Electrical and Mechanical Services Department
General Legislation Division

Code of Practice for **Amusement Rides**

2021 Edition

機電工程署
EMSD

Code of Practice

for

Amusement Rides

Electrical and Mechanical
Services Department
2021

Contents

Page

Foreword

The Code of Practice for Amusement Rides ("Code") is issued by virtue of section 49 of the Amusement Rides (Safety) Ordinance ("Ordinance") (Cap. 449). Unless otherwise stated by the Director of Electrical and Mechanical Services ("Director"), the Code is applicable to the design, manufacture, installation and examination of amusement rides under the control of the Ordinance.

The Code provides guidance and applicable requirements on the design and operation of amusement rides for its safe use and operation. The amusement ride owners ("Owners") and trade practitioners should ensure that relevant requirements stipulated in the Code are complied with and, for seeking design approval, the design of the amusement ride is in compliance with the prevalent international standards, specifications and guidelines (such as EN 13814, ISO 17842, ASTM F-24, GB 8408, AS 3533 and/or HSE 175) as recognised by the Director. The international standards quoted in the Code are reference yardsticks. Other equivalent standards may be acceptable.

The electrical works must comply with the following technical specifications and requirements:

(1) The Electricity Ordinance (Cap. 406) and the latest edition of the Code of Practice for the Electricity (Wiring) Regulations, issued by the Electrical and Mechanical Services Department ("EMSD").

(2) The latest edition of IEC 60364 "Electrical Installation for Buildings" and BS 7671 "The IET Wiring Regulations".

(3) The "Supply Rules" issued by either the Hongkong Electric Company Limited or the CLP Power Hong Kong Limited, as appropriate.

Owners and trade practitioners are reminded to observe specific requirements which may be issued in the form of technical guidelines by the Director. Technical guidelines applicable to amusement rides can be observed from –

https://www.emsd.gov.hk/en/other_regulatory_services/amusement_rides/publications/guidance_notes_guidelines/index.html

It should be noted that updates on the Code or technical guidelines may be required with emerging technology and experience. As such, these documents will be reviewed and updated from time to time and new guidelines for other special subjects may be issued where situation warrants. Enquiries may be lodged to the General Legislation Division of the EMSD.

1 General

1.1 Scope

The Code of Practice for Amusement Rides ("Code") specifies the general requirements for the design, manufacture, installation and examination of amusement rides to be operated for use by members of the public in Hong Kong. The Code covers the general design requirements, specifications of materials and equipment, provisions of redundancy and emergency arrangement, testing and commissioning, and operation safeguards of amusement rides.

1.2 Definitions

The definitions, including those stated in section 2 of the Amusement Rides (Safety) Ordinance ("Ordinance") (Cap. 449) as well as items repeated here below, will be used in the Code:

"Amusement ride" is a power-driven device, together with the machinery, equipment and plant connected to, or used in connection with, such device, which is designed to be driven or ridden by members of the public primarily for amusement purposes:

(a) and includes any such device that is capable of being moved from one place of operation to another;

(b) but does not include any such device which is driven solely either by human physical effort or by gravity or partly by such effort and partly by gravity only (that is, it is neither wholly nor partly power driven), other than a device which is specified in Schedule 2 of the Ordinance.

"Competent Person", "Qualified Person", "Owner" and "Surveyor" have the same meaning as defined in the Amusement Rides (Safety) (Operation and Maintenance) Regulation ("Regulation") (Cap. 449B).

"Kiddie ride" means an amusement ride that is designed primarily for use by children aged not more than 12 years, and has a designed carrying capacity of not more than 100 kg and a motive power not more than 1.1 kW.

"Registered Professional Engineer" ("RPE") has the same meaning as defined in the Engineers Registration Ordinance (Cap. 409) and is qualified to practice in a particular engineering discipline in Hong Kong.

"Safety Factor" means the ratio of the ultimate breaking load of a particular component against the design load of that component.

"Safety-critical Component" and "Safety-critical System" are respectively component and system whose failure will result in an uncontrolled operation or movement of the ride or failure of the restraint system, or where there is a risk of failure leading to fatality or injury.

1.3 Application Process

This section provides practical guidelines on the licensing requirements for the Owners of amusement rides and any person who wishes to operate amusement rides for use by members of the public in Hong Kong.

The design, manufacture, installation, operation and maintenance of amusement rides in Hong Kong are regulated by the Ordinance and its subsidiary legislation, for which the Electrical and Mechanical Services Department ("EMSD") is the regulating authority.

The guidelines hereunder outline the requirements of the Ordinance and are not exhaustive. The operation of amusement rides in fairground activities/carnivals can be subject to other statutory requirements in Hong Kong, for instances the requirements for building works, fire services installations, admission of the general public to the premises for entertainment, and/or airspace restrictions. The Owners and his/her agents should consult the relevant Government departments/authorities for the applicable requirements.

1.3.1 Licensing Process for Amusement Rides

The licensing process for amusement rides has three stages as outlined below. Section 5 is a flow chart that shows the sequence of events and key milestones of the first 2 stages, namely "design approval" (Stage 1) and "permit to use and operate" (Stage 2).

(a) Stage 1 – Design Approval

Before commencement of any on-site installation work, the applicant has to demonstrate to the satisfaction of the Director, with proper supporting documents, the adequacy of engineering design and the approach in addressing the reasonably foreseeable safety-related issues during the installation, operation and maintenance of the amusement ride. The applicant should submit a Form 1 – Submission of Designs, Specifications, Method and Programme of Installation of Amusement Ride (downloadable on the EMSD website) to the Director together with details of the mechanical, electrical and structural design, safety systems and operation instructions of the ride. The typical information to be submitted is given as follows:

(1) General Information

i. Particulars of manufacturer, model number, serial number and date of manufacture of the amusement ride.

ii. Motive power and power rating of the amusement ride.

iii. Duration of a normal ride cycle.

iv. Maximum number of passengers, number of passenger carrying units and maximum weight to be carried on the amusement ride.

v. Location map of the amusement ride, where applicable with clear demarcation between the ride and the associated civil structure.

vi. Design review report and/or design document control report of the amusement ride which is a travelling/mobile ride (if appropriate) designated for carnivals or similar purposes.

(2) Description of Design and Operation

i. Total weight of the amusement ride and the arrangement for foundation, anchorage and/or tensioning.

ii. Description of the ride motion with amplitude and duration of maximum speed, maximum acceleration and maximum deceleration in different directions.

iii. Description of ride components and driving systems from power source to passenger seats.

iv. The principle of ride control system with a comprehensive list of safety devices and/or systems which are operational in normal use and/or emergency cases. The list should include the purposes and functions of these devices as well as the test method.

v. Signaling and communication equipment.

vi. Means of braking, stopping and holding.

vii. Passenger containment system including restraints, safety devices and redundancy provisions.

viii. Outline description of key operational matters including the functional and operating procedures, the settings of safety gears, operation of controls, calibration and adjustment of the overload sensing devices, etc.

ix. Outline description of passenger flow and crowd control matters including the description of passenger loading and unloading process as well as the duties of individual operators during normal and emergency situations.

x. Risk assessment on design, operation, maintenance, and use and other design tools such as Fault Tree Analysis, etc. Design risk assessment should be produced by the designer of the amusement device.

(3) Drawings

i. Layout plan showing the dimensions of the amusement ride, floor loading and anchorage requirements, clearances to nearby objects and the safety envelope throughout the ride cycle.

ii. Layout plan showing the passenger queuing and crowd control arrangement, location of the control consoles, indicative signs, chief operator and operators.

iii. Assembly drawings including, but not limited to, ride tracks, lifting and swiveling mechanisms, bearings, supports, passenger units, grab devices, locking and safety systems, buffers, devices for prevention of roll-back, derailment and overturning, etc.

iv. Drawings and schematic diagrams for power supply, pneumatic system, hydraulic system, closed circuit television ("CCTV"), public address ("PA") system, mechanised exhibits and show set elements.

v. Drawings and schematic diagram for the ride control system including, but not limited to, the details of interface, intrusion detection, overload/overspeed sensing, alarm and other safety systems. The specifications of sensors and field control equipment should be included.

vi. Installation drawings showing the sequence of assembling, fixing torques of major connections, pressure of pneumatic or hydraulic systems, etc.

(4) Calculations

i. Design calculation, stress analysis and fatigue analysis that demonstrate the adequacy of strength of the design and materials, including safety factors.

ii. Design calculation that demonstrates the suitability of safety-critical components including safety devices, overspeed governor, driving machines, brakes, wire rope suspension, etc.

iii. Details of the software packages (author and version number of software) used in preparing design calculation, if any, and the list of clearly identifiable inputs and outputs with explanatory notes. For finite element analysis, system plots with assumed conditions should be provided.

(5) Others

i. An outline of the rules and regulations (in both Chinese and English) to the passengers in respect of the prohibited behaviours and restrictions on the physique of passengers.

ii. A rescue plan for evacuation of passengers under different scenarios within a reasonable time. The plan should include the rescue procedures, details of rescue equipment/facilities to be provided within or in the vicinity of the location and the arrangement for mobilising adequate staff members for rescue operation.

iii. Quality assurance document.

iv. Past inspection certificate or approval issued by other government agencies and/or authorities in the amusement ride industry.

v. Method and programme of installation

vi. Method and programme of dismantling (if appropriate).

vii. Fire safety.

viii. Design review completed by an RPE or other experienced professionals in the amusement ride industry. The design review body must be independent from the manufacturer and the designer of the ride being reviewed.

ix. Identification documents of the applicant, for instances copy of business registration certificate, authorisation document for company's representative, etc.

x. Inspection records of the manufacturing process and factory testing (see Clause 4.7).

xi. Maintenance requirements, including replacement schedule of parts and components, fault codes (where applicable).

For permanent or temporary amusement rides with a structure higher than 5 metres or where the circumstance warrants, the Owner should appoint an RPE in the structural discipline to verify that the structural design is sound and the relevant calculations are correct. Verification of, including but not limited to, structural strength, overall rigidity, stability against wind load/operation load, deflection, connection joints, fixing and foundation should be included.

