STANDARDIZED WORK

Quality & Industrial Performance version 3

“Going From Reactive to Proactive”

Introduction

PURPOSE:

- Ensure safe and ergonomic workplace
- Apply workplace organization as a baseline for standardized operations
- Develop process and identify ways to eliminate waste.
- To establish a repeatable, predictable baseline for continuous improvement involving the operator in both the initial and ongoing improvements to achieve the highest levels of safety, quality and productivity.

SCOPE:

- Assembly Area
- Manufacturing Operations
- Repair/Rework Area
- Shipping / Receiving
- All Operations
- Other Support Functions

RESPONSIBILITY:

- Ownership
  - ✓ Operations Manager
- All Plant Personal

Benefits

- Ensuring operators are consistently performing tasks and procedures the same across all shifts and personnel.
- An efficient production sequence.
- Identifying value added tasks. Makes it easy to identify and eliminate waste.
- Reduced variation within a process.
- Continuous improvement and problem solving.
- A lean organization.
- Promotes cross-functional teamwork.
- Provides for a safe, clean and well organized work environment.
- Improves employee mind-set & performance in Safety, Quality and Productivity.
- Provides “Status at a Glance” makes non standard conditions visible.
- Auditing operator conformance to work instructions (*Layered Process Audit*).

Safety and ergonomics of workplace, what are we searching for?

Item	Requirement	#Criteria	Criteria requirement
SW1	The workplace are safe, ergonomic, clean and well organized	**SW11**	**All people are trained for safety based on the safety policy. Visitors are informed by the safety rules to respect.**
		SW12	**Relevant safety standard are applied for each workplace.**
		SW13	**Systematic approach for all the workplaces organization is implemented and maintained to respect FIFO, visual management and cleanness. If clean room / area is required (due to sediment or painting requirement), special rules are utilized in order to minimalize risk of contamination.**
		SW14	Rules related to ergonomics of workstations are defined and applied for each workstation design. They take into account the environmental conditions.
		SW15	A continuous improvement is in place to eliminate waste (lean management) and improve production output (operational availability).

Criteria of Requirement

11 – page 5 et 6
12 – page 7
13 – page 8 - 21
14 – page 22 – 25
15 – page 26 - 38
Auditor hints – page 39

Next Requirement

Safety Handbook/Procedure Content

- The safety handbook/procedure should cover the following content:
  - General Plant layout showing location of ambulatory/healthy service, emergency exit, fire station, evacuation points, etc.
  - Specific Risk Information: description, prevention, rules, etc.
  - Work instructions in case of emergency evacuation
  - Personal Protection Equipment
  - Cares related to tools, devices, equipment
  - Emergency call number: list of phone numbers in case of issue
  - Accident and near miss communication

Visitors Procedure

- Visitors procedure shall be available. It could contains the following safety-related information:
  - Emergency telephone number
  - Visitor safety orientation
  - Emergency evacuation procedures and take shelter information

Safety: training needs

- Organization shall define the safety training needs based on:
  - Environment Risk assessment
  - Work Risk assessment
  - Local Legislation
  - other
- The safety training needs shall be conducted in two levels:
  - General safety rules (Basic)
  - Specific safety rules (Individual Job Training)

Note: specific safety rules could be added on the Job Element Sheet *(refer – Std Work)*

Design for Health and Safety

Application & Requirements

Relevant safety standards are applied for:

- Support new design projects and programs,
- Involves in-plant retrofits, modification and equipment moves.
- Develop and post Safe Operating Practices / Procedures.
- Involve appropriate Plant team members, including project engineers, skilled trades, health & safety, environmental and ergonomic interfaces, for application of appropriate risk assessments and resulting risk elimination or reduction.
- Plant works with project or program engineering leads to follow a documented process to validate safety at the design stage.
- Work area layouts and process layouts are analyzed during risk assessment/*Layered Process Audit* and actions are taken to apply health and safety control measures to reduce any remaining risk to an acceptable level.
- Plant follows a process to ensure or verify that all open items or employee concerns were addressed in the final installation.

Workplace organization

Organizations shall utilize a systematic approach/standard to implement and maintain Workplace Organization which includes internal stock and buffer too. It ensures:

- Only required and regularly used equipment, tools and materials are present in the work area.
- FIFO is kept.
- Work areas are controlled using visual management.
- Product and information flow is easily understood.
- Housekeeping is defined by work area instructions.
- Regular management reviews *(Layered Process Audits)* are performed.
- Waste elimination and continual improvement.
- A clean, bright workplace.

Good Workplace Organization establishes a standard that leads to the Identification & Elimination of Waste.

- **FIRST IMPRESSIONS**

(Example)

“You never get a second chance to create a first impression.”

What is your first impression of these facilities?

5S Workplace organization

STEP	ORIGINAL 5 S	OTHER 5 S TERMINOLOGY				QSB+	DEFINITION	PURPOSE
1	**Seiri**	Organization	Sift	Tidiness	Clear	**Sort**	Determine the purpose of the area and remove all unnecessary items from the workplace.	To prepare the workplace for the next 4 steps and to eliminate items that could cause injury, excessive cost, or any of the forms of wastes.
2	**Seiton**	Neatness	Sort	Orderliness	Organize	**Straighten**	Identify the best location for all required items in the workplace.	To eliminate many of the forms of waste (such as correction & motion) and make items readily available to the user.
3	**Seiso**	Cleaning	Sweep	Cleanliness	Clean	**Shine**	To become aware of and eliminate all unwanted dirt, dust, grime, paint, labels, tape, etc…	To eliminate unsafe conditions, improve quality of our products, enhance the workplace environment, identify and correct equipment problems (cleaning is checking), and initiate corrective action to prevent future accumulation of unwanted
4	**Seiketsu**	Standardization	Sustain	Standardization	Standardize	**Standardize**	The standardization required to maintain the steps of work place organization.	To allow for quick, easy, and effective maintenance of the workplace organization process.
5	**Shitsuke**	Discipline	Self-Discipline	Discipline	Continuous Improvement	**Sustain**	The system designed to sustain and support continuous improvement of workplace organization.	To assure continuous growth of this process.

- Workplace Organization is applicable to all types of environments (e.g. offices, conference rooms, tool cribs, operator workstations, team/group rooms, etc.).

- **S-1: Sort – Divide the needed and unneeded items at the job site, removing any unneeded items.**

  - Four areas of focus:
    - Equipment
    - Tools
    - Inventory/Storage
    - Personal items

  - Sort and Tag:
    - Place a green tag on any item in regular use.
    - Place a red tag on any item which isn't used or is not in working condition.
    - Place a yellow tag on any item that use or condition isn't known for sure.

- **S-2: Set in order – A place for everything and everything in it's place.**

  - Categorize:
    - How often do I use this item?
  - Determine a location:
  - There is a "best" place for every item.
    - If used frequently – keep near

    If not – place at the rear.
    - Use Shadow Boards.
  - Set limits for material levels:
    - Standard packs.
    - Work in process.
    - Container size and identification.

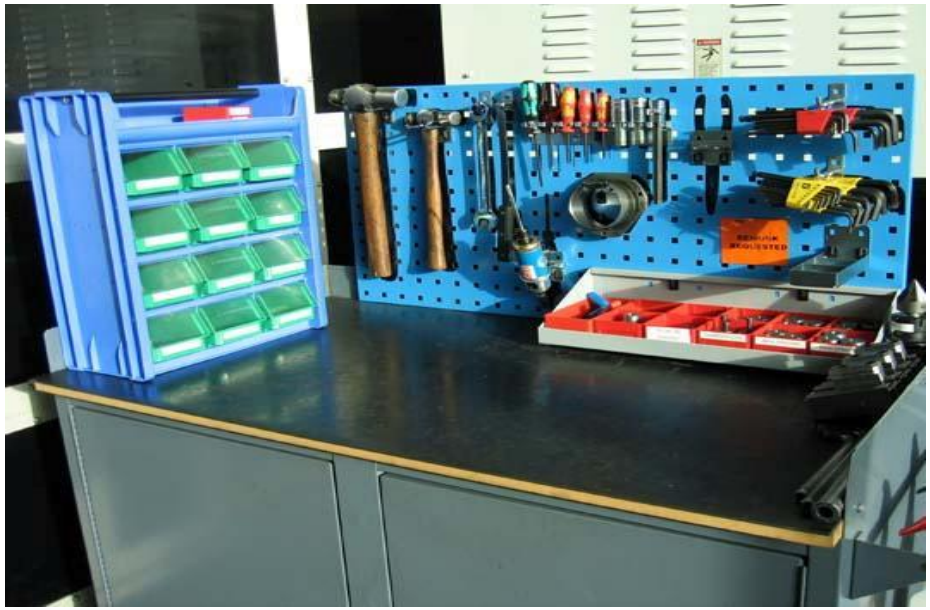
- **S-3: Shine - Eliminate the source of dirt and leaks (oil, air, water, etc.).**
  - Clean machines, tools, floors, cabinets.
  - Develop instructions for cleaning methods and frequency.
  - Organize for cleaning (correct materials, rags, brooms, etc.).
  - Find ways to reduce the time required for cleaning.

(Example)

Out-of-standard conditions can be easily identified and corrected.

- **S-4: Standardize - Standardize the area visually and mark the location of each item.**
  - Color coding for designated areas.
  - Designate area shapes.
  - Consistent label height and color throughout facility.
  - Storage containers and storage areas practices.

(Example)



- **S-4: Standardize (Continued)**
  - Determine cleaning schedule and methods.
  - Standardize cabinet organization.
  - Define a simple method to identify problems using visual controls.

(Example)

- **S-4: Standardize (Continued)**

GMPT FLOOR MARKING COLOR SPEC. (Example)

COLOR	Floor Marking Application	*LIVONIA* CRIB CODE
BLUE	**QUALITY ITEMS** *OPERATION GAGE TABLES & GAGE CARTS* *QUALITY INFORMATION DISPLAYS* *OTHER QUALITY RELATED ITEMS*	M-2307
GREEN	**PRODUCTIVE MATERIAL** *RAW STOCK, PURCHASED PARTS* *IN-PROCESS MATERIAL* *FINISHED MATERIAL*	M-2311
RED	**SCRAP MATERIAL** *SCRAP BINS* *SCRAP CARTS* *OTHER SCRAP RELATED ITEMS*	M-2309
YELLOW	**TOOLING AND SUSPECT MATERIAL** *TOOL CARTS* *TOOL TABLES* *SUSPECT MATERIAL*	M-2310
WHITE	**ALL OTHER ITEMS** *TRASH BINS* *HOUSEKEEPING STATIONS* *ALL OTHER ITEMS*	M-2308

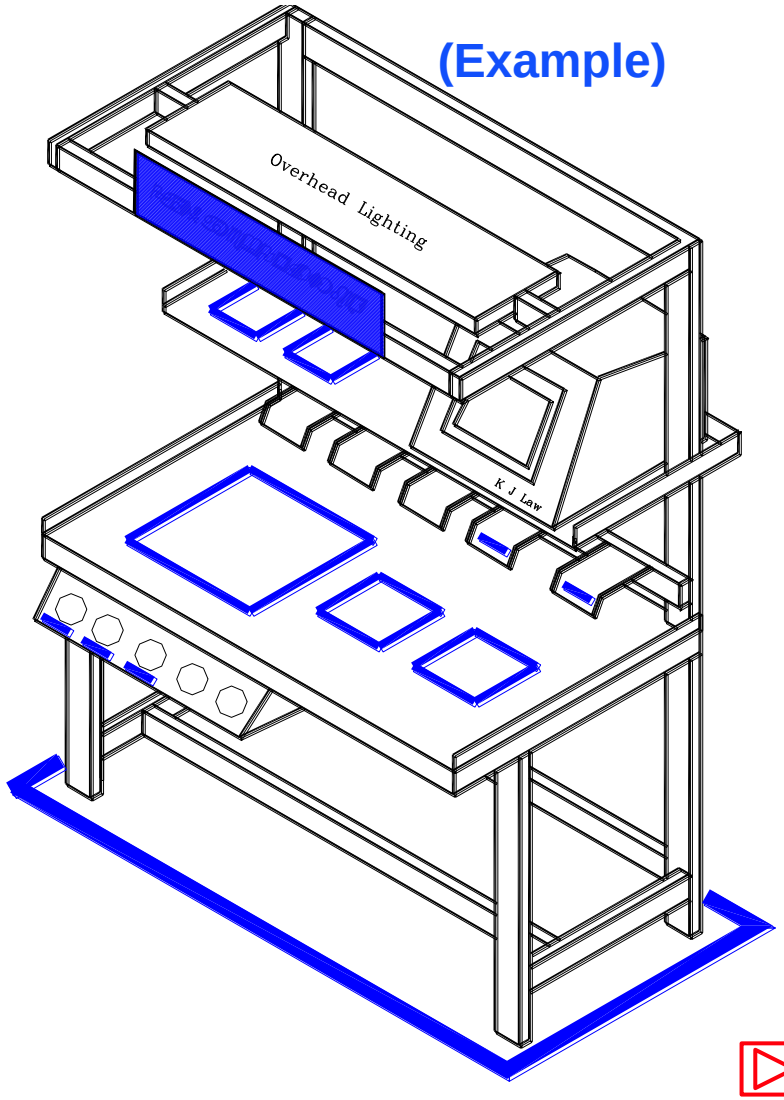
- **S-4: Standardize (Continued)**

FLOOR MARKING:
PAINT / TAPE A BLUE LINE 2-4” WIDE ON THE FLOOR SIZED TO SUIT TABLES WITH DESCRIPTION LABELED.

OVERHEAD SIGN:
SIGN TO INDICATE DEPARTMENT AND OPERATION #. TO BE ATTACHED TO THE TABLE OR HANGING FROM ABOVE AS APPROPRIATE.

LABELS & SILHOUETTES:
PLACEMENT OF GAGES AND DOCUMENTATION IS TO BE MARKED ON THE TABLE ALONG WITH THE APPROPROPRIATE SERIAL NUMBER OR DESCRIPTION FOR EACH.

(Example)

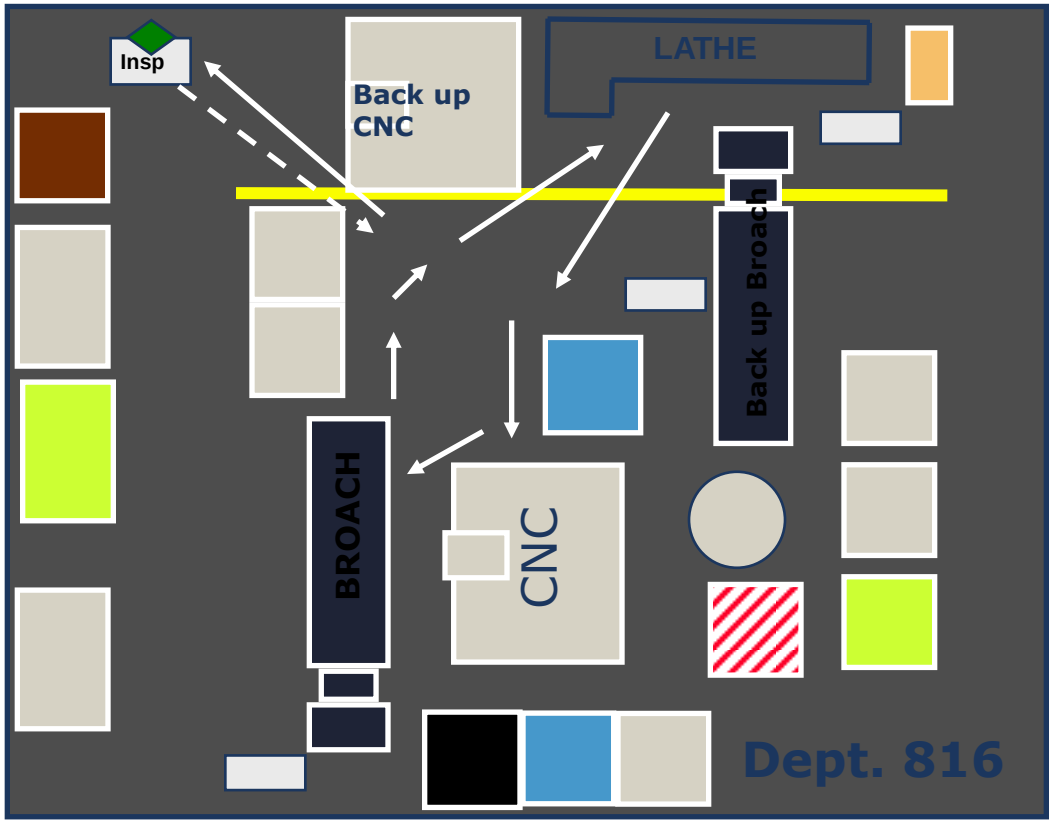


- **S-5: Sustain - Ongoing compliance and continual improvement.**
  - Leadership commitment and involvement (top down).
  - Drive 5S throughout the organization.
  - Incorporate housekeeping into Operator Instructions.
  - Training is the key to continual improvement.
  - Establish formal housekeeping audit/checklists.
  - Incorporate 5S compliance into a formal *Layered Process Audit* program.
  - Keep trying to find a better way.

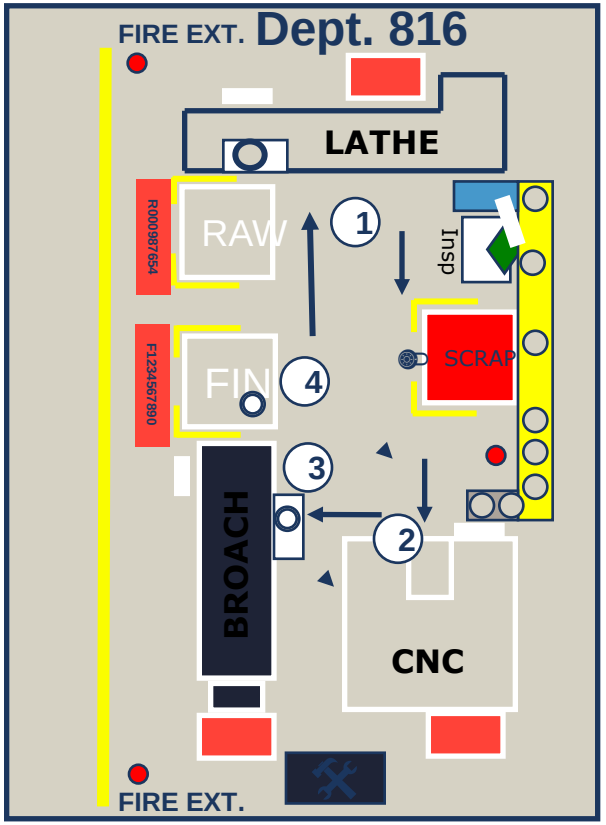
- ***A well organized workplace is the best place to visualize your Standardized Work – work flow, operator movement, time, etc.***

FLOOR LAYOUT (Example)

Before



After



- **Create a checklist**

5S Evaluation (Example)

Date:_____ Name :_____ Area:_____

Item No.	Description	5S Evaluation & Scoring Criteria Rating Scale: 0-5 (Poor = 0, Excellent = 5)	Item Score (0-5)	Notes for Next Level of Improvement
1	Removing Unnecessary Items	All items not necessary to performing work are removed from the workplace; only tools & products are present at work		
2	Storage of cleaning	All cleaning equipment is stored in a neat matter ; handy & easily available when needed.		
3	Floor cleaning	All floors are clean and free of debris, oil & dirt. Cleaning of floors is done routinely - - daily at a minimum.		
4	Bulletin boards	No outdated, torn or soiled announcements are displayed. All bulletins are arranged ina straight and neat manner.		
5	Emergency Access	Fire hoses and emergency equipment are unobstructed & stored in a prominent easy-to-locatemanner. Stop switches & breakers are marked or color-coded for easy visibility.		
6	Items on floor	Work-in-process, tools & any other material are not left to sit directly on the floor. Large items such as tote bins are positioned on the glance; lines are straight and at right angles with no chipped or soiled paint.		
7	Aislewys - marking	Aisles & walkways are clearly delineated and can be identified at a glance; lines are staight and at right angles with no chipped or soiled paint.		
8	Aislewys - maintenance	Aisles are always free of material & obstructions: nothing is ever placed on the lines & objects are always placed at right angles to the aisle lines.		
9	Storage & arrangement	Storage of boxed, containers & material is always neat at right angles. When items are stacked, they are never crooked or in danger of toppling over.		

(Example)

These questions relate to the 5S one point lesson.

Check the station post does it have a 5's One Point Lesson ?

Check the Layout does it look like the 5's Standard?

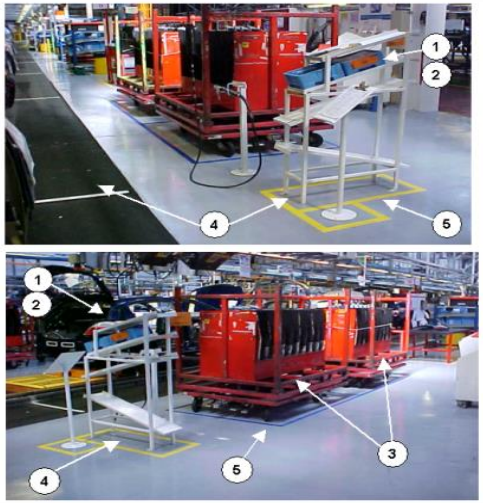
Check the station area are the floor markings in place and in good condition ?

Is everything in its floor marking place ?

Is there anything in the area that should not be there ? (something that has no marked position)

5S One Point Lesson

Section: Trim 2 Team 2	Division: 642. Trim	Operation: B Pillar Fit R/H	5s: T2 09R
Task Nos: 1 - 5	Prepared by: J.Carrington	Date Issued: 18/07/04	



No.	Task
1	Clean & Inspect Kan - Ban Racks for any Litter. Remove any litter and place in bin.
2	Remove any unwanted Stock or Scrap material. Take Scrap to Scrap material table.
3	Pull out Dolly's and Remove any Litter or Debris. Ensure Dolly is replaced to correct location.
4	Brush area under car / skid / dolly and Kan-Ban Rack area.
5	Re-apply Floor Marking as required.
6	

ONLY USE NON PERMANENT OVERHEAD PROJECTOR PEN ON THIS SHEET

Note:	Collect all cleaning materials from shadow board or cleaning locker. Tasks are to be carried out during a 5s stop or when a window of opportunity arises (i.e. breakdowns etc).
Safety:	Please ensure all PPE is worn, and safety procedures are adhered to. Report any abnormalities to Team Leader / Supervisor if found whilst carrying out tasks.

