Staffing the Operations and Maintenance Organization

APPA Institute for Facilities Management

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AIA Continuing Education Provider

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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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- APPA'S GUIDELINES PROCESS STARTED IN 1987 WITH PROACTIVE FACILITIES MANAGERS
- 1ST – CUSTODIAL (1992)
- 2ND – GROUNDS (2001)
- 3RD – MAINTENANCE (2002)

- Now in their third editions.

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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	Orderly Spotlessness.	Ordinary Tidiness	Casual Inattention	Moderate Dinginess	Unkempt Neglect	
	Showpiece 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 organize 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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APPA Custodial Guideline Concerning Appearance Factors and the Five Levels of Clean

Level	1	2	3	4	5
Description	Orderly Spotlessness	Ordinary Tidiness	Casual Inattention	Moderate Dinginess	Unkempt Neglect
FLOORS	Floors and base moldings shine and/or are bright and clean. Floors are bright, clean, and have no dull colors are fresh. No dirt buildup in corners or along walls.	Floors and base moldings shine and/or are bright and clean. There is no buildup in corners along walls, but there can be up to two days' dust, dirt, stains, or streaks.	Floors are swept or vacuumed clean, but upon close observation there can be stains. A buildup of dirt and/or floor finish in corners and along walls can be seen. There are dull spots and/or matted carpet in walking lanes. Base molding is dull and dingy with streaks or splashes.	Floors are swept or vacuumed clean, but are dull, dingy, and stained. There is an obvious buildup of dirt and/or floor finish in corners and along walls. There is a dull pattern in the stained, and streaked carpet and/or obviously matted along walking lanes. Base molding is dull, dingy, and dingy with streaks or splashes.	Floors and carpet are dull, dirty, dingy, scuffed, and/or matted. There is a conspicuous buildup of old dirt and/or floor finish in corners and along walls. Base molding is dirty, broad cast
VERTICAL AND HORIZONTAL SURFACES	All vertical and horizontal surfaces have a freshly cleaned or polished appearance and have no accumulation of dust, dirt, marks, streaks, smudges, or fingerprints	All vertical and horizontal surfaces are clean, but marks, dust, smudges, and fingerprints are noticeable upon close observation.	All vertical and horizontal surfaces have obvious dust, dirt, marks, smudges, and fingerprints.	All vertical and horizontal surfaces have conspicuous dust, dirt, smudges, fingerprints, and marks.	All vertical and horizontal surfaces have major accumulations of dust, dirt, smudges, and fingerprints, all of which will be difficult to remove. Lack of attention is obvious.
LIGHTING AND LIGHT FIXTURES	Lights all work and fixtures are clean	Lights all work and fixtures are clean.	Lights all work and fixtures are clean to 5 percent) lamps are burned out.	Light fixtures are dirty and some (up and flies. Many lamps (more than 5 percent) are burned out.	Light fixtures are dirty with dust balls
WASHROOMS	Washroom, shower, toilet fixtures, and tile gleam and are odor-free. Supplies adequate.	Washroom, shower, toilet fixtures are and tile gleam and are odor-free Supplies are adequate.	Washroom, shower, toilet fixtures. and tile gleam and are odor-free Supplies are adequate.	Washroom, shower, toilet fixtures, and tile gleam and are odor-free Supplies are adequate.	Less than acceptable assessment in the attributes listed for levels 1-4
TRASH CONTAINERS	Trash containers hold only daily waste, are clean and odor-free	Trash containers hold only daily waste, are clean and odor-free	Trash containers hold only daily waste, are clean and odor-free	Trash containers hold old trash. They are stained and marked. They smell sour.	Trash containes overflow. They are stained and marked. They smell sour.

