EU Excert

Certifying Expertise in European Explosives Sector

Handbook for the Implementation of Occupational Standards in the Explosives Sector

BOFORS TEST CENTER

KCEM

EVENT HORIZON EXPLOSIVE ENGINEERING PRECISION ENERGETICS

MAXAM

Vogler's

Erasmus+

Handbook for the Implementation of Occupational Standards in the Explosives Sector

Published by EUExcert and downloadable free of charge from:

http://www.euexcert.org

http://iexpe.org/

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ACKNOWLEDGEMENTS

This project has received funding from the European Union's Erasmus+ Programme for Strategic Partnership Vocational Training under Grant Agreement No. 2014-1-SE01-KA202-001030.

We are most grateful to the EUExImp project partners for their unflagging interest in the project, their commitment of time, effort, funding and good humour throughout the project and, of course, for their contribution to this handbook and the step-by-step guide that accompanies it. The partners were:

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We could not have written this book without the support and advice of Denise Clarke of Homeland Security Qualifications and her permission to use many extracts from her published papers.

Erik Jakobsson of APEL AB for providing external quality assurance of the project and, incidentally, a driver for deadlines.

FOREWORD

Competence is widely recognised as a key element of safety in the explosives industry, yet 'human error' remains a significant factor in explosives-related accidents around the world.

SAFEX International[1] is a non-profit, membership- based, organization which is headquartered in Switzerland. SAFEX's purpose is to eliminate the harmful effects of explosives on People, Property and the Planet (Environment) by encouraging Members to learn from each other's experiences. These experiences are taken from all stages of the explosives life cycle including the design, development, manufacture, storage, distribution, use and disposal/recycling of explosives products. In 2016, they shared details of some 13 incidents with their members, some of which clearly have human factors in the chain of events leading to the incident. This is a selection of some of the incidents reported:

Year	Month	Day	Country	Location	Fatalities	Injuries	Production
2016	June	4	USA	Sterling	0	0	Detonators
2016	May	16	Australia	Mulwala	0	2	RDX
2016	September	10	Chile	Antofagasta	2		Emulsion
2016	October	13	Brazil	Cruzeiro	1	1	Lead Azide
2017	March	2	Poland	Krupski Młyn	1	2	Nitro esters
2017	May	7	Sweden	Gyttorp	1		Detonators

Figure 1. SAFEX incident reports

The Small Arms Survey[2], a Geneva-based small arms and armed violence research centre, informs us that there were at least 47 fatalities and 90 injuries due to unplanned explosions in 2016, which were due to a variety of causes[3], many of which have human factors as the root cause or contributory factor.

ID	Month	Day	Country	Location	Fatalities	Injuries	Cause
1	January	27	Cameroon	Mora	0	0	5
2	May	31	India	Pulgaon	16	19	2
3	June	5	Sri Lanka	Colombo	1	47	4
4	June	20	Russian Federation	Astrakhan	0	0	6
5	June	21	Libya	Garabulli	30	24	5
6	June	26	Mauritania	Ould Yenje	0	0	4
Total					**47**	**90**	

Figure 2. Unplanned Explosions in Munitions Sites – 2016 (Small Arms Survey)

[1] https://www.safex-international.org/

[2] http://www.smallarmssurvey.org/home.html

[3] Cause codes:

2 – Inappropriate storage systems and infrastructure
4 – Failure to take into account external, environmental influences and events
5 – Poor security
6 – Cause undetermined or unrecorded (at the time of writing)

This handbook should be of interest to anyone who has a desire to define or measure the competence of individuals in the explosives industry. The Occupational Standards and processes described in the handbook can be used in qualifications or as management tools, in training development or delivery, the handbook has something for most people in the explosives industry. Whether you or your organisation is a training provider, individual candidate, organisation seeking qualifications or another way of measuring competence of explosives-workers in the workplace, a regulator or other interested party, there is useful information here for you.

The handbook is intended to provide the reader with the how and why of implementing Occupational Standards for Explosives, Munitions and Search Occupations. The 'how' is succinctly demonstrated through the associated 'Step-by-Step Guide to the Implementation of Occupational Standards'. The 'why' is demonstrated through the case studies of each of the 'industry partners' in the EUExImp project.

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NORMATIVE REFERENCES

1. The referenced documents are indispensable for the application of this handbook. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document, including any amendments, applies.

2. Normative references are important documents to which reference is made in this guide and which form part of the provisions of this guide.

3. The following normative documents contain provisions, which, through reference in this text, constitute provisions of this handbook. For dated references, subsequent amendments to, or revisions of, any of these publications do not apply. However, parties wishing to implement occupational standards are strongly encouraged to apply the most recent editions of the normative documents indicated below. For undated references, the latest edition of the normative document referred to applies.

4. The full details of all the explosives-related occupational standards can be found at the following websites:

    4.1. Working with Scottish Government and the devolved administrations, Skills Development Scotland (SDS) has managed the National Occupational Standards (NOS) database from November 2016, in advance of the closure of the UK Commission for Employment and Skills. The standards are used across the UK, specifying the standards of performance individuals must achieve in the workplace, together with the knowledge and understanding required for roles.

    4.2. Homeland Security Qualifications – brings the ESA occupational standards together: http://www.homelandsecurityqualifications.co.uk/documents/

Informative References

5. Further informative references are given as footnotes within the text of the handbook. These form a bibliography of additional documents and websites that contain other useful information for the implementation of occupational standards.

General

6. The latest version/edition of any references should be used. All the references are in the form of footnotes and are available either as hyperlinks or are available to the general public. Please bear in mind that the hyperlinks were good at the time of publishing but the project team has no control over any changes made by the originators. National authorities, employers and other interested bodies and organisations should obtain copies before starting to implement these occupational standards.

OVERVIEW

1. **Aim.** The aim of this manual is to provide the reader, be they a training provider, individual candidate, organisation seeking qualifications or another way of measuring competence of explosives-workers in the workplace, or other interested party, the how and why of implementing Occupational Standards for Explosives, Munitions and Search Occupations. The 'how' will be demonstrated through the associated 'Step-by-Step Guide to the Implementation of Occupational Standards' with additional detail in relation to those activities that were undertaken by the partners in the EUExImp project. The 'why' will be demonstrated through the case studies of each of the 'industry partners' in the project.

2. "EUExImp was "set up as a case study where five industry partners from five nations will implement selected key-roles from the occupational standards in tight collaboration with the five other partners in the project team, who all have previous experience of developing the standards."

3. Did the project achieve its aims?

4. Yes:

    4.1. The EUExImp Step-by-Step Guide to Implementing Occupational Standards was published[1] in June 2016.

    4.2. The Handbook for the Implementation of Occupational Standards in the Explosives Sector was published[2] in August 2017.

    4.3. Bofors Test Center (Sweden) considered the use of occupational standards as a management tool in Key Role 3 – Test and Evaluation; Key Role 7 – Storage and Key Role 13 - Generic. The company will use the principles, processes and procedures from the project in its bid for ISO17025 accreditation when it is required.

    4.4. Event Horizon (UK) implemented a new suite of training and qualifications for the UK explosives special effects industry in Key Role 10 – Other Applications (Use of Explosives in the Entertainment Industry) and Key Role 13 - Generic.

    4.5. GJR Pirotecnia e Explosivos SA (Portugal) qualified all the members of its black powder manufacturing team in Key Role 4 – Manufacture; Key Role 11 – Disposal and Key Role 13 – Generic

    4.6. Maxam Deutschland (Germany) mapped the training and qualifications of the staff on its Mini-Booster production line to show any obvious differences and/or similarities between the existing 'traditional' German training and qualification system with the 'outcome-centred' occupational standards system. In addition, it would also show any competences that were required by the company that are not covered in the training and vice-versa, training that is given but where competences are not required. In this way, the company

[1] http://www.euexcert.org/pdf/EUExImp-Step-by-Step-Guide-to-Implementing-Occupational-Standards-First-Edition.pdf
[2] http://www.euexcert.org/

showed that its staff implement Key Role 2 – Safety Management; Key Role 3 – Test and Evaluation; Key Role 4 – Manufacture; Key Role 7 – Storage; Key Role 8 – Transport; Key Role 9 – Facilities and Key Role 13 – Generic.

4.7. Voglers Eesti OÜ qualified its Explosives Safety Supervisor, by which route it implemented Key Role 2 – Safety Management and Key Role 13 – Generic."

5. One of the most significant unexpected outcomes of this project was that it became clear to all participants that the principles, processes and methods used by the partners in their sub-projects could be just as easily applied to many other sectors.

BACKGROUND

6. **The EUExImp project**. Project activities were related to the need for up-skilling the workforce in the European explosives sector to enable organisations and other stakeholders in the sector to maintain or develop their competitiveness to ensure survival on the global market, prevent job losses and maintain a safe industry. Project goals comply with the Horizon 2020 targets to ensure that skills and qualifications can be more easily recognised, within and across national borders, as the project focuses on one specific sector on the European market, the explosives sector. The restructuring of the industry, in general, has led to many changes, such as lower job growth and skills drain due to workers' retirement. It has brought several changes to the explosives sector related to education and training, where most training previously was organized as in-house training, now it is mainly provided by external education and training institutions. These providers need incentives to adapt their supply to better match industry demands, by the means of collaboration around education and training with industry partners.

7. The project aims therefore to develop support structures dedicated for education and training initiatives targeted for the explosives sector. The target is twofold:

   7.1. To implement selected key-roles from the occupational standards, specifically developed for the explosives sector in Europe, in five industry partner organisations in UK, Estonia, Portugal, Sweden and Germany; and

   7.2. To develop easy to use and easy to understand tutorial materials, as a step-by step guide for process management and this handbook of good practice.

8. KCEM AB (Sweden) led the project which was partially funded with EC monies through the Erasmus+ programme. KCEM AB is the Swedish National Node for EUExcert, using its Education Board as a reference group for EUExcert. KCEM AB worked through the Swedish Council for Higher Education as the funding authority for Erasmus+ projects in Sweden.

9. PICRITE Ltd is the UK project partner and Event Horizon Ltd is the UK industry partner; IExpE remains the UK National Node for EUExcert and conduit for working with other EUExcert organisations and EUExcert Association.

10. The project aims to develop knowledge of how to implement the occupational standards as a HR and management tool at plant level as well as developing existing training into a package that is transferable within and across organisational and national boundaries. In addition, the project aims to develop tools for implementing new improved HR-practice based on occupational standards. The tools have been developed as a step-by-step guide and manual for process

management when implementing occupational standards and revised to include good practice and delivered as a handbook for translation and dissemination purposes.

11. The use of occupational standards in HR-practice ensures that skills gaps analysis, competence development, education and training, recruitment will be based on European standards and therefore ensures transferable competencies and ultimately mobile workers. Employees who are provided with lifelong learning and supplementary education and training based on their needs in relation to their tasks at work ensures that the risks and hazards at work decreases and the work will continue to be safe.

12. The project was conducted as 5 sub-projects, i.e. what each industry partner intended to do to implement the NOS:

    12.1. Sweden: KCEM AB; SAAB Bofors Test Centre AB – BTC explored the use of the NOS in a management role, to identify the skills of their explosives workers on their HR system as part of their ISO 17025 compliance management framework.

    12.2. UK: PICRITE Ltd; Event Horizon Pyrotechnics Limited – Event Horizon redesigned their existing SFX courses, mapped to the NOS and, in conjunction with the prime British Entertainment and Cinematographic Trade Union (BECTU), developed and now delivers qualifications.

    12.3. Germany: Dresdner Sprengschule GmbH; MAXAM Deutschland - their role was to compare and contrast the NOS with existing German mandatory training and qualification requirements to identify possible gaps and/or opportunities for change.

    12.4. Portugal: University of Coimbra; G.J.R. - Pirotecnia e Explosivos, SA – GJR intends to implement manufacturing qualifications for its staff.

    12.5. Estonia: Tallinn University of Technology; Voglers Eesti OÜ – Voglers intends to use UK qualifications in explosives safety management, to demonstrate their company and workers' competence to their international customers.

13. **EUExcert.** The EUExcert programme[4] aims to establish a stable, firm basis and framework for vocational education of people in the European explosives sector. Training and education institutions as well as social partners will have a tool for competence and career planning, including new training methods as they are developed.

14. The intended effect of EUExcert is to enhance safe working and reduce the number of accidents in the explosives business and establish a competitive industry. In the explosives sector in several European countries a high proportion of the most experienced and knowledgeable people are nearing retirement or have already retired. Consequently, it is important to replenish this expertise in this key technological area.

15. The desired effect will be achieved through the development of a competence and qualifications framework that it is recognised across the European community (and hopefully beyond). As such, organisations and individuals using the system should be able to identify the required and available skills, knowledge and understanding of explosives workers. This recognition should, in turn, lead to enhanced mobility of explosives workers as their recognised competence should meet a very high proportion of the regulatory requirements for an explosives worker in the state

[4] http://www.euexcert.org/

where the work would be undertaken; it has generally been accepted that there will be an element of national knowledge that would need to be 'topped-up', e.g. the national implementation of EU legislation or other regulations/licensing requirements.

16. EUExNet created a transnational European web-based network of explosives sector National Nodes from each of the partner nations. It was the EUExNet project that accepted the use of the UK NOS as a basis for future work because the Standards were used to underpin national- and industry–recognised qualifications across the sector and because they are outcome-based, requiring the individual to provide evidence of competency and currency in their occupation, not input-based i.e. dependent on what was taught on a specific training or education event. Eight of the ten partners agreed that they would attempt to use the UK NOS as a bottom-up approach to influencing change in their state.

17. Since the end of the EUExNet project, the UN Saf*er*Guard Programme[5] has adopted these Occupational Standards as the basis for specifying and measuring the competence of explosives and ammunition staff in its International Ammunition Technical Guidelines (IATG) 01.90[6].

HOW TO USE THE HANDBOOK

18. In keeping with the aims of the project in general, and this handbook in particular, you might use the handbook in one or more of these ways:

    18.1. To help you understand the how and why of implementing Occupational Standards for Explosives, Munitions and Search Occupations. The 'how' is demonstrated through the associated 'Step-by-Step Guide to the Implementation of Occupational Standards' and the additional detail relating to those activities that were undertaken by the partners in the EUExImp project. The 'why' is demonstrated through the case studies of each of the 'industry partners' in the project, which might chime with your own individual or organisational needs.

    18.2. To help you measure competence in your organisation, which could be useful in either maintaining your internal standards or demonstrating the competence of your staff to external 'authorities' such as regulators or quality management accreditors.

    18.3. To assist you in developing your competence management systems or determining the training needs of individuals or an organisation.

    18.4. To assist in specifying or designing training and assessment for internal or external training providers.

    18.5. As a reference for the occupational standards

    18.6. To use the case studies as examples of how to implement the occupational standards in your workplace.

19. We, the EUExImp partners, hope that the handbook is as useful for you as our participation in the project was for us.

[5] https://www.un.org/disarmament/un-saferguard/
[6] https://s3.amazonaws.com/unoda-web/wp-content/uploads/2016/11/IATG-01.90-Personnel-Competences-V.2-rev.pdf

CHAPTER 1 – QUALIFICATIONS

1. Vocational qualifications exist in many European states and descriptions of the partner nations' vocational qualifications systems is given in the chapter on EQF Qualifications elsewhere in this handbook. It should be noted that, at the time of writing, few EU states have vocational qualifications for explosives workers listed in their VET frameworks.

2. The aim of this chapter is to give the reader a handrail to implementing explosives-related vocational qualifications (VQs) in their own organisation.

3. We will look at the reasons why you might want to implement qualifications within the organisation, how to decide which qualifications are best suited to your organisation, how to register candidates/learners (the terminology changes but in this context, both refer to the individual who is to be qualified) for qualifications and the assessment process.

EUExImp partner implementation of qualifications

4. As a partner in the EUExImp project, Voglers Eesti OÜ hoped to gain experience and knowledge with Pan-European value. Their aim was achieved by having one of their staff achieving a Level 3 VQ as an Explosives Safety Supervisor, learning about relevant processes and procedures as they became relevant. Voglers Eesti OÜ is a private company which started in Estonia on 1996. The company specializes in drilling, blasting and explosives, and on the earlier days loading and mocking, also crushing the blasted rock. Voglers was supported in the project by Tallinn University of Technology (TUT), which was established in 1918 and is the leading engineering R&D institution in Estonia, which supports Estonia's sustainable development through R&D and science-based higher education in the fields of engineering, technology, natural and social sciences.

   4.1. The project case study for Voglers Eesti OÜ is at Annex A-5.

5. MAXAM Deutschland is a respected and renowned provider of blasting products, services, and technical assistance for the global mining, quarrying, seismic, specialty and construction sectors. The Dresdner Sprengschule has been an international acknowledged educational institution for more then five decades and also a competent partner for all business consulting in the faculties of blasting technology, pyrotechnics, explosive ordnance disposal, transport of dangerous goods as well as civil engineering. MAXAM Deutschland has more than 140 years of experience in production and application of civil explosives, and its areas of business are:

   - Production, sales and application of civil explosives.
   - Production of Boosters, Emulsions, ANFO and permitted explosives.
   - Blasting service; Calculation of different blasting operations, measurement of blasting vibrations.

6. MAXAM Deutschland, supported by Dresdner Sprengschule, acted as a form of 'control group' in the EUExImp project. By this we mean that, because explosives qualifications in Germany (and the Czech Republic, a former EUExNet partner which uses a similar system) are enshrined in

State and Federal law, they are not able to make direct use of the Standards for their mandatory qualifications. They implemented the Standards indirectly by comparing (mapping) their existing qualifications against the Standards to confirm that the Standards could be accommodated across the MAXAM Group if required and that the federally-approved training provided by Dresdner Sprengschule delivers the knowledge and almost all of the skills required for MAXAM explosives workers..

6.1. The MAXAM Deutschland case study is at Annex A-4.

7. Event Horizon is an engineering company that specialises in the use of explosive materials. They have extensive experience in a wide range of fields including; aerospace, defence, explosive ordnance disposal (EOD), demolition, salvage and special effects (SFX). They provide 'Institute of Explosives Engineers' (IExpE) and 'Broadcasting Entertainment Cinematograph and Technicians Union' (BECTU) endorsed explosives safety training to the UK film industry. The completion of this training enables an individual to progress their career through the Joint Industry Grading Scheme (JIGS). Event Horizon also runs and teaches a SFX course that is endorsed by the Institute of Explosives Engineers (IExpE). Event Horizon' aims for the EUExImp project were to review the BECTU grading system for explosives SFX, then design and provide new training and externally verified qualifications aligned to the BECTU JIGS grades and IExpE membership grades. Event Horizon was supported through the project by PICRITE Ltd.

7.1. The Event Horizon case study is at Annex A-2.

8. G.J.R. – Pirotecnia e Explosivos, SA is a manufacturer of pyrotechnic articles, and black powder, and a distributor of explosives products. Other business areas are the display of fireworks shows and the application of explosives at quarries and construction works. GJR was supported by the University of Coimbra(UC) , one of the oldest universities in continuous operation in the world and one of its largest higher education and research institutions. UC has a strong relationship with the military and civil industry of explosives in Portugal. The Laboratory of Energetics and Detonics (LEDAP) is an infrastructure built in 1990 under the cooperation of the Portuguese Society of Explosives (SPEL) and the University of Coimbra and it has been the main laboratory facility for the support of experimental research about explosives, pyrotechnics and propellants.

9. GJR joined the project to test the processes for the implementation of occupational standards. They expected to change some of their practices and develop knowledge and share our experience. Decided that their greatest benefit would be by qualifying five people in the area of explosives operations.

9.1. The GJR case study is at Annex A-3

10. Bofors Test Center's (BTC) core business is the testing of products containing explosive substances. They have access to a large field of operations (approx. 100 km2) with six permanent test sites available. All these sites have well-developed infrastructure such as advanced anti-shrapnel cover for personnel and equipment. Should these sites not fulfil customer's particular requirements, BTC has a number of mobile solutions for setting up a temporary test site within or outside our facility. With our large areas of land, recording equipment and filming capabilities we have great scope for testing almost anything. They are certified to ISO 9000 and ISO 14000.

11. Being a test centre, it is logical to take the next step, certifying towards ISO 17025. A certification according to standard ISO 17025 means a greater opportunity to market the products and services on both the civil and defence market. One of the key issues lacking today is a system to

verify the personal skills and competences of our employees. One possible solution is to implement the occupational standards, so BTC participation in this project aims to examine these possibilities. BTC assessed the utility of the Standards and has the possibility of creating bespoke, in-house, qualifications for its staff when the necessity arises.

11.1. The BTC case study is at Annex A-1

Why Qualify?

12. Occupational Standards in Explosive Substances and Articles have a validity all their own. However, there are many additional benefits to the use of externally verified VQs that are based upon these standards.

13. Initial qualification demonstrates a certain level of skills and knowledge, however, experience increases the level of competence.

14. It can be argued that skill-fade[7] (the decay of ability or adeptness over a period of non-use), lack of awareness of new legislation, or not learning lessons from accidents can be a cause of complacency and further accidents, so maintaining currency is particularly important in the explosives industry. Refresher training and re-qualification is one way of ensuring that currency is maintained in this high-hazard sector.

Benefits for line managers

15. VQs in Explosive Substances and Articles will help your staff to carry out their work more effectively and get credit for doing so. The qualifications are practical, observable, and rooted in the job to be done, in particular:

15.1. the achievement of VQs will assure managers of the competence of their staff and the consistency of the standards to which work is carried out

15.2. VQs in Explosive Substances and Articles will help you to recognize the achievements of your staff which should increase their confidence and motivation

15.3. VQs are flexible - credit can be built up over almost any period, providing you and your staff with more career development options

15.4. VQs provide a framework enabling you to give purpose, direction and impetus to staff training and development, with the added advantage of clear progression paths

15.5. VQs will help you to deal with staff as individuals, each with his or her tailored programme for training, practice and assessment

15.6. emphasis on the support and expertise of local managers in implementing VQs enhances your role within your organization

15.7. involvement in almost any aspect of the delivery of VQs in Explosive Substances and Articles will give you opportunities to develop and add to your own skills, and you can use evidence of this to gain credits in VQs and/or other qualifications suited to your own job

[7] http://blog.wranx.com/what-is-skill-fade-and-how-to-combat-it

role (e.g. in management)

15.8. VQs and the Occupational Standards upon which they are based may be useful to you in other ways: for example, they could help you to draw up job descriptions, design career profiles, select and promote staff, and demonstrate your organization's fitness to undertake specific technical projects.

Benefits for staff

16. VQs also bring a number of benefits to individuals including:

16.1. a sense of achievement in carrying out tasks to the standard required

16.2. public recognition for the work they are doing, or have done in the past

16.3. national recognition: this applies wherever they go and whoever they work for

16.4. a flexible, progressive scheme that allows them to get credit for one unit of the award at a time

16.5. gaining credit by carrying out their normal job to the standard required and, because NVQs are linked to the workplace, they may not have to go away on a course or take examinations to achieve them

16.6. some parts of many VQs are "transferable" in that the competence involved is needed in more than one occupation

16.7. appropriate VQs may be accepted for admission to further and/or higher education courses proof of competence for an VQ may be accepted as contributing to the achievement of other forms of qualification or recognition eg professional body membership.

17. In SAFEX Newsletter 52[8], Clarke informs us that:

17.1. "In 2009, the UK's Ministry of Defense (MoD) published a requirement for all explosives workers to demonstrate their competence. This applies both to those employed by the MoD (military and civilian) and to the explosives workers employed by MoD's suppliers so it goes right across the industry and the driver is therefore both by regulatory and driven by the customer" said Dave Winterborne (Qualifications Assessor and Internal Verifier). "This means that we need to understand people's behaviours because wrong behaviours often lead to safety failures" he went on. "We need a structure for the entire workforce that operates on several levels so that we can structure individuals' learning and assess their behaviours in the workplace against fixed and absolute benchmarks."

18. Indeed, across Europe, the impetus for members of EUExcert is the regulatory requirement to demonstrate the competence of the explosives workforce. EUExcert has recommended the use of qualifications because of their ability to demonstrate the competence of an organization's

[8] https://www.safex-international.org/safex/media/downloadable-files-list/Newsletters/newsletter-52.pdf

workforce through the structure of independent assessment and verification. One of the aims of EUExcert is to enhance the mobility of explosives labour across the EU and the implementation of qualifications facilitates the achievement of this aim. From the perspective of the individuals working toward a qualification, its achievement is an overt demonstration of their competence and is a powerful motivational tool.

19. For the majority of readers, though, the main reason for qualification is regulatory, i.e. people working with explosives are required, either by the laws of their own country or the state in which they hope to work, to hold a recognised qualification.

Which qualification?

20. Deciding which qualification is the most appropriate for you or your staff, if it is not prescribed in the terms and conditions of your job, is non-trivial.

21. The reasons for undertaking a qualification are many and varied but include:

    21.1. As part of a career structure, e.g. the BECTU JIGS grading system.

    21.2. As continuous professional development.

    21.3. In response to changes in legislation.

    21.4. To demonstrate competence to regulators or auditors.

    21.5. To fill a particular job.

22. Whatever the reason, it is quite likely that you will want to understand exactly what is involved in the qualification in terms of the knowledge and skills that you want to demonstrate. The Standards and their detailed elements provide insight into the depth of a qualification, especially if the detailed learning objectives of the qualification are known.

23. During the project, we found the most effective way of understanding our needs was to create role profiles in terms of the Standards, for the jobs that either exist or are an aspiration. The process of role profiling is covered in detail in the Step-by-Step Guide to the Implementation of Occupational Standards at the back of this book and available separately from EUExcert[9].

24. The Standards are not 'levelled', i.e. they are standalone statements of competence; it is the design of a qualification that brings about a level, and the Awarding Organisation that designs and offers a qualification will usually describe it in terms of the national implementation of the European Qualifications Framework (EQF).

[9] http://www.euexcert.org/pdf/EUExImp-Step-by-Step-Guide-to-Implementing-Occupational-Standards-First-Edition.pdf

EQF Level	Knowledge	Skills	Competence
	In the context of EQF, knowledge is described as *theoretical and/or factual*.	**In the context of EQF, skills are described as *cognitive* (involving the use of logical, intuitive and creative thinking), and *practical* (involving manual dexterity and the use of methods, materials, tools and instruments)**	**In the context of EQF, competence is described in terms of *responsibility and autonomy*.**
Level 1	Basic general knowledge	Basic skills required to carry out simple tasks	Work or study under direct supervision in a structured context
Level 2	Basic factual knowledge of a field of work or study	Basic cognitive and practical skills required to use relevant information in order to carry out tasks and to solve routine problems using simple rules and tools	Work or study under supervision with some autonomy
Level 3	Knowledge of facts, principles, processes and general concepts, in a field of work or study	A range of cognitive and practical skills required to accomplish tasks and solve problems by selecting and applying basic methods, tools, materials and information	Take responsibility for completion of tasks in work or study; adapt own behaviour to circumstances in solving problems
Level 4	Factual and theoretical knowledge in broad contexts within a field of work or study	A range of cognitive and practical skills required to generate solutions to specific problems in a field of work or study	Exercise self-management within the guidelines of work or study contexts that are usually predictable, but are subject to change; supervise the routine work of others, taking some responsibility for the evaluation and improvement of work or study activities
Level 5[1]	Comprehensive, specialised, factual and theoretical knowledge within a field of work or study and an awareness of the boundaries of that knowledge	A comprehensive range of cognitive and practical skills required to develop creative solutions to abstract problems	Exercise management and supervision in contexts of work or study activities where there is unpredictable change; review and develop performance of self and others
Level 6[2]	Advanced knowledge of a field of work or study, involving a critical understanding of theories and principles	Advanced skills, demonstrating mastery and innovation, required to solve complex and unpredictable problems in a specialised field of work or study	Manage complex technical or professional activities or projects, taking responsibility for decision-making in unpredictable work or study contexts; take responsibility for managing professional development of individuals and groups
Level 7[3]	Highly specialised knowledge, some of which is at the forefront of knowledge in a field of work or study, as the basis for original thinking and/or research Critical awareness of knowledge issues in a field and at the interface between different fields	Specialised problem-solving skills required in research and/or innovation in order to develop new knowledge and procedures and to integrate knowledge from different fields	Manage and transform work or study contexts that are complex, unpredictable and require new strategic approaches; take responsibility for contributing to professional knowledge and practice and/or for reviewing the strategic performance of teams
Level 8[4]	Knowledge at the most advanced frontier of a field of work or study and at the interface between fields	The most advanced and specialised skills and techniques, including synthesis and evaluation, required to solve critical problems in research and/or innovation and to extend and redefine existing knowledge or professional practice	Demonstrate substantial authority, innovation, autonomy, scholarly and professional integrity and sustained commitment to the development of new ideas or processes at the forefront of work or study contexts including research

Figure 3. EQF Descriptors[10]

25. The EQF does not replace national qualifications systems and the EU provides a useful resource to allow readers to compare their national system of qualifications with the EQF Levels[11].

26. In the UK, HSQ offers explosives-related vocational qualifications at UK levels 2, 3 and 4 which are delivered by training providers that have been approved as Qualifications Centres. As examples, here are summary extracts from EUExImp partner nations' published descriptions. More detailed comparisons of the EQF descriptors for levels 2, 3 and 4 against EUExImp partners' national systems are to be found in the ECF Qualifications annex.

LEVEL 2

27. The owner of EstQF level 2 qualification:

    27.1. has basic factual knowledge of a field of work or study;

    27.2. has basic cognitive and practical skills required to use relevant information in order to carry out tasks and to solve routine problems; uses simple rules and tools;

[10] https://ec.europa.eu/ploteus/en/content/descriptors-page
[11] https://ec.europa.eu/ploteus/en/compare

27.3. works and studies under supervision with some autonomy.

28. The holder of a German NQF Level 2 will be in possession of competences for the professional fulfilment of basic requirements within a clear and stably structured field of study or work. Fulfilment of tasks takes place largely under supervision.

29. In Portugal, a Level 2 NQF qualification demonstrates that the holder has a basic factual knowledge of a field of work or study, they also have the basic cognitive and practical skills required to use relevant information in order to carry out tasks and to solve routine problems using simple rules and tools, and that they can work or study under supervision, with some autonomy

30. In UK, Level 2 qualifications recognise the ability to gain a good knowledge and understanding of a subject area of work or study and to perform varied tasks with some guidance or supervision.

LEVEL 3

31. The owner of Estonian EstQF level 3 qualification:

31.1. has knowledge of facts, principles, processes and general concepts, in a field of work or study;

31.2. has a range of cognitive and practical skills required to accomplish tasks and solve problems by selecting and applying basic methods, tools, materials and information;

31.3. takes responsibility for completion of tasks in work or study;

31.4. adapts own behaviour to circumstances in solving problems.

32. The holder of a German NQF Level 3 will be in possession of competences for the autonomous fulfilment of technical requirements within a field of study or field of occupational activity which remains clear whilst being openly structured in some areas.

33. In Portugal, a Level 3 NQF qualification demonstrates that the holder has knowledge of facts, principles, processes and general concepts in a field of work or study and that they have a range of cognitive and practical skills required to accomplish tasks and solve problems by selecting and applying basic methods, tools, materials and information, which means that they can take responsibility for completion of tasks in work or study. Adapt own behaviour to circumstances in solving problems.

34. In UK, Level 3 qualifications recognise the ability to gain and where relevant apply a range of knowledge, skills and understanding. Learning at this level involves obtaining detailed knowledge and skills. Level 3 is appropriate for people wishing to go to university, people working independently, or in some areas supervising and training others in their field of work.

LEVEL 4

35. The owner of Estonia EstQF level 4 qualification:

35.1. has factual and theoretical knowledge in broad contexts within a field of work or study;

35.2. has a range of cognitive and practical skills required to generate solutions to specific problems in a field of work or study;

35.3. exercises self-management within the guidelines of work or study contexts that are usually predictable, but are subject to change;

35.4. supervises the routine work of others, taking some responsibility for the evaluation and improvement of work or study activities.

36. The holder of a German NQF Level 4 will be in possession of competences for the autonomous planning and processing of technical tasks assigned within a comprehensive field of study or field of occupational activity subject to change.

37. In the Portuguese system, the holder of a Level 4 qualification has demonstrated that they have factual and theoretical knowledge in broad contexts within a field of work or study and a range of cognitive and practical skills required to generate solutions to specific problems in a field of work or study. The Level 4 holder can exercise self-management within the guidelines of work or study contexts that are usually predictable, but are subject to change. Supervise the routine work of others, taking some responsibility for the evaluation and improvement of work or study activities

38. In UK, Level 4 qualifications recognise specialist learning and involves detailed analysis of a high level of information and knowledge in an area of work or study. Learning at this level is appropriate for people working in technical and professional jobs, and/or managing and developing others. Level 4 qualifications are at level equivalent to Certificates of Higher Education.

Registration

39. Each State and Awarding Organisation will have their own requirements and procedures for registration of candidates.

ASSESSMENT

40. It is quite evident that to gain a qualification, a candidate must be assessed. The assessment of individuals for vocational qualifications based on occupational standards can take many forms but the abiding principle is that the candidate's real-life performance and underpinning knowledge will be assessed in appropriate contexts.

41. We should take account of the sensitivity of assessment and, in SAFEX Newsletter 50[12], Clarke suggests that

41.1. "One of the issues in conducting performance appraisals is the potential for sensitivity and potential subjectivity of judging performance, so, has the use of the ESA NOS

[12] https://www.safex-international.org/safex/media/downloadable-files-list/Newsletters/NL50.pdf

removed or reduced this? The AWE points out that the assessor still has to apply his/her own qualified opinion of the evidence that has been presented (in a way that is similar to the CPD requirements used in any professional registration activity).

41.2. As Shaun Dooley of the AWE points out, "The use of the ESA NOS removes the 'mystery' of what competence 'looks like' (the phrase is often heard that someone 'doesn't know what they are looking for but they know it when the see it'). The use of the ESA NOS helps assessors to 'see' what they are looking for." To be assessed against an ESA NOS means that everyone is subject to the same requirements. "Working toward the ESA NOS aligns everyone to achieving the same standards", as Dave Nelson of Deflog VQ Trust explained – a point with which Lars Erik Pettersson agreed "The candidates taking the qualifications are pleased to be judged against the objective standard provided by the ESA NOS and they understand the need to be assessed in detail against all the components of the standards."

41.3. Whilst many people have experience of assessing people in general terms (e.g. for performance appraisal purposes), few have experience of assessing people against such specific technical standards as the ESA NOS. Historically, people have been inclined to be judgmental, but "this structured approach [means] greater objectivity … your judgment is a lot more finite because the detail is in the standards and this makes it easier", as Ken Cross (of PICRITE Ltd and a qualifications assessor and internal verifier) put it. This approach certainly helps to remove the sensitivity of the appraisal process."

42. There are two principal processes for assessment against occupational standards: first, the direct observation of the candidate's performance and knowledge in the workplace; second, the recognition or accreditation of prior experience and learning. These processes are shown in the following diagram and explained in detail in the Step-by-Step Guide to the Implementation of Occupational Standards appended to this handbook.

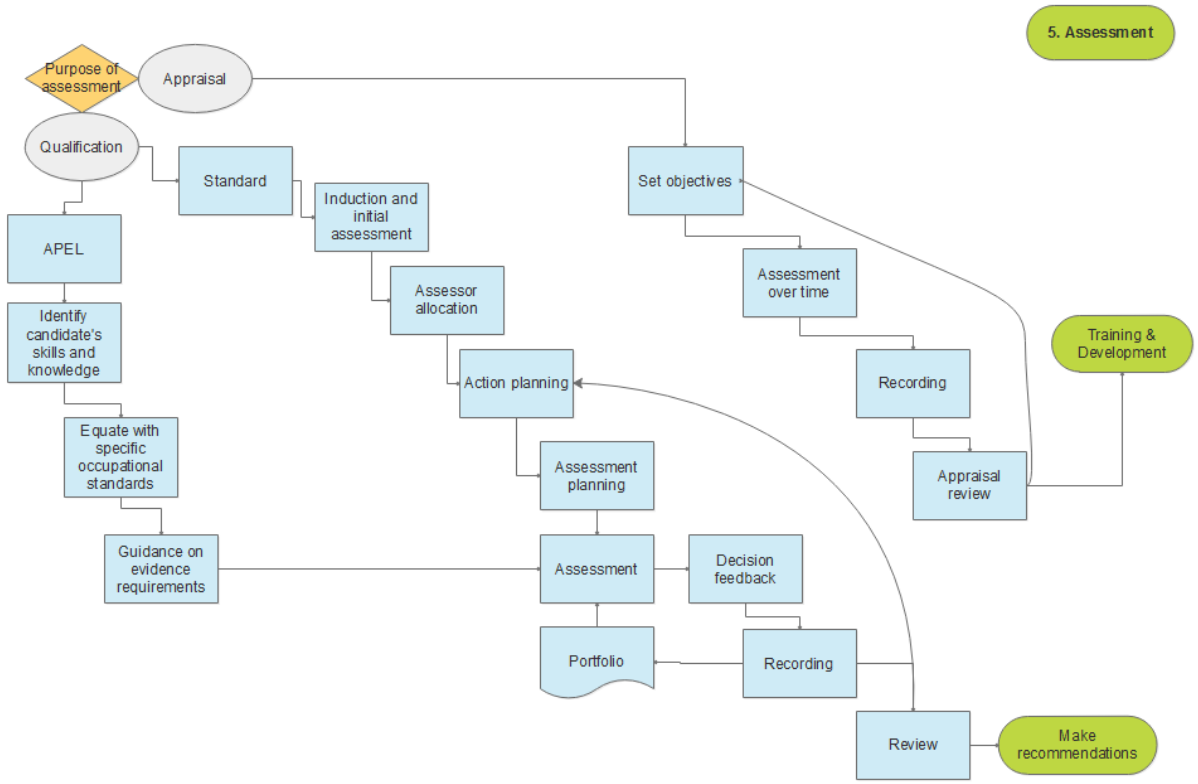


Figure 4. Assessment processes

43. Crucial to the acceptance of these qualifications is the principle of external verification, as part of a robust governance framework. Such a qualification governance framework is used by the UK and includes:

    43.1. Regulator – the organisation that works on behalf of government to ensure the quality and rigour of qualifications.

    43.2. Standards Setting Body – an industry-led group of experts that meets regularly to set and maintain Occupational Standards.

    43.3. Awarding Organisation – a body that is regulated by the regulator and which designs and provides quality assurance of qualifications.

    43.4. External Verifier (EV) – a SQEP individual who accredits qualification centres and conducts quality assurance audits on those centres for the awarding organisation.

    43.5. Qualifications Centres – organisations that are accredited by the awarding organisation for the delivery and assessment of its qualifications.

    43.6. Internal Verifier (IV) (also known as Internal Quality Assurer or IQA) – an occupationally SQEP individual verifies the quality and consistency of assessment of one or more assessors on behalf of the qualifications centre.

43.7. Assessor – an occupationally SQEP individual who assesses one or more candidates' competence against the required NOS.

43.8. Qualifications.

43.9. Recognition of prior experience and learning.

43.10. Education and training.

44. Evidence can take almost any form and some of the most commonly accepted are:

44.1. Observation. The assessor observes the learner undertaking the activity in the workplace and makes comments on what is observed.

44.2. Witness Testimony. The assessor requests a statement from one or more of the learner's colleagues, line management or others, e.g. customer or other independent, reliable witness, that explains that the witness has observed the learner doing their job to an accepted standard and in accordance with organisational procedures. The assessor then makes a judgement of which element(s) of the relevant Standard(s) are covered and that the required standards have been met.

44.3. Written questions. The assessor provides the learner with one or more written questions that are intended to allow the learner to demonstrate their knowledge of an element of the Standard or to explain their actions in a process or procedure that it is not possible to observe, for example, an emergency procedure. Questions may be provided before or after an observation.

44.4. Verbal questions. The assessor asks the learner questions during or after an observation, or as part of a professional discussion. The aim is usually for the learner to be able to explain their actions, a process or procedure or the policies, regulations or the like that form the framework for their work.

44.5. Professional Discussion. The assessor and candidate enter into a structured dialogue, which is recorded in notes and often in an audio or video recording. The professional discussion enables the participants to explore complex ideas or processes and is particularly useful for candidates who are not comfortable with written questions.

44.6. Assignment/project. The assessor sets the learner an assignment or project which will usually result in some useful document or practice for the learner's organisation. This type of evidence is common in some of the higher-level qualifications, for example in reviewing an organisation's explosives safety policy.

44.7. Test. The assessor sets the learner a written or practical test to tease out particular, little-used, knowledge or skills that are a required part of meeting a Standard but so infrequently used in the workplace that the timeframe for assessment wold not be acceptable.

44.8. Simulation. In general, awarding organisations prefer not to allow assessment of simulations of work. Exceptions to this rule exist in the explosives industry in jobs where it is manifestly unsafe for either an assessor or work colleague to observe the actions of the learner directly. A classic example of this situation can be seen in the work of an explosive ordnance disposal operator who is required to work on their own, at a safe distance and often out of sight of their team or line-manager. This absolute requirement for working in a 'one-person risk' environment must, however be assessed in training in order to ensure that the potential operator is competent to be able to work safely outside the training environment.

44.9. Product/process evidence. This type of evidence, also known as 'naturally occurring evidence' includes such things as check sheets, attendance sheets, signed documents resulting from actions in the workplace, work diaries; almost anything that can be used to demonstrate that the learner did a particular task on a particular occasion.

44.10. Other… The list above is comprehensive but not necessarily all-inclusive. A good assessor will work with the learner to find the best evidence of the learner's competence and the types of acceptable evidence are almost unlimited.

45. Ideally, the assessor will use more than one type of evidence to make their judgement of competence of the individual and 'observation' should be included whenever it is safe and practical to so.

46. Whatever form the evidence takes, it must adhere to the same requirements i.e. it must be:

46.1. Valid: provide genuine evidence of achievement of the Standard/element;

46.2. Authentic: be the candidate's own work;

46.3. Reliable: give consistently reproducible results

46.4. Current: give a current picture of competence/ knowledge; (as a rule of thumb, to be current evidence would be less than 2 years old)

46.5. Sufficient: cover all the requirements of the standard;

47. In achieving these requirements, we are likely to achieve validity and reliability – which are the key requirements of effective assessment.

48. EUExImp project partner GJR recognised that to qualify their members of staff they would need to be able to work in Portuguese as well as English. Their solution was to qualify two Portuguese nationals, both greatly experienced in the industry and having excellent English language skills, as assessors.

49. The procedure for the two assessors to achieve the qualification was carried out by QinetiQ Qualifications Centre and was based on the understanding of the assessment methodology and their skill to prepare and conduct two partial assessment of two different. Five days were used to perform the training and assessment of the two candidates. The first two days were used for

the candidate assessors to receive the theory elements of the qualification, two days were used for observations of the assessor candidates in the work environment (conducting partial assessments) and one day was used for professional discussion with each candidate.

50. The theoretical stage was conducted in a meeting room at a local venue and covered the principles and practices of assessment in the workplace. The practical stage was done at the factory and required each candidate assessor to be seen to undertake 2 assessments (by observation, questioning and work product) of 2 learners, i.e. a total of four assessments. This was followed by a professional discussion between the candidate assessor and the instructor/assessor which allowed the instructor/assessor to gain a deeper understanding of the candidate assessor's knowledge and attitudes and performance during their own training and assessment.

51. At the different steps of the assessment process, each candidate added to a Portfolio that was completed at the end. The accredited Internal Verifier assured the maintenance and improvement of quality assessment, supporting the assessor and monitoring the quality of the assessor's performance, ensuring standardisation between assessors and to meet the external quality assurance requirements.

52. The two assessors were accredited by the 'Open Awards' awarding organisation, achieving the Open Awards Level 3 Award in Assessing Competence in the Work Environment (OCF).

53. A Coutinho, a 3rd-party accreditor who is now one of the assessors for GJR, writes that

> "My participation in this project was as follows:
> - Analysis of Standards;
> - Analysis of company processes;
> - Qualification as a certified assessor;
> - Realization of assessments to 3 GJR level 2 employees
>
> The qualification process as an assessor took place during one week with room and factory training, and it was very important for me to understand the methodology of assessments, its benefits and how to perform them in the future.
>
> At this moment, I am working with the other qualified assessor in GJR's company to complete the qualification of three level two employees of GJR."

Assessment for purposes other than qualification

54. Assessment of competence is a natural part of management and supervision, and it certainly features as a major part of any formal appraisal process or procedure. As can be seen in Figure 2, occupational standards can be used throughout the appraisal process, from setting objectives at the beginning of the appraisal period through to the appraisal review and formulating an individual and group development and training plan or programme.

55. In the EUExImp project, Bofors Test Center (BTC) recognised that "One of the key issues lacking today is a system to verify the personal skills and competences of our employees. One possible solution is to implement the occupational standards. BTC participation in this project aims to

examine these possibilities." in their journey towards accreditation as an ISO 17025 compliant test house. In developing their existing competence management system to make use of the Standards, it became clear that line managers would need to be able to make consistent assessment of the multi-skilled BTC staff competences in various specialist areas. Given the management and leadership background of many of the staff in BTC, there is ample experience of personnel assessment for appraisal against management objectives and wider goals. It was felt, however, that assessment against the Standards was somehow different so we arranged a couple of sessions of mock assessment, which proved that our assumption had been correct in this case.

EXPLOSIVES QUALIFICATIONS BASED ON OCCUPATIONAL STANDARDS

56. At the time of writing, there are three organisations that award explosives-related qualifications based on occupational standards.

Homeland Security Qualifications (HSQ)

57. HSQ has developed industry-recognized vocational qualifications (VQs) at Levels 1-4 in the form of Awards, Certificates and Diplomas. These qualifications follow the United Kingdom's model for regulated qualifications and are operated on the same basis. The full Explosive Substances and Articles National Occupational Standards (ESA NOS), including munition clearance and search, are available as downloads from the Documents page of their website[13], along with a document explaining the many and varied uses of NOS.

58. At the time of writing, HSQ offers a range of industry-approved competence-based qualifications, almost all of which derive from the Explosive Substances and Articles National Occupational Standards (ESA NOS).

Level	Size	Title	HSQ no
4	Diploma	Planning and management of munition clearance operations (PMMCOp)	Q12-D4-001
3	Diploma	Supervisory management of munition clearance operations (SupMgtMCOp)	Q12-D3-003
3	Certificate	Search for and disposal of munitions (SearchDM)	Q12-C3-005
2	Diploma	Contribution to the disposal function (ContrDF)	Q12-D2-007
1	Award	Support for munition clearance operations (SMCOp)	Q12-A1-009
4	Diploma	Planning and management of specified target search operations (PMgtSTSOp)	Q12-D4-002
3	Diploma	Supervisory management of specified targets search operations (SupMgtSTSOp)	Q12-D3-004
3	Certificate	Specified targets search (STS)	Q12-C3-006

[13] http://www.homelandsecurityqualifications.co.uk/documents/

Level	Size	Title	HSQ no
2	Certificate	Contribution to the search function (ContrSF)	Q12-C2-008
1	Award	Support for specified targets search operations (SSTSOp)	Q12-A1-010
2	Award	Movement of explosives (MOE)	Q08-A2-001
2	Diploma	Explosives storage and maintenance (ESM)	Q57-D2-001
2	Certificate	Explosives storage operations (ESO)	Q07-C2-001
2	Certificate	Explosives maintenance operations (EMO)	Q05-C2-001
2	Award	Using small arms (USA)	Q15-A2-001
4	Diploma	Explosives Management*	Q00-D4-003
3	Diploma	Explosives Supervision*	Q00-D3-002
2	Diploma	Explosives Operations*	Q00-D2-001
4	Diploma	Explosives Safety Management and/or Advice and/or Regulation	02-001-04
3	Diploma	Supervision of Explosives Safety Management and/or Advice and/or Regulation	02-002-03
4	Diploma	Use of Explosives in the Entertainment Industry	Q10-D4-001
3	Diploma	Use of Explosives in the Entertainment Industry	Q10-D3-002
2	Certificate	Use of Explosives in the Entertainment Industry	Q10-C2-003

59. *The qualifications in Explosives Management, Explosives Supervision and Explosives Operations are flexible. In addition to a common core, candidates can choose units in explosives safety management, test and evaluation, manufacture, maintenance, storage, transport and disposal to match the requirements of their roles in the workplace.

The Mineral Products Qualifications Council (MPQC)

60. http://www.mpskills.co.uk/

61. The Mineral Products Qualifications Council is a not for profit organisation whose members are derived from the quarrying, mineral products and mining sector.

62. The Skills Centre division provides an extensive portfolio of training and assessment services:

    62.1. This includes a range of industry recognised SHE (Safety Health and Environmental) courses aimed at managers; supervisors and operatives. This reinforces an individual's CPD (Continued Professional Development) and helps towards the route to competence.

62.2. The industry recognised “MPQC plant operator training and assessment scheme” including over 50 items of individual plant.

62.3. Instructional technique courses in order to become accredited instructors within the MPQC Plant Operator Scheme.

62.4. JAUPT approved centre able to offer a range of driver CPC training. In particular the industry endorsed “Driver Skills Card” through the MPQC developed “Site Safety Awareness Course”

62.5. A range of QCF[14] / SVQ vocational qualifications can be arranged through the MPQC approved assessment centre.

62.6. Contractors Safety Passport with focussed industry content (available from October 2011).

62.7. Consultancy services to help and advise a company or site on the route towards competence.

62.8. A range of Shotfiring publications.

63. MPQC was created for industry to help, develop and maintain industry training needs. MPQC is uniquely involved and represented on all the industry bodies and organisations. In addition, our Training and Education Committee is the forum in which new qualifications and training is discussed, evaluated and developed.

64. MP Skills is the UK extractive industry’s leading Approved Assessment Centre specialising in delivering vocational qualifications for the extractives industry which are awarded by the Mineral Products Qualification Council (MPQC). Dedicated to working with businesses within the quarrying, mineral products and mining sector, we use our unique expertise to help organisations achieve occupationally relevant qualifications throughout their workforce.

