User Instructions Manual

skyTECH Spring Brake System and Crash Pad

SKY-SB-01, SKY-SB-02, SKY-SB-03, SKY-SB-04
SKY-SB-05-4, SKY-SB-05-8

Skyline Ziplines Ltd.

admin@skylineziplines.ca
www.skylineziplines.ca

Revision History

Revision	Sections Affected	Changes	Date
0	-	Original Publication	16 January 2018
1.0	8.2	Added section 8.2	16 September 2018
1.1	1.4, 3.1, 11, Last Page	Header Styles, Removed 7' Crash Pad Specs., Updated Cable Compatibility & Skyline Office Postal Code	14 May 2019

Table of Contents

CONTENTS

Warnings and Important Notices

You will find on this page, and throughout this user instructions manual, many warnings and important notices that must be considered seriously when operating this system. It is imperative to understand the meaning of the warnings and potential hazards.

It is the responsibility of the operator to document and maintain a product use, inspection and maintenance logbook. Skyline Ziplines supplies inspection criteria and guidelines, forms and log sheets specific to all manufactured systems and equipment. It is the responsibility of the operator to follow all guidelines, intervals, and criteria set forth by these documents.

WARNING: This product is designed for zip line operations only. The operator(s) must read and understand the instructions in this manual before using this product. Manufacturer's instructions must be followed for the proper use and maintenance of the system and provided equipment. Alterations or misuse of this equipment, or failure to follow instructions, may result in serious injury or death.

This document does not replace a complete training necessary for the use of this product. Knowledge by the user of all appropriate techniques and risks is required.

This manual contains information and instructions specific to the skyTECH Spring Brake System, Crash Pad, and associated equipment manufactured by Skyline Ziplines Ltd. Make sure this User Instructions Manual is the latest version available. Contact Skyline Ziplines to obtain the latest document revisions, important Updates and other notices.

Products and systems manufactured by Skyline Ziplines are intended for use by professionals trained and experienced in the use, inspection, and maintenance of these products, or for use by persons under the direct visual surveillance of competent and responsible persons.

Before using this equipment, record the product identification information from the ID label in the inspection and maintenance log at the end of this document. Make sure this User Instructions Manual is readily available with the product. Contact Skyline Ziplines Ltd to obtain additional copies of this manual.

1.0 Description

1.1 Applications

The skyTECH Spring Brake System is to be used as braking safety equipment for commercial zipline amusement rides only

1.2 Standards

Refer to local, provincial/state and federal laws and regulations pertaining to the installation and use of this type of equipment

1.3 Description of Spring Brake

1.3.1 skyTECH Spring Brake System

Product Codes:

- Soft Spring (15 lbf/in): SKY-SB-01
- Standard Spring (30 lbf/in): SKY-SB-02
- Extra-Stiff Spring (60 lbf/in): SKY-SB-03
- Spacer: SKY-SB-04

Specifications:

- Stainless Steel 302 Construction
- CNC Machined UHMW Spacers
- Stainless Steel Hardware
- Field Replaceable
- Eliminates Metal-to-Metal Contact

1.4 Description of Crash Pad

1.4.1 skyTECH Spring Crash Pad

Product Codes:

- 4-Foot Pad: SKY-SB-05-4
- 8-Foot Pad: SKY-SB-05-8

2.0 Limitations

Consider the following application limitations before using this equipment:

2.1 Capacity and Working Load Limit

- Not to be used in operations exceeding 60 mph braking speeds
- Not to be used in operations exceeding 300 lbs. patron weight

2.2 Environmental Hazards

Use of this equipment in areas with environmental hazards may require additional precautions to prevent injury to the user or damage to the equipment. Hazards may include, but are not limited to: heat, chemicals, corrosive environments, electrical fields and wires, gases and sharp edges.

