

FACULTY WORKSHOPS DEVELOPMENT PROJECT

AGENDA

- Current Situation
- Findings on Current Situation
- Workshop Development Objectives
- Development Consideration.

COURSES – WORKSHOP MATRIX

MAINSTREAM & MANF

[illegible]

TYPES MACHINERY AT THE WORKSHOP

Prep Machining Workshop	Prep Welding Workshop	Prep Carpentry Workshop	Prep Forming Workshop	Old Welding Workshop	Old Machining Workshop		Foundry
معمل تصنيع	ماكينة لحام نقطة	معمل	معمل	ماكينة لحام كهربى SMAW	معمل تصنيع	ماكينة التجليخ	معمل بنظرية
معمل تصنيع	ماكينة لحام كهربائى	معمل	معمل	ماكينة لحام كهربى GMAW	معمل تصنيع	ماكينة التجليخ	معمل أرضى يعمل
معمل تصنيع		معمل	ماكينة نجارة	ماكينة لحام كهربى GTAW	معمل تصنيع	ماكينة التجليخ	معمل صغيرة تعمل
فريزة رأس	ماكينة صنفرة		ماكينة تنى حديد	ماكينة لحام كهربى PAC	ماكينة هوب لفتح	ماكينة التجليخ العائم	معمل إختبار
معمل تصنيع		معمل	مكبس هيدروليكى	ماكينة لحام كهربى RSW	معمل تصنيع	ماكينة سن العدة	
معمل تصنيع	حلية		مقص كهربائى	معمل تصنيع	معمل تصنيع	معمل تصنيع	
معمل تصنيع		معمل	معمل		معمل تصنيع	معمل تصنيع	
معمل تصنيع		معمل	معمل		فريزة رأسية	المقشطة الرأسية	
منشار ترددى		ماكينة لحام شريط	مكبس هوائى		فريزة أفقية	معمل تصنيع	
صاروخ قطع		ماكينة سن شريط	معمل تصنيع			معمل تصنيع	
معمل تصنيع		ماكينة سن تزجة	معمل				
معمل تصنيع		ماكينة سن	ماكينة قلوطة مواسير				
معمل تصنيع		معمل تصنيع					

CURRENT MECHANICAL WORKSHOP

The Current Mechanical Workshop Machinery is divided in two Location:

- 1) Old Workshop occupies $\approx 1000 \text{ m}^2$**
- 2) Preparatory Year Workshop $\approx 400 \text{ m}^2$**

Total Area = 1400 m^2

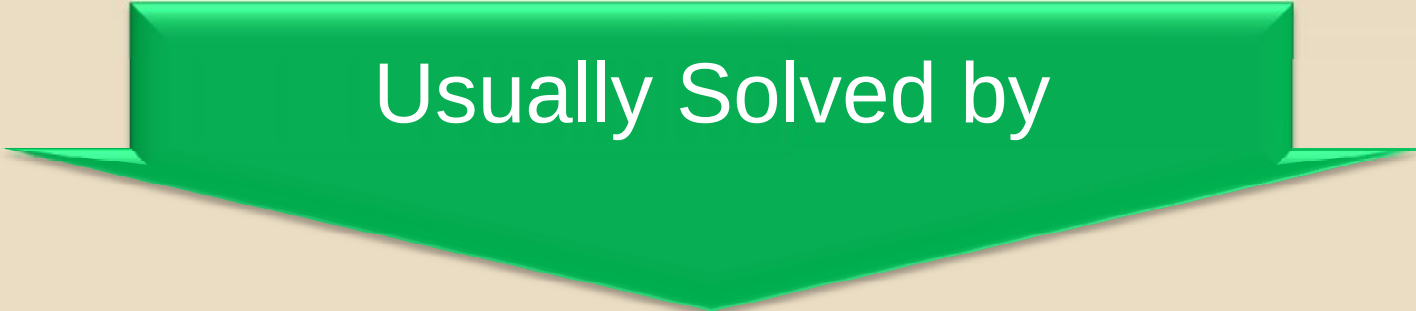
FINDINGS ON CURRENT SITUATION

- The Workshop serves 19 courses.
- Total 8330 students hours per week.
- Different courses need the same machine (i.e. 5 courses need the shaping machines).
- The Workshop includes 52 different types of machinery.
- The Mechanical Workshop includes 21 different types of machinery.
- The machines serve not only teaching but also course projects, graduation projects and research.
- Available teaching slots are limited.
- No qualified technicians/trainers are available.

FINDINGS ON CURRENT SITUATION

Previous Findings caused the following:

- Most of the machines serve more than one course, which in turn caused high probability of Clashes between courses on the machines



Usually Solved by

High Students' Density in Workshop

WORKSHOP DEVELOPMENT OBJECTIVES

- Modernize the Workshop.
- Develop the human resources working at the workshop.
- Design New layout for the workshop satisfying the following:
 - Serving all courses with the highest possible quality.
 - Improve the machines utilization.
 - Maximum area utilization.
 - Workshop Safety precautions.

NEW LAYOUT DESIGN CONSIDERATION

Courses Considerations:

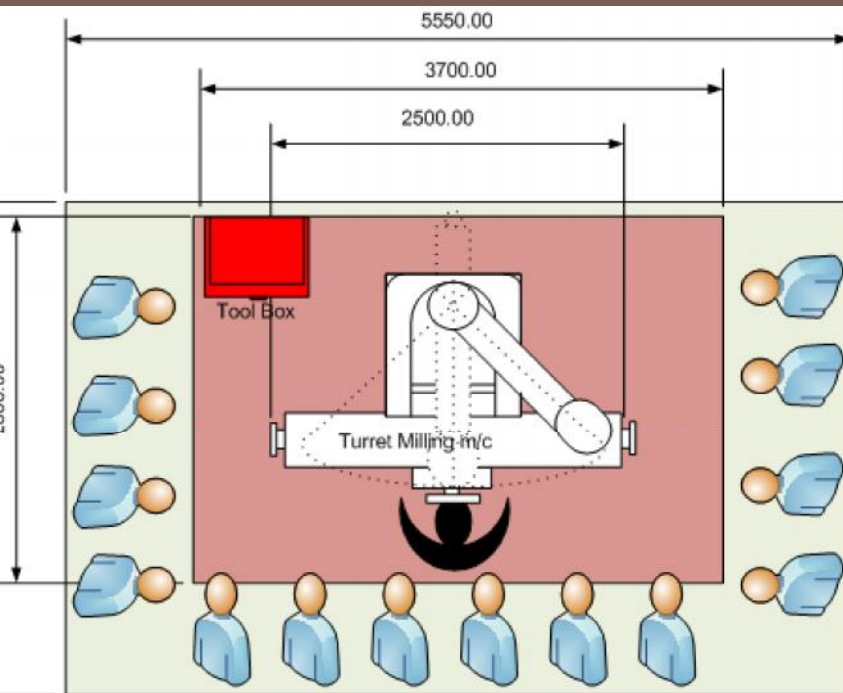
1. Course Coincidence Factor: The ratio of courses that need the workshop each semester.
2. Course Rotation Cycle: The number of weeks that certain machine will be needed for a specific course each semester.
3. Scheduling Flexibility Factor: The probability that for specific course the workshop content schedule can be made to float over the semester.
4. Students Activities at the workshop (observing, recording, sketching and/or hands-on).
5. Number of students that attend the workshop for each machine.
6. Number of Students registered in the course.
7. Number of students per section in the course.

NEW LAYOUT DESIGN CONSIDERATION

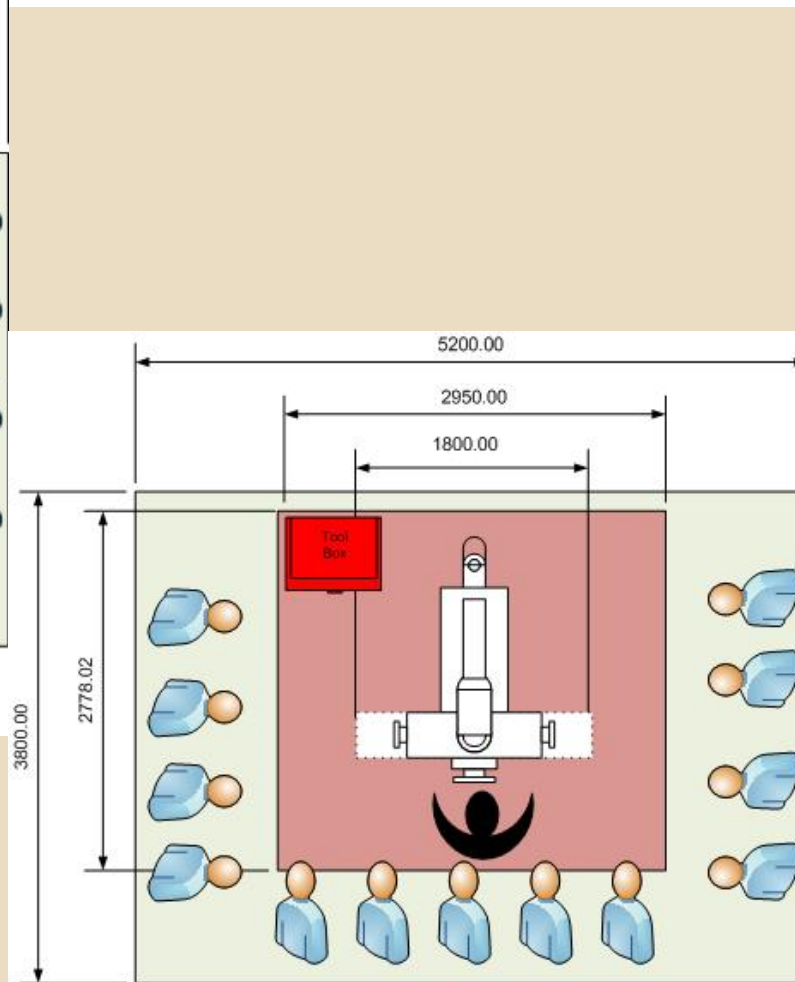
2. Workstation Considerations:

1. Machine dimensions.
2. Machine working area.
3. Maintenance area.
4. Operator's working area.
5. Working bench(s).
6. Maximum number of students in the workstation area.
7. Share of Aisles.

