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BUILDING PROGRAM STATEMENT FOR THE GENERAL CHEMISTRY FACILITY. CHEMISTRY DEPARTMENT FACILITIES REQUIREMENTS THROUGH 31,000 STUDENTS.

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This building program statement for the new chemistry addition at Purdue University was compiled to provide the architect and development planning personnel with information about academic specifications that could be used as a basis for designing a new chemistry facility. The general plan is based on projected student enrollment. Specific plans "A", "B", and "C" are based on graduate school enrollment. Space allocations for each division are discussed in relation to plans "A" and "B". The statement discusses building characteristics such as acoustics, air-conditioning, bulletin boards, bells, clocks, electrical equipment, floors, offices, laboratories, safety, telephone and television conduit. Facilities requirements relative to chemistry are classroom space, teaching laboratory space, Special considerations necessary for the audiology and speech sciences--department mission, staff and space department, clinic, office, consultation space, graduate teaching laboratories and television complex--are discussed. Appendixes include tables of enrollment projections and space requirements for the department of Chemistry, Audiology, and Speech Sciences. (HH)

PURDUE UNIVERSITY

SCHEDULES AND SPACE

BUILDING PROGRAM STATEMENT

FOR THE

CHEMISTRY ADDITION

APRIL 1967

Chemistry Department

Facilities Requirements

Through 31,000 Students

PURDUE UNIVERSITY

WEST LAFAYETTE CAMPUS

BUILDING PROGRAM STATEMENT FOR THE GENERAL CHEMISTRY FACILITY

PROGRAM COORDINATED AND COMPILED BY

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IN COOPERATION WITH

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APRIL 1967

April 13, 1967

Dr. Paul F. Chenea
Vice President for Academic Affairs

Dear Dr. Chenea:

The following building program statement for the new Chemistry addition is respectfully transmitted for your consideration. Its purpose is to provide the architect and Development Planning with the pertinent information to be used as the basis for designing the proposed new Chemistry facility. The architect should use these academic specifications in developing an acceptable set of preliminary drawings and final plans. This program documents the logic used in deriving the estimated space requirements.

The plans described differ only in the estimated numbers of graduate students planned for the department. Plan "A" is based on the Chemistry Department's estimate of 800 graduate students at a level of 22,000 University undergraduates; while 660 are considered under Plan "B" and 550 under Plan "C". If research space were utilized as it is presently, Plan "A" could accommodate over 1,000 graduate students, Plan "B" could accommodate over 850 graduate students, and Plan "C" could accommodate over 700 graduate students. The percentage increase in research space over 1966 assignments for Plan "A" = 152%, Plan "B" = 115%, and Plan "C" = 73%.

All plans provide for instructional facilities which should be adequate for a Total University undergraduate enrollment just over 22,000 students. (A 25 percent increase over 1966.) These plans include space for students and staff over and above that currently being provided (i.e. Post-doctoral offices, undergraduate research labs, self-supported graduate students, etc.) If the space allocations for these additional committments were reduced or eliminated the reduction in total space requirements could be as much as 22,000 square feet for Plan "A", 21,000 square feet for Plan "B", and 17,000 square feet for Plan "C". This could conceivably reduce the total cost by as much as 1.5 to 2 million dollars.

Plan "C" probably comes closest to the ten million dollar budget originally established. However, the required minor remodeling of about 15,000 square feet in the present building will be an additional cost to any of the above plans. Also, if efficient use is to be made of the numbers of classrooms presently in new Heavilon Hall it would be desirable to add about 20,000 square feet of offices to the proposed Chemistry Building to adequately balance the numbers of offices and classrooms in that part of campus. A total of 15,000 square feet has been included in all plans for expansion of Audiology and Speech Sciences.

Respectfully,

W. Charles Sherwood

W. Charles Sherwood
Associate Coordinator
Schedules and Space

WCS:am

PROGRAM SUMMARY-COMPARISON OF PLANS

BASIC COMPARATIVE DATA	1966	PLAN A	PLAN B	PLAN C
University Undergraduates	16,417	22,156	22,156	22,156
University Graduates	4,783	9,000	9,000	9,000
Chemistry Graduates(Fall '65)	393	800	660	550
Percent of Univ. Grads	8.6%	8.9%	7.3%	6.1%
Graduate Student Capacity Based Upon 1966 Research Space Use		(1,027)	(874)	(702)
Percent of Univ. Grads		(11.4%)	(9.7%)	(7.8%)
Professorial Staff	65	126	111	97
Post-Doctorals	40	140	120	80
Teaching Assts.	217	242	242	242
Research Grad Students	268	585	485	392
Clerical Staff (FTE)	31	53	50	45
Total Teaching FTE	124	174	170	170
Grad Students/Research Prof.	10.3	8.4	8.0	8.1
Post-Doc's/Research Prof.	1.1	1.5	1.5	1.2
Res. Grads/Post-Doc	6.7	4.2	4.0	4.9
% Teach FTE = Ph.D.	22.5%	30.4%	28.8%	28.3%

ESTIMATED SPACE REQUIREMENTS	CURRENT SPACE	TOTAL - NEW	TOTAL - NEW	TOTAL - NEW
Instructional	56,844	87364 - 47870	87364 - 47870	84864 - 45370
Office	17,974	42956 - 34607	37715 - 29366	32179 - 23830
Library	5,263	9178 - ----	9178 - ----	9178 - ----
Seminar Rooms	893	3237 - 2550	3237 - 2550	2487 - 1800
Commons & Merch Serv	750	2575 - 2500	1475 - 1400	1475 - 1400
Research	65,122	164426 -101175	139776 - 76525	112386 - 49135
Shop, Storage, Misc.	6,610	6965 - ----	6965 - ----	6965 - ----
TOTALS FOR CHEMISTRY	153,456[a]	316701 -188702	285710 -157711	249534 -121535
Percent Increase Over 1966		106%	86%	63%
Audiology and Speech Sciences	10,315	24505 - 15000	24505 - 15000	24505 - 15000
GRAND TOTAL NEW ASSIGNABLE SPACE		203,702	172,711	136,535
ESTIMATED GROSS AREA AND COSTS				
Gross Area @ 65% Assignable to Gross		313,294	265,630	209,991
Cost @ $50 per Gross Sq. Ft.		$15,664,700	$13,281,500	$10,499,550
Cost @ $55 per Gross Sq. Ft.		$17,231,170	$14,609,650	$11,549,505
Gross Area @ 60% Assignable to Gross		339,571	287,909	227,604
Cost @ $50 per Gross Sq. Ft.		$16,978,550	$14,395,450	$11,380,200
Cost @ $55 per Gross Sq. Ft.		$18,676,405	$15,834,995	$12,518,220

[a]Includes temporary facilities.

PROGRAM STATEMENT DISTRIBUTION LIST

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I. INTRODUCTION

HISTORY OF THE CHEMISTRY DEPARTMENT

The Early Years

The Department of Chemistry is today one of the largest and most distinguished instructional units in Purdue University, a role it has assumed since 1874 when Purdue first opened its doors to students. Initiating a pattern of excellence followed through the years, Harvey W. Wiley, a distinguished food chemist and father of the Pure Food and Drug Law, was appointed the first Professor of Chemistry and with five others formed the initial faculty of Purdue University. During the first half-century of the University, a total of sixteen professors shared in the growth of the Department; establishing a sound program of instruction in Chemistry.

By 1927, the original Chemistry building occupied in 1907 was severely overcrowded in trying to serve over 2000 students. To alleviate these conditions, the first wing to the present building was completed in 1930, providing teaching space for 2400 students as well as some research space for the newly-established graduate program. In this same year, the first two Ph.D. degrees in Chemistry were awarded and there already were 38 graduate students registered in the Department.

Looking back, this period was a turning point in the development of the Department. Up to this time, the Chemistry Department had served almost exclusively as an undergraduate instructional unit. Then, with the establishment of the Graduate School, the Department embarked on developing a strong research program to complement its instructional capabilities. The success of this program can be measured by the fact

that Purdue now ranks among the top five universities in Ph.D.'s granted each year in Chemistry.

Under the stimulus of this rapidly-growing graduate enrollment the research program of the Department fluorished, gaining for the University world-wide recognition. The pioneering work in chlorination and fluorination was the cornerstone of this program. Having achieved international renown for this work, the Department was requested during the Second World War to commit its talents and resources to the Manhattan Project. As well as the immediate major contributions to the separation of uranium isotopes for the manufacture of atomic weapons, this work led to many of the organic halogen compounds which have proven important to our modern science and technology. Paralleling this research were the pioneering research on colorimetry and spectrophotometry, the work on nitroparaffins, the studies of polynitro compounds as explosives and rocket fuels, the research on synthetic antimalarial drugs, and the extensive work on organic and inorganic structures, reaction mechanisms, and boron compounds and the borohydrides. Each contributing to the Department's growing reputation, these research programs laid the foundation for the enviable position the Department now assumes as a major chemical research center.

But with this rapid growth came once again the problem of building space. In the late thirties, the General Chemistry laboratories were removed from the Chemistry Building to increase the space for upper-level instruction and research. The General Chemistry laboratories were first moved into converted space in the old Electrical Engineering building adjacent to the Wetherill Laboratory, then shifted to the FWA buildings

in 1949 as a temporary solution until the Chemistry Building could be completed. Even then, every available area in the Chemistry Building was pressed into use to accommodate the rising undergraduate and graduate enrollments. In 1950, with the Department stagnated by lack of space, permission was granted to complete the building. The size of the instructional program by this time precluded the possibility of incorporating the General Chemistry laboratories in the new space so the decision was made to re-plan the addition for advanced undergraduate and graduate teaching and research. Constructed in three stages because of financial limitations, the new addition, double the size of the existing building, was occupied in June 1955.

The Last Decade

The undergraduate instructional program in Chemistry at Purdue has always involved large numbers of students. In fact, it is believed that the Department's General Chemistry program is presently the largest in the nation. Table I indicates how it has grown in the last decade and also shows, with the exception of the last two years, that the number of students in General Chemistry follows closely the overall freshman enrollment.

TABLE 1. Comparison of General Chemistry and Freshman Class Enrollment 1955 - 1966

Year	Gen. Chem.	Freshman	General Chem. as % of Freshman Class
1955-56	3259	3062	106.4
1956-57	3605	3378	106.7
1957-58	3604	3798	94.9
1958-59	3302	3419	96.6
1959-60	3636	3468	104.8
1960-61	4038	4074	99.1
1961-62	4352	4887	89.0
1962-63	3720	3790	98.1
1963-64	3470	3751	92.5
1964-65	3846	4138	92.9
1965-66	4414	5055	87.3
1966-67	3800	4971	76.4

In line with a national trend during the last few years, the Department has worked hard at improving its undergraduate instruction. This has been especially difficult in General Chemistry due to the woeful facilities. A number of visitors have observed that Purdue has the poorest laboratories for General Chemistry of any large university and, as many students note, they are worse than that offered by most of the high schools in Indiana. Consequently the attempts to upgrade the laboratory with new experiments and modern equipment have been largely thwarted. However, enthusiastic teachers and bright students have combined to make the Department's General Chemistry program among the best currently offered at any university, a noteworthy achievement in view of the large numbers and the poor facilities.

The upper-level undergraduate instruction has not been as severely cramped and it has been possible to effect significant improvements. Strong support from the University and other sources (especially NSF) have enabled the introduction of modern and often expensive instrumentation and techniques into these courses and laboratories. Purdue's undergraduates are now receiving an education in chemistry which is probably as sound and as advanced as they could receive anywhere, including the more well-known and traditional schools. The enrollment in the upper-level (including graduate level) courses in recent years is shown in Table 2, grouped into subject areas.

TABLE 2: Enrollment in Upper-Level Chemistry Courses

By Year and Subject Area[a]

	Analytical	Biological	Inorganic	Organic	Physical	Total
FALL 1959	148	137	120	951	316	1672
Spring 1960	218	174	161	766	253	1572
Fall 1960	192	155	93	909	342	1691
Spring 1961	220	195	169	736	324	1644
Fall 1961	157	168	65	1268	349	2007
Spring 1962	206	199	169	946	332	1852
Fall 1962,	231	227	90	1470	448	2466
Spring 1963	234	284	140	1181	513	2352
Fall 1963	260	200	166	1244	486	2356
Spring 1964	295	226	160	1115	480	2276
Fall 1964	234	229	133	1298	507	2401
Spring 1965	305	225	203	974	420	2126
Fall 1965	198	175	150	1555	451	2529

[a]Including dual-level and graduate courses.

This period has also seen a large increase in the number of B.S. degrees granted to Chemistry majors, as shown in Table 3.

TABLE 3: B.S. Degrees Granted to Chemistry Majors 1960 - 1965

Academic Year	B.S. Degrees
1959-60	20
1960-61	29
1961-62	30
1962-63	36
1963-64	45
1964-65	55
1965-66	48

This increase in the number of Chemistry majors has given rise to an increasingly severe problem, that of providing space for them to pursue their undergraduate research problems. During the last decade it has become common among leading universities for advanced undergraduates to undertake a research problem under the direction of a senior staff member. Space has not been available to be set aside for this purpose and consequently these students have had to work in the "corners" of graduate research laboratories.

Data on the number of Chemistry graduate students enrolled and on the advanced degrees granted during the last decade are given in Table 4. The relative constancy of these numbers results in large part from the constant amount of space available for research during this period and from the relatively constant undergraduate Chemistry enrollments. The large increases in graduate enrollment the last few years have been

dictated by sharply rising needs for teaching assistants in General Chemistry, superseding the question of whether or not the Department has room for them.

TABLE 4: Chemistry Graduate Student Enrollment and M.S. and Ph.D Degrees Granted 1956 - 1966

Academic Year	Graduate Students	M.S. Degrees	Percentage M.S. Terminal	Ph.D. Degrees
1955-56	---	44	48	36
1956-57	237	37	38	29
1957-58	242	29	62	41
1958-59	262	16	81	31
1959-60	268	21	86	28
1960-61	259	24	67	43
1961-62	253	21	71	35
1962-63	273	20	80	41
1963-64	304	18	83	41
1964-65	354	22	96	35
1965-66	393	--	--	--

JUSTIFICATION AND PROJECTION OF REQUIREMENTS THROUGH 1980

Justification

During the last ten years, the growth of the Department has been marked more by a strengthening and maturing than by just increases in numbers. In this period, the reputation of the Chemistry Department at Purdue has changed, as it were, from contender to leader. Today, it ranks among the top five chemistry departments in the nation in the quality of its undergraduate and graduate instruction, in its output of B.S. and Ph.D. graduates, in the significance of its research and publications, and in the recognition given its staff and students.

Never before has the Department been at such a high level professionally. Even in the last two or three years, the quality and productivity of the staff has jumped significantly. The research program of the Department has a depth and momentum never before realized. Many of the professors are nationally and internationally recognized as experts in their fields. Honors are received regularly, invited lectures at other universities have become common. Some of the staff are invited each year to serve as touring speakers for sections of the American Chemical Society. Invitations to present papers at national and international scientific meetings are increasingly commonplace. Publications in scholarly journals have increased significantly, both in quality and in number. Many of the staff hold offices or serve on national committees of the American Chemical Society and other scientific organizations. In recognition of their excellence, many act as consultants to industry and government. Perhaps one of the best indications of the current quality of the Department, and certainly an objective indication, is the outside support it receives

for its research program - this now amounts to over two million dollars a year!

Another significant factor in the recent growth of reputation of the Department has been the renewed emphasis placed on the undergraduate instructional program. Unlike many schools who seem to be abandoning interest in their undergraduates in favor of their graduate programs, the Department of Chemistry has heavily committed its resources to its undergraduates. The best teachers are assigned to these courses and are given the time to plan and effect desired improvements. Courses and curricula have been modified to better reflect modern chemistry and to tailor the instruction to the diverse needs of the students. To stimulate the superior students, an honors program has been established and senior staff have been assigned to identify and work with them. Probably the most significant feature of these efforts is the unusual enthusiasm and devotion displayed by the staff whenever an opprotunity arises to effect an improvement in teaching. And where it has been possible, the Department has given and continues to give its unqualified support towards this end.

The severest problem now facing the Chemistry Department is adequate space. Great concern exists among the faculty over assigned space; hardly a day passes without some new problem arising. Students are crammed into the research laboratories, creating morale problems and leading to a loss of interest in chemistry, capable graduate students go elsewhere because of no assigned space, recruitment of new faculty becomes increasingly difficult, some faculty members threaten to resign and the remainder become increasingly restless.

Substantial sums of money have been spent in remodeling marginal space to accommodate pressing needs. Often these costs exceed the costs of new construction and result in minimal permanent utility. General Chemistry and organic instructional laboratories are presently being operated beyond their design capacities. Research laboratories are overflowing with students and equipment. Permanent faculty are given offices four floors above laboratories - and they are encouraged to work alongside their students. Classrooms have been remodeled into offices, low-ceilinged storage areas into equipment rooms, attic areas into laboratories and offices, rest rooms into offices and darkrooms and basement utility rooms into laboratories. The situation is reaching the critical point and immediate, concrete action is essential to preserve the present degree of excellence.

