



DESIGN, CONSTRUCTION
AND MAINTENANCE OF
TREETOP ADVENTURE PARKS

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engineering

INTRODUCING TREETOP ADVENTURE PARKS

“Treetop Adventure Parks” are an answer to the high demand for active tourism in the Nature.

For families, schools, corporate groups and tourists, a Treetop Adventure Park is a chance to live out a childhood dream – climbing, soaring and swinging through the trees.

Treetop Adventure Parks are a fantastic new way to discover the forest environment – and an answer to the growing tourist demand for outdoor activities in nature.

Guests venture from one tree to another via a series of exciting challenges. Suspended bridges, nets, walkways, barrels, Tarzan jumps, ziplines (flying foxes), treehouses and more connect tree to tree at heights from 2 to 20 meters.

A Treetop Adventure Park is composed of 4 to 12 circuits, each with 8 to 16 challenges. Circuits are designed with graded difficulty levels, so participants can have a safe and enjoyable adventure, regardless of their skill and experience.

Treetop Adventure Parks are accessible to all – whatever their level of agility or experience. Guests as young as four or well into their seventies can find a circuit that is right for their fitness level, or even try the more challenging circuits.

HOW DEMAND HAS GROWN

1995:

First Treetop Adventure Park opens in France.

2000:

France is home to 45 Treetop Adventure Parks.

2005:

More than 350 parks in operation in France, England, Spain, Italy, Switzerland, Mexico and Canada.

2006:

First Treetop Adventure Parks open in Asia-Pacific: 1 in New Zealand, 1 in Australia and 1 in Bali.

2010:

Treetop Adventure Parks open in USA, China, Singapore, Korea and Malaysia.





A WORLDWIDE SUCCESS

For Customers:

- A new, exciting activity in nature.
- The chance to realize a childhood dream - climb up into the trees and soar and swing through them.
- Proven 100% safety record worldwide.
- Perfect for families and groups.
- Corporate opportunities from staff outings to team building and promotional events.
- Fun for spectators as well as adventurers.

For Investor:

- Large untapped market.
- Unrivalled customer satisfaction.
- Low capital investment .
- Rapid R.O.I.



SkyZip engineering

Based in Bali, SkyZip Engineering specializes in the design, construction and management of ziplines (flying foxes) and eco-adventure parks.

All our treetop adventure parks are designed and built following European Standard EN 15567-1, a globally recognized safety standard developed in the EU.

SkyZip Engineering's experienced team includes: one consultant designer, one engineer, one construction manager, two supervising carpenters and 15 climbers specializing in work at heights with wire ropes.

It typically takes between 2 and 5 months to design and build a treetop adventure park. The precise duration depends on the number of circuits and challenges and the location.

1

Escape Tots Trail , Penang Island, Malaysia

Escape Adventure is a very successful adventure park combining several outdoor activities for children. Opened in 2013, Escape Tots Trail is a multi-activity play structure that aims to make young children having fun when learning on their climbing skills

2

Escape Monkey Business, Penang Island, Malaysia

This is truly the main attraction of the Escape Park, Escape Monkey Business is a real added value and enables all the ages to have fun and compete together with a wide range of challenges (flying foxes, nets bridges, etc.). Even watching people in the monkey business is already highly entertaining.

3

Bukit Naang Treetop, Riau Sumatra

Situated near Pekanbaru, Riau, this park opened in January 2008, as part of a larger recreation area that includes a water park, a restaurant and a lake. The treetop park includes two circuits, 20 challenges, and a large treehouse, with the highest platform 22m up in the trees.

4

Atlantis Water Outbound, Jakarta

This innovative circuit hovers between the water and sky, set in trees and on wooden piles over a waterpark by the seaside in Jakarta. Net bridges, treehouses, a zipline (flying fox) and a climbing wall provide a complete adventure that adds real value to the waterpark experience.

5

Outbondholic, Ancol, Jakarta

Developed in partnership with PT. Taman Impian Jaya Ancol, this adventure park features 10 circuits for all ages. A total of over 68 challenges include the longest zipline (flying fox) in Indonesia -- 480 meters long! There are four circuits designed for children, all equipped with a continuous safety line that allows even very young children to venture from tree to tree safely and easily.

