

REAL ESTATE CENTER

Office Space Demand



Technical Report 978

February 1993

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Summary

Determining the market's real needs for new office space has been a dilemma. This study pioneers in analyzing office space per worker based on a large sample of firms in Houston.

Office space demand is simply the combination of the number of office employees and their need for productive space. The average office worker in the Houston area occupies 298.25 square feet. However, substantial variations emerge when examined by Standard Industrial Codes (SIC) categories. Variations are more pronounced when geographic differences within the Houston metropolitan area are introduced.

Substantial, consistent variations in typical office space allocations per worker were found to exist by type of firm and by geographic location. The overall average usable square feet per worker was found to be near the 250 square feet expected by conventional wisdom.

Inaccurate and incomplete information pertaining to office space demand has been a recurring problem for decades. Commercial leasing agents, appraisers, lenders and developers seek the sizes and types of office space needed by the market. Without accurate information on office employment and office space needs per worker, however, the market's real needs for new office space can not be estimated.

Office space demand is simply the combination of the number of office employees and their need for productive space. The quantity of office space for each worker depends on the type of firm.

The typical methodology for forecasting aggregate office space demand for a point in time in a specific geographic area is:

$$\sum_{i=1}^{10} (\text{Employment}_i) \text{ forecast} \times \text{Share of (office workers}_i) \times \text{Space per (worker}_i)$$

where i represents each of the ten one-digit Standard Industrial Codes (SIC).

The total occupied space for a year in the future depends on the accuracy of the employment forecast by SIC category, the accuracy of the estimate of the share of office workers in this forecast and the expected space per worker

for each SIC category. The focus of this research is the measurement of office space per worker in the Houston market.

Forecasting Employment

Historic, accurate counts of total employment by SIC category for each county are available from both state sources (departments of labor or employment securities) and from federal sources, such as *County Business Patterns*.

Accurate employment forecasts by SIC category for each county often are not available. Multi-year economic forecasts for metropolitan areas usually are available from local and national economic forecasting entities (banks, universities, consulting firms.) The effective demand for a specific office building is usually best understood at the county (or part of a county) level. Problems in forecasting employment by SIC category for counties may have contributed to errors in estimating future office space demand.

Share of Office Workers

The primary source for estimates of the share of office workers among all employees is the *auxiliary* or *ancillary* worker employment subcategory for each SIC category published annually in *County Business Patterns*. Estimates of the

share of white collar workers were not designed by the U.S. Department of Commerce to be a count of office workers in private office buildings. Other methods of estimating office workers are possible for the finance, insurance and real estate (FIRE) industry, as well as service employment category using detailed, unpublished, four-digit SIC employment data from the Commerce Department. However, for the typical appraiser, developer, lender or market analyst, *County Business Patterns* is the primary source of office employment estimates.

The share of office workers in an SIC category may range from a high of near 100 percent for the finance, insurance and real estate (FIRE) category to less than 5 percent for construction. The actual share of office workers per SIC grouping can vary widely between counties in the same metropolitan area, depending on the extent to which facilities are administrative or production oriented.

These office worker estimates by SIC category may be inaccurate in some cases. Forecasting the number of office workers by one- or two-digit SIC code has proven to be a complex task (Howland, 1992).

A survey of the number of office workers for 10,985 firms occupying Houston office space suggests that the *County Business Patterns* data are useful at the general county level but difficult to use for any one employment category.

The Kerr Resource Center, Inc., in Houston conducts an annual tenant survey. In analyzing this large database, Kerr eliminates firms without complete SIC codes or employee counts. The University of New Orleans Real Estate Market Data Center analyzed this data to remove outliers and improve the consistency of the estimates of office space per worker within the Houston metropolitan area. For consistency, firms reporting less than 100 square feet per worker were excluded as being probable assignments of employees other than office workers to the office locations. Similarly, firms reporting more than 600 square feet per worker were excluded as being firms in the midst of short-term staffing reductions or "rightsizing" decisions.

Houston Office Employment

A total of 278,667 office workers is identified in *County Business Patterns* as of 1989 within Harris, Fort Bend and Montgomery counties.

