



The Augmented Reality Formwork Assembly Training

ARFAT - Training System

Guide



ERASMUS+ Programme

Cooperation for Innovation and the Exchange of Good Practices

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Introduction

This Guide is designed to help trainees, trainers and coordinators engaged in the ARFAT training system.

It also provide detailed guidance for the use of the up-to-date, tailor-suited to sectoral needs, modern formworks and scaffolding works ARFAT training system, appropriate to be integrated into existing VET offerings or to serve European community as a stand-alone training.

About the project

The aim of the ARFAT project is to address H&S issues and, particularly, the prevention of accidents on construction sites caused by activities related to scaffoldings and formworks.

The project addresses modern skills needs of construction engineers, construction workers, stakeholders and associations in the construction sector, SMEs and companies (construction sector), VET providers, and technical universities, delivering a European solid, reliable and comprehensive pedagogical tool.

ARFAT training is supported financially by the European Commission as part of an ERASMUS+ Programme of Cooperation for Innovation and the Exchange of Good Practices.

For more information, please visit our website:
www.arfat.il.pw.edu.pl



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1. How to use this Guide

This Guide describes how the ARFAT training is organized according to a set of specific goals in a **brief and visual style**.

The training goals describe the skills the trainee is supposed to achieve after the training. In order to enable the achievement of these skills, the ARFAT project has developed a set of training contents, a methodology, two main learning resources (manual and mobile application) and evaluation activities to provide information about the degree of the specific goals achieved by the trainee. All those items are included in this Guide.

The training is divided into **training sessions**, which have also been incorporated to the ARFAT manual. Most of them correspond with safe work procedures related to scaffoldings and formworks activities and have a practical orientation.

Each session has its specific goals, contents and learning resources that will be shown in further sections of this Guide.

Graphic resources

Throughout this Guide you will find some text in green and yellow coloured boxes.

The information in these boxes might be important for both trainer and trainee (green boxes), or show key aspects to be taken into account by the trainer or the coordinator of the training (yellow boxes).



2. Training Information

General aims or goals of the training

After the training, the trainee should be able:

- To know the main aspects related to safe work procedures of scaffoldings and formworks activities.
- To identify the concrete hazards related to the tasks described in each procedure.
- To know how to proceed safely in each case and apply preventive measures for the specific hazards.
- To safely transport, assembly, use and disassembly scaffolding and formwork elements.

Training elements

ARFAT training use all the best features of traditional learning methods (professional manual) and modern training techniques (Augmented Reality software and multimedia files).



Trainee's profile

Construction engineers, engineering students, construction workers, manager of SMEs and personal from stakeholders and associations in the construction sector.

Training recommended ratio

From 10 to 12 course members per trainer.

Training duration

30 hours

About training locations

Most of the training can be carried on in a regular classroom designated for theoretical learning. However, in some cases the trainee will manage real size augmented reality elements and a large indoor or outdoor space will be required.

Training contents

Theoretical contents:

- Introduction.
- Normative bases and definitions.
- Classifications.
- Constructive and use-specific conditions.

Safe work procedures:

- Scaffolding transport.

- Scaffolding assembly: state of the soil.
- Scaffolding assembly: fall protection elements.
- Scaffolding usage: communication.
- Scaffolding usage: structural integrity and periodical checks.
- Scaffolding disassembly.
- Formwork transport: stacking and lifting of elements.
- Formwork transport: guidance of suspended load.
- Formwork assembly.
- Formwork usage: concreting.
- Formwork usage: maintenance.
- Formwork disassembly.

3. Training sessions

This chapter describes the stages in which the training is organized and the estimated duration of each one to elaborate the training program.

Note that a group of 3 or 4 sessions at maximum can be done in a day.

The learning resources related to each session: theoretical contents, augmented reality exercises or videos are linked with the ARFAT manual.

The augmented reality exercises can be accessed independently with a mobile device in which the ARFAT application has been previously installed.

The augmented reality exercises that required large spaces are described in the annex of this Guide.

Theoretical training

Session number	Contents of the training – learning units	Duration
1	Introduction and expected learning outcomes. Presentation of the ARFAT manual and the application.	2 hour
2	Formworks, scaffolds and false work overview, normative bases and definitions	2 hours
3	Classifications. Constructive and use-specific conditions	2 hours

Practical training

Session number	Contents of the training – learning units	Duration
4	Scaffolding transport	2 hours
5	Scaffolding assembly: state of the soil	3 hours
6	Scaffolding assembly: fall protection elements	3 hours
7	Scaffolding usage: communication	2 hours
8	Scaffolding usage: structural integrity and periodical checks	2 hours

