IWEA
Irish Wind Energy Association

Health and Safety Guidelines for the Onshore Wind Industry on the Island of Ireland 2011

www.iwea.com

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Foreword

Health and Safety Authority

[To be finalised]

IWEA Foreword

These Guidelines for Health & Safety in the Wind Energy Industry Sector on the island of Ireland reflects our commitment to keeping IWEA members and the industry up to date with Health and Safety developments, new legislation, guidance and best practice. The Guidelines are intended for information, general guidance and as an aide-mémoire for senior and operational managers within the industry sector. We will include minor changes reflecting any revised information in further versions of the document and by updates to members. As such, we welcome and encourage any comments on the format, quality and accuracy of this publication.

We acknowledge that improvements can always be made, and whilst the Guidelines do not constitute advice, or indicate any specific course of action, we wish to support and promote the sharing of good practices within the industry, so please contact IWEA if you have any enquiry on these Guidelines or the supporting Health and Safety issues they aim to promote.

Johanna Cafferkey, Chairperson IWEA Health and Safety Strategy Group

Disclaimer

The contents of these Guidelines are intended for information and general guidance only, do not constitute advice, are not exhaustive and do not indicate any specific course of action. Detailed professional advice should be obtained before taking or refraining from taking action in relation to any of the contents of these Guidelines or the relevance or applicability of the information herein.

Glossary

Note: entries are primarily limited to those terms not explained in the text.

AC	Alternating Current
ACOP	Approved Code of Practice
APS	Association of Project Safety
CAA	Civil Aviation Authority
CDM	Construction (Design & Management) Regulations 2007
CIAT	Chartered Institute of Architectural Technologists
CIBSE	Chartered Institute of Building Services Engineers
CIOB	Chartered Institute of Builders
CITB	Construction Industry Training Board
Client	The organisation which carries out a project or for which a project is carried out
Commoners	Persons who have rights over land
COSHH	Control of Substances Hazardous to Health
CPHSP	Construction Phase Health & Safety Plan
CSSHP	Construction Stage Safety and Health Plan
DC	Direct Current
Distribution Code	Regulations governing the connection and operation of generating plant to the distribution network
DNO	Distribution Network Operators
DRA	Design Risk Analysis (as used by designers under the SHWW Construction Regulation or CDM)
DSEA	Dangerous Substances and Explosive Atmospheres
EAW	Electricity at Work Regulations
EMAS	Employee Medical Advisory Service
ERP	Emergency Response Plan
ETCI	Electro-Technical Council of Ireland
FLO	Fisheries Liaison Office
HASWA	Health & Safety at Work etc.Act 1974 UK
HASWNIO	Health & Safety at Work (Northern Ireland) Order 1978
HAV	Hand Arm Vibration
H&S	Health & Safety
HIAB	Truck or lorry mounted crane (proprietary name)
HSA	Health and Safety Authority
HSE	Health & Safety Executive (UK)
HSENI	Health & Safety Executive of Northern Ireland
HSF	Health & Safety File (as defined under CDM)
HV	High Voltage – a voltage exceeding 1000V AC or 1500V DC measured between conductors, or 600V AC or 900V DC measured between conductors and earth

ICE	Institute of Civil Engineering
IEC	International Electrotechnical Commission
IEI	Engineers Ireland
IMechE	Institute of Mechanical Engineers
IRATA	International Rope Access Trade Association
IOSH	Institution of Occupational Safety & Health
ISM	International Safety Management Code
IStructE	Institute of Structural Engineers
IVB	Independent Verification Body
KPI	Key performance indicator
kV	kilovolt
LV	Low Voltage – a voltage exceeding 50V AC or 120V DC, whether measured between conductors or to earth, but not exceeding 1000V AC or 1500V DC measured between conductors, or 600V AC or 900V DC measured between conductors and earth
MHSWRNI	Management of Health & Safety at Work Regulations (Northern Ireland) 2000
NATS	National Air Traffic Services
NLB	Northern Lighthouse Board
NOK	Next of Kin
O&M	Operations and Maintenance
PPE	Personal Protective Equipment
PSDP	Project Supervisor Design Process
PSHP	Preliminary Safety & Health Plan
PSCS	Project Supervisor for the Construction Stage
PPM	Planned Preventive Maintenance
PTW	Permit to Work
RIDDOR	Reporting of Injuries, Diseases and Dangerous Occurrences Regulations (Northern Ireland) 1995
RNLI	Royal National Lifeboat Institution
ROV	Remotely Operated Vehicle
RSPB	Royal Society for the Protection of Birds
SCADA	Supervisory Control and Data Acquisition
SHWW	Safety, Health and Welfare at Work
SHWWA	Safety, Health and Welfare at Work Act 2005
SHWWCR	Safety, Health and Welfare at Work (Construction) Regulations 2006
SHWWGAR	Safety, Health and Welfare at Work (General Application) Regulations 2007
SMS	Safety Management System
TSO	Transmission System Operator
UXO	Unexploded Ordnance
WTG	Wind Turbine Generator
WTSR	Wind Turbine Safety Rules (developed by RenewableUK and now commonly used within the industry)

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Appendices

BEST PRACTICE GUIDELINES FOR WIND ENERGY HEALTH AND SAFETY

1. Introduction

1.1 The Irish Wind Energy Association (IWEA) was established to promote the use of wind power on the island of Ireland. IWEA acts as a central point for information for our membership as well as a lobbying group to promote wind energy to government. IWEA researches and proposes solutions to current issues and generally acts as the forum for the Irish wind industry. IWEA is committed to promoting the use of wind energy in Ireland and beyond as an economically viable and environmentally sound alternative to thermal or nuclear generation. In September 2010 IWEA established a group dedicated to Health & Safety in the Wind Industry in Ireland. The goals of the Health & Safety Strategy Group are:

- To act as an information sharing forum for IWEA members
- To communicate safety best practice and to highlight safety issues to the IWEA membership
- To facilitate the development of safety best practice
- To safeguard the industry through the use of safety alerts, lessons learnt documents and contact information.

1.2 Members are expected to adhere to the highest standards and ensure that contracts for design, procurement, construction, commissioning and operation are written so as to promote safe practices and avoid clauses that may compromise Health and Safety. This is fundamental to the development and maintenance of a strong safety-first culture within the industry.

1.3 IWEA recognises the importance of the Client in establishing high standards for Health and Safety at every stage of a renewable energy project. Clients and developers should promote high standards through the selection and management of the whole of their supply chain, including designers, manufacturers, contractors and operators. Clients also have enhanced legal responsibilities for project safety under the SHWW Construction Regulations (ROI) and CDM Regulations (NI), as explained later in this document, which include ensuring that sufficient resources, including time, are allocated to a project. It is further recognised by the regulations that designers and manufacturers will have significant impact on Health and Safety throughout the life of the project. Designers have an obligation to eliminate, or, if impractical, reduce the severity of hazards. As such they have a major influence in promoting improvements in Health and Safety within the industry.

1.4 It is also accepted that a commitment to good practice requires that throughout the life cycle of a wind farm,steps are in place to ensure that the workforce are involved in improving Health and Safety standards as far as reasonably practicable through appropriate consultation, suitable training, competence assessments and by ensuring adequate supervision.

1.5 IWEA wishes to promote experience transfer between members so that good and best practices can be disseminated through learning from accidents, incidents, near events and operating experience. It is recognised that significant costs to operators, designers, manufacturers and suppliers can occur as a result of workplace accidents. Investment in safety to reduce accidents makes sound commercial sense. IWEA is in the process of setting up a “Best Practice and Lessons Learned” area in the Health and Safety section of the IWEA website which is open to all.

1.6 Recognising the advantages of having a common standard for safeguarding persons from the inherent dangers that exist from electrical and mechanical plant IWEA recommends the adoption of a safe system of work for operational turbines. One such system of work is the Wind Turbine Safety Rules (‘the Rules’). The Rules do not replace legislation or other regulatory requirements, however, they have been welcomed by owners, operators and service organisations and are in widespread use on operational turbines in ROI and the UK. More detailed information on the Rules and guidance on their application can be found in Section 10.3 at iwea.com and at www.renewable-uk.com.

1.7 These Guidelines have been drawn up with the aim of enhancing Health and Safety on wind energy developments on the island of Ireland incorporating both ROI and NI. The guidelines are based almost exclusively on the Guidelines published by Renewable UK in September 2010. Specific changes in this Irish version of the guidance include the following:

- Inclusion of the applicable legislation references from ROI and NI
- Inclusion of relevant guidance from the Health and Safety Authority in Ireland and the Health and Safety Executive of Northern Ireland
- Deletion of all references and guidance relating to the offshore wind industry (It is planned to update this guidance to include offshore wind and renewables in the future)

1.8 While the majority of these Guidelines are applicable to any geographic location, the document assumes that Irish (ROI or NI) mainland legislation applies. Where this is not the case, reference to the appropriate regulatory requirements will need to be made.

1.9 IWEA welcomes feedback on its published material and readers are encouraged to forward comments and suggestions for future revisions to health&safety@iwea.com

2. The Nature of the Guidelines

2.1 These Guidelines are intended to be relevant to all organisations contributing to the life cycle of wind farms (from initial feasibility studies through to decommissioning) and particularly relevant to senior and operational management within organisations developing, constructing or operating wind farms, or considering becoming involved in the sector.

These Guidelines are not intended to provide in-depth advice and guidance on all aspects of Health and Safety in relation to the design, construction, commissioning, operation, maintenance and removal of wind turbines. Nor are they designed to replace existing H&SA Guidance, HSENI Guidance or HSENI ACOPs. These Guidelines are intended to provide a summary. of existing guidance so as to provide senior management with sufficient information to ask the necessary questions in relation to these aspects, in order to satisfy them selves that their organisation is promoting good standards of Health and Safety within this industry.

2.2 The Guidelines have been formulated exclusively for onshore wind farms.

2.3 This document recognises the more recent challenges that can influence Health and Safety in our busy, fast-growing industry. These include issues of competence, adequate resources, short-service employees and workers whose mother tongue is not English

2.4 In most respects this document describes existing guidance on Health and Safety. With regard to training for personnel working on wind farms IWEA does not currently run a safety accreditation scheme whereby wind industry training providers are accredited by IWEA. However the IWEA Health and Safety Strategy group is committed to reviewing training and competence standards relevant to the industry and details are expected to be announced in 2012.

IWEA does organise training on a wide range of wind energy topics including Health and Safety through Wind Skillnets. Wind Skillnet has conducted extensive training needs analysis with its member companies, worked closely with IWEA and taken guidance from leaders in the Irish Wind Industry to develop a suite of courses that will meet the requirements of trainees in the Wind Industry through 2011. The courses cover a range of topics range from turbine operation, maintenance and productivity, finance, planning, grid connection, wind monitoring and health and safety.

Wind Skillnet is funded by member companies and the Training Networks Programme which is funded from the National Training Fund through the Department of Education and Skills. It is tasked with delivering subsidised training to IWEA Members in a structured way. The network is directed by a Steering Group Committee, made up of a cross section of IWEA members and is managed by a Network Programme Manager, Johanna Cafferkey.

3. Status of the Guidance in these Guidelines

3.1 Organisations involved with the wind energy industry are reminded that they have statutory duties under Irish and UK Health and Safety legislation depending on the location of the wind farm. The purpose of this document is to offer advice on Health and Safety issues that are specific to the wind energy industry. Satisfying the requirements of these Guidelines should not be viewed as an indication of total compliance with the law. There is no substitute for knowledge of individual duties and legal requirements.

3.2 This document is primarily aimed at addressing relevant Health and Safety issues. It does not attempt to consider in detail environmental risks as they may relate to any wind farm project. However, duty holders are reminded that there is often significant overlap in fulfilling both Health and Safety, and environmental responsibilities. Policies, procedures, training and risk assessments should pay due regard to both areas in the most effective and pragmatic manner to ensure they are adequately considered.

4. Further Information

4.1 A list of Health and Safety guidance publications applicable to ROI and NI can be found in Appendix 1.

4.2 Further advice is available directly from the HSA (ROI) or HSENI (NI) Some contact points are provided in Appendix 2

4.3 Where any organisation does not have the necessary knowledge, competence or resources available to it, specialist advice can be sought from independent third parties and consultants. It is likely that in most situations the first port of call to enquire about selecting a consultant will be via the Chartered Institution of Occupational Safety and Health (IOSH) (http://www.iosh.co.uk/). IOSH provides details of how to obtain Health and Safety assistance. Other specialist organisations that may provide additional advice and expertise are listed in Appendix 2.

5. Principles of Successful Health and Safety Management

5.1 Legislative requirement

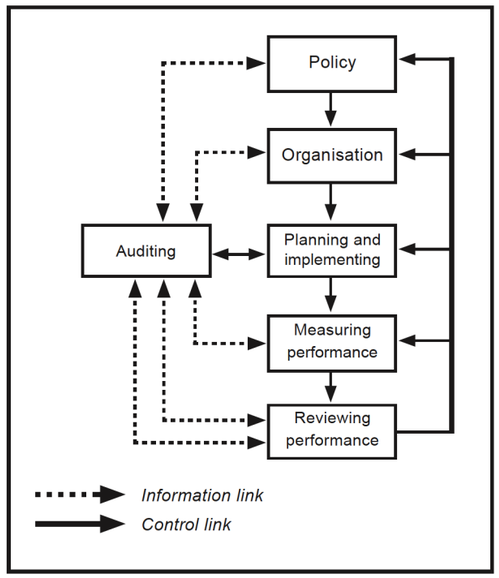
The primary Acts of legislation which govern health and safety on the island of Ireland are the Safety, Health and Welfare at Work Act 2005 in ROI and the Health and Safety at Work (Northern Ireland) Order 1978 in NI.

These primary Acts and supporting legislation require all employers to establish a Health and Safety policy, organisation and arrangements, and to document the system so as to ensure the effective implementation of the policy. High standards of Health and Safety may only be achieved where relevant responsibilities are formally specified and the organisation can demonstrate a strong Health and Safety culture.

The key elements of successful Health and Safety management are:

- clear policy;
- organisation;
- planning;
- implementation;
- measurement of performance; and
- auditing and review.

Properly linked, these key elements combine to form a coherent and effective Health and Safety management system.



Further guidance is provided in the HSA publication Workplace Safety and Health Management (HSA, 2006) and Successful Safety and Health Management (HSG65) published by HSE. Selected sections of these guidance documents are used and developed in this chapter.

A further management system standard of relevance is BS OHSAS 18001:2007, Occupational Health and Safety Management Systems. More details on this standard are contained in Section 6.

In Northern Ireland the Management of Safety and Welfare at Work Regulations (Northern Ireland) requires that organisations should obtain the advice and assistance of 'Competent Persons' on Health and Safety matters. These Competent Persons can be in-house advisers or a team of safety professionals, or the advice may be outsourced to external consultants. HSENI prefers to see the appointment of internal advisers, who may have simplified access to a wide area of documents and confidential information.

In the Republic of Ireland the SHWW Act 2005 defines the term "competent person" and requires that employers must appoint one or more competent persons to perform safety functions. When appointing competent persons employers are required to give preference to persons in their own employment.

5.2 Leadership

It is well recognised that effective Health and Safety performance is driven by the commitment and leadership of senior management. Health and Safety must be regarded as a key risk-management issue that must be driven from the top. Failure to do so can put employees and members of the public at risk and expose the organisation, its Directors, senior managers and employees to serious legal, contractual and financial consequences.

Organisations operating across the supply chain are strongly encouraged to pay due regard to these actions and the relevant Guidelines that support them.

Effective Health and Safety performance comes from the top; members of the Board have both collective and individual responsibility for Health and Safety. Directors and Boards need to examine their own behaviour, both individually and collectively, and compare this with any guidance given. If they see that their actions fall short of the standards required, then they should take action to change what they do to become more effective leaders in Health and Safety.

Why Directors and Board members need to act:

- Protecting the health, safety and welfare of employees, and that of members of the public who may be affected by their activities, is an essential part of risk management and must be led by the Board.
- Failure to include Health and Safety as a key business risk in Board decisions can have catastrophic results. Many high-profile safety cases over the years have been rooted in failures of leadership.
- Health and Safety law places duties on organisations and employers, and Directors can be personally liable when these duties are breached; Members of the Board have both collective and individual responsibility for Health and Safety.

In the Republic under the 2005 Act responsibility for safety and health is placed directly on those in charge in the workplace. In other words, directors and managers who control the work being done must take on this responsibility. Further information on the responsibilities of directors and senior managers is available in the HSA publication "Guidance for Directors and Senior Managers on their responsibilities in Health and Safety" (HSA, 2007)

In Northern Ireland the Corporate Manslaughter and Corporate Homicide Act 2007 in conjunction with the Health and Safety (Offences) Act 2008 places greater needs on a business to ensure that their health and safety management is sufficiently adequate in the event of an incident especially if a fatality occurs.

For NI specific information on actions for Company Directors and Board members can be found in the joint HSE/IOD document Leading Health and Safety at Work, available from www.hse.gov.uk/leadership. These and other questions relating to the Directors' and senior managers' operational control of the business are likely to be asked by the police or the HSE in the event of a serious incident.

Questions for Directors and Board members to answer for themselves include:

- How do you demonstrate the Board's commitment to Health and Safety?
- What do you do to ensure appropriate Board-level review of Health and Safety?
- What have you done to ensure your organisation, at all levels, including the Board, receives competent Health and Safety advice?
- How are you ensuring all staff, including the Board, are sufficiently trained and competent in their Health and Safety responsibilities?
- How confident are you that your workforce, particularly safety representatives, are consulted properly on Health and Safety matters, and that their concerns are reaching the appropriate level including, as necessary, the Board?
- What systems are in place to ensure your organisation's risks are assessed, and that sensible control measures are established and maintained?

5.3 Policy

Setting the overall aims of the organisation and confirming management commitment

The first steps for any business seeking to implement key elements of a successful Health and Safety management system are to set out the ultimate aims of a sound Health and Safety policy. The Board should apply the logic and rigour of business planning to the identification and control of risks.

A Health and Safety policy should influence all your activities, including the selection of people, equipment and materials, the way work is done, and how you design and provide goods and services. The policy should demonstrate to staff and anyone else that you have arrangements in place to manage and control Health and Safety risks.

This control is normally focused on tackling hazards according to a risk base – i.e. assessing what the risks are, ranking them, and tackling the greatest risks first. This risk-based approach is reflected elsewhere as the organisation's risk assessment strategy (see also Section 5.7).

In ROI an organisation is required to prepare an occupational safety and health policy programme as part of the preparation of the Safety Statement required by section 20 of the 2005 SHWW Act.

5.4 Organisation

Identifying who will do what

The Board is normally in overall control of the organisation and it is incumbent upon the Board to obtain competent advice and the assistance of the relevant Competent Persons to advise it on its strategy.

To secure the implementation of good or best practice and the continual development of a high quality Health and Safety policy, it is essential to have a clearly defined structure to manage the implementation of policy and for clear procedures to be implemented.

Although Health and Safety is the responsibility of everyone in an organisation, specific responsibilities may be delegated by the Board to individuals involved in the management of Health and Safety. These responsibilities may be appropriate for all levels of the organisation, and the relationships between those individuals may be set out along normal reporting lines. The aims of the organisation should be to:

- ensure communication of relevant information throughout the organisation;
- secure the competence of employees;
- monitor the performance of the organisation; and
- review the operation of the safety management system.

5.5 Planning and implementation

Putting policy into practice

To be successful in Health and Safety management, it is necessary to draw up plans and set performance standards, with the overall aim of eliminating or controlling risks. The plans define the standards of Health and Safety that the organisation is aiming to achieve, how they will be accomplished, and the timescale for achievement. The planning and implementation process, which should include staff consultation and training, will result in operating and maintaining systems which:

- identify objectives and set timescales for their achievement and review;
- set performance standards for management actions;
- set performance standards for the control of risks to employees and others affected by work activities (for example, customers and visitors);
- set performance standards for contracts and key performance indicators for monitoring contractors (to enable selection or re-selection);
- establish priorities for provision and maintenance of control measures;
- ensure adequate supporting documents for all performance standards; and
- provide adequate resources, including time.

In devising control measures, it is necessary to analyse work practices. Where possible, the operatives as well as the Competent Person should be involved in the assessment. This should enable the actual work processes to be systematically assessed to identify hazards and then to carry out meaningful risk assessments of these hazards (see Section 5.6). In formulating risk control measures after the risk assessments have been completed, it is recommended that the following hierarchy of risk management be used:

- If possible, completely eliminate the hazard so that risks can be avoided altogether.
- Substitute a less hazardous work process.
- If not possible to eliminate or substitute, tackle the hazard source to reduce its potential.
- Failing this, priority should be given to measures to control the risk, which will protect all workers (Collective Measures).
- Physical measures such as guards are preferable to systems, supervision or training. If systems are used then these should, if possible, be designed to fail to safe rather than failing to danger
- As a last resort only, measures must be taken to control the risk by means of personal protection (Personal Measures).

Detailed reference should be made to regulations that may specify a hierarchy of measures particular to that regulation, hazard or activity. In particular the principles of prevention set out in the SHWW Act 2005 (ROI) and the MHSWR (NI) 2000 must be considered.

5.6 Measuring and reviewing performance

Check standards are really being achieved, praise achievement, and ensure faults and opportunities for improvement are acted upon

In order to check that the Health and Safety standards are actually being achieved in practice, it is necessary to measure performance against the predetermined plans, standards and procedures. Any areas in which the planned standards are not being met should be identified for remedial action. The types of systems that can be used to monitor Health and Safety performance can be categorised into active and reactive systems.

Active monitoring systems (before things go wrong), also known as proactive monitoring

- Monitoring of specific objectives and reporting results quarterly or monthly
- Periodic examination of documents to review performance assessment, recording of training needs and delivery of suitable training
- Systematic inspection of premises, plant and equipment by supervisors, maintenance staff, management and safety representatives, or other employees to ensure the continued effective operation of workplace precautions
- Environmental monitoring and health surveillance to check on the effectiveness of health control measures and to detect early signs of harm to health
- Direct observation of work and behaviour by first line supervisors to assess compliance with procedures, rules and risk control
- Operation of audit systems
- Regular review of Health and Safety performance reports by the Board of Directors
- Periodic inspection of vacant property carried out by suitably qualified and experienced property surveyors

Reactive monitoring systems (after things go wrong)

Identify where Health and Safety standards are not being met, and report and analyse failures – for example, accidents, cases of ill health or damage to property.

