TPE@LU Theme Park Risk Assessment

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Any risks associated with the ride shall be assessed relative to the severity and probability of the specified event occurring, both during the construction and during the life cycle of the ride. As risks are identified, the team will immediately commence finding ways in which a certain risk can be reduced, and responsibility will be assigned to the appropriate groups in order to effectively mitigate risk and monitor them.

Before the construction of the site, the ground will be inspected by geotechnical survey. If the ride is in conjunction with an adjacent location near the site zone, or it resides in a pre-existing theme park, geotechnical data may be available to theorize ground conditions. Loose soil foundation is a high-severity risk because if the inspected site differs from the conditions assumed, construction will need to be delayed while the engineering team performs ground stabilizing methods. To help mitigate the issues this may cause, the engineers will determine whether the soil is capable of withstanding increased strength with methods such as deep compaction – if not, the worst-case scenario is a cut-and-fill with engineered materials and soils.

Additional risks arise during construction due to height regulations. The construction of our attraction will require extensive use of scaffolding materials and crane operations. The severity of an on-site injury is at maximum, not only because safety is the most important value in engineering, but also because the ramifications for irresponsible safety measures could include a full shut-down of a project. OSHA has the capability to launch extensive investigations into the workplace environment and may result in the closure of a project throughout this duration. The solution is to meet all applicable OSHA requirements for heights, such as utilizing guardrails on top of scaffolding and safety nets underneath a drop within the specified height of no more than 30 feet, and harnesses for each worker.

A big dilemma during construction is the risk of natural disasters. Depending on the area, regulations may be required for a certain type of weather risk in the United States. Natural disasters have a high degree of severity, but the severity decreases based on the measures that are taken place to maintain the structural integrity of construction components like scaffolding and any equipment. Structurally, load factors such as wind and snow should be factored into the overall design of the scaffolding if the risk of one occurring both aligns with the timetable of the project as well as the general climate of the area. Regardless of the risk of flooding, the site shall be graded to divert stormwater into a non-preexisting storm utility during development to prevent pollution and extra runoff. Post-construction, the ride will comply with the standards set either in the theme park’s specified weather protocol or exist individually in a unique case.

Both during and post-construction, mechanical defects are a severe risk. During work, all components will be analyzed during the procurement stage of the project to assess any inconsistencies or substandard manufacturing. Scheduled checks shall be conducted to assess whether fatigue has taken place in any areas and whether replacements are necessary. This limits the amount of wear and tear on specific structural members. In the case of a mechanical defect while the ride is in operation, the emergency brake system will be carefully implemented within the ride to prevent whiplash-related injuries. If the defect causes a significant failure within the system, the ride will be forced to be shut down.

Another risk associated with post-construction activities is operational error. This can be the cause of many things such as fatigue, inadequate training, or not complying with safety standards. Depending on the severity of the error and the amount of negligence tied to the operator, the ride may be shut down and discipline will be handed. The consequences of operational errors include mild aspects like unnecessary ride delays and unfortunately in many cases lead to fatalities. Because of this, every employee will be notified of the checks required prior to every session. When at all possible, more than one person will oversee handling of operations to reduce the human error aspect. Finally, emergency drills will be conducted in order to re-verify the competence of each operator within the ride.

A final risk involves issues with individual riders, whether due to illness attributed to the ride itself or a failure to comply with the rules. Riders who do not follow the rules of the ride will be given zero tolerance and will be asked to leave the ride. Because the ride incorporates both lateral and transverse spinning motions, medical warnings will be prominently displayed outside of the ride itself and reassured by the ride operator before every turn, because without disclosing medical risks the theme park can be held legally liable. The condensed risk management plan is summarized below.

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| **Risk** | **Consequences** | **Severity** | **Probability** | **Solutions** |
| Loose Soil | Unstable structures, delayed construction | 4 | 2 | If mild: soil compaction. If severe: cut-and-fill with new material |
| Height Dangers | Injury, OSHA investigations, premature project closure | 5 | 1 | Comply with all OSHA regulations (Safety nets, harnesses, scaffolding railing) |
| Natural Disasters | Flooding, structural instability added structural load, erosion. | 5 | 1 | Check state codes regarding natural disasters, incorporate weather loads into structural design, divert stormwater and sediment using facilities |
| Mechanical defects | Ride closure/delay, structural fatigue, sudden ride stoppage causing injuries | 2 | 4 | Integrate emergency braking system into the design. Perform scheduled checks for maintenance. |
| Operational error | Ride breakdown, delays, and in the worst cases rider injuries/fatalities | 5 | 1 | Elaborate training system for operators. Have multiple overseeing ride operations at one time. Conduct emergency drills on a semi-regular basis. |
| Rider issues - Disciplinary | Ride delay | 1 | 3 | Escorted off of the ride immediately, adhere to the theme park's protocol if escalation occurs. |
| Rider issues - Illness | Ride delay, cleanup, first aid. In severe cases, lawsuits. | 5 | 2 | Disclose all medical risks prominently outside the ride, operator repeats before every ride. Operators are aware of the location and presence of first-aid kits within the theme park. |

*Table 1: Summary of Risk Management Plan*