Example of training program

9	Scaffolding disassembly	1 hour
10	Formwork transport: stacking and lifting of elements	2 hours
11	Formwork transport: guidance of suspended load	2 hours
12	Formwork assembly	3 hours
13	Formwork usage: concreting	2 hours
14	Formwork usage: maintenance	2 hours
15	Formwork disassembly	1 hour
16	Conclusions and closure of the training period	1 hour

Monday (8:00 to 12:00) (13:00 to 17:00)	Sessions 1 to 4: 1. Introduction and expected learning outcomes. Presentation of ARFAT manual and application. 2. Formworks, scaffolds and false work overview, normative bases and definitions. 3. Classifications. Constructive and use - specific conditions. 4. Scaffolding transport.
Tuesday (8:00 to 12:00) (13:00 to 17:00)	Sessions 5 to 7 5. Scaffolding assembly: state of the soil. 6. Scaffolding assembly: fall protection elements. 7. Scaffolding usage: communication.
Wednesday (8:00 to 12:00) (13:00 to 17:00)	Sessions 8 to 11 8. Scaffolding usage: structural integrity and periodical checks. 9. Scaffolding disassembly. 10. Formwork transport: stacking and lifting of elements. 11. Formwork transport: guidance of suspended load.

4. Example of training program

Coordinators, and other people involved in the organization of the training, need to elaborate a program according to the training sessions described in the chapter 3.

The aim of this chapter is to show an example of a training program, but is a condensed one. It has been done with the assumption that the workers are taken from the construction site to attend this training for 4 consecutive days.

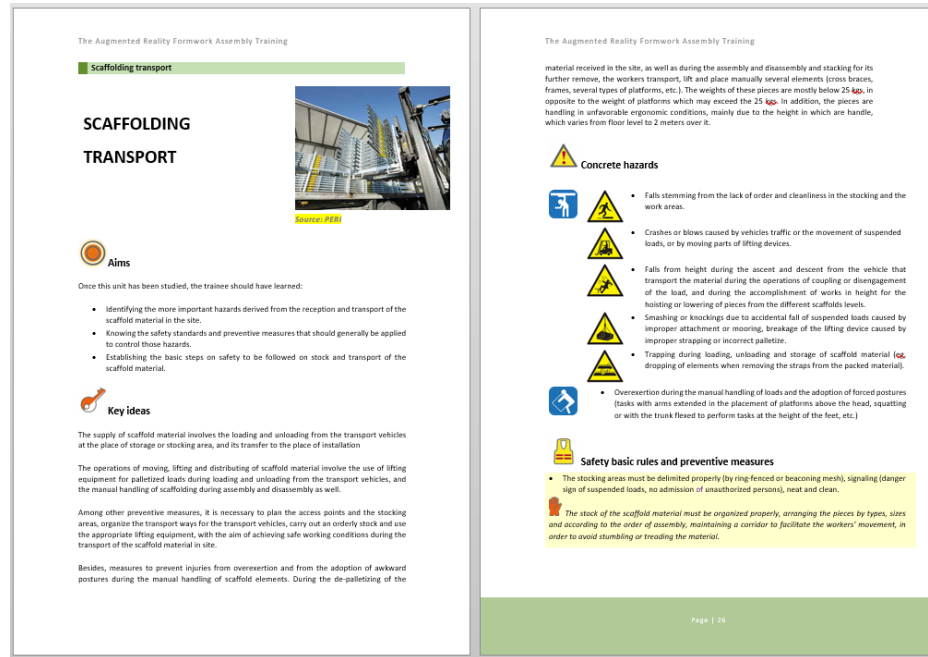









Image of the inside of the ARFAT manual

Graphic resources

You'll find icons in the ARFAT manual that denote different things like learning objectives, key ideas or training resources, warnings of possible hazards or safety basic rules and preventive measures.

Following there is an explanation of what each icon means.

Icon	Meaning
	Aims or goals to be achieved by trainee after the training session.
	Key ideas related to each safe work procedures.
	Concrete hazards related to the activities described in the procedure.
	Safety basic rules and preventive measures for the hazards related to the activities above mentioned.
	Additional warnings and precautions to take into account in each case.
	Specific working instructions about the safety basic rules.
	Augmented reality resources and exercises, and instructional videos to be launched with the ARFAT application installed in a mobile device.

6. ARFAT mobile application

Augmented reality (AR) technology is an enhanced version of reality where views of physical real-world environments are augmented with superimposed computer-generated images. The aim is to enhance one's current perception of reality.

You can launch augmented reality exercises if you install in your mobile phone or tablet the ARFAT mobile application.

