Steel fabrication/shipyards Table 1: Established alternative processes to avoid/reduce use of vibrating equipment

Activity or process	Example vibration magnitude (m/s^2)	Corresponding time to reach: EAV	ELV	Alternative methods	Further information (links on HSE website)
Manual cutting of steel plate and re-working to correct component profile using:				Expect to see accurate pre-prep, cutting components to correct size, with a minimum of "green" . *"Measure twice, cut once."* Significant exposures from re-work using grinders etc. should be challenged.	BMT "Noise Reduction in Shipyards" booklet
	4 (lowest)	3 h	12 h	Select suitable modern, precision processes for cutting out, as appropriate:	
angle grinders	8 (highest)	45 m	3 h	• CNC oxy-fuel flame cutting • CNC machining	Example: machining
straight grinders	6 (typical)	1½ h	5½ h	• laser profiling (up to approx 5 mm plate thickness)	Example: laser cutting
	15 (highest)	15 m	1 h	• abrasive waterjet cutting (up to 150 mm thickness) – cold process with no heat distortion	
chipping hammers (rarely)	18 (typical)	10 m	40 m	• submerged plasma cutting	Plasma cutting
Nibbling machine (hand-fed type)	10 (typical)	30 m	2 h	• submerged spark erosion (electrical discharge machining) Note: improving accuracy and minimising manual reworking is also usually cost-effective.	
Weld preparation and finishing using tools as above	As above	As above	As above	• Apply bevelled edges for welding while cutting out to avoid unnecessary grinding • Use single sided welding (with a suitable backing material) to avoid routine back gouging associated with double sided welding (resulting distortion can be managed with "strongbacks", heat line straightening, etc.)	Noise reduction in the ship repair industry – research report 1992 Control of noise in heavy fabrication SIM 03/1001/14
Removing fairing aids, lifting lugs, etc. using grinders (see above)	As above	As above	As above	Design fairing and lifing processes to avoid temporary welded aids which must be removed by grinding. • Use magnetic, vacuum or screw clamps and anchors instead of welded fairing aids • Bolt fairing aids to welded studs which require less grinding to remove • Design welded lifting lugs that can be left in place • Use lifting clamps instead of welded lifting lugs • Use bolted lugs or shackles instead of welded lifting lugs	BMT "Noise Reduction in Shipyards" Booklets 1 and 2 Noise reduction in the ship repair industry – research report 1992

Activity or process	Example vibration magnitude (m/s^2)	Corresponding time to reach: EAV	ELV	Alternative methods	Further information (links on HSE website)
Surface preparation using:				Cleaning steel surfaces and preparing for painting. Use of scaling tools should be minimised (small and awkward areas only) and modern vibration-reduced tools should be used.	Noise reduction in the ship repair industry – research report 1992
needle scalers	5 (lowest) 18 (highest)	2 h 10 m	8 h 35 m		Control of noise in heavy fabrication SIM 03/1001/14
scaling hammers (piston type)	10 (lowest) 40 (highest)	30 m 2 m	2 h 7 m	Where reasonably practicable an appropriate alternative process should be used, for example: • shot blasting • abrasive vacuum blasting • ultra high pressure water jetting • dry ice pellet blasting (non-abrasive, "clean" method) • ice blasting (wet)	Example: abrasive blasters
deck planers, leaf-type scalers, peening tools	15 (typical)	15 m	1 h		

Note 1: The vibration magnitudes, and associated trigger times to exceed EAV/ELV, are indicative only and will vary depending on equipment type and conditions of use.
Note 2: Changes of process to eliminate or reduce vibration may introduce other hazards to safety or health or safety (e.g. chemical, fume, spatter, noise, dust) which must be addressed and managed.
Note 3: For shipyards, HSE policy since 1998 has been to serve IN for action plan/control where no progress has been made; PN for old design chipping or scaling tools used for more than 1 hour.

PLEASE FAX COMPLETED FORM TO: 020 7717 6681
Alternative Processes for Heavy Steel Fabrication – Feedback Form

Your views are important to us so that we can improve the way we communicate information on managing the risks from hand arm vibration. We would be grateful if you could spare a couple of minutes to fill in this form and fax it back to us at the above number. Any information you provide will be treated in confidence and will only be used for research purposes. You do not have to give your contact details.

Please rate the following statements by ticking the box which most closely represents your level of agreement or disagreement with each statement.

	Strongly Agree	***Agree***	***Don't Know***	***Disagree***	***Strongly Disagree***
The activities/processes listed include those that I was concerned with					
The information given was useful in helping my organisation decide whether it should be taking action					
I was able to understand the information on alternative working methods					
I found the alternative working methods were relevant/realistic					
The information in the linked references and related guidance was helpful					
My organisation intends to take action to apply the alternative working methods					

If you have any comments you would like to make, please do so in the space below:

About you:

Please tick the primary business of your organisation

Foundries	Construction	Manufacturing
Quarry/masonry		
Agriculture/forestry	Engineering supplier	Other *Please specify*

What is your role/job in your organisation?

Employee	Middle Manager	Senior Manager
Supervisor/Foreman	Health & Safety Professional	Union representative
Self employed	Other *Please specify*	

How many people work in your organisation?

Less than 50 employees	Between 51 and 250	Between 251 and 500
Between 501 and 1000	More than 1000	

Thank you very much for your feedback. Please fax this to the number given at the top of the page

HSE are always looking for new ideas and solutions to hand-arm vibration problems. If you are willing to share your experience with others please give your details below so that we can discuss this with you.

Name: …….. Company: ……

Telephone number:…… Email: ……