65. MP Skills delivers the MPQC vocational qualifications. With a focus on ensuring workplace competence throughout the extractives industry, their range of awarded qualifications are current, sector specific and will always be up to date with the latest guidelines.

66. The vocational qualification awards offered by MP Skills include, among a number of non-explosives qualifications:

66.1. Blasting Operations

66.2. Drilling Operations

66.3. Blasting for Non-Blasting Managers

67. The last qualification is aimed at people who are responsible for blasting operations at a site but who are not appointed explosives supervisors under the Quarries Regulations 1999, Regulation 25 (1) (b). It provides attendees with sufficient knowledge and practical understanding of blasting operations to be able to manage a blasting operation at a quarry. The successful

[14] The QCF framework has been withdrawn by UK Government and no new registrations can be accepted.

candidate will have sufficient knowledge to successfully complete the knowledge assessment criteria for the MPQC Level 6 Award in Managing Quarry Drilling and Blasting Qualification.

Creative Skillset

68. Creative Skillset[15] oversees occupational standards for the performing arts community. Some of these are relevant to Special Effects (SFX) technicians who work with explosives:

    68.1. SKSSFX01 - Prepare a SFX breakdown and budget

    68.2. SKSSFX02 - Design and plan the effect

    68.3. SKSSFX03 - Special effects workshop practice

    68.4. SKSSFX10 - Create an explosive and pyrotechnic effect

    68.5. SKSSFX11 - Implement a special effect on a production

[15] http://creativeskillset.org/

CHAPTER 2 – MAPPING AN EXISTING TRAINING COURSE

AIM

1. The aim of mapping an existing training course is for you to be able to describe the course training objectives and outcomes in terms of occupational standards.

2. This map can then be used to identify any gaps between what is taught and what an existing vocational qualification requires the candidate to be able to demonstrate. Alternatively, the map can be used to itemise a course certificate for future comparison with the membership criteria of professional bodies or job criteria if they are themselves mapped or written in terms of occupational standards.

WHY MAP COURSE CONTENT?

3. Having spent time defining role profiles and mapping them to the ESA NOS, you know what the individual member of staff is expected to be able to do. The next logical step is to assess the member of staff against their role profile to gauge their competence level and identify any gaps between their existing competence and the organisation's expectations. Filling those gaps is highly likely to require formal training so you need to be able to compare the role profile with existing qualifications and available training courses.

4. Next you need to be able to identify suitable training courses that can provide some or all of the knowledge criteria and an acceptable level of skills in the performance criteria of the Standards in the role profile. You can use words and phrases from the Standards to search for potentially suitable training courses.

5. Once you have identified some candidate courses, the next step is to map the existing training courses to the ESA NOS. This will pinpoint any gaps in the training so that courses can be revised and new training commissioned where necessary.

6. The next step is to map the role profiles to existing qualifications and to available training courses, commissioning bespoke training where it is needed to meet any specialized requirements.

THE OUTLINE PROCESS

7. You will need all the information available for the course you intend to map to the occupational standards and the standards relevant to the type of explosives working that the course supports.

8. Identify all the training objectives of the course, in detail. Set them out in a matrix, e.g. from a hypothetical training course for disposal of explosives by burning we see three training objectives relating to the movement of the explosives to the burning area and firefighting at the area.

Training Objective	Key Learning Points	Occupational Standards (P = Performance Criteria K = Knowledge Criteria)
Understand UN Explosive Hazard Classification System and Codes	• Explain relevant terms and definitions: “compatibility group”; “hazard class”; “hazard division”. • Explain the purpose of explosive Hazard Classification Codes (HCC) • Describe the construct of a HCC. • Describe the 7 hazard divisions that can be allocated to explosive substances and articles. • Describe the 4 fire divisions and how they relate to hazard divisions • Describe the mixing rules for compatibility groups • Describe the types of conventional ammunition that should always be stored separately (or under specific conditions) from other types of ammunition.	11.13A: K - iii;
Understand National Explosives Regulations	• Explain relevant terms and definitions: “explosives”; “Explosive substance”; “Explosive article”; “ammunition”; “munitions”; shall”; “may”; “can”; “should”; “National Explosives Regulations ….” • Describe the purpose of national regulations • Be aware of the background to the creation of explosives regulations • Be aware of the risks posed by inadequately managed ammunition stockpiles: Safety; Security; Stability; Diversion of munitions • Be aware of the structure of the regulatory framework • Be aware of the review policy for national explosives regulations	11.13A: K – i;
Supervise firefighting capability when disposing of explosives by burning	• Review hose run-out and testing • Establish a water supply • Indicate or specify assigned personnel	11.13A: P – c. K - iv; viii; 11.13A: P – c; 11.13A: K- xiv;

9. Identify all the skills that the learner is expected to be able to undertake after completion of training.

    9.1. An example from our matrix is to be able to run out a firefighting hose.

10. Identify all the knowledge that the learner is expected to have at the end of the course

    10.1. An example from the matrix is to know and understand the structure of the national explosives regulatory framework.

11. For your own part, you will also need to know and understand the occupational standards that are appropriate to the area or areas of the explosives sector for which the training course exists. Taking that knowledge of the Standards, we can see that our hypothetical training course maps to Occupational Standard 11.13A but there are significant gaps between the totality of 11.13A (Performance Criteria a – h; Knowledge Criteria i – xviii) and the elements that are met by these three training objectives.

12. The courses of action available to the person using this map if they wish their member of staff to achieve Standard 11.13A might be one or a combination of:

    12.1. Request that the course is expanded to include all the knowledge criteria

    12.2. Request that the course is expanded to include all the performance criteria

        12.2.1. Generically, so that the qualification gained is obviously transferable
        12.2.2. Specific to the organisation in a bespoke qualification

    12.3. Identify which elements can be met by either simply gaining experience in the workplace, 'On-the-Job' (OTJ) or formal training within the organisation, or a combination of the two. Request that the course is expanded to include the remaining knowledge and performance criteria.

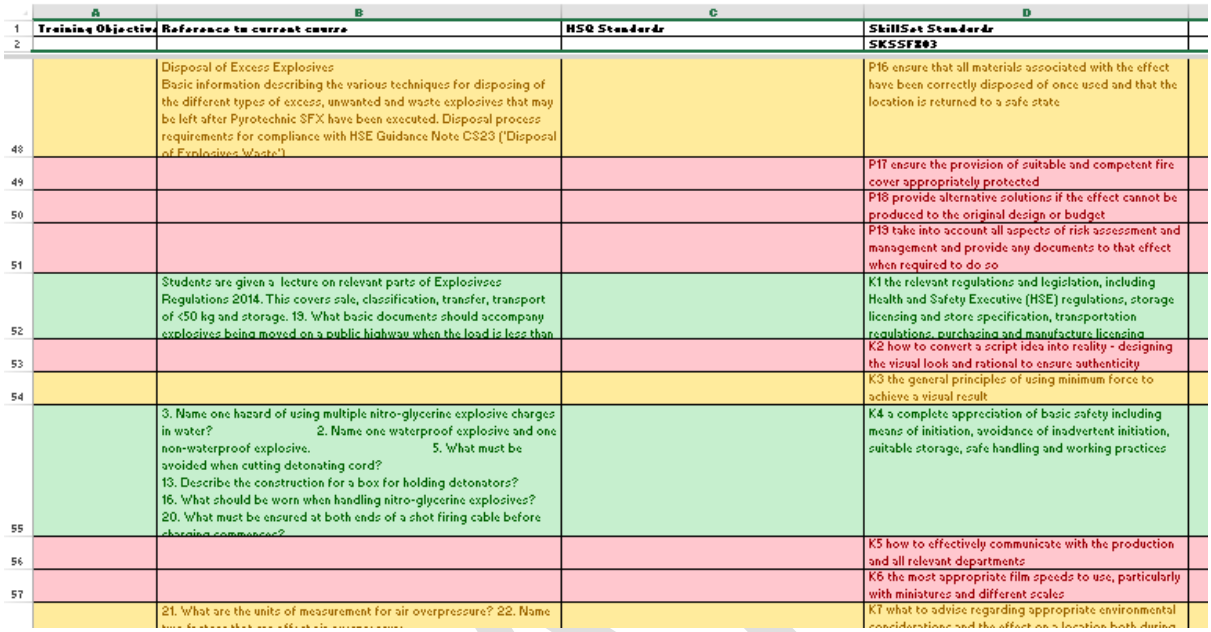
THE EVENT HORIZON EXPERIENCE

13. Identifying appropriate occupational standards. Event Horizon has worked with BECTU for many years and many members of their staff are members of the union in their own right. As such, and having delivered the so-called Part 1 course, they were aware of the SkillSet occupational standards for special effects

14. After a short introductory session on how to map the course to the Standards, Event Horizon went on to identify not only which of the Standards are covered in their current training but also whether they covered it as either 'knowledge' or 'performance' in keeping with the Standards. The former was identified by whether the topic was assessed in the current end-of-course examination and the latter would be considered as fully mapped if it was tested practically during the training.

15. GAP ANALYSIS

16. Event Horizon made use of a simple tabular map of the Standards to their training and the clever part of their work was in identifying partial or complete gaps between their training and the existing SkillSet and HSQ standards/qualifications. This was achieved by colour-coding: green for completely mapped; amber for partially mapped; red for not included in current training, as shown in this extract from an early draft.



	A	B	C	D
1	Training Objectiv	Reference to current course	HSQ Standards	SkillSet Standards
2				SKSSFX03
48		Disposal of Excess Explosives Basic information describing the various techniques for disposing of the different types of excess, unwanted and waste explosives that may be left after Pyrotechnic SFX have been executed. Disposal process requirements for compliance with HSE Guidance Note CS23 ('Disposal of Explosives Waste')		P16 ensure that all materials associated with the effect have been correctly disposed of once used and that the location is returned to a safe state
49				P17 ensure the provision of suitable and competent fire cover appropriately protected
50				P18 provide alternative solutions if the effect cannot be produced to the original design or budget
51				P19 take into account all aspects of risk assessment and management and provide any documents to that effect when required to do so
52		Students are given a lecture on relevant parts of Explosives Regulations 2014. This covers sale, classification, transfer, transport of <50 kg and storage. 19. What basic documents should accompany explosives being moved on a public highway when the load is less than		K1 the relevant regulations and legislation, including Health and Safety Executive (HSE) regulations, storage licensing and store specification, transportation regulations, purchasing and manufacture licensing
53				K2 how to convert a script idea into reality - designing the visual look and rational to ensure authenticity
54				K3 the general principles of using minimum force to achieve a visual result
55		3. Name one hazard of using multiple nitro-glycerine explosive charges in water? 2. Name one waterproof explosive and one non-waterproof explosive. 5. What must be avoided when cutting detonating cord? 13. Describe the construction for a box for holding detonators? 16. What should be worn when handling nitro-glycerine explosives? 20. What must be ensured at both ends of a shot firing cable before charging commences?		K4 a complete appreciation of basic safety including means of initiation, avoidance of inadvertent initiation, suitable storage, safe handling and working practices
56				K5 how to effectively communicate with the production and all relevant departments
57				K6 the most appropriate film speeds to use, particularly with miniatures and different scales
		21. What are the units of measurement for air overpressure? 22. Name		K7 what to advise regarding appropriate environmental

17. Once they had their accepted qualifications designs they could get around to mapping the existing courses to not only the Standards but also to the qualifications. It made sense to wait until this stage because of the previously mentioned issue of volume of Standards included in the Role Profiles.

18. Using the process outlined in the 'Step-by-Step Guide to Implementing Occupational Standards', which is available as a separate document, they followed the 'Which document is available? … Programme …' route shown in the flow chart.

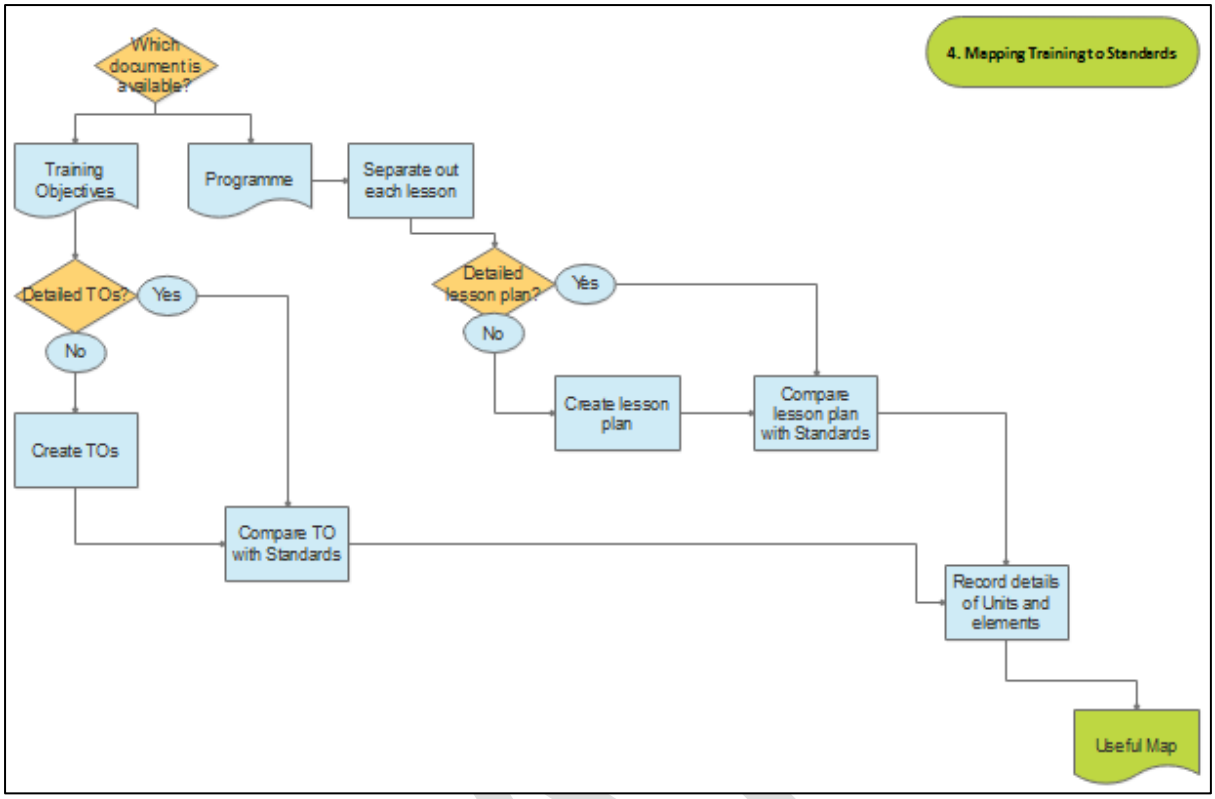


Figure 5. Mapping Training to Standards

19. Having the course material, course design and a copy of the Candidate Pack[16] for each of the qualifications meant that they could relatively easily identify which Units and elements of units should be included in the course and which would be better suited to being assessed using Witness Testimony as evidence.

20. It was always the intention that gaining a vocational qualification should be achievable in the least complex way possible, within the governance and assurance requirements of the awarding organisation and the BECTU grading system. The hazardous nature of working with explosives and pyrotechnics on a film or television stage or a theatre stage or outdoor re-enactment arena, it was considered that evidence should come from two main sources: the theory and practical parts of the course they were designing and from witness testimony in the form of signed-off entries in candidates' logbooks. The latter requirement led to offering briefings to potential 'witnesses', i.e. SFX Supervisors and Senior Technicians, on the value of their comments and the VARCS[17] qualities it should embody.

21. At the beginning of the process, the starting materials were:

    21.1. The Course Programme, which had evolved organically over the years that it had been delivered, without any systematic approach or audit trail of initial design, requirements for change and consequent changes made.

    21.2. The course presentations, which usually did not have speaking notes and none of which were related to a lesson plan.

[16] Available to HSQ-approved Qualifications Centres
[17] Valid; Authentic; Reliable; Current; Sufficient

22. The actual process of mapping the existing course design and materials to the NOS was conducted with the simple aim of ensuring that as much as could reasonably be achieved within a time-limited training and assessment course, with the remainder being clearly identified so that the candidate and their supervisor would know what would be required to be observed and signed-off in the workplace. Mapping then became an iterative process of considering the course materials available for each of the assessment criteria in the qualification, what was already covered in the theory exam and on the practical day, what could be included in a redesigned course and assessment and what could not.

23. This exercise showed where they had the requirements for the qualification well covered and where the Unit/Element became the Training/Learning Objective for new lesson plans and training material.

THE MAXAM DEUTSCHLAND EXPERIENCE

24. Our idea here was to map the requirements of the certificates of competence required by people involved in the manufacture of mini-boosters. Because the certificates of competence are absolutely dependent on the individual having passed an approved course and maintaining their currency by attending annual updates within the company and 5-yearly refresher courses, it was clear that mapping the content of the approved courses would achieve our aim.

25. The critical understanding in this process was that a well-designed course will take as its basis the knowledge and skills that the student is expected to be able to demonstrate at the end of the course, i.e. the outcomes. These are often listed or articulated in some detail as 'Training Objectives' or 'Learning Objectives'. Now, each of the occupational standards is written as a set of performance and knowledge criteria which are the outcomes of training and experience that an individual is expected to be able to demonstrate to be deemed competent against that Standard. The content of NOS 4.13 – Separate recoverable materials and waste produced by the explosive process - is shown here by way of example:

Unit 4.13 Separate recoverable materials and waste produced by the explosive process

Contexts

- Explosive environments: low negative consequence; high negative consequence
- Waste: explosive substances and/or articles; materials contaminated with explosives

Performance Criteria	Knowledge Requirements
You need to:	You need to know and understand:
a work safely at all times, complying with health and safety, environmental and other relevant regulations, legislation and guidelines	i the health, safety and environmental and other statutory legislation, regulations and safe working practices and procedures governing explosives, and their implications for your area of work
b confirm that you have the correct procedures concerning operational requirements for the process	ii the relevance of personal protective equipment (PPE)
c ensure that processed, part processed, excess and recoverable materials are separated and removed at the correct stages in the process, and are identified accordingly	iii work area hazards
d ensure that any spillages and contamination are cleaned up promptly, in accordance with your organisation's procedures	iv the actions to be taken in response to an unplanned event
e ensure that the recoverable materials and waste are dealt with, according to your organisation's procedures	v the nature of the recoverable materials and waste
f ensure that materials and waste are handled in ways that prevent them from being damaged, spilled or contaminated	vi how to segregate different kinds of recoverable materials and waste, and why it is necessary to do so
g report any problems beyond your level of authority to the appropriate person	vii the requirements for packing, storing and transporting recoverable materials and waste
h complete correctly the required documentation	viii the requirements of the relevant standard operating procedure (SOP)
	ix the importance of the procedures for dealing with spillages and contamination
	x the potential impact of your actions on the environment
	xi reporting lines
	xii the documentation requirements

26. In order to map the course content against the Standards, we simply took each of the Standards as a detailed learning objective and considered:

    26.1. Does the course include the subject of the Standard?

    26.2. Do the relevant lessons include all of the performance and knowledge criteria relevant to the Standard?

    26.3. Is the individual required to demonstrate their ability in each of the elements?

27. The next stage of mapping was to ask these questions of the Standards against each of the courses required by people involved in the production of mini-boosters. It was important not to

consider this in terms of the role profiles, considering only the course content. This distinction ensured that we did not stray into trying to 'make things fit'. It was important that we had a clear idea of:

27.1. The Role Profile, i.e. what we believed the individual is required to be able to do

27.2. The Statutory Courses required, i.e. what the State requires individuals to be taught

28. We could then compare the two lists of Standards to identify any gaps. The curricula of the SGH and SGL courses are outlined here:

28.1. Curriculum SGH (5 day course):

1. Legal foundations
    - German law of explosives (regulation relating to explosive material)
    - Regulation about Occupational Safety and Health
    - Regulation about Immission and Environmental Protection:
    - Regulation for the transportation of dangers goods (ADR)
    - Administrative offense and criminal law

2. General definitions in the explosive area
    - History of the explosives
    - Definition in the explosives area
    - Impact of explosives material
    - Test methods for explosives

3. Chemical and physical properties of explosives material

4. Structure, characteristics, Function and disposal of
    - Igniter and detonator
    - Explosives material, detonating cord
    - Propellant charge

5. Composition/composing of objects with explosives
    - Cartridge ammunition
    - Rockets with solid propellants
    - Parts and components of explosives

6. Analysis and evaluation of accidents and incidents

7. Practical demonstration of the function of different explosives

8. Examination

28.2. Curriculum SGL (4 day course):

1. Introduction to the subject

- General definitions in the explosive area and in the pyrotechnics
- Impact of explosives material and pyrotechnic articles and compositions
- Explanation of explosives materials and pyrotechnics which are dispatched

2. General regulations and rules
    - Special regulation for the transportation of explosives material and pyrotechnics
    - Tasks and responsibilities of the people who carried out the transportation process
    - Requirements of the explosives material and pyrotechnics for the transportation
    - Duties of the responsible people regarding to the safety and security

3. General properties of dangerous goods

4. Documentation concerning the transportation and storage of dangerous goods

5. Types of vehicles and transport, enclosures, equipment

6. Inscriptions, labeling and information of dangerous goods

7. Carrying out of transportation process

8. Activities after accidents and incidents in connection with transportation and storage

9. Examination

29. At the end of the process, we had a second spreadsheet showing …

Explosives National Occupational Standards	Course Content leading to:				
CLICK TO VIEW PERFORMANCE CRITERIA AND KNOWLEDGE REQUIREMENTS FOR EACH UNIT	Certificate in Storage and Transport	Certificate in Storage, Transport and Use (Testing)	Certificate in Storage, Transport and Manufacture	Certificate in Production	Certificate in Destruction of explosives
Test & Evaluation (trials)					
3.1 Establish the performance criteria for explosive substances and/or articles					
3.2 Determine the existence of a suitable trial or test procedure for explosive substances and/or articles					
3.3 Design a new trial procedure for explosive substances and/or articles					
3.4 Design a new test procedure for explosive substances and/or articles					
3.5 Adapt an existing trial procedure for explosive substances and/or articles					
3.6 Adapt an existing test procedure for explosive substances and/or articles					
3.7 Validate trial or test procedure for explosive substances and/or articles					
3.8 Plan the trial of explosive substances and/or articles					
3.9 Plan the test of explosive substances and/or articles					
3.10 Manage the trial of explosive substances and/or articles					
3.11 Manage the test of explosive substances and/or articles					
3.12 Carry out pre-trial or pre-test tasks relating to explosive substances and/or articles		X	X	X	X
3.13 Contribute to pre-trial or pre-test tasks relating to explosive substances and/or articles					
3.14 Carry out trials of explosive substances and/or articles					
3.15 Carry out tests of explosive substances and/or articles		X	X	X	X
3.16 Contribute to conducting a trial or test of explosive substances and/or articles					
3.17 Evaluate the results of trials of explosive substances and/or articles					
3.18 Evaluate the results of tests of explosive substances and/or articles		X	X	X	X
3.19 Carry out post-trial or post-test tasks relating to explosive substances and/or articles		X	X	X	X
3.20 Contribute to post-trial or post-test tasks relating to explosive substances and/or articles					
Manufacture					
4.1 Develop and update explosives standard operating procedure/s					
4.1.1 Draft explosives procedure/s					
4.1.2 Obtain approval for new or amended procedure/s					
4.2 Contribute to the validation and optimization of new or modified explosives processes and equipment					
4.2.1 Validate new or modified explosives processes and equipment					
4.2.2 Optimise new or modified explosives processes and equipment					
4.3 Resolve explosives operational problems		X	X	X	X
4.3.1 Identify explosives manufacturing problems		X	X	X	X
4.3.2 Implement and evaluate the chosen solution		X	X	X	X
4.4 Prepare the explosives process area and equipment		X	X	X	X
4.5 Move materials within the explosives process		X	X	X	X
4.6 Prepare explosives process materials		X	X	X	X
4.7 Supervise the preparation of explosives processing operation					
4.8 Monitor and control explosives processing		X	X	X	X
4.9 Supervise explosives processing					
4.10 Solve explosives process problems		X	X	X	X
4.10.1 Identify explosives processing problems		X	X	X	X
4.10.2 Implement and evaluate solutions		X	X	X	X
4.11 Shut down the explosives process		X	X	X	X
4.12 Supervise the shutdown of explosives processing					
4.13 Separate recoverable materials and waste produced by the explosives process		X	X	X	X
4.14 Contribute to explosives standard operating procedures					

CHAPTER 3 – DESIGNING A TRAINING COURSE

INTRODUCTION

1. This chapter is intended to provide you with a good idea of the principles of designing a training syllabus so that you can either:

   1.1. design a syllabus that you can request a training provider to deliver.

   1.2. Be an 'intelligent customer' when you request a training provider to design and deliver a training needs analysis and/or training syllabus and/or training course.

   1.3. As a training provider, deliver a training package that is based on publicly available Standards, using a systematic approach that is easily explained to, and understood by your client

2. Occupational standards can be used for many purposes, as shown in Figure 1, and in this section we will show how the Standards are the base requirements for a training syllabus.

Figure 6. Use of Standards for HR purposes (HSQ Ltd)

3. It seems self-evident that the requirement for a training syllabus is to fill knowledge and/or skills gaps for an individual and/or a business, perhaps for professional development or as part of a change programme. Either way, a systematic, structured approach based on the outcomes described as either performance- or knowledge- criteria in the occupational standards can provide a training syllabus that meets your requirements.

4. On the face of it, the process for designing a training course or syllabus is fairly simple. You need to set the requirements for the syllabus, determine the best way for those requirements to be met, develop the training and assessment methods and materials, and finally to package them into the syllabus. This outline process is captured neatly in what is recognised worldwide as a 'Systems Approach to Training'. At the highest level, a Systems Approach to Training is a 5-stage process of analysis, design, development, implementation and evaluation (though evaluation is a constant process that runs throughout the others). This model is often referred to as the ADDIE model and is captured in Figure 2:

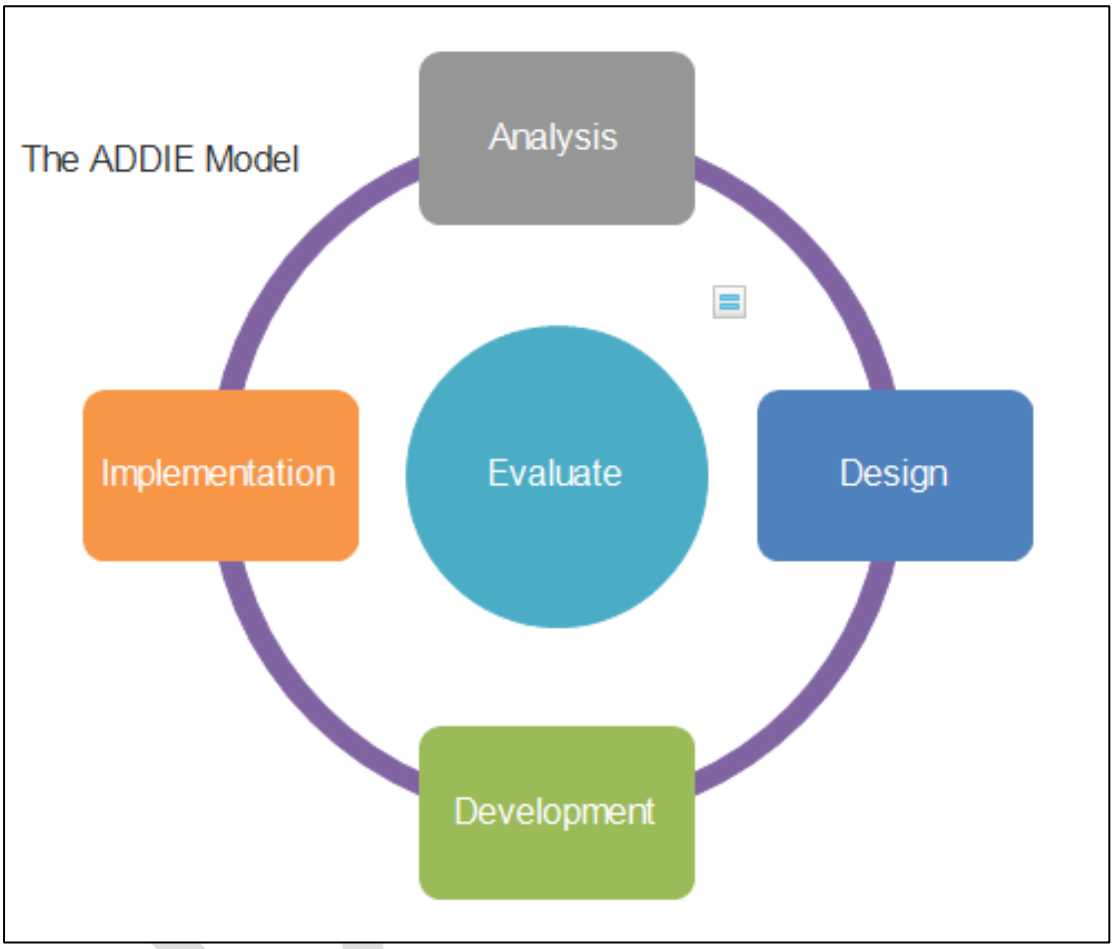


Figure 7. Systems Approach to Training model

5. An open-source example of a comprehensive Systems Approach to Training is provided in the US Marine Corps Systems Approach to Training Users' Guide[18]. This handbook is not intended to be a treatise on the implementation of a systems approach to training but will make use of the principles given in the USMC Guide in this way:

[18] http://www.marines.mil/Portals/59/Publications/NAVMC%201553.1_1.pdf

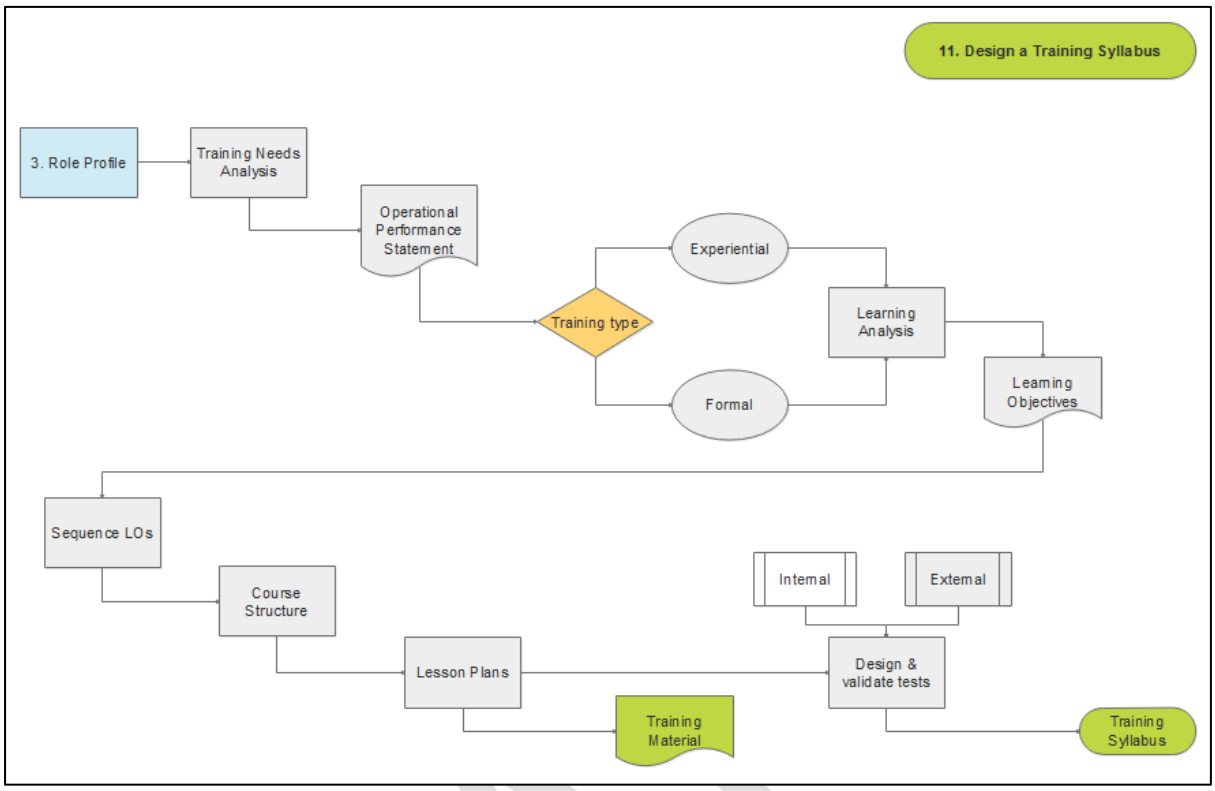


Figure 8. Designing a training syllabus

6. Implementation of the course design is the prerogative of the training provider and is not covered in this handbook. This chapter therefore provides some guidance in the principles of analysis, design, development and evaluation incorporating the use of occupational standards.

ANALYSIS PHASE

7. The analysis phase traditionally includes 'job analysis', 'training analysis' and 'determine the instructional setting' which we have called 'Role Profile', 'Training Needs Analysis' and 'Key Skills Analysis' respectively. For our purposes, the analysis phase aims to:

    7.1. Define the task list based on Subject Matter Expert (SME) input.

    7.2. Develop Individual Training Criteria (ITC) that identify the conditions, standards, and performance steps necessary for the successful completion of a task.

    7.3. Determine where the tasks will be instructed (formal school or experiential by so-called 'On-The-Job' (OTJ) training).

JOB ANALYSIS - ROLE PROFILE

8. In a systems approach to training the first activity would be to conduct a job analysis, the process of ascertaining job requirements for the design of training. It provides raw data about a job from a wide-ranging examination of the job. The end products of analysis are

usually the Operational Performance Statement (OPS) [also known in the USMC system as the Individual Training Criteria (ITC)] and Job Specification. A Job Specification is a detailed statement of the activities associated with a job and of the qualifications, experience and personal qualities needed to carry it out.

9. The OPS is a detailed statement of the tasks and sub-tasks required to be undertaken by an individual to achieve the operational or workplace performance. It is written in terms of Performance, Conditions and Standards. A task is a major part of job that can be produced, compiled, achieved and/or accomplished by itself. Performance 'defines what the operator or trainee has to do'. Conditions define the environment in which the performance has to be achieved and only aspects that impact on the performance are included. "Standards" in this context specify the criteria of successful achievement.

10. You will recognise the similarity between the Conditions and Performance criteria of the OPS and the Context, Performance and Knowledge sections of an Occupational Standard.

11. Many of the precepts of job analysis are used in the activity of 'role profiling' which is a methodology used to identify which Occupational Standards are relevant to the work that an individual does.

12. In one of its quarterly newsletters[19], the SAFEX International organisation includes an article by Denise Clarke that describes "the development of common role profiles so that training that will meet these common needs can be commissioned, developed and delivered". It goes on to say that "these common or generic role profiles have a single purpose, to design common training and qualifications. Working role profiles are specific to an organization or a group of individuals within an organization although there may well be some commonality across the industry". Usefully, the article explains the relationship between a role profile and a job description by defining them this way:

    12.1. "Job descriptions are detailed descriptions of job inputs, responsibilities, reporting lines and performance parameters;

    12.2. role profiles are summaries of a role, described in terms of its outcomes. They cover a number of jobs and they specify the competences required by role holders

    12.3. both job descriptions and role profiles provide an overview of the scope and key accountabilities associated with a job or role;

    12.4. both may list relevant training and qualifications.

    12.5. role profiles are sometimes described as blend of a job description and a person specification.

    12.6. Role profiles:

[19] SAFEX International Newsletter no 48, p11.

12.6.1. provide clarity on what is expected, particularly when mapped to NOS (which specify standards of performance);

12.6.2. facilitate job evaluation (because there is greater consistency amongst roles described by role profiles rather than lots of individual job descriptions);

12.6.3. facilitate career progression (because of the reduction of job descriptions, this means that there is a reduction in the number of job titles which in turn provides greater transparency of career opportunities)."

13. You will see in Chapter 4 how to create a role profile that is mapped to the Standards but the description given here should be sufficient to say that a well-constructed Role Profile is a perfect output from a job analysis for our purposes.

TRAINING NEEDS ANALYSIS

14. Having derived a role profile that is mapped against the Standards, it is now possible to determine what training is required to ensure that the needs of the individual and the business are fulfilled. Some of the training requirements might be met by gaining experience and learning in the workplace, so-called on-the-job training, while some will need to be conducted as formal training or education.

15. The USMC Guide describes what we are calling Training Needs Analysis as being performed to determine the job performance requisite or Individual Training Criteria (ITC) of each task performed on the job. These ITC include a task statement (ITS), conditions, standard, performance steps, administrative instructions and references:

15.1. Task. The task describes what the job holder must do.

15.2. Condition(s). The conditions set forth the real-world circumstances in which the tasks are to be performed. Conditions describe the equipment and resources needed to perform the task and the assistance, location, safety considerations, etc., that relate to performance of the task.

15.3. Standard(s). Standards provide the proficiency level expected when the task is performed. Standards can measure a product, a process, or a combination of both. Standards must reflect a description of how well the task must be performed. This standard can cite a technical manual or doctrinal reference (e.g., ...in accordance with DEFSTAN 00-88), or the standard can be defined in terms of completeness, time, and accuracy.

15.4. Performance Step(s). Performance steps specify the actions required to accomplish a task. Performance steps follow a logical progression.

15.5. Reference(s). References are doctrinal publications (e.g., technical manuals, field manuals, Organisational orders/instructions) that provide guidance in performing the task in accordance with the given conditions and standards. References cited should be current and readily available to the individual.

15.6. Administrative Instructions. Administrative instructions provide the instructor with special circumstances relating to the ITS, such as simulation requirements and safety or real world limitations, which may be a prerequisite to successful accomplishment of the ITS.

DETERMINE THE TRAINING TYPE

16. Determining the training type is important because it defines who is responsible for instructing and the level of proficiency the learner must achieve when conducting the task in an instructional environment. When determining the training type, the designer must consider two guiding factors – effectiveness and efficiency – to seek the best training programme within acceptable costs while achieving the learning requirement.

DESIGN PHASE

17. The aim of this phase is to simulate real-world work requirements within the necessarily constrained learning environment (OTJ training may have fewer constraints but it will rarely be unsupervised and therefore constrained in some way). The underlying premise is that the closer the learning environment is to the actual job, the more likely the learner is to transfer the knowledge and skills gained to the job.

18. The sub-phases in the design phase are:

18.1. Produce a target population description that will guide the formal school or unit in the preparation of instruction/training. For our purposes, we expect the training provider / designer to understand this from the Role Profiles derived earlier.

18.2. Learning Analysis. The learning analysis is used to describe what the learners will do during instruction, what they will be tested on, and what methods and media are likely to be most appropriate in order to maximise the potential for each learner to learn and transfer the skills and knowledge to the workplace. The output from this learning analysis will be the learning objectives, test items and the methods and media for both.

18.3. Sequence Learning Objectives. Effective sequencing of learning objectives will create the flow of instruction that should enable learners to make logical transitions from one topic or lesson to the next. Sequenced learning objectives lead to efficient instruction and provide a draft course structure.

DEVELOPMENT PHASE

19. This phase naturally builds on the outputs from the analysis and design phases. The aim of this phase in the Systems Approach to Training is for curse designers to produce course descriptive data, the programme of instruction and master lesson file. The sub-phases of the develop phase are:

19.1. Develop a Course Structure. The course structure is a detailed chronological document identifying the implementation plan for a course.

19.2. Develop Concept Cards. Concept cards identify the academic and administrative resources required to deliver lessons, evaluation and events.

19.3. Operational Risk Assessments. An Operational Risk Assessment will be conducted for each lesson or event taking place within a programme of instruction. The associated risk assessment tools will be incorporated in the master lesson file to inform users and regulators.

19.4. Develop Lesson Materials. The designer and training provider will need to draft lesson plans, design and procure training aids, instructor guides and any supplementary material that will be required to deliver lessons effectively and efficiently.

19.5. Construct Tests. This involves selecting and placing test items from the learning objectives on to the appropriate test. It includes developing and providing the grading criteria for each element of the course and also providing instructions for the learner and evaluation team.

19.6. Validate Instruction. The course and materials should be validated before implementation to determine the effectiveness prior to delivery.

19.7. Develop the Programme of Instruction. The programme of instruction is a detailed description of the course and provides a record of how the designer and/or training provider satisfies the training needs.

19.8. Assemble a Master Lesson File (MLF). The designer or training provider should have only ONE MLF for each course.

DEFINING LEARNING OUTCOMES – TRAINING OBJECTIVES

20. As mentioned earlier, the descriptions of the Conditions and Performance criteria of the OPS are paralleled by the Context, Performance and Knowledge sections of an Occupational Standard. This makes the design of a course much less difficult because the designer can choose a relevant occupational standard from which industry-accepted wording can be extracted to provide the content of the conditions and performance elements of the OPS for that particular competence.

21. Choosing the relevant occupational standard requires the designer to determine the level/grade of competency at which the learner is expected to perform. As we know, many of the explosive substances and articles occupational standards are written for one of the levels/grades of operator, supervisor or manager. Knowing this can therefore lead the course designer towards making use of an occupational standard that also provides a good proportion of the 'Standards' criteria for the OPS.

22. A Role Profile that is constructed using properly written occupational standards naturally gives a course designer the learning outcomes they need to be able to:

22.1. Determine the outcomes that can/should be taught on the course and those which are better suited to workplace or academic learning.

22.2. Determine the most appropriate methods of training and assessing a learner to achieve the desired outcomes, e.g. practical lessons in applying particular techniques that the learner will be expected to use in the workplace; theory lessons in the underlying legislation/regulations/organisational procedures for the activities the learner will undertake.

22.3. Sequence the learning outcomes into a syllabus so that a learner builds their knowledge, skills and understanding of acceptable behaviours and attitudes in their field of endeavour.

22.4. Draft the lesson plans to match the syllabus.

22.5. Write or obtain suitable training materials to support the training and assessment.

22.6. Determine the skillsets and number of instructors and assessors required to deliver the training.

22.7. Write the Assessment Strategy, Assessment Specification and assessment materials for the course.

THE EVENT HORIZON EXPERIENCE

23. After mapping the existing courses to NOS, it was time for the owner of the training requirement, BECTU, to work with Event Horizon to set down exactly what the expectations are for each grade.

24. The nature of work in this part of the explosives industry is that individuals move around a lot, working on location almost anywhere on the globe. Despite this constraint, Event Horizon did receive agreement that a three-tier qualifications framework should meet their requirement.

25. Event Horizon approached HSQ to determine the most appropriate way to deliver the framework – bespoke or recognised qualifications. BECTU's aspiration to enable their qualified members' credentials to have value in the wider industry and in the eyes of the authorities, plus deeper consideration of the need for each qualification to demonstrate the capability of the individual in the most efficient way, led to the conclusion that the industry-recognised qualifications fit the bill.

26. Event Horizon confirmed this conclusion with BECTU and pressed on with the development of their Qualifications Centre and the redesign of their training courses and the associated assessment strategies to deliver the knowledge requirements and some of the performance criteria for these qualifications:

26.1. Level 4 Diploma in the use of explosives in the entertainment industry - HSQ code: Q10-C2-003.

26.2. Level 3 Diploma in the use of explosives in the entertainment industry - HSQ code: Q10-D3-002.

26.3. Level 2 Certificate in the use of explosives in the entertainment industry - HSQ code: Q10-D4-001.

CHAPTER 4 – MAPPING A ROLE PROFILE AGAINST THE STANDARDS

1. In this chapter, we will give you a handrail to create Role Profiles for you or your staff. Such a role profile is important in pretty much every way that you might want to implement the occupational Standards because it is a simple document that ties the abstract Standards to the physical person.

2. The English language is quite sparse in words relating to jobs, roles, tasks and other work activities, hence the common interchangeability of the phrases 'job description' and 'role profile' and the possibilities for confusion. For the purposes of this book, we will understand the difference between a job description and a role profile in this context:

   2.1. A **job description** will include all the tasks that a person is expected to do in the course of their lawful duties; it can also include a description or list of the personal attributes expected.

   2.2. A **Role Profile** in this context is a detailed list of the activities that the incumbent is expected to be able to perform, that conform to the performance and knowledge criteria for each relevant occupational standard.

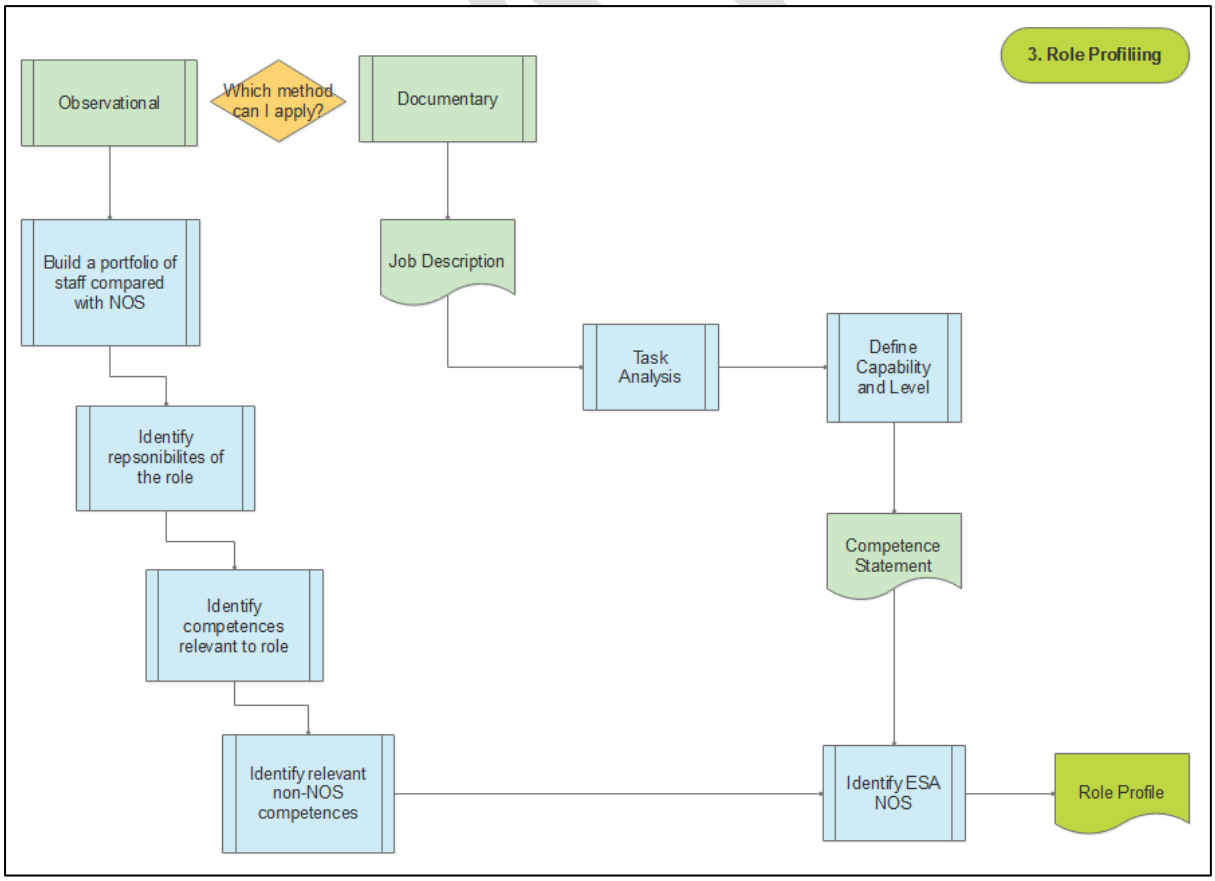


Figure 9. Role Profiling Process

3. As you will see from the examples in this chapter, it is entirely possible, maybe even inevitable in a small/medium enterprise where staff are increasingly likely to be multi-skilled, that a job description will incorporate a number of different roles and therefore require a suite of role profiles.

4. There are two possible approaches and the complete process is pictured in the flow chart at Figure 1.

5. Bottom-up, documentary approach:

    5.1. Design a new job description or take the existing job description

    5.2. Break it down into activities and personal attributes

    5.3. Ignore the personal attributes

    5.4. Compare each line of the activities list against a list of occupational standards

    5.5. When you find a match, open up the detailed occupational standard and decide whether the job holder is required to conduct <u>all</u> of the performance criteria and to know and understand <u>all</u> of the knowledge criteria listed.

        5.5.1. YES – this Standard is relevant and can be annotated as such

        5.5.2. NO – this standard is not relevant and either the job description needs to be modified to meet the criteria or the search for a proper match resumed.

6. Top-down, observational approach:

    6.1. Select a worker to observe

    6.2. Arrange to visit them at their place of work

    6.3. Interview to allow them to explain all the things that they do:

        6.3.1. Tick off Standards as the interview progresses
        6.3.2. Clarify points against the Standards

    6.4. Observe them at work over a couple of visits, to ensure that you have captured all of their working activities, capturing Standards as you see them being used

    6.5. Ask their supervisor and/or manager for an explanation of what they expect from the worker, capturing Standards as they come to light.

GJR/UC methodology

7. As with the other industry partners in the EUExImp project, before GJR could embark on the role profiling exercise, they first needed to understand the Standards and how they apply to qualifications and their workforce.

8. To understand the standards, they worked through them one by one, relating it to their own needs, using a tabular approach:

Responsibility 1	**Competences relevant** Mandatory	Key **role**	**Performance** Criteria	Knowledge **Requirements**
	Optional			

Execute the manufacturing processes	**Competences relevant** Mandatory Prepare explosives process area and equipment Move materials within the explosives process Monitor and control explosives processing Shut down explosives process	**Key Role** 4	**Performance Criteria** Work safely at all times, complying with health and safety, environmental and other relevant regulations, legislation and guidelines Ensure that you have the required authorisation to proceed ...	**Knowledge Requirements** The health, safety and environmental and other statutory legislation, regulations and safe working practices and procedures governing explosives, and their implications for your area of work ...
	Optional Prepare the explosives process materials Work effectively in a team involving explosive substances and/or articles	4 13	...	...

