



Staffing the Operations and Maintenance Organization

APPA Institute for Facilities Management

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Course Goals

- Focus on Custodial, Maintenance and Grounds
- Review the Basic Methodologies used to Determine Staffing
- Discuss the Pitfalls and Benefits of Each
- Focus on aggregate and zero-based staffing methods as described in the APPA Operational Guidelines Trilogy



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APPA'S STAFFING GUIDELINES TRILOGY



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SOME COMMON THEMES



- MAINTAINED THE 5 LEVELS OF SERVICE
- USE ZERO BASED STAFFING CALCULATIONS
- MATURED FROM STAFFING GUIDELINES TO OPERATIONAL GUIDELINES
- INTEGRATED SUSTAINABILITY AND COMPLIANCE THROUGHOUT ALL 3 BOOKS



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CAVEATS



- **THESE ARE OPERATIONAL GUIDELINES VERSUS "STANDARDS"**
- RECOGNIZE THAT INSTITUTIONS ARE DIFFERENT, YET WITH COMMON AREAS OF INTEREST
- GUIDELINES CAN BE ADAPTED TO YOUR INSTITUTION




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APPA Level of Attention Matrix




Level of Attention	1	2	3	4	5	6
Custodial						
Maintenance	Ordinary Spotlessness.	Ordinary Tidiness	Casual Inattention	Moderate Dirtness	Unkept Neglect	
	Shoepace Facility Maintenance activities appear highly focused. Equipment & building components are fully functional and in excellent operating condition. Service calls responded to immediately	Comprehensive Stewardship Maintenance activities appear organized with direction. Equipment and building components are usually functioning and in operating condition. Service calls responded to in a timely manner.	Managed Care. Maintenance activities appear somewhat organized but remain people dependent. Equipment and building components are mostly functional but suffer occasional breakdowns. Service call response times are variable and sporadic.	Reactive Management. Maintenance activities appear somewhat chaotic and are people dependent. Equipment components are frequently broken and inoperative. Service calls not responded to in a timely manner.	Crisis Response. Maintenance activities appear chaotic and without direction. Equipment components are routinely broken and inoperative. Service calls are never responded to in a timely manner.	
Grounds	State-of-the-art maintenance applied to a high-quality diverse landscape. Associated with high-traffic urban areas, such as public squares, government grounds, or college, university, or school campuses.	High level of maintenance. Associated with well-developed public areas, malls, government grounds, or college, university, or school campuses. Recommended level for most organizations.	Moderate-level maintenance. Associated with locations that have moderate to low levels of development or visitation, or with operations that because of budget restrictions cannot afford a high level of maintenance.	Moderately low-level maintenance. Associated with locations affected by budget restrictions, and thereby cannot afford a high level of maintenance.	Minimum level maintenance. Associated with locations suffering from severe budget restrictions.	Natural area that is not developed.

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Facility Characteristics for Maintenance



- Service Efficiency
- Building Systems' Reliability
- Facility Maintenance Operating Budget as % of CRV
- Campus Average FCI



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- *Calculating Facility Condition Index (FCI)*

$$\frac{\text{Current Renewal (backlog) (DM)}}{\text{Current Replacement Value (CRV)}} \times 100$$

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Discussion

- Who has used these operational guidelines?
- Have they been helpful?
- Which parts have you used?

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Space Inventories

- What to Measure & How?
 - Gross Square Feet
 - Cleanable Square Feet
 - Room Type
 - Acres (pavements? footprints?)



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Staffing Determination Methods

1. History +/-
2. Survey Data or Benchmarking
3. Aggregate or Macro Method
4. Zero-Based Staffing or Micro Method



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Staffing Determination Methods

