Schweizerische Eidgenossenschaft
Confédération suisse
Confederazione Svizzera
Confederaziun svizra

Federal Department of the Environment,
Transport, Energy and Communications DETEC

**Federal Office for the Environment FOEN**

# Type approval of safety nets for protection against rockfall

Test Certificate No. S 05-10

## System description

| | | |
|---|---|---|
| • **System designation** | | **ISOSTOP 2000 kJ** |
| • **Address of designer** | | isofer ag, Industriequartier, 8934 Knonau, Switzerland |
| • **System description** | | |
| – Energy class | | 2000 kJ |
| – Posts: | profile | HEB 160 (S235JRG2) |
| | length $a_l$ | 5.31 m |
| | interval $a_s$ | 10 m |
| – Support ropes: | type | wire cable |
| | diameter | 24 mm, retention cable 22 mm, braking cable 18 mm |
| – Net: | type | twisted wire cable net (DIN 2078, SN EN 10244-2) |
| | diameter | 10 mm (peripheral cable 12 mm) |
| | mesh | 140 x 140 mm (wire netting cover 50 x 50 mm) |
| | height $h_v$ | 4.80 m |

– System drawings

| Description | No. | Date |
|---|---|---|
| System and assembly handbook | - | May 2005 |
| System drawing of cable guide 2000 kJ (3 copies) | - | 24.05.2005 |
| Technical documentation | - | 06.04.2005 |

## Basic documentation

- **Field test**

  WSL test report — Date: 30 June 2005 — Report no. 05-10

- **Overall assessment**

  Overall assessment of the EKLS — Date: 13 September 2005 — Report no. S 05-10

## Test results

- **Preliminary test of outer part**
  - Penetration of test body: yes ☐ / no ☒
  - Additional observations: none

| | |
|---|---|
| • **Preliminary energy test (50%)** | 1000 kJ |
| – Penetration of test body | yes ☐ / no ☒ |
| – Braking time $t_s$ | 0.34 s |
| – Braking distance $b_s$ | 5.10 m |
| – Sum of the tensile forces in the 3 upper cables | 315 kN |
| – Sum of the tensile forces in the 3 lower cables | 260 kN |
| – Maximum tensile force in stay cables | 91 kN |
| – List of damaged elements | |
| No significant damage to any structural members. Eighteen of the 30 breaking elements were deformed. | |
| – Assessment of repairs | |
| Fourteen braking elements were replaced. The required working time was 27 man-hours. The extent of repairs necessary following the test is ascertained to be normal. | |
| • **Main energy test (100%)** | 2000 kJ |
| – Penetration of test body | yes ☐ / no ☒ |
| – Braking time $t_s$ | 0.46 s |
| – *Maximum permissible braking distance $b_s$* | *10.0 m* |
| – Measured braking distance $b_s$ | 6.8 m |
| – *Minimum permissible residual braking height $h_n$* | *2.5 m* |
| – Measured residual braking height $h_n$ | 2.63 m |
| – Sum of the tensile forces in the 3 upper cables | 350 kN |
| – Sum of the tensile forces in the 3 lower cables | 255 kN |
| – Maximum tensile force in stay cables | 117 kN |
| – List of damaged elements | |
| No significant damage to any structural members. Twenty-four of the 30 breaking elements were deformed. | |
| • **Assessment of special criteria** | |
| – Comments on assembly and on the assembly instructions | |
| The existing documentation is adequate for carrying out the assembly work and can be stated to be satisfactory. The assembly time is within the normal range. No particular difficulties were encountered with assembly. | |
| – Comments on adaptability to the terrain | |
| The adaptability to the terrain can be stated to be normal. | |
| – Comments on design complexity | |
| The design can be stated to be satisfactory. The accompanying documentation facilitates safe assembly. Work in the terrain generally proves difficult with cables of 24 mm diameter. | |

Comments on anticipated life cycle

The posts are galvanised according to standard practice. The net is galvanised according to standard practice: a variant is offered with plating comprising 95% Zn und 5% Al. The components are delivered in versions adequate for the required life cycle of the installation.

The anticipated life cycle is ascertained to be adequate.

## Overall assessment

☒ **Test passed** ☐ **Test not passed**

Examined based on the following guidelines: GERBER, W. 2001: Guideline for the approval of rockfall protection kits, Environment in practice, Federal Office for the Environment (FOEN) and Swiss Federal Research Institute WSL, Berne, 39 pages, revised June 2006.

RESERVATION: Should deficiencies arise following certification of the safety net, FOEN may revoke product release and delete it from the type approval list.

| **Date** | **Name, position** | **Signatures** |
|---|---|---|
| 19.05.2006 | **Andreas Götz, Deputy Director** |  |

Federal Office for the Environment (FOEN)
Risk Prevention Division
3003 BERN
http:// www.umwelt-schweiz.ch/typenpruefung