This estimate relies on counting the ancillary and auxiliary employees as office workers plus employees in the business services category. Not included in this total are physicians and medical service workers who occupy offices but are not represented adequately in the survey of workers used in this research.

Typically, office workers account for approximately one third of all employed persons. In Houston, the 33.5 percent share for office workers is consistent with this expectation. An estimated 261,128 office employees work in Houston. The cumulative office employee estimate based on *County Business Patterns* appears to be plausible.

The counts within many categories are surprisingly similar. For example, federal data and the Kerr count of manufacturing, attorneys, engineers, architects, accountants and business services match closely. In other areas, such as mining, the *County Business Patterns* and the survey counts differ substantially. Firms in the oil and gas industry can be classified as mining, manufacturing, construction (in some cases) or as business services. It is likely the survey research placed more of these firms directly in the mining category than does the federal employment count.

Office demand forecasts focus on persons working in the larger leased office space or office buildings occupied by the owner. Some office employment does not affect the demand for these larger leased buildings; much of the clerical support for retail and wholesale trade often is housed at the store or warehouse site. Residential real estate and insurance agents often occupy space in the smaller, one- or two-story buildings that may not be counted in the supply of office space for larger structures. The FIRE count in *County Business Patterns* substantially overstates office employment demand.

The developer, analyst or lender trying to estimate office market demand may be able to approach an accurate total count from *County Business Patterns* but is likely to experience wide ranges of forecast demand for each of the seven SIC categories related to office space demand.

Office Space Per Worker

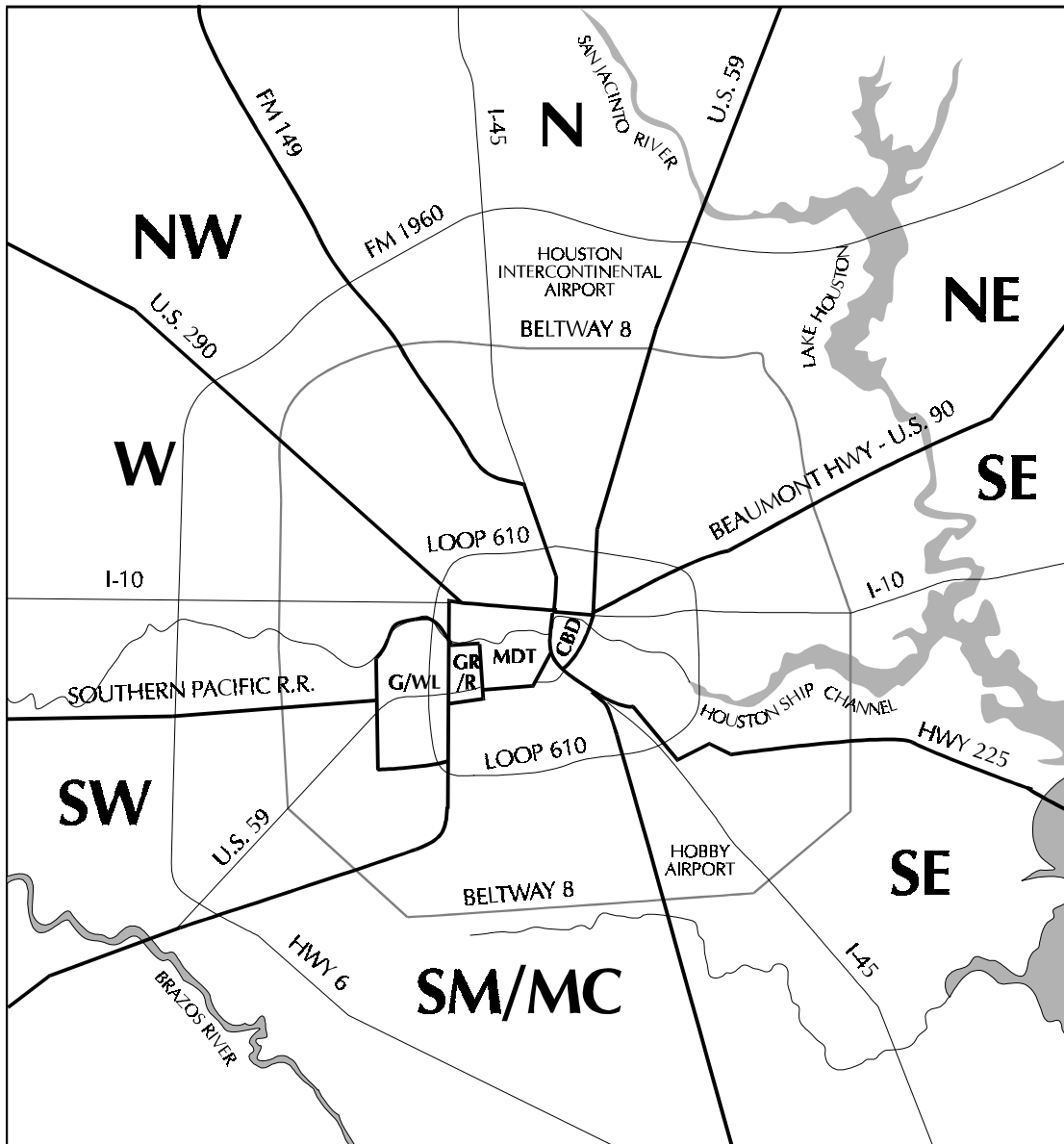
Just as there is some difficulty in estimating the current share of office workers for each employment category, estimating the typical

