



BFPA TRAINING COURSES

**FOUNDATION COURSE
IN WORKING SAFELY
WITH HYDRAULIC HOSE
AND CONNECTORS**

BFPA
BRITISH FLUID POWER ASSOCIATION

TRAINING COURSE

**BFPA HOSE
ASSEMBLY SKILLS
TRAINING PROGRAMME**

BFPA
BRITISH FLUID POWER ASSOCIATION

TRAINING COURSE

**HOSE INTEGRITY,
INSPECTION AND
MANAGEMENT**

BFPA
BRITISH FLUID POWER ASSOCIATION

TRAINING COURSE

**SMALL BORE TUBING
INTEGRITY COURSE**
USING TWIN FERRULE COMPRESSION FITTINGS

BFPA
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TRAINING COURSE

**HYDROSTATIC PROOF
PRESSURE TESTING**

BFPA
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TRAINING COURSE



BRITISH FLUID POWER ASSOCIATION

AN INTRODUCTION TO BFPA TRAINING

The BFPA have for many years been passionate about raising standards within the fluid power industry and with this objective in mind we have utilised the knowledge of industry experts to develop a series of valuable training courses aimed at all sections of the industry, from Construction, Marine, Agriculture, and Offshore to Renewable Energy, Rail, and Mining plus many other industries where hydraulics and pneumatics are incorporated.

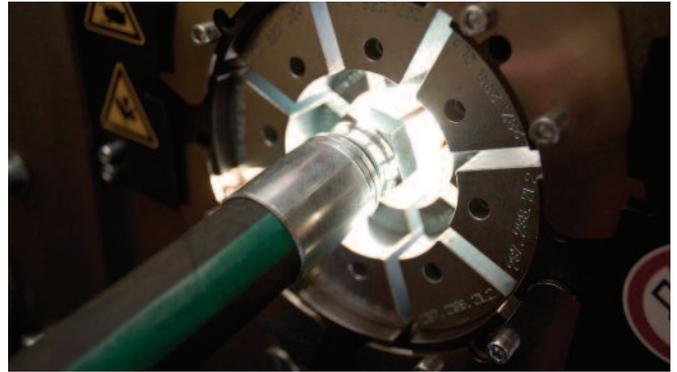
We are confident that these training courses from the BFPA Training Academy will be relevant for both employers and employees as each short generic training course is designed to increase and improve safety for people who work with hydraulic and pneumatic hoses at all levels, from the system designer and field engineer to the machine operator and the person who actually makes hose assemblies.

All of these training courses are available throughout the year and can be accessed directly from the BFPA through either our Open Course Programme or through agreed On Site Training.

Delegates attending BFPA courses receive a copy of the course book signed and dated by the trainer, a certificate of training along with an individual BFPA Training Passport Card and their training record uploaded to the training academy website.

For further enquiries regarding Open Course availability or the cost of On Site training please email info@bfpatrainingacademy.co.uk.

Alternatively please ring the BFPA on **01608 647900** to speak with us directly.

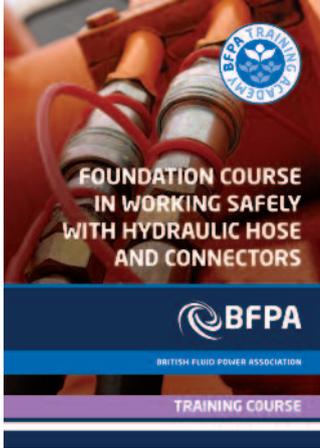




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The Home of Knowledge



FOUNDATION COURSE IN WORKING SAFELY WITH HYDRAULIC HOSE AND CONNECTORS

ABOUT THE COURSE

This is a one day course and is designed to show the correct practices needed to work safely with and around Hydraulics. Designed as either an excellent induction course for someone new to the industry or a superb safety course for people who are not primarily hydraulic or fluid power technicians but work from time to time on machinery containing hydraulic components. The day contains video presentation examples of safe working practices involving associated dangers of fluid injection injuries and examples of hose being manufactured from the raw components. A high quality personalised course book, certification of attendance and registration on the BFPA national data base, give both

the attendee and employer confidence that the correct methods and culture are being adopted and used.

WHY SHOULD YOU ATTEND THE COURSE

“The recent training by the BFPA for KPM employees was excellent and I would recommend it to any company in the Hydraulic field, if you would like a testimonial at any time I am more than happy to do this for you, please pass on my thanks to the BFPA trainer for his excellent training and thank you for your support.”

