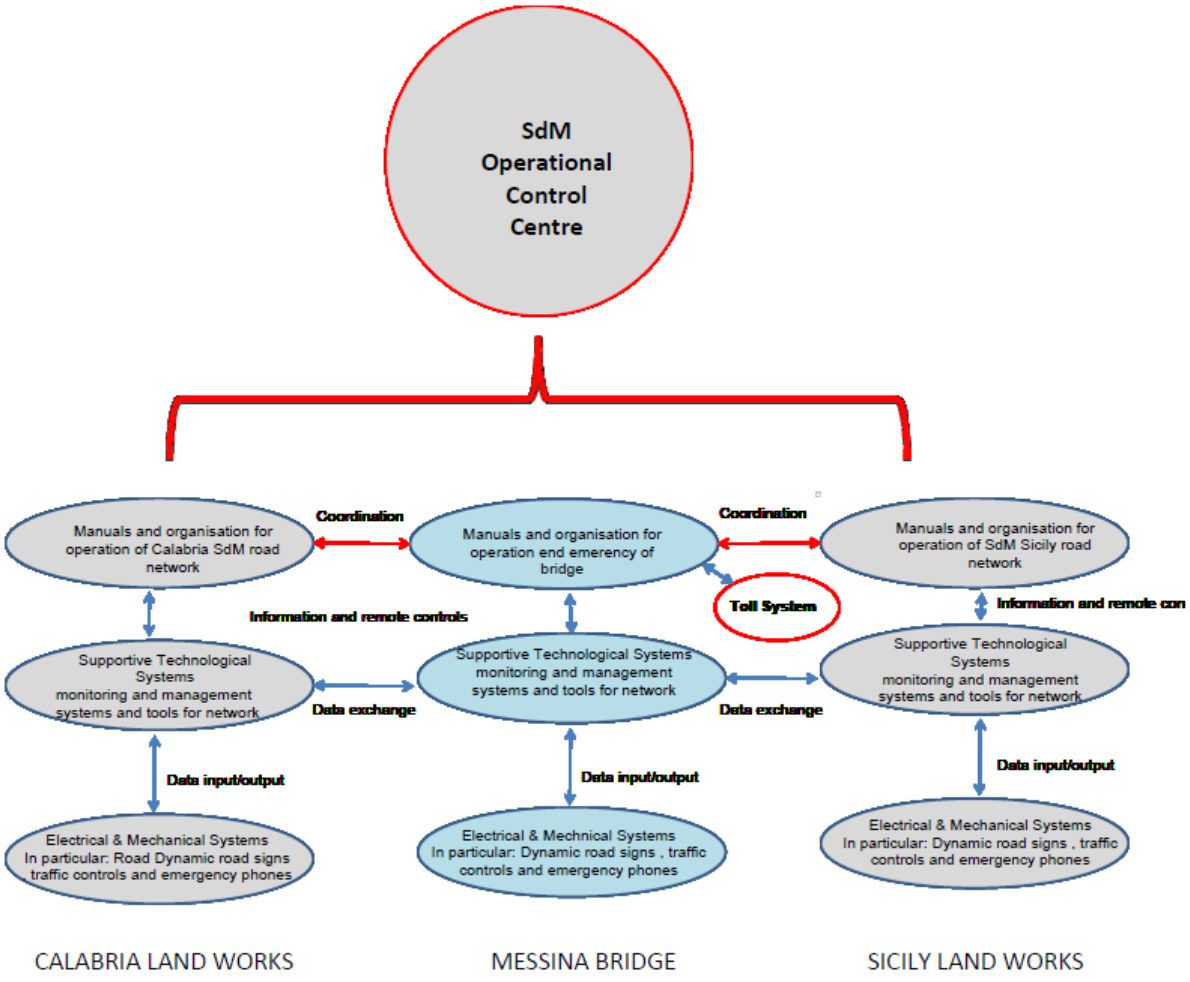


Figure 3-1 Anticipated O&E framework for the SdM infrastructure network. The management and monitoring systems for the Calibria and Sicily land works may be merged into on set of systems. "Operation" contains in this context operation as well emergency events and tasks.

3.2 Intended Use of O&E Manual

The O&E Manual contains the agreed procedures & instructions to be applied for the bridge by the staff and external parties solving tasks in bridge operation and handling emergencies on the bridge.

It is anticipated that the O&E Manual will be used in the following way:

- As a basis for training of personnel
- As source for reading forms and instructions as check-lists and basis for carrying out specific tasks.
- As reference for occasional look-up on procedures and instructions which are rarely used or which are complicated
- As a basis for audits and drills
- As a written documentation which can be cross-checked for consistency with respect to other documents handling operation and emergency (operational concept and safety concept).

At least all emergency instructions and procedures shall be implemented as on-line instructions in the SCADA system. It is urgently important that procedures and instructions for tasks in rare emergency events with critical response times are readily available to the O&E staff.

3.3 Basis

A basis for the O&E Manual has been elaborated in Progetto Definitivo. The basis acts as basis for the manual and the elaboration of procedures and instructions:

CG1000-P-RG-D-P-GE-M7-00-00-00-00-01-A, Operation & Emergency, Basis for Manual, Revision A-01.

3.3.1 SdM Tender Documents

The basis for the O&E Manual is the following documents:

1 GCG.F.06.05, Linee guida per la preparazione del manual di esercizio e di gestione delle emergenze, Revision 0 (2004).

2 *GCG.F.06.01, Sistema di gestione e controllo, Revision 0 (2004).*

3 *GCG.F.06.04, Linee guida per preparazione del programma di ispezione e manutenzione e della documentazione d'uso e manutenzione, Revision 0, (2004).*

4 *GCG. F.06.03, Linee guida per l'analisi quantitative di rischio, Revision 0, (2004).*

3.3.2 EUROLINK Tender Proposal

COWI has provided the following tender proposals on behalf of EUROLINK:

59012B-TD-1315 Tender Design Report for Operation and Emergency Management Manuel, issue 0, 13.4.2005

59012B-TD-1314 Tender Design Report for Inspection and Maintenance Manual, issue 0, 11.4.2005.

59012B-TD-1316 Tender Report for Operation and Maintenance Organisation, issue 0, 14.4.2005

3.3.3 Basic Definitions

Accident is an event with unwanted consequences such as injured or killed persons, loss or damage of vehicles, equipment or structures, interruption of road or rail traffic or environmental damages.

Caretaking is trivial daily maintenance by SdM employees or contractors.

Closure of bridge is closure of bridge for incoming traffic.

Dangerous goods may be transported by rail or road. Goods by rail shall comply with RID, and goods by road shall comply with ADR.

Emergency is a situation that poses an immediate *risk* to health, life, equipment, structures or environment.

Evacuation is the controlled egress of passengers, drivers, personnel and others from train, road vehicle or bridge.

Evacuation of bridge is closure of bridge and assistance to evacuation of bridge users and personnel, who not by themselves can escape from the bridge.

Hazard is a possible situation or condition with the potential for unwanted consequences such as injured or killed persons, loss or damage of vehicles, equipment or structures, interruption of road or rail traffic or environmental damages.

Health & safety (H&S) concerns the *safety* of the employees of SdM and employee of the contractors and other working under the management of SdM.

Operation covers the normal work process handling ordinary tasks and events associated with the operation of the bridge.

Incident is an event deviating from the planned pattern of operational events.

Inspection is inspection of equipment and structures by trained employees or contractors to investigate the condition or state of a part or a piece of equipment of the bridge.

Maintenance is non-trivial maintenance/repair by SdM employees/contractors.

Personnel in the SdM organisation comprise employees of SdM or of a contractor with reference to SdM. Personnel in the RFI and ANAS organisation will refer to the RFI and ANAS managements.

Risk is the combination of a frequency of occurrence of an *accident* and the magnitude of the consequences of the *accident*

Rescue is to transfer people, vehicles or equipment involved in an accident from an unsafe situation to a safe situation.

Safety is the condition of being protected against accidents. The safety level is described by the level of *risk*. The smaller the risk level the larger the safety level.

Security is the condition of being protected against accidents caused by malicious acts intended to cause damage. This include crime, sabotage and terrorism.

Special transport is vehicle on road or rail with dimension, weight or speed deviating from normal vehicles on road or rail.

3.3.4 Assumed Roles of External Agencies and Authorities

The final elaboration of the O&E Manual shall be based on a dialogue with external agencies and authorities. It has not yet been possible to hold such meetings within the phase of Progetto

Definitivo. Consequently, the following roles of external agencies and authorities have initially been assumed as a basis for the design of the O&E Manual:

AUTHORITIES

- *Polizia* provides actions on crimes, traffic offences, security and emergencies. *Polizia* will in the development of the O&E Manual be detailed into the different Polizia authorities, e.g. Forze dell'Ordine, Polizia Stradale.
- *Vigili del fuoco* provides action of fire fighting, towing of cars and rescue and evacuation of people.
- *Servizio di Pronto* provides ambulance services
- *Aviazione Civile* is assumed to handle all requirements and tasks regarding the management of air traffic in operation and emergency.
- *Autoritá Marittime* is assumed to handle all requirements and tasks regarding the management of maritime traffic in operation and emergency. This includes control of VTS (Vessel Traffic System).
- Protezione Civile is assumed to handle major emergencies related to e.g. earthquake, volcano eruption, flooding, train disasters etc.
- Prefetture is assumed to be involved in the control of major emergencies.

EXTERNAL AGENCIES

RFI is the infrastructure manager of the railway and operates and maintain the railway and will have responsibility for the operation and maintenance of the railway on the bridge.

ANAS provides the overall administration of the Italian highway network. O&E Manual assumes ANAS to be the external agency to deal with regarding the road network interfacing with the SdM road network. Furthermore local road authorities may be part of the road network.

A number of train operators will be contracted to drive trains on the railway. They will operate under the rules and the operational control of RFI. No direct interface between SdM and the operators are envisaged.

4 Management Principles and Organisation

The management principles and the organisation are based on:

- Operational concept extracted from SdM tender specification
- Safety concept extracted from SdM tender specifications
- Results of operational risk analysis
- Available input from the design process regarding interfaces to the Operation & Emergency Manual of the bridge.

4.1 Principles

Operation actions comprise carrying out tasks for:

- Normal operation (planned tasks & events)
- Abnormal operation representing unplanned, unintended events, incidence and minor accidents,
- Emergency events.

O&E Manual shall support the personnel with operation and emergency tasks. This includes interaction with:

- Inspection and Maintenance personnel and associated contractors and suppliers
- External authorities and agencies.

The O&E Manual is anticipated to be a supplementary documentation to SdM management systems (quality, health and safety and environment). Figure 4-1 shows the overall anticipated structure of documentation for SdM.

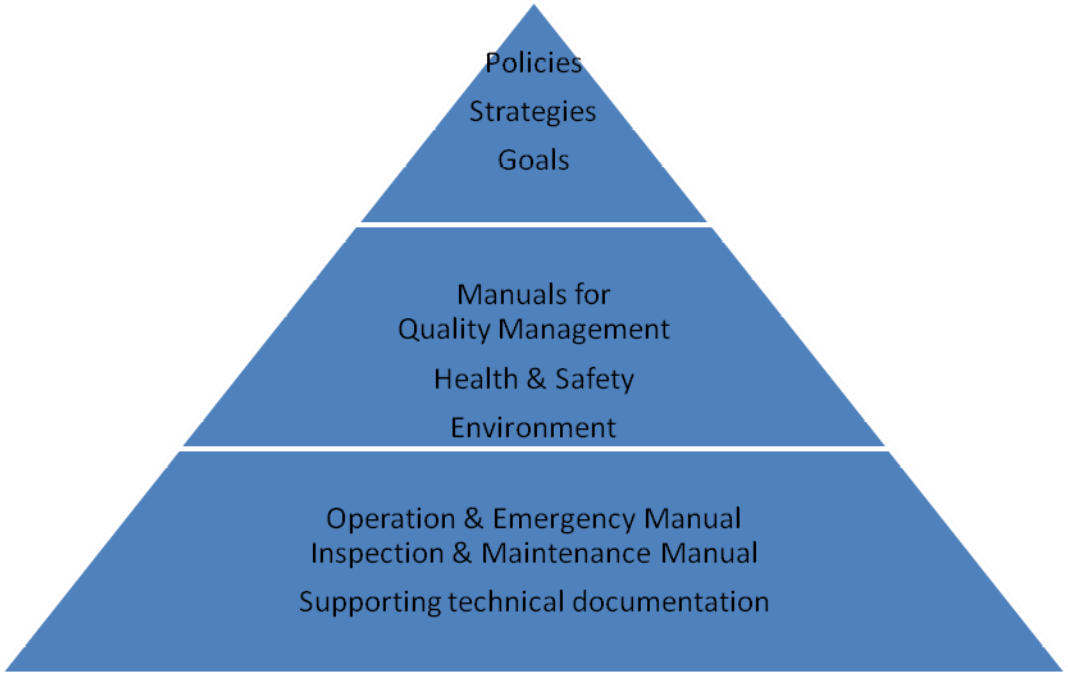


Figure 4-1 Overall anticipated documentation structure for SdM Management

4.1.1 Defined Response Time as a Goal

The response time on operational actions will depend on the criticality of an event with respect to traffic flow, safety and costs. For each event in each procedures and instructions, a goal on response time must be defined. The requirements for response times shall be carried out in dialogue with authorities and external agencies in the final design phase. The settling of response times will influence the contents of procedures and instructions as well as their implementation.

The definition of response time in an overall emergency context is assumed to be the duration from the time of alarm to emergency services to the time they arrive on the emergency site. The response time in the context of specific requirements to SdM's procedures and instruction may be defined as the duration from the moment of incoming call to OCC to the first OCC induced action imposing a mitigating change on the emergency event. The overall emergency requirements shall apply for the combined actions of SdM and emergency services whereas the specific SdM requirements apply to the actions required by SdM.

4.1.2 Documentation of Events and O&E Actions

Events and the results of O&E actions shall be documented to the extent that events and actions have consequences with respect to traffic flow, safety, costs and maintenance condition of the bridge.

4.1.3 Coordination with Inspection and Maintenance

Procedures and instructions of the O&E Manual will be parallel to the technical instructions and technical procedures of the Inspection and Maintenance Manual. The two manuals should always be consistent with respect of the tasks for carrying out inspection and maintenance.

4.1.4 Coordination with External Agencies and Authorities

Coordination and interaction with external agencies and authorities are described in the O&E procedures such that responsibilities, tasks and goals are defined consistently. The O&E procedures and instructions are assumed to be adapted by the external agencies and authorities.

4.1.5 Updating O&E to be Effective and Safe

Annually and after major emergencies and drills, the O&E shall be evaluated, and if considered necessary revised.

The O&E approach shall also be updated to changes in the SdM organisation, SdM Management defined policies, interfaces to external parties and the gained experiences on the performance of the O&E organisation as well as the technological systems supporting O&E.

The gained experiences shall consider the operational performance based on the documented results on the tasks carried out with an evaluation of e.g. response times and the quality of the tasks carried out.

Each part of the O&E Manual shall have an owner who will be the responsible for the updating. The overall responsible for updating of the O& E Manual will be the SdM Management.

The updating of O&E shall use the results from training, audits and emergency drills.

4.2 Concept for Operation

The operational scenarios representing different events are divided into three types of operational modes:

- A **normal operational mode**, where operation is as planned and represents planned pro-active actions
- An **abnormal operational mode**, which requires routine actions due to incidences and minor accidents. The actions will comprise actions with the objective of returning to normal operation mode as soon as possible.
- An **emergency mode**, which requires actions due to an emergency.

The O&E Manual is driven by needs and events. Some events will be very trivial routines with modest consequences at stake, others will cover rare events with large potential consequences if not handled correctly.

4.2.1 Events in Normal or Abnormal Operational Mode

Pro-active actions in normal mode and actions on abnormal events will be described to the extent that they have a significant impact on the goal of a safe and efficient operation of the bridge. Events with only marginal importance will not be described as the solution of the required tasks will be assumed to be more effectively carried out based on ad hoc decisions by personnel in charge of operational control.

