

A MEN'S ATHLETIC BUILDING FOR KANSAS STATE COLLEGE

by

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INTRODUCTION

After consideration of various problems, which might be suitable for a study such as this, it was decided that a Men's Athletic Building would more nearly approach the type of problem the author desired to study. This subject presents an architectural as well as a structural design problem. Realizing the problems arising in the design for such a building, the author has presented a number of studies in parti and a solution for some structural elements.

It was necessary to set up certain limitations and to decide upon the scope of the problem. It was assumed that a Men's Athletic Building would be erected at Kansas State College. This building should serve the dual purpose of housing the activities of men's Physical Education Department and providing a place in which various indoor athletic events could be held. It should be located to facilitate the activities of the department and at the same time be placed on a site which would be in harmony with any future campus developments. In the study of this problem the flexibility as to uses and the possibility of future additions should be kept in mind.

Specific requirements should include:

1. Ample seating capacity for at least 5,000 spectators.
2. A 220 yard track sufficiently wide for six lanes.
3. Adequate entrance and exit facilities for the movement of a large number of people.
4. Provision for sufficient offices for the Director of Athletics and the teaching staff of the Department of Physical Education.
5. Provision for gymnasium facilities and minor sports rooms.
6. Ample provision for a natatorium and seats for spectators.
7. Space for showers, lockers, and toilets.

The need for such a building was suggested by the crowded condition of the present gymnasium. The building originally designed for a gymnasium now houses the Military Department, a part of the Music Department, Women's Physical Education Department, and Men's Physical Education Department. The fact, that there is no building in which large numbers of people can convene justifies a desire for a building of this type. The ever increasing interest in intramural sports makes some future enlargement of athletic accommodations necessary; consequently, the Men's Athletic Building seems the practical problem.

In approaching this problem the study of previous

work provided a source of valuable information. This study was conducted through the use of books and periodicals containing information directly related to this problem and discussions of similar buildings on other campuses. As similar buildings were studied, the author was impressed by the lack of buildings with all the elements included in this problem.

With this information at hand many studies in part were made with the express purpose of obtaining a number of suitable schemes and of selecting the scheme, which in the author's opinion, could best be adapted to the needs of the Department of Physical Education of Kansas State College. As a result of this study eight separate schemes were evolved and a discussion of these was presented. After the selected design had been developed, the structural aspects of the problem were considered.

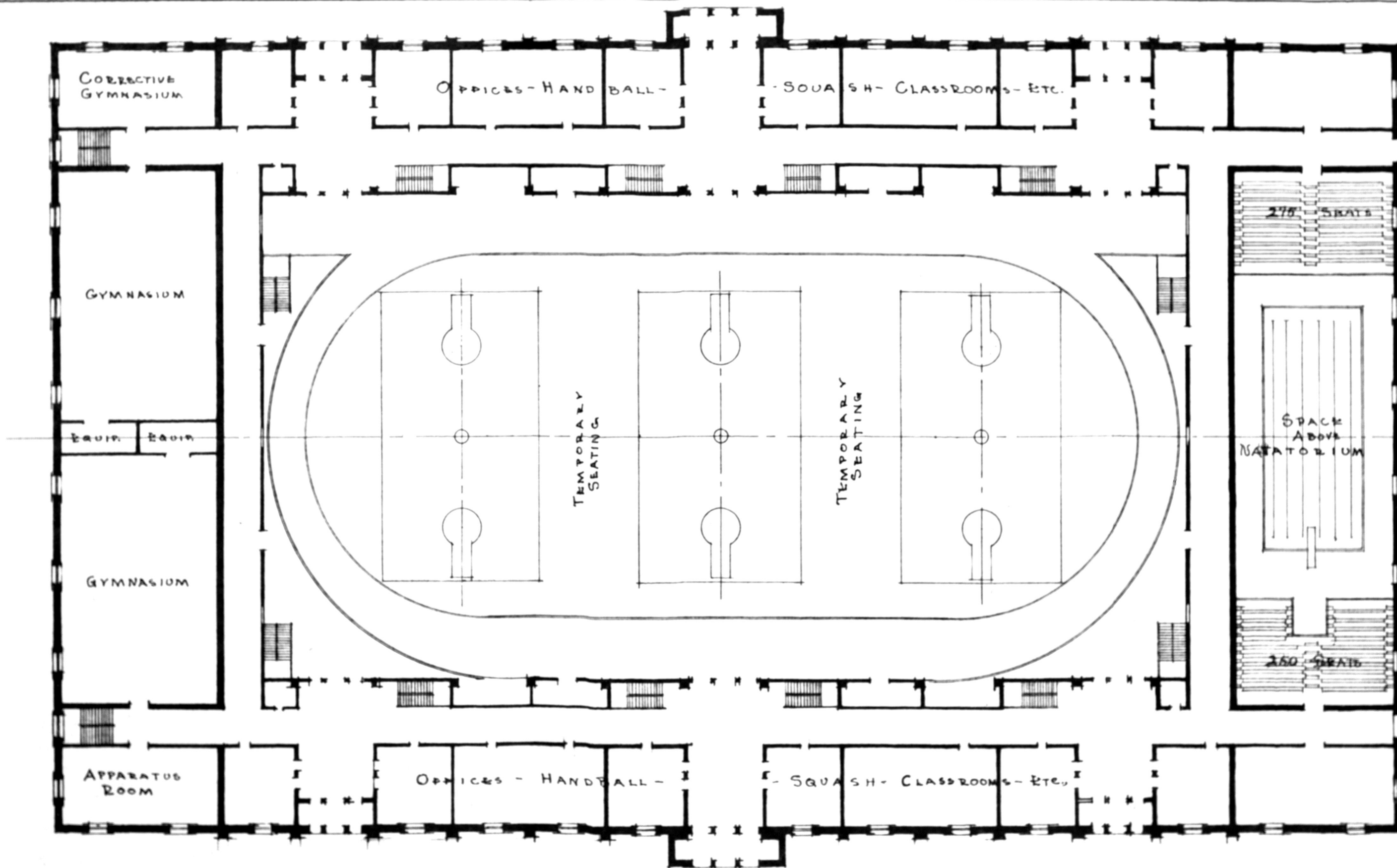
STUDIES IN PARTI

Considerable thought was given to the possible locations of this building. There seemed to be but two logical sites available. One of these seemed to be the plot of ground between Calvin Hall and Memorial Stadium, and the other seemed to be the plot between the baseball field and Memorial Stadium. The final scheme definitely eliminated the first of these because that site would be too small for the building. The second site presented many distinct advantages over the first; that is, close proximity to the Stadium, to the baseball field, and to the center of the Campus.

In the study of parti, one of the first schemes developed was Plan No. 1 (Plate No. I, page 6). The main entrances were on each side of the building and auxiliary entrances were at the ends of each corridor. The gymnasia are located at one end of the sports arena with storage space between the two rooms. The natatorium is at the other end. Spectators' seats in the gymnasium were not included because of the narrow room. If seats were needed, it would be possible to place them on the floor in the form of temporary bleachers. Provision for spectators' seats in the natatorium was made at the ends

PLATE NO. I

Plan No. 1, a Plan designed with entrances on
sides and gymnasium and pool at
opposite ends.



FIRST FLOOR PLAN
SCALE 1" = 30'-0"

PLAN No. 1
GYMNASIUM AND POOL AT
OPPOSITE ENDS. MAIN
ENTRANCES AT SIDES

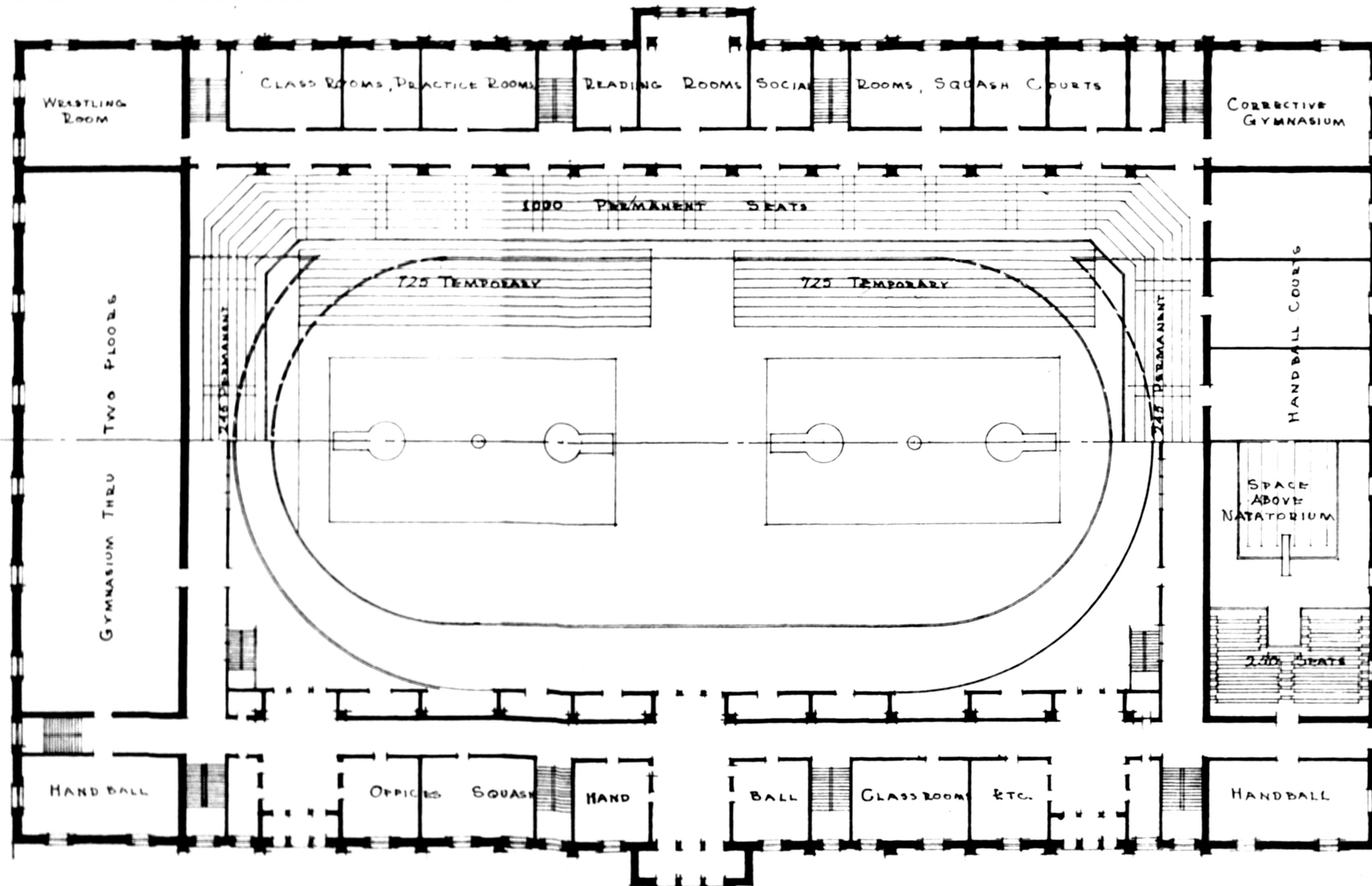
of the pool. The gymnasium and natatorium extend through two floors; the gymnasium occupies the first and second floors, and the natatorium occupies the basement and first floors. The second floor over the natatorium could be carried on beams with the space above used for handball courts. Offices were near the central side entrance and were joined by classrooms and minor sports rooms. The crowds would be distributed through corridors on first and second floors and to the balcony by means of stairways placed on a line with the interior columns.

Although this plan has the advantage of being very compact, it has faults that exclude it as a final solution. The location of the stairways penalizes seating space. Another disadvantage of this scheme is the location of the columns. If the columns are placed, as in this scheme, the span would be decreased sixteen feet; but the view from the balcony would be obstructed by the columns.

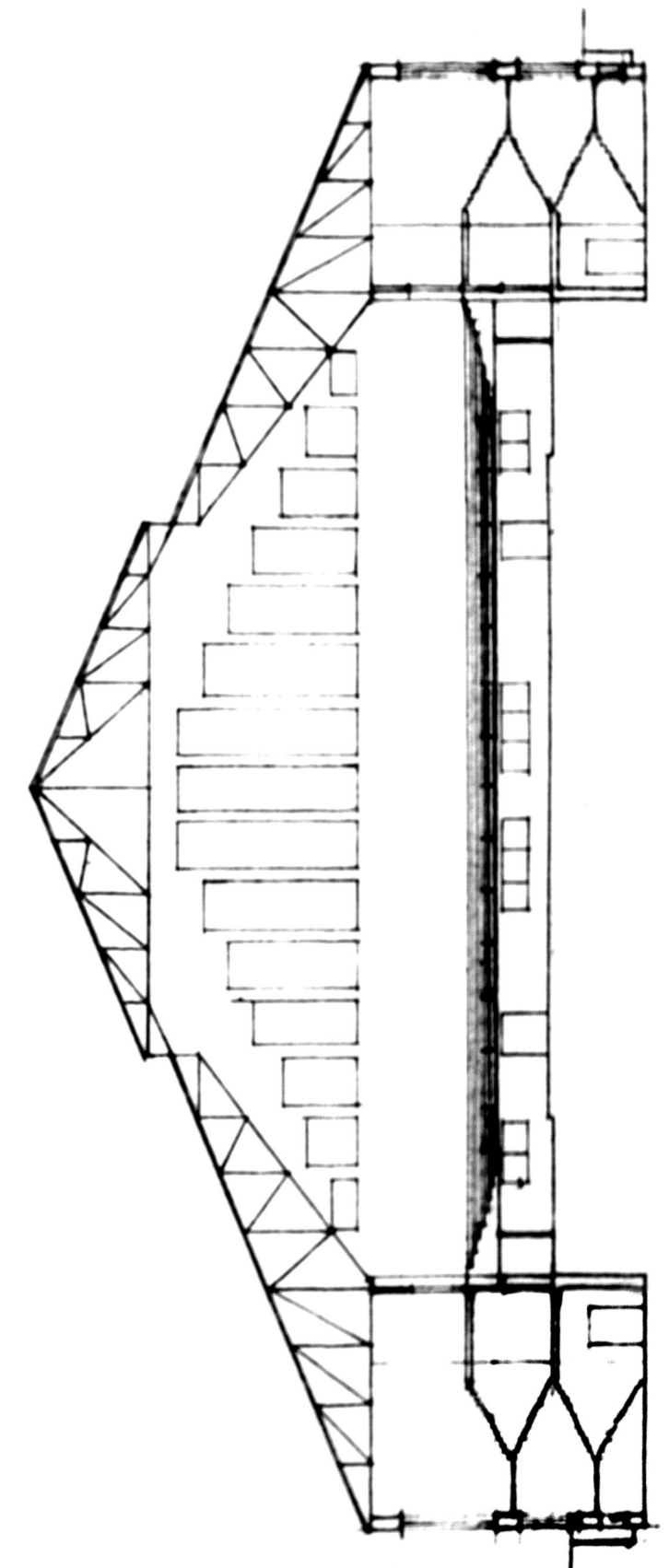
Plan No. 2 (Plate No. II, page 9) was developed in an attempt to maintain a compact building and yet eliminate the objectionable features of the previous plan. The stairways were taken out of the space beneath the balcony and moved to the outer walls. In this plan as in Plan No. 1 the natatorium extended from the basement

PLATE NO. II

Plan No. 2, a plan designed for a sloping site
and stairs brought to
outer walls.



COMPOSITE FLOOR PLAN
SCALE 1" = 30' - 0"



CROSS SECTION

PLAN No. 2

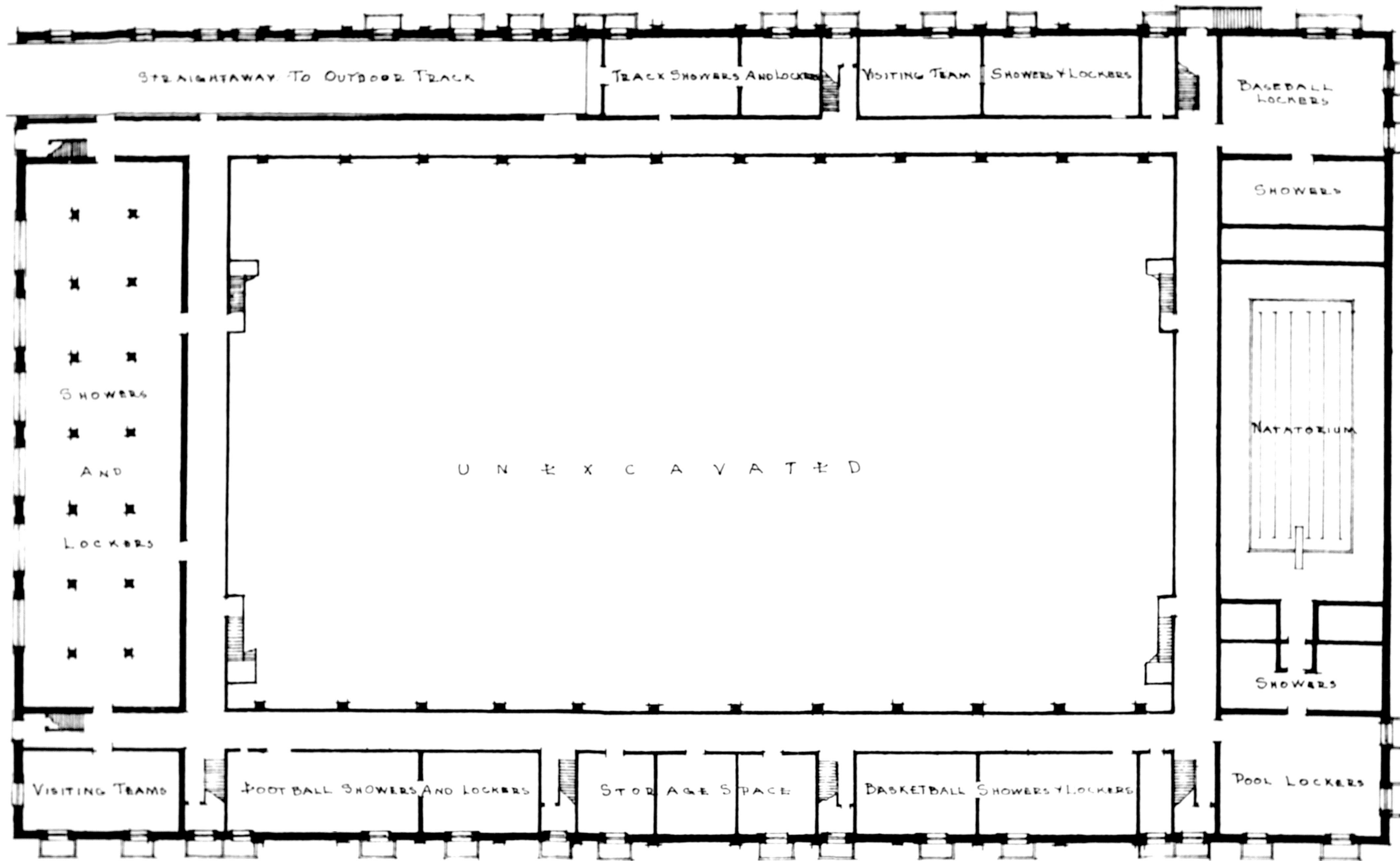
GYMNASIUM AND POOL AT
OPPOSITE ENDS. STAIRS
BROUGHT TO OUTER WALLS

to the second floor. Handball courts were placed on second floor with entrances from the balcony. Permanent seating has been provided in the balconies around the sports arena. The balconies were supported on columns in the walls of the storage space beneath the balcony and on the interior columns. The end balconies rest on columns in the corridor walls nearest the track and are tied to the columns in the gymnasium and natatorium walls. With this arrangement it would be possible to provide approximately 3,000 permanent seats in the balconies and 2,900 temporary seats of the bleacher type on the arena floor, with a total seating capacity of 5,900 seats. Stairways have been provided at the gymnasium end from grade entrances at the basement level. The locker and shower units have been placed in the basement as shown in Plan No. 2-b (Plate No. III, page 12).

There were six possible locations considered for this plan on the chosen site. It could be placed on an axis with the completed Engineering Building as shown in Plot Plan No. 1-a (Plate No. IV, page 14). This arrangement would have several advantages. It would make it possible to continue the drive in front of the Engineering Building on to the road on the west side

PLATE NO. III

Plan No. 2-b, a plan designed for basement
of Plan No. 2.



