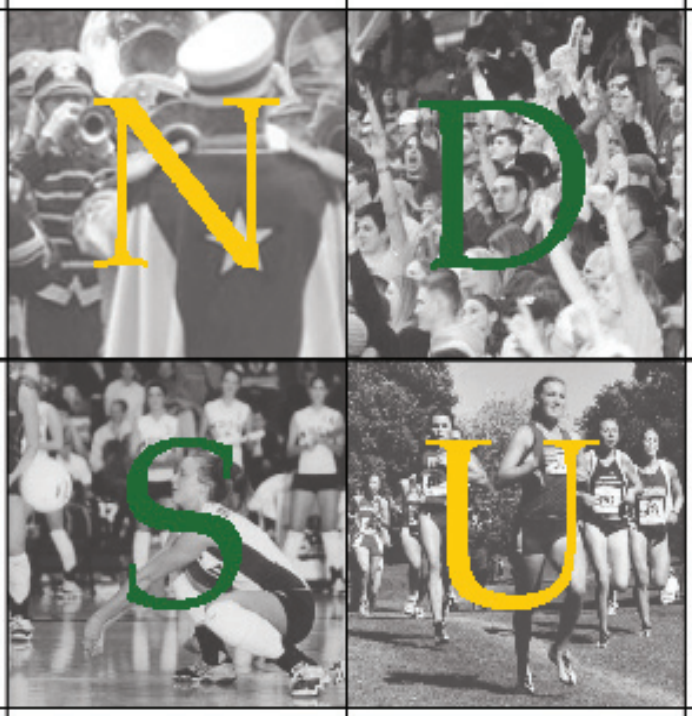

North Dakota State University

Bison Sports Arena

Matt Kalbus
Undergraduate Thesis
Department of Architecture & Landscape Architecture
2004-2005

"North Dakota State University Bison Sports Arena: Moving the University Forward"

AN UNDERGRADUATE THESIS SUBMITTED TO
THE DEPARTMENT OF ARCHITECTURE AND LANDSCAPE ARCHITECTURE
NORTH DAKOTA STATE UNIVERSITY

by

Matthew W. Kalbus

IN PARTIAL FULFILLMENT OF THE REQUIREMENTS
FOR THE DEGREE OF
BACHELOR OF ARCHITECTURE

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This is a thanks to all the people that have made this possible.

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1. Project Introduction

A. Building Type

The Bison Sports Arena for North Dakota State University will be a multi-use recreational facility not only for the athletes of NDSU but for any student, faculty member or visitor to the campus. This facility will enhance the athletic department for the campus and will also attract more visitors. This athletic and recreational facility will be a building block for the change from Division II athletics to Division I athletics.

B. Project Emphasis

This being an athletic and recreational facility, incorporating the human form into the design is the main area that I want to explore. Using the study of Kinesiology, I will implement these principles into the form and context. Using these principles, they athletic complex should incorporate lightweight materials but at the same time using heavier materials such as brick and concrete is essential to maintaining the character of the rest of the North Dakota State University campus. The heritage and culture of this region is an area that should not be overlooked.

C. Project Goals & Objectives

My main goal for this thesis project is to create an athletic complex that will exceed the expectations of the university and its visitors. The new Bison Sports Arena should be able to make the Division I athletics more appealing.

D. User/Client Description

The main users will be the students and staff of NDSU. The other secondary clients will be the visitors that come to NDSU to watch sporting events. This building could also be used for concerts and other types of venues of different sorts. This building will primarily be used during the main school hours, 8 a.m. to 5 p.m. This building would also be used during evenings for practices and training of athletes. The times when the building will have the heaviest use will be when there are sporting events and other types of venues. The facility will welcome visitors from other cities and towns when these types of venues are held at the Bison Sports Arena.

E. Project Justification

The growth of NDSU over the recent years is the main reason for this project. The current rate of growth of NDSU will not allow the present Bison Sports Arena to be adequate in the future. The main drive of this project is to be able to design a new athletic complex that will be able to sustain NDSU athletics for the expanding future. They other challenge is designing a facility that can handle the switch from Division II athletics to Division I.

2. Project Background Information

A. NDSU History

In January of 1890, a bill was introduced to the North Dakota state legislature which called for the establishment and operation of the North Dakota Agricultural College and Experiment Station at Fargo. The bill passed and was approved by the governor on March 9, 1890. The first meeting of the Board of Trustees was on May 1, 1890. The following article appeared in the Daily Argus, May 2, 1890: "At the meeting of the Fargo Agricultural College board yesterday afternoon the following members were present: J. B. Power of Power, E. M. Upson of Cummings, M. Saunderson of Edgeley, and O. W. Francis of Fargo. Mr. Francis was elected president and J. B. Power, secretary. After organization the situation was discussed and steps taken to obtain for the college the $15,000 to be given by the government for an experiment station.

The approval of the first budget and the confirmation of the president Horace E. Stockbridge and the first three faculty members (Henry L. Bolley, Edwin F. Ladd, and Clare Bailey Waldron) on October 15, 1890, mark the real beginnings of North Dakota Agricultural College (NDAC). Old Main was the first building built on the North Dakota Agricultural College campus.

"The North Dakota Agricultural College is a state and national institution, belonging to the group of so-called land-grant colleges of the country, owing their existence to the provisions of the act of Congress, approved July 2, 1862, whereby grants of public lands were made to each of the states and territories for the purpose of endowing in each at least one college whose leading object shall be, without excluding other classical and scientific studies, and including military tactics to teach such branches of learning as are related to agriculture and the mechanic arts, in order to promote the liberal education of the industrial classes and professions of life."

This "First Annual Catalogue" also defines the character and design of the institution, as well as its objective: "'The design of the institution is to afford practical instruction in agriculture and the natural sciences connected therewith, and also the sciences which bear directly upon all industrial arts and pursuits. The course of instruction shall embrace the English language and literature, mathematics, military tactics, civil engineering, agricultural chemistry, animal and vegetable anatomy and physiology, the veterinary art, entomology, geology, and such other natural sciences as may be prescribed. Political, rural, household economy, horticulture, moral philosophy history, bookkeeping, and especially the application of science and the mechanic arts to practical agriculture in the field.

A full course of study in the institution shall embrace not less than four years, and the college year shall consist of not less that nine calendar months.'" … Further, "the object of this institution is not the making of farmers, but rather the making of men and women, and then so to equip them that, if their inclinations draw them toward the farm, their efforts there may be reasonably expected to be attended by success. It is not the intention, however, to limit or restrict the capabilities of students, and while the curriculum is made sufficiently rigid to enforce the principles on which the work of the institution is founded, abundant scope is given by means of electives for the display of individual preferences and the development of personal abilities.'"

In 1892, College Hall, the first building on campus, was completed (today called 'Old Main'), and contained classes, offices, and laboratories for the faculty, a room for the library, an uncompleted upper floor used as a gymnasium, the office of the President, and an enrollment of 80.

In November of 1960, the citizens of North Dakota voted to officially change the name of the institution to North Dakota State University (NDSU). Unofficially, the students had been referring to the school as "North Dakota State College" since the 1920s.

North Dakota State University's current enrollment is over 12,000 students as of the fall of 2004, offering over 100 undergraduate and graduate programs of study. The main campus encompasses 98 buildings on nearly 30 square blocks or 258 total acres, 5.8 miles of streets and 15.5 miles of sidewalks. In all, NDSU is located on 22,053 acres of North Dakota land.

B. NDSU General Facts

How many students are enrolled at NDSU?

Current enrollment at North Dakota State University is approximately 12,026 students (fall 2004).

What is the ratio between students and faculty?

The student to teacher average ratio is 19 to 1.

Is NDSU on quarters or semesters?

NDSU is on the semester system. Fall semester usually begins the end of August and runs to the middle of December. Spring semester usually begins in January. Each semester is 15 weeks long. In addition, NDSU offers two summer sessions. One session is four weeks long and the other one is eight weeks long.

What is the average class size?

The average class size is 30 students. However, first year students will have a variety of class sizes. Some classes may be larger lectures with as many as 300 students and some classes will be around 20 students. Introductory courses typically have more students, while classes specifically relating to your major often have fewer than 25 students.


North Dakota 
State University 
Bison Sports 
Arena

C. NDSU Athletics

The proud tradition of North Dakota State University athletics was one of the finest in the country at the NCAA Division II level for many years. The Bison men's and women's programs were regular contenders for championships on a national scale. Now a Division I program featuring 16 varsity sports, the vision for North Dakota State is "Continuing the Championship Tradition of Bison Athletics."

Where did Bison come from?

North Dakota State University's athletic teams have progressed from the "Farmers" in the 1890's to the "Aggies" in the early 1900's to the "Bison," NDSU's current athletic symbol. In 1919, head football coach Stan Borleske developed it because he and members of the football team didn't like being known as "Aggies." Borleske wanted a strong and fierce mascot. The "Bison" was a logical choice. The great animals once roamed the North Dakota prairie in vast numbers, and over the years Bison athletic teams added an additional name, the "Thundering Herd."

D. Bison Sports Arena History & Present Conditions

In 1966, North Dakota State University made a request to the Board of Higher Education, the Governor, and State Legislature for a new athletic complex. In 1967, it was announced that the State Legislature appropriated $1,750,000 towards the construction of the proposed $3,100,000 Field House and Physical Education Building. The remaining costs were paid by federal funds, contributions from alumni and friends and student funds.

The plans called for building that was a multi-purpose structure. It offered ideal facilities for athletic events, conventions, shows, expositions, stage attractions and other events, as well as much-needed quarters for expanded physical education and intra-mural programs. An original completion date was set for late 1969. The new sports center was to contain 2,000 chair-type seats and 10,000 bleacher-type seats. Facilities within the building included - in addition to the large multi-purpose main area - an Olympic-size swimming pool, seven handball-paddle ball courts, a gymnastics area, wrestling area, locker room complex, training room, classrooms, a 220-yard (8-lap) oval running track on the main floor, and administrative offices for the physical education and athletic departments. The building represented the single largest appropriation made by the North Dakota Legislature for a structure within a state college or university. At the time, the new facility featured the largest indoor seating capacity of any building of its type in the state.

The completed building had 150,639 square feet of space and was divided into three levels. The main floor consisted of an all-purpose gymnasium, track, offices, lockers, and classrooms, training and exercise room, swimming pool. The second floor included handball courts and basketball courts. The third level contained future office space and room for a press box.

North Dakota State University *Bison Sports Arena*

There was a clever commentary that appeared in The Spectrum in 1969 that commented on the potential problems the new field house presented to the public. "UND fans will be proud to realize that Grand Forks provides the only effective weather break for the north entry. (This lack of protection may not be an oversight though, since it will be noticed only during the basketball season, the period of the arena's heaviest use.) The architects have also included special opponent seating, an afterthought design decision added 300 permanent seats, of which 160 have views obstructed by two major structural columns." The commentary noted that the numerous rooms contained within the building may "remind the average fan of the labyrinth" and that a "center for trained guides might have been squeezed in behind the façade

Despite the potential problems, the dedication of the new Field house took place on October 10, 1970 during the Homecoming ceremonies. The faculty and Spectrum were treated to a preview on October 7. The public received an invitation for an open house on October 11. Today, the Field house is known as the Bison Sports Arena and is still home to the Athletic Department.

