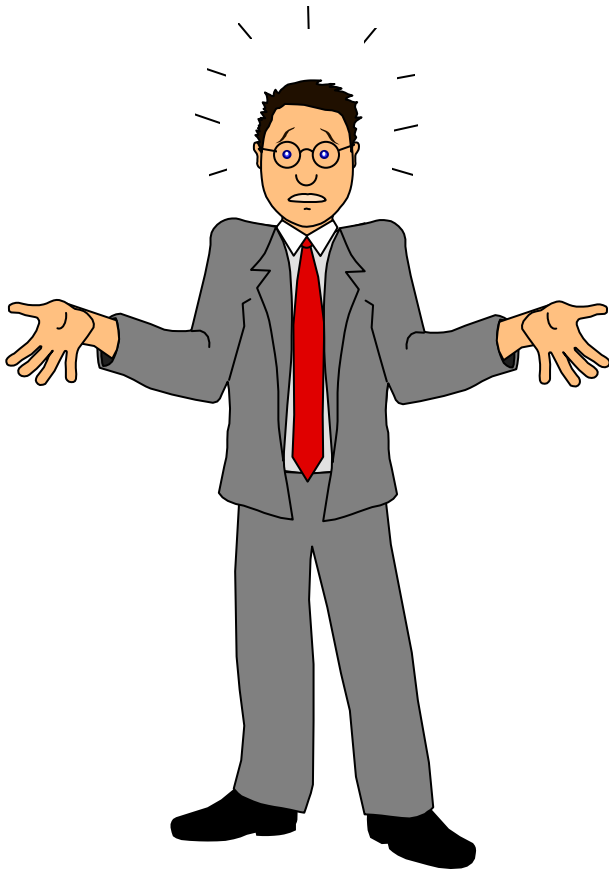


# 1991 NIOSH LIFTING EQUATION



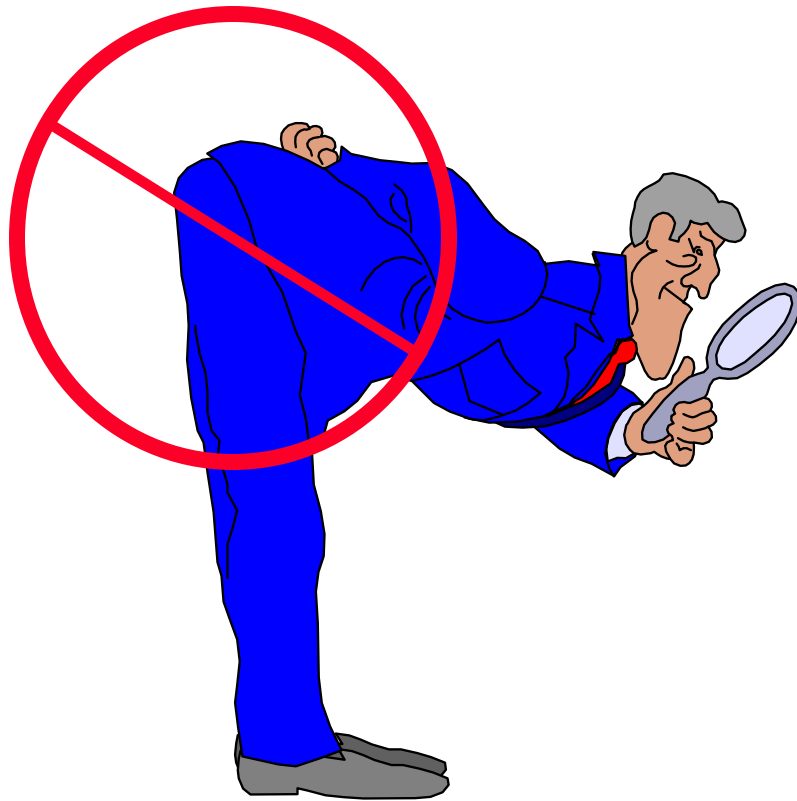
# What is the NIOSH Lifting Equation?