**Table 1. Comparison of *County Business Patterns* and Survey Office Employment, 1989-90
Houston, Texas**

SIC Groups	1989 Total Employment	1989 Ancillary and Auxillary Employment	1990 Surveyed Office Workers
Mining	58,765	36,400	65,989
Office Space		61.9%	112.3%
Construction	108,754	1,959	7,010
Office Space		1.8%	6.4%
Manufacturing	167,725	14,400	13,607
Office Space		8.6%	8.1%
Transportation	105,000	11,550	20,112
Office Space		11.0%	14.2%
Wholesale and Retail Trade	354,666	22,400	8,933
Office Space		6.3%	2.5%
Finance, Insurance and Real Estate	107,397	107,397	58,342
Depository Institutions	27,896	27,896	10,485
Insurance	24,968	24,968	14,287
Business Services	96,111	96,111	88,455
Attorneys	16,527	16,572	17,254
Engineering and Architectural	25,065	25,065	26,130
Accountants	8,231	8,231	7,327
Subtotal	830,696	278,667	261,128
Office Space		33.5%	31.4%

Sources: *County Business Patterns* and survey data from Kerr Resource Center, Inc.; analyses by University of New Orleans Real Estate Market Data Center and Real Estate Center at Texas A&M University.

Geographic Submarkets, Houston, Texas



Sources: Kerr Resource Center, Inc., Houston, Texas, and Real Estate Center at Texas A&M University

space used per worker for each category is more uncertain.

Actual counts of space per worker are presented in Table 2 for each of the major SIC categories in 11 geographic regions of the Houston metropolitan area. The regions are taken from the *Houston Mapbook* and are shown in the figure.

The average Houston area office worker occupies 298.25 square feet. Today, office

leases often count the prorated share of common area in the rentable area. Typical gross-building-to-usable-area ratios for office buildings are 115 percent to 120 percent. The average usable area per office worker in 1990 would have been 259 to 248 square feet. The conventional wisdom estimate for usable space per office worker often is mentioned as 225 to 250 square feet. Aggregated across all types of