4.2.2 Events in Emergency Mode

A number of unwanted events cannot be ruled out to occur as shown in the operational risk analysis (ORA) for the bridge. These events will be hazards causing an emergency. Such hazards may result in human losses, damages to the bridge, financial/socio-economical losses due to closure of the bridge, and also environmental impacts.

The operational risk analysis (ORA) has focused on the major hazards and has defined these events in detail as events to be handled by the O&E Manual. This may include assumptions on design requirements and requirements to O&E procedures and instructions. The O&E Manual

covers the events identified in the ORA except for insignificant events with both a small frequency of occurrence and limited consequences.

However in addition more emergency events, which have not been detailed by the ORA, may exist and will be included in the underlying operational analysis used as basis for the O&E Manual of the bridge.

Finally, it may be noticed the O&E Manual also relies on input from ORA input carried out for the Land Works, which is outside the present scope of the ORA of the bridge. This ORA input is assumed to be provided for the detailed design phase.

4.3 SdM Organisation for Operation & Management

Figure 4-2 shows the overall SdM O&M organisation (marked by green boxes). The figure shows that SdM operation and maintenance (O&M) are divided into Operation & Emergency (O&E) and Inspection & Maintenance (I&M) with a number of external relations to authorities and agencies.

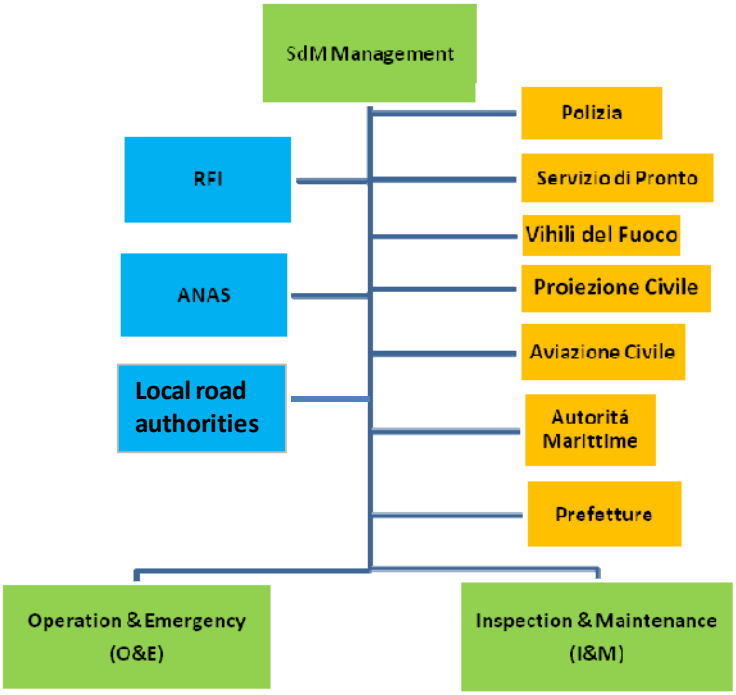


Figure 4-2 Overall assumed SdM organisation with interfaces to authorities and external agencies.

4.3.1 SdM Management

O&E and I&M refer to the SdM Management. It is outside the scope of the O&E Manual to describe the functions of the SdM Management, which is assumed to handle:

- Finance
- Human resources
- Legal matters (incl. compliancy with law and agreements and contractual handling)
- Quality management
- Environmental management
- Health and Safety management
- Public relations
- Marketing
- Executive reporting
- IT support for SdM in general.

The O&E Manual focuses entirely on the operational and emergency management to control an efficient and safe bridge traffic under the constraints of an overall SdM management. The I&M Manual provides the basis for efficient and safe and inspection and maintenance of the bridge with the constraints of the O&E Manual regarding safety and traffic operation.

SdM will have close corporation with other agencies regarding the operation and maintenance of the railway by RFI, and the road before and after the Messina Bridge area operated and maintained by ANAS and local road authorities. This may also comprise associated toll road consortiums on toll roads interfacing with the SdM road network.

4.3.2 O&M Organisation

Figure 4-3 shows the organisation of Operation and Maintenance comprising O&E and I&M:

Operation & Emergency (O&E) is described by the present O&E Manual. The O&E is supported by operational on-line information from the technological systems. O&E organisation interacts on an

operational level with external agencies and authorities. Interaction agreements and management report is handled on a general management level. The interaction with these external parties is further described in Chapter 4.4.6.

Inspection & Maintenance (I&M) is further described in the Inspection & Maintenance manual. Inspection & maintenance comprises systematic in-depth inspection and non-routine maintenance.

The interaction between O&E and I&M is further described in Chapter 4.4.5.

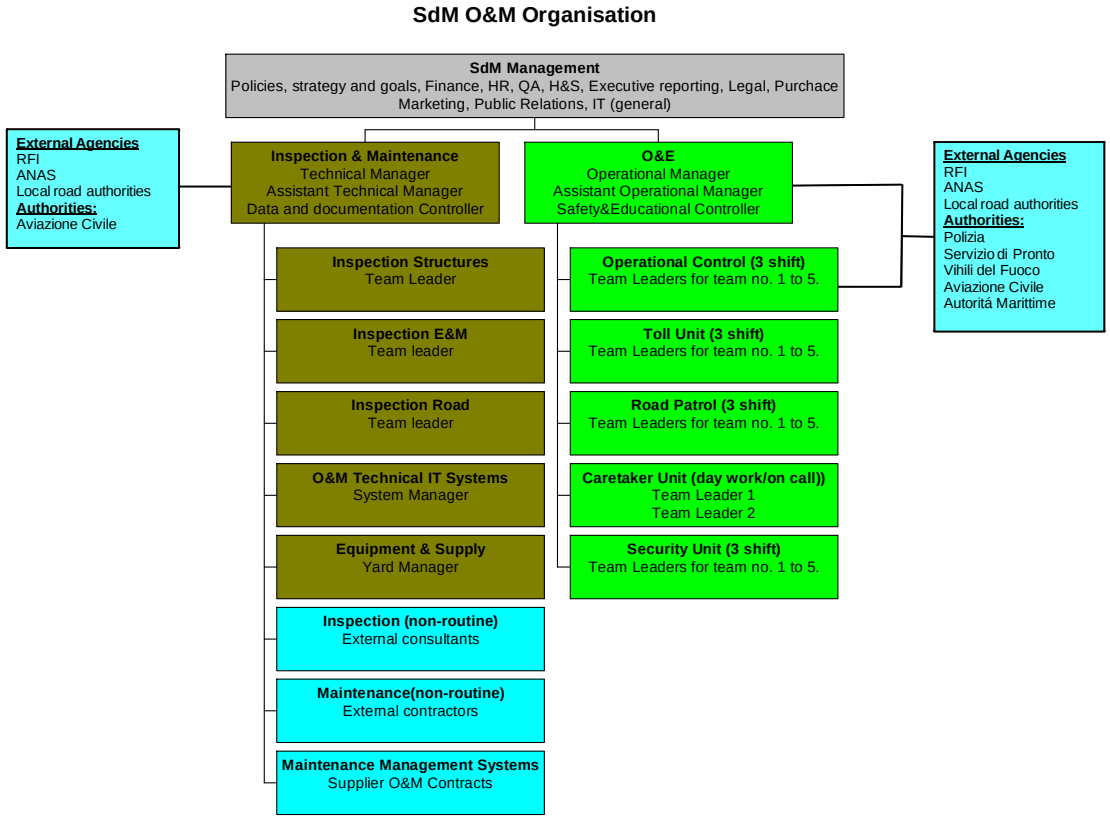


Figure 4-3 O&M organisation with interfaces to authorities and external agencies (proposal)

4.3.3 O&E Organisation - Tasks and Responsibilities

Table 4-1 O&E organisation - staff and responsibilities

- **O&E Management**
  - Staff:
    - Operational Manager
    - Assistant Operation Manager (back-to-back)
    - Safety & Educational Controller
  - Responsibilities:
    - Management of O&E work teams
    - Planning of operation and handling of emergencies
    - Report to SdM Management
    - Safety logging, reporting & planning of safety induction, drills
    - Coordination with external authorities and agencies
    - Coordination with I&M work plans and follow-up on caretaking.
    - Participation in evaluation and revision of O&E+I&M manuals
- **Operational Control:**
  - Staff (3 shifts, 24 hours):
    - Team Leader 1, 2, 3, 4 and 5.
  - Responsibilities:
    - Control and command of operation & emergency of the bridge
    - Coordination of all parties with actions interfering with bridge
    - Logging of the operation and emergencies.
- **Toll Unit:**
  - Staff (3 shifts, 24 hours):
    - Team Leader 1, 2, 3, 4 and 5.
  - Responsibilities:
    - Operation of toll system
    - Logging and reporting on operation
- **Road Patrol:**
  - Staff (3 shifts, 24 hours):
    - Team Leader 1, 2, 3, 4 and 5.
  - Responsibilities:
    - Surveillance patrols on road
    - Assistance and control on road to traffic
    - Assistance and control on road to I&M works
- **Caretaker Units:**
  - Staff (1 day work with 24 hours on call):
    - Team Leader 1, 2 and 3.
  - Responsibilities:
    - Routine maintenance on bridge (inc. cleaning)
    - Reporting of needs for inspection and (non-routine) maintenance
- **Security Unit:**
  - Staff (3 shifts, 24 hours):
    - Team Leader 1, 2, 3, 4 and 5.
  - Responsibilities:
    - Patrol of fences, doors and gates
    - Follow-up on alarms and intruders
    - Report on incidents

4.3.4 I&M Organisation - Tasks and Responsibilities

Table 4-2 I&M organisation - staff and responsibilities (proposal)

- **I&M Management**
  - Staff:
    - Technical Manager
    - Assistant Technical Manager (back-to-back)
    - Data and Documentation Controller
  - Responsibilities:
    - Management of I&M work teams
    - Planning of I&M
    - Report to SdM Management
    - Training of personnel
    - Management of data and documentation
    - Coordination with external authorities and agencies
    - Coordination with O&E work plans and follow-up on caretaking.
    - Participation in evaluation and revision of O&E Manual
- **O&M Technological Systems:**
  - Staff (day work/24 hours on call):
    - System Manager
  - Responsibilities:
    - Routine adjustment of systems
    - Manage maintenance and development of systems
    - Administration of user help function
- **Equipment & Supply:**
  - Staff:
    - Yard Manager:
  - Responsibilities:
    - Management of O&M equipment and spare parts
- **Inspection (routine)**
  - Staff:
    - Team Leader 1,2 and 3
  - Responsibilities:
    - Planning of inspection activities
- **Inspection (non-routine)**
  - External consultant *(assumed to be applied due to the amount of inspection work to be carried out or due to requirements on special competencies).*
- **Maintenance (non-routine)**
  - External contractor (assumed to be applied due to the amount of work to be carried out or due to requirements on special competencies).

4.3.5 Interface between O&E and I&M

Table 4-3 shows the interfaces between O&E and I&M branches of the O&M organisation. The interaction with I&M is foreseen to comprise normal operational mode and abnormal mode in connection with accidents and technical problems.

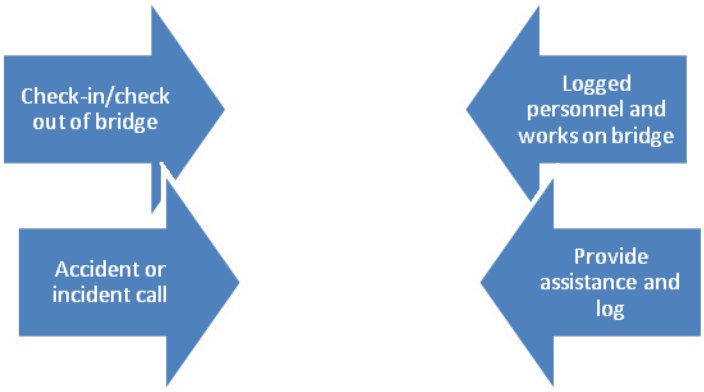
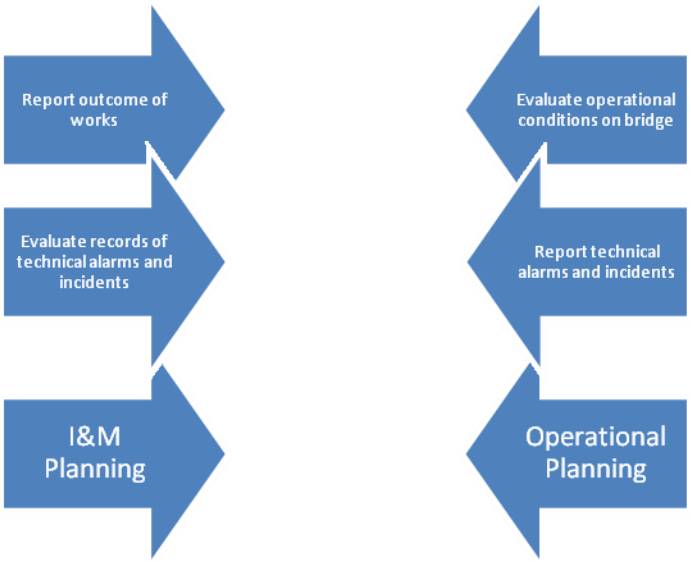
The O&E and I&M interacts with respect to:

- Operational O&E procedures for carrying out I&M works on the bridge
- Ordering of I&M to carry out repair works to get bridge back into normal operation after an incident. This can be carried out through the BMS system where work orders will be accessible.
- Coordination of which maintenance works is part of the operational caretaking and which part is part of non-routine maintenance work covering the long term conditions of the bridge.
- Access to as-built-documentation

These interfaces will be coordinated between I&M and O&E manuals to obtain efficient and safe procedures with an unambiguous organization of tasks and communication with no overlap.

The organisation and the manuals have been designed independently on whether some tasks may be sub-contracted. The reason is that the SdM requirements to procedures are considered to be independent on whether tasks are carried out within or outside the SdM organisation.

Table 4-3 Examples of interaction between I&M and O&E.

I&M - interaction with - O&E	O&E Procedures/instructions
	O&E safety induction procedure.
	O&E work permit and traffic restriction instructions.
	O&E safety instruction for bridge works
	O&E inspection and maintenance procedure

4.3.6 Interaction with External Agencies and Authorities

Table 4-4 shows the expected overall interaction with external agencies and authorities. There will be a significant interaction with the external agencies and authorities for the normal, abnormal and emergency modes of operation.

External agencies comprise:

- RFI will as infrastructure manager of the railway be operating and maintaining the railway. It is assumed that a number of RFI rules and procedures will be the basis with some adaption to crossing of the bridge. There will be interfaces to SdM with respect to caretaking, inspection and maintenance work on the bridge as well as in case where emergencies interact with the railway traffic.
- ANAS (contracted consortiums) will be operating and maintaining the roads outside the Messina Bridge area. Here ANAS rules for operation and maintenance will apply and it is envisaged that SdM will seek to adapt to these but the presence of the bridge may also induce special procedures for ANAS and local road authorities.

Authorities are:

- Polizia who will let bridge area be contained in normal Polizia work regarding traffic, crime terrorism, and emergencies. Furthermore Polizia and SdM will interact regarding the needs to handle special events on the bridge. It is noticed that *Polizia* shall in the development of instructions and procedures be further detailed into the different Polizia authorities, e.g. Forze dell'Ordine, Polizia Stradale, Carbineri and probably more.
- Similar relations will comprise the Servizio di Pronto and Vigili del Fuoco but only with respect to emergencies.
- Aviazione Civile (Civil Air Force) and Autorita´Marittima (Maritime Authority) will interact with SdM with respect to warning light on the bridge and to the extent that emergencies in air or sea may cause a threat to bridge or vice versa, the bridge may expose air or sea traffic to a threat.
- Protezione Civile and Prefetture are both primarily envisaged to be involved in major emergencies on the bridge, when a disaster has occurred or is threatening to occur.

Common to external agencies and authorities and SdM is that the design of the O&E Manual will require a close dialogue and discussions to clarify the interfaces and the interaction.

Table 4-4 does not show the special interactions, which will exist between external agencies (RFI and ANAS) and the authorities. These parties will together with SdM have to define these interactions in detail.