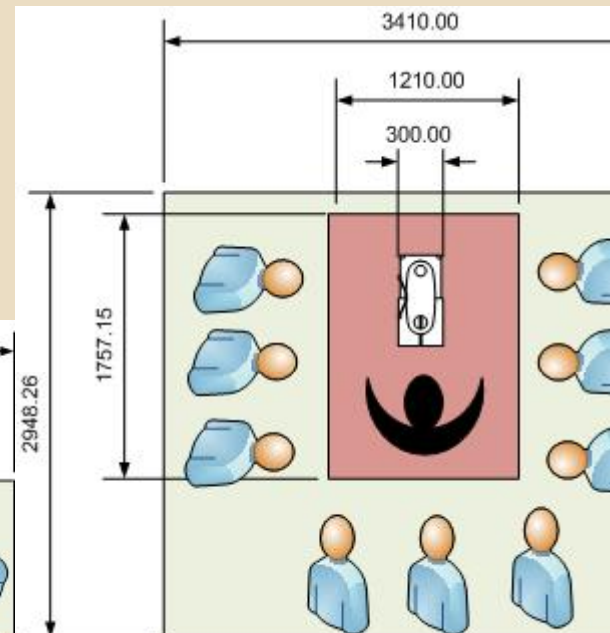
DESIGN OF MACHINE WORK STATIONS



Turret Milling

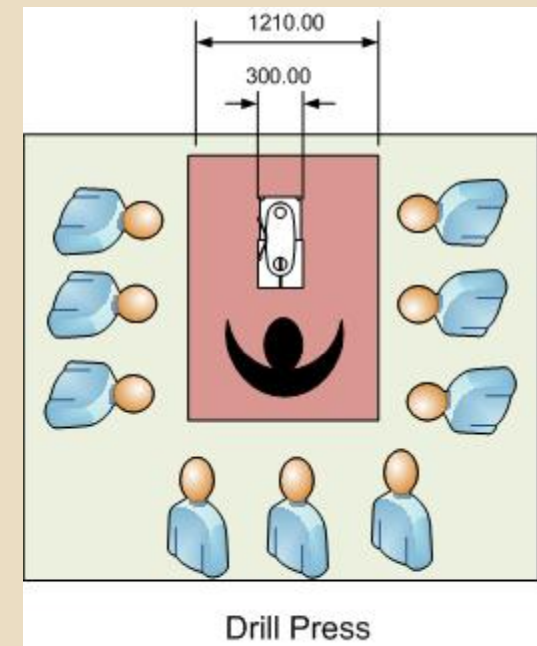
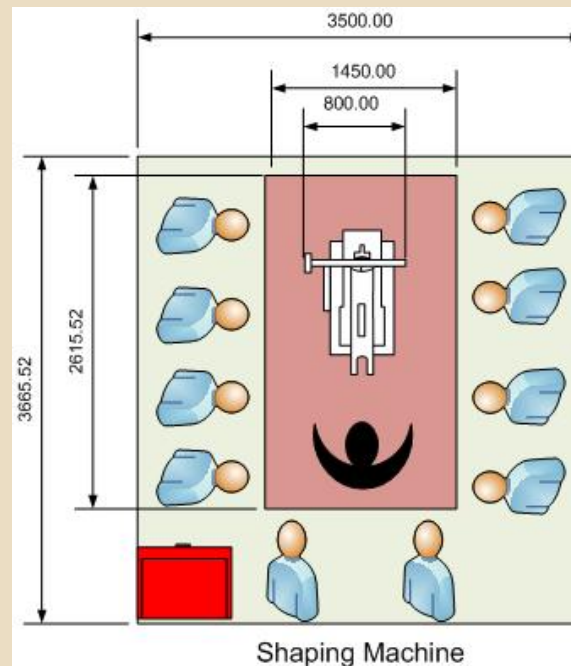
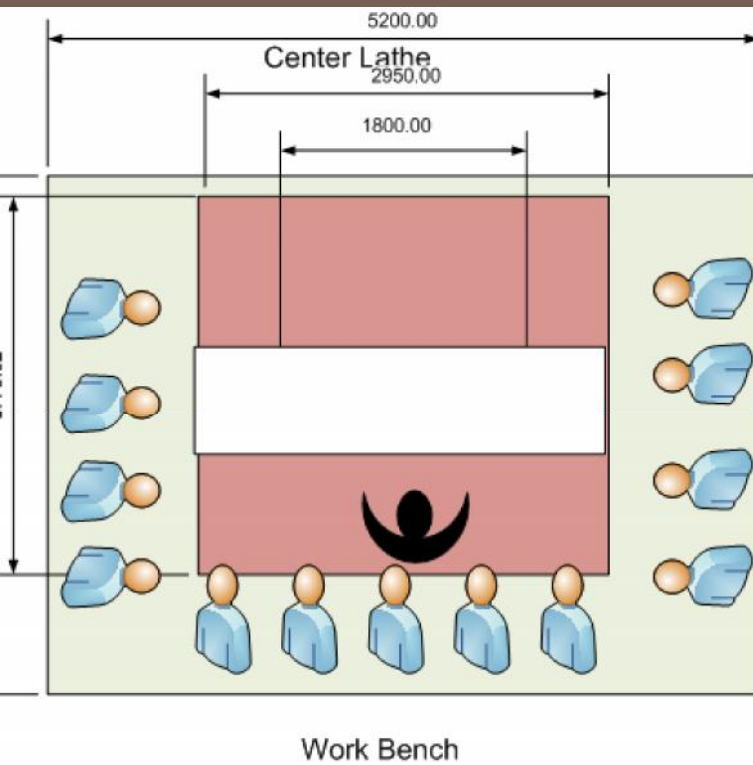


Vertical Milling

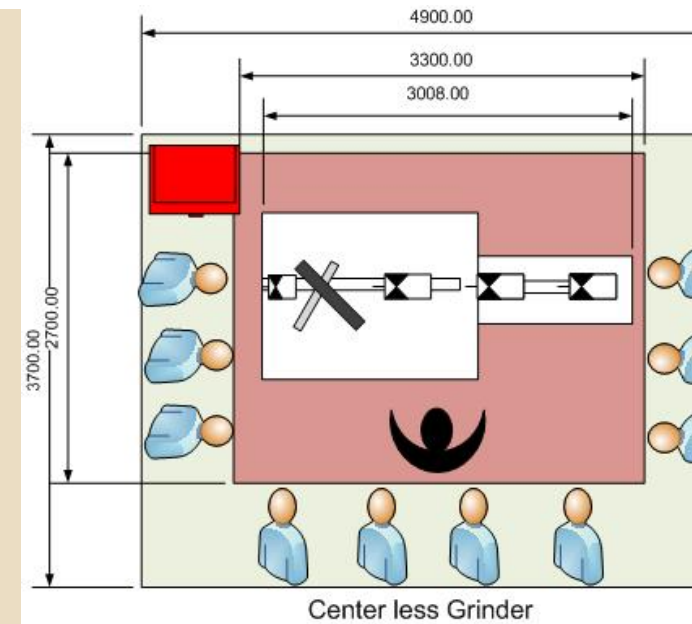
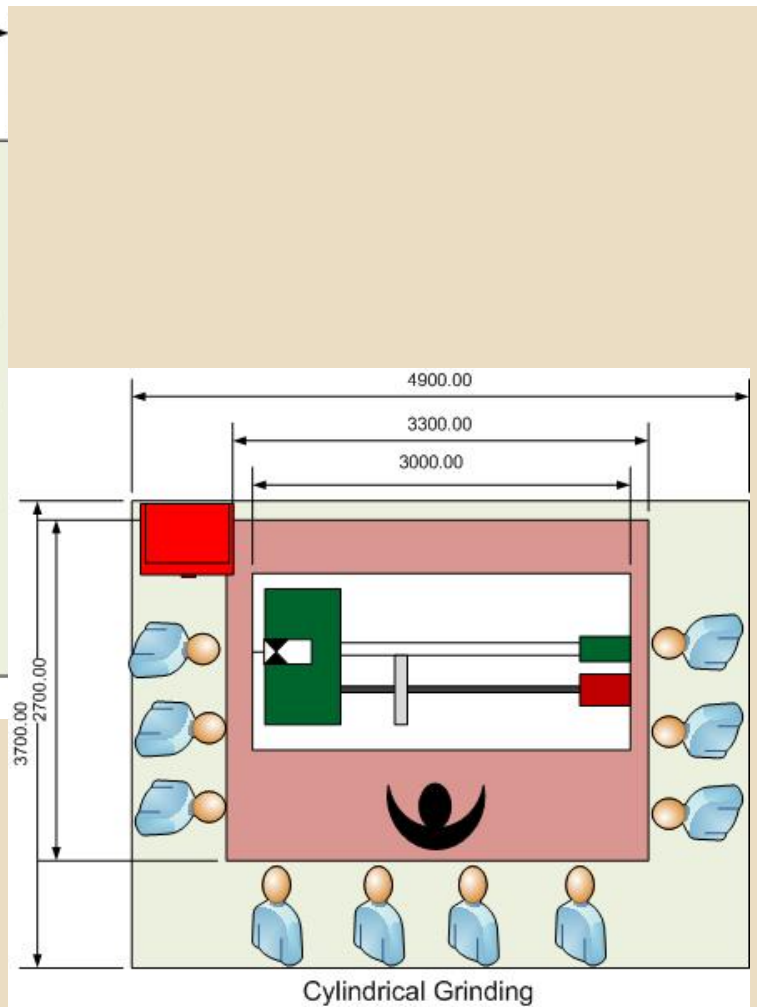
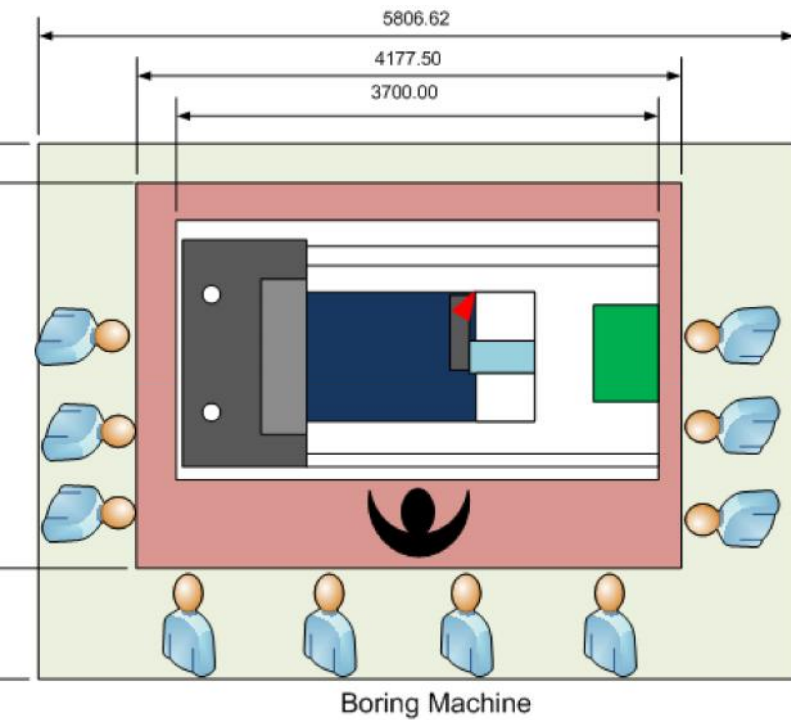


Drill Press

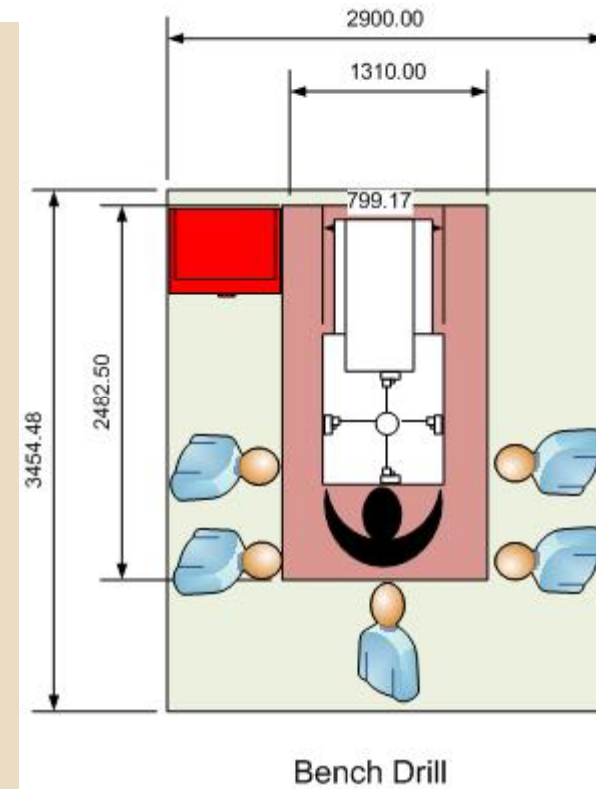
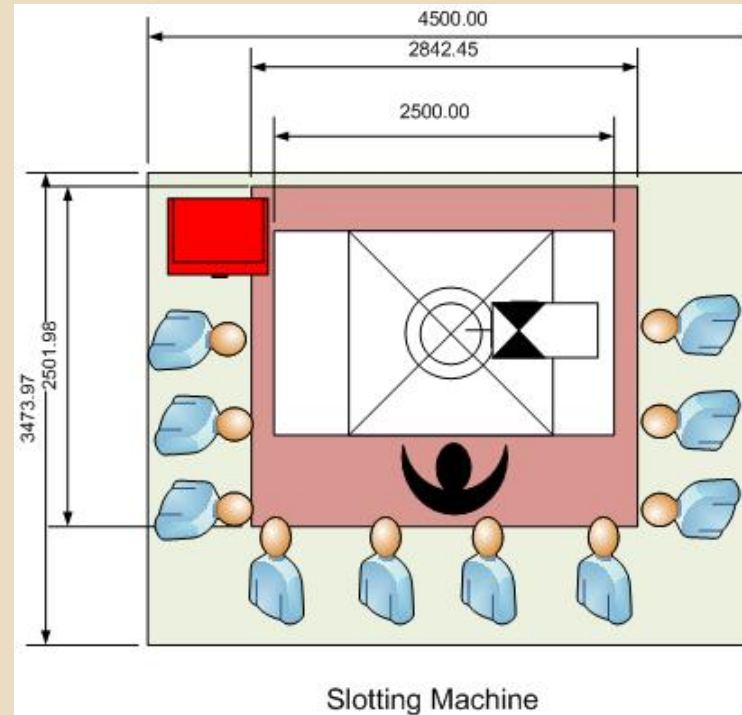
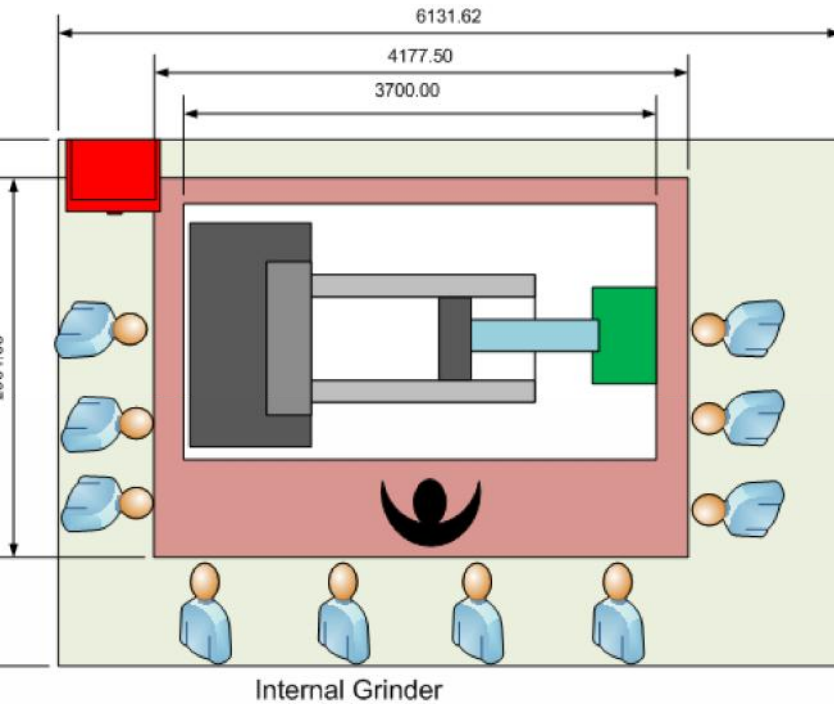
DESIGN OF MACHINE WORK STATIONS