- An equation that helps to evaluate lifting demands by computing a weight limit for manual lifting tasks.
- Developed by a committee of experts.
- Accepted world wide

# Why use the NIOSH Lifting Equation?

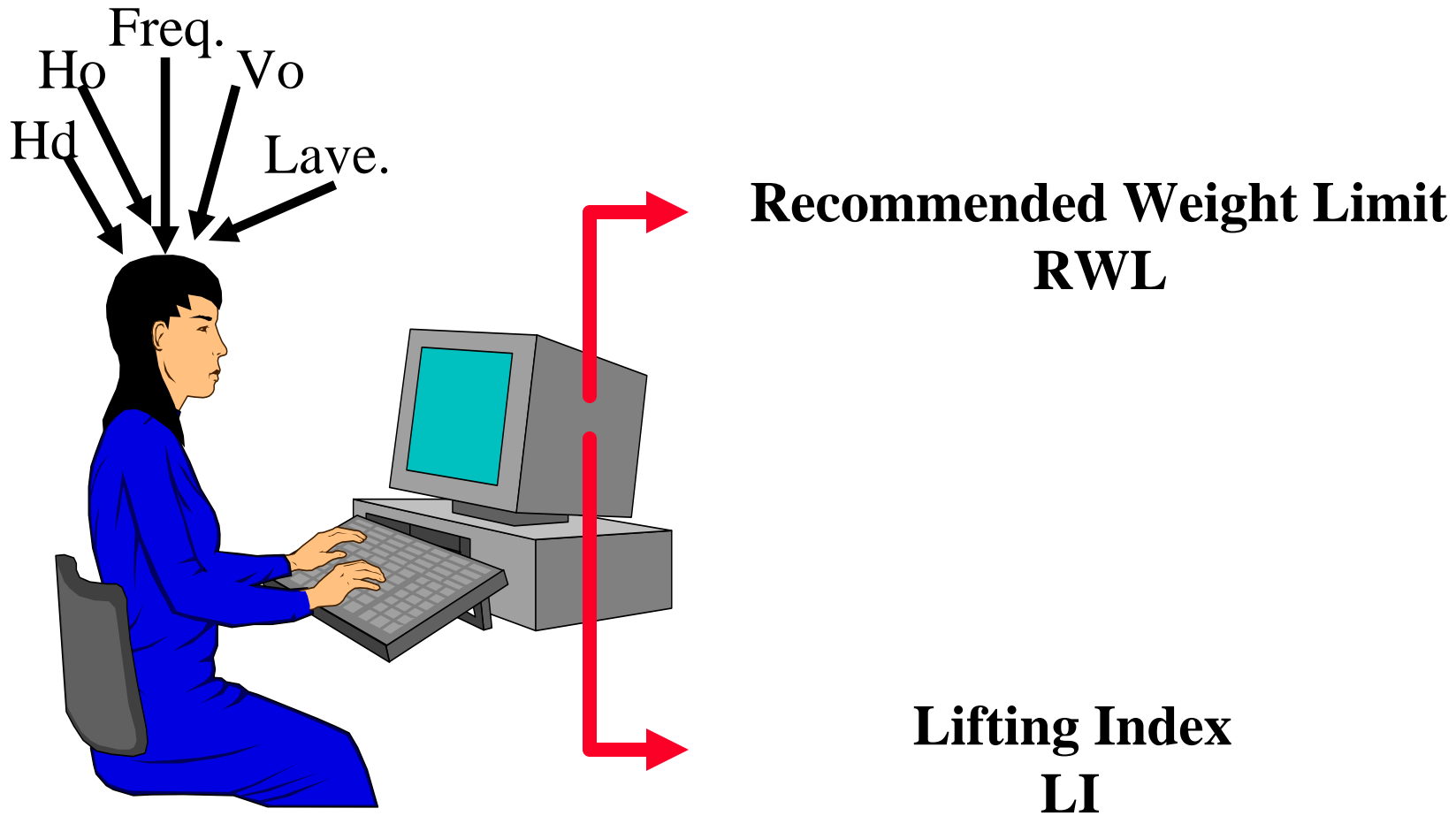
- To help prevent or reduce the occurrence of lifting related lower back pain among our employees.