**Table 2. Comparison of Space per Worker by SIC Group and Region
Houston, Texas, 1990**

	Mining Construction	Manufacturing (2000) SICs	Manufacturing (3000) SICs	Transportation and Utility	Wholesale and Retail Trade	Finance Real Estate Insurance	Business Services	Health Professional Services	Public Administration	Region
CBD										
No. of Firms	294	23	10	82	30	243	91	540	30	1,344
Square Feet	11,127,026	247,062	216,968	1,872,254	244,463	5,177,968	373,199	6,039,591	334,960	25,646,491
No. of Employees	28,302	540	545	5,843	787	16,830	1,229	19,045	1,342	74,490
Avg. Space per Wkr.	393.15	457.52	398.11	320.43	310.63	307.66	303.66	317.12	249.6	344.29
GALLERIA										
No. of Firms	255	61	59	165	169	768	414	773	128	2,797
Square Feet	2,932,801	1,448,576	364,335	1,079,733	269,655	3,852,346	1,064,311	3,474,354	510,069	15,007,180
No. of Employees	9,094	2,926	1,049	2,988	944	13,697	4,567	14,013	1,682	51,007
Avg. Space per Wkr.	322.5*	495.07	347.32	361.36	285.65	281.25*	233.04*	247.94*	303.25	294.22
GREENWAY										
No. of Firms	65	22	12	60	32	178	140	379	20	911
Square Feet	1,194,025	189,247	20,441	547,607	70,718	1,128,543	373,731	1,515,964	121,026	5,166,402
No. of Employees	3,547	524	61	1,886	248	4,175	1,308	6,039	680	18,490
Avg. Space per Wkr.	336.63*	361.16*	335.1	290.35	285.15	270.31*	285.73	251.03*	177.98	279.42
MIDTOWN										
No. of Firms	14	2	4	19	16	59	36	99	14	264
Square Feet	171,075	4,500	5,900	187,865	189,379	1,211,204	271,042	472,686	58,752	2,606,583
No. of Employees	434	19	23	752	691	3,931	1,092	1,581	206	8,904
Avg. Space per Wkr.	394.18	236.84*	256.52*	249.82*	274.07	308.12	248.21*	298.98	285.2	292.74
NORTH										
No. of Firms	96	40	63	91	107	316	152	287	22	1,176
Square Feet	1,952,914	236,474	331,287	819,547	354,262	1,220,162	1,199,768	765,003	144,932	7,029,349
No. of Employees	6,052	641	875	2,960	1,575	4,743	5,728	2,447	464	25,504
Avg. Space per Wkr.	322.69*	368.91*	378.61	276.87	224.93*	257.26*	209.46*	312.63	312.35	275.62*
NORTHEAST										
No. of Firms	29	8	1	5	7	23	11	34	3	99
Square Feet	158,382	13,300	3,000	10,000	13,061	74,959	25,050	65,562	21,300	239,682
No. of Employees	534	45	5	40	42	287	90	226	53	858
Avg. Space per Wkr.	296.6*	295.56*	600*	250*	310.98	261.18*	278.33	290.1	401.89	279.35

*Significantly different from CBD space per worker at .05 or lower probability of random occurrence.

Sources: Data provided by Kerr Resource Center and analyses by the University of New Orleans Real Estate Market Data Center and Real Estate Center at Texas A&M University.