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Custodial Facility Characteristics

- Floors
- Vertical & Horizontal Surfaces
- Lighting Levels
- Washrooms
- Trash containers
- Also: 33 room types and 55 cleaning tasks

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APPA Operational Guidelines For Educational Facilities- **Grounds** second edition (2011)
Level of Attention Matrix

Level of Attention	1	2	3	4	5	6
Description and Application	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.
Turf Care	Grass height maintained according to species and variety of grass. Mowed at least once every five working days but may be as often as once every three working days. Aeration as required but not less than four times per year. Reseeding or sodding as needed. Weed control to be practiced so that no more than 1 percent of the surface has weeds present.	Grass should be cut once every five working days. Aeration is carried out as required but not less than two times per year. Reseeding or sodding must be done when bare spots are present. Weed control is practices when weeds present a visible problem or when weeds re-spent 5 percent of the turf surface. some pre-emergent herbicide products may be used at this level.	Grass cut once every ten working days. Normally not aerated unless turf quality indicates a need or in anticipation of application of fertilizer. Reseeding or sodding only when major bare spots appear. Weed control measures normally applied when 9 percent of small areas- or 15 percent of the general turf-is infested with weeds.	Low-frequency mowing scheduled based on species. Low-growing grasses may not be mowed. High grasses may receive periodic mowing. Weed control limited to legal requirements of noxious weeds.	Low-frequency mowing scheduled based on species. Low-growing grasses may not be mowed; high grasses may receive periodic mowing. Weed control limited to legal requirements for noxious weeds.	Not mowed. Weed control only if legal requirements demand.
Fertilizer	Adequate fertilization applied to plant species according to their optimum requirements. Application rates and times should ensure an even supply of nutrients for the entire year. Nitrogen, phosphorus, and potassium percentages should follow local recommendation. trees, shrubs, and flowers should be fertilized according to their individual requirements for optimum growth. Unusually long or short growing season may modify the chart slightly.	Adequate fertilizer level to ensure that all plant materials are healthy and growing vigorously. Amounts depend on species, length of growing season, soils, and rainfall. Rates should correspond to at least the lowest recommended rates. Distribution should ensure an even supply of nutrients for the entire year. Nitrogen, phosphorus, and potassium percentages should follow local recommendations. Trees, shrubs, and flowers should receive fertilizer levels to ensure optimum growth.	Applied only when turf vigor seems to be low. Low-level application once per year. Suggested application rate is one-half the level recommended.	Not fertilized.	Not Fertilized.	Not fertilized.

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Facility Characteristics for Grounds

- Turf Care
- Fertilizer
- Irrigation
- Litter Control
- Pruning
- Diseases & Insect Control
- Snow Removal

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Facility Characteristics for Grounds

- Surfaces
- Repairs
- Inspections
- Floral Plantings

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Facility Characteristics for Evaluating and Describing Levels of **Maintenance**

