ANDREWS & CLARK
CONSULTING ENGINEERS

W. EARLE ANDREWS
ERNEST J. CLARK
DONALD W. SMITH

305 EAST 63RD STREET
NEW YORK 21
TEMPLETON 8-2600
AREA CODE 212

July 17, 1962

Major Gilmore D. Clarke
Clarke & Rapuano
830 Third Avenue
New York 22, New York

Dear Gil:

This is the last copy of the Monorail Report prepared by Disney. We have another copy here and the rest of them are distributed.

I think it is well worth reading.

Cordially,

Earle

FEASIBILITY OF THE DISNEYLAND-ALWEG MONORAIL SYSTEM AT THE 1964-1965 NEW YORK WORLD'S FAIR AND IN FLUSHING MEADOW PARK 1966-1973

A Report Prepared By

WED ENTERPRISES, INC.

in co-ordination with
Andrews and Clark

For

THE NEW YORK WORLD'S FAIR 1964-1965 CORPORATION
Flushing Meadow Park, New York

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Section I

INTRODUCTION

In May, 1962, representatives of WED Enterprises, Inc., Disneyland, Andrews and Clark, Economics Research Associates, and the New York World's Fair 1964-1965 Corporation, met with the Honorable Robert Moses to evolve preliminary ideas and concepts concerning the installation and operation of a periphery Monorail ride at the Fair. The type of Monorail under discussion was the Disneyland-Alweg designed system operating at Disneyland, which after investigation by the New York Fair staff, is considered to be the most appropriate attraction for demonstrating progress in this field of transportation at the Fair.

Preliminary estimates and calculations on capacity, cost and revenue suggested that such a project would likely generate a profit both during the Fair and after the Fair as a Flushing Meadow Park attraction. It was also a concensus of opinion among those in these meetings that such an attraction would add substantially to the overall Fair presentation, and further that its installation was a technically feasible undertaking from the standpoint of such site factors as right-of-way availability, utility interference, foundation conditions and road crossings.

Also discussed in considerable detail was the suitability of Monorail operation as a major attraction in Flushing Meadow Park after the Fair, and it was agreed that such an undertaking was a desirable public service in keeping with the importance of this Park in New York's total recreational planning, and that, therefore, the Monorail should be viewed as a permanent attraction and its feasibility evaluated in this light.

On June 5, 1962, the New York World's Fair 1964-1965 Corporation authorized WED Enterprises, Inc. to undertake a feasibility study of the Disneyland-Alweg Monorail System at and after the Fair, in coordination with Andrews and Clark. The purpose of the work is to objectively evaluate the following elements of such an installation:

1. Engineering and design parameters and specifications.
2. Recommended capacity and train configuration.
3. Construction and installation costs.
4. Projections of revenue, operating cost, operating profit, and payout.

This report sets forth the findings and evaluations of the work outlined above. Its preparation at WED Enterprises has been facilitated by staff assistance from the following firms:

1. Andrews and Clark, Consulting Engineers.
2. Walt Disney Productions and Disneyland.
3. Economics Research Associates, Economic Planners.
4. J. B. Allen and Company, General Contractors.
5. Wheeler and Gray, Consulting Structural Engineers.
6. Wegematic Corporation (Alweg).

Fundamental to the considerations outlined in this report is the proposed location of the Monorail ride, which is shown in Figure 1. Significant elements of the route are as follows:

1. Its total length is approximately 12,400 feet of main line beamway and 1,000 feet of spur track.

2. It is a single track, periphery clockwise routing, designed to provide an orienting view of the entire grounds to the Fair visitors.

3. It is a single station, loop ride with its station location at the Main Entrance of the Fair.

4. Design concepts are developed from the Disneyland-Alweg installation at Disneyland adapted to Fair site physical and operational conditions.

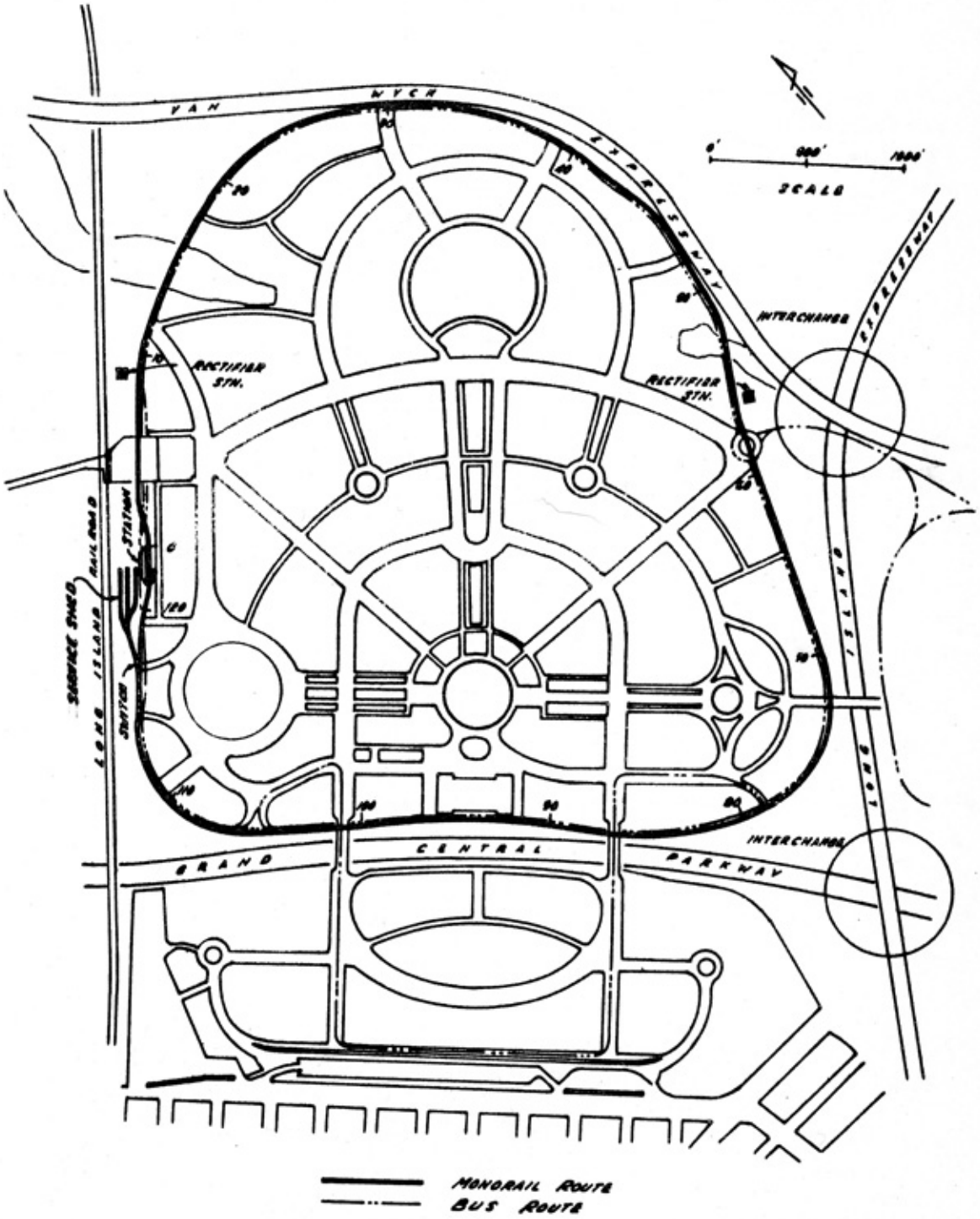


Figure 1

NEW YORK WORLD'S FAIR 1964-1965
PROPOSED DISNEYLAND ALWEG MONORAIL ROUTE

Section II

SUMMARY AND CONCLUSIONS

The following four sections of this report develop and analyze data concerning the engineering and economic feasibility of the proposed Disneyland-Alweg Monorail as a periphery ride at the 1964-65 New York World's Fair. These sections treat ride capacity, design and engineering parameters, construction and installation cost, operating profit and payout. Findings are summarized in this section.

Capacity Analysis

On the 12,400 feet right-of-way of the periphery loop, total cycle time is calculated at seven minutes 28 seconds, equivalent to 8.03 trips per train per hour. This cycle is based on an average speed of 25 M. P. H., which is well below design capability of 45 M. P. H. With its starting and stopping acceleration capabilities the train can cruise at less than 30 M. P. H. and achieve an average speed of 25 M. P. H.

The four compartment car, six-car train recommended in this study seats 204. Its hourly peak capacity is thus 1,638 passengers. On an operating schedule of two years at the Fair, 180 days per season, 14 hours average operation per day, total ride volume is projected at 4.95 million passengers per train at a capacity utilization of 60 percent. Three trains develop a ride volume of 14.86 million passengers. Sixty percent utilization is considered an appropriate estimating factor for the New York World's Fair, although it can conceivably be exceeded.

Three trains is the maximum number that can be run on the system. In a three train operation, dispatch interval of two minutes 29 seconds (7:28 divided by 3) is reasonably in excess of total station time of one minute 50 seconds.

Operations after the Fair are established on a one train system, with a yearly theoretical capacity of 2,734,000 on a 145 day schedule (April 1st to October 31st, week-ends only, except during the period June 10th to September 30th, and Spring Vacation, when a seven day weekly schedule is appropriate). Total hours operated equal 1,608 per year; 12 hours per day during the summer, 8 hours per day at other times.

Ride volume is projected at 25 percent capacity utilization or 658,500 passengers per year. During the eight year period, 1966-1973, ride volume totals 5,268,000. This capacity utilization is considered appropriate only if Flushing Meadow Park is developed as a recreational center of major importance.

Total ride volume during the decade 1964-1973 is thus projected at 20,128,000 passengers.

