

Fall Protection for Engineers

3-day seminar – 13th to 15th of May 2013 – BG BAU,
Frankfurt / Germany

Venue

BG BAU – Berufsgenossenschaft der Bauwirtschaft
Bezirksverwaltung Frankfurt
Hungener Straße 6
60389 Frankfurt am Main
Germany

The seminar begins on Monday, 13th of May 2013 at 10:45 a.m.
The seminar is scheduled to end on Wednesday, 15th of May 2013 at 04:00 p.m.

We look forward to working with you in Frankfurt.

Organizers:



In cooperation with:



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Introduction

Accidental falls remain the leading cause of injuries and fatalities in different industries. The hazard of falling accompanies almost all jobs on construction sites, shipping or mining. During erection of electricity transmission towers and telecommunication towers, the hazard of falling cannot be removed. When constructing typical buildings the fall hazard can and is primarily controlled by the use of guardrails/barriers, but this method is not suitable for towers, oil rigs, wind-mills and a majority of various jobs. For example in aircraft hangars, maintenance personnel have to work at heights or walk on the wings of airplanes. Like it or not, we have to resort to personal fall arrest systems (PFAS) and often have to deal with anchor devices – especially complex horizontal lifelines (HLL).



(Photo: Sperian Protection)

The design of PFASs requires knowledge of the dynamics of accelerating and decelerating falling masses. Engineers need an ability to calculate the maximum arrest force (MAF) acting on the FAS user, the total dynamic FAS extension (Total Fall Distance, TFD) and the required clearances. The design of anchor devices should ensure that the strength of their components is capable of withstanding the maximum arrest load (MAL) that is generated in an HLL. Mathematical modeling of flexible horizontal lifelines when the line's sag is represented by a catenary equation is needlessly difficult. Parabolic models are almost as accurate and much simpler; however, even this approximation cannot be tackled without iteratively solving the equations.

The MAF should not hurt the fall victim. Its level is limited in EU standards to 6 kN (8 kN in Canada and the USA). Notwithstanding the limits, the real injury threshold for a human body subjected to transitory deceleration depends on the direction and the point of application of the MAF on the fall casualty's body. The new MAF limits for the "X" and "Y" directions are lower than the official 6 (8) kN.

Protection against falls from heights is considered by many to be the most complex part of the entire Personal Protective Equipment (PPE) field. In addition to the above described mathematical skills, the FAS designer is faced with an enormous task of selecting components which are available in a lot of models, makes, types and classes from a large number of suppliers. The differences between various models of equipment that all meet the same standard can be subtle, but can also significantly affect the peak impact forces and required clearances. Designers cannot rely on minimum requirements published in standards to accurately describe and compare how equipment certified to these standards will behave. Elimination of the force of gravity is not a viable option, and all joking aside, accidental falls will continue to happen. While we should always seek ways of preventing falls, the removal of the fall hazard is, on very many jobs, either impossible or not economically feasible. We must therefore strive to arrest falls by designing systems that minimize the chance of injuring the worker. This is a noble goal, but very difficult or impossible to achieve with certainty. It is incumbent on design professionals to know and follow best practices that are known to minimize the risks.

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General Information

This seminar which was already organized with great success in Haan in September 2009, in June 2010 and in April 2011 would be of special interest to the construction industry, architects, anyone who designs or assembles components into complete fall protection systems, safety personnel in every industry where fall hazards exist, production managers and supervisors responsible for workers' safety, fall protection equipment manufacturers, government safety specialists, electric and telecommunication utility safety specialists, transportation safety personnel, safety trainers, test engineers, standards writing organizations, mine safety specialists, oil and gas companies, armed forces, the professional height rescue teams, alpinists etc.

The seminar will be held in English.

A formal engineering degree is not a pre-requisite for attendance; however participants are expected to be familiar with the dynamics of masses and basic algebraic mathematics.

The seminar fee is 2.200,00 Euros. It includes meals during the day, a seminar dinner and extensive seminar materials.

The Seminar's Objective

The Fall Protection for Engineers seminar reveals the current state-of-the-art techniques and understandings in design of personal fall protection systems (PFPS). Our design philosophy places special emphasis on the following features that should be part of all Fall Protection Systems:

1. We should initially respond to all fall hazards with an attempt to remove the hazard of falling, either by changing the process or by employing equipment, systems or techniques that prevent workers from being in or reaching locations where falls can occur,
2. When it is not feasible to prevent falls, Fall Arrest Systems must be used to reduce fall accident frequency and severity, by meeting as many of the following objectives as possible:
 - The systems must comply with or exceed existing regulations and standards,
 - The Residual Risks in FAS should be minimized,
 - The Fall Protection Engineer should employ all modern tools available to FSA designers and be knowledgeable in the state-of-the-art technology,
 - The systems must be user-friendly,
 - They cannot be overly expensive to acquire,
 - They cannot adversely affect productivity,
 - Their overall benefit should result in cost savings for the employers.