It is envisaged that the required future process for corporation will comprise:

- Meetings with SdM and external agencies and authorities to clarify basis of needs, interfaces, responsibilities and requirements with respect to operational concept and safety concept.
- Participation in risk forum meetings according to section 5 of GCG.F.06.03 a “Forum for discussing risks” (“Forum per la discussione dei rischi”) will be established in connection with operational risk analysis.
- Detailing of operational concept and safety concept with outline of O&E procedures and instructions interacting with external agencies and authorities.
- Further meetings with discussion of O&E proposal for operational concept and safety concept.
- Operational and safety concept for approval by SdM and external agencies and authorities.
- Start of operation of bridge with regular subsequent meetings with adjustment of operational and safety concept.
- Regular emergency drills and updating of O&E Manual based on experiences from drill and operation.
- Special operational and emergency drills shall be carried out in a period before opening the bridge.

The final O&E Manual will in an annex provide an overview of emergency procedures with external parties with interfaces to the O&E of the bridge. The O&E Manual should at all times involve and be known by the external agencies and authorities, and the O&E Manual should be consistent with procedures and instructions with these parties.

Table 4-4 Interaction between SdM and external parties (overall)

RFI => O&E Interaction	**RFI <= O&E Interaction**	**Procedures**
Apply for safety certificate to bridge Provide safety induction for railway Apply for work permit on bridge Provide work permit for railway Check-in-check-out of bridge Log check-in/check-out Report works Report incident/accident on railway Stop trains/interruption of train traction power Apply for special transport Participate in emergency drill	Provide safety induction Apply for safety certification to rail Provide work permit on bridge Apply for work permit on railway Log check-in/check-out Check-in/check-out railway work Report works Provide assistance Report incidence/accident on bridge Confirm special transport Arrange emergency drill	To be clarified by dialogue with SdM and RFI.
ANAS=>O&E Interaction	**ANAS<=O&E Interaction**	
Coordination of traffic (traffic queue, traffic restrictions, emergency, special vehicle transports) Coordination of maintenance	Coordination of traffic (traffic queue, traffic restrictions, emergency, special vehicle trans.) Coordination of maintenance	To be clarified by dialogue with SdM and ANAS
Polizia=> O&E Interaction	**Polizia<= O&E Interaction**	
Coordination on traffic management Request for check point at toll Priority toll gate for emergency Assistance Assistance Assistance Participate in emergency drill	Coordination on traffic management Facilities for Polizia Make toll gate available Request for assistance due to traffic offenses Request for assistance to security threat Request for emergency assistance Arrange emergency drill	To be clarified by dialogue with SdM and Polizia
Vigili del Fuoco/Servizio di Pronto Intervanto=>	**<=O&E**	
Provide assistance	Request assistance on: Accident assistance (road, rail) Fire assistance (road vehicle, rail vehicle, bridge, building) major emergency assistance Spill of hazardous substance Arrange emergency drills	To be clarified by dialogue with SdM and Vigili del Fuoco//Servizio di Pronto Intervento
Aviazione Civile Autoritá Marittime=>	**<=O&E**	
Require aerial and naval lights Inform on required precaution Inform and act on aerial/maritime threats	O&M aerial and naval lights Adapt to flight/naval accidents (traffic restriction /emergency, pollutions) Adapt to aerial/maritime threats (close bridge)	To be clarified by dialogue with SdM and the authorities.
Protezione Civile / Prefetture =>	**<=O&E**	
Co-arrange plan for major emergencies Co-arrange drills for major emergencies Interaction in major emergencies	Co-arrange plan for major emergencies Co-arrange drills for major emergencies Interaction in major emergencies	To be clarified by dialogue with SdM and Proiezione Civile

4.3.7 Communication

The methods of the communications will be elaborated in the final design phase of the manual in connection with the elaboration of instructions and procedures and the underlying management systems.

However, *Table 4-5* lists the overall means of communication

The lines of communication within O&E organisation and with respect to the external agencies and authorities have to be robust. This means that they shall be described and contain fall-back possibilities in case persons or systems are not available in an emergency.

If the responsible of a task is not available there should be a back-to-back person able to handle the task and if this fails, a superior manager should be available. In terms of communication, this means that in urgent matters the equipment will be telephone, mobile or Tetra radio system. The Tetra system will be applied generally in emergency and take over all communication in case of civil emergencies having the nature of a disaster. Furthermore, the Tetra system will be applied by O&M people out in the field on the bridge. It remains to be clarified how the bridge Tetra system will interact with the system of Polizia and other rescue services.

Events are to be logged in terms of identification of localization of sender and receiver, contents of information, date and time (GCG F.06.01). In case of emergencies and alarms in general, communication in terms of emergency calls and alarms always are fully logged.

It is also assumed that automatic communication of alarms to relevant receivers should be incorporated as a process in the management systems. This should at least be the case for emergency.

The call from emergency phones (SOS stations) is specified to have dial options for OCC, 115, 118, 112 and 113. However, it is recommended that only one dial option for Polizia is realized as this will provide a simpler emergency mean of communication. In any case emergency call shall be coordinated as the emergency call be just as well be carried out by mobile phone.

Although out of scope of the O&E Manual, it is finally assumed for public information that SdM will apply communication media in terms of RDS-TMC on FM radio in the region and Internet information in connection with corporation with ANAS and other external agencies and authorities.

Table 4-5 Overview of communication concepts anticipated to be applied.

Communication	Concept	Mode of operation	Logging
SdM Office telephone	Internal communication & communication with external partners.	Normal and abnormal modes of operation. Dedicated lines from authorities & agencies.	Id of in- and outgoing calls
SOS station	As emergency phone and a fire alarm buttom.	Emergency calls/fire alarm from public	Logging of call/alarm
Bridge I&M phone	User on bridge contacts OCC or SdM office telephone (internal call)	I&M personnel may apply this from special positions on the bridge.	Id of position
Tetra Radio system	Compulsory communication system for I& M and emergency. Radio system may replace telephone/ mobiles in of case emergency. The technical details of Tetra system for emergency is pending.	I&M personnel in normal work. SdM and rescue services in emergency mode.	Logging may be possible
Mobile (call)	Mobile supplement the SdM office telephone and Tetra radio system.	Alternative phone number to SdM officice telephone when required.	Id of calls
Mobile (sms)	No procedure - informal communication	Normal mode of operation for none urgent information.	No logging
e-mail	Use of out of office facility is compulsory.	For none urgent information.	IT Logging
Hand carried mail	Copy of all incoming and outgoing mail	Normal mode of operation	Archived
SCADA message	Passive information which is the OCC operators responsibility to receive.	Normal mode of operation for none urgent information.	Logging by IT system
SCADA alarm	Visual and auditable alarms requiring a receipt of all intended receivers/operators	Abnormal or emergency mode of operation.	Logging by IT system
SdM Intranet	Passive information available for organisation and external partner	Normal mode of operation for general information of partners	Logging by IT system
SdM Extranet	Passive none-urgent information available for organisation and external partner	Normal mode of operation.General information of external partners.	Logging by IT system
Internet (SdM web page)	Passive none-urgent public information with email facility for contact to SdM	Information of public by SdM home pages+ other public home pages.	Logging by IT system
RDS-TMC (traffic messagechannel)	Traffic and traveller messages	Information of drivers by their car radio receivers	No

4.4 Documentation Control - O&E Manual

4.4.1 Document Handling

The O&E Manual will be store in the SdM database controlled by Electronic Document Management System (EDMS), confer the Quality Management System for SdM.

Document control of procedures and instructions shall be consistent with the quality management control system of SdM. It is assumed to comprise:

- Document number.
- Owner of document with reference to an organisational position.
- Who has prepared the document.
- Who has checked it according to the SdM quality management system.
- Who has approved it according to the SdM quality management system.
- Date of the actual document revision.
- Revision number.
- Page number *n* of *nn*.

This will be further detailed in the manual for the EDMS.

Each procedure and instruction shall refer to other interfacing procedures and instructions in the O&E and I&M manuals. This shall allow for a controlled and easy update of the manuals in terms of changes of procedures or instructions.

The prepared O&E documents shall in the design and executive phase be prepared on behalf of SdM with documentation information within the document control system for the project, ACONEX. After completion of the project, the documents shall be stored in a database by EDMS.

4.4.2 Registered Owners

See preliminary proposal in table in Appendix 1.

4.4.3 When to Update Manual

The procedure for update of manual shall be consistent with the SdM quality management system. The manual shall be updated when there are changes in:

- Operational criteria.
- Operational risks.
- Events, experience or data indicate a need for revision.
- Changes in agreements or contracts with external parties.
- Changes of structures and systems which has consequences for O&E.

When an update has been carried out:

- Updates of the manual shall be distributed to the registered owners.
- Parts of the manual if accessible in the SCADA system or other IT technological system shall also be updated.
- All users of the manual should be trained in a way such that they understand, acknowledge and accept the changes in the manual.

The current revision shall be incorporated as document id for every page of the manual.

4.4.4 Procedures and Instructions

The O&E Manual will contain a number of procedures and instructions for the tasks to keep the bridge safe and efficient in normal/abnormal operational modes and to handle emergencies. O&E procedures and instructions exist in parallel with separate technical procedures and instructions given in the I&M Manual.

Table 4-6summarizes the general concept of O&E procedures and instructions. A procedures addresses *When*, *Who* and *How* with instructions providing the step-by-step guidance. An instruction focuses only on *How* in terms of step-by-step guidance.

Table 4-6 When-who-how procedure-instruction concept

Procedure *task description*	**When**	Event driven or pro-active action				
	Who	*nn1*	*nn2*	..	..	*nn_N*
	How	*Do x*	*Do y*	..	..	*Do z*
	Instruction *a detailed step-by-step guidance*	*Step 1..3*	*Step 1..3*	….	..	*Step 1..3*

A procedure comprises instructions for more than one party/actor/personnel and describes the combined interactions for solving the overall tasks of the procedure. The contents of an SdM O&E procedure are:

- **Owner**: Owner and therefore overall responsible for the procedure.
- **Title:** A heading describing the contents of procedure
- **Purpose:** Overall purpose of the procedure outlining the overall task and intended result and **When** to do it.
- **Assumption:** Definition of the conditions on which the instruction shall be applied.
- **Tasks:** Explain the scope and responsibility of the parties required for carrying out the procedure:
- **Who**, **What** to do and **How-to-do-it**
- **References:** References to instructions, procedures and informative documents, including any relevant references
- **Enclosures:** Enclosures of attached documents needed for carrying out the procedure.

SdM **O&E-ProXXX**

Owner: Staff Role /Service Name *Procedure Name*

PURPOSE	Overall purpose of the procedure outlining **When** to carry out a procedure with the aim of obtaining a certain **Result**	
ASSUMPTION	Basic assumptions about the application of the procedure	
TASK	Description of the overall task in detail. Insert process diagram/illustrations appropriate.	
WHO	**WHAT TO DO**	**HOW-TO-DO-IT**
Responsible 1	✓ Responsibility for Sub task 1	✓ Step by step instructions or reference to separate SdM O&E Instruction.
Responsible 2	✓ Responsibility for Sub task 2	✓ Step by step instructions or reference to separate SdM O&E Instruction.
Responsible 3	✓ Responsibility for Sub task 3	✓ Step by step instructions or reference to separate SdM O&E Instruction.
References:	References to interface documents and informative documents.	
Enclosures:	Enclosures of attached documents needed for carrying out the procedure. E.g. a step-by step instruction or a reporting form to be filled out.	

Prepared	nnn		Date	xxxx
Checked	mmm		Revision	x
Approved	aaa		Page	1 of 1

Special SdM O&E Instructions will be prepared according to a standard table of contents.

An instruction is dedicated to a single actor/party/personnel and describe the required task step-by-step. Instructions are replaced by standard manuals in case a suited manual exists for the user interface to a system or piece of equipment. The contents of an instruction are:

- **Owner**: Owner and therefore overall responsible for the instruction.
- **Title:** A heading describing the contents of the instruction.
- **Purpose:** Overall purpose of the instruction outlining the overall task and intended result and **When** to do it.
- **Assumption:** Definition of the conditions on which the instruction shall be applied.
- **Tasks:** Explain the task of the instruction step-by-step:
- **References:** References to Instructions, procedures and informative documents, including any relevant references
- **Enclosures:** Enclosures of attached documents needed for carrying out the procedure.

SdM **O&E-Instruction XXX**

Owner: Staff Role /Service Name *Instruction Name*

PURPOSE	Overall purpose of the instruction outlining **When** to carry out a procedure with the aim of obtaining a certain **Result**
ASSUMPTION	Basic assumptions about the application of the instruction
TASK	Description of the overall task in detail Step 1: Step 2: Step 3: Insert illustrations as appropriate.
References:	References to interface documents and informative documents.
Enclosures:	Enclosures of attached documents needed for carrying out the procedure. E.g. a sketch or a reporting form to be filled out.

Prepared	nnn		Date	xxxxx
Checked	mmm		Revision	x
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4.4.5 Development of Procedures and Instructions

The development of procedures and instructions has and shall be carried out in a systematic and transparent way:

- Basis shall be an event tree showing which event or events the procedure or instruction cover, cf. Figure 4-4. The procedure or instruction shall thus handle the consequences associated with the event.
- The event tree shall be taken from the long-listing of events for normal, abnormal or emergency events. An event is describing an operational situation or condition.
- Some events representing important hazards will have been analysed in the operational risk analysis where assumptions regarding design and O&E procedure and instruction may have been defined. O&E procedures and instructions will comply with these assumptions.
- The remaining events will be analyzed in detailed as part of the development of the operational concept.
- As general basis a Safety Concept report ensures consistency between design of structures, systems and manuals as it makes general assumptions about safety transparent.
- Each procedure and instruction shall be adapted to the response times required by SdM and agreed with authorities and external agencies, cf. 4.1.1.
- In procedure and instructions, the application of management system or special equipment shall be address with the required reference to dedicated user manuals, if relevant.

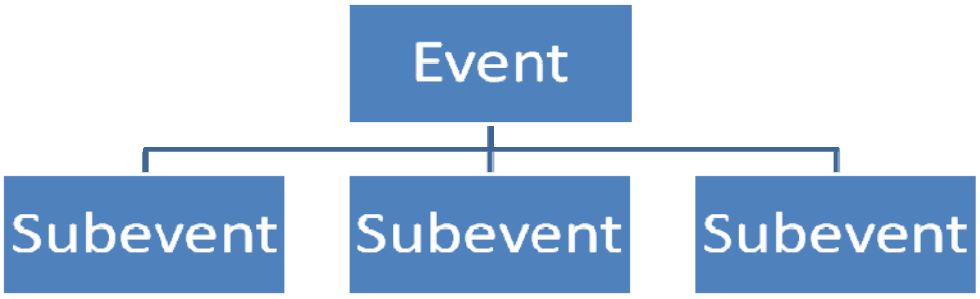


Figure 4-4 Event three shall be the basis for development of procedures and instructions.

- Background and assumptions for procedures and instructions shall be listed.

- A process diagram shall be specified showing the order of tasks and interaction between different parties and will thus provide the structure and order of separate tasks and commands, cf.

Figure 4-5 A procedure/instruction will be design based on a description of a process of tasks and commands.

- Paradigms for procedures and instructions will be followed and provide the framework of procedures and instructions.
- Language in procedures and instructions shall be simple and short sentences with imperative statements. Concepts shall be sufficiently defined to ensure an unambiguous translation from English to Italian.
- The procedures and instructions shall be kept short and concise.
- New issues/question coming up as a result of the development of a procedure/instruction shall be listed and raised to clarification.
- The procedure/instruction shall be given a document number when the number system has been decided.

RESULT OF THE DEVELOPMENT OF A PROCEDURE/INSTRUCTION WILL BE:

- Background documentation may comprise: Event tree marking, process diagram, background data, assumptions, risk/operational analysis, clarifications of raised issues/questions.
- Completed O&E procedure/instruction.

5 Operational Plan

5.1 Operational Objectives

Operational objectives are:

- Keep the bridge open for fluent road and railway traffic and clear of any obstacles
- No unplanned interference with road and railway traffic
- Effective operation of all tasks for the bridge
- For normal mode operation, comply with planned schedules of tasks
- Fulfilment of defined response times on abnormal and emergency events.