When reporting and response systems are put in place, it is important to ensure that monitoring information is evaluated by people competent to recognise situations in which there is an immediate risk to health or safety, as well as longer-term trends. They must have sufficient authority to ensure that appropriate remedial action is taken. Effective investigation and analysis requires that:

- priority is given to incidents that indicate the greatest risk;
- both the immediate and the underlying causes of events are identified;
- information reaches management with sufficient authority to initiate remedial action, including organisational and policy changes; and

- adequate analysis is made of all collected data to identify common features or trends and initiate improvements at an organisational level.

The response to auditing is the final step in the Health and Safety management cycle. Together, performance auditing and review constitute the 'feedback loop' needed to enable the organisation to maintain and develop its ability to manage risks to the fullest possible extent. Auditing and review ensure that any inadequate performance is identified and appropriate remedial action is put into effect. Regular auditing of Health and Safety systems can identify whether they have deteriorated or are becoming obsolete. Auditing needs to be comprehensive and to examine over time all the components of the Health and Safety management systems in an organisation.

Legal Privilege (after problems are identified)

If consultants or auditors have identified an issue that may result in a prosecution for a breach of statutory duty or a claim for personal injury (or other legal proceedings), then it may be possible to carry out further investigations under legal privilege. You are advised to take legal advice if any investigation is likely to proceed in this manner.

(ROI Cross-check required here)

5.7 Risk assessment

Risk assessment is a key activity in the management of Health and Safety. It is a legal requirement for every employer to make a suitable and sufficient assessment of the risks to the health, safety and welfare of their employees whilst they are at work, and to the health and safety of others who may be affected by the work they undertake.

An assessment of risk is also a requirement of most other regulations, including Working at Height, Control of Substances Hazardous to Health, Manual Handling and others.

Risk assessments should address all Health and Safety risks, during every phase of the life cycle of a wind farm, including those to members of the public, as well as personnel working on site. Various techniques are available and some are more suited than others to different phases of a wind farm development, such as design, manufacture, installation, commissioning, operation, maintenance and decommissioning. Organisations should define the risk assessment techniques to be used within their Health and Safety management system, along with the levels of competence required by those performing or reviewing the risk assessments.

Risks should be designed out or reduced to as low a level as reasonably practicable. Designers have a duty under the construction regulations (ROI) or CDM (NI) to identify and eliminate hazards at every stage of the design process, and to provide information with the design as to the nature of any significant risks remaining. Clients are in a strong position to influence designers, by placing emphasis on, and ensuring throughout that the design achieves a high standard of Health and Safety compliance.

The findings of a risk assessment should be in the form of controls to be applied to the workplace to reduce exposure to the identified risks. Both the identified risks, and the control measures selected to prevent the realisation of those risks, must be communicated to those carrying out the work, prior to work commencing. Records of all information, instruction and training are required to be retained as evidence that they were provided.

The findings of all risk assessments are required to be recorded and reviewed at regular intervals to ensure they remain up-to-date. Initial guidance on risk assessment can be found in the HSA publication Guidance on Safety Statements and Risk Assessments (HSA, 2006) or the HSE's publication INDG163, Five Steps to Risk Assessment.

It should be noted that this guidance is basic and duty holders are, in most situations, encouraged to develop their own risk assessment procedures and templates, which can take into account industry - and site-specific issues.

Method Statements

Project-specific risk assessments may be used to devise methods of work (sometimes referred to as 'method statements'). These method statements should not be prepared entirely as generic 'process' documents unless the process is unlikely to change. If there is a possibility that these method statements will be revised (e.g. ground conditions are unknown), then the method statements should be under the control of an operative or supervisor qualified and competent to be able to review the effectiveness of the method, or to call a halt to the work pending revision of the method of work.

Sufficiently robust work instructions should be given to operatives and contractors to ensure that work is stopped and delayed if necessary. In addition, adequate precautions in contracts may need to be reviewed for delay caused as a result of safety precautions.

If the method of work is not capable of change without reference to a manufacturer or designer then these people should be on-hand to assist and revise the method statement as needed. Contractual requirements in procurement may assist with this responsiveness.

5.8 Management of change

Temporary and permanent changes to an organisation, personnel, systems, procedures, working methods and practices, equipment and materials may be planned or unplanned. Although every effort should be made by designers and others to identify appropriate work methods (including assembly instructions and equipment to be used) and control measures to eliminate risks and to minimise the need for change, unexpected or unforeseen events or situations may still arise at any stage throughout the wind farm cycle. These events and situations may require unplanned changes to be implemented quickly which, if not managed effectively, may significantly increase risk to Health and Safety.

Both the SHWW Construction Regulations (ROI) and CDM (NI) require all parties to cooperate and coordinate their activities throughout the design and construction phases. Clients have specific responsibility to ensure all parties are provided with sufficient time and resources to enable them to plan and carry out their work safely.

Whether changes are planned or unplanned it is important to ensure that their potential impact on Health and Safety is properly assessed, so that hazards or risks associated with the change are identified and effectively managed.

Organisations should develop an effective management of change process, which is capable of being implemented across all aspects of wind farm development and operation, to enable changes to be effectively managed into the workplace. This process should consider:

- the methods and work required to be changed;
- the methods and work required to implement the change;
- additional equipment required to be used to implement change or that which is required to be introduced as a result of the change;
- the review and, where necessary, revision of existing risk assessments;
- the review and, where necessary, revision of existing safe system of work, method statements and work instructions;
- any additional control measures – organisational, procedural, engineering controls and/or PPE, necessary to implement the change and/or required to be introduced as a result of the change;
- the issuing of modified information and instruction;
- the re-training of personnel involved with the work; and
- the allocation of sufficient time and resources to implement the change.

5.9 Management of supply chain

One of the greatest risks in any safety management system concerns the management of the interaction with suppliers or contractors. Supply chain management can take large resources to control and it can easily result in problems if it is not well managed.

The key issues for the Board and the Competent Person to focus their attentions on are:

- the selection of suitable Competent Persons (see Section 9.6), such as project supervisors, CDMCs or internal business advisers;
- the selection of suitable designers and contractors
- the contractual definition of key performance indicators (KPIs); and
- the monitoring of contractors according to KPIs, and compliance with method statements.

6. Legislation and Standards

6.1 Health and Safety legislation relevant to wind farm projects

The law relating to Health and Safety consists of statutory duties under Health and Safety legislation, and also duties under the common law. The legislation covering statutory duties and the common law exist side by side, and some statutes have created duties under the common law. The legislation that is most likely to be relevant to different phases of a wind farm is listed in the tables below for ROI and NI.

At common law, the burden remains on a plaintiff to show that the employer has failed to take reasonable care to avoid the risks of harm that he ought reasonably to have foreseen might arise in the circumstances. The hallmark of liability at common law is that the employer must be shown not to have acted reasonably.

In breaches of statutory duty, the burden of proof is reversed and it is incumbent upon the employer to show that there was no risk, or if there was a risk, then everything reasonably practicable had been done to avoid it. The adjective 'reasonably' serves only to qualify the concept of practicability. Reasonableness of conduct does not stand as the hallmark by which statutory liability is avoided as it does at common law.

The focus of the defence by which liability for an alleged breach of statutory duty is avoided, once it has been shown that the place of work was unsafe, is practicability – qualified by reasonableness.

Under statute, there is a duty on employers to ensure that the employee's place of work is safe. If the place of work is not safe (even though the danger is not great or the risk is not very likely to occur) the employer's duty is to do what is reasonably practicable to eliminate it.

Once any risk has been identified, the approach must be to ask whether it is practicable to eliminate it and then, if it is, to consider whether, in the light of the quantum of the risk, and the cost and difficulty of the steps to be taken to eliminate it, the employer can show that the cost and difficulty of the steps substantially outweigh the quantum of risk involved.

IN ROI The Safety, Health and Welfare at Work (Construction) Regulations 2006 supported by the Safety, Health & Welfare at Work Act 2005 and the Safety, Health and Welfare at Work (General Application) Regulations 2007, are the main pieces of Health and Safety management legislation required to be considered when preparing for and carrying out construction activities, including planning, design, installation, commissioning, maintenance and decommissioning.

In NI the Construction (Design & Management) Regulations 2007 (CDM) supported by the

Health & Safety at Work (Northern Ireland) Order 1978 and the Management of Health & Safety at Work Regulations 1999 (MHSWR), are the equivalent main pieces of Health and Safety management legislation.

The tables below are intended to provide a guide as to which Act or Regulation may apply to each of the wind farm life cycle phases, which are described in Sections 7 to 10 of this document. It is not exhaustive and the indication of applicability should not be taken as a legal interpretation. Acts, Regulations and Codes of Practice are listed but subsequent amendments are not. As changes or amendments are made to Health and Safety Legislation the legislation section of the HSA and HSENI websites are updated (See http://www.hsa.ie/eng/Legislation/ and http://www.hseni.gov.uk/resources/legislation.htm for further details).

Table 1

Health and Safety Legislation applicable to on-shore Wind Farm Developments in the Republic of Ireland

Acts
Safety, Health and Welfare at Work Act 2005
Chemicals Act 2008
Carriage of Dangerous Goods by Road Act 1998
Organisation of Working Time Act 1997
Safety in Industry Act 1980
European Communities Act 1972
Factories Act 1955
Regulations
Safety, Health and Welfare at Work (Construction) Regulations 2006
Safety, Health and Welfare at Work (General Application) Regulations 2007
Safety, Health and Welfare at Work (Exposure to Asbestos) Regulations 2006
Safety, Health and Welfare at Work (Confined Space) Regulations 2001
Safety, Health and Welfare at Work (Chemical Agents) Regulations 2001
Safety, Health and Welfare at Work (Biological Agents) Regulations 1994
Safety, Health and Welfare at Work (General Application) Regulations 1993 (Part X and the Twelfth Schedule relating to the notification of accidents and dangerous occurrences)
Chemicals Act (CLP Regulation) Regulations 2011
European Communities (Carriage of Dangerous Goods by Road and Use of Transportable Pressure Equipment Regulations) 2011
European Communities (Carriage of Dangerous Goods by Road) (ADR Miscellaneous Provisions) Regulations 2010
European Communities (Machinery) Regulations 2008
European Communities (Pressure Equipment) Regulations 1999
Carriage of Dangerous Goods by Road Regulations 2010
Codes of Practice
Code of Practice for Avoiding Danger from Underground Services 2010
Code of Practice for the Safety, Health and Welfare at Work (Chemical Agents) Regulations 2001 (2010)
Code of Practice for Working in Confined Spaces 2010
Code of Practice for Access and Working Scaffolds 2008
Code of Practice for Safety in Roof work 2011
Code of Practice for Avoiding Danger from Overhead Electricity Lines 2008

Table 2

Health and Safety Legislation applicable to on-shore Wind Farm Developments in the Northern Ireland

Acts
Health & Safety at Work (Northern Ireland) Order 1978
Fire Services (Northern Ireland) Order 1984
The Employers Liability (Defective Equipment and Compulsory Insurance) Order 1972
The Factories Act (Northern Ireland) 1965
Regulations
Management of Health & Safety at Work Regulations (Northern Ireland) 2000
The Construction (Design & Management) (Northern Ireland) Regulations 2007
The Workplace (Health, Safety & Welfare) Regulations (Northern Ireland) 1993
The Health & Safety (Consultation with Employees) (Northern Ireland) Regulations 1996
The Safety Representatives and Safety Committee Regulations (Northern Ireland) 1979
Provision and Use of Work Equipment Regulations (Northern Ireland) 1999
Lifting Operations and Lifting Equipment Regulations (Northern Ireland) 1999
Pressure System Safety Regulations (Northern Ireland) 2004
Electricity at Work Regulations (Northern Ireland) 1991
Working at Height Regulations (Northern Ireland) 2005
Confined Space Regulations (Northern Ireland) 1999
The Control of Vibration at Work Regulations (Northern Ireland) 2005
The Control of Noise at Work Regulations (Northern Ireland) 2006
Control of Substances Hazardous to Health Regulations (Northern Ireland) 2003
Dangerous Substances and Explosive Atmospheres Regulations (Northern Ireland) 2003
The Carriage of Dangerous Substances & Use of Transportable Pressure Equipment Regulations (Northern Ireland) 2010
The Chemicals (Hazard Information and Packaging for Supply) Regulations (Northern Ireland)2009
Health & Safety (Display Screen Equipment) Regulations (Northern Ireland) 1992
Manual Handling Operations Regulations (Northern Ireland) 1992
Personnel Protective Equipment at Work Regulations (Northern Ireland) 1993
The Construction (Head Protection) Regulations (Northern Ireland) 1990
The Health & Safety (Safety Signs and Signals) Regulations (Northern Ireland) 1996
The Health & Safety (First Aid) Regulations (Northern Ireland) 1982
The Reporting of Injuries, Diseases and Dangerous Occurrences (Northern Ireland) Regulations 1995
The Health and Safety (Consultation with employees) Regulations (Northern Ireland) 1996
Health & Safety Miscellaneous Amendments (Northern Ireland) Regulations 2003
Health & Safety Miscellaneous Amendments and Revocations (Northern Ireland) Regulations 2009
The Control of Asbestos Regulations (Northern Ireland) 2007
Environment and Safety Information (Northern Ireland) Order 1993
The Supply of Machinery (Safety) Regulations 2008
Pressure Equipment Regulations 1999 (Pressure Equipment Directive)

Table 2 continued

Northern Ireland Approved Codes of Practice
Safe Work in Confined Spaces in Northern Ireland - Approved Code of Practice {Confined Spaces Regulations (Northern Ireland) 1999}
Workplace Health Safety and Welfare - Approved Code of Practice {Workplace, Health and Welfare Regulations (Northern Ireland) 1993}
First Aid at Work - Approved Code of Practice {Health and Safety (First Aid) Regulations (Northern Ireland) 1982
Note: A list of Great Britain HSE/HSC Codes of Practice Approved for Use in Northern Ireland is available from HSENI or on the HSENI website

6.3 Relevant British and European standards

The following British and European Standards have been created specifically for use within the wind energy industry. The content of some may impact on Health and Safety. Where relevant the BS EN number has been used as opposed to the applicable IEC reference. However both should be checked.

PD IEC WT01:2001 – IEC System for Conformity Testing and Certification of Wind Turbines – Rules and procedures

BS EN 61400-1:2005 – Wind turbines – Design requirements

BS EN 61400-2:2006 – Wind turbines – Design requirements for small wind turbines

BS EN 61400-11:2003 – Wind turbine generator systems – Acoustic noise measurement techniques (amended 2006)

DD IEC TS 61400-12: 2006 – Wind turbine generator systems – Power performance measurement of electricity producing wind turbines.

DD IEC TS 61400-13: 2001 – Wind turbine generator systems – Measurement of mechanical loads

IEC/TS 61400-14: 2005 – Wind turbine generator systems – Declaration of apparent sound power level and tonality values

DD IEC TS 61400-22: 2011 – Wind turbine generator systems – Conformity testing and certification

IEC 61400-21:2008 – Wind turbine generator systems – Measurement and assessment of power quality characteristics of grid connected wind turbines

IEC TS 61400-23:2002 – Wind turbine generator systems – Full-scale structural testing of rotor blades

PD IEC/TR 61400-24:2002 – Wind turbine generator systems – Lightning protection

BS EN 61400-25-1:2007 – Wind turbine generator systems – Communications for monitoring and control of wind power plants – Overall description of principles and models

BS EN 61400-25-2:2007 – Wind turbine generator systems – Communications for monitoring and control of wind power plants – Information models

BS EN 61400-25-3:2007 – Wind turbine generator systems – Communications for monitoring and control of wind power plants – Information exchange models

BS EN 61400-25-4:2008 – Wind turbine generator systems – Communications for monitoring and control of wind power plants – Mapping to communication profile

BS EN 61400-25-5:2007 – Wind turbine generator systems – Communications for monitoring and control of wind power plants – Conformance testing

BS EN 61400-25-6:2008 – Wind turbine generator systems – Communications for monitoring and control of wind power plants – Logical node classes and data classes for condition monitoring

BS EN 50308:2004 – Wind turbine generator systems – Protective measures – Requirements for design, operation and maintenance

PD CLC/TR 50373:2004 – Wind turbine generator systems – Electromagnetic compatibility

IEC 60050-415:1999 – Wind turbine generator systems – International electrotechnical vocabulary – Part 415

BS EN 61508-7:2002 – Functional safety of electrical/electronic/programmable electronic safety-related systems

BS ISO 81400-4:2005 – Wind turbine generator systems – Design and specification of gearboxes

DD IEC/TS 62257-9-1:2008 – Recommendations for small renewable energy and hybrid systems for rural electrification – Micropower systems

Other relevant standards include, but are not limited to:

BS EN ISO 14122-1:2001 – Safety of machinery – Permanent means of access to machinery – Part 1: Choice of fixed means of access between two levels

BS EN ISO 14122-2:2001 – Safety of machinery – Permanent means of access to machinery – Part 2: Working platforms and walkways

BS EN ISO 14122-3:2001 – Safety of machinery – Permanent means of access to machinery – Part 3: Stairs, stepladders and guard rails

BS EN ISO 14122-4:2004 – Safety of machinery – Permanent means of access to machinery – Part 4: Fixed ladders

BS EN 795:1997 – Protection against falls from a height – Anchor devices – Requirements and testing

BS 7883:2005 – Code of Practice for the design, selection, installation, use and maintenance of anchor devices conforming to BS EN 795

- The structure of standards enables other more commonly used standards such as BS EN ISO 9001 (Quality Management) and BS EN ISO 14001 (Environmental Management) to be easily transposed into a single Integrated Management System (IMS) covering all three internal company disciplines.

- BS OHSAS 18001:2007 is auditable, and certification to the standard by accreditation bodies is now being awarded to companies which have demonstrated that they have achieved a specific level of competence in respect of their Health and Safety management.

6.3 The Safety, Health and Welfare at Work (Construction) Regulations 2006 (ROI Only)

Regulations 1 to 29 of the Safety, Health and Welfare at Work (Construction) Regulations 2006 are concerned with the duties of clients, designers, project supervisors, and the general duties of contractors. The Regulations are aimed at protecting workers from accidents and ill heath in the construction industry.

The Regulations were made under the Safety, Health and Welfare at Work Act 2005 and the provisions of the 2005 Act apply to all construction projects. A range of other Regulations also apply to construction projects, including Regulations relating to chemical agents, asbestos, lifting equipment, noise, vibration, optical radiation, electricity, manual handling, work equipment, and workplace conditions.

Specific Guidance has been issued by the Health and Safety Authority on the Procurement, Design and Management requirements of the Regulations. (Reference Appendix 1) and relevant extracts from that guidance are used here as it applies to wind energy projects. Following the guidance is not compulsory and duty holders are free to take other actions to achieve compliance. However if duty holders do follow the guidance they will normally be doing enough to comply with the law. Health and Safety Authority inspectors seek to secure compliance with the law and may refer to HSA guidance as illustrating good practice and compliance.

Actions taken at an early stage of the design process have a significant potential to reduce the level of risk on construction projects. Good co-ordination of activities and co-operation between all parties during design and construction is essential in reducing the high levels of risk found on many construction projects. The regulations aim to improve safety and health in the construction industry by focusing on planning, management and co-ordination, and by establishing a chain of responsibility from the client through to the contractor and to each individual employee.

The regulations apply to all projects which come under the definition of construction work. However, a specific criterion determines whether the project is notifiable to the HSA. This criterion is: where the project work is expected to last more than 30 days or involve more than 500 person days of work. It is anticipated that the majority of the works relating to wind farm development will be notifiable.

The Construction Regulations defines a number of key duty holders within a project:

- Client
- Project Supervisor Design Process
- Designer(s)
- Project Supervisor for the Construction Stage
- Contractors.

6.3.1 The Client

A client is a person or company for whom a project involving construction work is undertaken for the purposes of trade, business or undertaking. The client usually has effective control over key aspects of the project such as the control over who is appointed as:

- the designers of the main elements of the project;
- the Project Supervisor Design Process;
- the Project Supervisor Construction Stage; and
- the Contractor or Contractors who will undertake or manage the main elements of the project.

The Client is the person or company with the controlling interest in the project. Generally, the client will retain a significant level of control over the appointment of other designers and contractors appointed for that project.

The Client's duties are to:

- appoint, in writing before design work starts, a project supervisor for the design process (PSDP) who has adequate training, knowledge, experience, and resources;
- appoint, in writing before construction begins, a project supervisor for the construction stage (PSCS) who has adequate training, knowledge, experience, and resources;
- be satisfied that each designer and contractor appointed has adequate training, knowledge, experience, and resources for the work to be performed;
- co-operate with the project supervisor and supply necessary information;
- retain and make available the Safety File for the completed structure. The Safety File contains information on the completed structure that will be required for future maintenance or renovation;
- provide a copy of the safety and health plan prepared by the PSDP to every person tendering for the project. The Safety Plan documents how health and safety on the project will be managed up to project completion;
- notify the Authority of the appointment of the PSDP where construction is likely to take more than 500 person days or 30 working days

In order to co-ordinate the design and construction work being undertaken, the Client must put in place persons or organisations to oversee the co-ordination of the design and construction work. These

appointees are called the Project Supervisor Design Process (PSDP) and the Project Supervisor Construction Stage (PSCS).

The appointment of the PSDP and PSCS by the Client must be in writing with a written acknowledgement from the chosen candidates that they accept the appointment. Any changes that are made to these appointments must be formally made in writing and acknowledged by the new appointees in writing. The Client should keep copies of these appointments on file. There can only be one Project Supervisor Construction Stage for one project at a given time. This requires that where various types of construction work overlap (geographically and in time) on a site, one Project Supervisor Construction Stage should be appointed for this work, and the work should be considered part of one project. However in case where there is clearly more than one project (for example main windfarm build and an adjacent grid connection works which is substantially removed from the main site) there can be more than one PSCS or PSDP.

