Code of Practice for Marine and Cranes

Achieving ABB Occupational Health and Safety Standard
Introduction

This code of practice for ABB Marine and Cranes has been developed to provide practical direction to Marine and Cranes personnel and Contractors on how to achieve ABB's health and safety standards. The main focus is on site operations, but the requirements set down are also applicable as a baseline for other activities. This material shall be used for training, and its requirements must be implemented.

Sales and project managers shall use this code when tendering for work, and making agreements with customers, and contractors. This code represents ABB's minimum standards, and is based on the International Labour Office (ILO) code of practice 'Safety and Health in Construction' as well as best practice from within the Marine and Cranes industry. Where national legislation, and or customer requirements set a higher standard, then the higher standard shall be used.

Some health and safety risks may not be covered by this code, in which case, reference shall be made directly to ABB standards, and the ILO code of practice, IMO standard or local instructions.

The following table is indicatively showing main focus groups of different code of practices.

<table>
<thead>
<tr>
<th>No</th>
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<th>Site personnel/Service engineers - Marine</th>
<th>Site personnel/Service engineers - Cranes</th>
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<tr>
<td>1</td>
<td>Safety Planning</td>
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<td>●</td>
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<tr>
<td>2</td>
<td>Training Requirements</td>
<td>●</td>
<td>●</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Prior Traveling</td>
<td>●</td>
<td>●</td>
<td>●</td>
</tr>
<tr>
<td>4</td>
<td>High Risk Countries</td>
<td>●</td>
<td>●</td>
<td>●</td>
</tr>
<tr>
<td>5</td>
<td>Driving and Transport Safety</td>
<td>●</td>
<td>●</td>
<td>●</td>
</tr>
<tr>
<td>6</td>
<td>Site Familiarization</td>
<td>●</td>
<td>●</td>
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</tr>
<tr>
<td>7</td>
<td>Signage</td>
<td>●</td>
<td>●</td>
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</tr>
<tr>
<td>8</td>
<td>First Aid and Emergency Medical</td>
<td>●</td>
<td>●</td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>Emergencies on Site</td>
<td>●</td>
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<tr>
<td>10</td>
<td>Personal Protective Equipment</td>
<td>●</td>
<td>●</td>
<td>●</td>
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<td>11</td>
<td>Lone Working</td>
<td>●</td>
<td>●</td>
<td></td>
</tr>
<tr>
<td>12</td>
<td>Electrical Safety</td>
<td>●</td>
<td>●</td>
<td></td>
</tr>
<tr>
<td>13</td>
<td>Testing and Commissioning Equipment</td>
<td>●</td>
<td>●</td>
<td></td>
</tr>
<tr>
<td>14</td>
<td>Safe Use of Ladders</td>
<td>●</td>
<td>●</td>
<td></td>
</tr>
<tr>
<td>15</td>
<td>Working at Height</td>
<td>●”</td>
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</tr>
<tr>
<td>16</td>
<td>Airborne Hazards</td>
<td>●</td>
<td>●</td>
<td>●</td>
</tr>
<tr>
<td>17</td>
<td>Noise Hazard</td>
<td>●</td>
<td>●</td>
<td>●</td>
</tr>
<tr>
<td>18</td>
<td>Asbestos Materials in a Ship</td>
<td>●</td>
<td>●</td>
<td></td>
</tr>
<tr>
<td>19</td>
<td>Chemical Safety</td>
<td>●</td>
<td>●</td>
<td>●</td>
</tr>
<tr>
<td>20</td>
<td>Compressed Gases in a Ship</td>
<td>●</td>
<td>●</td>
<td></td>
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<td>21</td>
<td>Hydraulic Pressure</td>
<td>●</td>
<td>●</td>
<td></td>
</tr>
<tr>
<td>22</td>
<td>Entry into Azipod Unit</td>
<td>●”</td>
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<td></td>
</tr>
<tr>
<td>23</td>
<td>Working Under a Ship</td>
<td>●”</td>
<td>●</td>
<td></td>
</tr>
<tr>
<td>24</td>
<td>Azipod Hauling Lifting Operations</td>
<td>●”</td>
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</tr>
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<td>25</td>
<td>Permanent Magnets</td>
<td>●</td>
<td>●</td>
<td></td>
</tr>
<tr>
<td>26</td>
<td>Radar</td>
<td>●</td>
<td>●</td>
<td></td>
</tr>
<tr>
<td>27</td>
<td>Sea Trials</td>
<td>●</td>
<td>●</td>
<td></td>
</tr>
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<td>Pneumatic Tools</td>
<td>●</td>
<td>●</td>
<td></td>
</tr>
<tr>
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<td>Respiratory Protective Equipment</td>
<td>●</td>
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</tr>
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<td>Hygiene when Travelling</td>
<td>●</td>
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<td>Rigging and Slinging</td>
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*) Mainly when project scope includes Azipod units

**) Site safety briefing shall be organized by site manager/site host, covering the site specific practices and risks.
1.0 INTRODUCTION

This Code of Practice provides guidelines on safety planning for site operations. Most of this information can also be found in the Global Marine Systems Project Safety Plan, but this CoP is angled more to the site personnel's point of view and it covers new build projects, large service projects, crane projects and service trips. (Global Marine Systems Project Safety Plan covers only new build projects).

2.0 SCOPE

These requirements apply to all ABB Marine and Cranes employees and contractors when working on site. If national legislation or customer requirements impose a higher standard, then the higher standard shall be followed. In such cases this shall be documented.

3.0 HAZARDS AND RISKS

Environment, Health and Safety (EHS) aspects for site works shall be identified, evaluated and correct controls shall be put into place in accordance with the hierarchy of controls (see CoP 2, “training and competence”). This has to be done by all ABB personnel and contractors. In order to be able to do this properly, persons in different roles need suitable EHS competence (see CoP 2, “training and competence”). The following personnel are especially important while securing proper EHS for site operations:

Project Manager (PM) is overall responsible for EHS in the project and shall ensure that:
- The Project Safety Plan is established and implemented during the project start-up and is updated as relevant.
- EHS risks are identified, evaluated and actions taken as necessary. PM shall seek customer clarification in this matter, and also about the customer’s safety rules and regulations.
- EHS planning, scheduling and documentation of activities to eliminate or minimize significant EHS risks.
- Establish Project Emergency Contact Plan.
- Give relevant ESE documents to site personnel, and ask for relevant EHS document from site personnel for monitoring of EHS performance.

Site Manager (SM) (when applicable) is responsible for EHS on site related to ABB personnel and contractors and is accountable to PM. SM shall ensure that:
- Site safety risks are assessed as required and actions taken as necessary.
- Unsafe activities are immediately stopped and safe operations restored.
- Safety Data Sheet (SDS) are available for all ABB supplied chemicals (see CoP 19, “chemical safety”).
- Coordinates/communicates tasks with yard and contractors, e.g. scheduling tasks in safe order.
- ABB personnel and contractors get EHS briefing on site.
- All ABB personnel and contractors on site follow the Project Safety Plan.
- EHS incidents and accidents are reported.
- Safety Tours at site are performed.

Manager selecting persons to site (e.g. Commissioning Manager) shall ensure that:
- Site personnel (employees and contractors) are competent, trained and formally authorized to work safely at site (see CoP 2, “training and competence”).
- Personal Protective Equipment (PPE), tools and other equipment are available and functional/ calibrated.

Sales Manager shall ensure that:
- ABB safety requirements are communicated to the customer.
- If project is executed at new yard, safety advisor is consulted regarding risks prior tendering.
- Safety costs are taken into consideration in the sales proposal.

Site Personnel in general shall ensure that (more information in chapter 4.0):
- Instructions are followed and selected controls implemented.
- ABB Stop Take Five philosophy is followed.
4.0 OPERATIONAL CONTROLS

Safety shall be part of preparation and execution of all site works. It shall be in the agenda of project meetings as well as start-up meetings for the whole project (internal and with customer), for commissioning meetings (internal and with customer) and shall be part of execution. Suitable level corrective action shall be taken on reported near misses, unsafe conditions and behaviors based on risk assessment.

All site personnel are responsible to:

- Familiarize themselves with ABB Project Safety Plan, including participation in customer safety orientation (if applicable).
- Follow the prevailing instructions, safety rules and regulations, including the BU Marine and Cranes Codes of Practice.
- Check regularly that PPE and tools are functional and in good order. Report malfunctioning PPE and tools to supervisor (see CoP 10, “personal protective equipment”).
- Report near miss incidents and accidents, unsafe conditions and unsafe behaviors to site/project manager and line manager.
- Perform JOR, SJA/JSA/JRA, SOT and tool box meeting when required (see details under).
- Follow ABB Stop Take Five philosophy.

Safety Observation Tours (SOT)
Safety Observation Tours shall be performed periodically by Project manager/Site Manager. SOT is required for all projects with an ABB Site Manager. For projects without ABB Site Manager PM shall perform SOT during site visits.

Job Observation Report (Applicable for NO)
Before the site work can start, the Commissioning / Service Engineer has to make sure that the work site is ready. Job Observation Report (JOR) has to be filled out by the Commissioning / Service Engineer before work is started, and again if he/she has been away from the site for more than one week. This is to ensure that required level of EHS is in place before the work takes place. Completed JOR is to be sent to ABB Project Manager / Site Manager for archive in project file. If there are any deviations or actions required, ABB Project Manager / Site Manager (or Client site responsible) is to be notified immediately. If any hazardous conditions are revealed, the work shall not be started before SJA is performed and / or necessary actions carried out.

Safe Job Analysis / Job Safe Analysis / Job Risk Analysis (abbreviated here SJA)
A “Safe Job analysis” (SJA) shall be performed, if an unfamiliar task is identified i.e. it is not covered by existing controls (e.g. procedures or instructions) or existing controls are not considered to be adequate (Residual risk in Risk Assessment remains too high). In the SJA, all conditions and activities in the specific working area shall be considered. The procedure describing in detail securing of safety for personnel, material and environment, are to be worked out together with involved personnel. Completed SJA are to be signed by the persons that have worked out the document, sent to ABB Project Manager / Site Manager, Client site responsible (if applicable) and stored in project files by ABB Project Manager. All relevant personnel shall be informed.

Toolbox meeting at Site incl. JESA (Applicable for CN)
The purpose of the Toolbox meeting is to achieve an exchange of information and ideas on health, safety and environmental matters. The Project Site Manager/ Site leader shall be responsible for conducting Toolbox meetings for all employees in their respective work areas including contractors. The Project Site Manager or nominee shall ensure a record of Toolbox Meetings is completed for each safety talk given, including topics and names of employees attending. A copy of the Toolbox Talk and relevant open actions will be forwarded to the Project Manager on completion for review and follow up.

Stop Take Five philosophy
Before entering to work, each ABB employee or contractor shall use ‘five minutes’ to consider if risks related to the works are properly controlled. If not, necessary controls regarding an identified risk shall be implemented. If controls for the risk are not known, a SJA shall be performed.
Flow diagram showing main phases of risk identification, evaluation and mitigation:

1. Service Job / Project* scope known
2. Does general risk assessment cover the risk?
   - Yes: Update the risk assessment
   - No: Perform Safe Job Analysis
3. Are the controls adequate?
   - Yes: Include to safety plan (projects only)
   - No: Stop Take Five prior executing the work
4. Are the controls adequate?
   - Yes: Execute work
   - No: Perform Safe Job Analysis

* New Build, Modernization and Dry Docking Projects
** Discuss with Project Manager/ Site Manager/ Customer

Note: for further assistance, contact your LBU OHS Advisor
Safety Planning Requirements

5.0 TRAINING AND COMPETENCE
All ABB employees and contractors shall fulfill EHS requirements in respect of their work activities (see CoP 2, “training and competence”). They must be familiar with the contents of this CoP.

6.0 MONITORING AND CHECKING

6.1 Active monitoring
The LBU manager and applicable accountable managers in line are responsible:
   a) For ensuring that persons working on site environment are briefed on this Code of Practice.
   b) Individuals working in site environment are following the requirements of this Code of Practice.
   c) This Code of Practice shall be part of OHS audits and reviews conducted by the LBUs.

6.2 Reactive monitoring
All personnel involved in the project shall report all accidents, near-miss incidents, damage to the environment and/or material, as well as unsafe conditions and behaviors to the Site Manager and/or project manager. The gained experience will be used to prevent similar situations to occur again.

7.0 DOCUMENTATION & RECORDS
The following records shall be kept by the LBU (to the extent applicable):

   • Project Safety Plan
   • EHS Risk Assessment
   • Records of personnel training
   • Records of performed Safety Tour
   • Records of performed Safety Observation Tour
   • Records of reported near miss incidents, accidents and unsafe conditions/behaviors
   • Records of SJA/JSA/JRA
   • Records of JOR
   • Records of Toolbox Talk

8.0 REFERENCES
The below references are not all-inclusive. If a local reference is missing or the link below does not work, please contact your OHS Advisor for further assistance.

   a) GMS Project Safety Plan
   b) EHS Risk Assessment
   c) SOT template:
      1) CN : Safety Observation Tours Report EN
      2) FI : Safety check list 3AFV000352
      3) NO : 3AJM000230-014
      4) SG : SOT form Marine & Cranes
   d) Reporting of Near Miss Incidents: GISA 01.05A22
   e) NO: SJA/JSA/JRA template: 3AJM000230-007
   f) NO: JOR template 3AJM000230-006
   g) CN: Project Site Toolbox Meeting,
   h) US: SOT / JSA / Safety Meeting Minutes Template
1.0 INTRODUCTION
The Health and Safety (H&S) of ABB personnel when working on site will be determined to a large extent on their competence to undertake the work. This code of practice describes the minimum training and competence requirements for ABB Marine and Cranes personnel working in a site environment.

2.0 SCOPE
This COP applies to all ABB Marine and Cranes employees and contractors working on customer sites. If national legislation or customer requirements impose a higher standard, then the higher standard shall be followed. In such cases this shall be documented.

3.0 HAZARDS AND RISKS
Without suitable health and safety competence persons working on site will not be able to identify the hazards correctly, and therefore will not be capable of evaluating the risk and putting into place the correct controls in accordance with the hierarchy of controls as shown in fig 1. Risk is the product of hazard severity and the probability of the occurrence of harm. The latter will be determined by a number of factors and a fundamental factor that will have a significant effect on the risk of injury from a particular task or activity will be the degree of training and competence. If ABB personnel are not trained or competent then the risk of injury will increase.

![Hierarchy of Controls](image-url)
4.0 OPERATIONAL CONTROLS

This code of practice defines the minimum occupational health and safety training/competence requirements for all site personnel. Additional training/competences can be/are required in some specific work tasks. All personnel working in a customer site environment shall be skilled for the work in question and instructed in the health and safety contents and requirements set out in these ABB Marine and Cranes codes of practice.

All persons shall also receive suitable training and/or instruction on the personal protective equipment (PPE):

- Correct use of the PPE that they have been issued with and what not to do;
- How to fit RPE (Respiratory Protective Equipment) correctly;
- How to obtain replacements.
- Emergency arrangements where PPE may be needed.

All persons who attend site shall receive a suitable site induction briefing to ensure that they are fully familiar with (accountable: Site Manager. If not in place the Project Manager or Customer):

  a) General site layout
  b) Access points to the site;
  c) Safe walking routes;
  d) Location of welfare facilities including toilets, washing, canteen, drinking water facilities;
  e) Location/arrangements regarding medical help;
  f) Site first aid arrangements;
  g) Emergency evacuation arrangements and assembly points;
  h) Site OHS rules including PPE requirements;
  i) Emergency contact phone numbers (including customers’ representative on site).

The following valid safety trainings are required for persons involved in mechanical work:

- First aid (preferred for all, in minimum as defined in CoP 8 “first aid and emergency medical”)
- Basics fire training (e.g. use of fire extinguisher)
- Basics on Electrical safety including Seven Steps approach and safety distances
- Hot work license (preferred, especially in ship building environment)
- Azipod Confined Space (if working inside Azipod unit)
- Scaffolding inspection (min. one person at site, if work involves working on scaffoldings)

The following valid safety training courses are required for electrical work:

- The above-mentioned courses
- Electrical Safety Training (electricians level, this replaces Basic training i.e. point c) above
- Live electrical work safety training

Project and site managers must have role specific valid health and safety training.

5.0 TRAINING AND COMPETENCE

Every project team member must be familiar with these requirements prior starting any work on site.

6.0 MONITORING AND CHECKING

The LBU manager is responsible to secure that managers selecting persons to sites are following these requirements.

Managers selecting person for site works shall be responsible for ensuring that all persons who are required to carry out work on site have the required trainings and competence.

7.0 DOCUMENTATION & RECORDS

Managers selecting persons to sites must be able to show records proving that the minimum occupational health and safety requirements for the selected person(s) are met. Site managers must be able to show records that proper site briefing has taken place.
Requirements prior to travelling to site

1.0 INTRODUCTION

The requirement for international travel is an integral part of the Marine and Cranes business requirements and travel requirements need to be planned well in advance. This will save time and reduce any personal stress that might arise as a result of having to organize things in a hurry. This Code of Practice (COP) has been prepared to summarize the key requirements in respect of travelling to site.

2.0 SCOPE

These requirements apply to all ABB Marine and Cranes employees and contractors. If the local regulatory or customer requirements impose a higher standard, then the higher standard shall be followed. In such cases this shall be documented.

3.0 HAZARDS AND RISKS

Hazards and risks will vary and will depend on travel arrangements and the destination country. The following need to be considered and evaluated:

- Travel and medical insurance,
- visa requirements,
- declaration of work to be performed
- transportation and tickets,
- immigration and customs documentation,
- accommodation,
- local contacts including ABB host country organization,
- diseases – vaccination,
- medication and medical treatment,
- unusual blood type, transportation in country of destination,
- invitation letter by customer,
- working conditions including working hours,
- required personal protective equipment (PPE).

For high risk countries identified in the ABB Security Threat Map the country specific hazards and risks are described within the Travel Code of Conduct for the country and authorization for travel may be required from the Host Country Manager. For the identified Water Threat Level areas the specific hazards and risks are documented in the Ship Security Plan. See links below and separate COP 4 “High Risk Countries”.

General threats [http://www223.abb.com/sites/threatmap/Pages/Home.aspx](http://www223.abb.com/sites/threatmap/Pages/Home.aspx)

Maritime threat [http://inside.abb.com/cawp/gad00303/1dbbde5668530204c12577f12577f0005ea014.aspx](http://inside.abb.com/cawp/gad00303/1dbbde5668530204c12577f12577f0005ea014.aspx)

4.0 OPERATIONAL CONTROLS

The following shall be covered as a minimum:

- Approval is required in all cases by line manager prior to travel. For high risk countries see COP 4 in respect of threat levels 1&2.
- Travel to be arranged through an ABB approved travel agency and details will be entered into the travel tracker system automatically. This applies also when travelling to countries with threat level 3.
- In those cases where travel is arranged by a non ABB travel agency then the details shall be entered manually.
- Hotel booking arranged through Hotelzon or an approved travel agency
- Travel checklist filled in, if applicable

ABB travel portal: [http://inside.abb.com/cawp/gad01068/b09623676e204b7585256b4200504113.aspx](http://inside.abb.com/cawp/gad01068/b09623676e204b7585256b4200504113.aspx)

See ABB advice on the intranet and links below.


Travel security procedures [http://inside.abb.com/cawp/gad00303/be29b0a377c29f15c12577f00057222e.aspx](http://inside.abb.com/cawp/gad00303/be29b0a377c29f15c12577f00057222e.aspx)

Threat levels [http://inside.abb.com/cawp/gad00303/82718debe61aa497c12577f00057224e.aspx](http://inside.abb.com/cawp/gad00303/82718debe61aa497c12577f00057224e.aspx)

Safe business travel [http://inside.abb.com/cawp/gad00303/40c8f98d21a3dccac12578c5006b1161.aspx](http://inside.abb.com/cawp/gad00303/40c8f98d21a3dccac12578c5006b1161.aspx)
International SOS  

Accessing the Online TIS Approval Database  

Travel Advice Sheets  
http://inside.abb.com/cawp/gad00303/b9540063c3493c5c12577f000563de6.aspx

5.0 TRAINING AND COMPETENCE

ABB Travel policy, ABB general advice for travelling and working internationally, and Emergency procedures shall have been communicated to ABB Marine and Cranes employees and/ or contractors prior to travelling.

6.0 MONITORING AND CHECKING

Communication arrangements and travel plan shall be available to the LBU responsible manager/ unit.

All incidents, unsafe conditions, unsafe behaviors and near misses shall be reported to the applicable database. See ABB standard GISA 01.05A22.

7.0 DOCUMENTATION AND RECORDS

Travel documents and plan, management approval, hotel booking and contact persons shall be made available by the LBU responsible unit, e.g. in the travel database.
1.0 INTRODUCTION
As a global company, ABB works in almost a 100 countries. The political situation in some countries and in certain international waters, where ABB might operate could represent a significant risk to employees working there. ABB has well established travel security procedures to identify those countries where threats are higher and also to assist in monitoring the status of travelers and to receive updated advice. This Code of Practice has been developed to assist Marine and Cranes personnel in complying with these requirements.

2.0 SCOPE
This COP applies to all ABB Marine and Cranes employees and contractors. If the local regulatory or customer requirements impose a higher standard, then the higher standard shall be followed. In such cases this shall be documented.

3.0 HAZARDS AND RISKS
Hazards and risks will very much depend on the required travel arrangements and the country destination. Typical risks that could be encountered include:
- social unrest;
- kidnapping & extortion;
- theft;
- armed robbery;
- piracy;
- terrorism;
- transport and traffic situation;
- natural disaster.

Countries that are identified in the ABB Security Threat Map will have the country specific hazards and risks described in the Travel Code of Conduct for the country. For the identified Water Threat Level areas the specific hazards and risks are documented in the Ship Security Plan. These procedures are regularly updated and general advice is also provided on international travel and global risks. See links below.

General threats http://www223.abb.com/sites/threatmap/Pages/Home.aspx
Maritime threat http://inside.abb.com/cawp/gad00303/1dbbde5668530204c12577f0005ea014.aspx

ENSURE THAT YOU FAMILIARIZE YOUSELF WITH THESE REQUIREMENTS EACH TIME YOU TRAVEL. THEY ARE THERE FOR YOUR SAFETY.

4.0 OPERATIONAL CONTROLS
The following control measures shall be applied as a minimum:
- The employee who will be traveling shall consult the ABB Security Threat Map for Threat Level on land and in waters and check on current requirements;
- Ensure that prior to departure that the traveler is suitable to travel to high risk rated areas, and also willing and ready to go;
- The person who will be traveling shall undergo medical screening to ensure that he is in good physical fitness;
- For travel to countries threat level 3 and above, approval is required by LBU Manager and visit should be registered with the host country by ensuring that the ticket is purchased through an ABB travel agency and details put on the travel tracker system. This is done automatically but for those arrangements which are not made through an ABB approved travel agency then the details shall be entered manually.
- For travel to countries where the threat level is 2 then approval is required by LBU Manager and details to be entered into the TIS system. Prior approval is required from Local Division Manager with copies to host Country Manager and ABB Group Travel.
- For travel in high risk countries (threat level 1) additional authorization by the local Division Manager (LDM), Country Manager and ABB Group Travel is required prior to travel;
- Travel Information Sheet (TIS) shall be completed and submitted five days prior to travel
- Ship Security Plan (SSP) completed and submitted prior to travel if in Threat Level waters
- Automated Travel Advisory (ATA) will be sent to the traveler upon booking a trip and will contain advice and recommendations regarding medical and security advice for the selected country.
Requirements when travelling to high risk countries

- Traveler shall normally be briefed about the security situation and relevant instructions, usually by the Security Manager International Operations, using the general security brief and selected country security brief

See also general advice on travel in COP 3.

