GUIDELINES

FOR

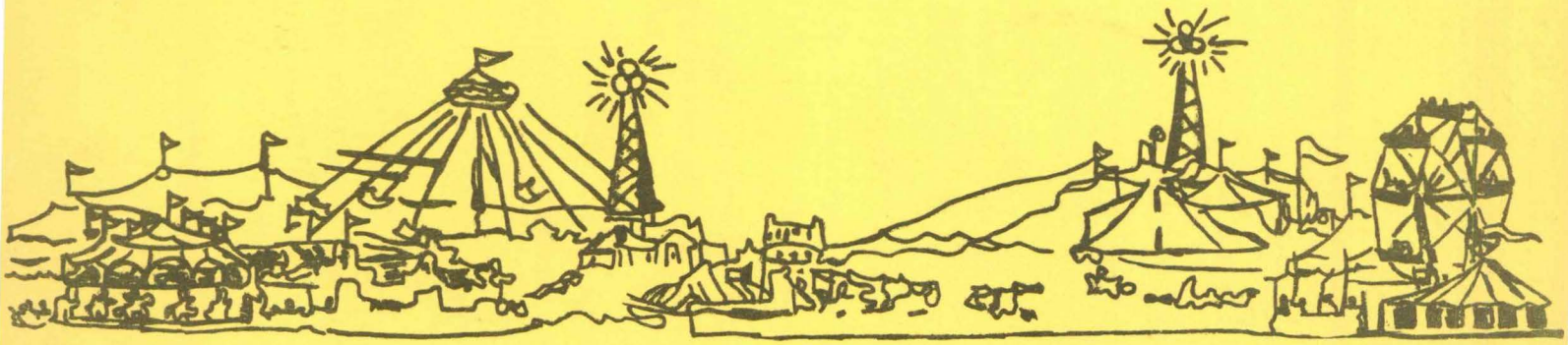
AMUSEMENT PARK/RIDE DIVISION

INSPECTIONS

OF

ELECTRICAL/RIDES/CONCESSIONS/MIDWAY

Iowa
a place to grow



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Iowa
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ELECTRICAL

POWER DISTRIBUTION (SERVICE) SYSTEM

The power distribution system consists of all power generating (service) equipment, service junction (panel boards or boxes), service cabling, distribution boxes, and service feeders. Thus, the system starts at the service phase connection, service neutral electrode, service and equipment grounding electrode and ends with the service lateral or service feeder connections at a device (ride, concession, or auxiliary equipment).

The service system is first given a quality check by a complete walk around with the power off and with the "off" being secured by the inspectors personal lock. This is then followed up by detailed technical examinations.

SERVICE SYSTEM - QUALITY

This part of the annual inspection is initiated by checking to insure that the power is off and by locking specific devices to insure that the power cannot be turned on during the inspection. The quality of the system is checked by making a walk around and observing any obvious problems in the following:

- Power Source
  - Barriers around panel boards and generating equipment
  - Panel boards bonded together
  - Jumper wires around fuses
  - Loose connections
  - Neutral and equipment ground bonded together at main panel
- Distribution Boxes
  - Existence of bus bars
  - Color coding
  - Existence of overcurrent devices
  - Broken or loose connectors
  - Locks
  - Connectors at least 6 inches above ground level
  - Jumper wires around fuses
  - Strain relief grips on cords; such as WIRE MESH KELLEM GRIPS

SERVICE SYSTEM - QUALITY cont'd.

- Conductors
  - Size of wire for load
  - Existence of grounding conductors
  - Color coding
  - Existence of connectors
  - Grounding blades removed on feeders (devices and auxiliary equipment)

SERVICE SYSTEM - EQUIPMENT GROUNDING

The purpose of this system is to provide a sufficiently low resistance to ground such that a direct ground fault will trip an overload device. The grounding system consists of the following items which are checked against subsequent requirements:

- Electrodes
- Electrode conductor
- Bus bars
- Equipment conductors
- Connectors resistance
- Resistance

ELECTRODES

1. To be located in a protected area; out of traffic lanes.
2. Shall utilize underground water pipe where available.
3. Two (2) rods - 1/2 inch or greater when copper alloy
    - 5/8 inch or greater when steel or iron
    - drive 8 feet or as near as possible
    - if less than 4 feet, bury electrode in trench
    - rods to be at least 6 to 10 feet apart

ELECTRODES cont'd.

4. Plate - 2 square feet of surface area
   - 0.06 inches thick or greater copper alloy
   - 1/4 inch thick or greater if steel or iron

5. Other - see articles 250-81 through 250.86, pages 95, 96 and 97 of NFPA, No. 70-1975.

ELECTRODE CONDUCTOR

The following table delineates minimum acceptable sizes:

SIZE OF LARGEST SERVICE-RESISTENCE CONDUCTOR OR EQUIVALENT FOR PARALLEL CONDUCTORS		SIZE OF GROUNDING ELECTRODE CONDUCTOR	
COPPER	ALUMINUM OR COPPER-CLAD ALUMINUM	COPPER	ALUMINUM OR COPPER-CLAD ALUMINUM
2 or smaller	0 or smaller	8	6
1 or 0	2/0 or 3/0	6	4
2/0 or 3/0	4/0 or 250 MCM	4	2
Over 3/0 thru 350 MCM	Over 250 MCM thru 500 MCM	2	0
Over 350 MCM thru 600 MCM	Over 500 MCM thru 900 MCM	0	3/0
Over 600 MCM thru 1100 MCM	Over 900 MCM thru 1750 MCM	2/0	4/0
Over 1100 MCM	Over 1750 MCM	3/0	250 MCM

REFERENCE: NFPA 70-1975, Table 250-94, page 100

1. Where used outside, aluminum or copper-clad aluminum grounding conductors shall be installed at a height equal to or greater than 18 inches above the earth.
2. All connections to use standard electrical fittings.

FORMULA FOR BUS BAR SIZE

To get the bus bar size, first find the total amps of the circuit. Divide the total amps by 1000 for copper and 600 for aluminum. Divide the answer by the thickness of the bar which will give you the correct width needed.

Examples are for 100 amp, 200 amp and 400 amp circuits and 1/4 inch, 1/2 inch and 1 inch thickness of metal.

1/4" copper	100 A ÷ 1000 = .1 ÷ .250 = .4 = 7/16" x 1/4" bar
	200 A ÷ 1000 = .2 ÷ .250 = .8 = 5/8" x 1/4" bar
	400 A ÷ 1000 = .4 ÷ .250 = 1.6 = 1 5/8" x 1/4" bar
1/4" aluminum	100 A ÷ 600 = .167 ÷ .250 = .668 = 11/16" x 1/4" bar
	200 A ÷ 600 = .34 ÷ .250 = 1.36 = 1 3/8" x 1/4" bar
	400 A ÷ 600 = .67 ÷ .250 = 2.68 = 2 11/16" x 1/4" bar
1/2" copper	100 A ÷ 1000 = .1 ÷ .500 = .2 = 1/4" x 1/2" bar
	200 A ÷ 1000 = .2 ÷ .500 = .4 = 7/16" x 1/2" bar
	400 A ÷ 1000 = .4 ÷ .500 = .8 = 13/16" x 1/2" bar
1/2" aluminum	100 A ÷ 600 = .167 ÷ .500 = .334 = 3/8" x 1/2" bar
	200 A ÷ 600 = .34 ÷ 500 = .68 = 11/16" x 1/2" bar
	400 A ÷ 600 = .67 ÷ .500 = 1.34 = 1 3/8" x 1/2" bar
1" copper	100 A ÷ 1000 = .1 ÷ 1 = .1 = 1/8" x 1" bar
	200 A ÷ 1000 = .2 ÷ 1 = .2 = 1/4" x 1" bar
	400 A ÷ 1000 = .4 ÷ 1 = .4 = 7/16" x 1" bar
1" aluminum	100 A ÷ 600 = .167 ÷ 1 = .167 = 3/16" x 1" bar
	200 A ÷ 600 = .34 ÷ 1 = .34 = 3/8" x 1" bar
	400 A ÷ 600 = .67 ÷ 1 = .67 = 11/16" x 1" bar

TAPS FROM BUS BARS OF MIDWAY BOX

Conductors or cable assemblies which are 50 feet or shorter and not protected by an overcurrent device at the midway box, shall have a current rating of at least one third of the next overcurrent device supplying the circuit.

Shown in the table below are the minimum size conductors allowed for 100 amp and 200 amp overcurrent protecting device supplying current to the midway box.

50' or Shorter Ride/Device Supplies

Overcurrent Device	Copper Size	Aluminum Size
100 amp	#8 AWG	#6 AWG
200 amp	#4 AWG	#2 AWG

The overcurrent device on the ride or device must be rated at, or below, the current rating of the supply cable or conductors.

All cables smaller than a #8 on 100 amp and #4 on 200 amp circuits shall be protected at the midway box by an overcurrent device rated at or below their allowable ampacities. Refer to the table on page 12 of the guidelines for their capacities.

For lengths over 50', larger sizes will be required to compensate for voltage drop and fault current tripping ability.

BUS BARS

1. Bus bars are to be loaded at less than or equal to the manufacturer's ratings. The definition of load, in this case, is the sum of the overload protection devices serviced by the subject bus bar.
2. Spacing of bus bars (with respect to each other and other parts):

MINIMUM SPACING BETWEEN BARE METAL PARTS

	OPPOSITE POLARITY WHEN MOUNTED ON SAME SURFACE	OPPOSITE POLARITY WHEN HELD FREE IN AIR	LIVE PARTS TO GROUND
Not over 125 V.	3/4 inch	1/2 inch	1/2 inch
Not over 250 V.	1 1/4 inch	3/4 inch	1/2 inch
Not over 600 V.	2 inches	1 inch	1 inch

NOTE: Table from NFPA 70-1975, paragraph 284-26, page 228

EQUIPMENT GROUNDING CONDUCTORS

The minimum conductor sizes are contained in the following table:

RATING OR SETTING OF AUTOMATIC OVERCURRENT DEVICE IN CIRCUIT OF EQUIPMENT, CONDUIT, ETC., NOT EXCEEDING (AMPERES)	SIZE	
	COPPER WIRE NO. *	ALUMINUM OR COPPER-CLAD ALUMINUM WIRE NO. *
15	14	12
20	12	10
30	10	8
40	10	8
60	10	8
100	8	6
200	6	4
400	3	1
600	1	2/0
800	0	3/0
1000	2/0	4/0
1200	3/0	250 MCM
1600	4/0	350 MCM
2000	250 MCM	400 MCM
2500	350 MCM	500 MCM
3000	400 MCM	600 MCM
4000	500 MCM	800 MCM
5000	700 MCM	1000 MCM
6000	800 MCM	1200 MCM

The conductors shall have an insulation covering equal to the following:

S ST

SO STO

with the provision that it is approved by the manufacturer for use when exposed to extended or continual direct rays of the sun.

CONNECTORS AND CONNECTIONS

1. The grounding electrode conductor shall be connected on the supply side of the disconnect (NFPA No. 70-1975, Paragraph 250-23, page 85).
2. Grounding conductor connections shall only be attached by connectors specifically manufactured for electrical service.
3. Each conductor shall be attached separately at any junction, distribution, electrode, or other such connection.
4. All grounding connections are to be in a protected area or position, and are to be made on clean bare metal.
5. Strain relief grips on cables; such as WIRE MESH KELLEM GRIPS.

NOTE: Items #2 through #4 are from the NFPA No. 70-1975, Paragraph 250-112 through 250-118, pages 86 and 87.

SERVICE SYSTEM - OVERLOAD PROTECTION

1. The conductors shall be protected by overcurrent devices not to exceed the ampacities listed in the following table:

SIZE	INSULATED COPPER		INSULATED ALUMINUM AND COPPER-CLAD ALUMINUM	
AWG MCM	75° C. CABLE ONE CONDUCTOR IN FREE AIR	75° C. CABLE THREE CONDUCTORS PER CABLE	75° C. CABLE ONE CONDUCTOR IN FREE AIR	75° C. CABLE THREE CONDUCTORS PER CABLE
14	20	15	--	--
12	25	20	20	15
10	40	30	30	25
8	65	45	55	40
6	95	65	75	50
4	125	85	100	65
3	145	100	115	75
2	170	115	135	90
1	195	130	155	100
0	230	150	180	120
00	265	175	210	135
000	310	200	240	155
0000	360	230	280	180
250	405	255	315	205
300	445	285	350	230
350	505	310	395	250
400	545	335	425	270
500	620	380	485	310

NOTE: This is restricted to conductor types S, SO, ST, and STO which are constructed to withstand 167° F. or 75° C.; data from NFPA 70-1975, Tables 310-16 through 19, pages 131 through 134. Ampacity of flexible cords is

slightly lower than above table with reference to Table 400-5, page 238, for type S, SO, ST, and STO cords.

