



A New Standard for Simulation Engineers



Agenda

- PSE Overview
- Certification, or an Educational Framework?
- How is the Program Used Today?
- Certification | How does it Work?
- Governance
- Foundation for NAFEMS Activities
- Q&A





PSE Overview

PSE Competencies

PSE (Professional Simulation Engineer) defines the competencies that good simulation engineers should possess.

- The scheme consists of a database of thousands of detailed competency statements
- Peer-reviewed over several years by experts


These competencies are the foundation for the PSE Competency Tracker and PSE Certification.




PSE Competence Statements





FEAco12 - Outline a common method employed to solve the large sets of sparse symmetric matrices common in FEA.




CFDco2 - Compare and contrast the finite difference , finite volume and finite element discretisation methods.



NGECco9 - Discuss the limitations of contact algorithms available in a finite element system.



MASco5 - Discuss the general issue of scatter in material properties relevant to your analysis and simulation and how this is allowed for.



PSE Background

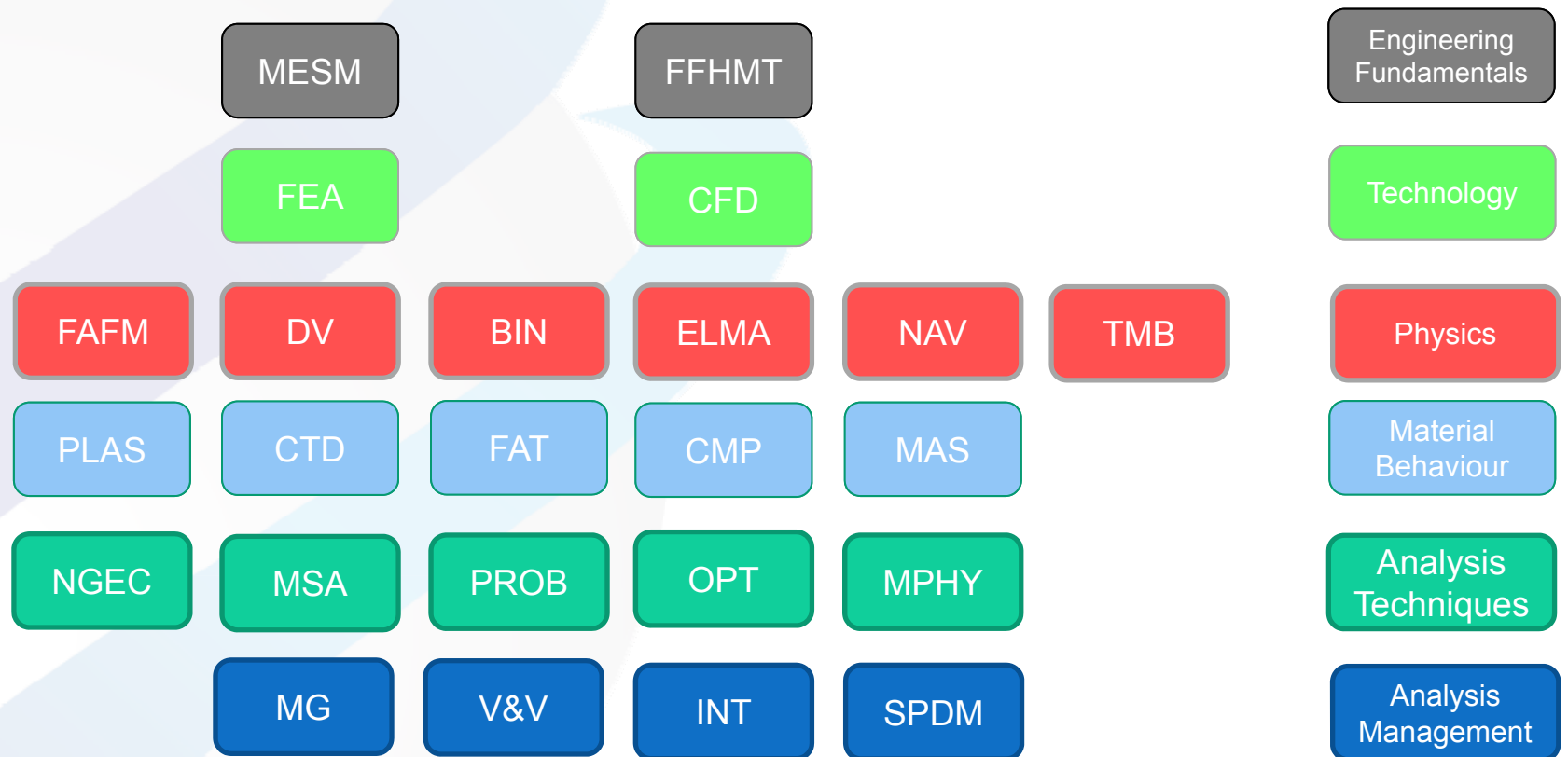
- CCOOPS – Certification of Competencies in the Power and Pressure Systems Industry throughout Europe
 - Project launched with ½ Million Euro Funding under the EU Leonardo da Vinci Programme
- EASIT² – Engineering Analysis Simulation Innovation Transfer² European project 18 Technical Areas
- PSE – Professional Simulation Engineer
 - Officially launched at the 2013 Salzburg NAFEMS World Congress
 - 26 Technical Areas