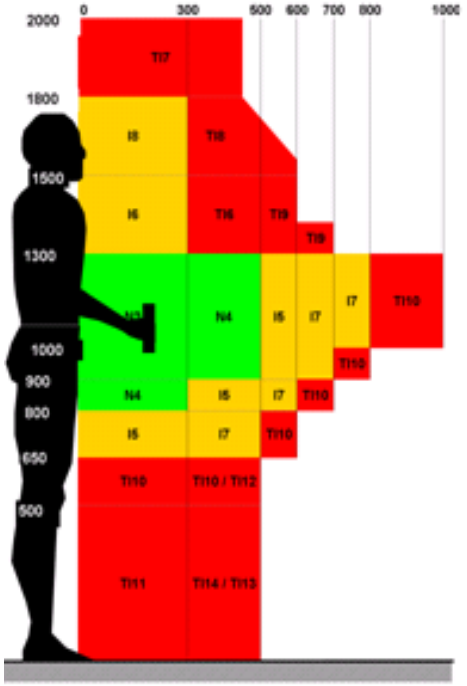
Requirements

Utilize evaluation tools for ergonomic risk assessment. The Ergonomics Plan is a documented process that provides guidelines for ergonomic risk evaluation, medical management, risk factor remediation and training.

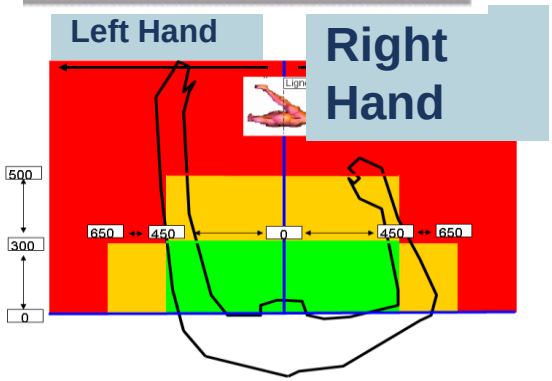
Ergonomics Plan Standard Elements

- Documented ergonomics process with leadership commitment and worker involvement for identifying and resolving reactive and proactive ergonomic issues.
- Provides early involvement in the Engineering Design Process, to ensure product and process designs incorporate ergonomic principles.
- Use of ergonomic tools and guidelines used for job evaluation.
- Medical management focused for better application of human factors in ergonomic design of work places and on early detection of workplace-related medical conditions in employees.

Ergonomics Standard



Working Position		
X	>1800	> Head
Δ	>1300	>= Heart
O	<1300 >800	> Upper Thigh
Δ	<800	<= Upper Thigh
X	<650	<= Lower Thigh



Methodology

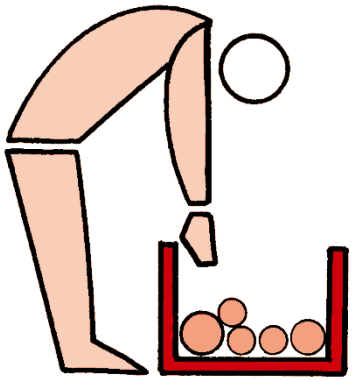
- Work operations are analyzed motion by motion.
- For each motion, a ergonomic load is defined according to predefine rules.
- A penalty is associated to each level of ergonomic load.
- The ergonomic load of the whole operation is the sum of all motion penalties.

- **Step #1:** Evaluate ergonomic load of work operations
- **Step #2:** Identify the most painful operations
- **Step #3:** Implement action plans to improve

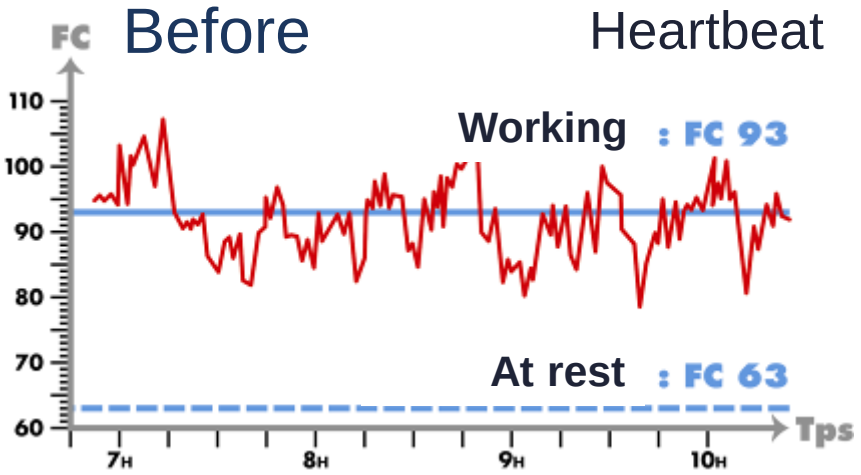
Potential Ergonomics Issues

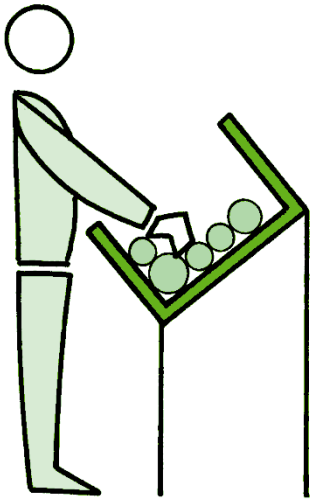
(Example)

Manual Handling: Example of ergonomic improvement (Example)

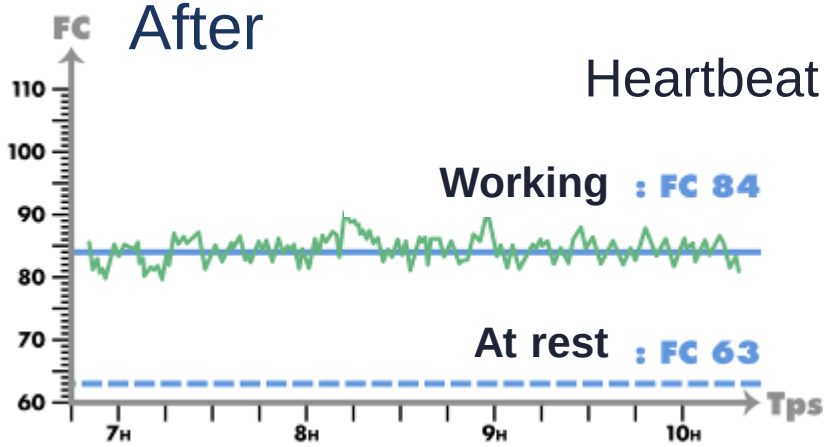


Before





After

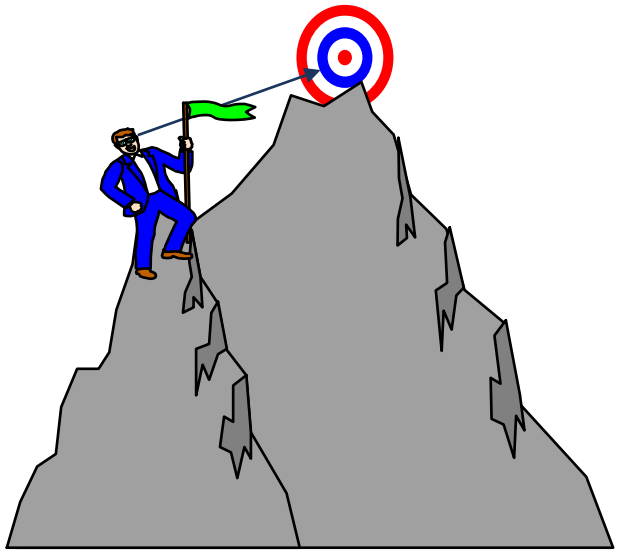


Elimination of waste

- It is everyone's responsibility to promote and participate in a continuous improvement culture within their daily activities. Continuous Improvement is an ongoing process – it has no end as we can always improve. Even when a process is stable, and Business Plan requirements have been met, we should look for further ways to improve.

Only if you climb to the summit. . .

. . . Can you see the next objective!



Elimination of waste

Traditional Thinking

- Waste not defined
- React to large scale examples
- Reactive Improvement

QSB+ Thinking

- Waste is tangible
- Identify many small incremental opportunities
- Continuous improvement

Elimination of waste

Enemy #1: Waste

Before we can understand the concept of waste, we need to be able to differentiate between non-value added and value added work.

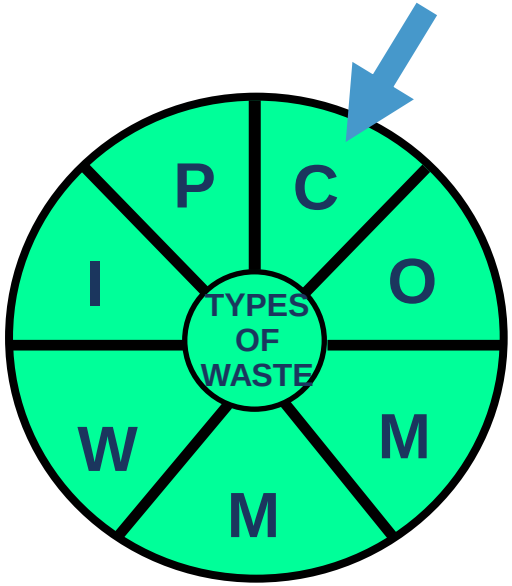
Non Value Added Work

This type of work does not add value to the product, however some non-value added work is necessary. For example, picking up a tool is necessary. It is the *unnecessary* non - value added work that is waste.

Value Added Work

Work that directly adds value to the products. Value added work is defined as a change to the product, that adds value to the product and that the customer is willing to pay for (e.g. assembly of parts, application of paint, etc.).

- Waste is any step that is *unnecessary* in carrying out the job. It includes things like waiting, rearranging materials, looking for things, and unnecessary walking.



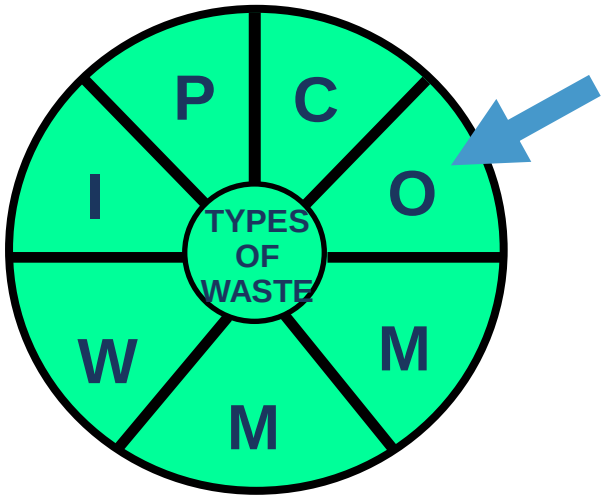
CORRECTION

Definition: Doing something over which requires additional motion, additional processing, additional inventory and/or waiting. All repair activities are opportunities to eliminate waste.

Characteristics: Additional resources required to repair, reactive organization.

Main Causes: Poor training, inadequate tools, large inventory.

OVERPRODUCTION

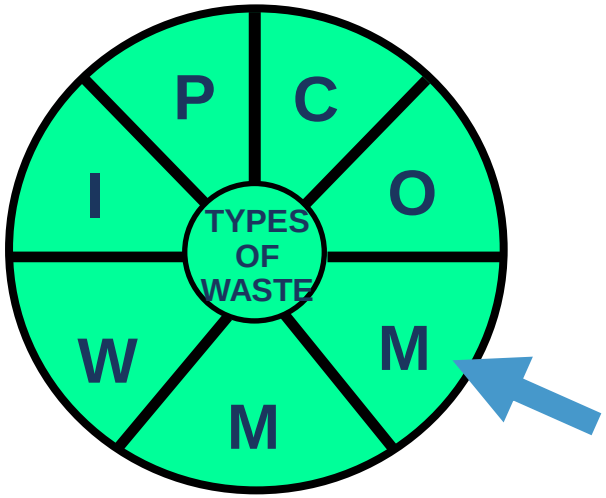


Definition: Generating excess parts, information, etc., too soon or too fast in a process. The waste of overproduction often causes other forms of waste.

Characteristics: Large inventory within the process, busy areas, large movement of parts and people, increased staffing and energy costs.

Main Causes: Unbalanced operations, lack of communication, high equipment downtime.

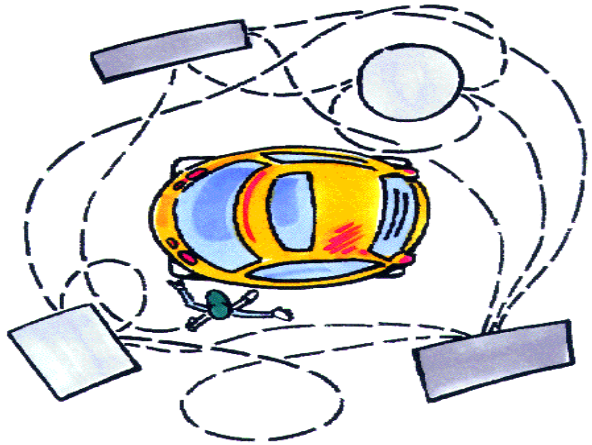
MOTION



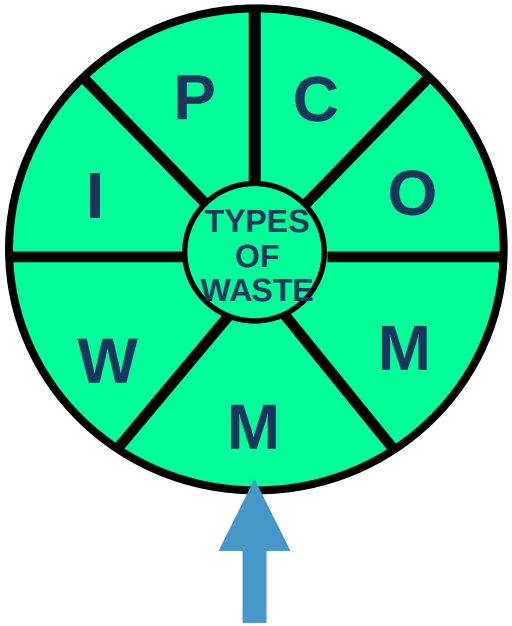
Definition: Unnecessary work movements by a team member or machine which is not necessary in adding value to the product.

Characteristics: Extra walking, excessive use of force, excess handling.

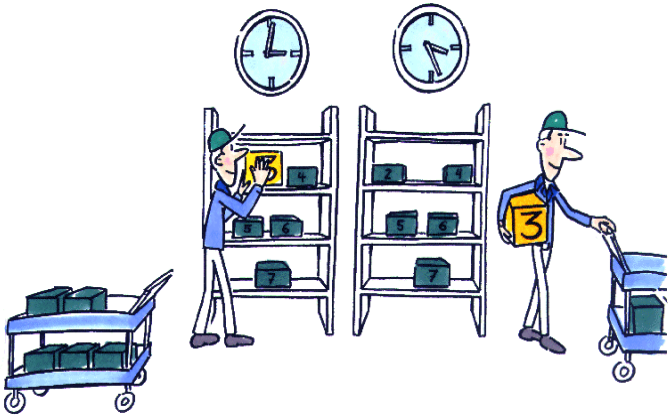
Main Causes: Worksite poorly laid out or standardized work sequence not properly planned or followed.



MATERIAL MOVEMENT



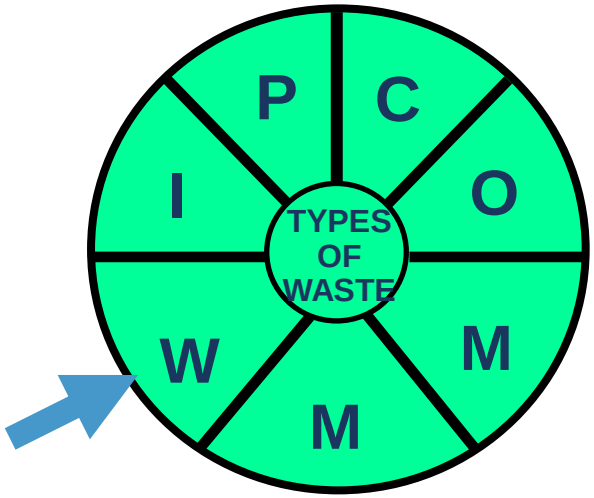
Definition: Unnecessary transporting, storing or rearranging of items, parts, equipment, etc. which is not required for production.



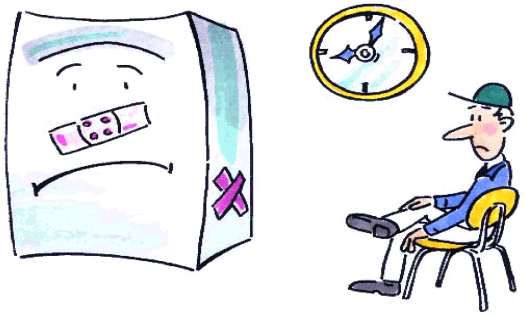
Characteristics: Moving or rearranging of materials, temporary storage areas.

Main Causes: Large batches, lack of workplace organization.

WAITING



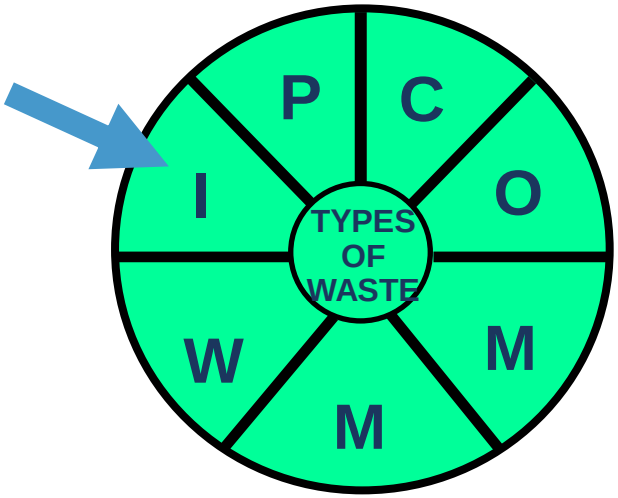
Definition: To remain in one place while doing something other than what is related to the task at hand. It is an unproductive use of time as it adds no value to the process.



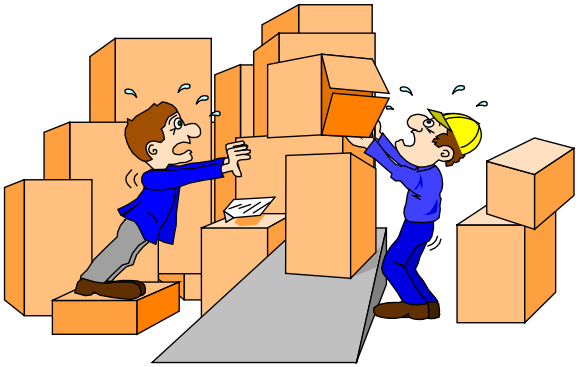
Characteristics: Worker waiting for a machine or another worker. Waiting for people, information or meetings to start on time is waste.

Main Causes: Operations not balanced, broken equipment.

INVENTORY

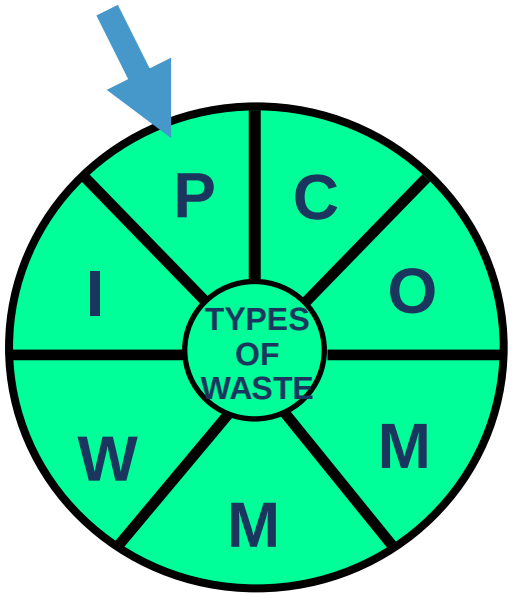


Definition: Too much of anything which may take up space, lead to obsolescence, impact safety, cause waste of motion or waste of material movement.



Characteristics: Large receiving docks, extra bins, racks and fork trucks.

Main Causes: Unlevel scheduling, no pull system, too many material storage areas.



PROCESSING

Definition: Doing something the customer does not perceive as adding value to the product.

Characteristics: Clicking a torque wrench twice when one is sufficient by the quality standards, polishing the underside of a hood, mixed pallets.

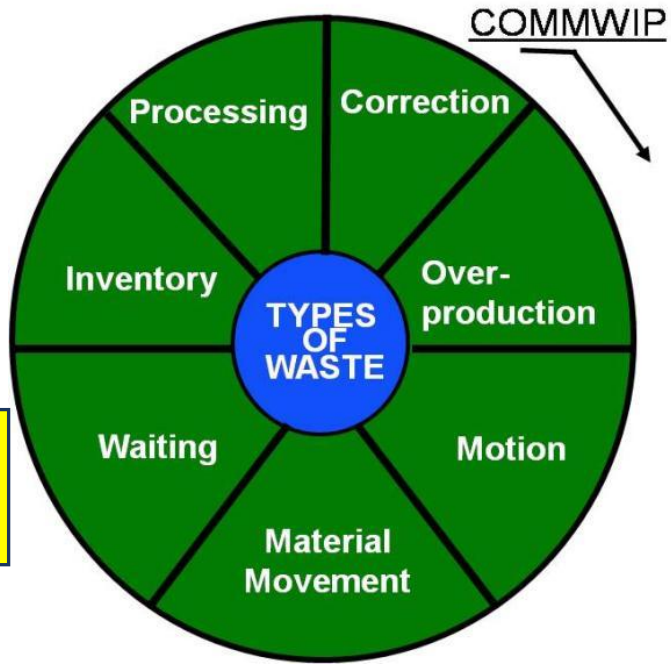
Main Causes: Lack of standards, no existing or inefficient procedures.