DESIGN OF MACHINE WORK STATIONS

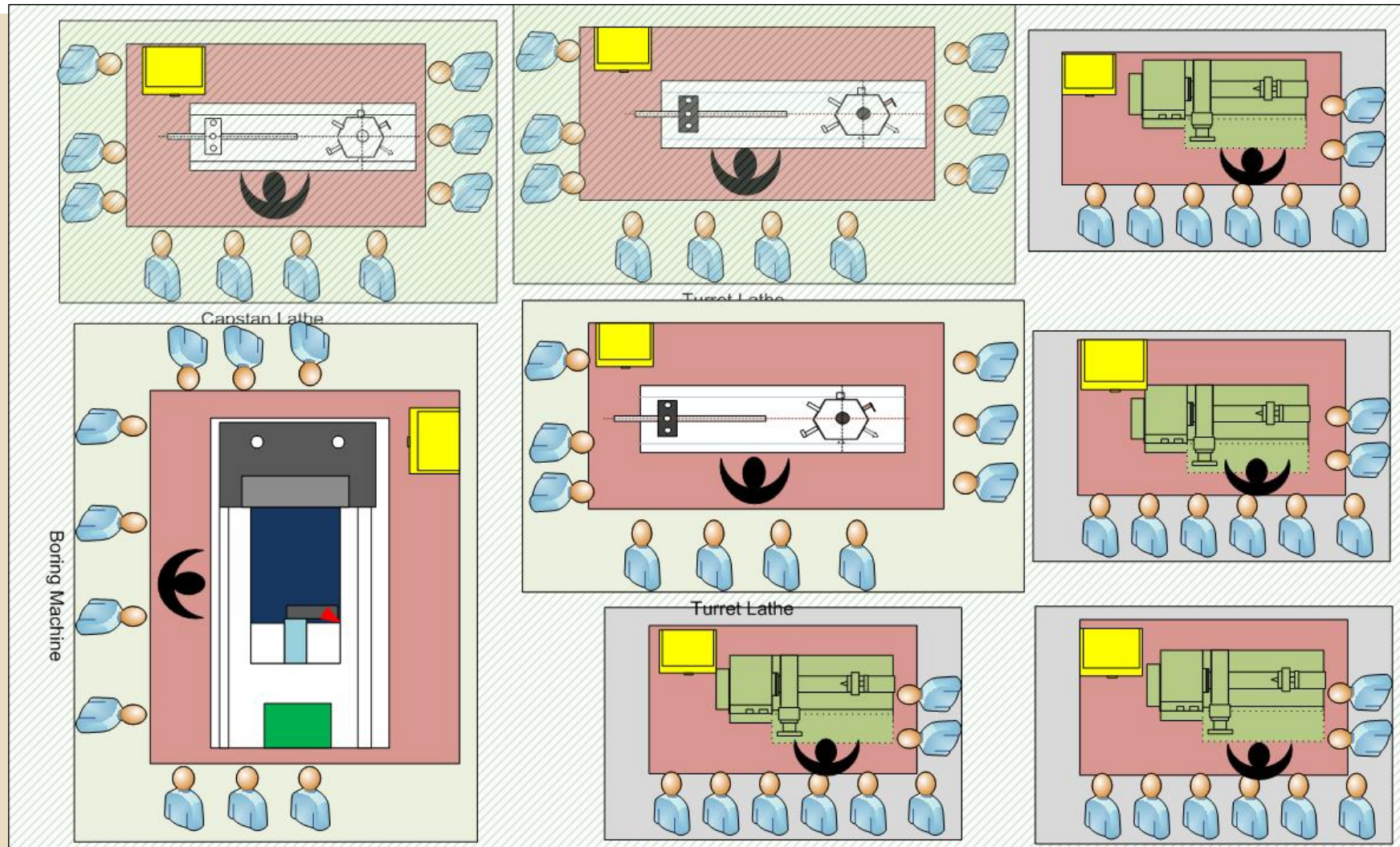


DESIGN OF MACHINE WORK STATIONS

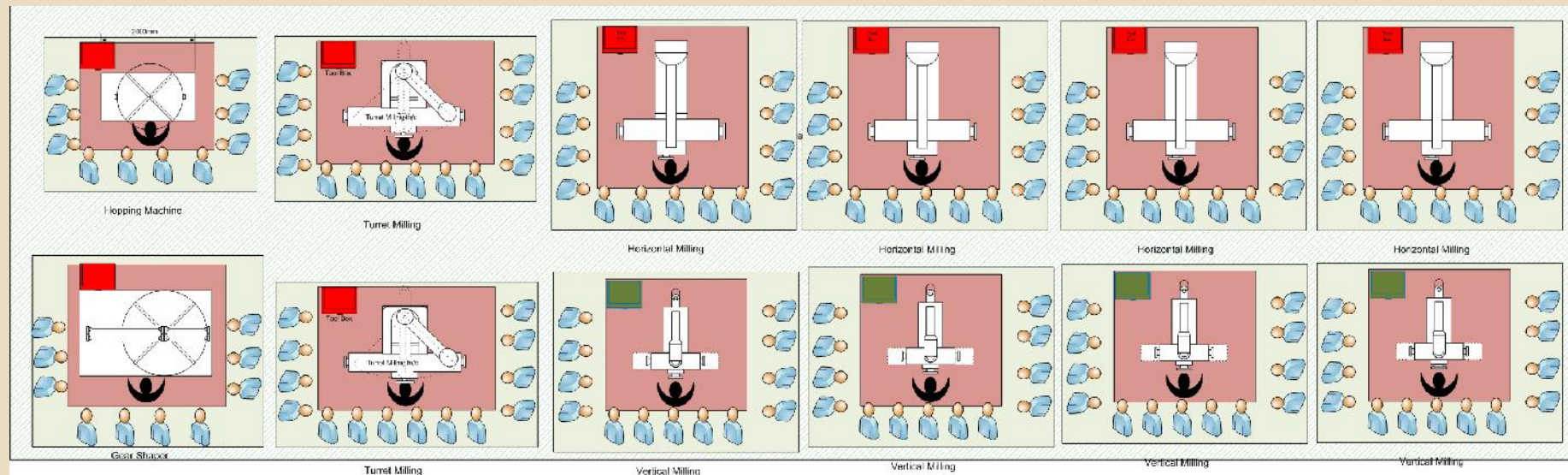


DEPARTMENTS' LAYOUT

Turing Department



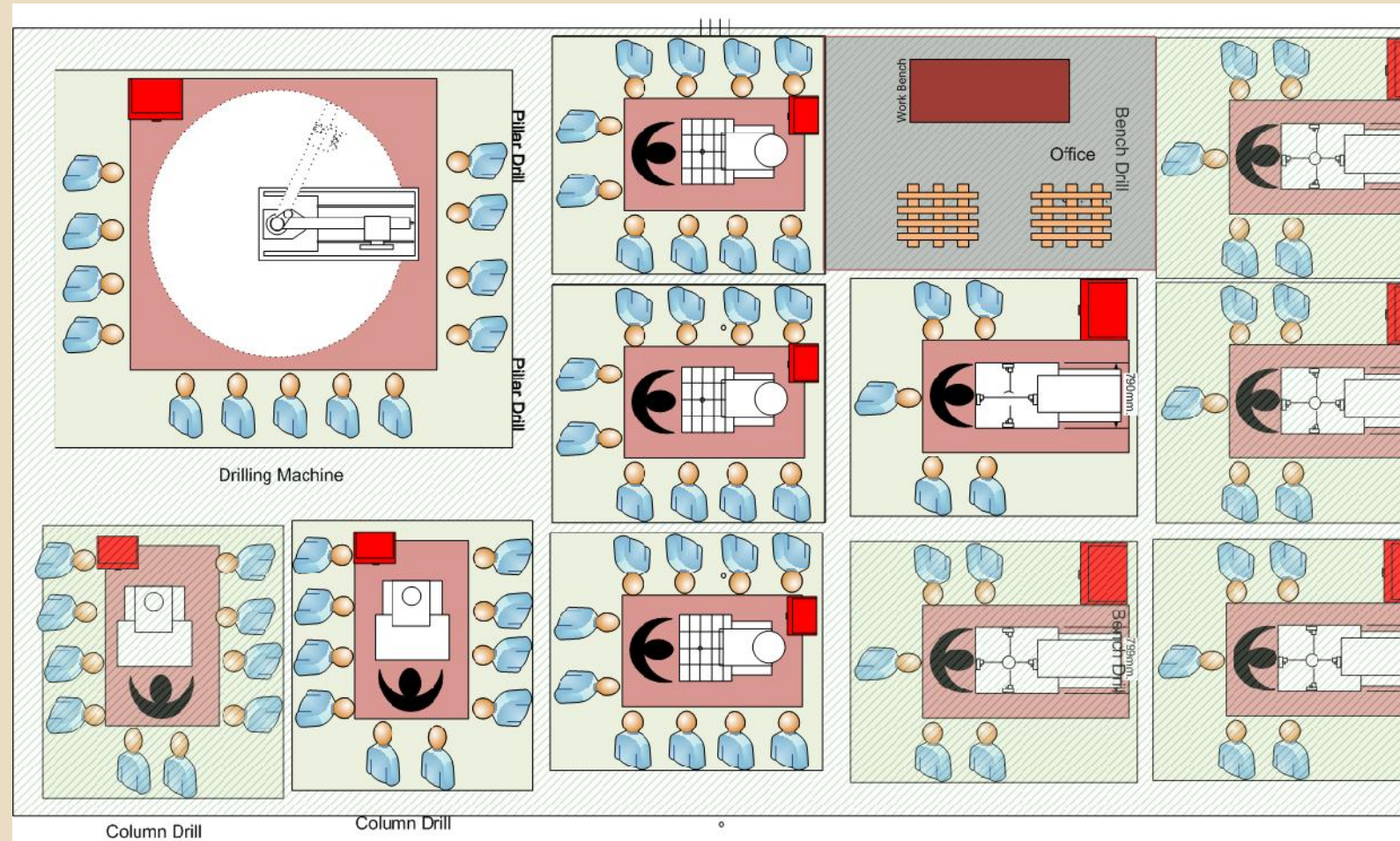
DEPARTMENTS' LAYOUT



Milling Department

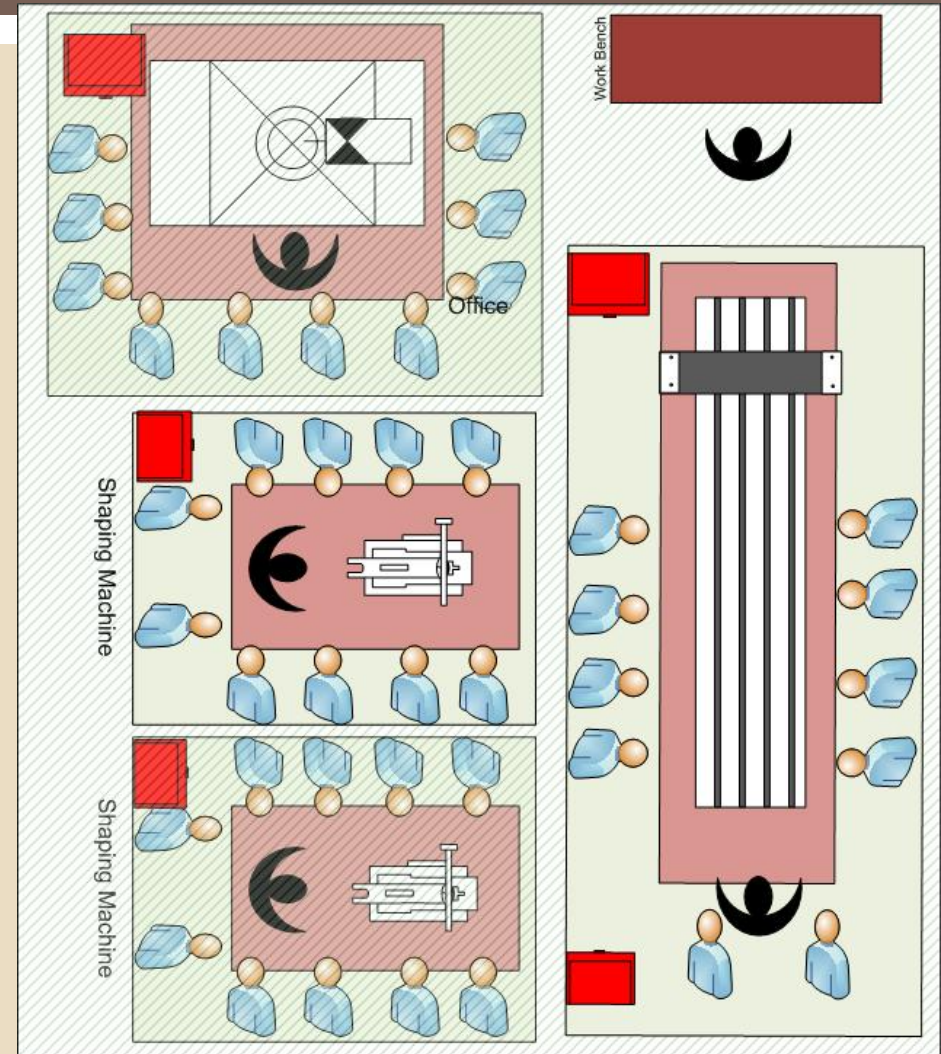
DEPARTMENTS' LAYOUT

Drilling Department



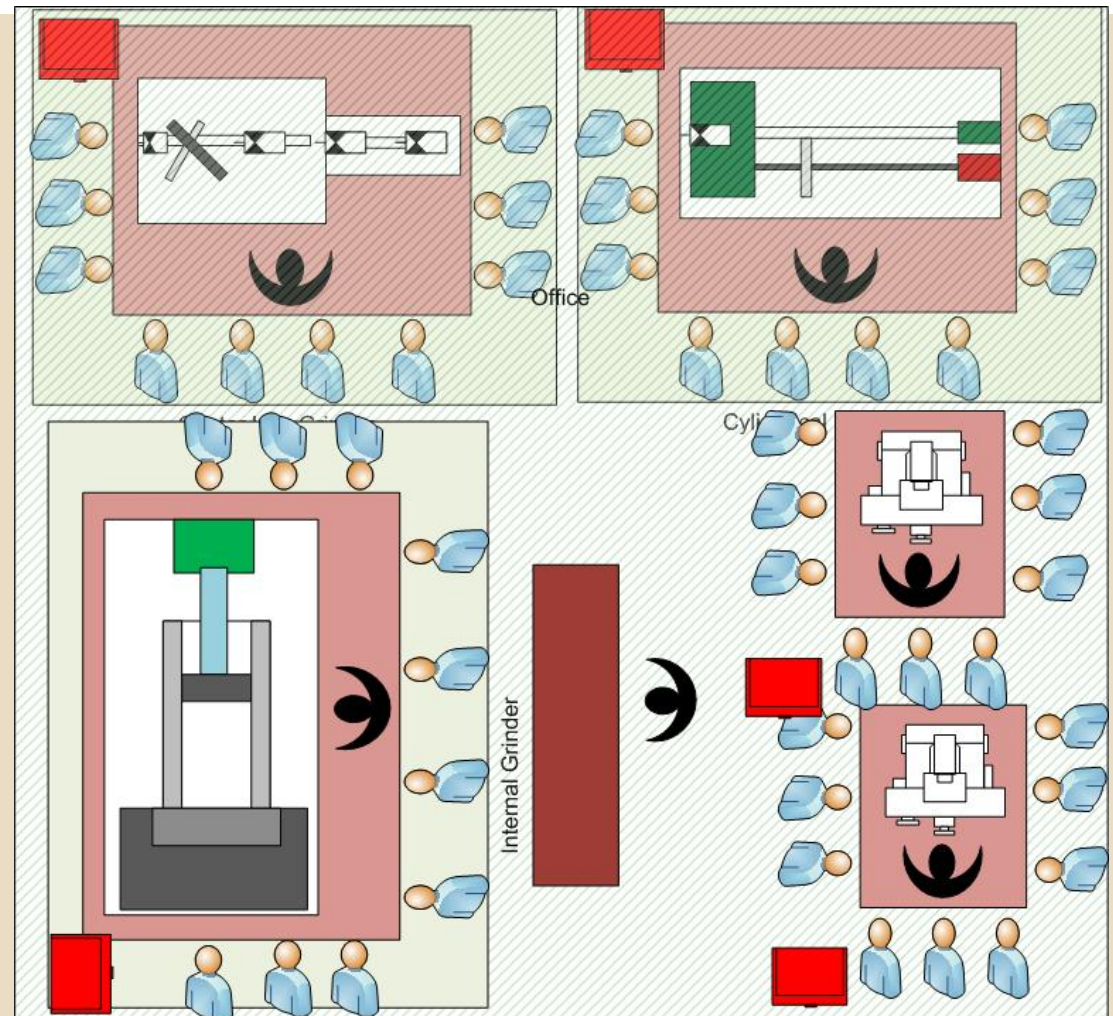
DEPARTMENTS' LAYOUT

Shaping Department



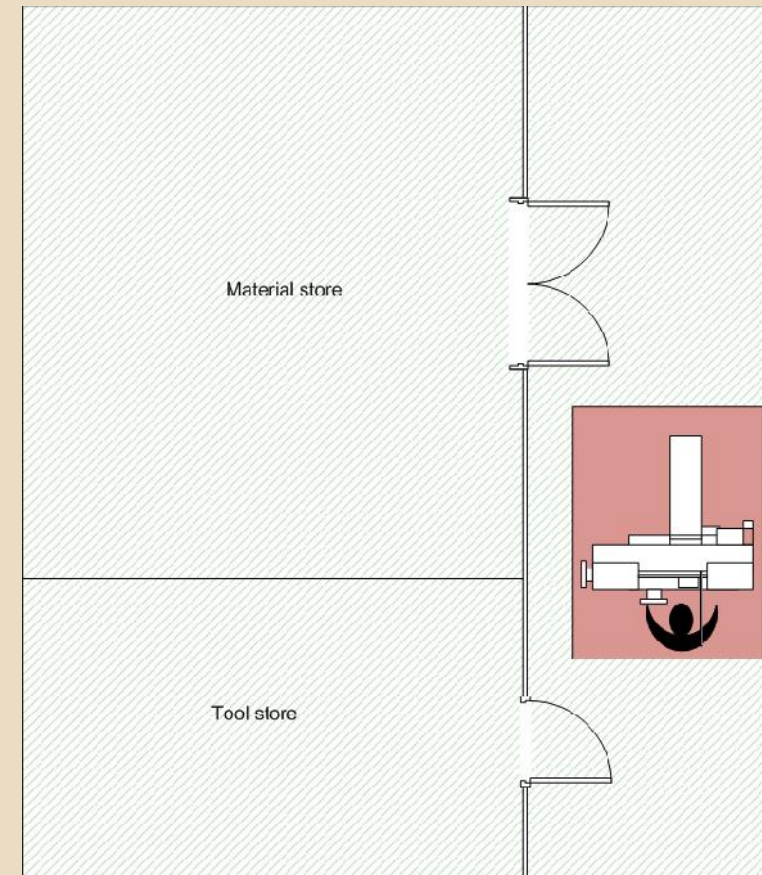
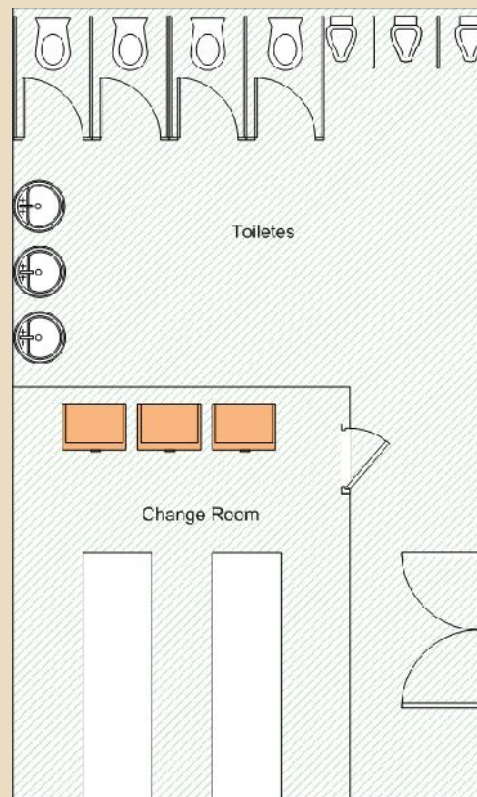
DEPARTMENTS' LAYOUT

Grinding Department



DEPARTMENTS' LAYOUT

Service Departments



ACTIVITY RELATIONSHIP DIAGRAM

	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	
Raw Material Stores (Metallic materials)	X	X	I	E	I	I	I	I	I	O	O	I	I	X	X	X	I	I	I	O	O	O	O	O	O	X	
Raw Material Stores (Timber and wood logs)	X	O	X	X	X	X	X	X	X	X	X	X	X	A	A	A	X	X	X	O	O	O	U	U	O	X	
Tools store			X	E	E	E	E	E	O	O	O	O	O	I	I	I	I	E	E	O	O	O	O	O	I	X	
Conventional Turning machinery				X	E	E	E	E	U	U	U	O	U	U	U	U	O	I	I	U	O	O	I	I	I	X	
Conventional Milling machinery					X	E	E	E	X	X	X	O	X	X	X	X	O	I	I	O	O	O	I	I	I	X	
Conventional Drilling machinery						X	E	E	X	X	X	O	O	U	U	U	O	I	I	O	O	O	I	I	I	X	
