

# Renewal of the lining of mountain tunnels in service

## Issues on the aging tunnels

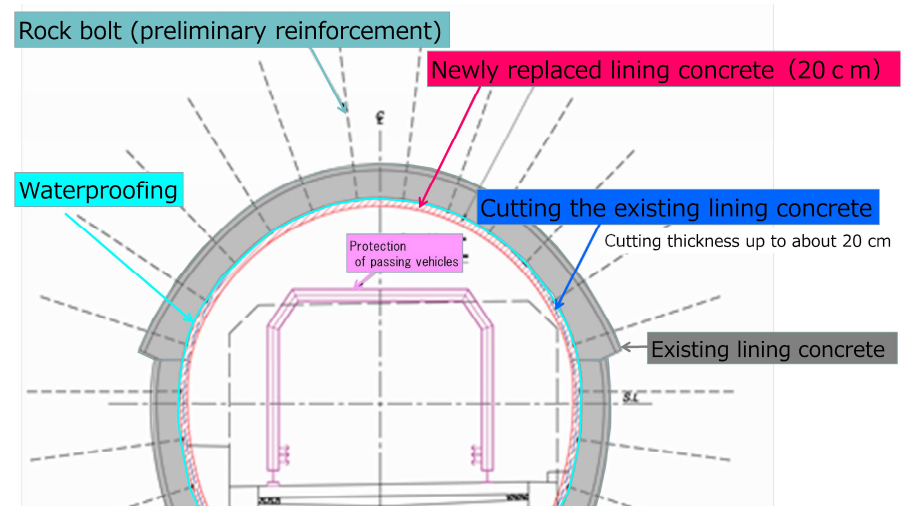
The aging tunnel lining has many cracks and water leaks. The leaking water may freeze into icicles that may hit passing vehicles.



Water Leakage and freezing (icicles)

## Construction method to renew a section of the lining concrete

The new construction method renewing a section of the concrete lining with the expressway still in service will solve the issues



STEP4

STEP3

STEP2

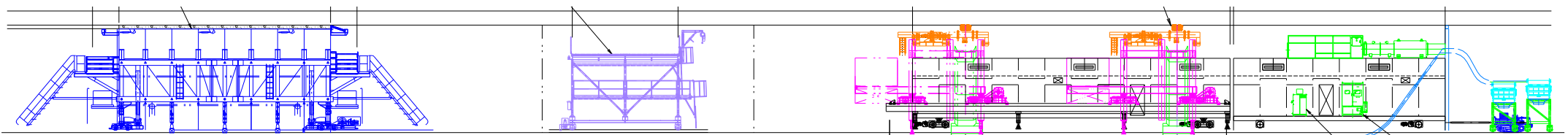
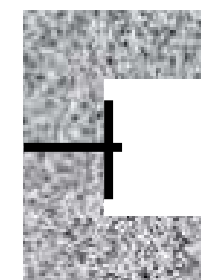


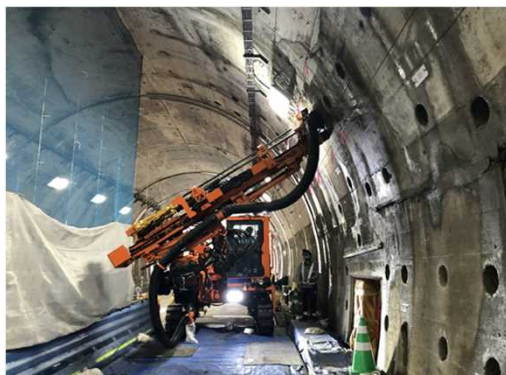
Fig Construction system (appearance diagram)

Construction direction →

### STEP1

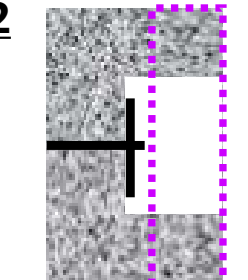


Installation of rock bolts



Reinforce the tunnel with rock bolts before cutting the existing lining concrete.

### STEP2

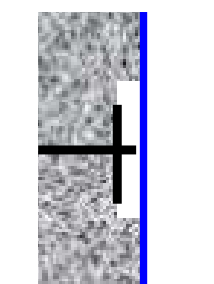


Cutting existing lining concrete



Cutting lining concrete

### STEP3

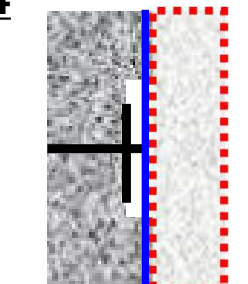


waterproofing



Installation of waterproofing

### STEP4



Place new lining concrete



Lining concrete placement