Elimination of waste

Abstract Thinking

+
Overburden
Unevenness

Concrete Thinking



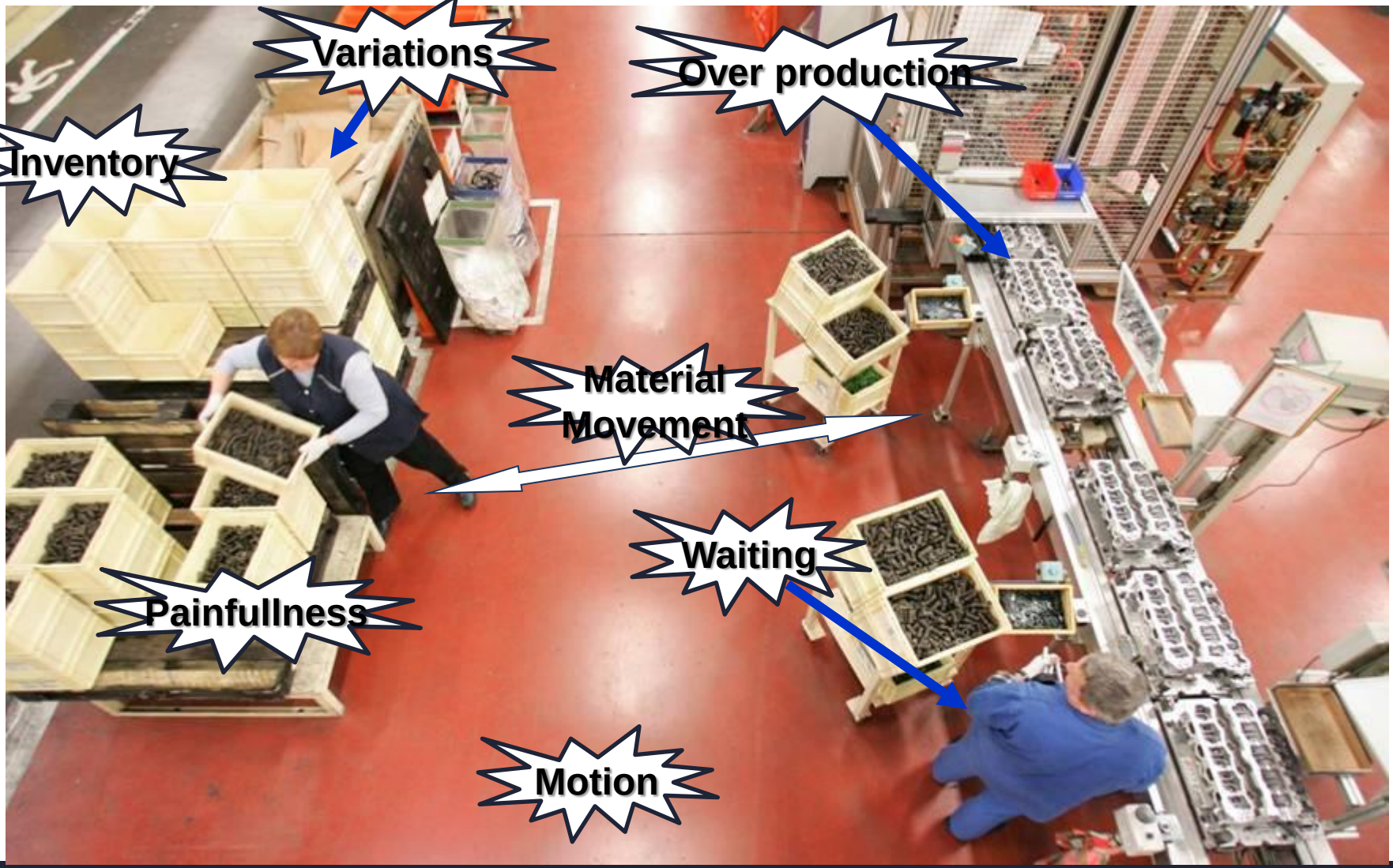
- Waste NOT Defined
- React To Large Examples
- Reactive Improvement

- Waste Is "Tangible"
- Identify Many Small Opportunities
- Leads To Large Overall Change
- Continuous Improvement

Note: The memory aid for the 7 Types of Waste is COMMWIP.

Different types of wastes

(Example)



Waste Identification Activity:

Steps

- Go to shop floor.
- Observe assigned job and identify as many of Seven Types of Waste as possible.
- Complete the “Waste Identification Worksheet”.
- Report out on your teams findings

	Observations		Impact Areas					Location	Recommend Changes
	What types of waste do you see?	What is the waste category? (see legend)	Safety	People	Quality	Responsiveness	Cost	Operation Number	What would you do to remove the waste?
1									
2									
3									
4									
5									
6									
7									
8									
9									
10									

Auditor hints

Check on shop floor potential safety issues e.g.: hidden corners, potential accidents, pedestrian way, colour coding on floor, noise, temperature etc.

On the shop floor, appreciate the level of light, the temperature (cold/hot), the level of noise, the loads carried by operators, the level of work (hands up...).

Look for result of ergonomics evaluation.

Look at a "painful" workstation. Verify its action plan for the improvement.

Check workplace organization and visualization at several different places (incoming/storage area, work stations, maintenance room).

5S audit records and verify actions implemented for findings.

Layout is in coherence with the workstation.

Method for waste elimination is applied (VSM, 7 Waste etc.) and periodical review minutes are available.

Workplace Organization & waste elimination, what are we searching for?

Item	Requirement	#Criteria	Criteria requirement
SW2	Working instructions are standardized and available for each workstation.	SW21	**Standardized Work Instruction (SWI) covering all the produced references are available for each operation near the workstation.**
		SW22	**SWI are developed by cross-functional team and managed for product/process changes.**
		SW23	**SWI shall contain at minimum :** **- Work elements including quality controls and their sequence,** **- Operator movement with sketch of work flow,** **- Standard in-process stock,** **- Required PPE and safety requirement if applicable,** **- Support description with pictures, sketches and images,** **- Reference to product/process/control standards.**
		SW24	Line balancing is managed (bottleneck and takt time for all workstations are followed). Takt time and overall cycle time are managed.

Criteria of Requirement

21 – page 41 - 44
22- page 45 - 46
23 – page 47 - 72
24 – page 42
Auditor hints – page 73

Prev. Requirement Next Requirement

Definition:

The document of work functions performed in a repeatable sequence, which are agreed to, developed, followed, and maintained by the functional organization.

WITHOUT STANDARDIZED WORK

WITH STANDARDIZED WORK

Purpose:

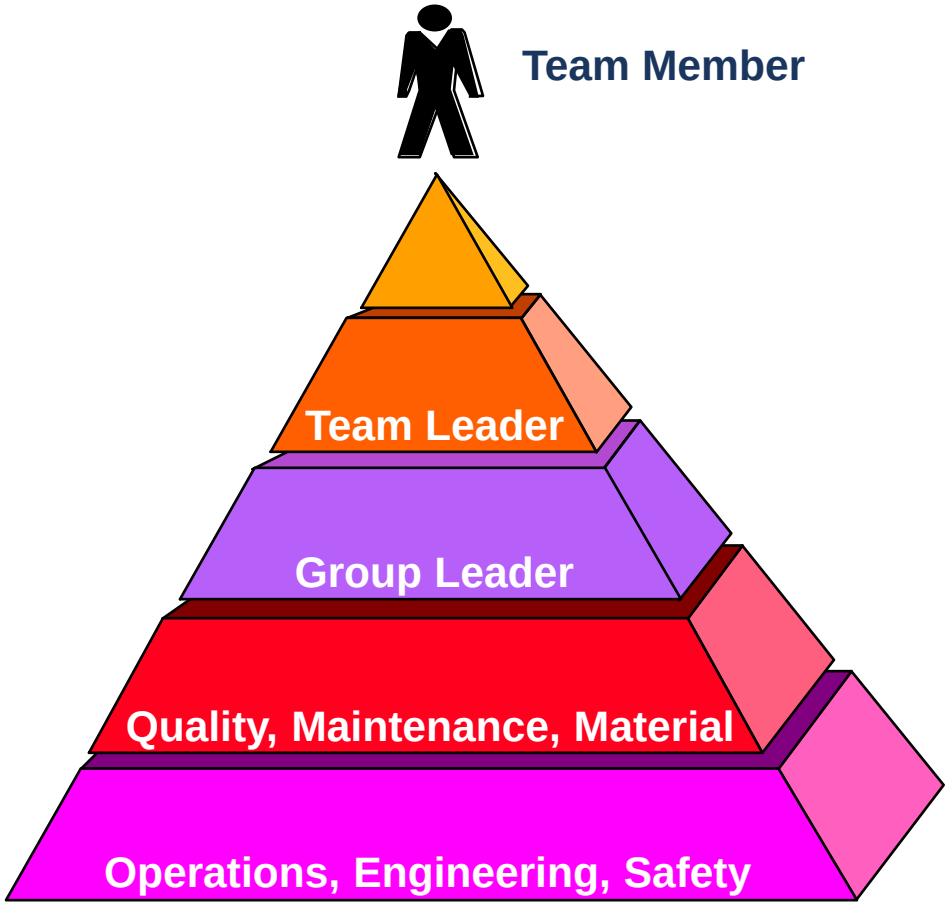
To establish a repeatable, predictable baseline for continuous improvement and to involve the operator in both the initial and ongoing improvements to achieve the highest levels of safety, quality and productivity.

Standardized Work

- Cross-functional team(s) shall identify and **list all operations** to implement Standardized Work.

  Examples of how to prioritize:
  - Customer Quality Concerns
  - Necessity for a Defined sequence or method of work
  - Off-line Rework
  - High RPN
  - Employee Flow-through
- Cross-functional teams shall develop Standardized Work.
- Standardized Work covers whole of the produced references and line balancing (levelling of the workload across all workstations).
- Impacted and new employees shall be trained in the use of Standardized Work *(Training).*
- Cross-functional team(s) shall continuously develop and improve Standardized Work.

Organizational focus



Team Member

Roles in Standardized Work

- Participate in developing Standardized Work (SW) & contribute ideas
- Suggest improvements to SW
- Provide feedback to Team Leader on SW
- Use SW as the basis for problem solving & training
- Follow Standardized Work

The function of everyone, including the Support Staffs, is to support production Team Members.

Manual vs. Electronic Standardized Work

- Team Leaders need to thoroughly understand the output (doing the work manually helps create this understanding).
- Documents should be easy to maintain.
- Documents should be flexible, easy to understand and visually depict all *waste* in the system.
- The Team Leaders' first responsibility is to support the operator (not a computer system).
- Many enablers are required to allow an electronic system to be more effective than manual development & maintenance.

USE PAPER and PENCIL PLEASE !!

Standard Operation Sheet (SOS)

Definition:

- The agreed upon order of the job elements a team member follows in order to maximize safety, quality & efficiency
- A team member-*based* document that organizes job elements into a sequence that can be successfully repeated.

This document (standard) can then be used for :

- Training new team members
- Analyzing jobs for improvement opportunity
- Auditing (*Layered Process Audits*)
- Problem solving

The advantages of the SOS sheet:

TECHNICAL MEMORY

Safety / Accident History		Quality Problem History	
Date:	What happened?	Date:	What happened?
		March-11-05	Received a PR&R from Bowling Green with Lock Switch that has popped back out of the bezel.

On back of JES

Standard Operation Sheet (SOS)

(Example)

OPERATION:	FROM:_____ TO:_____	QUANTITY PER SHIFT:_____ SHIFT:_____	CUSTOMER CYCLE TIME:_____ OPERATOR CYCLE TIME:_____

STEP NO.	WORK ELEMENT	ELEMENT TIME			STANDARD IN-PROCESS STOCK	QUALITY CHECK	CRITICAL OPERATION	SAFETY
		HAND WORK	MACHINE	WALK				
	TOTAL							

A Standardized Operation Sheet Shall Include:

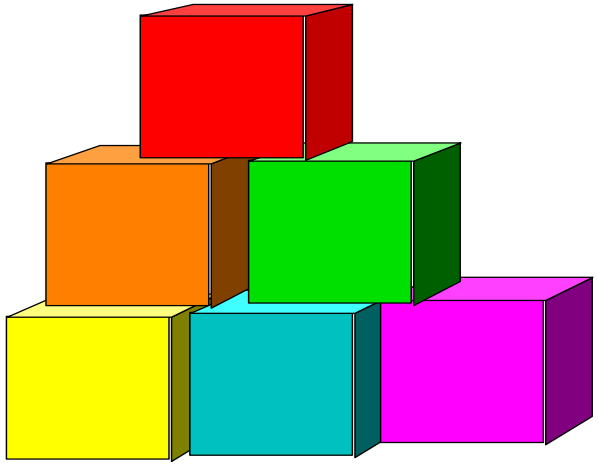
- Work Elements
- Element Times
- Work Flow - Sequence
- Standard in-process stock
- Operation Cycle Time
- Takt Time – Customer and Actual

WORKSTATION AREA DRAWN TO SCALE

Element Definition

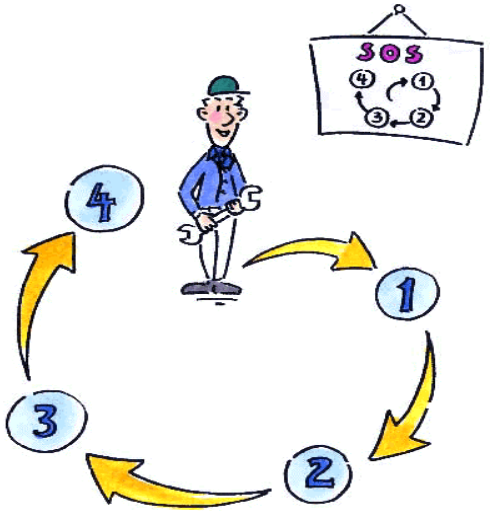
A work element is a logical grouping of actions that advances work to its successful completion

Elements are the basic building blocks of SW. They are used during training to teach the job in manageable chunks.



Work Sequence

Agreed upon order in which work is done to maximize safety, quality, and efficiency.

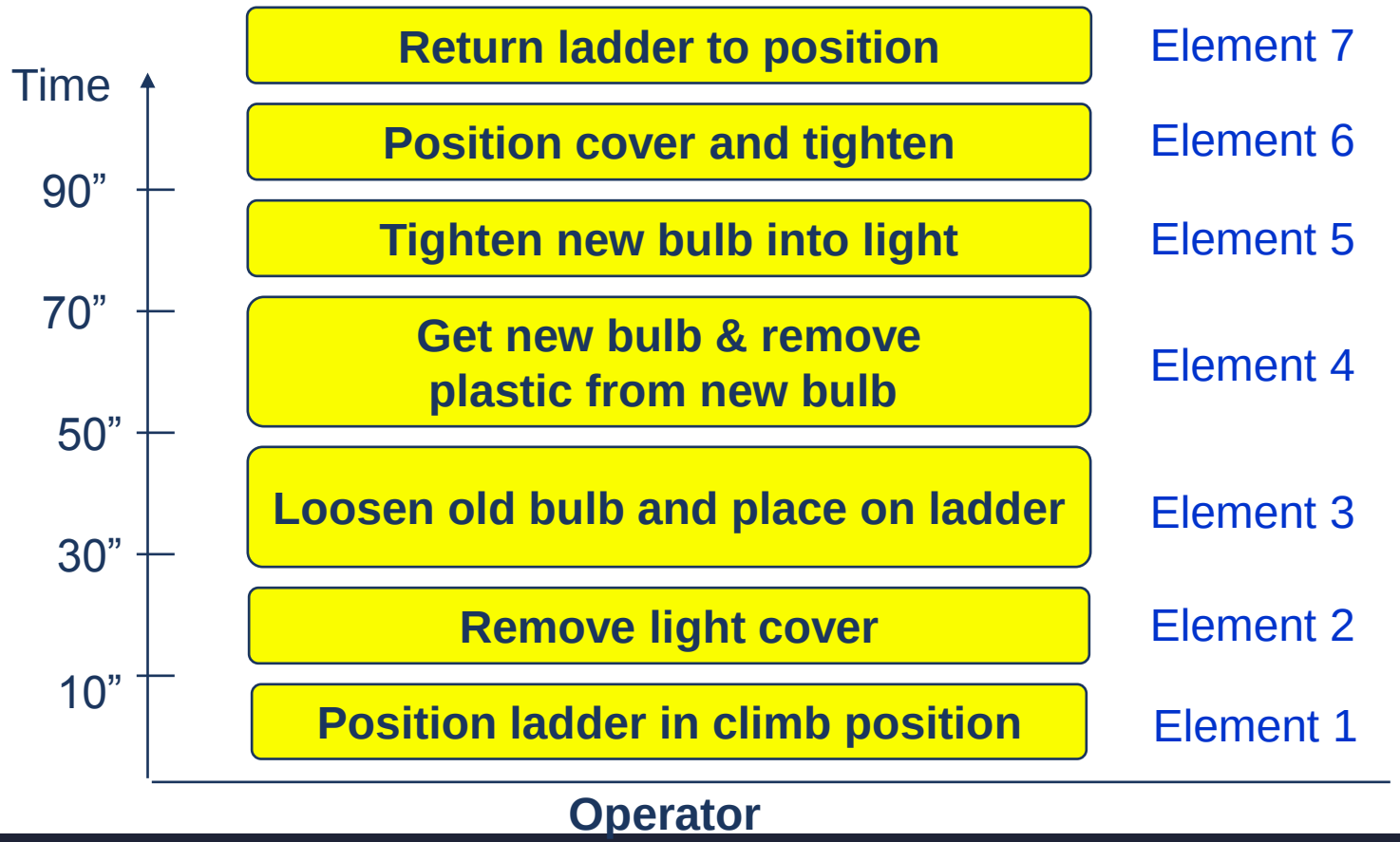


WORK ELEMENTS

- **Any Job can be broken down into job elements. . .**

(Example)

Changing a light bulb



Keys to Building Work Elements

- **Factors to consider:**
  - Geographic build location
  - Product grouping
  - Time required to complete the element
  - Walking is not an element, and usually not included in element sheets.
  - The first element in any job can be, “read manifest and get parts”.
  - Don’t automatically use the groupings as described in your current engineering Standardized Work. Use common sense to break the job down the way you think of it every day.

Total available Production Time per shift/day:
MINUS Breaks and Lunches

Definition:

The maximum time available to produce a product or service based on customer demand.

Customer Assembly Plant DEMAND in pieces per shift/day

Formula:

$$TT = \frac{\text{Production Time Available Per Period}}{\text{Customer Demand Per Period}}$$

(Example)

Customer Takt Time is 60 Seconds

WORK ELEMENT

Torque down the Four Screws	20 Seconds
Get and hand Start Four screws	20 Seconds
Get & Place Speaker Grill on Door	20 Seconds

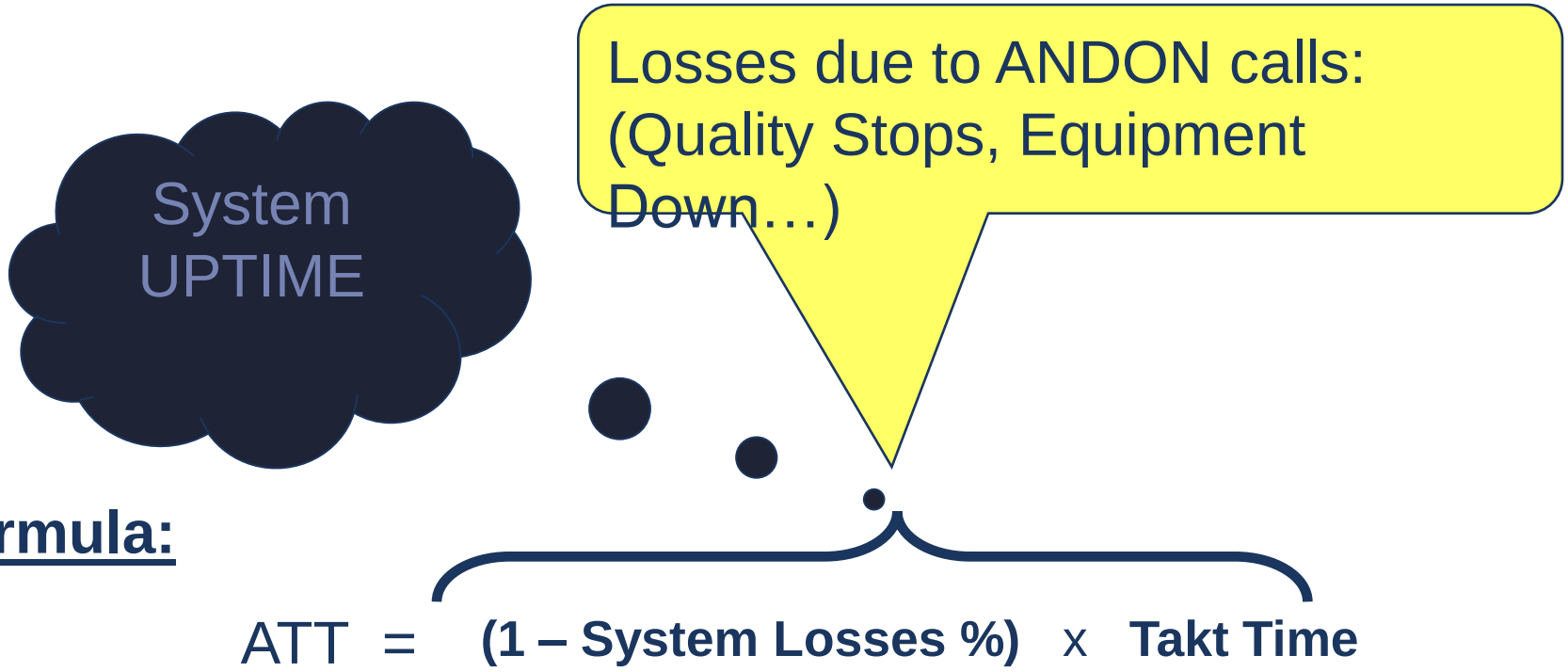
Customer Takt Time changes to 20 Seconds

20 Seconds	20 Seconds	20 Seconds
Get & Place Speaker Grill on Door	**Get and hand Start Four screws**	**Torque down the Four Screws**
One Person	Second Person	Third Person

ONE PERSON JOB = 60 Seconds of Work

Actual Takt Time (ATT)

Definition: The planned time available to produce a product or service after accounting for system losses.



