SafetyOn and G+ Good practice guidelines

Contractor engagement and behavioural safety in onshore civils

SafetyOn

G+ Global Offshore Wind Health & Safety Organisation

In partnership with energy institute

SAFETYON AND G+

GOOD PRACTICE GUIDELINES – CONTRACTOR ENGAGEMENT AND BEHAVIOURAL SAFETY IN ONSHORE CIVILS

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BACKGROUND

Onshore civil engineering/construction works ('onshore civils') are an element of both onshore and offshore wind energy projects. For onshore projects, onshore civils includes, for example, the construction of access roads and foundations for wind turbine generators (WTGs). For offshore projects, they include trenching for cable routes on land and the construction of onshore infrastructure such as substations or operations bases.

From incident data and industry experience, SafetyOn and the Global Offshore Wind Health and Safety Organisation (G+) have identified onshore civils as a key risk area, with particular concerns about ensuring that contractors are fully engaged in health and safety, and (consequently) safe behaviours on site. SafetyOn and G+ therefore established a working group (WG), drawn from their memberships, to steer the development, with industry input, of these Good Practice Guidelines (GPG).

OBJECTIVES

The main purpose of the GPG is to set out the collective expectations of G+ and SafetyOn members, in order to share, advance and encourage good practice.

INTENDED AUDIENCES

The GPG is intended primarily for organisations that have a capacity to direct or influence civils works on site. These include wind farm developers, owners, and operators and their lead contractors, as well as interfacing organisations such as grid providers. For brevity, all such organisations are referred to as 'wind companies' in the guidelines.

The GPG is designed for use at management/organisational levels, rather than directly by on-site ('front-line') personnel.

USING THE GUIDELINES

This GPG provides a resource for wind companies to adopt and implement within their own safety management systems, for example by:

- Using it as a baseline to establish common ground between project parties.
- Incorporation into company standards, procedures and practices.
- Incorporation into contract specifications, as minimum requirements (with a requirement that alternative solutions should be justified as being at least equally safe, and be agreed between contracting parties).
- Use as a source of prompts for audits and reviews.
- Use as a resource for developing on-site materials, such as for safety campaigns, signage or checklists.

Wind companies should go beyond the guidelines where reasonably practicable, in accordance with the 'as low as reasonably practicable' (ALARP) principle.

SCOPE

Focus on contractor engagement and behavioural safety

The focus and emphasis are on contractor engagement, and hence on behavioural safety, in onshore civils. The guidelines do not cover working methods, technologies, plant, equipment etc., or specific hazards. So, for example, the guidelines do not explain how to carry out lifting operations safely in terms of the inspection of lifting equipment, what training should be provided for crane operators or what should be covered in a lifting plan. There is already a significant amount of guidance (and regulation, in some jurisdictions) on such topics.

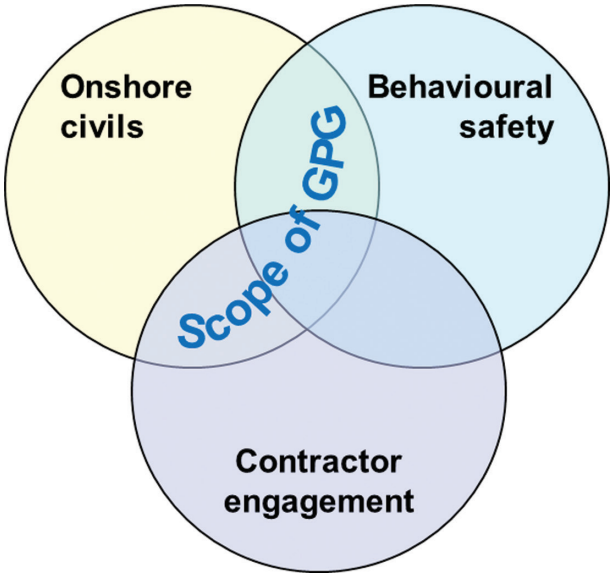


Figure 1: Guideline scope – focus on contractor engagement and behavioural safety

Following the guidelines – especially, for example, those on consulting with contractors and establishing feedback routes – should help to improve behavioural safety (and safety culture in general). However, the guidelines do not attempt to give detailed advice on behavioural safety programmes, since the most effective approach is likely to be highly dependent on the organisation's existing culture and context. Also, much of the existing guidance is now some 20 years old. Competent advice should be sought before embarking on a behavioural safety programme.

The figure above shows how onshore civils, contractor engagement and behavioural safety relate. There are, for example, aspects of onshore civils not related to contractor engagement and behavioural safety. These guidelines are concerned with the intersection area labelled in blue, in which onshore civils has elements of contractor engagement and/or behavioural safety.

Life cycle stages

The guidelines cover the entire wind project life cycle and so can be used in engagement with

contractors at all stages.

Geographical scope

The guidelines are intended to be used globally but are, necessarily based mainly on material and experience from regions and countries with the highest levels of installed capacity (e.g. Europe), which therefore have the most experience, and generally more mature safety regulation and practices. The availability of material in the English language has also been a factor.

GUIDELINE STRUCTURE

The guidelines have been structured broadly according to life cycle stage, from preparing to provide a safe system to decommissioning, dismantling and demolition. They also cover aspects that may apply across several life cycle stages: abnormal and emergency situations, and continuous improvement.

Each Guideline is presented as a short statement, followed by further explanation of the issues, 'how to' information, and signposts to any relevant references or additional sources.

A checklist, collating all of the guidelines is provided.

KEY MESSAGES

The overarching good practice points are:

– leadership: setting expectations and examples of safe behaviours;
– early engagement with contractors;
– setting and explaining generic safety expectations on contractors;
– having clear, concise safety requirements and a safety plan specific to each project;
– defining clear, coherent roles and responsibilities;
– open and continuous consultation and communication;
– addressing the challenges of working with a large and partly transient workforce, and
– clear and visible communication of 'golden rules' such as the right and duty to stop work if there is imminent danger, and the importance of reporting incidents and concerns.

1 INTRODUCTION

1.1 BACKGROUND

Onshore civil engineering/construction works ('onshore civils') are an element of both onshore and offshore wind energy projects. For onshore projects, onshore civils includes foundations for wind turbine generators (WTG) and access roads. For offshore projects, they include infrastructure such as substations, cable routes on land and operations bases.

From industry experience and incident data[1] collected by SafetyOn and the G+, it has been identified that onshore civils is a key risk area, with particular concerns about the contractor engagement – ensuring that contractors are fully engaged in health and safety, and (consequently) safe behaviours on site. In particular, it has been identified that some contractors, especially those who have only a short-term involvement with a project, are less likely to engage fully in the safety culture or follow required procedures.

SafetyOn and G+ recognised that, in order to raise expectations and drive continuous improvement, it would be helpful to:

– Set out in one place the collective expectations of G+ and SafetyOn members. Although these expectations do in some cases simply reflect existing regulations, standards or guidance, they are not all stated in one readily accessible place, and some aspects are not currently covered.
– Take account of the differences in markets: local regulations and standards differ and are more or less mature. Contract parties can have different scopes and responsibilities (the division of responsibility between wind company and grid operator varies from country to country, for example). Relying on wind companies and contractors following regulations and practices in the relevant geographical area would therefore be insufficient to achieve a consistent, high level of safety in both new and established markets.
– Help new entrants get up to speed, and raise the bar for more established companies.
– Take account of the fact that there is a constrained supply chain at present; not all the available contractors are working to the same level or have much experience.

SafetyOn and G+ therefore established a WG, drawn from their memberships, to steer the development of these guidelines.

Annex A gives more detail of the development process.

1 The published statistics are at https://safetyon.com/work-programme/statistics and https://www.gplusoffshorewind.com/work-programme/workstreams/statistics

1.2 OBJECTIVES, AUDIENCES AND USES OF THE GUIDELINES

1.2.1 Objectives

The purpose of these guidelines is to share, advance and encourage good health and safety[2] practice in onshore civils in the wind industry, with a focus on contractor engagement and behavioural safety.

1.2.2 Audience

The guidelines are intended primarily for organisations that have a capacity to direct or influence civils works on site. These include wind farm developers, owners, and operators and their lead contractors, as well as interfacing organisations such as grid providers. For brevity, all such organisations are referred to as 'wind companies' in these guidelines. The guidelines are designed for use at management/organisational levels, rather than directly by on-site ('front-line') personnel.

The guidelines set out the SafetyOn and G+ view of good practice, in terms of what wind companies should do, and what they should expect from their (sub)contractors. Wind companies should, however, go beyond the guidelines where reasonably practicable, in accordance with the ALARP principle.

1.2.3 Using the guidelines

The guidelines provide a resource for wind companies to adopt and implement within their own safety management systems, for example by:

- using them as a baseline for common ground, helping to bring parties together as a team with shared values and expectations;
- incorporation into company standards, procedures and practices;
- incorporation into contract specifications, or
- use as a source of prompts for audits and reviews, and
- use as a resource for developing on-site material for front-line personnel, such as for safety campaigns, signage or checklists.

SafetyOn and G+ recommend that wind companies should reference the guidelines as mandatory minimum requirements where they can, for example when placing a contract. Alternative solutions should be justified as being at least equally safe, be agreed between contracting parties and be documented.

2 From here on, 'safety' is used as shorthand for 'health and safety'. 'Safety' should be read to include health (both mental and physical) as well as safety in relation to e.g. injury. This is in no way intended to imply that health concerns are less important, but simply because writing 'health and safety' in full can lead to clumsy wording.

1.3 SCOPE

1.3.1 Focus on contractor engagement and behavioural safety

These guidelines are primarily concerned with contractor engagement and behavioural safety in onshore civils, not with safety management of onshore civils in general. Therefore, **the guidelines do not give advice on working methods, technologies, plant, equipment etc., or on specific hazards**, such as work at height or excavations. They are focused only on areas in which wind companies can:

– approach contractor engagement and behavioural safety in ways that enable and encourage good management of such hazards by the contractors, or
– usefully involve contractors in safety-related decisions.

For example, the guidelines do not advise on how to excavate safely around buried services, but they do note that the wind company should inform contractors of any known or suspected services, amongst other pre-construction information. Competent contractors should be aware of the 'subject matter' guidance relevant to their activities and associated hazards, and follow it as appropriate.