For amusement rides with a substantial height and/or where any passenger may be suspended in a position that he or she cannot return to the ground safely by himself or herself, the rescue operation may require the assistance of the Fire Services Department ("FSD"). Under such circumstances, the Owner should consult the FSD on the requirements of rescue facilities, rescue procedure, and emergency vehicular access.

The approval of design, specification, method and programme of installation of an amusement ride should in general be granted with a Form 2 – Approval of Designs, Specification, Method and Programme of Installation of Amusement Ride. The Owner must ensure the compliance with conditions stipulated on the Form 2 by the Director.

(b) Stage 2 – Permit to Use and Operate

After completion of installation of an amusement ride and before operating the ride for use by members of the public, the Owner should arrange the following works and provide the following information to the satisfaction of the Director.

(1) Operation, Maintenance and Emergency Manuals

The Owner should submit manuals with details of pre-operational checks, operation and maintenance of the amusement ride as well as the procedures for handling emergency situations.

(2) Examination by Surveyor

All the manufacture and installation of an amusement ride should be in conformity with the approved design and manufacturer's recommendations. Upon completion of manufacture, installation, testing and commissioning of amusement ride, the Owner should engage a Surveyor to carry out a comprehensive examination for the amusement ride and prepare a survey report recording the detailed results of the examination and certifying the integrity of the ride and its fitness for public use.

The examination should include, but not limited to, the following:

i. An assessment of conformity of the ride to the approved design including the overall operational performance and that of individual mechanical, electrical, structural, control, safety, hydraulic and pneumatic systems.

ii. Test and measurement of all safety-critical components, stability of the ride, safety clearance and all relevant functional and performance tests laid down in section 4 of the Code or any other tests deemed necessary to ensure the safety and performance of the ride.

The Owner should also make necessary arrangement for a Surveyor to witness and certify all the critical procedures during the construction, installation, testing and commissioning stages as deemed required for determining the integrity and functionality of the ride. Such witness examinations are particularly important for the procedures that cannot be carried out again when installation of the ride is completed.

Where any part of the examination (for instance the non-destructive tests on structural components) is carried out by a recognised body other than the Surveyor, all findings provided by the recognised body should be submitted as part of the survey report and be scrutinised and endorsed by the Surveyor.

(3) Ride Inspection by the EMSD

The EMSD may carry out surveillance inspection of the ride during its manufacture, installation, and upon completion of testing and commissioning.

(4) Rescue Drill

After satisfactory examination completed by the Surveyor, the Owner should arrange a rescue drill performed by his/her operational crew to demonstrate the effectiveness of rescue arrangements. For high-rise or special rides where the rescue procedures involve the participation of the FSD, a rescue drill in collaboration with the FSD should be arranged.

(5) Competent Person

Before operating the amusement ride for public use, the Owner is required to nominate at least one of his employees, who has appropriate academic qualifications and work experience, to apply for approval of the Director as the Competent Person responsible for the management of the operation and maintenance of the ride. The application for being a Competent Person is required to be lodged with a Form 21 – Application for Approval as a Competent Person (downloadable on the EMSD website) and the prescribed fee. Following receipt of application and verification of the qualifications of the candidate, the EMSD would invite the candidate for an assessment consisting normally of a written test and a site test to ascertain whether the candidate has possessed sound engineering knowledge and good understanding of the statutory requirements and the design, installation, operation and maintenance of the ride.

Upon completion of the above, the applicant should submit a Form 3 – Application for Permit to Use and Operate of Amusement Ride (downloadable on the EMSD website) to the Director together with the survey report, the prescribed fee and any necessary documents.

The permit to use and operate an amusement ride should in general be granted with a Form 5 – Permit to Use and Operate Amusement Ride. During the operation and maintenance of the ride, the Owner must comply with the conditions stipulated in the Form 5 by the Director.

(c) Stage 3 – Annual In-service Examination

The Owner is obliged to ascertain the integrity and safe operation of the amusement ride. As a part of the requirement, the Owner is required to appoint a Surveyor to carry out detailed examination not less than once every 12 months.

The Owner is required to submit the survey report with a Form 23 – Report on Periodic Examination of Amusement Ride to the Director within 30 days after the examination is completed.

1.3.2 Additional Requirements for Travelling/Mobile Rides in Carnival Events

The licensing requirements detailed above are applicable to the mobile amusement rides for carnival events. In addition, more specific requirements are listed below:

(a) General

i. For a carnival event with a large quantity of amusement rides, the holder of the licence under the Places of Public Entertainment Ordinance (Cap. 172) may act as the representative of the Owner of the rides when lodging applications for amusement rides under the Ordinance.

ii. An applicant who planned to submit applications for a large quantity of amusement rides at the same time is strongly recommended to submit the applications to the EMSD well ahead of the intended date for operation to allow time for processing the applications.

iii. For travelling/mobile amusement rides stored or in used overseas, the applicant should obtain the design and installation approval from the EMSD before shipping the rides to Hong Kong.

iv. The applicant is recommended to have a team of technical staff who are familiar with the technical details of the respective amusement rides. A local technical support team for on-site issues is also recommended.

(b) Design and Installation Approval

i. The applicant should ensure that the site conditions are appropriate for ride installation and operation. Other conditions including but not limited to the floor loading, leveling, emergency vehicular access and access points to drainage/other underground utilities/services should also be considered.

ii. For tracking the operation and repair history of travelling/mobile rides, the past maintenance records, survey reports, inspection certification, details of alterations and incidents happened (if any) should be submitted to the EMSD. In addition, the rides should be inspected by a competent party to be in good working order before shipping to Hong Kong. Such inspection reports should be submitted to the EMSD for vetting.

iii. All decorative structures attached to the rides should be certified by an RPE or an equivalent competent party for their structural integrity.

(c) Permit to Use and Operate

i. For ride examination, subject to the actual conditions of the ride and the comprehensiveness of the examination, the scope of non-destructive tests on the ride structure may be extended. The scope of examination should be submitted for the EMSD's consent.

ii. For operation personnel, the curriculum vitae (CV) detailing the qualifications and experience of the Chief Operators should be submitted to the EMSD for assessment at least three weeks before the time scheduled for trial operation (point v). The EMSD may conduct interview with individual candidate to assess their competence.

iii. Training records of the operators should be checked and endorsed by the Competent Person and the Chief Operators before the trial operation (point v).

iv. For operational arrangement, a control centre should be established on site for overall site management. Provisions should include, but not limited to, site condition monitoring, weather condition monitoring and making central command to the operators with proper communication means/devices.

v. A trial operation should be conducted in the presence of the Surveyor and the EMSD with the participation of all operational and maintenance staff, including the Chief Operators, operators and emergency staff, to confirm the competency and readiness of the operation team. Satisfaction of the trial operation should be stated in the Surveyor's examination report and the list of operational team members should also be included in the report.

(d) Attendance Record and Reporting

i. During the event period, the Chief Operator should keep a log book to record the attendance of Chief Operators and operators on a daily basis (names, signatures and attendance period). The log book should be made available upon request for the EMSD's inspection.

ii. The Owner is to report, according to section 11 of the Regulation, reportable incidents to the EMSD by phone immediately (within 30 minutes) and submit a written incident report to the EMSD within 24 hours of occurrence. The Owner should establish an effective communication channel with the media to handle public concerns of amusement rides.

1.3.3 Major Alteration

Major alteration of amusement ride refers to any modification that involves changes in loading (e.g. changes in seating arrangement), speed, operating range (e.g. height), safety clearance, major load-bearing structure, driving mechanism, control mechanism (e.g. brakes, shock absorbers, speed limiters), software packages, passenger restraints, safety protection systems, safety-critical components, etc.

The Owner must not carry out any major alteration to an amusement ride without the prior approval of the Director[1]. The Owner who wishes to carry out major alteration should provide a detailed proposal of major alteration to the Director with a **Form 10 – Application for Carrying out Major Alterations**. The Director's consent to major alteration should in general be granted with a **Form 11 – Consent to Effect Major Alteration**. When the modification is completed, the Owner should arrange an examination of the ride by a Surveyor and apply for the permission of the Director for re-opening the ride for public use by submitting a **Form 12 – Application for Permission to Resume the Use and Operation of Amusement Ride/Kiddie Ride after Major Alterations** (downloadable at the EMSD website), the survey report and the prescribed fee. In general, similar procedures as required for licensing a new amusement ride should be followed. The permit to resume the use and operation of amusement ride after major alteration should in general be granted with a **Form 13 – Permit to Resume the Use and Operation of Amusement Ride/Kiddie Ride**. During the operation and maintenance of the ride, the Owner should comply with the conditions stipulated in the **Form 13** by the Director.

1.3.4 Kiddie Rides

Design approval and Competent Person are **not** mandatory requirements for kiddie rides. The licensing process of kiddie rides is summarised as follows:

(a) Permit to Use and Operate

Upon completion of installation of kiddie ride, the applicant is required to appoint a Qualified Person or a Surveyor approved under the Ordinance to examine the kiddie ride and certify its fitness for public use. The applicant should submit a **Form 4 – Application for Permit to Use and Operate Kiddie Ride** (downloadable at the EMSD website) together with the following documents:

i. Survey report prepared and endorsed by Qualified Person or Surveyor;

ii. Photo of the kiddie ride;

iii. Location plan showing dimensions of the kiddie ride and clearance from nearby objects;

iv. Notice of prohibited conducts;

v. The prescribed fee; and

vi. Any other documents deemed necessary to demonstrate the kiddie ride in safe working conditions.

The Permit to Use and Operate for kiddie ride should in general be granted with a **Form 6 – Permit to Use and Operate Kiddie Ride**. During the operation and maintenance of the kiddie ride, the Owner should comply with the conditions stipulated in the **Form 6** by the Director.

[1] Section 14 of the Ordinance stipulates that "except with the prior consent of the Director, the owner of an amusement ride shall not effect any major alterations to the ride".

