

OCEAN EXPRESS – REGULATORY CONTROL, OPERATION AND MAINTENANCE EXPERIENCE

INTRODUCTION

Ocean Park has been operating two aerial cable car lines since 1977. The Park has gone through a tremendous growth in the past years. Facilities and attractions have expanded dramatically. A new funicular ropeway system was commissioned in September 2009 to enhance the Park's operation. The funicular system is named the "Ocean Express".

The entire Ocean Express journey is within a tunnel. Operation of this system is not affected by adverse weather at all. This weatherproof nature and its large carrying capacity has ensured that the Ocean Express is the most reliable and efficient way of transporting guests between the Waterfront and the Summit. (Ocean Park is geographically separated into two areas. The lowland area is called the Waterfront and the headland area is called the Summit)

There are two 2-car vehicles running in the system. Each vehicle has 400 passengers capacity. Ocean Express takes 3 minutes to carry the guests from Waterfront to Summit and vice versa. The carrying capacity of Ocean Express reaches 10,000 guests per hour in both directions. The system has remarkably improved the guest flow and the operating mode of the Park.

Besides being an efficient transportation system, Ocean Express is designed based on a themed story line which enhances its entertaining value for the guests. The stations and vehicles are themed according to the classical "Jules Verne" deep sea adventure concepts. A multi-media show combining powerful lighting, audio & visual effects illustrating an "undersea odyssey" adventure experiences is presented on the vehicles, which provides a unique experience to the passengers throughout the whole journey.

As an underground funicular, fire safety is one of the most important elements in the Ocean Express system. Vehicles are designed to have extreme-low fire load (< 1MW / vehicle). Fire service equipments (such as smoke detectors, linear heat detectors, break glass alarms and fire hydrants) are provided inside the tunnel. Escape walkways with positive air pressure are built alongside the tunnel. Smoke extraction systems are installed along the entire tunnel. People inside the escape walkways will be directed to places of safety through the walkway exits built by the tunnel portals or in the middle of the tunnel.

KEY DATES

Feb. 2007:	Contract Award.
Mar. 2008:	Form 1 Submission (Design Submission).
May 2008:	Tunnel Blast Through.
Nov. 2009:	Form 2 Award (Design Approval)
May 2009:	Form 21 Submission (Competent Person Application).
June 2009:	Form 22 Award (Competent Person Approval).
July 2009:	Surveyor Inspection Report Submission.
Aug. 2009:	Form 5 Award (Permit To Use).
Aug. 2009:	Soft Opening.

Sept. 2009: Grand Opening.

SYSTEM DESCRIPTIONS

Ocean Express traverses up the Brick Hill through a 1.3km underground tunnel. With the exception of the passing loop in the middle, the line is completely straight and has a constant 9% gradient.

The Waterfront Station is on the ground level at the Waterfront Plaza while the Summit Station is on 3rd floor of the Summit Building. Boarding Platforms and Alighting Platforms are built on either side of the vehicle berthing bay. Guest space in station is partitioned (by gratings) into Queuing Area and Holding Area in the Boarding Platforms.

To manage a large number of guests efficiently, a crowd control procedure is executed as: -

- 1) Vehicle arrives at station.
- 2) Passengers alight vehicle to Alighting Platforms.
- 3) Guests in Boarding Platforms board vehicle.
- 4) Vehicle departs station.
- 5) Guests in Holding Area move to Boarding Platforms.
- 6) Guests in Queuing Area move to Holding Area.
- 7) Guests outside the station move to Queuing Area.

There are concrete platforms on both sides of the vehicle along the entire tunnel for emergency alighting. Pressurized escape walkways are built alongside the tunnel. In case of detrainment, guests in the tunnel could enter the pressurized escape walkways through the cross door built every 50m apart. Once inside the pressurized escape walkways guests are protected from any fire and smoke in the tunnel. Pressurized escape walkway exits are at both ends of the tunnel by the portals. An additional exit is also built near the middle of the tunnel.

Ocean Express is powered by a 2,000KVA transformer. It supplies the main drive and the power rails.

- The main drive comprises of a 710V AC motor & a coupling gearbox. It drives the bull wheel and the main rope. The main rope hauls the 2 vehicles to move in a “jig-back motion”.
- The power rails supply electric power to the vehicles to energize all the on-board equipments such as air conditioning units, lighting, batteries, chargers and LCD panels.