Figure 1 illustrates this aspect of the scope graphically, showing how the topics of onshore civils, contractor engagement and behavioural safety relate. There are, for example, aspects of onshore civils not related to contractor engagement and behavioural safety. These guidelines are concerned with the intersection area labelled in blue, in which onshore civils has elements of contractor engagement and/or behavioural safety.

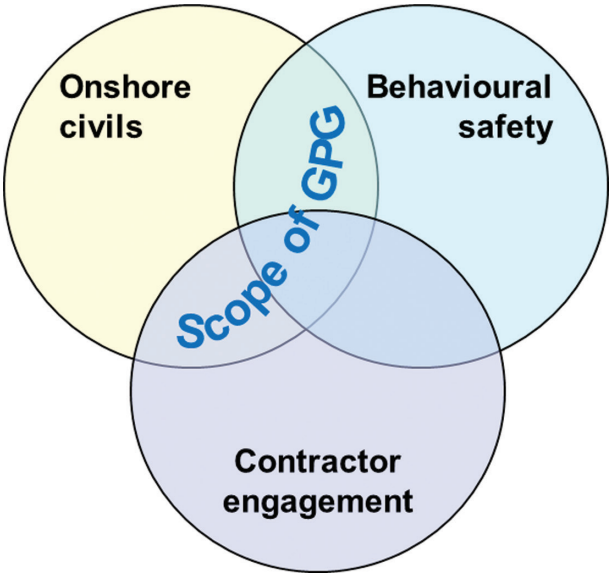


Figure 1: Guideline scope – focus on contractor engagement and behavioural safety

1.3.2 Activities and topics covered

A non-exclusive list of onshore civils activities is given in 2.2.

1.3.3 Life cycle stages

The guidelines cover the entire wind project life cycle and so can be used in engagement with contractors at all stages.

The focus is on risks that may materialise during on-site civil works, and latent risks that may materialise in later commissioning, operation and maintenance, or decommissioning. Such risks will be strongly dependent on earlier stages in the life cycle, for example whether the work has been effectively planned, and how far risks have been eliminated by design.

1.3.4 Geographical scope

The guidelines are intended to be used globally but, are necessarily based mainly on material and experience from regions and countries with the highest levels of installed capacity (e.g. Europe), which therefore have the most experience, and generally more mature safety regulation and practices. The availability of material in the English language has also been a factor.

Each state or region will have its own legislation that will need to be followed, as a minimum. These guidelines are in addition to such regulations.

2 DEFINING AND UNDERSTANDING ONSHORE CIVILS

This section describes the onshore civils system to which these guidelines apply. The 'system' includes all elements: people, policies and procedures, plant and equipment as well as engineered structures and other physical elements, all in their environmental and operational contexts.

Sections 2.1 to 2.3 respectively outline the physical elements, the activities and the main hazards. The environmental and operational contexts are described in Annex B.

2.1 PHYSICAL ELEMENTS

Enabling and temporary works, as well as permanent elements of the system, need to be considered.

The physical elements that may have associated onshore civils work include:

- Foundations for onshore WTGs, electrical substations, meteorological, CCTV and communications masts, and other infrastructure.
- Access roads.
- Hardstandings such as site compounds, areas for temporary generators, storage, laydown and pre-assembly areas.
- Transmission cables and other buried or overhead services (cable trenches can be 10s of km long).
- Transition joint bays between export cables from offshore wind farms and land cables.
- Operations bases, welfare, administrative, reception and security facilities.
- Utilities: 'domestic' electricity, water, sewerage, communications.
- Drainage.
- Fencing, signage, lighting.
- Environmental protection or reinstatement works, e.g. for storage of peat for reinstatement, or groundworks for habitat and landscape reinstatement.

2.2 ACTIVITIES

Onshore civils activities include:

- Intrusive surveys such as borehole or horizontal directional drilling, trial excavations and archaeological investigations (non-intrusive techniques, such as photographic and geophysical surveys, are not considered in these guidelines).
- Site clearance.
- Diversion of utilities and rights of way.
- Groundworks, e.g. for drainage or borrow pits.
- Excavations, piling and drilling, including horizontal directional drilling (HDD).
- Steel fixing.
- Concrete works.

– Cable trenching and cable laying or pulling.
– Lifting.
– Dismantling and demolition.

Offsite manufacture or fabrication, outside the construction site, is not considered in these guidelines.

2.3 MAIN HAZARD TOPICS

The following list of topics under which hazards may arise in onshore civils hazards has been derived from SafetyOn, G+ and wider industry input, as presenting the greatest risk and/or being most difficult to manage. They include hazards that may be created, or affected, by contractor activities, and those to which contractors may be exposed. Some are hazards in their own right, others are factors that may increase the risks or make controlling them more difficult. They are listed alphabetically – no order of significance is implied:

– Awareness, training and competence.
– Cable and pipeline strikes, other buried services and unexploded ordnance.
– Driving and travel to work (may be extensive in remote areas, adding to working day).
– Electricity.
– Emergency services access and response time. Familiarisation (what do emergency services need to know about the site? what does the wind company need to know about their service/availability?).
– Excavations.
– Ground loads and bearing strength (e.g. to support cranes and other plant).
– Ground slippage/peat movement.
– Hand working.
– Hazardous substances (contaminated land, existing structures, construction and maintenance materials etc).
– Interfaces – e.g. with adjoining windfarms (which may be in different lifecycle phases) or with existing land uses – hazards to and from the windfarm under construction.
– Language and cultural differences.
– Lifting operations and lifting equipment.
– Mobile elevating work platforms (MEWPs).
– Moving plant, machinery and vehicles – on site and for workforce and deliveries using public roads.
– Noise and vibration.
– Overhead lines.
– Poor quality risk assessments/ method statements (RAMS).
– Power and water supplies.
– Public/third party access – authorised or unauthorised: hazards from and to the site (e.g. vandalism).
– Scaffolding.
– Slips, trips and falls.

- Telecommunications.
- Temporary works.
- Weather.
- Working at height.
- Working in remote/inhospitable areas (e.g. in terms of emergency service access and response time, difficult terrain, inclement weather, travel time adding to fatigue).

3 GUIDELINES

The guidelines have been structured broadly according to life cycle stage, from preparing to provide a safe system (3.1) to decommissioning, dismantling and demolition (3.8). Aspects that may apply across several life cycle stages are then covered in 3.9 (abnormal and emergency situations), and 3.10 (continuous improvement). Figure 2 gives an overview.

This life cycle-based structure is an idealised way of grouping the guidelines in a reasonably logical order, simply to help readers navigate the document. The actual sequence of activities will vary, depending on the wind company's preferred approach, and possibly from project to project. For example:

- Prequalification may be undertaken generically, in order to establish a list of preferred suppliers who will be invited to tender for all projects, or for a specific project.
- Contractors may be engaged (formally or informally) during the planning and design phase, or only once the design is complete.
- Different areas of a wind farm may be at different stages of the life cycle: some WTGs may still be under construction while others are already in operation, for example.
- Many hazards need consideration at more than one stage. For example, any requirement for special vehicles to cope with terrain and climate needs to be made clear to contractors in the tender, then taken into account in planning and design, and monitored during operation.

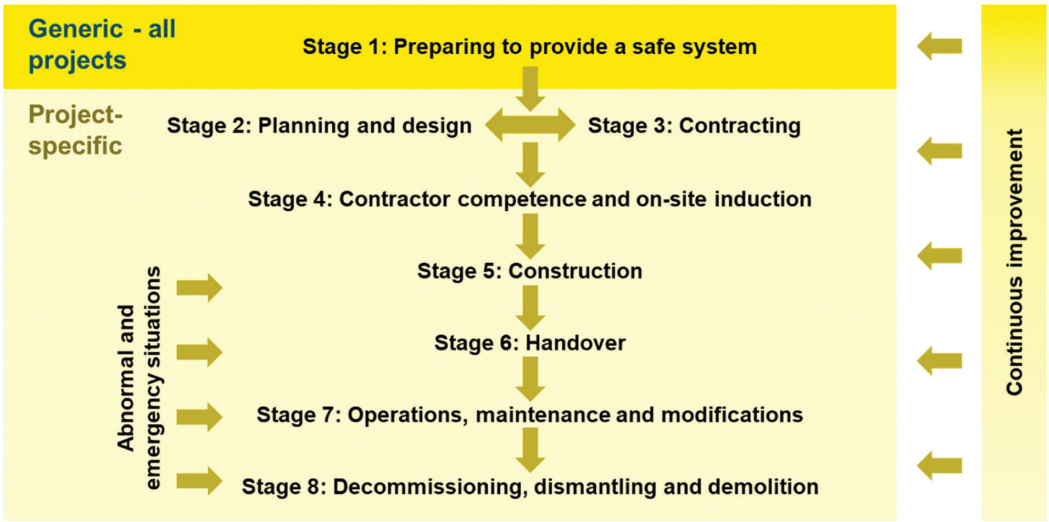


Figure 2: Life cycle stage model

Each guideline is presented as a statement in **bold**, followed by additional explanation of the issues and 'how to' information, and any specific references. Annex C collates all of the guidelines in the form of a checklist.

References are collated in Annex J and a bibliography of additional material is provided in Annex I.

3.1 STAGE 1: PREPARING TO PROVIDE A SAFE SYSTEM

This section gives guidelines for what wind companies should do at the generic level, for application to all projects.

3.1.1 General – use of guidelines

Two key points about the use of the guidelines themselves, as noted in 1.2, are restated here as guidelines in their own right.

Go beyond the guidelines where reasonably practicable, in accordance with the ALARP principle.

Reference the guidelines as mandatory minimum requirements where possible, for example when placing a contract.

Alternative solutions should be justified as at least equally safe, be agreed between contracting parties and be documented.

3.1.2 Understanding safety obligations

Identify and understand safety obligations relating to contractors

'Obligations' include legal duties, the requirements, needs and expectations of interested parties, and requirements of the wind company's own policy commitments.

Wind companies will need to be familiar with generic safety legislation in the jurisdictions in which they operate.

It is a good safety management principle (backed up in law in some jurisdictions), that a client (a wind company in this case) should not attempt to 'contract out' their overall responsibility for safety to a contractor.