6

Bandung Treetop Adventure Park, Bandung, West Java

Bandung Treetop opened in 2010 to service the vast market in West Java and Jakarta, and is the largest treetop adventure park in South-East Asia. It includes 8 circuits, with 88 challenges, among them 26 ziplines (flying foxes).





7

Kopeng Treetop Adventure Park in Central Java

Up in the hills of Central Java near the historical town of Yogyakarta, the city of Solo, and the industrial town of Semarang, Kopeng Treetop is an extremely successful adventure park. With 85 challenges spread across 8 circuits, it plays host to a wide variety of clients from families to corporate team-building groups.

9

Mirah Fantasia Treetop, Banyuwangi, East Java

Situated in Banyuwangi, East Java, this single-circuit park opened in June 2007 as part of a larger recreation area with a waterpark, water slides, a bird park and water sports. Set by the sea, it includes ten challenges.

11

Gowa Discovery Park, Makassar, Sulawesi

Opened in 2011, this park forms part of a much larger recreation and tourism area by the sea in southern Sulawesi. The treetop park includes four circuits with a total of 40 challenges, and pairs well with a waterpark, a bird park, and an elephant park.

8

Tretes Treetop Adventure Park, Pasuruan, East Java

Opened in 2012, Tretes Treetop Adventure Park features 6 circuits and 50 challenges for all ages. Its design is perfectly suitable for families with young children as well as for company outings.

10

Bali Treetop Adventure Park in Bedugul, Bali

Bali Treetop Adventure Park opened in January 2006 and is an extremely popular park, not only with local and international tourists but with international and local families resident in Bali. International schools run trips to the park, while companies use it for staff outings, team building and promotional events.

12

Temporary Treetop Parks for Exhibition, Fairs & Festival

Sky Zip Engineering has installed and operated temporary ziplines (flying foxes) and treetop parks in Java and Bali. These make highly entertaining and (when required) profitable additions to festivals and events of every kind.

THE POTENTIAL MARKETS ARE VAST



Proximity to a large town facilitates:

- Corporate groups (Outing, Team Building, Special Events)
- Families on weekends and public holidays
- Schools visits

Tourist or recreational locations draw:

- Families on holidays
- International or local tourist groups
- Children groups on holiday camps

Families

With circuits customized for all ages and levels, treetop adventure parks are an unrivaled leisure activity for families. From children as young as four to the most daring teenagers, from young-at-heart parents to adventurous grandparents, everyone can enjoy a treetop adventure park, whether as adventurer or spectator. Treetop adventure parks also make a great location for special events such as birthday parties.

Tourists

Tourists are always in search of new activities during their holidays. Many treetop adventure parks work closely with travel agents and tour guides and receive large numbers of individual tourists and tour groups.

Corporate groups

Many treetop adventure parks around the world have corporate groups as their lead clients. Companies use the parks for outings, birthday events, product launches and team building. To maximize the appeal to these groups and create a full day experience, many parks provide catering, meeting facilities and other team building activities.

Schools

Treetop adventure park activities help with the following educational goals:

- Development of physical coordination
- Problem-solving
- Confidence-building
- Acceptance and respect of safety rules
- Learning one's own limits
- Respect of the natural environment

THE ESSENCE OF SUCCESS

Safe

- ✓ Strict respect of European Standards EN 15567-1 (Construction) and EN 15567-2 (Exploitation).
- ✓ Thorough staff training.
- ✓ Everyday routine maintenance.

Unique

- ✓ First treetop adventure park in your area.
- ✓ Long ziplines (flying foxes).
- ✓ Novelties such as treehouses.
- ✓ Outstanding challenges such as Tarzan jumps.

Fun For All Ages

- ✓ Circuits for every age and level, from simple, low circuits for children from 4 to 8 years old, to extreme, very high circuit for teenagers and adults.
- ✓ Attractive to participants and spectators.
- ✓ Enough variety to drive repeat business.

Green

- ✓ No nails in the trees.
- ✓ No contact between any metallic parts and the trees.

Fast

- ✓ Circuits and challenges tailored to avoid delays, queues and waits.