2.3 Sharp Edges

Avoid using where the zip line equipment or other system components will be in contact with, or abrade against unprotected sharp edges

2.4 Training

Skyline Spring Brake and Crash Pad must only be installed and used by persons trained in their correct application and use (See Section 5)

2.5 Crash Pad Use

In accordance with Bulletin No. SKY1010 Safety Notification (contact Skyline Ziplines for Notification), all skyTECH Spring Brake Systems must install a crash pad. Use of a skyTECH Spring Brake System without the adequate protection of the Crash Pad component may lead to blunt force trauma, entanglement, and/or additional serious injuries.

3.0 System Requirements

3.1 Compatibility of Components

Skyline equipment is designed for use with the Skyline approved components and subsystems only. Substitution or replacements made with non-approved components or subsystems may jeopardize compatibility of equipment and may affect the safety and reliability of the complete system.

3.1.1 Approved Additional Brake Systems

- skyTECH Catch Block
- skyTECH Catcher
- Head Rush Technologies zipSTOP
- Contact Skyline Ziplines for any questions regarding brake system compatibility

3.1.2 Approved Trolleys

- skyTECH Rocket Trolley
- skyTECH Turbine Trolley
- Contact Skyline Ziplines for any questions regarding trolley compatibility

3.1.3 Approved Cable Size

- ½”, 3/8”, 7/8” Diameter

\- or -

- All Skyline Approved Cable Diameters
- Contact Skyline Ziplines for any questions regarding approved cable compatibility

3.1.4 Approved Spring Crash Pad Installations

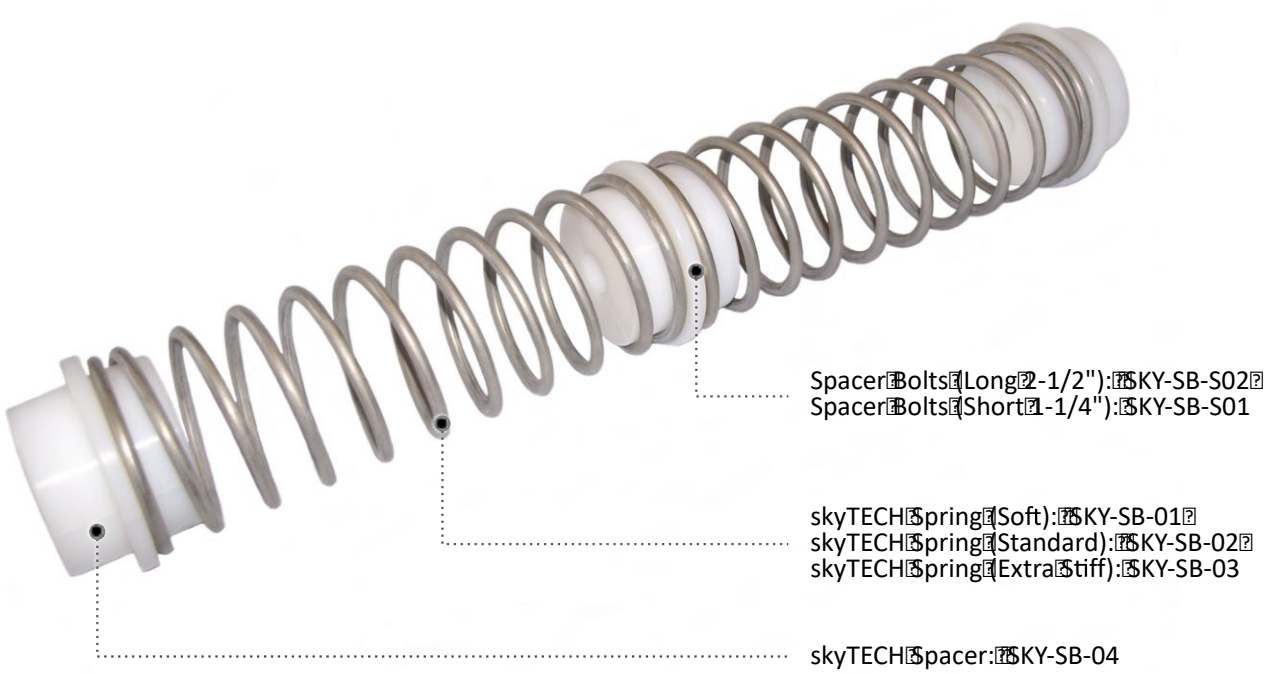
- skyTECH Spring Brake System
- Contact Skyline Ziplines for any questions regarding brake system compatibility