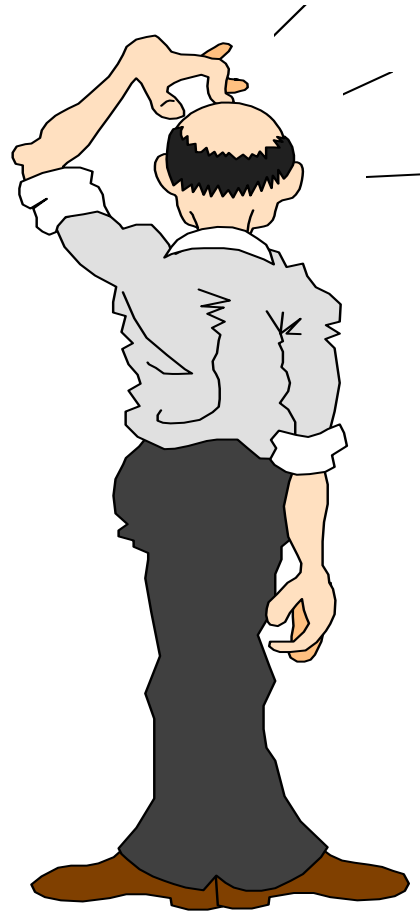
# When to use the NIOSH Lifting Equation

- ☞ Help identify potentially hazardous lifting jobs.
- ☞ Help in design/modification process.
- ☞ Help prioritize evaluation of multiple lifting tasks

