

VISION & LIGHTING

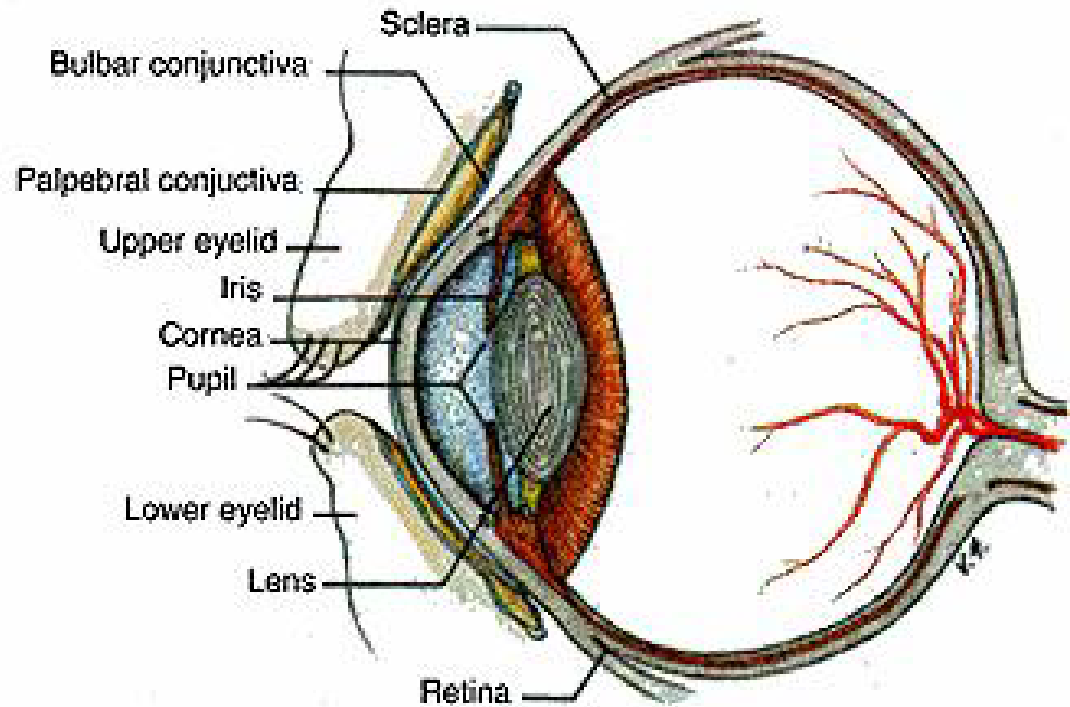


Topics to be discussed

- **The eye & visual capabilities**
- **Lighting for work**

Structure of the eye

- Iris
- Pupil
- Retina
- Fovea
- Rods
- Cones



Mosby's Medical Encyclopaedia

Visual acuity

- Fine detail
- Changes with ageing

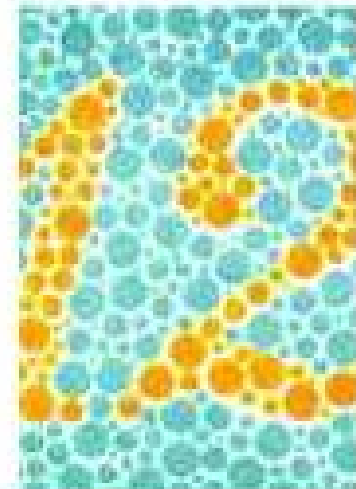
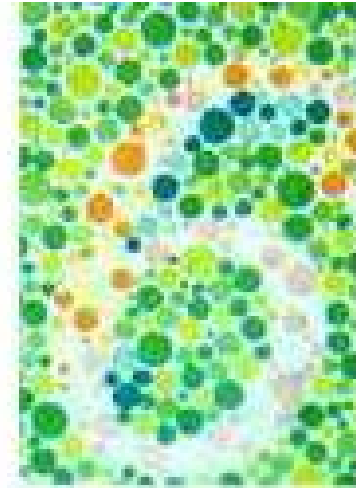


Snellen Eye Chart

www.disabled-world.com

Colour vision

- Seeing colour
- Colour deficiency
- Visual aids



Mosby's Medical Encyclopaedia



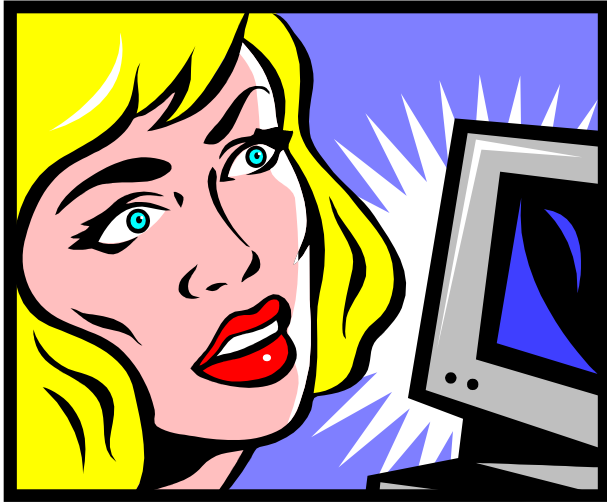
Vision in low light

- **Lack of colour**
- **Adaptation**

Which jobs in your industry require either very good visual acuity and/or colour vision?

Are they designed to allow this?