In the next section are outlined the numerical projections of growth anticipated for the Department through 1980. A perusal of these numbers clearly illustrates one basic point: the Department of Chemistry at Purdue cannot hope to constitute a small band of cloistered scholars as has been the history of chemistry departments in some of the more famous universities. Rather, Chemistry at Purdue most cope with and, indeed, thrive on quantity education in its future search for excellence.

How an instructional unit of such magnitude can achieve unsurpassed excellence has occupied the thoughts and directed the actions of the Department for some time. And now this question looms larger as plans are made for the building which will hopefully enable this goal to be reached. Obviously, application of the techniques of the small, ivy-covered universities leads to chaos for large numbers of students. Equally certain is that the application of the methods of other

large universities will not result in Purdue being the unchallenged and unsurpassed leader in chemistry. Thus, it is clear that the planning will of necessity be tailored uniquely for the Department's peculiar situation. With this in mind, it is believed that what follows must now be undertaken.

First, and perhaps foremost, outstanding facilities must be available. Without the room to set up and use equipment, modern education in chemistry is impossible. Without adequate space, original research is impeded. Without space for supporting research equipment and services, modern instrumental science quickly stagnates. Without well-planned teaching laboratories, chemistry is no longer shown to be an experimental science. Without adequate classrooms, instruction suffers. Without private office space, close contact between faculty and individual students is severely hampered. Less readily pinpointed but equally important, crowded conditions act as a depressant on originality and enthusiasm, both necessary qualities in the study and pursuit of science. In brief, the key to all of the Department's plans is adequate space. With enough space, its goals can be realized; without it, retrogression is almost inevitable.

Assuming that the students continue to be as capable as those of the past, an outstanding faculty is the next determinant of success. As was indicated earlier, the Department now has an excellent faculty; as it is expanded in the future, it can be made even better. But no faculty can achieve its full potential and maximum impact unless given the time to be creative. In this regard, it is hoped to reduce teaching loads and routine assignments to enable the staff to spend the enormous amounts of time essential for revising, modernizing, and innovating the teaching

of chemistry. Much needs to be done in this area. In addition, it would be desirable to add to the staff, as distinguished professors, more men of outstanding national and international stature to act as a stimulating nucleus for the rest of the staff. These men would have a significant impact on the Department, contributing directly by strengthening the research program and indirectly by attracting better undergraduate and graduate students to Purdue.

The Department is committed to the use of graduate teaching assistants in the undergraduate courses. These much-maligned teachers are often remarkably effective, frequently inspiring the undergraduates more than the senior faculty. As a prime user of these assistants, the Department has a special responsibility to continually try to improve their effectiveness. A significant help in this quest would be to provide these people with offices where they could counsel their students in relative privacy, where they could prepare for their classes, and where they could grade tests. Continually surprising is the vigor and enthusiasm of the teaching assistants in spite of their handicapped conditions. Forcing them to teach but not providing them the necessary space is a waste of talent.

To help the undergraduates during their early years while they are becoming adjusted to the mass education of a large university, the Department would like to initiate a counselling system where the students could bring their problems and meet with capable instructors who would be able to help them. Still in the planning stages, this counselling is envisaged to fill a role between that of specific course "help sessions" and that of the offices of student advisors. Hopefully, the

program would remove the lonesomeness and defeatism associated with being alone and in trouble in a large course in an often impersonal university.

As pointed out earlier, the research program of the Department is now fairly broad in scope. With the necessary future expansion of the faculty will come the opportunity to strengthen present areas of endeavor as well as exploit more fully some of the interdisciplinary and fringe areas. Specifically, the Physical Division is in need of more staff to give it greater depth. No chemistry department can be strong without a strong physical chemistry group. Further, some emphasis should be placed in the future on expansion in the area of chemical physics - an interdisciplinary field utilizing the tools of physics to study chemical systems. Action must be taken in the future to develop the area of solid state chemistry, a present weakness in the Department. The new interdepartmental program in Biochemistry should be supported by added staff in Chemistry. Inorganic Chemistry is in need of strengthening; the Organic and Analytical Divisions should be broadened. Ambitious though all of these plans may be, they are essential to the continued development of the Department.

In keeping with the future excellence planned for the Department, particular attention must be paid to an expanded use of post-doctoral fellows. Presently, the Department is lagging far behind on this score. Schools like MIT and Harvard plan on three or four post-doctorals per research professor; the current average here is less than one. Both in terms of research output while at Purdue and the advanced training which these future teachers of chemistry receive as post-doctorals, the benefits to the University and to the entire academic community are significant

enough that a greatly expanded program should be part of the future planning.

For the superior Chemistry majors intending to pursue graduate work, undergraduate research should be encouraged. Sufficient space should be set aside for this purpose so that at least the better half of the junior and senior majors can undertake an original research problem.

Obviously, these plans do not carry with them a guarantee of success toward the Department's goal of unsurpassed excellence. But they are essential steps in that direction.

Projection of Requirements Through 1980

There are many uncertainties involved in predicting University enrollments as there are also in the prediction of the courses in which those students will be enrolled. How these enrollments affect undergraduate Chemistry courses is, of course, dependent upon the required curricula of Chemistry majors and others. But, at this point it is safe only to assume that current practices constitute the best approximation for the future. It is recognized that some schools are considering changing the nature of their Chemistry requirements;;however, for the most part, this appears to just change the subject matter taught, not to eliminate Chemistry requirements from the curriculum entirely.

The space requirements set forth in this program statement are based upon an expected attainment of an enrollment of 22,156 undergraduate students and 9,000 graduate students by the year 1980. These numbers were derived through the use of a computerized version of the enrollment projection model, which has long been employed by Mr. N. M. Parkhurst. The method consists of distributing the new freshman class, which was projected by another algorithm, into various curricular areas assuming constant

distribution ratios. Undergraduate students other than freshman were projected by applying advancement ratios which were also assumed to be constant at the 1965-66 levels. The Number of graduate students was fixed by consideration external to the model. After enrollments had been projected by curriculum and classification for each year through 1980, course enrollments were projected based on the assumption that the percentage of students from a given curriculum and classification taking a particular course would remain constant, e.g. 45% of the ME 3's would be taking SPE 114. Total course enrollment was then found by summing the projected course enrollments from each classification (See Appendix A). It should be pointed out that all the assumptions of constant percentages and distribution ratios are justified since these enrollments are projections not predictions.

In Table 5 the University enrollments by curriculum and student classification for the fall semester 1980-81 are displayed. These are the data which generated the Chemistry course enrollments in Appendix A. Table 6 shows the total projected fall semester undergraduate enrollments for each year from 1966 through 1980. The Chemistry course enrollments generated from the enrollments displayed in Table 5 gave rise to the space and staff needs summary in Table 7. Table 7 summarizes by course level the student contact hours, room hours and FTE staff required within each category of unique space. This procedure was applied to the fall 1965 data and the toal FTE staff generated was compared to the actual instructional FTE and found to be very close - 112 FTE staff simulated vs. 124 FTE staff actual. This disparity was largely due to larger section sizes and the assumption of better scheduling and utilization in the simulation model.

The distribution of total projected staff by rank was accomplished by determining the rank of the staff necessary to teach each level of instruction and the mix of graduate assistants that would do teaching and research.

TABLE 5: University Enrollments by Curriculum and Student Classification

	FR1	FR2	SO3	SO4	JR5	JR6	SR7	SR8	SR9	OTH	TOTAL
A	542	32	504	48	391	54	343	46	68		2028
ENGR	2210	107	739	98	62	9	1				3226
FOR	84	14	62	13	40	9	34	8	11		275
HE	333	44	228	68	166	45	157	54	2		1097
PHAR			88	4	97	7	92	6	110		316
AE			87	22	80	22	76	22	17		326
CE			80	49	93	52	93	56	36		459
EE			230	133	236	162	230	144	76		1211
S	881	51	628	99	459	115	364	103	63		2763
GRAD	9000										9000
HUM	885	103	959	166	980	134	960	111	117		4415
IE			48	12	91	14	105	14	32		316
INDM	210	33	329	126	518	158	539	127	127		2167
ME			174	71	204	78	214	60	95		896
NT	77	4	67	3							151
AET	13	5	11	17							46
AGE			17	1	15	1	18	1	6		59
AMT	61	9	44	25							139
ARET		1									1
CHE			72	47	66	50	63	36	26		360
ESE			48	10	32	8	23	10	5		136
GFT	7		14								21
IED	26	26	40	51	73	67	72	54	13		422
IIT	22	14	25	18							79
MTE			21	16	20	16	16	12	1		102
PMEN	48	16	48	15	52	10	53	9	11		262
PPT		14		9							23
UNCL	76	29	29	6	19	2					161
VSM	79	71	73	80							303
TEMP	396										396

UNIV TOTAL = 31,156

TABLE 6. PROJECTED UNDERGRADUATE STUDENT ENROLLMENTS FALL SEMESTER 1966-1980

1966-67	16,440	1973-74	21,260
1967-68	17,249	1974-75	21,745
1968-69	18,034	1975-76	22,253
1969-70	18,802	1976-77	22,387
1970-71	19,559	1977-78	22,513
1971-72	20,164	1978-79	22,524
1972-73	20,876	1979-80	22,404
		1980-81	22,156

This analysis resulted in arriving at a total of 121 FTE staff as the requirement for graduate teaching assistants. We further assumed that these teaching assistants would average as half time appointments; therefore, 242 graduate students will be required to assist with the instructional tasks in 1980. This number could turn out to be significantly different if present teaching methodology were to change. The professorial teaching staff were determined in a similar manner.

A chief determinant of the number of senior faculty required is the number of graduate students engaged in research activity. The number of graduate students can be projected in relation to total University graduate enrollment or predicted in other manners. If one assumes that numbers of Chemistry graduate students will grow at approximately the same rate as the total University graduate enrollment thenone might expect about 800 graduate students in Chemistry by 1980. However, there are those who advocate that the growth of Chemistry graduate students at Purdue will not keep space with the total graduate enrollment. One of the major

TYPE OF SPACE		HOURS OF USE BY COURSE LEVEL LOWER	UPPER	DUAL LEVEL	GRAD LEVEL	TOTAL HOURS
CHMLECT	HRS	303.00	115.00	48.00	63.00	529.00
	SCH	15585.00	6639.00	2144.00	4223.00	28591.00
	RATIO	51.44	57.73	44.67	67.03	54.05
	FTE	37.33	10.41	5.17	7.17	60.08
GENCHMLAB	HRS	654.00				654.00
	SCH	14523.00				14523.00
	RATIO	22.21				22.21
	FTE	44.11				44.11
NONE	HRS					
	SCH					
	RATIO					
	FTE	6.25	.25			6.50
INTERMLAB	HRS	141.00				141.00
	SCH	3057.00				3057.00
	RATIO	21.68				21.68
	FTE	10.75				10.75
ANLCHMLAB	HRS		104.00			104.00
	SCH		2192.00			2192.00
	RATIO		21.08			21.08
	FTE		12.50			12.50
ORGCHMLAB	HRS		207.00			207.00
	SCH		3402.00			3402.00
	RATIO		16.43			16.43
	FTE		11.76			11.76
PHYCHMLAB	HRS		18.00			18.00
	SCH		984.00			984.00
	RATIO		54.67			54.67
	FTE		6.00			6.00
GLASS LAB	HRS			6.00		6.00
	SCH			84.00		84.00
	RATIO			14.00		14.00
	FTE			.34		.34
ADVANALYT	HRS			56.00		56.00
	SCH			640.00		640.00
	RATIO			11.43		11.43
	FTE			5.26		5.26
BIOCHMLAB	HRS			9.00		9.00
	SCH			84.00		84.00
	RATIO			9.33		9.33
	FTE			.65		.65
ADVORGLAB	HRS			24.00		24.00
	SCH			372.00		372.00
	RATIO			15.50		15.50
	FTE			3.04		3.04
SPEANALAB	HRS				32.00	32.00
	SCH				240.00	240.00
	RATIO				7.50	7.50
	FTE				3.04	3.04
INORGLAB	HRS				12.00	12.00
	SCH				222.00	222.00
	RATIO				18.50	18.50
	FTE				2.24	2.24
TOTALS	HRS	1098.00	444.00	143.00	107.00	1792.00
	SCH	33165.00	13217.00	3324.00	4685.00	54391.00
	RATIO	30.20	29.77	23.24	43.79	30.35
	FTE	98.44	40.92	14.46	12.45	166.27

determinants, of course, is the requirement for teaching assistants but over and above this the availability of funds for the support of research activities and paradoxically the available space, as well as a few other factors, help determine enrollments.

Therefore, because of the importance of the numbers of graduate students in determining space requirements two different plans for new facilities have been presented. Plan "A" is based upon a graduate student enrollment of 800 students. Plan "B" is based upon an enrollment of about 660 graduate students and represents a 3.5 per cent increase in numbers per year. (This is in contrast with the more than 7 per cent annual growth which the department has been experiencing in the last five years). Table 8 documents the projected graduate student enrollments by year.

Extrapolations of the number of senior faculty were made for each plan. Provisions were made for a reduction in the ratio of the number of graduate students per major professor. The ratio presently is about 10.3 students for each major professor. It is felt that ideally a ratio of from six to eight graduate students per professor should prevail. Plan "A" is based upon a ratio of 8.4 students for each professor while Plan "B" is based upon 8.0 students per major professor. On these bases the staff outlined in Table 9 would be required. Tentatively these faculty would be assigned in a ratio of about 25% each for Organic and Physical and the remainder equally distributed between the other divisions.

TABLE 8: Projected Chemistry Graduate Student Enrollment

Year	Growth Following Total Graduate Enrollment	Growth of 3.5% Annually
1965-66	*375	393
1966-67	401	407
1967-68	431	421
1968-69	463	436
1969-70	489	451
1970-71	521	467
1971-72	557	483
1972-73	589	500
1973-74	619	518
1974-75	653	336
1975-76	682	555
1976-77	707	574
1977-78	733	594
1978-79	754	615
1979-80	789	637
1980-81	815	659

*These projections were made during 1964-65; the actual 1965-66 Chemistry enrollment is 393.

As indicated previously, the number of post-doctoral fellows presently in the department is in a ratio of less than one for each senior faculty member while many of the so called "better" universities support four and five post-doctorals per major professor. Therefore, it is necessary if the department is to be allowed to excell further that this ratio be increased to

at least more than one post-doctoral for each major professor. Plan "A" and "B" both allow for about 1.5 post-doctorals for each senior staff member involved in research programs.^ (Table 9 and 10) A growth from the present 40 post-doctorals to some 140 for Plan "A" and about 120 for Plan "B" is predicted. (Since these men are usually paid under sponsored research contracts, they receive University support only to the extent that they occupy research space. Generating space for these people is a deviation from normal space assignment practices at Purdue in that post-doctorals have in the past not generated a space allocation in the Four State Supported Universities' Capital Appropriations Study).

Senior undergraduate research people presently number about 25. With the increasing emphasis in chemistry on an early introduction to original research, a reasonable estimate of the number of such people by 1980 is 50 (representing about one-half of the number of senior Chemistry majors).

Service and clerical personnel are becoming increasingly important to scientific research. As instrumentation becomes more sophisticated and widespread, so must the number of people engaged in instrumental design, construction, and maintenance increase. An approximate doubling of this supporting staff is not an unreasonable expectation, especially if the Department carries through on its plan to initiate a service facility which would serve the entire University, McClure Park, and the community as well as the Department. Similarly, the increasing stenographic load associated with teaching functions and research publications will require an expansion of the clerical staff from the present 31 to at least 50.

