

Shade Tree Grills Project



-Shade Tree Grills-



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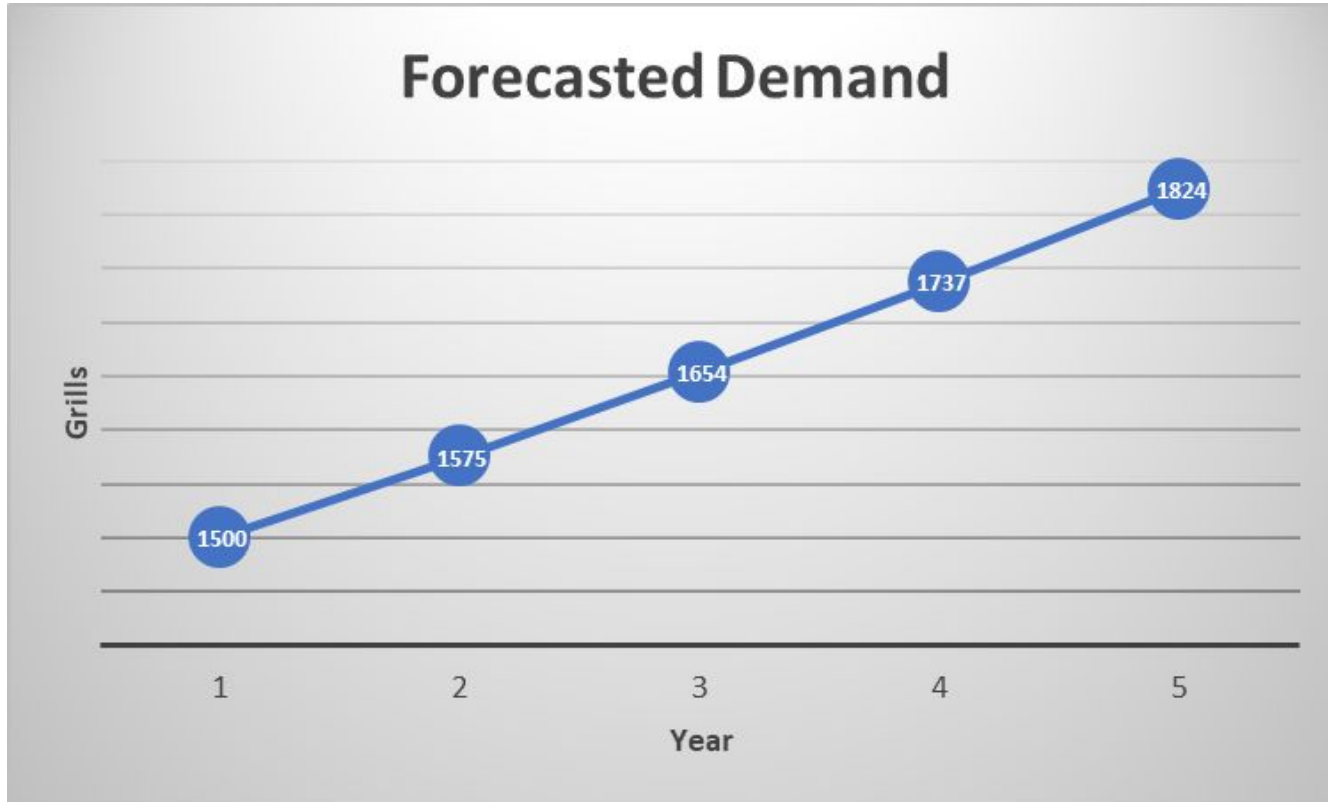
Background: Shade Tree Grills

We are producing a layout for Shade Tree Grills.

- This company produces 1,500 grills per day
- 75% plant efficiency
- 200 workdays per year
- Each grill consists of legs, a top support, a control panel, wood slats, a bottom support, tube plugs, knobs, leg extensions, a tank holder, and axles
- Used machines such as pallet trucks, forklifts, and conveyors

We hope to use this as an example for any grill production company looking to go into business.