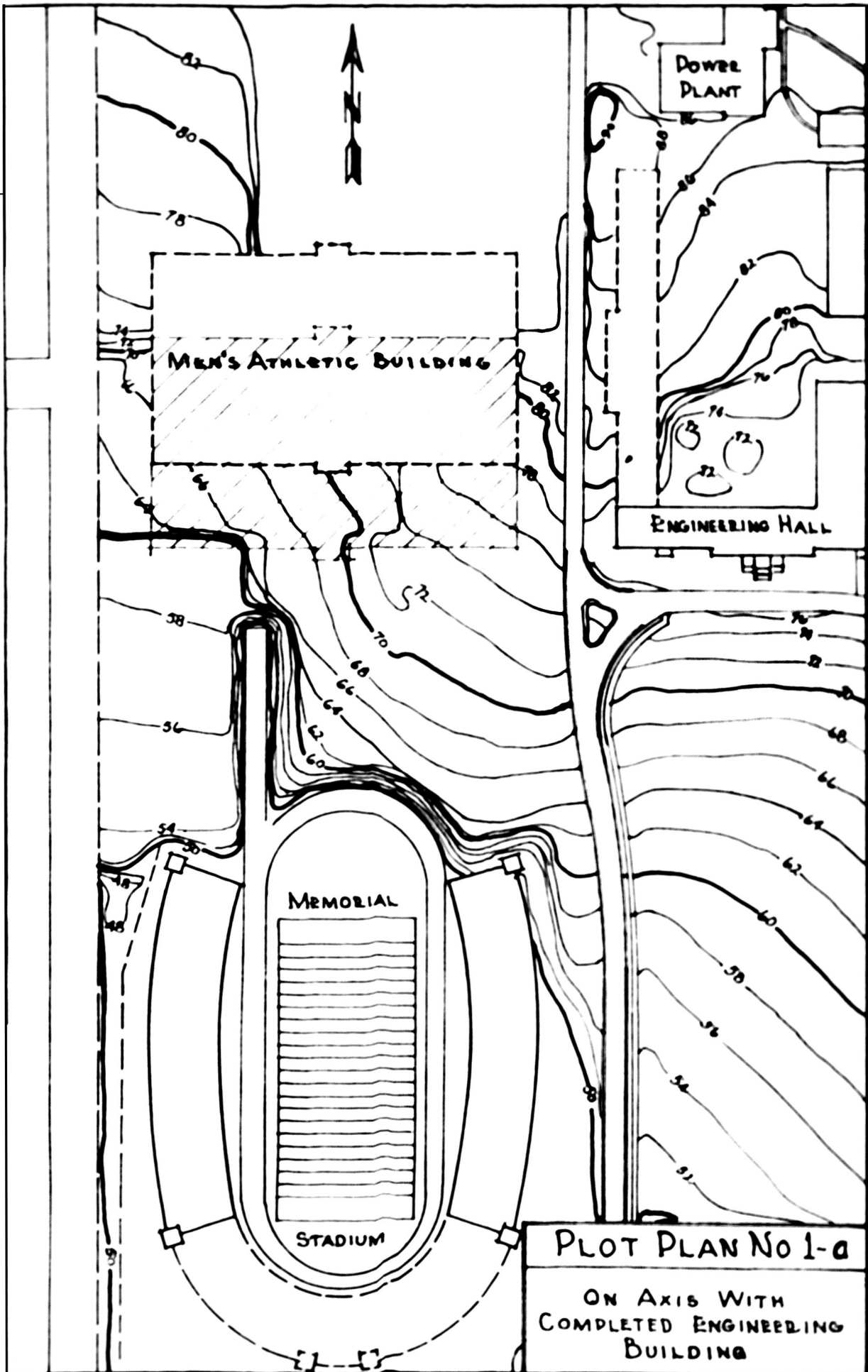
BASMENT FLOOR PLAN
SCALE 1" = 30'-0"

PLAN No. 2B

SHOWING ARRANGEMENT
OF SHOWERS, LOCKERS
AND STRAIGHTAWAY

PLATE NO. IV

Plot Plan No. 1-a, a location for
Plan Nos. 1 and 2, west of
Engineering Building.



of the campus; if it were so desired, the drive could be made north of the new building. If this location should be used, the building would present a pleasing view from the Stadium and Anderson Avenue. However, this location would involve moving the baseball field. A building of this size should not be placed too close to smaller buildings. This building so placed would appear out of scale with the Engineering Building. The space would be a little small for this building. An alternate similar location is indicated by the shaded area in Plot Plan No. 1-a (Plate No. IV, page 14). The second location on this site was the present practice field and just east of the straightaway to the outdoor track as shown in Plot Plan No. 2-a (Plate No.V, page 17).

This plan has much to merit its use as an alternate design. It is a compact and consequently an economical plan. It meets the requirements of the problem. The side entrances supplemented by the end entrances make it possible to move large crowds rapidly. The entrances to the balconies through doors in the second floor corridors provide maximum seating in the balcony. With the plan placed on the site as shown in Plot Plan No. 3-a (Plate No. VI, page 19) the stairways and basement

PLATE NO. V

Plot Plan No. 2-a location for Plan Nos. 1 and 2,
and on practice field east of
the straightaway.

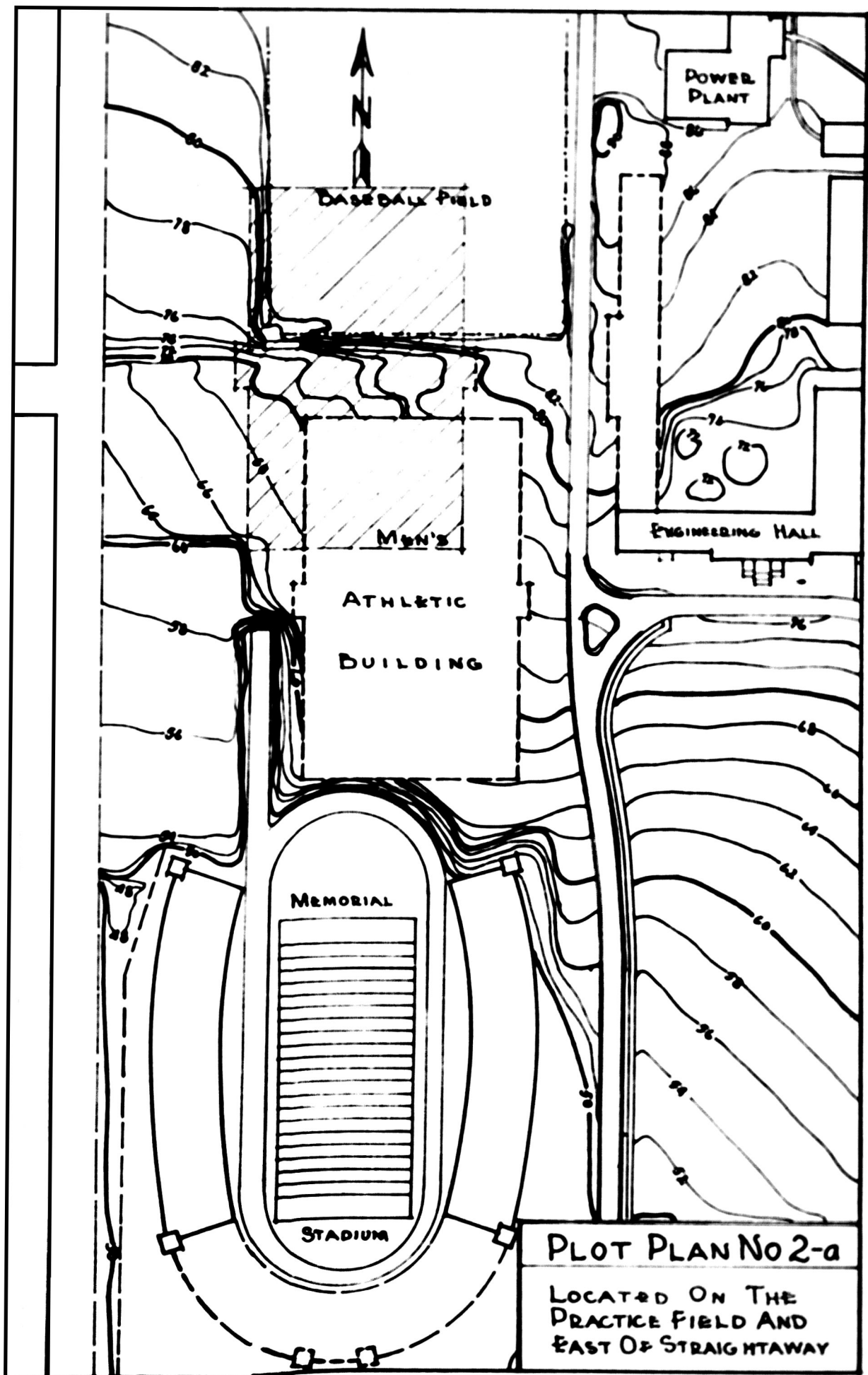
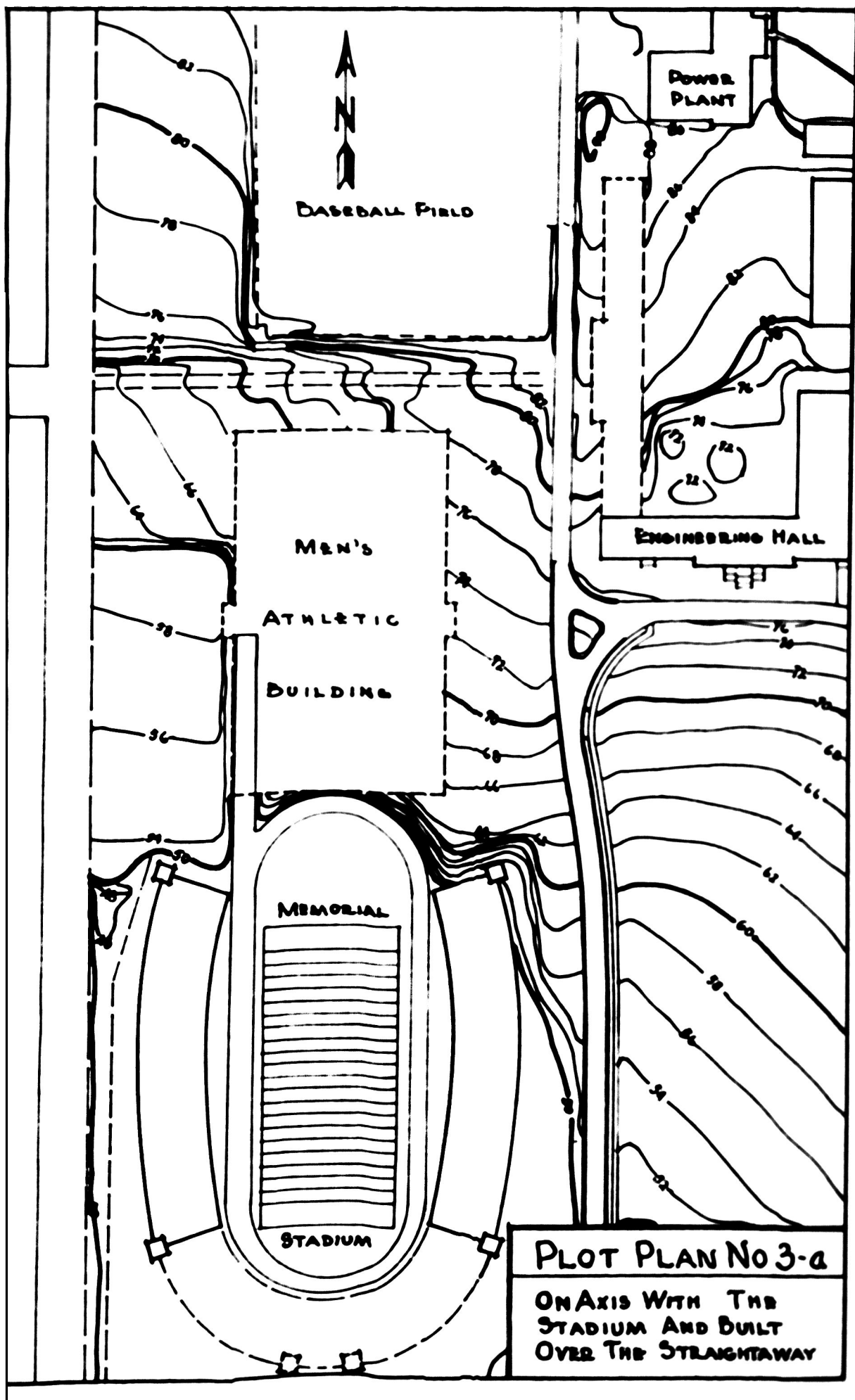


PLATE NO. VI

Plot Plan No. 3-a location for Plan Nos. 1 and 2
on axis of the Stadium and built
over straightaway.



would conform to the difference in existing grade.

This scheme was discarded because it was felt that a better arrangement of the various units could be attained. The seating in the natatorium has been placed on the ends of the pool because of the narrow width. This does not give the public the most advantageous position from which to watch swimming meets. Although it would be possible to provide an observation balcony at the first floor level extending over space around the pool as done by Starrett and Van Vleck, architects, Downtown Athletic Club, New York City.⁽¹⁾ In general, it seemed to the author that the gymnasium and natatorium were hardly sufficient size to meet the needs of the Athletic Department. Professor Washburn of the Physical Education Department expressed the opinion that the width of the gymnasium would be hardly sufficient.

This location on the site has many advantages in common with the first location. In addition it has the advantage that no vital changes in other campus elements would be necessary. This location places the axis of

(1)
Arch.For. 54:157. Feb. 1931.

the drive and of the main entrance on line. However, it also has some rather serious disadvantages. It would be off axis with the Stadium and would seem crowded if placed as shown in Plot Plan No. 3-a (Plate No. VI, page 19). This calls for the building to be built partially over the straightaway to the outdoor track. This does not seem to be a serious disadvantage. At the University of Illinois the indoor track is built in a tunnel which connects the armory and the gymnasium. This location does away with the crowded condition presented by the other locations. It removes the building a greater distance from the Engineering Building and nicely forms one side of a quadrangle which might be formed by other buildings to be built in the future. This location would leave both the baseball field and the road south of the proposed building undisturbed. With a building placed at this point, the amount of fencing of the Stadium could be appreciably decreased. Location at this point would eliminate the possibility of a continuation of the drive in front of the Engineering Building to the road west of the campus. A relatively serious grade situation would also arise, but this could be eliminated by proper arrangements of stair entrances. It was felt that the covered part of the track would receive sufficient light

from the windows at the side. A fourth location was tried, but since it has many objectionable features; it was discarded. (Plot Plan No. 4-a, Plate No. VII, page 24) The track would be placed literally in a tunnel with no outside light which might prove annoying to contestants. This scheme would again be too close to the Engineering Building. It seemed that the best solution to the location of this Plan or of Plan No. 1 would be as shown in Plot Plan No. 3-a.

The next study in parti was made with the intention of enlarging the gymnasium and the natatorium and bringing these various units in a more harmonious relationship with each other. The result of this study is shown in Plan No.3 (Plate No. VIII, page 26). The gymnasium and natatorium were increased in size and brought to one end of the building; the principal entrance in this end. The width of these rooms was increased to provide three basketball courts 35 by 70 feet. The increased width in the natatorium made it possible to provide side seating for spectators. Additional seats were also placed at the end of natatorium nearest the main entrance to the building. Entrances to the natatorium from the main lobby and from the side corridor were placed at the end and at the side of the pool respectively.

PLATE NO. VII

Plot Plan No. 4-a location over
straightaway.

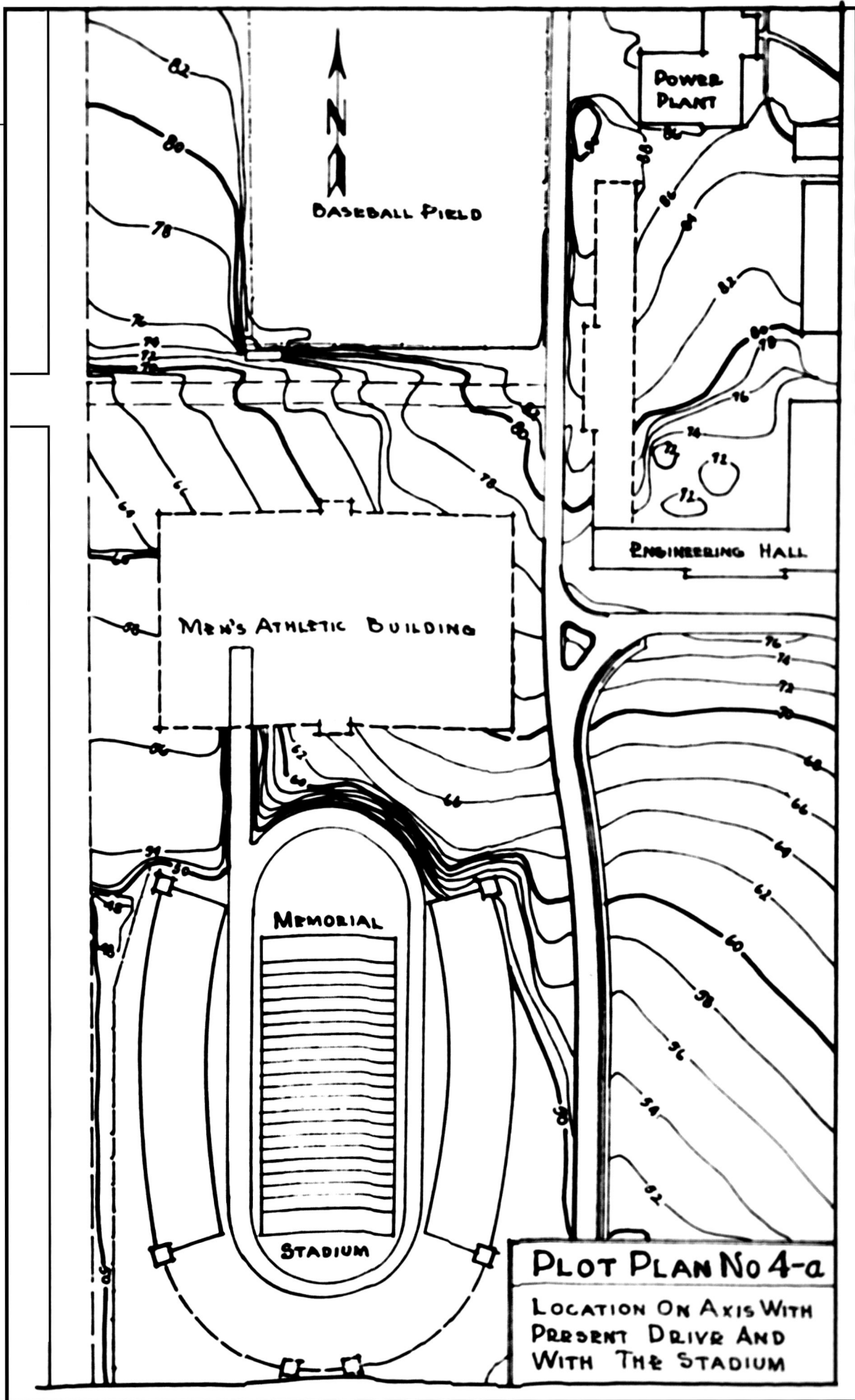
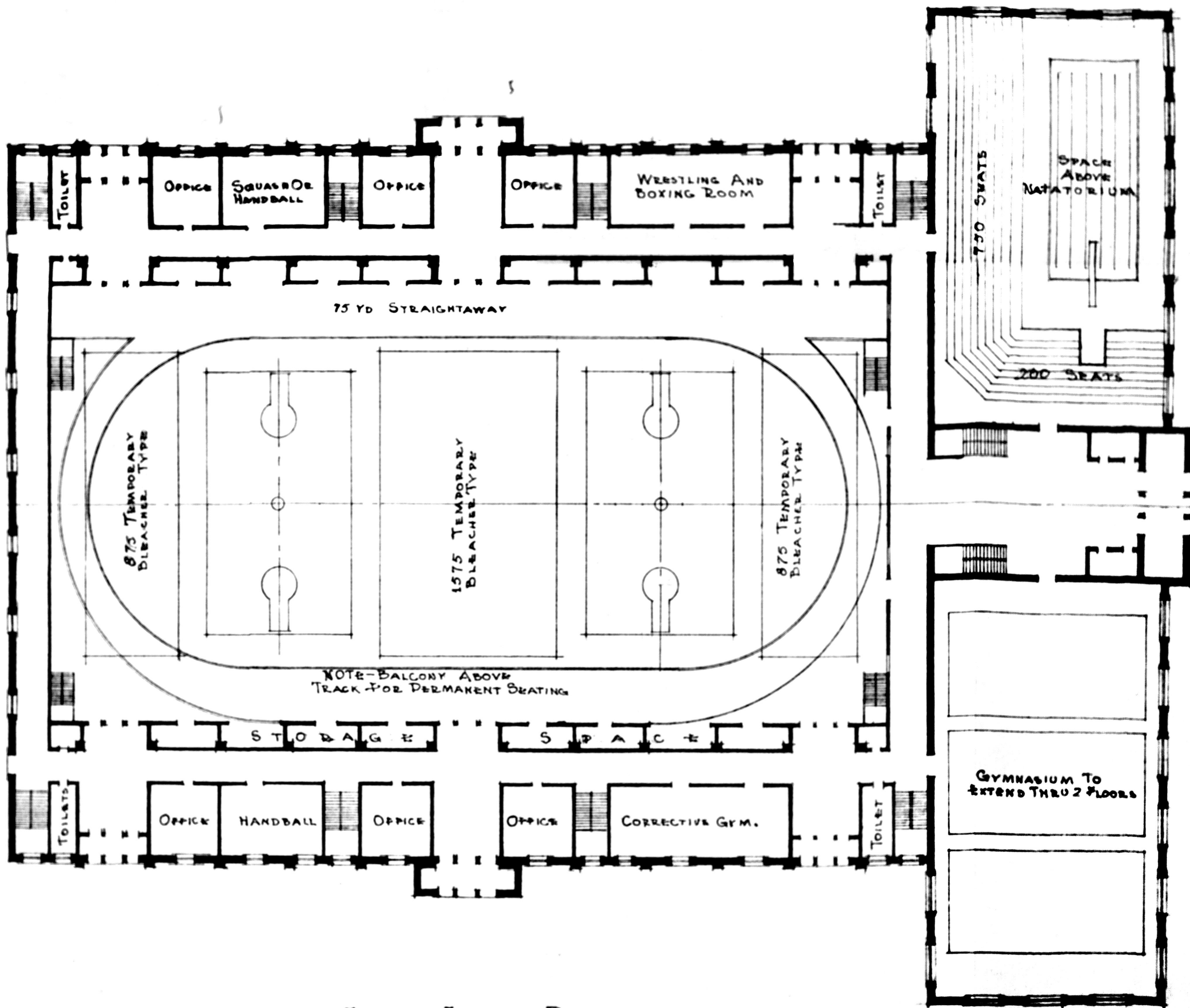


PLATE NO. VIII

Plan No. 3, a plan designed with gymnasium
and natatorium at one end.