Early appointment of the PSDP in particular should be made to ensure that the safety and health implications of decisions taken at the earliest stages of a project are considered. The PSDP can bring about the greatest reduction in risk at the concept and scheme design phases. As the project moves further into the detailed design phase, it becomes more difficult to make fundamental changes that eliminate hazards and reduce resulting risks. On windfarm projects consideration should be given to appointing the PSDP when the initial layout is being developed i.e. pre-planning. The PSDP must be appointed at or before the start of design work to enable him or her to:

- advise Clients on the competence and resources of their appointees;
- ensure that early design decisions fully address significant safety and health issues;
- enable the development of an adequate preliminary Safety and Health Plan; and
- enable the Safety File to be produced in a user friendly format suitable for future use.

If construction work on a project is planned to last longer than 30 working days or exceed 500 person-days, the Client must promptly notify the Health and Safety Authority of the project, the details of the Project Supervisor Design Process, and the Project Supervisor Construction Stage where this is known, as set out in Approved Form AF.1 This Notification should be made at the earliest possible point after the making of the appointment of the PSDP. The notice should be sent by registered post to the Authority or as may be directed by the Authority. The Project Supervisor Construction Stage is also required to notify the Authority of a construction project.

Detailed guidance on criteria for competence assessment of project supervisors is given in section 4 of the HSA publication "Clients in Construction: Best Practice Guide" (2009)

6.3.2 The Project Supervisor Design Process (PSDP)

Though the Project Supervisor Design Process must have an extensive knowledge of the design process, that person does not necessarily carry out design work, nor even be a designer. The important point is that the person appointed is competent in safety and health, and is adequately resourced for the role.

The Project Supervisor Design Process will generally be an organisation rather than an individual person for all but the smallest contracts. The organisation would typically be an architectural practice, a contractor, a firm of consulting engineers, or a specialist project management group.

The person (or company) appointed to the position should be competent having regard to the task, the size of the project and the hazards, and have (or have within its ranks persons who have) –

- extensive knowledge of the design process;
- familiarity with the type of construction work involved with the project;
- a sound understanding of the safety and health issues associated with that work;
- good communication skills and systems; and
- sufficient training appropriate to the type of work, e.g. a recognised certificate, higher certificate, or degree in Safety and Health awarded as part of the national framework of qualifications.

The duties of the PSDP can be summarized as follows:

- Identify hazards arising from the design or from the technical, organisational, planning, or time related aspects of the project;
- Where possible, eliminate the hazards or reduce the risk;
- Communicate necessary control measures, design assumptions, or remaining risks to the PSCS so they can be dealt with in the Safety and Health Plan;
- Ensure that the work of designers is co-ordinated to ensure safety;
- Organise co-operation between designers;
- Prepare a written safety and health plan for any project where construction will take more than 500 person days or 30 working days or there is a Particular Risk and deliver it to the client prior to tender;
- Prepare a safety file for the completed structure and give it to the client;
- Notify the Authority and client of non-compliance with any written directions issued;

During the design process the Project Supervisor Design Process (PSDP) is required to take account of the General Principles of Prevention when deciding the technical and organisational aspects of the project. This will help in the planning and phasing of the project and when estimating the timeframe for the safe completion of the project and, where appropriate, for phases of the project.

In addition the PSDP must take account of any existing Safety and Health Plan or Safety File. The Safety File may contain information which will alert the PSDP and Designers of significant safety and health risks that will need to be addressed in the safety and Health Plan.

In co-ordinating the application of the General Principles of Prevention, the PSDP must consider how risks during the construction process can be proactively eliminated or mitigated by designers during the design process. If it is apparent that certain risks cannot reasonably be eliminated, then the second principle above suggests that risks must be evaluated. One method of evaluating the risks as required is by the carrying out of written risk assessments of the integral elements of the design process. This is commonly referred to as a design risk assessment. The PSDP has a key role in co-ordinating the carrying

out of these risk assessment and to assess if any gaps have been left in the assessment process. The PSDP must co-ordinate, so far as is reasonably practicable, activities of the designers in respect of their duties under the Construction Regulations 2006 and, together with the PSCS, facilitate co-operation between the permanent works designers and the temporary works designers, as may be necessary.

The PSDP should take steps to ensure co-operation between permanent and temporary works designers, in particular that the designs are compatible and that loading from the temporary works will not exceed the loads that can be safely carried by the permanent works at a particular stage of their construction.

The requirement of the Construction Regulations 2006 for the PSDP to co-ordinate the design of the works, including the design of temporary works, does not eliminate the need for the appointment (generally by contractors) of competent temporary works engineers who understand the complexity of the forces involved in temporary works/permanent works interaction, and who can design the temporary works to safely take account of these forces. Temporary works on windfarm projects may include scaffolding at substations, shuttering at turbine bases and traffic management measures in the vicinity of the windfarm or where grid connection works take place on public roads.

The PSDP must prepare a Safety and Health Plan which should be prepared in adequate time to allow it to be provided for anyone tendering or negotiating for the position of PSCS. This will allow the potential PSCS consider the implications of any issues emanating from the Safety and Health Plan when preparing the tender or proposal for execution of the works.

A copy of the Safety and Health Plan must be available to allow an Inspector assess the type of arrangements envisaged prior to the Construction Stage of any project. It may provide a valuable store of knowledge for use in follow-up or similar projects, or may provide a useful store of knowledge to be adopted, and adapted as appropriate. A copy of the plan must be kept for a period of five years.

The PSDP must prepare a Safety File for the project, and present it to the Client when the project is complete. The Safety File is a record of information for the end user, which focuses on safety and health. The information it contains will alert those who are responsible for the structure and services in it of the significant safety and health risks that will need to be addressed during subsequent maintenance, repair or refurbishment, extension or other construction work or, indeed, its demolition. In order to prepare the Safety Fie, the PSDP should receive appropriate information from designers, Project Supervisor Construction Stage, and other duty-holders. This will require co-operation and co-ordination right from the start.

6.3.3 The Designer(s)

The term “design” has a very broad definition in the Regulations. Design work is the preparation of drawings, particulars, specifications, calculations, the preambles and preliminaries of bills of quantities in so far as they contain specifications or other expressions of purpose, according to which a project, or

any part or component of a project, is to be executed. It should be noted that the term “project” also has a very broad meaning under the Regulations, as have related terms such as “construction work” and ”structure”.

The design process is the process through which the design of a project is prepared and developed from initial concepts through to detailed specification, usually involving different teams and disciplines at various stages throughout the life of the project. For wind energy projects this may include early site investigation work.

Designers are organisations or individuals who undertake design work for a project, including the design of temporary works. They are in a unique position and can often make decisions that can significantly reduce the risks to safety and health during the construction stage and during subsequent use and maintenance.

Designers include:
- civil designers of roads and foundations, electrical designers of electrical infrastructure and interfaces to the grid, turbine designers
- those who specify or alter a design, or who specify the adoption of certain methods of work or the use of specific materials (this may include the Client).

Included within this definition also are temporary works designers whose work may include such matters as trench shoring, scaffolding, propping, working platforms, etc.

Designer’s duties under the Regulations can be summarized as:

- Identify any hazards that your design may present during construction and subsequent maintenance
- Where possible, eliminate the hazards or reduce the risk
- Communicate necessary control measures, design assumptions or remaining risks to the PSDP so they can be dealt with in the Safety and Health Plan;
- Co-operate with other designers and the PSDP or PSCS;
- Take account of any existing safety and health plan or safety file;
- Comply with directions issued by the PSDP or PSCS;
- Where no PSDP has been appointed, inform the client that a PSDP must be appointed;
- The Safety Health and Welfare at Work Act 2005 requires designers to ensure that the project is capable of being constructed to be safe, can be maintained safely and complies with all relevant health and safety legislation.

Essentially the Regulations require that all designers must take account of the General Principles of Prevention which are contained in Schedule 3 to the Safety, Health and Welfare at Work Act 2005 and any relevant Safety and Health Plan or Safety File. The Principles of Prevention are a hierarchy of risk elimination and reduction.

Eliminating hazards and reducing risk, if feasible, at design stage is the first step in managing safety and

health on construction projects. All designers must take into account the existing hazards on the project relevant to areas of concern and consider these with respect to the potential new hazards generated by the design process for construction workers, end users, and members of the public.

6.3.4 The Project Supervisor Construction Stage (PSCS)

The Project Supervisor Construction Stage is responsible for managing and co-ordinating the construction phase safety and health issues on site. Regulations 6 to 29 of the Construction Regulations 2006, and particularly Regulation 16, provide a framework for this process, with the requirement that the key risk management issues be set out in writing in the construction phase Safety and Health Plan. It is important to note that the presence of a Project Supervisor Construction Stage (PSCS) does not relieve other contractors/employers of their obligation to comply with their statutory safety and health obligations.

Duties of the PSCS can be summarized as follows:

- Co-ordinate the implementation of the construction regulations by contractors;
- Organise co-operation between contractors and the provision of information;
- Co-ordinate the reporting of accidents to the Authority;
- Notify the Authority before construction commences where construction is likely to take more than 500 person days or 30 working days;
- Provide information to the site safety representative;
- Co-ordinate the checking of safe working procedures;
- Co-ordinate measures to restrict entry on to the site;
- Co-ordinate the provision and maintenance of welfare facilities;
- Co-ordinate arrangements to ensure that craft, general construction workers, and security workers have a Safety Awareness card, e.g. Safe Pass and a Construction Skills card where required;
- Co-ordinate the appointment of a site safety representative where there are more than 20 persons on site;
- Appoint a safety adviser where there are more than 100 on site;
- Provide all necessary safety file information to the PSDP;
- Monitor the compliance of contractors and others and take corrective action where necessary;
- Notify the Authority and the client of non-compliance with any written directions issued;
- The PSCS may issue directions to designers or contractors.

The PSCS must develop a suitable Safety and Health Plan for the project, prior to the commencement of construction work. The plan provides the blueprint for managing and co-ordinating safety and health during construction. The plan needs to explain how the key safety and health issues will be managed. It must be relevant to the particular project and should be built on the Safety and Health Plan prepared on a preliminary basis by the PSDP. The PSCS should develop this Safety and Health Plan so that it:

- incorporates the approach to be adopted for managing safety and health during the construction stage;

- takes account of the relevant sections of the Safety Statements prepared by the different contractors under Safety, Health and Welfare at Work Act 2005. (The PSCS should check the safety statements prepared by the contractors to ensure that they relate to the site in question and the work activities to be carried out);
- includes the specific control measures for dealing with Particular Risks;
- takes account of other work activities taking place on the site (e.g. where the construction work overlaps with non-construction activities);
- incorporates the common arrangements (including emergency procedures and welfare as well as details regarding control, co-ordination, and management of shared equipment, such as scaffolding and lifting appliances);
- document the arrangements for ensuring effective co-operation and co-ordination;
- includes arrangements for monitoring compliance with the Safety and Health Plan and with safe working procedures;
- includes arrangements for checking that persons on site have received appropriate safety and health information and training, e.g. Safe Pass and CSCS, and that consultation arrangements are in place;
- includes arrangements for ensuring effective communications between all parties, and the arrangements for appointing a site safety representative (this may include matters such as frequency of project or site meetings and how safety and health is to be dealt with at these meetings, frequency of site safety representative inspections, etc);
- includes information and arrangements for the welfare of workers (effective washing, welfare and changing facilities are a vital part of health precautions, for example, against cement contact dermatitis and contamination by other hazardous substances);
- is modified as necessary as work progresses and as changes occur.

As much of the Safety and Health Plan as possible should be developed before construction work starts, particularly the procedures and arrangements which are applicable to the generality of the construction stage and early work packages, the Safety and Health Plan must be kept up to date, modified, and altered in the light of changing circumstances and standards achieved on site and as the construction work progresses. If the contracting arrangements are such that design and preparation for many of the work packages is not complete at the start of the construction stage, the parts of the Safety and Health Plan relating to those packages need to be developed. Safety statements and information from contractors starting work during the different work stages of a project will invariably mean that parts of the Safety and Health Plan have to be amended and updated before construction of such work packages commences. Reviews of parts of the Safety and Health Plan may also need to be made if there are design changes or alterations, unforeseen circumstances or if variations to planned circumstances arise. It is vital that such changes are notified to all parties working on site who will be affected.

As an integral part of developing the Safety and Health Plan, the PSCS must check that a hazard identification and risk assessment has been carried out for each of the main stages during construction. To do this properly, information, including method statements and safety statements, will generally be needed from the contractors who will be working at the site. If risks arise because a number of contractors are exposed to a common hazard (e.g. from site transport, shared scaffolding, unguarded openings or lifting operations), the PSCS needs to ensure that the risks are avoided, or if this is not

reasonably practicable, effectively controlled and managed.

The Project Supervisor Construction Stage is also required to co-ordinate the implementation of the relevant requirements of the Construction Regulations 2006 in order that contractors consistently apply the general principles of prevention, paying particular attention to the requirements in Schedule 2 to the Regulations and following the Safety and Health Plan.

In co-ordinating the implementation of safe working procedures, the PSCS must proactively manage the interaction between contractors, personnel, and any other parties who have an impact on the construction process during the construction stage.

There is a clear onus on the PSCS to have practical arrangements in place for checking and monitoring safe working procedures to ensure the safety and health of persons throughout the course of a project. These arrangements should be documented in the Safety and Health Plan and will generally include:

- emergency arrangements and procedures (e.g. fire, including means of escape and first aid provisions);
- arrangements for the provision and use of plant and equipment which will be used by a number of contractors (e.g. cranes, hoists and scaffolding);
- co-ordinating the work of contractors so as to minimise the effect of one activity on another from the point of view of safety and health;
- giving the contractors relevant safety and health information relating to the project.

The PSCS must take reasonable measures to ensure that no unauthorised person enters the work area, and this should be documented in the Safety and Health Plan. Only people who are explicitly authorised, either individually or collectively, by the PSCS or designated person should be allowed on site.

The Project Supervisor Construction Stage must notify the Health and Safety Authority of any site where:

- the construction work is planned to last longer than 30 working days; or
- the volume of construction work is scheduled to exceed 500 person-days.

The notice must be submitted before the commencement of work on the site. The particulars required to be notified are set out in the Approved Form AF2. A copy of the AF2 must be clearly displayed at the site.

6.3.5 Contractors

Contractor duties under the SHWW Construction regulations are to:

- Co-operate with the PSCS;
- Provide a copy of your safety statement and relevant information to the PSCS;
- Promptly provide the PSCS with information required for the safety file;
- Comply with directions of Project Supervisors;

- Report accidents to the Authority and to the PSCS where an employee can not perform their normal work for more than three days;
- Comply with site rules and the safety and health plan and ensure that your employees comply;
- Identify hazards, eliminate the hazards, or reduce risks during construction;
- Facilitate the Site Safety Representative;
- Ensure that relevant workers have a safety awareness card and a construction skills card where required;
- Provide workers with site specific induction;
- Appoint a safety officer where there are more than 20 on site or 30 employed;
- Consult workers and Safety Representatives;
- Monitor compliance and take corrective action.

6.3.6 Activities falling under the Regulations

The Safety, Health and Welfare at Work (Construction) Regulations, 2006 apply to all 'Projects' included or intended to include 'Construction Work' in respect of any 'Structure'. It can reasonably be seen that the Regulations shall apply to the majority of construction projects carried out. Whilst major projects are easily identifiable under the definitions of project, construction and structure, for smaller projects or scopes of work where a client still feels there is ambiguity and uncertainty, they should review the Safety, Health and Welfare at Work (Construction) Regulations 2006 and consult with a competent person. The definitions of the terms 'Construction Work' and 'Structure' are important in the context above and are detailed in the Regulations. In the wind energy sector the regulations are applicable to the design and construction and commissioning phases of projects, ongoing operations and maintenance, and decommissioning of wind farms.

6.3.7 Approved HSA Guidance

Additional information on interpretation and application of the SHWW Construction Regulations can be found in the Health and Safety Authority publication "Guidance on the Procurement, Design and Management sections of the SHWW Construction Regulations 2006" available on the HSA website. (Ref Appendix 1)

6.4 The Construction (Design and Management) (Northern Ireland) Regulations 2007

CDM were introduced in the UK and in Northern Ireland to achieve uniformity, structure and focus in the management of Health and Safety in construction and demolition projects. They provide a framework within which all projects should be managed. The Regulations are supported by the CDM ACOP 144 (Reference Appendix 2) which is approved for use in Northern Ireland. The key aims of CDM are to:

'integrate Health and Safety into the management of the project and to encourage everyone involved to work together to

a) improve the planning and management of projects from the very start;
b) identify hazards early on, so that they can be eliminated or reduced at the design or planning stage, and the remaining risks can be properly managed;
c) target effort where it can do the most good in terms of Health and Safety; and
d) discourage unnecessary bureaucracy'.

The regulations apply to all projects. However, a specific criterion determines whether the project is notifiable to the HSENI. This criterion is: where the project work is expected to last more than 30 days or involve more than 500 person days of work. It is anticipated that the majority of the works relating to wind farm development will be notifiable.

A 'notifiable' project requires the formal assessment and appointment of CDM Coordinator and Principal Contractor.

CDM defines a number of key duty holders within a project:
- Client
- CDM Coordinator
- Designer(s)
- Principal Contractor
- Contractors.

6.4.1 The Client

A Client is an organisation or individual for whom a construction project is carried out. The Client can be considered to be the entity to which the final project will be delivered. The CDM ACOP states:

'The Client has one of the biggest influences over the way a project is delivered. They have substantial influence and contractual control, and their decisions and approach determine:
a) the time, money and other resources available for projects,
b) who makes up the project team, their competence, when they are appointed and who does what,
c) whether the team is encouraged to cooperate and work together effectively,
d) whether the team has the information that it needs about the site and any existing structures, and
e) the arrangements for managing and coordinating the work of the team, because of this they are made accountable…'

Joint Ventures

In the case of a Joint Venture (JV), the role of Client must be agreed by the steering committee, and either:

- that an individual organisation within the JV accepts the role formally with the full written agreement of all of the other parties in the JV

or

- that the steering committee of the JV undertakes the role of Client themselves. CDM place greater emphasis on the 'non-transferable' responsibilities of the Client than the Construction (Design and Management) Regulations (Northern Ireland) 1996 that they replace.

6.4.2 The CDM Coordinator (CDMC)

The CDMC should be appointed before any significant design decisions are made on the project, and consequently this should be as early as practicable in the project timeline.

The CDMC should have sufficient independence from the Client to allow him to act impartially in considering the safety and health throughout the project. This is not to say that the CDMC may not be an employee of the Client but, if he is, then he should be able to demonstrate true impartiality.

The CDMC is appointed by the Client and shall follow a robust assessment of competence. The CDMC should ideally have continuity throughout the project.

A prospective CDMC should be offered the role by the Client in writing and he shall give a written acceptance of this. Included in this written acceptance is the confirmation that the CDMC considers himself competent to undertake the role within the given parameters.

6.4.3 The Designer(s)

The Designer(s) is/are appointed by the Client. In the initial stages of the development life cycle the main or lead designer may be an individual within a development team who is tasked with creating the layout of the project. This individual is key to ensuring that the appropriate DRA is performed on the design as it evolves. During later stages of the development process other designers may be appointed; these designers may be civil, electrical, etc. and are commonly external companies or consultants contracted to the project. It is important that designers understand that they hold this designated role, as defined within CDM. Their appointment and their design works should be coordinated by a lead designer and/or the CDMC as appropriate. The lead designer and CDMC shall assess the competence and resources of all additional design contractors prior to appointing them to the project.
Examples of those who may be designers:

- project developer
- external project development consultant (or company)
- geotechnical consultant
- noise consultant
- wind assessment consultant

- wind turbine manufacturer.

It should be noted that, where a design is prepared or modified outside of Northern Ireland for use in construction work, the regulations will apply to the person who commissions it (if established within Northern Ireland) or, if that person is not so established, any Client for the project should ensure that the duties for designers are complied with.

6.4.4 The Principal Contractor (PC) and Contractors

The CDMC should support the Client to assess the competence and suitability of a Principal Contractor (and other contractors where these are not to be appointed by the PC) as part of the tender evaluation process, using as a guide Appendix 4 of the CDM ACOP L144. The Principal Contractor will commonly be an external construction organisation that has demonstrated its competence in the form of experience, suitably skilled employees, robust management systems and adequate resources to deliver the project.

6.4.5 Role-holder duties (Extracted from CDM ACOP L144)

All construction projects (Part 2 of the Regulations)	Additional duties for notifiable projects (Part 3 of the Regulations)
Clients	
• Check competence and resources of all appointees • Ensure there are suitable management arrangements for the project including welfare facilities • Allow sufficient time and resources for all stages • Provide pre-construction information to designers and contractors	• Appoint CDM Coordinator* • Appoint Principal Contractor* • Ensure that the construction phase does not start unless there are suitable: - welfare facilities, and - construction phase plans in place • Provide information relating to the Health and Safety file to the CDM Coordinator • Retain and provide access to the Health and Safety file(* There must be a CDM Coordinator and Principal Contractor until the end of the construction phase)
CDM Coordinator	

	• Advise and assist the Client with his/her duties • Notify HSE • Coordinate Health and Safety aspects of design work and cooperate with others involved with the project • Facilitate good communication between Clients, designers and contractors • Liaise with Principal Contractor regarding ongoing design. Identify, collect and pass on pre-construction information • Prepare/update the Health and Safety file
Designers	
• Eliminate hazards and reduce risks during design • Provide information about remaining risks	• Check Clients are aware of duties and CDM Coordinator has been appointed • Provide any information needed for the Health and Safety file
All construction projects (Part 2 of the Regulations)	**Additional duties for notifiable projects (Part 3 of the Regulations)**
Principal Contractors	
	• Plan, manage and monitor construction phase in liaison with contractor • Prepare, develop and implement a written plan and site rules • (Initial plan completed before the construction phase begins) • Give contractors relevant parts of the plan • Ensure suitable welfare facilities are provided from the startand maintained throughout the construction phase • Check competence of all appointees • Ensure all workers have site inductions and any further information and training needed for the work • Consult with the workers • Liaise with CDM Coordinator regarding ongoing design • Secure the site

Contractors	
• Plan, manage and monitor own work and that of workers • Check competence of all their appointees and workers • Train own employees • Provide information to their workers • Comply with the specific requirements in Part 4 of the Regulations • Ensure there are adequate welfare facilities for their workers	• Check Client is aware of duties, a CDM Coordinator has been appointed and HSE notified before starting work • Cooperate with Principal Contractor in planning and managing work, including reasonable directions and site rules • Provide details to the Principal Contractor of any contractor whom he engages in connection with carrying out the work • Provide any information needed for the Health and Safety file • Inform Principal Contractor of problems with the plan • Inform Principal Contractor of reportable accidents, diseases and dangerous occurrences
Everyone	
• Check own competence • Cooperate with others and coordinate work so as to ensure the Health and Safety of construction workers and others who may be affected by the work • Report obvious risks • Comply with requirements in Schedule 3 and Part 4 of the Regulations for any work under their control • Take account of and apply the general principles of prevention when carrying out duties	

6.4.6 Activities falling under the Regulations

Regulations are applicable to the design and construction and commissioning phases of projects, ongoing operations and maintenance, and decommissioning of wind farms.

