



**12<sup>th</sup> U.S. & North America Ventilation Symposium  
June 2008**

***Ventilation On Demand  
(VOD)***

***Auxiliary Fan Project***

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## *Ventilation On Demand*

**This intent of this project is to prove the feasibility both from a technical and practical approach with respect to the implementation of Ventilation on Demand in auxiliary ventilated drifts.**

## *Ventilation On Demand*

### *History*

- ❖ *A survey was conducted for 125 days in 2001 to assess the current ventilation system with respect to:*
  - *Mining activity*
  - *Temperature/Humidity*
  - *Blasting Contaminants*

## *Ventilation On Demand*

### *Key Activities Assessed*

- ❖ *Mining activities*
  - *Mucking – LHD's*
  - *Drilling – Jumbo Drills*
  - *Backfilling stopes – LHD's*
  - *Idle – No Activity*

## *Ventilation On Demand*

### *Key Activities Assessed*

#### ❖ *Temperature Profiles*

- *Mucking – LHD's*
- *Drilling – Jumbo Drills*
- *Backfilling Stopes – LHD's*
- *Idle – No Activity*

# *Ventilation On Demand*



*A survey was conducted for 3 production blasts in 2003 to assess the current ventilation system with respect to:*

## **❖ Blast Gas Clearing**

- **Carbon Monoxide (CO)**
- **Carbon dioxide (CO<sub>2</sub>)**
- **Nitrogen Monoxide (NO)**
- **Nitrogen Dioxide (NO<sub>2</sub>)**
- **Dust's**

## *Key Learning's*

### ❖ **Utilization**

- **Normal Fans on 100% time**
- **Auxiliary Fans - opportunity 56% with time of day “on/off”**
- **Auxiliary Fans - VOD required for 25% of time**

# *Ventilation On Demand*



## *Key Learning's*

### ❖ **Blasting Gases**

- **Normal clearing times ~ 45 to 200 minutes**
- **Automated Fans - opportunity to start fans immediately following blast to reduce clearing times & exposures**
- **Carbon Monoxide best indicator of air quality following a blast.**



# *Ventilation On Demand*



## *Key Learning's*

### ❖ **Temperatures**

- **Equipment Base – localized to individual heading**
- **Typical mucking cycle times ~ 8 minutes**
- **System takes 5-20 minutes to stabilize**
- **Less pronounced to marginal influence downstream**

## *Ventilation On Demand*

- ❖ **Ventilation On Demand can be controlled in 3 separate stages**
  - **Main intake and exhaust fans**
  - **Level control (intake &/or exhaust regulators)**
  - **Development headings & ancillary fan installations**