FIRST FLOOR PLAN
SCALE 1" = 30'-0"

PLAN No. 3

GYMNASIUM AND POOL
BROUGHT TO ONE END.
MAIN ENTRANCE AT THE END

The main entrance to the building was brought from the sides to the center of the end containing the gymnasium. Ticket booths were placed at the sides of the main entrance. Stairways leading up to the second floor and balcony and down to the basement were also placed in the main lobby. As in previous schemes the public was distributed to the balcony seats on second floor by means of corridors and doorways which were placed between the interior columns. The public must pass over the sports arena floor to get to the bleacher type seats on the first floor. In addition to the main entrance the three entrances on the sides of the building have been retained in similar locations as in previous plans; stairways near these entrances lead to the second floor. The combined bleacher and permanent seats have a capacity of 5,000; 3,000 are of the bleacher type. Circulation of the contestants is attained by means of stairways to the basement located on the corners and outside the running track. Stairs lead to the basement from the first floor at the same points and beneath the stairways which lead to the second floor. The corrective gymnasium and wrestling and boxing rooms were placed on opposite sides near the end of the building containing the gymnasium and natatorium. To provide handball courts over the natatorium was not thought

practical since it would be quite expensive to satisfactorily truss across the wider span. In addition to the cost factor, it would lessen the desirability of the natatorium by lowering the ceiling considerably, due to the depth of the required trusses.

Plan No. 3 has a number of advantages in its favor. Probably one of the greatest improvements is the greater freedom and feeling of spaciousness given by the enlarged gymnasium and natatorium units. This increase in space made possible the placing of the spectators seats along the side of the pool. With the arrangement for the gymnasium shown in this scheme, it is possible to use three 35 by 70 feet courts. This scheme also serves to bring the units of the department into closer relationship.

This plan, although thought to be considerably better adapted to the problem, has some undesirable features which would not make it a satisfactory solution for the problem in question. Perhaps, one of the chief objections to this plan is the fact that the offices are located in positions away from the main entrance to the building. There is considerable wasted space in the main lobby due to the great depth of the natatorium and gymnasium. Another disadvantage of Plan No. 3 is the fact that there is no adequate provision for an apparatus room

and the space which might be allotted to handball courts seemed to be insufficient. It was, therefore, felt that some better arrangement might be developed whereby these objectionable characteristics might be eliminated.

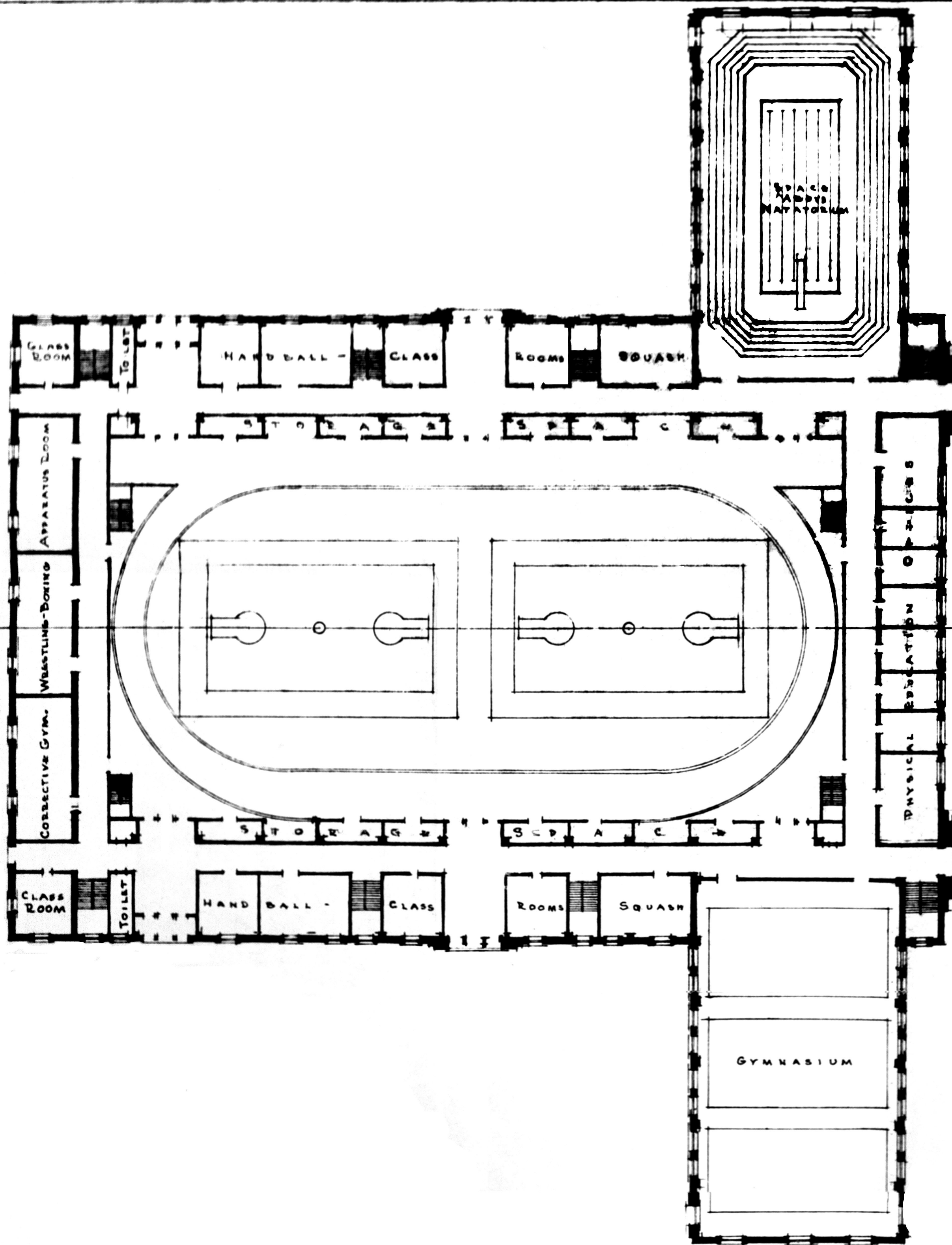
Realizing the desirability of locating the natatorium and the gymnasium in separate wings and at the same time the necessity of eliminating certain disadvantages of previous plans, Plan No. 4 (Plate No. IX, page 31) was developed. In this plan the natatorium and gymnasium have been counter-balanced in the wings and at the sides of the building. The main entrances were placed at the end of the corridors running along the side of the sports arena. This arrangement has been used in the Yost Field House at the University of Michigan by the architects, Smith, Hinchman, and Grylls.⁽²⁾ The offices of the staff of the Department of Physical Education have been placed between the two main entrances. Distribution of the public as in other schemes has been confined to corridors and stairways leading to the seating accommodations. The corrective gymnasium, apparatus, and wrestling rooms

(2)

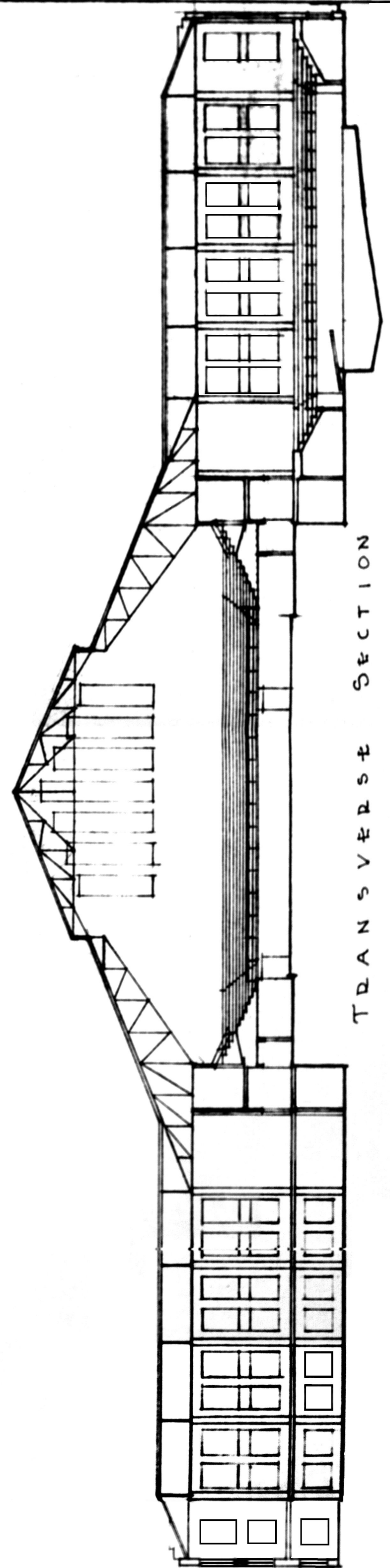
Klauder, Charles Z. and Wise, Herbert C., College Architecture in America, p. 227.

PLATE NO. IX

Plan No. 4, a plan designed with end entrances
on axis of corridors.



FIRST FLOOR PLAN
SCALE 1" = 30'-0"



PLAN No. 4
ENTRANCES AT FRONT
AND ON CORRIDOR AXES.
OFFICES AT FRONT.

have been placed across the rear of the building. A new arrangement of the natatorium seating space was tried in which the seats were made to carry all the way around the pool.

This scheme has some vast improvements over the preceding one, in the author's opinion. The arrangement of the offices near the main entrances is decidedly better than that of preceding studies in parti. The location of the gymnasium and natatorium in the wings makes it possible to have direct light from three sides of the rooms. This arrangement makes for less wasted space. Shower and locker space under the gymnasium becomes much more usable because of the fact that light enters the building from three sides. These advantages are offset by certain undesirable characteristics.

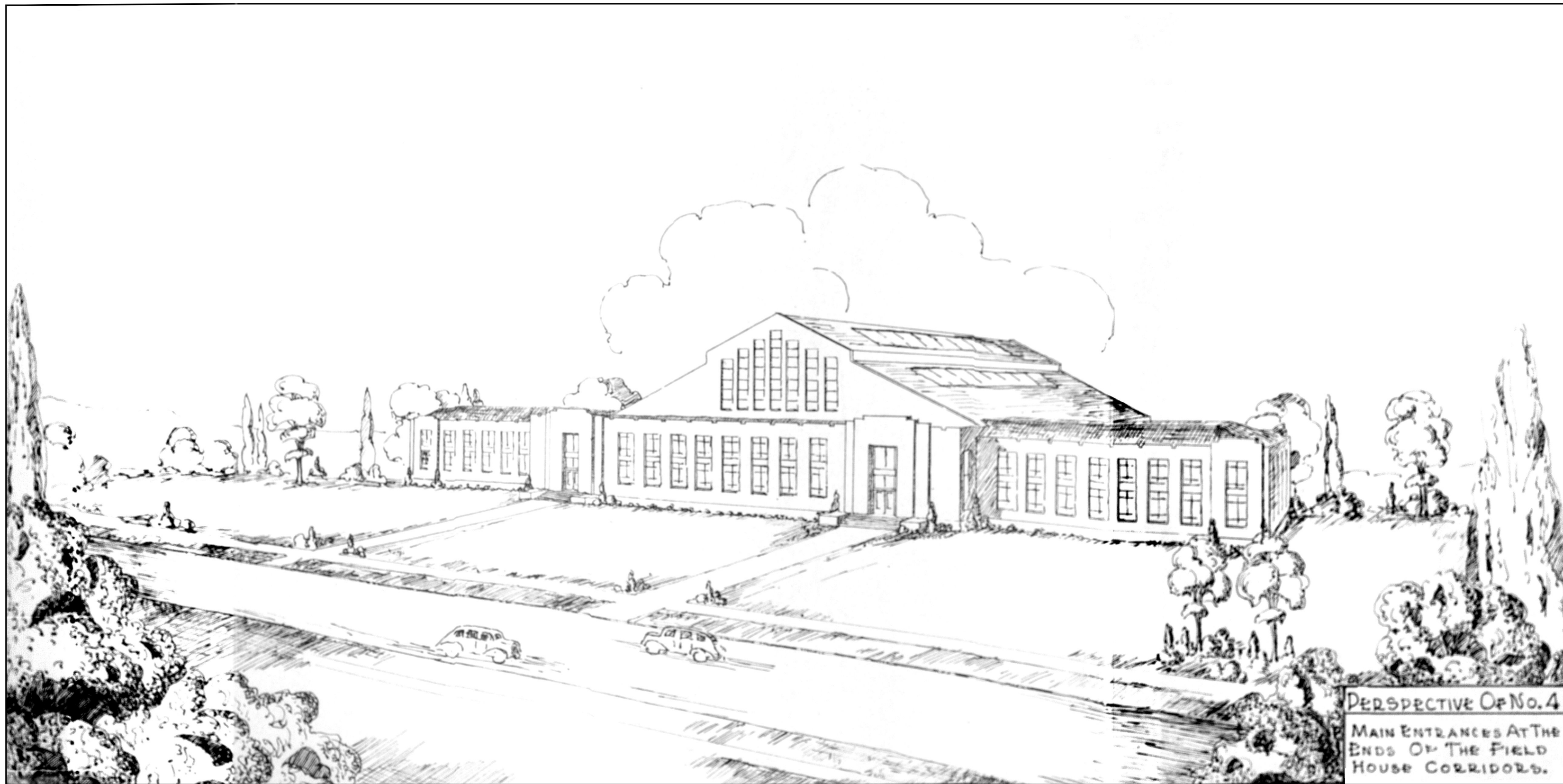
In the attempt to eliminate certain faults in this plan other difficulties developed. Chief among these was the fact that the corrective gymnasium, the wrestling and boxing room, and the apparatus room were forced to the rear of the building to a location which was too remotely situated with respect to the other principal gymnasium units. It was found to be possible to remedy this difficulty in later schemes. The attempt at a different arrangement of the seating facilities in the

natatorium proved to be unsuccessful due to the fact that it destroys valuable basement space. It was felt that some further study was necessary on the arrangement and position of various sports rooms. With this specific item in mind the author studied some better arrangements of the rooms. Plate No. X, page 35 is a perspective sketch of Plan No. 4.

Plan No. 5 (Plate No. XI, page 37) is a variation of Plan No. 4 in which special attention was given to the problem of a more desirable combination of minor sports rooms. The natatorium and gymnasium wings were moved one bay to the front. The space containing the corrective gymnasium, apparatus room, and wrestling room was taken from the rear of the building and brought forward and made into one large room which was devoted to the activities of wrestling and boxing, the corrective gymnasium, and the apparatus room. On this scheme a flat roof was used over the natatorium and the gymnasium. The handball courts have been handled somewhat more successfully in this scheme than in some of the others. This scheme brings the various units in close relationship, but again the offices have been moved away from the main entrances which might be undesirable. Plate No. XII, page 39 is a perspective of Plan No. 5. Since this

PLATE NO. X

A perspective sketch of Plan No. 4.