# How the equation works

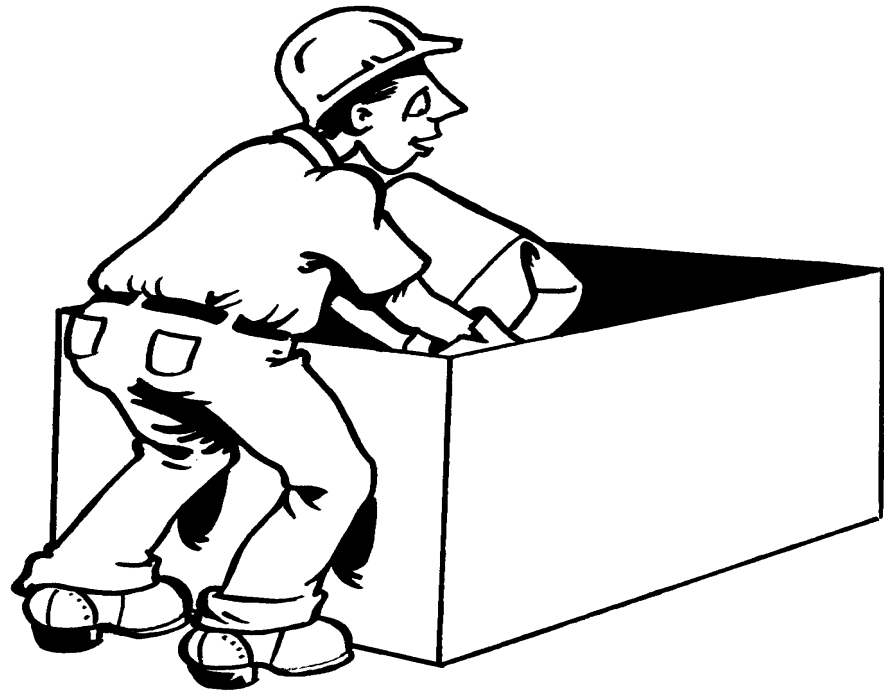


# How to use the NIOSH Lifting Equation



Step #1

Pick the Lifting Task







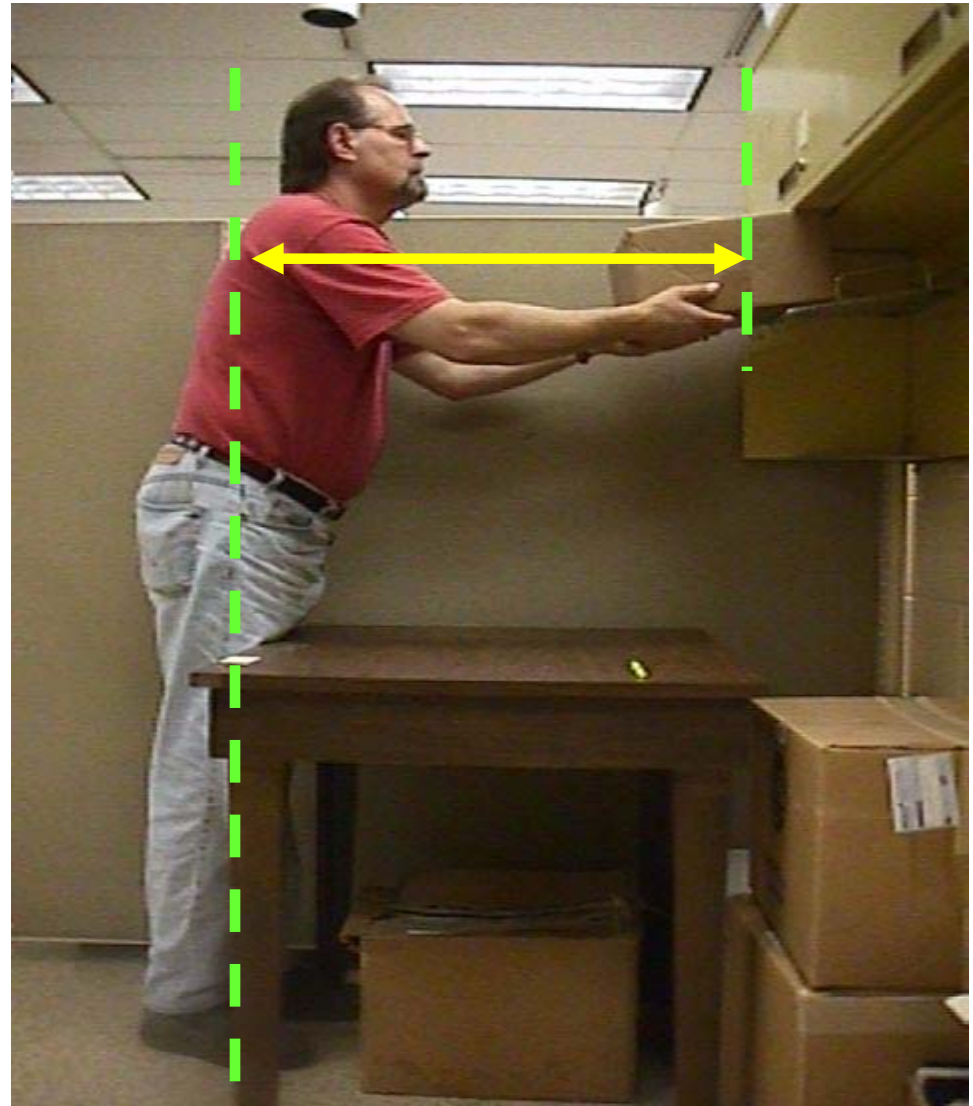


# Hand Location Vertical Origin (V-Origin)



Object Wt. (lbs)		Hand Location (in.)				Asymmetry (degrees)		Period (hours)	Freq (l/min)	Handle
L(avg)	L(max)	Origin		Destination		Orig	Dest	P	F	C
		H	V	H	V					

# Hand Location Horizontal Destination (H-destination)



Object Wt. (lbs)		Hand Location (in.)				Asymmetry (degrees)		Period (hours)	Freq (l/min)	Handle
L(avg)	L(max)	Origin		Destination		Orig	Dest	P	F	C
H	V	H	V	H	V					

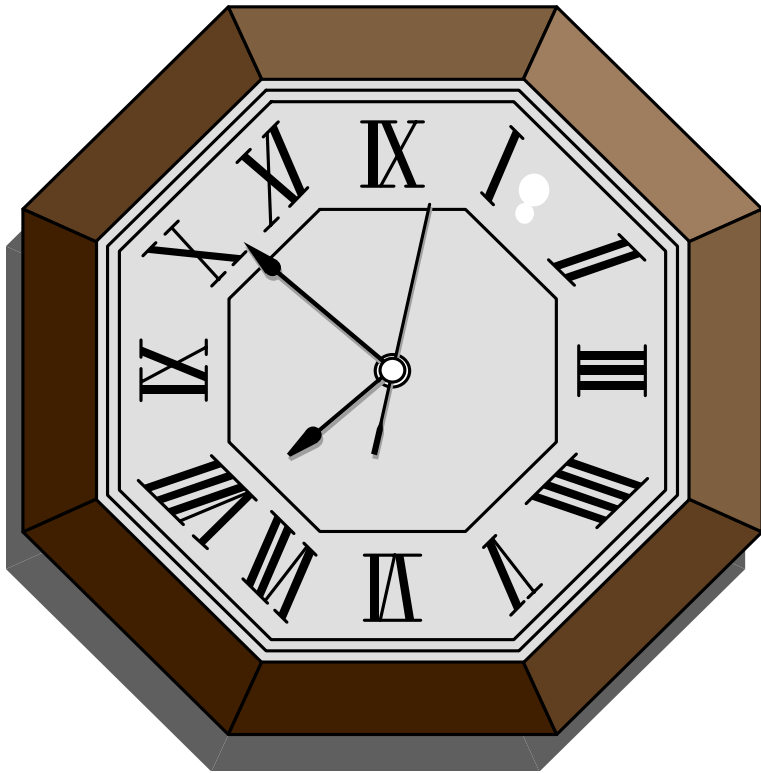
# Hand Location Vertical Destination (V-destination)



