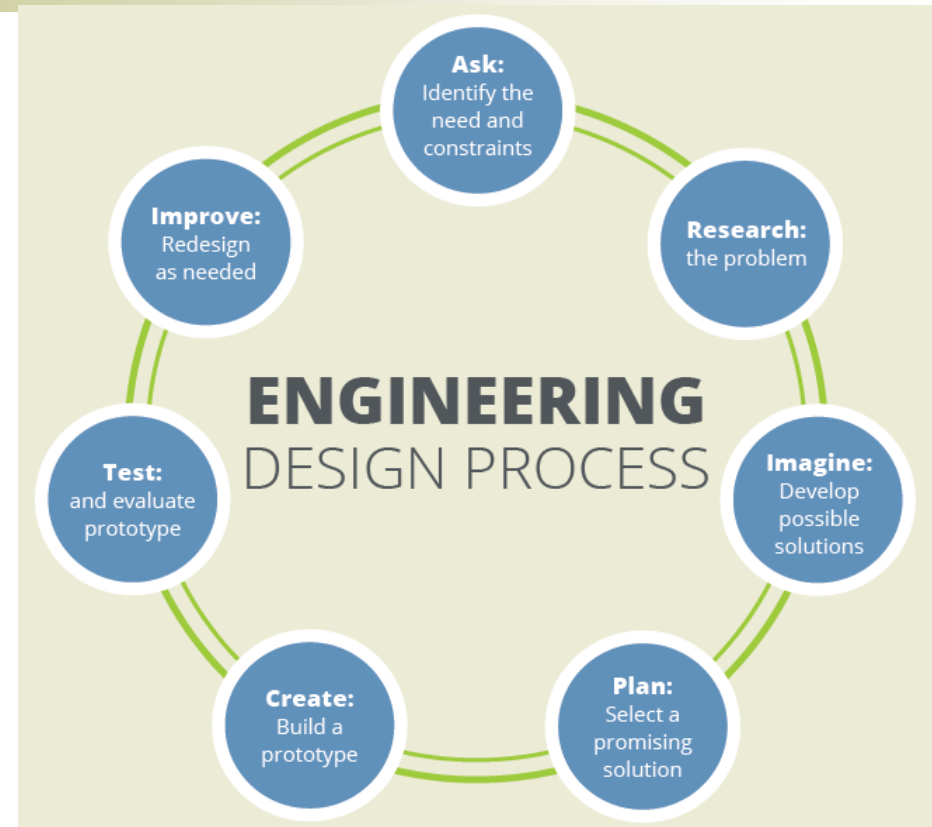


ERGONOMICS IN ENGINEERING DESIGN



What is Ergonomics?

- “Ergonomics is an applied science concerned with the design of workplaces, tools, and tasks that match the physiological, anatomical, and psychological characteristics and capabilities of the worker.” *Vern Putz-Anderson*
- OSHA defines ergonomics as the science of “designing the job to fit the worker, instead of forcing the worker to fit the job.”
- “The Goal of ergonomics is to ‘fit the job to the person,’ rather than making the person fit the job.” *Ergotech*

[Objective of Ergonomics]

Ergonomics has 2 main objectives

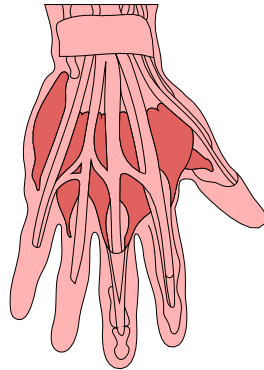
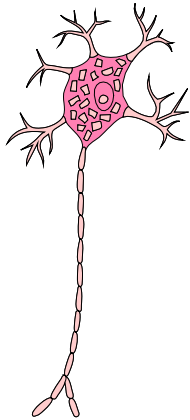
- I. to enhance the effectiveness and efficiency with which work and other activities are carried out.
- I. to enhance certain desirable human values, including improved safety, reduced fatigue and stress, increased comfort, greater user acceptance, increased job satisfaction, and improved quality of life.

