# Ergonomics standards

Training

# Summary

# Introduction

- Ergonomics is a strong pillar to implement the 5S methodology
- Improves work conditions and results

REMINDER: The 22 rules of economy of movements

## Simultaneity of movements

1. Both hands must start and end their movements at the same time.
2. Both hands must not remain inactive at the same time, except during rest.
3. The movements of the arms must be symmetrical and simultaneous.

## Minimum energy expenditure

4. The movements necessary to work must use the smallest possible muscle mass.
5. Continuous movements are preferable to “Zig Zag” movements or movements in broken lines with acute angles.

## The living force

6. Live force should be used whenever possible to assist the operator's movements. It should be minimized if movement is controlled.
7. Ballistic movements are faster, easier and more precise than constrained or controlled movements.

## Pace

8. Acquiring a pace is essential for the ease and automatic execution of a job.

## Order of the equipped work area

9. There must be a defined place for all materials or components.
10. Tools, materials and testers should be placed as close as possible from the operator.
11. The materials, components and tools must be arranged to allow the best possible sequence of movements.

## Use of gravity

12. Gravity feed boxes and containers must supply the performer(s) close to their workplace.
13. Gravity must be used for evacuation: chutes, conveyors, inclined rollers, etc.

## Comfort and lighting of the work surface

14. Each operator must be provided with the best conditions for the lighting of his work.
15. The height of the work surface and the seat should as close as possible to allow working standing or sitting.
16. A seat allowing good posture must be provided to each operator.

## Freedom of hands

17. The hands must be relieved of all the work which can be done more advantageously by an assembly.

## Combining / positioning

18. Tools should be combined whenever possible.
19. Tools and devices should be positioned whenever possible.

## Control elements

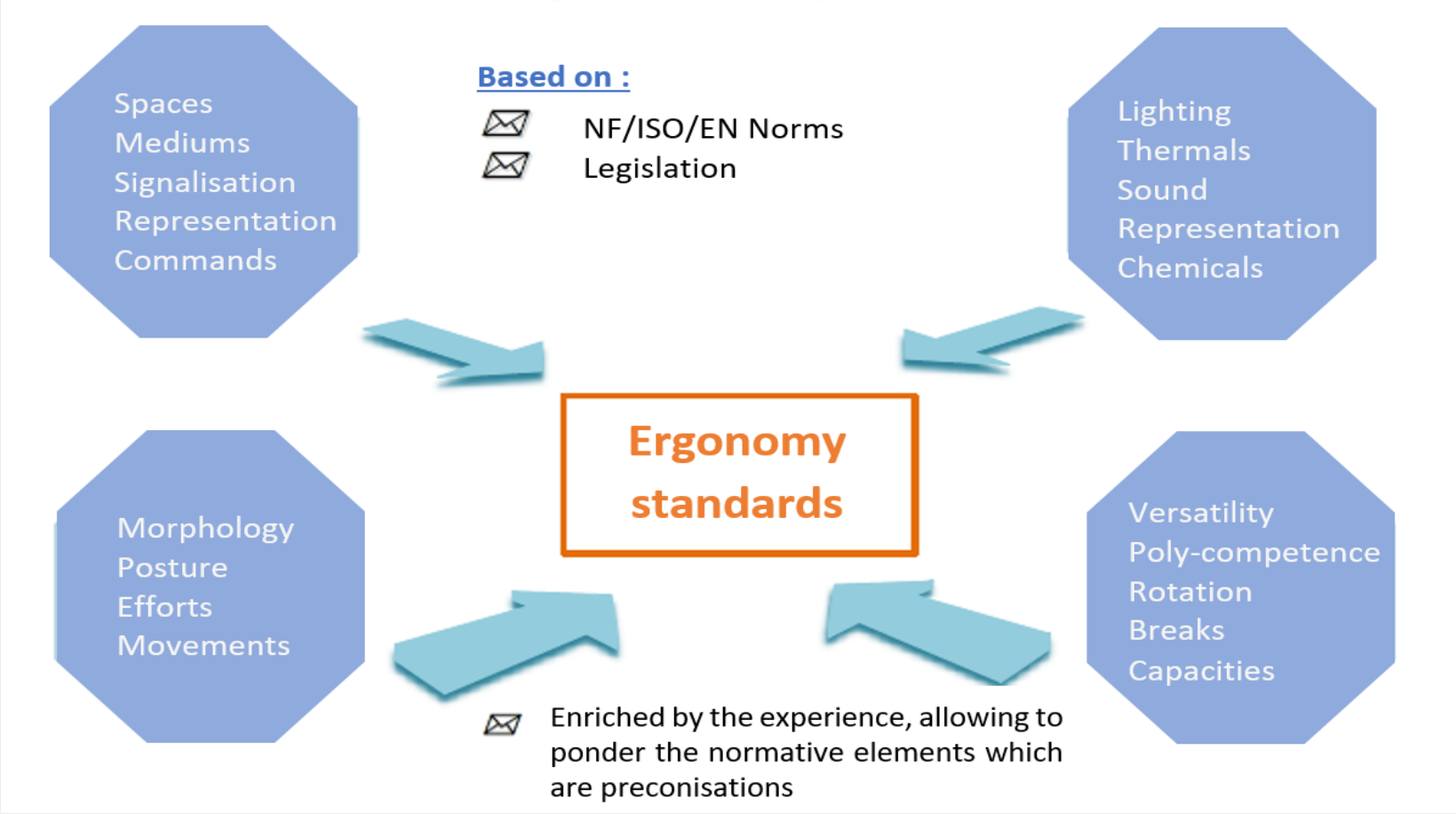
20. The handles must allow the largest possible contact surface.
21. The levers and flywheels must allow them to be maneuvered with the slightest change in posture and with as much mechanical efficiency as possible.

