March 2015

GENERAL DYNAMICS
Bath Iron Works

Environmental, Health and Safety

Handbook

GENERAL DYNAMICS
Bath Iron Works
SAFETY
IS OUR BEST DEFENSE

SAFETY CORE VALUE

Safety takes priority over any competing goal

Guiding Safety Principles:

- The goal for safety incidents is zero
- Employee training and involvement are critical to achieving safe practices and behaviors
- Report all hazards, near misses, unsafe conditions, and incidents
- Take immediate action to "STOP' and eliminate unsafe conditions
- Watch out for your own and each other's safety
- Communicate, assess and learn from our collective safety experiences

This handbook is designed to offer guidance for your safety, the safety of those around you, and protection for the environment we hold dear. It is not a controlled document, in that rules and regulations may and will change before the handbook is updated. For the most up-to-date information on any subject, please refer to controlled documents, such as SPMs, DOIs, WIs, etc. These documents are reviewed periodically and updated as necessary.

We all have a part to play regarding environmental, health and safety. Please take the time to read and understand the rules and regulations that protect you, your fellow employees, and the environment. Never put yourself, others, or the environment at risk. If you are not sure how to proceed, there is always a rule, procedure, or someone who can provide needed guidance—you are never alone.

Environmental, Health & Safety Policy

BIW is committed to protect the environment and provide a safe and healthy workplace.

We are committed to:

- **Recognize and prevent** workplace hazards and pollution
- **Involve our employees** and community to create a safe workplace and protect the environment
- **Comply** with all Environmental, Health & Safety laws, regulations and other commitments;
- Periodically review and set objectives for **continuously improving** our processes to prevent injuries, ill health and pollution

ENVIRONMENTAL, HEALTH & SAFETY HANDBOOK

PREFACE

This handbook is general in nature and is not meant to be all-inclusive. It may not have the most current information available. Employees are responsible to review other relevant documents. These documents take precedence. BIW has many other rules, work practices, and directives such as Environmental, Health and Safety Procedures (EHSPs and SPMs), Work Instructions (WIs) Departmental Operating Instructions (DOIs), and other methods of controlling the hazards inherent in shipbuilding. These procedures are available on the BIW Intranet. If you do not have Intranet access, please contact your supervisor for copies of procedures.

Rules and regulations in this handbook shall apply to all BIW employees, and all subcontractors, visitors, SUPSHIP personnel, military personnel, and others on BIW property.

Supervisors are responsible for safety and environmental compliance in their areas, as well as for the safe work practices and safe behavior of any employee. Each employee is responsible to work in a safe and environmentally compliant manner, by following all environmental, health and safety rules and regulations as a condition of employment. Particular care shall be given to assuring that tools and equipment are in safe condition and that the proper tools for each job are used. The company considers it the employee's responsibility to resolve or report unsafe or noncompliant conditions to supervision.

Nothing in this safety handbook shall violate the Union contract, State, or Federal law. Any questions regarding this handbook or interpretations of rules in this handbook should be addressed to Environmental, Health and Safety, (EHS), x1635.

ENVIRONMENTAL, HEALTH & SAFETY EXPECTATIONS

As BIW employees, we are all expected to work safely at all times and in a manner that is protective of the environment. Our mutual expectations will be met by working together and following established rules. Some of those expectations are as follows:

Management at all levels has responsibility for assuring that every activity is performed under safe and environmentally compliant conditions. Every member of management is required to continually consider the safety of all subordinates and enforce established safety procedures.

Our mutual expectations can be met by working together in following some basic rules.

- If a mechanic or a supervisor is unsure of the safety requirements or guidelines relating to the task being performed, it is their responsibility to research those issues prior to starting the job. Supervision will ensure all safety requirements are in place before continuing.
- Follow approved procedures.
- Stay alert for possible hazards around you and your fellow workers.
- Be responsible for your work area by maintaining good housekeeping practices at all times.

Poor housekeeping, such as lines, leads, and ventilation tubes left on the floor, contributes to slips, trips and falls. Maintaining good housekeeping also prevents material from being washed down storm drains and into the river.

- Only operate equipment that you've been properly trained for and are authorized to use.
- In the event of a serious accident or incident as described in SPM-S-03, the supervisor shall notify the Safety Engineer in his/her area and line management. If it is after working hours, contact the on-call Safety Engineer @ **315-5278**.
- If your work affects others, be sure to inform them of what you are doing and eliminate any possible hazards immediately.
- Always plan your work with safety in mind.
- If ever in doubt as to your or anyone's safety, stop and consult a supervisor or a Safety representative immediately.

1.0 GENERAL SAFETY RULES

1.1 In order to minimize risk of injury when entering or exiting the shipyard during their working hours, employees will use designated walkways to get to and from their assigned workplace. Do not take shortcuts through high-risk areas, such as Manufacturing buildings.

1.2 Running, horseplay, and practical jokes are strictly forbidden.

1.3 No employee shall at any time remove or make inoperative any safety device on tooling, equipment or machinery.

1.4 Leads, lines, hoses and vent tubes are to be hung up off of walking and working surfaces by personnel installing or using them. Ensure at the end of the task or shift that leads are coiled and hung up, so as not to create a hazard, and powered off. Similarly, they are to be removed from the work site when no longer in use.

1.5 When working in or on the overhead, or from upper levels, do not drop or throw anything to lower levels. You may need to tether tooling or material to avoid them from falling to areas below.

1.6 Scaffolding or staging structures, such as ladders, shall not be used as a support to lift or lower material.

1.7 Always use the appropriate device to raise yourself up to conduct work such as a ladder, sawhorse, staging, or aerial lift.

1.8 Handrails are to be used when ascending or descending stairways.

1.9 Jacks, mag-base drills, magnet lights, and other equipment must be secured with cable to eliminate the hazard of the device falling.

1.10 Electrical drop lights are provided with cages to protect personnel and the bulb. If the cage or bulb is damaged or missing, remove the drop light from service immediately.

1.11 Protruding nails or spikes are to be pulled out of or hammered into the material.

1.12 Items such as stuffing tubes, light hangers, studs, pins, etc. must be covered or identified by other means to protect against trips or potential impalements.

1.13 Ensure the ground pins on equipment or power cords, droplights, etc., are present and in good condition.

1.14 Ground Fault Current Interrupter (GFCI) is required to be used with electrical equipment or tools to avoid potential shock injuries. GFCI is sometimes provided from the outlet or from a GFCI extension cord, available at the Tool Crib.

1.15 All appliances must be UL listed and have proper grounded plugs. Appliances include but are not limited to: toaster ovens, refrigerators, microwaves, radios, coffeepots, hot plates, etc.

2.0 PERSONAL PROTECTIVE EQUIPMENT

Proper engineering and administrative controls shall be implemented in order to reduce employee exposure to work-related hazards. Personal Protective Equipment (PPE) is the last step in reducing employee exposure. When used properly, the controls, combined with PPE, will provide a safe and healthy working environment.

In order to ensure the maximum level of protection, personal protective equipment shall be worn in a manner consistent with the manufacturer's design criteria.

Personal Protective Equipment shall be worn in all production areas or when otherwise indicated. All PPE requires EHS evaluation and approval before use at BIW, even when the PPE is provided by the employee. **The only exception to the PPE requirement is:**

- Employees traveling to their manufacturing work site at the start of or leaving at the end of their shift
- Employees reporting to work after the start of the regular shift or leaving early

- Basic Personal Protective Equipment for each area will be defined by posted signage within the area. Basic PPE refers to hard hats, safety glasses, hearing protection, and protective footwear. Protective footwear is required in all production areas and is not listed on the PPE signage. Basic PPE does not refer to trade or job-specific PPE.

For more information, see SPM-S-05.

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PPE Requirements (north end of Main Yard):

- Green - none
- Yellow - footwear, safety glasses
- Red - ALL (hard hats, footwear, safety glasses)

2.1 Head Protection

Employees and contractors shall wear hard hats at all times while in all production areas of BIW property, including:

- High bay storage rack areas – all Warehouses
- All walkways throughout Manufacturing areas (inside or outside buildings)
- All areas where there is overhead work or where cranes pass overhead
- In conjunction with welding hoods in areas where hard hats are required
- While working in the overhead—it is permissible to remove a hard hat when and only when the hat itself does not fit in the area where your head is located
- All rigging operations regardless of work area requirements

Processes/Areas that are excluded from this requirement include:

NOTE: These exclusions only apply when there is no danger from overhead hazards.

Processes

- Working on computer systems in completed ALO spaces where construction work has ceased
- Computer work in shipboard spaces designated for office use where no construction work is occurring

- Spray painting operations
- Events, ceremonies, trials, etc. where construction work has been ceased
- Boiler operation
- Cab-operated burning machines and cranes
- Snow shoveling in outside storage areas at Hardings and EBMF provided there are no overhead hazards, such as the monobox crane
- Employees who are actively engaged in abrasive blasting, blow-down processes, or other operations where the supplied air hood is required

Areas

- Nomex, Pipe, Tin, D/09 Service Shops
- Administrative office spaces
- Carpenter Shop
- EBMF (inside building only)
- Hardings Blast & Paint Building
- Machine Shop
- Maintenance Shops, Pipe Coverers, Maintenance Garage
- Building 18
- Label Plate
- Beyond east-west roadways to the North Dock, formerly known as #15 Craneway

2.2 Eye Protection

During working hours, ANSI-approved safety glasses with side shields or safety goggles shall be worn at all times in all areas of BIW property, excluding administrative office spaces.

ANSI Z87.1 glasses are required in the shipyard. Should you damage or crack your prescription safety glasses while at work, your prescription glasses will be replaced at the BIW Main Store or Hardings Main Office upon presentation of the damaged or cracked glasses.

No dark or shaded lenses with a shade grade greater than 1.7 shall be worn in buildings, units or ships, or after sunset. Shaded safety lenses are permitted outside, but not after sunset.

In addition to the above requirements, the following charts shall be used as a guideline for double eye protection and shaded lens protection while engaged in certain operations.

OPERATIONS REQUIRING DOUBLE EYE AND FACE PROTECTION

OPERATION	PROTECTIVE	COMMENTS
Boring Drilling Filing Punch Press Reaming Sealing Scraping Sawing (wood)	Safety glasses with side shields OR Monogoggles OR Cup goggles	Face shield required for overhead work
Blowing down Chipping Disc Sanding Grinding (Stone&Offset) Needle gunning Wire brushing Sawing (metal)	Safety Glasses with side shields and a face shield OR Monogoggles plus a face shield OR Full face respirator	Monogoggles with face shield or full face respirator recommended for overhead work
Chemical Handling	Safety glasses with side shields and face shield required when handling corrosives	

GUIDE FOR SHADE NUMBERS

Process	Electrode Size (inches)	Arc Current (Amperes)	Minimum Protective Shade	Suggested* Shade No. (Comfort)
SMAW	Less than 3/32	Less than 60	7	--
	3/32-5/32	60-160	8	10
	5/32-1/4	160-250	10	12
	More than 1/4	250-550	11	14
GMAW and FCAW		Less than 60	7	--
		60-160	10	11
		160-250	10	12
		250-550	10	14
GTAW		Less than 50	8	10
		50-150	8	12
		150-500	10	14
CAC-A Gouging	light	Less than 500	10	12
	heavy	500-1000	11	14
PAW		Less than 20	6	6 to 8
		20-100	8	10
		100-400	10	12
		400-800	11	14
PAC		Less than 20	4	4
		20-40	5	5
		40-60	6	6
		60-80	8	8
		80-300	8	9
		300-400	9	12
		400-800	10	14
TB		--	--	3 or 4
TS		--	--	2
CAW		--	--	14

Processes:

SMAW	Shielded Metal Arc Welding
GMAW	Gas Metal Arc Welding
FCAW	Flux Cored Arc Welding
GTAW	Gas Tungsten Arc Welding
CAC-A	Air Carbon Arc Cutting (Gouging)
PAW	Plasma Arc Welding
PAC	Plasma Arc Cutting
TB	Torch Brazing
TS	Torch Soldering
CAW	Carbon Arc Welding
OFW	Oxy-Fuel Gas Welding
OC	Oxygen Cutting

GUIDE FOR SHADE NUMBERS

Process	Plate Thickness (inches)			Suggested* Shade No. (Comfort)
OFW				
light	Under 1/8			4 or 5
medium	1/8 to 1/2			5 or 6
heavy	Over 1/2			6 or 8
OC				
light	Under 1			3 or 4
medium	1 to 6			4 or 5
heavy	Over 6			5 or 6

* As a rule of thumb, start with a shade that is too dark to see the weld zone. Then go to a lighter shade which gives sufficient view of the weld zone without going below the minimum. In oxy fuel gas welding, cutting or brazing where the torch and/or the flux produces a high yellow light, it is desirable to use a filter lens that absorbs the yellow or sodium line of the visible light spectrum.