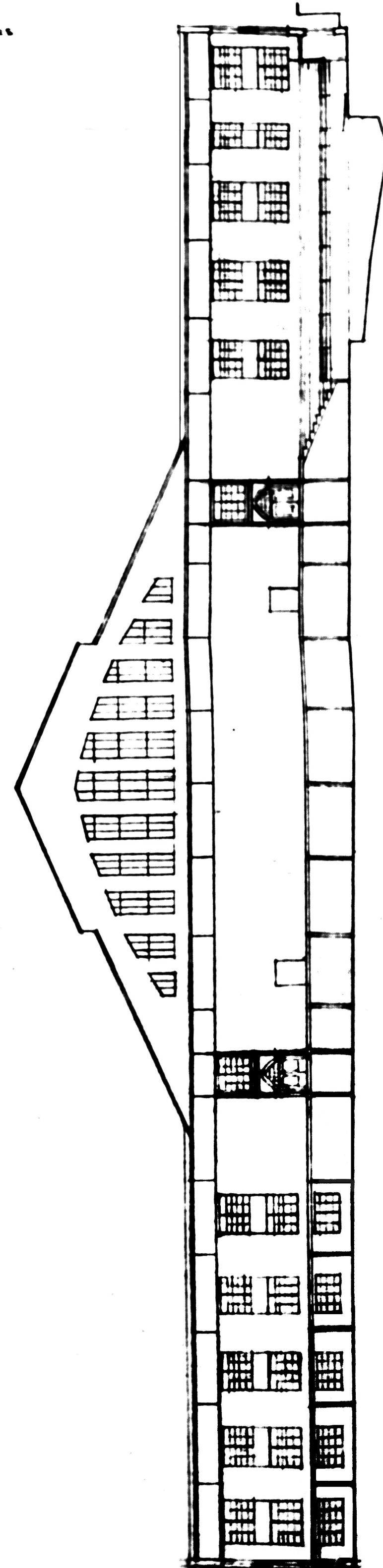
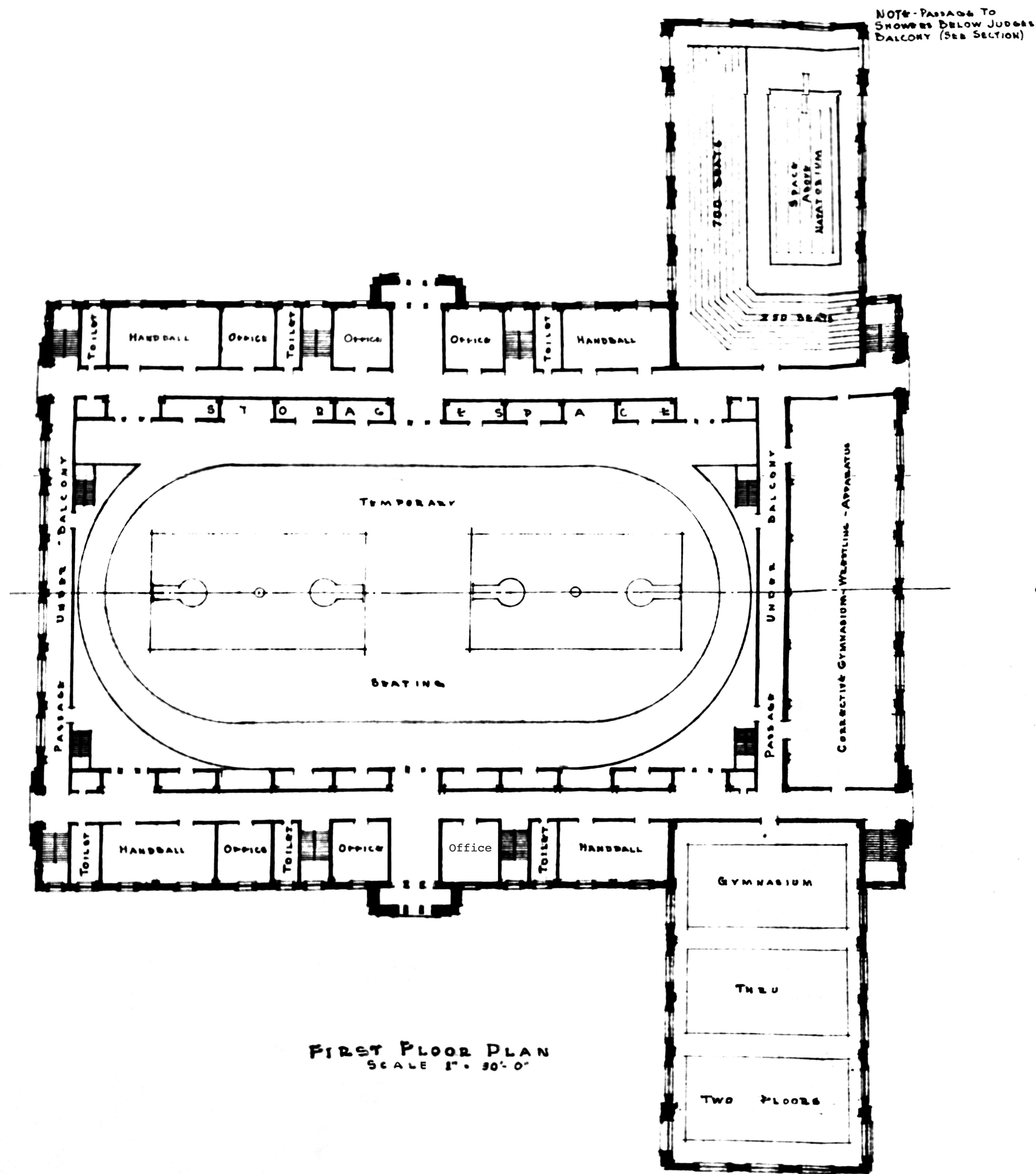


PERSPECTIVE OF NO. 4

MAIN ENTRANCES AT THE
ENDS OF THE FIELD
HOUSE CORRIDORS.

PLATE NO. XI

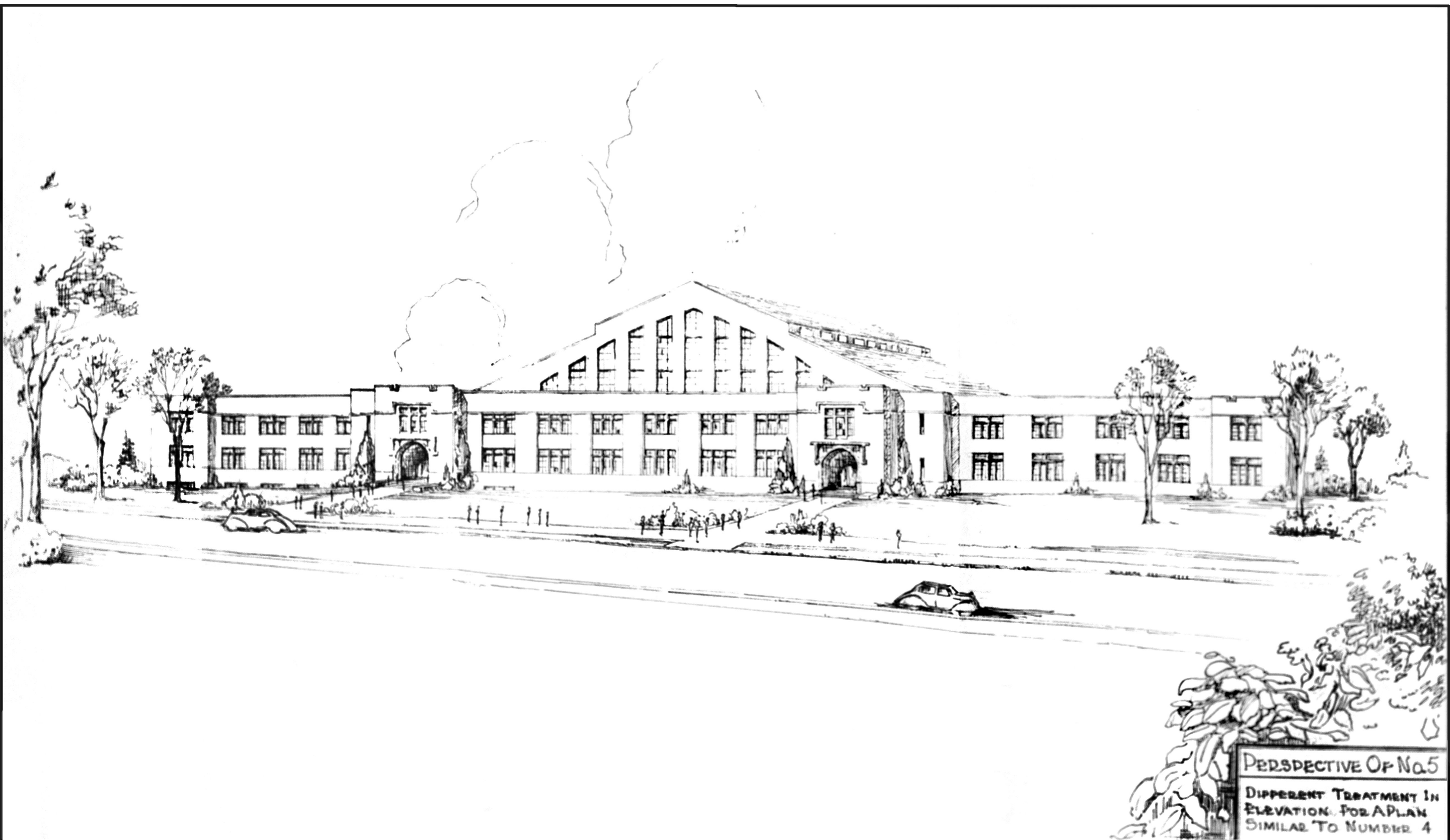
Plan No. 5, a plan designed with gymnasium units
concentrated at one end.



PLAN No. 5
GYMNASIUM AND POOL
IN WINGS AND CORRECT-
IVE GYMNASIUMS AT FRONT

PLATE NO. XII

A perspective sketch of Plan No. 5.



PERSPECTIVE OF No. 5

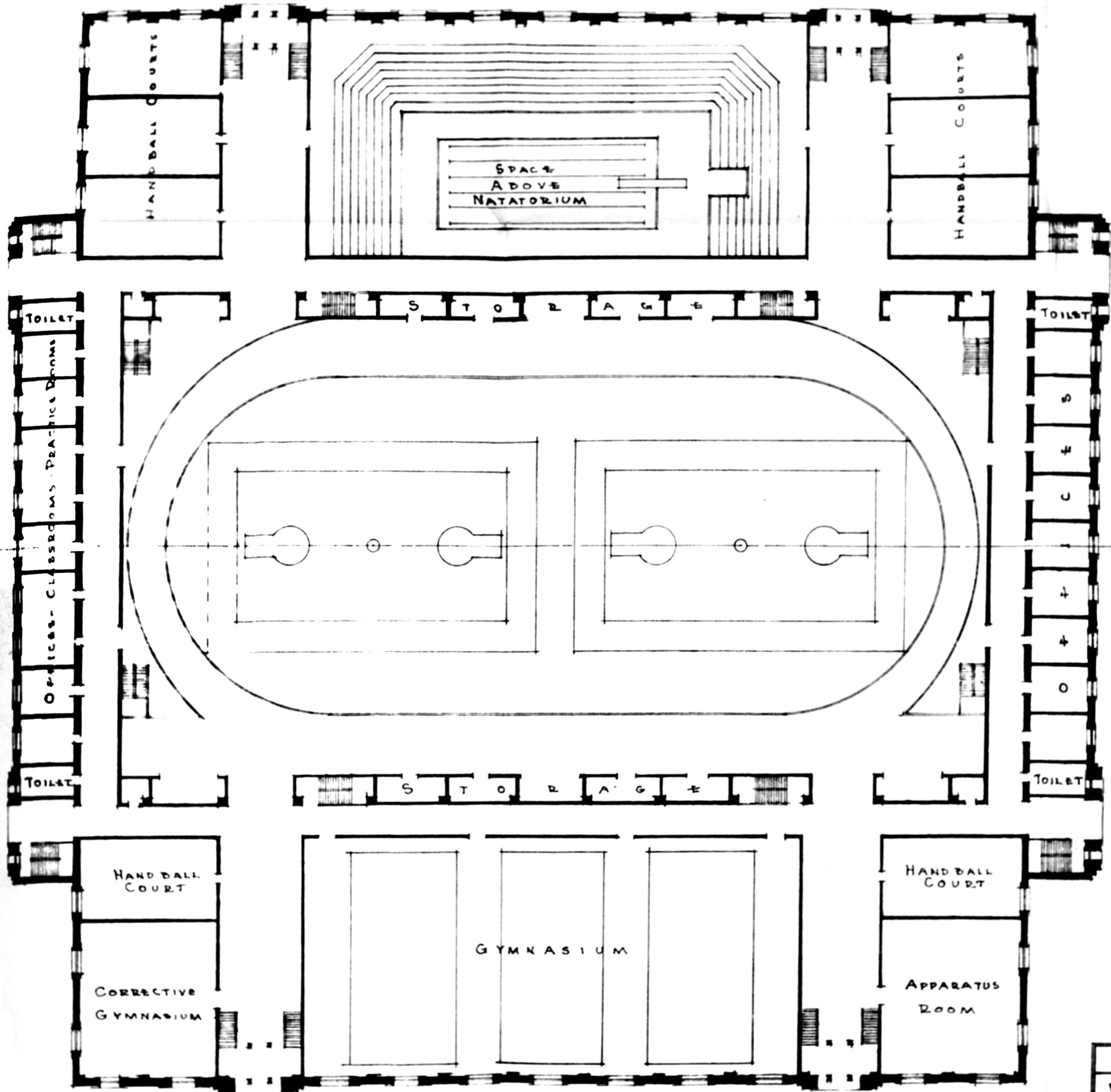
DIFFERENT TREATMENT IN
ELEVATION FOR A PLAN
SIMILAR TO NUMBER 4

scheme did not completely solve the problem at hand it was thought best to try some other scheme which would be a greater departure from the types already presented.

Plan No. 6 (Plate No. XIII, page 42) is the result of an attempt to present a scheme which would attain the requirements of the problem and eliminate the use of wings for the gymnasium and natatorium. This was done by placing the gymnasium and natatorium along the side with a corridor between these units and the sports arena. The handball courts, the small gymnasium, and the apparatus room were placed at the ends of the natatorium and the main gymnasium. The natatorium would extend from the basement floor to the ceiling of the second floor. The corrective gymnasium could be made to extend through but one floor and the wrestling and boxing room could be placed on the second floor in this position. The apparatus room, of course, would be carried through both floors. Should it seem that the one story height was insufficient, the apparatus room and the wrestling and boxing room could be combined. This arrangement would give two story heights for all three activities. The handball court space would at least be sufficient. The architects, Charles Z. Klauder and Herbert C. Wise recommend six to ten handball courts for a large university but go on to say that other

PLATE NO. XIII

Plan No. 6, a plan designed with gymnasium
and natatorium parallel to
sports arena.



FIRST FLOOR PLAN
SCALE 1" = 30'-0"

PLAN No. 6
WITH EIGHT MAIN
ENTRANCES, POOL
AND GYMNASIUM AT SIDES.

authorities recommend one handball court for each one hundred students.⁽³⁾ In the author's opinion the former rule would provide sufficient facilities for this game on this campus. The seats in the natatorium were moved to the outer wall in order that better light and ventilation might be afforded the shower and locker space below. This was made possible by the arrangement of the entrances in this scheme. This scheme provided for eight entrances of equal importance which would completely solve the problem of rapid movement of the public in and out of the building. The offices were placed at one end of the building and the classrooms, social rooms, and practice rooms were placed at the other end. There seemed to be several desirable features in this plan.

A distinct economy is inherent in this plan in that a large floor area is contained within a relatively small amount of enclosing wall. This scheme also has in its favor the arrangement of the offices in one end and near important entrances which if properly placed on the plot could be the main entrances. The generous allotment of

(3)

Klauder, Charles Z. and Wise, Herbert C., College Architecture in America, p. 228.

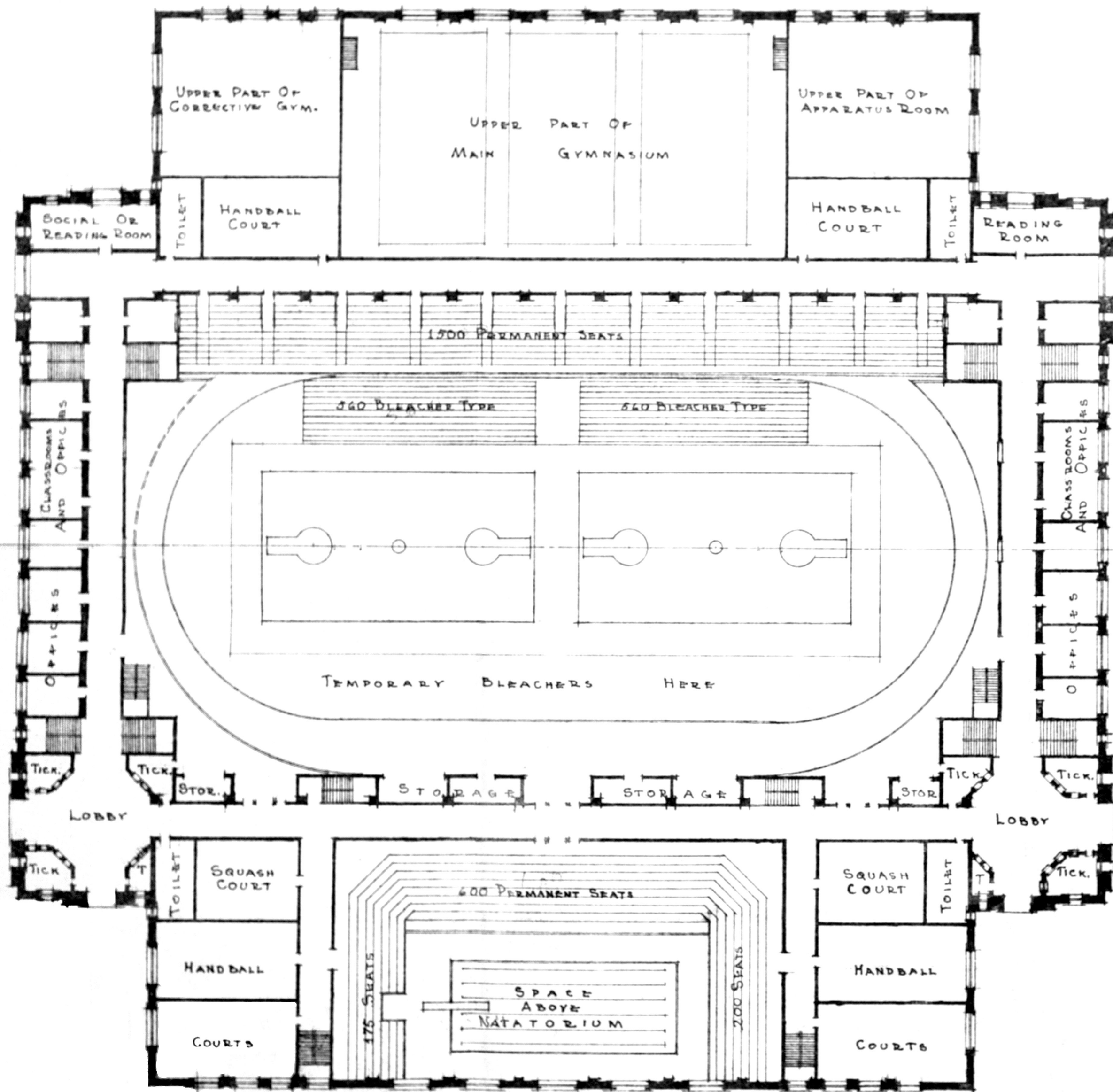
space to the entrances makes the movement of crowds easy. It will be noted that from any point in the main side corridors exits are in evidence in all directions.

In spite of the favorable qualities of this parti there are some very unfavorable features which would detract from its desirability as a final solution. It was felt that the entrance facilities occupied too great a part of the building to make it a practical scheme. The great depth to the rooms to be used as shower and locker rooms in the basement would deprive these rooms of natural light and ventilation. This, however, could be corrected by means of artificial light and mechanical ventilation. The general layout of this plan would make it difficult if not impossible to make any future additions, should they be desired. It is also quite evident that there is but one satisfactory site on the proposed location for this building. These undesirable characteristics were felt sufficient to prevent this from being chosen as the final design. It was considered worth while to try to develop this idea one step further and see if it could be so arranged as to eliminate the most objectionable of these features.

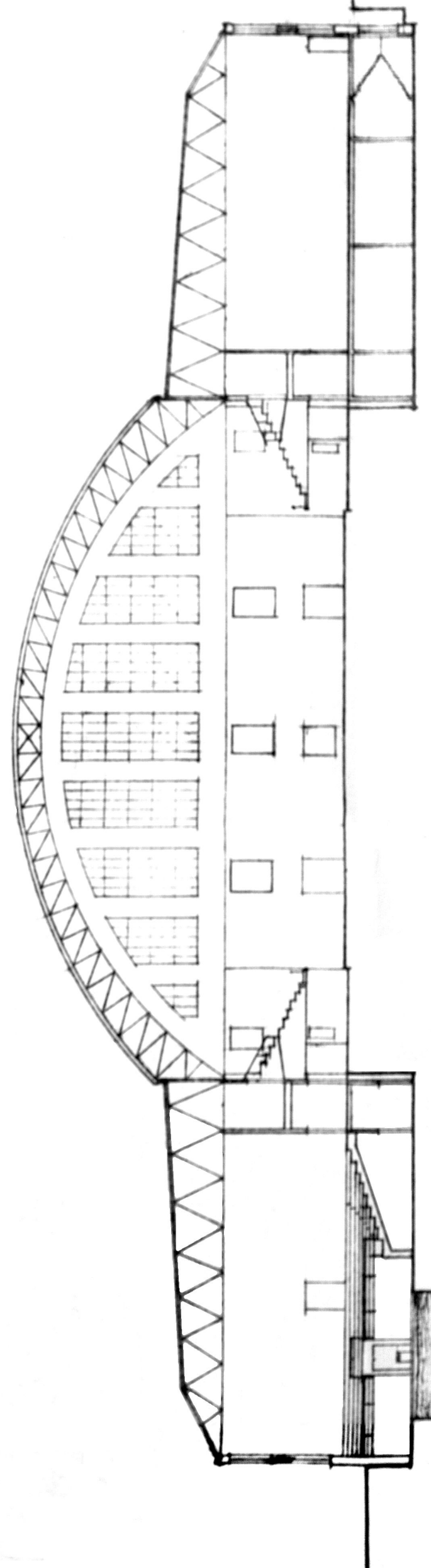
In Plan No. 7 (Plate No. XIV, page 46) changes were made which were thought to be such that it would

PLATE NO. XIV

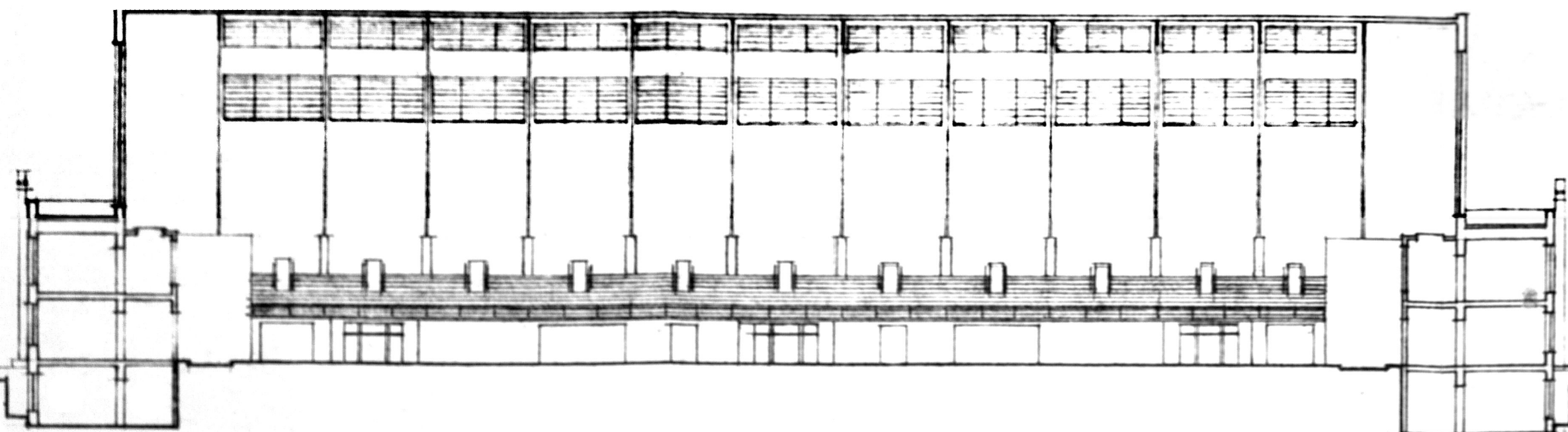
Plan No. 7, a plan designed with
four main entrances.