2. For more than three (3) conductors per cable, the allowable ampacities of the above table, shall be reduced as shown below:

NUMBER OF CONDUCTORS	PERCENT OF VALUES IN ABOVE TABLE
4 to 6	80
7 to 24	70
25 to 42	60
45 and above	50

3. Where standard ratings and settings of overcurrent devices do not correspond to the requirements of (1) and (2) the next higher standard rating and setting may be used.

4. Handles or levers of circuit breakers shall be guarded.

5. All fuses and circuit breakers are to have a clear and legible rating and manufacturer label.

6. Plug or type "S" fuse and fuseholders shall not be utilized in a system of over 125 volts.

7. Circuit breakers shall be arranged and mounted so that their operation will not likely injure the operator.

8. Circuit breakers shall indicate "off" and "on" position.

9. Items (3) through (8) are from NFPA 70-1975, Section 240, pages 72 through 81.

OVERHEAD WIRING

1. Overhead conductors shall not be smaller than a No. 10 for spans up to 50 feet in length, and not smaller than a No. 8 for longer spans.
2. Conductors will be connected such that stress cannot be transmitted to joints or terminal screws.
3. Service conductors which do not exceed 600 volts shall have the following minimum clearance:

   10 feet - above finished grade, sidewalks, or from any platform or projection from which they can be reached

   15 feet - over commercial areas, parking lots, or other areas subject to truck traffic

   18 feet - over public streets, alleys, roads, or driveways

   3 feet - from windows, doors, porches, fire escapes, or similar locations.

RIDE ELECTRICAL INSPECTION

- Grounding conductor (green wire) must be contained within the power supply cord, not taped to the outside.
  - Inspect feeder plugs to insure existence of grounding wire
  - Insure feeder green wire is bolted and lugged to the fuse box enclosure
  - Check disconnect bonding to ride frame
  - Insure green wire goes to and is attached to each motor frame and to each light fixture
  - Make certain grounding blades are not removed from plugs
- Electrical equipment attached to the articulating parts of a ride shall be grounded to the equipment grounding circuit through slip rings, commutator or other approved methods.
- Check motor frame grounding
- No green conductors allowed into the ride panel, junction, or disconnect boxes except equipment grounding
- Voltage to ground is less than or equal to 12 volts; ride frame and articulating side
- Watch for jumper wires around fuses
- Make certain area between slip rings and insulators between and behind slip rings are clean (watch for dirt, grease, and grime build up)

RIDE ELECTRICAL INSPECTION, cont'd.

- Check commutator brushes for wear, arcing and pits
- Check slip rings for wear through and gaps
- Make certain that protectors (bushings or grommets) are utilized to protect the wiring where it penetrates beams, pipes, etc. with sharp edges
- All connections to be made with connectors made specifically for electrical service
- Inspect panel and disconnect boxes for arcing and burnt switch surfaces
- Panel boards on generator system to be closed off (dead front or guarded)
- Conductor sizes are to conform with Equipment Grounding Conductors, minimum conductor sizes, page 10.

SUPPORTIVE INFORMATION AND STANDARDS DATA

1. Conductor sizing - conductor sizes are to conform to Equipment Grounding Conductors, minimum conductor sizes, page 10, plus the following from NFPA 70-1975, articles 430-22 and 24, pages 292 and 294.
   a. All motors associated with the amusement rides are defined as having to meet the "continuous duty" rating.
   b. Single motor - ampacity of supply circuit conductor is not to be less than 125% of motor full-load current rating.
   c. Several motors - ampacity of supply conductor shall be no less than the sum of the full-load current rating of all motors plus 25% of the highest rated motor in the group.
2. Overcurrent protection - conform to Service System - Overload Protection, pages 12, 13 and 14, plus the following:
   a. Motors automatically started and motors over one (1) HP shall be protected by one of the following:
      (1) Separate overcurrent device responsive to motor current only shall be rated to trip at no more than the following motor full-load current ratings:

125% on motors marked with service factor not less than 1.15

125% on motors marked with temperature rise not over 40° Centigrade

115% on all other motors

(2) A thermal protector integral with motor (see NFPA 70-1975, articles 430-32, part (a)(2) for design requirements)

(3) For other methods see NFPA 70-1975, articles 430-32, part (a)(3) and (4)

b. Motor HP is less than or equal to 1.0 manually started

(1) If motor is within sight (visible and less than 50 feet) the overcurrent protection shall be equal to the branch circuit conductor overcurrent protection size of Service System - Overload Protection pages 12, 13 and 14.

(2) If motor is out of sight of operator, the overcurrent protection shall be the same as a motor with the HP greater than 1.0

c. Motor HP is less than or equal to 1.0 automatically started; overcurrent protection same as motor with HP greater than 1.0

3. Wire mounting

   a. Where wires pass through an opening in an enclosure, conduit box, or barrier, a bushing shall be used to protect the conductors from the sharp edges; NFPA 70-1975, articles 430-13

   b. Wire harness (wires running from fixture to fixture, switch to motor, switch to lights, etc.) shall be enclosed within conduit or be made up of S, SO, ST, and STO rubber insulated cords clipped to the device frame every 18 inches

   c. All conductors mounted on a ride subjected to a dynamic load shall utilize a strain relief grip at junctions or other approved connections.

HYDRAULIC SYSTEMS

PRIORITY ITEMS

- Watch for leaking oil around component parts (motors, hoses, valves, greasing systems and cylinders)
- Check color of oil; milky color represents water in the system; dark color shows that the oil is burning
- Check oil temperature; 120° F. to 130° F. is ok; 150° is high maximum; heat exchanger or larger tank may be required if rest of system checks out
- Suction strainers and filters should be changed often to prolong life of system; if they are clogged, pumps or hydraulic motors could cavitate
- Keep pumps and motor shafts aligned; alignment through flexible couplings should be not greater than .003 inch out of alignment for minimum wear and heat on coupling parts
- Hoses and piping systems are recommended to have a safety factor of 8 and checked for leaks, cracking and general condition

INFORMATION

- There are fourteen classifications of hydraulic oils; check with supplier before attempting to mix different oils in system

HYDRAULIC SYSTEMS cont'd.

- Heat exchangers are available for approximately $150.00
- Size 74 micron oil filters (nominal) will do fairly good job for system
- Parker Hannifen has a service available to check oil for problems of impurity
- Additives are available for special problems; rust oxidation and anti-wear

COMPRESSED AIR SYSTEMS

Compressors

The following items are to minimize the possibility of fire or explosion:

- Limit operating temperature to 350° F.
- Watch oil level; do not overfill; watch for excess consumption
- Use proper type and grade of oil; the lowest viscosity for the job
- Maintain valves and rings in good working condition
- A high temperature alarm in the discharge may be needed if high temperatures are prevalent

Gauges and Safety Valves

- Air receivers (tanks) shall have A.S.M.E. stamped safety valve; no other valve allowed between safety valve and air receiver
- Relieving devices shall prevent pressure from rising more than 10% above the maximum working pressure of the tank
- Tanks shall have pressure indicating gauge
- Gauges and safety valves shall be located where they cannot be easily damaged
- Test safety valve (pull handle or ring) on frequent and regular basis

COMPRESSED AIR SYSTEMS cont'd.

Air Receivers

- Tanks should be installed with sufficient clearance for easy access for repair and inspection
- Shall have a safety factor not less than 4; recommend safety factor of 5
- Locate drain valves at lowest point to permit accumulated liquids to be drained at frequent intervals
- All new air receivers shall be constructed in accordance with the 1968 edition of the A.S.M.E. Boiler and Pressure Vessel Code, Section VIII

Compressed Air for Cleaning

- Used only when reduced to less than 30 p.s.i. and effective chip guarding and personal protective equipment is used.

Hose Restraining Devices

- Hoses larger than 1/2 inch inside diameter should have safety device at supply connection to restrain hose or reduce pressure in case of hose failure
- Restraints required at both ends when hose is used for air receiver supply line; i.e. Tip Top

MINIMUM REQUIREMENTS FOR CONCESSION STANDS

ELECTRICAL

- Disconnect - fuse or breaker box shall be in each concession
- Blades on disconnect will have no electric current when switch is open
- Supply wire to midway box shall not be smaller than #10 for wire 150 feet or less and #8 for wire over 150 feet
- Equipment grounding wire shall be contained within cord and not taped on outside
- Equipment ground shall be Green or Green with Yellow strip; tape or paint is permissible; White is neutral, Black or Red is hot
- Cords shall be continuous lengths without splice or tap
- Equipment ground shall be connected to side of disconnect box and bonded to trailer frame; bonding screw or strap from neutral bar to box shall be removed; all exposed metal parts of electrical equipment and machines or devices within shall be grounded
- Cords shall have special fitting or box connector to keep wire from pulling on wire connection

MINIMUM REQUIREMENTS FOR CONCESSION STANDS cont'd.

- Fluorescent lights and metal fixtures shall be grounded
- Hanging cord shall be tied off with insulated support
- Allowable voltage leak - 12 volts or less to ground
- Cord plugs shall have cover plate that is not easily removed
- Cord shall be of type S - SO - ST - STO; brewery cord may be used for lights

MECHANICAL

- Hinges, awnings, and braces must be safety keyed; nails shall not be used for hinge or support pins
- No stakes or ropes to be placed in line of traffic
- Seats and counter areas must be free of nails and splinters
- No high powered ammunition to be used in shooting gallery; spatterless ammunition only
- Shooting galleries, dart games, and ball pitches must have adequate ricochet protection to prevent projectiles leaving the concession stand area and striking passersby

MIDWAY GROUNDS

LOCATION

- Insure rides and concessions are not set in natural drainage
- Keep rides and concessions away from electrical lines (10 feet clearance from lines - minimum)
- Keep roadways and walks of sufficient width for emergency vehicles

HOUSEKEEPING

- Keep roadways and walks free of debris, holes and other hazards
- Adequate number of trash receptacles shall be provided for use by the public
- Rubbish, garbage and other debris to be cleaned up daily

SANITATION

- Adequate number of rest rooms shall be provided for the public if not already provided

FIRE PROTECTION

- Adequate and sufficient amount of fire fighting equipment shall be provided (ABC fire extinguishers or proper size hose)
- No person shall travel more than 50 - 75 feet to reach a hose or portable fire extinguishing device
- Also see in Amusement Park/Ride Safety Rules and Regulations
  - 61.8 - Bulk Storage of Gasoline
  - 61.11 - Telephone Numbers for Emergencies; i.e. medical aid, fire, etc.
  - 61.18 (1) - Location
  - 61.18 (1) (c) - Public Protection
  - 61.18 (6) (d) - Housekeeping

RIDES - GENERAL REQUIREMENTS

1. Blocking
   a. All rides must be placed on a good, sound foundation.
   b. Concrete or other hollow blocks will not be allowed.
   c. Cribbing or crossing of blocks are required when more than two (2) blocks high.
   d. To keep certain rides from walking, tipping, etc., they must be staked or sandbagged.
2. Carriers
   a. Must be in good, serviceable condition.
   b. Safety restraints (lap bars, safety belts, chains, gates, etc.) must be installed where there is a possibility of passengers being ejected, falling out, or receiving other injuries.
   c. Cushions and padding must be in good condition and free of tacks, nails, etc.
3. Safety pins
   a. All pins, bolts, etc. must be safety locked with hair pins, cotter keys, spring keys, or another type of locking device to keep the pins, bolts, etc. in its proper place.
   b. All pins must be in place and of proper size and type.

c. No nails or wire will be allowed.

4. Wear tolerance

a. Differential between pins and holes shall be less than 1/16 inch.

b. The pins and holes shall be reconditioned to the manufacturer's specifications; filled and redrilled and new pins, drilled out and oversized pins, etc.

5. Bearings

a. Must be in good condition and the wear tolerance must be less than the manufacturer's requirements.

b. Tolerances that are over the manufacturer's requirements will not be permitted to operate.

6. Ride supports - (sweeps, chains, spokes, axles, shafts, etc.)

a. Must be free of cracks, defects, or rusty, corrosive areas.

b. Testing of critical areas by methods such as Dye Penetrant, magnetic particle, ultrasonic, etc., may be necessary for the safety of a ride.

7. Speed and overloading - rides must be operated within their designed rating keeping a balanced load and without overloading.

RIDES - GENERAL REQUIREMENTS cont'd.

8. Operator

   a. Must be trained for and familiar with the ride he operates and should be checked periodically for his performance.

   b. Ride operator must stop the ride and notify the show owner or show agent immediately when trouble occurs which he cannot handle.

9. Brakes, clutches, roll backs, safety trips, etc.

   a. Shall be in good condition.

   b. Lining and shoes should have approximately 1/16 inch wear left above the rivets; must be replaced when rivets touch the brake or clutch drum.

   c. Roll back and safety trips must be of correct strength and size to hold the load.