Level	1	2	3	4	5
Description	Showpiece Facility	Comprehensive Stewardship	Managed Care	Reactive Management	Crisis Response
Customer Service and Response Time	Able to respond to virtually any type of service, immediate response.	Response to most service needs, including limited noncritical maintenance activities, is typically in a week or less.	Services available only by reducing maintenance, with response times of one month or less.	Services available only by reducing maintenance, with response times of one year or less.	Services not available unless directed from top administration, none provided except emergencies.
Customer Satisfaction	Proud of facilities, have a high level of trust for the facilities organization.	Satisfied with facilities-related services, usually complimentary of facilities staff.	Accustomed to basic level of facilities care. Generally able to perform mission duties. Lack of pride in physical environment.	Generally critical of cost, responsiveness, and quality of facilities services.	Consistent customer ridicule, mistrust of facilities services.
Preventive Maintenance vs. Corrective Maintenance	100%	75-100%	50-75%	25-50%	0%
Maintenance Mix	All recommended preventive maintenance (PM) is scheduled and performed on time. Reactive maintenance (e.g., spot relamping and adjusting door closers) is minimized to the unavoidable or economical. Emergencies (e.g., power outages) are very infrequent and handled efficiently.	A well-developed PM program. PM is done at a frequency slightly less than defined schedule. Much reactive maintenance required from premature failures, high number of lamps burned out. Occasional emergencies caused by pump failures, cooling system failures, etc.	Reactive maintenance predominates from systems failures, especially during harsh seasonal peaks. PM effort made based on available time and labor. The high number of emergencies (e.g., pump failures, heating and cooling system failures) causes reports to upper administration.	Labor is used to react to systems that are performing poorly or not at all. Significant time spent procuring parts and services due to the high number of emergencies. PM work consists of simple tasks and done inconsistently (e.g., filter changes, greasing and fan belt replacement).	No PM performed due to more pressing problems. Reactive maintenance is the norm (e.g., doors won't lock, fans lock up, HVAC systems fail). Good emergency response because of skills gained from frequent failures. No status reporting, upper administration is tired of reading the reports.
Regulatory Compliance	Highly trained staff or contracted services provide for full compliance for required and recommended OSHA, EPA, and life safety requirements at the best business practices level. Independent department/group with funding to support and develop campus programs with authority to make and implement changes. All required and recommended OSHA, EPA, and life safety programs training in place. Records are well organized and more than adequate to satisfactorily meet third-party audits. Overarching management system in place or under development, tracking goals and achievements, including campus communication.	Full awareness of OSHA, EPA, and life safety requirements, including outreach to the campus at large. Trained staff or contracted services provide for full compliance for required and recommended OSHA, EPA, and life safety requirements. Independent funding specifically provided to support and develop campus OSHA, EPA and life safety programs. All required and recommended OSHA, EPA, and life safety programs in place. Records are well organized and more than adequate to satisfactorily meet regularly scheduled third-party audits.	General awareness of OSHA, EPA, and life safety requirements, including institutional responsibilities. Adequate staff time or contracted services provide compliance for routine OSHA, EPA, and life safety requirements. Funding specifically identified but as a portion of the responsible department's budget. OSHA, EPA and life safety programs, training and records adequate to pass audit/inspection action.	Some awareness of OSHA, EPA, and life safety requirements, including institutional responsibilities. Part-time staff or contracted services used to address OSHA, EPA, and life safety issues as they arise. Funding not specifically identified but assumed to be part of responsible department's budget. Partial OSHA, EPA and life safety programs developed with minimal training.	Little or no awareness of OSHA, EPA, and life safety requirements, including institutional responsibilities. OSHA, EPA, and life safety programs management is unassigned or assigned as a collateral duty without pertinent training. Funding provided only to avoid potential fines for noncompliance.
Aesthetics, Interior	Like-new finishes.	Clean/crisp finishes.	Average finishes.	Dingy finishes.	Neglected finishes.

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Facility Characteristics for Maintenance

- Customer Service & Response Time
- Customer Satisfaction
- Preventative vs. Corrective Maintenance
- Regulatory Compliance
- Aesthetics, Interior
- Aesthetics, Exterior
- Aesthetics, Lighting

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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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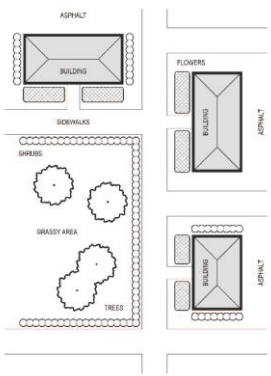

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Staffing Determination Methods

