

# BEST PRACTICES FOR THE DESIGN OF THE CRO'S VIEW OF TVS

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Rail Conference



# Agenda

- What
- Why
- How
- Examples



# What is a Typical TVS Activation Procedure

Fire Detection

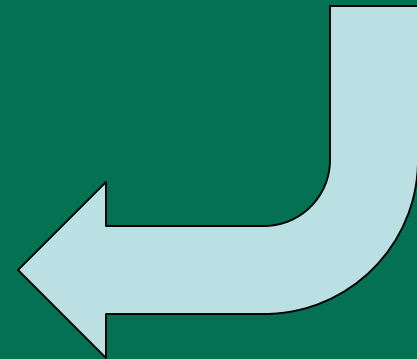


Operator  
Acknowledgement



Operator Decision

TVS Activation



# Typical TVS Activation Procedure

Fire Detection

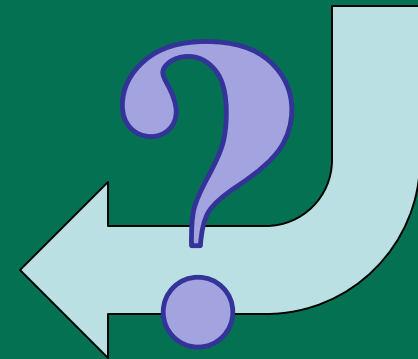


Operator  
Acknowledgement



Operator Decision

TVS Activation



# Why is This Important??

- Need to ensure Operator makes the correct decision
- Need to ensure Operator activates the correct TVS mode
- Time is of the essence
- Operators are NOT tunnel ventilation engineers!



# Things to Keep in Mind

- Simple, intuitive screens to encourage a quick response
- Present all the decision making information necessary on the same screen
- Reliability!!!
- As much of the intelligence is built in as possible

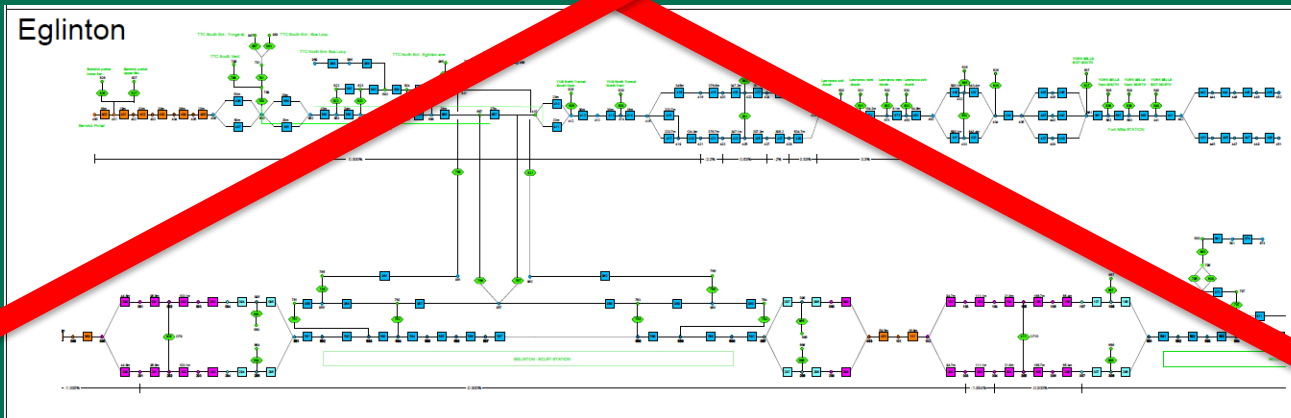
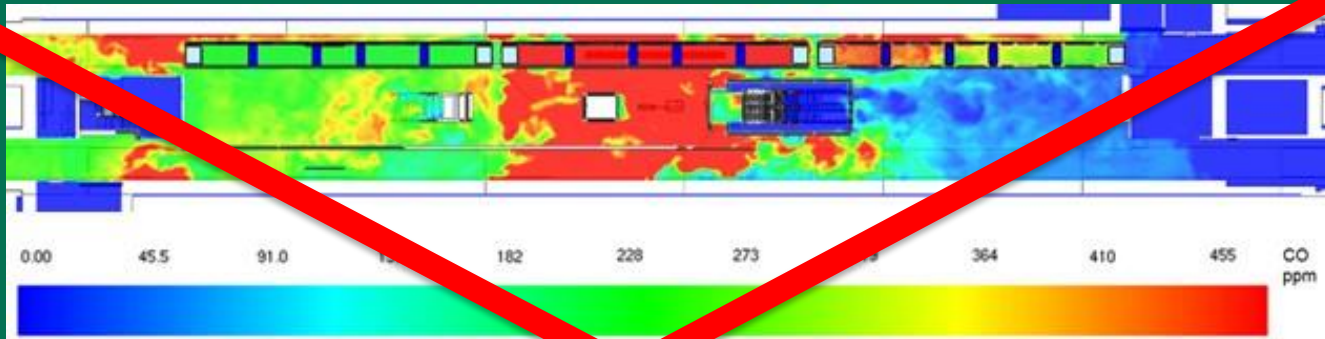