Production Volume Analysis



Production Volume Analysis (Assuming 5% Demand Growth)

Production Volume Analysis					
Part Name	PPD Year 1	PPD Year 2	PPD Year 3	PPD Year 4	PPD Year 5
Legs	6,106	6,411	6,732	7,070	7,424
Top Support	3,023	3,174	3,333	2,501	3,676
Congtrol Panel	1,519	1,595	1,675	1,759	1,847
Wood Slats	6,106	6,411	6,732	7,070	7,424
Bottom Support	3,030	3,182	3,342	3,509	3,685
Tube Plugs	6,067	6,370	6,689	7,025	7,377
Knob	1,517	1,593	1,673	1,757	1,845
Leg Extensions	3,033	3,185	3,345	3,513	3,689
Tank Holder	1,515	1,591	1,671	1,755	1,843
Axle	1,515	1,591	1,671	1,755	1,843

Product Analysis

Product Analysis (Manufactured)					
Part Name	Year 1	Year 2	Year 3	Year 4	Year 5
Legs	6000	6300	6616	6948	7296
Top Support	3000	3150	3308	3474	3648
Congtrol Panel	1500	1575	1654	1737	1824
Wood Slats	6000	6300	6616	6948	7296
Bottom Support	3000	3150	3308	3474	3648
Tube Plugs	6000	6300	6616	6948	7296
Knob	1500	1575	1654	1737	1824
Leg Extensions	3000	3150	3308	3474	3648
Tank Holder	1500	1575	1654	1737	1824
Axle	1500	1575	1654	1737	1824

Product Analysis (Bought)					
Part Name	Year 1	Year 2	Year 3	Year 4	Year 5
Bottom Grill Casting	1500	1575	1654	1736	1823
Grease Can Wire	1500	1575	1654	1736	1823
Top Grill Casting	1500	1575	1654	1736	1823
Wood Handle	1500	1575	1654	1736	1823
Wheels	3000	3150	3308	3473	3647
Hub Caps	3000	3150	3308	3473	3647
Ignitor	1500	1575	1654	1736	1823
Valve Assembly	1500	1575	1654	1736	1823
Burner element	1500	1575	1654	1736	1823
Cooking Grid	1500	1575	1654	1736	1823
Rock Grate	1500	1575	1654	1736	1823
Heat Shield	1500	1575	1654	1736	1823
Accessories Bag	1500	1575	1654	1736	1823
Bolts PP5	18000	18900	19845	20837	21879
Nuts	4500	4725	4961	5209	5470
Washer	1500	1575	1654	1736	1823
Screws	19500	20475	21499	22574	23702
Bolts PP9	3000	3150	3308	3473	3647
Colter Pin	3000	3150	3308	3473	3647
Pin	3000	3150	3308	3473	3647

Process Analysis

Part No.	Part Name	Production Quantities (per day)	Weight (lbs.)	Movement Factor	Equivalent Flows (per day)	Routing
STG4	Legs	7296	6	24	175104	R-I-S1-F-Pa-P-S2
STG8	Top brace	3648	4	16	58368	R-I-S1-F-Pa-P-S2
STG12	Control panel	1824	5	20	36480	R-I-S1-F-Pa-P-S2
STG7	Wood slats	7296	3	12	87552	R-I-S1-F-P-S2
STG9	Bottom brace	3648	8	32	116736	R-I-S1-F-Pa-P-S2
STG5	Tube plugs	7296	0.25	1	7296	R-I-S1-F-P-S2
STG13	Knob	1824	0.5	2	3648	R-I-S1-F-P-S2
STG6	Leg extensions	3648	2	8	29184	R-I-S1-F-P-S2
STG10	Tank holder	1824	5	20	36480	R-I-S1-F-P-S2
STG11	Axle	1824	2	8	14592	R-I-S1-F-P-S2
----	Purchased parts	91163	40	160	14586080	R-I-S1-P-S2