9. For Key Role 4 - Manufacture, the Portuguese partners identified three role titles (Manufacturing Engineering, Manufacturing Supervisor and Manufacturing Operator). They then translated and analysed the responsibilities and competences relevant to the role for each of them.

Mandatory	Optional	Key role
• 4.4 • 4.5 • 4.8 • 4.11	• 4.6 • 4.13 • 4.14 • 5.4 • 5.9 • 5.15	• 4 - MANUFACTURE OF EXPLOSIVE SUBSTANCES AND ARTICLES • 5 - MAINTENANCE

10. The responsibilities and competences relevant to each role were compared against the available staff description of the functions of the workers at the company. This exercise was performed using the tasks described in the procedure manual and organisation chart layout of the company for the manufacturing of black powder for quarries.

11. The project partner's previous experience in EUExcert projects was of great benefit to the industry partner right from the start. Role profiling had been a topic of discussion and Coimbra University had been one of the EUExcert partners that made a small pilot study of rolling out a qualification in the last project.

12. The Portuguese team had taken careful notes of the role profiling process and developed a system of role profiling which mapped their expectations of production staff not only to the Standards but also to company manuals, to ensure that they had covered as many aspects as possible. This detail proved very useful in the next stage, when they identified the qualifications that would be most relevant for the company and those staff that would be assessed within the scope of the project.

Explosives National Occupational Standards	JOB TITLE					
CLICK TO VIEW PERFORMANCE CRITERIA AND KNOWLEDGE REQUIREMENTS FOR EACH UNIT	ESA Manufacturing Engineer	ESA Manufacturing Supervisor	ESA Manufacturing Operator	GJR Document		
Manufacture						
4.1 Develop and update explosives standard operating procedure/s	E					
4.1.1 Draft explosives procedure/s						
4.1.2 Obtain approval for new or amended procedure/s						
4.2 Contribute to the validation and optimization of new or modified explosives	D	D				
4.2.1 Validate new or modified explosives processes and equipment						
4.2.2 Optimise new or modified explosives processes and equipment						
4.3 Resolve explosives operational problems	E					
4.3.1 Identify explosives manufacturing problems						
4.3.2 Implement and evaluate the chosen solution						
4.4 Prepare the explosives process area and equipment			E	OP	2.1-2.3	3.1-3.4
4.5 Move materials within the explosives process			E	OP	2.1-2.3	3.1-3.4
4.6 Prepare explosives process materials			E	OP	2.1-2.3	3.1-3.4
4.7 Supervise the preparation of explosives processing operation	E	E		SU	2.1-2.3	3.1-3.4
4.8 Monitor and control explosives processing			E	OP	2.1-2.3	3.1-3.4
4.9 Supervise explosives processing		E		SU	2.1-2.3	3.1-3.4
4.10 Solve explosives process problems		E				
4.10.1 Identify explosives processing problems						
4.10.2 Implement and evaluate solutions						
4.11 Shut down the explosives process	E	E	E	EN/SU/OP	2.1-2.3	3.1-3.4
4.12 Supervise the shutdown of explosives processing	E	E		EN/SU	2.1-2.3	3.1-3.4
4.13 Separate recoverable materials and waste produced by the explosives process			E	OP		
4.14 Contribute to explosives standard operating procedures		E	D			
Maintenance						
5.1 Plan the maintenance programme for explosive substances and/or articles						
5.2 Manage the maintenance programme for explosive substances and/or articles						
5.3 Manage the maintenance plan for explosive substances and/or articles						
5.4 Implement the inspection of explosive substances and/or articles			D	SU	2.4	3.1-3.4 e 3.5
5.5 Implement the adjustment of explosive substances and/or articles				OP	2.1-2.3	3.1-3.4
5.6 Implement the complex removal of explosive substances and/or articles						
5.7 Implement the routine removal of explosive substances and/or articles				SU	2.1-2.3 e 2.4	3.1-3.4

13. Combining their new understanding with the role profiling methodology set out in the Step-by-Step Guide, they created this table that maps all the functions that each of the three roles

against the Standards, followed by a Role Profile for each:

Role title:		
ESA Manufacturing Engineer	**ESA Manufacturing - Supervisor**	**ESA Manufacturing - Operator**

Role purpose:		
To plan and manage the manufacture of ESA safely, efficiently and in an environmentally sound manner using appropriate techniques which are efficient, effective and timely and in compliance with all relevant legal and other requirements. Consult Technical Authorities as appropriate.	To supervise the manufacture of ESA safely, efficiently and in an environmentally sound manner using appropriate techniques and to contribute to their efficiency, effectiveness and timeliness and in compliance with the organisation's procedures.	To manufacture ESA safely, efficiently and in an environmentally sound manner using appropriate equipment, plant, processes, procedures and techniques in compliance with the organisation's procedures.

Responsibilities of this role:		
Design and implement a robust Safe Statement Of Work, which identifies Hazards, mitigates risks, predicts possible outcomes including unplanned events,	Implement a robust Safe Statement Of Work, which identifies Hazards, mitigates risks, predicts possible outcomes including unplanned events, and provides appropriate emergency procedures.	To comply with the Safe Statement Of Work and your organisation's policies, procedures and practices.
and provides appropriate emergency procedures.		
Comply with your organisation's policies, procedures and practices.	Comply with your organisation's current policies, procedures and practices.	Perform pre- and post-use checks to ensure facilities, plant and equipment are serviceable for the task; to maintain facility as

Voglers Eesti OÜ Experience

14. The roles identified for this part of the project were:

    14.1. Explosives Safety Manager

    14.2. Explosives Safety Supervisor

    14.3. Blasting Master

    14.4. Transport supervisor

    14.5. Storage supervisor

    14.6. Mixing supervisor

    14.7. Blaster

    14.8. Blasting assistant

    14.9. Mixing operator

    14.10. Plant operator

15. The company invested some considerable time and effort in this role profiling activity, bringing in the Managing Director (also Explosives Safety Manager, with ultimate responsibility in Estonian Law) and two explosives safety supervisors, one of whom is also the company's Blasting Master. As is often the case, working systematically through the various roles helped the company to understand how the Standards can be used to see which members of staff undertake which tasks. It also aided the understanding the subtle differences between role profiles in this context and job descriptions, which are descriptions of all the activities that the job incumbent undertakes and therefore might include a number of different role profiles.

Explosives National Occupational Standards						
CLICK TO VIEW PERFORMANCE CRITERIA AND KNOWLEDGE REQUIREMENTS FOR EACH UNIT	EXPLOSIVES SAFETY MANAGER	EXPLOSIVES SAFETY SUPERVISOR	BLASTING SUPERVISOR	MIXING SUPERVISOR	STORAGE SUPERVISOR	TRANSPORT SUPERVISOR
Safety Management						
2.1 Formulate national policy for explosives substances and articles						
2.2 Determine the classification of explosive substances and/or articles						
2.2A Make recommendations for the classification of explosive substances and/or articles						
2.3 Review the factors affecting the safety of specific explosive substances and/or articles	X					
2.3A Make recommendations on the factors affecting the safety of specific explosive substances and/or articles		X				
2.4 Analyse the acceptability of safety control measures for specific explosive substances and/or articles	X					
2.4A Review safety control measures for specific explosive substances and/or articles		X				
2.5 Review an organisation's safety management system for explosives	X					
2.5A Assess an explosives safety management system		X				
2.6 Develop the organisational safety policy and/or strategy for explosives	X	E				
2.7 Implement the organisational safety policy and/or strategy for explosives	X	X				
2.8 Analyse and identify aggregated hazards and risks for explosives	X	X				
2.8A Assess the suitability of explosives facilities	X	X				
2.9 Determine and implement aggregated risk control measures for explosives	O	X				
2.9A Implement risk control measures for explosive substances and articles safety		E				
2.10 Develop and implement assurance systems for explosives safety	X					
2.10A Carry out assurance audit of systems for explosives safety		X				
2.11 Develop emergency response systems and procedures for explosives safety	X	X				
2.12 Investigate explosives-related safety incidents	X	T				
2.12A Contribute to the investigation of explosives safety incidents		E				
2.13 Assess explosives licence applications						
2.14 Prepare and submit an explosives licence application	X					
Test & Evaluation (trials)						
3.1 Establish the performance criteria for explosive substances and/or articles						
3.2 Determine the existence of a suitable trial or test procedure for explosive substances and/or articles						
3.3 Design a new trial procedure for explosive substances and/or articles						
3.4 Design a new test procedure for explosive substances and/or articles						
3.5 Adapt an existing trial procedure for explosive substances and/or articles						
3.6 Adapt an existing test procedure for explosive substances and/or articles						
3.7 Validate trial or test procedure for explosive substances and/or articles						
3.8 Plan the trial of explosive substances and/or articles						
3.9 Plan the test of explosive substances and/or articles						
3.10 Manage the trial of explosive substances and/or articles						
3.11 Manage the test of explosive substances and/or articles						
3.12 Carry out pre-trial or pre-test tasks relating to explosive substances and/or articles						
3.13 Contribute to pre-trial or pre-test tasks relating to explosive substances and/or articles					X	X
3.14 Carry out trials of explosive substances and/or articles						
3.15 Carry out tests of explosive substances and/or articles						
3.16 Contribute to conducting a trial or test of explosive substances and/or articles					X	X

16. An example role profile is at Appendix 1.

Considering the knowledge and performance requirements.

17. There is a tendency to want to include every occupational standard that an operator does in a supervisor in the same key role and likewise for a manager's role to include everything that a supervisor is expected to do. The reality of life is that while a supervisor needs to understand everything that their operators do and a manager must understand the job and roles of a supervisor, they do not necessarily need to be able to perform those duties themselves. That said, the manager and supervisor certainly do need to be able to recognise when an activity or process is being done incorrectly.

18. When considering any single occupational standard for inclusion in a role profile, you need to consider very carefully whether the person you are creating the role profile for really has to be able to perform all of the activities in the performance criteria and to know and understand all of the knowledge criteria. Remember that the occupational standard is not necessarily as simple as the one-line descriptor appears. You can see an example of a Role Profile at Appendix 1.

19. If we take an example from manufacturing, Key Role 4, Standard 4.7 – Supervise the Preparation of the Explosives Processing Operation:

20. It seems clear from the descriptor that this is a standard that applies to a supervisor, however there might be a temptation to include this in the role profile of an experienced operator in the company because the writer knows the individual concerned very well. Don't forget that while the role profile can describe what is expected of the present incumbent, it should firstly be a description of what anyone who is to undertake that role should be able to know and do. As such, it could be argued that the manager and operator are not required to fulfil all of these criteria but only the following:

20.1. Operator:

20.1.1. Knowledge:

i the health, safety and environmental and other statutory legislation, regulations and safe working practices and procedures governing explosives, and their implications for your area of work

ii the relevance of personal protective equipment (PPE)

iii the nature, characteristics, hazards and risks of the explosive substance and/or article

iv work area hazards

Unit 4.7 Supervise the preparation of the explosives processing operation

Contexts

- Explosive environment: low negative consequence; high negative consequence
- Tasks: single operations; multiple operations

Performance Criteria		Knowledge Requirements	
You need to:		You need to know and understand:	
a	work safely at all times, complying with health and safety, environmental and other relevant regulations, legislation and guidelines	i	the health, safety and environmental and other statutory legislation, regulations and safe working practices and procedures governing explosives, and their implications for your area of work
b	confirm that the correct operating instructions have been issued	ii	the relevance of personal protective equipment (PPE)
c	obtain the necessary authorisation to proceed	iii	the nature, characteristics, hazards and risks of the explosive substance and/or article
d	organise your own work, and that of others, effectively	iv	work area hazards
e	ensure that the specified operating parameters have been maintained	v	the actions to be taken in response to an unplanned event
f	confirm that the area and equipment to be used is in a safe and functional condition	vi	what constitutes an abnormal event
g	confirm that the materials to be used are of the correct identity, quality and quantity	vii	the interaction between the materials and the equipment being used
h	report any problems, beyond your authority, to the appropriate person	viii	the compatibility mixing rules
i	complete correctly the required documentation	ix	how to interpret and check operating parameters
		x	the functions and uses of the different types of equipment in the operation
		xi	the importance of confirming the status of equipment
		xii	the importance of checking the materials against specification
		xiii	how to deal with deviations
		xiv	the importance of communication
		xv	the limits of your responsibility
		xvi	the competences of team members
		xvii	how to handle equipment safely, in ways that protect yourself and others from risk
		xviii	problem solving techniques
		xix	reporting lines
		xx	the documentation requirements

v the actions to be taken in response to an unplanned event

vi what constitutes an abnormal event

vii the interaction between the materials and the equipment being used

viii the compatibility mixing rules

ix how to interpret and check operating parameters

x the functions and uses of the different types of equipment in the operation

xi the importance of confirming the status of equipment

xii the importance of checking the materials against specification

xiii how to deal with deviations

xiv the importance of communication

xv the limits of your responsibility

xvi **NOT APPLICABLE**

xvii how to handle equipment safely, in ways that protect yourself and others from risk

xviii **NOT APPLICABLE**

xix reporting lines

xx **NOT APPLICABLE**

20.1.2. Performance;

a work safely at all times, complying with health and safety, environmental and other relevant regulations, legislation and guidelines

b confirm that the correct operating instructions have been issued

c obtain the necessary authorisation to proceed

e ensure that the specified operating parameters have been maintained

f confirm that the area and equipment to be used is in a safe and functional condition

h report any problems, beyond your authority, to the appropriate person

i complete correctly the required documentation

20.2. Manager:

20.2.1. Knowledge:

i the health, safety and environmental and other statutory legislation, regulations and safe working practices and procedures governing explosives, and their implications for your area of work

ii the relevance of personal protective equipment (PPE)

iii the nature, characteristics, hazards and risks of the explosive substance and/or article

iv work area hazards

v the actions to be taken in response to an unplanned event

vi what constitutes an abnormal event

vii the interaction between the materials and the equipment being used

viii the compatibility mixing rules

ix how to interpret and check operating parameters

x the functions and uses of the different types of equipment in the operation

xi the importance of confirming the status of equipment

xii the importance of checking the materials against specification

xiii how to deal with deviations

xiv the importance of communication

xv the limits of your responsibility

xvi the competences of team members

xvii how to handle equipment safely, in ways that protect yourself and others from risk

xviii problem solving techniques

xix reporting lines

xx the documentation requirements

20.2.2. Performance:

a work safely at all times, complying with health and safety, environmental and other relevant regulations, legislation and guidelines

b confirm that the correct operating instructions have been issued

c obtain the necessary authorisation to proceed

d organise your own work. and that of others, effectively

e **NOT APPLICABLE**

f **NOT APPLICABLE**

g **NOT APPLICABLE**

h report any problems, beyond your authority, to the appropriate person

i complete correctly the required documentation

21. There are only a few elements missing from the whole list in each case, but the important thing is that unless the individual is required to fulfil all of the criteria, then the Standard cannot apply to them.

Appendices:

1. Example Role Profile

APPENDIX 1 – Example Role Profile

Role title:	**ESA Test, Trials and Evaluation Supervisor**

Role purpose:
To plan and supervise the Test, Trial and Evaluation of ESA safely, efficiently and in an environmentally sound manner using appropriate techniques which are efficient, effective and timely and in compliance with all relevant legal and other requirements. Consult Technical Authorities as appropriate.

Responsibilities of this role:
Design and implement a robust Safe Statement Of Work, which identifies Hazards, mitigates risks, predicts possible outcomes including unplanned events, and provides appropriate emergency procedures.
Comply with your organisation's policies, procedures and practices.
Ensure facilities (including plant and equipment) are fit for the TT&E task; maintenance regime is up-to-date and that they are certified to carry out the planned task. Report discrepancies and contribute to improvement.
Confirm the type, quantity, condition and requirement for testing, trial and evaluation of ESA. Determine, adapt or design equipment equipment/plant, process, procedure or technique (where appropriate).
Define logistics, hand-over, approval, receipt and despatch processes. Record TT&E outcome and CFFEH is certified as appropriate.
Produce a robust plan to effectively and efficiently carry out the TT&E tasks, which should ensure that legal and performance and stakeholder requirements are met (SHE, Quality, scheduling)
Communicate the plan and de-conflict where necessary.
Monitor the plan and adjust as appropriate within level of responsibility.
Review performance, identify and recommend or initiate improvements.
Ensure self and others are competent with suitable; training, knowledge, experience, behaviour and ability.
Ensure resources (people, time) available to complete, safely and successfully the disposal task.

Competences relevant to this role:	**ESA NOS Reference**
Mandatory	
Carry out assurance audit of systems for explosives safety	2.10A
Establish the performance criteria for explosive substances and/or articles	3.1
Determine the existence of a suitable trial or test procedure for explosive substances and/or articles	3.2
Plan the test of explosive substances and/or articles	3.9
Carry out pre-trial or pre-test tasks relating to explosive substances and/or articles	3.12
Carry out tests of explosive substances and/or articles	3.15
Carry out post-trial or post-test tasks relating to explosive substances and/or articles	3.19
Determine the existence of a suitable explosive substances and/or articles disposal procedure	11.2
Supervise explosives safety	13.18

Work effectively in a team involving explosive substances and/or articles	13.1
Pack or re-pack explosive substances and/or articles	13.12
Unpack explosive substances and/or articles	13.13
Optional	
Design new test procedure for explosive substances and/or articles	3.4
Adapt existing test procedure for explosive substances and/or articles	3.6
Manage the test of explosive substances and/or articles	3.11
Evaluate the results of tests of explosive substances and/or articles	3.18
Provide explosives technical or safety advice and/or guidance to others	13.9
Prepare and care for equipment in an explosives environment	13.15
Certify as Free From Explosive Hazard	13.17

Qualifications relevant to this role	**Essential/ Desirable**
Level 3 N/SVQ in Test and Evaluation Supervision of Explosive Substances and/or Articles (03-002-03)	D
Swansea University BEng(Hons) in Test Range Engineering	D
3-day intro to Systems Engineering short course, Cranfield University Shrivenham	D
NEBOSH General Certificate or equivalent	E

Training relevant to this role	**Essential/ Desirable**	**Source**
Explosives Substances and Articles foundation	E	EITN members
Online WOME introduction	D	Cranfield Delft University Et al
Risk Assessment and Risk Management e.g. FMECA, Fault Tree Analysis, HSG65, HSG268…		
Quality management and continuous improvement		
Process engineering		
Safety process leadership		
Cranfield 'Risk Assessments for Explosives'	D	Cranfield
Trained to standard of Level 2 T&E	E	
Level 2 Storage and movement	E	
Level 3 Storage and movement	D	
Environmental….POEMS/14001	D	
Foundation Certificate in Environmental Management	D	

Licence required for this role?	**NO**

Date:

CHAPTER 5 – INTEGRATING OCCUPATIONAL STANDARDS WITH EXISTING HUMAN RESOURCE MANAGEMENT SYSTEM

Figure 10. Use of Standards for HR Purposes (HSQ Ltd)

1. It can be argued that one of the roles of a Human Resources department is to ensure that the workforce of the organisation is demonstrably competent. As such, it will hold records of qualifications and competencies of members of staff. It may also have a responsibility for the organisation's training programmes and setting the competence policy and maintaining the organisation's competence framework.

2. In SAFEX Newsletter 44[20], Denise Clarke explains that 'Standards lie at the heart of all human resources (HR) processes. There are in fact many possible uses of standards in a range of HR processes as described by the diagram above.

3. By describing what an organization expects of its staff, standards can be used for many different purposes such as:

    3.1. recruitment and selection – e.g. job adverts, interview aide memoires, job descriptions, role profiles;

    3.2. appraisal – standards amplify an organization's expectations so appraisals can be more objective & evidence-based;

[20] SAFEX Newsletter No.44, 1st Qtr. 2013

3.3. training needs analysis – through self-assessment, development discussions, 360° feedback, Personal Development Plans, audits of team strengths and development needs;

3.4. training syllabus design – based on the requirements of the standards;

3.5. career management – e.g. career maps, career planning tools;

3.6. succession planning – systematic approaches to talent management based on an organization's analysis of development needs;

3.7. demonstration of a commitment to known quality standards, investment in people and the ability to comply with legislation, regulation and codes of practice;

3.8. … and many more specific applications within each part of the HR cycle.'

WHY DEMONSTRATE COMPETENCE?

4. Often there is an external driver to demonstrate competence – regulation and accreditation come easily to mind. The UK's Health & Safety Executive has published guidance for the implementation of Explosives Regulations 2014[21], which states that 'there are ten general principles underpinning the safety provisions of ER2014' and it is important to note the first of these principles is that "People undertaking explosives operations should be competent to carry out their particular roles." Section 5.2.1 of the ISO 17025[22] technical standard requires that "The laboratory management shall ensure the competence of all who operate specific equipment, perform tests and/or calibrations, evaluate results, and sign test reports and calibration certificates."

5. Internally, the organisation should know what skills and knowledge it has in-house, which it can bring to bear in delivering its goods and services. Knowing what competences are available can aid planning of current wok, bids for future work and identify gaps that might be usefully filled for planned or aspirational projects.

6. Safety is both an external and internal driver when we talk about explosives.

COMPETENCE FRAMEWORKS

7. Mind Tools[23] is a training provider, established in 1996, that provides training in individual and corporate learning and development, including competence management. The individuals come from many different levels within organizations – ranging from senior executives and business owners to young professionals and career-starters. Many global organizations also use their

[21] http://www.hse.gov.uk/pubns/books/l150.htm - **Explosives Regulations 2014 - Guidance on Regulations – Safety provisions**

[22] ISO/IEC 17025:2005 - **General requirements for the competence of testing and calibration laboratories -** https://www.iso.org/standard/39883.html

[23] www.mindtools.com

material to increase productivity, improve management and leadership skills, and support organizational development initiatives. In their online literature, Mind Tools offers a useful description of what a competency framework is, and how it might be implemented:

7.1. "A competency framework defines the knowledge, skills, and attributes needed for people within an organization. Each individual role will have its own set of competencies needed to perform the job effectively. To develop this framework, you need to have an in-depth understanding of the roles within your business. To do this, you can take a few different approaches:

7.1.1. Use a pre-set list of common, standard competencies, and then customize it to the specific needs of your organization.

7.1.2. Use outside consultants to develop the framework for you.

7.1.3. Create a general organizational framework, and use it as the basis for other frameworks as needed.

7.2. Developing a competency framework can take considerable effort. To make sure the framework is actually used as needed, it's important to make it relevant to the people who'll be using it – and so they can take ownership of it.

7.3. The following three principles are critical when designing a competency framework:

7.3.1. Involve the people doing the work – These frameworks should not be developed solely by HR people, who don't always know what each job actually involves. Nor should they be left to managers, who don't always understand exactly what each member of their staff does every day. To understand a role fully, you have to go to the source – the person doing the job – as well as getting a variety of other inputs into what makes someone successful in that job.

7.3.2. Communicate – People tend to get nervous about performance issues. Let them know why you're developing the framework, how it will be created, and how you'll use it. The more you communicate in advance, the easier your implementation will be.

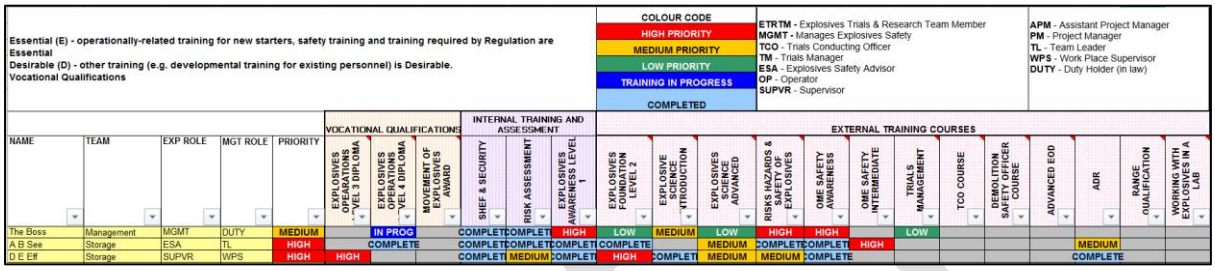
7.3.3. Use relevant competencies – Ensure that the competencies you include apply to all roles covered by the framework. If you include irrelevant competencies, people will probably have a hard time relating to the framework in general. For example, if you created a framework to cover the whole organization, then financial management would not be included unless every worker had to demonstrate that skill. However, a framework covering management roles would almost certainly involve the financial management competency."

HOW?

8. Many organisations manage their HR using off-the-shelf or bespoke databases or simple spreadsheets.

Spreadsheet Model

9. At its most basic level, a spreadsheet that depicts the competences required and held by the organisation's staff may suffice, so long as the information displayed is backed up with evidence for the various competences, as in this fictitious example:



Essential (E) - operationally-related training for new starters, safety training and training required by Regulation are Essential
Desirable (D) - other training (e.g. developmental training for existing personnel) is Desirable.
Vocational Qualifications

COLOUR CODE: HIGH PRIORITY; MEDIUM PRIORITY; LOW PRIORITY; TRAINING IN PROGRESS; COMPLETED

ETRTM - Explosives Trials & Research Team Member
MGMT - Manages Explosives Safety
TCO - Trials Conducting Officer
TM - Trials Manager
ESA - Explosives Safety Advisor
OP - Operator
SUPVR - Supervisor

APM - Assistant Project Manager
PM - Project Manager
TL - Team Leader
WPS - Work Place Supervisor
DUTY - Duty Holder (in law)

NAME	TEAM	EXP ROLE	MGT ROLE	PRIORITY	VOCATIONAL QUALIFICATIONS: EXPLOSIVES OPERATIONS - VEL 3 DIPLOMA	VOCATIONAL QUALIFICATIONS: EXPLOSIVES OPERATIONS - VEL 4 DIPLOMA	VOCATIONAL QUALIFICATIONS: MOVEMENT OF EXPLOSIVES AWARD	INTERNAL TRAINING AND ASSESSMENT: SHEF & SECURITY	INTERNAL TRAINING AND ASSESSMENT: RISK ASSESSMENT	INTERNAL TRAINING AND ASSESSMENT: EXPLOSIVES AWARENESS LEVEL 1	EXTERNAL TRAINING COURSES: EXPLOSIVES FOUNDATION LEVEL 2	EXPLOSIVE SCIENCE INTRODUCTION	EXPLOSIVES SCIENCE ADVANCED	RISKS HAZARDS & SAFETY OF EXPLOSIVES	OME SAFETY AWARENESS	OME SAFETY INTERMEDIATE	TRIALS MANAGEMENT	TCO COURSE	DEMOLITION SAFETY OFFICER COURSE	ADVANCED EOD	ADR	RANGE QUALIFICATION	WORKING WITH EXPLOSIVES IN A LAB
The Boss	Management	MGMT	DUTY	MEDIUM		IN PROG		COMPLET	COMPLET	HIGH	LOW	MEDIUM	LOW	HIGH	HIGH		LOW						
A B See	Storage	ESA	TL	HIGH		COMPLETE		COMPLET	COMPLET	COMPLET	COMPLETE		MEDIUM	COMPLET	COMPLET	HIGH						MEDIUM	
D E Eff	Storage	SUPVR	WPS	HIGH	HIGH			COMPLET	MEDIUM	COMPLET	HIGH	COMPLET	MEDIUM	MEDIUM	COMPLETE							COMPLETE	

Human Resources Management Databases - The Bofors Test Centre Experience

10. Using HSQ's Key Roles as a framework, and the process outlined in the Step-by-Step Guide to the Implementation of Occupational Standards, we created comprehensive role profile maps for an Assembly/disassembly Foreman and a Test Leader.

Explosives National Occupational Standards CLICK TO VIEW PERFORMANCE CRITERIA AND KNOWLEDGE REQUIREMENTS FOR EACH UNIT	TEST LEADER	EQF level	Competera requirement	Competera now	ASSEMBLY / DISASSEMBLY FOREMAN	EQF level	Competera requirment	Competera now
Test & Evaluation (trials)								
3.1 Establish the performance criteria for explosive substances and/or articles	X	3	2					
3.2 Determine the existence of a suitable trial or test procedure for explosive substances and/or articles	X	4	3					
3.3 Design a new trial procedure for explosive substances and/or articles	X	2	1					
3.4 Design a new test procedure for explosive substances and/or articles	X	3	2					
3.5 Adapt an existing trial procedure for explosive substances and/or articles	X	3	2					
3.6 Adapt an existing test procedure for explosive substances and/or articles	X	4	3					
3.7 Validate trial or test procedure for explosive substances and/or articles	X	2	1					
3.8 Plan the trial of explosive substances and/or articles	X	3	2					
3.9 Plan the test of explosive substances and/or articles	X	4	3					
3.10 Manage the trial of explosive substances and/or articles	X	4	3					
3.11 Manage the test of explosive substances and/or articles	X	4	3					
3.12 Carry out pre-trial or pre-test tasks relating to explosive substances and/or articles	X	4	3					
3.13 Contribute to pre-trial or pre-test tasks relating to explosive substances and/or articles					X	3	2	3
3.14 Carry out trials of explosive substances and/or articles	X	4	3					
3.15 Carry out tests of explosive substances and/or articles	X	4	3					
3.16 Contribute to conducting a trial or test of explosive substances and/or articles					X	3	2	3
3.17 Evaluate the results of trials of explosive substances and/or articles	X	3	2					
3.18 Evaluate the results of tests of explosive substances and/or articles	X	4	3					
3.19 Carry out post-trial or post-test tasks relating to explosive substances and/or articles	X	4	3					
3.20 Contribute to post-trial or post-test tasks relating to explosive substances and/or articles					X	3	2	2
Manufacture								
4.1 Develop and update explosives standard operating procedure/s								
4.1.1 Draft explosives procedure/s								
4.1.2 Obtain approval for new or amended procedure/s								
4.2 Contribute to the validation and optimization of new or modified explosives processes and equipment								
4.2.1 Validate new or modified explosives processes and equipment					X	2	1	
4.2.2 Optimise new or modified explosives processes and equipment					X	2	1	
4.3 Resolve explosives operational problems					X	3	2	
4.3.1 Identify explosives manufacturing problems					X	3	2	
4.3.2 Implement and evaluate the chosen solution					X	3	2	
4.4 Prepare the explosives process area and equipment					X	3	2	
4.5 Move materials within the explosives process					X	3	2	
4.6 Prepare explosives process materials					X	3	2	
4.7 Supervise the preparation of explosives processing operation					X	3	2	
4.8 Monitor and control explosives processing					X	3	2	

11. An important lesson that was learned very early in the role profiling exercise was that although a manager may have responsibility for a particular process, he or she does not necessarily need to have level 4 or higher competence in every element of the work; it is quite acceptable in the right context for a manager to have level 2 or 3 knowledge and practice of the matter in order to make informed decisions on problems and solutions presented by more expert workers.

12. Within the company's competence management system, they had previously defined a set of generic levels, accepting that particular areas of work might have specific descriptions of the level of competence to guide management and staff. The generic competence levels are:

12.1. Level 1. Basic Skills

Basic knowledge required to have a good knowledge in the field. In some theoretical subjects, the levels are comparable secondary qualifications. When Level 1 is a requirement of the position, this means that the subject itself is peripheral to the work practice (can be self-supported).

12.2. Level 2. Proficiency

Knowledge makes a mastery of the terms in a professional manner. Can directly perform satisfactory work in knowledge. (Can self-solve arising problems). In some theoretical subjects, the level is comparable to advanced courses at university. For practical knowledge level means that the individual has at least two years of experience in the field.

12.3. Level 3. Expert knowledge

Very deep and detailed knowledge of the field. (Can educate others). Can create instructions in the field. In some theoretical subjects, the level is comparable to a university degree or equivalent. For practical knowledge level means more years of experience in the field.

13. To help to gauge the levels of competence in terms of using the Standards, we compared the system's levels of competence against the EQF descriptors and the company decided that the closest alignment was:

Competence Management System Level	EQF Level
0 (some competences incomplete)	Not applicable
1 (skilled, work with support/supervision)	2 (operator)
2 (experienced, can supervise)	3 (supervisor)
3 (very skilled and experienced, can educate)	4 (manager)

14. Now that we had a framework, the next stage was to map the Standards in the Role Profiles that had been developed, which also gave us the chance to question the alignment we had agreed. There were a couple of instances where the alignment was not clear at first but looking closely at the elements of the Standard and considering the company's requirement in detail, the alignment rang true in all cases.

15. In the extract from the BTC working spreadsheet shown here you can see not only the alignment of Competera level to EQF level, but also examples of where the Assembly/Disassembly foreman's assessed Competera level exceeds the company's requirement. This is not seen as 'over-training' but as an advantage for the company.

1	Explosives National Occupational Standards									
2	CLICK TO VIEW PERFORMANCE CRITERIA AND KNOWLEDGE REQUIREMENTS FOR EACH UNIT	TEST LEADER	EQF level	Competera requirement	Competera now	ENVIRONMENTAL TESTING LABORATORY OPERATOR	ASSEMBLY / DISASSEMBLY FOREMAN	EQF level	Competera requirement	Competera now
3	Research, Design and Development									
71	3.13 Contribute to pre-trial or pre-test tasks relating to explosive substances and/or articles						X	3	2	3
72	3.14 Carry out trials of explosive substances and/or articles	X	4	3						
73	3.15 Carry out tests of explosive substances and/or articles	X	4	3						
74	3.16 Contribute to conducting a trial or test of explosive substances and/or articles						X	3	2	3
75	3.17 Evaluate the results of trials of explosive substances and/or articles	X	3	2						
76	3.18 Evaluate the results of tests of explosive substances and/or articles	X	4	3						
77	3.19 Carry out post-trial or post-test tasks relating to explosive substances and/or articles	X	4	3						
78	3.20 Contribute to post-trial or post-test tasks relating to explosive substances and/or articles						X	3	2	2

16. It was important that the live system, which is used to manage the company in real-time, would not be compromised during the project and the President's experiments with creating new fields and relationships. It was clear from the first visit that the only sensible way to adapt the system was to create a copy of the existing database that could be used solely for the purpose of development. Stefan Krol undertook this himself, with the support of his IT department. Once the developmental database had been created he could make changes and test their effects without damaging the live system.

17. In keeping with the general advice to obtain stakeholders' buy-in for any change programme, BTC ensured that the staff who would be 'assessed' were informed about the project, the company's intentions and the parts that they would play in the process. This openness is the norm in BTC, which made for a positive atmosphere during the 'mock assessments' which are covered shortly.

18. As well as the 'buy-in' of the staff, it is important that those charged with making judgements of staff competence understand the principles and practices of assessment against the Standards. In most organisations, this will be the line managers. From their perspective, assessing the competence of their staff against occupational standards should not be perceived as being an additional burden. Rather, it is highly likely that they already make assessments of their staff as part of 'normal business', whether that is to ensure the quality of the organisation's products or as part of annual appraisal for bonus awards or for personal development planning, etc. This was certainly the case with BTC, who recognised that the subject matter experts they employ to manage complex tests and trials were the people best placed to make the assessments of competence. On the other hand, GJR Pirotecnia e Esplosivos, because they were undertaking formal qualifications, decided that their managers needed to understand the principles of assessment against the Standards but their assessors would be third-parties, external to the company itself.

19. The assessment processes can be seen in greater detail in the Step-by-Step Guide to Implementing Occupational Standards in this handbook, but the basic principles are outlined here:

    19.1. Assessors should be suitably qualified and experienced, i.e.

        19.1.1. Knowledgeable and current in the subject
        19.1.2. Trained to assess people in the workplace
        19.1.3. Know the Standards
        19.1.4. Know the qualification (if applicable)

    19.2. Assessors will judge competence based on outcomes of working, i.e. evidence which might be in any of these forms:

    19.3. Observation – direct observation of the person undertaking the task

    19.4. Witness testimony – a written statement by someone who has seen the individual conducting the relevant activity, often a colleague, supervisor of other manager.

    19.5. Written questions – in an assessment for a qualification, these might be the best way of demonstrating knowledge. They are less likely to be used if the Standards are being

used purely as a management tool.

19.6. Verbal questions – This is a more likely method of assessing knowledge if the Standards are being used as a management tool.

19.7. Professional interview – a formal interview where the assessor spends some time with the individual, working through a structured interview, which is recorded in the form of notes.

19.8. Assignment/project – A manager might have set their member of staff a project as part of normal business and the final product is considered to be an excellent form of evidence of the individual's capability.

19.9. Test – in a scenario where the Standards are being used as a management tool, it is possible that a member of staff might be required to undergo a practical test of their competence before they are allowed to work without supervision. An example might be that a relatively experienced worker demonstrates all the elements of the process for making up a bespoke propellant charge for a forthcoming trial before working in a 'one-person risk' area.

19.10. Simulation – simulation differs from testing in that the individual is observed working in a completely safe environment, conducting all the activities they would do in the actual workplace. For qualifications, this type of evidence is generally only accepted in very high-hazard environments such as the nuclear industry and explosives ordnance disposal, where it would be an unacceptable risk to have an observer present at the point of working.

19.11. Product/process evidence – also known as 'naturally occurring evidence', these are the documents that the individual creates as part of their day-to-day work, such as issue vouchers, job sheets, work orders, etc.

19.12. Other – whatever the assessor and 'candidate' determine could be accepted as evidence of competence, that could be shared with others at a later date if required.

19.13. Whatever form the evidence takes, it must adhere to the same requirements i.e. it must be:

19.13.1. Valid: provide genuine evidence of achievement of the Standard or element of the standard;
19.13.2. Authentic: be the candidate's own work;
19.13.3. Reliable: give consistently reproducible results;
19.13.4. Current: give a current picture of competence/ knowledge (as a rule of thumb, to be current, evidence would be less than 3 years old);
19.13.5. Sufficient: cover all the requirements of the standard.

19.14. In achieving these requirements, we are likely to achieve validity and reliability – which are the key requirements of effective assessment.

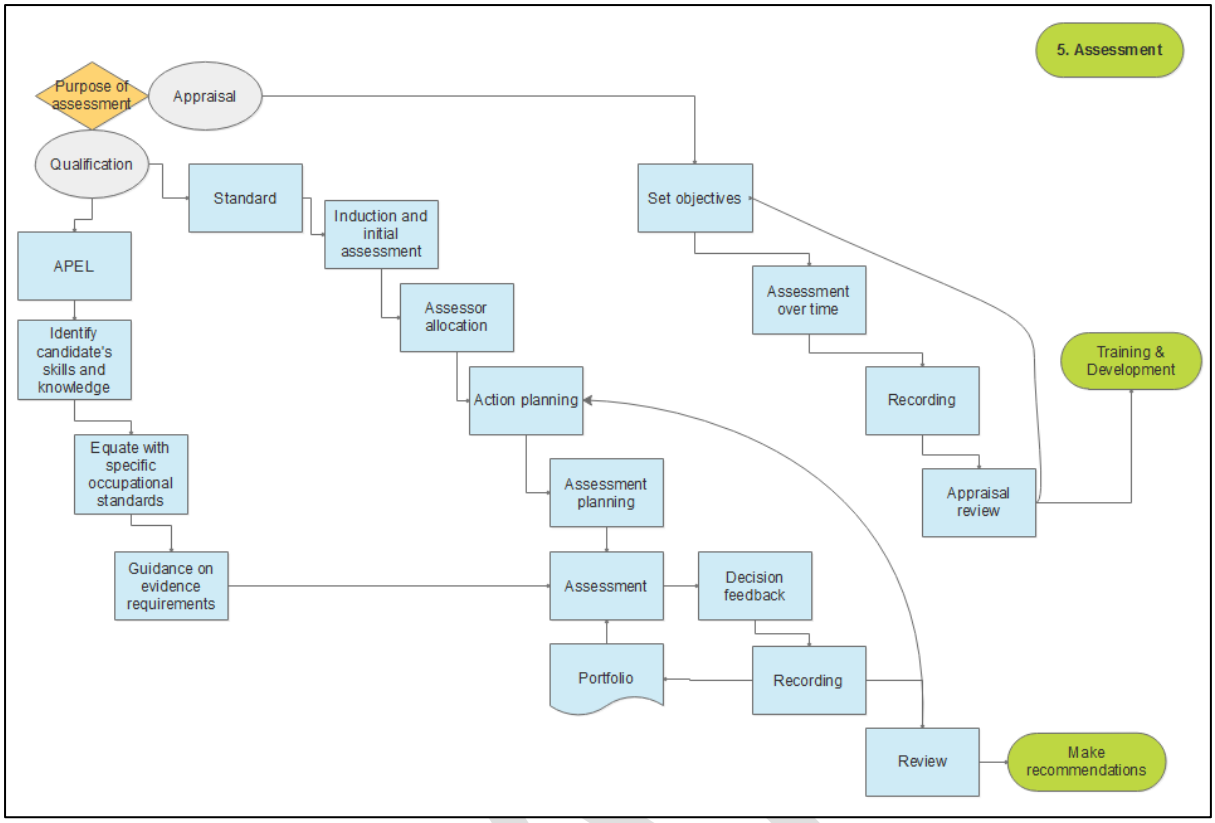


Figure 11. The Assessment Process

20. In the case of BTC, the apparent complications of overlaying the many Occupational Standards identified in the role profiling activities was almost overwhelming for the company. It was decided that a mock assessment might help in understanding the Standards in better detail and so choose those Standards that best demonstrate the critical competences for each role. This 'down-selecting' of the number of Standards is a very important part of the design of qualifications that the awarding organisation undertakes when creating international, national, industry-recognised or bespoke qualifications[24]. For our purposes, i.e. understanding the principles of assessment of competence in the workplace and improving our understanding of the use of occupational standards, we would only need to assess one of each of our 'candidates' against one or two of the Standards identified in the Role Profile we created for each.

21. We decided to conduct a mock assessment of a Test Leader and the Assembly/Disassembly Foreman and, as is often the case with assessments of 'candidates' in their real-time working environment, the actual Standards and elements of those Standards that would be assessed could not be predicted until the week before the assessment at the very earliest. Over a two-day period, we:

    - Used a presentation about the Assessment Process as the basis for a discussion/workshop for the President of BTC.
    - Conducted some 'Assessment Planning' to confirm which qualification/Standards/Elements would be assessed and by which type(s) of evidence
    - Conducted assessment by observation and verbal questions.

[24] For more detail, contact Homeland Security Qualifications
http://www.homelandsecurityqualifications.co.uk/

- Had a period of Reflection during which the President of BTC evaluated the work we had done.

22. This activity was very helpful in teasing out exactly what was required to demonstrate competence for the ISO 17025 accreditation, which could be summarised as 'Prepare the work – do the work – report on the work'. For this very specific requirement this would allow BTC to 'down-select', from the role profiles that they created, to as few as three or four Standards for each role. The presentation and discussion was followed by a very useful session on finding occupational standards for other disciplines in BTC[25] so that we could demonstrate that the principles of the Standards are common to all disciplines and therefore the principles of assessment could be applied across the whole company.

[25] As ISO 17025 will be focused towards the "products" BTC delivers, i.e. measurements results, the focus will be on competences and skills directly involved in that area. The roles will be the:

- HS-Photographers.
- Measurement engineers, operating different systems, were each system has its own set of competences and skills in three different levels.
- Environmental laboratory engineers, operating different machines such as vibrators, chock machines etc.

CASE STUDY – SAAB BOFORS TEST CENTER

BACKGROUND

Bofors Test Center's (BTC) core business is testing of products containing explosive substances. We have access to a large field of operations (approx. 100 km2) with six permanent test sites available. All these sites have well-developed infrastructure such as advanced anti-shrapnel cover for personnel and equipment. Should these sites not fulfil customer's particular requirements, BTC has a number of mobile solutions for setting up a temporary test site within or outside our facility. With our large areas of land, recording equipment and filming capabilities we have great scope for testing almost anything. We are certified to ISO 9000 and ISO 14000.

Being a test centre, it is logical to take the next step, certifying towards ISO 17025. One of the key issues lacking today is a system to verify the personal skills and competences of our employees. One possible solution is to implement the occupational standards. BTC participation in this project aims to examine these possibilities. A certification according to standard ISO 17025 means a greater opportunity to market the products and services on both the civil and defence market.

The ISO website[26] describes ISO 17025 as follows:

> ISO/IEC 17025:2005 specifies the general requirements for the competence to carry out tests and/or calibrations, including sampling. It covers testing and calibration performed using standard methods, non-standard methods, and laboratory-developed methods. It is applicable to all organizations performing tests and/or calibrations. These include, for example, first-, second- and third-party laboratories, and laboratories where testing and/or calibration forms part of inspection and product certification. ISO/IEC 17025:2005 is applicable to all laboratories regardless of the number of personnel or the extent of the scope of testing and/or calibration activities. When a laboratory does not undertake one or more of the activities covered by ISO/IEC 17025:2005, such as sampling and the design/development of new methods, the requirements of those clauses do not apply.
>
> ISO/IEC 17025:2005 is for use by laboratories in developing their management system for quality, administrative and technical operations. Laboratory customers, regulatory authorities and accreditation bodies may also use it in confirming or recognizing the competence of laboratories. ISO/IEC 17025:2005 is not intended to be used as the basis for certification of laboratories. Compliance with regulatory and safety requirements on the operation of laboratories is not covered by ISO/IEC 17025:2005.

The ISO 17025 Standard itself states that:

"5.2.1 The laboratory management shall ensure the competence of all who operate specific equipment, perform tests and/or calibrations, evaluate results, and sign test reports and calibration certificates. When using staff who are undergoing training, appropriate supervision shall be provided. Personnel performing specific tasks shall be qualified on the basis of appropriate education, training, experience and/or demonstrated skills, as required.

5.2.2 The management of the laboratory shall formulate the goals with respect to the education, training and skills of the laboratory personnel. The laboratory shall have a policy and procedures for identifying training needs and providing training of personnel. The training programme shall be

[26] http://www.iso.org/iso/catalogue_detail.htm?csnumber=39883

relevant to the present and anticipated tasks of the laboratory. The effectiveness of the training actions taken shall be evaluated.

> NOTE 1 In some technical areas (e.g. non-destructive testing) it may be required that the personnel performing certain tasks hold personnel certification. The laboratory is responsible for fulfilling specified personnel certification requirements. The requirements for personnel certification might be regulatory, included in the standards for the specific technical field, or required by the customer.
>
> NOTE 2 The personnel responsible for the opinions and interpretation included in test reports should, in addition to the appropriate qualifications, training, experience and satisfactory knowledge of the testing carried out, also have:
>
> - relevant knowledge of the technology used for the manufacturing of the items, materials, products, etc. tested, or the way they are used or intended to be used, and of the defects or degradations which may occur during or in service;
> - knowledge of the general requirements expressed in the legislation and standards; and
> - an understanding of the significance of deviations found with regard to the normal use of the items, materials, products, etc. concerned."

BTC's 'Operating Manual – This is How We Work' publication states that they have identified four core processes that describe how their business activities re-shape efforts toward one result. The core processes are interconnected in the following principal sequence:

Competence Development > Generate Business > Produce Services > Promote Returning Business

The core processes are broken down into sub-processes that describe work methods in better detail and are supported by activities within "Support Operations". "Support Processes" exists as support to the processes that define the foundation that the core processes are built on. Support processes consist of management processes, documentation management, legislation, etc.

BTC recognises that demands for ever increasing expertise on their part is an integral part of their being able to get 'in depth' and develop their services and, thereby, to offer their customers better and more comprehensive solutions with regard to testing and measurement procedures. The core process "Competence Development" entails all of these activities and "Competence Development" is based on competence profiles on an individual level.

BTC believes that the company's success depends on how well they utilise the individual learning power in teams and groups for the best interests of the entire organisation, and thereby afford these advantages to all customers and interested parties, ensuring their growth and survival.

The foundation is the competence of the individual. This 'formula' illustrates the basic perspective that BTC uses to guide their processes:

Competence= ((technology) x (teamwork) x (collective learning))

Where the three parts that generate "competence" deal with how the company co-operates and functions as a whole (teamwork) in relation to new tools (technology), and how the company's work environment facilitates learning at all levels (collective learning).

BTC uses these principles to guide learning so that it becomes optimally advantageous for the company as a whole. There are individual competence plans and gap analyses, that they call "the Star", and these serve as support for learning as well as regularly scheduled personnel development and salary goal dialogues.

THE BTC SUB-PROJECT

In outline, BTC's sub-project has the following elements:

- Role Profiling workers
- Describing BTC's implementation of Competera[27], the competence management system they use.
- Adapting Competera and the NOS such that they can be integrated
- Creating a developmental "company" and database for the design and testing of the integration
- Redefining BTC's current competence levels 1-3
- Implementing the new design
- Testing the new design
- Rolling out the new design to the rest of the company.