**Table 2. Comparison of Space per Worker by SIC Group and Region
Houston, Texas, 1990 (continued)**

	Mining Construction	Manufacturing (2000) SICs	Manufacturing (3000) SICs	Transportation and Utility	Wholesale and Retail Trade	Finance, Insurance and Real Estate	Business Services	Health Professional Services	Public Administration	Region
NORTHWEST										
No. of Firms	53	19	18	63	54	168	89	221	14	696
Square Feet	997,922	55,190	63,665	418,479	319,235	868,237	586,207	734,239	329,908	4,351,782
No. of Employees	3,014	218	189	1,520	1,145	3,520	1,934	2,806	1,157	15,450
Avg. Space per Worker	331.1*	253.17*	336.85	275.32	278.81	246.66*	303.11	261.67*	285.14	281.67
SOUTHEAST										
No. of Firms	36	6	22	31	22	95	72	167	22	453
Square Feet	374,257	25,332	789,937	188,245	32,800	349,650	297,660	595,561	481,733	2,797,017
No. of Employees	1,401	80	3,487	876	114	1,260	1,106	2,663	2,124	11,914
Avg. Space per Worker	267.14*	316.65*	226.54*	214.89*	287.72	277.50	269.13*	223.64*	226.80	234.77*
MEDICAL CENTER										
No. of Firms	10	8	2	7	13	46	33	148	9	277
Square Feet	509,480	59,324	1,900	558,936	35,006	451,571	82,477	621,788	38,400	2,360,382
No. of Employees	1,446	466	7	1,312	156	1,380	427	2,435	135	7,772
Avg. Space per Worker	352.34	127.3	271.43*	426.02	224.4	327.23	193.15*	255.35*	284.44	303.7
SOUTHWEST										
No. of Firms	44	20	11	35	56	179	109	222	33	712
Square Feet	361,790	32,325	78,191	40,000	141,405	624,587	544,574	1,901,955	100,000	3,831,727
No. of Employees	1,171	113	258	160	621	2,331	2,221	7,403	422	14,722
Avg. Space per Worker	308.96*	286.06*	303.07	250*	227.71*	267.95*	245.19*	256.92*	236.97	260.27*
WEST										
No. of Firms	263	46	57	127	133	491	320	760	55	2,256
Square Feet	5,100,940	176,358	348,665	545,566	726,144	1,704,898	1,254,542	2,671,207	225,445	12,759,265
No. of Employees	17,984	570	966	1,775	2,610	6,188	4,662	9,551	816	45,143
Avg. Space per Worker	283.64*	309.4*	360.94	307.36	278.22	275.52*	269.1*	279.68*	276.28	282.64*
TOTAL SIC										
No. of Firms	1,159	255	259	685	639	2,566	1,467	3,630	350	10,985
Square Feet	24,880,612	2,487,688	2,224,289	6,268,232	2,396,128	16,664,125	6,072,561	18,857,910	2,366,525	81,795,860
No. of Employees	72,979	6,142	7,465	20,112	8,933	58,342	24,364	68,209	9,081	274,254
Avg. Space per Worker	340.93	405.03	297.96	311.67	268.23	285.63	249.24	276.47	260.60	298.25

*Significantly different from CBD space per worker at .05 or lower probability of random occurrence.

Sources: Data provided by Kerr Resource Center, Inc. and analyses by the University of New Orleans Real Estate Market Data Center and Real Estate Center at Texas A&M University.

office workers, this typical estimate appears reasonable.

When examined by SIC category, however, substantial variations emerge. Mining (341 square feet) and manufacturing (405 square feet) are significantly more extensive users of space per worker than the average firm. Conversely, business services (249.2 square feet), government (260.6 square feet) and wholesale-retail trade (268.2 square feet) require as much as 10 percent less space per worker than the average firm.

Variations in space per office worker become more pronounced when geographic differences within the Houston metropolitan area are introduced. In all cases, private offices in the more expensive central business district (CBD) use more space per worker than the average rate for their SIC group. **The need for prestige and enhanced public image appears to exceed the need for space efficiency among firms within CBD office locations.** A test of significance between means shows a 5 percent or less likelihood that this larger space usage in the CBD is a chance event for the majority of the SIC groupings.

Within the outlying suburban areas of the north, southeast, southwest and west, space per worker is significantly smaller than in the CBD, Galleria or midtown areas. Although rents are lower in these outlying suburban areas, firms use office space more efficiently than in the center of Houston. In these outlying suburbs, space per worker often was less than 80 percent of the space allocation in the CBD. The average gross space per worker in these four areas was 263.3 square feet with a usable area of 229 to 219 square feet. This is a 15 percent smaller space per worker than the overall market and more than 20 percent less than the CBD.

Attempts to forecast office space demand by market analysts could overestimate suburban demand by using an expected allocation per worker that is too large. Overbuilding in the suburbs could have been fostered by overestimating the typical space per worker in suburbs versus the CBD. Market research studies for individual buildings are not publicly available to verify this conjecture.

Studies have been published with even larger office space per worker estimates of 347 gross square feet in suburban Washington, D.C. (Gruen and Gruen, 1986). Regions with a large concentration of law offices, international sales

offices or corporate headquarters may use space more lavishly to enhance public image. Overbuilding of office space was more pronounced nationally in the suburban markets than in the CBD of most cities between 1987 and 1991.