[Kawasaki Precision Machinery \(UK\) Ltd](#)

CHAPTER ONE

BASIC HYDRAULICS

Delegates will learn about:

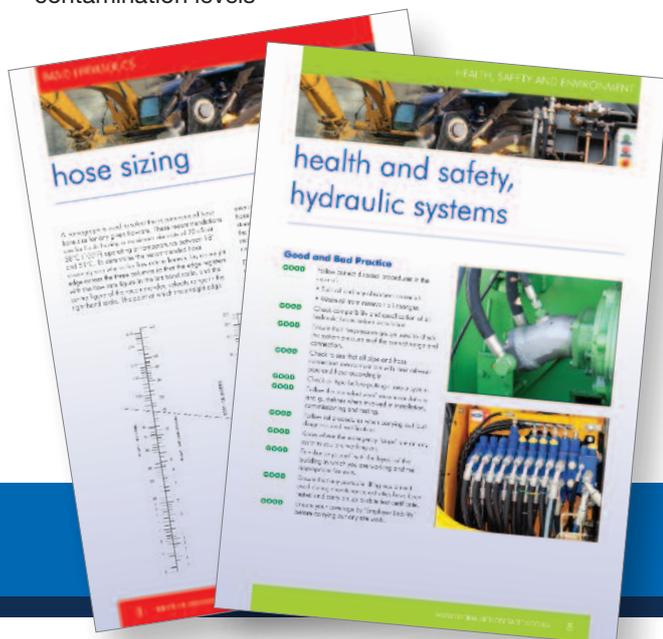
- understanding what is meant by the terms, ‘pressure’, ‘force’ and ‘area’ and how these 3 factors are important
- how to determine hose size, comparing how changing the 3 variables; flow rate, hose bore size and fluid velocity affect one another. The difference caused by a change of fluid temperature and fluid viscosity are also considered
- a basic hydraulic circuit diagram is used to show typical components used to make up a simple circuit
- contamination – why cleanliness is important to your customer and what steps can be taken to minimize contamination levels

CHAPTER TWO

HEALTH, SAFETY & ENVIRONMENT

Delegates will learn about:

- health & safety legislation, duties of the employer and employee
- competency – how is it defined
- risk assessment – 5 steps to risk assessment
- hose assembly and installation safety consideration and the dangers of hose failure
- site/workshop safety
- good & bad practice for health & safety when working with hydraulic systems
- high pressure injection injuries – detecting pinhole leaks in a hydraulic system (this is supported by 3 short DVDs showing the dangers of injection injuries, the importance of correct and prompt diagnosis and subsequent treatment)
- how to avoid injection and burn injuries and what other safety matters should also be considered



CHAPTER THREE

HOSE & CONNECTOR IDENTIFICATION

Delegates will learn about:

- the importance of understanding the application, useful factors to consider
- hose sizes
- industry standards for hose – EN, ISO & SAE
- hose selection
- hose end terminations, material types and end terminations commonly used in the fluid power industry
- hydraulic fluid types

CHAPTER FOUR

HOSE ASSEMBLY

Delegates will learn about:

- the industry standard method of measuring hose assembly overall length
- cutting the hose to length – the importance of a good, clean cut
- skiving – internal and external
- preassembly of one piece and two piece couplings
- angular orientation and hose bias when the hose assembly has two angled connectors
- crimping/swaging – covering all aspects from correct die selection, machine setting, correct positioning of the hose assembly within the machine, measuring the crimp diameter, reducing the crimp diameter if necessary and ensuring that the operation has been completed correctly
- typical sample inspection plan for volume hose assembly manufacture
- pressure testing of hose assemblies – ratios based on working pressure and application
- cleaning and protecting of hose assemblies prior to supplying to the customer

CHAPTER FIVE

INSTALLATION

Delegates will learn about:

- correct installation of adaptors and hose assemblies
- environmental conditions which can cause hose and connector degradation
- good and bad practice when tightening up connectors
- good and bad practice for installation, considering issues such as bend radius, natural hose bias and reducing damaged caused by abrasion, heat, kinking and twisting