(b) Half-yearly In-Service Examination

The Owner of kiddie ride is required to appoint a Qualified Person or a Surveyor to carry out detailed in-service examination of the kiddie ride not less than once every 6 months.

(c) Minor Alteration/Relocation of Kiddie Rides

For any minor alteration/relocation of kiddie ride within the same licensed premises, the Owner of kiddie ride could submit the **Notification on Minor Alteration/Relocation of Kiddie Ride within the same Licensed Premises** (downloadable from the EMSD website) to the EMSD for the alteration/relocation. The criteria of minor alteration/relocation are listed below:

i. Relocation of the kiddie ride must be within the same licensed premises;

ii. No modification of the kiddie ride is allowed;

iii. The kiddie ride must not be fixed on the floor/wall/ceiling etc.; and

iv. The dedicated fencing where applicable and safety distance must be maintained.

2 Design Requirements

2.1 Risk Assessment

The applicant should conduct risk assessment to analyse and evaluate the risks associated with the amusement ride, from the design, operation, maintenance and use perspective, in a systematic way followed by appropriate risk reduction measures. The risk assessment should comprise the following steps:

(a) Determination of the operational limits of the amusement ride, with due consideration given to the aspects of height, velocity, acceleration and deceleration of the passenger unit of the ride;

where height is the maximum elevation of the passengers on the ride;
velocity is the maximum speed attained by the passengers;
acceleration is the maximum acceleration attained by the passengers; and
deceleration is the maximum deceleration attained by the passengers.

(b) Systematic identification of reasonably foreseeable hazards, hazardous situations and/or hazardous events during all phases of the amusement ride life cycle;

(c) Estimating the elements of risk associated with these hazards; and

(d) Application of appropriate risk reduction measures to reduce the risk to the acceptable level. If additional hazards do occur, they should be added to the list of hazards and appropriate measures will be required.

The design risk assessment should be used to guide the structure and content of the operating and maintenance procedures. The operation and use risk assessment with risk reduction measures should be the guiding documents setting out the principles and limitations of the use and operation of the ride within an acceptable level of residual risk for all hazards analysed.

Risk assessment should be conducted in accordance with ISO 12100 and ISO 13849-1; otherwise the methodology and process of risk assessment should be properly documented.

For safety-critical components or systems where single or double point failure, involving sensitive equipment or undetectable failure, could lead to fatality or injury, further assessment with Fault Tree Analysis (FTA) and/or Failure Mode and Effect Analysis (FMEA) should be carried out.

2.2 Design Loads

Clauses 2.2.1 to 2.2.5 hereunder set out the various modes of loading that should be taken into account in performing design calculation and stress analysis for the amusement ride. If departure from the below-stated design consideration is necessary for special applications such as uncommon ride operation, a set of appropriate and proven design procedures should be followed with details of design loads and calculation documented.

2.2.1 Dead Loads

Dead loads are loads that are permanently applied on the ride, including:

(a) The weight of structural components of the ride; and

(b) The weight of fixed parts and moving parts associated with the ride.

2.2.2 Live Loads

Live loads are loads that are applied to the ride and are varying during normal operation. For verification of structural integrity, the average mass of each passenger should be assumed to be not less than 75 kg and 40 kg for adult and child respectively. The designed carrying capacity may be higher than the live loads.

The aisles, walkways, platforms or the likes on which passengers and operators can access should be of adequate strength and be able to bear at least a uniformly distributed load of not less than 5 kPa.

2.2.3 Dynamic Loads

Dynamic loads are loads that are applied to the structure or components due to ride motions. Dynamic loads are usually generated by:

(a) acceleration, deceleration, braking, forces of centrifugal, gyroscopic and Coriolis motions.

(b) release of potential or kinetic energy during operation of the ride.

(c) difference in passenger seating pattern.

A comprehensive analysis of the ride motion, including its loading or reaction at anchorage and foundation, should be made. Forces, moments and their magnitudes and directions during all operating conditions should be estimated for all critical components and structural members of the ride.

The analysis should take into consideration the effect of partial and unbalanced loading. In particular, the effect of emergency braking should be checked.

For the effect of vibration, the implication of vibration arising from excitation frequencies of the structures and critical components should also be checked.

2.2.4 Wind Loads

For outdoor rides having a structure higher than 5 metres or where the circumstance warrants, design checking in respect of the structural stability against overturning, shifting, and uplift by an RPE in the structural discipline should be made. For out-of-service condition, the wind pressure specified in the Code of Practice on Wind Effects in Hong Kong (or other applicable Practice Note issued by the Building Department) or the wind speed of 28 m/s, whichever larger, should be used. For in-service condition, wind speed of not less than 15 m/s should be used for the calculation.

The requirements specified in the preceding paragraph are the minimum requirements. Rides that are designed and verified to be suitable for operation with a wind speed higher than the minimum requirements should be operated in accordance with the design or the conditions as stipulated in the permit by the Director.

2.2.5 Other Special Loads

Where appropriate, the following special loads should be taken into account in the design calculation:

(a) Thermal stress due to temperature changes.

(b) Pre-tensioning effect on membrane structure and supports.

(c) Change in ambient conditions (weather elements).

(d) Ground unevenness and settlement.

(e) Forces due to assembling or erection.

(f) Forces due to unusual conditions, e.g. perpetual vibrations induced from neighboring environment.

(g) Hydrostatic forces (e.g. pressure or weight) or shock waves.

(h) Test loads.

(i) Bracing and restraint loads.

2.3 Stress Analysis and Related Issues

2.3.1 Structural Calculation and Stress Analysis

The design calculation of an amusement ride should include a comprehensive stress analysis of the combination of loads (as outlined in Clause 2.2) exerted on individual structural components so as to demonstrate that the entire ride design is structurally sound. The structural design involving structural steel works should conform to the "Code of Practice for the Structural Use of Steel" published by the Buildings Department of HKSARG, or other international standards accepted by the Director.

2.3.2 Mechanical Design and Safety Factors

For mechanical design involving the use of materials other than structural steels, the safety factors used in the design calculation should be consistent with established mechanical/materials handbooks and/or international standards for the particular material under the specific design conditions.

When the relevant standards are at variance over the safety factors required for a particular mechanical design, the requirements of the more conservative standard should be adopted as far as possible in particular for considering:

(a) The nature of amusement ride taking into account the maximum height, speed, acceleration and deceleration of motion;

(b) Ambient factors such as wind loads, rains, etc.

(c) Result of risk assessment and the nature of possible incidents;

(d) The failure mode, for example whether the failure is due to ductile deformation, initiation of fatigue cracking, brittle fracture or their combination; and

(e) The likelihood of discovery of incipient failure during day-to-day inspection of the ride before such failure has progressed to a stage where a real danger exists.

2.3.3 Fatigue Life

An assessment of fatigue life for the amusement ride should be carried out and documented in the design submission. Proper measures, including but not limited to the following, should be taken:

(a) The design of all load bearing components and joints of an amusement ride should preferably be infinite lifetime. Proper selection of safety factor to keep the stress below threshold of fatigue limit is recommended.

(b) Under any circumstances that the infinite lifetime approach is not applicable, fault-tolerant design (provision of redundancy with no single point of failure), safe-life design (mandatory replacement of parts after reaching the designed lifetime/load cycles) or other equivalent measures should be implemented according to the recommendation from the ride manufacturer and taking into account in the design risk assessment.

2.3.4 Deflection

The deflection of simply supported beam should not exceed 1/360 of the span. The deflection of cantilever beam and column should not exceed 1/180 of the cantilever length, or otherwise in compliance with the requirements of the "Code of Practice for the Structural Use of Steel".

2.4 Stability

The following requirements against overturning and lateral sliding are applicable to all amusement rides. Design check by an RPE in the structural discipline for compliance with the said requirements should be required for rides of height (dynamic) exceeding 5 metres or where circumstance warrants.

2.4.1 Overturning

The stabilising moment under the most unfavourable in-service conditions should not be less than 1.5 times of the overturning moment along the most critical direction. The stabilising moment under the out-of-service conditions should not be less than 1.25 times of the overturning moment.

Where the stabilising moment is totally or partially provided by a permanent foundation/anchoring system, the connection between the ride and the foundation should have a safety factor of not less than 3. The holding down force and moment, as appropriate, at each fixation should be specified.

2.4.2 Lateral Sliding

Where a holding force is required to counteract the lateral sliding of the ride as a result of ride motion or loads (e.g. due to unbalanced loads, wind loads, etc.), the following requirements should be satisfied:

(a) For free-standing structure with or without additional dead weight (i.e. friction being the only holding force against lateral sliding), a safety factor of not less than 1.5 should be attained. Additional dead weight can be added to the free-standing structure to achieve the required safety factor. The plan of placing the dead weight should be verified by an RPE to be of no adverse effects to the structure.

(b) For anchoring system involving hold-down bolts or other direct connections to the foundation, the strength of connection in shear direction should be of a safety factor of not less than 3.

2.5 Restraint Device

2.5.1 Application

Restraint device should be provided when passengers may:

(a) be ejected due to the motion of the ride;

(b) be moved suddenly and unexpectedly within the passenger unit or collide with protrusions adjacent to the ride; or

(c) pose a danger to themselves or others if they do not remain seated during the ride cycle.

Remarks: (i) Partial restraint may be achieved by the design of the passenger unit, seat configuration and other inherent restraint features. On the other hand, such features may also have negative effects on the protection of the passengers. Manufacturer should carry out an overall review to set up the best protection for passengers.

(ii) Restraint device of the mechanical type is considered not suitable for waterborne rides witha risk of overturning.

2.5.2 General

The configuration of restraint device should in general be determined by the magnitudes and directions of acceleration (deceleration) attended by the passengers during the ride cycle.

Restraint device should be secure and comfortable to the passengers. Harness and seat belt should be easily adjustable. Bars, belts, supports, locks and latches should be of sufficient strength to withstand the forces applied to them under the most unfavourable operating conditions.