Formula:

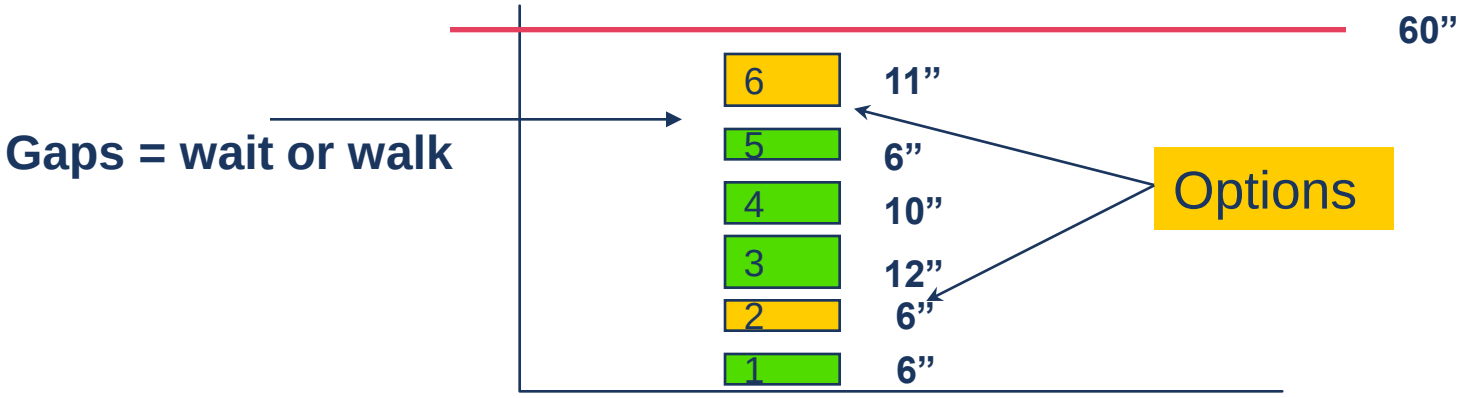
$$ATT = (1 - \text{System Losses \%}) \times \text{Takt Time}$$

ELEMENT TIME

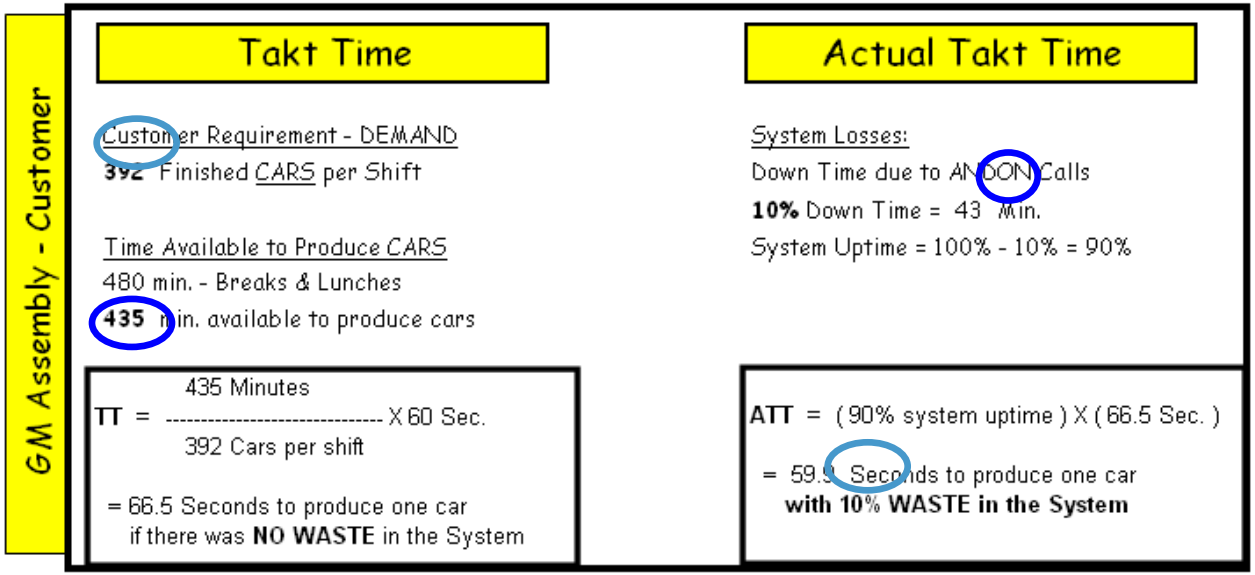
Time Required to Complete the Element:

- A rough guideline could be to set element size to about 10% of the job (ATT) .

(Example)

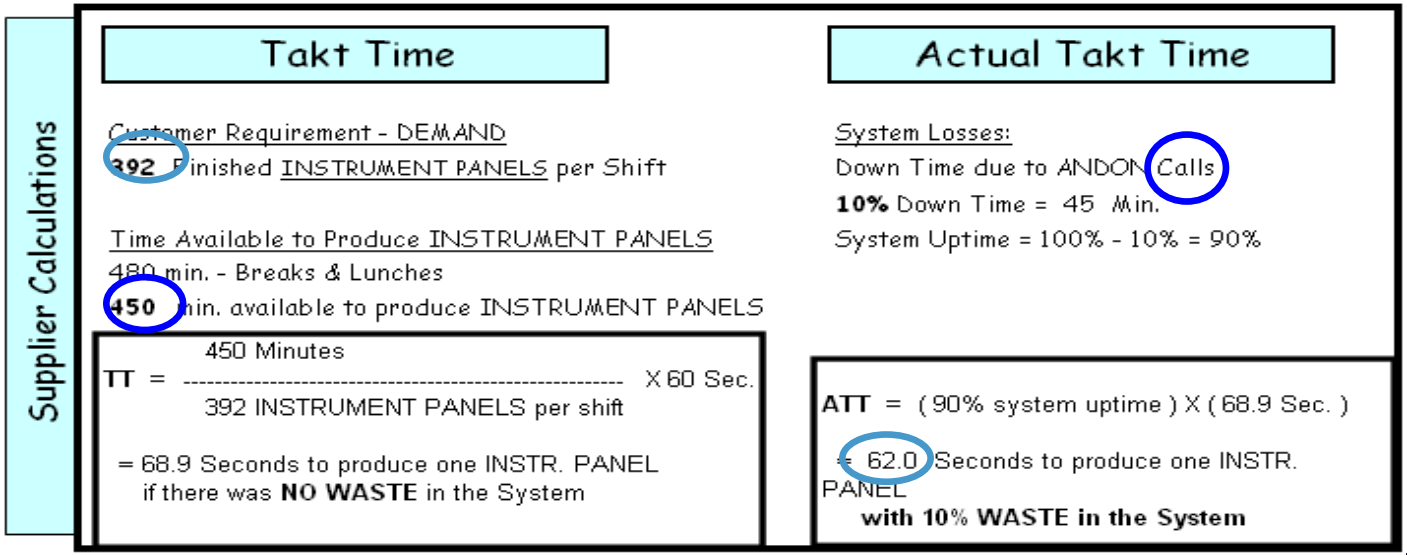


STANDARDIZED WORD

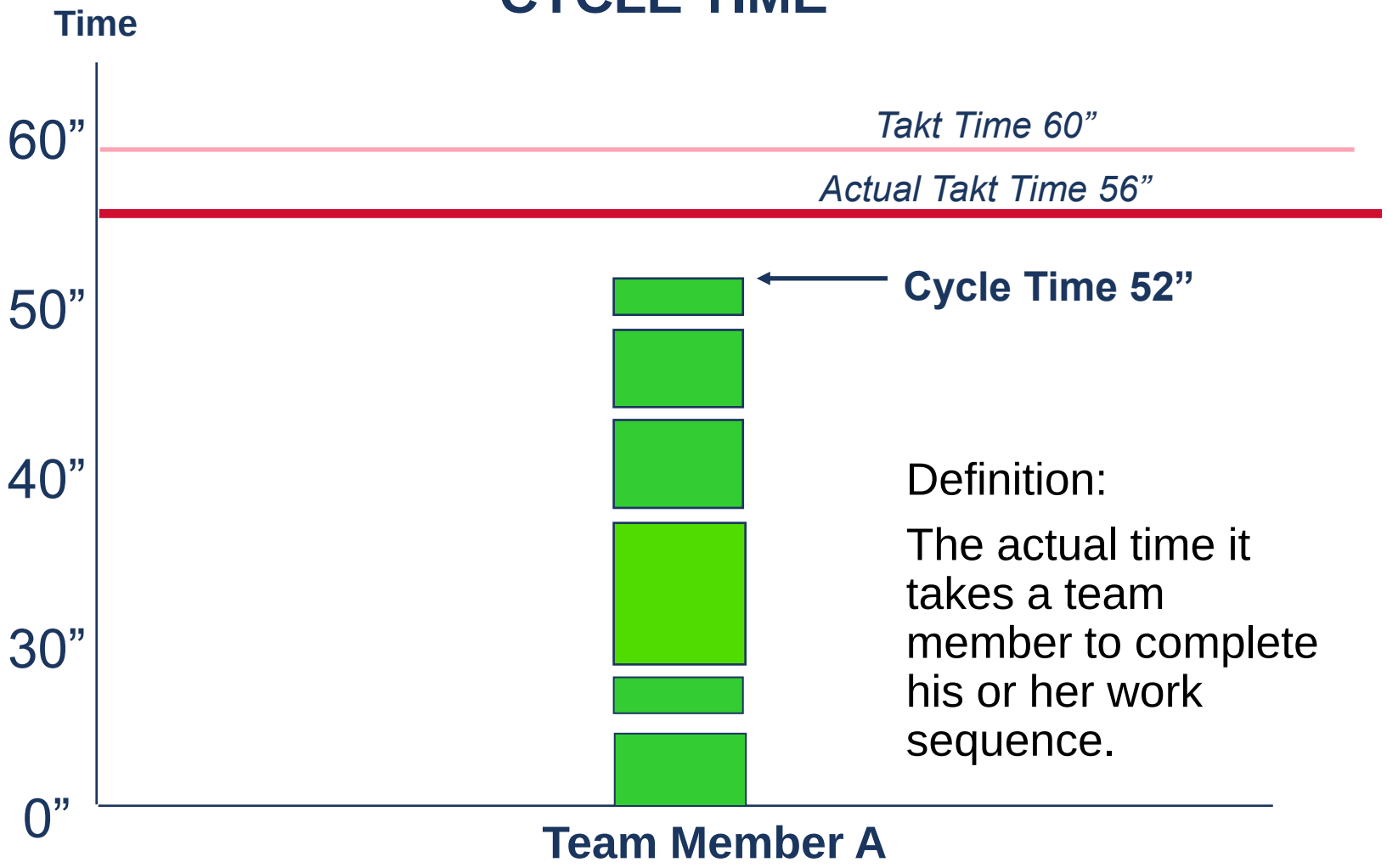


Can the "Time Available To Produce" be different between customer & supplier?

Can the Supplier ATT be slower than customer ?



CYCLE TIME



Definition:

The actual time it takes a team member to complete his or her work sequence.

STANDARD OPERATING SYMBOLS

- **Place symbols on the layout as appropriate:**

• Safety

As Indicated on Job Element Sheet

• Quality Check

100% Gauging / Testing

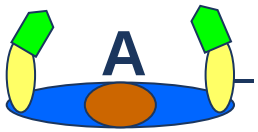
• Standard In-Process Stock-
(Minimum in one container at workstation)

• Critical Operation

• Mandatory Sequence

WORK FLOW

Add team member work path to the layout



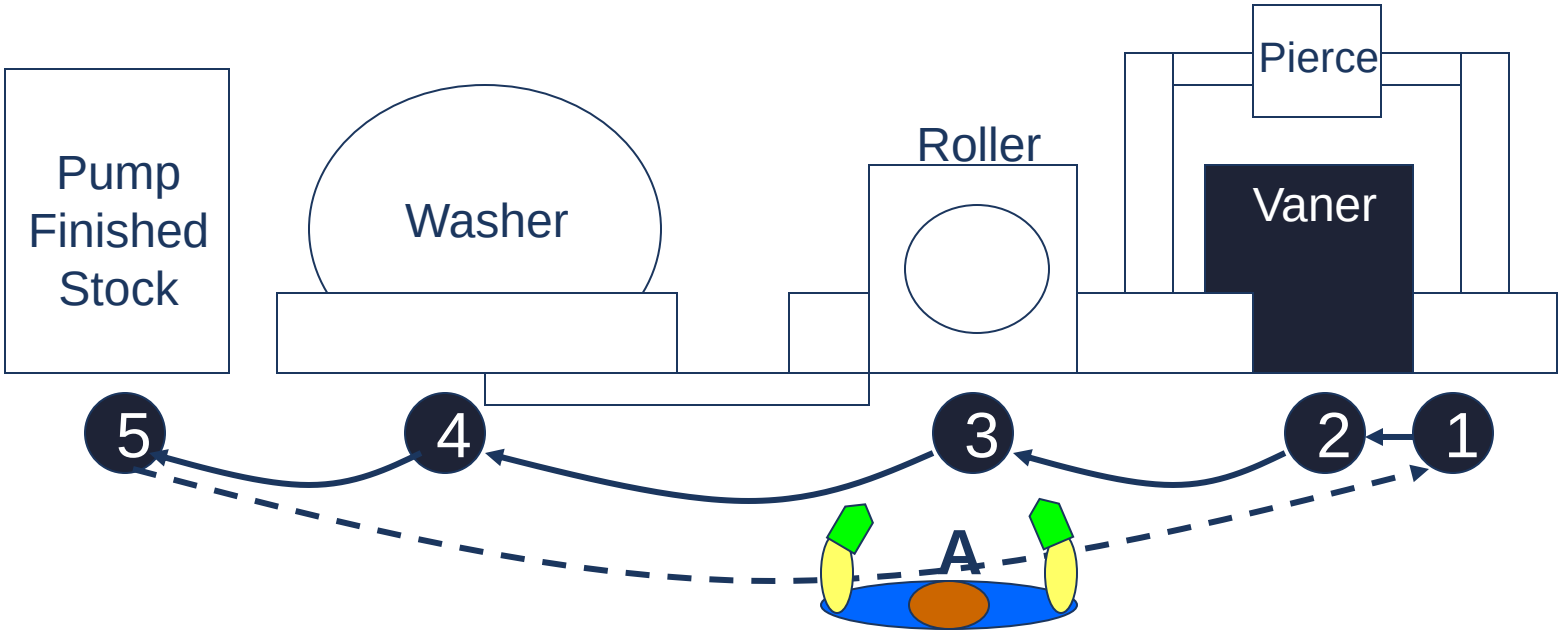
– Identify Team Member/process

– Identify location where each job element is performed

– Indicate forward walk path through process

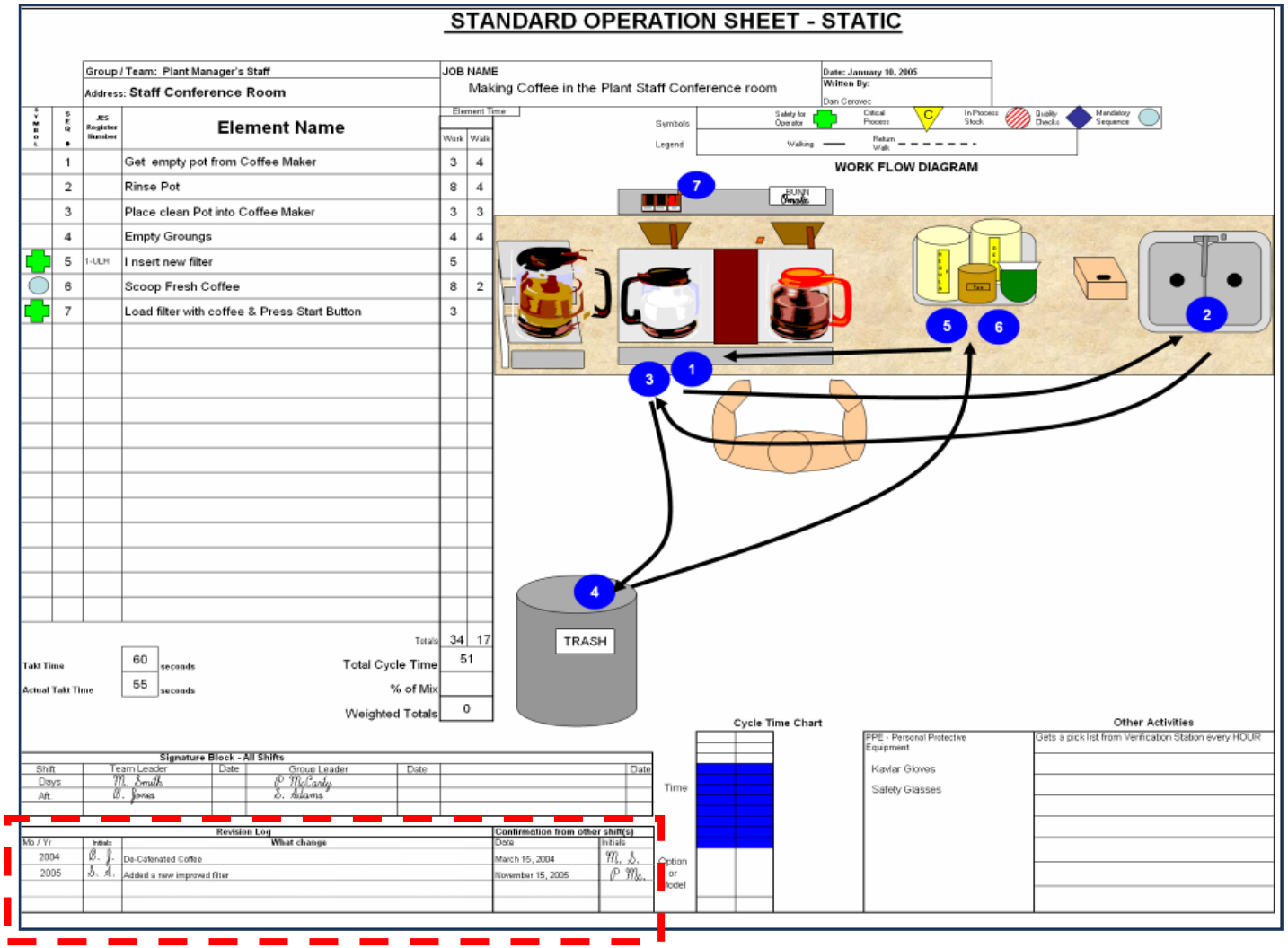
– Indicate return walk path from last job element to first

WORK FLOW



STANDARDIZED WORD

(Example)



STANDARD OPERATION SHEET - STATIC

Group / Team: Plant Manager's Staff
Address: Staff Conference Room

JOB NAME
Making Coffee in the Plant Staff Conference room

Date: January 10, 2005
Written By:
Dan Cerovec

Level	Seq #	IES Register Number	Element Name	Element Time Work	Element Time Walk
	1		Get empty pot from Coffee Maker	3	4
	2		Rinse Pot	8	4
	3		Place clean Pot into Coffee Maker	3	3
	4		Empty Groungs	4	4
	5	1-ULH	I nsert new filter	5	
	6		Scoop Fresh Coffee	8	2
	7		Load filter with coffee & Press Start Button	3	
			Totals	34	17

Symbols / Legend: Safety for Operator, Critical Process, In Process Stock, Quality Checks, Mandatory Sequence, Walking, Return Walk

WORK FLOW DIAGRAM

Takt Time: 60 seconds
Actual Takt Time: 55 seconds

Total Cycle Time: 51
% of Mix:
Weighted Totals: 0

Cycle Time Chart

Other Activities

PPE - Personal Protective Equipment: Kavlar Gloves; Safety Glasses

Gets a pick list from Verification Station every HOUR

Signature Block - All Shifts

Shift	Team Leader	Date	Group Leader	Date		Date
Days	M. Smith		P. McCurdy			
Aft.	B. Jones		S. Adams			

Revision Log

Mo / Yr	Initials	What change	Confirmation from other shift(s) Date	Initials
2004	B. J.	De-Catenated Coffee	March 15, 2004	M. S.
2005	S. A.	Added a new improved filter	November 15, 2005	P. Mc.