Corrosive Liquids

Special provisions for eye protection and emergency eyewash and/or shower facilities are required for handling corrosive liquids. Contact Environmental, Health & Safety for a preliminary risk assessment prior to giving any consideration to the use of corrosives.

2.3 Foot Protection

BIW requires ANSI Z41-1991, and ASTM F-2412 and F-2413-approved safety footwear with a protective toe cap in production areas. Footwear may not have a heel higher than 1 3/4", regardless if it is protective footwear or not. Other footwear that is not permitted to be worn in the shipyard at any time are crocs, Tevas, sandals, open back shoes, and shoes that do not cover the top of the foot.

It is recommended that footwear be all leather. Fabric or partial fabric shoes or boots should not be worn while conducting hot work. In this application hot work is defined as tack welding, welding, and burning operations. These operations may potentially cause fabric to melt or burn.

The exceptions to wearing the required protective footwear are as follows:

- Portal and bridge crane operators as long as they remain on designated walkways traveling to and from their crane
- Employees working in non-manufacturing areas or traveling through manufacturing areas on designated exterior walkways to access the MSC or Conley Building times.
- Non-employees on facility tours accompanied by authorized BIW personnel on designated exterior walkways
- During Sea Trials

Required footwear is available for employee purchase at the BIW Employee Store.

2.4 Hand Protection

Protective gloves shall be required for specific job functions to reduce potential for injuries and illness. Gloves shall not be worn when operating rotating or reciprocating machinery.

See SPM-S-05 for more information

Glove Requirements

MANUFACTURING PROCESSES

Required ●	Leather & Pigskin (lined or not) 	Blue Beast Welding 	Pigskin Welding 	Small Welding 	Blaster's Glove 
Issue Location:	Company Store	Company Store	Company Store	Company Store	FLS Issue
Process:					
Oxy/Fuel Burning		●	●	●	
Hand Grinding	●			●	●
Handling Material	●				●
Brazing	●				
Gouging		●	●		
Plasma Cutting		●	●	●	
Sandblasting					●
Shipfitting	●		●	●	●
Cleaning	●				
Tacking	●	●	●	●	
Welding		●	●	●	
Cable Stripping					
Wire Rope pulling or cutting	●				

Gloves are required to avoid burns, cuts, punctures, or splinters
Electrical rated gloves are managed by the cognizant department

Glove Requirements

MANUFACTURING PROCESSES

Required ●	Burning Mitten 	Insul Burning Mitten 	Silver Knight 	Kinco Insul Leather Glove 	Cotton Rubber Coated Glove 	Tuff Flex Kevlar 
Issue Location:	Tool Crib	Company Store	Company Store	Company Store	Tool Crib	FLS Issue
Process:						
Oxy/Fuel Burning	●	●	●			
Hand Grinding			●	●	●	
Handling Material		●	●	●	●	
Brazing	●	●	●	●		
Gouging	●	●	●			
Plasma Cutting	●	●	●			
Sandblasting						
Shipfitting			●	●		
Cleaning				●	●	
Tacking	●	●	●	●		
Welding			●			
Cable Stripping						●
Wire Rope pulling or cutting						

Gloves are required to avoid burns, cuts, punctures, or splinters
Electrical rated gloves are managed by the cognizant department

Glove Requirements

Required ●	Neoprene Thick 	Natural Rubber Thick 	Nitrile Thin 	Vinyl Thin 
Issue Location:	Maint. Stock Room	Paint Issue	Slump Areas	Paint Issue
Process:				
Bondo		●	●	●
Corrosives	●	●		
Chemical Paint Stripper	●	●		
Flame Retarding Dip Tank	●	●		
Fuel (09)	●	●		
Custodial		●	●	●
Solvent Cleaning	●	●		
Spray Paint	●	●		

Gloves are required to avoid chemical burn or toxicity

2.5 Hearing Protection

Hearing protection shall be worn at all times where indicated on posted signs. This requirement applies to all persons working in these areas, as well as those passing through. Earplugs and ear muffs are available at all shipyard tool cribs.

The tasks listed below will require operators to use “single” hearing protection (earplugs or ear muffs) or “double” hearing protection (earplugs AND ear muffs). Other employees working near these tasks must also follow the requirements that apply within the listed line-of-sight unobstructed distances.

Employees passing through are not required to comply with this chart, unless other area-based hearing protection requirements are in effect.

Task	Single	Single within 25 ft	Double	Double within 25 ft	Single within 25 to 50 feet
Abrasive blasting	●	●			
Bobcat	●				
Buffing	●				
Chipping decking	●	●			
Chipping metal			●	●	●
Cut-off wheel	●				
Deck scaling	●	●			
Flame straightening	●				
Forklift gasoline/diesel	●				
Gouging			●	●	●
Grinding/Sanding	●	●			
Hammering steel	●	●			
Needlegunning	●	●			
Plasma cutting	●	●			
Power sawing	●	●			
Routering	●				
Sonar noise	●				
Turbine noise	●				
Wire wheel brush	●				

When there are no area or task-based hearing protection directives, then employees must use the following general guidelines:

1. In any situation, if you must raise your voice to be understood by someone within an arm's length away, then the noise levels are high enough to require hearing protection.
2. Snap your fingers behind your back. If you are unable to hear this, then the noise levels are high enough to require hearing protection.

Personal listening devices such as i-Pods that place earpieces in or over the ear are not permitted to be worn in production areas (inside or outside of buildings). Hearing aids are not considered to be forms of hearing protection.

For more information, see SPM-IH-13.

2.6 Respiratory Protection

The wearing of respiratory protection may be required when performing certain operations or when working in environments which contain airborne concentrations of toxic or hazardous substances. If your job assignment requires a respirator, you will be informed of that requirement by your supervisor.

Prior to being assigned a respirator, you must be fit-tested and trained to use the device; you must also be evaluated to determine if you are physically qualified to wear a respirator.

Upon completion of these prerequisites, you will be issued a respirator certification card. No employee shall be issued a respirator without presenting a valid certification card or badge.

In order to provide maximum protection, the sealing surface of a respirator face piece must be firmly sealed against the wearer's face. Full-face and half -face tight-fitting respirators shall not be worn by any employees having facial hair between the face and the sealing surface of the respirator. Employees who are given a work assignment that requires a respirator are expected to be clean shaven, meaning that facial hair is prohibited where the respirator seals against the face.

- Examples of facial hair include, but are not limited to, beards, goatees, stubble (i.e., defined per OSHA guidelines as facial hair that exceeds one day's growth), long sideburns, and low hairlines.

- A Soul Patch, a small strip of facial hair centrally located between the lower lip and the upper chin, is acceptable except where it comes in contact with any part of the respirator.
- Mustaches which do not extend below the corners of the mouth AND which do not interfere with respirator valve function are acceptable.

When not in active use, filter-type respirators shall be stored in the protective poly bags that are provided with the respirator when issued.

Respirators must be returned to the point of issue at different time frames. Ensure that you are aware of the correct time frame to return your respirator.

Respirator Type:	**Return Policy (Calendar Days)**
Half face, negative pressure	7
Full face, negative or posi-	1 (shift)
Loose fitting powered air purifying respirator	User-maintained with annual return
Any supplied air respirator	1 (shift)
Any supplied air respirator	7

Using your certification card to obtain a respirator for another employee, or using another employee's certification card to obtain a respirator for yourself is strictly prohibited.

Employees must comply with the "Respirator/ Ventilation Requirements" chart in SPM-IH-03 for the various shipyard tasks.

For more information, see SPM-IH-03.

2.7 Protective Clothing

General Requirements:
Shirts shall be worn at all times. Shirts must have at least a 1/4 length sleeve. Full leg and torso covering is required at all times in all industrial and storage areas.

Hot Work Requirements:

- When welding, gouging, burning (oxy/fuel or plasma) or preheating (open flame) elsewhere, you are required to wear FR-rated coveralls.
- When burning or gouging in the overhead, an aerial lift, or a tight space (i.e., working under a foundation, small tank or void, or wedged between two structures), a leather jacket is required in addition to FR-rated coveralls.
- When tacking, shooting studs in the overhead, or brazing, you must wear FR-rated coveralls or leathers. You may substitute either of these for an FR-rated jacket at your own expense.
- If you are required to wear a body harness, regardless of location, and you are gouging or burning, the body harness and lanyard must be FR-rated.
- GTAW (Tig) welding does not require FR-rated coveralls or leathers.

Visitors on tour through any production area shall be required to adhere to the BIW Standards regarding protective clothing. The one exception to this rule will allow female visitors to wear a dress while on tour, with the understanding they proceed through production areas in a timely manner and remain in the walkways at all times. No high heels, open toed shoes, or exposed feet are allowed.

2.8 Personal Care

When the length of hair presents a hazard, it must be restrained in such a way that it does not expose the employee to the hazard.

All items of jewelry are discouraged in production areas. Jewelry has an ability to conduct electricity, become tangled in machinery or equipment, or be caught during movement, all of which can lead to an injury. Remember, the jewelry you wear must not compromise your safety.

Employees are strongly encouraged to wash prior to eating and after bathroom use. Eating or drinking in areas undergoing surface preparation or preservation is prohibited.

2.9 Fall Protection

Fall protection is required on the leading edge in areas that are five feet above another surface or when impalement hazards exist that cannot be protected. No work is to be performed until adequate protection is provided. An employee can be protected by one of the following:

- **Perimeter Fall Protection** – requires cable and stanchions (C&S) or hard railing with no breaks in the protection except for access and egress. C&S shall not be cut, altered, or removed for any reason by employees who have not been trained and qualified.

  Cables and stanchions may be used as fall protection on elevated edges, open holes, and around other hazards. Leads, lines, hoses, and ventilation tubes must not be hung from the cable. This creates deflection in the cable that compromises performance.

- **Fall Restraint** - requires a body harness/lanyard and a tag line or anchor point that prohibits the employee from falling into an open hole or off a deck edge. A restraint situation means the employee cannot fall if something goes wrong because he or she is restricted from the hazard.

- **Fall Arrest** – requires a body harness/lanyard; an engineered tagline, retractable lanyard, or other device; and most importantly, an anchor point capable of withstanding 5,000 pounds per employee (unless designed by a Qualified Person). An arrest situation means a fall will occur if something goes wrong, but the employee will be protected from impact with the surface below.

Each form of protection will be unique for the tasks to be performed and will be designed to protect employees from hazards associated while working at heights. Fall restraint and fall arrest methods call for a full body harness, which require a Fall Protection Plan for the job being worked. Exceptions to this include operating aerial or scissor lifts with restraint lanyards (see SPM-S-46, Personnel Lift, for more information).

When working over land or structure, each employee working from a “picture box”, aerial lift, or suspended platform shall be secured by a body harness and lanyard.

When working over water, from floating equipment, employees must wear body harnesses.

More specific information related to this topic is documented in SPM-S-07, Guidelines for Fall Protection.

3.0 WORK AREAS

3.1 Housekeeping

Good housekeeping is essential to safety and health. All employees are responsible for the housekeeping and orderliness of their industrial debris. Work in progress or material in storage must be kept out of walkways. Scrap material is to be placed in proper disposal containers by the employees creating the scrap, prior to leaving the job or prior to completing the shift.

As part of each employee's responsibilities, it is expected that each employee clean up their own industrial debris while performing their job functions. Additionally, as a precaution to protect yourself as well as others in the area against airborne particles, it is expected that each employee look over the work site prior to starting a job before activating an air tool.

Temporary or permanent electrical cords, welding leads, and/or air hoses shall not be extended across roadways, aisles and walkways, or arranged in any manner so as to create a tripping hazard, or where there is a risk that the insulation could be worn away or damaged. Hoses and electrical conductors shall be elevated over or placed under the walkway or working surface or covered by adequate crossover planking.