Storage and Warehouse: # of Dock Doors Required Initial

Part Name	Amt / grill	Total / 1500 grills	Size / part in shipping box (in.^3)	Total Size / 1500 grills (in.^3)	SUM (in.^3)
Bottom grill casting	1	1500	5378	8064000	19576500
Grease can wire	1	1500	27	40500	
Top grill casting	1	1500	2880	4320000	
Wood handle	1	1500	40	60000	
Legs	4	6000	48	72000	
Top support	2	3000	84	126000	
Tube plugs	4	6000	27	40500	
Leg extensions	2	3000	32	48000	
Wood slats	4	6000	32	48000	
Bottom support	2	3000	48	72000	
Tank holder	1	1500	24	36000	
Axle	1	1500	48	72000	
Wheels	2	3000	72	108000	
Hubcaps	2	3000	8	12000	
Control panel	1	1500	384	576000	
Knob	1	1500	8	12000	
Igniter	1	1500	12	18000	
Valve assembly	1	1500	160	240000	
Burner element	1	1500	192	288000	
Cooking grid	1	1500	112	168000	
Rock grate	1	1500	448	672000	
Heat shield	1	1500	360	540000	
Accessories bag	1	1500	1440	2160000	
1/2" bolts	12	18000	27	40500	
Nuts	3	4500	27	40500	
Washer	1	1500	27	40500	
3/8" screws	13	19500	27	40500	
3/8" bolt	2	3000	27	40500	
Cotter pin	2	3000	27	40500	
Pin	2	3000	27	40500	
Steel coil	3	4500	50000	1500000	

Receiving

Shipping

A	B	C	D	E
Single Packaged Completed Grill Size (28" wide x 48" tall x 20" deep in. ^3) =	25760	in.^3		
SUM of ALL completed grill sizes =	38640000	in ^3		
Average 60ft trailer dimensions (720"x100"x110" in.^3) =	7920000	in.^3		
Amount trailers needed (sum size completed grills/avg truck size) =	4.878787879	trucks		
	=	5	trucks	
	5 trucks / 8 hour	=	0.625	trucks/hr
	Service Rate	=	0.5	trucks/hr

Average 60ft trailer dimensions (720"x100"x110" in.^3) =	7920000	in.^3		
Amount trailers needed (sum size of parts/avg truck size) =	2.471780303	Trucks		
	=	3	Trucks	
	3 trucks / 8 hour day	=	0.375	trucks/hr
	Service Rate	=	0.75	trucks/hr

Storage and Warehouse: # of Dock Doors Required Initial

Receiving:

Arrival Rate: $\lambda = .375$ trucks / hr

Service Rate: $\mu = .75$ trucks / hr

Want $W < 2$:

- $L < .75$

With $C = 2$:

- $\rho = .6$
- $L = .6$ so GOOD

Dock # = 2

Shipping:

Arrival Rate: $\lambda = .625$ trucks / hr

Service Rate: $\mu = .5$ trucks / hr

Want $W < 2$:

- $L < 1.25$

With $C = 4$

- $\rho = .3125$
- $L = 1.1$ so GOOD

Dock # = 4



Storage and Warehouse: # of Dock Doors Required Highest Demand

A	B	C	D	E	F
Part Name	Amt / grill	Total / 1500 grills	Size / part in shipping box (in.^3)	Total Size / 1500 grills (in.^3)	SUM (in.^3)
Bottom grill casting	1	1500	5376	9805824	23731024
Grease can wire	1	1500	27	49248	
Top grill casting	1	1500	2880	5253120	
Wood handle	1	1500	40	72960	
Legs	4	6000	48	87552	
Top support	2	3000	84	153216	
Tube plugs	4	6000	27	49248	
Leg extensions	2	3000	32	58368	
Wood slats	4	6000	32	58368	
Bottom support	2	3000	48	87552	
Tank holder	1	1500	24	43776	
Axle	1	1500	48	87552	
Wheels	2	3000	72	131328	
Hubcaps	2	3000	8	14592	
Control panel	1	1500	384	700416	
Knob	1	1500	8	14592	
Igniter	1	1500	12	21888	
Valve assembly	1	1500	160	291840	
Burner element	1	1500	192	350208	
Cooking grid	1	1500	112	204288	
Rock grate	1	1500	448	817152	
Heat shield	1	1500	360	656640	
Accessories bag	1	1500	1440	2626560	
1/2" bolts	12	18000	27	49248	
Nuts	3	4500	27	49248	
Washer	1	1500	27	49248	
3/8" screws	13	19500	27	49248	
3/8" bolt	2	3000	27	49248	
Cotter pin	2	3000	27	49248	
Pin	2	3000	27	49248	
Steel coil	3	4500	50000	1750000	

Receiving

Shipping

	A	B	C	D	E
1	Single Packaged Completed Grill Size (28" wide x 46" tall x 20" deep in.^3) =	25760	in.^3		
2					
3	SUM of ALL completed grill sizes =	46986240	in.^3		
4					
5	Average 60ft trailer dimensions (720"x100"x110" in.^3) =	7920000	in.^3		
6					
7	Amount trailers needed (sum size completed grills/avg truck size) =	5.932606061	trucks		
8			=		
9			6	trucks	
10					
11		6 trucks / 8 hour	=	0.75	trucks/hr
12					
13		Service Rate	=	0.5	trucks/hr

Average 60ft trailer dimensions (720"x100"x110" in.^3) =	7920000	in.^3		
Amount trailers needed (sum size of parts/avg truck size) =	2.99341414	Trucks		
	=			
	3	Trucks		
	3 trucks / 8 hour day	=	0.375	trucks/hr
	Service Rate	=	0.75	trucks/hr

Storage and Warehouse: # of Dock Doors Required

Highest Demand

Receiving:

Arrival Rate: $\lambda = .375$ trucks / hr

Service Rate: $\mu = .75$ trucks / hr

Want $W < 2$:

- $L < .75$

With $C = 2$:

- $\rho = .6$
- $L = .6$ so GOOD

Dock # = 2

Shipping:

Arrival Rate: $\lambda = .75$ trucks / hr

Service Rate: $\mu = .5$ trucks / hr

Want $W < 2$:

- $L < .125$

With $C = 5$:

- $\rho = .3$
- $L = 1.2$ so GOOD

Dock # = 5

Space Requirement

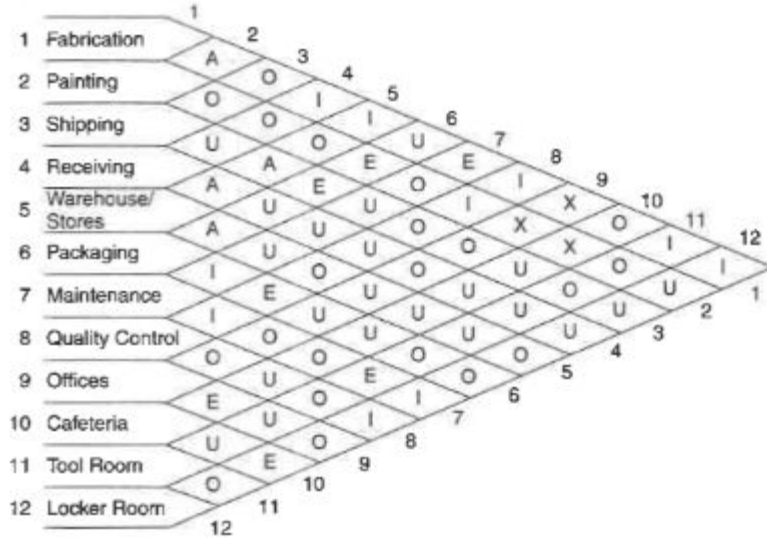
- Used the provided documents to make sure all departments were the required and efficient size in our layouts.