1. Historically Based

Benefits and Pitfalls



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1. Historically Based



Year	sq. Footage	Moving & Setup Staff (including supervisor)	Electrician (including supervisor)	Plumbers (including supervisor)	HVAC (including supervisor)	Carpenters (including supervisor)	Locksmiths	Painters
1998	128,442	225,452	2	382,211	382,211			
1999	203,122	285,876	3	412,226	412,226			
2000	402,020	492,226	4	432,226	432,226			
2001	482,122	481,122	5	512,226	512,226			
2002	1,412,122	281,122	6	592,226	592,226			
2003	1,482,122	282,122	6	593,226	593,226			
2004	1,512,122	283,122	6	594,226	594,226			
2005	1,542,122	284,122	6	595,226	595,226			
2006	1,572,122	285,122	6	596,226	596,226			
2007	1,602,122	286,122	6	597,226	597,226			
2008	1,632,122	287,122	6	598,226	598,226			
2009	1,662,122	288,122	6	599,226	599,226			
2010	1,692,122	289,122	6	600,226	600,226			
2011	1,722,122	290,122	6	601,226	601,226			
2012	1,752,122	291,122	6	602,226	602,226			
2013	1,782,122	292,122	6	603,226	603,226			
2014	1,812,122	293,122	6	604,226	604,226			
2015	1,842,122	294,122	6	605,226	605,226			
2016	1,872,122	295,122	6	606,226	606,226			
2017	1,902,122	296,122	6	607,226	607,226			
2018	1,932,122	297,122	6	608,226	608,226			
2019	1,962,122	298,122	6	609,226	609,226			
2020	1,992,122	299,122	6	610,226	610,226			
2021	2,022,122	300,122	6	611,226	611,226			
2022	2,052,122	301,122	6	612,226	612,226			
2023	2,082,122	302,122	6	613,226	613,226			
2024	2,112,122	303,122	6	614,226	614,226			



Year	Sq. Footage	Moving & Setup Staff (including supervisor)	Electrician (including supervisor)	Plumbers (including supervisor)	HVAC (including supervisor)	Carpenters (including supervisor)	Locksmiths	Painters
2003	1,343,894	5	268,777	3	447,961	3	447,961	2
2004	1,353,516	5	270,703	3	451,172	3	451,172	2
2006	1,637,233	6	272,872	3	545,744	3	545,744	4
2007	1,836,187	6	305,031	3	612,062	4	612,062	2
2008	1,840,242	9	204,471	3	613,414	4	660,061	5
2009	1,888,648	10	188,865	3	625,549	4	472,162	5
2010	2,026,108	11	184,192	4	506,527	4	506,527	5
2011	2,131,090	11	193,735	4	532,773	4	532,773	5
2012	2,331,431	11	212,130	4	583,358	4	583,358	5
2013	2,444,412	12	203,701	4	611,103	4	611,103	5
2014	2,667,447	12	222,287	4	666,862	5	633,489	5.5
2015	2,717,723	12	226,477	5	543,545	5	543,545	6.5
2016	2,783,565	12	231,964	6	463,928	6	463,928	7.5
2017	2,765,282	12	230,440	6	460,880	6	460,880	7.5
2018	2,770,562	12	231,047	6	462,094	7	396,080	7.5
2019	3,079,835	12	256,653	6	513,306	7	439,576	7.5
2020	3,159,594	12	263,300	7	451,371	7.5	421,279	9.5
2021	3,161,148	12	263,420	7	451,501	7	451,501	8
2022	3,163,148	12	263,420	7	451,501	7	451,501	8
2023	3,165,148	12	263,420	7	451,501	7	451,501	8
2024	3,167,148	12	263,420	7	451,501	7	451,501	8



2. Survey Data or Benchmarking





- Competitive or External Benchmarking
- APPA Facility Performance Indicators or FPI
- Benefits and Pitfalls




No, this is not a benchmark!



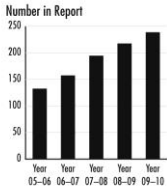
Institution	Annual Grounds Budget	# FTEs	# Acres	# Sq. Ft.	Cost/Acre	Acres/FTE
Elon University	\$1,001,776.00	19	185	8,058,600	\$5,415.01	9.74
Duke University	\$2,300,000.00	50	294	12,786,120	\$7,823.13	5.88

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2. Survey Data or Benchmarking APPA FPI

Year	Number in Report	Avg gsf Per FTE	Avg Maintenance Level	Productivity Factor	gsf/FTE Percentage Change from 05-06	Level Percentage Change from 05-06	Productivity Factor Percentage Change from 05-06
Year 05-06	132	48,827	2.85	3.70	0.00%	0.00%	0.00%
Year 06-07	157	66,622	2.79	3.68	-3.31%	-2.11%	-0.50%
Year 07-08	194	74,656	2.79	4.12	7.81%	-2.11%	11.50%
Year 08-09	217	67,952	2.76	3.81	-1.29%	-3.16%	2.86%
Year 09-10	238	69,345	2.73	3.94	0.75%	-4.21%	6.38%

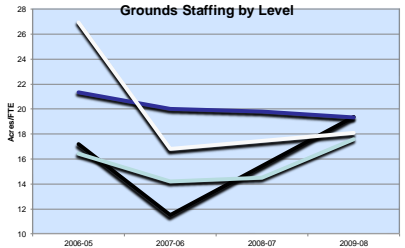


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APPA FPI

Grounds Staffing by Level



level 1 level 2 level 3 level 4

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2. Survey Data or Benchmarking

Qualify the data!