Conventional Shapping machinery							X	E	U	U	U	U	U	X	X	X	O	I	I	O	O	O	I	I	I	X	
Grinding machinery								X	O	U	X	O	O	X	X	X	O	O	O	O	O	O	I	I	I	X	
Forging machinery									X	O	U	U	O	X	X	X	O	U	U	O	O	O	I	I	O	X	
Casting machinery										X	A	X	X	X	X	X	O	O	O	I	I	I	I	I	U	X	
Paint shop and lab											X	X	X	X	X	X	X	X	X	X	O	O	I	I	U	X	
Sheet metal machinery												X	E	X	X	X	I	O	O	O	O	O	I	I	I	X	
Mechanical presses														X	X	X	X	U	U	U	U	O	O	I	I	O	X
Wood cutting															X	A	A	X	X	X	O	O	O	I	I	O	U
Wood surface preparation machinery																X	A	X	X	X	O	O	O	I	I	O	X
Wood forming machinery																	X	X	X	X	O	O	O	I	I	O	X
Welding machinery																		X	O	O	O	O	O	I	I	I	X
Non-conventional machinery																			X	E	O	O	O	I	I	O	X
CNC machinery																				X	O	O	O	I	I	O	X
Technicians toilets and change room																					X	O	O	U	U	O	X
Workers Toilets																						X	O	U	U	O	X
Custodial services																							X	U	O	O	X
First aid																								X	I	O	O
Workshop management																									X	U	O
Finishing and assembly area																										X	O
																											X

