

Protection From Wildfire Smoke

An Overview of Cal/OSHA's Regulation in Title 8 CCR §5141.1

Enrique Medina, MS, CIH, CSP, FAIHA
Alliance Consulting International

Presentation Objectives

- ▶ Recognize conditions that pose a health risk to employees from wildfire smoke.
- ▶ Implement controls at the work site.
- ▶ Protect workers from exposure to wildfire smoke.
- ▶ Understand how to comply with the Cal/OSHA regulation.

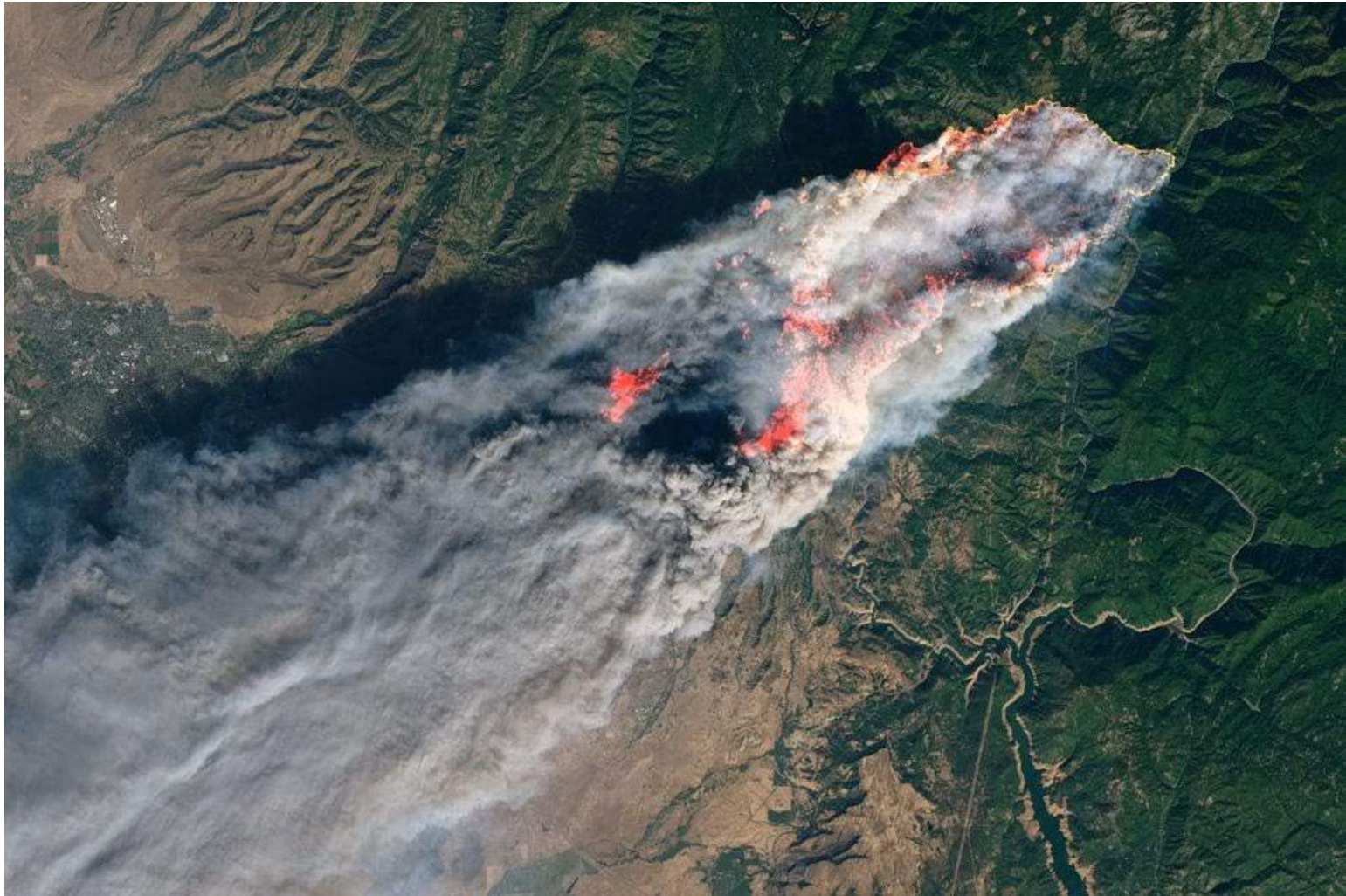
Basic Compliance Actions

1. Monitor the Air Quality Index (AQI) in the area, or take real-time measurements of PM2.5.
2. Communicate with employees.
3. If AQI for PM2.5 reaches 151: Protect employees from exposure.
4. Provide training on health effects, protective measures, regulation, and employee rights.