5.0 TRAINING AND COMPETENCE

ABB Travel policy, ABB general advice for travelling and working internationally, Travel code of conduct for the Treat Level area and Emergency procedures shall be communicated to ABB Marine and Cranes employees and/ or contractors prior to travelling.

6.0 MONITORING AND CHECKING

a) The LBU responsible manager/ unit shall ensure that the communication arrangements and travel plan is available in the Travel Information Sheet database.

b) It is important that the traveler notifies the host country organization of his presence in the country.

All incidents, unsafe conditions, unsafe behaviors and near misses shall be reported to the applicable database. See ABB standard GISA 01.05A22.

7.0 DOCUMENTATION AND RECORDS

a) ABB uses a travel tracking system that enables quick access in order to identify who is in a particular affected area in case of a crisis or incident. It is therefore a record.

b) For high risk countries (threat level 1 and 2) the TIS system is used in addition.
1. INTRODUCTION
Road travel is one of the major areas for accidents and incidents. This code of practice (COP) has been prepared to provide practical guidance on best practice to be followed in respect of driving and road safety. The objective is to promote travel safety and security, ensure proper planning, efficiency and reasonable costs as well as harmonize travel-related practices.

2. SCOPE
These requirements apply to all vehicles that are used for business by ABB Marine and Cranes employees as well as to vehicles used by contractors to transport their workers to and from site.

In some countries it is not advisable to drive on your own. In such cases the vehicles shall be leased, rented or hired with a driver, or if the vehicle is an ABB car it should be driven by a local. Below is listed as an example as at the date of issue the high risk road traffic countries. See also Road Safety Standard, GI/SA-0.1.05A17.

If national legislation, and or ABB requirements and or customer requirements differ, then the higher standard shall be followed.

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<th>HIGH ROAD SAFETY RISK</th>
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<td>Benin</td>
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<tr>
<td>Bolivia</td>
</tr>
<tr>
<td>Bosnia and Herzegovina</td>
</tr>
<tr>
<td>Botswana</td>
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<tr>
<td>Burkina Faso</td>
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<tr>
<td>Burundi</td>
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<tr>
<td>Cambodia</td>
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<tr>
<td>Cameroon</td>
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<tr>
<td>Cape Verde</td>
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<tr>
<td>Central African Republic</td>
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<tr>
<td>Chad</td>
</tr>
<tr>
<td>China</td>
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</tbody>
</table>

3. HAZARDS AND RISKS
Road incidents often cause more deaths and serious injuries to employees and contractors than incidents on site. Unsafe vehicles, violations against regulations and speed limits, fatigue, etc are examples of hazards and risks.

Travel is an important part of work undertaken by BU Marine and Cranes, and within ABB Group driving is identified as one of the high risk tasks for our personnel.

4. OPERATIONAL CONTROLS
4.1 Risk Avoidance & risk reduction
- Use videoconferencing, same time meetings and teleconferences instead of traveling whenever practical;
- Plan early, if possible. Advance planning reduces risks and makes it possible also to find the lowest prices;
- Preferably pre-book transportation prior to travel via our travel agency partners, or local ABB colleagues;
Safety requirements for driving and road safety

- If booking a vehicle at the location, ask assistance from local ABB colleagues. Consider language barrier as it is common that there are often only very few English speaking persons in the leasing companies and they can usually speak only some simple words;
- Use ABB preferred rental companies (agreement between ABB Group and the rental company) in case vehicles are leased, rented or hired. This should ensure that vehicle meets safety standards;
- Do not drive vehicles rented by colleagues, unless you are registered as a co-driver on rental papers;
- Inspect the vehicle prior acceptance especially the existence of seat belts, condition of tires (wearing surface, air pressure, in snow conditions winter tires), at least two airbags “driver and passenger”, head rests at seats in the front and at back, ABS and power steering and first aid kit, air-conditioning in hot environment. The vehicle should not be older than 3 years;
- When booking vehicle with a driver, clearly emphasis requirement of seat belts in the back seat and need for safe driving practices each time to raise the attention! Whenever possible, travel in the back seat. Avoid ‘spot’ or hire direct taxis in high road risk countries.

4.2 Risk control

- Use seatbelt on each occasion and travel only in vehicles specifically designed for passenger use;
- If the vehicle is also transporting goods, ensure that the load is secured properly;
- Comply with all national road laws, and site speed limits;
- Do not use hand-held cell (mobile) phones, or radios when driving;
- Ensure the manufacturers limit for passengers, and load to be carried are not exceeded and follow procedures for safe operation and maintenance of the vehicle;
- Report all motor vehicle incidents and near misses. Take photos if possible and include details of those involved;
- Do not use motorcycles for business travel;
- Do not under any circumstances drive under the influence of alcohol or drugs, or when suffering from fatigue;
- Always assess your capability for driving, especially after completing long haul flights etc. If any doubts, use alternatives e.g. host pickup, appropriate taxi or public transportation;
- One common root cause of road incidents is fatigue. It is recommended that adequate rest is taken on long journeys and that a short break, say of at least 15 minutes, is taken after about 2 hours driving with a longer break, of about 60 minutes, after 4 hours;
- Since so many factors affect fatigue, no firm limits in terms of mileage or time are possible to set, except perhaps for very specific situations. Examples of recommended maximum distances set for some specific situations are 400 km (250 miles) for driving on generally good roads and 600 km (375 miles) for mainly motorway driving. However, any such recommendations should be regarded as exceptional journeys, not the norm. Mileage limits should be regarded as indicative and not rigid otherwise unreasonable situations could arise, such as an overnight stop a short distance from the destination or the use of cross country or town centre routes instead of an easier but longer motorway journey.

5. TRAINING AND COMPETENCE

- Ensure that you are suitably trained and licensed to operate the class of vehicle to be used;
- Employees who drive more than 30,000 km for business per year, or who are required to work in an area with a High Risk Level status shall attend a suitable advanced driving course.

6. MONITORING AND CHECKING

- The supervisor is responsible for ensuring that persons who are required to travel are aware of this Code of Practice;
- Individuals who are traveling are responsible for following the requirements of this Code of Practice;
- Driving and road safety practices shall be part of OHS audits and reviews conducted by the LBU.
- All incidents, unsafe conditions, unsafe behaviors and near misses shall be reported to the applicable database. See ABB standard GISA 01.05A22.
1.0 INTRODUCTION
A lack of hazard awareness, or working in environments which are unfamiliar can increase the risk of injury purely because persons working on the site do not have the site specific knowledge about the hazards and risks on site, as well as the control measures and procedures in place to deal with those risks. This code of practice (COP) therefore sets out some basic requirements to be followed when planning any visit to a shipyard or port to ensure that all ABB staff and any contractors are aware of the location, the site specific hazards and the general arrangements on site for controlling those risks.

2.0 SCOPE
This COP applies to all ABB Marine and Cranes employees and contractors, or work sites which have a nominated ABB Site manager or responsible person (and partially to personnel working for small and/or short term site works, such as service visits).

If national legislation or customer requirements impose a higher standard, then the higher standard shall be followed. In such cases this shall be documented.

3.0 HAZARDS AND RISKS
Working within any unfamiliar environment will increase health and safety risks owing to the lack of knowledge about any site specific hazards and any site specific rules, practices or procedures, or any prohibitions that are applicable.

4.0 OPERATIONAL CONTROLS

4.1 Planning
- Much can be done before arriving at site by ensuring that prior to any contract being agreed suitable enquiries are made with the customer to ensure that details of the site, including its layout, details of site specific hazards and any site safety rules that apply are obtained.
- The information obtained shall be incorporated into the H&S plan for the project/contract which shall be prepared during the tender/contract phase.

The information that shall be obtained shall include
- a site map and details of any safe walking routes, prohibited areas and location of the facilities including welfare, first aid etc;
- Details of the customers’ on site organization and contact person or a contact for the yard or port;
- Details of the site EHS rules which should include information in respect of any or all of the following:
  a) Prohibitions; e.g. alcohol and drugs
  b) Requirements for personal protective equipment on site
  c) Radio practices, e.g. frequencies
  d) Announcement practices
Requirements for site familiarization prior to starting work

e) Lock out / tag out – practices
f) Requirements for work permits e.g. hot work, electrical isolation etc
g) Fire and emergency procedures including emergency telephone numbers for fire, police, ambulance and emergency contact for the yard or part facility;
h) Waste treatment arrangements
i) Site security requirements
j) Vehicle parking requirements
k) Storage and lay down areas
l) Incident reporting requirements including near miss and hazard reporting requirements
m) Disciplinary matters on site.

4.2 On arrival at site

- On arrival at site all ABB employees and contractors shall report to the security gate and sign in and obtain their site ID if required;
- The ABB supervisor or site manager shall ensure that ABB employees and contractors are given a site briefing or induction regarding the site EHS rules and the emergency arrangements on site.
- Where the above is not provided then the ABB supervisor or site manager shall contact the customers’ representative on site in order to obtain this information;
- The site briefing or induction shall if possible cover the following topics:
  a) Site layout specifics including safe walking routes
  b) Important locations; e.g. parking, gates, lunchroom, emergency meeting places, offices, welfare facilities and first aid station;
  c) Emergency contact information including telephone numbers for ambulance, police, fire service and also the port, yard or vessel contacts;
  d) Vessel or Crane specifics, e.g. evacuation routes, fire extinguishers.
- For small and/or short term works, such as service visits where the works are <2-3 days, the ABB employee executing the work shall request a site escort from the Customer who is familiar with the site who can brief the ABB employee on the site and its various facilities and any EHS requirements. Internal ABB EHS requirements, such as emergency protocols, PPE etc. are not handled in this COP.

4.3 Prior to starting work

Prior to starting work the ABB supervisor or site manager shall carry out a briefing on:

- The scope of work to be carried out on site;
- Principal hazards and risks on site including presence and location of asbestos, radiation sources and in particular any non destructive testing on board the vessel; storage and use of hazardous chemicals etc;
- EHS (Environmental, Health & Safety) site requirements;
- Name and phone number of EHS responsible person on site or vessel;
- ABB responsible person for commissioning of ABB unit/service;
- Name of responsible person on board the vessel for connection or switching
- Details of any other contractors who may be working within the same working area as ABB and any risks that may affect ABB;
- Location of general welfare arrangements including
  a) Supply of drinking water
  b) Lunchroom and messing facilities
  c) Toilets and washing facilities
  d) Changing facilities and storage of clothing
  e) Storage of personal protective equipment
  f) First aid and medical facilities.
SITE FAMILIARIZATION

Requirements for site familiarization prior to starting work

5.0 TRAINING AND COMPETENCE
This COP shall be communicated to every project team member prior to starting any work on site.

6.0 MONITORING AND CHECKING
The ABB supervisor or site manager is responsible for ensuring that all project team members have been familiarized with the site prior starting any work. This shall include contract personnel working on behalf of ABB.
Site familiarization shall be part of EHS audits and reviews conducted by the LBUs.
All incidents, unsafe conditions, unsafe behaviors and near misses shall be reported to the applicable database.
See: ABB standard GISA 01.05A22.

7.0 DOCUMENTATION AND RECORDS
Site Familiarization shall be included as a part of the Project Safety Plan during project start-up phase and documented during the commissioning phase.
1.0 INTRODUCTION
It is generally accepted that safety signs and signals are not always understood by employees and others. This code of practice has been prepared to provide general information to ABB employees on signage that is used internationally to communicate such information clearly.

2.0 SCOPE
These requirements apply to all ABB Marine and Cranes employees or contractors when working on site. If the local regulatory or customer requirements impose a higher standard, then the higher standard shall be followed. In such cases this shall be documented.

3.0 HAZARDS AND RISKS
It is an important safety measure that all ABB personnel and ABB’s contractors on site are able to easily understand the safety signs. ABB employees who do not understand the system of safety signs and signals so could result in them failing to recognize a known hazard or another danger such as a prohibited area or an action which in turn could lead to serious injuries or even death. This will also apply to contractors or in some cases the public e.g. visitors to site.

4.0 OPERATIONAL CONTROLS

4.1 General
All persons on site shall be able to identify the 4 basic categories of safety signs. These are illustrated in fig 1 and are:

<table>
<thead>
<tr>
<th>Signage Category</th>
<th>Examples</th>
</tr>
</thead>
<tbody>
<tr>
<td>Safe condition</td>
<td>Means of escape</td>
</tr>
<tr>
<td></td>
<td>Emergency shower</td>
</tr>
<tr>
<td></td>
<td>First aid</td>
</tr>
<tr>
<td>Prohibition</td>
<td>No forklift trucks</td>
</tr>
<tr>
<td></td>
<td>No smoking</td>
</tr>
<tr>
<td></td>
<td>No entry</td>
</tr>
<tr>
<td>Hazard and warning or caution</td>
<td>Danger of electrocution</td>
</tr>
<tr>
<td></td>
<td>Danger fire risk</td>
</tr>
<tr>
<td></td>
<td>Danger of death</td>
</tr>
<tr>
<td>Mandatory (Must do)</td>
<td>Eye protection must be worn</td>
</tr>
<tr>
<td></td>
<td>Hand protection must be worn</td>
</tr>
<tr>
<td></td>
<td>Wear respirator</td>
</tr>
</tbody>
</table>
### Information on safety signs and signals

1. Safe condition—signs. (These typically indicate the means of escape e.g. in case of fire, first aid station, safety shower etc. They are rectangular or square in shape and the pictogram is on a green background).
2. Prohibition-signs. (These prohibit an activity or behavior that is likely to increase danger. They are circular in shape with a black pictogram on a white background, red edging and diagonal line).
3. Hazard warning-signs. (Warn of a particular hazard or danger. The signs are triangular in shape with a black pictogram on a yellow background with black edging).
4. Mandatory signs. (Indicate a requirement that must be complied with. The signs are round in shape and have a white pictogram on a blue background).

On many sites there will often be a sign board where a collection of signs may be displayed usually describing some of the hazards that are likely to be present and in particular any prohibitions that may apply together the required personal protective equipment. Safety signs can also come in combinations.

#### 4.2 Fire safety

Signage for fire safety is treated separately from the general signage in 4.1 above where the sign is red with a white pictogram.

![Fig 2 Examples of Fire Signage](image)

#### 4.3 Acoustic signals

Acoustic signals are also used on site the most common one being the fire alarm signal. It is important that when arriving at site for the first time ABB employees are informed about the fire signals and in particular the signal for evacuation. This is very important when working on board a vessel.

Other safety signals which are acoustic are alarms used to warn of impending or actual movement of machinery. The most common example is movement of cranes which normally have an acoustic signal warning persons of movement of load, the crane or both.

Site personnel shall contact site manager for advice in case they notice a safety sign that they do not understand.

### 5.0 TRAINING AND COMPETENCE

This content shall be communicated to every project team member prior they start any work on site.

### 6.0 MONITORING AND CHECKING

The site manager is responsible for ensuring that all project team members have been familiarized with the signage prior starting any work on site. This shall include contract personnel working on behalf of ABB.

Signage recognition shall be part of OHS audits and reviews conducted by the LBUs.

All incidents, unsafe conditions, unsafe behaviors and near misses shall be reported to the applicable database. See ABB standard **GISA 01.05A22**.

### 7.0 DOCUMENTATION AND RECORDS

None required.
1.0 INTRODUCTION
It is essential that all ABB Marine and Cranes personnel or contractors are aware how to act in cases where emergency medical treatment is required and/or first aid assistance is needed on site. This code of practice (COP) sets out basic requirements to be followed when working on customer sites.

2.0 SCOPE
This COP applies to all ABB Marine and Cranes employees and contractors, or work sites which have a nominated ABB Site manager/responsible person. If national legislation or customer requirements impose a higher standard, then the higher standard shall be followed. In such cases this shall be documented.

3.0 HAZARDS AND RISKS
Marine and Cranes work sites can often have poor accessibility for medical teams. This combined with imprecise location information of the injured person can increase the risks further (see COP 6 ‘Site Familiarization’). Failure to either provide for adequate first aid provision or emergency medical support is likely to increase the severity of outcome of any injury that may have been incurred.

4.0 OPERATIONAL CONTROLS
4.1 General
- All contracts or projects tendered for shall include suitable provision regarding the reasonable availability of emergency medical services. It is impossible to state what is reasonable, but at least the provisions must be such that a seriously injured person will be treated by a medical professional within one hour of any incident. This will normally be at hospital, or suitable trauma center. To achieve the response time for seriously injured persons at remote sites/locations it may be necessary to make/secure additional medical provisions at site, such as:
  a) Ambulance or vehicle capable of taking full length stretcher
  b) Availability of medical professional, and trauma facilities
  c) Helicopter evacuation
The above must be established from the customer during the tender stage of the contract.
- As an absolute minimum requirement every work location shall have a first aid available within 5 minutes of incident (exception might be confined spaces, which have own protocols, (see COP 22 ‘Entry into Azipod Unit’).
- All projects and work areas shall have a first aid kit readily accessible so that the first aid can start within above mentioned 5 minutes of an incident.
  a) For measure of best practice, and/or if it cannot be determined if adequate First Aid kit is readily available on site, ABB shall provide their own First Aid kit to every project.
  b) First aid kits shall be constructed of impervious material, dustproof and of sufficient size to store the required contents. They must be capable of being sealed and have a handle for emergency transport.
  c) The exterior of the first aid kit must clearly identify it’s purpose, for example - “First Aid”.
  d) Contents of the kits shall be suitable and sufficient for the site (see table 1 below) and shall be based on the hazards and risks involved e.g. if welding is carried out then treatment for burns must be considered.
  e) Every first aid kit shall be kept fully stocked and maintained in a clean and hygienic condition.
- Emergency contacts information shall be posted visibly around site, and communicated to all workers (see also COP 6 ‘Site Familiarization’). This shall include telephone/Radio contact name & numbers of
  a) Medical professional
  b) Ambulance
  c) Hospital

4.2 Emergency medical care
Emergency medical care is the provision of skilled medical help at the scene of an accident, medical emergency, or during transport to hospital. It consists of recognition, resuscitation and stabilization of the seriously injured and it extends beyond the preservation of life to the prevention of complications and the relief of suffering.
First aid & emergency medical requirements

4.3 First Aid Treatment
This includes:

(a) Treatment for the purpose of preserving life and minimizing the consequences of injury or illness until help from doctor, nurse/medical professional is obtained.

(b) Treatment of minor injuries which do not need treatment by doctor, nurse/medical professional

### Table 1
First Aid Kits Minimum Contents for Projects and Work Sites (note: this is NOT personal first aid travel kit)

<table>
<thead>
<tr>
<th>Item</th>
<th>Group A Kit Over 25 persons on site</th>
<th>Group B Kit 1-25 persons on site</th>
</tr>
</thead>
<tbody>
<tr>
<td>Absorbent compress</td>
<td>4</td>
<td>4</td>
</tr>
<tr>
<td>Antiseptic – Swabs</td>
<td>20</td>
<td>10</td>
</tr>
<tr>
<td>Alcohol swabs</td>
<td>20</td>
<td>20</td>
</tr>
<tr>
<td>Bandage Conforming 5cm</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>Burn treatment kit</td>
<td>6</td>
<td>6</td>
</tr>
<tr>
<td>Cold compresses – heat Stress</td>
<td>5</td>
<td>5</td>
</tr>
<tr>
<td>Contaminated Waste Bag</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Dressing strip – Plastic (50)</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>Dressing tape (hypoallergenic) 25 mm</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Dressing, wound – No.14P</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Dressing, wound – No. 13P</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>Emergency blanket</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Eye pad – Sterile single</td>
<td>3</td>
<td>1</td>
</tr>
<tr>
<td>Eye flush kit</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>First Aid Manual</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>First Aid Pamphlet</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Gloves latex – large (pair)</td>
<td>3</td>
<td>2</td>
</tr>
<tr>
<td>Non-adherent Dressing 7.5x7.5 cm</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>Protective eyewear</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Resuscitation Face Shield/Mask</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Safety pin 12 pack</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Scissors – Sharp/Blunt 125 mm</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Sodium chloride 30 ml</td>
<td>6</td>
<td>3</td>
</tr>
<tr>
<td>Splinters forceps</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Triangular bandage</td>
<td>6</td>
<td>2</td>
</tr>
<tr>
<td>Tongue blades – use for finger splints</td>
<td>5</td>
<td>5</td>
</tr>
</tbody>
</table>

5.0 TRAINING & COMPETENCE
Valid first aid training is a recommendation for all ABB Marine and Cranes employees and Contractors working on sites. The training shall fulfill at least International SOS standard. The training shall be refreshed at suitable intervals e.g. every 3 years. There must be at least one trained first aid person for every team and shift working on site.

6.0 MONITORING & CHECKING
Managers responsible for selecting site personnel shall have a system in place to ensure validity of first aid training of personnel travelling to site. First aid and emergency medical provision shall be part of OHS audits and reviews conducted by the LBUs.

All incidents, unsafe conditions, unsafe behaviors and near misses shall be reported to the applicable database. See ABB standard GISA 01.05A22.

7.0 DOCUMENTATION & RECORDS
Validity of first aid training shall form part of personnel information records and certificates of training shall be retained.
1.0 INTRODUCTION
Ports, shipyards and vessels are high risk environments, especially during construction phase or during large maintenance works. This is mainly due to several parallel work activities going on as well as the nature of the works, such as welding and painting which can introduce high risks e.g. fire on board. Some ports also have an increased risk level due to the goods being transported, e.g. chemicals. This code of practice (COP) has been developed to help ABB employees and sub contractors to be prepared in case of emergency at site.

2.0 SCOPE
These requirements apply to all ABB Marine and Cranes employees and contractors working on site or visiting site without guide. All personnel must have essential contact information with them and follow the site’s/customer’s protocols in case of emergency.

3.0 HAZARDS AND RISKS
Working on board a ship or on a crane (only one way of exit and no light) presents an increased risk in respect of evacuation if e.g. a fire breaks out or there is a chemical threat. By knowing how to act if such incidents should occur before they do, one will be able to handle the situation better.

4.0 OPERATIONAL CONTROL
All ABB personnel that are going to work on site or visit it needs to know the Emergency Contact Plan and the Escape Plan for the site. Personnel working on site also need to know the project’s Risk Assessment, Project Safety Plan and site’s/customer’s Emergency Preparedness plan

4.1 Emergency Contact Plan

![Emergency Contact Plan Diagram](image-url)

**Fig 1**
Example of Emergency Contact plan (text is illustrative only)
Emergency arrangements on Site

This document must be prepared by the Project Manager and given to personnel before they are sent to site. The first to be called on if an injury happens should be the site medic team, if the site has one. Then one should call the site’s QHSE responsible for help to contact the national ambulance, if e.g. one is in a foreign country where people do not speak English. You can also call directly. You must report all relevant incidents to PM or your manager.

4.2 Escape Plan

This plan should be a map of the area marked with the locations of muster points, firefighting equipment, first aid stations and escape routes. It should also describe how the site warns people if an emergency occurs, like bells ringing when there is a fire. This map can also show other useful site locations, like toilet and canteen.