Machine Name	Operation	Machine #	Space Required
JUTEC850	Bender	JTC850	106 ft ²
DrillPress	Drill	8062 TRADESMAN	34 ft ²
Lincoln Resistance	Welder	LR560	67 ft ²
MINTER 300	Stamp	MNS300	476 ft ²
Big 800	Wood/Steel Saw	B800	152 ft ²
RYOBI	Sander	RBS	31 ft ²
SHARP	Poly Bag	J69	64 ft ²
Ingersoll Rand	Paint Booth	IR800	440 ft ²
NISSEI	Injection Mold	NS60	73 ft ²

Receiving Department	750 ft ²
Raw Material Storage	4,050 ft ²
Fabrication Department	6,825 ft ²
Paint Department	2,260 ft ²
Packaging Department	7,500 ft ²
Finished Goods Storage	7,850 ft ²
Shipping Department	750 ft ²
Offices	4,150 ft ²
Maintenance	400 ft ²
Tool Room	170 ft ²
Quality Control	170 ft ²
Locker Room	1,440 ft ²
Cafeteria	600 ft ²

Material Handling Systems Design and Activity Analysis

Activity Relationship Diagram



- The methods and containers for our warehouse were 5 Pallet trucks, 3 Forklifts, 2 Conveyors, and Pallet, Tote, respectively. These choices were made by conducting research on various material handling methods and containers, analyzing the dimensions of the various parts in the warehouse

