Presented at the ICEAA 2024 Professional Development & Training Workshop - www.iceaaonline.com/min2024

QUANTECH services, inc
{The Sum of Quality}

Recipe: Homemade Pizza (or Facility Estimate)

Caitlin Burke, Olivia Lindsey, and Kristen Marquette
Quantech Services, Inc.
14 May 2024

Table of Contents

How to make a Homemade Pizza (Requirements)

- Facilities are leveraged by DoD Program offices to support Classified work, host Agile Program Increment (PI) events, areas for teams to perform Agile software development, and stakeholder presentations/demonstrations

- Each Facility type has different requirements (new construction/remodel, classification, support personnel, security, IT Equipment, Furnishing, etc.)

Determine the type of Pizza you are looking to make and find a recipe that works best for you

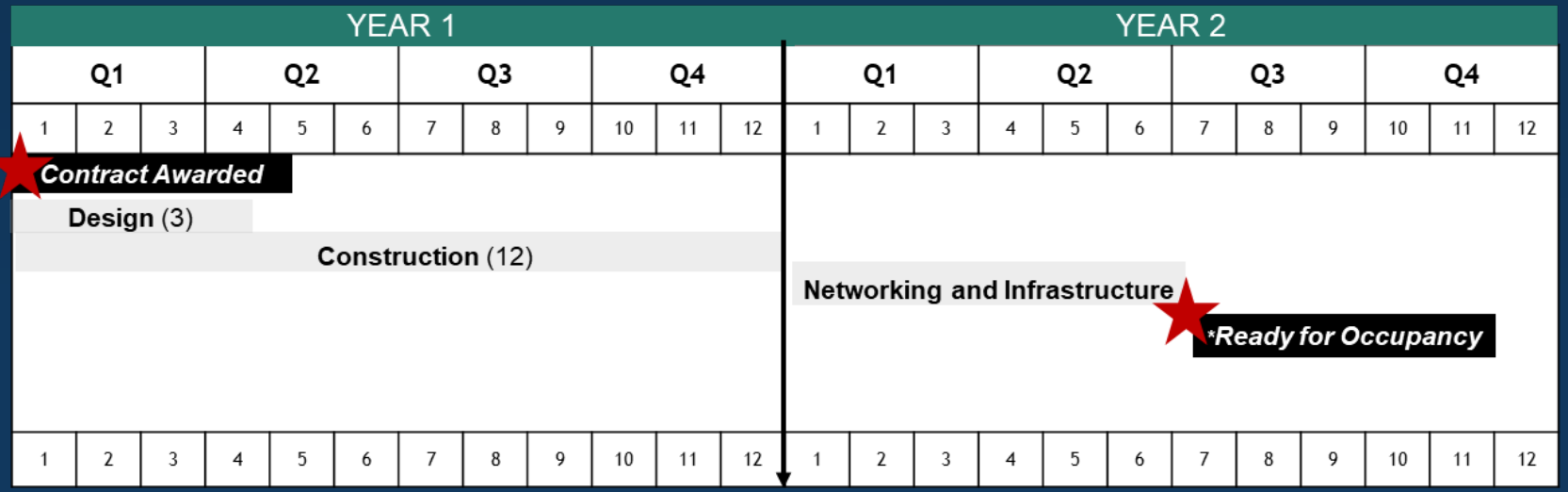
Importance of Homemade Pizza (Facilities Estimating Overview)

https://software.af.mil/

Facility Exercise (Making a Margherita Pizza)

- Modify an existing facility downtown Minneapolis, MN with approximately 110,000 SqFt to the Special Access Program Facility (SAP-F) level. The Facility will require:
  - Renovations/Build Out for SAP-F
  - 24x7 Security (interior and exterior)
  - Network and IT equipment
  - Includes Operational Expenditures (OpEx)

- Schedule:
  - Build out within 18 months
  - Fully Operational for 4 years



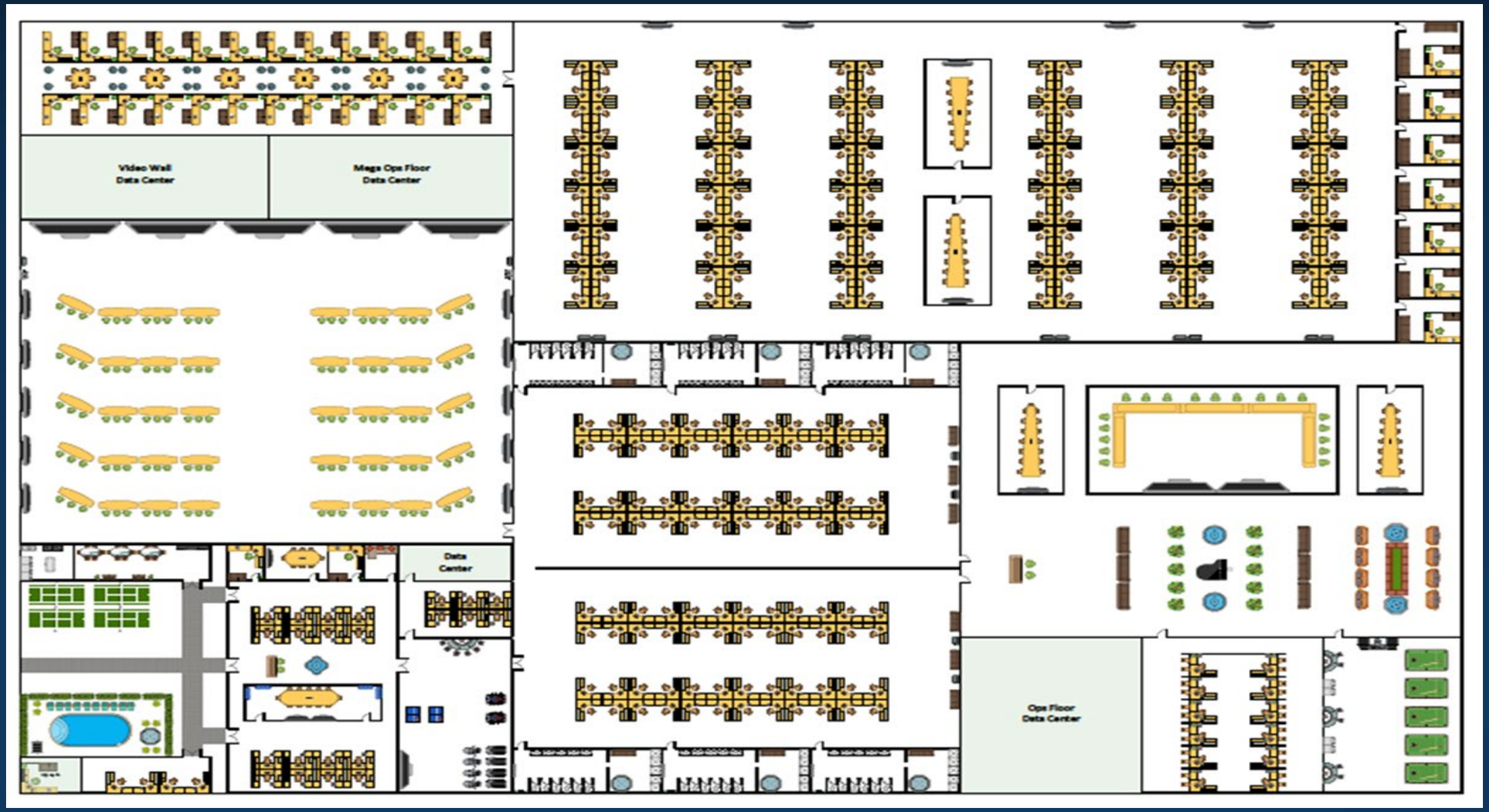
Margherita Pizza requirements: dough for 1 large pizza, marinara sauce, mozzarella, and fresh basil