4.3 Emergency Preparedness Plan

The site or the customer should provide ABB personnel an Emergency Preparedness Plan prior to work start, or its content can be covered during site specific safety introduction. If this is not provided, ABB PM needs to get a hold of the information and inform the personnel that are going to work there about what to do in case of critical situations. The Emergency Preparedness Plan should inform about what to do and who to alert in case of emergency on site, e.g.:

- Fatal or serious injuries
- Fire evacuation on board a vessel or crane
- Evacuation at sea
- Chemical spillage to the environment or on board
- Forces of nature like hurricane, tornado and earthquake
- Emergency related to work in confined space
- Emergencies that can happen when travelling to high risk countries (see CoP 4 for list of high risk countries)

A good emergency plan should also include key procedures, such as:

- STOP all the work if a emergency occurs
- Shut off the valves and switches close to you if you can
- WALK (DO NOT RUN) to the nearest designated muster point
- Stay there for head account
- Only go back to work when ALL CLEAR SIGNAL is given
- Always bring with you a flashlight when on board for a safe evacuation

4.4 Risk Assessment

The Emergency Contact Plan should cover operations/activities that have high scores in the project EHS Risk Assessment.

4.5 Project Safety Plan

The Project Safety Plan is the main safety document for the project, so this document should refer to all the above mentioned documents and link to them.

5.0 COMMUNICATION

All ABB persons who are likely to have to travel to customers’ sites shall be briefed on the contents of this COP.

6.0 MONITORING AND CHECKING

The project’s site emergency preparedness shall be part of OHS audits and reviews conducted by the LBUs. The LBU’s shall also check that the planning of the projects includes the requirement to obtain the site emergency information from the customer and the ship operator, whichever party is in control of the work on board the vessel or at site. This information shall be obtained before arriving on site preferably at the tender or contract stage.

All incidents, unsafe conditions, unsafe behaviors and near misses shall be reported to the applicable database. See ABB standard GISA 01.05A22.
1.0 INTRODUCTION
This code of practice in respect of the selection, provision and maintenance of personal protective equipment (PPE) has been developed for Marine and Cranes activities both for operations within the ports and, shipyards but also whilst at sea during commissioning.

2.0 SCOPE
These requirements in respect of PPE apply to all ABB Marine and Cranes employees and/ or contractors working on customers’ sites. Requirements for respiratory protection equipment (RPE) are covered in COP 29. If the local regulatory or customer requirements impose a higher standard, then the higher standard shall be followed. In such cases this shall be documented.

3.0 HAZARD & RISKS
Work instructions shall instruct in safe working methods and requirements for PPE. PPE shall be considered as the last resort protection measure, i.e. other safety measures should always be considered prior PPE. In most projects ABB is not fully in control of the work site, since the shipyard/ vessel owner/ vessel operator carry the main responsibility. There may also be several contractors working in the same area as ABB employees. Thus the usage of PPE should always be considered based on the actual situation at site.

4.0 OPERATIONAL CONTROLS
4.1 Selection & provision of general PPE
All PPE that is to be provided for Marine and Cranes personnel including any possible sub contractors must be fit for purpose and comply with the relevant EN or ANSI standard or their equivalent. The following represents an indicative list of PPE or other safety equipment that shall be provided for all persons who have to visit and work at customers' sites.

Personal issue
- Safety helmet or safety helmet equipped with visor
- Ear protection (personal or disposable)
- Respiratory protection-disposable dust mask or reusable half mask with P3 filters
- Eye protection (glasses, goggles or face shields)
- Overall or cover suit – flame resistant
- Protective footwear-boots
- Protective Gloves
- Flashlight with spare batteries
- ABB lock out/tag out equipment

Additional safety equipment to be available at site
- Danger signs and hazard tape
- Portable earthing devices
- Insulating mats
- HV indicator rods
- Walkie talkie

THE RISK ASSESSMENT & WORKING INSTRUCTION SHOULD SPECIFY THE PPE TO BE WORN IN RESPECT OF THE WORK ACTIVITY
<table>
<thead>
<tr>
<th>TASK OR ACTIVITY</th>
<th>Protective Helmets</th>
<th>Hearing Protection</th>
<th>Safety Glasses or goggles</th>
<th>Welding Helmet with goggles or face shield</th>
<th>Face Shield</th>
<th>Dust mask (disposable)</th>
<th>Half mask with P3 filter</th>
<th>Respirator with air supply</th>
<th>Gloves</th>
<th>Welding jacket and chaps</th>
<th>Coverall suit with HIVIZ</th>
<th>Safety footwear</th>
<th>Safety Harness</th>
</tr>
</thead>
<tbody>
<tr>
<td>General work in shipyard</td>
<td>EN 397</td>
<td>EN352-3, EN 458</td>
<td>EN166 &amp; 168</td>
<td>EN 169-171</td>
<td>EN 166</td>
<td>EN 140, 149</td>
<td>EN 136-139, 269-271</td>
<td>EN 531</td>
<td>ISO 20345, EN 345</td>
<td>ISO 10333</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Welding</td>
<td>to be carried</td>
<td></td>
<td>With P3 Filter</td>
<td>With P3 Filter</td>
<td>EN 12477</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Grinding</td>
<td>Face shield is preferred</td>
<td></td>
<td>With P3 Filter</td>
<td>EN 388</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Working in noisy environment</td>
<td></td>
<td></td>
<td>With P3 Filter</td>
<td>EN 388</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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<td></td>
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<tr>
<td>Work with exposure to airborne chemicals</td>
<td></td>
<td></td>
<td>With P3 Filter*</td>
<td>EN 388</td>
<td></td>
<td></td>
<td></td>
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<td></td>
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<tr>
<td>Work in confined spaces</td>
<td></td>
<td></td>
<td>Special rescue situations</td>
<td>EN 288</td>
<td></td>
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<td></td>
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<td></td>
<td></td>
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<tr>
<td>Working at height</td>
<td></td>
<td></td>
<td></td>
<td>EN 388</td>
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<tr>
<td>General Working with chemicals</td>
<td></td>
<td></td>
<td></td>
<td>EN 374</td>
<td></td>
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<tr>
<td>Working with exposure to airborne particles</td>
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<td></td>
<td>With P3 Filter</td>
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<td>EN 388</td>
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</tbody>
</table>

Note: overalls has to comply with ABB arc flash requirements
* Not suitable against all chemicals, check suitability against chemical in question from your local safety advisor.
4.2 Care and Maintenance

All non disposable PPE shall be maintained by each employee so that it is kept in good condition for use. In certain cases such as hearing protectors then they need to be checked periodically to ensure that the seals are being kept in good condition. Similar comments apply to eye protection, safety footwear and head protection.

In the case of disposable PPE such as ear plugs then the supervisor on site shall ensure that there are sufficient supplies kept and available on site.

4.3 Storage

All ABB staff that is required to travel to site shall be provided with a suitable bag in which to store all the required PPE to ensure that it is kept in good order and is prevented from being damaged in transit to site.

4.4 Summary of PPE requirements

- Never use PPE if it is dirty or damaged or if it is incomplete;
- Never leave PPE lying around where it may get contaminated, or damaged;
- If there is large amount of contamination present then do not work in the area.

- Always ensure that the PPE is in good working order before going to site and before first use;
- Always clean and store PPE properly. If it gets damaged then obtain a replacement.

5.0 TRAINING & COMPETENCE

All ABB employees shall receive suitable training and instruction on EHS requirements in respect of their work activities. In respect of PPE they shall be instructed in the:

- Correct use of the PPE that they have been issued with and what not to do;
- How to fit RPE (Respiratory Protective Equipment) correctly;
- How to obtain replacements.
- Emergency arrangements where PPE may be needed.

6.0 MONITORING

6.1 Active monitoring

a) All ABB staff shall be issued with suitable PPE based upon the risk assessment (JSA) carried out in respect of the work activity to be undertaken. It is important that all staff understand that they are responsible for checking their equipment BEFORE they go to site to ensure that it is in good order and that they have the necessary replacement supplies with them, particularly in respect of disposable equipment.

b) Periodically each person when he is back at his home location shall have his equipment checked by his supervisor to ensure that it is being maintained in a reasonable state.

c) PPE compliance shall form an essential part of any SOT carried out site.

6.2 Reactive monitoring

All incidents, unsafe conditions, unsafe behaviors and near misses related to PPE, incorrect use of PPE, no use of PPE etc. shall be reported to the applicable database. See ABB standard GISA 01.05A22.

7.0 DOCUMENTATION & RECORDS

The following records shall be kept by the LBU:

- Risk assessment or Job Safety Analysis (JSA) which specifies the requirement for PPE
- Record on training and instruction.
1.0 INTRODUCTION
There is no general prohibition of lone working but wherever it is practical lone working should be avoided. This code of practice has been developed as general guidance for those occasions when it may be necessary.

2.0 SCOPE
This COP applies to all ABB Marine and Cranes employees and contractors, or work sites which have a nominated ABB Site manager or responsible person. If the local regulatory or customer requirements impose a higher standard, then the higher standard shall be followed. In such cases this shall be documented.

3.0 HAZARDS AND RISKS
There is no additional hazard that arises from lone working but the risk of serious injury or illness arises from the fact that the worker is on his own and he cannot call for assistance and as a consequence the outcome from any incident will be more severe. This might include a work related incident or a medical condition.

4.0 OPERATIONAL CONTROLS
As in all cases risk assessment shall have been undertaken prior to any work starting and preferably during the planning stage when the possible lone working situation will have been identified. The assessment shall have identified the hazards associated with the proposed work activity and specified the control measures required in the normal way as per the hierarchy of control. Where lone working cannot be avoided then proper consideration shall be given to risk reduction measures. They shall include consideration of the following:

- Avoid the need for lone working if at all possible. If necessary postpone the job.
- For high risk activities such as live electrical work, work in confined spaces, work at height etc lone working is prohibited. Live electrical work means working either on or in close proximity to energized conductors.
- **On no account is lone working permitted when working on or near to electrical installations where there is a foreseeable risk of electrocution or in confined spaces, as there shall be suitable arrangements in place to provide emergency support and first aid, or to arrange for its provision.**
- Ensure that the lone worker is competent and understands the limits of the work activities.
- Ensure that the ABB employee registers his presence on site with the security office on site and that he informs them about his work location.
- Reduce the risk by limiting the activities to low risk ones such as monitoring duties only and no operation of plant, equipment or machinery, working at height, operating vehicles etc.
- In cases where an engineer may be required to work on electrical equipment such as a drive for a large crane then that person shall be accompanied until the seven steps have been properly applied and the equipment is proved dead and the isolator has been locked off.
- In a similar way the equipment cannot be re-energized until a second person is present.
- Provide a suitable means of communication so that the lone worker can alert a contact person or someone else on site in the event that there is something of concern, or in the case of an emergency. The person need not necessarily be an ABB employee.
- Provide the lone worker with some form of alarm, manual or automatic which operates when there is a lack of activity.
- Actively contact the lone worker to check on his status throughout the shift, or ensure that there is a regular call in schedule.
- In cases where the lone working situation arises unplanned then the lone worker shall contact his supervisor to agree the precautionary measures that need to be applied. He should also contact the customers’ representative on site.
- Ensure that the lone worker has a “travelling” first aid kit available.
Arrangements on site for lone working

5.0 TRAINING AND COMPETENCE
This content must be communicated to ABB Marine and Cranes employees and/or contractors prior to starting any work on site.

6.0 MONITORING AND CHECKING
The project manager or service manager is responsible for ensuring that ABB Marine and Cranes employees and/or contractors do not generally get involved in lone working. If it is absolutely necessary the project manager or Service manager shall check that the precautionary measures are adequate based on the risk assessment and that the employee concerned has been informed of the requirements prior to starting any work on site. He shall also be informed of any other work proceeding on site that may interface with the lone worker’s activity.

All incidents, unsafe conditions, unsafe behaviors and near misses shall be reported to the applicable database. See ABB standard GISA 01.05A22.

7.0 DOCUMENTATION AND RECORDS
Lone working is to be identified as a part of the Health and Safety planning during project start-up phase or as part of the risk assessment on site.
1.0 INTRODUCTION

Working on electrical systems at voltages above 50V will present serious hazards to persons both in terms of electrocution, but also in respect of the effects of arc flash which can occur on systems below 1000V as well as >1000V. This code of practice describes the basic minimum requirements for electricians/engineers of ABB Marine and Cranes working on electrical systems in a site environment. Further more detailed information is provided in the required electrical safety trainings (paragraph 5.0) and in the Group instructions (paragraph 8.0).

2.0 HAZARDS AND RISKS

Work undertaken on electrical equipment will present a number of basic hazards. This can include electric shock which if the person is subject to a voltage across his body can result in serious injury and often death depending on the voltage, and the current and time involved. This can occur at currents of 30mA. There is also the hazard of arc flash which occurs if an accidental short circuit occurs when a conductive object gets too close to a high amp (power) current source, or by equipment failure. It can often result in the release of very high energy levels over a very short time period releasing large amounts of heat with the conductors becoming molten, which are then vaporised. This can result in severe burns to the uncovered parts of body. It is particularly relevant at voltages below 1kV owing to the compact nature of the equipment and therefore the small clearances but can also occur at voltages above 1kV. Other hazardous effects include exposure to ultraviolet radiation, effects of arc blast (pressure wave) and possible fire.

3.0 SCOPE

This COP applies to all ABB Marine and Cranes employees and contractors working on customers’ sites. If the local regulatory or customer requirements impose a higher standard, then the higher standard shall be followed. In such cases this shall be documented.

4.0 OPERATIONAL CONTROLS

As in all cases when managing risk, risk avoidance and elimination is the first and preferred option. Thereafter it is about risk reduction followed by risk control measures. These are summarized at table 1.

<table>
<thead>
<tr>
<th>Risk avoidance/elimination</th>
<th>Ensure that work is well planned and organised to enable all equipment to be worked on so that it is free from electrical danger i.e. dead.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Risk reduction</td>
<td>Only allow skilled and authorised &amp; competent persons including contractors to be within the vicinity zone and the general working area. Use voltage rated tools to reduce the probability of any accidental short circuit and therefore the incidence of an arc flash.</td>
</tr>
<tr>
<td>Risk isolation</td>
<td>where there are other live parts exposed then ensure adequate physical separation and/or insulated screens are applied to prevent electrical danger during the work activity.</td>
</tr>
<tr>
<td>Risk controls</td>
<td>permit to work is issued to confirm that the correct precautions (7 steps ) have been applied. ensure that equipment to be worked on is suitably identified and where practicable segregated to prevent unauthorised/unskilled persons from entering the working area. isolators are locked out and tagged. earths or grounds are applied where appropriate. conductors to be worked on are tested to ensure that they are dead prior to the work commencing. competent &amp; skilled persons including contractors who will be working within the vicinity zone and the general working area shall be briefed on the work to be carried out and the control measures to be applied. personal protective equipment is specified, issued and worn to protect against electrocution and/or arc flash.</td>
</tr>
</tbody>
</table>

Table 1 Application of the Hierarchy of Control to Electrical Risks
4.1 Application of the 7 Steps

The 7 steps shall be applied to all electrical work carried on Marine & Cranes work sites.

**STEP 1 - CLEARLY IDENTIFY THE WORK LOCATION**
- A caution/danger notice or label shall be posted on the isolator and also on the conductor(s) to indicate that it is being worked on.
- It is important to be able to distinguish between the equipment that is dead and other equipment that may be live.
- Make sure that the possible live equipment are in good order.

**STEP 2 - DISCONNECT AND SECURE AGAINST RECONNECTION**
- Disconnect equipment from supply and ensure that the isolator is locked in the OFF position. If a number of people are working on the system then a multiple locking hasp and warning notice shall be used so that each person can apply his personal lock. This is often referred to as “Lock out - tag out”. See photos below.
- If isolation has been achieved by removing a fuse then ensure that the fuse is removed and held by the supervisor and that the fuse cabinet is locked and the key retained by the supervisor.

**STEP 3 - PROTECT AGAINST OTHER LIVE PARTS**
- Where there are adjacent conductors that may be live then additional screening measures will be required to ensure that no contact is possible (see next step).
- In the case of HV work (>1kv) safe distances shall be established by suitable barriers, to prevent the risk of contact (see table 2-EN 50110).

**STEP 4 - TAKE SPECIAL PRECAUTIONS WHEN CLOSE TO BARE CONDUCTORS**
- Wear relevant personal protective equipment including flameproof overalls, gloves rated at the correct voltage and face & neck protection. See also arc flash instruction.

**STEP 5 - CONFIRM THAT THE INSTALLATION IS DEAD**
- The circuits to be worked on shall be proved as dead by testing, at the point of work. The testing device itself shall be tested immediately before and after testing.

**STEP 6 - CARRY OUT EARTHING AND SHORT CIRCUITING**
- In addition to the above apply properly designed earthing devices to the conductors being worked on.
- On transformers it is important that both sides of the transformer have been isolated and earthed.
STEP 7 - ISSUE THE PERMIT TO WORK

- The use of a written permit to work linked to the lock off device shall be drawn up and issued by the supervisor who shall witness the testing of the conductors to ensure that they are dead and that they cannot be made live once work has started, e.g. no possibility of back feed or induced voltages.
- The permit to work shall be issued to the nominated person in charge of the work.
- Supervisor shall check on the work periodically to ensure that there is total compliance with the safety requirements;

4.2 Minimum distances

EN 50110 sets out the main requirements for safety when operating electrical installations. This describes the minimum distances that shall be maintained when working in areas where adjacent conductors may be energized. Table 2 summarizes the distances.

<table>
<thead>
<tr>
<th>Nominal system Voltage kV</th>
<th>Distance in air defining the outer limit of the live working zone (DL) mm-see fig 3</th>
<th>Distance in air defining the outer limit of the vicinity zone (DV) mm-see fig 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt;1</td>
<td>No contact</td>
<td>300 mm</td>
</tr>
<tr>
<td>3</td>
<td>120</td>
<td>1120</td>
</tr>
<tr>
<td>6</td>
<td>120</td>
<td>1120</td>
</tr>
<tr>
<td>10</td>
<td>150</td>
<td>1150</td>
</tr>
<tr>
<td>15</td>
<td>160</td>
<td>1160</td>
</tr>
<tr>
<td>20</td>
<td>220</td>
<td>1220</td>
</tr>
<tr>
<td>30</td>
<td>320</td>
<td>1320</td>
</tr>
</tbody>
</table>

Table 2-EN50110 - Guidance on Minimum Distances for Live Working and Vicinity Zones

4.3 Arc flash protection

All electricians in Marine and Cranes shall be provided and shall wear the personal protective equipment specified by ABB where there is a potential for arc flash. This shall include the provision of any or all of the following:

- suitable head protection EN 50365
- eye/face/neck protection EN 166
- suitable voltage rated gloves EN 60903 or ASTM equivalent
- whole body clothing EN ISO 11612 (flame proof)
- safety footwear EN531
- hearing protection
- voltage rated tools VDE EN 60900.

**DO NOT WEAR ANY UNCOVERED METAL PIECES, LIKE EARRING OR NECKLACE**

See also EN 50110 and Group guidance on Arc Flash protection.
4.4 In case of electrical shock

Act according to the given emergency instructions (and the emergency contact plan).

Note: If person experiences an electrical shock, he must go/be taken to a hospital even if the person seems to be fine afterward.

5.0 TRAINING AND COMPETENCE

Person working with electrical systems shall be skilled person to the voltages that are involved in his work. In particular he shall have adequate experience and training to the works he is performing. He must be familiar with “Seven Steps” and the Group instructions on electrical safety. Person must have valid electrical safety training and live works safety training.

6.0 MONITORING AND CHECKING

The LBU Manager shall have adequate arrangements in place to ensure that all persons who attend a customers’ site are competent for the work to be undertaken. He shall also ensure that Safety Observation Tours (SOT’s) and audits are carried out periodically to check that the requirements of this and any other COP are being complied with.

6.1 Active monitoring

a) All ABB personnel and contractors working with electrical systems must valid electrical safety trainings (covering also live works safety aspects)

b) Annually each person when he is back at his home location shall give his equipment to his supervisor so it can be checked for functionality and calibrated.

c) Usage of testing and commissioning equipment can be subject for discussion during SOTs.

d) Supervisor shall make sure that persons working for him are skilled and are taking the required trainings.

6.2 Reactive monitoring

All incidents, unsafe conditions, unsafe behaviors and near misses related to electrical safety shall be reported to the applicable database. See ABB standard GISA 01.05A22.

7.0 DOCUMENTATION AND RECORDS

Every Local Business Unit is responsible to keep up to date documentation of electrical & other relevant safety training undertaken by staff. This documentation must be available on site when needed.

Each LBU shall also have in place an effective system for the inspection, testing and maintenance of portable electric and other tools and devices e.g. for testing.

8.0 REFERENCES

a) GISA 01.01A03 Health and Safety Standards and Guidelines
b) GISA 01.05A18 Electrical Safety Guide
c) GISA 01.05A19 Electrical Testing Guide
d) GISA 01.05A21 High Voltage Electricity Safety Guide
e) GISA 01.05A23 Isolation and Lockout Guide
f) GISA 01.05A24 OHS Permit to Work Guide - High Voltage Tasks
g) GISA 01.05A32 Electrical Safety Rules Working less than 1kV
h) GISA 01.05A33 Electrical Safety Rules Working with over 1kV
i) See also EN 50110 Operation of Electrical Installations
j) Link to Electrical Safety portal: http://inside.abb.com/cawp/gad00303/193b27c7985cc9f0c125772a002b82d0.aspx
1.0 INTRODUCTION
Incorrect usage or use of defective/inadequate testing and commissioning equipment can lead to serious injuries. This Code of Practice has been prepared to provide basic guidance on the safe use of devices used in testing and commissioning of LV equipment.

2.0 SCOPE
These requirements apply to all ABB Marine and Cranes employees and contractors when working on site. If the local regulatory or customer requirements impose a higher standard, then the higher standard shall be followed. In such cases this shall be documented.

3.0 HAZARDS AND RISKS
An insulation tester, also known as megometer and megger, is a portable device used to test wire insulation. Wrong usage of an insulation tester can lead to electrocution. The shock should not be fatal for people unless they have some heart issues, but it can lead to dangerous situations like losing consciousness while standing on scaffolds.

A multimeter, also known as multimeter and VOM (Volt-Ohm meter), is used to measure voltage, current and resistance. Incorrect usage of an unsafe multimeter can in worst case lead it to explode. Multimeters are rated into categories based on their intended application. The four categories are:

- Category I: Used where equipment is not directly connected to the mains
- Category II: Used on single phase mains final sub-circuits
- Category III: Used on permanently installed loads such as distribution panels, motors and 3 phase appliance outlets
- Category IV: Used on locations where fault current levels can be very high, such as supply service entrances, main panels, supply meters and primary over-voltage protection equipment

4.0 OPERATIONAL CONTROLS

4.1 Insulation tester
- Completely discharge, drain the circuit and check for dead before connecting an insulation tester to it
- Disconnect the device to be tested from other electrical circuitry before testing
- Cables and capacitors can store charge for some time after test, and they can be charged with dangerous amounts of energy from a low output insulation tester. After testing, discharge the equipment/the measured circuit by using a cord between the circuit and ground, while wearing voltage rated gloves.
- Never touch the test leads
- Ensure that the insulation tester is within valid calibration date
- To avoid damage on equipment, do not use an insulation tester to test a low voltage-resistant device, unless the insulator has low resistance range. Insulators should mainly be used to test insulation measurements or conductor capability.