[Hazard Types]



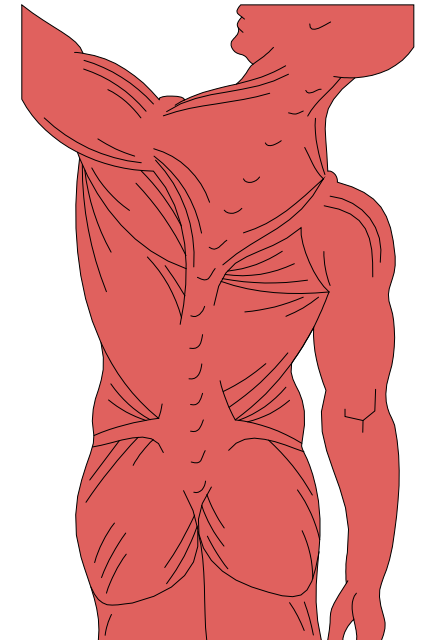
What are MusculoSkeletal Disorders?

- *MSDs are injuries and illnesses that affect muscles, nerves, tendons, ligaments, joints or spinal discs.*



[Common Body Parts Prone To Workplace MSDs]

- Back - Lower
- Neck and Upper Back
- Upper Extremities - Arms and Hands
- Lower Extremities - Legs and Feet



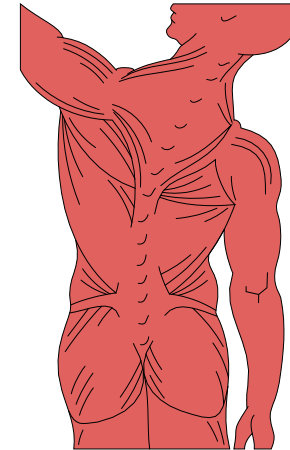
Musculoskeletal Disorders: Signs and Symptoms

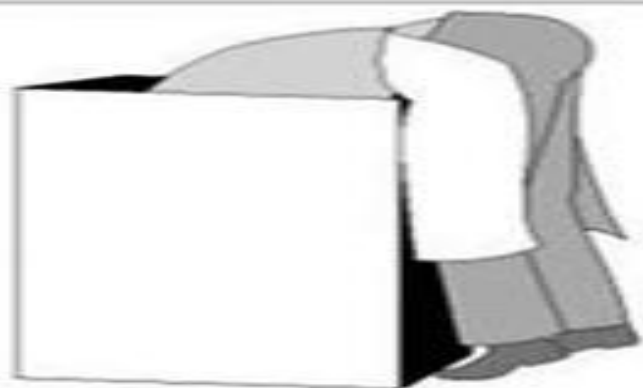
- Decreased ROM
- Decreased grip and/or pinch strength
- Swelling
- Fatigue
- Loss of function
- Numbness
- Burning sensation
- Tingling
- Pain
- Cramping
- Stiffness

Goals of Ergonomics Program...

*Reduce work-related **musculoskeletal disorders** developed by workers when their jobs involve...*

- Awkward postures
- Static positions
- Reaching
- Bending & Lifting
- Force
- Repetition
- Contact stress
- Vibration
- Repetition