This does not mean that no safety responsibilities can be delegated to a contractor. That would be impractical and undesirable, since a wind company cannot reasonably be expected to be expert in all aspects of a contractor's work. Indeed, they may engage a contractor precisely to make use of the contractor's expertise, and so obtain better safety outcomes overall. However, the client needs to assure themselves of the contractor's suitability, as described in later guidelines.

Identify and manage any inconsistencies between obligations

Inconsistencies or even conflicts may arise, especially where a project involves working across jurisdictions, or with contractors from different countries. For example, in some jurisdictions, it may be legal to transfer responsibility for safety risk to another party by contract, which could conflict with the previous guideline (3.1.2), recommending that wind companies retain overall responsibility.

Any differences between what is legally allowed or required, the wind company's principles, policies and approaches, those of other interested parties, and these guidelines need to be identified, discussed openly with the parties and resolved. Legal requirements will have to be complied with, but beyond this the most stringent of the various approaches should be taken, subject to reasonable practicability.

3.1.3 Contracting policy

Develop internal policy/guidance on the use of contractors

Safety-related questions for wind companies to ask themselves in deciding whether, and in what areas, to use contractors include:

– Is this a core activity over which the company needs to maintain strict control? (if yes, it suggests not to contract out)
– Is there internal competence and resourcing to undertake the work?
– Could contracting out undermine internal competence?
– How will learning from experience (LFE) be obtained from the contractor?
– If the work is further subcontracted, how will safety be maintained?

General guidance documents on contract management (not specific to wind, or onshore civils) are listed in the bibliography.

Develop internal policy/guidance on contractor engagement

Factors to take into account in developing internal policies, guidance or procedures are outlined as follows.

Contracts for different elements of the project will be placed at different points in the project life cycle. The best point at which to begin contractor engagement will depend on:

– The contractor role and scope of the work, contractors with a major role and wide scope (e.g. principal contractors) will in general need to be engaged before those who will deliver smaller, more specialised scopes that have less interaction with others.
– How the scope and sequence of the contracted work relate to the project programme. (planning, design, build etc…)
– The complexity and novelty of the work – the more complex or novel, the more important is early engagement.
– The level of understanding of the work within the wind company itself.

Explaining safety (and behavioural) expectations and listening to contractors' ideas and concerns can begin before any formal prequalification or tendering; for example, in how safety expectations are presented on the wind company website and at supply chain engagement events.

Early engagement of contractors in planning and design, and associated hazard identification, assessment and definition of controls, will in general have safety benefits.

Questions and concerns that contractors may raise include, for example, whether they will be paid for such engagement, whether they might acquire any additional liability or responsibility by being involved in the design, and whether there is an expectation on them to flow down the principle of early engagement to their supply chain. The wind company's policy in answering such questions should be stated. It may also be helpful to state the policy regarding any preferred forms of contract for early engagement (see 3.3.4).

Specific areas in which early engagement is most likely to be valuable are highlighted in the Stage 2 guidelines (3.2).

Contractual aspects of early contractor involvement are outlined in Stage 3 (3.3).

3.1.4 Intelligent customer capability

Act as an intelligent customer

An 'intelligent customer' has a clear understanding and knowledge of the product or service being supplied, in order to:

- Assure themselves whether contractors are suitably qualified and experienced.
- Be able to ask appropriate questions of the contractor.
- Understand the limitations and implications of the contractor's work (although it is not necessary to have the depth of knowledge required to undertake the work itself).
- Retain oversight and coordination of all contracted-out elements, such that they can ensure safety of the system as a whole.

3.1.5 Safety management system

Ensure a safety management system within which contractors can work safely and effectively

The safety management system, should contain sufficient and appropriate material relating to engagement with contractors, clearly explained, in a form that facilitates sharing of relevant content with contractors and providing a framework within which they can work safely. The system should include, or refer to, in particular:

- Company policies and procedures regarding use and engagement of contractors (3.1.3).
- Internal roles and responsibilities relating to contractors, with the associated skills and competence requirements.
- Generic expectations for all contractors on all projects (see 3.1.6).
- High-level criteria/thresholds for prequalification and selection of contractors. These should cover organisational capability (the policies, systems, people and resources), the skills, knowledge and experience of those who will carry out the work, and historical performance (see Annex E, and 3.3.5 for an outline of how these may need to be reviewed and adapted where necessary for particular projects and work scopes).
- Targets and key performance indicators (KPIs) for monitoring and evaluating contractor performance during operation. Care is needed to avoid defining targets and KPIs, etc. that can lead to 'target-chasing'.

3.1.6 Safety expectations

Define generic safety expectations for all contractors and projects

Safety and behavioural expectations should be based on, and refer to, the wind company's own safety policy and arrangements, local regulations, standards (ISO, IEC, etc.) and to other relevant guidelines. For example, there are several Good Practice Guidelines (GPGs) published by SafetyOn, at: https://safetyon.com/work-programme#publications and by G+ at https://www.gplusoffshorewind.com/work-programme/workstreams/guidelines.

Section 3.3.8 covers the development of more specific expectations on contractors, as Safety Requirements for particular projects and work scopes.

3.2 STAGE 2: PLANNING AND DESIGN

The overall safety aim in this life cycle stage is that, wherever possible, hazards are designed-out, or at least minimised, as early as possible, such that the system is 'safe by design' and contractors have a safe environment in which to work. Decisions made in planning and design will affect later life cycle stages, including the onshore civils work itself.

The guidelines in 3.2.1 to 3.2.3 describe general principles for effective contractor engagement during planning and design. Guidelines 3.2.4 to 3.2.11 highlight some specific aspects of planning and design in which contractor involvement will be particularly valuable.

3.2.1 Early contractor engagement

Build relationships and begin engaging with contractors early in the project

As noted in 3.1.3, explaining safety and behavioural expectations and listening to contractors' ideas and concerns can begin before any formal prequalification or tendering.

Contractual aspects of early engagement of contractors, are outlined in 3.3.4.

3.2.2 Design risk assessment

Involve contractors in design and design risk assessment

Wherever possible, those who will actually carry out the work should be involved in the design process and design risk assessment (DRA), helping to ensure that risks are eliminated or minimised by design (see bibliography). Statements about residual risks, such as 'contractor to address in construction phase' should be avoided where possible, unless it is clear that there is no better option in the design and that the contractor will be able to reduce the risk to ALARP.

3.2.3 Constructability review

Involve contractors in constructability reviews

Reviews should be conducted throughout the design phase, looking at how the engineered solution can be safely constructed. Wherever possible, reviews should include contractors.

3.2.4 On-site access

Plan and design appropriate and convenient on-site access routes

Contractor input – e.g. regarding the capabilities and requirements of large vehicles, will be beneficial in:

- Ensuring a safe layout from the vehicle movement point of view (e.g. visibility, vehicle/pedestrian interaction, avoiding the need to reverse).
- Ensuring thorough consideration of layout and construction aspects such as width, turning radius and swept path analysis for large vehicles, bearing strength, drainage, gradients and crossfalls.
- Ensuring adequate parking and passing places.
- Ensuring appropriate visibility, signage, marking and lighting.

– Site traffic safety measures could include e.g. providing vehicle transport on site where unsafe for pedestrians.
– Reducing any incentives to take unofficial short cuts – these can lead to vehicles becoming stuck or overturning on soft verges.

The SafetyOn GPG on traffic management https://safetyon.com/__data/assets/pdf_file/0011/894674/SafetyOn-Traffic-management-for-onshore-wind-farms.pdf gives further information (and also some material relating to the next topic, public roads).

3.2.5 Traffic management on public roads

Develop appropriate traffic management plans

This includes the selection/ restriction of routes to site on public highways, and the provision of work site transport (e.g. buses from local transport hubs) to reduce private vehicle traffic to site.

There have been issues of congestion (and hence, potentially, safety) caused by construction traffic gathering on public roads at the start-up of site work, and with drivers not staying on agreed public highway routes.

3.2.6 Public and third party access

Plan and design safe public and third party access

This includes ensuring safe and appropriate arrangements, informed by local consultation, for public access on or around the site during construction, with consideration of any necessary closure or diversion of rights of way or other restrictions, and how these will be effectively communicated to users. Restrictions should be focused on where actual risks are present and kept to the minimum area and duration. Limitations that are seen to be proportionate and credible are more likely to encourage compliance.

Contractors can have a useful role in ensuring the best balance between safety and access, from their understanding of the nature and frequency of vehicle and plant operations on site and other activities that may pose risks. Locally-based contractors may have local knowledge of formal and informal routes and uses of the land.

3.2.7 Telecommunications

Survey communication coverage and develop communication plan

A survey to map areas of no or weak signal will inform development of a practical communications plan, and on-site signage, to share with contractors before work starts.

No single communication technology works everywhere but there are several available (mobile phone, radio, internet etc).

Both on-and off-site communication should be considered. Off-site communication is needed for contact with company offices or bases, e.g. for safety advice, and in the event of needing to call emergency services.

Contractor engagement will be important in, for example, understanding what technologies

they already use, and any opportunities or constraints associated with new technologies.

3.2.8 Working environments

Plan and design appropriate working environments and infrastructure

Contractors should be involved in ensuring that the right work environments and supporting infrastructure are planned for and designed, such that work can be carried out safely and effectively. Considerations include, for example, weatherproofing, lighting, availability of electrical power and other supplies and services.

For example, transition joint bays vary greatly, from purpose-built wind-and weatherproof areas to 'pulled together' sites without good protection. Cable jointing is a skilled job, and the degree of weather protection afforded by the structure and other design features of the bay will affect how well it can be done.

3.2.9 Welfare and first aid

Plan and design accessible, appropriate welfare and first aid facilities

The minimum essential elements of welfare include access to toilets, changing and washing facilities, drinking water and somewhere to rest and eat. Additional facilities, such as smoking areas and access to refreshments should also be considered. People with disabilities should be provided for, and separate facilities may be needed for men and women.

Facilities should have adequate backup power supplies for heating and lighting, and reliable and effective communication with emergency services. This is particularly important for security staff, who may be present, alone or in very small numbers, for long periods outside main working hours.

A first aid risk assessment should be carried out to establish what is needed, taking account of, for example, the number of people present, the hazards and likely injuries/illnesses, the accessibility or response time of emergency services. So, for example, unless risk assessment conclusively shows otherwise, easily portable defibrillators and first aid kits designed for use in remote areas should be provided. First aid kits should include material for treatment of burns, insect bites and any other injuries associated with the site or activities; specialist rescue equipment, such as stretchers for use across bog or water, may be needed.