4.2 Multimeter
Before travelling to site:
- Test the multimeter at regular intervals and check that the calibration is valid
- If possible, choose a multimeter that has protection against overload on the ohm function and with protected entry connections
- Only use test cords with 90 degrees connections to the multimeter, protection against physical contact and different colors
- Use a multimeter with fused leads (500mA) and probes with minimum exposed metal on the tip to avoid short circuit across terminals or to earth during testing
- If possible, ensure that the multimeter complies to accepted safety standards (UL 3111, EN 61010, IEC 1010 (replaces IEC 348))
Safe use of testing & commissioning equipment

Before using the multimeter:
- Be sure that the multimeter is fully functional, test the functions before usage
- Check the test cords for physical damages
- Choose the right setting and range for the specific measurement

When measuring:
- Use the three-point test method, especially when checking to see if a circuit is dead. First, test a known live circuit. Second, test the target circuit. Third, test the known circuit again. This verifies that your meter works properly before and after the measurement. If possible, use a dedicated instrument (preferably with an attached “safe” proving device) to test for dead circuits, since a lot of things can go wrong with a multimeter.
- Hook on the ground clip first, and then make contact with the hot lead. Remove the hot lead first, the ground lead last.
- Hang or rest the meter if possible. Try to avoid holding it in your hands, to minimize personal exposure to the effects of transients.
- Keep one hand in your pocket when possible. This reduces the chance of a closed circuit across your chest area and through your heart.

4.3 Tools
- Use tools intended for electricians (e.g. fully insulated screwdrivers except for the tip). The maximum voltage limit should be stated on the tool.

5.0 TRAINING AND COMPETENCE
All ABB employees shall receive suitable training and instruction on EHS (Environmental, Health and Safety) requirements in respect of their work activities. In respect of testing and commissioning equipment, they shall be instructed in safe work with electrical equipment and correct use of insulator and multimeter. Equipment user manuals should be read, at least the parts regarding safety.

6.0 MONITORING AND CHECKING

6.1 Active monitoring
a) All ABB personnel shall be issued with the testing and commissioning equipment necessary for their work.
b) Annually each person when he is back at his home location shall give his equipment to his supervisor so it can be checked for functionality and calibrated.
c) Usage of testing and commissioning equipment can be subject for discussion during Safety Observation Tours (SOT).

6.2 Reactive monitoring
All incidents, unsafe conditions, unsafe behaviors and near misses related to testing and commissioning equipment shall be reported to the applicable database. See ABB standard GISA 01.05A22.

7.0 DOCUMENTATION & RECORDS
The following records shall be kept by the LBU:
- Record of calibration of instruments
- Record on training for safe work with electrical equipment
1.0 INTRODUCTION
Working at height including use of ladders is one of the major areas for accidents and incidents. This code of practice provides general guidance on the safe use of ladders and stepladders on work sites.

2.0 SCOPE
This COP applies to all ABB Marine and Cranes employees and contractors. If the local regulatory or customer requirements impose a higher standard, then the higher standard shall be followed. In such cases this shall be documented.

3.0 HAZARDS AND RISKS
The main hazard associated with working from a ladder is one of falling as a result of a number of possible causes. Typical causes of incidents involving ladders include:

- Ladders are defective because they have not been inspected nor maintained;
- "Home made" or makeshift equipment has been used;
- Placing of ladders on uneven surfaces or where they could slip easily;
- Ladders are in use close to exposed live electrical conductors including overhead lines;
- Persons working from ladders overreach causing them to fall;
- Use of tools that require a high degree of leverage causing a person to over balance and then fall.

4.0 OPERATIONAL CONTROLS

4.1 Risk avoidance/elimination
As with all health and safety requirements the hierarchy of control should be applied where risk avoidance should be the first consideration. A significant number of serious incidents occur each year involving ladders and hence they should not generally be used as a working place except for simple work of short duration e.g. 30 mins. Significant work of longer duration will require other measures and include the need to consider other methods for working at height e.g. fixed platforms, mobile scaffolds or mobile elevated working platforms (MEWP).

4.2 Risk reduction and control

4.2.1 Ladder pre-use inspection
- Always check a ladder before using it. See fig 1.

![Fig 1-Inspection items on ladders](image)

- Check all ladders to see that steps or rungs are tight and secure.
- Be sure that all hardware and fittings are properly and securely attached.
- Test movable parts to see that they operate without binding or without too much free play.
- Inspect metal and fibreglass ladders for bends and breaks.
- Never use a damaged ladder. **Tag it "Defective"** and report it to your supervisor (to be removed).
- Ladders should also have an ID.
4.2.2 Ladder set up

- Place ladder firmly and evenly on the ground with a slope of 4:1. Make sure the ladder is sitting straight and secure before climbing it. If one foot sits in a low spot, build up the surface with firm material. See fig 2.
- Do not try to make a ladder reach farther by setting it on boxes, barrels, bricks or other unstable bases.
- Do not allow ladders to lean sideways. Level them before using.

![Correct Ladder Set Up](image)

**Fig 2-Correct Ladder Set Up**

- Brace the foot of the ladder with stakes or place stout boards against the feet if there is any danger of slipping or get another person to foot it.
- Never set up or use a ladder in a high wind, especially a lightweight metal or fibreglass type. Wait until the air is calm enough to ensure safety.
- Never set up a ladder in front of a door unless the door is locked or a guard is posted.
- Do not use ladders on ice or snow unless absolutely necessary. If they must be used on ice or snow, use spike or spur-type safety shoes on the ladder feet and be sure they are gripping properly before climbing.
- Use safety shoes on ladder feet whenever there is any possibility of slipping.

4.2.3 Ladder Climbing & Standing-key points

- Keep the steps and rungs of ladders free of grease, oil, wet paint, mud, snow, ice, paper and other slippery materials. Also clean such debris off your shoes before climbing a ladder.
- Always face a ladder when climbing up or down. Use both hands and maintain a secure grip on the rails or rungs, always three points of contact.
- Never carry heavy or bulky loads up a ladder.
- Climb and stand on a ladder with your feet in the centre of the steps or rungs.
- Do not overreach from a ladder, or lean too far to one side. Overreaching is common cause of falls from ladders. A good rule is to always keep your belt buckle inside the rails of a ladder. Work as far as you can reach comfortably and safely, and then move the ladder to a new position.
- Never climb onto a ladder from the side, from above the top or from one ladder to another.
- Do not use rungs as hand grabs.

![Examples of Ladder Use](image)

**Fig 2-Examples of Ladder Use**
4.2.4 Correct use

- Never use metal ladders around exposed electrical wiring. Metal ladders should be marked with tags or stickers reading "CAUTION-Do Not Use around Electrical Equipment" or similar wording.
- When using a ladder where there is traffic, erect warning signs or barricades to guide traffic away from the foot of the ladder. If this is not possible, have someone hold and guard the bottom of the ladder.
- Do not try to move a ladder while you are on it by rocking, jogging or pushing it away from a supporting wall.
- Do not leave tools or materials on top of ladders.
- Never push or pull anything sideways while on a ladder. This puts a side load on the ladder and can cause it to tip out from under you.
- Allow only one person at a time on a ladder unless the ladder is specifically designed for two people.
- Never use a ladder as a horizontal platform, plank, scaffold or material hoist.
- Never use a ladder on a scaffold platform. If you need to reach higher, the scaffold should be higher.

![Correct use of Step Ladders](image)

5.0 TRAINING AND COMPETENCE

Persons using ladders at customers' sites shall be briefed on the contents of this Code of Practice.

6.0 MONITORING AND CHECKING

- The supervisor is responsible for ensuring that persons using ladders are aware of this Code of Practice.
- Use of ladders shall be part of OHS audits and reviews conducted by the LBUs.
- Ladders that are ABB equipment shall be given an ID number and shall be subject to a routine inspection once every 3 months and a simple record kept in a register or alternatively the ladder itself can be marked as having been inspected.
- Non ABB equipment should not generally be used. If however it is used in order to complete the job then it should be given a thorough visual check to ensure that it is fit for purpose.

All incidents, unsafe conditions, unsafe behaviors and near misses shall be reported to the applicable database. See ABB standard GISA 01.05A22.
1.0 INTRODUCTION

This code of practice (CoP) has been developed to provide practical information to Marine and Cranes personnel and contractors on the hazards and risks involved when working at height. Special attention is made on works performed under a ship, but the same principles apply also to other environments where working at height features.

Definition for work at height in this context is working in heights more than 1.8 meters (6 ft).

2.0 SCOPE

This COP applies to all ABB Marine and Cranes employees and/or contractors working on customers’ sites. If the local regulatory or customer requirements impose a higher standard, then the higher standard shall be followed. In such cases this shall be documented.

3.0 HAZARDS AND RISKS

The hazards and risks associated with working at height under a ship are the same as other environments where working at height features. The main difference is that the equipment used to provide a safe working platform is usually owned by the shipyard and can very often be in a poor state of repair. This is particularly the case in countries which do not have a high standard of EH&S traditionally.

Hazards therefore include:
- Falling from height;
- Falling objects

4.0 OPERATIONAL CONTROLS

4.1 Risk avoidance

As with health and safety risks the hierarchy of control should be properly applied and risk avoidance is the best and most preferred option. Therefore consideration should be given at the planning stage as to what work (if any) can be undertaken without having to work at height. If risk avoidance is not a practicable option then consideration will then need to be given to risk reduction and risk control possibilities.

4.2 Risk Reduction & control

When considering options for working at height there can be a number of possibilities. These include the use of:

1. Custom made equipment
2. Fixed scaffolding
3. Mobile scaffolding
4. Use of mobile elevated working platforms
5. Use of fall arrest equipment.

4.2.1 Custom made working platform

A custom made working platform designed specifically to provide a safe means of access to the Azipod units is a preferred option in that it avoids the necessity of having to erect the working platform each time it is required.

It does require to be maintained to ensure that it has not become damaged etc and is no longer unsafe to use.
Safety requirements when working @height

4.2.2 Fixed scaffolding

The main duty is to provide a safe place for persons to work from so that they cannot fall from height whilst carrying out their work. A fixed platform/scaffolding can provide an effective means by which this can be achieved but it has to be erected by a person who is competent, it has to be in a good state of repair and has to be complete.

Fig 2
(a) Sound footing (b) Vertical uprights +bracing (c) Secured by ties (d) platform, toe boards/rails

Fig 3(a) and (b)
Fixed Scaffold in a dangerous state

Fig 2 (a)-(d) shows the correct way for a fixed scaffold and these should feature in any fixed scaffold in a shipyard.

Key requirements are that:

1. Scaffolding shall erected by a competent person
2. Components shall be in good condition particularly load bearing ones
3. Vertical members shall be upright and have a secure footplate
4. Lateral bracing to be provided
5. Scaffolding to be tied or otherwise secured to the structure-e.g. ship.
6. Adequate platforms in good condition to be provided and which are complete.
7. Guard rails to be provided at 950 and 470mm
8. Safe means of access to be provided and secured.
9. If for any reason a scaffold is considered to be unsafe then it should be tagged as such.
10. It shall be inspected before first use and thereafter if modified etc.

Note! Check always the scaffolding safety card prior use of the scaffolding
4.2.3 Mobile scaffolding

Mobile scaffolding often have same faults or failings as other types of scaffolding. These include:

- Component parts become damaged but are still used.
- They are poorly erected with no adequate means of access,
- Poor platforms with limited numbers of boards in place or poor quality boards;
- No toe boards and no guard rails or poor guard rails;
- Wheels not locked in position;
- If sheeted then wind loading not considered adequately
- Not inspected nor maintained when mobile tower is moved or modified.

![Damaged and Dangerous Mobile Scaffolding](image)

Max ratio h:b=3:1

![Correct Set Up-Mobile/Modular Scaffold](image)

4.2.4 Mobile elevated working platforms

Mobile elevated working platforms (MEWP) provide a safe means of getting access to difficult areas beneath a ship. They can vary in size from small scissor lift type machines to larger self propelled ones.

Basic precautions for MEWP are:

1. Ensure surface is even (flat) and stable and able to withstand the weight the machine. Steel plates may be required if the bottom of the dry dock is uneven or unstable for any reason.
2. In areas where other persons may be working, or the work may be interfacing with the customers employees then the area shall be barricaded to keep unauthorized persons out of the area as shown in fig 6(b)
3. Check the safe working load.
Safety requirements when working @height

4. All operators of MEWP equipment shall wear suitable PPE as follows:
   a) A fall arrest harness attached to a lanyard with a shock absorber (ISO 10333/ANSI Z359.13) shall be worn at all times when in the basket of the elevated work platform. The lanyard shall be attached to the designated anchor point in the basket and attached to the personal harness at all times.
   b) Safety helmet
   c) High visibility vest or equivalent
   d) Safety boots.

Whenever a person is wearing a harness, an elevated work rescue plan shall be in place and a person in position with the knowledge to switch the elevated work platform to ground controls and lower the elevated work platform to the ground.

Fig 6
(a) Check Safe Working Load and (b) ensure that outriggers are deployed and area fenced off.

See also PA Div COP 15 on Mobile Elevated working platforms

4.2.5 Fall arrest
Fall arrest equipment should not normally be required if a safe working platform has been provided either by means of a fixed platform or by means of a mobile or modular platform.

If fall arrest equipment (fall arrest harness attached to a lanyard with a shock absorber) needs to be used, it shall comply with ISO 10333 and persons shall be instructed in its use. When fall arrest equipment is used, the safe method of working shall also consider how the rescue will be done in case it becomes necessary.

4.2.6 Lighting
A dry dock will generally not have lighting installed and hence it is important that any project considers the need for adequate lighting. Poor lighting will lead to persons not being able to see the working platform and the safe means of access and there will be much shadow. It is important that lighting is provided for the work place itself and the means of access to it. Lighting supplies should be protected with Ground Fault Circuit Interrupters or otherwise safe against cable damages etc.

5.0 TRAINING & COMPETENCE
All persons who are required to work at height under a ship shall be instructed and trained in respect of:
   a) Hazards associated with working at height;
   b) Recognition of faulty scaffolding equipment;
   c) Correct use of PPE including the use of fall arrest equipment.

6.0 COMMUNICATION
All Marine and Cranes personnel and contractors shall be briefed on the requirements of this COP.
7.0 MONITORING & CHECKING
The LBU shall ensure that, where site work involves working at height, Safety Observation Tours (SOT) and any scheduled safety inspections include checking of compliance with the requirements of this COP. This shall include:

a) Checking that employees have been trained and instructed in these requirements and
b) That they follow the requirements when working on site;
c) The scaffolding or other provision is checked before it is used for the first time and thereafter whenever it is altered or modified, or every 7 days.
d) In cases where the scaffolding is damaged or is otherwise inadequate it shall be tagged as such and withdrawn from use until it is repaired.
e) All fall arrest equipment is inspected before use by the user and formally every 12 months and a record kept.

8.0 DOCUMENTATION & RECORDS
The following records shall be kept:

a) Personnel qualification and training records shall be maintained for a minimum of five years.
b) Records pertaining to an incident shall be maintained for the duration of the involved individuals’ employment.
c) Records of inspection of safety harnesses and lanyards to be retained for 12 months.
d) Records of inspection of the scaffolding shall be retained for the duration of the project.
1.0 INTRODUCTION

Working on board a ship is in effect working within an enclosed space where airborne contaminants can be generated by work being undertaken by ABB or by the many other contractors who may be working on board either during its construction or during its service, repair or refit when it will be in dry dock. This code of practice (COP) has been developed as general guidance for ABB staff within Marine and Cranes so that they may be able to recognize potential situations where they could be exposed to airborne contaminants and take suitable precautions.

2.0 SCOPE

This COP applies to all ABB Marine and Cranes employees and contractors working on customers’ sites. If the local regulatory or customer requirements impose a higher standard, then the higher standard shall be followed. In such cases this shall be documented.

3.0 HAZARD & RISKS

Marine and Cranes activities will not generally give rise to significant exposure to airborne contaminants and in such cases where there is that possibility suitable control measures will have been identified in the risk assessment and safe working instructions. However work on board ship can mean that ABB could be working alongside other contractors who may be carrying out other work and outside the control of ABB. This could include activities that could generate airborne contaminants.

3.1 General

Materials can become airborne in a number of different ways and forms. As airborne contaminates they can be classified as shown in table 1.

<table>
<thead>
<tr>
<th>Solids</th>
<th>Liquids</th>
<th>Gases/Vapors</th>
</tr>
</thead>
<tbody>
<tr>
<td>Asbestos fibers</td>
<td>Sprayed droplets-</td>
<td>Ammonia</td>
</tr>
<tr>
<td>Engine exhaust</td>
<td>Paints</td>
<td>Carbon monoxide</td>
</tr>
<tr>
<td>particulates</td>
<td>Pesticides</td>
<td>Carbon dioxide</td>
</tr>
<tr>
<td>Lead dust and fume</td>
<td>Powder coatings</td>
<td>Freons</td>
</tr>
<tr>
<td>Silica dust</td>
<td>Liquid jetting</td>
<td>Helium</td>
</tr>
<tr>
<td>Welding fume</td>
<td>Sewage water</td>
<td>Nitrogen and oxides</td>
</tr>
<tr>
<td>Shot blasting dust</td>
<td>Mists</td>
<td>Mercury vapor</td>
</tr>
<tr>
<td>Wood dust</td>
<td>Chrome acid</td>
<td>Solvent vapors</td>
</tr>
<tr>
<td>Smoke</td>
<td>Cutting fluids</td>
<td>Exhaust gases</td>
</tr>
<tr>
<td>Fungal spores</td>
<td>Oil mist</td>
<td></td>
</tr>
<tr>
<td>Bacteria</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Virus</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Parasites</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Table 1

Examples of types of airborne Contaminants

Note: In this context this COP does not cover guidance on asbestos as this is dealt with by COP 18.

Whilst some contaminants can become airborne as a result of a natural process e.g. evaporation of flammable liquids or use of compressed gases, some will become airborne as a result of the process itself. For example electrical arc welding applies electricity to generate high temperatures so that the welding can occur on steel, aluminum etc. However the materials used in welding will include fluxes which will be vaporized adding to the general cocktail of substances that might be present. In determining therefore the potential hazard from airborne substances there are a number of factors that need to be considered. They are:

1. The hazardous nature of the contaminant e.g. toxic, harmful, irritant etc
2. The form of the substances including the particle size in the case of dusts etc;
3. The process by which it becomes airborne, hot, cold, spraying etc;
4. Environmental conditions including the presence or absence of exhaust ventilation.
Guidance on potential exposure to airborne contaminants

<table>
<thead>
<tr>
<th>Form</th>
<th>Description</th>
<th>Visibility</th>
<th>Example</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dust</td>
<td>Solid particles which can be supplied as part of a process e.g. powder handling or generated by the process e.g. crushing, grinding or blasting.</td>
<td>In diffuse light inhalable dust clouds are partially visible. Respirable dust (&lt;5µm) are practically invisible.</td>
<td>metal dust</td>
</tr>
<tr>
<td>Fume</td>
<td>Vaporized solid that has condensed. Particle size 0.001µm-1µm</td>
<td>Fume clouds tend to be dense. They are partially visible. Fume and smoke are generally more visible that similar concentrations of dust.</td>
<td>Solder fume, welding fume</td>
</tr>
<tr>
<td>Mist</td>
<td>Liquid particles generally process generated e.g. spraying. Particle size ranges from 0.01µm-100µm but size distribution may change as volatile liquids evaporate.</td>
<td>As for dust</td>
<td>paint spraying; jet washing</td>
</tr>
<tr>
<td>Fibers</td>
<td>Solid particles where the length is several times the diameter. Particle size is as for dust. Anything &lt;5µm is respirable.</td>
<td>As for dust</td>
<td>asbestos, fibre, fibreglass, refractory ceramic materials</td>
</tr>
<tr>
<td>Vapor</td>
<td>The gaseous phase of a liquid or solid at room temperature and behaves as a gas.</td>
<td>Generally invisible. At very high concentrations vapor laden cloud may just be visible.</td>
<td>Volatile organic compounds.</td>
</tr>
<tr>
<td>Gas</td>
<td>A gas at room temperature</td>
<td>usually invisible</td>
<td>chlorine, nitrogen, carbon dioxide</td>
</tr>
</tbody>
</table>

Table 2
General Properties of Airborne Contaminants

2.2 Welding
On board ship welding will be one of more common activities carried out either during its construction or during any repairs or re-fitting. In the case of electric arc welding every time an arc is struck between the electrode and the work piece particles and gases are emitted into the general working environment. These particles and gases are the unavoidable by products from the welding process and will appear as smoke which is made up of the larger particles (up to 50µm) and will eventually result in dustfall. The smaller particles usually <1µm will result in fume etc which can present a risk to health through inhalation. Any particle which is <5µm will enter the lungs and stay there. The dust produced can contain a range of different metals including iron, lead, manganese, copper, chromium. Fluorides can also be present. Gases will also be present in many cases either as shield gases or as oxides of nitrogen created by the intense heat created by the welding process. Ozone can also be present. Shield gases will include carbon dioxide, argon, helium.

2.3 Grinding
Grinding is a common activity on board ship and may also create airborne concentrations of dust. Whilst welding fume is created from a hot process grinding is a cold process which will generate large amounts of fine dust which will in many cases be respirable and in the same way the particles will enter the lungs and remain there. The composition of the dust will of course depend on the material being subject to grinding including any paint or other surface coating that may be present. This will generate particles etc but the hazardous nature will depend on its composition. Exhaust ventilation should be provided and persons exposed should use a respirator.

2.4 Painting
Painting is also a very common process found on board ship during construction and maintenance activities. Paint can of course be applied either by brush, roller or by spay. Spray painting will by its nature make the paint airborne resulting in any solvent being vaporized together with some paint particles and any uncombined chemicals that might be present. This could result in both an occupational health hazard as well as a fire hazard. Painting using a brush or roller is unlikely to result in airborne particles but there will still be natural evaporation of the solvent vapor. The amount will depend on the flash point of the solvent and the ambient temperature on board the vessel. The lower the flash point of the paint the more likely it will be for the solvent to evaporate. It is also true that solvents with low flash points will also present a serious fire hazard, particularly if there is inadequate ventilation.

2.5 Asbestos
Although asbestos has been banned in the construction of new ships under the IMO rules from 1 Jan 2011 there will be existing ships with asbestos in many different forms and locations. See COP 18 for guidance.
2.6 Confined space working

A ship is in effect a confined space and hence many processes carried out outside in the open air would not normally represent a significant risk to health. However if carried out within a confined space with no forced ventilation then there will be a risk to health. The severity of that risk will of course depend on:

1. The hazardous nature of the contaminant;
2. The duration of exposure
3. Concentration of the contaminant in air.
4. Effectiveness of any control measure in place such as exhaust ventilation

It is essential therefore that when working within confined spaces that ABB staff ensure that a suitable risk assessment has been carried out and proper note taken of what other work may be carried out within the same working area by other contractors as this may have a direct impact on ABB. This can include exposure to dust, fume, vapors and gases.

Gases can present a particular hazard as they can not only accumulate if there is no exhaust ventilation, but can also through the process in some cases use up the oxygen present leading to an atmosphere with reduced oxygen levels. This can occur with welding.

The use of oxy acetylene gases can present an added hazard where if care is not taken over the control of oxygen after use then it is possible for oxygen levels to increase which will present a very serious fire hazard.

Volatile organic compounds (VOC) or solvents will generate vapor which in most cases will be heavier than air. Gases also are generally heavier than air so will tend to accumulate in low lying areas of any enclosed space and are particularly hazardous in confined spaces. Adequate provision of exhaust ventilation is important to prevent such accumulation.