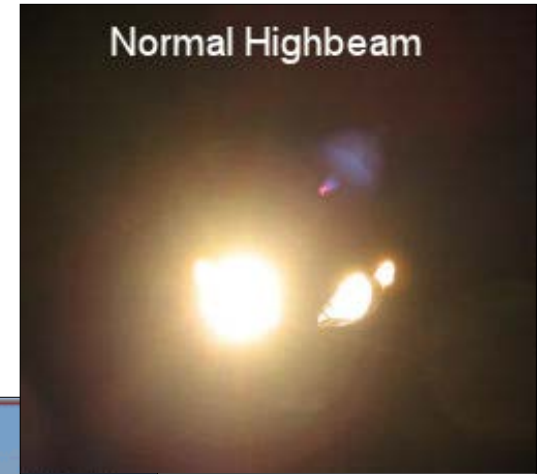
Contrast sensitivity



- Low contrast
- High contrast
- Flicker

Glare

- Disability
- Discomfort



www.eclipze.com.au



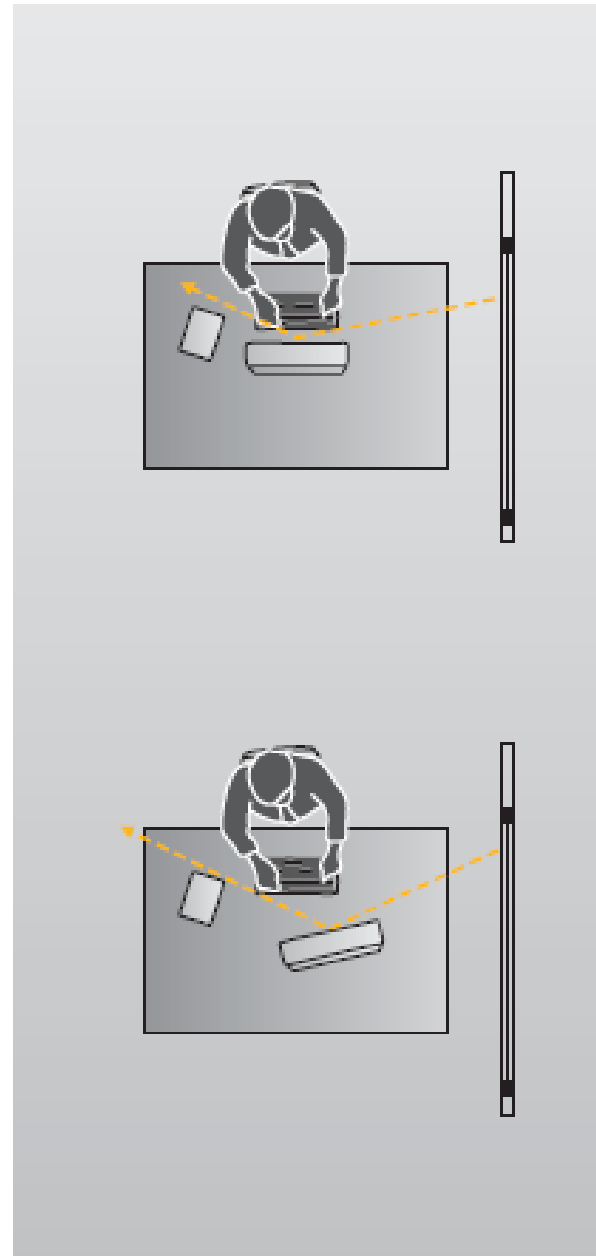
www.tintshield.com.au



Reflections

Place monitor side on to a window to reduce reflections

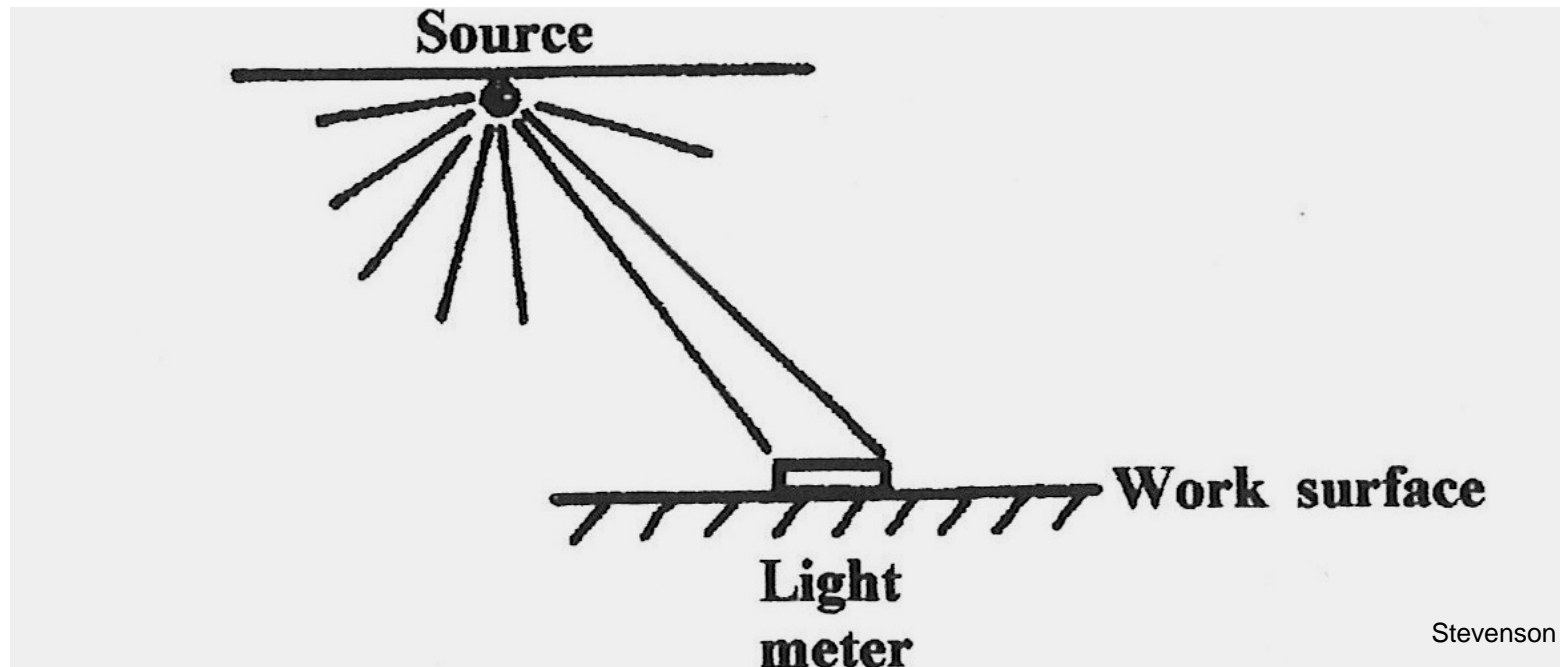
WorkSafe Vic.



Illuminance

Definition:

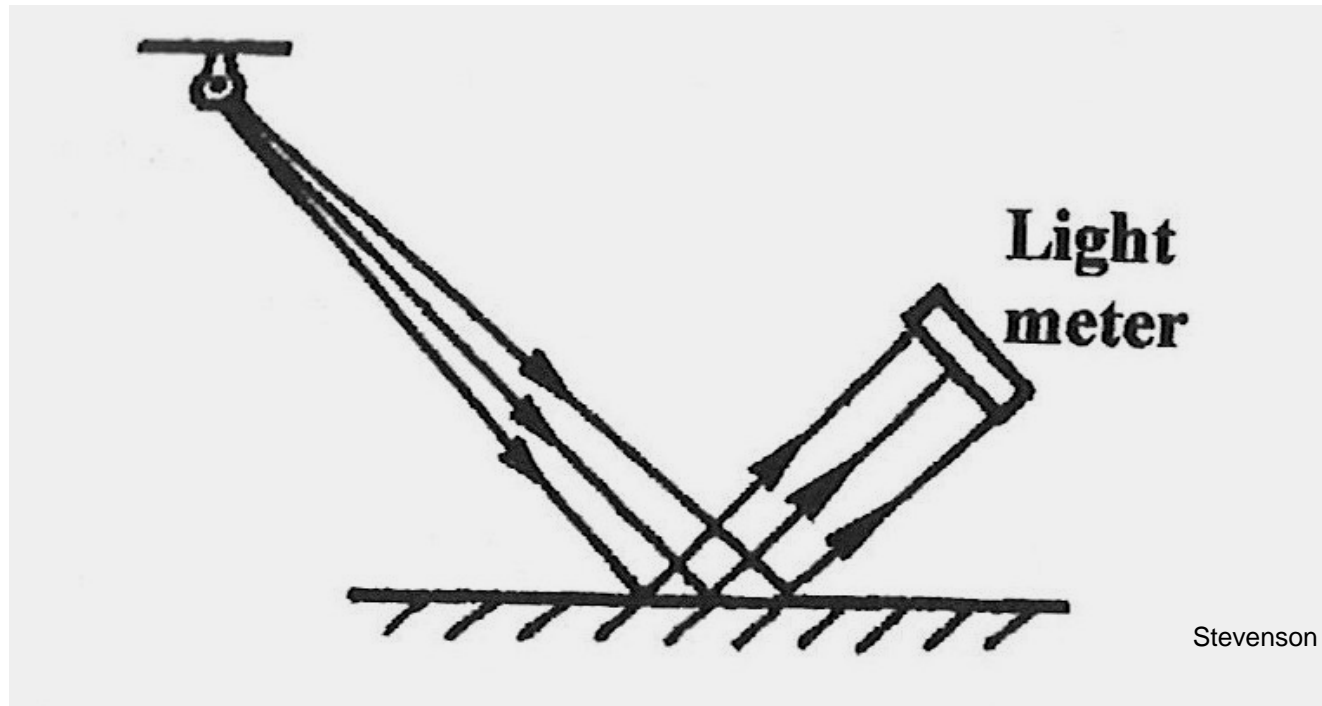
- Amount of light falling on a surface



Luminance

Definition:

- Amount of light emitted by objects or from surfaces





Luminaires

- Incandescent
- Gas discharge

Selection of lighting

- Orientation
- Normal
- Special



Lighting design

- Task
- Viewer
- Area
- Environment
- Lamp
- Illuminance
- Uniformity
- Maintenance
- Daylight



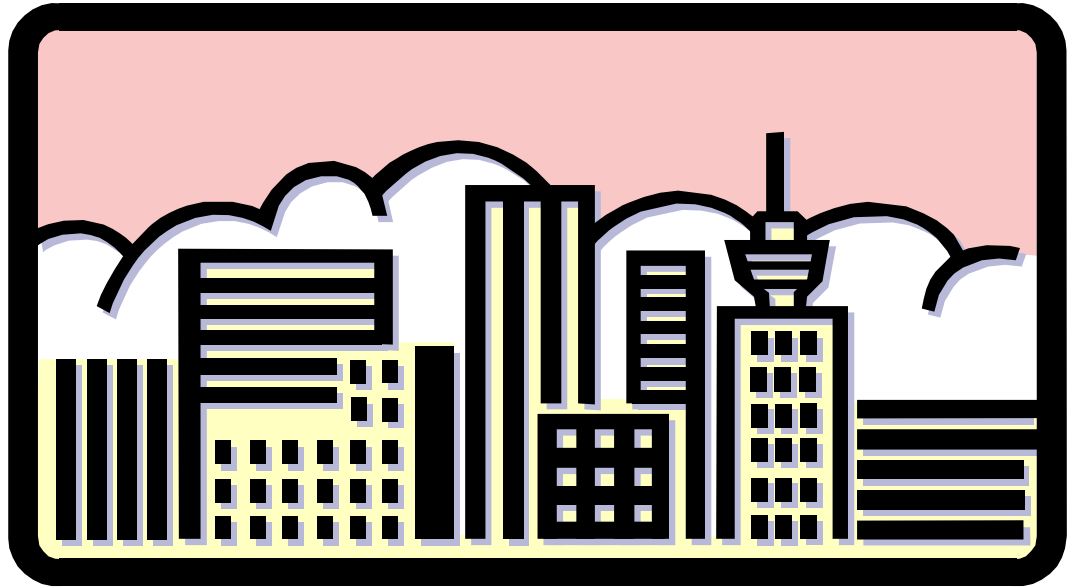
UOW

Reducing eye strain

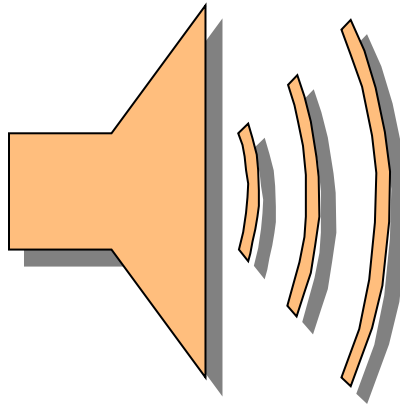
Regularly look
away from
near work.

Each 20
minutes, look
at least 6
metres/20 feet

“Each 20, look 20”



