



TECHNICAL SPECIFICATIONS OF THE EQUIPMENT

São Leopoldo - RS, September 2023



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1 INTRODUCTION

The construction of a ferris wheel is a challenging and complex undertaking that requires the utmost care and attention to ensure the safety, quality and efficiency of the attraction. In this context, it is essential to have high quality equipment in all stages of its manufacture, with first-line components and parts, providing complete information including assembly manual and fulfilling all the prerequisites that will be described during this Technical Specification.

The manufacturer must have the responsibility and a real commitment to the assembly of the equipment, with solid technical support and rigorous certifications, with 24-hour online service for prompt response in case of emergencies. In addition, the manufacturer's information plays a crucial role in the process of acquiring and installing the ferris wheel, ensuring its reputation in the market and its experience in similar projects. Thus serving as a determining factor for the choice of the manufacturer company.

Engineering and calculations also play a key role in ensuring the safety and stability of the structure, requiring the correct specification of each part and the realization of memorials of detailed calculations and technical drawings. The manufacturing company must also accurately estimate the assembly and delivery time of the ferris wheel.

The manufacturer must also provide safety, quality and energy efficiency certifications, as well as strength, stability and functionality reports to ensure its structural integrity and the correct functioning of the systems.

In addition, the equipment supplier must follow all international standards and certificates for Ferris wheel safety and performance, referenced in this Technical Specification, in addition to the performance standards of the country of manufacture.

By following all these requirements and guidelines, the Ferris wheel project will be well grounded, ensuring the satisfaction of the contractor and offering an unforgettable and safe experience to visitors to Mato Grosso. The ferris wheel will become not only an iconic attraction, but also a symbol of quality and excellence in the scenery of Brazil's tourist attractions.

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2 EQUIPMENT FEATURES

Regarding the characteristics of the equipment, the main aspects of the Ferris wheel should be highlighted, such as its height, design, number of cabins, load capacity and delivery availability.

2.1 Wheel height

The height of the Ferris wheel was set at 108 meters, considering several technical, aesthetic and functional aspects. This height will provide passengers with a panoramic view of the beauties of Mato Grosso. In this way, it will assume the title of the largest Ferris Wheel in Latin America and will enter the world ranking of equipment above 100 meters in height.

2.2 Ferris wheel design

For the design of the Ferris wheel, the Government of Mato Grosso chose a cable-stayed equipment with the rim in the lattice format, ensuring a robust and efficient structure, as well as a more modern design. The support will be ensured by six columns strategically positioned on the plates and inserts of the foundations.

Choosing a cable-stayed design gives the Ferris wheel greater stability and strength, allowing it to reach significant heights without compromising passenger safety. In addition, it minimizes the costs of future pathologies caused by time.

The truss configuration of the rim provides an even distribution of weight, reducing the effort at each point of the structure and making it lighter and more efficient in terms of the materials used.

The six strategically placed columns ensure a balanced distribution of loads and allow the ferris wheel to maintain its stability during operation. The arrangement of these columns also contributes to the aesthetic design of the ferris wheel, creating a symmetrical and elegant view.

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2.3 Number of cabins and load capacity

The selected Ferris wheel will feature a total of 42 cabins, 30 of them with standard finish and 12 with premium finish, providing a differentiated experience for visitors.

Each cabin must be designed to comfortably and safely accommodate a total of eight people. In this way, as there will be 42 cabins, the total capacity of the wheel will be 336 users simultaneously.

The total capacity of 336 people is a requirement of the Government of Mato Grosso in view of the public estimate and the quality service they aim to provide, avoiding long lines.

2.4 Cabin design

The cabins should be designed to offer comfort and safety to passengers, with a well-designed structure and quality materials. The design will be spherical, with aluminum structure and translucent parts in acrylic. They should be spacious enough to accommodate 8 people, will have RGB light system, bluetooth system and an interface for control that can be operated by the passenger for their entertainment. This panel will be coupled to the fiber structure on the reverse side of the door and will be 1.10m high from the floor.

Cabins shall be at least the following dimensions:

- a) Total height of cabins: 3110 mm;
- b) Outside diameter: 3000 mm;
- c) Internal useful height: 1890 mm;
- d) Weight capacity per cabin: 600 kg;

The 30 cabins with standard finish will have a seat and backrest in caramel color and the floor will receive a rubberized coating in burnt cement texture.

