SUPPLY CHAIN SUSTAINABILITY SCHOOL

PSRO
PLANT SECTOR REPRESENTATIVE ORGANISATION

Eco-operations National Training Delivery Framework

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Introduction

The construction plant sector through employers, contractors and clients are supporting and providing initiatives and solutions for the country's path to Net Zero. Machine usage has been identified as a core contributor to carbon-based emissions and carbon reduction is now on the agenda of the plant sector. The principal long-term aim is to eventually replace all carbon-emitting equipment with either zero emission battery-driven equipment or through the use of alternative non-fossil fuels.

Need for Education

The short-term aim is to reduce as far as practicable, emissions of current internal combustion-engined equipment through both minimising engine run time and efficient use of that equipment. This requires an education programme for both owners, operators and users of such equipment and from which Eco-operations' courses either in-house with an employer or through externally certified courses from established awarding organisations, are bringing vital learning for this subject.

Eco-operations Courses

Although there are courses or programmes being offered, or may be in development, there was a potential inconsistency of courses due to the absence of any overarching industry-derived subject matter content e.g. what topics should be learnt, what delivery methodologies are used etc. This meant that courses could be variable and potentially specific to a particular employer or client needs and may not be transferable to meet other employer or client requirements. This could have had the effect that operators and others may need to retake a course on new projects or on change of employer.

Need for a Framework

To ensure Industry's approach in meeting its obligations, there is a need for an overarching criteria that promotes consistency and standardisation for eco-operations, therefore the Plant Sector Representative Organisation (PSRO) and the Supply Chain Sustainability School (SCSS) jointly recognised the need for a plant operations-based Eco-operations national training framework. The PSRO set about devising such a framework and for which contributions were made by the SCSS Plant Group and endorsed by both parties.

Framework Parameters

The framework sets out the parameters for consistent delivery and identifies and provides guidance to owners, employers, clients, contractors, awarding organisations and training providers on the following areas:

- core and optional learning outcomes;
- extent and depth of delivery content;
- methodologies of delivery;
- assessment strategies;
- suggested durations;
- frequency of training/re-training;
- routes for occupation e.g. operatives, supervisors, managers, planners, others etc;
- references to relationships/compliance with relevant zero-zero-carbon regulative or industry-based initiatives and certification requirements.

Framework Aim and Outcome

The aim of this framework is that on completion of a course that has been based on this framework, course delegates should have attained a required level of understanding relevant to their occupation on the principles of reducing machine-based carbon emissions, enabling them to recognise and apply learnt reduction techniques, operational processes and emerging machine technologies.

The overarching outcome of this framework is that through learning, analysing and understanding; that each delegate takes personal ownership of the need to reduce emissions produced not only via their own work programmes but both through encouraging and supporting others - not just in the workplace but through their daily lives as a responsible member of society.

Funding and Support

The production of a framework aims to provide consistency and provides a mechanism for the sector to work with funding organisations to receive funding and grants for courses and certification, which can further both encourage take-up and offset delivery costs.

Framework Structure

The framework is divided into three parts:

- Part 1: Introduction, aims and principles of the Framework
- Part 2: Delivery Framework and Supporting Information
- Part 3: Learning Outcomes and Training Specification.

Course Types

There are a series of suggested course types depicted in part 2 of the framework. Each course type is based on the core occupation or discipline of delegates - which are listed at the top of part 2 - along with the learning outcome, the extent and depth of learning for that content using a scale of 1 to 3, and the appropriate assessment methodology. As the learning outcome and depth of learning maybe very similar for a number of occupations, these can be combined into a single course. This includes:

- Plant Operative, Plant Supervisor – Introductory;
- Plant Operative Advanced and Lead Plant Operative;
- Plant Supervisor, Plant Manager – Advanced.

Advanced Courses

There are suggested advanced course content for the following occupations:

- Plant Operative;
- Plant Supervisor;
- Plant Manager.

These are intended to build upon the introductory course and therefore delegates for the advanced programme should either:

a. Have previously attended the introductory course, or;
b. Attend a ‘combined’ course covering both topics and depth of learning for both the introductory and advanced programmes.

There are suggested durations in part 2 for ‘combined’ courses for the above occupations.

Combining Courses – Different Occupations

Courses of different occupations may be combined and indeed encouraged as this enables the sharing of experiences and aspects of each occupation. However, the depth of learning and course durations should be based on the higher learning level and the assessment specification level should be relevant to each individual occupation e.g. on a combined course of hire controller and plant buyer, the learning content and depth should be as for the plant buyer, but undertaking separate assessments according to their level.