# Pitfalls of a Poor Design

- Activating a wrong TVS mode: wrong fans and/or dampers, wrong direction, or insufficient fans
- Activating a contradicting mode
- Not activating the TVS quick enough to facilitate egress during the evacuation period
- Confusion, miscommunication, panic

# Pitfalls of a Poor Design

- In a nutshell, none of the models you've run will matter if the Operator doesn't activate the correct mode in time!!





# Essentials of Design

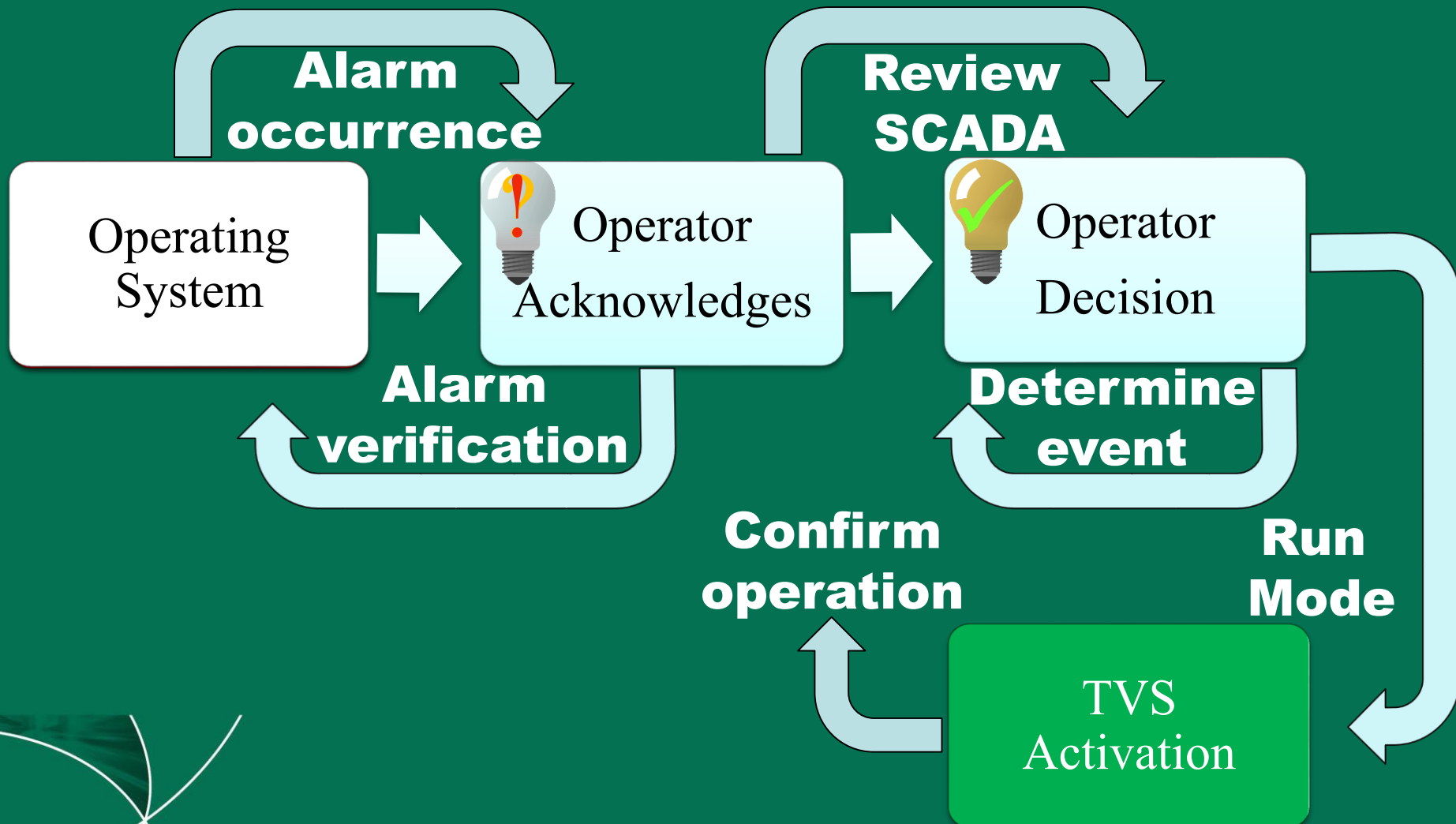
- Graphical HMIs
- Interface to train control system
- Computers are smart! Make them do the work, not the Operator
- Reliability!! – typically SIL 2