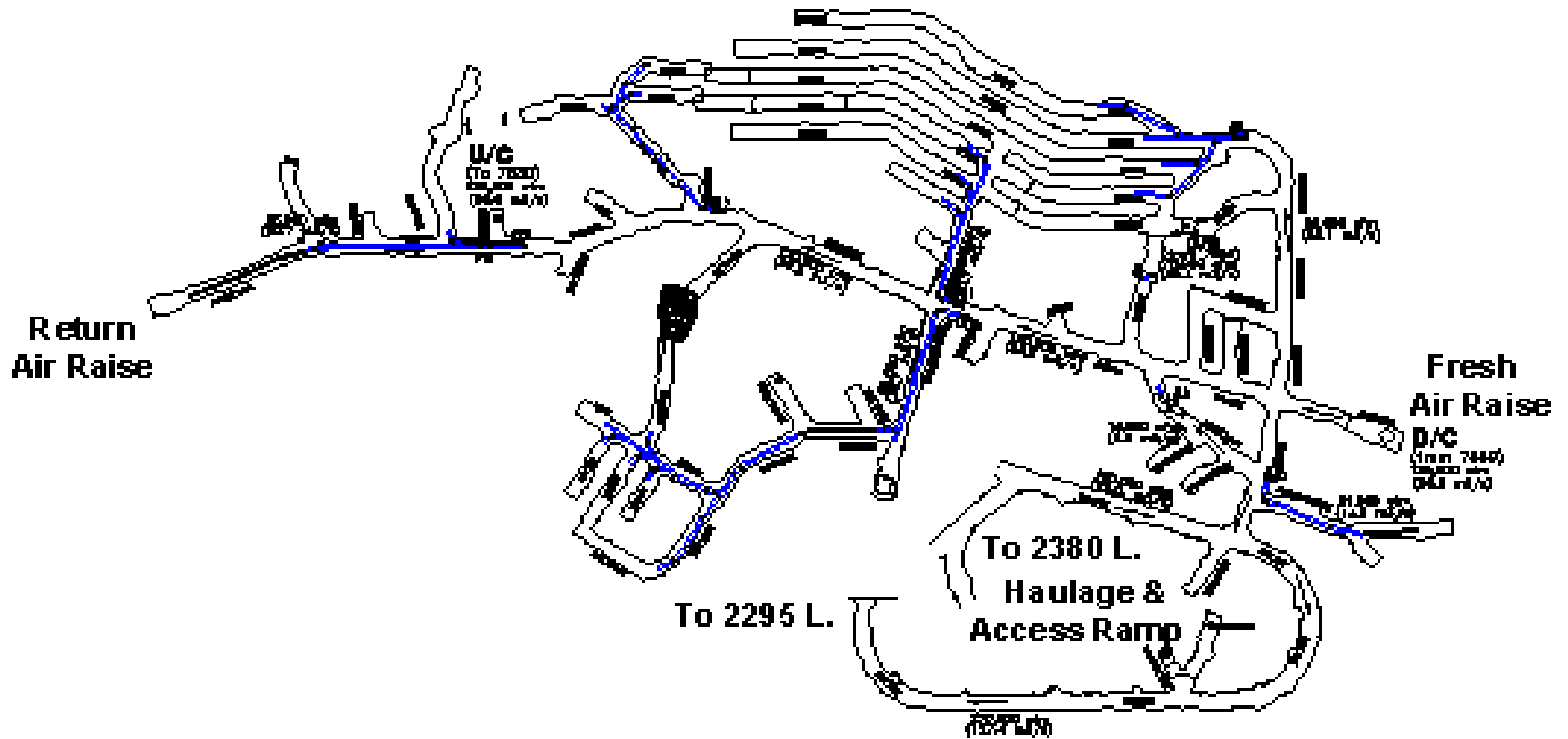
# *Ventilation On Demand*



## *Development Auxiliary System design*

- **Systems are currently designed and installed to meet the final product requirements; typically at Creighton that equates to *112 kW (150 hp) x 1220 mm (48"Ø) x 23.5 m<sup>3</sup>/s (50,000 cfm) @ 305 m (1000')* long development ends.**
- **The requirements will vary continuously over the next 1-2 yrs as development progresses starting with a requirement of approximately *37 kW (50 hp @30.5 m (100')* long initial starting point.**
- **This represents a sizable energy opportunity.**

# *Ventilation On Demand*



**7680 Level**

*Ventilation On Demand*



***The Ventilation On Demand (VOD) Project described here deals only with Auxiliary Fan Installations.***

- ❖ ***Development Headings***
  - ***Reduce airflow to development headings based on requirements only as opposed to current maximum ventilation flow practices.***
  - ***Possible energy reduction of power is to the cube of volume.***
  - ***savings estimated to be \$21,000/yr for a single 112 kW (150 hp) fan averaged over a 10 year period.***

# *Ventilation On Demand*



This pilot project is being conducted on the 2340m (7680ft) level of the mine:

- Two auxiliary ventilation systems consisting of 112 kW (150 hp) fans, duct installation (mining area), variable frequency drive starters and monitoring equipment.
- Tagging system for identification of 20 personnel and 50 vehicles (Operating, MTS, Maintenance, etc.)
- Computer software, hardware and programming
- Electrical hardware and installation (electrical dept.)
- SCADA and HMI development and implementation
- Commissioning
- Monitoring and reporting