4.0 OPERATIONAL CONTROLS

4.1 General

Working on board ship can present many hazards which could arise as a result of other contractors working in the same area as ABB. It is also the case that ABB’s activities if not properly controlled could also adversely affect other persons in the same area. As with all risks there is a preferred hierarchy when it comes to applying suitable controls measures which can be summarized as follows:

4.2 Control of airborne contaminants

4.2.1 Avoidance & elimination

The most effective control is to avoid being exposed to airborne contaminants. This will require ABB staff working on board the vessel in establishing if any other work is being carried out within ABB’s proposed working area and if so whether it is likely to present a risk to the health or safety of ABB staff. In circumstances where other contractors might be working in the same area and creating airborne contaminants then either the proposed work should not start until the other contractors working in the same area have completed their activity or effective control measures should be applied to deal with the airborne contaminant such as provide effective exhaust ventilation. If there is any doubt then contact your ABB supervisor or EHS advisor.
4.2.2 Risk reduction and control
Where it is not practicable to postpone the work and there is a likelihood of airborne contaminants being present within the proposed working area then the most effective control will be the provision of exhaust ventilation to remove the contaminant to atmosphere. It is important that the emission point is to atmosphere otherwise it may well be moving the contaminant from one work area to another. In some cases it may also be necessary to have both local exhaust ventilation and air input.

4.3 Respiratory protective equipment (RPE)
If ABB staff or contractors are potentially exposed to airborne contaminants then they should immediately wear suitable RPE. The use of a disposable mask or a half mask with a P3 filter will provide adequate protection. However these are not generally suitable for persons with facial hair. They should wear a full face respirator. See also COP29.

Half masks used for particulates-with P3 filter

5.0 TRAINING & COMPETENCE
All marine and Cranes staff who are required to work on board a ship shall be instructed in the content of this COP.

6.0 MONITORING
All incidents, unsafe conditions, unsafe behaviors and near misses shall be reported to the applicable database. See ABB standard GISA 01.05A22.

7.0 DOCUMENTATION & RECORDS
A record of the safety briefing shall be kept in respect of both ABB engineers and contractors.
Protection against noise hazards

1.0 INTRODUCTION
This code of practice (COP) has been developed to provide practical information to staff within Marine and Cranes on the hazards and risks involved with exposure to high noise levels whilst at work on board a ship or generally within a ship yard, and what precautionary measures should to be taken to reduce or preferably eliminate the risk and in any event protect their hearing.

2.0 SCOPE
This COP applies to all ABB Marine and Cranes employees and contractors. If the local regulatory or customer requirements impose a higher standard, then the higher standard shall be followed. In such cases this shall be documented.

3.0 HAZARDS AND RISKS
The hazard of noise induced hearing loss can occur over a relatively short period of exposure and to noise levels that do not at first sight appear to be that high. Noise (sound pressure) is transmitted through vibrating air and causes damage to the fine hair cells located in the inner ear which become damaged. These hair cells convert sound vibrations into electrical signals which are transmitted via the auditory nerve to the auditory centre of the brain. When these cells become so damaged that they can no longer convert the sound into electrical signals that portion of hearing is lost. The process is irreversible and is therefore permanent as fig 1 illustrates. It is the higher frequencies that are affected first which are part of the speech band and hence affects directly the ability to hear.

Fig 2-Equivalent noise exposures
Therefore a person exposed to 100 dB(A) for 15 mins would receive the same noise dose as a person who was exposed to 85dB(A) for 8 hours. This is because the decibel scale is logarithmic and so an increase in noise of 3 dB(A) represents in fact a doubling of the noise energy and therefore the potential damage or risk of hearing loss.

It is absolutely essential therefore to wear hearing protection for the whole period of exposure. The principle is that if the noise exposure is less than 85 dB(A) and preferably 80 dB(A) then the risk of noise induced hearing loss is eliminated for most people. A very small percentage however could still suffer some damage.
4.0 OPERATIONAL CONTROLS

4.1 Pre-employment

All new employees who are likely to work in high noise level environments on customers’ sites shall be subject to an audiometric test to ensure that any pre-existing hearing defects are known and that ABB has a record of the hearing performance. This is important for the employee as well as ABB to ensure that those persons who may have an existing hearing impairment are not placed in areas where there is a significant risk of hearing loss as well as having a benchmark of any existing hearing impairment.

4.2 Hazard identification & risk assessment

In the shipyard and on board ship it will not be possible to identify each and every noise hazard zone and hence it is assumed that all staff working for Marine and Cranes on board ship or within the shipyard environment will be exposed at some point to noise levels which are likely to exceed 80dB(A). A ship or a shipyard is a noise hazard zone particularly when working inside the ship. High noise levels are also present when traveling by helicopter.

Hearing protection equipment is required to be made available when entering the ship or a shipyard and always worn when working or moving around in the areas of high noise level (running engines, hand tool operation, grinding, machining, use of compressed air etc.). This applies even if the area is not marked with noise hazard signs, showing mandatory requirement.

Rule of thumb: If you cannot have a normal conversation with someone close to you without shouting then the noise level is likely to be above 85dB(A) and hearing protection should be worn.

5.0 TRAINING AND COMPETENCE

The content of this COP must be communicated to every project team member prior to starting any work on site. The training shall include instruction on the following topics:

- Effects of noise on hearing ability and general well being
- Noise induced hearing loss is irreversible and therefore permanent
- Noise induced hearing loss can occur with relatively short exposures
- Measurement/recognition of noise levels and typical levels in shipyard
- Types of personal protective equipment available
- Process for obtaining the correct equipment within Marine & Cranes
- Care and maintenance of equipment including need for cleanliness.

6.0 MONITORING AND CHECKING

The site manager or nominated person is responsible for ensuring that all project team members are aware of noise hazards prior to starting any work on site and they shall also periodically check that proper hearing protection is used. This shall include contract personnel working on behalf of ABB. OHS audits and reviews conducted by the LBUs shall include checking that in high noise areas suitable hearing protection is both available and worn.

All incidents, unsafe conditions, unsafe behaviors and near misses shall be reported to the applicable database. See ABB standard GISA 01.05A22.

7.0 DOCUMENTATION & RECORDS

Records shall be kept in respect of instruction of this COP, issue of any personal hearing protection (non disposable) and any noise surveys carried out at site.
**1.0 INTRODUCTION**

As a general principle the Marine and Cranes business does not include the use of asbestos products but it has to be recognized that whilst asbestos as a material is not involved in the manufacture and installation of Marine and Cranes products and services, there is the potential to be exposed to asbestos when working on the customers’ premises and in particular ships. This code of practice has been developed as general guidance for ABB employees who work within the marine and crane environment where they could be exposed to asbestos materials by accident where it may have been damaged or disturbed by other persons working in the same area.

**2.0 SCOPE**

This COP applies to all ABB Marine and Cranes employees and contractors working on customers’ sites. If the local regulatory or customer requirements impose a higher standard, then the higher standard shall be followed. In such cases this shall be documented.

**3.0 HAZARD & RISKS**

**3.1 Types of asbestos**

Asbestos is a fibrous mineral that occurs naturally in many parts of the world. It exists in two basic forms, serpentine and amphibole. The serpentine form produces fibers that are curled whereas the amphibole forms produce fibers that are straight and needle like. The small fibers, typically <5µm, once inhaled can get into the lung and potentially cause a number of respiratory diseases that include asbestosis which is a fibrosis of the lung, lung cancer and mesothelioma which is a cancer of the inner lining of the chest. The main types that are likely to be encountered are chrysotile (white), amosite (brown) and crocidolite (blue).

**3.2 Hazard identification**

Asbestos is a versatile material that has variety of different uses or applications which are summarized below.

- **HIGH POTENTIAL**
  - Sprayed coatings and laggings particularly for insulation purposes
  - Loose fill and in blankets and mattresses
  - Insulating boards, blocks and composite products
  - Ropes, yarns and cloth
  - Millboard, paper and paper products;
  - Asbestos cement products
  - Bitumen roofing felts, damp proof courses
  - Asbestos paper backed vinyl flooring;
  - Un-backed vinyl flooring and floor tiles
  - Mastics, sealants, putties and adhesives;
  - Textured coatings and paints containing asbestos
  - Asbestos reinforced PVC and plastics.

- **LOW POTENTIAL**

The banning of different forms of asbestos has gradually taken place since the 70’s, e.g. 1976 a ban throughout the EU on the marketing and use of most forms of asbestos including chrysotile, a ban on amphiboles since 1985 and chrysotile was finally banned in the 90’s. However there is still a significant legacy issue in that there remains a significant amount of the material in existing buildings, plant and equipment. Under the International Maritime Organization SOLAS convention (chapter 11-1 reg 3-5) asbestos materials have been banned in respect of new installations on ships from 1st January 2011. However it means that ships built before 2011 will in many cases still contain asbestos materials and table 1 represents an indicative list extracted from the IMO guidelines. Maintenance workers therefore are the most likely persons to be most at risk but also others who may carry out similar work where they may be involved in working on plant or equipment or structures where they could disturb the material and generate airborne concentrations of fibers. This is most likely with asbestos insulation or sprayed coatings which contain high concentrations of asbestos and therefore are more likely to generate airborne fibers, particularly if the coatings are not sealed or have suffered mechanical damage. This is potentially the most likely source of exposure within an engine room where insulating coatings would have been used to insulate certain items of plant to prevent heat loss e.g. boilers, calorifier etc.
## General guidance on asbestos & what to do on discovery

<table>
<thead>
<tr>
<th>LOCATION</th>
<th>COMPONENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>Propeller shafting</td>
<td>Packing with low pressure hydraulic piping flange</td>
</tr>
<tr>
<td></td>
<td>Packing with casing</td>
</tr>
<tr>
<td></td>
<td>Clutch</td>
</tr>
<tr>
<td></td>
<td>Brake lining</td>
</tr>
<tr>
<td></td>
<td>Synthetic stern tubes</td>
</tr>
<tr>
<td>Diesel engine</td>
<td>Packing with piping flange</td>
</tr>
<tr>
<td></td>
<td>Lagging material for fuel &amp; exhaust pipe</td>
</tr>
<tr>
<td></td>
<td>Lagging material for turbocharger</td>
</tr>
<tr>
<td>Turbine engine</td>
<td>Lagging material for casing</td>
</tr>
<tr>
<td></td>
<td>Packing with flange of piping and valve for steam line, exhaust line</td>
</tr>
<tr>
<td></td>
<td>and drain line</td>
</tr>
<tr>
<td></td>
<td>Lagging material for piping and valve of steam line, exhaust line</td>
</tr>
<tr>
<td></td>
<td>and drain line</td>
</tr>
<tr>
<td>Boiler</td>
<td>Insulation in combustion chamber</td>
</tr>
<tr>
<td></td>
<td>Packing for casing door</td>
</tr>
<tr>
<td></td>
<td>Lagging for exhaust pipe</td>
</tr>
<tr>
<td></td>
<td>Gasket for manhole and hand hole</td>
</tr>
<tr>
<td></td>
<td>Gas shield packing for soot blower</td>
</tr>
<tr>
<td></td>
<td>Packing with flange of piping and valve for steam line, exhaust line</td>
</tr>
<tr>
<td></td>
<td>fuel and drain line</td>
</tr>
<tr>
<td></td>
<td>Lagging material for piping and valve for steam line, exhaust line</td>
</tr>
<tr>
<td></td>
<td>fuel and drain line</td>
</tr>
<tr>
<td>Incinerator</td>
<td>Packing for casing door, manhole and hand hole</td>
</tr>
<tr>
<td></td>
<td>Lagging material for exhaust pipe</td>
</tr>
<tr>
<td>Auxiliary machinery</td>
<td>Packing for casing door and valve</td>
</tr>
<tr>
<td>(pumps, compressors,</td>
<td>Gland packing</td>
</tr>
<tr>
<td>oil purifier, crane</td>
<td>Brake lining</td>
</tr>
<tr>
<td>Heat exchanger</td>
<td>Packing with casing</td>
</tr>
<tr>
<td></td>
<td>Gland packing for valve</td>
</tr>
<tr>
<td></td>
<td>Lagging material &amp; insulation</td>
</tr>
<tr>
<td>Valves</td>
<td>Gland packing with valve, sheet packing with piping flange</td>
</tr>
<tr>
<td>Pipes and ducts</td>
<td>Lagging material and insulation</td>
</tr>
<tr>
<td>Tanks (fuel, hot water, condenser) and other equipment</td>
<td>lagging material &amp; insulation</td>
</tr>
<tr>
<td>Electric equipment</td>
<td>Insulation material</td>
</tr>
<tr>
<td>Ceiling, floor and wall in accommodation areas</td>
<td>Tiles, partition boards including fire doors</td>
</tr>
<tr>
<td>Air conditioning system</td>
<td>Sheet packing, lagging material for piping and flexible joint</td>
</tr>
<tr>
<td>Miscellaneous</td>
<td>Ropes</td>
</tr>
<tr>
<td></td>
<td>Adhesives/mastics/fillers &amp; Sealing putty</td>
</tr>
<tr>
<td></td>
<td>Sound damping &amp; moulded plastic products</td>
</tr>
<tr>
<td></td>
<td>Electrical bulkhead penetration packing</td>
</tr>
<tr>
<td></td>
<td>Circuit breaker arc chutes</td>
</tr>
<tr>
<td></td>
<td>Pipe hanger inserts</td>
</tr>
<tr>
<td></td>
<td>Weld shop protectors/burn covers</td>
</tr>
<tr>
<td></td>
<td>Fire-fighting blankets/clothing/equipment</td>
</tr>
</tbody>
</table>

### Table 1
**Indicative list of likely location of asbestos on board ship**

(Extract from IMO guidelines for the development of the inventory of hazardous materials)

Typical exposures that are likely to be encountered where there is poor control are illustrated in table 2. Where asbestos is bound in to form a composite material that has been formed into a specific product or component (e.g. a gasket or an insulating board) then it is not likely to generate airborne fibers unless it is mechanical abraded or damaged in some way. The exposure limit for asbestos within the EU is 0.1 fibers/cm³ for an 8 hour time weighted average (TWA).
3.3 Identifying asbestos

As has been stated earlier asbestos has found many uses and hence it can be found in many different locations within a building structure including a ship and table 1 provides a general overview on where asbestos materials are likely to be found on board a ship.

<table>
<thead>
<tr>
<th>Task</th>
<th>Typical exposure (fibers/ml)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dry removal of sprayed coating</td>
<td>Up to 1000</td>
</tr>
<tr>
<td>Dry removal of lagging</td>
<td>Up to 100</td>
</tr>
<tr>
<td>Drilling of asbestos insulation board (AIB)</td>
<td>Up to 10</td>
</tr>
<tr>
<td>Use of jigsaw on AIB</td>
<td>Up to 20</td>
</tr>
<tr>
<td>Hand sawing AIB</td>
<td>Up to 10</td>
</tr>
<tr>
<td>Sweeping AIB debris</td>
<td>Up to 100</td>
</tr>
<tr>
<td>Drilling asbestos cement</td>
<td>Up to 1</td>
</tr>
<tr>
<td>Hand sawing asbestos cement</td>
<td>Up to 1</td>
</tr>
<tr>
<td>Use of circular saw on asbestos cement</td>
<td>Up to 20</td>
</tr>
</tbody>
</table>

Table 2

Typical Exposures of Asbestos where Control is Poor
(source HSE-Asbestos Essentials)
4.0 OPERATIONAL CONTROLS

4.1 General

Working on board ship can present many hazard of which some will be due to the many interfaces that might exist between ABB’s activities and that of other parties who may also be working on the vessel whilst it is in dry dock for repairs etc. Hazards may therefore arise as a result of other persons working in the same area as ABB whose work could adversely affect ABB engineers as well as those who are immediately involved with the work activity. It is also the case that ABB’s activities if not properly controlled could also adversely affect other persons in the same area. As with all risks there is a preferred hierarchy when it comes to applying suitable controls measures which require risk avoidance and elimination to be considered first before applying risk reduction, isolation and control measures where the application of personal protective equipment becomes the measure of last resort.

4.2 Possible accidental exposure

If ABB engineers are working on board a ship and it becomes apparent that there is asbestos present in the working area or within the access to it, or what is thought to be asbestos containing material then they should follow the general advice and guidance as follows:

1. When contracting with the dockyard or ship owner enquiries should have been made as to whether there is asbestos present on board ship and its location. The type of asbestos is also useful. There may already be an inventory and this will provide useful information as to the location of the material and this information should feature in the H&S plan.

2. If you suspect that there is asbestos present in the working area and it is possible that airborne fibers may be present then do not start work and report your concerns immediately to your ABB supervisor at site.

3. If you have started the work and you believe that asbestos fibers are present in the air e.g. as a result of work being carried out by other contractors on the ship then wear a suitable respirator such as a disposable or re-usable half mask respirator with a P3 filter. Once protected you should remove yourself from the area and report the matter.
General guidance on asbestos & what to do on discovery

DO NOT PUT YOURSELF AT RISK FROM BREATHING IN ASBESTOS FIBERS!
IF IN DOUBT, REMOVE YOURSELF FROM THE AREA AND CONTACT YOUR SUPERVISOR AND LBU OHS ADVISOR.

4. If possible place some form of sign or notice to indicate that the materials may be asbestos containing and should not be disturbed.

5. If the asbestos material has been damaged then it may be necessary to report the matter to the Chief Engineer or his representative on board.

6. If you have dust or debris on your clothing then you should carefully remove the clothing and place in a plastic bag, if one is available, suitably labeled and if possible take a shower before wearing a new set of clothes.

7. ABB supervisor shall contact the ABB OHS advisor and LBU Manager for advice on what steps shall be taken. Send possible samples of the dust or suspect material and photographs.

8. Follow any subsequent advice from the ABB OHS adviser and LBU Manager.

9. Any additional sampling shall be carried out by an ABB appointed or approved specialist.

4.3 Respiratory protective equipment (RPE)
If ABB staff or contractors are potentially exposed to asbestos by accident then they should immediately wear suitable RPE as set out in COP 29.

5.0 TRAINING & COMPETENCE
All ABB employees working on customer sites shall receive training on the content of this code of practice.

6.0 MONITORING
6.1 Active monitoring
Regular checks should be undertaken to ensure that:

1. In new build projects ABB shall stipulate with the customer that no asbestos materials shall be present on board the vessel or used;

2. In respect of each contract the LBU makes suitable enquiries with the ship owner or shipyard on the likely presence of asbestos and its location.

3. All ABB engineers and any contract staff have been briefed on what to look for in terms of possible asbestos materials and what action to take if they suspect that they might be at risk;

4. ABB engineers and contractors have the correct PPE in case they may need to use it

6.2 Reactive monitoring
All incidents, unsafe conditions, unsafe behaviors and near misses shall be reported to the applicable database. See ABB standard GISA 01.05A22.

7.0 DOCUMENTATION & RECORDS
A record of the safety briefing shall be kept in respect of both ABB engineers and contractors.
1.0 INTRODUCTION

This code of practice has been developed for Marine and Cranes to provide practical guidance on the safe use of chemical substances within ships. There is a separate code of practice for compressed gases.

2.0 SCOPE

This COP applies to all ABB Marine and Cranes employees and contractors working on customers’ sites. If the local regulatory or customer requirements impose a higher standard, then the higher standard shall be followed. In such cases this shall be documented.

3.0 HAZARDS & RISKS

3.1 General

All chemical substances are currently classified according to their harmful effects.

<table>
<thead>
<tr>
<th>SYMBOL</th>
<th>HAZARDOUS EFFECTS</th>
<th>SYMBOL</th>
</tr>
</thead>
<tbody>
<tr>
<td>EXPLOSION (E)</td>
<td>Solid liquid, pasty or gelatinous substances and preparations which may react exothermically (give out heat) without atmospheric oxygen thereby evolving gases which under certain conditions may detonate etc when partially confined.</td>
<td>EXTREMELY FLAMMABLE (F+)</td>
</tr>
<tr>
<td>VERY TOXIC (T+)</td>
<td>Substances and preparations which in very low quantities cause death or acute or chronic damage to health when inhaled, swallowed or absorbed via the skin.</td>
<td>HIGHLY FLAMMABLE (F)</td>
</tr>
<tr>
<td>TOXIC (T)</td>
<td>Substances and preparations which in low quantities cause death or acute or chronic damage to health when inhaled, swallowed or absorbed via the skin.</td>
<td>FLAMMABLE</td>
</tr>
<tr>
<td>HARMFUL (Xn)</td>
<td>Substances and preparations which may cause death or acute or chronic damage to health when inhaled, swallowed or absorbed by the skin.</td>
<td>OXIDISING AGENT (O)</td>
</tr>
<tr>
<td>IRRITANT (Xi)</td>
<td>Non corrosive substances and preparations which through immediate, prolonged or repeated contact with the skin or mucous membrane may cause inflammation.</td>
<td>DANGEROUS FOR THE ENVIRONMENT(N)</td>
</tr>
<tr>
<td>CORROSIVE (C)</td>
<td>Substances and preparations which may, on contact with living tissues, destroy them.</td>
<td></td>
</tr>
</tbody>
</table>

There is no international system for classifying hazardous substances for supply although in the EU there has been a long established system for classifying hazardous substances according to their harmful effects as in fig1. However there is a move towards harmonization with the UN’s Globally Harmonised System of Classification and Labelling of Chemicals (GHS), see fig 2 and there will be a gradual migration across.

In some special cases such as carcinogens, mutagens etc. they will be classified as toxic with additional information to describe the type of carcinogen and its class (1,2 or 3).
Safety in the use of hazardous substances

Fig 2
Change to UN Globally Harmonized System for Hazard Labels

Using or being exposed to hazardous substances when working on a ship will increase the hazard level particularly, when working in enclosed areas or in certain confined spaces such as an Azipod, where fumes, gases or vapors can collect owing to the lack of natural ventilation.

3.2 Labelling
All substances shall be labelled. In the case of substances or preparations which are dangerous then they are currently required to contain certain information as shown below but this will be replaced in due course with the UN symbols.

Identification of substance or preparation

<table>
<thead>
<tr>
<th>NAME OF SUBSTANCE</th>
<th>Risk phrases summarizing the main hazards or harmful effects</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>e.g. toxic by inhalation</td>
</tr>
<tr>
<td>Safety phrases</td>
<td>e.g. wear suitable personal protection gloves, eye protection</td>
</tr>
<tr>
<td>EC number</td>
<td></td>
</tr>
<tr>
<td>Name and address of supplier</td>
<td></td>
</tr>
<tr>
<td>Emergency telephone number</td>
<td></td>
</tr>
</tbody>
</table>

Hazard symbols

Contact details for supplier

Safety phrases summarizing the main precautionary measures

Fig 3
Example of a typical label under current system

If a substance or a preparation has no label on the container then do not attempt to use it.

3.3 Material Safety Data Sheets (MSDS or SDS)
No hazardous substances or other proprietary materials should be on the ship unless they are all in labelled containers and there is a MSDS available. The MSDS provides the necessary information about the hazardous nature of the substance and what precautionary measures will be required and any emergency measures that may be necessary. This will include information on disposal.
4.0 OPERATIONAL CONTROLS

4.1 General requirements
If a chemical substance or a proprietary material is used on site then following measures shall be in place:

- All substances or preparations shall be labelled as to their contents as shown in fig 3. If there is a container on the ship without any label. **DO NOT USE IT.**
- A SDS shall be available on the ship yard for any substance that is likely to be used;
- A risk assessment should be in place setting out the hazards and the required safety controls.
- Any person using a chemical substance shall consult the SDS for applying appropriate controls.

4.2 Toxic routes
Chemical substances can affect the body and its systems in a number of ways depending on the toxic route or pathway. Substances can be ingested through poor personal hygiene, inhaled or can be absorbed through the skin to enter the blood stream and then affect the various organs in the body.