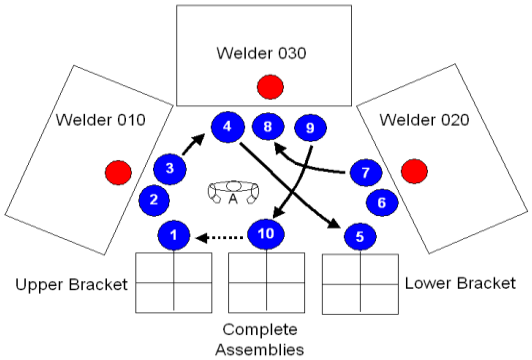
Revision history

Standardized Work – Combined Operation

(Example)

STANDARDIZED OPERATION SHEET / BEST PEOPLE PRACTICES

GROUP / TEAM	Bracket Assemblies			PROCESS NAME:	Bracket Welder						
OPERATION NAME / #	Team Member A										
	WORK ELEMENTS	ELEMENT TIME			DIAGRAM	QUALITY CHECK	SAFETY	ERGO	IN PROCESS STOCK	NO.	OPERATOR
		HANDWORK	MACHINE	WALKING						4	A
1	Get Upper Bracket From Stock	3		1							
2	Get Upper Bracket Assembly From 010	3									
3	Load Upper Bracket to Welder 010	5	12	2							
4	Load Upper Bracket Assembly to Welder 030	3		3							
5	Get Lower Bracket From Stock	3		1							
6	Get Lower Bracket Assembly From 020	3									
7	Load Lower Bracket to Welder 020	5	12	2							
8	Load Lower Bracket Assembly to Welder 030	3	30								
9	Get Complete Assembly From Kick-Out	2		3							
10	Aside Complete Assembly to Container	4		1							
	TAKT TIME 60 SEC	TOTAL HANDWORK	34		13						
	ACTUAL TAKT TIME 54 SEC	TOTAL CYCLE TIME	47								
		PARTS PER CYCLE	1								



CONTROL BLOCK
Team Leader's Signature
Group Leader's Signature

J.E.S. LOCATION: Team center

SAFETY REQUIREMENTS

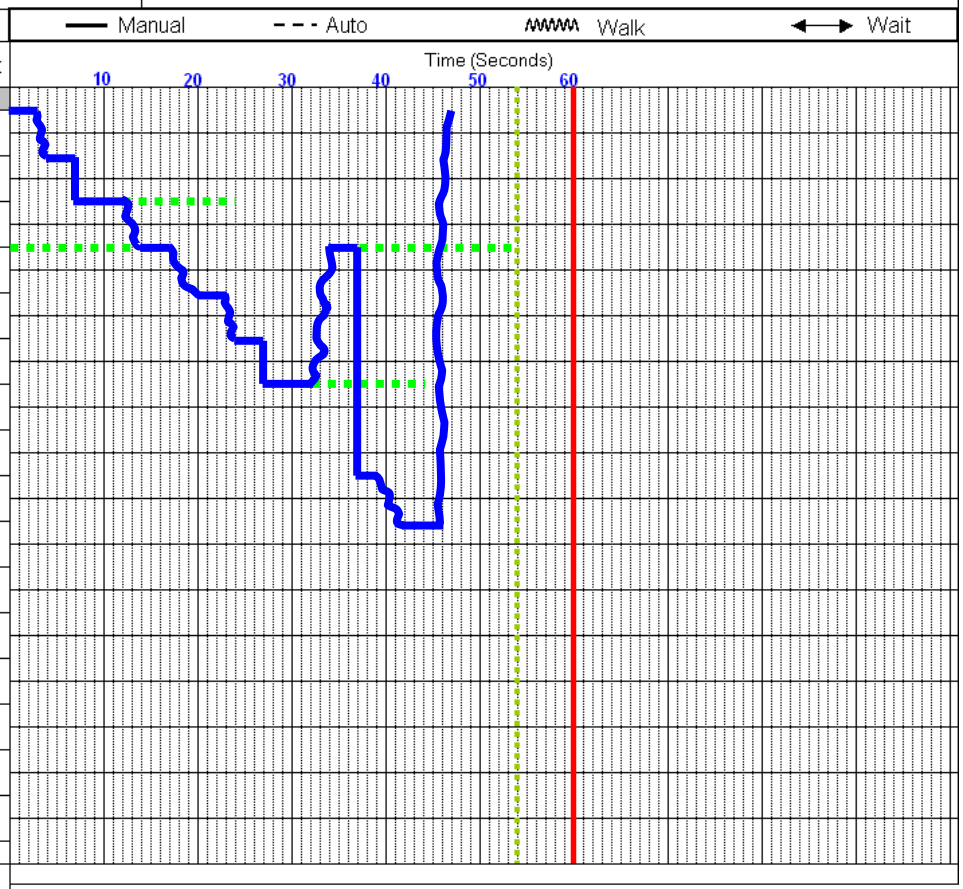
	OTHER ACTIVITIES

Standardized Work – Combined Operation (Example)

Work Combination Table

Department: 4 Cylinder Camshafts	Takt Time: 60	Date: 9/8/04
Operation: Team Member A	Actual Takt Time: 54	

Sym.	No.	Job Element	Element Time Man	Auto	Walk
	1	Get Upper Bracket From Stock	3		1
	2	Get Upper Bracket Assembly From 010	3		
	3	Load Upper Bracket to Welder 010	5	12	2
	4	Load Upper Bracket Assembly to Welder 030	3		3
	5	Get Lower Bracket From Stock	3		1
	6	Get Lower Bracket Assembly From 020	3		
	7	Load Lower Bracket to Welder 020	5	12	2
	8	Load Lower Bracket Assembly to Welder 030	3	30	
	9	Get Complete Assembly From Kick-Out	2		3
	10	Aside Complete Assembly to Container	4		1
		TOTAL	34		13



Standardized Work **shall** be displayed at or near each operation.

- Operations performed same way every time.
- Reduces the risk of omitting components.
- Quality checks and frequency are indicated.
- Process improvements easily identified.

WORK ELEMENTS

OPERATOR MOVEMENT

- Training is simplified and consistent.
- Reminds operator of correct sequence.
- Alerts operator to safety concerns.
- Assures operator is following approved process *(Layered Process Audits).*

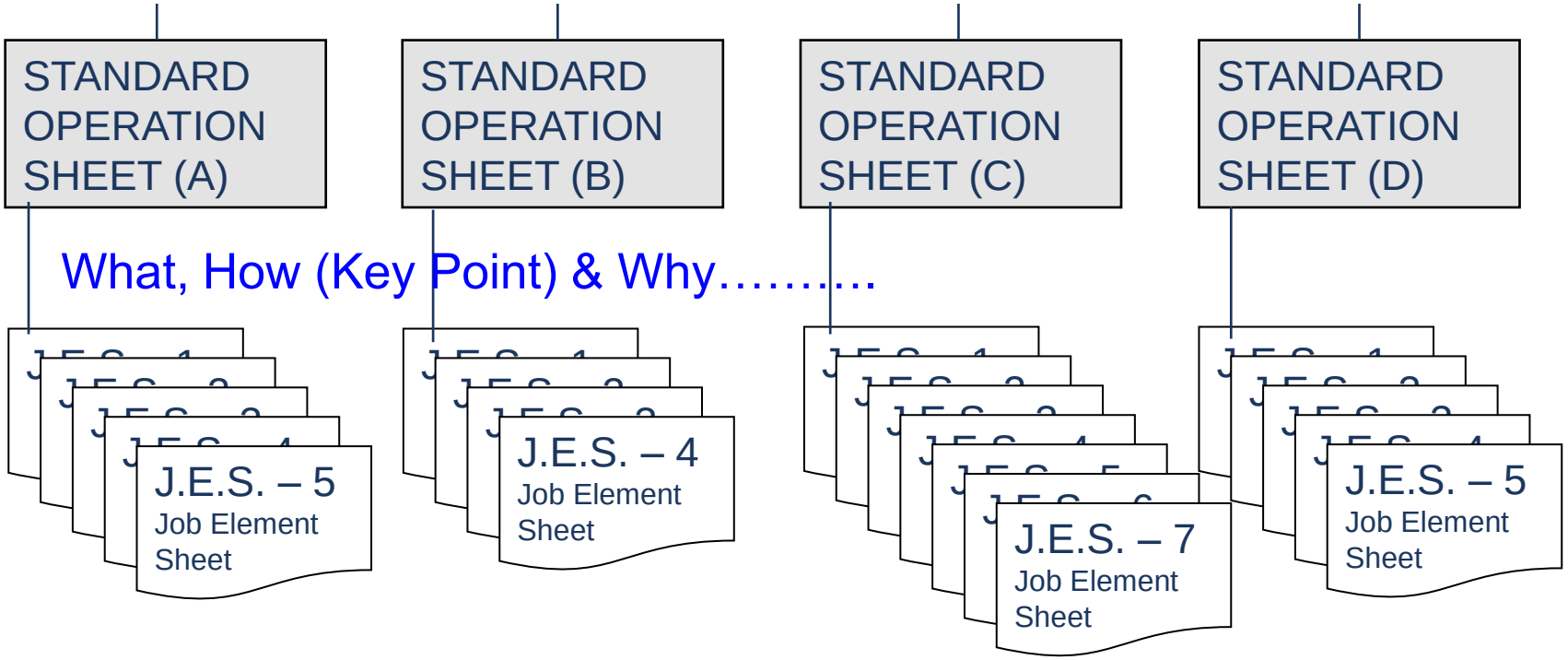
- Assures leadership operation is running as approved.
- Operator knows if equipment is showing signs of wear.
- Machine and operator hand work and walk time separated.
- Time allocated for quality checks are included.

OPERATION CYCLE TIME

Standardized Work provides a basis for effective Operator Instructions.

STANDARDIZED WORK DOCUMENTS

ELEMENT Sequence…….



JOB ELEMENT SHEET

Definition:

A user friendly document that provides detailed information on a specific element of work to ensure the successful execution of that element.

Purpose:

- To provide detailed training information for new team members.
- To bridge the gap between engineering information and shop floor knowledge.
- To provide a written history of that element.
- To provide a baseline for auditing, problem solving, continuous improvement, rebalancing of work and documentation transfer.

OPERATOR INSTRUCTIONS

Where to use operator instructions?

Operator instructions are commonly available for:

- manufacturing and assembly
- inspection and data collection
- pack out
- laboratory

Often overlooked activities include:

- offline rework and containment
- set-up and change-over events
- prototype and engineering activities
- process labeling points
- material handling
- shipping and receiving
- maintenance/repair
- office

STANDARDIZED WORD

JOB ELEMENT SHEET

VEH.	PAD	Stn # - Reg #
GMX-245		1-ULH

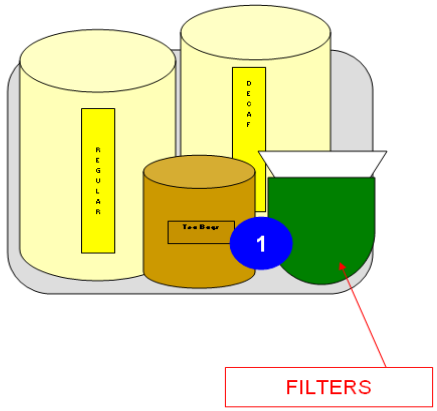
Element Name: 5 - Insert new filter

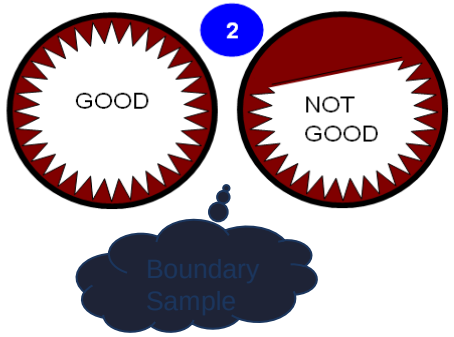
Option: ○ **Basic:** ●

Symbols: Safety for Operator; Quality Checks; Critical Process; C; Mandatory Sequence

Written by: Dan Cerovec

Page _1_ of _1_





Symbol	Step #	Major Step (What)	Key Point (How)	Reason (Why)
✚	1	Get Filter	Moisten Fingers under tap water and then separate filters from each other	Filters are very thin and will stick together. Moist fingers will help separate them.
			Do not BLOW on fiters to separate them.	Could spread germs
			Do not LICK fingers to separate filters	Could spread germs
◆	2	Align filter with wall of basket.	Make sure the filter is pressing against the edge of the filter basket.	Filter could fold over while the Coffee is brewing, and the Coffee grounds could get into the coffee pot

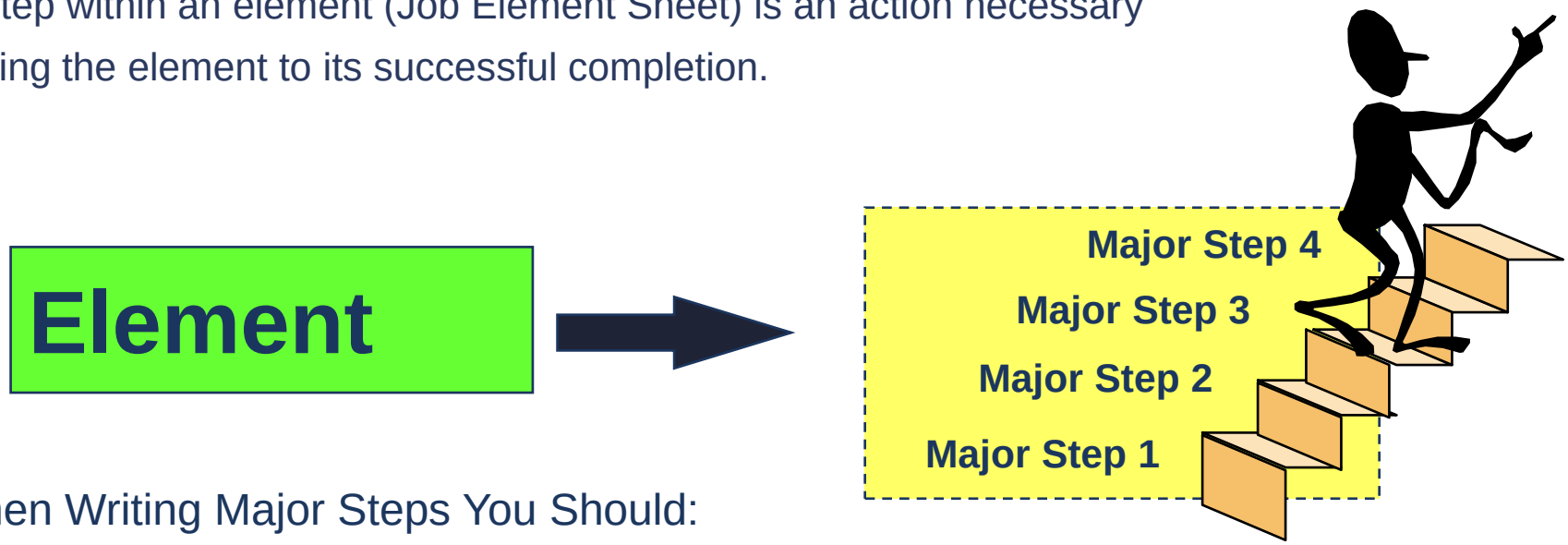
		Team Leader	Group Leader
Shift	Sign.	M. Smith	P McCarty
	Date	March-16-05	March-16-05
Shift	Sign.	B. Jones	S. Adams
	Date	March-15-05	March-15-05
Shift	Sign.	J. Doe	J. Walker
	Date	March-14-05	March-14-05

Station # history:	#1-Upper-LH	#1-Upper-LH		
Work Time history (in seconds):	3	5		
Date of change:	January-05-05	March-16-05		

Name	Signature	Description of change
M. Shith	M. Smith	Added aligning of the filter

MAJOR STEPS - WHAT

- A major step within an element (Job Element Sheet) is an action necessary for advancing the element to its successful completion.



- When Writing Major Steps You Should:
  - Be brief
  - Describe a single action
  - Avoid use of abbreviations, acronyms and jargon

Examples:

- Place part in fixture.
- Rotate jog switch to the Run position.
- Press Start Cycle button

KEY POINTS - HOW

1. Safety Points in a job operation which could result in team member injury
2. Success Operational points on which the success or failure of a particular job depends
3. Hints Points which make the job performance easier
4. Quality Points that describe quality requirements for an operation

Types of Key Points :

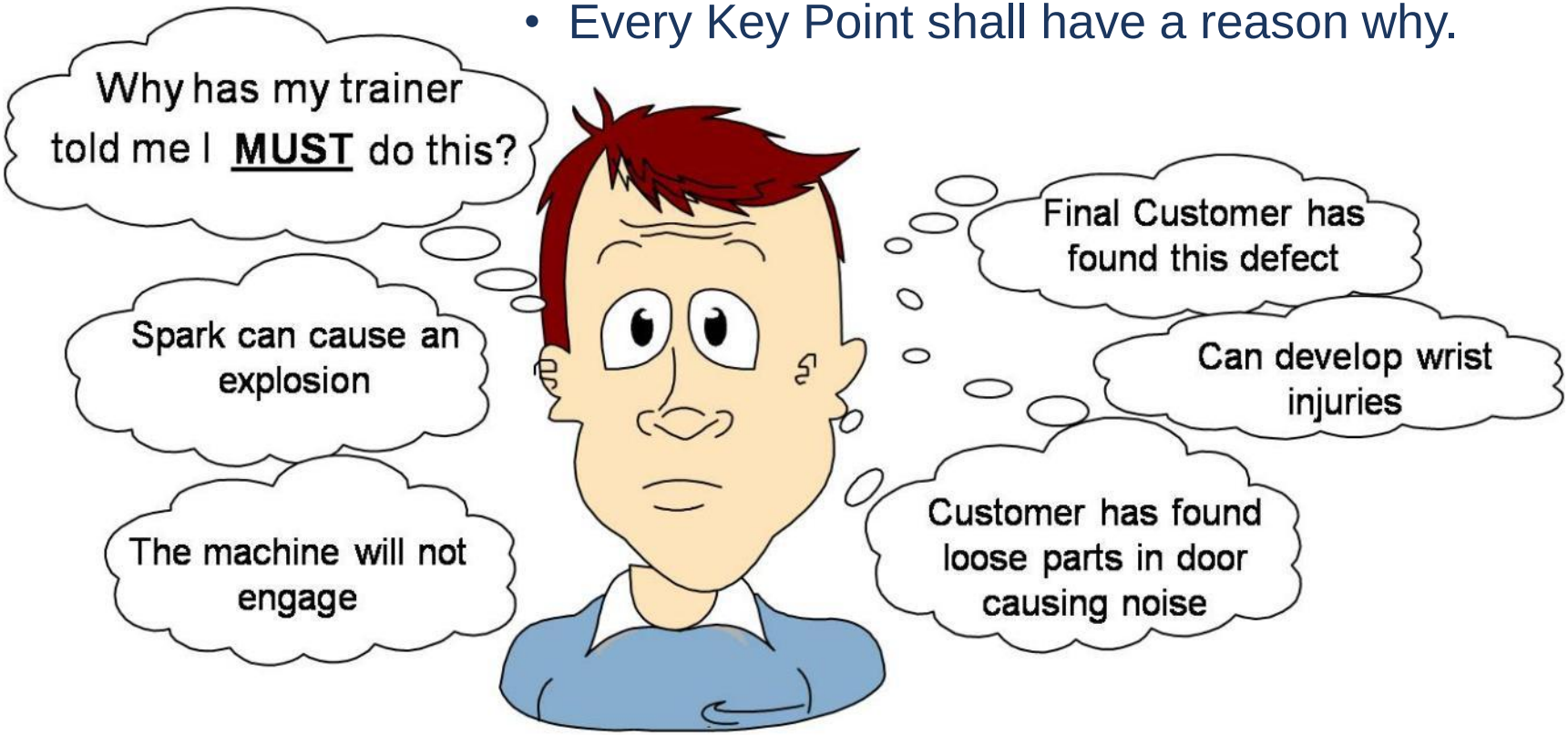
Key Points describe how to perform a step (not all steps require Key Points).

Examples of when to write Key Points:

- Could the team member get injured if they failed to follow a certain method or technique?
- Does success or failure depend on performing the work a certain way?
- Have you learned an easier way to perform the step?
- Is there a product quality standard associated with the task?

REASONS WHY

- What happens if the key point is ignored?
- Why is it done this way? What is the reason?
- Every Key Point shall have a reason why.