# *Ventilation On Demand*



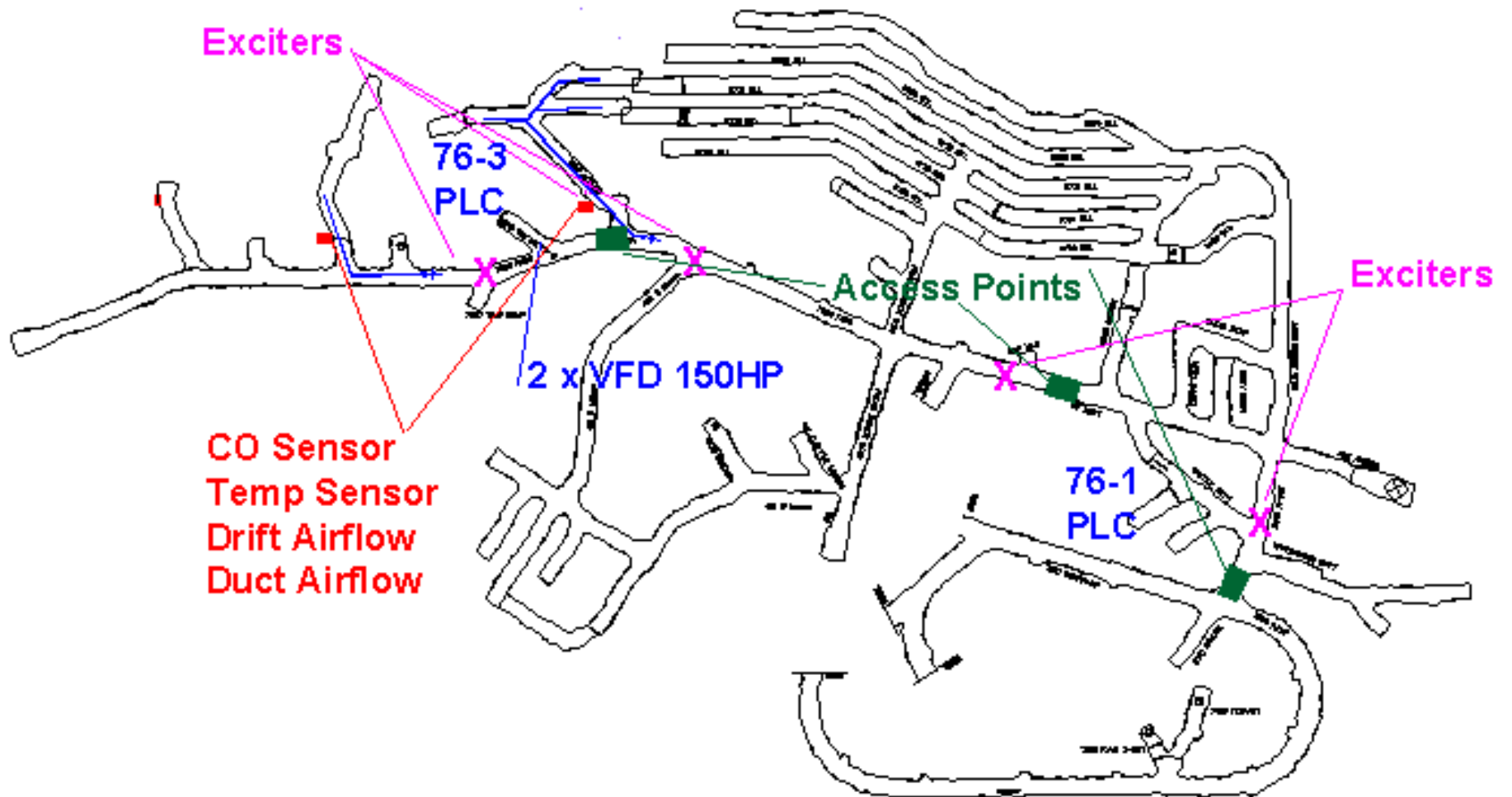
## *Project Participants*

**Vale Inco Limited**

**CANMET-MSL**

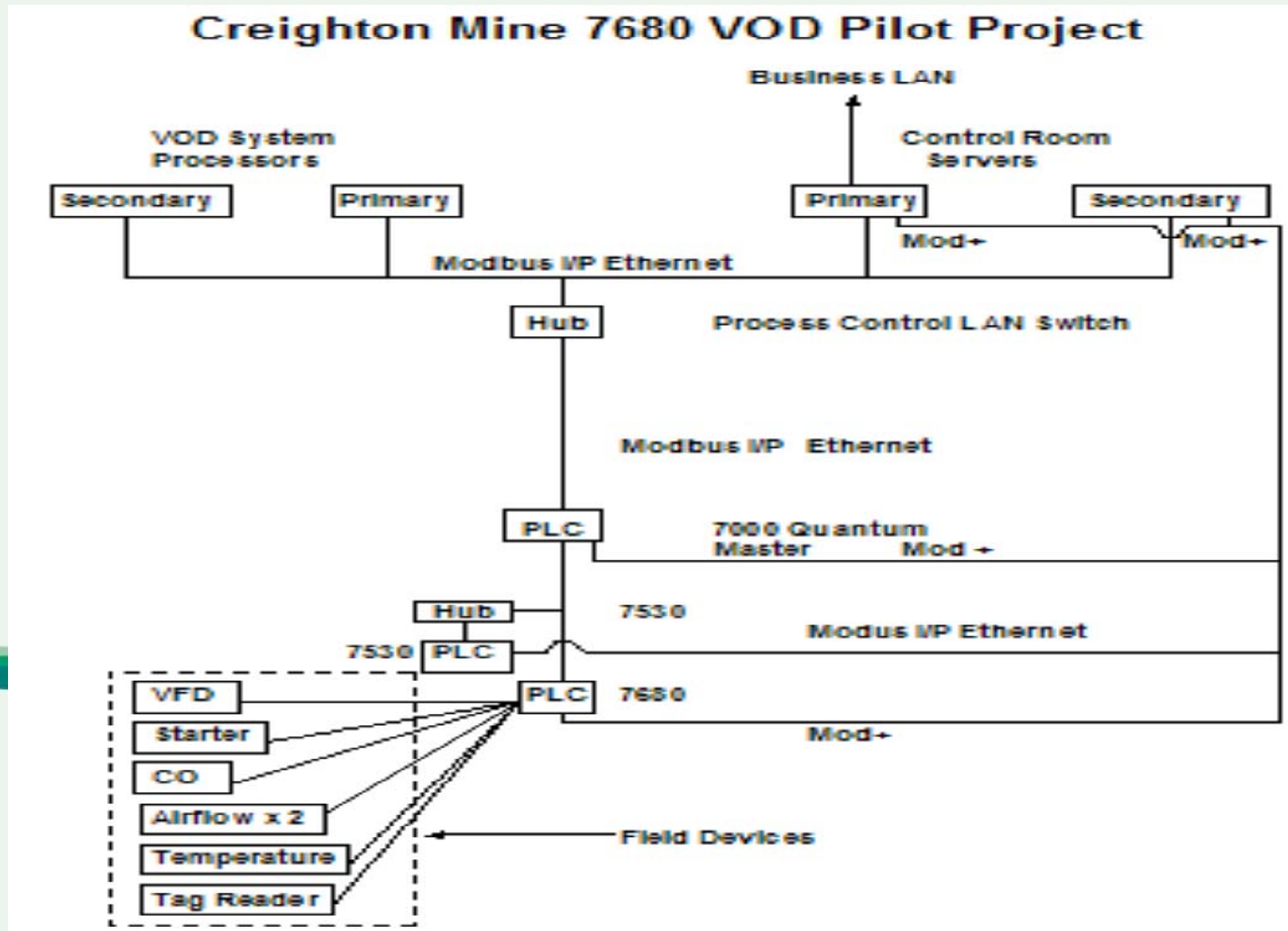


# Ventilation On Demand



**7680 Level**

# Ventilation On Demand



## *Ventilation On Demand*



### ***Auxiliary Fan Protocol*** - Full Fan Volume

**23.5 m<sup>3</sup>/s (50,000 cfm)**

- ❖ **Fan starts on equipment/Personnel entry with 15 minute ramp down delay**
  - **R1700G scoop (tag) and/or combination of up to 4 x misc. vehicles/personnel (tag) entering heading**
  - **CO > 25 ppm**
  - **Temperature > 30<sup>0</sup> C or 104<sup>0</sup> F**

# *Ventilation On Demand*



## ***Fan Protocol*** – Partial Volume 14.1 m<sup>3</sup>/s (30,000 cfm)

- ❖ Fan starts on equipment/Personnel entry with 15 minute ramp down delay
  - No R1700G scoop (tag)
  - Up to 3 x misc. vehicles/personnel (tag) entering heading
  - CO < 25 ppm
  - Temperature < 40<sup>0</sup> C or 104<sup>0</sup> F