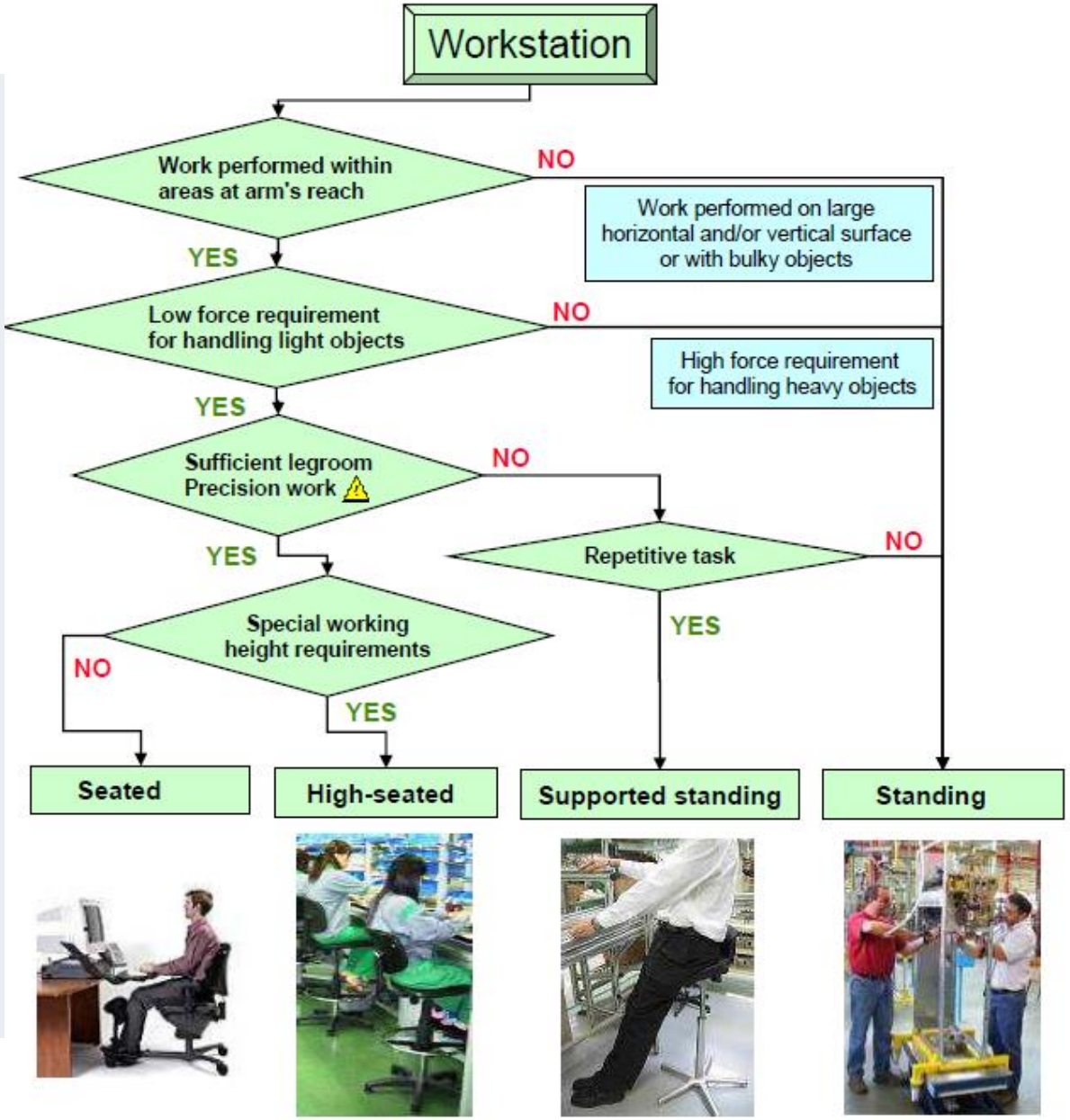
## Finger loading

22. When each finger performs a separate movement, the load of each finger must be distributed according to the capacities of each.

# Workbenches ergonomics – Ergonomics standards

The ergonomics standard, co-construction for the improvement of working conditions and the prevention of arduous work.