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3. Aggregate or Macro Method

- *The total number of personnel needed to support the needs of a given institution.*
- **Benefits and Pitfalls**



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Aggregate or Macro Method

Figure 3.1: Total Trades Maintenance Staffing per 1 Million Gross Square Feet by Space Type

Maintenance Level	Staffing FTEs			
	classroom	laboratory	office	residence
1	15	27	24	18
2	12	21	16	14
3	9	15	11	10
4	8	9	8	8
5	6	6	4	6

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Zero-Based or Micro Method

Figure 5.1: Sample Staffing Matrix per 1,000 Square Feet

Maintenance Tasks	Levels of Attention				
	1	2	3	4	5
Spring Preparation	0.03	0.03	0.03	0.04	0.04
200 Minutes	6.0	6.0	6.0	8.0	8.0
Spring Planting	0.03	0.03	0.03	0.04	0.04
600 Minutes	18.0	18.0	18.0	24.0	24.0
Weed - No Mulch	1.5	1.0			
60 Minutes	90.0	90.0			
Cultivate - No Mulch	1.5	1.0			
30 Minutes	45.0	30.0			
Fall Planting	0.03	0.03	0.03		
300 Minutes	9.0	9.0	9.0		
Fall Clean Up	0.03	0.03	0.03	0.04	0.04
400 Minutes	12.0	12.0	12.0	16.0	16.0
Bulb Planting	0.03	0.03	0.03	0.04	
600 Minutes	18.0	18.0	18.0	24.0	
Pre-Emergent Control	0.03	0.03	0.03	0.04	0.04
5 Minutes	0.2	0.2	0.2	0.2	0.2
TOTALS					
Minutes/Week	229.1	176.1	101.5	85.8	55.4
60 Minutes	3.82	2.94	1.69	1.43	0.92
/6 Hours/Day	0.64	0.49	0.28	0.24	0.15
/5 Days/Week	0.13	0.10	0.06	0.05	0.03
Square Feet/Person	7,692	10,000	16,667	20,000	33,333

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Zero-Based or Micro Method

Frequency Adjustment Factors	
Activity Frequency	Adjustment Factor
1.5 times per week	1.5
1 time per week	1
Bw weekly	5
Monthly	0.25

Frequency Adjustment Factors		
Activity Frequency	Adjustment Factor for 30-Week Season	Adjustment Factor for 25-Week Season
6 times per season	6/30 = 0.20	6/25 = 0.24
5 times per season	5/30 = 0.17	5/25 = 0.20
4 times per season	4/30 = 0.13	4/25 = 0.16
3 times per season	3/30 = 0.10	3/25 = 0.12
2 times per season	2/30 = 0.07	2/25 = 0.08
1 time per season	1/30 = 0.03	1/25 = 0.04

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Case Study Univ. Of Michigan

Horticultural Crew Work

Perennial Beds	Min. to do	Time to complete	Frequency by Month												Frequencies		
			July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	March	April	May	June			
Activities Involved	Quantity	Unit	1000 SF or LF Activity once (fr.)												per year		
Perennial Beds-Hand Weeds/Plugs																	
Priority One Zone	9723 SF	90	14.6	2	2	1	0	0	0	0	0	0	0	1	2	2	10
Priority Two Zone	12667 SF	90	19.5	2	2	1	0	0	0	0	0	0	0	2	2	2	9
Priority Three Zone	4586 SF	90	6.8	1	1	0	0	0	0	0	0	0	0	1	1	4	

Estimated Staff Needed by Month for Each Maintenance Categories												
Activity	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	March	April	May	June
Horticulture	3.7	4.1	1.5	3.1	3.4	1.2	1.1	1.1	1.4	2.6	3.6	3.9
Turf	1	1.1	1.3	1.6	0.9	0	0	0	0	0.6	1.4	1.1
Irrigation	0.4	0.4	0.4	0.4	0.2	0	0	0	0	0.2	0.4	0.4
Mwe HG	2	2	1.9	3.5	2.7	0.4	0	0	0.1	0.8	2	2
Forestry	0.3	0.4	0.2	0.1	0.4	0.5	1.7	0.5	0.6	0.2	0.6	0.3
Snow Removal	0	0	0	0	0.4	3.1	3	3.1	1.6	0.3	0	0
Total	7.4	8	5.3	8.7	8	5.2	5.8	4.7	3.7	4.7	8	7.7