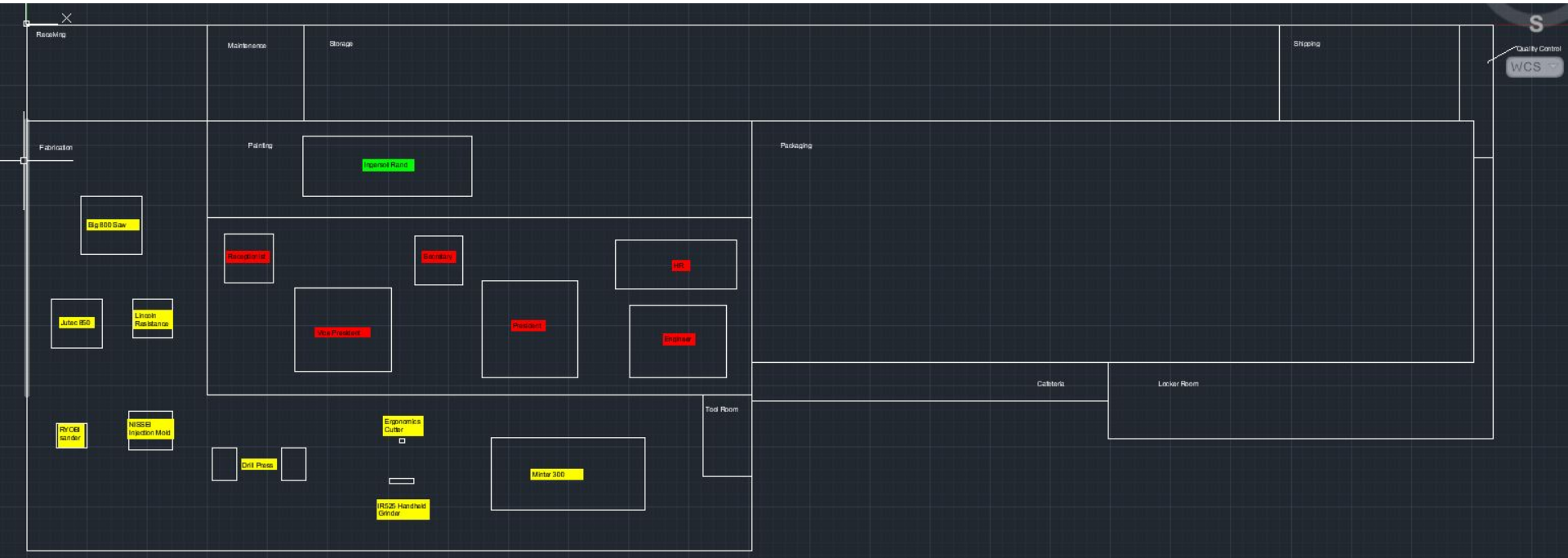


Initial Layout

- Consisted of 9 key departments
- We had two receiving docks and four shipping docks
- Layouts were calculated and drawn to scale, consisting of machinery needed for each department

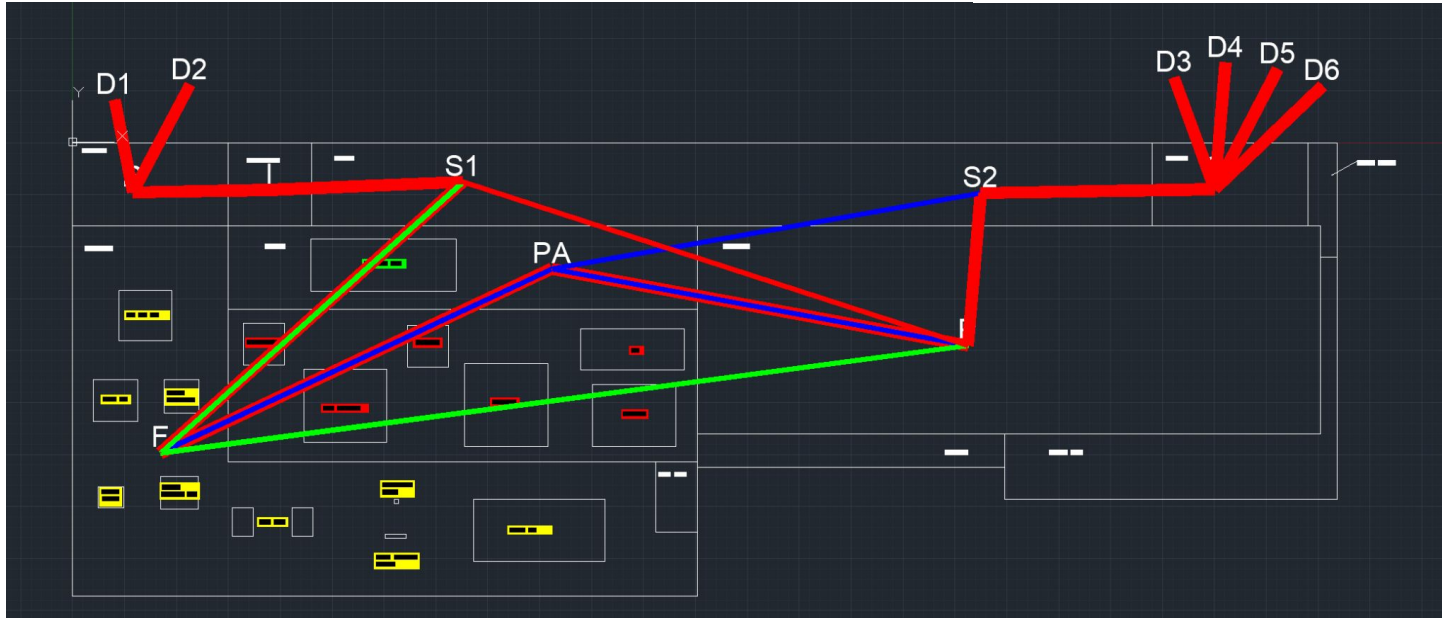
Road			
receiving (750 sq ft)	maintenance (400 sq ft)	storage (2 depts) (4050 sq ft)	shipping (750 sq ft)
fabrication (6825 sq ft)	painting (2260 sq ft)	packaging (7500 sq ft)	quality control (170 sq ft)
tool room (170 sq ft)	offices (4150 sq ft)	cafeteria (600 sq ft)	locker room (1440 sq ft)