3.1.5 Rope/Cord Specifications

- Diameter: 5.5mm – 8mm
- Minimum Strength: 13kN
- High abrasion resistance and UV resistance
- Dry, non-absorptive (Hydrophobic)
- High bend-fatigue resistance

4.0 Nomenclature and Assembly

4.1 Description of Parts



4.2 Procedure for Installing Spring Brake System as EAD (Most Common)

Tools Required: Ladder, 3/16” Allen Wrench, Rubber Mallet
*Install only on installed ziplines, do not install prior to tensioning the wire rope
**Install extra-stiff springs at the rear of the spring pack
***Spring Brake MUST be installed on the main zipline cable

4.2.1 Position the ladder for optimal stability and access to the main zipline cable
4.2.2 Remove all four bolts from spacer with the 3/16” Allen Wrench
4.2.3 Place spacer on cable and install the two short spacer bolts (SKY-SB-S01, 1-1/4”) into the countersunk holes with the 3/16” Allen Wrench
4.2.4 Place end of spring on cable and hit with the rubber mallet until the spring end encompasses the cable
4.2.5 Rotate the spring onto the cable. The last couple of coils may require the rubber mallet to assist
4.2.6 Slide the spring onto the spacer and install one long spacer bolt (SKY-SB-S02, 2-1/2”) to retain the spring on the spacer. Screw the bolt in until the base of the bolt head touches the spring coil.
*If the bolt is inset too much, the spring will jump over the bolt and separate from the spacer
4.2.7 Repeat alternating installation of spacers and springs until desired amount of springs are installed.
4.2.8 Install one last spacer so that every spring has a spacer on both ends (book ending)
4.2.9 Slide the spring pack to the back, resting against the wire rope socket. If no socket was used to terminate the cable, install a 6” piece of wire rope with two Crosby G-450 Wire Rope Clips as a back bumper for the spring bank to rest against

4.3 Procedure for Installing Spring Brake System as Primary with Anti-Recoil

Tools Required: Ladder, 3/16” Allen Wrench, Rubber Mallet
*System only compatible with skyTECH Catch Block, skyTECH Rocket and Jet Trolleys
**Contact Skyline Ziplines for a more precise description and design for installation

4.3.1 Position the ladder for optimal stability and access to the main zipline cable
4.3.2 Install desired spring bank as described in section 4.2
4.3.3 Install a skyTECH Catch Block as described in section 4.2 of the Catch Block User Instructions Manual
4.3.4 Install a Mauri Pro Lewmar DC1 Clutch Lever (DCI 6-8mm or 8-10mm, dictated by system rope diameter) on the tower, aligned vertically, in an easy-to-access and safe working conditions area

4.3.5 Install a redirect pulley directly above the skyTECH Catch Block

4.3.6 Install two Mauri Pro Harken Fixed Block Pulleys (HAR 448) on the termination tower, one directly above the clutch in line with the overhead brake line and one directly below the clutch in line with the main zipline cable

4.3.7 Install an approved rope (See Section 3.1.5 and Lewmar Clutch Manual) by terminating on the Upper Aluminum Spacer (Gooseneck) of the skyTECH Catch Block (See Catch Block manual); pass through the overhead redirect pulley; back to the tower; through the fixed block pulley, clutch, and fixed block pulley; and back to the skyTECH Catch Block to terminate on the Lower Aluminum Spacer (Gooseneck)