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)	Moving SF Staff Member	Electricians (including supervisor)	Electricians SF/FTE	Plumbers (including supervisor)	Plumbers SF/FTE	HVAC (including supervisor)	HVAC SF/FTE	Carpenters (includes supervisor)	Carpenters SF/FTE	Locksmiths	Locksmith	Painters	Painters SF/FTE	WWR (less Admin)	Total WWR SF/FTE	WWR Workers Staff on
1992	794,000				265,000	3	264,667		794,000									
1993	829,417				276,472	3	276,472		829,417									
1994	877,082				292,361	3	292,361		877,082									
1995	966,529				322,176	3	322,176		966,529									
1996	1,159,235	2	289,809	4	289,809	4	289,809	4	289,809	4	289,809	4	289,809	4	289,809	4	289,809	4
1997	1,198,072	4	299,518	4	299,518	4	299,518	4	299,518	4	299,518	4	299,518	4	299,518	4	299,518	4
1998	1,198,072	4	299,518	4	299,518	4	299,518	4	299,518	4	299,518	4	299,518	4	299,518	4	299,518	4
1999	1,198,072	4	299,518	4	299,518	4	299,518	4	299,518	4	299,518	4	299,518	4	299,518	4	299,518	4
2000	1,198,072	4	299,518	4	299,518	4	299,518	4	299,518	4	299,518	4	299,518	4	299,518	4	299,518	4
2001	1,198,072	4	299,518	4	299,518	4	299,518	4	299,518	4	299,518	4	299,518	4	299,518	4	299,518	4
2002	1,198,072	4	299,518	4	299,518	4	299,518	4	299,518	4	299,518	4	299,518	4	299,518	4	299,518	4
2003	1,343,884	5	268,777	3	447,961	3	447,961	4	335,971	6	223,981	3	447,961	2	671,942	3	447,961	2
2004	1,353,516	5	270,703	3	451,172	3	451,172	4	338,379	7	193,559	3	451,172	2	676,758	3	451,172	2
2006	1,637,233	6	272,872	3	545,744	3	545,744	4	409,308	7	233,890	3	545,744	2	818,617	3	545,744	2
2007	1,836,187	6	306,031	3	612,062	4	459,047	5	367,237	7	262,312	3	612,062	2	918,094	3	612,062	2
2008	1,840,242	9	204,471	3	613,414	4	460,061	5	368,048	7	262,892	2	920,121	2	920,121	3	613,414	2
2009	1,888,648	10	188,865	3	629,549	4	472,162	5	377,730	7	269,807	2	944,324	2	944,324	3	629,549	2
2010	2,026,108	11	184,192	4	506,527	4	506,527	5	405,222	7	289,444	2	1,013,054	3	1,013,054	3	675,369	3
2011	2,131,090	11	193,735	4	532,773	4	532,773	5	426,218	7	304,441	2	1,065,545	3	1,065,545	3	710,363	3
2012	2,333,433	11	212,130	4	583,358	4	583,358	5	466,687	7	333,348	2	1,166,717	3	1,166,717	3	777,811	3
2013	2,444,412	12	203,701	4	611,103	4	611,103	5	488,882	7	349,202	2	1,222,206	3	814,804	3	814,804	3
2014	2,667,447	12	222,287	4	666,862	5	533,489	5.5	484,990	7	381,064	2	1,333,724	3	889,149	3	889,149	3
2015	2,717,723	12	226,477	5	543,545	5	543,545	6.5	418,111	7.5	362,363	2	1,358,862	3	905,908	3	905,908	3
2016	2,783,565	12	231,964	6	463,928	6	463,928	7.5	371,142	7.5	371,142	2	1,391,783	3	927,855	3	927,855	3
2017	2,765,282	12	230,440	6	460,880	6	460,880	7.5	368,704	8.5	325,327	2	1,382,641	3	921,761	3	921,761	3
2018	2,772,562	12	231,047	6	462,094	7	396,080	7.5	369,675	8.5	326,184	3	924,187	3	924,187	3	924,187	3
2019	3,079,835	12	256,653	6	513,306	7	439,976	7.5	410,645	8.5	362,334	3	1,026,612	3	1,026,612	* 3	1,026,612	3
2020	3,159,594	12	263,300	7	451,371	7	451,371	7.5	421,279	9.5	332,589	3	1,053,198	3	1,053,198	3	1,053,198	3
2021	3,161,148	12	263,429	7	451,593	7	451,593	8	395,144	8.5	371,900	3	1,053,716	3	1,053,716	** 3	1,053,716	3
2022	3,161,148	12	263,429	7	451,593	7	451,593	8.5	371,900	8.5	371,900	3	1,053,716	3	1,053,716	3	1,053,716	3

