



Applied Ergonomics – Facility Design

The science and application of ergonomics can be used to improve many aspects of the interactions of people with jobs, processes, products, and environments. It involves assessing the physical, physiological, anthropometric, biomechanical, psychosocial, cognitive and organizational components of a work system to optimize efficiency as well as promote worker health and safety.

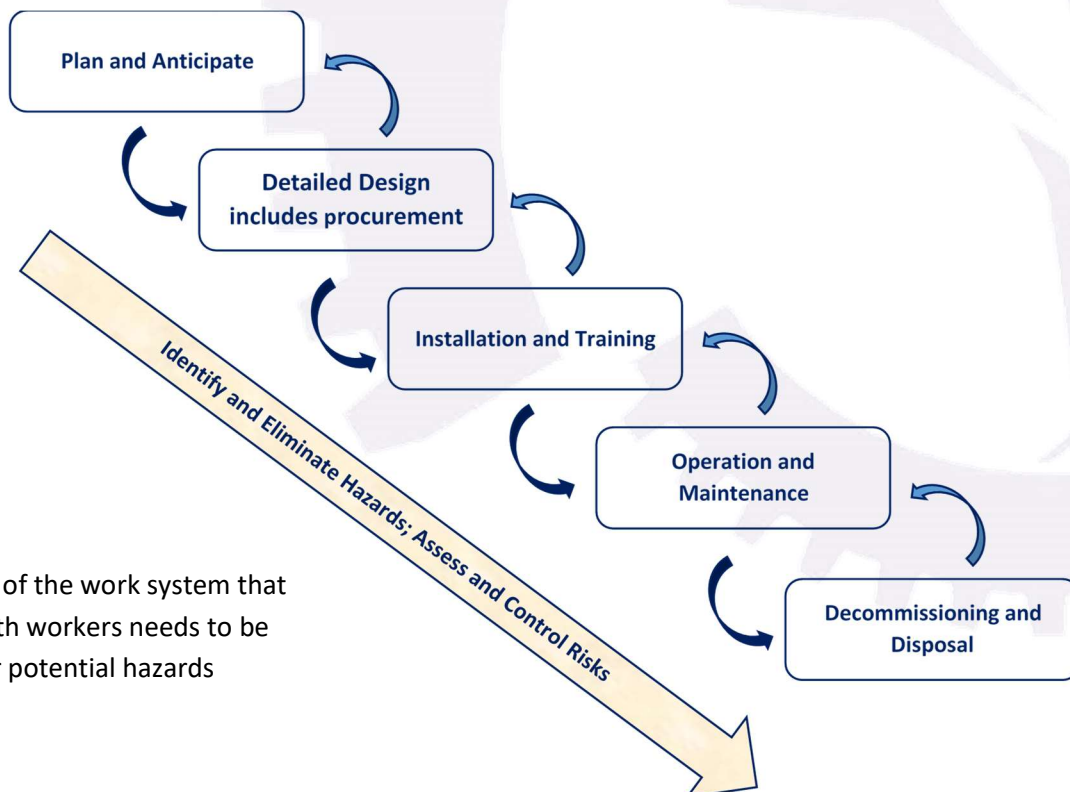
WorkSMART relies on the use of evidenced based assessment tools, methods, protocols and national / international standards in the development of proposed recommendations. We utilize an approach that is compatible with the Plan-Do-Check-Act (PDCA) model found in CAN/CSA-Z1000, Occupational Health and Safety Management System as well as ISO 14001. These standards provide an overall framework for addressing preventive and protective measures, worker participation, training, design, procurement issues, documentation, and legal and other requirements.

Application of Ergonomics in the Design and Operation of a Work System

Ergonomics has its greatest benefit when used early in the design of a work system rather than being used to solve problems after the design is complete. Applying a user-centred approach is a key attribute of ergonomics and ensures that a broad range of worker characteristics and requirements are accommodated in the planning stages. Hazards that are inadvertently designed into a workspace or work process can be difficult and expensive to address later when the workplace is already in operation.

However, ergonomics is most effective when incorporated throughout the life cycle, to help avoid the introduction of hazards into the work system and to identify possible risks for injury, illness, cognitive impairment, or inefficient work design.