4.2.1 Inhalation
The inhalation hazard is the most difficult to control and it is high risk where the chemical substance is in use within a confined space such as a compartment on board ship or in an Azipod unit. The following factors need to be considered when dealing with airborne contaminants:

- Substances can become airborne as a result of hot processes such as welding, cold processes such as grinding or as an aerosol as in the case of spray painting;
- Exposure limits are usually quoted as ppm or mg/m³ and will be specified in the MSDS. There is no internationally approved system but the limits published by the ACIGH, the US industrial hygiene agency are generally accepted globally. They should not be exceeded;
- Any exposure to airborne contaminants should be reduced to as low a level as is reasonably practicable using local exhaust ventilation (LEV). In confined spaces where such chemicals are likely to be used the local exhaust ventilation is a mandatory requirement.
- Where the use of LEV is not practical or is insufficient to control the exposure, then suitable respiratory protective equipment (RPE) shall be provided and worn. See also COP 29 on the selection and use of RPE. If there is any doubt then contact the EHS Advisor.

4.2.2 Skin contact or skin absorption
The skin is porous and some chemical substances can pass through the skin into the blood stream. In such circumstances the use of barrier protection in the form of gloves and eye protection are required. Barrier creams may also be used in addition.

Gloves are also appropriate where there may be an injection risk using high pressure tools.

4.2.3 Ingestion risks
For chemical substances or preparations with an ingestion risk the controls require:

- Provision of suitable barrier protection e.g. PPE such as gloves; goggles etc
- Prohibition of partaking of food and drink within the working area.
- Provision of a place for workers to take their meal breaks and practice of good personal hygiene prior to partaking to food or drink;

4.4 Confined space working
Some chemical substances can be used in normal conditions and not represent a major risk to the operator. However when used in a confined space e.g. within the compartment of ship or within the Azipod unit then the risk will increase dramatically. In such situations a separate rigorous risk assessment shall be carried out including checking the atmosphere in the confined space. In such circumstances enhanced or additional controls will be required. See separate COP 22.
5.0 TRAINING & COMPETENCE

All ABB employees or contractors working in a ship or shipyard environment shall be briefed on the contents of this code of practice. This shall include the following:

- Details of the chemical substances to be used and their hazardous properties;
- Health effects (acute or chronic) on the body;
- Safety controls to be applied in respect of storage, transporting, handling, and use;
- PPE to be provided including its care and maintenance;
- Disposal arrangements;
- Any relevant emergency arrangements.

6.0 MONITORING & CHECKING

The ABB supervisor on site is responsible for ensuring that persons working in a ship or shipyard environment have been briefed on this code of practice. He is also responsible for ensuring that there is an MSDS on site for each chemical in use and that all containers are properly labelled. All persons working in the ship or shipyard shall the requirements of this COP.

This COP shall form a part of any EHS audits and reviews conducted by the LBU.

In the case of any confined space working without the use of self contained breathing apparatus then atmospheric checks shall be carried as part of the permit to enter process to ensure that it is free from contaminants and has sufficient oxygen or air.

All incidents, unsafe conditions, unsafe behaviors and near misses shall be reported to the applicable database. See ABB standard GISA 01.05A22

7.0 EXAMINATION & CHECKING OF EQUIPMENT

7.1 LEV systems

Local exhaust ventilation when provided shall be subject to a regular monthly inspection and check to ensure that it is still functioning at the appropriate level of efficiency.

7.2 Care and maintenance

Personal protective equipment issued on a personal basis (i.e. not disposable) such as RPE should be kept clean and should be stored in a suitable place. See also COP 10 and 29. In the case of disposable equipment such as gloves, eye protection or disposable half mask respirators then there should be sufficient supplies maintained.

8.0 DOCUMENTATION & RECORDS

Copies of the following shall be available:

- MSDS for the chemical substances in use;
- Risk assessment for the task and safe working instruction;
- Monthly inspection records for respiratory protection issued on a personal basis i.e. non disposable;
- Inspection records of LEV equipment;
- Inspection reports of any breathing apparatus provided.
1.0 INTRODUCTION

Compressed gases supplied in cylinders are in common use throughout industry and in particular in the marine sector. In a shipyard environment compressed gases are more likely to be supplied via manifolds and multiple hoses. Their use on board ship however can bring a number of significant hazards and this code of practice has been developed to provide information about the safe, handling and use of these materials when working on board ship.

2.0 SCOPE

This COP applies to all ABB Marine and Cranes employees and contractors working on customers’ sites. If the local regulatory or customer requirements impose a higher standard, then the higher standard shall be followed. In such cases this shall be documented.

3.0 HAZARDS AND RISKS

3.1 General

Cylinders containing compressed gases can present a range of hazards which include:

- Effects of blast of gas under pressure
- Direct effects of the contents e.g. toxic, flammable, corrosive etc.
- Fire or explosion in respect of flammable gases, e.g. propane
- Manual handling injuries from the movement of cylinders or from cylinders falling
- Leaking of gas resulting in build up of concentration of gas. e.g. oxygen enriched atmosphere in confined spaces

3.2 Confined space working

Working within a ship however can result in the above hazards increasing in significance because of the environment. The main point is that a ship below decks is often a confined space and hence the use of gases in this environment will increase the overall hazard. Most gases are also heavier than air hence they will collect in compartments or other similar places, such as the Azipod unit. For work inside Azipod unit a separate rigorous risk assessment must be carried out including checking on the atmosphere in the confined space. See hazard sheet 22.

3.3 Fire & explosion

Chemical properties of certain gases bring with them significant fire and explosion risks. Oxygen enrichment is a hazard where the concentration of oxygen in air increases with the real possibility of a fire and explosion. This is a particular hazard on board ship as if oxygen is allowed to collect then the fire characteristics of materials will change dramatically leading to a serious fire. The increase of oxygen in air need only be 1% before this becomes a reality.

Propane and butane are two liquefied petroleum gases (LPG) and have wide use. Propane is generally used for flame cutting and burning and butane tends to be used for heating purposes. If not used carefully then serious incidents can result ranging from small burns or fires to serious explosions. The vapours are also heavier than air and will collect therefore in ships compartments, ducts, bulkheads etc. Both propane and butane when vaporized will produce a large volume of gas at normal temperature and pressure, 230 times for butane and 270 times for propane.

Example: 1 litre of liquid propane, when vaporised, will produce 270 litres of gas. The gas mixed with air at its lowest explosive limit of 2% will produce 13,500 litres of flammable mixture which if ignited will result in a major explosion.

4.0 OPERATIONAL CONTROLS

4.1 General

The following represents best practice for storage, transportation and handling of compressed gases in cylinders:

- Compressed gases must have labels to identify their contents;
- Gas cylinders, especially the valves are protected from weather, e.g. rain;
- Gas cylinder storage area shall have good natural ventilation and cylinders should be stored in upright position, on a flat surface and secured against falling over;
- Smoking shall be prohibited in the storage area and firefighting equipment shall be readily accessible;
- Fuel gases shall stored separately from oxygen (more than 1m apart);
- Cylinders should be lifted using suitable cradles and slings when using a hoist or crane;
- Pipe work connection checks are carried out to ensure that connections are of good quality with crimped fittings;
- Checks are carried out after use to ensure that valves always closed after use;
- Hoses are checked periodically for wear and damage;
- Flashback arrestors are used on cylinders containing fuel gases, see fig 1.
Safe storage, handling, and use of compressed gases in a ship

Common gases and hazards in a ship building and dry docking environment are shown in table 1 below.

<table>
<thead>
<tr>
<th>Gas</th>
<th>Color code</th>
<th>Places it accumulates</th>
<th>Hazardous Effect</th>
<th>Prevention Measures</th>
</tr>
</thead>
<tbody>
<tr>
<td>Oxygen ((O_2))</td>
<td>White RAL 9010</td>
<td>Gas is heavier than air and will collect in low lying areas, pits, sumps etc.</td>
<td>Increase oxygen levels will increase the risk of fire. An increase of 1% can give rise to serious fires.</td>
<td>If you smell a leak close the valve in the distribution manifold or on the cylinder. Prevent sparks or other sources of ignition and any increase in temperature. Ventilate the space. Repair any leaking component e.g. valve, hose etc.</td>
</tr>
<tr>
<td>Acetylene ((C_2H_2))</td>
<td>Maroon RAL 3009</td>
<td>Tends to be slightly lighter than air</td>
<td>Explosive when mixed with air</td>
<td></td>
</tr>
<tr>
<td>Liquifed prtroleum gas LPG ((C_3H_8))</td>
<td>Red RAL 3000</td>
<td>Gas is heavier than air and will collect in low lying areas, pits, sumps etc.</td>
<td>Explosive when mixed with air</td>
<td></td>
</tr>
<tr>
<td>Inert gases Helium (He) Argon(Ar) Nitrogen(N2)</td>
<td>Bright green RAL 6018</td>
<td>Argon is slightly heavier than air and will collect in low lying areas, pits, sumps etc. Helium and Nitrogen are lighter than air</td>
<td>Will replace oxygen and hence cause suffocation</td>
<td>Inert gases are very difficult to detect as they are odorless. Check for leaks by applying soapy water to fittings.</td>
</tr>
<tr>
<td>Carbon dioxide ((CO_2))</td>
<td>Grey RAL 7037</td>
<td>Gas is heavier than air and will collect in low lying areas, pits, sumps etc.</td>
<td>Will replace oxygen and hence cause suffocation</td>
<td>Very difficult to detect as it is odorless. Check for leaks by applying soapy water to fittings.</td>
</tr>
</tbody>
</table>

Table 1

RED AND WHITE SHALL NOT BE NEXT TO EACH OTHER (always >1m apart)!
4.2 Labelling
There is no internationally recognized standard for color coding of gases but within Europe there is an EN standard (EN1089). There is also UN standard for hazard symbols. Gases are color coded according to the risk diamond on the main label as shown in figure below.

- A. Company name
- B. Address of the company
- C. Risk & safety phrases
- D. Hazard symbols (UN classification)
- E. EEC label
- F. Revision number
- G. EEC number if applicable
- H. Product name
- I. UN identification number and proper shipping name
- J. Additional information

5.0 TRAINING AND COMPETENCE
Persons working in a ship environment must know the contents of this Code of Practice.
If person is using compressed gases on site he shall

a) Check equipment prior to use to ensure that it is in good order.

b) Check the area for smell to detect if there might have been any leakage. If there is any suspicion of any leak then call the nearest supervisor on the ship. DO NOT PROCEED UNTIL THIS IS DONE.

c) On completion of the work ensure that all regulators are fully closed.

d) At the end of the shift a check should be made on the regulators on the cylinders or on the manifold and the manifold and the hoses removed to the open air. Failure to do this could result in a build up of gas in the compartment of ship if there is a leak on if the valve is not fully closed. This very dangerous if the leak is oxygen.

e) If another contractor is working in the same area make sure that ABB’s activities will not adversely affect the contractors’ health or safety.

6.0 MONITORING AND CHECKING

a) The supervisor is responsible for ensuring that persons working in a ship environment are briefed on this Code of Practice.

b) Individuals working in a ship environment are responsible for following the requirements of this Code of Practice.

c) This Code of Practice shall be part of OHS audits and reviews conducted by the LBUs.

All incidents, unsafe conditions, unsafe behaviors and near misses shall be reported to the applicable database. See ABB standard GISA 01.05A22
1.0 INTRODUCTION

Hydraulic power is widely used within Marine and Cranes machinery and tools and in most cases quite safely with few incidents. The hazards associated with the use of such systems are often hidden and not obvious to workers. This code of practice has been developed to remind ABB staff and contractors of the hazards and risks associated with hydraulic power systems and tools and what the required control measures are to mitigate those risks.

2.0 SCOPE

This COP applies to all ABB Marine and Cranes employees and contractors working with or in close vicinity of hydraulic pressure systems & tools. If the local regulatory or customer requirements impose a higher standard, then the higher standard shall be followed. In such cases this shall be documented.

3.0 HAZARDS & RISKS

The hazards associated with hydraulic fluid systems include effects of high pressure contact with the fluid, fire, lacerations, burns and in the case of hydraulic powered machinery potential for crushing in the event of failure.

2.1 High pressure injection effects

Hydraulic systems store hydraulic fluid at high pressure, e.g. about 150 bar (abt. 2000psi), so if a line fails then a jet of fluid at very high pressure can be released. If the operator is in contact with the fluid stream then there is a very real possibility of the fluid being injected directly through the skin. This can result in serious damage particularly if the fluid penetrates the muscles or organs. In severe cases this can lead to amputation as a result of possible gangrene. Fluid that has entered the body has to be removed by surgery. This risk is highest if operators are searching for pinhole leaks using their hands.

2.2 Fire

Most hydraulic fluids are not highly flammable as they have flash points that range from 149°C-315°C. A hydraulic system can increase in temperature under normal operating conditions but without any significant increase in the risk of fire. However if there is a leak under high pressure then the fluid will atomise and it will ignite when in contact with hot surfaces or other sources of ignition e.g. welding arc. The resultant fire is usually torch like with a high heat release rate with the potential for serious burns etc. Where the release is confined then there is also the potential for explosion.

2.3 Mechanical damage

If there is a failure of a flexible hydraulic line there is also the potential for it to lash about spraying oil in all directions but also injure those nearby as a result of the impact by the flailing hose.

2.4 Occupational health

Hydraulic oil is petroleum based lubricating oil and contains certain additives. Skin contact should be avoided when working with the oil, wear gloves and avoid any prolonged breathing of its vapour, mist or fumes. Check the Safety Data Sheet (SDS) in respect of the correct PPE to be used.

4.0 OPERATIONAL CONTROLS

4.1 High pressure injection

High pressure injection injuries are probably the most likely with hydraulic systems and the majority are those that involve pinhole leaks which are often difficult to locate and operators will often use their hands to determine their location. Always use a piece of card or similar material to locate the leak. Do not use your hands as the fine jet of hydraulic fluid under pressure will pierce the skin.

4.2 Maintenance

The prevention of fire involving hydraulic systems is based upon ensuring that the system and in particular any lines or flexible hoses are inspected or maintained. All hoses, lines and associated fittings should be inspected periodically but not using hands to locate any possible pinhole leaks. Any deterioration should be carefully examined to determine if it is significant. If there is any doubt the component should be replaced. Typically conditions that would warrant a replacement include:

a) Any evidence of hydraulic fluid leakage at the surface of a flexible hose, or its junction with the metal and any couplings;

b) Any blistering or abnormal deformation to the outer covering of a hydraulic hose;
Safety in the use of hydraulic pressure systems & tools

c) Any leakage at any threaded or clamped joint that cannot be eliminated by normal tightening or other recommended procedures;
d) Evidence of any excessive abrasion or scrubbing on the outer surface of a hose, rigid line or other hydraulic fitting. Where this has occurred then some modification will be required to protect the hose or line;
e) Replace filters regularly.

DO NOT USE YOUR HANDS TO LOCATE A PINHOLE LEAK IN A HYDRAULIC HOSE OR LINE!

4.3 Summary

- Never work on a hydraulic system unless you have been trained and are competent;
- Do not disconnect any hoses or couplings without first checking to ensure that the pressure has been reduced to atmospheric;
- Never search for pinhole leaks in hoses using your hands; you may get injected with oil;
- Do not cross hydraulic lines;
- Do not remove cylinders until the working units are at rest on the ground or are otherwise supported or blocked;
- Do not connect a high pressure pump to a low pressure system.

- Always refer to the manual on the equipment being worked on and check the circuit diagrams;
- Maintain a working area that is free from obstruction and general slipping hazards;
- Use the correct personal protective equipment (PPE) which shall include safety footwear, overalls, chemical resistant gloves and eye protection. See code of practice on PPE.
- Always block, secure or lower to the ground any equipment that might move, rotate or fall;
- Always relieve system pressures including any accumulators that may be in the system;
- Use test equipment e.g. pressure gauge that has a higher rating than the system by applying a suitable factor of safety;
- Always clean up any spillage promptly to avoid leaving a slipping hazard;
- Do not work under any hydraulic equipment unless it has been made safe by mechanical propping, lowering to the ground etc;
- Always wash your hands before partaking of food or drink.

4.4 Emergency preparedness

When working with hydraulic systems and tools make sure that you are aware of the emergency eye wash facilities and general first aid. If a skin injection injury occurs see a medical practitioner immediately - DO NOT LEAVE IT!

Also check on location of fire extinguishers and the emergency means of escape.

5.0 MONITORING & CHECKING

Only monitoring requirement relates to the need to inspect hydraulic hoses and connections on a regular basis in accordance with the manufacturers’ instructions.

All incidents, unsafe conditions, unsafe behaviors and near misses shall be reported to the applicable database. See ABB standard GISA 01.05A22.

6.0 TRAINING & COMPETENCE

Marine and Cranes staff shall be briefed on the requirements of this COP.
1. INTRODUCTION

This code of practice (COP) has been developed to provide practical information to staff within Marine and Cranes and contractors on the hazards and risks involved while entering an Azipod, related confined spaces and the required controls. This COP does not provide any permit to access Azipod and is not all-inclusive. Persons entering the Azipod confined spaces must be authorized and trained to do so and required controls must be in place. For further details contact your safety advisor.

Examples of possible confined spaces onboard:
- Azipod & Cooling Air Unit & Slip ring unit
- Double bottom & compartments in ships
- Storage tanks
- Rooms or areas where there is no ventilation or poor ventilation e.g. cable ducts

How to Identify a Confined Space?
- Limited openings for entry & exit
- Unfavourable natural ventilation
- Not designed for continuous worker occupancy

Fig 1. Examples of Azipod related Confined Spaces

2.0 SCOPE

This COP applies to all ABB Marine and Cranes employees and contractors working on customers’ sites. If the local regulatory or customer requirements impose a higher standard, then the higher standard shall be followed. In such cases this shall be documented.

3.0 HAZARDS AND RISKS

While working inside Azipod unit, the employees could be exposed to the following hazards (but not limited to):
- Atmospheric hazards
- Hazards due to moving mechanical parts
- Electrical live parts
- Hazards due to vertical entries
- Potential oil contamination possibly causing skin irritation
- Thermal hazards (e.g. high temperature of propulsion motor)
- Inconveniences due to confined space.
4.0 OPERATIONAL CONTROLS

4.1 Risk avoidance

As with health and safety risks the hierarchy of control should be properly applied and risk avoidance is the best and most preferred option. Therefore if it is possible to perform the work without entering the Azipod Unit, this working method should be preferred.

If it is necessary to enter the Azipod Unit, answer the following questions.

Can you answer all following questions **YES** before entering Azipod Confined Space?
- Are you authorized to enter this confined space?
- Has a hazard assessment been completed?
- Have you been trained to do this? i.e. have you valid Azipod Space Training or equivalent?
- Have the pre-entry testing and inspection been completed?
- Are there rescue provisions in place, in case something goes wrong?

**IF YOU ANSWER ANY OF ABOVE QUESTIONS “NO” YOU ARE NOT ALLOWED TO ENTER AZIPOD.**

4.2 Risk Reduction & control

The following actions are required to ensure protection of workers from the hazards that can be present in confined spaces.

4.2.1 Entry without respiratory breathing equipment

Entering Azipod confined spaces requires special training, special tools, some specified PPE, rescue tools and rescue personnel. Details of these requirements are trained as part of the Azipod Space entry training. Person responsible of sending the personnel to work inside Azipod confined space must verify that all required controls are available on site when the work is planned to take place.

**MINIMUM OF TWO TRAINED PERSONS ARE REQUIRED FOR ANY ENTRY INTO AZIPOD !**
- ONE ENTERING THE AZIPOD
- ONE SAFETY PERSON IN THE AZIPOD ROOM

**NEVER ENTER WITHOUT SECURING ATMOSPHERE FIRST!**

Acceptable limits while entry is to be made without self contained breathing apparatus.

<table>
<thead>
<tr>
<th>Level of Oxygen/air (%)</th>
<th>Health Effect</th>
</tr>
</thead>
<tbody>
<tr>
<td>22.2%</td>
<td>Oxygen enriched atmosphere &amp; fire</td>
</tr>
<tr>
<td>20.8</td>
<td>Normal-safe for entry (+/- 0.2%)</td>
</tr>
<tr>
<td>19.5</td>
<td>Oxygen deficient atmosphere</td>
</tr>
<tr>
<td>16%</td>
<td>Impaired judgment and breathing</td>
</tr>
<tr>
<td>14%</td>
<td>Rapid fatigue and faulty judgment</td>
</tr>
<tr>
<td>11%</td>
<td>Difficulty in breathing and death</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Substance</th>
<th>Acceptable limits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Oxygen (O2)</td>
<td>Greater than 19.5 % and less than 23.5 %</td>
</tr>
<tr>
<td>Flammability (LEL)</td>
<td>Less than 10 % of Lower Explosive Limit (LEL)*</td>
</tr>
<tr>
<td>Carbon Monoxide (CO)</td>
<td>Less than 30 ppm**</td>
</tr>
<tr>
<td>Hydrogen Sulphide (H2S)</td>
<td>Less than 10 ppm**</td>
</tr>
<tr>
<td>Other substances</td>
<td>Less than Permissible Exposure Limit (PEL)</td>
</tr>
</tbody>
</table>

*same as Lower Flammable Limit (LFL)  
**parts per million
Flow diagram for use in drawing up a permit to enter a Azipod confined space:

4.2.2 Entry for rescue
Entry for rescue requires certified Azipod space entry training, ensuring persons capability to use the rescue equipment and correct rescue methods.
In case the rescued people is unconscious or confused i.e. there are any signs that the atmosphere might be endangered, the atmosphere must be secured prior entering for rescue.

5.0 TRAINING & COMPETENCE
All persons who are required to carry out Azipod space working shall be instructed and trained properly:
  a) Azipod space trainings (working & rescue as specified)
  b) Hazards relating Azipod spaces
  c) Documentation & check-lists
  d) Operation of the gas monitor
  e) Use of safety harness & lanyard
  f) Other required PPE
6.0 PROTECTIVE EQUIPMENT

The required tools and PPE for Azipod confined space works are categorized as

a) General tools;

b) PPE;

c) Rescue tools.

All tools and PPE must be fit for purpose and comply with the relevant EN or ANSI standard or their equivalent. The following lists are indicative.

6.1 General tools

Due to practicality reasons (less travel items) it is recommended to make arrangements with customer for having the general tools on board a vessel as well as inspection process. The general tools are:

- Retractable lifeline (min. 5 m), 1 pc (To avoid tangling, you may consider using rope for releasing the lifeline up and correspondingly for pulling it down, if several people are entering)
- Anchor point (suitable for the location, to be used if permanent one is not available)
- Set of screw lock carabiner (with different openings and sizes)
- Climbing carriage (for Azipod X product only), 1 pc
- Atmospheric safety device (min. 4 gas, see monitored substances table on page 2)

6.2 Personal Protective Equipment (PPE)

The following represents an indicative list of PPE and other safety equipment that shall be provided for all persons entering Azipod confined spaces. Requirements for general PPE for site environment are contained in COP 10.

- Integrated safety harness/coverall or safety harness and coverall
- Safety cap, with small or without visor (instead of safety helmet)
- Led headlight
- Safety Glasses, safety shoes (other PPE based on need)
- Atmospheric safety device, portable (O₂ monitoring)
6.3 Rescue tools
Due to practicality reasons (less travel items) it is recommended to make arrangements with customer for having the rescue tools on board a vessel as well as inspection process agreed. The rescue tools are:

- Same as PPE in chapter 6.2, 1 set
- Rope, abrasion resistant (50 m / for rescuer)
- Rope, abrasion resistant (110 m / for person to be lifted)
- Rope belayer brake, 1 pc
- Double pulley, 2 pcs
- Rope clamp, right handed, 2 pcs
- Spreader, 1 pc
- Neck support, adjustable, 1 pc
- Seal for rescue pack, 20 pcs
- Sealed box for rescue tools, 1 pc

Example: Pre-assembled lifting equipment, ready to use in emergency.