5.2 Operational Principle

OCC provides 24 hours operational supervision and control of the bridge.

The tasks contained in a procedure or an instruction, are always triggered by an event or a planned schedule of tasks. The event may or may not be due to planned operational decision or an unwanted event such as realized hazard.

Each O&E task is categorized into:

- Normal operation (green)
- Abnormal operation (yellow)
- Emergency operation (red).

The railway traffic management principles are decided by RFI, which is the infrastructure manager of the railway. Through a dialogue with RFI, additional principles and rules will be necessary to obtain consistency with the present Operation and Emergency Manual of the bridge. This will be part of the work in the final design phase.

RFI traffic management will provide procedures for special or dangerous transports.

RFI will provide procedures for inspection and maintenance consistent with the general principles for operation and emergency of the bridge.

5.3 Operational Contents

O&E Manual covers a number of work processes of the operation and maintenance of the bridge excluding the Management Process:

- O&E Administration (supportive process)
- Operational Control Centre works (supportive process)
- Bridge Safety & Security works (supportive process)
- Toll works (supportive process)
- Inspection & Maintenance works (supportive process)
- Environmental Control (supportive process)
- Road Traffic (main process)
- Rail Traffic (main process)
- Marine Traffic (secondary process)
- Airplane Traffic (secondary process)

Procedures for events and actions related to each process describe required tasks involving several actors/parties or personnel.

Instructions are only aimed to be applied by a single actor/party/personnel and contain a step-by-step instruction with a narrow perspective of carrying out a certain sequences of well defined actions.

Instructions are supplemented by user manuals/guidelines dedicated for the user interface of certain systems or piece of equipment.

5.4 Command and Control in Operational Control Centre (OCC)

Overall operational principles:

- There is always a person (team leader, or one of his assistants) in charge of command and control in OCC. This person manages the OCC work and ensure proper manning, clarify questions on actions and provides the overall OCC command and control in emergencies.
- Policia has the authority of road traffic, all matters regarding offenses and is in control and command of all emergency cases. OCC complies with the commands of Policia in the management of traffic and emergency.
- RFI rules for operation, maintenance and emergency on the railway apply but with additional procedures and instructions related to the railway located on the bridge in vicinity of road traffic, bridge maintenance and with exposure to potential severe weather.
- The space confined by the barriers of the railway shall be considered as a restricted high risk area. Presence within the barriers of railway, e.g. stay on the platforms requires the additional permission of RFI. Any work within these barriers requires additional permission of RFI.

5.5 Position System of Bridge

I&M Manual defines the positions of all elements of the bridge structure such that operation and emergency actions can be defined and directed with reference to these in an unambiguous way. As-built-documentation shall be available through the Bridge Management System (BMS) managed by the Inspection & Maintenance organisation.

5.6 Automatic Information and Remote Control

OCC will be supported by a number of monitoring, control and management systems. These systems provide the operator with information, alarms, remote controls and in some cases also with decision support through automatically performed analyses and forecasting.

Table 5-1 lists the control parameters for the bridge, which will assist the operators in carrying out their tasks of the O&E Manual.

The monitoring and control systems shall to the extent it is relevant, have the O&E procedures and instructions incorporated so that they will be accessible through the user interface of the systems.

Other tools, which may assist the operator, are:

- Weather forecasting system
- Traffic forecasting system
- Bridge Management System (BMS) with access to as-built documentation, supports management of maintenance works and provides a user interface to provide and access status of work orders.

In addition to systems associated with the bridge, OCC will interact with the information and controls of the infrastructure elements with interfaces to the bridge and its traffic:

- Elements of the SdM tunnel and road network
- Road network intersecting with the SdM network
- RFI railway network as RFI operates and controls the railway across the bridge.

This interaction is planned to be clarified in the final design phase.

Table 5-1 Overview of OCC information, alarm and remote control parameters in control room.

**) Information to be confirmed by Eurolink*

Control parameters	Information	Alarm	Remote Control
Traffic Management System			
Variable Message Signs (VMS)	Yes	No	Yes
Lane Control Signs (LCS)	Yes	No	Yes
TV	Yes	No	Yes
Automatic incident detection (CCTV)	Yes	Yes	Yes
Automatic number plate recognition	Yes	Yes	No
Emergency traffic gates (movable barriers)	Yes	No	Yes
Retractable barriers to crossovers (railway)	Yes	No	Yes
Weigh in-motion system	Yes	Yes	No
SCADA			
Power management system	Yes	Yes	Yes
Roadway lighting system	Yes	Yes	No
Technical area Lighting	Yes	Yes	Yes
SHMS (inc. weather parameters, structural load)	Yes	Yes	No
Fire detection	No	Yes	No
Fire hydrant system	No	No	No
Navigation Light	No	Yes	No
Aircraft Warning Light	No	Yes	Yes
Dehumidification System	Yes	Yes	Yes
Drainage	No	No	No
Safety Systems			
Intrusion Sensors	Yes	Yes	No
CCTV - anti-sabotage and terrorism	Yes	No	Yes
Railway Traffic Management System			
Train entrance on bridge	Yes*)	No*)	No*)
Train exit of bridge	Yes*)	No*)	No*)
Train weight	Yes*)	Yes*)	No*)
Type of train goods?	Yes*)	No*)	No*)
Train emergency	Yes*)	Yes*)	No*)

5.7 Overall Handling of Ambient Conditions

Table 5-2 shows the overall preliminary proposal on criteria on ambient conditions on which the management of road traffic will be based. Procedures and instructions will provide the detailed actions. RFI shall carry out a similar assessment on the ambient conditions for railway operation in corporation with SdM.

Table 5-3 shows the overall preliminary proposal on criteria on ambient conditions for carrying out various operational field works and I&M works on the bridge. Procedures and instructions related to health and safety will provide the detailed actions. RFI is assumed to carry out a similar health and safety assessment on the ambient conditions for railway maintenance in corporation with SdM. Confer also subsequent section on health and safety.

Table 5-2 Ambient conditions related to modes of operation for road traffic (preliminary criteria to be settled in the final design phase together with a dialogue with owner and authorities).

Impact\Operational mode	**Normal Mode**	**Abnormal Mode**	**Emergency Mode**
Road Traffic Management	**No action**	**Warning/speed restriction**	**Warning/speed restriction /closure of bridge**
Cross winds (10 min. North-South)	NORMAL WIND <10 m/s	MODERATE WIND 10-25 m/s	HEAVY WIND >25 m/s
Rain	LIGHT RAIN < 6 mm/hour	MODERATE RAIN 6-50 mm/hour	HEAVY RAIN >50 mm/hour
Hail showers	LIGTH HAIL Sparse with rain	MODERATE HAIL Ground whiten/6 mm hails	-
Visibility	NORMAL VISIBILITY >500 m	REDUCED VISBILITY 100-500 m	NO VIBILITY <100 m
Road temperatures	NO ICE RISK >3 ^{o} C	ICE RISK < 3 ^{o} C	-
Earthquake (after occurence)	NO DAMAGES PGA<1.2 m/s2	MINOR DAMAGES 1.2 m/s2<PGA<2.6 m/s2	SEVERE DAMAGES >2.6 m/s2
Visual disturbances (accidents, intruders, oscillating structures, Etna eruption, fires on land, ship traffic etc.)	NORMAL OPERATION No impact on traffic speed	VISUAL DISTURBANCE Slow down/congestion	-

Table 5-3 Ambient conditions related to modes of operation for various operation field works and I&M works on the bridge (preliminary criteria to be settled in the final design phase).

Impact\Operational mode	**Outside locations**	**Safe Field Work**	**Non-Safe Field Work**	**Work in Emergencies**
Mean wind speed (10 min. North-South, z m msl.)				
	Deck level	<20 m/s	>20 m/s	
	Deck level, inspection gantry	< 15 m/s	>15 m/s	
	Main cable	< 10 m/s	> 10 m/s	
	Outside surfaces pylon, gantries	< 10 m/s	> 10 m/s	
Rain	Main cable	No expected rain	Expected rain	
	All other locations	< 50 mm/hour	>50 mm/hour	
Hail showers				
	Main cable and gantries	No expected hails	Expected hails	
	All other locations	At most MODERATE HAIL Ground whiten/6 mm hails	HEAVY HAIL Ad hoc decision	
Lightning				
	All outside locations	No lightning risk	Lightning risk	
Visibility at location				Ad hoc decision based on emergency management (polizia).
	Deck level	NORMAL VISIBILITY >500 m	REDUCED VISBILITY 100-500 m	
	Deck level, inspection gantry	At worst REDUCED VISBILITY 100-500 m		
	Main cable	NORMAL VISIBILITY >500 m	REDUCED VISBILITY 100-500 m	
	Outside surfaces pylon, gantries	NORMAL VISIBILITY >500 m	REDUCED VISBILITY 100-500 m	
Temperature road level				
	Deck levels	-	-	
	All other locations	NO ICE RISK >3 ^{o} C	ICE RISK <3 ^{o} C	
Chilliness factor				
	Outside locations	>0 ^{o} C	< 0 ^{o} C	
Heat factor				
	Outside	< 25 ^{o} C	> 25 ^{o} C	
	Inside	< 25 ^{o} C	> 25 ^{o} C	

5.8 Road Traffic Management Plan

An overall traffic management plan will be designed for entire SdM road network as a separate task outside the O&E Manual. This traffic management plan will also be basis for operation and emergency of road traffic of the bridge. The plan is not yet available and preliminary the O&E Manual assumes the overall principles stared in the following.

The overall traffic management will determine common principles for traffic management and ensure that the management is coordinated for the entire SdM road network and the adjacent ANAS road network. The need for this is clear as events in another part of the SdM or ANAS road network may influence the traffic on the bridge and at the toll station. Vice versa, events associated with the bridge may influence the road traffic on other parts of the road network.

Operational principles for traffic management comprise:

- 24 hours traffic monitoring (surveillance, automatic incident detection, weigh-in motion, vehicle counting)
- Automatic traffic information and control in normal mode by information of road vehicle drivers through traffic portals and signs.
- Traffic information and control in abnormal mode by traffic portal assisted by road patrol. Policia controls redirection of traffic. Further messages may be forwarded through broadcasting network (RDS) and through the information channels by ANAS.
- Traffic information and control in emergency mode by traffic portal assisted, traffic emergency gates, toll station assisted by road patrol. Policia controls redirection of traffic.
- Special vehicles to obtain permission from OCC by application in writing. Special vehicles shall check-in and check-out with OCC before crossing the bridge.
- Traffic management principles shall always be coordinated within the SdM road network and coordinated with the road network interfacing the network of SdM.

The O&E instructions and procedures related to traffic management will be detailed based on the above principles and the overall traffic management plan for the SdM road network.

5.8.1 Traffic Information, Warnings and Restrictions

Table 5-4 provides the restrictions to be imposed on road traffic when certain events occur in normal mode, abnormal mode or emergency mode.

Table 5-4 Outline of traffic management parameters for control of traffic. Preliminary proposal awaiting overall traffic management plan of SdM road network.

Event	**Warning**	**Slow lane**	**Fast lane**	**Vehicle**
Normal mode				
No restrictions	None	110 km/hr	110 km/hr	-
Abnormal mode				
High cross winds	Yes	To be settled	To be settled	No light vehicles
Heavy rain	Yes	To be settled	To be settled	-
Low visibility	Yes	To be settled	To be settled	-
Poor road	Yes	Ad hoc	Ad hoc	-
Special vehicle transport	If needed	Ad hoc	Ad hoc	To be settled
Vehicle on halt	If needed	Ad hoc	Lane closed	
Lane closed	Yes	-	-	-
Maintenance work	Yes	Details to be settled in relevant procedure	Details to br settled in relevant procedure	-
Emergency				
Person on road	Yes	Ad hoc	Ad hoc	-
Accident emergency lane	Yes	Ad hoc	Ad hoc	-
Accident slow lane	Yes	To be settled	To be settled	-
Accident fast lane	Yes	To be settled	To be settled	-
Fire	Yes	To be settled	To be settled	-
Railway accident	If needed	Ad hoc	Ad hoc	-

5.8.2 Traffic Sign Portals

Eight portals are placed on the bridge in each direction. One portal are placed at each tower in each direction. The distance between the portals is approximately 470 m with shorter distances at the middle of the bridge and longer near the end of the bridge. Figure 5-1 shows the principle of a portal. The lane control signs are used to direct the normal traffic lanes, and if needed traffic in the emergency lane.

Each portal has the following traffic management functions:

- Traffic regulation (speed limits and other restrictions)
- Expected travel duration
- Warnings on driving conditions (congestion level, condition of road, visibility, wind)
- Maintenance work warning
- Road incidents warning
- Emergency on road warning

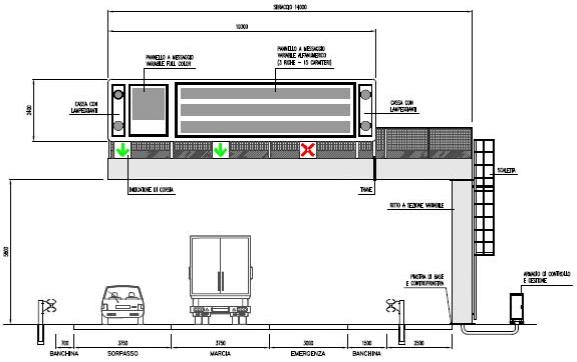


Figure 5-1 Portal with variable message signs(VMS) and lane control signals (LCS) (design to be verified).

5.8.3 Redirection of Traffic

Traffic may be redirected in case of an abnormal or emergency mode of operation with an impact on traffic.

Table 5-5 Overall redirection principles.

Traffic Restriction	Mitigation option 1	Mitigation option 2	Mitigation option 3
Local lane closure (closure over a given distance)	Traffic warning	Road patrol on spot warning/management of traffic.	TMA protection and temporary barriers at local position
One lane closure	Traffic warning. Only traffic in one lane with temporarily barriers.	Use of emergency lane with temporarily barriers.	-
Two lane closure (driving direction closed)	Traffic warning. Toll station closed and traffic emergency gates closed	Redirection of traffic to emergency parking or turn-around of traffic	Two-way-traffic on one bridge carriageway, cf. 5.8.5
Bridge closed	Traffic warning. Toll station closed and traffic emergency gates closed	Redirection of traffic to emergency parking or turn-around of traffic	Application of ferries (long-term closure of bridge)

5.8.4 Carriageway Emergency Gates

The bridge is supplied with traffic emergency gates which by remote control can be closed in case of emergency.

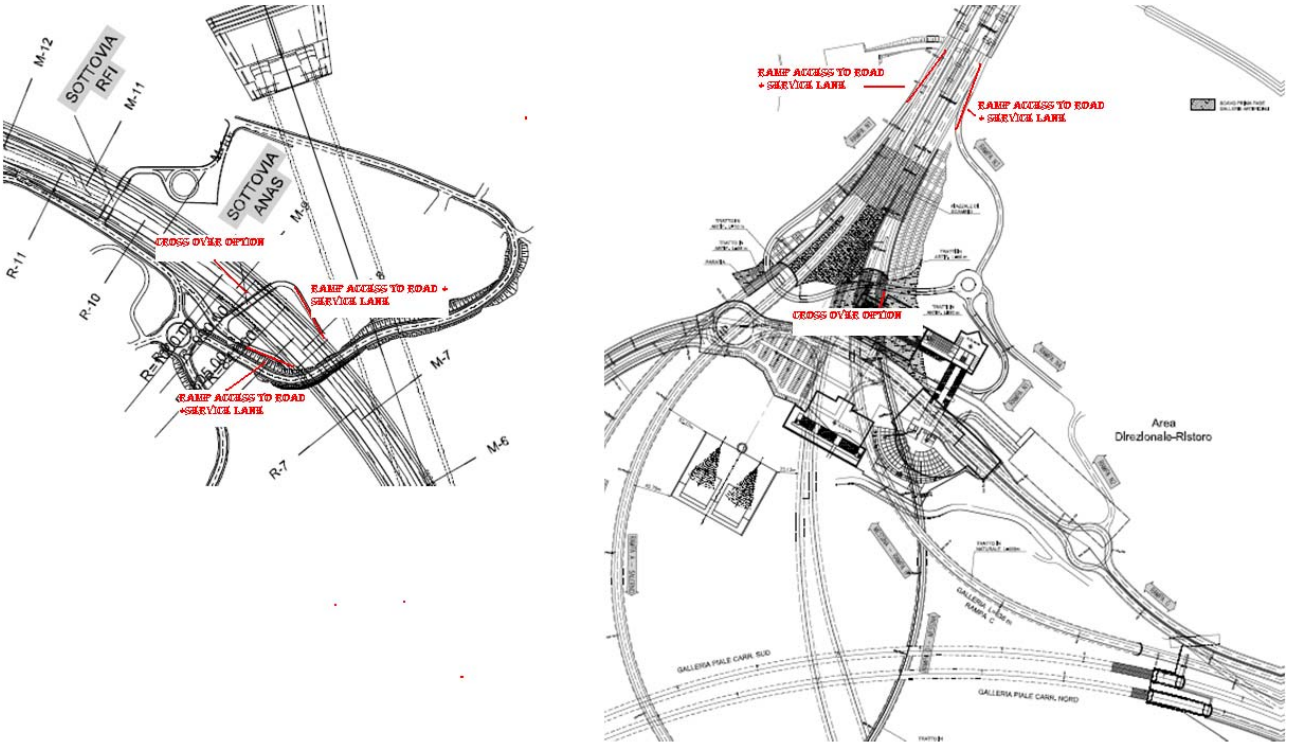
The carriageway is supplied with a traffic emergency gate at the towers to prevent the traffic entering the main span.

