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Design of Michigan State
College Airport

A Thesis Submitted to

The Faculty of
MICHIGAN STATE COLLEGE
of
AGRICULTURE AND APPLIED SCIENCE

by

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THESIS

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TABLE OF CONTENTS

Introduction	Page 2
Site	Page 2
Rating	Page 2
Requirements	Page 3
Earthwork.	Page 3
Drainage	Page 4
Surfacing.	Page 4
Lighting	Page 5
General Airport Facilities	Page 5
Meteorological Data.	Page 6
Design	Page 10
Cost Estimate.	Page 11

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In the area of Lansing and East Lansing, there is but one airport. With the steady increase in flying, both commercial and private, it is apparent that with future expansion, a greater number of airports must be constructed:

Site:

The proposed airport is located one and one-half miles south of Michigan Avenue on Harrison Road. It is a quarter section lying southeast of the intersection of Harrison Road and Mount Hope Road. The property is owned by Michigan State College. The airport would be centerally located between Lansing and East Lansing, being about a ten-minute drive from Lansing, and about a five-minute drive from East Lansing. The roads leading to the airport are of bituminous pavement. The airport has an elevation of about 860 feet, and the surrounding country is suitable for emergency landings. It is so located that planes landing or taking off will not fly over either Lansing or East Lansing, thus eliminating the hazard of flying low over populated districts. The airport is located on the Pennsylvania Central Airlines between Lansing and Detroit, and the prevailing winds are such that the smoke from the cities will not drift in that direction.

Rating:

The airport comes under the landing area classification of 1. Airports are classified by the length of the effective

runways or landing strips, based on freedom of obstruction in the direction of takeoffs and landings. At the present time a gliding ratio of 20 to 1 is sufficient.

Requirements:

The requirements for a class 1 airport as set up by the Civil Aeronautics Authority are as follows: "Class 1, landing area shall be sufficient to permit the safe operation of private planes of the size now in use. For purposes of airport planing, a landing area located at sea level, whether its landing area be of the allway or landing strip type, will be considered for inclusion under the '1' classification if the landing area provides a sufficient number of landing strips at least 300 feet wide, and having a minimum effective length of 1500 feet, or permits the possibility of laying out such strips if an allway landing area, making possible, landings and take-offs to be made within $22\frac{1}{2}^{\circ}$ of the prevailing wind direction for at least 75% of the total winds of over 5 miles per hour velocity.

For landing areas located at higher altitudes, the same general requirements as to landing fields apply with the exception that the minimum effective length of 1500 feet must be increased by the percentage shown in Figure 1.

All landing areas should be adequately fenced."

Earthwork:

The airport is graded so that the entire field is available for use. The earthwork was computed using the

barrow pit method. Cuts and fills were only partially balanced, because to balance them would lower the entire elevation of the field. About 161,000.00 cubic yards of earth is needed to complete the fill, this can be borrowed from other college property, located north of the airport, to the rear of the Poultry Experimental Station.

Drainage:

The top soil is of sandy loam, and dark top soil, and is from six to eight inches deep. The subsoil is clay and sand down to a considerable depth. Drainage of the airport is accomplished by a joint system, catch basins and under-drains. The laterals are spaced 50 feet apart, and are laid at about a three-foot depth. The field will have a finished grade of .2%, sloping from the south and southwest to the north and northeast.

Surfacing:

Runways are located as shown on the enclosed plan, and are constructed of a penetration bituminous pavement. They are of a design and type recommended by the Michigan State Board of Aeronautics, and come under the Michigan State Highway Specifications as adopted on December 1, 1939. These specifications are 21A and 4.06. Aprons are of the same material. Parking lots are constructed of gravel. The entire airport, with the above exceptions, is seeded with a mixture of seeds, giving a firm and

durable sod. The airport is to be enclosed with a good grade 5 feet fence.