Making the Dough (Structural Framework)

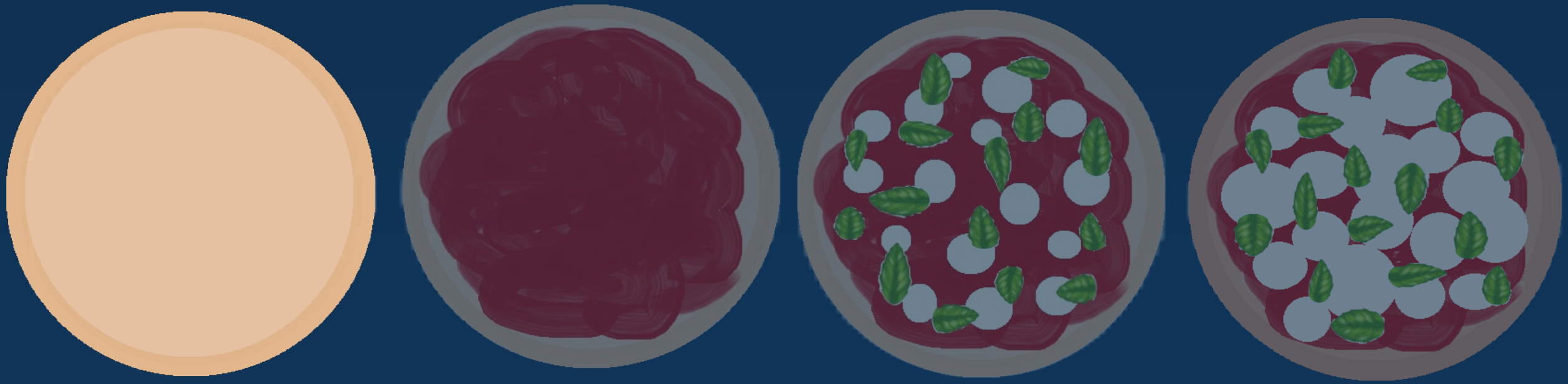
- Depending on the status of your facilities structure, there are many non-recurring costs that need to be considered
- Determine your vision for the space
- What needs to be done to the structure to make it operational?
  - Full build
  - Renovations to existing structure
  - Leveraging an existing space
  - Enhancing the Classification of the area

Dough: How much do you need? Personal pizza, family size, flatbread, bagel bites, etc.

Making a Margherita Pizza



Making a Margherita Pizza



Need enough dough for 1 large Margherita Pizza

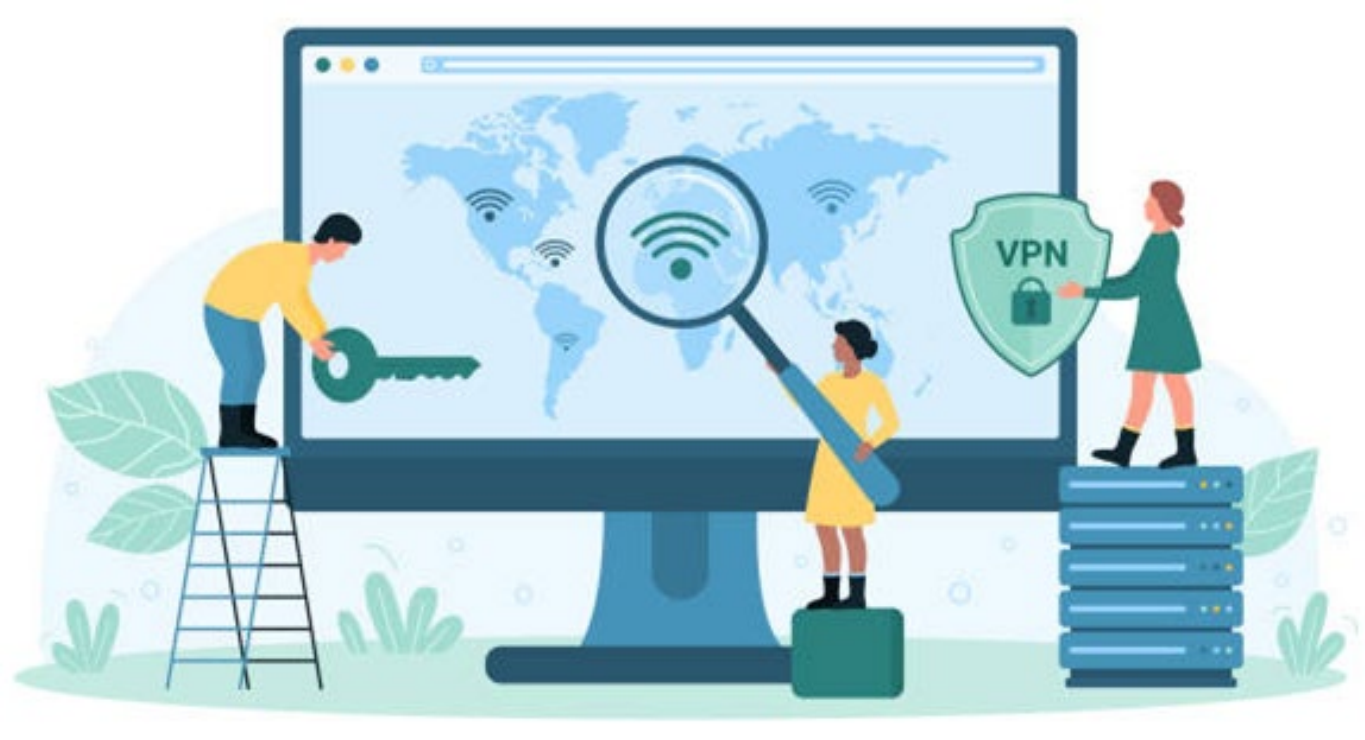
Sauce Styles (Infrastructure)