Awkward Postures



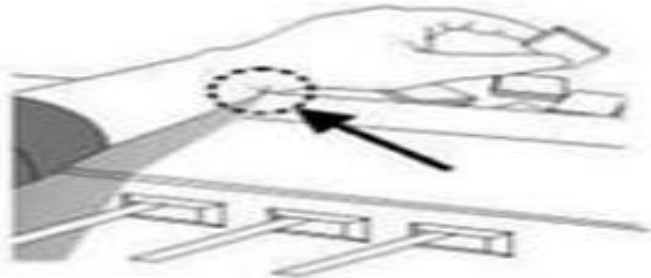
Overhead Work



Twisting and Carrying Loads



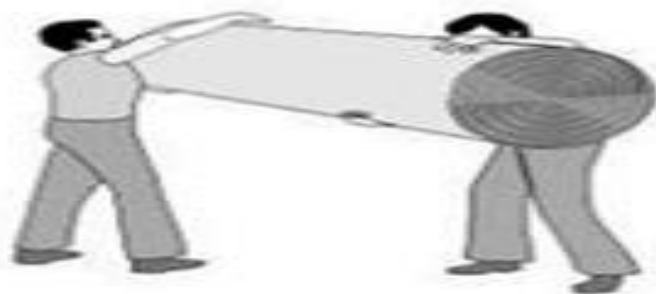
Wrist Deviations



Contact Stress



Poor Shoulder/Wrist Position



Lifting Bulky Loads



Hand - Arm Vibration



Whole Body Vibration

Control for Ergonomic Hazard

Ergonomics

Hierarchy of Controls

Engineering Controls

Workstation Design
Tool Design
Process Modification
Mechanical Assist



Administrative Controls

Training
Job Rotation
Pacing
Policy
Job Enlargement

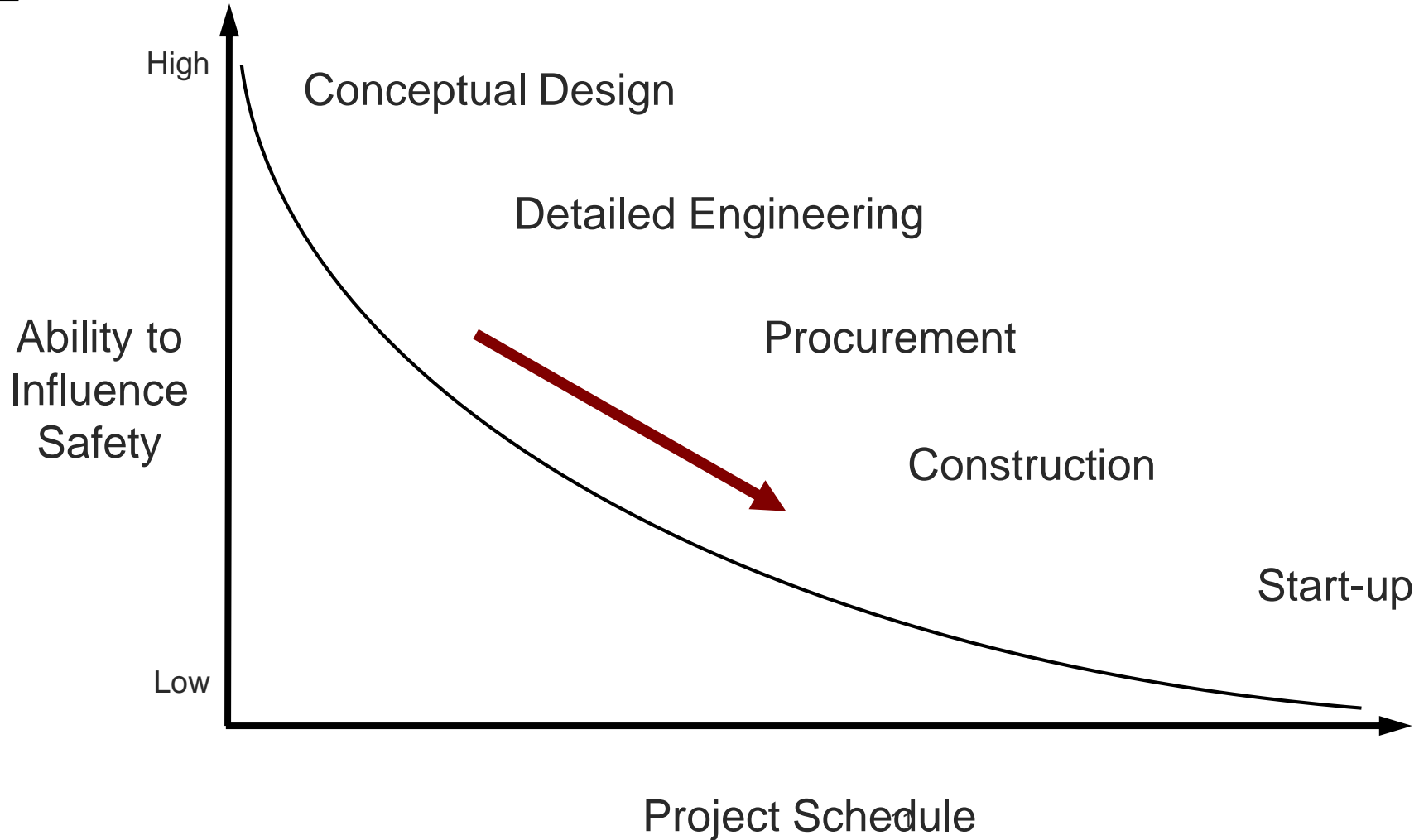