6.4.7 Approved Code of Practice (ACOP)

Additional information on interpretation and application of CDM can be found in HSE ACOP L144. The ACOP is approved by HSENI for use in Northern Ireland.

6.4.8 CDM (Part 4)

Part 4 (regulations 26 to 44 of CDM) encompasses the requirements previously detailed in the Construction (Health, Safety & Welfare) Regulations (Northern Ireland) 1996. Although guidance is not provided in the ACOP L144 for these regulations, the regulations themselves can be found in the ACOP Appendix 1 and these set out clear requirements, with respect to construction work, in the following areas:

- safe places of work
- good order and site security
- stability of structures
- demolition or dismantling
- explosives
- excavations
- cofferdams and caissons
- reports of inspections

7. Site Development and Planning

7.1 Introduction

This section highlights the considerations that should be given to Health and Safety when appraising the feasibility of proceeding with a wind farm project. This phase also deals with the period covering the preparation and application for planning consent and includes information that might be required on Health and Safety for inclusion in any Environmental Statement. It is at this stage that fundamental de sign decisions are likely to be taken.

7.2 Legislative Requirements

7.2.1 A table of the various legislative requirements and guidance on their applicability to each stage of the project is included in Section 6.

It is important that each Client is in a position to discharge its duties under SHWWCR (ROI) or CDM (NI) in the early stages of project development and that those persons taking such decisions understand their obligations as Designers under SHWWCR / CDM.

The Client should appoint the right people; pass on all reasonably obtainable information in its possession to the other duty holders; allow a minimum amount of time before the construction phase commences for the planning and preparation of work; and ensure that suitable management arrangements are in place.

The Client needs to ensure that Contractors provide their workers with the correct welfare facilities and that designers ensure that their designs meet Health and Safety requirements for workplaces during their construction.

The HSA in ROI has produced “Guidelines on the Procurement, Design and Management Requirements of the Safety Health and Welfare at Work (Construction) Regulations 2006” (HSA, 2006) which gives detailed guidance on competence assessment of duty holders under SHWWCR. Further Guidance is provided in “Clients in Construction: Best Practice Guidance” (HSA, 2009)

For Northern Ireland the HSENI has approved the HSE UK Approved Code of Practice L144, Managing Health and Safety in Construction, which gives clear guidance on assessing competence in Appendix 4, for projects in Northern Ireland. The ACOP notes that assessments should focus on the needs of a particular job and should be proportionate to the risks arising from the work. Unnecessary bureaucracy associated with competency assessments obscures the real issues and diverts effort away from them.

7.2.2 Any person procuring or arranging site investigation or other preliminary works, e.g. a met mast, should check whether the work is defined as construction work and ensure that, where appropriate, a CDM coordinator or PSDP is appointed.

7.3 Public safety considerations

This section focuses on the need to ensure that potential risks to non-industry personnel, e.g. members of the public, are addressed throughout the life phases of projects and that residual risks are acceptable when compared with people's expectations of day-to-day risk exposure. IWEA is committed to working with relevant authorities to continue to develop and promote clear guidelines for use by developers and planning authorities to deal with risks to the public. These, together with relevant standards (see 6.3) and industry good practice, should minimise risks. It is important to stress the excellent safety record of modern wind turbines and that the issues listed below relate to events that occur very infrequently.

In ROI the Client is legally required to take account of the safety of all people who may be affected by a construction project. In the Safety, Health and Welfare at Work Act 2005 all employers have a duty of care to non-employees. During the construction phase the responsibility for ensuring the safety of non-employees and the general public will lie with the appointed Contractors performing the actual work and the appointed PSCS for coordinating the works of the Contractors. This should be taken account of from the early stages of the development and control measures "built in" to the design stage and then the Preliminary Safety and Health plan.

7.3.1 The project development process requires identification of hazards and management of risks to public safety. Risk assessments combine consideration of the hazard presented by the specific installation/ location (taking due account of all risk control measures) and the nature and frequency of public exposure. The process must provide assurance that the risks from the proximity and layout of turbines in relation to areas used by the public, are acceptable.

7.3.2 Specific issues on which public safety assurance is appropriate include:

- turbine structural integrity,
- Construction traffic and transport of abnormal loads on public roads
- fire/flame spread,
- ground stability,
- lightning,
- falling objects,
- ice throw/shedding,
- public access,
- site security and signage (for vehicles)
- landowner access / egress arrangements during construction

Further guidance on turbine integrity is detailed in Section 10.5 of this document as well as information in Section 7.4.3 on potential issues for consideration in risk assessment.

Additional information on public safety is contained within HSE document HSG 151 – Protecting the Public, see Appendix 1 – References.

For wind farm schemes in the process of development, it is recommended that the Environmental Assessment accompanying the planning application includes a section on public safety considerations, stating how it is intended to address the above aspects. Where a PSDP/CDMC has been appointed their input on safety considerations should be included.

7.3.3 Specific issues on which public health assurance may be appropriate include:

- Noise, vibration, dust and associated issues
- Contamination of water supplies

Detailed commentary and advice on public health issues are not considered in these guidelines. For further details on the current state of knowledge and guidance please refer to www.iwea.com

7.4 Initial site investigations and exploratory activities

7.4.1 Some activities undertaken during this phase can, in themselves, pose a significant Health and Safety r risk and as such require the same degree of attention as construction and later-phase activities. Typical site development activities may include:

- met mast installation and wind data monitoring
- onshore surveys including boreholes, peat probing/excavations,
- exhibitions/roadshows,
- surveys requiring use of aircraft
- the risk of ground movement e.g. previous peat slides.
- surveys for underground services

Where these activities constitute construction work a client is required to appoint competent contractors and project supervisors (Refer to section 6 for additional detail)

7.4.2 Significant site-specific hazards should be identified so that

- appropriate risk assessments can be carried out;
- designers can take account of these hazards in their designs.
- they are included in PH&SP / PCI documents
- workers can be made aware of the risks;
- control measures can be put in place; and

- training, including toolbox talks, can be provided.

7.4.3 Method statements should be prepared for all activities in sufficient detail to ensure that a safe system of work can be established and high-risk activities are identified, controlled and monitored. In undertaking risk assessments and preparing method statements, due regard should be given to the applicability of sections 9.9–9.23 of these Guidelines.

7.5 Design Considerations

7.5.1 When selecting the position of wind turbines, the following should be considered:

- the boundaries of land ownership and rights of way;
- the location of existing site services, e.g. overhead or underground electrical and telecommunication cables;
- the identification of buried services, e.g. gas, oil or other hazardous substance transmission pipelines;
- public safety, e.g. risks from mechanical failure, ice etc.;
- the proximity of other turbines, meteorological masts and buildings;
- the effects of fatigue loading;
- vehicular access, e.g. one-way systems to allow safe access and egress, and to reduce the need to reverse vehicles in the site layout;
- access for technicians to the proposed wind turbine site;
- the inclusion of pedestrian gates adjacent to cattle grid crossings;
- previous and future mining activity;
- contaminated ground;
- aircraft activity including balloonists (see 7.5.7 below);
- drop zones for parachutists;
- other factors related to consents;
- explosive and other dumping grounds;
- military activity zones;
- coastal erosion;
- effects of impact on existing radar and communication systems;
- interests of other state and environmental agencies, and attention to guidance issued by such organisations e.g. emergency services
- geotechnical anomalies and geohazards – peat, shallow gas pockets , turbidity

For projects in Northern Ireland IWEA advises designers to engage with the UKOPA to identify any hazardous pipelines on or close to existing wind farms and discuss any necessary precautionary measures. It is also advised that members note the UKOPA guidance (1.5 times tower-height from any hazardous pipeline) when designing layouts for new sites and engage with the UKOPA member where a potential breach of guidance is identified.

Designers are also advised to refer to advice and guidelines issued by National Grid, which may specify a figure of 5 times tower-height from applicable transmission lines.

It is important that consideration is given to the potential hazards that apply during each of the different life phases of the scheme, as some hazards may only apply to specific life phases. For example, coastal erosion is most likely to be an issue only during the operational phase, whereas soft ground pockets are most likely to be an issue during the construction and installation phase but could affect the operational phase as well.

7.5.2 The following site-specific weather conditions should be considered. Available regional data can be used depending on the type and stage of assessment being carried out.

- mean and maximum wind speeds in relation to the survival wind speed of the turbine;
- turbulence levels arising from complex terrain (hilly) sites or nearby structures/buildings;
- temperature and the likely incidence of icing;
- susceptibility to lightning strike;
- susceptibility to fog;
- excessive precipitation, e.g. causing difficult site access or flooding;
- any requirements for continued collection of meteorological data;
- level of snow falls

7.5.3 Site-specific information on ground conditions may be required to assess:

- contamination from previous land use;
- strength requirements of foundations;
- stability of excavations, e.g. the possibility of peat slides;
- details of potential gradient and pH of soil;
- requirements for access roads, hard standings and support pads for crane outriggers;
- site drainage, e.g. proneness to flooding, water retention on roads;
- hazards from previous use, e.g. mining, disposal of waste, military range;
- requirements to maintain present use, e.g. arable, grazing land;

7.5.4 Requirements for the site electrical system and electrical connection to the grid will include:

- consultation with Distribution Network Operators (DNOs)/National Grid (NI) or ESB/Eirgrid (ROI)
- reference to British and European standards on equipment supply;
- capability to isolate, earth and lock off installed equipment as appropriate;
- establishment of short-circuit levels;
- voltage regulation;
- suitable protection systems, e.g. fault clearance times, discrimination;
- suitable location for substation;
- security of electrical substation.
- marking and recording of cable routes.

7.5.5 Satisfactory arrangements will be needed for site access, including:

- checking vehicle weights, sizes and ground clearances
- liaison with local authorities and police, and notification of local inhabitants;
- liaising with the local emergency services to ensure all parties are aware of each other's emergency response capabilities and requirements;
- maintenance of public access requirements, e.g. parking, passing places, public highways;
- establishing sustainable site ground pressures, e.g. requirements for specialist vehicles;
- ensuring vehicle stability on steep slopes and in possible collapse of old mine workings or other excavations;
- establishing requirements for temporary signs and notices;
- maintaining public rights of way, e.g. footpaths and bridleways;
- preventing interference between vehicles and underground/overhead services;
- preventing nuisance noise to local population, generated by large vehicle movements;
- taking account of the range of poor weather conditions;
- providing adequate means for traffic control, passing places and parking;
- segregation of vehicles and pedestrians;
- vehicle speed limitations;

7.5.6 Take account of local habitation in respect of:

- excessive vehicle movements and routes;
- nuisance during construction, e.g. noise and dust levels;
- noise emission levels from the wind turbines;
- visual impact; and
- presence of children.

7.5.7 Ensure that the site is not affected by regular aviation by:

- taking account of local civil/military airfields and notifying the appropriate bodies (Irish Aviation Authority in ROI and Civil Aviation authority in NI (TBC)
- checking that it is not subject to low-flying aircraft; and
- identifying and managing local pursuits, such as ballooning, parachuting, microlight aircraft or model aircraft flying.

7.5.8 Consult with landowners regarding:

- existing and likely future land usage;
- crops and livestock;
- recreational shooting and stalking;
- location and marking of buried services; and
- their responsibilities.

7.5.9 Make provision for members of the public by:

- establishing a procedure to control visitors, taking account of any rights to roam;
- establishing whether the land has any commoners', crofters' and other similar rights;
- taking security measures against unauthorised access and vandalism; and

The above list, although very comprehensive, may not cover every project-specific risk. For example other site/project-specific issues could include security risks (criminal/terrorism) and nature/wildlife conservation issues.

8. Design, Specification, Manufacture and Assembly

8.1 Introduction

8.1.1 This section highlights the considerations that should be given to Health and Safety in the design phase of a wind farm. For the purposes of this Guidance the term 'design' also includes the specification, manufacture, assembly and procurement of components, which, when put together during the construction phase, constitute an operational wind farm.

8.1.2 It is the responsibility of wind farm designers to ensure that the wind turbines and associated equipment are designed to avoid or, where this is not entirely possible, to minimise risks to Health and Safety whilst they are being assembled, constructed, installed, commissioned, operated, maintained and decommissioned. IWEA recognises that it is best practice continually to strive for safer designs, minimising the risk to personnel and the public alike.

8.1.3 It is strongly recommended that operations personnel be involved as early as possible during the design, construction and commissioning phases, so that they may add valuable practical knowledge and experience to enhance the overall design.

8.1.4 During design, the ultimate decommissioning and dismantling of the wind farm should be addressed. Relevant information needs to be incorporated into the Health and Safety file required under the SHWW Construction Regulations (ROI) and CDM (NI).

8.2 Legislative requirements

8.2.1 A table of the various legislative requirements and their applicability to each stage of the project is included in Section 6.

8.2.2 The design will be developed during this phase. Both the SHWW Construction Regulations and CDM place important duties on designers. The regulations and associated Guidance should be studied to understand the detailed obligations imposed on those involved in the design phase of a scheme particularly the requirement to design in accordance with the General Principles of Prevention

8.2.3 The Client-appointed PSDP or CDMC will be active during the design phase, to ensure that designers are taking appropriate actions, and to collect information to prepare (or ensure that some person prepares) the relevant Health and Safety plans and information for issue to the intended construction duty holders. The PSDP /CDMC has responsibility to co-ordinate the work of designers and evaluate whether there are any safety risks involved in the construction and the materials that will be used. The PSDP / CDMC may require designers to provide information in writing on the elimination or reduction of risk through safe design and attend design review meetings at various stages of the design process

8.3 Site data

8.3.1 Information that will almost certainly be required by the designer includes:

- detailed analysis of wind conditions, e.g. survival wind speeds, turbulence levels;
- other relevant weather/climatic information, e.g. incidence of freezing conditions;
- risk of lightning;
- soil conditions, e.g. resistivity, pH;
- ground conditions, e.g. mine workings / previous ground movement;

8.3.2 Continuing needs for information about site conditions may require:

- installation of meteorological instruments and

Where on-site data collection activities are involved, the applicability of guidance detailed in Section 7.4 above should be reviewed.

8.4 Wind turbine/associated hardware design

8.4.1 Consultation with Distribution Network Operators (DNOs) will be required in respect of:

- the distribution code;
- any technical or engineering recommendations issued by the DNO;
- the DNO's safety rules;
- substation layout and design;
- short-circuit fault levels;
- electrical protection, e.g. fault clearance times, discrimination; and
- voltage/frequency regulation.

Note: larger capacity wind farms may require liaison with the Transmission System Operator (TSO) and attention to the equivalent documentation, e.g. the Grid Code.

8.4.2 Reference to British and European standards (see Section 6.3) will be required to:

- ensure compliance with current best practice and
- make a comparative assessment of other standards for suitability of use in ROI / NI.

8.4.3 Specific design considerations will be required in respect of:

- manufacturer's turbine certification;
- compliance with the requirements of the machinery
- manufacturer's operations manual and maintenance instructions;
- results of factory acceptance testing;

- provision of assembly instructions, drawings and design information for the construction phase;
- assembly criteria and workmanship standards to be achieved;
- inspection, test and commissioning criteria and documentation;
- interfaces between turbine mechanical, LV and HV activities;
- safe isolation of mechanical and electrical equipment for maintenance, e.g. locking-off devices, clamping of rotating parts;
- fail-to-safe modes, e.g. to ensure all critical component failures fail to a safe condition and prevent additional runaway failure events;
- earthing and protection;
- safe remote control/operation, e.g. preventing remote control when a machine is being maintained;
- in-service condition monitoring systems, devices and components;
- insulation of electrical equipment and cables;
- guarding of dangerous parts of machinery;
- turbine overspeed control;
- controls, e.g. for starting or changing operating conditions, stopping, emergency stop;
- provision of clear and unambiguous markings and warnings;
- provision of safe working access, e.g. striving to minimise the risks associated with vertical ladders by way of safety harness anchor points, providing rest platforms, powered personnel hoists, lighting, i ncluding emergency lighting;
- the selection of work equipment for work at height must:
  - be suitable and sufficient, and be of adequate strength for its intended use;
  - be appropriate to the nature of the work to be performed and the foreseeable loadings on it;
  - allow passage without risk for the duration and frequency of use;
  - offer collective protection over personal protection;
- provision of safe work areas;
- preventing unauthorised access and control of the equipment, e.g. security and passwords, only allowing control by personnel in the nacelle during maintenance;
- practicality of access by helicopter;
- the need for fire detection/protection;
- provision of a safe means of escape;
- provision of accommodation and emergency rations;
- occurrences of incidents and near events as collated on the IWEA Health and Safety Best Practice area of the IWEA website including all safety alerts issued;
- Raising the alarm and communication in the case of emergencies
- emergency response arrangements for the evacuation and removal of injured personnel from the turbine and treatment of injured personnel in remote locations;
- PPE requirements for safe construction, operation and maintenance;;

In putting into effect these design issues, direct reference should be made to the relevant regulations, codes of practice, standards and guidance that may apply.

8.4.4 The design should take account of Health and Safety during:

- pre-erection fabrication work by third parties e.g. assembly of turbine foundation parts by civil contractors
- erection and construction, e.g. sequence of erection, stability of partially built structures or site environmental conditions likely to be experienced;
- commissioning;
- normal operation, maintenance, cleaning and repair;
- dismantling, demolition and removal;
- abnormal/ unplanned scenarios; and
- foreseeable emergency situations.

8.4.7 Provision will be required against unauthorised damage/interference/ operation by:

- either humans or animals;
- third parties when carrying out maintenance on site;
- specifying adequate safety clearance from exposed electrical conductors;
- provision of devices such as anti-climbing guards;

8.4.8 The design should include the provision of information and instructions to:

- cover all aspects of normal operation and maintenance;
- cover any actions in the case of foreseeable abnormal situations; and
- take account of residual risks in any relevant design risk assessments.

This would include, for example, the measures to be taken to ensure compliance with the Work at Height Regulations, through consideration of the appropriate means of access and egress from the turbine nacelle.

9. Construction, Commissioning and Demolition

9.1 Introduction

As part of the IWEA safety strategy a construction safety sub-group has been established with the aim of helping to develop best practice in the area of wind farm construction in Ireland.

The installation and commissioning phases of the project will represent one of the highest risk phases with respect to Health and Safety considerations. As discussed in Section 8, much can and should be done in the design phase to remove or reduce construction phase risks, and Section 9 now addresses key steps to further mitigate risks during this phase of the project.

The term 'construction' includes commissioning, dismantling and demolition, and the term 'Contractor' includes all persons/organisations undertaking such work.

9.2 Legislative requirements

9.2.1 A table of the various legislative requirements and their applicability to each stage of the project is included in Section 6. A list of further guidance on the application of the legislation in ROI and NI is given in Appendix 1.

9.2.2 During the construction phase of a project, the works will be under the control of the PSCS or Principal Contractor appointed by the Client under SHWWCR or CDMNI respectively. All persons and organisations working on the project site (including persons working for the Client) come under the control of the PSCS/Principal Contractor and must comply with the site rules. Only one PSCS/ Principal Contractor may be appointed for a single site at any time.

However, it may be appropriate, where different work packages are being carried out in parallel, for these to be defined as separate projects, each with its own PSCS/Principal Contractor, provided each has a separate delineated site and access to it. The interfaces between each project would need to be explained in the Preliminary Safety and Health Plan (ROI) or Pre-Construction Health and Safety Information (NI). In this situation, the Health and Safety plan prepared by the PSCS/ Principal Contractor must recognise the interfaces involved and contain measures to manage those interfaces. Duties of the PSCS/ Principal Contractor and other contractors on site are listed in Section 6.

9.3 Notification

9.3.1 The SHWW Construction Regulations requires the HSA to be notified of any project that will last more than 30 days (of construction) or involve more than 500 man days. The Client is responsible for notifying the HSA of the construction project by means of completion of Form AF1 as soon as the design process begins.

If construction work on a project is planned to last longer than 30 working days or exceed 500 person-days, the Client must promptly notify the Health and Safety Authority of the project, the details of the Project Supervisor Design Process, and the Project Supervisor Construction Stage where this is known, as set out in Approved Form AF.1This Notification should be made at the earliest possible point after the making of the appointment of the PSDP. The notice should be sent by registered post to the Authority or as may be directed by the Authority. The Project Supervisor Construction Stage is also required to notify the Authority of a construction project before construction commences on site (AF2 Form)

Prior to erection or use of tall structures and equipment, whether temporary or permanent, e.g. cranes, turbine towers or tall met masts, the following authorities and organisations should be informed:

- Irish Aviation Authority
- local airfields; and
- parachutist, paraglider, microlight and ballooning organisations.

Request confirmation from all parties informed, to ensure all information provided has been made available to all potential air users

9.3.2 CDMNI requires the HSENI to be notified of any project that will last more than 30 days (of construction) or involve more than 500 man days. The CDMC is responsible for notifying HSENI of the construction project (usually by means of completion of Form F10) shortly after their appointment. If information is missing from the form (e.g. this is before the Principal Contractor is appointed) then an additional notification may be sent in.