Engineering and Design Parameters

Engineering and design specifications on which this report is based are summarized as follows:

Trains

Number:	3 Trains - 6 Cars each.
Dimensions:	Length 187 Feet; Width 6 Feet 6-1/2 Inches; Height 7 Feet, 8 Inches.
Operation:	Clockwise.
Seating:	Opposing Seats, Compartment configuration as at Disneyland.
Windows:	Roll-up on the door side. Detachable on the outer side.
Air Conditioning:	Front and Rear Dome Compartments. Ventilation and heating furnished to all compartments.
Interior Lighting:	Aisles Only.
Communication:	2 Way Radio, internal P. A. and Tape Machine.
Weight:	122,500 lb. gross loaded.
Drive:	(6) 55 H. P., 300 Volt D. C. Motors.
Max. Design Speed:	45 M. P. H.
Auxiliary Power:	Internally provided.
Tires:	(84) 8.25 x 20, 12 Ply (56) 6.90/6.00 x 10, 10 Ply

Station

Platform:	30 Ft. above grade.
Ticket Booths & Turnstiles:	(4) @ 1,250 Guests/Hour Capacity.
Dimensions:	217 Ft. x 30 Ft.
Capacity of Ramps:	5,000 Per Hour.
Special Features:	Inspection Platform. Supervisory Office. Specialized Architectural emphasis to achieve Marquee values.

Beamway

Minimum Radius of Curvature:	350 Ft.
Maximum Grade:	± 5%
Superelevation:	Set at 50% offset of Centrifugal force at 45 M. P. H.
Height above grade:	30 Ft., higher at Station.
Design Loads:	Maximum Gross Bogie weight 17,500 lbs. 34% of gross weight as impact factor. 30% of gross weight as braking factor. 20 psf wind load.
Bogie Spacing:	26 Ft. 5 Inches.
Foundations:	Driven piles, 60 tons capacity, 80 Ft. long on the average.
Dimensions:	1 Ft. 8 Inches wide. Sixty Ft. Max. Span. 2 Ft. 10-1/2 Inches minimum depth.
Type:	Prestressed over 40 Ft. long.

Electrical System

Bus Bar Voltage:	600 Volts D. C.
Rectifier Input:	4160 V-3-60 AC.
Rectifier Rating:	(2) @ 1,000 KVA each. 100% excess capacity.
Beamway Lighting:	Continuous Strip Fluorescent.
Rectifier Stations:	Two at opposite locations.
Safety System:	Induction Block Signal.

Service and Maintenance Building

Dimensions:	60 Ft. x 210 Ft., two story.
Capacity:	Three Trains at one time.
Type:	Light Frame, Industrial Siding. Piled Foundations, Sprinklered, heated.

Required Construction Schedule

Construction:	9 Months.
Installation:	2 - 3 Months, Installation testing and shakedown.
Total Requirements:	12 Months.

Construction and Installation Costs

Section V details the following estimates of total cost prepared by WED Enterprises, Inc., and Wegematic Corporation (Alweg), which is summarized as follows:

	WED Estimate	Alweg Estimate
Trains	$ 1,660,073	$ 1,232,000
Beamway	3,200,313	2,624,900
Electrical	511,266	388,506
Station	440,062	150,000
Maintenance & Storage	310,500	162,000
	$ 6,122,214	$ 4,557,406

As pointed out in Section V, WED Enterprises and its consultants are of the opinion that the Alweg estimate needs adjustment to reflect observable differences in content and concept of facility requirements. These adjustments are very approximate at this date, and will be subject to further refinement as appropriate:

	WED Estimating Adjustments to Alweg Estimates
Trains	$ -0-
Beamway	245,454
Electrical	115,500
Station	231,375
Maintenance & Storage	-0-
	$ 592,329

The Alweg total after the above adjustments is $5,139,735.

Operating Profit and Payout

Estimates of profitability are calculated on a price scale and distribution as follows:

	New York World's Fair	Flushing Meadow Park
Adults	75¢	50¢
Children	50¢	25¢
Adults	75%	60%
Children	25%	40%

Operating profit estimates in Section VI are summarized as follows:

	New York World's Fair 1964-1965	Flushing Meadow Park 1966-1973
Gross Revenue	$ 10,216,250	$ 2,141,200
Licensing Fees	1,021,625	214,120
	9,194,625	1,927,080
Operating Labor	$ 321,048	$ 231,600
Operating Expense	220,000	80,000
Maintenance Labor	605,956	439,960
Maintenance Expense	200,000	80,000
Total Oper. and Maint. Expense	$ 1,347,004	$ 921,560
Total Operating Profit	$ 7,847,621	$ 1,005,520
Total 1964-1973	$ 8,853,141	

From the foregoing operating profit estimate, payout is derived. Against WED estimated total costs of $6,122,214, payout in the decade 1964-1973 is 144.6 percent of total cost. In the case of the adjusted Alweg cost estimate, payout is 171.9 percent. In the period of the New York World's Fair alone, payout against the WED estimate is 128.2 percent; against the adjusted Alweg estimate, 153.4 percent.

Conclusion

It is the finding of this study that the installation of a Disneyland-Alweg Monorail system as a periphery ride at the New York World's Fair and a park attraction in Flushing Meadow Park is feasible, both in reference to engineering and design standards applicable to the site and installation, and the economic aspect of a reasonable expectation of return on investment.

Section III

CAPACITY ANALYSIS

Essential to all of the estimating and system analysis contained in this report is a development of capacity requirements consistent with potential visitor volume at the New York World's Fair. The subsequent configuration of number of trains, cars per train, and capacity per train is derived from these data. Capacity requirements and visitor penetrations at the New York World's Fair are developed in the first portion of this section. In the final portion of this section, train capacity is applied to conditions existing after the New York World's Fair when the Monorail is used as a Flushing Meadow Park attraction.

Capacity at the New York World's Fair

Train configuration and capacity recommendations are developed from the data in Tables I and II. Table I develops a cycle of seven minutes 28 seconds at the New York World's Fair (compared to a cycle of nine minutes 30 seconds on the two station Disneyland installation). This cycle is derived from an assumed average speed of 25 M. P. H. for running time (compared to 21. 2 M. P. H. at Disneyland) and total station time of one minute 50 seconds (compared to two minutes flat at the Disneyland Main Station and 55 seconds at the Disneyland Hotel Station). The cycle in the New York World's Fair loop equates to 8. 03 trips per hour per train.

The next step in this analysis is to determine how many trains can be operated in the system as follows:

	Dispatch Interval	
	Minutes-Seconds	Minutes (Decimals)
Cycle	7:28	7. 47
Total Station Time	1:50	1. 83
Dispatch Interval:		
1 Train System	7:28	7. 47
2 Train System	3:44	3. 73
3 Train System	2:29	2. 49
4 Train System	1:52	1. 87

Table I

DISNEYLAND AND NEW YORK WORLD'S FAIR CYCLE TIME COMPARISON [1]

	Disneyland		New York Fair	
	Times In:		Times In:	
	Minutes-Seconds	Decimals	Minutes-Seconds	Decimals
Load Time	0:45	0.75	0:45	0.75
Unload Time	0:25	0.42	0:25	0.42
Load/Unload Time	1:10	1.17	1:10	1.17
Ready Time	0:50	0.83	0:40	0.67
Total Main Station Time	2:00	2.00	1:50	1.83
Second Station Time [2]	0:55	0.92	N. A.	N. A.
Total Time - All Stations	2:55	2.92	1:50	1.83
Length of Beamway Loop	12,270'		12,400'	
Average Running Speed	21.2 MPH		25 MPH	
Average Running Speed	31.09 Ft./Sec.		36.67 Ft./Sec.	
Trip Time	6:35	6.58	5:38	5.64
Total Station Time	2:55	2.92	1:50	1.83
Total Cycle Time	9:30	9.50	7:28	7.47
Trips Per Hour Per Train	6.31		8.03	

1/ Certain figures may not precisely add due to rounding.
2/ Drop-off Station at Disneyland Hotel.

Table II

CAPACITY CONFIGURATIONS AT DISNEYLAND AND THE NEW YORK WORLD'S FAIR

	Disneyland 1/	New York Fair-5 Car Train 2/			New York Fair-6 Car Train 3/		
	3 Trains	1 Train	2 Trains	3 Trains	1 Train	2 Trains	3 Trains
Capacity Per Trip (Seats)	108	172	172	172	204	204	204
Total Cycle Time (Minutes)	9.50	7.47	7.47	7.47	7.47	7.47	7.47
Dispatch Interval (Minutes)	3.17	7.47	3.72	2.49	7.47	3.72	2.49
Trips/Train/Hour	6.31	8.03	8.03	8.03	8.03	8.03	8.03
Total Trips Per Hour	18.93	8.03	16.06	24.09	8.03	16.06	24.09
Theoretical Capacity Per Hour	2,044	1,381	2,762	4,143	1,638	3,276	4,914
Total Days Operated 4/	297	360	360	360	360	360	360
Hours Per Day (Average)	11	14	14	14	14	14	14
Effective Utilization of Cap. (%)	46.4	60	60	60	60	60	60
Total Ride Volume for 2 Year Season 4/ (Millions)	3.1	4.18	8.35	12.53	4.95	9.91	14.86
Penetration of 70,000,000 Attendance (%)	N. A.	6.0	10.5	17.9	7.1	14.2	21.2

1/ Capacity 3 Compartment Car, 4-Car Disneyland Trains is (8 x 3 x 4 + 7 (front) + 5 (back) = 108.
2/ Capacity of 4 Compartment Car, 5-Car N. Y. W. Fair Trains is (8 x 4 x 5) + 7 (front) + 5 (back) = 172.
3/ Capacity of 4 Compartment Car, 6-Car N. Y. W. Fair Trains is (8 x 4 x 6) + 7 (front) + 5 (back) = 204.
4/ Calculation for Disneyland is based on 297 Days at an average of 11 hours per day for one year.
Calculation at N. Y. World's Fair is based on 360 Days for 2 Seasons at an average of 14 hours per day.

From the foregoing, it is apparent that this system capacity is three trains. Four trains places the dispatch interval at 1:52, which is too close to the station time requirement of 1:50.

Table II develops capacity data for one, two and three trains in two configurations. The first configuration is a four compartment, five-car train. Each compartment seats eight, or 32 per car. The front and rear cars seat 12 additional persons. Total seating capacity is 172 (37-32-32-32-39). The second configuration is a four compartment, six-car train which seats 204 (37-32-32-32-32-39). Hourly capacity for the five car train is 1,381 and for the six car train, 1638 (compared to 681 per train at Disneyland).

From the foregoing hourly capacities, capacity utilizations and estimated ride volumes are also derived in Table II. In these calculations, operations at the New York World's Fair are predicated on two 180 day seasons with an average daily schedule of 14 hours per day.