Welfare facilities should be close to the work site(s), such that the workforce is not deterred from taking sufficient breaks. Breaks are important for remaining engaged with safety information and formal/ informal exchange of safety information in the welfare area, as well as for mental and physical wellbeing. Sitting inside the 'bubble' of a digger cab for many hours a day is not good for any of these. As windfarms can extend over large areas, mobile or satellite welfare facilities (and fire/emergency assembly points) may need to be provided.

Contractor input to planning and design decisions related to all of those will be helpful, as contractor personnel are likely to be the main users of these facilities.

3.2.10 Resourcing

Estimate workforce skills and numbers required over the project

Realistic forecasts made by the wind company (ideally with input from early contractor

engagement – see 3.2.1) in preparation for tendering and kept up to date throughout the project, can reduce the need for transient, short-term workforces. It will also help contractors to plan their own resourcing and so avoid potential safety issues associated with resourcing, such as inadequate training or excessive time pressure. Early contractor involvement will be beneficial, as the contractors themselves will usually be best placed to make such estimates.

3.2.11 Lone working

Develop lone working policy and arrangements, eliminating lone working where possible

For some project activities, e.g. early site surveys, or out-of-hours security, there may be lone working, or very small teams present on site. Wind companies should consider whether this is really necessary, or whether the risks could be eliminated by using remote surveillance and/or intruder detection systems. These have been used on long cable routes, for example.

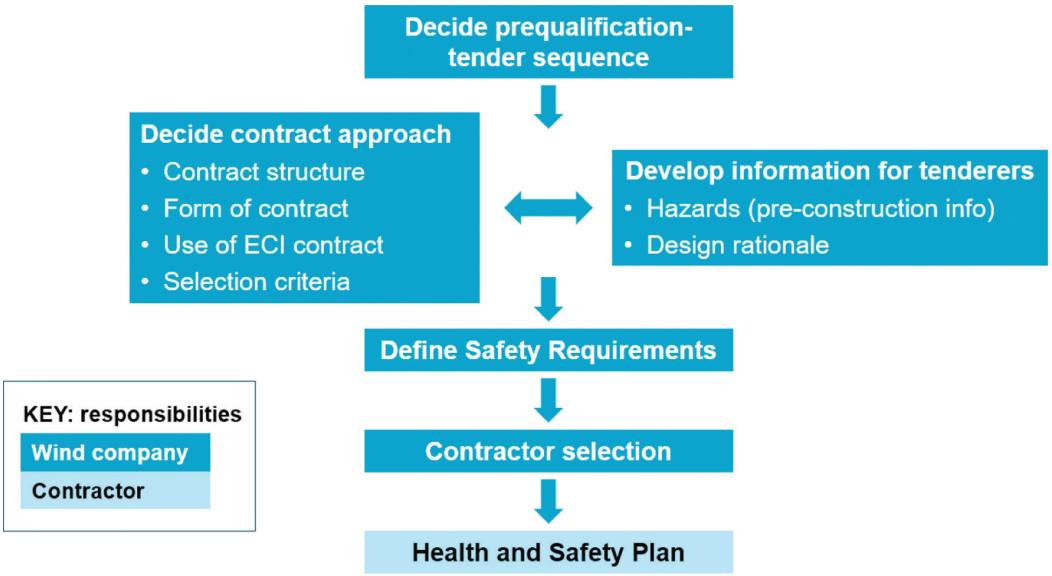
Contractor input to decisions about lone working will be important, as contractor personnel are likely to be the most exposed to the risks.

3.3 STAGE 3: CONTRACTING

This section provides guidelines for use where, after following the wind company's own policy and guidance on contracting (3.1.3), it has been decided to contract-out some or all of the civils work.

The contracting process will often be iterative with planning and design (Stage 2), because the work packages required will only become clear as planning and design progress. This iteration will be especially important where early contractor engagement is required.

Figure 3 presents a simplified model of the contracting process from the safety viewpoint. The following guidelines are structured in line with this model.



NB: A (Health and) Safety Plan (or similar document) setting out how health and safety will be managed should be developed as a common statement and key reference for all parties to the project. In some jurisdictions, however, it is the principal contractor's responsibility to prepare the Plan. See also 3.3.10.

Figure 3: Contracting process

3.3.1 Prequalification and tender process

Take safety into account when deciding the prequalification-tender sequence

The number and scope of the stages in contractor selection processes can vary. For some projects or work packages, there may be a prequalification stage before issuing an invitation to tender to qualified contractors. Other projects or work packages may go straight to the issue of a tender invitation. Prequalifications are sometimes generic, asking questions relevant to any potential work that the contractor might be invited to bid for, and sometimes specific to a project or type of work.

Decisions regarding the number and scope of stages in the selection process are likely to be driven mainly by commercial strategy, project management and supplier market considerations rather than there being a strong *a priori* preference for one or the other route from a safety viewpoint. Nevertheless, safety considerations should be taken into account.

Because of this variability, the following guidelines do not specify whether a particular selection activity falls into the prequalification or tender stage – the processes are referred together as 'selection'.

3.3.2 Contract organisational structure

Develop a contract structure that facilitates effective management and communication between parties

The hierarchy of, and relationships between, client, contractors and subcontractors should be structured to optimise and clearly define:

– The roles and responsibilities of each party.

– Lines of control and communication.
– Responsibilities for, and lines of consultation and communication with other interested parties, such as neighbouring communities, landowners, regulators, emergency services, etc.

Key safety considerations in setting up an effective structure include:

– The safety maturity of the parties: what can realistically be expected of them, and what supervision and monitoring are required?
– Access to, and responsibilities for, provision and maintenance of any shared facilities and services, such as access roads and welfare facilities.
– Responsibility for systems at the transmission grid interface. There may be differing assumptions and expectations in different countries (reflecting how electricity markets are structured and regulated) about exactly where the boundary with the grid operator lies.

In some jurisdictions, there are legally mandated safety duties on key parties (e.g. clients, principal contractors and other contractors, principal and other designers). In the EU, for example, these are the national implementations of Directive 92/57/EEC – Temporary or Mobile Construction Sites – see https://osha.europa.eu/en/legislation/directives/15. In the UK, the relevant legislation is the Construction (Design and Management) (CDM) Regulations 2015 https://www.hse.gov.uk/construction/cdm/2015/summary.htm

Such legislation, and associated regulatory guidance, should be used as the starting point for allocating responsibilities, adding project-specific detail and implementing arrangements as appropriate.

3.3.3 Contract format

Use a standard form of contract

For safety, as for other aspects of a contract, it will generally be beneficial to use a standard, widely recognised form of contract, such as NEC3, NEC4 or one of the FIDIC suite of contracts for all contracted-out work. Consistent forms of contract will make it easier to achieve consistent and effective safety management between contractors (e.g. for WTG and Balance of Plant) and to flow down safety requirements to subcontractors.

https://www.neccontract.com/products/contracts

https://fidic.org/bookshop

3.3.4 Early contractor involvement (contractual)

Consider using an ECI contract

Early contractor engagement, in a general sense, has been described in 3.2.1. The term 'early contractor involvement' (ECI) is used in these guidelines to refer specifically to formal, contractual arrangements for such early engagement.

The NEC4 form of contract includes an option (X22) for ECI. It is a two-stage process. Stage 1 is the pre-construction ECI phase, with development of the scope, detailed design and agreement on price. Stage 2 is the construction phase, including completion of any remaining detailed design.

NEC4 Early Contractor Involvement ECI (optional Clause X22[3]). https://www.neccontract.com/About-NEC/News-and-Media/Engaging-suppliers-early-with-NEC4

The ECI option affects many aspects of the contract, not just safety: overall, it is intended to help contractors ensure construction operations run smoothly, and so reduce costs. Whether or not a wind company should use it will therefore depend on many factors.

3.3.5 Selection criteria

Develop appropriate selection questions and criteria

Generic contractor selection criteria, which can be defined in the overall safety management system as described in 3.1.5, may need to be amended or extended for the specific project or work package. Changes may be required to, for example:

– Reflect any specific safety priorities – for example, if particular contractor experience is required in dealing with an unusual hazard.
– Take account of LFE from previous tenders and contracts. Such changes should also be made, if and as appropriate, to the generic questions and criteria.

Annex D: provides a non-exhaustive list of selection criteria that may be considered.

Tender law in some jurisdictions may restrict what can be asked for in prequalification, selection and tender processes.

3.3.6 Pre-construction information

Inform contractors about known or potential project-specific hazards

These could include, for example, any:

– Buried services and overhead lines (especially as these may not be shown on published maps, registers etc).
– Land contamination.
– Existing infrastructure that may be structurally unsound or contain hazardous materials.
– Adjacent facilities that may pose hazards to the construction site, constrain working methods or be particularly vulnerable in the event of a construction accident.

In the UK, for example, there is a specific duty on Clients to provide Pre-Construction Information (PCI) to every designer and contractor either bidding for the work or already appointed to the project. See https://www.hse.gov.uk/construction/cdm/2015/summary.htm.

There is no need to list standard, foreseeable hazards of which any competent contractor should be aware, such as lifting, work at height or excavation, unless they are likely to be particularly severe or unusual in some respect. This would clutter up the document and dilute the prominence that needs to be given to the significant project or site-specific hazards. However, the wind company should ensure that it is clear to the contractor that such standard hazards are not covered. Also, in an emerging industry, where some contractors will have

3 An ECI clause for use with the earlier, NEC3, contract is also available. The NEC website says 'The NEC3 and NEC4 versions of the ECI clause have some small, but not insignificant, differences. Those wishing to use ECI with NEC3 may wish to adopt the wording of option X22 from NEC4, making the appropriate changes to align it with NEC3 drafting style and content.'

little experience, it is important to be careful about assuming what will be 'obvious' to them.

Offering a site visit to (potential) contractors can be beneficial.

The system description in section 2 of these guidelines may be useful as a prompt to the identification of features and hazards about which contractors should be informed.

3.3.7 Information to tenderers – design rationale

Inform contractors about the safety rationale for the design

As well as outlining physical elements of the design, it is helpful to identify the safety functions of the system elements and outline *why* they have been, or are being, designed as they are, from the safety viewpoint. This will help to avoid any tendencies to deviate from the design and its intent when on site, e.g. by changing a construction sequence or assembly details that may compromise safety.