UNDERSTANDING THE STANDARDS

During the first visit to BTC the act of role profiling a number of workers was the carrier wave for the company to really begin to understand the possibilities of the occupational standards as a management tool and the practicalities of their implementation.
Understanding the terminology within The Standards, especially in translation to any sort of Swedish equivalent, was a minor challenge. Some words, such as 'manage, 'supervise' and 'contribute to', are intended to point the reader towards the most appropriate VET (vocational, education and training) level[28] that an assessor, learner or manager would expect the individual to be able to demonstrate in that particular activity. The eight descriptors are tabulated here:

[27] http://www.competera.se/

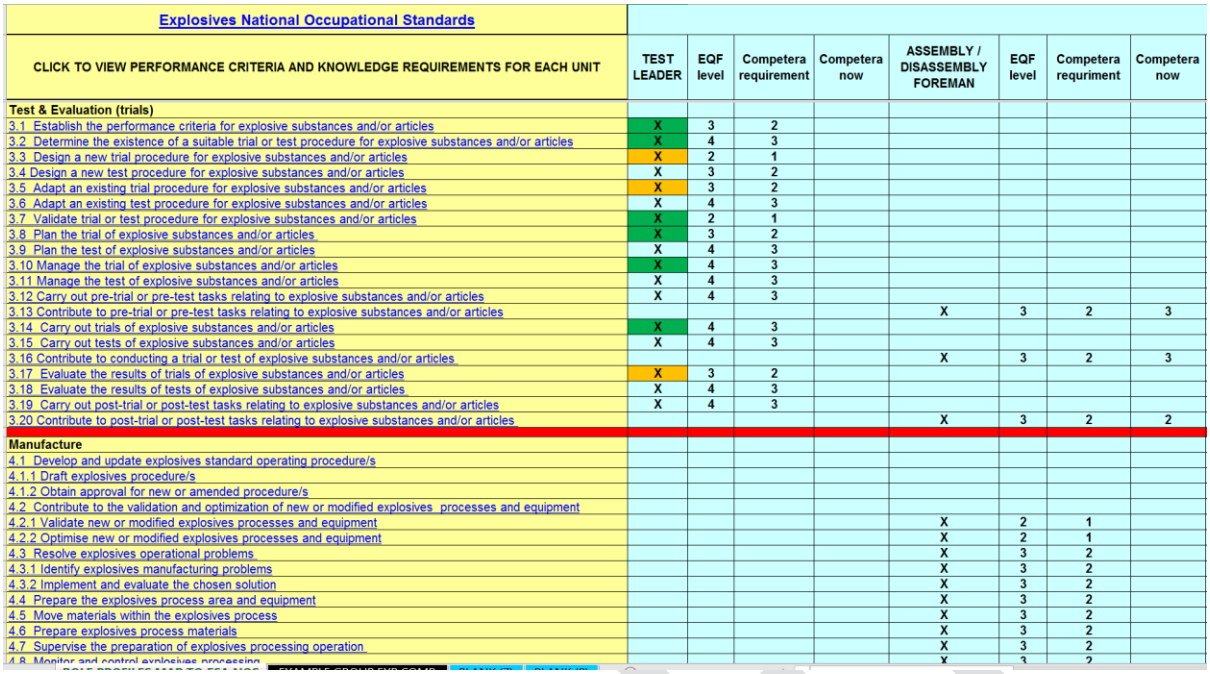
[28] https://ec.europa.eu/ploteus/content/descriptors-page

EQF Level	Knowledge	Skills	Competence
	In the context of EQF, knowledge is described as *theoretical and/or factual*.	**In the context of EQF, skills are described as *cognitive* (involving the use of logical, intuitive and creative thinking), and *practical* (involving manual dexterity and the use of methods, materials, tools and instruments)**	**In the context of EQF, competence is described in terms of *responsibility and autonomy*.**
Level 1	Basic general knowledge	Basic skills required to carry out simple tasks	Work or study under direct supervision in a structured context
Level 2	Basic factual knowledge of a field of work or study	Basic cognitive and practical skills required to use relevant information in order to carry out tasks and to solve routine problems using simple rules and tools	Work or study under supervision with some autonomy
Level 3	Knowledge of facts, principles, processes and general concepts, in a field of work or study	A range of cognitive and practical skills required to accomplish tasks and solve problems by selecting and applying basic methods, tools, materials and information	Take responsibility for completion of tasks in work or study; adapt own behaviour to circumstances in solving problems
Level 4	Factual and theoretical knowledge in broad contexts within a field of work or study	A range of cognitive and practical skills required to generate solutions to specific problems in a field of work or study	Exercise self-management within the guidelines of work or study contexts that are usually predictable, but are subject to change; supervise the routine work of others, taking some responsibility for the evaluation and improvement of work or study activities
Level 5 [1]	Comprehensive, specialised, factual and theoretical knowledge within a field of work or study and an awareness of the boundaries of that knowledge	A comprehensive range of cognitive and practical skills required to develop creative solutions to abstract problems	Exercise management and supervision in contexts of work or study activities where there is unpredictable change; review and develop performance of self and others
Level 6 [2]	Advanced knowledge of a field of work or study, involving a critical understanding of theories and principles	Advanced skills, demonstrating mastery and innovation, required to solve complex and unpredictable problems in a specialised field of work or study	Manage complex technical or professional activities or projects, taking responsibility for decision-making in unpredictable work or study contexts; take responsibility for managing professional development of individuals and groups
Level 7 [3]	Highly specialised knowledge, some of which is at the forefront of knowledge in a field of work or study, as the basis for original thinking and/or research Critical awareness of knowledge issues in a field and at the interface between different fields	Specialised problem-solving skills required in research and/or innovation in order to develop new knowledge and procedures and to integrate knowledge from different fields	Manage and transform work or study contexts that are complex, unpredictable and require new strategic approaches; take responsibility for contributing to professional knowledge and practice and/or for reviewing the strategic performance of teams
Level 8 [4]	Knowledge at the most advanced frontier of a field of work or study and at the interface between fields	The most advanced and specialised skills and techniques, including synthesis and evaluation, required to solve critical problems in research and/or innovation and to extend and redefine existing knowledge or professional practice	Demonstrate substantial authority, innovation, autonomy, scholarly and professional integrity and sustained commitment to the development of new ideas or processes at the forefront of work or study contexts including research

ROLE PROFILING

Using HSQ's Key Roles as a framework, and the process outlined in the Step-by-Step Guide to the Implementation of Occupational Standards, we created comprehensive role profile maps for an Assembly/disassembly Foreman and a Test Leader.

An important lesson that was learned very early in the role profiling exercise was that although a manager may have responsibility for a particular process, he or she does not necessarily need to have level 4 or higher competence in every element of the work; it is quite acceptable in the right context for a manager to have level 2 or 3 knowledge and practice of the matter in order to make informed decisions on problems and solutions presented by more expert workers.



Explosives National Occupational Standards								
CLICK TO VIEW PERFORMANCE CRITERIA AND KNOWLEDGE REQUIREMENTS FOR EACH UNIT	TEST LEADER	EQF level	Competera requirement	Competera now	ASSEMBLY / DISASSEMBLY FOREMAN	EQF level	Competera requriment	Competera now
Test & Evaluation (trials)								
3.1 Establish the performance criteria for explosive substances and/or articles	X	3	2					
3.2 Determine the existence of a suitable trial or test procedure for explosive substances and/or articles	X	4	3					
3.3 Design a new trial procedure for explosive substances and/or articles	X	2	1					
3.4 Design a new test procedure for explosive substances and/or articles	X	3	2					
3.5 Adapt an existing trial procedure for explosive substances and/or articles	X	3	2					
3.6 Adapt an existing test procedure for explosive substances and/or articles	X	4	3					
3.7 Validate trial or test procedure for explosive substances and/or articles	X	2	1					
3.8 Plan the trial of explosive substances and/or articles	X	3	2					
3.9 Plan the test of explosive substances and/or articles	X	4	3					
3.10 Manage the trial of explosive substances and/or articles	X	4	3					
3.11 Manage the test of explosive substances and/or articles	X	4	3					
3.12 Carry out pre-trial or pre-test tasks relating to explosive substances and/or articles	X	4	3					
3.13 Contribute to pre-trial or pre-test tasks relating to explosive substances and/or articles					X	3	2	3
3.14 Carry out trials of explosive substances and/or articles	X	4	3					
3.15 Carry out tests of explosive substances and/or articles	X	4	3					
3.16 Contribute to conducting a trial or test of explosive substances and/or articles					X	3	2	3
3.17 Evaluate the results of trials of explosive substances and/or articles	X	3	2					
3.18 Evaluate the results of tests of explosive substances and/or articles	X	4	3					
3.19 Carry out post-trial or post-test tasks relating to explosive substances and/or articles	X	4	3					
3.20 Contribute to post-trial or post-test tasks relating to explosive substances and/or articles					X	3	2	2
Manufacture								
4.1 Develop and update explosives standard operating procedure/s								
4.1.1 Draft explosives procedure/s								
4.1.2 Obtain approval for new or amended procedure/s								
4.2 Contribute to the validation and optimization of new or modified explosives processes and equipment								
4.2.1 Validate new or modified explosives processes and equipment					X	2	1	
4.2.2 Optimise new or modified explosives processes and equipment					X	2	1	
4.3 Resolve explosives operational problems					X	3	2	
4.3.1 Identify explosives manufacturing problems					X	3	2	
4.3.2 Implement and evaluate the chosen solution					X	3	2	
4.4 Prepare the explosives process area and equipment					X	3	2	
4.5 Move materials within the explosives process					X	3	2	
4.6 Prepare explosives process materials					X	3	2	
4.7 Supervise the preparation of explosives processing operation					X	3	2	
4.8 Monitor and control explosives processing					X	3	2	

COMPETERA[29], THE HR AND COMPETENCE MANAGEMENT SYSTEM

BTC uses a commercial HR software suite called Competera, produced in Sweden by IT Services and which advertises "Better management of HR processes". Competera is described as an easy to use and cost effective tool to enable personnel administration that provides the organization with the right skills and management of staffing and succession planning. At its core, it relies on the premise that HR staff work is performed today at many different levels in the organization and that users that require modern tools in their work with these HR processes.

BTC has invested significantly in integrating their HR processes with Competera, creating a comprehensive competence framework with three 'levels' based on the complexity of an activity and the length of time, training and experience that the company expects an individual to have to be able to work at that level.

As an example of the BTC framework, we will look briefly at the company's expectations of a worker at each of the levels:

- Level 1 munitions assembly/disassembly worker
- Level 2 test engineer
- Level 3 Test Leader

In creating their framework, BTC performed some contortions to enable their levels and 'qualifications' to fit the way that the software processed the competences to allow the company to be able to use the system to create relevant GAP-analyzes.

[29] http://www.competera.se/

ADAPTING COMPETERA AND THE NOS SUCH THAT THEY CAN BE INTEGRATED

Creating a Developmental "Company" and Database for the Design and Testing of the Integration

It was clear from the first visit that the only sensible way to adapt the system was to create a copy of the existing database that could be used solely for the purpose of development. Stefan Krol undertook this himself, with the support of his IT department. Once the developmental database had been created he could make changes and test their effects without damaging the live system.

Redefining BTC's Current Competence Levels 1-3

When we were finding ways to align the Competera levels and EQF levels it was apparent that we needed a 'Competera Level 0' to represent those individuals who are effectively trainees or at least haven't yet achieved the requisite level of competence within the company.

Definitions of Competera levels

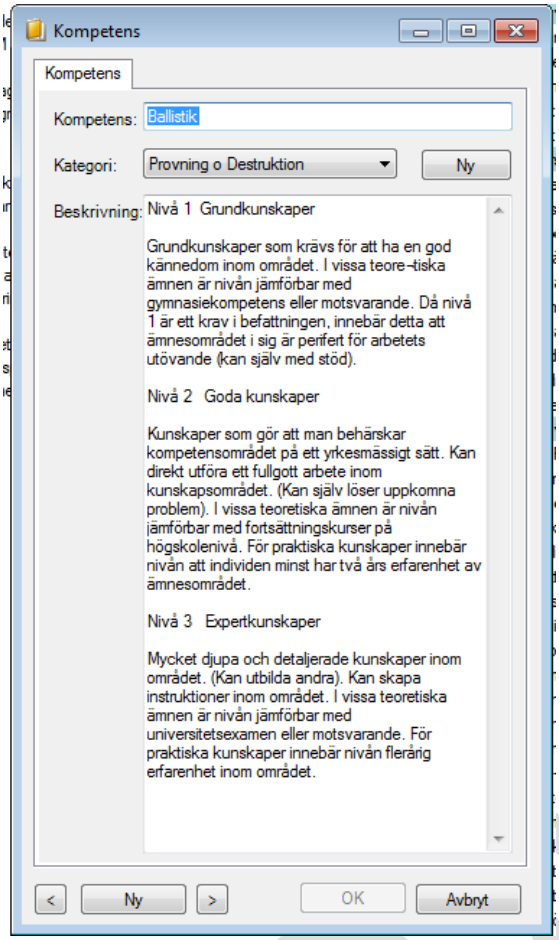
The company has a set of generic levels and particular areas of work might have specific descriptions of the level of competence to guide management and staff.

The generic competence levels are:

Level 1. Basic Skills
Basic knowledge required to have a good knowledge in the field. In some theoretical substances are level comparable secondary qualification. When Level 1 is a requirement of the position, this means that the subject itself is peripheral to the work practice (can be self-supported).

Level 2. Proficiency
Knowledge makes a mastery of the terms in a professional manner. Can directly perform satisfactory work in knowledge. (Can self-solve arising problems). In some theoretical subjects, the level is comparable to advanced courses at university. For practical knowledge level means that the individual has at least two years of experience in the field.

Level 3. Expert knowledge
Very deep and detailed knowledge of the field. (Can educate others). Can create instructions in the field. In some theoretical subjects, the level is comparable to a university degree or equivalent. For practical knowledge level means more years of experience in the field.



An example of specific competence levels comes from the area of testing:

Level 1. Basic knowledge of testing techniques, methodologies and regulations that govern the testing of the products within its own field of technology.

Level 2. Good knowledge of testing techniques, methodologies and regulations that govern the testing of the products within its own field of technology. Self-ever be able to put up and run tests in its own technology.

Level 3. Excellent knowledge that provides a holistic approach in testing technology area and its various disciplines, such as metrology, environmental resistance, and where relevant regulatory framework.

EQF Descriptors

We considered the Competera levels of competence against these EQF descriptors:

EQF Level	Knowledge	Skills	Competence
	In the context of EQF, knowledge is described as *theoretical and/or factual*.	**In the context of EQF, skills are described as *cognitive* (involving the use of logical, intuitive and creative thinking), and *practical* (involving manual dexterity and the use of methods, materials, tools and instruments)**	**In the context of EQF, competence is described in terms of *responsibility and autonomy*.**
Level 1	Basic general knowledge	Basic skills required to carry out simple tasks	Work or study under direct supervision in a structured context
Level 2	Basic factual knowledge of a field of work or study	Basic cognitive and practical skills required to use relevant information in order to carry out tasks and to solve routine problems using simple rules and tools	Work or study under supervision with some autonomy
Level 3	Knowledge of facts, principles, processes and general concepts, in a field of work or study	A range of cognitive and practical skills required to accomplish tasks and solve problems by selecting and applying basic methods, tools, materials and information	Take responsibility for completion of tasks in work or study; adapt own behaviour to circumstances in solving problems
Level 4	Factual and theoretical knowledge in broad contexts within a field of work or study	A range of cognitive and practical skills required to generate solutions to specific problems in a field of work or study	Exercise self-management within the guidelines of work or study contexts that are usually predictable, but are subject to change; supervise the routine work of others, taking some responsibility for the evaluation and improvement of work or study activities
Level 5 [1]	Comprehensive, specialised, factual and theoretical knowledge within a field of work or study and an awareness of the boundaries of that knowledge	A comprehensive range of cognitive and practical skills required to develop creative solutions to abstract problems	Exercise management and supervision in contexts of work or study activities where there is unpredictable change; review and develop performance of self and others

The company decided that the closest alignment was:

Competera Level	EQF Level
0 (some competences incomplete)	Not applicable
1 (skilled, work with support/supervision)	2 (operator)
2 (experienced, can supervise)	3 (supervisor)
3 (very skilled and experienced, can educate)	4 (manager)

Now that we had a framework, the next stage was to map the Standards in the Role Profiles that had been developed, which also gave us the chance to question the alignment we had agreed. There were a couple of instances where the alignment was not clear at first but looking closely at the elements of the Standard and considering the company's requirement in detail, the alignment rang true in all cases.

1	Explosives National Occupational Standards									
2	CLICK TO VIEW PERFORMANCE CRITERIA AND KNOWLEDGE REQUIREMENTS FOR EACH UNIT	TEST LEADER	EQF level	Competera requirement	Competera now	ENVIRONMENTAL TESTING LABORATORY OPERATOR	ASSEMBLY / DISASSEMBLY FOREMAN	EQF level	Competera requirement	Competera now
3	Research, Design and Development									
71	3.13 Contribute to pre-trial or pre-test tasks relating to explosive substances and/or articles						X	3	2	3
72	3.14 Carry out trials of explosive substances and/or articles	X	4	3						
73	3.15 Carry out tests of explosive substances and/or articles	X	4	3						
74	3.16 Contribute to conducting a trial or test of explosive substances and/or articles						X	3	2	3
75	3.17 Evaluate the results of trials of explosive substances and/or articles	X	3	2						
76	3.18 Evaluate the results of tests of explosive substances and/or articles	X	4	3						
77	3.19 Carry out post-trial or post-test tasks relating to explosive substances and/or articles	X	4	3						
78	3.20 Contribute to post-trial or post-test tasks relating to explosive substances and/or articles						X	3	2	2

In the extract from the BTC working spreadsheet shown here you can see not only the alignment of Competera level to EQF level, but also examples of where the Assembly/Disassembly foreman's assessed Competera level exceeds the company's requirement.

IMPLEMENTING THE NEW DESIGN:

INTEGRATING OCCUPATIONAL STANDARDS WITH HR SYSTEM

The existing competence framework presented a fairly serious challenge to the integration of the Standards and the role profiling or qualification methodology that is based on an individual's ability to demonstrate how they would meet the Standards at the management levels of practitioner/operator, supervisor or manager.

The greatest challenge we faced was having to create a new 'Role' field within the Competera system for each role profile, followed by 'Competence' fields for each Standard and then grouping the 'Competences' under each 'Role'.

We recognised that the 'Key Role 13 – Generic Functions' Standards have wide utility across all the explosives workers so they were created in Competera as a separate 'Role' so that they could easily be referenced by any of the individuals in their own record.

TESTING THE NEW DESIGN:

The Competera system is well tried and tested so it was only necessary to test the working of new records and that they can be viewed from a number of aspects, e.g. to provide management with a view of what skills gaps they have within a particular team.

Mock Assessment

The apparent complications of overlaying the many Occupational Standards identified in the role profiling activities was almost overwhelming for the company. It was suggested that a mock assessment might help in understanding the Standards in better detail and so choose those Standards that best demonstrate the critical competences for each role. This 'down-selecting' of the number of Standards is a very important part of the design of qualifications that the awarding organisation undertakes when creating international, national, industry-recognised or bespoke qualifications[30]. For our purposes, i.e. understanding the principles of assessment of competence in the workplace and improving our understanding of the use of occupational standards, we would only need to assess one of each of our 'candidates' against one or two of the Standards identified in the Role Profile we created for each.

We decided to conduct a mock assessment of a Test Leader and the Assembly/Disassembly Foreman and, as is often the case with assessments of 'candidates' in their real-time working environment, the actual Standards and elements of those Standards that would be assessed could not be predicted until the week before the assessment at the very earliest.

Over a two-day period, we

- Used a presentation about the Assessment Process as the basis for a discussion/workshop for the President of BTC.
- Conducted some 'Assessment Planning' to confirm which qualification/Standards/Elements would be assessed and by which type(s) of evidence
- Conducted assessment by observation and verbal questions.
- Had a period of Reflection during which the President of BTC evaluated the work we had done.

In the presentation about the assessment process the emphasis was on how line managers and senior staff can use the principles and practices of assessment that are available as a Level 3 qualification to ensure the competence of staff in terms of the Occupational Standards. This 'ensure' term is important to the company as it is a requirement of the ISO17025 technical standard that:

[30] For more detail, contact Homeland Security Qualifications
http://www.homelandsecurityqualifications.co.uk/

"5.2.1 The laboratory management shall ensure the competence of all who operate specific equipment, perform tests and/or calibrations, evaluate results, and sign test reports and calibration certificates. When using staff who are undergoing training, appropriate supervision shall be provided. Personnel performing specific tasks shall be qualified on the basis of appropriate education, training, experience and/or demonstrated skills, as required.

5.2.2 The management of the laboratory shall formulate the goals with respect to the education, training and skills of the laboratory personnel. The laboratory shall have a policy and procedures for identifying training needs and providing training of personnel. The training programme shall be relevant to the present and anticipated tasks of the laboratory. The effectiveness of the training actions taken shall be evaluated.

> NOTE 1 In some technical areas (e.g. non-destructive testing) it may be required that the personnel performing certain tasks hold personnel certification. The laboratory is responsible for fulfilling specified personnel certification requirements. The requirements for personnel certification might be regulatory, included in the standards for the specific technical field, or required by the customer.
>
> NOTE 2 The personnel responsible for the opinions and interpretation included in test reports should, in addition to the appropriate qualifications, training, experience and satisfactory knowledge of the testing carried out, also have:
>
> □□ relevant knowledge of the technology used for the manufacturing of the items, materials, products, etc. tested, or the way they are used or intended to be used, and of the defects or degradations which may occur during or in service;
> □□ knowledge of the general requirements expressed in the legislation and standards; and
> □□ an understanding of the significance of deviations found with regard to the normal use of the items, materials, products, etc. concerned."

We discussed the types of evidence that might be readily available within the normal working practices of the two 'candidates' that would be acceptable if they were being formally assessed. The attributes for each piece of evidence are that they must be:

- Valid – demonstrate genuine achievement of the Standard
- Authentic – the candidate's own work
- Reliable – show that the candidate gives consistently reproducible output
- Current – show that the candidate uses current practice
- Sufficient – show that the candidate's work meets all the elements of the Standard

To help the BTC staff, we created a 'Mock Assessment Portfolio' that included a variety of relevant Standards, with space for the manager/assessor to enter important information about the evidence. An example of a page from the portfolio for the Test Leader is shown here:

Unit 3.8 Plan the trial of explosive substances and/or articles

Contexts

Complexity: high negative consequence; numerous interrelated tests or activities; variable outcomes
Resources: fully equipped; with limited resources; from other organisations
Reviews: where the customer agrees the plan; where changes are needed following discussions with the customer
Hazards and risks caused by: complexity of the explosive substances and/or articles; condition of the explosive substances and/or articles; primary hazards; secondary hazards

Performance Criteria	Evidence	Evidence Type	Location/ Reference
a. work safely at all times, complying with health and safety, environmental and other relevant regulations, legislation and guidelines	Trials plan that refferes to regulations and guidelines.	P	Office / red net.
b. confirm the appropriate trials procedure	Trials plan that refferes to regulations and guidelines.	P	Office / red net.
c. make effective use of appropriate modelling tools	Can use "offereringsverktyget"	OBS	Yellow net
d. confirm the fitness for purpose of the proposed trial site	Trials plan for lake test	P	Office / red net.
e. incorporate the requirements of additional tasks to be carried out concurrently into.the trials plan	Test plan describing bookings,preparations, transports etc.	P	Test plan Alvdalen yellow net.
f. identify and obtain resource requirements that are appropriate to the trial	Test plan and calculation toll with good quality in combination with an after analyze	P/OBS	Red and yellow net
g. allocate responsibilities appropriately	At pre-test briefing, trials plan and test plan.	OBS /P	On site.Red and Yellow net
h. produce a clear and accurate trials plan	Trials plan	P	Red net
i. ensure that hazard and risk assessments are carried out	Trials plan, Test plan	P	Red net
j. agree deliverables with the customer, with agreed interim reviews	Mail conversations and draft versions of Trials plan	P	Y and R net.
k. obtain the approval to changes made to the plan in the correct format	Trials plan or confirmed with E-mail or in the firing protokoll.	P	Y or R net.
l. develop contingencies to accommodate identified difficulties	Trials plan or risk analyses connected. Questioning	P Q	R net
m. ensure that any issues relating to the segregation and disposal of process residues and products have been addressed in the plan	Trials plan	P	R net
n. maintain the requirements of confidentiality at all times	Observations at test site, and client responses to post test questioning.	OBS and WT	On site
o. adhere to the relevant quality standards	Obs, following the processes.	OBS and Q	On site
p. take action to resolve and record problems	Mail converations and Trials plan	P and WT	R and Y net
Knowledge Requirements			
i. the health, safety and environmental and other statutory legislation, regulations and safe working practices and procedures governing explosives, and their implications for your area of work	Trials plan and questioning	P and Q	Office / red net.

Notes:
OBS = Observation; P = Work Product; Q = Questioning; WT = Witness Testimony

For the purposes of this case study and the information of other members of BTC staff, that actual location/reference is not given but would be the full file reference, whether that is a physical or electronic file.

Ideally, all this evidence could be saved as documents in Competera, however that was not possible, since the net known as "R net" is a closed net with high security to be able to work with information classified up to "secret". Competera runs in more open "yellow" environment. This would, however, not create a major issue in real life.

We held a further meeting at BTC to consider how to use the NOS to demonstrate competence for the ISO 17025 bid, without unduly complicating the Competera system, and how to assess people in the workplace.

Initially, we thought that we would consider those NOS from the role profiles we created that are most critical/important for what we need to demonstrate as an ISO 17025 accredited organisation. The idea was that this should make the list of Standards to be assessed much more manageable. Prior to the meeting, we thought that we could look at three NOS for each of our two roles:

> Test Leader: 3.8 - Plan the trial of explosive substances and/or articles; 3.10 - Manage the trial of explosive substances and/or articles; 3.14 - Carry out trials of explosive substances and/or articles
>
> Assembly/disassembly foreman: 4.9 - Supervise explosives processing; 4.10 - Solve explosives process problems; 7.5 - Supervise the maintenance of storage conditions for explosive substances and/or articles

On the day, however, we discussed the principles of assessment that would be appropriate for line managers to use to make a judgement of the Competera competence levels of members of staff.

This presentation and discussion was followed by a very useful session on finding occupational standards for other disciplines in BTC so that we could demonstrate that the principles of the Standards are common to all disciplines and therefore the principles of assessment could be applied across the whole company.

As ISO 17025 will be focused towards the "products" BTC delivers, i.e. measurements results, the focus will be on competences and skills directly involved in that area. The roles will be the:

- HS-Photographers.
- Measurement engineers, operating different systems, were each system has its own set of competences and skills in three different levels.
- Environmental laboratory engineers, operating different machines such as vibrators, chock machines etc.

By using the same methods as in the mock assessments mentioned above, it should be fairly easy to show proof of how the company" *ensure the competence*" as required by ISO 17025.

TESTING THE EFFECTIVENESS OF THE CHANGES (OR POTENTIAL FOR CHANGE)

Looking back at why BTC participated in the EUExImp project: SAFETY comes first and the company wanted to see whether it could improve that.

BTC has ISO 9000 and 14000 but some customers are starting to talk about the need to use ISO 17025: “Accredited Lab”. BTC’s concern was that If ONE test centre were go that way, all others would have to follow. It would be an absolute customer requirement.

BTC has rigorous calibrating routines, and works in very defined processes. The only thing that is “missing” is a quality definition of the workforce competences and the skills. "Our guys know what is required and what they do, but how can we prove that?" The question was therefore, ‘Can we use “NOS as a management tool”, or can we use this method for ISO 17025?’

BTC decided that although the method used for the “test run” of the explosives skills is good, and it works with support from Competera, the explosives area is not where we need to place our effort. The method works and we have determined that in some cases it might be possible to use existing NOS standards from other areas, or at least partly.

As an example, the V_0 radar is complex enough to start with, yet it is one of the simplest tools that only measures the initial speed of a projectile. We have 5 of them, and 8 guys who can operate them. At least 2 are in use every day. The first steps will be to analyze the competences and skills it takes to operate such a radar and deliver reliable data. The structure is there in Competera, and there is a place to put the requirements.

ROLLING OUT THE NEW DESIGN TO THE REST OF THE COMPANY

BTC has decided not to implement the NOS in the explosives skills and competences all over the company. Due to the multi-role workforce, such a step would take significant time and effort. The gain in safety and in other areas does not correspond with the effort needed. However, the method will be used when a ISO 17025 CERTIFICATE is the market requirement.

UNEXPECTED OUTCOMES

One of the unexpected outcomes of the project was the realisation that one could apply the principles of the Standards to other, non-explosives staff. In the case of BTC this will include their instrumentation staff, e.g. high-speed photography and measurement engineers:

- Obtain or set standards in terms of context/scope/conditions; performance criteria; knowledge requirements.
- Include the Standards in the role profile for the individual.
- Include the Standards in the competence management system.
- Assess the individuals against the Standards.

CASE STUDY – EVENT HORIZON

BACKGROUND

Event Horizon is an engineering company that specialises in the use of explosive materials. We have extensive experience in a wide range of fields including; aerospace, defence, explosive ordnance disposal (EOD), demolition, salvage and special effects.

They provide 'Institute of Explosives Engineers' (IExpE) and 'Broadcasting Entertainment Cinematograph and Technicians Union' (BECTU) endorsed explosives safety training to the UK film industry. The completion of this training enables an individual to progress their career through the Joint Industry Grading Scheme (JIGS). All course tutors are members of IExpE and have many years' experience both in the film industry and the explosives industry. A full filmography can be seen at the company website (www.precisionenergetics.co.uk).

From discussions with Event Horizon management and the council of the IExpE, it was clear that the courses met the long-standing requirements of the industry but they had evolved over time in order to meet new requirements but they had never been subject to any formal systematic approach to training design. The initial course of instruction, also known as 'Part 1' or 'Basic' was required to provide sufficient knowledge and skills for the successful trainee to be able to work safely under close supervision on a film or TV production set. The BECTU grading scheme then required the trainee to record a set amount of time on differing productions before applying for re-grading as technicians and eventually as senior technicians and taking the so-called 'Institute Course' which, in conjunction with their proven experience and an additional suite of written examinations, would enable them to apply for membership of IExpE and also for further re-grading as a Supervisor.

In outline, Event Horizon's sub-project has the following elements:

- Define BECTU's requirements for qualifications and IExpE Membership.
- Work with IExpE to map their membership criteria to NOS
- Map the Event Horizon Basic Course to NOS
- Map the 'Institute Course' to NOS
- Create a new BECTU Stage 1 and Stage 2 suite of qualifications based on NOS and the requirements
- Identify any spin-off or additional qualifications that might be useful to EH and/or BECTU
- Consider creating EH as an HSQ Centre
    - Assessors
    - Internal Verifier
- Capture the challenges and solutions as a case study and good practice guide for a chapter of the EUExImp 'intellectual output' manual/guidance note.

DEFINING BECTU REQUIREMENTS

SFX Grading Scheme.

The Joint Industry Special Effects Grading Scheme provides a career structure for those involved in physical, pyrotechnic and visual special effects. There is a BECTU member-only area of their website[31] that contains all of the relevant documentation on the management of this scheme

[31] https://www.bectu.org.uk/advice-resources/sfx-grading

including rules, appeals procedures, codes of practice, rates, job descriptions, etc. The Joint Industry Committee (made up of representatives from the BBC, ITV, PACT and BECTU) determines the levels of experience, training and responsibility required to hold the various job titles (grades) within the scheme.

Special effects professionals are encouraged to join the scheme as trainees. As they receive training and their experience grows, they can apply for re-grading as technicians, senior technicians, and eventually, as supervisors. The structure of the Joint Industry Special Effects Grading Scheme is also used by employers (production companies, producers, etc.) to ensure that they are employing suitably experienced, qualified and responsible individuals.

This system helps to ensure that productions are, or become, low risk ventures, both from the completion and health and safety points of view.

Accredited special effects operators can apply to appear on the list of individuals who are accredited special effects operators. This list, which is not restricted to BECTU members, is updated regularly. Re-grading applications are submitted through the national official, BECTU, 373-377 Clapham Road, London, SW9 9BT.

Interview with BECTU management

Confirmed that the scheme includes all aspects of SFX, not only explosives. As such a trainee can expect to spend 5 years until he or she applies for an upgrade to Technician and this 5 year spacing is also expected between this and each of the further grades of Senior Technician and Supervisor.

Mr Neil Corbould was Chairman of BECTU at the time of the meeting and agreed that the formalisation of training and demonstration of competence as an amalgam of knowledge, skills, experience and behaviours can only be good for the trade.

Event Horizon and BECTU agree that it should be possible to correlate the existing grades with qualifications at EQF levels 2, 3 and 4. We also discussed the idea of bespoke qualifications that clearly state what the attendee has achieved and that, if possible, they should be close to other European training and competence requirements, e.g. Germany.

Mr Corbould took an action from the meeting to work through the mapping table produced by Event Horizon to identify which standards would apply at each of the grades of Technician, Senior Technician and Supervisor.

Tom's notes:

- Very basic/beginners 'Intro & Awareness course' , perhaps only a couple of hours (DVD)? Delivered on site to trainees, drivers etc.
- 3 levels/courses aimed at Technician / Snr. Technician / Supervisor
- Trainee (intro & awareness) - (5 yrs) - 1. Tech - (5 yrs) - 2. Snr. Tech - (5 yrs) - 3. Supervisor
- 'Refresher course every 'x' years ?
- Bespoke courses created from selected elements of relevant standards
- Training & Assessment - simulation in Quarry (Somerset), can be filmed to create archive footage etc.

- Observation in workplace - work sheets completed by candidates and signed off by supervisor.

Tom followed up with numerous phone calls and emails which resulted in the BECTU executive agreeing that the new qualification structure and supporting qualifications would be suitable for their use.

MAPPING THE EXISTING COURSES TO THE OCCUPATIONAL STANDARDS

Identifying appropriate occupational standards. Event Horizon has worked with BECTU for many years and many members of their staff are members of the union in their own right. As such, and having delivered the so-called Part 1 course, they were aware of the SkillSet occupational standards for special effects

After a short introductory session on how to map the course to the Standards, Event horizon went on to identify not only which of the Standards are covered in their current training but also whether they covered it as either 'knowledge' or 'performance' in keeping with the Standards. The former was identified by whether or not the topic was assessed in the current end-of-course examination and the latter would be considered as fully mapped if it was tested practically during the training.

GAP ANALYSIS

Event Horizon made use of a simple tabular map of the Standards to their training and the clever part of their work was in identifying partial or complete gaps between their training and the existing SkillSet and HSQ standards/qualifications. This was achieved by colour-coding: green for completely mapped; amber for partially mapped; red for not included in current training, as shown in this extract from an early draft.

	A	B	C	D
1	Training Objectiv	Reference to current course	HSQ Standards	SkillSet Standards
2				SKSSFX03
48		Disposal of Excess Explosives Basic information describing the various techniques for disposing of the different types of excess, unwanted and waste explosives that may be left after Pyrotechnic SFX have been executed. Disposal process requirements for compliance with HSE Guidance Note CS23 ('Disposal of Explosives Waste')		P16 ensure that all materials associated with the effect have been correctly disposed of once used and that the location is returned to a safe state
49				P17 ensure the provision of suitable and competent fire cover appropriately protected
50				P18 provide alternative solutions if the effect cannot be produced to the original design or budget
51				P19 take into account all aspects of risk assessment and management and provide any documents to that effect when required to do so
52		Students are given a lecture on relevant parts of Explosives Regulations 2014. This covers sale, classification, transfer, transport of <50 kg and storage. 19. What basic documents should accompany explosives being moved on a public highway when the load is less than		K1 the relevant regulations and legislation, including Health and Safety Executive (HSE) regulations, storage licensing and store specification, transportation regulations, purchasing and manufacture licensing
53				K2 how to convert a script idea into reality - designing the visual look and rational to ensure authenticity
54				K3 the general principles of using minimum force to achieve a visual result
55		3. Name one hazard of using multiple nitro-glycerine explosive charges in water? 2. Name one waterproof explosive and one non-waterproof explosive. 5. What must be avoided when cutting detonating cord? 13. Describe the construction for a box for holding detonators? 16. What should be worn when handling nitro-glycerine explosives? 20. What must be ensured at both ends of a shot firing cable before charging commences?		K4 a complete appreciation of basic safety including means of initiation, avoidance of inadvertent initiation, suitable storage, safe handling and working practices
56				K5 how to effectively communicate with the production and all relevant departments
57				K6 the most appropriate film speeds to use, particularly with miniatures and different scales
		21. What are the units of measurement for air overpressure? 22. Name		K7 what to advise regarding appropriate environmental

The same table was used by Event Horizon and BECTU to identify what should be included in the three grades of the revised, progressive suite of qualifications.

DESIGNING A REVISED SFX TRAINING AND QUALIFICATION FRAMEWORK

The next stage from mapping the existing courses to NOS was for the owner of the training requirement, BECTU, to work with Event Horizon to set down exactly what the expectations are for each grade.

The nature of work in this part of the explosives industry is that individuals move around a lot, working on location almost anywhere on the globe. Despite this constraint, Event Horizon did receive agreement that a three-tier qualifications framework should meet their requirement.

Event Horizon approached HSQ to determine the most appropriate way to deliver the framework – bespoke or recognised qualifications. BECTU's aspiration to enable their qualified members' credentials to have value in the wider industry and in the eyes of the authorities, plus deeper consideration of the need for each qualification to demonstrate the capability of the individual in the most efficient way, led to the conclusion that the industry-recognised qualifications fit the bill.

Event Horizon confirmed this conclusion with BECTU and pressed on with the development of their Qualifications Centre and the redesign of their training courses and the associated assessment strategies to deliver the knowledge requirements and some of the performance criteria for these qualifications:

- Level 4 Diploma in "The use of explosives in the entertainment industry" - HSQ code: Q10-C2-003.
- Level 3 Diploma in "The use of explosives in the entertainment industry" - HSQ code: Q10-D3-002.
- Level 2 Certificate in "The use of explosives in the entertainment industry" - HSQ code: Q10-D4-001.

Event Horizon will work with BECTU to ensure that those technicians, senior technicians and supervisors who will be called upon to provide witness testimony for candidates' portfolios, most likely in the form of signing-off candidates' BECTU logbook entries, understand the principles of assessment and therefore the importance of their testimony.

ROLE PROFILING TO IDENTIFY THE STANDARDS TO BE ADDRESSED IN THE NEW QUALIFICATIONS SCHEME

The first stage in designing the new qualifications scheme was to create role profiles for each grade, as agreed with BECTU.

The grades covered in this role profiling activity were:

- Trainee (this is a formal grade in the BECTU system, although as an individual progresses he/she might be awarded sub-grades of 'Assistant Technician' or 'Engineer' to allow them to be paid a higher rate and to give the customer a better feel for the individual's experience.)
- Technician
- Senior Technician
- Supervisor

Event Horizon used an existing role profile template and mapping table in a top-down process to create new role profiles for approval.

It was important that the company understood the rationale for creating a role profile for each grade as part of the top-down approach being taken to ensure that all the activities that could be expected of a practitioner in each grade were captured. The selection of ESA and SKSFX NOS for each grade ensured the best fit of Standards to the role, which could then be used to design the training programmes for each, including formal courses and what would be expected to be learned on-the-job.

Although restricted to just those two sets of NOS, this work was very similar to the job analysis phase of a more formal systems approach to training (SAT), which would allow the company to explain the logic to the sponsor of the training programme, BECTU.

During the role profiling work, it became clear that Event Horizon would need to provide examples of how some units would relate to the SFX operators at any grade. These examples would be of some significance in explaining the design of the qualifications and associated training and assessments to BECTU and individual supervisors and technicians. Two of the examples are shown here:

- NOS 3.16 - Contribute to conducting a trial or test of ESA. It is very common for SFX technicians to modify or create a pyrotechnic article to achieve a very specific effect. Before being taken into use on set, the technician will conduct a test or trial of the pyrotechnic substance or article to ensure it gives the desired effect and is safe to use in the proximity of actors and equipment. A trainee can be expected to:
    - Assist techs in setting up, carrying out and de-rigging pyro test. Basic Understanding of products (bullet hits, maroons, detonator, detcord, etc.) and equipment (firing box, battery, firing lines etc), what it/they do and essential safety requirements. E.g. safety on the firing box, shunting lead wires etc.,
    - Basic understanding of suitable products or ways of achieving the effect. (eg body hit with a squib or strungbound maroon?)
    - Ability to carry out instructions (under constant supervision) as ordered, in a safe and effective manner. E.g. connecting pyro to firing line, make a system live, fire the effect, make system safe.
- NOS 7.6 - Maintain the quality of explosive substances and/or articles in storage. All SFX technicians store their products at some stage and they understand that the explosive substances and articles that they use can be degraded by climatic conditions. They therefore maintain the quality of their products in storage so that the products work as designed and the technician doesn't lose money through having to replace the products too frequently. A trainee can be expected to:
    - Understand suitable storage conditions, look for potential problems that may arise e.g damp making boxes soggy etc

WORKING WITH IEXPE ON MEMBERSHIP CRITERIA

At the IExpE AGM in Apr 15, a new grade of Technical Member (TMIExpE) was approved and it was introduced in 2016. Existing Associate members (AIExpE) of the Institute will continue with their current rights and benefits and they will also be offered the opportunity to change to the new grade.

Event Horizon and BECTU requested that the three grades of BECTU qualification should be aligned with the grades of IExpE membership:

BECTU GRADE	IExpE GRADE
Trainee	Student
Technician	Technical Member Associate (for those already in IExpE before 31 Dec 15)
Senior Technician	Member
Supervisor	Member Fellow

DESIGNING THE NEW QUALIFICATIONS

Event Horizon met the awarding organisation, Homeland Security Qualifications (HSQ), because it is the awarding organisation that creates, manages and awards qualifications in order to maintain impartial governance and rigour in the system. This principle applies whether the qualifications are national, industry-standard or bespoke for a particular organisation.

We had an idea of what we wanted but were concerned about the sheer volume of individual Standards in each Role Profile that we had created. The role profile for the Technician grade includes over a hundred individual Standards in eleven key roles. Clearly this was going to be unmanageable and place an unfair burden on candidates and assessors.

Fortunately, HSQ has dealt with this situation on many occasions and they were able to advise on how to whittle down the number of Standards in a qualification that remains relevant to the industry and individual while ensuring the core competence of the individual and maintaining the required quality. As it happens, HSQ had designed qualifications for the use of explosives in the entertainment industry some years ago, in concert with stage and film pyrotechnicians and civil war re-enactors, but none of which had been taken up as a formal qualification. Our design session with HSQ therefore became a lot easier as it then required us to update the qualifications, ensuring that the critical, core needs of BECTU and the wider SFX community were still met.

The actual design of the Level 3 Diploma in the Use of Explosives in the Entertainment Industry includes 17 Standards that, when combined, demonstrate the overall competence of the candidate. The Key Roles covered in the Level 3 Diploma are: Explosives Safety Management; Procurement; Movement; Other Applications (Entertainment); Generic. The design sets out the Standards the candidate is required to complete, the EQF Level, the Combination Value (a representative value that is similar in all respects to the number of credits that might be attributed to a standard if it were included in an academic course) and the nominal number of hours of learning time (DLH in the table, 'Directed Learning Hours', which can be time in training, private study or gaining experience on the job) a candidate is expected to take on average to achieve the standard. In most cases the

'HSQ Unit No' is the same as the National Occupational Standard reference number, but HSQ has simplified their listing by renumbering some of the NOS that include the suffix 'A', e.g. QU2.15 is listed in the NOS as 2.9A.

A top-level qualification design looks like this (many of the rows are omitted for brevity):

HSQ Unit No.	Unit Title	Level	Combination Value	DLH
QU2.15	Implement risk control measures for explosive substances and/or articles	3	3	15
QU10.2	Design the explosives display	3	3	5
QU13.2	Work effectively in a team involved in activities for explosive substances and/or articles	2	4	6

At the end of work with the awarding organisation, we had confirmed designs for 3 qualifications:

- Level 4 Diploma in The use of explosives in the entertainment industry - HSQ code: Q10-C2-003.
- Level 3 Diploma in The use of explosives in the entertainment industry - HSQ code: Q10-D3-002.
- Level 2 Certificate in The use of explosives in the entertainment industry - HSQ code: Q10-D4-001.

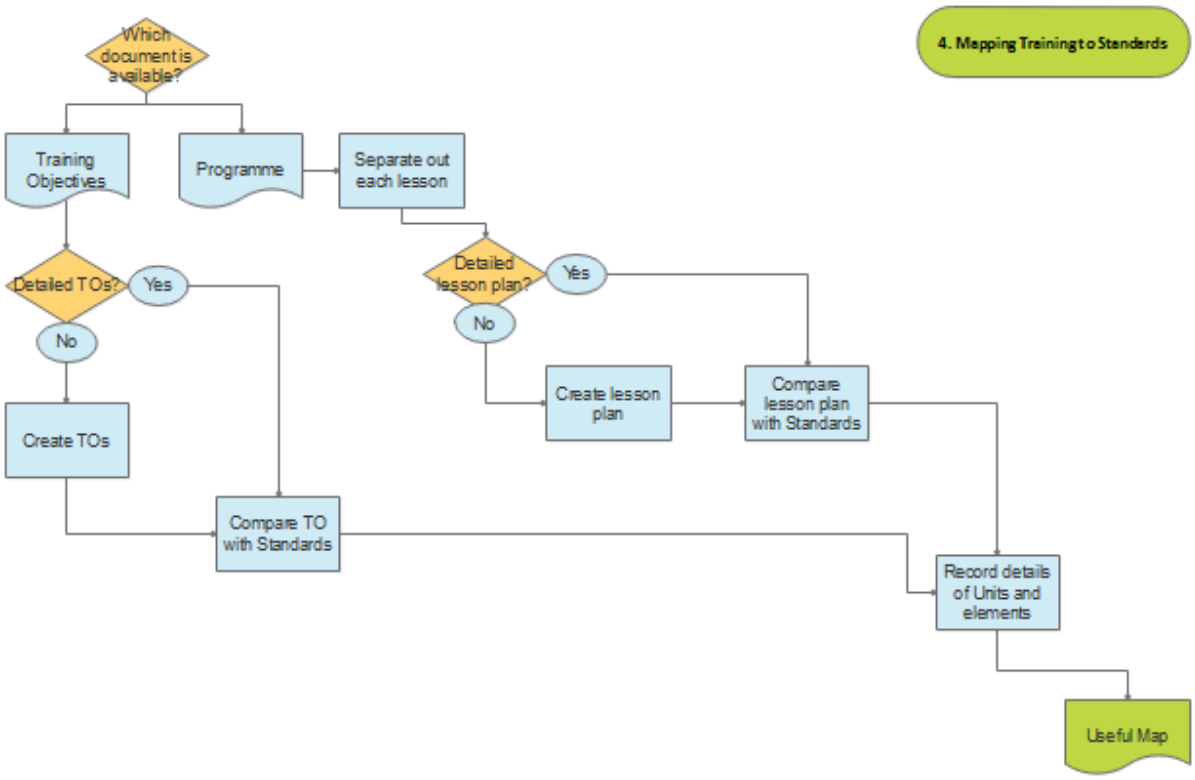
In parallel with the design of the qualifications, Event Horizon continued with its aim of becoming an HSQ Qualifications Centre and will be able to offer these qualifications:

MAPPING THE EXISTING COURSES TO THE STANDARDS

…and identifying the gaps between training and the new qualifications

Once we had our accepted qualifications designs we could get around to mapping the existing courses to not only the Standards but also to the qualifications. It made sense to wait until this stage because of the previously mentioned issue of volume of Standards included in the Role Profiles.

Using the process outlined in the '[Step-by-Step Guide to Implementing Occupational Standards]', which is available as a separate document, we followed the 'Which document is available? … Programme …' route shown in the flow chart.



Having the course material, course design and a copy of the Candidate Pack for each of the qualifications meant that we could relatively easily identify which Units and elements of units should be included in the course and which would be better suited to being assessed using Witness Testimony as evidence.

It was always our intention that gaining a vocational qualification should be achievable in the least complex way possible, within the governance and assurance requirements of the awarding organisation and the BECTU grading system. Given the hazardous nature of working with explosives and pyrotechnics on a film or television stage or a theatre stage or outdoor re-enactment arena, we considered that evidence should come from two main sources: the theory and practical parts of the course we were designing and from witness testimony in the form of signed-off entries in candidates' logbooks. The latter requirement led to us offering briefings to potential 'witnesses', i.e. SFX Supervisors and Senior Technicians, on the value of their comments and the VARCS[32] qualities it should embody.

At the beginning of the process, our starting materials were:

[32] Valid; Authentic; Reliable; Current; Sufficient

- The Course Programme, which had evolved organically over the years that it had been delivered, without any systematic approach or audit trail of initial design, requirements for change and consequent changes made.
- The course presentations, which usually did not have speaking notes and none of which were related to a lesson plan.

The actual process of mapping the existing course design and materials to the NOS was conducted with the simple aim of ensuring that as much as could reasonably be achieved within a time-limited training and assessment course, with the remainder being clearly identified so that the candidate and their supervisor would know what would be required to be observed and signed-off in the workplace. Mapping then became an iterative process of considering the course materials available for each of the assessment criteria in the qualification, what was already covered in the theory exam and on the practical day, what could be included in a redesigned course and assessment and what could not.

This exercise showed us where we had the requirements for the qualification well covered and where the Unit/Element became the Training/Learning Objective for new lesson plans and training material. Using the format provided in the candidate pack for the qualification as a basis (the 2 teal-coloured columns at the left of this extract) and adding two further columns (the light green columns at the right-hand side), we worked through each Standard and element. For each element, we considered whether it was delivered in the training, what we would expect candidates to already know from their experience as a Trainee within the BECTU grading system, how we would assess against the assessment criteria and what actions we would need to take to ensure that a candidate would achieve all of the Standards in a reasonable timeframe, either through modifying the training or clearly identifying elements that would need to be observed and recorded by Supervisors or Senior Technicians on-set.

Title	QU 10.4 Contribute to the preparation and positioning of explosive effects		
Level	3		
Combination value	3		
DLH	5		
Learning outcomes When awarded a combination value for this unit, a learner will:	Assessment criteria Assessment of this learning outcome will require a learner to demonstrate that they can:	Assessment Method Practical / Theory Test	Teaching method Reference to course & actions required
01 Be able to contribute to the preparation of explosive effects for single phase displays	01.01 Confirm the suitability of the area and resources to meet the design requirements for the explosive display 01.02 Prepare the area in accordance with the explosive display plan using equipment and consumables 01.03 Prepare and set up the equipment and explosive effects in accordance with the explosive display plan and confirm their serviceability 01.04 Ensure that safety arrangements are in place in accordance with the explosive display plan	01.01.01 Practical, Verbal Question/Observation – Give candidate a plan of the effect, take them to the location and ask them whether the area is suitable to perform the effect and what resources they would need (explosive article, cable, firing gear etc.) 01.02.01 Practical, Observation – Watch candidate preparing their individual charge for the strafing run (separate explosive from ground with sandbag etc) 01.03.01 Practical, Observation – Watch candidate preparing their firing device (test resistance and continuity and confirm maintenance of equipment)	Practical day plan/method statement including product data sheets, provided to all candidates 01.01.01 Slide - Det Hazards 1. Slide - Description of relevant explosive articles and associated resources (when, where, how, data sheet) 2. Slide – what areas/locations are suitable for different articles/substances e.g fragmentation, flammable environment

At the end of the exercise we had developed new course programmes, lesson plans, assessment strategies and assessment specifications for each course. This enables us to demonstrate the rigour of the governance framework to BECTU and other organisations that might wish to confirm the credentials of the successful candidates.

