Industrial and Systems Engineering

University at Buffalo *The State University of New York*

APPLIED METAL COATING(AMC)

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Applied Medical Coatings, LLC

company background

AMC's facility is based in Lockport, New York. AMC specializes in finding coating solution to meet customers' medical performance needs. Customers' products can be coated with: fluro-polymers, conductive & conformal coatings, hydrophilic coatings, with liquid or powder systems. These coatings are used for surgical instruments, electrosurgical devices, hospital and lab equipment, and others.

objectives

- To reallocate facilities from old facility to new facility
- To optimize the process of production and production activity
- To minimize amount of cluttering
- To ensure compliance with departmental restrictions

introduction

In this project analysis, three types of algorithms are used :

MULTIPLE Algorithm

- Multi-floor Plant Layout Evaluation
- Construction and improvement type algorithm
- Distance-based objective function
- Can exchange non-adjacent departments

CORELAP Algorithm

- Computerized Relationship Layout Planning
- Construction type algorithm
- Adjacency-based objective function
- Selection of the departments to enter the layout is based on Total Closeness Rating

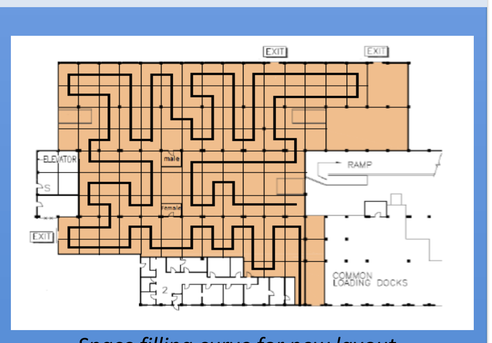
BLOCPLAN Algorithm

- Construction and improvement type algorithm
- Distance and adjacency based objective function
- Arranges departments only in one bands, they are rectangular, band widths may vary

methodology

MULTIPLE Algorithm

1)Create a Space Filling Curve which can connect the maximum number of grids.
2)The departments are placed based on the relationship chart.
3)The space filling curve is followed until the required number of grid for each department is reached.



Space filling curve for new layout

CORELAP Algorithm

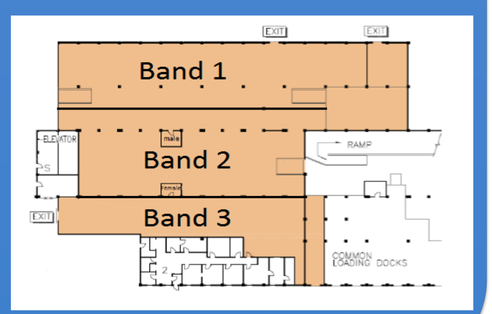
1)Place the first department in the middle of layout which with the greatest TCR value. If there is a tie, then choose the one with more A's.
2)The next department is chose according to the importance of relationship which has an A (E, I, etc.) relationship with the already placed departments.
3)The procedure continues until all departments have been placed.

Dept	Department relationship													Summary					TCR	Sequence
	A	B	C	D	E	F	G	H	I	J	K	L	M	A	E	I	O	U	X	
A		O	O	O	X	X	O	U	U	U	O	A	O	U	1	0	0	5	4	2	7	6
B	O		X	A	X	X	O	U	U	U	I	O	O	U	1	0	1	4	3	3	7	5
C	U	X		O	X	E	X	U	U	E	X	I	U	0	2	1	2	3	4	6	4
D	U	A	O		X	I	O	U	U	I	X	O	U	1	0	2	2	4	2	9	2
E	X	X	X	X		X	X	X	X	X	X	X	X	0	0	0	0	0	12	-12	11
F	X	X	E	I	X		X	U	U	E	X	E	U	0	3	1	0	3	5	6	3
G	O	O	X	O	X	X		U	U	U	X	X	U	0	0	0	3	4	5	-2	9
H	U	U	U	U	X	U	U		U	U	X	X	U	0	0	0	0	9	3	-3	10
I	U	U	U	U	X	U	U	U		O	X	U	U	0	0	0	3	9	2	1	8
J	O	I	E	I	X	E	U	U	O		X	I	U	0	2	3	2	3	2	12	1
K	A	O	X	X	X	X	X	X	X	X		X	X	1	0	0	1	0	10	-5	7
L	O	O	I	O	X	E	X	X	U	I	X		U	0	1	2	3	2	4	6	-
M	U	U	U	U	X	U	U	U	U	U	X	U		0	0	0	0	10	2	-2	-

Total closeness rating table for new layout

BLOCPLAN Algorithm

1)Assign each department to two or three of the bands.
2)Computes appropriate band width by dividing the total area of departments in that band by the building length.
3)Arrange the department in each band according to a particular sequence.



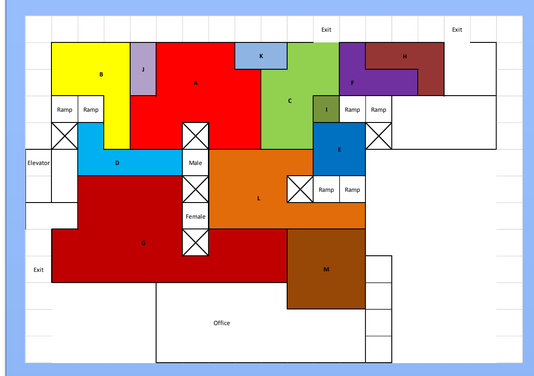
Division of bands for new layout

result

There will be 2 to 3 iterations for each algorithm in order to get the highest adjacency score. For each algorithm, only the best layout is displayed with its adjacency score.