Personal Protective Equipment

Gloves
Wraps
Shields

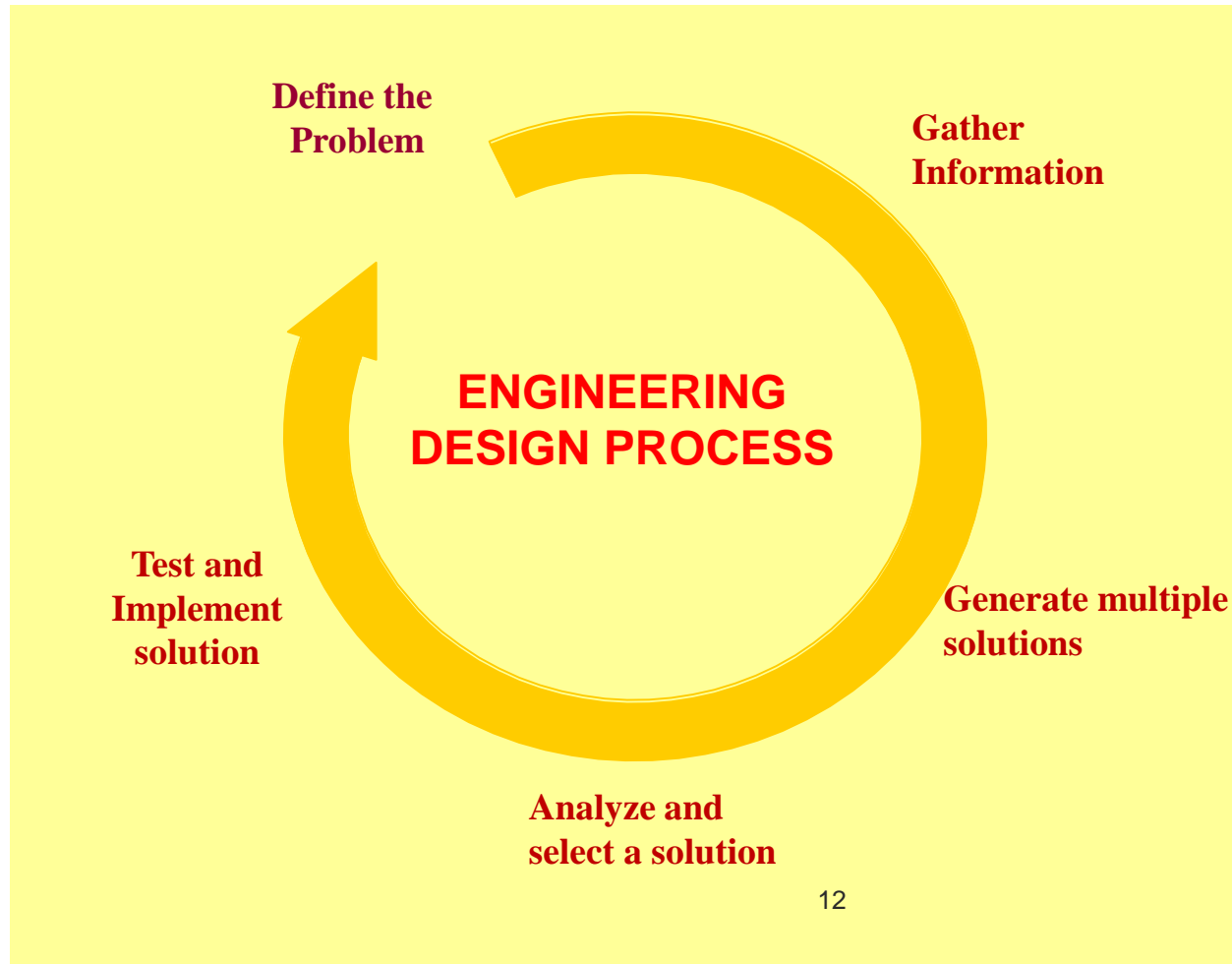


[Engineering Control]



THE DESIGN PROCESS

Five steps to solving Design Problems



[Analysis of Design Solutions]

- Functional analysis
- Industrial design/Ergonomics
- Mechanical/Strength analysis
- Electrical/Electromagnetic
- Manufacturability/Testability
- Product safety and liability
- Economic and market analysis
- Regulatory and Compliance

[Design and Performance]

Optimal Design

Design Mismatch



Worker Health & Safety

Hassle

Quality