Object Wt. (lbs)		Hand Location (in.)				Asymmetry (degrees)	Period (hours)	Frequency (l/min)	Handle	
L(avg)	L(max)	H	V	H	V	Orig	Dest	P	F	C



# Period (hrs.)



Object Wt.		Hand Location (in.)				Asymmetry		Period	Freq	Handle
(lbs)		Origin		Destination		(degrees)		(hours)	(l/min)	
L(avg)	L(max)	H	V	H	V	Orig	Dest	P	F	C

# Frequency



X 1, 2, 3...

Object Wt.		Hand Location (in.)				Asymmetry	Period	Frequency	Handle	
(lbs)		Origin		Destination		(degrees)	(hours)	(l/min)		
L(avg)	L(max)	H	V	H	V	Orig	Dest	P	F	C

# Handle



Object Wt. (lbs)		Hand Location (in.)				Asymmetry (degrees)		Period (hours)	Freq (l/min)	Handle
L(avg)	L(max)	Origin		Destination		Orig	Dest	P	F	C
H	V	H	V	H	V	Orig	Dest	P	F	C

# Good Handle



Optimal containers (boxes, crates) with optimal Handles or cutouts

# Fair Handle



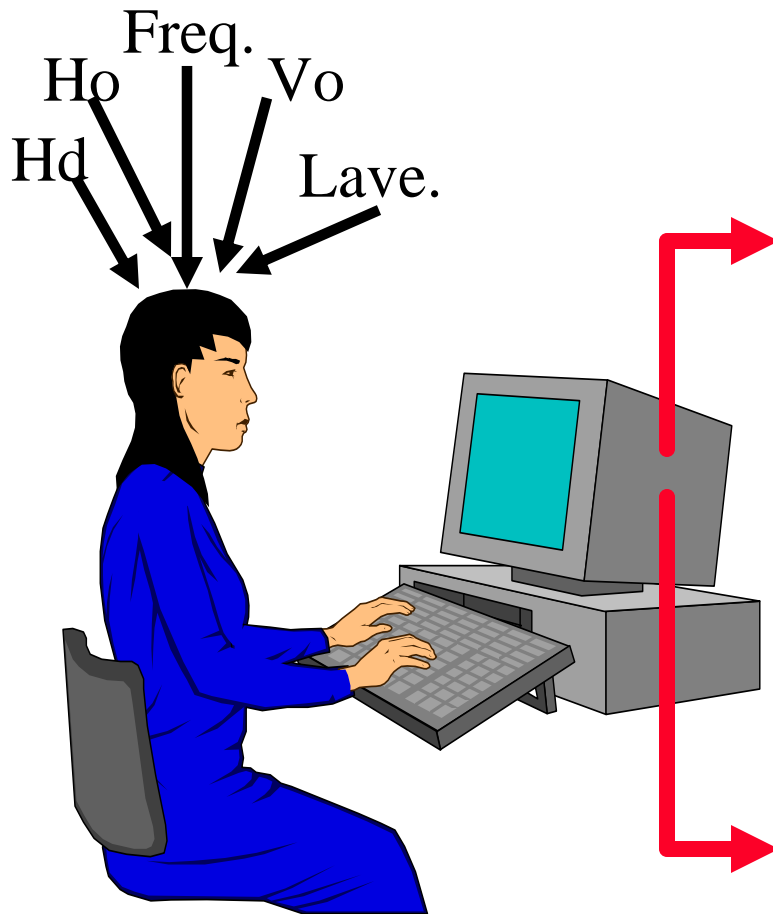
Optimal containers with less than optimal handles or cutouts,  
or hand can be flexed 90 degrees