Air Quality Index Color Chart

Air Quality Index Levels of Health Concern	Numerical Value	Meaning
Good	0 to 50	Air quality is considered satisfactory, and air pollution poses little or no risk.
Moderate	51 to 100	Air quality is acceptable; however, for some pollutants there may be a moderate health concern for a very small number of people who are unusually sensitive to air pollution.
Unhealthy for Sensitive Groups	101 to 150	Members of sensitive groups may experience health effects. The general public is not likely to be affected.
Unhealthy	151 to 200	Everyone may begin to experience health effects; members of sensitive groups may experience more serious health effects.
Very Unhealthy	201 to 300	Health alert: everyone may experience more serious health effects.
Hazardous	301 to 500	Health warnings of emergency conditions. The entire population is more likely to be affected.

Camp Fire Smoke Plume



Woolsey Fire in Ventura County



Wildfire Smoke Plumes 11/9/18



SF Bay Area Air Quality Nov. 8 & 10



Wildfire Smoke Composition

- ▶ PM2.5: Fine Particulate Matter < 2.5 microns:
 - Char: keeps part of original plant cell structure
 - Ash: minerals from char combustion
- ▶ Heavy metals (As, Pb, Ni, Cd, Cr)
- ▶ Polycyclic aromatic hydrocarbons (PAHs)