Durations

Suggested durations are listed in part 2. Ideally, courses should be completed in a single session and include the assessment at the end of learning. However if the course is split into separate sessions, additional time should be added to provide a check on prior learning. Where courses have been combined, additional learning time is suggested in the matrix. For external funding purposes, training providers may need to increase durations to meet funding rules.

Delivery and Resources

The learning content is predominately theory-based and should be delivered using a range of delivery methodologies including discussion, demonstration and presentation of key facts that covers the required learning for the relevant topics and depth of learning. Delivery locations should allow uninterrupted sessions in suitable environments that do not restrict learning and free from interruptions and distractions. Learning aids such as handouts are encouraged.

Trainer Specification

Those delivering training courses should ideally:

- Have, or have had, construction site experience of around 2 years, including the operation or supervision or planning of a range of common construction plant types;
- Hold verifiable knowledge of the plant operations at or above the level being taught;
- Hold verifiable knowledge of plant-based emissions and the effects on the environment;
- Hold or be working towards a recognised teaching/training or assessor qualification (dependent on their role);

Trainers must also be able to evidence an in-depth understanding of plant and vehicle maintenance requirements.

Assessment

Part 2 of the framework provides guidance on the types and extent of assessment depending on course and occupational type. Employers, Awarding Organisations and Training Providers should constantly be aware that the whole ethos of eco-operations courses are ultimately about raising both awareness of the wider spectrum of global emissions and how the operation of construction equipment aims to reduce harmful emissions.

Certification

A certificate should be issued following completion of the relevant course type stating as a minimum:

- Type of course;
- Date of completion;

- Details of delegate;
- Delegate's employer.

It is recommend that the certificate should also state the words '***Course content based on the PSRO/SCSS Eco-operations National Training Delivery Framework'*** to prevent repeat courses of a similar nature.

The PSRO and SCSS logos are restricted for use and cannot be applied to the certificate. No expiry date of a course or certificate shall be indicated on the certificate.

Retraining

Ideally, any course programme previously undertaken should not need to be repeated by delegates unless either the advanced course is being undertaken for the same occupation or discipline, or that they have progressed to a new role. It may be prudent however for the employer to conduct post-training review or evaluation sessions as well as provide refresher programmes. These will maintain the core aim of personal ownership of emission reductions and should further provide updates on new technologies, applications and improved methods of work.

Resources and Links

A range of free training and support for sustainable plant is available from the Supply Chain Sustainability School: https://www.supplychainschool.co.uk/partners/groups/plant-group/

Queries

For further information or clarification on this framework, please contact either: enquiries@psro.org.uk or info@supplychainschool.co.uk

About the Supply Chain Sustainability School

The Supply Chain Sustainability School's (SCSS) Plant Group is leading the way for the UK's built environment to drastically reduce onsite emissions to air that are harmful to human health and the planet.

Established in 2019 by Partners of the School and other key industry stakeholders, the Group collaborates to identify and provide the supply chain with information and guidance on plant standards and management. For more information visit https://www.supplychainschool.co.uk/partners/groups/plant-group/

About the PSRO

The Plant Sector Representative Organisation (PSRO) is an employer-led body comprising of representatives from construction-focussed employers and includes Build UK, CECA, CPA, FPS, HBF, NFDC and SPOA.

The principal aim of the PSRO is to act as the Sector Representative Organisation for the construction plant sector and advise industry, relevant authoritative bodies - including the Construction Leadership Council (CLC) - certificating bodies/card schemes and other relevant parties over the necessary standards required for plant occupational-related training, assessment and certification activities. More information on the PSRO can be found at www.psro.org.uk

Acknowledgement

This eco-operations framework is a co-production of the PSRO Technical Review Group and the SCSS Plant Group. The PSRO and SCSS acknowledge the contribution of Flannery Plant Hire (Oval) Ltd and L Lynch Plant Hire Ltd to the content of this framework.

Scope of Occupations/Roles										
Plant Operative *Introductory*	Plant Operative *advanced*	Lead Plant Operative	Plant Supervisor *Introductory*	Plant Supervisor *advanced*	Plant Manager *Introductory*	Plant Manager *advanced*	Site Manager	Hire Controller	Plant Buyer/ procurer	Plant Mech
POI	**POA**	**LPO**	**PSI**	**PSA**	**PM1**	**PMA**	**SM**	**HC**	**PB**	**PF**