A BUSINESS TAILORED TO YOUR MARKET



From the start of the project, Skyzip Engineering focuses on your commercial success. Our consultants help you evaluate your needs according to your location, target market and business plan.

Are you building in a forest, a theme park, a golf course, a shopping mall or a tourist resort? Do you hope to attract corporate groups, families, tourists or repeat visitors?

The perfect structure for your business will depend on all these factors.

With years of experience designing, constructing and maintaining treetop adventure parks, our design engineers create bespoke technical solutions to build a park that fits your business goals.



LOW OPERATING COST

SkyZip Engineering helps you prepare your operating budget. The main costs to take into account are:

- Staff Salaries

The number of staff required depends on:

- The number of circuits and challenges in the park.
- The park layout: are the challenges spread far apart, or are all circuits and challenges visible from the starting point?
- The type of challenges (hard challenges such as the Tarzan Jump require more staff).
- The type of belay (link between adventurer and cables) chosen for children's and adults' circuits.

The minimum number of staff for a treetop park with 6 circuits and 65 challenges in a condensed area is:

- One cashier
- Two instructors to fit the harness and assist at the demonstration circuit
- Three or four instructors on the circuits

- Land costs

- Marketing, promotion and advertizing costs

- Insurance

- Annual inspection and maintenance cost

- Equipment costs

WHERE CAN I BUILD A TREETOP ADVENTURE PARK?



SkyZip Engineering can design and build zipline circuits and aerial adventure challenges in environments from shopping malls to water parks. For a classical treetop adventure park, however, the land requirements are:

- 1 to 5 hectares of woodland
- Trees with a trunk diameter of 32 to 80 cm
- Easy road access and available parking space
- Toilet facilities (or permission to install these)
- Electricity (or the possibility of installing this)
- Space for a cabin to serve as a sales counter and equipment store

HOW MANY CUSTOMERS CAN VISIT A TREETOP ADVENTURE PARK?



A typical park covers 1 to 5 hectares of woodland and includes 4 to 10 circuits, with between 40 and 120 challenges. A typical layout is shown below. Depending on the scale of your park, you will have capacity for:

- 60 to 220 customers simultaneously
- 200 to 800 customers per day



WHAT TREES ARE SUITABLE?

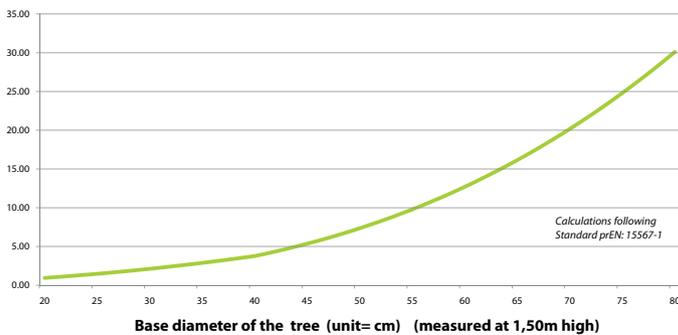


One of SkyZip Engineering's expert botanists will check all trees and confirm their suitability for use in a Treetop Adventure Park. As a rule of thumb, sample calculations are shown below.