Prior to erection or use of tall structures and equipment, whether temporary or permanent, e.g. cranes, turbine towers or tall met masts, the following authorities and organisations should be informed:

- MOD, CAA, NATS (the minimum information required is OS/GPS location and tip-height above existing ground level);
- local airfields; and
- parachutist, paraglider, microlight and ballooning organisations.

Request confirmation from all parties informed, to ensure all information provided has been made available to all potential air users.

9.4 Document control and record keeping

Requirements for compiling and retaining Health and Safety records are defined in the specific legislation contained within Section 6. It is recommended from the outset that a document control and record keeping procedure is established, and arrangements made for the storage, retrieval and maintenance of the records for their required retention period.

Typical project documentation will include:

- Health & Safety management system procedures and documentation;
- pre-construction information;
- preliminary and construction stage plans;
- drawings and specifications;
- Electrical systems status records
- minutes of project meetings;
- project reports;
- method statements;
- risk assessments;
- Work permits and associated documentation.
- safety incident records including Near Misses, Good Catches, Dangerous Occurrences and Injuries
- chemical agent risk assessments (ROI) or COSHH assessments (NI) and health surveillance records;
- test and commissioning reports;
- training records and certification;
- equipment certification;
- daily personnel attendance records; and
- post-construction surveys.

In addition to the above both the SHWW Construction Regulations and CDMNI requires the Client to ensure that a Safety File is created and maintained for the lifetime of the structure. This file is required to contain all relevant information relating to the structure.

9.5 Planning, communication and coordination

Maintaining high standards of planning, communication and coordination of project Health and Safety goals, rules and requirements throughout the construction phase can go a long way in preventing accidents.

9.5.1 Planning

9.5.1.1 In ROI the PSCS must develop a suitable Safety and Health Plan for the project, prior to the commencement of construction work. The plan provides the blueprint for managing and co-ordinating safety and health during construction. The plan needs to explain how the key safety and health issues will be managed. It must be relevant to the particular project and should be built on the Safety and Health Plan prepared on a preliminary basis by the PSDP.

The PSCS should develop this Safety and Health Plan so that it:
- incorporates the approach to be adopted for managing safety and health during the construction stage;
- takes account of the relevant sections of the Safety Statements prepared by the different contractors under Safety, Health and Welfare at Work Act 2005. (The PSCS should check the safety statements

prepared by the contractors to ensure that they relate to the site in question and the work activities to be carried out);
- includes the specific control measures for dealing with Particular Risks;
- takes account of other work activities taking place on the site (e.g. where the construction work overlaps with non-construction activities);
- incorporates the common arrangements (including emergency procedures and welfare as well as details regarding control, co-ordination, and management of shared equipment, such as scaffolding and lifting appliances);
- document the arrangements for ensuring effective co-operation and co-ordination;
- includes arrangements for monitoring compliance with the Safety and Health Plan and with safe working procedures;
- includes arrangements for checking that persons on site have received appropriate safety and health information and training, e.g. Safe Pass and CSCS, and that consultation arrangements are in place;
- includes arrangements for ensuring effective communications between all parties, and the arrangements for appointing a site safety representative (this may include matters such as frequency of project or site meetings and how safety and health is to be dealt with at these meetings, frequency of site safety representative inspections, etc);
- includes information and arrangements for the welfare of workers (effective washing, welfare and changing facilities are a vital part of health precautions, for example, against cement contact dermatitis and contamination by other hazardous substances);
- is modified as necessary as work progresses and as changes occur.

As much of the Safety and Health Plan as possible should be developed before construction work starts, particularly the procedures and arrangements which are applicable to the generality of the construction stage and early work packages, the Safety and Health Plan must be kept up to date, modified, and altered in the light of changing circumstances and standards achieved on site and as the construction work progresses. If the contracting arrangements are such that design and preparation for many of the work packages is not complete at the start of the construction stage, the parts of the Safety and Health Plan relating to those packages need to be developed. Safety statements and information from contractors starting work during the different work stages of a project will invariably mean that parts of the Safety and Health Plan have to be amended and updated before construction of such work packages commences.

Reviews of parts of the Safety and Health Plan may also need to be made if there are design changes or alterations, unforeseen circumstances or if variations to planned circumstances arise. It is vital that such changes are notified to all parties working on site who will be affected.

As an integral part of developing the Safety and Health Plan, the PSCS must check that a hazard identification and risk assessment has been carried out for each of the main stages during construction. To do this properly, information, including method statements and safety statements, will generally be needed from the contractors who will be working at the site. If risks arise because a number of contractors are exposed to a common hazard (e.g. from site transport, shared scaffolding, unguarded openings or lifting operations), the PSCS needs to ensure that the risks are avoided, or if this is not

reasonably practicable, effectively controlled and managed.

9.4.1.2 In NI a Construction Phase Plan is required to be completed by the Principal Contractor under CDM. In addition to this plan, the Principal Contractor is required to define a timetable for project completion. Sufficient time must be built into the project timetable to allow for Health and Safety to be effectively managed. Consideration should be given to:

- project organisational structure and clearly defined Health and Safety roles and responsibilities of all appointees under CDM, responsible persons and site personnel;
- setting of clear objectives and goals for Health and Safety throughout the project;
- setting of clear Health and Safety site rules and performance requirements;
- defining systems, procedures and documentation to be used to manage Health and Safety;
- interfaces between contractors and overlapping work;
- the construction methods to be used, including the preparation of method statements, risk assessments and safe systems of work;
- the order of construction activities/events required to complete the work safely;
- the equipment, facilities and personnel to be utilised throughout the construction phase;
- safety precautions to be implemented;
- allocation of appropriate resources to ensure all necessary information, instruction and training is provided;
- allowing sufficient time for employee consultation;
- working times and limitations on personnel, shift rotation and handover;
- project programming to define timescales of work completion and project milestones; and
- review of planning and plan arrangements, frequency, responsibility and actions.

9.5.2 Communication and coordination

Both the SHWW Construction Regulations and CDMNI require employers who share a workplace to cooperate and coordinate their activities in the interest of Health and Safety. Arrangements for maintaining communication and coordination throughout the construction phase should consider:

- the frequency and methods of communication between the duty holders
- site personnel;
- third parties and other site users;
- the public;
- arrangements for shared workplaces;
- arrangements for emergency response;
- provision of information, instruction and training;
- equipment to be used to post or deliver communication information; and
- audit and review to measure performance and make sure ‘the message is getting through’, and everyone at all levels understands their role within the project.

9.5.3 Communication on site

Maintaining good communication on site is crucial to help maintain Health and Safety standards, and to respond effectively to requests for support and emergency assistance. Arrangements should ensure:

- contact can be maintained with key personnel, e.g. by mobile phones or radios, at all times;
- procedures are established for persons working alone or in small groups (lone access to towers and remote places should be avoided);
- rules and procedures are understood and followed,
- site risks are communicated and control measures are understood
- all workers understand instructions and information whatever their native language;

Methods of communications on site may include:

- Site inductions
- Safety workshops
- Safety briefings
- Toolbox talks
- Safe system of work plans (SSWP)
- Coaching audits
- Safety notice boards.
- Safety signs

9.6 Competence

9.6.1 SHWW Construction Regulations 2006 (ROI)

When making the appointments of Project Supervisors, it is essential that the Client is as satisfied as he or she can reasonably be that those appointed are competent to carry out the duties set out for them in these Regulations.

The Client is obliged to make reasonable enquires regarding the competence of those proposed to be appointed. Assessment of the responses to any enquiries made needs to be guided by common sense and, where appropriate, professional advice. The professional bodies in the construction industry may be in a position to offer advice as regards the essential qualifications and training required.

In large scale projects, or where panels of contractors are used, a prequalification procedure might be an integral part of the enquiry into competence of certain potential appointees.

When assessing competence, the following general guidelines should be considered:

- Only those competencies and resources that relate to the duties of the person being assessed need to be considered;

- The matter to be considered is the capacity of the person being assessed to comply with the duties that they would carry under the Regulations;
- The assessment should relate to the project under consideration but may also focus on previous projects executed and experience gained elsewhere;
- The assessment should be proportionate and should concentrate on the main issues, rather than being generic;
- It follows that a relatively minimal assessment should suffice for what will clearly be a relatively low-risk project;
- An extensive assessment should not be necessary when dealing with a person whom you have recently subjected to the process on a similar project;
- Past performance on safety and health, including accidents reported to the Health and Safety Authority, enforcement record, and previous remedial actions should inform the assessment;
- A good guide should be a proven track record of competence within the duty-holder's field.

Clients also have a duty to ensure that those appointed as PSDP, designers, PSCS, or contractors have adequate resources to carry out their functions under the Regulations. Resources as they relate to the PSDP (and designers) include staff with the requisite expertise and competence to assist in the execution of the role of PSDP (or designer) for a project or part of a project. The regulations require that assurance is sought by the Client that the PSDP or Designer will deploy resources to the project at a suitable time and in an appropriate manner to allow the role of PSDP/Designer be executed in accordance with the Regulations. Resources may also include infrastructure within or available to a company, such as information technology, communication systems, in-house safety management systems, and other items of infrastructure which facilitate the execution of the role of PSDP/Designer in accordance with the Regulations.

The assessment of resources is an important aspect of the Regulations. To reasonably assure himself or herself of the resources that will be deployed to a project by the successful appointees, the client is expected to make reasonable enquiries in relation to potential appointees. These reasonable enquiries might take the form of enquiries to the potential appointees themselves and/or of others who are familiar with the competence and capabilities of the proposed appointee or members of the proposed appointee's team.

Further detail on competence assessment of project supervisors, designers and contractors is available in two HSA publications "Best Practice Guide for Clients in Construction" (HSA, 2009) and "A Guide to the design and management sections of the Safety, Health and Welfare at Work Construction Regulations 2006" (HSA, 2006)

9.6.2 CDM (Northern Ireland)

A key stage in the successful delivery of any project is ensuring that only competent organisations and individuals are appointed. The HSE states that for an organisation or individual to be deemed competent they must possess sufficient knowledge of the specific tasks to be undertaken and the risks that the work will entail; have sufficient experience and ability to carry out their duties in relation to the project;

and be able to recognise their limitations and take appropriate action in order to prevent harm to those carrying out construction work, or those affected by the work. (Source: HSE CDM ACOP)

In addition, ACOP L144 also states that 'no-one should undertake any work which they themselves are not competent to perform'.

The Association of Project Safety (APS) holds registers of both corporate and individual members who have demonstrated levels of competence in their particular construction discipline. It is recommended that those organisations and personnel appointed under CDM are, as a minimum, registered with APS.

It is recommended that a two-stage assessment is performed. An example for a technical or managerial level role would involve:

- Stage 1 would include task knowledge appropriate for the tasks to be undertaken. This would include knowledge and experience of the design and construction process. Typically, individuals would be professionally qualified to a chartered level (e.g. CIBSE; ICE; IEE; IMechE; IStructE; RIBA; CIAT; CIOB, etc.). In addition, evidence of Health and Safety knowledge would be expected. This could include relevant CPD qualifications (e.g. IOSH Managing Safely, NEBOSH National General Certificate in Construction Occupational Safety and Health) and registers (e.g. ICE), and membership (e.g. IOSH, APS).

- Stage 2 would be to gather evidence to determine if the individual has the experience and ability to perform the task. This would specifically include evidence that they have experience of projects with comparable hazards and complexity. This will be particularly important for wind farm projects. It should be noted that a similar approach is recommended when assessing the competence of organisations.

9.7 Risk assessments and method statements

9.7.1 Risk assessments have been covered in Section 5.7 above. However, the risk assessment process should remain 'live' throughout the construction phase, so that appropriate reviews, modifications and updates may be made to reflect actual events during the work. Changes in work methods and practices, and subsequent risk assessment should be controlled in accordance with Section 5.8 – Management of Change.

9.7.2 Method statements should be prepared for all activities in sufficient detail to:

- provide a clear understanding of the work to be performed;
- provide an understanding of the appropriate control measures and precautions to be used;
- provide an understanding of residual risks that cannot be otherwise controlled;
- provide an understanding of roles and responsibilities related to the work to be undertaken;
- allow the Principal Contractor to develop the Health and Safety plan; and
- allow high-risk activities to be properly monitored and controlled.

9.8 Safe systems of work

Apply a safe system of work such as the Wind Turbine Safety Rules when the turbines become energised. See Section 10.9 below for further information.

9.8.1 Permit-to-work systems should be considered for:

- activities in which it is not practical to remove significant hazards;
- high-risk activities, e.g. excavations, hot work (the application of heat, including welding, burning or grinding on plant containing flammable materials) and entry into confined spaces;
- managing the connection of newly constructed plant and equipment to an electrical and
- working on installed equipment that has been put into service, i.e. post-energisation.

Further information may be found in HSE Guidance document HSG 250 – Guidance on permit-to-work systems (see Appendix 1).

9.8.2 Procedures should be established:

- for access and egress to the site
- for the control and management of traffic on the site particularly during high volume periods
- for high-risk activities, e.g. working at height, working over water and heavy lifting;
- for equipment to be 'handed over' or 'energised';
- to keep all contractors, and their employees, informed of equipment status;
- to ensure that the work of one contractor does not adversely affect others;
- for connection of equipment to 'live' services;
- to control access to equipment that is automatically or remotely controlled;
- to assess the requirements for first aid training and the provision of equipment;
- for lone and remote workers;
- to ensure adequate response to emergency situations

9.9 First Aid

IN ROI under the SHWW General Application Regulations 2007 employers have a duty to provide first-aid equipment at all places of work where working conditions require it. Depending on the size or specific hazards (or both) of the place of work, trained occupational first-aiders must also be provided. Further guidance on first aid rooms and recommended first number of first aiders is provided in HSA Guidance (Ref Appendix 1)

IN NI the Health and Safety (First-Aid) Regulations (Northern Ireland) 1982 apply. They require that suitable risk assessments should be conducted to ensure that adequate and appropriate equipment, facilities and personnel are provided to ensure employees receive immediate attention if they are injured or taken ill at work. Further Guidance is provided in an approved NI code of practice (Ref Appendix 1)

Specific examples that may require further attention for wind related projects include consideration of:

- Adequate eye wash, defibrillators, emergency showers, stretchers and other specific items of equipment relevant to the project
- Suitable measures to ensure first aid provisions are properly maintained;
- The provision of Automated External Defibrillators (AEDs) at appropriate locations and suitable trained operators
- Additional training with respect to electric shock/burns, hypothermia, suspension syncope. (Note: Only following advice from a suitable competent person)
- The need to communicate to everyone on site what first aid provisions there are and where to find/ summon them including the equipment and first-aiders
- Recording of first aid treatment in accordance with the statutory and company specific requirements

Note: Principles and practice apply to operations and maintenance activities as well.

9.10 Emergency arrangements (Onshore Windfarms Only)

9.10.1 A site Emergency Response Plan (Project ERP) must be in place during the construction phase, with appropriate additions or adjustments for specific or 'one-off' operations. Where contractors are involved, the plan must detail 'bridging' arrangements between the Emergency Response Plans of individual contractors.

When developing the ERP, consideration should be given to the remoteness of the site location and response times of emergency services, and appropriate arrangements provided, i.e. equipment and trained personnel (e.g. first aid / rescue training), to ensure self sufficiency and preservation of life until emergency services are in attendance.

Emergency Response Plans must include (as a minimum):

- the roles and responsibilities of all key personnel appointed to effectively manage the organisation's emergency response arrangements, including those in overall control and those appointed to control each site;
- contact details for organisation's legal advisers to be used in the event of serious incidents;
- emergency contact details for all internal and external parties involved in the works;
- third-party emergency service contact details;
- the location of all site access points and site plans;
- details of potential hazards and emergency situations that the emergency services may encounter;
- details and locations of significant hazards, e.g. high-voltage equipment;
- details and locations of nearby installations that may provide assistance in an emergency;
- emergency communications procedures;
- emergency response procedures for initial actions in emergencies that could be anticipated, including:

- evacuation of nacelle and WTG,
- emergency shutdown of energised equipment,
- failed lifting operations,
- fire,
- sickness,
- injury,
- pollution,
- bomb threat / sabotage,
- extreme weather,
- peat ground movement
- engulfment / drowning

- procedures for personnel tracking;
- procedures for the notification of next of kin;
- public relations procedures for dealing with the press;
- statutory reporting requirements;
- training and drills requirements;
- procedures for liaising with the emergency services and regulatory authorities; and
- procedures for calling-off assistance to represent employees during interviews with regulatory authorities (note: work colleagues may be prevented from assisting as nominated persons)

It is recommended that exercises are regularly undertaken to validate the ERP and to ensure that operations staff are familiar with it. It is particularly important to engage local emergency services, including medical facilities, in understanding the potential needs of the project and the environmental conditions under which they may be asked to assist.

9.10.2 The following procedures should be established in line with the ERP, based on suitable and sufficient risk assessments and following consultation with local emergency services:

- all foreseeable emergency situations relevant to onshore sites, including evacuation and escape;
- safe transportation and storage of hazardous materials, e.g. flammable substances;
- hazardous activities, such as hot work (the application of heat, including welding, burning or grinding on plant containing flammable materials), potentially including cable jointing/terminating;
- abnormal weather conditions, e.g. extreme cold, floods and lightning; and

9.10.3 Based on a suitable and sufficient fire risk assessment, working areas should be provided with:

- means of raising the alarm;
- clear and accessible evacuation instructions;
- suitable means of escape, including signage, emergency lighting and designated assembly areas;
- portable fire-fighting equipment;
- means of disposing of scrap and waste materials safely;
- fixed fire detection and extinguishing systems, where appropriate;
- additional precautions/devices as recommended by the fire risk assessment (e.g. places of safety, r

refuges etc.)

9. 10.4 Ensure that persons working on site:

- are familiar with all relevant emergency arrangements;
- are trained, well versed and practised with the arrangements, and know what to do; and
- know who will take charge in emergency situations.

9.11 Information, consultation, training and supervision

9.11.1 Ensure that:

- persons appointed to work on site possess the necessary level of skills and competence;
- statutory notices and posters are clearly displayed;
- Safety awareness training as required by legislation has been provided to relevant persons (safe pass ROI) a site safety representative chosen by the workers where possible has been appointed where required by legislation (SHAWCR ROI)
- employees are able freely and openly to express their views about Health and Safety;
- employees are provided with information about Health and Safety, e.g. toolbox talks;
- site induction training is provided, registered and enforced, so that no person may access the works without having been inducted;
- information is displayed on site-specific hazards, e.g. warning notices;
- sufficient supervision of appropriate experience is provided;
- training takes account of potential language barriers of workers; and
- any additional training to be confirmed via risk assessment and training-needs analysis.

9.11.2 Before and during work on site it is necessary to:

- establish the level of competence of persons as they arrive on site;
- make an assessment of any necessary further specialist training or refresher training to be provided;
- ensure details of all training are recorded;
- provide Health and Safety information regarding the site to all contractors;
- provide training on working at height techniques;

9.12 Weather conditions

An adverse-weather policy should be established to cover:

- effects of high winds, e.g. specify permissible wind speeds governing lifting operations;
- effects on workers of inclement weather, e.g. when working at height, on steep slopes and in bad ground conditions;

- risk of being snowed in or cut off, e.g. due to flooding;
- lack of visibility, e.g. fog and low cloud;
- work on, or in close proximity to, metal structures when there is a risk of lightning strike;
- dry weather increasing the risk of heath/moorland fires;
- hot sunny weather increasing risk of sunstroke, sunburn and dehydration;
- cold weather increasing the risk of frostbite/hypothermia;
- additional weather-related PPE;

9.13 Temporary facilities

9.13.1 Provision should be made for:

- location of temporary structures, e.g. on firm ground, secured/anchored against high winds;
- safe access to working areas, which might include pedestrian and site transport;
- first aid facilities and trained first-aiders;
- communication links on and off site, e.g. temporary landlines, mobile phones and radios;
- safe unloading, storage and laydown of materials;
- preventing unauthorised access to quarrying activity or borrow pits;
- washout areas for concrete delivery vehicles
- adequate and safe installation of temporary services, e.g. electricity, LPG supplies and fuel supplies;
- recording of the location of temporary services e.g gas lines, electricity cables etc.
- adequate maintenance and servicing of any gas appliances (and associated flue systems) that are provided for the use of workers, e.g. water heaters, cookers or heaters; and

9.13.2 Temporary facilities should be:

- kept clean and regularly maintained;
- securely fenced and contained against vandalism or leaks to the environment, e.g. fuel oil; and
- waste should be regularly removed from the site.

9.13.3 Welfare arrangements for workers should include:

- protection against extremes of climate;
- toilets and washing facilities, including hot water;
- mess and first aid facilities;
- storage for personal protective equipment;
- changing/drying rooms;
- adequate heating / ventilation of facilities for office work

9.14 Site access

9.14.1 Liaison with public highway authorities will be required to plan delivery of materials, plant and equipment to ensure safe passage and ensure that associated risks are managed, as far as other road users are concerned. This often involves the development and agreement of transport plans.

Temporary access roads should be established which:

- allow safe transition of vehicles from the public highway, which avoids the need for reversing;
- are subject to a speed limit;
- should be marked with warning signs and notices;
- are constructed to support anticipated loads, e.g. mark soft verges;
- identify specific hazards, e.g. steep inclines;
- provide properly designed and constructed crossings, e.g. at watercourses, underground services;
- avoid or warn against the presence of overhead services, e.g. electricity cables;
- take account of the risks to pedestrians and livestock from site vehicles and segregate pedestrians from vehicles;
- allow sufficient space for long/heavy vehicles to manoeuvre.

Where the site is traversed by public right of ways (bridal paths, roads, walking tracks) provision should be made for the effective management of these crossings during the construction phase. Arrangements to protect members of the public and the workers should be included in the Health & Safety Plan / Construction Phase Plan and managed by the PSCS/PC with the co-operation of all the contractors on the site. These arrangements may include:

- Gates with locking facilities.
- Splayed openings to afford a good view of oncoming traffic.
- Traffic control systems
- Warning signage.
- Convex mirrors.
- Lighting after dark.
- Manned during periods of high traffic volume.

These arrangements should included in the site induction information be briefed to all concerned.