The ergonomics application process involves the following five elements,



Each aspect of the work system that interacts with workers needs to be assessed for potential hazards

The process is repeated often and is cyclical in nature. The bold circular arrows indicate that the task of identifying and eliminating hazards and assessing and controlling risks occurs at each stage of design. At the same time, operations that are upset, or when a company schedules “shut down” of an operation, the organization can refer to the hazards identified during the “operation and maintenance” stage of an existing process and then consider them during the “plan and anticipate” and “detailed design” stages that take place prior to the installation or redesign of a new process.

Where hazards cannot be eliminated, the risk must be assessed and then controlled by implementing the appropriate preventive and protective measures. The implementation of preventive and protective measures must be monitored and followed-up to ensure their effectiveness. Where they are not effective, or in circumstances where new unforeseen hazards are introduced as a result of their implementation, further changes will need to be made.

Element 1. Plan and Anticipate

This is the conceptual stage. As there is usually no physical example to evaluate, we must rely on pre-existing data on human performance and anthropometry (human measurements), legislative requirements, and the experience of workers, OHS specialists, engineers, architects, and others with relevant knowledge to determine potential hazards.

During this stage, each aspect of the workplace or work process to be created, and its interactions with workers, needs to be defined (the work system). This requires an examination of, but not limited to,

- Facility and Work Design
- Workspace Layout/Workflow
- Equipment/Furnishings
- Work Environment
- Work Organization
- Worker Demands (Physical and Cognitive)

At this early stage in design, the basic parameters are established. For example, the work system outputs/products are defined, the users of the work system are identified, the production models are established, the automation levels are chosen, and the human operations (including worker populations) are clarified.

Element 2. Detailed Design and Procurement

As the external structure is almost ready to go, the main priority of this project is to determine if there are any hazards associated with the planned architectural design.

During the detailed design stage, the major interactions between one or more people and components of the work system are defined, tasks are broken down, and hazards identified. As part of the process, WorkSMART will review designs and potential impacts with the end users/stakeholders. In particular, we need to ensure that that design will,

- accommodate a broad range of the population;
- prevent adverse effects on workers, promote health and well-being, and facilitate optimal task performance;
- allow for workers’ postural stability and mobility;
- consider body dimensions, posture, muscular strength, and movement; and
- consider both the cognitive and physical demands related to equipment and the interface design

Element 3. Installation and Training

During the installation and training stage, installation of new workspaces, equipment, machinery, or work processes takes place and training on safe and effective use needs to be provided. The predicted interactions between people (the installers and the users) and the components of the work affected by the installation need to be documented in order to identify and eliminate hazards wherever possible, or to introduce appropriate risk controls.

Workers will also need to be trained in the safe and effective use of new workspaces, tools, equipment, machinery, or work processes and procedures as well as the potential consequences of non-compliance.

Element 4. Operation and Maintenance

As operations begin, it is important to monitor the interactions between people and the components of their work to ensure the design of the work environment and all furnishings, tools, equipment, etc. are working in the anticipated manner they were intended to.

During this phase, standard operating procedures regarding the operation and maintenance of the facility and all equipment will need to be clearly stated and reviewed against worker practices. The focus is on ensuring the right processes and procedures are in place relevant to minimizing the impact on health and safety (from an ergonomics perspective) while optimizing operational efficiency and streamlining with existing business systems.

There will also be a need to develop/review the internal process for the handling of employee concerns including complaints regarding work activities, tools and equipment, and how it will feed into the overall disability management program already established.

Element 5. Decommissioning and Disposal

Just as in the previous elements, the interactions between people and the components of their work need to be reviewed to identify and eliminate potential hazards and to assess and control risks.

Standing Still is Not an Option

While it is true incorporating ergonomics initially may be more costly, the industrial experience is that in the long run, the costs of re-doing or correcting a design or work system that is already in place once problems appear, is about 40% greater.

When a job, task, tool, process or system is designed using ergonomics principles, the results are generally,

- a task that is safer (fewer losses due to incidents and injuries),
- tasks that are easier to learn (less training time and costs),
- tasks that can be performed by a broader range of people (easier to find qualified workers),
- processes that maximize alertness and minimize drowsiness (minimizing errors and omissions),
- processes that are more controlled (less variability in output), and
- processes that are more efficient (less downtime and rework scenarios).

