SMS SUMMIT 2024

COST CATALOG STRATEGY

Updated: July 2024

Presentation: Thursday, Aug. 1
Session 3B (NAS 120): 3:00 PM—4:00 PM

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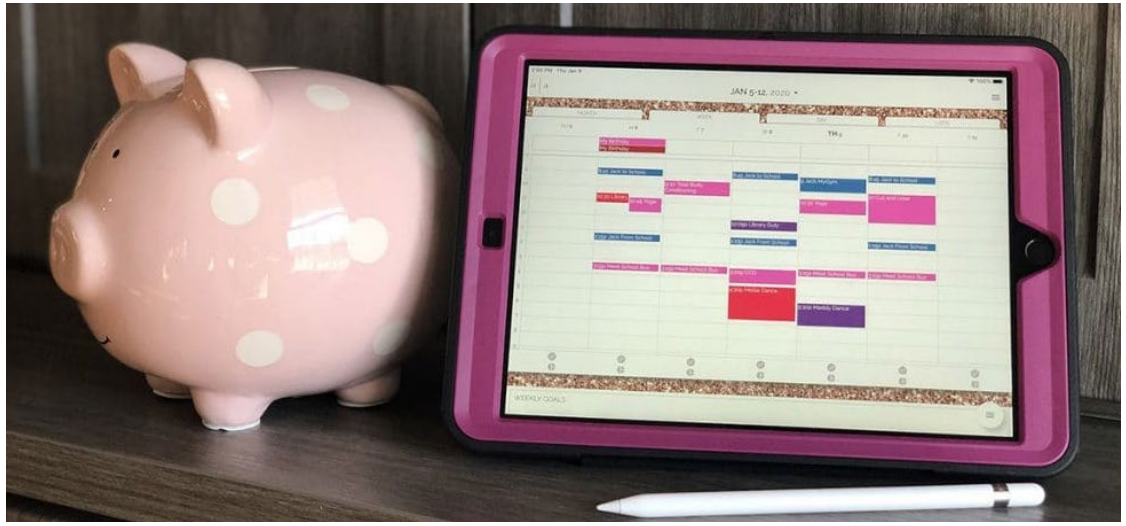
ENGINEER RESEARCH & DEVELOPMENT CENTER

AGENDA

1. Status of SMS Cost Data & Catalog
2. Partnership with Gordian/RSMeans
3. Collaboration with DoD Cost Working Group
4. Costbook Efforts
5. Uses and Examples of Costs in SMS
6. Potential Ideas and Intentions
7. Q&A Section



IMPORTANCE OF ACCURATE COST DATA

- One of the guides for any facility manager
- Critical for work planning, resource budgeting, and decision-making
- These are processes supported by SMS
- An up-to-date Costbook has been a top request from users
- Estimate repair needs & deferred maintenance
- We need compatibility with our data format
- Also, expertise and ongoing stewardship

BUILDER SMS DATA STRUCTURE & CATALOG

❖ Different building types, components, work activities, and methods

CMC_I	SYS_DESC	COMP_DESC	MAT_CAT_DESC	COMP_TYPE_DESC	Replace Unit Co	SERVICE_LIF	UOM_E
30212	A10 FOUNDATIONS	A1010 STANDARD FOUNDATIONS	A101001 WALL FOUNDATIONS	Foundation Wall	$ 26.20	100	SF
35050	A10 FOUNDATIONS	A1010 STANDARD FOUNDATIONS	A101001 WALL FOUNDATIONS	Foundation wall and footing per square foot o	$ 7.62	100	SF
41000	A10 FOUNDATIONS	A1010 STANDARD FOUNDATIONS	A101001 WALL FOUNDATIONS	General	$ 60.50	100	LF
21351	A10 FOUNDATIONS	A1010 STANDARD FOUNDATIONS	A101001 WALL FOUNDATIONS	Grade Beams	$ 210.00	100	LF
42000	A10 FOUNDATIONS	A1010 STANDARD FOUNDATIONS	A101001 WALL FOUNDATIONS	Other	$ 128.00	100	LF
21350	A10 FOUNDATIONS	A1010 STANDARD FOUNDATIONS	A101001 WALL FOUNDATIONS	Strip Footing	$ 177.00	100	LF
43000	A10 FOUNDATIONS	A1010 STANDARD FOUNDATIONS	A101001 WALL FOUNDATIONS	Unknown	$ 243.50	100	LF
30001	A10 FOUNDATIONS	A1010 STANDARD FOUNDATIONS	A101002 COLUMN FOUNDATIONS & PILE CAPS	Column Pier	$ 3,800.00	100	EA
30002	A10 FOUNDATIONS	A1010 STANDARD FOUNDATIONS	A101002 COLUMN FOUNDATIONS & PILE CAPS	Column Pier - Concrete	$ 21,575.00	100	EA
30003	A10 FOUNDATIONS	A1010 STANDARD FOUNDATIONS	A101002 COLUMN FOUNDATIONS & PILE CAPS	Column Pier - Steel	$ 30,000.00	100	EA
30004	A10 FOUNDATIONS	A1010 STANDARD FOUNDATIONS	A101002 COLUMN FOUNDATIONS & PILE CAPS	Column Pier - Wood	$ 5,725.00	60	EA
41001	A10 FOUNDATIONS	A1010 STANDARD FOUNDATIONS	A101002 COLUMN FOUNDATIONS & PILE CAPS	General	$ 920.00	100	EA
42001	A10 FOUNDATIONS	A1010 STANDARD FOUNDATIONS	A101002 COLUMN FOUNDATIONS & PILE CAPS	Other	$ 11,050.00	100	EA
21348	A10 FOUNDATIONS	A1010 STANDARD FOUNDATIONS	A101002 COLUMN FOUNDATIONS & PILE CAPS	Pile Cap	$ 4,525.00	100	EA
21347	A10 FOUNDATIONS	A1010 STANDARD FOUNDATIONS	A101002 COLUMN FOUNDATIONS & PILE CAPS	Spread Footing	$ 613.00	100	EA
43001	A10 FOUNDATIONS	A1010 STANDARD FOUNDATIONS	A101002 COLUMN FOUNDATIONS & PILE CAPS	Unknown	$ 20,125.00	100	EA
41002	A10 FOUNDATIONS	A1010 STANDARD FOUNDATIONS	A101003 DEWATERING	General	$ 1.30	100	SF
42002	A10 FOUNDATIONS	A1010 STANDARD FOUNDATIONS	A101003 DEWATERING	Other	$ 1.30	100	SF
43002	A10 FOUNDATIONS	A1010 STANDARD FOUNDATIONS	A101003 DEWATERING	Unknown	$ 1.30	100	SF
41003	A10 FOUNDATIONS	A1010 STANDARD FOUNDATIONS	A101090 OTHER STANDARD FOUNDATIONS	General	$ 1,620.00	100	EA
21349	A10 FOUNDATIONS	A1010 STANDARD FOUNDATIONS	A101090 OTHER STANDARD FOUNDATIONS	Other	$ 3,100.00	100	EA
43003	A10 FOUNDATIONS	A1010 STANDARD FOUNDATIONS	A101090 OTHER STANDARD FOUNDATIONS	Unknown	$ 5,850.00	100	EA
21357	A10 FOUNDATIONS	A1020 SPECIAL FOUNDATIONS	A102001 PILE FOUNDATIONS	CIP Concrete	$ 1,535.00	100	EA
41004	A10 FOUNDATIONS	A1020 SPECIAL FOUNDATIONS	A102001 PILE FOUNDATIONS	General	$ 14.27	100	SF
42004	A10 FOUNDATIONS	A1020 SPECIAL FOUNDATIONS	A102001 PILE FOUNDATIONS	Other	$ 28.50	100	SF
21356	A10 FOUNDATIONS	A1020 SPECIAL FOUNDATIONS	A102001 PILE FOUNDATIONS	PC Concrete	$ 1,845.00	100	EA
35051	A10 FOUNDATIONS	A1020 SPECIAL FOUNDATIONS	A102001 PILE FOUNDATIONS	Piles and beams per square foot of floor area	$ 4.32	100	SF
21354	A10 FOUNDATIONS	A1020 SPECIAL FOUNDATIONS	A102001 PILE FOUNDATIONS	Steel H Section	$ 2,500.00	100	EA
21355	A10 FOUNDATIONS	A1020 SPECIAL FOUNDATIONS	A102001 PILE FOUNDATIONS	Steel Pipe	$ 3,750.00	100	EA
21353	A10 FOUNDATIONS	A1020 SPECIAL FOUNDATIONS	A102001 PILE FOUNDATIONS	Treated Wood	$ 3,175.00	60	EA
43004	A10 FOUNDATIONS	A1020 SPECIAL FOUNDATIONS	A102001 PILE FOUNDATIONS	Unknown	$ 21.85	100	SF