NOTE: Rescue to be performed by trained personnel - Always secure atmosphere prior entering.

7.0 MONITORING & CHECKING
The LBU shall ensure that, where Azipod space working is required, Safety Observation Tours (SOT) and any scheduled safety inspections include checking of compliance with the procedure for confined space working. This shall include:

a) Checking that employees have been trained and instructed in the requirements and
b) That they follow the requirements when working in confined spaces;
c) Permits are properly completed and issued by the supervisor

The confined space program shall be evaluated on an annual basis to ensure that the program is functioning as required to protect confined space workers.

All tools and PPE must be at least annually checked/ tested/ calibrated. Follow standard EN 365 (Personal protective equipment against falls from a height – General requirements for instructions for use, maintenance, periodic examination, repair, marking and packaging) or equal.

8.0 DOCUMENTATION & RECORDS
The following records shall be kept:

a) Personnel qualification and training records shall be maintained for a minimum of five years.
b) Records pertaining to an incident shall be maintained for the duration of the involved individuals’ employment.
c) Valid calibration records of atmosphere testing devices;
d) Entry permits shall be retained for the duration of the project;
e) Records of inspection of safety harnesses and lanyards to be retained for 12 months.
Protection against falling objects when working under a ship

1.0 INTRODUCTION

This Code of Practice (COP) has been prepared to provide basic guidance to ABB staff and contractors on the basic safety precautions that are required to protect persons under the ship who might be put at risk from the potential for items to fall from the decks above onto the bottom of the dry dock.

2.0 SCOPE

This COP applies to all ABB Marine and Cranes employees and contractors working on customers’ sites. If national legislation or customer requirements impose a higher standard, then the higher standard shall be followed. In such cases this shall be documented.

3.0 HAZARDS & RISKS

On any work site where work is being carried on at different levels there is always the potential for tools and other items to fall. One of the key issues is that every time when a ship is in dry dock there will be many different contractors working on the vessel at different locations. Some work such as blasting and painting, outer deck works, rail works etc. may well be carried out on the side of the ship.

Marine personnel working on the bottom of the dry dock during Azipod Unit overhauling are especially under exposure to these risks. The main hazard is not when persons are working under the ship but more when they are walking in and out of the area where they might be positioned in any drop zone.

In some cases bad practice is carried out when getting rid of materials by throwing over the side to the dock bottom to be then collected and disposed of.

4.0 OPERATIONAL CONTROLS

4.1 Initial on site meeting

One of the most important controls is through the ship yard to advise all the contractors on the vessel that ABB personnel will be working below the ship on the bottom of the dry dock.

Another key control is ABB site manager to ask in the regular ship yard meetings “what works will be executed in the vessel aft area” (pay special interest if any of the works are performed in the exterior areas of the vessel). If any such works are performed, ensure that ship yard informs specifically these teams of ABB presence underneath the vessel aft.

4.2 Physical protection

One way of ensuring that the risk from falling objects is much reduced, is to provide a dedicated access point around the stern of the vessel. One step further is to construct this by means of simple scaffold tubes to form a simple corridor with the scaffold boards acting as a crash deck. If all persons are then instructed that they always use the dedicated access point then the risk of any falling object landing on a person is virtually eliminated. The corridor should be long enough to ensure that persons when leaving the safety of the underside of the vessel can do so without being exposed in the drop zone which would be immediately adjacent to the ship’s side.

4.3 Personal Protective Equipment

All personnel when working in the dry dock shall wear type approved & valid safety helmet/ hard hat to protect against the possibility of falling objects within the work area itself and if anything falls from other parts of the ship. For further details, see CoP 10 Personal Protective Equipment (PPE).

5.0 TRAINING & COMPETENCE

No special training is required apart from all persons having to attend a site induction at the beginning of the work on site where access into the work area and egress from it should be pointed out for persons to use. All persons must however be briefed on the requirements of this COP.
Protection against falling objects when working under a ship

6.0 MONITORING & CHECKING
The supervisor on site is responsible for ensuring that a safe means of access has been proved as above and that all persons are using it. Compliance shall be checked during Safety Observation Tours (SOT).

7.0 DOCUMENTATION & RECORDS
None required.
1.0 INTRODUCTION
ABB Marine performs Azipod propulsor related service & maintenance works. Sometimes the maintenance work requires pull out of the entire Azipod rotor, sometimes just the components, such as Azipod hull cap, propeller and/or DE- or NDE-bearings. This work can take place at dry dock’s all around the world, typically in close co-operation with local ship yard and the ship operator.

2.0 SCOPE
This COP applies to all ABB Marine and Cranes employees and contractors working with Azipod Units. If the local regulatory or customer requirements impose a higher standard, then the higher standard shall be followed. In such cases this shall be documented.

2.1 Typical Azipod shaft line works during dry dockings

2.1.1 Azipod shaft line overhauling
Azipod Shaft line overhauling contains typically three major steps
1. Propeller side works (including propeller removal), (Pict. 1)
2. Thrust bearing side works (thrust bearing cap & bearing removal), (Pict. 2).
3. Shaft line overhauling, (Pict 3).

Propeller weights 25…75 Tons.
Propeller cap weights 3 … 6 Tons.
Shaft line weights 65…125Tons.

2.1.2 Azipod thrust shaft & -bearing change
In some cases thrust bearing can be changed individually by special tools without pull out of the entire Azipod rotor, see picture 4.

Picture 4. Thrust bearing change with special lifting tool.
3.0 HAZARD & RISKS

Typical hazards and risks that are present in dry docks are to be informed to all employees working in site. Most common way to get the information on these risks is site safety trainings. Often the sites use also safety signatures showing hazardous or risky working areas, see picture 6. These signatures are used in this CoP for showing the risks related to Azipod hauling lifting operations.

Notice! Sign shape, color and message text language can vary between different countries. If there is any questions relating to the signs, don’t hesitate to ask ABB site manager or local safety contact person for clarification.

More information on safety signs can be found from Marine & Cranes COP no. 7.

3.1 Typical dry docking work risks

Most typical risks related to Azipod shaft line hauling lifting operations are listed below (observed when analyzing dry docking related near miss reports):

1. Heavy lifting’s
   a. Lifting tools (hydraulic & pneumatic)
   b. Lifting eyes (steel & welding quality)
   c. Communication during operation

Notice! Use own, well maintained equipment. If using other parties’ equipment, ensure the condition and use competence prior use. Make sure lifting eyes are suitable for use.

2. Fall risk when working scaffoldings (see CoP 15)
   a. The Scaffolding safety culture
   b. The scaffolding inspections procedure in different countries

3. Traffic in dock bottom (see especially CoP 6 and CoP 23)
   a. The forklift etc. traffic nearby Azipod working area

4. Airborne hazards (see CoP 16)
   a. Grinding / welding flying particles
5. Dropping tools from higher decks (see CoP 23)
   a. Tools dropping from higher decks

Always check risks from project safety plan & site specific OHS Risk Review matrix, example below:

Table 1. Example of OHS Risk Review matrix.

Typical risks of Azipod hauling lifting operations shown with signs, picture 6.

3.2 Identifying

When working in dry dock, follow ABB Stop Take Five philosophy. It’s always important to plan beforehand every task and think work through before starting work. Follow also the related safety- & work instructions. If you notice any problems compared to safety instruction take contact to the site manager or your supervisor. If neccessaet a separate Safe Job Analysis (SJA) shall be performed (see CoP 1).
4.0 OPERATIONAL CONTROLS

4.1 General

Working on dock bottom can present many hazards of which some will be due to the many interfaces that might exist between ABB’s activities and that of other parties who may also be working on the dock bottom whilst the vessel it is in dry dock for repairs etc. Hazards may therefore arise as a result of other persons working in the same area as ABB.

ABB Marine dry docking responsible is usually nominated ABB site manager. He will introduce site for the service team and also manage Project Safety Plan. ABB dry docking project manager prepares project safety plan that ABB site manager follows during dry docking.

Notice ! Site specific OHS Risk Review matrix shall be prepared for each individual dry dock & attached to the project safety plan.

It is also the case that ABB’s activities, if not properly controlled, could also adversely affect other persons in the same area. As with all risks there is a preferred hierarchy when it comes to applying suitable controls measures which require risk avoidance and elimination to be considered first before applying risk reduction, isolation and control measures where the application of personal protective equipment becomes the measure of last resort.

1. When contracting with the dockyard or ship owner, the work scope and work responsibilities shall be agreed. Also contact person relating safety shall be nominated.
2. Always prepare project specific safety plan with risk assessment (see CoP 1)
3. Plan required controls
4. Implement adequate controls

The dry docking project manager or dry docking site manager is responsible for ensuring that ABB Marine and Cranes employees and contractors do not generally get involved in risky situation. If a high risk task is absolutely necessary, the dry docking project manager or dry docking site manager shall check that the precautionary measures to control the risks are adequate based on the risk assessment. Also the employee concerned has to be informed of all the requirements prior to starting any such work on site.

If dry docking takes place at new yard project manager must ensure that safety advisor verifies project risk matrix quality.

5.0 TRAINING & COMPETENCE

ABB employees and contractors must have the required training, be skilled for the work in question and have the needed instructions available (e.g. lifting plans, assembly documents etc.) before working on dry dock.

6.0 MONITORING

Accountable managers must follow that this CoP is implemented. Compliance shall be followed with Safety Observation Tours (SOT). OHS site assessments will be reflected against this CoP.

7.0 DOCUMENTATION & RECORDS

The filled dry docking safety plan shall be available at site for both ABB engineers and contractors as a live document, including risk matrix.

All incidents, unsafe conditions, unsafe behaviors and near misses shall be reported to the applicable database. See ABB standard GISA 01.05A22.
1.0 INTRODUCTION
Large equipment, such as large electrical motors, which contain permanent magnets (PM) are becoming more and more common in the industry. This will result in a new type of risk, mainly when PM equipment is opened e.g. for maintenance. This code of practice has been prepared to provide guidance to Marine and Cranes personnel about the hazards and risks associated with such work and the precautions that should be adopted.

2.0 SCOPE
This COP applies to all ABB Marine and Cranes employees and/ or contractors working with machinery. If the local regulatory or customer requirements impose a higher standard, then the higher standard shall be followed. In such cases this shall be documented.

3.0 HAZARD & RISKS
As such there is nothing extraordinary if magnetization is done with PM’s. Typically it does not make any difference to the surroundings or to the equipment. As an example, if the same output electrical motor is generated by an induction motor or PM motor, the magnetic field strength inside the motor is almost identical when the motor is running and the surroundings of the motor are identical. The difference is that the magnetic field of the PM motor will be also when the motor is not running. Therefore personnel opening and maintaining such PM equipment must be familiar and competent with the required safety measures. Persons who are not familiar with the dangers of PM’s must not enter areas where PM’s are exposed.

Permanent magnet stray fields, caused by open or disassembled PM equipment or parts of it, may disturb or damage other electrical or electromagnetic equipment and components, such as cardiac pacemakers, credit cards and equivalent.

Loose magnetic parts, tools and waste must also be kept away from PM’s. Ferromagnetic tools in a magnetic field generated by a large PM will result in large forces being generated, which easily can bruise or even break fingers or limbs etc.

In addition rotating/moving PM parts or PM materials may cause induced voltages, which may cause damage to surrounding equipment and can create a DC voltage shock potential due to the discharge of an induced voltage via a person touching the object with an induced voltage potential.
4.0 OPERATIONAL CONTROLS

Those who may be required to work within an environment where PM's are present shall be aware of the hazards and risks involved and the required control measures. Marine and Cranes personnel must be familiar with the risks and competent to undertake the work and apply the required control measures. These will include:

- Recognizing the dangers and adopting the right attitude;
- Understanding that a permanent magnet is not a tool;
- Follow the equipment manufacturers’ instructions;
- Place warning signs and limit the working area to authorized persons only;
- Do not work if unsure, seek help from your safety advisor;
- Ensure that there are no ferromagnetic materials in the vicinity of a PM;
- Ensure that handling of magnets is carried out only at planned locations and with approved tools;
- Limit the time in the vicinity of the magnets;
- Ensure that a good standard of general tidiness is maintained.

Typical safe distances vs. risk

- **Distance over 2 m (7 ft)**
  - Safe distance
  - No precautions required

- **Distance 1-2 m**
  - (3 ½ - 7ft)
  - Risk of sticking increased
  - Magnetic stray field strengthens exponentially

- **Distance below 1m (3 ½ ft)**
  - High risk, be alert
  - Think carefully what you are doing
  - "If you feel the magnetic stray field it is too late"

Visitors entering areas where PM’s are exposed, must be:

- Informed of PM magnets and the dangers
- Check that they do not have a pacemaker fitted
- Always guided when moving in the area
- No visitors shall be permitted to enter into the high risk area (area within 2 meter distance)
5.0 TRAINING & COMPETENCE
As a minimum, training for workers must include the following:

- What is permanent magnet
- Risks while working with permanent magnets
- Tools and working methods

All incidents, unsafe conditions, unsafe behaviors and near misses shall be reported to the applicable database. See ABB standard GISA 01.05A22.

6.0 MONITORING & CHECKING
LBU managers shall ensure that requirements of this Code of Practice are implemented and followed.
1.0 INTRODUCTION
Radar installations are a source of non ionizing radiation which can represent an occupational health hazard. This Code of Practice (CoP) has been prepared to provide Marine and Cranes' personnel with basic guidance on what steps they can take when working on board a ship or other structure which uses similar equipment to ensure their safety and health.

2.0 SCOPE
This CoP applies to all ABB Marine and Cranes employees and/or contractors working on customers’ sites. If the local regulatory or customer requirements impose a higher standard, then the higher standard shall be followed. In such cases this shall be documented.

3.0 HAZARDS & RISKS

3.1 EMF emissions
Radars usually operate at radio frequencies (RF) between 300 MHz and 15 GHz. They generate EMFs that are called RF fields. RF fields within this part of the electromagnetic spectrum are known to interact differently with the human body.
RF fields below 10 GHz (to 1 MHz) penetrate exposed tissues and produce heating due to energy absorption. The depth of penetration depends on the frequency of the field and is greater for lower frequencies. Absorption of RF fields in tissues is measured as a Specific Absorption Rate (SAR) within a given tissue mass. The unit of SAR is watts per kilogram (W/kg). SAR is the quantity used to measure the "dose" of RF fields between about 1 MHz and 10 GHz. A SAR of at least 4 W/kg is needed to produce an adverse health effect in people exposed to RF fields in this frequency range. RF fields above 10 GHz are absorbed at the skin surface, with very little of the energy penetrating into the underlying tissues. The basic dosimetric quantity for RF fields above 10 GHz is the intensity of the field measured as power density in watts per square metre (W/m²) or for weak fields in milliwatts per square metre (mW/m²) or microwatts per square metre (µW/m²).
Exposure to RF fields above 10 GHz at power densities over 1000 W/m² are known to produce adverse health effects, such as eye cataracts and skin burns.

3.2 Human Exposure
The power that radar systems emit varies from a few milliwatts (police traffic control radar) to many kilowatts (large space tracking radars). However, a number of factors significantly reduce human exposure to RF generated by radar systems, often by a factor of at least 100:

- Radar systems send electromagnetic waves in pulses and not continuously. This makes the average power emitted much lower than the peak pulse power.
- Radars are directional and the RF energy they generate is contained in beams that are very narrow and resemble the beam of a spotlight. RF levels away from the main beam fall off rapidly. In most cases, these levels are thousands of times lower than in the main beam.
- Many radars have antennas which are continuously rotating or varying their elevation by a nodding motion, thus constantly changing the direction of the beam.
- Areas, where dangerous human exposure may occur are normally inaccessible to unauthorized personnel.

3.3 Other Health Hazards
Studies conducted to date examined health effects other than cancer such as eye conditions (cataracts) and adverse reproductive effects. Overall conclusion is that there is no clear evidence to support a causal link between non ionizing radiation emitted by radar systems.
4.0 OPERATIONAL CONTROLS

4.1 Protective measures

As a general principle Marine and Cranes’ activities will not require employees to work within the effective range of the radar installation. However if there is an exposure potential to RF energy during ABB field operations during work on elevated structures such as marine cranes or working on elevated shipboard structures then this hazard must be considered as part of the risk assessment for the task. In such cases the risk assessment must include exposure potential to RF energy emitted from radar and radio antennae. There shall be no work carried out in close proximity to any radar or radio antennae unless the radar or radio system has been de-energized and locked out, or other means have been applied such as electronic means to exclude the radar pointing in certain areas, and shielding. Also, the ABB employee should determine if administrative controls including audible and visible alarms, warning signs, and restriction of access through barriers, locked doors, or limiting access time to radar have been applied.

DO NOT WORK CLOSE TO ANY RADAR INSTALLATION WITHOUT CHECKING THAT IT HAS BEEN ISOLATED AND LOCKED OUT, or MAINTAIN A SAFE DISTANCE OF >10m

4.2 Exposure limits

Human exposure to EMF emitted by radar systems is set by the International Commission on Non-Ionizing Radiation Protection (ICNIRP) see also www.icnirp.de. The exposure limits for occupational exposure are 100W/m² or 10mW/cm² and for general public exposure: 10W/m² or 1mW/cm².

5.0 TRAINING & COMPETENCE

All persons engaged in activities where RF/microwave exposure potential exists shall be instructed in the content of this Code of Practice. This shall include in particular:

- Occupational health hazards associated with RF energy and the required safety controls, and;
- What action to take in cases of emergency.

6.0 MONITORING & CHECKING

a) All LBU’s shall ensure compliance with this Code of Practice (CoP). This shall generally be achieved by establishing during the planning stage whether there will be any radar installations on board the ship operating under power and in the area that will be occupied by ABB personnel.

b) Compliance will be monitored through auditing.

c) Non compliance with this CoP may result in disciplinary action and removal from the project or service site.

7.0 EXAMINATIONS & CHECKING OF EQUIPMENT

Before any ABB personnel or contractors work where RF energy exposure exists, a pre-start check by the operator to ensure that the installation has been isolated and that it has been recorded in the Risk assessment.

8.0 DOCUMENTATION & RECORDS

The following documentation & records shall be kept if there is potential to RF energy exposure:

- A site specific Risk Assessment/Job Safety Analysis, and obtain approval and authorization.
- Copy of the work permit(s) will be kept on site during the work.
Requirements for attending Sea Trials

1. INTRODUCTION
A lack of hazard awareness, or working in environments which are unfamiliar can increase the risk of injury purely because persons do not have the specific knowledge about the hazards and, as well as the control measures and procedures in place to deal with those risks. This code of practice (COP) therefore sets out some basic requirements to be followed when attending sea trials on a vessel to ensure that all ABB staff and any contractors are aware of the specific hazards and the general arrangements to control those risks.

2. SCOPE
This COP applies to all ABB Marine and Cranes employees and/ or contractors, which attend sea trials for new builds or following dry docking of a vessel.

If national legislation or customer requirements impose a higher standard, then the higher standard shall be followed. In such cases this shall be documented.

3. HAZARDS AND RISKS
Working within any unfamiliar environment will increase health and safety risks owing to the lack of knowledge about any specific hazards and specific rules, practices or procedures, or any prohibitions that are applicable.

4. OPERATIONAL CONTROLS
There must be a nominated responsible person for the sea trial (ABB Supervisor). This person is the customer contact during the trial and he manages ABB works, employees and contractors.

4.1 Planning
- Before attending sea trials suitable enquiries to the ship yard or customer shall be made to ensure that details of the sea trial, details of specific hazards and safety rules that apply are obtained prior to ABB employees attending sea trials.
- The information obtained shall be incorporated into the H&S plan for the project/contract which should be prepared during the tender/contract phase.
- The information shall include details of any prohibited areas on board the vessel as well and location of the first aid/ medical care facility on the vessel;
- Details of the customers’ organization and the customer’s contact person on the vessel;
- Details of the ship yard’s or vessel’s OHS rules during the sea trial shall be obtained which should include information in respect of any or all of the following:
  a) Requirements for personal protective equipment on the vessel, e.g. live vests;
  b) Radio practices, e.g. frequencies;
  c) Announcement practices, e.g. evacuation signals;
  d) Lock out/tag out – practices;
  e) Fire and emergency procedures including emergency telephone numbers for fire and emergency contact for the vessel (e.g. muster stations, signals, etc.);
  f) Incident reporting requirements including near miss and hazard reporting requirements;
- Based on the details received from the customer ABB supervisor shall prepare a sea trial manning plan to ensure that sufficient resources and competences are available for the sea trial.
- ABB supervisor shall also secure that adequate spares, tools, measurement equipment and safety equipment will be available for the sea trial.

4.2 Prior to attending sea trials
Prior to attending sea trials the ABB supervisor shall carry out a briefing on:
- Roles during the sea trial i.e. the chain of command, e.g.
  a. Name/position/ phone number of ABB responsible person on board the vessel during the sea trial (and his substitute during rest periods)
  b. Name/position/phone number of EHS responsible person on the vessel
  c. Name/position/ phone number of responsible person on board the vessel for connection or switching
- The length and scope of the sea trial;
Requirements for attending Sea Trials

- Principal hazards and risks on site including presence and location of hazardous sources and in particular any non destructive testing on board the vessel;
- EHS requirements during the sea trial;
- Ongoing/completion of work during sea trial that could not be finished while vessel was in ship yard or dry dock;
- Details of any other contractors who may be working within the same working area as ABB or working with interfacing systems and any risks that may affect ABB;
- Location of general arrangements including:
  a) Storage of personal protective equipment, e.g. live vests;
  b) First aid and medical facilities;
  c) Emergency muster station;
- ABB Supervisor shall also carry out safety checking on board. This includes e.g. verification that emergency exits from ABB working areas are not locked

4.3 Following sea trials

In some instances it could be required to check, replace, modify, or adjust equipment/systems following a sea trial after reaching ship yard (new build) or port (dry docking). Prior to start of any work the ABB supervisor shall carry out a briefing on:

- The scope of the work;
- Details of specific hazards and safety rules that apply;
- Communication;

In these cases ABB Marine & Cranes specific work procedures and OHS rules shall be followed which should include information in respect of any or all of the following, when applicable:

  a) Confined space entry;
  b) Electrical safety;
  c) Testing of equipment;
  d) Hot work;

5. TRAINING AND COMPETENCE

This COP shall be communicated to every project team member prior to attending any sea trials;

6. MONITORING AND CHECKING

The project manager or ABB supervisor is responsible for ensuring that all project team members have been familiarized with the requirements to follow for attending sea trials. This shall include contract personnel working on behalf of ABB.

This CoP shall be part of OHS audits and reviews conducted by the LBUs

7. DOCUMENTATION AND RECORDS

- Signed document of Sea Trial familiarization
- Actual working hour sheets per person
1.0 INTRODUCTION
Pneumatic tools are widely used in shipyards and sometimes misused or improperly maintained. This Code of Practice (COP) has been prepared to provide basic guidance to ABB staff and contractors on the basic safety precautions that are required when using or working in close vicinity of such equipment.

2.0 SCOPE
This COP applies to all ABB Marine and Cranes employees and contractors working on customers’ sites. If the local regulatory or customer requirements impose a higher standard, then the higher standard shall be followed. In such cases this shall be documented.