3.2 Ventilation

The proper use of exhaust ventilation is extremely important during any operation which produces air contaminants (e.g., welding, oxy-fuel and plasma burning, brazing, carbon-arc gouging, grinding, and painting). Temporary exhaust ventilation must be positioned as close to the source of emissions as possible, in order to capture and remove contaminants from the work area. This practice accomplishes two objectives: first, the air contaminants are carried away before you have a chance to inhale them; and second, the air quality in the work area stays cleaner and healthier. Refer to SPM-IH-03, “BIW Respirator and Ventilation Selection Policy”.

Certain ventilation tubes are color-coded to identify unique hazards:

Yellow or yellow/black	Confined Spaces (not to be removed except by authorized personnel)
Orange	Refrigerants

The Ultra Hall has two segregated ventilation systems; one for spray painting and the other for all other work processes. At Hardings and EBMF, there are segregated systems for exotic metals, i.e., titanium, aluminum. Employees must ensure they are using the proper ventilation system for the work they are performing.

3.3 Temporary Scaffolding, Ladders and Ramps

Access and egress to and from ships, barges, and units or between any two vessels shall be provided by trained and qualified personnel. Ladders or ramps shall be of adequate strength, well maintained and properly secured. Ensure three points of contact when ascending or descending ladders. Step ladders must be fully extended when in use. They can only be used on a level surface. When working from a step ladder, keep your center of gravity between the rails. Always inspect the ladder prior to use.

Jumping on or off ships, barges or units is prohibited.

When it is impracticable to install a ramp or walkway, a substantial straight ladder, extending at least 36 inches above the upper landing surface shall be used. In all cases it must be adequately “footed” or secured with non-combustible material against shifting or slippage. Ladders with bent or splintered side rails, or broken or missing treads, rungs, or cleats shall be removed from service immediately unless rungs are removed to provide access.

Electric arc welding operations shall not be performed from metal ladders or metal stools to prevent the potential fall hazard from an electric shock.

Scaffolding is also installed and maintained by trained and qualified employees and must be kept in a safe and secure condition. Any defective components shall be replaced immediately by the appropriate employee. Back rails and toeboards shall meet or exceed the minimum requirements. Toeboards no less than 1” by 4” are required on working surfaces to prevent tools and material from falling on people below. ¾” x 6” (or greater) plywood is acceptable to use as a substitute. If in the performance of your tasks, you must remove a toeboard, you must first secure the area below with Do not Enter tape and signs. Upon completion of your

task, you must replace the toeboard and remove the tape and signs. Backrails shall be positioned with a top rail with an upper surface between 42” to 45” above the upper surface of the staging platform or runway and a midrail located halfway between the upper rail and the staging platform or runway.

It is the responsibility of all employees to keep scaffolding clear of industrial debris or equipment. Do not store material, debris, equipment, or tooling on the edges of scaffolding. Do not work off scaffolding that is ice or snow covered.

3.4 Heaters/Fans

Only Company-provided heaters or fans will be permitted on BIW property. Only trained and qualified employees are responsible for the proper installation of these items. Fans and heaters shall be located in such a way that clothing or hair cannot be drawn into them. Guarding must be in place to protect against accidental contact with rotating parts. Missing guards or guard openings in excess of 1/2 inch must be removed from service until repaired.

4.0 POWERED VEHICLES

4.1 Drive Times

Employees are to remain alert to various warning horns, whistles, and bells throughout the yard produced by vehicles such as forklifts and cranes. These warning sounds must be heeded and appropriately acted upon, such as moving away from overhead loads, keeping clear of tracks during crane movement, or staying clear of emergency vehicles. Lighting is provided on many different vehicles and types of equipment to aid hearing-impaired employees. Motor vehicle traffic and crane movement are restricted during the following time periods (exceptions require approval from Safety Operations):

NO Driving Times

MAIN YARD	HARDINGS
6:45 am - 6:55 am	6:15 am - 6:25 am
11:30 am - 11:40 am	11:30 am - 11:40 am
3:25 pm - 3:35 pm	2:55 pm - 3:00 pm
3:45 pm - 3:55 pm	
11:35 pm - 11:45 pm	

NORTH GATE	EBMF
12:00 pm - 12:10 pm	6:13 am - 6:23 am
	11:30 am - 11:40 am
	2:43 pm - 2:53 pm
	3:20 pm - 3:30 pm

4.2 General

All vehicles are limited to 10 mph or less inside yards.

Seat belts shall be worn by all occupants in all company vehicles at all times while in operation outside the yard and in private vehicles by employees while traveling on company business.

Vehicles that have restricted visibility are required to have an audible back-up alarm. They shall not be operated if the alarm is not functioning unless a dedicated spotter is utilized to facilitate movement. If the described methods are inadequate to allow a vehicle to move safely, then Safety and Health Operations must be contacted to assist in the development of a safe move plan.

The driver of the vehicle is responsible for the safe loading and operation of the vehicle. The driver shall ensure that visible warning devices (e.g. flags) are attached to material which extends beyond the borders of the vehicle at the time the vehicle is loaded to alert pedestrians moving around the vehicle and other vehicle operators to the hazard.

All mechanical maintenance shall be performed by a qualified mechanic. When required, the vehicle's checklist is to be completed by the driver on each shift.

The driver shall ensure that oversized loads have been properly permitted before hauling over the road, and that any required escorts accompany the vehicle.

Only trained and authorized operators shall operate aerial lifts or personnel-lifts. Safety harnesses and lanyards shall be worn and secured at all times, including working over water in an aerial lift.

Operators shall not park vehicles in walkways or leave an unattended vehicle obstructing any roadway. Do not block roadways that may restrict emergency vehicle passage.

Stationary operation of diesel, gasoline, or propane motorized rolling stock in buildings will require the attachment of a ventilation tube on the exhaust pipe to control toxic exhaust gases. See SPM-EL-28 for specific details.

4.3 Overhead Cranes, Gantry Cranes, and Mechanical Lifting Devices:

Only designated personnel who are trained and qualified shall operate a crane or mechanical lifting device. Operators shall not pass loads over the heads of other employees. Employees are required to move away from overhead loads.

The operator of cranes and mechanical lifting devices must give audible warning when a load is to pass over an area where any people are located. The operator must not knowingly move loads over personnel.

The rated lifting capacity of any lifting device shall be posted on the equipment and not be exceeded unless an approved engineered lift is planned with Engineering, Facilities Crane Engineers and Safety Engineering.

Where mechanical lifting devices are used, sufficient safe clearances shall be allowed for aisles, at loading docks, through doorways and wherever turns or passing through is required

4.4 Aerial Lifts

Only personnel trained and licensed in accordance with SPM-T-01, Certification Procedure – Mobile Equipment, will be permitted to operate an aerial lift. Aerial lifts include: cherry pickers, knuckle booms, scissor and motorized man-lift platforms.

All operators must be certified on the type and model of equipment they will be operating.

Training will include classroom instruction and/or on-the-job training as set forth in the specific equipment training program.

Prior to use, the operator shall inspect the Aerial Lift to ensure the equipment is in safe operating condition and is free of damage or defects. If a discrepancy is discovered, the operator shall report the defect to Area Management immediately for corrective action. The equipment must not be operated until the discrepancy has been resolved. The ground and basket controls shall be tagged to restrict the use of the equipment.

A warning barrier must be established and signs posted to surround the equipment and/or work zone to protect pedestrians from accidental contact with the boom or the potential to be caught between the lift and a pinch point. Depending on the potential risk of an incident, the use of yellow “caution” or orange “do not enter tape” tape with attached signs can be used to control personnel access.

The use and placement of Aerial Lifts on board a ship must be evaluated by a Safety Engineer and approved by the Area/Hull Manager prior to the task being performed. When approved, the operator shall comply with the appropriate “Operating Controls” to ensure the task can be performed safely. Fall protection shall be worn at all times. Operators of Aerial Lifts shall be restrained within the basket. An adjustable tie-back lanyard has been approved for use. The use of a standard 6-foot shock-absorbing lanyard is not permitted, unless assessed and approved by Safety Engineering or the Area Competent Fall Protection person prior to the task being performed.

Aerial Lifts used for fall protection rescue personnel shall be placarded at the ground and basket control station to ensure the lift is dedicated for rescue use

For more information, see SPM-S-46.

4.5 Forklift Operations:

Only trained and certified operators shall operate a forklift.

Seat belts are required to be worn when operating a forklift.

No person shall be allowed to stand or pass under the elevated portion of any truck whether loaded or empty. When a forklift is left unattended and out of sight, or 25 feet from the operator, the following precautions shall be implemented:

a) Load engaging means shall be fully lowered.
b) Controls shall be neutralized.
c) Power shall be shut off.
d) Brakes set.
e) Wheels shall be blocked if the truck is parked on an incline.

Only approved forklifts shall be used in hazardous locations (i.e., blast/paint buildings).

If at any time a forklift develops a mechanical or electrical problem which would impair the safe operation of the forklift, it shall be taken out of service until such time as it is restored to a safe operating condition.

All forklifts shall be inspected by the operator on each shift prior to being placed into service. Any defects found shall be immediately reported to the operator's supervisor.

To avoid shifting loads, operators shall:

- Ascend and descend grades slowly;
- Drive with the load on the uphill side of the grade;
- Ensure loads are well secured.

4.6 Traveling:

All traffic regulations shall be observed, including authorized plant speed limits of 10 mph, unless otherwise posted.

The right of way shall be yielded to pedestrians, ambulances, fire trucks, cranes, and other vehicles in emergency situations.

Cell phone use and other distracting activities, such as eating, drinking, etc., are strictly prohibited— this policy applies to:

- All employees who operate a motor vehicle during work hours, including both company-supplied and personally owned vehicles.

- All BIW and non-BIW personnel operating a motor vehicle on Bath Iron Works owned or controlled property, including, but not limited to the shipyard, off-sites and affiliated parking lots, regardless of work hours.
- All employees operating a rental vehicle where Bath Iron Works is the renting party and/or holds liability for the operation of the vehicle, regardless of work hours.

The driver shall slow down and sound the horn at cross aisles and other locations where vision is obstructed. If the load being carried obstructs forward view, the driver shall be required to travel with the load trailing.

The driver shall slow down for wet and slippery surfaces.

5.0 HAZARDOUS MATERIALS / SUBSTANCES

5.1 Hazardous Materials

Many hazardous materials can be used safely provided that the appropriate precautions are taken. Information is available to employees in the form of **Safety Data Sheets** (SDSs), container labels, and training.

All hazardous materials used by BIW have SDSs available for employee review. The SDSs offer employees the means of becoming familiar with hazardous substances before working with them. SDSs provide recommended practices and information in the areas of personal protective equipment, health hazards, hazardous chemical contents, proper work practices, emergency procedures, and other precautions. SDSs are kept on file with Environmental Operations, and many are available on the Intranet. Paper copies can be obtained by calling x5555.

Basic **Hazard Communication** (HazCom) training at new employee orientation includes “Right to Know” information and lessons on categories of

hazardous materials. Supervisors are responsible for providing HazCom training in the form of an annual safety talk. No hazardous material shall be used by anyone who has not received HazCom training. Employees must store material in accordance with SDS guidelines.

Proper labeling of hazardous materials is a key part of a hazard communication program and certain information must be present on hazardous material containers. Secondary containers shall be labeled with the product identity and hazard warnings. See SPM-IH-05 for more information.

5.2 Compressed Air

Direct yard air pressure is maintained between 90 and 100 psi, and is to be used at that pressure for pneumatic tools only, or for an authorized process such as gouging or air pressure testing. Yard air, when used to blow down equipment, clean floors, or dry off wet or painted surfaces, shall require a special nozzle which will reduce air pressure to 30 psi when the nozzle comes in contact with any surface. Eye and face protection is required when blowing down. See Section 2.2 of this handbook.

Some dusts pose an explosion potential and should not be dispersed (made airborne) by compressed air blow downs. Prior to blowing down dusts, refer to SPM-EL-29 to ensure that the operation has been approved.
Never point a jet of compressed air at another person or use it to clean clothing, as it can penetrate the skin and cause a severe injury.

5.3 Compressed Gases

Compressed gases are widely used throughout the shipyard for welding, cutting and brazing, as well as heating spaces, testing tanks, powering vehicles, and as fire-extinguishing agents.