Southeast view of present Bison Sports Arena

South Entrance

Ticket Booths

Trophy Cases

Main Arena

Indoor Track

Upper Level Basketball Seating

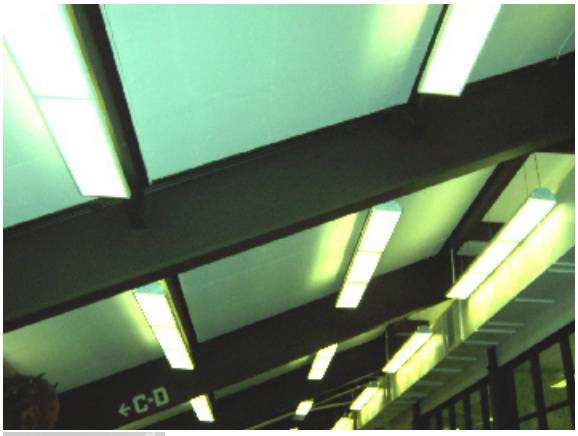
Aerial of Main Arena

Second Level Concourse

Concourse Overlooking Pool

Study and Relaxation Lounge

Bison Hall of Fame on Second Level Concourse



Structure Supporting Second Level Basketball Seating

Basketball Hoops on Second Level Concourse

Weight Room on South End of Second Level

Departmental Office Near South Entrance

E. Facts & History of Fargo

Fargo, North Dakota

Fargo is a city located in Cass County in the US state of North Dakota. As of the 2000 census, the city had a total population of 90,599. It is the county seat of Cass County. It is also the largest city in North Dakota.

General Information

For travel, Fargo is served by Hector International Airport and is also located along Interstate 29 and Interstate 94. The city is on the border between North Dakota and Minnesota, defined by the Red River of the North. Moorhead, Minnesota is located across the river. Additionally, Fargo is bordered on the other side by West Fargo.

From the late 1990s onward, Fargo has consistently had one of the lowest unemployment rates of any Standard Metropolitan Statistical Area in the United States (at one point its jobless rate fell to less than 1 per cent), and its crime rate has been perhaps the lowest of any American city its size or larger in recent years. It is also noted for its plentiful supply of affordable housing; these factors have prompted Money magazine to rank the city very near the top of its annual list of America's most livable cities throughout the late 1990s and early 2000s. The local paper is The Forum of Fargo-Moorhead.

Geography

Fargo is located at 46°52′17″ North, 96°48′31″ West (46.871414, -96.808658)1. According to the United States Census Bureau, the city has a total area of 98.3 km² (37.9 mi²). 98.3 km² (37.9 mi²) of it is land and none of the area is covered with water.

F. Fargo Demographical Information

Subject	Number	Percent
Total Population:	90,599	100.0 %
Sex & Age		
Male	45,306	50.0 %
Female	45,293	50.0 %
Under 5 years	5,763	6.4 %
5 to 9 years	5,263	5.8 %
10 to 14 years	5,008	5.5 %
15 to 19 years	7,012	7.7 %
20 to 24 years	13,477	14.9 %
25 to 34 years	15,144	16.7 %
35 to 44 years	13,051	14.4 %
45 to 54 years	11,054	12.2 %
55 to 59 years	3,157	3.5 %
60 to 64 years	2,550	2.8 %
65 to 74 years	4,532	5.0 %
75 to 84 years	3,171	3.5 %
85 years and over	1,417	1.6 %
Median age(years)	30.1	N/A
18 years and over	71,463	78.9 %
Male	35,601	39.3 %
Female	35,862	39.6 %
21 years and over	64,756	71.5 %
62 years and over	10,604	11.7 %
65 years and over	9,120	10.1 %
Male	3,559	3.9 %
Female	5,561	6.1 %

Fargo, North Dakota Statistics Continued...

Race		
One race	89,284	100.0 %
White	85,321	95.6 %
Black or African American	922	1.0 %
American Indian and Alaska Native	1,119	1.3 %
Asian	1,482	1.7 %
Asian Indian	388	0.4 %
Chinese	278	0.3 %
Filipino	86	0.1 %
Japanese	43	0.0 %
Korean	142	0.2 %
Vietnamese	349	0.4 %
Other Asian	196	0.2 %
Native Hawaiian and Other Pacific Islander	40	0.0 %
Native Hawaiian	16	0.0 %
Guamanian or Chamorro	0	0.0 %
Samoan	18	0.0 %
Other Pacific Islander	6	0.0 %
Some other race	400	0.4 %
Two or more races	1,315	1.5 %
Race alone or in combination w/ one or more other races:		
White	86,430	96.8 %
Black or African American	1,287	1.4 %
American Indian and Alaska Native	1,535	1.7 %
Asian	1,824	2.0 %
Native Hawaiian and Other Islander	81	0.1 %
Some other race	836	0.9 %
Hispanic or Latino and race		
Total Population	90,599	100.0 %
Hispanic or Latino(of any race)	1,167	1.3 %
Mexican	668	0.7 %
Puerto Rican	54	0.1 %
Cuban	47	0.1 %
Other Hispanic or Latino	398	0.4 %
Not Hispanic or Latino	89,432	98.7 %
White alone	84,660	93.4 %

Fargo, North Dakota Statistics Continued...

Relationship		
Total Population	90,599	100.0 %
In households	86,584	95.6 %
Householder	39,268	43.3 %
Spouse	16,407	18.1 %
Child	21,532	23.8 %
Own child under 18 years	18,376	20.3 %
Other relatives	1,740	1.9 %
Under 18 years	382	0.4 %
Nonrelatives	7,637	8.4 %
Unmarried partner	2,334	2.6 %
In group quarters	4,015	4.4 %
Institutionalized population	817	0.9 %
Noninstitutionalized population	3,198	3.5 %
Households by Type		
Total Households	39,268	100.0 %
Family households (families)	20,724	52.8 %
With own children under 18 years	10,392	26.5 %
Married-couple family	16,407	41.8 %
With own children under 18 years	7,686	19.6 %
Female householder, no husband present	3,078	7.8 %
With own children under 18 years	2,095	5.3 %
NonFamily households	18,544	47.2 %
Householder living alone	13,602	34.6 %
Householder 65 years and over	3,137	8.0 %
Households with individuals under 18 years	10,751	27.4 %
Households with individuals 65 years and over	6,264	16.0 %
Average Household size	2.2	N/A
Average family size	2.91	N/A

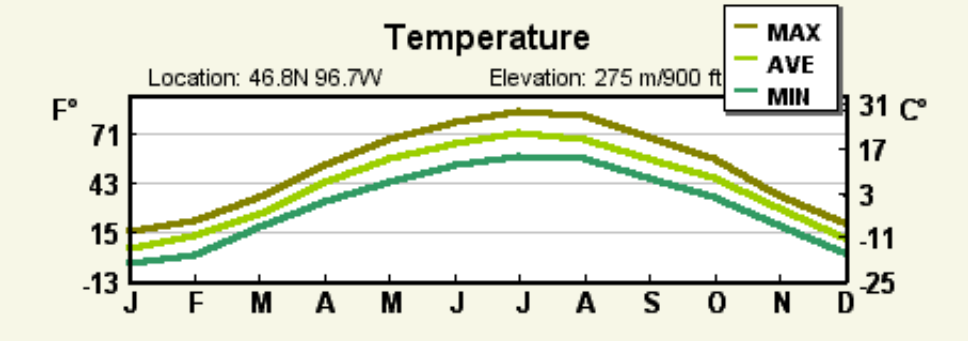
Fargo, North Dakota Statistics Continued...

Housing Occupancy		
Total housing units	41,200	100.0 %
Occupied housing units	39,268	95.3 %
Vacant housing units	1,932	4.7 %
For seasonal, recreational, or occasional use	199	0.5 %
Homeowner vacancy rate (percent)	1.6	N/A
Rental vacancy rate (percent)	5.1	N/A
Housing Tenure		
Occupied housing units	39,268	100.0 %
Owner-occupied housing units.	18,508	47.1 %
Renter-occupied housing units.	20,760	52.9 %

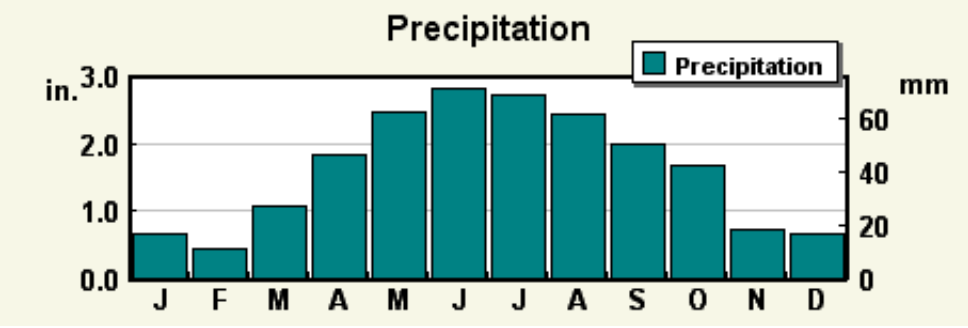
3. Site Analysis & Survey

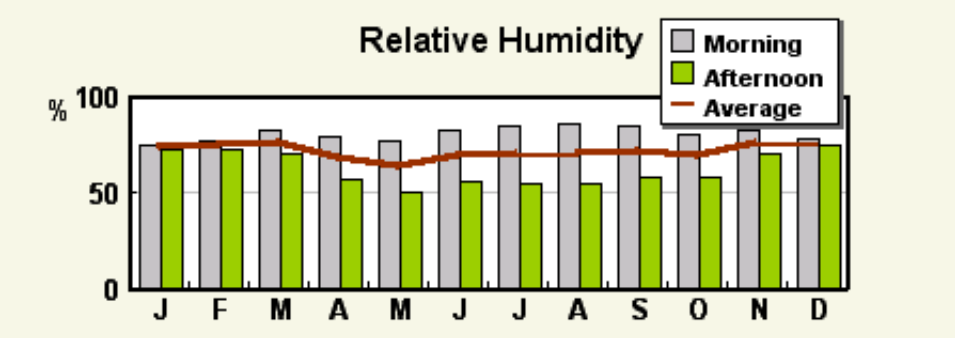
A. Regional Climate

Fargo is located in the northern-central region of the United States which places it in the climate zone of humid continental. This means that there are seasonal variations including extremes such as warm summers and cold winters. The summers usually only contain few hot, humid days and the nights are quite pleasant. The winters are cold and dry. Temperatures in the coldest months, such as January and February, only have a few days where the temperature reaches above freezing.

