

SÉCURITÉ INCENDIE DANS LES TUNNELS DE TRANSPORT
FIRE SAFETY IN TRANSPORT TUNNELS

MESURES POUR LES TUNNELS FERROVIAIRES
RAILWAY TUNNELS MEASURES

Safety long railway tunnels - system choice AlpTransit (AT) base tunnels Switzerland

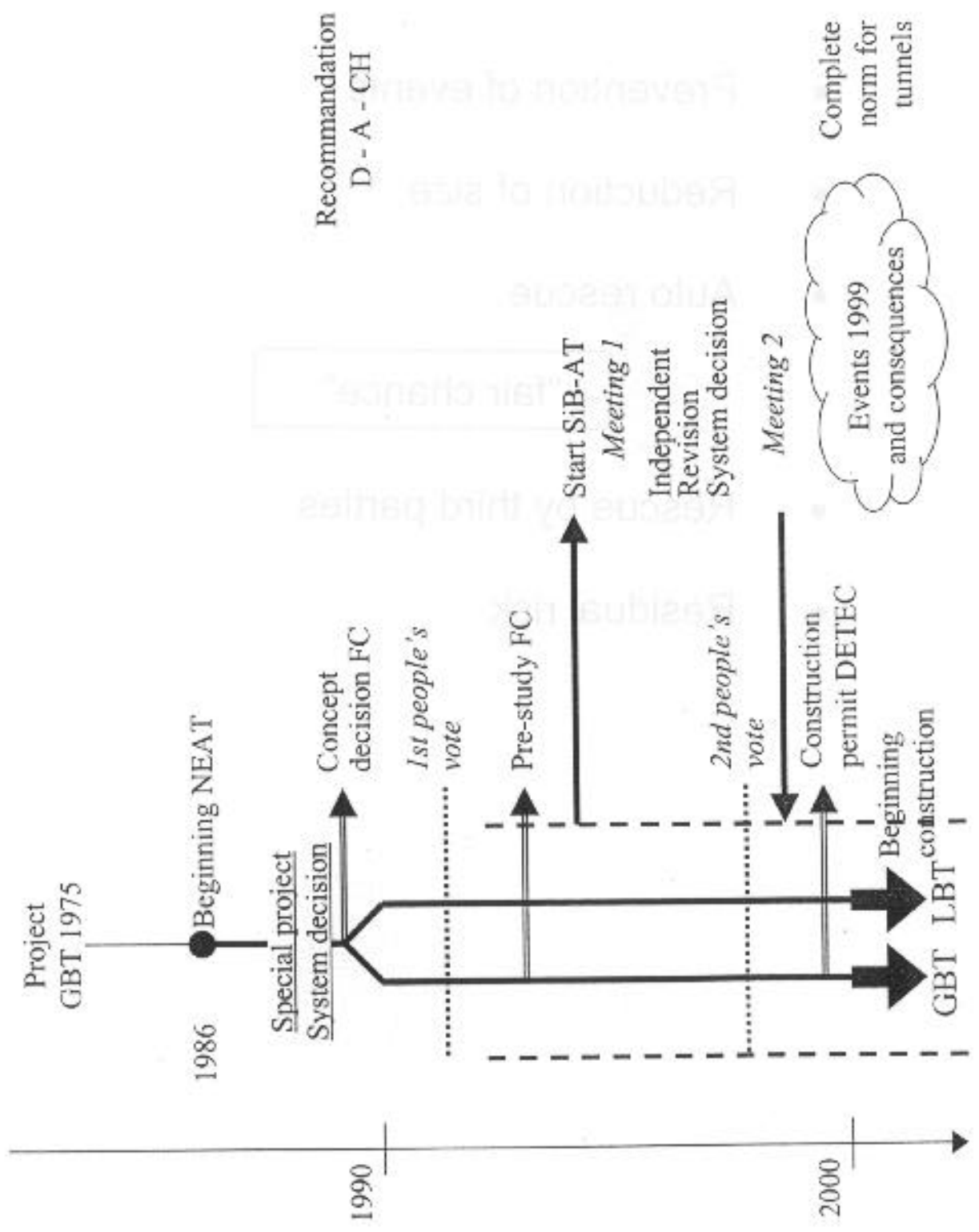
Process handling AT

Formal decisions AT

SiB-AT

Norms Prescriptions

Method safety analysis (various influences)



Tunnel safety: the different steps by order of importance (the "cascade")

- Prevention of events
- Reduction of size
- Auto rescue

→ "fair chance"

- Rescue by third parties
- Residual risk

Definition of safety standard – objectives of supervisory authority

- Problems related to objectives (process)
- "New thinking"
- Safety proof adequate at every level
- Central objectives
- Network overview, sustainability

Safety log for railway tunnels - objectives

- **Quality of trains**
 - International standard for interoperability
 - Ability to run for 15 mn in case of fire
 - Control system on the whole network (hot boxes, displacements of loads)
- **Quality of operations control and train supervision**
 - few switches
 - redundancy of train control system
- **Decisive event**
 - Fire (complete fire) every 50 years
 - extinguished in 80 – 90 % of cases by passengers / staff
 - 95 – 99 % of burning trains reach emergency stops
 - Criterion: fair chance of self rescue in any place in troubled tunnel atmosphere
 - 10 mn at most after event, people can get to "safe tunnel", i.e. escape way no longer than 500 m.
- **Ventilation**
 - Basis: piston effect
 - complementary influence is possible
- **Keep it simple**
- Decisions correct in each stage / process of proof

Railway tunnels in Switzerland according to risks

	SBB	RhB	BLS	FART	MOB	FO	Others	Total	Part
Risk category A	76	39	12	20	15	4	113	279	40%
Risk category B	101	47	20	12	11	9	73	273	39%
Risk category C	57	25	14	2	3	5	15	121	17%
Risk category D	15	2	3	0	0	1	5	26	4%
Total	249	113	49	34	29	19	206	699	100%
Part	36%	16%	7%	5%	4%	3%	29%		

Provisory classification of tunnels according to risk categories

<i>Length</i>	<i>Risk category with small coefficient</i>	<i>Risk category with average coefficient</i>	<i>Risk category with large coefficient</i>
up to 100 m	A	A	A
0,1 - 0,3 km	B	B	B
0,3 - 1 km	B	C	C
1 - 3 km	C	C	D
more than 3 km	D	D	D

Legend:

A: very small risk, no specific measures for tunnels

B: small risk, in general no specific measures for tunnels

C: average risk, specific measures for tunnels according to specific cost effectiveness

D: high risk, specific measures for tunnels are justified