The toll station also provides a traffic emergency gate for the traffic from Sicily towards the bridge, which can be applied to close the bridge for traffic.

It is further assumed that there also exist traffic emergency gates associated with the tunnels being part of the SdM network.

5.8.5 Road Cross-over and Looping Facilities

Figure 5-1 shows for the Sicily as well as the Calabria side, available cross-over/loop routes. Both cross-overs allow emergency and maintenance vehicles to return before the terminal structure (and before the toll station). Also normal road traffic can be redirected through the available loops.



Figur 5-1 Ramps to road and service lane with loops allowing cross-overs before and after bridge. Left: Sicily Side, Right: Calabria side (to be verified).

It will also be possible to make cross-over for vehicles from one driving direction to the other at two cross-over positions of the main span. As this require stop of railway traffic, this requires an

emergency or a maintenance work which can justify stop of train traffic. The decision to use the cross-overs is anticipated to be based on an ad hoc decision.

The two positions at 435 m from central node have barriers, which can be removed to allow cross over of the railway. This opening system in the barriers is assumed to be a fail-safe system connected to the railway interlocking systems ensure setting train traffic on halt in case a barrier is opened *(to be clarified with RFI).*

5.8.6 Parking Space for Stranded Vehicles

In case of bridge closure, there shall be emergency parking space available for the stranded vehicles, and it shall be possible to redirect the traffic out of the queue away from the bridge. *This is outside the scope of the present work of the O&E Manual.*

5.9 Toll Station Work Plan

The toll station work plan is managed by a team leader on duty with reference to the OCC team manager in charge.

A weekly planning shall contain:

- Traffic forecast (ordinary traffic and special vehicles)
- Number of gates to be in operation over 24 hours for each week day
- Number of staff required in shift over 24 hours for each week day
- Number of required back-up staff
- Planned maintenance of toll gates
- Daily adjustment of plan depending on traffic forecast adjustment and incidences.

Toll station operation shall continuous be coordinated with ANAS road network administration with interfaces to the SdM network.

5.10 Security and Safety Plan

Table 5-6 provides an overview of the security systems on the bridge.

Operational principle: The security and safety plan handles any external threat to the bridge, its users and its employees. 24 hours manning plan shall exist with OCC. Areas near the approaches to the bridge and near the towers have been provided with the automatic incidence cameras.

Table 5-6 Overview of security systems.

Security equipment	**Security Equipment cf. Drawing no.**
General	*On- land: Intruder detection* *Bridge: Anti-terrorism CCTV detection of approaching aircrafts and sea vessels and other objects.*
Road girder	*Incident detection. In girders access control and fire detection.*
Railway girder	*Train access/exit detection and train weight monitoring. In girder access control and fire detection.*
Service lane	*Barrier as access control for traffic.*
Tower	*Lift alarm system and access control. Fire detection in technical rooms.*
Main cable	*n/a*
Terminal structure	*To be elaborated by Eurolink.*
Anchor block	*Fire detection and access control*
OCC building	*To be elaborated by Eurolink.*
Toll station	*To be elaborated by Eurolink.*
Access roads and fences	*To be elaborated by Eurolink.*

5.11 Environmental Plan

General reference is made to the environmental plan of SdM, which is outside the scope of O&E Manual.

Environmental emergencies are comprised by emergency procedures.

All work shall be based on a work permit approved by Technical Manager/OCC Manager concluding also on risk with an environmental impact. Approval shall comply with the employments organisational reference in SdM.

5.12 Health & Safety

General reference is made to the health & safety plan of SdM, which is outside the scope of O&E Manual.

Principles assumed for the O&E Manual are:

- All employees, hired contractors, consultants, RFI staff to work on bridge, and staff of emergency services shall have completed a safety induction.
- All work shall be based on a work permit approved by Technical Manager/OCC Manager. Approval shall comply with the employments organisational reference in SdM.
- Criteria for safe work on bridge comply with the overall H&S policy of SdM.

Notice: It is proposed that for people in the field on the bridge, there should be some welfare installation at each cross beams of each towers a small enclosure should have facilities such a small wash basin, a toilet and a cooled rest area. Such welfare facilities will contribute not only to health and safety but also proactive to safety as it will provide workers with better conditions for rest and also having a suitable area in case of placing injured or un-well persons. Such welfare facilities may also be required from Italian law.

5.13 Inspection and Maintenance Plan

Primary principles:

- Inspection and Maintenance are to be carried out in accordance with the Inspection & Maintenance manual.
- Inspection and maintenance shall comply with the operational procedures and instruction regarding coordination of work, impact on road and railway traffic, H&S requirement and environmental requirements.

- OCC has through Bridge Management access to work orders and as-built-documentation.

5.13.1 Dedicated Locations for Maintenance Vehicles

Dedicated locations for maintenance vehicles (and emergency vehicles if needed) comprise:

- Service lane in the two driving directions separated from road traffic and with no access to road (current status of design) and internal of girders and towers. The railway is assumed not to be accessible through the internals of cross beams connecting the three girders but will have to accessed by the four service areas/cross overs from the road *(to be verified).*
- Towers, terminal structures and anchor blocks will be accessible from dedicated service roads in terrain *(to be verified!)*

  Railway maintenance, and if needed emergency vehicles will have the option of parking at one of four service areas/cross overs accessible from the fast lane in both driving directions *(safe access to these areas to be verified).* Service areas may also be used for parking of equipment.

5.14 Competencies, Training and Drills

Recommendation: We recommend the tasks outlined in this Chapter are included and detailed in the final O&E Manual. The tasks are not mentioned in F.06.05 and are outside the scope the contract (Eurolink/COWI). Eurolink to clarify with SdM whether these issues shall be included in the detailed design phase.

5.14.1 Competencies for Each Position in the Organization

Each position in the organisation should be described with requirement to the competencies regarding education, language, experience and personal capabilities. The competency requirements are parts of the scope of SdM human resource function and are outside the scope of this contract.

5.14.2 Training of O&E Personnel

Training in each position should be carried out according to a defined programme before any employee is placed to act on his own in a position. The training requirements are part of the scope of SdM human resource function and are outside the scope of this contract.

First aid training and fire fighting shall be mandatory.

5.14.3 Emergency Drills

A programme containing emergency drills should be planned and carried out on a regular basis. Emergency drills should contain ordinary emergency events such as car crashes as well as major emergency events.

The purpose of the programme is to test the operational routines in an emergency in close corporation with external agencies and authorities. The planning and program of emergency drills is outside scope of this contract. A procedure should be set-up for carrying out such drills. This should be carried out in close corporation with Protezione Civile, which requires that SdM provides an opportunity for corporation and dialogue on this topic.

5.14.4 Common Forum for Discussing Risks and Emergency Procedures

According to section 5 of GCG.F.06.03 a “Forum for discussing risks” (“Forum per la discussione dei rischi”) will be established in connection with operational risk analysis. Similarly for the design of the Operation and Emergency Manual, a dialogue shall according to GCG.F.06.05 be performed with authorities and external agencies with respect to the Operation & Emergency Manual.

It is suggested that this dialogue is commenced when SdM find it appropriate.

It is suggested that SdM arrange the risk forum to be a common permanent forum also in the operational phase for developing organisations, and agreement on corporations, common procedures for emergencies, and for identification of need for modifications or update of assumptions regarding risk and emergency.

5.14.5 Audits

It is assumed that a quality management system will exist for the SdM organisation. As part of this system, audits will be carried out on regular basis of the O&E organisation. The SdM quality management system is outside the scope of the O&E Manual

6 Emergency Plan

Figure 6-1 shows the safety chain on which the safety concept for the bridge is based. Overall principles for handling emergency:

1. Policia has the control and command of emergency actions.
2. Procedures and instructions for normal and abnormal modes of operation shall aim in preventing emergencies. Procedures and instructions for emergency modes shall seek to avoid losses of human lives and injuries, loss of value and minimize the interruption of traffic.
3. The bridge design and systems will together with guidance to users and training of employees aim at people being able to escape and get access to first aid.
4. The underlying safety concept behinds the bridge design provides the necessary facilities for escape, access, and allows emergency services to carry out the required actions.
5. Technological systems and equipment allow for optimal mitigation together with an adequate design of the bridge.
6. All emergencies shall be logged and an SdM accident form, confer annex of this manual shall be completed. The SdM accident form supplements the accident registration of Policia. The logged emergencies and accident data shall be used for the on-going evaluation of the operation of bridge.
7. *Table 6-1* and *Table 6-2* provide an overview of the available emergency services. When a detailed dialogue with the authorities has been carried out in the detailed design phase, the tables can be further detailed with respect to the key players, and contacts can be placed in Appendix 2 if this is plausible.

8. Also when the details of the corporation with authorities have been settle, an overview of the most important external emergency procedures shall be given in Appendix 3, and these procedures should be made available for SdM.

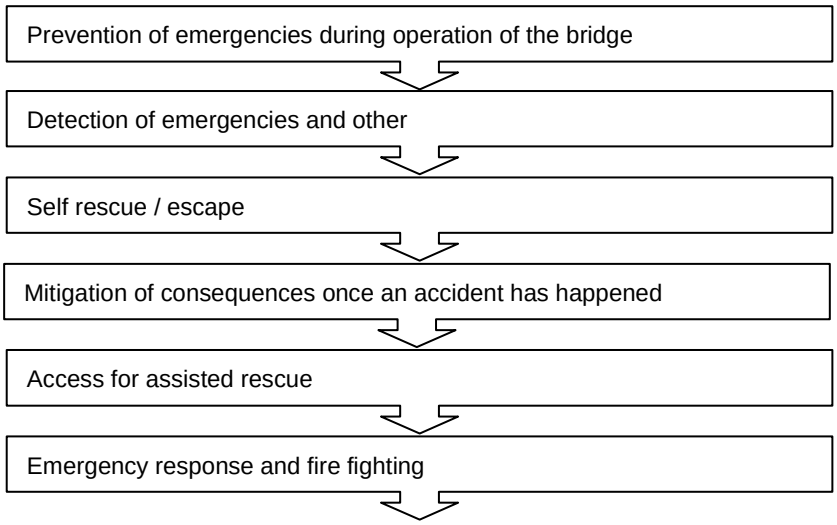


Figure 6-1 Safety chain for handling emergencies.

Table 6-1 Overview of emergency organisation

Emergency	Communication call	Control & command	Rescue	Evacuation	Primary Technical assistance	Other external assistance
Road	113	Policia	*Vigili del fuoco* /Road Patrol	*Servizio di Pronto*	Road patrol/OCC	*Servizio di Pronto* / *Vigili del fuoco*
Railway	113	RFI/Policia	*Vigili del fuoco*	*Servizio di Pronto or by arranged bus/train*	Road Patrol/Caretaker unit	*Servizio di Pronto* / *Vigili del fuoco*
Employee	113/OCC	*Vigili del fuoco*	*Vigili del fuoco*	*Vigili del fuoco*/ *Servizio di Pronto*	Technical Manager	*Servizio di Pronto*
General fire	113//OCC/Alarm	Policia	*Vigili del fuoco*	*Vigili del fuoco* / *Servizio di Pronto*	OCC/Technical Manager	*Servizio di Pronto*
Environment	113//OCC	Protezione Civile	*Vigili del fuoco*	Polizia	OCC/Technical Manager	VTS (Stretto di Messina)
Severe Earthquake	Civil emergency based on Tetra Radio System	Protezione Civile	*Vigili del fuoco*	Polizia	OCC	*Servizio di Pronto*
Closure of bridge	'Decision from Policia	Policia	Policia	OCC	OCC	ANAS
Sabotage or threat	113	Policia	Policia	OCC	OCC	*Vigili del fuoco*

Table 6-2 Overview of emergency services

Emergency Service	**Sicily Side**	**Calbrai Side**
Carabinieri	Stazione Di Ganzirri- Via Lago Grande, Messina	Comando Compagnia Villa S. Giovanni, Via Marina Arenile, 38, 89135 Reggio di Calabriam 10 km from bridge.
Polizia Municipale	Comune Di Messina Sez Marittima- Via Consolare Pompea, Messina	Municipio Villa S. Giovanni Via Solferino, 15, 89018 Villa San Giovanni Reggio di Calabria, located 2 km from bridge.
Polizia Stradale	Polizia Stradale Messina Via Raffaele Villari 1 98123 (MESSINA - ME)	Piazza Stazione, 1, Villa San Giovanni Reggio di Calabria, located 1 – 2 km from the bridge
Servizio di Pronto Ambulance and ambulance helicopter services.	SUES 118 MESSINA C.da Sperone 98100 Messina	SUEM 118 REGGIO CALABRIA V. Giuseppe Melacrino, snc 89100 REGGIO CALABRIA
Helicopter access at bridge site	Location to be identified (out of scope of O&E Manual)	Location to be identified (out of scope of O&E Manual)
Vigili del fuoco	Distaccamento cittadino di Messina Nord, Viale Annunziata, Messina, 10 km from bridge.	Comando Provinciale Reggio Calabria, Via Sbarre Superiori 115/b, Reggio Calabria, 19 km from bridge.
Hospital	Azienda Ospedaliera Università di Messina, 20 km from bridge	Ospedale Bianchi Melacrino Morelli, 15 km from bridge.

6.1 Access and Escape Routes

Table 6-3 provides an overview of access and escape routes. General drawings and description of the bridge and labelling of positions and labelling of all elements of the bridge can be accessed through the Bridge Management System owned by the I&M organisation.

It is envisaged that the general drawings will provide sufficient information to provide an overview of escape and access routes. The bridge will have a position system in terms of signs on the bridge providing the personnel and others in the field with indication of his position, cf. I&M Manual.

Police and fire fighters units associated to bridge shall always be equipped with keys and access cards for the bridge.

Table 6-3 Overview access and escape routes.

Emergency site	Access and Escape Route cf. Drawing no.	Restrictions
Road	*To be completed*	Emergency lane width: 3.75 m. Escape routes along emergency lane, SOS stations per 500 m.
Service lane	*To be completed*	Lane width: Minimum clearance 2.82 m
Railway	*To be completed*	Platform width:1,5 m on each side of railway. Limited access for wheel chairs at service areas without cross over.
Service area/railway cross over	*To be completed*	Danger from road traffic and railway traffic. Access to cross over allow a normal road vehicles. Service area allows parking of maintenance vehicles, equipment and containers.
Girders	*To be completed*	Ladders, manholes
Tower	*To be completed*	Stair case or ladders if lift fails.
Main cable	*To be completed*	Access via ladder. Walk on cable in case of cradle failure
Terminal structure	*To be completed*	Stair case/ladders
Anchor block	*To be completed*	Stair case/ladders
OCC building	*To be provided by Eurolink*	-
Toll station	*To be provided by Eurolink*	Danger from road traffic, traffic restrictions required.