Compressed gases, by their nature, present various potential hazards, including fire, explosion, and asphyxiation when working in confined and enclosed spaces. Precautions shall be taken to avoid the formation of a flammable

atmosphere or an atmosphere deficient of oxygen through following the established guidelines. See SPM-S-39 for further guidance.

Compressed gases commonly used in the shipyard include, but are not limited to:

FLAMMABLE	NON-COMBUSTIBLE
• Burning/brazing gases (Mapp, Propylene, Acetylene) • LNG (Liquefied Natural Gas) • Propane (LPG)	• Carbon Dioxide (CO2) • Nitrogen (N2) • Argon (Ar) • Carbon Dioxide / Nitrogen mixtures • Argon / Carbon Dioxide mixtures • Helium • Helium/Argon mixtures

*Note: Special precautions must be taken when handling oxygen. Elevated concentrations of oxygen accelerate combustion to a point where ordinary combustibles will burn violently. The presence of oxygen at elevated concentrations decreases ignition temperature and increases the flammability range, increasing combustion hazards.

- Hands and gloves shall be free of grease and oil when handling oxygen regulators.
- Use only regulators indicated for use with oxygen.

- Never use oil, grease, or other organic petroleum lubricant to lubricate oxygen regulators, valves, or fittings.

Compressed gases are distributed in two ways in the yard:

1. Portable cylinders
2. Pipe-fed to various work stations from bulk storage sites

Cylinders:
All cylinders shall be legibly marked as to their contents and the flammable, combustible, or oxidizing characteristics.

All compressed gas cylinders shall be chained or wired upright to prevent them from falling and rupturing the cylinder or valve stem.

Acetylene cylinders shall not be stored or moved in a horizontal position, nor be opened more than half turn.

Cylinders must have their safety caps secured in place, with valves shut off, when not in use or while being moved or handled.
When transporting cylinders, ensure that they are secured and that tailgates are in the upright position.

- All cylinders shall be stored:
  - upright on flat surfaces
  - in a well-ventilated area away from heat sources.
- In addition, oxygen and fuel gas cylinders shall not be stored within 20 feet of combustible materials, and never in a confined space.
- A 5-foot non-combustible, vertical barrier with a minimum ½ hour fire rating separating them may be utilized in lieu of the 20 foot rule.
- Cylinders shall be lifted only in cradles or in approved slings, never by the cap or cover.

Piped (Manifold) Gases

Manifolds shall be placed in well-ventilated areas and never in confined spaces. All gas manifolds shall be stenciled and color-coded as follows to identify each gas used:

Green	**Oxygen**
Red	**MAPP Gas (Propylene)**
Blue	**Argon**

Nothing that could damage the manifold or valves or interfere with the quick closing of valves shall be placed on or in the immediate vicinity of the manifold. Provide 36” clearance to facilitate normal and

emergent operations.

No oxy/fuel line shall be left unattended in a confined space – EVER. No oxy/fuel line shall be left unattended in an enclosed space for more than ten (10) minutes. If this time limit is to be exceeded, the line is to be bled and coiled back to the manifold or cylinder valve.

All valves shall be shut off, regulators bled off, lines disconnected and coiled, and all safety caps threaded on when the authorized user will be absent for more than 10 minutes, at the completion of the job, and at the close of his/her shift.

No inert gas line shall be left unattended for more than one hour. Employees using inert gas shall be trained on the applicable requirements of SPM-S-39. All inert gas lines shall be disconnected at the completion of the job and the end of the shift.

Damaged or leaking tools and lines shall be turned in to the nearest tool crib. Oxy/fuel hoses are tagged with a due date code. Check the due date prior to hooking up the hose. Return the hose to the tool crib if it is outdated. Oxy fuel lines are checked on an annual basis; they can be repaired only by authorized personnel.

Do not paint fittings, regulators, hoses, leaders, or torches. This contributes to deterioration of hoses and inhibits the inspection process.
In the event of a need to evacuate a building or ship area, all line valves and the main valves to the manifold shall be shut off in accordance with the evacuation plan for that area.

Only employees trained, authorized, and issued a BIW license for oxygen, acetylene, propane, and MAPP/Propylene gases shall be permitted to use oxy-fuel equipment. See SPM-S-39.

When an employee recognizes a flammable gas leak, the valve will be secured (if the source of gas is known). He/she will notify those in the immediate area who are performing hot work to cease the operation and to evacuate the space. The employee will then notify supervision and/or the fireguard so announcements can be made over the intercom system. No one will re-enter the space. Supervision or the fireguard will call the facility's emergency number so an assessment of the area can be made. The Laboratory will determine if entry and/or hot work may proceed.

5.4 Paints and Solvents

Paints and solvents shall be transported and stored only in approved containers. Secondary containers shall be labeled with the product name and health hazard warnings. Secondary containers for paints (i.e., lily tubs) shall be labeled with “No Thinning Allowed”. See SPM-EL-16.

All solvent/storage cabinets/flammable liquid lockers shall be bonded or grounded. There shall be no hot work within 10 feet of a solvent storage cabinet/ flammable liquid locker.

Special care will be taken to ensure that no incompatible materials are stored in solvent storage cabinets/flammable liquid lockers. Incompatible materials include acids, oxidizers, and corrosives. Combustible materials such as cardboard, papers, and rags may not be stored in flammable liquid lockers.

Most paints and solvents are flammable. Care must be taken to avoid igniting the vapors created from paints and solvents.

Paints and solvents must be disposed of properly; see Section 11.0.

Depending on how paints and solvents are used, special PPE and ventilation requirements may be necessary. See SPM-IH-03, SPM-EL-04, and SPM-S-05.

5.5 Radiation

Ionizing Radiation

Ionizing radiation results from the decay of unstable radioactive materials known as radioisotopes. Radioisotopes are used in Non-Destructive Testing (NDT) by licensed BIW personnel. The procedures used by the NDT personnel are strictly regulated by the Nuclear Regulatory Commission.

The following work practices shall be followed when using radioisotopes:

a. While radioisotopes are in use, the affected areas shall be taped off and warning signs prominently displayed. Yellow/magenta radiation hazard tape and signs will be used to designate affected areas.
b. All workers not directly involved in the testing operations involving radioisotopes are prohibited from entering the area.
c. Workers engaged in the use of radioactive materials shall wear dosimeter badges.
d. NDT work shall be done on off shifts whenever practical.

Non-Ionizing Radiation

Non-ionizing radiation includes electromagnetic radiation in the form of visible, infrared, ultraviolet light, and radiofrequency waves generated by various sources.

It is the non-ionizing radiation from radar antennas that is of concern in this section.

a. The safety precautions outlined in SPM-IH-09, "Safe Operation Transmitting and/or Rotating Shipboard Antenna" shall be observed when antenna rotation and/or radiation are planned.

b. Temporary warning signs will be posted at all access routes to potentially hazardous areas prior to transmitting and/or rotating antennas. The signs are black and red and read " Danger Radio Frequency Radiation Hazard" "Do not proceed beyond this point- contact D/10 Combat Systems".

c. Refer to SPM-S-46 for requirements when operating aerial lifts adjacent to radar-active ships.

d. Employees wearing Pacemakers must remain in areas away from radiating antennas to ensure personal safety.

Electromagnetic radiation interferes with pacemaker function, in particular, welding equipment and welding leads. If you are wearing a pacemaker, please consult with the BIW Medical professionals.

6.0 ERGONOMICS AND MANUAL HANDLING

Ergonomics is the science of optimizing human performance at work by designing tools, equipment, tasks and jobs to fit the capabilities and limitations of people. The goal of ergonomics is to maximize human productivity and efficiency while minimizing and reducing the risk of injury.

The five major risk factors in shipbuilding are:

1. Awkward and static postures
2. Forceful exertions and manual handling
3. Repetitive motions and task duration
4. Contact stresses
5. Hand-arm vibration

These risk factors are affected by duration, frequency, magnitude, and combination of risk factor exposure.

6.1 Ergonomic Controls

Solutions that minimize and/or eliminate risk factors improve performance and reduce the risk of injury. Four general categories of solutions are:

Engineering
The preferred solution, as it eliminates risk factors through design and/or modification of the work processes and methods, tools, equipment and work stations. BIW examples include overhead cranes and lifts, lift tables, pallet jacks, low vibration tools, and powered tools.

Work Practices
Procedures, practices or run rules for safe and proper work that are understood and followed by managers, supervisors and employees. Examples include proper work techniques (lifting techniques, welding/grinding techniques), correct use of equipment, preventative maintenance of tools, no paint mark-up, and daily oiling of tools.

Administrative
Reduce the duration, frequency and severity of exposure to ergonomic risk factors over time. BIW examples include task/job rotation, micro-pauses, and job enlargement.

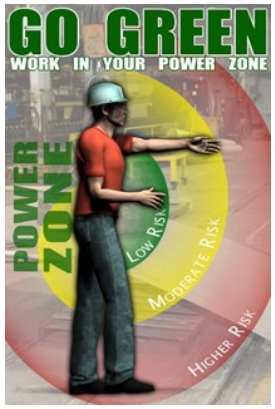
Personal Protective Equipment (PPE)
PPE is used as a way to protect the body until other controls can be developed. BIW examples include: knee pads, gloves, elbow pads, and arm and shoulder guards.

6.2 Ergonomic Risk Factors and Common Solutions

6.2.1 Awkward & Static Postures

Awkward and prolonged static positions may rob muscles and tendons of needed oxygen and place stress on the body. Examples of awkward positions include bending and twisting the wrist, neck or back; reaching above shoulder height; and crawling and kneeling. Static postures occur when a body position is maintained for long periods of time with no variation.

The Go Green Work in your Power Zone concept helps to identify awkward positions. Green zone positions are low risk, yellow are moderate risk, and red zone positions are the highest risk. Ideally, avoid red positions when feasible and try to work in the green and yellow zones.



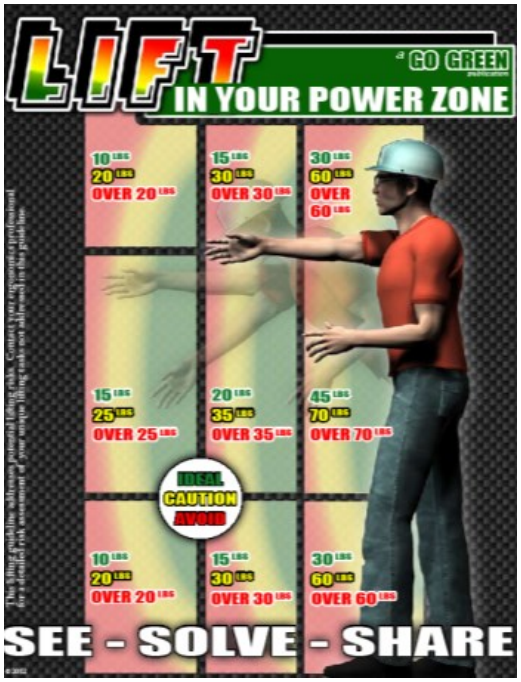
Solutions to reduce awkward and static postures include:

- Sawhorses, carts, stands, and tables raise material off the floor
- Long reach needle guns and walk-behind grinders allow for grinding in standing positions
- Step ladders, platforms, staging and saw horses raise you up to get closer to the work
- Box tilters and rotating table tops keep work within an easy reach
- Rotating between various positons when working reduces fatigue and stress to one body part
- Taking a micro-pause (5-10 seconds) to relax and rest your hands, arms, legs, and muscles helps to minimize the effects of static postures and fatigue

6.2.2 Forceful Exertions and Manual Handling

Shipbuilding tasks involve forceful exertions of the hands, elbows, shoulders, back and legs. Examples include gripping and squeezing hand and pneumatic tools, handling materials, lifting and carrying equipment or material, and pushing and pulling cables.

The Power Zone guidelines can be used to identify risky lifting situations based on the object weight and location of the hands. Green lift are low risk for the majority of employees. Yellow lifts represent a moderate risk for 50%, and red lifts are high risk for 75% of employees. Avoid red lifts.