Restraint device should be easy to use and designed to prevent accidental release due to movement of the passengers or the ride.

The design of restraint device should take into consideration the evacuation and rescue of passengers from any reasonably foreseeable position and/or situation in the amusement ride, including emergency stops and stops in unplanned locations.

2.5.3 Warning Sign

If the restraint device is not adjustable, signs should be displayed restricting the minimum and maximum physique of passengers permitted to use the ride.

The risks of disregarding any warning should be addressed in the risk assessments, followed by the corresponding risk reduction measures.

2.5.4 Fixing of Restraint Device

Restraint device should be securely fastened to the structural members of the ride. Where bolts are used, nuts should be provided with locking devices, e.g. castellated nuts with locking pins or other means to make the nuts captive. The use of screws for fastening restraint device should be avoided.

If the restraint device forms part of or is attached to the door or gate of the passenger unit, double lock or double latch should be provided.

2.5.5 Requirements for Interlocking

If the ride motion is so vigorous that there is a risk of passengers being ejected from the seats, the restraint device should be interlocked with the ride control as follows:

(a) The restraint device should be locked in the operating position by positive means and the release mechanism should be inaccessible to passengers. The restraint device should

allow manual release by operators or rescue personnel in the event of emergency situations or ride malfunctioning, where evacuation or rescue is required.

(b) During normal operation, the restraint device should be released automatically by the control system or manually by the operators at the unloading position.

(c) Where practicable, the control system should prevent the dispatch of ride from the loading point unless all the restraint devices are engaged.

The release mechanism of the restraint may be accessible to the passengers provided that the risk of passengers being ejected/falling off/falling out of the seat and the risk of passengers colliding with protrusions along the path of ride motion is negligible.

2.5.6 Restraint of Simpler Design

If the passengers are expected to remain seated in the entire course of the ride cycle, but there are no extraordinary movements or protrusions which passengers could come into contact with, a lap-bar restraint may suffice and the release mechanism may be accessible to passengers.

2.5.7 Deletion of Restraint Device

Where a risk assessment has concluded that, because of the nature of a ride, a safer outcome could be accomplished by enabling the passenger to leave the ride in the event of abrupt stoppage, then restraint device need not to be provided.

2.5.8 Cushion

Restraint device should have a configuration without acting upon sensitive and fragile parts of the passenger's body. In addition, cushion should be provided for restraint device and the surface of the rides with which passengers will impact during the ride cycle.

2.5.9 Lock and Latch

The lock and latch on rides should provide a clear indication on its locking status such that the operators can easily check during the loading/unloading process. Lock and latch should be located in a proper position so as to prevent inadvertent release by passengers. The loss of holding power (e.g. spring tension, power supply, pneumatic pressure, etc.) should not cause the lock or latch to release. In case of malfunction or emergency stop of the ride where the passengers are maintained in their seats or positions by the restraint devices, arrangements should be made for unlocking the device by the operators or other authorised personnel. Alternative approach for releasing the passengers with support of appropriate risk assessment may be acceptable.

2.5.10 Movement of Passengers on the Seats

The seat should be shaped to prevent the passengers from sliding under the restraint device (lap-type bar, seat belt or chain); otherwise, crotch strap, chain or the likes should be provided.

2.5.11 Prevention of Vigorous Head Movement

The seat and restraint device should be designed to mitigate any excessive head movement for protection of passengers' head and neck muscles.

2.5.12 Strength of Restraint Device

Where the ride is designed to operate in a position with the passengers in an upside-down position and the passengers' body weight is supported by the restraint device, the restraint device should be specially designed to carry the passengers' weight for such mode of operation.

2.6 Brake System

The brake system of an amusement ride should be one or a combination of the following kinds of systems:

(a) Pressure or mechanically actuated friction brake acting on the drive mechanism or directly on the passenger unit. For friction brake applied to a free running passenger unit, the brake should perform effectively under all weather and operating conditions.

(b) Hydraulic regenerative brake or hydraulic relief brake in which the hydraulic motor is decelerated by reversing the hydraulic flow in a controlled manner to achieve a smooth braking action.

(c) Electrical brake of the regenerative, dynamic or eddy current (permanent magnet or electromagnet) type.

For rides which include vertical lifting of passenger unit, the brake system of that lifting section should be fail-safe, that is the brake is automatically engaged in the event of loss of power or control signal (e.g. hose breakage, wire breakage).

If the ride may move during the loading and unloading of passengers, parking brake or holding brake should be provided.

The braking action should be designed to avoid excessive force/deceleration that would cause injury of passengers or damage to the integrity or stability of ride structure. Operational brakes, including stopping and speed regulation, should be designed to avoid exceedance of the maximum deceleration of 4.91 m/s^2. Emergency brakes should be designed to avoid exceedance of the maximum deceleration of 6.87 m/s^2, unless special protection device (lap bar, etc.) is provided for the passengers.

For ride which stops by inertia or any mechanisms other than those mentioned above, an explicit risk assessment should be carried out to validate the adequacy of the design.

2.7 Lifting System

2.7.1 General

Where passengers on an amusement ride are lifted or lowered, appropriate means should be provided to safely return the passenger carrying unit to its loading/unloading position, or to another designated location for safe disembarkation in accordance with Clause 3.16 regarding evacuation.

In case of failure or malfunction of the hydraulic or pneumatic system, the maximum lowering speed should not exceed 0.3 m/s for any passenger unit, unless shock absorbing devices or other equivalent systems are provided for the passengers.

2.7.2 Hydraulic System

Hydraulic cylinders or rams used in the lifting system should:

(a) conform to ISO 4413;

(b) have a safety factor of not less than 6 against rupture under the most extreme acceleration and deceleration;

(c) be designed to prevent buckling at full extension; and

(d) be fitted with a hydraulic restrictor at its lifting pressure port.

2.7.3 Pneumatic System

Pneumatic cylinder or rams used in the lifting system, no matter acting bi-directionally or carrying load in both directions (over-centre system), should:

(a) conform to ISO 4414 and the Boilers and Pressure Vessels Ordinance (Cap. 56);

(b) be designed to accommodate the maximum pressure developed in the most extreme acceleration and deceleration;

(c) be designed to prevent buckling at full extension; and

(d) be fitted with a quick-action holding valve at its pressure port(s).

If the pneumatic cylinder or ram cannot be fitted with a positive load-holding device, the ride should be equipped with an independent and automatic system that activates under emergency conditions (e.g. overspeeding) to restraint the motion.

2.7.4 Wire Rope Systems

If the passengers are lifted by hoisting a passenger unit or a cradle with wire ropes, the wire rope system should comply with the following requirements. Any special design deviating from the following should be supported by sufficient grounds and in compliance with applicable international standards on wire rope system.

(a) Minimum number of wire ropes

(1) At least 4 suspension ropes are required. Design with 2 suspension ropes may be considered for the following exceptional cases:

i. The height of falling does not exceed 2 metres; or

ii. Rail-guided passenger unit is equipped with fall arrestor, eddy-current brake or a redundant system for the lifting device.

(b) Rope loading

(1) The imposed load should be equally shared by the wire ropes.

(2) In case spring equalisation is used, each individual spring should be capable of supporting the total static load without damage (without permanent deformation).

(3) In case equaliser beam is used, the movement within the equaliser members should be restricted such that, on the loss of one suspension rope, the load is transferred to the other ropes but the unbalanced load among the remaining ropes should not be more than 10% of the load carried by any individual rope.

(c) Emergency brake (Safety brake)

(1) The emergency brake should operate directly on, or be rigidly coupled to, the winding drum or the traction drum or directly on the wire ropes.

(2) The emergency brake should be capable of stopping the motion within a safe distance under the conditions of 25% overloading or 40% overspeeding.

(d) Winding drum machinery

(1) Multiple layer drum should not be used.

(2) Roller pressing the wire rope on the drum or equivalent device should be provided to prevent the rope from leaving the drum inadvertently.

(3) Under all operating conditions, there should be not less than 2 full dead turns of wire rope remaining on the drum.

(4) A wire rope spooling device synchronised mechanically with the rotation of the winch drum should be provided to guide the wire rope positively so that the wire rope is accurately wound and channeled in the grooves.

(5) If wire ropes are wound on more than one drum, all the drums should be synchronised mechanically to ensure proper leveling of the passenger unit or cradle at all operating positions.

(6) The winding motion should stop when wire rope slack or cross over on drum is detected, and an alarm signal should be given.

(7) Operational limit switch and whole-current non-self-resetting over-travel limit switch should be provided for normal and emergency stop control at both ends of travel.

(e) Traction drive machinery:

(1) Wire rope slippage should not be allowed in the operating range; and

(2) Operational limit switch and whole-current non-self-resetting over-travel limit switch should be provided for normal and emergency stop control at both ends of travel.

(f) Lifting with wire ropes

(1) Device should be provided to detect the breakage of wire ropes and to stop the ride motion, unless fall arrester or equivalent safety gear is provided, or it is proved that the velocity will be within a safe limit in all circumstances;

(2) The fall arrestor should be of fail-safe design. Fall arrestor would be engaged whenever the speed of descend exceed 140% of the normal full speed;

(3) The ratio of sheave or drum diameter to wire rope diameter should not be smaller than 30:1 for all components in contact with wire ropes; and

(4) Buffering devices should be provided at landing so as to prevent excessive impact to passengers in any case of failure.

3 General Specification for Materials, Installation and Facilities

3.1 Suspended Passenger Unit

Suspended passenger unit should be suspended with rigid distributor device or similar design to prevent entanglement of lifting chains/wire ropes. Backup system should be provided for all single-point suspended passenger units, sways, arms and other passengers-carrying components. The backup system may consist of chains, ropes, pins or other structural members of adequate size and strength. Pin holes and bolt holes of the suspension and backup system should be properly staggered to avoid wrong assembly.

