AFOEM Annual Training Meeting
Friday, 3 May to Sunday, 5 May 2019
Auckland, New Zealand

RACP
Specialists. Together
EDUCATE ADVOCATE INNOVATE

Australasian Faculty of
Occupational and Environmental Medicine
The specialist work doctors

Common Occupational Scenarios

Aluminium boat building

A boat building business approaches you to become their doctor. They have never had a doctor before, but they do get a nurse in to do a general health check and hearing tests and spirometry once every two years.

Putting frameworks to use

Aim: overview of initial work place assessment and advice on hazard management programme using I.A.M.A. format.

- Identify
- Assess
- Manage
- Audit

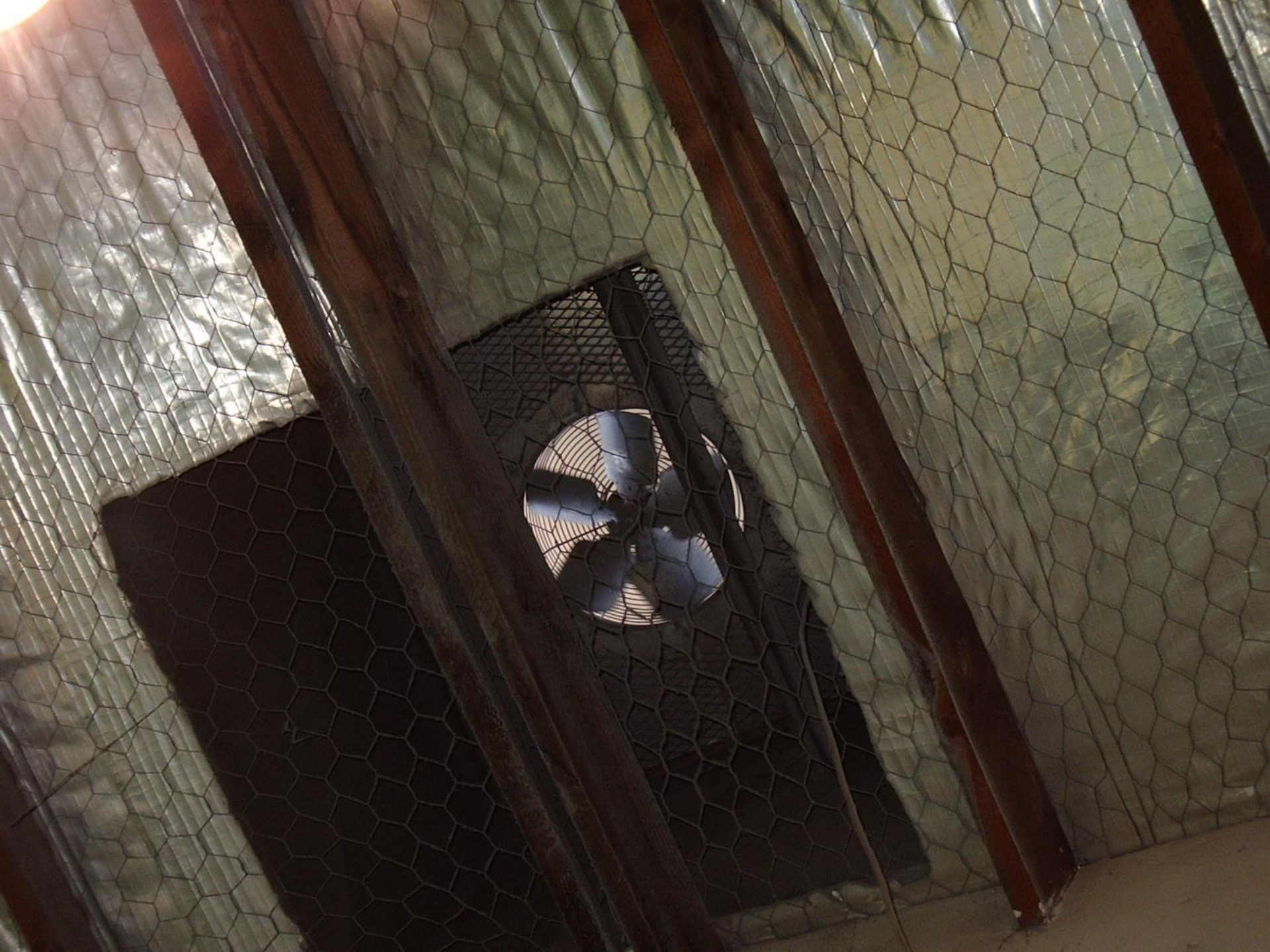
Identify

- Identification (of hazard)
  - historical
  - previous monitoring
  - hazard register / MSDS sheets
  - work site assessment
  - task / materials inventory
- Identification (of exposed population / individual)
  - ?particularly vulnerable individual / groups


NOTICE


TRADESMAN "SECURITY"
TOOL BOX
TB20
FEATURES
IDEAL FOR
3M
Dustmaster


MIG
305C
CEBORA



Hazards

Physical

Ergonomic

Chemical

Biological

Psychosocial

Legal / legislative

Physical

- Noise
- Lighting
- Vibration from power tools
- UV radiation
- Heat sources
- Electricity
- Heat and cold - weather dependant