Workstation
Work performed within areas at arm's reach
NO
Work performed on large horizontal and/or vertical surface or with bulky objects
YES
Low force requirement for handling light objects
NO
High force requirement for handling heavy objects
YES
Sufficient legroom Precision work
NO
YES
Repetitive task
NO
YES
Special working height requirements
NO
YES
Seated
High-seated
Supported standing
Standing

# Workbenches ergonomics – Seat

The choice of the seat will depend on:

- task constraints
- posture flexibility
- ease to sit and stand
- seat stability required
- material covering
- ease to be adjusted

# Workbenches ergonomics – Seat


Specific Recommendations exist:

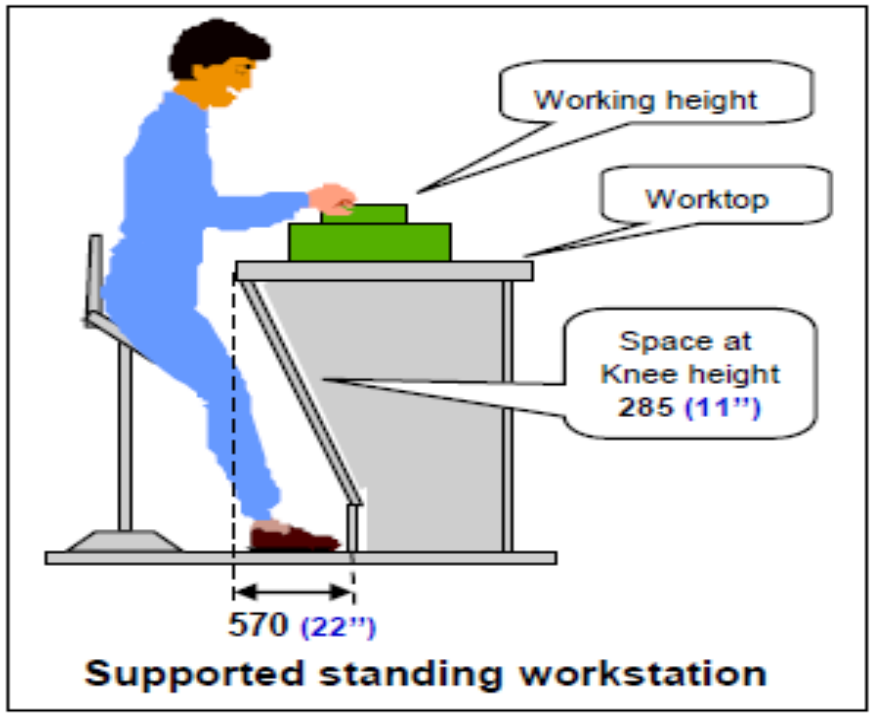
- Easily adaptable
- Provide support and comfort
- Prevent sweat accumulation and electrostatic discharge
- Back rest adjustable in height and inclination
- Base should have 5 bearing points to ensure stability

# Workbenches ergonomics – Work Performance

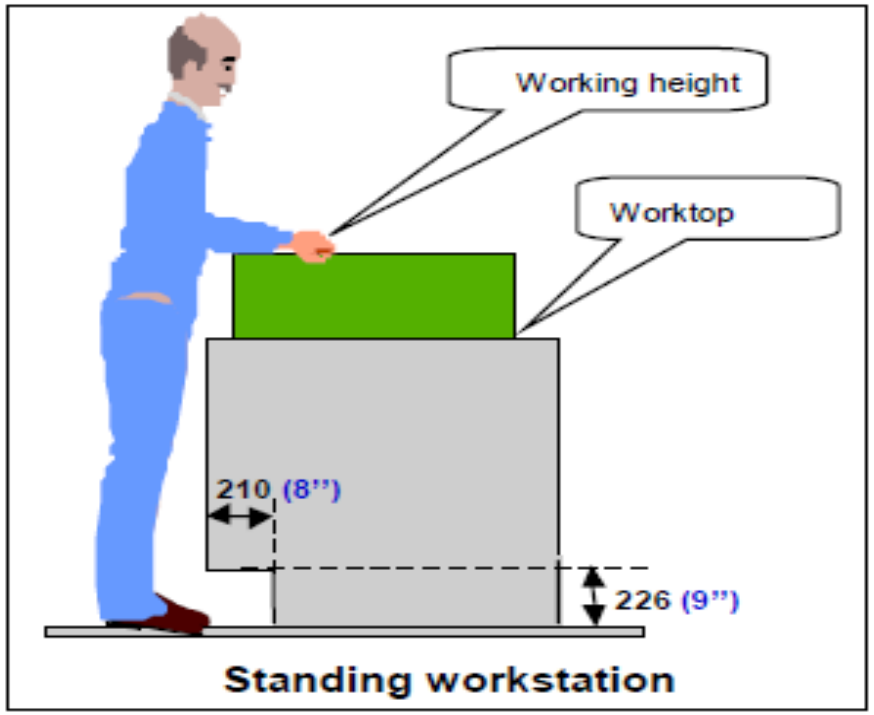
8 Fundamental Ergonomics Principles for better work performance:

- Principle 1. Maintain Neutral Posture
- Principle 2. Work in the Power / Comfort Zone
- Principle 3. Allow Movement and Stretching
- Principle 4. Reduce Excessive Force
- Principle 5. Reduce Excessive Motions
- Principle 6. Minimize Contact Stress
- Principle 7. Reduce Excessive Vibration
- Principle 8. Provide Adequate Lighting