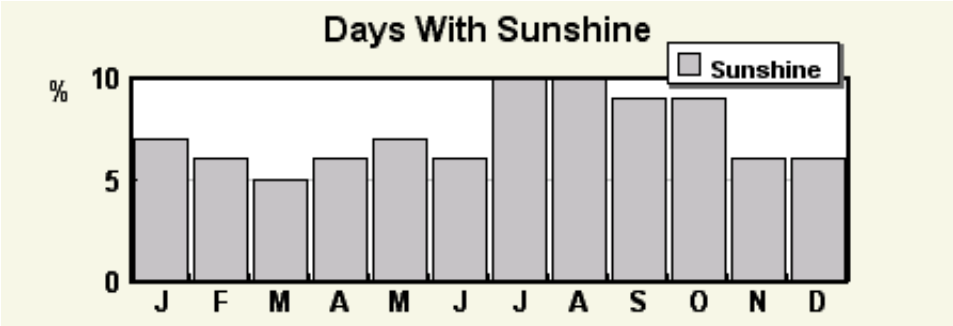


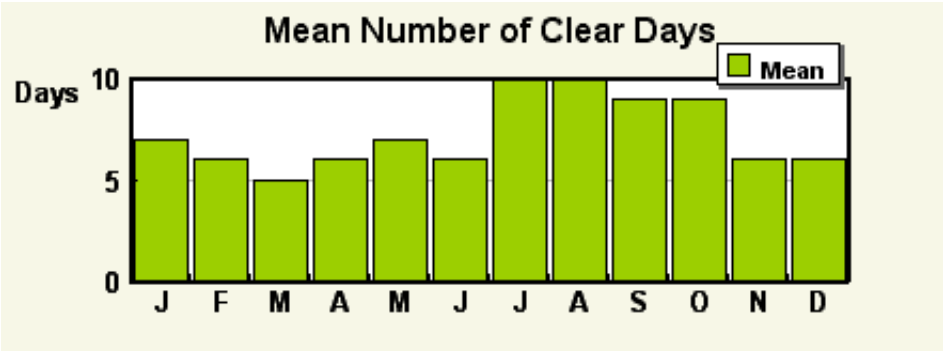
Precipitation is more abundant in the eastern part of the state than the western part. The average rainfall for Fargo is about 19 to 20 inches per year. The average winter snowfall is 38 to 40 inches per year and can begin to fall as early as September and as late as May. Eastern North Dakota is flat so even the smallest amount of snowfall combined with the winds can cause blizzard-like conditions.





The terrain of Fargo is very flat causing winds to bring cloudiness and fog. The wind direction in the summer months blows from the south to the southeast. The wind direction in the winter blows predominantly from the northeast bringing down cold air from Canada. The average summer prevailing winds blow at an average of 12 miles per hour.





B. Local Climate

The tables below display average monthly climate and weather indicators in Fargo North Dakota.

Temperatures in Fahrenheit

Fargo Temperature	Jan	Feb	Mar	Apr	May	Jun
Avg. Temperature	5.9	12.0	25.9	43.0	56.2	65.5
Avg. Max Temperature	15.4	21.1	34.6	53.8	68.5	77.4
Avg. Min Temperature	-3.6	2.7	17.3	32.1	43.8	53.6
Days with Max Temp of 90 F or Higher	0.0	0.0	0.02	< 0.5	1.0	2.0
Days with Min Temp Below Freezing	31.0	28.0	8.0	17.0	4.0	< 0.5

Fargo Heating and Cooling	Jan	Feb	Mar	Apr	May	Jun
Heating Degree Days	1832	1484	1212	660	307	93.0
Cooling Degree Days	0.0	0.0	0.0	0.0	35.0	108

Fargo Precipitation	Jan	Feb	Mar	Apr	May	Jun
Precipitation (inches)	0.7	0.5	1.1	1.8	2.5	2.8
Days with Precipitation 0.01 inch or More	9.0	7.0	8.0	8.0	10.0	11.0
Monthly Snowfall (inches)	9.6	6.1	7.5	3.2	0.1	< 0.05

Other Weather Indicators	Jan	Feb	Mar	Apr	May	Jun
Average Wind Speed	12.6	12.4	13.1	13.6	12.9	11.6
Clear Days	7.0	6.0	5.0	6.0	7.0	6.0
Partly Cloudy Days	7.0	7.0	9.0	9.0	10.0	11.0
Cloudy Days	17.0	15.0	17.0	15.0	14.0	13.0
Percent of Possible Sunshine	50.0	56.0	58.0	60.0	61.0	62.0
Avg. Relat. Humidity	57.0	75.0	77.5	75.0	66.5	66.0

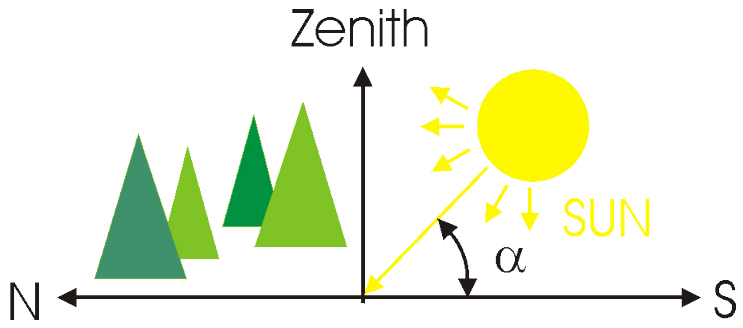
Fargo Temperature	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Avg. Temperature	71.1	68.8	57.7	45.7	28.1	11.6	41.0
Avg. Max Temperature	83.4	81.3	69.4	56.7	36.8	20.1	51.5
Avg. Min Temperature	58.8	56.4	45.9	34.6	19.4	3.1	30.3
Days with Max Temp of 90 F or Higher	5.0	5.0	1.0	< 0.5	0.0	0.0	14.0
Days with Min Temp Below Freezing	0.0	0.0	2.0	13.0	27.0	31.0	179

Fargo Heating and Cooling	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Heating Degree Days	19.0	48.0	239	598	1107	1655	9254
Cooling Degree Days	209	165	20.0	0.0	0.0	0.0	537

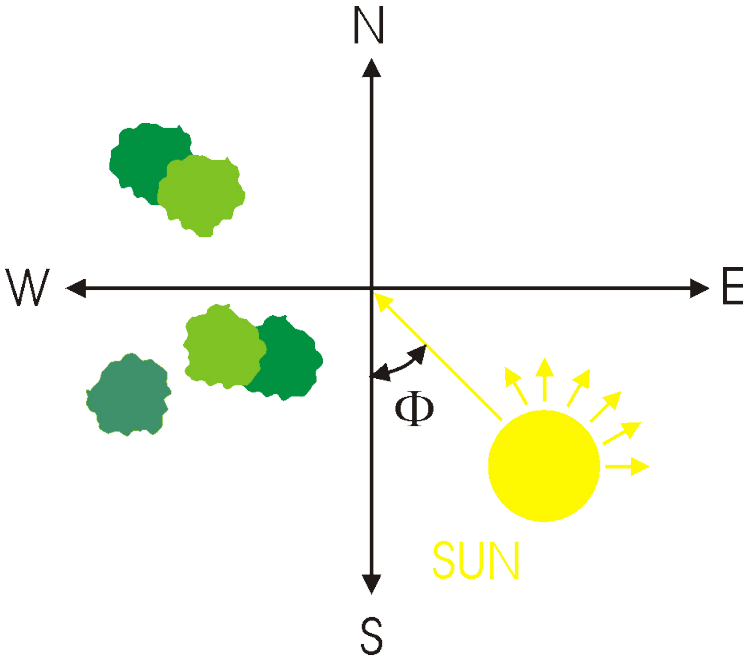
Fargo Precipitation	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Precipitation (inches)	2.7	2.4	2.0	1.7	0.7	0.7	19.4
Days with Precipitation 0.01 inch or More	10.0	9.0	8.0	7.0	6.0	8.0	100.0
Monthly Snowfall (inches)	0.0	< 0.05	0.0	0.6	6.1	7.2	40.4

Other Weather Indicators	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Average Wind Speed	10.5	11.0	11.8	12.5	12.8	12.2	12.2
Clear Days	10.0	10.0	9.0	9.0	5.0	6.0	88.0
Partly Cloudy Days	13.0	12.0	9.0	8.0	6.0	7.0	109
Cloudy Days	8.0	9.0	12.0	14.0	18.0	18.0	168
Percent of Possible Sunshine	71.0	69.0	60.0	54.0	40.0	43.0	57.0
Avg. Relat. Humidity	71.0	71.0	70.0	69.5	71.0	75.0	77.5

Altitude - The vertical angular position of the sun in the sky above the horizon



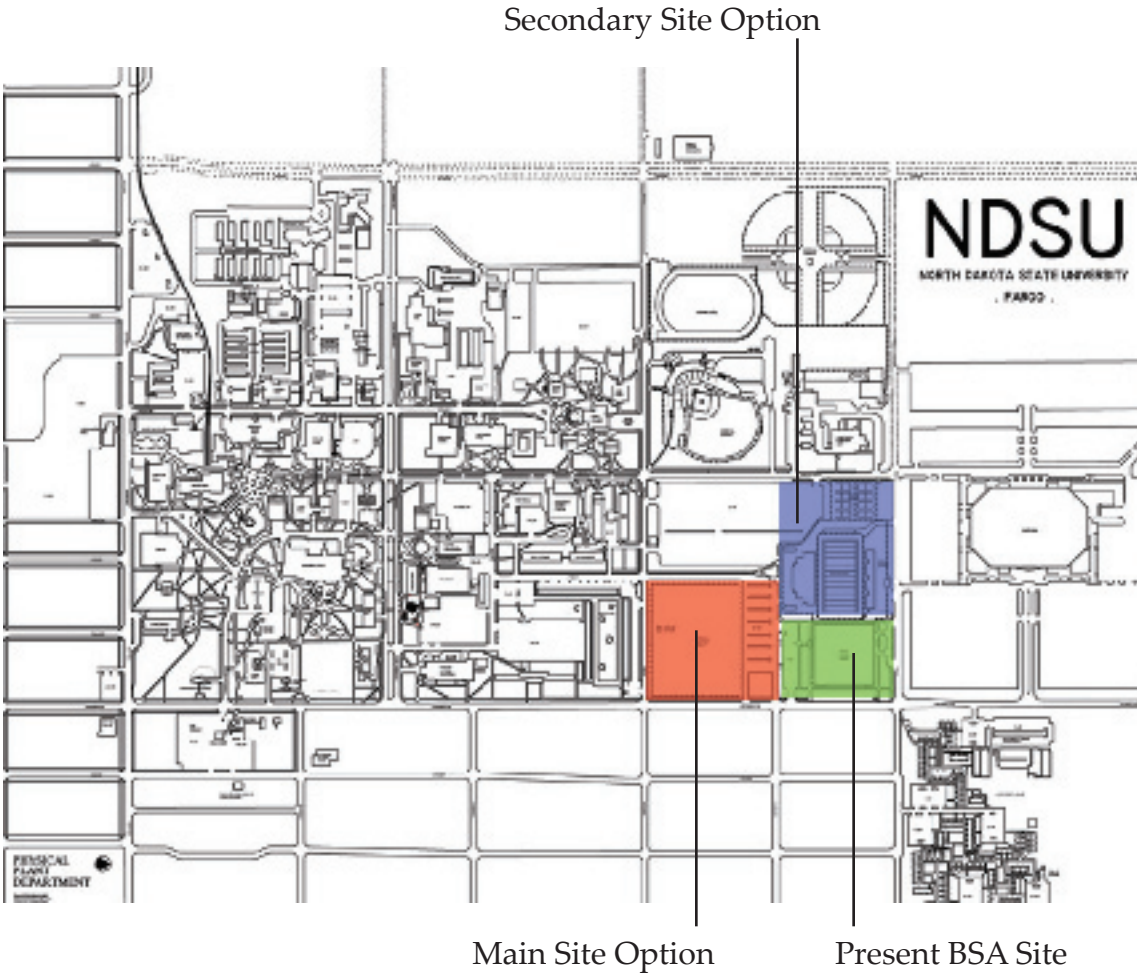
Azimuth - The horizontal angular position of the sun in the sky measured east and west of south



The average amount of daylight can vary from 16 hours in July to as little as 9 hours in December. Noon sun angles are the longest in the summer months.