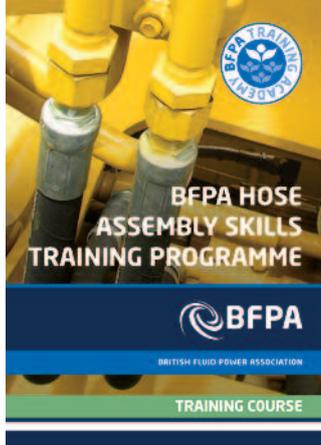
CHAPTER SIX

HOSE & CONNECTOR FAILURE

Delegates will learn about:

- reasons for hose and connector failure. How to reduce/eliminate the likelihood of failure occurring
- re-ending hydraulic hose assemblies – DON'T & don't mix and match. The stance of the BFPA and other bodies within the fluid power industry on these two important topics





HOSE ASSEMBLY SKILLS TRAINING PROGRAMME

ABOUT THE COURSE

This is a two day course and is carried out in both a classroom environment for the theoretical element and shop floor environment for the practical element. The training programme is designed to bring the attendee up to a sound level of appreciation which will enable them to development into a quality hydraulic hose technician. The Hose Assembly Skills training course also includes an practical assessment of the candidates' skills and understanding. A high quality personalised course book, certification of skills achievement and registration on the BFPA National data base, give both the attendee and employer confidence that the correct methods and culture are being adopted and used.

CHAPTER ONE

THREAD AWARENESS

Delegates will learn about:

- understanding how to correctly identify an end termination by following 8 steps
- using a range of measuring instruments and gauges in conjunction with tabulated data to positively identify a range of end terminations
- understanding the main characteristics and geometry of the male and female end termination along with how it seals for a range of end terminations including BSP, (60° cone 'o' ring and non 'o' ring, elastomeric and metal to metal sealing), BSPT, JIC, SAE 45° flare, Flange, ORFS, Metric, (light and heavy), Metric port/stud end, French GAZ, NPT/NPTF, BSP – Japanese, SAE port/stud end, Metric – Komatsu and Staple type connectors
- the various positive and negative features (both technical and commercial) for each end termination

WHY SHOULD YOU ATTEND THE COURSE

“We just wanted to convey our thanks for what was received as incredibly informative and most useful course for us. All attendees were extremely happy with the content and information which they will apply in future use of hose manufacturing and also fittings and hose information in general.

Your knowledge and experience on the subject was very clear, and we simply want to extend our conveyance of thanks to you for an excellent couple of days training.”

Hydac Technology Limited

CHAPTER TWO

HOSE ASSEMBLY

Delegates will learn about:

- understanding the production equipment and their associated requirements (including calibration) for the successful production of quality hose assemblies
- selecting and cutting the hose to length – the importance of a good, clean cut
- the industry standard method of measuring hose assembly overall length
- coupling selection
- how to work through the theoretical and practical aspects of manufacturing hydraulic hose assemblies using a combination of verbal and written instructions
- skiving – internal and external
- preassembly of one piece and two piece couplings, pros and cons of each coupling type
- angular orientation and hose bias when the hose assembly has two angled connectors
- crimping/swaging – covering all aspects from correct die selection, machine setting, correct positioning of the hose assembly within the machine, measuring the crimp diameter, reducing the crimp diameter if necessary and ensuring that the operation has been completed correctly
- pressure testing of hose assemblies – ratios based on working pressure and application
- cleaning and protecting hose assemblies prior to supplying to the customer



CHAPTER THREE

CONTAMINATION

Delegates will learn about:

- cleanliness – why it is important
- hose cutting
- comparing visually samples of cut and cleaned hose
- cleaning a hose assembly by flushing
- using a projectile to clean a hose
- storage and handling to reduce contamination
- understanding the 3 principle methods established by ISO to measure contamination levels

CHAPTER FOUR

TIGHTENING OF CONNECTORS

Delegates will learn about:

- tightening of adjustable style adaptors
- tightening of hose connectors – straights and elbows
- understanding some of the common methods used within the industry to ensure connectors are correctly tightened

CHAPTER FIVE

HOSE ASSEMBLY ROUTING & INSTALLATION

Delegates will learn about:

- hose assembly routing, good and bad practice considering ISO and BFPFA recommendations
- protecting hoses in service
- typical installation and application problems

CHAPTER SIX

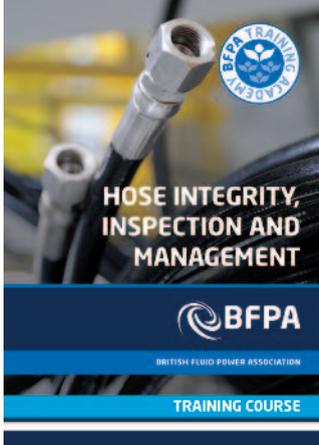
HOSE MANAGEMENT

Delegates will learn about:

- the recommended storage life for bulk hose, hose assemblies and stored equipment
- understanding how long a hose should last in service considering the application, the environment, damage, application history and hose management schemes
- maintenance and reworking of hose assemblies
- examples of actual failure resulting from improper use, classifications, symptoms, mode of and cause of failure

The spiral bound course book is supported by a worksheet which is completed by the candidate. This worksheet forms the basis of the assessment.