- Baseline with over 7,000 elements
- CMC as unique identifier
- Choices in UoM and other categories
- Standardized UNIFORMAT Classification
- Former Legacy Unit Cost information

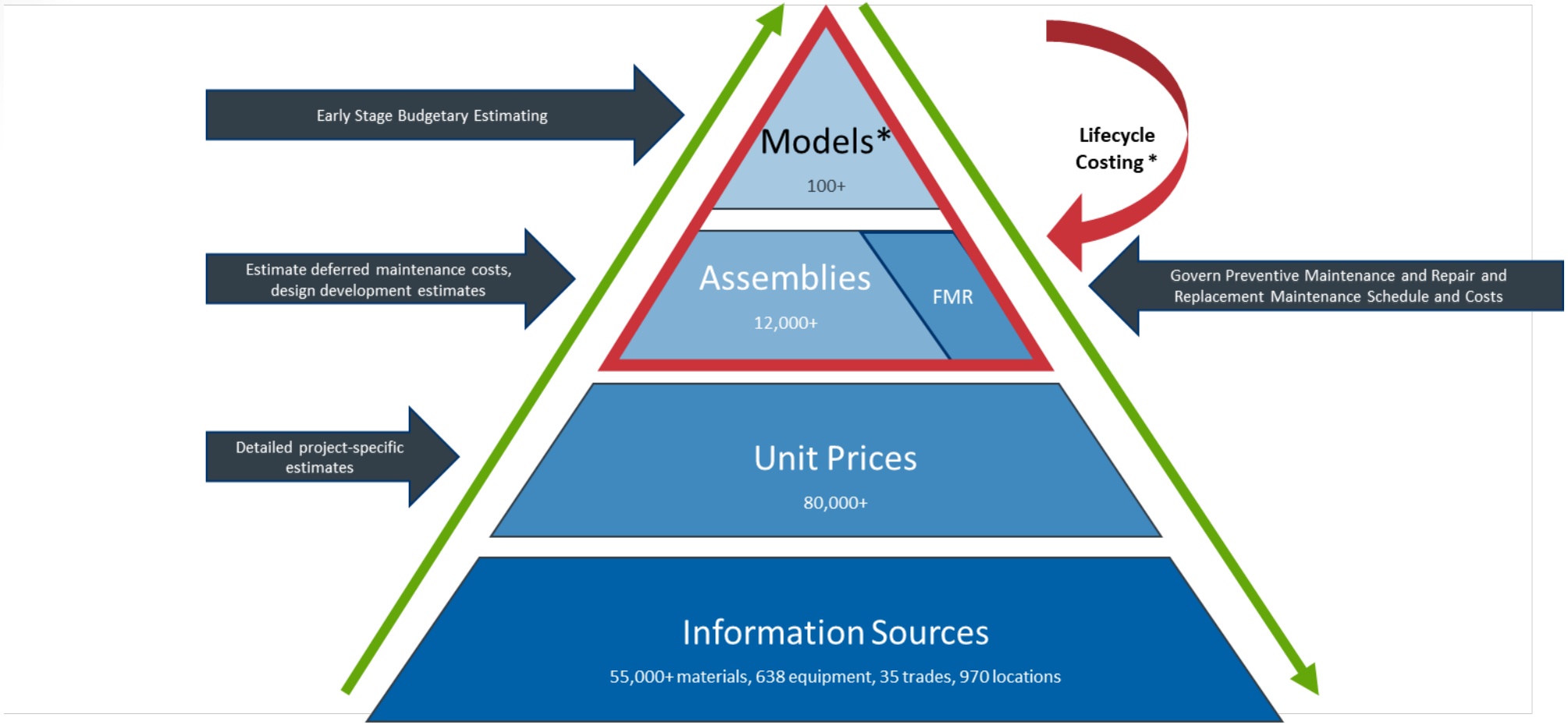
ACQUISITION OF COST INFORMATION

- We explored federal & commercial options
- Factors that we considered:
  - data recognition/satisfaction,
  - format requirements for integration,
  - quality,
  - communication

- Started with priority, representative, and commonly used items, then expanded to new ones

RSMeans data from GORDIAN®

RSMEANS DATABASE STRUCTURE



RSM. ESTIMATING RESEARCH METHODOLOGY

- Material Price Drivers
- Annual Update
- Enhancements

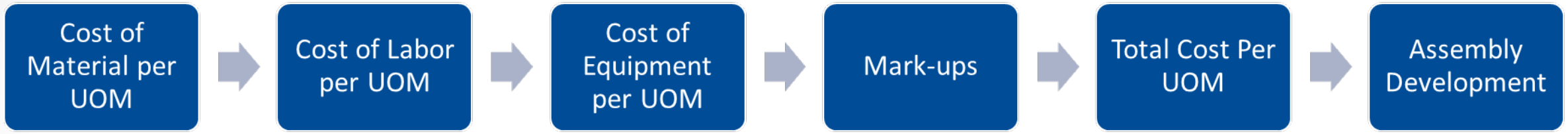
- Union Wages
- Davis - Bacon
- Prevailing Wages
- Local Requirements

- Rental Equipment Costs

❖ All costs are based upon the Unit of Measure

RSM. UNIT PRICES & STEPS

- All costs are based upon the Unit of Measure



REMOVE AND REPLACE (R&R) VS INSTALL

Remove and Replace (R&R)

- Pricing includes the cost of removal and disposal of old materials, equipment, and the installation of new materials
- Does not include “structural” items which are priced as Install

Install (Structural)

- Includes install costs for material, labor, and equipment
- Does not include costs of removal and disposal

MARK-UP

Included

- Material Cost – base cost plus 10% O&P
- Installation Cost
  - Labor – base cost plus fringe, workers comp, fixed overhead, overhead, profit
  - Equipment – base cost plus 10% O&P

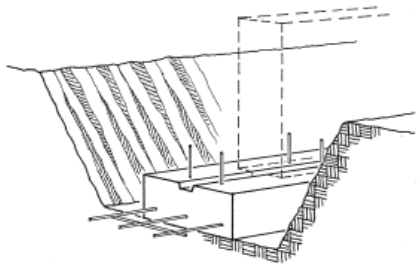
Not Included

- General Conditions
- General Contractor O&P

ASSEMBLIES

A10 Foundations

A1010 Standard Foundations



The Strip Footing System includes: excavation; hand trim; all forms needed for footing placement; forms for 2″ x 6″ keyway (four uses); dowels; and 3,000 p.s.i. concrete.

The footing size required varies for different soils. Soil bearing capacities are listed for 3 KSF and 6 KSF. Depths of the system range from 8″ and deeper. Widths range from 16″ and wider. Smaller strip footings may not require reinforcement.

Please see the reference section for further design and cost information.

System Components	QUANTITY	UNIT	COST PER L.F. MAT.	INST.	TOTAL
SYSTEM A1010 110 2500					
STRIP FOOTING, LOAD 5.1 KLF, SOIL CAP. 3 KSF, 24″ WIDE X 12″ DEEP, REINF.					
Trench excavation	.148	C.Y.		1.60	1.60
Hand trim	2.000	S.F.		2.40	2.40
Compacted backfill	.074	C.Y.		.33	.33
Formwork, 4 uses	2.000	S.F.	5.64	10.50	16.14
Keyway form, 4 uses	1.000	L.F.	.53	1.34	1.87
Reinforcing, fy = 60000 psi	3.000	Lb.	2.49	2.07	4.56
Dowels	2.000	Ea.	2.34	6.04	8.38
Concrete, f'c = 3000 psi	.074	C.Y.	12.95		12.95
Place concrete, direct chute	.074	C.Y.		2.11	2.11
Screed finish	2.000	S.F.		.90	.90
TOTAL			23.95	27.29	51.24

GENERAL, OTHER, AND UNKNOWN CATEGORIES

- **General**: Assigned to an RSMeans cost item that best represents the UniFormat II category into which it falls based upon the Lead Engineer's judgment
- **Other**: Assigned to an RSMeans cost item that represents the closest to average cost within the UniFormat II category
- **Unknown**: Assigned to an RSMeans cost items that best represent the highest cost within the UniFormat II category

ESTABLISHING DOD COST WORKING GROUP

Charter for collaboration & feedback from users:

- Written in April 2022
- Improving Communication
- Organizing Actions & Groups
- Declaring Data Disclaimer
- 12 DoD agencies
- Over 30 participants

Title: BUILDER SMS Component Cost Review Working Group

Point of Contact: Juan Davila-Perez Juan.L.Davila-Perez@erdc.dren.mil, SMS Cost SME

Background: BUILDER SMS uses a library of component level replacement costs to estimate the cost of work actions, run comparative scenarios and calculate indexes. Convening this Working group will provide improved oversight, transparency, and quality of the cost data used in BUILDER.