"The reason this key point is so important is. . . "

STANDARDIZED WORD

JOB ELEMENT SHEET

VEH.	PAD	Stn # - Reg #
GMX-245		1-ULH

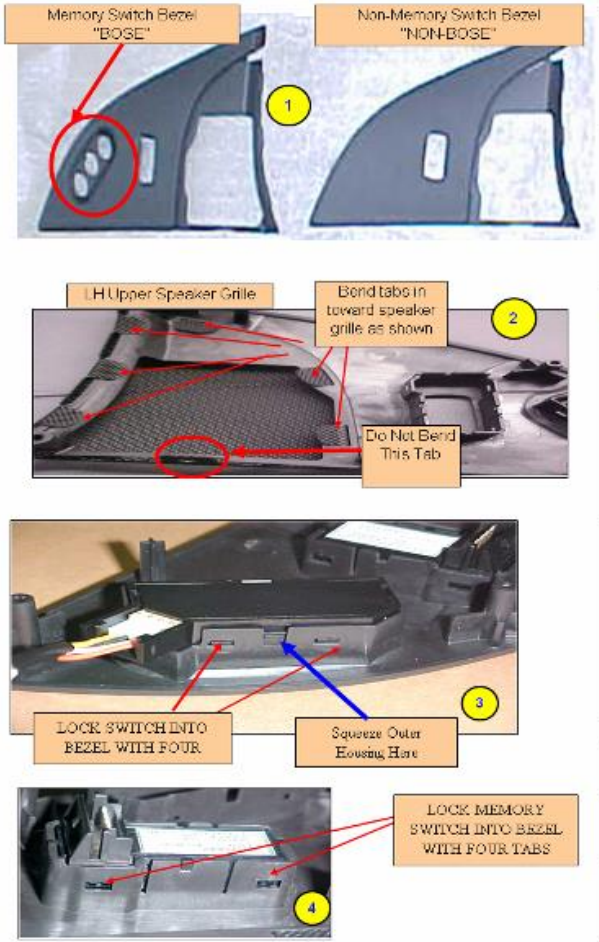
Element Name: #1 Pre-Assemble Switch Bezel

Option: ○ Basic: ●

Symbols: Safety for Operator; Critical Process; Mandatory Sequence; Quality Checks

Written by: Dan Cerovec

Page 1 of 1



Symbol	Step #	Major Step (What)	Key Point (How)	Reason (Why)
	1	Select Correct Switch Bezel	Check the list from VS Operator Get Bose or Non-Bose Bezel	Build only models required
	2	Install LH Upper Speaker Grill into Switch Bezel	Bend Tabs inward toward speaker grill Do-Not Bend Bottom Tab	Bottom tab is used to secure Upper door
◆	3	Install Door Lock Switch	**Push** the switch until the tabs are locked into place **Squeeze** outer housing to ensure tabs are locked in You should hear click when locked in place Check that TABS engaged	If not locked, switch will pop back out Bowling Green has found switches that pop back out (**This Plant has Received a PR&R for this defect on 03/14/05**)
		NEW	Bose Doors Only Ensure the Switch Tabs are locked into place	If not locked, switch will pop back out

		Team Leader	Group Leader
Shift	Sign.	M. Smith	P McCarty
	Date	March-16-05	March-16-05
Shift	Sign.	B. Jones	A. Adams
	Date	March-15-05	March-15-05
Shift	Sign.	J. Doe	J. Walker
	Date	March-14-05	March-14-05

Station # history:	#1-Upper-LH	#1-Upper-LH		
Work Time history (in seconds):	12	14		
Date of change:	January 05 05	March 16 05		

Name	Signature	Description of change
M. Smith	M. Smith	Added Squeeze outer housing step & Key point

STANDARDIZED WORD - **OPERATOR INSTRUCTIONS**

(Example)

Rev. Date: 5/15/03	JOB ELEMENT SHEET	Page: 1 of 1

	Shift	Team Leader	Supervisor/Group Leader	Date	Area/Cell/Department:	FINAL DRIVE
Control Block	1	Bill Jones	John Doe	05/15/03	Operation Number:	N/A
	2	John Steele	Jane Smith	05/15/03	Process/Part Name:	HEAVY DUTY/VOLVO UNLOAD
	3	Amy James	Andy Johnson	05/15/03		

NO. 2A

SEQ	- STEP (What) -	SYM	- KEY POINT (How) -	REF	- REASON (Why) -
1	VISUALLY INSPECT DUNNAGE	◆	1A USE BLUE VINYL GLOVES		1A CUSTOMER DEMAND
		◆	1B REMOVE ALL TAGS, STICKERS AND DEBRIS		1B PROPERLY IDENTIFIED ASSEMBLIES TO CUSTOMER
		◆	1C SET ASIDE DAMAGED OR DIRTY DUNNAGE		1C REDUCE SEDIMENT LEVELS
2	VISUALLY INSPECT ASSEMBLY AND WRITE CORRESPONDING STACK HEIGHT NUMBER ON INTERNAL GEAR. *ONLY #'s 3 THROUGH 9 ARE TO BE USED*	◆	2A ENSURE CORRESPONDING INKJET INFORMATION IS CORRECT WITH STACK HEIGHT NUMBERS WRITTEN IN WHITE ON HEAVY DUTY, PINK ON VOLVO AND A YELLOW DOT ON VOLVO INTERNAL		2A PROPERLY IDENTIFIED ASSEMBLIES TO CUSTOMER *NUMBERS 3 THROUGH 9 ARE THE ONLY ONES ACCEPTED BY OUR CUSTOMER. OTHERS ARE TO BE PUT INTO REJECT BUGGY*
3	DEPRESS PARK LOCK PAWL INTO PARKING GEAR	◆	3A ACKNOWLEDGE SPRING TENSION AND WINDOW CLEARANCE		3A OBTAINS "PARK" STATUS IN AUTOMOBILE
4	INSERT SHORT END OF SHIPPING PIN INTO INTERNAL GEAR PIN HOLE, LONG END LOCKING PARK LOCK PAWL IN POSITION	K	4A TURN INTERNAL GEAR WHILE DEPRESSING PARK LOCK PAWL UNTIL PARK LOCK PAWL ADVANCES INTO FULL DEPTH		4A ALLOWS FINAL DRIVE ASSEMBLY TO BE INSTALLED INTO TRANSMISSION CASE AT ASSEMBLY PLANTS
5	REMOVE ASSEMBLY FROM LINE AND LOAD INTO CORRESPONDING DUNNAGE	Ergo	5A INSERT UNLOAD ASSIST DEVICE INTO THE SUN GEAR SHAFT AND LIFT FINAL DRIVE ASSEMBLY INTO THE BASKET USING THE "UP" AND "DOWN" CONTROL LEVERS		5A REDUCES BODY STRAIN
			5B LOWER ASSEMBLY CAREFULLY INTO DUNNAGE,		5B PREVENT BEARING FRACTURE

Symbol Legend (SYM): Safety | Ergonomics | Quality | **K** Knack | C Critical

File/Ref:ES-705-FAHDVU

Usage of Standardized Work Instruction

Training for new team members

- Main propose of SWI in order to ensure that each trainee gets the same training. Each steps are explained, not depends on trainer.

Optimizing and balancing line

- An optimizing/balancing process is established based on work elements and their takt time vs. operator number.
- There are various balances for the same production line based on different planned production outputs and product mix (e.g.: modification of speed line)

Analysing job for improvement opportunities, including feedback from Team Member

Layered Process Audit

- Based on Standardized Operation Sheet, within ’a minute review’ LPA auditor become familiar with the process audited.

Problem solving

- At first check what the process should be based on SWI. Do not mislead root cause analysis following current process (1Diamond).

Auditor hints

Work instructions at different workplaces (manufacturing, quality control, material handling/logistic), check:

1. Easy availability,
2. Compare instructions to work performed by operators. Observe 3 full cycles of the job in station & verify that the Major Steps, Key Points are followed Reason is understood,
3. Controls listed in Control Plan is added to SWI, efficient time allocated for quality checks.

Try to perform an manual operation based on SWI, check all necessary information, hint, key points... described to perform operation.

Ask few operators to explain SWI. Does operator understand it?

Various balances are managed for different planned production outputs and product mix (e.g.: modification of line speed).

Start-up process, what are we searching for?

Item	Requirement	#Criteria	Criteria requirement
SW3	The operations to validate the start of production are applied. Reference parts/boundary samples are managed.	SW31	**Start-up standad is defined (beginning, after maintenance, production stop, ...) and applied. Check that start up instruction includes a list of the checking tasks to be carried out and recorded:** **- availability and functionality of all the manufacturing and control equipment, error proofing and PPE,** **- process/product parameters with tolerance limits,** **- availability of components and materials,** **- environmental conditions at the workstation (cleanliness, lighting, etc.).**
		SW32	**Traceability of start up is ensured till validation is completed (first-off parts) and reactivity is applied in case of any deviation.**
		SW33	**Reference parts and boundary samples are identified, available and managed including periodically review (update on customer feedback/complaint.**
		SW34	A visual management of main events of the line are in place in order to pay more attention during start-up production activities.
		SW35	After maintenance activities, re qualification of means must be done (start-up, testings…)

Criteria of Requirement

31 – page 75 - 77
32 – page 76
33 – page 78 - 80
34 – page 77
35 – page 76
Auditor hints – page 81

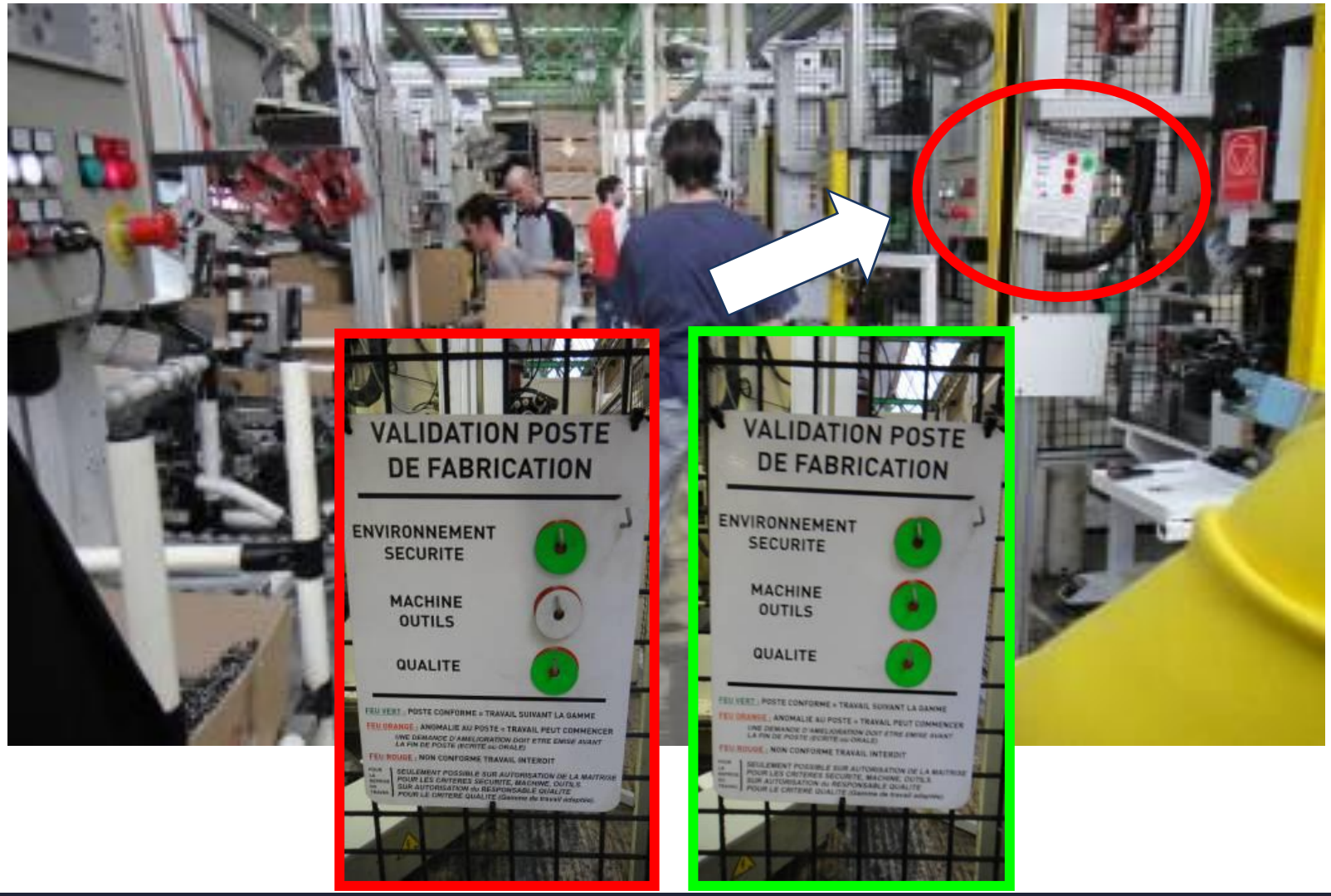
Prev. Requirement Next Requirement

Start-up Process

- Start-up process needs to be applied:
  - start of production,
  - part number change,
  - tool change,
  - after maintenance activity,
  - after significant production stop, etc.
- Start- up process has to be described in SWI, special instruction or checklist.
- Start up instruction includes a list of the checking tasks to be carried out and recorded:
  - availability and smooth running of manufacturing and control equipment, error proofing and PPE,
  - environmental conditions at the workstation (cleanliness, lighting,…),
  - process/product parameters with tolerance limits
  - availability of components and materials.
- Start up instruction defines first-off parts validation. Traceability to be ensured till validation completed, result is documented.

Start-up

(Example)



Standard Task Sheet

(Example)

Definition:

- The STS is a document that defines an entire JOB. It contains all the *Tasks* that a Team Member has to perform. It assumes that the Team Member possesses the required *baseline knowledge.*

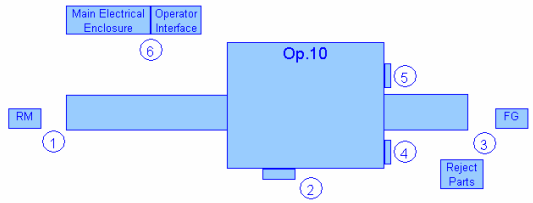
Purpose:

- Checks alignment between what we are actually doing and what we say we should be doing.
- Provides Team Members in the Non-Cyclic environment an overview of the tasks which have to be completed daily/weekly/monthly etc.
- Defines timing (frequency and length) of tasks.
- Used for Non cyclic operations like: start-up process, maintenance, etc.

STANDARD TASK SHEET

Area	Part Name	Available Operating Time	Date
Component Machining	Input Shaft	434 minutes	02/17/2004
Operation	Process	Customer Demand	
Input Shaft Machining	Operation 10 - Team Member 'A'	500	

Workplace Map



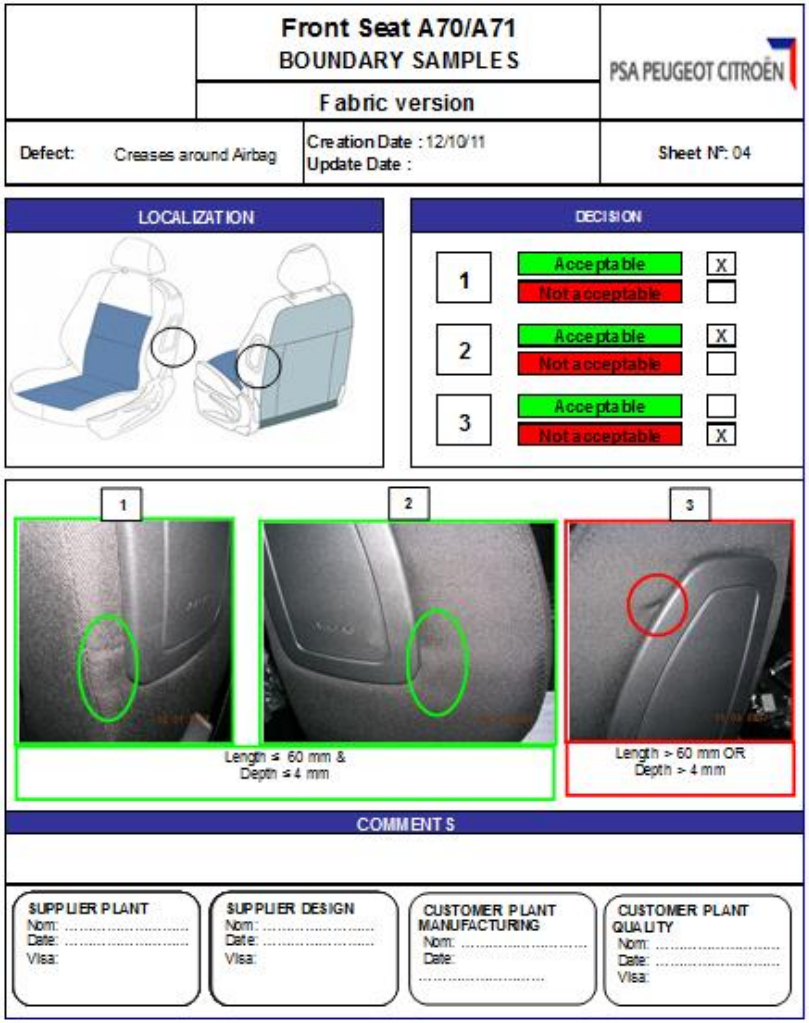
#	Task	SOS	JES	OTHER	Task Cycle Time (sec)	Frequency (pieces)	Total Cycle Time (sec)	Travel Time Between Tasks
1	Load machine		x		238	20	99.2	0.0
2	Clean and calibrate quality check machine	x	x		568	125	37.9	
3	Off-load machine			x	316	20	131.7	
4	Change tooling station 1	x	x		161	125	10.7	
5	Change tooling station 2	x	x		233	100	19.4	
6	Start up machine	x	x		518	500	8.6	
						TOTAL	307.5	

Control Block				Control Block
Shift	Team Leader	Group Leader	Date	LOCAL PLANT GUIDELINES
1	John Smith	Fred Bush	2/18/04	
2	Bob Sims	Amy Johnson	2/18/04	
3	Helen Jones	Will Jones	2/18/04	

Boundary samples

- Responsibilities for definition of samples are established (including customer if required). At boundary samples tolerances for each characteristic and decision criteria are clearly established.
- Samples (some cases they can be replaced by photos) are clearly identified and in accordance with latest design and approval status.
- Usage of samples are described/referred in instructions, used in training process.
- They have easy access in area where they are used, storage preserves original condition.
- Samples are periodically reviewed and its result is documented based on acceptance criteria and customer feedback/complaint.

Boundary samples - pictures (Example)



Boundary samples - storage

(Example)

Auditor hints

Take few start-up instructions for automatic equipment and verify content.

Ask a set-up person about roles of set up.

Evidence of traceability between parts produced & 1st off part.

Check back records for start up activities and verify:

- exact date of start-up documented,
- set-up parameters recorded and within tolerance,
- first-off parts result,
- in case of any deviation action initiated and result verified.

Verify that boundary samples are available for operators.

Check that samples represent typical failures.

Ask operator when they using samples.

Verify sample storage condition.

Evidence that samples used for training.

They have easy access in area where they are used, storage preserves original condition.

Gage control, what are we searching for?

Item	Requirement	#Criteria	Criteria requirement
SW4	Reference parts and boundary samples (called samples) are available and managed in order to confirm inspections.	SW41	**All the gages are periodically calibrated and recorded according to procedures, ensured that only calibrated gages are in use.**
		SW42	**The capability of the measurement means is periodically checked according to procedures. The acceptance criteria are defined for calibration and capability.**
		SW43	**For each deviation/non-conformity or equipment exceeding calibration due date, containment and corrective actions are defined and validated and followed by Quality Manager (apply handling of non-conformance)**
		SW44	If calibration performed in-house, necessary skilled staff, calibration procedures are defined, criteria acceptance for calibration are specified, equipment and facility are available, if outsourced external laboratory accreditation is verified.

Criteria of Requirement

41 – page 83 - 89
42 – page 86
43 – page 86 et *90*
44 – page 90
Auditor Hints – page 91

Prev. Requirement Next Requirement

Overview

This Procedure applies to all Supplier Manufacturing sites.

At a minimum, sites should include the following devices within their gage procedures:

- Gages included in the sites control plan
- Devices used to evaluate conformance to part and product specifications
- Masters used to evaluate/adjust all devices under gage control
- Metrology lab and layout room devices
- Coordinate measuring machines and optical comparators
- Product torque wrenches and transducers
- Leak test orifices
- Balance, flow test weight viscosity and surface texture devices
- Functional test transducers e.g. torque to turn, final test
- Hardness testers and chemistry analyzer
- Personal tools and measuring devices
- Measuring, tools used to qualify or maintain production tools

Overview (continued)

Organizations shall have written, documented procedures for developing, maintaining and establishing proper use and functions for manufacturing gages within PSA supplier locations.

Gage Definitions:

- ***Gage –*** Any device used to obtain measurement, or assess the conformance of a part or characteristic relative to specifications.
- ***Adjustment –*** A set of operations to bring a gage into a state of performance suitable for its use.
- ***Calibration –*** A set of operations that compares and evaluates under specified conditions, the relationship between a gage and a traceable standard
- ***Certification –*** A set of operations to document the results of a calibration, indicating conformance or non-conformance to specifications.
- ***Master –*** A device used to check and/or adjust a gage to a specified value.
- ***Mastering –*** A set of operations to verify that the gage results agree with the master.

Overview (continued)

Additionally:

- The supplier should indicate in their gage procedure, whether other special measuring devices, such as *Error Proofing* are in or out of scope for gage control activity.

- Device Mastering is a part of the gage procedure, but the frequency is at the discretion of the supplier.

- Last Part Checked should be held for confirmation of last known good part at a frequency of at minimum of 1 per shift. Best practice would be to retain hourly samples for each inspection, retained for the entire shift or previous 8 hours.

Calibration, Control, & Maintenance

Guidelines:

- In addition to their calibration schedule, suppliers should establish a process of regular gage surveillance to assure the equipment is fit for use (may be part of a layered audit process) and a program of periodic GR&R studies to establish measurement variability to be incorporated in process capability determination.
- The acceptance criteria shall be defined for calibration and capability.

Note: Gage R&R acceptability criteria are defined in the **Measurement Systems Analysis** Reference Manual

Calibration, Control, & Maintenance (Continued)

Guidelines:

- New programs should adopt a common gage numbering scheme.
- The calibration interval specified for a device should initially be set in accordance with the manufacturer's recommendation. Revisions to this frequency should be made on the basis of: gage type, past experience, GR&R level, calibration history, frequency/severity of use, type, and tolerance of characteristic being checked.

Calibration, Control, & Maintenance (Continued)

Gage Calibration Frequency Reference Table

	No of Months	
	Minimum	Maximum
Attribute gages for Process verification	12	24
Variable Gage Masters	12	24
Optical Template Gages	12	24
Attribute Fixture Gages	12	36
Any Gage in Full-Time Use	12	

Gage Instructions

Best Practices Operator Gage Instructions:

- Operator gage instructions shall, when appropriate, be updated if a process or product change impacts gaging.
- Operator Instructions should be:
  - developed by the gage manufacturer and supplier with customer GD&T requirements.
  - used for Standardized Operator Training.

Responsibilities

- The quality system group at the manufacturing duns location is responsible for the local gage procedure.

- If calibration performed in-house, necessary skilled staff, equipment and facility are available, if outsourced external laboratory accreditation is verified.

- In case of deviation/non-conformity or equipment exceeding calibration due date, containment and corrective actions are defined and validated and followed by Quality Manager (apply handling of non-conformance).

Auditor hints

Check several gages in different area (production, lab, incoming, storage) for:

1. identification,
2. calibration status and their record,
3. proper usage and storage (ask operators about usage and handling of gages, are aware about risks of damaged gage).

List of gages contains identification and calibration period.

Check schedule for calibration.

Verify a work instruction for a gage (see the acceptance criteria).

Gage R&R are been conducted to calibrate operators from shift to shift / line to line.

Standardized Work effectiveness, what are we searching for?

Item	Requirement	#Criteria	Criteria requirement
SWE	Target defined and followed to optimize processes.	**SWE1**	**Tracking of external and internal issues created by not well defined working instruction.**
		SWE2	**Capability & calibration follow up indicators (e.g.: number of late calibration).**
		SWE3	**Tracking of downtime and/or scrap rate caused by set up.**
		SWE4	Direct labour efficiency (ratio of real number of parts produced against the theoretical number to be produced during the opening time).
		SWE5	Cycle times levelling.