In converting theoretical hourly capacity into expected ride volume this report considers 60 percent utilization of capacity an appropriate basis. It is a figure which can be substantially exceeded during peak periods. As a point of comparison, the Disneyland Monorail operates year around at approximately 45 to 50 percent of theoretical capacity. This figure varies between 80 to 90 percent on peak days to 20 to 30 percent on low volume days. In a short season, high volume, one time event like the New York World's Fair, 60 percent is considered a conservative and realistic estimating factor for a highly appealing attraction.

From these factors ride volume ranging from a minimum of 4.18 million for one five-car train to a maximum 14.86 million for three six-car trains is estimated in Table II. For these configuration limits, penetrations in the total planned attendance of 70,000,000 range from a low of 6.0 percent to a high of 21.2 percent respectively. In view of these relatively low penetrations the higher capacity configuration is selected as the planning model for this report. The recommended configuration is therefore estimated as a three train, four-compartment car, six-car train, generating a total ride volume of 14,860,000 at 60 percent utilization. If repeat attendance at the New York World's Fair follows an expected 3.5 visits per person pattern, 20,000,000 individuals will visit the Fair a total of 70,000,000 times. On this premise, the Monorail System can serve 74.3 percent of these persons ($\frac{14.86 \times 3.5}{70}$ = 74.3%).

The fact that the maximum configuration (three trains - six cars) is far from saturating the potential audience, corroborates the economic logic of selecting the largest of these several capacities in Table II. Disneyland experience provides a further check on the foregoing penetrations. The

Monorail serves 3.1 million out of 5.0 million total visitors at Disneyland. Adjusting for repeat visits of 20 percent per year (non-cumulative), the Disneyland Monorail serves 3.1 out of 4.0 million individual attendances, or 77.5 percent of total individual attendance (adjusted to exclude repeat attendance).

Capacity in Flushing Meadow Park (1966-1973)

Operations as a park attraction at Flushing Meadow Park after the Fair are estimated on the assumption that only one train will be used at any one time.

A prototype schedule for such operations is outlined in Table III, which suggests a calendar running from April 1st through October 31st, week-ends only except during the summer period June 10th to September 30th. Hourly schedule is estimated on the basis of 12 hours per day during the summer and 8 hours per day on non-summer week-ends. Thus, a total of 1,608 available hours are suggested for this schedule.

Theoretical capacity for one train operation on this schedule is 2,734,000. Effective capacity is calculated at 25 percent of theoretical of 658,500 riders. A 25 percent effective utilization is considered to be a reasonable goal if Flushing Meadow Park is developed as a popular mass attraction, serving a large part of the New York City and suburban populations.

Its reasonableness is supported by the fact that out of 145 days of operation each year, 112 are scheduled during the busy summer period from June 10th to September 30th.

For the eight year period 1966-1973, aggregate ride volume at 25 percent capacity utilization for one train, is projected at 5,268,000.

Table III

RECOMMENDED SCHEDULE AT FLUSHING MEADOW PARK 1966-1973

Dates	Schedule	No. of Days	Total Hours
4/1 - 6/10	Week-ends Only, 8 Hours Per Day	20	160
Spring Vacation	Week Days, 8 Hours Per Day	5	40
6/10 - 9/30	Seven Days Per Week, 12 Hours Per Day	112	1,344
10/1 - 10/31	Week-ends Only, 8 Hours Per Day	8	64
	Total	145	1,608

Section IV

ENGINEERING AND DESIGN PARAMETERS

The Monorail beamway will, in general, parallel the main loop of the primary bus route north of Central Expressway. A single station will be located in an area south and adjacent to the Fair entrance structure at the Long Island Railroad sidings. A proposed service and storage building with connecting spur is located a short distance southwest of the proposed station.

The average height of top of beamway above existing grade will be 30 feet. Variation in grade will be made to blend with site condition and to provide interest on the ride. Maximum height will be reached where the Monorail beamway crosses over the Fair Main Entrance structure. Here a minimum clearance of 12 feet above the pedestrian platform will require the top of beamway to rise approximately 38 feet above ground. Total length of the loop is approximately 12,400 feet. The beamway profile is shown in Figure 2.

This section develops specific engineering and design specifications for the major elements of the New York World's Fair Monorail System. Major elements treated include the trains, station, beamway, electrical system, maintenance and storage facilities, and construction and installation considerations.

Trains

Three six-car trains with four compartments in each car are planned, each to provide a maximum capacity of 1,638 passengers per hour. The general design concept follows the Disneyland-Alweg train design in layout and styling; however, each train is 187 feet long and is planned to carry 204 seated passengers. To avoid extensive re-engineering of the cars, a clockwise operating direction is contemplated throughout this report. This direction is considered satisfactory from the standpoint of Fair operations.

Typical seating arrangement is planned similar to the Disneyland-Alweg train, wherein each compartment contains two rows of four opposing seats mounted across the width of the train and having a common aisle leading to a single door on one side of the train.

Cars will have roll-up and detachable windows. Air conditioning and heating will be supplied to the front and rear dome compartments, with heating and ventilation furnished to all other compartments.

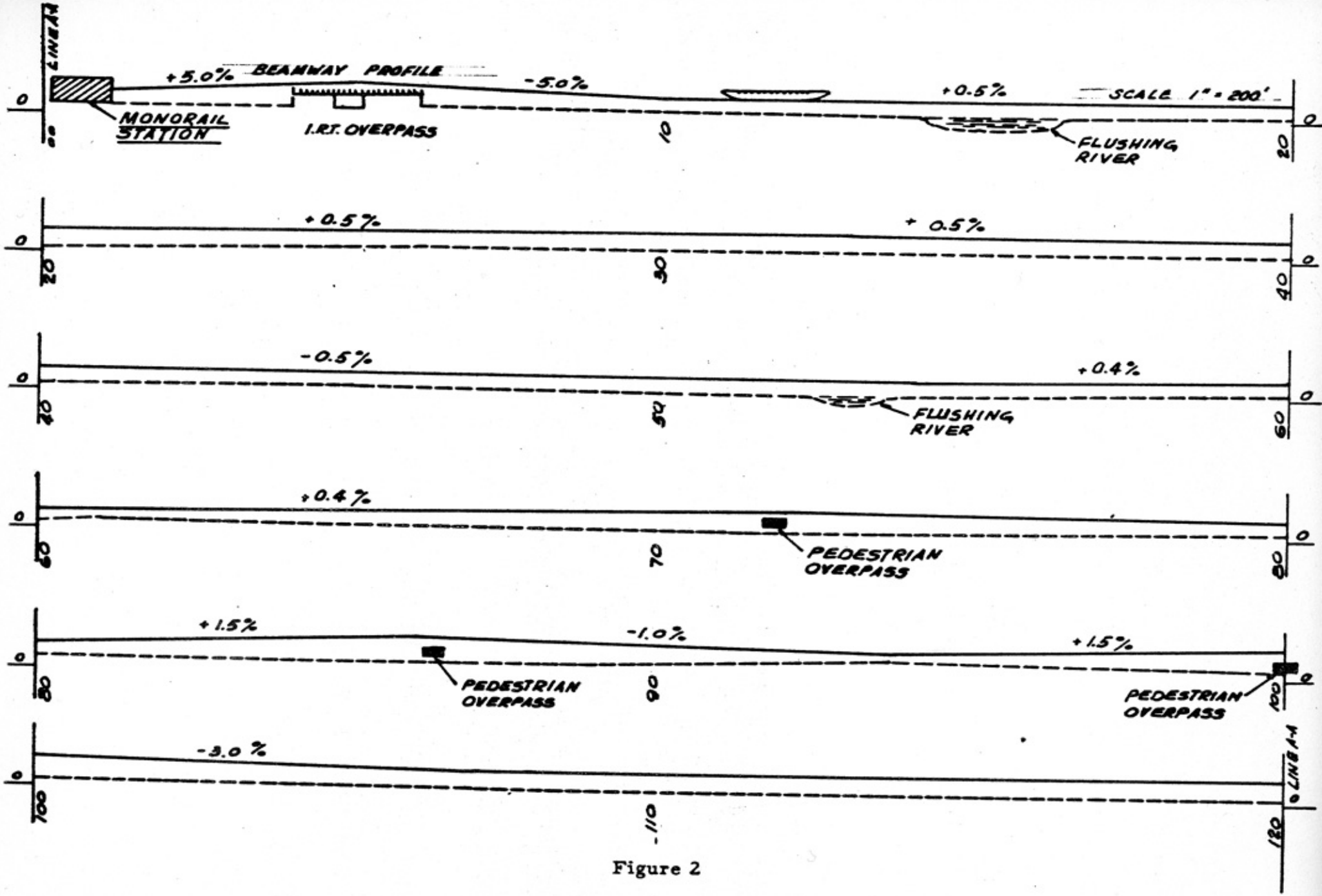


Figure 2

BEAMWAY PROFILE

Interior lighting for the cars will be located at the aisles only except for the operator's compartment, which will have additional service lighting. A two-way radio is planned for the operator's compartment, as well as a P. A. system and a tape machine connected to speakers in each compartment. Communications with passengers may be maintained by the operator's voice or by a taped spiel.

Gross loaded weight of train is estimated to be 122, 500 pounds. Maximum speed of the train is 45 miles per hour. Drive power for each train will be furnished by six series-connected 300 volt 55 H. P. D. C. traction motors mounted in pairs on three of the seven bogies. This power train provides rapid, smooth acceleration which is nearly noiseless in operation.

An auxiliary power unit will be installed on each train to propel the train to the station and service area at low speed in event of major power failure on the train, or in the main electrical power system.

Dynamic braking and an overspeed governor is planned to help control the movement of the trains. The operator's throttle will be hand operated and connected to a step control system to provide a smooth transition of movement during acceleration and deceleration.