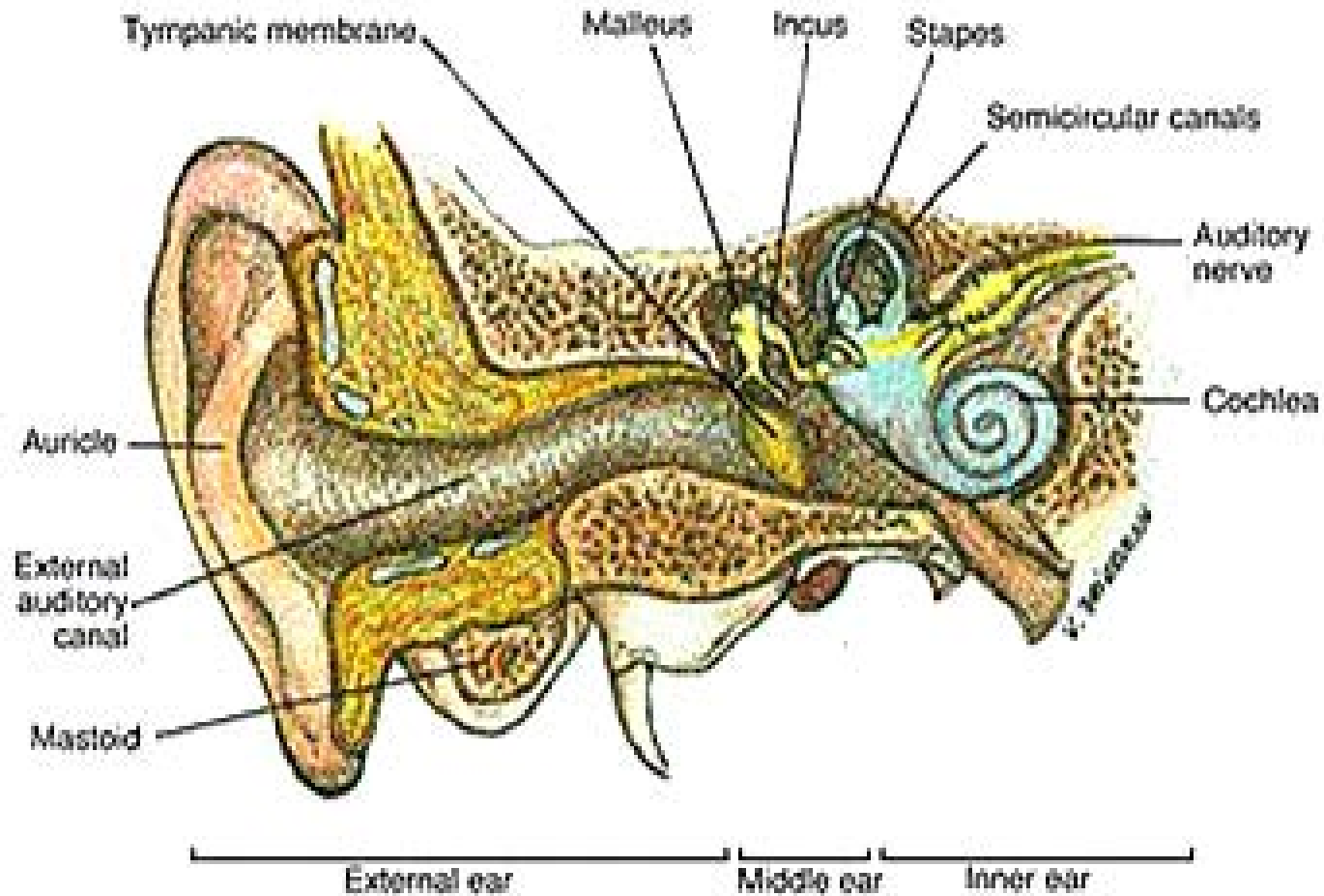
NOISE



Topics to be discussed

- **Ears and hearing**
- **Noise**
- **Controlling noise exposure**

Structure of the ear



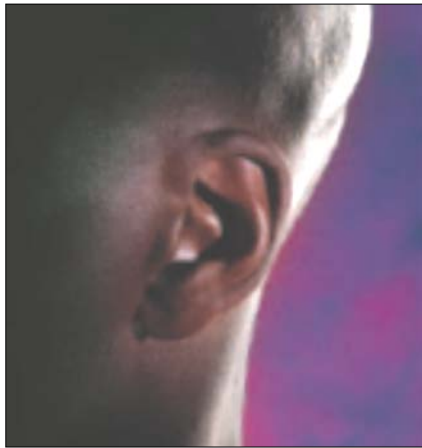
Mosby's Medical Encyclopaedia

M506 – Ergonomic Essentials
Physical Factors of the Work Environment

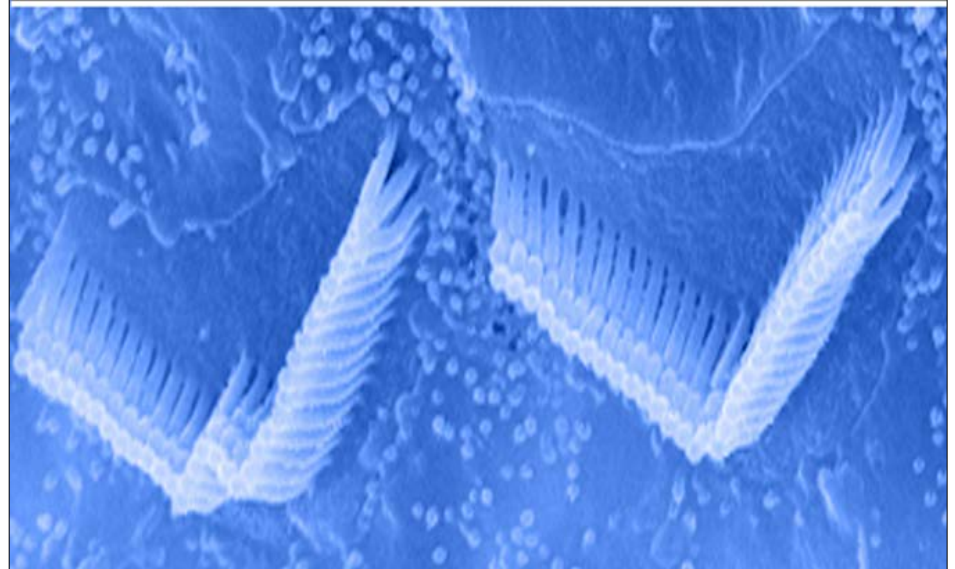
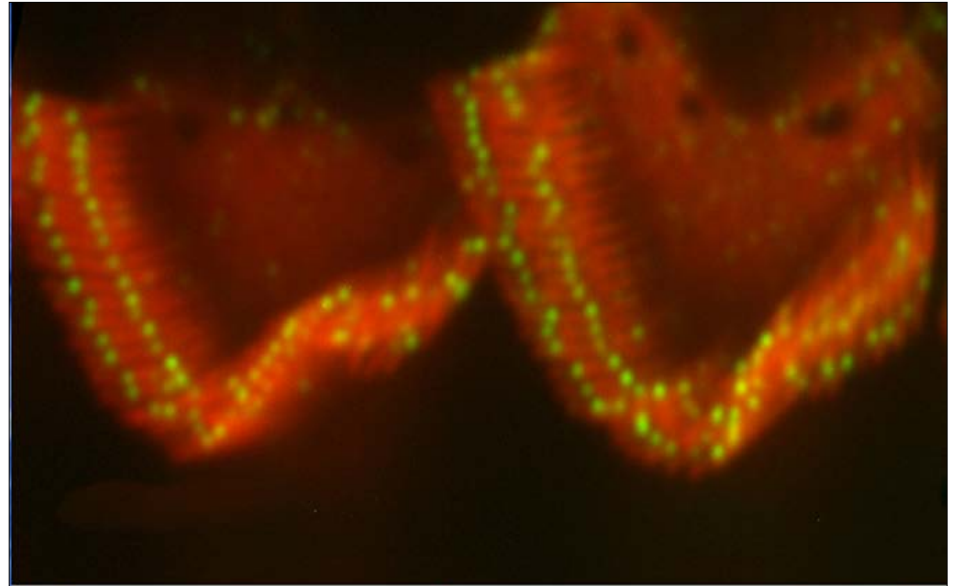


Hearing problems

- Hearing loss
- Tinnitus



HSE



Nuisance noise

- Loud
- High frequency
- Unaccustomed
- Dislike source
- Unfamiliar
- Intermittent



Measuring noise

- **dB(A) – average**
- **dB(C) – peak**



www.noisemeters.com

Typical noise levels



HSE



Controlling noise (1)

1. Engineering solutions?



Controlling noise (2)

2. Administrative controls?

Controlling noise (3)

3. PPE: hearing protection?



Correct

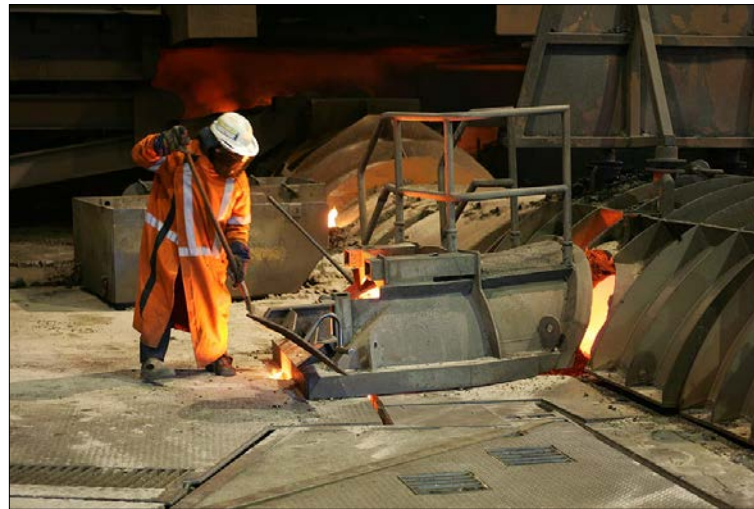


Incorrect

HSE



THERMAL ENVIRONMENT



Bluescope Steel



Factors affecting the thermal environment



Qld Health

- **Air temperature**
- **Radiant temperature**
- **Humidity**
- **Air movement**
- **Human activity**
- **Clothing**