Part of our assessment strategy for each course was to assess candidates' prior experience, particularly for demonstrating competence in Key Role 13. A major factor was the need to make any documents a natural part of the course from the candidates' perspective. With this in mind, as well as the continuous assessment during the course, we felt that a workbook was a sensible solution.

When we were designing the material for the L2 course, we recognised that an 'Enrolment/Arrivals Form' that required candidates to bring their logbooks and other evidence such as testimonials with them would be useful and it could also act as a self-assessment/reflection statement. Working through the course design process, we noted that there were many occasions when the answers to written questions were the most appropriate evidence. It was natural, then, to combine the needs for prior knowledge and experience with coursework in a workbook that would be part of the candidate's qualification portfolio and a useful addition to their professional logbook.

The initial design for the workbook looked like this:


EVENT HORIZON
EXPLOSIVE ENGINEERING

LEVEL 2 – USING EXPLOSIVES IN THE ENTERTAINMENT INDUSTRY
WORKBOOK

Name:

Candidate Number:

What are your career aspirations?
(QU13.1 - 01.05.01)

In the same vein, it was clear that the instructor/assessor needed a simple document to capture their assessment evidence while they were busy running the course. We designed an "Assessor's Observation Sheet' to capture observation notes, verbal questions and professional discussion notes:

LEVEL 2 CERTIFICATE IN USING EPLOSIVES IN THE ENTERTAINMENT INDUSTRY
ASSESSOR OBSERVATION SHEET

OBSERVATIONS

VERBAL QUESTIONS

8.4 – 01.06 Describe the requirements of explosives transport documentation

ACCIDENTAL OUTCOMES FROM THE PROJECT

The owner of Event Horizon recognised during the first year of the project that the drive towards demonstrable competence within the SFX community, coupled with the professionalisation of the SFX courses they deliver, provided an opportunity for the company to step further into the training, assessment and qualification arena. In July 2015, Event Horizon entered into dialogue with Homeland Security Qualifications, the awarding organisation for vocational qualifications in the explosives, munitions and search occupations, with a view to becoming an HSQ Qualifications Centre.

This development provides Event Horizon with a better understanding of the occupational standards, looking at them from a quality assurance viewpoint to ensure that there is consistency in the assessment of candidates, i.e. the application of the Standards in the training and workplace environment.

Setting up a qualifications centre also required the formal training and qualification of sufficient assessors and internal quality assurance (also known as internal verification (IV)) to enable the company to assess candidates on the various courses and also their workplace evidence as they continue towards completion of their own qualifications following training.

Role of VQ Assessors

VQ assessors support and assess people working towards qualifications in settings like colleges, training centres and the workplace. The assessor's job is to help make sure that trainees meet all the occupational standards needed to achieve their qualification. The role of the assessor may combine some teaching or training duties with assessment work.

The tasks expected of an assessor include:

- planning and delivering vocational training programmes and workshops
- observing and assessing candidates in their workplace
- examining candidates' portfolios of evidence
- questioning candidates about how they would deal with non-standard situations
- providing feedback and offering advice if the standards are not met
- signing off the award when all the requirements have been met
- keeping records of candidates' progress
- attending meetings with other assessors
- working closely with training staff and candidates' managers.

In the UK a VQ assessor needs one of the following qualifications:

- Level 3 Award in Assessing Competence in the Work Environment – for assessing occupational competence in the workplace

- Level 3 Award in Assessing Vocationally Related Achievement – for assessing vocational skills and knowledge outside the workplace, for example in classrooms or workshops

- Level 3 Certificate in Assessing Vocational Achievement – for assessing both occupational competence in the workplace, and skills, knowledge and understanding outside the workplace.

An assessor is usually required to hold a qualification at level 3 or above in the area of work they wish to assess; for example a Level 3 Diploma in Health and Social Care or equivalent if assessing care assistants. Older qualifications, such as level 3 NVQs can still be used to meet this requirement. Event Horizon will expect any assessor to hold a current qualification in the subject area that they will assess. 'Current' in this context means that the assessor can demonstrate that they have worked in their specific area at Level 3 or equivalent within the last 3 years.

Role of Quality Assurance Verifiers

An internal or external verifier provides assurance that an organization's assessment methods meet the awarding organization's quality standards.

An internal verifier (IV) requires:

- Level 3 Award in Assessing Competence in the Work Environment
- Experience of assessing in the same, or similar, occupational area to the one they will be verifying.
- EITHER Level 4 Award in Internal Quality Assurance of Assessment Processes and Practice – for those who quality assure the work of assessors
- OR Level 4 Certificate in Leading the Internal Quality Assurance of Assessment Processes and Practice – for those who manage and plan the work of a team of assessors.

An external verifier (EV) needs:

- Level 3 Award in Assessing Competence in the Work Environment
- Experience of assessing in the same, or similar, occupational area to the one you will be verifying.
- EITHER Level 4 Award in External Assurance of Assessment Processes and Practice – for those checking assessment procedures for an external organization such as an awarding body
- OR Level 4 Certificate in Leading the External Quality Assurance of Assessment Processes and Practice – for those who manage the work of a team of external verifiers.

MAKING EVENT HORIZON A QUALIFICATIONS CENTRE

Event Horizon ran one of their basic courses in September 2015, to which Ken was invited as an observer. Discussions before and during the event with Tom and Charlie concluded that it would be beneficial to the company if they were to become a registered qualifications centre to deliver a number of different qualifications, not the least of which would be the suite of SFX qualifications being developed in this project.

Event Horizon was put in touch with the awarding organisation, Homeland Security Qualifications (HSQ) to begin the process. Tom was also put in contact with the International School for Security and Explosives Education (ISSEE) which has an Assessor Centre that will train, assess and qualify new assessors and Internal Verifiers.

On 11 Nov 15, Event Horizon formally registered its intent to become a qualifications centre with HSQ.

Tom and Charlie attended an assessor course and subsequently completed their assessments on the job when they were assessing trainee.

CASE STUDY – GJR Pirotecnia e Explosivos

BACKGROUND

G.J.R. – Pirotecnia e Explosivos, SA is a manufacturer of pyrotechnic articles, black powder and a distributor of explosives products. Other business areas are the display of fireworks shows and the application of explosives at quarries and construction works.

GJR joined the project to test the procedures for the implementation of occupational standards. They expected to change some of our practices and develop knowledge and share our experience. We will be involved in the project with five persons.

GJR was supported by the University of Coimbra(UC), one of the oldest universities in continuous operation in the world and one of its largest higher education and research institutions. It is organized into eight different faculties according to a wide range of fields, granting academic bachelor's, master's and doctorate degrees in arts & humanities, laws, sciences and technologies, medicine, pharmacy, sports, social sciences and economics. UC has approximately 25,000 students, and hosts one of the largest communities of international students in Portugal.

The University of Coimbra (UC) has a strong relationship with the military and civil industry of explosives in Portugal. The Laboratory of Energetics and Detonics is an infrastructure built in 1990 under the cooperation of the Portuguese Society of Explosives (SPEL) and the University of Coimbra and it has been the main laboratory facility for the support of experimental research about explosives, pyrotechnics and propellants.

Many teachers and researchers from Mechanical, Chemistry and Geology & Mines of University of Coimbra have taught in several courses about explosives and pyrotechnics characteristics and application in military and civil use. Several master's degree theses and PhD theses have been made about subjects related with civil and military explosives, detonation, initiation, thermal decomposition, shock generator, prediction of detonation and combustion, environment effects. In parallel teachers and researchers have produced several papers and participated in international conferences (ICT Conference, APS conference, Detonation Symposium, Pyrotechnic seminar, international symposium in Fireworks, ICDERS, etc). At the same time many teachers and researchers of UC has been participating in several European projects about explosives.

Many projects related with explosives have been performed by teachers and researchers of the UC. Most of them have been developed in cooperation with European partners: in military area under the framework of the European Defence Agency (EDA) and financed by Ministry of Defence (e.g. Formulation and Production of New Energetic Materials (FPNEM)), in the civil area under the framework of the EU Leonardo da Vinci programme and committed to education and certification of competencies and skills (e.g.. EUExcert, ESSEEM, EUExNet). The cooperation of teachers and researchers of the UC with the Portuguese explosives and pyrotechnics industry has been performed in several areas: training courses, short and large contracts with military divisions and civil private companies, co-supervision of stages for master students, seminars and workshops. Several teachers and researchers of UC are/were members of the Board of several societies or committees (European Federation of Explosives (EFEE); IGUS Group, Portuguese Association of Studies and Engineering of Explosives (AP3E) and Technical committee of Conferences and Journals about Energetic Materials).

In outline, GJR's sub-project has the following elements:

- Understanding vocational qualifications

    - Understanding occupational standards
    - Understanding the combination of standards that make a qualification
    - Understanding assessment in the workplace
- Consultation on which approach to take to qualifying company staff.
- Role Profiling workers
- Confirming the qualifications required across the company
- Prioritising which qualifications need to be part of the project and which might wait
- Identifying which members of staff will be involved in the project and in the future
- Identifying a qualifications centre to provide the required registrations, training, assessment and verification.
- Undertaking the qualifications
- Maintaining the Case study

They first created a check sheet that identified which partner would take the lead:

	UC	GJR
Understanding occupational standards	✓	
Understanding the combination of standards that make a qualification	✓	
Understanding assessment in the workplace		✓
Consultation on which approach to take to qualifying company staff	✓	✓
Role Profiling workers		✓
Confirming the qualifications required across the company	✓	✓
Prioritising which qualifications need to be part of the project and which might wait	✓	✓
Identifying which members of staff will be involved in the project and in the future	✓	✓
Identifying a qualifications centre to provide the required registrations, training, assessment and verification	✓	
Undertaking the qualifications		✓
Maintaining the Case study	✓	✓

In order to understand the standards, they worked through them one by one, relating it to their own needs, using a tabular approach:

	Competences relevant	Key Role	Performance Criteria	Knowledge Requirements
Execute the manufacturing processes	**Mandatory** Prepare explosives process area and equipment Move materials within the explosives process Monitor and control explosives processing Shut down explosives process **Optional** Prepare the explosives process materials Work effectively in a team involving explosive substances and/or articles	4 4 13	Work safely at all times, complying with health and safety, environmental and other relevant regulations, legislation and guidelines Ensure that you have the required authorisation to proceed	The health, safety and environmental and other statutory legislation, regulations and safe working practices and procedures governing explosives, and their implications for your area of work ...

UNDERSTANDING VOCATIONAL QUALIFICATIONS

For the key profile 4 on Manufacture were identified three role titles (Manufacturing Engineering, Manufacturing Supervisor and Manufacturing Operator). For each of them were translated and analysed the responsibilities and competences relevant to the role.

Mandatory	Optional	Key role
• 4.4 • 4.5 • 4.8 • 4.11	• 4.6 • 4.13 • 4.14 • 5.4 • 5.9 • 5.15	• 4 - MANUFACTURE OF EXPLOSIVE SUBSTANCES AND ARTICLES • 5 - MAINTENANCE

CONSULTATION ON THE COMPANY'S APPROACH

The responsibilities and competences relevant of each role title were compared in rude approach with the available staff description of the functions of the workers at the company. This exercise was performed using the tasks described in the procedure manual of the company for the manufacturing of black powder for quarries.

Consultation on which approach to take to qualifying company staff

Build a portfolio of company staff and compare with NOS standards

Responsibilities of this role	
	☑
	☑
	☒
	☑

Competences relevant to this role			
Mandatory		Optional	
	☑		☒
	☒		☑
	☒		☒
	☑		☑
	☒		☑

Others competences identified But out of NOS

Mandatory		Optional	

It was also identified the levels of recommended of mandatory vocational training and the correspondent level within the EU qualification framework.

Consultation on which approach to take to qualifying company staff

Additional vocational training to approach to qualification

SQ Level VQ	Training relevant to this role
SQ Level ? VQ (i/under 8 EU Framework)	AAAAAAAAA
	BBBBBBBBBB

At the first company meeting in Portugal the partners requested clarification of the assessment standards, specifically whether a candidate was required to 'pass' every element of each unit in their qualification. Readers will understand that the project partner comes from a higher education academic institution, in which a candidate under test conditions would be required to attain a mark of 40-75% to 'pass' the test, depending on the assessment strategy of the institution for that particular qualification.

It is important to note two things in response to this question:

- The approach to assessment for these vocational questions is outcome-based and the candidate and assessor will agree the assessment method such that the candidate can demonstrate their competence in the most relevant way. The assessor will provide feedback at the assessment but should not declare a 'pass/fail' decision. A candidate will be told that they either have or have not attained the standard required for that particular unit or element of a unit at that time. The candidate who does not attain the standard on a particular assessment can be reassessed a number of times, using different assessment

techniques and types of evidence, to allow for the candidate 'having a bad day' or suffering from assessment nervousness.

- A candidate is expected to provide evidence that demonstrates their competence in all elements of each unit.

ROLE PROFILING

The project partner's previous experience in EUExcert projects was of great benefit to the industry partner right from the start. Role profiling had been a topic of discussion and Coimbra University had been one of the EUExcert partners that made a small pilot study of rolling out a qualification in the last project.

The Portuguese team had taken careful notes of the role profiling process and developed a system of role profiling which mapped their expectations of production staff to the Standards and also to company manuals, to ensure that they had covered as many aspects as possible. This detail proved very useful in the next stage, when they identified the qualifications that would be most relevant for the company and those staff that would be assessed within the scope of the project.

The role profiling methodology that GJR and UC adopted was…

Propose the roles:

PROPOSALS

Role title:		
ESA Manufacturing Engineer	**ESA Manufacturing - Supervisor**	**ESA Manufacturing - Operator**

Role purpose:		
To plan and manage the manufacture of ESA safely, efficiently and in an environmentally sound manner using appropriate techniques which are efficient, effective and timely and in compliance with all relevant legal and other requirements. Consult Technical Authorities as appropriate.	To supervise the manufacture of ESA safely, efficiently and in an environmentally sound manner using appropriate techniques and to contribute to their efficiency, effectiveness and timeliness and in compliance with the organisation's procedures.	To manufacture ESA safely, efficiently and in an environmentally sound manner using appropriate equipment, plant, processes, procedures and techniques in compliance with the organisation's procedures.

Responsibilities of this role:		
Design and implement a robust Safe Statement Of Work, which identifies Hazards, mitigates risks, predicts possible outcomes including unplanned events,	Implement a robust Safe Statement Of Work, which identifies Hazards, mitigates risks, predicts possible outcomes including unplanned events, and provides appropriate emergency procedures.	To comply with the Safe Statement Of Work and your organisation's policies, procedures and practices.

and provides appropriate emergency procedures.		
Comply with your organisation's policies, procedures and practices.	Comply with your organisation's current policies, procedures and practices.	Perform pre- and post-use checks to ensure facilities, plant and equipment are serviceable for the task; to maintain facility as appropriate and to report discrepancies and contribute to improvements.
Ensure facilities (including plant and equipment) are fit for the manufacturing task; maintenance regime is up-to-date and that they are certified to carry out the planned task. Report discrepancies and contribute to improvement.	Check facilities (including plant and equipment) are fit for the manufacturing task and that the maintenance requirements are up-to-date. Report discrepancies and contribute to improvement.	To contribute to the effective manufacture of ESA by: - • Understanding the type, quantity, quality of ESA to be manufactured. • Conducting a manufacturing process, procedure or technique. • Conducting logistics, hand-over, receipt and despatch.
Confirm the type, quantity, condition and requirement for manufacture of ESA. Determine, adapt or design a manufacturing equipment/plant, process, procedure or technique (where appropriate).	Contribute to a robust plan for carrying out the effective and efficient disposal tasks; communicate it and de-conflict where necessary.	Execute the manufacturing processes.
Define logistics, hand-over, approval, receipt and despatch processes. Record manufacturing outcome and FFE is certified as appropriate.	Execute the plan and recommend adjustments as appropriate.	Review performance, identify and recommend improvements.
Produce a robust plan to effectively and efficiently carry out the manufacturing tasks, which should ensure that legal and performance and stakeholder requirements are met (SHE, Quality, scheduling)	Review performance, identify and recommend or initiate improvements.	Effectively utilise resources to complete, safely and successfully the manufacturing task
Communicate the plan and de-conflict where necessary.	Direct resources (people, time) available to complete, safely and successfully the disposal task.	Develop and maintain own competence.

Monitor the plan and adjust as appropriate within level of responsibility.	Developing and maintaining competency of self and others to undertake the task.	
Review performance, identify and recommend or initiate improvements.		
Ensure self and others are competent with suitable; training, knowledge, experience, behaviour and ability.		
Ensure resources (people, time) available to complete, safely and successfully the disposal task.		

Competences relevant to this role:					
<u>Mandatory</u>					
Develop and update explosives Standard Operating Procedure/s	4.1	Supervise the preparation of explosives processing operation	4.7	Prepare explosives process area and equipment	4.4
Resolve explosives operational problems	4.3	Supervise explosives processing	4.9	Move materials within the explosives process	4.5
Plan explosive substances and/or articles configuration activities	5.13	Solve explosives process problems	4.10	Monitor and control explosives processing	4.8
Manage explosive substances and/or articles configuration activities	5.14	Supervise the shutdown of explosives processing	4.12	Shut down explosives process	4.11
Audit the effectiveness of explosive substances and/or articles configuration activities	5.16	Contribute to explosives Standard Operating Procedure/s	4.14		
Define explosives facilities requirement	9.1	Manage explosive substances and/or articles configuration activities	5.14		

Ensure explosives facilities are fit for purpose	9.2	Ensure explosives facilities are fit for purpose	9.2		
Manage explosives safety	13.16	Supervise explosives safety	13.8		

Optional					
Contribute to the validation and optimization of new or modified explosives processes and equipment	4.2	Contribute to the validation and optimization of new or modified explosives processes and equipment	4.2	Prepare the explosives process materials	4.6
Supervise the preparation of explosives processing operation	4.7	Supervise the placing of explosive substances and/or articles into storage	7.2	Separate recoverable materials and waste produced by the explosive process	4.13
Prepare and submit explosives licence application	2.14	Conduct an assessment of risks in the workplace (CPPCO 3.13)	13.8	Contribute to explosives Standard Operating Procedures/s	4.14
Manage explosive substances and/or articles stock levels and stock inventories	7.13	Provide explosives technical or safety advice and/or guidance to others	13.9	Implement the inspection of explosive substances and/or articles	5.4
Develop and implement explosives facility decommissioning plan	9.4	Make presentations of explosives matters	13.10	Implement the routine assembly of explosive substances and/or articles	5.9
Determine the existence of a suitable explosive substances and/or articles disposal procedure	11.2	Hand over explosive substances and/or articles	13.11	Implement explosive substances and/or articles configuration activities	5.15
Manage continuous improvement for explosive substances and articles activities	13.4	Manage equipment in an explosives environment	13.14	Work effectively in a team involving explosive substances and/or articles	13.1
Provide explosives technical or safety	13.9	Certify as Free From Explosives	13.17	Hand over explosive	13.11

advice and/or guidance to others				substances and/or articles	
Make presentations on matters relating to explosives.	13.10			Pack or re-pack explosive substances and/or articles	13.12
Manage equipment in an explosives environment	13.14			Unpack explosive substances and/or articles	13.13
				Prepare and care for equipment in an explosives environment	13.15
				Certify as Free From Explosives	13.17

VQs relevant to this role		
HSQ Level 4 VQ in Explosive Substances and Articles Manufacturing Management (04-001-04)	HSQ Level 3 N/SVQ in Explosive Substances and Articles Manufacturing Supervision (04-002-03)	HSQ Level 2 VQ in Explosive Substances and Articles Manufacturing Operations (04-003-02)

Training relevant to this role		
Explosives Substances and Articles	Risk assessment	Explosives awareness
Risk Assessment and Risk Management e.g. FMECA, Fault Tree Analysis, HSG65, HSG268…	Process engineering	
Quality management and continuous improvement	Explosive substances and articles awareness	
Process engineering	Management/supervision of small teams	
Safety process leadership	Assessment of Competence in the Working Environment	
	Process Safety Management	

IDENTIFYING QUALIFICATIONS AND STAFF FOR THE PROJECT

The selection of qualifications that would benefit the company and the staff to undertake those qualifications was the key driver for GJR's involvement in the project, to provide assurance to the management that their competence management system met the same rigorous criteria as the other parts of their quality management system.

Bearing in mind that participation in the EUExImp project was very much a pilot for improving the demonstrability of competence within the company, GJR decided that the black powder production team would undertake vocational qualifications.

Taking into account the work done in role profiling the staff against the entire suite of occupational standards, and comparing the role profiles with the HSQ qualifications available, it was evident that the staff needed to be qualified in manufacture and disposal (because waste is a natural by-product of manufacture). It was equally clear that two options were available at the time: either each person could undertake two separate qualifications from the existing suite available or the company could ask a training provider and the awarding organisation to design a bespoke qualification.

KEY ROLE 4 MANUFACTURE

Level 4 VQ in Explosive Substances and Articles Manufacturing Management

Unit no.	Unit title	M	O
4.1	Develop and update explosives Standard Operating Procedure/s	✓	
4.2	Contribute to the validation and optimization of new or modified explosives processes and equipment		✓
4.3	Resolve explosives operational problems	✓	
4.7	Supervise the preparation of explosives processing operation	✓	
2.14	Prepare and submit explosives licence application		✓
5.13	Plan explosive substances and/or articles configuration activities		✓
5.14	Manage explosive substances and/or articles configuration activities		✓
5.16	Audit the effectiveness of explosive substances and/or articles configuration activities		✓
7.13	Manage explosive substances and/or articles stock levels and stock inventories		✓
9.1	Define explosives facilities requirement	✓	
9.2	Ensure explosives facilities are fit for purpose	✓	
9.4	Develop and implement explosives facility decommissioning plan		✓
11.2	Determine the existence of a suitable explosive substances and/or articles disposal procedure	✓	
13.4	Manage continuous improvement for explosive substances and articles activities		✓
13.9	Provide explosives technical or safety advice and/or guidance to others	✓	
13.10	Make presentations of explosives matters		✓
13.14	Manage equipment in an explosives environment	✓	
13.16	Manage explosives safety	✓	
	ADDITIONAL		
4.11	Shutdown the explosives process	✓	
4.12	Supervise the shutdown of explosives processing	✓	
11.6	Plan the disposal of explosive substances and/or articles (non-complex)	✓	

Figure 12. Example of Qualification Design

As it happens, at the same time, HSQ had been introducing a new suite of qualifications at Diploma level, in 'Explosives Operations'. GJR took a second round of comparison of their requirements against these new qualifications during a company meeting in June 2016 and concluded that this was a much better route because it combines their need for manufacturing and disposals qualifications.

The mapping of the new qualifications to the role profiles is shown at Appendix A.

SELECTING A QUALIFICATIONS CENTRE

During the first company visit, specifically during an explanation of the company's intentions to the staff who would undertake the qualifications selected, it became clear that assessment must be conducted in Portuguese. Although all the staff speak some English, some very well indeed, the complication of translating backwards and forwards was considered too cumbersome, time-consuming and could lead to misunderstanding for the assessor and verifiers. The logical conclusion was therefore that the Portuguese partner(s) should have their own assessors trained.

The outline proposal at this stage was thus for:

a. Training 1 (or possibly 2) assessors from the company. It was clear in our discussions and talking with the staff that it would be best if the assessments were to be conducted in the candidates' mother tongue. The assessor and IV would then be able to have relevant parts from evidence translated.
b. Creating a satellite centre of the UK-based qualifications centre within GJR.
c. Registration and support for 1x Level 4 ESA Manufacturing Manager, 1x ESA Manufacturing Supervisor, 3x ESA Manufacturing Operator
d. The qualifications centre to provide Internal Verification / Internal Quality Assurance services to GJR. The company's quality management policy for all their activities is to use a third-party for 'internal audits'.

After the second meeting, the revised outline proposal became:

a. Training 1 (or possibly 2) assessors from the company and possibly the University. It was clear in our discussions and talking with the staff that it would be best if the assessments were to be conducted in the candidates' mother tongue. The assessor and IV would then be able to have relevant parts from evidence translated.
b. Creating a satellite centre of the UK-based qualifications centre within GJR.
c. Registration and support for 1x Level 4 Explosives Operation Managers, 1x ESA Explosives Operations Supervisor, 3x ESA Explosives Operations Operator.
d. The qualifications centre to provide Internal Verification / Internal Quality Assurance services to GJR. The company's quality management policy for all their activities is to use a third-party for 'internal audits'.

The company that provides GJR with its 3rd-party audits for quality management was briefed on the proposal and the roles and responsibilities of assessors and IV, after which GJR concluded that they would make use of the external company as their assessor.

Initially, GJR was aware of only one organisation that could offer all the requirements listed, however, in the time between the first and second company meetings a second organisation

suggested that it could also provide these services. GJR then entered into a tendering process with the two organisations.

Having clarified the content of training & assessment and the costs entailed, we entered into a contract with a training provider that could train and qualify our own assessors, who would then assess all our candidates in a reasonable timeframe, allowing us to become a satellite qualifications centre in the early days and developing our expertise as assessors and internal verifiers to become a fully-fledged Qualifications Centre within a couple of years.

UNDERTAKING THE QUALIFICATIONS

Confirmation of the qualifications with the awarding organisation

The second Company Meeting confirmed that the most suitable qualifications for the black powder team were available in the new suite of explosives operations qualifications available from HSQ, which include more disciplines in one qualification. This is much more appropriate for small companies whose workforce is required to undertake a number of different key roles within their normal job description. In the case of GJR this particularly applies in needing manufacture and disposal roles.

Assessor qualifications

GJR arranged for two people to take the assessor qualification. The procedure for the two assessors to achieve the qualification was carried out by QinetiQ Centre and was based on the understanding of the assessment methodology and their skill to prepare and conduct two partial assessment of two different. Five days were used to perform the training and assessment of the two candidates. The first two days were used for the candidate assessors to receive the theory elements of the qualification, two days were used for observations of the assessor candidates in the work environment (conducting partial assessments) and one day was used for professional discussion with each candidate.

The theoretical stage was conducted in a meeting room at a local venue and covered the principles and practices of assessment in the workplace. The practical stage was done at the factory and required each candidate assessor to be seen to undertake 2 assessments (by observation, questioning and work product) of 2 learners, i.e. a total of four assessments. This was followed by a professional discussion between the candidate assessor and the instructor/assessor which allowed the instructor/assessor to gain a deeper understanding of the candidate assessor's knowledge and attitudes and performance during their own training and assessment.

At the different steps of the assessment process, each candidate fed a Portfolio that was completed at the end. The accredited Internal Verifier assured the maintenance and improvement of quality assessment, supporting the assessor and monitoring the quality of the assessor's performance, ensuring standardisation between assessors and to meet the external quality assurance requirements.

The two assessors were accredited by the 'Open Awards' awarding organisation, achieving the Open Awards Level 3 Award in Assessing Competence in the Work Environment (OCF).

A Coutinho, a 3rd-party accreditor who is now one of the assessors for GJR, writes that

"My participation in this project was as follows:

- Analysis of Standards;
- Analysis of company processes;
- Qualification as a certified assessor;
- Realization of assessments to 3 GJR level 2 employees

The qualification process as an assessor took place during one week with room and factory training, and it was very important for me to understand the methodology of assessments, its benefits and how to perform them in the future.

At this moment, I am working with the other qualified assessor, and the company GJR, to complete the qualification of three level two employers of GJR."

Explosives operations qualifications

The new assessors initiated the assessment of GJR staff (Level 2, Level 3 and Level 4), first preparing the process before collecting documentation of the GJR internal organization, rules and procedures, so that they could obtain evidences from various reports and records of the candidates' work activities. Based on the Rules of Combination and HSQ Units (mandatory and optional) established for each level, the assessment processes were conducted in order to confirm that the evidence presented was sufficient to demonstrate the competence of the candidate against the Standards. Each assessment process was adapted according the vulnerabilities of the learner and in way to minimize the risks and disturbance during the observations.

Observation in work, verbal questions, witness testimonies and simulation were used to complete the portfolio of each learner.

GJR candidates well understood the assessment procedure and the importance of the portfolio, as the register document of all evidences collected from the observation, questions, witness testimony from other elements of the staff in the organisation chart, and documents produced within the diary tasks.

GJR candidates proved to be motivated to pursue their learning progress in the company in order to achieve all the points for a higher level.

TESTING THE EFFECTIVENESS OF THE CHANGES

A Coutinho, with his combined experience as a 3rd-party accreditor for quality management and now as an assessor, comments that ", I think this project is very important for a large number of entities:

- **For the employers** who were qualified, because they achieve a formal qualification that proves they are capable of doing their job. This is important, not only for them to be able to apply for another job, but also in terms of their self-confidence and pride;
- **For GJR – Pirotecnia Explosivos, SA**, who verified that their processes are current, understood and fulfilled by their workers;
- **For Explosives Companies in Portugal,** who did not have these formal qualifications;
- **For the Qualified Assessors,** who improved their knowledge, and gained a powerful tool for helping their clients."

The experiences of the newly qualified assessors, the five candidates for explosives operations qualifications and the EUExImp partners from GJR and Coimbra University were presented at the annual conference of the AP3E organisation. AP3E is the Portuguese association for the explosives sector and it has both companies and individuals as members. AP3E has been following and disseminating the EUExImp project using their website, newsletter and journal to appeal to the importance of the adoption of standards in Portugal.

The success of the implementation of the standards in a medium enterprise in the explosives sector in Portugal and the participation of Coimbra University in this process open good perspectives for the future adoption of occupational standards in the explosives sector.

Appendices:

A. GJR Manufacturing Qualifications Design Vs ESA Ops Qualification

APPENDIX A to GJR Case Study

GJR PYROTECHNICS AND EXPLOSIVES ESA QUALIFICATIONS

MANUFACTURE

Explosive Substances and Articles Manufacturing Management	Level 4
Explosive Substances and Articles Manufacturing Supervision	Level 3
Explosive Substances and Articles Manufacturing Operations	Level 2

KEY ROLE 4 MANUFACTURE

CV = Combination Value

DLH = Directed Learning Hours

Level 4 VQ in Explosive Substances and Articles Manufacturing Management

Unit no.	Unit title	M	O	ESA Ops Qual (CV – DLH)
4.1	Develop and update explosives Standard Operating Procedure/s	✓		M (4 – 10}
4.2	Contribute to the validation and optimization of new or modified explosives processes and equipment		✓	O (3 – 8)
4.3	Resolve explosives operational problems	✓		M QU 4.8 (5 – 15)
4.7	Supervise the preparation of explosives processing operation	✓		L3 O QU 4.9 (3 – 7)
2.14	Prepare and submit explosives licence application		✓	O QU 2.22 (4 – 15)
5.13	Plan explosive substances and/or articles configuration activities		✓	O (3 – 20)
5.14	Manage explosive substances and/or articles configuration activities		✓	L3 O (4 – 25)
5.16	Audit the effectiveness of explosive substances and/or articles configuration activities		✓	O (3 – 15)
7.13	Manage explosive substances and/or articles stock levels and stock inventories		✓	O QU 7.12 (3 – 10)
9.1	Define explosives facilities requirement	✓		O (5 – 20)

Unit no.	Unit title	M	O	ESA Ops Qual (CV – DLH)
9.2	Ensure explosives facilities are fit for purpose	✓		M (4 – 10)
9.4	Develop and implement explosives facility decommissioning plan		✓	O (4 – 25)
11.1	Assess the explosive substances and/or articles for disposal			O (4-20)
11.2	Determine the existence of a suitable explosive substances and/or articles disposal procedure	✓		L3 O (4 – 20)
11.3	Adapt an existing explosive substances and/or articles disposal procedure			O (4 - 15)
13.4	Manage continuous improvement for explosive substances and articles activities		✓	M QU 13.3 (4 – 8)
13.9	Provide explosives technical or safety advice and/or guidance to others	✓		M QU 13.4 (4 – 8)
13.10	Make presentations of explosives matters		✓	L2 O QU 13.5 (3 – 5)
13.14	Manage equipment in an explosives environment	✓		L3 O QU 13.9 (3 – 5)
13.16	Manage explosives safety	✓		M QU 13.11 (6 – 16)
	ADDITIONAL			
4.11	Shutdown the explosives process	✓		L2 O QU 4.13 (2 – 14)
4.12	Supervise the shutdown of explosives processing	✓		L3 O QU 4.11 (3 – 7)

Unit no.	Unit title	M	O	ESA Ops Qual (CV – DLH)
11.6	Plan the disposal of explosive substances and/or articles (non-complex)	✓		O QU 11.5 (2 – 5)
11.7	Manage tasks for the disposal of explosive substances and/or articles	✓		O (10 – 10)
11.8	Carry out pre-disposal tasks for explosive substances and/or articles	✓		O (4 – 5)
11.13A	Dispose of explosive substances and/or articles by non-complex burning procedures	✓		O QU 11.16 (10 – 10)
11.16A	Dispose of explosive substances and/or articles by non-complex detonation procedures	✓		O QU11.22 (10 – 10)
11.19	Carry out post-disposal tasks for explosive substances and/or articles	✓		L3 O QU 11.26 (4 – 5)
13.1	Work effectively in a team involved in activities for explosive substances and/or articles	✓		L2 M QU 13.2 (4 – 6)
13.8	Conduct an assessment of the risks in the workplace	✓		L3 M QU 13.14 (5 – 8)
	TOTALS			M = 27 - 77 O = 73 - 188 L3 = 26 - 77 L2 = 9 - 25 **TOT=135 - 367**

Candidates must achieve:

All 18 mandatory units and

any further optional units in consultation with GJR management

i.e. ≥18 units

HSQ Level 4 Diploma in Explosives Management – Q00-D4-003	
Candidates must achieve: • all 6 mandatory units, providing 27 combination values • 21 combination values from any combination of the optional units Candidates may only take unit 2.19 or 2.20 but not both. ie a total of 48 combination values	
Min combination values (Mandatory units): 27	**Max combination values (Mandatory units): 27**
Min combination values (Optional units): 21	**Max combination values (Optional units): 44**
Min DLH for qualification: 93	**Max DLH for qualification: 162**

LEVEL 3 VQ IN EXPLOSIVE SUBSTANCES AND ARTICLES MANUFACTURING SUPERVISION

Unit no.	Unit title	M	O	ESA Ops Qual (CV – DLH)
4.2	Contribute to the validation and optimization of new or modified explosives processes and equipment		✓	L4 O (3 – 8)
4.7	Supervise the preparation of explosives processing operation	✓		O QU 4.9 (3 – 7)
4.9	Supervise explosives processing	✓		O QU 4.9 (3 – 4)
4.10	Solve explosives process problems	✓		L4 O QU 4.8 (5 – 15)
4.12	Supervise the shutdown of explosives processing	✓		O QU 4.10 (3 – 4)
4.14	Contribute to explosives Standard Operating Procedure/s	✓		M QU 4.7 (3 – 20)
5.14	Manage explosive substances and/or articles configuration activities		✓	O (4 – 25)
7.2	Supervise the placing of explosive substances and/or articles into storage	✓		O QU 7.1 (3 – 10)
9.2	Ensure explosives facilities are fit for purpose	✓		L4 M (4 – 10)
13.8	Conduct an assessment of risks in the workplace (CPPCO 3.13)	✓		M QU 13.14 (5 – 8)
13.9	Provide explosives technical or safety advice and/or guidance to others	✓		O QU 13.4 (4 – 8)
13.10	Make presentations of explosives matters		✓	M QU 13.5 (3 – 5)
13.11	Hand over explosive substances and/or articles		✓	M QU 13.6

Unit no.	Unit title	M	O	ESA Ops Qual (CV – DLH)
				(2 – 5)
13.14	Manage equipment in an explosives environment	✓		O QU 13.9 (3 – 5)
13.17	Certify as Free From Explosives		✓	L2 O QU13.15 (1 – 5)
13.18	Supervise explosives safety	✓		O (3 – 8)
	ADDITIONAL			
4.11	Shutdown the explosives process	✓		L2 O QU 4.13 (2 – 14)
11.6	Plan the disposal of explosive substances and/or articles (non-complex)		✓	L4 O QU 11.5 (2 – 5)
11.9	Contribute to pre-disposal tasks for explosive substances and/or articles	✓		L2 O (2 – 4)
11.13A	Dispose of explosive substances and/or articles by non-complex burning procedures		✓	O QU 11.17 (7 – 10)
11.20	Contribute to post-disposal tasks for explosive substances and/or articles	✓		L2 O QU 11.27 (2 – 4)
13.1	Work effectively in a team involved in activities for explosive substances and/or articles	✓		M QU 13.2 (4 – 6)
QU 2.15	Implement risk control measures for explosive substances and/or articles			M (3 – 15)
QU 2.17	Carry out assurance audit of systems for explosives safety			M (4 – 10)
QU 9.3	Conduct safety checks on explosives facilities			M (3 – 10)

Unit no.	Unit title	M	O	ESA Ops Qual (CV – DLH)
QU 13.1	Develop your competence in working with explosives, munitions or specified targets			M (3 – 10)
QU 13.10	Prepare and care for equipment in an explosives environment			M (1 – 2)
QU 13.13	Work safely in an explosives environment			M (6 – 16)
	TOTALS			M = 37 - 107 O = 33 - 81 L4 = 14 - 38 L2 = 7 - 27 **TOT= 91 - 253**

Candidates must achieve:

All 15 mandatory units and

any further optional units in consultation with GJR management

i.e. ≥18 units

HSQ Level 3 Diploma in Explosives Supervision – Q00-D3-002	
Candidates must achieve: • **all 11 Mandatory units, providing 37 combination values** • **30 combination values from any combination of optional units** **ie a total of 67 combination values of which 35 must be at level 3**	
Min combination value (Mandatory units): 37	**Max combination value (Mandatory units): 37**
Min combination value (Optional units): 30	**Max combination value (Optional units): 30**
Min DLH for qualification: 142	**Max DLH for qualification: 273**

LEVEL 2 VQ IN EXPLOSIVE SUBSTANCES AND ARTICLES MANUFACTURING OPERATIONS

Unit no.	Unit title	M	O	ESA Ops Qual (CV – DLH)
4.4	Prepare explosives process area and equipment	✓		M QU 4.3 (2 – 5)
4.5	Move materials within the explosives process	✓		M QU 4.4 (2 – 5)
4.6	Prepare the explosives process materials	✓		O QU 4.5 (2 – 5)
4.8	Monitor and control explosives processing	✓		O QU 4.12 (2 – 14)
4.11	Shut down explosives process	✓		O QU 4.13 (2 -14)
4.13	Separate recoverable materials and waste produced by the explosive process	✓		O QU 4.6 (2 – 5)
4.14	Contribute to explosives Standard Operating Procedures/s		✓	L3 O QU 4.7 (3 – 20)
5.4	Implement the inspection of explosive substances and/or articles	✓		O (3 -10)
5.9	Implement the routine assembly of explosive substances and/or articles		✓	O (3 – 10)
5.15	Implement explosive substances and/or articles configuration activities		✓	O (3 – 10)
13.1	Work effectively in a team involving explosive substances and/or articles	✓		M QU 13.2 (4 – 6)
13.11	Hand over explosive substances and/or articles	✓		M QU 13.6 (2 – 5)
13.12	Pack or re-pack explosive substances and/or articles	✓		O QU 13.5 (3 – 5)

Unit no.	Unit title	M	O	ESA Ops Qual (CV – DLH)
13.13	Unpack explosive substances and/or articles		✓	O QU 13.8 (1 – 2)
13.15	Prepare and care for equipment in an explosives environment	✓		M QU 13.10 (1 – 2)
13.17	Certify as Free From Explosives		✓	O QU 13.15 (1 – 5)
QU 7.2	Put explosive substances and/or articles into storage			M (2 – 5)
QU 7.14	Carry out stock checks of explosive substances and/or articles			M (1 – 5)
QU 13.1	Develop your competence in working with explosives, munitions or specified targets			M (3 – 10)
QU 13.13	Work safely in an explosives environment			M (6 – 16)
	TOTALS			M = 23 - 59 O = 22 - 80 L3 = 3 - 20 **TOT= 48 - 159**

Candidates must achieve:

All mandatory units and

any further optional units in consultation with GJR management

i.e. a minimum of 11 units

HSQ Level 2 Diploma in Explosives Operations – Q00-D2-001	
Candidates must achieve: • all 9 mandatory units, providing 23 combination values • 17 combination values from any combination of optional units ie a total of 40 combination values of which 31 must be at level 2	
Min combination value (Mandatory units): 23	**Max combination value (Mandatory units): 23**
Min combination value (Optional units): 17	**Max combination value (Optional units): 17**
Min DLH for qualification: 90	**Max DLH for qualification: 147**

At a further company meeting, the project partners went through the company's requirements for manufacturing and disposal, in relation to the relatively recently published HSQ qualifications in explosives operations as described above and concluded that their needs could be met by becoming qualifiedin these new, multi-disciplinary qualifications byb assessment against the units (Standards) marked in either green or amber in the t right hand column:

KEY ROLE 4 MANUFACTURE

CV = Combination Value
DLH = Directed Learning Hours

Level 4 VQ in Explosive Substances and Articles Manufacturing Management

Unit no.	Unit title	M	O	ESA Ops Qual (CV – DLH)
4.1	Develop and update explosives Standard Operating Procedure/s	✓		M (4 – 10}
4.2	Contribute to the validation and optimization of new or modified explosives processes and equipment		✓	O (3 – 8)
4.3	Resolve explosives operational problems	✓		M QU 4.8 (5 – 15)
4.7	Supervise the preparation of explosives processing operation	✓		L3 O QU 4.9 (3 – 7)
2.14	Prepare and submit explosives licence application		✓	O QU 2.22 (4 – 15)
5.13	Plan explosive substances and/or articles configuration activities		✓	O (3 – 20)
5.14	Manage explosive substances and/or articles configuration activities		✓	L3 O (4 – 25)
5.16	Audit the effectiveness of explosive substances and/or articles configuration activities		✓	O (3 – 15)
7.13	Manage explosive substances and/or articles stock levels and stock inventories		✓	O QU 7.12 (3 – 10)
9.1	Define explosives facilities requirement	✓		O (5 – 20)
9.2	Ensure explosives facilities are fit for purpose	✓		M (4 – 10)

Unit no.	Unit title	M	O	ESA Ops Qual (CV – DLH)
9.4	Develop and implement explosives facility decommissioning plan		✓	O (4 – 25)
11.1	Assess the explosive substances and/or articles for disposal			O (4-20)
11.2	Determine the existence of a suitable explosive substances and/or articles disposal procedure	✓		L3 O (4 – 20)
11.3	Adapt an existing explosive substances and/or articles disposal procedure			O (4 - 15)
13.4	Manage continuous improvement for explosive substances and articles activities		✓	M QU 13.3 (4 – 8)
13.9	Provide explosives technical or safety advice and/or guidance to others	✓		M QU 13.4 (4 – 8)
13.10	Make presentations of explosives matters		✓	L2 O QU 13.5 (3 – 5)
13.14	Manage equipment in an explosives environment	✓		L3 O QU 13.9 (3 – 5)
13.16	Manage explosives safety	✓		M QU 13.11 (6 – 16)
	ADDITIONAL			
4.11	Shutdown the explosives process	✓		L2 O QU 4.13 (2 – 14)
4.12	Supervise the shutdown of explosives processing	✓		L3 O QU 4.11 (3 – 7)
11.6	Plan the disposal of explosive substances and/or articles (non-complex)	✓		O QU 11.5 (2 – 5)

Unit no.	Unit title	M	O	ESA Ops Qual (CV – DLH)
11.7	Manage tasks for the disposal of explosive substances and/or articles	✓		O (10 – 10)
11.8	Carry out pre-disposal tasks for explosive substances and/or articles	✓		O (4 – 5)
11.13A	Dispose of explosive substances and/or articles by non-complex burning procedures	✓		O QU 11.16 (10 – 10)
11.16A	Dispose of explosive substances and/or articles by non-complex detonation procedures	✓		O QU11.22 (10 – 10)
11.19	Carry out post-disposal tasks for explosive substances and/or articles	✓		L3 O QU 11.26 (4 – 5)
13.1	Work effectively in a team involved in activities for explosive substances and/or articles	✓		L2 M QU 13.2 (4 – 6)
13.8	Conduct an assessment of the risks in the workplace	✓		L3 M QU 13.14 (5 – 8)
	TOTALS			M = 27 - 77 O = 73 - 188 L3 = 26 - 77 L2 = 9 - 25 **TOT=135 - 367**

Candidates must achieve:

All 18 mandatory units and

any further optional units in consultation with GJR management

i.e. ≥18 units

HSQ Level 4 Diploma in Explosives Management – Q00-D4-003
Candidates must achieve: • all 6 mandatory units, providing 27 combination values

<table>
<tr><td colspan="2">

- 21 combination values from any combination of the optional units

Candidates may only take unit 2.19 or 2.20 but not both.

ie a total of 48 combination values

</td></tr>
<tr><td>Min combination values (Mandatory units): 27</td><td>Max combination values (Mandatory units): 27</td></tr>
<tr><td>Min combination values (Optional units): 21</td><td>Max combination values (Optional units): 44</td></tr>
<tr><td>Min DLH for qualification: 93</td><td>Max DLH for qualification: 162</td></tr>
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LEVEL 3 VQ IN EXPLOSIVE SUBSTANCES AND ARTICLES MANUFACTURING SUPERVISION

Unit no.	Unit title	M	O	ESA Ops Qual (CV – DLH)
4.2	Contribute to the validation and optimization of new or modified explosives processes and equipment		✓	L4 O (3 – 8)
4.7	Supervise the preparation of explosives processing operation	✓		O QU 4.9 (3 – 7)
4.9	Supervise explosives processing	✓		O QU 4.9 (3 – 4)
4.10	Solve explosives process problems	✓		L4 O QU 4.8 (5 – 15)
4.12	Supervise the shutdown of explosives processing	✓		O QU 4.10 (3 – 4)
4.14	Contribute to explosives Standard Operating Procedure/s	✓		M QU 4.7 (3 – 20)
5.14	Manage explosive substances and/or articles configuration activities		✓	O (4 – 25)
7.2	Supervise the placing of explosive substances and/or articles into storage	✓		O QU 7.1 (3 – 10)
9.2	Ensure explosives facilities are fit for purpose	✓		L4 M (4 – 10)
13.8	Conduct an assessment of risks in the workplace (CPPCO 3.13)	✓		M QU 13.14 (5 – 8)
13.9	Provide explosives technical or safety advice and/or guidance to others	✓		O QU 13.4 (4 – 8)
13.10	Make presentations of explosives matters		✓	M QU 13.5 (3 – 5)
13.11	Hand over explosive substances and/or articles		✓	M QU 13.6

Unit no.	Unit title	M	O	ESA Ops Qual (CV – DLH)
				(2 – 5)
13.14	Manage equipment in an explosives environment	✓		O QU 13.9 (3 – 5)
13.17	Certify as Free From Explosives		✓	L2 O QU13.15 (1 – 5)
13.18	Supervise explosives safety	✓		O (3 – 8)
	ADDITIONAL			
4.11	Shutdown the explosives process	✓		L2 O QU 4.13 (2 – 14)
11.6	Plan the disposal of explosive substances and/or articles (non-complex)		✓	L4 O QU 11.5 (2 – 5)
11.9	Contribute to pre-disposal tasks for explosive substances and/or articles	✓		L2 O (2 – 4)
11.13A	Dispose of explosive substances and/or articles by non-complex burning procedures		✓	O QU 11.17 (7 – 10)
11.20	Contribute to post-disposal tasks for explosive substances and/or articles	✓		L2 O QU 11.27 (2 – 4)
13.1	Work effectively in a team involved in activities for explosive substances and/or articles	✓		M QU 13.2 (4 – 6)
QU 2.15	Implement risk control measures for explosive substances and/or articles			M (3 – 15)
QU 2.17	Carry out assurance audit of systems for explosives safety			M (4 – 10)
QU 9.3	Conduct safety checks on explosives facilities			M (3 – 10)

Unit no.	Unit title	M	O	ESA Ops Qual (CV – DLH)
QU 13.1 NOS12.22	Develop your competence in working with explosives, munitions or specified targets			M (3 – 10)
QU 13.10	Prepare and care for equipment in an explosives environment			M (1 – 2)
QU 13.13 NOS12.20	Work safely in an explosives environment			M (6 – 16)
	TOTALS			M = 37 - 107 O = 33 - 81 L4 = 14 - 38 L2 = 7 - 27 **TOT= 91 - 253**

Candidates must achieve:

All 15 mandatory units and

any further optional units in consultation with GJR management

i.e. ≥18 units

HSQ Level 3 Diploma in Explosives Supervision – Q00-D3-002	
Candidates must achieve: • **all 11 Mandatory units, providing 37 combination values** • **30 combination values from any combination of optional units** **ie a total of 67 combination values of which 35 must be at level 3**	
Min combination value (Mandatory units): 37	**Max combination value (Mandatory units): 37**
Min combination value (Optional units): 30	**Max combination value (Optional units): 30**
Min DLH for qualification: 142	**Max DLH for qualification: 273**

LEVEL 2 VQ IN EXPLOSIVE SUBSTANCES AND ARTICLES MANUFACTURING OPERATIONS

Unit no.	Unit title	M	O	ESA Ops Qual (CV – DLH)
4.4	Prepare explosives process area and equipment	✓		M QU 4.3 (2 – 5)
4.5	Move materials within the explosives process	✓		M QU 4.4 (2 – 5)
4.6	Prepare the explosives process materials	✓		O QU 4.5 (2 – 5)
4.8	Monitor and control explosives processing	✓		O QU 4.12 (2 – 14)
4.11	Shut down explosives process	✓		O QU 4.13 (2 -14)
4.13	Separate recoverable materials and waste produced by the explosive process	✓		O QU 4.6 (2 – 5)
4.14	Contribute to explosives Standard Operating Procedures		✓	L3 O QU 4.7 (3 – 20)
5.4	Implement the inspection of explosive substances and/or articles	✓		O (3 -10)
5.9	Implement the routine assembly of explosive substances and/or articles		✓	O (3 – 10)
5.15	Implement explosive substances and/or articles configuration activities		✓	O (3 – 10)
13.1	Work effectively in a team involving explosive substances and/or articles	✓		M QU 13.2 (4 – 6)
13.11	Hand over explosive substances and/or articles	✓		M QU 13.6 (2 – 5)
13.12	Pack or re-pack explosive substances and/or articles	✓		O QU 13.5 (3 – 5)

Unit no.	Unit title	M	O	ESA Ops Qual (CV – DLH)
13.13	Unpack explosive substances and/or articles		✓	O QU 13.8 (1 – 2)
13.15	Prepare and care for equipment in an explosives environment	✓		M QU 13.10 (1 – 2)
13.17	Certify as Free From Explosives		✓	O QU 13.15 (1 – 5)
QU 7.2	Put explosive substances and/or articles into storage			M (2 – 5)
QU 7.14	Carry out stock checks of explosive substances and/or articles			M (1 – 5)
QU 13.1	Develop your competence in working with explosives, munitions or specified targets			M (3 – 10)
QU 13.13	Work safely in an explosives environment			M (6 – 16)
	TOTALS			M = 23 - 59 O = 22 - 80 L3 = 3 - 20 **TOT= 48 - 159**

Candidates must achieve:

All mandatory units and

any further optional units in consultation with GJR management

i.e. a minimum of 11 units

HSQ Level 2 Diploma in Explosives Operations – Q00-D2-001	
Candidates must achieve: • all 9 mandatory units, providing 23 combination values • 17 combination values from any combination of optional units ie a total of 40 combination values of which 31 must be at level 2	
Min combination value (Mandatory units): 23	**Max combination value (Mandatory units): 23**
Min combination value (Optional units): 17	**Max combination value (Optional units): 17**
Min DLH for qualification: 90	**Max DLH for qualification: 147**

Fortuitously, during the second day of this company meeting, the individual who conducts GJR's third-party assurance for quality management and who is their likely candidate for qualifying as a Assessor for the Level 2 qualifications, was on-site and briefed. He appeared to have understood the concept of the Standards, qualifications and assessment.