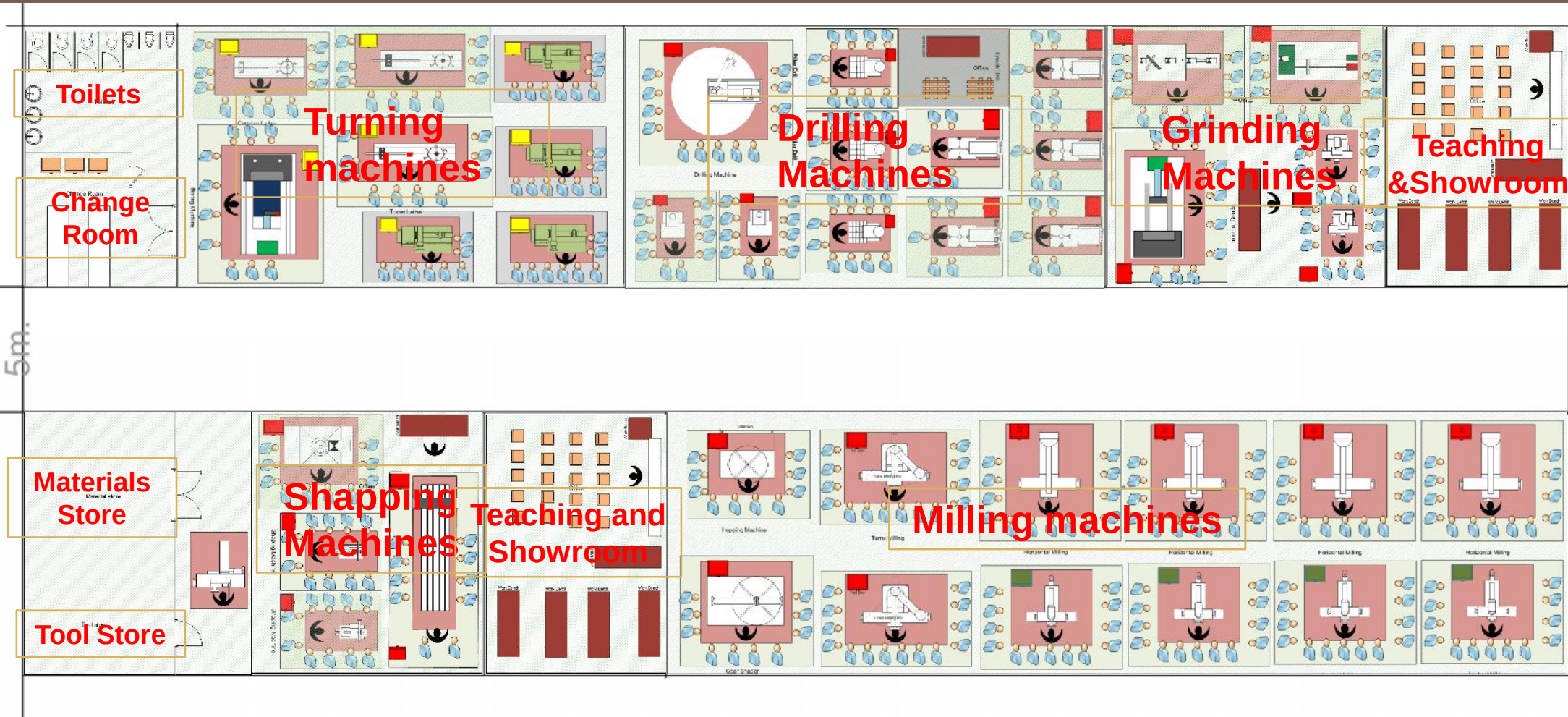
A	Absolutely necessary
E	Especially important
I	Important
O	Ordinary
U	Unimportant
X	Undesirable
	REASONS
1	Quantity of flow
2	Cost of material handling
3	Equipment used in material handling
4	Need for close communication
5	Need share some personnel
6	Need to share some equipment
7	Separation necessary due to:
	Noise
	Danger
	Chemicals
	Fumes
	Explosion

ACTIVITY RELATIONSHIP DIAGRAM

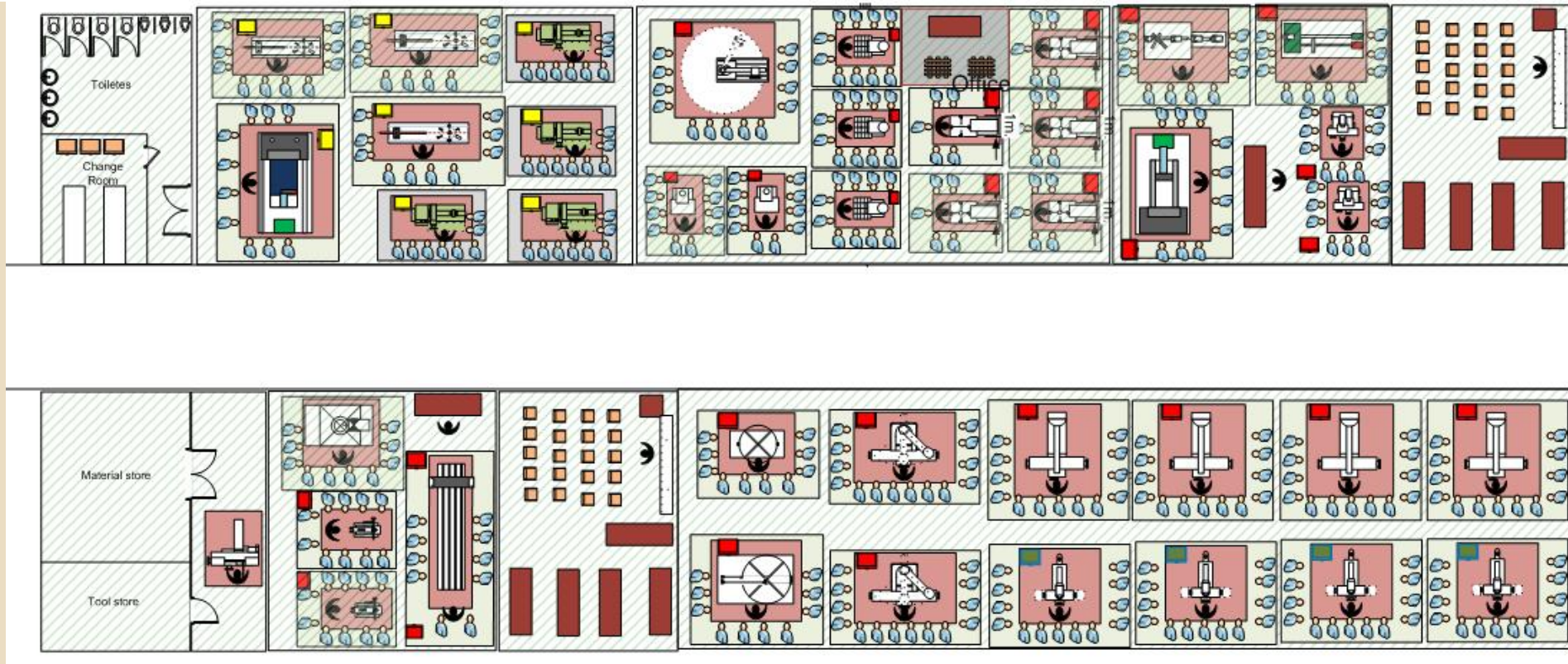
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25
Raw Material Stores (Metallic materials)	Y	-1	2	3	2	2	2	2	2	1	1	2	2	-1	-1	-1	2	2	2	1	1	1	1	1	1
Raw Material Stores (Timber and wood logs)	Y	1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	4	4	4	-1	-1	-1	1	1	1	0	0	1
Tools store			Y	3	3	3	3	3	1	1	1	1	1	2	2	2	2	3	3	1	1	1	1	1	2
Conventional Turning machinery				Y	3	3	3	3	0	0	0	1	0	0	0	0	1	2	2	0	1	1	2	2	2
Conventional Milling machinery					Y	3	3	3	-1	-1	-1	1	-1	-1	-1	-1	1	2	2	1	1	1	2	2	2
Conventional Drilling machinery						Y	3	3	-1	-1	-1	1	1	0	0	0	1	2	2	1	1	1	2	2	2
Conventional Shapping machinery							Y	3	0	0	0	0	0	-1	-1	-1	1	2	2	1	1	1	2	2	2
Grinding machinery								Y	1	0	-1	1	1	-1	-1	-1	1	1	1	1	1	1	2	2	2
Forging machinery									Y	1	0	0	1	-1	-1	-1	1	0	0	1	1	1	2	2	1
Casting machinery										Y	4	-1	-1	-1	-1	-1	1	1	1	2	2	2	2	2	0
Sand lab											Y	-1	-1	-1	-1	-1	-1	-1	-1	-1	1	1	2	2	0
Sheet metal machinery												Y	3	-1	-1	-1	2	1	1	1	1	1	2	2	2
Mechanical presses													Y	-1	-1	-1	0	0	0	0	1	1	2	2	1
Wood cutting														Y	A	4	-1	-1	-1	1	1	1	2	2	1
Wood surface preparation machinery															Y	4	-1	-1	-1	1	1	1	2	2	1
Wood forming machinery																Y	-1	-1	-1	1	1	1	2	2	1
Welding machinery																	Y	1	1	1	1	1	2	2	2
Non-conventional machinery																		Y	3	1	1	1	2	2	1
CNC machinery																			Y	1	1	1	2	2	1
Technicians toilets and change room																				Y	1	1	0	0	1
Workers Toilets																					Y	1	0	0	1
Custodial services																						Y	0	1	1
First aid																							Y	2	1
Workshop management																								Y	0
Filling and assembly area																									Y

28	Raw Material Stores (Metallic materials)
2	Raw Material Stores (Timber and wood logs)
43	Tools store
30	Conventional Turning machinery
23	Conventional Milling machinery
28	Conventional Drilling machinery
26	Conventional Shapping machinery
26	Grinding machinery
8	Forging machinery
11	Casting machinery
-2	Sand lab
16	Sheet metal machinery
8	Mechanical presses
6	Wood cutting
5	Wood surface preparation machinery
9	Wood forming machinery
18	Welding machinery
22	Non-conventional machinery
22	CNC machinery
18	Technicians toilets and change room
22	Workers Toilets
23	Custodial services
38	First aid
38	Workshop management
30	Filling and assembly area