C. Site Selection

The site for this complex would best to be located on the corner of 15th Avenue North and University Drive. This is just south of the present Bison Sports Arena. This is an optimal location because it remains on campus and near heavy student activity. This site is currently being occupied by the NDSU football team for their practice field. The practice field could easily be relocated to Dacotah Field until construction of the new Bison Sports Arena is completed. At that time the university could decide if they want to use the present Bison Sports Arena site for a football practice or if the site would be better put to use for some other University activity.



D. Site Issues & Survey

Looking northwest across University Drive to main site option

View of University Drive southwest of site

Looking north on University - adjacent to the campus and the BSA site

Residential Houses and Apartments east of Bison Sports Arena site

Looking West Down 15th Avenue North

Residential Housing Project Currently Under Construction Located South of Site

Student Dormitories Located Southwest of Proposed BSA Site

Large Coniferious Trees Thriving on South Side of Proposed Site

Looking South to Site

Large Parking Lot Located West of Proposed Site

Houses Located East of University Drive

4. Case Studies

A. Reily Recreational Center – Tulane University - New Orleans, LO

Front Entry Perspective

Location:
New Orleans, Louisiana, USA

Facility User:
Tulane Green Wave

Completion Date:
1989

The 150,000-square-foot Reily Student Recreation Center serves student, faculty and staff recreation and leisure time needs at Tulane University. The facility hosts intramurals, club sports and physical education classes.

Olympic Size Swimming Pool

The Reily Center was built in 1989 as a result of the efforts and interests of the Tulane student body. In 1986, students passed a referendum to assess themselves fees for the construction of this beautiful facility, with 150,000 square feet of activity space and a variety of recreational programs.

North Dakota State University *Bison Sports Arena*

Entry Lobby

The Reily Student Recreation Center is home to the Department of Campus Recreation and Student Centers. The Department is part of the Division of Student Affairs. The Reily staff is charged with facility management and recreational programming to meet the needs of Tulane students, faculty and staff.

Programming opportunities include Intramural Sports, Club Sports, Instructional Programs, Fitness and Wellness Programs, and Special Events.

Tulane has invested $15 million to provide the finest health and fitness facility in the region. Students have access to the Reily Center, which features an Olympic sized indoor pool and diving area, an outdoor social pool and sun deck, several gymnasiums, an indoor track, racquetball courts, a weight room, saunas, aerobics studios, pool tables, and a refreshment bar.

B. Kohl Center – University of Wisconsin - Madison, WI

Glass Front Entry

Basketball Arena

Location:
Madison, Wisconsin, USA

Facility User:
Wisconsin Badgers

Completion Date:
October 1, 1998

The Kohl Center's unique, cantilevered balconies provide an intimate atmosphere for both basketball and ice hockey crowds. It is the first arena in the United States to use the "Xylox variable rise seating system" - With the flip of a switch, 750 seats on one end of the seating bowl adjust from basketball sightlines to hockey sightlines within the timeframe of six minutes.

The entry to Kohl Center gleams with elaborate, blown glass artwork on the "Mendota Wall." Created by internationally-renowned glass artist and University of Wisconsin alumnus Dale Chihuly, the montage comprises 1,000 pieces of brightly-colored glass which recall the colors and shapes of Madison's Lake Mendota.

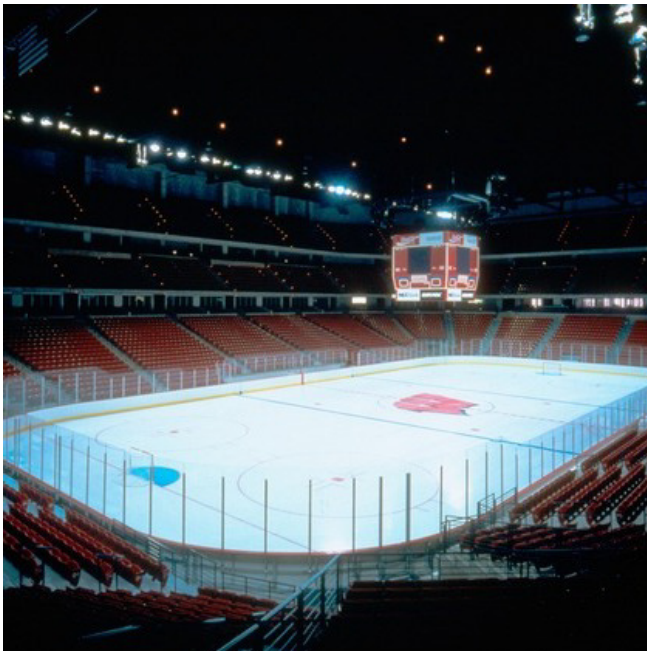
Luxury Suites

Designed by H.O.K. of Kansas City and Venture Architects of Milwaukee, the Kohl Center incorporates some of the latest technology and building practices. H.O.K. is the architect of the United Center, Coors Field, and Camden Yards. The head architect was George Heinlein. Formerly with H.O.K., he is now with Heinlein Schrok Architecture. Heinlein is the designer of the Nashville Arena and the new Miami Heat facility. The general contractor, the Oscar J. Boldt Company, has built the Wisconsin Timber Rattlers' Fox Cities Stadium. The Oscar J. Boldt Company, with the Hammes Company, under the name of the Badger Sports Development Company will build Miller Park, in Milwaukee.

A unique end-zone seating system from Italy will be installed for the first time in the world. Called Xylox, the variable pitch risers are positioned at the far ends of the arena. The system allows for a change in seating layout between hockey and basketball. Built by the Occor firm, the system has a steep pitch or angle for hockey games, which require a larger floor space; and a shallow pitch for basketball, where the basketball floor uses less space than hockey. Running electrically, the 8' of vertical travel that Xylox will provide, can be operated by one individual. The new risers have brought the interest of many similar arenas and are likely to be installed in the new Miami Heat professional basketball arena.

The seating in the Kohl Center was given high priority. A sightline study was conducted over several months and findings were used in significant design elements. All seats are barrier free and even the railings ringing each balcony where designed so they would be less obtrusive. The railings use a flat bar as the top support, which is angled towards the arena floor to create a smaller obstruction in sight. The remaining bars, which fill out the railings, are small and round; again to minimize the obstructions. The Kohl Center also has exceeded the number of wheelchair accessible seating at 165, giving great views from many levels around the arena.

Lobby



Ice Hockey Seating Configuration

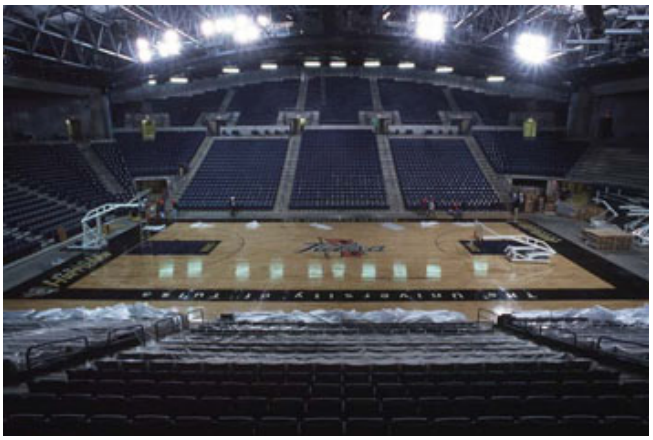
Another significant element is the overhanging second balcony. The seating sections weigh 390 tons each, hanging over 31' above the first balcony level. This was done to produce a similar environment to the old Fieldhouse. It has also placed the farthest seat from the basketball floor at 120'. The arena will hold a total of 16,500 for basketball. The lower bowl has 7500 seats, while each balcony holds an additional 4500 seats.

Due to a modified soil analysis the Kohl Center has no piles placed in the ground. Instead the arena rests on conventional spread footings. Each footing has a 14000 psi bearing capacity. Altogether the 40,000 cubic yards of concrete in the Kohl Center could build a sidewalk from Madison to Chicago, Illinois.

The arena features a 265' wide clear span. The roof, which weighs 1200 tons, is built to support an additional 93,000 pounds, for the scoreboard. The 40,000 square feet of glass used is enough for 166 homes. The HVAC system uses 410,000 supply fans.

C. Donald W. Reynolds Center – University of Tulsa - Tulsa, OK

Main Entry



Basketball Arena

Location:
Tulsa, Oklahoma, USA

Facility User:
Tulsa Golden Hurricane

Completion Date:
September 1, 1998

Donald W. Reynolds Center was designed to be as functional and flexible as possible to meet the needs of different event and activity types. Retractable seating provides the capability to accommodate stage events as well as athletic events.

The public concourse, at an average width of 20 feet, encircles the arena bowl and provides ample circulation space for spectators. After fifty years of playing home basketball games in various off-campus locations, the University of Tulsa now has an on-campus arena that doubles as a focal point for campus activities.

North Dakota State University Bison Sports Arena

Aerial of Front Entry

Conference Room

The Reynolds Center is a 138,000 square feet facility that includes an 8,355 seat arena. The facility, located on the northwest corner of Harvard Avenue and 11th Street, south of Mabee Gymnasium and east of Skelly Stadium, is not only home to the men's basketball program, but also serves as the home site of the women's basketball and women's volleyball teams.The facility also houses cutting edge facilities for video editing and strength training; and the state's only accredited academic program in athletic training/sports medicine. In addition, the center directly supports student commencement activities, career fairs, student-sponsored concerts, cultural festivals, classroom instruction and campus-related community events.

Press Room

Weight Room

The center provides the campus with an exceptional indoor events facility where, for the first time in TU's history, the entire university community can gather at once. The facility is a physical anchor for the campus that will strengthen TU's community outreach and energize the surrounding community - enabling the university and the city to come together at TU with spirit and pride.