Space Per Worker and Prestige Offices

One way to observe variations in office space use unrelated to the type of firm is to identify a narrow category of firm and examine competing firms' space usage for all 11 geographic areas of Houston. Office area by region is summarized in Table 3 for several professions or types of firms with concentrations of corporate offices in Houston.

Law firms in the CBD employ more than half the legal personnel in Houston. The prestige, corporately oriented law firm office uses 373 square feet per employee, while suburban law firms range from 237 to 313 square feet. More use of law libraries, conference rooms and entry areas with visual impact produces the greater space requirements in the CBD. Houston CBD law firm space usage is not much different from the 1986 Gruen and Gruen estimate for Washington, D.C.

Oil and gas exploration firm headquarters in the CBD used 402 gross square feet of office space per employee. In the western corridor where more "back-office" operations are clustered, space per worker drops to a more typical 285 square feet.

Some of the apparently large space users among oil and gas explorations, petrochemical production firms and pipeline operators are more the result of personnel layoffs than downsizing of the firm's leased space. Temporarily, the office space per worker appears abnormally large until the firm renegotiates its leased office area for a smaller total space or subleases some of the space.

Other professional service firms and banks have much less geographic variation in space per worker. Accounting firms average 257 square feet per worker but have relatively little variation in space usage by geographic area. In fact, the accounting firms in the CBD use less space per worker than those in suburban locations where rents are lower.

Banks, savings institutions, engineering and architectural firms also have no significant variation in space per worker across the

**Table 3. Comparison of Space per Worker by Specialized Firms
Houston, Texas, 1990**

	CBD	Galleria	Greenway	Midtown	North	NE	NW	SE	Medical	SW	West	SIC Total
Accountants												
No. of Firms	35	112	51	9	53	5	39	27	10	53	121	515
Square Feet	992,403	201,012	148,673	30,450	75,377	6,700	96,157	35,990	11,250	81,585	203,479	1,883,076
No. of Employees	4,174	753	510	88	247	16	403	121	52	270	693	7,327
Avg. Space per Worker	237.76	266.95	291.52	346.02*	305.17*	418.75*	238.6	297.4	216.35	302.17*	293.62*	257.01
Banks												
No. of Firms	31	21	5	4	14	2	9	6	7	13	14	126
Square Feet	2,270,654	209,780	49,000	46,500	152,148	25,616	147,600	153,844	152,403	135,441	146,822	3,489,808
No. of Employees	6,322	696	208	174	555	115	605	542	403	425	440	10,485
Avg. Space per Worker	359.17	301.41	235.58*	267.24	274.14	222.75	243.67*	283.8	378.17	318.68	333.69	332.84
Engineering and Architecture												
No. of Firms	16	111	46	14	32	6	39	34	6	33	139	476
Square Feet	474,427	1,361,161	534,827	28,400	152,310	9,212	172,248	22,667	10,700	1,428,664	1,463,058	5,957,674
No. of Employees	2,245	6,998	2,748	97	405	53	666	1,720	33	5,638	5,527	26,130
Avg. Space per Worker	211.33	194.51	194.62	292.78	376.07*	173.81	258.63	187.5	324.24	253.4	264.71	228.00
Insurance												
No. of Firms	10	122	41	18	93	8	66	26	10	66	150	610
Square Feet	128,545	745,207	419,037	1,015,950	269,788	13,100	423,582	44,800	101,933	199,834	644,620	4,006,396
No. of Employees	454	2,646	1,336	3,323	1,173	63	1,743	187	410	697	2,255	14,287
Avg. Space per Worker	283.14	281.64	313.65	305.73	230	207.94	243.02	239.6	248.62	286.71	285.86	280.42
Government												
No. of Firms	16	31	17	11	14	2	9	18	8	7	16	149
Square Feet	253,402	156,967	119,026	55,952	133,482	20,800	254,736	476,533	37,200	65,600	179,995	1,753,693
No. of Employees	1,115	541	675	200	427	52	922	2,090	129	286	641	7,078
Avg. Space per Worker	227.27	290.14	176.33	279.76	312.6	400	276.29	228	288.37	229.37	280.8	247.77
Attorneys												
No. of Firms	369	245	101	49	65	6	37	26	56	35	134	1,123
Square Feet	4,056,180	863,281	339,562	188,771	102,224	7,950	72,153	40,800	104,188	62,600	231,676	6,069,385
No. of Employees	10,881	2,561	1,110	626	335	23	304	144	327	203	740	17,254
Avg. Space per Worker	372.78	337.09*	305.91*	301.55*	301.15*	345.65	237.35*	283.31*	318.62*	308.37*	313.08*	351.77

