Michigan Technological University

Campus Master Plan Supplement

1993
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Michigan Technological University
Houghton, Michigan

Prepared by
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Michigan Technological University intends to build on its reputation as a leader in science and engineering education as it moves into the twenty-first century. Concurrently, it will strive for national and international recognition for the excellence of its research and graduate education. The University will continue to enhance its curricula in the liberal arts and business, as well. These efforts signify our commitment to meeting the needs of the citizens of the State of Michigan and to position the state for renewed prosperity.

As the University prepares to enter a new century it is particularly important that a wide range of opportunities facing the University be considered. Michigan Tech is deeply involved in planning its future. Problems such as growth, campus development, ultimate size, types of programs, and financial requirements are receiving primary consideration.

This document focuses on physical planning opportunities. Of critical concern is the issue of how new facilities can be incorporated on campus in a way which strengthens Michigan Tech's unique atmosphere while responding to current and long term needs.

We at Michigan Tech realize that the future is not always predictable, and that many of our plans and predictions will need to be modified in response to changing circumstances. However, we believe it is essential at this critical point in Tech's history to define our objectives and set realistic intermediate goals. The accompanying Master Plan Supplement is an important step in this planning process. Specific stepping stones are identified in the plan which will help define the University's exciting path into the twenty-first century.

Sincerely,

Curtis J. Tompkins
President
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INTRODUCTION

Michigan Technological University Vision Statement

Michigan Technological University will be a nationally and internationally recognized leader in meeting challenges of the future through undergraduate and graduate education and research in sciences and engineering. At the undergraduate level, we will have comprehensive, forward-looking curricula in sciences and engineering that educate technically competent, intellectually vital graduates who are at the same time effective communicators and aware of the social, economic and cultural contexts of their work. At the graduate level and in research we will focus especially on growth in interdisciplinary approaches in areas of established strength and future need. Consistent with the increasing complexity of science and technology, we will substantially increase the proportion of graduate students. At each educational level and within each segment of the University community, we will increase the proportion of individuals from under-represented racial and gender groups.
Purpose of the Plan

This document serves to supplement the 1966 Campus Master Plan which has proven to be a comprehensive and valuable long-range plan. The former plan has effectively established solid principles which have guided physical development for the last 27 years and which will continue to define the basis for accommodating new development in the years ahead. This document builds upon these principles and provides additional refinements needed to accommodate University needs and expectations in the immediate future.

The Master Plan Supplement focuses on the central core of the campus which is located North of US 41 (Townsend Drive). This sixty-acre area serves as the academic center and focal point of campus. As the central core area it is the most dynamic and important campus zone. In order to meet the University's expectations over the next 5 to 7 years, it is essential to update the Plan for this area. The University leadership will use the Supplementary Master Plan to interpret and translate short-term project needs in light of previously approved 1966 Master Plan principles. It is therefore the intent of the Supplement to refine earlier concepts as appropriate which will strengthen rather than replace the 1966 Plan.

Michigan Tech's 1966 Campus Master Plan can continue to guide physical development into the 21st Century. The University administration and faculty is continuing to define opportunities needed to keep the University viable in the next century. In 1988, the University identified long-term programmatic opportunities. These are described in the report entitled "2005 Two Decades into Michigan Technological University's Second Century: A Long Range Plan". The opportunities identified in this study reflect new directions in higher education in general and at MTU specifically. These concepts require refinement of a number of the physical planning concepts originally identified in the 1966 Physical Master Plan. This document identifies and makes physical planning recommendations which respond to the following specific issues:

1. A projected enrollment of 6,500 to 7,000 as compared to the original enrollment estimate of 9,000 students.

2. A significant increase in the graduate student population.
3. Combination of research and instruction within the Campus core rather than at a separate location.