Working Group Objective: The overall objective of this Working group is to ensure the BUILDER costbook data is sufficiently reviewed to ensure component replacement unit costs are as accurate as possible for BUILDER cost estimation.

Approach: Each DoD service component or agency may identify an individual with experience or background in cost estimating to serve on the cost review Working group. The Working group will meet as needed to review costs, assign review tasks, and report back on findings. The exact meeting schedule will be coordinated to support the timeline detailed below.

Work Group Tasks: To accomplish the objective, the Working group will review the component replacement unit costs provided each year by Gordian to ensure those costs generally align with the value of each component type in the BUILDER catalog, identify potential unit cost outliers that require additional review, and collectively agree on the addition of new component type items to the cost database.

Schedule:

- September – SMS TCX receives updated costbook for next fiscal year from Gordian
- October – SMS TCX performs several QA checks on the cost data to spot potential outliers, then sends annotated dataset to the Working group members
- November – Working group members review the cost data and annotate any additional outliers that they find. Working group members meet at the end of November to discuss the findings
- December – TCX compiles Working group comments and sends them to Gordian for review.
- January – Gordian responds to comments and sends an updated cost dataset, which TCX will provide to the Working group. The Working group meets again as needed to discuss responses.
- February – TCX compiles any requests for new adds to the costbook and sends them to the Working group. The Working group meets to accept/prioritize new requests.
- March – TCX sends a list of requested new adds to Gordian for inclusion in the subsequent cost data set deliverable.
- Ad Hoc – The Working group may meet as needed to discuss other cost-related topics, such as changes to the component catalog, changes to units of measure, development of future cost estimating capabilities, etc.

Disclaimer: Any cost data provided for review is licensed proprietary data and not to be shared outside of this group without permission.

SMS COSTBOOK VERSION 2024

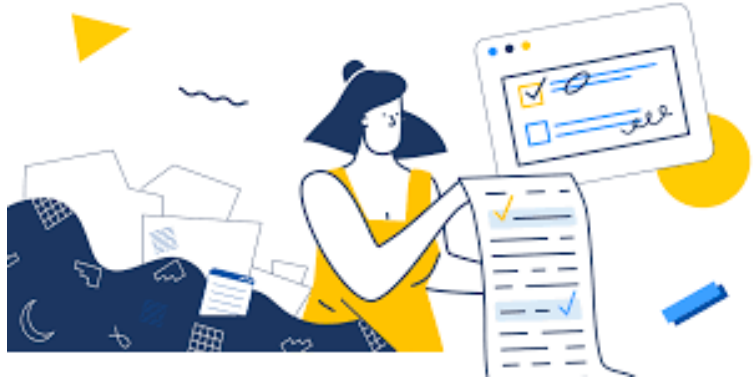
CMC ID	Assembly Coc	Imperial Description	Imperial UOM	Service Li	Material Cost C	Installation Cost C	Total Cost OP
35050	A10180100018	Foundation wall and footing per square foot of floor area	SF Flr	NULL	$ 2.90	$ 4.72	$ 7.62
35051	A10289000100	Piles and beams per square foot of floor area	SF Flr	NULL	$ 2.34	$ 1.98	$ 4.32
35052	B10180050010	Reinforced slab per square foot of floor area	SF Flr	NULL	$ 6.10	$ 5.15	$ 11.25
45100	B10200187000	Remove and Replace Bowstring Truss for Hangars	Linear Foot	75	$ 270.00	$ 64.00	$ 334.00
35053	B10280050010	Roof structure, insulation and roofing per square foot of floor area	SF Flr	NULL	$ 15.45	$ 5.95	$ 21.40
70851	B20180100370	Remove and Replace , Exterior Closure ,Structural insulated panel, 7/16" OSB both faces, EPS insulation, 5-5	Square Feet	25	$ 5.65	$ 6.95	$ 12.60
41047	B20180101000	Remove and Replace , Exterior Joint Sealant ,General	Linear Foot	20	$ 0.87	$ 5.55	$ 6.42
71432	B20200117000	Remove and Replace Security Windows, Aluminum, 5 Min FE	Square Feet	30	$ 283.00	$ 139.00	$ 422.00
71430	B20200127000	Remove and Replace Security Windows, Aluminum, 15 Min FE/BR	Square Feet	30	$ 283.00	$ 141.00	$ 424.00
71419	B20200127001	Remove and Replace Blast Resistant Window	Square Feet	30	$ 276.00	$ 212.00	$ 488.00
80216	B20200217000	Remove and Replace Circulating Rotating Entrance Doors, 7' High, Average Quality	Each	40	$ 48,300.00	$ 6,550.00	$ 54,850.00
21393	B20200217001	Remove and Replace Balanced Doors 3' x 7', Premium	Square Feet	40	$ 430.00	$ 117.00	$ 547.00
42052	B20200217002	Remove and Replace Sliding Storefront Doors, Mall Fronts, Aluminum and Glass 15' x 9'	Square Feet	40	$ 46.50	$ 33.00	$ 79.50
43052	B20200217003	Remove and Replace Swinging Glass Entry Doors w/Hardware 6' x 7' Opening	Square Feet	40	$ 140.00	$ 50.50	$ 190.50
45102	B20200217004	Remove and Replace Storefront with Panic Exit Doors	Square Feet	40	$ 94.00	$ 17.75	$ 111.75
45101	B20200217005	Remove and Replace Storefront with Latch Bolt Doors	Square Feet	40	$ 94.00	$ 16.75	$ 110.75
45104	B20200317000	Remove and Replace Curtain Wall with Panic Exit Doors	Square Feet	40	$ 81.50	$ 24.00	$ 105.50
45103	B20200317001	Remove and Replace Curtain Wall with Latch Bolt Doors	Square Feet	40	$ 81.50	$ 23.50	$ 105.00
70602	B20280101000	Remove and replace, windows, security bars/screen	Square Feet	12	$ 18.95	$ 5.45	$ 24.40
80218	B20300217000	Remove and Replace Specialized Glazed Doors 6' x 7' Opening	Opening	40	$ 10,800.00	$ 1,500.00	$ 12,300.00
45106	B20300217001	Remove and Replace Glazed Doors with Panic Hardware 6' x 7' Opening	Opening	40	$ 20,200.00	$ 2,650.00	$ 22,850.00
45105	B20300217002	Remove and Replace Glazed Doors with Latch Bolt 6' x 7' Opening	Opening	40	$ 20,200.00	$ 2,575.00	$ 22,775.00
35054	B20380050010	Exterior personnel and overhead doors per square foot of floor area	SF Flr	NULL	$ 2.07	$ 0.46	$ 2.53
70825	B20380101000	Remove and replace, solid doors, aluminum (residential)	Each	15	$ 470.00	$ 160.00	$ 630.00

- 4087 rows/items by 8 columns

QUALITY ASSURANCE & CHECKS OF DATA

Control performed by Gordian before production and SMS/WG analysis:

1. All CMCs to be mapped correctly back to the catalog
2. All UoMs to match
3. Assembly descriptions should be equivalent
4. Reasonable Cost Progression in component groups
5. No duplicated CMCs, Codes, & Descriptions for the whole table
6. Changes between versions should be close to inflation
7. Flagging extreme changes for revisions
8. Searching for outliers (including component costs/SF > replacement/SF of a building)



PETITIONS TO IMPORT COSTBOOK BY INSTANCE

- We try to fit into the organization/agency's cycles and needs
- Open discussion with their team for a plan of importing updates
- Dedicated impact analysis (changes year to year, and magnitude occurrences and quantities)
- Options of importing all data from a version or specific items that should and others shouldn't