# Workbenches ergonomics – Workstation dimensionning

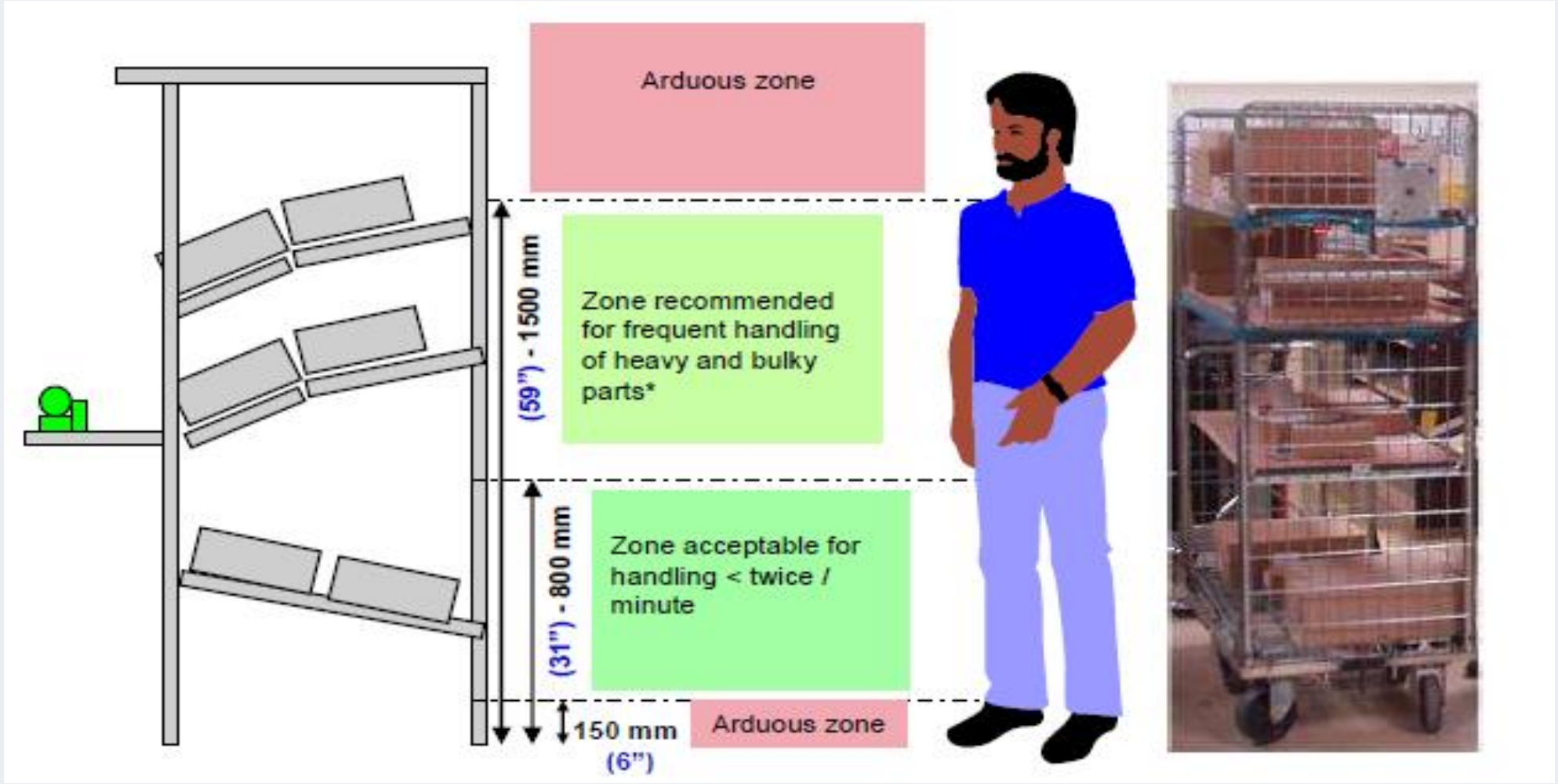


Supported standing workstation



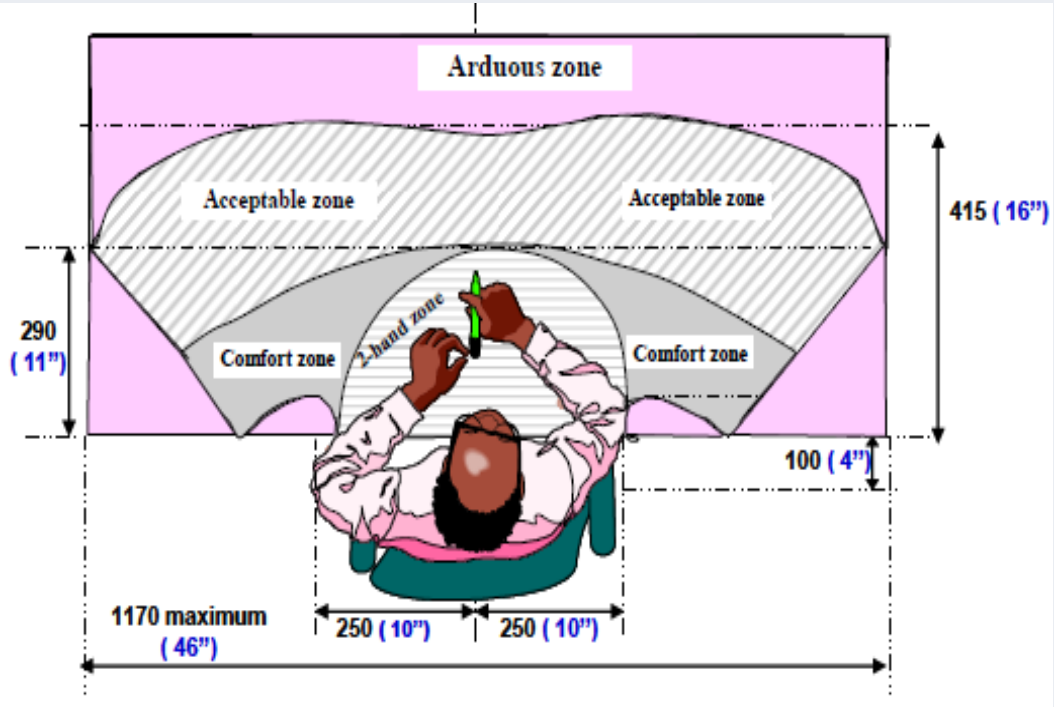
Standing workstation

# Workbenches ergonomics – Workstation material replenishment

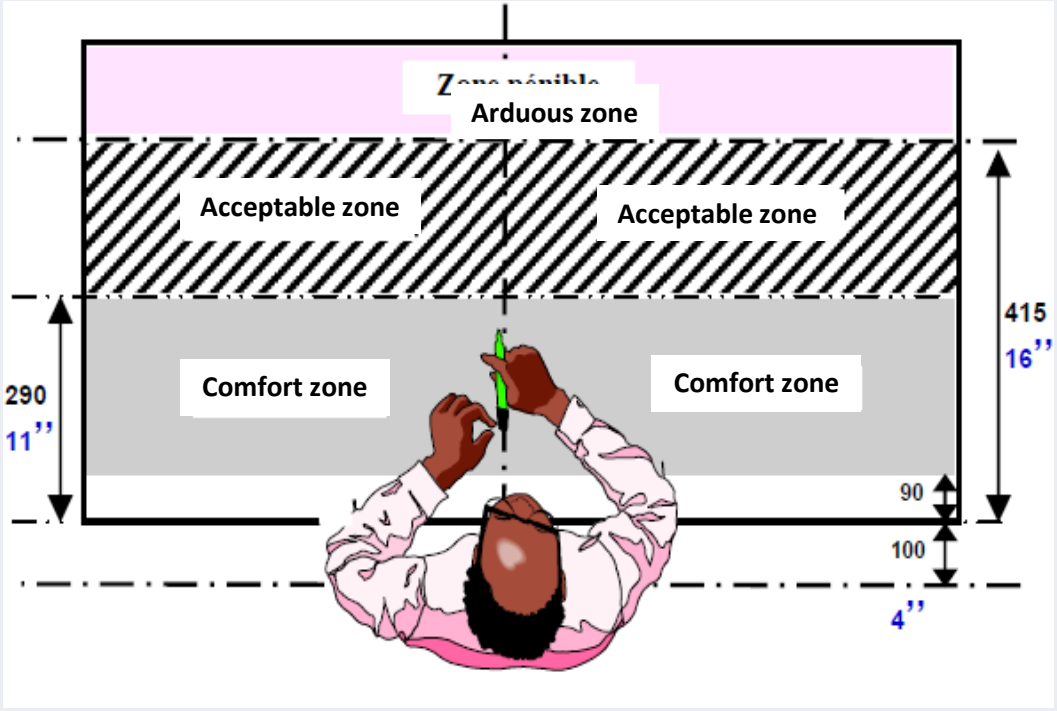


# Workbenches ergonomics – Working zones

## Seating




## Standing

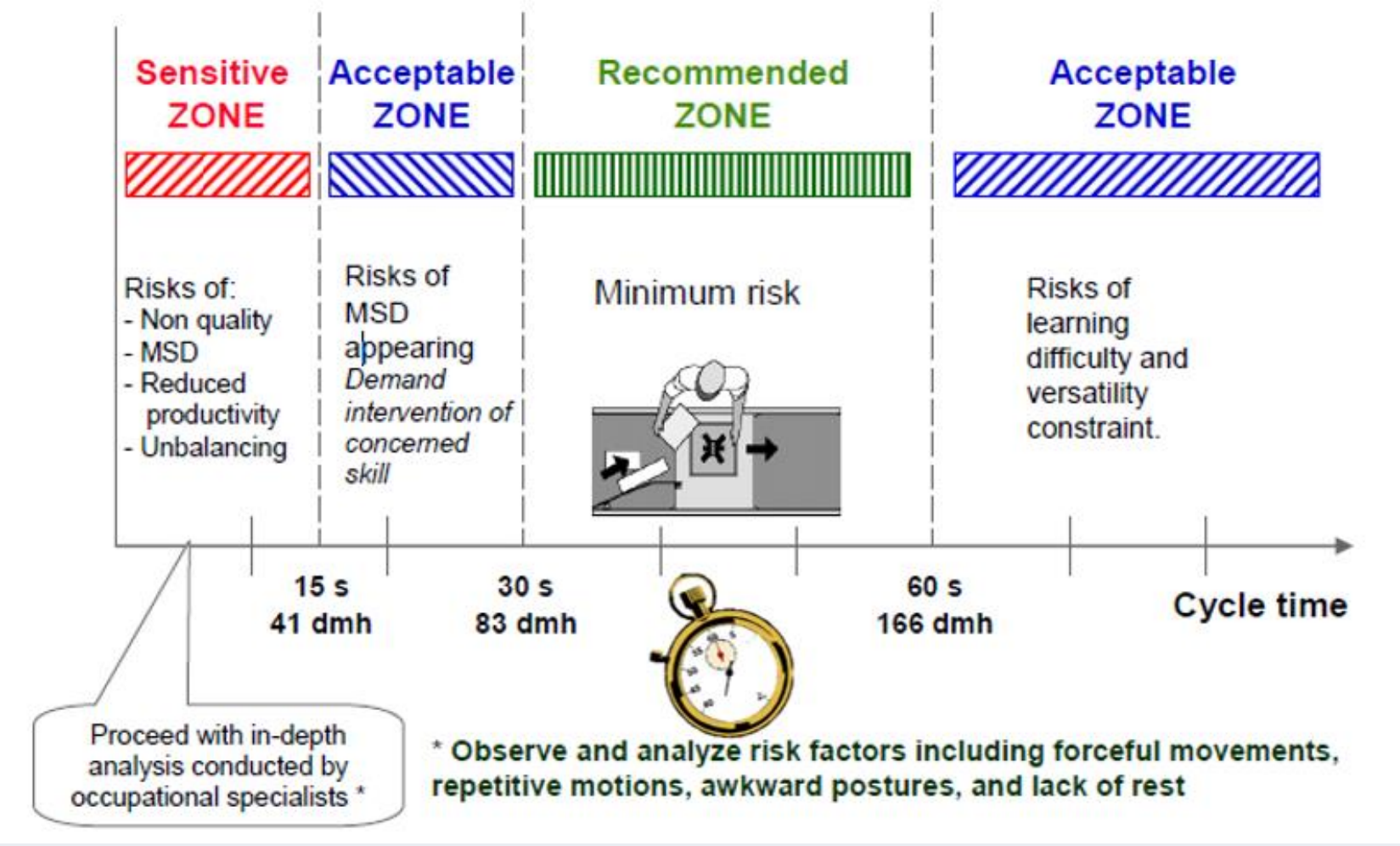


# Workbenches ergonomics - Positionning of controls


## Recommendations:

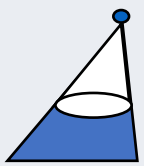
- Manual controls located in acceptable gripping zones
- The degree of force to be applied should be considered
- Controls used frequently should always be located near the visual task
- A control used for emergency operation should be capable of actuation in a very short time