HOSE INTEGRITY, INSPECTION AND MANAGEMENT COURSE

ABOUT THE COURSE

This one day course has been written and developed using the technical expertise available to the BFPA and the BFPDA and sets out to establish a benchmark for training people responsible for hose inspection and management from a wide variety of industry sectors and establishing a recognised standard in hose management best practice. Through the introduction of the Hose Integrity, Inspection and Management course, we have further enhanced the training package to include all core issues surrounding the efficient inspection, analysis, identification, registering and recording of hydraulic hose. During the training the individual will be assessed in order to achieve a BFPA industry recognised certificate. As with all BFPA courses a high quality personalised course book, certification of hose management achievement and registration on the BFPA National data base, gives both the attendee and

employer confidence that the correct methods and culture are being adopted and used.

WHY SHOULD YOU ATTEND THE COURSE

“The course is an excellent addition to the suite of training offered by the BFPA and authorised trainers. We soon realised that this course has the potential to cross a vast section of industry, this is mainly due to the excellent content and presentation, which makes the course very interesting and accessible to manufacturers, distributors and most importantly end users. We feel that the time and effort put in by the BFPA has raised the bar to a new level of understanding safety for all industries.”

Interpump Hydraulics T/A IMM Hydraulics (UK) Limited

CHAPTER ONE

HOSE ASSEMBLY - LIFE EXPECTANCY

Delegates will learn about:

- considering how long a hose assembly should last in service
- understanding the 3 distinct stages where failure can occur in the life of a hose assembly
- understanding the factors which help to determine the expected service life of a hose assembly
- the benefits of rubber hose – overview
- the benefits of thermoplastic hose – overview
- the advantages of rigid pipe and hose assemblies
- the 9 phases within the life cycle of a hose assembly

CHAPTER TWO

RISK ANALYSIS

Delegates will learn about:

- risk analysis
- defining the consequences of failure for a hose assembly
- defining the probability of failure for a hose assembly
- calculating the resultant risk
- analysing the results of the risk assessment
- a risk based inspection programme



CHAPTER THREE

COMPETENCE ASSURANCE

Delegates will learn about:

- a robust competence assurance system
- the competence assurance cycle
- a typical competence profile for personnel involved with hose assemblies
- industry definitions to distinguish a person who is competent, knowledgeable and aware

CHAPTER FOUR

IDENTIFY, INSPECT & RECORD

Delegates will learn about:

- ISO stipulated requirements for the identification of hydraulic hose assemblies including what information shall be included
- an overview of the methods commonly used to uniquely identify a hose assembly
- the visual inspection of a hose assembly upon receipt before it is put into service
- supporting documentation for a hose assembly prior to it entering service
- Certificate of Conformity (C of C) and Test Certificates

CHAPTER FIVE

HOSE REGISTER

Delegates will learn about:

- recording a hose assembly prior to it going into service/one already in service
- examples of a hose register and what information is typically contained in them

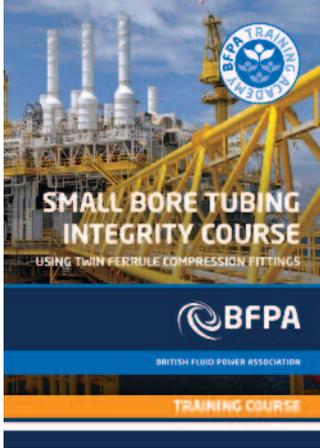
CHAPTER SIX

VISUAL INSPECTION

Delegates will learn about:

- preparing a hose assembly installation inspection checklist
- ensuring that inspection is undertaken in a safe manner – making reference to BFFA publication P113 'Fluid Injection Injury Emergency – The Facts'
- preparing a hose assembly in service inspection checklist
- bulk hose branding – examples of branding methods commonly used
- examples of hose assembly damage/failure
- corrosion of the hose reinforcement
- inspection of equipment
- inspecting around mating parts
- galvanic (bimetallic) corrosion
- correct and incorrect use of hose whip checks
- inspecting quick release couplings