For amusement ride where there is a risk of falling from a height of 2 metres or more, the passenger unit should be suspended by 4 wire ropes or chains unless other fall protection system such as a fall arresting device and safety gear is in place. The anchoring position should be suitably designed such that when one of the wire ropes or chains broke, the passenger unit should remain reasonably stable and the tilting of the passenger unit should not cause passengers to fall out.

3.2 Wire Ropes, Shackles and Pulleys

Suspension wire ropes should be stranded steel wire ropes complying with EN 12385. The rope should be free of joints or repairs. The safety factor of wire rope should not be less than 10, but a higher safety factor of 14 should be considered where the circumstance warrants. Both ends of the wire rope should be securely fastened and the strength of rope termination should be not less than 80% of the breaking load of the wire rope. The wire rope should be properly guided throughout the path of travel. Pulleys with self-lubricating bearings should be provided at all bends. The diameter of pulley should be compatible with that of the corresponding wire rope. Guidance device should be provided to prevent the wire rope from slipping off the pulley.

3.3 Hydraulic System

All the hydraulic fluid transmission system associated with amusement ride should conform to ISO 4413 and the requirements specified hereunder.

3.3.1 Design Information

The design submission should include a schematic diagram of the hydraulic system, in accordance with ISO 1219-2, and the following information:

(a) Identification of equipment by name and model number;

(b) Torque and speed of hydraulic motor;

(c) Flow rate of pump;

(d) Power and speed of pump prime mover;

(e) Pressure settings; and

(f) Fluid type and viscosity grade.

3.3.2 Installation and Safety Features

Hydraulic system components which require regular maintenance or adjustment should be easily accessible from a safe working position. The following safety features should be incorporated into the design of the hydraulic system:

(a) Safety device to protect against hose failure which could affect the operational stability of the ride;

(b) Overpressure protection for the discharge side of pump capable of handling the maximum flow of the pump;

(c) Overpressure protection for loadbearing hydraulic cylinders; and

(d) Protection device against over-travelling.

3.4 Pneumatic System

The pneumatic system should conform to ISO 4414. Pressure vessel inside the pneumatic system should fulfill the requirements of the Boilers and Pressure Vessels Ordinance (Cap. 56). The design submission should include a schematic diagram of the pneumatic system, in accordance with ISO 1219-2, and the following information:

(a) Identification of equipment by name and model number;

(b) Torque and speed of compressor motor;

(c) Flow rate of compressor;

(d) Power and speed of compressor prime mover; and

(e) Pressure settings.

3.4.1 Installation and Safety Features

Pneumatic system components which require regular maintenance or adjustment should be easily accessible from a safe working position. The following safety features should be incorporated into the design of the pneumatic system:

(a) Safety device to protect against hose failure which could affect the operational stability of the ride; and

(b) Pressure vessel should be fitted with appropriate pressure relief valve. The discharge point should be contained or directed so as to eliminate the risks of equipment contamination or injury of persons.

3.5 Electrical Requirements

3.5.1 High Voltage Installation

High voltage electrical installation (exceeding 1 000 V a.c. or 1 500 V d.c.) should be prohibited for amusement rides, except cold-cathode illumination systems (e.g. neon lights).

3.5.2 Low Voltage Installation

Low voltage installation (50 to 1 000 V a.c. or 120 to 1 500 V d.c.) for amusement rides should be equipped with over-current protective device of appropriate rating. The protective device may either be:

(a) Air Circuit Breaker (ACB) and Moulded Case Circuit Breaker (MCCB) should be in compliance with and type tested to IEC 60947-2; or

(b) Miniature Circuit Breaker (MCB) should be in compliance with and type tested to IEC 60898-1; or

(c) Residual Current Device (RCD) should be in compliance with and type tested to IEC 61008-1 or IEC 61009-1; or

(d) Fuse switch should be in compliance with and type tested to IEC 60269-1.

3.5.3 Extra Low Voltage Installation

For extra low voltage installation (less than 50 V a.c. or 120 V d.c.), transformers should either be inherent short-circuit proof or provided with overload and short-circuit protection. Bare conductors should not be used.

3.5.4 Equipotential Bonding Requirements

All electrical installations, except for extra low voltage installations, should be earthed in accordance with the following requirements:

(a) Where the power is from the mains supply, all conductive parts not forming part of the live conductors should be solidly and effectively earthed in accordance with IEC 60364 and the Code of Practice for the Electricity (Wiring) Regulations.

(b) Where the power is from a generating set, the generating set should comply with ISO 8528. The star point of the generator and the generator frame should be solidly bonded to an earth electrode solely driven for the purpose. The amusement ride and the generator frame should be connected together with earthing conductor of adequate ample size to the same requirements as mains supply in accordance with IEC 60364.

3.5.5 Local Wall-mounted Switch Panels

The panels should comply with IEC 61439-1 and constructed generally to Form 2b to IEC 61439-2. The enclosure should be of ingress protection at least IP 41 to IEC 60529 for indoor applications and at least IP 54 to IEC 60529 for outdoor applications.

3.5.6 Free-standing Motor Control Switchboard

The low-voltage motor control switchboard should be free-standing floor-mounted cubicle switchboard containing the motor starters, controls and switchgears for various electrical equipment of the amusement ride. The switchboard should be verified to comply with IEC 61439-1 and constructed generally to Form 3b of IEC 61439-2. The enclosure should be of ingress protection at least IP 31 to IEC 60529 for indoor applications and at least IP 54 to IEC 60529 for outdoor applications. The switchboard should be clearly marked and labeled with the safety signs, control circuits and electricity characteristics of the switchboard.

3.5.7 Isolating Switch

Every amusement ride that is connected to a power supply should be provided with an isolating switch in a position readily accessible to the maintenance personnel working in the vicinity of the ride.

3.5.8 Emergency Lighting

Adequate emergency lighting and illuminated "EXIT" signs should be provided for safe operation of the amusement ride in accordance with the Codes of Practice for Minimum Fire Service Installations and Equipment.

3.5.9 Power Points

Where the public is admitted, the power supply to motors, equipment, lighting and socket outlets installed on the moving parts of an amusement ride and to all socket outlets which are less than 2.5 m above the floor level or within the arm reach should be protected by one of the following methods:

(a) Provided with residual current device (RCD) of rated residual current not exceeding 30 mA; or

(b) An extra-low voltage system connected to the non-earthed secondary side of the isolating transformer.

3.5.10 Other Requirements

(a) Any cable passing under an amusement ride or within 1 metre of any moving part thereof should be provided with mechanical protection.

(b) Exposed lamps, except those supplied by extra-low voltage or protected by a residual current device, should not be installed in any locations accessible to the public.

(c) All electrical terminations and connections should be capable of withstanding any reasonably foreseeable vibration and movement.

(d) Power supply to the control devices handled by passengers should be an extra-low voltage supply only.

(e) Pendant, roving controls or any control handled by operators should be either double insulated or connected to an extra-low voltage supply.

3.5.11 Flexible Cable and Plug

(a) The supply cord and other connecting cables should be of heavy-duty type and should be mechanically protected where necessary.

(b) The removal of a single access cover from the coin container, coin mechanism or other similar components should not cause the live part or basic insulation to be exposed.

(c) Every drive motor and all exposed metal parts of the equipment should be effectively earthed to the mains earth.

3.5.12 Electrified Metallic Grid

Where an amusement ride involves an electrified metallic grid installed in an area accessible to the public, the electrified metallic grid should be installed at least 2.5 metres above the floor level and the supply voltage should not exceed 120 V ripple free direct current.

3.5.13 Electrical Installation of Aquatic Rides

Electrical installation in the vicinity of water pools or channel (e.g. those of aquatic ride) should comply with Code 26M of the Code of Practice for the Electricity (Wiring) Regulations.

3.6 Ride Control Equipment

The control panel (also called control station, control console or control equipment) of the amusement ride should fulfill the following requirements:

(a) The location of control panels should be carefully selected so as to minimise any interference of passengers or passers-by, and to allow the operators at the main control panel to have an unobstructed view of the loading and unloading process. Should the operator at the main control panel be unable to view the whole loading and unloading process or passenger's misbehavior during ride motion, then proper monitoring and communication measures such as CCTV, intercom, public address system, etc. should be provided. Such provisions should be considered in the risk assessment.

(b) The Chief Operator should be able to have direct and supervisory control of all functions for loading, unloading and handling emergency situations from the main control panel.

(c) Visual indicators should be installed, where necessary, to display the operational status of the ride. For alerts, warning and abnormal status, audible alarms should be available.

(d) The controls and indicators on the mimic panel should be arranged in such a way that the flow of signals and control actions corresponds to the actual ride cycle.

(e) Any emergency stop should bring the ride to stop in a safe manner. The ride should only be reset manually after activation of emergency stop. The emergency stops should be of push-button type located prominently for immediate access by operators.

3.7 Lightning Protection

For outdoor amusement rides involving tall and massive structures, an assessment on the risk of being struck by lightning should be made in accordance with BS EN 62305-2. If provisions of lightning protection are determined to be necessary, the design should conform to BS EN 62305.

3.8 Steam and Gas Propelled Equipment

(a) All boilers and steam receivers associated with amusement ride are required to comply with the requirements of the Boilers and Pressure Vessels Ordinance (Cap. 56).

(b) High-pressure steam is not allowed in amusement rides.

(c) Hot water boilers and burners should be constructed to BS 855 and BS 799, respectively. All the exposed surfaces, pipeworks and accessories should be well insulated such that the surface temperature should not exceed 40°C.

(d) The steam or hot water systems should be equipped with safety devices including, but not limited to, dual safety valves, low water level cutout, over temperature protection and automatic firing control.

(e) Miniature locomotives and steam engines should comply with BS 7328.

(f) Where hot air is used (except hot air balloon), all the exposed ducting, diffusers or other components should be well insulated such that the surface temperature should not exceed 40°C. The temperature of hot air should not exceed 60°C.

(g) For flying captive balloons or the likes, prior approval from the Director of Civil Aviation should be sought and where the use of fuel gas is required, requirements of the Gas Safety Ordinance (Cap. 51) are required to be complied with.