Particulate Matter Diameters

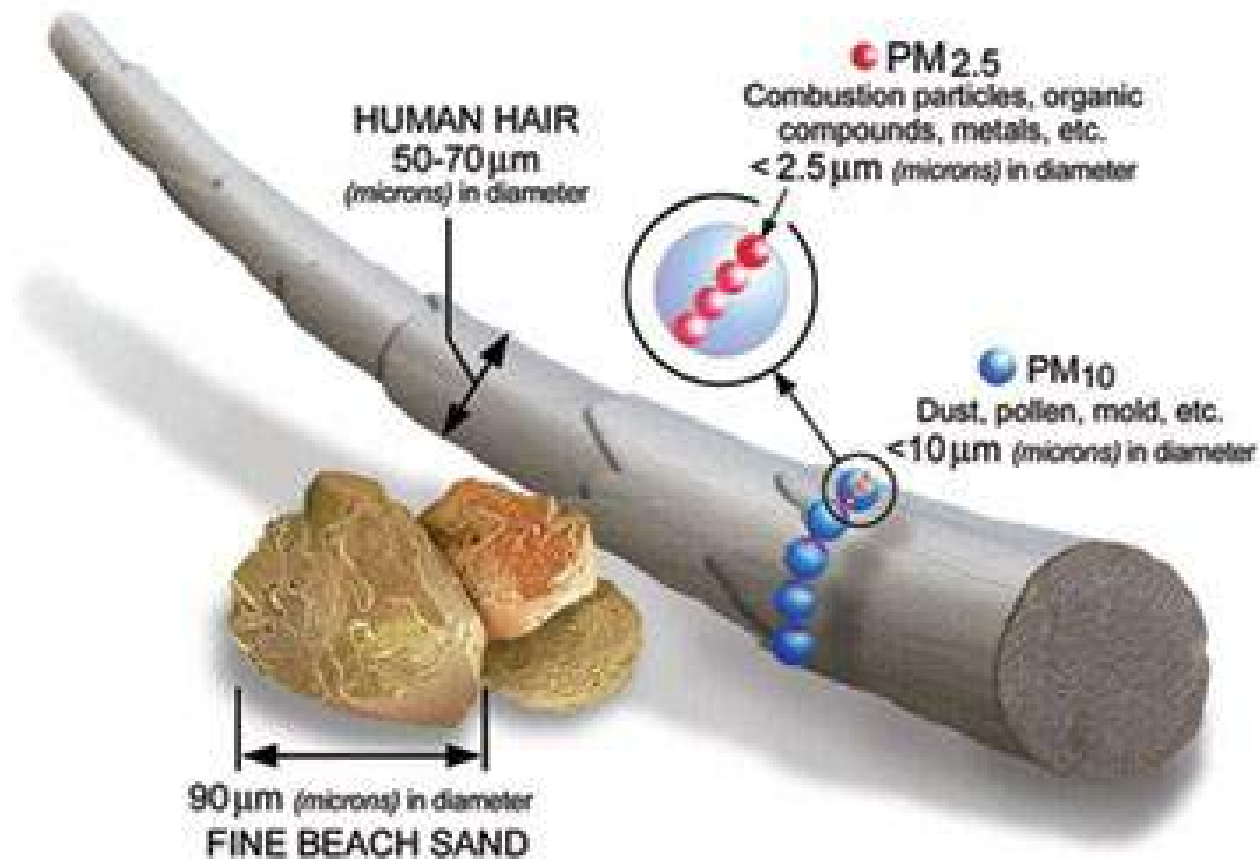


Image courtesy of the U.S. EPA

Health Issues of Particle Pollution

- ▶ Irritation of the eyes, nose and throat
- ▶ Coughing, chest tightness and shortness of breath
- ▶ Asthma attacks
- ▶ Reduced lung function
- ▶ Irregular heartbeat
- ▶ Heart attacks
- ▶ Ischemic Stroke, Alzheimer's Disease
- ▶ Premature death in people with heart or lung disease

Health Effects From 2007 San Diego Wildfires

- ▶ Outpatient visits for acute bronchitis were 72% higher in the 5-day period after the peak fire.
- ▶ ED visits for asthma went up 73% on days with an AQI for PM2.5 of 101–150
- ▶ Increases in respiratory problems during wildfires can be expected even at mildly degraded levels of air quality.

Health Risk from Smoke Inhalation during 2015 Wildfires

At AQI 44 to 71 ($< \frac{1}{2}$ Cal/OSHA PM_{2.5} level)
Higher risk:

- ▶ Asthma for ages 19–44
- ▶ COPD & high blood pressure for Ages 45–64
- ▶ Respiratory illness for all working age adults
- ▶ Emergency visits for cardiovascular disease increased for all working age adults.

Regulatory Thresholds

1. Employees may be reasonably expected to be exposed to wildfire smoke, and
2. PM_{2.5} AQI = 151 or above.

Outdoor occupations: construction, utilities, agriculture, landscaping, recreation, billposting, tree trimming, roofing.

Indoor/outdoor jobs: delivery drivers, sales & service personnel, law enforcement, EMTs.

Exceptions to the Regulation

- ▶ Work in enclosed buildings or vehicles with mechanical air filtration.
 - All openings must be kept closed to minimize outdoor contamination.
- ▶ Exposed for one hour or less during shift.
- ▶ Firefighters engaged in wildland firefighting.
- ▶ Where employer demonstrates that AQI for PM 2.5 is less than 151 at the work site.

Compliance Preparations

- ▶ Make plans for prompt medical treatment of injured or ill employees.
- ▶ Provide respirators for voluntary use.
- ▶ Train employees.
- ▶ Written program is not required but it's a good idea to adapt H&S Plan or IIPP.

What to Do If Wildfires Affect Air Quality

- ▶ Check current and forecast AQI at start of shift and periodically during work shift.
 - By Zip Code at <https://www.airnow.gov/>
 - or measure air quality directly.
- ▶ Communicate with employees in a readily understandable form.
- ▶ Provide ways to reduce exposure.