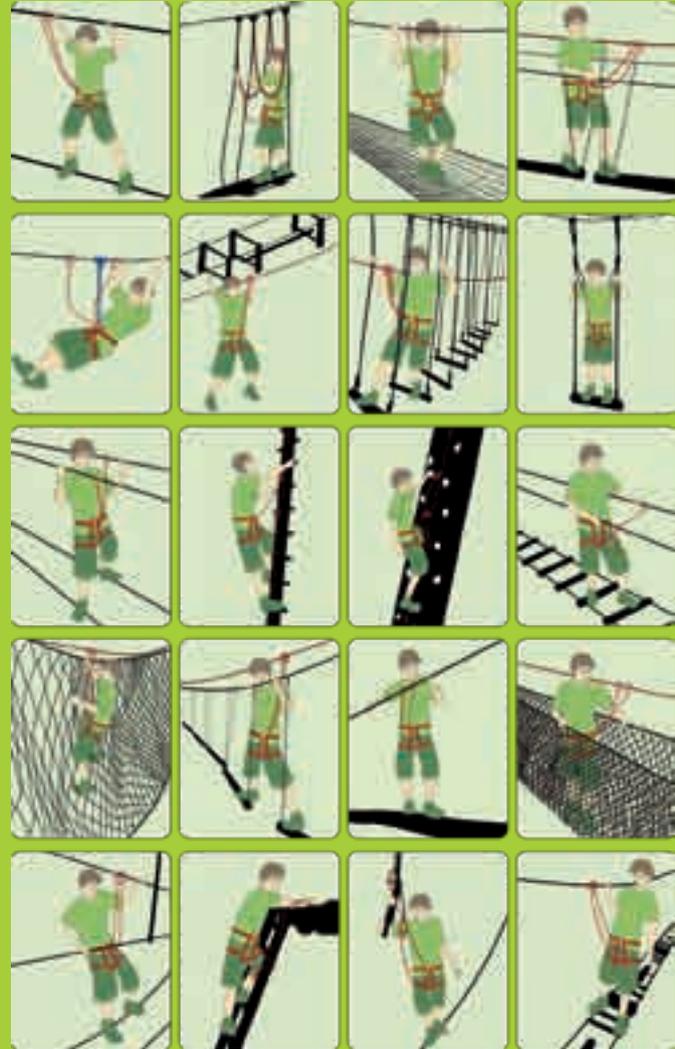
APPROXIMATIVE MAXIMUM HEIGHT OF THE SAFETY CABLE (M) (Tree without supporting cables - Shroud) WOOD WITH LOW MAXIMUM BENDING STRESS (150 BARS)

Precise calculation has to be done for each tree and depends on:

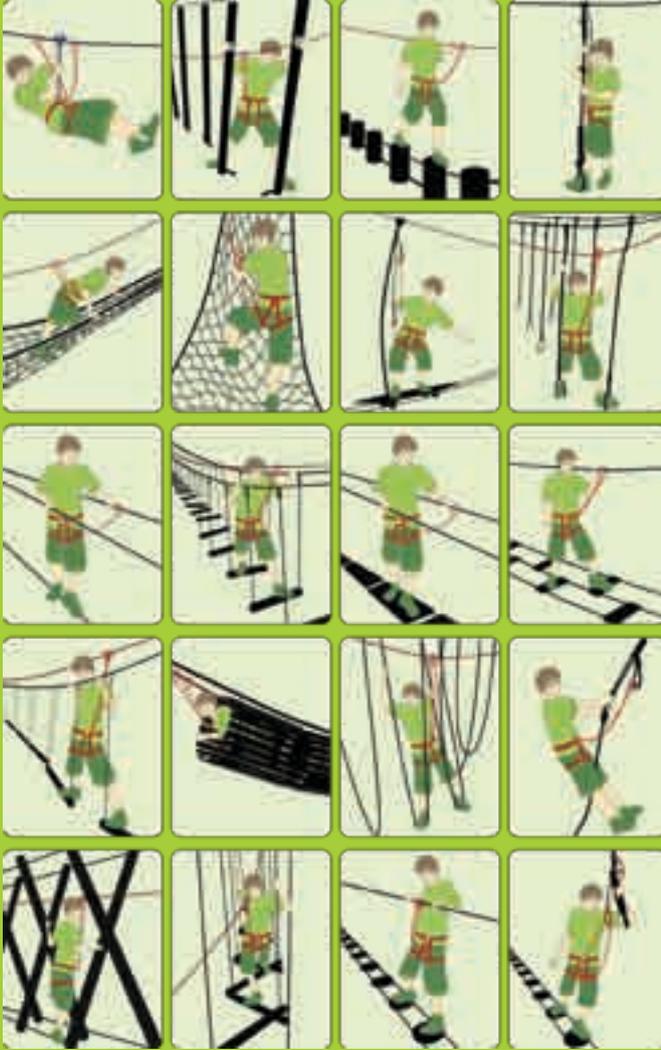
- the position of the cable (height, angles)
- type of the challenge
- species and shape of the tree
- use of shrouds



TYPES OF CHALLENGES



WHAT BELAY SYSTEM SHOULD I USE?