ANALYSIS OF EXISTING CONDITIONS

Introduction

The University has worked diligently to implement the physical development patterns proposed in the 1966 Master Plan. They have followed the Plan closely and as new development has occurred the campus has assumed a strong sense of physical order. Open space, pedestrian walks, utility corridors, parking and buildings join together to establish a physical setting which is functionally appropriate and aesthetically unique. As a result a strong physical framework is clearly evident and established patterns form a basis which future growth must relate to. The successful implementation of the planning concepts is evidenced by the comparison of the 1966 Master Plan Concept drawing and a recent aerial photograph which is presented on the following page.

Environmental Analysis

The campus is positioned on four terraces which are defined by steep slopes and offer spectacular views to Portage Lake and to the other side of the Keweenaw Waterway Valley. Great care is being taken to protect and stabilize these slopes in order to curtail erosion and minimize shifting of soil. Extensive bank planting and careful positioning of walks, roads, and buildings to parallel the terrain thereby reducing their impact on fragile areas. Similar measures have also been undertaken along the Lake edge to reduce the impact of wave action and to insure stabilization of the land-water edge. The University places great importance on maintaining and controlling these areas and has been very successful in protecting them.
1966 Master Plan Concept

Existing Campus
Pedestrian Circulation

Michigan Technological University is a pedestrian oriented campus where most destinations are within a 10-minute walking distance. The compact campus minimizes the impact of winter temperatures and facilitates interaction and ease of access. A vehicular-free pedestrian zone exists within the heart of the academic core. The East-West pedestrian spine functions as the primary corridor which links all major student and faculty destinations within the central core. All major buildings are positioned along its edges. This pedestrian mainstream forms the strongest organizational component of the campus fabric and must be respected and strengthened as new buildings are added within the zone.

Campus residents and employees are appropriately concerned for student safety at a number of pedestrian road crossings. The most troublesome are North-South pedestrian movements across US Route 41 (Townsend Drive) where students, faculty and staff are confronted by Campus-bound automobiles as well as regional traffic heading to and from Houghton. Another conflict point, but of much less concern, is for pedestrians crossing the Campus Access Drive which parallels US 41 to the North. The new elevated walkway which links the Minerals and Materials Engineering Building with academic facilities offers a safe alternative for the few students who are traveling in this direction.

Changes in grade also make it difficult for pedestrians to move from one terrace level to another. This is particularly true along the US 41 corridor and along the north edge of the core area. Opportunities for using elevated walkways to link major destinations should be explored.
Vehicular Circulation

A clear system of perimeter vehicular circulation has been achieved in order to direct vehicles to and within the Campus. Wayfinding has greatly improved through the removal/relocation of a number of roads over the last 30 years. The few roads which penetrate the Campus typically provide access to major drop off areas and parking. College Avenue, at the West end of campus, consumes a considerable land area and inappropriately combines pedestrian and vehicular traffic.

Parking within the central core area is located along peripheral edges. This reduces pedestrian-vehicular conflicts and facilitates direct access from contiguous roads. These "close in" parking spaces are very attractive to all campus residents and are intensively used.

Visual Desire Survey

The University community recognizes the unique character and aesthetic contribution made by Portage Lake and the valley. Distant views from many locations typifies the Campus experience. These views must be carefully protected and building placement along the Northern edge of the core area must not obscure primary views.

An internal open space area has been established at the heart of the academic core while important visual arrival zones have been developed at the east and west ends of campus.

Another important aspect of the MTU campus is the consistent use of brick and stone building materials. The University has been highly successful in maintaining consistency. A distinctive image has resulted.
Building Patterns

MTU has grown from a few scattered buildings to a major institution of high learning. Today, there are 20 buildings within the central core. These facilities jointly provide 1,435,951 gross square feet of space for academic, research, administrative, and support functions. The oldest building on campus is the ROTC Building which was built in 1904. The newest is the Minerals and Materials Engineering Building which provides extensive research facilities. The size and year of construction for all campus core buildings appears in the following table.