Detailed Layout



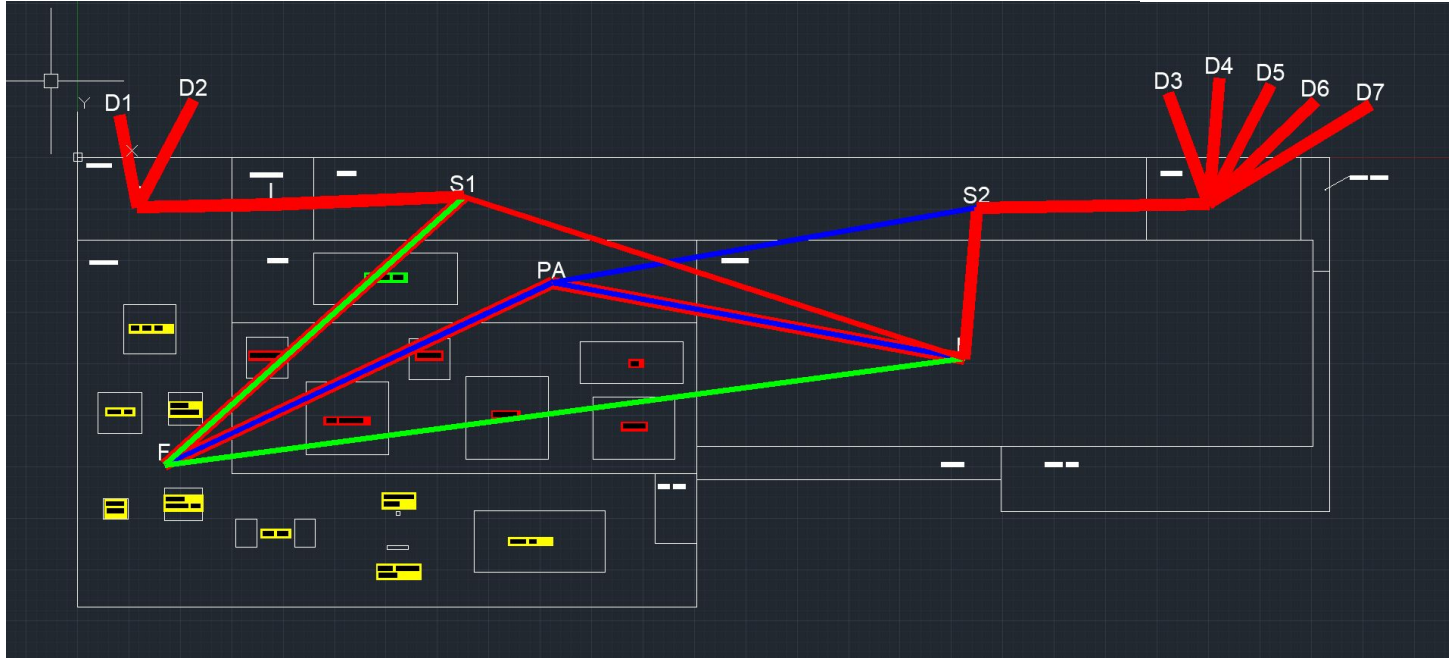
Material Flow Analysis: Year 1

Cost: \$82,203.61



Material Flow Analysis: Year 5

Cost: \$58,495.61



Project Evaluation

Item	Result
Total Distance	2,112,036 ft
Overall Size of the building	29,065 sqft
Total Space Area	29,065 sqft
Space Utilization	100%
Material Handling Cost	\$58,495.61
Total Cost	\$58,495.61
Lean Elements	Kaizen

Thank you!