TABLE 9: CHEMISTRY DEPARTMENT COMPARATIVE STAFF AND GRADUATE STUDENT DATA 1966, PLAN A-1980 AND PLAN B-1980

TYPE STAFF OR GRADUATE STUDENT	ACTUAL 1966	PLAN A 1980	PLAN B 1980	SPACE REQUIRED/UNIT OFFICE	OFF. SERV.	RESEARCH	RES. SERV.
A. Administrative (FTE)	3	4	4	120-130[a]	15-5		
B. Professorial-Perm. (People & FTE)	54	115	100	120-130[b]	15-5		
B1. Res. Programs (people)	38	95	82			120	30
B1a. Teaching (FTE)	14	32	30				
B1b. Course Revision (FTE)	2	5	4				
B1c. Direct Research (FTE)	22	58	48				
B2. Non-Res. Programs (People)	16	20	18				
B2a. Teaching (FTE)	6	8	7				
B2b. ADM. & Other (FTE)	10	12	11				
C. Professorial-Temp. (People)	11	11	11	120-130	15-5		
C1. Teaching Only (FTE)	3	4	4				
C2. Teaching (.4) & Research (.6) (People)	8	7	7			120	30
D. Post-Doctorals (People)[c]	40	140	120	120-130(1/2)		150	30
D1. Some (.1) Teaching (People)	0	35	30				
D2. All Research (People	40	105	90				

TABLE 9

TYPE STAFF OR GRADUATE STUDENT	ACTUAL 1966	PLAN A 1980	PLAN B 1980	SPACE REQUIRED/UNIT OFFICE	OFF. SERV.	RESEARCH	RES. SERV.
E. Teaching Assts. (.5 FTE) (People)	217 (96 FTE)	242	242				
E1. No Research (People) (.5 FTE)	125	200	160	120-130 (1/3)			
E2. Research Also (People)	88	42	82	Incl. in Res. Lab.		150	30
F. Research Assts. (People)	152	498	358	Incl. in Res. Lab.		150	30
G. Undergrad Research (People)	20	50	50			120(1/2)	15
H. Fellowships (People)	28	50	50				
H1. 1st year (Little Res.)	5	12	12	120-130 (1/4)			
H2. 2nd year Res.	23	38	38	Incl. in Res. Lab.		150	30
I. Self-Support (People)	5	10	10				
I1. 1st year (Little Res.)	1	3	3				
I2. 2nd year Res.	4	7	7	Incl. in Res. Lab.		150	30
J. Clerical (FTE)	31	53	50	100			
K. Technicians (FTE)	6	24	18				
K1. Operators	3	12	9				
K2. Research Assts.	3	12	9			120	30

TABLE 9

TYPE STAFF OR GRADUATE STUDENT	ACTUAL 1966	PLAN A 1980	PLAN B 1980	SPACE REQUIRED/UNIT OFFICE	OFF. SERV.	RESEARCH	RES. SERV.
L. Service	38	68	60				
L1. Managers	4	5	5	100			
L2. Workers	34	63	55				
M. Total Teaching (FTE)							
M1. (B1a + B1b + B2a + C1 + C2 x 0.4 + D1 x 0.0[a] + E[b] x 0.5)	124	174	170				
M2. Calculated Via Computer Simulation	112	168	168				
N. Total Course Enrollments (Excluding 698 & 699)	7,250	12,600	12,250				
O. Graduate Students	393	800	660				
O1. 1st year	125	250	200				
O2. 2nd year	100	200	160				
O3. Remainder	168	350	300				
O4. Number Research Grad (E2 + F + H2 + I2)	268	585	485				

[a]Plus 70 sq. ft. Dept. Head

[b]Plus 10 Div. Heads @ 30 sq. ft. ea.

[c]This assumes that Post-Doctorals now generate research space whereas in the past and in the Capital Appropriation Study separate requirements for them have not been considered.

W.C.S.
2/7/67

The numbers stated above are belived to be a reasonable expression of the Department's minimum needs given the projected increases in enrollment. Of course, if the estimated numbers of students fail to materialize, these estimates can be reduced. However, expectations are usually exceeded by reality.

TABLE 10. PERTINENT RATIOS AND INDICATORS OF PROJECTED CHEMISTRY PROGRAM CHANGE FROM 1966 TO 1980
(Ratios calculated from data presented on Table 9)

RATIO	1966	Plan A 1980	Plan B 1980
1. Total Grad Students/Maj. Prof. (O/B1)	393/38 = 10.34	800/95 = 8.42	660/82 = 8.04
2. Num. Res. Grad Stud./Maj.Prof. (04/B1)	268/38 = 7.05	585/95 = 6.15	485/82 = 5.91
3. Num. Res. Grad Stud./FTE Res. Directors (04/B1c)	268/22 = 12.18	585/58 = 10.08	485/48 = 10.10
4. Num. Post Docs./Res. Program (Maj. Prof.) (D/B1)	40/38 = 1.05	140/95 = 1.47	120/82 = 1.47
5. Num. Res. Grad Stud./Post-Doctoral (04/D)	268/40 = 6.70	585/140 = 4.17	485/120 = 4.04
6. Teach Assts As % of Total Grad Stud. (E/O)	217/393 = 55.21	242/800 = 30.25	242/660 = 30.25
7. Total Grad Stud./Total Prof. Staff (Conventional Grad Stud./Staff Ratio) (O/A+B+C)	393/68 = 5.77	800/130 = 6.15	660/115 = 5.73
8. Support Staff/ Total Prof. Staff (J+K+L/A+B+C)	75/68 = 1.102	145/130 = 1.115	128/115 = 1.115
9. PhD Teach FTE as % of Total Teach FTE	28/124 = 22.5%	53/174 = 30.4%	49/170 = 28.8%
10. Number Enrollments/FTE (Excluding 698 & 699) (N/M1)	58.37	72.41	72.04
11. Ratio of Planned Teaching FTE to Simulated (M1/M2)	1.107	1.024	1.035

Disparity between actual and projected due to:
(1) Larger Course enrollments and sections and more efficient use of staff
(2) Better scheduling and utility to fill sections

II. SUMMARY OF CHEMISTRY SPACE REQUIREMENTS

This section summarizes the existing facilities, the new facilities required for each plan and the facilities which must be remodeled in the present building. An attempt has been made to design table 11 so that it will be a handy guide for the architect in checking to insure that the correct number of rooms of each dimension have been included in the plans. In addition to the area specified, about 15,000 sq. ft. of space is to be included for Audiology and Speech Sciences as outlined in Chapter VI.

It is of interest to note that Plan "A" provides for a 106% increase in space over present assignments while plan "B" provides for an 86% increase. In addition, about 24,000 sq. ft. of unsatisfactory facilities will be replaced with more functional and modern facilities. About 15,000 sq. ft. of space in the present structure will require some degree of remodeling.

Of the 70 percent of the space in the present building which is deemed necessary to be air conditioned, 30 percent is now serviced with chilled water. About 56 percent of that space has some type of air conditioning and it is anticipated that an additional 10 percent will be air conditioned before construction of the new addition. This leaves about 34 percent of the present space to be air conditioned. It is hoped that this can be accomplished concurrently with the construction of the new facility.

TABLE 11. SUMMARY OF FACILITIES REQUIRED - PLAN B WITH ADJUSTMENT NOTATIONS FOR PLAN A.

TYPE SPACE REQUIRED	PRESENT BUILDING AS IS	PRESENT BUILDING REMODEL	NEW SPACE
CLASSROOMS			
5 Classrooms (500 sq. ft. and 30 sta. each)			2,500
8 Classrooms & Class Serv. (Presently Available)	12,818		
1 Seminar-Conference (Presently Available)	687		
3 Seminar-Conf-Classroom (450 sq. ft. and 24 sta. each)			1,350
4 Seminar-Conference (300 sq. ft. and 12-15 sta. each)			1,200
(Sub-Total)	(13,505)		(5,050)
TEACHING LABORATORIES			
18 General & Intermediate Labs (1,550 sq. ft. and 24 sta. each)			27,900
3 Type "A" Analytical Labs (1,400 sq. ft. and 20 sta. each) - CHM Courses 224 & 421 -			4,200
1 Type "B" Analytical Lab (1,200 sq. ft. and 20 sta. each) - CHM Courses 524 & 525L -			1,200
1 Type "C" Analytical Lab (720 sq. ft. and 8 sta. each) - CHM Course 625L -			720
1 Biochemistry Lab (Current area 36 sta.) - Present Room 365 -	1,727		
1 Inorganic-Radio Chem Lab (Current Area-8 sta.) - Present Room 165 -	466		

TABLE 11 continued:

TYPE SPACE REQUIRED	PRESENT BUILDING AS IS	PRESENT BUILDING REMODEL	NEW SPACE
1 Inorganic-Descript & Synthetic (Current area-40 sta.) - Present Room 217 -	1,891		
2 Type "A" Organic (Current area-24 sta. each) - CHM Courses 263L & 265L - - Present Rooms 316 & 317 -		3,927	
3 Type "B" Organic (Current area 32 sta. each) - CHM Courses 251L & 255L - - Present Rooms 416 and 417 -	3,990		
- Present Room 413 with part of Room as Instrument Space -		1,584	
2 Type "C" Organic Lab (Current Area) - CHM Courses 560 - - Rooms 455, 460, 465 - (Instruments in Room 413)	3,205		
2 Physical Labs (Current Area) - CHM Courses 374L - - Rooms 116 & 117 -	4,082		
1 Glass-blowing lab			250
1 Chemistry Education Lab			1,500
(Sub-Total)	(15,361)	(5,511)	(35,770)
TEACHING LAB SERVICE			
Instrument Rooms for General CHM			
9 Type "A" at 350 sq. ft.			3,150
6 Type "B" at 350 sq. ft.			2,100
1 Type "C" at 600 sq. ft.			600
1 Preparation Room - General CHM			2,000
1 Instrument Room for Analytical			600
1 Analytical Prep Room			250
1 Biochemistry Instrument Room - Current Rooms 343 & 343A -	230		

TABLE 11 continued

TYPE SPACE REQUIRED	PRESENT BUILDING AS IS	PRESENT BUILDING REMODEL	NEW SPACE
1 Inorganic Instrument Room - CHM Course 445 - - Current Room 221 -		523	
2 Organic Prep Lab - Current Rooms 325 & 425 -	440		
1 Organic Instrument Room - Current Room 456 -	175		
2 Instrument Rooms for Physical - Present Rooms 115 & 120 -	506		
2 Ice Cart Rooms 118 & 418	15		
(Sub-Total)	(1,366)	(523)	(8,700)
CHEMISTRY STORES			
1 Pyrex Warehouse			3,000
1 General CHM Dispensing Room			900
3 Research Dispensing Room (Each 600 sq. ft.) (Plan A - add 600 sq. ft.)			1,800
Existing Warehouse, Dispensing, and Receiving Area	11,541		
(Sub-Total) (Plan A - add 600 sq. ft.)	(11,541)		(5,700)
OFFICES			
Analytical:			
1 Division Head @ 150-160 sq. ft.			155
12 Professors (Perm.) @ 120-130 sq. ft.			1,520
1 Professors (Temp.) @ 120-130			125
10 Post Doctoral Offices @ 120-130			1,200
1/2 Fellowship @ 120-130 sq. ft.			65
5 Clerical @ 100 sq. ft.			500

TABLE 11 continued:

TYPE SPACE REQUIRED	PRESENT BUILDING AS IS	PRESENT BUILDING REMODEL	NEW SPACE
Biochemistry:			
1 Division Head @ 150-160 sq. ft.			155
13 Professors (Perm.) @ 120-130 sq. ft.			1,620
1 Professors (Temp.) @ 120-130			125
10 Post Doctoral Offices @ 120-130			1,275
1/2 Fellowship @ 120-130 sq. ft.			65
5 Clerical @ 100 sq. ft.			500
General:			
1 Division Head @ 150-160 sq. ft.			155
7 Professors (Perm.) @ 120-130 sq. ft.			805
4 Professors (Temp.) @ 120-130 sq. ft.			500
53 Teaching Ass'ts. @ 120-130 sq. ft.			6,667
1 Clerical Pool @ 500-700 sq. ft.			600
Inorganic:			
1 Division Head @ 150-160 sq. ft.	155		
13 Professors (Perm.) @ 120-130 sq. ft.	(3) 375	(10)	1,245
1 Professors (Temp.) @ 120-130			125
10 Post Doctoral Office @ 120-130	(1) 120	(9)	1,155
1/2 Fellowship			65
5 Clerical	(1) 100	(4)	400
Organic:			
1 Division Head @ 150-160	155		
20 Professors (Perm.) @ 120-130	(15)1,850	(5)	625
2 Professors (Temp.) @ 120-130	250		
15 Post Doctoral Offices @ 120=130	(10)1,250	(5)	625

TABLE 11 continued:

TYPE SPACE REQUIRED	PRESENT BUILDING AS IS	PRESENT BUILDING REMODEL	NEW SPACE
3/4 Fellowships	90		
7 1/2 Clerical @ 100 sq. ft.	750		
Physical:			
1 Division Head @ 150-160			155
20 Professors (Perm.) @ 120-130	(2) 250		(18) 2,225
2 Professors (Temp.) @ 120-130			(2) 250
15 Post Doctorals @ 120-130	(1) 125		(14) 1,750
3/4 Fellowships			90
7 Clerical @ 100-110	(1) 118		(6) 632
Other:			
1 Department Head @ 180-200			190
3 Administrative Ass'ts 120-130			380
4 Division Heads @ 150-160			620
6 Professors (Perm.) @ 120-130			735
1 Clerical Pool @ 500-700 sq. ft.			600
1 Secretary to the Dept. Head			150
1 Clerical Supervisor @ 120-130			125
5 Clerical Assistants Offices @ 100-110			525
5 Service Managers @ 100	500		
Chemistry Stores	1,778		
(Sub-Total) (Plan A - add 5,091 sq. ft.)	(7,866)		(28,699)
OFFICE SERVICE			
General Chem Workroom			250
Main Office Duplicating & Workroom			417

TABLE 11 continued:

TYPE SPACE REQUIRED	PRESENT BUILDING AS IS	PRESENT BUILDING REMODEL	NEW SPACE
Miscellaneous	483		
(Sub-Total) (Plan A - Add 150 sq. ft.)	(483)		(667)
RESEARCH LABORATORIES			
General Flexible Research	38,078	3,325	
Laboratories on a Module of about 12' X 25'			64,107
(Sub-Total) (Plan A - Add 19,970 sq. ft.)	(38,078)	(3,325)	(64,107)
RESEARCH SERVICE			
Flexible Service Areas on a Module of About 240-300 sq. ft. assigned to divisions	5,312	1,228	3,618
Machine Shop	2,409		
Glass Shop	1,450		
Instrument & Electronics Shop			3,500
Other Research Service (i.e. Anterooms et al.)	3,823		500
(Sub-Total) (Plan A - Add 4,080 sq. ft.)	(12,994)	(1,228)	(7,618)
OTHER SPACE			
Staff Commons @ 600 sq. ft. (Adjacent to and possibly combined with Student Commons) (Plan A - Add 200 sq. ft.)			600
Student Commons (Possibly a folding door between Staff Commons) (Plan A - Add 900 sq. ft.)			800
Library	5,036	4,142	
General Departmental Shop	4,860		
Storage	1,964		

TABLE 11 continued:

TYPE SPACE REQUIRED	PRESENT BUILDING AS IS	PRESENT BUILDING REMODEL	NEW SPACE
Merch Serv	75		
Miscellaneous (First Aid Room)	141		
(Sub-Total)	(12,076)	(4,142)	(1,400)
GRAND TOTAL	113,270	14,729	157,711

(Plan A - Add 30,991 sq. ft.)

TABLE 12. SUMMARY OF NEW OFFICES REQUIRED BY SIZE AND BY STAFF RANK

NUMBER	SUMMARY BY SIZE	AREA
1	Office @ 180-200 sq. ft.	190
9	Offices @ 150-160 sq. ft.	1,390
188	Offices @ 120-130 sq. ft.	23,362
2	Offices @ 500-700 sq. ft.	1,200
25	Offices @ 100-110 sq. ft.	2,557
	TOTAL	28,699

(Plan A add 41 offices @ 120-130 sq. ft. = 5,091 sq. ft.)