- Each Program has their own infrastructure requirements
- What type of infrastructure will your Program need for the space?
  - Material: Network and IT equipment
  - Classification level considerations for material purchases
  - Security Requirements (cyber security, fencing, penetration testing, etc.)

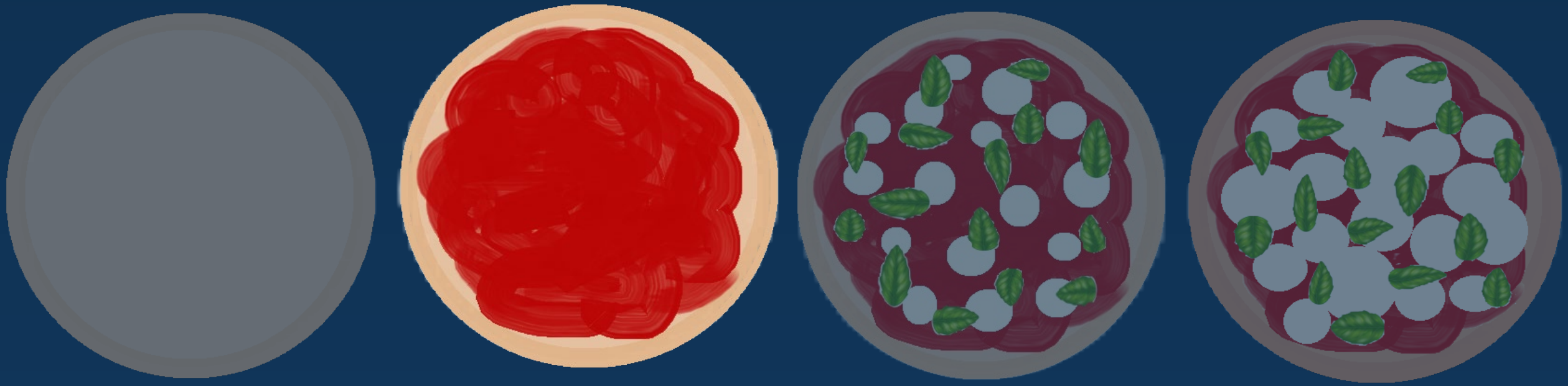
Sauce Types: marinara, pesto, olive oil, barbecue, alla vodka etc.

Making a Margherita Pizza

- Our facility will be classified SAP-F, includes NIPR through JWICS networks, and IT equipment within 6 months post-renovation



Making a Margherita Pizza



Our Margherita Pizza is going to be a spicy marinara with proper sauce to dough ratio

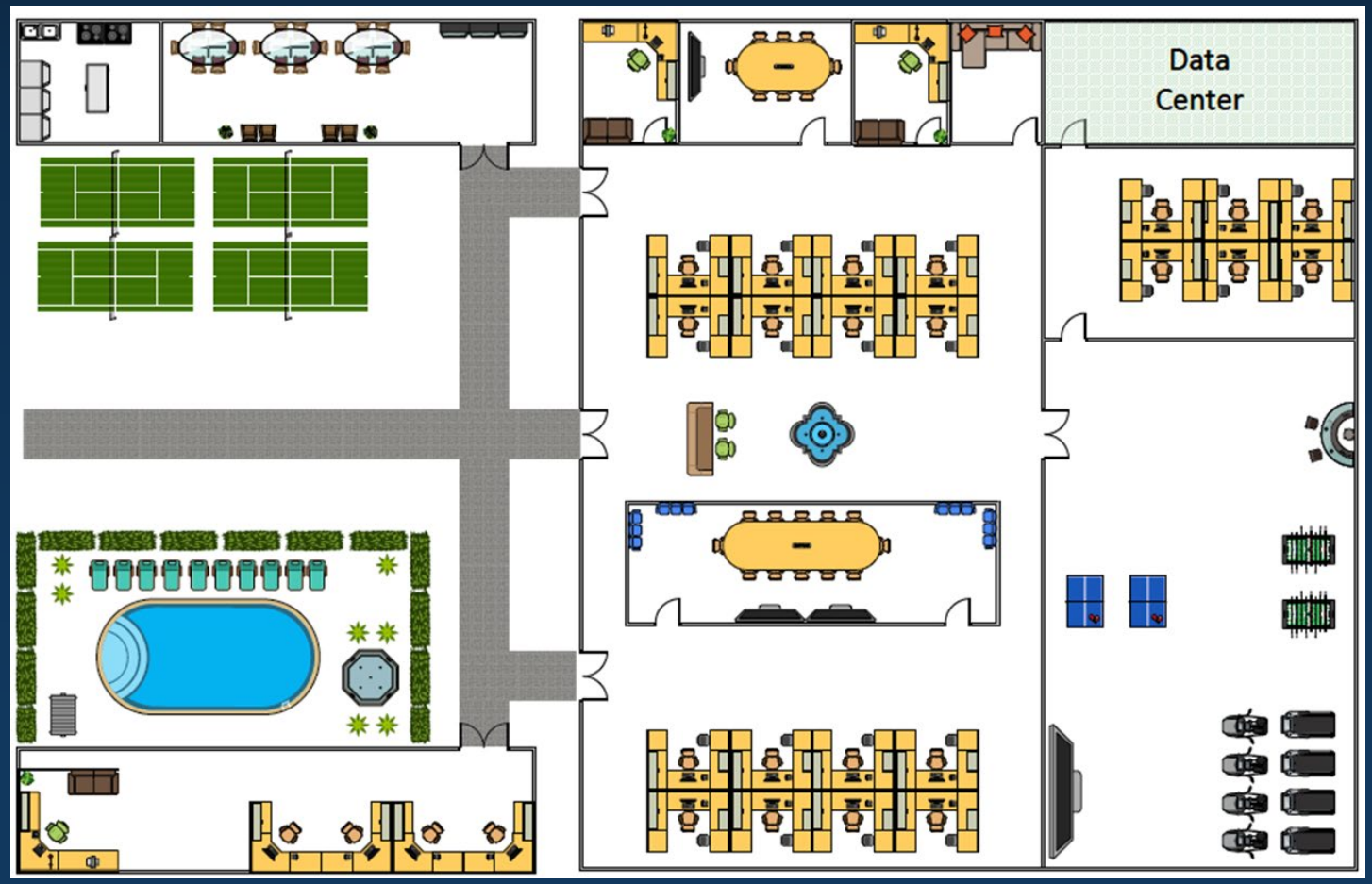
Toppings (Recurring Costs)