# *Ventilation On Demand*



## ***Fan Protocol*** – Partial Volume 9.4 m<sup>3</sup>/s (20,000 cfm)

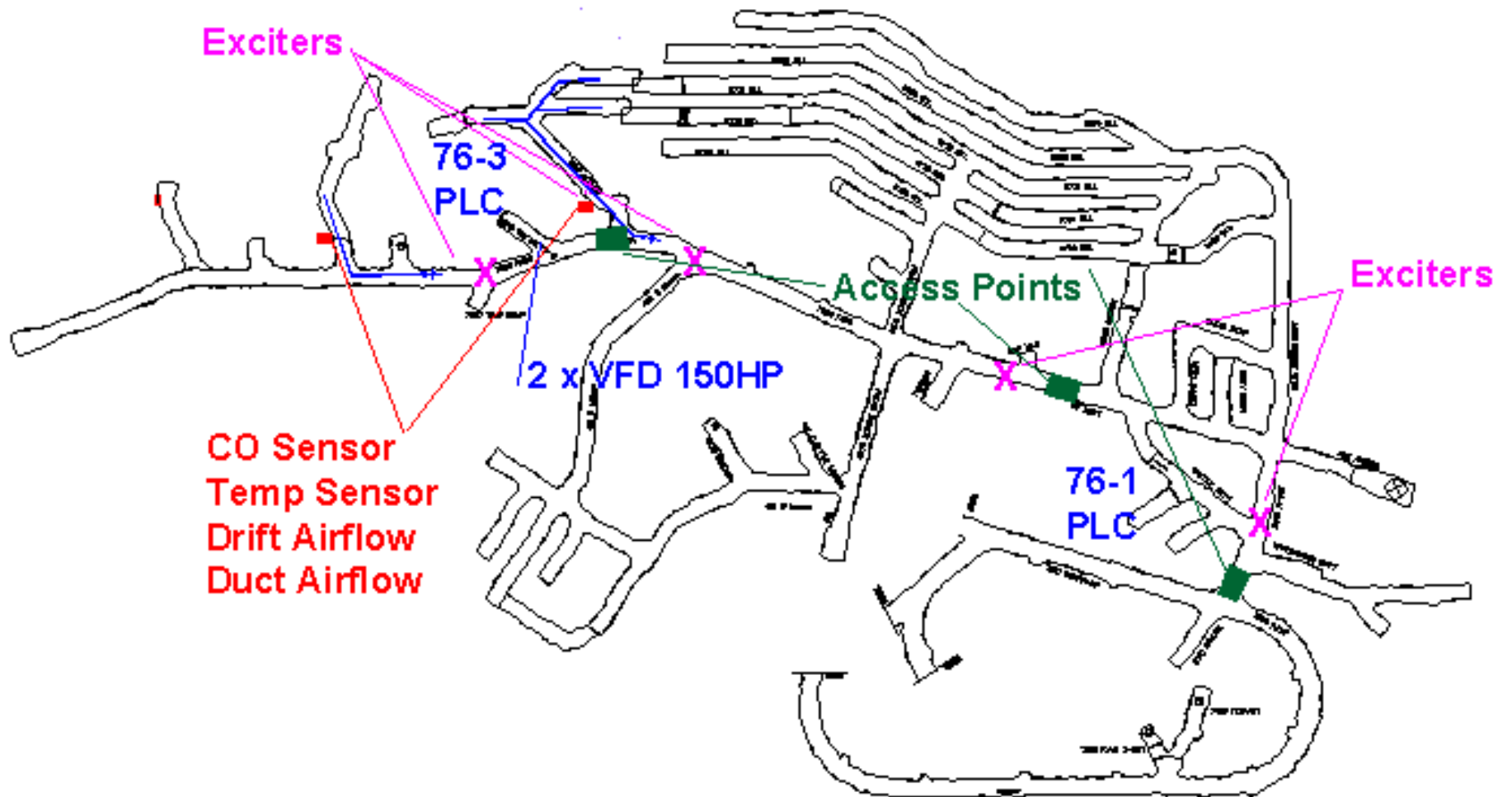
- ❖ Fan starts on equipment/Personnel entry with 15 minute ramp down delay
  - No scoop (tag)
  - Up to 2 x misc. vehicles/personnel (tag) entering heading
  - CO < 25 ppm
  - Temperature < 40<sup>0</sup> C or 104<sup>0</sup> F

## *Ventilation On Demand*

### ***Fan Protocol*** – No Volume 0 m<sup>3</sup>/s (0 cfm)

- ❖ No vehicles or personnel (tag) read entering in last 15 minutes
  - CO < 25 ppm
  - Temperature < 40<sup>0</sup> C or 104<sup>0</sup> F
- ❖ Loss of Control Power
  - Fan ramps up to full speed