The availability, accessibility and quality of design decision logs are crucial, for this purpose of informing contractors about rationale and for safety more generally. Experience has found that logs are often lacking in early stages.

3.3.8 Safety requirements

Develop Safety Requirements for contractors

Safety Requirements for contractors should be provided with the tender invitation, so that the contractor can understand what will be needed. The Requirements will subsequently form a starting point for developing the Safety Plan (3.3.10).

The Requirements should be built on the high-level, generic expectations for contractors as identified in 3.1.5. They should take account where necessary of project-specific and work-package-specific factors, and draw on the evolving design and DRAs.

Wind companies will typically have a standard set of Safety Requirements for all projects and contracts. Where there is a need for additional detail or changes to reflect project or work-package factors, it will usually be better to show these in an appendix rather than by altering the main text. This will help to maintain (where appropriate) a consistent approach with other contractors on the project, and with other projects. Making changes to the main text will make it more difficult to 'disentangle' the specific from the generic when the Requirements need to be edited for the next project, and will complicate document control.

How much detail is in the Requirements as compared to how much is in the Plan, in particular how far they should prescribe or recommend solutions for managing hazards, will depend on several factors, including:

– The relative experience of the wind company and the contractor(s). While retaining the Intelligent Customer role (3.1.4), the wind company should not prescribe solutions in detail for hazards of which the contractor has greater skills and experience.
– The status of planning and design. The earlier in the process that the Requirements are issued, the less understanding there will be of what the hazards are and how the design can eliminate or minimise them. It will therefore be appropriate to leave the details for a later stage of Plan development.
– The approach to contractor engagement (3.2.1 and 3.3.4). Where there is early engagement, there can be a more collaborative approach to developing the Safety Requirements and the Plan as work progresses.

3.3.9 Behavioural safety programmes

Many of the guidelines will have an effect on behaviours (and on safety culture more widely), for example by setting clear expectations on contractors, and by facilitating and welcoming feedback. The specific question addressed in this section, however, is whether to implement a structured behavioural safety programme.

Consider the advantages and disadvantages of a behavioural safety programme

The advantages and potential pitfalls of behavioural safety programmes have been identified in, for example, https://www.hse.gov.uk/humanfactors/topics/behaviouralintor.htm. Key points to consider when deciding whether to implement a programme for onshore civils are that:

– There are many advantages to a behavioural safety programme, but these programmes (and cultural change) take time, resources and a concerted effort: senior management commitment will be needed.
– The effectiveness of a programme largely depends on the existing culture.

- It is a useful addition to the toolkit for occupational safety, but has limited benefits for the control of major hazards.
- The bias towards measurable success can take the focus away from the basics of safety management.
- In line with the hierarchy of control, a focus on individual behaviours will not be effective unless all higher-level measures have already been taken; it should not be used to try to compensate for an ineffective safety management system, or poorly-planned and designed work or workplaces.
- In identifying improvements, the safety management system and engineered solutions need to be considered: a behavioural problem does not always require a behavioural solution.
- Any programme should include *management* as well as workforce behaviours.

Seek competent advice before embarking on a behavioural safety programme

Much of the authoritative guidance on behavioural safety (see bibliography), while still available or referenced on the HSE website, is now some 20 years old.

Agree and define any behavioural safety programmes in consultation with the contractor(s)

Because of the importance of the existing safety cultures of the organisations and workforces involved, which can vary widely, it is important that contractors are consulted before prescribing a behavioural safety programme.

3.3.10 Safety Plan

Ensure that an appropriate Safety Plan is in place

The purpose of a Safety Plan is to outline the safety arrangements, site rules and control measures, as a common basis for all working on site.

The leading (prime or principal) contractor would usually develop the Safety Plan. In the UK, under the CDM Regulations, it is the responsibility of the Principal Contractor to prepare the Plan (referred to as the Construction Phase Plan)

The Plan will reflect the Safety Requirements, but expand on them as necessary in order to achieve the purpose, for example by adding:

- the findings of further, project-specific hazard identification and assessment, and/or
- practical detail of how the contractor will meet the Requirements. In general, as noted in 3.3.8, it is not appropriate for the wind company to prescribe exactly *how* hazards should be managed, but rather to leave it to the contractor who has the specialised expertise and experience.

Table 1 shows the typical steps leading towards the development of a Safety Plan across the lifecycle stages.

Table 1: Development of a safety plan

Stage	Responsibility	Task	Key inputs
1. Preparation	Wind company	Develop generic safety expectations	Wind company's own policy and arrangements
2. Planning, Design and Contracting	Wind company	Develop Safety Requirements and PCI	Generic expectations from Stage 1. Project-specific design information and DRAs. Other project and work package specifics
3. Contracting	Contractor	Develop Safety Plan	Safety Requirements and PCI from Stage 2/3. Contractor experience and engagement with wind company

3.4 STAGE 4: CONTRACTOR COMPETENCE AND ON-SITE INDUCTION

This section focuses on individual personnel arriving on site.

Engage with the contractor organisation to ensure that all contractor personnel have the required competences

Responsibility for training of individuals lies with their employer. The wind company should therefore engage with the contractor organisation, rather than risk putting an individual under pressure once on site if they are not clear about the scope or validity of their training.

One example of a competency requirement is that related to the hazards of driving on rough roads, on narrow lanes, between high hedges, in adverse weather, etc. Four-wheel drive training as commonly provided is often just about operating and handling the vehicle, not general road behaviour. Such training can give useful confidence in vehicle handling, but over-confidence can be an issue. See also 3.2.4 regarding on-site access and 3.2.5 regarding traffic management on public roads.

Define required skill cards and qualifications

Competence requirements for the project or activity need to be agreed and defined.

There are multiple schemes for accrediting and issuing skill cards and other qualifications. The Global Wind Organisation is working to develop internationally consistent training standards and qualifications specific to the wind industry, some of which, such as https://www.globalwindsafety.org/standards/slinger-signaler, are relevant to onshore civils.

There are also several construction industry schemes, such as www.solas.ie or www.cscs.uk.com.

Wind companies will need to be aware of the relevant schemes for their project location,

and assure themselves that the schemes cover the required scope and level of competencies. For sites with contractors and personnel from different countries, it will also be important to understand any existing inter-acceptability or equivalence arrangements between different national schemes, or to define the wind company's own.

3.5 STAGE 5: CONSTRUCTION

This section covers the actual work on site.

3.5.1 Induction

Ensure all personnel receive a site-specific induction

The topics covered should include, but not be limited to, the following:

- senior management commitment to safety;
- outline of the project;
- management of the project;
- first aid;
- accident and incident reporting;
- emergency arrangements (e.g. e.g. contacts, plans and equipment);
- communications (see 3.5.4);
- arrangements for briefing and updating personnel, e.g. toolbox talks;
- arrangements for consulting the workforce;
- individual's responsibilities;
- site rules (e.g. personal protective equipment (PPE), use of personal phones, permits to work, fire prevention, traffic management, hot works, restricted areas...), and
- any particular risks and control measures that those working on the project need to know about.

Inductions should also be provided to those who do not regularly work on the site, but who visit infrequently, such as delivery drivers. The inductions should be focussed on and proportionate to, the nature of the visit. Inductions to escorted visitors need not have as much detail as those for unescorted visitors.

Where there are likely to be workers whose language is not the main language used on site, translations of the induction pack and site rules and signage should be available.

It will usually be most appropriate for the (principal) contractor to deliver the induction.

3.5.2 Teams and communications

Consider and allow for language and cultural differences

Where there are multi-national teams, make good use of pictorial/ video communication to avoid language difficulties. Key documents and signage could be translated, and 'buddy'

systems set up.

Nordisk Vindkraft. *Havsnäs Wind Farm A guide on Health and Safety.* http://www.nordiskvindkraft.se/media/2420985/Havsnas-Health-and-Safety-guide.pdf is a useful case study. It stresses the importance of regular communication with contractors, clear expectations and language issues, and managing a large and sometimes transient workforce.

3.5.3 Site access and occupancy

Ensure control and knowledge of who is actually on site at any time

For general safety management and emergency purposes, as well as security, it is important to ensure that there is control of access to the site, and to know who is on site at any time, not just who is scheduled to be. Apps are available to control access and track personnel locations.

There have been issues with hire plant fitters, working to their own computerised maintenance schedule, arriving on site and starting work, without signing in or induction.

3.5.4 Communications

Ensure that everyone is aware of the communications plan

Everyone working on site, including those who are only on the site occasionally or briefly, needs to be aware of the communication plan as developed, as described in 3.2.7. Key areas to understand are:

– lines of communication (who, what and when);
– contact details;
– what communication systems work where, and
– what equipment they need.

3.5.5 Consultation and communication with the workforce

Ensure awareness of risks, and of opportunities to give feedback

Transient, short-term workers should be included in safety engagement activities such as safety walkrounds, toolbox talks and 'stops for safety'. It was stated in the workshops for these guidelines that incidents on first visits to site (both first-time for an individual, and first visit to site, using e.g. existing farm or forestry roads) were relatively common. They included for example, vehicles running off the edge of the road and tipping over and drivers ignoring one-way systems.

IT can help effectively communicate with those out on site, deliver safety information. This needs good tracking of who has taken part in what. For example, interactive displays in welfare areas, safety apps/QR codes to deliver inductions and updates. Caution: although such tools can have questions to test understanding, care is needed to ensure they are not just a 'tick box' exercise.

3.5.6 Hired-in plant

Ensure that there are adequate checks on, and training for, use of hired-in plant

Ensure that contractors only hire safe and appropriate plant, perform adequate, regular checks on hired-in plant, and give suitable training and instruction to workers in using it safely.

3.5.7 Interfaces

Ensure safe management of interfaces between construction and operation

There may be interfaces between areas of a wind farm, or with adjacent farms, that are under construction and in operation. This interface can move with time as work progresses. Dialogue between the respective teams is important.

3.6 STAGE 6: HANDOVER

Develop and implement a clear and coherent strategy for handover from civils to the next team

It is essential that all parties are made aware of, and understand, the expectations and their roles and responsibilities in the handover process, such that there are no gaps or inconsistencies in responsibility.