- Recurring costs are those that allow the Facility to continue operations
  - OpEx costs
  - Security personnel
  - IT Equipment Tech Refreshes
  - Facility Maintenance
  - Furnishings

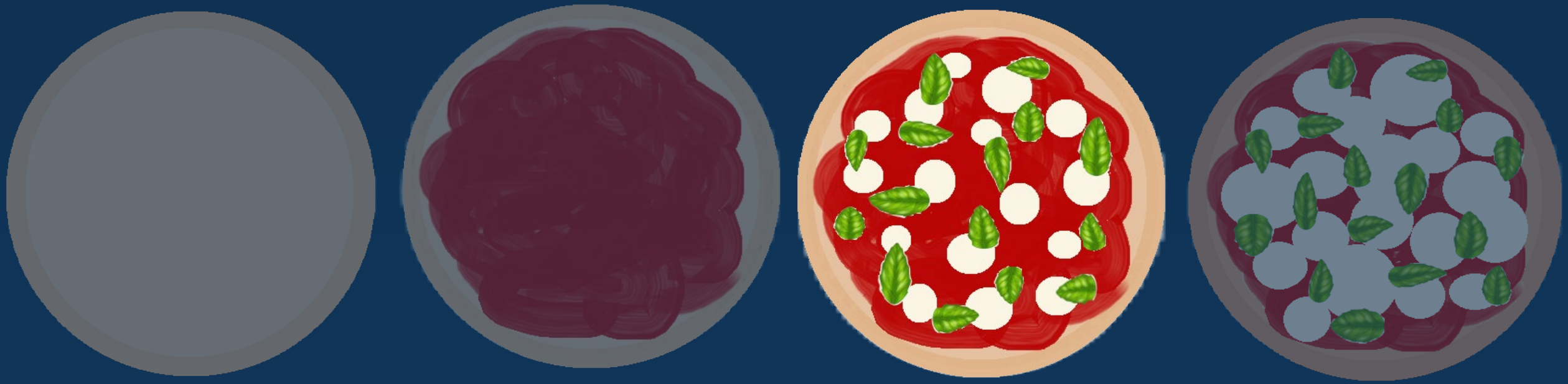
Pizza toppings: cheese, meat, vegetables, herbs etc.

Making a Margherita Pizza

- Our facility will be operational for 4 years and require the following recurring costs
  - OpEx Costs
  - 24x7 Security
  - Furnishings
  - Hardware Refresh/Maintenance



Making a Margherita Pizza



Our Margherita Pizza will need fresh mozzarella and basil

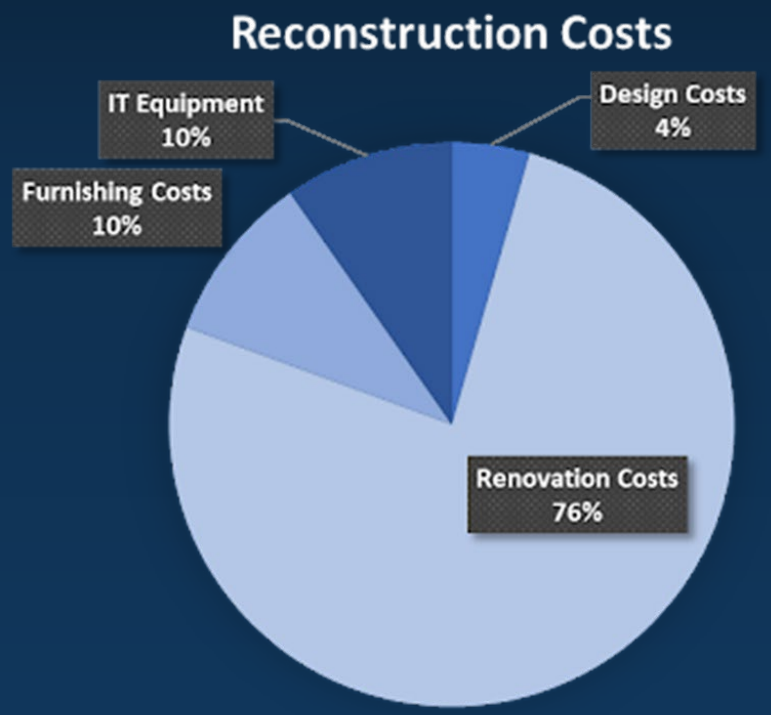
Gathering/Prepping Ingredients (Data Collection/Analysis)

- Data Sources - what data can you leverage?
  - Analogous programs (SW factory, SCIF buildouts, etc.)
  - Price per SqFt in specified location
  - Engineering build up (BOM)
  - Security specifications for the facility

Ingredients: flour, milk/water/oil, yeast, cornmeal, salt, cheese, sauce, various toppings