	- SUMMARY BY STAFF RANK -	
1	Department Head @ 180-200 sq. ft.	190
8	Division Heads @ 150-160 sq. ft.	1,240
71	Professorial - Permanent @ 120-130	8,775
9	Professorial - Temporary @ 120-130	1,125
48	Post Doctorals @ 120-130 sq. ft.	6,005
3	Fellowships @ 120-130 sq. ft.	285
25	Clerical @ 100 sq. ft.	2,557
1	Clerical @ 150 sq. ft.	150
1	Clerical Supervisor @ 120-130 sq. ft.	125
2	Clerical Pools @ 500-700 sq. ft.	1,200
3	Administrative Ass'ts. @ 120-130	380
53	Teaching Ass'ts. @ 120-130 sq. ft.	6,667
	TOTAL	28,699

TABLE 13 COMPARATIVE SUMMARY OF PRESENT CHEMISTRY SPACE USE AND PROPOSED ALTERNATIVE

TYPE SPACE	PRESENT BUILDING USE NET AREA PRESENT USE	DELETIONS	ADDITIONS	NET AREA PROPOSED USE	PL TOT REQUIR
Classroom & Class Serv	13,868	1,050	-----	12,818	15,3
T-Lab	19,360	1,330	2,842	20,872	56,6
T-Lab Serv(Chm)	2,176	1,040	753	1,889	10,5
Research	42,224	5,200	4,379	41,403	105,5
Res Serv (Chm)	10,764	926	4,384	14,222	21,8
Office (Chm)	10,323	4,441	206	6,088	34,7
Office Serv (Chm)	1,424	941	-----	483	1,1
Seminar-Conf-Class	893	206	-----	687	3,2
Commons	528	528	-----	------	1,4
Merch Serv	222	222	75	75	
Shop (Dept'l Maint)	4,638	-----	222	4,860	4,8
Storage	1,603	-----	361	1,964	1,9
Misc	------	-----	141	141	1
SUB-TOTAL(CHM)	108,023	15,884	13,363	105,502	257,5
T-Lab Serv (C. St.)	3,915	-----	-----	3,915	4,8
Res Serv (C. St.)	10,662	3,036	-----	7,626	12,4
Office (C. St.)	1,562	-----	216	1,778	1,7
SUB-TOTAL(C. ST.)	16,139	3,036	216	13,319	19,0
Office (Libr)	158	-----	-----	158	----
Study Hall	1,962	227	-----	1,735	----
Libr Serv	131	-----	-----	------	----
Stack	3,012	-----	-----	------	----
SUB-TOTAL (LIBR)	5,263	227	4,142	9,178	9,1
TOTAL ASSIGNABLE	129,425	19,147	17,721	127,999	285,7
GEN BLDG	97,298	------	1,426	98,724	----
TOTAL NET AREA	129,425	19,147	19,147	129,425	----

USE AND PROPOSED ALTERNATIVE FUTURE REQUIREMENTS

USE		PLAN B (660 GRAD STUDENTS)		PLAN A (800 GRAD STUDENTS)	
TIONS	NET AREA PROPOSED USE	TOTAL REQUIREMENTS	NET AREA TO BE PROVIDED	TOTAL REQUIREMENTS	NET AREA TO BE PROVIDED
--	12,818	15,318	2,500	15,318	2,500
42	20,872	56,642	35,770	56,642	35,770
53	1,889	10,589	8,700	10,589	8,700
79	41,403	105,510	64,107	125,480	84,077
84	14,222	21,840	7,618	25,920	11,698
06	6,088	34,787	28,699	39,878	33,790
--	483	1,150	667	1,300	817
--	687	3,237	2,550	3,237	2,550
--	------	1,400	1,400	2,500	2,500
75	75	75	------	75	-----
22	4,860	4,860	------	4,860	-----
61	1,964	1,964	------	1,964	-----
41	141	141	------	141	-----
63	105,502	257,513	152,011	287,904	182,402
--	3,915	4,815	900	4,815	900
--	7,626	12,426	4,800	13,026	5,400
16	1,778	1,778	------	1,778	------
16	13,319	19,019	5,700	19,619	6,300
--	158	------	------	------	------
--	1,735	------	------	------	------
--	------	------	------	------	------
--	------	------	------	------	------
42	9,178	9,178	------	9,178	------
21	127,999	285,710	157,711	316,701	188,702
26	98,724	------	------	------	------
47	129,425	------	------	------	------

TABLE 14. SUMMARY OF SPACE TO BE REMODELED IN THE PRESENT CHEMISTRY BUILDING

ROOM NUMBERS	AREA	DESCRIPTION OF SPACE	WORK TO BE DONE
221	523	Inorganic Instrument Room	Furnish some "Lab" type furniture
Northwest Corner of 2nd Floor	3,325	Possible Nuclear and Radiochem Research	Replace present hoods.. Install additional hoods. Replace lab furniture. Revamp air flows (safety). Air condition and humidity control. Internal stairs to present area. Tile floors. Install false ceilings and "smooth" the walls.
273, 273A, 273B, 273C, 277, 277A, 277B, 277C, 277D, 279, 279A, 279B, 280, 281, 401, 401A, 401B, 401C	4,142	Library Expansion	Remove selected partitions. Furnish "some" furniture. Internal stairway(s). Waterproof (under lab) ceilings.
316 & 317	3,927	Organic Labs	Revamp or replace benches. Remove vertical sliding chalkboards.
320	1,228	Research Service Area	Remove sloped floor and strip room of furnishing. Air condition. Provide additional electricity and some furniture.
413	1,584	Organic Lab	Replace benches. Minor remodeling.
TOTAL AREA	14,729		

TABLE 15. STATUS OF AIR CONDITIONING IN THE PRESENT CHEMISTRY BUILDING - 1966

STATUS BY ROOM		AREA	PERCENT GRAND TOTAL
I. Rooms Requiring Chilled-Water Air Conditioning:			
A. Presently without any air conditioning:[1] 12, 13, 14A, 114, 120, 173-176, 205-210B, 212, 216-216B, 222, 231-237, 250, 250A, 250E, 261, 262, 269, 306-310B, 313, 320, 334, 335, 360, 362, 378, 401-401C, 402, 405, 406-410B, 420, 421, 422, 430, 430A, 431-437, 440, 442, 450, 450A, 450E, 455, 460-462, 473-473B, 475, 477, 478, 480, 481.	Sub-Total	30,473	34%
B. Rooms presently without any air conditioning, but requested (from Special Projects) for chilled-water air conditioning before construction of the new addition: 62, 117, 178-180B, 213, 214, 221, 456.	Sub-Total	8,728	10%
C. Rooms that presently have package mechanical air conditioning which should be replaced with chilled-water air conditioning, if feasible: 14, 65, 77, 101-101B, 104, 150-150H, 160, 172, 182, 183, 200, 200A, 216C, 242, 250B-250D, 255, 260, 336, 337, 350-350E, 355, 373-373B, 375, 377, 450B-450D, 458.	Sub-Total	24,580	27%
GRAND TOTAL AREA: 63,781 sq. ft.	Total	63,781	71%
II. Rooms Presently Air Conditioned with Chilled-Water: 54, 55, 55E, 73, 75, 81, 105-110B, 150J, 150K, 150L, 165-168, 185, 201, 202, 220-220B, 225, 230B, 265, 268, 268A, 273A-281, 301-301G, 314, 322, 330, 330A, 330B, 331-343A, 361, 361A, 363, 501-505, 560-562.	Sub-Total	25,899	29%
	Grand Total	89,680[2]	100%

[1]Essentially includes all research laboratories and associated service areas and offices. Excludes most undergraduate teaching laboratories, service areas and other areas.

[2]This represents 70% of the 127,999 sq. ft. in the present building. It is judged that the remainder of the space in the building is such that air conditioning is not required.

TABLE 16 COMPARATIVE SUMMARY BY TYPE SPACE AND POSSIBLE ALLOCATION AMONG DIVISIONS (PLAN A)[1]

TYPE SPACE	ANALYTICAL OLD / NEW	BCHM OLD / NEW	GENERAL OLD / NEW	INORG. GLD / NEW	LIBR. OLD / NEW	ORGANIC OLD / NEW	PHYSICAL OLD / NEW	OTHER OLD / NEW	GEN ACAD OLD / NEW	CHEM STORES OLD / NEW	TOTAL OLD / NEW	GRAND TOTAL
Classroom	---	---	---	---	---	---	---	---	12,818 / 2,500	---	12,818 / 2,500	15,318
Sem-Conf Classroom	---	---	---	---	---	---	---	687 / 2,550	---	---	687 / 2,550	3,237
Teach Lab	- / 6,120	1,727 / -	- / 27,900	2,357 / -	---	12,706 / -	4,082 / -	- / 1,750	---	---	20,872 / 35,770	56,642
T-Lab Serv	- / 850	230 / -	- / 7,850	523 / -	---	615 / -	506 / -	15 / -	---	3,915 / 900	5,804 / 9,600	15,404
Office	- / 4,020	- / 4,328	- / 10,488	650 / 3,678	---	4,938 / 1,389	- / 6,327	500 / 3,560	---	1,778 / -	7,866 / 33,790	41,656
Office Serv	---	---	- / 300	---	---	---	---	483 / 517	---	---	483 / 817	1,300
Research	- / 20,076	- / 21,382	---	10,033 / 11,299	---	31,370 / -	- / 31,370	---	---	---	41,403 / 84,077	125,480
Res Serv	- / 1,560	- / 1,665	---	1,500 / 1,500	---	3,000 / -	- / 2,973	9,722 / 4,000	---	7,626 / 5,400	21,848 / 17,098	38,946
Commons	---	---	---	---	---	---	---	- / 1,400	---	---	- / 2,500	2,500

TABLE 16

TYPE SPACE	ANALYTICAL OLD / NEW	BCHM OLD / NEW	GENERAL OLD / NEW	INORG. OLD / NEW	LIBR. OLD / NEW	ORGANIC OLD / NEW	PHYSICAL OLD / NEW	OTHER OLD / NEW	GEN ACAD CHEM STORES OLD / NEW	TOTAL OLD / NEW	GRAND TOTAL
Library (All Classifications)	---	---	---	---	9,178 / -	---	---	---	---	---	9,178
Shop (Dept'l Maint.)	---	---	---	---	---	---	---	4,860 / -	---	4,860 / -	4,860
Storage	---	---	---	---	---	---	---	1,964 / -	---	1,964 / -	1,964
Merch Serv	---	---	---	---	---	---	---	75 / -	---	75 / -	75
Miscellaneous	---	---	---	---	---	---	---	141 / -	---	141 / -	141
TOTALS	- / 32,626	1,957 / 27,325	- / 46,538	15,063 / 16,477	9,178 / -	51,629 / 1,389	4,588 / 40,670	18,477 / 13,777	12,818 / 2,500	13,319 / 6,300	127,999 / 188,702	316,701
GRAND TOTALS	32,626	29,282	46,538	31,540	9,178	53,018	42,258	32,254	12,818 / 2,500	19,619	316,701	316,701

[1]Shifts in allocations may occur but total space by classification will be maintained.

TABLE 17 COMPARATIVE SUMMARY BY TYPE SPACE AND POSSIBLE ALLOCATION AMONG DIVISIONS (PLAN B)[1]

TYPE SPACE	ANALYTICAL OLD / NEW	BCHM OLD / NEW	GENERAL OLD / NEW	INORG. OLD / NEW	LIBR. OLD / NEW	ORGANIC OLD / NEW	PHYSICAL OLD / NEW	OTHER OLD / NEW	GEN ACAD OLD / NEW	CHEM STORES OLD / NEW	TOTAL OLD / NEW	GRAND TOTAL
Classroom	---	---	---	---	---	---	---	---	12,818 / 2,500	---	12,818 / 2,500	15,318
Sem-Conf. Classroom	---	---	---	---	---	---	---	687 / 2,550	---	---	687 / 2,550	3,237
Teach Lab	- / 6,120	1,727 / -	- / 27,900	2,357 / -	---	12,706 / -	4,082 / -	- / 1,750	---	---	20,872 / 35,770	56,642
T-Lab Serv	- / 850	230 / -	- / 7,850	523 / -	---	615 / -	506 / -	15 / -	---	3,915 / 900	5,804 / 9,600	15,404
Office	- / 3,565	- / 3,740	- / 8,727	750 / 2,990	---	4,345 / 1,250	493 / 5,102	500 / 3,325	---	1,778 / -	7,866 / 28,699	36,565
Office Serv.	---	---	- / 250	---	---	---	---	483 / 417	---	---	483 / 667	1.150
Research	- / 16,882	- / 17,937	---	11,500 / 6,437	---	26,377 / -	3,526 / 22,851	---	---	---	41,403 / 64,107	105,510
Res. Serv.	- / 1,318	- / 1,400	---	1,840 / 300	---	2,400 / -	2,300 / 600	7,682 / 4,000	---	7,626 / 4,800	21,848 / 12,418	34,266
Commons	---	---	---	---	---	---	---	- / 1,400	---	---	- / 1,400	1,400

TABLE 17

TYPE SPACE	ANALYTICAL OLD / NEW	BCHM OLD / NEW	GENERAL OLD / NEW	INORG. OLD / NEW	LIBR. OLD / NEW	ORGANIC OLD / NEW	PHYSICAL OLD / NEW	OTHER GEN ACAD CHEM STORES OLD / NEW	TOTAL OLD / NEW	GRAND TOTAL
Library (All Classifications	---	---	---	---	9,178 / -	---	---	---	9,178 / -	9,178
Shop (Dept'l Maint.)	---	---	---	---	---	---	---	4,860 / -	4,860 / -	4,860
Storage	---	---	---	---	---	---	---	1,964 / -	1,964 / -	1,964
Merch Serv	---	---	---	---	---	---	---	75 / -	75 / -	75
Miscellaneous	---	---	---	---	---	---	---	141 / -	141 / -	141
TOTALS	- / 28,735	1,957 / 23,077	- / 44,727	16,970 / 9,727	9,178 / -	46,443 / 1,250	10,907 / 28,553	16,407 / 13,442	12,818 / 2,500	13,319 / 5,700	127,999 / 157,711	285,710
GRAND TOTALS	28,735	25,034	44,727	26,697	9,178	47,693	39,460	29,849	15,318	19,019	285,710	285,710

[1]Shifts in allocations may occur but total space by classification will be maintained.

III. BUILDING CONSIDERATIONS

Acoustics

Teaching Laboratories, Classrooms, Conference Areas, Corridors and Offices should be acoustically treated to reduce the noise level. In general, all areas except some research laboratories and service areas should be acoustically treated.

Air Conditioning

In general, the entire project should be air-conditioned. Special air conditioning and ventilation requirements for specific areas are detailed in the description of the individual areas.

Audio-Visual

All requirements for audio-visual equipment should be coordinated with the campus Audio-Visual Department, Physical Plant Electronics Shop, and Television Unit before inclusion in the final specifications for the building. In general, all classrooms and teaching labs should also provide for later addition of remote AV systems.

Building Efficiency

A ratio of net assignable to gross area of 62-65% or over should be attained.

Display Cases and Bulletin Boards

Copious glass-covered display boards must be provided near teaching laboratories and others throughout the building, to be specified after preliminary plans.

Chalkboards

All chalkboards installed should be easy to write on, easy to erase, and easy to read. In general, this requires high-quality black chalkboards. A small (4' x 6') chalkboard should be installed on one wall of each research laboratory and office.

Class Bell System

A class bell system to indicate class changes should be installed and synchronized with the campus central system on all levels of the new addition.

Clocks

Centrally-controlled programmed clocks should be located in the corridors of this building on all levels. Non-corrective clock outlets should be provided in all clerical pool offices, lounges, teaching laboratories and other locations which will be determined when the schematic plans are made available.

Columns

All instructional laboratories should be free of obstructing columns.

Custodial Areas

Custodial rooms with floor sink, hot and cold water, appropriate shelving and lighting should be provided on each floor, but should not exceed 50 square feet each.

Directory Cases

Directory cases should be provided in all the corridors and stairwells of the building. The exact location of these directory cases and bulletin boards will be specified when schematic plans are available.

Electrical Outlets

The numbers, types, and locations of specific electrical outlets will be indicated for each room after the preliminary drawings.

Elevators

In view of the anticipated research equipment which may be required to be transported from floor to floor the following general specifications are submitted for consideration. One freight elevator of approximately 10 tons capacity should be provided accessible directly to the outside truck delivery dock. The platform should be a minimum of 8 feet by 15 feet. A minimum doorway width of 7 feet should be provided at each end. The door clearance should be as high as the corridor ceilings or a minimum of 8 feet high. The elevator should be equipped with a rollup door on each end so that deliveries can be made directly onto the elevator from the loading dock outside of the building. The freight elevator lobby at each floor level should be large enough to handle and maneuver the large items of equipment which may be carried on the elevator. Two or more passenger/freight elevators with a capacity of about 2,500 pounds and a platform of approximately 6 feet by 7 feet should be provided and should open into the general corridors of the building.

Equipment and Furniture

Equipment and furniture layouts will be included in the architect's plans. Layouts of the more usual labs are shown in Appendices C & D. A tentative detail list of the equipment required for the General Chemistry laboratories is included in Appendix B.

Floor Coverings

It is suggested that floor coverings be included in all areas except those where heavy loads will be transported and in certain utility and service areas.

Floor Levels

The floor levels as the academic requirements are presently envisioned should match with the floor levels of the present building.

Floor Loadings

Because of the department's anticipated need for heavy floor loading capabilities in several research laboratories it is suggested that a portion of the building (say 10% of the Research Space) from the basement to the top of the building be designed with very heavy floor loading capabilities, possibly 5-10 times normal. All areas should probably be designed for a live load not less than 125 pounds per square foot. Those areas which will carry more concentrated load capacity will be indicated in the detailed requirements of the various areas.

Offices - General Specifications

All offices should be designed in accordance with Purdue University's "Design Considerations for Private Offices". In general, all offices should be no longer than 13 feet in length and no less than 8 feet in width. All-single full-time equivalent (FTE) offices should be no less than 100 square feet nor no more than 130 square feet in area, except for those rooms specifically enumerated in the program statement. A single FTE office will house either a full-time staff member or three teaching assistants. All electrical and telephone outlets should be wall mounted, never floor mounted.