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The Speakers

The BG BAU and partners have, in the spirit of international cooperation, invited two experts from Canada to share with their European colleagues, the Canadian experience in design of fall protection systems. Both Andrew C. Sulowski, P.Eng., and Greg Small, P.Eng. share between them over 55 years of continuous work in fall protection engineering all over the world. They are retained as consultants to fall protection manufacturers and suppliers of engineered systems, to assist with complex problems and develop innovative solutions.

Another speaker is Wolfgang Schäper. He is a world-renowned expert in personal fall protection. He is convenor and member in several working groups of CEN/TC 160 and other German Committees. As a Technical Auditor for “PPE against falls from a height/descender devices” of the notified body “Zentrum für Sicherheitstechnik Haan” he gained a lot of practical experiences.

Seminar Material Supplied to All Participants

The seminar materials supplied to all participants include several manuals, books, and videos. The sheer volume of the provided references necessitates that we also provide carry-on luggage to make it easier to get these resources home. Participants will also receive a copy and one-year-license to use High Engineering Corp’s (Microsoft Excel) spreadsheets to simplify the highly complex calculation of Fall Arrest System forces and clearances (especially in the HLLs). The knowledge and information offered by all speakers is unique and cannot be obtained from any other source. Today’s global economy and optimal protection of our workforce compels us to know and use state-of-the art engineering techniques for fall protection. We are confident that participants will concur that their investment will pay for itself very quickly. Participants will develop a new and very scarce level of expertise to offer their current or future employers.



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Programm

DAY 1 Monday, 13th of May, 2013

- 10:45 a.m. Registration of participants
- 11:15 a.m. **Introduction**
Karl-Heinz Noetel
BG BAU – German Social Accident Insurance Institution for the building trade
- Andrew Sulowski*
Sulowski Fall Protection Inc. (Toronto, Canada)
- Greg Small*
High Engineering Corp. (Calgary, Canada)
- 11:30 a.m. **Fall Protection Regulations in the European Union and European Standards for Personal Fall Protection Equipment**
- EU Directive Regarding Personal Protective Equipment
- Standards for Components
- Standards for Testing
Wolfgang Schäper
BG BAU - German Social Accident Insurance Institution for the building trade
- 12:15 p.m. Lunch
- 01:15 p.m. **Introduction to Human Body Physiology for Fall Protection Engineers**
- The Effects of the Maximum Arrest Force (Shock Load) and Orthostatic Intolerance (Static Suspension)
- The Limits of Energy Absorbers
- The Post-Fall Rescue Time
Andrew Sulowski
- 03:15 p.m. Coffee Break
- 03:30 p.m. **Typical Fall Protection Equipment**
- Harnesses
- Lanyards
- Vertical Lifelines (VLLs)
- Ladder Systems
- Self Retracting Lanyards (SRLs)
Andrew Sulowski
- 05:00 p.m. **Design Assumptions - Equipment**
Worker; Harnesses; Lanyards; Vertical Lifelines; Ladder Systems; Self Retracting Lanyards
Greg Small
- 06:00 p.m. End

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DAY 2 Tuesday, 14th of May, 2013

- 08:30 a.m. **Calculations of Clearances**
- Free Fall
 - Deceleration Distance
 - Stretch-Out
 - Swing Falls
 - Clearance Margin
- Greg Small*
- 09:15 a.m. **Mathematical Modelling - Personal Energy Absorbers (PEA) and Vertical Lifelines**
- Derivation
 - Example Hand Calculations
- Greg Small*
- 10:30 a.m. Coffee Break
- 10:45 a.m. **Mathematical Modelling - Energy Absorbers and Vertical Lifelines (cont'd)**
- Software Calculations
 - Use on Sloping Surfaces
- Greg Small*
- 12:15 p.m. **Lunch**
- 01:15 p.m. **Selected Industrial and Military Fall Protection Systems**
- Various best practices from around the world
- Andrew Sulowski*
- 03:15 p.m. Coffee Break
- 03:30 p.m. **Mathematical Modelling - Simple Horizontal Lifelines (HLLs)**
- Equations
 - Software Calculations
- Greg Small*
- 05:15 p.m. **Mathematical Modelling - Balance Sag Equation**
- Horizontal Lifelines using Horizontal Lifeline Energy Absorbers (HLLLEAs)
- Derivation of Equation
- Hand Calculations
- Greg Small*
- 06:00 p.m. End
- 07:00 p.m. Seminar Dinner