Technical Areas

- *Mechanics, Elasticity and Strength of Materials**
- *Core Finite Element Analysis**
- *Fundamentals of Flow, Mass & Heat Transfer**
- *Core Computational Fluid Dynamics**
- Materials for Analysis and Simulation
- Fatigue
- Flaw Assessment and Fracture Mechanics
- Nonlinear Geometric Effects and Contact
- Beams, Membranes, Plates and Shells
- Dynamics and Vibration
- Optimisation
- Plasticity
- Thermo-Mechanical Behaviour
- General Analysis Management
- Verification and Validation
- PLM Integration and CAD-CAE Collaboration
- Simulation Process and Data Management
- Buckling and Instability
- Multi-physics Analysis
- Composite Materials and Structures
- Creep and Time-Dependency
- Multi-Scale Analysis
- Probabilistic Analysis
- Noise, Acoustics and Vibro-Acoustics
- Electromagnetics
- Multi-body Dynamics

Technical Areas





Certification, or an
Educational Framework?



Educational Framework

Plan, Track & Manage Competency

The Competency Tracker can be used to:

- Access PSE Competencies Online
- Browse Educational Resources
- Track & Manage Competency



Certification Scheme

Gain recognition for achievement of competency

- Independent Assessment by Industry Experts

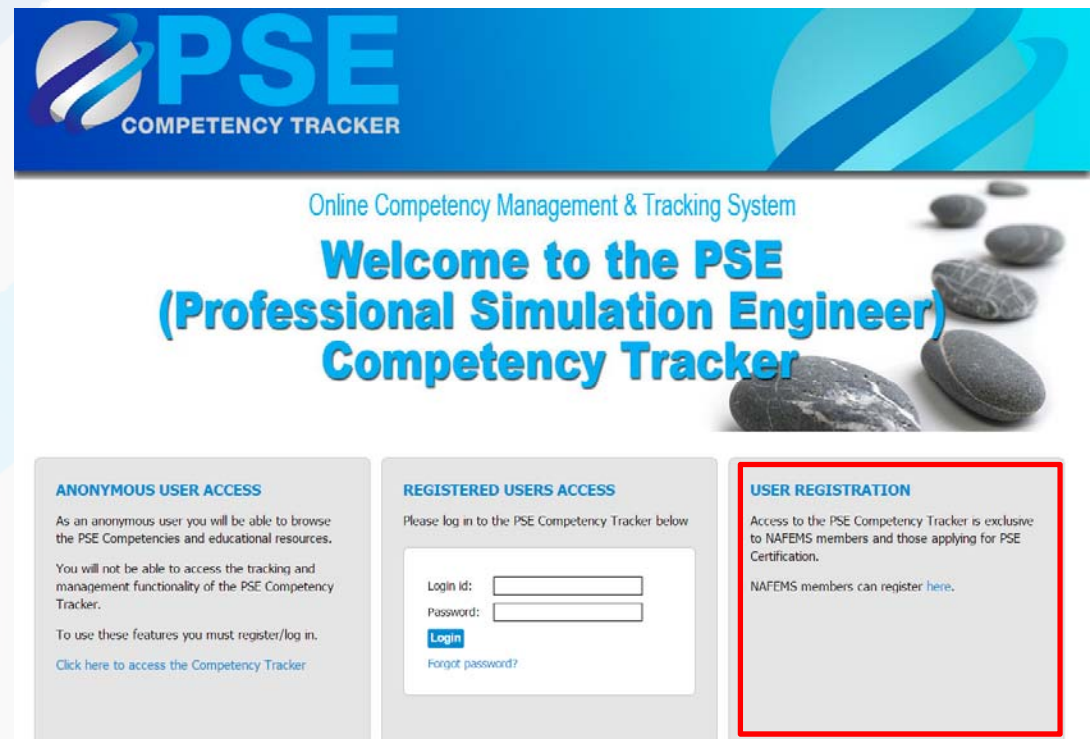


How to Access the Competency Tracker

Register for Access: <https://www.psecompetencytracker.org/>

Complete Tracker Available to:

- PSE Certification Applicants
- NAFEMS Members



The screenshot shows the homepage of the PSE Competency Tracker. At the top is a blue banner with the PSE logo and the text 'COMPETENCY TRACKER'. Below the banner, the text 'Online Competency Management & Tracking System' is displayed. The main heading reads 'Welcome to the PSE (Professional Simulation Engineer) Competency Tracker'. To the right of the text is an image of several smooth, dark stones. Below the heading, there are three columns of content. The first column, titled 'ANONYMOUS USER ACCESS', explains that anonymous users can browse competencies but cannot access tracking or management features. The second column, titled 'REGISTERED USERS ACCESS', provides a login form with fields for 'Login id:' and 'Password:', a 'Login' button, and a 'Forgot password?' link. The third column, titled 'USER REGISTRATION', states that access is exclusive to NAFEMS members and those applying for PSE Certification, and that NAFEMS members can register [here](#). This third column is highlighted with a red border.

PSE
COMPETENCY TRACKER

Online Competency Management & Tracking System

**Welcome to the PSE
(Professional Simulation Engineer)
Competency Tracker**

ANONYMOUS USER ACCESS

As an anonymous user you will be able to browse the PSE Competencies and educational resources. You will not be able to access the tracking and management functionality of the PSE Competency Tracker.