CMC_ID	Current Costs	SERVICE_LIFE	UOM_E	New Costs	Count of Sections	Section Qty	Total Current Costs	Total New Costs	Difference between Total Costs	Percent Changed
30212	$ 24.18	100	SF	$ 26.20	18,740	22,750,307	$ 550,019,839.65	$ 596,058,043.40	$ 46,038,203.75	7.72
41000	$ 58.15	100	LF	$ 60.50	41	27,219	$ 1,582,667.81	$ 1,646,749.50	$ 64,081.69	3.89
21351	$ 205.04	100	LF	$ 210.00	6,824	4,931,355	$ 1,011,125,522.34	$ 1,035,584,550.00	$ 24,459,027.66	2.36
42000	$ 123.94	100	LF	$ 128.00	3	639	$ 79,199.03	$ 81,792.00	$ 2,592.97	3.17
21350	$ 165.26	100	LF	$ 177.00	67,147	25,459,506	$ 4,207,341,215.44	$ 4,506,332,562.00	$ 298,991,346.56	6.63
30001	$ 3,646.86	100	EA	$ 3,800.00	132	2,042	$ 7,446,883.02	$ 7,759,600.00	$ 312,716.98	4.03
30002	$ 21,371.10	100	EA	$ 21,575.00	4,286	122,295	$ 2,613,578,063.03	$ 2,638,514,625.00	$ 24,936,561.97	0.95
30003	$ 29,582.90	100	EA	$ 30,000.00	1,261	19,395	$ 573,760,345.50	$ 581,850,000.00	$ 8,089,654.50	1.39
30004	$ 5,610.55	60	EA	$ 5,725.00	731	14,328	$ 80,387,960.40	$ 82,027,800.00	$ 1,639,839.60	2
41001	$ 872.19	100	EA	$ 920.00	61	1,392	$ 1,214,082.22	$ 1,280,640.00	$ 66,557.78	5.2
42001	$ 10,711.05	100	EA	$ 11,050.00	45	709	$ 7,594,134.45	$ 7,834,450.00	$ 240,315.55	3.07
21348	$ 4,360.93	100	EA	$ 4,525.00	1,065	41,797	$ 182,273,686.72	$ 189,131,425.00	$ 6,857,738.28	3.63
21347	$ 581.46	100	EA	$ 613.00	23,508	569,288	$ 331,016,492.62	$ 348,973,544.00	$ 17,957,051.38	5.15
41003	$ 1,545.45	100	EA	$ 1,620.00	16	3,389	$ 5,237,535.13	$ 5,490,180.00	$ 252,644.87	4.6
21349	$ 2,958.29	100	EA	$ 3,100.00	8	107	$ 316,537.03	$ 331,700.00	$ 15,162.97	4.57
21357	$ 1,519.95	100	EA	$ 1,535.00	902	61,127	$ 92,909,922.52	$ 93,829,945.00	$ 920,022.48	0.98
41004	$ 14.16	100	SF	$ 14.27	6	11,147	$ 157,830.24	$ 159,067.69	$ 1,237.45	0.78
42004	$ 28.31	100	SF	$ 28.50	1	650	$ 18,400.05	$ 18,525.00	$ 124.95	0.67
21356	$ 1,795.38	100	EA	$ 1,845.00	51	7,609	$ 13,661,015.98	$ 14,038,605.00	$ 377,589.02	2.69

REQUESTS FOR NEW ITEMS TO BE ADDED

- In our agreement with Gordian, we can request 200 items every year
- Gordian solicit a Preliminary list (25%) by Q1, and the Final list (100%) by Q2
- WG shares their requested items in a form, pointing out the CMC, and notes to consider
- We accept recommendations from Gordian and scan catalog items absent in the Costbook
- We are expanding from BUILDER items, covering other domains too for ESMS

CMC	System	Subsystem	Component	Description	UOI		Requesting Agency	Notes
New	B10 SUPERSTRUCTURE	B1010 FLOOR CONSTRUCTION	B101003 FLOOR DECKS AND SLABS	Plywood	SF		ARMY-LHC	
New	B20 EXTERIOR ENCLOSURE	B2010 EXTERIOR WALLS	B201001 EXTERIOR CLOSURE	Transite Abestos Panel	SF		ARMY-LHC	
New	B20 EXTERIOR ENCLOSURE	B2010 EXTERIOR WALLS	B201001 EXTERIOR CLOSURE	Terra Cotta	SF		ARMY-LHC	This cover
New	B20 EXTERIOR ENCLOSURE	B2020 EXTERIOR WINDOWS	B202001 WINDOWS	Bullet/Blast Resistant	SF		ARMY-LHC	This cover
New	B20 EXTERIOR ENCLOSURE	B2030 EXTERIOR DOORS	B203001 SOLID DOORS	Fiberglass	EA		ARMY-LHC	
New	B20 EXTERIOR ENCLOSURE	B2030 EXTERIOR DOORS	B203003 REVOLVING DOORS	Turnstile	EA		ARMY-LHC	For full he
New	B20 EXTERIOR ENCLOSURE	B2030 EXTERIOR DOORS	B203091 OTHER EXTERIOR PERSONNEL DOORS	Glass, Sliding, Aluminum	EA		ARMY-LHC	
New	B20 EXTERIOR ENCLOSURE	B2030 EXTERIOR DOORS	B203091 OTHER EXTERIOR PERSONNEL DOORS	Glass, Sliding, Vinyl	EA		ARMY-LHC	
New	B30 ROOFING	B3010 ROOF COVERINGS	B301001 STEEP SLOPE ROOF SYSTEMS	Architectural Shingles	SF		ARMY-LHC	
New	B30 ROOFING	B3010 ROOF COVERINGS	B301001 STEEP SLOPE ROOF SYSTEMS	Transite Abestos Panel	SF		ARMY-LHC	
New	B30 ROOFING	B3010 ROOF COVERINGS	B301001 STEEP SLOPE ROOF SYSTEMS	Translucent Panel	SF		ARMY-LHC	
New	B30 ROOFING	B3010 ROOF COVERINGS	B301006 ROOF OPENINGS AND SUPPORTS	Solar Tubes	EA		ARMY-LHC	One avera
New	C10 INTERIOR CONSTRUCTION	C1010 PARTITIONS	C101001 FIXED PARTITIONS	Wall - CIP Concrete	SF		ARMY-LHC	
New	C10 INTERIOR CONSTRUCTION	C1010 PARTITIONS	C101001 FIXED PARTITIONS	Wall - Laminated Plastic	SF		ARMY-LHC	This inclu

COST DATA USES IN SMS

- Work item estimates for **Component Replacement**
- Work item estimates for **Component Repairs**
- **Building Condition Index** (**BCI**) and all other indices derived from BCI.
- **Facility Condition Index** (**FCI**) depending on Component Replacement costs as Deferred Maintenance & Repair costs

❖ Understanding that BCI & FCI aren't the same as they have different purposes/missions.

COMPONENT REPLACEMENT COST FACTORS

$$f$$

- **Cost of Component Specification** [from the Cost Book]
  Ex: D303001, Chiller, Reciprocating, Air-Cooled, 80-Ton
- **Component quantity** [from component section]
  Ex: Two (2)
- **Location** [from inherited site location]
  Ex: NAS Pensacola, FL
- **Year of replacement** [from analysis requirement]
  Ex: 2026
- **Any component cost modifiers (adders or multipliers)** [applied by the managing organization]

COMPONENT REPLACEMENT COST CALCULATION

Replacement of (2) 80-Ton Reciprocating Air Cooled Chillers at Pensacola Naval Hospital in 2026

Component Specification

D303001, 80-Ton Reciprocating Air-Cooled Chiller

Component Quantity

x2

Year of replacement

2026

Cost Book

Contains unit costs of all component sections as estimated for 2024 based on the "national average" costs.

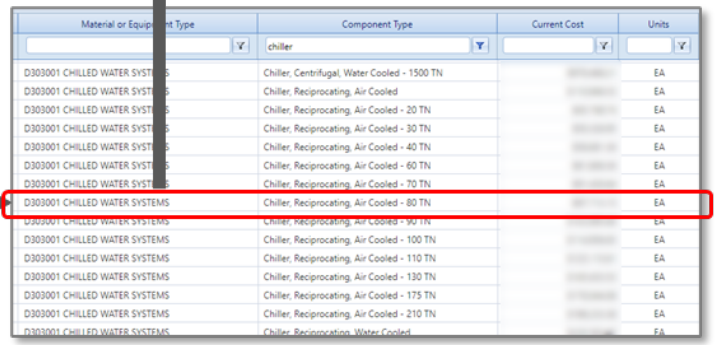
- Looks up the unit cost of replacing an 80-ton reciprocating air-cooled chiller in 2024

Unit cost of component

$85,000 / Ea.