# Workbenches ergonomics – Cycle time

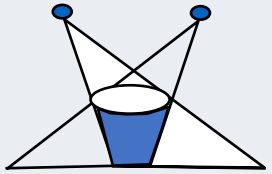


# Workbenches ergonomics – Illumination

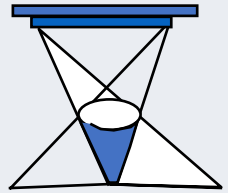
- Lighting homogeneity



One light generates a large overhead shade

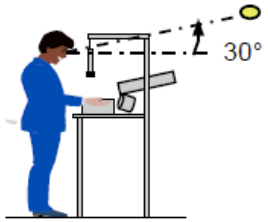


Two lights soften the shadow



A large lighting equipment minimize the shadow

- Dazzle elimination

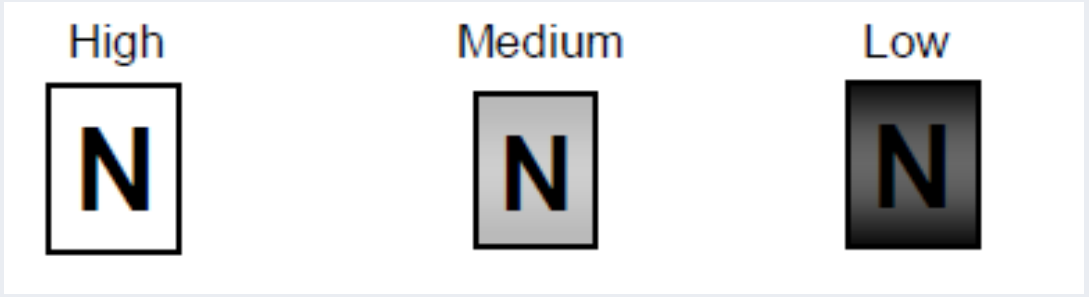



The operator can see the light if he raises the sight by more than 30°

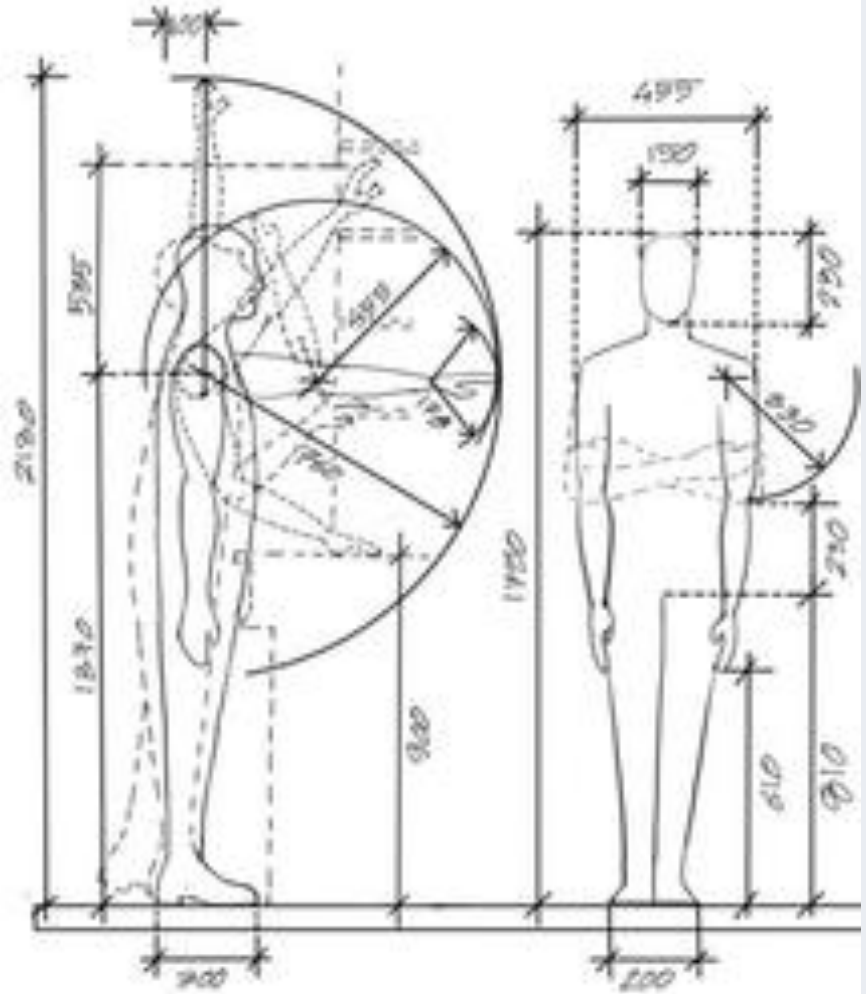
Good placement of lights to suppress reflection and minimize shadow

Risk of direct light reflection

- Contrasts



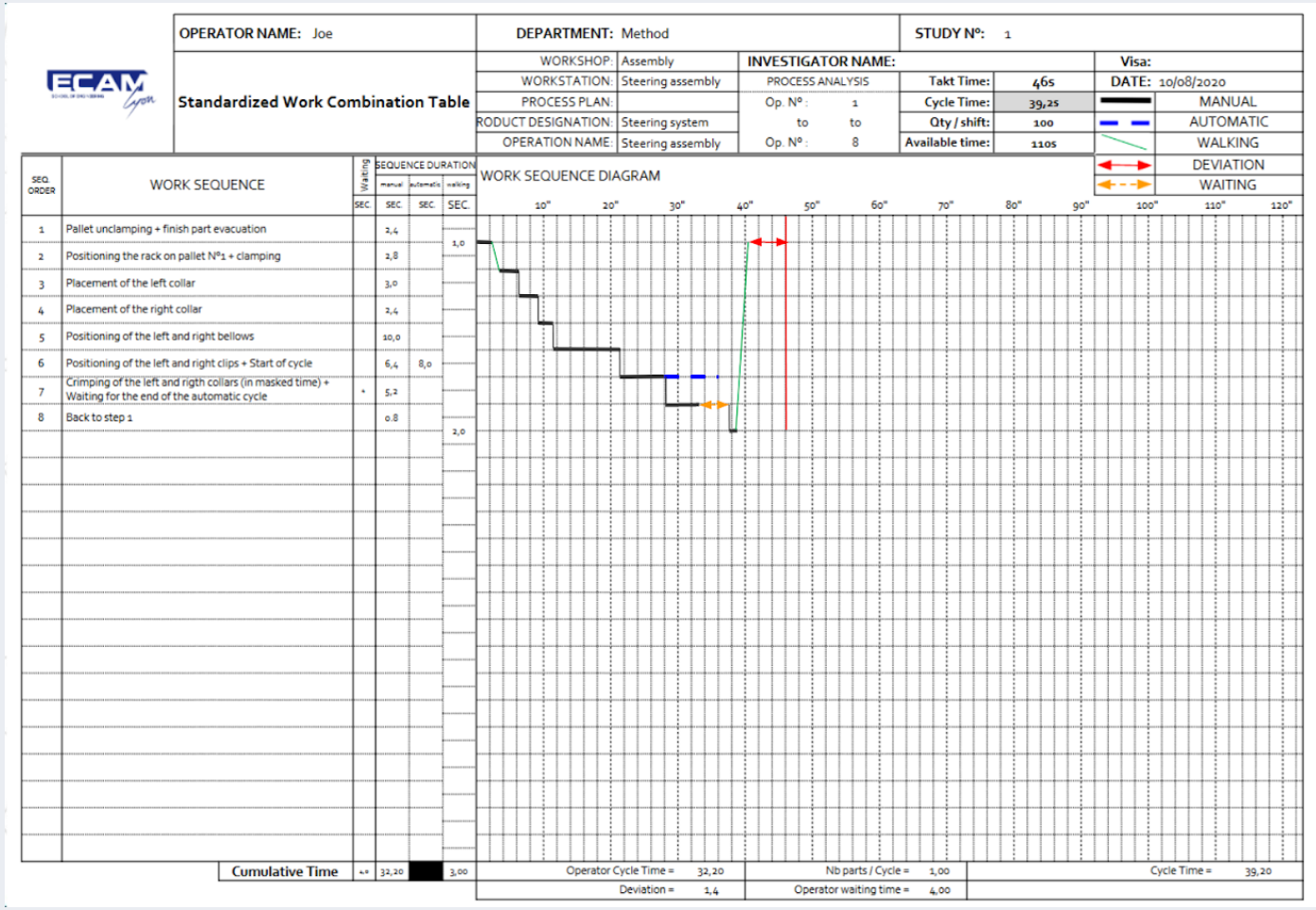
# Workbenches ergonomics – Anthropometric models