4.4 Procedure for Installing Spring Brake System as Primary with 2:1 Reduction

*Please contact Skyline Ziplines Ltd. for 2:1 Spring Brake Installations

4.5 Procedure for Installing Crash Pad on Spring Brake System as Primary

Tools Required: Ladder, Approved Cord approx. 12ft (4m) in length

4.5.1 Position the ladder for optimal stability and access to the main zipline cable

4.5.2 Separate the Crash Pad at the Velcro seam

4.5.3 Slide the Crash Pad onto the cable with the Skyline Ziplines logo on the uphill side

4.5.4 Slide the Crash Pad onto the spring bank and close the Velcro

4.5.5 Wrap the approved cord (See Section 3.1.5) around the Crash Pad as a choke

4.5.6 Tie a non-slip knot such as a follow-through figure-8 knot

4.5.7 Pass the cord through the Velcro seam approximately 6” from the front of the pad

4.5.8 Tie the cord to the front spring with a non-binding knot such as a barrel knot; this ensures that the knot can be untied easily by staff for daily pre-use inspections of the spring bank

4.6 Procedure for Installing Crash Pad on Spring Brake System as EAD

Tools Required: Ladder

4.6.1 Position the ladder for optimal stability and access to the main zipline cable

4.6.2 Separate the Crash Pad at the Velcro seam

4.6.3 Slide the Crash Pad onto the cable with the Skyline Ziplines logo on the uphill side

4.6.4 Slide the Crash Pad onto the spring bank and close the Velcro

4.6.5 Attach the webbing to the third spring

5.0 Standard Operating Procedures

The following operating procedures outline only the necessary steps required to complete each process. The procedures do not consider additional safety requirements and additional safety considerations that should be considered for each site. Please consult a qualified person and/or your site-specific manual to ensure all necessary steps are taken to guarantee safety in your operations.

5.1 Standard Operating Procedures – EAD

5.1.1 Perform pre-use inspection in accordance with Site Operating Manual
5.1.2 Perform radio protocol
5.1.3 Remove guest from zipline

5.2 Standard Operating Procedures – Primary System with Anti-Recoil

5.2.1 Perform pre-use inspection in accordance with Site Operating Manual
5.2.2 Ensure clutch is in the “CLOSED” position
5.2.3 Perform radio protocol
5.2.4 Remove guest from zipline
5.2.5 Release clutch into “OPEN” position

6.0 Training

It is the responsibility of the buyer/user of this equipment to make sure that they understand these instructions, and are sufficiently trained in the correct use and care of this equipment. The user must be aware of the operating characteristics, application limits, and the consequences of improper use. Training must be done prior to use and user must be evaluated for his/her competence to use this equipment. Gaining an adequate education in proper techniques and methods of safety is your own responsibility. Training should be done under the supervision of competent persons.

It is recommended that Skyline Ziplines perform a manufacturer's training to cover the material in this document, use with other equipment, and site specific training.

**Competent persons: (OSHA) One who is capable of identifying existing and predictable hazards in the surroundings or working conditions that are hazardous our dangerous to employees, and who has the authorization to take prompt corrective measures to eliminate them.*

7.0 Inspection

7.1 Frequency

7.1.1 The skyTECH Spring Brake System and Crash Pad must be formally inspected daily prior to initial use and recorded in the inspection log

7.1.2 The skyTECH Spring Brake System and Crash Pad must be informally inspected prior to each use for normal operation, orientation, and overall condition

7.1.3 Visual and NDT inspections are required based on volume

7.1.4 The skyTECH Spring Brake System and Crash Pad must be inspected by the manufacturer or approved competent person(s) at least once a year (or more frequently if deemed necessary by the frequency and/or conditions of use). The results of this formal inspection must be recorded in the inspection and maintenance log at the end of this manual

7.2 Daily Pre-Use Inspection Process

The daily pre-use inspection process is included in Appendix A. The forms available in this manual may be used for operations and as a template for site specific forms. It is critical that every item presented on the provided form is inspected and documented.

7.3 Volume Inspection Process

The volume inspection process is included in Appendix A. The volume inspection for the Spring Brake Systems occurs after 1,000 cycles per unit or 6 months, whichever comes first.