SMALL BORE TUBING INTEGRITY COURSE

ABOUT THE COURSE

This is a one day course covering the various theoretical, practical and safety elements involved in the manufacture of Small Bore Tubing Assemblies using twin ferrule compression fittings. This course includes the benefits of small bore tube assemblies, tube preparation, bending, assembly, installation runs, producing to drawings and thread identification. During the training the attendees will take part in a series of practical tasks along with a theory question paper. A high quality personalised course book, certification of skills achievement

and registration on the BFPA National data base, give both the attendee and employer confidence that the correct methods and culture are being adopted and used.

WHY SHOULD YOU ATTEND THE COURSE

By completing this comprehensive BFPA Small Bore Tubing Integrity Course, candidates will be able to demonstrate that they have gained the appropriate skills, knowledge and ability when working with twin ferrule compression fittings and tube line fabrication.

CHAPTER ONE

TWIN FERRULE COMPRESSION FITTINGS

Delegates will learn about:

- correct tightening, including the use of gap gauges
- pre-swaging
- disassembly and reassembly
- common installation problems
- visual identification of metric and imperial fittings
- recommendations for clamping of small bore tube
- tube fitting identification marks
- twin ferrule fitting sealing areas
- different profiles of the ferrules used by different manufacturers
- installation procedures for port connectors
- assembly procedures for plugs and caps
- assembly procedures for tube insert and plastic tubing

CHAPTER TWO

TUBE VERSUS PIPE

Delegates will learn about:

- the definition of tube and pipe
- the advantages of tubing over pipe
- bending quality tube and the use of less fittings
- tube selection
- tube hardness
- surface condition
- gas services
- good and bad tube storage
- tube materials, wall thickness and typical working pressures
- temperature reduction factors



CHAPTER THREE

TUBE PREPARATION

Delegates will learn about:

- correct handling of tube
- common tools and how they should be used in the preparation of tube

CHAPTER FOUR

TUBE BENDING PRINCIPLES

Delegates will learn about:

- the main parts of a tube bender
- spring back during the bending process
- defective bends
- the recommended free tubing length
- tube gain
- tube line fabrication
- the basis for measurement when producing a bend
- managing the change to the plane of bending
- marking the tube
- positioning the tube
- producing an offset bend

CHAPTER FIVE

PLANNING THE ROUTE

Delegates will learn about:

- good and bad practice for tube runs
- working to a sample drawing considering tube gain and offset bend allowance in order to calculate the correct length

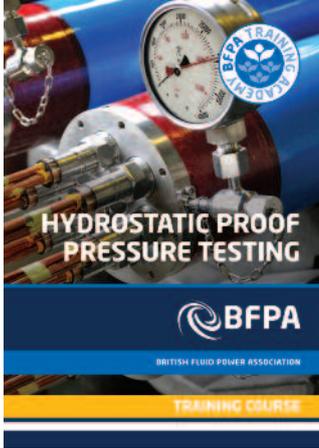
CHAPTER SIX

ASSOCIATED THREADS

Delegates will learn about:

- understanding how to correctly identify an end termination by following 8 steps
- using a range of measuring instruments and gauges in conjunction with tabulated data to positively identify a range of end terminations
- understanding the main characteristics and geometry of the male and female along with how it seals for the following end terminations: BSP port/stud, BSPT, JIC, Metric port/stud, NPT and SAE port/stud
- understanding how to correctly tighten adjustable (positional) elbows





HYDROSTATIC PROOF PRESSURE TESTING COURSE

ABOUT THE COURSE

This one day course covers the theoretical and practical aspect of pressure testing with each delegate being trained to an assessed level.