Solutions to reduce forceful motions include:

- Team Lifting—Do not handle loads beyond your physical capacity. Lifting capacity varies among individuals. Ask for help when lifting heavy or awkward objects.
- Keep objects to be manually handled in the Power Zone, between knee and shoulder height and less than a forearm's reach away.
- Do not pull or tug on material that is "caught" or "hung-up"
- Use your hand or forearm to build a bridge to support your upper body when learning or bending over to perform a task.
- Use power tools in place of manual tools that require high hand forces.
- Use ergonomically designed hand tools where feasible. The tool weight, handle size and length, trigger design, tool activation/reaction, and vibration can influence the amount of hand force required to use the tool.
- Wear properly fitting gloves and appropriate gloves for the task. Gloves can reduce grip strength by as much as 20%.

- Use mechanical assistance such as chain falls, cranes, overhead lifts, lift tables, dollies, carts, carrying handles, vent lifters, grasshoppers and powered tools when feasible.

NOTE: Some equipment may require special training before using

Tips for manually lifting material:

1. Face the load
2. Keep your chest high and head up
3. Bend your knees
4. Keep your back straight (maintain natural curves of spine) and avoid twisting or rounding your back
5. Keep the load close to you, ideally within a forearm's distance
6. Establish firm footing and solid grasp; don't lift from a twisted or awkward position or move to a twisted or awkward position with the material in hand
7. Point your feet in the direction of the load

6.2.3 Repetitive Motions and Task Duration

Repetitive motions involve repeating the same motions over and over again at a fast pace with little variation in the task. When motions are repeated frequently (e.g., several times in a minute) for prolonged periods, such as several hours without any breaks, there may be inadequate time for muscles and tendons to recover. If the repetitive tasks also involve other ergonomic risk factors, muscles and tendons become strained or fatigued more quickly.

Examples to reduce the risk from repetitive motions include:

- Alternate hands to reduce fatigue.
- Job /Task Rotation — Rotating employees into several different jobs during the course of a work day is a way to distribute work so that each employee spends less time performing the same repetitive tasks. To achieve the benefits of job rotation, the different jobs need to involve the use of different muscles or body parts.
- Team blitzes – Using several employees to complete a job in a timely fashion (e.g., masking parties).

- Micro breaks or rest pauses — Building short micro pauses (5-10 seconds) between motions or tasks is another way to give muscles and tendons recovery time.

6.2.4 Hand-Arm Vibration

Hand-Arm Vibration (HAV) is present when operating power tools. Examples include: grinders, sanders, needle guns, chipping hammers, and chain saws. Ways to reduce the effects of HAV include:

- Perform daily inspection and maintenance on your tools. Daily oiling of your tools can reduce HAV by 10-15%. See posters outside the Tool Cribs for details.
- Regular preventative maintenance by Tool Repair improves the performance and reduces HAV of your tools. Return your tools to the Tool Crib for regular maintenance. Well maintained tools vibrate 2-3 times less than poorly maintained ones.
- Use low vibration grinders and sanders when feasible.
- Match the tool horsepower, rpm and abrasive to the task. This ensures maximum performance and minimizes the effects of HAV.
- Use alternative tools and equipment in place of handheld vibrating tools when feasible (e.g.,

weld seam facer, mechanized grinding, Fisette jigs, Danimal, walk-behind grinders/sanders, blast equipment, Silverado, plate edge prep tool, surface prep tool).

6.2.5 Contact Stresses

Contact stress results from continuous contact or rubbing between hard or sharp objects and surfaces and sensitive body tissues, such as the fingers, palms, elbows, thighs, knees, and feet. This contact creates localized pressure for a small area of the body, which can inhibit blood flow, nerve function, or movement of tendons and muscles. Some contact stresses present in shipbuilding include:

- Working on your knees on bare steel or concrete
- Leaning on your elbows when working in tight spaces
- Resting your wrist against hard or sharp edges
- Using your hand or knee as a hammer
- Using hand tools with short handles that cut into your palm
- Chair seats that are too long or short for your legs; placing stress on the back of the legs.

- Ways to reduce mechanical stress include knee and elbow pads or padded surfaces/mats, adjusting your work position to minimize contact stresses on the body; longer handled tools; and adjusting the seat pan on your chair to allow 2-3 inches distance from the back of your knees to the front edge of the seat.

6.3 Computer Workstation Set-Up

The following tips are recommended to minimize fatigue and discomfort when working at a computer.

- Adjust your chair to fit your body. Most chairs at BIW have several adjustments including: height, backrest, seat pan depth and tilt, and arm rests.

Recommended sitting position is:

- Feet resting firmly on the floor or a footrest
- Knees no less than a 90 degree – 90-120 preferred
- Back supported by the chair lumbar support
- Back rest at a 90–120 degree reclined angle, depending on the task
- The chair seat pan depth should allow 2-3 fingers distance between the back of your knees and the front edge of the seat
- Armrests at or 1” below elbow height

- Keep your keyboard and mouse next to each other and within a forearm's distance away
- The keyboard and mouse should be no higher than your elbow height
- Your arms and elbows should be relaxed and close to your body
- Position your monitor 2" below eye level, directly in front of you, and at a comfortable viewing distance
- Use a document holder if you transcribe from paperwork.

The Go Green Work in your Ergo Power Zone concept can be applied to office workstations to minimize injury risk. Frequently used objects should be in the green zone or a forearm distance from the body (i.e., keyboard and mouse); occasionally used items can be in the yellow zone or an arm's distance away, and infrequently used objects can be in the red zone.

6.4 Work Techniques and Tips

Below is a list of work practice techniques and tips that you can use to minimize your risk of an injury to your back, shoulders, elbows and knees.

Back Injury Prevention Tips—Four tips to minimize your risk of a back injury:

1. Keep It Close and Off the Ground
   - Lift objects in green and yellow zones
   - Raise objects off the ground
   - Slide objects toward you before lifting
2. Use Mechanical Assistance
   - Use equipment to lift, move, carry or position heavy or awkward objects
   - Get help when lifting heavy or awkward objects

3. Maintain the Curves
   - Always maintain the natural curves of the spine when lifting, pushing, pulling and sitting
   - Avoid excessive bending and rounding of your back – Keep Your Back Straight
   - Lock your spine in its natural position by tightening your abdominal muscles prior to lifting or bending and use your legs and hips to lift
   - Adjust lumbar support in your chair or car/ truck seat to match the curve of your back
4. Build a Bridge
   - Use your hand, forearm, elbow or even your head to “build-a-bridge” that supports the weight of your upper body when lifting, bending or reaching.

Shoulder Injury Prevention Tips—Three tips to minimize your risk of a shoulder injury:

1. Plan Your Work To Minimize Time in the Red Zone
   - Review jobs before starting to find ways to get in better and safer positions.
   - Use staging or taller step ladders to minimize extended reaches and get higher up to the yellow zone.

- Keep red zone positions to less than 50% of your day.

2. Minimize Forceful Motions and Impacts
   - Use mechanical assistance when lifting, pushing or pulling heavy objects.
   - Pad or flag hard or sharp objects
   - Use good body mechanics when lifting, pushing, pulling or reaching.

3. Tips for Red Zone Positions
   - Rotate between red, yellow and green positions – avoid working in red positions for more than four hours
   - Take micro-pauses of three to ten seconds to drop your arms and get blood flowing from overhead work
   - Pack your shoulders (down and back) and avoid forward head poking motions
   - Stay tight and brace your body by tightening your stomach and other muscles.

Good Body Mechanics

- Lift, push, pull or reach in green and yellow zones
- Push and pull using forward and backward motions
- Use whole body stepping motions when pushing, pulling and moving objects
- Use large muscles of the chest, back, and legs when pushing, pulling and moving objects
- Keep your ears over your shoulders and your shoulders over your hips
- Keep your back straight use your legs

Poor Body Mechanics

- Lifting, pushing or pulling in the Red Zone - Red Zone positions reduce your strength by 60-80%
- Sideways pushing and pulling motions use smaller and weaker muscles
- Back twisting and leaning to the side
- Unstable stance, standing on one leg

Knee Injury Prevention Tips

Seven tips to minimize your risk of a knee injury:

1. Raise the Work, Avoid Kneeling - When feasible raise the work to the green and yellow zone to get off your knees. Stand, sit or lie down when you can as an alternative, and kneel as the last option.
2. Avoid Extreme Knee Bending - Avoid stepping higher than 12", minimize squatting and kneeling on one knee, alternate between various kneeling positions.
3. Keep Kneecap Behind Toes -
   Tip: descend stairs backwards to reduce stress on your knees.
4. Keep Feet In-Line with Knee - Sit on your heels; never sit on your ankles, it twists your meniscus.
5. Minimize Lifting Stress - Get assistance when lifting and carrying heavy or awkward objects, store objects off the ground to minimize squat lifting, and use a backpack instead of a tool bag.
6. Use PPE - Proper footwear, knee pads, kneeling pads, mats, and knee savers.
7. Stay Healthy - Keep Body Mass Index less than 35, ideally less than 30; maintain strong balanced muscles, take micro-breaks of 5-10 seconds every hour to get up, and flex and extend the knee to get the blood flowing.

6.5 Lighting

- All means of access and walkways leading to work areas, as well as the work areas themselves shall be adequately illuminated based on the following table:

Light Level (foot-can-dles)	**Area or Operation**
3	General areas on vessels and vessel sections such as access-ways, exits, gangways, stairs and walkways
5	General landside areas such as corridors, exits, stairs, and walkways
5	All assigned work areas on any unit or unit section
10	Landside work areas such as machine shops, assembly buildings, equipment rooms, tool rooms, carpenter shops, lofts, warehouses and outdoor work areas
30	First aid stations and offices

- Facilities will maintain all building lights in accordance with the table above.
- Responsible management needs to ensure units and unit sections have enough lights to meet the lighting requirements in the table prior to assigning employees to work in the units.
- Contact Facilities if you need additional lighting support.

7.0 TOOLS AND MACHINERY

7.1 General

- Never use tools/machinery that are not designed for the job.
- Never use tools/machinery that are not in good repair. Examine each tool before use. Return tool to crib if it is damaged or not in good working order. This includes personal tools.
- Remember the tool you are using may be subject to a return policy; if so, return as required.
- Never use tools/ machinery unless you have been trained on and have demonstrated knowledge of their proper use and know their safety requirements, as well as their mechanical limitations. Training can be as elaborate as classroom-based, or as simple as receiving an instruction.
- Where guards provided on tools prevent specific operations from being performed, alternate methods of guarding the point of operation and the operator can be devised. Alternate methods shall provide the same level of safety for the operator and others as the provided guard. Alternate methods must be specifically approved by Safety and Health Operations.

NEVER Remove Guarding.

- Never modify tools or machinery without proper design and test criteria from Hull or Facility Engineering and approval from Safety and Health Operations.
- When using tools that could present a hazard to others, direct work away from aisles, walk-ways, and other employees working in close proximity. If the direction of work cannot be controlled, shields or temporary barriers shall be used.

7.2 Hand Held Power Tools

All hand held power tools shall be equipped with a constant pressure switch or control that will shut off when pressure is released. Never secure a tool switch or control in the on or open position.

Disconnect tools when not in use, before servicing, and when changing accessories, such as blades, bits, and discs.

Never carry tools by the cord or hose.

When required, guards will be used and properly adjusted. Tool crib employees are knowledgeable in these requirements.

Electrical hand tools shall be double-insulated or properly grounded. Do not repair damage to electrical components or wiring. See section 8.4 of this handbook.

Hand held tools that vibrate, causing an employee to grip with excessive force during operation, may require the employee to regulate the time frame the tool is used. Contact Safety and Health Operations or the Occupational Health Nurse for more information that may help prevent chronic injuries.

7.3 Machinery

Points of operation on mechanical power presses, shears, and other machinery shall be guarded for work.

Hydraulic and pneumatic power presses, hammers, and press brakes will have guards on points of operation, where possible. The unused sections of press brakes will be guarded at all times during operation. Where point of operation guarding is not feasible, efforts will be made to use hand tools, push sticks, or other means to prevent inadvertent contact with the point of operation.

If two employees are required to handle a work piece, the operating controls for both employees must be interlocked to prevent the operation of a machine without both employees' awareness.

Fixed machinery shall be securely anchored to prevent walking or movement.

When operating rotating or reciprocating machinery, do not wear gloves, neckties or loose-fitting clothing. It is strongly recommended that rings and other jewelry be avoided. If a holding device is used (such as pliers), gloves are permitted.