Springs:

- Using a tape measure, measure the length of the spring
- Springs are retired when their length is less than or equal to 11 inches

Spacers:

- Inspect spacer for all four bolts
- Inspect spacer for cracks, deformations deeper than ¼", and material missing

7.4 Documentation Process

Located in Appendix A is a sample Inspection form that Skyline Ziplines recommends using as a template. Located in Appendix B is a sample Maintenance form that Skyline Ziplines recommends using as a template. Located in Appendix C is a flowchart explaining the appropriate process for inspections, maintenance, and documentation. It is important to reference this flowchart for proper Quality Assurance documentation.

7.5 Lock Out, Tag Out

To ensure the highest standard of safety, it is required that all sites produce a Lock Out, Tag Out system. The system/process is designed to identify and prevent the use of all equipment identified through the inspection process as REJECTED (not suitable for use). Below is an example provided by Skyline Ziplines and is also included in the flowchart in Appendix C:

7.5.1 Item identified as rejected or failed during inspection by staff member
7.5.2 Failure/rejection is noted on inspection log (Appendix A)
7.5.3 Item is marked with a tag with the following information:
- 7.5.3.1 Name of staff member
- 7.5.3.2 Date of inspection
- 7.5.3.3 Reason for rejection

7.5.4 Item is placed in designated Lock Out, Tag Out area. This area must be removed from the operating area to avoid any chance of use

8.0 Maintenance and Storage

8.1 Storage

Proper storage of equipment leads to longer equipment life and assurance of the integrity of the product. Follow the below guidelines for long term:

- Store the product in a cool, dry, and clean environment out of direct sunlight
- Avoid areas that vapors may exist
- Avoid stacking trolleys on top of each other and metal to metal contact
- Thoroughly inspect all equipment after extended storage

8.2 Replacement Parts and Repairs

All replacement parts must be purchased through Skyline Ziplines Ltd. All equipment repairs must be performed by the following: Skyline Ziplines Ltd, an authorized contractor/vendor of Skyline Ziplines Ltd with approval, or trained and authorized onsite personnel.

8.3 Spring Brake Maintenance – Change Out Spacer

Tools Required: Ladder, 3/16” Allen Wrench

8.3.1 Remove the two long spacer bolts (SKY-SB-S02, 2-1/2”) with the 3/16” Allen Wrench

8.3.2 Slide both springs off the spacer

8.3.3 Remove the two short spacer bolts (SKY-SB-S01, 1-1/4”) with the 3/16” Allen Wrench

8.3.4 Remove the spacer from the cable

8.3.5 Remove all four bolts from the new spacer with the 3/16” Allen Wrench

8.3.6 Place spacer on cable and install the two short spacer bolts (SKY-SB-S01, 1-1/4”) into the countersunk holes with the 3/16” Allen Wrench

8.3.7 Slide both springs on to the new spacer

8.3.8 Install two long spacer bolt (SKY-SB-S02, 2-1/2”) to retain the springs on the spacer. Screw the bolt in until the base of the bolt head touches the spring coil

*If the bolt is inset too much, the spring will jump over the bolt and separate from the spacer

8.3.9 Inspect unit and record maintenance in log (Appendix B)

8.4 Spring Brake Maintenance – Removal of a Spring

Tools Required: Claw Hammer, 3/16” Allen Wrench

*Do not use cutting implements near high tension wire ropes, serious injury or death may result

8.4.1 Remove the two long spacer bolts (SKY-SB-S02, 2-1/2”) holding the spring onto the two spacers with the 3/16” Allen Wrench

8.4.2 Wedge the claw hammer into the last spring coil

8.4.3 Pry the end of the spring off the cable

8.4.4 Spin the spring off the cable

8.4.5 Inspect unit and record maintenance in log (Appendix B)

9.0 Lifetime

The lifetime of a skyTECH Spring Brake System is determined through the NDT method described in section 7.3. The actual lifetime depends on the intensity and the frequency of use as well as the environment. An exceptional circumstance might limit the product lifetime to a single use. A product that was not inspected at least once per year should be removed from service and replaced.