CHAPTER ONE

ASSOCIATED DANGERS

Delegates will learn about:

- the dangers associated with pressure testing
- fluid injection injuries
- a typical situation of trapped pressure
- the different types of pressure tests and their definitions
- commonly referred to publications relating to pressure testing
- legionella and the possible contamination of pressure testing equipment when water is the test medium



WHY SHOULD YOU ATTEND THE COURSE

“The recently attended BFPA Proof Pressure Testing Course was well received by Clover Tool Europe employees. The balance between verbal instruction and hands on involvement was well structured. The detail on fittings and thread identification was of great value as it is an area that is not often covered in this level of detail in previous training courses attended. All attendees would highly recommend this course to future delegates”

Clover Tool Europe Ltd

CHAPTER TWO

A SAFE SYSTEM OF WORK

Delegates will learn about:

- what duty holders (the employer) involved in pressure testing must comply with under the Health & Safety at Work Act
- a safe system of work
- the hierarchy for segregating items under test as identified in HSE document GS4
- examples of typical ‘good practice’ when undertaking a pressure test
- identification of ‘controls measures’ as identified in HSE document GS4 covering; test procedures, the maintenance and selection of pressure test equipment, test fittings, test hose assemblies, and physical safeguarding
- the inspection of test hose assemblies (including common failure modes and discard criteria)
- air hose connections
- whip checks
- burst sleeving



CHAPTER THREE

EQUIPMENT AND SUPPORTING INFORMATION

Delegates will learn about:

- typical pressure test rigs
- methods of pressure generation
- the elements included within a typical pressure test rig
- pressure gauges, including what factors should be considered in order to select the correct pressure gauge
- recording the test results; chart recorders and data loggers

CHAPTER FOUR

SELECTION, STORAGE AND MAINTENANCE OF COMPONENTS

Delegates will learn about:

- 'good and bad practice' for the storage of hose assemblies used for pressure testing purposes
- examples of factors that can adversely affect hose and hose assemblies in storage
- the inspection of hose assemblies used for pressure testing purposes
- the storage of test adaptors and related components
- pressure rating of test adaptors and related components
- the damage to test adaptors and related components through repeated use

CHAPTER FIVE

THREADED CONNECTORS AND SEALING

Delegates will learn about:

- methods of sealing and O-ring selection including; adjustable elbows with no 'retaining ring', adjustable elbows with a 'retaining ring', bonded seals with self centralising web, bonded seals without self centralising web, O-ring, copper washer and elastomeric seal
- correct measuring of O-rings
- bonded seals including factors which influence their burst pressure
- understanding how to correctly identify an end termination by following 8 steps using a range of measuring instruments and gauges in conjunction with tabulated data to positively identify a range of end terminations
- understanding the main characteristics and geometry of the male and female end termination along with how it seals for a range of end terminations including BSP (60° cone O-ring and non O-ring, elastomeric and metal to metal sealing), BSPT, JIC, SAE 45° flare, Flange, ORFS, Metric (light and heavy), Metric port/stud end, French GAZ, NPT/NPTF, BSP – Japanese, SAE port/stud end, Metric – Komatsu, and Staple type connectors
- the differences between NPT/NPTF and BSPT threads
- the application of PTFE Sealing Tapes, thread sealants and anaerobic adhesives
- 'medium pressure' (20k) and high pressure (up to 60k) cone and threaded connectors; tubing, sealing methods, identification, and assembly

CHAPTER SIX

THE PRESSURE TEST

Delegates will learn about:

- the International Standard and scope relating to pressure testing
- Containment (GS4)
- the hierarchy of control measures (GS4)
- testing of hose assemblies having a volumetric capacity greater than that of the pressure test rig reservoir
- the typical durations of the pressure test
- common pressure test ratios (based on working pressure of the hose/hose assembly)
- common test fluids
- pressure testing procedure, including a practical element for each delegate
- reporting the results



TRAINING PASSPORT SCHEME FROM THE BFPA



Once you have completed a training course you will be entitled to a training card as part of the BFPA Training Passport Scheme.

This new initiative developed by the BFPA aims to help you keep an easily accessible record of the BFPA training you have achieved. You will be able to show these training passport cards to employers and customers to confirm qualifications and they will act as a reminder for when individual training courses need to be renewed.

BENEFITS

- Become a member of a national passport training scheme for the fluid power industry.
- Raise your profile by receiving recognition for training courses completed with the BFPA and our approved training providers.
- An easy way to demonstrate your training achievements to prospective customers and employers.
- Promote safe work practices and raise standards within the fluid power industry.



RETROSPECTIVE CARDS

If you have achieved a BFPA training course within the last two years, or a BFPA CETOP accredited course at any time you can apply retrospectively for the card, all we need is the name of your course, the date of achievement and a head and shoulders photo with accompanying proof of identity.

For further information please email info@bfpatrainingacademy.co.uk or call **01608 647900**.





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