EXISTING FACILITIES

<table>
<thead>
<tr>
<th>Building #</th>
<th>Name of Building</th>
<th>Date Built</th>
<th>Gross Area Square Feet</th>
<th>Net Assign. Area</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Administration Building</td>
<td>1969</td>
<td>70,700</td>
<td>40,831</td>
</tr>
<tr>
<td>4</td>
<td>ROTC Building</td>
<td>1904</td>
<td>19,600</td>
<td>14,723</td>
</tr>
<tr>
<td>5</td>
<td>Academic Offices Building</td>
<td>1908</td>
<td>38,000</td>
<td>24,972</td>
</tr>
<tr>
<td>7</td>
<td>Electrical Energy Resources</td>
<td>1976</td>
<td>158,450</td>
<td>93,171</td>
</tr>
<tr>
<td>9</td>
<td>Alumni House</td>
<td>1961</td>
<td>7,784</td>
<td>4,880</td>
</tr>
<tr>
<td>11</td>
<td>Walker Arts &amp; Humanities</td>
<td>1986</td>
<td>87,094</td>
<td>50,500</td>
</tr>
<tr>
<td>12</td>
<td>M &amp; M Eng. Building-Research</td>
<td>1991</td>
<td>172,800</td>
<td>100,500</td>
</tr>
<tr>
<td>13</td>
<td>Enterprise Devel. Center</td>
<td>1983</td>
<td>4,032</td>
<td>2,420</td>
</tr>
<tr>
<td>14</td>
<td>Civil-Geology Building</td>
<td>1957</td>
<td>86,300</td>
<td>49,533</td>
</tr>
<tr>
<td>15</td>
<td>Fisher Hall</td>
<td>1964</td>
<td>112,100</td>
<td>60,134</td>
</tr>
<tr>
<td>17</td>
<td>Library</td>
<td>1966</td>
<td>81,000</td>
<td>49,347</td>
</tr>
<tr>
<td>19</td>
<td>Chemistry &amp; Metallurgy</td>
<td>1968</td>
<td>162,500</td>
<td>90,492</td>
</tr>
<tr>
<td>20</td>
<td>ME-EM Building</td>
<td>1971</td>
<td>162,500</td>
<td>88,187</td>
</tr>
<tr>
<td>31</td>
<td>Douglas Houghton Hall</td>
<td>1938</td>
<td>92,500</td>
<td>78,625</td>
</tr>
<tr>
<td>34</td>
<td>Memorial Union</td>
<td>1989</td>
<td>89,791</td>
<td>67,343</td>
</tr>
<tr>
<td>41</td>
<td>Central Heating Plant</td>
<td>1951</td>
<td>11,900</td>
<td>11,400</td>
</tr>
<tr>
<td>42</td>
<td>Physical Plant Storage Bldg.</td>
<td>1942</td>
<td>5,200</td>
<td>4,650</td>
</tr>
<tr>
<td>43</td>
<td>Lakeside Lab</td>
<td>1908</td>
<td>9,800</td>
<td>5,304</td>
</tr>
<tr>
<td>44</td>
<td>Service &amp; Storage Bldg.</td>
<td>1952</td>
<td>18,600</td>
<td>16,009</td>
</tr>
<tr>
<td>TOTAL</td>
<td></td>
<td></td>
<td>1,435,951</td>
<td>876,421</td>
</tr>
</tbody>
</table>
Existing Facilities
Utility Analysis

MTU's campus development plan was prepared in the mid 60's to provide for orderly and meaningful plans for development of the academic programs and physical plant at MTU. In conjunction with this plan, a campus utilities study was conducted by Commonwealth Associates, Inc. to develop a master plan for providing adequate utility services to all physical plant facilities.

The campus development plan and utilities study was prepared for a campus enrollment of 10,000 students and a campus size of 5,300,000 GSF. Current campus enrollment is 6,700 students and a campus size of 2,485,700 GSF.

Installation of the campus utilities which began in 1970 followed the study recommendations for underground services.