9.14.2 Areas of ‘hard standing’ should be established:

- allowing vehicles to be parked off the public highway;
- which are reinforced and marked, sufficient to withstand the weight of heavy vehicles;
- to support crane outriggers without settlement; and
- for adequate laydown or storage areas.

If the need for reversing vehicles cannot be eliminated, provide and keep clear adequate turning areas,

and provide effective systems to control it.

9.14.3 Transport on site should be:

- assessed and selected for suitability, so as to be safe and right for the job, to deal with site conditions, e.g. rough terrain, enforced speed limits;
- subject to proper maintenance, repair and inspection; and
- only driven or operated by suitably trained persons with banksmen and supervisors as required (following risk assessment).

Note: particular consideration should be given to ensuring that visiting drivers understand what they have to do to ensure safe working on the site. This is likely to require vehicle control measures at entrances to the site.

9.14.4 Temporary fences and/or barriers may be required to:

- segregate vehicles from pedestrians;
- restrict or control access to members of the public;
- restrict access to areas containing crops or livestock; and
- indicate rights of way or landowners' boundaries.

9.14.7 Working at height

Part 4 of the SHWW General Application Regulations 2007 as amended (ROI) and The Work at Height Regulations (Northern Ireland) 2005 (NI)) are similar in their requirements relating to work at height. The Regulations require employers to:

- avoid the need to work at height wherever possible;
- ensure the work is properly planned;
- carry out a suitable and sufficient risk assessment;
- ensure the work is appropriately supervised throughout;
- ensure the work is carried out in a safe manner;
- provide suitable and sufficient measures to prevent anyone falling; and where necessary to mitigate the effects of a fall should it occur
- not start work until appropriate emergency and rescue arrangements are in place;
- ensure work is only undertaken when weather conditions do not jeopardise safety;
- ensure no person engages in any activity, including organisation, planning and supervision, in relation to work at height or work equipment for use, unless they are competent to do so, or if being trained, are supervised; and
- ensure all places of work at height and all equipment used are inspected prior to use and on an ongoing basis throughout the work.

Organisations involved with performing work at height during the construction phase should ensure they

develop and implement appropriate procedures and documentation to ensure all effective controls are in place, are being maintained and are compliant to the requirements of the regulations. Further information on specific aspects of working at height are given below.

Selection of work equipment for work at height

The following requirements must be considered when selecting equipment:

- give collective protection measures priority over personal protection measures;
- take account of:
  - the working conditions and the risks to the safety of persons at the place where the work equipment is to be used,
  - the distance and consequences of a potential fall,
  - the duration and frequency of use,
  - the need for easy and timely evacuation and rescue in an emergency,
  - any additional risks posed by the use, installation or removal of that work equipment, or by evacuation and rescue;
- ensure its characteristics and dimensions are appropriate to the nature of the work to be performed and the foreseeable loadings, and allow passage without risk;
- ensure all purchased equipment is supplied with a CE Mark and relevant certification.

Where work platforms are used for access and egress the potential falling distance must be negotiated.

Existing places of work and means of access or egress at height should:

- be stable and of sufficient strength and rigidity for the purpose for which it is intended to be, or is being used;
- where applicable, rest on a stable, sufficiently strong surface;
- be of sufficient dimensions to permit the safe passage of persons and the safe use of any plant or materials required to be used, and to provide a safe working area having regard to the work to be carried out there;
- possess suitable and sufficient means for preventing a fall;
- possess a surface which has no gap:
  - through which a person could fall,
  - through which any material or object could fall and injure a person,
  - giving rise to other risks of injury to any person, unless measures have been taken to protect persons against such risk;
- be so constructed and used, and maintained in such condition, as to prevent, so far as is reasonably practicable:
  - the risk of slipping or tripping,
  - any person being caught between it and any adjacent structure; and
- where it has moving parts, be prevented by appropriate devices from moving inadvertently during work at height.

Fragile surfaces

Ensure that:

- no person passes across or near, or works on, from or near, a fragile surface when not required to do so;
- where this cannot be prevented, suitable and sufficient platforms, coverings, guard rails or similar means of support or protection are provided and used;
- where a risk of falling remains, suitable and sufficient measures to minimise the distances and consequences of a fall are provided, e.g. fall arrest;
- warning notices are fixed at the approach; and
- where this is not practicable, persons are made aware of it by other means.

Falling objects

Employers must:

- take suitable and sufficient steps to prevent the fall of any material or object;
- take suitable and sufficient steps to prevent any person being struck by any falling material or object;
- ensure that no material or object is thrown or tipped from a height; and
- ensure that materials and objects are stored in such a way as to prevent risk from collapse, overturning or unintended movement.

Danger areas

All work areas that present a risk of falling or being struck by a falling object must be fitted with equipment and signage that prevents unauthorised access.

Use of personal fall protection systems

A personal fall protection system shall be used only if:

- a risk assessment has demonstrated that:
  - the work can be performed safely while using that system and
  - the use of other, safer work equipment is not reasonably practicable;
- the user and a sufficient number of available persons have received adequate training specific to the operations envisaged, including rescue procedures.

A personal fall protection system shall:

- be suitable and of sufficient strength for the purposes for which it is being used;
- where necessary, fit the user;
- be correctly fitted;

- be designed to minimise injury to the user and, where necessary, be adjusted to prevent the user falling, or slipping from it, should a fall occur; and
- be so designed, installed and used as to prevent unplanned or uncontrolled movement of the user.

A personal fall protection system designed for use with an anchor shall be securely attached to at least one anchor, and each anchor and the means of attachment shall be suitable and of sufficient strength and stability for the purpose of supporting the load.

A work positioning system shall be used only if:

- the system includes a suitable backup system for preventing or arresting a fall;
- the user is connected to it; and
- where it is not reasonably practicable, all practicable measures are taken to ensure that the work positioning system does not fail.

A rope access or positioning technique shall be used only if:

- it involves a system comprising at least two separately anchored lines, of which one ('the working line') is used as a means of access, egress and support, and the other is the safety line;
- the user is provided with a suitable harness and is connected by it to the working line and the safety line;
- the working line is equipped with safe means of ascent and descent, and has a self-locking system to prevent the user falling should they lose control of their movements; and
- the safety line is equipped with a mobile fall protection system, which is connected to and travels with the user of the system.

Taking the risk assessment into account, and depending in particular on the duration of the job and the ergonomic constraints, provision must be made for a seat with appropriate accessories.

The system may comprise a single rope where:
- a risk assessment has demonstrated that the use of a second line would entail higher risk to persons and
- appropriate measures have been taken to ensure safety.

A fall arrest system shall incorporate a suitable means of absorbing energy and limiting the forces applied to the user's body.

A fall arrest system shall not be used in a manner:
- that involves the risk of a line being cut;
- where its safe use requires a clear zone (allowing for any pendulum effect), that does not afford such a zone;
- that otherwise inhibits its performance or renders its use unsafe.

A work restraint system shall be so designed that, if used correctly, it prevents the user from getting into a position in which a fall can occur.

Use of ladders

- Ladders may only be used when the result of a risk assessment has demonstrated that the use of more suitable work equipment is not justified because of the low risk, because the duration of required use is short, or because of existing features on site which cannot be altered.
- Any surface upon which a ladder rests should be stable, firm, of sufficient strength and of suitable composition to support the ladder safely, so that its rungs or steps remain horizontal with any loading intended to be placed on it.
- A ladder should be positioned to ensure its stability during use.
- A suspended ladder should be attached in a secure manner so it cannot be displaced and swinging is prevented.
- A portable ladder should be prevented from slipping during use by:
  - securing the stiles at or near their upper or lower ends and
  - an effective anti-slip or other effective stability device.
- A ladder used for access should be long enough to protrude sufficiently above the place of landing to which it provides access.
- No interlocking or extension ladder shall be used unless its sections are prevented from moving relative to each other while in use.
- Where a ladder or run of ladders rises a vertical distance of 9 metres or more above its base, there should, where reasonably practicable, be provided at suitable intervals sufficient safe landing areas or rest platforms.
- Every ladder should be used in such a way that:
  - a secure handhold and secure support are always available to the user and
  - the user can maintain a safe handhold when carrying a load.

Inspection – This means visual or more rigorous inspection by a competent person as is appropriate for safety

Inspection of places of work at height
Ensure that the surface and every parapet, permanent rail or other such fall protection measure are checked prior to use.

Inspection of work equipment

Employers must ensure that:

- all installed work equipment is not used unless it has been inspected;
- work equipment exposed to conditions causing deterioration is inspected at suitable intervals and after extreme events;
- no work equipment leaves its site unless it is accompanied by physical evidence that it has been inspected and is within its retest date; and
- the results of an inspection are recorded and kept until the next inspection.

Inspection of working platforms – scaffolding

Employers must ensure that:

- platforms above 2m are not used unless inspected;
- the person carrying out an inspection prepares a and submits it to the person requesting the inspection within 24 hours; and
- reports are kept on site until the construction work is completed.

Inspection reports
Inspection reports must contain the following information:

- the name and address of the person for whom the inspection was carried out;
- the location of the work equipment inspected;
- a description of the work equipment inspected;
- the date and time of the inspection;
- details of any matter identified that could give rise to a risk to the health or safety of any person;
- details of any action taken as a result of any matter found;
- details of any further action considered necessary; and
- the name and position of the person making the report.

In ROI details of inspections must be recorded in the Statutory Form GA3 available with other guidance in the HSA Code of Practice for Access and Working Platforms (HSA, 2009)

Duties of persons at work

Every person must:

- report any activity or defect that is likely to endanger themselves or others;
- use any work equipment or safety device provided to them by their employer; and
- use the work equipment or device in accordance with the training and information provided to them.

9.15 Security

During construction the PSCS / PC must take reasonable measures to ensure that no unauthorised person enters the work area, and this should be documented in the Safety and Health Plan. Only people who are explicitly authorised, either individually or collectively, by the PSCS/PC or designated person should be allowed on site.

The PSCS will need to have measures in place so that only authorised people are allowed into any area where construction work is taking place.

Typical authorised people might include:
- contractors or employees carrying out construction work;
- those who need to enter the work area for purposes connected with the work (e.g. architects, engineers and representatives of the client);
- individuals or organisations who have a statutory right to enter the work area (e.g. Health and Safety Inspectors, Building Control Inspectors and others who have statutory powers to enter the site);
- employee representatives.

Authorised people should have the relevant site rules explained to them and undertake any necessary induction training. Some authorised visitors may need to be supervised while on site or visiting specific areas. How access is controlled depends on the nature of the project, the risks and the location. The boundaries of all sites should be physically defined, where practical, by suitable barriers .The type of barriers should reflect the nature of the site and its surroundings.

Security measures should be sufficient to prevent access by any unlawful visitors without causing them harm.

All security measures should be put into effect prior to construction work starting and should be updated as necessary throughout occupation of the site. The measures should:

- ensure provision to prevent unauthorised access to the site;
- ensure materials are stored without risk to Health and Safety;
- ensure construction plant is secured against unauthorised operation;
- establish procedures for control of visitors;
- establish procedures for visiting workers; and
- ensure provision to monitor the effectiveness of the security arrangements.

In practice it may be very difficult to fully secure a large wind farm site against unauthorised access. While the PSCS/PC must take reasonable measures in this area, each contractor should make arrangements on the site to ensure, based on a suitable risk assessment, that their work area, tools, equipment, plant and machinery are secure and do not pose a risk to un-authorised visitors or children. These procedures may include:

- The control of keys in machinery
- The locking and securing of construction plant.
- The movement of plant to a secure area on the site.
- The control of keys for buildings and structures
- A procedure for ensuring that buildings and structures are locked and secure.
- The prevention of access to heights e.g. scaffolding, ladders, cranes etc.
- The prevention of access to materials and substances.

A public safety risk assessment and site security plan should be included as part of the Health & Safety Plan / Construction Phase Plan by the PSCS/PC.

9.16 Existing services / previous land usage

9.16.1 The Preliminary Safety and Health plan prepared by the PSDP (ROI) or the Pre-construction information provided by the Client to the Principal Contractor under CDM (NI) should identify all existing services on site. Before work starts on site a physical check by the PSCS / Principal Contractor should be performed to confirm the location of all key services and signs of previous land use. This would typically involve:

- contacting all public utilities;
- identifying existing services and marking on drawings or charts;
- obtaining suitable detection equipment, e.g. cable locators;
- land is not contaminated from previous dumping or tipping;*
- checking that no old mine workings exist;*
- checking for previous military use, e.g. unexploded ordnance.*

*Obtain specialist advice if potential for such conditions exists.

9.16.2 Before and during construction the following practices should be observed:

- check for, identify and mark buried services before excavation takes place (see HSA Code of Practice for Avoiding Danger from Underground Services (HSA, 2010) or HSG47)
- identify and place ‘goalposts’ to warn of overhead electricity lines (see HSA approved Code of Practice For Avoiding Danger from Overhead Electricity Lines (ESB, 2008)
- treat all services as live;
- determine whether live services can be temporarily de-energised or diverted;
- expose buried services by appropriate means, e.g. hand digging;
- place ‘goalposts’ to warn of overhead services

9.17 Excavations

Specific requirements in relation to safety of excavations are detailed in Part 5 of the SHWW Construction Regulations 2006 (ROI) and Regulation 31 of CDM 2007 (NI)

9.17.1 Prior to excavations being undertaken ensure:

- a proper assessment is made of local ground conditions;
- that the proposed excavation will not cause any premature collapse of, or damage to, surrounding structures;

- the excavation is located away from traffic routes, or traffic routes are relocated;
- the excavation is prevented from collapsing;
- people, work equipment and materials are prevented from falling into the excavation; and
- no buried services (e.g. gas, electricity, water) exist in the locality.

9.17.2 As excavations are carried out:

- the sides should be supported or 'battered' back;
- it should be kept free of water;
- it should not be allowed to deteriorate as a result of bad weather;
- any deterioration should be made good;
- adequate barriers should be kept in place to prevent unauthorised access;
- the condition of the excavation is required to be inspected at the start of a shift, after any event that may have affected the strength of the excavation and after any unintentional fall or material is dislodged; and
- inspections should be recorded as evidence they were performed, and by a competent person.

9.18 Lifting and handling

9.18.1 Before carrying out any manual handling operation, ensure:

- compliance with Part 2, Chapter 4 of the SHWWGA Regulations 2007 Manual Handling of Loads (ROI) or the Manual Handling Operations Regulations (Northern Ireland) 1992 as appropriate.
- a relevant risk assessment has been carried out; and
- persons are trained on and adopt the correct manual lifting techniques and practices;

9.18.2 Where reasonably practicable the elimination of manual handling risks should be considered by means of supply to site of machine-handled loads e.g. pre-fabrication off-site, palletised loads etc. General good practice principles that should be considered include:

- Tasks which are carried out most frequently and that involve stooping, twisting, travelling or climbing with loads should be prioritised for improvement
- Every individual's capability and competence should be considered before manual handling is undertaken. Training should be provided for all those carrying out manual handling tasks
- Wherever possible loads should be marked with their weight and presented with suitable hand holds
- Wind farms present an environment with challenges such as restricted work spaces, complex travel routes and exposure to the elements.

9.18.2 Before any lifting devices, including cranes, are used on site, ensure:

- appointment of a competent person to be in control of lifting operations;

- valid test certificates exist, including those for slings, lifting chains, shackles and lifting points on structures;
- only competent personnel trained in the use of the lifting equipment and accessories are involved;
- proper risk assessments are made on the lifting operation to be undertaken;
- account is taken of ground conditions and uneven terrain;
- precautions are taken to avoid contact with site services, e.g. overhead electrical cables;
- any restrictions on operations in poor weather conditions are clearly identified;
- all operations involving the use of elevated access platforms or man riding platforms are properly risk assessed, and control measures identified and implemented;
- all lifting operations are properly planned with all staff fully briefed, and lifting devices are of adequate capacity;
- cranes and HIABs are derigged and booms lowered before moving off;

9.19 Electrical Safety

Safe system of work procedures and in some cases permit-to-work procedures will be necessary to control work activities on or near live electrical systems. The Wind Turbine Safety Rules provide instruction to control post-installation and energisation operations.

Special attention should be given to boundary point between the wind farm electrical system and grid electrical system during the construction phase to ensure the safety of workers on both sides of this system boundary point from the risk of electrocution. Ideally this boundary point (e.g. switch, disconnect, cable or busbar) should be identified as early as possible after its construction and it's operation or final construction controlled using a permit to work system.

Special attention should be given to the first connection and energisation of newly constructed windfarm electrical apparatus. Safe work procedures must ensure that.

- All persons are clear of the apparatus and have been warned that the apparatus is about to be made live.
- The apparatus has been declared, by a competent person, fit to be connected and made live.
- Apparatus that will not be connected to the system and on which further work is to be completed cannot be inadvertently connected and made live

WTG/infrastructure electrical assembly work completed during the construction phase should be performed by an appropriately qualified and competent electrical assembly engineer, and work completed in accordance with the relevant ETCI (ROI), IEE and IEC standards for electrical installation.

The integrity of the electrical infrastructure of all site facilities should be assessed at the time of completion and thereafter at prescribed intervals in accordance with Part 3 of the SHWW General Application Regulations 2007 (ROI) or the Electricity at Work Regulations (Northern Ireland) 1991 as appropriate.

Signage should be installed on all electrical generating equipment, junction boxes, switchgear panels and doors to identify the Health and Safety risks that personnel may be exposed to should they open covers, doors or panels. All covers, doors and panels should be locked, or otherwise prevented from being opened without a mechanical device/tool, to restrict access and prevent exposure to live electrical components and systems.

The configuration and status of installed electrical systems on the site should be recorded and this record should be updated as additions and changes occur. This record may take the form of a electrical schematic diagrams, line diagrams and an associated log sheet. This approach should be applied to the temporary electrical system put in place at the start of the construction phase (e.g. supplies to site accommodation and site lighting) and updated right through the commissioning, energisation and handover of the completed wind farm electrical system.

Portable appliance testing (PAT) should be performed on all electrical equipment used by employees to perform their work, to ensure the equipment is safe to use.

All portable electrical tools should be 110 volt and connected to a double wound, center tapped 110 volt step down (yellow) transformer. All electrical plugs should be properly rated. Electrical tools and their plugs and supply leads of should be inspected before use and removed from service or repaired if defects are found. All 230/400 volt electrical cables supplying 110volt supply transformers must have suitable mechanical protection and have suitable earth fault protection at the point of supply.

Further advice on electrical safety is listed in Appendix 1

9.20 Chemicals and substances

9.20.1 A suitable Chemical Agents Risk Assessment (ROI) or COSHH assessment (NI) should be made, utilising materials safety data sheets (from the supplier) and other sources of information for:

- all chemicals and other substances used on site, e.g. epoxy-based materials, oils, lubricants and fuels;
- processes causing dust and fumes, e.g. welding, grinding, etc.; and
- biological hazards that may be present on site from previous and/or existing animal inhabitants, e.g. Weil's disease (rats), anthrax (cattle), brucellosis (cattle), bovine tuberculosis (cattle), and cystic echinococcosis or hydatid disease (sheep).

9.20.2 Ensure that proper arrangements are made for:

- reviewing the need to use the substance, substitution with a safer alternative, or reduction of quantities used and stored on site;
- correct handling of chemicals/substances including disposal;

- correct storage of chemicals/substances, including bunding/ventilation;
- correct transport arrangements;
- provision of suitable first aid;
- welfare facilities;
- containment, clean-up and reporting of spillages;
- detection and management of vapours and fumes where necessary;
- environmental monitoring; and
- employee health surveillance.

Employers and contractors should be aware of the new REACH regulations that place additional duties on the downstream users of chemicals. REACH (Registration, Evaluation, Authorisation and Restriction of Chemicals) is a European regulation that has direct application in all EU member states. The regulations should lead to an improved level of Health and Safety information being passed down the supply chain. Further details are available via the HSA / HSENI.

The Code of Practice for the Safety, Health and Welfare at Work (Chemical Agents) Regulations 2001 provides guidance for use of chemicals in ROI.

ACOP L5 – Control of Substances Hazardous to Health (Fifth Edition) provides additional advice and guidance to the COSHH (Northern Ireland) Regulations 2003 (Ref Appendix 1).

9.21 Dangerous substances and explosive atmospheres

In ROI Requirements in relation to Explosive Atmospheres at Places of Work are detailed in Part 8 of the SHWW General Application Regulations and guidance is provided on its application by the HSA (Appendix 1) Employers must carry out a risk assessment of any work activities involving flammable substances and record the findings of the risk assessment in a document called the "explosion protection document."

In NI an assessment of the risks posed by substances that are flammable, highly flammable, extremely flammable, oxidising or explosive, and any dusts which when mixed with air may form an explosive mixture (classified as 'Dangerous Substances' under the Dangerous Substances and Explosive Atmospheres (Northern Ireland) Regulations 2003), needs to be performed to assess their potential for the creation of an explosive atmosphere within the workplace.

Sites that use and store Liquid Petroleum Gas (LPG) canisters, fuels or substances that are classified in any of the above categories, are required to carry out an assessment.

The assessment should identify the potential for an explosive atmosphere to occur within the workplace. Areas of significant risk require zonal classification and additional controls to prevent sources of ignition and accidental release of dangerous substances.

The following should be considered to reduce risk:

- reducing the quantity of dangerous substance;
- avoiding or minimising release;
- controlling any release at source;
- preventing the formation of an explosive atmosphere;
- collecting and containing releases;
- avoiding ignition sources;
- avoiding adverse conditions, e.g. high temperature; and
- segregating incompatible substances.

Areas which contain dangerous substances should be categorised into the following zonal classifications:

Zone 0 – an explosive atmosphere is present continuously;
Zone 1 – an explosive atmosphere is present occasionally; and
Zone 2 – an explosive atmosphere is not likely to occur in normal operation, but if it does, persists for a short period only .

All zonal areas are required to be identified with an EX warning sign and additional control measures are dependent on the zonal area classifications.

Further information is provided in Guide to the General Application Regulations Part 8: Explosive Atmospheres at Places of Work (ROI) or HSE ACOP L138 – Dangerous Substances and Explosive Atmospheres (NI) as appropriate (Ref Appendix 1).