10. Electrical

   a. All rides shall be effectively grounded.

   b. Motors, fluorescent lights, controls, metal reflectors, enclosures, or other metal parts that may be accidently energized must be bonded to the ride ground at its termination or an unbolted or pinned section to which it is attached.

c. Where there is a danger of fluorescent lights dropping on passengers or being thrown into crowds, they must be safety locked.

d. Fluorescent lights must have safety covers installed.

11. Gasoline

a. Rides using flammable liquids for engines must not be filled while engine is running and passengers are on the ride.

b. Flammable liquid containers must be kept away from the ride while it is operating.

c. Container must be kept away from the public.

12. Guarding - moving or hot parts (belts, chains, gears, shafts, knuckle joints, exhaust pipes, etc.) that may be injurious to the ride operator or the public shall be effectively guarded to prevent contact.

13. Fire extinguishers - adequate fire protection shall be provided for each ride.

14. Ride clearance

a. Rides are to be set up 12 feet apart; 6 feet on kiddie rides (umbrella rides, boat rides, etc.)

b. Fence may be side by side if it would equal the 12 feet required distance.

c. No ride shall be so placed that a person can reach over the fence and grab a hand of a passenger reaching out of a carrier.

BOATS

PRIORITY ITEMS

- Flotation devices
  - length greater than or equal to 16 feet
    - one throwable device
    - one life jacket per passenger
  - length less than 16 feet - at least one (1) float cushion (throwable device) per passenger
  - make certain life jackets for children are children size
  - check cushions for leaking bags or torn exterior
  - no "belts" allowed
  - all devices to be Coast Guard approved
- Air venting
  - 13 square inches of vent intake area per cubic foot of enclosed volume
  - intake air must be taken to boat bottom via piping or duct
- Make certain gas vents are present and that they vent overboard.
- Fire extinguisher (Class A-B-C) must be in a readily available (exposed) location.
- Engine intake must have a flame arrestor

INFORMATION

BOATS, DIESEL POWERED

PRIORITY ITEMS

- Engine room - positive ventilation shall be provided, adequate for the area.
- Exhaust - to an outside terminus, wet or dry
  - gas tight
  - accessible for repair and inspection
  - shielded to prevent undue stress
  - supported by fire resistant hangers
  - visual alarm required or water cooled pipes for overheating
- Wet System
  - Any part uncooled shall be protected or jacketed for protection.
  - wet pipe piercing combustible bulkheads shall have a minimum of 2 inch clearance, if water tight, pack glands with fire resistant material.
- Dry System
  - A minimum of 9 inches shall be maintained from all combustible materials or insulated by material or water jacket. Areas may be shielded or adequate air space provided.
  - Mufflers or silencers shall be provided with spark arresting properties.
  - Provisions shall be made to prevent water or rain from entering exhaust system.

- Fuel System
  - Metal tanks shall be made of iron, steel or nickelcopper
  - Tanks shall have a safety factor of 4 and comply with Table 2, NFPA Volume 10-1975, NFPA No. 302-1972, page 302-14.
  - Tanks shall not be galvanized internally.
- Location
  - Tanks shall be accessible or hatches provided for inspection.
  - Metal tanks shall be well ventilated, in a dry location.
  - Tanks shall be well supported to prevent deformation and movement.
  - Only nonabrasive and nonabsorbent supports shall be in contact with the tanks to permit free air circulation.
  - All fuel tanks shall be electrically bonded to the common ground.
- Fuel pipes and related accessories
  - Pipes, connections and accessories shall be accessible and secured.
  - No outlets for drawing fuel from tanks shall be permitted except for filter bowl plugs provided for servicing.

- Proper well fitted connections shall be used and well sealed.
- Piping shall be seamless steel capable of withstanding not less than one and a half times the maximum working pressure.

Fill and vent pipes

- shall be so arranged that overflow of liquid and vapor cannot escape to inside sections of craft and will flow overboard
- fill pipe not less than 1 1/2 inch I.D. made tight to tank and deck plate outside of coaming
- Flexible connections, bonding and other provisions shall comply with NFPA No. 302-1972, Part I, Chapter 3, Paragraph 323, pages 302-19-20, Volume 10-1975 edition.
- Vents shall terminate as remotely as possible from any hull opening with provisions to minimize water intake and restriction of water release.
- Vents shall be connected at highest point on tank and not taped into fill pipe with a minimum I.D. of 9/16 inch.

- Vents shall be provided with removable corrosion resistant fire screens of at least 30 x 30 mesh and not reduce the net vent area.

- Fuel lines and accessories
  - A manual stop shall be installed at the engine end of the lines.
  - Purifiers used for heating fuels shall be located in a separate compartment from the engine room, lines gas tight and if electric motor is used, shall be suitable for Class I hazardous location with its controller located in a separate compartment. They shall follow the requirements of NFPA No. 302-1972, Part I, Chapter B, Paragraph 324, pages 302-20-21, Volume 10-1975 edition.

INFORMATION

- separate exhaust for each manifold recommended for back pressure build-up prevention
- Pipe shall be resistant to fuel products causing combustion or corrosion.
- Corrugated or bellows type may be used, if needed, for flexibility.

- Wet System
  - Injectors shall be as close to engine manifold as possible, but no spray or steam shall enter the manifold.

BOATS, DIESEL POWERED cont'd.

- Fuel System
  - tanks may be integral with the hull
  - approved and protected gage glasses, with approved valves, top and bottom, may be used on service or day tanks only and shall be accessible within engine compartment
- Location
  - approved non-metallic tanks may be foamed or equivalently bedded in place
- Fuel pipes and related accessories
  - corrections shall be made with ground joints or continuous gaskets or counterfaces
- Electrical System
  - Electrical systems shall comply with Chapter 5-Direct Current Systems and Chapter 6-Alternating Current Systems of NFPA 302-1972, pages 302-31 and 302-44
- Fire Extinguishers
  - An adequate number of portable fire extinguishers or fire fighting equipment shall be provided in accordance with Chapter 7-Fire Extinguishing Equipment, NFPA 302-1972, page 302-45 and 302-49
- Operation and maintenance

BOATS, DIESEL POWERED cont'd.

·· Operation and maintenance of the craft and equipment shall be in accordance with Chapter 8, NFPA 302, page 302-50 and 302-55

COASTER (STEEL)

PRIORITY ITEMS

- Same as Mouse plus the following
  - Myler Coaster
    - underlocks and underlock frames and rollers to be inspected closely
    - lap bars and locks must be in excellent condition
    - check track for edge chipping and large nicks
    - check track for breaks in welding, braces, cross ties, etc.
    - bolts and pins to be secured
  - Herschell Coaster
    - 14 inch safety dogs replaced with spring loaded tube with dog attached
  - check draw bars and safety cables between cars
- Check air tank pop-off valve
- Inspect air tank for rusting
- Examine air line lubricator
- Check haul chain
- Catwalk required on chain haul
- Electrical - see Ride Electrical Inspection, pages 16 and 17.

COASTER (STEEL) cont'd.

- Check condition of cars for upholstering, rivets, and bolts missing on the securing of the skin to the car
- Blocking - check closely for stability
- Tie cables, irons and attachments to be in good condition and properly adjusted
- Replace wheels when worn to 3 3/4 inches; 4 inches new
- Replace thrust wheels when worn to 6 1/8 inches; 6 3/8 inches new

INFORMATION

- Little Dipper (Herschell) has four (4) castings and through-axles on each car
- 1960 Coaster (Herschell) has two (2) trunions on each car
- Reverse haul annually
- Replace reducer oil annually
- Operator to check track daily
- Models - Herschell: Monster Mouse, 1960 Coaster
  Mad Mouse, Little Dipper
  Others: Wild Mouse, Zyclon
- Replace FLEXLOC nuts after six (6) setups
- Drain air tank daily
- Air tank pressure greater than or equal to 80 - 85 pounds before it will operate; 90 pounds at regulate

COASTER (STEEL) cont'd.

- Place ajax on damp brakes
- Lube track side walls in tight turns
- Air tank switch: in - 100 pounds, off - 120 pounds

COASTER (WOOD)

PRIORITY ITEMS

- Track butts to be 4 feet apart; watch for loose track screws (especially in dips); watch steel track angle (top and side); bolt ends of track
- Examine cars - lap bars and mechanism, draw bars and safety cables, sharp edges, and wheel castings under roller locks, upholstering, wood and metal conditions
- Bent chords and braces - watch for split ends (replace), if chords not level, footings may be bad; bolt braces in the curves
- Structure braces - run from bottom to top; no end splits; rubbing at end of brace indicates serious problem
- Ledgers
  - fail by splitting at post bolt holes; caused by (thus check for) drying, fatigue, shrinkage, bolt failure, inadequate paint, poor post, and poor foundation
  - no knots allowed; check for crushing under track
  - replace if there is one crack/one hole @ side
- Brake system - examine mechanism for wear and missing fasteners; check effectiveness; if clamp brake inspect ventral fin
- Posts
  - footings - check wood density to 12 inches above ground; make certain it is well painted

- upper section - watch for fissures, cracks, checks, and loose knots; 3/4 inch alignment tolerance
- under bottom of dips - 4 x 4 or 4 x 6's

- Cables - at least 3/8 inch with thimbles and clamps; double clamps required with thimbles
- Batter braces - ground to track level; strong piers
- Walk boards - inspect for poor boards and projecting nails
- Handrails - continuous with splice pads; 30 inches high
- Inspect platform for hazardous items
- Make certain that there are no overhanging trees
- Ribbon boards - should be level (if not, indicates trouble); watch ribbons while car is passing (excess vibration indicates failure in ribbon ledger)
- Keep track tight
- Gauge tracks on curves at least twice each season
- Watch for track scalloping; is an indication of excess side motion
- Use low carbon 10-10 steel for brakes
- Leading edges of steel rail and side rails should be bolted

INFORMATION

- Post center rot (bottom) prevent by 45° hole filled with PENTA
- Posts to be dense heart fir or long leaf pine
- Ledgers to be clear, dense, and flat grain; dense select structural B & S Douglas Fir Coast
- Repair one hole crack on ledger with 1/2 x 3 x 3 inch metal angle clip
- Fasten ribbon board butt joints carefully (weather tight)
- Pre-drill all fastener holes to prevent splitting
- Loosen cables in winter
- Track Life
  - untreated, four (4) years
  - pressure treated, eight (8) years
  - pressure treated and paint on board, twelve (12) years

COBRA

PRIORITY ITEMS

- Check clevis and dampening device where seat hanger attaches to sweep
- Center ride in fenced area and check seat to fence clearance
- Keep ride time short, over-riding can cause passengers to become ill
- Check bolt tightness of the three main bearings on setup and weekly
- Check condition and tightness of lap bars
- Insure main arm is crossways when raising or lowering the ride
- Check daily all pins, safety pins, welds, bolts and blocking
- Electrical - see Ride Electrical Inspection, pages 16 and 17.

INFORMATION

- Clean KYDEX seats with Brushlon marine brush (3M) and heavy duty detergent or Fantastic spray cleaner
- Check fluid in motor drive units (4) only when units are warm

CUDDLE-UP

PRIORITY ITEMS

- Inspect cars by inverting; wheel axles, castings, fasteners, and connections and cars for broken framework
- Make certain platform steel is fastened with countersunk screws
- Speed - 14 RPM on wheel
- Length of ride - 1 1/2 minutes
- Electrical - see Ride Electrical Inspection, pages 16 and 17.
- Inspect cable clamps and shoe guides
- .0015 (15 thousandths) of an inch between pinion gears

INFORMATION

DARK-WALK-THROUGH

PRIORITY ITEMS

- Shoes required for mechanical devices
- Inspect floor closely for roughness, smoothness, nails, fire retardant, and tripping hazards
- Emergency back-up lighting must be available in dark devices
- Inspect walls for loose nails; should use headless nails; push paneling to expose loose nails
- Watch for nailed emergency doors; use watchmen
- Fire retardant paint on walls
- Window bottoms are to be 32 inches or more from any point
- Dark - make sure fire extinguishers can be seen from any point
- Lights should be protected by heavy screening; i.e., turkey wire
- Electrical - see Ride Electrical Inspection, pages 16 and 17.
- Portable - high board must be lowered during winds
- No smoking signs must be posted
- If pinch points cannot be guarded by conventional methods, drive units must have torque limiter or other slip drive device

INFORMATION

FERRIS WHEEL

PRIORITY ITEMS

- Check #5 ELI main axle every four (4) years and thereafter for cracks by magnaflux or equal method and visual inspection before each setup
- Check #16 ELI for a main axle pin hole break; clue is broken or welded spoke tenons at the hub; replacement axle has a relocated stay pin
- Cracks in rim ends; vertical above butt end
- Check seat fittings for wear; especially handlebar, latch and spring
- Check for broken springs in handlebar plunger
- Hair guard protection shall be provided
- Electrical - see Ride Electrical Inspection, pages 16 and 17.
- Check loading platform for old wood, splinters, broken boards, etc.
- Lack of center pin at joint just above wind brace
- Lack of tapered fasteners in joint above wind brace
- Lack of rim pins
- Check for tapered fasteners in hinge pins (three (3) @ side)
- Lack of pins in base of tower

FERRIS WHEEL cont'd.