The facility supports the university's commitment to its NCAA Division I athletic program while broadening opportunities for increased revenue and decreased rental expense. The center is the nation's first collegiate arena to provide the latest in permanent two-way fiber-based communication links to the broadcast community through Venue-net, a technology that is the standard for professional sports in North America.

D. *Multi-Use Facility – University of Houston – Houston, TX*

Entry Perspective

Weight Room

Location:
Houston, Texas, USA

Facility User:
University of Houston Cougars

Completion Date:
1995

The University needed a new training facility to accommodate not only its growing student body, but also to attract future student-athletes to its program. This state-of-the-art facility serves the entire varsity athletic department. The complex includes a football training area, a locker room for 120 players, a weight training area, team meeting rooms, an auditorium with a video production studio, sports medicine facilities, a large student-athlete lounge and coaches' and staff offices.

The crown jewel of the complex is its full 100-yard indoor football practice field featuring a retractable artificial turf. Beneath the turf are a regulation NCAA 200-meter competition track, tennis courts and basketball courts. Additionally, the building can accommodate indoor practice for golf and baseball.

North Dakota State University Bison Sports Arena

Indoor Track Complex

Indoor Football Practice Field

Funds to build the $29.1 million, 220,000-square foot facility were donated by alumni John and Rebecca Moores, who believed that Cougar student-athletes deserved a top-notch facility. Thanks to the Moores', everything in the facility is top-notch from the impressive Hall of Fame at the entrance of the building, to the 120-yard Astroturf indoor practice field, which covers an indoor track, four indoor tennis courts, a hardwood basketball/volleyball court and two Sport Courts, to the locker rooms for 13 Cougar athletics teams, to the 16,500-square foot weight room, to the state-of-the-art athletic training room, to the Academic Center for Excellence (ACE) to the meeting rooms and athletics department offices.

E. Training Facility - Pennsylvania State University - University Park, PA

Front Entry

Lobby

Location:
University Park, Pennsylvania, USA

Facility User:
Nittany Lions

Completion Date:
July, 1999

Penn State Football continues a long tradition of excellence and maintains an enthusiastic following across the country. The previous training facility, built in 1956, had been renovated and expanded numerous times in an effort to keep up with the ever-changing needs of the program. Penn State determined that a new training building was required to recruit, prepare and support the future.

To help the university achieve a competitive edge in the Big Ten, HOK Sport + Venue + Event, in association with L.D. Astorino and Associates, designed a new 89,000-square-foot training complex, with convenient access to existing indoor and outdoor practice fields. In addition to state-of-the-art training facilities, offices and locker rooms, the new building's design provides enhanced energy efficiency, security and ease of operation and control.

North Dakota State University *Bison Sports Arena*

Weight Room

A state-of-the-art team auditorium with seating for 180 allows the entire squad to watch game tapes, review performance at practices and receive instruction. Additional team meeting rooms are located throughout the building, seating from 25 to 60 people for breakdown sessions. The coaching wing includes three meeting rooms complete with projection screens and offices. A video production room and a film storage area increases convenience and availability of game tapes for the staff.

Also included are a student lounge adjacent to a large academic support center, complete with a computer study room, tutoring room, two individual study rooms and a group study room that provides an excellent learning environment. Already with one of the nation's best graduation rates for football players, the new support center is designed to provide the tools for an improvement in student-athlete classroom performance at Penn State.

With the expansion of Beaver Stadium that added more than 10,000 seats, private suites and club-level seating (in addition to a variety of other new amenities) and the new Lasch Building, Penn State is demonstrating a commitment to athletic facilities the equal of any in the nation.

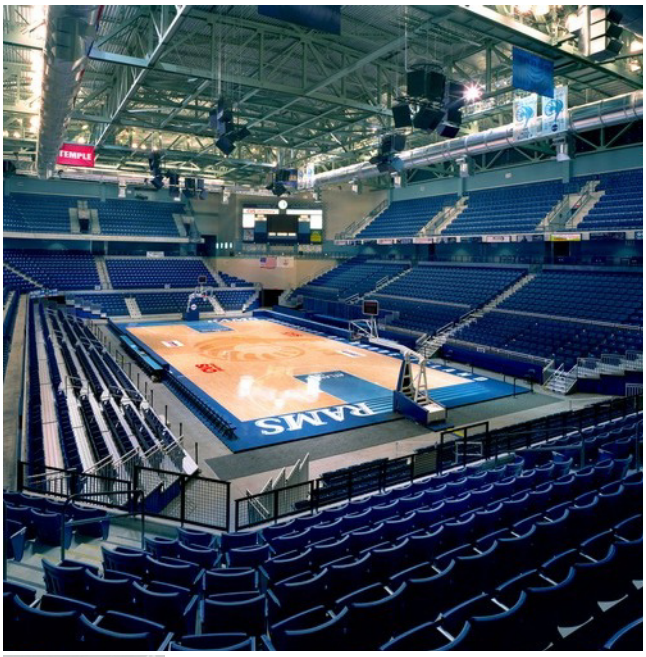
Lobby & Study Area

Built at a cost of $14.7 million, the new building is a unique blend of training and medical treatment areas, locker rooms, meeting rooms, academic support units and offices. Perhaps the most impressive feature of the new Lasch building is the strength, training and medical area. The weight room is two stories high and occupies approximately 10,000 square feet of space.

In addition,there is a large medical/testing area that includes separate rooms for treatment and taping, rehabilitation and three hydro-pools, one fitted with a treadmill. Offices for trainers, nutritionists and a doctor's office with exam room offer convenience and immediacy for any ailing athlete.

F. Ryan Center - University of Rhode Island - Kingston, Rhode Island

Aerial Perspective



Basketball Arena

Location:
Kingston, Rhode Island, USA

Facility User:
University of Rhode Island Rams

Completion Date:
June, 2002

The Thomas M. Ryan Center at the University of Rhode Island provides more than 8,000 seats for athletic, cultural, entertainment and conference events.

The Convocation Center offers convenient access to the campus residence facilities, and is readily accessible to the broader Rhode Island community.

The new building's brick facade complements the red brick exterior of Keaney Gymnasium. The three-level structure is designed with tall walls made up of glass windows. On three sides of the arena bowl, prime courtside bleacher seats are reserved for URI students.

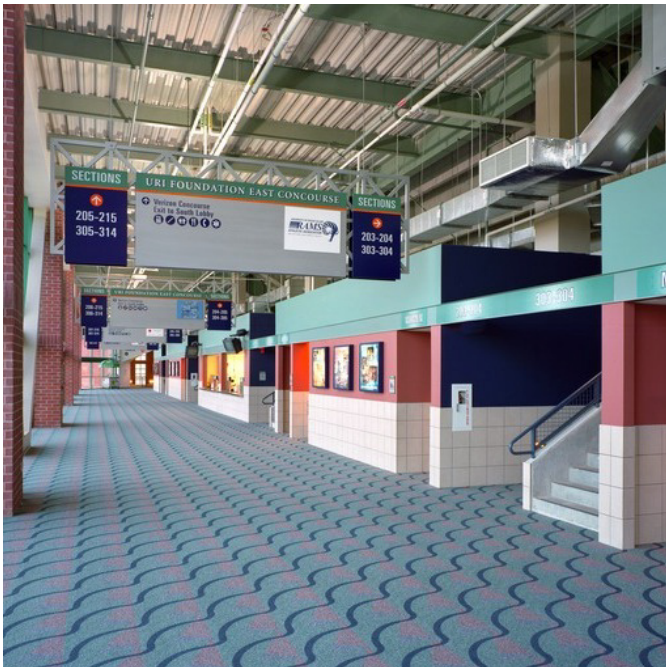
Lounge

View showing lighthouse concept of arena

Rhode Island lighthouses were the inspiration for the design of the three towers, marking the North and South entrances of The Ryan Center. Standing 86 feet high and located on the University of Rhode Island campus in scenic South County, the 200,000 sq. ft. building is home to the URI Rams Men's and Women's Basketball teams.

A multi-purpose facility, The Ryan Center hosts family entertainment, concerts and other community events. Amenities include two state-of-the-art, full-color scoreboards with video capabilities. The house sound system, designed with acoustic provisions, provides a full range of high power sound to all seats in the venue, including the concourse and Alumni Room, making it suitable for any event. The Ryan Center boasts three tiers of seating in the arena to bring all 7,700 seats close to the action. No Seat is further than 74 feet from the action.

The Arena can also be subdivided to provide a half-house venue for smaller functions. The Event Floor seating retracts to provide space suitable for family shows or trade conferences. A portable stage is available for concerts and performance events and the Event Floor itself can seat up to 500 for a banquet.



Concourse

LEVEL 1 (Event Level)- Houses the Arena, Event Floor, Box Offices, Guest Services, Will Call, The Ram's Zone Retail Store, Locker Rooms, Kitchen Facilities and Management Offices.

LEVEL 2 - (Main Concourse) Access to General Seating, Restrooms, The Alumni Room and Concessions, as well as an extraordinary view of Meade Stadium.

LEVEL 3 - (Suite Level) Features the Hospitality Suites. A private venue for prime viewing. The Alumni Room is the Ryan Center's venue for pre-and post-game events. The beautifully outfitted lounge is available as a function room for parties for up to 125 when events are not occupying the arena and is open to Priority Seat Holders with food and beverage service during basketball games. The Alumni Room is also home to the URI Hall of Fame. The hospitality suites

5. Programmatic Requirements

A. Major Project Elements

Lobby (Incorporating the history of NDSU athletics)
Basketball Court and Stands
Swimming Pools
Racquetball Courts
200 Meter Track
Football Practice Field
Weight Rooms
Locker Rooms
Departmental Offices
Storage
Mechanical/Electrical Services
Parking
Athletic Training Room
Café/Eatery
Bathrooms
Ticket Booths
Classrooms