# Poor Handle



Bulky, hard to handle, objects with sharp edges, or non-rigid bags

# How the equation works



## **Recommended Weight Limit RWL**

The weight nearly all workers can lift for a substantial time period (8hr) without an increased risk of developing lower back pain.

## **Lifting Index LI**

A relative estimate of the physical stress for a particular manual handling task.

# Who is at Risk?



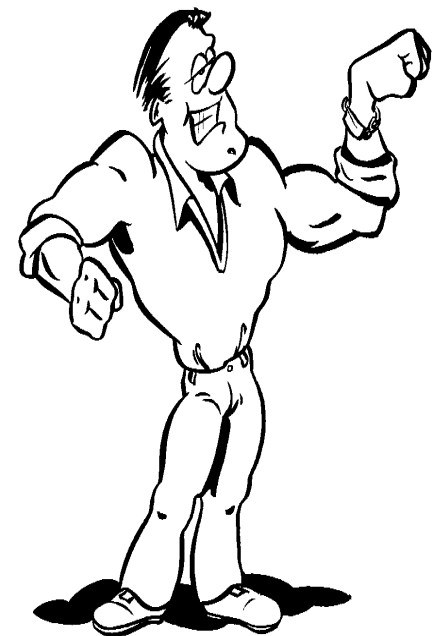
LI=1.0



Design Objective

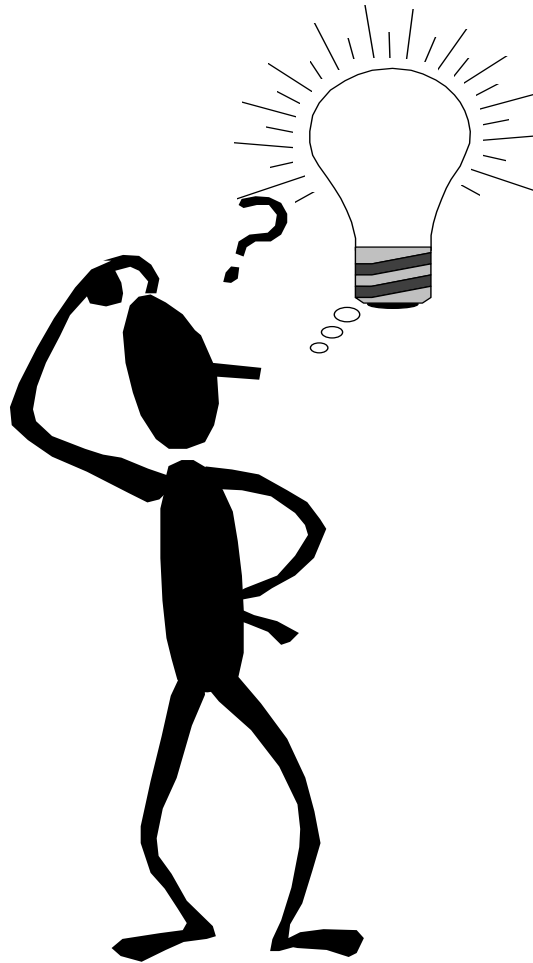


LI=2.0



LI=3.0

# Using the equation for design/modification



# Step #1

Look at LI to establish if high level of risk exists

Object Wt. (lbs)		Hand Location (in.)				Asymmetry (degrees)		Period (hours)	Freq (l/min)	Handle
L(avg)	L(max)	H	V	H	V	Orig	Dest	P	F	C
20	25	19	14	33	54	0	0	7	3	fair

RWL	RWL	LI	LI											
Origin	Dest	Origin	Dest	HM	VM	DM	FM	AM	CM	HF	VF	DF	FF	Fmax
10.7	6.0	1.87	3.32	0.53	0.88	0.87	0.84	1.00	0.95	0.32	0.86	0.78	0.89	18