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Case Study UT Austin

Turf Maintenance Analysis		Zone	Building Name							
Total Zone Inventory:										
Turf (tractor)	115,925	SF or	2.68	Acres	growing year and productive hours are variable depending on your location and specific campus operations					
Turf (push mow)	3,000	SF or	0.18	Acres						
Edging	3,650	LF								
String Edge	365	LF								
Crossing Year										
Productive Hrs per workday	1									
Service Levels										
Task	Unit	Freq	Period	Rate	Adjust Factor	Totals (avg) min/week	Adjust Factor	Totals (avg) min/week	Adjust Factor	Totals (avg) min/week
Mow - 72" Power	Acres	1	Weekly	36	1.000	144.000	1.000	36.000	0.500	48.000
Mow - 21" Push	SF	1	Weekly	6	1.000	72.000	1.000	6.000	0.500	24.000
Edge Trim, Gas Trimmer	LF	1	Weekly	25	1.000	136.875	1.000	91.250	0.500	45.625
String Edge	LF	1	Weekly	19	1.000	3.475	1.000	3.000	0.500	2.500

Time required to accomplish each task is calculated automatically and converted to FTE requirements and shown on the final summary sheet.

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Case Study UT Austin

LANDSCAPE ZONE ASSET INVENTORY AND MANPOWER ANALYSIS						
update as of:			24-Jun-08			
Zone	Building Name					
Zone Staff:						
Total Zone Size:	391,515	SF or	8.99 Acres of Landscape assets			
Total Asset Inventory for Zones:						
Turf (tractor)	115,925	SF or	2.68 Acres			
Turf (push mow)	3,000	SF or	0.18 Acres			
Shrubs	13,130	SF or	0.30 Acres			
Hardscape	253,560	SF or	5.82 Acres			
Edging	3,650	LF				
String Edge	365	LF				
Asset totals						
% of Total Area						
Turf (tractor)			29.84%			
Turf (push mow)			2.04%			
Shrubs			3.35%			
Hardscape			64.76%			
Edging						
String Edge						
if Service Levels as designated in zone asset column:						
Manpower Analysis:	SVC LEVEL 1	SVC LEVEL 2	SVC LEVEL 3	SVC LEVEL 4	Total Manpower Req'd	Total FTE Requirements
Turf	0.00	0.42	0.00	0.00	0.42	
Shrub	0.03	0.22	0.00	0.00	0.25	
Hardscape	0.09	0.28	0.00	0.00	0.37	
Total	0.12	0.92	0.00	0.00	1.04	

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Case Study XYZ University

Turf Maintenance - Open Area										1 year =	52 weeks	84.9 Ac
LABOR												
Levels of Maintenance												
	High			Medium			Low			Total min/wk	Total hrs/yr	Labor \$/yr
LABOR	min/acre	h/acre	\$/acre	min/acre	h/acre	\$/acre	min/acre	h/acre	\$/acre			
Mow												
72" rider	36.00	36.00	8.5	18.00	9.00	0.00	0.00	0.00	0.00	306.00	204.00	\$3,060.00
16" batwing	13.00	13.00	76.0	6.50	3.25	0.00	0.00	0.00	0.00	988.00	658.00	\$9,880.00
Fertilize PTO	15.00	0.75	84.5	0.38	0.00	0.00	0.00	0.00	0.00	63.38	42.25	\$633.75
Weed Control	130.00	3.25	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	\$0.00
Overseed	48.00	1.20	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	\$0.00
Irrigate	60.00	4.50	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	\$0.00
Aerate	60.00	3.00	1.50	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	\$0.00
TOTAL										904.92	504.92	\$13,573.75
MATERIALS												
Levels of Maintenance												
	High			Medium			Low			Total min/wk	Total hrs/yr	Total gal/acre/yr
Mow												

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Staffing Determination Methods



- History +/-
- Survey Data or Benchmarking
- Aggregate or Macro Method
- Zero-Based Staffing or Micro Method



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