Chemical

- Welding fume **
- Kerosene
- Metal dust debris
- Shield gas
- Forklift Exhaust

Other / General

- House keeping
- Forklift, lifting gear, machinery with blades and moving parts
- Manual handling
- Ergonomic posture
- Confined spaces
- Psychological

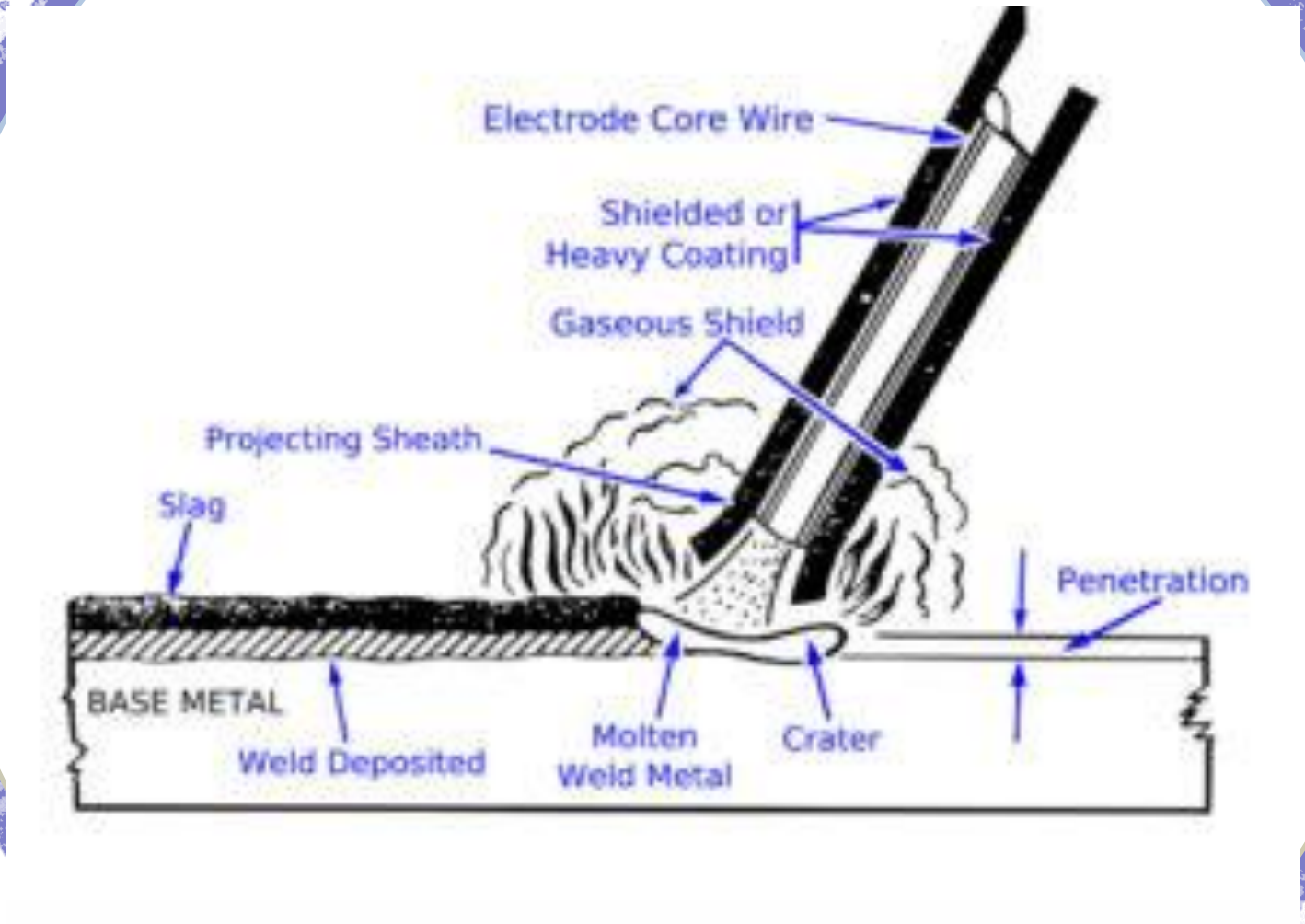
Welding

MIG Welding – metal inert gas

The concept of combining two pieces of metal together with a wire that is connected to an electrode current, is referred to as Metal Inert Gas (MIG) welding. In this type of welding process, a shielded gas is used along the wire electrode, which heats up the two metals to be joined. A constant voltage and direct current power source is required for this method, and this is the most common industrial welding process. The MIG or GMAW process is suitable for fusing mild steel, stainless-steel as well as aluminium.