The equipment specified for each office depends upon its intended occupant (s) and their functional equipment requirements as generated by the responsibilities and duties which they are required to perform. An office equipped for a typical full-time staff member might include a double pedestal desk approximately 30" x 60" with 3 file drawers, 2 boxdrawers and a 26" wide center drawer. Hook strips should be mounted on the wall to allow for at least 60 lineal feet of wall mounted bookshelves, however, only 40 lineal feet of shelving should be installed initially (4 - 10' x 10" shelves). An 18" to 20" deep credenza should be provided to be located the full length of the shortest wall and should include at least four file drawers. A comfortable wooden swivel chair and two side shairs (one with arms) should be provided. A chalkboard approximately 6 feet in length should be provided on one wall. One metal wastebasket should be provided in all offices. One wall-mounted 2 or 3 prong coat hanger should be installed in each office (Preferable behind the door).

Offices outfitted for graduate teaching assistants should include 3 single pedestal desks with two file drawers and one center drawer each. A section of chalkboard approximately 6 feet long should be installed on one wall. Wall mounted hook strips should be installed to allow for at least 60 lineal feet of bookshelves. However, only 20-30 lineal feet of shelving need be installed for use by teaching assistants but this does provide the flexibility to use these rooms interchangeably as staff offices as well. One straight back chair should be provided for each desk and one additional straight back chair in each office. (It is doubtful that there will be a student conferring with each of the teaching assistants simultaneously; therefore, there is little need for more than on additional straight back side chair in each 3 man teaching assistant office. In fact,

most of the time all three teaching assistants will not be in the room at the same time.)

Research Laboratories - General

Detailed specifications, utility requirements, and a suggested layout of a typical "General-purpose" research laboratory can be found in Appendix D. The requirements for the more specialized research facilities will be specified in the preliminary plans by the Chemistry Departmental representatives as they work with the architect.

Safety

The placement of various specialized facilities which will house explosive or radioactive materials must be cleared with the appropriate campus, state and federal authorities before the final plans can be approved. Radioactive hoods should have separate exhaust and appropriate filters where required. Plans must be reviewed with the campus radiological control committee relative to the radiological control measures that should be taken. Emergency showers and eyewashers should be provided at reasonable intervals throughout the building.

Telephones

The Chemistry Department staff desires that telephone service be installed in most offices and intercom and telephone service conduit be installed into all offices and research laboratories. The telephone system for the total building will include a central switchboard in the main office (and will allow telephone conferences with more than 2 individuals). This would probably eliminate the need for an intercom system to be installed in the building. Areas for public telephones should properly be provided in the

corridors as required.

Television Conduit

At this time requirements for television conduit are somewhat inconclusive and use of television is not really envisioned by the department, however, conduit should be installed to allow future use in teaching labs, classrooms and seminar rooms. The appropriate campus authorities should be consulted to help reach a decision on conduit for telephones, intercom, and television. (Dr. Hayt, Mr. Miles, Mr. Townsley, Mr. Terwilliger, Mr. Moses, Mr. Baker and the general telephone representatives).

IV. SPECIFIC CHEMISTRY SPACE REQUIREMENTS

CLASSROOM SPACE

Classroom space required is based upon the number of room hours in each class size range generated by the course enrollment projections and course requirements file (Appendix A). Table 18 below lists the projected classroom requirements by class size range. It should be noted that whether these 5 new classrooms enumerated below are constructed is dependent to some extent upon the site location of the undergraduate instructional laboratories. If they are constructed on the old Heavilon Hall site, then construction of these 5 rooms will not be required since the classrooms in new Heavilon Hall can be used. However, if that is not the site choosen, then the rooms will be required in the building with the General Chemistry laboratories.

In addition, a requirement is generated for seminar-conference rooms by the many research group seminars, course staff meetings, committee meetings and general seminars. It has been estimated that as many as 200 to 300 room hours per week will be generated by these types of activities. Three classroom-seminar rooms of about 450 sq. ft. and 24 table and chair stations each should be provided. Four conference-seminar rooms of about 300 sq. ft. and 12 to 15 stations each should also be provided. All rooms will be centrally scheduled by Schedules and Space with priority on the conference rooms given to Chemistry.

The five classrooms should seat about 30 students in multiple aisle pedestal mounted tablet arm chairs. The rooms should be about 500 sq. ft. in area and rectangular in shape with the length being no more than 1 1/2 times the width. Chalkboards should be installed across the entire front

wall (the narrowest width) and adequate coat hooks and book shelf space provided along one side wall. Chalkboard space should also be provided along the remaining side wall. The 3 classroom-seminar rooms and 4 conference-seminar rooms should also be equipped with chalkboards along one of the narrowest walls and should be of a dimension such that the length does not exceed more than 1 1/2 times the width. Lighting in all rooms should be switched such that only partial light can be obtained if desired for visual presentations.

TABLE 18. PROJECTED 1980 CLASSROOM REQUIREMENTS BY CLASS-SIZE RANGE

ROOM NO	CLASS SIZE	NUMBER ROOM HOURS	SATISFIED BY	ROOM SIZE
1	335-165	40	CHM 200	350
2	165-100	40	CHM 104	170
3	100-63	40	CHM 172	170
4	63-33	40	CHM 160	77
5	33-24	42	CHM 360	40
6	24-23	42	CHM 362	35
7	23-23	42	CHM 420	36
8	23-23	42	CHM 421	38
9	23-23	42	New Room 1	25-30
10	23-22	42	New Room 2	25-30
11	22-22	42	New Room 3	25-30
12	22-21	42	New Room 4	25-30
13	21-14	31	New Room 5	25-30
TOTALS	13 Rooms	527	5 New Rooms	25-30

TEACHING LABORATORIES

Planning of the General Chemistry laboratories has been considered at length. The present deplorable facilities bear no relevance to the requirements of modern chemistry. It is assumed that sufficient recognition has been awarded this point that the argument need not now be pursued further.

The planning already performed has resulted in a general concensus of needs. Foremost, the laboratories should be designed to permit the teaching of modern chemistry. This means that each student should have adequate benchtop space on which to work: 60 inches per student is recommended. Further, facilities should be provided to make maximum usage of modern instrumentation. It is recommended that each laboratory have adjacent to it a room devoted exclusively to special instruments (e.g. precision balances, spectrophotometers, pH meters, radiochemical apparatus) which would keep this expensive equipment away from the "busyness" of the laboratory but yet be closely accessible.

To maximize the effectiveness of these laboratories and to preclude the necessity of simultaneously requiring other classrooms, the laboratories should be designed as complete functional units. This means that only one section under the supervision of one teacher should occupy one laboratory. Further, the laboratory should be designed in such a way that pre-laboratory discussions, laboratory problem sessions, and experiment demonstrations can all be carried out in the one room. This, too, implies that the room have a capacity of only one section (no more than 24 students) that all the students face one way, that the instructor be given a prominent (preferably raised) desk, that adequate blackboards be provided, and that the student desks be constructed in such a way that one can comfortably be seated for reasonable periods of time.

Proper scheduling will allow the Chemistry Department to attain 45 to 48 hours teaching laboratory usage in the general and intermediate Chemistry laboratories. However, there are those specialized laboratories which are required that may not be used but a few hours per week due to the small enrollment in some of the more specialized courses. Even though some rooms in the present building will be utilized in the future, requirements for all laboratories are explained in this section.

Basically, 18 new general-intermediate Chemistry laboratories and their associated service areas need to be constructed to replace the temporary and outdated laboratories in the FWA buildings. Five new analytical teaching laboratories will be required to replace the antiquated rooms in the existing building. These rooms can be more economically converted to other uses rather than trying to upgrade them for teaching analytical Chemistry. A new high school Chemistry laboratory and a small glass-blowing laboratory is also planned for the new facility. Organic, inorganic, biochemistry and physical chemistry laboratories will be located in the present building and will only require a gradual modnerization.

General and Intermediate Teaching Laboratories

The continued projected requirements for general and intermediate teaching laboratories totals 795 room hours. Using a utilization of 45 hours per week a requirement for 18 dual-purpose rooms at about 1,550 sq. ft. each is generated. (If the requirements for general and intermediate Chemistry laboratories were considered separately and not designed so

that they could be interchangeable for scheduling flexibility at least a total of 19 rooms would have been required.) A sketch of a typical lab is included in Appendix C. Some specifications for these laboratories are outlined below:

1. Each laboratory should accommodate at least 24 student stations.
2. Total bench space per student station should equal at least 60 lineal inches.
3. Individual or shared (2 stations) sinks should be provided.
4. One or more larger sinks should also be provided in the room.
5. All benches should face one direction - toward a demonstration table on a raised platform in the front of the room to enable the room to be used for recitations as well.
6. Utilities should not be distributed over the tops of the benches such that vision is obstructed. (Height of utilities or downdraft hoods over the bench top should be no more than 9 to 10 inches.)
7. Downdraft hoods should be provided at each station.
8. Student lockers (16 per station) should be contained within the room located such that a maximum use of space is made.
9. Lockers should (if possible) be arranged in either an even number of rows or even number of columns allowing possible simple conversion to double size drawers if instructional requirements were to change in the future.
10. The knee holes in the lab benches should be about 24 inches wide.
11. About 12 to 16 feet of conventional hood space should be provided in each room.

12. Chalkboards should be provided across the front of all rooms at a height above the demonstration table.

13. A 4' X 4' section of cork bulletin board should also be provided in each room as well as the glassed-in bulletin boards outside of all laboratories in the hallways.

14. A reagent bench of approximately 8 feet X 30 inches with storage cabinets below should be provided.

15. Storage space for one or two small centrifuges per bench should be provided on shelves at the sides of the room.

16. Conduit only for TV should be provided.

17. Services required at each station include gas, air, tap water and electricity. Distilled water should be available in the room, possible at the end of each bench.

Analytical Teaching Laboratories

Courses taught in analytical chemistry are 224L, 421L, 524L, 525L and 625L. These 5 courses can be accommodated in three different types of teaching laboratories. Courses 224L and 421L can share one type lab (type 1) 524L and 525L another type lab (type 2) and 625L must have a separate specialized laboratory (type 3) due to the special nature of the equipment and the nature of the experiments (fumes and toxic agents prevail abundantly. The other two advanced courses (524L and 525L) may from time to time during a semester use some of the equipment in this room but the instruction for all three courses could not take place in the same room because of the damage that the fumes and toxic agents generated in 625L could do to the precision equipment necessary for use in 524L and 525L.

The projected requirements for Type 1 laboratories totals 120 room hours at a class size policy of 20 students. Using a utilization of 44 hours per week a total need for 3 rooms is generated. Some specifications for these laboratories are outlined below:

1. Provide at least 20 student stations with 72 lineal inches of bench space per station.
2. Benches should be designed without the center utility island on top of the two sided benches or an additional depth should be provided on each side of the bench to accommodate large equipment.
3. Modular furniture should be used so that a station can be pulled out if necessary and the configuration of the lab changed without undue difficulty.
4. These laboratories presently require only 6 drawers per station because of the large hourly requirements per student, but for future flexibility it is desirable that 9 drawers per station should be designed into the benches.
5. Space should be provided for three 18" X 18" X 12" drying ovens or their equivalent and arranged so that heat and fumes given off are exhausted.
6. Chalkboards should be provided at convenient locations in the rooms.
7. Hood space should be provided in each room either with a few large hoods or downdraft hoods at each station.
8. Between 65 and 70 sq. ft. per station is required in this type laboratory.

The projected room hours for the type 2 laboratory are about 40 hours

with a class size policy of 20 students. Therefore, one 20 station room of about 1,200 sq. ft. is required. Some specifications for this laboratory are listed below:

1. Provide at least 20 student stations at 60 sq. ft. per station with 72 lineal inches of bench space per station.
2. The benches used will be dictated to a degree by the equipment to be placed in the room which will be specified after preliminary drawings.
3. No lockers are required for this laboratory.
4. Furniture must be modular and removable so that the laboratory can be redesigned with little difficulty.
5. High electrical loads should be provided for in this lab.
6. Temperature and humidity control should be provided and be well regulated.

The requirements for the type 3 analytical laboratory are about 90 sq. ft. per station because of the larger and more abundant equipment used. It is estimated that this room will be used 32 hours per week or more for organized courses. The specifications for this laboratory are the same as for the type 2 laboratory above except that 50% additional space is required per station for storage of large special and more expension equipment.

Inorganic Teaching Laboratories

Inorganic courses include 442L, 548L and 645. A common laboratory can be used for 442L and 645 which will generate a requirement of about 80 hours per week. The 548L course is presently a summer course requiring

special facilities in radio-chemistry. However, the remainder of the year these facilities are used for research. Presently room 165 is being used for 548L and should continue to be satisfactory in the future. For the 442L and 645 courses the present room 217 can accommodate their requirements if room 221 is converted to an instrument room for 442L.

Organic Teaching Laboratories

The state of the art of organic chemistry instruction is such that a four hour laboratory for chemistry majors is a requirement from the standpoint of the American Chemical Society's accreditation standards. Several years ago Purdue offered 6 hour laboratories in their organic courses but because of space pressures from expanding enrollments and research contracts they have compressed most of the organic laboratories to a three hour period. It is anticipated that four hour laboratories would be offered if possible. Therefore, it is relatively reasonable and definitely safer to plan on 2 lab periods per day with one on Saturday morning for a total of 11 per week. Then if enrollments increase more than anticipated there still exists the possibility of reducing the lab requirements to squeeze additional sections into the week. It is planned that all of the organic chemistry division will remain in the present building.

Two types of organic laboratory are required but are very similar except that the second type laboratory (251L and 255L courses) requires some different equipment. The first type laboratory serves the 263L and 265L courses. It is estimated that these courses will generate 66 room hours per week at a room size of 24 stations. These courses can easily be accommodated in present rooms 316 and 317 after minor modifications.

Of primary importance are the removal of 1 1/2 to 2 benches in each room to allow space for additional instrumentation. In addition, the remaining drawers will need to be revised from 6 per station to 9 per station. Present room 325 will be the preparation laboratory.

The second type laboratory for 251L and 255L generate a requirement for 84 room hours per week (4 hour labs). This is also a locker requirement of about 650 which can be satisfied by using present rooms 416, 417 and 413. Some minor modifications will also be necessary for these rooms such as removing 1 or 2 benches from each room to alleviate crowded conditions. This would leave 32 stations per room with 9 drawers per station for a total of 864 drawers. Room 413 provides the flexibility of being able to handle almost 1,000 students and being able to go to a class size policy of 12 as well as to possibly using part of the room for instruments. Present room 425 will be the preparation laboratory. These laboratories are characterized by the following specifications:

1. 72" bench top space/station.
2. Supervisory space 100 sq. ft. within the room.
3. Lockers contained within the room.
4. Project turn-in and grading space (flasks, etc.).
5. Cabinets for locked storage of student experiments and special chemicals.
6. Instruments include: gas chromatographs, IR and UV spectrophotomatry ovens, melting point apparatus, NMR spectrometer, etc.
7. Larger areas required for bulky appartus.

Physical Chemistry Teaching Laboratories

In these laboratories the concept of stations and number of students per

room and equipment set-ups is essentially out. The rooms will be left open all the time for the use of Chemistry 374L. There will be no drawers assigned, rather the student will be required to go through a certain number of physical experiments each semester. There will be laboratory hours over and above the 3-hour laboratories per week to which the student will be formally scheduled. A class size policy of about 15 students per section in the formal classes is anticipated. With an enrollment of 164 students; this is 11 sections or 66 hours per week of formal laboratory scheduling. It is entirely possible, however, that three 3-hour periods per each of five days and one on Saturday would be possible (16 periods per week). Therefore, it is anticpated that on a formal basis these laboratories would be used 33 hours per week with expansion up to 48 hours per week. Present rooms 116 and 117 will be the physical chemistry teaching laboratories and present rooms 115 and 120 the instrument rooms for the laboratories. No new space is required.

Biochemistry Teaching Laboratories

Presently the biochemistry curriculum is undergoing revision of courses; but new courses will be introduced and it cannot be foreseen which way they will go. In actuality, this division is a marriage of biochemistry, biology, and chemistry. Where all the courses will be taught it is essentially up for grabs and uncertainty surrounds this entire area. However, one room should be provided and if it is not needed in the future it can always be converted to research or if it expands rapidly the expansion can go into an adjacent research room. Therefore, it is suggested that room 365 be designated as a Biochemistry teaching laboratory and room 343 as the instrument room to be

used both for teaching and for research. It is entirely possible that the projected load of biochemistry could possibly triple or quadruple by 1980 due to the low base year from which we have projected. On the other hand, depending upon how well the marriage between the other two departments and the Chemistry department is consumated it might very well be that the biochemistry courses taught within the chemistry department may not grow at all. Therefore, it is recommended that this flexibility be left within the old building and that very minor modifications if any modifications at all be accomplished to these rooms. No new space is required.