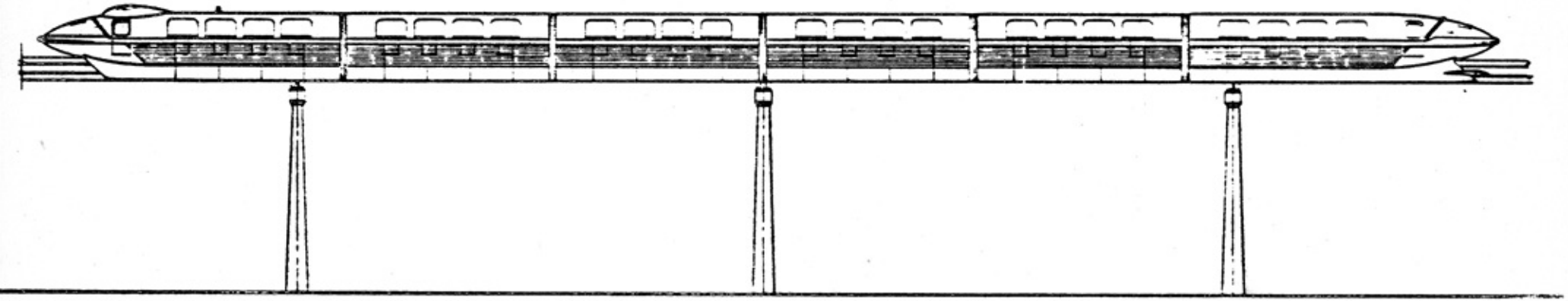
Each train will have a total of 84 high pressure pneumatic tires. Fourteen sets of dual 8. 25 x 20, 12 ply tires roll on top of the beamway, and fifty six 6. 90/6. 00-9, 10 ply tirres roll along the sides of the beams.

Figure 3 is a scale layout of the four compartment six-car Disneyland-Alweg train on the beamway.

Station

The Monorail in the New York World's Fair requires a station platform of an elevated structure type. The platform elevation will be approximately 30 feet above the ground to meet the proposed beamway alignment.

Because the station will function in the park after the Fair for a period much longer than the period of use during the Fair operation, the station complex must be visualized as an integral part of the ultimate park. In addition to functioning as a high capacity Fair ride, it must be a spot of transitional beauty as it moves visitors from the Park grounds to the advanced transit concept of Monorail. This can be accomplished by a unified assembly of specific architectural elements of the station based upon design



Scale - 1" = 20'

Figure 3

SCALE LAYOUT OF FOUR COMPARTMENT, SIX-CAR
DISNEYLAND ALWEG TRAIN ON BEAMWAY

concepts proven at Disneyland, where station design experience suggests the following objectives:

A. The Monorail Train should be visible to everyone as they enter the Park.

B. Primary and secondary transit within the Park should pass directly beside the Monorail Station, affording each visitor a view of where to go to board the Monorail.

C. The station, with the Monorail in front of it, would form its own marquee.

D. A plaza or a garden type approach to the station itself would bring continuity from the park to the Monorail.

With these elements in mind, the specific station plan is visualized as follows:

The Fair visitors are presented with a panoramic view of a graceful courtyard enclosed by low planting under artistic specimen trees. Around the courtyard are placed curving bench seats where guests may linger for a few moments rest, while observing a circular ring of seasonal flowers and the swift silent movement of the trains passing by overhead.

Passing through curved cue lines, guests may purchase tickets from any one of four ticket booths, each of which can handle 1,250 guests per hour. Four turnstiles are operated by two attendants immediately behind the ticket booth. Guests then wind their way up a gently curving ramp leading through the garden, which affords a spectacular view of the garden area and the Monorail train. The ramp arrives at the center rear of the station platform where guests are directed to one of two waiting areas. Between these two areas is a VIP area, which can discreetly accommodate special guests as well as persons in wheel chairs.

Passengers disembarking from the trains will exit from the platform to the right and to the left. A divider at the center of the platform will control the direction of exit. Departing passengers will leave on ramps which pass back and forth beneath the station platform as they lead to the ground level. Passengers boarding trains will enter the loading platform near the center and will fan right and left towards the ends of the train. This means of handling exiting and embarking passengers will reduce the unloading and loading time to a minimum.

An office for operating supervision and for administrative personnel is envisioned in an area directly beneath the main platform. An inspection platform for checking mechanical and electrical equipment and tires while the train is standing in the station is planned directly beneath the outer boarding platform.

The overall length of the station is 217 feet, and the width will be approximately 30 feet. The upper deck will be open on the sides. A light weight architectural roof will provide shade and protection from the elements. The two exit ramps will each be 15 feet wide to accommodate slower moving passengers. The single entrance ramp is also planned to be 15 feet wide. This station layout will comfortably accommodate the system design capacity of approximately 5,000 people per hour.

The loading station will be designed in accordance with all applicable AISC and ACI Code provisions, modified to meet local codes where required. This structure will be supported on driven steel or concrete pile foundations.

Figure 4 illustrates a generalized concept of the Station design. Figure 5 is an isometric view of the station ramps layout described above.

Beamway

The following sub-section presents engineering considerations relating to the design, construction, and cost analysis of the beamway, piers and foundations. All information and recommendations are based on design, construction and cost data for the similar closed loop Monorail, which has been in successful operation for several years at Disneyland. Experience in this operation will also be used as a basis for making improvements and modifications to the proposed New York World's Fair Monorail.

For a successful operation, a smooth ride is essential. It is emphasized that quality control is of the utmost importance in all phases of this project, beginning with engineering and carrying through the entire construction phase, with particular attention to dimension tolerances and rigid adherence to specified quality of all materials and workmanship.

Design Criteria For The Monorail Beamway, Piers and Foundations:

In this report, cost data and conclusions are based on the following design and operating criteria:

Figure 4

ARTIST'S CONCEPT
OF THE STATION

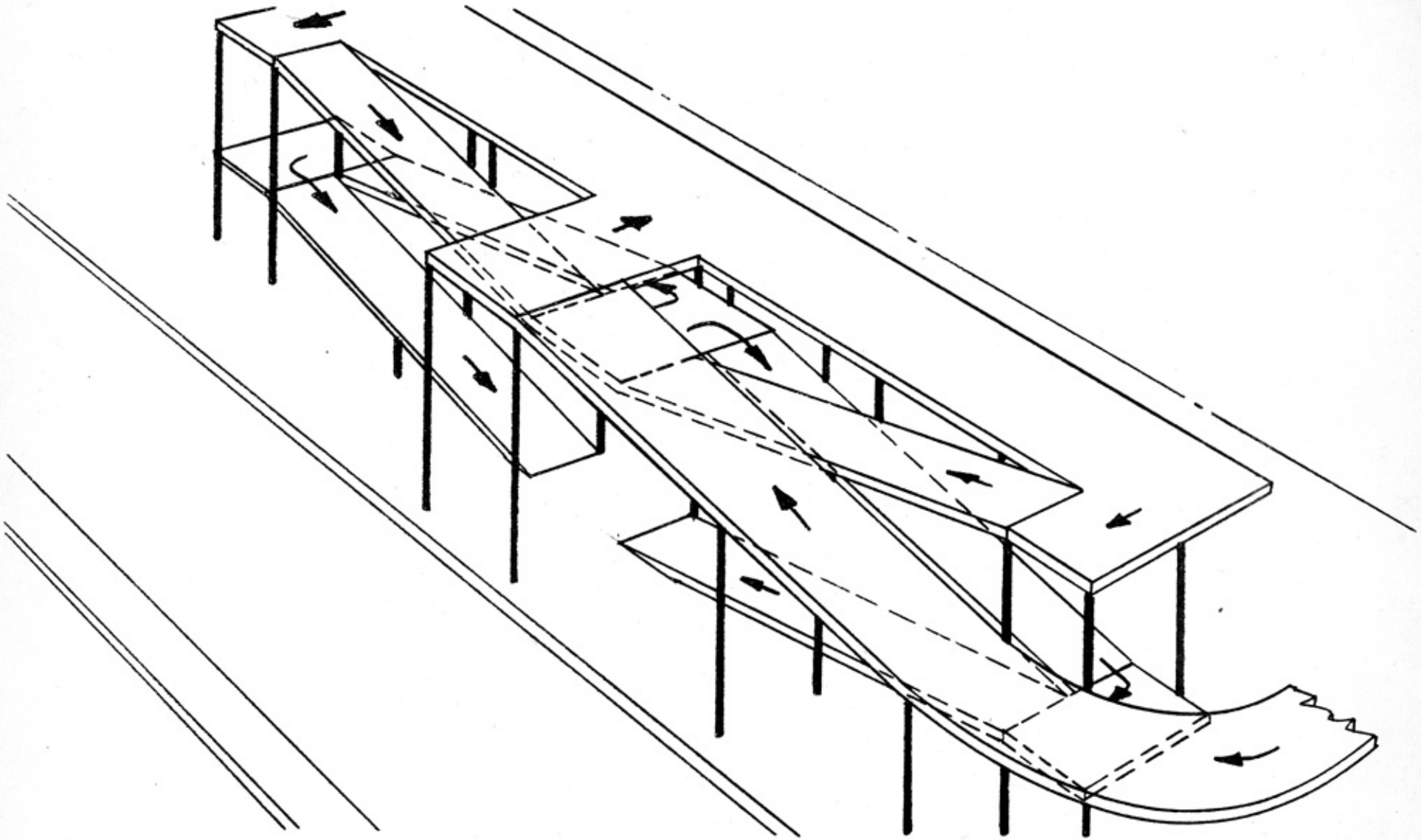


Figure 5

ISOMETRIC VIEW OF
STATION RAMPS LAYOUT

Maximum Speed -- 45 miles per hour.

Minimum horizontal radius of curvature for beamway -- 350 feet.

Maximum vertical grade -- $\pm$ 5%.

Superelevation -- established to compensate for approximately 50% of the centrifugal forces resulting from maximum design speed.

Height of Beamway -- 30 feet average height from grade to top of beam.

Design Loads:

Maximum gross bogie weight -- 17,500 lbs.
Spacing of bogies -- 26 Ft. 5 Inches.
Impact Factor -- 34% of gross weight.
Braking Factor -- 30% of gross weight applied in a longitudinal direction.
Wind Load -- 20 psf of vertical projection adjusted for shape factor.

Design Codes:

ACI - 318 - 56 and ACI-ASCE Joint Committee Recommendations for prestressed concrete, modified to comply with local applicable codes.

Foundations:

Driven piling.
Capacity -- 60 tons.
Length -- 80 feet average.

General Description:

The beamway will be 1 Ft. 8 inches wide. Depth will vary, depending on span, with a minimum depth of 2 Ft. 10-1/2 inches. Width and profile of beam are set by present car bogie configuration and any deviation would require basic re-design of rolling stock which is not considered advisable.

All beams will be made of precast concrete with 60 foot maximum span. Spans greater than 40 feet will be prestressed. Shorter radius beams will be reinforced by conventional means. Camber and curvature and all dimension tolerances must be rigidly controlled on both conventional and prestress spans to maintain smooth riding qualities.