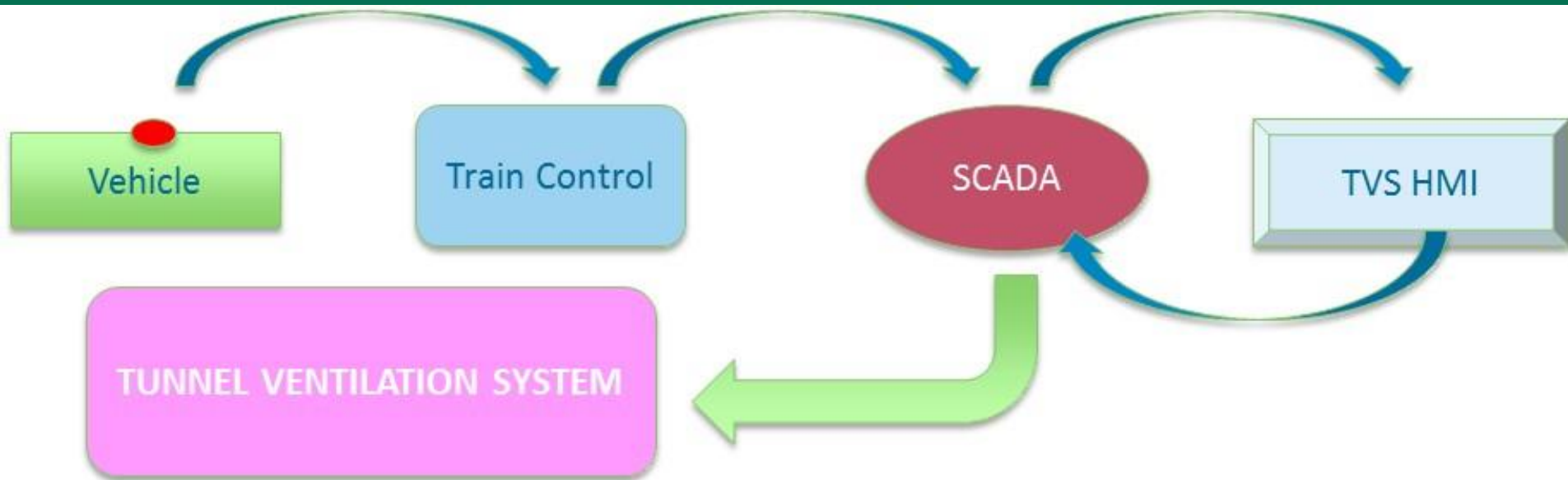
**SO...what does that look like?**



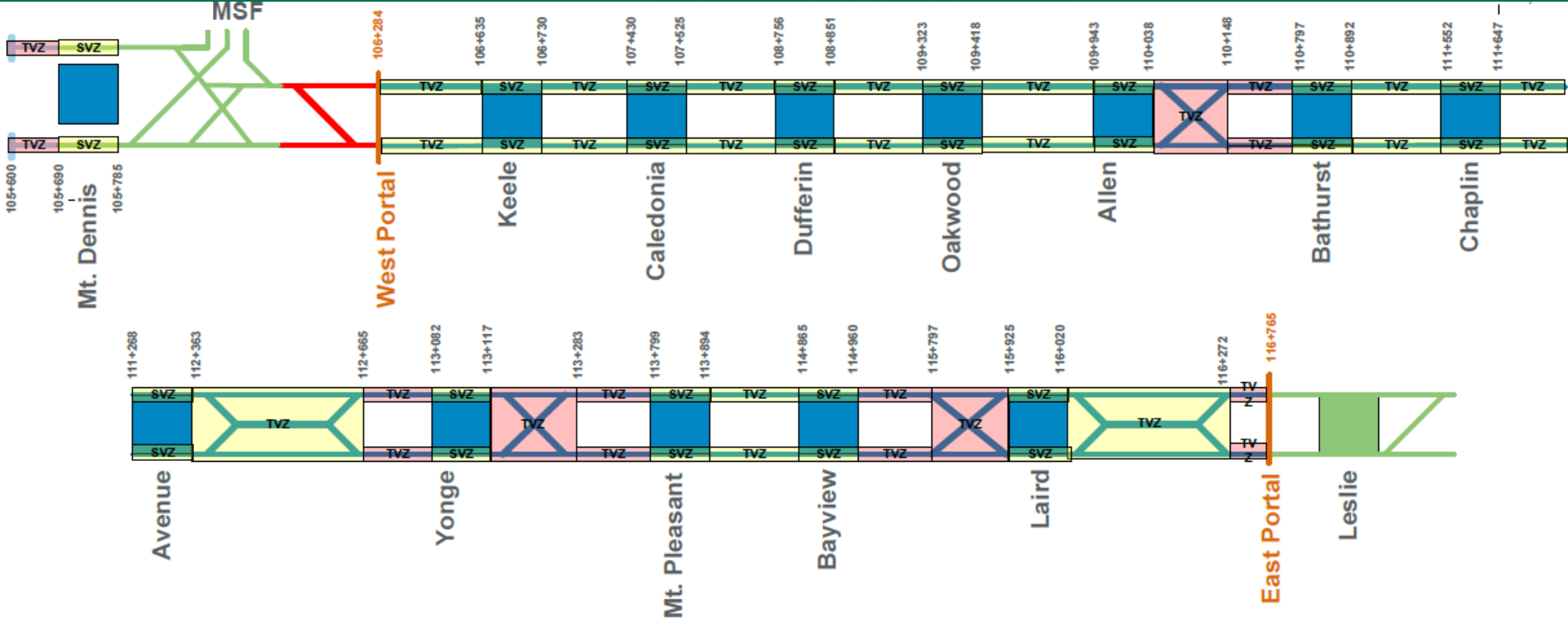
# Typical TVS Activation Procedure



# Steps for Emergency Response



# Typical TVS Vent Zone Map



# TVS Level -1 HMI (Canada Line Example)

21 May 12:16:48 LGS EMS CONCOURSE ACER DOOR OPENED **Ack** Unack Alarms: 194  
 21 May 12:16:38 YTS EMS GUIDEWAY PUMP #2A-1 STARTED **Ack** Total Alarms: 446  
 21 May 12:16:19 LGS EMS CROSS PASSAGE SOUTH TVFRS DOOR OPENED **Ack**



User supervisor  supervisor

21-May-2009  
12:16:59

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## Canada Line – Tunnel Ventilation System Overview



● Temp    ● Temp    ● Temp    ● Temp    ● Temp    ● Temp    ● Temp    ● Temp  
● FCP Enabled    ● FCP Enabled    ● FCP Enabled    ● FCP Enabled    ● FCP Enabled    ● FCP Enabled    ● FCP Enabled    ● FCP Enabled  
● Trouble    ● Trouble    ● Trouble    ● Trouble    ● Trouble    ● Trouble    ● Trouble    ● Trouble

# TVS Level-2 SVZ HMI (Canada Line Example)

21 May 12:13:22 LGS EMS CROSS PASSAGE AXER DOOR OPENED Ack Unack Alarms: 192  
21 May 12:13:09 OMC EMS RADIO RECT CHARGER AC MAIN NORMAL Ack Total Alarms: 444  
21 May 12:11:58 LAS EMS OB PLATFORM NORTH END GATE OPENED Ack