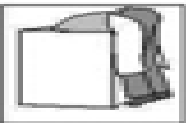
Discomfort

Productivity

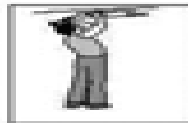
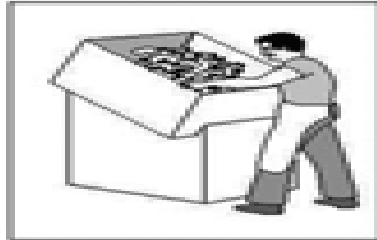
Pain

Injury

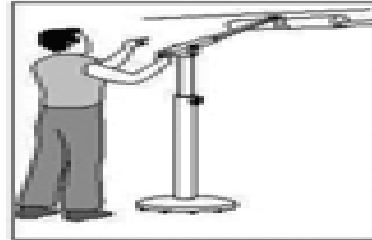
Disability



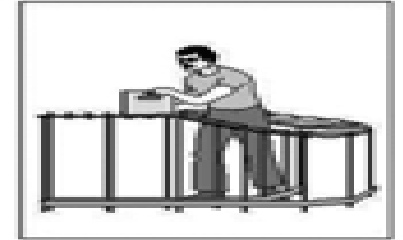
Raise and tilt the container for easier access and to reduce bending and lifting burdens.



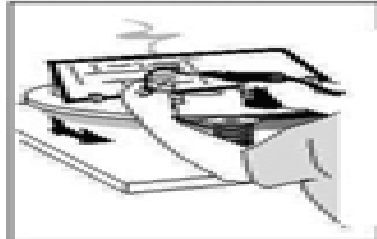
Extend and support tool to reduce stress on arm and shoulder.



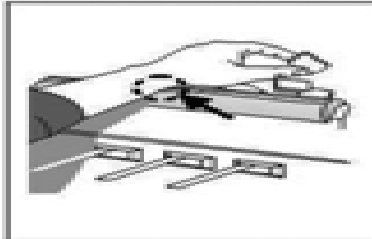
Use conveyors to reduce twisting and eliminate lifting and carrying.