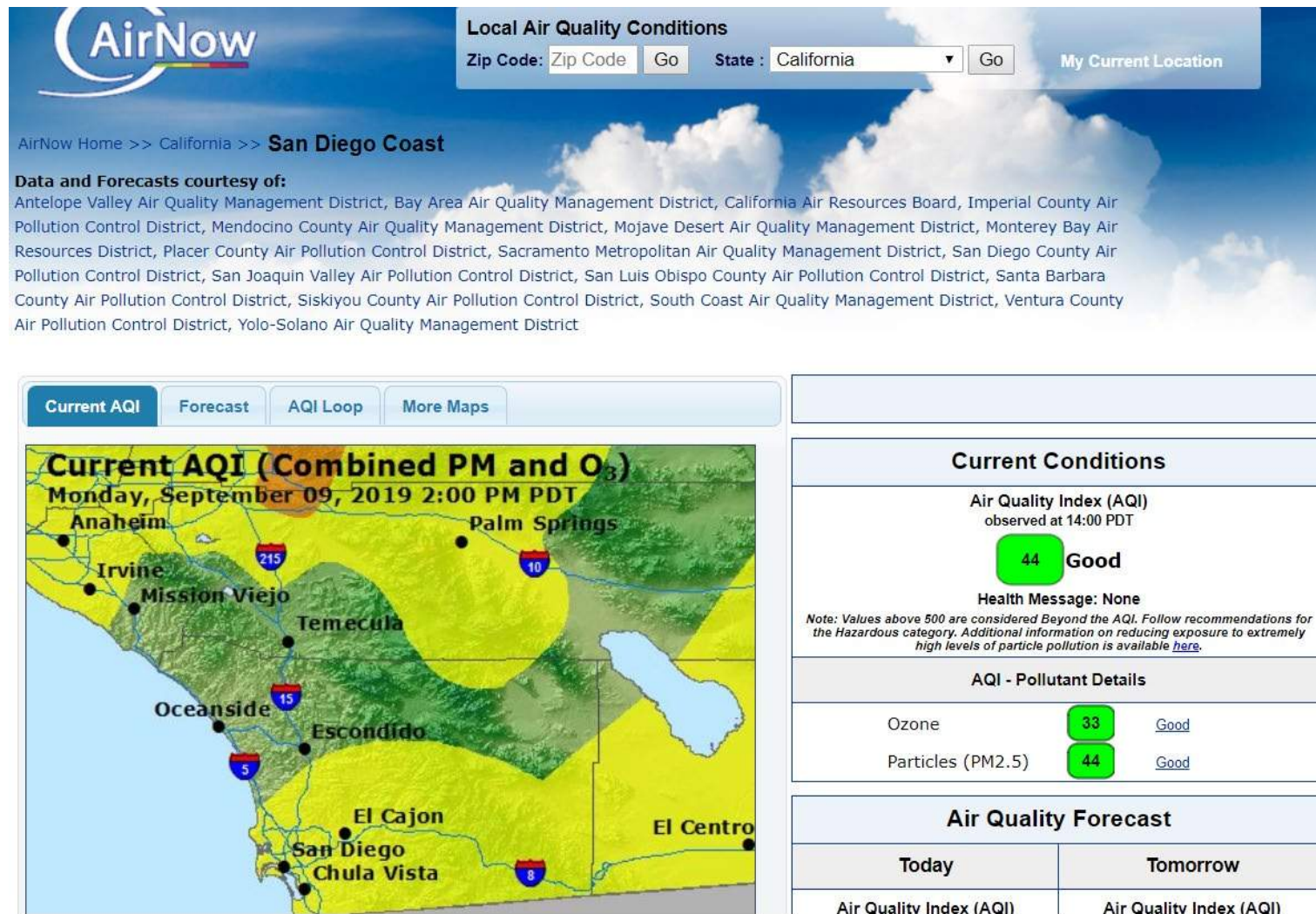
What is the Air Quality Index?

Air Quality Index (AQI) Values	Levels of Health Concern	Colors
<i>When the AQI is in this range:</i>	<i>..air quality conditions are:</i>	<i>...as symbolized by this color:</i>
0 to 50	Good	Green
51 to 100	Moderate	Yellow
101 to 150	Unhealthy for Sensitive Groups	Orange
151 to 200	Unhealthy	Red
201 to 300	Very Unhealthy	Purple
301 to 500	Hazardous	Maroon

- ▶ Health effects of six pollutants (PM, CO, Pb, NO₂, SO₂, Ozone)
- ▶ AQI 100 corresponds to NAAQS level that protects public health

Where to Find Your Area AQI


<https://www.airnow.gov/index.cfm?action=aqibasics.aqi>



Converting AQI to concentration

airnow.gov/index.cfm?action=airnow.calculator

AQI Calculator



*DIRECTIONS: Choose the tab for **AQI to Concentration** or the tab for **Concentration to AQI**. Select a pollutant, then enter the AQI value or the concentration (in units). Click on "Calculate" to see the results.*

AQI to Concentration

Concentration to AQI

Select a Pollutant

PM2.5 - Particulate <2.5 microns (24hr avg) ▼

Enter the AQI:

Concentration	Units:	AQI Category
<input type="text" value="55.5"/>	<input type="text" value="ug/m3"/>	Unhealthy

Sensitive Groups	Health Effects Statements	Cautionary Statements
People with respiratory or heart disease, the elderly and children are the groups most at risk.	Increased aggravation of heart or lung disease and premature mortality in persons with cardiopulmonary disease and the elderly; increased respiratory effects in general population.	People with respiratory or heart disease, the elderly and children should avoid prolonged exertion; everyone else should limit prolonged exertion.