Glass-Blowing Teaching Laboratory

The one course taught in the glass laboratory is Chemistry 500. It is estimated that 28 students will be enrolled in this laboratory which is now held in room 85 at about 360 square feet. A room of about 250 to 300 square feet appears to be required for this function. This is one formal hour per week -- then the students use this laboratory as required. It is anticipated that this course may assume less and less importance as time goes on. Therefore, it is entirely possible that this laboratory should be designed such that it can be used as a research laboratory or absorbed into the regular glass blowing shops if and when Chemistry 500 is abandoned; but for planning purposes a room of about 250 square feet with adequate ventilation is required for this particular function.

Chemistry Education Teaching Laboratory

This laboratory should be designed such that it can be converted to other uses if required in the future. A room of about 1,500 square feet

should be designed such that it will contain many basic reference works and compounds necessary to instruct the high school chemistry teacher. Two full time staff members will also be officed in this laboratory.

TABLE 19. DISTRIBUTION OF PROJECTED LABORATORY HOURS AND NUMBER OF TEACHING LABORATORIES AND SERVICE AREAS REQUIRED BY TYPE LABORATORY AND TYPE SERVICE AREA

TYPE LABORATORY	ROOM HOURS	NUMBER ROOMS	TOTAL NEW AREA REQUIRED
General and Intermediate	795	18	27,900
Type "A" Instrument Room		9	3,150
Type "B" Instrument Room		6	2,100
Type "C" Instrument Room		1	600
Analytical Lab Type 1	120	3	4,200
Instrument Room		1	600
Preparation Room		1	250
Analytical Type 2	40	1	1,200
Analytical Type 3	32	1	720
Inorganic Lab #1 (Rm 217)	30	1	------
Inorganic Lab #2 (Rm 165)	20	1	------
Organic Lab Type 1 (Rms 316 & 317)	66	2	------
Organic Lab Type 2 (413, 416, 417)	84	3	------
Physical Labs (116, 117)	66	2	------
Biochemistry (365)	10	1	------
General Chm Prep Area		1	2,000
General Chm Dispensing Area		1	900
High School Chem Education Lab		1	1,500
Glass-Blowing Lab		1	250
		TOTAL	45,370

TEACHING LABORATORY SERVICES

The auxiliary preparative and storage space for teaching laboratories involves somewhat of a conflict: one central facility is most efficient and minimizes duplication; separate areas for each laboratory are most convenient, especially so when the laboratories are dispersed throughout two buildings. Probably the best solution is a combination of the two: a central preparative and storage area for mass-quantity reagent and unknown preparation and separate rooms for each functional group of laboratories where special reagents, equipment, and unknowns can be safely stored. Since these latter rooms presently exist in conjunction with the teaching laboratories in the present building, the only new space required is for the central area. About 2,000 square feet of well-designed and centrally-located preparatory space will be adequate.

In addition, there is a need for some centrally-located special equipment rooms. These would house the equipment used simultaneously for several courses, often a necessity because of the prohibitive cost of acquiring duplicates of some of the modern expensive instruments. An example of such an instrument is the $29,000 nuclear magnetic resonance spectrometer presently being requested from the National Science Foundation for concurrent use in the Analytical, Inorganic, and Physical Chemistry undergraduate laboratories. A total of 2,000 square feet should be set aside for special teaching equipment rooms.

General Chemistry Stores Dispensing Rooms

Because of the probable distance of the freshman chemistry laboratories from the main chemistry stores it seems necessary that a special dispensing room be constructed in the new addition as a satellite area to the chemistry

stores dispensing area. This dispensing room should be about 900 sq. ft. in area, and be centrally located to the laboratories. Instrument rooms should be designed above and below the main dispensing room so that a dumbwaiter into the instrument rooms can be used for emergency dispensing and save running between floors.

Instrument Rooms for General and Intermediate Teaching Laboratories

Basically, three types of instrument rooms are necessary to serve the general and intermediate teaching laboratories. These three types have been arbitrarily designated as types A, B and C.

Type "A" instrument rooms must be integral with the teaching laboratories and may be shared by 2 or more labs if the adjacency criterion is met. These areas should be about 350 sq. ft. for each two teaching labs served. A total of 9 will therefore be required. Additional specifications are as follows:

1. Must be immediately adjacent to labs and allow visual supervision from the lab.
2. Cabinets should be placed above the table tops for storage of equipment.
3. Table top space of about 1 lineal foot per laboratory station served should be provided. (About 4 feet per operating station)
4. Typical equipment will include one pH meter, 1 precision balance and one spectrophotometer per 4 students; some radioactivity equipment in a ratio of about 1 piece of equipment for each 10 students.

Type "B" instrument rooms are similar to the type "A" rooms except that

they need not be integral with the laboratory; adjacency or reasonable closeness is satisfactory. In fact, it is desirable that these rooms be entered from the hallway not directly from the lab. These rooms will allow about double the equipment for the intermediate labs. Six rooms of about 350 sq. ft. are required.

One type "C" room of about 500-600 sq. ft. is required. This room will probably have an attendant and house more expensive and volumninous equipment. It should be centrally located to serve all general and intermediate chemistry laboratories. This room is to accommodate the required equipment and 10-12 students plus attendant at any one time.

Instrument Rooms for Analytical Teaching Laboratories

One instrument room and one preparation room is required for the analytical teaching laboratories. An instrument room of about 600 sq. ft. in size should be provided near the type 1 laboratories. A preparation room of about 250 sq. ft. should also be constructed near the type 1 laboratory.

RESEARCH LABORATORY SPACE

Total new research space requirements equal about 64,107 sq. ft. for Plan "B" and 84,071 sq. ft. for "A" of flexible research laboratories planned on a module approximately 12' x 25'

Professorial

Plan "A" generates a requirement for 122 research laboratories at 120 sq. ft. each or 14,640 sq. ft. Plan "B" generates 107 research labs at 120 sq. ft. each for a total of 12,840 sq. ft. In addition, between 6420 and 7320 sq. ft. of service space is generated by the permanent and temporary professorial staff.

Post-Doctorals

Plan "A" estimates 140 post-doctorals will each need a 150 sq. ft. laboratory. Plan "B" indicates a provision for only 120 post-doctoral laboratories at 150 sq. ft. each. In each plan 30 sq. ft. per post-doctoral candidate is allocated for research service space. Therefore, between 21,600 and 25,200 sq. ft. of post-doctoral research and service space is required. In the past these people have not generated space; it is a deviation from the Four State Supported Universities Capital Appropriations Study guidelines.

Graduate Research Assistants

Plan "A" estimates 498 graduate students will be on research appointments and 42 students will be on teaching appointments but will be doing some research also. Therefore, 540 research laboratories of 150 sq. ft. each plus service area of 30 sq. ft. for each laboratory or 97,200 sq. ft. would be required. Plan "B" would require only 440 such spaces or 79,200 sq ft.

Undergraduate Research

Research space requirements for undergraduates is about 3000 sq. ft. total; plus 15 sq. ft. of service area per each of 50 research students.

Other

All second year fellowship and self-supported students were allocated 150 sq. ft. of research space each. This is contrary to previous normal practice and is not allowed for in the Capital Appropriations Study of the Four State Universities. However, this does not amount to a great deal of space. For both Plans "A" and "B" this totals to 45 students and a total of 6750 sq. ft. of research space plus 30 sq. ft. per student for service area. Space is also allocated at a rate of 120 sq. ft. for

each research assistant budgeted as a technician. This is also contrary to the Capital Study.

RESEARCH SERVICE SPACE

Precision Machine Shop

This Shop, which occupies 540 square feet of building space, is proving to be a tremendous asset to the Department. By constructing some of their research instruments rather than waiting for them to become available commercially, staff members are able to work at the very frontiers of scientific research and thus are pace-setters rather than followers. The continuation and expansion of this Shop is crucial. These Shop requirements will be provided from 2409 sq. ft. of space in the present building. No space is required in the new addition.

Instrument and Electronics Shop

With the burgeoning use of complex instrumentation and electronics, this Shop will have to be expanded significantly. Presently occupying about 1000 sq. ft., an additional 2500 sq. ft. should be made available. This additional space would include the areas needed for equipment design, construction, testing, repair and storage. It is not unreasonable to expect a staff of 20 in this area by 1980. About 3500 sq. ft. of new space is required as one unit. It could very well be provided in the basement of the new addition.

Special Equipment Rooms

Each of the research divisions in the Department has need for special rooms for their special needs. For example, a number of rooms should be provided for Physical Chemistry which would have the capability to handle

extremely heavy floor loads in addition to providing thorough electrical noise shielding, high-capacity electrical power, and high-capacity atmospheric humidity and temperature control. For Biochemistry, additional cold rooms and special preparatory rooms are needed. The Organic Division needs special instrument rooms for nuclear magnetic resonance, infrared, ultraviolet, electron paramagnetic resonance, and mass spectrometry. Additional rooms are needed for X-ray diffraction equipment, for optical rotatory dispersion apparatus, for radioactive tracer work, for high-pressure reactions, for corrosive fluorine research, for cold storage of chemicals, as well as darkrooms equipped for research involving polarimetry and photochemical reactions. The Inorganic and Nuclear areas need space for an accelerator, a fluorine laboratory, a shop for radioactive work, an X-ray diffraction laboratory, darkrooms, an electrically-shielded calorimetry laboratory, and other special instrument rooms.

While some of these special needs can be accommodated within normal research laboratory space, an additional 3618 sq. ft. should be made available under Plan "B" and 7698 square feet under Plan "A". These areas should be rather flexible service areas of about 240 to 300 square feet each. The areas should be adjacent to the labs and in some cases may be contained within the laboratory.

Glass Shop

The Glass Shop now occupies about 750 square feet and houses one professional glass blower and two apprentices. To service the expanded Department of 1980, a staff of two professional and three apprentice glass blowers will be necessary. To house this expanded staff and

associated equipment, some 700 square feet of space will have to be added to the present area. This space will also be provided in the current building.

General Departmental Shop

The space presently available in this area can suffice for the next fifteen years if some remodeling is done. The Student Shop area abandoned in recent years because of pressing space needs should be recreated by using room 141, the present merchandizing service area. Thus, the total departmental shop area will then be 4860 square feet.

OFFICE SPACE

Offices are summarized in Tables 11 and 12. Plan "A" requires new offices totaling 33,790 square feet, and new office service space totaling 817 square feet while Plan "B" requires only 28,699 square feet of new offices and 667 square feet of new office service area. The allocations of office space by staff rank are listed in Table 9 and the general office considerations in Champter III. Basically, all divisions heads are allocated an office of 150-160 square feet each while the Department head is allocated an office of 190 to 200 square feet; all other professorial staff generate office space at a rate of 120 to 130 square feet per FTE staff, post-doctoral candidates each generate one half of an office while graduate teaching assistants are allocated 3 to an office 120 to 130 square feet in size. Clerical and service personnel, whose functions require office space, generate space at 100 square feet per full time equivalent staff. Table 20 details the office space required by type staff within each Chemistry division for both Plans "A" and "B".

There are presently nearly 50 rooms in the Chemistry Building being used as faculty offices. Of these, only 30 are of satisfactory size, configuration, and location for permanent use by the senior staff. (The remaining 20 will be used for junior staff.) Thus, to accommodate a senior staff of 100 in 1980, 71 new senior staff offices must be constructed (Table 12). Eight offices of 150-160 square feet each to be used by division heads and distinguished professors should be constructed.

In addition to planning the office space necessary for an expanded secretarial force, attention must also be paid to replacing unsatisfactory secretarial offices presently in use out of sheer necessity. Typically, such an office is a converted anteroom, crowded, poorly lighted and ventilated, shared with research equipment, walked through every few minutes by the many people working in a large research laboratory. About ten such offices are now in use and should be reverted back to their originally-intended use. Thus, including offices for the 19 new secretaries, a total of 25 secretarial offices must be provided at 100 square feet each for Plan "B". In addition, two rooms each of about 600 square feet should be provided for clerical-typists.

The next fifteen years will see the elevation of approximately five members of the service staff to the positions of shop managers, instrumentation counselors, design engineers, and other high-level service positions. These men will require relatively private offices. Five such offices averaging 100 square feet will be required and provided from space in the present building.

It is highly desirable that teaching assistants be given office space in keeping with their position as part-time members of the teaching staff. That portion of the 242 teaching assistants predicted in 1980

that will be first-year graduate students will not have research space and therefore will need a share of an office. Approximately 40 square feet per teaching assistant has been allocated.

TABLE 20: OFFICE SPACE REQUIREMENTS BY TYPE STAFF AND DIVISION

(Plan "A" and Plan "B")

TYPE STAFF REQUIRING SPACE	DIVISION							
	ANAL	BIOCH	GENRL	INORG	ORGAN	PHYSL	OTH	TOTAL
Plan A								
Administrative	----	----	----	----	----	----	540	540
Professorial-Perm	1,665	1,775	960	1,775	2,630	2,630	1,355	12,800
Professorial-Temp	125	125	500	125	250	250	-----	1,375
Post-Doctorals	1,200	1,275	----	1,275	1,875	1,875	-----	7,500
Teaching Assist's	----	----	6,667	----	----	----	-----	6,667
1st Yr. Fellows	65	65	----	65	90	90	-----	375
Clerical	500	500	600	500	750	750	1,400	5,000
Service Mgrs.	----	----	----	----	----	----	500	500
TOTAL	3,565	3,740	8,727	3,740	5,595	5,595	3,825	34,787
Plan B								
Administrative	----	----	----	----	----	----	570	570
Professorial-Perm	1,930	2,050]	1,055	2,050	3,000	3,000	1,590	14,675
Professorial-Temp	125	125	500	125	250	250	-----	1,375
Post-Doctorals	1,400	1,488	----	1,488	2,187	2,187	-----	8,750
Teaching Assist's	----	----	8,333	----	----	----	-----	8,333
1st Yr. Fellow	65	65	----	65	90	90	-----	375
Clerical	500	600	600	600	800	800	1,400	5,300
Service Mgrs.	----	----	----	----	----	----	500	500
TOTAL	4,020	4,328	10,488	4,328	6,327	6,327	4,060	39,878

OTHER SPACE

Chemistry Library

It is evident that the present facilities of the Chemistry Library are being strained to their upper limit. And it is also evident that the current literature explosion will continue in the years to come. Consequently, considerable expansion of the present Library facilities will be necessary.

Since the scientific literature is now doubling every ten years, it may even be conservative to estimate that the facilities for the next 15 years should merely double. But, hopefully, new efficiencies will be discovered in literature storage and retrieval that can reduce the space requirements.

Present library facilities include 5,036 square feet of space on the 3rd and 4th floor of the existing building. It is anticipated that the library facilities will expand in the present building taking over the present main offices on the 2nd floor and additional space on the 3rd and 4th floors. Approximately 4,142 additional square feet will be made available for library expansion and will require some minor remodeling. No library space will be required in the new addition unless a separate general Chemistry facility is constructed on a site other than the old Heavilon Hall location - then about 1,000 square feet of library reading room will be required in the new addition but will probably reduce the requirement for reading room space in the present building

Chemistry Stores

When the present building was planned, sufficient storeroom facilities were included to handle some 4000 undergraduate students. With the advent of the current IBM system, the present Chemistry Stores area can probably

handle the projected additional load from the new building if a number of strategically located dispensing-storerooms are included in the new building. One such dispensing storeroom for General Chemistry of about 900 square feet, will suffice if a rapid-handling system can be devised to connect the storeroom to the central facilities. This room should be centrally located to the General Chemistry Laboratories.

Presently, Chemistry stores occupies 14,361 square feet, part of which will be converted to research laboratory. This will leave a requirement for new storage space of about 3,000 square feet to replace that space converted to research. This space will be primarily used as a pyrex warehouse. Plan "B" requires three 600 square feet research dispensing rooms be constructed, one on every other primary research floor. Plan "A" would require a possible total of four 600 square feet dispensing rooms.

Commons

An increasingly critical problem, as the Department grows larger, is the promotion of a rapport among the graduate students and between the faculty and the graduate students. Should the "Purdue spirit" among the graduate students (and later the alumni) degenerate, the result would certainly be deleterious to the future recruitment of superior graduate students. To help cope with this problem and to give the students a more personal involvement with the Department, a coffee lounge and social room should be provided where students and staff can relax in comfortable surroundings and hopefully lower some of the (artificial)barriers between them. Furthermore and perhaps far more significant, a great deal of chemistry can be learned in so-called "bull sessions."

An area totaling no more than 1,400 square feet should be adequate if properly outfitted. It might also be desirable to be able to separate the room into two rooms of 800 square feet and 600 square feet respectively providing the separation is only by a temporary folding door or decorative screening strategically arranged.