The belay system is what secures your customers to the circuits. Your choice of belay system will affect the investment cost, the operating costs, the capacity and the safety standards of your treetop park.

SkyZip Engineering will help you select from the following recommended belay systems:

- Self belay with carabiners
- Continuous safety line
- Safety nets
- Permanent carabiners
- Continuous integrated systems



CONSTRUCTION PLANNING



1. Feasibility and Technical study:

A Basic Pre-Study can be done without SkyZip engineers visiting the site. The main goal of this pre-study is to get a general idea of what is possible and advisable to build on the site. Our consultants require:

- General photos of the site
- A general map of the site
- Photos of the trees (and species details, if known)
- Average diameters of trees (measured 1.5 m from the ground)
- Average distance from one tree to another
- Basic information on the ground inclination and slopes
- Target market (tourists, corporate groups, children, families...)
- Background on the region (tourism activity, proximity to large towns, prices of similar activities in the area..)

The full Feasibility Study begins when SkyZip engineers visit the site. Engineers measure and map all trees, while an expert botanist assesses the trees' species, health and maturity. The survey report includes:

- A list, with details, of all treetop circuits that can be installed on the site
- A list of all recommended challenges
- Details on the recommended belay systems for adults' and children's circuits
- Prices of each option
- Construction timeline

A full technical study is completed before construction begins to guarantee that the park will comply with international standards. This includes:

- Calculation of stresses in all parts and trees
- Choice of installation system
- Choice of material
- Complete bill of materials

2. Manufacture and Purchase of Parts and Equipments:

In order to offer the most competitive prices to our clients, SkyZip Engineering selects between locally purchased and imported materials on the basis of quality and price. Some parts are produced in our Bali workshop. All safety equipment is imported from Europe.

3. On-Site Construction:

- Construction of the platforms on the trees (Bangkirai wood or equivalent, galvanized nuts and bolts, polyurethane varnish). All platforms are held in place using a compression system to protect trees from any damage.
- Construction of the challenges (Bangkirai wood or equivalent, 6*19 Seale IWRC wire rope (diameter 10mm and 12.5mm), braided nylon or PP rope and nets). Protective half-logs are used to prevent cables from cutting into trees and avoid tree trunk degradation.

- Installation of the belay system
- Testing of all challenges
- Verification that all challenges comply with European Standards EN 15567-1.

4. Delivery of Equipment:

SkyZip Engineering only provides the best professional brands such as Petzl (Fr.), Beal (Fr.), Kanopeo (Swi.), ZipStop (Usa), Clic-It (Fr.)

The number of safety harness sets required depends on the number of challenges and on the target markets. Small parks can commence operation with 50 sets, while larger parks require at least 120 sets to open to the public. Additional sets can be purchased later when the number of guests increases.

5. Training of Local Staff (Patrol Guides)

SkyZip Engineering will train the local Patrol Guides Team. The key points of the training are:

- Understanding the treetop adventure park concept (rules, names of challenges, construction, circuit procedures).
- Methods and procedures for the daily operation of a treetop adventure park (distribution of harness, demonstration circuits, daily checks).
- General knowledge of ropes and knots
- Training for rescuers



6. Overseeing Certification with European Standards EN 15567-1 (Optional)

In some cases a client may wish to be certified as compliant with European Standards EN 15567-1. Upon request, an accredited independent controller is called to the site. This third party controller inspects the construction and delivers the certification of compliance.

7. Operation Procedures and Documentation

SkyZip Engineering provides documents and procedures for the operation of the treetop park in compliance with standard EN 15567-2. Areas covered include:

- Distribution and monitoring of customer equipment
- Daily checklists (before opening, during operation and after closing)

- Quarterly inspections
- Booking list and capacity management
- Ticketing and sales reporting
- Staff organization
- Incidents and risks reporting, analysis and control