The supply transformer and the main drive are provided with 100% standby units for easy switch-over to ensure the high availability and reliability. A separate rescue drive (comprising a diesel engine & hydraulic motors) is also in place in case of power supply failure.

Due to the low track gradient (9%), the Ocean Express requires to operate with a counter rope and a hydraulic tensioning device installed in the Waterfront Station. Both the main haul rope (43mm Ø) & the counter rope (26mm Ø) terminate at the vehicles’ under-frame rope drums.

A vehicle has 2 cars and each car is equipped with 2 bogies. Additional damping is fitted on the suspensions to minimize rolling noise produced by the wheels on the tracks. This improves the ride quality for guests. Each car is divided into 4 compartments. Every compartment is built with

horizontal floor; steps are provided between adjacent compartments to allow guests getting around inside the car.

Ocean Express has 2 operating modes. In manual mode operation, vehicle attendants are responsible for vehicle doors & platform swing gates operations; while all other controls are done by control room operators. In auto mode operation, all system controls including vehicle doors and platform swing gates are managed by control room operators.

Induction-loop cables laid by the tracks provide the medium for signal exchanges between control room and vehicles. Control and communication signals sent from control room to the induction-loop cables are picked up by vehicles antennas via inductive couplings. Likewise, status and communication signals are transmitted from the vehicles antennas to the induction-loop cables and control room.

THEMING EFFECTS

The Ocean Express story lines: -

“In the 19th century, an eccentric professor created an underwater station deep down in the ocean. He invented an amphibian-type submarine to commute between his research laboratory hidden in the tropical forest and the underwater cave.”

Waterfront Station is themed to resemble the underwater den. The blue-coloured station structures are painted irregularly with whitish wave-lines and illuminated by dynamic ripple lightings. The combined effects create a powerful deep-sea visual concept. The rusty-metallic looks of the station columns & gratings, the old-fashioned column lamps & ceiling fans and the bronze-coloured sea explorer statue together present a classical “Jules Verne” style design.

Summit Station has its structures printed yellowish-orange to resemble the professor’s research laboratory during sunset.

The vehicles are themed as the professor’s submarine. The frontend oval window & cover gratings resemble a 19th century deep sea diver mask.

The car interior looks like an old luxury submarine. Interior panels are painted rusty-metallic looks with trimmed oakwood fittings. Door sides, window sides and panel sides are all copper plated with copper rivets dotted regularly on edges. Ceilings are lined with circular copper pipes. The theming makes the car look unique and at the same time of durable quality.

The multi-media equipment includes LCD panels, wave lights, UV lights, ripple lights, stroboscopes and bass speakers. Their combined effects are synchronized & choreographed to produce the theatrical effects.

- In the uphill running vehicle, the multi-media show effects give passengers an out-of-this-world sensation of emerging from the deep sea to the surface - traversing through flocks of luminous sea jellies, fish and giant octopus.

- In the downhill running vehicle, the multi-media show effects give passengers the sensations of cruising through a river of hot lava and then submerging into the deep ocean - traversing through sea life species, the Atlantis City and numerous deep sea creatures.

OPERATION AND MAINTENANCE EXPERIENCE

O&M activities of Ocean Express are governed by the Laws of Hong Kong, Chapter 449B Amusement Rides (Safety) (Operations and Maintenance) Regulation.

Ocean Express normally operates from 7:45am till 7:30pm (system pre-operation checks commences daily at 7:00am). In special dates (such as Halloween months), operation time extends well after mid-night. Maintenance work starts daily after completion of guest services. Over-night maintenances are normally scheduled 2 times a week.

Ocean Express stops operations for 3 weeks every year for carrying out heavy maintenance work (such as bogie overhaul). Annual survey is conducted by Independent Surveyor, with inspection reports submitted to EMSD.

When first put into services Ocean Express encountered a number of teething problems. However, the problems are all of minor natures due to electrical wrong-settings or mechanical mis-alignments made during installations. The problems were resolved quickly.

After few months of operations, regular inspections of the line-sheaves indicated excessive wearing on the flange sides. The wearing was caused by repeated lateral-hitting by the ropes. Passengers with sensitive ears could hear low-pitch cranking tones coming regularly from under-frame. This rope vibration was a phenomenon of harmonic resonance of the haul rope causing excessive lateral movements. The problem was resolved by changing the locations of the sheave wheels to alter the natural frequency of the rope system.