The ARFAT application is available for iOS and Android:

bit.ly/ARFAT_IOS

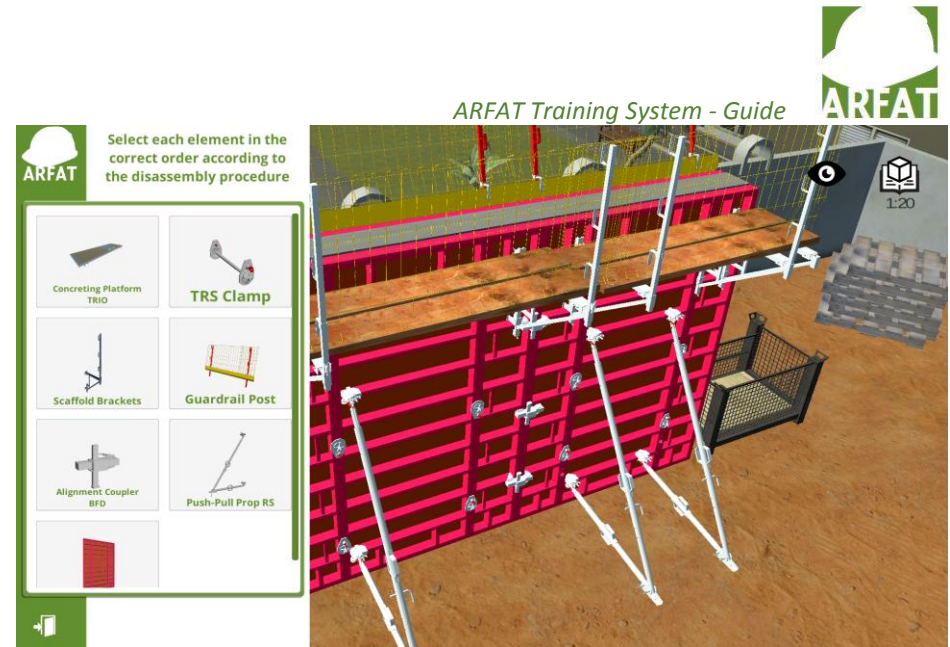


iOS version

bit.ly/ARFAT_ANDROID



Android version



You can see how easy it is to manage the ARFAT mobile application in the tutorial videos at ARFAT YouTube channel:



7. ARFAT markers

Augmented Reality distinguishes two modes of tracking, described in the literature as “marker”, often named as “marker-based”, and “markerless”. Augmented reality markers (AR-markers) are visual cues which trigger the display of the virtual information. Each marker contains some specific points that are further recognized by the camera or other digital device and augment onto the physical model. The whole process is supported by a processing algorithm.

ARFAT support marker-based AR for older devices.

You can download markers from our website (download section), or use cover of the ARFAT manual.



In order to change scale tap on the “eye icon”.

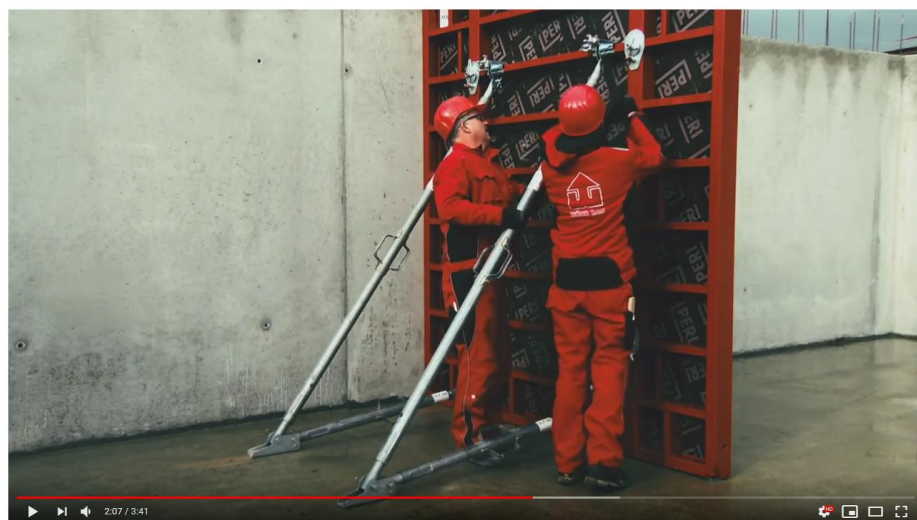


“Markerless” tracking does not use markers. This approach uses sensors in mobile devices in order to precisely detect the real-world environment, such as the locations of walls and points of intersection, allowing users to place virtual objects into a real context without needing to read an image. ARFAT application support markerless tracking for newer devices (*iPad Pro, iPhone7, Samsung Galaxy S8, Samsung Galaxy Note 8*, and newer or similar). All you need to do is set the starting point of AR visualisation by pointing camera of the device at marker and you can enjoy AR models in 1:1 scale (with no further need of marker).



8. ARFAT movies

The movies are available at ARFAT YouTube channel. They can also be accessed by project official website and ARFAT application.



For more information, please visit ARFAT website.

www.arfat.il.pw.edu.pl