COMPOSITE FLOOR PLAN



CROSS SECTION



LONGITUDINAL SECTION
SCALE 1" = 30'-0"

PLAN No. 7
GYMNASIUM AND POOL
ON SIDES. FOUR
MAIN ENTRANCES

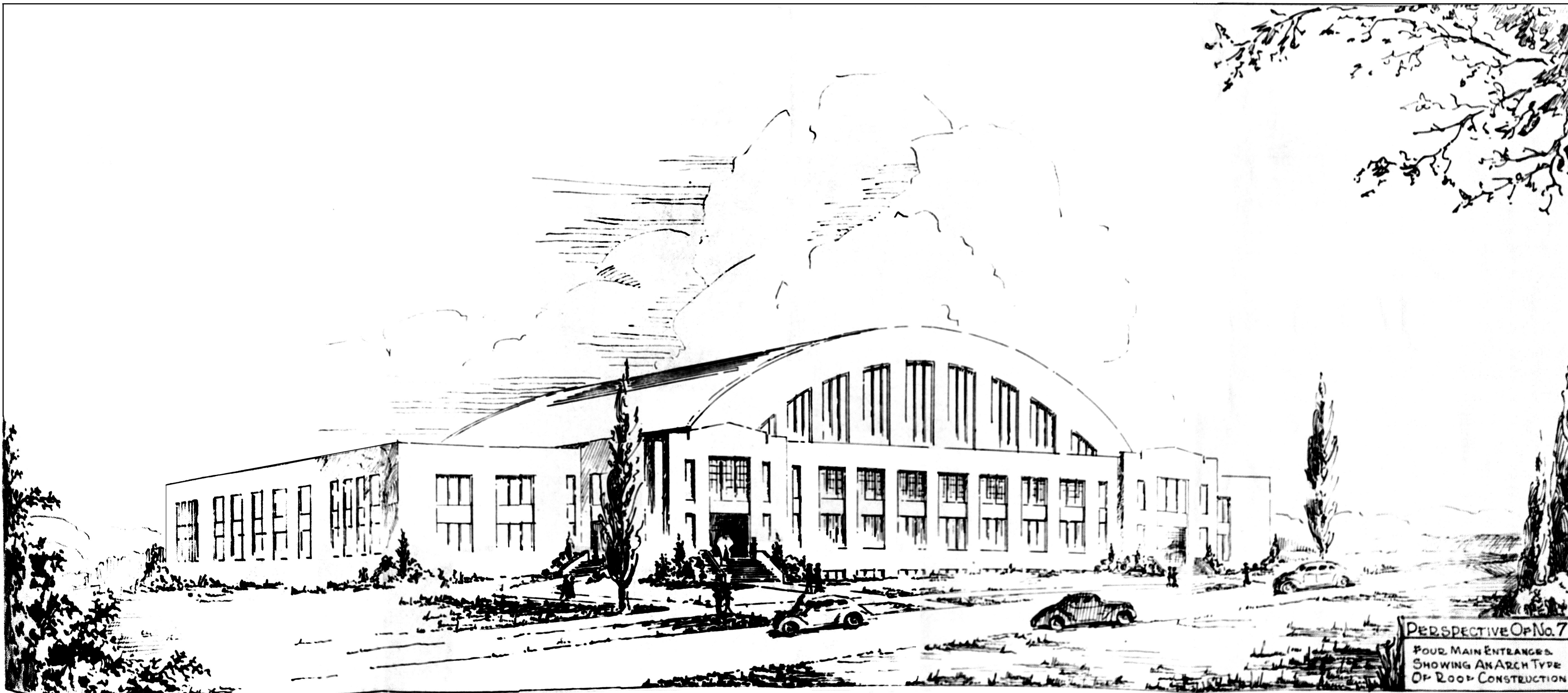
make this scheme a worth while solution to be offered as an alternate plan. The wasted space that was noted in the previous plan was saved by eliminating four of the eight entrances. More elaboration and emphasis was placed on the remaining four entrances, and ticket booths were placed in the entrance lobbies. Stairways were placed near these entrances leading up to second floor and down to the basement rooms. This scheme provides for 5,000 seats; 3,000 of which are permanent balcony type seats. The location of the of the stairs at the corners of the sports arena make it unadvisable to place balconies at the ends. The value of seats on the end of the basketball court is also questionable. It will be noted that it would be possible to increase the usable bleachers at the ends of those shown. These additional bleachers would make a total of approximately 2,700 seats of this type. To thus increase the temporary seats would impair the use of the track while they were set up. This interference of the seating facilities with the use of the track was considered undesirable. If, however, occasion arose which called for the use of this extra seating space, the temporary construction of seats would make it a fairly simple matter to increase it to full capacity. In this scheme the spectators' seats in the

natatorium were again placed at the interior wall. This, however, makes an undesirable arrangement in the shower and locker rooms beneath the seats. By reversing the arrangement and using the secondary corridors at the ends of the natatorium this difficulty would be eliminated. This type of building would lend itself to the use of a bowstring or some form of arch truss construction over the sports arena. The span would be 170 feet while the truss used on the "Palestra" at the University of Pennsylvania was a bowstring type spanning 180 feet 5 inches. Plate No. XV, page 50, is a sketch in perspective showing how this structure would appear if built. Plot Plan No. 1-c (Plate No. XVI, page 52) shows a suggested location for Plan No. 7. Some of the undesirable features of the previous plans have been eliminated, but there still remains a few faults which eliminate it as a final selection.

This plan is more compact due to the elimination of the side entrances and the long entrance lobbies made necessary by those entrances. The great distance from the outside light to the inside wall of the basement creates a problem in lighting, but this could be alleviated by artificial light. That there is one location on the site that would be suitable is objectionable. It would be

PLATE NO. XV

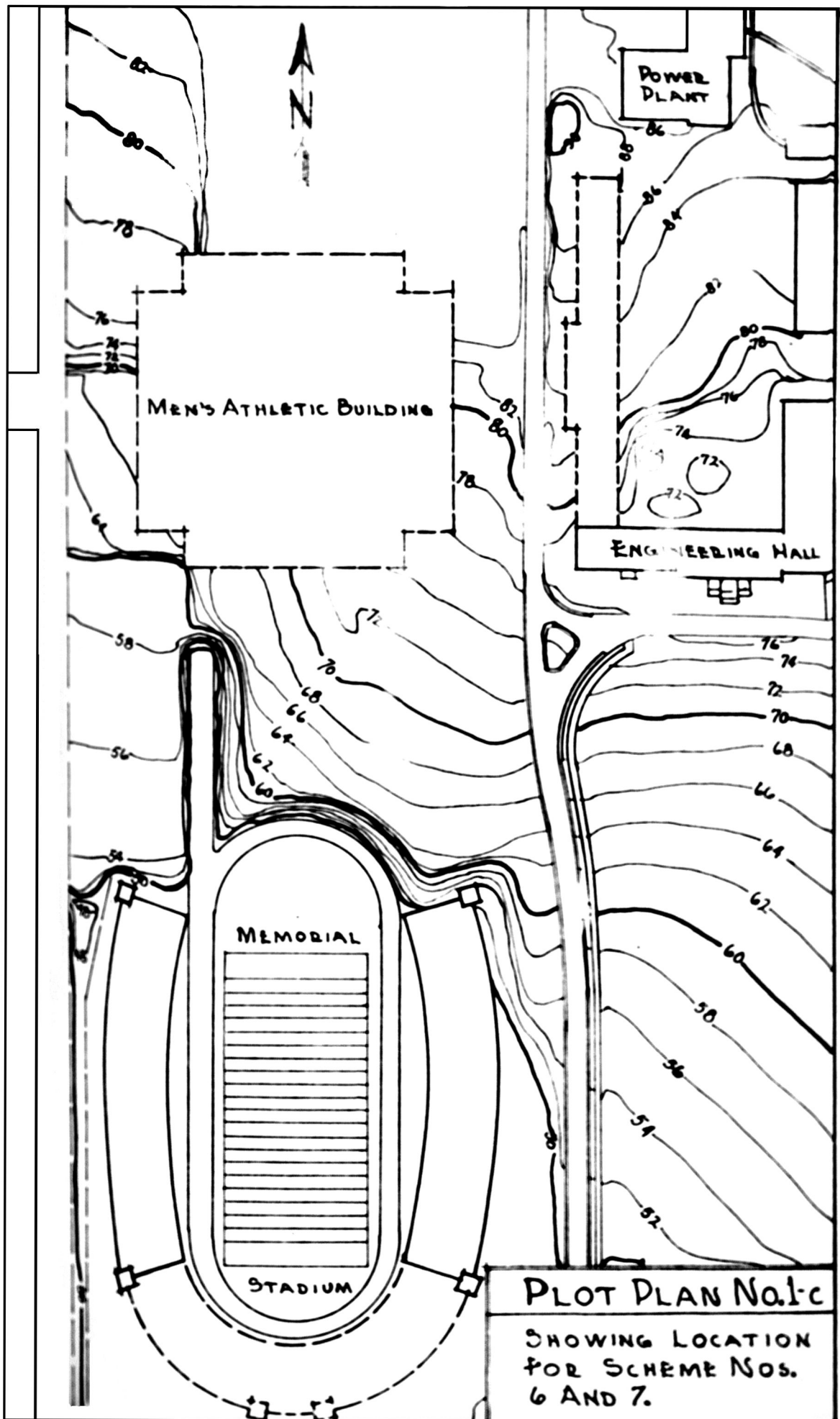
A perspective sketch of Plan No. 7.



PERSPECTIVE OF No. 7
FOUR MAIN ENTRANCES
SHOWING AN ARCH TYPE
OF ROOF CONSTRUCTION

PLATE NO. XVI

A location for Plan No. 7.

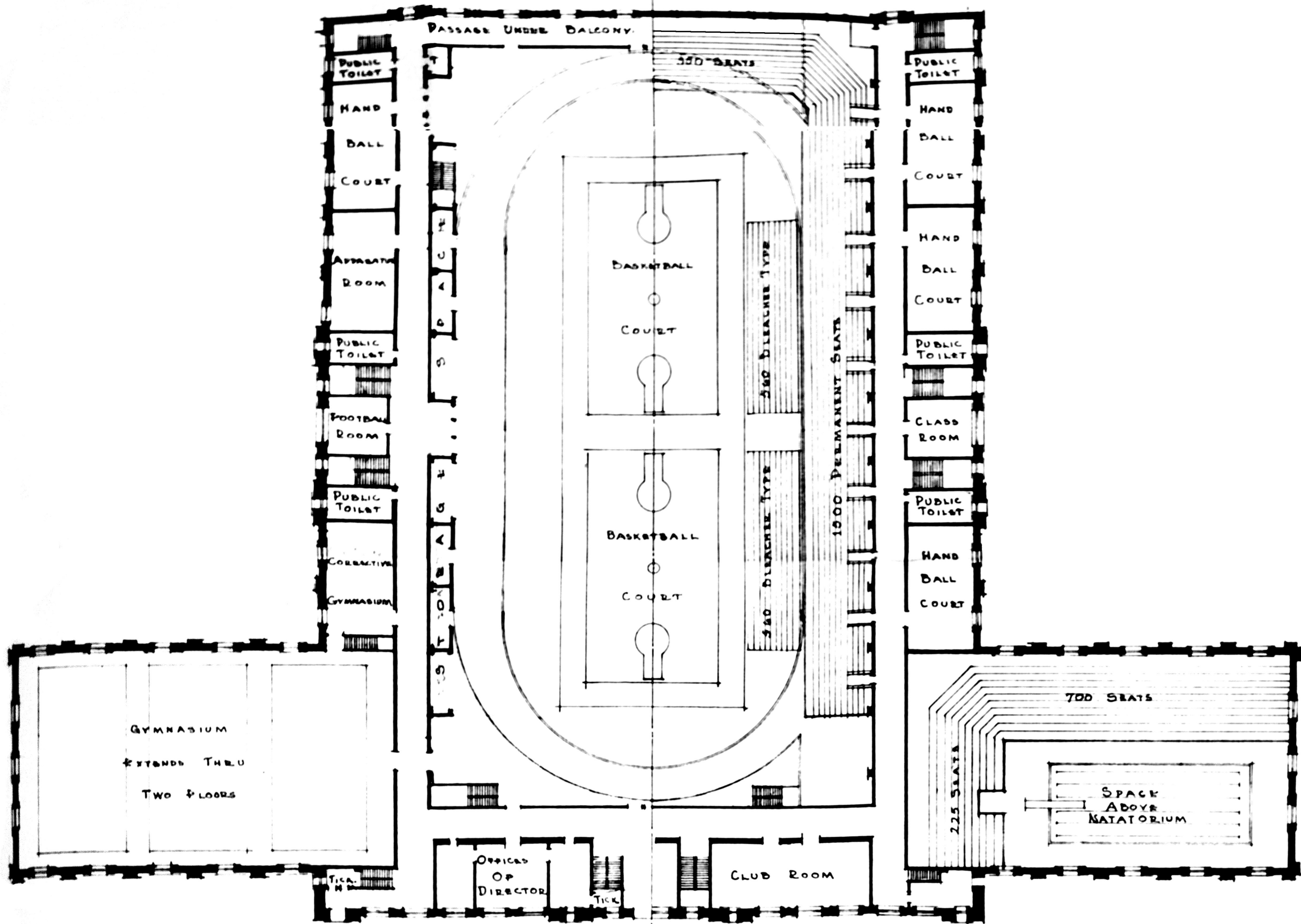


placed on the plot just west of the Engineering Building and would require considerable grading. However, a more serious objection was the fact that it would be almost impossible to make future additions to this building. Taking all these factors into consideration, it was decided that Plan No. 7 had certain desirable characteristics which were sufficient to justify the selection of it as an alternate scheme for the building. The advantages of natural light and ventilation to be obtained by placing the natatorium and gymnasium in the wings prompted the development of Plan No. 8.

Plan No. 8 (Plate No. XVII, page 55) was developed as a final effort to take the desirable features of the various schemes of this general type and group them into one plan. After considerable study the parti was developed and chosen as the final scheme to be submitted as a proposed design for a Men's Athletic Building for Kansas State College.

PLATE NO. XVII

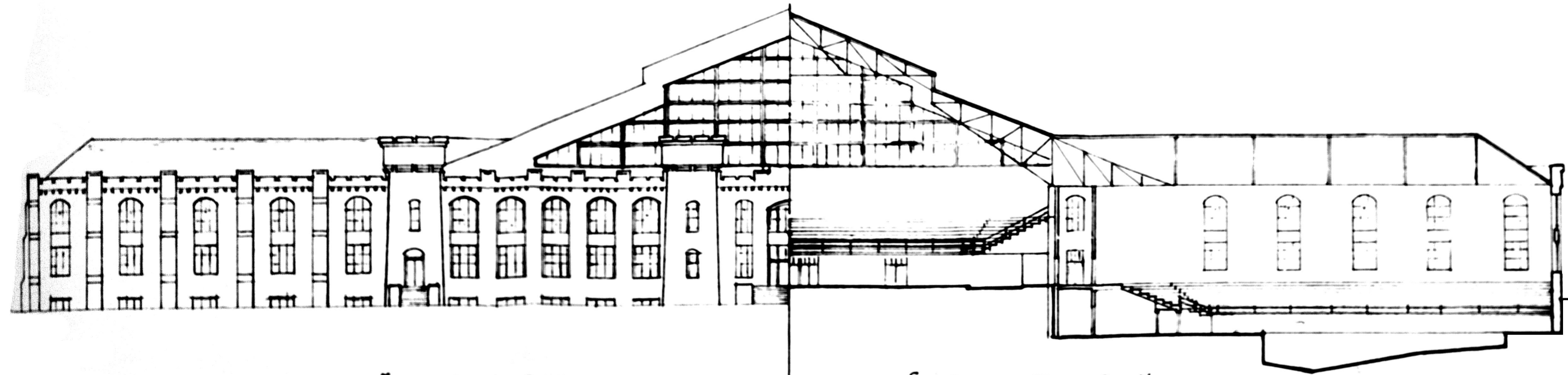
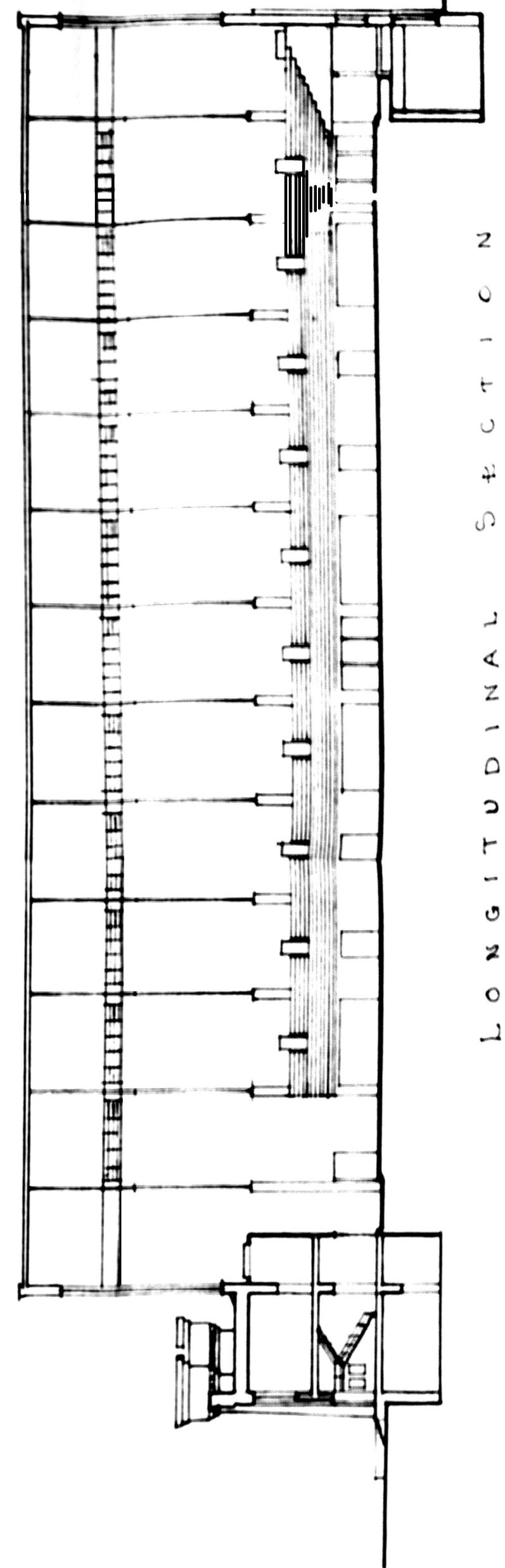
Plan, sections, and elevation of the
submitted design.