# Ventilation On Demand

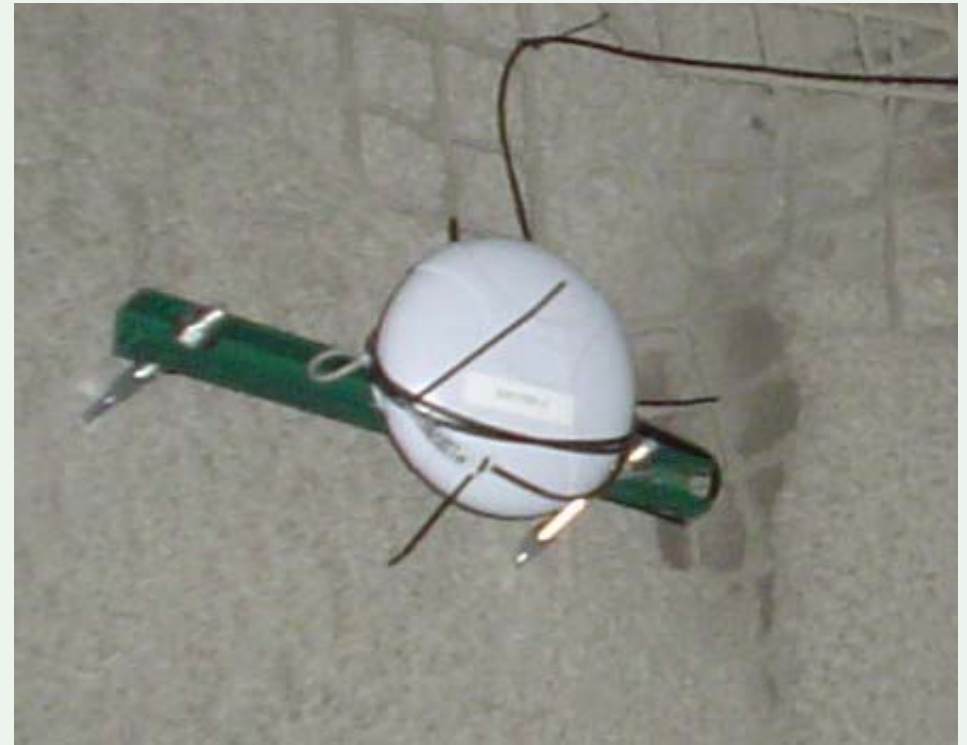


**7680 Level**

# *Ventilation On Demand*



***Access Point***



***Exciter***

***Temperature  
Sensor***



# *Ventilation On Demand*

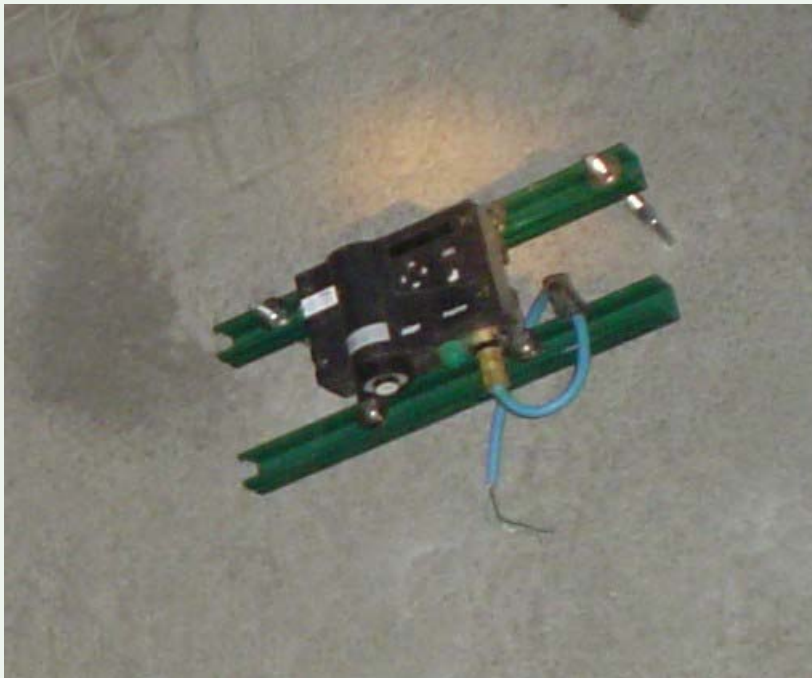


***Drift Airflow Monitor***



***Duct Airflow Monitor***

# *Ventilation On Demand*



***Drift CO Sensor***



***Vehicle Tag***

# *Ventilation On Demand*



## ❖ *Project Schedule*

- MOC # 17-2-152 - completed
- *Process Hazard Review - completed*
- Programming Development – August to December 2007
- Field Installation – January/February 2008
- Installation & Commissioning – April/May 2008
- Testing, Data Collection & Monitoring – June to August 2008
- Summary & Report – Sept./Oct. 2008

# *Ventilation On Demand*



## ❖ *Project Status*

- Field components have been installed
- Vehicle tag on test vehicle
- Trial run was conducted
- Require programming adjustments (component software to company system)
- Installing remaining vehicle tags