Making a Margherita Pizza

DataPoint #	SqFt	Seat Qty	Sensors & Cameras Qty	Security Stations Qty	Windows Qty	Total Cost
Project 1	750000	3450.0	153	6	36	$ 462,937,500
Project 2	500000	2300.0	100	4	30	$ 290,000,000
Project 3	250000	1150.0	50	3	15	$ 102,500,000
Project 4	50000	230.0	10	1	3	$ 10,100,000
Project 5	125000	575.0	20	2	8	$ 40,625,000
Project 6	150000	690.0	25	2	8	$ 61,350,000
Project 7	75000	345.0	12	1	5	$ 23,100,000
Project 8	200000	920.0	45	3	10	$ 83,600,000
Project 9	175000	805.0	30	2	8	$ 106,750,000
Project 10	400000	1840.0	75	4	20	$ 180,000,000
Project 11	350000	1610.0	65	3	18	$ 139,650,000
Project 12	475000	2185.0	80	4	15	$ 300,675,000
Project 13	105000	483.0	15	2	8	$ 56,910,000
Project 14	95000	437.0	14	1	6	$ 53,960,000
Project 15	275000	1265.0	55	3	15	$ 197,450,000
Project 16	55000	253.0	11	1	5	$ 14,850,000
Project 17	550000	2530.0	105	4	20	$ 287,650,000
Project 18	700000	3220.0	145	5	35	$ 537,600,000
Project 19	625000	2875.0	125	5	30	$ 315,625,000
Project 20	60000	276.0	12	1	3	$ 9,870,000
Project 21	425000	1955.0	77	3	20	$ 221,000,000
Project 22	325000	1495.0	63	3	15	$ 120,412,500
Project 23	650000	2990.0	135	6	35	$ 392,112,500



Requirements	Definitions
Sensors & Cameras	Includes BMS & locks for every door, motion sensors, cameras, and lights
Security Stations	Includes annunciator and monitoring servers for security
Windows	Includes Mylar coating for all windows
Total Cost	Includes design, rennovation, furnishing, and IT equipment costs

Making a Margherita Pizza

- Cost Estimating Relationship (CER): Total Cost of Structural Enhancements as a function of Number of Square Feet, Number of Sensors/Cameras, Number of Security Stations and Number of Windows

CER Equation:				
TotalCost$ = 994.3 * Number_SQFT + (-1414491) * NumSensorsCameras + (-31047208) * NumSecurityStations + 1946754 * Number_Windows				
Parameters:				
	Number of SQFT	**Number of Sensors/Cameras**	**Number of Security Stations**	**Number of Windows**
Min	50000	10	1	3
Max	750000	153	6	36

- Cost Estimating Relationship (CER): Total Cost of Structural Enhancements as a function of Number of Seats, Number of Sensors/Cameras, Number of Security Stations and Number of Windows

CER Equation:				
TotalCost$ = 216156 * Number_Seats + (-1414491) * NumSensorsCameras + (-31047208) * NumSecurityStations + 1946754 * Number_Windows				
Parameters:				
	Number of Seats	**Number of Sensors/Cameras**	**Number of Security Stations**	**Number of Windows**
Min	230	10	1	3
Max	3450	153	6	36

Making a Margherita Pizza

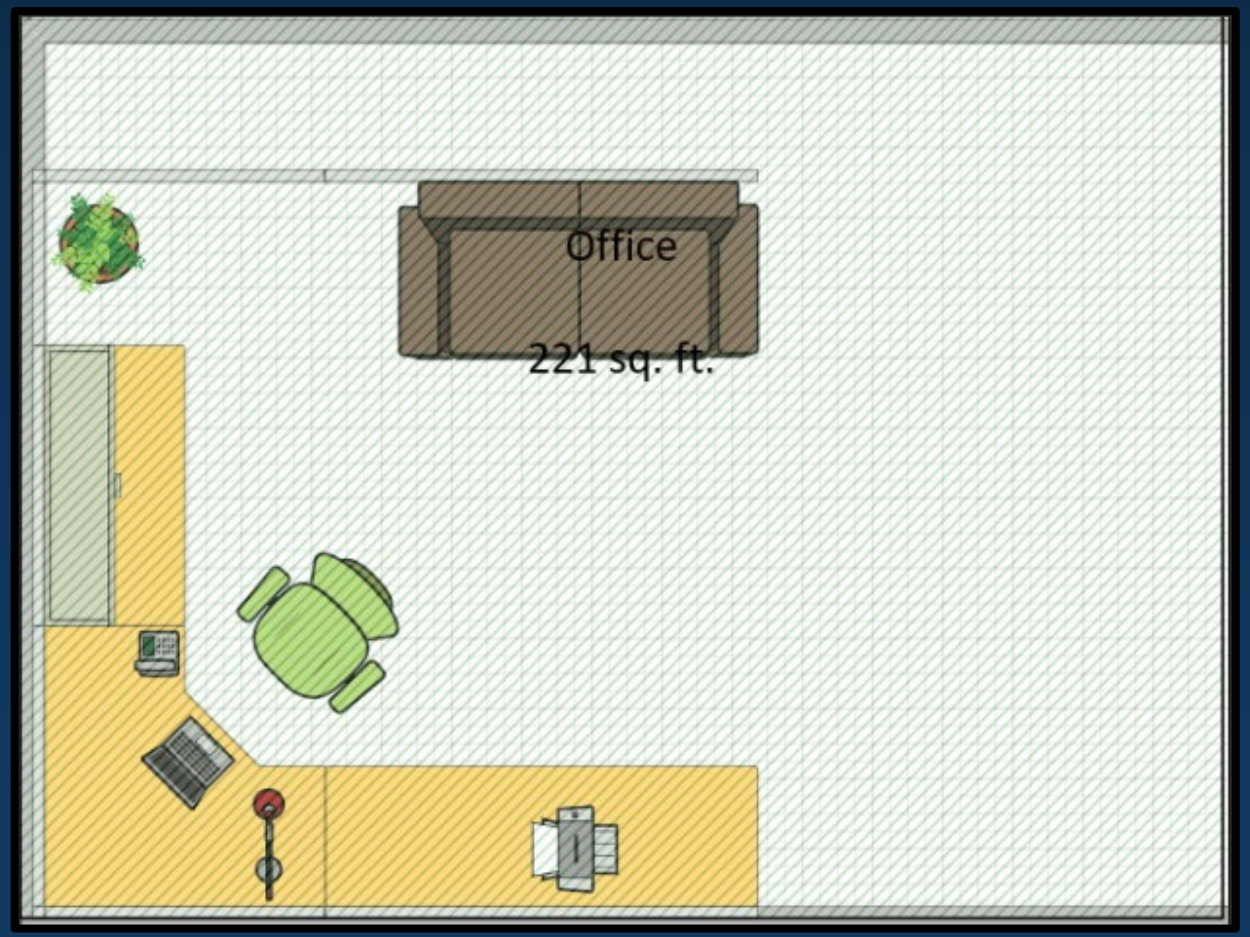
- Below is a sample from the *Military Construction (MILCON) UFC 3-701-01 DoD Facilities Pricing Guide (w/ change 3)*
- This resource serves as a crosscheck for renovation costs per SqFt and is available online