Apparent temperature (AT) from temperature and relative humidity - after Steadman 1994

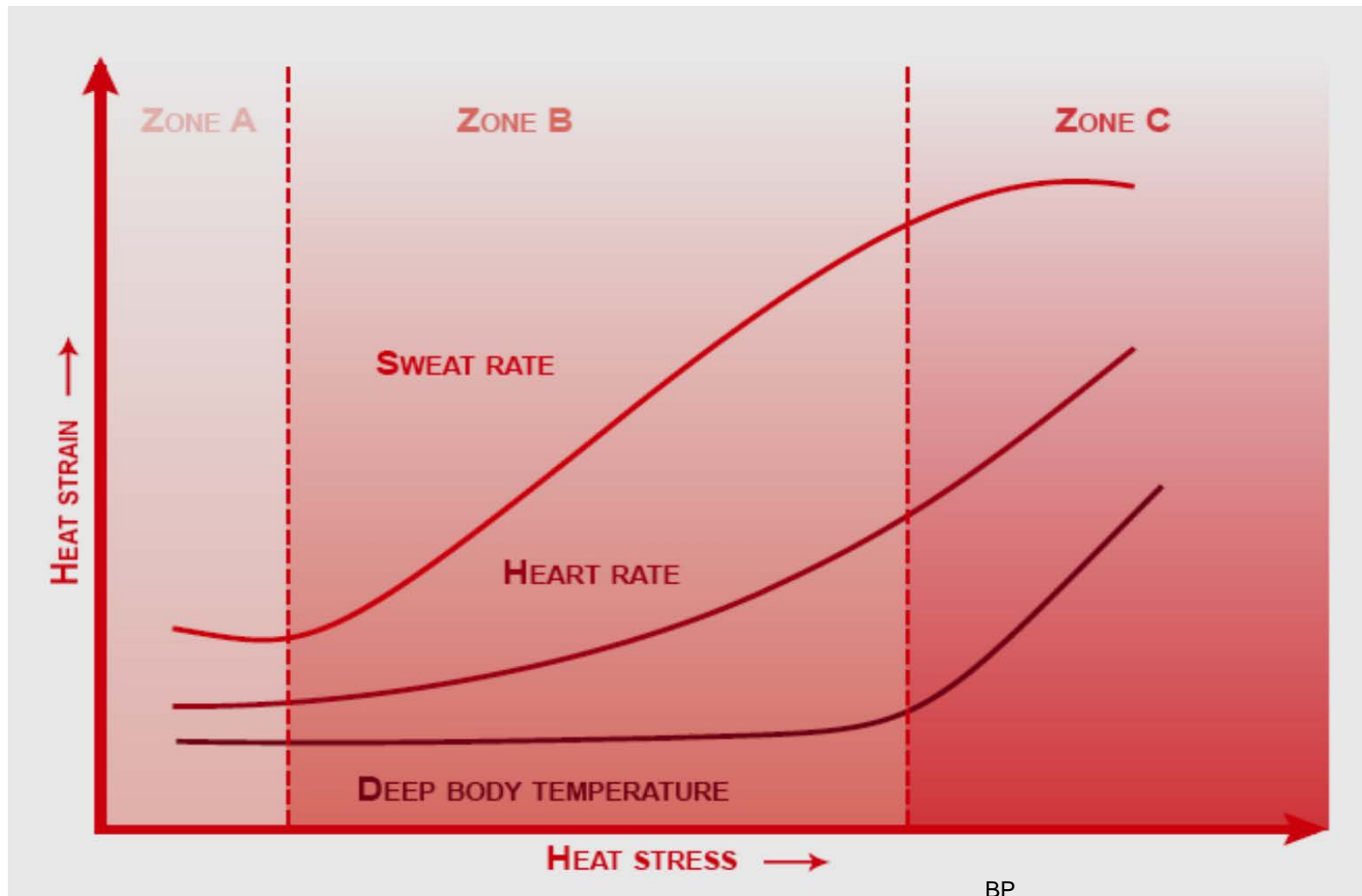
Temperature (°C)

Relative Humidity (%)

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0	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46
5	16	17	18	19	20	21	22	23	24	25	26	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	44	45	46	47	48
10	17	18	19	20	21	22	23	24	25	26	27	28	29	31	32	33	34	35	36	37	38	39	41	42	43	44	45	46	48	49	50
15	17	18	19	20	21	22	24	25	26	27	28	29	30	31	33	34	35	36	37	38	40	41	42	43	45	46	47	48	50		
20	17	18	20	21	22	23	24	25	26	28	29	30	31	32	33	35	36	37	38	40	41	42	43	45	46	47	49	50			
25	18	19	20	21	22	24	25	26	27	28	29	31	32	33	34	36	37	38	40	41	42	44	45	46	48	49					
30	18	19	21	22	23	24	25	26	28	29	30	31	33	34	35	37	38	39	41	42	43	45	46	48	49						
35	19	20	21	22	23	25	26	27	28	30	31	32	34	35	36	38	39	40	42	43	45	46	48	49							
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100	24	25	27	29	30	32	33	35	37	39	41	42	44	46	48	50															

AT above 50°C

Impact of heat stress



Apparent temperature (AT) as a Wind Chill - after Steadman 1994

Temperature (°C)

Wind Speed (km/h)

	-5	-4	-3	-2	-1	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
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Australian Bureau of Meteorology



Exposure to heat

- Engineering
- Work practices
- Personal tolerance

S.H.A.F.T.S.

To increase
tolerance to heat:

Sensible

Hydrated

Acclimatised

Fit

Thin

Sober

Exposure to cold

- Engineering
- Work practices
- Personal tolerance



HSM



BP

Thermal comfort surveys



- **Refer to Table 6.3 in manual**
 - Air tempt
 - Humidity
 - Thermal radiation
 - Air movements
 - Physical workload
 - Clothing
 - Worker opinion





VIBRATION



Topics to be discussed

- **Hand-transmitted vibration**
- **Whole body vibration**
- **Causes**
- **Effects**
- **Reducing risk**



Hand-transmitted vibration (1)

‘H.A.V.S’

Vascular

Neurological

Muscle

Joint

Bone



Source: www.havsrn.com

Hand-transmitted vibration (2)



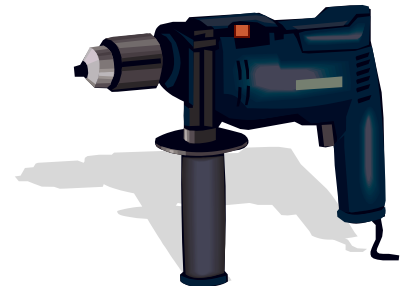
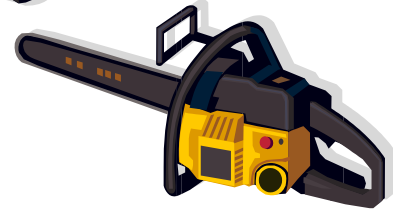
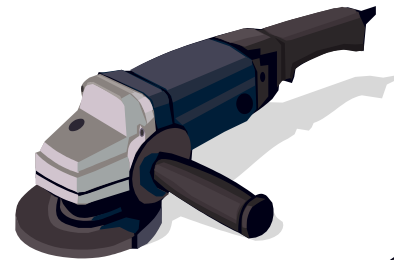
Source..