Typically, the civil contractor will be the principal contractor throughout (rather than handing over each turbine in turn once its civil works are completed or once it is commissioned/operational.) However, a tendency was noted in one of the contractor workshops for clients to appoint and mobilise the electrical contractor separately, such that there is an overlap of lead contractors. This would require careful safety management.

The handover is typically from civils to mechanical and electrical for fit-out or installation, then on to commissioning and/or operations.

3.7 STAGE 7: OPERATIONS, MAINTENANCE AND MODIFICATIONS (OM&M)

Ensure that arrangements for civil works carried out in OM&M take account of changes in context

Major maintenance or repowering work may require civil works, such as strengthening of hard standings to support heavier cranes than were used for construction, or to increase the width or load-bearing capacity of access roads.

The hazards, and hence the associated guidelines, are similar to those for these activities in initial construction (3.5). However, the operational context may be different. For example, the work may need to be carried out in proximity to other WTGs that are in operation. Also, the availability of supporting services and welfare facilities may be different, and possibly reduced.

3.8 STAGE 8: DECOMMISSIONING, DISMANTLING AND DEMOLITION (DDD)

Ensure that arrangements for civil works carried out in DDD take account of new hazards and changes in context

Hazards in DDD should have been identified in the design stage, and the system designed to enable safe **DDD at end of life**, with information in a Health and Safety File or equivalent. However:

– Hazards are likely to be different to those in construction, as the process is often not just a simple reversal of the construction sequence; it may be necessary, for example, to cut or break structures that had been constructed by pouring concrete or gluing.
– The operational context may be different from that during construction. For example, the work may need to be carried out in proximity to operational WTGs, and the availability of supporting services and welfare facilities may be different, possibly reduced.

Post-incident decommissioning can create new hazards, since unusual, relatively unplanned, works may be required; for example, to ensure the strength and stability of a damaged asset and safe means of access to it. Another example would be a need to cover a fire-damaged nacelle to protect it during incident investigation.

Further guidance is available in the SafetyOn GPG, https://safetyon.com/__data/assets/pdf_file/0009/880362/SafetyOn_Post-incident-decommissioning-of-onshore-wind-turbines.pdf

3.9 ABNORMAL AND EMERGENCY SITUATIONS

Ensure contractors are aware of, and follow, the SafetyOn emergency guidelines

Further guidance is available in the SafetyOn GPG, SafetyOn Onshore Emergency Response. Good practice guidelines for onshore wind energy developments https://safetyon.com/?a=777521

3.10 CONTINUOUS IMPROVEMENT

Ensure effective capture of learning from all contractors

Key areas to consider in continuous improvement include maintaining standards, sharing LFE and other organisational learning, and regular management review.

Contractors' involvement with onshore wind can be transient or intermittent – they may be engaged on one project, but not again for several years.

Experience shows that capture of, and learning from, experience is easier on operational sites, where a small number of organisations are involved and the workforce is relatively stable, than during construction, where there are multiple organisations and individuals, some with only short-term, transient involvement.

The EI Toolbox website https://toolbox.energyinst.org/about-toolbox is a useful resource for incidents and LFE.

Ensure effective capture of learning relating to the contracting process itself and behavioural safety

Feedback should be proactively invited on how well the contract process supported safety management. This can be done regularly throughout the contractor's involvement on longer contracts, and as part of the close-out of their scope of work.

4 SUMMARY OF KEY MESSAGES

The key, overarching good practice points are:

- early and open engagement with contractors;
- setting and explaining generic safety expectations on contractors;
- having clear, concise Safety Requirements and a Safety Plan specific to each project;
- defining clear, coherent roles and responsibilities;
- ensuring ongoing consultation and communication, and
- addressing the challenges of working with a large and partly transient workforce.

ANNEX A
GUIDELINE DEVELOPMENT

A.1 PRINCIPLES

The principles for development of this GPG were that it should be:

- User-focused: identifying and meeting the needs of the wind industry audience. It should be practical, highly useable, and of a manageable length.
- Aligned with the experience of stakeholders (and thereby making it more likely to be followed in practice).
- Accessible to all, including readers for whom English is not a first language. Country-specific terminology, descriptions of legal/regulatory arrangements, and excessive use of jargon or abbreviations have been avoided.
- Comprehensive but concise: filling gaps and signposting other guidance rather than duplicating material, or risking 'message creep' by too much paraphrasing or summarising of other guidance.
- Clear about its scope and relationship to other guidance, in order to avoid duplication and the risk of confusion if there are gaps or conflicting messages.
- Aligned and compatible with other SafetyOn /G+ Good Practice Guidelines in terms of content, style and structure.
- Future-proofed: so far as possible. So, for example, the guidelines avoid reproducing or referring to the details of specific regulations or standards (as these may be updated), but instead point to where the latest versions can be found.

A.2 DEVELOPMENT METHOD

Development involved:

- literature review/workshops;
- regular WG meetings;
- contractor workshops, and
- stakeholder engagement with the wider industry.

While G+ is global, SafetyOn's work is currently UK-focused. However, the wind industry is international, with both SafetyOn and G+ members being active in a number of countries.

The guidelines are currently based mainly on material and experience from regions and countries with the highest levels of installed capacity (e.g. Europe), which therefore have the most experience, and generally more mature safety regulation and practices. The availability of material in the English language has also been a factor.

Where a guideline is based only on a specific country's requirements or practices, this is noted.

A.3 LEVEL OF DETAIL

The guidelines are at a high level, applicable to onshore civil works of various types and in different contexts and locations. It would not be practicable, or indeed desirable, to develop detailed, prescriptive guidelines on all topics. Differences in, for example, national regulations and in site-specific and project-specific factors mean that each situation should be considered on its own merits.

A.4 INTENDED AUDIENCES

The main intended audiences are wind farm developers, owners and operators and their lead contractors ('wind companies'), especially those who are new entrants to the wind energy sector, as well as interfacing organisations such as grid providers.

The guidelines may also be of use to other interested parties, such as sub-contractors, interfacing disciplines within the wind industry, other industries that interface with onshore civils, and regulators.

A.5 RELATIONSHIP WITH GOOD/BEST PRACTICE AND ALARP

The guidelines set out SafetyOn and G+ recommendations for good practice, and are not merely 'nice-to-haves'. The intent is to raise the bar and drive continuous improvement. SafetyOn and G+ encourage wind companies to go beyond the guidelines where reasonably practicable, in accordance with the ALARP principle.

In the UK at least, the ALARP principle is enshrined in law: 'relevant good practice' sets a baseline, but further improvement to safety can only stop when the cost of any additional measures becomes grossly disproportionate to the safety benefit – see https://www.hse.gov.uk/managing/theory/alarpglance.htm. While this is a UK-specific view of ALARP, SafetyOn and G+ recommend that the same approach should be taken by members in all jurisdictions.

A.6 RELATIONSHIP WITH OTHER GUIDANCE

The guidelines are intended to stand as a self-contained document, rather than being part of, or needing to be read alongside, other documents. However, for brevity and to avoid the danger of distorting meaning, they signpost and reference existing documents rather than quoting or attempting to summarise or paraphrase extensive content from other sources.

As noted in 1.1, there are already many standards and guidance relating to the hazards in common construction activities, such as lifting operations, work at height and excavations. Much of this material is relevant, if not specific, to the wind industry, and some of it includes contractor engagement and behavioural safety aspects. The guidelines signpost such material only where there is a contractor engagement or behavioural safety aspect.

Unless there is good reason for differences (and recognising that diversity also has benefits), it is generally beneficial to have consistent approaches and expectations across the construction industry. Creating new or different content except where a specific need was apparent has been avoided. This consistency should be particularly helpful with regard to co-located or

hybrid sites (e.g. wind + hydrogen, or wind + battery storage) in that again, unless there is good reason, there should be consistency between safety approaches across all facilities on the site.

A.7 ONSHORE CIVILS FOR ONSHORE AND OFFSHORE PROJECTS

The guidelines are not split into sections for onshore civil works related to onshore and offshore wind. In the majority of cases, the guidelines are the same. Where there may be differences for implementation, or in the relative importance of a particular topic, for example due to the different environmental context or the nature and scale of facilities, these are noted.

ANNEX B
ENVIRONMENTAL AND OPERATIONAL CONTEXTS

This annex complements the description of wind energy systems in section 2, looking at the context in which such systems are constructed and operate.

Typically, civil works related to offshore wind projects will be close to the coast. The environment of onshore wind farms varies greatly, from flat farmland, sometimes near population centres, in low-lying areas such as Denmark and the Netherlands, to remote hill and mountain areas. The characteristics of the surrounding environment and of other facilities can affect civil works in several ways, as outlined in B.1-4.

B.1 ACCESS AND INFRASTRUCTURE

The terrain around remote sites may make access more difficult: existing public roads to the site can be narrow, steep, winding and in poor condition. There may be greater travel distances for personnel, and for emergency services, which need to be taken into account in planning shift patterns, accommodation, welfare and emergency response. Telecommunication capabilities (mobile phone signal, radio or internet) may be limited. Projects in more populated areas will typically have better access and telecommunications, and be closer to supporting services.

For offshore projects, deliveries of components, materials and equipment may be by vessel rather than land transport. Work over or near water may be required, for example if the project includes extensions or alterations to a quayside. However, work in existing ports and harbours will often be in a compound away from the water's edge, and so in practice not very different to work for onshore projects.

B.2 WEATHER

Remote areas typically have more hostile weather, making the provision of good welfare facilities critical. Weather protection may be needed for certain tasks, such as cable jointing. Adverse weather, such as high winds, heavy rain or snow, lightning or floods, can also create direct safety hazards and disrupt the project schedule.

B.3 ENVIRONMENTAL SENSITIVITY

Remote sites can often be in areas of protected habitat, such as peat, requiring additional care in civil works to avoid adverse impacts, and reinstatement works. These, and other areas where protected fauna live, may also require care to avoid disturbance, by noise for example. Coastal areas such as sand dunes, estuaries and other intertidal areas are also often ecologically sensitive.

B.4 INTERFACES WITH OTHER LAND USES AND USERS

Interfaces on-site and in the vicinity that may affect a contractor's civil work include:

- public roads (traffic management planning will often be required);
- shared use of site access roads, e.g. with forestry or farming vehicles;
- public rights of way and recreational use of land;
- agriculture, forestry and other land uses;
- adjacent facilities – e.g. the site may be next to an operational wind farm, or may itself be commissioned and handed over in stages as WTGs are completed;
- sea and flood defences;
- railways;
- overhead and buried services, and
- ports and harbours.