*Significantly different from CBD space per worker at .05 or lower probability of random occurrence.

Sources: Data provided by Kerr Resource Center, Inc. and analyses by the University of New Orleans Real Estate Market Data Center and Real Estate Center at Texas A&M University.

**Table 3. Comparison of Space per Worker by Specialized Firms
Houston, Texas, 1990 (continued)**

	CBD	Galleria	Greenway	Midtown	North	NE	NW	SE	Medical	SW	West	SIC Total
Manufacturers												
No. of Firms	8	48	12		50		16	21	2	11	48	216
Square Feet	172,168	342,485	20,441		294,513		62,315	787,437	1,900	78,191	145,560	1,905,010
No. of Employees	462	971	61		768		182	3,481	7	258	456	6,646
Avg. Space per Worker	372.66	352.71	335.1		383.48		342.39	226.21	271.43	303.07	319.21	286.64
Oil and Gas Exploration												
No. of Firms	282	201	45	4	77	2	29	7	5	31	212	895
Square Feet	10,824,418	2,726,362	1,093,386	5,900	1,809,545	1,350	687,921	6,100	505,730	243,631	4,871,110	22,775,453
No. of Employees	26,898	8,204	3,207	23	5,559	8	2,394	26	1,429	840	17,057	65,645
Avg. Space per Worker	402.42	332.32*	340.94*	256.52*	325.52*	168.75*	287.35*	234.6*	353.9	290.04*	285.58*	346.95
Petrochemical Production												
No. of Firms	5	7	5		4		1	1	1		2	26
Square Feet	16,100	960,100	133,784		9,438		2,000	3,300	1,500		4,000	1,130,222
No. of Employees	57	1,512	356		58		4	9	6		11	2,013
Avg. Space per Worker	282.46	624.99*	375.8		162.72		500*	366.67	250		363.64*	561.46
Pipeline Operators												
No. of Firms	15	9	4	9	12	1	3				10	63
Square Feet	592,573	564,700	75,510	157,545	88,200	1,200	122,412				22,300	1,624,440
No. of Employees	1,621	1,075	370	383	237	4	347				114	4,151
Avg. Space per Worker	365.56	525.3*	204.08*	411.34	372.15	300	352.77				195.61*	391.34
Area Totals												
No. of Firms	855	999	406	124	465	36	295	166	123	303	1,056	4,828
Square Feet	19,885,020	8,314,516	3,089,621	1,536,418	3,169,927	104,928	2,120,924	1,871,471	1,005,091	2,387,296	8,269,305	51,754,517
No. of Empl.	54,604	26,576	11,102	4,933	10,026	388	7,891	8,319	2,998	8,874	29,156	164,867
Avg. Space per Worker	364.17	312.86	278.29	311.46	316.17	270.43	268.78	224.94	335.25	269.02	283.62	313.92

*Significantly different from CBD space per worker at .05 or lower probability of random occurrence.

Sources: Data provided by Kerr Resource Center, Inc. and analyses by the University of New Orleans Real Estate Market Data Center and Real Estate Center at Texas A&M University.