3.9 Fire Protection

If the passenger of an amusement ride is totally enclosed in a cabin, all the upholstered furniture inside the cabin should be verified to comply with appropriate international standards on fire resistance, non-combustibility and toxicity control on smoke emission. Subject to risk

level, automatic firefighting equipment (e.g. sprinkler heads) should be provided if deemed necessary. Fire protection should comply with the requirements stipulated by the FSD.

3.10 Propulsion System and Associated Protective Mechanism

The propulsion system of an amusement ride should comply with the following requirements.

3.10.1 Protection for Overspeed

For amusement rides where overspeed may cause fatality or injury (e.g. a vertical ride involving a traction drive in the course of descending), the drive should be fitted with sensing devices that would trigger the mechanism to slow down and stop the movement of passengers in a safe manner whenever the designed maximum speed is exceeded. The amusement ride should only be reset manually after overspeed.

The overspeed sensing devices should be fail-safe and be able to be tested regularly. The test method and recommended test frequency should be mentioned in the maintenance manual.

3.10.2 Protection for Underspeed

For amusement rides where underspeed may cause fatality or injury (e.g. failure to maintain the centrifugal force to keep the passenger unit in proper orientation), the drive should be fitted with underspeed sensing devices that would trigger the mechanism to prevent the passenger unit from reaching a dangerous orientation whenever the designed minimum speed is not reached/maintained. The passenger unit should be able to restore to a safe orientation immediately upon loss of speed. The amusement ride should only be reset manually after underspeed.

The underspeed sensing devices should be fail-safe and be able to be tested regularly. The test method and recommended test frequency should be mentioned in the maintenance manual.

3.10.3 Retrieval by Manual Winding

If the passenger unit may be stranded in the event of drive system failure (e.g. loss of power), the ride should be equipped with proper facilities and procedures to facilitate manual winding of the passenger unit back to a safe position or emergency disembarkation in accordance with Clause 3.16 regarding evacuation.

If the ride is of a size/configuration that manual winding is not practical, an emergency power system and other appropriate measure should be installed/provided for evacuation.

3.11 Vehicle Body

Any part of amusement ride which the passengers may contact, including the passenger unit, loading and unloading area, queue area, etc., should be free of sharp edges and corners, and have no protruding objects such as studs, bolts and screws. Adequate padding should be provided at the locations on which passengers may impact during the ride cycle.

Each individual passenger unit should be provided with clear, unique and identifiable marking.

3.12 Safety Clearance and Envelope

Any fixed or moving objects that may injure the passengers during the ride cycle should be beyond the reach of the passengers. The following requirements on the safety envelope

should apply to all amusement rides unless the safety risk is otherwise properly avoided to the satisfaction of the Director.

3.12.1 Fully Enclosed Passenger Unit

If passengers are fully enclosed inside the passenger unit but there are openings of the following dimensions on the passenger unit, the minimum clearance from adjacent objects should be:

(a) If opening < 9 mm, minimum safety clearance = 90 mm

(b) If opening ≥ 9 mm and opening < 50 mm, minimum safety clearance = 150 mm

(c) If opening ≥ 50 mm, the requirements specified in Clauses 3.12.2 and 3.12.3 should apply.

3.12.2 Restrained Passenger in Open Type Passenger Unit

If passenger unit is not fully enclosed but passengers are effectively restrained in the seat, the following requirements should apply:

(a) The upper space of 1.5 m extending upward from the seating surface should not be obstructed.

(b) The height of seat back (H_{back}) under different angle of seat rest (θ) should be of the following minimum dimension:

(1) If $0° \leq \theta < 15°$, $H_{back} \geq 400$ mm

(2) If $15° \leq \theta < 30°$, $H_{back} \geq 550$ mm

(3) If $30° \leq \theta < 45°$, $H_{back} \geq 700$ mm

(4) If $45° \leq \theta < 90°$, $H_{back} \geq 800$ mm

(5) If $\theta \geq 90°$, $H_{back} \geq 900$ mm

Remarks: θ is inclination of seat back measured from a vertical plane; and

H_{back} is the height of the seat back measured from the seat surface to the top edge of the seat back

(c) If θ exceeds 45° during the course of ride motion, rigid over-shoulder restraint system should be provided.

(d) The lateral safety space should conform to EN 13814-1:2019 or ISO 13857. The safety space should also be determined based on the speed of passenger unit, the height of the seat side and the type of passenger restraint.

(e) If the speed of passenger unit exceeds 3 m/s, low seat sides will be not be acceptable.

(f) Where passengers are properly restrained but their legs are hanging free, the bottom safety space of 1.0 m extending downwards from the bottom of the seat surface should be maintained.

3.12.3 Unrestrained Passenger in Open Type Passenger Unit

If passenger unit is not fully enclosed and passengers are not effectively restrained in the seat, the following requirements should apply:

(a) The vertical safety space of 2.0 m extending upwards from the floor should not be

obstructed.

(b) The lateral safety space should conform to EN 13814-1:2019 and ISO 13857. The designed space should also be determined based on the speed of passenger unit and the height of the seat side.

3.12.4 Maintenance and Inspection Requirements

If a ride may need to be serviced and inspected by maintenance personnel during its operation, the clearance beyond the surface profile of any moving vehicles should not be less than 350 mm.

3.13 Passenger Gates

Gates for access control should be positively locked to prevent unauthorised entry. Entry to an amusement ride should be controlled with gates that are only openable from the inside, unless other appropriate control measures (e.g. the entry is manned and defined by a barrier, drop-bar, or chain, etc.) are provided.

Exits with proper indications and directional signs, including those used for emergency evacuation to enable the patrons to leave the ride in a smooth manner, should be provided.

Exit points, which is independent of entry points, should either be manned and delineated as for an entry point, or should be fitted with a gate secured against entry from outside but equipped with an obvious mean for opening from inside.

3.14 Maintenance Access

The platforms, walkways, stairways and ladders which are used by the operators and maintenance personnel for operation and maintenance purposes should be designed and constructed in accordance with BS 4592. Guarding and restraints should be provided to prevent falling from height.

3.15 Guard-rails

Guard-rail should be provided as appropriate to:

(a) ensure the safety of maintenance personnel when carrying out maintenance works;

(b) confine operators and passengers inside a safe zone; and

(c) protect the safety of the spectators, passers-by and those queuing in the vicinity of the ride.

The height of guard-rail should be between 900 mm and 1 150 mm with intermediate rails at the height between 450 mm and 600 mm. Where there is hazard of falling object, toe-board of height not less than 200 mm should be provided.

3.16 Evacuation Facilities

Appropriate procedures and facilities should be provided for the safe emergency disembarkation of passengers taking into account all reasonably foreseeable stoppage such as power failure, malfunction and fire. Such facilities may include, but not limited to:

(a) equipment to bring the ride to the loading/unloading position or any other positions that allows safe disembarkation of passengers; and

(b) walkways, stairs, platforms and hatchways that are strategically installed with signs as appropriate.

If an amusement ride is located within a building, provisions of fire services installation and means of escape should in principle comply with the statutory requirements under the Building Ordinance (Cap. 123) irrespective of whether the building is specifically designed to accommodate the ride or not. The facilities may be standalone structures, or form part of the ride or the building works. The provision of evacuation facilities should be sufficient for use by all passengers with the assistance of the operation staff or firemen in case of emergency disembarkation.

3.17 Welding

All on-site welding works should be carried out in accordance with the manufacturer's welding procedure specification by qualified welder possessing recognised certificate of proficiency to the satisfaction of the Surveyor. On-site welding under unfavourable site or weather conditions should be avoided. Any doubts on the adverse implication of welding work on the structural integrity of the ride should be referred to the manufacturer or the Surveyor for advice.

All welding works should comply with the following requirements and equivalent international standards:

(a) All load-bearing welds on metallic components should be produced in accordance with EN 1011 to at least Level C to ISO 5817. Welding of steels not covered by the above-said standard, e.g. wear-resistant or hardened steels used in specific applications such as pins, shafts or tracks, should only be carried out if due consideration has been given to the metallurgical effects of the welding on the purpose of use of the component. Welds subject to dynamic stress, i.e. fatigue loads, should be to at least Level B to ISO 5817.

(b) Welding procedures should be approved in accordance with ISO 15614-1. Welders should be approved in accordance with ISO 9606.

(c) Butt welds should be made using procedures which will give both yield and tensile strengths in the filler metal not less than those of the parent metal.

3.18 Guarding of Machinery

All moving or dangerous parts of machines should be effectively guarded in accordance with the requirements of the Factories and Industrial Undertakings (Guarding and Operation of Machinery) Regulations (Cap. 59Q).

3.19 Guidelines for Drifting Cart (also known as "Crazy Cart") as Amusement Ride

3.19.1 General Description

"Drifting Cart" is a kind of battery-powered cart with emphasis on drifting during operation.

3.19.2 Recognised Organisation to Provide Training

The Competent Person and the Operators must have completed specific safety training on the operation, maintenance and emergency handling of "Drifting Cart" facility. The safety training should be provided by organisations which are recognised for motorsports, for

example, National Sports Associations of Motorsport/Karting, members of the Federation Internationale de I'Automobile (FIA), etc.

3.19.3 Conditions for "Drifting Cart" Facility

(a) Design (Cart):

(1) Safety belts of at least 25 mm in width or other equally effective devices, which can prevent drivers from being injured when impacting with other carts, should be provided.

(2) The cart body should be surrounded by shock-absorbing fenders.

(3) Relevant certificate(s) on product safety should be provided.

(4) The seats should be of appropriate dimensions for participants.

(b) Design (Track):

(1) The track should be surrounded by barriers made of flexible materials of suitable strength to withstand and absorb the impact at maximum speed and sufficient height to avoid mounting of carts.

(2) The driving area should be well illuminated. The illuminance should not be less than 150 lux.

(3) The driving area should be levelled to be free from discontinuities.

(4) The risk of overturning should be minimised taking into account the speed, inclination, bend radius and width of the track.