Lighting:

Lighting equipment and installations of the airport conforms with the suggestions set up by the Civil Aeronautics Authority. Boundary lights on marker cones are located 40 feet from the edge of the field at intervals of about 300 feet. Approach lights mark the end of each runway, and are spaced 50 feet apart. Obstruction lights are located on top of all buildings, and other obstacles within the airport. "Obstruction lights are also placed on top of all obstacles outside the airport that are more than 70 feet high, and on all obstacles projecting above a glide angle of 20 to 1 from the end of the runway, a landing strip, or any obstruction which is upstanding above adjacent objects, and is within one-half mile of the airport."* A ceiling projector is also installed. An airport beacon is located on top of the administration building. On top of the hangar is an illuminated wind direction indicator, with an obstruction light at its uppermost point.

General Airport Facilities:

There is to be a hangar with two side annexes, one for offices, the other a repair shop. It is constructed of sheet steel with doors at both ends opening the full width of the hangar. The hangar is 100' X 60' x 18', and has a rounded roof. At the hangar there will be facilities for handling

* See C.A.A. Bulletin No. 10 on Airport Lighting.

small repair jobs. Fueling equipment is also available. Painted on top of the hangar will be the name of the airport and an arrow indicating north.

The Administration building is a two story building of brick construction, and has available space for offices and radio equipment.

At the present time electricity is being furnished to this district, and, therefore, there is no additional expense for bringing electricity to the airport

METEOROLOGICAL DATA

(Taken from summary published by Weather Bureau Office,
East Lansing, Michigan.)

Month	Av. hourly velocity	Prevailing direction.
Length of record, yrs.	9	9
January	10.5	SW
February	10.5	SW
March	10.4	NW
April	10.2	NW
May	8.5	S
June	7.7	S
July	7.0	SW
August	7.1	S
September	7.8	SW
October	8.8	S
November	10.4	SW

December	9.6	SW
YEAR	9.0	SW

EARTHWORK

Total Cut 456,103.70 cubic yards

Total Fill 572,038.88 cubic yards

Allow 10% for bulking

$$10\% (456,103.70) = 45,610.37$$

$$456,103.70 - 45,610.37 = 410,493.33 \text{ cubic yards}$$

Fill - Cut = Amount to borrow .

$$572,038.88 - 410,493.33 = 161,545.55 \text{ cubic yards}^*$$

* See Plate I.

DRAINAGE

See Plate II

Drainage Modulus 3/8

Submain	Main	Area in Acres	Discharge in cu.ft./ sec.	Discharge for sub- main	Total Discharge	Size of Tile from Curve	Size of Tile Used
Runway #1		20.76	.0157	.3259		6"	6"
Runway #2		12.41	.0157	.1948		5"	6"
	A				.5207	8"	8"
Runway #3		12.41	.0157	.1948		5"	6"
Runway #4		20.28	.0157	.3348		6"	6"
#7		2.28	.0157	.0358	.5690	8"	8"
#5		2.90	.0157	.04553		4"	4"
#6		6.49	.0157	.1005	.1460	5"	5"
	B	3.17	.0157	.0498	.7648	10"	10"
#8		9.66	.0157	.1517		5"	6"
#9		5.35	.0157	.0840	.2357	6"	6"
	C	37.45	.0157	.5880	.8237	8"	10"
#10		2.87	.0157	.0451		4"	4"
#11		6.31	.0157	.1001	.1452	5"	5"
#12		1.83	.0157	.0287	.1739	5"	6"
#13		6.06	.0157	.0951		4"	4"
	D	9.95	.0157	.1562	.4252	8"	8"
To river							
from							
catch basin							
	A	1.60	.0157	2.5120			20"

SAMPLE COMPUTATIONS

Runway Drain Number 1.

Area - 20.76 acres

Drainage Modulus $3/8$ requires a discharge of .0157
cu. ft./sec./acre.

$(20.76) (.0157) = .3259$ cu. ft./sec.

Size of tile from curve, 6"

Text used "Drainage And Flood Control Engineering",

By G. W. Pickels.