Learning Outcome *Learners will know and understand in accordance with a given level:*	**Learning Level for Occupations**						
	POI PSI PF	**POA LPO** *additional to introductory*	**PMI**	**PSA PMA** *additional to introductory*	**SM**	**HC**	**PB**
1. The definition of and general factors that are considered causes of climate change	**1**		**1**	**2**	**2**	**1**	**1**
2. How climate change is affecting society at an international, national, local and personal level	**2**		**2**	**3**	**3**	**2**	**2**
3. The aims and challenges of the ConstructZero industry initiatives	**1**		**1**	**2**	**3**	**1**	**2**
4. The constituent parts of air and how various gases and particulates can affect air quality	**n/a**	**2**	**1**	**2**	**2**	**1**	**1**
5. Who is affected and how through plant operations on sites	**1**		**2**	**3**	**3**	**1**	**1**
6. How internal combustion (IC) engines (diesel) convert fuel into work	**1**	**2**	**1**		**1**	**1**	**2**
7. The principles of how power, torque and transmission of power creates ‘work done’ by plant	**1**	**2**	**1**		**1**	**1**	**2**
8. What constitutes ‘tailpipe’ emissions from IC-engined plant and how they vary according to machine componentry, usage and environment	**2**		**2**	**3**	**2**	**3**	**3**

Learning Outcome	POI PSI	POA LPO	PMI	PSA PMA	SM	HC	PB
9. What is meant by low and zero-emission equipment and types of alternative fuels	1		2	3	2	3	3
10. Other types of power sources that are available for construction plant and their effectiveness and efficiency	2		2	3	2	3	3
11. How the effective selection of plant can lower local emissions	n/a	2	2	3	2	3	3
12. How effective site planning of an operation can lower local emissions	2	3	3		3	1	1
13. How tailpipe emissions can be lowered by plant operators and how and why they should play their part in reducing tailpipe emissions	2	3	2	3	3	1	2
14. Principles of telematic data and other technology systems to aid carbon reduction activities	1	2	1	2	2	1	2
15. Effects of monitoring on the operation of plant for emissions, operational costs and localised effects on society	1	3	2		3	1	2
16. The principles and outcomes of fuel-saving management techniques and tailpipe emissions	2	3	2	3	2	1	2
17. How maintenance activities can create improvements in emissions, costs and machine life	1	2	1	2	2	1	2
18. How fuel saving techniques apply to a range of common types of construction plant	2		1		3	1	1
Assessment Specification Level	1	2	2	3	2	2	3

Learning Level			
Level	**1**	**2**	**3**
Category	Appreciation	Overview	Descriptive
Description	Provided with very general explanations of the essential features of the topic but not any details.	Provided with explanations of both the fundamentals and facts of the topic with some details, but not all of the details.	Provided with detailed explanations of the topic and how it relates to current and future situations

Typical Course Duration			
Assessment Level	**1**	**2**	**3**
Suggested minimum course duration	Not less than 3 hours	Not less than 3	Not less than 6 hours
Suggested duration of combined courses (introductory and advanced)		Not less than 6	

Assessment Specification				
Level	**Level of Required Understanding**	**Delivery Method**	**No of questions**	**Grading**
1	Has demonstrated a basic recognition of the fundamentals and context of the topic	Multi-choice questions	Bank of not less than **36** questions with a minimum of **15** presented to delegates	Pass – 50% Credit – 85%
2	Able to provide a thorough explanation of both the fundamentals and facts of the topic with some details, but not all of the details	Mix of multi-choice and open answer questions	Bank of not less than **36** questions with a minimum of **15** multi-choice questions and **a** minimum of **6** open answer questions presented to delegates	Pass – 50% Credit – 85%
3	Able to provide a detailed explanation of the topic and able to explain issues and relate to current and future situations	Open answer questions	Bank of not less than **36** questions with a minimum of **15** presented to delegates	Pass – 50% Credit – 85%

Learning Outcomes *Learners will know and understand in accordance with a given level:*	Learning Content
1. The definition of and general factors that are considered causes of climate change	*Short and long-term patterns and variations in the Earth's climate* *Differences between climate and weather patterns* *Methods of determining past climate and weather patterns* *Definition of global warming and greenhouse effect* *Greenhouse, ozone, natural and 'man-made' additional gasses in the atmosphere*
2. How climate change is affecting society at an international, national, local and personal level	*International governmental responses to climate change* *Low carbon societal strategies* *Future generational impacts* *Conservation* *Changes to habitation and food production* *Air quality/smog etc.*
3. The aims and challenges of the ConstructZero industry initiatives	*Impact of built environment/construction activities on the climate* *Industry 'zero' initiatives* *Strategic role that encompasses engine-powered plant* *Societal demands and expectations* *LEZs and ULEZs* *Impacts on financial and costings* *Eco-operation programmes for meeting client requirements*