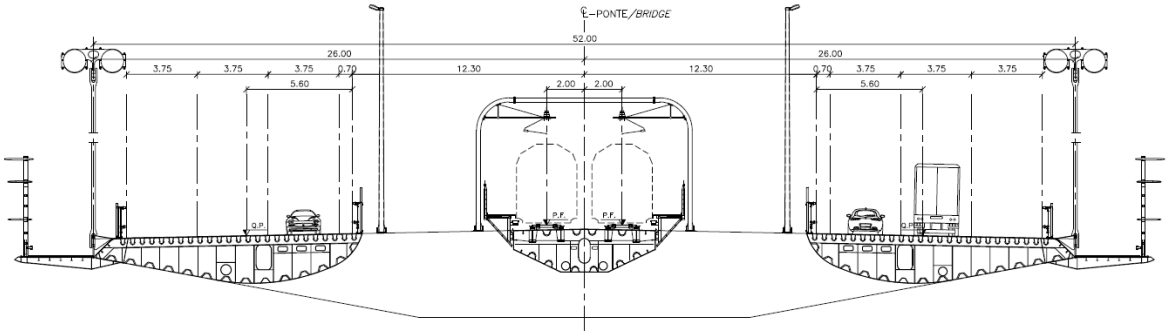
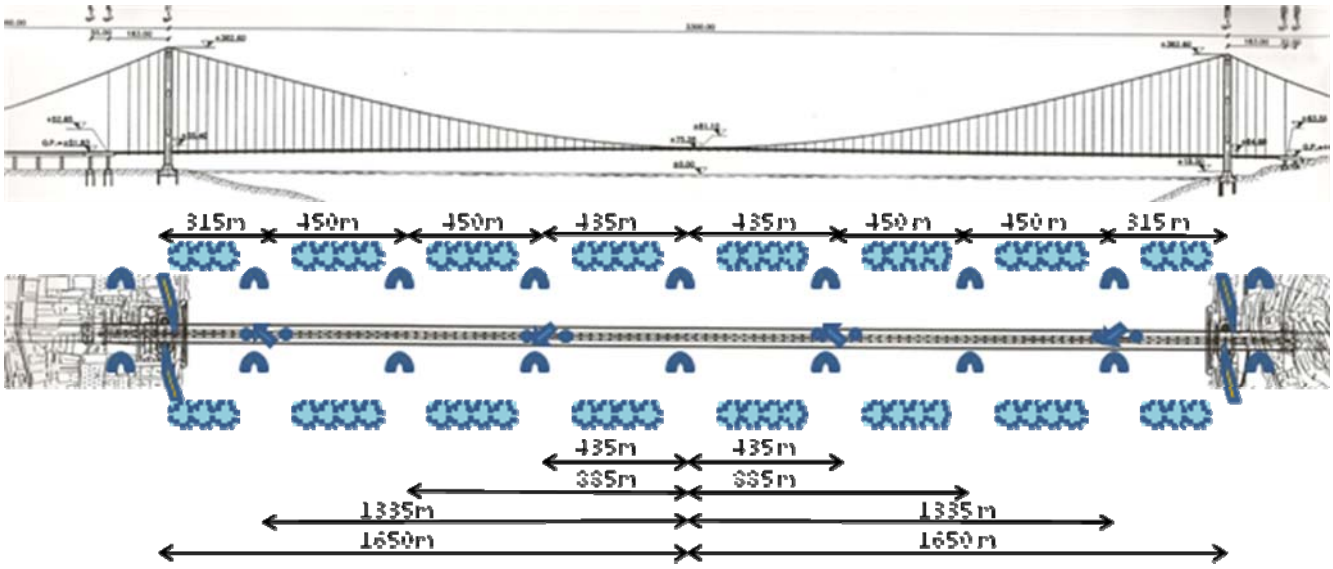


Figure 6-2 Cross of road, longitudinal section.



Emergency traffic gates at towers

Cross-overs or service areas each approximately 900 m

SOS stations

Fire hydrants approximately at 90 m distance (deviating distance at one location in the 435 m section and in the 315 m section.

Figure 6-3. Overview of emergency facilities on road/railway deck

6.2 Road Emergency

An overall traffic management plan will be design for entire SdM road network as a separate task outside the O&E Manual. This plan will comprise emergencies and be the general basis for operation and emergency of road traffic of the bridge, cf. also Section 5.8. The plan is not yet available, and preliminary the O&E Manual assumes the following overall principles:

- Vehicles involved in accidents where no person has been seriously injured shall be positioned in the emergency lane (3.75 m wide,). Rescue assistance to the scene shall be requested and traffic restrictions applied if required. The toll station shall ensure priority gates for emergency vehicles and other assisting vehicles as required.
- If it is not possible to use the ordinary road, access can also be made using the service lane. However maintenance vehicle and equipment on service way must be cleared and the free vehicle access from service gate to emergency shall be controlled by OCC
- A very major road emergency may justify interruption of train traffic, and emergency vehicles use of cross-over facilities over the railway between the two road directions. The two cross over facilities are located 435 m on each side of the mid-span. Use of these facilities requires RFI to stop all railway traffic, and OCC to impose traffic speed and possible lane restrictions on road traffic.
- An instruction will describe interruption of train traction power supply whenever required. Road emergency procedures will refer to this when emergency requires interruption of traction power.

6.3 Railway Emergency

Primary railway emergency principle:

- RFI controls the railway operation and emergency. In case of emergency, RFI shall be contacted for stop of railway traffic.
- Access of emergency services will be from road.
- Escape of railway passengers will be from train to platform to one of the four service areas with access to the road. A service area will be within 450 m of a train at halt. In an emergency, the neighbouring track may be included as escape area, which underlines the

importance of that a railway emergency, when detected, always should lead to an immediate stop of all train traffic in both directions until the extent of the emergency is under control. This is assumed to be contained in RFI standard procedures.

- Emergency light and signs are assumed to be implemented on the railway platforms to allow for safe escape during night.
- Evacuation of railway passengers in case of emergency or technical break down of train vehicles may follow the escape route, or alternative passengers may be evacuated to another dedicated train arriving to the train on halt. Evacuation will be controlled and commanded by the train crew until policia has taken over command.
- Persons with reduced mobility will be guided along the emergency walkway by train crew or other passengers. The walkway can be used by wheel chairs and for transportation of stretchers.
- An instruction will describe interruption of train traction power supply whenever required. Railway emergency procedures will refer to this when emergency requires interruption of traction power.

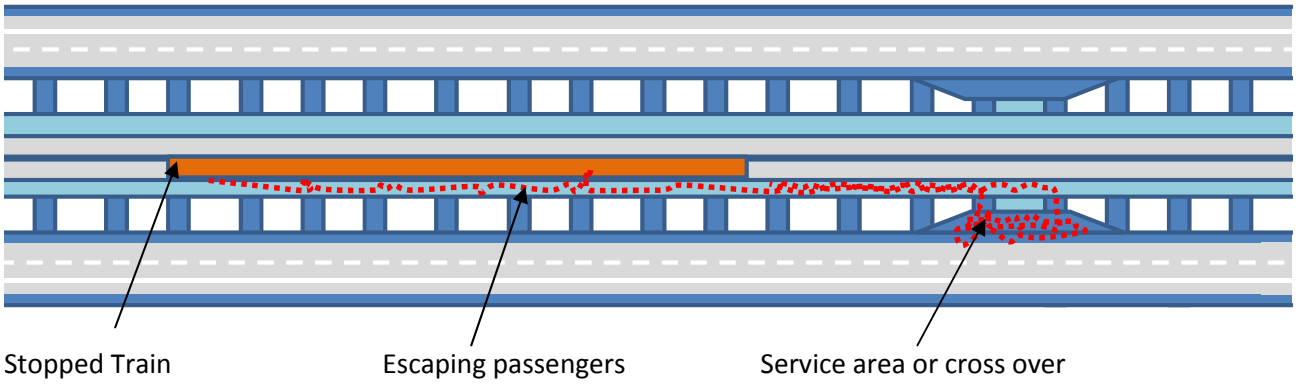


Figure 6-4 Escape strategy for train passengers

Principle for train in fire emergency: A train on fire shall comply with the following principles (*to be confirmed by results of ORA study and clarification by RFI):*

- When a fire is detected, the train shall avoid the risk of stopping in a tunnel.
- For a train in direction of Calabria this means that the train either shall stop before the tunnel or drive through the tunnel. Risk of stop in the tunnel shall be avoided and the length of

tunnel must be considered. The distance from tower to the railway tunnel entrance is roughly 400 meters. *It must be evaluated at which position before the tunnel, the risks of a burning train are smallest.*

- For a train in direction of Messina, this means that train shall stop before the tunnel and drive as close as possible to the tunnel to get free of all bridge structures. There appears to be roughly 1000 m (to be verified) from towers structure to tunnel start. The tunnel, which is about 15 km long, shall not be entered with any indication of fire on a train.

The drive through principle may imply that emergency stop buttons inside the train should be disabled while crossing the bridge (and the tunnels). *This needs clarification with RFI.*

The above emergency principles shall be discussed and detailed in dialogue with RFI.

6.4 General Emergency on Bridge

In case of extensive fire, high winds, earthquake, ship collision, airplane collision or an external treat or attack the bridge may be come closed.

Primary principle: Close the bridge for incoming traffic and evacuate people (users, passengers and employees) from the bridge. The details will be contained in a emergency procedure.

6.5 Fire Emergency

Primary principles:

- Fire on road and railway: Use of fire hydrant system on bridge.
- Fire in railway vehicle: Cf. railway emergency section.
- Fire inside towers: Use of fire hydrant system placed at bottom and at cross beam levels.
- Fire inside girders: Use of fire hydrant system on the bridge deck or manual fire fighting equipment.
- Fire in buildings: Fire fighting in buildings and other on-shore structures follows standard principles.

The fire mains on road and railway deck level are connected to hydrants placed on every fourth cross girder on both sides between the road girder and the rail girder. On each side the distance between the hydrants is maximum 90 m. The fire hydrant system is a ring system. Sectioning valves are located every 500 m.

Activation of fire hydrants shall require interruption of the train traction power supply before activation. The exact instructions for this requirement shall be described in the procedures related to fire emergencies on the bridge.

6.6 Work Site Emergency

Employees emergency can be divided into the areas and confinements of the bridge and the on-shore facilities (OCC building, toll station, equipment yard etc.).

Table 6-4 provides an overview of work site emergencies.

Emergency principle for the on-shore facilities:

- Normal first aid kit will be available and all SdM staff will be trained in first aid.

Emergency principle for employees on bridge structures comprises in addition:

- It is assumed that the employees always are at least two such that the unharmed person by Tetra radio can call for emergency assistance. Rescue teams shall comply with the safety principles of the bridge and not endanger themselves or their colleagues.
- As built drawing of all bridge areas and confinements shall exist with the fire fighting authority and Policia.
- Technical staff (road patrol, care taker unit, inspection & maintenance staff) shall be part of an 24 hour on-call plan allowing for technical assistance for access to all locations on the bridge.
- Work inside the barriers of the railway (on platforms) requires restriction in train traffic and additional permission from RFI
- Lighting and marker indications give the possibility to safely escape at night. The walkways and service lanes are illuminated by the normal road lighting. In case of failure of this lighting, marker indications and lights are provided. Fluorescent lamps of 18 W or 35 W are placed at

minimum 5 m distance at the cantilevered service access roads and at the access routes inside the girders and towers. Every third of these lamps are provided with back-up batteries for minimum 2 hours service. The access stairways and the interior of the anchor block, towers and girders are also illuminated.

- All gantries, lifts etc shall be equipped with first aid kit, manual fire fighting equipment and a container with water.

Table 6-4 Overview of work site emergency

Work Site Emergency	**Primary risk**	**Emergency Access**	**Emergency training**
On carriageway	Traffic	Road	Normal road emergency
On service lane	Maintenance work and vehicles	Service lane	Normal road emergency
Railway area	Traffic	Road	RFI emergency training
Girders (internal)	Maintenance work	Service lane+ladder	Fire fighters
Girders (outside)	Work at height	Gantry+ladder+rope rescue	Fire fighters trained for rope rescue
Towers (internal)	Work at height Closed confinements	Lift or alternative staircase. Use of ladders may be required.	Fire fighters trained for rope rescue and fire fighting in tall buildings
Towers (outside)	Work at height	Gantry+ladder+rope rescue	Fire fighters trained for rope rescue
Main cable	Work at height	Cradle, alternative walk on main cable, helicopter	Fire fighters trained for rope rescue and helicopter rescue teams
Anchor block (internal)	Work at height Closed confinements	Staircase + ladder.	Fire fighters trained for rope rescue and confined compartment rescue.
Anchor block (outside)	Work at height	Ladder+rope rescue	Fire fighters trained for rope rescue
Terminal structure (internal)	Maintenance work	Staircase + ladder	Fire fighters
Terminal structure (outside)	Work at height	Ladder+rope rescue	Fire fighters trained for rope rescue

6.6.1 Notes to Access to Internals of Girders

At 360 m distance (i.e. one out of 12) the cross girders can be accessed by stairs from the service lane to the lower side of the road girder and from here by a ladder through an opening 0.8 m x 1.0 m in the lower side of the road girder. The walkways are made of metallic grating and are 0.8 m – 2.0 m wide. The openings inside the girder are doors 1.3 m high x 0.8 m wide stairs. Inside the girders and cross girder the walkways are connected with ladders and openings.

At all other cross girders, access can be gained through 0.8 m x 0.5 m openings in the side of the road girder approaching the service lane.

All doors can be open from the inside without key. All openings into the interior of the girders are normally hermetically (air tight) closed.

6.6.2 Notes to Access to Internals of Tower

The towers will be equipped with lifts for normal access and escape. Towers legs are equipped with 2.2 m wide stairways with intermediate landings. Lifts and staircases are placed in both legs of both towers. The access facilities in each tower leg are inter-connected with walkways inside the three cross beams. Inside the towers and cross beams the various rooms are connected with doors and man holes. The doors are normally 0.8 m x 2.0 m.

Inside the cross beam no. 3, stairs provide access to the upper side of the beam. Furthermore, there is direct access from tower leg to the upper face of the cross beams. From the cross beam no. 3, access is gained to the saddles with an enclosed staircase. All areas are protected by railings. Transport of stretchers is assumed to be possible in all stair cases.

The access from the tower takes place through a door at the bottom of the tower or a door at the bridge girder level. Larger doors are available for transport of materials etc. at ground level. The area at the bottom of the tower legs is connected with a service road (*to be verified*).

6.6.3 Notes to Access to External Surfaces of Tower

The outside of the tower legs is accessed by climbing inspection gantries with wrenching motors at each cross beam level. The gantries will be suspended roughly 120 m. The platform will be transportable for erection from each cross beam on the tower face needed to be inspected. A safety rope system will be available for self rescue if needed.

The outside of the cross beams are accessed by an inspection gantry mounted on rails on top of the cross beam, and a platform underneath the cross beam with access to the face of the under side. The gantry on top includes two internal lifts for access to the sides of the cross beam and to the platform underneath the beam. The platform underneath the cross beam is moveable in size in order to adapt to the shape of the cross beam. In case of failure of the mechanical / electrical system, it is possible to escape by means of ladders.

7 Operational Procedures

Present chapter shows draft examples of procedures, which will be further elaborated. Section 2 presents the indices of the anticipated list of procedures and instructions in the O&E Manual.

Please notice: The examples should not be considered as finalized as the underlying events will need further analyses and discussion with involved parties as well as further development of the concepts for operation and safety.

The procedures have been drafted based on draft paradigms. However, also the paradigms need to be verified by SdM to account for special needs and possible cultural differences in the approach to written instructions.