9.22 Noise

Chapter 1 of Part 5 of the SHWW General Application Regulations – Control of Noise at Work (ROI) and the Control of Noise at Work Regulations (Northern Ireland) 2006 set limitations on the levels of noise employees may be exposed to whilst at work.

- Action values – the level at which employers must take action to reduce noise
- Exposure limits – the level of which must not be exceeded

Employers who perform work that is liable to expose any employees to noise at or above the action level must carry out a risk assessment. When performing the assessment consideration should be given to:

- the level, type and duration of exposure;
- the effect on employees or groups of employees;
- indirect effects from audible alarm systems;
- information provided by manufacturers;

- the availability of alternative equipment designed to reduce the emission of noise;
- noise levels beyond normal working hours;
- exposure in rest facilities;
- information obtained from health surveillance; and
- availability of hearing protectors.

Risk assessments must be performed by a competent person.

Further information may be found in Guide to the General Application Regulations Part 5 Chapter 2: Control of Noise at Work (ROI) or HSE Guidelines L108 – Controlling Noise at Work as appropriate (Ref Appendix 1).

9.23 Vibration

Chapter 2 of Part 5 of the SHWW General Application Regulations – Control of Vibration at Work (ROI) and the Control of Vibration at Work Regulations (Northern Ireland) 2005 set limitations on the levels of vibration employees may be exposed to whilst at work.

9.23.1 There are two types of physical effect from exposure to vibration at work:

Hand–arm vibration – vibration that is transmitted into the hands and arms during work activity, e.g. from pneumatic drills/hammers, electrical power tools; and

Whole body vibration – mechanical vibration that is transmitted into the body when seated or standing, through the supporting surface during work activity, e.g from ride-on plant or plant equipment, vehicles and helicopters.

9.23.2 The Regulations set limitations on the levels of vibration employees may be exposed to whilst at work.

Daily exposure action limit – the level at which employers must take action to reduce exposure to vibration
Daily exposure limit value – the level which must not be exceeded; if exceeded or likely to be exceeded, employees must be provided with health surveillance

9.23.3 Employers performing work liable to expose any employees to vibration levels at or above the daily exposure action limit must carry out a risk assessment, which should address:

- the magnitude, type and duration of exposure;
- employees whose health is at particular risk from such exposure;
- the condition of equipment and maintenance records;
- information provided by the manufacturers;
- the availability of replacement equipment designed to reduce exposure to vibration;

- any extension of exposure at the workplace to whole body vibration beyond normal working hours;
- specific working conditions, such as low temperatures; and
- previous health surveillance records.

The following should be considered when assessing appropriate prevention and control measures:

- alternative working methods that eliminate or reduce exposure;
- work equipment that produces the least possible vibration;
- the use of auxiliary equipment that reduces the risk of injuries caused by vibration;
- maintenance programmes for work equipment, the workplace and workplace systems;
- the design and layout of workplaces, work stations and rest facilities;
- suitable and sufficient information and training for employees, to ensure the work equipment is used correctly and safely;
- limitation of the duration and magnitude of exposure to vibration;
- appropriate work schedules with adequate rest periods; and
- the provision of clothing to protect employees from cold and damp.

9.23.4 Vibration exposure calculations

THE HSE in the UK has created a ready reckoner table to provide a visual guide to the levels of vibration exposure that are thought to be safe and those that may start to initiate vibration-related injuries. This can be downloaded from the HSE website (www.hse.gov.uk). This table provides those planning work with a guide to exposure times and can indicate from the outset those who may be at risk before work commences, allowing employers to take action at the earliest opportunity. The duration and magnitude of vibration exposure is required to be recorded for each individual daily, and reviewed to ensure personnel have not exceeded the daily exposure limit value.

The HSE has also created a vibration calculator, which can be downloaded from the HSE website (www.hse.gov.uk). The calculator allows employers to work out how much exposure over an 8-hour period employees have actually been exposed to. The calculator is designed to allow for multiple entries of vibration values (durations and magnitudes) from multiple tasks performed throughout the day by an employee. This provides the employer with accurate data of actual exposure and as stated in 9.22.2, if this value is exceeded, employees must be provided with health surveillance.
Additional information may be found in HSA document to the General Application Regulations Part 5 Chapter 2: Control of Vibration at Work (ROI) or HSE documents L140 – Hand–Arm Vibration and L141 – Whole Body Vibration (see Appendix 1).

9.24 Personal protective equipment (PPE)

Employers need to comply with the requirements of Part 2 Chapter 3 – Personal Protective of the SHWW (General Application) Regulations 2007 in ROI and the Personal Protective Equipment Regulations (Northern Ireland) 1993 in NI.

9.24.1 Persons working on site must be provided with appropriate PPE to protect against risks identified within a risk assessment that cannot be controlled by other means.

The PPE must be suitable for the individual and sufficient to provide adequate protection. When selecting appropriate PPE, consideration of the individual's physical size, make up and personal characteristics (such as facial hair), existing health conditions and whether or not the introduction of the PPE will increase risk to the individual's Health and Safety, needs to be given.

Accommodation for the PPE is required to be provided to allow the individual to store it in a clean and protected environment, which prevents contamination and deterioration.

Appropriate information, instruction and training (and, where necessary, supervision) is required to be provided to the individuals supplied with PPE, covering the reasons why the PPE is required to be worn (including risks and potential health effects of exposure) and on the correct use, storage and maintenance of the PPE.

The condition of the PPE should be monitored and it should be replaced when necessary.

9.24.2 When assessing the requirements for PPE to be used within the workplace, consideration should be given to:

- the risk assessment for the work required to be performed and the residual risks which cannot be controlled;
- the remoteness of the site and climatic conditions (both winter and summer);
- the need to work outside, e.g. exposure to ultraviolet light;
- the problems of access, e.g. the need to work at height;
- the need to work on, near or over water;
- the use of hazardous substances

9.25 Occupational health

All organisations should ensure that there is appropriate occupational health support and, where appropriate, there are specific health surveillance programmes. This would typically include policies and procedures that define:

- any requirements for a pre-employment medical;
- any legal requirements for health surveillance, e.g. vibration (HAVS), manual handling, hazardous substances, display screen equipment;
- requirements for health surveillance identified by a risk assessment, e.g. climbing;
- any local minimum standards, e.g. fitness, eyesight, hearing; and
- proper arrangements for managing health records, e.g. confidentiality.

Where a number of employees work together on the same site the owner/operator of that site should ensure the Occupational health arrangements are adequate, co-ordinated and consistent to the Occupational Health risks involved.

9.26 Reporting of accidents/dangerous occurrences and near events

9.26.1 ROI

In the case of an accident involving an employee at work in ROI, the employer is responsible for reporting the accident.

In any other case (if the injured person is self-employed or a member of the public), the person responsible for reporting the accident is the person having control of the place of work at which the accident occurred.

Accidents can be reported to the Health and Safety Authority in two ways; namely

(1) by hard copy, i.e. completing the Incident Report Form (IR1) and posting the completed form to the Workplace Contact Unit, Health and Safety Authority, The Metropolitan Building, James Joyce Street, Dublin 1, or

(2) online, via the Health and Safety Authority's website, www.hsa.ie.

Note: The HSA only accept the pre-printed forms published by the Authority photocopies are not acceptable Copies of the IR1 form are available from the Publications Section of the HSA by Telephoning 1890 289 389 or if calling from outside of the Republic of Ireland +353 1 6147000

Further details on what constitutes a reportable accident or dangerous occurrence is available on the HAS website at http://www.hsa.ie/eng/Topics/Accident_and_Dangerous_Occurrence_Reporting/

9.26.2 Northern Ireland

The Reporting of Injuries, Diseases and Dangerous Occurrences Regulations (Northern Ireland) 1997, place a legal duty on Employers, Self-employed people and People in control of premises to report work-related deaths, major injuries or over-three-day injuries, work related diseases, and dangerous occurrences (near miss accidents).

The NI2508 forms should only be used to report work-related accidents and dangerous occurrences as defined in the RIDDOR regulations.

Please see http://www.hseni.gov.uk/hea71592_riddor_booklet.pdf for advice and guidance on these regulations. If you still need assistance please ring us HSENI on 0800 0320 121.

In accordance with good practice, for all workers:

- details of all 'near events' and incidents should be recorded and investigated;
- appropriate remedial action should be taken following all 'near events' and incidents to prevent any recurrence

9.27 Completion of works

9.27.1 Before leaving site;

- remove all unused materials, waste, plant and equipment;
- restore all temporary workings to a safe condition and to the satisfaction of the landowner; and
- carry out a thorough site inspection.

9.27.2 The Safety File

Both SHWW Construction Regulations (ROI) and CDM (NI) require the compilation of the Safety File for the installation on completion of the works. This is a very important document for the ongoing operation and maintenance of the site, since it includes specific information about the key hazards and risks associated with the installation that must be taken into account in any future works being planned. The Health and Safety File must be updated to reflect any changes to the installation during the project lifetime.

10. Operation and Maintenance

10.1 Introduction

10.1.1 This section highlights the consideration that should be given to Health and Safety in the operation and maintenance of wind farms. The operation and maintenance phase covers all aspects of normal routine operation, planned and breakdown maintenance, inspections and testing. Much of the guidance in Section 9, 'Construction, Commissioning and Demolition', is also relevant to operation and maintenance of wind farms and should also be consulted.

10.1.2 Persons with responsibilities will include the owner of the wind farm, the operator (if different), operation/maintenance crews and contractors. The ultimate responsibility invariably lies with the owner of the wind farm. However, reference should be made to the duties set out in specific legislation, which will deter mine the duty holder responsible for any particular aspect of a wind farm's activity.

10.1.3 A person should be appointed to be in charge of the site and responsible for all operations with a clear mandate for dealing with any eventualities. A site Health and Safety Adviser should also be appointed to support and advise the 'person in charge' on all matters of Health and Safety. It should be made clear to everyone on site who these persons are, along with an explanation of their roles and responsibilities.

10.1.4 Those appointed in respect of 10.1.3 above should take into consideration occurrences of incidents and near events as collated on the "Best Practice and Lessons Learned" area in the Health and Safety section of the IWEA website including any Safety Alerts issued.

10.1.5 Best practice is to provide on site controlled copies of relevant Health and Safety information for the site and the equipment installed, in addition to the controlled copies held by site management personnel.

10.2 Legislative requirements

10.2.1 A table of the various legislative requirements and their applicability to each stage of the project is included in Section 6.

10.2.2 In ROI the Safety Health and Welfare at Work Act 2005 and SHWW (General Application) Application Regulations 2007 require work equipment, plant and plant equipment to be maintained in an efficient state, in efficient working order and in good repair. In addition the SHWW Construction Regulations 2006 will apply to any maintenance works which come under the definition of "construction work". In addition to plant and equipment being maintained in an efficient state, there is also the requirement for a periodic inspection of all work equipment that maybe subject to deterioration. In addition to this, lifting equipment requires a periodic statutory thorough examination, and this must be carried out by a competent person

10.2.3 In NI the Health & Safety at Work (Northern Ireland) Order 1978 and the Provision and Use of Work Equipment Regulations (Northern Ireland) 1999 require all work equipment, plant and plant equipment to be maintained in an efficient state, in efficient working order and in good repair.

Most maintenance activities fall under the CDM (Northern Ireland) Regulations 2007, however, the extent of compliance with these regulations depends upon whether or not the work to be performed is defined as construction work under the regulations, or the amount of time required to complete the work requires it to be classified as a notifiable project, e.g. 30 days or 500 man days. Further information is provided in Section 6 and in the CDM ACOP L144 but it is worth noting that the definition of construction work (pages 65–66 in the ACOP) includes waste resulting from the demolition or dismantling of a 'structure', and the definition of 'structure' includes masts, towers or parts of them.

10.2.4 A suitable Health and Safety management system should be identified and implemented to ensure that all activities are suitably planned, and all foreseeable risks assessed and mitigated. See Section 5 for further information.

10.2.5 Safe systems of work should be established and implemented regarding all work on all mechanical and electrical parts of the wind farm.

10.3 Operation

10.3.1 Operational instructions

Under the requirements of SHWWCR / CDM (Safety File), the EU Machinery Directive and CE Marking process, and the WTG Certification programme specified in IEC WT01, manufacturers of the wind farm hardware (including electrical infrastructure equipment and WTG) are required to supply to the owners/operators with an operations and maintenance manual. This manual is required to explain how the equipment is to be safely operated, maintained and inspected. The manual should also detail the frequency of maintenance checks and appropriate maintenance activities (including recommendations for component replacements) to be performed to maintain the integrity and the ongoing safety of the device.

Risk assessments for the operational instructions may also be required by the 2009 Machinery Directive (Directive 2006/42/EC, replacing Directive 98/37/EC, with effect from 29 December 2009).

10.3.2 Operational activities

Owners/operators shall commence the operational phase once handover of the hardware is complete. As covered in 10.2.4 and Section 5, a Health and Safety management system should be developed to ensure policies are established and appropriate arrangements are in place for Health and Safety throughout the operational wind farm site. To prevent knowledge gaps and increased Health and Safety risks to operational personnel, the Health and Safety management system should ideally be fully developed and operational before site handover is complete.

Owners/operators should ensure all operational monitoring activities are clearly defined for the operational phase. It is recommended that all routine operations performed during this phase are properly risk assessed and are controlled through standardised procedures, method statements and safe systems of work. Familiarity with standardised procedures and controls should increase operator awareness and reduce the potential for human error and frequency of accidents and incidents.

10.3.3 Condition monitoring

Condition monitoring (although a maintenance activity) is undertaken as part of the operational phase. Depending upon the level of condition monitoring equipment/systems installed, it may offer significant detailed feedback on the performance of components and WTG, and provide advanced warning of developing technical problems, such as component wear-out, whether premature or predicted. This will allow for early intervention, reduce the potential for a more serious failure event occurring and make the service life of the equipment more efficient.

Owners/operators should consider, at the earliest possible stage (design), the level and complexity of the condition monitoring required on their installed WTG and infrastructure. When defining the levels of condition monitoring required the following should be considered:

- any legal requirements relating to the equipment;
- the consequences of potential failure events;
- the criticality of equipment failure, and the need to identify and replace components quickly, e.g. to reduce the risk to public safety, the effects and cost of downtime, and penalty clauses;
- the availability of condition monitoring technology from the manufacturer or other organisations;
- any specific monitoring requirements required as a condition of planning consents;
- any historical data of similar component/equipment failures;
- the additional risks placed on individuals required to access the equipment, e.g. monitoring remotely to prevent the need for personnel to access turbine nacelles or visits to turbines offshore;
- the availability of spare components, e.g increased downtime waiting for replacement components/ equipment;
- the availability, logistics and cost issues relating to obtaining heavy installation equipment on site to install replacement parts, e.g. reactive failures may cause increases in downtime from a lack of available equipment / weather window; and
- data from the “Best Practice & Lessons Learned” area of the IWEA website and previous Safety Alerts.

10.4 Maintenance

10.4.1 Planned Preventive Maintenance Programme

A Planned preventative maintenance programme is required to be developed to ensure regular checks are made on critical components, and the likelihood of possible future component failures is identified (in conjunction with condition monitoring). Issues that need to be considered when developing a PPM programme include:

- information provided by the manufacturers;
- frequency of maintenance activities;
- when the maintenance is to be performed, e.g. time of year, day/night, during peak or off-peak generation;
- maintenance activities to be performed (see 10.4.2 below);
- tools and equipment to be used, including calibration requirements;
- competent personnel, disciplines required, specialist knowledge, employed personnel or contractors;
- risk assessment and method statements;

Safe systems of work to be used;

- permits-to-work and locking-off, where there is significant risk to Health and Safety;
- records to be made, written scheme of examination, reports;
- information, instruction and training to be provided or obtained, specialist competencies, local site rules and task-specific hazards, and control measures;
- PPE to be worn;
- other safety precautions to be adopted and/or implemented; and
- emergency arrangements.

10.4.2 PPM procedures for maintenance, inspection and testing activities should be established for:

- installed safety devices, e.g. overspeed devices, electrical protection;
- safety features, e.g. attachment points for safety harnesses;
- installed lighting and emergency backup;
- portable electrical appliances;
- electrical earthing and lightning conductors;
- equipment installed with high integrity, e.g. blade fixings;
- lifting equipment (Including statutory inspections as required by Part 2 of the SHWW (General Application) Regulations 2007)
- access plant and equipment;
- mechanical handling equipment;
- cathodic protection and coating systems;
- foundation integrity;

10.4.3 Reactive maintenance (unplanned intervention)

The number of failures that require this will be reduced by planned maintenance, but many circumstances, such as severe weather conditions, can arise, which require workers to carry out tasks beyond their normal work experience and/or which are more than usually hazardous by their nature. Records of all breakdowns should be kept to influence future planned maintenance policy revisions, training and designs.

Arrangements should be considered to manage unknown and changeable situations as a result of breakdowns, major component failure and resultant damage. These should be considered and, where necessary, additional training provided to maintenance personnel in Health and Safety, situation management and management of change (see Section 5.8).

10.4.4 Review of performance and maintenance data

All condition monitoring data and maintenance records should be reviewed at regular and periodic intervals, to identify any repetitive patterns and trends relating to component reliability and breakdown. Both the condition monitoring and PPM programme should be reviewed, and where any patterns and trends of component failure arise, additional monitoring and maintenance activities should be introduced.

10.5 Long-term turbine integrity

It is recommended that owners/operators consider the following when addressing the long-term integrity of their WTG.

At all times adhere to the manufacturers' recommended preventive maintenance instructions, including:

- the frequency of examinations and maintenance activity;
- methods to be used to perform the maintenance;
- component replacement recommendations; and
- any guidance provided to ensure the work is performed safely.

Ensure all manufacturer-recommended modifications are completed within recommended timescales, or as soon as is reasonably practicable. Note: where routine maintenance is not carried out by the original equipment supplier, it is suggested that the turbine manufacturer be contacted for confirmation that all appropriate modifications have been implemented.

Periodically (but not less than every 12 months), contact the turbine manufacturer to share performance information and be appraised of any additional measures that they now recommend, following experience from other turbines of the same model, or similar design or components, installed elsewhere. Carry out these measures to provide assurance of the continuing integrity of the turbine.

Prior to purchasing turbines second hand, seek appropriate competent expertise on the suitability of the turbine(s) for the site. All second hand turbines purchased should be supplied with all historical maintenance records, including as a minimum, details of modifications made and results of thorough examinations performed. Ensure prior to commissioning, an appropriate technical assessment has been carried out and new integrity certifications obtained from a recognised competent body.

If the operational conditions of any turbines have changed significantly during their operational lives, e.g. machines being exposed to increased wind turbulence due to the erection of significantly sized buildings nearby or adjacent tree growth, ensure that appropriate advice is sought on the continued compatibility

of the turbine(s) for their location(s).

For any turbines approaching the end of their design lives and where operational lives are proposed to be extended, ensure that appropriate technical assessments are carried out and new integrity certifications obtained beforehand from a recognised competent body.

10.6 Record-keeping

10.6.1 Ensure that:

- a Health and Safety policy statement is written and available within the workplace (Safety Statement in ROI)
- employers' liability certificates for subcontractors are capable of being displayed/viewed on site;
- the Health and Safety management system is documented;
- all drawings, specifications, and operation and maintenance manuals are made available to relevant personnel;
- all risk assessments, method statements and safe systems of work are made available to relevant personnel;
- the Health and Safety file is made available and updated when necessary, including drawings, following any modification to the wind farm;
- all EC Declaration of Conformity Certificates and WTG Certifications are readily available;
- written schemes of examination are available for relevant pressure systems, lifting equipment and lifting accessories;
- any health records are properly maintained, available for at least forty years and secured to prevent unauthorised access;
- all training records and competency assessments are retained and made readily available; and
- an accident book is available to workers and its location is known.

10.6.2 Establish appropriate records, such as those for:

- maintenance/inspection of PPE, e.g. safety harnesses;
- testing of fire alarms and drills;
- maintenance/inspection of fixed and portable firefighting equipment;
- written risk assessments, e.g. vibration, chemicals, manual handling, foreseeable significant risks;
- training;
- auditing, monitoring, checks or inspections carried out, and actions taken;
- tests on any installed safety features, e.g. overspeed devices, emergency lighting;
- maintenance reports and maintenance logs, e.g. to record when maintenance activities were performed on the WTG, by whom and any actions taken;
- calibration of inspection, measuring and test equipment;
- portable electrical appliance testing; and
- significant events, such as high-voltage switching.

10.7 Competence

10.7.1 Contractors

Competence of contractors and those appointed under the SHWW Construction Regulations (ROI) and CDM (NI) has been covered in Section 9.6 above. It is recommended that owners/operators of wind farms who engage contractors to perform works on their site, utilise the same principles stated under Section 9.6 and refer to guidance provided in HSA publication Guidelines on the Procurement, Design and Management Requirements of the SHWW Construction Regulations 2006 or CDM ACOP L144 as appropriate.

10.7.2 Operation and maintenance personnel

Owners/operators who select and appoint key personnel should adopt the principles set out in Section 9.6.2 above. In addition, they should establish for the site a comprehensive training and competency development programme for all personnel, taking into account:

- the level of competence they already possess;
- the level of competence they require to enable them to complete their work safely and/or unsupervised;
- the type and nature of the work they will undertake;
- industry standards for minimum training requirements,
- legislative requirements, e.g. high-voltage switchgear;
- identification of training and development needs;
- scheduling of training and development activities;
- review frequencies;
- performance review by managers and supervisors; and
- review and appraisal with individuals.

10.8 Risk assessments and method statements

10.8.1 Risk assessments have been covered within Sections 5.7 and 9.7. It is recommended that owners/operators use the principles set out within these sections and the supporting Guidelines in Appendix 1

Operational and routine maintenance operations are unlikely to change significantly throughout the operation and maintenance phase. This allows owners/operators to develop appropriate risks assessments and method statements more efficiently. Wherever possible, these operations and the control measures identified should be standardised so personnel become familiar with common hazards and the precautions required.