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DAY 3 | Wednesday 15th of May, 2013

- 08:30 a.m. **Mathematical Modelling - Horizontal Lifelines with Horizontal Lifeline Energy Absorbers**
- Hand Calculations
- Calculations using Software
Greg Small
- 09:30 a.m. **Software Modelling of Complex Horizontal Lifelines**
- Multiple Spans
- Flexible Anchors
- Thermal Effects
Greg Small
- 10:30 a.m. Coffee Break
- 10:45 a.m. **Assessing Risk in Industrial Fall Accidents and Managing Human Performance**
- Calculation of a New Form of Personalized Risk for First Line Supervisors
Andrew Sulowski
- 12:00 p.m. Lunch
- 01:00 p.m. **Software Modelling of Complex Horizontal Lifelines**
- Hybrid Systems
- Simultaneous vs. Sequential Falls
Greg Small
- 02:30 p.m. **Residual Risks in Fall Arrest Systems**
Andrew Sulowski
- 03:15 p.m. **Discussion, Questions and Answers, Certificates, Closing Remarks**
Greg Small
Andrew Sulowski
Karl-Heinz Noetel
- 04:00 p.m. End

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Arrival

Address:

Hungener Straße 6

60389 Frankfurt am Main

Germany

Telephone +49 (0) 69 47 05-0

Telefax +49 (0) 69 47 05-888

Arrival by train and bus

From Frankfurt main railway station:

- Take a train or an underground train to the station "Konstablerwache"
- Take the tram number 18 (direction "Frankfurt (Main) Gravensteiner-Platz") to the station "Münzenberger Straße" (duration about 10 minutes; during rush hours, there are trams about every 10 minutes) **or**
- Take the bus number 30 (direction "Bad Vilbel Bahnhof" / "Münzenberger Straße" / "Unfallklinik") to the station "Münzenberger Straße" (duration about 10 minutes; during rush hours, there are buses about every 10 minutes)
- Keep straight on the main street "Friedberger Landstraße" (approx. 200 meters) and then turn right to the "Hungener Straße"

From Frankfurt airport:

- Take the train
 - S 9 (direction "Hanau Hbf") **or**
 - S 8 (direction "Offenbach Ost")to the station "Konstablerwache" (duration about 20 minutes; during rush hours, there are trains about every 15 minutes)
- Take the tram number 18 (direction "Frankfurt (Main) Gravensteiner-Platz") to the station "Münzenberger Straße" (duration about 10 minutes; during rush hours, there are buses about every 10 minutes) **or**
- Take the bus number 30 (direction "Bad Vilbel Bahnhof" / "Münzenberger Straße" / "Unfallklinik") to the station "Münzenberger Straße" (duration about 10 minutes; during rush hours, there are buses about every 10 minutes)
- Keep straight on the main street "Friedberger Landstraße" (approx. 200 meters) and then turn right to the "Hungener Straße"

By taxi

From Frankfurt main railway station:

- Distance approx. 8 km; travelling time approx. 15 minutes (in cases of higher traffic volume the journey by taxi may last longer); price: approx. 17 € (depending on travel route)