MULTIPLE Algorithm

- 6 dummies, adjacency score: 0
- Best layout among 3 algorithms



No.	Department	Description	Area	Number of grids	Colour	Sequence
1	A	Department 1	35.1	16		5
2	B	Department 2	19	8		7
3	C	Department 3	19.5	9		4
4	D	Department 5	10.75	5		8
5	E	Department 6	8.31	4		12
6	F	Department 7A	10.4	4		2
7	G	Area C	57.12	25		9
8	H	EPR	8.24	4		10
9	I	Quarantine room	1.54	1		11
10	J	Storage room	3.8	2		3
11	K	Oven room	3.94	2		6
12	L	Shipping & receiving	30	13		1
13	M	Cafeteria	20	9		13
Total Grid for MULTIPLE	-		227.75	102	-	-
Dummy				6		
Total Grid				108		

adjacent department	relationship	score
B-J	I	2
B-A	O	1
B-D	A	4
J-A	O	1
A-C	O	1
C-F	E	3
F-H	U	0
C-I	U	0
C-E	X	-5
E-I	X	-5
C-L	I	2
A-L	O	1
L-M	U	0
L-G	U	0
G-M	U	0
D-G	O	1
A-D	U	0
A-K	A	4
C-K	X	-5
L-E	X	-5
I-F	U	0
C-H	U	0
	TOTAL:	0

CORELAP Algorithm

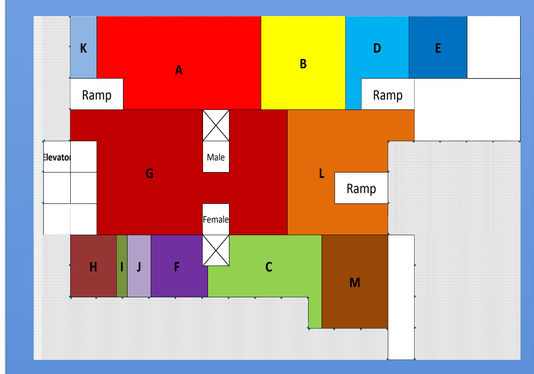
- 2 dummies, adjacency score: 22
- Layout is not realistic, although it has highest adjacency score

Department	Number of Grid needed	Approximately Number of Grid Needed
DP1	16.2	16
DP2	8.796	9
DP3	9	9
DP5	4.96	5
DP6	3.835	4
DP7A	4.8	5
Area c	26.3	26
Electric Panel Room	3.8	4
Quarantine	0.71	1
Storage/Testing Room	1.75	2
Oven Room	1.84	2
Shipping + Receiving	13.8	14
Cafeteria	9.23	9
	TOTAL Grid need for CORELAP	106
	Dummy	2
	TOTAL Grid	108

Adjacent Department	Relationship	score
G-I	U	0
G-A	O	1
I-A	U	0
A-B	O	1
A-K	A	4
B-K	O	1
B-H	U	0
H-E	X	-5
A-C	O	1
G-C	X	-5
B-D	A	4
B-L	O	1
D-L	I	2
C-J	E	3
D-J	E	3
J-L	I	2
J-F	E	3
C-F	E	3
L-F	E	3
L-M	U	0
F-M	U	0
	TOTAL	22

BLOCPLAN Algorithm

- Fully utilize every grids, adjacency score: 2
- Hinders efficient workflow



First Band:	
Total number of grid	39 grids
Total area	77.15 sq feet
Layout(from left to right)	K, A, B, D, E

Department	Number of Grid needed
A	17.7
C	7.3
E	3.5
F	4.4
K	2

Second Band:	
Total number of grid	41 grids
Total area	87.12 sq feet
Layout(from left to right)	G,L

Department	Number of Grid needed
G	26.9
L	14.1

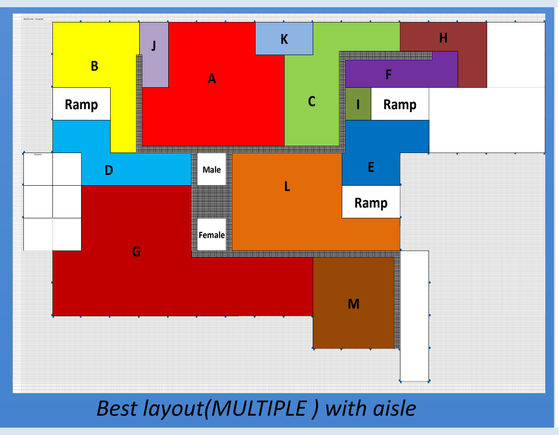
Third Band:	
Total number of grid	27 grids
Total area	63.48 sq feet
Layout(from left to right)	H, I, J, F, C, M

Department	Number of Grid needed
E	3.5
F	4.4
H	3.5
I	0.7
J	1.6
M	8.5

Adjacent department	relationship	score
A-K	A	4
A-B	O	1
B-D	A	4
D-E	X	-5
A-G	O	1
B-G	O	1
B-L	O	1
D-L	O	1
G-L	X	-5
G-H	U	0
G-I	U	0
G-J	U	0
G-F	X	-5
G-C	X	-5
L-C	I	2
L-M	U	0
H-I	U	0
I-J	O	1
J-F	E	3
F-C	E	3
C-M	U	0
	TOTAL	2

conclusion

- Shaded area will be the aisle, which need 20% of the grid and it is assign equally 10% grid from the side of aisle
- Adjacency of restricted department is minimized, which is able to avoid work-in-process product mix with final product
- The cluttered layout is avoided, which is able to save labor work and time



Best layout(MULTIPLE) with aisle

references

Foulds, L.R, and Robinson, D.F (1976). "A strategy for solving the plant layout problem". *Operations Research Quarterly* 27,845. Print.

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