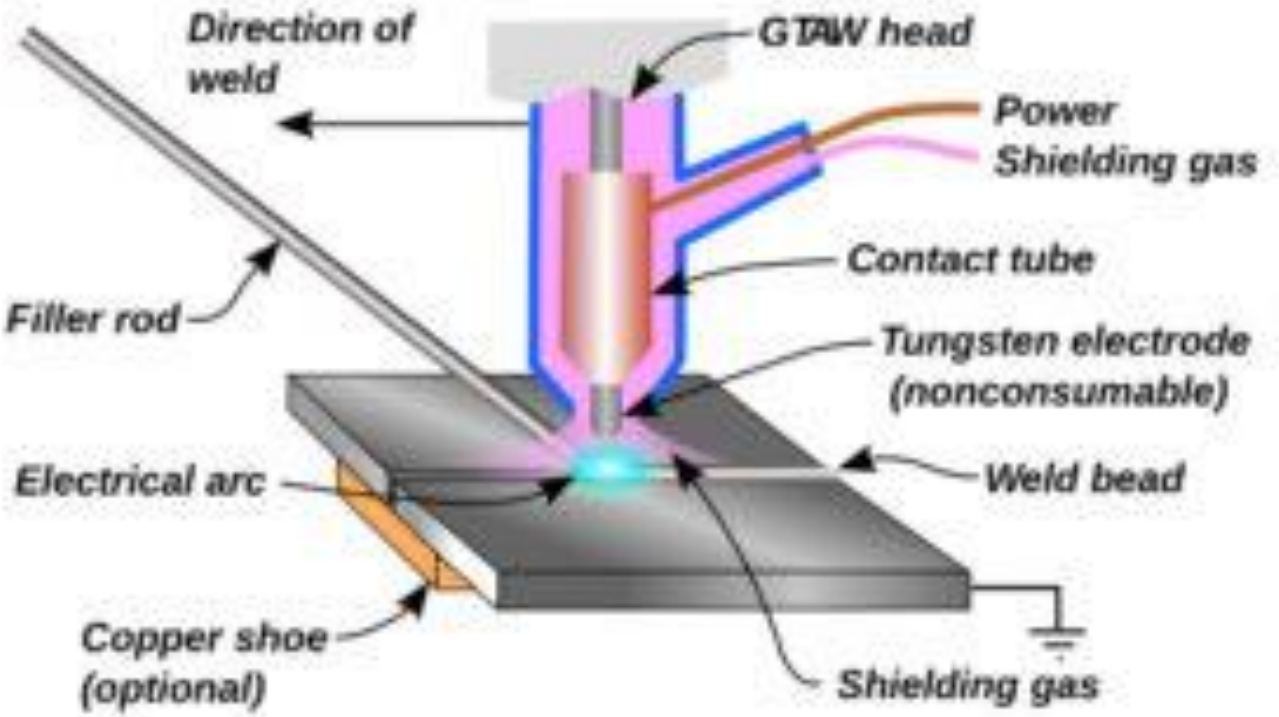
Arc Welding or SMAW (Shielded Metal Arc Welding)

Arc welding is also called as Shielded Metal Arc welding, or simply referred to as ‘Stick’. This is the most basic of all welding types. The welding stick uses electric current to form an electric arc between the stick and the metals to be joined. To weld iron and steel, this type of welding is often used in the construction of steel structures and in industrial fabrication. Stick welding can be used for manufacturing, construction and repair work.


Electrode Core Wire
Shielded or
Heavy Coating
Gaseous Shield
Projecting Sheath
Slag
Penetration
BASE METAL
Weld Deposited
Molten
Weld Metal
Crater

TIG (Tungsten Inert Gas) or GTAW (Gas Tungsten Arc Welding)

A non-consumable tungsten electrode is used in this type of welding process. This tungsten electrode is made use of to heat the base metal and create a molten weld puddle. By melting two pieces of metal together, an autogenous weld can be created. For this type of welding, the welder needs to have a lot of expertise as it's a very complex process. This welding process is employed to carry out high-quality work when a superior standard finish is required, without making use of excessive clean up by sanding or grinding.


Direction of weld
GTAW head
Power
Shielding gas
Contact tube
Filler rod
Tungsten electrode (nonconsumable)
Electrical arc
Weld bead
Copper shoe (optional)
Shielding gas

Welding Exposures

- Multiple chemical exposures depending on type of welding and products being welded:

Process	Base Metal	Contaminants
Shielded metal arc (stick welding)	Mild steel	Dust, iron oxide, manganese
Shielded metal arc (stick welding)	Stainless steel	Chromium, nickel, manganese, fluorides
Gas metal arc (MIG)	Stainless steel	Chromium, nickel, manganese, nitrogen oxides, ozone
Tungsten inert gas (TIG)	Aluminium	Ozone, aluminium oxide
Gas Brazing, cutting	Variable	Nitrogen oxides, cadmium oxide, metal fume

Health hazards of welding

Chemical Hazards

Air contaminants	
• Metals	Health hazard
○ Iron oxide	Benign pneumoconiosis
○ Manganese	Neurotoxicity, pneumonia
○ Cadmium oxide	Acute lung injury
○ Zinc Oxide	Metal fume fever
○ Chromium VI	Lung cancer, allergy
○ Nickel	Lung cancer, allergy
○ Fluoride	Skin or respiratory irritation
Gasses	
○ Ozone	Respiratory irritation, asthma
○ Nitrogen oxides	Acute lung injury
○ Carbon monoxide	Systemic poisoning
Particulates	