* Changed from employee number t

** Includes 2 FTE for COVID staffing

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Year	Sq. Footage	Moving & Setup Staff (including supervisor)	Moving SF Staff Member	Electricians (including supervisor)	Electricians SF/FTE	Plumbers (including supervisor)	Plumbers SF/FTE	HVAC (including Supervisor)	HVAC SF/FTE	Carpenters (including supervisor)	Carpenters SF/FTE	Locksmiths SF/FTE	Locksmith	Painters
2003	1,343,884	5	268,777	3	447,961	3	447,961	4	335,971	6	223,981	3	447,961	2
2004	1,353,516	5	270,703	3	451,172	3	451,172	4	338,379	7	193,559	3	451,172	2
2006	1,637,233	6	272,872	3	545,744	3	545,744	4	409,308	7	233,890	3	545,744	2
2007	1,836,187	6	306,031	3	612,062	4	459,047	5	367,237	7	262,312	3	612,062	2
2008	1,840,242	9	204,471	3	613,414	4	460,061	5	368,048	7	262,892	2	920,121	2
2009	1,888,648	10	188,865	3	629,549	4	472,162	5	377,730	7	269,807	2	944,324	2
2010	2,026,108	11	184,192	4	506,527	4	506,527	5	405,222	7	289,444	2	1,013,054	3
2011	2,131,090	11	193,735	4	532,773	4	532,773	5	426,218	7	304,441	2	1,065,545	3
2012	2,333,433	11	212,130	4	583,358	4	583,358	5	466,687	7	333,348	2	1,166,717	3
2013	2,444,412	12	203,701	4	611,103	4	611,103	5	488,882	7	349,202	2	1,222,206	3
2014	2,667,447	12	222,287	4	666,862	5	533,489	5.5	484,990	7	381,064	2	1,333,724	3
2015	2,717,723	12	226,477	5	543,545	5	543,545	6.5	418,111	7.5	362,363	2	1,358,862	3
2016	2,783,565	12	231,964	6	463,928	6	463,928	7.5	371,142	7.5	371,142	2	1,391,783	3
2017	2,765,282	12	230,440	6	460,880	6	460,880	7.5	368,704	8.5	325,327	2	1,382,641	3
2018	2,772,562	12	231,047	6	462,094	7	396,080	7.5	369,675	8.5	326,184	3	924,187	3
2019	3,079,835	12	256,653	6	513,306	7	439,976	7.5	410,645	8.5	362,334	3	1,026,612	3
2020	3,159,594	12	263,300	7	451,371	7	451,371	7.5	421,279	9.5	332,589	3	1,053,198	3
2021	3,161,148	12	263,429	7	451,593	7	451,593	8	395,144	8.5	371,900	3	1,053,716	3
2022	3,161,148	12	263,429	7	451,593	7	451,593	8.5	371,900	8.5	371,900	3	1,053,716	3

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2. Survey Data or Benchmarking

- Competitive or External Benchmarking
- APPA Facility Performance Indicators or FPI

•**Benefits and Pitfalls**

No, this is not a benchmark!

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Institution	Annual Grounds Budget	# FTEs	# Acres	Cost/Acre	Acres/FTE
NCSU	$2,504,610.00	73	947	$2,645.00	13.0
U of Tenn	$1,843,000.00	26	550	$3,351.00	21.2
U of South Carolina	$910,446.00	26	400	$2,276.00	15.4
App St Univ	$1,299,688.00	31	300	$4,332.00	9.7
W. Kentucky University	$943,000.00	21	200	$4,715.00	9.5
U of Alabama-Huntsville	$495,510.00	11	280	$1,770.00	25.5
Florida State University	$1,718,068.00	80	450	$3,817.00	5.6
Georgia Tech	$2,025,500.00	51	410	$4,940.00	8.0
East Carolina University	$498,210.00	61	465	$1,071.00	7.6
U of Southern Miss	$640,223.00	19	238	$2,690.00	12.5
U of Georgia	$1,966,250.00	95	605	$3,250.00	6.4
Miss State Univ.	$2,074,536.00	33	1200	$1,729.00	36.4
U of Richmond	$1,164,000.00	20	390	$2,985.00	19.5
Eastern Kentucky Univ.	$644,000.00	26	650	$991.00	25.0
U of Mississippi	$1,089,662.00	24	1000	$1,089.00	41.7
U of Florida	$786,000.00	97	2000	$393.00	20.6
U of Memphis	$1,000,000.00	30	300	$3,333.00	10.0
West Virginia University	$1,617,146.00	45	545	$2,967.00	12.1
Duke University	$2,300,000.00	61	628	$3,662.00	10.3

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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	61	628	27,355,680	$3,662.00	10.30

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Grounds Maintenance Summary

	TOTAL SF	LANDSCAPED SF
Groundcover	307,097.00	307,097.00
Turf	8,787,308.00	8,787,308.00
Artificial Turf	224,422.00	224,422.00
Accent Beds	61,952.00	61,952.00
Walks	1,185,588.00	1,185,588.00
Parking Lots	3,805,720.00	
Construction areas	75,781.00	
Mulched Areas	2,107,783.00	2,107,783.00
Managed Forest	10,059,706.00	
Volleyball	13,620.00	13,620.00
Bleachers/Stadium	170,207.00	
Tennis	195,015.00	
Basketball	24,749.00	
Rollerhockey	7,614.00	
Rock Area	55,307.00	
Substations	98,350.00	98,350.00
Total Sq Ft	**27,180,219.00**	**12,786,120.00**
Acres	**624**	**294**