(5) All structural columns inside or near the track should be properly wrapped with flexible materials to absorb the energy during impact by carts.

(6) Wet, slippery, bumpy, uneven or rough track surfaces should be avoided. Track surface must be maintained in suitable conditions throughout the operating hours.

(7) The driving area should be fenced to prevent the general public from walking onto the track.

(c) Operation:

(1) Age and height restrictions should be specified with reference to recognised standards and manufacturer's recommendations. Any riders unable to fit comfortably in the cart should be refrained from driving. Riders exceeding the weight limit recommended by the manufacturer should not be allowed to drive the cart.

(2) The maximum number of carts allowed for running on the track should be specified.

(3) Only one model/performance/specification of cart is allowed to be operated at the same time.

(4) Only one participant is allowed for driving a cart. No passengers should be allowed to be carried by the cart.

(5) Operation of the ride should be monitored continuously by specified minimum number of Controllers on the track. Controllers should be trained, e.g. has completed training conducted by recognised organisations (see Clause 3.19.2). Training with coverage on Drifting Cart provided by an organisation recognised by the Federation Internationale de l'Automobile (FIA) and/or the National Sports Association of Motorsport is acceptable.

(6) Operation of the ride should be monitored by CCTV with recording capability. The record of CCTV footage should be kept for at least one week.

(7) Prominent display of safety instructions and risks, and safety warnings, indicating the

safety precautions, possible mental or physical conditions that may make riders not suitable to operate the cart should be made. The safety notice is required to include, but not be limited to, those specified in section 20 of the Regulation, use of personal protective equipment, rules for overtaking, avoidance of cart-to-cart contact, proper driving route, avoidance of leaving the cart during the session, attention to operator's instructions, etc.

(8) Drivers should be briefed of the safety instructions and risks before driving. Proper record of drivers' recognition and acknowledgement of risks should be kept (e.g. signing of declaration, video record of drivers' reading/listening of the risks and drivers' recognition by verbal response to the operator, etc.). Disclaimer, if any, should not unreasonably transfer the risk to the participants, and contents of safety briefing should be pre-approved. Trainers should meet specific training and experience requirements.

(9) Drivers must be equipped with personal protective equipment (PPE), including helmet (with chin strap securely buckled). Neck support collar is required for riders aged 12 years or below. Elbow guards and knee guards are compulsory for children and are recommended for adults. Always wear athletic shoes (lace-up shoes with rubber soles). Driving with barefoot or sandals is not allowed. Shoelaces must be kept tied and out of the way of the wheels, motor and drive system. All PPE are to be properly kept and maintained at all times.

(10) Drivers should be in proper clothing, i.e. long hair properly tied up, no loose objects, and properly dressed.

(11) Drivers should keep fingers and other body parts away from the drive chain, steering system, wheels and all other moving components. Use of headphones and mobile phones are strictly prohibited when driving.

(12) There should be a designated battery charging area with proper measures for electrical and mechanical and fire safety. Chargers should be regularly checked for damages.

(13) First aid facilities must be provided. At least one of the operators on duty should be trained by a recognised organisation on the handling of emergency situations involving Drifting Cart including, but not be limited to, injuries, fire incident, etc.

(14) Sufficient insurance coverage on compensation for damages and injuries to players and the third-party must be arranged by the cart Owner.

(15) Appropriate means for locking and preventing the maximum speed of the cart from being adjusted for use and operation in excess of the approved maximum speed should be provided. Where hardware locking means is used, the setting of the maximum speed should be sealed. The locking means and the associated seal should remain intact, except for repair or recalibration of the maximum speed setting of the cart.

(d) Maintenance:

(1) Daily pre-operational check:

i. Cart body protection

ii. Seat

iii. Driving, steering and tire

iv. No sharp edges or angles

v. Track floor

vi. Track barrier

vii. Charging area

viii. Safety Notice

(2) The cart should be maintained and repaired in accordance with the manufacturer's guidelines, using only the manufacturer's authorised replacement parts and should not be modified from the original design. Worn or broken parts should be replaced immediately.

(3) Routine maintenance should be carried out for carts and the circuit.

(4) Regular comprehensive self-audit should be conducted and the relevant reports should be kept.

3.20 Guidelines for "Go-kart" as Amusement Ride

Any "go-kart" facilities, including the cart itself, circuits and associated devices for use as amusement rides, must comply with the relevant international standards. In addition, the following specific requirements should be observed.

(a) The design and operation of the go-kart facility should comply with the "CIK-FIA Leisure Karting Guidelines" issued by the Commission Internationale de Karting ("CIK-FIA") or other international standards as recognised by the Director.

(b) Subject to the age restriction of users, design of the kart, the circuit, etc., the maximum operation speed of the go-kart should be set. However, in no circumstances should it be allowed to exceed 30 km/h.

(c) No competition of any form, including race training, is allowed.

(d) All Competent Persons and Operators should have completed the training organised by a recognised organisation for motorsports, for example the National Sports Association on Karting, or a member of the Federation Internationale de l'Automobile (FIA). The coverage of training should include but not limited to go-kart safety and operation.

(e) Driver safety and operation briefings should be conducted in video format and demonstrated to the satisfaction of the Director and the recognised organisation mentioned in (d).

(f) First aid facilities should be provided.

(g) At least one of the controllers or operators on duty should be trained and certified by a recognised organisation to handle emergency situations including, but not limited to injuries and any special circumstances.

(h) The circuits and associated operation areas should be monitored by CCTV with recording capability. The CCTV footages are required to be kept for at least 7 days.

(i) Personal protective equipment (PPE) and clothing instructions should be provided and executed.

(j) Appropriate means for locking and preventing the maximum speed of the cart from being adjusted for use and operation in excess of the approved maximum speed should be provided. Where hardware locking means is used, the setting of the maximum speed should be sealed. The locking means and the associated seal should remain intact except for repair or recalibration of the maximum speed setting of the cart.

Battery electric cars designed to be used by kids as kiddie rides should have a speed not exceeding 5 km/h.

4 Testing and Inspection

The amusement ride should be examined by the Surveyor upon completion of the installation works and thereafter regularly at a frequency not less than once every 12 months. The examination should cover the structure, electrical and mechanical systems, control and safety systems, and all other systems which may affect the integrity and safe operation of the ride. The following tests and verifications, as appropriate, should be included in the examination:

(a) Overall inspection with regard to proper manufacture and installation as specified in the design documents and the Code.

(b) Conformity of the main dimensions, safety envelopes and clearances necessary for safe and free running of moving parts.

(c) Functional tests of the control and monitoring system and protective devices, including checking of alarm signals.

(d) Checking and measurement of the performance of brakes and safety-critical systems in normal and emergency conditions.

(e) Testing of the pneumatic and hydraulic systems.

(f) Electrical tests.

(g) Non-destructive tests for welds and structural works.

(h) Checking and measurement of the performance of the ride under full load and unbalanced load in all operating conditions.

(i) Measurement of speeds, accelerations and/or forces to check against the design.

4.1 Full Load Test

Full load test should be carried out by operating the ride at the nominal speed and under the designed service conditions, with equivalent dummy loads placed on the passenger units. Continuous running of the ride at full load for a prolonged period may be required to verify the reliability of the ride.

4.2 Unbalanced Load Test

The unbalanced load test should be carried out with the configurations specified by the manufacturer or decided by the Surveyor. Such configurations should be properly documented. The Surveyor should not proceed with the unbalanced load test if there is any adverse vibration, harmonic oscillation or abnormal movement of the ride or its foundation/footing. Such findings should be included in the examination report.

4.3 Electrical Test

Electrical works should be inspected and tested in accordance with the requirements of IEC 60364 and the Code of Practice for the Electricity (Wiring) Regulations. In particular, the following electrical tests should be conducted in sequence during the initial and periodic examination, except for those parts of installations that have been satisfactorily certified in the recent inspection and testing required under the Electricity (Wiring) Regulations (Cap. 406E) with a valid Form WR1 or Form WR2.

4.3.1 Visual Inspection

Visual inspection on the electrical works should be carried out in accordance with Code 21A of the Code of Practice for Electricity (Wiring) Regulations.

4.3.2 Continuity of Protective Conductors

Every protective conductor, including all conductors and any extraneous conductive parts used for equipotential bonding, should be tested for continuity.

4.3.3 Insulation Resistance

The insulation resistance of the electrical works should be measured and should be not less than the following values.

Circuit nominal voltage	Test voltage	Minimum insulation resistance
Extra-low voltage circuits where the circuit is supplied from a safety isolation transformer	250 V dc	0.5 MΩ
Up to and including 500 V with the exception of the above cases	500 V dc	1.0 MΩ
Above 500 V	1 000 V dc	1.0 MΩ

Care should be taken to ensure that the insulation of the equipment under test can withstand the test voltage without damage.

4.3.4 Polarity

The test of polarity should be carried out to verify that:

(a) fuses, single-pole controls and protective devices are connected in the phase conductor only;

(b) centre-contact Bayonet-type cap and Edison-type screw lampholders have earthed neutral conductor, or have their outer or screwed contacts connected to the neutral conductor; and

(c) wiring to socket outlets and similar accessories are correctly connected.

4.3.5 Earth Fault Loop Impedance and Earth Electrode Resistance

A test should be carried out to verify the effectiveness of the earthing by means of a phase-earth loop tester. The impedance for each loop should not exceed the requirements as stipulated in Code 11 of the Code of Practice for Electricity (Wiring) Regulations.

The earth electrode resistance should be measured with the method specified in Code 21B(7) of the Code of Practice for the Electricity (Wiring) Regulations.

4.3.6 Functions of Protective Devices

Every residual current device should be tested with residual current device tester simulating an earth fault or other methods complying with relevant international standards.

Air circuit breakers, moulded case circuit breakers, miniature circuit breakers, isolators, switches and indicative devices should be checked by hand operation.

Overload and fault current protection characteristics of protective relays should be verified with secondary injection test.