# Step #2

Establish the hazard location

Object Wt. (lbs)		Hand Location (in.)				Asymmetry (degrees)		Period (hours)	Freq (l/min)	Handle
L(avg)	L(max)	H	V	H	V	Orig	Dest	P	F	C
20	25	19	14	33	54	0	0	7	3	FAIR

RWL	RWL	LI	LI											
Origin	Dest	Origin	Dest	HM	VM	DM	FM	AM	CM	HF	VF	DF	FF	Fmax
10.7	6.0	1.87	3.32	0.53	0.88	0.87	0.84	1.00	0.95	0.32	0.86	0.78	0.89	18

# Step #3

Use multipliers (\*) to establish the most hazardous part of the lift

Object Wt. (lbs)		Hand Location (in.)				Asymmetry (degrees)		Period (hours)	Freq (l/min)	Handle
L(avg)	L(max)	Origin		Destination		Orig	Dest	P	F	C
		H	V	H	V					
20	25	19	14	33	54	0	0	7	3	FAIR

RWL	RWL	LI	LI	*	*	*	*	*	*					
Origin	Dest	Origin	Dest	HM	VM	DM	FM	AM	CM	HF	VF	DF	FF	Fmax
10.7	6.0	1.87	3.32	0.53	0.88	0.87	0.84	1.00	0.95	0.32	0.86	0.78	0.89	18