To use these features you must register/log in.
[Click here to access the Competency Tracker](#)

REGISTERED USERS ACCESS

Please log in to the PSE Competency Tracker below

Login id:

Password:

[Login](#)

[Forgot password?](#)

USER REGISTRATION

Access to the PSE Competency Tracker is exclusive to NAFEMS members and those applying for PSE Certification.

NAFEMS members can register [here](#).



PSE Competency Tracker



[expand all] [collapse all]

- ☒ Educational Base
 - ☒ FEA - Finite Elements Analysis (Core Module)
 - ☒ MESM - Mechanics, Elasticity and Strength of Materials
 - ☒ MAS - Materials for Analysis and Simulation
 - ☒ FAT - Fatigue
 - ☒ FAFM - Flaw Assessment and Fracture Mechanics
 - ☒ NGEC - Nonlinear Geometric Effects and Contact
 - ☒ BMPS - Beams, Membranes, Plates and Shells
 - ☒ DV - Dynamics and Vibration
 - ☒ OPT - Optimisation
 - ☒ PLAS - Plasticity
 - ☒ CFD - Computational Fluid Dynamics (Core Module)
 - ☒ TMB - Thermo-Mechanical Behaviour



PSE Competency Tracker

- ☐ PLASkn9 - Identify the extent to which your application software allows modification of nonlinear material solution parameters.
- ☐ PLASco1 - Discuss salient features of the inelastic response of metals.
- ☒ **PLASco2 - Explain the terms Isotropic Hardening, Kinematic Hardening and Rate Independency.**
- ☐ PLASco3 - Discuss the role of the Hydrostatic and Deviatoric Stress Components in yield criteria for isotropic, polycrystalline solids.
- ☐ PLASco4 - Explain the terms Limit Load and Plastic Collapse Load and explain why the latter is often a misnomer.
- ☐ PLASco5 - Explain the terms First Yield Load, Ultimate Load and Plastic Instability Load.
- ☐ PLASco6 - Discuss the use of the Twice Elastic Slope Criterion and explain why this is sometimes used.
- ☐ PLASco7 - Explain the phenomenon of Shakedown and define the term Shakedown Load.
- ☐ PLASco8 - Contrast the terms Ratchetting and Low Cycle Fatigue.
- ☐ PLASco9 - Explain the Upper and Lower Bound Theorems.
- ☐ PLASco10 - Discuss the effects of stress singularities at re-entrant corners on limit load.
- ☐ PLASco11 - Explain how plastic effects in a Finite Element system are commonly handled as a series of incremental iterative linear analyses and contrast the Variable Stif...
- ☐ PLASco12 - Explain, in general terms, the function of the Mises Flow Rule or Prandtl-Reuss Equations, used in a finite element solver.
- ☐ PLASco13 - Outline how the cumulative and incremental displacements, total strains, elastic strains, elastic stresses and plastic strains are related in the finite elemen...
- ☐ PLASco14 - Illustrate typical examples of Local Plastic Deformation and Gross Plastic Deformation.

Competence Statement

Resource References

Competence Record

COMPETENCE STATEMENT

Code: **PLASco2** Cognitive area: **Comprehension** NAFEMS level: **Standard** EQF level: **7**

Competency statement: **Explain the terms Isotropic Hardening, Kinematic Hardening and Rate Independency.**



PSE Competency Tracker

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Competence Statement **Resource References** Competence Record

RESOURCE REFERENCES FOR THE COMPETENCY STATEMENT

Type	Code	Resource	Reference	Link
Book	PLASref11	An Introduction to the Use of Material Models in FE, Nawal K. Prinja & Anup K. Puri, NAFEMS Ltd, 2005, ISBN-1: 875376069	Chapter 5.3 pp. 21-23	Link
Book	PLASref11	Understanding Non-linear Finite Element Analysis through Illustrative Benchmarks, A A Becker, NAFEMS Ltd, ISBN 1-874376-35-2, 2001.	Chapter 2, pp. 27	Link



PSE Competency Tracker

<input type="checkbox"/>	PLASkn9 - Identify the extent to which your application software allows modification of nonlinear material solution parameters.
<input type="checkbox"/>	PLASco1 - Discuss salient features of the inelastic response of metals.
<input checked="" type="checkbox"/>	PLASco2 - Explain the terms Isotropic Hardening, Kinematic Hardening and Rate Independency.
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Competence Statement

Resource References

Competence Record

Competency record: **PLASco2 - Explain the terms Isotropic Hardening, Kinematic Hardening and Rate Independency.**

Status: ☒ Achieved ☐ Not Achieved Method of achievement: Date:

Comments:

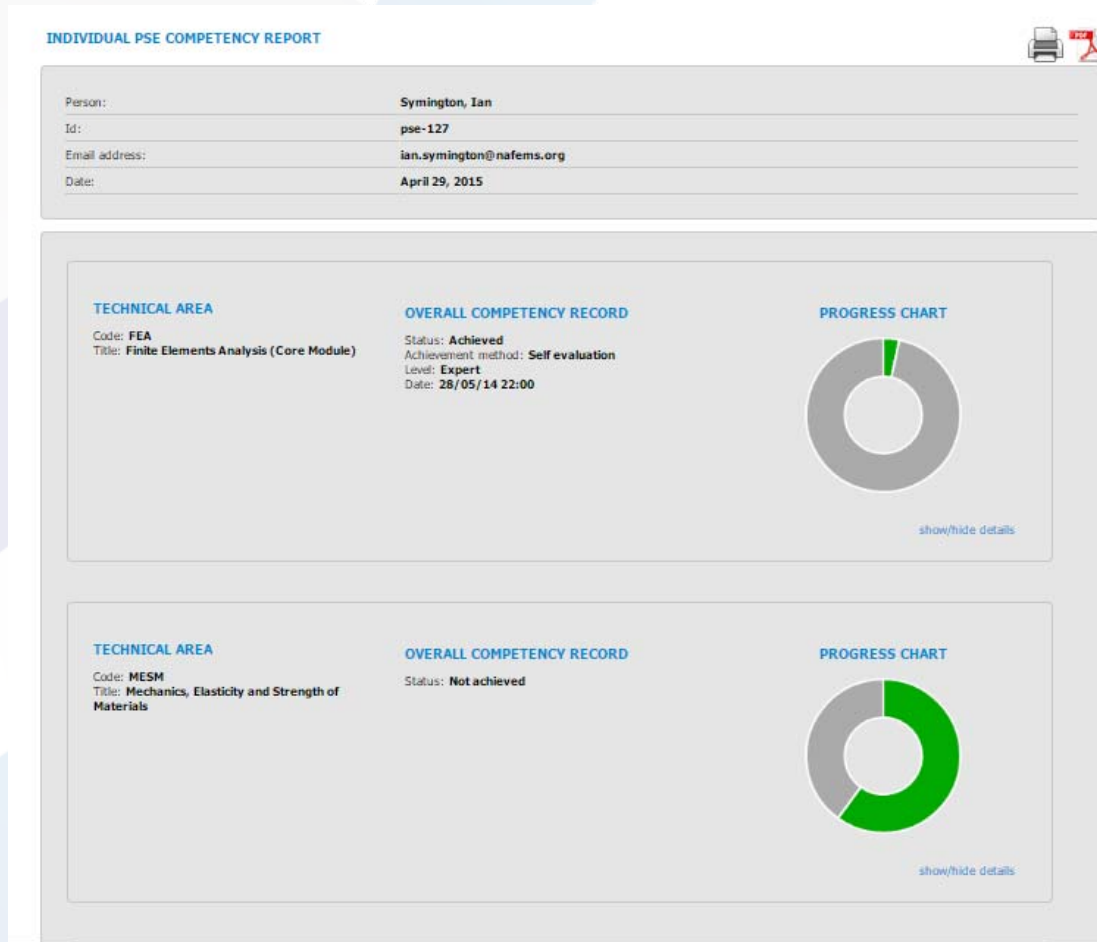
Read publications found in the "Resource Reference" section and can discuss the terms confidently.

Also attended Vendor training course on Material Plasticity where this topic was covered.

Save



PSE Competency Tracker





Independent Assessment of PSE Competencies Resulting in a Recognised Certificate

- Multi-level certification scheme that recognises achievement of PSE competencies
- Independently assessed by NAFEMS
- Online Application via NAFEMS website



Multi-Level Certification

Competencies can be claimed at Entry, Standard and Advanced Level

Entry

- Employs available software tools in an effective manner
- Able to work in a supervised capacity when provided with clear guidelines
- Doesn't take on general tasks without supervision
- Typically applies to trainees and/or technician level staff working under the supervision of a person(s) with appropriate competence who will sign off the results

Standard

- Has sufficient knowledge and comprehension of theory to employ available software tools in a safe and effective manner
- Able to work in an independent manner without supervision
- Conducts appropriate checks on results
- Is aware of their own limitations when faced with new or novel problems
- Observes professional practices

Advanced

- Can take on a range of complex, novel tasks without supervision
- Plans analysis strategies and validation studies
- Provides effective advice and guidance

How is the PSE being used today

By Individuals...

- Used to differentiate themselves
- Used for professional development
- Used as proof of competence to current and future employers
- Steady uptake in interest in PSE from individuals

By Companies...

- As an competence management system
- A clear way to demonstrate the company's commitment to quality standards
- A formal record of employee competency and training satisfying the requirements of ISO 9001
- Creating and maintaining competitive edge



Examples of How PSE is being used today

- Individuals
 - Using 'out of the box' PSE

PSE Competence Statements



PSE Competence Tracker



PSE Certification Assessment



Examples of How PSE is being used today

- High Tech Electronics Manufacturer
 - Managing Competence of Engineering Designers
 - Restrict access to simulation tools
 - > 80 engineers through process

PSE Competence Statements



PSE Competence Tracker



PSE Certification Assessment



Examples of How PSE is being used today

- Large Aerospace Manufacturer
 - Managing Competence of Analysis Engineers
 - Incorporated into companies own Competency Management Process