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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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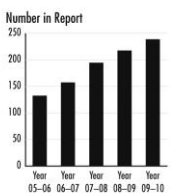
2. Survey Data or Benchmarking
APPA FPI

	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	68,827	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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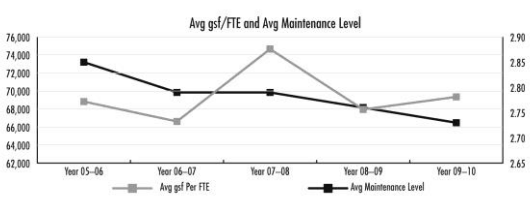
Survey Data or Benchmarking



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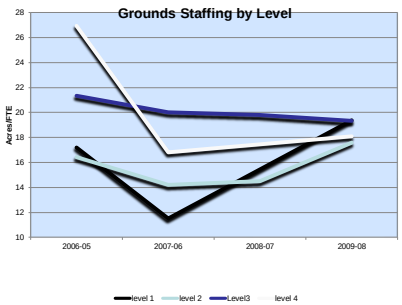
APPA FPI



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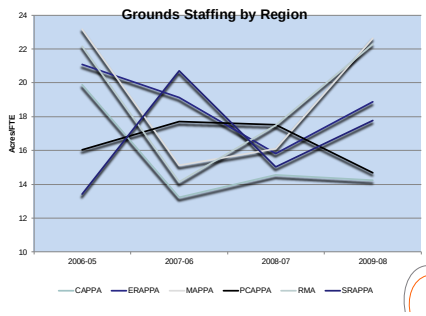
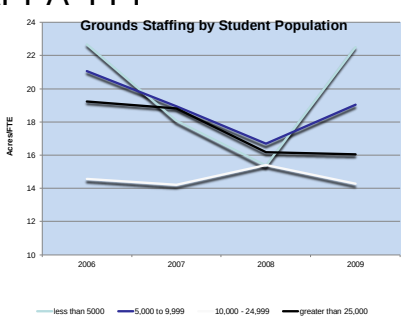
APPA FPI



32

APPA FPI



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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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Figure 3.10: Aggregate FTE Method – Worked Example: Traditional Four-Year Residential College

Step 1. Given

a. liberal arts, four year college, small town
b. college developed over 125 years
c. campus of 20 buildings
d. buildings improved to "timeless" and durable condition
e. campus FCI is 17
f. avg bldg age is 22 yrs
g. selected service level is 1
h. 90% students residential
i. faculty & staff: 435
j. students: 1,339

Step 2. Baseline FTE Determination

Figure 3.2		Figure 3.1	
Space Type	Area (gsf)	Staffing Factor	Baseline Staffing
classroom	64,350	15	0.97
laboratory	26,650	27	0.72
office	234,000	24	5.62
residence halls	825,000	18	14.85
campus total:	1,150,000	Total:	22.15

Step 3. FTE Adjustment Factor

Figure 3.8	Figure 3.6	Figure 3.6	Figure 3.5	Figure 3.9	
FCI	Age	Varied Facilities	Size	Campus Mission	Total of Factors
0.06	0.00	0.00	0.00	0.05	0.11

Step 4. Final FTE Staffing

Adjusted Staffing equals = (1 + sum of factors) X baseline staffing
= (1 + 0.11) X baseline staffing
Adjusted FTE = 24.59
Final FTE = 25
(without any management or support staff)