Total base cost of component

2 x $85,000 = $170,000

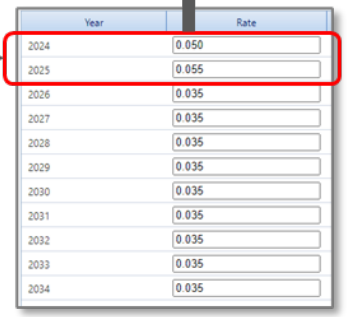


Material or Equipment Type	Component Type	Current Cost	Units
	chiller		
D303001 CHILLED WATER SYSTEMS	Chiller, Centrifugal, Water Cooled - 1500 TN		EA
D303001 CHILLED WATER SYSTEMS	Chiller, Reciprocating, Air Cooled		EA
D303001 CHILLED WATER SYSTEMS	Chiller, Reciprocating, Air Cooled - 20 TN		EA
D303001 CHILLED WATER SYSTEMS	Chiller, Reciprocating, Air Cooled - 30 TN		EA
D303001 CHILLED WATER SYSTEMS	Chiller, Reciprocating, Air Cooled - 40 TN		EA
D303001 CHILLED WATER SYSTEMS	Chiller, Reciprocating, Air Cooled - 60 TN		EA
D303001 CHILLED WATER SYSTEMS	Chiller, Reciprocating, Air Cooled - 70 TN		EA
D303001 CHILLED WATER SYSTEMS	Chiller, Reciprocating, Air Cooled - 80 TN		EA
D303001 CHILLED WATER SYSTEMS	Chiller, Reciprocating, Air Cooled - 90 TN		EA
D303001 CHILLED WATER SYSTEMS	Chiller, Reciprocating, Air Cooled - 100 TN		EA
D303001 CHILLED WATER SYSTEMS	Chiller, Reciprocating, Air Cooled - 110 TN		EA
D303001 CHILLED WATER SYSTEMS	Chiller, Reciprocating, Air Cooled - 130 TN		EA
D303001 CHILLED WATER SYSTEMS	Chiller, Reciprocating, Air Cooled - 175 TN		EA
D303001 CHILLED WATER SYSTEMS	Chiller, Reciprocating, Air Cooled - 210 TN		EA
D303001 CHILLED WATER SYSTEMS	Chiller, Reciprocating, Water Cooled		EA

Inflation Book

Contains projected inflation rates for each future year.

- Normalizes cost by multiplying the input of $170,000 by 2025's projected inflation rate (5%) and then again by 2026's projected rate (5.5%)



Year	Rate
2024	0.050
2025	0.055
2026	0.035
2027	0.035
2028	0.035
2029	0.035
2030	0.035
2031	0.035
2032	0.035
2033	0.035
2034	0.035

Total base cost of component adjusted for inflation

$170,000 x 1.05 x 1.055 = $188,318

COMPONENT REPLACEMENT COST MODIFIERS

Replacement of (2) 80-Ton Reciprocating Air Cooled Chillers at Pensacola Naval Hospital in 2026

Location

NAS Pensacola, FL

Additional cost modifiers defined by organization

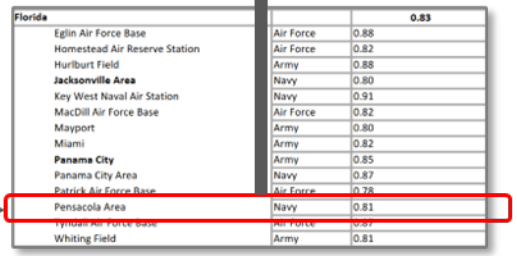
(Previous Page)

$188,318

Area Cost Factor Modifiers

Contains multipliers for each location to adjust costs based on the replacement location; "Average city" is 1.0

- Multiplies the input cost by the ACF for NAS Pensacola (0.81)



Florida		0.83
Eglin Air Force Base	Air Force	0.88
Homestead Air Reserve Station	Air Force	0.82
Hurlburt Field	Army	0.88
Jacksonville Area	Navy	0.80
Key West Naval Air Station	Navy	0.91
MacDill Air Force Base	Air Force	0.82
Mayport	Army	0.80
Miami	Army	0.82
Panama City	Army	0.85
Panama City Area	Navy	0.87
Patrick Air Force Base	Air Force	0.78
Pensacola Area	Navy	0.81
Tyndall Air Force Base	Air Force	0.97
Whiting Field	Army	0.81

Total base cost of component adjusted for location

$188,318 x 0.81 = $152,538

Cost Modifier Library

Contains organization-defined "adders" or "multipliers" to make additional adjustments to costs at the component level.

- Multiplies input by 1.03 multiplier modifier due to above-average access requirements.

Final total cost of replacement

$167,603 x 1.03 =

$157,114

COMPONENT REPAIR COST CALCULATION

Repair of (2) 80-Ton Reciprocating Air Cooled Chillers at Pensacola Naval Hospital in 2026

Total Cost of Replacement (from previous page)

$157,114

$$\$157{,}114 \cdot \left(\frac{100-CI}{100-CI_T}\right)^N$$

Calculated Cost of Repair

$157,114 x [(35/60)^2.1 = 0.32]

$50,657

CI = current predicted Condition Index of the component (**65** in this example)

CI_T = designated Condition Index terminal value (usually **40**)

N = cost escalation factor (determined by comparing the cost of a range of typical repair work actions at different life cycle points to the associated condition index values related to those prior to the repair– **2.1** in this example)

BUILDING CONDITION INDEX CALCULATION

$$BCI = \frac{\sum_{c=1}^{n} (Ci_c * CRV_c)}{\sum_{c=1}^{n} CRV_c}$$

Component Section (c)	Compoent Section Condition Index (CI)	Component Replacement Value (CRV)	CI * CRV
1	90	$ 17,000	$ 1,530,000
2	67	$ 14,000	$ 938,000
3	92	$ 71,000	$ 6,532,000
4	85	$ 17,000	$ 1,445,000
5	67	$ 47,000	$ 3,149,000
6	79	$ 100,000	$ 7,900,000
7	86	$ 55,000	$ 4,730,000
8	80	$ 94,000	$ 7,520,000
9	80	$ 21,000	$ 1,680,000
10	80	$ 77,000	$ 6,160,000
11	83	$ 40,000	$ 3,320,000
12	62	$ 2,000	$ 124,000
	Σ	$ 555,000	$ 45,028,000

$$\frac{\Sigma \text{ CRV}}{\Sigma \text{ CI}} = 81$$

PLANT REPLACEMENT VALUE (PRV)

- Current facility with today's costs & standards

- Mainly depends:

1. Size [typically SF]
2. Unit cost for its building type
3. Location

Equation 3-2. Calculating PRV

PRV = Q x PUC x ACF x HF x PD x SIOH x CF

Where:

PRV is plant replacement value

Q is facility quantity, in the same unit of measure as the PUC

PUC is PRV unit cost found in Table 3 of this UFC

ACF is area cost factor found in Table 4-1 of this UFC, to account for geographical differences in the costs of labor, materials, and equipment

HF is an adjustment of 1.05 to account for increased costs for replacement of historical facilities or for construction in a historic district. If the facility does not qualify as "historical", this factor is 1

PD is a factor to account for the planning and design of a facility; the current value of this factor is 1.09 for all but medical facilities, and 1.13 for medical facilities

SIOH is the factor to account for the supervision, inspection, and overhead activities associated with the management of a construction project. Application of SIOH rates will be in accordance with PTDO PDASD(EIE) (14 Apr 2022) for Military Construction Supervision, Inspection and Overhead Fixed Rates for Fiscal Year 2024 and Future projects. For a list of applicable remote locations, refer to NAVFACINST 7820.0 (8 Aug 2022) for Navy and the cognizant design agency for Army and Air Force. The aforementioned documents are included as "Related Materials" accompanying this UFC on the WBDG web site: https://www.wbdg.org/ffc/dod/unified-facilities-criteria-ufc/ufc-3-701-01.

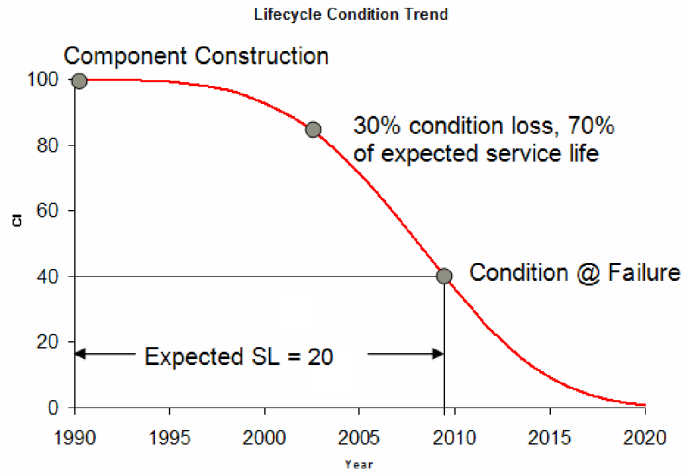
CF is a factor of 1.05 to account for construction contingencies

https://www.wbdg.org/FFC/DOD/UFC/ufc_3_701_01_2022_c4.pdf

FACILITY CONDITION INDEX (FCI)

$$\mathbf{FCI} = 100 \times (1 - \Sigma DM\&R / PRV)$$

- ❖ Relation of Maintenance & Repair (M&R) requirements vs Replacement
- The FCI would degrade over time with sustainment determining the rate
- A higher FCI is better



OBJECTIVE FOR IDEAS TO IMPROVE ESTIMATES

- We intend to find missing gaps in methods for sophisticated, accurate costs
- This could be achieved by considering more data and details
- One idea is tracking and saving historical information

- Another idea is that although assets are grouped into Facility Analysis Category (FAC), within those are distinct materials, design, layout, & complexity that can vary its work costs and value, including the PRV.
- The Adjusted Plant Replacement Value (PRV_a) is a component-based approach using System Replacement Value (SRV) based on the UFC 3-370 and balancing them with the standard deviation from DoD Guidance Unit Cost (GUC).
- The Inventory Template Model is a data-driven concept. Identifying the most common components in a group of Real Property buildings and the inputs of multiple factors would narrow down related data into selected criteria.
- A **Refined PRV** could be a function of the original PRV, PRV_a, the total cost of an inventory template.