In turn, the 12 cabins with premium finish should have seat and backrest in caramel color, where the design of the backrest differs from the seat, in addition to

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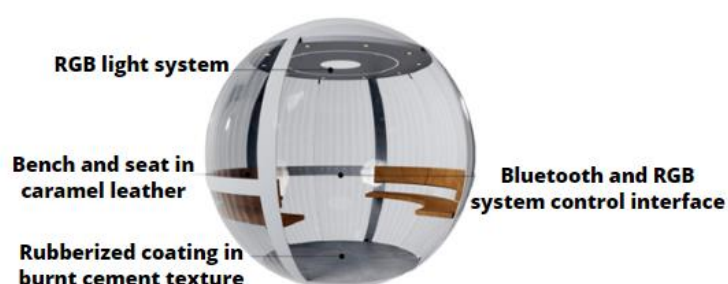
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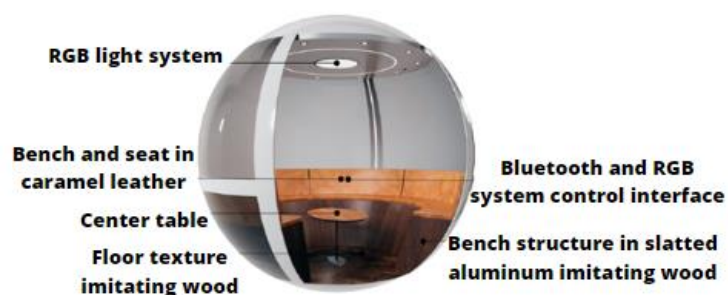
the structure the base of the seat being coated with slatted aluminum imitating wood. The floor should be in a rubberized or aluminum with printing imitating wood and the cabin will also feature a coffee table.

The images below demonstrate what cabin finishes should look like:

Standard cabin



Premium cabin



Every welding team must be qualified following the guidelines of ISO 9606-2:2004 or equivalent international standards. To guarantee aluminum welding joints, these guidelines must be followed.

The choice of vinyl floors for the cabins must follow the specific requirements established by the ABNT NBR 14917-1:2022 standard, which refers to the thickness criteria suitable for heavy commercial use. The adoption of this material is

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determined by the need to comply with durability and resistance standards, ensuring a robust and safe floor for the application in question. According to ABNT NBR 14917-1:2022, it is essential that the thickness of the vinyl floor meets the standards recommended for use in environments of high demand and traffic, contributing to the aesthetic integrity of the cabins and to the safety of the occupants for any possible accidents over time. It is important that if, in the country of manufacture of the material, there is a regulatory standard for this type of material, it must be referenced and attached with the proofs of tests and reports, attesting to its resistance to high traffic.

The upholstery of the cabin must comply with NBR 15164:2004, paying attention to the minimum measures of seat and backrest according to the table below presented in item 4.5 of the standard.

Minimum upholstery dimensions

Variable name	Minimum value
Minimum individual seat width	42.5 cm
Minimum useful seat depth	47.0 cm
Floor seat height	42.0 cm
Minimum backrest height	17.0 cm

In addition, it is also necessary to choose the correct polyurethane foam for the filling of the upholstery. As described in item 4.2 of NBR 15164:2004, it must meet the properties of the following table.

Properties of flexible polyurethane foam in parts

Properties	Type of backrest			
	Conventional backrest	Backrest soft	Conventional seat	Soft seat
Indentation force at 40%, N (min)	90	40	110	100
Dynamic fatigue – loss of thickness, % (max)	8	6	5	5
Dynamic fatigue – 40% loss of I.F. (max)	30	30	25	25
Permanent deformation at compression of 90%, (max)	12	8	8	6
Resilience, % (min)	35	35	40	41
Ash content, % (max)	0,5	0,5	0,5	0,5

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The coating is in legitimate leather fabric in caramel color, not being accepted materials and synthetic versions, where leather is classified as a type of heavy material based on the weight of the table below present in NBR 14252:1998.

Types of fabrics

Types of fabrics	Weight g/m ²
Lightweight	From 170 to 240
Medium	From 241 to 340
Heavy	Over 340

When preparing this topic, Brazilian standards were mentioned as the main reference. However, international standards are also accepted, as long as they are equivalent in terms of requirements and standards.