The operating area around machinery is to be kept clear of obstructions at all times to prevent employees from being exposed to trip hazards.

Never operate any machinery unless properly trained and authorized by the supervisor in charge of the machinery.

The operator shall ensure that all belts, pulleys, gears, shafts, and moving parts are guarded prior to operating the machinery.

Foot-operated machines shall be protected from accidental operation and all control switches shall

be so guarded that they cannot be accidentally turned on.

No maintenance work or machine cleaning (routine or special) shall be performed on machinery until the lock out/ tag out procedure is followed. See SPM-S-21 for details.

7.4 Special Tools

Abrasive Wheels

Bench and/or pedestal grinders must have tool rests. The tool rest must be within 1/8” of the wheel. Tongue guards must be installed and must not exceed ¼” from the wheel.

Do not grind aluminum on abrasive wheels marked "steel only".

Do not "groove" on abrasive wheel by grinding small objects in one spot.

Ensure that the grinding tool or machine does not exceed the RPM rating of the wheel that is being used. This may be checked at the tool crib for portable hand tools.

All grinding wheels or hand held power tools with a diameter greater than two (2 1/2) inches shall be guarded.

Wire Wheels also require tongue guards with ¼" placement.

The maintenance or mounting of grinding wheels on fixed grinding machinery requires a ring test and shall be done by properly trained personnel only.

Sanding Discs or Belts
Never use a polishing tool to grind metal.

Belt sanding machines shall be provided with guards at each nip point.

The unused run of a belt sander will be guarded at all times.

8.0 High Risk Processes

8.1 Confined Space Entry

There are many hazards associated with entry into confined spaces. These hazards differ greatly depending on the ship's stage of construction. Poorly ventilated, sealed or freshly painted tanks have the potential to be life-threatening due to the lack of oxygen or the presence of flammable or toxic vapors. Some of the processes performed during construction create their own hazards that are amplified by the design of a confined space. Yellow/black temporary exhaust ventilation is required to be installed in all confined spaces 30 minutes prior to entry. Many confined spaces also require that testing be performed by a Shipyard Competent Person before entry is permitted. SPM-EL-01 provides detailed guidelines to ensure your safety. The procedure applies to shipboard and land-side confined spaces and must be reviewed by supervisors with their employees prior to entering confined spaces. This communication training is critical to the safety of employees. Questions involving confined spaces should be directed to the Lab @ Ext. 3022.

A confined space is defined as:

1. A room not designed for human occupancy
2. Limited access
3. Does not have adequate natural ventilation
4. Can readily aggravate an exposure –because of its small nature, a confined space permits contaminants to be more concentrated

An enclosed space is defined as a space enclosed by bulkheads (walls) and an overhead (ceiling).

8.2 Hot Work

- All employees performing hot work must be trained on the requirements of SPM-EL-11 as applicable to their work location.

- Hot work at all BIW facilities will be performed in accordance with SPM-EL-11. Hot work is not permitted on commissioned ships or on ships that contain fuel without a Marine Chemist certificate and a written "Hot Work Permit" for the specific job, signed by a "Shipyard Competent Person" (SCP) (Laboratory Technician).

- All flammable liquids or combustible/ignitable materials must be removed from the work area for a distance of thirty five feet. Shielding the

hot work or protecting the combustible/ignitable materials by using a fire resistant covering is also acceptable. A trained fire watch is necessary if the above precautions cannot be accomplished.

- Hot work is not permitted on hollow structural voids (i.e. pipe stanchions, railings, fair waters, bilge keels, rudders, etc.) until tested by the SCP. Internal rusting of these structures creates potentially explosive atmospheres.
- Hot work is not permitted on coated surfaces, except as provided in SPM-IH-08.
- Hot work permits are required on ships that contain or have contained fuel and in non-designated hot work areas such as the paint building, storage buildings, office areas, etc.
- Hot work permits are requested by the trades or supervision for a specific job and signed by the Shipyard Competent Person (SCP) after appropriate inspections are performed. An SCP will determine if a trained Fire Watch is necessary.
- Some hot work requires that a trained fire watch be assigned. This typically occurs when combustible materials cannot be effectively removed or protected.

- For your personal safety and the safety of those around you, you are responsible to inspect the work area and the opposite side of your hot work to ensure that fire hazards have been addressed. Supervisors are expected to ensure that fire hazards have been abated.
- In enclosed and confined spaces, local exhaust ventilation tubes are required on all hot work processes. Employees must comply with the "Respirator/Ventilation Requirements" chart in SPM-IH-03 for various shipyard tasks.
- In the case of carbon arc gouging and plasma arc cutting, a box plenum must be attached to the ends of two ventilation tubes. If a box plenum does not fit into the workspace, each ventilation tube must have a 3-foot metal extension at the end.
- Where practical, welding screens must be used in welding and cutting operations to protect employees working nearby from harmful radiation.
- Goggles, hoods, and shields that give maximum eye protection for each cutting or welding process shall be worn by operators and their assistants (see Section 2.2). Additional guidance is available in SPM-S-05.

- Operators of manual or mechanized welding and cutting machines must be protected from potentially harmful ultraviolet radiation in the direct or reflected arc. Eye and face protection in the form of safety glasses and welding hoods are required for exposure to the direct arc. Refer to Section 2.2 of this handbook for the required shade values of lenses. Operators of mechanized welding machines with enclosures that shield the arc must wear safety glasses and welding hoods (or shaded face shields that are approved by Environmental, Health & Safety on a case-by-case basis) that provide protection from the indirect arc that reflects off nearby surfaces. Refer to SPM-S-05 for additional guidance.
- All burners and welders must wear flame-resistant gloves. See SPM-S-05 for a chart that outlines Protective Glove Requirements.
- See Section 2.7 for mandatory PPE for hot work.
- Hearing protection shall be used if excessive noise levels are encountered (see Section 2.5).
- Because plasma arc cutting presents unique hazards, separate training is required in order to use plasma equipment.

- Employees who plasma-arc cut or weld/tack (GMAW, FCAW, SMAW) on stainless or Inconel steel are required to use respiratory protection and attend Hexavalent Chromium Compliance training. See SPM-IH-15 for details on the program and the "Respirator/Ventilation Requirements" chart in SPM-IH-03.

8.3 Spray Painting

- Spray painting will be accomplished in accordance with SPM-EL-04.
- Spray Painting Permits issued by the Lab are required when spraying combustible liquids in enclosed or confined spaces.
- Spray Painting permits are filled out by the painting supervisor and signed by the SCP after an appropriate inspection to ensure that proper precautions have been implemented.
- Spray painting requires that containment, temporary ventilation, proper posting of the area, appropriate lighting, removal of all temporary electrical connections, and other safety precautions be implemented prior to the actual spray job.

- Spray painting will not occur when there are spark-producing operations within 20 feet, unless authorized by the SCP.
- When spray painting, the minimum personal protective equipment includes eye, skin, and respiratory protection in accordance with SPM-IH-03, SPM-EL-04, AND SPM-S-05.

8.4 Electricity

Electricity is one of the major forms of power in use at BIW. Only authorized personnel shall install, repair, and maintain electrical equipment on ships, buildings, or physical plants.

Only trained, qualified, and authorized personnel may relocate, remove, repair, or alter electrical wiring or equipment in the buildings and physical plant.

Only trained, qualified and authorized personnel will maintain and install all temporary electrical services.

Shipboard electrical circuits are to be maintained by personnel who are trained, qualified and authorized.

Report electrical problems! Do not attempt to tem-

porarily or permanently repair electrical wiring or circuits unless you are trained, qualified, and authorized to do so. Duct tape is never an acceptable repair for damaged cords, leads, or other electrical wiring. Report duct tape repairs to your supervisor.

Treat all lines and leads as if they are live. Lock-out/tag-out devices shall be used when electrical circuits or physical plants are under repair or for required maintenance purposes. These devices are to be removed only by the person who installed them, or in special cases, by a competent or authorized person directly involved in the project.

Grounding

Welding on improperly grounded material can lead to shock injuries. Ensure the structure (piece or pipe) you are welding is adequately grounded. This may require a ground strap. Coatings or other items that cover or prevent contact with the base metal must be removed or cleaned before proceeding. Additional guidance is available in SPM-S-12.

Lockout/Tagout

- SPM-S-21 addresses lockout/tagout within the facility and shipboard.
- Shipboard lockout/tags plus processes are controlled by DOI 10-018.

- Lockout/tags plus is a process that ensures the hazardous energy is controlled. Hazardous energy can be electrical, pressure, heat, steam, water and many others.

Never attempt to energize or bypass any electrical equipment that has been red-tagged or is in the process of lock-out/tagout.

Before using any electrical equipment, make sure you have received proper training. Check all power cords, welding leads, etc., to ensure that there are no exposed wires and that insulation is in good repair. Report any needed repairs immediately to Supervision. Do not attempt any repairs yourself.

All electrical shocks are to be reported immediately and the employee shall be transported by ambulance for evaluation.

Electrical Emergencies:

- If you see that someone is captivated by an energized electrical circuit: ***Do not touch the person!***
- De-energize the power source immediately if you are qualified or seek out a qualified person.

Call the emergency # (2222, 1222, or 911—then 2222) to get immediate medical assistance, then notify your supervisor. The Supervisor will then follow the requirements of SPM-S-03.

9.0 FIRE PRECAUTIONS AND EMERGENCIES

9.1 Fire Emergencies:

Remember that free access must be maintained at all times to all exits, fire alarm boxes, and fire extinguishing equipment. Be familiar with the locations of fire fighting and other emergency equipment in your area. Awareness of your work environment is paramount in keeping yourself and others around you safe.

Employees are expected to extinguish small fires when possible; good judgment should be used. There is no expectation that an employee place himself or herself in danger in order to contain a small fire. If for any reason you feel unsafe, evacuate immediately. REPORTING REQUIREMENTS? LAM TO GET BACK TO THIS

Classification of Fires:
Class A. A type of fire that leaves an ash, such as ordinary combustible materials, wood, paper, cloth, cardboard, etc. These fires can be extinguished with water or A.B.C. extinguishers.

Class B. With flammable liquids, grease, paint, or solvents, extinguish the fire by blanketing, smothering, or flame interruption using CO2, or PKP, or A.B.C. extinguishers.

Class C. C is current - involves electrical equipment. The electrical non-conductivity of the extinguishing agent is of prime importance. Use CO2, PKP, or A.B.C. extinguishers. DO NOT USE WATER.

Class D. Combustible metals such as magnesium, potassium, sodium, etc. Extinguish the fire by using dry sand, metal X, or dry compound.

Whenever a fire extinguisher is used or is discovered to have a broken seal, report it immediately to the Fire Department or a Fire Inspector. Call Ext. 2345 so that the fire extinguisher can be inspected, resealed, or replaced. Report all fires to management.

Fire extinguishers are inspected monthly by the Fire Department. It is important that if you move an extinguisher that you return it to its original location.

9.2 Flammable Liquids

Flammable liquids shall not be used when less hazardous liquids are as effective. Flammable liquids with a flash point of 80 degrees F or less shall be handled in accordance with established procedures (i.e., alcohol, gasoline, UGS-50).

Flammable and combustible liquids shall be stored in approved buildings, containers, or areas. Small volumes may be stored in shops if kept in approved flammable liquid storage cabinets or containers. Shipboard storage of flammable and combustible liquids shall not exceed more than one day's use unless authorized by the Fire Chief, Marine Chemist, or Safety and Health Operations.

9.3 Emergency Numbers

1. Use emergency numbers:

   Bath x2222
   Hardings/EBMF/CW x1222
   ALL OTHER LOCATIONS:
   911 – THEN CALL x2222

2. When reporting an emergency, be prepared to give the following information:
   a. The name of the building or ship
   b. What the emergency is
   c. Where it is located

d. Which entrance to use, your name, and the phone number.

Emergency phone number stickers for telephones are available through the Fire Department. If your phone does not have one, notify your supervisor, who will see that the phone is so marked.

9.4 Evacuation Procedures

All supervisors are required to maintain a mustering site for their crews in the event that a work site must be evacuated for any reason. Check with your supervisor for your mustering site. Report only missing personnel to the Fire Department Accountability Inspector or the Officer in Charge at the scene.