CONCLUSION & FUTURE INTENTIONS

- Ensuring accuracy and integrity on the cost data subject for our SMS customers
- Developing better and automated ways to run QA/QC checks ups in data
- Proceed with more communication and collaboration between the groups
- Determining a more detailed timeline and complying with its target dates
- Adding more items for other domains
- Including more operating actions (from Replacement to Sustainment, Maintenance & Repair)

THANK YOU!

QUESTIONS, COMMENTS, SUGGESTIONS?

Juan L. Davila-Perez
Juan.L.Davila-Perez@erdc.dren.mil
217-373-4573

U.S. ARMY

US Army Corps of Engineers®

BACK-UP/EXTRA SLIDES

RATIO OF WBS SYSTEMS COST TO FACILITY COST BY FACILITY TYPE

APPENDIX C of UFC 3-730-01

https://www.wbdg.org/FFC/DOD/UFC/ufc_3_730_01_2024.pdf

FACILITY TYPE	A10 Foundations	B10 Superstructure	B20 Exterior Enclosure	B30 Roofing	C10 Interior Construction	C30 Interior Finishes	D10 Conveying	D20 Plumbing	D30 HVAC	D40 Fire Protection	D50 Electrical	E10 Equipment	E20 Furnishings	F10 Special Construction
Intelligence Communications Center	6.14	9.68	7.08	3.87	5.61	7.41	0.52	3.65	21.86	2.3	31.57	0.12	0.05	0.14
Aircraft Operations Building	5.94	14.09	10.79	4.75	7.31	9.91	1.11	3.1	16.53	2.02	24.11	0.16	0.11	0.07
Military HQ/ Operations Building (Operations)	7.33	12.09	9.03	7.31	9.56	6.1	0.31	8.33	19.06	2.89	15.62	0.38	1.21	0.78
Military HQ/ Operations Building (Battalion)	5.56	13.11	9.14	3.91	7.93	8.53	1.46	3.45	18.01	2.3	22.32	1.41	0.18	2.69
General Instructions Building	3.61	11.47	13.66	3	9.69	8.54	0.61	5.94	17.2	2.51	22.56	0.41	0.71	0.09
High Bay Simulation Training Building	7.25	11.78	8.23	3.13	6.31	13.59	0.9	4	19.8	2.34	21.64	0.07	0.01	0.95
Applied Instruction Building	7.01	17.25	11.5	5.42	7.79	7	1.74	5.01	17.89	2.55	14.41	1.6	0.26	0.57
Reserve Center	4.56	12.84	12.22	3.99	7.89	11.15	0.68	5.29	19.68	2.62	18.15	0.78	0.01	0.14
General Purpose Maintenance Hangar	10.29	10.91	15.07	3.79	6.2	4.43	0.48	6.58	13.51	5.73	16.55	0.16	0.05	6.25
High Bay Maintenance Hangar	11.87	27.04	11.59	4.23	4.99	4.1	0.51	3.52	10.17	4.09	16.11	0.45	0.3	1.03

ADJUSTED PLANT REPLACEMENT VALUE (PRV_a)

Component-Based Approach Process:

1. Distribute overall Facility PRV to each system (B10, B20, D30, etc.)
   a) Use characteristic system percentages from UFC 3-730
   b) Results in System Replacement Value (SRV)

2. Adjust SRV for each system using the Component Replacement Value (CRV)
   a) Set maximum adjustment thresholds based on standard deviation from DoD Guidance Unit Cost (GUC)
   b) Results in Adjusted System Replacement Value (SRV_a)

3. Sum SRVa across all systems to calculate Adjusted Plant Replacement Value (PRV_a)

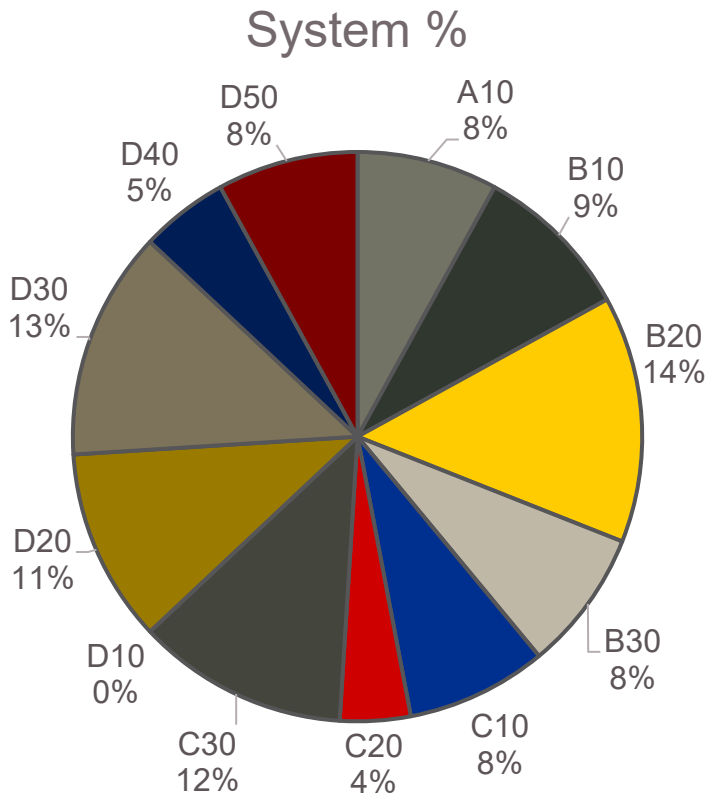
PRV_a EXAMPLE

124k SF Maintenance Hangar with ACF = 1 (National Average)

- PUC = $260/SF; GUC Standard Deviation = ±18%

✓ PRV = $32,240,000

System	Description	% PRV	SRV	Sum CRV	Delta	SRV_a
A10	Foundation	8%	$2,579,200	$2,000,000	-22%	$2,114,944
B10	Superstructure	9%	$2,901,600	$3,000,000	3%	$3,000,000
B20	Exterior Enclosure	14%	$4,513,600	$3,800,000	-16%	$3,800,000
B30	Roofing	8%	$2,579,200	$3,000,000	16%	$3,000,000
C10	Interior Construction	8%	$2,579,200	$2,100,000	-19%	$2,114,944
C20	Stairs	4%	$1,289,600	$800,000	-38%	$1,057,472
C30	Interior Finishes	12%	$3,868,800	$4,000,000	3%	$4,000,000
D10	Conveying	0%	$0	$0	0%	$0
D20	Plumbing	11%	$3,546,400	$3,500,000	-1%	$3,500,000
D30	HVAC	13%	$4,191,200	$3,200,000	-24%	$3,436,784
D40	Fire Protection	5%	$1,612,000	$1,200,000	-26%	$1,321,840
D50	Electrical	8%	$2,579,200	$3,500,000	36%	$3,043,456
					PRV_a =	*$30,389,440*