Criteria of Requirement

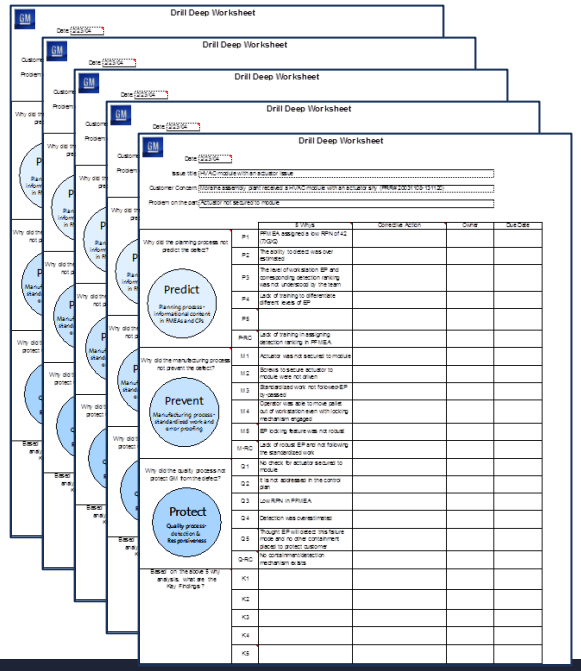
Prev. Requirement
What goes wrong ?

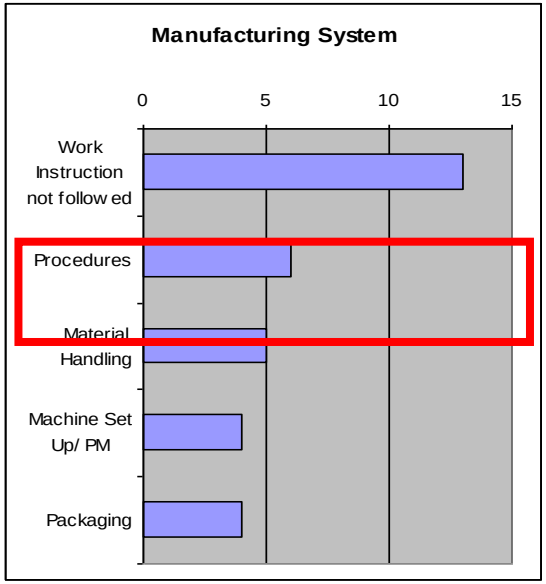
Tracking of external and Internal issues related to Standardized Work

ABC Company - Quality Fast Response Tracking Board

EXIT CRITERIA STATUS KEY	
R	1) Required but not initiated 2) Target Date Missed
Y	Initiated but not complete
G	Complete
N/A	Not Applicable

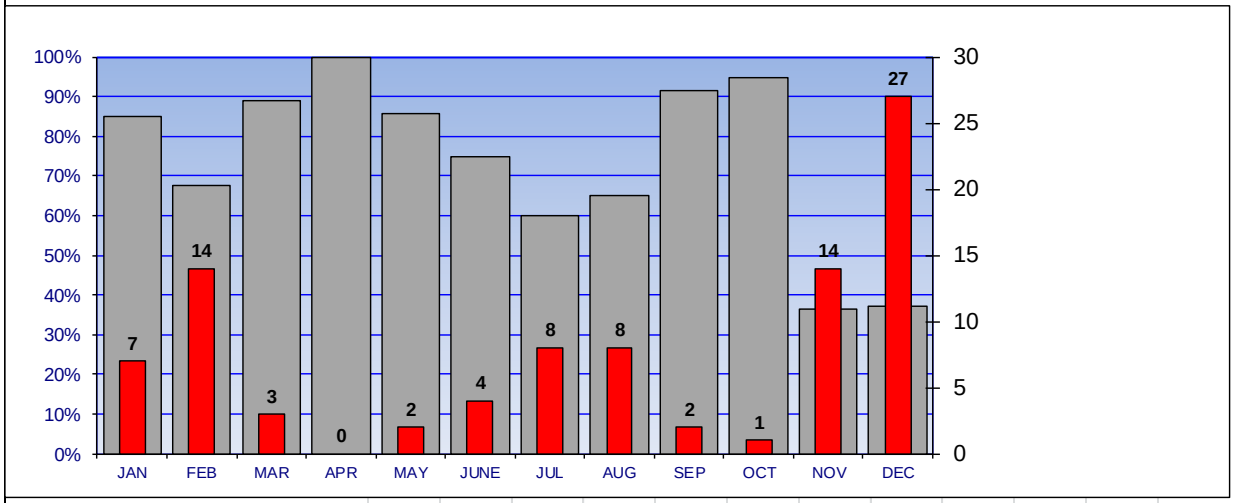
									Status & Date Green																		
									24h	7d	14d	34d	35d					40d									
ITEM #	Date Opened	Part & Part Number	Program Name	Internal / External IS/IR	Customer	Issue Description	Repetitive Issue?	Owner	Next Report Date By Owner	Containment - Short Term	Root Cause Identified	Implemented Error Proof/Detection	Corrective Action Verified	PFMEA / CP Updated	Standard Work, Operator Instructions	Layered Process Audits	Lessons Learned (Institutionalized)	Action Plan / Countermeasure	Forecasted Closed date	Actual Closed Date	Time to close	OVERALL STATUS (R, Y, G) Open > 30 Days=R
1	4/15/13	Bracket 93345678	Cruze	Int	GM	Lack of nut	Yes	Carlos	~~16/04~~ ~~22/04~~ ~~23/04~~ ~~29/04~~ ~~29/05~~ ~~19/06~~ ~~20/06~~ 25/06	G	G	G	G	G	G	G	G	G	1 - Delay in the root cause identification Item in CSL 2 - Lead time to import a sensor from Japan - 30 days Keep item in CSL	25-May	25-Jun	70	G
2	11/20/13	Pump 93333998	Onix	Ext	GM	Pump burned due to CONTAMINATION	No	Alex	~~11/21~~ ~~11/27~~ 12/04	G	G								30-Dec			Y





Layered Audit Result related to Standardized Work

DEPT._____ **LAYERED PROCESS AUDIT RESULTS**



	JAN	FEB	MAR	APR	MAY	JUNE	JUL	AUG	SEP	OCT	NOV	DEC
% ISSUES CLOSED:	85%	67%	89%	100%	86%	75%	60%	65%	92%	95%	36%	37%
TOTAL # OF NON CONFORMANCES:	47	43	27	16	14	16	20	23	24	19	22	43
TOTAL # OF CLOSE ISSUES:	40	29	24	16	12	12	12	15	22	18	8	16
TOTAL # OF OPEN ISSUES	7	14	3	0	2	4	8	8	2	1	14	27

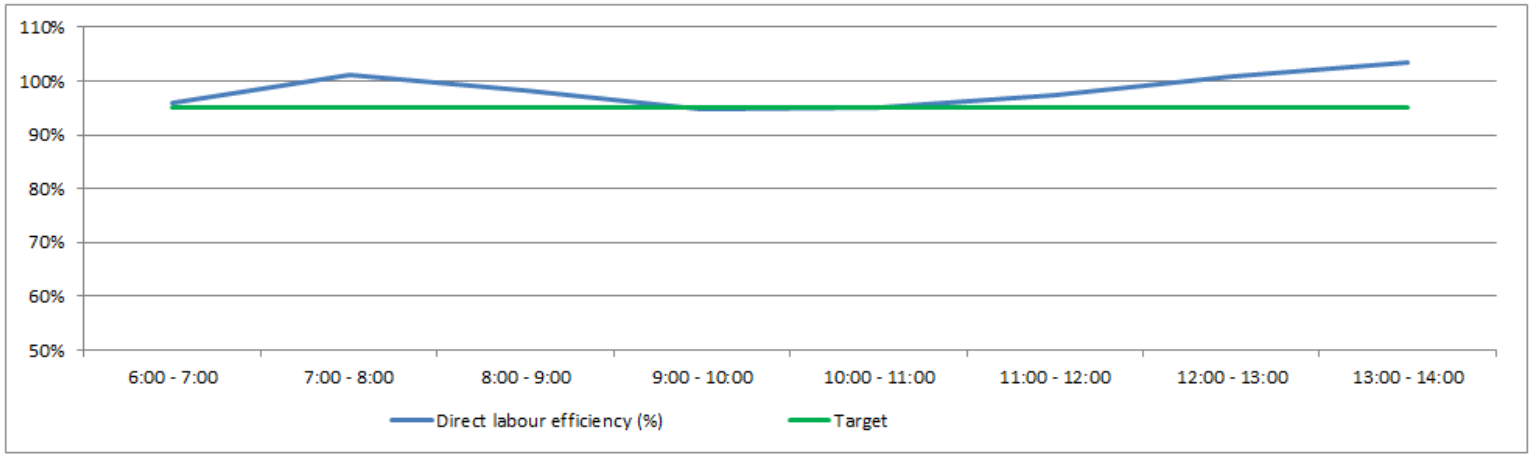
NON CONFORMANCES	NUMBER OF ITEMS NOT IN COMPLIANCE											
Safety	10	8	5	2	1	1	1	1	1	1	1	1
Std Work not defined properly	10	8	3	2	3	4	5	2	1	1	1	10
5S Related	2	7	7	3	2	2	2	2	2	2	3	2
Product	10	4	3	2	1	1	1	1	1	1	1	10
Voice of Customer	6	4	2	2	3	4	4	4	3	2	2	10
Std Work not followed	9	7	1	2	2	2	2	2	2	2	2	2
Gage Calibration		5	6	3	2	2	5	6	7	2	2	2
Poke Yoke								5	7	8	10	6

Direct labour efficiency

Start of prod · Break · Breakdown · Batch change · Lunch Break · Stockout · Break

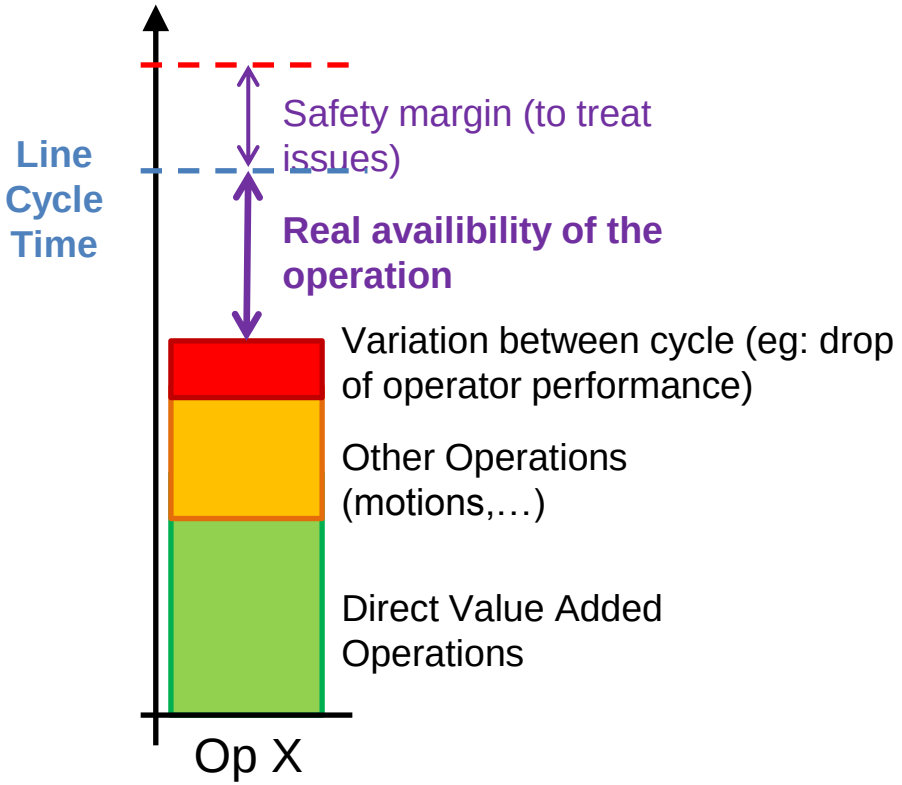
Time	6:00 - 7:00	7:00 - 8:00	8:00 - 9:00	9:00 - 10:00	10:00 - 11:00	11:00 - 12:00	12:00 - 13:00	13:00 - 14:00	Shift
Planned Production time (min)	60	60	45	60	60	30	60	45	420
Downtime (breakdown, Startup, batch change) (min)	10	0	0	3	15	0	2	0	30
Effective production time (min)	50	60	45	57	45	30	58	45	390
Theoretical nb of parts produced (based on cycle times)	67	80	60	76	60	40	77	60	520
Parts produced (goods & bads)	64	81	59	72	57	39	78	62	512
Direct labour efficiency (%)	96%	101%	98%	95%	95%	98%	101%	103%	98%
Target	95%	95%	95%	95%	95%	95%	95%	95%	95%

Cycle time = 45 s = 0,75 min



Cycle times levelling

Takt Time (customer/ downstream demand)



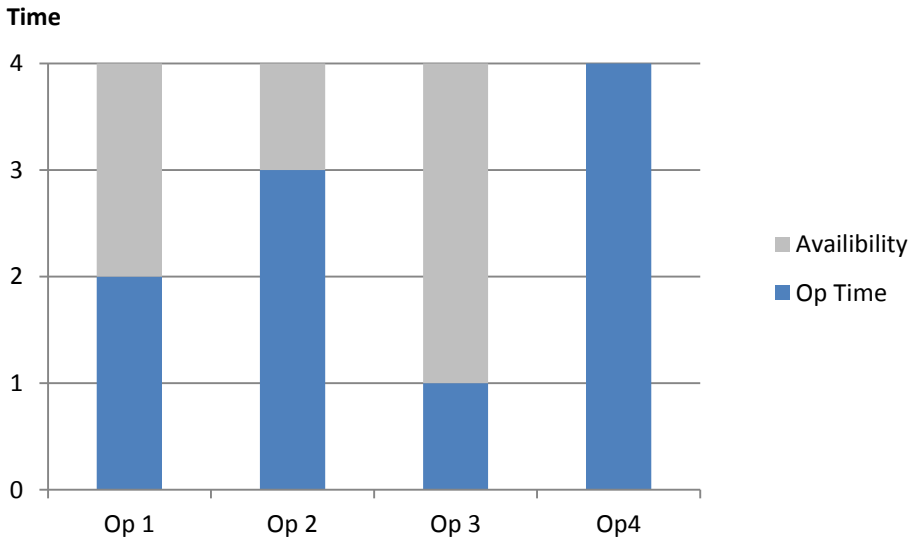
- **Cycle time:** time of the slowest operation in the line
- **Target situation:** Takt time = Cycle time
- **Cycle time leveling**: optimizing the different operations to minimize the rate of real availability at each operation
- **Example of metric:**

$$\frac{\sum Real\ availibility\ at\ each\ operation}{Cycle\ time}$$

Cycle times levelling (continued)

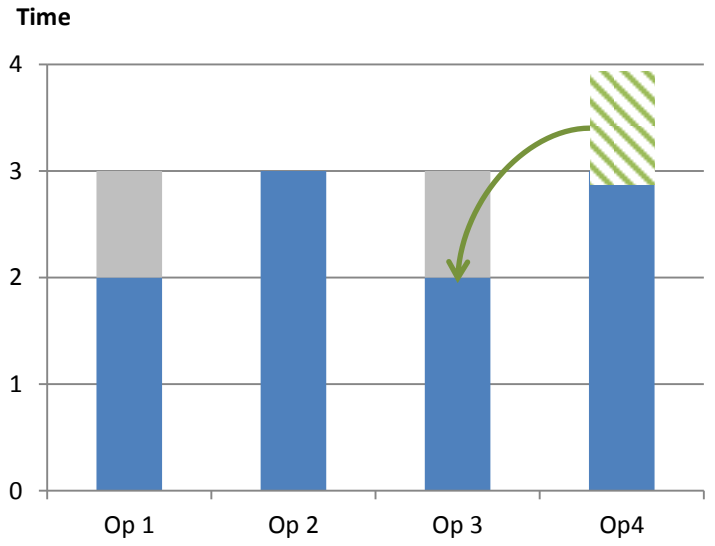
- **Bad Levelling**

$$\frac{\sum Real\ availibility\ at\ each\ operation}{Cycle\ time} = 150\%$$



- **Better Levelling**

$$\frac{\sum Real\ availibility\ at\ each\ operation}{Cycle\ time} = 75\%$$



Gage status follow up

Gage status tracking based on expiration data & open issues

as of 4/Nov/2013

Total # of gages	Expired	Expire within a month	Open issue
165	1	2	2

Details in tracking charts

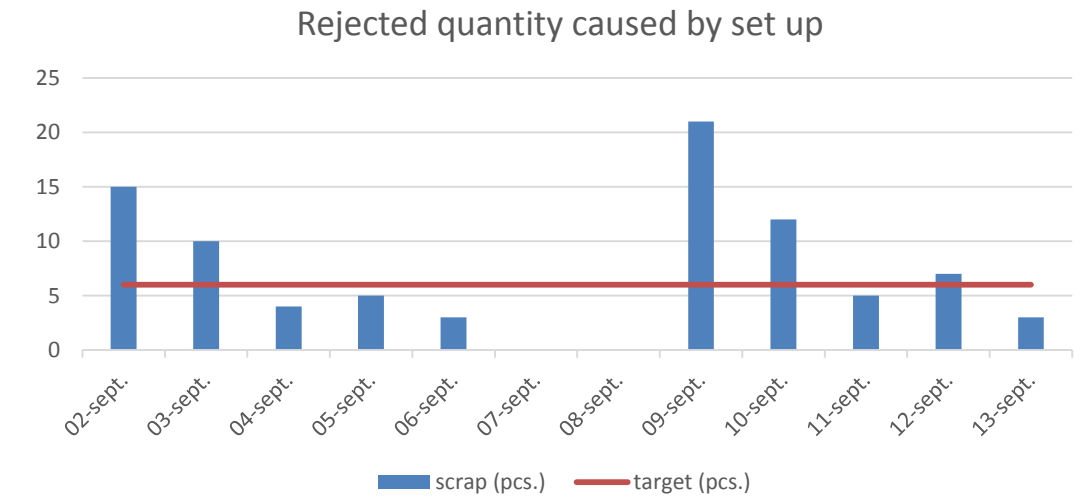
as of 4/Nov/2013

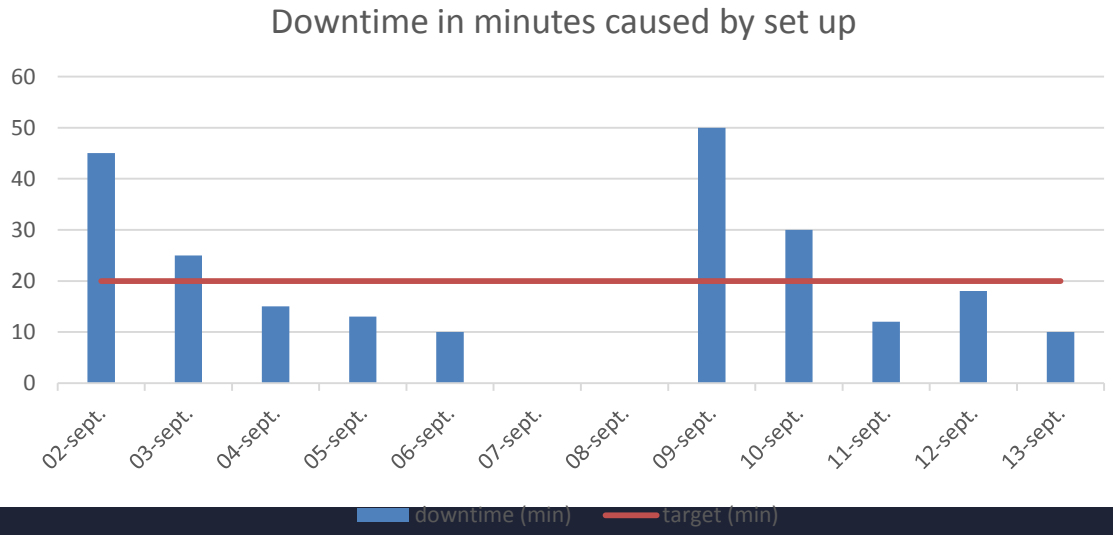
Gage	#	Calibration	Expiration	Action
Calliper	C003	12-Oct-12	12-Oct-13	Removed from production, blocked
Calliper	C005	16-Nov-12	16-Nov-13	Calibration on 8/Nov
Calliper	C013	16-Nov-12	16-Nov-13	Calibration on 8/Nov

as of 4/Nov/2013

Gage	#	Calibration	Expiration	R&R	Action
Leak tester	LT003	06-Sep-13	06-Mar-13	28%	New fixture
Function tester	FT007	06-Sep-13	06-Mar-13	19%	New pressure cell

Tracking downtime or scrap rate caused by set up





Ergonomics evaluation rate

Auditor hints

Prior to audit check customer complaints where root cause is linked to Standardized Work (working instruction not detailed, wrong set up etc.).

What goes wrong ?

- Standard Operation Sheet is created for customer auditor and not for
  - training of new operator,
  - supporting Layered Audit,
  - analysing jobs for improvement opportunity,
  - problem solving.
- Hints are missing to describe how to perform a step.
- Reasons are not defined.
- Less visualization more description.
- Gage R&R was not done for attribute gages or not repeated.