Two-Way Communication

- ▶ Communicate smoke hazard to employees in a form that is readily understandable.
- ▶ Inform employees of:
 - current AQI for PM2.5.
 - available protective measures
- ▶ Encourage employees to report:
 - wildfire smoke hazards
 - worsening conditions
 - smoke exposure symptoms

Employee Training

- ▶ Health effects of wildfire smoke.
- ▶ What AQI means and where to find it.
- ▶ What to do to protect themselves from smoke exposure.
- ▶ Right to seek medical treatment without fear of reprisals.
- ▶ The employer requirements

Engineering Control Strategies

- ▶ Reduce PM2.5 exposure to below AQI 151 or as much as feasible:
 - ▶ Air filtration
 - ▶ Ventilation
- ▶ If Engineering Controls do not reduce exposure implement administrative control strategies

Administrative Controls

- ▶ Move to areas below AQI 151.
- ▶ Change work hours.
- ▶ Reduce time in areas with unfiltered air.
- ▶
- ▶ Additional breaks.
- ▶ Reduce work intensity.

Respiratory Protection

At PM2.5 AQI 151 to 500:



- ▶ NIOSH-certified
- ▶ Filtering face piece
- ▶ N, O, P-95 to 100.
- ▶ Encourage voluntary use.

Voluntary Use Respirator Training

- ▶ The importance, limitations, and benefits of wearing a respirator when exposed to wildfire smoke.
- ▶ How to properly don and wear the respirator.
- ▶ How to clean, store, maintain, and replace it.
- ▶ Can follow Appendix D of Section 5144

Mandatory Use Respirator Use

- ▶ When PM2.5 AQI exceeds 500 (0.5 mg/m^3).
- ▶ Respiratory Protection Section 5144 applies.
- ▶ Provide respirator with Assigned Protection Factor of 10 or more.
- ▶ Require medical evaluation, fit testing, and change out schedules.

Measuring PM2.5 at Worksite

- ▶ Direct-reading dust monitor tracks real-time conditions.
- ▶ More precise readings of air quality.
- ▶ Must not underestimate exposure.
- ▶ Trained operator directs monitoring and knows how to interpret results.

Direct Reading Instruments



Nanozen



Airbeam2



TSI Dustrak DRX

PM2.5 Meter Comparison Chart

Features	Dustrak DRX	Nanozen	AirBeam2
Size selector	Plug in	Plug in	Built-in
PM2.5 Accuracy	Overestimate	Overestimate	Accurate
Correction Factor	Programmable	Programmable	Complicated
Sampling Filter	Built-in	Built-in	External
User Friendly	Easy	Easy	Very Easy
Units	µg/m3	µg/m3	µg/m3 & AQI
Display	Integrated	Integrated	Android app
Data Connectivity	Download data	Download data	Cast to Cloud
Cost	\$9,500	\$4,900	\$249+android
Suitable for	Compliance	Compliance	Screening

Pros and Cons of AQI vs Meter

AQI Index

PROS:

- ▶ Accessible data
- ▶ Units in AQI index
- ▶ No equipment cost
- ▶ No operator training

CONS:

- ▶ Work subject to AQI
- ▶ Daily levels only
- ▶ Few monitoring stations

Particle Meter

PROS:

- ▶ Site-specific levels
- ▶ Real-time data
- ▶ Control work schedule

CONS:

- ▶ Equipment cost
- ▶ Operator training
- ▶ Convert units to AQI
- ▶ Background levels

In Review: Connecting the Dots

- ▶ Wildfire smoke degrades air quality for weeks after the peak fire.
- ▶ Smoke travels far from actual fire source.
- ▶ 90% of smoke particulates are PM2.5
- ▶ Inhaling PM2.5 has serious short and long-term health effects to working age adults.
- ▶ Plan how to respond to wildfire conditions.

To Do's Before the Wildfire

Know how to:

- ▶ Monitor the Air Quality Index.
 - Or use a direct-reading instrument.
- ▶ Communicate with workers.
- ▶ Apply engineering and administrative controls to reduce exposures.
- ▶ Select and stock respirators for voluntary use.
- ▶ Conduct training.

Questions?

THANK YOU

Enrique Medina, MS, CIH, CSP, FAIHA
Alliance Consulting International
San Diego, CA
619-297-1469
emedina@pulse-point.com