Reactive maintenance activities as a result of a breakdown pose significantly greater Health and Safety risks to personnel, e.g exposure to unfamiliar situations as a result of damage created during component failure. In these circumstances consideration should be given to the following:

- the additional hazards posed as a result of component failure, e.g. falling debris, damaged/unstable work platforms, damaged lighting restricting visibility;
- the actions required to make the area safe, de-energised; removal of debris, damaged components, etc.;
- the hazards, and precautions required to make the area safe;
- seeking additional and expert advice from the appointed site Health and Safety Adviser;
- information from the Health and Safety File and Operations and Maintenance manual regarding replacement of components;
- additional emergency arrangements required for both the cleanup and replacement of components;
- the use of a Management of Change process (see Section 5.8) to cope with changing situations and events during the rectification work;
- additional training requirements; and
- incidents and near events as collated in the “Best Practice & Lessons Learned” area of the IWEA , together with all Safety Alerts issued.

10.8.2 Method statements have been covered in Section 9.7. It is recommended that owners/operators use the principles set out within this section to assist with the development of appropriate operation and maintenance method statements.

Method statements covering work on site must be prepared so that:

- high-risk activities can be identified, assessed, controlled and monitored;
- safe systems of work are devised;
- contractors can demonstrate adequate controls and compliance with their legal responsibilities; and
- lessons learned from incidents and near events should be used where appropriate to modify work procedures.

10.8.3 Consideration should be given to conditions associated with remoteness and climate:

- the risk of lightning;
- extremes of temperature, e.g. ice, snow, heat, risk of exposure;
- exposure to ultraviolet radiation;
- working at height;
- access at height;
- lone working;

10.9 Safe systems of work

10.9.1 A safe system of work for operational wind turbines has been developed known as the Wind Turbine Safety Rules (WTSR). The WTSR clearly specify actions and procedures that have to be followed in order that persons working on wind turbines are safeguarded from inherent dangers that exist from the installed electrical and mechanical equipment. These rules have set a common standard for

maintaining turbines.

IWEA plans to form a sub group of the IWEA Health and Safety Strategy Group in 2012 to develop and communicate a common understanding and approach on the application of the WTSR for IWEA members on the island of Ireland. It is envisaged that this group will work closely with the Operational Safety Rules (OSR) sub-group in Renewable UK.

For more detailed information please refer to the RenewableUK website (www.renewable-uk.com), where the 'Wind energy' area of the Health and Safety section contains links to the following documents, available for download:

- the Wind Turbine Safety Rules;
- Introduction to WTSR;
- Guidance: How to use the WTSR documentation;
- a model implementation plan (a list of chronological activities to achieve successful implementation);
- a model WTSR training course (a set of slides for use in training staff);
- a model audit programme for WTSR (a guide to areas requiring audit following implementation of the WTSR);
- guidance on the application of the WTSR; and
- WTSR support procedures (example documents for use by individual companies to develop site- or company-specific support procedures).

10.9.2 The WTSR set down the procedures to be followed when undertaking work or testing on plant and low-voltage (LV) apparatus associated with a wind turbine generator (WTG). Any work or testing on the high-voltage (HV) infrastructure that forms part of the wind farm or WTG should only be permitted under a set of approved HV safety rules.

10.9.3 The RenewableUK OSR sub-group in the UK has identified a need to examine how the rules could be developed to encompass the HV equipment that provides the connection to the grid, and which is now becoming increasingly present inside wind turbines. The result of this work is a new set of rules that can be applied to the turbines alone, or to the whole wind farm. The progress and results of a set of new rules, currently under operational trials, are available on the RenewableUK website (www.renewable-uk.com).

10.9.4 In order to establish a safe system of work, consider:

- the need to establish safe working methods and written procedures;
- the need to establish permit-to-work procedures;
- any requirements for isolation, locking-off or tagging;
- cross boundary/interface safety, e.g. with Distribution Network Operators;
- how persons are set to work and supervised;
- access to the workplace, e.g. scaffolds, installed ladders, lighting; and
- monitoring and reviewing of requirements.

10.9.5 Permit-to-work systems should be considered for:

- activities where it is not practical to remove significant hazards; and
- high-risk activities, which may include
  - hot work (the application of heat, including welding, burning or grinding, on plant containing flammable materials),
  - work on or near to live electrical systems,
  - work on systems, components or devices that require locking off to prevent premature energisation,
  - entry into confined spaces and
  - access to dangerous work areas.

Further information may be found in Section 9.8.1 and in HSE Guidance document HSG 250 – Guidance on permit-to-work systems (see Appendix 1).

10.9.6 Special controls, including supervision, may be required in the following situations:

- visitors or contractors attend a site: make sure they understand what they have to do to ensure safe working;
- people are working at height;
- people are working alone;
- equipment can be operated remotely;
- working over water;
- organised shooting on or adjacent to a wind farm;
- public access, e.g. use of footpaths across work areas, etc.;
- where non- or poor-English-speaking workers are employed;

10.9.7 Some general site rules should be established, covering aspects such as:

- coordination of deliveries by various subcontractors;
- segregation of vehicles and pedestrians;
- vehicle movement on site, especially reversing, and the use of banksmen; where possible, the need for reversing should be eliminated;
- limiting the speed vehicles move around the site, ideally by fixed features that mean drivers cannot move too quickly; speed limits are not always appropriate or enforceable;
- the wearing of personal protective equipment, e.g. hard hats, safety footwear, high-visibility clothing, etc.;
- control of access to work areas;
- working in inclement weather;

10.9.8 Appropriate policies and procedures should be devised and implemented with respect to site visits offshore, distinguishing between planned maintenance visits and unplanned intervention visits in the event of a breakdown.

10.10 Communication

Section 9.5.2 identifies methods of communication that should be used within the construction phase of the wind farm. However, the same principles may be adopted for use during the operational phase of the wind farm. It is recommended that owners/operators establish a procedure for communication and ensure that communication is covered in all work instructions, method statements, safe systems of work procedures and permit-to-work systems. Issues that should be considered include:

- frequency and methods of communication to be used between:
  - site personnel and the management team,
  - functions within a wind farm,
  - third parties,
  - the public,
  - shared workplaces, and
  - emergency services;
- aids to assist communication, e.g. notice boards, provision of information;
- accessibility of key staff and management commitment;
- methods of feedback and dealing with requests for information;
- meetings including purpose, frequency, format, distribution of meeting minutes; and
- audit and review of communication performance.

10.11 Emergency arrangements

An Emergency Response Plan (ERP) for dealing with all foreseeable emergency situations on an operational wind farm site will need to be drawn up, with appropriate additions or adjustments for specific or 'one off' operations.

Section 9.9 explains how an ERP should be developed, and these Guidelines, along with those referenced at the end of this section, should be used to develop the ERP for an operational wind farm.

10.12 Information, consultation, training and supervision

10.12.1 Information to be provided to employees

- Relevant sections and requirements of the Health and Safety management system (Safety Statement in ROI)
- The Health and Safety policy
- Company and site Health and Safety induction
- Information on Health and Safety hazards and the control measures required to prevent risks to their Health and Safety
- Site Health and Safety rules and procedures

- Information on work procedures, risk assessment, method statements, and safe systems of work procedures
- Information on fire safety and fire prevention, including risks of and control measures to prevent fire outbreak, evacuation procedures and those responsible for their implementation, and the use of firefighting equipment
- Information on first aid arrangements, names of first-aiders, location of first aid equipment, and procedures for accidents and incidents
- Information on relevant sections of the Emergency Response Plan
- Information on the welfare facilities
- Information on all changes to the workplace and their effects on Health and Safety
- Requirements for health surveillance
- Guidance on who should be trained as a first aider
- Guidance on additional first aid, emergency and occupational health support available
- For further information on first aid see section 9.9

10.12.2 Information to be displayed in the workplace

- Statutory notices and posters, site Health and Safety policy, displayed within the workplace at a location accessible to all
- Appropriate signage to provide warning of workplace hazards, prohibitions, controls, measures such as PPE, evacuation routes and location of safety equipment
- Site maps, including the location of wind turbines and other wind farm equipment, safety equipment and emergency response equipment

10.12.3 Information for contractors

- Relevant safety file and pre-construction information required to be provided under SHWWCR / CDM
- Site safety rules and procedures
- Roles and responsibilities of key site personnel
- Health and Safety information regarding the site and hazards that exist within the workplace that they may be exposed to
- Interfaces between work activities and other contractors
- First aid and welfare facilities available on site
- Emergency Response Plan and arrangements

10.12.4 Information to third parties

- Provide information to landowners, e.g. location of buried cables
- Provide information for members of the public, e.g. designated rights of way
- Ensure statutory warning notices are in place

10.12.5 Consultation

A procedure should be established to ensure proper consultation with employees or their representatives on all matters of Health and Safety within the workplace. The procedure should consider:

- whether or not the company should consult all individuals or ask them to appoint a representative;
- election processes for representatives;
- equipment, facilities and resources to be made available to representatives;
- provision of information in due time to allow employees or their representatives to provide feedback and input to decisions made on Health and Safety;
- provision of information regarding changes within the workplace;
- encouragement to involve employees in the risk assessment process; and
- encouragement to develop an open workplace in which views are respected and opinions shared.

10.12.6 Training

Training and development programmes should be set up for all personnel, with the aim of identifying and providing all necessary training related to their work, and monitoring and developing competence.
Training should include:

- site Health and Safety policy
- site Health and Safety induction;
- site rules and procedures;
- site personnel roles and responsibilities, including those of the individual being trained;
- relevant sections of the site's Health and Safety management system (Safety Statement in ROI)
- all technical aspects relating to their work;
- risk assessments, method statements, safe systems of work procedures, permit-to-work procedures, and emergency response arrangements and evacuation procedures relative to the work they shall undertake;
- additional training should be provided for additional roles, such as first aid and assigned responsibilities under the Emergency Response Plan; and
- Training provided should be in a common language to all; assistance should be provided where language barriers exist.

10.12.7 Supervision

Supervision and enforcement of Health and Safety instructions is a necessary requirement to ensure the successful implementation of the Health and Safety policy. Employers should ensure:

- adequate and appropriately experienced personnel are appointed to manage and supervise personnel;
- sufficient numbers are provided taking into account working hours, shifts and offshore restrictions; and
- supervisors are provided with appropriate and ongoing training and development to enable them to lead by example, manage personnel and situations effectively and without risk, ensure consistent compliance to Health and Safety standards, be able to motivate and inspire others, and actively encourage a positive Health and Safety culture.

10.13 Security

Section 9.14 identifies legal requirements and suggests issues that must be considered when assessing security needs for a wind farm. It is recommended that owners/operators use this Guidance to establish appropriate procedures and measures unique to their site.

10.14 Site services

Due account must be taken of:

- overhead power lines and suitable safety clearances;
- underground services, e.g. gas, electricity, telephone, water;
- the need to inform landowners
- the location and depth of underground services and accuracy of installation drawings;
- the need to provide detection equipment, e.g. cable-location devices;
- the owners of the services;
- electrical hand tools: power supply is to be 110V centre tapped earth, and a favourable risk assessment is to be provided for other voltages; and

10.15 Safety equipment

10.15.1 The requirement for safety equipment should be identified within risk assessments. This may typically include:

- cable detectors;
- high-voltage measuring devices;
- portable earthing devices;
- temporary barriers, screens and notices;
- isolation devices for installed equipment, e.g. locks, chains, mechanical clamps; and

10.15.2 Ensure that when safety equipment is used:

- it is recorded on a register;
- persons are trained and competent in its use;
- it is properly stored, cleaned and maintained;
- it is periodically checked to ensure it remains in good working order and is safe to use; and
- all inspections and examinations are recorded, and records are retained.

10.16 Site safety

10.16.1 The legal requirements and issues to be considered when defining the appropriate measures required for the Health and Safety topics listed below have been covered in various parts of Section 9.

It is recommended that owners and operators use the guidance provided in Section 9 when developing appropriate procedures and arrangements for a wind farm. Additional information unique to the operations and maintenance of a wind farm are listed below.

10.16.2 Weather (see Section 9.11)

A procedure should be established to monitor weather and provide ongoing updates of changing conditions. Consideration should be given to:

- setting weather limitations on operational activities, and instructions should conditions change;
- scheduling of maintenance activities against favourable seasonable climates, e.g. if non-essential, arrange for the work to be completed in summer months; and
- establishing methods of monitoring weather conditions to obtain accurate forecasting to aid in planning work activities and personnel

10.16.3 Temporary facilities (see Section 9.12)

Temporary facilities may be required during:

- remote working on major maintenance activities;
- site refurbishment;
- replacement or refurbishment of existing buildings and infrastructure

10.16.4 Lifting and handling (see Section 9.17)

This includes daily manual handling activities and lifting operations on site, both routine and major lifts.

When establishing the procedures required for manual handling, and to control the use of mechanical lifting equipment and devices, consider the following issues:

- identification and risk assessment of manual handling operations;
- the provision and use of equipment that reduces the need for manual handling;
- the provision of information, instruction and training to increase awareness and improve techniques;
- the need for health surveillance;
- the periodic testing and thorough examination of lifting equipment and accessories;
- risk assessment for lifting operations;
- preparation of safe systems of work and use of competent personnel for lifting operations
- training of personnel, operators and banksmen; and

- retaining records of testing and thorough examination.

10.16.5 Electrical safety (see Section 9.18)

Procedures for the control of electrical safety throughout a wind farm site should be established, and should consider:

- maintenance activities and the use of method statements, safe system of work procedures, permits-to-work, lock-off and precautions to be used, including PPE;
- integrity testing of the electrical infrastructure
- periodic Portable Appliance Testing (PAT) of all hand-held or portable electrical equipment used on site;
- defining competency levels to perform work;
- providing ongoing training and awareness to all staff on site; and
- emergency response to accidents/incidents involving electricity.

10.16.6 Chemical substances (see Section 9.19)

This covers use, storage and transportation of lubricants, oils and fuels, epoxy resin systems, solvents and paints.

Procedures for the control of substances hazardous to health should include:

- development and updating of a hazardous substance register for the site;
- establishing minimum quantities of materials to be stored on site;
- justification for the use and/or introduction of a new substance into the workplace prior to its purchase;
- assessment of risk from hazardous substances;
- need for environmental monitoring;
- transportation of hazardous substances;
- storage arrangements for hazardous substances;
- provision of information, instruction and training; and
- need for health surveillance.

10.16.7 Dangerous substances and explosive atmospheres (see Section 9.20)

If storing dangerous substances, e.g. flammable, highly flammable, extremely flammable materials, on site, such as fuels for generators, a risk assessment is required.

If no flammable substances are stored on site, no action is required.

If required, procedures should consider:

- the carrying out of an appropriate risk assessment by a competent person;
- defining zonal classification requirements and areas to be zoned;

- introduction of explosion protection and devices, to plant, lighting and equipment in the area, and provision of Ex signage;
- emergency response procedures and equipment to deal with accidents and incidents;
- information, instruction and training; and
- monitoring and reporting on the effectiveness of controls.

10.16.8 Noise (see Section 9.21)

Noise may be a concern in areas around generators, compressors and vehicle movement.

Procedures for assessing and, where necessary, controlling noise levels at work should be established, considering:

- identification of all areas of the site where noise levels may exceed daily limits;
- performance of noise assessments in areas of concern, by a competent person;
- identification of areas of risk, areas of safety and actions required to reduce levels;
- provision of information, instruction, training and, if necessary, PPE; and
- provision of health surveillance.

10.16.9 Vibration (see Section 9.22)

This covers the use of hand-held power tools, vehicles and being located on vibrating staging or surfaces. Procedures for controlling vibration at work should include:

- identification of vibrating work equipment;
- performance of a risk assessment on each piece of vibrating equipment;
- establishing control measures;
- maintaining personal exposure records during operation;
- assessment of actual exposure against daily limits;
- provision of information, instruction and training; and
- the need for health surveillance.

10.17 Personal protective equipment (PPE)

Section 9.24 identifies principles to be used for the identification, selection and control of PPE. These principles should be adopted for all PPE requirements during the operational and maintenance phase. Routine operations and activities undertaken on an operational wind farm are unlikely to change significantly, allowing the owners/operators to, wherever possible, standardise the PPE requirements for use on most operations performed on site. Familiarity with the standardisation of PPE requirements will increase awareness and reduce the potential for non-compliance.

10.19 Occupational health (see Section 9.25)

Establish procedures that define:

- any requirements for a pre-employment medical, e.g. fitness to climb;
- any legal requirements for health surveillance; e.g. vibration, chemicals, manual handling, display screen equipment;
- any local minimum standards, e.g. fitness, eyesight, hearing;
- proper arrangements for health records, e.g. confidentiality and security of personal details;

10.20 Reporting of accidents/dangerous occurrences

Section 9.26 identifies the statutory requirements and suggests good practice to be adopted when reporting accidents, incidents and dangerous occurrences. It is recommended that owners/operators establish procedures for reporting accidents, incidents and dangerous occurrences, and investigating their root causes.

These procedures should be developed in line with the ERP and should identify:

- how accidents, incidents and dangerous occurrences are to be reported and who should be notified, including internal personnel, local authorities, Regulatory bodies;
- methods of recording;
- who should carry out the organisation's own investigation, alongside any enforcement authority;
- the process of investigation;
- how the findings are to be reviewed;
- how employees and their representatives are to be notified of the findings; and
- how improvements and preventive measures shall be identified, agreed and implemented.

11. Developing Industry Best Practice and Emerging Risks

11.1 Introduction

It is not possible in the scope of these Guidelines to address every possible Health and Safety risk that may be encountered across the life cycle of a wind energy project. The dynamic nature of the industry is such that development and adoption of best practice is emerging very rapidly. Added to this, the scale and complexity of both planned and possible future projects will present many challenges in terms of Health and Safety risk management.

IWEA, on behalf of the industry on the island of Ireland, will take a lead in identifying, prioritising and communicating the most important issues relevant to the long-term safety and integrity of the industry. In developing a long-term Health and Safety strategy IWEA strongly advise that all duty holders take full account of the current and emerging state of knowledge of the risks and controls appropriate to a given project, technology or task involved. In particular, account should be paid to:

- the development of policies and procedures, including risk management arrangements, that are proportionate to the scale and complexity of the project;
- conducting robust risk assessment that takes account of the environmental constraints (e.g. extreme weather) that may be foreseeable;
- ensuring that product and operational safety checks pay particular attention to legal and safety standards when adopting new technologies;
- the training and competence standards that will be required; and
- developing an open safety culture that encourages the sharing and communication of Health and Safety best practice and lessons learned.

In addition to the direct operational Health and Safety risks across the life phases of a project, consideration should also be given to the:

- indirect and consequential Health and Safety impacts of projects and programmes;
- Health and Safety issues in contracts;
- emerging international dimensions of Health and Safety standards and best practice; and
- developing guidance in Ireland and overseas e.g. HSE via the Emerging Energy Technologies Programme (EET).

11.2 Specialist activities and support services

These Guidelines are intended to be relevant to all organisations contributing to the life cycle of wind farms (from initial feasibility studies through to decommissioning), and particularly relevant to senior and operational management within organisations developing, constructing or operating wind farms, or considering becoming involved in the sector.

These Guidelines therefore do not provide detailed advice on any specialist activities or support services that may be required to be carried out. Where these are provided, then, the basic principles in the selection, appointment and monitoring of those individual(s) will apply. In every situation and/or organisation an individual must have:

- sufficient knowledge of the specific tasks to be undertaken and the risks that the work will entail, and
- sufficient experience and ability to carry out their duties in relation to the project, to recognise their limitations and to take appropriate action in order to prevent harm to those carrying out the work, or those affected by the work.

[Insert information on IWEA H&S Sub-Groups. (Construction, Emergency Response, Transport)]

APPENDIX 1

References

The following publication references have been provided to allow readers who wish to understand more about the application and interpretation of specific areas of Health & Safety legislation, approved codes of practice and guidance to do so.

Guidance from the Health and Safety Authority

Health & Safety Authority (2006) Guide to the Safety, Health and Welfare at Work Act 2005, Dublin, HSA Publications.

Health & Safety Authority (2006) Workplace Safety and Health Management, Dublin, HSA Publications.

Health & Safety Authority (2006) Guidance on Risk Assessments and Safety Statements, Dublin, HSA Publications.

Health & Safety Authority (2006) Safety Representatives and Safety Consultation Guidelines, Dublin, HSA Publications.

Health & Safety Authority (2006) Guidelines on the Procurement, design and management Requirements of the Safety Health and Welfare at Work (Construction) Regulations 2006, Dublin, HSA Publications.

Health & Safety Authority (2007) Guidance for Directors and Senior Managers on their Responsibilities for Workplace Safety and Health, Dublin, HSA Publications

Health & Safety Authority (2007) 2007 Code of Practice for the Safety, Health and Welfare at Work (Chemical Agents) Regulations 2001, Dublin, HSA Publications

[Additional references pending]

Guidance from HSENI

Note: An updated list of Health and Safety legislation and guidance applicable to Northern Ireland is available o the HSENI website at http://www.hseni.gov.uk/resources/legislation.htm under the following headings:

- List of GB ACOPs approved for use in Northern Ireland
- List of guidance on regulations
- List of Northern Ireland ACOPs
- List of Primary Legislation
- List of subordinate health and safety legislation

Safe Work in Confined Spaces in Northern Ireland - Approved Code of Practice {Confined Spaces Regulations (Northern Ireland) 1999}

Workplace Health Safety and Welfare - Approved Code of Practice {Workplace, Health and Welfare Regulations (Northern Ireland) 1993}

First Aid at Work - Approved Code of Practice {Health and Safety (First Aid) Regulations (Northern Ireland)} 1982

Guidance from HSE UK

All publications are available from HSE Books, The Stationary Office (TSO) or most large book stores.

HSE Books catalogue – free from HSE Books

HSG65 – Successful Health and Safety Management – ISBN 978 0 7176 1276 5

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APPENDIX 2

Useful Contacts

IWEA
Sycamore House, Millennium Park, Osberstown, Naas, Co. Kildare

Health and Safety Authority
The Metropolitan Building, James Joyce Street, Dublin 1

Health and Safety Executive of Northern Ireland
33 Ladas Drive, Belfast BT6 9FR, Northern Ireland

Emergency Services within the Republic of Ireland
[To be confirmed]

Emergency Services within Northern Ireland
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IOSH practitioners can be contacted via the IOSH Register of Consultancy Services.

Association for Project Safety (APS)
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