RUNWAY CROSS SECTION



Hor. Scale - 1" = 200'

Vert. Scale - 1" = 5'

Penetration Bituminous Pavement - Recommended By the Michigan State Board of Aeronautics, adopted from the Michigan State Highway Department specifications of December 1, 1939.

6 inch compacted gravel base course

M. S. H. 21A

M. S. H. spec. 4.06

Prime Coat .4 gal./sq.yd.

M. S. H. spec. T 3

Bond Coat .25 gal./sq.yd.

M. S. H. spec. T 8

Cover Material 15#/sq.yd.

M. S. H. spec. 32A

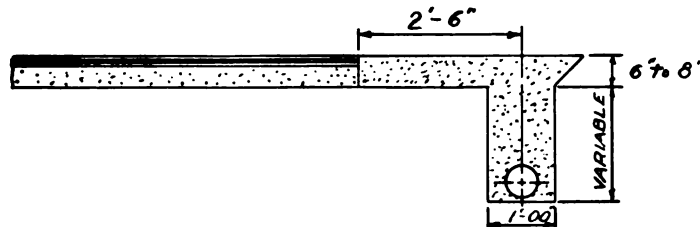
Surface Coat .25 gal./sq.yd.

M. S. H. spec. T 8

Cover Material 15#/sq.yd.

M. S. H. spec. 32A

RUNWAY DRAINAGE



Gravel or Crushed Rock Graded:

80% between 1/4 and 1/2 in.

95% passing 3/4 in.

95% retained on # 10

Hor. Scale - 1" = 20'

Vert. Scale - 1" = 5'

6 Inch Farm Drain Tile used for all runway drains.

COST ESTIMATE

Salvage of buildings on the property will compensate for their removal.

Grading 456,103.70 cu. yds. @ \$.07	31,927.26
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Earth Borrowed, 161,545.55 cu. yds. @ \$.30	48,463.67
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Drainage:

Trenching and Filling 136,610 lin. ft.

@ \$.65	88,796.50
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Trenching for runway drainage, 1017

lin. ft. @ .55	559.35
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Filling with gravel, 117.14 cu. yds. @ \$2.20	1,577.71
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4" Farm Tile, 101726 lin. ft. @ \$.06	6,103.56
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5" Farm Tile, 1,476 lin. ft. @ \$.05½	81.18
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6" Farm Tile, 29,226 lin. ft. @ \$.12	3,507.12
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8" Farm Tile, 3,239 lin. ft. @ \$.20	647.80
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10" Farm Tile, 1960 lin. ft. @ \$.30	588.00
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Catch Basins, 10 @ \$40.00	400.00
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Man Holes, 5 @ \$60.00	300.00
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Runways:

Construction and Material, 101,888 sq. yds.

@ \$.40/sq.yd.	40,755.20
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Grass Seeding:

35% Kentucky Blue

25% Brome

15% Common Rye

15% Red Top

5% Red Clover

5% Alsike	
129.43 acres, 20#/acre @ \$5.39/acre	697.53
Gravel for parking lots and road, 2,442.63	
cu. yds. @ \$1.50	3,663.95
Concrete floor for Hangar, 138.8 cu. yds.	
@ \$3.50	486.11
Fence, 10,348 running ft. @ \$.19	1,966.12
Corner Posts and End Posts	20.74
Lighting: (All prices listed as installed)	
34 Boundary lights and cone @ \$170.00	5,780.00
21 Approach lights and cone @ \$170.00	3,570.00
1 Illuminated Wind indicator with obstruct-	
ion light	64.40
2 Moveable Flood Lights @ \$300.00	600.00
1 Ceiling Projector and Ceiling Height	
Indicator	420.00
2 Obstruction Lights @ \$14.40	28.80
1 Beacon @ \$144.00	144.00
Hangar, 100 X 60	7,500.00
Administration Building, 38 X 30, 2 story.	<u>10,000.00</u>
TOTAL	\$258,649.00
Engineers Fee, 5%	<u>12,932.45</u>
TOTAL ESTIMATE	\$271,581.45



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