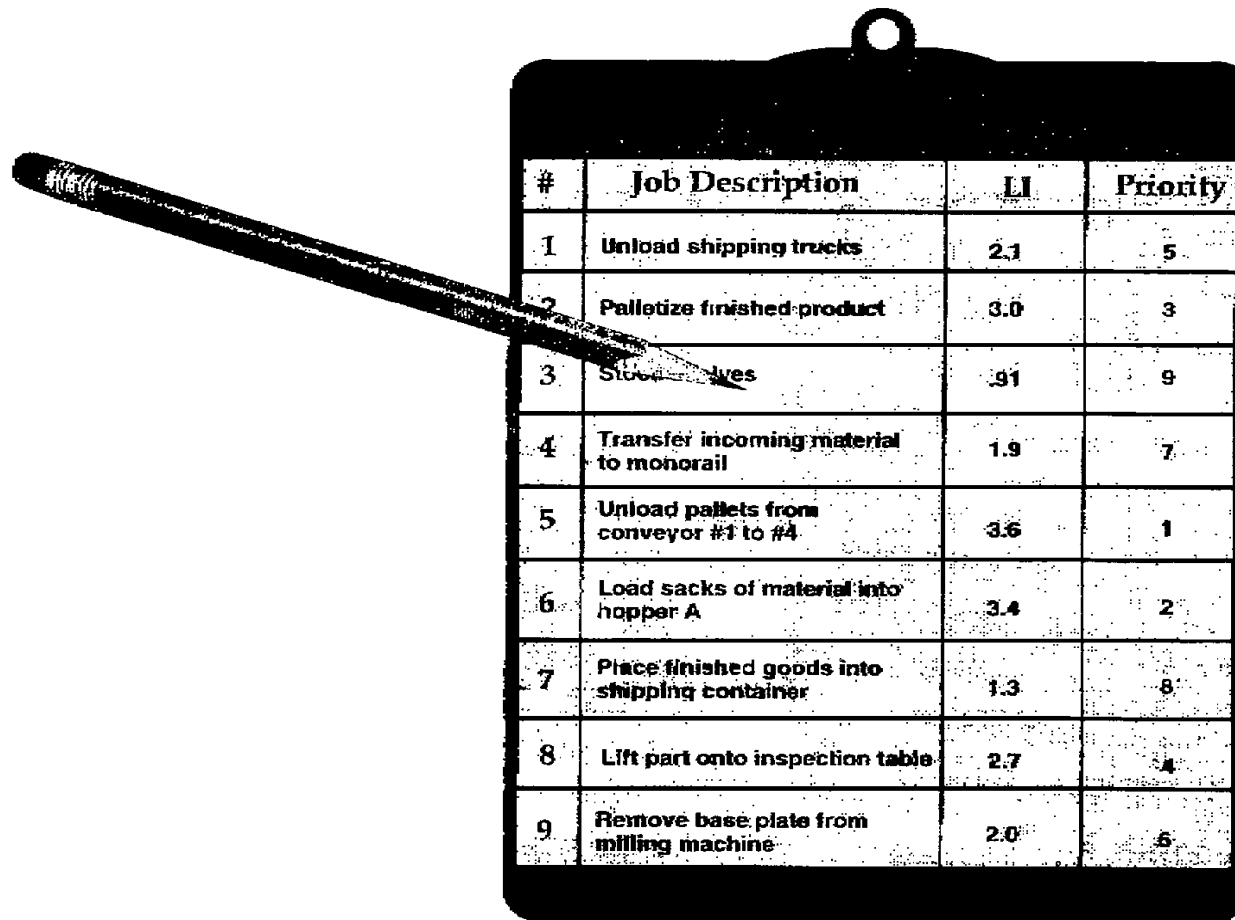
# Step #4

Experiment with measurements to find optimum design.

Object Wt.		Hand Location (in.)				Asymmetry		Period	Freq	Handle
(lbs)		Origin		Destination		(degrees)		(hours)	(l/min)	
L(avg)	L(max)	H	V	H	V	Orig	Dest	P	F	C
20	25	19	14	33	4	54	0	7	3	FAIR

RWL	RWL	LI	LI	*	*	*	*	*	*					
Origin	Dest	Origin	Dest	HM	VM	DM	FM	AM	CM	HF	VF	DF	FF	Fmax
10.7	6.0	1.87	3.32	0.53	0.88	0.87	0.84	1.00	0.95	0.32	0.86	0.78	0.89	18

# Using the equation for Project Prioritization



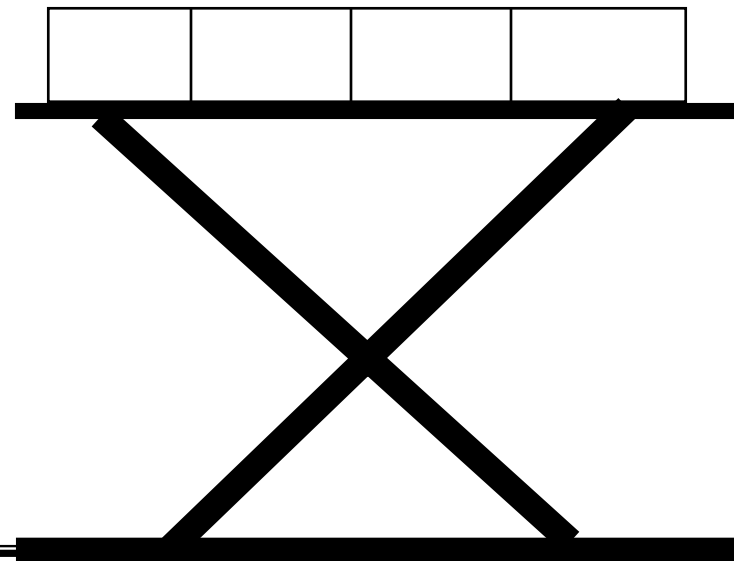
A clipboard with a pencil pointing to a table of project prioritization data. The table has four columns: #, Job Description, LI, and Priority. The data is as follows:

#	Job Description	LI	Priority
1	Unload shipping trucks	2.1	5
2	Palletize finished product	3.0	3
3	Stack shelves	.91	9
4	Transfer incoming material to monorail	1.9	7
5	Unload pallets from conveyor #1 to #4	3.6	1
6	Load sacks of material into hopper A	3.4	2
7	Place finished goods into shipping container	1.3	8
8	Lift part onto inspection table	2.7	4
9	Remove base plate from milling machine	2.0	6

# Using the equation for Quantifying Improvements



Decreased LI from lifting  
modifications implemented



# Limitations of Equation

- ❶ Can not be used for nonlifting tasks.
- ❷ Will not account for unpredictable conditions.
- ❸ Not designed to certain lifting tasks.
- ❹ Will not account for slippery/wet floor.
- ❺ Assumes lifting and lowering tasks have the same degree of risk.

# NIOSH Lifting Equation

- Widely accepted.
- Lifting task risk evaluation.
- Modify/design lifting task.
- Comparison of planned corrective action.
- Prioritize evaluation of lifting tasks.
- Show improvements.