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Aggregate or Macro Method

Figure 4.5: Barton Hall Staffing Summary

		Level 1		Level 2		Level 3		Level 4		Level 5	
APPA Space Category	Total Cleanable Sq. ft.	Sq. ft. per custodian	# cust.	Sq. ft. per custodian	# cust.	Sq. ft. per custodian	# cust.	Sq. ft. per custodian	# cust.	Sq. ft. per custodian	# cust.
Office with carpet	17,309	12,253	1.41	24,471	0.71	45,560	0.38	74,024	0.23	116,839	0.15
Public with hard floor	7,851	9,101	0.86	24,445	0.32	36,072	0.22	44,515	0.18	47,643	0.17
Entryway	312	5,100	0.06	8,790	0.04	13,788	0.02	22,441	0.01	36,137	0.01
Res. Lab no hazard	1,643	7,787	0.21	11,670	0.14	14,949	0.11	27,029	0.06	88,575	0.02
Storeroom	2,048	81,784	0.03	240,156	0.01	452,223	0.005	1,895,924	0.001	3,348,775	0.001
Washroom	1,092	2,579	0.42	3,549	0.31	3,549	0.31	3,549	0.31	3,549	0.31
Stairwell	468	9,290	0.05	18,649	0.03	21,829	0.02	30,614	0.02	93,830	0.01
Classroom with hard floor	5,800	10,232	0.57	19,132	0.30	31,952	0.18	43,441	0.13	48,507	0.12
Totals	**36,523**		**3.61**		**1.85**		**1.25**		**0.94**		**0.78**

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4. Zero-Based or Micro Method

- The sum of all time necessary to perform each specific task on a given frequency
- **Benefits and Pitfalls**

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Zero-Based or Micro Method

Figure 5.1: Classroom with Hard Floors, Special Matrix

Routine Activities	Your Frequency	Your Freq. Code	Adjusted Minutes	Base Time
Spot Clean Walls and Doors	Weekly	0.20	0.62	3.12
Relamp	D/A		0.08	3.46
Clean Chalkboards and Trays	Daily	1.00	3.15	3.15
Dust Flat Surfaces	Weekly	0.20	0.23	1.16
Empty Waste Containers	Daily	1.00	0.46	0.46
Empty Pencil Sharpeners	Daily	1.00	0.40	0.40
Sweep, Dust-mop Floors	Daily	1.00	16.40	16.40
Clean Erasers	Daily	1.00	0.60	0.60
Damp-mop Floors	Weekly	0.20	3.32	16.61

Adjusted Minute Subtotal			25.26	
CSF/Custodian			19,952	

Project Activities	Your Frequency	Your Freq. Code	Adjusted Minutes	Base Time
Dust Blinds	Annually	0.004	0.02	4.95
Project-clean Furniture and Seating	Annually	0.004	0.29	73.73
Clean Trash Containers	Semiannually	0.008	0.01	1.01

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Zero-Based or Micro Method

Figure 5.2: Minutes to Clean for Barton Hall, First Floor, cont'd

Room #	CSF	APPA Space Category	Routine CSF/Cust	Routine FTE	Routine MTC	Project Adj Mins	Std Spc Area	Project MTC	Project FTE	Total MTC	Total FTE
101A	203	Research Lab without Hazardous Waste	12,767	0.016	6.68	1.00	324	0.63	0.001	7.31	0.017
101/B	550	Classroom with Hard Floor	22,963	0.024	10.06	6.92	1,200	3.17	0.008	13.23	0.032
118	100	Storeroom	240,156	–	0.18	0.00	480	–	–	0.17	–
116	50	Storeroom	240,156	–	0.09	0.00	480	–	–	0.09	–
114	50	Washroom	3,575	0.014	5.87	0.25	282	0.04	–	5.92	0.014
120	156	Research Lab without Hazardous Waste	12,767	0.012	5.13	1.00	324	0.48	0.001	5.61	0.013
122	90	Storeroom	240,156	–	0.16	0.00	480	–	–	0.16	–
121	110	Office with Carpet Floor	30,450	0.004	1.52	4.04	1,200	0.37	0.001	1.89	0.004
123	110	Office with Carpet Floor	30,450	0.004	1.52	4.04	1,200	0.37	0.001	1.89	0.004
125	110	Office with Carpet Floor	30,450	0.004	1.52	4.04	1,200	0.37	0.001	1.89	0.004
127	110	Office with Carpet Floor	30,450	0.004	1.52	4.04	1,200	0.37	0.001	1.89	0.004
129	150	Storeroom	240,156	0.001	0.26	0.00	480	–	–	0.26	0.001
131	150	Storeroom	240,156	0.001	0.26	0.00	480	–	–	0.26	0.001
128	110	Office with Carpet Floor	30,450	0.004	1.52	4.04	1,200	0.37	0.001	1.89	0.004
100C	113	Stairwell	22,657	0.005	2.10	0.83	208	0.45	0.001	2.54	0.006
100B	150	Stairwell	22,657	0.007	2.78	0.83	208	0.60	0.001	3.38	0.008
100P	431	Public (Circulation) with Hard Floor	27,612	0.016	6.56	2.76	1,400	0.85	0.002	7.41	0.018
101D	576	Classroom with Hard Floor	22,963	0.025	10.54	6.92	1,200	3.32	0.008	13.86	0.033
101E	576	Classroom with Hard Floor	22,963	0.025	10.54	6.92	1,200	3.32	0.008	13.86	0.033
124	288	Classroom with Hard Floor	22,963	0.013	5.27	6.92	1,200	1.66	0.004	6.93	0.016
126/126A	144	Storeroom	240,156	0.001	0.25	0.00	480	–	–	0.25	0.001