User supervisor Class supervisor  
PS&D E&M TVS GDS PCS TSH PA/PIDS MCS NETWORK CCTV RADIO

21-May-2009 12:14:02

SubSystem System Navigation Overview Summaries Reports Help

### Langara / 49th Avenue Station Zone Tunnel Ventilation

\* Non-Fire Mode Exhaust | Non-Fire Mode Supply  
Emergency Fire At Platform

OUTBOUND TUNNEL TVZ-21	TEMP OUTBOUND TEMP SVZ-9A	OUTBOUND TUNNEL TVZ-19
INBOUND TUNNEL TVZ-22	TEMP INBOUND TEMP LANGARA STATION 502 M 501 SVZ-9B	INBOUND TUNNEL TVZ-20

Emergency Fire At Platform  
Mode Exhaust | Max. Fire Mode Supply  
To LGS Level 3  
Reset to Normal

MDS-LGS LGS-ORS

Alarms Events Send To OVW

The Operator selects the mode for 'Emergency Fire at Platform' and the system commences

# TVS Level-2 TVZ HMI (Canada Line Example)

21 May	12:14:48	Sea Island Station PA	Request Expired	Ack	Unack Alarms: 192
21 May	12:13:22	LGS EMS CROSS PASSAGE AXER DOOR	OPENED	Ack	Total Alarms: 444
21 May	12:13:09	OMC EMS RADIO RECT CHARGER AC MAIN	NORMAL	Ack	

User supervisor    Class supervisor    21-May-2009 12:14:57

PS&D   E&M   TVS   GIDS   PCS   TSH   PA/PIDS   MCS   NETWORK   CCTV   RADIO

SubSystem   System   Navigation   Overview   Summaries   Reports   Help

### Langara / 49th Avenue – Oakridge / 41st Avenue Zone Tunnel Ventilation

**With multiple trains in the zone, the Operator protects the Non-incident train at the expense of the Non-incident vehicle**

The diagram shows a schematic of the tunnel ventilation system. It is divided into four main sections: OUTBOUND, OUTBOUND TUNNEL TVZ-19, INBOUND TUNNEL TVZ-20, and INBOUND. The OUTBOUND TUNNEL TVZ-19 section contains two train icons labeled 209 S and 201 M, and two train icons labeled 210 and 202. The INBOUND TUNNEL TVZ-20 section contains two train icons. The OUTBOUND and INBOUND sections each contain three train icons labeled SVZ-9A, SVZ-9B, and SVZ-8A, SVZ-8B respectively. The diagram is flanked by two stations: LANGARA / 49th AVENUE STATION on the left and OAKRIDGE / 41st AVENUE STATION on the right. Above and below the tunnel sections are control buttons for 'Additional Fan In Supply' and 'Emergency Fire Mode'. The 'Emergency Fire Mode' buttons are highlighted with a yellow circle.

Additional Fan In Supply    Emergency Fire Mode    Emergency Fire Mode    Additional Fan In Supply

OUTBOUND    OUTBOUND TUNNEL TVZ-19    OUTBOUND

SVZ-9A    209 S    210    SVZ-8A

201 M    202

LANGARA / 49th AVENUE STATION    OAKRIDGE / 41st AVENUE STATION

SVZ-9B    SVZ-8B

INBOUND    INBOUND TUNNEL TVZ-20    INBOUND

Additional Fan In Supply    Emergency Fire Mode    Emergency Fire Mode    Additional Fan In Supply