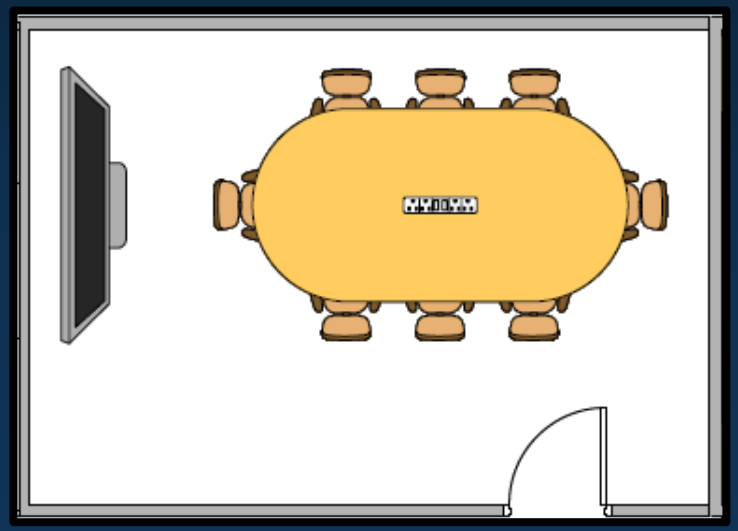
Unit Costs for Military Construction	Reference Size	Oct 2022 unit cost (GUC)	Reference Size	Oct 2022 unit cost (GUC)	Standard Deviation	Standard Deviation /GUC	Number of Projects
FACILITY TYPE	(gross m2)	($/m2)	(gross SF)	($/SF)	($/SF)	pct (%)	
COMMUNICATIONS BUILDINGS:							
SATELLITE COMMUNICATIONS CENTER		**		**	**		1
COMMUNICATIONS FACILITY	6,132	5,436	66,000	***505***	120	24%	6
AIRCRAFT OPERATIONS BUILDINGS:							
AIRCRAFT OPS FACILITY WITHOUT TOWER	5,203	5,554	56,000	516	162	31%	9
CONTROL TOWER (STAND-ALONE) *	VM	1,421,190	VF	132,033	23,630	18%	3
AIRFIELD FIRE & RESCUE STATION (CENTRAL FIRE ALARM SYSTEM NOT INCLUDED	2,137	8,191	23,000	761	192	25%	11
HEADQUARTERS/OPERATIONS BUILDINGS:							
COMPANY LEVEL (LOWEST LEVEL)	2,694	5,802	29,000	***539***	159	29%	3
SQUADRON/ BATTALION HQS (MID LEVEL)	1,579	5,985	17,000	***556***	97	17%	12
BRIGADE/DIVISION WING HQS (UPPER LEVEL)	6,596	4,941	71,000	***459***	56	12%	4
ACADEMIC INSTRUCTION BUILDINGS:							
GENERAL INSTRUCTION (LECTURE CLASSROOM)	2,044	5,899	22,000	***548***	167	30%	5
HIGH BAY W/ SIMULATION TRAINING - SMALL (< 18,000 SF)	660	7,675	7,100	***713***	132	19%	3
HIGH BAY W/ SIMULATION TRAINING - LARGE (> 18,000 SF)	4,274	6,222	46,000	***578***	95	16%	7
APPLIED INSTRUCTIONS (HANDS ON TRAINING) - SMALL (< 35,000 SF)	2,323	4,661	25,000	***433***	96	22%	3
APPLIED INSTRUCTIONS (HANDS ON TRAINING) - LARGE (> 35,000 SF)	13,006	4,704	140,000	***437***	160	37%	3
ARMED FORCES RESERVE CENTER	4,552	4,941	49,000	459	103	22%	5

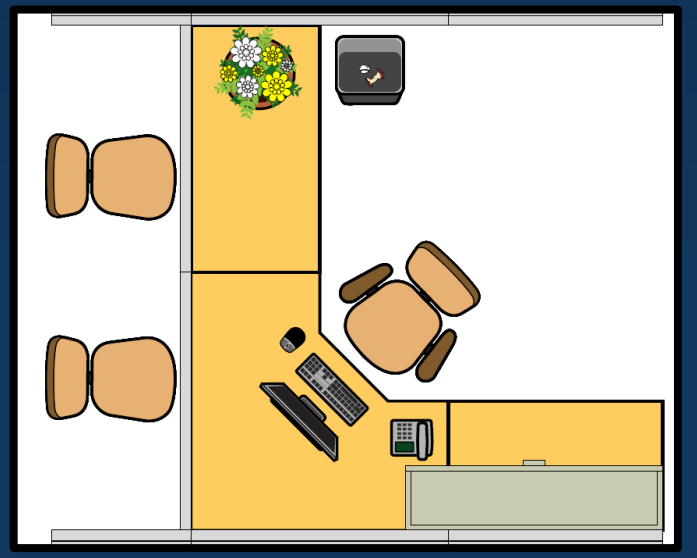
https://www.wbdg.org/ffc/dod/unified-facilities-criteria-ufc/ufc-3-701-01