4.3.7 Lightning Protection System

The lightning protection system should be tested as per Clause 3.7 of the Code.

4.4 Tests for Hydraulic and Pneumatic System

The following components of hydraulic and pneumatic system should be checked:

(a) Ram and cylinder;

(b) Leveling switches;

(c) Pipeworks, joints, bolts, fixings, stop valves, oil reservoir, pump and motor;

(d) Control valves, pilot and leveling valves, overrun and cut-off devices, pressure relief valves, safety valves;

(e) Air release cock and anti-siphon valve; and

(f) Pressure vessels.

Besides, the following tests should be carried out to verify the integrity of the hydraulic/pneumatic system and its components as per the manufacturer's specifications:

(a) Functional test to ascertain the correct operation of the system and all safety devices; and

(b) Pressure tests to every part of the hydraulic/pneumatic system at the maximum working pressure under all operating conditions.

4.5 Non-Destructive Test

Non-Destructive Test (NDT) referred hereunder comprises a variety of methods for locating cracks or discontinuities on the surface or inside of structural components of the ride. The presence of these cracks or discontinuities may be detrimental to the structural or functional integrity of the components and hence affect the overall integrity of the ride. The cracks present in the structural elements may lead to reduction in their mechanical strengths. The NDT should have no deleterious effects on the material or structure under testing.

NDT ranges from simple techniques such as visual examination of surfaces, through the well-established methods of radiography, ultrasonic testing, magnetic particle crack detection (MPI), to the specialised methods such as the measurement of Barkhausen noise and positron annihilation. Every test method has attributes and limitations that should be considered when choosing an NDT program for a ride. The factors that should be taken into account include

the manufacturing process, the intended service, and the service environment of the component.

Aspects of NDT methods such as terminology, equipment and working principles should comply with CEN-TC138. The technician carrying out the NDT should be familiar and experienced with the standard and procedures relevant to the particular method used. The technician should be accredited according to ISO 9712, PCN (Personnel Certification in NDT), ASNT (American Society of NDT) or other internationally recognised certification schemes.

The Surveyor or the appointed technician carrying out NDT should be able to distinguish between original manufacturing flaws and flaws developed during ride operation, and to distinguish between significant and insignificant flaws. Therefore, the Surveyor or the appointed technician should acquaint himself with the fabricating method, the stresses acting on that component, and the type, size and orientation of flaw which is significant under those conditions of stress, material or geometry.

Manufacturer should recommend a schedule of components for non-destructive tests in terms of running hours of the ride, otherwise the Owner should arrange to carry out NDT on a portion of critical welds at least once a year, and ensure that all critical welds are checked with magnetic particle inspection, ultrasonic test or equivalent methods in a 10-year or shorter cycle as determined by the actual status of the ride (i.e. any frequent pre-mature failure of components). NDT should cover elements like structural frames, supports, tracks, wheel assemblies, shafts, spindles, sweep arms, vehicle frame and attachments, steel cables, structural columns, chains, pins and bolts, etc. The acceptance criteria should be in accordance with ISO 5817 or other equivalent international application standards.

4.6 Certification and Test Record

Under the Ordinance, the Surveyor is the person who is appointed by the Owner to be responsible for examination of the ride, and certification on the integrity and safe operation of the ride. Verification of test records on individual parts or sub-system of ride performed by manufacturers or others inspection bodies as proof of satisfactory testing conducted and covered in the record is acceptable if reasonable steps have been taken to verify that the tests are relevant, the procedures used are appropriate and the results reliable. Such test records include:

(a) Type test certificate of standard product;

(b) Test certificate issued by an independent testing institute for wire ropes, pressure vessels, safety gears, buffers, etc.; and

(c) Non-destructive test on welding and structural works.

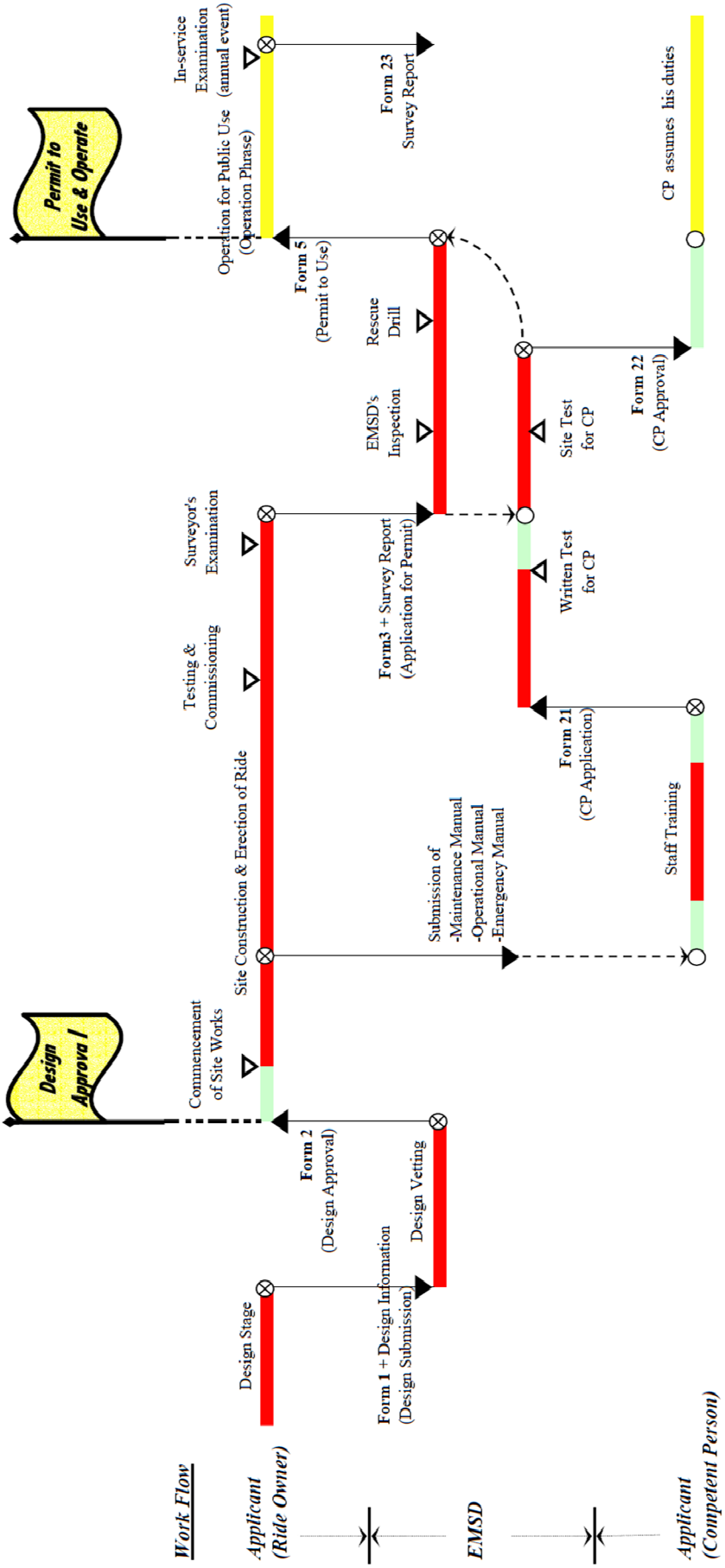
Although the Surveyor may make reference to above-mentioned information as he/she thinks fitted, the Surveyor should always exercise his due diligence to check the accuracy of these test records and carry out a thorough examination of the ride to check and verify its fitness for use by members of the public. Any tests performed by the Surveyor or critical information that justifies his/her conclusion should be documented in the survey report. Apart from a conclusion on the integrity and safe operation of the ride, the Surveyor should report on wider safety-related matters and recommend on improvement measures for the ride.

4.7 Pre-installation Inspection

Before the rides are installed or the design approval is granted, appropriate inspections may be arranged to witness the manufacturing process, initial testing, design review, functional and safety testing, etc. As a general requirement, the compliance of the material, parts,

assemblies, components as well as their assembly and combined effects of the entire installation should be confirmed with respect to the approved design documents. Records are to be submitted to the EMSD and reference may be made to the manufacturer's inspection documents, quality system and/or declarations as part of the proof of conformity, and previous examination reports.

5 Chart of Licensing Process



6 Reference

(a) Amusement Rides (Safety) Ordinance, Cap. 449

(b) Amusement Rides (Safety) (Operation and Maintenance) Regulation, Cap. 449B

(c) Boilers and Pressure Vessels Ordinance, Cap. 56

(d) Building Ordinance, Cap. 123

(e) Electricity Ordinance, Cap. 406

(f) Engineers Registration Ordinance, Cap. 409

(g) Gas (Safety) Ordinance, Cap. 51

(h) Code of Practice for Electricity (Wiring) Regulation

(i) Code of Practice for Fire Resisting Construction

(j) Code of Practice for Minimum Fire Service Installations and Equipment

(k) Code of Practice for the Provision of Means of Escape in Case of Fire

(l) Code of Practice for the Structural Use of Steel

(m) Code of Practice on Wind Effects in Hong Kong

(n) BS EN 13814:2019 – Safety of amusement rides and amusement devices

(o) ISO 17842:2015 – Safety of amusement rides and amusement devices

(p) ASTM International – F24 on Amusement rides and devices

(q) GB 8408 – Large-scale amusement device safety code

(r) AS 3533 – Amusement rides and devices

(s) HSE 175 – Fairgrounds and amusement parks: Guidance on safe practice

7 Enquiry

General Legislation Division
Electrical and Mechanical Services Department
3 Kai Shing Street, Kowloon, Hong Kong

Telephone Number	:	(852) 1823
Facsimile Number	:	(852) 2577 4901
Electronic Mail	:	rides@emsd.gov.hk
Website	:	www.emsd.gov.hk

General Legislation EMSD

Electrical and Mechanical Services Department
3 Kai Shing Street, Kowloon, Hong Kong
Tel: (852) 1823
Website: www.emsd.gov.hk
Email: info@emsd.gov.