Reset to Normal

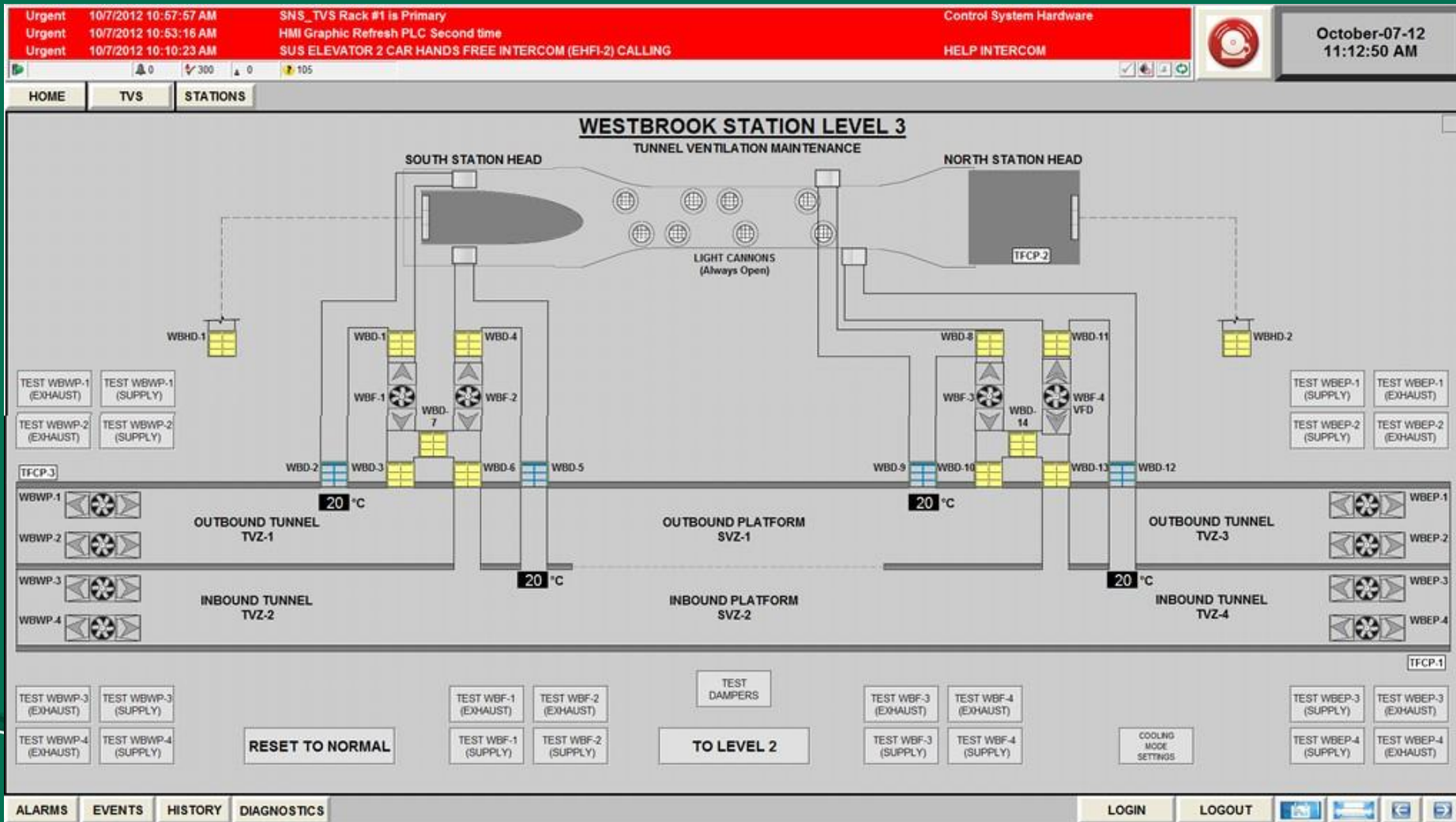
LGS    ORS

Alarms    Events    Send To OVW






# TVS Level-3 HMI (Calgary West LRT example)



# Key Presentation Take-Aways

- What constitutes successful operation
  - Correct identification of the event
  - Correct identification of the location of the event
  - Correct determination of the course of action required
  - Correct execution of the identified course of action.

# Key Presentation Take-Aways

- How do we get there
    - Deliver the Operator clear and concise information
    - Train the Operator to understand what they are seeing
    - Train the Operator to determine what their response must be to the event
    - Provide the Operator with clear and concise methods of undertaking the response
- 

# What tools do we need to deliver the desired response

- Good information on location and type of event
- Quick methods of confirming the primary information
- Easily understood data presentation
- Easily operated response.



# What tools do we need to deliver the desired response

- Good information – from both facility and vehicles
- Confirmation - by staff or video review
- Data presentation – SCADA system
- Response – SCADA system
- Integration of the TVS and SCADA systems early in the design



Any Questions?