Central Heating Plant

MTU has a central heating plant and steam distribution system serving the University's central campus. The plant has a total connected boiler capacity of 250,000 lbs. of steam per hour with a reliable capacity of 120,000 lbs per hour, maintaining 100% back-up capacity. The steam distribution system consists of a tunnel system from the plant to the academic core, which then runs the entire length of the core, and south to the athletic area. The service to the individual buildings are tapped into this tunnel and run in a mini tunnel system. The distribution system was designed in accordance with the plants connected capacity in anticipation of plant growth. New facilities in the academic core typically would be within a couple hundred feet of the tunnel. The plant and distribution system are in good condition and with a reasonable amount of renewal and maintenance; it should continue to provide reliable service for the next 10 to 15 years. The plant is presently serving 2,251,000 GSF of campus facilities with an instantaneous peak load of 75,000 lbs. per hour and 1 hour average peak load of 70,000 lbs. The present connected load includes instructional, research, administrative, housing, athletic and service facilities.

We project the plant can reliably provide the steam services for an additional 1,500,000 square feet. Energy conservation opportunities and enhanced technology have created the plant's ability to service the additional space.
Electric Communications

MTU's incoming electrical service is provided by Upper Peninsula Power Company at 69 KV to MTU's primary electrical substation where the voltage is reduced to 12470,7200 volts for distribution to the campus. The electrical/communications distribution system consists of a concrete encased duct bank which runs through the entire length of the academic core and south to the athletic area. The electrical/communication system essentially mirrors the steam system with facility connections tapped from this main duct bank.

The electrical system is a dual line radial feed system providing 100% back-up. The system capacity is 7,500 KVA. Peak demand experienced to date is 4,900 KW at approximately .9 power factor. Based on this operational data, we project the system can reliably service an additional 1,000,000 square feet.

MTU's communication system consists of (6) conduits which have provided adequate space for university communication. The advent of new technology (fiberoptic) will enable the system to meet the foreseeable future needs.

Water

MTU's water system is a combined fire and domestic looped manifold system, with an 8-inch main around the circumference of the campus. Water usage today on campus is 28% below what it was in the late 70's as a result of conservation efforts. The water is provided by the City of Houghton with no present capacity problems. MTU water mains were sized for annual usage of 375,000,000 gallons and peak demand of 1,100 gallons. Current usage is approximately 130,000,000 gallons annually. The city is in the planning phase of water district improvements that will improve what is now an over pressurization problem in a couple of areas in town and on campus. The water system will meet our foreseeable future needs.
Sewers

MTU's sewers are separated into storm and sanitary systems. The storm system provides some flow regulation and drains into Portage Lake at various locations. A 15-inch sanitary main capable of handling 3,500,000 gallons per day ties directly to Portage Lake Water and Sewage Authorities' new transmission main. This new 48-inch gravity main with a capacity of 19,000,000 gallons per day extends from the City of Houghton and passes through the campus at the waterfront on its way to the treatment facility east of campus. The size of MTU's sanitary main and the new sewage treatment plants capacity of 18,000,000 gallons per day provides sufficient additional capacity for MTU's foreseeable future needs.
Utility Corridors

- Water
- Steam
- Gas
- Communications/Elec.
- Storm/San. Sewer
- Major Utility Corridor
SUPPLEMENT '93 MASTER PLAN RECOMMENDATIONS

Introduction

Michigan Technological University is one of Michigan's four nationally recognized research universities. In order to fulfill this role the University leadership has identified a number of important programmatic objectives. These include:

1. Expand the University's services to the people of the U.P. through continuing education programs and research for business and industry.

2. Strive to become a world-class leader in environmental studies and research.

3. Achieve an enrollment of 6,500 to 7,000 total students.

4. Significantly increase the graduate student population.

5. Continue to provide diversified, quality undergraduate programs.

Based upon these challenging programmatic objectives a wide range of physical planning opportunities have been identified for consideration for the five- to seven- year planning period. These recommendations include additional refinements to the open space, pedestrian circulation, vehicular circulation, parking and utility systems as well as building patterns. It is anticipated that many of these improvements can be achieved as a part of proposed building projects.
Physical Master Plan Principles

The physical improvements recommended in the Supplemental Plan will not only contribute to the detailed character of campus but also help unify it. The continued recognition of physical planning principals is an essential component of the Plan. These are as follows:

1. Combine both research and instructional facilities within the academic core and within a 10-minute walk.

2. Link functionally related buildings with enclosed connections to provide protection from the severe winter climate.

3. Enhance the University's relationship with the community, relocating non-academic functions in downtown.

4. Explore opportunities to utilize available off-campus space for housing, storage and other non-academic functions.

5. Upgrade the open space character, landscape quality and spatial definition of the pedestrian core between building groupings.