Table 4. Architectural Design Space Requirements and Houston Actual Office Space Use in Square Feet

	Typical Architectural Guidelines	Houston Typical Offices
Law Firms		
Small Firms	189-209	308-18
Large Firms	274	306-73
Accounting Offices		
Managerial and Private Areas	277	257
Government (Open Systems Office)	125	176-288
Physicians' Offices	300-450	277-387

Houston metropolitan area. Even though drafting tables and file storage require space, engineering-architectural firms appear to be the most efficient users of office space among the professions surveyed. They use an average of only 228 gross square feet per worker. The office building efficiency orientation of the engineering profession may explain this low level of office space allocation. Medical office space needs tend to vary by medical specialty. The Kerr sample covered less than 5,000 physicians' office personnel, while the Houston area is the site for more than 25,000 physicians' office jobs.

Government agencies had no significant variations in space use per worker across the Houston metropolitan area. The clerically oriented services offered by government and their needs for cost minimization produced a relatively low allocation of space per worker—248 gross square feet.

A similar analysis of office space use was prepared based on a 1989 survey by Kerr. The results produced similar space-per-worker estimates based on a smaller sample. For example, the market average gross space per worker was 300 square feet in 1989 versus 298 square feet in 1990. The stability of these estimates further supports the internal consistency of this data collection effort. It does not appear office space per worker is currently

changing in Houston, but apparently distinct locational preferences exist by type of firm.

Architectural Estimates of Space Per Worker

Several published guides to office space use are available. They are based on both governmental office requirements (*General Services Administration [GSA] Guide for Space Planning and Layout*) and private design recommendations (De Chiara and Callender, 1990; Malkin, 1982). Comparisons among these sources reveal typical design standards for efficient use of office space. Actual surveys of office space by type of firm are not presented in these guides. The space allocations are designed to meet typical technological requirements of the firm and not the actual preferences of individual firms.

Selected architectural design recommendations are summarized and compared with reported average space allocations for Houston in 1990 (Table 4). The architectural drawing space allocations have been increased by a 1.18 common area factor for comparison to the Houston survey data by Kerr.

In two of three instances where a comparison could be presented, the actual space usage is substantially larger than pure architectural efficiency guidelines suggest. If accounting firms are indicative of typical firm needs, the architectural guidelines are similar. Similarly,

the average suburban office space per worker was found to be 229 to 219 square feet. In areas where prestige considerations do not strongly influence office space use, the actual usage may be closer to expected architectural guidelines than in the more prestigious CBD Class A office towers.

Future Research

Not only can surveys of firms yield measures of office space per worker, but also they can reveal the locations of concentrations of jobs by four-digit SIC Code. Knowing the relative importance of a location in attracting differing types of firms helps leasing agents and builders better serve the marketplace.

Firms more likely to relocate to a specific area can be identified by leasing agents. Developers can construct buildings with amenities targeted to serve particular types of firms.

The accuracy of forecasting the demand for office space also can be improved. Once employment in a particular SIC code is forecast, the likely geographic distribution of these jobs can be estimated. Builders and lenders could have a better understanding of the need for additional office space in a specific geographic submarket.

It also is possible a better understanding of firm location decisions and space needs will help to clarify the role government or quasi-government facilities play in attracting or retaining firms. For example, the proximity of courts to law office locations and the growth of law firm concentrations could be studied. The location of firms that complement each other could be studied and potential market needs identified.

Conclusions

This study presents a pioneering analysis of office space per worker that may provide the basis for a better explanation of the demand for office space, firm location decisions and the changing allocation of office space in a market striving for administrative productivity. It is a joint research effort of the Real Estate Center at Texas A&M University and the University of New Orleans Real Estate Market Data Center using data collected by Kerr Resource Center, Inc., of Houston.

Based on a large sample of firms occupying office space in Houston, the typical requirements for office space per worker by type of firm and location have been presented. Firms in the CBD were found to be using significantly more office space per worker than firms in the same business located in the suburbs.

Substantial, consistent variations in typical office space allocations per worker were found to exist by type of firm (one-digit SIC Codes) and by geographic location. The overall average usable square feet per worker was found to be near the 250 square feet expected by conventional wisdom.

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This publication was funded by appropriations to the Real Estate Center by the Texas Legislature.

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