B. Spatial Requirements

Main Spaces

Basketball Court = 4700 sq. feet

Basketball Court and Walkway = 7980 sq. feet

Basketball Seating = 24000 sq. feet

Suites(12) = 500 x 12 = 6000 sq. feet

Pool = 12300 sq feet

Racquetball Courts(5) = 800 x 3 = 2400 sq. feet

Tennis Courts(2) = 2808 x 2 = 5616 sq. feet

Indoor Football Practice Field/200 Meter Indoor Track = 50000 sq feet

Lobby = 2100 sq. feet

Cafe = 900 sq feet

Weight Rooms = 10500 sq. feet

Conference Rooms(4) = 250 x 4 = 1000 sq. feet

Classrooms(3) = 800 x 2 = 1600 sq. feet

Training Room = 1200 sq. feet

Student Study Lounge = 800 sq. feet

Faculty Lounge = 450 sq. feet

Computer Room = 900 sq. feet

Secondary Spaces

Athletic Department = 1400 sq. feet

Departmental Offices(10) = 120 x 10 = 1200 sq. feet

Ticket Office = 500 sq. feet

Locker Rooms(2) = 2000 x 2 = 4000 sq. feet

Restrooms
Mens(4) = 500 x 4 = 2000 sq. feet
Womens(4) = 500 x 4 = 2000 sq. feet

Support Spaces

Janitorial Services(2) = 400 x 2 = 800 sq. feet

Mechanical and Electrical = 10000 sq. feet

Storage(6) = 200 x 6 = 1200 sq. feet

Elevators(3) = 100 x 3 = 300 sq. feet

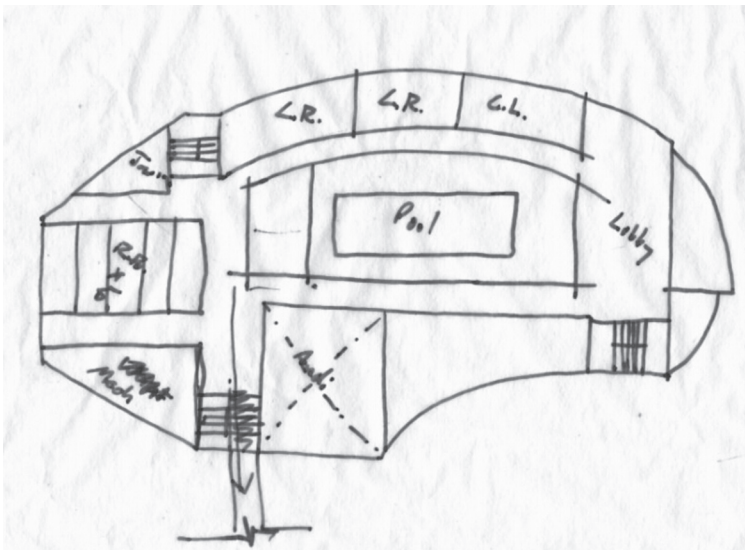
Gross Square Feet = 151616

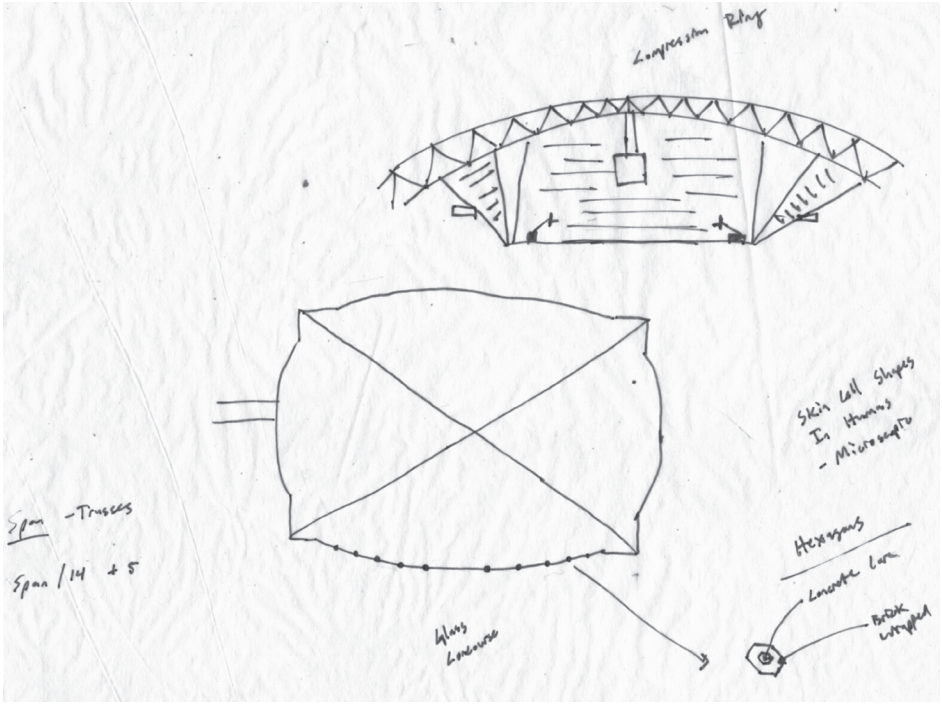
Circulation(1.5 x Gross Square Feet) = 151616 x 1.5