PSE Competence Statements



PSE Competence Tracker



PSE Certification Assessment



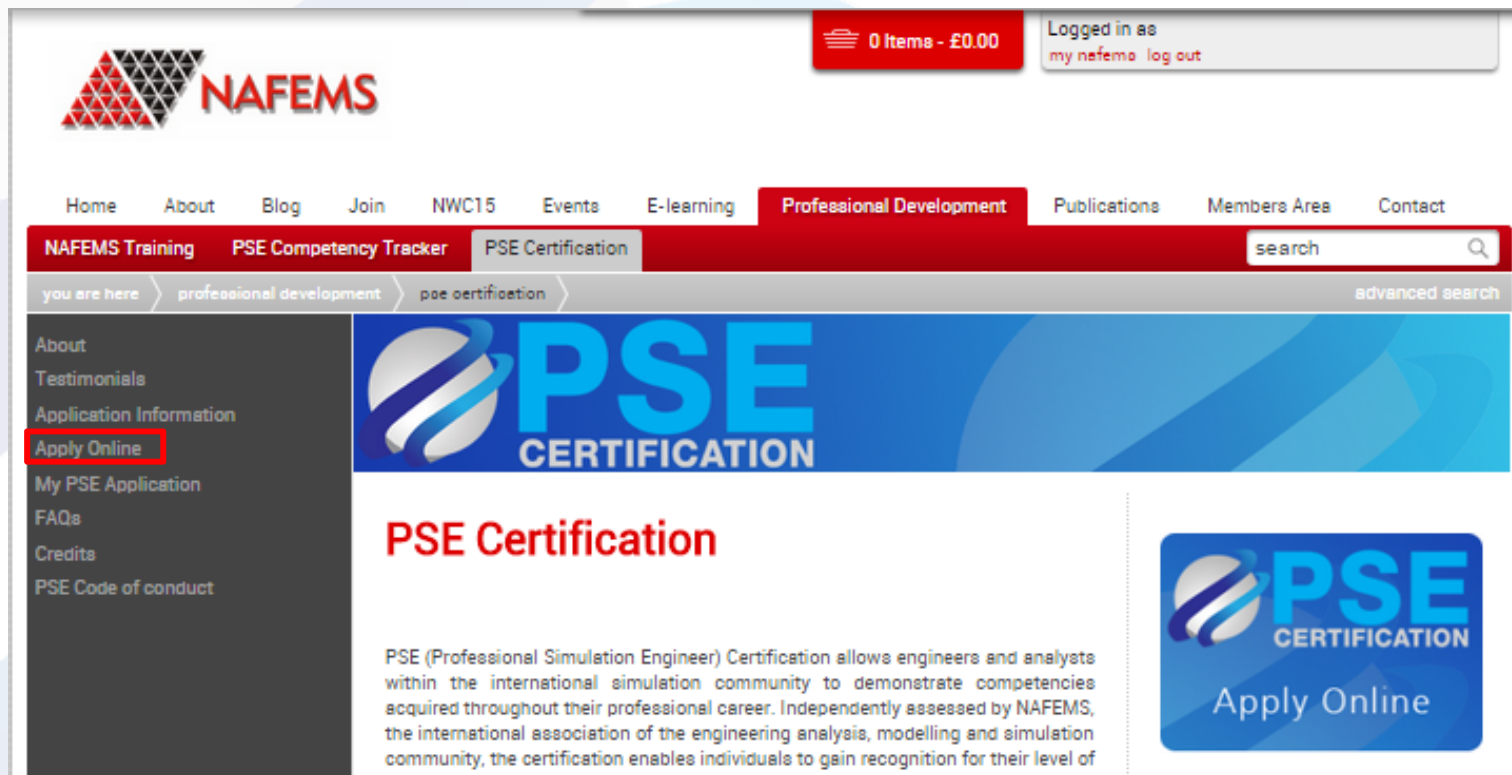


Certification | How Does it Work?



Certification – Application

- Apply Online: http://www.nafems.org/professional_development/certification/
- Application Fee: £150 / \$230 / €210