Making a Margherita Pizza

- Our Facility has an average of 221 SqFt per Seat



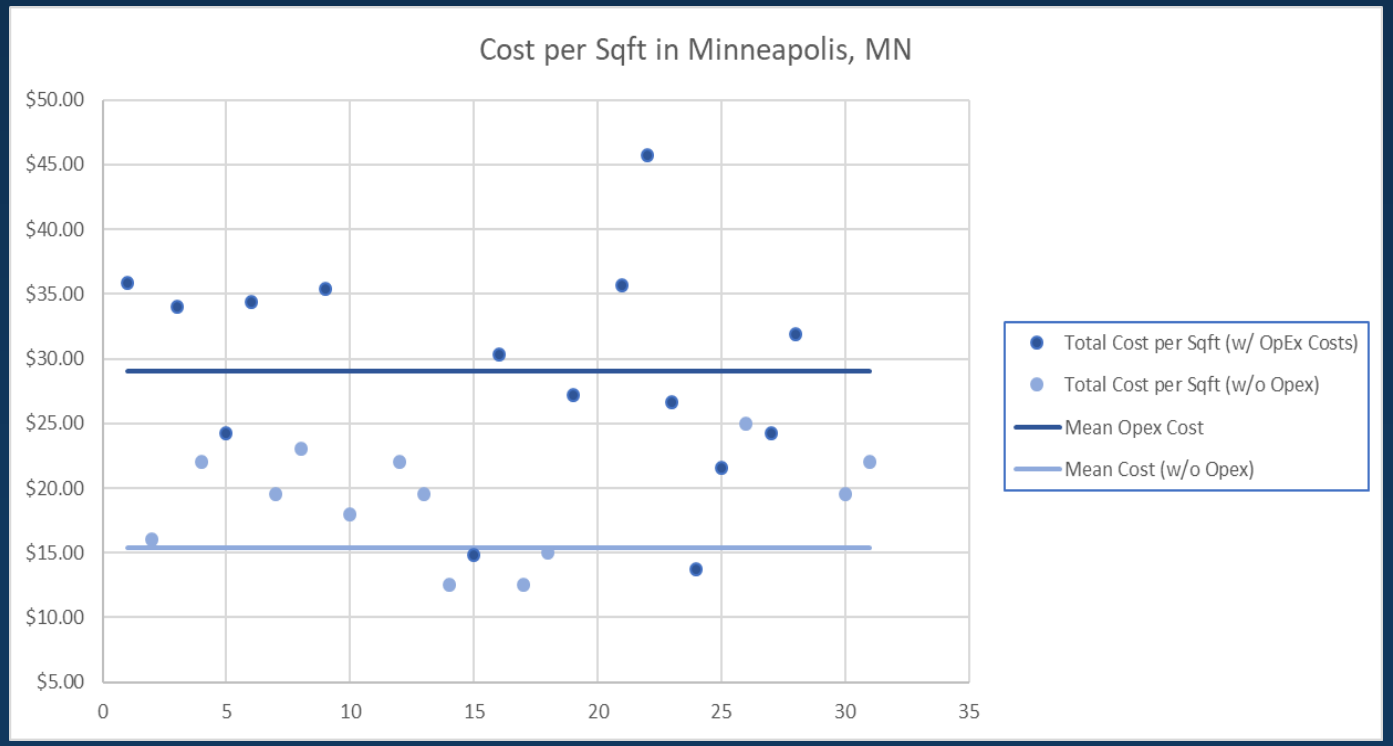




QUANTECH services, inc {The Sum of Quality}

Making a Margherita Pizza

- Collected 28 data points for facility rentals in downtown Minneapolis
- Reduced dataset to the 15 OpEx data points
- Triangular Distribution: Mean $28.21 per SqFt, Min $9.51, Max $39.40



Making a Margherita Pizza

Network BOM				
QTY	Item	NETWORK	UNIT PRICE	EXTENDED PRICE
1	Network	NIPR	$ 425,036.21	$ 425,036.21
2	Network and Firewall	SIPR+JWICS	$ 1,552,031.16	$ 3,104,062.32
1	Firewall	NIPR only	$ 901,325.74	$ 901,325.74
3	Servers		$ 34,996.62	$ 104,989.86
3	Logging		$ 40,061.38	$ 120,184.14
3	Microsoft	/equivalent	$ 47,082.43	$ 141,247.29
3	Cloud Security	F5/equivalent	$ 365,003.94	$ 1,095,011.82
3	Rack		$ 28,798.11	$ 86,394.33
3	Patch Panel		$ 9,002.57	$ 27,007.71
4	Comm's		$ 18,000.00	$ 72,000.00
20	Crypto		$ 80,000.00	$ 1,600,000.00
3	KVM		$ 10,435.69	$ 31,307.07

Bake the Pizza (Build the Estimate)

- Consider all the requirements:
  - Build Out/Non-recurring Costs
    - Renovations/Build Out for SAP-F
    - Network and IT Equipment
  - Recurring Costs
    - OpEx Costs
    - IT and Network Maintenance and Refresh
    - 24x7 Security
- How should it be structured?
  - WBS
- Consider all methodologies and analysis