Don’t forget <u>other aspects of role</u>

- Cleaning products including solvents and degreasers

Don’t forget <u>contaminants</u>

• Galvanised metals	Zinc oxide
• Paints	Lead, cadmium, isocyanates, aldehydes, epoxies
• Biocides	Organic mercury, organic tin
• Chlorinated solvents	Phosgene
• Rustproofing	Phosphorus, phosphine
• Alloys, sheet metal	Cadmium, nickel, manganese, beryllium
• Solders	Rosin, colophony

Physical Hazards	
• Radiation	
○ Ultraviolet	Photokeratitis, skin erythema
○ Infrared	Burns, cataract
• Heat	Burns, heat exhaustion, eye injury
• Electricity	Electric shock, electrocution
• Noise	Hearing loss
Ergonomic	
• Slips, trip, falls	
• Repetitive stress injury	
Biological	
• ? any	
Psychosocial	
• Working in isolation	
• Bullying	
• Job satisfaction	

Assessment of Identified Hazards

Workplace and Hazards

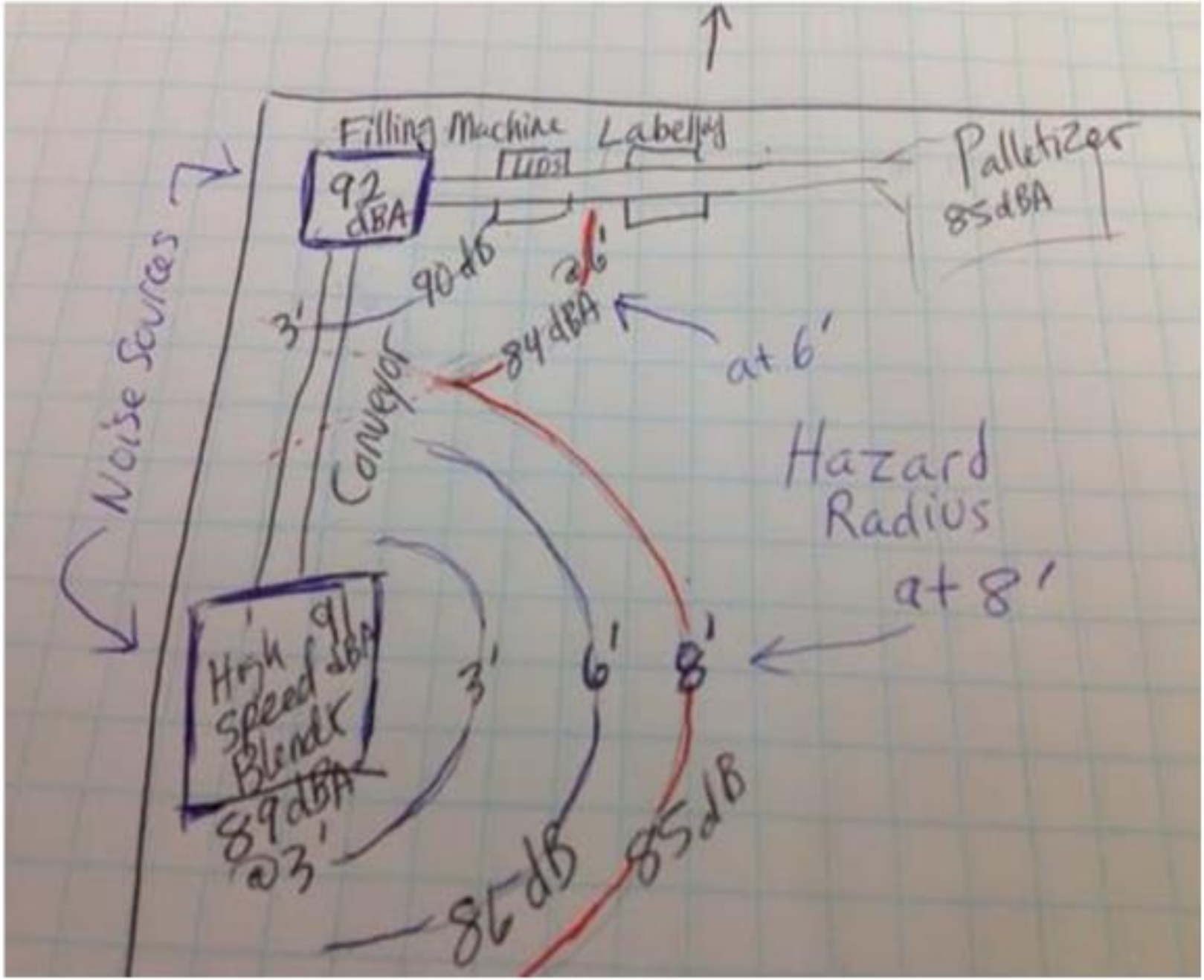
- MSDS and toxicology information
- W.E.S.
- Noise surveys
- Air or dust sampling
- Previous workplace monitoring results