7.1 Work Permit & Access O&E Procedure

SdM ***O&E-ProXXX***

Owner: OCC (SdM) *Work Permit& Access*

PURPOSE	To describe procedures for work permit and access for work	
ASSUMPTIONS	Permit with completion of Enclosure 1 is required for: Personnel to carry out I&M work and other work who are not part of the SdM organisation or part of a contractor or partner having a long term agreement/contract. All personnel who require access to bridge for work interfering with bridge structure or bridge operation. Permit with completion of Enclosure 1 is not required for: SdM personnel and contractors/partners with long term contract/agreement with work not interfering with bridge structure or bridge operation (typical routine inspection work) Personnel involved in emergencies Personnel managing traffic such as Road Patrol and personnel with caretaking function.	
TASK	✓ Submission of work permit request ✓ Approval of work permit ✓ Log-in and access to work site ✓ Communication during work ✓ End of work and log out ✓ Repeat log-in and log-out procedure day by day until work is completed.	
WHO	**WHAT TO DO**	**HOW-TO-DO-IT**
Work Team Leader (TL)	✓ Submit work permit request	✓ *Complete Work Permit Form Part 1 and 2(Enclosure 1)*
OCC (SdM)	✓ Approval of work permit request	✓ Check and receipt on Work Permit Form(Enclosure 1) ✓ Keep the work permit form and update it as required by input from TL.
		Each work day
OCC (SdM)	✓ Provision of keys and radios	✓ Hand-over ✓ Receipt on Work Permit Form Part 3 (Enclosure 1). ✓ Confirm if no Work Permit Form required. ✓ Log into OCC work shift report
Work Team Leader (TL)	✓ Keys and radios to team members [in case of large work site contractor teams working on same site, each member may not need radio].	✓ Get radio at OCC (SdM) ✓ Set up radios ✓ Check if radios are working (contact to OCC and contact between team members) ✓ Ensure all on the on the work team know their job
Work Team Leader (TL)	✓ Log-in to work location	✓ Use access cards and keys. ✓ Inform OCC (SdM) you start the work ✓ Radio confirmation to OCC on arrival on work site
Work Team Leader (TL)	✓ Ad hoc communication	✓ Notify OCC on any change of location, character of work or incidences with importance for bridge operation or other works.

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		✓ Exception: If circumstances dictate, that one person has to work alone, the person shall call OCC every 15 minutes.
OCC (SdM)	✓ Ad hoc communication	✓ Notify Team Leader of any change in weather /traffic /other work that may affect their work ✓ Make check calls if work team do not call as agreed.
Work Team Leader (TL)	✓ Log-out to work location	✓ *Inform OCC(SdM you leave the work site* ✓ On departure from site check that all access doors are closed and confirm with OCC if access is monitored. ✓ *Return keys and radios to OCC*
OCC (SdM)	✓ Log end of work	✓ Receipt on Work Permit Form Part 3 (Enclosure 1). ✓ Log into OCC Work Shift Report
Work Team Leader (TL) /OCC (SdM)	✓ Work over several days	✓ Repeat log-in and log-out procedure day by day, cf. Work Permit Form Part 3, (Enclosure 1).
Work Team Leader (TL)	✓ Incidence/accident	✓ Act on accident according *O&E InsXXX Emergency/Security Call to OCC.* ✓ Complete Accident Form and hand it over to OCC
OCC (SdM)	✓ Incidence/accident	✓ Act on accident according *O&E InsXXX Emergency/Security Call to OCC.* ✓ Forward received accident form to SdM H&S Responsible.
Work Team Leader (TL)	✓ Inform OCC the work is completed	✓ Sign Work Permit Form, Part 1 (Enclosure 1).
References:	*O&E-InsXXX Accident Form* *O&E InsXXX Emergency/Security Call to OCC*	
Enclosures:	**ENCLOSURE 1: WORK PERMIT FORM**	

ENCLOSURE 1: WORK PERMIT FORM

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SdM **O&E-ProXXX**

Owner: OCC (SdM) *Work Permit& Access*

	WORK PERMIT FORM Part 1 of 3 *(add. enclosures as needed)*		
Application by team leader	Name and function Company Address Email Mobile phone		
Work Plan (enclosure if needed)			
Work Site Position (enclosure if needed)			
Special Precautions H&S Bridge traffic Other works			
SdM reference contact			
Period of works	**From:** **To:**		
Team Names:	**Name**	**Company**	**Telephone no:**
Team leader signature	I hereby declare that my team is instructed about the work, has had the required safety induction by SdM/RFI, and has been equipped with required safety equipment to carry out the above works within the stated period: Date and Name		
OCC (SdM)	The work plan and the period of work have been approved. Date and Name		
Team leader signature	I hereby declare that work has been completed and any incidences have been reported Date and Name.		

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SAFETY CHECK LIST FOR TL *TL CHECK WITH PEN*	WORK PERMIT FORM Part 2 of 3	
	EQUIPMENT	**REMEMBER**
✓ General	✓ Access card ✓ EN471 Clothing, class 3 ✓ Safety boot ✓ Hard hat with strap ✓ Gloves ✓ Radio (from OCC) ✓ Flash light ✓ Safety gloves ✓ Ear plugs (noise protection) ✓ Mobil phone as back-up	✓ SdM safety induction ✓ Always 2 persons together in contact by eye and ear. ✓ Exception: If circumstances dictate, that one person has to work alone, the person shall call OCC every 15 minutes. ✓ Access to water in hot weather. ✓ No drugs.
✓ On road	✓ -	✓ Cf. approved traffic plan by OCC (SdM)
✓ Within Railway safety area	✓ Cf. RFI rules.	✓ RFI safety induction
✓ At height (> 3m)	✓ Harness	✓ Team leader has responsibility of condition and use of harness.
✓ Main cable	✓ Special harness	✓ Always two persons with one person with main cable walking experience.
✓ Drowning risk	✓ Life jacket	✓ -
✓ Inside towers and girders	✓ -	✓ Drinking water (risk of dehumidification due to dehumidification plant operating)
✓ Inspection gantries	✓ Harness	✓ Trained operator
✓ Contained chambers (e.g. drainage system, anchor bloc etc.)	✓ Air quality alarm ✓ Gas detector ✓ Protection suit ✓ External radio antenna	✓ Trained for work in confined areas
✓ M &E Installations	✓ Cf. relevant rules and regulations	✓ Electrical work requires certification.
✓ Chemical substances	✓ Protection glasses, ✓ Masks, ✓ Protection suit	✓ Observe and follow guidelines for substances.
✓ Other	✓	✓ TL is responsible for planning the work with the required equipment and tools to complete the work in a safe and satisfactory way.

SdM **O&E-ProXXX**

Owner: OCC (SdM) *Work Permit& Access*

OCC Day by Day Log	**WORK PERMIT FORM Part 3 of 3**						
Completion by	OCC & TL	TL	**OCC**	**OCC**	TL	**OCC**	**OCC**
Start Work Time	Work Permit Still valid? Y/N	No. of people.	**No. of Radios**	**No. of Keys**	Received	**End Work Time**	**Received**

TL = Work Team Leader

OCC= OCC (SdM)

8 Emergency Procedures

Present chapter shows draft examples of procedures, which will be further elaborated. Section 2 presents the indices of the anticipated list of procedures and instructions in the O&E Manual.

Please notice: The examples should not be considered as finalized as the underlying events will need further analyses and discussion with involved parties as well as further development of the concepts for operation and safety.

The procedures have been drafted based on draft paradigms. However, also the paradigms need to be verified by SdM to account for special needs and possible cultural differences in the approach to written instructions.

8.1 Vehicle on Halt/Person on Road O&E Procedure

SdM **O&E-ProXXX**

Owner: O&E Operator *Vehicle on Halt/Person on Road*

PURPOSE	Rescue people, remove vehicle and restore traffic	
ASSUMPTION	A vehicle or a person is on the road of the bridge	
TASK	Manage incident, if necessary with assistance from emergency services. Subsequent clearing and repairing bridge and restoring normal traffic	
WHO	**WHAT TO DO**	**HOW-TO-DO-IT**
OCC (SdM)	✓ Assess situation ✓ Initiate appropriate procedure, A or B	✓ A. Emergency: If the incident has potential risk for further accidents or involves any type of emergency ✓ B. No Emergency: No further risks
A -Incident with Emergency (e.g. vehicle on halt on carriageway, collision, risk of fire, explosion, medical emergency)		
OCC (SdM)	✓ Manage traffic	✓ Switch appropriate incident warning signs on ✓ Close/restrict traffic on the affected bridge direction *Cf. O&E Table xxxx: Traffic control by types of incidents* *Cf. O&E Ins xxxx: Traffic Management*
	✓ Call emergency services and Police	✓ Request for assistance ✓ Inform on position and nature of incident ✓ Instruct on access to incident
	✓ Call Road Patrol (SdM)	✓ Request for assistance ✓ Inform on position and nature of incident ✓ Request TMA vehicle, if necessary
	✓ Advice Toll Unit (SdM)	✓ Request clear way for emergency vehicles
	✓ Adjust traffic restrictions	✓ When advised by Road Patrol (SdM) resume restricted traffic , if possible
SdM Road Patrol	✓ Make incident scene safe	✓ Park behind the vehicle with blinking lights on ✓ Position TMA and traffic warnings
	✓ Manage incident until arrival of Polizia ✓ Assist emergency services	✓ Provide First aid ✓ Evacuate unharmed and, if possible, injured to a safe area (service road, if possible) ✓
	✓	✓ Coordinate with emergency services and Police ✓
SdM Toll Unit	✓ Ensure free passage to emergency response vehicles	✓ Manage traffic at toll area in order to clear way for emergency services through service gate
Police	✓ Manage incidence and traffic on the incidence scene.	✓ Take over the incidence management ✓ Coordinate rescue ✓ Manage traffic on the incident scene ✓ Investigate incident ✓ Advice OCC (SdM) to resume traffic when the incident is considered under control

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Fire Fighters	✓ Rescue ✓ Fire fighting ✓ Polution fighting ✓ Wreckage tidy up	✓ Rescue injured and trapped ✓ Extinguish fire ✓ Evacuate unharmed ✓ Tidy-up ✓ Remove vehicle
Ambulance	✓ Rescue	✓ First aid and life saving ✓ Evacuate injured
B - Incident with No Emergency (e.g. vehicle on halt on emergency lane due to illegal parking or technical problem etc.)		
OCC (SdM)	✓ Manage traffic	✓ Switch incident warning signs on
	✓ Call for rescue assistance	✓ Inform on position and nature of incident ✓ Instruct on access to incident
	✓ Call for Road Patrol (SdM)	✓ Inform on position and nature of incident
Road Patrol (SdM)	✓ Traffic warning on incident scene	✓ Park behind the vehicle with blinking lights on
	✓ Evacuate people	✓ Evacuate people to a safe area (service lane, if possible)
	✓ Assist with technical problem	✓ Request assistance from Fire Fighters to remove the vehicle, if needed
	✓ Clear bridge if vehicle parked illegally	✓ Direct road user away from bridge ✓ Inform police of offence, if needed
Fire Fighters	✓ Remove vehicle from the bridge	Normal road procedure of Fire Fighters
Police	✓ Investigate and report incidence ✓	Normal road procedure of Polizia
End of actions		
Caretaker Unit (SdM)	✓ Clear site ✓ Organize repair works	✓ Clear site of any debris, spillage ✓ Perform any temporary repair works *Cf. O&E Ins xxx: Request for caretaking/maintenance*
Road Patrol (SdM)	✓ Remove restrictions on site	✓ Remove warning signs of the incident when carriageway is cleared ✓ Inform OCC (SdM) that the carriageway is free
OCC (SdM)	✓ Remove traffic restrictions	✓ Remove any restrictions in place *Cf. O&E Ins xxxx: Traffic Management*
OCC(SdM)	✓ Record incident	*Cf. O&E Pro xxxx: Report from OCC shift*
References:	References to interface documents and informative documents. *O&E Ins xxxx: Traffic Management* *O&E Ins xxx: Request for caretaking/maintenance*	

SdM **O&E-ProXXX**

Owner: O&E Operator *Vehicle on Halt/Person on Road*

	O&E Pro xxxx: Report from OCC shift
Enclosures:	*Encl: O&E Table xxxx: Traffic management/event classification*

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Enclosure 1 O&E Table: Traffic control by types of incidents

TYPES OF INCIDENTS	TRAFFIC CONTROL STEPS			
	1st	2nd	3rd	4th
Major Emergency ✓ Vehicle on halt on fast lane ✓ Vehicle at halt on slow or emergency lane but further hazard potential (e.g. fire, explosion, major collision)	Lane warning 30km/h*	Bridge closure	Lane warning 30km/h + TMA	Normal
Minor Emergency ✓ Vehicle on halt on slow lane with no immediate hazard potential (e.g. medical emergency, minor collision)	Lane warning 30km/h*	Lane warning 30km/h* + TMA	Normal	
No Emergency ✓ Vehicle on halt on emergency lane (e.g. illegal parking, technical problem)	Lane warning*	Lane warning + Road Patrol	Normal	

* *Note: Speed restriction pattern to be gradual on the bridge in order to attain the desired speed limit at the incident position*

8.2 Train Accident O&E Procedure

SdM **O&E-ProXXX**

Owner: Polizia *Train Accident*

PURPOSE	Rescuing people, removing train and restoring railway traffic	
ASSUMPTIONS	RFI has been informed that a train accident has happened on railway section of bridge. An accident could be derailment, collision, fire, explosion, hit person or hit object	
TASK	✓ Evoke emergency services ✓ Make accident scene safe ✓ First aid and rescue of passengers ✓ Evacuation ✓ Log and report accident ✓ Remove train from bridge ✓ Clear and tidy up accident area ✓ Repair critical damages to railway or bridge structure ✓ Resume traffic	
WHO	**WHAT TO DO**	**HOW-TO-DO-IT**
Polizia	✓ Assess accident ✓ Evoke alarms ✓ Rescue actions	✓ Interrogate caller ✓ Alarm RFI, OCC(SdM) and rescue services ✓ Provide emergency instructions ✓ Manage and assist on accident scene ✓ Report accident
Immediate Actions		
Polizia	✓ Alarm RFI, SdM and rescue services	✓ Common alarm to all parties. ✓ What type of accident? ✓ Extent of casualties, injuries and damages? ✓ What kind of assistance is necessary? ✓ Is bridge structure or road traffic endangered? Cf. O&E Pro xxxx: Train fire/explosion/toxic gaz
Polizia	✓ Call RFI	Cf. general procedures for train accident.
	✓ Call emergency services	Cf. general procedures for train accident.
	✓ Call SdM Operator	✓ Inform of position and nature of incident and specify requested assistance from SdM.
RFI	✓ Stop railway traffic and interrupt overhead line power.	Cf. RFI general procedures for accident. ✓ Confirmation to all parties on railway is safe for rescue.
OCC (SdM)	✓ Manage traffic	✓ Switch traffic restrictions on for road traffic: Close/restrict traffic on bridge to protect first rescue vehicles on scene. *Cf. O&E Ins xxxx: Traffic Management*
OCC (SdM)	✓ Call SdM Road Patrol	✓ Request all available road patrols ✓ To go accident scene ✓ Set-up restrictions for road rescue from fast lane. ✓ Request TMA (Truck Mounted Attenuator) assistance

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OCC (SdM)	✓ Call Toll Unit	✓ Request clear way for emergency vehicles
Toll Unit (SdM)	✓ Ensure clear way	✓ Manage traffic at toll area in order to clear way for emergency services through service gate
Road Patrol (SdM)	✓ Restriction to fast lane at lay by close to accident	✓ **1st vehicle:** ✓ Park at the nearest lay-by with flashing lights on ✓ Go to accident scene ✓ **2nd vehicle:** ✓ Position TMA and traffic warnings
	✓ Rescue people on the bridge (outside train)	✓ Inform Polizia on accident extent ✓ Make accident scene safe ✓ Start-up management of first aid, self-aid and evacuation
Rescue Actions		
Police	✓ Take over and manage accident scene	Cf. general police procedures for train accidents
RFI	✓ Assist police ✓ Secure accident scene ✓ Rescue people on the train	Cf. RFI general procedure Cf. SdM Train evacuation procedure
Fire Fighters	✓ Handle fire/explosion/toxic substance ✓ Rescue injured and trapped	Cf. existing general procedures for train accident
Ambulance	✓ First aid ✓ Evacuate injured	Cf. existing general procedures for train accident
Road patrol (SdM)	✓ Manage traffic on road site. ✓ Assist on accident scene	✓ Ad hoc assistance
Tidy Up Actions		
Polizia	✓ Investigate accident scene	✓ Cf. General Polizia procedure
Road Patrol (SdM)	✓ Assess when it is safe to resume traffic	✓ Coordinate with emergency services and Police ✓ Advice OCC (SdM) to resume traffic when the incident is considered under control
OCC (SdM)	✓ Adjust traffic restrictions	✓ When advised by Road Patrol (SdM) resume restricted traffic , if possible ✓ Call Care Taker unit (SdM)
RFI	✓ Tidy railway up	Cf. RFI general procedure.
	✓ Remove train from	Cf. RFI general procedure.