To prove compliance with the standard, it is requested to present a supporting report on the quality of the leather and properties of the foam used. The required reports must be issued by an independent laboratory accredited by INMETRO, if national territory, or a similar or renowned institution in the country of origin of the participating company or place of manufacture of the products, in the case of foreign companies.

2.5 Availability and delivery time

The manufacturer must comply with the information given on the availability of the equipment and the delivery time. The manufacture of the equipment must be a maximum of 10 months. These details are essential for proper project planning and deployment.

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3 REQUIRED CONTROLS AND SYSTEMS

Regarding the necessary controls and systems, it is extremely important to present all the essential elements that ensure the safe and efficient operation of the Ferris wheel. This approach should cover all relevant areas of the project, from operation and monitoring to passenger safety.

3.1 Ferris wheel control system

The control system is responsible for monitoring and controlling the operation of the ferris wheel, including the rotational movement, speed, stops, acceleration and deceleration. This system is essential to ensure safe and smooth operation of the ferris wheel. It plays a central and indispensable role in the operation, being responsible not only for monitoring, but also coordinating and optimizing a number of crucial aspects to ensure not only effectiveness, but also the safety and comfort of passengers.

Through its efficient interaction with mechanical, electrical and software systems, this system is able to organize a precise operation, controlling the rotation, speed, stops, acceleration and deceleration of the Ferris wheel, as well as the direction of rotation, points of greater working resistance and other parameters related to movement.

Based on the sophisticated interaction between the various components of the control system, the operation of the Ferris wheel allows a safe experience for all involved, with uninterrupted operation and an entertainment and contemplation platform that provides a smooth and comfortable acceleration and deceleration.

3.1.1 Speed control

The speed control system allows you to adjust and control the speed of the ferris wheel according to the needs and operational requirements. It offers the ability to set different rotational speeds.

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The approximate lap time parameter should be 25 minutes. In addition, the safe operation of the equipment should be between 0.15m/s and 0.40m/s, and for the passenger ride should not exceed 0.30m/s. The speed of 0.30 to 0.40 m/s should only be used for the assembly of the equipment, maintenance of the ferris wheel and special emergency episodes.

3.2 Lighting system

The ferris wheel lighting system plays an essential role in creating a visually appealing experience for visitors to the attraction. The lighting system can be divided into two groups: Indoor lighting and Outdoor lighting. The entire lighting system should be detailed in the manuals of use and assembly.

In LED lamps without built-in ballast, related to lighting in general, as a nominal power of up to 60 w and with a nominal voltage of up to 120V cc. without undulation, the safety and interchangeability requirements must be approved and the tests and conditions necessary for compliance must be attested. To ensure these requirements, the supplier is requested to submit a report attesting to the conformity of the bases of the LED lamps with the IEC 60061:2023 standard.

The safety and interchangeability requirements must be approved and the tests and conditions necessary for conformity must be certified. To guarantee these requirements, the supplier is requested to present a report certifying the compliance of the LED lamp bases with the IEC 60061:2023 standard.

When preparing this topic, Brazilian standards were mentioned as the main reference. However, international standards are also accepted, as long as they are equivalent in terms of requirements and standards.

To prove compliance with the standard, a report is requested. The required reports must be issued by an independent laboratory accredited by INMETRO, if national territory, or a similar or renowned institution in the country of origin of the participating company or place of manufacture of the products, in the case of foreign companies.

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3.2.1 Indoor lighting

Priority should be given to the visual comfort of the occupants of the attraction with energy-efficient RGBW LED equipment with brightness, lighting and color intensity adjustments. Visitors must have an internal control for the change of the color of the cabin during the tour.

A system with a lamp should be used in the upper inner part of the cabin with LEDs that guarantee a minimum illumination of 200 lux on the central table of the equipment.

3.2.2 External lighting

Known as scenic lighting, it is used to enhance the aesthetics and look of the attraction by prioritizing visibility and highlighting the ferris wheel in its installation location. High-performance LED systems should be used in your installation, with possible configuration of visual effects, through programming or synchronization of lighting. Stage lighting should be present around the rim and cables on both sides. In addition to scenic reflectors with color variation in the columns.