- Deterioration of wood axle blocks
- Knee braces should not jiggle or rattle when pushed up
- Replace brake shoe when rivets touch brake drum or surface; or cracked or chipped shoes are noted
- Cut in base angle to allow brake finger attachment not allowed (weld the piece back in)
- Check wheel speed: No. 5 ~ 6 1/2 RPM, No. 12 ~ 5 3/4 RPM, No. 16 ~ 4 1/4 RPM
- Insure drive cable does not rub against itself at crossing or snap off of elephant ears during operation
- Hub and spoke hole wear; fix when wheel chunks or over 1/16 inch wear noted
- Check for gear guarding, belt, clutch guard, cable sheaves
- Check for wear where seat rides on seat pin
- Watch for seat pins that have been tightened with pipe wrench
- Worn foot bottom locks or missing locks
- Slip resistant paint on floor pads
- Wear at end of spokes on tenon curved surface
- Repair brake expander bar holes if holes are

1/8 inch oversize or if bar has a 1/16 inch groove

- Guy cables should be equally tight
- Towers must be plumb both ways
- Sight vertical tower alignment
- Check cross cables by sighting across axle
- Check for broken hardware at cable ends
- Stay pins in wheel hubs; lock rings in proper position
- Repair if sheave axle rattles in tower plate holes
- Each wood block must have four (4) elephant ears
- Check drive cable for wear and other defects
- Check drive gear and drive sheave for wear
- Replace clutch lining when rivets will touch friction surface or if cracked, chipped, or missing sections of lining

INFORMATION

- Serial number is on the hub or tower plate; year is last two (2) numbers
- Size is located at end of base
- Watch rope around feet during assembly
- Spoke ends can be replaced

- Need holes in sheave groove when using rubber insert
- If drive cables rub, tower is out of alignment
- Use plenty of pine tar on drive cable even if rubber sheave is used
- ELI will provide a drift pin for seat pin alignment
- Remove top five (5) seats each night
- Change sheave axle position monthly (park ~ yearly)
- Check wheel trueness weekly; 8 5/8 inches from tower angle to spoke for No. 5 and 12, and 11 3/8 inches for No. 16
- Store clutch, sheave axle, and sheaves out of weather
- Hemp rope; untwist - if powder or flakes are present, rope is worn out
- Adjust clutch if wheel won't turn, hard to engage, and clutch wobbles
- Broken #1290 clutch pulley hub will cause clutch to wobble
- Hot counter shaft bearing is caused by over tight belts
- Clutch stand jack temperature should allow you to place your hand on it

FERRIS WHEEL cont'd.

Some Safety Rules for Wheel Operators in Handling Passengers

1. Assist the passengers on and off the Wheel when necessary.
2. If the Wheel is being misused in any way by the passengers, shut down the Wheel until the condition is corrected. Do not allow the seats to be rocked.
3. Persons under the influence of alcohol or drugs must not be allowed on the Wheel.
4. Smoking by passengers should not be permitted, since hot ashes can be dropped or blown into the eyes of other passengers on the Wheel.
5. Be cautious and ready for the unexpected where children are involved. Underage children should be accompanied by a responsible adult.
6. Passengers waiting for the next ride must be kept away from any of the moving parts of the Wheel.
7. Be alert when the Wheel is operating and be prepared for an emergency stop.
8. Never, under any circumstances, walk away from a Wheel while it is operating and carrying passengers.
9. Take pride in operating safely; a safe Wheel is a profitable one.

FLYING BOBS

PRIORITY ITEMS

- Operator must avoid lingering in unstable speed of 7 - 7 1/2 RPM; maximum speed - 13 RPM
- Cars must have an interlocking rubber damper
- Inspect safety cable and safety chain closely; Herschell chain mount must be tight; grade 8 bolt with internal snap pin
- Replace ball joint attachment at .006 (six thousandths) clearance
- Examine roller cradle uniball
- Electrical - see Ride Electrical Inspection, pages 16 and 17.
- Examine center to end of sweeps for cracks
- Check track for large gouges and crack in support structure; no grease, oil or lubrication on track
- Spring-loaded spreader should be 180° from driving sweep
- Test cars by swinging them to insure no binding
- Trailer to be leveled both ways; approximately 49 inches above ground; weight off wheels
- Soft ground - bottom block under tires to be 3 inches by 10 inches by 7 inches
- Track to be leveled with transit; track to be blocked to evenly distribute loads

FLYING BOBS cont'd.

- Make certain main relief valve is set at 1500 pounds
- Seat handlebars must have a locking device
- Wheels must be replaced when cracks appear or separation between tire and rim appear
- Waiting passengers must not stand around platform of the ride
- Violent action may occur at 7 - 9 RPM; do not linger ride at this speed
- Insure spring loaded spreader bar is located directly opposite drive motor

INFORMATION

- Isolate pressure gauge with needle valve
- Grease main bearing monthly
- Lube pinions daily
- Limit leveling jacks to 9 inches
- Out sweeps flex during operation (3/4 inch in the horizontal plane of motion)

FLYING COASTER

PRIORITY ITEMS

- Inspect cars
  - for frame cracks
  - lap bar for cracks and broken latches
  - upper lap bar must be padded
  - safety pin and key underside of car to hold it to the frame
- Electrical - see Ride Electrical Inspection, pages 16 and 17.
- Examine sweep arms for cracks at sweep bend
- Make certain that hydraulic shock units are in good operating condition
- Speed - less than or equal to 11 RPM

INFORMATION

FUN HOUSE

PRIORITY ITEMS

- Inspect walls for loose nails; should use headless nails; push on paneling to expose loose nails
- Lights should be protected by heavy screening; i.e. turkey wire
- Window bottoms are to be 32 inches or more from the floor
- Watch for nailed emergency doors; use watchmen
- Inspect floor closely for conditions of roughness, smoothness, nails, fire retardant, tripping hazards, splinters, etc.
- Electrical - see Ride Electrical Inspection, pages 16 and 17.
- Shoes required for mechanical devices
- Emergency back up lighting must be available in dark devices
- Dark - make sure fire extinguishers can be seen from any point
- Fire retardant paint on walls
- Portable - high board must be lowered during winds
- Insure guarding of moving pinch points on motion areas or driving belts, chains, etc.

FUN HOUSE cont'd.

- Standard handrails must be provided on ramp and stairs
- No smoking signs must be posted
- If pinch points cannot be guarded by conventional methods, drive units must have torque limiter or other slip drive device

INFORMATION

HELICOPTER

PRIORITY ITEMS

- Examine four (4) bolts closely on upper center pole bearing for loose nuts
- Sweeps - replace light wall (under 1/8 inch) models with thick wall (3/16 inch) sweeps; total replacement is required
- Electrical - see Ride Electrical Inspection, pages 16 and 17.
- Inspect car mounting, lap bar, and latches
- Examine safety pins on sweep, hydraulic cylinder (make sure cylinder ends are not pulling out) and pull rods
- Cars are to clear platform by 6 inches on Helicopter, 10 inches on Star Jet platform
- Operator must watch passengers carefully for a child that may be trying to get out!!
- Operation of hydraulic cylinders should be smooth
- Check condition of brake lining
- Make certain platform spacers are utilized
- Speed - 7 RPM
- Check tank filter and cleanliness of oil
- Oil temperature less than or equal to 180°

HELICOPTER cont'd.

- Hydraulic manifold pressure to be 650 pounds (test by opening petcock) for Helicopter and 680 pounds for Star Jet
- Center of ride must be on level ground and firmly blocked
- Make certain top rain cover is on
- Tie rod, sweep, and car numbers should match numbers on center base
- Inspect passenger operating cable, thimbles, and clamps
- Shock springs on sweep rods must be in good condition
- Examine tension rod mount, tension rods, hydraulic cylinder clevises, clevis mounts on center chassis, and associated pins for wear (1/16 inch) and defects
- Attach pull rods to sweep with grease fittings up
- Operator should alternate car numbers for first load
- Oil tank air filter should be cleaned frequently
- Test hydraulic fluid level

INFORMATION

- Change oil semiannually
- Clean inside of oil tank with kerosene

HELICOPTER cont'd.

- Clean bottom bearing by softening grease with auto flushing oil; regrease weekly
- Fluid sheave oil level is obtained with 2 1/2 inch mark at center position
- Disconnect drive belt when checking live hydraulics at center of ride
- Bad lower bearing will cause ring gear to break
- Last two (2) digits of serial number is ride manufacture date

HIMALAYA

PRIORITY ITEMS

- Inspect sweep centers to make certain pins are positively safety keyed
- Examine center mechanisms such as sweep arms, wheels, and supports for cracks
- Check cars
  - lap bars
  - upholstery
  - support pins and car sweep attachment bolts
  - safety chains required between car support pins
- Make certain brake mechanism is in good condition
- Electrical - see Ride Electrical Inspection, pages 16 and 17.
- Speed - not over 14 RPM
- Check pin to hole tolerances on articulating members less than or equal to 1/16 inch replacement needed
- Watch and replace wheels when cracked or gap appears between tire and wheel
- Waiting passengers must not stand around platform of ride when ride is in motion
- Ride must be leveled and stable blocking used

INFORMATION

HURRICANE

PRIORITY ITEMS

- Watch usage of door handle; it can strike passengers during loading and unloading
- Speed - 15 RPM
- Length of ride - 2 1/2 minutes
- Ride is to be allowed to coast to a stop
- Check oil pressure regulation versus spec's
- Check for cracks along welded plate under cars near seat belts; reinforcement kits available from factory. Have them installed.
- Check for cracks in fiberglass
- Ride must be well blocked and level
- 160#-170# psi maximum on high pressure tank; 120# psi maximum on low pressure tank; 90# psi maximum on main cylinder

INFORMATION

- Low voltage causes most problems
- Forty (40) grease fittings on head
- Slave cylinder must be closed during disassembly (air system)
- Adjust cam on major control to eliminate creep
- Change oil filter annually; ten (10) micron

HUSTLER

PRIORITY ITEMS

- Make certain car does not hesitate at end of orbit; if it does, the chain is loose; restrict idlers to 1/8 inch of movement
- Hustler - eleven (11) people per car; 13 RPM
- Make certain engine has governor
- Electrical - see Ride Electrical Inspection, pages 16 and 17.
- Inspect inner bottom of tubs for cracks
- Lid on cross arm at main boom intersection will pop off due to excess speed; examine lid for excessive welding
- Watch for poor outrigger blocking
- Ride not to be stopped in less than one (1) revolution
- Load carefully crosswise
- Level ride crosswise
- Check clearance between chain at idlers (3 - 4 inches)
- Watch main bearing and sweep bearings for wear; rock booms to check play. Wear can cause main boom to catch and tear up ride

INFORMATION

- If cross bar at loading is not square; main chain has jumped a tooth
- Chain lube - soak chain in oil all winter

KID RIDES

(Cars, Umbrella Rides, Circular Train, Motorcycle, Etc.)

PRIORITY ITEMS

- Inspect carriers for sharp and rough edges, unprotected bolt heads, lack of adequate upholstery, and pinch points
- Electrical - see Ride Electrical Inspection, pages 16 and 17.
- Recommendation: Ground level rides should be fenced, using 36 inch fencing with holes that will allow a 9 inch ball to pass through; entrance to have a gate
- Watch for tripping hazards
- Center of rotating rides with sweeps should have a canvas cover; will become mandatory later
- Make certain there is adequate passenger support and hand holds
- Rides must be set up 6 feet (minimum) apart

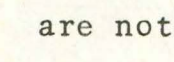
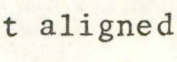
INFORMATION

LOOP-O-PLANE

PRIORITY ITEMS

- Inspect car frame, door latch, seat belt, and door hinges for defects
- Check car shaft for wear, cracks, and missing retainer
- Watch for worn connecting pins and oblong holes; 1/16 inch total tolerance
- Electrical - see Ride Electrical Inspection, pages 16 and 17.
- Maximum speed: 22-24 RPM with no load; 20 RPM maximum loaded
- Tension in guy cables should be equal and cables should be or should remain tight while ride is operating
- Examine car tie rod assembly for defects
- Front window modification - three (3) vertical bars
- Cars should run straight
- Inspect upper rear end for loose sprockets
- Ride time: 3 - 4 loops in each direction
- Examine brake lining
- Check drive chains for broken links and missing clips
- Control stand must have cover on it

LOOP-O-PLANE cont'd.