ANNEX C
COLLATED LIST OF GUIDELINES

Section	No.	Wind companies should …
3.1 Stage 1: Preparing to provide a safe system		
3.1.1	1	Go beyond the guidelines where reasonably practicable, in accordance with the ALARP principle
3.1.1	2	Reference the guidelines as mandatory minimum requirements where possible, for example when placing a contract
3.1.2	3	Identify and understand safety obligations relating to contractors
3.1.2	4	Identify and manage any inconsistencies between obligations
3.1.3	5	Develop internal policy/ guidance on the use of contractors
3.1.3	6	Develop internal policy/ guidance on contractor engagement
3.1.4	7	Act as an intelligent customer
3.1.5	8	Ensure a safety management system within which contractors can work safely and effectively
3.1.6	9	Define generic safety expectations for all contractors and projects
3.2 Stage 2: Planning and design		
3.2.1	10	Build relationships and begin engaging with contractors early in the project
3.2.2	11	Involve contractors in design and design risk assessment
3.2.3	12	Involve contractors in constructability review
3.2.4	13	Plan and design appropriate and convenient on-site access routes
3.2.5	14	Develop appropriate traffic management plans
3.2.6	15	Plan and design safe public and third party access
3.2.7	16	Survey communication coverage and develop communication plan
3.2.8	17	Plan and design appropriate working environments and infrastructure
3.2.9	18	Plan and design accessible, appropriate welfare and first aid facilities
3.2.10	19	Estimate workforce skills and numbers required over the project
3.2.11	20	Develop lone working policy and arrangements, eliminating lone working where possible
3.3 Stage 3: Contracting		
3.3.1	21	Take safety into account when deciding the prequalification-tender sequence
3.3.2	22	Develop a contract structure that facilitates effective management and communication between parties
3.3.3	23	Use a standard form of contract
3.3.4	24	Consider using an ECI contract

Section	No.	Wind companies should …
3.3.5	25	Develop appropriate selection questions and criteria
3.3.6	26	Inform contractors about known or potential project-specific hazards
3.3.7	27	Inform contractors about the safety rationale for the design
3.3.8	28	Develop Safety Requirements for contractors
3.3.9	29	Consider the advantages and disadvantages of a behavioural safety programme
3.3.10	30	Ensure that an appropriate Safety Plan is in place
3.4 Stage 4: Contractor competence and on-site induction		
–	31	Engage with the contractor organisation to ensure that all contractor personnel have the required competences
–	32	Define required skill cards and qualifications
3.5 Stage 5: Construction		
3.5.1	33	Ensure all personnel receive a site-specific induction
3.5.2	34	Consider and allow for language and cultural differences
3.5.3	35	Ensure control and knowledge of who is actually on site at any time
3.5.4	36	Ensure that everyone is aware of the communications plan
3.5.5	37	Ensure awareness of risks and of opportunities to give feedback
3.5.6	38	Ensure that there are adequate checks on, and training for use of, hired-in plant
3.5.7	39	Ensure safe management of interfaces between construction and operation
3.6 Stage 6: Handover		
–	40	Develop and implement a clear and coherent strategy for handover from civils to the next team
3.7 Stage 7: Operations, maintenance and modifications (OM&M)		
–	41	Ensure that arrangements for civil works carried out in OM & M take account of changes in context
3.8 Stage 8: Decommissioning, dismantling and demolition (DDD)		
–	42	Ensure that arrangements for civil works carried out in DDD take account of new hazards and changes in context
3.9 Abnormal and emergency situations		
–	43	Ensure contractors are aware of and follow the SafetyOn emergency guidelines
3.10 Continuous improvement		
–	44	Ensure effective capture of learning from all contractors
–	45	Ensure effective capture of learning relating to the contracting process itself and behavioural safety

ANNEX D
DEVELOPING CONTRACTOR SELECTION QUESTIONS AND CRITERIA

This Annex gives further details of the guideline *Develop appropriate selection questions and criteria* in 3.3.5.

It is not straightforward to set good prequalification or selection questions that will really differentiate between contractors' health and safety management systems and performance. However, simply asking a contractor for some demonstration of their commitment, approach and performance can help to communicate high expectations.

There is an argument not to create a shortlist of 'safety-approved' bidders and then select purely on price and other criteria. The aim is to eliminate unacceptable bidders first, and then still take safety into account when deciding between those that remain. Where a weighted sum scoring system is used, this aim can also be achieved by setting a mandatory minimum safety score, such that an unacceptable safety score cannot be outweighed by good performance against other criteria. This will help to eliminate any commercial pressure to go for the cheapest solution.

Key indicators to use in screening and subsequent assessment should cover organisational capability (the policies, systems, people and resources), the skills, knowledge and experience of those who will carry out the work and historical performance. Indicators can include:

- A robust, credible, high-quality safety management system.
- Clear and effective governance, roles and responsibilities for safety.
- Resilience and stability.
- Evidence of informed senior management leadership on safety.
- Demonstrable skills, knowledge and experience, qualifications, training and competence in the specific intended activities (competence checks should be done as a matter of course, but this does not always take place).
- Familiarity with and compliance with relevant good practice.
- Previous experience of working with the contractor. If there has been poor performance in the past, has the contractor recognised mistakes made and are they willing to learn from these and make changes for the future?
- External certification to relevant standards, such as ISO 45001 or OHSAS 18001 (health and safety) and ISO 9001 (quality).
- Availability and findings of satisfactory internal and external audit reports.
- Accident/incident records, and how lessons have been learned and implemented, provide an indicator of overall safety culture as well as of any specific safety topics of concern. For example, an unusually large number of serious incidents would be a red flag, but so too would very few records of near misses and safety concerns, as this may indicate a poor reporting culture.
- Record of any prosecutions, enforcement actions, improvement notices or other interventions by authorities or regulators. If there have been such interventions, has the contractor demonstrated learning and implemented effective measures to prevent reoccurrence?

ANNEX E
ILLUSTRATIVE EXAMPLE SAFETY PLAN CONTENTS

NB: This example of Safety Plan contents is illustrative, and must not be used as ready-made, 'copy-paste' solution. There must always be thorough consideration of the specific safety issues for each project, in its context. In particular, it does not provide a comprehensive list of hazards or of how to manage them.

E.1 INTRODUCTION

Objectives

Scope – what is and is not included (in terms of e.g. project stages, physical elements, activities …)

Site description, boundaries, interfaces, significant hazards, etc.

Document review, update and revision

E.2 PROJECT AND SITE DESCRIPTION

Parties involved

Relationships between parties

Organisation structure

Duties, roles and responsibilities

Cooperation and coordination

Project location

Site features and Conditions (refer to PCI)

Project timescales

Project resources

E.3 SAFETY FUNDAMENTALS

Safety policy – values commitments, aims and targets

Site Rules/Golden rules

E.4 SAFETY TOPICS (IN ALPHABETICAL ORDER)

Accidents, Incidents, Near Misses and safety concerns reporting, investigation follow-up actions and LFE.

Accommodation

Adjacent facilities and operations that may interact with the work; for example, if there is an adjacent, operational wind farm. With a move to hybrid sites e.g. wind + storage or wind + hydrogen, identify associated hazards and how they may interact with wind project. For example, hazards associated with hydrogen pipeline construction include expansion during welding, or uneven heating, pipes slipping off skids.

Awareness, training and competence. Ensuring qualifications are relevant, valid and in date.

Behavioural safety – any programmes, incentive schemes etc.

Borrow pits

Cable laying

Confined spaces

Consultation and communication. Toolbox talks etc, opportunities for feedback and suggestions.

Contaminated land

Contractor's compound

Covid-19

Driving/ travel to work e.g. where long travel distances are involved, leading to fatigue, and in remote areas.

Drugs and alcohol policy

Electricity. Power supplies available. Use of generators. Bringing the electrical contractor onto site is a key step requiring care to ensure safe interfaces. Note: system elements/components, such as electrical packages and cabling, are generally larger for offshore projects. The plant required for their construction will therefore be correspondingly bigger/ different.

Emergency Planning and Arrangements. Control and communications, Fire.

Excavations. Planning, access/ egress, support of sides, temporary works aspects, correct materials. Edge protection issues. Musculo-skeletal issues from work in excavations, e.g. when fixing steel for foundations.

First aid

Fuel delivery, storage and handling

Hand working close up to workface and/or using hand tools.

Hazardous materials. Use of hazardous substances. Existing hazardous materials such as asbestos in existing buildings that are to be cleared.

Home, or other off-site working

Induction and Training

Language

Lifting Operations and Equipment

Local activities and land uses e.g. public access, recreation, forestry, farming, animals, shooting that may interact with the work, or distract workers**.** Hazards of work in remote or inhospitable areas – e.g. due to distance from hospitals or other support, constraints on access for emergency services.

Lone working

Manual handling

Medical fitness

MEWPs Importance of staying on prepared routes and suitable ground.

Monitoring and evaluating performance, targets and KPIs. Define (contractual) KPIs and other metrics, and their reporting frequency.

Moving plant, machinery and vehicles – especially reversing incidents. Segregation of people, plant and vehicles can be hard to achieve, e.g. on a cable route where the workforce themselves are working directly with the plant/vehicles, there may be multiple work sites and other hazards or features, such as overhead power lines or buried services, may constrain what can be done.

Occupational/Mental Health and Wellbeing. As well as being an issue in their own right, mental health and wellbeing/ welfare affect (safety-critical) behaviours. SafetyOn has started another WG on these topics – check the website for emerging material.

Overhead cables

Permits to Work. What work requires a Permit? What is the process for obtaining and discharging a Permit?

Personal Protective Equipment (PPE) specific to the site, project and activities.

Risk Assessment and Method Statements (RAMS). Emphasise that these are too often generic, and don't match the work actually being done, or consider the site-specific context carefully enough.

Scaffolding especially adapting scaffold structures to circular turbine towers.

Site Set Up and Access e.g. adequate supporting infrastructure and systems such as good welfare facilities, roads with adequate load-bearing capacity.

Slips, trips and falls especially on rough, uneven or slippery ground, getting stuck in soft peaty or marshy ground, and when working in excavations.

Sub-Contractors. Selection, engagement, management and supervision (flow-down of these guidelines).