CASE STUDY – MAXAM Deutschland

BACKGROUND

Maxam Deutschland GmbH is a part of the Spanish MAXAM Europe S.A. The company has more than 140 years of experience in production and application of civil explosives and its areas of business are:

- Production, sales and application of civil explosives.
- Production of Boosters, Emulsions, ANFO und permitted explosives.
- Blasting service; Calculation of different blasting operations, measurement of blasting vibrations.
- Safety advice for different blasting applications.

The project to test the procedure of implementing the occupational standards is very important for the production process of explosives, especially permitted explosives based on nitric ester. There will be involved in this project the safety engineer, plant manager, production manager and one technician. All these participants have more than 10 years of experience. Our expectation is to find impulse to increase the safety standard in our process of production, transport, storage and handling of explosives. Increase of the effectiveness of our safety management system (by technical and organizational measures).

In §7 of the German Explosive Act it is stipulated, that a permit is necessary for handling and transporting explosive materials.

> § 7 Permit states that:
>
> "Whoever commercially, independently within a business enterprise or an agricultural or forestry business or when employing workers
>
> 1. wants to deal with explosive substances or
>
> 2. wants to carry out the transport of explosive substances
>
> needs a permit."

In § 19 Explosive Act (SprengG) it is regulated, that through the permit holder responsible persons are assigned which within their area of responsibility independently handle and transport explosive materials.

A prerequisite for these delegations of authority is a certificate of competence according to § 20 Explosive Act. The certificate of competence is based on an officially recognized proof of technical qualification.

In simple terms, the approved certificates of competence have only four criteria:

- The applicant must not have a criminal record.
- The applicant must be a minimum of 21 years of age.
- The applicant must not have (mental??) health issues.
- The applicant must have passed an approved initial course and 5-yearly refreshers.

Approved ways of working are set out in regulations and also in guidance approved by the national body of insurance companies. The insurance body guidance sets the requirements for acceptable risk and acceptable working and/or mitigation methods to achieve those levels of risk. Regulation requires individuals in positions of responsibility to hold either a licence issued by the authority or a letter of delegation of responsibility from a licence-holder. These letters of delegation will be issued based on the licence-holder's judgement of the competence of the potential delegate.

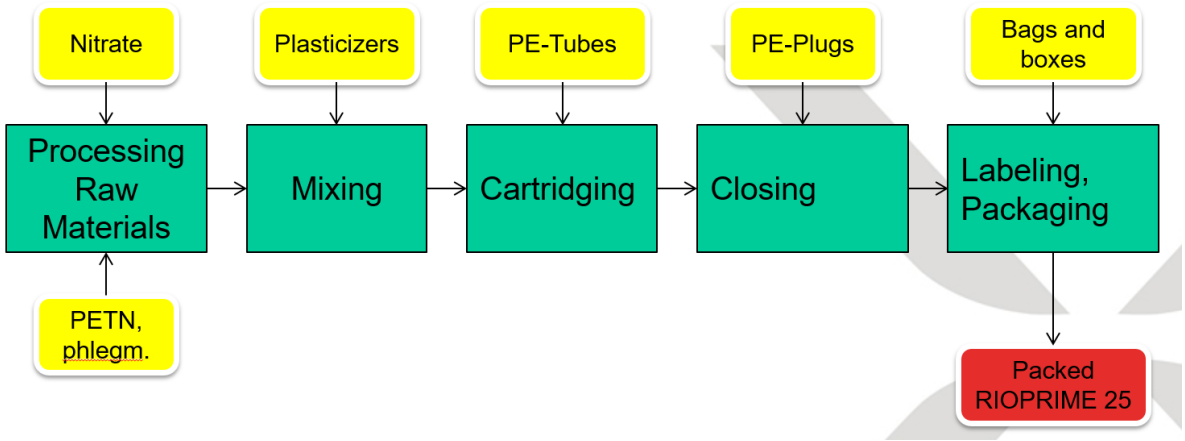
The previous experience of Dresdner Sprengschule in EUExcert projects was of great benefit to the industry partner right from the start. His understanding of both the occupational standards and the German system of training according to the regulatory requirements was essential to this element of the EUExImp project.

The approach we decided to take to comparing the UK NOS system with the German regulatory system was firstly to create role profiles, using the NOS, for the people who undertake the tasks involved in the production of MAXAM's mini-booster product and secondly to map the content of the required training courses against the NOS. This was expected to show any obvious differences and/or similarities between the two systems. In addition, it could also show and competences that are required by the company that are not covered in the training and vice-versa, training that is given but where competences are not required.

In outline, MAXAM's sub-project has the following elements:

- Understanding the Standards
- Make Role Profiles for the persons who conduct the steps in the process of manufacturing mini-boosters
- Map the content of the courses that lead to the required Certificates of Competence against the Occupational Standards (the same as mapping a qualification to the Standards)
- Map some existing courses to the Standards
- Identify any gaps between the courses and Certificates of Competence
- Maintaining the Case study

The process of manufacturing mini-boosters is represented here:



In German law, any person undertaking work with explosives must have a qualification that pertains to the process they perform. In the case of the production of mini-boosters, for example, the operator responsible for inspecting the raw materials for the mini-boosters is required to:

MAXAM

The Procedure

Process Step:

Incoming Goods Inspection

The following work is to be carried out:

→ Examination of PETN (explosive)
according to valid inspection requirements
- Chemical, physical and technological blasting performance test
- Documentation of the test results

The responsible person must possess a certificate of competence for storage, transport and use within the scope of testing explosive materials.
5-day course - §20 of the Explosives Act; Kapitel 1.3 of ADR; R-242

→ Examination of the other solid raw materials
- Chemical and physical examination
- Documentation of the examination results

8

UNDERSTANDING THE STANDARDS

Dresdner Sprengschule has been a partner in the EUExcert programme since its inception and, having a deep understanding of education and training theory through the rigour of the formal German education and training system, they made the process of understanding the Standards fairly easy for the MAXAM Deutschland partners.

ROLE PROFILING

We made an assumption that each of the tasks outlined in the process for manufacturing mini-boosters would be undertaken by an individual, ignoring the likelihood of a single person undertaking more than one of the tasks. Each task therefore became a role and could be profiled in terms of the occupational standards.

So that we had a complete understanding of these roles in terms of the Standards, we spent quite some time comparing each role against every one of the Standards, considering the Performance Criteria and the Knowledge Requirements. At the end of this process, we had a comprehensive spreadsheet with a role profile per column:

Explosives National Occupational Standards	JOB TITLE									
CLICK TO VIEW PERFORMANCE CRITERIA AND KNOWLEDGE REQUIREMENTS FOR EACH UNIT	Receipt and Storage of Raw Materials	Incoming Goods Inspection	Preparation and provision of raw materials	Preparation of the explosive mixture	Cartridging	Closing, Labelling and Packaging	Examination of finished products	Storage and Shipment of the End Products	Collection and Destruction of Cleaning and Production Waste	Production Management
Test & Evaluation (trials)										
3.1 Establish the performance criteria for explosive substances and/or articles										X
3.2 Determine the existence of a suitable trial or test procedure for explosive substances and/or articles										X
3.3 Design a new trial procedure for explosive substances and/or articles										
3.4 Design a new test procedure for explosive substances and/or articles										
3.5 Adapt an existing trial procedure for explosive substances and/or articles										
3.6 Adapt an existing test procedure for explosive substances and/or articles										X
3.7 Validate trial or test procedure for explosive substances and/or articles		X					X			X
3.8 Plan the trial of explosive substances and/or articles										
3.9 Plan the test of explosive substances and/or articles										X
3.10 Manage the trial of explosive substances and/or articles										
3.11 Manage the test of explosive substances and/or articles										X
3.12 Carry out pre-trial or pre-test tasks relating to explosive substances and/or articles		X					X			
3.13 Contribute to pre-trial or pre-test tasks relating to explosive substances and/or articles										
3.14 Carry out trials of explosive substances and/or articles										
3.15 Carry out tests of explosive substances and/or articles		X					X		X	
3.16 Contribute to conducting a trial or test of explosive substances and/or articles										
3.17 Evaluate the results of trials of explosive substances and/or articles										
3.18 Evaluate the results of tests of explosive substances and/or articles		X					X		X	X
3.19 Carry out post-trial or post-test tasks relating to explosive substances and/or articles		X					X			
3.20 Contribute to post-trial or post-test tasks relating to explosive substances and/or articles										
Manufacture										
4.1 Develop and update explosives standard operating procedure/s										X
4.1.1 Draft explosives procedure/s										X
4.1.2 Obtain approval for new or amended procedure/s										X
4.2 Contribute to the validation and optimization of new or modified explosives processes and equipment				X	X	X				X
4.2.1 Validate new or modified explosives processes and equipment	X			X	X	X				X
4.2.2 Optimise new or modified explosives processes and equipment				X	X	X				X
4.3 Resolve explosives operational problems			X	X	X	X				X
4.3.1 Identify explosives manufacturing problems			X	X	X	X				X
4.3.2 Implement and evaluate the chosen solution			X	X	X	X				X
4.4 Prepare the explosives process area and equipment			X	X	X	X				
4.5 Move materials within the explosives process	X		X	X	X	X				
4.6 Prepare explosives process materials	X		X	X	X	X				
4.7 Supervise the preparation of explosives processing operation				X	X	X				X
4.8 Monitor and control explosives processing				X	X	X				X
4.9 Supervise explosives processing				X	X	X				X
4.10 Solve explosives process problems				X	X	X				X
4.10.1 Identify explosives processing problems				X	X	X				X
4.10.2 Implement and evaluate solutions				X	X	X				X
4.11 Shut down the explosives process	X		X	X	X	X	X			X
4.12 Supervise the shutdown of explosives processing				X	X	X				X
4.13 Separate recoverable materials and waste produced by the explosives process	X		X	X	X	X	X			
4.14 Contribute to explosives standard operating procedures	X		X	X	X	X	X			

MAPPING THE CERTIFICATES OF COMPETENCE AND COURSES

The idea here was to map the requirements of the certificates of competence required by people involved in the manufacture of mini-boosters. Because the certificates of competence are absolutely dependent on the individual having passed an approved course and maintaining their currency by attending annual updates within the company and 5-yearly refresher courses, it was clear that mapping the content of the approved courses would achieve our aim.

The critical understanding in this process was that a well-designed course will take as its basis the knowledge and skills that the student is expected to be able to demonstrate at the end of the course, i.e. the outcomes. These are often listed or articulated in some detail as ‘Training Objectives’ or ‘Learning Objectives’. Now, each of the occupational standards is written as a set of performance and knowledge criteria which are the outcomes of training and experience that an individual is expected to be able to demonstrate to be deemed competent against that Standard. The content of NOS 4.13 – Separate recoverable materials and waste produced by the explosive process - is shown here by way of example:

Unit 4.13 Separate recoverable materials and waste produced by the explosive process

Contexts

- Explosive environments: low negative consequence; high negative consequence
- Waste: explosive substances and/or articles; materials contaminated with explosives

Performance Criteria	Knowledge Requirements
You need to:	You need to know and understand:
a work safely at all times, complying with health and safety, environmental and other relevant regulations, legislation and guidelines	i the health, safety and environmental and other statutory legislation, regulations and safe working practices and procedures governing explosives, and their implications for your area of work
b confirm that you have the correct procedures concerning operational requirements for the process	ii the relevance of personal protective equipment (PPE)
c ensure that processed, part processed, excess and recoverable materials are separated and removed at the correct stages in the process, and are identified accordingly	iii work area hazards
d ensure that any spillages and contamination are cleaned up promptly, in accordance with your organisation's procedures	iv the actions to be taken in response to an unplanned event
e ensure that the recoverable materials and waste are dealt with, according to your organisation's procedures	v the nature of the recoverable materials and waste
f ensure that materials and waste are handled in ways that prevent them from being damaged, spilled or contaminated	vi how to segregate different kinds of recoverable materials and waste, and why it is necessary to do so
g report any problems beyond your level of authority to the appropriate person	vii the requirements for packing, storing and transporting recoverable materials and waste
h complete correctly the required documentation	viii the requirements of the relevant standard operating procedure (SOP)
	ix the importance of the procedures for dealing with spillages and contamination
	x the potential impact of your actions on the environment
	xi reporting lines
	xii the documentation requirements

In order to map the course content against the Standards, we simply took each of the Standards as a detailed learning objective and considered:

- Does the course include the subject of the Standard?
- Do the relevant lessons include all of the performance and knowledge criteria relevant to the Standard?
- Is the individual required to demonstrate their ability in each of the elements?

The next stage of mapping was to ask these questions of the Standards against each of the courses required by people involved in the production of mini-boosters. It was important not to consider this

in terms of the role profiles, considering only the course content. This distinction ensured that we did not stray into trying to 'make things fit'. It was important that we had a clear idea of:

- The Role Profile, i.e. what we believed the individual is required to be able to do
- The Statutory Courses required, i.e. what the State requires individuals to be taught

We could then compare the two lists of Standards to identify any gaps. We could then compare the two lists of Standards to identify any gaps. The curricula of the SGH and SGL courses are outlined here:

Curriculum SGH (5 day course)

9. Legal foundations
    - German law of explosives (regulation relating to explosive material)
    - Regulation about Occupational Safety and Health
    - Regulation about Immission and Environmental Protection:
    - Regulation for the transportation of dangers goods (ADR)
    - Administrative offense and criminal law

10. General definitions in the explosive area
    - History of the explosives
    - Definition in the explosives area
    - Impact of explosives material
    - Test methods for explosives

11. Chemical and physical properties of explosives material

12. Structure, characteristics, Function and disposal of
    - Igniter and detonator
    - Explosives material, detonating cord
    - Propellant charge

13. Composition/composing of objects with explosives
    - Cartridge ammunition
    - Rockets with solid propellants
    - Parts and components of explosives

14. Analysis and evaluation of accidents and incidents

15. Practical demonstration of the function of different explosives

16. Examination

Curriculum SGL (4 day course)

10. Introduction to the subject
    - General definitions in the explosive area and in the pyrotechnics

- Impact of explosives material and pyrotechnic articles and compositions
- Explanation of explosives materials and pyrotechnics which are dispatched

11. General regulations and rules
    - Special regulation for the transportation of explosives material and pyrotechnics
    - Tasks and responsibilities of the people who carried out the transportation process
    - Requirements of the explosives material and pyrotechnics for the transportation
    - Duties of the responsible people regarding to the safety and security

12. General properties of dangerous goods

13. Documentation concerning the transportation and storage of dangerous goods

14. Types of vehicles and transport, enclosures, equipment

15. Inscriptions, labeling and information of dangerous goods

16. Carrying out of transportation process

17. Activities after accidents and incidents in connection with transportation and storage

18. Examination

At the end of the process, we had a second spreadsheet showing …

Explosives National Occupational Standards	Course Content leading to:				
CLICK TO VIEW PERFORMANCE CRITERIA AND KNOWLEDGE REQUIREMENTS FOR EACH UNIT	Certificate in Storage and Transport	Certificate in Storage, Transport and Use (Testing)	Certificate in Storage, Transport and Manufacture	Certificate in Production	Certificate in Destruction of explosives
Test & Evaluation (trials)					
3.1 Establish the performance criteria for explosive substances and/or articles					
3.2 Determine the existence of a suitable trial or test procedure for explosive substances and/or articles					
3.3 Design a new trial procedure for explosive substances and/or articles					
3.4 Design a new test procedure for explosive substances and/or articles					
3.5 Adapt an existing trial procedure for explosive substances and/or articles					
3.6 Adapt an existing test procedure for explosive substances and/or articles					
3.7 Validate trial or test procedure for explosive substances and/or articles					
3.8 Plan the trial of explosive substances and/or articles					
3.9 Plan the test of explosive substances and/or articles					
3.10 Manage the trial of explosive substances and/or articles					
3.11 Manage the test of explosive substances and/or articles					
3.12 Carry out pre-trial or pre-test tasks relating to explosive substances and/or articles		X	X	X	X
3.13 Contribute to pre-trial or pre-test tasks relating to explosive substances and/or articles					
3.14 Carry out trials of explosive substances and/or articles					
3.15 Carry out tests of explosive substances and/or articles		X	X	X	X
3.16 Contribute to conducting a trial or test of explosive substances and/or articles					
3.17 Evaluate the results of trials of explosive substances and/or articles					
3.18 Evaluate the results of tests of explosive substances and/or articles		X	X	X	X
3.19 Carry out post-trial or post-test tasks relating to explosive substances and/or articles		X	X	X	X
3.20 Contribute to post-trial or post-test tasks relating to explosive substances and/or articles					
Manufacture					
4.1 Develop and update explosives standard operating procedure/s					
4.1.1 Draft explosives procedure/s					
4.1.2 Obtain approval for new or amended procedure/s					
4.2 Contribute to the validation and optimization of new or modified explosives processes and equipment					
4.2.1 Validate new or modified explosives processes and equipment					
4.2.2 Optimise new or modified explosives processes and equipment					
4.3 Resolve explosives operational problems		X	X	X	X
4.3.1 Identify explosives manufacturing problems		X	X	X	X
4.3.2 Implement and evaluate the chosen solution		X	X	X	X
4.4 Prepare the explosives process area and equipment		X	X	X	X
4.5 Move materials within the explosives process		X	X	X	X
4.6 Prepare explosives process materials		X	X	X	X
4.7 Supervise the preparation of explosives processing operation					
4.8 Monitor and control explosives processing		X	X	X	X
4.9 Supervise explosives processing					
4.10 Solve explosives process problems		X	X	X	X
4.10.1 Identify explosives processing problems		X	X	X	X
4.10.2 Implement and evaluate solutions		X	X	X	X
4.11 Shut down the explosives process		X	X	X	X
4.12 Supervise the shutdown of explosives processing					
4.13 Separate recoverable materials and waste produced by the explosives process		X	X	X	X
4.14 Contribute to explosives standard operating procedures					

Following on from the role profiling activity, we undertook a simple gap analysis to confirm the detail of what elements of the various Standards are covered in the two main courses and the outcome of that process is at Annex A to this chapter.

RESULTS AND CONCLUSIONS

The two main courses provide the employee with the majority of the 'Knowledge Requirements' in the relevant Standards; the training provided also gives a small proportion of the skills required, i.e. the 'Performance Criteria' for the tasks they are required to undertake. The elements are specific to an organisation and we could not discern any generic principles that could/should be taught on the technical courses being reviewed.

This project has clearly demonstrated that the occupational standards developed in UK and taken up by the EUExcert partners can easily be mapped to the learning objectives and training curricula of technical explosives courses within the German system. It follows that an explosives qualification based on these Standards could easily be mapped to the German competence regulations and vice versa. The aims of the EUExcert programme are viable:

> EUExcert aims to establish a stable firm fundament and framework for vocational education of people in European explosive sector. Training and education institutions ,as well as social partners, will have a tool for competence and career planning.

RECOMMENDATIONS

If any organisation wishes to ensure that these elements are included in training and/or assessment, particularly organisation that are subject to the German or similar qualifications system, they will need either to run bespoke training with a training provider or train and assess in-house.

The NOS knowledge requirements can aid organisations in specifying their training objectives.

POSSIBLE FUTURE

Dresdner Sprengschule has the possibility of using the Standards and principles for their adoption and implementation to make their training more accessible to international candidates who might wish to specify their training objectives in common terminology.

MAXAM Deutschland have the possibility of using the Standards to specify work and associated competence requirements across the entire MAXAM Group.

APPENDIX A - Gap Analysis Findings

Working through the NOS that had been selected as part of the previous study, we found that the courses, naturally, cover the theory elements required, with the exception of these particular areas:

3.15

vi the customer's objectives and needs

vii the test procedure and plan

iii the design, characteristics and potential hazards of the test

xii special designated responsibilities (e.g. emergency response)

xv test reporting documentation

xvi the competences of the personnel involved

xvii reporting lines and procedures

xix your own level of authority

xx the roles and responsibilities of team members

xxi the relevant quality standards and compliance regime

xxii the requirements of confidentiality

3.18

vii the composition and functioning of the explosive substances and articles under test

viii the relevant performance specifications for the explosive substances and articles

ix the tolerances defined by the performance specification

x the test criteria

xi the limitations of the test equipment

xii the capabilities and limitations of the data analysis methods and techniques

xiii how to interpret, collate information, from different sources, into suitable formats for comparison

iv test documentation and procedures

xv reporting lines and procedures

xvi the relevant quality standards and compliance regime

3.19

xiv reporting lines and procedures

xv your level of authority, and that of others with whom you work

4.3.1

xiv the documentation requirements

4.3.2

xv the documentation requirements

4.4

ix the equipment layout, and connection to other systems

xiii the limits of your responsibility

xiv reporting procedures

xv the requirements of the documentation

4.5

xii your organisation's procedures for waste disposal

xiii the documentation requirements

4.6

xiv the documentation requirements

4.8

x the limits of your authority

xii reporting lines

xiii the documentation requirements

4.10.1

xiv the limits of your authority

xvi the requirements of documentation

4.10.2

ix equipment layout, and its connection with other systems

xiv reporting lines

xv the documentation requirements

4.13

xi reporting lines

xii the documentation requirements

11.8

ix the competences of team members

13.16

v the organisation's explosives safety management system

x the competence of the personnel involved

ANALYSIS

All these elements are specific to an organisation and we could not discern any generic principles that could/should be taught on the technical courses being reviewed.

Joerg and Reimund to add a paragraph here

RECOMMENDATIONS

If any organisation wishes to ensure that these elements are included in training and/or assessment, particularly organisation that are subject to the German or similar qualifications system, they will need to either run bespoke training with a training provider or train and assess in-house.

The NOS knowledge requirements can aid organisations in specifying their training objectives.

CASE STUDY – VOGLERS EESTI

BACKGROUND

Voglers Eesti OÜ is a private company which started in Estonia on 1996. The company specializes in drilling, blasting and explosives, and on the earlier days loading and mocking, also crushing the blasted rock. In recent years Voglers Eesti has cooperated in several international projects in different countries for drilling and blasting, for example in Sweden, Norway, Brazil and Australia.

The company has been successfully operating for 21 years. During these years the experience in blasting has been very various, starting from quarries and ending up with explosive demolition of buildings and underwater blasting. The key person involved in this project has a wide horizon in international expertise of blasting through different projects, partnerships and experience on field, and has a certificate as a person responsible for organising the handling of explosive substances. As the company is also renting out workforce for different projects, with certificates for senior blasters, blasters and pyrotechnics, we hope to get more experience and knowledge with Pan-European value. The number of staff involved in the project is expected to be approximately 10 persons.

Voglers work in the EUExImp project is supported by Tallinn University of Technology (TTU), which was established in 1918 and is the leading engineering R&D institution in Estonia. The mission of TTU is to support Estonia's sustainable development through R&D and science-based higher education in the fields of engineering, technology, natural and social sciences.

In addition to the classification scheme (CERCS) T140 , other research fields are related to energy research in TTU: P305 Environmental chemistry, P360 Inorganic chemistry, P430 Mineral deposits, economic geology, T150 Material technology, T190 Electrical engineering, T270 Environmental technology, pollution control, T340 Mining, T350 Chemical technology and engineering, T370 Carbochemistry, petrochemistry, fuels and explosives technology.

Energy research in Tallinn University of Technology is mainly divided between 2 faculties: School of Engineering includes research in energetics groups as follows: Power Electronics; Electrical Engineering and Electromagnetic Compatibility; Power System Dynamics and Control; Energy Demand-Side Management and Microgrids; Electrical Drives, Electric Vehicles and Automation; Electrical Machines; High Voltage; Energy Systems; and School of Science includes Mining Technology and Resources; Peat Science; Mining Waste Management;. TTU is internationally well known in oil shale technology, chemical and materials technology research and electrical engineering.

The Division of Mining of TTU deals with research and teaching drilling and blasting technologies, usage of explosives in construction and military applications, including investigating environmental effects like dust, noise, seismic waves and stability of infrastructure. This Division has been involved in previous projects and has long experience of research in the field of Explosives engineering.

In outline, Voglers' sub-project has the following elements:

- Understanding vocational qualifications
    - Understanding occupational standards
    - Understanding the combination of standards that make a qualification
    - Understanding assessment in the workplace
- Consultation on which approach to take to qualifying company staff.
- Role Profiling workers

- Confirming the qualifications required across the company
- Prioritising which qualifications need to be part of the project and which might wait
- Identifying which members of staff will be involved in the project and in the future
- Identifying a qualifications centre to provide the required registrations, training, assessment and verification.
- Undertaking the qualifications
- Maintaining the Case study

UNDERSTANDING VOCATIONAL QUALIFICATIONS

During the first Company Visit, there were a couple of presentation about the use of occupational standards and particularly their use as the basis for vocational qualifications.

  - Understanding occupational standards
  - Understanding the combination of standards that make a qualification
  - Understanding assessment in the workplace

ROLE PROFILING

The roles identified for this part of the project were:

- Explosives Safety Manager
- Explosives Safety Supervisor
- Blasting Master
- Transport supervisor
- Storage supervisor
- Mixing supervisor
- Blaster
- Blasting assistant
- Mixing operator
- Plant operator

The company invested some considerable time and effort in this role profiling activity, bringing in the Managing Director (also Explosives Safety Manager, with ultimate responsibility in Estonian Law) and two explosives safety supervisors, one of whom is also the company's Blasting Master. As is often the case, working systematically through the various roles helped the company to understand how the Standards can be used to see which members of staff undertake which tasks. It also aided the understanding the subtle differences between role profiles in this context and job descriptions, which are descriptions of all the activities that the job incumbent undertakes and therefore might include a number of different role profiles.

IDENTIFYING QUALIFICATIONS

The role profiling activity proved very useful in terms of the company structure and identifying the likely qualifications that different roles would attract. The company aspires to have all its staff formally qualified for their explosives-related roles but recognises that the best approach for them would be to run a pilot scheme that would help them understand the detail of obtaining a qualification and also how it can be compared with the existing Estonian vocational qualification system.

The company came into the project with the idea that they would benefit most from obtaining the Level 4 vocational qualification in Explosives Safety Management and the Level 3 vocational qualification in Explosives Safety Supervision.

In considering which roles and individuals should take part in the first qualifications we must understand that this family-run company is in the vanguard of blasting- and explosives-safety and professionalism in Estonia. The EUExImp project was not funded to provide the qualifications, only the environment and framework within which the partners could act. All Erasmus+ projects require partners to partially fund their participation so as such, each partner would be required to fund activities that were a consequence of their participation.

During the project scoping phase Voglers were quite clear that their participation would need to provide some benefit to the company. Initially, the intention was to qualify the Explosives Safety Manager and two Explosives Safety Supervisors, however, commercial considerations had a significant bearing and it was decided quite early on that the Explosives Safety Manager would not undertake a qualification for two reasons: the greater benefit to the company was in qualifying the Explosives Safety Supervisors as an element of succession planning; the Explosives Safety Manager, who is the MD of the company, would not have time to devote to the qualification due to other professional responsibilities in Estonia and Europe.

The role profiles created for other explosives workers in the company were considered to be a lower priority at this stage because of the need to be assessed in English and almost entirely in the workplace, whereas evidence for the explosives safety management qualifications is more likely to be found from naturally-occurring documents or by assignment. Importantly, the Board of Voglers Eesti OÜ could see more benefit in the international arena from holding the explosives safety management qualification within the company.

CHOOSING THE CANDIDATES

Identifying which members of staff will be involved in the project and in the future is a complex process of understanding the needs of the company for the short- and long-term, balanced with the perceived business benefits that having suitably qualified people can bring. For Voglers, this process involved the identification of the most advantageous role for the business to support that would bring either a tangible or intangible benefit, which the company could use to demonstrate its commitment to professional standards to existing and potential clients, the Estonian regulator, and to the company's own staff. This external and internal demonstration of commitment was an important factor is choosing the members of staff for these first qualifications. The members of staff were to be both customer-facing and well respected within the company.

In this pilot phase for the company, a good deal of time was spent in understanding the commitment that would be required of the candidates. Given that the qualifications are UK-based, and at the time of the project there were only English-speaking assessors and verifiers, it was clear that the candidates should have a good command of the English language. This would place them in a good position to be able to understand the standards, to enter into detailed dialogue with their assessor and possibly the verifiers, and to translate essential elements of their portfolio of evidence so that the assessors etc. could understand the content and significance of the evidence presented.

Naturally, the company was concerned about how much time the potential candidates would need to spend in compiling their portfolio and assessment activities. One of the great business benefits of this type of vocational qualification is that it is outcome-based, i.e. to a great extent, the onus is on the assessor, through regular dialogue with the learner and the company, to find existing evidence that demonstrates that the learner is suitably competent in each element of the standard that is being assessed. Understanding the key role, the individual standards in detail, and the way that the company and learner work, is essential to the way the assessor approaches the assessment. Likewise, it is essential that the company and learner understand the assessment and verification process and Voglers went to great pains to ensure that they did just that, as described in the next section.

Having worked through the role profiling process and discussed in detail the commitment required from a 'learner' (the generic term used by the awarding organisations for what is often called a candidate in more traditional training and education environments) it was decided that this pilot phase would involve the two explosives safety supervisors working towards the L3 VQ in Explosives Safety Supervision.

Having made contact with a qualifications centre that offers this qualification, it became clear that, until Estonia can establish its own centre, a great deal of the assessment would need to be conducted in English. Although both the Explosives Safety Supervisors have a good command of English, it was decided that only one would attempt the qualification within the scope of the project on the grounds of cost and language.

Ultimately, within the bounds of the project, Voglers went forward with the assessment of one of the Explosives Safety Supervisors for a Level 3 Vocational Qualification in Explosives Safety Supervision.

SELECTING THE ASSESSMENT ORGANISATION

Identifying and selecting a training and assessment provider looks, on the surface, like a fairly standard business process and decision: you simply look online for a range of training and assessment organisations; confirm which offer the product you are seeking; send out an invitation to tender; sift the responses to a short-list; confirm the qualities and attributes you want are deliverable at a price, quality and timeframe you want and finally enter into a contract. In reality, if you and your organisation has little or no experience of working the outcome-based regime of vocational qualifications underpinned by occupational standards, the process becomes slightly more complex as it is necessary to add in time and effort in understanding the process and implications at each stage, always with the end-state in mind.

Voglers recognised very early in the project that the key to this process would be their understanding of the assessment and verification process so that they could specify their requirements to the prospective assessor organisations.

'competence-based assessment' may be defined[33] as "*… a form of assessment that is derived from the specification of a set of outcomes; that so clearly states both the outcomes – general and specific – that assessors, students and interested third parties can all make reasonably objective judgments with respect to student achievement or non-achievement of these outcomes; and that certifies*

[33] Wolf, Alison; Competence-Based Assessment (Assessing Assessment); Open University Press, 1995

student progress on the basis of demonstrated achievement of these outcomes. Assessments are not tied to time served in formal educational settings."

Assessment of workplace competence and knowledge can take a number of different forms. The most common form of assessment in this scheme for explosives-related vocational qualifications is the compilation of a portfolio of evidence. This requires candidates to assemble a variety of different kinds of evidence, organised into a portfolio which is mapped against the components of the ESA NOS. It is considered that providing such a variety of evidence types is a better test of competence then producing purely one kind because it shows that the learner, their organisation and the assessor have selected the type(s) of evidence that best demonstrate the learner's competence in a particular unit or element. For learners, the use of a wide variety of evidence (work products, assessor questioning and observation etc) provides for a choice of assessment methods that may better meet their preferred learning styles.

The portfolio can include any combination of the following types of evidence:

- Work products, which are outputs that candidates produce as a natural consequence of doing their jobs, such as reports, calculations, correspondence, minutes of meetings, journals/diaries, etc.
- Observation reports, where an assessor has watched the candidate carrying out a task, and which might be backed up with photographs or video recordings of the observation.
- Witness testimonies, which are short statements provided by a reliable person who has seen the candidate carrying out a task.
- Written evidence of the assessor's verbal questions and the learner's responses to these, which might be backed up by audio recording of the questions and answers.
- Written questions and the learner's responses.

Written examinations can provide evidence of someone's knowledge which, of course, is one important element of competence and you will recall that we have defined competence as being a blend of knowledge, skills, experience and attitude or behaviours. These could be written examination papers or printouts of a touchscreen test (such as the UK driving theory test), short answer tests, multiple choice papers, quizzes, or any acceptable form of formal test. However, it is important to reiterate that any of these can only attest to someone's knowledge – their ability to translate this knowledge into workplace competence will still need to be assessed.

Whatever form the evidence takes, each piece of evidence must adhere to the same requirements, i.e. it must be:

- Sufficient: cover all the requirements of the standard;
- Valid: provide genuine evidence of achievement;
- Authentic: be the candidate's own work;
- Current: give a current picture of competence/ knowledge;
- Reliable: give consistently reproducible results

Many readers will understand that one of the issues in conducting performance appraisals is the potential for sensitivity and potential subjectivity of judging performance, so we should consider whether assessment using this regime of the ESA NOS removes or reduces this. An active user[34] in the UK has pointed out that the assessor still has to apply his/her own qualified opinion of the evidence that has been presented (in a way that is similar to the CPD requirements used in any

[34] SAFEX Newsletter No.50, 3rd Qtr. 2014

professional registration activity). Assessment by a suitably trained, qualified and experienced assessor, against an ESA NOS means that everyone is subject to the same requirements. The same practitioner stated that “The use of the ESA NOS removes the 'mystery' of what competence 'looks like' (the phrase is often heard that someone ‘doesn't know what they are looking for but they know it when the see it’). The use of the ESA NOS helps assessors to 'see' what they are looking for.”

Capturing the material required for the individual’s portfolio can cause learners a lot of heartache, however, it is not necessary to keep thick files of paper-based documents. Some qualifications centres work entirely electronically, some are entirely paper-based and some use a mixture of both. The important thing from Voglers perspective was that it should be simple and make use of single pieces of evidence against many units/elements.

The ‘standard’ outcome-based assessment methodology relies on regular face-to-face contact between the assessor and the learner. With the learners being based in Estonia and the assessor and verifiers being in the UK, this clearly had the potential to become excessively costly and difficult to balance against the perceived business benefits. The experience of a Swedish company showed that it is quite possible to conduct much of the required planning and assessment of documentary evidence remotely, making use of teleconferencing and file sharing software such as Skype and DropBox. Clearly it is essential for the assessor to see the learner in the workplace actually doing their work but with good planning it is possible to keep such visits to only the minimum times and duration. This requirement must be clear to the qualifications centre from the outset.

UNDERTAKING THE QUALIFICATIONS

Registering the learners. In the end, costs and availability led to us registering only one candidate in this pilot project. The actual process was simple, though, with most effort going into making sure that the assessor, IV and candidate knew exactly how the assessment would take place.

Assessment planning

One of the great benefits of this qualification was the ability for the assessor and IV to work from UK, with the candidate in Estonia. Because much of the evidence would be company documentation, one of the challenges was to decide exactly what would need to be translated into English so that the assessor and verifiers could be sure that the Standards had been achieved.

Working remotely to reduce costs to the company given that the assessors are from UK and the learners in Estonia, while still meeting the awarding body’s requirement for rigour in verification, did not prove as difficult as might have been imagined. We made maximum use of videoconferencing and Witness Testimony to support the remote assessment, with the assessor and internal verifier having briefed witnesses on the value and qualities required of their testimony.

We made use of recent changes to Estonian explosives legislation and company priorities to provide a real-world basis for work that would be undertaken by the candidate, which would provide evidence for some of the complex units and elements of the qualification. These changes to storage regulations and the introduction of EX2 vehicles for transportation of explosives required the company to review its explosives safety management policy and procedures.

The Candidate's Perspective

During the EUExImp Project, I went through an Explosives Safety Supervisor assessment as a Voglers Eesti worker. My job was mainly involved with blasting and work environment as well as track and tracing and storage management.

The first step of the assessment was understanding the standards and qualifications. Fortunately, there is no big differences in between UK and Estonia, although Estonia has not yet maintained such a well-formed and thorough system for mapping the standards of qualifications, especially for the professions connected to industrial explosives and blasting.

We decided that we would have an assessment for explosives safety supervisor, as the subject was very actual in our company at the moment and the certificate for this profession would be useful also in the future, as the company plans to work internationally.

The second important stage was to find a proper assessor. We also had to take into account that the assessment was for an Estonian, working in Estonia and the assessors would be from United Kingdom, working in United Kingdom. In this light we considered whether we should take a course to have an assessor in Estonia who would then continue assessing Voglers Eesti workers and others in the future. But as the profession involves very few companies with only some professional workers, it was not a practical solution. We asked for offers from different assessment providers and chose the most suitable. Due to high costs of the assessment, we decided to have only one person assessed at a time.

As there were many changes going on in Estonian regulations for explosives safety, the company had to go through a total revision of documents, which included risk assessments, operating permits and other. This situation was suitable to connect with the assessment, as the requirements for the explosives safety supervisor included a lot of knowledge and skills which the company needed to have for the new permits and new safety documents. As a work environment specialist, ADR driver and a blaster, I have to have these skills and knowledge, and this is my everyday work.

For a year, I documented my work and acquired certificates. I also showed my knowledge and working skills in an explosives storage to Ken Cross, who would act as a witness and give a written testimony about my performance. The explosives storage is in use of Voglers Eesti and on the same territory lies the explosives mixing plant. I act as a safety supervisor for both sites. I participated in an online conference call with the assessors from United Kingdom, who would ask verbal questions from me and assess my knowledge in various matters connected to explosives and safety. I gathered all documents and witness testimonies into my personal portfolio. I filled the necessary fields of the assessment portfolio, referring to different evidences of my work and knowledge and sent the portfolio to the assessors in United Kingdom.

The assessors found my evidence of skills and knowledge sufficient and in accordance to the UK standards.

This experience was very useful and important for the company. It gives a very clear overview of needed skills and competencies in the company. It will be a very useful tool for the future, when the company is in need of more workers.

With this project, we also acquired a good example of formulating occupational standards. Voglers Eesti is very active in participating the changing and creating of Estonian regulations and law. Now the company has more good knowledge and examples to share with the government authorities in the future.

CHANGES IN THE COMPANY

The project has definitely brought in some changes to the company. The first and the most important change is probably how different qualifications are looked at inside the company. First of all, it changed how we look at our own qualifications, inside the company and Estonian qualifications (we can now make suggestions to our framework). Our skills and knowledge have become measurable and hiring new people will be easier.

Also, now it is possible to put more responsibility to workers on each area of expertise according to their precise qualification by the standards. The skills and knowledge are more transparent.

The company will definitely benefit from having a UK certified Explosives Safety Supervisor on board, as there are also some international blasting projects ahead. At the moment we can compare directly only to UK and other countries that publish their occupational standards. When it comes to working with international contracts, we can now show that we have a wider horizon, and experience, about the differences between qualification frameworks, and that we can adjust. Having qualifications that are mapped to the European Qualification Framework (EQF) should also allow us to demonstrate competence to organisations in States that use or recognise the EQF. It will also be very important when we will be hiring from abroad (or hiring locals when working abroad) as we now have a precise tool for hiring people with right skills and qualifications.

TESTING THE EFFECTIVENESS OF THE CHANGES

Effect on the company.

Voglers Eesti considers that this experience was very useful and important for the company. It gave a very clear overview of needed skills and competencies in the company. It will be a very useful tool for the future, when the company is in need of more workers.

From this project, we also acquired a good example of formulating occupational standards. Voglers Eesti is a very active participant in the changing and creating of Estonian regulations and law. Now the company has a good deal of experience, knowledge and examples to share with the government authorities in the future.

Effects on the University.

Tallinn University of Technology (TTU) has obtained new experiences and knowledge of occupational standards and training systems of blasters, blasting masters and other explosive handlers in UK and wider in EU.

TTU gained experience about the feasibility of successful implementation of the British occupational standards in Estonia. The British training system was very similar, because this kind of training system works in Estonian Defence Forces (Army, Navy, Air Force and Defence League (National Guard)). Unfortunately we almost have no training system for civilian explosives handlers. So it was a great challenge for us.

Based on experience TTU gained from participating in EUExImp project, the University has taken the opportunity to elaborate training system that is in compliance with EU requirements. Working-out and applying training courses and evaluation standards, merging continuous education with the training system of explosives handlers so that they are qualified to work across EU. In this case we

(mostly TTU and Voglers Eesti) are at the very beginning, because the real mission-oriented training system really exists mainly in our Military and Law Enforcement structures and in the University's curriculum for preparing mining engineers. The training of practical explosives handlers is somehow insufficient - we have a evaluation/examination system (procedures), but our training courses are currently not standardised enough. This represents a big challenge for TTU so we will use both handbook and step-by-step guide for creating curricula for different courses etc.

We are working on the integration of our EUExImp experiences into the curriculum of mining engineering in Tallinn Univeristy of Technology. This is expected to enable us to carry out training of explosives handlers according to the needs of the Estonian mining industry and which can be exported with our graduates who work around the world.

Effect on the Estonian VET Framework.

Comparison of Estonian occupational standards to EU occupational standards and training systems. Experience gained from the EUExImp Project was used in the preparation of Estonian occupational standards in 2015 to 2016. In the main, we used the topics of existing UK standards and training courses for explosives handlers for specifying the tasks and educational and experience-based demands for explosives handlers.

GLOSSARY

ABBREVIATION	TERM	MEANING
ADDIE	Analyse, Design, Development, Implementation, Evaluate	The analytical process that underpins a structured 'Systems Approach to Training'.
	Adjustment	To make alterations to settings that enable the explosive article to meet the appropriate design/maintenance specification
	Assembly	The process by which explosive and non-explosive components (i.e. substances and/or articles) are assembled or re-assembled which may be part of a replacement task
	Characteristics	The form (e.g. solid, liquid, small arms ammunition, missile, fuzes etc.) and physical or behavioural properties (e.g. sensitivity, composition or compatibility) that define the explosive substances and/or articles
	Complex	Refers to both explosive substances and/or articles and activities i.e.: i an unconventional or novel explosive substance or article with many inter-related aspects or an assembly of several discrete components or a substance that requires many different properties in order to perform its function (e.g. guided weapons, torpedoes, shaped charges, paste explosives) ii the procedures for dealing with these (e.g. addressing multiple phases, or it may involve an element of setting up or testing) iii the plan for dealing with these including non-complex items (e.g. the scale of the task, logistics, location, inter-related phases or factors such as multiple hazards)
	Compliance	The extent to which people, processes and procedures relating to explosive substances and/or articles meet quality standards, objectives and regulations
	Configuration	The systematic combination of compatible explosive and/or non-

		explosive components to confirm or re-role a substance, article or test to perform a specific function which has been strictly recorded
	Conformance	The extent to which an explosive substance or article meets a defined specification
	Consequence	The possible outcome which could affect the environment, people and consequential loss
	Critical	Absolutely necessary to the success of the task as a lack of action could result in a high negative consequence
	Erasmus+	Erasmus+ is the EU's programme to support education, training, youth and sport in Europe. Its budget of €14.7 billion will provide opportunities for over 4 million Europeans to study, train, gain experience, and volunteer abroad.
EUExCert	European Union Explosives Certificate	A European programme intended to enhance safe working and reduce the number of accidents in the explosives business and establish a competitive industry, originally by the development and introduction of a common training and certification process but now by the international recognition of qualifications mapped to accepted, open, Standards.
EUExDL	EUExcert Driving Licence	The second project in the EUExcert programme, which aimed to design a coherent framework for explosives qualifications and certification.
EUExImp	EUExcert Implementation (of occupational standards)	The fourth project in the EUExcert programme, in which industrial partners aimed to implent occupational standards as qualifications or managment tools.
EUExNet	EUExcert Network	The third project in the EUExcert programme, which created a transnational network of companies and organisations working towards enhanced safety through cometence in the field of explosives.
	Equipment	Covers all plant, tooling, apparatus etc. that is non-consumable
EQF	European Qualifications Framework	The European Qualifications Framework (EQF) acts as a translation device to make national qualifications

		more readable across Europe, promoting workers' and learners' mobility between countries and facilitating their lifelong learning. The EQF aims to relate different countries' national qualifications systems to a common European reference framework. Individuals and employers will be able to use the EQF to better understand and compare the qualifications levels of different countries and different education and training systems.
EstQF	Estonia Qualifications Framework	Estonia's qualifications framework for implementing the EQF
	Explosive article	An article containing one or more explosive substances (Definition source: The Manufacture and Storage of Explosives Regulations 2005 (MSER))
	Explosive substance	A substance or preparation, not including a substance or preparation in a solely gaseous form or in the form of a vapour which is capable by chemical reaction in itself of producing gas at such a temperature and pressure and at such a speed as could cause damage to surroundings or which is designed to produce an effect by heat, light, sound, gas or smoke or a combination of these as a result of non-detonative self-sustaining exothermic chemical reactions (Definition source: The Manufacture and Storage of Explosives Regulations 2005 (MSER))
	Facility	A location of the necessary functionality to carry out an activity or activities relating to explosive substance and/or articles. The equipment in a facility may be regarded as part of that facility if fixed to that location. The management of facilities includes design, commissioning and maintenance.
	Hazard	Something with the potential to cause harm which may include articles, substances, plant or machines, methods of work, the working environment and other aspects of work organization (Definition source:

		Management of Health and Safety at Work Regulations 1999 ACOP L21)
HSQ	Homeland Security Qualifications Limited	Awarding Organisation for vocational qualifications based on UK national occupational standards for explosives, munitions, search and munitions clearance occupations
	Horizon 2020	Horizon 2020 is the biggest EU Research and Innovation programme ever with nearly €80 billion of funding available over 7 years (2014 to 2020) – in addition to the private investment that this money will attract. It promises more breakthroughs, discoveries and world-firsts by taking great ideas from the lab to the market.
	Loose items	Non-palletized loads e.g. single or multiple boxes of explosive substances or articles packed in accordance with current regulations
	Nature	The different general properties exhibited by explosive substances and/or articles e.g. HE, incendiary, smoke
	Non-complex (also described as *routine*)	Refers to both explosive substances and/or articles and activities ie: i conventional explosive substances or articles or with a perception of minimal negative consequence ii an existing recognized single procedure iii the plan for dealing with these
NOS	National Occupational Standard	A statement of the standards of performance individuals must achieve when carrying out functions in the workplace, together with specifications of the underpinning knowledge and understanding. NOS are National because they can be used in every part of the UK where the functions are carried out. **NB. The NOS are International because they have been shown to have the same degree of utility in the EUExImp partner organisations and have adopted in the International Ammunition Technical Guidelines,**

		published by the UN SaferGuard programme. NOS are Occupational because they describe the performance required of an individual when carrying out functions in the workplace, i.e. in their occupation (as a plumber, police officer, production engineer etc). NOS are Standards because they are statements of effective performance which have been agreed by a representative sample of employers and other key stakeholders and approved by the UK NOS Panel. NOS are developed for employers by employers through the relevant Sector Skills Council or Standards Setting Organisation
NQF	National Qualification Framework	
NVQ	National Vocational Qualification	
	Operating environment	The stimuli to which the explosive substances and/or articles may be subjected during usage, storage or transportation that have a potential effect eg mechanical, thermal, electrical, moisture, electro-magnetic etc.
QCF	Qualifications Credit Framework	UK's qualifications framework for implementing the EQF.
	Qualification	The formal process of acceptance of explosive substances or articles for their intended use
	Repair	Bringing a defective or damaged explosive article up to a required standard. It may also involve replacement or refurbishment
	Risk	The likelihood of potential to harm from the hazard being realized. The extent of the risk will depend on: the likelihood of that harm occurring; the potential severity of that harm i.e. of any resultant injury or adverse health effect; and the population that might be affected by the hazard i.e. the number of people who might be exposed (Definition source: Management of Health and Safety at Work Regulations 1999 ACOP L21)

SQA	Scottish Qualifications Authority	The national body which has responsibility for the development and upkeep of the UK's NOS. It took on the responsibility for the four nations of the UK in December 2016.
SSB	Standards Setting Body for Explosives, Munitions and Search Occupations	A voluntary, freestanding, democratic and autonomous grouping of representatives of key employers operating in the explosives, munitions and search industries. It exists to: design, maintain and foster National Occupational Standards (NOS) and other specifications of competence that reflect current practice in the explosives, munitions and search industries; design, maintain and foster qualifications frameworks that reflect current requirements in the explosives, munitions and search industries; identify skills gaps and other workforce development issues in the explosives, munitions and search industries. **NB. Although the SSB is a UK body (so that there is only one set of Standards), the EUExcert Association and UN SaferGuard programme are each represented so that requests for change can be voiced.**
SSSG	Sector Skills Strategy Group	A body of interested organisations that seeks to: Provide strategic direction to sustain the explosives skills required to meet present and future business needs and so raise the reputation of the UK explosives sector; exploit sector wide collaborative skill development opportunities and other UK and European Government skill development initiatives; influence government skills policy as appropriate.
	Stakeholder	Anyone with an interest in the issue i.e. in control of, or affected by, the issue. These could be internal colleagues, from an external organization or members of the public
	Test	A new or existing single procedure which tests explosive substances

		and/or articles with perception of minimal negative consequence (see *Test & Evaluation Evidence Specifications* for examples)
	Trial	A series of tests or a single test with a series of requirements or outcomes, or with multiple hazards or involving complex explosive substances and/or articles or with a perception of high negative consequence (see *Test & Evaluation Evidence Specifications* for examples)
UKCES	United Kingdom Commission for Employment and Skills	A publicly funded, industry-led organisation that offers guidance on skills and employment issues in the UK. UKCES was responsible for all NOS until it was disbanded under government changes in December 2016.
	Unitized items	A quantity of packages of explosive substances or articles arranged on a pallet in a specific manner and securely strapped or fastened so that the whole is handled as a unit
	Vehicle	Any form of transport including road vehicles, trains, aircraft, waterborne vessels for the purpose of conveying explosive substances and articles
VET	Vocational Education and Training	Vocational education is education that prepares people to work in a trade, a craft, as a technician, or in professional vocations such as engineering, accountancy, nursing, medicine, architecture, or law. Craft vocations are usually based on manual or practical activities and are traditionally non-academic but related to a specific trade or occupation. Vocational education is sometimes referred to as career education or technical education.
VQ	Vocational Qualification	Vocational qualifications refer to work-related qualifications. They are designed to enable the learner to acquire knowledge and skills that are required by the national occupational standards (NOS) to be able to perform a particular job. A vocational qualification gives the learner a proof that he or she is adequately trained for

		a particular workplace once the programme is completed, especially if holding an occupational vocational qualification.