- Insure drive shaft guard is installed
- Inspect yearly for wear and general condition
- Alternate loading side
- Watch for wear on clutch throwout assembly; flat rollers
- Worn chain will sag on sprocket; loose chain will sag between idler and sprocket
- Flex coupling will wear badly if center shafts are not aligned ( ; bad), ( ; ok)
- Level ride crosswise
- Front of ride slightly higher than rear
- Speed - 20 RPM maximum
- 1/16 inch maximum wear on sweep bushings
- 1 inch movement in and out at end of sweep means too much wear
- .015 inch between cam and rollers on clutch adjustment
- Check car bolt assemblies - long and short bolts for proper type and tightness

INFORMATION

- Old models - 20 inch column; newer models - 14 inch column
- Grease pendulum bearing daily
- 1937 - last model without counterweight
- Clutch should snap closed

MERRY-GO-ROUND

PRIORITY ITEMS

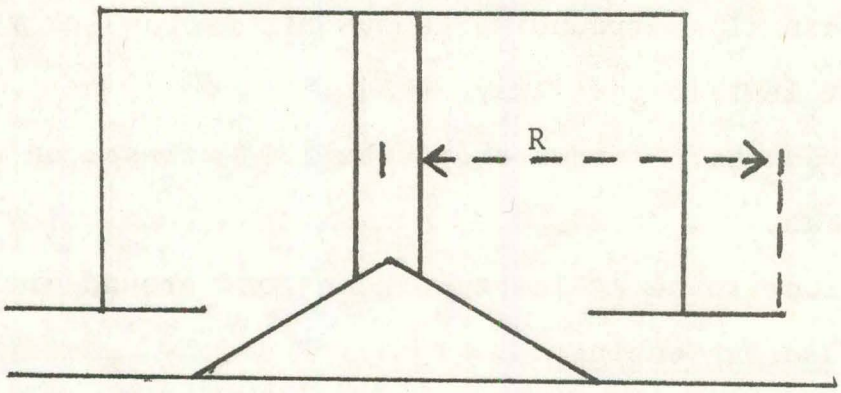
- Check guy rod, rod pins, and rod end clevises
- San Antonio - pins on upper crank retainers must be in, such that the crank rotation keeps them in; check all pins, safety fasteners, set screws, and nuts to insure that they are secure and tight
- Check horses and benches
- Electrical - see Ride Electrical Inspection, pages 16 and 17.
- Check spider gear and shaft collar for tightness
- Make certain that the 1/8 inch thick phenolic collar is present under the top bearing
- Inspect hub and banjo braces, brace pins, and clevises
- Leading edges of telescopes should be rounded, free of sharp edges or splits
- Herschell - examine platform telescope locks for broken springs and that they are locked down
- No rings
- Make certain gears, belts, and pulleys are guarded
- Speed - see Table; (peripheral speed less than or equal to 1100 feet/minute)
- Ride to be assembled on level ground

- Listen for loud squeaks in upper part of center pole
- Examine brake lining
- Keep all surrounding equipment, benches or fence, at least 6 feet away
- Crankshaft throws should be 180° off set on alternate shafts
- Floor to be at least 4 inches off ground or floor
- Gasoline engines
  - no fuel storage
  - fire extinguishers less than or equal to 50 feet away (Class A)
- Outside horse telescopes are longer than inside telescopes
- Mounting stirrup to be on center platform side of horse or animal

INFORMATION

- Clean major gear yearly (large bevel)
- Change hydro-sheave oil yearly
- Link belt reducer; 600 weight oil
- Keep telescopes well greased
- Reverse drive chain annually

Technical Note - Allowable Merry-Go-Round Speeds



1. Peripheral Speed to be 1,100 feet/minute

   Peripheral Speed = Speed at maximum radial distance (R), on platform, from center of ride

2. $W = \frac{VK}{R}$ Where W = rotational rate (RPM)

   " R = radial distance (feet)

   " V = peripheral speed (feet/minute)

   " K = conversion constant

R (feet)	W (RPM)
10	17.5
12	14.6
14	12.5
16	10.9
18	9.7
20	8.7
30	5.8

MERRY MIXER

PRIORITY ITEMS

- Insure pan cable retainers are present under each sweep
- Unit pole bearings and shaft under .062 wear
- Drive cables are to be in good condition, check for wear, tolerance and excessive broken strands
- Check seat safety bars for tightness and that they are latching properly
- Check all bolts, pins, safety keys and all areas for cracks
- Pin and hole wear under .062 wear
- Maintain proper load balance of passengers
- Speed: Main frame - clockwise - 12 RPM

  Unit pole and seats - counterclockwise - 24 RPM
- Electrical - see Ride Electrical Inspection, pages 16 and 17.

INFORMATION

- Capacity - 48 persons
- Space required - 60 feet
- Weight - 8 tons

METEOR

PRIORITY ITEMS

- Inspect door latches and hinges carefully
- Make certain lap bars are utilized
- Examine main column between ram and main spindle for vertical cracks in the channel; manufacturer has added additional steel inside the channel
- Check tub arch lighting mount for cracks; light channel (aluminum) has been replaced by heavier material
- Electrical - see Ride Electrical Inspection, pages 16 and 17.
- Speed - 21.2 RPM in clockwise direction for seat platform; 12.5 RPM in counterclockwise direction for center unit
- Check condition of steps as original handrails were apparently impractical
- Railing should be installed completely around each platform with door set to close when the ride begins to move
- Inspect mechanism below platform for signs of wear and V-belt damage
- Two (2) operators required

- Insure stud bolts are present in bottom of railing posts, under platform
- Check condition of platform pins at outer edge of platform
- Check seat bar latch plates (top and bottom) for cracks

INFORMATION

MINIATURE RAILROAD

PRIORITY ITEMS

- Inspect track
  - gap: 30° = 1/4 inch; 70° = 1/8 inch; 100° = 1/16 inch
  - gauge is less than or equal to 1/8 inch; if 1/4 to 1/2 inch, train cannot run
  - curve bank angle is less than or equal to 2°
  - track level is less than or equal to 1/2° variance per 16 feet
  - cross tie spacing is less than or equal to 24 inches
- Tunnel head clearance - 8 feet from the ground
- All side clearances - 24 to 36 inches
- Examine cars
  - rough edges and inadequate upholstery
  - check hitch bars for loose bolts
  - drive tires on tire-driven units should not be bare
- If electric powered by third rail, ride must be fenced and no direct pedestrian crossings allowed
- Electrical - see Ride Electrical Inspection, pages 16 and 17.
- Brakes

MINIATURE RAILROAD cont'd.

- inspect carefully on gas powered units
- all units to have an emergency brake
- check air system for water and damaged lines
- Herschell C. P. Huntington - air pressure should hold to near 90 pounds for several hours with engine off

- If fueled by wood or coal, check for spark arrestor
- If steam, check for valid boiler inspection certificate; if not inspected, contact boiler division

INFORMATION

- Tie ballast - 3/4 to 1 inch
- Grading ballast - 2 to 3 inches
- Lubricate (lightly) outside rail (inside surface) on curved section to minimize wear on wheel flanges
- Ties - 4 x 4 inches

MONSTER

PRIORITY ITEMS

- Check bolts in pillow blocks; check threads for signs of stripping and other deformations
- Use only a grade 8 bolt

MOUSE

PRIORITY ITEMS

- Test brakes
  - brakes are to be fail safe (spring loaded) with air (no CO_2 cartridges), cable, or hydraulics holding them in the off position
  - Herschell Mad Mouse - brake #1 should slow a fully loaded car for brake #2 to stop it; brake #1 should stop an empty car; all other brakes are to stop a fully loaded car (Emergency)
  - actuate emergency brake control; should also stop chain haul
  - inspect all air lines for deterioration and damage
  - check for water bleed valves in air lines
- Inspect track
  - correct use of taper pins and fasteners (Herschell)
  - track mounting bolt heads for excessive wear at wood cross ties
  - Make certain that the sharp "S" turn near the end of ride has been replaced
  - watch for welding in wrong places; can be hazardous

- Inspect car
  - lots of padding; all sharp edges covered
  - inspect lap bar assembly and latch carefully
  - examine car structure for defects
  - Herschell - replace side roller at 6 1/8 inches and casters at 3 3/4 inches or if riding surface edge is sharp
  - check car underlocks; steel bar to have 1/2 inch track clearance
- Make certain limit switch at bottom and top of chain haul is operating, and check chain haul stop switch at operator station
- Electrical - see Ride Electrical Inspection, pages 16 and 17.
- Ride set up on fairly level ground; no hollow blocks
- Inspect cable bracing for fraying, number, and size of clips, correct installation and cable snugness
- Load heavy passengers to rear
- Monster Mouse - heavy passengers must be to the rear
- Five (5) cars maximum
- Check air tank pop-off valve

- Inspect air tank for rusting; not to be located near public, static pressure test every 2 years
- Examine air line lubricator
- Check haul chain
- Catwalk required on chain haul
- Jack stands must be in a straight line

INFORMATION

- Little Dipper (Herschell) has four (4) castings and through axles on each car
- 1960 Coaster (Herschell) has two (2) trunions on each car
- Reverse chain haul annually
- Replace reducer oil annually
- Operator to check track daily
- Models
  - Herschell - Monster Mouse, 1960 Coaster
    Mad Mouse, Little Dipper
  - Others - Wild Mouse, Zyclon
- Replace FLEXLOC nuts after six (6) setups
- Drain air tank daily
- Place ajax on damp brakes
- Lube track side walls in tight turns
- Air tank switch; on - 100 pounds, off - 120 pounds

OCTOPUS

PRIORITY ITEMS

- Make certain old models have proper modifications
  - outer arm reinforcement
  - car spindles and safety pins
  - eccentric reinforcement
  - shorten sweeps
  - column reinforcement
  - sweep reinforcement
  - 1 1/8 inch support sweep rods to 1 1/4 inch
- Electrical - see Ride Electrical Inspection, pages 16 and 17.
- Inspect car strap hinges carefully
- Inspect car door latch closely
- Examine webb closely for failures
- Replace swivel blocks if there is metal buildup around holes
- Swivel blocks - 1/16 inch wear or five (5) year replacement, whichever is first
- Double bend in sweep support rod; replace - unsafe
- Check all safety pins
- Speed ~ 6 to 7 RPM; engine governor
- Examine control rod tube hanger at center structure
- Needs soft brake; grease lining if jerky; ajax

OCTOPUS cont'd.

- Check brake lining - replace when rivets show
- Watch for excessive welding on outriggers
- No blocking allowed under center base and mud sills must be blocked at outer end and quarter or spring block required
- Replace wood block under car if worn
- Watch for hammered pillow blocks
- Control rods need lots of oil
- Belt guarding is required
- Watch for flattened rollers on clutch plate
- Watch gear box housing
- Check clutch drive shaft adjusting bolts
- Check bolts in pillow blocks; check threads for signs of stripping and other deformations
- Use only a grade 8 bolt (150,000 psi)

INFORMATION

- There are approximately 461 machines operating
- Rotation direction is counterclockwise

PARATROOPER

PRIORITY ITEMS

- Examine rides for modified center shaft; new shaft will be shrunk fit; no weld on spindle; timken bearing replaces roller bearing (proof of replacement must be provided)
- Examine lap bar for worn hinges and weak springs
- Check bow to which cars are attached for cracks; must be reinforced across entire bow to gussets; examine area around gussets for cracks
- Inspect car hanger pin; large pin through car
- Make certain fluorescent lights and tubes are secure and safety chained to the ride
- Electrical - see Ride Electrical Inspection, pages 16 and 17.
- Check safety loop and fastener on car
- Must have double acting monroe shock on car
- Tie rods between sweeps are to have safety chains and are to be tied in the center with wire where they cross
- Test landing height to insure feet will not hit
- Check clearance of all nearby obstructions; walk entirely around the ride
- Examine limit arm rod for breakage; see mod kit

PARATROOPER cont'd.

- Make certain that check valve is present on bottom of ram
- Observe operator making a landing
- Examine brake
- Never start ride with brake on or apply brake while ride is in motion
- Maximum speed - 12.5 RPM
- Ride cycle - 1 to 1 1/2 minutes
- 12 inch square of blocking under each dolly shoe and outriggers
- Trailer must be level both ways
- Tie rods between sweeps are to be tightened with a lever 6 inches or shorter in length
- Check back support struts (nonhydraulic models), cross bracing, clevises, and associated pins for defects
- Check sweep mountings for wear (1/16 inch tolerance)
- Check sweeps for defects and excessive welding
- Make sure hydraulic mounting bolts are tight
- Check oil tank filter
- Check I-beam frame of trailer for straightness; braces will not fit properly if beam is bent
- Check rim drive track near brackets for cracks

PARATROOPER cont'd.