Telecommunications. Areas of no or weak signal, especially in remote areas.

Communications plan.

Temporary works, including ditch crossings and access routes. Not all contractors have a clear idea of what is required in temporary works design.

Underground services and features. Cable/pipeline strikes – hitting buried electrical cables or gas pipelines etc. during excavation. HDD below or through flood defences, or under railways, roads and other infrastructure, can also create hazards.

Weather. Arrangements need to be suitable for worst weather conditions, not just average. Bad weather leads to rushing and taking shortcuts, and makes many things (e.g. emergency response) more difficult. Note local weather conditions, e.g. areas liable to fog, wind gusts, snow accumulation, flooding…

Welfare facilities and arrangements

Wildlife and plants that may be dangerous to personnel, e.g. bears, snakes, insects and/or that have the potential for road accidents, such as deer. Poisonous flora.

Work Equipment. Management, inspection and maintenance, arrangements for fitters to come on site. A specific area of concern is with new or hired-in plant, for example if the controls are different from those that the operator is used to.

Working at height – falls, dropped objects. Specific aspects of working at height relevant to the wind industry include working on the backs of flatbed vehicles, or on top of transformers and other relatively low structures, as well as at greater heights on WTGs themselves.

E.5 SAFETY FILE INFORMATION

APPENDICES

Communications Plan

Delivery driver rules

Emergencies – pocket guide/poster

Fire Safety Plan

Induction pack(s) with any variants for the workforce and for escorted/unescorted visitors)

Key Contacts on-site/head offices/emergency services etc

Safety performance data template

Site rules

Skills Cards/Qualifications Accepted

Traffic Management Plan

Welfare checklist

ANNEX F
ABBREVIATIONS

ACOP	Approved Code of Practice
ALARP	as low as reasonably practicable
CDM	Construction (Design and Management) Regulations 2015
DDD	decommissioning, dismantling and demolition
DRA	design risk assessment
ECI	early contractor involvement (form of contract)
EI	Energy Institute
ERP	emergency response procedure
GPG	SafetyOn or G+ Good Practice Guidelines
HDD	horizontal directional drilling
IEC	International Electrotechnical Commission
ISO	International Organization for Standardization
LFE	learning from experience
MEWP	mobile elevating work platform
OEM	original equipment manufacturer
OM&M	operations, maintenance and modifications
PC	principal contractor
PCI	pre-construction information
PPE	personal protective equipment
RAMS	risk assessments and method statements
WG	working group
WTG	wind turbine generator

ANNEX G
GLOSSARY

In this document:

Behavioural safety is used as a broad term, including all aspects of human behaviour in relation to safety.

Behavioural safety programme is a more specific term, referring to the use of behaviour modification approaches, generally involving the definition of safe and unsafe behaviours, observations of actual behaviours at work, and feedback or reinforcement as appropriate – see https://www.hse.gov.uk/humanfactors/topics/behaviouralsafety.htm.

Contractors is used to mean those who carry out, manage or supervise on-site, physical civil works or associated physical activities, such as on-site transport. It excludes those who provide services, such as designers, planning consultants, and companies providing non-intrusive surveys. It also excludes product suppliers, such as the manufacturers of WTGs, and suppliers of construction plant, equipment and materials, are also excluded, except to the extent to which they may access or work on the site. It primarily refers to those not employed by the wind company, but some of the guidelines may be equally applicable to in-house departments and personnel.

Early contractor engagement means engagement in a general sense, by any means.

Early contractor involvement (ECI) is used in these guidelines to refer specifically to formal, contractual arrangements for early engagement.

Onshore civils. Onshore civil engineering or construction works. There are no universally accepted definitions of terms such as 'civil engineering'. 'civil(s) (works)' or 'construction' that provide a clear understanding of whether or how they differ. 'Onshore civils' is used in this document, as a broad term encompassing the full range of understandings.

Safety is used as shorthand for 'health and safety' and should be read to include health (mental and physical) as well safety. This is in no way intended to imply that health concerns are less important, but simply because writing 'health and safety' in full can lead to clumsy wording.

System, as in 'the onshore civils system' includes all elements: people, policies and procedures, plant and equipment as well as engineered structures and other physical elements, all in their environmental and operational contexts.

Wind companies. Wind farm owners, operators and developers (i.e., typically, the clients for wind energy projects).

ANNEX H
VERBAL FORMS OF GUIDELINES

May indicates a guideline whose suitability depends on circumstances: '…it may be helpful to…'. It is also used to describe different possible cases that need to be considered, as for example in '…there may be a need for work over water'.

Must/shall. SafetyOn and G+ does not have legal authority to mandate requirements, so terms such as 'must' and 'shall' are not used, except when citing legal requirements.

Should. Consistent with other SafetyOn and G+ Good Practice Guidelines, this document uses 'should' as the default term for presenting good practices. This allows for flexibility in the means of achieving the safety aims, but does not mean that the practice is merely optional. Rather, SafetyOn and G+ recommend that wind companies should either:

– follow the guidelines, going beyond them where reasonably practicable;
– do something else at least equally safe, or
– risk assess, justify and document the acceptance of any exemption.

ANNEX I
BIBLIOGRAPHY

Some key sources of further guidance are listed and arranged by topic. References/links are to versions used in the development of these guidelines, but readers are advised always to consult the latest versions

Behavioural safety

It should be noted that many of the documents listed here, while still available or referenced on the HSE website, are now some 20 years old. Competent advice should be sought before embarking on a behavioural safety programme

Behaviour based safety (consultant website) https://behaviouralsafety.net/

Fleming, M. (2001). *Safety Culture Maturity Model*. Offshore Technology Report 049. HSE Books

Fleming, M. and Lardner, R. (2001). *Behaviour Modification Programmes: establishing Best Practice*. Offshore Technology Report 048. HSE Books, ISBN 0 7176 1920 6

HSE HSG48 – *Reducing Error and Influencing Behaviour*. http://www.hse.gov.uk/pubns/priced/hsg48.pdf

HSE – *Behavioural safety and Major Accident Hazards – Magic Bullet or Shot in the Dark* http://www.hse.gov.uk/humanfactors/topics/magicbullet.pdf

HSE Contract Research Report 430/2002 – *Strategies to promote safe behaviour as part of a health and safety management system*. http://www.hse.gov.uk/research/crr_pdf/2002/crr02430.pdf

HSE Contract Research Report 660/2008. *Behaviour change and worker engagement practices within the construction sector.* https://www.hse.gov.uk/research/rrpdf/rr660.pdf

https://publishing.energyinst.org/topics/process-safety/leadership/human-factors-briefing-note-no.-14-behavioural-safety

Human Factors in Renewables https://safetyon.com/__data/assets/pdf_file/0008/836234/SafetyOn-Human-Factors-ebook.pdf

Step Change (2000). *Changing Minds: A practical guide for behavioural change in the oil and gas industry,* website – www.stepchangeinsafety.net

Contract(or) management

IOGP 423 HSE *Management Guidelines for Working Together in a Contract Environment.* https://www.iogp.org/bookstore/product/hse-management-guidelines-for-working-together-in-a-contract-environment/

https://publishing.energyinst.org/topics/power-generation/managing-contractors.-a-guide-for-the-energy-industry

Managing contractors a guide for the energy industry

Contract structure, roles and responsibilities

https://windeurope.org/intelligence-platform/product/briefing-on-key-organisational-requirements-roles-and-responsibilities-korrr/

Managing Health And Safety in Construction. Construction (Design and Management) Regulations 2015. Guidance on regulations L153. https://www.hse.gov.uk/pubns/priced/l153.pdf

Decommissioning, dismantling and demolition

https://safetyon.com/__data/assets/pdf_file/0009/880362/SafetyOn_Post-incident-decommissioning-of-onshore-wind-turbines.pdf

https://windeurope.org/intelligence-platform/product/decommissioning-of-onshore-wind-turbines

Design risk assessment and management

Dropped loads: https://www.gplusoffshorewind.com/__data/assets/pdf_file/0017/641042/Web-version-G-adaptation-of-DROPS-reliable-securing_LM.pdf

Guidance for Design Risk Management. Improving design risk management (DRM) in the construction industry

https://www.ice.org.uk/media/xk1hthfs/drm-guidance-version-2-april-2020-final.pdf

Manual handling and ergonomics: https://www.gplusoffshorewind.com/__data/assets/pdf_file/0012/699447/Manual-handling-case-studies.pdf

Work at height: https://www.gplusoffshorewind.com/__data/assets/pdf_file/0010/633556/Work-at-Height-Guidelines-2nd-Edition-B31jk-web-version.pdf

Intelligent customer

https://www.hse.gov.uk/humanfactors/topics/customers.htm

https://www.hse.gov.uk/humanfactors/topics/contractorisation.htm

https://safetyon.com/__data/assets/pdf_file/0003/933744/SafetyOn-2021-incident-data-reportjk3-Final.pdf

Safety culture

Nordisk Vindkraft. *Havsnäs Wind Farm –a guide on Health and Safety.* http://www.nordiskvindkraft.se/media/2420985/Havsnas-Health-and-Safety-guide.pdf is a useful case study. It stresses the importance of regular communication with contractors, clear expectations and language issues, and managing a large and sometimes transient workforce.

Safety Culture Gap Management for Designers and Contractors, 2015. https://myice.ice.org.uk/getattachment/knowledge-and-resources/best-practice/safety-culture-gap-management/Safety-Culture-Gap-Management-for-Designers-and-Contractors.pdf.aspx

Third party access

NatureScot. *Good Practice during Wind Farm Construction*. https://www.nature.scot/sites/default/files/2020-12/Good%20Practice%20during%20wind%20farm%20construction%20-%204th%20Ed.pdf

This reference does not specifically address safety, but Part 8 Recreation and Access, is particularly useful. It is intended for Scotland, where country-specific factors include the legally established right to roam, but similar principles apply elsewhere.

Traffic management

Best Practice Guide for Transport and Installation of Onshore WTG Systems. https://estaeurope.eu/wp-content/uploads/2020/10/ESTA-WTG-2020-FINAL.pdf

SafetyOn Good practice guidelines *Traffic management for onshore wind farm* https://safetyon.com/__data/assets/pdf_file/0011/894674/SafetyOn-Traffic-management-for-onshore-wind-farms.pdf

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