- Handheld power tools
- Hand guided powered equipment
- Powered machines

Hand-transmitted vibration (3)

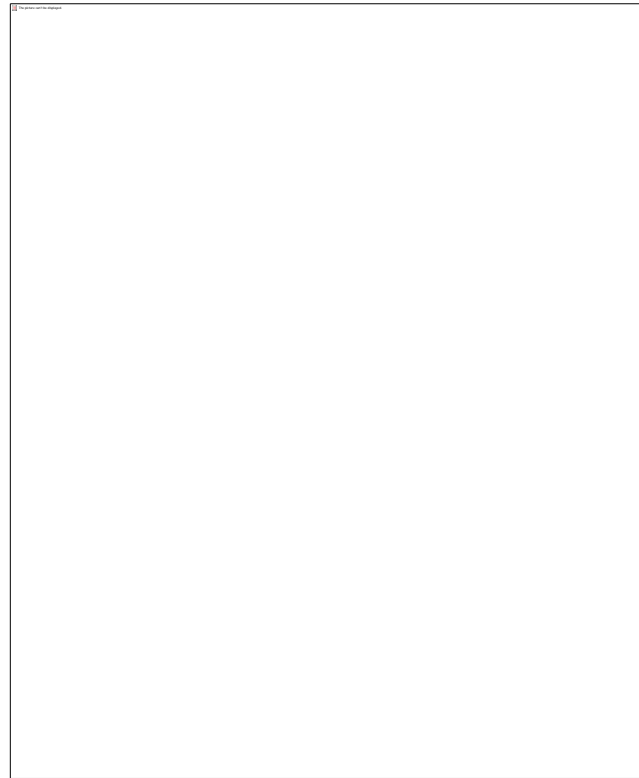
Common tools:

- Jackhammer
- Rotary hammer
- Impact drill
- Chainsaw
- Angle grinder
- Hand-guided machines





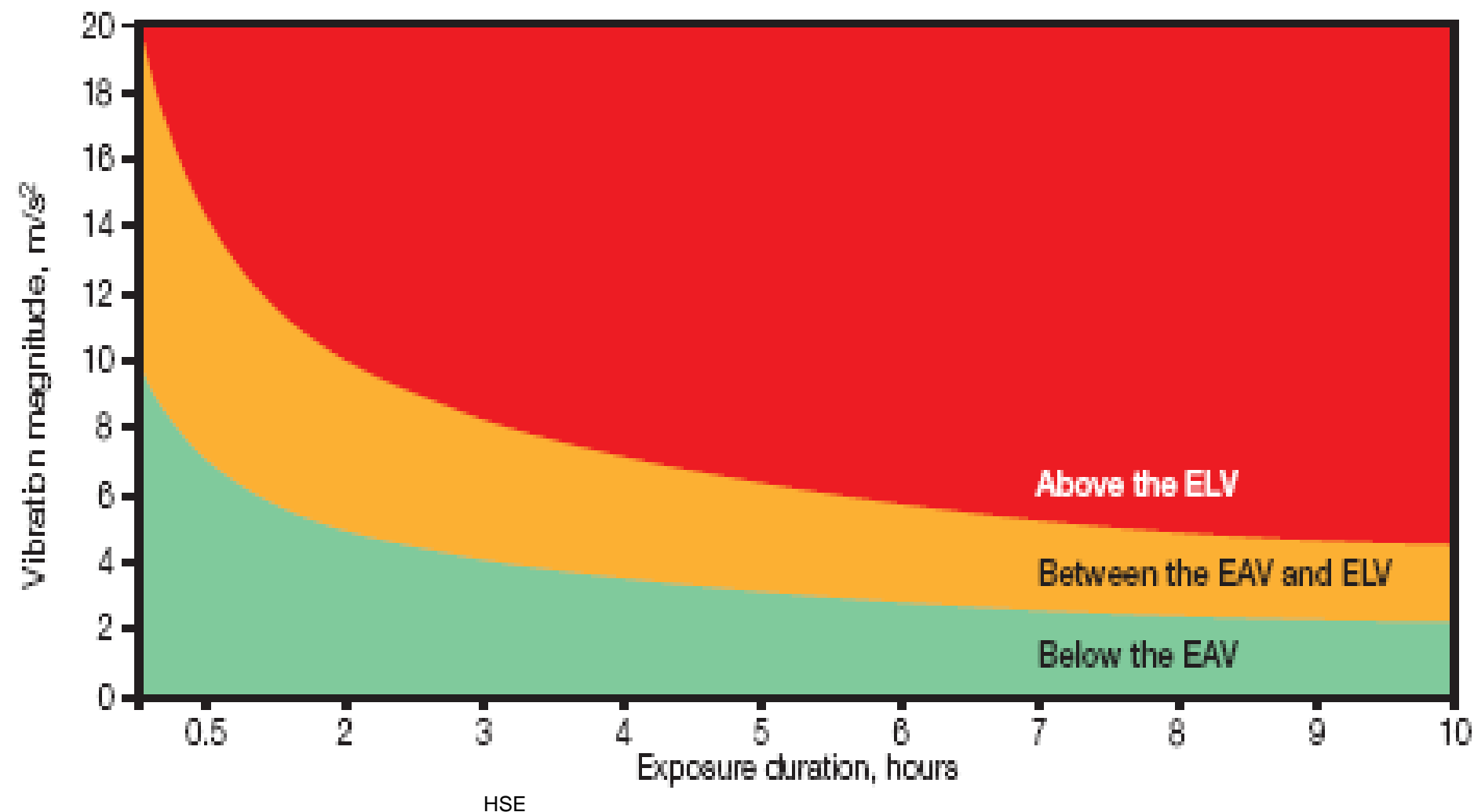
Hand-transmitted vibration (4)



HSE



Hand-transmitted vibration (5)





Hand-transmitted vibration (6)

Reduce risk...