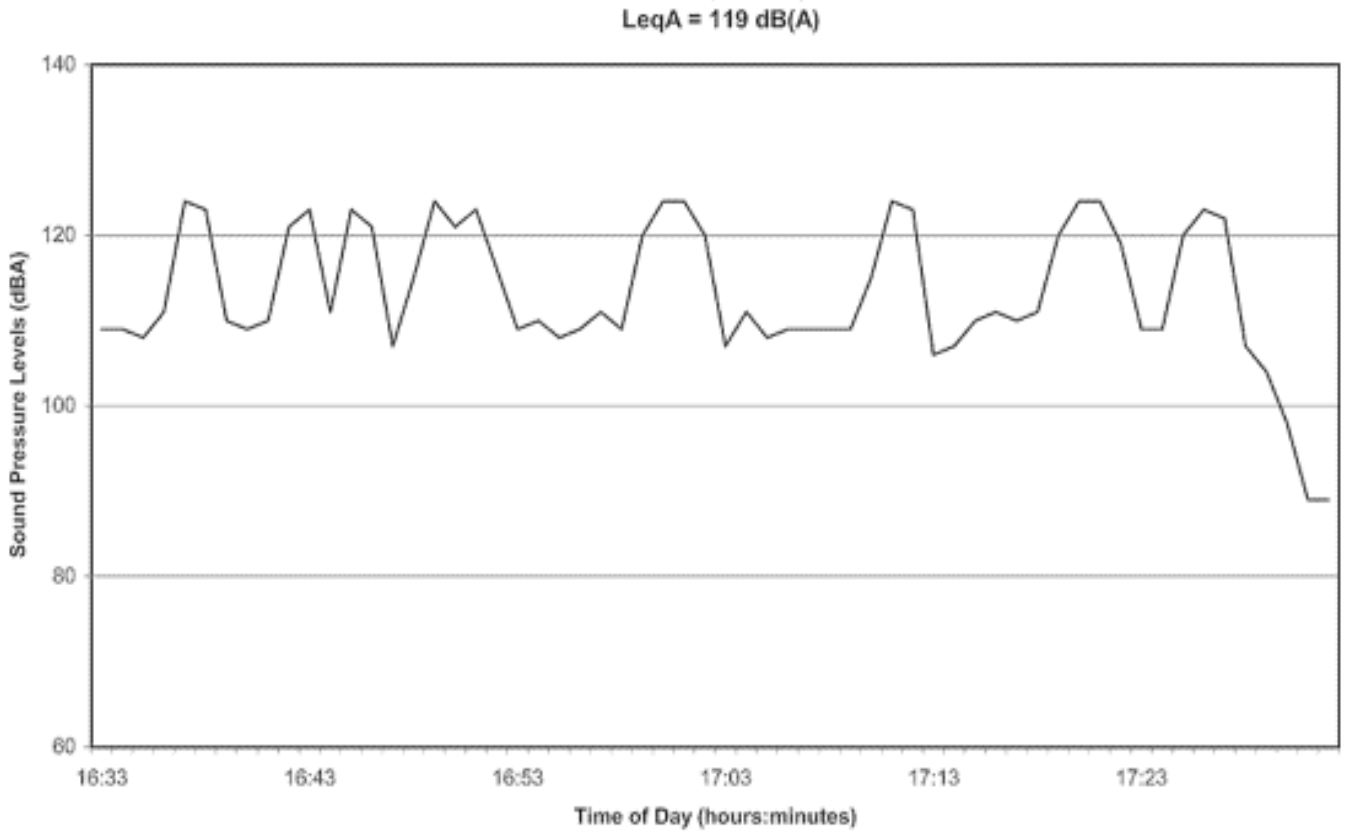
Workers

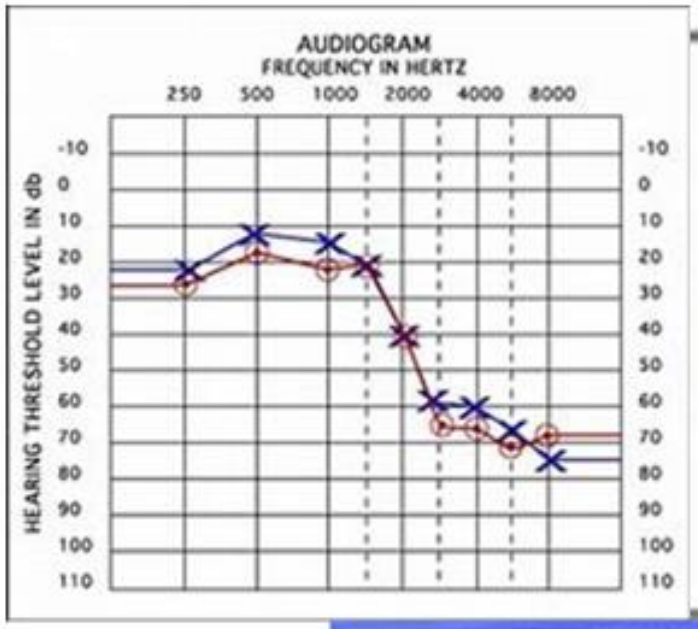
- Worker monitoring results
- Of workers – any with asthma or other medical illnesses?