- Car support bows must have safety chains and be secured in place
- Car support bows must have safety retainer bar installed

INFORMATION

- 24 psi in drive tires
- Turn drive tire crank six (6) turns after initial contact
- Ajax (dry powder) will calm down a glazed brake shoe

PONY TRACK

PRIORITY ITEMS

- Electrical - see Ride Electrical Inspection, pages 16 and 17.
- Saddles are to have double girths and safety straps
- Ponies carrying very small children should be walked by operator or parents
- Biting animals to have muzzles during operation
- Inspect saddles and equipment for wear
- Ride shall be well fenced
- Double chain on the halter

INFORMATION

ROCK-O-PLANE

PRIORITY ITEMS

- Watch for sheared pin on restraining bar
- Electrical - see Ride Electrical Inspection, pages 16 and 17.
- Check cross bar locking pins and springs for breakage
- Examine brake lining
- Outer mud sills carry entire load; must be well blocked
- Sweep cables must be tight
- Check overhead and end obstructions
- Maximum speed: 9 - 10 RPM
- Examine car brake arms on back side; caused by poor adjustment
- Check car for broken metal and wire mesh (expanded metal)
- Check door latches and lap bar safety key hole for excess wear
- Check tub lock nut or safety device on car spindle
- Check car bearings for wear; must be tight
- Check cross brace pins and holes for wear greater than 1/16 inch
- Ride should not be stopped in less than one (1) revolution

- Idler should float without hitting a stop
- Check sheave alignment with themselves and with sweeps
- Correct tension on drive cable; spring plunger moves back and forth approximately 5/8 inch while operating
- Cable vibration as it leaves the elephant ear
  - horizontal OK if not excessive
  - should be little or no movement vertically
- Examine control mechanism wear
- Center safety pads should only touch ground; carry no weight
- Watch first vertical frame, from rear on left, on trailer on bend
- Watch for bent clutch shaft
- Counter shaft should run smoothly
- Sweep support for traveling should have small indentation in rubber when loading for traveling
- Trailer wheels should not carry any weight when assembled
- Watch exits and entrance for height of platform; ride may not be set right if platform is too high
- Check for wear in cross pins and pinholes; less than .062 wear

ROCK-O-PLANE cont'd.

- No larger than 1/8 inch oversize pins on cross sweep braces
- More fence may be required if access to moving parts are open to public
- Keep "V" in fence at front entrance to ride

INFORMATION

- Replace brushes at 10% remaining
- Cover trailer gland heads while playing
- Do not use mineral oil on drive cable
- Watch out when pulling out sweeps
- No failures or cracks have occurred on main spindle

ROK-N-ROLL

PRIORITY ITEMS

- Inspect seat belt mount at interior wall molding
- Electrical - see Ride Electrical Inspection, pages 16 and 17.
- Make certain that car linch pin is installed properly; only 1 inch pins are permissable; no replacements allowed
- Make certain that seat brake mod kit is installed
- Check for required structural beef-up in dome area
- Make certain that sweep cross rods have turn buckles mounted in opposite directions
- Examine portable operator unit for wear and loose fasteners
- Inspect stairs for solid footing
- Solid blocking under each leveling jack
- Speed
  - rotational - 6 RPM
  - looping - 24 RPM
- Cycle time - 2 minutes riding time
- Capacity - four (4) adults per seat
- Check air pop off valve by pulling out on stem to insure it is free
- Check air pop off valve by bypassing kick-out switch

- Level trailer; no weight on rear tires
- Inspect air tank by draining; if lots of water and rust appear, get sonic unit for thickness check
- Make certain air tank pressure switch in - 65 psi, out - 85 psi
- Inspect lubricator in air system
- Replace brake disc when thickness is less than or equal to .4375 inches
- Replace brake pucks when compensator has traveled inward greater than or equal to 7/16 inch
- Check drive chain for wear
- Inspect master cylinders for leakage
- Check oil tank filter and oil for cleanliness
- Check ribs on seat belt locking device; replace if ribs are worn smooth
- Check taper locks at sweep ends; weekly basis
- Check car hubs for cracks
- Check seat belt and clamp for wear
- Check center hub for cracks
- Check seat hub for cracks

INFORMATION

- Sweep tires - 80 psi
- Drain air tank daily
- Power off before tampering with air pressure switch

ROLL-O-PLANE

PRIORITY ITEMS

- Front car windows must have safety bars
- Watch for safety pins being used as car door latch
- Electrical - see Ride Electrical Inspection, pages 16 and 17.
- Watch for evidence of arcing on control switch
- Examine entire structure for loose bolts
- Examine door hinge bolts and door latch hole
- Inspect column for cracking; add gussets
- Make certain safety belt is inside out
- Safety cable must be present on booms
- Check car spindle key way for wear and looseness
- Watch for previous hub bearing failures; roughs up the outside of hub tube
- Boom pin and hole wear clearance is less than or equal to 1/16 inch
- Crank arm must be tight
- Check lower hub bushing; clearance is less than or equal to .0004 (40 thousandths)
- Examine rotation bar at crank end for wear
- Examine rotation cable for wear on rotation bar end next to tube (wears by rubbing against support tube)

ROLL-O-PLANE cont'd.

- Check car for broken metal and wire mesh
- Check car spindle and bearings for wear; must be tight
- Check lock nut on car spindle
- No more than 1/16 inch wear tolerance on main brass bushings
- 12 RPM
- Ride time not to exceed 2 minutes

INFORMATION

- Serial number
  - pre-war - control stand and mud sill
  - post-war - lower portion of column
- Built forty (40) in twelve (12) years

ROTOR

PRIORITY ITEMS

- Inspect central structure and carrier surface
- Electrical - see Ride Electrical Inspection, pages 16 and 17.
- Examine brake mechanism and linkage
- Speed - less than or equal to 33 RPM
- Ride time - less than or equal to 1.5 minutes
- Passenger load must be evenly distributed
- Set pressure relief at 800 psi while accelerating vane (old)
- Set pressure relief at 750 psi while accelerating Staff (new)
- Set pressure relief at 350 to 450 psi on brakes

INFORMATION

ROUND-UP

PRIORITY ITEMS

- Electrical - see Ride Electrical Inspection, pages 16 and 17.
- Safety chain at waist height in each cage and covered with material (i.e. hose)
- Operator must have protection from flying objects
- Make certain that ram has a "smooth landing" mod kit
- Inspect center tower bolts for shearing
- Check all pins for correct size of safety hairpins and presence of
- Check wear of pins of cage sections, 2 pin type may have most, 1/16 inch maximum allowed
- Inspect welds across the tub corners for cracks
- Top center piece may have cracks; manufacturer modified lower part of center hub in mid-60's
- Make certain brace rods are only hand snug with cotter or safety pins
- Check footings
- Ram has fail safe valve for loss of pressure or broken hose; verify valve is present and not damaged
- Check electric brakes; modified brakes are 12 volt

ROUND-UP cont'd.

- Machine guard on clutch and belts
- Examine counter shaft bearing
- Relief valve set at 1300 - 1400 pounds (on wheel side)
- Oil level must be equal in the hydrosheaves
- Examine tank filter and oil
- Verify that rocker-arm shaft has been replaced with a solid shaft (see manufacturer)
- Verify adequate voltage - line to line less than 5% difference
- Check rim pins and holes for wear
  - 1/16 inch maximum wear
- RPM 18.5

INFORMATION

- Stop dry cylinder chatter by using "NEVER SEIZE"
- New rams are hard chromed to prevent scoring
- Main bearing failure at start of third season; on a folding Round-Up

SCAT

PRIORITY ITEMS

- Tub speed - 20 RPM
- Main beam speed - 8 RPM
- Check tightness of main bearing bolts
- Watch main bearing and sweep bearings for wear; rock booms to check play
- Seat belts and head pads must be present
- Rear stabilizing jack must be snug and not carry weight of trailer
- Ride to full stop before reversing
- Important - check bolt tightness on the three main bearings, both upper and lower rings, every week. Torque the nut (nut bolt head) to 125 foot lbs.
- Check floor beams near rim drive for cracks especially near area which was cut away for bolt removal or replacement
- Check outer ends of tubs and cage posts near floor and beams for cracks
- Check for cracks on drive rim beams where area is cut away for bolt heads
- Tire pressure - 40 to 45 lbs. on tubs. Pull tires in against drive no tighter than absolutely necessary. Tire pressure on center drive - 55 lbs.

SCRAMBLER

PRIORITY ITEMS

- Examine handlebar striker adjustment (at least 1/4 inch engagement), hinges, and latch mating; must be smooth operating and no cracks
- Lap bars must be installed
- Electrical - see Ride Electrical Inspection, pages 16 and 17.
- Inspect seat skin (inside and out); especially back below back box for missing rivets
- Remove back wooden block and examine back tray toward rib for cracks
- Make certain that front metal lip is on seat cushion and in place under foot box riser lip when in use
- CAUTION decal must be on handlebar
- Examine seat clip clutches carefully
  - watch ride while loaded; if seat walks clockwise or remains fixed there is a problem; if passengers are unstable there is a problem
  - no grease on plate!!
  - 100 pound torque at handlebar latch; perpendicular to sweep or with ride unloaded run to top speed and set brake center pole and seat sweeps to stop at same time

- watch for worn clutch springs; by springs rubbing cover
- 1 3/32 inches on clutch spring
- plug grease fitting if nylon bearing

- Maximum speed - gas, 11.0 RPM and electric, 11.4 RPM
- Engine must have governor with excess rod cut off
- Check for weld crack in seat sweep channel at vertical weld of tapered piece that extends to pin connection; dye or magnaflux
- Make certain that unit poles have had additional gussets
- Closely inspect safety pin at lower end of unit pole
- Inspect pins for wear (1/16 inch tolerance); see wear table
- Serial numbers 1 - 290; verify existence of upper bearing retaining ring
- Check brake cables; cable clamps should not be used; if clamps are present, frame has probably been cut
- Inspect brake cable sheaves for breakage
- Check main brake spring by turning ride backward; no turn - no spring

SCRAMBLER cont'd.

- Length of ride - 1 1/2 minutes; start to stop
- Load should be balanced across unit poles before center pole
- Load heavy people on outside of seat
- Sweep clearance; 3 1/2 inches or greater over all obstructions, including drive shaft; measure with three (3) people in seat; also 1 inch clearance of tub step over sweep
- Frame and seats should follow slope
- Check blocking to insure center pole is not lifted off ground
- Examine adjustment of interconnection between clutch and brake cable
- Should stop ride in two (2) revolutions
- Inspect nylon bearing in center of each drive shaft section
- Check for bent tie rods and paint inside of rods
- Watch for knife edge on floating gear; replace
- Verify that a safety wire is through key lock bolt heads on main pinion gear
- Look for cupped teeth in main pinion; upper bearing needs a spacer
- Replace nylon bushing (and pins if needed) in handle-bar hinges to prevent latch and catch damage; will not let handlebar close properly

SCRAMBLER cont'd.

- Every four (4) years or 3,000 hours change unit pole bearings
- Check unit pole bearings for loose or missing bolts

INFORMATION

- One Scrambler one year carried 1,050,000 passengers
- Serial Number
  - center pole
  - where power shaft pins to center pole
- Replace main bearing when inner surface of race is flaking
- Pin hole reaming must be accomplished with a jig supplied by ELI
- Cover the tops of the unit poles for winter outside storage

SKOOTERS

PRIORITY ITEMS

- Watch for missing cushions on pole and on steering wheels
- Inspect ceiling for tears
- Electrical - see Ride Electrical Inspection, pages 16 and 17.
- Insure ride operator exercises adequate directional control
- Safety straps for children under 42 - 48 inches
- Examine pole cushioning closely for cuts right at top of seat
- Center islands are required on larger buildings
- No children allowed on lap
- Inspect ramps and aisle area for smoothness
- Entrance aisle is less than or equal to 24 inches
- Examine blade wear
  - must wear at end, not in center
  - watch for hairline cracks along edge
- Replace band springs if bands are sloppy
- Spring rods on ceiling adapter must be bent over casting
- Recommended replacement of wheels at 1/4 inch of material above steel rim

SKOOTERS cont'd.

- Replace rough wheels or wheels worn uneven
- Replace bent trolley poles
- Ride time - minimum, 2 minutes; maximum, 4 minutes
- Do not use flake graphite
- Brass blades not recommended
- Place 18-gauge steel over bumper board
- Exit signs must be provided at exits
- Signs for direction of travel must be posted
- Use clown height for reference

INFORMATION

- Replace clutch lining at 1/32 remaining
- Boil clutch lining with a little "Mr. Clean" for installation
- Spray silicone on rubber bumper and bumper strips
- Clean paint with car cleaner and car wax
- Reverse ride direction periodically
- One (1) strip of graphite paint across the floor

SKY DIVER

PRIORITY ITEMS

- Inspect seat latch carefully for loose bolts
- Examine seat latch pins and holes for wear and clearance
- Examine cars for sharp metal or broken mesh
- Watch for loose seat shoulder bolts
- Watch for loose hood attachment bolts
- Make certain seat reinforcement has been made on both sides; remove plug and check bolts to insure they are tight
- Electrical - see Ride Electrical Inspection, pages 16 and 17.
- Examine structure for safety pins; especially around the car
- Inspect tower legs for damage caused during assembly
- Assemble on level, firm ground
- Speed - 8 RPM
- Check upper drive back plate bearing
- Inspect oil tank and return filter
- If older ride; check for hole in scissor channel to oil assembly rollers
- Drive ground rod for lightning protection

SKY DIVER cont'd.