V. REMODELING IN THE PRESENT CHEMISTRY BUILDING

As plans are being made for the expansion of the Department into a new building, the problem of dovetailing functions between the two buildings comes to the fore and brings with it the question of remodeling. Unlike some departments where the only considerations are the inhabitability and size of rooms (which can usually be accounted for by moving walls), a chemistry department utilizes at least two distinct types of space. On the one hand, it uses office- and classroom-type space where ventilation, air conditioning, lighting, and (movable) furniture are the primary considerations. On the other hand, a chemistry department also uses large amounts of space where research services - electrical power, water, drains, gas, air, oxygen, distilled water, hot water, fixed furniture, and hoods - must be built in. The costliness of these services implies that where they are presently installed, they should be used, and where they presently are absent, the costs of installing them are frequently prohibitive (often exceeding the costs of new construction). Consequently, the reassignment of existing space in the Chemistry Building is severely restricted. Fortunately, however, the present building was designed such that very little space is now outmoded, even the portions of the building which are nearly 40 years old. Essentially all research laboratories will continue unchanged, the exceptions being the "dungeons" in the basement recently pressed into use. These will revert to service and storage rooms. Essentially all offices will continue to be used as offices, but junior staff will be assigned to the lesser quality ones rather than senior staff. Classrooms, shops, research service areas, analytical facilities, and storerooms will continue essentially

unchanged.

One area that needs attention, though, is that of the advanced organic teaching laboratories (Rooms 316, 317 and 413). In planning, we have assumed that some remodeling will be done to these rooms, especially to the laboratory benches. Unless this is done, permitting more students to be accommodated, more new laboratories will be required than previously stated.

Another area in which remodeling will be required is the Chemistry Library. With the special flooring now in this area, it could be quite expensive to convert it into, say, office space, then planning to build an entirely new area for the Library in the new building. Alternately, and possibly less expensive, the Library could be expanded into the Main Office area and/or an area on the fourth floor presently devoted to offices. These alternates will require more intensive study but, in any case, some remodeling will be necessary.

The only reasonable expansion for Nuclear and Radiochemistry research is in the area adjacent to their present facilities. To move the entire research area to new facilities in order to provide expansion space would be quite expensive because of the replacement of the highly specialized facilities currently in existance. Therefore, the only relatively inexpensive alternative for expansion is to remodel the space on the second floor for Nuclear and Radiochemistry research. There are about 3325 square feet of space which would require replacement of laboratory furniture and hoods, tiling of the floors; making the walls washable and generally making the area safe and acceptable as laboratory which will handle radioactive materials.

Finally, chilled water air conditioning should be extended to the rest of the present building (63,781 square feet), except perhaps for some shop and storeroom areas (See Table 15, page 15, page 38). The lecture rooms, Main Office, and Library well-water cooling systems should be changed over to chilled water. The mechanical units serving some areas, notably Nuclear and Radiochemistry, should be replaced with chilled water units. Where now used, window mechanical units should be replaced. Experience with chilled water air conditioning indicates that this project is feasible; its desirability clearly shown by the present policy of the University to air condition all new academic construction

VI. SPACE REQUIREMENTS FOR AUDIOLOGY AND SPEECH SCIENCES

DEPARTMENT MISSION

The field of Audiology and Speech Sciences is the scientific study of the physical, biological, bio-engineering, psychological, sociological, the linquisitic bases involved in the production, transmission, and perception of both normal and disordered human communication. Individuals functioning within this area of professional work are involved with both the scientific study of the various aspects of the field and with the translation of the results of such study into direct service to individuals and groups who seek to improve their own communicative facility. The accomplishment of these tasks involves clinical, laboratory, and computer integration of basic and applied principles from the social, biological, and physical sciences.

The Department of Audiology and Speech Sciences has a threefold mission in the University. It provides the dedactic instruction in areas of normal and disordered human communication. It serves as the center for research in human communication. In its clinical program, the Department provides services to students and residents of the state who have problems in the perception or production of speech. Within these broad aspects of the assigned mission, there are several specific sub-goals and activities which need to be recognized if the total program is to be adequately understood.

In the academic portion there are three basic areas of instruction and two types of programs for each area. A basic area, speech and hearing sciences, serves as an underpining to the other two and is concerned with the anatomy and physiology of the speech and hearing mechanism, the measurement and analysis of the speech production mechanism, and the study of the

acoustical aspects of speech. The area of audiology concerns itself with the study of the ear and auditory neural pathways as receptors of the speech signal, the measurement and qualitative evaluation of disorders in the hearing mechanism, and the habilitation or rehabilitation of persons having hearing impairments. The third area, speech pathology, is the science which deals with the diagnosis of functional and organically based speech and language disorders and the habilitation or rehabilitation of persons having such disorders. For each of these areas there is a program of instruction at the undergraduate level and a program at the graduate level.

The undergraduate program of the Department emphasizes the acquisition of basic factual materials in all three areas of instruction. The vast majority of undergraduate students are preparing for careers as speech and hearing therapists in the public schools. The emphasis, therefore, in most undergraduate courses is the material that will help Purdue graduates to maintain their positions as leaders in the area of Public School work.

The graduate program of the Department has many facets. It trains audiologists, speech pathologists, and speech scientists at the master's level and the doctoral level for positions in university and college teaching, medical clinics, research laboratories, community and agency rehabilitation centers, and for supervision of programs in the public schools. Specialized course work is offered in depth in each of the three areas previously enumerated.

The second major aspect of the Department's mission is the conduct of research leading to the acquisition of new knowledge in and the application of theoretical concepts to the field of human communications.

Some of this research effort is directly related to the training of graduate students and takes the form of thesis and dissertation projects conducted by the graduate students under the direction of members of the staff. The remainder of the research effort is made up of the individual and collaborative projects of staff members. Many of the staff members of the Department are recognized on and off the campus as outstanding scientists in their fields of specialization and have made many key contributions to the advancement of knowledge in their fields. The Department is recognized internationally as a leading center for research in the area of speech and hearing science.

The third major aspect of the mission of the Department of Audiology and Speech Sciences is the clinical program. The Speech and Hearing Clinics provide diagnostic and remedial services for individuals who have disorders in speech and hearing. The clinical activities serve three purposes. They provide the teaching laboratory for students in their undergraduate and graduate training so that application can be made of the principles learned in the classroom. They provide the source material for a large number of the research endeavors of the staff and graduate students. Finally, these activities serve members of the University community and the surrounding area who have need of habilitative and rehabilitative assistance for communicative disorders.

The philosophy of the Department is to give equal emphasis to all aspects of its mission and to develop these areas in such a way as to keep the close relationship that exists between them as an everyday reality. By so doing the strength of one area increases the strength of the other areas and vice versa.

ENROLLMENT PROJECTIONS

The Department has placed no limit on its enrollment at either the undergraduate or graduate level. It is its intention to expand at the rate of student demand for training in the field and at a rate that does not exceed its ability to maintain the already established level of excellence for which the program is known. Projections for future years are based, therefore, on the assumption that staff and space support will be given by the University as required.

From the current enrollment levels (191 undergraduates and 77 graduates), projections have been made in three ways. The first (low estimate) was based on the average of the size of the undergraduate and graduate enrollments for the Department in recent years compared to the size of the total undergraduate and graduate enrollments for the University. In percentage these averages were 1.2 for the undergraduates and 1.6 for the graduates. These percentages were then used to compute the number of students the Department could expect from the total enrollments anticipated by the Registrar.

A second projection (middle estimate) was then made to reflect the fact that the Department's share of the total enrollment has grown during the past five years at both the undergraduate and graduate levels. To allow for the possibility that this growth rate was abnormally high for the period, the average increase was reduced by 50 per cent. Estimates were then made for the undergraduate program on the basis of an increase of .03 per cent per year from a base of 1.2 per cent and for the graduate program on the basis of an increase of .05 per cent per year from a base of 1.6 per cent. These values were then applied to the total enrollments

anticipated by the Registrar to compute possible Department enrollments.

A final projection (high estimate) was made on the basis of the average increase in enrollment for the two years in the past five showing the smallest growth for the undergraduate and graduate programs. For the undergraduate level this average was 6 per cent. At the graduate level the average was 9.6 per cent. A projection for each was then made on the assumption that they would continue to grow at these rates each year. The results of each of these methods of predicting student enrollment are shown in the following table.

TABLE 21. LOW, MEDIUM AND HIGH PROJECTIONS OF GRADUATE AND UNDERGRADUATE AUS ENROLLMENTS BY YEAR

Year	Type of Estimate	Projected Enrollment		
		Undergraduate	Graduate	Total
1970	low	228	90	318
	medium	260	122	382
	high	256	122	378
1975	low	268	122	390
	medium	335	174	509
	high	338	193	531
1980	low	285	145	430
	medium	380	225	605
	high	450	304	754
1985	low	295	165	460
	medium	402	278	680
	high	606	480	1086

STAFF PROJECTIONS

The calculation of staff size for the Department of Audiology and Speech **Sciences** is based on the assumption that no new programs will be initiated but that the existing program will be strengthened by adding depth in areas now taught. It is assumed also that staff will be added on research appointments on the eventual basis of one research billet to four instructional achieving this ratio in 1985.

The research orientation of the graduate program in the Department necessitates a student to staff ratio of no more than 7 to 1 for graduate instruction. The intensive laboratory and clinical aspects of the undergraduate program dictates a student staff ratio of 27 to 1 for undergraduate instruction. The projections for staff in Table 22 (3I to 6I) are based on these ratios applied to the most conservative estimate of future student enrollment. The estimate for graduate teaching assistants (2I) is based on a combined graduate and undergraduate student to assistant ratio of 23 to 1. This ratio is the maximum that is feasible in the Department. The number of graduate research assistants shown is based on the projected increase in staff contractual research.

TABLE 22. PROJECTED AUS F.T.E. STAFF BY RANK AND YEAR

	F.T.E. Staff by Rank			
Year	3I-7I	4R-6R	2I	2R
1970	23.0	2.0	15.0	5.0
1975	27.0	5.0	17.0	9.0
1980	31.0	6.0	18.0	12.0
1985	35.0	8.0	20.0	15.0

SPACE REQUIREMENTS

In Table 23, the additional space requirements for the Department during the period through 1980 are presented. In Table 24, the projected course enrollments based on the lowest estimate of Departmental growth are presented. Overall, a total of about 15,000 square feet of assignable space is the minimum requirement to sustain the Department to 1980.

Clinic Requirements

The clinical training portion of the Department program will grow at the same rate as the enrollment in the undergraduate and graduate program. The space required for this activity is planned on the basis of 70 per cent room usage on a 40 hour week. It appears that one third of the graduate students in the program at any time will need 10 hours per week of clinical training and that one fourth of the undergraduates will require 6 hours per week and an additional one fourth of the undergraduates will require 2 hours per week. On this basis, the total number of clinical rooms (at 60 square feet per room) required in 1980 will be 37 or a net need for 18 new rooms.

Research Laboratory Requirements

Space must be made available for staff research projects that are independent of thesis research. Since the graduate teaching faculty will be hired in part on the basis of their own research competency, time will be programmed for them to continue their own research. It is assumed that, on the average, four staff members can share a single laboratory of 200 square feet. For staff members assigned primarily to research it is assumed that on the average one 200 square foot facility would serve two researchers. On this basis, the additional 1980 laboratory requirements

(at 200 square feet per laboratory) would be 10 laboratories or 2,000 square feet.

Graduate thesis research activities are in progresss at all times for approximately 28 per cent of the graduate enrollment. Of this portion of the graduate enrollment, 20 per cent of the projects will be directly related to ongoing staff research and will use the same space as that assigned to the regular staff. For the remainder it is estimated that at most an average of four students can be expected to share a 200 square foot laboratory space. This projection requires 1980 room assignments which generate a need for 7 new 200 square feet graduate research laboratories for a total of 1400 square feet.

In order to support the research, clinical and instructional programs, additional shop space will be required for maintenance, issue, and storage of equipment. It is estimated that 400 square feet will be needed for these purposes. This room should contain a modular bench for equipment maintenance with a wall mounted shelf above the bench. About 12 feet of cabinets or shelves for paper supplies and small parts should be provided. About 60 lineal feet of built-in storage shelves floor to ceiling is required. An issue counter with files space below should be installed in one corner of the approximately 20' X 20' room.

Three types of research laboratories (200 sq. ft. each) are required (Types A, B, C). Each lab should have independent 3 wire 20 amp service through a full length plug strip 18" off the floor running the entire length of one of the longest walls. All rooms should be grounded to independent earth grounds. Hall doors should be of the noise reducation type (Riverbank Labs type).

Type "A" rooms (four required) should include IAC 1200 series sound room or equivalent, air line for 100 psi and R.F. shielding throughout. Type "B" rooms (twelve required) to include air line for 100 psi. Type "C" rooms (two required) should include desk height tables along both walls. Two low impedance and two high impedance outlets along the wall side of the table every 30 inches of desk length. These lines are to be terminated at a panel in an adjacent type "B" room. Removable partitions two feet high every 30" of desk length should be installed for listening carrels. There should be 16 stations in each type "C" room. All rooms should be equipped with a 4' X 6' chalkboard and a 2' wide X 4' high corkboard.

Office Requirements

Office space must be made available to replace laboratories and clinic areas now being used to house staff and to provide for expected new staff which will be required to support the instructional, research, clinical and public service responsibilities of the department. A total of about 32 new staff offices of 120 sq. ft. each should be provided.

Office space is required for graduate teaching and research assistants at a ratio of one 120 sq. ft. office for each 3 teaching assistants or each 4 research assistants. Eighteen such offices are required to house 36 teaching assistants and 24 research assistants. Two 120 sq. ft. offices are required to house 4 clinical staff.

Two 120 sq. ft. offices should be provided for the Staff Psychologist and Staff Social Worker. In addition, a space to house departmental and clinic records of 240 sq. ft. is required.

Parent Consultation Rooms

Four parent consultation rooms with a one-way glass and common

observation area should be provided. These rooms should be about 8 feet wide by 10 feet long. The windows from the observation room to the consultation room should be 2'6" X 5' one-way glass. There should be an intercom from each room to the observation area with four phone jacks to each room. Storage cabinets should be built in above the window and will also conceal the microphone. Except for their size, the clinical rooms of 60 sq. ft. each have the same specifications with the addition of a built-in desk height table along the window wall of each clinical room.

Undergraduate Clinic Report Lab

This room should be about 16' X 20' to 20' X 20' in size and should contain lockers with combination or key locks on both side walls and coat racks on both sides of the door. The room will be used by undergraduate students in writing clinical reports using records which cannot be taken from the area. Workshelves should be provided on each side of the room with adequate lighting under the lockers. The room should be equipped with writing tables, a chalkboard and a corkboard.

Dental Research Lab

This room should be about 200 sq. ft. in size with a darkroom at one end. The darkroom need not be specially treated for sound. A curtain over the passage to the darkroom will be sufficient. In the main room standing height tables should be installed along the longest walls with storage cabinets above. An air line at 100 psi and a wash basin are also required.

ENT Exam Room

The Ear Nose and Throat examination room should be about 120 sq. ft. in size and be equipped with a wash basin and a 100 psi air line.

Graduate Teaching Laboratories

Two 20 station graduate teaching laboratories should be constructed in some adjacent manner so that 5 or 6 individually treated sound rooms can be shared. Each room should be about 17 feet wide and 26 to 30 feet long. Standing height workbenches should be installed along the two longest walls and as a center island. A two foot deep storage shelf should be provided above all wall counters. Each bench should be serviced by a separate 20 amp electrical circuit with a plug strip the full length of the table. Storage drawers should be provided below the benches within each three foot section and knee hole space of about 20 to 24 inches should also be provided. An instructor's table should be located at one end of the room and be equipped with 20 amp electrical service, 100 psi air line and storage cabinets below. A pull down projection screen, fourteen feet of chalkboard, and pull down corkboards for mounting charts are to be installed. However, a more satisfactory alternative might be horizontal sliding chalkboards with a corkboard mounted behind. All floors should be tiled.

The 5 or 6 individually sound treated rooms should be about 5 feet wide by 7 feet long and treated for noise reduction from all directions as follows:

37.5- 75 HZ	30 dB
75 -100 HZ	45 dB
150 -300 HZ	60 dB
300 -600 HZ	75 dB
600 -1200 HZ	80 dB
1200 -2400 HZ	80 dB
2400 -4800 HZ	80 dB
4800 -9600 HZ	80 dB

Television Complex

This complex is a group of two adjacent rooms designated as a TV studio lab (200 sq. ft.) and a TV control and storage room (240 sq. ft.).

The hall door to the studio lab should be sound treated (Riverbank Labs type). A three foot by eleven foot sound treated (three layer) one-way observation window should be installed between the studio lab and the control room. Coaxial cable should lead from a terminal panel in the control room to all clinical and laboratory rooms and to the studio. Variable light control should be provided in the studio with provisions for overhead spot lights. Provision should be made for temperature control in the studio when taping. All specifications for this complex should be checked with the appropriate campus television specialists.