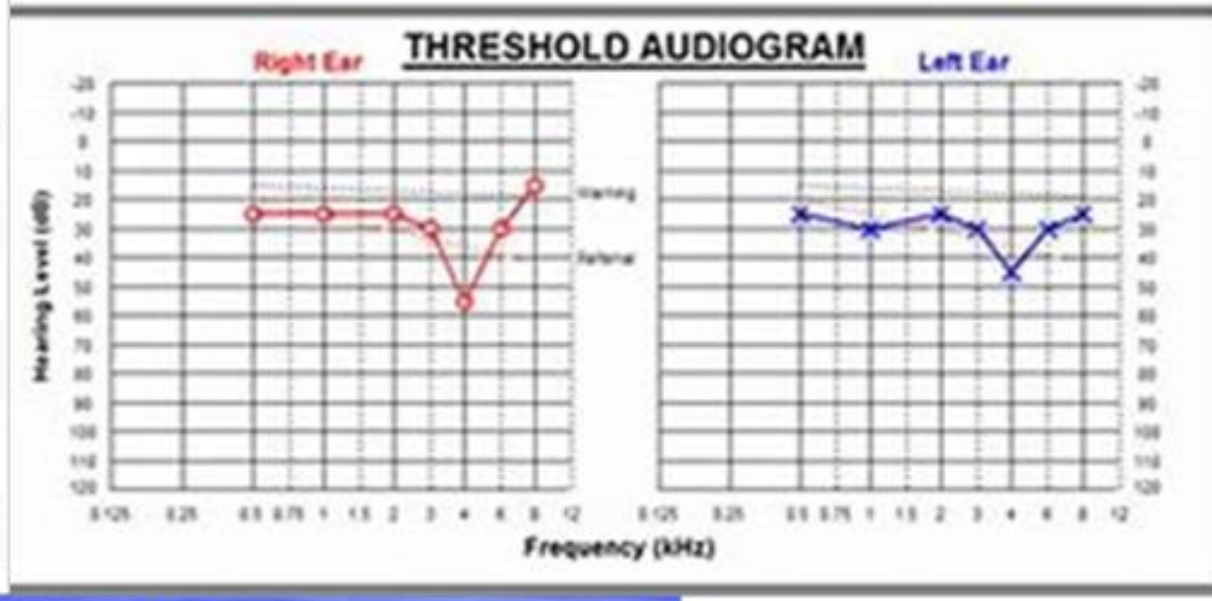

668

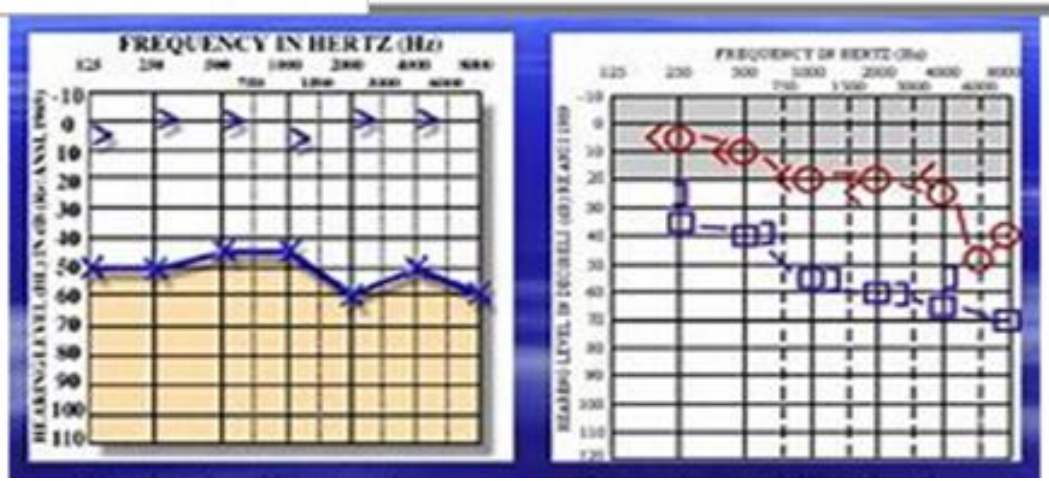

EXTECH
639


Filling Machine
Labeling
92 dBA
Palletizer
85dBA
90dB
3'
2'
84dBA
at 6'
Conveyor
Noise Sources
Hazard Radius
at 8'
High Speed Blender
91 dBA
89dBA @3'
3'
6'
8'
85dB
85dB


LeqA = 119 dB(A)
140
120
100
80
60
Sound Pressure Levels (dBA)
16:33
16:43
16:53
17:03
17:13
17:23
Time of Day (hours:minutes)


AUDIOGRAM
FREQUENCY IN HERTZ
250
500
1000
2000
4000
8000
HEARING THRESHOLD LEVEL IN db
-10
0
10
20
30
40
50
60
70
80
90
100
110


THRESHOLD AUDIOGRAM
Right Ear
Left Ear
Hearing Level (dB)
Frequency (kHz)


FREQUENCY IN HERTZ (Hz)

When reporting back to a workplace, how do you go about recommending what hazards money is spent on managing?

Risk Prioritisation

Risk Matrix		Risk (consequence)		
		Low	Medium	High
Likelihood	Low			
	Medium			
	High			

Risk Communication

- Don’t forget this, very important topic.
- Wont go into this now.