For the lights the ideal is the use of LEDs with indication of 8 points of illumination each meter with quality chip to guarantee a perfect RGB illumination, in addition to the protection against water and dust ingress with a minimum rating of IP66, being if possible the IP67 rating.

LEDs should be placed on both sides of the piling cables and the entire side of the lattice rims. The equipment must have RGB+W color characteristics where the white color does not depend on the union of red, green and blue colors. The system must be presented with working voltage at 24V, a minimum service life of 50.000 hours at 80% of luminous flux, its protective housing can be in aluminum or PC+ABS installed on aluminum rails.

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3.3 Sound system

The sound system must prioritize sound quality with a balance between its power and efficiency. The choice of speakers should take into account the geometric shape of the cabins and their acoustics, so that all occupants can have a good experience regardless of their position within the equipment.

The mounting indication is a sound system with at least 2 6" speakers in 2-way kits with individual power of 50w RMS mounted in pairs to ensure quality in acoustics and balance.

For the connectivity of the user with the sound system is indicated the bluetooth system in Portuguese (from Brazil), having easy connection with devices such as smartphone and tablets. The indication is the use of a bluetooth system with version 5.1 or higher approved and associated by BLUETOOTH SIG.

3.4 Electrical system and communication with the cabins

The communication system of the cabins of a ferris wheel is essential to ensure the safety of passengers and allow efficient operation of the equipment. The communication system between the wheel operation team and the passengers must occur through a two-way intercommunication system, where it is possible for the central to pass information and warnings of the equipment and the user can answer their questions and report emergencies.

In this way, inside the cabin, an intercom with a clearly identified 220V/DC12V power supply must be arranged. It should be located in the column at the back of the cabin, above the bluetooth connection and lighting system, for the reach of all passengers.

Regarding the electrical power system of the cabin air conditioning, there must be a 220V power supply that will be controlled by the operation panel. The electrical circuits for feeding the cabin air conditioners must be at least divided into three circuits.

Regarding the lighting of the interior of the cabins, it must be powered by AC220/DC12V that is turned on or off by the control room.

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The electrical control board should be installed above the maintenance plate at the top of the cab. It is the main electrical unit inside the cabin. Provides power supply for the electrical equipment inside the cab and its front end, connected with the inlet line of the collector ring.

3.5 Cabin air conditioning system

The air conditioning system of the cabins must ensure a pleasant indoor environment regardless of the external temperature and its climatic changes. There must be an internal temperature monitoring system from a thermostat and an air conditioner per cab, which is controlled by an operator in the ferris wheel command center. The external ambient temperature and the internal temperature will be informed on the external display of the cabin and checked by the boarding platform staff thus maintaining a cool and comfortable environment. The photo below brings a reference of how the external monitor will be:

Monitor on the outside of the cabin showing the cabin temperature in degrees Celsius



The air conditioning systems installed in the cabins must be able to maintain a minimum internal temperature of 20°C, even when the external temperatures reach up to 42°C during the Brazilian summer. For this, a cooling capacity of at least 3.95 kW is required.

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3.6 Security camera system

The security camera system is important for monitoring and controlling the attraction during its operation. Its monitoring must be carried out by high-resolution cameras in real time by the security team or the operators, allowing the immediate detection of any suspicious or risky situation.

Quality equipment must be used with a minimum resolution of full HD 1080p, in varifocal dome format with full view of the cabin, infrared system, monitoring and recording system with the capacity to store all cabin files for a minimum of 2 months.

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4 TECHNICAL SUPPORT

In order to ensure proper operation, commitment to deadlines, delivery times and efficient maintenance of the ferris wheel, requirements will be established in relation to technical support. These demands are critical to ensuring effective operation, passenger safety and the continuous optimum performance of the equipment.

4.1 Delivery time

The manufacturer must inform the maximum deadline for production of the Ferris wheel and the maximum deadline for the delivery of the equipment in the port of China, defined by MT PAR. The total term of production and delivery in the port is limited to 10 months, from the signing of the contract with the Government of Mato Grosso.

4.2 Ferris wheel warranty

The supplier must guarantee the full functioning of the equipment for at least 5 years.