6. Maintain a strong sense of orientation to the Portage Lake Valley by protecting valley views from key viewing areas.

7. Maintain a strong sense of architectural continuity while minimizing long term maintenance costs through the continued use of brick and stone.

8. Utilize topography to accommodate large buildings.

9. Establish a clear entry image and sense of arrival at the western and eastern extremities of the campus.

10. Increase utilization of parking at the Student Development Complex.
Plan Recommendations

The University must make significant improvements if it is to achieve its recently redefined mission. This includes the addition of new buildings and the upgrading of existing site conditions. These improvements can make important contributions to the functional character, the campus ambience and the sense of campus order in the immediate future.

The Supplemental Master Plan drawing appears on the following page. This illustration documents opportunities to accommodate a wide range of physical development options. Of particular importance are the five potential building locations which are identified. These zones reflect future envelopes within which new buildings can be accommodated. All are located in a manner which is consistent with recommended and established development patterns. It has been estimated that these building envelopes have the capacity to accommodate approximately 800,000 gross square feet of new construction. This expansion capacity represents a significant increase and one which is more than adequate for satisfying short term growth requirements.

Of the five identified zones two are proposed to be located in the hillside north of Cliff Drive. These locations (Sites 1 and 2) are appropriate for major buildings which can extend from the top of the slope to the base of the hill, just as the new Minerals and Materials Engineering Building does. Sites 1 and 2 are viewed as being excellent locations for major teaching and research facilities because of their size and proximity to existing engineering academic buildings. Sites 1, 2 and 3 are locations not previously considered in the 1966 Master Plan. However, with the strong focus being placed on research, they offer exciting advantages.

Sites 1 and 2 are in close proximity to existing engineering buildings which allows for direct and protected pedestrian access between buildings. The creation of a cluster or grouping of functionally related facilities strengthens the relationship of academic and research activities. It is recommended that these buildings do not exceed the existing height of the Minerals and Materials Engineering Building.
There are a number of advantages to building into the hillside. These are as follows:

1. Significant expansion of research facilities which require large building masses can be achieved, without sacrificing open space in the heart of the campus.

2. Teaching/research facilities can be placed adjacent to related building uses.

3. New facilities can maximize visual orientation to Portage Lake and the Valley.

4. Direct and enclosed pedestrian connections can be created with existing and functionally related buildings over and under Cliff Drive.

5. Service access can be achieved at two different levels, at the lake edge and from Cliff Drive.

6. The proposed sites can be developed without displacing any parking.

Site 3 offers an area which can also accommodate a large building footprint which usually is characteristic of research facilities. It also has the unique advantage of direct access to and from the water. This site should be reserved for a facility which can maximize this relationship to Portage Lake. The building height at this location should not extend above the crest of the upper slope in order to ensure views to the lake and valley from the library open space.

Site 4 is proposed to handle expansions to the existing library. There are two potential alternatives. The first, shown as Site 4a considers wrapping expansion around three sides of the current facility—along the south, east and west sides. This building is unique because it is symbolically the center of the academic core. To convey this uniqueness it has been given a formal geometric shape. It would be difficult to add onto one side of the building and preserve its existing quality and character. Therefore a more comprehensive approach is offered. The wrap-around approach
offers not only the chance to capture much needed interior space but also to create a single entry and exit point. Consideration could also be given to the creation of an all weather connection to the Union.

The other option for library expansion is to take advantage of Site 4b. This approach assumes that the existing building remains unchanged above ground but that extensive expansion occurs below ground to the north. This development under the library plaza allows for the exciting opportunity to create underground connections to the Chemistry, Metallurgy and Electrical Energy Buildings. Above ground the library would remain in its present park-like setting.