COMPONENT INVENTORY TEMPLATE MODEL

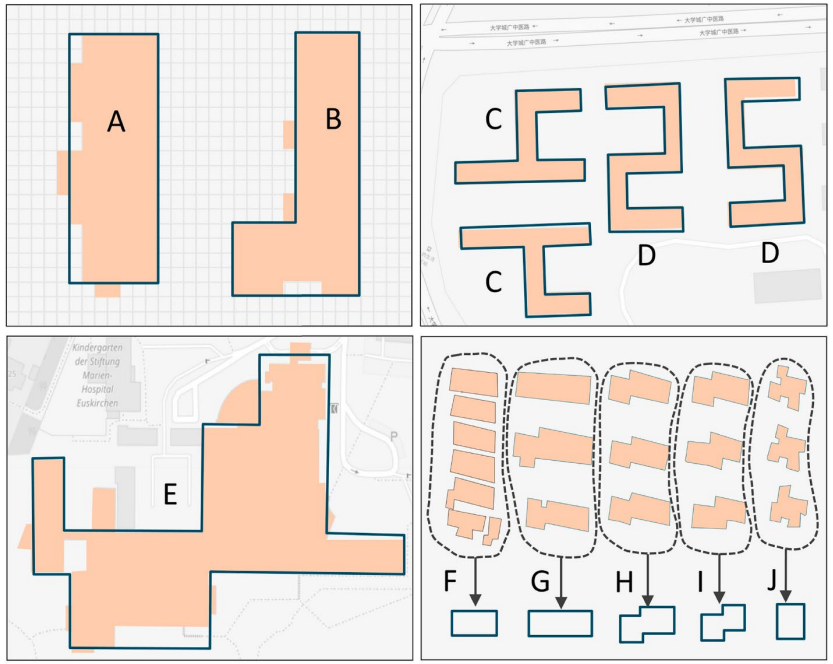
Data-Driven Approach Concept:

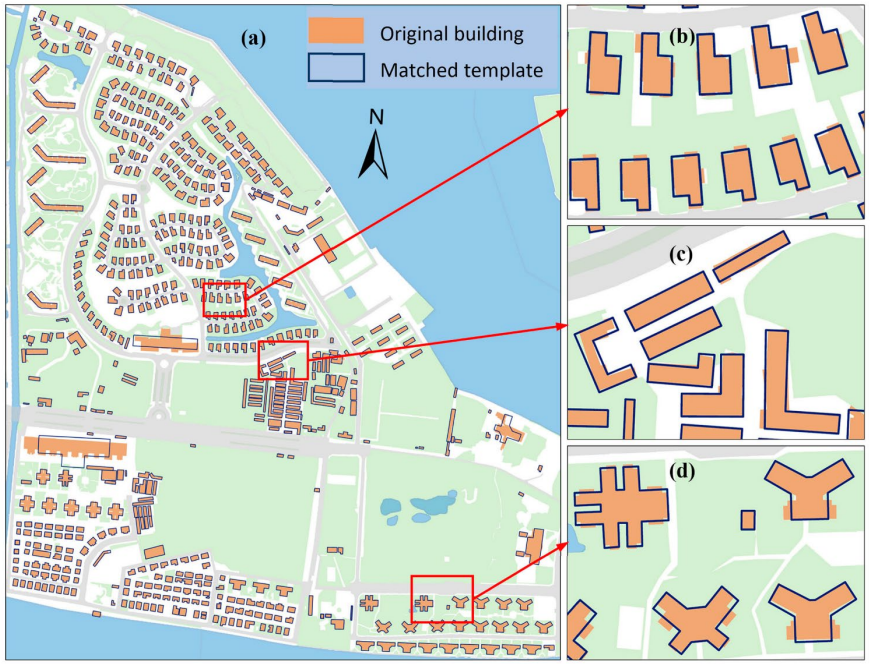
1. Develop a model with historical BUILDER sample data of:
   a) 70,000 Real Property buildings with 400 different FAC codes
   b) 4,000,000 sections of 4,000 components

2. Enter inputs and their ranges:
   a) Building Type ID (FAC)
   b) Year Built
   c) Size
   d) Site ID (Location)
   e) Cutoff Percentage (50% => majority)

TEMPLATE THEORY CONSIDERATIONS

- Properties with a Building Type (FAC) has a similar service, operation, and mission
- More data can be found on ordinary building types
- The template can be put together to identify the most common components in a group
- The inputs of multiple factors would narrow down related data into selected criteria





https://www.mdpi.com/2220-9964/6/8/250

MODEL INPUTS EXAMPLE

	Inputs
Building Type ID	1431
Year Built	1970
Year Built Range	20
Building Size (Square Feet)	10000
Building Size Range (Square Feet)	9999
Site ID	
Cutoff Percentage	50

Building ID	Building Type ID	Building Size	Building Year Built	Building Site ID
D86F2D92-85F8-46D0-BB11-0F95117864D2	1431	4103	1955	6203
0A9F212A-5E60-46BB-AED5-69EC69E252CA	1431	5288	1955	6203
BB95FD10-61FB-46E0-9251-A0A57C77135C	1431	2135	1955	6203
C05C7A2E-7224-47CF-89B6-A62364449D6F	1431	2841	1955	6203
7E6B0AA9-5804-4C65-A1D7-BED3D36B0DBE	1431	2304	1975	6203
41B92971-0733-4A8D-9CCB-AFD6EA9BCEBF	1431	784	1971	7859
ABDD8E1C-E904-4DE8-9A28-53C1D0D8F8A4	1431	1067	1955	4298
6FCDA90B-B2E9-469E-877F-A82435DCE9C2	1431	15689	1985	4298
09086A2A-529A-4A53-AB93-12A9E9B517E0	1431	3094	1955	4298
A39ECD60-E4AA-4A14-A1CC-36FCFCD20D0A	1431	5456	1955	6203
39256513-61E6-4AD9-9EC4-F271D4F7D205	1431	2744	1981	6203
8853C7C4-AD5C-4B16-B4C3-2461A3D2236B	1431	5040	1979	6203
10729893-523B-425B-809F-4791E2D0749D	1431	11257	1955	4298

	Information Based on Inputs
Building Type Name	SHIP OPERATIONS BUILDING
Newest Year Built Accepted	1990
Oldest Year Built Accepted	1950
Largest Building Size Allowed (Square Feet)	19999
Smallest Building Size Allowed (Square Feet)	1
Number of Buildings that Meet Criteria	13
Minimum Number of Times Component Should Appear	6.5
Average Building Size of Buildings That Meet Criteria (SF)	4754
Building Median Size of Buildings That Meet Criteria (SF)	3094

	UFC DATA
FAC	1431
FAC Title	SHIP OPERATIONS BUILDING
PUC ($ FY 2023)	539
UFC 3-730 Facility Type	AIRCRAFT OPERATIONS BUILDING
A10	5.94
B10	14.09
B20	10.79
B30	4.75
C10	7.31
C30	9.91
D10	1.11
D20	3.1
D30	16.53
D40	2.02
D50	24.11
E10	0.16
E20	0.11
F10	0.07