FIRST FLOOR PLAN

SECOND FLOOR PLAN

SCALE 1" = 30'-0"



PLAN No. 8
OFFICES AT FRONT.
A CENTRAL ENTRANCE
AND SIDE ENTRANCES

DEVELOPMENT OF SUBMITTED DESIGN

Design

In this, the selected design, the same general idea was retained as in Plans Nos. 3, 4, and 5. The gymnasium and natatorium were kept in the same location as in Plan No. 4 (Plate No. IX, page 31). The rooms at the rear of the building were eliminated and this end treated as in Plan No. 5 (Plate No. XI, page 37). The main entrance was brought to the center as in Plan No. 3 (Plate No. VIII, page 26).

There were four locations considered as being possible for the building on the chosen site. These locations were shown in Plot Plans Nos. 1-b, 2-b, and 3-b (Plates Nos. XVIII, XIX, and XX, pages 58, 60, and 62). The first location considered would face north and extend over the present outdoor straightaway as did the selected location for Plan No. 2. This would require a main entrance on the north which is not especially desirable in this locality. The second location considered was turned at ninety degrees to this and placed on an axis with the proposed addition to the Engineering Building. This arrangement, of course, would require the baseball field to be moved farther north. It was felt

PLATE NO. XVIII

Plot Plan No. 1-b, locations for submitted
design on axis with Memorial Stadium.

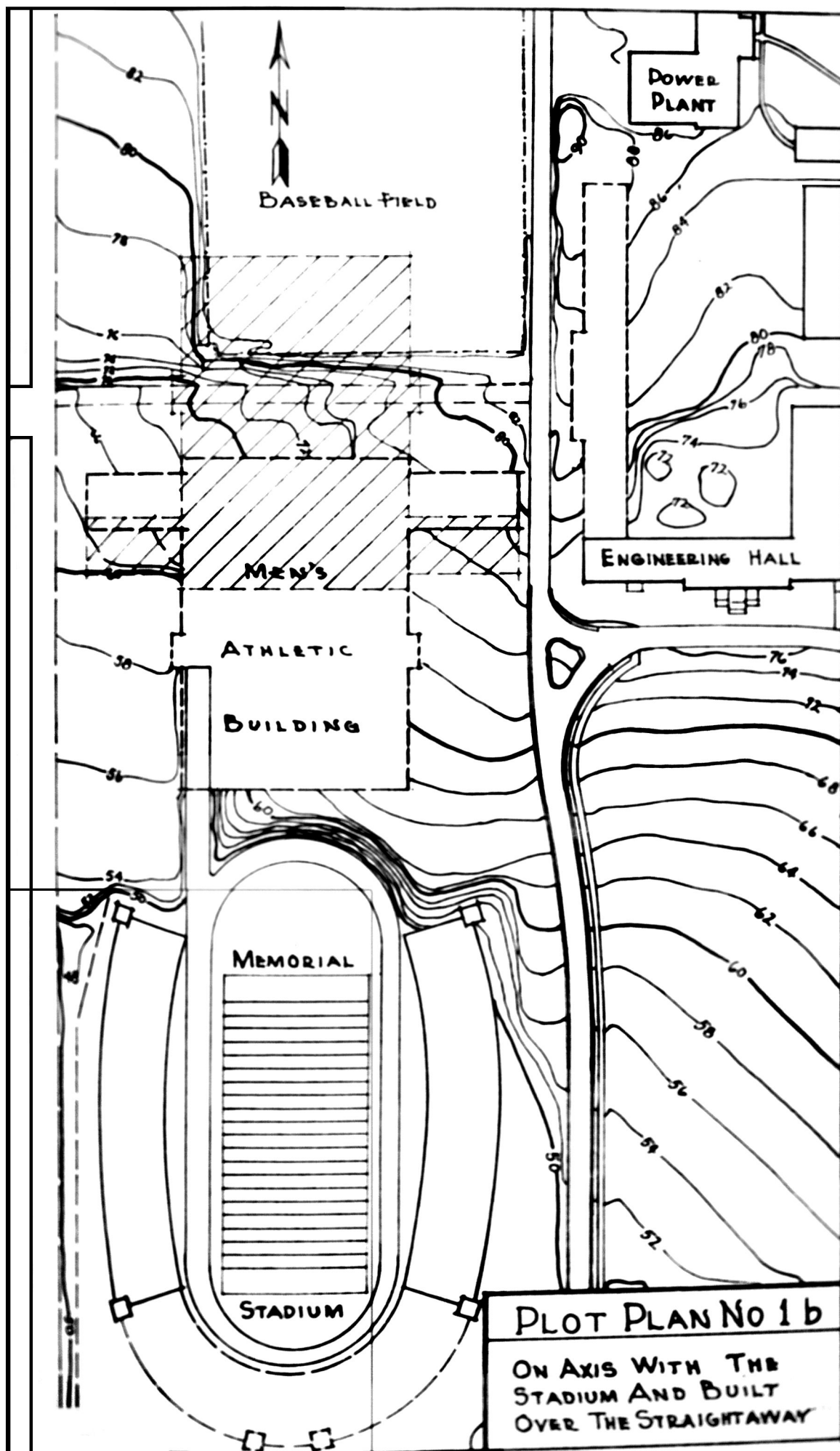


PLATE NO. XIX

Plot Plan No. 2-b, location for submitted
design on axis with the completed
Engineering Building.

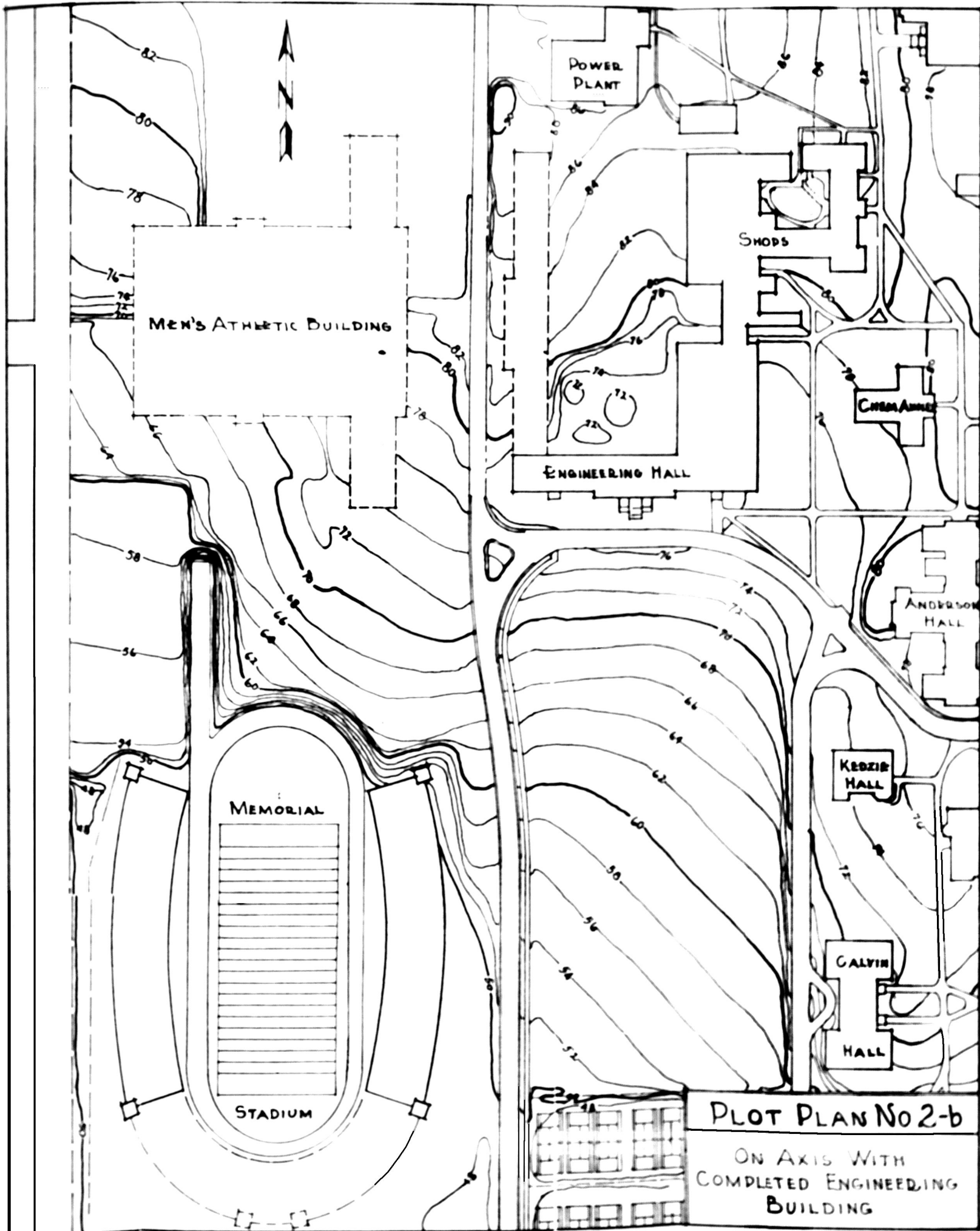
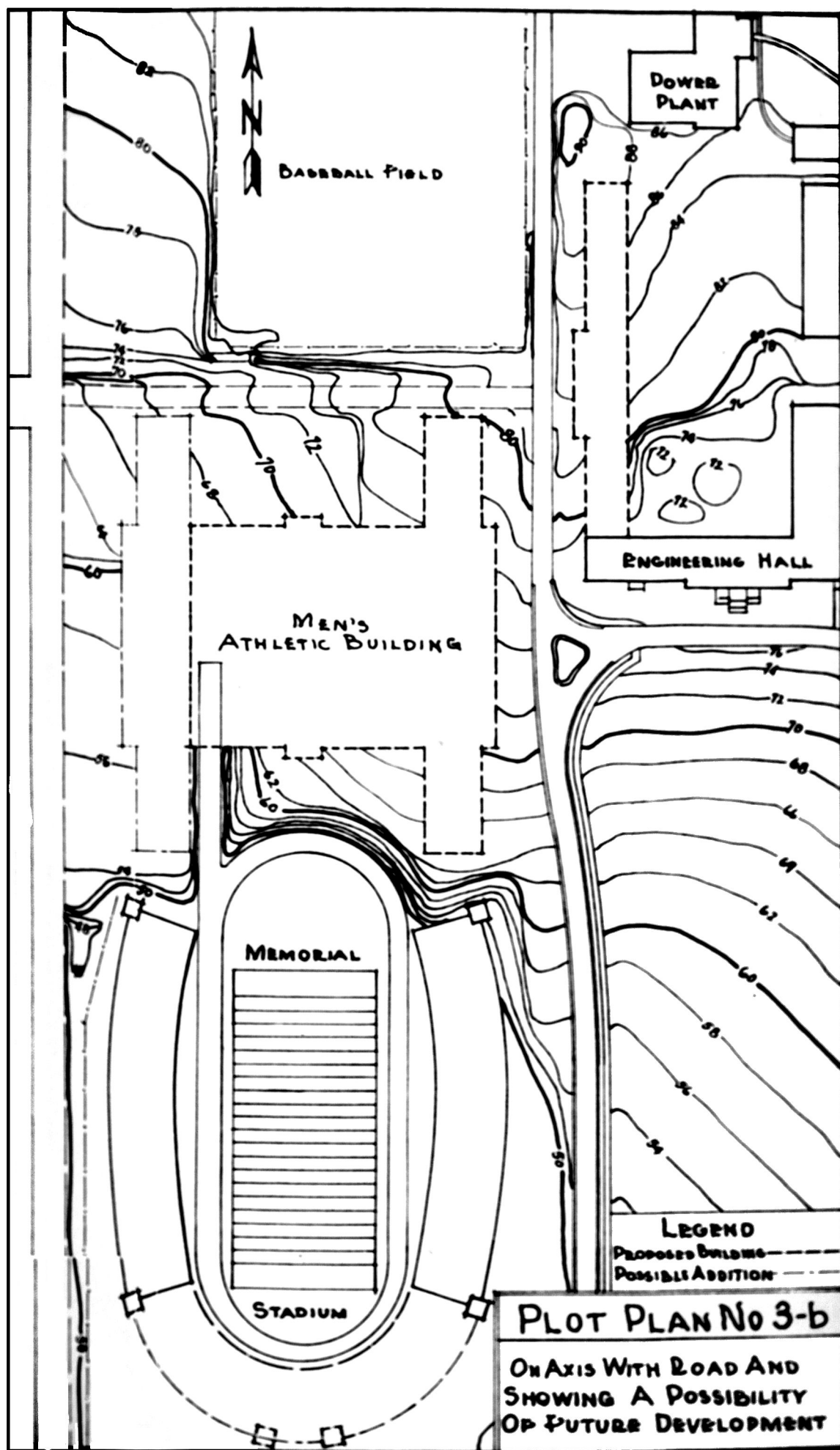


PLATE NO. XX

Plot Plan No. 3-b, location suggested
for submitted design.



that both this and the preceding location would be too close to the Engineering Building to make the building appear out of scale with its surroundings, and create an impression that the buildings were somewhat crowded together. The third location which was finally chosen was the present practice field and facing east as shown in Plot Plan No. 3-b. The fourth location represented by the shaded area in Plate XVIII, page 58 would place the building on an axis with the Stadium and facing south. Because of the necessity of placing it back from the straightaway, the baseball field would have to be moved north. The same feeling of scale would apply as in the case of Plot Plans Nos. 1-b and 2-b. This and the first arrangement would place one wing of the building at a greater distance from the campus and might tend to cause confusion in circulation between classes.

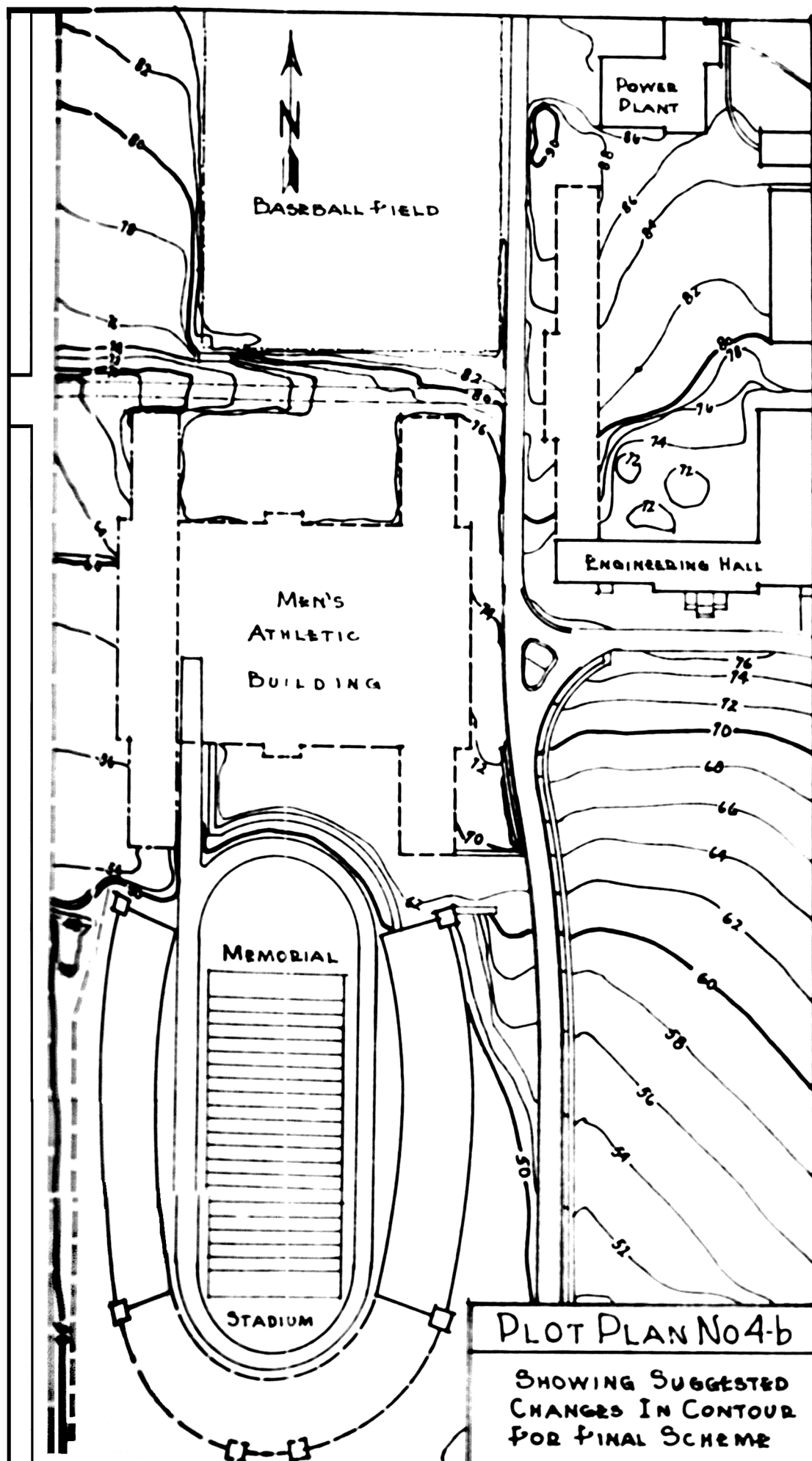
The third location seemed to the author to be the best location for a Men's Athletic Building for Kansas State College. Placed in this position it would provide one building for another quadrangle comprised of the Engineering Building, the Men's Athletic Building, and a proposed Administration Building. Further campus developments should then provide a building to be placed somewhere on the location of the present tennis courts.

With the building placed as shown in Plot Plan No. 3-b, it would be possible and quite desirable to take advantage of the grade conditions and make an additional floor below the basement floor on the south side. By removing the soil between the proposed building and the Stadium both basement floors would become floors above grade level. The soil could be used in building up the area on the west of the straightaway and in raising the grade at the front of the building. By connecting the northeast pylon of the Stadium and the southeast corner of the gymnasium wing with a heavy retaining wall, the area between the Stadium and the proposed building could be made level with the football field. This location also provides for a future possible addition of an armory for Kansas State College. Should this addition be made a retaining wall located at the corresponding point on the west would create an attractive area between the Stadium and the Men's Athletic Building. The proposed building placed on the suggested site would form a wind-break for the football field.

Plot Plan No. 4-b (Plate No. XXI, page 66) illustrates the suggested grading for the selected design. This design was developed for one basement story. By an excavation at the northeast corner of the natatorium to a

PLATE NO. XXI

Plot Plan No. 4-b, suggested changes in
contour for selected site.



depth of four feet below the present grade level and carrying a grade of six feet across the front of the building, a fill of five or six feet would be necessary at the south end of the gymnasium. This fill is terminated by a retaining wall. Should one basement story be used, it would be necessary to build a retaining wall around the north end of the Stadium. The south entrance at grade could be used for contestants' entrance to the basement.

The office facilities are confined to the portion of the building nearest the main entrance. The ticket booths are placed beneath the landings of the stairs leading from the main entrance and are directly connected with the offices. The main gymnasium measures 80 by 144 feet and is large enough for three 35 by 70 feet basketball courts. The corrective gymnasium adjoins the main gymnasium. A small stairway is located between the gymnasias to be used by the gymnasium students to get from the shower and locker rooms to the gymnasium floor. Both gymnasias extend through two floors. The public toilets are near the stairways at all points except at the main entrance. The apparatus room which also extends through two floors is located west of the stairway on the south side of the building. Beyond this, handball courts

are placed on both first and second floors. On the north side and in a similar location are four more handball courts. These with one additional court over the wrestling and boxing room make a total of seven handball courts, a sufficient number for Kansas State College. The wrestling and boxing room is made to extend through but one floor because these sports would be confined to this space only for practice or for class work. Any exhibition match would in all likelihood be held in the sports arena where seating facilities would be adequate. A club room is provided at the front over the offices of the Department of Physical Education. Faculty toilets are provided on the second floor at the head of the secondary stairways in the front of the building.

Entrance to the natatorium is gained at the first floor level. The seats are of the stadium type and slope down at an angle giving an unobstructed view of the pool which is at basement level. Seating facilities for 700 spectators on the west side and 225 spectators at the south end are provided in the natatorium. In order that the space beneath the seats could be used advantageously, the pool was placed at the side and to one end of the room. At floor levels not containing entrances the space between the stairs is used for class or varsity rooms.