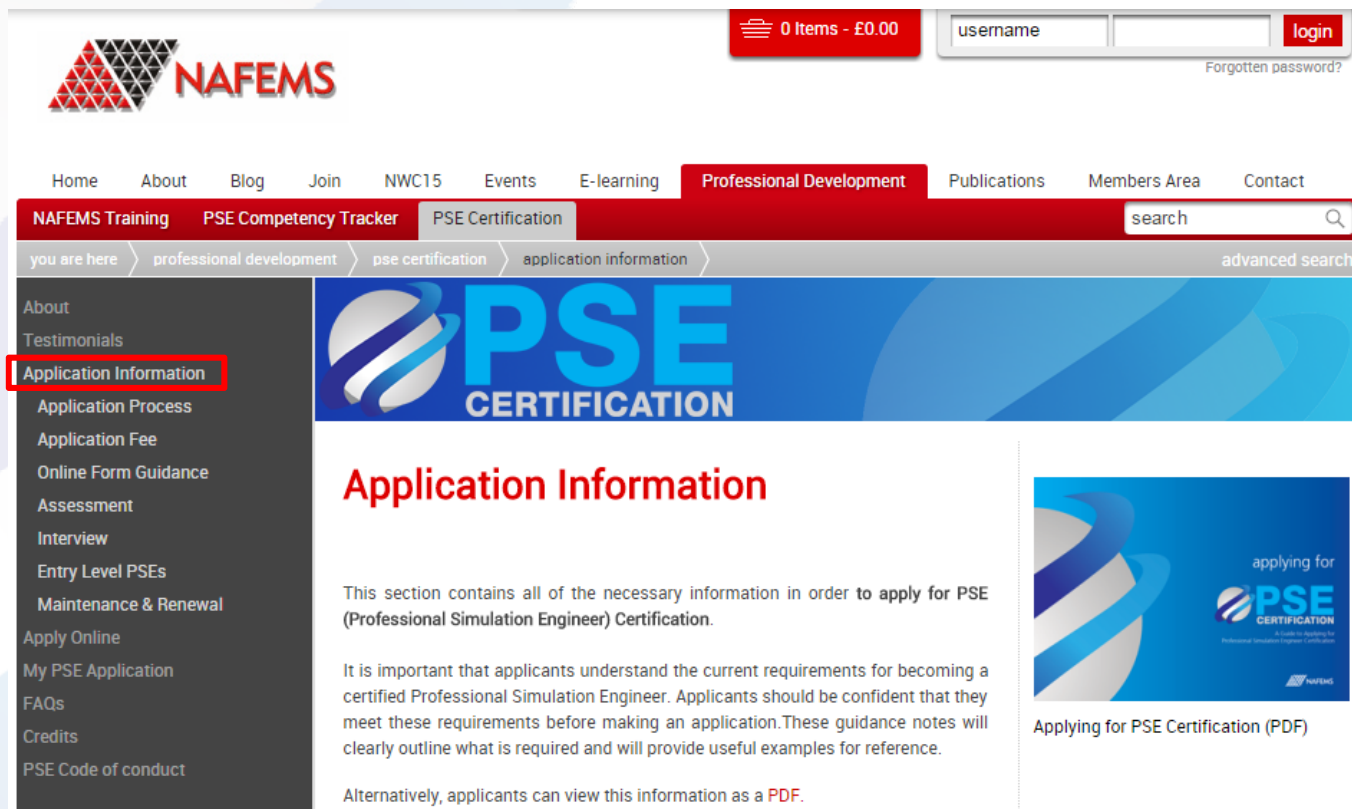


The screenshot displays the NAFEMS website interface. At the top, the NAFEMS logo is on the left, and a shopping cart icon shows '0 Items - £0.00'. To the right, it says 'Logged in as my nafems' with a 'log out' link. Below this is a navigation menu with links: Home, About, Blog, Join, NWC15, Events, E-learning, Professional Development (highlighted), Publications, Members Area, and Contact. Under 'Professional Development', there are sub-links: NAFEMS Training, PSE Competency Tracker, and PSE Certification (highlighted). A search bar is located to the right of these sub-links. Below the navigation menu, a breadcrumb trail reads 'you are here > professional development > pse certification >'. On the left side, a sidebar menu lists: About, Testimonials, Application Information, Apply Online (highlighted with a red box), My PSE Application, FAQs, Credits, and PSE Code of conduct. The main content area features a large blue banner with the 'PSE CERTIFICATION' logo. Below the banner, the text 'PSE Certification' is displayed in red. A paragraph of text explains that PSE (Professional Simulation Engineer) Certification allows engineers and analysts to demonstrate competencies. To the right of this text is a blue button with the 'PSE CERTIFICATION' logo and the text 'Apply Online'.