CONTACTS

These people were partners in the EUExImp project and have agreed to publish their contact details for the benefit of other organisations wishing to implement occupational standards:

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Qualifications Centres	See HSQ website: http://www.homelandsecurityqualifications.co.uk/hsq-approved-centres/	GJR (TBC)
Registers of Assessors and Internal Verifiers	Homeland Security Qualifications - RAIVEMS 52 Ickburgh Road London E5 8AD United Kingdom E: denise.clarke@homelandsecurityqualifications.co.uk T: +44 20 8806 4910 Website: http://www.homelandsecurityqualifications.co.uk/	ISSEE Assessor Centre The Centre for Homeland Security Talbot Hall Heythrop Park Enstone Oxon OX7 5UE United Kingdom E: Brendan.Vanner@issee.co.uk T: +44 1608 678382 Website: http://www.issee.co.uk/

THE STANDARDS

1. National Occupational Standards in Explosive Substances and Articles have been developed in the UK for the whole industry – both civilian and military – by the Standards Setting Body for Explosives, Munitions and Search Occupations (SSB for EMSO). These standards are based on the outcome of a methodical analysis of the roles and functions of people working within the industry.

2. Even without the formal external recognition provided by the associated formal vocational qualifications, the standards provide systematic mechanisms to support the following:

    2.1. the design of criteria for:
        2.1.1.the selection, training and assessment of:
            2.1.1.1. new entrants
            2.1.1.2. existing staff
        2.1.2.staff appraisal and promotion
    2.2. the identification of training needs
    2.3. the specification of organizational human resource (HR) policies
    2.4. an infrastructure for assuring the competence of staff without the member of staff necessarily having to go away from their workplace. Internal and external training courses and the necessary lost productivity can be costly but may be the most effective way of gaining the required knowledge and basic skills.
    2.5. targeting the use of budgets and human resources
    2.6. the demonstration of a commitment to quality (e.g. EN ISO9000), investment in people, and the ability to comply with Industry Codes of Practice
    2.7. benchmarking tools.
    2.8. Improving the professional image of workers in the sector

3. The benefits of the external accreditation of these standards, which have great utility in their own right, are described later in this booklet.

History of UK National Occupational Standards for Explosives Munitions and Search Occupations

4. From 2000 to 2003 the UK Ministry of Defence (MOD) recognised that it was losing expertise and experience. In 2005 the UK MOD commissioned a Munitions Strategy study from which one of the conclusions was that “There is a growing concern throughout the munitions community over the reduction in numbers and competence of those employed in the munitions business”. From the end of the Cold War, reduced demand, privatisation and rationalisation saw the traditional MOD explosives capability shrink dramatically. In the mid-80’s, the Royal Ordnance Factories employed some 19,000 people but by 2006 this had reduced to less than 5000. Throughout this period, in response to this declining demand, industry managed its own contraction and consolidation but its concern then was that in the near future it would have to deal with less knowledgeable customers and legislative authorities. As you might expect, all this contraction led to the expertise in the industry remaining vested in fewer people and a much reduced need to recruit and train new staff. Only when the remaining staff began to retire or move to other jobs, did the scale of the decline in expertise begin to manifest itself.

5. In July 2009, the MoD published a requirement to demonstrate competence against the National Occupational Standards (NOS) for Explosive Substances & Articles (ESA), where an article is any equipment containing explosives. This requirement still applies to all people working with or responsible for ordnance, munitions and explosives (OME) [35]. Specifically, it says:

> *The competence of those working in Weapons, Ordnance, Munitions or Explosives (WOME) shall be demonstrated against the standards of best practice set by the sector; these are the National Occupational Standards (NOS) for Explosives Substances and Articles (ESA).*

6. The UK Health and Safety Executive (HSE) has also stated that, when carrying out inspections, it plans to review the competence of personnel against the ESA standards. We anticipate that proof of competence when working with explosives will become increasingly important in the UK. This can be done by working to standards.

What is an Occupational Standard[36]?

7. UK National Occupational Standards (NOS) are statements of the standards of performance individuals must achieve when carrying out functions in the workplace, together with specifications of the underpinning knowledge and understanding.

   7.1. NOS are National because they can be used in every part of the UK where the functions are carried out.

   7.2. NOS are Occupational because they describe the performance required of an individual when carrying out functions in the workplace, i.e. in their occupation (as a plumber, police officer, production engineer etc).

   7.3. NOS are Standards because they are statements of effective performance which have been agreed by a representative sample of employers and other key stakeholders and approved by the UK NOS Panel.

8. All of the completed and approved OS are kept on a database – UK Standards. This is publicly accessible and allows people to search for the different jobs they are interested in. Many participants have found it somewhat difficult to search for the Standard or group of standards that they seek so the awarding organisation, Homeland Security Qualifications, maintains an up to date listing of the NOS by Key Role on its website37, which is considered to be much more user-friendly.

[35] Joint Service Publiciation 482 – MOD Explosives Regulations, Edition 4, Chapter 3, Paragraph 1.10.2, Jan 2013;
https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/197455/C3_Edt4_FINAL.pdf
[36] https://www.gov.uk/government/publications/national-occupational-standards
[37] http://www.homelandsecurityqualifications.co.uk/documents/

EUExcert[38] Acceptance of UK NOS

9. The EUExcert programme aims to establish a stable, firm basis and framework for vocational education of people in the European explosives sector. Training and education institutions as well as social partners will have a tool for competence and career planning, including new training methods as they are developed.

10. The intended effect of EUExcert is to enhance safe working and reduce the number of accidents in the explosives business and establish a competitive industry. In the explosives sector in several European countries a high proportion of the most experienced and knowledgeable people are nearing retirement or have already retired. Consequently it is important to replenish this expertise in this key technological area.

11. The desired effect will be achieved through the development of a competence and qualifications framework that it is recognised across the European community (and hopefully beyond). As such, organisations and individuals using the system should be able to identify the required and available skills, knowledge and understanding of explosives workers. This recognition should, in turn, lead to enhanced mobility of explosives workers as their recognised competence should meet a very high proportion of the regulatory requirements for an explosives worker in the state where the work would be undertaken; it has generally been accepted that there will be an element of local knowledge that would need to be 'topped-up', e.g. the national implementation of EU legislation or other regulations/licensing requirements.

12. The project involves:

    12.1. Mapping competency needs for the explosives industry for the European market

    12.2. Developing a competency framework that can be developed into a European standard

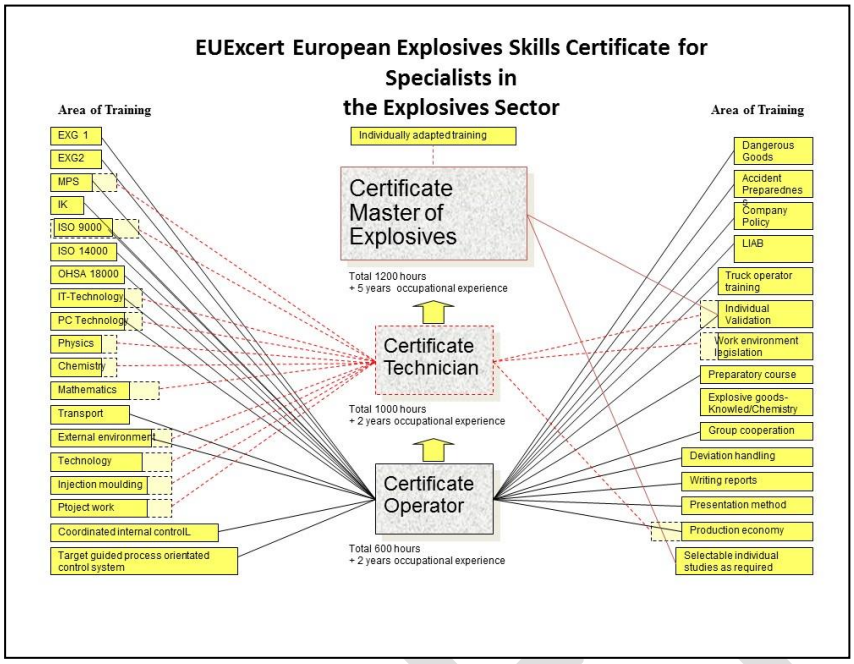
    12.3. Disseminating results from the project to international stakeholders and the explosives sector.

13. From 2003 the EUExcert programme has completed 3 projects in the development of one or more certificates of competence in explosives that would be recognised across Europe and hopefully in other parts of the world. These 3 phases were EUExcert 1 from 2003-Oct 2006, EUExDL from Oct 2006-Sep 2008 and EUExNet from Nov 2009 until Oct 2011.

    13.1. The overall aim of EUExcert 1 was to map competency needs in the industry of explosives for the European market and in a European context, and develop a competency framework which could be developed into a European standard. The project was successful in developing a greater understanding of the demand of competencies in the explosives sector, and especially the need to sustain sector specific competencies and skills when the older generation employees as retiring from their work. The project partners developed a deeper understanding of the impact of the present and close future situation relating to competence loss in each partner country and at the European and international level. The project showed that it is possible and preferable to develop a European standard for competencies for the explosives sector.

[38] http://www.euexcert.org/

13.2. EUExDL proposed the concept of a modular education and training system that



would lead to three 'driving licences' or certificates, i.e. 'Operator', 'Technician' and 'Master of Explosives', requiring 600 hours and 2 years occupational experience, 1000 hours and 2 years occupational experience and 1200 hours with 5 years or more occupational experience. This model of progression was retained in the next project, albeit not as a single, all-encompassing explosives qualification, but for qualifications in discrete specialisations.

13.3. EUExNet created a transnational European web-based network of explosives sector National Nodes from each of the partner nations. The aims of this project were:

13.3.1. to establish a European network between national stakeholders and build on occupational standards, which the earlier projects had recommended. Through use the standards and ensuing competencies will become transferable and transparent.

13.3.2. to establish a European association which after the project will be self-financing. Among other things the association will promote mobility of students, teachers and professionals. Forming of the association and the network will also strengthen the competitiveness of the European explosives sector.

13.4. It was the EUExNet project that accepted the use of the UK NOS as a basis for future work because the Standards were used to underpin national- and industry–recognised qualifications across the sector and because they are outcome-based, requiring the individual to provide evidence of competency and currency in their occupation, not input-based i.e. dependent on what was taught on a specific training or education event. Eight of the ten partners agreed that they would attempt to use the UK NOS as a bottom-up approach to influencing change in their state.

13.4.1. An Occupational Standard (OS) as used in this handbook is therefore a document that describes the knowledge, skills and understanding an individual needs to be

competent at a job.

13.5. To paraphrase the detailed description of an occupational standard from above, then:

13.5.1. OS are International because they can be used in every part of the world where the functions are carried out.

13.5.2. OS are Occupational because they describe the performance required of an individual when carrying out functions in the workplace, i.e. in their occupation (as a plumber, police officer, production engineer etc).

13.5.3. OS are Standards because they are statements of effective performance which have been agreed by a representative sample of employers and other key stakeholders and approved by the UK NOS Panel.

13.6. The fourth project in the EUExcert Programme is known as EUExImp (European Explosives sector Implementation of occupational standards). The project aims to develop knowledge of how to implement the occupational standards as a HR and management tool at plant level as well as developing existing training into a package that is transferable within and across organisational and national boundaries. In addition the project aims to develop tools for implementing new improved HR-practice based on occupational standards. The tools will be developed as a step-by-step guide for process management when implementing occupational standards and this manual which expands on the step-by-step guide and includes examples of good practice.

13.6.1. The use of occupational standards in HR-practice ensures that skills gaps analysis, competence development, education and training, and recruitment will be based on European standards and therefore ensures transferable competencies and ultimately mobile workers.

13.6.2. Employees who are provided with lifelong learning and supplementary education and training based on their needs in relation to their tasks at work ensures that the risks and hazards at work decreases and the work will continue to be safe.

13.6.3. The project was conducted as sub-projects, i.e. what each industry partner intended to do to implement the Standards:

- In Sweden KCEM AB is the project partner and SAAB Bofors Test Centre AB the industry partner. BTC will use the NOS in a management role, to identify the skills of their explosives workers on their HR system as part of their ISO 17001 compliance management framework.
- For the United Kingdom PICRITE Ltd is the project partner and Event Horizon Pyrotechnics Limited the industry partner. Event Horizon is going to redesign their existing SFX courses, mapped to the NOS and to develop and deliver qualifications in concert with the UK's prime customer for SFX technicians (the British Entertainment and Cinematographic Trade Union (BECTU)).
- In Germany, Dresdner Sprengschuele GmbH is the project partner and MAXAM Deutschland GmBH took on the position of industry partner. Germany has a long-standing legal framework for licensing competent people to work with explosives at all stages from research to disposal. MAXAM Deutschland and Dresdner

Sprengschule will make a comparison of the Occupational Standards with the long-standing German system, by mapping the Certificates of Competence for the members of staff in the production of mini-boosters.

- For Portugal, the University of Coimbra was the project partner, working with G.J.R. - Pirotecnia e Explosivos, SA as the industry partner. GJR intends to implement manufacturing qualifications for its staff. Having taken the time to understand the Standards and assessment processes, GJR decided to qualify the production team that manufactures black powder to gain Diplomas in explosives operations at Levels 4, 3 and 2 across the team.
- In Estonia, the Tallinn University of Technology was the project partner with Voglers Eesti OÜ as the industry partner. Voglers intends to use UK qualifications in explosives safety management to be able to demonstrate their workers' competence to their international customers.

The Standards Setting Body for Explosives Munitions and Search Occupations (SSB)

14. It is vitally important that the Standards are consistent across all users, be they from the civil, regulatory or defence sections of the industry, from all nations that adopt the Standards. This element of governance is provided by the Standards Setting Body for Explosives, Munitions & Search Occupations (SSB for EMSO, or, more commonly, the SSB). The SSB meets regularly to review all the standards in response to users requirements, so although the SSB is UK-based it takes all comments and requirements into consideration.

15. The purpose of the Standards Setting Body for Explosives, Munitions & Search Occupations is to foster competence in the explosives industry through the commissioning and maintenance of nationally accredited standards and qualifications, whether they be government- or industry-recognised qualification. A voluntary, freestanding committee, the SSB seeks to achieve consensus views on competence-related matters through consultation with and between stakeholders. The SSB also works closely with a number of other bodies, including the Health & Safety Executive.

16. The SSB was originally established in early 2000 to develop National Occupational Standards (NOS) and National/Scottish Vocational Qualifications (N/SVQs) for use in munition clearance (essentially explosive ordnance (EOD) disposal) and search (MCS) occupations. This sector was – and to some extent still is – largely the preserve of the Armed Forces and other government agencies, although non-governmental and commercial organisations are increasingly involved in this field, often working alongside or in tandem with their military counterparts.

17. The MCS standards project commenced in September 2000 with rigorous research to describe the industry – civilian and military – and to identify the training and skills issues needing to be met by the proposed standards and qualifications. Conducted by specialists in consultation with search and munition clearance managers and operatives from across the industry, this preliminary work enabled the production of a detailed occupational map, a narrative description of the purpose, scale and scope of the industry and its training and accreditation mechanisms, along with analysis of current trends, needs, strengths, weaknesses, opportunities and threats.

18. The next stage, standards development, began with the definition of a "Key Purpose Statement", outlining the common aims of the industry. Then, the myriad functions that need to be carried out across the industry in order to achieve this purpose were defined. Simultaneously, experts from the Army, Navy and Royal Air Force, along with representatives of civilian de-mining

companies and the Defence Science & Technology Laboratories, collaborated with qualifications specialists to develop National Occupational Standards in MCSO. Subsequently, these Standards were field-tested prior to the drafting of N/SVQs for each discrete role within the industry. These draft N/SVQs were then subjected to rigorous scrutiny by practitioners and trainers serving the industry prior to submission for accreditation by the regulatory authorities. Accreditation was granted in 2002 and the N/SVQs were launched at the National Army Museum in London on 21 October 2003.

19. In late 2003, at the request of the MOD's Defence Ordnance Safety Group, the SSB undertook to repeat this process for the whole of the Explosives Substances & Articles (ESA) sector (often known as "ordnance, munitions and explosives" (OME), including research and development, safety management, test and evaluation, manufacture, maintenance, procurement, storage, transport, facilities management, disposal and civil applications (eg special effects, oil and gas exploration, mining and quarrying).

20. During 2004 and 2005, the SSB's Occupational Working Group for ESA (OWG for ESA) held over 50 meetings and 45 one to three day workshops at which managers and practitioners assisted the SSB's expert adviser in:

    - mapping the scope and size of the sector;
    - defining its over-arching function (or mission);
    - analysing the sector's key roles and functions;
    - drafting NOS.

21. Almost 400 individuals participated in various parts of the process, although a central team of about 20 individuals bore the brunt of the work. The validation process alone involved over 300 people at 16 sites across the industry. The cash costs of the project of around £350k were met largely by principal stakeholders, although limited public funding was received through Science Engineering & Manufacturing Technologies Alliance (SEMTA), the Sector Skills Council (SSC) responsible at the time. The true cost of the project was probably to £900k.

22. Once the NOS were validated and endorsed by the OWG for ESA in late 2005, they were submitted to the appropriate authorities for accreditation. Then, work was carried out to:

    - develop N/SVQs for people working at different levels (from operator to operational manager) based on the NOS;
    - draw up evidence specifications, assessment guidance, centre and candidate guidance and model portfolios;
    - map the NOS to Key Skills.

23. Consideration continues to be given to assuring the continuing fitness for purpose of the ESA NOS and to devising fundable apprenticeship frameworks.

The Occupational Standards.

24. The full details of all the explosives-related standards and/or qualifications can be found at the following websites:

    24.1. UK Commission for Employment and Skills:
    http://www.ukstandards.co.uk/Pages/index.aspx

24.2. Homeland Security Qualifications – brings the ESA occupational standards together: **http://www.homelandsecurityqualifications.co.uk/documents/**

24.3. Mineral Products Qualifications Council: **http://www.mpskills.co.uk/industry-qualifications/**

25. The Occupational Standards for Explosive Substances and Articles, as at 30 Jun 15 are at Appendix A.

26. A typical Standard consists of:

26.1. a one-line descriptor, which is what people often refer to when they talk about 'The Standard'

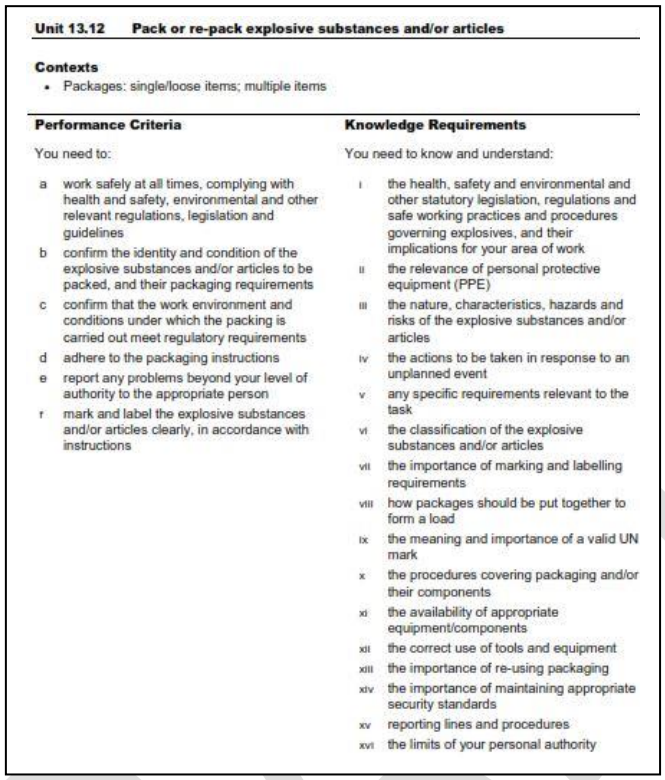
26.2. Contexts. The Contexts describe the critical parameters of competent performance which may include internal and external factors, options or situations. Someone cannot be deemed to be competent unless they can meet the performance criteria in all the situations describe by the contexts. So, looking at ESA standard 7.9 *Supervise the selection, preparation and despatch of explosive substances and/or articles,* a Storage Supervisor could not be deemed competent if he or she could only deal with single orders, single consignments that were fulfilled in part with full resources. A competent Storage Supervisor can also deal with mixed order, multiple consignments that were fulfilled in full with limited resources. Achievement of the contexts shows the breadth of someone's competence and the fact that they can deal with the non-routine and unpredictable as well as the full range of expected situations.

26.3. Performance Criteria. The performance criteria are the outcomes against which someone's performance would be measured. Because they are written as outcomes, they can be assessed (by a suitably qualified and experienced assessor) and the assessment judgments that result should be fair and unequivocal. The ESA standards were written to describe competence in the workplace so it follows that the performance criteria must be evidenced by real work. People cannot prove their competence against the performance criteria by sitting an examination or writing a report and only in very rare situations would evidence from simulated activities be acceptable. As each ESA standard is designed to be a stand-alone specification of competence, any requirement that is relevant to that standard must be included in it. So, all the ESA standards begin with the same performance criterion [you need to]: *work safely at all times, complying with health and safety, environmental and other relevant regulations, legislation and guidelines.*

26.4. Knowledge Criteria. Some of the knowledge that is needed to fulfil the performance criteria can be inferred from competent performance. For example, if you *adhere to reporting procedures at all times* (and this would be assessed over a period of time), then it follows that you know what those procedures are. However, some knowledge cannot be inferred from competent performance. This is specified in the Knowledge requirements. The intention of all these standards is that competence would be measured in the workplace. However, for some points of knowledge, this could be taught off the job in a training module. For example, a training course could cover the legislative and regulatory requirements of health and safety and *the rules governing mixing hazard divisions and compatibility groups*. On the other hand, it might be more appropriate to assess whether someone knows *how long it takes to assemble orders* in the workplace because this will

vary from one organisation to another and indeed, between different production areas.

27. An example of a typical Standard is 'Pack or Repack Explosive Substances or Articles' which is an activity that the majority of explosives workers will have to perform.



Unit 13.12 Pack or re-pack explosive substances and/or articles

Contexts

- Packages: single/loose items; multiple items

Performance Criteria	Knowledge Requirements
You need to:	You need to know and understand:
a work safely at all times, complying with health and safety, environmental and other relevant regulations, legislation and guidelines	i the health, safety and environmental and other statutory legislation, regulations and safe working practices and procedures governing explosives, and their implications for your area of work
b confirm the identity and condition of the explosive substances and/or articles to be packed, and their packaging requirements	ii the relevance of personal protective equipment (PPE)
c confirm that the work environment and conditions under which the packing is carried out meet regulatory requirements	iii the nature, characteristics, hazards and risks of the explosive substances and/or articles
d adhere to the packaging instructions	iv the actions to be taken in response to an unplanned event
e report any problems beyond your level of authority to the appropriate person	v any specific requirements relevant to the task
f mark and label the explosive substances and/or articles clearly, in accordance with instructions	vi the classification of the explosive substances and/or articles
	vii the importance of marking and labelling requirements
	viii how packages should be put together to form a load
	ix the meaning and importance of a valid UN mark
	x the procedures covering packaging and/or their components
	xi the availability of appropriate equipment/components
	xii the correct use of tools and equipment
	xiii the importance of re-using packaging
	xiv the importance of maintaining appropriate security standards
	xv reporting lines and procedures
	xvi the limits of your personal authority

28. When considering whether or not an individual has achieved 'The Standard', it is important to understand that to do so, the individual must be able to demonstrate that they meet the requirements of all the elements of the Standard.

29. Readers will have noted that the Standard does not specify what training, education, courses, certificates or degrees are required to meet the Standard. Nor does a Standard define what evidence an individual must be able to produce to demonstrate their competence in any element or the standard as a whole. These requirements and their assessment is picked up in the chapter on Qualifications.

APPENDIX A – THE STANDARDS
(AS AT JUN 15)

KEY ROLE 1 – Research, Design and Development

1.1 Create the complex specification for explosive substances and/or articles
1.2 Create the specification for an explosive substance or article
1.3 Assimilate and evaluate the information on explosive substances and/or articles
- 1.3.1 Identify sources and gather the information on explosive substances and/or articles
- 1.3.2 Evaluate and present the information on explosive substances and/or articles

1.4 Gather and interpret the information on explosive substances and/or articles
- 1.4.1 Gather information from identified sources on explosive substances and/or articles
- 1.4.2 Interpret and present the information on explosive substances and/or articles

1.5 Identify and gather the information on explosive substances and/or articles
1.6 Prepare the research strategy for explosive substances and/or articles
1.7 Prepare the research programme for explosive substances and/or articles
1.8 Submit proposals for research work for explosive substances and/or articles
1.9 Plan the research into explosive substances and/or articles
- 1.9.1 Decide the research protocols for explosive substances and/or articles
- 1.9.2 Draw up research plans for explosive substances and/or articles

1.10 Carry out the research strategy and analyse the information collected on explosive substances and/or articles
- 1.10.1 Carry out investigations into explosive substances and/or articles
- 1.10.2 Analyse and evaluate research information on explosive substances and/or articles

1.11 Carry out investigations and analyse the information collected on explosive substances and/or articles
- 1.11.1 Carry out investigations into explosive substances and/or articles
- 1.11.2 Analyse and evaluate research information on explosive substances and/or articles

1.12 Contribute to carrying out investigations and analysing the information collected on explosive substances and/or articles
- 1.12.1Contribute to investigations into explosive substances and/or articles
- 1.12.2 Contribute to analysing research information on explosive substances and/or articles

1.13 Evaluate and document complex research and findings on explosive substances and/or articles
- 1.13.1 Evaluate the effectiveness of results in meeting complex research objectives for explosive substances and/or articles
- 1.13.2 Document the research and findings on explosive substances and/or articles

1.14 Assess and document research and findings on explosive substances and/or articles
- 1.14.1 Assess the effectiveness of results in meeting research objectives for explosive substances and/or articles
- 1.14.2 Document the research and findings on explosive substances and/or articles

1.15 Develop a dissemination plan for explosive substances and/or articles
1.16 Carry out small scale processing for explosive substances and/or articles
1.17 Design the scale up process for explosive substances and/or articles
1.18 Create the specification for the design of complex explosive articles
1.19 Create the specification for the design of an explosive article
1.20 Identify and analyse the factors applicable to the explosive article design specification
1.21 Generate design options for explosive articles
1.22 Evaluate design options for explosive articles
1.23 Gather information to assist in generating design options for explosive articles
1.24 Build prototype(s) of selected complex design(s) for explosive articles
- 1.24.1 Prepare drawings for complex explosive article prototype(s)

1.24.2 Carry out assembly-related activities to build complex explosive article prototype(s)

1.25 Build prototype(s) of selected design(s) for explosive articles

1.25.1 Prepare drawings for the explosive article prototype(s)

1.25.2 Carry out assembly-related activities to build the explosive article prototype(s)

KEY ROLE 2 – Safety Management

2.1 Formulate national policy for explosives substances and articles
2.2 Determine the classification of explosive substances and/or articles
2.2A Make recommendations for the classification of explosive substances and/or articles
2.3 Review the factors affecting the safety of specific explosive substances and/or articles
2.3A Make recommendations on the factors affecting the safety of specific explosive substances and/or articles
2.4 Analyse the acceptability of safety control measures for specific explosive substances and/or articles
2.4A Review safety control measures for specific explosive substances and/or articles
2.5 Review an organisation's safety management system for explosives
2.5A Assess an explosives safety management system
2.6 Develop the organisational safety policy and/or strategy for explosives
2.7 Implement the organisational safety policy and/or strategy for explosives
2.8 Analyse and identify aggregated hazards and risks for explosives
2.8A Assess the suitability of explosives facilities
2.9 Determine and implement aggregated risk control measures for explosives
2.9A Implement risk control measures for explosive substances and/or articles
2.10 Develop and implement assurance systems for explosives safety
2.10A Carry out assurance audit of systems for explosives safety
2.11 Develop emergency response systems and procedures for explosives safety
2.12 Investigate explosives-related safety incidents
2.12A Contribute to the investigation of explosives safety incidents
2.13 Assess explosives licence applications
2.14 Prepare and submit an explosives licence application

KEY ROLE 3 – Test and Evaluation

3.1 Establish the performance criteria for explosive substances and/or articles
3.2 Determine the existence of a suitable trial or test procedure for explosive substances and/or articles
3.3 Design a new trial procedure for explosive substances and/or articles
3.4 Design a new test procedure for explosive substances and/or articles
3.5 Adapt an existing trial procedure for explosive substances and/or articles
3.6 Adapt an existing test procedure for explosive substances and/or articles
3.7 Validate a trial or test procedure for explosive substances and/or articles
3.8 Plan the trial of explosive substances and/or articles
3.9 Plan the test of explosive substances and/or articles
3.10 Manage the trial of explosive substances and/or articles
3.11 Manage the test of explosive substances and/or articles
3.12 Carry out pre-trial or pre-test tasks relating to explosive substances and/or articles
3.13 Contribute to pre-trial or pre-test tasks relating to explosive substances and/or articles

3.14 Carry out trials of explosive substances and/or articles
3.15 Carry out tests of explosive substances and/or articles
3.16 Contribute to conducting a trial or test of explosive substances and/or articles
3.17 Evaluate the results of trials of explosive substances and/or articles
3.18 Evaluate the results of tests of explosive substances and/or articles
3.19 Carry out post-trial or post-test tasks relating to explosive substances and/or articles
3.20 Contribute to post-trial or post-test tasks relating to explosive substances and/or articles

KEY ROLE 4 – Manufacture of Explosive Substances and Articles

4.1 Develop and update explosives standard operating procedure/s
    4.1.1 Draft explosives procedure/s
    4.1.2 Obtain approval for new or amended procedure/s
4.2 Contribute to the validation and optimization of new or modified explosives processes and equipment
    4.2.1 Validate new or modified explosives processes and equipment
    4.2.2 Optimise new or modified explosives processes and equipment
4.3 Resolve explosives operational problems
    4.3.1 Identify explosives manufacturing problems
    4.3.2 Implement and evaluate the chosen solution
4.4 Prepare the explosives process area and equipment
4.5 Move materials within the explosives process
4.6 Prepare explosives process materials
4.7 Supervise the preparation of explosives processing operation
4.8 Monitor and control explosives processing
4.9 Supervise explosives processing
4.10 Solve explosives process problems
    4.10.1 Identify explosives processing problems
    4.10.2 Implement and evaluate solutions
4.11 Shut down the explosives process
4.12 Supervise the shutdown of explosives processing
4.13 Separate recoverable materials and waste produced by the explosives process
4.14 Contribute to explosives standard operating procedures

KEY ROLE 5 – Maintenance

5.1 Plan the maintenance programme for explosive substances and/or articles
5.2 Manage the maintenance programme for explosive substances and/or articles
5.3 Manage the maintenance plan for explosive substances and/or articles
5.4 Implement the inspection of explosive substances and/or articles
5.5 Implement the adjustment of explosive substances and/or articles
5.6 Implement the complex removal of explosive substances and/or articles
5.7 Implement the routine removal of explosive substances and/or articles
5.8 Implement the complex assembly of explosive substances and/or articles
5.9 Implement the routine assembly of explosive substances and/or articles
5.10 Assess the feasibility of repair of an explosive substance or article
5.11 Implement the complex repair of explosive substances and/or articles
5.12 Implement the routine repair of explosive substances and/or articles

5.13 Plan configuration activities for explosive substances and/or articles
5.14 Manage configuration activities for explosive substances and/or articles
5.15 Implement configuration activities for explosive substances and/or articles
5.16 Audit the effectiveness of configuration activities for explosive substances and/or articles

KEY ROLE 6 – Procurement

6.1 Identify the requirement and specification for explosive substances and/or articles
6.2 Define the procurement strategy for explosive substances and/or articles
6.3 Contribute to the identification of the requirement and specification for explosive substances and/or articles
6.4 Identify potential suppliers of explosive substances and/or articles
- 6.4.1 Announce the requirement to potential suppliers of explosive substances and/or articles
- 6.4.2 Shortlist potential suppliers of explosive substances and/or articles

6.5 Provide explosives-related technical input to assist in identifying potential suppliers and/or articles
- 6.5.1 Compile technical information for the explosive substances and/or articles requirement 9
- 6.5.2 Assess the capability of potential suppliers of explosive substances and/or articles, and/or of articles to be supplied

6.6 Negotiate and award contracts for explosive substances and/or articles
- 6.6.1 Draft technical sections of explosives-related invitations to tender
- 6.6.2 Evaluate and make recommendations for the supply of explosive substances and/or articles

6.7 Place orders to the supply of explosive substances and/or articles
- 6.7.1 Confirm the fitness for purpose of the explosive substances and/or articles
- 6.7.2 Place an order for explosive substances and/or articles

6.8 Manage the contract for the supply of explosive substances and/or articles
- 6.8.1 Monitor the performance of suppliers of explosive substances and/or articles
- 6.8.2 Manage relationships with suppliers of explosive substances and/or articles

6.9 Ensure compliance with contract terms for the supply of explosive substances and/or articles
- 6.9.1 Collate contractual information for explosive substances and/or articles
- 6.9.2 Compare information on explosive substances and/or articles with contractual requirements

KEY ROLE 7 – Storage

7.1 Move explosive substances and/or articles manually
7.2 Supervise the placing of explosive substances and/or articles into storage
7.3 Put explosive substances and/or articles into storage
7.4 Supervise the receiving of explosive substances and/or articles into storage
7.5 Supervise the maintenance of storage conditions for explosive substances and/or articles
7.6 Maintain the quality of explosive substances and/or articles in storage
7.7 Select and prepare explosive substances and/or articles for despatch
7.8 Despatch explosive substances and/or articles
7.9 Supervise the selection, preparation and despatch of explosive substances and/or articles
7.10 Manage the receipt of explosive substances and/or articles

7.11 Manage the storage of explosive substances and/or articles
7.12 Manage the despatch of explosive substances and/or articles
7.13 Manage stock levels and stock inventories of explosive substances and/or articles
7.14 Audit stock levels and stock inventories of explosive substances and/or articles
7.15 Carry out stock checks of explosive substances and/or articles
7.16 Maintain stock control systems for explosive substances and/or articles
7.17 Operate specialised plant and machinery to performance requirements for explosive substances and/or articles
7.18 Lift, transfer and position explosive substance and/or article loads

KEY ROLE 8 – Transport

8.1A Plan and manage the safe and secure transportation by road of explosive substances and articles
- 8.1.1A Plan the safe and secure transportation by road of explosive substances and articles
- 8.1.2A Manage the safe and secure transportation by road of explosive substances and articles

8.1B Plan and manage the safe and secure transportation by rail of explosive substances and articles
- 8.1.1B Plan the safe and secure transportation by rail of explosive substances and articles
- 8.1.2B Manage the safe and secure transportation by rail of explosive substances and articles

8.1C Plan and manage the safe and secure transportation by sea of explosive substances and articles
- 8.1.1C Plan the safe and secure transportation by sea of explosive substances and articles
- 8.1.2C Manage the safe and secure transportation by sea of explosive substances and articles

8.1D Plan and manage the safe and secure transportation by air of explosive substances and articles
- 8.1.1D Plan the safe and secure transportation by air of explosive substances and articles
- 8.1.2D Manage the safe and secure transportation by air of explosive substances and articles

8.2 Obtain information on the explosive substances and articles load
8.3A Plan the route and timings for the delivery and collection of explosive substances and articles by road
- 8.3.1A Obtain information on the destination and schedule
- 8.3.2A Identify a route to the destination
- 8.3.3A Estimate driving distances and times for the route
- 8.3.4A Plan driving stages

8.3B Obtain information on the destination and schedule of the explosive load by rail
8.3C Obtain information on the destination and schedule of the explosive load by sea
8.3D Obtain information on the destination and schedule of the explosive load by air
8.4 Load the vehicles with explosive substances and articles
- 8.4.1 Prepare the vehicle for loading
- 8.4.2 Load the vehicle

8.5 Supervise the loading of the vehicle with explosive substances and articles by others
8.6 Unload explosive substances and articles from the vehicle
- 8.6.1 Comply with proof-of-delivery requirements
- 8.6.2 Assist in the unloading of the vehicle

8.7 Supervise the unloading of explosive substances and articles from the vehicle by others
8.8 Complete pre-driving preparations (DGV 6)
- 8.8.1 Identify vehicle instruments and controls
- 8.8.2 Complete vehicle and safety checks

8.8.3 Complete vehicle and load documentation

8.9 Maintain the safety and the security of the load, self and property (DGV 7)

8.9.1 Identify the legal, safety and operating requirements for the vehicle and the load

8.9.2 Protect the vehicle and load from security risks

8.10 Maintain awareness of driving conditions (DGV 8)

8.10.1 Assess the effects of driving conditions

8.10.2 Monitor the load during driving

8.10.3 Contribute to the safety of self, vehicle, load and other road users

8.11 Operate the vehicle systems (DGV 9)

8.11.1 Operate and monitor vehicle instruments and controls

8.11.2 Ensure the efficient and careful use of the vehicle

8.12 Drive the vehicle on public roads (DGV 10)

8.12.1 Position the vehicle on the road

8.12.2 Control the speed of the vehicle

8.12.3 Overtake other vehicles

8.12.4 Brake the vehicle within a limited space

8.12.5 Control the vehicle in an emergency situation

8.13 Drive the vehicle in restricted spaces (DGV 11)

8.13.1 Select a space for manoeuvring the vehicle

8.13.2 Manoeuvre the vehicle in restricted spaces

8.14A Couple and uncouple the vehicle (DGV 12)

8.14.1A Couple the vehicle

8.14.2A Uncouple the vehicle

8.14B Couple and uncouple the train

8.14.1B Couple the train

8.14.2B Uncouple the train

8.15 Escort the explosive substances and articles load

KEY ROLE 9 – Facilities Management

9.1 Define explosives facilities requirement

9.2 Ensure explosives facilities are fit for purpose

9.3 Conduct safety checks on explosives facilities

9.4 Develop and implement the explosives facility decommissioning plan

9.5 Conduct decommissioning tasks on explosives facility

KEY ROLE 10 – Other Applications

10.1 Contribute to an efficient and effective blasting environment (BL1)

10.1.1 Contribute to efficiency in the workplace

10.1.2 Develop and maintain effective working relationships

10.1.3 Organize own work and maintain standards

10.2 Contribute to health and safety in the blasting workplace (BL2)

10.2.1 Operate safely in the workplace

10.2.2 Respond to emergencies

10.2.3 Assist in the security of the workplace

10.3 Receive, store and issue explosive materials (BL3)

10.3.1 Receive and store explosive materials

10.3.2 Issue explosive materials to authorised

10.4 Receive and handle explosive materials on-site (BL4)

10.4.1 Receive explosive materials on-site

10.4.2 Handle explosive material on site

10.5 Charge blast holes to specification (BL5)

10.5.1 Check blast sites prior to charging

10.5.2 Prepare the explosive materials

10.5.3 Charge blast holes with explosive materials

10.5.4 Remove and dispose of surplus materials

10.6 Blast to specification (BL6)

10.6.1 Complete and check the initiation circuit

10.6.2 Clear and secure the danger zone

10.6.3 Sound warning and fire the blast

10.6.4 Inspect blast site after detonation

10.6.5 Collate feedback and record findings of the blast operations

10.7 Deal with misfires (BL7)

10.7.1 Identify type and position of misfire

10.7.2 Take remedial action with misfires

10.7.3 Recover explosive materials

10.8 Determine the blast requirements (BL8)

10.8.1 Identify the area for blasting

10.8.2 Determine the objectives of the blast

10.9 Design and arrange for the authorization of the blast specification (BL9)

10.9.1 Collate information for the blast design

10.9.2 Produce a detailed blast specification

10.9.3 Arrange for the authorization of the blast specifications

10.10 Produce profiles of rock faces and landforms (BL10)

10.10.1 Prepare and set up equipment

10.10.2 Produce profile data

10.11 Supervise the blast operation (BL11)

10.11.1 Supervise the preparation for the blast

10.11.2 Supervise the firing of the blast

10.11.3 Confirm the conclusion of the blast

10.12 Design the complex explosive display

10.13 Design the explosive display

10.14 Prepare and position explosive effects

10.15 Contribute to the preparation and positioning of explosive effects

10.16 Initiate the explosive effect

10.17 Modify explosive effects delivery systems

10.18 Use explosives for engineering purposes

10.18.1 Develop the technical design

10.18.2 Prepare and position charges for engineering purposes

10.18.3 Initiate the effect for engineering purposes

KEY ROLE 11 – Disposal

11.1 Assess the explosive substances and/or articles for disposal

11.2 Determine the existence of a suitable disposal procedure for explosive substances and/or articles
11.3 Adapt an existing explosive substances and/or articles disposal procedure
11.4 Design a new disposal procedure for explosive substances and/or articles
11.5 Plan the disposal of explosive substances and/or articles (complex**)**
11.6 Plan the disposal of explosive substances and/or articles (non-complex)
11.7 Manage tasks for the disposal of explosive substances and/or articles
11.8 Carry out pre-disposal tasks for explosive substances and/or articles
11.9 Contribute to pre-disposal tasks for explosive substances and/or articles
11.10 Dispose of explosive substances and/or articles by complex mechanical breakdown procedures
11.11 Dispose of explosive substances and/or articles by complex chemical breakdown procedures
11.12 Dispose of explosive substances and/or articles by complex biological breakdown procedures
11.13 Dispose of explosive substances and/or articles by complex burning procedures
11.14 Dispose of explosive substances and/or articles by complex incineration procedures
11.15 Dispose of explosive substances and/or articles by complex deflagration procedures
11.16 Dispose of explosive substances and/or articles by complex detonation procedures
11.10A Dispose of explosive substances and/or articles by non-complex mechanical breakdown procedures
11.11A Dispose of explosive substances and/or articles by non-complex chemical breakdown procedures
11.12A Dispose of explosive substances and/or articles by non-complex biological breakdown procedures
11.13A Dispose of explosive substances and/or articles by non-complex burning procedures
11.14A Dispose of explosive substances and/or articles by non-complex incineration procedures
11.15A Dispose of explosive substances and/or articles by non-complex deflagration procedures
11.16A Dispose of explosive substances and/or articles by non-complex detonation procedures
11.17 Dispose of explosive substances and/or articles by function as intended procedures
11.18 Contribute to the disposal task for explosive substances and/or articles
11.19 Carry out post-disposal tasks for explosive substances and/or articles
11.20 Contribute to post-disposal tasks for explosive substances and/or articles

KEY ROLE 12 – Munition Clearance and Search

12.1 Plan munition clearance operations and programmes
12.2 Manage munition clearance operations and programmes
12.3 Evaluate and improve the effectiveness of munition clearance and search operations and programmes
12.4 Provide advice on munition clearance and search-related matters
12.5 Define the boundaries of the area to be searched for munitions
12.6 Identify and record the location and disposition of potential munitions within boundaries
12.7 Contribute to locating the disposition of potential munitions
12.8 Confirm the presence of munition(s)
12.9 Contribute to confirming the presence of munitions
12.10 Remove the threat of munitions
- 12.10.1 Confirm the threat posed by munitions
- 12.10.2 Implement protective measures
- 12.10.3 Render safe or dispose of munitions

12.11 Contribute to removing the threat of munitions
12.12 Move and transport munitions

12.12.1 Determine whether to move munitions
12.12.2 Supervise the movement and transportation of munitions

12.13 Contribute to the movement or transportation of munitions
12.14 Enable areas cleared of munitions or specified targets to be remediated
12.15 Complete munitions or specified targets reports
12.16 Assist in locating the position of the munition
12.17 Assist with the movement and transportation of munitions
12.18 Use and maintain search or munition clearance equipment
12.19 Assist with the preparation, maintenance and use of search or munition clearance equipment
12.20 Work safely (Packaging 4.9)
12.20.1 Minimize the risks to health and safety
12.20.2 Minimize the risks to the environment in the workplace
12.21 Evacuate casualties
12.22 Develop your competence in working with munitions or specified targets

12.1A Plan specified targets search operations
12.2A Manage specified targets search operations
12.3A Organize and supervise the delivery of specified targets search plans
12.3A.1 Draw up plans to counter identified threats
12.3A.2 Supervise the delivery of specified targets search plans
12.4A Evaluate the effectiveness of specified targets search operations
12.5A Provide advice on specified targets search matters
12.6A Identify and describe the area to be searched
12.7A Contribute to identifying and describing the area to be searched
12.8A Detect and locate specified targets and other risks
12.8A.1 Gain safe access to specified targets
12.8A.2 Confirm or deny the presence of specified targets and other risks
12.9A Contribute to locating and gaining access to specified targets
12.9A.1 Contribute to gaining safe access to specified targets
12.9A.2 Contribute to confirming or denying the presence of specified targets and other risks
12.10A Assist in searching for specified targets

KEY ROLE 13 – Generic Functions

13.1 Work effectively in a team involved in activities for explosive substances and/or articles
13.2 Manage your own resources (Management & Leadership A1)
13.3 Manage your own resources and professional development (Management & Leadership A2)
13.4 Manage continuous improvement in activities for explosive substances and articles
13.5 Allocate and check work in your team (Management & Leadership D5)
13.6 Provide leadership for your team (Management & Leadership B5)
13.7 Provide leadership in your area of responsibility (Management & Leadership B6)
13.8 Conduct an assessment of the risks in the workplace (CPPCO 3.13)
13.8.1 Identify hazards in the workplace
13.8.2 Assess the level of risk and recommend action
13.8.3 Review your workplace assessment of risks
13.9 Provide technical or safety advice and/or guidance to others on explosives
13.10 Make presentations on matters relating to explosives
13.10.1 Prepare presentations on matters relating to explosives
13.10.2 Deliver presentations on matters relating to explosives

13.11 Hand over explosive substances and/or articles
13.12 Pack or re-pack explosive substances and/or articles
13.13 Unpack explosive substances and/or articles
13.14 Manage equipment in an explosives environment
13.15 Prepare and care for equipment in an explosives environment
13.16 Manage explosives safety
13.17 Certify as Free From Explosives (FFE)
13.18 Supervise explosives safety

EU ExCert

Certifying Expertise in European Explosives Sector

EUExImp Step-by-Step Guide to Implementing Occupational Standards

Erasmus+

ACKNOWLEDGEMENTS [Extract from Step-by-Step Guide]

This project has received funding from the European Union's Erasmus+ Programme for Strategic Partnership Vocational Training under Grant Agreement No. 2014-1- SE01-KA202-001030.

We would also like to thank the Swedish Council for Higher Education for their operational support.

The authors, i.e. the so-called 'old partners' in the EUExImp project, would like to thank the industry partners for their time, effort and patience in undertaking the project.

Particular thanks are due to Denise Clarke of Homeland Security Qualifications for her support and her permission to include too many extracts from documents and articles to reference individually.

Last but not least, thanks to all those who participated in the 7th International Conference and Workshop on Explosives Education and Certification for their valuable insight and input, which helped to refine the processes described in this guide.

FOREWORD

Thank you for picking up this guide, which we hope will be of use to you and your organisation. While it is based on the real experiences of the project partners, we hope that you will help us to improve future versions by sending us your comments.