Bake Pizza at 450 degrees on pizza stone for 20 minutes *Cooking times may vary

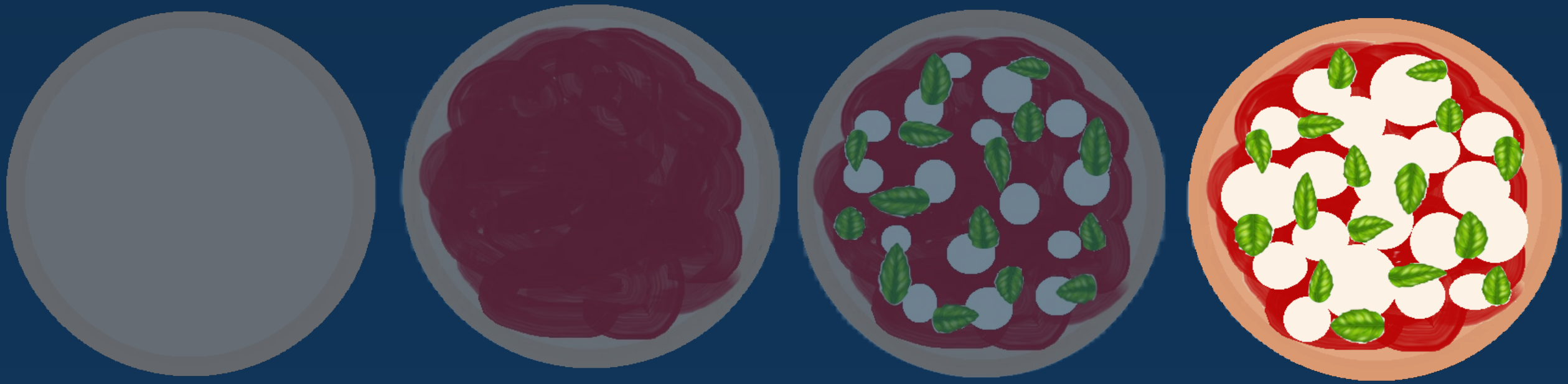
Making a Margherita Pizza

SqFt CER									Methodologies
TY$M @ Mean	FY24	FY25	FY26	FY27	FY28	FY29	FY30	Total	
Facility Estimate	**$ 16.72**	**$ 36.69**	**$ 6.19**	**$ 6.85**	**$ 7.02**	**$ 7.19**	**$ 22.04**	**$ 102.70**	**Roll Up**
Building Occupancy	$ 16.72	$ 36.33	$ -	$ -	$ -	$ -	$ -	**$ 53.06**	**Roll Up**
Build Out	$ 16.72	$ 27.80	$ -	$ -	$ -	$ -	$ -	**$ 44.53**	Structural Cost CER 1 is a function of SqFt (110K), Sensor/Camera Qty (18), Service Workstation Qty (2), Window Qty (10)
Network	$ -	$ 8.53	$ -	$ -	$ -	$ -	$ -	**$ 8.53**	Sqft (110K) * Cost per SqFt
Recurring Costs	$ -	$ 0.35	$ 6.19	$ 6.85	$ 7.02	$ 7.19	$ 22.04	**$ 49.64**	**Roll Up**
Annual OpEx	$ -	$ -	$ 3.04	$ 3.55	$ 3.65	$ 3.73	$ 3.81	**$ 17.78**	SqFt (110K) * Cost per SqFt
IT Equipment	$ -	$ 0.35	$ 0.95	$ 0.98	$ 1.00	$ 1.03	$ 6.11	**$ 10.43**	**Roll Up**
IT Mx	$ -	$ 0.35	$ 0.95	$ 0.98	$ 1.00	$ 1.03	$ 0.65	**$ 4.97**	SqFt (110K) * Cost per SqFt * Mx Factor (20%)
IT Refresh	$ -	$ -	$ -	$ -	$ -	$ -	$ 5.47	**$ 5.47**	SqFt (110K) * Cost per SqFt * Refresh Schedule (5 Year)
Network	$ -	$ -	$ 1.76	$ 1.81	$ 1.86	$ 1.90	$ 11.58	**$ 18.91**	**Roll Up**
Network Mx	$ -	$ -	$ 1.68	$ 1.73	$ 1.77	$ 1.81	$ 1.85	**$ 8.84**	Network Total Cost * Mx Factor (20%)
Network Annual Cost	$ -	$ -	$ 0.08	$ 0.08	$ 0.09	$ 0.09	$ 0.09	**$ 0.43**	Network Comms Qty (4) * Network Comms Unit Cost
Network Refresh	$ -	$ -	$ -	$ -	$ -	$ -	$ 9.63	**$ 9.63**	Network Total Cost * Refresh Schedule (5 Year)
Labor	$ -	$ -	$ 0.43	$ 0.51	$ 0.52	$ 0.53	$ 0.54	**$ 2.53**	**Roll Up**
Security	$ -	$ -	$ 0.43	$ 0.51	$ 0.52	$ 0.53	$ 0.54	**$ 2.53**	Security FTE (2) * Labor Rate

Making a Margherita Pizza

Seats CER									Methodologies
TY$M @ Mean CL	FY24	FY25	FY26	FY27	FY28	FY29	FY30	Total	
Facility Estimate	**$ 16.20**	**$ 35.81**	**$ 6.19**	**$ 6.85**	**$ 7.02**	**$ 7.19**	**$ 22.04**	**$ 101.30**	**Roll Up**
Building Occupancy	$ 16.20	$ 35.46	$ -	$ -	$ -	$ -	$ -	**$ 51.66**	**Roll Up**
Build Out	$ 16.20	$ 26.93	$ -	$ -	$ -	$ -	$ -	**$ 43.13**	Structural Cost CER 2 is a function of Seat Qty (500), Sensor/Camera Qty (18), Service Workstation Qty (2), Window Qty (10)
Network	$ -	$ 8.53	$ -	$ -	$ -	$ -	$ -	**$ 8.53**	Sqft (110K) * Cost per SqFt
Recurring Costs	$ -	$ 0.35	$ 6.19	$ 6.85	$ 7.02	$ 7.19	$ 22.04	**$ 49.64**	**Roll Up**
Annual OpEx	$ -	$ -	$ 3.04	$ 3.55	$ 3.65	$ 3.73	$ 3.81	**$ 17.78**	SqFt (110K) * Cost per SqFt
IT Equipment	$ -	$ 0.35	$ 0.95	$ 0.98	$ 1.00	$ 1.03	$ 6.11	**$ 10.43**	**Roll Up**
IT Mx	$ -	$ 0.35	$ 0.95	$ 0.98	$ 1.00	$ 1.03	$ 0.65	**$ 4.97**	SqFt (110K) * Cost per SqFt * Mx Factor (20%)
IT Refresh	$ -	$ -	$ -	$ -	$ -	$ -	$ 5.47	**$ 5.47**	SqFt (110K) * Cost per SqFt * Refresh Schedule (5 Year)
Network	$ -	$ -	$ 1.76	$ 1.81	$ 1.86	$ 1.90	$ 11.58	**$ 18.91**	**Roll Up**
Network Mx	$ -	$ -	$ 1.68	$ 1.73	$ 1.77	$ 1.81	$ 1.85	**$ 8.84**	Network Total Cost * Mx Factor (20%)
Network Annual Cost	$ -	$ -	$ 0.08	$ 0.08	$ 0.09	$ 0.09	$ 0.09	**$ 0.43**	Network Comms Qty (4) * Network Comms Unit Cost
Network Refresh	$ -	$ -	$ -	$ -	$ -	$ -	$ 9.63	**$ 9.63**	Network Total Cost * Refresh Schedule (5 Year)
Labor	$ -	$ -	$ 0.43	$ 0.51	$ 0.52	$ 0.53	$ 0.54	**$ 2.53**	**Roll Up**
Security	$ -	$ -	$ 0.43	$ 0.51	$ 0.52	$ 0.53	$ 0.54	**$ 2.53**	Security FTE (2) * Labor Rate

Making a Margherita Pizza



Bake at 450 degrees for 20 minutes until cheese is melted and crust is lightly golden

Serve it up (Conclusion)

- Make sure you have enough pizza for your party
  - Understand the Program's structural vision for the Facility
- Key to a great pizza is the dough to sauce ratio
  - Clearly spec your infrastructure to reflect the needs of your program

- Pizza Toppings should reflect your guest preferences and dietary restrictions
  - Make sure your recurring scope is relevant for your Program (Tennis court?)
- Fresh ingredients make a better pizza
  - The better the data collected, the better the estimate
- Don't burn or undercook your pizza!!!
  - Ensure the methodologies estimate the full scope of the Facility

Questions?

Sources

- Slide 4 - Map of Software Factories
- Slide 6 - Chef Tossing Dough image
- Slide 9 - Pizza Sauce image
- Slide 10 - IT Equipment/Network image
- Slide 12 -
  - Mozzarella image
  - Basil image
- Slide 15 -
  - Shopping Basket image
  - Pizza Ingredients image
- Slide 17 - Unified Facilities Criteria Resource
- Slide 27 -
  - Burnt Pizza image
  - Slice of Cheese image