10.0 Incident and Failure Reporting

In the unfortunate situation that a skyTECH Spring Brake and/or Crash Pad is involved in an incident or a failure, please notify Skyline Ziplines immediately so that prompt corrective measures can be taken by Skyline Ziplines. Product Safety Alerts are available at request and are sent out to all previous customers via email.

Complete information concerning the incident (date, location, details as to event and consequence, etc.) must be communicated to admin@skylineziplines.ca and/or called into the office at 604-905-4149.

Skyline Ziplines will investigate the incident and if a product recall alert is required, shall notify all known customers and distributors who have purchased the product.

11.0 Warranty

Subject to the following limitations, terms, and conditions, Skyline Ziplines LTD warrants to the original purchaser of each Product that such Products when purchased new, are free of defects in materials and workmanship. This limited warranty may be exercised for a period of up to one year from the date of receipt. This limited warranty does not apply to normal wear and tear, nor to claimed defects, malfunctions or failures that result from abuse, neglect, improper assembly, improper maintenance, alteration, collision, crash, or misuse.

EXCEPT AS EXPRESSLY SET FORTH ABOVE, SKYLINE ZIPLINES LTD DISCLAIMS ALL OTHER WARRANTIES, EXPRESS OR IMPLIED, INCLUDING, WITHOUT LIMITATION, IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PURPOSE. SKYLINE ZIPLINES LTD'S RESPONSIBILITY FOR WARRANTY CLAIMS IS LIMITED TO, AT SKYLINE ZIPLINES LTD'S SOLE DISCRETION, REIMBURSEMENT OF THE ORIGINAL PURCHASE PRICE, REPAIR OF THE PRODUCT, OR REPLACEMENT OF THE PRODUCT WITH THE SAME OR SIMILAR PRODUCT. NOTWITHSTANDING anything in THESE TERMS to the contrary, SKYLINE ZIPLINES LTD SHALL NOT be responsible or held liable for punitive, indirect, incidental or consequential damages, including without limitation, liability for loss of use, loss of profits, loss of Product or business interruption however the same may be caused, including fault or negligence of SKYLINE ZIPLINES LTD.

To exercise rights under this limited warranty, Customer must return the affected Product to Skyline Ziplines LTD (unless otherwise instructed by Skyline Ziplines LTD) to:

SKYLINE ZIPLINES LTD
6-1006 LYNHAM ROAD
WHISTLER, BRITISH COLUMBIA, CANADA V8E 0S3

Skyline Ziplines LTD will use reasonable commercial efforts to return all product in a timely manner to the designated location and will be responsible for all shipping costs. Skyline Ziplines LTD reserves the right to modify this limited warranty at any time, in its sole discretion.

Appendix A – Inspection Form

*Sample files available upon request

This Page Is Intentionally Blank

INSPECTION FORM I-04

skyTECH Spring Brake
skyTECH Crash Pad

Inspection Information

Frequency: Daily Pre-Use
Performed By: Trained Staff Member
Models: Springs, Spacer, Crash Pad
Manufacturer: Skyline Ziplines LTD.

Inspect all matching equipment in accordance with the inspect criteria listed below. At the bottom, record the equipment's disposition by marking the appropriate ID number. If the answer is YES to one or more of the following questions, the unit is deemed UNFIT for service.

1. Known Equipment History
- Has the unit received an impact exceeding 60 mph without a subsequent inspection?
- Has the unit been exposed to detrimental chemical products or an intensive source of heat?
- Has the unit been formally inspected within the last year by a competent person?

2. Preliminary Observations
- Are all tags and labels attached and legible?
- Has the product undergone modifications or alterations not performed or authorized by the manufacturer?

3. Spring Inspection
- Are there any visual indications of damage; short or compressed springs, broken metal, or deformations?
- Are there any springs separated from spacers?