8.3 Train Evacuation O&E Procedure

SdM **O&E-ProXXX**

Owner: RFI *Train Evacuation*

PURPOSE	Train evacuation in case of accident and/or a train has been brought to halt.	
ASSUMPTION	RFI or Polizia has decided to evacuate train. Emergency services have been called, if required	
TASK	Evacuate passengers from a train in a safe way	
WHO	**WHAT TO DO**	**HOW-TO-DO-IT**
RFI	✓ Decide type of action	✓ Train evacuation by road ✓ Train evacuation onto another train
Train evacuation by road in case of train accident, **cf.** Cf. *O&E Pro xxxx title: Train Accident* (emergency evacuation e.g. collision, fire, explosion)		
RFI	✓ Call OCC (SdM)	✓ Request road evacuation by OCC (SdM) for a given number of unharmed passengers
OCC (SdM)	✓ Arrange evacuation by road	✓ Call for bus assistance ✓ Impose additional traffic restrictions in terms of closure of carriage way in one direction.
Polizia	✓ Evacuation traffic on site	✓ Manage traffic on road site
RFI	✓ Evacuate passengers from railway to road	✓ Information to passengers on evacuation to bridge, cf. *Escape Route Train evacuation Enclosure 1.* ✓ Assist disabled people, children and old. Emergency rescue may be necessary. ✓ Bus shall be manned by a RFI person. ✓ Register all passengers by name and address when in bus.
All	✓ Finalize accident actions	✓ Cf. *O&E Pro xxxx title: Train Accident*
Train evacuation onto another train (e.g. technical problem, obstacle on railway line)		
OCC (SdM)	✓ Traffic management	✓ Set-up traffic restriction on road according to RFI's need for assistance from road vehicles.
Road Patrol (SdM)	✓ Local traffic management at lay by ✓	✓ In case of required assistance from road vehicles on road, Road Patrol (SdM) shall manage traffic on site in term of warning signs and TMA, cf. *Lay by traffic restrictions Enclosure 2*
RFI	✓ Manage train evacuation onto another train	✓ Cf. general RFI Procedure. ✓ cf. *Escape Route Train evacuation Enclosure 1.*
RFI	✓ Remove train at halt	✓ Cf. general RFI Procedure.
Road Patrol (SdM)	✓ Remove warning signs	✓ Remove incident warning signs and TMA ✓ Inform OCC (SdM) that the carriageway is free

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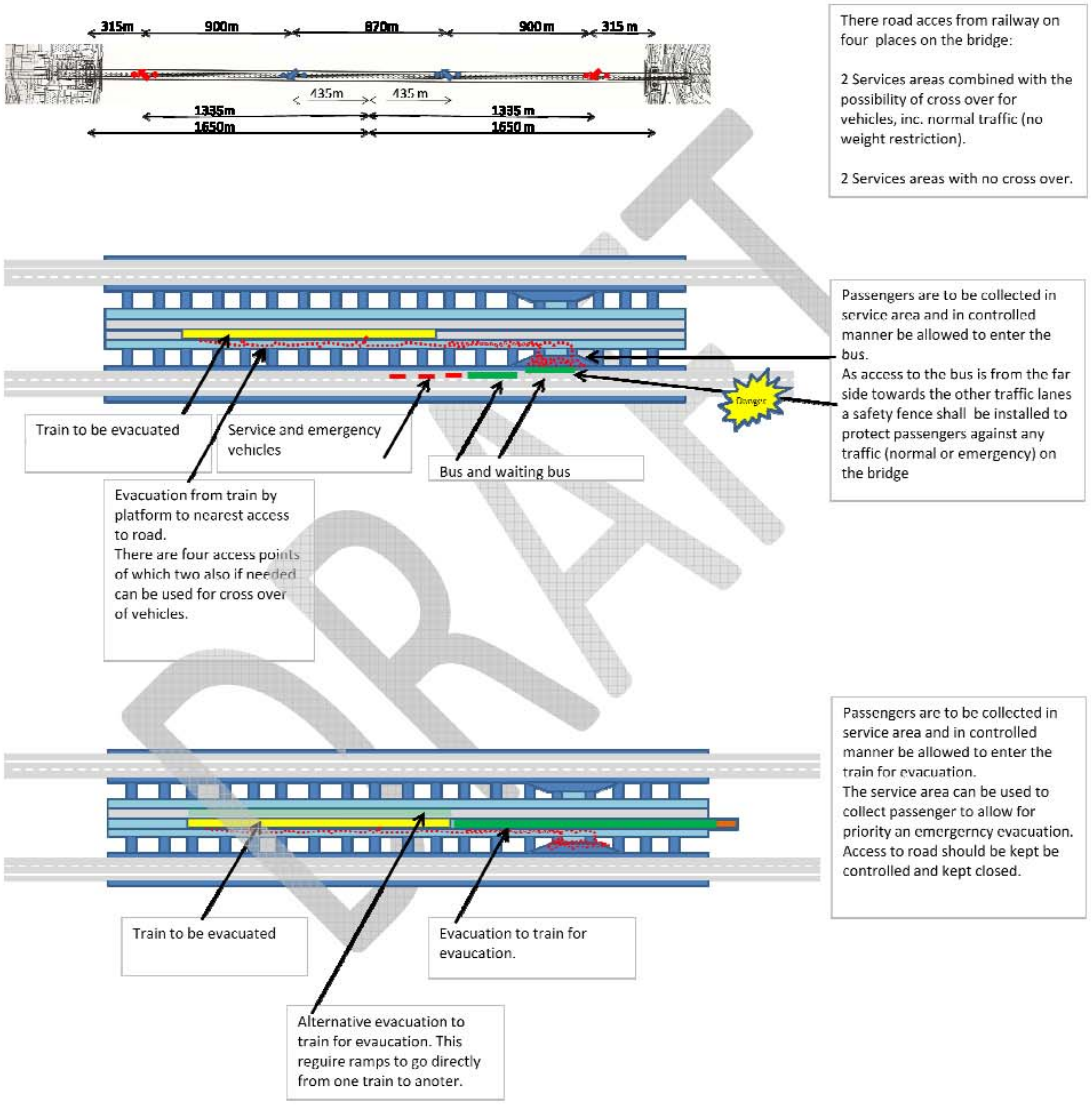
SdM **O&E-ProXXX**

Owner: RFI *Train Evacuation*

OCC (SdM)	✓ End traffic management of incidence	✓ Remove any restrictions in place ✓ Log accident. *Cf. O&E Pro xxxx: Traffic Management*
References:	1. Polizia general procedures 2. RFI general procedures 3. SdM *O&E Pro xxxx title: Train Accident* 4. *SdM O&E Pro xxxx: Traffic Management*	
Enclosures:	1. *Escape Route Train evacuation* 2. *Lay by traffic restrictions*	

ENCLOSURE 1 *Escape Route Train evacuation*



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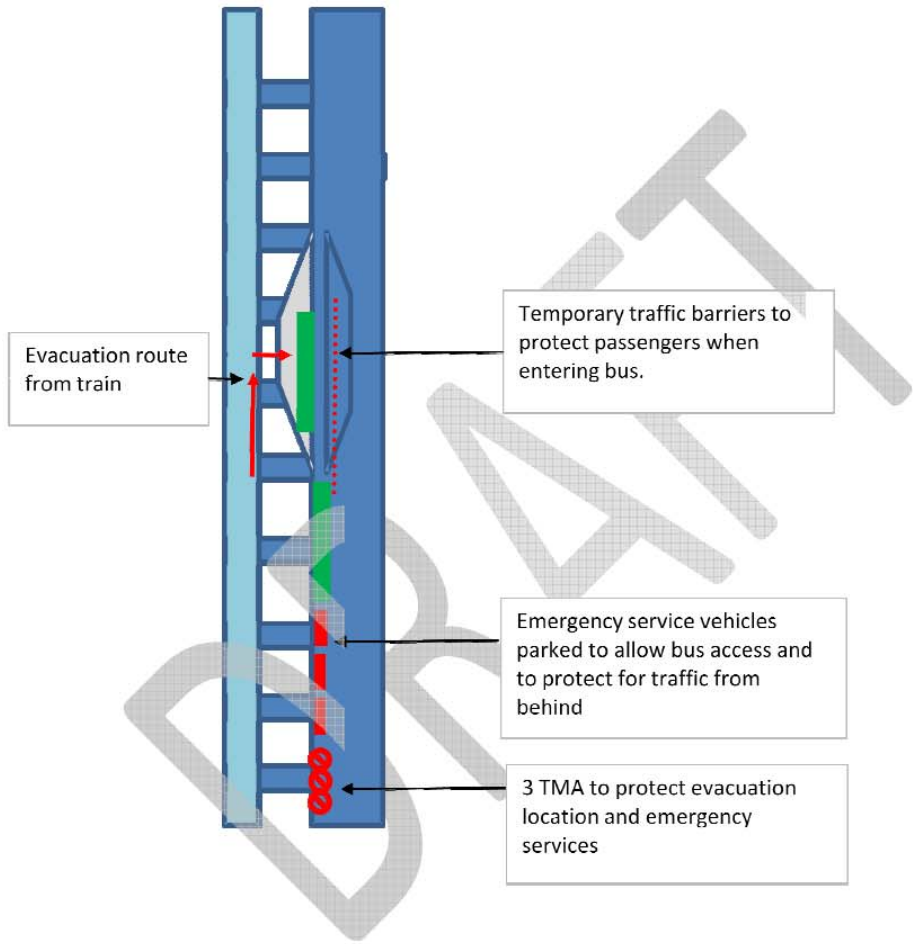
ENCLOSURE 2 *Lay by traffic restrictions*



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9 Instructions

Present chapter shows draft examples of instructions, which will be further elaborated. Section 2 presents the indices of the anticipated list of procedures and instructions in the O&E Manual.

<u>Please notice:</u> The examples should not be considered as finalized as the underlying events will need further analyses and discussion with involved parties as well as further development of the concepts for operation and safety.

The nstructions have been drafted based on draft paradigms. However, also the paradigms need to be verified by SdM to account for special needs and possible cultural differences in the approach to written instructions.

9.1 Emergency/Security Call to OCC Instruction

SdM — ***O&E-Ins XXXX***

Owner: O&E Operator — *Emergency/Security Call to OCC*

PURPOSE	Instruction describes actions on an emergency call to O&E Operator
ASSUMPTION	Call can be from emergency phone, radio system, phone or oral message. Call can come from anyone. The call shall be logged.
TASK	1. Interrogation of caller: ✓ **Who** is calling? ✓ **What** has happened? ✓ **When** has it happened? ✓ **What** injuries? ✓ **What** is your phone number? ✓ **What** is your position? (railway/road, direction, lane, nearest km indication)
	2. Instruction to caller: ✓ **Stop** accident/threat/risk ✓ **Bring** everybody into safety ✓ **Instruct** in providing first aid ✓ **Wait** for help and further instruction
	3. Instructions for emergency assistance: ✓ Evoke relevant procedure ✓ Cf Pro. xxxx Security threat or action ✓ Cf Pro. xxxx Fire/explosion/toxic gas or fluid on bridge ✓ Cf Pro. xxxx Earthquake damages ✓ Cf Ins. xxxx Evacuation/closure of bridge ✓ Cf Ins. xxxx Evacuation of building ✓ Cf Ins. xxxx Fire in building ✓ Cf. Ins. XXXX Toll emergency request for assistance ✓ cf. Pro. XXXX Intruder alarm follow-up ✓ Cf. Pro. XXXX Vehicle on halt/person on road ✓ Cf. Pro. XXXX Illegal vehicle ✓ Cf. Pro. XXXX Traffic accident ✓ Cf. Pro. XXXX Vehicle fire/explosion/toxic gas Cf. Pro. XXXX Train accident ✓ Cf. Pro.XXXX Train evacuation ✓ Cf. Pro,xxxx, Train fire/explosion/toxic gas
	4. End of actions: ✓ Log call in the OCC report for shift' ✓ If work incidence report this ✓ Cf. Ins. XXXX Report from OCC Shift ✓ Cf Pro.XXXX Work incidence ad accident reporting
References:	References to interface documents and informative documents. -
Enclosures:	Enclosures of attached documents needed for carrying out the procedure. -

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9.2 Accident Form O&E Instruction

SdM **O&E-InsXXX**

Owner: O&E Operator *Accident Form*

Part A: About you

Your name?
Your job title?
Your telephone number?
Your e-mail address?
Name of your organisation?
What is the address?
Your organisation type of work

Part B: About the incident

Date of incident
Time of incident
Location and position of incident

Part C: About the injured person(s)

If you are reporting a dangerous occurrence, go to Part F. *If more than one person was injured in the same incident, please attach the details asked for in Part C and Part D for each injured person.*	
Full name of the injured person?	
Employment of injured person? (tic one box only)	√
SdM employee Which department?	
SdM contractor Name of contractor Which SdM contact person	
External partner employee Which?	
Driver or passenger in a vehicle	
Other member of the public	
Address of injured person?	

Part D: About the injury

What was the injury?
What part of the body was injured?

Was the injury	√
A fatality	
A major injury or condition	
An injury preventing the person normal work for more than 3 days?	
Did the injured person	
Become unconscious	
Need resuscitation?	
Remain in hospital for more than 24 hours	
Non of the above	

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SdM **O&E-InsXXX**

Owner: O&E Operator *Accident Form*

Part E: About the kind of accident

Please tic the one box that best describes what happened, then go to Part G	√
Operation & Maintenance work	
Contact with moving machinery	
Hit by a moving, flying or falling object	
Hit by a moving road vehicle	
In a moving car	
Hit by a moving train	
Hit something fixed or stationary	
Injured while handling, lifting or carrying	
Slipped , tipped or fell on the same level	
Fell from a height	
How high was the fall	
Trapped by something collapsing	
Drowned or asphyxiated	
Exposed to or in contract with a harmful substance	
Exposed to fire	
Exposed to an explosion	
Contact with electricity or an electric discharge	
Physically assaulted by a person	
Road accident	
Injured in single-driver-accident	
Injured in car collision	
Hit by a moving road vehicle	
Railway accident	
Person hit by train	
Material hit by train	
Train derailment	
Train collision	
Another kind of accident (describe in Part G)	

Part F: Dangerous occurrences

Describe

Part G: Describing what happened

Give as much detail as you can, For instance:
The name of any substance involved
The name and type of any machine involved
The events that led to the incident
The part played by any people
If it was a personal injury, give details of what the person was doing. Describe any action that has since been taken to prevent a similar incident. Enclose description.
Work being carried out at location
Weather conditions
Traffic conditions

Part H: Signature

Your signature Date

Part I: Enclosures

Annexes

Annex 1: Registered Owners of Manual

-O-TO BE ELABORATED-O-

Organization and address	Name	Position	Manual date and revision

Annex 2: Emergency Contacts in Manual

-O-TO BE ELABORATED-O-

Organization and address	Name	Position	Comment

Annex 3: External Emergency Procedures

The following external emergency procedures are of relevance for the bridge operation and SdM subscribe to having updated versions of these manual kept in the operational control room.

It shall at all times be ensured that the SdM O&E Manual are consistent with the emergency procedures of the involved external parties.

-O-TO BE ELABORATED-O-

Organization	**Title**	**Revision with SdM**	**Comment**
RFI			
ANAS			
Policia			
Vigili del Fuoco			
Servizio di Pronto Intervento			
Aviazione Civile			
Autorittá Marittime			
Protezione Civile			
Prefetture			