TABLE 23 SUMMARY OF AUDIOLOGY AND SPEECH SCIENCES
NEW SPACE REQUIREMENTS TO 1980

TYPE SPACE	NUMBER	AVERAGE SIZE	TOTAL AREA
Staff Offices	32	120	3840
Grad Teaching Asst. Offices	12	120	1440
Grad Res. Asst. Offices	6	120	720
Speech Therapy (Clinic Rms.)	18	60	1080
Undergrad Clinical Report Lab.	1	395	395
Staff Res. Lab	10	200	2000
Grad Res. Lab	7	200	1400
Clerical Office	2	120	240
Equip Storage & Issue	1	400	400
Dental Res. Lab	1	200	200
TV Control Rm.	1	240	240
TV Studio	1	200	200
Dept. & Clinic Records	1	240	240
Parent Conference Rm.	4	80	320
Department Library	1	300	300
Grad Teaching Lab	2	600	1200
Staff Psychologist Office	1	120	120
Staff Social Worker Office	1	120	120
ENT Examination Room	1	120	120
Observation Rooms	4	135	540
	Total Assignable Square Feet		15,115 sq. ft.

APPENDIX A

PROJECTED CHEMISTRY COURSE ENROLLMENT DATA

CHEMISTRY DEPARTMENT PURDUE UNIVERSITY
STAFF AND SPACE NEEDS FOR
1975-1980 1ST SEMESTER COURSE ENRL AND GSP PER H.A. AND C.S. 16 NOV 66 -PAGE 02
REQUIREMENTS PROJECTIONS

DEPT	CRS	TYPE	SPACE	CONT	FTE	CLASS	ENRL	SEC	SCH	RMHR	TOT FTE	PCT FILL OF LAST SECT
CHM	107	PRIM	CHMLECT	1.0	.25	350	395	2	395	2	.33	12.8571
CHM	107	SEC	CHMLECT	1.0	.12	24	395	18	395	18	2.16	95.4545
CHM	107	LAB	GENCHMLAB	3.0	.19	24	395	18	1185	54	3.42	95.4545
CHM	107	SUPR	NONE		.25	432	395	2			.50	91.4352
CHM	109	PRIM	CHMLECT	2.0	.25	350	207	2	414	4	.33	59.1429
CHM	109	SEC	CHMLECT	1.0	.10	24	207	10	207	10	1.00	85.7143
CHM	109	LAB	GENCHMLAB	3.0	.15	24	207	10	621	30	1.50	85.7143
CHM	109	SUPR	NONE		.25	432	207	2			.50	47.9167
CHM	111	PRIM	CHMLECT	1.0	.25	350	1060	4	1060	4	.50	2.8571
CHM	111	SEC	CHMLECT	1.0	.13	24	1060	47	1060	47	6.11	8.6957
CHM	111	LAB	GENCHMLAB	3.0	.20	24	1060	47	3180	141	9.40	8.6957
CHM	111	SUPR	NONE		.25	432	1060	3			.75	45.3704
CHM	112	PRIM	CHMLECT	1.0	.20	350	193	1	193	1	.20	55.1429
CHM	112	SEC	CHMLECT	1.0	.13	24	193	9	193	9	1.17	4.1667
CHM	112	LAB	GENCHMLAB	3.0	.20	24	193	9	579	27	1.80	4.1667
CHM	112	SUPR	NONE		.25	432	193	1			.25	44.6759
CHM	113	PRIM	CHMLECT	2.0	.37	350	343	2	686	4	.49	98.0000
CHM	113	LAB	GENCHMLAB	3.0	.30	24	343	16	1029	48	4.80	59.0909
CHM	113	SUPR	NONE		.25	432	343	2			.50	79.3981
CHM	115E	PRIM	CHMLECT	2.0	.43	350	1339	4	2678	8	.86	82.5714
CHM	115E	SEC	CHMLECT	1.0	.12	24	1339	59	1339	59	7.08	21.7391
CHM	115E	LAB	GENCHMLAB	3.0	.19	24	1339	59	4017	177	11.21	21.7391
CHM	115E	SUPR	NONE		.25	432	1339	4			1.00	9.9537
CHM	115K	PRIM	CHMLECT	2.0	.43	350	773	3	1546	6	.71	20.8571
CHM	115K	SEC	CHMLECT	1.0	.12	24	773	34	773	34	4.08	60.8696
CHM	115K	LAB	GENCHMLAB	3.0	.19	24	773	34	2319	102	5.46	60.8696
CHM	115K	SUPR	NONE		.25	432	773	2			.50	78.9352
CHM	116	PRIM	CHMLECT	2.0	.33	350	456	2	912	4	.43	30.2857
CHM	116	SEC	CHMLECT	1.0	.13	24	456	21	456	21	2.73	72.7273
CHM	116	LAB	GENCHMLAB	3.0	.20	24	456	21	1368	63	4.20	72.7273
CHM	116	SUPR	NONE		.25	432	456	2			.50	5.5556
CHM	116A	PRIM	CHMLECT	2.0	.38	350	522	2	1044	4	.50	49.1429
CHM	116A	SEC	CHMLECT	1.0	.16	24	522	24	522	24	3.84	72.7273
CHM	116A	LAB	INTERMLAB	3.0	.23	24	522	24	1566	72	5.52	72.7273
CHM	116A	SUPR	NONE		.25	432	522	2			.50	20.8333
CHM	117	PRIM	CHMLECT	2.0	.38	350	284	2	568	4	.50	81.1429
CHM	117	SEC	CHMLECT	2.0	.20	24	284	13	568	26	2.60	90.9091
CHM	117	LAB	INTERMLAB	3.0	.21	24	284	13	852	39	2.73	90.9091
CHM	117	SUPR	NONE		.25	432	284	2			.50	65.7407
CHM	119	PRIM	CHMLECT	2.0	.25	350	75	1	150	2	.25	21.4286
CHM	119	LAB	GENCHMLAB	3.0	.33	24	75	4	225	12	1.32	12.5000
CHM	119	SUPR	NONE		.25	432	75	1			.25	17.3611
CHM	120	PRIM	CHMLECT	1.0	.20	350	213	2	213	2	.26	60.8571
CHM	120	SEC	CHMLECT	1.0	.12	24	213	10	213	10	1.20	68.1818
CHM	120	LAB	INTERMLAB	3.0	.25	24	213	10	639	30	2.50	68.1818
CHM	120	SUPR	NONE		.25	432	213	2			.50	49.3056
CHM	224	PRIM	CHMLECT	2.0	.25	350	148	1	296	2	.25	42.2857
CHM	224	LAB	ANLCHMLAB	8.0	.50	24	148	7	1184	56	3.50	16.6667
CHM	224	SUPR	NONE		.25	432	148	1			.25	34.2593
CHM	251	PRIM	CHMLECT	3.0	.38	350	487	2	1461	6	.50	39.1429
CHM	251	SEC	CHMLECT	1.0	.10	17	487	29	487	29	2.90	64.7059

C H E M I S T R Y D E P A R T M E N T P U R D U E U N I V E R S I T Y
STAFF AND SPACE NEEDS FOR
1975-1980 1ST SEMESTER COURSE ENRL AND CSP PER U.A. AND C.S. 16 NOV 66 -PAGE 03

				REQUIREMENTS			PROJECTIONS					
DEPT	CRS	TYPE	SPACE	CONT	FTE	CLASS	ENRL	SEC	SCH	RMHR	TOT FTE	PCT FILL OF LAST SE
CHM	251L	LAB	ORGCHMLAB	3.0	.20	15	364	26	1092	78	5.20	100.0000
CHM	255	PRIM	CHMLECT	3.0	.38	350	292	2	876	6	.50	83.4286
CHM	255L	LAB	ORGCHMLAB	3.0	.17	17	290	18	870	54	3.06	5.8824
CHM	257	PRIM	CHMLECT	2.0	.30	350	234	2	468	4	.39	66.8571
CHM	257	SEC	CHMLECT	2.0	.25	25	234	10	468	20	2.50	36.0000
CHM	261	PRIM	CHMLECT	2.0	.30	350	330	2	660	4	.39	94.2857
CHM	261	SEC	CHMLECT	2.0	.10	24	330	14	660	28	1.40	75.0000
CHM	263L	LAB	ORGCHMLAB	3.0	.14	20	200	11	600	33	1.54	52.6316
CHM	265L	LAB	ORGCHMLAB	6.0	.28	24	140	7	840	42	1.96	100.0000
CHM	373	PRIM	CHMLECT	3.0	.35	150	153	2	459	6	.46	2.0000
CHM	374	PRIM	CHMLECT	3.0	.35	150	184	2	552	6	.46	22.6667
CHM	374L	LAB	PHYCHMLAB	6.0	2.00	60	164	3	984	18	6.00	73.3333
CHM	421	PRIM	CHMLECT	2.0	.50	150	126	2	252	4	.66	84.0000
CHM	421	LAB	ANLCHMLAB	8.0	1.50	24	126	6	1008	48	9.00	25.0000
CHM	500	LAB	GLASS LAB	3.0	.17	20	28	3	84	6	.34	40.0000
CHM	505	PRIM	CHMLECT	1.0	.22	150	122	2	122	2	.29	81.3333
CHM	513	PRIM	CHMLECT	1.0	.10	30	54	2	54	2	.13	80.0000
CHM	524	PRIM	CHMLECT	2.0	.75	90	68	2	136	4	.99	75.5556
CHM	524	LAB	ADVANALYT	8.0	.75	15	68	6	544	48	4.50	66.6667
CHM	525	PRIM	CHMLECT	2.0	.75	50	62	2	124	4	.99	24.0000
CHM	525L	LAB	ADVANALYT	4.0	.38	15	24	2	96	8	.76	60.0000
CHM	530	LAB	BIOCHMLAB	3.0	.10	5	2	1	6	3	.10	40.0000
CHM	533	PRIM	CHMLECT	3.0	.23	150	150	2	450	6	.30	100.0000
CHM	533L	LAB	BIOCHMLAB	3.0	.25	24	16	1	48	3	.25	66.6667
CHM	534	PRIM	CHMLECT	3.0	.30	150	52	2	156	6	.39	34.6667
CHM	534L	LAB	BIOCHMLAB	3.0	.30	24	10	1	30	3	.30	41.6667
CHM	560	PRIM	CHMLECT	1.0	.35	90	124	2	124	2	.46	37.7778
CHM	560	LAB	ADVORGLAB	3.0	.38	16	124	8	372	24	3.04	75.0000
CHM	561	PRIM	CHMLECT	3.0	.35	150	89	2	267	6	.46	59.3333
CHM	563	PRIM	CHMLECT	3.0	.23	150	92	2	246	6	.30	54.6667
CHM	577	PRIM	CHMLECT	2.0	.20	150	155	2	310	4	.26	3.3333
CHM	577	SEC	CHMLECT	1.0	.10	30	155	6	155	6	.60	16.6667
CHM	625	PRIM	CHMLECT	2.0	.65	50	60	2	120	4	.86	20.0000
CHM	625L	LAB	SPEANALAB	4.0	.38	8	60	8	240	32	3.04	50.0000
CHM	629	PRIM	CHMLECT	2.0	.27	40	49	2	98	4	.35	22.5000
CHM	634	PRIM	CHMLECT	3.0	.36	90	84	2	252	6	.47	93.3333
CHM	635	PRIM	CHMLECT	3.0	.26	60	33	1	99	3	.26	55.0000
CHM	641	PRIM	CHMLECT	3.0	.56	150	203	2	609	6	.74	35.3333
CHM	645	LAB	INORGLAB	6.0	1.12	20	37	2	222	12	2.24	85.0000
CHM	646	PRIM	CHMLECT	2.0	.30	50	37	1	74	2	.30	74.0000
CHM	649	PRIM	CHMLECT	2.0	.50	50	14	1	28	2	.50	28.0000
CHM	651	PRIM	CHMLECT	3.0	.51	150	238	2	714	6	.67	58.6667
CHM	657	PRIM	CHMLECT	2.0	.32	90	137	2	274	4	.42	52.2222
CHM	668	PRIM	CHMLECT	3.0	.42	90	117	2	351	6	.55	30.0000
CHM	671	PRIM	CHMLECT	3.0	.40	90	146	2	438	6	.53	62.2222
CHM	672	PRIM	CHMLECT	3.0	.40	50	43	1	129	3	.40	86.0000
CHM	682	PRIM	CHMLECT	3.0	.40	50	29	1	87	3	.40	58.0000
CHM	695A	PRIM	CHMLECT	1.0	.10	150	200	2	200	2	.13	33.3333
CHM	695C	PRIM	CHMLECT	1.0	.25	170	300	2	300	2	.33	76.4706
CHM	695D	PRIM	CHMLECT	1.0	.10	150	200	2	200	2	.13	33.3333
CHM	695E	PRIM	CHMLECT	1.0	.10	150	250	2	250	2	.13	66.6667

APPENDIX B

PROJECTED AUDIOLOGY AND SPEECH SCIENCES

COURSE ENROLLMENTS-1980

APPENDIX B

PROJECTED AUDIOLOGY AND SPEECH SCIENCE COURSE ENROLLMENT - 1980
(BASED ON LOW ESTIMATE OF DEPARTMENT GROWTH)

Course	1970		1975		1980		1985	
	Sem I	Sem II	Sem I	Sem II	Sem I	Sem II	Sem I	Sem II
210-1	30	30	34	34	27	27	28	28
210-2	30	30	34	34	27	27	28	28
210-3	-	-	-	-	27	27	28	28
240-1	30	30	34	34	36	36	37	37
240-2	30	30	34	34	35	35	37	37
241-1 (L)*	15	15	17	17	12	12	15	15
241-2 (L)	15	15	17	17	12	12	15	15
241-3 (L)	15	15	17	17	12	12	15	15
241-4 (L)	15	15	17	17	13	13	15	15
241-5 (L)	-	-	-	-	12	12	14	14
301-1	30	30	23	23	24	24	25	25
301-2	30	30	22	22	24	24	25	25
301-3	-	-	22	22	23	23	24	24
418		60		67		71		74
420-1	30	30	34	34	25	25	25	25
420-2	30	30	33	33	25	25	25	25
420-3	-	-	-	-	21	21	24	24
445-1	30	30	34	34	36	36	37	37
445-2	30	30	34	34	36	36	37	37
446-1 (L)	15	15	17	17	12	12	15	15
446-2 (L)	15	15	17	17	12	12	15	15
446-3 (L)	15	15	17	17	12	12	15	15
446-4 (L)	15	15	17	17	13	13	15	15

(Continued on Next Page)

APPENDIX B continued:

Course	1970		1975		1980		1985	
	Sem I	Sem II	Sem I	Sem II	Sem I	Sem II	Sem I	Sem II
446-5 (L)	-	-	-	-	12	12	14	14
460-1	30	30	34	34	36	36	37	37
460-2	30	30	34	34	36	36	37	37
462-1 (L)	15	15	17	17	12	12	15	15
462-2 (L)	15	15	17	17	12	12	15	15
462-3 (L)	15	15	17	17	12	12	15	15
462-4 (L)	15	15	17	17	13	13	15	15
462-5 (L)	-	-	-	-	12	12	14	14
510	35	35	40	40	45	45	48	48
515-1 (L)	10	10	11	11	12	12	12	12
515-2 (L)	10	10	11	11	12	12	12	12
515-3 (L)	10	10	11	11	11	11	12	12
515-4 (L)	10	10	11	11	11	11	12	12
520		15		20		23		27
522	18		25		29		33	
530		27		37		44		50
534	27		37		44		50	
538		27		37		44		50
540-Lecture	27		33		44		50	
540-1 (L)	14		17		16		17	
540-2 (L)	13		16		16		17	
540-3 (L)					12		16	
545		27		37		44		50
550	30		34		36		37	
550A	30		34		36		37	

(continued on next page)

APPENDIX B continued:

Course	1970 Sem I	1970 Sem II	1975 Sem I	1975 Sem II	1980 Sem I	1980 Sem I	1985 Sem I	1985 Sem II
552-1		15		17		18		19
552-2		15		17		18		18
552A-1		15		17		18		19
552A-2		15		17		18		18
557	99		12		15		17	
518	18		25		29		33	
560	36		49		58		66	
565		13		17		20		23
590 (DD)	15	15	20	20	25	25	30	30
600	36		49		58		66	
610	36		49		58		66	
616		9		12		15		17
618	9		12		15		17	
630 or 638-1	14		9		11		13	
630 or 638-2			8		11		12	
634		9		12		15		17
645	12		16		19		21	
646		12		16		19		21
650		7		10		12		14
655		9		12		15		17
670	9		12		15		17	
672		9		12		15		17
686	9		12		15		17	
Educ 426	30	30	34	34	36	36	37	37
Educ 427	30	30	34	34	36	36	37	37

*(L) - Lab