In the sports arena provision is made for two movable basketball courts. These court floors are to be made in sections and stored in the space provided beneath the balconies. A 220 yard track is provided with a seventy-five yard straightaway along the north side. Bleacher type seats are provided for approximately 2,200 people on the earth floor of the sports arena. This does not impair the use of the track in any way. Should occasion arise in which more seats are needed this capacity could be increased to 2,700 by adding more sections on the ends of the bleachers as shown in Plate No. II, page 9.

Balconies above the track extend from the second column on one side around the end of the sports arena and back to the second column on the other side. These balconies are supported on columns placed in walls of the storage rooms below and tied to the interior main columns. Entrance to these balconies is provided by means of doorways between the interior columns at the second floor level. In the balcony 3,000 permanent seats are provided along the sides and 700 seats on the end. The total seating capacity of the permanent and bleacher type of seating is 5,900 with a possible expansion to 6,400 should additional seats be desired. Radio and press rooms could be provided between trusses and above the ceiling of second floor.

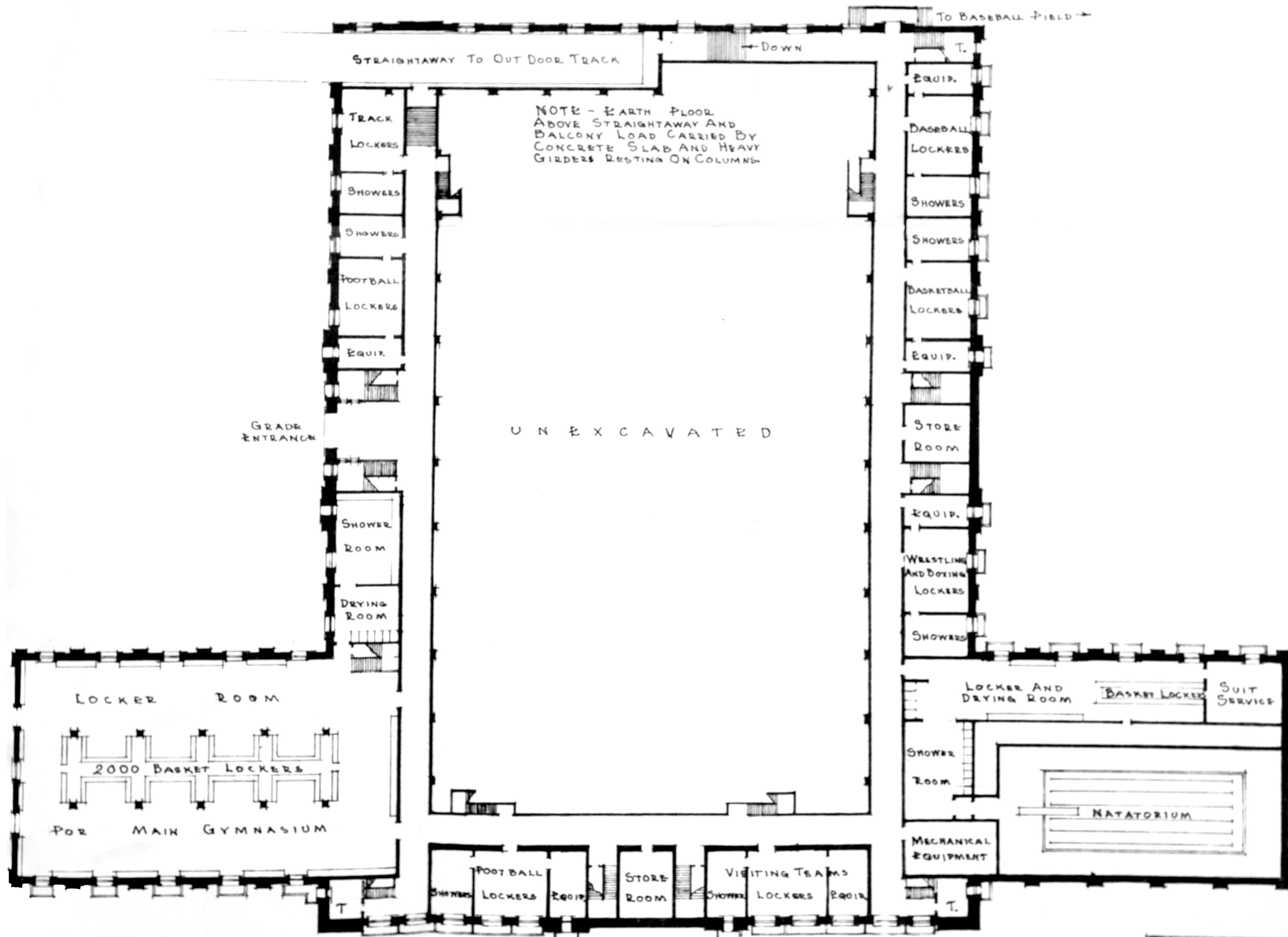
The straightaway (Plan No. 8-b, Plate No. XXII, page 72) is 24 feet wide and will require a heavy girder supported on columns spaced wider apart than the regular spacing of the trusses. This girder would carry the regular exterior and interior columns and the columns at the corridor line along the west end of the building. By setting these girders and the slab over them a little below the first floor line, an earth fill could be made over the part extending under the sports arena floor. Reference to the Plot Plan showing the proposed building and the revised grades shows the straightaway at a level of 10 feet 6 inches below the level of the basement floor. Stairs are provided to connect the straightaway and the basement corridors. The addition of the other basement floor would be possible at a relatively low cost and , in many ways, seems justifiable.

Should the locker and shower space allotted to the football teams seem inadequate, it would be a simple matter to provide additional space by converting the equipment and store rooms into locker rooms or by eliminating one stairway and devoting the whole space to the football teams.

The locker room for the gymnasium is located below the gymnasium floor and is the same area as the

PLATE NO. XXII

Plan No. 8-b, basement plan for
selected design.



BASMENT FLOOR PLAN
SCALE 1" = 30'-0"

PLAN No. 8B.
SHOWING ARRANGEMENT OF SHOWERS AND LOCKERS.

gymnasium. This gives an area of 4,000 square feet which would be sufficient for a class of 125. The lockers are of a basket type and are arranged between the columns. A passafeway between the rows of basket shelves facilitates removal of soiled clothing and towels by an attendant. Dressing lockers are placed around the walls. The shower room is 24 by 34 feet and is large enough to accommodate 32 shower heads. Allowing three persons to a shower unit, a class of 96 can be accommodated; allowing four persons to a shower unit, a class of 128 can be accommodated. A drying room and toilet room is combined between the locker and shower rooms. Basket space sufficient for 2,000 baskets is provided.

An entrance is provided to the basement at the northwest corner of the basement which would enable the baseball teams to go directly from the field to the locker rooms rather than by way of the stairways in the building. Locker, shower, and equipment rooms for basketball and wrestling contestants are placed along this side of the building.

The shower and locker rooms for the swimming classes are placed beneath the seats in the natatorium. A suit service room and a tier of basket lockers is provided here. Toilet facilities are provided at the end of the locker room. The shower room is provided with nine shower

heads. At the entrance to the pool there is a compartment containing a set of shower units which make it impossible for anyone to get into the pool without first taking a shower. The floor of this compartment is covered with a few inches of water. The pool is 30 by 75 feet and is sufficiently wide for six lanes. As recommended by the American Association of Universities the pool has been made with 15 feet of platform at the diving board end, 12 feet at the opposite end, 10 feet on each side, and 12 feet in depth at the deepest point. A room at the end of the pool houses the mechanical equipment and could serve as a heating and lighting sub-station for the building. The space between the locker rooms and the wall around the pool could be used for heating equipment for the natatorium.

Public entrance to the building is by a central or main entrance, two auxiliary entrances in the towers at either side of the main entrance, and entrances at the sides of the main part of the building. Ticket booths are located beneath the stair landings at each entrance. The public is distributed through corridors to the sports arena floor and then to the temporary seats; also up stairways to second floor corridors and through doors to ramps leading to the balcony seats.

Plate No. XXIII, page 77, is a rendered perspective of the final parti. The character of the architecture harmonizes with that of the present Stadium.

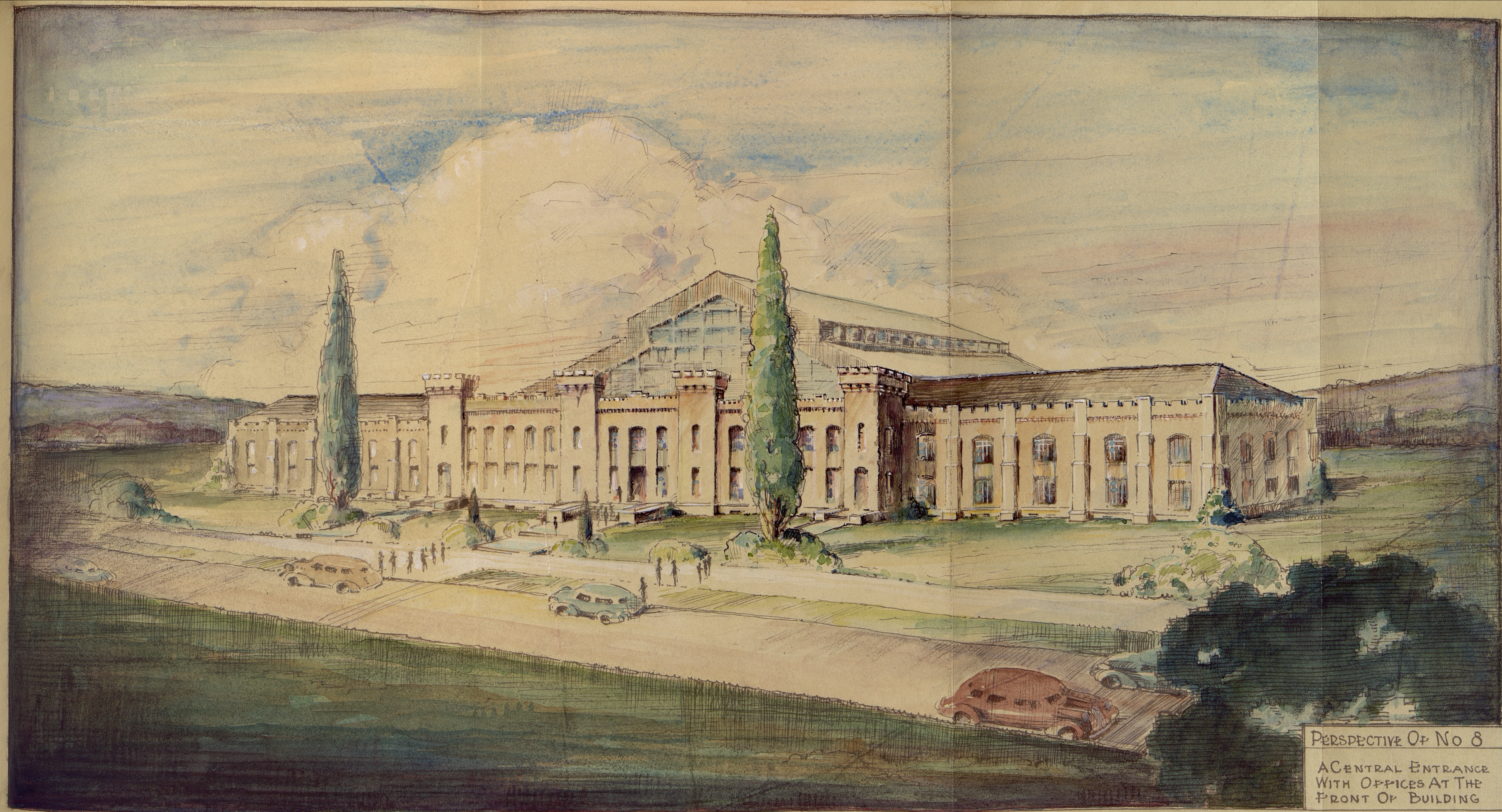
Framing

Many types of trusses were investigated in order to select the most economical truss for this scheme. The use of the three-hinged arch although quite often used in such buildings has the disadvantage of obstructing the view from the balconies. Crescent or Bowstring roof trusses are considerably heavier than other types for the same span. At one time it was thought that two cantilever trusses could be set up and pinned together at the peak. This might not be satisfactory because of the possibility of a reversal of stress on the shallow section near the peak with a full wind load on the truss. It was finally decided that a truss of two cantilever and a simply supported central span should be designed for this building. This type of truss has a downward reaction at the exterior columns and an upward reaction at the interior columns.

The general layout of the truss is shown on Stress Sheet No. 3 (Plate No. XXVII, page 89). The span from center to center of interior columns was 170 feet.

PLATE NO. XXIII

A rendered perspective of the final parti.



PERSPECTIVE OF NO 8

A CENTRAL ENTRANCE
WITH OFFICES AT THE
FRONT OF BUILDING

The span from center to center of outside columns was 250 feet. The central span was decided on as 90 feet. This was not an unreasonable span for a simple truss and that gave the cantilever spans distance from the interior end of the cantilever spans equal to forty feet. The central span was raised 5 feet above the ends of the cantilever span to give space for side lights and ventilating sash. The panels were laid out at ten feet each for the cantilever spans and nine feet for the central span. The web members were so placed as to all be in tension in the cantilever spans. A study of the necessary length of the building revealed that the track could be enclosed and corridors be provided in a building 315 feet in length. Thirteen spaces at 24 feet 3 inches made a total inside dimension of 315 feet 3 inches.

After the general dimensions were decided upon the loading was assumed. The roofing material considered was a Pyro-bar pre-cast slab with a built up roof over the top of it. The roof system was made up of main purlins which were 12 inch channels weighing 35 pounds per linear foot and reaching from truss to truss. Between and set flush with the top of these were placed 6 inch channels weighing 10.5 pounds per linear foot. These secondary purlins were placed at third points on the main purlins.

Sag rods were connected to the main purlins near the third points and angled over to the top chord of the roof truss. These sag rods were designed to take the component of stress parallel to the slope of the roof. The bulb tees which carry the Pyro-bar slabs run parallel to the main purlins. The total snow panel load was computed on the basis of 40 degrees latitude and for a one-fifth pitch roof with 20 pounds per square foot measured horizontally. The total dead panel load on the cantilever span was estimated to be 8,880 pounds. The snow panel loads were 4859 pounds maximum and 2425 pounds minimum load. The wind panel loads were computed by the use of Duchemin's Formula on the basis of 30 pounds on the vertical surface. The use of these imperical formulae for wind pressures has been found to be in error by leading investigators in that field. However, it was considered that the assumptions of the weights of the trusses were such as to make the truss safe for any variation in stress that might occur. The wind panel load on the cantilever span was estimated at 5,100 pounds. The panel loads on the central span were: dead loads 7,440, snow loads 4,370 or 2,185, and wind load 4,580 pounds. The dead load reactions were computed as 145,440 pounds acting upward for the reaction at the

interior columns and 41,640 pounds acting downward at the exterior columns. Stresses in the various members were obtained graphically and the method was illustrated on Stress Sheets Nos. 1-3 (Plates Nos. XXV, XXVI, XXVII, pages 85, 87, 89). Stresses were recorded in the Truss Data Sheets (Plate No. XXIV, pages 82 and 83).

The various members of the truss were designed in accordance with specifications set forth by the American Institute of Steel Construction. The design of the roof truss was shown on the Main Truss Detail Sheet (Plate No. XXVIII, page 91). Bracing in the vertical plan was placed over the interior columns and at the peak of the central span. Lateral bracing in the horizontal plane of the cantilever span was placed at the center of the forty foot part over the minor rooms at the side in the form of X-bracing. Stresses did not require this but it was thought well to provide rigidity in the building as a whole by securely bracing the lower chord of the cantilever span. Bracing was placed in the sloping lower chord of the cantilever span in the form of straight angles between trusses at interior spans and X-bracing in the two end spans. The lower chord of the central span was similarly braced. These bracing angles were not designed for any stress but were designed

PLATE NO. XXIV

Truss Data Sheets, stresses in members and
other tabular data used in design
of roof truss.

MEMBER	LENGTH (INCHES)	STRESSES IN MEMBERS (KIPS)						NET AREA (SQ. INCHES)	UNIT STRESS (LBS./SQ. IN.)	ALLOWABLE UNIT STRESS	RATIO OF $\frac{1}{T}$	WEIGHT PER LINEAL FOOT	WEIGHT OF MEMBERS	NUMBER OF RIVETS	MAKE UP OF SECTION
		DEADLOAD	MAX. SNOW	MIN. SNOW	WIND (WNWD)	WIND (LEWD)	MAX. TOTAL								
D-1 = B-50	129.20	+110.90	+60.58	+30.59	+58.0	-2.97	+199.19	13.15		18000	70.6	53.0	570		2/3 6x6 x 11/16
C-2 = Z-49	"	+110.90	+60.58	+30.59	+55.90	-11.80	+197.09	13.15		18000	"	"	570		" " "
A-4 = Y-47	"	+122.40	+66.86	+33.43	+61.50	-11.80	+217.33	13.15		18000	"	"	570		" " "
E-6 = X-45	"	+132.40	+72.33	+36.17	+65.90	-11.80	+234.47	13.15	+17850	18000	"	"	570	35	" " "
F-9 = W-42	"	+129.80	+67.64	+34.82	+60.30	-12.05	+218.92	13.15	+16700	18000	"	"	570	16	" " "
G-11 = V-40	"	+97.60	+53.52	+26.66	+44.50	-12.45	+168.81	13.15		18000	"	"	570		" " "
H-13 = U-38	"	+63.20	+34.53	+17.27	+26.75	-13.20	+107.22	13.15		18000	"	"	570		" " "
I-15 = T-36	"	0.00	0.00	0.00	-00.80	-15.00	-15.00	13.15		18000	"	"	570		" " "
J-16 = T-35	60.00	-37.20	-21.85	-10.93	-12.58	-47.93	-60.71	4.96	-14050	-15000	54.5	17.0	85.0	9	2/3 4x3 x 3/8
K-2 = 49-50	48.00	-9.00	-4.92	-2.46	-5.65	0.00	17.11	1.78	-9650	-18000	52.0	6.1	25.0	6	1/2 3x3 x 5/16
L-3 = 48-49	152.60	+14.10	+7.60	+3.80	+9.1	0.00	+27.00	2.15	+16750	18000	140.0	8.5	108.0	7	1/2 3 1/2 x 3 1/2 x 3/8
M-4 = 47-48	96.00	-13.40	-7.32	-3.66	-8.25	0.00	-25.31	1.78	-14200	-18000	110.0	6.1	48.8	6	1/2 3x3 x 5/16
N-5 = 46-47	187.20	+17.30	+9.45	+4.73	+10.80	0.00	+32.83	2.487	+17600	18000	175.0	9.8	153.0	8	1/2 3 1/2 x 3 1/2 x 7/16
O-6 = 45-46	144.00	-17.90	-9.78	-4.89	-11.00	0.00	-33.79	2.09	-16200	-18000	145.5	7.2	86.0	7	1/2 3 1/2 x 3 1/2 x 5/16
P-7 = 44-45	226.20	+20.90	+11.42	+5.71	+13.00	0.00	+32.61	3.313	+12000	+18000	185.5	12.8	220.0	10	1/2 4x4 x 1/2
Q-8 = 43-44	178.25	-47.60	-27.10	-13.55	-28.50	-0.30	-91.65	6.62	-13850	-15000	145.0	22.6	340.0	14	2/3 4x4 x 7/16
R-9 = 42-43	161.50	+28.20	+15.40	+7.70	+15.10	+0.32	+51.00	3.09	+16550	+18000	176.0	12.2	162.0	10	2/3 3x3 x 5/16
S-10 = 41-42	156.00	-33.50	-18.30	-9.15	-18.00	-0.37	-60.65	4.18	-14500	-15000	144.0	14.4	188.0	9	2/3 3 1/2 x 3 1/2 x 5/16
T-11 = 40-41	140.00	+28.50	+15.57	+7.79	+14.80	+0.42	+51.09	3.092	+16550	+18000	152.5	12.2	143.0	7	2/3 3x3 x 5/16
U-12 = 39-40	120.00	-32.40	-17.70	-8.85	-16.40	-0.48	-57.65	3.84	-15050	-15000	129.0	13.2	132.0	7	2/3 3x2 1/2 x 3/8
V-13 = 38-39	125.50	+35.60	+18.36	+9.18	+15.50	+0.70	+58.28	3.63	+16000	+18000	116.0	14.4	151.0	10	2/3 3 1/2 x 3 1/2 x 5/16
W-14 = 37-38	84.00	-32.70	-17.86	-8.93	-15.10	-0.67	-56.73	3.84	-14750	-15000	114.0	13.2	92.0	7	2/3 3x2 1/2 x 3/8
X-15 = 36-37	120.00	+58.40	+31.90	+15.95	+23.75	+2.20	+98.10	5.444	+18025	+18000	82.0	20.8	208.0	9	2/3 5x3 1/2 x 3/8
Y-16 = 36-II	48.00	-41.64	-22.75	-11.38	-16.65	-1.15	-69.67	4.96	-14050	-15000	54.5	17.0	68.0	9	2/3 4x3 x 3/8
Z-II = 35-II	123.50	0.00	0.00	0.00	-4.0	-15.73	-15.73	1.78	-8850	+20000	142.0	6.1	63	6	1/2 3x3 x 5/16
AA-17 = 34-35	108.00	+83.70	+48.86	+24.43	+23.20	-1.86	+132.56	7.40	+17900	+18000	57.4	22.8	268	16	2/3 6x6 x 3/8