Certification – Guidance

- Guidance information is available to download from website

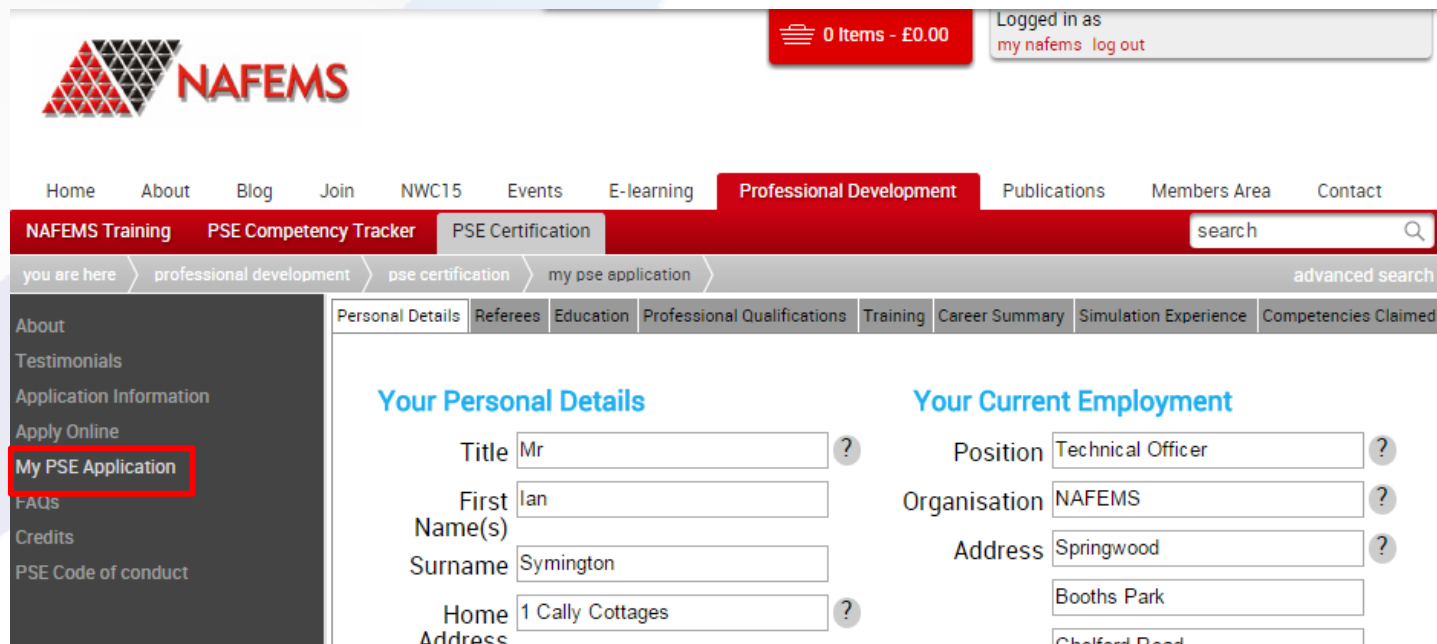


The screenshot displays the NAFEMS website interface. At the top, the NAFEMS logo is on the left, and a shopping cart icon shows '0 Items - £0.00'. To the right is a login section with a 'username' input field, a 'login' button, and a 'Forgotten password?' link. Below this is a navigation menu with links: Home, About, Blog, Join, NWC15, Events, E-learning, Professional Development (highlighted), Publications, Members Area, and Contact. A secondary navigation bar includes 'NAFEMS Training', 'PSE Competency Tracker', 'PSE Certification', and a search bar. A breadcrumb trail reads: 'you are here > professional development > pse certification > application information >'. On the left sidebar, a list of links includes 'About', 'Testimonials', 'Application Information' (highlighted with a red box), 'Application Process', 'Application Fee', 'Online Form Guidance', 'Assessment', 'Interview', 'Entry Level PSEs', 'Maintenance & Renewal', 'Apply Online', 'My PSE Application', 'FAQs', 'Credits', and 'PSE Code of conduct'. The main content area features a large blue banner with the 'PSE CERTIFICATION' logo. Below the banner, the heading 'Application Information' is displayed in red. The text states: 'This section contains all of the necessary information in order to apply for PSE (Professional Simulation Engineer) Certification.' It continues: 'It is important that applicants understand the current requirements for becoming a certified Professional Simulation Engineer. Applicants should be confident that they meet these requirements before making an application. These guidance notes will clearly outline what is required and will provide useful examples for reference.' At the bottom of the main content area, it says: 'Alternatively, applicants can view this information as a PDF.' To the right of this text is a thumbnail image of a PDF document titled 'applying for PSE CERTIFICATION' with the NAFEMS logo. Below the thumbnail, the text 'Applying for PSE Certification (PDF)' is visible.



Certification – Application

- The application is stored online and can be saved and modified at a later date



The screenshot displays the NAFEMS Professional Development website. At the top, the NAFEMS logo is on the left, and a shopping cart icon shows '0 Items - £0.00'. On the right, it says 'Logged in as my nafems' with a 'log out' link. The main navigation bar includes links for Home, About, Blog, Join, NWC15, Events, E-learning, Professional Development (highlighted), Publications, Members Area, and Contact. Below this, a secondary navigation bar shows 'NAFEMS Training', 'PSE Competency Tracker', and 'PSE Certification' (highlighted). A search bar is on the right. A breadcrumb trail reads 'you are here > professional development > pse certification > my pse application'. On the left, a sidebar menu lists various links, with 'My PSE Application' highlighted in a red box. The main content area is titled 'Your Personal Details' and 'Your Current Employment'. The 'Your Personal Details' section includes fields for Title (Mr), First Name(s) (Ian), Surname (Symington), and Home Address (1 Cally Cottages). The 'Your Current Employment' section includes fields for Position (Technical Officer), Organisation (NAFEMS), and Address (Springwood, Booths Park, Chalford Road).

NAFEMS

0 Items - £0.00

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my nafems log out

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NAFEMS Training PSE Competency Tracker PSE Certification search

you are here > professional development > pse certification > my pse application advanced search

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Application Information
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My PSE Application
FAQs
Credits
PSE Code of conduct

Personal Details Referees Education Professional Qualifications Training Career Summary Simulation Experience Competencies Claimed

Your Personal Details

Title Mr ?

First Name(s) Ian

Surname Symington

Home Address 1 Cally Cottages ?