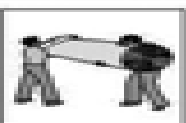
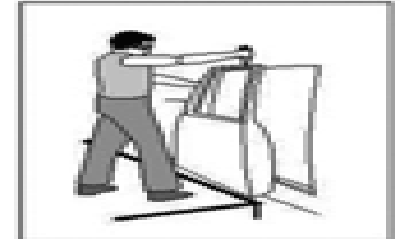
Use a turntable with fixture to hold the work; select a tool that reduces wrist deviations.



Round or pad edges of guards, containers, or work tables.



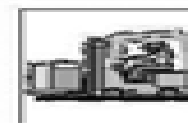
Raise worker with platform and use in-line tool to reduce wrist bending.



Use mechanical assist devices for less stressful handling.



Select power tools with anti-vibration properties. Use handle coatings that suppress vibrations; increase coefficient of friction to reduce force requirements.



Use balancers, isolators and damping materials to reduce vibrations at the source or along transmission path. Make driving surface smooth.

[Human Factor in Engineering Design]

Human factors discovers and applies information about human behaviour, capabilities, limitations, and other characteristics to the design of products, machines, systems, tasks, jobs, and work-environments for productive, safe, comfortable, and effective human use.

[BENEFITS OF ERGONOMICS]

- Decreased injury risk
- Increased productivity
- Decreased mistakes/rework
- Increased efficiency
- Decreased lost work days
- Improved morale

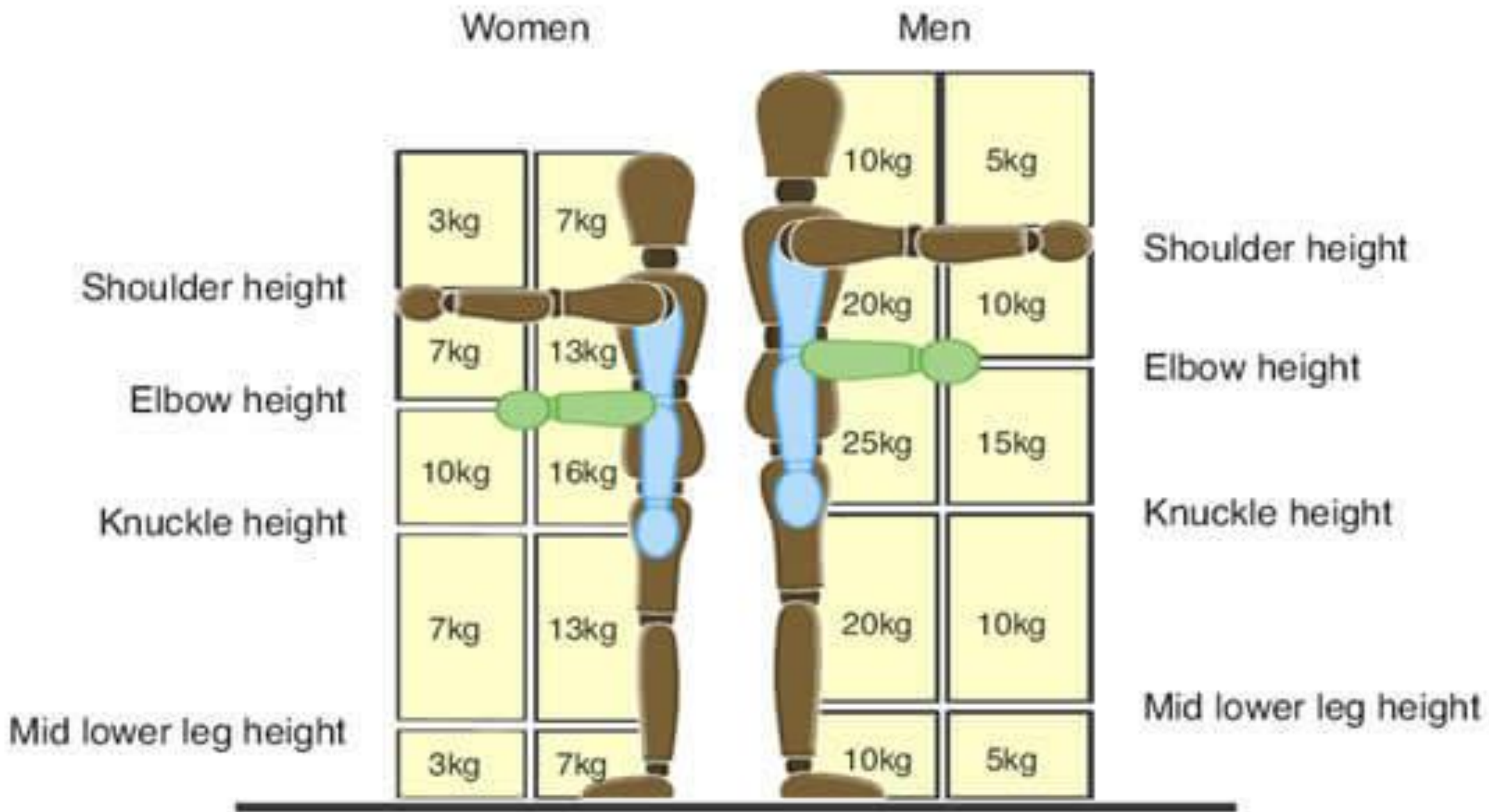
[A Word on Lifting]