TRUSS DATA SHEET

STRESSES AND OTHER
TABULAR DATA REQUIRED
FOR ROOF TRUSS DESIGN

MEMBER	LENGTH (INCHES)	STRESSES IN MEMBERS (KIPS)						NET AREA (SQ. INCHES)	UNIT STRESS (LBS./SQ. IN.)	ALLOWABLE UNIT STRESS	RATIO OF 1 st	WEIGHT DEAD LIFT	WEIGHT OF MEMBERS	NUMBER OF RIVETS	MAKE UP OF SECTION
		DEAD LOAD	MAX SNOW	MIN SNOW	WIND (WIND)	WIND (LEWIND)	MAX TOTAL								
1-III = 50-I	120.00	- 102.60	- 56.08	- 28.03	- 41.50	- 2.97	- 172.13	16.72	- 14100	18000	48.75	57.00	570	38	2 1/2 8 x 6 x 3/8
2-III = 48-I	120.00	- 113.40	- 61.95	- 30.93	- 48.00	- 2.97	- 192.33	" "	"	"	"	"	870	"	" " "
3-III = 46-I	120.00	- 124.50	- 68.01	- 34.00	- 55.45	- 2.97	- 213.95	" "	"	"	"	"	570	"	" " "
4-III = 44-I	120.00	- 136.10	- 74.35	- 37.18	- 62.35	- 2.97	- 235.63	" "	"	"	"	"	570	"	" " "
5-III = 42-II	146.50	- 166.70	- 91.07	- 45.54	- 75.70	- 3.80	- 287.94	19.88	- 14475	"	59.0	67.60	825	"	2 1/2 8 x 6 x 3/4
10-II = 41-II	146.50	- 117.70	- 64.19	- 32.09	- 62.10	- 3.32	- 211.69	" "	"	"	"	"	825	"	" " "
12-II = 39-II	146.50	- 110.90	- 60.58	- 30.29	- 46.60	- 2.88	- 187.79	" "	"	"	"	"	825	"	" " "
14-II = 37-II	146.50	- 71.90	- 39.28	- 19.64	- 28.95	- 2.08	- 120.49	" "	"	"	"	"	825	"	" " "
16-II = 35-II	123.50	= 0.00	0.00	0.00	- 4.00	- 15.73	- 15.73	1.78	- 8850	20000	142.00	6.1	67	6	1 1/2 3 x 3 x 5/16
17 = 5-34	116.20	- 90.40	- 53.90	- 26.55	- 27.86	+ 2.00	- 141.81	10.12	- 14450	18000	62.0	34.40	993	18	1 1/2 6 x 6 x 7/16
18 = 7-33	116.20	- 90.40	- 53.10	- 26.55	- 29.50	+ 2.00	- 146.45	" "	"	"	"	"	993	"	" " "
19 = 9-31	116.20	- 80.40	- 49.30	- 24.67	- 27.80	- 8.26	- 132.87	" "	"	"	"	"	993	"	" " "
20-21 = 10-28	116.20	- 77.00	- 45.23	- 22.62	- 28.30	- 11.60	- 127.92	" "	"	"	"	"	993	"	" " "
22-24 = 10-27	116.20	- 77.00	- 45.23	- 22.62	30.10	11.60	- 122.72	" "	"	"	"	"	993	"	" " "
27-18 = 33-34	43.25	7.50	- 44.40	- 2.20	- 4.95	0.00	- 14.65	1.78	- 8250	18000	42.5	6.1	22	6	1 1/2 3 x 3 x 3/16
18-19 = 32-33	138.50	+ 12.00	+ 7.07	+ 3.53	+ 4.70	- 12.10	+ 20.23	1.507	+ 17900	18000	151.0	6.1	71	5	1 1/2 3 x 3 x 5/16
20-20 = 31-32	86.80	- 11.40	- 6.70	- 8.35	- 6.43	+ 8.63	- 21.18	1.78	- 11175	18000	99.5	6.1	44	6	1 1/2 3 x 3 x 5/16
20-21 = 30-31	168.60	+ 14.60	+ 8.58	+ 4.29	+ 8.30	- 4.80	+ 27.19	2.047	+ 17700	18000	142.0	7.2	102	7	1 1/2 3 x 3 x 7/16
21-22 = 29-30	129.60	- 18.90	- 10.10	- 5.05	- 11.80	+ 2.43	- 35.75	3.56	- 10050	10300	115.5	12.2	132	5	2 1/2 3 1/2 x 2 1/2 x 5/16
22-23 = 28-29	110.10	+ 6.20	+ 3.64	+ 1.82	+ 4.13	+ 0.00	+ 12.15	1.507	+ 10750	18000	120.0	6.1	56	5	1 1/2 3 1/2 x 3 1/2 x 5/16
23-24 = 27-28	64.80	- 6.70	- 3.94	- 1.97	- 5.00	0.00	- 13.67	1.78	- 7725	18000	120.0	6.1	23	6	1 1/2 3 x 3 x 3/16
24-25 = 26-27	192.50	+ 85.10	+ 20.62	+ 10.31	+ 20.23	- 3.46	+ 65.64	3.63	+ 18050	18000	190	14.4	183	8	2 1/2 4 1/2 x 7 1/2 x 5/16
25-26	216.00	0.00	0.00	0.00	0.00	0.00	0.00	2.694	0	18000	192.0	12.2	220	6	2 1/2 3 1/2 x 2 1/2 x 5/16
26-III = 32-II	108.00	+ 74.40	+ 43.70	+ 21.85	+ 16.20	- 6.14	+ 118.10	7.40	+ 17900	18000	57.4	29.8	268	16	2 1/2 6 x 6 x 3/8
27-III = 30-II	108.00	+ 64.70	+ 38.00	+ 19.00	+ 10.98	- 3.10	+ 102.70	"	"	"	"	"	268	"	" " "
28-III = 26-II	216.00	+ 46.60	+ 27.37	+ 13.69	- 0.60	- 0.60	+ 73.97	"	"	"	"	"	536	"	" " "

TRUSS DATA SHEET

STRESSES AND OTHER
TABULAR DATA REQUIRED FOR
ROOF TRUSS DESIGN (CONT.)

PLATE NO. XXV

Stress Sheet No. 1, graphical solution for
dead load stresses in one-half
of main truss.

NOTE - DEAD LOAD REACTIONS
OBTAINED ALGEBRAICALLY.

NOTE - SEE STRESS SHEET
NUMBER THREE FOR THE
TRUSS DIAGRAM, ETC.

STRESS SHEET No. 1

DEAD LOAD STRESSES ON
ONE HALF OF TRUSS
SCALE 1" = 6000P

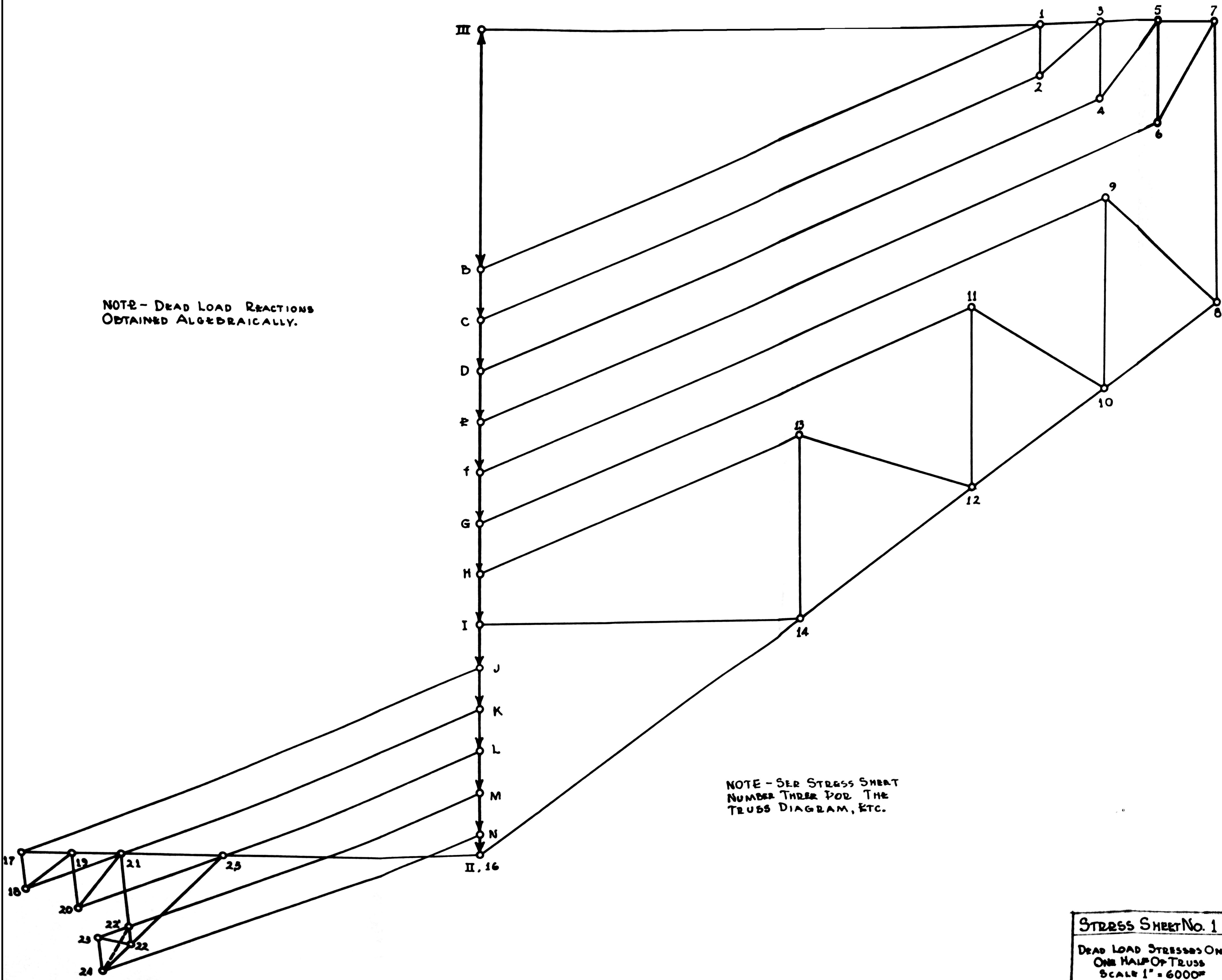


PLATE NO. XXVI

Stress Sheet No. 2, graphical solution for
wind stresses in members of central
span of main truss.

NOTE FOR RAY DIAGRAM,
EQUILIBRIUM POLYGON, AND
REACTIONS SEE STRESS SHEET
NUMBER THREE

17 19 21 16 30 32 27,28,29 31 35 33,34

18 20 22 23 24

I I₁ J₁ J K L M N

II 25,26

O,P,Q,R,S,T

STRESS SHEET No 2

WIND STRESSES ON
THE CENTRAL SPAN
SCALE 1" = 2000'

WIND STRESSERS ON
THE CENTRAL SPAN
SCALE 1" = 2000#

PLATE NO. XXVII

Stress Sheet No. 3, truss diagram for stresses
and graphical solution for wind stresses
in members of cantilever spans
of main roof truss.

SUMMATION OF
VERTICAL AND HORIZONTAL
COMPONENTS OF WIND
SCALE 1" = 12000'

TRUSS AND SPACE
DIAGRAMS
SCALE 1" = 10'-0"

WIND STRESSES
IN LEeward CANTILEVER
SCALE 1" = 1500'

RAY DIAGRAM FOR
WIND STRESSES IN CENTRAL SPAN
SCALE 1" = 6000'

RAY DIAGRAM FOR
WIND STRESSES IN THE WINDWARD
CANTILEVER
SCALE 1" = 6000'

WIND STRESSES
IN WINDWARD CANTILEVER
SCALE 1" = 6000'

RAY DIAGRAM FOR
WIND STRESSES IN THE
LEeward CANTILEVER
SCALE 1" = 3000'

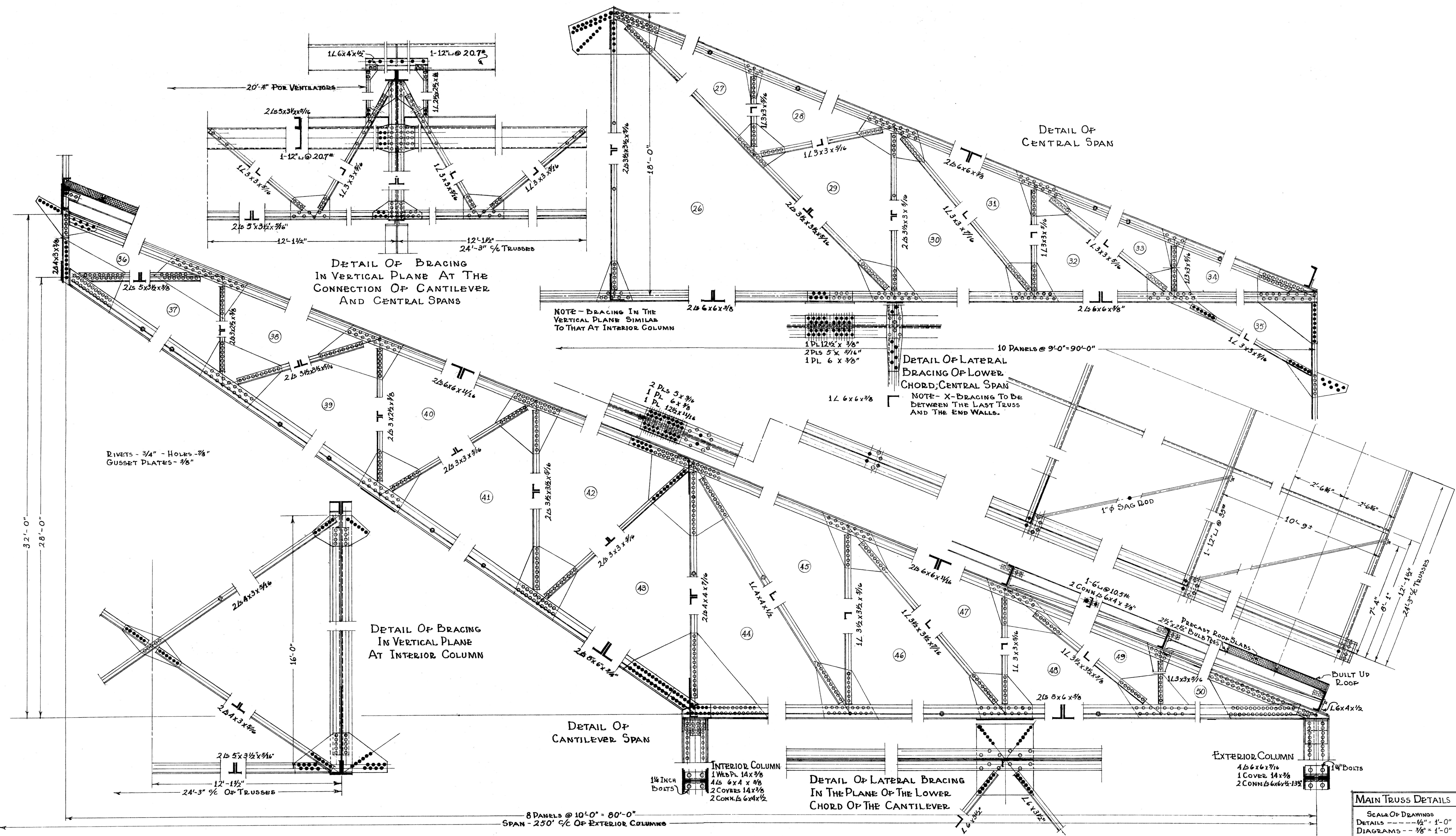
WIND FORCE POLYGON
SCALE 1" = 6000'

STRESS SHEET No. 3

TRUSS DIAGRAM FOR
STRESSES AND WIND
STRESSES IN CANTILEVERS

PLATE NO. XXVIII

Main Roof Truss Detail Sheet, showing design
and riveting of main truss members
and section of interior and
exterior columns.



MAIN TRUSS DETAILS
 SCALE OF DRAWINGS
 DETAILS --- 1/2" = 1'-0"
 DIAGRAMS --- 3/8" = 1'-0"

for the ratio of length to radius of gyration not to exceed 120 for compression and 200 for tension members. They serve the purpose of stiffening the structure as a unit.

The weight of the truss was computed after it was designed and found to be approximately 20 tons. This weight did not include any bracing or any purlin system. This was considerably lighter than certain examples that were available. The truss used at the University of Minnesota spans 236 feet, rises 104 feet above the floor, and weighs 70 tons. A two-hinged type used at the University of Chicago weighs 32 tons. The Bowstring truss used at the University of Pennsylvania spans 180 feet and weighs 46 tons. The truss, designed by Raymond Usher Brooks for his thesis, A Field House for Kansas State College, was for a span of 166 feet 6 inches and spaced 27 feet 6 inches. Mr. Brooks estimated his truss to weigh 26 tons. This gives a fairly accurate comparison of the efficiency of the type of truss as designed for this building. In the author's opinion, such a type would be both efficient and desirable. Erection would be comparatively simple. The trusses would be shipped in sections as indicated by field joints on the main truss detail and would be assembled on the job.

The columns were designed to take the horizontal force of the wing in bending as well as the direct tension and compression due to vertical loads. It was considered sufficiently accurate to assume the point of inflection to be at the second floor line. The stiffening effect of the connections to the truss was not considered as taking any part of the stress. The loads were considered as distributed equally between the two columns. The necessary section was found to be a built up section made of four, six by six by seven-sixteenths inch angles and one, fourteen by three-eighths inch web plate for the exterior column. The connection angles used were six by six by one-half inch. Connection of the column was made by the use of four, one and one-quarter inch turned bolts in reamed holes. The section at the interior column was a built up section of four, six by four by three-eighths inch angles and one, fourteen by three-eighths inch web plate and two, fourteen by three-eighths inch cover plates. Six by four by one-half inch connection angles were used and four, one and one-fourth inch turned bolts in reamed holes formed the connection for the interior column to the truss.

CONCLUSION

As a result of this study it appears that the design suggested is a practical and desirable solution to the problem of A Men's Athletic Building for Kansas State College. It is quite evident that such a building would be an asset to Kansas State College in that it would serve to bring state-wide championship contests to the campus and thereby serve to stimulate interest in Kansas State College among the future college students of the state. Such a building could well serve as a place in which large conventions might be held. With the removal of the basketball courts to the storage space provided for that purpose sufficient seating could be obtained for any meeting that might be held in this locality. The building, so located, would help to create an interest in the future development of that section of the campus. The location is such that a large percent of the automobiles which would bring the public to the various contests to be held in the building could be parked off the campus. With drives on three sides of the building and Anderson Avenue so near the parking situation would be alleviated to some extent.

If in the future, Kansas State College should get appropriations for an armory the proposed addition might well serve in that capacity.

A building, such as this would be, would provide adequately a men's gymnasium and for the additional cost of a roof the requirements for a field house could be satisfactorily fulfilled. The desirability of such a combination of men's athletic units which not only concentrates athletic activities but also provides such an economical solution for virtually two buildings in one would most certainly justify a movement to arouse interest in A Men's Athletic Building for Kansas State College.

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