- Tool selection
- Maintenance
- Warm and dry
- Exposure schedule

Whole body vibration (1)

Source:

- Sitting in plant
- Standing on a work platform

Examples:

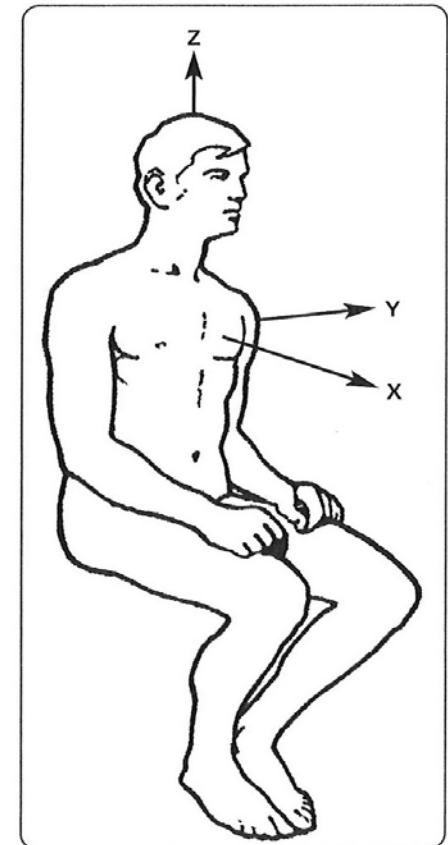
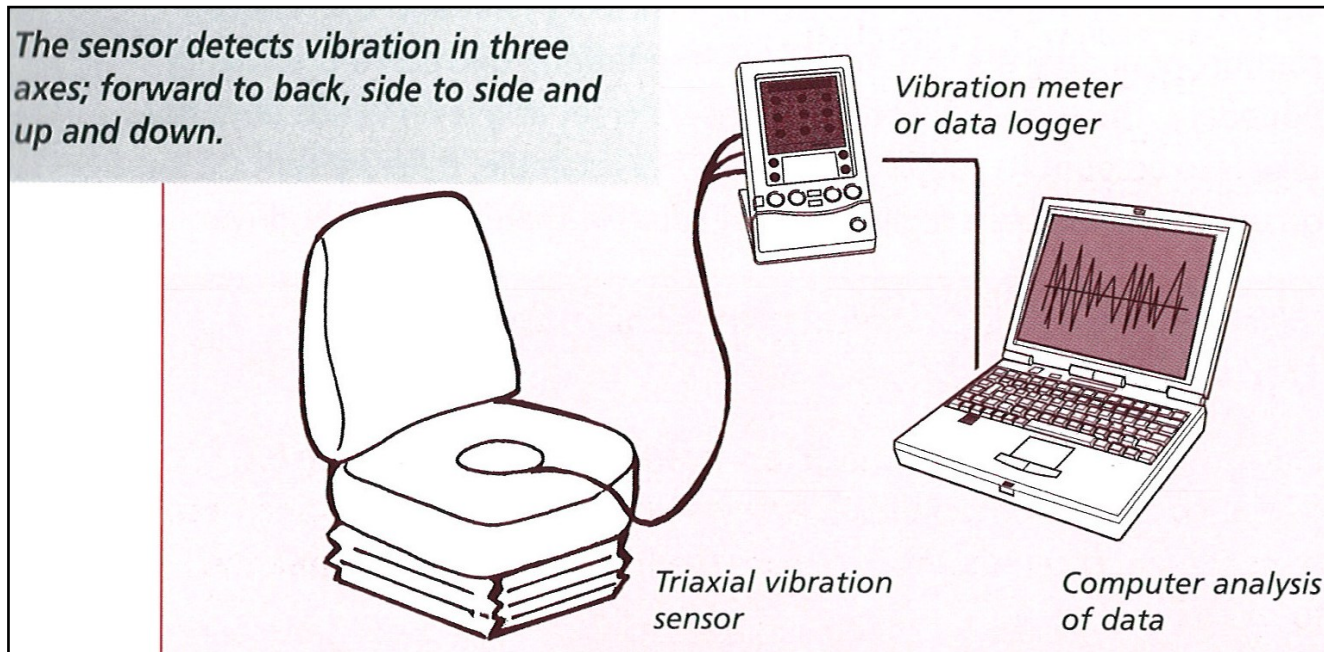
- Off road machinery in mining, construction, forestry & agriculture
- Driving vehicles designed for smooth roads over uneven surfaces / yards



UOW

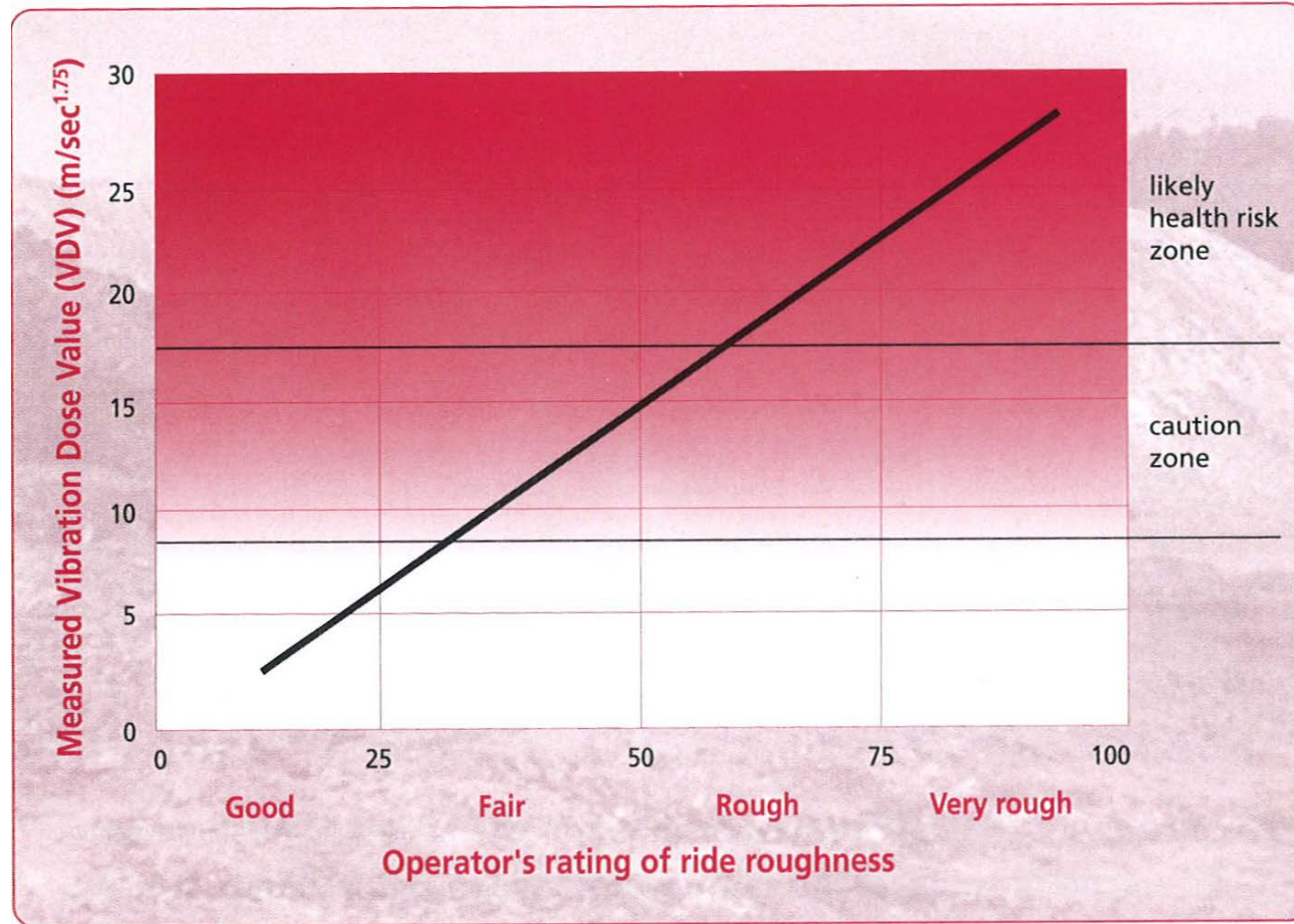
Whole body vibration (2)

To assess exposure (as per ISO 2631):



McPhee

Whole body vibration (3)



Best ever ride



Worst ever ride

McPhee

Whole body vibration (4)

Reduce risk:

- Road maintenance
- Well maintained vehicles
- Cab isolation
- Limiting speed
- Operator training
- Vibration monitoring
- Regular rest breaks



KAB Seating



SMELL, TASTE & TOUCH





Senses at work...