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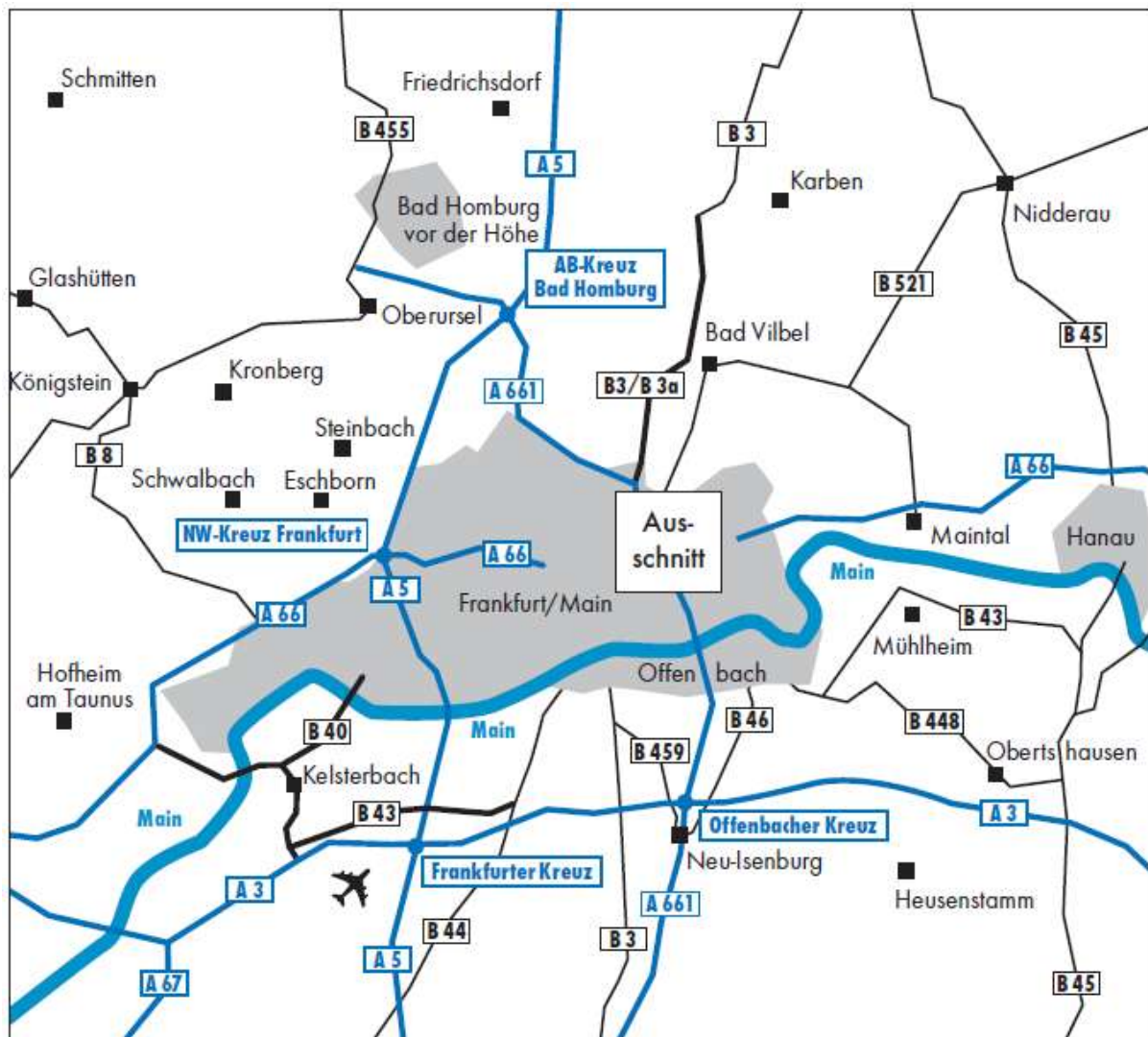
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From Frankfurt airport:

- Distance approx. 20 km; travelling time approx. 20 minutes (in cases of higher traffic volume the journey by taxi may last longer); price: approx. 37 € (depending on travel route)

Arrival by car

- For those arriving by car please use maps below.