Rigid control of form construction is important to maintain uniformity of configuration and provide adjustments for variable radii and superelevations. Controlled use of the forms will materially save time and cost in this program.

The number of variable radii on the beamway should be the minimum possible to simplify construction problems in beam curvature adjustments.

Figures 6 and 7 show sections of a conventional reinforced beam and a prestressed beam.

Piers

Typical supporting piers will be precast concrete. Special piers may be concrete or steel. Offset piers will be provided where required to avoid utilities, maintain road and street alignment and for other special pier installations. Special piers will be required at switches.

Elevation of pier bases will be adjusted within limits below grade to standardize casting lengths. Figure 8 shows the typical pier elevations.

Foundations

Additional borings may be required to verify length and design criteria for piles. Test piles are recommended to substantiate capacity and establish uplift values.

Based on presently available data, driven steel or concrete piles will be required, of 60-ton capacity and an average length of 80 feet.

Foundations will be designed and adjusted to accommodate existing utilities and other permenent installations that interfere with normal footing installations where it is more practicable to adjust the footings than relocate existing utilities or obstructions. Precise data on location of existing utilities and other underground installations affecting foundations will be required.

Provisions for lateral resistance will be provided by batter piles, compacted fill or other acceptable means.

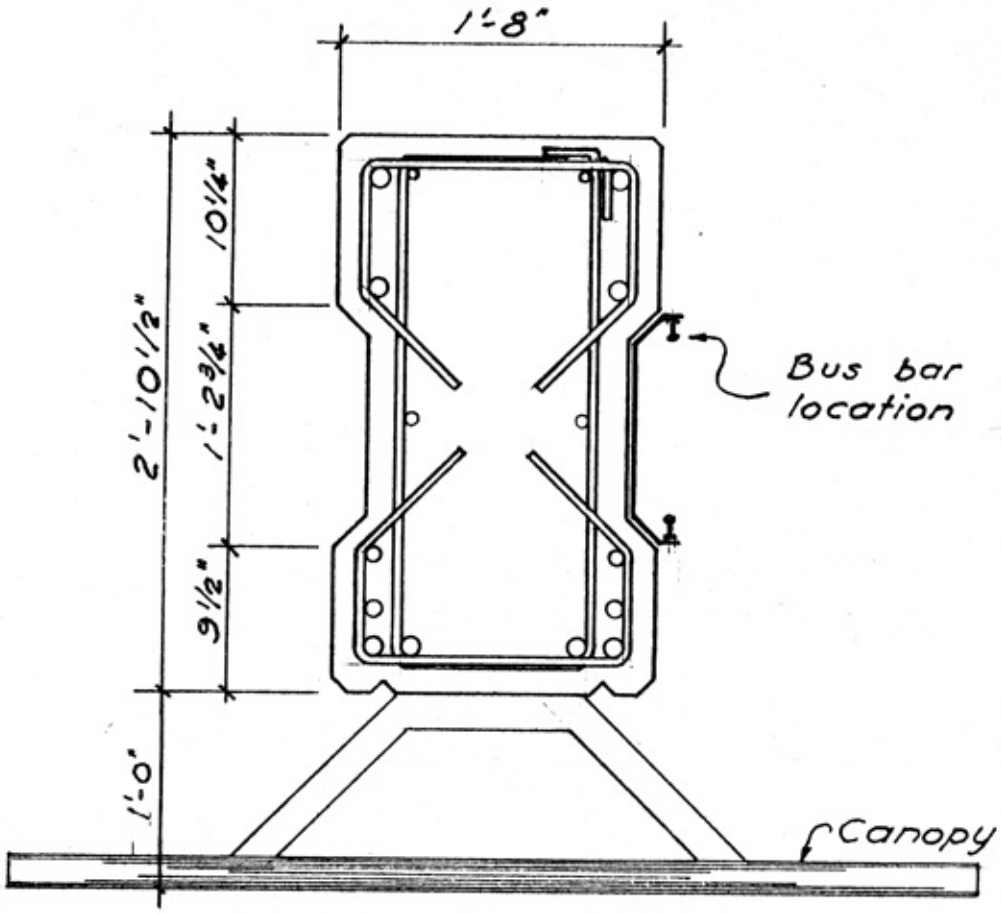


Figure 6

CONVENTIONAL REINFORCED BEAM SECTION
(40 ft. maximum span)

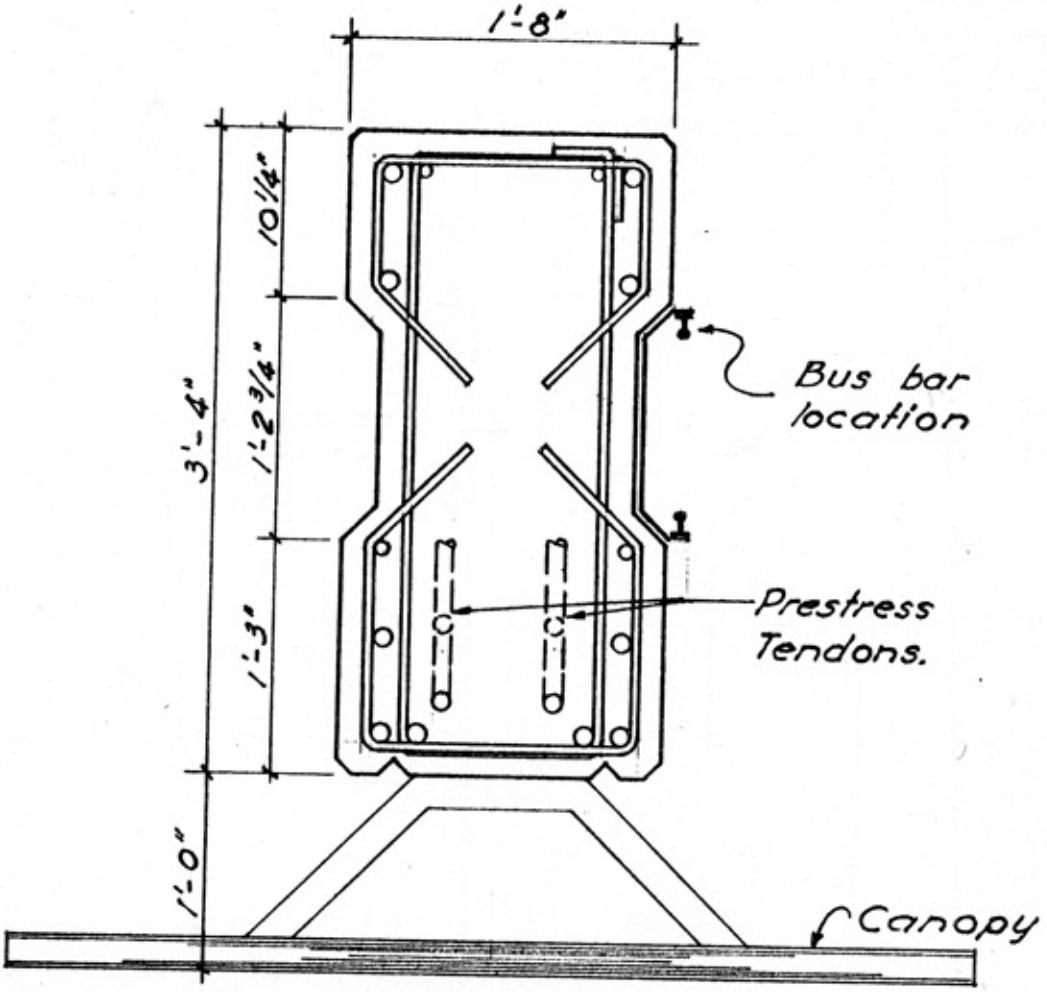


Figure 7

PRESTRESSED BEAM SECTION
(60 ft. max. span)