Total Spaces Estimated = Total Square Feet = 227,424

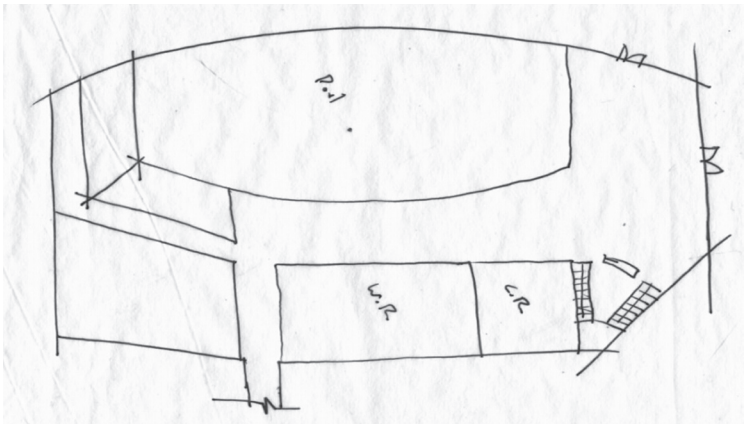
6. Design Process

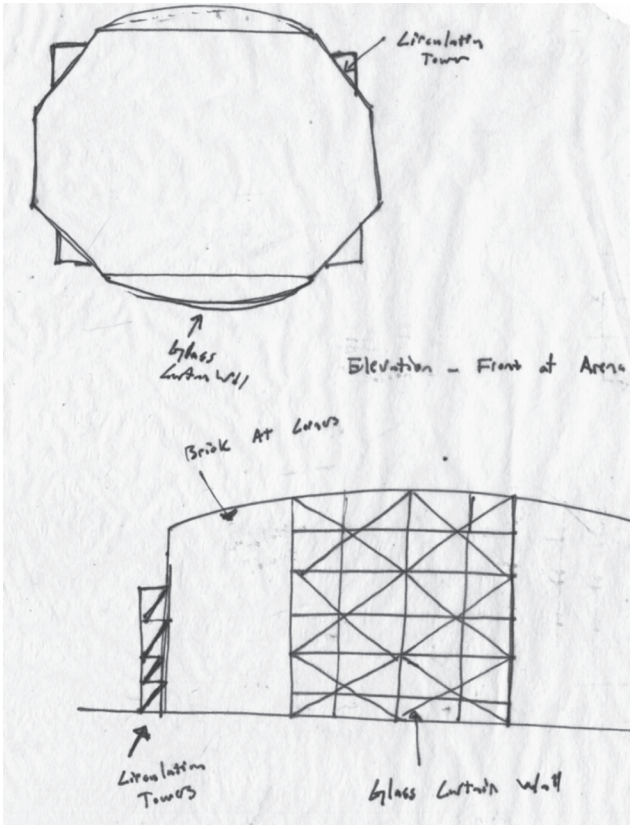
Preliminary Design Sketches



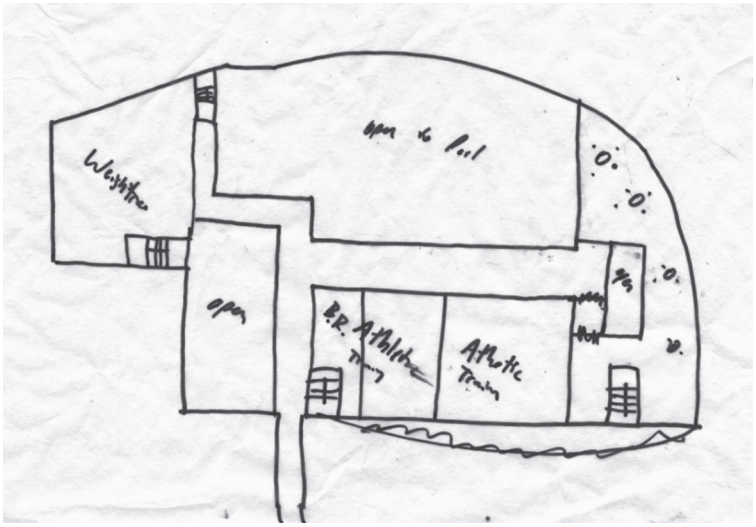


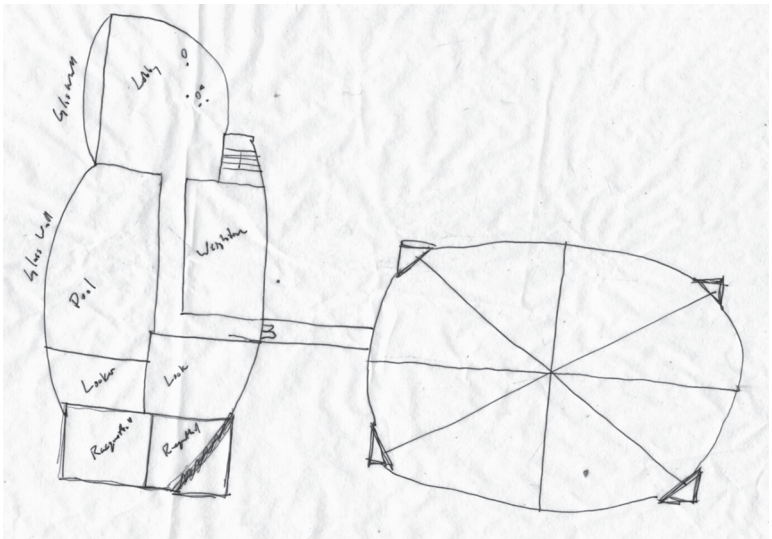
Preliminary Design Sketches



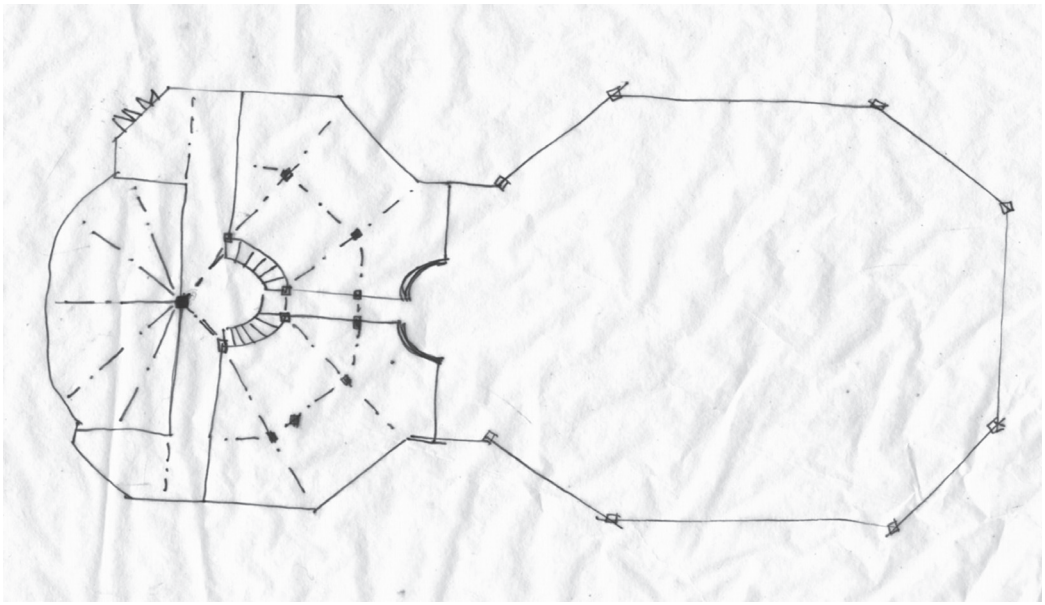


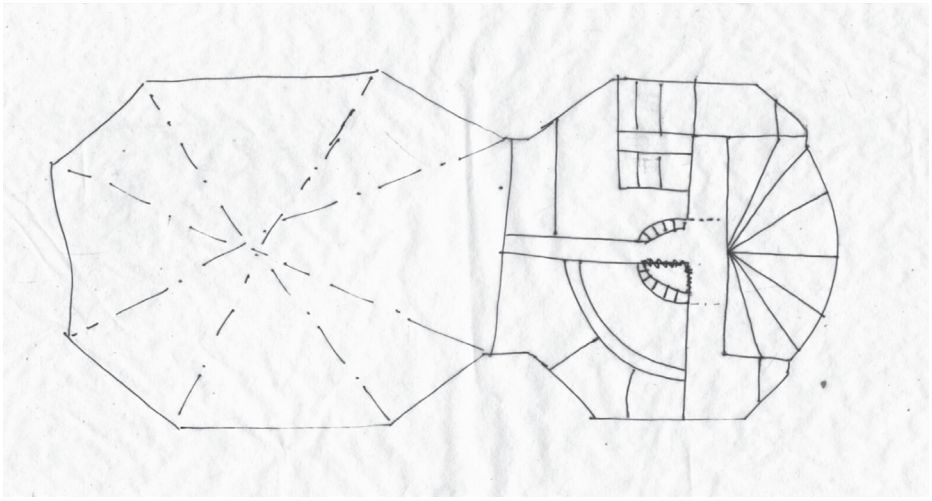
Preliminary Design Sketches





Midterm Design Sketches





7. Final Project

North Dakota State University *Bison Sports Arena*

2004-2005 Undergraduate Thesis

North Dakota State University

Department of Architecture & Landscape Architecture

Matt Kalbus

North Dakota State University *Bison Sports Arena*

2004-2005 Undergraduate Thesis

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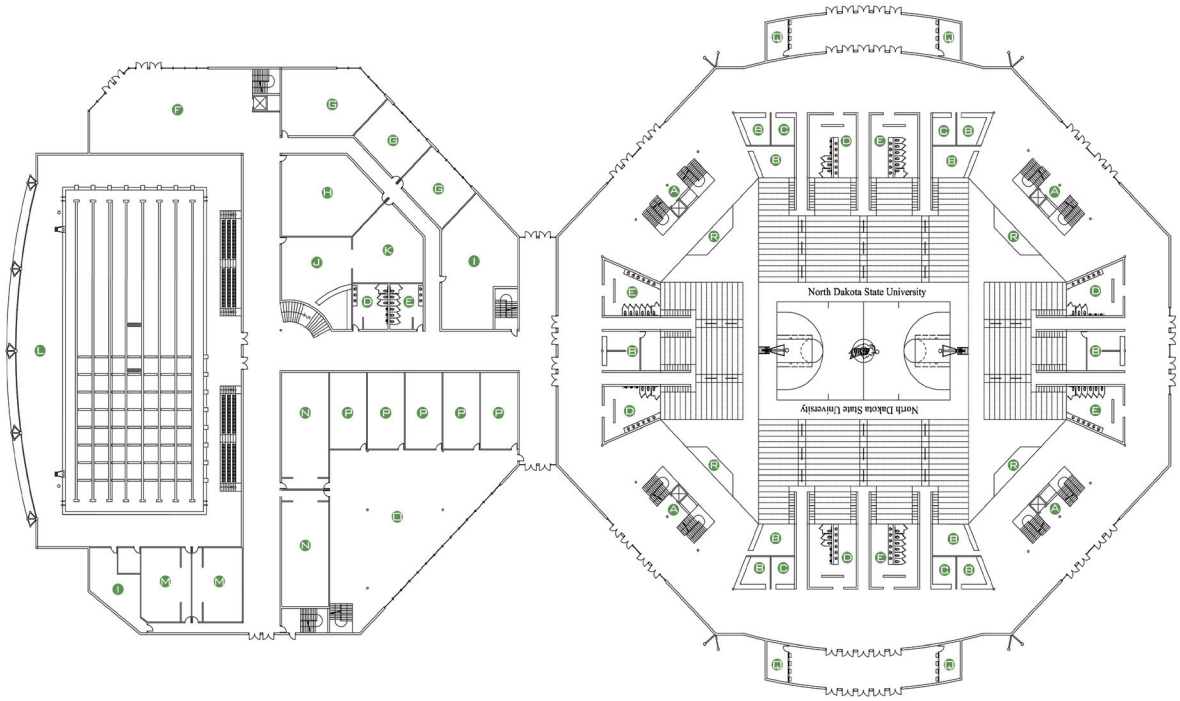
B - SONS SPORTS ARENA



MAIN LEVEL
1" = 25'-0"
N

- A VERTICAL CIRCULATION
- B CONCESSION
- C NOVELTY
- D MEN
- E WOMEN
- F LOBBY
- G CLASSROOM
- H COMPUTER ROOM
- I MECHANICAL/STORAGE
- J CAFE
- K LOUNGE
- L POOL
- M POOL LOCKER ROOM
- N LOCKER ROOM
- O WEIGHTROOM LOWER LEVEL
- P RACQUETBALL COURT
- Q TICKET BOOTH
- R HANDICAP SEATING

PROJECT JUSTIFICATION

With the increasing size of the student enrollment at NDSU over the recent years, the present Bison Sports Arena will not be able to accommodate the needs that it will sustain in the future. They other major justification for this project is that NDSU is now in Division I athletics and this makes the university more inviting to perspective collegiate athletes. This new facility will should make Division I athletics more appealing

PROJECT EMPHASIS

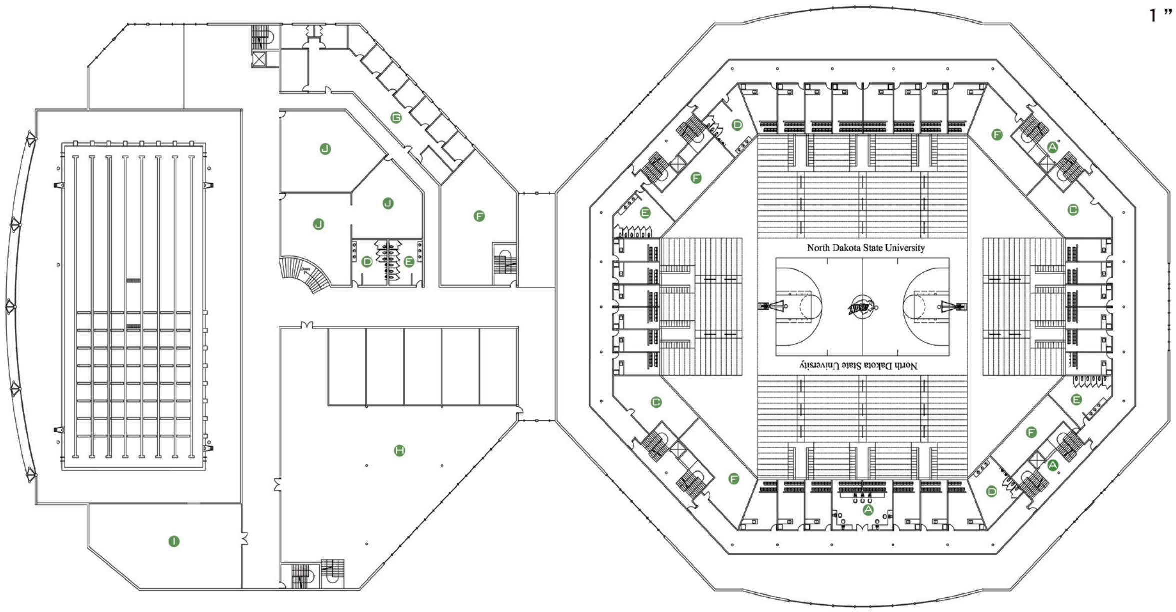
The predominant idea for this project is to design a multi-purpose facility that incorporates lightweight materials that are light and strong at the same time. The other idea is to maintain the character of the North Dakota State University campus by using materials such as brick and stone. The use of brick on the building shows longevity in the life of the building.

2004-2005 UNDERGRADUATE THESIS
NORTH DAKOTA STATE UNIVERSITY
DEPARTMENT OF ARCHITECTURE & LANDSCAPE ARCHITECTURE
MATT KALBUS

B I S O N S P O R T S A R E N A

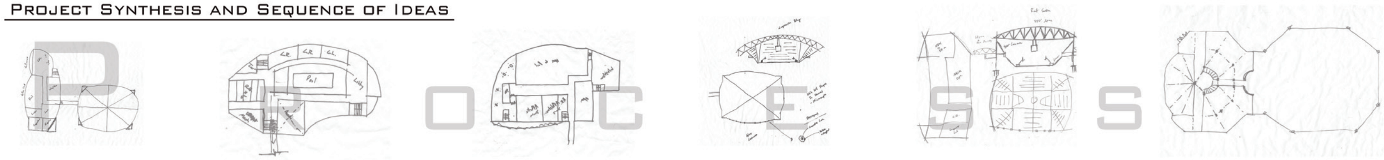
NDSU

SECOND LEVEL/SUITES
1" = 25'-0"



- A VERTICAL CIRCULATION
- B CONTROL BOOTH/PRESS BOX
- C CATERING
- D MEN
- E WOMEN
- F MECHANICAL/STORAGE
- G ATHLETIC DEPARTMENT OFFICES
- H WEIGHTROOM UPPER LEVEL
- I CARDIO/GYMNASTICS
- J ATHLETIC TRAINING