Throughout the development of the EUExcert programme, we have maintained the view that safety in the explosives sector is achieved not only by external regulation but also by the continuous improvement of the competence of the people involved. Many of you will have some academic or scholarly knowledge of your profession but many will have entered the sector and made progress through practical experience. The Occupational Standards that are used to underpin this guide provide a common method by which the competence of all workers in the explosives sector can be measured, independently of the route by which they have entered the profession.

We hope that implementing these Occupational Standards to improve competence in the sector will serve to reduce the number of accidents, incidents and near-misses in the sector.

Erik Nilsson	Ken Cross
Project Leader	Technical Adviser

IF YOU ARE READING THIS AS PART OF THE HANDBOOK FOR IMPLEMENTATION OF OCCUPATIONAL STANDARDS IN THE EXPLOSIVES SECTOR, YOU CAN FIND THE COMPLETE, UP TO DATE, EDITION AT
http://www.euexcert.org/

THE KEY ROLES

1. The first stage of the Standards Setting Body for Explosives, Munitions and Search Occupations (SSB) work in the development of the occupational standards created an 'Occupational Map' - a descriptive report of the industry, its size and composition; skills and training issues; roles employed; numbers employed and other notable related issues. From this occupational map, the SSB carried out the preliminary scoping work to identify the main areas of activity (the "key roles"), resulting in a 'Functional Map' of the whole sector.

2. The Key Roles (KR) are:

2.1. KR 1 – Research and Development

2.1.1. The standards defined here describe the required competences of people working in the Design, Research and Development of explosive substances and/or articles. The functions of Technicians working in explosives laboratories are described elsewhere, by the Laboratory and Associated Technical Activities (LATA) National Occupational Standards.

2.1.2. Tying the KR to possible qualifications and jobs:

2.1.2.1. Research into Explosive Substances and/or Articles Level 4.

2.1.2.1.1. This role is aimed at senior research managers who are engaged in research activities at an operational level. It does not involve setting the strategic direction but it is likely to involve leading a team of scientists.

2.1.2.1.2. Typical job/role titles are: Research Project Leader, Research Leader, Research Project Manager, Senior Scientist.

2.1.2.2. Design and/or Development of Explosive Substances and/or Articles Level 4.

2.1.2.2.1. This role is aimed at senior research/design managers who are engaged in design activities at an operational level. It does not involve setting the strategic direction but it is likely to involve leading a team of scientists.

2.1.2.2.2. Typical job/role titles are: Design Manager, Design Engineer, Weapon Designer, Development Manager, Project Leader/Manager, Engineering Manager.

2.1.2.3. Research, Design and Development of Explosive Substances and/or Articles Level 3.

2.1.2.3.1. This role is aimed at junior scientific or engineering managers who are actively engaged in either research or design and development activities. They are unlikely to have staff management responsibilities, but

they may well provide direction to laboratory technicians.

2.1.2.3.2. Typical job/role titles are: Researcher, Designer, Development Scientist, Explosives Technologist, Design/Development Engineer.

2.2. KR 2 – Explosives Safety Management

2.2.1. These standards are aimed at policy makers and explosives safety managers/advisers.

2.2.2. The development and implementation of task-related safety cases is described within each relevant functional area of the National Occupational Standards in Explosive Substances and Articles (e.g. manufacturing risk assessments are described in the Manufacturing key role, maintenance risk assessments are described in the Maintenance key role etc).

2.2.3. This suite describes the relationship and interface between different elements of an organisation's safety management system for explosives, and is therefore aimed at those with special responsibilities. All explosives workers have some responsibility for the safe management of explosives and Standards relating to this general requirement are listed in KR 13.

2.2.4. Tying the KR to possible qualifications and jobs:

2.2.4.1. Explosives Safety Management and/or Advice and/or Regulation Level 4.

2.2.4.1.1. This role is aimed at those specialists within organizations who carry a particular responsibility for explosives safety management across an organization, or the provision of explosives safety advice or those who make policy and regulate the explosives industry.

2.2.4.1.2. Typical job/role titles are: Explosives Safety Manager, Explosives Safety Adviser, Inspector, Weapons Safety Manager, Weapons Safety Officer.

2.2.4.2. Test & Evaluation Management of Explosive Substances and/or Articles Level 4.

2.2.4.2.1. This role is aimed at those managers who are responsible for the safe and efficient conduct of an explosives trial. The trial might involve explosive substances being tested in a laboratory or it might be an explosive article (eg a weapons system) being tested on a jig indoors on an open range. This is an operational role and may well carry with it responsibility for staff management.

2.2.4.2.2. Typical job/role titles are: Trials Manager, Trials Conducting Manager, Range Manager, Range Safety Officer, Test Manager, Test Engineer, Firing Officer.

2.3. KR 3 – Test and Evaluation

2.3.1. These standards are designed for those involved in the design, management and conduct of tests and trials of explosive substances and articles. The ESA might be novel or have been in use or on the market for some time.

2.3.2. A 'test' is a new or existing single procedure which tests explosive substances and/or articles with perception of minimal negative consequence.

2.3.3. A 'trial' is a series of tests or a single test with a series of requirements or outcomes, or with multiple hazards or involving complex explosive substances and/or articles or with a perception of high negative consequence.

2.3.4. Tying the KR to possible qualifications and jobs:

2.3.4.1. Test and Evaluation Supervision of Explosive Substances and/or Articles Level 3.

2.3.4.1.1. This role is aimed at those staff who report to the Trials Manager but who carry out tests of explosive substances or articles on their own account. The test might involve explosive substances being tested in a laboratory or it might be an explosive article (eg a weapons system) being tested on a jig indoors or on an open range. This role carries with it responsibility for the supervision of other test personnel (eg range workers or laboratory technicians).

2.3.4.1.2. Typical job/role titles are: Trials Conducting Officer, Test Officer, Leading Hand, Prover, Test Department Manager.

2.3.4.2. Test and Evaluation Operations of Explosive Substances and/or Articles Level 2.

2.3.4.2.1. This role is aimed at people who support the testing of explosive substances or articles by carrying out specific duties as directed by the manager or supervisor. This might take place either in a laboratory, on a jig indoors, or on an open range.

2.3.4.2.2. Typical job/role titles are: Range Worker, Junior Laboratory Technician.

2.4. KR 4 – Manufacture

2.4.1. The occupational standards listed in this KR are for those who manage, supervise and operate in the field of manufacturing explosives. The Standards cover the writing and implementation and monitoring of operating procedures and processes. Importantly they also include the resolution of processing problems and the shutting down of explosives processing.

2.4.2. Tying the KR to possible qualifications and jobs:

2.4.2.1. Explosive Substances and Articles Manufacturing Management Level 4

2.4.2.1.1. This role is aimed at operational managers responsible for the manufacture of explosive substances or articles.

2.4.2.1.2. Typical job/role titles are: Manufacturing Manager

2.4.2.2. Explosive Substances and Articles Manufacturing Supervision Level 3.

2.4.2.2.1. This role is aimed at supervisors who are responsible for a team of operators or process workers who manufacture explosive substances and/or articles. This may involve the manufacture or raw substances or materials or it may involve some assembly or processing of explosive components.

2.4.2.2.2. Typical job/role titles are: Manufacturing Supervisor, Process Supervisor, Chargehand.

2.4.2.3. Explosive Substances and Articles Manufacturing Operations Level 2.

2.4.2.3.1. This role is aimed at operators who are responsible for the manufacture of explosive substances or articles. This may involve the manufacture or raw substances or materials or it may involve some assembly or processing of explosive components. It also involves ensuring that their own work meets the required quality standards.

2.4.2.3.2. Typical job/role titles are: Process Workers, Process Operators

2.5. KR 5 – Maintenance

2.5.1. This KR covers the high-level management of a maintenance programme for ESA as well as the conduct of 'simple' and 'complex' maintenance activities and the configuration control necessitated by changes planned and made.

2.5.2. Tying the KR to possible qualifications and jobs:

2.5.2.1. Explosives Maintenance Management Level 4.

2.5.2.1.1. This role is aimed at managers responsible for the development and delivery of the explosives maintenance programme including carrying out audits of the effectiveness of configuration activities.

2.5.2.1.2. Typical job/role titles are: Explosives Maintenance Manager, Weapons Engineer Officer.

2.5.2.2. Explosives Maintenance Supervision Level 3.

2.5.2.2.1. This role is aimed at those maintenance supervisors who are responsible for planning how the explosives maintenance programme will be carried out and for the delivery of those plans. This role also involves carrying out complex explosives tasks as well as supervising a team of maintenance operators.

2.5.2.2.2. Typical job/role titles are: Explosives Maintenance Supervisor, Weapons/Armaments Technician.

2.5.2.3. Explosives Maintenance Operations Level 2.

2.5.2.3.1. This role is aimed at those explosives maintenance personnel carrying out maintenance tasks under the supervision of the level 3.

2.5.2.3.2. Typical job/role titles are: Explosives Maintenance Operator, Weapons Assembly Technician.

2.6. KR 6 – Procurement

2.6.1. The standards that follow in this KR refer solely to the procurement of explosive substances and/or articles. The procurement of other goods or services is not covered. Procurement is defined as "the act or process of procuring; *especially*: the obtaining of military supplies by a government"[39] and, although the military context is apt, the term can be used for any organisation that has a formal regime for the acquisition of ESA.

2.6.2. KR 6 covers the setting of requirements, procurement strategy, technical input and selection of suppliers, and management of contracts.

2.6.3. Tying the KR to possible qualifications and jobs:

2.6.3.1. Explosive Substances and/or Articles Procurement Management Level 4.

2.6.3.1.1. This role is aimed at those managers responsible for the procurement of predominantly complex explosive substances and/or articles and explosives-related products and/or services. This role is likely to carry staff management responsibility, but a significant proportion of their work is carried out in loose teams comprising various technical experts.

2.6.3.1.2. Typical job/role titles are: Explosives Procurement Manager, Procurement Manager

2.6.3.2. Explosive Substances and Articles Procurement Level 3.

[39] http://www.merriam-webster.com/dictionary/procurement

2.6.3.2.1. This role is aimed at either those staff working to the level 4 and providing a discrete contribution to the procurement function or to those individuals who are responsible for the procurement of predominantly non-complex explosive substances and/or articles on their own account.

2.6.3.2.2. Typical job/role titles are: Explosives Procurement Officer, Purchasing Officer.

2.7. KR 7 - Storage

2.7.1. KR 7 covers the whole gamut of storage of ESA from receipt to despatch, including the maintenance of storage conditions for the ESA, stock control and stock checks, and the preparation and movement of loads.

2.7.2. Tying the KR to possible qualifications and jobs:

2.7.2.1. Explosives Storage Management Level 4.

2.7.2.1.1. This role is aimed at operational managers who are responsible for drawing up and managing the implementation of explosives storage plans and ensuring that the storage facility meets the required standards for the storage of explosive substances and/or articles.

2.7.2.1.2. Typical job/role titles are: Explosive Storage Manager, Explosives Logistics Manager, Jetty Manager.

2.7.2.2. Explosives Storage Supervision Level 3.

2.7.2.2.1. This role is aimed at those who are responsible for the receipt and storage or explosive substances and/or articles. This includes carrying out inventories and it may involve stock control. It involves the leadership of the storage team.

2.7.2.2.2. Typical job/role titles are: Explosive Storage Supervisor, Magazine Supervisor, Jetty Supervisor.

2.7.2.3. Explosives Storage Operations Level 2.

2.7.2.3.1. This role is aimed at those who receive, despatch and move explosive substances and/or articles within the storage facility (either manually, or using specialized equipment). This may involve unloading vehicles or trains. This role carries a responsibility to ensure that the facility continues to meet the required standards.

2.7.2.3.2. Typical job/role titles are: Magazine Attendant, Warehouse Operator, Storeman, Stevedore, Docker, Ammunition Worker.

2.8. KR 8 - Transport

2.8.1. It is important to note that KR 8 applies primarily for the transportation of ESA within an explosives facility and for the planning of moves of ESA on public roads or by sea, rail or air. Other national and international standards and qualifications, such as ADR, apply for the transportation of ESA (and other dangerous goods) outside the explosives facility.

2.8.2. Many organisations will choose to use the same standards and qualifications for their workers on-site so they are covered in the KR for completeness.

2.8.3. Tying the KR to possible qualifications and jobs:

2.8.3.1. Explosives Transport Supervision Level 3.

2.8.3.1.1. This role is aimed at those working at supervisory level who plan the safe and efficient transport of explosive substances and/or articles. This might be by road, rail, air or sea.

2.8.3.1.2. Typical job/role titles are: Explosives Transport Supervisor, Explosives Logistics Officer.

2.8.3.2. Explosives Road Transport Operations Level 2.

2.8.3.2.1. This role is aimed at drivers of explosives who transport the load on public roads.

2.8.3.2.2. Typical job/role titles are: Driver, Lorry Driver, Van Driver.

2.9. KR 9 – Facilities Management

2.9.1. These standards are for those involved in the design of new explosives facilities or taking into use existing real estate, its subsequent management and eventual decommissioning.

2.10. KR 10 – Other Applications

2.10.1. The standards in KR 10 have been designed for industries using explosives and describe the preparation and use of explosives. This includes such purposes as for fireworks displays, film special effects, mineral extraction (on and offshore), agriculture, demolition, quarrying and tunnelling, and so on. The can be summarised as:

2.10.1.1. Blasting & Shotfiring (MPQC/Proskills NOS for blasting)
2.10.1.2. Use of explosives in entertainment
2.10.1.3. Use of explosives for engineering purposes

2.10.2. MPQC (formerly EPIC), the quarrying industry's National Training Organization, has developed a suite of National Occupational Standards (NOSs) and qualifications based upon them. These standards are directly relevant to some of the industries listed above, although the terminology might not be readily recognized outside the quarrying industry. They are included in this booklet for reasons of their direct relevance.

2.10.3. Occupational Standards have been developed for other industries where the quarrying standards are not relevant e.g. for entertainment and engineering purposes. The engineering NOSs have been drafted from a functional perspective and do not relate to the roles of the personnel concerned. Further standards would need to be developed to reflect other roles' contributions to the functions listed.

2.10.4. Many of the functions carried out to achieve a particular end have already been described in other explosive substances and articles (ESA) booklets. Those functions listed in KR10 deal with those not listed elsewhere. When considering the activities carried out by people in the industries listed above, reference should also therefore be made to the other KRs.

2.11. KR 11 – Disposal

2.11.1. KR 11 lists the occupational standards for the management and conduct of disposal/demilitarisation of explosive substances and articles as part of the normal procurement cycle. The ESA for disposal could be from R&D, manufacturing, storage, T&E, maintenance phases its life, including becoming 'shelf-life expired'.

2.11.2. The standards include 'simple' and 'complex' disposal by detonation, burning, deflagration, incineration, mechanical, chemical or biological breakdown, and also disposal by 'function as intended'.

2.11.3. Tying the KR to possible qualifications and jobs:

2.11.4. Explosive Substances and/or Articles Disposal Management Level 4.

2.11.4.1. This role is aimed at operational managers responsible for the complex disposal of explosive substances and/or articles by 3 defined methods. It might also involve leading a team of others engaged on disposal tasks.

2.11.4.2. Typical job/role titles are: Explosives Disposals Manager, Demolition Manager, Demolition Safety Officer.

2.11.5. Explosive Substances and/or Articles Disposal Supervision/Operations Level 3.

2.11.5.1. This role is aimed at supervisors responsible for the non-complex disposal of explosive substances and/or articles by 2 defined methods. It might also involve the supervision of others engaged on disposal tasks.

2.11.5.2. Typical job/role titles are: Explosives Disposals Officer, Explosives Disposals Supervisor.

2.11.6. Explosive Substances and/or Articles Disposal Operations Level 2.

2.11.6.1. This role is aimed at those support workers assisting with disposal tasks under the direction either of the level 3 or the level 4.

2.11.6.2. Typical job/role titles are: Disposals Operator, Process Worker.

2.12. KR 12 – Munitions Clearance and Search

2.12.1. This KR lists the standards for the planning, management, conduct and evaluation of Explosive Ordnance Disposal and Search operations.

2.13. KR 13 – Generic.

2.13.1. The Standards listed in KR 10 can apply to workers at all grades across most, if not all, of the other KRs.

2.13.2. Teamworking and competence in an explosives environment
2.13.3. Hazard identification and risk assessment
2.13.4. Advising on explosives matters
2.13.5. Pack, repack and unpack explosive substances and articles
2.13.6. Use and management of equipment in an explosives environment
2.13.7. Explosives safety
2.13.8. Certify Free From Explosive Hazard

FUNCTIONAL MAP

3. The complete functional map describes the high-level functions expected of people involved in a particular key role. It provides the basis for the design of the much more detailed occupational standards which would describe the skills and knowledge of an individual carrying out an activity within the high-level function.

4. As an example, the functional map for KR 6 - Procurement is shown here:

6 Procure explosive substances and articles	6.1 Identify explosive substances and/or articles requirement and specification	
	6.2 Define explosive substances and/or articles procurement strategy	
	6.3 Contribute to the identification of explosive substances and/or articles requirement and specification	
	6.4 Identify potential explosive substances and/or articles suppliers	6.4.1 Announce the requirement to potential suppliers of explosive substances and/or articles
		6.4.2 Shortlist potential suppliers of explosive substances and/or articles
	6.5 Provide explosives technical input to assist in Identifying potential suppliers and/or articles	6.5.1 Compile technical information for the explosive substances and/or articles requirement
		6.5.2 Assess the capability of potential explosive substances and/or articles suppliers and articles
	6.6 Negotiate and award contracts for explosive substances and/or articles	6.6.1 Draft technical sections of explosives invitations to tender
		6.6.2 Evaluate and make recommendations for the supply of explosive substances and/or articles
	6.7 Place orders for the supply of explosive substances and/or articles	6.7.1 Confirm the fitness for purpose of the explosive substances and/or articles
		6.7.2 Place order for explosive substances and/or articles
	6.8 Manage contract for the supply of explosive substances and/or articles	6.8.1 Monitor the performance of the explosive substances and/or articles supplier
		6.8.2 Manage explosive substances and/or articles supplier relationships
	6.9 Ensure compliance with contract terms for the supply of explosive substances and/or articles	6.9.1 Collate explosive substances and/or articles contractual information
		6.9.2 Compare explosive substances and/or articles information with contractual requirements

EQF QUALIFICATIONS

In April 2008 the European Parliament and Council adopted the Recommendation on the establishment of the European Qualifications Framework for lifelong learning[40] (EQF).

The EQF aims to establish a common reference framework as a translation device between different qualification systems and their levels. This framework comprises general, higher and vocational education and training, and should lead to better transparency, comparability and portability of citizens' qualifications (e.g. diplomas, certificates etc.)

The EQF recommends that each level of qualification should, in principle, be attainable by way of a variety of educational and career paths. This should foster lifelong learning and increase the employability, mobility and social integration of workers and learners. The recommendation should also facilitate building bridges between formal, non-formal and informal learning.

The EQF neither replaces nor defines national qualification systems nor qualifications. It does not describe any particular qualifications or individual competences, but Annex II of the Recommendation describes the eight EQF levels via descriptors for the three categories "knowledge", "skills" and "competences".

The Member States are encouraged to develop national qualifications frameworks that rely on and are linked to the EQF. Moreover, it is recommended to the Member States to:

- Relate their national qualifications systems to the European Qualifications Framework by 2010;
- Adopt measures, as appropriate, so that, by 2012, all new qualification certificates, diplomas and "Europass" documents issued by the competent authorities contain a clear reference, by way of national qualifications systems, to the appropriate European Qualifications Framework level;
- Use an approach based on learning outcomes when defining and describing qualifications;
- Promote and apply the principles of quality assurance in education and training set out in Annex III.
- These principles, which include both higher and vocational education and training, are as follows:
- Quality assurance policies and procedures should underpin all levels of the European Qualifications Framework.
- Quality assurance should be an integral part of the internal management of education and training institutions.
- Quality assurance should include regular evaluation of institutions, their programmes or their quality assurance systems by external monitoring bodies or agencies.
- External monitoring bodies or agencies carrying out quality assurance should be subject to regular review.
- Quality assurance should include context, input, process and output dimensions, while giving emphasis to outputs and learning outcomes.

The second part of Annex III contains a summary of elements which quality assurance systems should contain (e.g. clear and measurable goals and standards; appropriate resources; consistent

[40] http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:C:2008:111:0001:0007:EN:PDF

evaluation methods, associating self-assessment and external review; feedback mechanisms and procedures for improvement; widely accessible evaluation results etc.)

Descriptors defining levels in the European Qualifications Framework (EQF)

Each of the 8 levels is defined by a set of descriptors indicating the **learning outcomes** relevant to qualifications at that level in any system of qualifications

EQF Level	**Knowledge**	**Skills**	**Competence**
	In the context of EQF, knowledge is described as *theoretical and/or factual*.	**In the context of EQF, skills are described as** ***cognitive* (involving the use of logical, intuitive and creative thinking), and** ***practical* (involving manual dexterity and the use of methods, materials, tools and instruments)**	**In the context of EQF, competence is described in terms of *responsibility and autonomy*.**
Level 1	Basic general knowledge	Basic skills required to carry out simple tasks	Work or study under direct supervision in a structured context
Level 2	Basic factual knowledge of a field of work or study	Basic cognitive and practical skills required to use relevant information in order to carry out tasks and to solve routine problems using simple rules and tools	Work or study under supervision with some autonomy
Level 3	Knowledge of facts, principles, processes and general concepts, in a field of work or study	A range of cognitive and practical skills required to accomplish tasks and solve problems by selecting and applying basic methods, tools, materials and information	Take responsibility for completion of tasks in work or study; adapt own behaviour to circumstances in solving problems
Level 4	Factual and theoretical knowledge in broad contexts within a field of work or study	A range of cognitive and practical skills required to generate solutions to specific problems in a field of work or study	Exercise self-management within the guidelines of work or study contexts that are usually predictable, but are subject to change; supervise the routine work of others, taking some responsibility for the evaluation and improvement of work or study activities
Level 5[1]	Comprehensive, specialised, factual and theoretical knowledge within a field of work or study and an awareness	A comprehensive range of cognitive and practical skills required to develop creative solutions to abstract problems	Exercise management and supervision in contexts of work or study activities where there is unpredictable change; review

EQF Level	Knowledge	Skills	Competence
	In the context of EQF, knowledge is described as *theoretical and/or factual*.	**In the context of EQF, skills are described as** ***cognitive* (involving the use of logical, intuitive and creative thinking), and** ***practical* (involving manual dexterity and the use of methods, materials, tools and instruments)**	**In the context of EQF, competence is described in terms of *responsibility and autonomy*.**
	of the boundaries of that knowledge		and develop performance of self and others
Level 6[2]	Advanced knowledge of a field of work or study, involving a critical understanding of theories and principles	Advanced skills, demonstrating mastery and innovation, required to solve complex and unpredictable problems in a specialised field of work or study	Manage complex technical or professional activities or projects, taking responsibility for decision-making in unpredictable work or study contexts; take responsibility for managing professional development of individuals and groups
Level 7[3]	Highly specialised knowledge, some of which is at the forefront of knowledge in a field of work or study, as the basis for original thinking and/or research Critical awareness of knowledge issues in a field and at the interface between different fields	Specialised problem-solving skills required in research and/or innovation in order to develop new knowledge and procedures and to integrate knowledge from different fields	Manage and transform work or study contexts that are complex, unpredictable and require new strategic approaches; take responsibility for contributing to professional knowledge and practice and/or for reviewing the strategic performance of teams
Level 8[4]	Knowledge at the most advanced frontier of a field of work or study and at the interface between fields	The most advanced and specialised skills and techniques, including synthesis and evaluation, required to solve critical problems in research and/or innovation and to extend and redefine existing knowledge or professional practice	Demonstrate substantial authority, innovation, autonomy, scholarly and professional integrity and sustained commitment to the development of new ideas or processes at the forefront of work or study contexts including research

Compatibility with the Framework for Qualifications of the European Higher Education Area

The Framework for Qualifications of the European Higher Education Area provides descriptors for cycles. Each cycle descriptor offers a generic statement of typical expectations of achievements and abilities associated with qualifications that represent the end of that cycle.

1. The descriptor for the higher education short cycle (within or linked to the first cycle), developed by the Joint Quality Initiative as part of the Bologna process, corresponds to the learning outcomes for EQF level 5.
2. The descriptor for the first cycle in the Framework for Qualifications of the European Higher Education Area corresponds to the learning outcomes for EQF level 6.
3. The descriptor for the second cycle in the Framework for Qualifications of the European Higher Education Area corresponds to the learning outcomes for EQF level 7.
4. The descriptor for the third cycle in the Framework for Qualifications of the European Higher Education Area corresponds to the learning outcomes for EQF level 8.

Comparison of EQF and EUExImp Partners Vocational Qualifications Levels

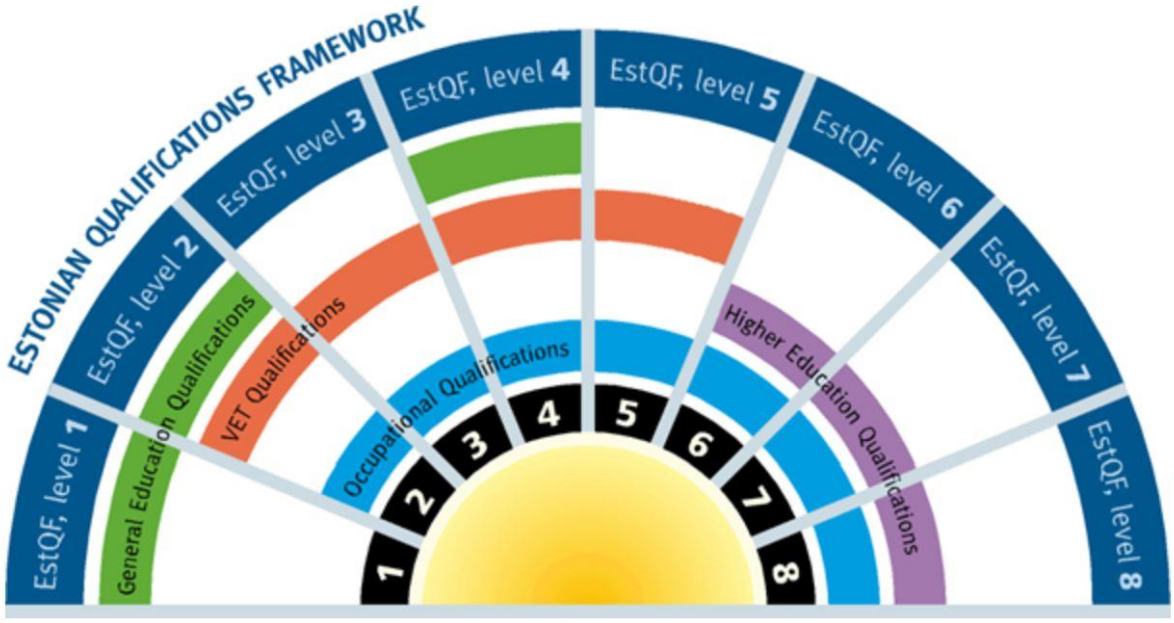
As stated earlier, the EQF does not replace national qualifications systems and the EU provides a useful resource to allow readers to compare their national system of qualifications with the EQF Levels[41].

EQF	EstQF	Germany	Portugal	Sweden	UK (England)	UK (Scotland)	UK (Northern Ireland)	UK (Wales)
					Entry 1, 2	1, 2	Entry	Entry 1, 2
1	1	1	1	1	Entry 3	3	1	Entry 3
2	2	2	2	2	1	4	2	1
3	3	3	3	3	2	5	3	2
4	4	4	4	4	3	6	4	3
5	5	5	5	5	4, 5	7, 8	5	4,5
6	6	6	6	6	6	9, 10	6	6
7	7	7	7	7	7	11	7	7
8	8	8	8	8	8	12	8	8
Key		Nation recognises/awards vocational qualifications at this level						

HSQ offers explosives-related vocational qualifications at levels 2, 3 and 4 which are delivered by training providers that have been approved as Qualifications Centres. As examples, and for reference during the EUExImp Project, here are comparisons of the EQF descriptors for levels 2, 3 and 4 against EUExImp partners' national systems.

[41] https://ec.europa.eu/ploteus/en/compare

ESTONIA



Estonia EstQF Level 4:

The owner of EstQF level 4 qualification:

- has factual and theoretical knowledge in broad contexts within a field of work or study;
- has a range of cognitive and practical skills required to generate solutions to specific problems in a field of work or study;
- exercises self-management within the guidelines of work or study contexts that are usually predictable, but are subject to change;
- supervises the routine work of others, taking some responsibility for the evaluation and improvement of work or study activities.

Upper secondary general education certificate

The graduate of upper secondary school curriculum: conducts in an ethical manner, follows the generally accepted values and moral norms;

- takes responsibility for his or her choices and obligations taken, respects other people's and one's own freedom, is a sovereign personality;
- uses different learning strategies, is able to compile a research and to present it, is able to work in a team and make a contribution to achieving collective goals;
- knowingly helps to preserve and develop the Estonian language, culture and country; understands the Estonian culture in the context of European and other cultures; understands, values and respects his or her cultural traditions, as well as the ones of other nations;
- is able to evaluate his or her aspirations while taking into consideration his or her abilities and possibilities; is able to foresee possible success and failure; is aware of different fields of work and directions of the labour market; is able to obtain information on further studies and job opportunities; plans his or her career;

- uses language correctly and expressively, is able to debate in a reasoned manner; thinks critically and creatively, develops and values his/her ideas and the ones of others, can justify his or her choices and views;
- can speak at least two foreign languages at the level of an independent language user; uses mathematical knowledge and methods in different spheres of life; has a developed scientific view of the world and understands the essence of modern natural sciences; is familiar with global issues and takes personal responsibility for helping to solve them; values and follows the principles of sustainable development;
- uses modern technology purposefully and with a sense of responsibility, values the impact of technology on everyday life, has conscious views on development of technology and its use;
- has developed and active position as a citizen, sees himself or herself as a dialogue competent member of society in the contexts of Estonia, Europe and the world; is able to avoid and solve conflicts, is tolerant;
- appreciates fine arts, is able to use tools in his or her creations, as well as techniques and materials;
- practices a healthy lifestyle, knows how to preserve and restore his or her mental and physical health.

Upper secondary VET certificate

The graduate of upper secondary VET study programme or VET study programme based on upper secondary education: is familiar with his or her vocation, knows and uses the principles, theories and technologies in normal and new working situations;

- is able to independently perform the complex and diverse tasks of the vocation that require novel solutions;
- takes responsibility for performance of his or her tasks;
- is able to make suggestions for improvement of working conditions and to guide co-workers;
- is able to take partial responsibility for the training of his or her co-workers;
- is able to analyse and evaluate the level of his or her knowledge;
- is capable of independent and self-managed learning;
- is able to argue and express his or her views in new situations;
- is able to use self-assessment to change his or her conduct, taking into consideration the social context, if applicable;
- is able to solve problems of the vocation, using the common sources of information;
- is able to evaluate the reliability and validity of the information used;
- participates in the work of different teams and is able to manage them, if necessary.

Estonia EstQF Level 3:

The owner of EstQF level 3 qualification:

- has knowledge of facts, principles, processes and general concepts, in a field of work or study;
- has a range of cognitive and practical skills required to accomplish tasks and solve problems by selecting and applying basic methods, tools, materials and information;
- takes responsibility for completion of tasks in work or study;
- adapts own behaviour to circumstances in solving problems.

VET based on basic education certificate

The graduate of VET study programme based on basic education:

- is familiar with the vocabulary of their vocation, the principles, technologies, processes, techniques, materials, tools and devices, and knows how to use and implement them;
- is able to independently perform different tasks of the vocation and takes responsibility for their performance;
- learns and complements his or her knowledge independently;
- is able to express himself or herself and to justify his or her opinions in different situations in both oral and written form;
- is able to solve problems of the vocation, using the common sources of information;
- is able to optimally solve problems of the vocation and adapt his or her behaviour accordingly;
- participates successfully in the work of different teams and is capable of performing different tasks in teams.

Estonia EstQF Level 2:

The owner of EstQF level 2 qualification:

- has basic factual knowledge of a field of work or study;
- has basic cognitive and practical skills required to use relevant information in order to carry out tasks and to solve routine problems; uses simple rules and tools;
- works and studies under supervision with some autonomy.

Basic education certificate based on simplified curriculum

The graduate of simplified study programme for basic school:

- respects himself, his home and family, is able to manage himself and his family; loves his homeland;
- is aware if himself and fellow people and their differences, cultural differences between himself and other people;
- knows and follows to the best of his abilities the law and democratic principles;
- refrains from ethically wrong enticements and propositions;
- knows the principles of a healthy lifestyle and tries to follow them;
- knows the principles of environment sustaining and tries to act in an environmentally sustainable manner;
- gives purpose, plans and evaluates his daily activities;
- is able to make choices in familiar situations, ask for advice, make decisions and handle responsibility;
- is willing to cooperate; participates in continuing education relevant to his skills; understands basic information;
- is able to obtain information (including from the Internet) has the following basic skills: observing, listening and understanding speech, reading, writing, calculating;
- understands the necessity of working, has basic skills, is able to submit to work discipline during work hours, is ready to look for a suitable job;
- has an image of the world as a whole.

Basic education certificate

The graduate of simplified study programme for basic school:

- respects himself, his home and family, is able to manage himself and his family; loves his homeland;
- is aware if himself and fellow people and their differences, cultural differences between himself and other people;
- knows and follows to the best of his abilities the law and democratic principles; refrains from ethically wrong enticements and propositions;
- knows the principles of a healthy lifestyle and tries to follow them;
- knows the principles of environment sustaining and tries to act in an environmentally sustainable manner;
- gives purpose, plans and evaluates his daily activities;
- is able to make choices in familiar situations, ask for advice, make decisions and handle responsibility;
- is willing to cooperate; participates in continuing education relevant to his skills;
- understands basic information;
- is able to obtain information (including from the Internet)
- has the following basic skills: observing, listening and understanding speech, reading, writing, calculating;
- understands the necessity of working, has basic skills, is able to submit to work discipline during work hours, is ready to look for a suitable job;
- has an image of the world as a whole.

VET without basic education requirement certificate

The graduate of VET study programme without basic education requirement:

- knows and describes the main concepts and principles of the vocation;
- understands the main processes of work, knows vocabulary, materials, tools and the most common devices of the vocation;
- is able to perform ordinary, limited responsibility tasks on his or her vocation;
- needs supervision in working;
- works well in working situations that are generally stable;
- needs advice and supervision when learning;
- is able to adapt and manage in different social environments;
- knows how to communicate in accordance with the situation and conversation partners;
- is able to use given information materials to solve problems of the vocation;
- is able to evaluate the outcomes of his or her work.

GERMANY

German NQF Level 4

Be in possession of competences for the autonomous planning and processing of technical tasks assigned within a comprehensive field of study or field of occupational activity subject to change.

Professional competence

• Knowledge:
Be in possession of deeper general knowledge or theoretical professional knowledge within a field of study or field of occupational activity.
• Skills:
Be in possession of a broad spectrum of cognitive and practical skills which facilitate autonomous preparation of tasks and problem solving and the evaluation of work results and processes according consideration to alternative courses of action and reciprocal effects with neighbouring areas.
Provide transfers of methods and solutions.

Personal competence

• Social competence:
Help shape the work within a group and the learning or working environment of such a group and offer ongoing support. Justify processes and results. Provide comprehensive communication on facts and circumstances.
• Autonomy:
Set own learning and work objectives, reflect on and assess such objectives and take responsibility for them.

German NQF Level 3

Be in possession of competences for the autonomous fulfilment of technical requirements within a field of study or field of occupational activity which remains clear whilst being openly structured in some areas.
Professional competence

• Knowledge:
Be in possession of extended general knowledge or extended professional knowledge within a field of study or field of occupational activity.
• Skills:
Be in possession of a spectrum of cognitive and practical skills for the planning and processing of technical tasks within a field of study or field of occupational activity. Evaluate results in accordance with criteria which are largely prestipulated, provide simple transfers of methods and results.

Personal competence

• Social competence:
Work within a group and occasionally offer support. Help shape the learning or working environment, present processes and results to the appropriate recipients of such information.
• Autonomy:
Learn or work autonomously and responsibly including within contexts which are less familiar. Appraise own actions and the actions of others. Request learning guidance and select various learning aids.

German NQF Level 2

Be in possession of competences for the professional fulfilment of basic requirements within a clear and stably structured field of study or work. Fulfilment of tasks takes place largely under supervision.
Professional competence

• Knowledge:
Be in possession of basic general knowledge and basic professional knowledge with a field of study or
Work.
• Skills:
Be in possession of basic cognitive and practical skills required to carry out tasks within a field of study or work, evaluate the results of such tasks in accordance with pre-stipulated criteria and establish correlations.

Personal competence

• Social competence:
Work within a group. Accept and express general feedback and criticism. Act and react in accordance with the given situation with regard to verbal and written communication.
• Autonomy:
Learn or work in a responsible manner and largely under supervision within familiar and stable contexts. Appraise own actions and the actions of others. Use pre-stipulated learning guides and request learning guidance.

PORTUGAL

In its June 2011 report[42] "Referencing of the Portuguese Qualifications Framework to the European Qualifications Framework –Final report", the Agência Nacional para a Qualificação, I.P. explains in detail the way that Portugal embodied the Recommendation on the establishment of the European Qualifications Framework for lifelong learning[43] (EQF) into the Portuguese National Qualifications Framework (NQF). Specifically, this report establishes the referencing of levels 1 to 5 of the NQF to the EQF.

The report shows that the referencing process has demonstrated that there is a clear and direct relationship between the EQF levels and descriptors and the Portuguese NQF levels and descriptors:

[42] http://www.eqavet.eu/Libraries/EQF/PT_EQF_Referencing_Report.sflb.ashx
[43] http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:C:2008:111:0001:0007:EN:PDF

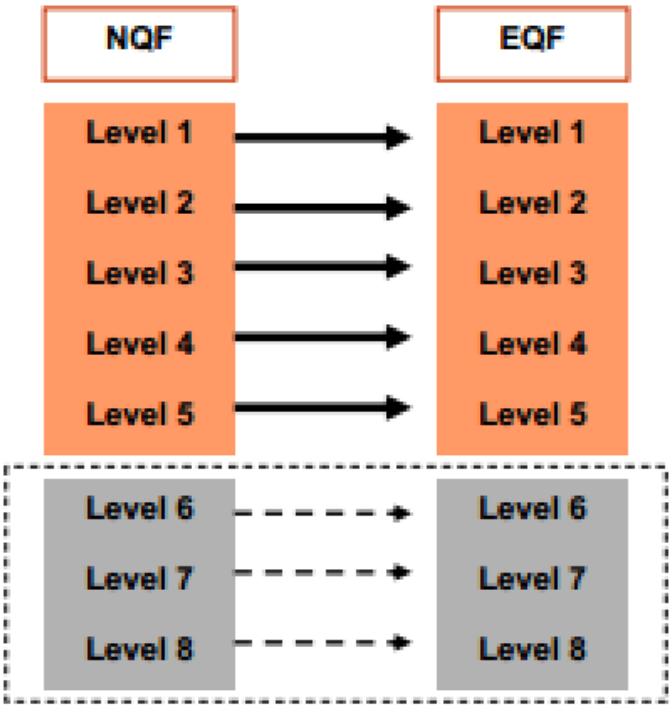


Figure 13. Portuguese NQF referenced to EQF

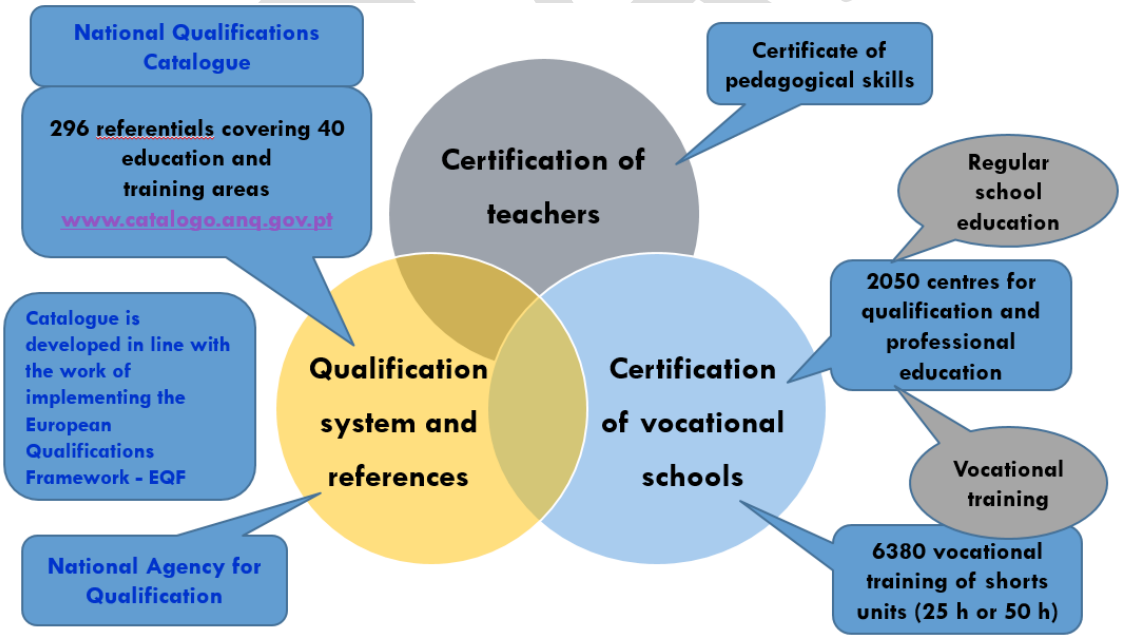


Figure 14. Portuguese qualification and certification system

The Portuguese National Qualifications Catalogue (NQC) is a strategic management instrument for non-higher national qualifications. It also acts as a regulatory instrument for the double certificated training offer. The NQC lists the qualification pathways that are relevant to the economy, organised

in a modular format to better guide both initial double-certificated training and ongoing certificated training. It is intended to cover all the business sectors in the economy. In a paper[44] for the industry journal 'Explosives Engineering', Rodrigues and Góis explain that although the National Qualification Framework(NQF) has been in force since October 2010 and 296 referentials for 40 education and training areas have been designed, the explosives industry hasn't yet approached the National Agency for Qualifications to identify the range of vocational training and the referential of qualifications required.

The NQC contains unique qualifications referencing for the full range of the double certificated training offer as well as for processes for the recognition of competences acquired in informal and non-formal settings. These are organised in a modular format, in the form of short training units which can be independently certificated and can be built into qualification pathways. Currently, there are 253 qualifications spread across 39 education and training areas.

The development of the NQC involves the organisation of a qualifications referencing scheme based on learning outcomes in an approach which is more closely linked to competence needs emerging in the labour market and through which objectives can be determined with greater clarity. This basing of the qualifications referencing scheme on learning outcomes, an underlying principle of the NQC, is also of critical importance to the organisation of processes for the recognition of competences and for the validation of the pedagogical strategies employed.

NQF Level 2

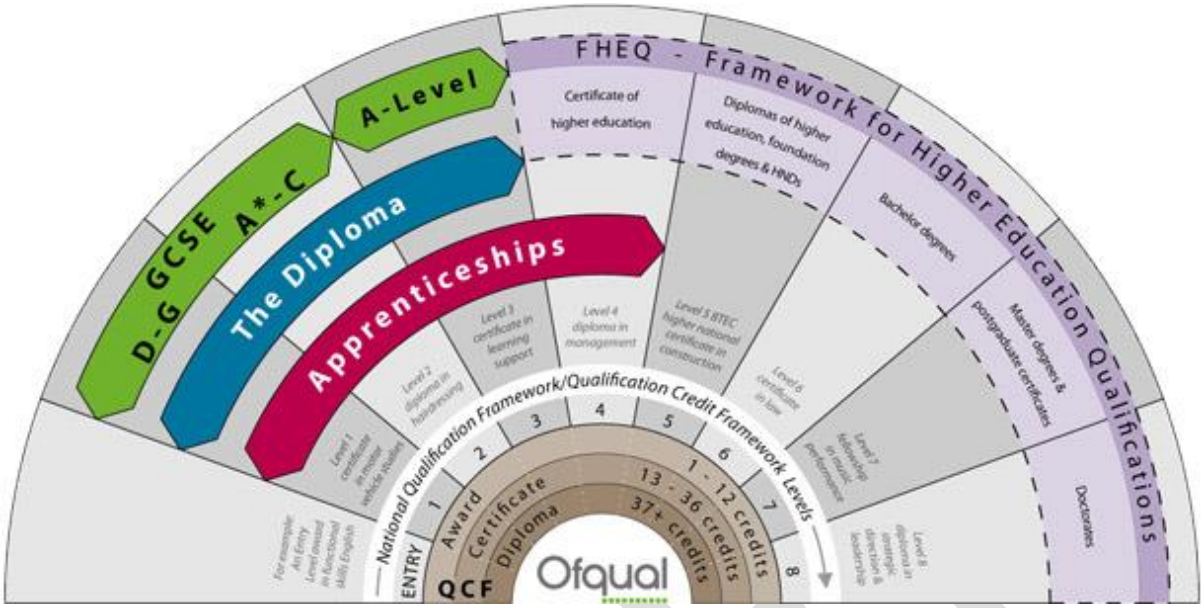
Knowledge: Basic factual knowledge of a field of work or study.
Skills: Basic cognitive and practical skills required to use relevant information in order to carry out tasks and to solve routine problems using simple rules and tools.
Attitudes: Work or study under supervision, with some autonomy

NQF Level 3
Knowledge: Knowledge of facts, principles, processes and general concepts in a field of work or study.
Skills: A range of cognitive and practical skills required to accomplish tasks and solve problems by selecting and applying basic methods, tools, materials and information.
Attitudes: Take responsibility for completion of tasks in work or study. Adapt own behaviour to circumstances in solving problems.

NQF Level 4
Knowledge: Factual and theoretical knowledge in broad contexts within a field of work or study.
Skills: A range of cognitive and practical skills required to generate solutions to specific problems in a field of work or study.
Attitudes: Exercise self-management within the guidelines of work or study contexts that are usually predictable, but are subject to change. Supervise the routine work of others, taking some responsibility for the evaluation and improvement of work or study activities

[44] "Why occupational standards on ESA are important to Portuguese companies", Explosives Engineering, IExpE, September 2016.

UNITED KINGDOM



QCF Level 4

Level 4 qualifications recognise specialist learning and involves detailed analysis of a high level of information and knowledge in an area of work or study. Learning at this level is appropriate for people working in technical and professional jobs, and/or managing and developing others. Level 4 qualifications are at level equivalent to Certificates of Higher Education.

Level 4 Vocational Qualifications

Vocational qualifications (VQs) are designed to allow learners to learn in a way that suits them, and give learners the skills that employers are looking for. Occupational VQs are designed to meet the national occupational standards (NOS) for a particular sector/work place and employers rely on these qualifications for evidence that an employee is competent to carry out the job.

Higher National Certificate (HNC)

A Higher National Certificate (HNC) is a higher education qualification. The HNC is studied full-time, the qualification normally takes one year or two years part time.

QCF Level 3

Level 3 qualifications recognise the ability to gain and where relevant apply a range of knowledge, skills and understanding. Learning at this level involves obtaining detailed knowledge and skills. Level 3 is appropriate for people wishing to go to university, people working independently, or in some areas supervising and training others in their field of work.

GCE AS and A Level

The AS is a stand-alone qualification usually made up of two units and is worth half a full A level. GCE advanced levels (A levels) are made up of advanced subsidiary (AS) units and A2 units. A levels are

available in over 45 subjects and are usually sat by 16 to 18 year olds in schools or colleges, but are open to anyone who wants to gain a qualification.

National Vocational Qualifications (NVQ) level 3

National Vocational Qualifications (NVQs) cover a broad range of industry sectors and occupations and are delivered either in the learner's actual workplace or in a workplace setting. Each NVQ is made up of units of national occupational standards, which define the knowledge, understanding and competence required to perform that particular job related role.

Functional Skills Level 3 (England only)

Functional skills are a key element to the curriculum and qualifications reforms in England. They are the practical skills that allow people to use English, mathematics, and information and communication technology (ICT) in real life contexts. In developing functional skills, people can adapt and apply the knowledge to suit different situations they may face at home, at work, in education, and in the community.

QCF Level 2

Level 2 qualifications recognise the ability to gain a good knowledge and understanding of a subject area of work or study and to perform varied tasks with some guidance or supervision.

GCSEs Grades A*-C

General Certificate of Secondary Education, is now the main school-leaving qualification in England. GCSEs are available in over 50 subjects. GCSEs can be studied alongside other qualifications and are usually sat by 15-18 year olds in schools or colleges.

Higher Diploma (England only)

The Diploma is a composite qualifications for 14-19 year olds made up of principal learning; generic learning, and additional and specialist learning. They can be taken at three levels: Foundation, which is a Level 1 qualification; Higher Diploma, which is Level 2; and the Advanced and Progression Diplomas, which are both Level 3. Diplomas have been designed with input from employers and are available in industry sector related 'lines of learning.'

National Vocational Qualifications (NVQ) Level 2

National Vocational Qualifications (NVQs) cover a broad range of industry sectors and occupations and are delivered either in the learner's actual workplace or in a workplace setting. Each NVQ is made up of units of national occupational standards, which define the knowledge, understanding and competence required to perform that particular job related role.

Functional Skills at level 2 (England only)

Functional skills are a key element to the curriculum and qualifications reforms in England. They are the practical skills that allow people to use English, mathematics, and information and communication technology (ICT) in real life contexts. In developing functional skills, people can adapt and apply the knowledge to suit different situations they may face at home, at work, in education, and in the community.

Handbook for the Implementation of Occupational Standards in the Explosives Sector

Published by EUExcert and downloadable free of charge from:

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