There are various forms of alarms in use in the yard and on ships, including but not limited to horns, bells, buzzers, flashing lights, and public address systems. You should become familiar with the alarms and protocols in your area.

A Fire Safety Plan has been developed by the Fire Department and is available on the BIW Intranet (Environment/Health/Safety, EHS Mgmt System, BIW Emergency Response Manual, Evacuation Procedures). The intent of the plan is to provide

employees with a set of procedures to ensure they are protected from fire hazards in all aspects of shipyard employment, regardless of geographical location. The importance of knowing and understanding your surroundings cannot be overstated. *Remember that safety is everyone's job.*

10.0 WARNING SIGNS/BARRIER TAPE

10.1 General **-** It is important to remember that warning tape and signs are one form of communication used in the shipyard; it is important to read the messages on the signs and adhere to them. If signs are missing, avoid entering the area for your own safety and report the issue to the nearest supervisor. For more information, see SPM-S-11.

10.2 YELLOW CAUTION TAPE is used to secure an area when performing a job that may present an intermittent hazard of low risk that requires extra precautions. ***Only "Caution" signs will be used with yellow caution tape.***

10.3 ORANGE DO NOT ENTER TAPE is used to secure an area when performing a process or an operation that contains potential hazards of higher risk such as missing fall protection, potential falling material, burning paint, etc. See partial list below. ***Only Do Not Enter signs will be used with orange Do Not Enter tape.***

Some examples are:

- Falling Material (Load Outs/Suspended loads, Scaffold Erection and Dismantling, Overhead Crane Work, Staging Blow Down)
- Lack of Fall Protection/Slippery Conditions (Unit Erections, Ice & Snow Conditions)
- Biological Agents (Blood Cleanup)
- Load Testing (Static & Dynamic Testing, Machinery Testing)
- Struck-By Exposure (Milling Machine Operation, Unit Lifting and Jacking, Line Handling)
- Energy Release Exposure (Working Live Power, Shore Power Hook Up Zones)

Personnel seeking entry into the secured area must obtain permission from the supervisor(s) in charge or the designee before entering the area. The person granting access must be present at the secured area to give permission for entry.

Any other use of Do Not Enter Tape and Signs other than those established in the list above requires the evaluation and permission from the Environmental, Health and Safety Division.

10.4 RED DANGER TAPE is used by Safety, Health, and Environmental representatives exclusively. It is used in situations where imminent danger(s) or severe hazard(s) may exist. Only personnel authorized by Safety, Health, and Environmental Operations may be permitted to enter the boundaries of red danger tape. ***Only "Danger" signs shall be used with red danger tape.***

10.5 MAGENTA/YELLOW striped tape is used by Non-Destructive Testing personnel. It is used to warn against potential radiation hazards during the NDT process. No one is permitted in the area during testing.

10.6 RADIO FREQUENCY RADIATION Hazard sign is used to communicate the potential danger when antennas rotate and/or radiate. Do not pass beyond this sign.

10.7 NOTICE SIGNS are used only to communicate general information to the employees. Examples are the closing of a passageway, disposal of waste material(s), and general trade work. It may be appropriate to have a Notice sign give direction to "Do Not Enter" to protect a production process, i.e., curing of paint. Notice signs may not be used with any

barrier tapes, i.e. “Caution”, “Do Not Enter”, or “Danger” tape.

10.8 The correct sign will be hung with the appropriate tape. The sign will include the reason for the direction, the supervisor(s) (or designee) name or point of contact, the date when starting, and phone extension or beeper number.

10.9 Tape and sign barriers shall be properly maintained i.e., tape and signs damaged by weather shall be replaced. Upon completion of the task, all tape and signs must be removed and disposed of promptly. It is the responsibility of the person who installs the tape and sign(s) to maintain compliance for the duration of the process.

11.0 HAZARDOUS WASTE MANAGEMENT

All waste material shall be handled in accordance with established procedures and placed in the appropriate containers to ensure proper disposal. Every employee is responsible for discarding waste into the proper container. SPM-EL-06 details specific instructions for handling hazardous waste. SPM-EL-23 further specifies requirements for those employees assigned to the central waste accumulation buildings.

11.1 General

BIW Environmental Operations personnel make every reasonable effort to identify hazardous wastes generated at BIW. Any employee generating a waste that is suspected to be hazardous should contact a supervisor or Environmental Operations to make a proper determination. Only trained personnel can handle hazardous waste.
At BIW, potential hazardous wastes include (but are not limited to) the following:

- Boiler soot and debris
- Waste antifreeze with lead
- DOP plasticizer
- Developer/cleaner fluid

- AFFF contaminated with lead
- Sodium hydroxide solution
- Photographic fixer
- Gasoline/diesel and debris
- Tectyl 891
- Waste mercury
- Lead paint /chips and debris
- Waste paint and solvent wash
- Waste coolant
- Waste machine coolant with lead or chromium
- Expired flammable materials

Hazardous waste transported within the Bath facility must have a fluorescent orange shipping tag with the preprinted words “Ship To: HAZARDOUS WASTE STORAGE BUILDING.” This label must be affixed to the secured container prior to transporting. Any other shipping tag with the words ‘HAZARDOUS WASTE” is not acceptable.

11.2 Training

- Employees handling hazardous waste are required to have annual training. This training is provided in Mandatory Safety Talk #170, and meets regulatory requirements.

- Employees assigned to central waste accumulation areas must receive annual classroom training as well as on-the-job training in order to work in these areas.

11.3 Hazardous Waste Collection

- Hazardous waste must be accumulated in containers that are compatible with the material.
- Storage of hazardous waste containers must be in approved accumulation locations.
- Waste paint should be poured off directly into collection drums located at the accumulation stations by trained personnel. Waste is not to be placed outside designated storage buildings.

11.4 Labeling

All hazardous waste containers must be clearly labeled to identify the material and must have the proper markings. Every container of hazardous waste at BIW must have the following markings at a minimum:

- The words “Hazardous Waste”
- What the waste is (i.e., “waste paint”)
- The accumulation start date

In most cases, Hazardous Waste personnel will pre -label containers. If a container is not labeled, Environmental Operations must be contacted at x5000.

11.5 Waste Paint and Solvents

These wastes are to be accumulated at designated locations throughout the shipyard. In general, these are the white buildings labeled “HazStor” found at each facility. Personnel generating this waste are to make every effort to segregate the two waste streams to maximize recycling efforts for solvent.

When authorized by Environmental Operations, “Satellite Accumulation Areas” can be established for small quantities of waste.

Hazardous Waste Personnel check all storage and satellite areas weekly. Each facility designates personnel to relocate waste from these locations to a 90-Day Hazardous Waste Storage area when the containers become full, where they await shipment by a licensed hazardous waste transporter.

11.6 Paint Kits and Debris

Paint kits are to be returned to the Paint Issue Station upon job completion or no later than the end of shift. The attendant will then determine if the paint can be re-issued. Waste paint shall be poured into the appropriate hazardous waste drum by the paint issue station attendant, when determined to be of

no further use. Used rollers, paint brushes, stirring sticks, empty cardboard containers, etc., are to be placed in the paint debris boxes located near the Issue Stations.

Note: This material must contain no free liquids. All free liquids should be returned to the Paint Issue Station or poured off into the proper drum at the collection location.

11.7 Aerosol Spray Cans and Hand-Held Disposable Gas Cylinders

Spent aerosol cans and gas cylinders are to be placed in the fluorescent orange cans marked "SPENT AEROSOL CANS" located throughout production areas. Non-empty spray cans are to be returned to the Tool Issue Room for re-issue.

11.8 Dip Tanks

Area Management must contact Environmental Operations to coordinate removal and disposal of the tank contents from the following tanks:

- Brulin tanks
- Parts washer tanks
- Wave Guide tank
- Label Plate shop tanks
- Bernite tanks

Upon refilling of any tank, precautions must be taken to ensure the contents do not overflow, causing a spill.
Note: To prevent inadvertent contamination, dip tanks should only be utilized for their intended purpose.

11.9 Corrosive Liquids (i.e. acids, boiler treatment chemicals, etc.)

Waste corrosive liquids must be collected in DOT-approved corrosive liquid containers by the generating department and sent to the Hazardous Waste Building immediately for accumulation and storage.
Note: Corrosive liquids must not be mixed together or with other material without approval from the Environmental Operations Department.

11.10 Miscellaneous Hazardous Waste

Many of the Hazardous Materials utilized at BIW could be hazardous waste if discarded. Employees are responsible for contacting Supervision if the proper disposal method for a hazardous material is not known. Area Management is responsible for coordinating disposal of any other wastes with the Environmental Operations Department.

12.0 SPECIAL WASTE

12.1 General

Certain types of waste are not classified as "hazardous waste" by EPA, but do require special handling. SPM-EL-20 outlines the requirements for managing special wastes.

12.2 Oil Filters

Used oil filters at Bath are to be transported to the Maintenance Garage for crushing. At off-site locations, used oil filters are to be placed in marked drums for proper disposal.

12.3 Blast Grit

Spent abrasive is to be cleaned up as soon as feasible to prevent contamination from "shipyard debris" and other pollutants. Each type of abrasive media (aluminum oxide, steel shot, and garnet) is to remain segregated from first use to disposal, to facilitate recycling where possible. Spent abrasives must be disposed of in labeled drums or roll-offs.

12.4 Asbestos

Asbestos must be disposed of in proper containers provided by Environmental Operations. Personnel handling asbestos must be properly trained in accordance with safety & health procedures.

13.0 UNIVERSAL WASTE

13.1 General

Universal wastes are hazardous wastes that can be recycled. SPM-EL-24 outlines the requirements for managing universal waste. Any employee designated to handle Universal Wastes must receive Universal Waste Training.

13.2 Fluorescent Light Bulbs/CFLs

Spent bulbs must be packaged by **trained** employees and shipped to the Central Waste Accumulation Storage Area.

Waste accumulation areas are designated at each facility generating spent bulbs.

13.3 Computer Monitors (CRT's)

CRTs cannot be discarded into general trash. Contact Environmental Operations for proper disposal.

13.4 Spent Batteries:

Battery disposal at BIW falls into two categories:

- Alkaline Batteries: All spent batteries marked alkaline can be disposed of in any regular trash container (*example: Size D batteries used in flashlights).*

- All Other Batteries: All other batteries must be returned to the tool crib or shipped to the Hazardous Waste Storage area (*example: Batteries used in automobiles, Ni-Cd batteries used in emergency lighting or power tools, lithium batteries used in digital cameras).* **The above described waste must never be thrown in the trash.**

13.5 Mercury Devices/PCB- Containing Light Ballasts

Those devices containing mercury or light ballasts containing PCBs must be handled as Universal Waste in accordance with SPM-EL-24.

14.0 NON-HAZARDOUS SOLID WASTE

14.1 General

Non-hazardous solid waste must be managed in accordance with SPM-EL-20. BIW is committed to recycle as much of its waste as possible. Proper segregation of wastes is crucial to recycling and preventing unnecessary waste from entering landfills. The following is a breakdown of where non-hazardous waste must be placed.

14.2 Container Accessibility

Area Management and Supervision are responsible for making color-coded containers (Red, Yellow, Gray and Green) accessible to waste handling vendors. This includes ensuring that containers are lifted off ships and units and placed in designated areas in time for pick-ups. Red Totes brought into buildings must be returned to the outside of the building for proper processing prior to the end of 2nd shift. SPM-EL-20, Solid Waste Management Procedure, outlines these requirements as well as the waste pick-up schedules.

14.3 Wood Disposal

Scrap wood must be placed into GRAY containers marked “Wood Only” or directly into roll-offs labeled “Wood Only.” Large or bulky pieces of scrap wood should be banded together on pallets for easier transport.

14.4 Scrap Metal Disposal

In general, scrap metal is to be placed into YELLOW containers for recycling. **Note:** Certain areas, such as the Pipe Shop and Machine Shop have their own containers for scrap pipe or turnings.

14.5 Single Stream Recycling

Cardboard, paper, plastic, glass, and metal drink cans must all be placed in GREEN containers for proper recycling. Any food residues should be cleaned from containers. Every effort should be made to break down large material (i.e., cardboard boxes) to maximize space in the containers.