MODEL COMPONENTS TEMPLATE EXAMPLE

Component ID	Component System	Component Sub-System	Component Type	Component Sub-Type	UoM	Unit Cost	Percentage of Occurrence	Average Quantity	Total Cost of Component
21350	A10 FOUNDATIONS	A1010 STANDARD FOUNDATIONS	A101001 WALL FOUNDATIONS	Strip Footing	LF	$ 162.00	69.23	326	$ 52,812.00
21357	A10 FOUNDATIONS	A1020 SPECIAL FOUNDATIONS	A102001 PILE FOUNDATIONS	CIP Concrete	EA	$ 1,490.00	7.69	12	$ 17,880.00
21359	A10 FOUNDATIONS	A1030 SLAB ON GRADE	A103002 STRUCTURAL SLAB ON GRADE	General	SF	$ 27.65	100	3389.62	$ 93,722.99
41021	A20 BASEMENT CONSTRUCTION	A2020 BASEMENT WALLS	A202001 BASEMENT WALL CONSTRUCTION	General	SF	$ 27.55	15.38	835	$ 23,004.25
41025	B10 SUPERSTRUCTURE	B1010 FLOOR CONSTRUCTION	B101001 STRUCTURAL FRAME	General	SF	$ 20.00	46.15	5514.33	$ 110,286.60
41033	B10 SUPERSTRUCTURE	B1020 ROOF CONSTRUCTION	B102001 STRUCTURAL FRAME	General	SF	$ 12.20	84.62	4831.45	$ 58,943.69
21389	B20 EXTERIOR ENCLOSURE	B2010 EXTERIOR WALLS	B201001 EXTERIOR CLOSURE	Concrete Block	SF	$ 14.43	61.54	3901.75	$ 56,302.25
41051	B20 EXTERIOR ENCLOSURE	B2020 EXTERIOR WINDOWS	B202001 WINDOWS	General	SF	$ 76.00	100	519.46	$ 39,478.96
21401	B20 EXTERIOR ENCLOSURE	B2030 EXTERIOR DOORS	B203001 SOLID DOORS	Steel	EA	$ 3,740.00	69.23	4.33	$ 16,194.20
21409	B30 ROOFING	B3010 ROOF COVERINGS	B301005 GUTTERS & DOWNSPOUTS	Gutters	LF	$ 15.90	61.54	203.13	$ 3,229.77
21407	B30 ROOFING	B3010 ROOF COVERINGS	B301005 GUTTERS & DOWNSPOUTS	Downspouts	LF	$ 17.90	53.85	80.71	$ 1,444.71
21421	C10 INTERIOR CONSTRUCTION	C1010 PARTITIONS	C101001 FIXED PARTITIONS	Wall - Drywall w/Stud Framing	SF	$ 10.43	92.31	1499.5	$ 15,639.79
21425	C10 INTERIOR CONSTRUCTION	C1020 INTERIOR DOORS	C102001 STANDARD INTERIOR DOORS	Wood Door/Metal Frame	EA	$ 1,150.00	61.54	8.38	$ 9,637.00
21429	C10 INTERIOR CONSTRUCTION	C1030 SPECIALTIES	C103001 COMPARTMENTS, CUBICLES & TOILET PARTITIONS	Toilet Partitions	EA	$ 1,065.00	69.23	5.78	$ 6,155.70
41099	C10 INTERIOR CONSTRUCTION	C1030 SPECIALTIES	C103010 CASEWORK	General	LF	$ 294.00	53.85	14	$ 4,116.00
30196	C20 STAIRS	C2010 STAIR CONSTRUCTION	C201001 INTERIOR AND EXTERIOR STAIRS	Interior Stairs - Concrete (24 Riser Flight)	EA	$ 26,925.00	15.38	1	$ 26,925.00
21624	C30 INTERIOR FINISHES	C3010 WALL FINISHES	C301004 TILE & TERRAZZO WALL FINISHES	Tile	SF	$ 68.10	69.23	281	$ 19,136.10
21439	C30 INTERIOR FINISHES	C3020 FLOOR FINISHES	C302001 TILE FLOOR FINISHES	Ceramic Tile	SF	$ 11.20	76.92	239.3	$ 2,680.16
21452	C30 INTERIOR FINISHES	C3020 FLOOR FINISHES	C302004 RESILIENT FLOOR FINISHES	Vinyl Tile	SF	$ 6.75	69.23	1311.33	$ 8,851.48
21456	C30 INTERIOR FINISHES	C3030 CEILING FINISHES	C303001 ACOUSTICAL CEILING TILES & PANELS	General	SF	$ 6.71	84.62	1660.73	$ 11,143.50
21455	C30 INTERIOR FINISHES	C3030 CEILING FINISHES	C303002 GYPSUM WALLBOARD CEILING FINISHES	General	SF	$ 7.39	53.85	1049.86	$ 7,758.47
21479	D20 PLUMBING	D2010 PLUMBING FIXTURES	D201001 WATERCLOSETS	General	EA	$ 2,285.00	100	2.46	$ 5,621.10
21478	D20 PLUMBING	D2010 PLUMBING FIXTURES	D201002 URINALS	General	EA	$ 2,335.00	61.54	1.5	$ 3,502.50
21477	D20 PLUMBING	D2010 PLUMBING FIXTURES	D201003 LAVATORIES	General	EA	$ 2,575.00	92.31	1.83	$ 4,712.25
21468	D20 PLUMBING	D2010 PLUMBING FIXTURES	D201004 SINKS	Kitchen Sink	EA	$ 3,675.00	53.85	1.29	$ 4,740.75
21486	D20 PLUMBING	D2020 DOMESTIC WATER DISTRIBUTION	D202001 PIPES & FITTINGS	General	LF	$ 54.00	100	329.77	$ 17,807.58
21494	D20 PLUMBING	D2020 DOMESTIC WATER DISTRIBUTION	D202003 DOMESTIC WATER EQUIPMENT	Water Heaters, Residential, Electric	EA	$ 3,675.00	61.54	1	$ 3,675.00
21625	D20 PLUMBING	D2030 SANITARY WASTE	D203001 WASTE PIPE & FITTINGS	General	LF	$ 63.45	100	213.23	$ 13,529.44
41179	D20 PLUMBING	D2030 SANITARY WASTE	D203003 FLOOR DRAINS	General	EA	$ 2,550.00	76.92	2.8	$ 7,140.00
40255	D20 PLUMBING	D2090 OTHER PLUMBING SYSTEMS	D209001 SPECIAL PIPING SYSTEMS	General	LF	$ 25.55	7.69	600	$ 15,330.00
20471	D30 HVAC	D3020 HEAT GENERATING SYSTEMS	D302002 FURNACES	Electric, 68.3 MBH	EA	$ 5,275.00	23.08	1	$ 5,275.00
20564	D30 HVAC	D3030 COOLING GENERATING SYSTEMS	D303002 DIRECT EXPANSION SYSTEMS	Condenser, DX, Air Cooled - Direct Drive, 3 ton	EA	$ 5,325.00	23.08	1	$ 5,325.00
40135	D30 HVAC	D3040 DISTRIBUTION SYSTEMS	D304001 AIR DISTRIBUTION, HEATING & COOLING	Ductwork	LF	$ 51.05	46.15	884.83	$ 45,170.57
21629	D30 HVAC	D3050 TERMINAL & PACKAGE UNITS	D305006 PACKAGE UNITS	A/C Unit, Split Systems w/ Air Cooled Condenser - 2 TN	EA	$ 3,520.00	30.77	1	$ 3,520.00
21627	D30 HVAC	D3060 CONTROLS & INSTRUMENTATION	D306002 ELECTRONIC CONTROLS	General	EA	$ 728.00	38.46	8	$ 5,824.00
44289	D30 HVAC	D3090 OTHER HVAC SYSTEMS AND EQUIPMENT	D309090 OTHER SPECIAL MECHANICAL SYSTEMS	Ventilation/Heat Recovery System - 1000 CFM	EA	$ 10,500.00	15.38	1	$ 10,500.00
40247	D40 FIRE PROTECTION	D4010 FIRE ALARM AND DETECTION SYSTEMS	D401001 FIRE ALARM DISTRIBUTION	Fire Alarm Control Panel	EA	$ 293.00	69.23	1	$ 293.00
44100	D40 FIRE PROTECTION	D4010 FIRE ALARM AND DETECTION SYSTEMS	D401001 FIRE ALARM DISTRIBUTION	Control equipment - fire alarm	SF	$ 1.88	61.54	5985.25	$ 11,252.27
40237	D40 FIRE PROTECTION	D4010 FIRE ALARM AND DETECTION SYSTEMS	D401002 FIRE ALARM DEVICES	General	EA	$ 596.00	84.62	26.45	$ 15,764.20
21006	D40 FIRE PROTECTION	D4020 FIRE SUPP WATER SUPPLY / EQUIP	D402001 FIRE PROTECTION WATER PIPING AND EQUIPMENT	Backflow Preventer - 6"	EA	$ 7,350.00	15.38	1	$ 7,350.00
21001	D40 FIRE PROTECTION	D4030 STANDPIPE SYSTEMS	D403001 STANDPIPE EQUIPMENT & PIPING	Riser - 4" diam	EA	$ 15,925.00	23.08	1.33	$ 21,180.25
20997	D40 FIRE PROTECTION	D4040 SPRINKLERS	D404001 SPRINKLERS AND RELEASING DEVICES	Wet Pipe Systems - ordinary hazard	SF	$ 8.22	15.38	10572.5	$ 86,905.95
40290	D50 ELECTRICAL	D5010 ELECTRICAL SERVICE & DISTRIBUTION	D501004 PANELBOARDS	Safety Switch, 30-100 Amp	EA	$ 690.00	76.92	2.9	$ 2,001.00
21605	D50 ELECTRICAL	D5020 LIGHTING & BRANCH WIRING	D502001 BRANCH WIRING	General	SF	$ 8.28	100	4858.08	$ 40,224.90
21602	D50 ELECTRICAL	D5020 LIGHTING & BRANCH WIRING	D502002 LIGHTING EQUIPMENT	Exit Lighting	EA	$ 225.00	92.31	3.17	$ 713.25
44043	D50 ELECTRICAL	D5020 LIGHTING & BRANCH WIRING	D502002 LIGHTING EQUIPMENT	Interior Lighting, FL - 2 Lamp T8	EA	$ 462.00	84.62	15.45	$ 7,137.90
42273	D50 ELECTRICAL	D5090 OTHER ELECTRICAL SERVICES	D509003 GROUNDING SYSTEMS	Other	SF	$ 31.25	100	8928.21	$ 279,006.56
21342	E10 EQUIPMENT	E1030 VEHICULAR EQUIPMENT	E103004 AUTOMOTIVE SHOP EQUIPMENT	Compressor, Electric, 5 HP, dual controls	EA	$ 4,275.00	7.69	1	$ 4,275.00

UFC PRV	$ 2,562,406.00
SUM OF CRV	$ 1,213,120.09