GENERAL WORKSHOP LAYOUT

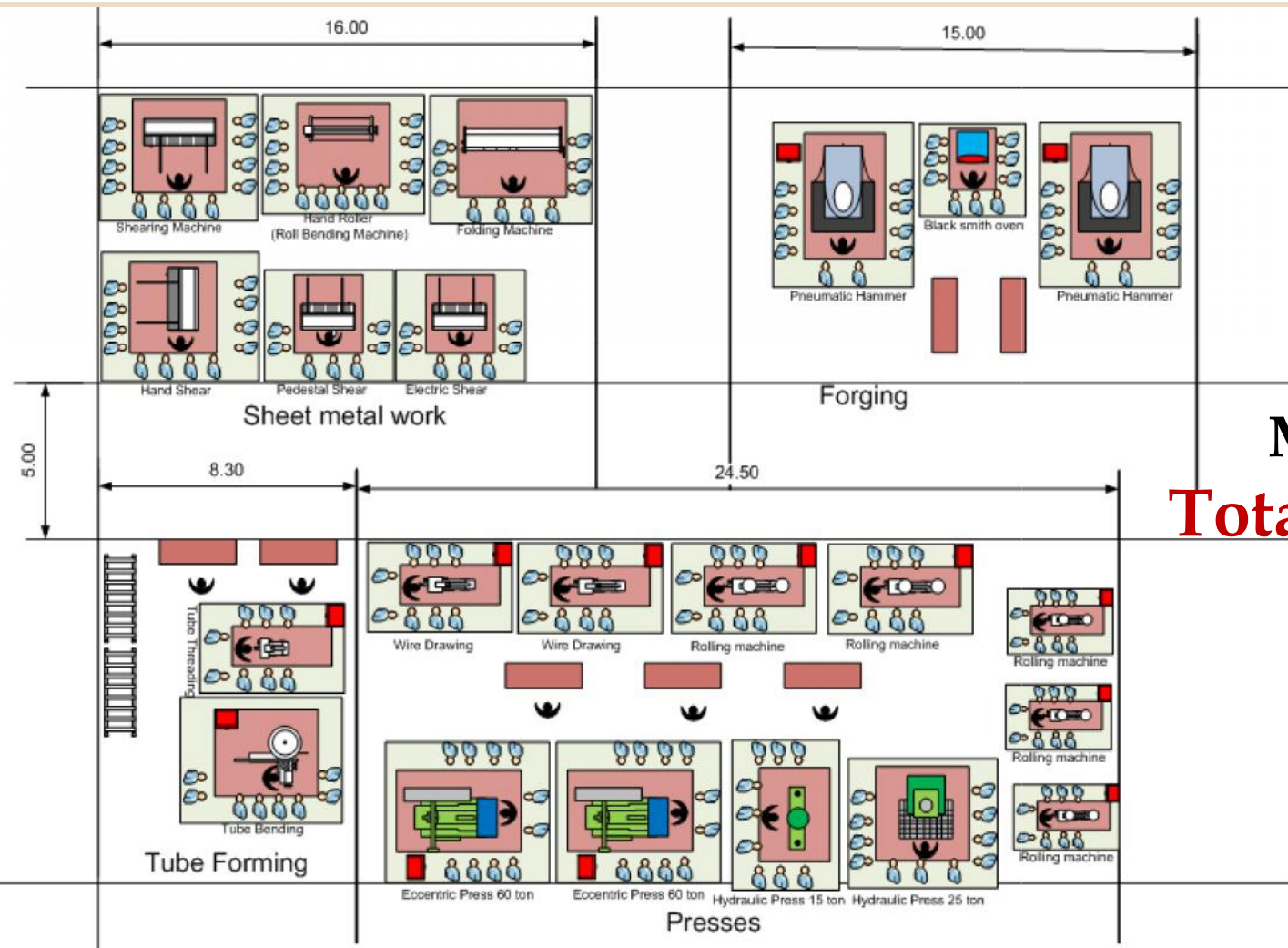


DEPARTMENTS' LAYOUT



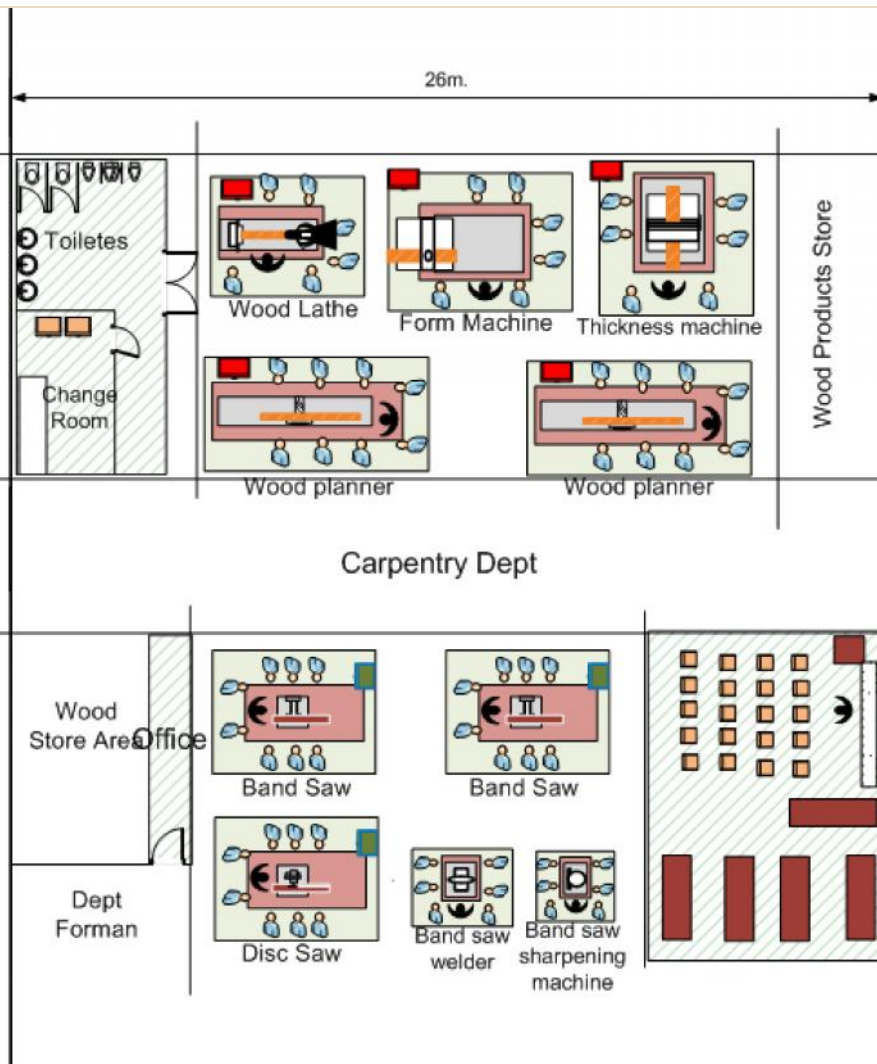
Mechanical Workshop Layout
Total Workshop Area = 1400 m²

LAYOUT OF SHEET METAL AND FORGING DEPT.



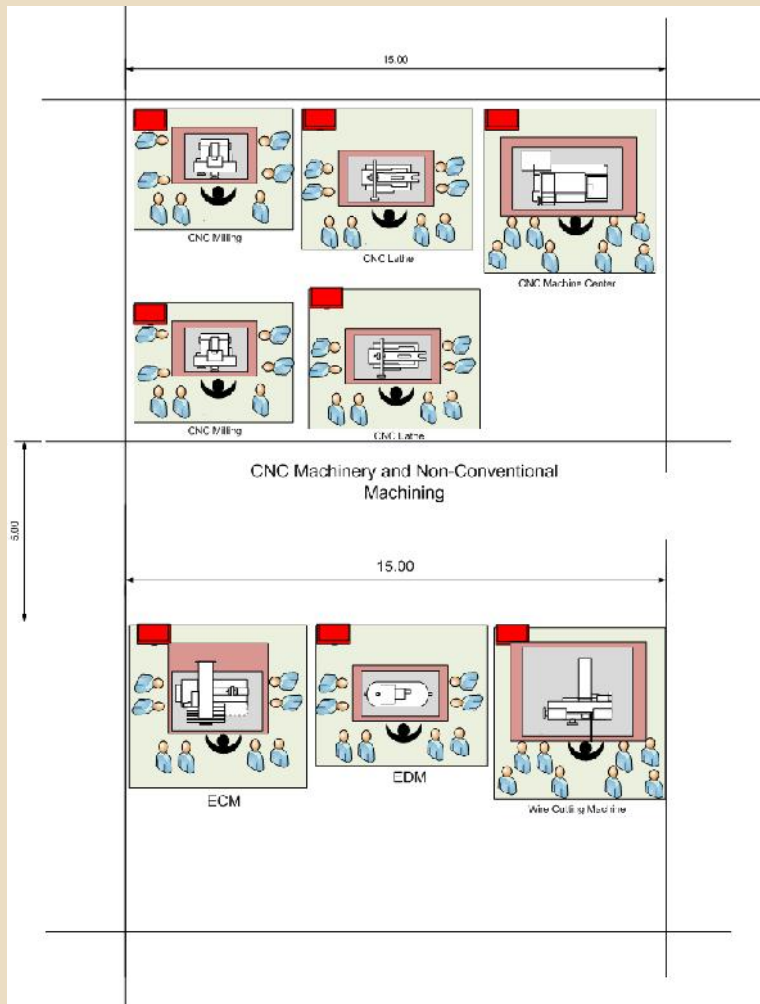
Metal Forming Dept. Layout
Total Workshop Area = 600 m²

LAYOUT OF CARPENTRY DEPT.



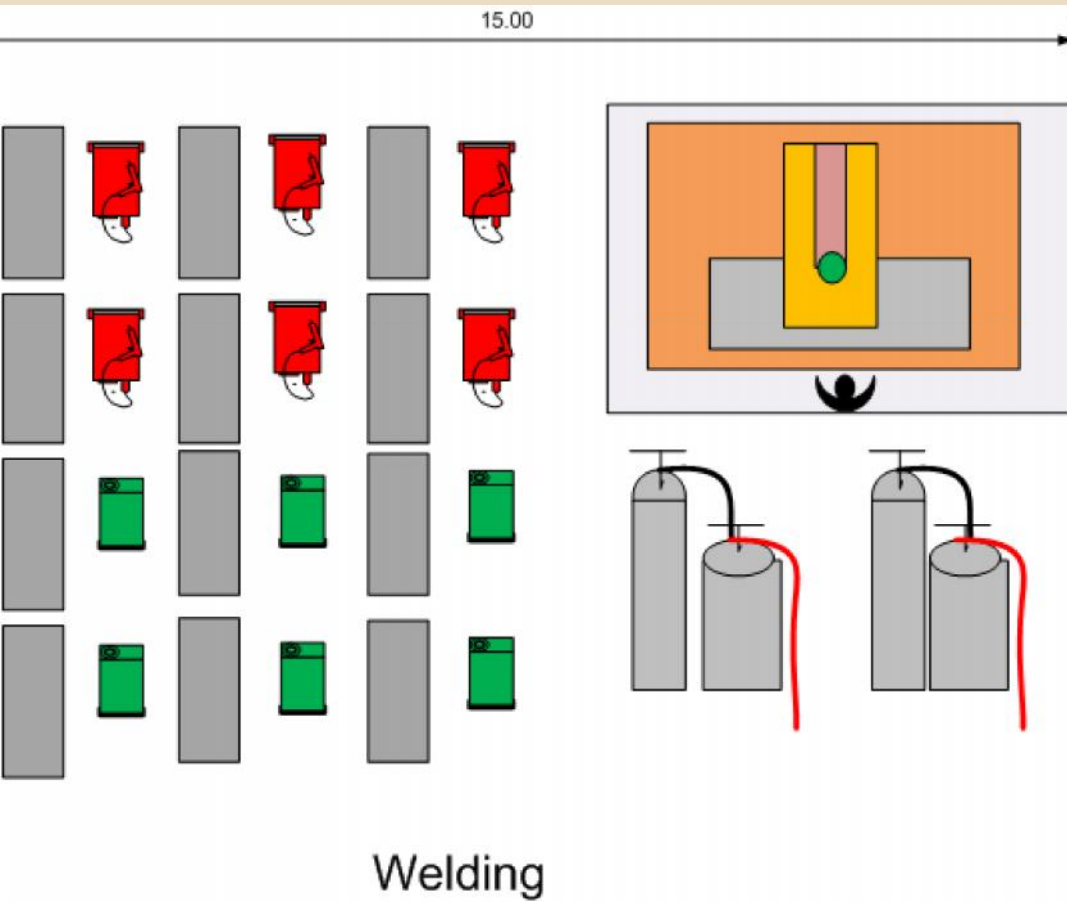
Carpentry Dept. Layout
Total Workshop Area = 500 m²

LAYOUT OF CNC & NON-CONVENTIONAL DEPT.



CNC & Non-Conventional Dept. Layout
Total Workshop Area = 300 m²

LAYOUT OF WELDING DEPT.