14.6 Cloth Rag Disposal

Shop towels are sent off-site for cleaning and reuse. In order to facilitate this process, dirty rags must be placed in properly marked containers and remain covered at all times. Rags saturated with liquid (i.e., solvents, paints, etc.) must be sent to Hazardous Waste. Rags saturated with water must be wrung out before being placed in proper containers.

14.7 Oily Waste

All oil at BIW can be recycled. If you are generating oil, waste oil should be accumulated in the proper container and marked “Waste Oil”. Full containers should be shkpped to the Hazardous Waste Central Accumulation area at the facility for proper collection and recycling.

14.8 Shipyard Waste

All other non-hazardous waste that does not fall into any of the above categories is to be thrown away in any of the RED receptacles or a designated trash chute. **NOTE:** Never throw away any hazardous waste, universal waste, liquids or recyclable material into red waste containers.

14.9 Waste Determination

Contact Environmental at x5000 if you are unsure of the waste you are generating. A determination can then be made on how to properly handle and dispose of the waste material. Do not place unknown waste material into red shipyard waste containers.

15.0 SPILL PREVENTION & RESPONSE

15.1 General

Chemical or oil (such as lube, hydraulic, or fuel) spills can create hazardous conditions and damage the environment. Even spills onto impervious surfaces, such as pavement, can eventually lead to environmental harm when storm water washes the residues into the river.

All employees are responsible for following Best Management Practices (BMPs) as outlined in SPM-EL-15, when handling materials which could spill. Spills must be handled and reported in accordance with SPM-EL-03.

15.2 Spill Response

Incidental spills must be immediately contained and cleaned up by the person conducting the process that resulted in the spill. If additional material or help is needed contact:
Bath Hazardous Waste Buildings, Ext 3018
EBMF, Ext 2784
Hardings, Ext 1747

Note: An Incidental spill is a small quantity that results from normal operations (i.e., paint spillage during mixing, oil drips from filling of equipment. etc.). These types of incidents are minor and should be handled by the individuals at the locations.

For spills of unknown material or spills that are beyond your own ability to clean-up, contact the emergency numbers in Section 15.3 below for assistance. Refer to SPM-EL-03 for notification and response requirements.

When an employee recognizes a spill of a flammable or combustible liquid such as paint or oil aboard a vessel at BIW, he/she will notify those in the immediate area who are performing hot work to cease the operation. The employee will then notify Supervision and/or the fireguard so announcements can be made over the intercom system. Supervisors or the fireguard will call the facility's emergency number so an assessment of the conditions can be made. The Laboratory will determine if hot work may continue.

15.3 Spill Notification

To Report Spills:

- EBMF, Hardings x1222
- Bath and all other facilities x2222

15.4 Petroleum Product Transfers

Transfers of petroleum products create the potential for significant spills. All transfers of petroleum product to or from ships must be done in accordance with the BIW Petroleum Transfer Operations Manual. This manual details the specific requirements to safely transfer petroleum products. It specifically requires that only Qualified Personnel, as deemed by the Chief Operating Engineer, can conduct transfers. All other types of petroleum product transfers must be done in accordance with SPM-EL -25.

15.5 Material Storage

Employees shall ensure liquids such as oils, paints, and solvents are stored in adequate secondary containment, so that accidental spills or leaks cannot reach the receiving waters.

Exterior Storage:

- Material storage must be located away from receiving waters and catch basins, and in low -traffic areas.
- Temporary staging of liquid materials (paint, solvent, oil etc.) shall be located away from storm drains.
- The mixing of paints and solvents shall be carried out in locations and under such conditions that no accidental spills may enter the receiving waters.

- Hand-carrying open containers of oil, solvents, or paints shall be prohibited to the maximum extent practical.
- All containers of product must be covered when not in use.
- Proper spill containment shall be utilized on all exterior operations where petroleum products are used, such as CPP system fill and test or void space fill and drain operations, to prevent accidental leaks or spills from discharging directly into the river.
- Employees shall keep material out of walkways and off of loading and unloading areas. These areas should be marked with painted lines and signs.
- The employee handling material shall be responsible for establishing visible barriers or signals for material that temporarily extends into walkways, roadways, etc.

Interior Storage:

- Pallets, boxes, bags, containers, bundles, etc. stored in tiers shall be blocked, interlocked, and limited in height so that they are stable and secure at all times. Only use pallets in good repair. Pallets and material storage reduce the handling necessary to transport material into production areas, as well as removing the finished product from shop areas.

- Designated storage areas shall allow clearance between the top rack of storage and automatic sprinkler heads of at least 18".
- Materials handled from aisles must allow for the turning radius of any vehicle to be used.
- All exits and aisles, automatic sprinkler system controls, electrical panel boxes, fire hoses, extinguishers and other emergency equipment must be maintained and unobstructed at all times.
- Material cannot be stored in aisles at any time.
- A distance of 8 feet must be maintained at all times between combustible materials and flammable liquids.
- There are limitations on the volume of flammable and combustible liquids that can be stored inside. Contact Environmental, Health & Safety for these limits.

16.0 AIR EMISSIONS

16.1 Paint Usage

BIW is limited to the amount of Volatile Organic Compounds (VOC's) that can be contained in paint. The regulation that dictates this is referred to as NESHAP. SPM-EL-16 outlines the specific requirements for using paints on ships or ship parts.

In general, the following requirements apply:

- The type and amount of thinner that can be used with a particular coating is controlled.
- Contact the Paint Warehouse at x3306 to determine if a coating can be thinned.
- If a coating can be thinned, the Warehouse will issue the proper thinner in the allotted amounts.
- Paint and solvent containers must be covered at all times unless material is being added or removed from the container or the material is being mixed.
- All coatings must be approved by EHS and Paint and Process contact.

16.2 Exterior Blasting and Painting

To ensure compliance with regulations, BIW has established Best Management Practices (BMPs). BMPs are BIW's required practices to minimize environmental impact. SPM-EL-15 contains specific information on the proper BMPs for exterior blasting and painting. Environmental Operations must

be notified 24 hours prior to any exterior blasting operations.

Some examples of BMPs are:

- Blasting and mechanical cleaning activities must be contained to the maximum extent practical to prevent abrasives, dust, and paint chips from polluting the atmosphere and/or reaching the receiving waters. While in drydock, the “enviro-screen” must be in place at both ends of the drydock during blasting activities.

- Uncontained, exterior abrasive blasting on hulls located in the water, or within close proximity where media may enter the water, is prohibited.

- Spray painting activities must be enclosed, covered, or contained, to the maximum extent practical, to prevent overspray from polluting the atmosphere and/or reaching the receiving waters.

- Exterior abrasive blasting and/or spray painting are prohibited when the wind velocity exceeds 20 miles per hour from any direction at the nozzle.

- Blasting units and associated pollution control equipment are to be operated and maintained at maximum efficiency, at all times.

16.3 Miscellaneous Air Issues

Particulate filters and collectors (i.e., Torrits, spray room filters, and rotoclones) are to be maintained in standard operating condition. Any associated filter pressure drop gauges or indicators are to be maintained in standard operating condition. There should be no visible emissions from these types of units.

Releases of Refrigerant or Halon, whether inside or outside, need to be reported to the Environmental Operations Department at Ext. 5000 for proper documentation.

17.0 WATER DISCHARGES

BIW generates many process wastewaters. These are wastewaters that result from the introduction of water into an industrial setting. Proper handling and disposal of wastewater is critical to protecting our environment.

SPM-EL-21 outlines the specific requirements for handling wastewater, and should be referred to for the most up-to-date list of water discharge requirements.

SPM-EL-15 outlines the specific requirements to minimize contamination to storm water runoff. At BIW the main types of water discharges are:

1. Direct to a water body,
2. Sewer discharges (with and without pretreatment)
3. Storm Water discharges
4. Snow Dumps

17.1 Water Discharge BMPs

At a minimum the following BMPs must be followed for water discharges of any kind:

- There must be no visible oil residues or sheen (unless being discharged to the sewer through an oil/water separator);
- All decks, surfaces and other areas that water may come in contact with must be swept clean prior to using water;

- All debris must be contained;
- No cleaners or other chemicals are to be added (with the exception of Iron Out) without approval from Environmental Operations.

Wastewater Discharge Summary

Discharge Stream	Direct Discharge	Direct Discharge to Sewer	Discharge to Sewer w/Pre-treatment	Collection
flame straightening (Bath)	x			
sonar dome hydro test	x			
clean storm water pumped from units and spaces under construction	x			
building wash without cleaners or chemicals	x			
hull deck wash with Iron Out (<3,000 psi)	x			
hull wash to remove marine growth (3,000 to 10,000 psi)	x			

Wastewater Discharge Summary				
Discharge Stream	Direct Discharge	Direct Discharge to Sewer	Discharge to Sewer w/Pre-treatment	Collection
Clean standing water on building floors from storm water or snow melt	x			
snow from plowing and shoveling roads and walkways	x			
2nd rinse and subsequent from TSP/Citric and ChemCrest flush-es		x		
boiler blow down		x		
pipe hydro test		x		
metal quenching		x		
potable water tank chlorinating and disinfecting		x		
potable water tank rinse		x		
flame straightening (EBMF)		x		
Brulin rinse		x		
HVAC cooling tower		x		

Wastewater Discharge Summary				
Discharge Stream	**Direct Discharge**	**Direct Discharge to Sewer**	**Discharge to Sewer w/Pre-treatment**	**Collection**
wash water from exterior vehicle power washing		X		
wash water from power washing air filters from ship de-misters, air condition units, etc.		X		
Aqua Miser process water		X		
blast settling tank wastewater		X		
others as approved by the POTW		X		
oily water from ship bilges			X	
photo process discharge			X	
air compressor oily water			X	
hull blast water (>10,000 psi) via drydock storm water collection tanks			X	
Strip-it and Time Saver process water				X
machine shop coolant				X

Wastewater Discharge Summary				
Discharge Stream	Direct Discharge	Direct Discharge to Sewer	Discharge to Sewer w/Pre-treatment	Collection
waste oil missile water after separation			x	
MAFO door rinse after neutralization			x	
HeathPit water			x	
Wave Guide rinse		x		
TSP/Citric Acid and ChemCrest 1st flush and rinse				x
Wave Guide cleaning solution				x
AFFF solution from system testing				x
machine coolants				x
bilge cleaning with cleaners				x
blast vacuum and rotoclone water				x
Brulin solution				x
RDP solution used for any surface preparation or cleaning process				x
Bernite Solution				X

The list in the preceding table is not "all-inclusive." Any department that generates wastewater from a process that is not outlined above must notify Environmental Operations to determine proper handling.

17.2 Storm Water Discharges

Run-off from storm water has the potential for creating a significant impact to the water surrounding BIW facilities. As pollutants from various operations (welding, burning, grinding, painting, , blasting, etc.) fall to the ground, they can get washed into the river and negatively impact the river or other nearby streams.

The best and most effective way to prevent storm water run-off from causing water quality problems is to keep areas that rain water contacts clean. Picking up debris and sweeping at the completion of a job or shift are the most effective ways that can be done.

SPM-EL-15 contains the BMPs that need to be followed to minimize impacts from storm water run-off.

18.0 COMMUNITY NOISE CONTROL

BIW has an obligation to be a responsible citizen in the communities we operate in. All of BIW's manufacturing facilities are situated in residential areas and are subject to community noise control standards. These community noise standards set limits on shipyard noise for daytime hours (7AM-7PM) and more stringent limits for nighttime hours (7PM-7AM). To ensure compliance with these standards and to prevent disturbing our neighbors, there are several best management practices that need to be followed. SPM-EL-22 lists in detail the BMPs for reducing the impact of shipyard noise on our neighbors. Several of the key BMPs are as follows:

- All solid waste and recycling containers at the Brunswick facilities are to be picked up after 7 AM.
- Coppus blowers used on the LLTF are to be covered with sound control boxes to the maximum extent possible.
- The West Side bay doors on the POII and Ultra /Outfitting Hall are to be kept closed after sunset.
- The use of the 1MC intercom system is to be limited to day time use as much as possible.

ENVIRONMENTAL, HEALTH & SAFETY HANDBOOK

Total Safety Culture

A Journey To Safety Excellence

Safety... If not us then who?

Emergency Number:

Bath: X2222
EBMF, CW, Hardings: X1222
All other facilties: 911, then X2222