- Check car body frame for cracks. Repair if needed; reference - Chance Manufacturing Service Information Bulletin #101A
- Without flow control valves on hydraulic motors, removing one motor will allow ride to operate 1/4 faster (overspeed)

INFORMATION

SKY RIDE

PRIORITY ITEMS

- Make certain passengers cannot open doors or unfasten safety belts during ride operation
- Inspect safety belts and bars for defects
- Electrical - see Ride Electrical Inspection, pages 16 and 17.
- Support tower mud sills are to be substantially staked (four (4) stakes per sill) and located on firm soil (no sand or bogs)
- Check support tower vertical alignment
- Examine main cable and cable supports carefully
- Make certain passengers are not carried close to power lines, buildings, or trees (see Rule 61.18.1.c)
- A separate ride operator assistant is required if the carrier does not stop during loading or unloading and crowd warrants
- Ride is not allowed to carry passengers over concession stands and people in front of concession stands
- Ride must be stagger loaded
- Carrier attachment shall be with a nut that will accommodate a safety key

INFORMATION

SKY WHEEL

PRIORITY ITEMS

- Operation of lap bar should be checked to insure proper locking
- Electrical - see Ride Electrical Inspection, pages 16 and 17.
- Fluorescent tubes must be in safety tubes or taped to prevent falling
- Make sure there is a metal pin through seat latch ball
- Inspect seat ball joints and bushings for wear
- Inspect truss rod ends for breaks; replace - don't repair
- Check spoke castings for cracks
- Check grid members on sheaves for cracks
- Examine circular rails (rails contacted by drive wheels) where one rail is bolted to the next for cracks
- Examine screw jack nuts carefully for cracks and gauled threads
- Examine cable clamps for proper installation
- Make certain that taper locks are tight on wheel axle
- Inspect motor mounts for loose bolts

SKY WHEEL cont'd.

- Check vertical tower alignment by equal gaps between upright structure and revolving structure
- Make certain blocking is solid on firm soil
- Replace electric motor brakes at gap less than or equal to 3/8 inch
- Additional ground rod required for lightning protection
- Wind braces must be installed
- Watch for pivoting of back jack stands on blocking
- Alignment of towers cannot be off; 1/2 inch or more will cause bearing and collar wear
- 340 - 360 pounds of pressure on cable
- No bolt shall be less than grade 5
- No welding allowed on bull shaft; this is a special alloy steel
- Insure that seat handle bar has stop chain or cable
- Check main boom axle and wheel axles for cracks
- Seat latch to be safety keyed; new style available from factory
- Check width of spokes for proper spacing and bolt washer modification to seat spindles; reference - Chance Service Information Bulletin #99
- Inspect seat ball joints and bushings for condition and wear

- Wind braces must be installed
- Install secondary locking device; Chance Bulletin #96
- Lash trailers to truck tractor in high winds

INFORMATION

- Change gear box oil 4 to 6 months (4 to 5 quarts); main drive
- Change boom drive gear box oil 4 to 6 months
- Twenty-five (25) machines operating

SPIDER

PRIORITY ITEMS

- Electrical - see Ride Electrical Inspection, pages 16 and 17.
- Inspect car strap hinges carefully
- Inspect car door latch closely
- Examine sweeps closely for failures
- Swivel blocks - 1/16 inch wear or five (5) year replacement, whichever is first
- Double bend in support rod; replace - unsafe
- Check all safety pins
- Speed ~ 6 - 7 RPM Spider
- Examine control rod tube hanger at center structure
- Needs soft brake; grease lining if jerky; ajax
- Check brake lining; replace when rivets show even
- Watch for excessive welding on outriggers
- No blocking allowed under center cage
- Watch for hammered pillow blocks; check condition
- Control rods need lots of oil
- Belt guarding is required
- Watch gear box alignment and flattened rollers on clutch plate
- Check clutch drive shaft adjusting bolts
- Check for cracks on all sections of sweeps

SPIDER cont'd.

- Check bolts in pillow blocks; check threads for signs of stripping and other deformations
- Use only a grade 8 bolt
- Sweeps must have factory modifications (beef up)

INFORMATION

STAR JET

(Herschell Helicopter and Star Jet Rides)

PRIORITY ITEMS

- Examine four (4) bolts closely on upper center pole bearing for loose nuts
- Sweeps - replace light wall (under 1/8 inch) models with thick wall (3/16 inch) sweeps; total replacement is required
- Electrical - see Ride Electrical Inspection, pages 16 and 17.
- Inspect car mounting, lap bar, and latches
- Examine safety pins on sweep, hydraulic cylinder, and pull rods
- Examine hoses for weather/heat checking
- Cars are to clear platform by 6 inches on Helicopter and 10 inches on Star Jet platform
- Operator must watch passengers carefully for a child that may be trying to get out!!
- Check brake lining
- Make certain platform spacers are utilized
- Speed - 7 RPM
- Check tank filter and cleanliness of oil
- Oil temperature less than or equal to 180°
- Hydraulic manifold pressure to be 650 pounds

(test by opening petcock) for Helicopter and 680 pounds for Star Jet

- Center of ride must be on level ground and firmly blocked
- Make certain top rain cover is on
- Tie rod, sweep, and car numbers should match numbers on center base
- Inspect passenger operating cable, thimbles, and clamps
- Examine tension rod mount, tension rods, hydraulic cylinder clevises, clevis mounts on center chassis, and associated pins for wear (1/16 inch), and defects
- Springs on sweep rods must be in good condition
- Attach pull rods to sweep with greese fittings up
- Operator should alternate car numbers for first load
- Oil tank air filter should be cleaned frequently
- Test hydraulic fluid level

INFORMATION

- Change oil semiannually
- Clean inside of oil tank with kerosene

STAR JET cont'd.

- Clean bottom bearing by softening grease with auto flushing oil; regrease weekly
- Fluid sheave oil level is obtained with 2 1/2 inch mark at center position
- Disconnect drive belt when checking live hydraulics at center of ride

SWING

(Chair, Flying Comet, Airplanes, and Flying Scooters)

PRIORITY ITEMS

- Electrical - see Ride Electrical Inspection, pages 16 and 17.
- Safety Retainer
  - cable or chain attached to or over sweep through main carrier cable, thimbles, or chain links
  - Flying Comet - second set of cables across sweep arms; requires attaching original cables lower on arm; operator should consult with manufacturer (King)
  - make certain carriers have safety retainers
- Examine metal rings where cages are attached to the sweeps
- Carriers are to have individual car locking bars or straps
- Inspect sweeps and framework for defects, excess welding, corrosion, and bending
- Examine longitudinal and corner framework of carriers for defects and corrosion
- Corner posts must be anchored, heavily sandbagged, or otherwise held down
- No twisted wire chain

SWING cont'd.

- Watch for dog or other spring loaded snaps; use only rated clevises with safety keys and standard wire rope, clips, thimbles, and fasteners
- Check propellors to insure they are securely fastened to the carrier; rides with propellor or fan drives to be guarded
- Speed - Flying Comet is less than or equal to 12 RPM
- Rides must have entrance safety chains
- Check center bearing for wear
- Check chains and/or cables regularly for wear damage or frayed strands, especially at attachment points including safety chain or cable attachment area
- Rotating parts (gears, belts, chaindrives, etc.) to be guarded against contact
- Center column bearing to be free of wear, no slop back and forth of main shaft
- Check links where safety chain or cable attaches or passes through links for wear

INFORMATION

SWINGER

PRIORITY ITEMS

- Check for cracks in tower hinges (three). NOTE: Check emergency factory service bulletin dated July 30, 1974. Modification required.
- Inspect all sweeps carefully for cracks
- Check sweep hinge and welding on hinges for cracks
- Check condition of sweep hinge tubes for wear or bending
- Sweep #1 (stationary sweep) requires additional reinforcement. Construction drawing for reinforcement can be obtained from the factory.
- Check hanger rods, S-hooks, and seat chains for wear, breaks, or cuts
- Check seat supporting chains carefully for cracks, breaks, dents, cuts, or worn areas
  - Place a weight of 175 lbs or a person weighing 175 lbs in seat and twist chain, untwist. Check all links carefully.
- Inspect seats for cracks and chips, especially around seat belt brackets and eye bolts
- Check the hanger rods for cracks, opened hooks or excessive wear

- Inspect the seat belts and restraining chains
  - They must be fastened securely to the seat; show no cracks, cuts or excessive wear
  - Check to see that they are in safe working order with no broken springs
- Check hub rollers and roller track for wear and proper adjustment. Two rollers on each track should have no clearance and the third roller should have .010 inch of clearance
- Safety Retainer
  - Cable or welded link chain attached to or over sweep through seat carrier cable thimbles or chain
  - Ride must have stable blocking under outriggers
- Electrical - see Ride Electrical Inspection, pages 16 and 17.
- Check chains and/or cables regularly for wear damage or frayed strands, especially at attachment points, including safety chain or cable attachment area

SWINGING GYM

PRIORITY ITEMS

- Electrical - see Ride Electrical Inspection, pages 16 and 17.
- All handlebars inside must be padded to protect riders
- Expanded metal sides checked, broken areas welded and reinforced (this is source of severe accident if rider were to have arm or leg penetrate side)
- Support arms - check for excessive welding or misalignment and six (6) points where arms attach to cage
- Riders instructed by operator to hold on during entire ride until cage comes to a complete stop - post signs
- Car brakes - good operating condition, drum and band kit recommended
- Check condition of wood friction brake at bottom of ride
- Non-skid material installed over all cage floors, note condition
- Check bearings and collar bolts (self-locking nut or keyed) for loose bolts and improper type
- Watch riders for over exertion
- Check A-frames (especially at top end) and bearing housings for cracks

- Check bearing spindles for gouging wear caused from bearing mounting plates or loose bearings

INFORMATION

TEMPEST

PRIORITY ITEMS

- Make certain car does not hesitate at end of orbit; if it does, chain is loose; restrict idlers to 1/8 inch of movement
- Tempest - fourteen (14) people per car; 9 RPM
- Make certain engine has governor
- Electrical - see Ride Electrical Inspection, pages 16 and 17.
- Make certain seat belts are present
- Inspect inner bottom of tubs for cracks
- Lid on cross arm at main boom intersection will pop off due to excess speed; examine lid for excessive welding
- Watch for poor outrigger blocking; outrigger braces must be utilized
- Ride not to be stopped in less than one revolution
- Load carefully crosswise
- Level ride crosswise carefully
- Check clearance between chain at idlers (3 - 4 inches)
- Main boom bearing must be tight, loose or worn bearing may cause ride to catch on tie down bracket. Check by rocking boom up and down, check ride boom bearings in the same manner

- Check area where tub spindles are welded to boom for wear
- Insure locking bolt is installed in center umbrella telescope, four (4) total

INFORMATION

- If cross bar at loading is not square, main chain has jumped a tooth
- Chain lube - soak chain in oil all winter

TILT-A-WHIRL

PRIORITY ITEMS

- Inspect structure, in which platform pivet pin mounts in, for defects
- Inspect tub pin for wear and defects (platform pivot pin)
- Electrical - see Ride Electrical Inspection, pages 16 and 17.
- Test brakes; raise lap bars - tub should not move; electric brakes should also stop and hold tubs
- Examine wheels (car and dolly) for flats and hairline
- Check car wheel axles for wear (1/32 inch)
- Make certain car center pins are lubricated; remove pin cap and make certain pin and cotter key are in place; check to see if bushing is worn
- Inspect track
  - dolly wheels close to edge near motor; brace rods too tight
  - power track section, brace rods, and clutch assembly have same custom shop number
- Replace center clevis and center hubs when wear is 1/16 inch (sweep pins are 3/4 inch)
- Check sweep arms for excessive welding

TILT-A-WHIRL cont'd.