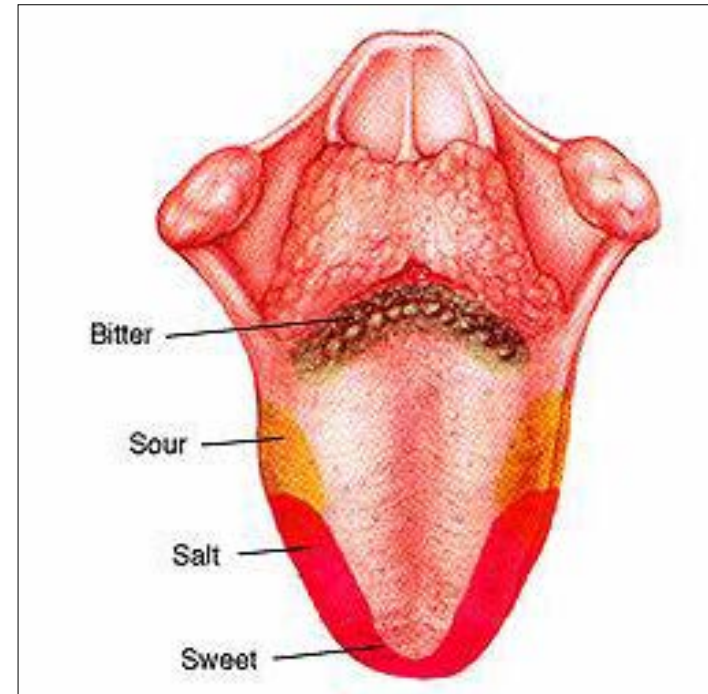
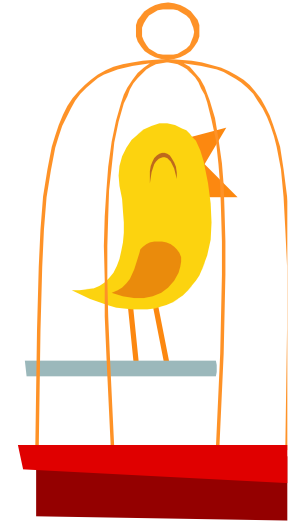
- Smell
- taste &
- touch

may all be required in jobs, with
varying degrees of
importance...

Smell & taste

.. many hazardous substances do NOT emit an odour...

& sense of smell adapts quickly to some smells...



Mosby's Medical Encyclopaedia

M506 – Ergonomic Essentials
Physical Factors of the Work Environment

Smell & taste

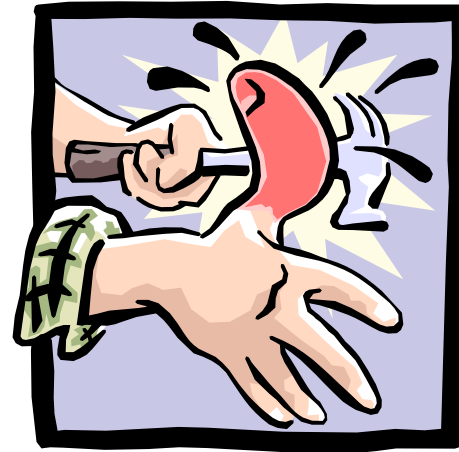
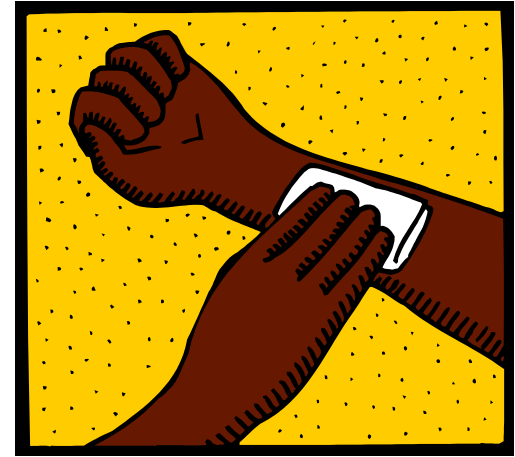


Bluescope Steel

Skin & touch

Types of skin damage:

- Contact eczema
- Cuts & abrasions
- Skin irritation
- Sunburn
- Cold exposure





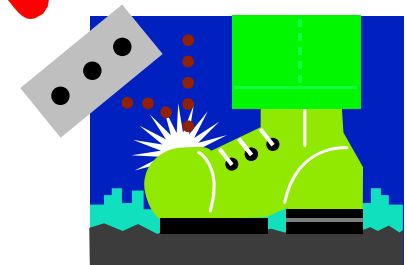
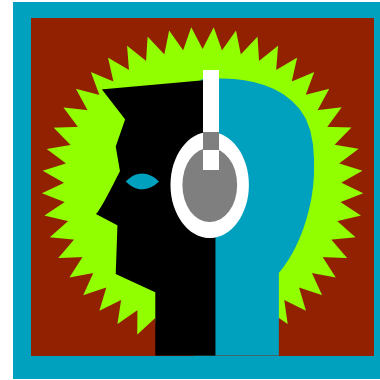
CLOTHING & PERSONAL PROTECTIVE EQUIPMENT

& ergonomics considerations...

Protective clothing

When selecting PPE:

- Consult with users
- Ensure correct size & style for individuals
- Compatible with other PPE
- Training in correct use
- Documented maintenance, inspection & replacement schedule





Footwear

Considerations?

- Surfaces
- Contaminants
- Need for slip resistance
- Durability
- Toe protection
- Forefoot flexibility



HSM

Gloves



BP



HSM

Considerations for glove selection?



Eye protection & head protection



Bluescope Steel



HSE



Considerations for eye or head selection?

Hearing protection

Considerations for hearing protection?

- Long hair
- Safety glasses
- Earrings
- Fitting earplugs



HSE



Correct



Incorrect



Risk perception & PPE use

Risk perception is lowered if:

- Hazard is encountered routinely
- Risk is cumulative
- Rewards with non use

Source: HSE Noise at work



Ergonomics considerations with PPE use...

- Anthropometric variability
- Biomechanical impact
- Thermal impact
- Sensory effects
- Comfort
- Ease of use & adjustments, etc

PPE use...

PPE may be a *compromise* between
comfort,
performance
&
protection