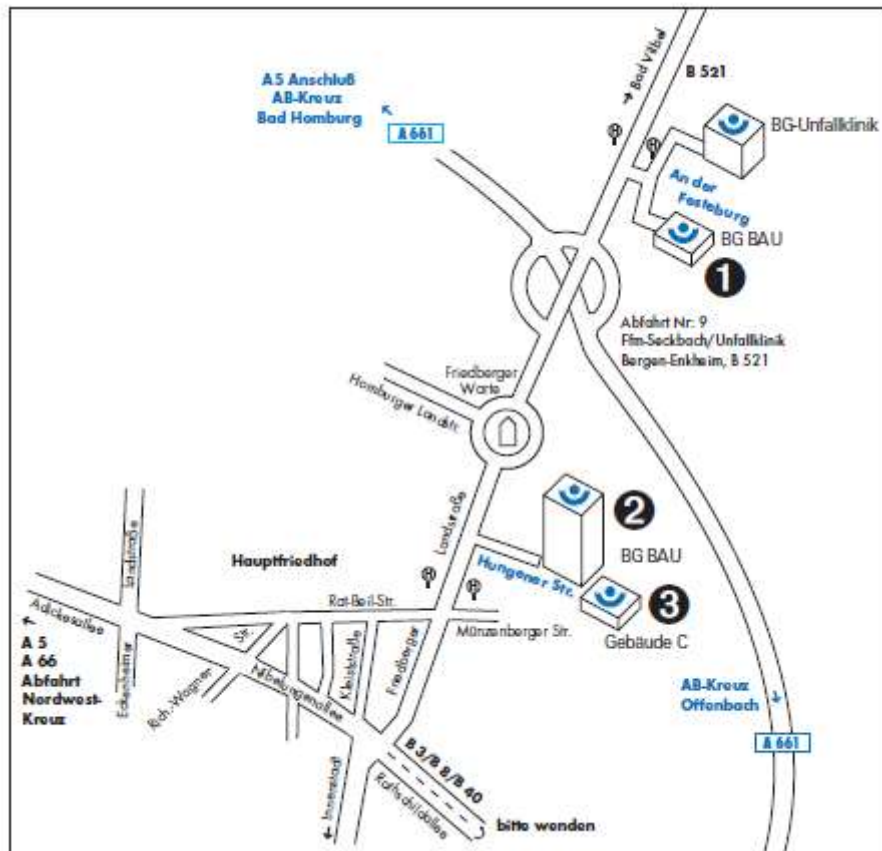


(Map 1)

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Extracted part (Ausschnitt) of Map 1



(Map 2)

- | | |
|---|---|
| ❶ Berufsgenossenschaft der Bauwirtschaft An der Festeberg 27 – 29 60389 Frankfurt | ❷ Berufsgenossenschaft der Bauwirtschaft |
| | ❸ Arbeitssicherheitsausstellung Gebäude C Hungener Straße 6 60389 Frankfurt |

Through the following link <http://www.bgbau.de/die-bg-bau/ansprechpa/anfahrt/frankfurt> you have the possibility to receive a more detailed route description to the BG BAU building in Frankfurt for those arriving by car (unfortunately only available in German).

Info

The meeting place is situated in **building number 3**.
The room number of the meeting place is **H1** on the 1st floor.

Source reference: Flyer „Anfahrtsplan BV 4 07/2005 AMD Medienstelle“; Homepage Deutsche Bahn AG; Homepage Taxi Frankfurt eG

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Hotel Information

We have made preliminary reservations of rooms at special rates in the following two hotels:

BEST WESTERN PREMIER IB Hotel Friedberger Warte

Homburger Landstraße 4

60389 Frankfurt am Main

Tel: +49 (0) 69-7680640

Fax: +49 (0) 69-768064555

E-Mail: info@ibhotel-frankfurt.bestwestern.de

www.ibhotel-frankfurt.bestwestern.de

The hotel is in walking distance from the BG BAU building and easily accessible by foot, by car or by public transport.

From station “Münzenberger Straße”

- Take the tram number 18 (direction “Frankfurt (Main) Gravensteiner-Platz”) to the station “Friedberger Warte” (duration about 3 minutes; during rush hours, there are trams about every 10 minutes)
- Take the bus number 30 (direction “Bad Vilbel”) to the station “Friedberger Warte” (duration about 3 minutes; during rush hours, there are buses about every 10 minutes)

One night in a single room costs 93 € (breakfast included).

The seminar-dinner will take place in the restaurant of this hotel.

Please make your own reservation – at your own costs – directly with the hotel before **12th of April 2013**, mentioning the keyword **Fall Protection**.

NH Frankfurt City

Vilbeler Str. 2.

60313 Frankfurt

Tel. +49 (0) 69-9288590

Reservation: +49 (0) 302 23 85 911

E-Mail: nhfrankfurtcity@nh-hotels.com

www.nh-hotels.de/nh/de/hotels/deutschland/frankfurt/nh-frankfurt-city.html

The hotel is about 2,5 km from the BG BAU building and easily accessible by car or by public transport.

From station “Münzenberger Straße”

- Take the tram number 18 (direction “Frankfurt (Main) Lokalbahnhof”) to the station “Frankfurt (Main) Hessendenkmal” (duration about 8 minutes; during rush hours, there are trams about every 10 minutes)
- Take the bus number 30 (direction “Frankfurt (Main) Hainer Weg”) to the station “Frankfurt (Main) Hessendenkmal” (duration about 8 minutes; during rush hours, there are buses about every 10 minutes)

One night in a single room costs 160 € (breakfast included).

Please make your own reservation – at your own costs – directly with the hotel before **15th of April 2013**, mentioning the keyword **Fall Protection**.

If you have any questions or would prefer another hotel, please do not hesitate to contact us.