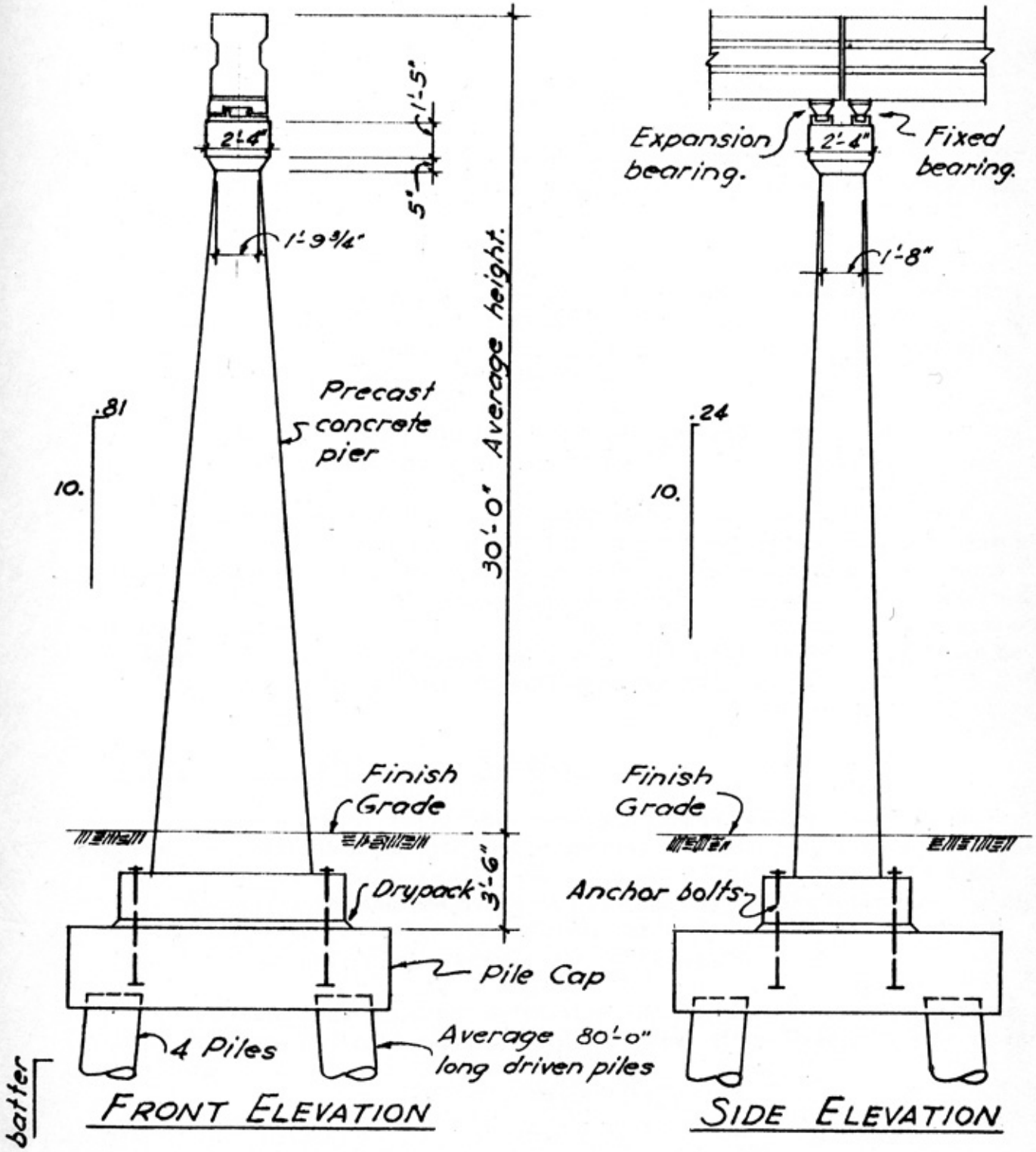


Figure 8

TYPICAL PIER ELEVATIONS

Electrical System

The Monorail trains will operate on 600 volts of direct current transmitted along a pair of copper and steel bus bars mounted along the recess on one side of the beams.

From power sources near the entrance overpass structure and near the Long Island Expressway and the Van Wyck Expressway interchange, 4160 volt, three phase A. C. electrical energy will be converted to D. C. energy at two 1000 KVA rectifier sub-stations located near the A. C. power sources. Short D. C. power leads connect to the bus bars on the beamway near these locations.

Each rectifier is designed with 100 percent reserve capacity over the connected load. In event of power failure at one sub-station, the entire system, with three trains running, can operate from the other sub-station. Experience in the Disneyland operation has indicated the advisability of incorporating this provision into the system.

An induction block signal system will be used to control train proximities and provide a safety margin against train collisions.

Continuous strip fluorescent lighting is recommended beneath the beamway canopy to take advantage of the night time aesthetics of the system. Consideration will be given to blending this lighting effect with the master lighting scheme for the Fair grounds. A study is recommended to determine if this lighting, which will parallel the bus route, can replace or supplement some of the many lamp standards proposed along this route. If this can be effected a substantial savings in lighting costs may result.

Service Spur and Maintenance Building

A service spur and maintenance building is recommended to house the trains when out of service and to provide a facility where routine maintenance as well as major repairs can be made. With the continuous loop system proposed for the beamway, it is necessary to have a facility, readily accessible, where a malfunctioning train can be quickly removed from the main line to permit full operation of the other trains.

Present considerations determine that this facility be located along the Long Island Railroad right-of-way southwest of the Fair overpass entrance structure.

Access to the building will be by means of one spur track switched from the main track. One switch will also be provided at the entrance to the service building connecting the three parallel interior tracks to the spur.

The building will be approximately 60 feet x 210 feet in plan dimension, designed to house three full trains. Construction will be light frame with industrial type siding and the structure will be supported on driven steel or concrete pile foundations. The structure will be two levels in height with the upper level enclosed and provided with minimum heating and lighting to be used as a service area. The lower level will be left open, but can be made available for other uses at nominal additional cost if desired.

A service hoist built into one beamway within the building is necessary to lower bogies for major mechanical repairs. A gasoline powered lightweight inspection and maintenance car, designed to travel on the beamway, should be housed at this location.

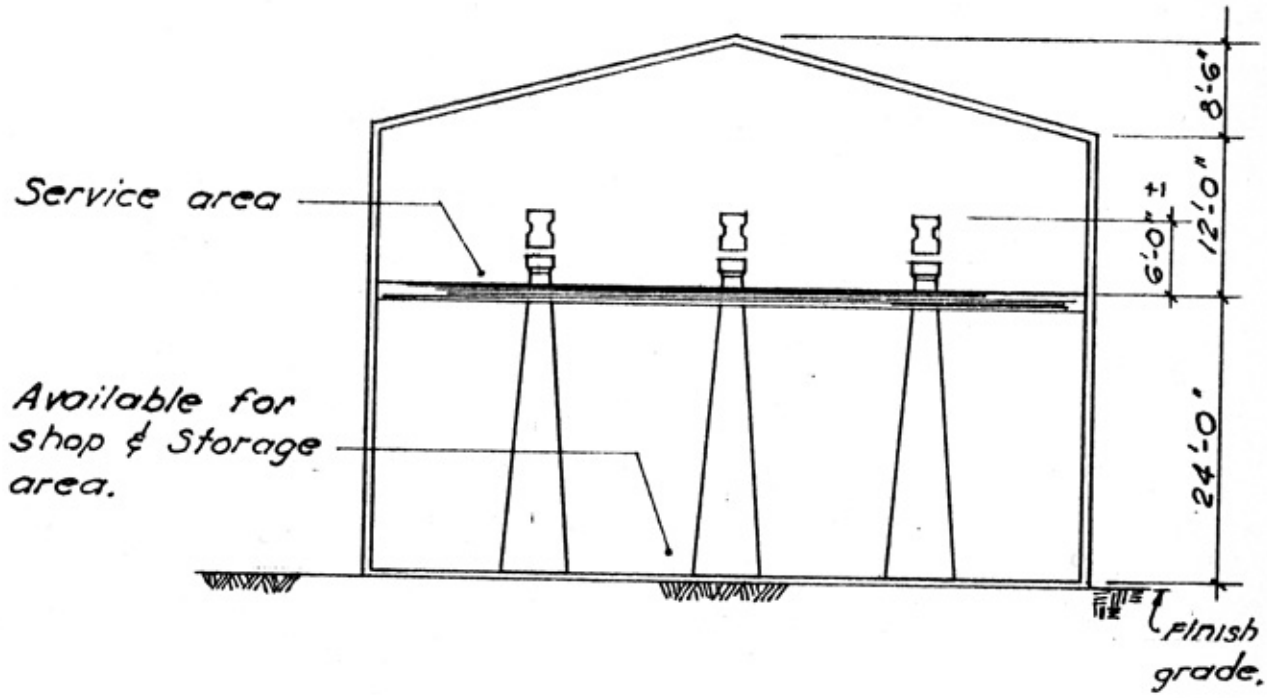
Figure 9 shows a plan layout and section of the Service Building.

Construction and Installation

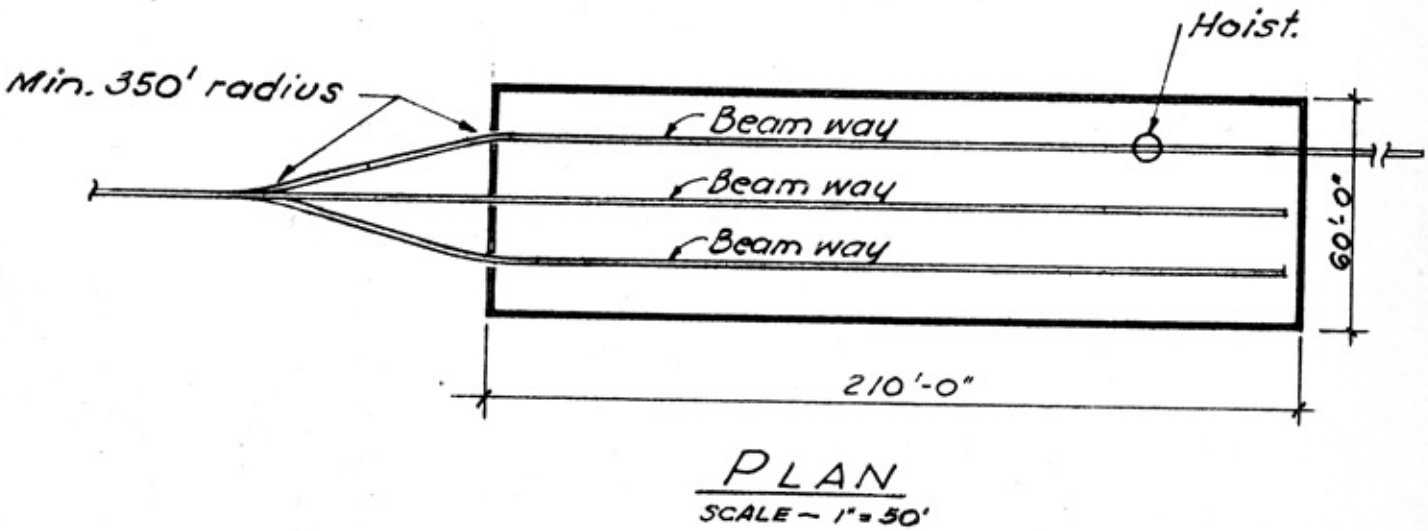
It is estimated that approximately nine months construction time will be required to complete the beamway, station and service facility. Two to three months testing and shakedown time is required for the trains and electrical components prior to opening to the public. Thus, a twelve month construction schedule can be feasible. With this in mind, it is recommended that consideration be given to opening the Monorail to the public and to visitors to the Fair Site during construction as a means of allowing preliminary viewing of the various areas of the Fair, which would otherwise be impractical to display to the public. Such an operation would provide an added source of revenue, enhance procedures for training and acquiring personnel, and in other ways build up pre-opening attention and excitement concerning the Fair.

A temporary on-site casting and storage area is required for constructing the beam and pier units. Consideration has been given to establishing a 300 foot by 600 foot casting yard and a 300 foot by 600 foot storage yard in the area northeast of the Van Wyck Expressway.

In addition to numerous work cars and pier forms, there are available in storage at Disneyland three complete steel forms for casting 60 foot straight beams and five adjustable steel forms for casting curved beams up to 42 feet in length. Because of the great number of radii required on the proposed route, it is felt that three adjustable forms for beam lengths to 60 feet are required. In addition, a straight 60 form and two fixed, curved 60



SECTION
SCALE – 1/16" = 1'-0"



PLAN
SCALE – 1" = 50'

Figure 9

SERVICE BUILDING PLAN LAYOUT AND SECTION

foot forms will be needed for this construction program. Two adjustable forms for spans to 42 feet in length are also required. By making use of the existing forms -- extending three adjustable short forms to 60 foot lenths and by modifying two straight 60 forms to fixed radii -- a substantial savings in form work costs and construction time will result.