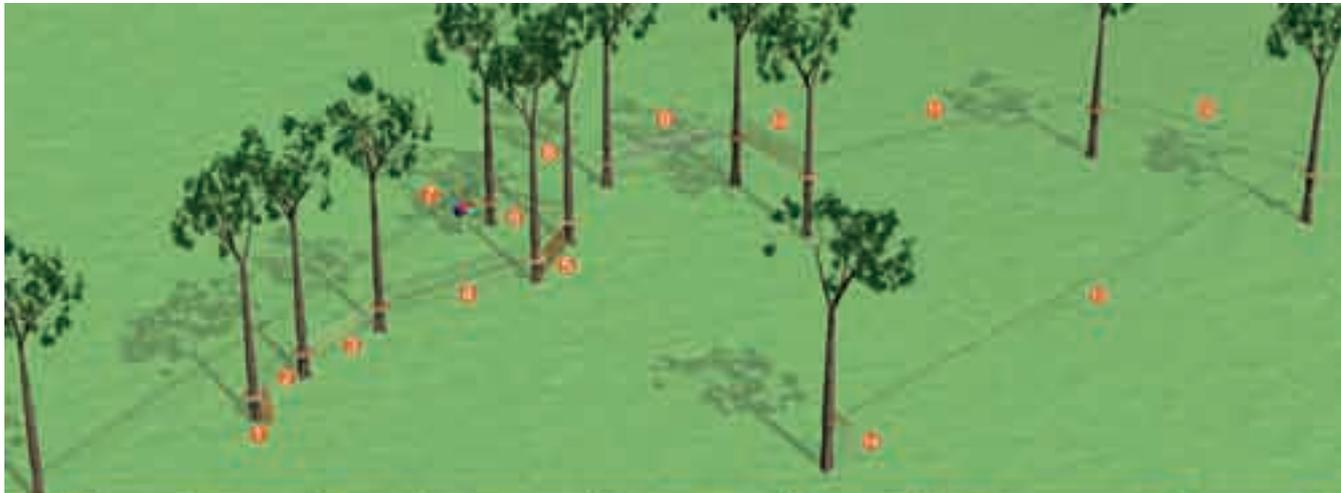
8. Optional:

In addition SkyZip Engineering can provide quotations for:

- Construction of Treehouses
- Construction of a wood cabin (Sales Counter and equipment store)
- Landscaping (e.g paved walkways on the ground under the trees)
- Consulting for Marketing (design of brochures, creation of sales kit)



EXAMPLE OF DRAWING BY SKY ZIP ENGINEERING BEFORE CONSTRUCTION








DISCOVERY COURSE:
Untuk para pemula agar mereka dapat mengenal aktivitas ini dengan nyaman perlu membiasakan diri dengan penggunaan peralatan security secara otomatik. Di jalur ini, orang yang gampang cemas pun tetap bisa tersenyum!

CHILDREN COURSE
Ages : 4 to 8 years old

JUNIOR & ADULT COURSE
Ages : over 6 years old

minimum height of hand raised up 110 cm

minimum height of hand raised up 130 cm

CHALLENGES:

- 1 Climbing Wall
- 2 Ropeless Bridge
- 3 Flat Net
- 4 Halfway Bridge
- 5 Game Steps
- 6 Legs Crossing
- 7 Airplane (for Children Course)
- 8 Horizontal Flying Fox
- 9 Updull Fishing Net
- 10 Flying Swings
- 11 Flying Fox
- 12 Monkey Track
- 13 Flying Fox
- 14 Downhill Net

BALI TREE TOP CENTER OF ADVENTURE

KEMUN RAYA ENA KAWI
BEDUGAL
BALI

LIPI

DISCOVERY COURSE
CHILDREN COURSE & JUNIOR / ADULT COURSE

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EXAMPLE OF CALCULATION BY SKY ZIP ENGINEERING TO COMPLY WITH STANDARDS EN 15567-1

Each Challenge is calculated before construction, and verified after construction

Calculation Hypothesis

- (1) Flexion capacity (XP 52-902-1) :

$$Q_i = \frac{\sigma_m \pi \phi_0^3}{32}$$

- (2) The impact force is calculated with the wire rope characteristic given by Beal & according to the formula below:

$$F = Mg \left(1 + \sqrt{1 + \frac{2Kf}{Mg}} \right)$$

- (3) Unloaded wire rope modeled by the parabola equation:

$$y(x) = ax^2 + bx + c$$

- (4) Length of the safety line using the curvilinear integral of the parabola times the construction stretch (0,125%):

$$s = \int_0^L \sqrt{1 + (y'(x))^2} dx$$

- (5) Stresses are calculated with the assumption of a triangular shape for a loaded wire rope. They are due to the wire rope weight and the load applied on the challenge.
- (6) The safety line low point is calculated assuming a triangular shape and considering that the sum of the lengths of the upstream and downstream parts is constant.
- (7) Elongation is computed recursively (order 8) according to the initial value of the stress calculated when the safety line is loaded.