The final site is located at the east end of the core contiguous to the Arts and Humanities Building. Site 5 expansion allows for the preservation of the wooded open space immediately to the west of the building. This building envelope has been carefully defined to avoid loss of parking, yet allows for an enclosed and elevated pedestrian bridge across Route 41/Townsend Drive to Wadsworth Hall. This link will also provide a direct, safe and all weather passage from the parking lots located south of Route 41 to the Walker Arts and Humanities Building.

The following table identifies the projected capacities for each of the five sites.

DEVELOPMENT CAPACITIES

<table>
<thead>
<tr>
<th>Zone #</th>
<th>SF</th>
<th>Max/Min Height</th>
<th>Est. Capacity (1)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>37,000</td>
<td>7</td>
<td>220,000 gsf</td>
</tr>
<tr>
<td>2</td>
<td>37,000</td>
<td>7</td>
<td>220,000 gsf</td>
</tr>
<tr>
<td>3</td>
<td>56,000</td>
<td>4</td>
<td>190,000 gsf</td>
</tr>
<tr>
<td>4a</td>
<td>46,500</td>
<td>3</td>
<td>120,000 gsf</td>
</tr>
<tr>
<td>4b</td>
<td>72,000</td>
<td>2</td>
<td>120,000 gsf</td>
</tr>
<tr>
<td>5</td>
<td>50,600</td>
<td>3</td>
<td>130,000 gsf</td>
</tr>
</tbody>
</table>

(1) All capacities assume an 85% efficiency factor for building development within the identified envelopes.
The campus is well maintained and presents a positive image. However there are a number of improvements which are justified as new development occurs. This includes a wide range of landscape and facility improvements.

The addition of major trees within the core area is desired not only to reduce the impact of winter winds on pedestrians but also to screen buildings. Opportunities to better define major open space areas such as the Library Plaza, to direct and emphasize valley views at critical points along the spine, and to strengthen the spatial sequence experienced by pedestrians traveling the central spine warrants consideration.

Other site improvement needs include the potential redesign of the Library Plaza to more clearly define the area and to draw people to the valley viewing area. The addition of more hard surfacing, a major piece of sculpture, benches and mature trees can make important contributions to emphasize this as the most important open space and image area on Campus.

Parking remains an important campus issue. While the Master Plan Supplement identifies techniques for adding buildings, the sites have been selected to avoid the loss of parking spaces.

The Master Plan proposes to upgrade the gravel parking lot (No. 1) at the west end of the campus. By paving the existing gravel lot it can be expected that the capacity of the lot can be increased by almost 10%. In order to improve vehicular movements into the parking areas south and west of the Student Union, it is recommended that the Hubbell entry be closed and a new entry created at Clark Street.

To facilitate east and west pedestrian movement at the west end of the Core it is proposed to close the remaining section of College Avenue from Hubbell to Cliff Drive. This will improve pedestrian flow, allow for the reduction and replacement of pavement with landscaping and the upgrading of one of the Campus's major entry areas.
Implementation

The leadership is aggressively pursuing implementation of the recommendations identified in this study. The concepts have been carefully reviewed by the administration and with faculty representatives. The University is moving ahead with plans to begin making these improvements as funding becomes available.

The following projects have been identified.

<table>
<thead>
<tr>
<th>No.</th>
<th>Project Title</th>
<th>Gross Square Feet</th>
<th>Total Project Cost</th>
<th>Source of Funding</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Theater</td>
<td>77.0*</td>
<td>$15,000,000</td>
<td>Private</td>
</tr>
<tr>
<td>2</td>
<td>Environmental Sciences and</td>
<td>175.0</td>
<td>$70,000,000</td>
<td>State</td>
</tr>
<tr>
<td></td>
<td>Engineering Center</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Library Building</td>
<td>100.0</td>
<td>$40,000,000</td>
<td>State</td>
</tr>
<tr>
<td>4</td>
<td>Upgrade West End Parking Lot</td>
<td></td>
<td></td>
<td>Internal (fees)</td>
</tr>
</tbody>
</table>