Welding Dept. Layout
Total Workshop Area $\approx 150\text{m}^2$

TOTAL WORKSHOP AREA

<i>Mechanical workshop</i>	$\approx 1400 \text{ m}^2$
<i>Metal Forming workshop</i>	$\approx 600 \text{ m}^2$
<i>Carpentry workshop</i>	$\approx 500 \text{ m}^2$
<i>CNC & Non-conventional</i>	$\approx 300 \text{ m}^2$
<i>Welding workshop</i>	$\approx 150 \text{ m}^2$
	2950 m^2
<i>Foundry (casting)</i>	$\approx 700 \text{ m}^2$
<i>Polymer workshop (with lab)</i>	$\approx 150 \text{ m}^2$
<i>Total</i>	3800 m^2

FOUNDRY WORK REQUIREMENT & ENVIRONMENT

Includes:

- Cast house
- Furnaces
- Forging
- Welding

Work Requirement:

- Open large storage area
- Good ventilation
- High roof
- Benches for hands-on exercises
- Safety gears (gloves, coat, eye glasses)
- High electric energy
- Should be isolated from other work areas

■ Possible Hazards:

- High heat emissions
- Fumes
- Sand and dust
- Falling weights
- Electric hazards
- Flammable materials (solar, charcoal, gases)
- Exposed hot surfaces

CARPENTRY WORK REQUIREMENT & ENVIRONMENT

Includes:

- Wood cutting
- Wood forming
- Wood cladding

Work Requirement:

- large storage area
- Good ventilation
- High roof (long logs)
- Benches for exercises
- Safety gears
- Should be isolated from other work areas

N.B. students are not allowed to use carpentry machinery

■ Possible Hazards:

- Flying wood dust
- Very sharp moving tools
- Falling weights
- Electric hazards
- Flammable materials
- Moving parts

MECHANICAL WORKSHOP WORK REQUIREMENT & ENVIRONMENT

Includes:

- Mechanical workshop
- CNC machinery
- Non-Conventional machining

Work Requirement:

- Safety gears
- Controlled work environment
 - Closed space
 - air-conditioning

■ Possible Hazards:

- Sharp moving parts
- Possible flying chip
- Electrical hazards

SHEET METAL AND FORMING WORKSHOP WORK REQUIREMENT & ENVIRONMENT

Includes:

- Sheet metal
- Presses
- Tube forming
- Wire drawing
- Polymer forming machinery

Work Requirement:

- Safety gears

■ Possible Hazards:

- Sharp edges
- Fast moving parts
- Electrical hazards

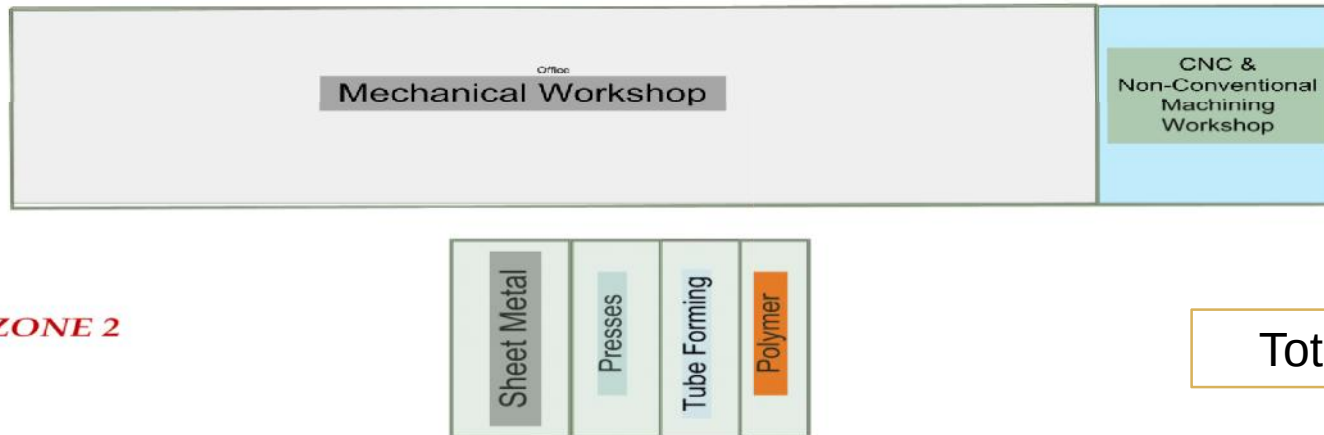
ZONING OF WORKSHOPS

ZONE 1



Total Area= 950m²

ZONE 2

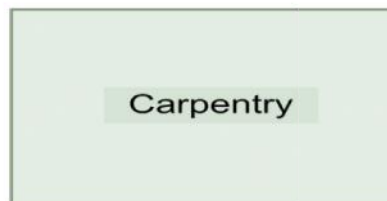


Total Area= 1700m²

≈2300m²

Total Area= 600m²

ZONE 3



Total Area= 500m²

SOME USEFUL DATA FOR DESIGN

- Truss span ≥ 18 m
- Truss bay spacing = 12 m
- Truss clean height at least 6.5 m
- Illumination: Windows or daylight design
- Ventilation: air change rate 5 liter/sec/person
- Outdoor air supply in case of air conditioning = 0.8 liter/sec/m²
- Temperature: 18 – 21Co
- Roof insulation coefficient “U”= 0 – 7 watt/m²/Co
- Min area per person = 7 m²

SOME USEFUL DATA FOR DESIGN

- Main vehicle door height= 5m
- Min height for high stacking over head hoist or mezzanine = 7.5m

What will be the next steps?

PROPOSED STEPS

1. Study of undergraduate study bylaws for specialization studying production engineering or workshop technology
2. Evaluate the technical conditions of the existing workshop machinery
3. Detailed layout
4. Human Resources:
5. Project Management

FUTURE ASSIGNMENTS

1. Study of undergraduate study bylaws for specialization studying production engineering or workshop technology

- Revising the undergraduate study bylaws and course contents for refinement
- Adopt workshop technology course content for preparatory year to fulfill special departmental requirements
- Redefine course contents and determine teaching and lab requirement
- Re-estimate number of students per course based on redefined bylaws with future forecast
- Approve and endorse modifications of courses contents and delivery techniques

FUTURE ASSIGNMENTS

2. Evaluate the technical conditions of the existing workshop machinery

- Physical examination of existing workshop machinery
- Determine machinery to be scraped
- Determine machinery and equipment to be added in scope of the amendments made to bylaws
- Determine required tools
- Set appropriate specifications of the new machinery, equipment and tools
- Estimate procurement and maintenance budget
- Set appropriate financial plan for procurement and maintenance

FUTURE ASSIGNMENTS

3. Detailed layout

- Re-calculate number of machinery required from each type after considering further machinery uses
- Determine machine foot print exact dimensions for work station design considering appropriate teaching space
- Departmentalize machinery according type and nature of use
- Locate electric power supply outlets for each machine
- Estimate total electrical power load of each department and distribution panels

FUTURE ASSIGNMENTS

Detailed layout

- Determine required utilities (such as compressed air, gas, steam, water, etc)
- Determine zones of possible fire hazards and determine required firefighting and extinguishing systems.
- Determine different flow paths within the workshops (people flow, material flow, escape outlets, etc)
- Determine appropriate handling equipment
- Determine appropriate working temperature and humidity at each department based on emissions and the nature of each operation

FUTURE ASSIGNMENTS

Detailed layout

- Determine air flow rate at each department
- Determine materials storage and related equipment
- Determine workers' and technicians' services
- Determine student required services
- Determine general departments' requirement (flooring, lighting, change rooms, toilets, canteen, etc)
- RELAYOUT

FUTURE ASSIGNMENTS

4. Human Resources:

- Propose organization structure for the management of the workshop
- Determine quality and number of needed technicians
- Prepare job description and manning tables

5. Project Management

Thank you

INPUTS

Available time slots per Week **30**
 Coincidence Factor **0.6**
 No of Students per section **40**
 Max. No. of Rotation Cycles **4**
 Flexibility Factor **0.8**

	Prep. Year	Manufacturing Technology (1)	Manufacturing Technology (2)	Manufacturing Technology (3)	Machine Tools	Theory Of Metal Forming	Theory of Metal Cutting	Mechanical Measurement	CNC	Metrology
No. of Students	2700	500	400	80	80	80	80	80	80	80
number of sections	68	13	10	2	2	2	2	2	2	2
No of sessions per week	1	1.5	1	2	1	1	1	1	1	1
Course Rotation Cycle	4	4	4	4	4	4	4	4	4	4
No.Sections per week	17	4	3	1	1	1	1	1	1	1

OUTPUT TABLE

NO.	Machines	No. of Machines needed	Workstation Area
1	Wood lathe	1	15.4
2	Wood Planer	1	21.45
3	Thickness	1	20.025
4	Band Saw	1	16.45
5	Wood Form	1	21.2
6	Blacksmith Furnace	2	22.88
7	Pneumatic Hammer	2	23.625
8	Hydraluic Press	2	16.32
9	Eccentric Press	2	23.625
10	Pneumatic Press	2	12.45
11	Rolling Machine	3	19.76
12	Wire Drawing	3	12
13	Bench Press	3	25.3
14	Goulitene Sheat	1	20
15	Hand Shear	1	21
16	Roll Bending	1	20
17	Foalding Machine	1	20.8
18	Tube bending	1	12.48
19			
20			
21			
22	Working Benches	7	11.21
Total No. of Machines		29	Workstations Area (m ²)
			Total Estimated Area(m ²)=





Total Area for machine section
15.4
21.45
20.025
16.45
21.2
45.76
47.25
32.64
47.25
24.9
59.28
36
75.9
20
21
20
20.8
12.48
78.47
636.255
1272.5

11.04	1.3949275	TIG welder	13.68
11.04	1.9429348	manual shearing machine	20
11.04	1.8138587	hand roller	19.76
11.04	1.4900362	work bench	19.76
11.04	1.9202899	MIG welder	15.2
14.4	1.5888889	hand shear	
14.4	1.640625	hydraulic press 15 ton	16.32
19.2	0.85	pedestal shear	15.1475
21.6	1.09375	hydraulic press 25 ton	12.45
21.6	0.5763889	electric shear	14.94
20.16	0.9801587	eccentric press 60 ton	
20.16	0.5952381	tube bending	
20.16	1.2549603	tube threading	13.05
3.84	5.2083333	folding machine	
3.84	5.46875	pneumatic hammer	
3.84	5.2083333	wood lathe	
3.84	5.4166667	wood planner	
3.84	3.25	band saw	
		disc saw	16.625
		form machine	
		thickness machine	
		band saw welder	11.7
		band saw shapnering machine	9.9
		CNC milling	14.74

CNC machine center	21.375
wire cutting machine	23.75
EDM	21.5
ECM	21.5
Oxyacetylene welding	6
spot welding	24
drill machine	25.3
horizontal band saw	19.76

[illegible]

Wood Working Workshop

	Wood Planer											Thickness						
Metrology	Prep. Year	Manufacturing Technology (1	Manufacturing Technology (2	Manufacturing Technology (3	Machine Tools	Theory Of Metal Forming	Theory of Metal Cutting	Mecganical Measurment	CNC	Metrology	Prep. Year	Manufacturing Technology (1	Manufacturing Technology (2	Manufacturing Technology (3	Machine Tools	Theory Of Metal Forming	Theory of Metal Cutting	
0	1	0	1	0	0	0	0	0	0	0	1	0	1	0	0	0	0	
0	8	0	15	0	0	0	0	0	0	0	8	0	15	0	0	0	0	
0	1.3	0	0.66667	0	0	0	0	0	0	0	1.3	0	0.7	0	0	0	0	
	1.9										1.9							
	1										1							
	15										10							
0	17	0	3	0	0	0	0	0	0	0	17	0	3	0	0	0	0	
		20																
	11										11							

[illegible]

			Forgining																				
			Blacksmith Furnace										Pneumatic Hammer										
			Mecganical Measurement	CNC	Metrology	Prep. Year	Manufacturing Technology (1)	Manufacturing Technology (2)	Manufacturing Technology (3)	Machine Tools	Theory Of Metal Forming	Theory of Metal Cutting	Mecganical Measurement	CNC	Metrology	Prep. Year	Manufacturing Technology (1)	Manufacturing Technology (2)	Manufacturing Technology (3)	Machine Tools	Theory Of Metal Forming	Theory of Metal Cutting	Mecganical Measurement
	0	0	0	1	1	0	0	1	0	0	0	0	0	0	0	1	1	0	0	1	0	0	0
	0	0	0	10	10	0	0	10	0	0	0	0	0	0	0	10	10	0	0	10	0	0	0
	0	0	0	1	1	0	0	1	0	0	0	0	0	0	0	1	1	0	0	1	0	0	0
				3												3							
				2												2							
				10												10							
				14												14							

[illegible]

Forming Workshop

[illegible]

[illegible]