Managing the Hazards

- Source
- Pathway
- Worker

- Hierarchy of controls
  - Eliminate
  - Substitute
  - Isolate
  - Minimise
    - engineering controls
    - organisation controls
  - PPE

Cut protection:

- Chain mesh
- Knitted with steel core

Temperature (heat):

- Kevlar
- Tukon
- Leather

Chemical protection:

- Latex
  - Good for acids and ketones
  - Avoid hydrocarbons/alkanes/petrochemicals/aromatics/alkenes
- Nitrile
  - Good for hydrocarbons
  - Avoid ketones/acids
- Neoprene
  - Good for most
- PVC
  - Good for acids/bases
  - Avoid organic solvents/ketones/aromatics
- Butyl
  - Good for ketones, esters and oxidizing chemicals

Food handling:

- Latex
- Vinyl
- Polyethylene
- Disposable nitrile

Respiratory Protection

Three main types:

- Air purifying respirators
  - Draw inhaled air through a purifying filter.
  - 2 main types:
    - Particulate respirator which filters out dusts
    - Gas respirator which filters out certain gases and vapours
  - Get combination of these two
  - Don't give protection against lack of O_2
  - Only use when type and concentration of contaminant is known

- Supplied air respirators
  - Deliver clean air from source outside contaminated area
  - Can be supplied:
    - At normal atmospheric pressure
    - From higher pressure source
      - e.g. compressed air line or independent supply

- Self-contained breathing apparatus (SCBA)
  - Supply of clean air from source carried by wearer
  - Used to give protection against dangerous breathing hazards:
    - Lack of O_2
    - Very toxic contaminants
    - When type of hazard is unknown

Dust mask classes

- P1 – retain about 80% of particles smaller than 2 micrometers
- P2 – retain about 94% of particles smaller than 0,5 micrometer
- P3 – retain about 99,95% of particles smaller than 0,5 micrometer


1 X / L


MAXIMUM
MAXIMUM
SAFETY EAR MUFFS

Hearing protection (PPE)

Must be used if exposures above:

- A Noise Exposure Level, (LAeq,8h) of 85dBA, or a Peak Level (Lpeak) of 140 dB (Peak, unweighted)
- Muffs vs plugs
- Every 3dB increase in noise represents a doubling of the noise exposure and hence halving of the allowable exposure times.

TABLE 1: NOISE EXPOSURE CLASSES

Hearing Protection Class	$L_{Aeq,8h}$ (dBA)	Types of Suitable Hearing Protectors
1	Less than 90	Earplugs or Earmuffs
2	90 to less than 95	Earplugs or Earmuffs
3	95 to less than 100	Earplugs or Earmuffs
4	100 to less than 105	Earplugs or Earmuffs
5	105 to less than 110	Earplugs or Earmuffs

Audit

Review control measures and their effectiveness

- Reassess hazards
- Workplace monitoring
- Worker monitoring
- Review whole system

Spray painting

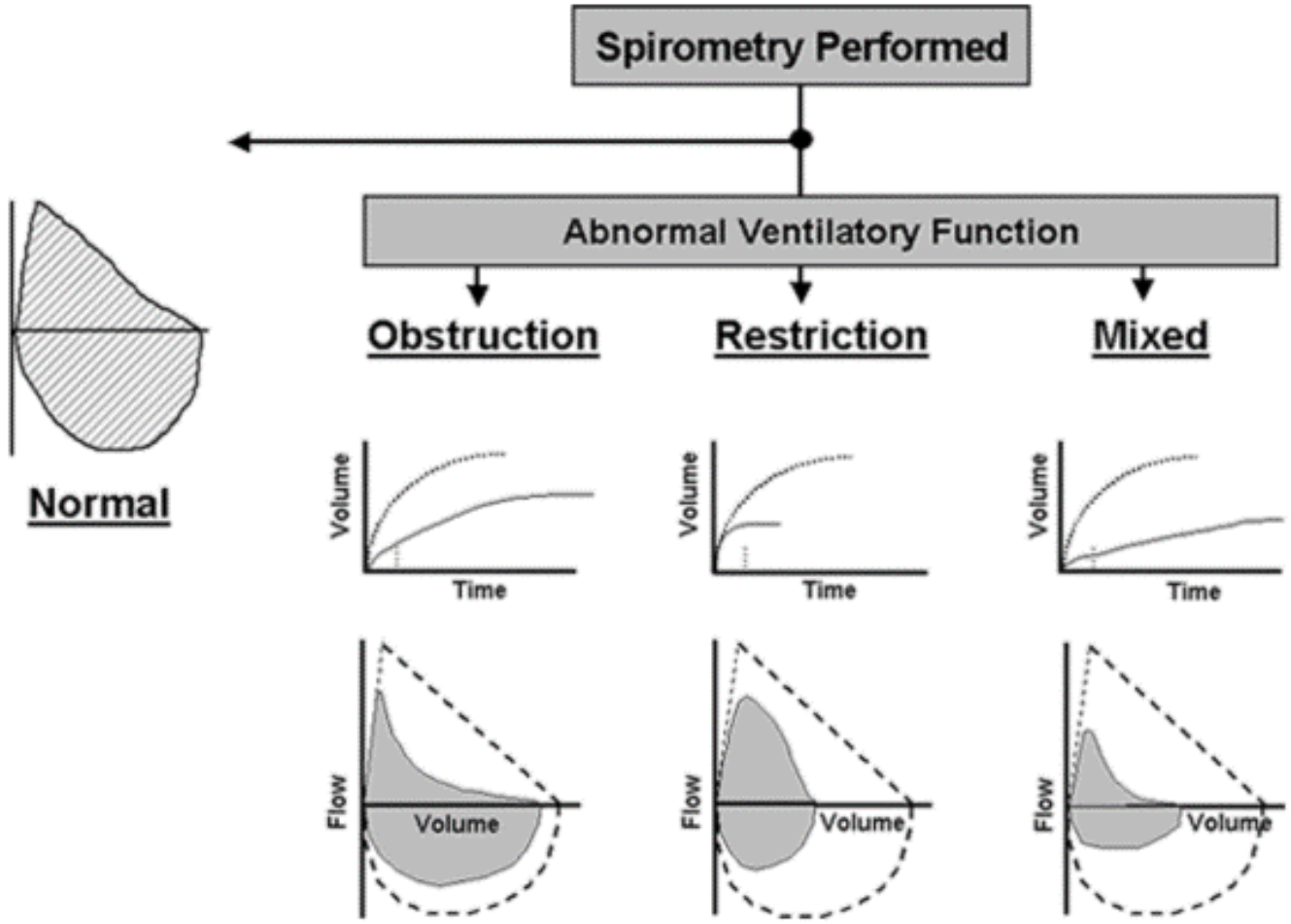
- What is the major hazard with the spray painting aspect of the workplace.
- What occupatioinal illness can this chemical cause?