- Facilitate an elementary approach
- Model based on the physical body size of most of the population.
- Suggested dimensions are derived from known measurements for the fit adult population.
- More specific and accurate measurements should be used for in-depth ergonomic design.
- Working zones should be adjusted for 90% of the population.
- The frequency of the distribution for the stature will depend on the population and it can vary from one country to another.
- It change accordingly if you are a woman or a man.

# Time analysis

The **Standard Work Combination Table (SWCT)** combines human movement and machine movement based on takt time and is used as a tool to determine the range of work and work sequence for which a team member is responsible.



**Standardized Work Combination Table**

| | | | | | |
|---|---|---|---|---|---|
| OPERATOR NAME: | Joe | DEPARTMENT: | Method | STUDY N°: | 1 |
| WORKSHOP: | Assembly | INVESTIGATOR NAME: | | Visa: | |
| WORKSTATION: | Steering assembly | PROCESS ANALYSIS | | DATE: | 10/08/2020 |
| PROCESS PLAN: | | Op. N° : | 1 | Takt Time: | 46s |
| RODUCT DESIGNATION: | Steering system | to | to | Cycle Time: | 39,25 |
| OPERATION NAME: | Steering assembly | Op. N° : | 8 | Qty / shift: | 100 |
| | | | | Available time: | 110s |

MANUAL · AUTOMATIC · WALKING · DEVIATION · WAITING

| SEQ. ORDER | WORK SEQUENCE | Waiting SEC. | SEQUENCE DURATION manual SEC. | automatic SEC. | walking SEC. |
|---|---|---|---|---|---|
| 1 | Pallet unclamping + finish part evacuation | | 2,4 | | 1,0 |
| 2 | Positioning the rack on pallet N°1 + clamping | | 2,8 | | |
| 3 | Placement of the left collar | | 3,0 | | |
| 4 | Placement of the right collar | | 2,4 | | |
| 5 | Positioning of the left and right bellows | | 10,0 | | |
| 6 | Positioning of the left and right clips + Start of cycle | | 6,4 | 8,0 | |
| 7 | Crimping of the left and rigth collars (in masked time) + Waiting for the end of the automatic cycle | * | 5,2 | | |
| 8 | Back to step 1 | | 0.8 | | 2,0 |
| | Cumulative Time | ** | 32,20 | | 3,00 |

WORK SEQUENCE DIAGRAM

10" 20" 30" 40" 50" 60" 70" 80" 90" 100" 110" 120"

| | | | | | |
|---|---|---|---|---|---|
| Operator Cycle Time = | 32,20 | Nb parts / Cycle = | 1,00 | Cycle Time = | 39,20 |
| Deviation = | 1,4 | Operator waiting time = | 4,00 | | |

# Time analysis

The symbols used in SWCT:

| | |
|---|---|
| | MANUAL |
| | AUTOMATIC |
| | WALKING |
| | DEVIATION |
| | WAITING |

Description of work sequence:

**OPERATOR NAME:** Joe

**DEPARTMENT:** Method

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|---|---|---|
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| WORKSTATION: | Steering assembly | PROCESS ANA |
| PROCESS PLAN: | | Op. N° : |
| RODUCT DESIGNATION: | Steering system | to |
| OPERATION NAME: | Steering assembly | Op. N° : |

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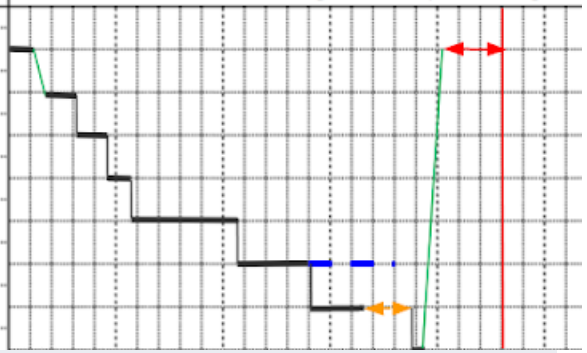

# Thank you for your attention

Any Questions ?