Goultene Sheat														
Hand Shear														
Manufacturing Technology (1)	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Manufacturing Technology (2)	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Manufacturing Technology (3)	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Machine Tools	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Theory Of Metal Forming	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Theory of Metal Cutting	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Mecganical Measurment	0	0	0	0	0	0	0	0	0	0	0	0	0	0
CNC	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Metrology	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Prep. Year	1	8	1.3	1.3	1	8								3.8
Manufacturing Technology (1)	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Manufacturing Technology (2)	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Manufacturing Technology (3)	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Machine Tools	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Theory Of Metal Forming	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Theory of Metal Cutting	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Mecganical Measurment	0	0	0	0	0	0	0	0	0	0	0	0	0	0
CNC	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Metrology	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Prep. Year	1	8	1.3	1.3	1	8								3.8

Sheet Metal Workshop

[illegible]

[illegible]

[illegible]

Metrology

Prep. Year

Manufacturing Technology (1

Prep. Year

Manufacturing Technology (1

Manufacturing Technology (2

Manufacturing Technology (3

Machine Tools

Theory Of Metal Forming

Theory of Metal Cutting

Mecganical Measurment

CNC

Metrology

Courses	No of Students	No. of Students per group	Targeted No. of students per machine	No of subgroups	
					Center lathe
					4
					1
No. o students per group					
No of subgroups per session					
Prep year	2000	25	2	1	4
Manufacturing Tech (1) 1 st Year Mech.	460	50	2		7
Manufacturing Tech (2) 2 nd Year Mech.	380				
Manufacturing Tech (3) 3 rd Year Prod.	70	35	2		5
Machine Tools Design 3 rd Year Prod.	70	35	3		3
Theory of Metal Forming 3 rd Year Prod.	70	35			
Mechanical measurement 3 rd Year Prod.	70	35			
Theory of Metal Cutting 3 rd Year Prod	70	35			
CNC 4 th Year Prod.	70	35	1		
Metrology 4 th Year Prod.	70	35	2		5
					7
Area per Machine					25
Total Area per machine					175
Total Area of Workshop					1300

Turning			Milling & Gear Cutting					
Turret	Capstone	Boring	Vertical	Horizontal	Universal	Hobbing	gear Shaper	Bench Drill
8	8	8	4	4	4	10	10	4
3	3	3	3	3	3	1	1	4
			2	2	2			1
		2	3	3	3			2
1	1	1	2	2	2	2	2	2
1	1	1	1	1	1	2	2	1
2	2							
			2	2				
2	2	2	3	3	3	2	2	2
25	25	25	25	25	25	25	25	25
50	50	50	75	75	75	50	50	50

Drilling			Shaping			Grinding	
Pillar Drill	Column Drill	Radial Drill	Shaper	Slotter	Planner	Surface	Clyndrical
4	4	4	8	8	8	6	6
4	4	4	3	3	3	4	4
1			1			1	1
2	2	2	2	2	2	2	2
2	2	2	1	1	1	1	1
1	1	1	1	1	1		
						1	
2	2	2	2	2	2	2	2
25	25	25	25	25	25	25	25
50	50	50	50	50	50	50	50

Grinding			Filling	Welding			
Centerless	Planerary	Internal	Benchs	O2 Welding	Arc	Spot	Argon
6	6	6	18	5	5	5	5
4	4	4	1	1	1	1	1
			13	2000	2000	2000	
2	2	2					
				380	380	380	380
1	1	1					
2	2	2	2				
25	25	25	25				
50	50	50	50				

[illegible]

Measure Lab	Metal Cutting Lab
70	
	70
70	

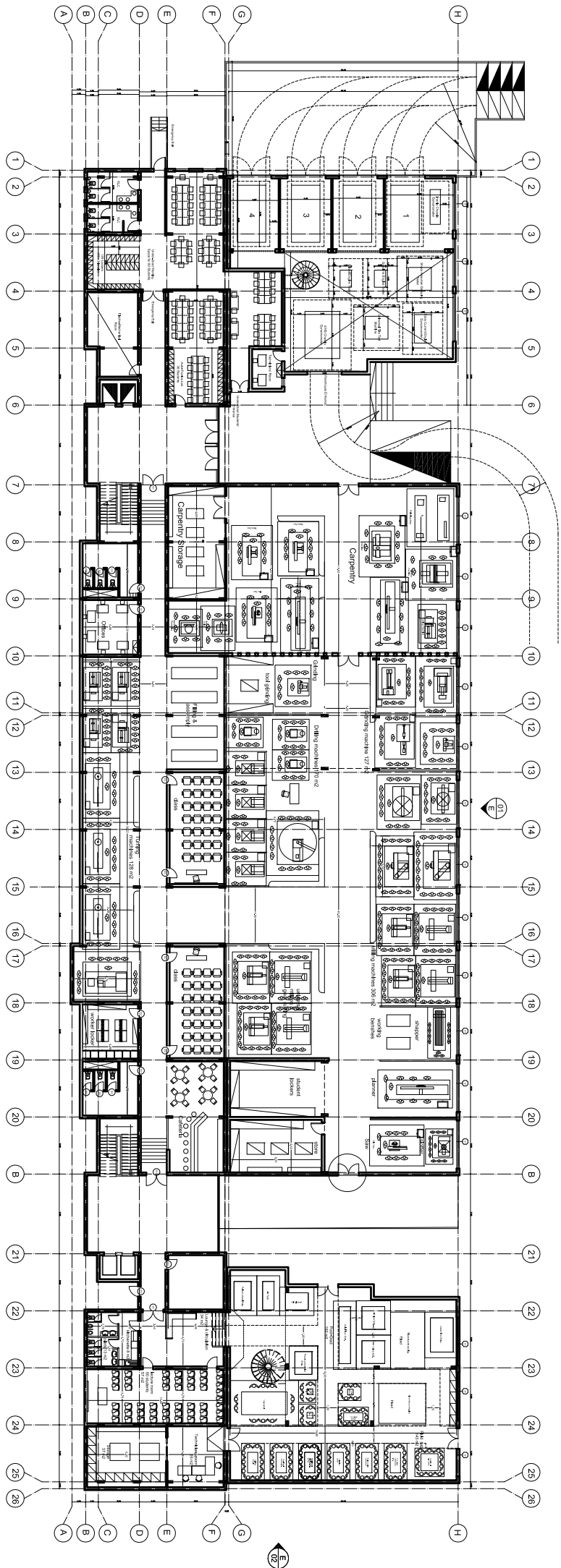
Courses	Turning				M
	Center lathe	Turret	Capstone	Boring	Vertical
No. o students per group	5	8	8	16	5
No of subgroups per session	1	1	1	1	1
	2000				2000
Manufacturing Tech (1) 1 st Year Mech.	460			460	460
Manufacturing Tech (2) 2 nd Year Mech.					
Manufacturing Tech (3) 3 rd Year Prod.	70	70	70	70	70
Machine Tools Design 3 rd Year Prod.	70	70	70	70	70
Theory of Metal Forming 3 rd Year Prod.					
Mechanical measurement 3 rd Year Prod.					
Theory of Metal Cutting 3 rd Year Prod					
CNC 4 th Year Prod.		70	70		
Metrology 4 th Year Prod.	70				70
Total No. of Students Served	2670	210	210	600	2670
No. of Groups	534	27	27	38	534
Available time Slots (per 4 weeks)	230.4	230.4	230.4	230.4	230.4
No. of needed machines	3	1	1	1	3
Area per Machine	25	25	25	25	25
Total Area per machine	75	25	25	25	75

Milling & Gear Cutting				Drilling			
Horizontal	Universal	Hobbing	gear Shaper	Bench Drill	Pillar Drill	Column Drill	Radial Drill
5	5	8	8	4	5	5	8
1	1	1	1	1	1	1	1
2000	2000			2000	2000		
460	460			460	460	460	460
70	70	70	70	70	70	70	70
70	70	70	70	70	70	70	70
70							
2670	2600	140	140	2600	2600	600	600
534	520	18	18	650	520	120	75
230.4	230.4	230.4	230.4	230.4	230.4	230.4	230.4
3	3	1	1	3	3	1	1
25	25	25	25	25	25	25	25
75	75	25	25	75	75	25	25

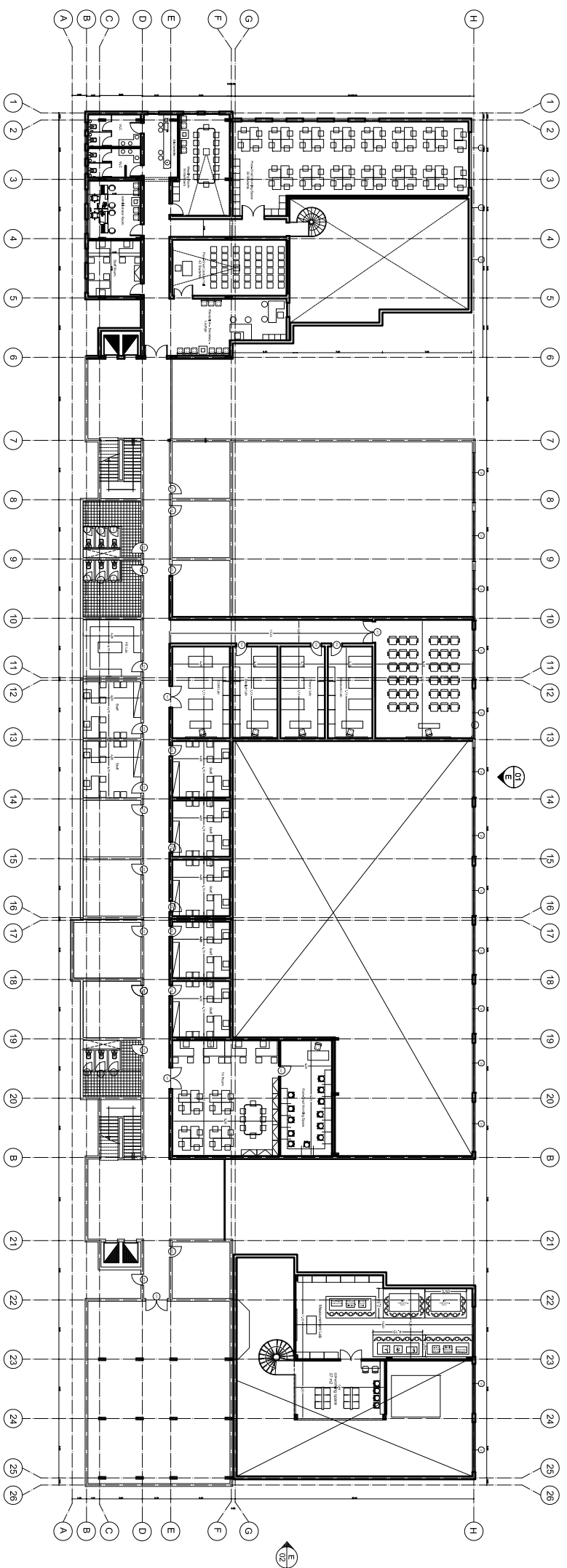
Shaping			Grinding				
Shaper	Slotter	Planner	Surface	Clyndrical	Centerless	Planerary	Internal
8	8	8	6	6	6	8	6
1	1	1	1	1	1	1	1
2000			2000	2000			
460	460	460	460	460	460	460	460
70	70	70	70	70	70	70	70
70	70	70					
			70				
2600	600	600	2600	2530	530	530	530
325	75	75	434	422	89	67	89
230.4	230.4	230.4	230.4	230.4	230.4	230.4	230.4
2	1	1	2	2	1	1	1
25	25	25	25	25	25	25	25
50	25	25	50	50	25	25	25

Filling	Welding				Forgining		Foundry
Benches	O2 Welding	Arc	Spot	Argon	Hand Tools	Hammer	
18	5	5	5	5	5	10	
1	1	1	1	1	1	1	
2000	2000	2000	2000		2000	2000	
						460	
	380	380	380	380			380
						70	
						70	
2000	2380	2380	2380	380	2000	2600	
112	476	476	476	76	400	260	
230.4	230.4	230.4	230.4	230.4	230.4	230.4	
1	3	3	3	1	2	2	

Carpentry	Forming	Polymers Lab	Sand Lab	CNC Lab	Measure Lab	Metal Cutting Lab
	460					
			380			
	70	70				
	70					
					70	
						70
				70		
					70	



GROUND FLOOR PLAN



FIRST FLOOR PLAN