3.0 HAZARDS AND RISKS
Pneumatic tools generally operate using an air supply of about 80psi or 550kpa for normal power tools. Lower pressures may of course be used e.g. for blow guns. The hazards and risks involved include:

- Failure of pressure hose due to damage or wear causing injury to eyes etc;
- Subsequent whipping or snaking of the flexible hose;
- Possible serious injuries from direct contact with the pressure nozzle of the tool. This can result in air getting into the bloodstream which can be dangerous. It is particularly dangerous where directed to a persons’ anus as a fatal injury may occur.
- Tripping hazards from the trailing hose
- Possible fire or explosion hazard if using blow gun to remove flammable dust from working area etc;
- Possible toxic hazard if potentially hazardous materials are made airborne;
- Exposure to high noise levels from tools.

4.0 OPERATIONAL CONTROLS
There is likely to be a wide range of pneumatic tools that might be used in a shipyard. They will include grinders, chippers, nut runners etc. The supply of air will generally be provided by the ship yard by means of a main compressor which will supply air to the various operating points via a manifold. The portable tool will then be connected via a quick release coupling to the manifold.

4.1 Hoses
a) As with all equipment it must be fit for purpose in all its uses and capable of withstanding general wear and tear in the operating environment. A shipyard is a heavy environment and the hoses used shall be of heavy duty material. It should also be resistant to oil. Synthetic grade hoses should be used where mineral oil may be present and natural for vegetable oil.
b) Hoses should be reasonably light if they are to be handled by the operator but consistent with the environment in which they are to be used.
c) The hose should be coupled to the supply manifold by means of a quick acting coupler. This should be designed so that when disconnected it automatically seals the air pressure on the up stream side whilst slowly venting the air pressure on the downstream side.
d) For hoses that are >10mm in diameter and 10m in length or subject to a pressure >7 bar or 723kpa then they shall be fitted with a self-venting socket which releases downstream pressure before disconnection is possible. The alternative will be to fit a plug with a controlled venting action. Items (c) and (d) will prevent any whipping or snaking in the event of a failure.
e) An alternative to (c) and (d) is to fit emergency shut off valves as close to the coupling as possible.
f) If at all possible it is useful to fit a restraining wire to the tool end of the hose to prevent any snaking or whipping.
g) All hoses should be located so that as far as is practicable they do not represent a tripping hazard.

4.2 Blow guns
a) Blow guns used to remove dirt etc shall be either designed with reduced jet velocity safety nozzles or air curtain safety nozzles. These designs reduce the risk of eye injury or any danger that arises from direct skin contact. Use a brush or vacuum cleaner for removing dirt or debris.
b) Do not use air guns or blowers to clean yourself and do not under any circumstances engage in horseplay.
Safe use of portable pneumatic systems & tools

c) Do not use simple reduced orifice devices in direct line with the supply hose as they can be extremely dangerous unless they are fitted with a tamper proof pressure regulator.
d) Do not use blow guns in areas where there is flammable or hazardous dust present.

4.3 Portable tools

a) Pressure regulators should be in place to reduce the pressure to the optimum value for the tool. The required pressure should be marked on the tool.
b) Filters and lubricators should be fitted to the supply pipe (tools need proper lubrication)
c) Pneumatic tools will give rise to high noise levels and ear protection will be required. They also give rise to vibration. Noise and vibration levels should be taken into account while selecting/buying tools for use.

4.4 Summary of operational controls

- Do not use compressed air to blow debris or to clean dirt from your clothes.

NEVER FOOL WITH AIR HOSES OR CLEAN YOURSELF DOWN-AS YOU MAY DO SERIOUS HARM TO YOURSELF OR OTHER PERSON.

- Do not use damaged hoses/lines
- Do not use airlines that have been used for water as they can damage the tool
- Do not carry or handle a pneumatic tool by its hose.
- Do not use tools without whip-checks or restraint fitted.
- Do not change tools without isolating the air first -(crushing hoses is unacceptable)
- Do not leave compressor running unnecessarily

- Ensure that the compressed air supplied to the tool is clean and dry. Dust, moisture, and corrosive fumes can damage a tool.
- Ensure that the compressed air is free of carbon monoxide
- Keep tools clean and lubricated.
- Use only the attachments that the manufacturer recommends for the tools you are using.
- Inspect the points of couplers for signs of wear and replace as required.
- Turn off the air pressure to hose when not in use or when changing power tools.
- Check hoses regularly for cuts, bulges and abrasions. Never use defective equipment. Report defects to your supervisor.
- Ensure all connections are fitted with whip-checks or restrains before use.
- Avoid creating trip hazards caused by hoses laid across walkways or curled underfoot.
- Use ear protection while using pneumatic tools.

5.0 MONITORING
Inspect hoses, tools and connections on a regular basis in accordance with the manufacturers’ instructions. Monthly checks are recommended for hoses which are subject to flexing and mechanical damage for signs of cracking and other deterioration.

It is always good practice for those who are using the tool to check the condition of the tool and hose including its connection at each end to ensure that it is fit for purpose prior to use. Never return damaged equipment to storage, initiate replacement process.

6.0 TRAINING & COMPETENCE
There is no specific safety training required for pneumatic tools but all Marine and Cranes staff shall be briefed on the requirements of this COP and a record kept.

7.0 DOCUMENTATION & RECORDS
No specific records are required
1.0 INTRODUCTION
This Code of Practice (COP) has been developed to provide guidance to Marine and Cranes personnel working in shipyards, ports and on board vessels on the use of respiratory protective equipment (RPE) that may be required.

2.0 SCOPE
This COP applies to all ABB Marine and Cranes employees and contractors working on customers’ sites. If the local regulatory or customer requirements impose a higher standard, then the higher standard shall be followed. Where such decisions have been made there shall be documented evidence, e.g. a gap analysis, showing that the selected requirement impose a higher standard.

3.0 HAZARDS & RISKS
3.1 General
Respiratory protection is required when the employee is exposed to a hazardous level of an airborne contaminant which cannot be removed by other means. Airborne contaminants can be present in a number of different forms as set out in table 1 below. The hazard therefore will be based upon the hazardous nature of the substance and the concentration of that substance in air.

<table>
<thead>
<tr>
<th>Solids</th>
<th>Liquids</th>
<th>Gases/Vapors</th>
</tr>
</thead>
<tbody>
<tr>
<td>Asbestos fibers</td>
<td>Sprayed droplets-</td>
<td>Ammonia</td>
</tr>
<tr>
<td>Engine exhaust particulates</td>
<td>Paints</td>
<td>Carbon monoxide</td>
</tr>
<tr>
<td>Lead dust and fume</td>
<td>Pesticides</td>
<td>Carbon dioxide</td>
</tr>
<tr>
<td>Silica dust</td>
<td>Powder coatings</td>
<td>Freons</td>
</tr>
<tr>
<td>Welding fume</td>
<td>Liquid jetting</td>
<td>Helium</td>
</tr>
<tr>
<td>Shot blasting dust</td>
<td>Sewage water</td>
<td>Nitrogen and oxides</td>
</tr>
<tr>
<td>Wood dust</td>
<td>Mists</td>
<td>Mercury vapor</td>
</tr>
<tr>
<td>Smoke</td>
<td>Chrome acid</td>
<td>Solvent vapors</td>
</tr>
<tr>
<td>Fungal spores</td>
<td>Cutting fluids</td>
<td>Exhaust gases</td>
</tr>
<tr>
<td>Bacteria, Virus</td>
<td>Oil mist</td>
<td></td>
</tr>
</tbody>
</table>

Table 1
Examples of airborne contaminants in various forms

Respiratory protective equipment will be required where there is a potential risk of inhalation of the hazardous substance. Hazardous substances in this context can include substances which are:

- Very toxic or toxic
- Carcinogenic (incl. mutagens & teratogens)
- Harmful
- Irritants
- Sensitizers
- Radioactive substances
- Biological agents
- Dust (> 4 mg/m³ for respirable dust (<5µ.) and >10mg/m³ for total inhalable dust(>5µ))
**4.0 OPERATIONAL CONTROLS**

**4.1. General**

As a general principle work undertaken by Marine and Cranes personnel will not involve being exposed to airborne concentration of airborne contaminants and hence respiratory protection would not be required. However the work may involve working alongside or close to other contractors who may be on the vessel and who may be generating airborne contaminants as part of their work scope within or close to the proposed working area. Work should be planned so that this situation does not arise if at all possible.

*IF YOU HAVE DOUBTS THAT THE AIR QUALITY IS POOR IN THE WORK AREA THEN LEAVE THE AREA FOR FRESH AIR AND REPORT THE MATTER TO YOUR SUPERVISOR*

In those cases where an engineer feels that he might be affected for a short term airborne contamination then he should wear a suitable half mask respirator examples of which are shown in A & B below. Example A is a disposable type and example B is a re-usable type where the filters should be changed periodically. See also COP 10, 18 and 19.

![Half Mask for Particulates only (A&B)](image)

**Table 2**

**Types of Respiratory Protective equipment**

Control of airborne contaminants using RPE will depend on the type and form of the substance as shown in table 1. For protection against particulates then the correct filter that is required is a (P3) but this can also be used for protection against fume (P1 &2 filters are suitable only if the manufacturer specifies them as being adequate).

*IF YOU ARE UNSURE WHICH FILTER TYPE TO USE, CHECK WITH YOUR OHS ADVISER*

**4.2 Ergonomic factors**

The use of half mask respirators is acceptable for relatively short duration e.g. up to 1 hour as better measures of control should be achieved with the use of local exhaust ventilation. However half mask respirators are NOT suitable for employees who have facial hair as there will not be a good mask to face seal. In those cases they will need to be provided with a full face respirator type.

**4.3 Care and Maintenance**

The proper functioning of non disposable respirators is dependent upon a regular maintenance and cleaning schedule. In general, respirators should be inspected for basic function prior to each use and cleaned as often as necessary to prevent the occurrence of unsanitary conditions. Non disposable RPE shall be issued on a personal basis and it is the responsibility of the user to ensure that his RPE is in good condition and that the filters are changed at the appropriate intervals.
As a general guide if you are using RPE on a daily basis for significant periods then change the filters daily. In all other cases follow the manufacturers’ instructions. If the RPE is fitted with two filters then change both at the same time. Useful to mark the date it was changed on the filter. All Marine and Cranes personnel working on a customers’ sites shall be issued with a sufficient supply of filters if using half mask respirators or in the case of disposable masks a sufficient supply.

DO NOT EXCEED THE LIFE EXPECTANCY OF THE FILTER.

4.4 Storage

All ABB staff who are required to travel to site shall be provided with a suitable bag in which to store all the required PPE to ensure that it is kept in good order and is prevented from being damaged in transit to site.

4.5 Summary of RPE requirements

- The RPE handled in this COP does not protect against lack of oxygen;
- Never use if dirty or damaged or if incomplete;
- Never leave RPE lying around where it may get contaminated;
- If it appears that there is large amount of contamination present in the work area, do not work in the area.

- Always ensure that the complete device is in good order before going to site and before first use;
- Ensure that the mask fits correctly before starting work. Check the tightness of the straps and refer to manufacturers’ instructions;
- If you wear a beard or similar facial hair then you will need a full face respirator and you need to make fitness test (your RPE supplier should be able to advise on this);
- Always check that the filters are the correct ones and that filters are OK;
- On a 2 filter mask always change both filters at the same time;
- Always clean and store the mask properly;
- If the fan stops on a powered set of equipment stop work and leave work area immediately.
- Always wear RPE if airborne contaminants are present e.g. grinding, welding, painting in the working area.

5.0 TRAINING & COMPETENCE

All ABB employees shall receive suitable training and instruction on OHS requirements in respect of their work activities. This shall include the requirements of this COP. In respect of RPE they shall be instructed in correct use of the RPE and how to look after it and the arrangements to obtain replacements.

6.0 MONITORING

6.1 Active monitoring

a) All ABB staff shall be issued with suitable RPE which shall include either sufficient supplies of disposable half mask respirators or a personal issue half mask respirator as shown in example B with a supply of filters. It is important that all staff understand that they are responsible for checking their equipment BEFORE they go to site to ensure that it is in good order and that they have the necessary replacement supplies with them, particularly in respect of spare filters and disposable equipment.
**Provision, use and maintenance of respiratory protective equipment**

b) Periodically each person when he is back at his home location shall have his equipment checked by his supervisor to ensure that it is being maintained in a reasonable state.

c) RPE compliance shall form an essential part of any SOT carried out site.

d) Always dispose used cartridges and replace with a new one.

6.2 Reactive monitoring

All incidents, unsafe conditions, unsafe behaviours and near misses related to contaminated environment, defective condition of PPE, incorrect use of PPE, no use of PPE etc. shall be reported to the applicable database. See ABB standard GISA 01.05A22.

7.0 DOCUMENTATION & RECORDS

The following records shall be kept by the LBU:
- Risk assessment or JSA which specifies the requirement for PPE including RPE
- Record on training and instruction.
**Protection against hygiene related illnesses**

1.0 INTRODUCTION

This code of practice (COP) has been developed to provide practical information to staff within Marine and Cranes and contractors on the hazards and risks involved while traveling with particular emphasis on hygiene matters.

2.0 SCOPE

These requirements apply to all ABB Marine and Cranes employees or contractors.

3.0 HAZARDS AND RISKS

There are many considerations to be aware of when travelling; hygiene is one of them. Different countries have differing ways of managing hygiene whether it is because of facilities or the lack of them, cultural differences or simply the water that is available. Typical hazards are:

- Food poisoning
- Protozoan diseases
- Fungal infections

4.0 OPERATIONAL CONTROLS

4.1 Risk avoidance

As with health and safety risks the hierarchy of control should be properly applied and risk avoidance is the best and most preferred option. Below are listed few hygiene related tips in risk avoidance during travel:

**Water:** Even if the water in a country is fine for consumption, it can have a different composition that can affect our systems and make us ill. Therefore it is recommended always use bottled water for drinking when abroad, even for making hot drinks just to be extra cautious. Along with this, be careful about using ice in drinks, washed fruit and vegetables and it may be worth using bottled water for cleaning teeth. If you have no other water source, make sure the water is boiled before you drink it by holding it at a rolling boil for one minute. Remember to drink lots of water to keep your urinary tract healthy.

**Bathing:** Pay attention to cleanliness of hotel bathroom. Do not accept poor clean up, since fungal diseases spread especially on wet surfaces and locations. If no other mean, use sandals or thongs when taking a shower. Although the condition typically affects the feet, it can spread to other areas of the body, including the groin. Don't share a towel with anyone.

**Eating:** Avoid shellfish that has been included in a buffet as it may have been left out all day; shellfish can cause food poisoning very easily. Always ask for meats and fish to be cooked ‘well done’ as sometimes storage of meats can differ greatly and our systems may struggle to digest it efficiently. Make sure any dishes, cups or other utensils are totally dry after they are washed

**General hygiene:** Wash your hands: most infections are caught by touching dirty objects. Always wash after using the toilet, after touching an animal. Wash before eating, and where possible after touching anything everyone else touches (public phone, ATM, public computer keyboard, handrail). Clean your nails whenever they're dirty, and keep them short. When you wash your hands, make sure they are totally dry before you touch any food.

5.0 TRAINING & COMPETENCE

All ABB Marine and Cranes employees and contractors travelling and working internationally, shall be briefed on the content of this COP.

6.0 PROTECTIVE EQUIPMENT

Have your personal travel kit (e.g. toothbrush and toothpaste, razor and shaving cream, hair brush or comb, Skin cream, contact lenses and contact lens disinfectant solution) and your travel first aid kit with you while traveling.

7.0 MONITORING & CHECKING

None
1.0 INTRODUCTION
This Code of Practice (CoP) has been developed to provide practical information to Marine and Cranes personnel and contractors on the safety requirements when rigging or slinging loads whilst working on the customers’ site.

2.0 SCOPE
This CoP applies to all ABB Marine and Cranes employees and contractors working on customers’ sites. This CoP is mainly based on European Union machine directive. If the local regulatory or customer requirements impose a higher standard, then the higher standard shall be followed. In such cases this shall be documented.

This COP applies in respect of rigging and slinging equipment.

In this context rigging and slinging equipment includes wire ropes, chains, and synthetic fiber rope belts or slings. It also includes the means of attaching the load to the hook including shackles, hooks, and eyebolts.

3.0 HAZARDS AND RISKS
Any lifting system is only as strong as the weakest link and therefore every part of the lifting system needs to be rated for the loads to be lifted and if any part fails then it is likely to be catastrophic resulting in the load falling. This could result in injury to persons directly involved in the lifting operation but could also result in damage to the load itself. Typical factors that may be involved in a lifting failure include:

   a) Persons have not be trained and are not competent to rig or sling loads;
   b) Lifting equipment is not rated in terms of safe working load for the load being lifted (lifting tools that are used EU to be CE-marked);
   c) Lifting equipment is in a damaged state and as a result has a much reduced safe working load;
   d) General misuse of lifting equipment.

4.0 OPERATIONAL CONTROLS
4.1 General requirements
Identification & marking of working load limit (WLL or SWL)
1. All lifting accessories shall be marked with their working load limit (WLL) or safe working load (SWL). See fig 1(a) and (b).

   Fig 1(a) & (b)

2. In the case of lifting equipment that can be used in different configurations then information in respect of the working load limit shall be kept with the lifting equipment. In the case of lifting slings the identification tag shall indicate the maximum working load limit.

3. Each item of lifting equipment including lifting accessories shall have a certificate issued by the manufacturer specifying the working load limit or safe working load. A register of all the certificates of lifting equipment shall be maintained by the LBU (Also ABB designed tools, e.g. in Europe CE-documented).
Guidance on safe rigging & slinging requirements

4. All items of lifting equipment shall have a unique identification number or plant number. An inspection record, card index or inspection register shall be maintained, containing essential information that shall include the plant ID number, inspection dates, perceived faults and defects and any repairs carried out, or the item has been scrapped.

Inspection & maintenance

5. All lifting accessories shall be inspected once every 12 months and a report of the inspection kept. Where the equipment has been subject to severe conditions e.g. marine, chemical etc then the period of inspection shall be reduced to a frequency that is appropriate for the type of use. All equipments to be checked before each lifting activity.

6. All inspections shall be carried out by a competent person.

7. The lifting equipment shall not be used until any defects that have been identified have been rectified or the item has been removed from use and destroyed.

Storage of lifting accessories

8. All lifting accessories shall be stored correctly to ensure that they are not damaged. Fig 2 below illustrates an example.

4.2 safe rigging & slinging

1. All persons shall be trained and competent in respect of rigging and slinging of the likely loads to be required to be lifted within the work on board ship. If you have not been trained or have doubts on your competence, then do not get involved in the rigging or slinging of loads.

2. Before the lift, always check following issues.

   - Weight
   - Centre of gravity
   - Correct lifting angle
   - Lifting gears

   Each item of lifting equipment shall be marked with its designated working load limit by means of an identification tag. If there is no tag then do not use it.

3. Before lifting the condition of the lifting accessories shall be checked to ensure that they have the correct safe working load and that they are in good condition. It’s also important to verify possible sharp edges that could damage lifting straps. See pictures below.
4. A trial lift shall always be carried out with the load just raised off from ground so that the stability and fixing or attachment points can be checked.

5. The hooks of the cranes or lifting accessories shall be equipped with safety latch or other reliable backup such as a self-locking hook. When using shackles the pin should be positioned across the hook.

6. Hooks shall be loaded from the bottom of the gap as shown in figure above.

7. Master link shall be compatible with the hook of the crane (i.e. big enough).

8. Sling shall be long enough to ensure a safe lifting angle which shall not exceed 60°. Acceptable lifting angle to be confirmed from lifting tool instructions.
### Guidance on safe rigging & slinging requirements

#### Types of Slinging arrangements  Permitted Slings / Good Practice

<table>
<thead>
<tr>
<th>Sling Type</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Reeving Sling</strong></td>
<td>Lifting short lengths of tube (limited lifting capacity).</td>
</tr>
<tr>
<td><strong>Cradle Sling</strong></td>
<td>Lifting coils of steel strip.</td>
</tr>
<tr>
<td><strong>Hals hing Sling</strong></td>
<td>Method of using a single sling in place of an endless sling where a 'bight' is required. A stirrup fitted temporarily in the bight will minimize damage to the sling.</td>
</tr>
<tr>
<td><strong>Double Wrap Slings</strong></td>
<td>The double wrap grips the load and helps to prevent it from slipping sideways out of the slings.</td>
</tr>
<tr>
<td><strong>Combination Slings</strong></td>
<td>Concrete beams, steel joists, etc.</td>
</tr>
<tr>
<td><strong>Sling around shackle</strong></td>
<td>A sling which is 'doubled' around a shackle has a Safe Working Load equivalent ONLY to that of a SINGLE of the rope.</td>
</tr>
</tbody>
</table>

#### Bad Practice

- Do not ‘Hook back’ to the leg of a sling.
- Do not use single slings this way (Slippage risk).
- Do not use tangled or “tuned” chains.
5.0 TRAINING & COMPETENCE

5.1 Site manager and supervisor

The site manager, supervisor and other relevant persons shall be instructed in the requirements of this CoP.

5.2 Slinger/rigger

- All personnel involved in lifting operations shall be provided with adequate training, instruction and guidance in safe lifting practices. Training shall include both theory and practical training using relevant crane. At least the following items shall be included in training.
  1. Influencing factors that affect the safe working load.
  2. Rigging and slinging of typical loads in Marine and Cranes.
  3. Use of lifting accessories.
  4. Inspecting for defects.
  5. Abnormal situations, as swinging of the load, jammed load etc.

- Training shall be rearranged at least every second year.

6.0 COMMUNICATION & CONSULTATION

All persons who are likely to work on customers’ sites shall be briefed on the requirements of this code of practice.

7.0 MONITORING & CHECKING

7.1 Active Monitoring

Active monitoring shall include:
- Persons using lifting equipment must inspect the equipment prior use;
- Inspection of lifting accessories (12 monthly or as prescribed for equipment used in harsh environments) and a record kept;
- Check that training and instruction of persons involved in lifting operations is current i.e. in date.
- Managers and supervisors to undertake safety inspections and SOT’s (Safety Observation Tour).
7.2 Reactive Monitoring – Incident Reporting, and Investigation

All incidents, unsafe conditions, unsafe behaviors and near misses shall be reported to the applicable database. See ABB standard GISA 01.05A22.

8.0 DOCUMENTATION & RECORDS

The following records shall be retained:
1) Register of lifting equipment including accessories
2) Manufacturers’ certificates of proof load for all equipment in use.
3) Reports of thorough inspection in respect of inspections of lifting accessories (12 monthly or as prescribed).
4) Certificates of training and instruction

8.0 SUMMARY OF REQUIREMENTS

- Ensure that the weight and center of gravity is known and that the safe working load of the lifting equipment exceeds the weight of the load by at least 50%.
- Ensure that all the equipment to be used is in good condition and has been inspected within the previous 12 months or sooner in the case of equipment is used in harsh environments;
- If a lifting sling or other accessory has no tag or other ID indicating when it was last inspected – DO NOT USE IT.
- Where lifting equipment is used with 2 or more legs ensure that the proposed configuration will not exceed the safe working load. Angle to be confirmed lifting equipment instructions.
- Multiple leg slings shall be connected by means of a suitable ring.
- Ensure that the lifting hook is vertically above the center of gravity of the load.
- Loads shall either be secured directly to the lifting hook or by using a shackle where the pin of the shackle is across the hook.
- The lifting hoist shall be secured to a suitable beam or other anchor point.
- Where eyebolts are used they shall be connected vertically.
- Avoid dragging lifting equipment on surfaces where they may be damaged.