4.3 Ferris wheel lifetime

The service life of the equipment must be at least 30 years. In this way, it is important that the manufacturer also passes the information on the life expectancy of each part of the equipment, being at least the same time as the required warranty in respect of the following components:

- a) Structural service life: at least 30 years;
- b) Lifetime of cables: at least 20 years;
- c) Cabin lifespan: at least 10 years;
- d) Lifetime of the cab axle system: 10 years;

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- e) Lifetime of engine mechanisms: at least 10 years;
- f) Lifetime of electrical panels: at least 20 years;
- g) Lifetime of the stage lighting: at least 50 thousand hours of use/use for 10 hours a day.

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5 CERTIFICATIONS, TESTS AND REPORTS

As for certifications, tests and reports, supporting documents will be required that attest to the quality and safety of the equipment. The manufacturer shall submit certifications proving the conformity of the product with the applicable technical standards and regulations.

All materials that will be applied to the equipment must have their quality certificate, regardless of whether they are produced in the factory or outsourced. These documents must be presented to the technicians in Brazil at the time of the packing list conference before sending the equipment.

5.1 Tests and report of resistance of the structure

The structure of the cable-stayed ferris wheel of 108 meters in height must be submitted to some reports of resistance of the materials applied in the equipment, for the fact that it must attest to the resistance of the materials such as thickness of the plates, resistance of the bearings, resistance of the cables referring to the action of the wind and weather suffered, ensuring the safety and stability of the equipment under normal operating conditions, with winds up to 15 m/s and with wind action at 35 m/s.

5.2 Wind tests and report

Wind testing for a ferris wheel is an essential procedure for evaluating the stability and safety of the structure during extreme wind conditions. Performing this test is important to ensure that the Ferris wheel can withstand high-intensity winds, which can occur during adverse weather events such as storms or hurricanes.

It is noteworthy that for the projection of the equipment should be considered the history of wind of Mato Grosso of 35 m / s. In addition, it must withstand that operations occur normally with winds of up to 15m/s.

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5.3 Tests and sound reports of each cabin

The sound levels should be controlled for better hearing comfort of the passenger, and should be limited to 90 dB so that there is no interference in the nearby cabins.

5.4 Reports of operation of speakers of each cabin

The sound systems of the ferris wheel booths must be tested to ensure the quality of the audio played. As technical characteristics for choosing the speaker, it is requested:

Power	Frequency response	Sensitivity
≥ 50 W RMS	50 to 20000 Hz	≥ 92

The supplier must forward the reports and quality certificates containing the Thiele-Small parameters.

All required reports must be issued by an independent laboratory accredited by INMETRO, if national territory, or similar or renowned institution in the country of origin of the participating company or place of manufacture of the products, in the case of foreign companies.

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6 MANUFACTURER INFORMATION

The manufacturer must provide all relevant information that proves its reputation and experience in the ferris wheel market. This information is essential to ensure the reliability, quality and safety of the company, ensuring that the project is successful and meets all the expectations and requirements of the contractor.

6.1 Manufacturer's reputation

It is critical that the manufacturer provides comprehensive information about its reputation in the amusement park and ferris wheel equipment market, since this assessment can offer greater confidence from the acquisition by the government of Mato Grosso, such as:

6.1.1 International recognition

Information from the manufacturer about its international recognition in the amusement park and entertainment industry. In addition to certificates of participation in fairs and events of the sector.

6.1.2 Quality and environmental certifications

Highlight if the manufacturer has relevant certifications, such as ISO 9001, which ensures quality management, and ISO 14001, which demonstrates commitment to environmental management.

6.1.3 Testimonials and partners

Include testimonials from satisfied customers and possible partnerships with other manufacturers or renowned companies in the industry.

6.1.4 Safety and quality policies

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Inform about the manufacturer's policies and guidelines related to safety, quality, and compliance with applicable technical standards.

6.2 Experience in similar projects

The experience of the manufacturer in similar ferris wheel projects is of paramount importance to ensure the excellence and safety of the enterprise. In this context, it is imperative that the manufacturer sends information about its vast experience in projects of the same size. Information such as:

6.2.1 Number of projects carried out

The manufacturer must specify how many ferris wheel designs it has already completed.