More material about SW

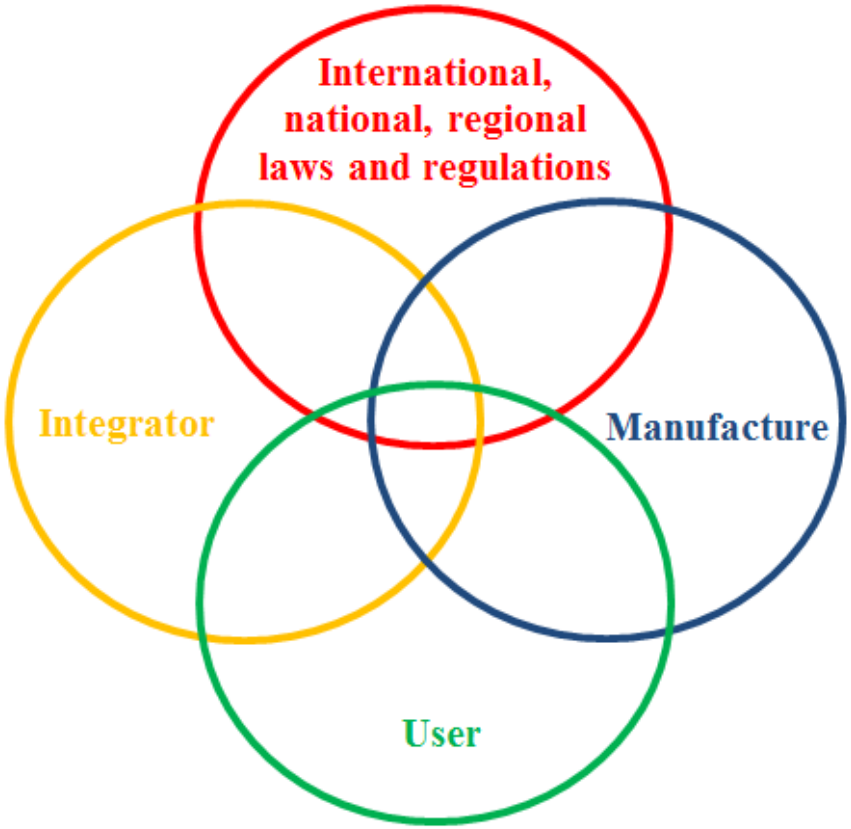
Design for Health and Safety

Allows to organization to:

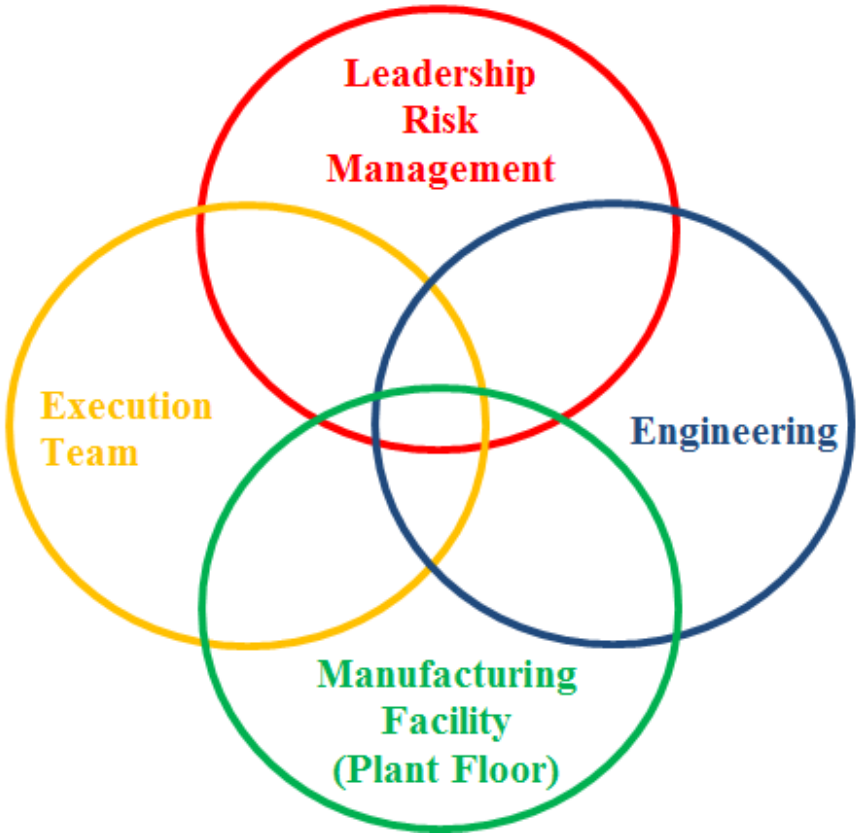
- Design and safely deploy creative, flexible and cost effective manufacturing engineering solutions.
- Capture and document benefits relating to people, quality, responsiveness, and cost, for all proposed safety solutions.
- Offer an initial safety solution and then migrate to an optimal safety solution based on project timing, and team input.
- Provide a repeatable standardize methodology to either eliminate or reduce remaining risks to a safe level, and meet all international, national, laws and local codes.
- Share best safety solutions with other teams through a common database.

Design for Health and Safety

Each major entity is identified by a circle in below figures. The circles are arranged to show how the groups interact.

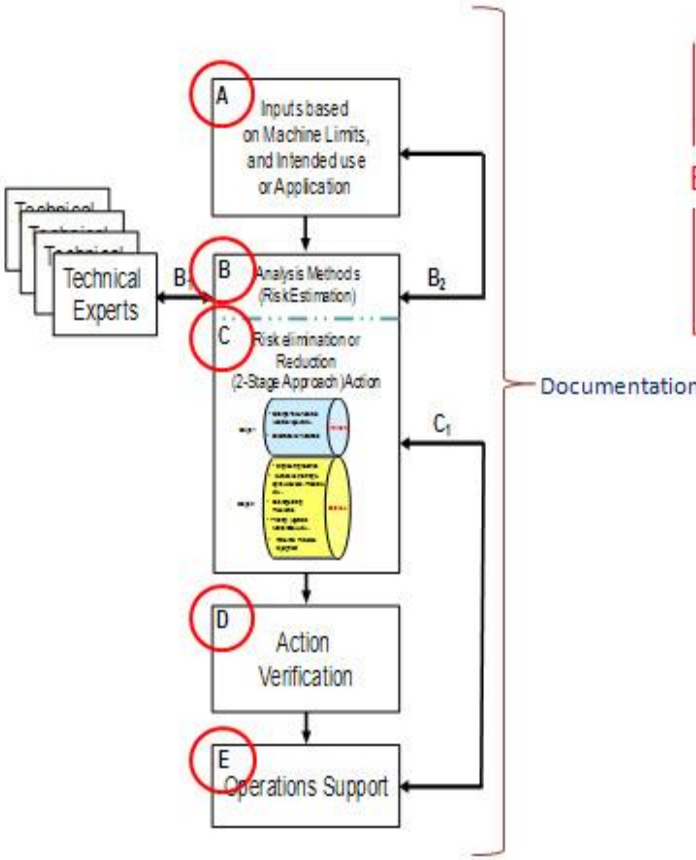


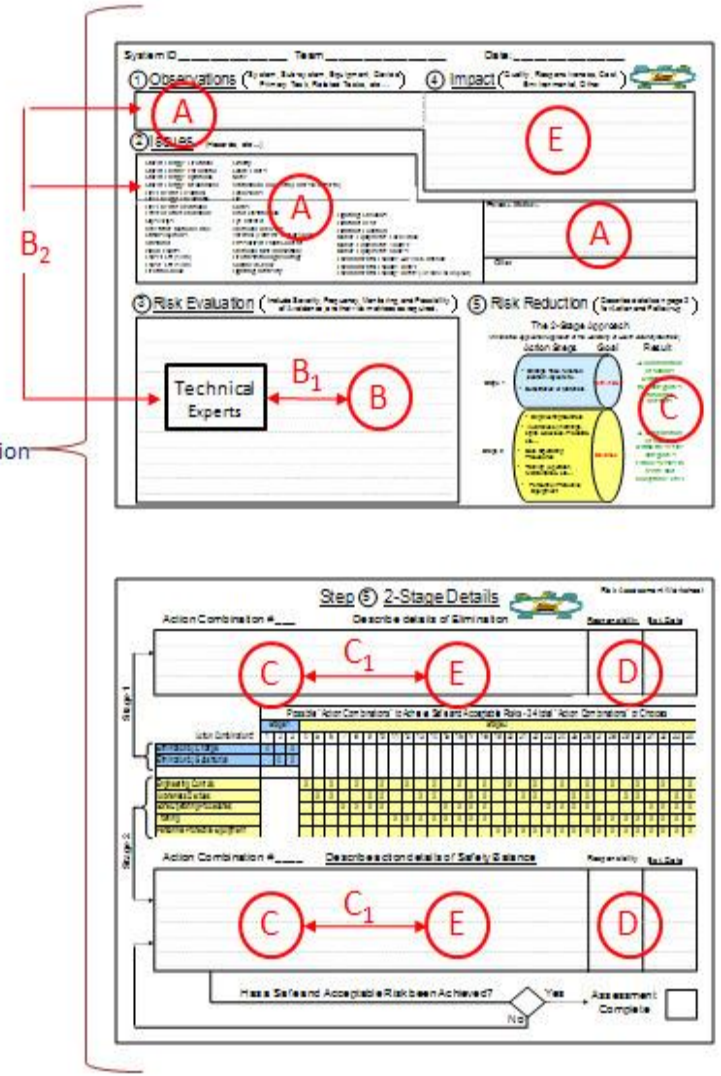
Region/Country Level



Plant Level

Risk Assessment





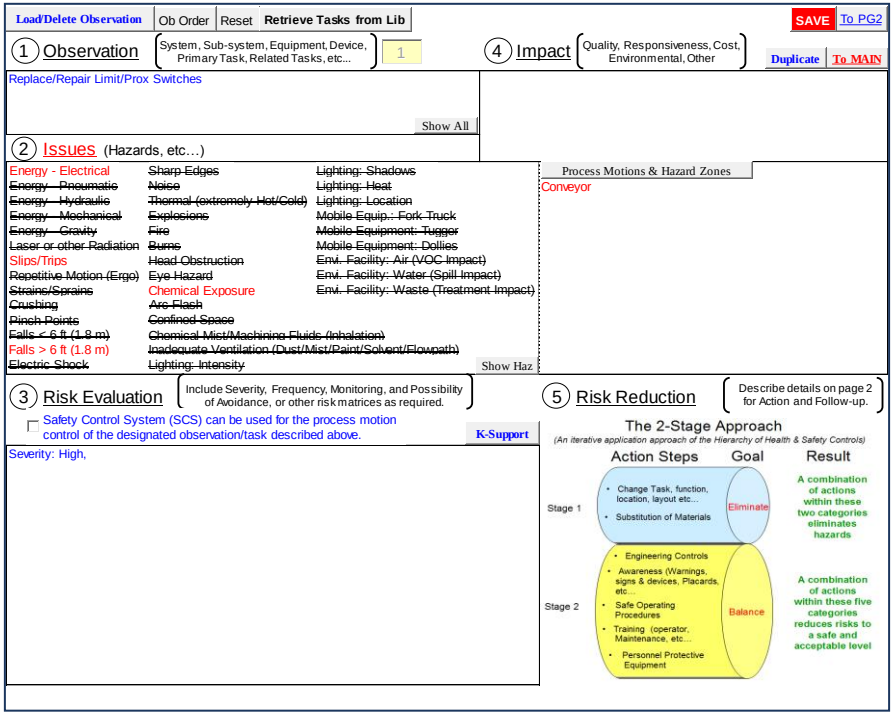
Benefits:

- Easy to use & portable (quick data capture)
- Scalable (can be used at any time in a project or program)
- Captures Savings (capital, responsiveness, thru-put, quality, etc …)
- Shows all risk elimination / risk reduction options (where you've been, where you are, where you could go)
- Identifies Actions, Responsibilities & Dates

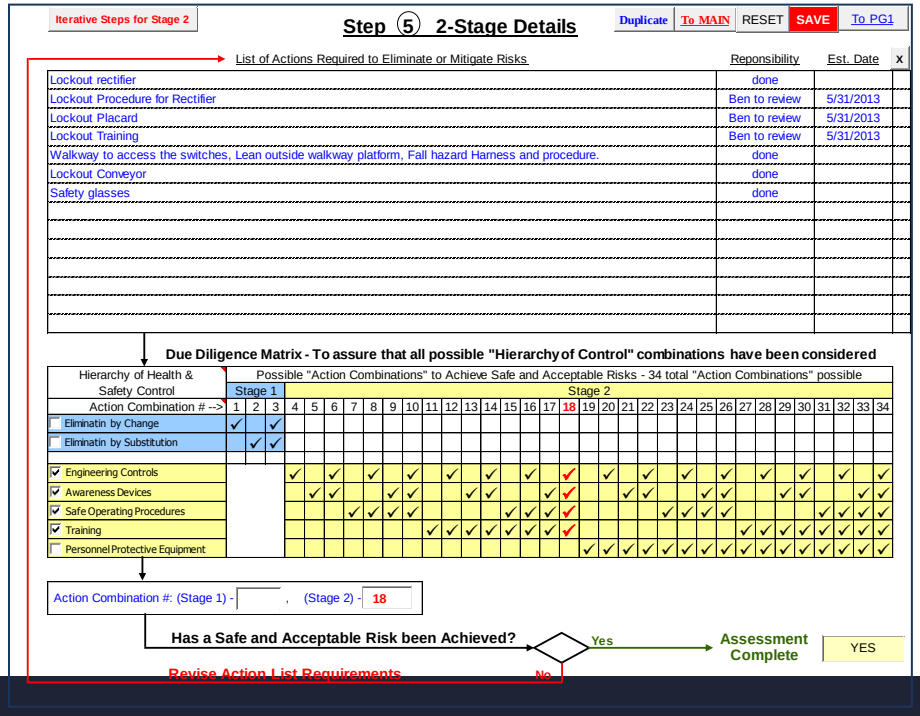
Risk Assessment Flowchart

Risk Assessment Worksheet

Work Area/Process – Risk Assessment



(Example)



Work Area/Process – Risk Assessment

System ID_____ Team_____ Date:_____

1 Observations (System, Sub-system, Equipment, Device, Primary Task, Related Tasks, etc...)

Materials stacked two high (>5 feet) on corner of pedestrian aisle and Fork Truck aisle

4 Impact (Quality, Responsiveness, Cost, Environmental, Other)

Reduce potential of Pedestrian Incidents with Vehicles (PIV)

2 Issues (Hazards, etc...)

Stored Energy: Electrical	Gravity		
Stored Energy: Pneumatic	Sharp Edges		
Stored Energy: Hydraulic	Noise		
Stored Energy: Mechanical	Ventilation Flow Path (Fumes/Dusts/etc.)		
Live Energy: Electrical	Explosions		
Live Energy: Pneumatic	Fire		
Live Energy: Hydraulic	Burns		
Laser or other Radiation	Head Obstruction	Lighting: Shadows	Process Motion:
Slips/Trips	Eye Hazard	Lighting: Heat	
Repetitive Motion (Ergo)	Chemical Exposure	Lighting: Location	
Strains/Sprains	Thermal (extreme Hot or Cold)	Mobile Equipment: Fork Truck	
Crushing	Pressurized Paint/Solvent	Mobile Equipment: Tugger	
Pinch Points	Chemical Mist (Inhalation)	Mobile Equipment: Dollies	
Falls < 6 ft (1.8m)	Electrostatic High Voltage	Environmental Facility: Air (VOC impact)	
Falls > 6 ft (1.8m)	Confined Space	Environmental Facility: Water	
Electric Shock	Lighting: Intensity	Environmental Facility: Waste (Treatment impact)	Other

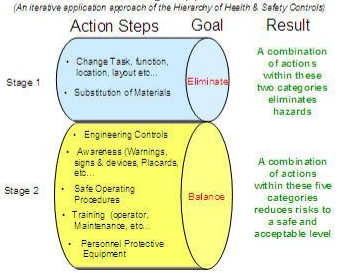
3 Risk Evaluation (Include Severity, Frequency, Monitoring, and Possibility of Avoidance, or other risk matrices as required.)

The possibility and potential severity of an incident occurring due to blocked visibility at the corner is great.

5 Risk Reduction (Describe details on page 2 for Action and Follow-up)

The 2-Stage Approach

(An iterative application approach of the Hierarchy of Health & Safety Controls)



(Example): Fork truck/pedestrian issue

Risk Assessment Worksheet

Step 5 2-Stage Details

Action Combination # 1 — Describe details of Elimination

	Responsibility	Est. Date
The material will be stacked only one high beside the aisle allowing visibility for both the pedestrian and the fork truck driver. Both parties will then be able to make eye contact when approaching the intersection. Create no-storage areas by posts (etc) to keep tiered material away form isle.	Lee & Brown	8-12-08

Possible "Action Combinations" to Achieve Safe and Acceptable Risks - 34 total "Action Combinations" possible

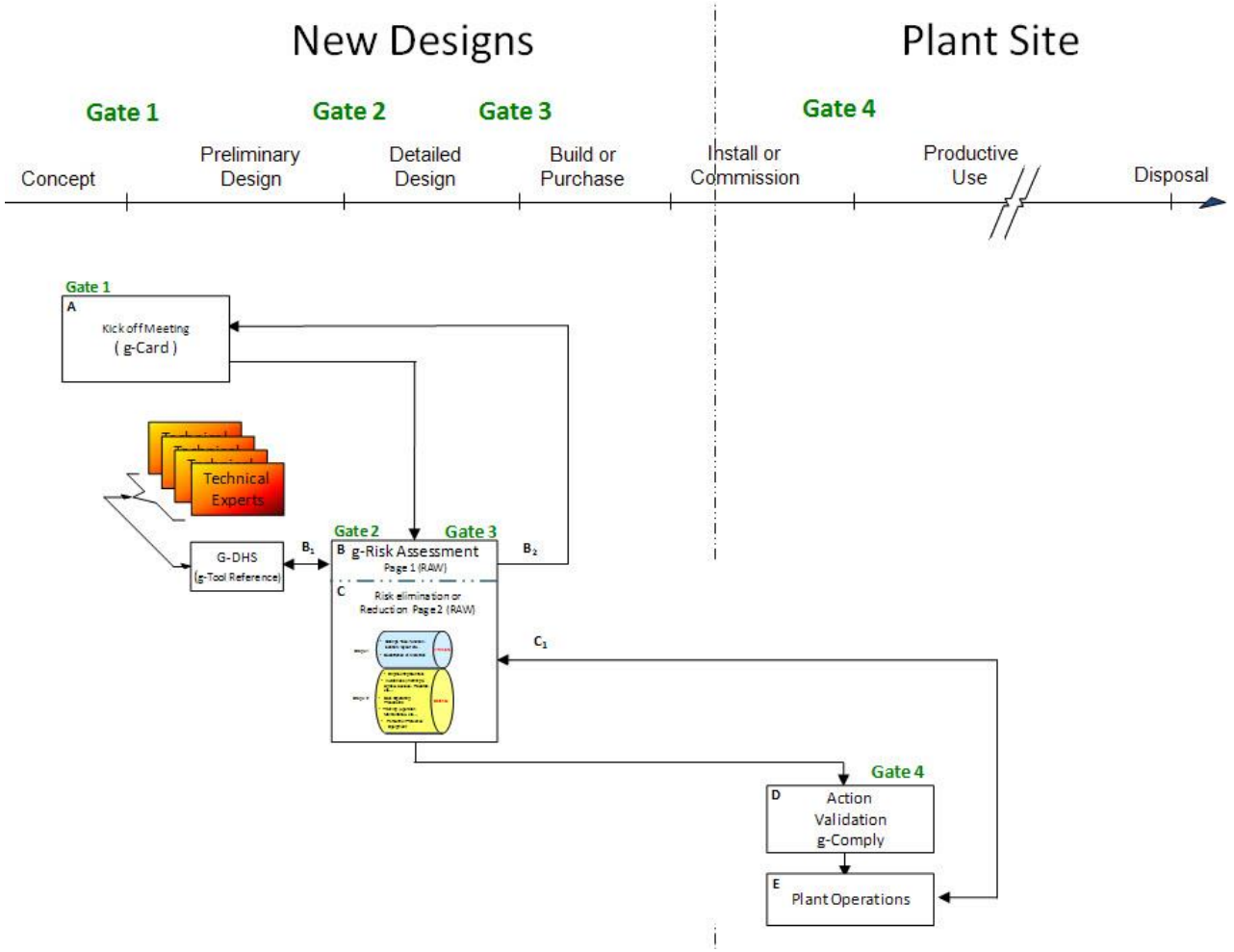
	Stage 1			Stage 2																													
Action Combination #	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34
Stage 1 — Elimination by Change	X		X																														
Stage 1 — Elimination by Substitution		X	X																														
Stage 2 — Engineering Controls				X		X		X		X		X		X		X		X		X		X		X		X		X		X		X	
Stage 2 — Awareness Devices					X	X			X	X			X	X			X	X			X	X			X	X			X	X			X	X
Stage 2 — Safe Operating Procedures							X	X	X	X					X	X	X	X					X	X	X	X					X	X	X	X
Stage 2 — Training											X	X	X	X	X	X	X	X									X	X	X	X	X	X	X	X
Stage 2 — Personnel Protective Equipment																			X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X

Action Combination # 13 — Describe action details of Safety Balance

	Responsibility	Est. Date
Material Handling leadership to review all storage areas (mark layout)	Lee	5-15-08
Provide additional training to truck drivers, of new marked areas and on proper stacking height and distance form Isle.	Brown	5-7-08

Has a Safe and Acceptable Risk been Achieved? — Yes → Assessment Complete ☐ — No

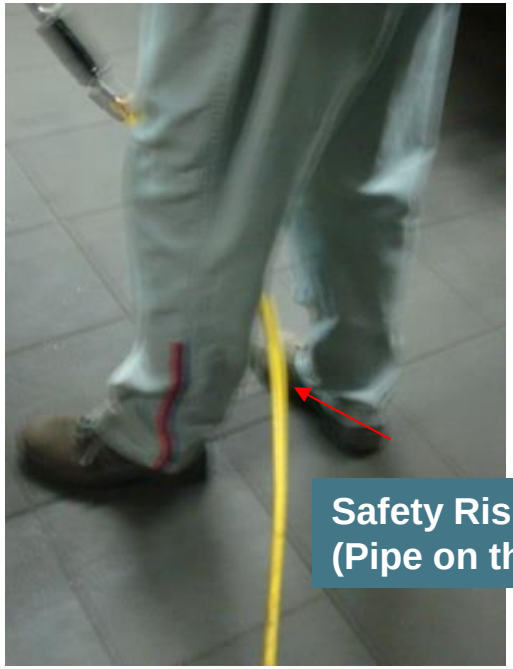
Risk Assessment: how it is implemented for any project or program



Potential Safety Issues

(Example)

Issues identified during *Layered Process Audit*.



Safety Risk (Pipe on the floor)

Safety Requirements at Workstation (Example)