European Standard Compliance		
Tree Compliance	OK	OK
Wire Rope Comp.	OK	OK
Loop Compliance	OK	OK

Wire Rope Parameters

Reference	6 x 19 S IWRC
Linear Mass	0,676 kg/m
Breaking Load	12029 kg
Young Modulus	84 kN/mm ²
Diameter	0,5 inches

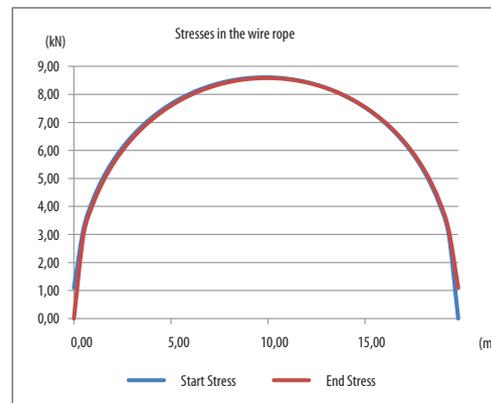
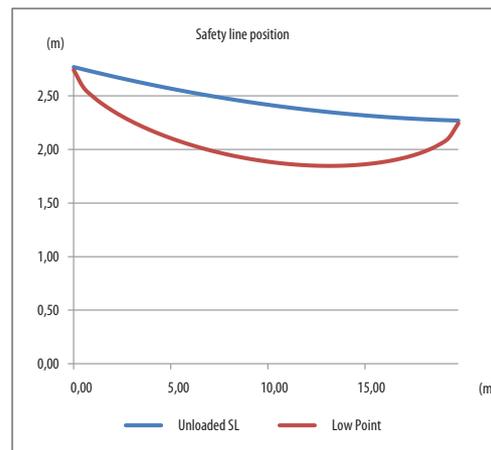
Geometric parameters and strains

	Start Tree	End Tree
at 1.3 m (m)	0,62	0,60
at anchorage (m)	0,54	0,60
Permitted Load (MPa)	150	150
Loop angle (°)	93	64
Flexion Capacity (1)	12910	26721
Safety line anchorage		
Anchorage Height (m)	2,77	1,2
Difference (m)		-0,5
Angle (°)	-2,60	0,29
Distance (m)		19,8
Average slope (%)		-2,53%
Average slope (°)		-1,45

Weight applied (kg)	50
Distance safety line/harness (cm)	NA
Fall Factor	0,00
Beal Lanyard characteristic (N)	7781
Impact Force (2) (kg)	100,00

Mathematical Parameters (3)

a =	1,02E-03	b =	-4,54E-02
c =	-2,77		
Initial wire rope sag (m)		0,10	
Safety Line Initial Length (m) (4)		19,83	
Direct Length (m)		19,81	
(5)	Start Tree	End Tree	
Unloaded stress (kg)	332	332	
Maximal stress (kg)	878	875	



Comments :	Document Name	01_08_Flying_Fox	Document Type	Safety Line Calculation	
	Author	Quentin Mosquet	Challenge Reference	01_08_Flying_Fox	
	Creation Date	29/06/2010	Challenge Type		
	Modification Date		Park	Bali Treetop Adv. Park	



PT. AWANG AWANG ADVENTURE

Construction and Management of Ziplines and Eco-Adventure Parks

Jl. Bumbak Gg. P. Buton No. 1, Umalas, Kerobokan, Bali, Indonesia

Tel: +62-361-8520680 / +62-81-338306898 Email: info@skyzipengineering.com

www.skyzipengineering.com