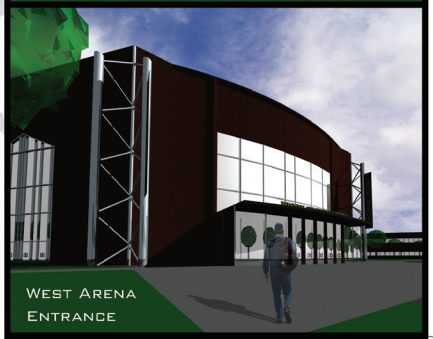
PROJECT SYNTHESIS AND SEQUENCE OF IDEAS

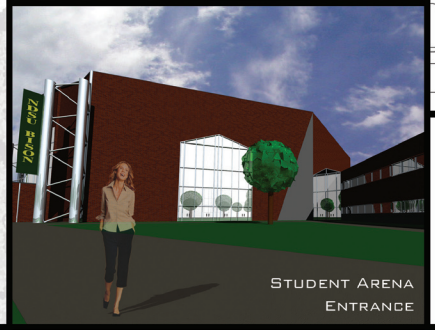


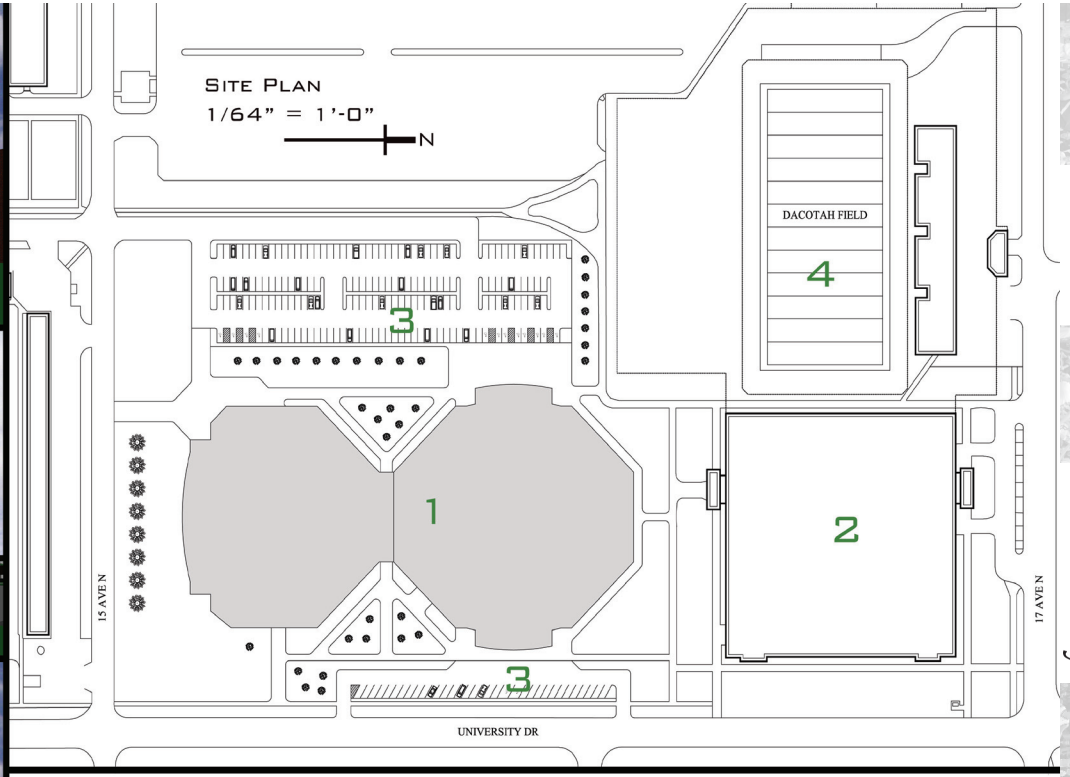
2004-2005 UNDERGRADUATE THESIS
NORTH DAKOTA STATE UNIVERSITY
DEPARTMENT OF ARCHITECTURE & LANDSCAPE ARCHITECTURE
MATT KALBUS

4

BISON SPORTS ARENA







Site Analysis & Synthesis

The new Bison Sports Arena will be located on the site located directly south of the present BSA. This site is located on the corner of University Drive and 15th Ave North.

The old BSA will still be used for some athletics and can also be used for other university functions.

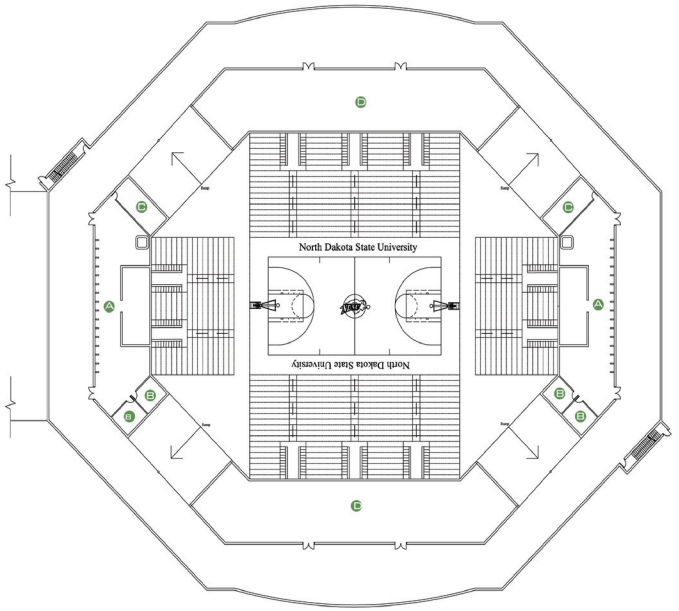
The two parking lots on the east and west side of the new BSA will allow close access to the building.

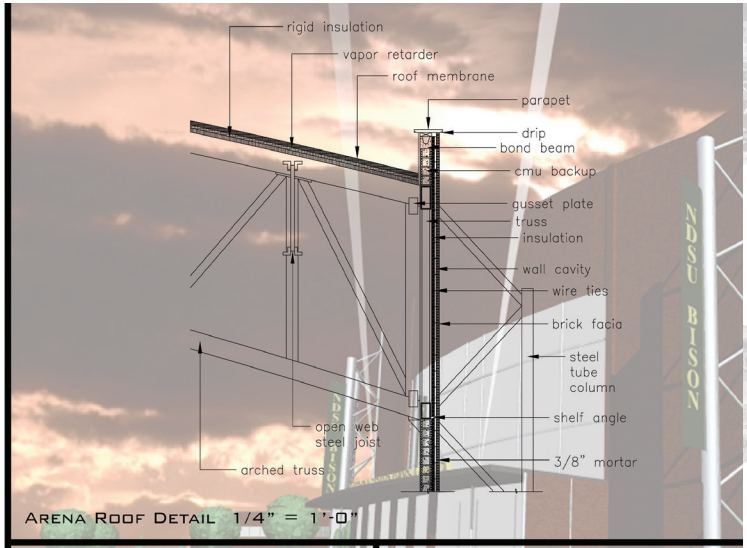
With the demolition of the old football practice field for the new Bison Sports Arena, the football team can utilize the Dacotah field for football practice.

2004-2005 Undergraduate Thesis
North Dakota State University
Department of Architecture & Landscape Architecture
Matt Kalbus

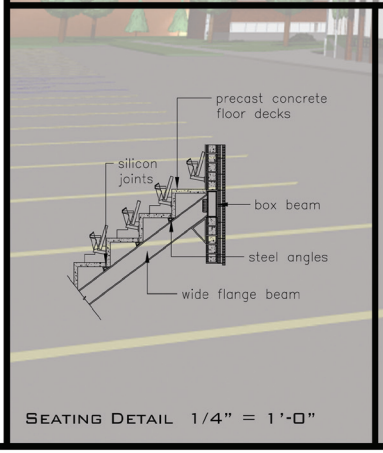
A Locker Room
B Offices
C Equipment
D Mechanical/Storage

Court Level
1" = 25'-0"

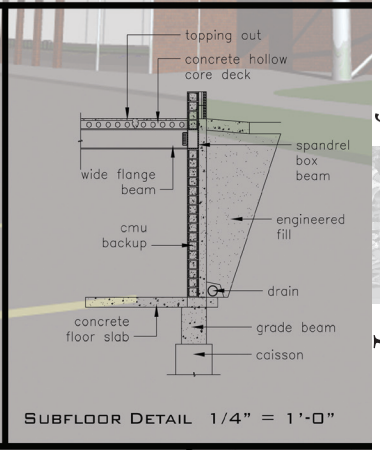




Arena Roof Detail 1/4" = 1'-0"



Seating Detail 1/4" = 1'-0"



Subfloor Detail 1/4" = 1'-0"

2004-2005 Undergraduate Thesis
North Dakota State University
Department of Architecture & Landscape Architecture
Matt Kalbus

8. Schedule

Thesis Schedule

Aug24 – Classes Begin

Aug24 – 1st thesis meeting during arch/la 561

Aug27 – 1st draft of thesis statement due at 1:00 p.m. in office

Sep01 – Thesis statement returned to office by faculty

Sep02 – Thesis statements returned to students

Sep06 – Labor Day holiday

Sep09 – Revised thesis statement of intent due

Sep16 – Marked up statement of intent available

Oct07 – Thesis proposal, abstract and cover due

Oct14 – Preference slips due in main office

Oct21 – Primary and secondary critics announced

Oct28 – Last day of arch 561 class

Nov11 – Veteran's Day holiday

Nov19 – Final day of arch 571 studio

Nov24 – Draft thesis program due to primary critic

Dec09 – Final thesis program due to primary critic

Dec10 – Final day of fall semester classes

Dec13-17 – Finals

Thesis Schedule Continued.....

Jan11 – Spring semester classes begin

Jan12 – Conceptual Design and Development
Meet w/ Primary

Jan17 – Martin Luther King Day

Jan 18 – Meet w/ secondary

Jan 19 – Meet w/ primary

Jan17-Feb28 – design development & site planning

Jan 26 – Meet w/ primary

Feb 1 – Meet w/ secondary

Feb 2 – Meet w/ primary

Feb 9 – Meet w/ primary

Feb 15 – Meet w/ secondary

Feb 16 – Meet w/ primary

Feb21 – President's Day holiday

Feb22-Mar06 – Design development continued

Mar 2 – Meet w/ primary

Mar07-11 – Mid-semester thesis reviews

Mar12-13 – Begin presentation drawings

Mar14-18 – Spring break

Mar25-28 – Easter holiday

Thesis Schedule Continued.....

Mar29-Apr24 – Finish presentation drawings for review

Apr25 – Thesis projects due at 4:30 pm in Memorial Union

Apr26-27 – Annual thesis exhibit in Memorial Union ballroom

Apr28-May 05 – Final thesis reviews

Apr29 – Draft of thesis document due to primary critic

May06 – Last day of classes

May09-13 – Finals

May12 – Final thesis document at 4:30 pm in main office

May13 – Commencement at 4:00 Fargodome

9. Appendix

Previous Studio Experience

-2nd year (Yergens)
Downtown Dining

-2nd Year (Hatlen)
Atomic Coffee Shop
Prairie Green Sustainable Housing
NDSU College of Business Administration
Walking Bridge

-3rd Year (Martens)
Fort Abercrombie Museum
Grafton Airport Terminal

-3rd Year (Elnahas)
Experimental Performing Arts Center
West Acres Bank

-4th Year (Barnhouse, Urness, & Walters)
Urban Design Studio – Downtown Fargo

-4th Year (Faulkner)
Marvin Windows Housing
San Francisco High-rise

-5th Year (Martens)
Downtown Valley City Storefront Preservation

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