Occupational asthma

- Airway narrowing that is reversible over short periods of time, either spontaneously or as a result of treatment
- Occupational asthma is asthma initiated by an agent inhaled at work (as opposed to pre existing asthma aggravated by a non specific irritants)
- Spirometry ≥12 % increase in FEV1 (or FVC) and absolute increase in FEV1 (of FVC) of ≥200 mL post bronchodilator
- Serial peak flows ≥20 % variability very significant (≥15% probably significant)

Types of Occupational Asthma

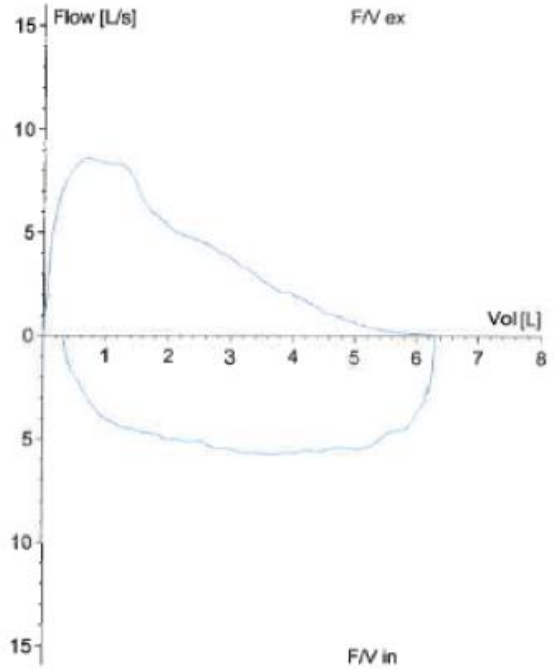
- Can be irritant or allergic
- Identify likely irritant or allergen
- Skin testing (usually high molecular wt compounds) – positive tests do not always correlate with asthma
- RAST / ELISA testing if available – positive tests do not always correlate with asthma
- Challenge testing to demonstrate airways hyperresponsiveness or to specific agent, but can be dangerous


Spirometry Performed
Abnormal Ventilatory Function
Obstruction
Restriction
Mixed
Normal
Volume
Time
Flow
Volume

Date of Birth:	7/05/1955	Height:	175 cm
Weight:	75.0 kg	BMI:	24
Race:	Caucasian	Operator:	Jim Robinso
Ref. Physician:	Dr R. Douglas	Ward:	Respiratory I
GP:	5th Avenue Family Practice (6)	Gender:	male

Visit date 05.11.18 **Norm Set: GLI 2012**

		Pred	Pre	%Ref
FVC	L	4.34	6.29	145
FEV1	L	3.34	4.17	125
FEV1%F	%	77	66	86
MFEF	L/s	2.71	2.55	94



PHYSIOLOGIST COMMENTS

Data is acceptable and reproducible with good effort and technique.

INTERPRETATION

SPIROMETRY

	Pre-Bronchodilator				Post-Bronchodilator				
	Best	LLN	z-score	%Pred	Best	z-score	%Pred	Change	%Chng
FVC (L)	**3.90**	3.70	−1.34	82%	**4.70**	−0.09	99%	600 mL	20%
FEV1 (L)	**2.02**	2.91	−3.78	54%	**2.61**	−2.21	70%	590 mL	29%
FEV1/FVC	**0.52**	0.68	−3.54		**0.55**	−3.35			
FET (s)	**10.3**				**11.2**				
Reference values: GLI 2012 Test quality: Pre: FEV1 - A, FVC - A; Post: FEV1 - A, FVC - B