6.2.2 Magnitude and complexity

Highlight the magnitude and complexity of the projects already carried out, indicating whether the manufacturer has experience in building ferris wheels of similar or larger sizes to the specified (108 meters).

6.2.3 Emblematic projects

Mention emblematic projects that have been successfully executed by the manufacturer. This can include iconic ferris wheels in different parts of the world or in popular tourist destinations.

6.2.4 Cable-stayed ferris wheel experience

Highlight if the manufacturer has specific experience in building cable-stayed ferris wheels, especially of similar height to that specified for the project.

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7 MATERIALS USED

Regarding the materials used in the construction of the ferris wheel, it is crucial that the manufacturer provides detailed information about its quality, provenance and strength. Data on the types of steel, aluminum or other materials used, as well as their technical specifications and mechanical properties, will be required.

The use of high quality and resistant materials is fundamental to ensure the safety and durability of the ferris wheel, especially considering the constant exposure to weather conditions and operational loads. Therefore, it is essential that the manufacturer provides resistance reports, certifications and proof that the materials meet the applicable technical standards and norms. In addition, warranties for all materials must be included in the warranty manual.

7.1 Type of engines and brands

The equipment must have at least 16 three-phase electric motors, with a nominal voltage of 380V, frequency of 60Hz, with IPW66 protection, with reducer system and electric brakes. The engines must have as a parameter those of the YEJ series with brake system usually of the closed type. The equipment must have a redundancy in relation to the engine brake that must contain a manual lever for emergencies.

The equipment's 16 drive motors must all be equipped with brakes to minimize the risk of operating failures. Each motor is equipped with a current relay.

The manufacturer should opt for renowned and reliable brands to ensure a better performance and service life of the Ferris wheel. Engines must have a minimum warranty of 10 years. Care for the protection and service life of the engines should be in the user manual as they are crucial to keep the system running efficiently over the established service life.

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7.2 Isolation of equipment for maritime transport

Because these are elements that will be transported by sea, it is important to detail the insulation used to ensure adequate protection of all equipment. This includes information on the type of insulation, materials used and procedures adopted to prevent damage caused by vibration, humidity, shocks and other adverse elements.

All ends of the column sections must present a redundant mechanical protection of greater thickness, using as a parameter the E.V.A material of at least 30mm, and can be replaced by a similar material.

The rim sessions must at their ends receive a redundant protection E.V.A of 30 mm or similar.

The scenic light must also come in a closed container inside boxes of at least reinforced 16mm naval plywood, for insulation and to have greater security, as it is a fragile material and can in no way receive some kind of damage.

The plates connecting with the foundation and the inserts should come in the first wave of the material, which occurs after the 30 days of contracting.

7.3 Structure materials and cabin protection

The cabins should have their structure made of aviation aluminum alloy profile and transparent organic glass made with high-strength acrylic polymeric materials. It is important that the cabins have protective films that assist in the internal climate and protect passengers against UVA and UVB rays. The level of transparency should vary between 25 and 30%. It refers to the 3M brand or similar quality.

The manufacturer must provide with the user manual the information on the care necessary to keep the acrylic in good condition over time, such as proper cleaning and avoiding the use of corrosive substances.

If the products have been approved by the standards of the country of manufacture, it is of the utmost importance that these standards are presented.

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As it is a ferris wheel installed in the city of Cuiabá, in the state of Mato Grosso, one of the hottest cities in Brazil, the acrylic must be thought so that there is a reduction in temperature and so that the air-conditioning system has a good performance.

7.4 Stage light, specifications, typology, warranty and testing

The manufacturer must provide a clear breakdown about the ferris wheel's scenic lighting system, including information about the variety of colors, lighting effects, and schedules available. In addition, it is crucial to provide information on the typology of the elements used in the system, as well as the guarantees provided by the manufacturers of the components.

In addition, the manufacturer must highlight the tests performed to ensure the correct functioning and durability of these systems is essential, as well as the submission of the reports of the functioning tests. All of them must be from authorized entities and/or professionals in the country of manufacture, and the tests must demonstrate the parameters used.