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Zero-Based or Micro Method

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

	Levels of Attention				
Maintenance Tasks	**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
Biweekly	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
Activities Involved	Quantity	Unit	1000 SF or LF	Activity once (hr.)	July	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	March	April	May	June	per year
Perennial Beds-Hand Weed/Police																	
Priority One Zone	9723	SF	90	14.6	2	2	1	0	0	0	0	0	0	1	2	2	10
Priority Two Zone	12967	SF	90	19.5	2	2	1	0	0	0	0	0	0	0	2	2	9
Priority Three Zone	4588	SF	90	6.9	1	1	0	0	0	0	0	0	0	0	1	1	4

	Estimated Staff Needed by Month for Each Maintenance Catagories											
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
Mow IHS	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)	116,825	SF or	2.68	Acres										
Turf (push mow)	8,000	SF or	0.18	Acres										
Edging	3,650	LF												
String Edge	365	LF												
Growing Year	42	Weeks												
Productive Hrs per workday	8													
							SVC LVL 1		SVC LVL 2		SVC LVL 3		SVC LVL 4	
Task	Unit	Freq.	Period	Rate			Adjust Factor	Totals (avg min/week)	Adjust Factor	Totals (avg min/week)	Adjust Factor	Totals (avg min/week)	Adjust Factor	Totals (avg min/week)
Mow - 72" Power	Acre	1	Weekly	36			1.500	144.824	1.000	96.550	0.500	48.275	0.500	48.275
Mow - 21" Push	SF	1	Weekly	6			1.500	72.000	1.000	48.000	0.500	24.000	0.500	24.000
Edge/Trim, Gas trimmer	LF	1	Weekly	25			1.500	136.875	1.000	91.250	0.500	45.625	0.250	22.813
String Edger	LF	1	Weekly	10			1.500	5.475	1.000	3.650	0.500	1.825	0.250	0.913

Growing year and productive hours are variable depending on your location and specific campus operations.

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 Zone:					% of Total Area
Turf (tractor)	116,825	SF or	2.68	Acres	29.84%
Turf (push mow)	8,000	SF or	0.18	Acres	2.04%
Shrubs	13,130	SF or	0.30	Acres	3.35%
Hardscape	253,560	SF or	5.82	Acres	64.76%
Edging	3,650	LF			
String Edge	365	LF			
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
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

Asset totals

Total FTE requirements

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Case Study XYZ University

Turf Maintenance - Open Area — 1 year = 49 weeks — 84.9 Ac

LABOR

Levels of Maintenance	High		Medium		Low		Total min/wk	Total hrs/yr	$15	Labor $/yr
	LABOR min/Ac	#Ac.		#Ac.		#Ac.				
Mow										
72" rider	36.00	36.00	8.5	18.00		9.00				
		306.00		0.00		0.00	306.00	204.00		$3,060.00
16' batwing	13.00	13.00	76.0	6.50		3.25				
		988.00		0.00		0.00	988.00	658.67		$9,880.00
Fertilize PTO	15.00	0.75	84.5	0.38		0.00				
		63.38		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
Overseed	48.00	1.20		0.00		0.00				
		0.00					0.00	0.00		$0.00
Irrigate	60.00	4.50		0.00	0.0	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
					TOTAL			904.92		$13,573.75

MATERIALS

Levels of Maintenance	High		Medium		Low		Total min/wk	Total hrs/yr	fuel	gal./hr	$/yr
		#Ac.		#Ac.		#Ac.			Gl/hr		
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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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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Questions?

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