Existing and proposed utilities will require re-location of certain of the smaller lines. In some cases the foundations must be modified to bridge over or to otherwise provide clearances at major lines. The design layout and construction costs reflect these conditions for the proposed route, based on data furnished by Andrews and Clark.

Allowances have been made for cofferdam construction at nine pier locations where the beamway crosses the Flushing River. A cost item for relocating trees, which interfere with the construction, has been provided.

Section V

CONSTRUCTION AND INSTALLATION COSTS

The several elements of cost for the proposed installation are the trains, beamways, electrical systems, station and ramps, and maintenance shed and shops. This section presents estimated costs for each element and the total.

Throughout this section, two separate estimates are submitted for comparative purposes. The first of these is that prepared by WED Enterprises and its associates referred to in the Introduction of this report. The second is that prepared by the Wegematic Corporation (Alweg). Both estimates are generally predicated on a similar set of specifications and design parameters as outlined in Section IV of this report. However, in the opinion of WED Enterprises, certain adjustments are necessary to the Alweg estimate to reflect to some extent known omissions in content and concept of facility requirements. These differences are due partly to the short time available to Alweg for developing these estimates and the necessary coordination to make them comparable. It is believed that the adjustments noted achieve an essential degree of comparability.

For reference, the basic Wegematic estimate letter showing values prior to any adjustments is submitted as Appendix A. One reference in this letter is specifically quoted as follows:

> "By introducing minor changes in foundation and column design it is our contention that under certain conditions which also reflect the way the contract for the building of the structure is let out, we believe that a savings of approximately $400,000 on the structure itself could be realized."

It is the opinion of WED Enterprises and its consultants that the design changes referred to in this quotation are not minor, and involve fundamental differences in the aesthetics and engineering economics of the overall design.

WED estimates are based on prior experience in construction of the system at Disneyland. They include detailed adjustments for the following influences on total cost:

1. Fair Site conditions in New York.
2. The New York area labor market.
3. Anticipated improvements in unit cost reflecting learning curve advances over the prior installations at Disneyland.
4. Allowances for contingent increases.

Trains

Table IV shows the Alweg and WED estimates for three six-car trains. The Alweg estimate is $1,232,000. The WED estimate is $1,660,073. No adjustments are applied to the Alweg estimate.

Station

Table V shows Alweg and WED estimates for the proposed main entrance station. The unadjusted Alweg allowance is $150,000. The WED estimate is $440,062. In this table, several adjustments are arbitrarily applied to the Alweg estimate (totaling $231,375) in order to reflect in some degree certain items not known to Alweg; specifically, complications in ramp design, exterior lighting and the level of aesthetic importance recommended by WED at the entrance marquee.

Beamway

Table VI shows Alweg and WED estimates for the cost of beamway including as separate items its foundations, beams and piers. The unadjusted Alweg estimate is $2,624,900. The WED estimate is $3,200,313. Adjustments have been applied to the Alweg estimate as shown in an amount totaling $235,454 to reflect greater comparability.

Electrical Systems

Table VII shows Alweg and WED estimates for the cost of the lighting, power and signal installations which make the total external electrical system. The unadjusted Alweg estimate is $388,506. The WED estimate is $511,266. Adjustments in external lighting and power rating of the rectifier installation applied by WED increase the Alweg estimate by $115,500.

Maintenance and Storage Shed

Table VIII shows Alweg and WED estimates for the cost of the Maintenance and Storage sheds for three trains and associated capital equipment. The Alweg estimate (apparently an allowance) is $162,000. The WED estimate, which details extensive capital equipment and building improvements, totals $310,500.

Table IV

ESTIMATED COSTS OF THREE FOUR COMPARTMENT, SIX-CAR TRAINS

	WED Estimate	Alweg Estimate
Design & Engineering	$ 29,981	
Electric Controls	396,588	
Car Bodies	808,626	
Bogies	359,227	
Sound	18,060	
Ventilation & Heating	27,568	
Painting	20,023	
Total	$ 1,660,073	$ 1,232,000
Variance	$ 428,073	

Table V

ESTIMATED COST OF THE PROPOSED STATION

	WED Estimate		Alweg Estimate
Design & Engineering	$ 57,000		
Demolition	5,625		
Rought & Finish Grade	14,288		
Station Construction	167,737		
Ramps	98,437		
Landscape	9,000		
Exterior Lighting	56,250		
Signs	10,688		
Ticket Booths	11,250		
Turnstiles	9,787		
Sub-Total			$ 150,000
Adjustments to Alweg Estimate			
Design & Engineering			57,000
Ramps			98,437
Landscape			9,000
Exterior Lighting			56,250
Sign			10,688
Total	$ 440,062		$ 381,375
Variance		$ 58,687	

Table VI

ESTIMATED COST OF THE BEAMWAY

	WED Estimate	Alweg Estimate
FOUNDATIONS		
Design and Engineering	$ 36,981	
Piles	523,568	
Excavation & Backfill & Haul Out	21,275	
Piles Caps & Anchorage	195,893	
Utility Changes	74,750	
Figure Adjustment for Utilities	25,381	
Expose Utilities	6,612	
Test Piles	2,300	
Landscape Changes	40,250	
Curb & Paving Repairs	11,500	
Foundations At River	23,000	
Sub-Total	$ 961,510	
BEAMS AND PIERS		
Design and Engineering	83,223	
Forms	75,000	
Fabrication	1,392,024	
Transportation	28,750	
Erection	413,770	
Field Layout and Engineering	11,500	
Canopy	80,263	
Switches	69,000	
Special Long Span Beams	6,613	
Special Piers	21,160	
Material Quality Control	57,500	
Sub-Total	$ 2,238,803	$ 2,624,900
Adjustments to Alweg Estimate		
Forms		75,000
Design & Engineering		120,204
Landscaping Changes		40,250
Total	$ 3,200,313	$ 2,860,354
Variance	$ 339,959	

Table VII

ESTIMATED COST OF ELECTRICAL SYSTEMS

	WED Estimate		Alweg Estimate
Design & Engineering	$ 19,664		
Rectifiers	111,550		
Vaults	18,400		
Feeds & Panels	23,575		
Signal System	93,725		
Beamway Lighting	80,500		
Bus Bar	107,525		
Bus Bar Protective Covers	2,300		
Insulators, Connectors & Brkts.	54,027		
Sub-Total			$ 388,506
Adjustments to Alweg Estimate			
Beamway Lighting			80,500
Rectifiers Est. at 500 KVW			35,000
Total	$ 511,266		$ 504,006
Variance		$ 7,260	

Table VIII

ESTIMATED COST OF THE MAINTENANCE AND STORAGE SHED

	WED Estimate	Alweg Estimate
Design and Engineering	$ 36,000	
Building	172,500	
Hoist	18,400	
Electrical and Lighting	46,000	
Tools and Equipment	10,000	
Service Road and Paving	6,900	
Sprinklers	20,700	
Total	$ 310,500	$ 162,000
Variance	$ 148,500	

Total Construction and Installation Costs

The foregoing elements of cost are summarized in Table IX. The unadjusted Alweg estimate totals $4,557,406. The WED estimate totals $6,122,214. The Alweg estimate, after all adjustments made by WED at this time, as indicated in the foregoing sub-sections, totals $5,139,735 (after adjustments of $582,329).

Table IX

TOTAL CONSTRUCTION AND INSTALLATION COSTS

	Alweg Estimate	Adjustments To Alweg Estimate	Adjusted Alweg Estimate	WED Estimate	Variance
Trains	$1,232,000	$ --	$ 1,232,000	$ 1,660,073	$ 428,073
Beamway	2,624,900	235,454	2,860,354	3,200,313	339,959
Electrical	388,506	115,500	504,006	511,266	7,260
Station	150,000	231,375	381,375	440,062	58,687
Maintenance Shed & Shops	162,000	--	162,000	310,500	148,500
Total	$ 4,557,406	$ 582,329	$ 5,139,735	$ 6,122,214	$ 982,479
					(16.0%)

Section VI

OPERATING PROFIT AND PAYOUT

The following section details projected operating profit during and after the Fair and concludes with a treatment of payout on estimated cost of construction. On the assumption that the ownership of the Monorail will be in a non-profit structure, no income taxes are applied to profits in computing payout.

Operating Profit

In establishing revenue at the Fair and after the Fair, WED Enterprises recommends consideration of a price scale at the following level:

	New York Fair	Flushing Meadow Park
Adults	75¢	50¢
Children (Under 13)	50¢	25¢

These values are considered appropriate in view of charges at similar enterprises for similar attractions. In making such comparisons, the scope and scale of the proposed New York Fair ride appears to be greater, suggesting that more value is offered and that these prices are reasonable.

Expected distribution of adult and children tickets is estimated as follows:

	New York Fair	Flushing Meadow Park
Adults	75%	60%
Children (Under 13)	25%	40%

The variations in above distributions are substantiated by available data on similar operations throughout the country. The essence of such data establishes that the Monorail should become more of a children's outing as a single attraction in Flushing Meadow Park.