The material must have the following minimum characteristics:

- a) Color: RGB+W
- b) Working voltage: 24V
- c) Light source: 6/9 pieces SMD LEDs
- d) CRI: 80
- e) Control: ON/OFF, DMX512
- f) Grayscale: 8bit, 16bit
- g) Supply life: 50,000, h
- h) RDM: Optional
- i) Chipboard brand: Optional (Cree, OSRAM, Lumileds, Epistar, etc...)
- j) Cover: PC (Transparent, opal)
- k) Case: PC + ABS
- l) Installation: Installation by aluminum profile
- m) Working temperature: -40°C to 60°C

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- n) Storage temperature: -40°C to 70°C
- o) Protection rating: IP66≥
- p) Luminous flux: 30 LM/W (RBG+W)
- q) Central light intensity: 22cd (RBG+W)
- r) Beam angle: 120°/80°*120°

Some standards should be referenced to support the norms of scenic lights:

The ABNT NBR IEC 60529 standard provides a classification system of degrees of protection provided by electrical equipment casings against the ingress of solid foreign bodies and water. It uses IP (Ingress Protection) codes to indicate the level of protection of an enclosure. The IP code consists of two parts: the first indicates protection against solid objects, while the second indicates protection against liquids.

Meanings of tests for protection against solid foreign objects

First characteristic numeral	Meanings of the test (calibrators and dust chamber)	Test force
0	No testing required	-
1	Rigid ball without cable or protector Ø mm50 ^{+0,05} ₀	50 N ± 10 %
2	Rigid ball without cable or protector Ø mm 12,5 ^{+0,05} ₀	30 N ± 10 %
3	Rigid steel rod with Ø mm, with burr-free ends2,5 ^{+0,05} ₀	3 N ± 10 %
4	Rigid steel rod with Ø mm, with burr-free ends1,0 ^{+0,05} ₀	1N ± 10 %

The dust test shall follow the guidelines of item 13.4 of the ABNT NBR IEC 60529 standard and shall be considered satisfactory protection if no dust deposit is found inside the enclosure at the end of the test.

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Main meanings and conditions for water ingress protection tests

Second characteristic numeral	Meaning of the essay	Water flow	Test duration
0	No testing required	-	-
1	Drip box Shell	$1^{+0,5}_0$ mm/min	10 min
2	Drip box Enclosure fixed in 4 positions with inclination of 15°	$3^{+0,5}_0$ mm/min	2.5 min for each tilt position
3	Oscillating tube Vertical sprinkling with a maximum distance of 200 mm $\mp$ 60° or Sprinkler nozzle Vertical Aspect $\mp$ 60°	0,07 L/min % per drilling, multiplied by the number of holes $\mp$ 5 10 L/min % $\mp$ 5	10 min 1 min/m² for at least 5 min
4	Same for the numeral 3 with sprinkling a of the vertical $\mp$ 180°	Same for number 3	
5	Waterjet Nozzle of 6.3 mm diameter, distance from 2.5 m to 3 m	12,5 L/min % $\mp$ 5	1 min/m² for at least 3 min
6	Waterjet Nozzle of 12.5 mm diameter, distance from 2.5 m to 3 m	100 L/min % $\mp$ 5	1 min/m² for at least 3 min

The liquid tightness test must follow the guidelines of item 14.2.8 of the ABNT NBR IEC 60529 standard. To be considered satisfactory protection, no water should enter, and the correct operation of the equipment must be guaranteed without jeopardizing its safety.

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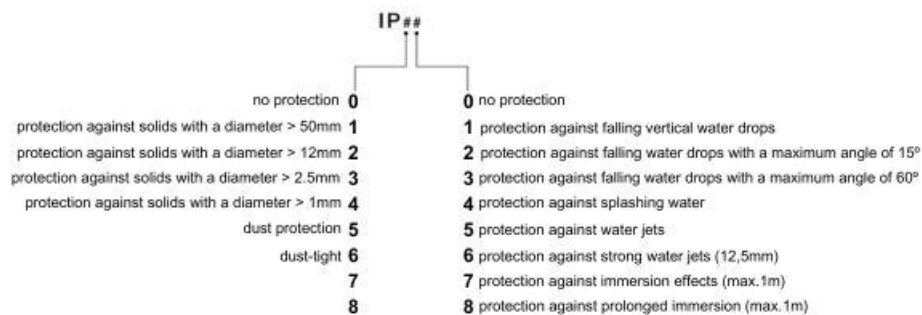


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LED protection rating

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