4. Spacer Inspection
- Are there any visual indiciations of damage such as chips, cracks, missing material, or deformations?
- Is there any loose or missing hardware?

5. Crash Pad Inspection
- Are there any visual indications of damage such as fabric tears, rips, missing material, exposed velcro, or deformations?
- Are there any issues with the fastening of the Crash Pad to the Spring Brake?

Disposition Circle all Line numbers correlating with all units that have PASSED the inspection and are FIT for service

01	02	03	04	05	06	07	08	09	10

Failed Equipment List all Line numbers for units deemed UNFIT for service. Consult the manual for proper Lock Out, Tag Out Protocol

Notes/Comments

Inspected By:

Date:

INSPECTION FORM I-41

skyTECH Spring Brake
skyTECH Crash Pad

Inspection Information

Frequency: 1,000 Cycles or 6 Months	***Models:*** Springs, Spacer, Crash Pad
Performed By: Trained Staff Member	***Manufacturer:*** Skyline Ziplines LTD.

Inspect all matching equipment in accordance with the inspect criteria listed below. At the bottom, record the equipment's disposition by marking the appropriate ID number. If the answer is YES to one or more of the following questions, the unit is deemed UNFIT for service.

1. Spring Inspection

- Measure every spring, do any measure less than 11.00"? Remove and replace

2. Spacer Inspection

- Are there any cracks, loss of material, or deformations deeper than 1/4"? Remove and replace

Disposition - Circle all Line numbers correlating with all units that have PASSED the inspection and are FIT for service

01 02 03 04 05 06 07 08 09 10

Failed Equipment - List all Line numbers for units deemed UNFIT for service. Consult the manual for proper Lock Out, Tag Out Protocol

Notes/Comments

Inspected By:

Date:

Appendix B – Maintenance Log

*Sample files available upon request

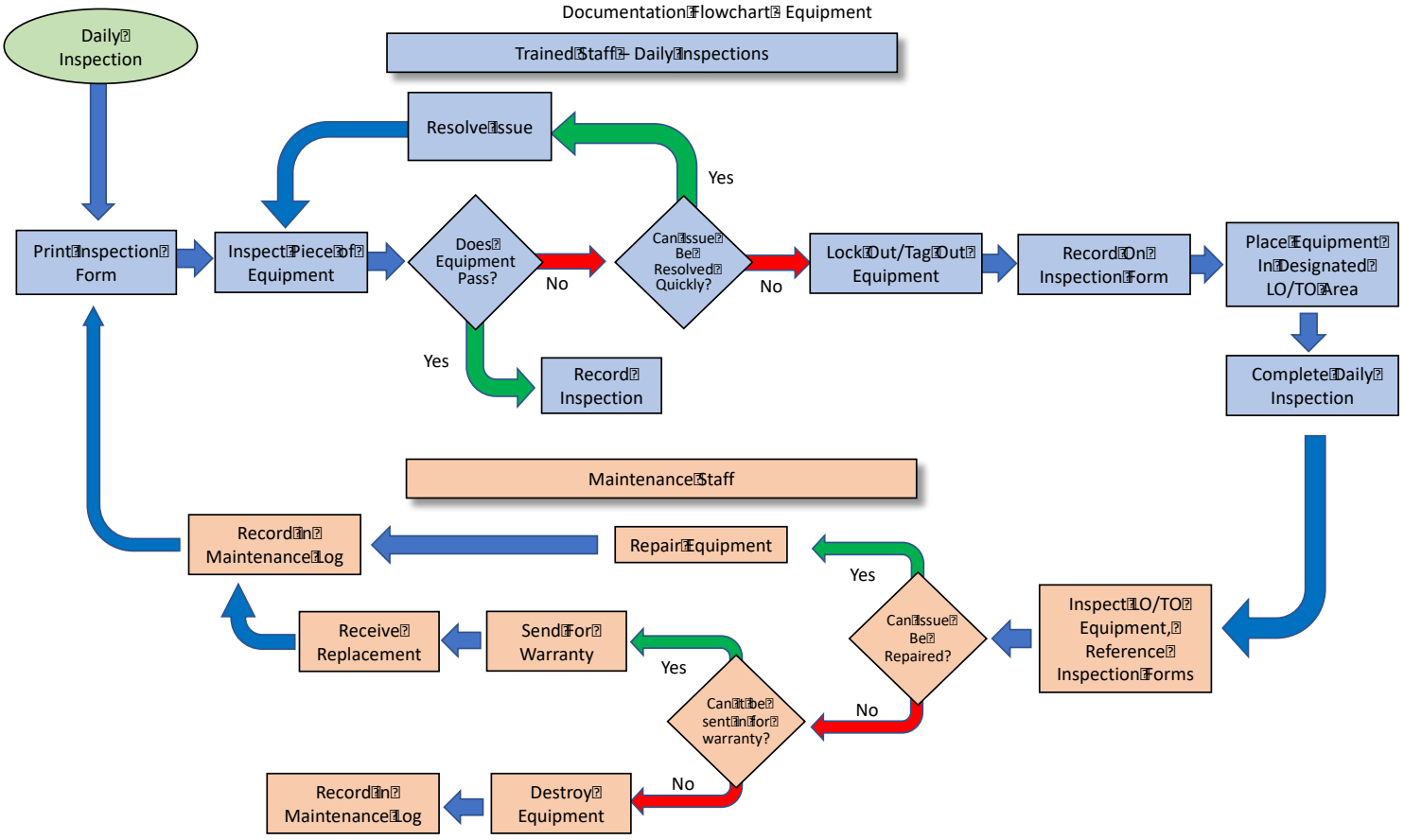
This Page Is Intentionally Blank

MAINTENANCE FORM M-04

skyTECH Spring Brake and Crash Pad

Unit ID:	Performed By:	Date:
Work Performed:		Vedict (Circle One): FIT UNFIT RETIRED
Unit ID:	Performed By:	Date:
Work Performed:		Vedict (Circle One): FIT UNFIT RETIRED
Unit ID:	Performed By:	Date:
Work Performed:		Vedict (Circle One): FIT UNFIT RETIRED
Unit ID:	Performed By:	Date:
Work Performed:		Vedict (Circle One): FIT UNFIT RETIRED
Unit ID:	Performed By:	Date:
Work Performed:		Vedict (Circle One): FIT UNFIT RETIRED
Unit ID:	Performed By:	Date:
Work Performed:		Vedict (Circle One): FIT UNFIT RETIRED
Unit ID:	Performed By:	Date:
Work Performed:		Vedict (Circle One): FIT UNFIT RETIRED
Unit ID:	Performed By:	Date:
Work Performed:		Vedict (Circle One): FIT UNFIT RETIRED
Unit ID:	Performed By:	Date:
Work Performed:		Vedict (Circle One): FIT UNFIT RETIRED
Unit ID:	Performed By:	Date:
Work Performed:		Vedict (Circle One): FIT UNFIT RETIRED
Unit ID:	Performed By:	Date:
Work Performed:		Vedict (Circle One): FIT UNFIT RETIRED
Unit ID:	Performed By:	Date:
Work Performed:		Vedict (Circle One): FIT UNFIT RETIRED
Unit ID:	Performed By:	Date:
Work Performed:		Vedict (Circle One): FIT UNFIT RETIRED
Unit ID:	Performed By:	Date:
Work Performed:		Vedict (Circle One): FIT UNFIT RETIRED
Unit ID:	Performed By:	Date:
Work Performed:		Vedict (Circle One): FIT UNFIT RETIRED

Appendix C – Documentation Process Flowchart



Skyline Ziplines Ltd.
Headquarters
6-1006 Lynham Road
Whistler, British Columbia
Canada V8E 0S3

Canada Phone: (604) 905 - 4149

admin@skylineziplines.ca
www.skylineziplines.ca