What is the maximum weight limit I can lift?

The manual handling guidelines set out recommended safe lifting limits for men and women.

The maximum weights should be adjusted depending on:

- how they are being lifted,
- how close to the body they are held, and
- how high or how low the weights are to be lifted



Computer Workstation Ergonomics

- Chair
- Monitor
- Keyboard
- Mouse
- Document holders
- Lumbar pads/pillows
- Arm rests



- Glare
- Eye strain
- Footrests
- Wrists pads
- Keyboard trays
- Laptops

Chair Basics

- Good lumbar (low back) support
- Comfortable sitting for at least 2 hours
- Chair has 5 point base
- Adjustable arm rests (or none)
- Seat pan is comfortable
- Easily adjustable while sitting
- Appropriate height & depth of seat pan



Monitor issues and glare

protect your eyes !

- Eye-to-screen distance at least 18 inches
- Top of screen at eye level or slightly below
- Don't stare...blink frequently to lubricate eyes
- Use blinds to control outside light
- Screen colors: dark letters on light background (IBM blue)

Work technique

ask yourself...

- Do you avoid leaning on the wrist rest while keying and mousing?
- Are you using a light touch to key?
- Are you holding your mouse loosely with your hand and fingers in a relaxed position?
- Do you let go of the mouse when not using it?
- Do you take 20 second breaks after every 20 **minutes of keying?**

Work technique

- Do you take eye breaks and look at a distance every 20 minutes?
- Do you blink while you look at the screen?
- Do you take stretch breaks throughout the day?
- Have you set up your work to encourage alternating sitting and standing throughout the day?
- Have you optimized your settings on your computer to make your work easier? (i.e. flicker rate, mouse speed, font size)
- Do you know how to adjust your keyboard tray and chair?

[About Us]



Tru-Spec Safety Consult Ltd, a professional consulting and training company established to fulfil the growing demand by the private and government sector organisations for professional expertise in Occupational Health, Safety, Quality and Environmental Management.



[Our Services]

Our range of services covers the General Industries, Construction, Oil and Gas and the Marine Industry. We provide services in the following domains:

- Design and Implementation of SHEQ Management Systems.
- Provision of suitably qualified and experienced SHEQ officers
- Provision of Environmental Management Services
- Conduction of In-House / On-Site and Specialize HSE Trainings
- Sale and supply of a wide range of Personal Protective Equipment (PPE)



[Contact]

**Suite DA 5 Apo Sparklight Mall
Opp Living Faith Church,
Durumi District,
Abuja.**

Tel: +2347031846642, +2348028914572

trusafetyconsult@gmail.com