Revenue generation is developed from the above data as follows:

New York World's Fair	Two Seasons
Child Passengers, 3,715,000 @ 50¢	$ 1,857,500
Adult Passengers, 11,145,000 @ 75¢	8,358,750
(Ratio 25% children to 75% adult)	$ 10,216,250

Table X

ANNUAL OPERATING EXPENSES AT THE FAIR AND PARK

A. New York World's Fair (One Season - 180 Days - 26 Weeks)

		Season
1.	Operating Labor 26 Weeks @ $6,174/Week	$ 160,524
2.	Maintenance Labor 26 Weeks @ $11,653/Week	302,978
3.	Operating Expenses - Estimated	100,000
4.	Maintenance Expense - Estimated	100,000
5.	Wardrobe Requirements	10,000
	Total Per Year	$ 673,502

B. Flushing Meadow Park

			Season
1.	Operating Labor		
	4/1-6/10 - 20 Days @$200/Day	$ 4,000	
	Spring Vacation- 5 Days @$200/Day	1,000	
	6/10-9/30-112 Days @$300/Day	33,600	
	10/1-10/31 - 8 Days @ $200/Day	1,600	$ 40,200
2.	Maintenance Labor		
	4/1-6/10 -20 Days @$275/Day	$ 5,500	
	Spring Vacation 5 Days @$275/Day	1,375	
	6/10-9/30-112 Days @$410/Day	45,920	
	10/1-10/31-8 Days @275/Day	2,200	54,995
3.	Operating and Maintenance Expense		20,000
	Total Per Year		$ 115,195

Table XI

OPERATING PROFIT AT THE NEW YORK WORLD'S FAIR AND FLUSHING MEADOW PARK, 1964-1973

	Two Seasons New York World's Fair 1964-1965	Eight Years Flushing Meadow Park 1966-1973
Gross Revenue	$ 10,216,250	$ 2,141,200
Licensing Fee	1,021,625	214,120
Net Revenue	$ 9,194,625	$ 1,927,080
Operating Labor	$ 321,048	$ 231,600
Operating Expense	220,000	80,000
Maintenance Labor	605,956	439,960
Maintenance Expense	200,000	80,000
Total Operating & Maint. Exp.	$ 1,347,004	$ 921,560
Total Operating Profit (1964-73)	$ 7,847,621	$ 1,005,520
Total	$ 8,853,141	

From the foregoing calculation the finding of this study is a payout of total cost in the period 1964-1973 equal to 144.6% (based on the WED estimate) or 171.9% (based on the adjusted Alweg estimate).

Appendix A

COPY OF WEGEMATIC CORPORATION LETTER

27 June 1962

WED Enterprises, Inc.
800 Sonora Ave.
Glendale 1, California

Re: New York World's Fair

Gentlemen:

In accordance with our conversations with you we have made a "First Preliminary Estimate" of the cost of installing a Disneyland type Alweg monorail at the New York World's Fair in New York. For this estimate it has been assumed that the track would be a length of 2. 36 miles (12, 360 feet), excluding Spur Track. The Spur Track has a total length of 1, 300 feet.

Our estimate is based on a total Bogie weight of 17 1/2 Keps and on an effective prestressed force of 420 Keps for the 60 foot beam spans. All beams will be 60 feet long with the exception of curved beams with a smaller radius of 1, 000 feet, when the span will be 40 feet.

The beam cross section is assumed to be the same as the Disneyland installation. Column and bearing design also are in agreement with the design for Disneyland and the estimate is based on an average height of columns of 30 feet from grade to the top of the beam.

In accordance with what has been indicated by you the foundation cost is estimated on four 60 ton piles per foundation. The average length of the beams has been assumed at 80 feet.

Based on the date I have given above, we estimate the cost for the installation of the Alweg track itself to be $2, 924, 900. 00, this price includes the beams for the switches, maintenance shed, station and special structures (besides the track itself). The only cost item not included refers to speed ramps or escalators for the loading and unloading of the station area.

The station cost has been estimated at $150, 000. 00 and the same figure has been included for the maintenance shed.

We do not believe, however, that the design, as given above, is the most economical one. By introducing minor changes in foundation and column design it is our contention that under certain conditions which

also reflect the way the contract for the building of the structure is let out, we believe that a saving of approximately $400,000.00 on the structure itself could be realized.

We estimate that the three 6 section trains for this installation complete would cost approximately $1,232,000.00. This price is based on the design criteria that you have furnished us. The price is based on European manufacture and is free at the World Fair Site.

For the auxiliary installations we have estimated as follows:

Power rails installed	$ 56,946.00
Signaling system installed	52,200.00
Substation AC/DC installed	256,360.00
Substation Building	23,000.00

The additional we have estimated is necessary maintenance equipment at $12,000.00.

WEGEMATIC CORPORATION

Sixten Holmquist
President

Appendix B

OPERATING AND MAINTENANCE PERSONNEL REQUIREMENTS AND PAYROLL COSTS AT THE NEW YORK WORLD'S FAIR

Job	Personnel Per Shift	Personnel Per Day	Pay Rate	Hours Per Day	Payroll Per Day	Payroll Per Day Plus E. B.	Payroll Weekly
Summer Fair Operation							
Operations							
Operators							
Foremen	1	2	2.745	16	43.92	51.39	256.95
Ticket Taker	2	4	2.495	32	79.84	93.41	467.05
Platform	6	12		96	239.52	280.24	1,401.20
Operators	3	6		43	119.76	140.12	700.60
Day Off Relief	5	10		80	199.60	233.53	1,167.65
TOTAL	17	34					$ 3,993.45
		Plus 25¢ Foreman Differential - 2 D/Wk.					9.36
TOTAL							$ 4,002.81
Ticket Sellers							
Ticket Seller	4	8	2.46	64	157.44	184.21	921.05
Foremen	1	2	2.71	16	43.36	50.73	253.65
Day Off Relief	2	4	2.46	32	78.72	92.10	460.50
TOTAL	7	14					$ 1,635.20
		Plus 25¢ Foreman Differential - 2 D/Wk.					9.36
							$ 1,644.56
TOTAL OPERATING HOURLY LABOR							$ 5,647.37
Supervision							
Supervisor	1	3	$150.00/Wk.			175.50	526.50
TOTAL OPERATING LABOR							$ 6,173.87

Job	Personnel Per Shift	Personnel Per Day	Pay Rate	Hours Per Day	Payroll Per Day	Payroll Per Day Plus E. B.	Payroll Weekly
Maintenance							
Mechanics	3	9	3.44	72	247.68	289.79	$ 1,448.95
			Plus 25¢ x 24 Hrs. x 7 Days - Foremen				49.14
			15¢ x 3 x 8 Hrs. x 7 Days - Shift Diff.				29.48
			30¢ x 3 x 8 Hrs. x 7 Days - Shift Diff.				58.97
Electricians	3	9	3.54	72	254.88	298.21	1,491.05
			Plus 25¢ x 24 Hrs. x 7 Days				49.14
			15¢ x 3 x 8 Hrs. x 7 Days				29.48
			30¢ x 3 x 8 Hrs. x 7 Days				58.97
Janitorial	5	5	2.455	40	98.20	114.89	574.45
Relief	2	2		16	39.28	45.96	229.80
			Plus 25¢ x 8 Hrs. x 7 Days				16.38
Oilers	2	2	2.625	16	42.00	49.14	245.70
			Plus 30¢ x 2 x 8 Hrs. x 7 Days				39.31
AC & R Mech.	2	2	3.50	16	56.00	65.52	327.60
			Plus 30¢ x 2 x 8 Hrs. x 7 Days				39.31
File Clerk	1	1	1.90	8	15.20	17.78	88.90
TOTAL MAINTENANCE HOURLY LABOR							$ 4,776.63
Supervision							
Supervisors	1	3	$200.00/Wk			234.00	702.00
TOTAL MAINTENANCE LABOR							$ 5,478.63
TOTAL OPERATING AND MAINTENANCE LABOR							$ 11,652.55

Job	Personnel Per Shift	Personnel Per Day	Pay Rate	Hours Per Day	Payroll Per Day	Payroll Per Day Plus E. B.	Payroll Weekly
Winter-Week-End Operation							
Operations							
Operators							
Foremen	1	1	2.745	8	21.96	25.69	$ 51.38
Operator	1	1	2.495	8	19.96	23.35	46.70
Ticket Taker	1	1		8	19.96	23.35	46.70
Platform	2	2		16	39.92	46.71	93.42
Brakeman	1	1		8	19.96	23.35	46.70
TOTAL	6	6		48			284.90
Ticket Sellers							
Ticket Seller	1	1	2.71	8	21.68	25.37	50.74
TOTAL	1	1					50.74
TOTAL OPERATING HOURLY LABOR							$ 335.64
Supervision							
Supervisor	1	1	$150.00/Wk.				175.50
TOTAL OPERATING LABOR							$ 796.04

Job	Personnel Per Shift	Personnel Per Day	Pay Rate	Hours Per Day	Payroll Per Day	Payroll Per Day Plus E. B.	Payroll Weekly
Maintenance							
Mechanics	2	2	3.44	16	55.04	64.40	$ 322.00
			Plus 25¢ x 40				11.70
Electrician	2	2	3.54	16	56.64	66.27	331.35
			Plus 25¢ x 40				11.70
Janitorial	1	1	2.455	8	19.64	22.98	114.90
AC & R Mech.	1	1	3.50	8	28.00	32.76	163.80
Oiler	1	1	2.625	8	21.00	24.57	122.85
File Clerk	1	1	1.90	8	15.20	17.78	88.90
TOTAL MAINTENANCE HOURLY LABOR							$ 1,167.20
Supervision							
Supervisor	1	1	$200.00/Wk.			234.00	234.00
TOTAL MAINTENANCE LABOR							$ 1,401.20
TOTAL OPERATING AND MAINTENANCE LABOR							$ 2,197.24

NOTE: Pay Rates used are existing Disneyland Rates and will be subject to 7¢ increase in July, 1962.

MONORAIL - NEW YORK WORLD'S FAIR WARDROBE REQUIREMENTS

PURCHASE PRICE

Item	PRICE Men	Women
Trousers	$ 13.75	$ 13.75
Shirt	13.00	13.00
Shoes	9.15	6.00
Cap	6.15	8.40
Emblem	3.50	3.50
Cap Cover	3.35	3.35
Scarf	1.50	1.50
Jacket	25.00	25.00
TOTAL UNIFORM COST	$ 75.40	$ 74.50

48 Operating Personnel x 3 $\frac{\text{Uniform}}{\text{person}}$ x 75.40 Per Uniform = $ 10,857.60

CLEANING COST

Item	Unit Cost	Number Per Day	Petty Cost	Weekly Cost
Shirts	.45	48	21.60	151.20
Trousers	.45	24	10.80	75.60
Scarfs	.15	48	7.20	50.40
Cap	1.25	2	2.50	17.50
Jacket	1.25	2	2.50	17.50
TOTAL			44.60	$ 312.20

Seamstress	1	1	2.25	$105.30

NOTE: The wardrobe purchase price shown is a maximum. By having three uniforms per person and using a seamstress, it is felt that no replacement cost would be required for the Fair operation.

MONORAIL - NEW YORK WORLD'S FAIR SHOP REQUIREMENTS

Bench Tools, Air Power Equipment and Brake Repair Equipment $ 10,000.00 (Est.)