- Make certain 1/2 x 7 1/2 inch (#258) platform pin is installed; requires redrilled safety pin hole on steel platforms
- Inspect main ride brake lining
- Make certain 3 inch stand pipe is on reduction gear housing; fill to top of pipe
- Check for loose drive sheave (lock tight on set screw)
- Watch for scored brake drum
- Check toggle lever bolts; oversize to 5/8 inch bolt
- Ride must have outside catwalk and railing
- Replace platform hinge pins and hinges when worn or bent (hinge hook)
- Check center bearing for wear; push back and forth on center without sweeps attached

INFORMATION

- Lube center clevises daily
- Lube center bearing (Zerk 1608) one (1) pump per week
- Lube bearing 405228 (reduction gear)
- Wood platform wheel mounts were last used in 1937

TIP TOP

PRIORITY ITEMS

- Electrical - see Ride Electrical Inspection, pages 16 and 17.
- Check line to line voltage; less than or equal to 5% difference
- Examine bottom of tub for missing nuts and loose or missing nuts on handrail
- Make certain each tub has smooth handrail around top edge and that steering wheel is covered (totally) with rubber
- Check tub top bearing for lack of grease and deterioration
- Check for loose or exposed wires, piping, etc., at entrance to ride adjacent to control panel
- Watch flooring for loss of nonskid material
- Make certain electric brake will hold the tub
- Watch operator to insure metal cover is over the controls when he has left his station
- Inspect center pole for fatigue; just above the upper end of bottom gusset (which has lightning holes)
- Make certain additional gusset has been added for the above problem
- Examine front end hinge bearings for wear (slap); if loose, remove shims until snug

TIP TOP cont'd.

- Watch pressure tank on old rides without boiler inspection approval
- Inspect air tank via large caps at elbows
- Inner fence should not be raised
- Check to make sure upper ring rain cover is on
- Air pressure relief valve - pop at 100 psi
- Riders must not leave tubs until all motion has stopped
- Fuel for compressor should be safety stored
- Safety chain or straps required on each end of air hose
- Pressure - not less than 80 lbs; not more than 100 lbs; ideal pressure is 90 lbs.
- 120 cubic inch compressor adequate
- Check to see if tub nuts are installed and safety locked or keyed
- Check main bearing on top; some may break loose and ball bearings drop down inside of spindle housing; may cause housing to bulge
- 8.7 RPM - Tip Top I; 10 RPM - Tip Top II

INFORMATION

- Ninety (90) machines operating
- Acorn nut on gooseneck pump hides pressure set screw

- If compressor is overworking, main cylinder rings are worn out
- Drain air tanks daily

TOBOGGAN

PRIORITY ITEMS

- Electrical - see Ride Electrical Inspection, pages 16 and 17.
- Inspect hatch
  - correct safety pins
  - broken latch spring
  - loose latch block
  - modified latch block for 1/4 inch hairpins
- Passengers must have hands inside car prior to closing the hatch
- Check safety dog by rolling car very slowly into tube
- Make certain that the "hatch open tickle switch" is operating
- Inspect car under carriage; brake drive chain, pins must be on outside
- Check for modified chain dog assembly
- Inspect chain dog kick-up ramp for wear
- Make certain a bell modification is present and is being utilized for car spacing
- Make certain upper track support arm pivot pin
- Inspect track and braces for cracks and correct safety pins
- Examine trailer for cracks; especially around possum belly

TOBOGGAN cont'd.

- Check screw jacks under trailer for firm bracing
- Make certain there is a foot guard for the operator
- Make certain top gooseneck sprocket is centered; off center clues - mushrooming of chain pin heads and side wear on car tires
- Check chain tightness - one (1) click per chain link
- Check chain speed - 14 seconds up the tube
- Check ride speed - 37 seconds; top of barrel to gate
- Only one car in the tube at a time
- Chain tightness 1 1/2 inch on movement
- New type lap bar now available for cars
- Ride time: 13 seconds up tube, 40 - 43 seconds down tracks, and 53 - 56 seconds total
- Check entire track and bracing for breaks and cracks

INFORMATION

- Bleed lift cylinders prior to assembly
- Read and record pressure valve when interrupting lift
- Drain air tank daily
- Daily checks and maintenance chart (see Maintenance Check List attached)
- Outriggers are to be just snug

Maintenance Check List	DAILY	WEEKLY	MONTHLY
Lubricate drive chain - use STP	X		
Lubricate cars - use STP on chain	X		
Oil car pick-up and safety dog - SAE 20W	X		
Fluid clutch on car - transmission fluid	X		
Car tire pressure		X	
Car nuts and springs, latches	X		
Air compressor - check your operating manual		X	
Lubricator on air tank		X	
Drain water from air tank		X	
Drain water from oil tank		X	
Stop cars on emergency brakes	X		
Car chain tightness	X		
Clean filters on oil and air tanks		X	
Air and oil plumbing; pipes, fittings, and hoses	X		
All hydraulic cylinders for leaks or damage	X		
Air line solenoids and valves*			X
Electrical cables and outlets	X		
All track and support bolts and pins	X		
All air brakes at all locations	X		

*If solenoid or valve malfunction remove spool and clean and oil. You may need to replace 'O' ring. If spool is scored valve must be replaced.

TRABANT

PRIORITY ITEMS

- Inspect seat and seat frame for defects
- Inspect lap bars carefully; bar and latch must be in excellent operating condition
- Make certain horizontal safety bar between cars is present
- Electrical - see Ride Electrical Inspection, pages 16 and 17.
- Check outer ends of sweeps for cracks
- Check sweep vertical movement; if 1 inch or more at outer end of sweep, fill and drill inner sweep holes
- Make certain seat tie downs are set in and are tightened properly
- Examine rim iron pins and outer sweep rim iron pins and holes for excessive wear (1/32 inch); bushing kits available
- Inspect rail at bottom of ride (rail you would step on when entering the seat) for cracking
- Make certain center lighting ball has modified mounting plate, J-bolt and spherical washer (safety chain must be present)
- Make certain hydraulic lift cylinder upper clevises are new type; if old clevis used, check adjacent structure for cracks

- Make certain hydraulic lift cylinder pin conversion kits (upper and lower) have been installed on serial numbers 68 - 128 and smaller
- Make certain "old ward hydraulic cylinders" with external packing have been replaced
- Inspect hydraulic hoses
- Examine limit switch for damage (assembly, etc.)
- Ram limit switch must be set to stop lift at 1 inch from end of cylinder; must not hit end of cylinder, adjust accordingly
- Make certain vertical fluorescent tubes are properly made safe
- Watch for loose operator toggle switches
- Operator is to balance load carefully
- No children under 8 years old without an accompanying adult
- Ride time is under 2 minutes; ram should not be up over 15 - 20 seconds
- Check main brake lining
- Check for portable control box jumper switch; allows lights to be kept on
- Inspect leveling jacks for broken bottom plates
- Outrigger supports are to be snug
- Examine oil tank filter

TRABANT cont'd.

- Check trailer level; both ways
- Keep top filter on oil tank clean; dirty filter will decrease life of pump by 75%
- Check for revised double C clamp under carriers
- Switch is for tear down or set up
- Check for broken springs in leveling jacks
- A kit is available for hand jack repairs
- Dyes and Aluma Ease are available for jack stands; aluminum threads bind up
- One seat has adjustable safety bar; check for proper adjustment
- Use safety post or block under boom when elevated for inspection or repair
- Check boom for cracks; reference - Chance Service Information Bulletin #92
- Old model - rim key pins must be over .26 inch (smallest diameter - .082 maximum wear; .34 new; .44 round side)

INFORMATION

- Replace main points twice a year
- Clean slip rings weekly
- Pump going on and off is caused by noncentered slip ring

- Return oil filter is to be cleaned semiannually
- Extension rods are available for the leveling jacks
- Drive tire pressure ~ 65 lbs

TURBO

PRIORITY ITEMS

- Examine end (outer) of sweep carefully for cracks; must check entire circumference
- Mod kit available for above problem; consists of a ring around end of sweep and additional metal at bolt holes
- Electrical - see Ride Electrical Inspection, pages 16 and 17.
- Inspect car and expanded metal screen carefully
- Check safety pins carefully
- Examine hub bolts carefully for looseness; manufacturer recommends tac weld (D.C. - low hydrogen rod)
- Inspect main chain drive sprocket for loose bolts
- Replace brake puck when 1/8 inch of self-adjusting screw is remaining
- Watch for cracks in main porting block mounting plate; left block and next block are the worst
- Turret speed - 8 RPM
- Wheel speed - 8 RPM
- Verify that brakes have Goodyear teflon ring behind pack
- Check under hub cap behind slip rings for proper main bearing lubrication

INFORMATION

TWISTER

PRIORITY ITEMS

- Sweep speed - 13 RPM; spin - 50 RPM (NOT ACCEPTABLE!) Chance
- Examine end of sweep, car spindle and car
- Original seat chains shall be replaced with seat belts
- Electrical - see Ride Electrical Inspection, pages 16 and 17.
- Replace sweeps every nine (9) years (Herschell and Chance)
- Sweep joint appears to be weak
- Watch truck clamps and braces at floor fold
- Sweep speed - 10 RPM - Herschell
- Check daily for visible cracks
- Rear seat to have padded head rest
- Chance manifold needle valve setting while ride is accelerating - 1500 psi
- Relief valve factory set at 600 psi to 700 psi maximum; do not change from proper setting. Check Chance Service Information Bulletin #90
- All car seats must have restraining belts
- Check headrests for bending or cracking. Repair or report condition to Chance Manufacturing according to Service Information Bulletin #74

TWISTER cont'd.

- Check for installation of control lever detent - Chance Service Information Bulletin #89
- Check sweeps for cracks (all Twisters)
- Check area around access hole to be given close attention, also check plate bolts for proper type; reference - Chance Service Information Bulletin #91
- Check tack welds and sweep joints for cracks or loose joints. Report and repair; reference - Chance Service Information Bulletins #104 and 104A

INFORMATION

- Possum belly doors must be open while ride is operating

YO YO

PRIORITY ITEMS

- Turn off all main switches or breakers before connecting to electrical source
- Insure ride and ground wires are connected to a positive ground
- Electrical - see Ride Electrical Inspection, pages 16 and 17.
- Insure that all pins and safety pins (hairpins, etc.) are in place before attempting to operate ride
- Check blocking and turnbuckles after running through several cycles
- 73 foot diameter is maximum swing out (sweeps in level position)
- Before operating ride with passengers perform items listed under "Operators Daily Check List"
- If head starts to tilt over before sweeps are in horizontal position, release "Lift and Tilt Switch" immediately
- Ride speed 9 1/2 RPM; do not operate over 10 RPM
- Inspect seats for loose or missing nuts and worn or loose chain attachment points
- Replace worn, frayed or cut seat belts. Pull on seat belt to make sure it locks in place

- Check oil level and oil color. Any changes in normal color or level may be sign of impending trouble.
- Use proper size and grade of bolts when replacement is needed
- Check bolts securing sweep links at least annually and in coastal areas every six months. Replace if needed according to manufacturing requirements. Always replace with new nuts.
- Check undercarriage of trailer for cracks. Cracks and breaks have occurred in front section (swinging section) of trailer
- Safety cable or welded link chain is required to be attached to or over top of T-bars and through top area of chair support chains
- Insure ride is on solid footing. NOTE: leveling jacks have a maximum stroke of 9 inches
- Place level on main support beams when leveling, top bed of trailer may not be exact for leveling purposes
- Check chains and/or cables regularly for wear damage or frayed strands, especially at attachment points including safety chain or cable attachment area
- Check shackle and bolt for proper thickness or wear. Notify factory of condition for replacement Reference - Chance Service Information Bulletin #94

- Check rear erection cylinder mount for cracks or breaks. Have area repaired and hydraulic circuit changed. Reference - Chance Service Information Bulletin #102
- Check links in chain where safety cable is attached or passes through link for wear

ZIPPER

PRIORITY ITEMS

- Make certain new lap bars with thick rubber are used
- Electrical - see Ride Electrical Inspection, pages 16 and 17.
- Examine inside car wheels for wear; adapter kit available
- Check U-bolt connecting seat supports to drive cable
- Examine all tower and wind brace safety pins
- Watch for start transient; if it jolts, adjust four-way valve choke
- Make certain large sheave stud bolts are tight
- Replace brake shoes at rivet exposure
- Check trailer level bubble; located just in front of tower
- Check all blocking carefully
- Ride time - 2 minutes
- Check 1/2 inch clearance between sheave brake shoe and drive sheave
- Check boom brake - 1/64 inch clearance between brake shoe and drive rim
- Inspect hydraulic lines and tank filter
- To keep drive shaft from whipping in case of breakage of universal joints, install a safety ring around drive shaft

ZIPPER cont'd.

- Main cables have normal life of three years and should be replaced after that
- NOTE - Urgent safety bulletin from company on door safety latch
  - Check bolt holding safety lug to seat frame; bolt must be at least grade 5 and must be flush with hairpin hole in safety lug
  - Check spring latch on door. The door must not open without pulling back on spring latch
  - If spring latch is bent, replace it; do not attempt to straighten it
  - Install safety strap around frame and door frame at top and bottom hinge area

INFORMATION

- Use DTE - 26 Mobile hydraulic oil in real hot weather
- If tower won't raise, pump is out or 2500 hydro-state is out
- If wheel is slow, probably needs a new relief valve
- If ram falls 3 feet when lowering, air needs bleeding