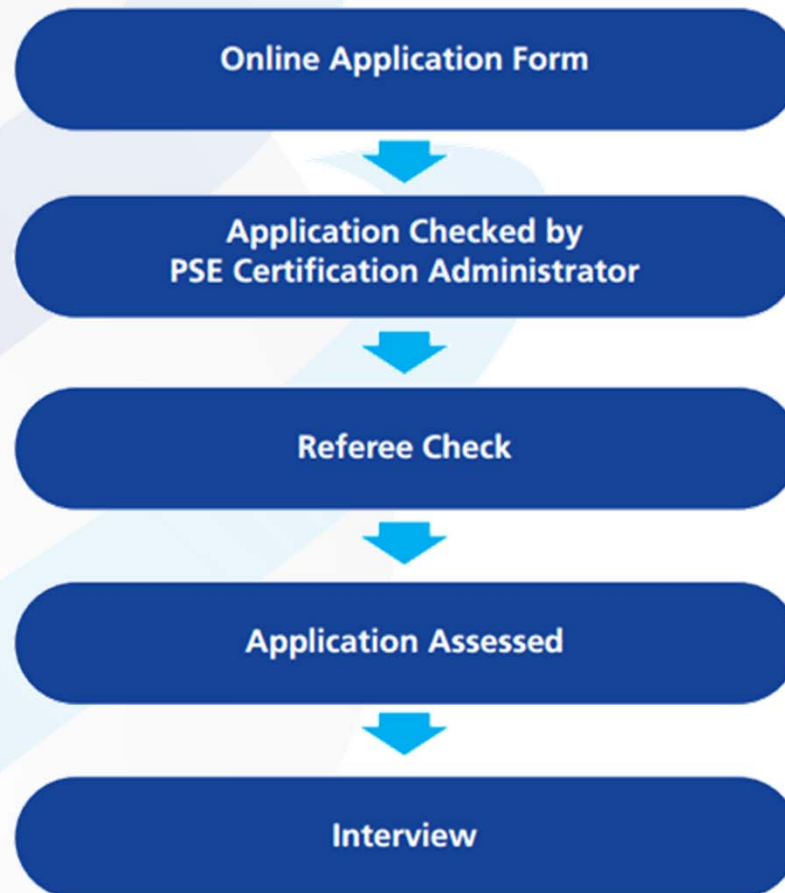
Your Current Employment

Position Technical Officer ?

Organisation NAFEMS ?

Address Springwood ?
Booths Park
Chalford Road

Certification – The Process



Certification – The Interview

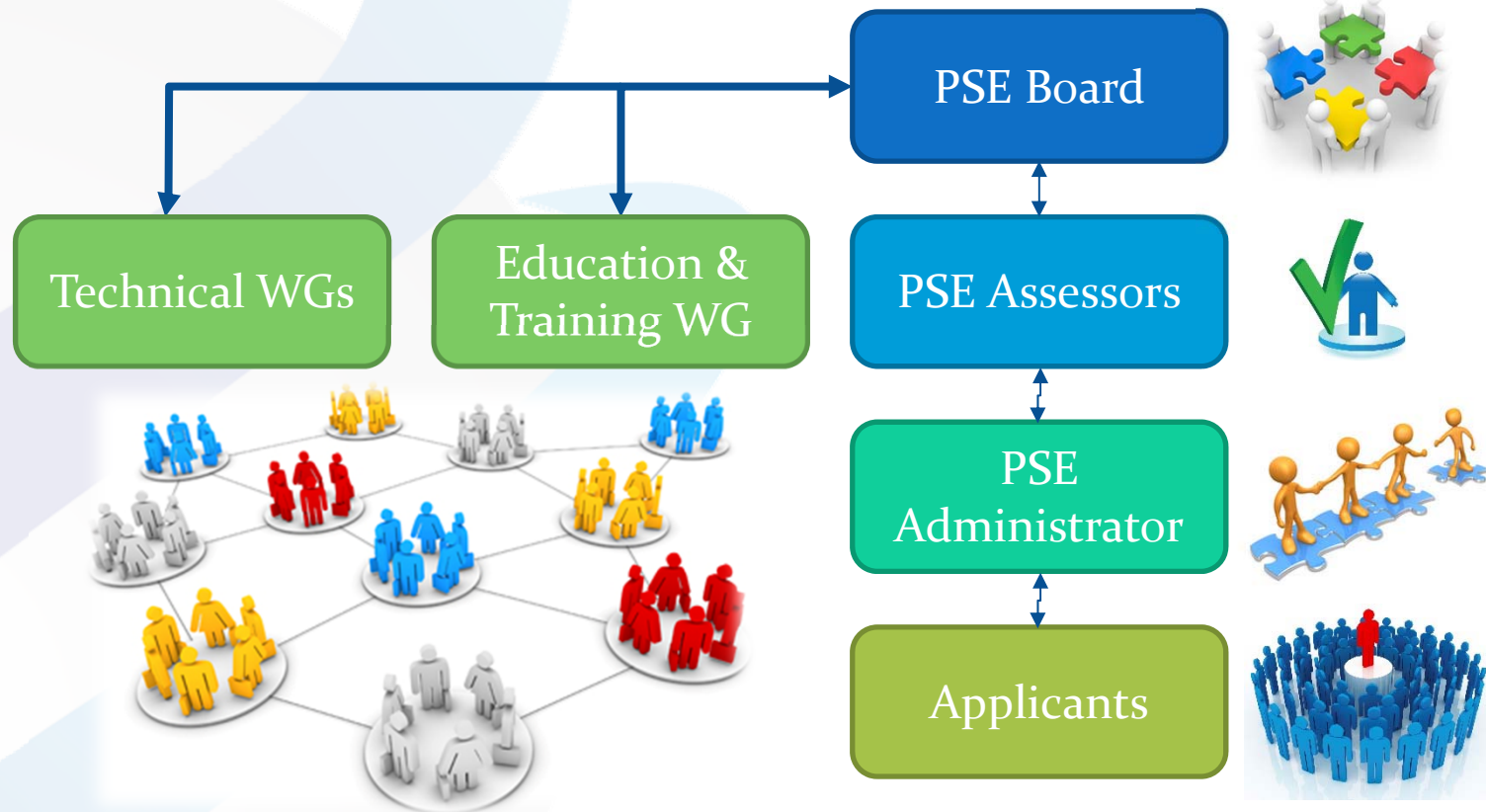
- Duration: 45 minutes
- Location: Webex
- Two PSE Assessors and the PSE administrator in attendance
- Open questions about the candidates background & simulation experience
- Specific questions relating to the PSE competencies





Governance

Governance





The Foundation for
NAFEMS activities



Future developments

- PSE feeds into “Academic Course Approval”
 - Ensure that graduates possess the skills that industry require
- Associate all NAFEMS training courses with the competence statements
- Working groups tasked with developing the educational resources





Find out more at
www.nafems.org