4. The constituent parts of air and how various gases and particulates can affect air quality	*Definition of air quality* *What constitutes the 'component parts of air (nitrogen/oxygen/carbon dioxide/inert gasses)* *Differences between gasses and particulates* *Outline of the human respiratory system* *Respiratory effects of gasses and particulates* *Low altitude and high altitude emission effects*
5. Who is affected and how through plant operations on sites	*Population at national level* *Population at local level* *Urban areas and residential* *Localised air quality* *Effects due to weather/seasons/high and low pressure areas/air movement*
6. How internal combustion (IC) engines (diesel) convert fuel into work	*Outline of fossil-based fuel, from crude to refining* *Component parts of an IC engine* *Getting air and fuel into the engine* *Compressing, igniting and combusting fuel (CI and SI)* *Converting heat energy into mechanical energy* *Turbocharging/fuel settings*
7. The principles of how power, torque and transmission of power creates 'work done' by plant	*Converting mechanical energy into work through torque* *How torque creates work done through transmission of torque in typical plant* *Efficient engine speed range* *Mechanical and hydraulic (hydro-static and hydro-dynamic) power* *How torque, power and movement is increased*

8. What constitutes 'tailpipe' emissions from IC-engined plant and how they vary according to machine componentry, usage and environment	*Fuel quality* *Engine speed and loadings* *Fuel types* *Engine and ambient air temperatures* *Working efficiencies* *How heat alters unburnt fuel into gasses* *Constituent gasses exhaled from the combustion chamber inc. (dioxides/oxides/hydrocarbons/other compounds)* *Smoke 'types'* *Workload demand*
9. What is meant by low and zero-emission equipment and types of alternative fuels	*Reduced tailpipe emissions equipment (Particulate filtration devises/Catalytic conversions. Fuel additives)* *Modern engine design e.g. stage 5* *Electric/Hybrid drives* *Fuel additives* *HVO and synthetic fuels* *Hydrogen/H2 fuel cells* *Higher-quality fossil fuels*
10. Other types of power sources that are available for construction plant and their effectiveness and efficiency	*Electric driven equipment, power sources, durations/range* *Cycle of operation* *Methods of generating grid-supplied electricity* *Grid-based direct feed and battery charging supply* *Diesel generator effectiveness (when no alternatives exist)* *Variable, constant-supply and flywheel energy-storage generators*

11. How the effective selection of plant can lower local emissions	*Plant type, size, weight, adaptability, accessories*
12. How effective site planning of an operation can lower local emissions	*Correct machine type for operation* *Machine specification* *Minimizing vehicle/componentry movements* *Cycles of operation*
13. How tailpipe emissions can be lowered by plant operators and how and why they should play their part in reducing tailpipe emissions	*Efficient usage* *Maintenance* *Societal demands/expectations, immediate family and future generational expectations, personal affects, co-workers, nearby residential areas* *Urban areas, LEZs and ULEZs*
14. Principles of telematic data and other technology systems to aid carbon reduction activities	*Integral part of plant management processes* *Ease of use systems inc. driver assist/intelligent machines/3D-machine control* *'On-board' monitoring systems* *Measurement of engine performance, component and machine operational activities* *Range of measured metrics inc. machine location, position, boundaries, activity, performance,* *'Real-time' live and historical reporting from machine to one or more data collection centres* *Collation, extraction and interpretation of relevant data*
15. Effects of monitoring on the operation of plant for emissions, operational costs and localised effects on society	*Plant and production management inc. telematics* *Comparisons of work activities and fuel usage* *Machine specification for the intended work* *Available products/technology/apps etc.*

16. The principles and outcomes of fuel-saving management techniques and tailpipe emissions	*Minimising fuel flow into the engine combustion chamber* *Engine speed ranges and high torque areas* *Minimal engine loadings* *Minimal engine speed compared to vehicle or component movement* *Power modes*
17. How maintenance activities can create improvements in emissions, costs and machine life	*Effects of poor maintenance including:* • *engine efficiencies due to poor filtration and clean fluids* • *engine wear* • *increased throttle usage to overcome inefficient engine* • *transmission maintenance* • *wheels/tyres and tracks* • *reporting on aspects that affect operational efficiency.*
18. How fuel saving techniques apply to a range of common types of construction plant	*Based on specific machine type but inc:* • *Cycles of operation* • *supporting plant positioning* • *correct use of machine operational work modes* • *keeping engine speed within maximum torque bands* • *driving speeds and gear selection* • *hydraulic movements* • *idling/shutting down* • *work planning.*